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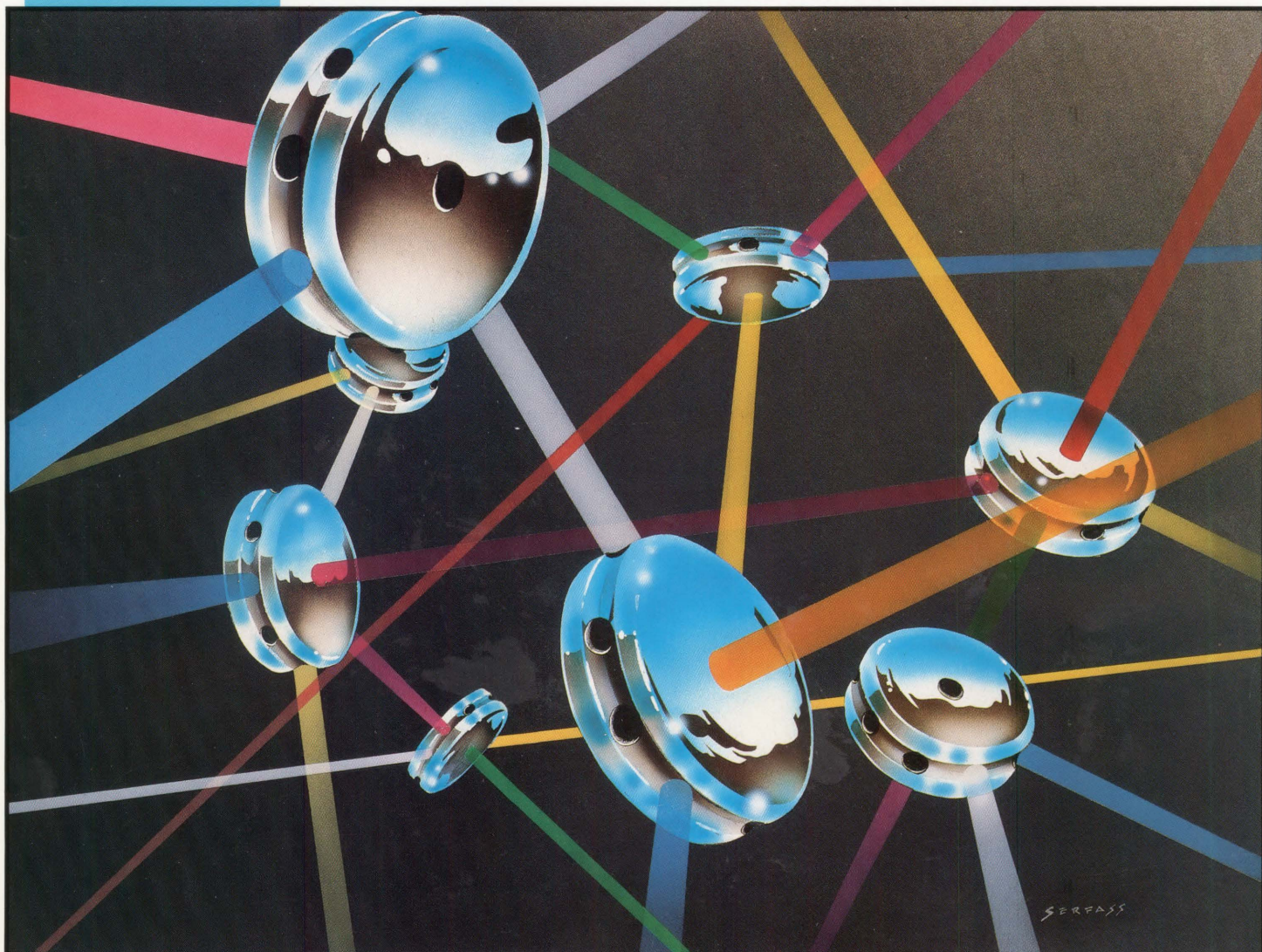
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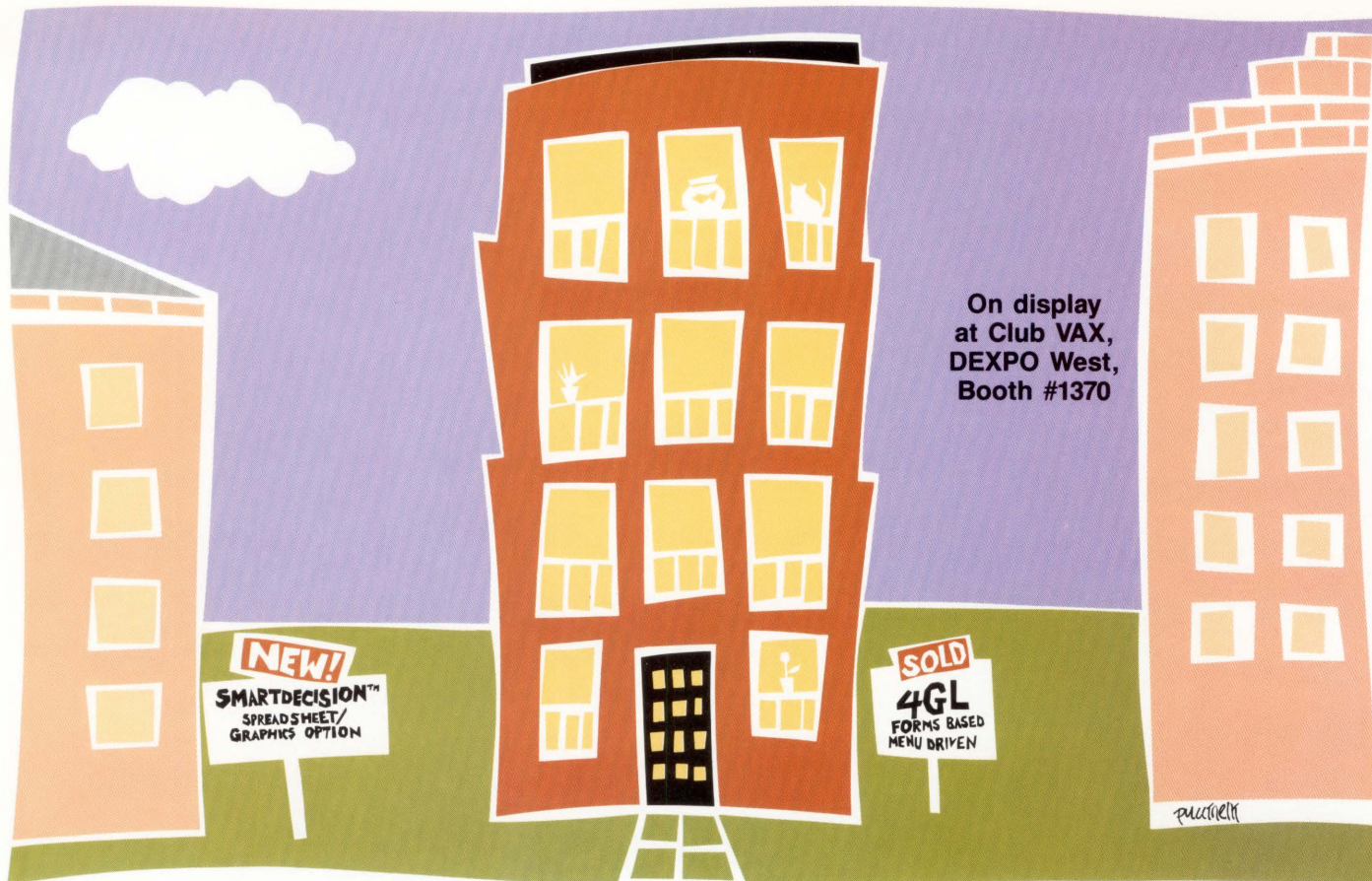
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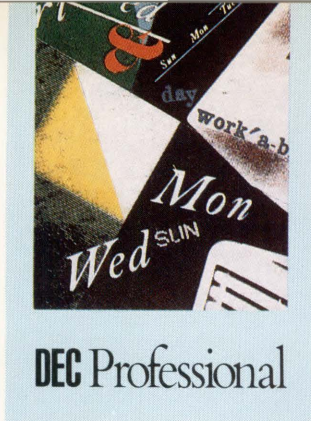
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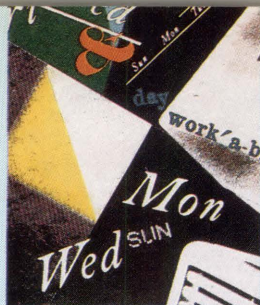
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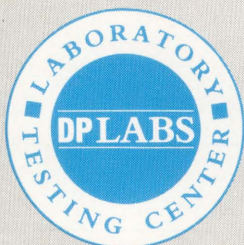
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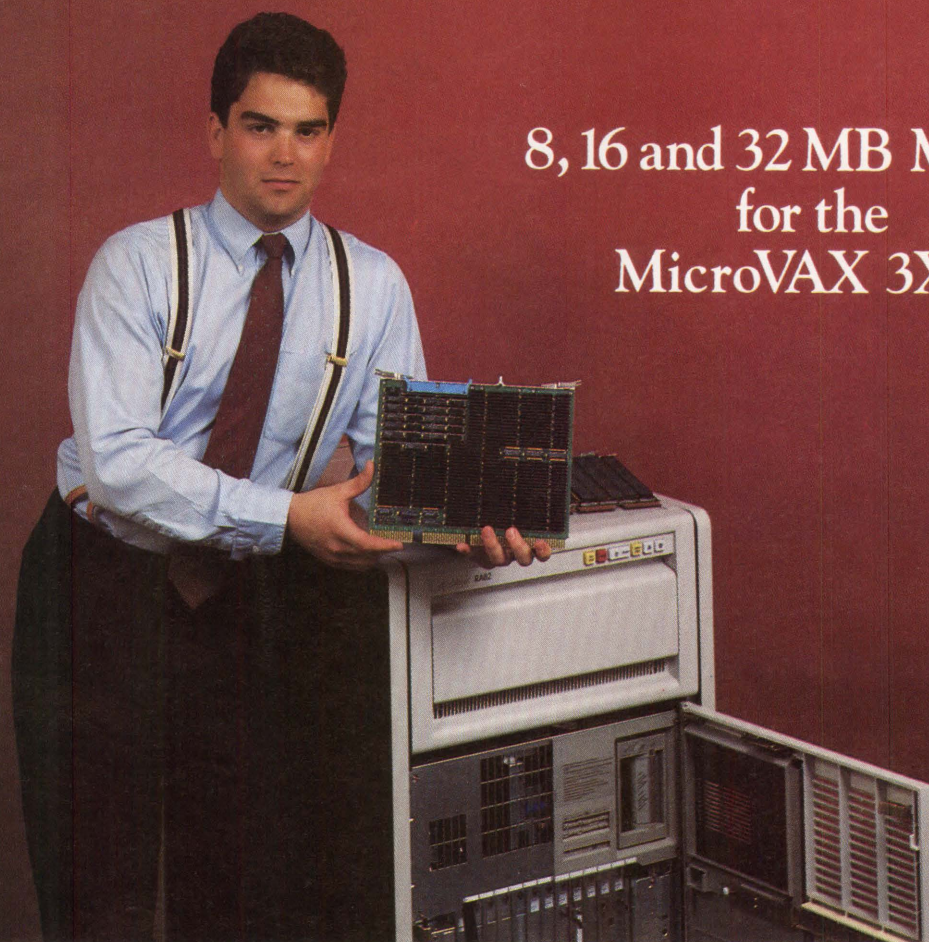
PROFESSIONAL PRESS, INC.

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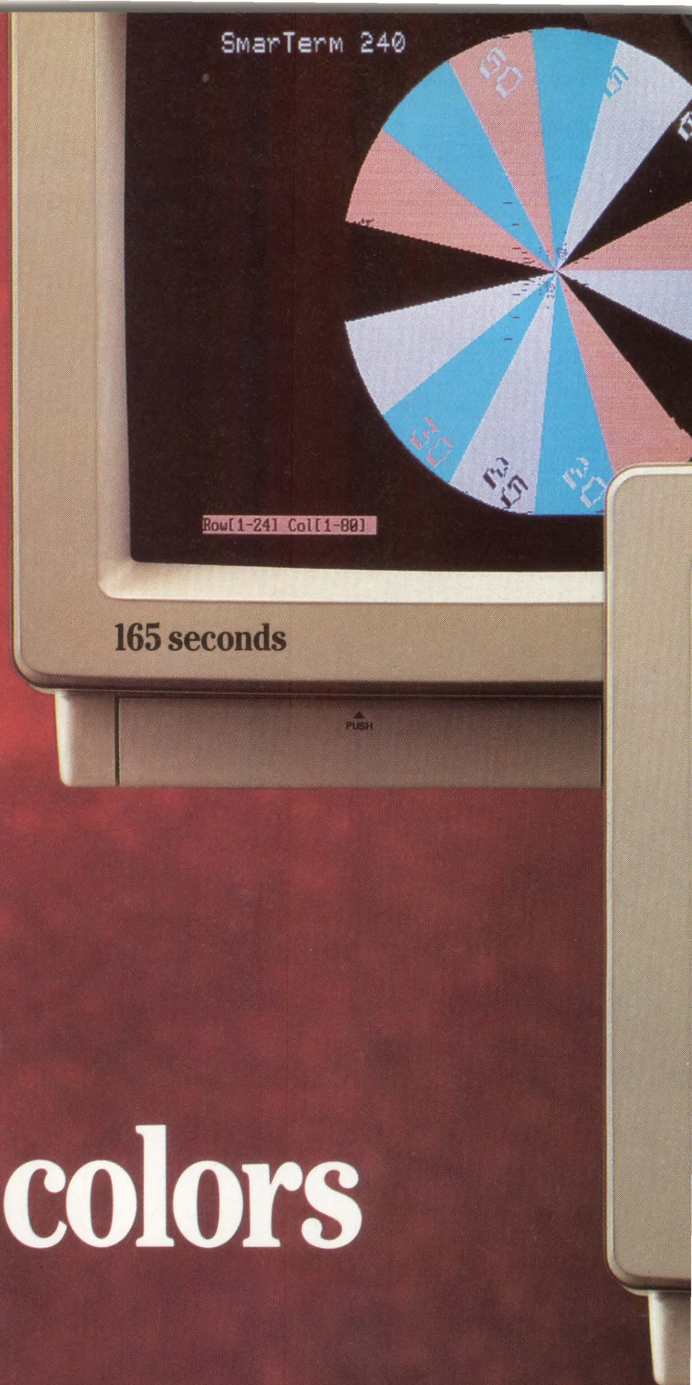
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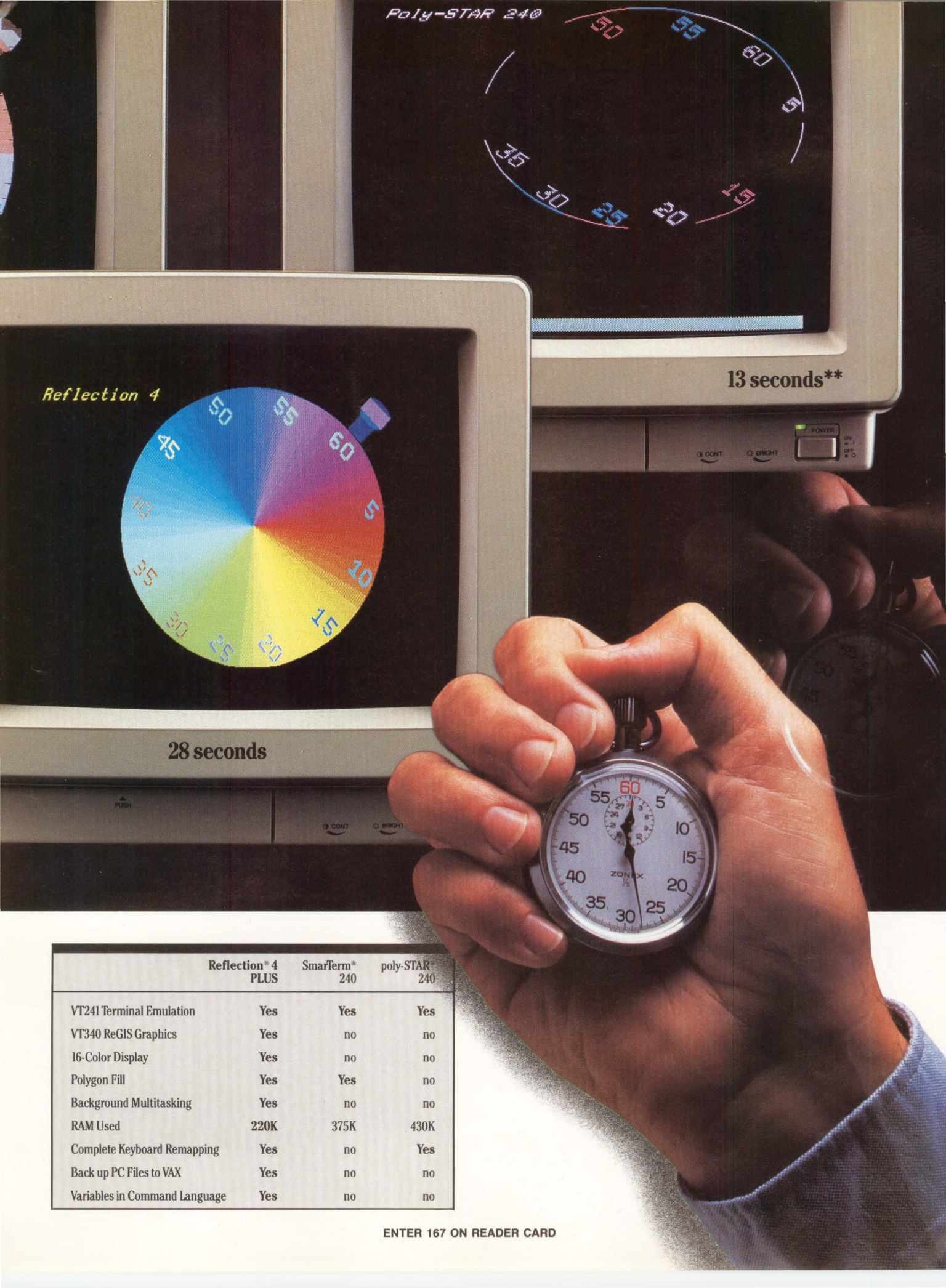
Test was run on an IBM AT with an EGA and high-resolution color monitor. Screens were timed locally using one data file. Files photographed are identical, except for product names. Software versions: Reflection 4-3.1; SmarTerm 240-2.0b poly-STAR/240-1.1.

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VT241 Terminal Emulation	Yes	Yes	Yes
VT340 ReGIS Graphics	Yes	no	no
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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

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PUBLISHER

Carl B. Marbach

Can An Architecture Grow Old?

tends to last longer than the machines it's implemented on. The IBM 360 is long gone, but the architecture that first appeared around 1960 is still here. The VAX 11/780 (yes, it did have the 11 from the PDP-11), introduced in 1977, is far from gone. Our subscriber base shows more than 27,000 subscribers with one in use. The 360 architecture is 28 years old, VAX/VMS 11 years old. So, judging by IBM standards, VAX/VMS is an early adolescent.

One thing that keeps an architecture young is that it's exploited and pushed further by both software developers and hardware engineers. Over the years, the IBM 360 architecture has added bits of addressing, virtual memory and other hardware to keep within striking distance of the state of the art.

Although we haven't added any bits to the VAX, wouldn't it be nice to have two concurrent operating systems (UNIX and VMS) in memory at the same time, both running processes simultaneously? It might take one extra bit to decide which operating system would be in control at any one time. And while 32-bit addressing seemed adequate in 1977, the new precision architecture computers from Hewlett-Packard and the AS/400 series from IBM sport a 48-bit address space.

VAX hardware has changed somewhat with the introduction of VAXSTATION workstation computers. These desktop VAXs have a full bit-mapped graphic display closely coupled to the VAX processor inside and allow the VAX to do things that were impossible for a VAX 11/780. By attaching a specialized processor to a VAX, you can add functionality to the basic architecture without changing the basic structure of the computer.

I suspect that we're about to see the most basic change in VAX architecture ever. Soon there will be a new face, a new way to look into our VAX system, a new way to control what it does. We have many people to thank (or blame) for this new system: Xerox, Apple, MIT and, of course, Digital.

The X Window System, DECWINDOWS, or whatever it will be called, will change the look of the landscape, alter the feel of the VAX and give us a different way to do things. In some cases, it will be so different that it might be difficult to tell that there's a VAX there at all. In the world of the X Win-

dow System, the terms client and server define positions. But it's doubtful that the original VAX designers knew such terms or how they'd be used.

A successful architecture is robust. That term implies an ability to expand to do new things that were beyond the scope of the original design. The VAX has proved to be a robust computer, doing many things that it never was intended to do, and doing them well.

I could never envision a wristwatch-sized VAX, even though we once published a cartoon showing a watch with the word READY on the face. READY was the RSTS prompt, not unlike the \$ prompt from VMS. Did the original VAX designers know their creation would exist on a single chip and be housed in a desktop-sized box that's smaller than the CRT it drives? Did they know their creation would exist in a four-processor symmetric multiprocessor system that could exist in a 16-VAX cluster and cost millions of dollars?

At a recent press conference announcing DEC's transaction processing solution, someone remarked that talking about VAX architecture was boring. "I've heard it all before," the person said. It might be boring, but the VAX keeps growing (smaller and larger), doing more (symmetric multiprocessing) and filling our need for enterprisewide computing systems. If you find anything wrong with the VAX of today, it isn't old age, it's probably acne, which it will outgrow.

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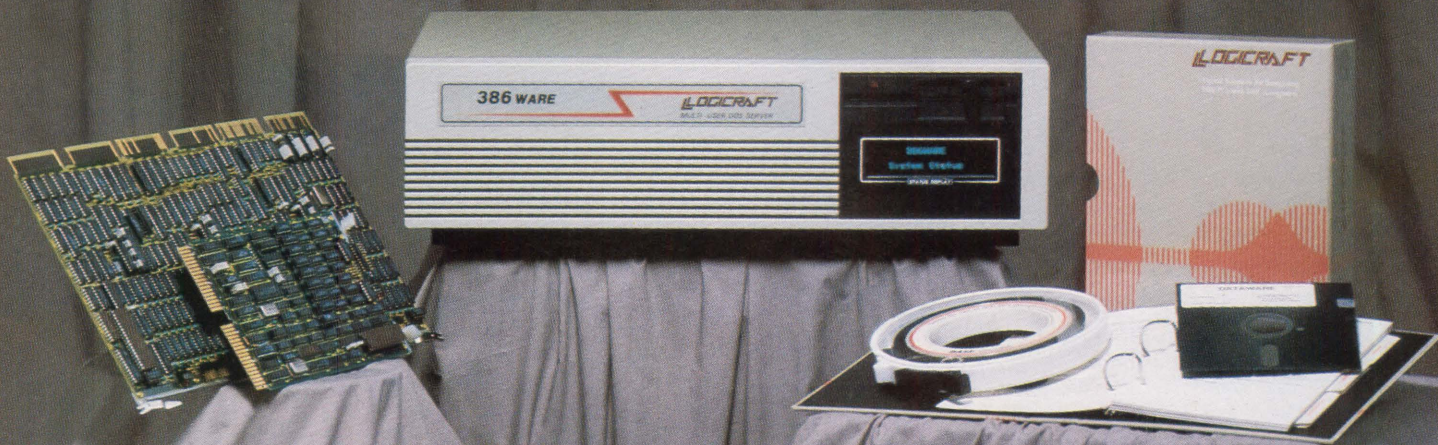
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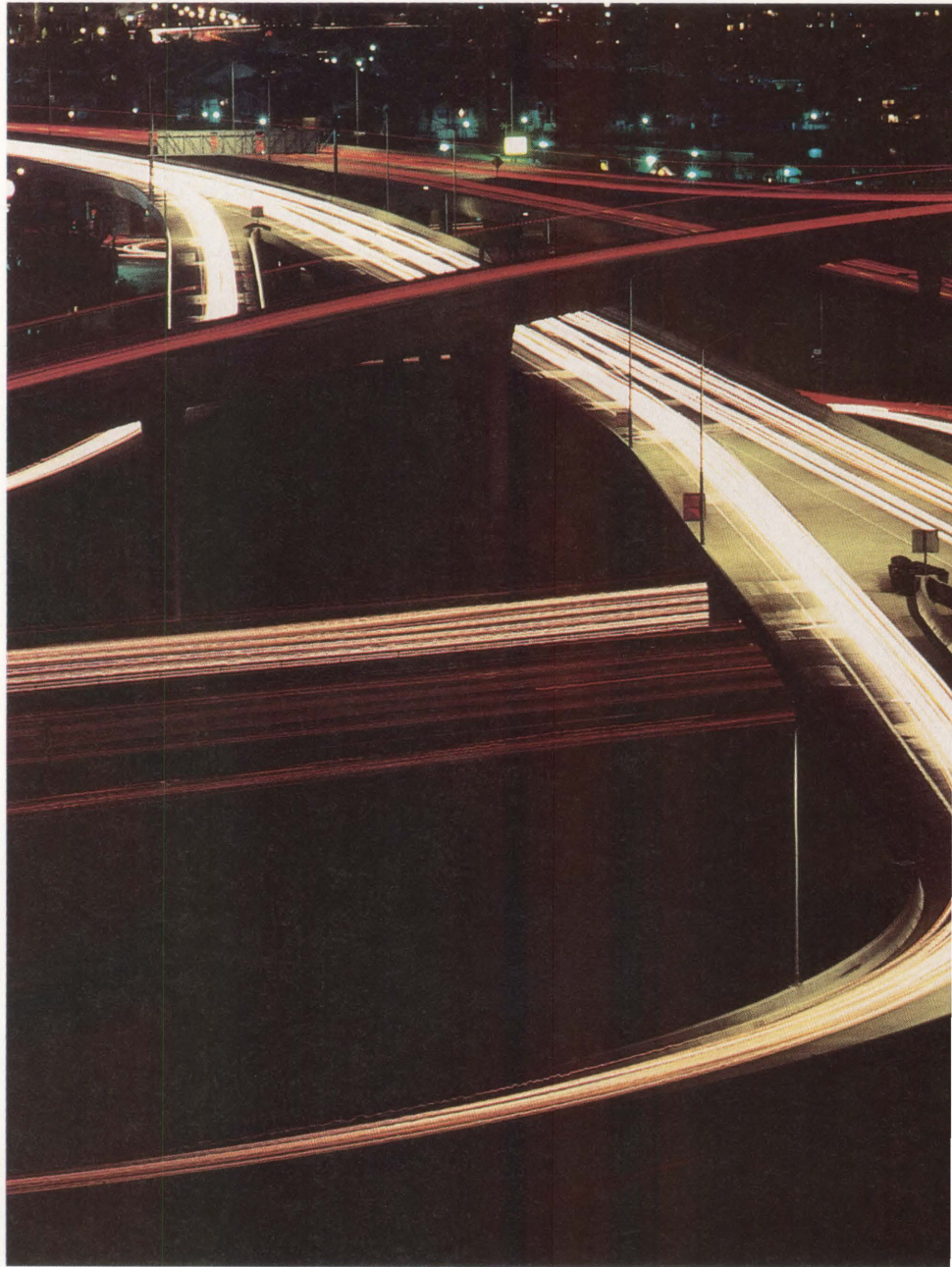
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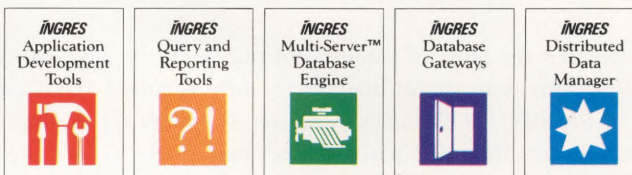
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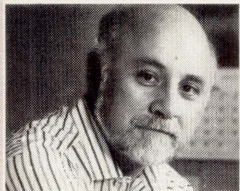
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EDITORIAL

Dave Mallery

Patents: The Intellectual Currency Of The '90s

Patents and trademarks will have an increasing influence on business in the next decade. Business will ignore them at great risk. A patent is a monopoly granted by the government on any appropriate subject matter that's new, useful and non-obvious, properly disclosed and processed in a timely fashion. It creates a new form of private property: intellectual property.

A patent holder can keep the patented idea or process to himself or he can license it. There's no obligation to license. It's private property. No one can make me sell you my house if I don't want to.

Patents are also a real form of currency. Companies are creating patent portfolios just so they can have something to put on the table in licensing negotiations with other companies. It's been said, and not in jest, that if you wish to build anything that resembles a stored program computer, you'd better talk with IBM's patent and trademark department. It's also interesting that the list of top patent applications in recent years reads like the Tokyo phone book.

If I design a new electrical wall plug that has a special, unique, non-obvious intrinsic feature and I obtain a patent for it, you can't make a working outlet for that plug unless I license you. Market pressures, however, usually force some adjustments. If no one buys my appliances because they also have to buy my outlets, then I retain my monopoly in glorious isolation. But if I'm in a position to migrate my huge appliance customer base into upgrading to a new model with my plug, then I can force them to buy their outlets from me as well.

This state of affairs should allow me to keep my margins high and prosper. As long as I can keep my customers so wedded to my appliances that they resist the temptation to change brands, this will continue.

The real danger is that I've put my customers into a fight-or-switch choice. If they switch, they're buying appliances from the competition. In this case, my patent has created a loss of market share for me.

If they don't switch, my competition in the outlet business is in a pickle. They have few courses of action and little hope. Once issued, patents are hard to challenge. Their only hope is to find that I really didn't invent this tiny feature of the plug and that "prior art" exists. If I planned well, that's unlikely. About the only other action they can take is to bring antitrust actions against me, but judges today take a dim view of that attack unless my actions are truly brazen.

What remains is the trial and judgment of the marketplace.

Many thanks to the Clearpoint Research Foundation, partial sponsor of a recent symposium on Patents, Monopolization and Competition in the Computer Industry.

Lab Notes

The BI bus means that the issue of patents and trademarks is alive and well. To keep up with the latest developments with the BI bus, we recently acquired THORIN:, a VAX 8250 and the latest member of the *DEC PROFESSIONAL* cluster. Its plugs and outlets are ready and waiting for whatever adventures the third-party market may plan.



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XT/AT COMPATIBLES WORK

In *ARISTALK* (July 1988), Ken Miglionico notes that he can't get his Wyse PC AT compatible working under VMS Services for MS-DOS and PCSA. He also states that you must use only IBMs or VAXMATES. Not so. At the University of Cincinnati, we've successfully interfaced Zenith XT and AT compatibles and Tandy XT compatibles to MICROVAX II and 2000 systems, as well as IBM XTs and VAXMATES. On the compatibles, we couldn't use the DEC-supplied keyboard to go with the DEPCA boards, however, because (unlike IBM) these machines strobe the keyboard and complain when they don't find their own.

We've been successful using non-DEC-supplied Ethernet adapters under V1.1, although this use isn't supported by DEC. I expect that life under V2.0 will be better than under V1.1 if DEC lives up to its claims.

Theodore Allan Morris
Cincinnati, Ohio

CAPACITY PLANNING

In *Managing Your MICROVAX* (July 1988), David W. Bynon states that capacity planning for CPU performance

CORRECTION

In the article "Imagen-ation" by David B. Miller (July 1988), the credit for the file used to print the Tektronix 4014 graphics image on page 68 was omitted. The file was supplied courtesy of Northwest Digital Systems. The words GRAPHICS-PLUS should have appeared at the top of the image. For more information, contact Northwest Digital Systems, P.O. Box 15288, Seattle, WA 98115; (206) 524-0014.

CIRCLE 450 ON READER CARD

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.

and memory requirements on a VAX-CLUSTER should be considered on a node-by-node basis.

In my experience, the only way to properly analyze VAXCLUSTER performance and effectively perform VAX-CLUSTER capacity planning is to consider the cluster as one system. This especially is true if you offer LAT services and employ a central JBCSYSQUE.DAT file. However, DEC's documentation presents little information on how to do this.

Steven Szep
New York, New York

MAGIC MENU MISLED

The From The Lab review of EMETEK's Magic Menu (June 1988) is informative and well-written. However, there's one part of the review that could be misleading. Howell D. Rasor mentions that Magic Menu can be a memory hog, using 2.4 MB when running eight of the nine choices. He says this could be a problem on systems with limited resources (i.e., RAM).

This would make it seem that you

could have only a few Magic Menu users on a MICROVAX. In reality, you can have many. The VMS operating system allocates the optimum amount of memory. Because Rasor was the only user and there was spare memory, it used 2.4 MB. This reduced his page faulting and memory swapping.

If there were more users, less memory would be used, and there would be a little more disk activity. You wouldn't be memory limited. That's the beauty of a virtual memory machine like the VAX. In both instances, the number of image activations is reduced substantially, making the total additional load placed on the machine by Magic Menu very minimal.

Joel Corwin
EMETEK
Los Angeles, California

MORE REC.COMs

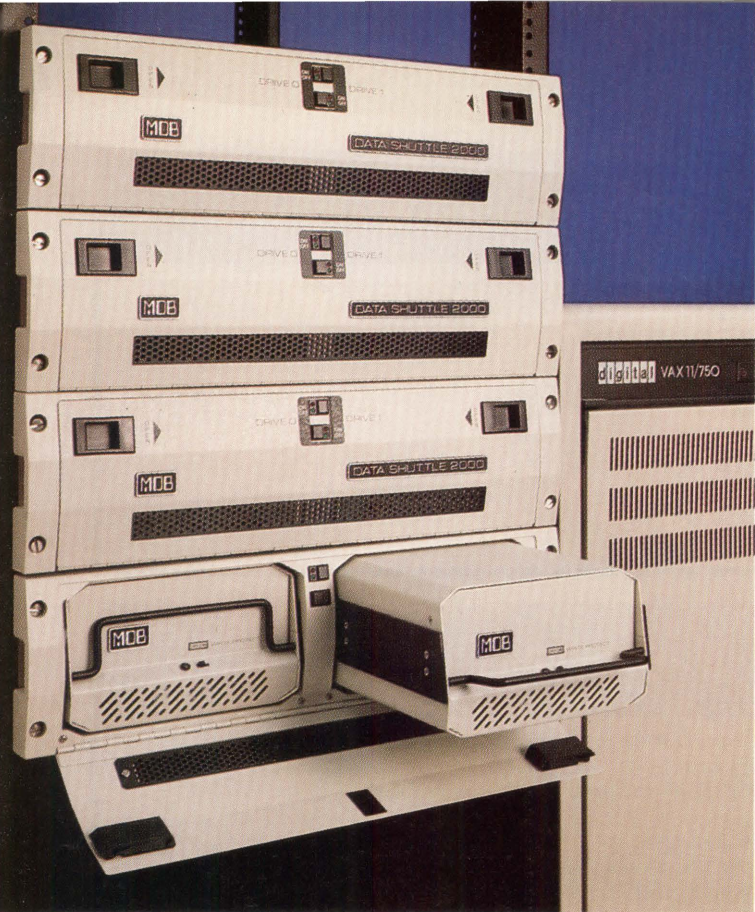
In *DCL Dialogue* (July 1988), Kevin G. Barks presents a command procedure that calculates the number of records in a file. He uses it as an example of a "stupid DCL trick." The method is straightforward, but breaks his own rule in that it isn't the simplest DCL solution to the problem.

The command procedure shown here produces the same results and is one-third shorter (see Program 1). The same VMS informational message is used but is parsed differently by using the embedded spaces as delimiters in locating the record count.

I find *DCL Dialogue* the most interesting and informative column presented by the trade journals. The same applies to *DEC PROFESSIONAL* and *VAX PROFESSIONAL*.

Joseph Pasquale
Montgomeryville, Pennsylvania

In reference to Barks's REC.COM program, I often use another trick to count



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PROGRAM 1.

```

$! REC.COM
$ REC_COUNT == -1
$ IF F$SEARCH(P1) .EQS. "" THEN EXIT
$ ASSIGN/USER REC.TMP SYS$OUTPUT
$ APPEND/LOG 'P1' NLAO:
$ OPEN/READ IN REC.TMP
$ READ IN REC
$ REC_COUNT == F$INT(F$ELEMENT(5," ",REC))
$ CLOSE IN
$ DELETE/NOCONFIRM/NOLOG REC.TMP;*
$ EXIT

```

PROGRAM 2.

```

$! REC2.COM - Jim Laing - 6/30/88
$! Invoke with P1-filename(s)
$! Exits with REC_COUNT equal to number of records in filename(s) specified
$ SET NOON
$ IF P1 .EQS. "" THEN GOTO ZIPPO
$ IF F$SEARCH(P1) .EQS. "" THEN GOTO ZIPPO
$ ASSIGN/USER REC.TMP SYS$OUTPUT
$ ASSIGN/USER NL: SYS$ERROR
$ SEARCH/NOOUTPUT/LOG 'P1' PHRASE_THAT_WOULD_NEVER_BE_FOUND
$ OPEN/READ IN REC.TMP
$ READ IN REC
$ REC_COUNT == F$INT(F$ELEMENT(3," ",REC))
$ CLOSE IN
$ DELETE/NOCONFIRM/NOLOG REC.TMP;*
$ EXIT
$ ZIPPO:
$ REC_COUNT == -1
$ EXIT

```

lines (see Program 2). I SEARCH/NOLOG for some string that never will be found; the SEARCH command with /LOG qualifier gives you a record count. In a few simple tests, I found this to be about twice as fast as REC.COM. There's a significant reduction in direct I/Os, CPU time and elapsed time. Of course, the differences between Barkes's REC.COM and my REC2.COM are more pronounced when you're counting records in a large file.

Jim Laing
Wilmington, Massachusetts

Kevin G. Barkes: The suggestions by Messrs. Pasquale and Laing will indeed increase the efficiency of the procedure. Even though SEARCH appears to be more CPU intensive than a simple APPEND, it's faster because it

only performs reads, and APPEND does both reads and writes (to the null device). I forgot about SEARCH's record count ability, violating my own rule to be proficient with command qualifiers. I've been remanded to my office with the DCL Dictionary and have been properly humbled. ■

CORRECTION

In the article "Data Sharing In A VMS/UNIX Environment" by Robert W. Taylor, Ph.D. (July 1988), the caption for Screen 2 on page 41 was incorrect. The correct caption is: Screens from Census database running on a Sun workstation, using Freeform from Dimension.



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MICROVAX II UPGRADE

QUERY:

Bill Naddy (SIG 23/MESS 113): Does anyone know whether DEC has any plans to offer an upgrade package from the MICROVAX II to the 3000 for a reasonable price? We're CPU bound, and I'd much rather upgrade the CPU than the cluster.

REPLIES:

Jeff Corbett (SIG 23/MESS 114): It's been reported that the MICROVAX II to MICROVAX III upgrade kit made an accidental, short-lived appearance on the DEC Electronic Store without a price listed. DEC probably will hold out on an official announcement until it can sell some 3600s and 6210s.

Why don't you want to cluster? My LAVC is great. I wish my 750 were a 3600, but who doesn't?

Bill Naddy (SIG 23/MESS 115): Nothing against clustering, but dollars are dollars, and I'd rather have a raise than lots of wonderful hardware. I didn't know this had shown up in the Electronic Store. I know DEC will upgrade someday, but even at \$20,000, how many MICROVAX II owners will sign up? I asked our regional DEC manager and he declined to comment. Has anyone else heard any rumors?

Dr. R (SIG 23/MESS 119): Yes, Virginia, there's a forthcoming MICROVAX II-to-CVAX upgrade package. It still may be listed in the DEC Electronic Store, (800) 332-3366. Do a search on KA650, and you'll be rewarded with all the details on this unannounced beauty.

LIB\$SET__LOGICAL

QUERY:

Brian Desantis (SIG 46/MESS 235): This is directed to Hunter Goatley but all who

can help, please do. Regarding your LOGIN program using symbols, logicals and defined keys through MACRO programs, I'm finding them quite useful and offer my thanks. I've been able to make some minor modifications defining the keys and attributes but am having trouble with logical names. Is there a way to define them with attributes like a DEFINE name translation/TRANS=(TERM, CONCEALED)? The problem seems only to be on the surface, but it's troublesome.

I use logicals for directory names. If B is my directory DUA0:[BRIAN] and A is DUB3:[TEST], a SET DEFAULT A: should put me in DUB3:[TEST]. DIR affirms this, but a SHOW DEF lists A:[BRIAN]. This is a problem in procedures that use F\$ENV("DEFAULT") to save a directory specification and restore it when finished.

REPLIES:

Hunter Goatley (SIG 46/MESS 238): The RTL function LIB\$SET__LOGICAL will accept an item list and an attribute mask so you can change the attributes of a logical name. This routine is documented in the VAX/VMS Documentation Set, Vol. 8B, Systems Routines. For examples of coding an item list in MACRO, see Vol. 8D, System Services, Logical Name Services.

I've never encountered the problem you're describing with A: and B:. Did this happen when using the program? They may be getting defined with the attribute LNM\$_CONCEALED, which indicates the logical name is an RMS concealed device and won't be translated by DCL or the system services.

Brian Desantis (SIG 46/MESS 241): Hunter, thank you. With a few of the

How To Use ARIS

If you're a subscriber to *DEC PROFESSIONAL*, you can call up our VAX and log into ARIS, our Automated Reader Information Service. 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. Baud rates: 300, 1200 or 2400.

Recent Changes

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 *ARISTalk* are:

23 MICROVAX
37 VMS
46 Utilities

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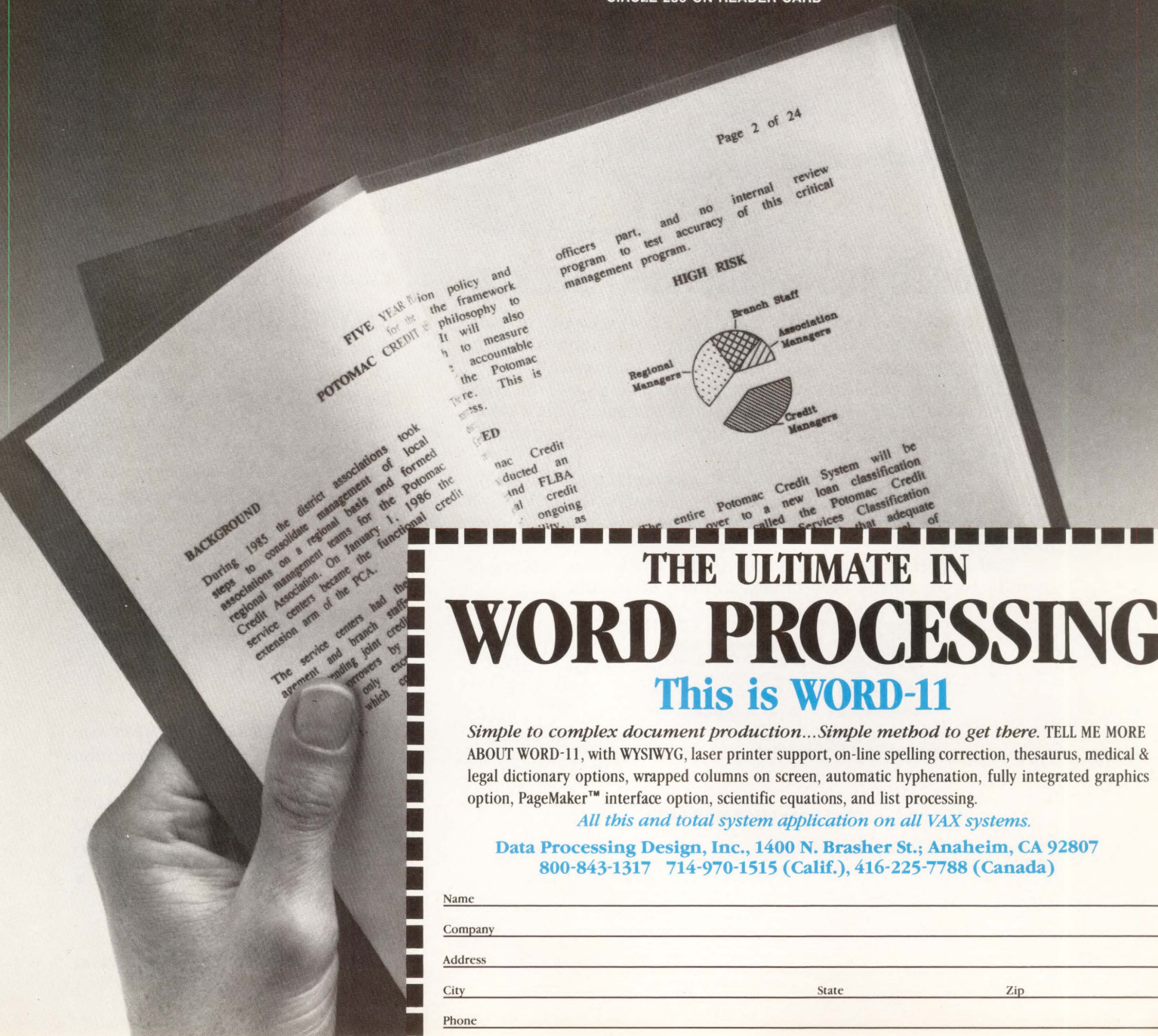
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logicals, I want to have both term and concealed translations set. I don't want anything other than default characteristics with the rest, as a DEFINE name translation would give me.

Brian T. Carcich (SIG 46/MESS 272): This has nothing to do with translation characteristics of logical names, but it

may enhance your understanding of what default means.

When you define a logical to be a DEVICE:[DIRECTORY.SUBDIR], you don't need to add the colon to the SET DEFAULT logical name command. I think SET DEFAULT sees the colon and interprets A: as a device that gets pre-

fixed onto your current default directory. When RMS (or whatever) gets called via DIR, it translates the A (before the colon) in your default, A:[BRIAN] and finds A is DEV:[DIR]. It then drops the extra directory and DEV:[DIR]:[BRIAN] becomes DEV:[DIR]. I believe it drops the extra directory because of the way the \$TRNLNM System Service interprets colons.

If you start with your default as DEV1:[DIR1] and logical A is DEV2:[DIR2], then SET DEFAULT A: replaces your current DEV1: with A:. Therefore, your default is A:[DIR1], which is translated DEV2:[DIR2]:[DIR1].

SHOW DEFAULT gives the A:[DIR1] response with no warnings, but that's the way the DCL default works. Remember that your default is a string of characters in a certain syntax NODE::DEV:[DIR.SUBDIR1.SUBDIR2.ETC], and SET DEFAULT only checks the syntax and doesn't care if the default specified really exists. SHOW DEFAULT used to be the same way; however, since VMS 4.0, it checks if the directory specified exists on the node and device and issues a warning if it doesn't.

CALYPSO SEQUEL

RUMOR:

Dr. R (SIG 37/MESS 628): As the once and future Regent of Rumomongery, it's my solemn duty to inform ARIS users that a Calypso sequel is in the offing. Called Calypso/XCP, this prodigious processor will be equipped with 60-nanosecond CVAX II (RIGEL) chips, thus delivering about 4 to 16 VAX Units of Processing (VUPS) to power-hungry system managers. Delivery date is unknown but could be affected by the recent Silverlake announcement. Details forthcoming when available.

REPLY:

Robert G. Schaffrath (SIG 37/MESS 631): Although I don't have any information as exciting as a new CPU, there's a new Q-bus terminal controller called DHF11 that should see light sometime in the near future. It's a 32-port DEC-423 interface. ■



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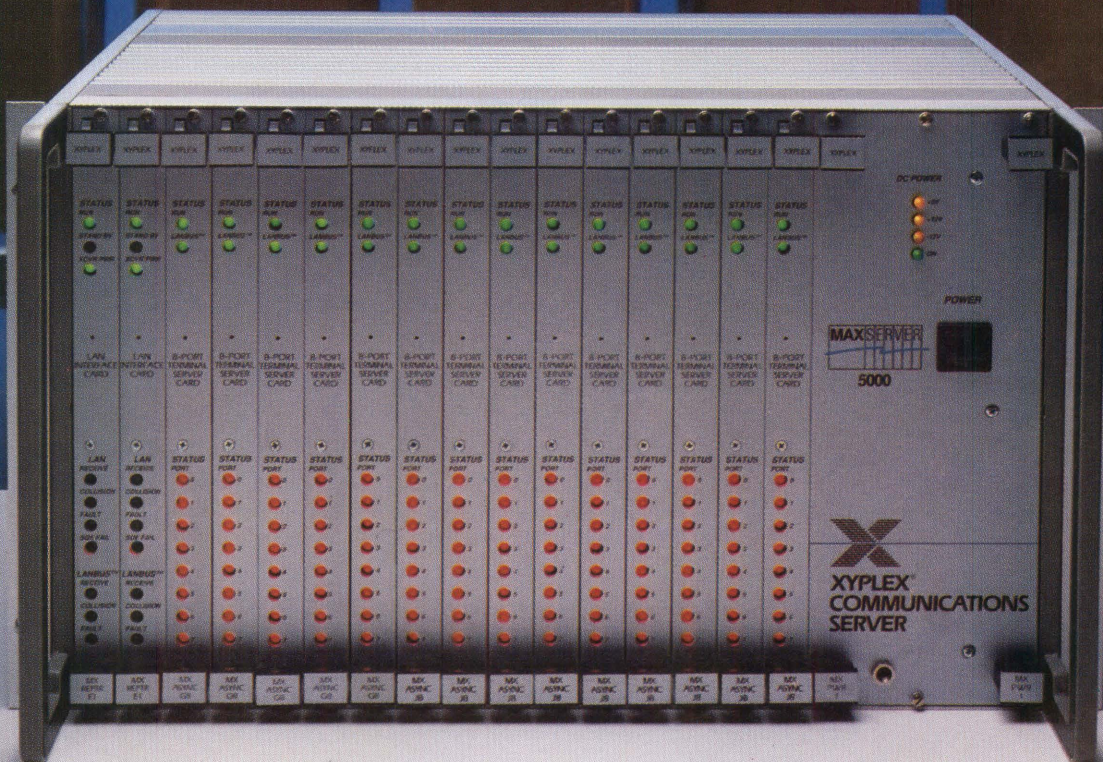
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Warranty	1 Year	3 Years

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Indisputably, the oldest company in the DEC industry is Facit Inc. of Merrimack, New Hampshire. According to George Bausewein, director of marketing communications, the company evolved from a copper mining venture that started circa 1413.

By the Industrial Revolution, Facit had become high tech. Since the 1800s, it has produced office machines. In the early 1960s, Facit entered the computer peripherals market and has manufactured printers since the early 1970s.

Usually associated with printers and other peripherals for the IBM PC, Facit recently introduced a family of three near-letter-quality dot-matrix printers for VAXs.

The B3100DE, B3150DE and B3350DE emulate the DEC LA75 printer command set and the IBM Proprinter. Thus, they can be used with either VAXs or PCs.

Two Hitachi microprocessors are on-board each printer. One is for paper handling and one is for user-selectable software.

The printers are in-

tended to be used in straightforward printing applications but are well-suited for assembly lines. Four possible paper paths make the printers amenable to various paper types, forms and labels. The printers can be fed from below or above. Paper with multiforms can be tractored through, but a standby mode allows single sheets to be pulled through without dismantling the forms.

This function is directed

from a keypad panel located on top of the printers. Pitch and letter-quality functions also can be set from the keypad.

Speeds of 250 cps are attainable in draft mode on the 3100 and 3150. The 3350, with its 18-wire print head, is better-suited for word processing, as it provides higher-quality characters and print speeds of 100 cps. The 3150 and 3350 offer a 136-column mode (15½-inch carriage) for spreadsheets and other wide-sheet applications.

Facit also is expected to release a 24-wire print head

to accommodate kanji characters.

The printers run at about 55 dB, but a noise key limits the print heads to 50 dB while reducing speeds slightly. The print buffers are capable of printing four copies.

Font cards can be plugged into a small font drive located on top of the printers. There are more than 20 font cards available, all of which are compatible with other Facit printers. Three fonts are located on the chips as well, so fonts can be selected without using font cards.

Three types of ribbon cartridges are available: black, long-life black and four color. The four-color ribbon can produce seven colors.

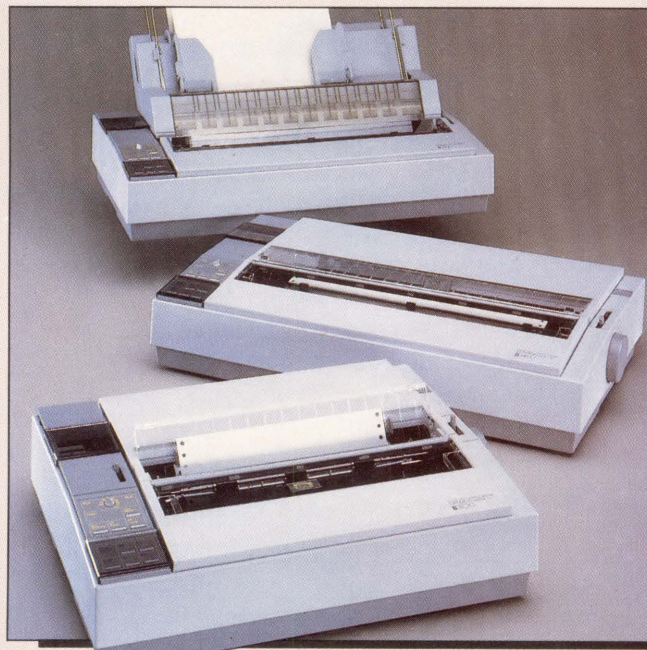
The printers also emulate the LA50 and LA210. Centronics parallel and RS-232 ports are provided.

The printers will be distributed in the U.S. through Facit's network of OEMs and resellers. The B3100DE is priced at \$745, the B3150DE at \$1,015 and the B3350DE at \$1,165.

For further information, contact Facit Inc., 9 Executive Park Dr., Merrimack, NH 03054; (603) 424-8000.

Circle 576 on reader card

—Evan Birkhead



Control panels on Facit's B-line printers let users select print quality, font pitch and decibel level.

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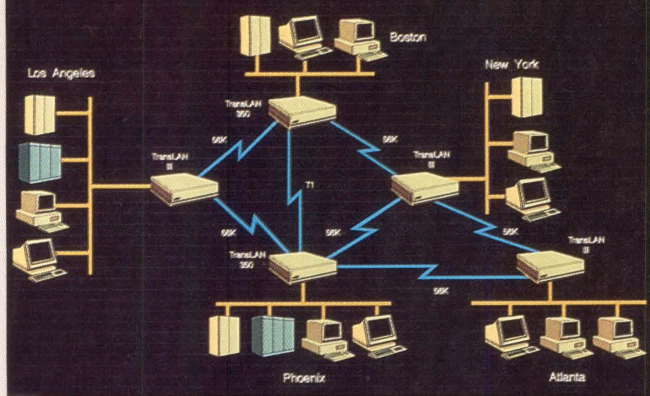
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DP88



Distributed Load Sharing (DLS) eliminates the inability of bridged networks to contain active loops.

Vitalink's Remote Bridge Boosts 802 Wide Area Network

TransLAN 350 Combines Bridge And Router Functions

While its benefits within buildings or departments are significant, a local area network (LAN) is just one step in the overall networking of islands of automation. The key is to link networked islands of automation efficiently and economically into wide area networks (WANs).

Vitalink Communications Corporation of Fremont, California, offers a standards-based transparent WAN. The company has developed a network architecture based on Ethernet and IEEE 802 standards that allows computers and devices from many vendors sharing a common backbone to communicate over long distances. The network architecture provides a common pathway through which data from multivendor equipment can travel at high speeds and take advantage of multiple paths and parallel links.

The 802 WAN is capable

of concurrently handling high-speed and low-speed data transfers and dynamically forwarding frames to a variety of locations. Further, because of its flexibility and open architecture, the 802 WAN is likely to be compatible with future equipment procurements. It operates with data framed according to networking standards developed by IEEE.

The 802 WAN is built with equipment that performs a number of functions, including the transparent extension of a LAN to a distant LAN, the conversion of incompatible data to a format that can be carried by the LAN, and the managing and analyzing of the operation of both the LAN and WAN.

A cornerstone of the WAN is the TRANSLAN bridge. It transparently connects two or more Ethernet or 802.3 LANs to form a WAN. TRANSLAN simplifies

the operation of a WAN by automatically learning its relative location in the network and forwarding data to its destination. The network user sees all interconnected LANs as a single LAN. Therefore, all the connected devices appear to be local. The user is able to use the same commands to connect to both local and remote devices.

The TRANSLAN 350, with Distributed Load Sharing (DLS), is a fourth generation of the TRANSLAN family of remote bridges. It uses multiple Motorola 68020 processors and has a 5,000-frame-per-second forwarding rate.

The TRANSLAN 350 can connect directly to two T1 links (1.544 megabits/sec.), multiple parallel circuits or alternate routes between sites. Each TRANSLAN supports from one to eight V.35, RS-449 or RS-232 ports. DLS combines the path-control functions of a router with the protocol transparency of a data-link-layer bridge.

Another member of the TRANSLAN family is the TRANSLAN III bridge with DLS. The TRANSLAN III provides the networking features and capabilities of the TRANSLAN 350, but at lower aggregate link speed. TRANSLAN III is used to connect sites that require up to eight links at speeds of 9600 bps to 64 Kbps, or one T1 link.

Randy Fardal, Vitalink's director of product marketing, states, "The TRANSLAN 350 enables customers to use all the bandwidth available in their network and have automatic rerouting of informa-

tion if a path fails. Because TRANSLAN bridges are transparent to higher-level protocols, they provide seamless connectivity for various types of devices in a way that's much faster and less complex than comparable routers."

The DLS capability extends the Spanning Tree Protocol (STP) and allows virtually all links to carry production traffic. STP provides TRANSLAN and Digital bridges with the ability to identify loops in a network, calculate path capacities and then place the lowest-capacity links in a backup state. By determining these variables, STP can configure the most efficient network topology automatically.

The 802 WAN now can be designed with alternate paths between locations, automatic, dynamic alternate routing, and no single points of failure. The result is a more flexible, reliable and robust WAN.

The TRANSLAN 350 provides other advanced capabilities, including direct DS1-circuit support; the ability to identify all links, bridges and data rates used by a frame in moving from its source to its destination address; and an encryption device resync function.

The TRANSLAN III lists for \$12,750 and the TRANSLAN 350 for \$18,500, including software.

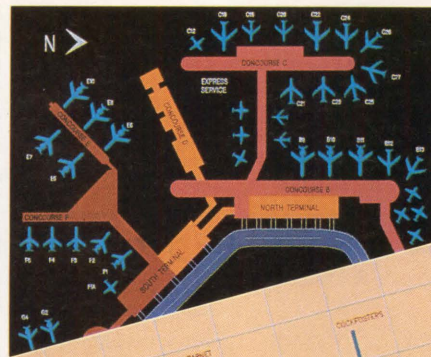
For more details, contact Vitalink Communications Corp., 6607 Kaiser Dr., Fremont, CA 94555; (415) 794-1100 or (800) 443-5740.

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—Suzanne Garr



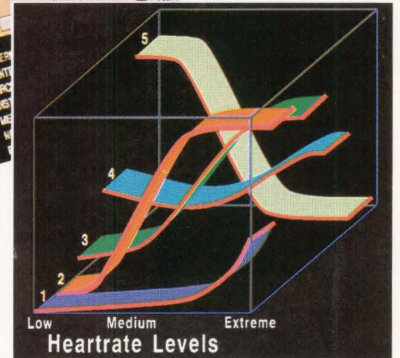
This freehand drawing was created using DRAW's tablet mode.



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.



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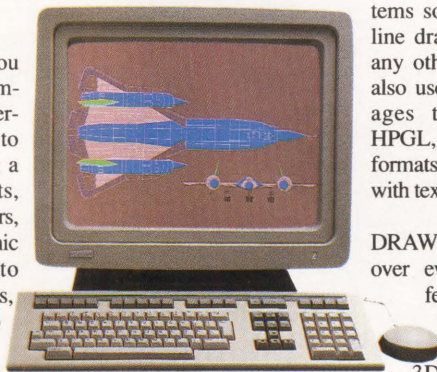
To make your illustration creation even easier, DRAW has a symbol library with more than 400 elements — from geographical boundaries and icons for computer equipment to circuits and logic symbols. You can easily add to this li-

brary with your own custom symbols for every day use.

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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.



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MegaCard MP and MegaRAM VX Provide Relief For Slipped Disks

System Industries' Disk Emulators Combine Disk Storage And High-Speed Access

If slow disk access or an environment hostile to delicate disk drive systems are problems at your site, the MegaCard MP and MegaRAM VX solid-state disk emulators from System Industries of Milpitas, California, may be for you.

MegaCard MP and MegaRAM VX emulate Digital's RA8X series disk drives using MSCP protocols. The CPU looks at the products as if they are under the control of a UDA50 or KDA50 disk controller, depending on whether they are installed on a UNIBUS or Q-bus.

Various configurations of each product allow for memory capacities ranging from 8 MB to 512 MB, depending on whether 256K DRAMS or one-megabit chips are used. MegaCard MPs plug directly into your system's backplane. MegaRAM VX is a rack-mounted system allowing for larger configurations to be installed using fewer backplane slots.

No moving parts mean low access times and high-speed data transfers. The Q-bus port supports data transfer rates of up to 3.3 MB/sec. and the UNIBUS port supports a 1.8 MB/sec. data rate. Maximum access time is 80 microseconds.

"When you add MegaRAM [MegaRAM VX or MegaCard MP] to your system, you are buying performance," remarks Charles Donchess, national product

line manager at System Industries.

"Specific performance gains are applications dependent, but MegaRAM will provide 10 times more I/Os per second than a rotating disk. Users running I/O-intensive applications, such as CAD, CIM, process control, MRP and online transaction processing, have been able to shorten program run times, add more users and extend the life of their CPUs."

MegaRAM VX and MegaCard MP are software compatible with the disk drives they emulate. No software or driver changes are necessary. You can run standard disk diagnostics to verify system operation.

Due to their solid-state construction and lack of moving parts, both units should prove extremely reliable when compared with their rotating counterparts. An operational and maintenance display makes troubleshooting and maintenance easy. Error detection and correction can be performed on a bit or word level.

Battery backup provides a means of protecting your data from power losses. An optional battery pack can be purchased to support 128 MB for 30 minutes. Extra battery units can be purchased to extend support time for hours and even days.

A Winchester disk holding 128 MB of data is an available backup option. Data can be backed up manually or an automatic backup can be set to occur in the event of a power failure. A unique battery backup feature is included with the

disk unit to keep your data intact until the backup is complete. Data is verified automatically before power is removed from the unit. An automatic data restore function is available that will reload the data from disk. Included with each backup package are all controlling electronics and a battery pack.

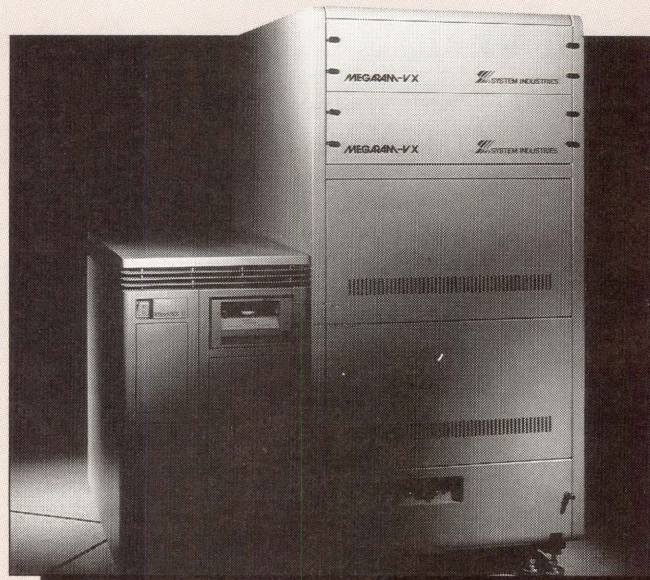
High-speed data transfers are possible with the High-Speed Interface. This option provides a direct memory access port allowing data transfers to and from the MegaCard MP or MegaRAM VX at rates of up to 12 MB/sec. Addresses may be specified in Random Access or Block Access modes.

A Multi-Port option lets you configure the MegaCard MP and MegaRAM VX with up to four controller boards made up of any combination of Q-bus, UNIBUS and High-Speed Interface boards. Thus, up to four separate processors and high-speed devices can be interfaced with the units. The internal memory interface bus has a 16 MB/sec. bandwidth, allowing it to support the Q-bus, UNIBUS and the High-Speed Interface.

Fluctuations in memory pricing make it difficult to determine exact prices for the MegaCard MP and MegaRAM VX. Current pricing is \$500 per MB, depending on configuration.

For more information, contact System Industries, 560 Cottonwood Drive, Milpitas, CA 95035; (408) 432-1212.

Circle 497 on reader card
—David B. Miller



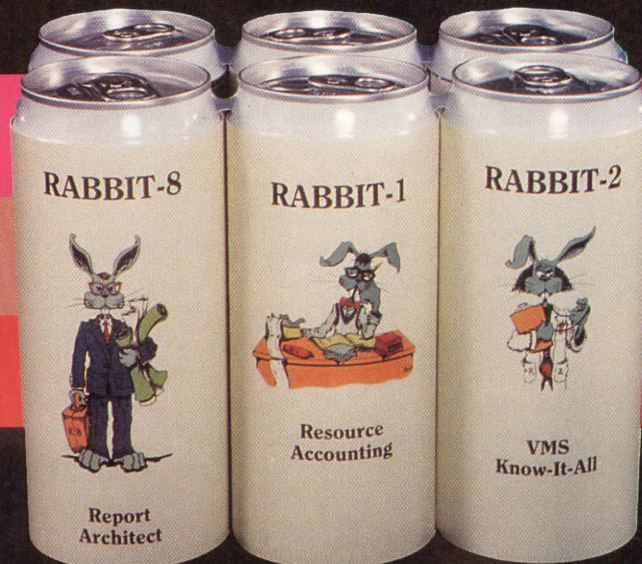
The MegaRAM VX combines the speed of memory access with the storage and functionality of conventional disk drives.

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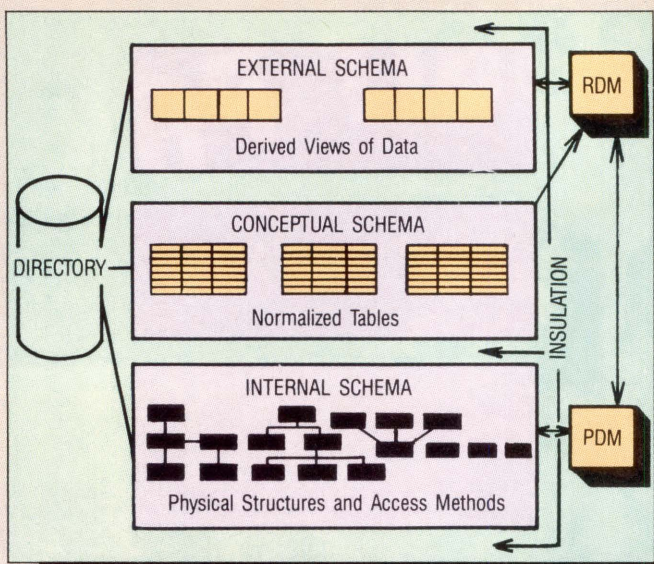
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The three-schema model for Supra RDBMS. Programs, 4GLs and user queries interact with the external layer.

CinterAct Features Revisions To Cincom's RDBMS

Supra Supplants Ultra

At CinterAct, a conference for Cincom Systems Inc.'s software users, Cincom released several upgrades of and revisions to The Information System/Extended Architecture (TIS/XA), the framework that integrates its software products. TIS/XA bridges Cincom's VAX and IBM systems and unifies all Cincom packages into one software architecture and one set of standards.

Held in Cincinnati, CinterAct coincided with Cincinnati's bicentennial, which featured, among other events, the inaugural flight of a British Airways Concorde from London.

For DEC users, the most significant event was the release of Supra for VAXs. Supra is Cincom's critically acclaimed RDBMS for large manufacturing applications on IBM mainframes.

Supra for the VAX will replace Cincom's Ultra in-

teractive database system, but the company says it has provided an easy upgrade path for Ultra users. The migration should take only two hours, depending on the size and complexity of the database, explains Tom McLean, Cincom's vice president of marketing. Jo Anne Heck, a senior section manager at McDonnell Douglas Corporation of St. Louis, reports that her company's changeover from Ultra 1.5 to Supra "will be an easy migration."

The VAX version is intended to interoperate closely with the IBM version. According to Heck, applications designed using VAX Supra "could run unaltered on the IBM version of Supra."

Supra 1.0 was benchmarked at 24.39 transactions per second on a VAX 6230

with VMS 5.0 running the DebitCredit test at DEC's Digital Benchmark Center. Cincom, based in Cincinnati, is a participant in DEC's Cooperative Marketing Program (CMP).

Supra comprises a three-level architecture that insulates applications from the underlying structure of the database (see Figure). The external layer defines how users see the data and screens. The conceptual layer is the structure of the corporation's database. The lowest, internal layer specifies physical definition of the data.

The primary components of Supra include:

1. A directory that provides a central organizational database and defines the three schema and their relationships. This insulates user requests from physical requirements that specify the RDBMS.
2. A Relational Data Manager (RDM) and a new Physical Data Manager (PDM). The RDM has a data manipulation language that allows users transparent access to data. It can be used with, among others, COBOL, BASIC and FORTRAN, or with MANTIS, Cincom's 4GL application development language. The PDM works behind the scenes to manage physical files of stored data, the conceptual layer. Among its other system management functions, the PDM permits the central database to be accessed from any node on a DECNET.
3. A relational query language, SPECTRA, which lets non-technical users create applications. This ties

IBM machines and VAXs together.

4. A set of utilities for both programmers and administrators. These maintain files in the central directory and in the PDM, and define and test relational views of data before they are implemented.

Throughout, compatibility and procedures similar to Cincom's Supra for the IBM mainframe environment are maintained.

The size of a single copy of Supra varies according to CPU size. Prices range from \$47,250 for the 8250 to \$220,500 for an 8978 cluster.

In other product-line moves, Cincom released an optional add-on module, Repetitive Manufacturing Control (RMC), for its manufacturing management information system, Control. Now in Release 6.2, Control comprises two integrated systems: Control: Manufacturing and Control: Financial.

Cincom also announced a CASE technology agreement with Index Technology Corporation of Cambridge, Massachusetts; D. Appleton Company (DACOM) of Manhattan Beach, California; and Aion Corporation of Palo Alto, California. The CASE alliance combines MANTIS with CASE tools from the other developers. MANTIS is also transportable between VAXs and IBMs.

For further information, contact Cincom Systems Inc., 2300 Montana Ave., Cincinnati, OH 45211-3899; (513) 662-2300.

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—Evan Birkhead

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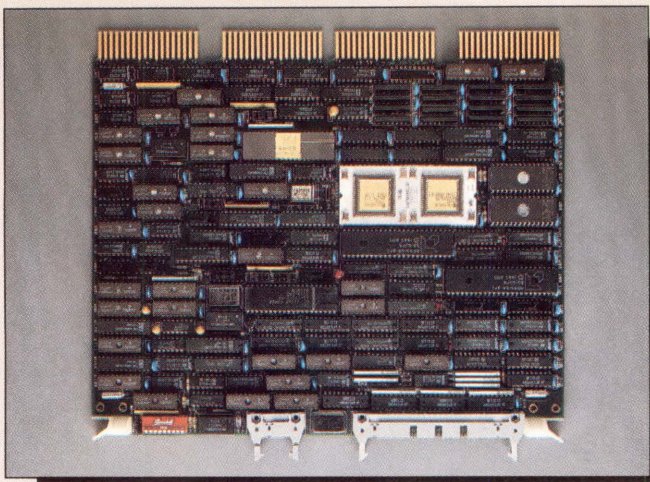
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CIRCLE 176 ON READER CARD



The CoPro is the result of a joint effort between MDB and Lockheed Aeronautical Systems Company.

Cooperation Produces CoPro

MDB Systems And Lockheed Join Forces

If your MICROVAX II or older LSI-11-based system is suffering from the blahs, the MLSI-CP11 CoPro coprocessor might be your ticket.

MDB Systems of Orange, California, "co-processed" with Lockheed Aeronautical Systems Company, Ontario, California, to produce the Q-bus/UNIBUS-based coprocessor. MDB did the design work and builds the board, while Lockheed furnishes system support and software.

The unit is treated as a peripheral device on the bus. Up to eight CoPros can be installed on a single bus. An average of 1 mip increase in performance can be expected for each CoPro installed.

The CoPro uses DEC's 18 MHz DCJ11 chip, which supports 22-bit addressing and the PDP-11/70 instruction set. An FPJ11 floating point accelerator permits floating point operations in excess of 220K FLOPS, bringing the CoPro's performance up to the level of a PDP-11/70 with

a floating point accelerator option.

There's 512 KB of private, dynamic fast RAM on-board. An additional 3.5 MB of memory can be accessed through a Global Memory Window mapped onto the host's memory. Each CoPro can access host common memory through separate or shared memory windows. Individual CoPros can isolate memory from the host, forcing all data to be transferred to main memory before the host can access it, providing data security for sensitive applications.

Users can be logged onto separate CoPros sharing the same host and not be aware of each other's presence.

Two 32K x 8-bit EPROMs are available for user-defined applications, as well as containing initial program load code and on-board diagnostics. Access time for the EPROMs is less than 350 nanoseconds.

Data transfers and status information are accom-

plished via two 16-bit dual ported registers. Dual Direct Memory Access (DMA) channels provide full duplex DMA between the Q-bus and the CoPro's internal bus. The CoPro is configured to handle read and write operations concurrently.

External devices can interface directly to the CoPro's processor bus, although they can't directly interface to the host's Q-bus. Devices can take advantage of the CoPro's DMA access to its memory or to the program I/O and interrupt features that interface with the DCJ11 processor. One device supported by the CoPro's external bus is a four-channel expansion module sporting full duplex and DMA capabilities, as well as an 8036 Communications I/O component. Use of these daughterboards in conjunction with the CoPro effectively provides a powerful front-end communications processor.

An RS-232 serial port supporting baud rates between 300 bps and 38.4K bps is included. It's used to connect a console terminal.

The CoPro is a Q-bus device that can be used on UNIBUS systems using MDB adapter modules.

Due to bus structure differences between the 18-bit UNIBUS and 22-bit Q-bus, only the lower 256 KB of memory can be addressed across the bus.

According to Stan Margulis, MDB's vice president, "The significance of the CoPro lies not so much in its exploitation of state-of-the-art hardware technology, but in its unique provision

for life extension of, and even more unique, the combination of existing DEC operating systems and user investment therein."

Dave Ayres of Lockheed Aeronautical Systems adds, "Established PDP-11 and MICROVAX II system applications will be able to reach MULTIMIP and M/FLOP performance by simply adding modules — built with off-the-shelf technology with processor architecture and operating software identical, not just compatible, to the host — at a fraction of the cost of a new supercomputer solution."

Loaders and drivers to control interprocessor communications are supplied by Lockheed. DEC's QIO interface is used to allow customer applications to access global memory. Although the CoPro currently runs RSX-11-S, the host machine can run RSX-11-M, RSX-11-M+, RSX-11-S, MICRORSX or VMS. An RT-11 version of the CoPro will be available in the future.

A single CoPro module lists for \$7,500. A software toolkit and documentation with a limited authorization to copy lists for \$1,500. A \$2,000 license to use the CoPro with a DEC operating system is required for each CoPro purchased.

For further information, contact MDB Systems Inc., 1110 West Taft Ave., Orange, CA 92665; (714) 998-6900.

Circle 578 on reader card

Lockheed Aeronautical Systems Co., 1800 Airport Dr., Ontario, CA 91761-0033; (714) 395-2411.

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—David B. Miller

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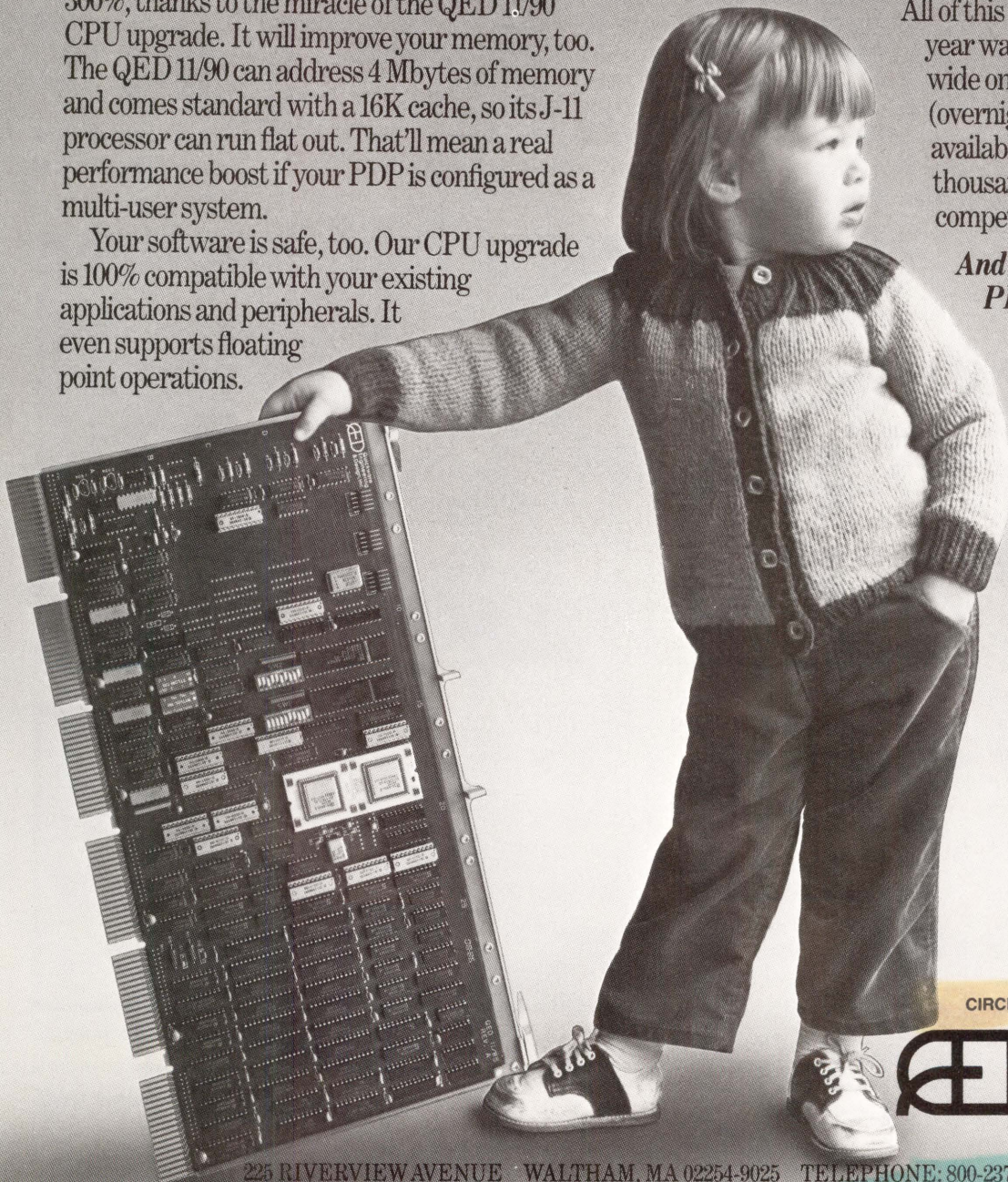
You can increase system performance by up to 300%, thanks to the miracle of the QED 11/90 CPU upgrade. It will improve your memory, too. The QED 11/90 can address 4 Mbytes of memory and comes standard with a 16K cache, so its J-11 processor can run flat out. That'll mean a real performance boost if your PDP is configured as a multi-user system.

Your software is safe, too. Our CPU upgrade is 100% compatible with your existing applications and peripherals. It even supports floating point operations.

Surprisingly, the QED 11/90 can be installed in any PDP-11 in just a couple of minutes, because it fits all existing CPU's with no backplane changes.

All of this comes with a one year warranty and nation-wide on-site service (overnight replacement available). Best of all, it's thousands less than the competition.

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Pericom's MX7000 Series Carves New Emulation Niche

*PC-Based Graphics Workstations
Feature Tektronix, ReGIS Emulations*

A number of applications using emulations under MS-DOS convert PCs into terminals. These packages use PC communications devices to connect with the host and display graphical output on EGA or VGA adapters or other video display cards with appropriate device drivers. They provide a cost-effective solution for applications where overall functionality isn't of prime importance.

But many emulations, like the popular Tektronix 42xx, can't operate efficiently under these conditions. In addition, certain graphics users may have to overlay alphanumeric text on the graphics plane, potentially raising costs or reducing the number of available colors. Alpha users may suffer from slow scroll speeds.

Available in either 286 (MX7286) or 386 (MX7386) processor-emulating versions, the MX7000 Series workstations from Pericom Inc. of Torrance, California, provide standalone PC as well as graphics terminal emulation. Users can switch between terminal emulation and DOS applications by toggling keys.

The MX7000s emulate DEC's VT52 through VT340, without multisessioning, and ReGIS terminals. With appropriate software drivers, they support AutoCAD and other PC design packages. The VAX CPU sees the

workstation as a terminal, a logical application.

Tektronix 42xx emulation also is on-board. "Even DEC feels there is somewhat of a market for Tek emulation," points out Bill Tickner of Pericom PLC, Pericom's U.K.-based parent company.

Pericom is targeting sites where users need to access central databases but require PC workstation capabilities for functions such as design or administration. The market focus reportedly will be on the petrochemical, aerospace, pharmaceutical and financial industries.

With the MX7386, graphics and alphanumerics hardware resides in the system bus. There are two cards. One is designed for alphanumerics and graphics enhancement logic.

The other is a 12-MHz 68000 workstation processor with 1 MB of memory for complex graphics functions. The workstation card can operate in parallel with the PC processors to offload graphics-intensive functions. The MX7286 comes with either an 8- or 12-MHz processor and 1 MB of memory.

The MX terminal card provides the user with four graphics bit planes with a resolution of 1024 x 768 and four alphanumeric planes capable of displaying 80 or

132 columns and 24, 32 or 48 lines of text. The graphics and alpha planes use dedicated logic aimed at drawing graphical images and displaying or scrolling text.

Both workstations come with either a 15- or 19-inch high-resolution color monitor, a 20- or 40-MB hard disk, a 3½- or 5¼-inch floppy drive, serial (19.2 Kbps RS-232) and parallel (printer) ports, and a custom-designed VT220/IBM PC keyboard.

System expansion possibilities include two 16-bit and one 8-bit option on the 80286, and one of each on the 80386. Other options

include higher-capacity hard disks and modules that provide IBM coax or Ethernet compatibility.

Pericom markets the workstations through its national distribution network. For OEMs, a board-only configuration will be available.

For more information, contact Pericom Inc., 2219 205th St., Suite 103, Torrance, CA 90501; (213) 618-9190.

Circle 575 on reader card

Pericom PLC, The Priory Cosgrove Milton Keynes MK19 7JJ; (0908) 560022.

Circle 580 on reader card

—Evan Birkhead



Pericom MX7000 Series workstations can function as DEC- and Tek-compatible graphics terminals or can operate in standalone mode.

Face it. Here's what it takes to improve the view from your desk.

The 407HR color graphics terminal from GraphOn has what it takes to improve the view from the desk of anyone doing serious graphics on a VAX. Our formula: take the best qualities of DEC and Tektronix, combine them, and then extend them to new levels of usefulness. Here's what you get:

More Detail. Our Tek 4207 emulation provides 1024 by 768 high resolution for more detail. ReGIS resolution of 800 by 500 matches the DEC VT340.

Better Color. Both Tek and DEC modes have been extended to 256 colors at one time from a palette of over 16 million.

Versatility. The 407HR integrates superior graphics with flawless 132-column VT220 alphanumerics. And when you switch between Tek and DEC modes, the 407HR automatically resizes its display to give you the largest possible image, at the correct aspect ratio.

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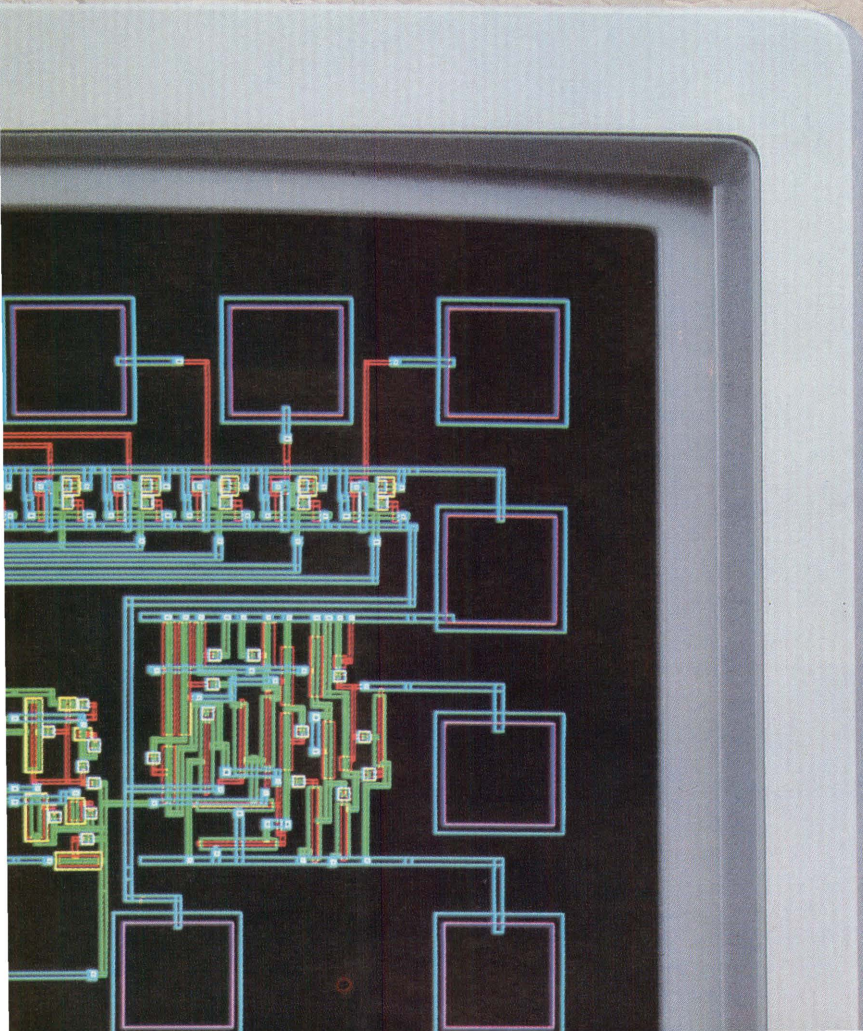
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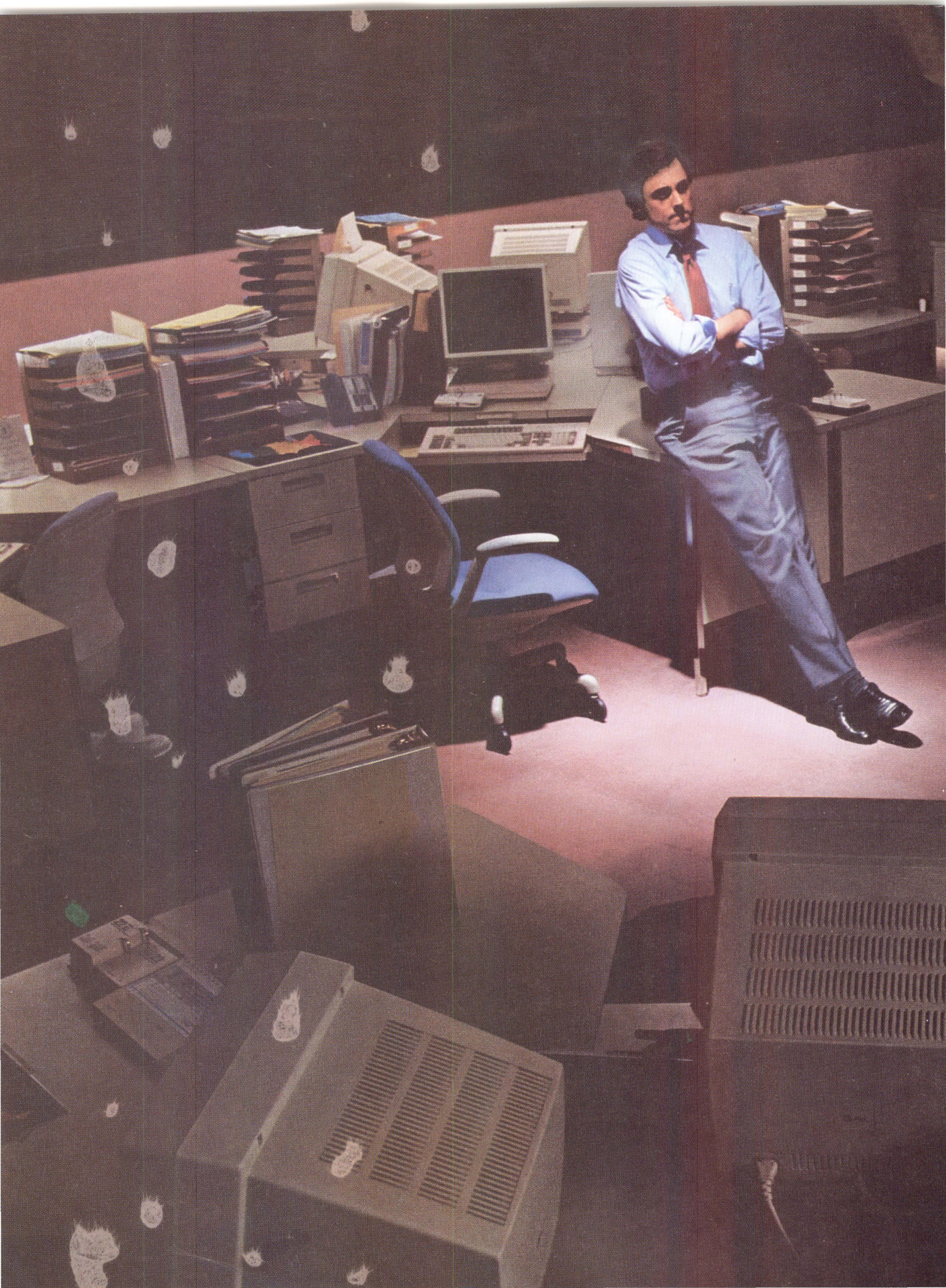
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Software Layering On VMS

MINIMIZING CONNECTIONS between modules.

BY PHILIP A. NAECKER

SOFTWARE LAYERING is the logical extension of software modularization, which is the isolating of specific software functions in separate modules that can be maintained independently. Software layering extends this by providing whole classes of software functions (e.g., database access) in a group of modules that serve to insulate programs from changes in underlying support structures.

In brief, software layering means that any function performed by the operating system can be performed from within a user-written program; i.e., the function is callable from a program. Further, the function will continue to work even when there are changes in the

systems and data structures underlying the function.

Software layering, which is used extensively in DEC's VMS operating system, has contributed greatly to the success of VMS. However, many complain that VMS isn't layered sufficiently. There are functions that can be performed by components of VMS that can't be performed by a user program. The inadequate layering of VMS may be one reason the release of VMS version 5.0 was delayed.

Layering Basics

The basic idea of software layering is simple. Instead of constructing software

from a series of interlocking modules, you build it from a series of independent layers in which each layer performs an entire function. Software layering strives to minimize the connections or interfaces between modules, and thereby minimize interdependencies.

Consider a traditional building-block approach to constructing a software application in a personnel department. If a function is to be used in more than one routine in the application, it's generally modularized or placed in a separate callable subroutine. For example, a function to look up an employee's name through an employee's number might be placed in a routine called

PER_NAME_FROM_NUMBER. This routine then can be used anywhere the employee's name is needed.

But modularization has a number of weaknesses. First, a routine like PER_NAME_FROM_NUMBER probably isn't used in isolation. There are likely to be routines to obtain other information about an employee, and there also may be routines to open and close the personnel database that contains the information.

The number of routines exacerbates the next problem: What do you do when PER_NAME_FROM_NUMBER needs to change? If it has been used in hundreds of modules or in dozens of applications, changing the routine can be difficult and time consuming, because so many applications must be relinked. This is true when any personnel routine must be changed. Because many personnel routines use other personnel routines, a change in one is likely to necessitate the relinking of every application that uses it.

Layered software behaves differently. A change to a module beneath the interface is transparent to any program using that module. On VMS, this is ac-

complished through shareable images linked dynamically at run time. Thus, a change in PER_NAME_FROM_NUMBER automatically is made available to every program that uses it the next time the program is run. It also ensures that interdependent modules, such as PER_NAME_FROM_NUMBER and PER_NUMBER_FROM_NAME, are changed simultaneously. Dynamic linking serves to protect the calling program from changes in the underlying modules.

Just as calling programs must be protected from changes in the subroutines, the subroutines must be free to change without being restricted by the stability requirements of applications. Dynamic linking provides the means to change the underlying subroutine as long as the interface isn't changed; the CALL statement in the calling program can't change without programmer intervention. Dynamic linking also means that we can change the subroutine whenever needed. For example, say we discover a way to improve performance in our PER_NUMBER_FROM_NAME routine. Every application that uses this routine will benefit

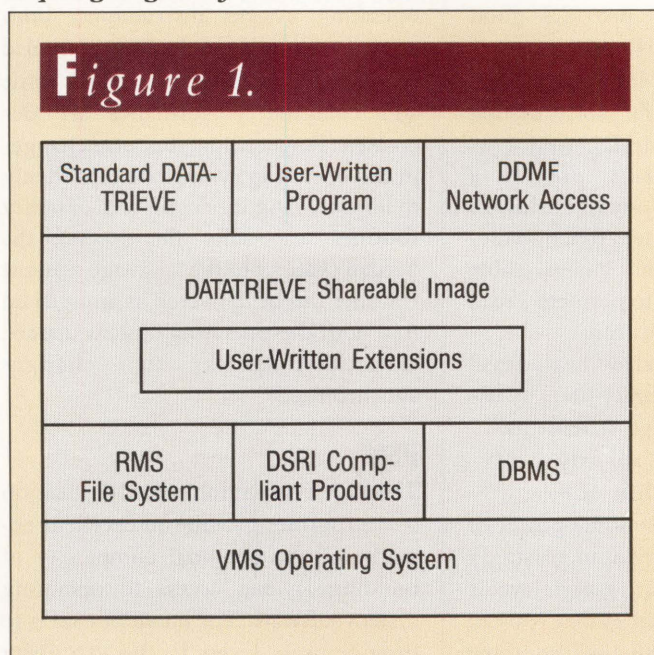
from the improved performance.

But not all features of layered software are embodied in dynamic linking. Suppose a programmer needs more functionality (e.g., wildcard lookup capability) than is provided in PER_NUMBER_FROM_NAME. In a non-layered environment, he probably would get the record definition for the file, open the file, and read it. Then, if the developer of the original PER_NAME_FROM_NUMBER wants to change the file layout (or move the employee name to a different file or relation in a database), the new routine would break. "Tough luck," you say.

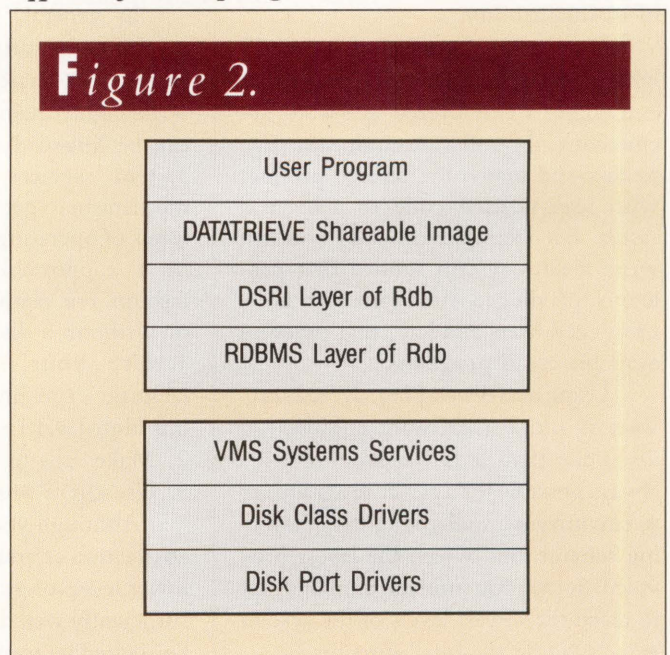
Unfortunately, shortcuts like this seem to crop up in programs for the company president, so it's not always easy to say "Tough luck." And often, by the time it's discovered that the routine cheats and uses the file directly, it has been incorporated into other programs.

On the other hand, if we force the programmer to submit a request for a new routine, for example PER_NUMBER_FROM_WILDCARD, and the routine is developed by those responsible for the entire personnel data access system, the request might become lost

Layering diagram of VAX DATATRIEVE.



Typical software layering on VMS.



SOFTWARE LAYERING IS important because it provides a technical means that makes it relatively painless to achieve the disciplined software engineering approach.

in a sea of similar requests. One solution is to provide the programmer with access to the internal routines used by the shareable image to manipulate the personnel data. The programmer doesn't benefit from the higher level of abstraction provided by a routine like `PER_NUMBER_FROM_WILDCARD`, but at least he can build his routine in a way that won't break every time the data is moved.

That leads to another attribute of layered software. A layered software architecture provides a mechanism to access lower levels of functionality (lower layers in the layering diagram) without loss of support. As lower levels of functionality are used, there's less data abstraction and more work to access the information, but not necessarily any loss of maintainability.

One great benefit of properly layered software is that it's inherently extensible. In a layered software architecture, the software engineer is free to mix and match the layered product with user-written code to achieve a result. For example, on VMS you can write a new system service that performs privileged functions for non-privileged users and have that function available to all programs.

Using and developing layered software is more a software engineering discipline than it is a technology. It's always possible for a clever programmer to circumvent a well-thought-out layering scheme and bypass the layers provided. Some programmers think it's best to reach the lowest levels of the system and "twiddle the bits" directly.

This may be good for them, because it provides job security. Their programs will break every time there's a change in the underlying software or operating system. But for those who make things work and keep them working, this approach is unsatisfactory. Software layering is important because it provides a technical means that makes it relatively painless to achieve the disciplined software engineering approach.

Layering And VMS

On VMS, software layering is used both in the operating system and in the dependent software products. The dependent products often are called layered products because they layer on top of the operating system.

In general, VMS provides good capability for software layering. For example, VMS-shareable images let a user write highly maintainable software that can be linked dynamically. And VMS system services usually provide a mechanism to get to many of the lowest levels of operating system functionality in a supportable and maintainable fashion. For example, to perform a read or write on a disk you can:

1. Use your favorite high-level language's run-time library (RTL) by using high-level language statements.
2. Make calls to RMS directly.
3. Use QIO's to the disk ACP.

Although you lose some power of abstraction as you work at increasingly lower levels of granularity, each level is sufficiently well defined so that you can be assured your programs will continue

to work over time.

There are many good examples of software layering on VMS, as well as some important layered components that are missing. Let's look at a few of these in a case-by-case fashion.

Language RTLs

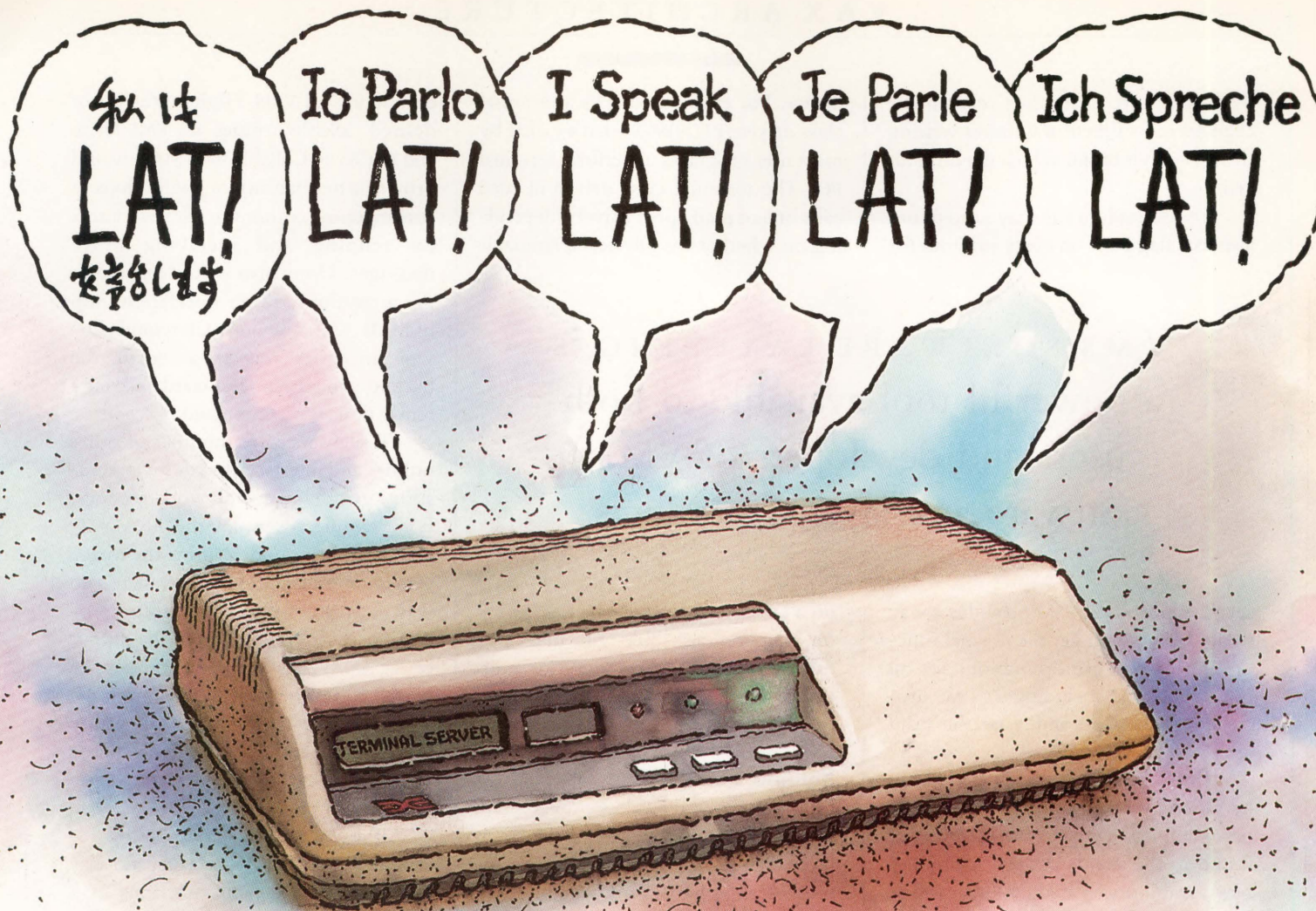
The first layered products running on VMS were the languages. On VMS, a language is implemented in two parts: a compiler that's used only at compile time, and an RTL that's implemented as a shareable image. The RTL bridges the gap between the operating system and a specific language and performs commonly used functions like formatting and conversion, file access and text string manipulation.

The RTL is developed and maintained by the language development team at DEC but is distributed as part of the operating system. The RTL routines are accessed by calls from the compiled code, and because the RTLs are distributed as part of the operating system, the compiler can be sure that these routines will be available on whatever system is running the application.

The advantages of this approach are substantial. If each of these common functions is performed directly using operating system instructions, both compilations and the resulting compiled modules are much longer, and run-time and compiler performance are decreased. Furthermore, because changes in the operating system are most likely to impact a language in the area of utility routines (especially file access), the needed changes to the language support routines can be delivered as an updated RTL with the operating system update, thus keeping the two changes synchronized.

PSM

The VAX Print Symbiont Modification (PSM) routines provide an excellent example of the potential complexity of building layered access to operating system software. The intent of PSM is to provide users access to the VAX Print



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Symbiont, so that they can make changes in its function without writing their own symbiont, which is a difficult task.

For example, a site may need to put a special flag page on every printout for

device. For example, there's a terminal class driver (TTDRIVER) that's called by most user programs to perform terminal I/O. The terminal class driver in turn calls one of many port drivers, depending on whether the physical terminal is

VMS SOFTWARE LAYERING is a powerful tool available to both users and developers of VMS software and layered products.

security purposes. PSM provides a way to do this but still get the normal functioning of the print symbiont for all other functions, including /FORMS processing, burst pages and restartable print jobs.

But although PSM is layered (it can be called by users and used to create a new symbiont with custom features not found in the standard VMS symbiont), new symbionts created by PSM can't be layered themselves. This is a major shortcoming. For example, many users want the advantages of LAT-based printers, which are supported by a symbiont that uses PSM, called LATSYM. But LATSYM isn't modifiable, so if you want to create, say, your own flag page for a printer that's on the LAT, you're out of luck.

Drivers

A powerful VMS idea is that of layered class and port drivers. A class driver is a generic software construct that provides a general software interface to a class of devices, such as disks or terminals. The class driver is called by programs that want to interact with or obtain information about a device.

The port driver is in turn called by the class driver, in a layered fashion. The port driver is hardware dependent and knows about the physical communications medium to the device and about the specific physical attributes of the

on a DZ device, a DMF, the LAT and so on. On the disk side, the disk class driver (DUDRIVER) calls one or more port drivers, such as the PADRIVER for the CI.

Volume Shadowing

Not every layered product provides new functionality directly to users. Some layered products can be transparent to users. VMS Volume Shadowing is an example of a layered product that executes at very low levels in the operating system and is transparent to most users. The Volume Shadowing layered product is actually just a key that enables an image already shipped with VMS. The image is a device driver (the DSDRIVER) that implements volume shadowing. Because the DSDRIVER is simply another disk class driver, there's no effect on any other programs or layered products.

Is It Layered Enough?

Many VMS utilities are callable and therefore can be used in a layered application. The SORT, CONVERT, TPU Editor, Librarian and several other tools are callable and can be layered under applications.

Even so, many VMS watchers believe there's not nearly enough layering in VMS. They cite the following points:

1. Many utilities still aren't callable,

even in V5.0 of VMS. High on the list of desired callable utilities are VMS MAIL and BACKUP. Callable VMS MAIL would provide a mechanism for applications to conveniently communicate with users by sending and receiving MAIL messages. Users also would be able to put a customized user interface on top of MAIL. Callable BACKUP would provide an easier way to automate the backup process, an awkward task currently done with command procedures.

The absence of a number of other utilities and interfaces forces users to institute great kludges and work-arounds. For example, although the ANALYZE/IMAGE utility can determine the image version number and link date, there's no way to get this information from a program or from DCL. Instead, the output of the ANALYZE/IMAGE utility must be parsed to locate these items. Similarly, although DCL and the INSTALL utility can tell if an image is installed, there's no way to get this information in a program.

2. Although DCL is extensible by adding new verbs, there's no graceful way to modify the default functions of a DCL command without incurring a lot of startup overhead (using foreign commands). The only way to change the operation of a DCL command is to get a copy of the command definition file (CLD) and modify it. This technique violates one of the principles of layering, however, because it will fail when the next release of the operating system makes changes to that command.

Further, there's no way to extend DCL by adding lexical functions, an unfortunate omission for sites that want to customize their environments. Although we can add a new privileged system service and have that available to every program on the system, we can't make that service available to the most frequently used program on the system, DCL itself.

3. The omissions in DCL extend beyond the issue of extensibility. DCL does a number of things that mere mortals can't do, or at least can't do in a supported fashion. For example, in DCL the

command \$ SET UIC changes the identity of a user. There's no corresponding system service that a program can call, so there's no supported mechanism that a program can use to change a process's UIC. Other examples of the special nature of DCL abound.

4. In the system management area, DEC has a new layering project under way. Embodied in the new SYSMAN architecture, the goal of this project is to layer most system management functions under a common architecture so that they can be performed from a variety of user interfaces and on any node in a network.

The beginnings of this new architecture were seen in VMS V4.x, when VMS added new system services for reading and modifying the system authorization information and rights list. But these functions operate at a very low level, the item level, and don't lend themselves to simple use from a program. While it's still not clear when all of the system management functions (e.g., quota management, network management, LAT management, system parameters) will be available through the SYSMAN architecture, it sounds as if this will be some years from now.

5. Each version of VMS has taken longer to develop than the previous version. VMS watchers speculate that one reason is that nearly every change to VMS has necessitated a change in the VMS system kernel. Therefore, the entire VMS development process has been gated by the number of people who concurrently can work on the kernel.

However, it appears now that this limitation has been fixed. The system kernel has been decomposed substantially and the interfaces between those components have been defined architecturally. This has been a major task and is supposedly one of the reasons that VMS V5.0 arrived late.

How Far Can You Go?

How far can you go with software layering? One of my favorite examples is the layering in the VAX Information Architecture (VIA) data management soft-

ware. Figure 1 shows the layering diagram of one component of VIA, VAX DATATRIEVE.

In this layered architecture, a user can write a program that can do everything that standard DATATRIEVE can do, because the user can write a program that calls the DATATRIEVE image in the same way as standard DATATRIEVE. DATATRIEVE itself takes advantage of this feature in the Distributed Data Management Facility, which provides network access to DATATRIEVE from remote nodes.

On the other end, a user can extend DATATRIEVE by adding functions that layer beneath the DATATRIEVE shareable image interface. These extensions are then available both to user-written programs and to standard DATATRIEVE.

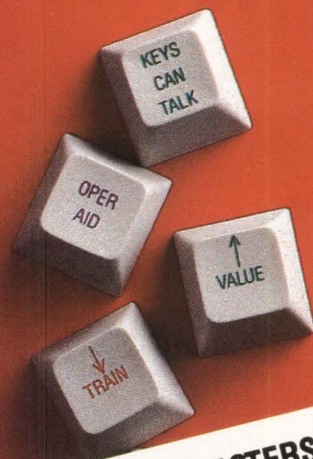
But there's more. Each of the boxes below the DATATRIEVE shareable image also has several layers. If we expand the layering diagram fully, it will look something like Figure 2.

Because the VIA architecture is layered, changes in each layer have no impact on other layers except, possibly, those that have an interface directly with the layer that changes. For example, when the Rdb development team decides it needs to change the on-disk structure of an Rdb database, only the RDMS component in the layering diagram will have to change. Similarly, when VMS made Ethernet-based clusters available (as a new port driver), none of the other components of the system had to change to take advantage of the new functionality.

VMS SOFTWARE LAYERING is a powerful tool available to both users and developers of VMS software and layered products. The ability of VMS to compete with new operating systems will depend greatly on the ability of the VMS development team to extend the layered software features of VMS.

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GETTING ON

The Digital Bus

HAS DEC CLOSED the door or is it open for
those who know how to look? BY DAVID W. BYNON

BACK WHEN LIFE was simple and only PC software had copy protection, there were the MASSBUS and the UNIBUS. These adapters were general-purpose, proprietary buses used for peripherals like disk and tape controllers. Bus adapters, or backplanes, were used to communicate with a central processor and main memory bus. On the VAX 11/780 this is called an SBI, and to the VAX 11/750 this is known as the memory interconnect.

Although the MASSBUS and UNIBUS, as well as the Q-bus, are proprietary bus systems, DEC published its technical specifications and encouraged OEMs to build products for them. The OEMs did just that, and DEC's processor products became a long-term success.

DEC continues to build upwardly compatible computers.

Times Change

At present, DEC's engineering strategy moves away from the traditional bus designs like MASSBUS, UNIBUS and Q-bus. It's current emphasis is to build computer interconnects. Just look at what's available: VAX Bus Interconnect (VAXBI); Network Interconnect (NI), i.e., Ethernet; Computer Interconnect (CI); and Storage Interconnect (SI).

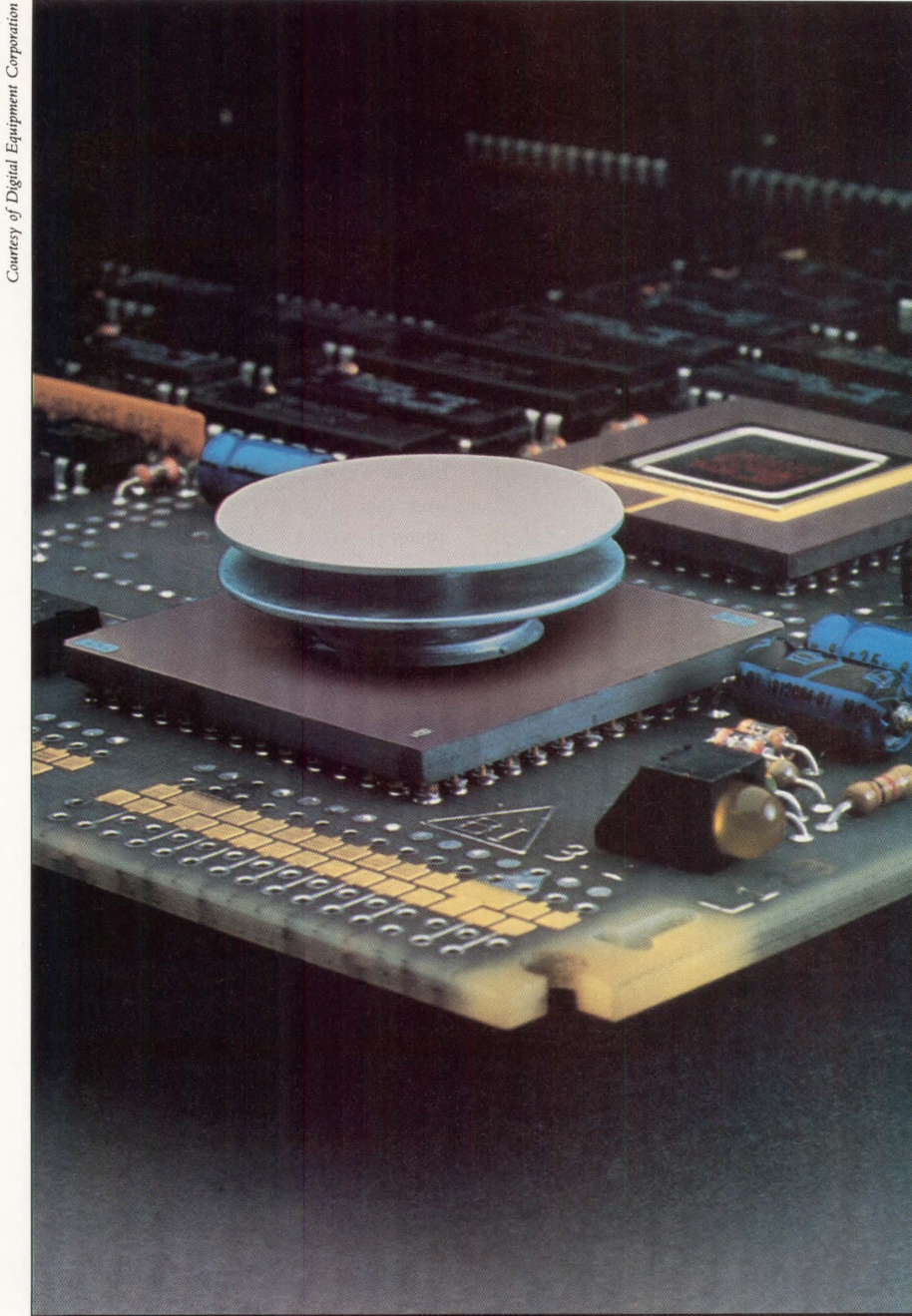
When DEC changed its engineering strategy, it revamped the proprietary bus policies. The announcement of VAXBI brought the shocking news that the door was closed to anyone without a license. As a result, many argue that

DEC is forgetting who helped make it the company it is today.

But DEC, like any smart investor, is securing its money. While the VAXBI licensing policy is not 100 percent open, all is not lost. The door is open to those who look. The new engineering strategy — VAXBI, NI, CI, SI — makes DEC's future clear. New products will be built around common interconnects. The primary interconnect, because it's the common element among all DEC systems, will be the NI.

A Technical Look

The VAXBI bus is the interconnect around which DEC is building future generations of VAX systems. It is likely to remain current well into the 1990s.



The VAXBI Corner displaying the Bus Interface Interconnect Chip.

The VAXBI is a fully specified 32-bit synchronous bus. A single ZMOS interface chip, the Bus Interface Interconnect Chip (BIIC), provides the interface between the VAXBI bus and the user interface on each of the system components, called nodes.

This chip is responsible for all bus transactions, including interrupts, multiprocessing commands, error

checking and distributed arbitration. The BIIC's arbitration scheme ensures fair access for all nodes on the bus. The BIIC, a custom clock receiver and a few discrete components on one end of the edge connector make up the VAXBI Corner.

A second VAXBI component, the VAXBI Chip Interface (BCI), is a synchronous interface bus that provides the

connection between the BIIC and the user interface of each node.

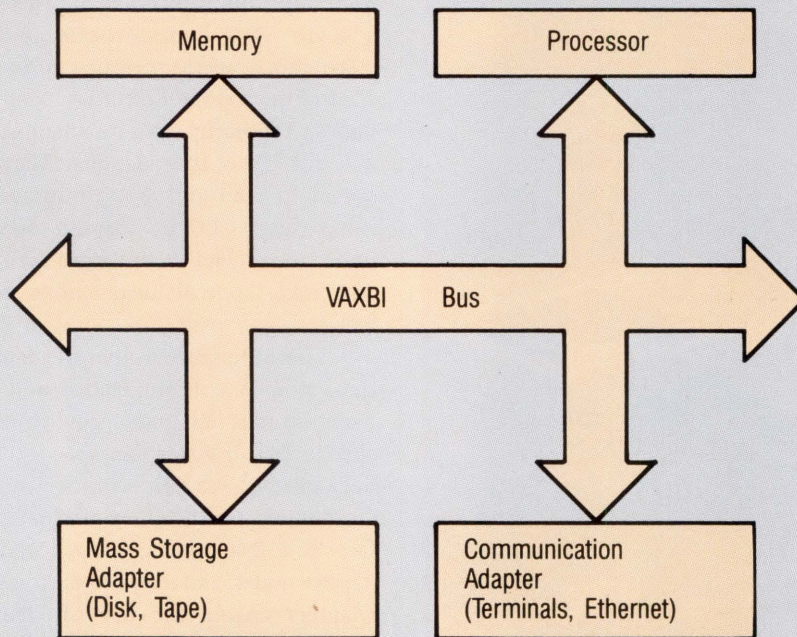
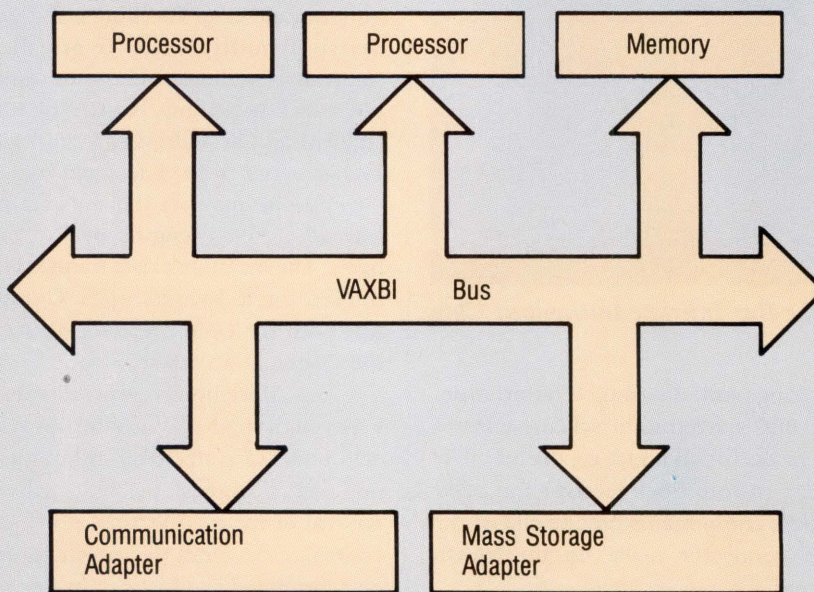
A VAXBI node is one or more VAXBI modules, which may be a mix of three options: CPUs, memories and adapters. CPU nodes process machine instructions, access memory nodes and control the action of adapters. Memory nodes temporarily store instructions and data for CPUs and adapters. They respond to read and write transactions issued by a CPU or adapter. Adapter nodes move data to and from memory and take control instructions from CPUs.

There are several types of adapters: mass storage, communication and bus. Mass storage adapters provide high-speed data transfer between storage devices and VAXBI memory nodes. Communication adapters provide interfaces to LANs, other computer systems (cluster nodes) and terminal devices. Bus adapters enable the use of UNIBUS devices. As many as 16 VAXBI nodes can be supported on a single VAXBI bus.

The VAXBI performs synchronous operations, meaning all operations are clocked. Events occur on the bus at 200-nanosecond intervals (in Grace Hopper terms, that's about 196.66 feet of light speed) with all address, data, arbitration and error checking being time-division-multiplexed over all 32 transmission lines. The addressable range of a VAXBI bus is 1 GB, or 30-bit addressing. The address space is divided evenly between I/O and memory.

VAXBI bus data transfers are performed at fixed lengths of 4, 8 or 16 bytes. The maximum data transfer is 13.3 MB/sec. for 16-byte transfers. Compare this with the UNIBUS at 1.1 MB/sec. or the Q-bus at 3.3 MB/sec.

Bus arbitration is evenly distributed between the nodes. When the bus is idle, any node can arbitrate, although the node with highest priority will win control of the bus. When a node gains control, it becomes the master for only one command transaction. In this way, no single node can take over. It then sends its command and address information to begin a VAXBI transaction.

Figure 1.*Low-end VAXBI bus configuration.***Figure 2.***Multiprocessing VAXBI bus configuration.*

The node that responds to the master's transaction is called the slave.

One of the most important features of the VAXBI bus is that it maximizes the use of multiple processors. Of the 13 VAXBI transactions, nine fully support multiprocessing. Two of these instructions support interlocked communication between nodes and another provides interprocessor interrupts.

It's interesting to look at the way DEC builds computer systems around the VAXBI bus. For instance, single-processor systems can use the VAXBI bus as a combination memory and I/O bus (see Figure 1). Multiprocessing systems with two CPUs and a common memory node can use the VAXBI as a shared memory bus (see Figure 2).

The VAXBI bus also will support single-board computers with a private memory bus. This scheme is used to build a high-end system, where the full bandwidth of the VAXBI is required for I/O (see Figure 3). In these high-end systems, which may support multiple processors, a high-speed memory bus is used. A VAXBI adapter connects one or more VAXBI buses to the system.

When Old Is New

A new processor can make an old bus design seem fresh. The MICROVAX 3xxx series did just that for the tiring Q-bus. Just when it looked as if the MICROVAX line would go to a single-board computer design, such as that of the MICROVAX 2000, DEC threw users a new bone.

This was both good and bad news for the OEMs who build and market hardware for the Q-bus. It was good because the controllers and peripherals will work with the new Q-bus processor. But it was bad because DEC packages the MICROVAX 3500 in a new chassis that meets FCC requirements by using an RFI seal at the top of each board. So the OEMs will have to redesign their boards.

The Q-bus consists of two unidirectional and 42 bidirectional signal lines incorporated into a backplane. The backplane, which houses the signal lines



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*IDC 1986 U.S. Terminal Census.

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and physical connectors for each module, is divided into four rows (A-D) and eight or 12 slots (columns).

As a special design for the MICROVAX II and 3xxx processors, the Q-bus is wired so that some of the C and D backplane rows are interconnected. This CD interconnection is

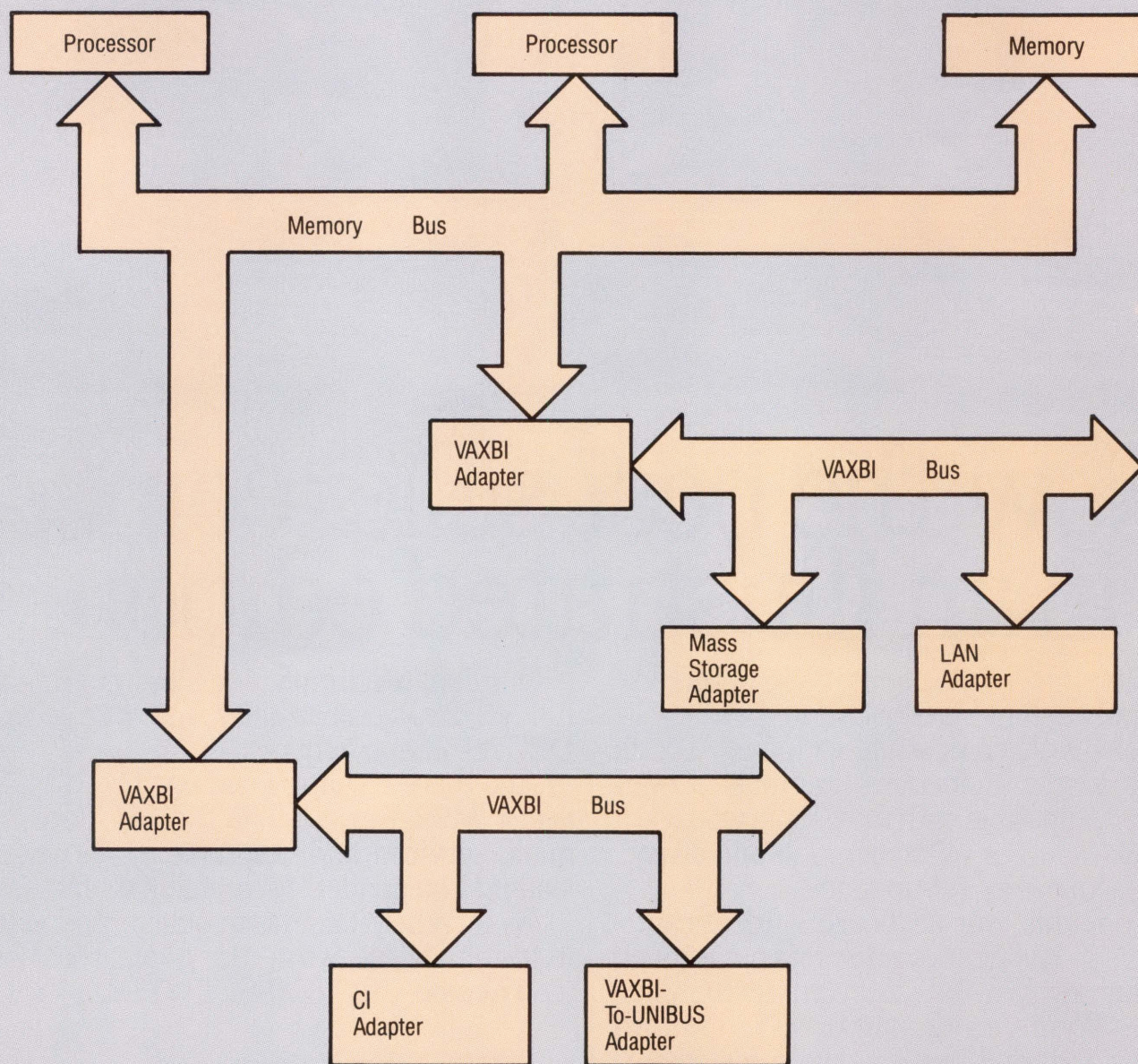
called the MICROVAX Memory Interconnect, or CD. Depending on the backplane, three or more slots may be wired this way.

DEC produces several Q-bus designs. Two were designed for LSI and MICROPDP systems. They used 16- and 18-bit addressing. The MICROVAX II and

3xxx systems require 22-bit addressing and therefore use an extended Q-bus design. This is called the MICROVAX Q22 bus.

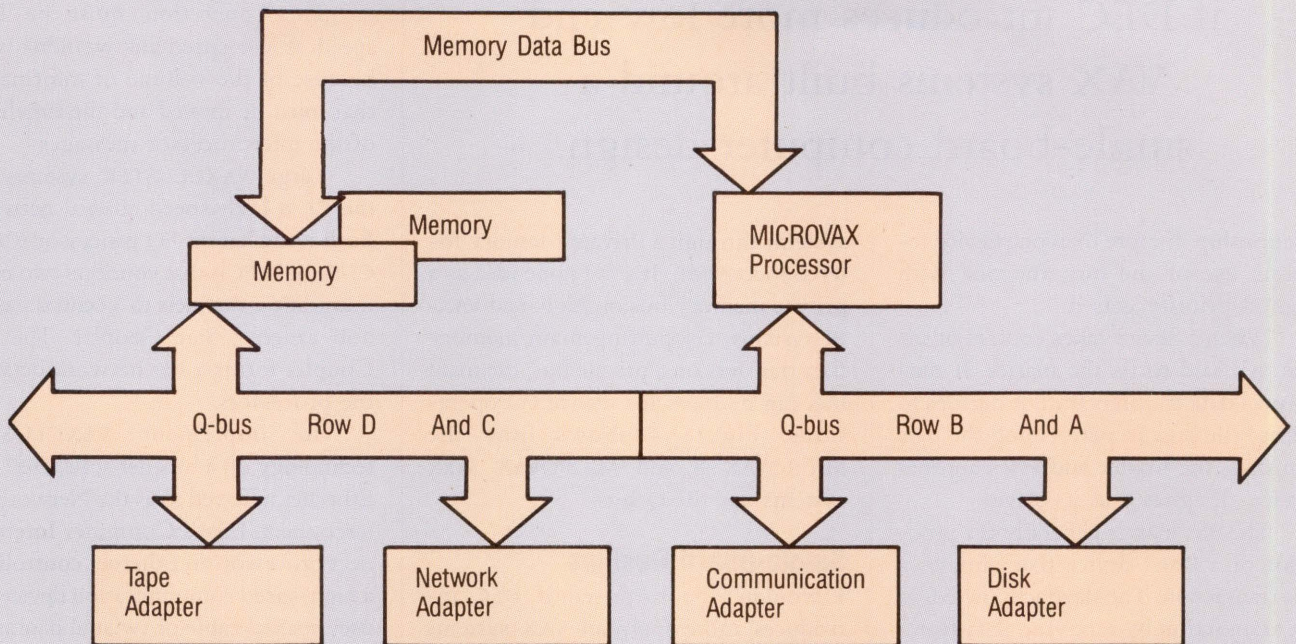
All communication on the Q-bus is performed asynchronously, allowing devices to transfer data at varying data rates. The bus operates in a master/slave

Figure 3.



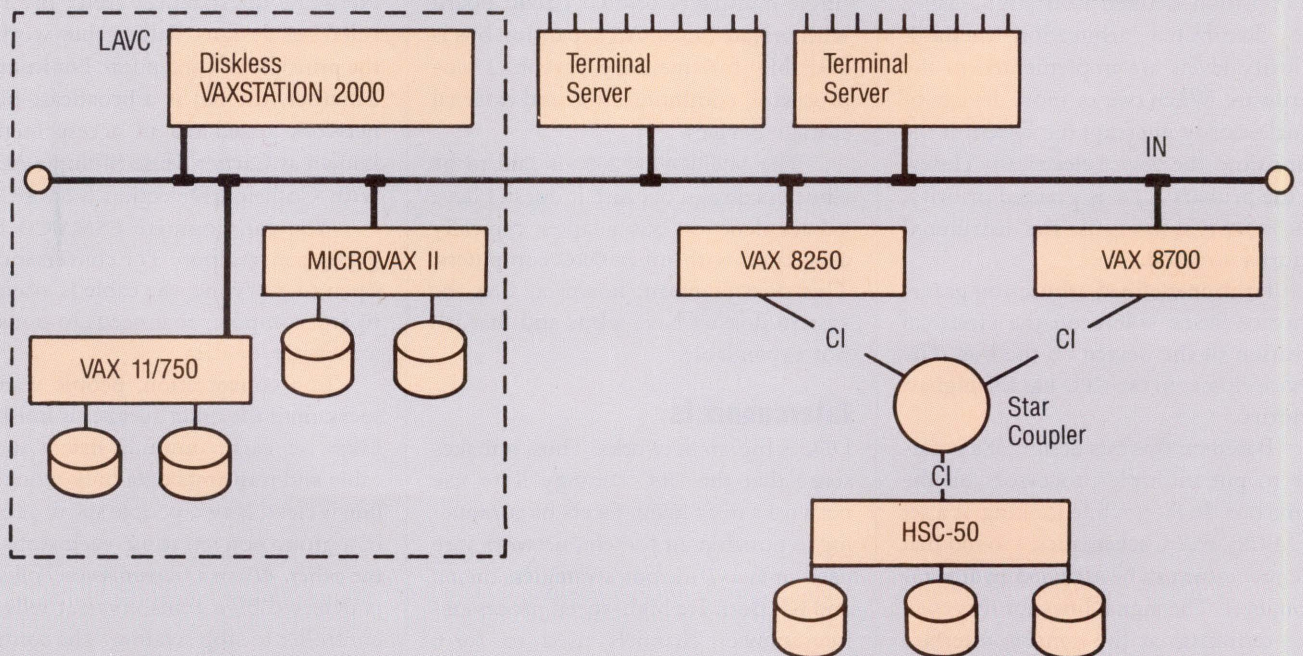
High-end multiprocessor VAXBI bus configuration.

Figure 4.



MICROVAX Q-bus bus configuration.

Figure 5.



Computer Interconnect and Network Interconnect bus configuration.

I WOULDN'T BE SURPRISED if DEC introduces more low-end VAX systems built around a single-board computer design.

relationship. If more than one device requests use of the bus, the one with highest priority gets it.

When a device takes control of the bus, it's said to be the master. It may control data transfers until it decides to release the bus. In performing the data transfers, the master addresses another device, designated as its slave.

The bus master generally is a processor or a DMA device that initiates a bus transaction. The slave acknowledges the transaction by receiving data from, or transmitting data to, the master. An example of this is a disk drive controller as master, transferring data into memory as the slave.

The Q-bus supports two methods of device priority: distributed arbitration and position-defined arbitration. Using the distributed arbitration method, priority levels are implemented in the hardware. When two or more devices of equal priority interrupt the system at the same time, the device electrically closest to the primary CPU is granted priority. MICROVAX systems use the distributed priority method.

Position-defined arbitration grants priority based solely on the electrical position of the device on the bus. The device closest to the CPU has the highest priority.

Based on this bus design, it's possible to put multiple processors on the same bus. In fact, while looking at a set of MICROVAX II schematics, I found that the processor can be assigned an arbitration level. The signal lines for this control terminate at the console interface module housing the time-of-year clock.

Q-bus performance is enhanced on the MICROVAX II and MICROVAX 3xxx

systems through a Private Memory Interconnect (PMI). It's the same idea as a private memory bus on high-end VAX-BI systems. By putting main memory data transfers on a private bus, the main bus can be freed for device I/O operations. Figure 4 shows how the MICROVAX II and MICROVAX 3xxx systems use the Q-bus.

Single-Board Designs

I wouldn't be surprised if DEC introduces more low-end VAX systems built around a single-board computer design. The MICROVAX 2000 systems have been tremendously successful.

The MICROVAX 2000 uses the same CPU and floating point processor as the KA630 (MICROVAX II), repackaged on a single multilayer printed circuit board with private buses. An expansion bus is available for memory, graphics coprocessor, communication and external storage devices.

The MICROVAX 2000 is said to be a busless design because it doesn't have a backplane or bus adapter typically associated with other DEC computers. This doesn't mean, however, that the system doesn't have a bus and that it's not expandable.

Interconnects

DEC is big on networks. Thus, it makes sense that the DEC strategy is to use networks in as many facets of computing as possible. At present, networks are used in two DEC bus strategies, the CI and NI. Both are high-speed processor-interconnect channels used to form VAXCLUSTERS.

Processor-interconnects are needed to pass information and data between

the cluster members. For instance, this might consist of member connection messages, cluster transition states information, and user files.

The connection must be high speed. A low-speed link wouldn't work because of the volume of information that must be moved and the timeliness of the interprocessor messages.

Large VAXCLUSTER systems use the CI, a high-speed coaxial network. Each node has an I/O processor (CI780, CI750 or CIBCI) that connects two communication channels to a central passive hub called a Star Coupler. The Star Coupler forms a star network between the processors.

To implement VAXCLUSTER technology on a broader scale, DEC uses Ethernet, referred to as the Network Interconnect. Like a Computer Interconnect processor, an Ethernet controller is a high-speed communication device that uses coaxial cable or twisted pair as the medium. Small differences exist: The CI has a 70-megabit bandwidth compared with Ethernet's 10, and an Ethernet controller has only one channel.

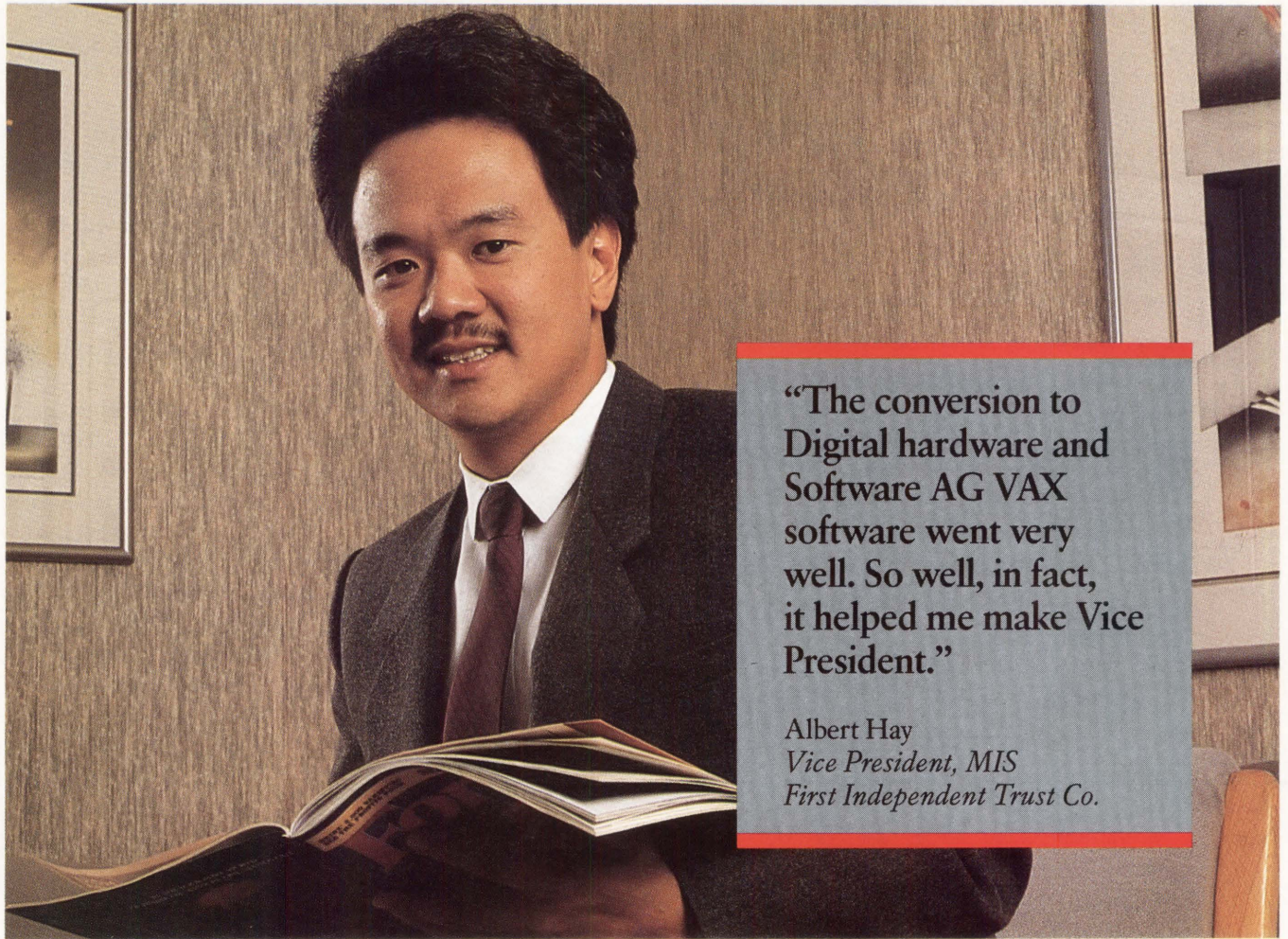
Unlike the VAXBI and Q-bus designs, the Computer Interconnect and Network Interconnect aren't priority-ruled bus designs. Rather, they work on the principle of contention. For instance, Ethernet (the NI) is a broadcast-based network based on an access method known as Carrier Sense Multiple Access with Collision Detection (CSMA/CD).

You can compare CSMA/CD to a group conversation. The conversation is open to everyone; the cable is available to any computer that needs to transmit a message or data.

In a conversation, people wait to speak until the other speaker is finished. Likewise, each computer listens to the cable and transmits data only when the line is clear. If two people speak at once in a group conversation, each stops for the other. When a transmission collision is detected by a transceiver, it tells the controller to stop sending. The controller will wait a random period and try to send again.

This type of bus protocol allows

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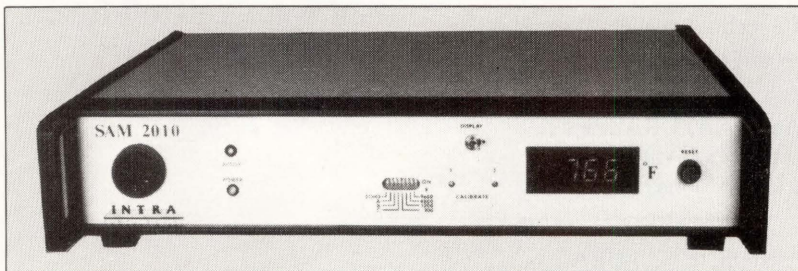
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processors and devices with a wide range of capabilities to use the same bus. Compatibility is no longer a major issue. Figure 5 shows how the CI and NI buses tie systems together.

DEC's Interconnect Future

The 1990s will be the decade of the node. Every computing component will be a node on the bus, which will be a network. OEMs that rant and rave about this DEC policy and closed DEC architecture have their eyes closed. The whole world is open to OEMs that have imagination.

Some very innovative products are on the market. For example, the Performance 4000 terminal server from Emulex Corporation, of Costa Mesa, California, uses DEC's Ethernet LAT protocol. It provides the same services as DEC's terminal servers, but has additional features.

First, it's expandable from 16 to 32 lines. Second, it has a parallel printer port. Now you can use a non-serial printer without having to use some newfangled converter. This is just one example of an expansion device that connects to a DEC bus. There are many others.

What I'd like to see is an EtherTerm — an Ethernet-based terminal. You take your favorite microprocessor, like an Intel 80386 or DEC 78032, mix it with a high-resolution graphics processor, such as the Dragon chip set, add 4 to 16 MB of memory and enough firmware to house the X Window System and your network software, and button it all up with a LAN coprocessor, such as the Intel 82586.

And what about an NI-based storage server for MICROVAX systems?

If you examine how DEC has designed VMS software, you'll find that the door to new hardware is wide open. For this reason, DEC's interconnect strategy looks like it has a bright future.

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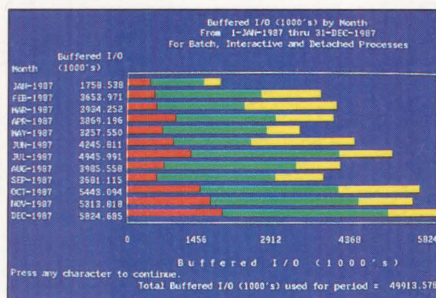
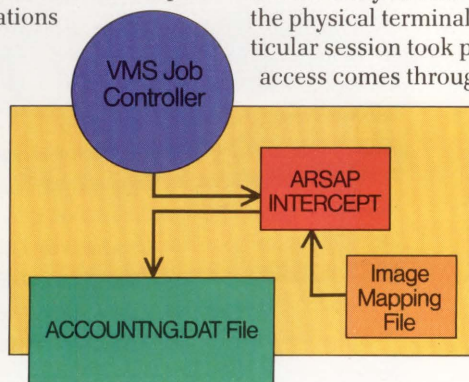
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The screenshot displays two reports from the ARSAP system. The top report, titled 'User Accounting', lists various users and their resource usage. The bottom report, titled 'Project Accounting', shows resource allocation across different projects. Both reports include columns for user/project name, resource type, and usage statistics.

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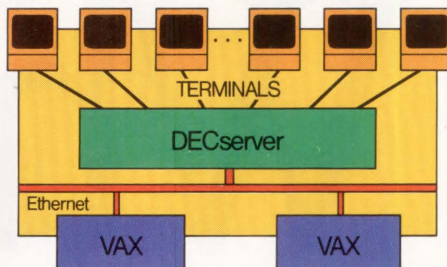
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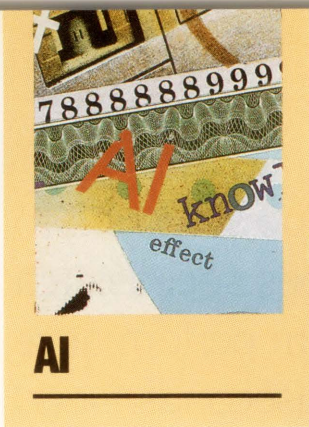
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EXPERT SYSTEMS TO SPOT TROUBLES

By Kent Cearley

Leaving A Trail To Correct Problems And Use Documentation Effectively.

Expert systems are one of the more practical technologies emerging from AI research. Several products from DEC use this technology, ranging from XCON, which was developed in 1979 and is involved in the configuration of most customer shipments, to VPA, a new package designed to advise system managers of performance bottlenecks and what can be done about them.

Unfortunately, the term *expert system* has become a new buzzword. It often is lumped into a set of AI jargon like neural nets and frame-based representation that obscures its inherent simplicity and its practicality for real-world problems. One problem for which it's suited is common for system managers.

The Scenario

Under the scenario, a printer queue suddenly stops, or a user's terminal is hung. A series of steps is followed to determine the source of the problem. Depending on the cause, remedial action is taken and the problem is resolved, under the optimistic version.

In reality, the help desk receives the call and tries to contact the system manager. He can't be found, and a frantic search ensues for documentation or procedures, which, hopefully, are understandable and helpful for the

problem. Or, he's found and remembers vaguely that this problem almost was intractable, but the fix was so obvious that it wasn't worth writing down.

The Program here enables the manager or problem solver to leave a trail so that if the problem recurs, it will lead to the appropriate solution. A framework also can be developed, with the same program, for a dynamic documentation base that can interact with operators and help determine the cause of the problem and suggest probable solutions.

This is an interactive extension of the help file. Although help systems are a relatively closed architecture, the system developed here is extended in a variety of ways.

This system addresses three concerns: design, tool selection and ease of maintenance/extensibility. These are obstacles to most expert system development, and there are highly paid professionals who address them in large projects or lucrative contracts. In our implementation, the solutions to these obstacles are simple and direct.

Design

The first stage is design. This is a good place to clarify goals without regard to the specifics of implementation. The goal is to develop an online version of the troubleshooting guide. The structure of this guide is familiar to those experienced with the Chilton's school of car

A

maintenance and is even found in several DEC manuals.

Because designing many expert systems consists of structuring the information in a troubleshooting format, most of the work already is done. Where there are questions in the troubleshooting procedures, the operator will be prompted for information (or, by extension, they can be determined with calls to external routines). Where particular paths can be followed based on the operator's answer, there will be branches in the flow of interactions. When a solution has been found, it will be recommended to the operator and can be initiated automatically.

In AI and particularly in expert systems, programs operate in problem space. Conceptually, this is the separation of the problem and solution by an abstract space, consisting of all possible paths from one to the other. The troubleshooting guides start exploring several possible paths through this space and, based on each choice, gradually end up at a specific point.

This is an example of a forward-chaining methodology, the navigation of problem space proceeding from the set of possible problems to the solutions. Backward-chaining systems start with a possible solution and work backward through the problem space to see if they have the right problem. Because troubleshooting guides are usually classification

problems (i.e., determining the nature of the problem), this system is forward chaining.

One tremendous advantage of implementing expert systems over conventional programming is you don't need to know exhaustively what you're trying to accomplish. You can start with a few paths and solutions, for instance a direct implementation of the troubleshooting checklists, and fill in a little more each time you discover a new solution or different contingency.

The tree can grow in this problem space to encompass every nook and cranny you explore neurally in searching for solutions or in characterizing the essential nature of the problem. Best of all, even a partially completed system is of value; it can solve problems to the extent of its knowledge base.

Selecting Tools

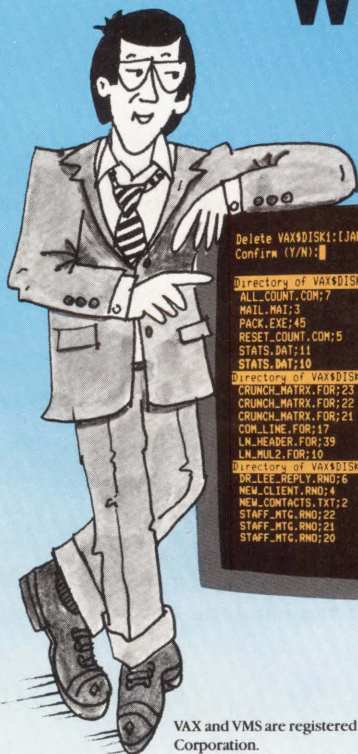
After you understand the design approach, the next step is to select tools that are suitable to its implementation. A tool should allow most of the effort to be spent in entering and extending what the system knows, versus mastering syntax or other incidental detail. This is the goal of programs known as expert system shells.

These shells can be expensive and often require training

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MAIL.MAI:3	23	22-AUG-1988 10:07	[SYSTEM]
PACK.CVE:45	109	10-DEC-1987 14:31	[DEVEL,JAN]
RESET_COUNT.COM:5	15	7-APR-1988 9:22	[DEVEL,JAN]
STATS.DAT:11	21	14-JUL-1988 12:09	[KEY,MGR]
STATS.DAT:10	21	13-JUL-1988 11:46	[KEY,MGR]

Directory of VAX\$DISK1:[JAN.SOURCE] 1295 blocks 61 files

CRUNCH_MATRIX.FOR:23	47	15-SEP-1988 13:01	[DEVEL,JAN]
CRUNCH_MATRIX.FOR:22	47	15-SEP-1988 12:43	[DEVEL,JAN]
CRUNCH_MATRIX.FOR:21	47	15-SEP-1988 12:21	[DEVEL,JAN]
COM.LINE.FOR:17	20	6-SEP-1988 17:04	[DEVEL,JAN]
LN_HEADER.FOR:39	19	9-SEP-1988 14:05	[DEVEL,JAN]
LN_MUL2.FOR:10	14	7-SEP-1988 9:59	[DEVEL,JAN]

Directory of VAX\$DISK1:[JAN.CORRESP] 223 blocks 44 files

DRALES.REPLY.RND:5	29	9-AUG-1988 11:21	[DEVEL,JAN]
NEW.CLIENT.RND:4	55	1-JUL-1988 9:09	[MKTG,ELN]
NEW.CONTACTS.TXT:2	17	5-AUG-1988 16:15	[MKTG,ELN]
STAFF.MTG.RND:22	25	19-SEP-1988 13:42	[DEVEL,JAN]
STAFF.MTG.RND:21	24	19-SEP-1988 13:35	[DEVEL,JAN]
STAFF.MTG.RND:20	19	19-SEP-1988 10:03	[DEVEL,JAN]

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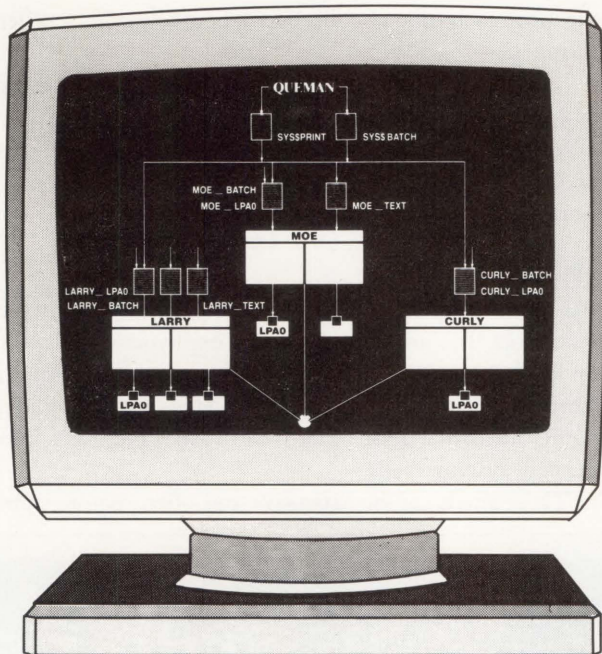


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or extensive reading to bring up the simplest implementation. The approach uses a language with many of the features of shells built in.

The language is OPS5; it costs about \$3,150 for a MICROVAX. Compared to most expert system development shells, this is relatively cheap. Most shells for the VAX have a variety of data structures and options and are as complex as they are powerful. These features and complexity aren't always necessary. OPS5, for example, has two basic constructs: assertions (like assignments in traditional programming, e.g., A=1) and rules (if x, then y).

Although simple, even this syntax won't have to be understood for this project. A shell will be provided consisting of five statements. Troubleshooting specifics will be inserted as text into a basic rule template. After plugging in this text, everything else is handled automatically. Here's an example, using this technique to implement a section of a troubleshooting guide. This is followed by how it is maintained and extended.

For the example, I'll use the troubleshooting section in the *DEC SERVER 100 Operations Guide*. This section, for release 1.2, begins in Chapter 4. Using the Table of Contents, we can extract the information to design a simple outline. This outline is helpful in understanding both the scope and the depth of the knowledge base. It also provides an excellent source document for maintenance and testing.

The six headings in the troubleshooting section are:

- 4.1 What to do first
- 4.2 Problems affecting all ports
- 4.3 Problems affecting individual ports
- 4.4 Problems involving service nodes
- 4.5 Problems involving the Ethernet
- 4.6 Digital service

Under these headings are various steps to isolate the problem until a determination is made and solutions are suggested. The complete section of the troubleshooting outline for section 4.2 breaks down into:

- 4.2
- 4.2.1
- 4.2.2
- 4.2.2.1
- 4.2.2.2
- 4.2.2.3
- 4.2.2.4
- 4.2.3
- 4.2.4
- 4.2.4.1
- 4.2.4.2
- 4.2.5
- 4.2.6

Translating into the design of the expert system, each level is a menu of the levels beneath it. If the first menu looked like this:

- 1. Problem is affecting all ports (4.2)
- 2. Problem only affecting individual port(s) (4.3)
- 3. Problem involves service nodes (4.4)
- 4. Problem seems to involve Ethernet (4.5)

and the user selects 1 as the closest approximation to what he thinks is happening, this would translate in the trouble guide to 4.2. At this point, you would display a menu of choices to classify the problem further. These choices would be:

- | | |
|-----------------------------------|---------|
| 1. Server green light is off | (4.2.1) |
| 2. Server green light is blinking | (4.2.2) |
| 3. No console messages | (4.2.3) |
| 4. Downline loading problems | (4.2.4) |
| 5. Message 913 appears on console | (4.2.5) |

Whenever the problem doesn't break down any further, you have a recommendation for action. This occurs, for example, at selections 4.2.2.1 and 4.2.2.2. This is the end of the problem chain, and there's a small difference in the way you enter the rule.

Here are the rule templates:

```
(P 1.4
  (STATE "NODE 1 4 .)
  -->
  (WRITE (CRLF) | Problem menu           |
        (CRLF) | goes in this window... |
        (CRLF) |                          | )
  (MAKE NEXT-NODE MENU))
(P solution
  (STATE "NODE solution .)
  -->
  (WRITE (CRLF) | Solution text          |
```

```
(CRLF) | goes in this window... |
(CRLF) | ...                      |
(CRLF) |                          | )
(MAKE NEXT-NODE RETURN))
```

The first template is for a menu, and the second is for a solution or the end of a problem chain mentioned above. The uppercase text needs to be entered exactly as is; the lowercase is the variable information you fill in, based on which section you're entering.

The shell has one rule already coded, the main menu. This can be modified to whatever problem domains you want to implement. If an item is selected that you haven't coded yet, the user will get a "Not implemented yet . . ." message. The rules can be appended in any order to the end of the shell.

Here's an example of the main menu already coded in the shell:

```
(P Main_routine
  (state "node 1 .)
  -->
  (write (crlf) | --- Troubleshooting Menu --- |
        (crlf) |                               |
        (crlf) | 1 - Terminal Hang             |
        (crlf) | 2 - SNA Gateway               |
        (crlf) | 3 - Router                    |
        (crlf) | 4 - DECNET Problems           |
        (crlf) | 5 - DECSERVER 100             |
        (crlf) |                               | ) )
```

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OPS5 Tips

OPS5 WRITE statements have no provisions for such basic requirements as clearing the screen or using character attributes. This can be added, however, with any editor that allows you to insert escape sequences. The escape codes can be added between the | | brackets in the WRITE statement. Typical sequences for VT100/VT200 are:

```
<ESC>[?31 Set column width to 80 and clear screen
<ESC>[1m Bold
<ESC>[7m Reverse video
<ESC>[0m Back to normal
```

If you're using EDT, <ESC> can be inserted with this key sequence:

```
{GOLD} 27 {GOLD} {SPECINS}
```

Lines with (CRLF) after the WRITE statement and before the last (CRLF) on the line closed with a parenthesis can be added as required to accommodate all the necessary text. Assuming you've customized already, the main menu selections let you implement the DECserver 100 selection. Take the highest-level headings from the troubleshooting guide and enter them in the menu template:

```
(P 1.5
(state ^node 1 5 .)
-->
(write (crlf) | DECserver 100 Troubleshooting menu |
(crlf) |
(crlf) | Please select the option which describes |
(crlf) | the problem most closely |
(crlf) |
(crlf) | 1 - All ports on the server are affected |
(crlf) | 2 - Only individual ports are affected |
(crlf) | 3 - Access to service nodes affected |
(crlf) | 4 - Seems to be related to Ethernet |
(crlf) |
(make next-node menu))
```

The text following <node is the main menu node '1' followed by the menu selection which brought '5' followed by a terminator '.'. These must be separated by spaces. In the title (the text following 'P'), the selections must be separated by '.' with no embedded spaces. These names following the 'P' should be unique.

To implement the next level, say selection 1, the node will be 1.5.1. This scheme continues until the node is a solution node. Here's 1.5.1:

```
(P 1.5.1
(state ^node 1 5 1 .)
-->
(write (crlf) |
(crlf) | 20 seconds after initialization, the green |
(crlf) | light on the DECserver 100 should be in one |
(crlf) | of three states. Please select the one |
(crlf) | which is appropriate: |
(crlf) |
(crlf) | 1 - Light is off |
(crlf) | 2 - Light is blinking |
(crlf) | 3 - Light is on, solid green |
(crlf) |
(make next-node menu))
```




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DEC Now Producing AI VAXSTATIONS

Licenses for LISP and the OPS5 expert system building toolkits currently are shipping with specially configured AI VAXSTATIONS. The new machines are running VAX LISP V2.2, which DEC says provides a 25 percent improvement in performance over V2.1.

The AI VAXSTATION 2000, the low-end member of the family, is designed to facilitate the transfer of AI programs among nodes in a Local Area VAXCLUSTER. The AI VAXSTATIONS 3200 and 3500 are higher-performance versions that are "appropriate for developing even the largest AI applications," according to DEC.

All three workstations run LISP and VAX OPS5 on either ULTRIX or VMS. Both VAX LISP and VAX OPS5 were designed to integrate with VAX C and FORTRAN, which DEC hopes will increase the potential for AI application development.

DEC benchmarked the 3200 and 3500 (which are powered by CMOS microprocessors) running LISP 3.5 times faster than a MICROVAX II.

—Evan Birkhead

AI Development Platform	Main Memory	Storage	Monitor	Options
AI VAXSTATION 2000	6 MB	71-MB disk	19" monochrome	Cartridge tape drive
AI VAXSTATION 3200	15 MB	159-MB disk, 95-MB tape	19" b&w, 4-plane grayscale graphics	
AI VAXSTATION 3500	16-32 MB	280-MB disk, 296-MB tape	19" color, 8-plane graphics	

The specialized AI platform configurations.

To implement 1.5.1.1, a solution, use the second template:

```
(P 1.5.1.1
  (state "node 1 5 1 1 ..)
  -->
  (write (crLf) |
        (crLf) | Problem: Power is not reaching the server.
        (crLf) |
        (crLf) | Corrections:
        (crLf) |
        (crLf) | * Make sure plug is in securely
        (crLf) | * Check wall outlet, insure circuit
        (crLf) |   breaker has not been tripped
        (crLf) | * Insure voltage switch is set to
        (crLf) |   correct voltage
        (crLf) | * Check fuse in DECSERVER, refer to
        (crLf) |   DECSERVER 100 Terminal Server
        (crLf) |   Site Preparation/Hardware
        (crLf) |   Installation guide
        (crLf) | * Swap power cords
        (crLf) |
        (crLf) |
        (make next-node return))
  )
```

After the system is laid in, you can customize the outline for problems specific to your site and incorporate your own experience.

The only difference in this template is that MAKE NEXT-NODE is followed by RETURN instead of MENU. This is required for rules that offer a solution to the diagnosed problem.

The three rules just coded (not including the main menu which already exists) can be added in any order to the end of the text of the OPS5 shell with a text editor. OPS5 then can be invoked to compile the rules with the command: \$ OPS5 filespec. This creates an executable version that can be run by: \$ RUN filespec. The main menu is displayed, and interaction at the terminal begins.

This example implemented the following section of the *DECSERVER 100 Troubleshooting Guide*:

```
4 - DECSERVER 100
  4.2 Problem is affecting all ports
    4.2.1 Server green light is off
```

The implementation can continue with 4.2.2 or 4.3, and the rules can be created and entered in any order. The system so far can solve a single problem; with each additional rule, its scope expands. After the system is laid in, you can customize the outline for problems specific to your site and incorporate your own experience. This maintenance and extension are two of the most important real-world issues in effective use of expert system technology.

Maintenance And Extension

All changes to the troubleshooting system should be made to the outline first. This accomplishes two things: it documents system changes, and it shows what rules must be added, modified or replaced.

The outline should map one-to-one with individual rules. This will make it easy to test and debug potential problems, such as incorrect advice or missing classifications.

The evolution of rules is an ongoing process. It doesn't require an expert to extend the system. With an understanding of the template syntax and its relationship to the troubleshooting outline, it should be an easy process for a number of people to contribute their expertise in an incremental fashion.

OPS5 allows interfacing to other DEC programming languages and tools. This capability could be exploited by

allowing menus to determine the problem classifications for themselves rather than relying on the operator. The operator would be prompted only for what the procedures couldn't determine. OPS5 also can write to external files. This could allow the program to create DCL procedures for the resolution of certain problems.

I hope this demonstrated how easy it is to begin employing the benefits of expert systems. This system evolved from

real-world issues in system management. What it lacks in sophisticated user interfaces, it makes up in simplicity of use and price/performance. —*Kent Cearley is senior software programmer in the office of University Management Systems, University of Colorado, Boulder, Colorado.*

ARTICLE INTEREST QUOTIENT

Circle On Reader Card

High 419 Medium 420 Low 421

PROGRAM

```

;; --- OPS5 Expert System Shell

(vector-attribute node)

(literalize state
  verb
  response
  level
  node)

(startup
  (strategy lex)
  (watch 0)
  (disable halt)
  (make state "verb query "level 1 "node 1 . "response 1)
  (run)
)

;; --- Shell Control Productions

(P Not-Found
  (state)
  -->
  (remove 1))

(P Not-Implemented
  (state "response <> nil)
  -->
  (write (crlf) (crlf) | Function not yet implemented... |)
  (remove 1))

(P Pop
  (state "response *pop*)
  (state "verb stack)
  -->
  (remove 1 2))

(P Get-Query
  { <f1> {state "level {<level> <> nil} "node {<node> <> nil}}}
  (next-node {<node2> <> return})
  -->
  (modify 1 "verb stack)
  (bind <idx> (litval node))
  (bind <off> (compute <idx> + <level> - 1))
  (bind <nxt> (acceptline "pop*))
  (make state "response <nxt>
    "level (compute <level> + 1)
    "node (substr <f1> node <off>) <nxt> .)
  (remove 2))

(P Display-Solutions-Loop
  (next-node return)
  -->
  (bind <j1> (acceptline))
  (remove 1))

;; --- Main Menu

(P Main_routine
  (state "node 1 .)
  -->
  (write (crlf)
    (crlf) | --- Troubleshooting Menu -- |)
  (crlf) |
    (crlf) | 1 - Terminal Hang          7 - EMail
    (crlf) | 2 - System Down           8 - DECSERVER100
    (crlf) | 3 - SNA Gateway            9 - DECSERVER200
    (crlf) | 4 - Router                10- Fiber Optics
    (crlf) | 5 - Printer Problems      11- Backup/Restore
    (crlf) | 6 - DECNET Problems       12- ALLIN1
    (crlf) |
    (crlf) | Enter Selection ==> |)
    (make next-node menu))

;; --- End of Expert System Shell --- User Written Rules follow

(P 1.5
  (state "node 1 8 .) ; comments can be added after semicolons
  -->
  (write (crlf) | DECSERVER 100 Troubleshooting menu
    (crlf) |
    (crlf) | Please select the option which describes
    (crlf) | the problem most closely
    (crlf) |
    (crlf) | 1 - All ports on the server are affected
    (crlf) | 2 - Only individual ports are affected
    (crlf) | 3 - Access to service nodes affected
    (crlf) | 4 - Seems to be related to Ethernet
    (crlf) |
    (make next-node menu))

(P 1.5.1
  (state "node 1 5 1 .)
  -->
  (write (crlf) |
    (crlf) | 20 seconds after initialization, the green
    (crlf) | light on the DECSERVER 100 should be in one
    (crlf) | of three states. Please select the one
    (crlf) | which is appropriate:
    (crlf) |
    (crlf) | 1 - Light is off
    (crlf) | 2 - Light is blinking
    (crlf) | 3 - Light is on, solid green
    (crlf) |
    (make next-node menu))

(P 1.5.1.1
  (state "node 1 5 1 1 .)
  -->
  (write (crlf) |
    (crlf) | Problem: Power is not reaching the server.
    (crlf) |
    (crlf) | Corrections:
    (crlf) |
    (crlf) | * Make sure plug is in securely
    (crlf) | * Check wall outlet, insure circuit
    (crlf) | breaker has not been tripped
    (crlf) | * Insure voltage switch is set to
    (crlf) | correct voltage
    (crlf) | * Check fuse in DECSERVER, refer to
    (crlf) | DECSERVER 100 Terminal Server
    (crlf) | Site Preparation/Hardware
    (crlf) | Installation guide
    (crlf) | * Swap power cords
    (crlf) |
    (make next-node return))

```


SCANUAF

By James D. Snyder

A Program To Display Users Whose UAF Accounts Satisfy Selected Criteria.

The VAX/VMS User Authorization File SYSUAF.DAT contains account information for all system users. At Princeton Plasma Physics Laboratory, we have a VAXCLUSTER consisting of six nodes, which is heterogeneous in that each node has its own SYSUAF.DAT authorization file. Most users have accounts on each node, and many have different privileges and quotas on each node.

In addition, we have several MICROVAX IIs connected to the cluster via DECNET, each of which has its own authorization file. There are DEC utilities (such as AUTHORIZE) and third-party utilities that allow examination of various UAF parameters for a specific user in a single authorization file.

However, we often need to look at some or all of our authorization files simultaneously and from a different angle. Rather than seeing the parameters for a specific user on a particular node, we need to be able to see quickly and easily a display of all users whose accounts satisfy a specified set of criteria in any or all authorization files (see Figures 1 and 2).

For example, we have to be able to generate a list of all users who have SYSPRV or SETPRV privilege on any cluster node, haven't logged in on any or all nodes in the past year or have an excessively large or small working set quota on any or all nodes. To facilitate this, we developed a program called SCANUAF. SCANUAF allows our system manager to enter parameters that effectively say, "Show me all users who ...," where

"..." represents anything that can be determined from the authorization files.

Input Commands

SCANUAF signals that it's ready for input with the prompt SCANUAF>. Input commands to SCANUAF consist of sets of parameter-value pairs. The parameter half of a pair designates the UAF parameter to be examined. Any parameter defined in the UAF (other than passwords) may be specified. For the most part, parameter names are the same as those that would be specified in the AUTHORIZE utility.

The value half of a pair is the value against which the values from the UAF records are to be compared. A value may be an integer or a character string, depending on the parameter to which it applies.

A parameter-value pair is connected by a comparison character. The characters =, \, < or > are used, respectively, to search for users whose UAF value is equal to, not equal to, less than or greater than the value specified in the command.

For example, to display all users who have a base process priority of 4, the command would be:

```
SCANUAF> PRIORITY=4
```

To display all users who haven't logged in interactively since the beginning of 1988, the

A

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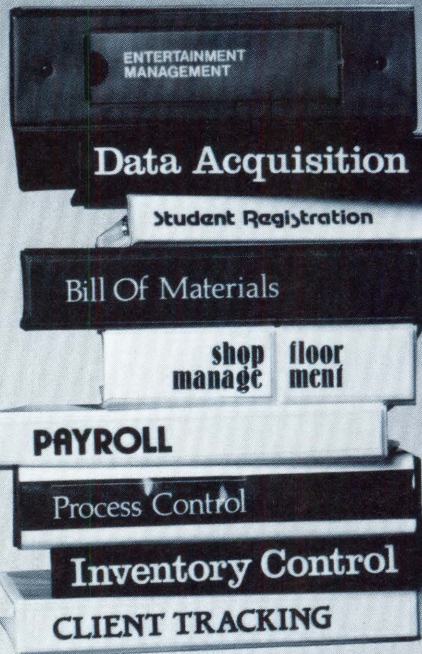
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FIGURE 1.

SCANUAF> LOGINT <01-JAN-1988

Node: USC

Username:	AMARTIN LOGINT	: (None)
Username:	ANCHER LOGINT	: 16-JUN-1986 16:23:59.62
Username:	APALLADINO LOGINT	: 5-NOV-1986 12:08:49.93
Username:	APAN LOGINT	: (None)
Username:	APUNJABI LOGINT	: 29-JUL-1986 16:28:22.14
Username:	ARCHIVE LOGINT	: (None)
Username:	ARCTFTR_NONS LOGINT	: (None)
Username:	ARNOLD LOGINT	: (None)
Username:	ARUN LOGINT	: (None)
Username:	BARNES LOGINT	: 14-APR-1986 11:05:58.42
Username:	BOLLENBACHER LOGINT	: (None)
Username:	BROWN LOGINT	: 3-JUN-1985 08:15:32.52
Username:	CBOWMAN LOGINT	: (None)
Username:	CHALSEY LOGINT	: (None)
Username:	COBRIEN LOGINT	: (None)

Display all users who have not logged in since 01-JAN-1988.

command would be:

SCANUAF> LOGINT <01-JAN-1988

For a given search, our system manager can enter up to five parameter-value pairs, each separated by an operator AND or OR. For example, to display all users with (SYSPRV,BYPASS) or SETPRV authorized privilege who haven't logged in interactively since the beginning of 1988, the command would be:

SCANUAF> PRIV=(SYSPRV,BYPASS) OR
PRIV= SETPRV AND LOGINT
<01-JAN-1988

Processing

For a given UAF record, each specified parameter-value pair from the input line is evaluated and is assigned a logical value of TRUE or FALSE. After a pair is given a logical value, the operator preceding the pair tells whether the logical value should be ANDed or ORED with the composite logical value of the previous pair. If the composite logical value for an entire input string is TRUE, SCANUAF displays the username on that UAF record and (optionally) the UAF information that resulted in the record's selection.

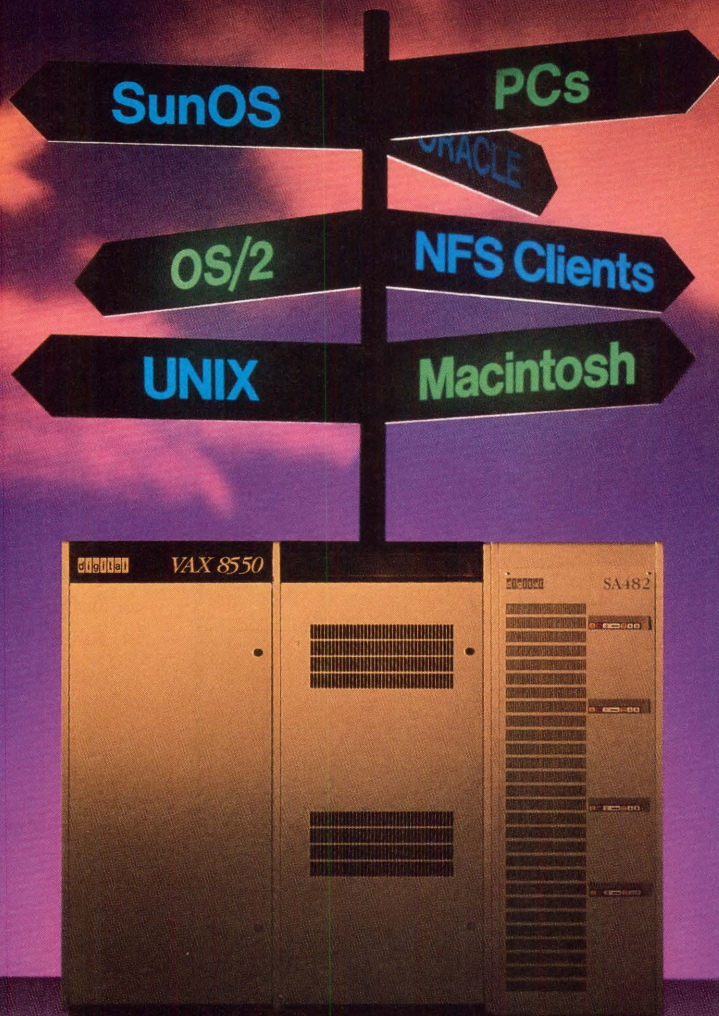
One useful feature of the program comes implicitly with use of the \ comparison character. For example, to see a list of the last time user SMITH logged in interactively on each node, specify USER=SMITH as one parameter-value pair and pick an implausible interactive login date for the value part of another parameter-value pair, as follows:

SCANUAF> USER=SMITH AND
LOGINT .-JAN- 1900

SCANUAF provides special commands to allow our system manager to tailor the searching and display mechanisms. These commands allow for the following:

1. Restrict the searching to the author-

Unlimited Resources.



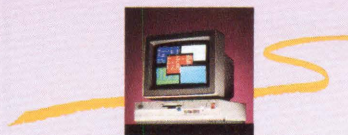
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FIGURE 2.

SCANUAF > BYTLM > 64000

Node: USC

Username: CARROLL
BYTLM : 81920

Username: CVG
BYTLM : 81920

Username: FIELD
BYTLM : 65000

Records: 566 Matches: 3

Node: HAX

Username: CARROLL
BYTLM : 81920

Username: FIELD
BYTLM : 65000

Username: SYSTEM
BYTLM : 70000

Records: 566 Matches: 3

Node: DAX

Username: CARROLL
BYTLM : 81920

Username: FIELD
BYTLM : 65000

Records: 569 Matches: 2

Node: EPX

Username: CARROLL
BYTLM : 81920

Username: FIELD
BYTLM : 65000

Records: 569 Matches: 2

Node: RAX

Username: CARROLL
BYTLM : 81920

Username: FIELD
BYTLM : 65000

Records: 605 Matches: 2

Node: GAX

Username: CARROLL
BYTLM : 81920

Username: CVG
BYTLM : 81920

Username: FIELD
BYTLM : 65000

Records: 567 Matches: 3

Display all users who have a BYTLM greater than 64000.

ization file for a specific node, the cluster nodes or nodes accessed via DECNET.

2. Route program output to a file or the terminal screen.

3. Restrict the program output to a list of usernames only.

4. Invoke the AUTHORIZE utility, for any node, without leaving the program.

5. Interrupt searching of a given node and proceed to the next node, or abort the search entirely.

Program Maintenance

SCANUAF is written so that when we add or delete a cluster node or MICROVAX node, the program doesn't have to be changed. The list of node-names and authorization file locations is kept in a separate text file named SCANUAF.NODES, which is all that has to be edited when a change occurs.

The layout for the UAF records was determined from the \$UAFDEF module in SYS\$LIBRARY:LIB.REQ. If the UAF record layout changes in some future release of VMS, the program will have to be modified to account for the changes.

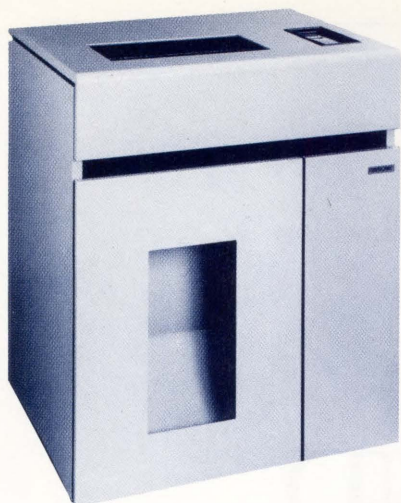
Program Availability

SCANUAF is available through ARIS. It's written entirely in FORTRAN; however, there should be no need to modify, recompile or relink the code to make it run on any VAX/VMS system. The only file that must be edited is SCANUAF.NODES, which should take about two minutes. In addition to the source, object and executable code, there's a complete user's guide and a help file to explain what has to be done to make the program run at your installation.

—James D. Snyder is a system programmer at Princeton University Plasma Physics Laboratory, Princeton, New Jersey.

Editor's note: All supporting programs are available on ARIS. For information on how to download them, see page 20.

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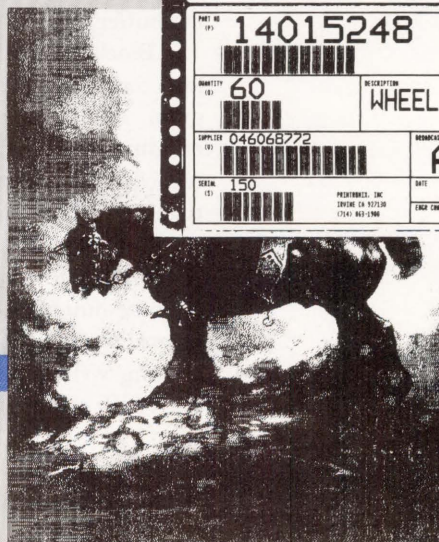
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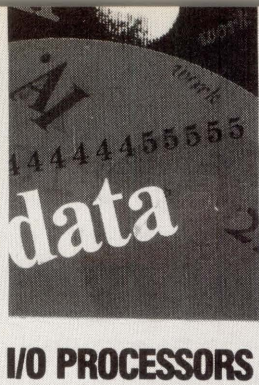


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BLOCK I/O AND RECORD I/O

By Darylene Colbert

Comparing I/O Methods For Optimum Performance.

Developers of large software applications are concerned with efficiency. One way to improve performance is to examine how a program handles I/O. For VAX developers, this means choosing either block I/O or record I/O.

Most programmers are familiar with record I/O. Under VMS, record I/O operations are provided by Record Management Services (RMS). Record processing under RMS appears to your program as the movement of records directly between your program and a file on disk.

But this isn't the case. RMS uses internal memory areas called I/O buffers to read or write blocks of data. Transparently to your program, RMS transfers blocks of a file into or from an I/O buffer. Records within the I/O buffer then are made available to your program when RMS transfers the records between the I/O buffer and the program.

Block I/O, on the other hand, bypasses the RMS record processing capabilities. Your program assumes complete responsibility for dividing blocks into records and moving the records to and from program storage. Rather than perform record operations by means of one of the supported record access modes, you process the file as a logical structure consisting of some number of blocks. A program reads or writes one or more blocks by specifying a starting virtual block number in the file and the length of the transfer. Block I/O operations

provide you with an intermediate choice between RMS operations and direct use of the Queue I/O Request system service.

When SAS Institute decided to rewrite its software for all host platforms in C, a comparison of block I/O and record I/O became necessary. It was important to determine which type of I/O would be most efficient and functional for our VMS software.

Test Environment

The SAS System can be characterized as a large application using relatively large data files that have a sequential file organization and a fixed record length. In the test jobs used to compare the two types of I/O, the only variables changed were the type of I/O used and the size of the internal buffers. All other parameters remained constant. The test images were written in C and were equivalent in functionality. The images read and wrote a data file of fixed-length 512-byte records, 25,000 blocks long.

For medium and large buffer sizes, the results for reading the file were almost identical to those for writing a file; in this article, the statistics obtained from each are used interchangeably. The jobs ran on a VAX 8600 with a moderate system load. The load consisted of 30-40 users whose work involved editing, compiling, linking and running SAS processes.

The test images used a default extension

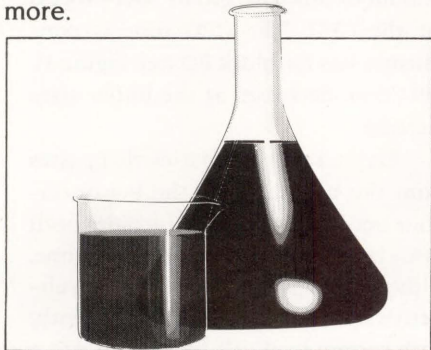
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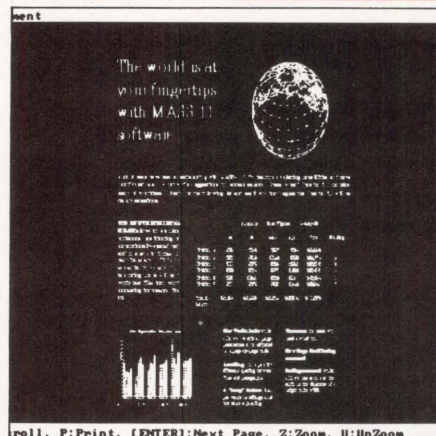
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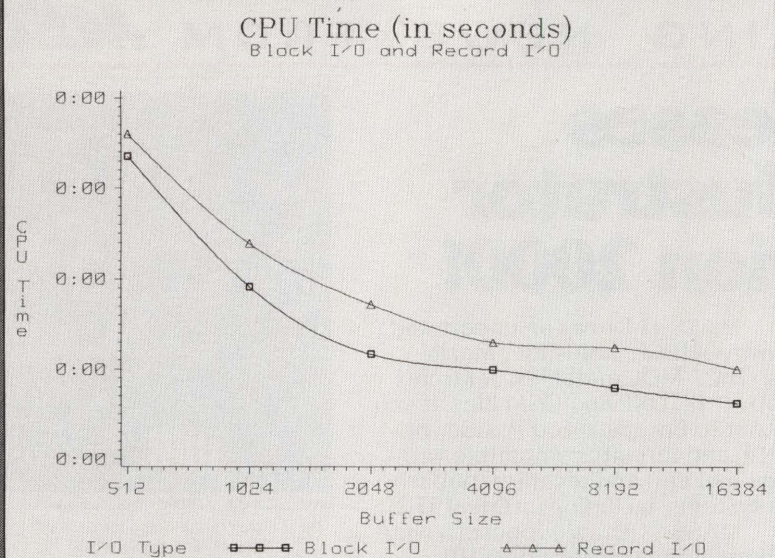
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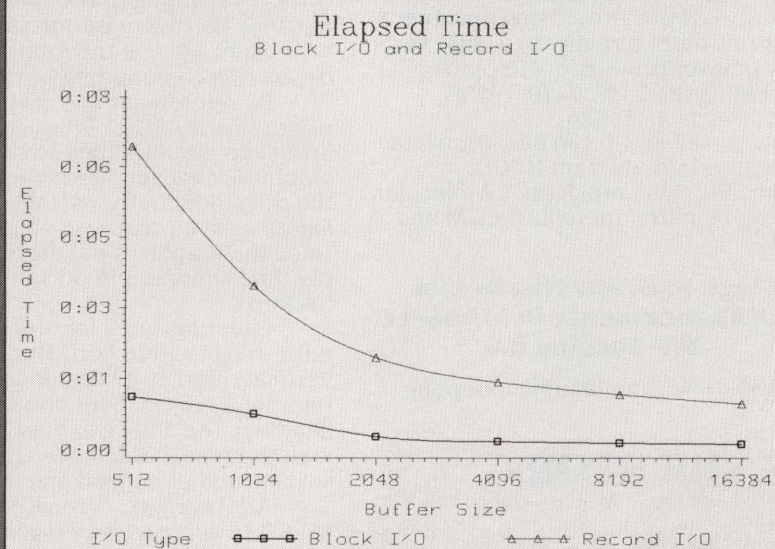
FIGURE 1.



CPU time (in seconds).

F

FIGURE 2.



Elapsed time (in minutes).

quantity of 160 blocks and a retrieval window size of 255. The only optimization made in the record I/O image was to let RMS use the read-ahead (RAH) and write-behind (WBH) options. To allow this, the RAH and WBH flags were specified and the number of buffers used was set to two.

Each method was tested using various buffer sizes. For block I/O, this corresponds to the program's internal buffer. For record I/O, it corresponds to the buffers used by RMS. The buffer sizes used, in bytes, were 512, 1,024, 2,048, 4,096, 8,192 and 16,384; a buffer size greater than 16 KB is atypical for our application. Each image was run multiple times for each buffer size. The resource usage statistics for each buffer size were then averaged.

Test Results

Five statistics were compared: CPU time, elapsed time, page faults, direct I/O count and buffered I/O count. These statistics were gathered only for the actual read/write operations and didn't include image activation or the open/close operations.

The CPU time used is the total amount of time charged to your process for the CPU. The CPU time is consistently less for block I/O (see Figure 1). CPU time decreases as the buffer sizes increase.

Elapsed time is the time that passes from the beginning of the I/O operations until completion. It includes both CPU time and I/O completion time. Although elapsed time is a more subjective statistic because it varies greatly with system load, it's most visible to a user. Elapsed time determines how long the user waits while data is being read or written. Figure 2 shows that the elapsed time for block I/O is less than that for record I/O. As the buffer size is increased and fewer disk accesses are required, the elapsed time for both methods decreases.

Page faulting is a function of your working set size; the smaller your working set size, the more paging VMS must do to perform the same amount of

work. Figure 3 shows the number of page faults incurred during the I/O operations. These jobs were run with a working set quota of 1,000 pages, which wasn't a limiting factor. With that working set size, very little paging occurred during the I/O operations. However, if the working set size had been smaller than the physical memory needed for program execution, faulting would have increased. This is true for both block I/O and record I/O.

The direct I/O count reflects the number of times an I/O operation is performed to or from a physical device, in this case the disk. In both block and record I/O, as the size of the internal buffer increases, the direct I/O buffer count decreases (see Figure 4). This happens because the buffer is filled completely before an access is made to the disk. Thus, the larger the buffer, the fewer the accesses required to write the same amount of data.

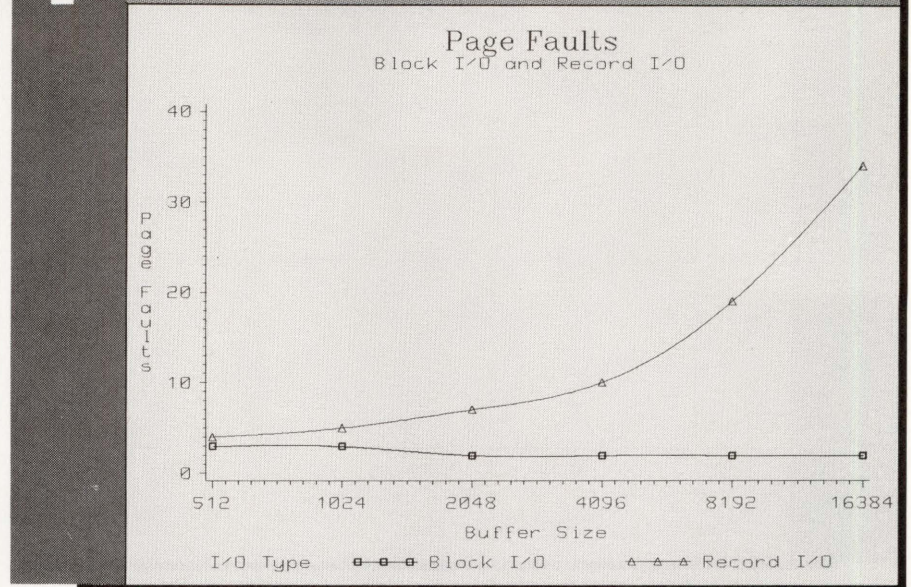
The direct I/O count is the same for both block and record I/O for each buffer size. This is expected because the number of accesses required for a specific amount of data is a function of the buffer size, not of the I/O method used.

The buffered I/O count reflects buffering automatically done by VMS when some form of intermediate buffering is required. For example, requesting I/O on a slow device, like a terminal, requires buffered I/O. VMS performs this intermediate buffering in system space, and the buffered I/O count is incurred only for this buffering in system space. The program's internal buffer for block I/O and the RMS internal buffer for record I/O both reside in program space. Therefore, nothing in our comparisons affects the buffered I/O count. This is shown by the constant line for both record and block I/O in Figure 5.

The Analysis

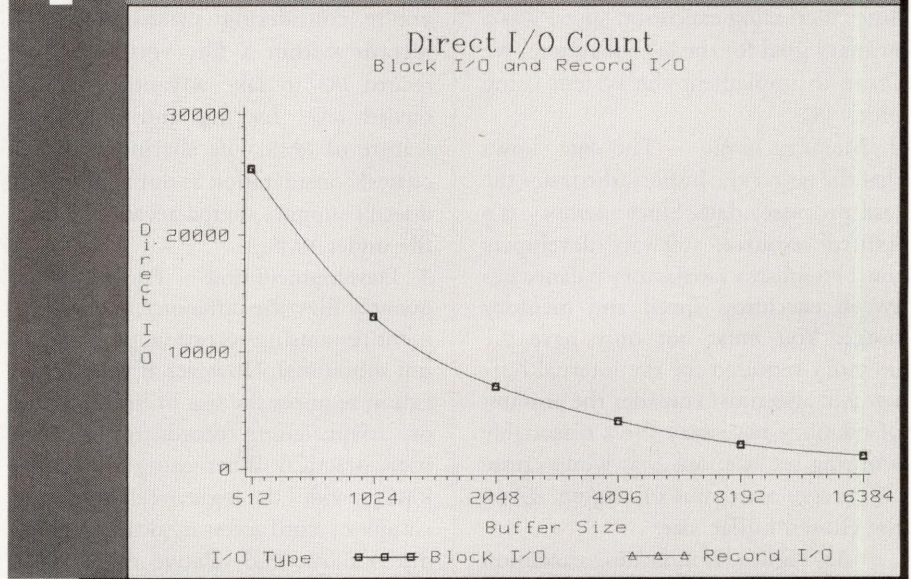
We analyzed the data to see how it pertained to our application. We considered four primary areas: execution speed, memory usage, file sharing and development time.

FIGURE 3.



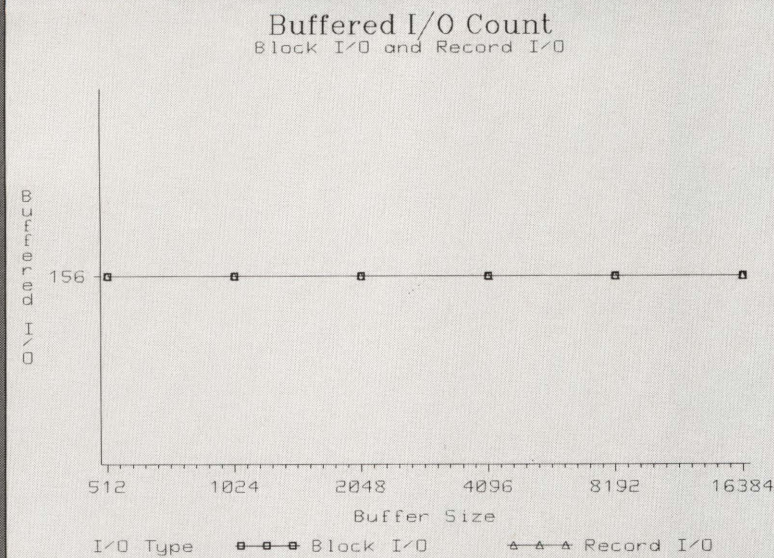
Page faults.

FIGURE 4.



Direct I/O count.

FIGURE 5.



Buffered I/O count.

1. Execution speed — The two statistics that most directly reflect execution speed are CPU time and direct I/O count. For CPU time, block I/O is more efficient. For direct I/O count, there's no difference between block and record I/O. Since increasing execution speed was a primary goal for the I/O subsystem, we chose to implement the system using block I/O.

2. Memory usage — The data shows that the larger the buffers, the faster the task processes data. Since memory is a limited resource, software developers must establish a satisfactory balance between execution speed and memory usage. You must not only have the memory required for the internal buffer, you also must consider the amount of memory necessary for a reasonable working set size; one that won't create an excessive amount of paging, given the chosen buffer size.

As Figure 1 indicates, execution speed doesn't increase much once your buffer is larger than 4,096 bytes. With that buffer size, you remain within a reasonable page faulting range, the direct I/O count decreases and elapsed

time decreases. For these reasons, we chose an internal buffer size of 4,096 bytes to use with our block I/O design.

3. File sharing — Typically, many users may want to access a file at the same time. This is called shared access. If you're considering shared access of records within a file, you must use record I/O to take advantage of the record level locking and unlocking feature of RMS. File sharing wasn't a critical consideration as our application doesn't support shared access to a data file under VMS.

4. Development time — For simple sequential files, the difference in development time using record or block I/O is not substantial. However, if your application requires the use of indexed files or variable length records, record I/O is more practical. When using record I/O, RMS provides the logic necessary to use complex record access modes such as indexed mode and relative mode. RMS with record I/O also provides complex record formats.

When choosing an I/O method, future development plans also should be considered. Once you commit to one method, whether block or record I/O,

it's not as easy to access and modify the file using the other method. RMS files contain internal information meaningful to RMS itself, so if an existing file is modified using block I/O, none of the RMS internal structures will be updated. Likewise, if the file is created using block I/O, none of the RMS internal structures will be created, and attempting record access through RMS will prove futile.

Because optimizing performance was our primary objective, we chose to use block I/O to implement the SAS I/O subsystem for the next major release of our system. The RMS features and tuning parameters provided when record I/O is used aren't necessary for our application. Along with the block I/O format, we chose an internal buffer size of 4,096 bytes. This buffer size provides the best trade-off between performance and memory used for buffering.

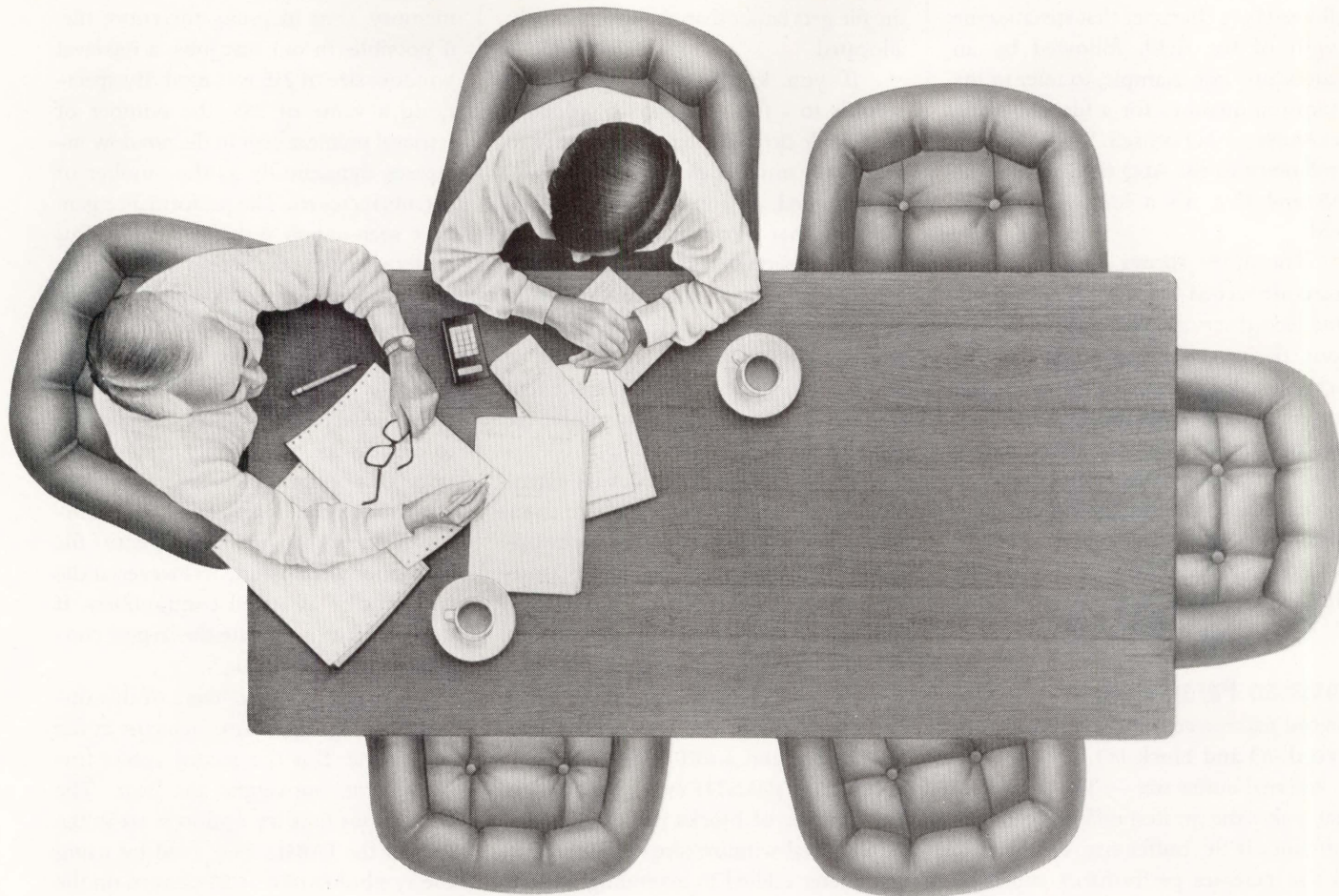
Improving Performance

In our testing, we found that the default values for parameters used by RMS didn't always reflect the I/O that our application performs. For this reason, software developers should consider adjusting the parameters that can be set in your program to tune the performance of the I/O operations. For applications that use record I/O, there are many of these parameters. But for block I/O applications like ours, there are only a few parameters that significantly affect performance and can be tuned to improve performance.

You can adjust tuning parameters by changing fields in the File Access Block (FAB) and the Record Access Block (RAB). These are predefined structures that RMS uses to give or receive information about the structure of a file and the structure of the records within the file. Alternatively, many parameters can be set with the DCL SET RMS_DEFAULT command.

The FAB allows you to communicate file-related information to file service calls, such as file characteristics, file specifications and run-time options.

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Each field within the FAB is assigned a predefined symbolic offset name. Each field name is prefixed with FAB\$, followed by a character that specifies the length of the field, followed by an underscore. For example, to refer to the allocation quantity for a file, the symbol FAB\$L_ALQ is used. This indicates a reference to the ALQ field within the FAB and that it's a longword-length field.

The RAB allows you to communicate record-related information to RMS record services, such as tuning options, the record access mode, and the location, type and size of the input and output buffers. Like the FAB, the RAB uses predefined symbolic offset names and a standard prefix. For example, to specify the multibuffer count field within the RAB, use RAB\$B_MBF. In this example, the name indicates that the MBF field is a field in the RAB and that it's a byte-length field.

Common Parameters

Several parameters are common to both record I/O and block I/O.

1. Internal buffer size — The parameter that makes the greatest difference in performance is the buffer size. As the buffer size increases, performance improves. For block I/O, the buffer size is specified in the programmer's code, often as an array of the desired size and type. For record I/O, the buffer size is specified in units of blocks in the RAB\$B_MBC field of the RAB or with the DCL command \$ SET RMS_DEFAULT/BLOCK_SIZE = n.

The optimum size depends on the intended use of the file, and the only way to find the best size is to experiment. The default is determined by the SYSGEN parameter, RMS_DMBC. Remember that the cost of a larger buffer size is a larger memory usage. We found that an internal buffer size of eight blocks was optimum for our application.

2. Default extension quantity — There are two parameters that affect performance when adding records to a file and therefore increasing the file size. The

first is default extension quantity. This specifies how many blocks to allocate on disk for adding records to a file when the file gets larger than the space initially allocated.

If you know you'll be adding records to a file, you should specify a reasonable default extension quantity to reduce the number of times the file will be extended. If you use an extension quantity that is too small, you'll incur many extensions, causing your file to be fragmented over the disk and resulting in slower access time. However, if your extension quantity is too large, you'll be reserving large areas of disk space that might not be used and, therefore, are wasted.

If you don't specify a default extension quantity, RMS will compute a size to use; however, this size may not be optimum. You can approximate a reasonable quantity if you can estimate the average number of records that will be added to the file. The default extension quantity is specified using the FAB\$W_DEQ field in the FAB or with the DCL command \$ SET RMS_DEFAULT/EXTEND_QUANTITY = n, where n is the number of blocks per extension.

3. Retrieval window size — The second parameter related to extending a file is the retrieval window size. Each extension to a file is called an extent. If a file is extended repeatedly, the extensions probably will be scattered on the disk. A pointer to each extent, called a retrieval pointer, resides in the file header. For improved performance when reading records from the file, some number of these retrieval pointers are kept in memory in a structure called a window.

The more retrieval pointers you keep in memory in the window, the faster your record access will be. The cost of the retrieval pointers is charged to your buffered I/O byte count quota. Since the number of retrieval pointers needed is directly related to the number of existing extents, the default extension quantity and the retrieval window size should be considered together.

The default window size is seven

pointers. Valid values are in the range of zero through 127 or 255, which specifies that all retrieval pointers be kept in memory, thus mapping the entire file, if possible. In our test jobs, a retrieval window size of 255 was used. By specifying a value of 255, the number of retrieval pointers kept in the window increases dynamically as the number of extents increases. The performance gain isn't seen when writing the file, but rather when the file is read back in. The retrieval window size is specified in the FAB in the FAB\$B_RTV field.

4. Contiguous best try — One way to decrease the number of extents, and, therefore, retrieval pointers required, is to request the contiguous best try option. This option makes RMS attempt to allocate the file using a minimum number of extents. It will make the entire file contiguous, if possible. However, if the file can't be allocated contiguously, it does its best to allocate the largest contiguous areas possible.

The only disadvantage of this option is a slight performance cost at file open time. But the record access improvement outweighs the cost. The contiguous best try option is set in the FAB in the FAB\$L_FOP field by using the symbol FAB\$V_CBT to turn on the option.

Specific Parameters

Some parameters are specific to record I/O.

1. Number of buffers used — You can specify not only the size of the internal buffer that RMS is to use when using record I/O, but also how many buffers of that size you want RMS to use. The RMS buffers are allocated from the process working set. For sequential files, you must specify at least two buffers if you use the RAH and WBH options.

If you don't intend to use RAH and WBH, one buffer is normally sufficient for sequential files. A greater number of buffers takes space in the process working set. If the number of buffers is too large, they can degrade performance by causing excessive page faulting. The

default number of buffers is one. To specify more than one buffer, use the RAB\$B_MBF field or the DCL command SET RMS_DEFAULT/BUFFER_COUNT=n, where n is the number of buffers.

2. Read-ahead and write-behind options — When these options are in effect, RMS alternates buffer use between two buffers: One contains the next records to be read from or written to the disk, while the other completes I/O. With RAH, records are read into a buffer before they're needed, so you don't have to wait for I/O to complete when you're ready to process another record. With WBH, when the first buffer is filled, the next record processed goes to the second buffer. The I/O operation for the first buffer then takes place. The system doesn't have to wait while the I/O operation completes; instead, program processing continues.

These options are available only with sequential files, and you must specify two buffers to use them. The only cost of turning on these options is that associated with using two buffers instead of one. With most languages, RAH and WBH are the default operations. With others, you must specify these options explicitly by using a clause in the language. To specify them in the RAB, use the values RAB\$V__RAH and RAB\$V__WBH in the RAB\$L__ROP field.

OUR DECISION TO USE block I/O over record I/O was based on two major considerations. First, the overall performance of block I/O is better than that of record I/O.

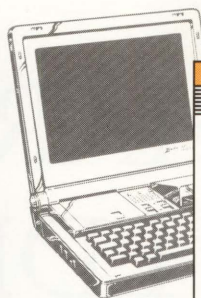
Second, at this time, we don't need the features provided by RMS record I/O. As our I/O requirements and features change, we may look to RMS to provide the capabilities we need. — Darylene Colbert is a systems developer in the VMS Host Group at SAS Institute Inc., Cary, North Carolina. An earlier version of this article was published in the DECUS PROCEEDINGS, Spring 1987.

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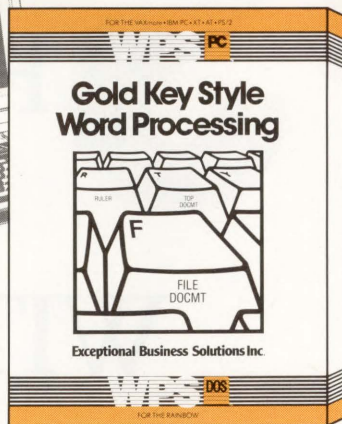
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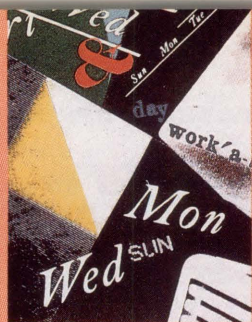
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WORD PROCESSING

SHARED EDITING WITH WPS-PLUS

**By Isaac Rosen, Ph.D.,
and Faith Einerson**

A Method For Non-Privileged Users.

Sometimes it's useful for two or more non-privileged users to share the editing of a document. They can work sequentially on one part or simultaneously on different parts. For example, one person can write a rough draft of a document and another fill in the details. Or several people can write separate chapters that will be merged.

To share editing, the document work file that contains the special control characters used by WPS-PLUS must be accessible for transmission among non-privileged users. Transmitting the formatted ASCII output files produced by WPS-PLUS or using MAIL through WPS-PLUS isn't useful because all control characters and soft carriage returns are lost.

Unfortunately, WPS-PLUS doesn't provide support for shared editing. In fact, one feature of WPS-PLUS impedes the sharing of document editing. 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. Users can change document and folder names and rearrange documents at will.

To accomplish this, WPS-PLUS names its work files with non-English ASCII strings based on the date and time of file creation. This file-naming convention means that work file names are unrelated to and can't be discerned from the files' contents.

Shared editing can be accomplished easily by privileged users who can change their account name, login directory and UIC. Non-privileged users can share editing if they share the same UIC group and login directory. Alternatively, you can establish a common account and directory specifically for editing shared documents. But security considerations often make such options undesirable.

Transferring Files

To address this problem, we set up a system for transferring WPS-PLUS work files among naive, non-privileged users. The system uses two DCL command procedures, a short FORTRAN program, and a special disk directory, DISK\$USER:[TRANSFER], which has world read and write access to act as a transfer point among users. A command procedure copies the work file into the transfer directory, the recipient reads the work file from the transfer directory into his own document work file using WPS-PLUS, and then another command procedure clears the transfer directory.

Program 1, PASSIT.COM, is a simplified version of our command procedure to send files. Our version does some fancy screen formatting and error trapping and allows many

A

PROGRAM 1.

```

$ ! *****SYS$MANAGER:PASSIT.COM*****
$ ! V. 3
$ ! ***** Program to transfer WPS files to another user *****
$ ! -----
$ ! General instructions to the user -- what responses will be
$ ! required to execute the program.
$ ! -----
$ ! Initialization
$ ! -----
$ SAY := WRITE SYS$OUTPUT
$ SAY ""
$ SAY "TRANSFER WPS-PLUS FILE TO ANOTHER USER:  "
$ SAY ""
$ INQUIRE TO_WHOM "TO WHOM DO YOU WANT TO SEND IT?"
$ DEST :=DISK$USER:[TRANSFER]TO'TO_WHOM'.WPL
$ ! -----
$ ! FORTRAN program WPSDOC.FOR is used to retrieve the correct file name,
$ ! which is placed in the process logical WPS_DOCNAME
$ ! -----
$ DEFINE/NOLOG/USER_MODE SYS$INPUT SYS$COMMAND:
$ RUN SYS$SYSROOT:[SYSMGR.UTILITIES]WPSDOC
$ IF F$TRNLNM("WPS_DOCNAME") .EQS. "" THEN GOTO ERR_SEARCH
$ ! -----
$ ! The file is copied to the transfer directory
$ ! -----
$ ON ERROR THEN GOTO ERR_COPY
$ COPY/NOLOG 'F$TRNLNM("WPS_DOCNAME")' 'DEST'/PROTECTION=W:RWED
$ ! -----
$ ! MAIL message is sent to recipient that file is available
$ ! -----
$ ON ERROR THEN GOTO ERR_MAIL
$ SUB := "'TOPIC'-FILE
$ MAIL/SUBJECT=""SUB"" SYS$SYSROOT:[SYSMGR.UTILITIES]PASSIT.TXT 'TO_WHOM'
$ DEASSIGN SYS$OUTPUT
$ ! -----
$ ! Give user "success" messages

```

```

$ ! -----
$ SAY " FILE HAS BEEN COPIED TO THE DISK$USER:[TRANSFER] DIRECTORY "
$ SAY ""
$ SAY " AND A MAIL MESSAGE HAS BEEN SENT TO 'TO_WHOM'"
$ SAY " IT CAN BE BROUGHT INTO WPS USING DOCUMENT TRANSFER"
$ SAY ""
$ SAY " VMS FILE: 'DEST'"
$ DEFINE SYS$OUTPUT PASSIT.OUT
$ GOTO ENDPASSIT
$ ! -----
$ ! Error Messages
$ ! -----
$ ERR_SEARCH:
.
.
.
$ GOTO ENDPASSIT
$ ! -----
$ ERR_COPY:
.
.
.
$ GOTO ENDPASSIT
$ ! -----
$ ERR_MAIL:
.
.
.
$ GOTO ENDPASSIT
$ ! -----
$ ! Wrap-Up and Clean Up
$ ! -----
$ ENDPASSIT:
.
.
.
$ EXIT

```

files to be transferred in one session. But the shorter version shown here demonstrates the techniques used.

First, it asks for the name of the recipient. Next, it executes the FORTRAN program WPSDOC.FOR (see Program 2), which gets the WPS-PLUS document number from the user, finds the corresponding VMS file name and puts the VMS file name into the logical WPS_DOCNAME. Then, PASSIT copies the document identified by the logical WPS_DOCNAME to the destination DISK\$USER:[TRANSFER]TO'name'.WPL, where 'name' is the user name of the recipient. Finally, PASSIT sends a mail message to the recipient notify-

ing him that a WPS-PLUS file has been sent, deletes any temporary files, and deassigns any created logicals.

The recipient brings the file into WPS-PLUS using the Receive from VMS (RV) option from the Document Transfer (DT) menu screen. The VMS file name is, of course, DISK\$USER:[TRANSFER]TO'name'.WPL. Folder and file names then are assigned to the document. After obtaining the file, the recipient runs another command file, HAVEIT.COM, which automatically clears the transfer directory by deleting files addressed to the recipient (see Program 3).

Keeping Track

WPS-PLUS uses a small database to keep track of the VMS file name associated with each document number and each folder and document name. This database is contained in the file DOCDB.DAT located in the subdirectory

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PROGRAM 2.

```

C      PROGRAM WPSDOC
C
C Read WPS DOCDDB.DAT file.
C
      PARAMETER      (LENREC = 500)

      CHARACTER      BUF * 500           !input buffer
      CHARACTER      FILENAME * 80       !output file name
      CHARACTER      DIRLOGICAL * 6      !WPS logical
      CHARACTER      DOCID * 6           !document ID
      CHARACTER      WPSDIR * 60         !user's WPS directory
      CHARACTER      DBFILE * 70        !full database file name
      CHARACTER      DBFILENAME * 9      !database file name
      CHARACTER      OUTLOGICAL * 11     !logical for file name

      DATA           DIRLOGICAL /'OAUSER'/
      DATA           DBFILENAME /'DOCDDB.DAT'/
      DATA           OUTLOGICAL /'WPS_DOCNAME'/

C Translate logical "OAUSER" to get root directory of WPS files.

      CALL SYS$TRNLOG (DIRLOGICAL, IXLN, WPSDIR, . . .)

C Get document number.

100      WRITE (6, 1000)
1000     FORMAT (/, '$Document number: ')
      READ (5, 2000) NUMDOC
2000     FORMAT (I6)

C Create document ID for searching database file.

      IDNUM = 1000000 - NUMDOC
      ENCODE (6, 1010, DOCID) IDNUM

1010     FORMAT (I6)

C Open database file.

      DBFILE = WPSDIR (1:IXLEN) // DBFILENAME
      OPEN (UNIT = 2, FILE = DBFILE, STATUS = 'OLD',
            1 RECL = 500)

C Search database for document ID.

      IEND = 0
      DO WHILE (IEND .EQ. 0)
        READ (2, 2010) BUF
        FORMAT (A<LENREC>)
        IF (DOCID (1:6) .EQ. BUF (31:36)) THEN
2010
C Document found, create file name.

          FILENAME = WPSDIR (1:IXLEN - 1) // BUF (50:68)
          NAMELEN = IXLN + 19
          IEND = 1

C Create process logical WPS_DOCNAME for document file name.

          IERR = LIB$SET_LOGICAL (OUTLOGICAL, FILENAME)

        ENDIF
      ENDDO

      CLOSE (UNIT = 2)
      CALL EXIT

      END

```

PROGRAM 3.

```

$ !-----HAVEIT.COM-----
$ ! Companion program to PASSIT. Deletes the files from the [TRANSFER]
$ ! directory
$ !-----
$ ! Local definitions and values for "num": number of files to be deleted
$ ! and "count": local counter
$ !-----
$ SAY := WRITE SYS$OUTPUT
$ WHO = F$USER()

$ LENGTH = F$LENGTH(WHO)
$ TO_WHOM = F$EXTRACT(1,(LENGTH-2),WHO)
$ FILENAME := DISK$USER:[TRANSFER]TO_TO_WHOM*.WPL;*
$ DEL 'FILENAME'
$ !-----
$ ! Ending "success" message.
$ !-----
$ END:
$ SAY "<esc>[1mTRANSFER DIRECTORY HAS BEEN CLEARED<esc>[0m"
$ EXIT

```

[WPSPLUS] under the user's root directory. The user's root directory is stored by WPS-PLUS in the logical OAUSER when the user logs in or executes the command file SYS\$MANAGER:WPSPLUS_LOGIN.COM. The DOCDDB.DAT file consists of fixed-length records of 500 bytes with document numbers stored as 1,000,000 minus the document number in characters 31-36 and the corresponding

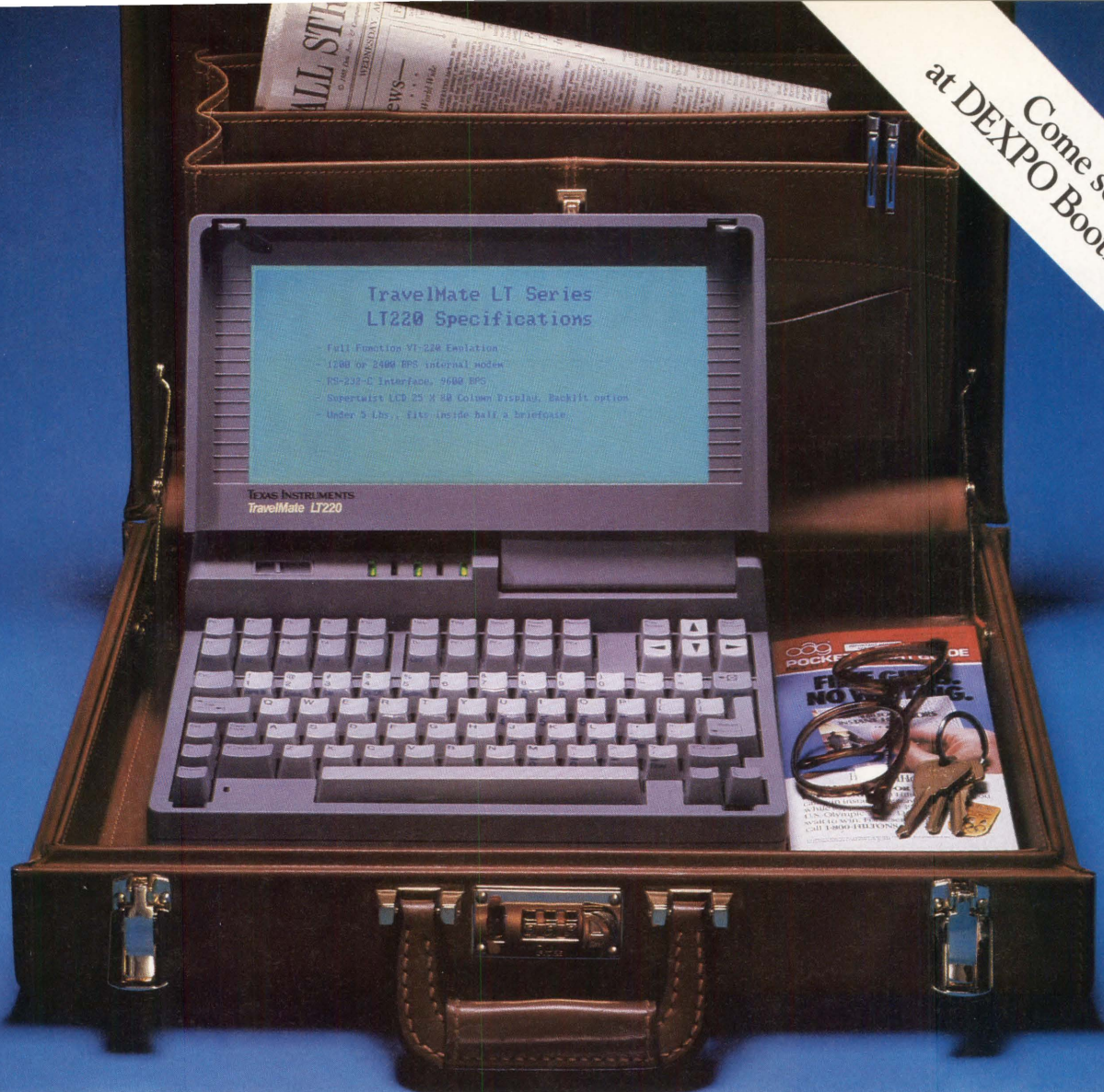
VMS file names stored in characters 50-68. Each record is read and tested for the desired document number until a match is found. Then the file name is loaded into logical WPS_DOCNAME.

Using the command files PASSIT and HAVEIT and the FORTRAN program WPSDOC, naive, non-privileged users

can share word processing. We've found this to be very useful. —Faith Einerson is system manager in the Department of Radiation Therapy and Isaac Rosen, Ph.D., is associate professor of medical physics at the University of Texas Medical Branch at Galveston, Texas.

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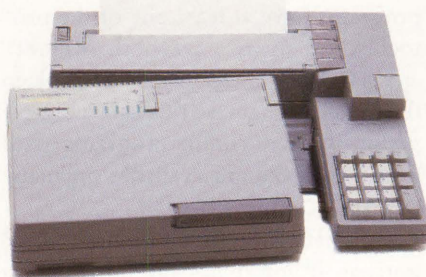
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NETWORKING EDITOR

Bill Hancock

Laptops To Compute On The Go, Part 2

Editor's note: In this second and final part of his series on laptop

computers, Bill Hancock analyzes data exchange and compatibility, disks, batteries, printers and software.

Last month, I discussed a number of issues concerning laptops, including screen readability, keyboards, terminal emulation and modems. Another issue to consider is data exchange and compatibility when you're using dissimilar laptops, such as the Dynamac from Dynamac Computer Products, and an MS-DOS laptop.

The Mac (and Dynamac) currently use a disk controller known as the Integrated Woz Machine (IWM) after Steve Wozniak, designer of the chip and co-founder of Apple Computer. It provides 800 KB of formatted storage on a 3½-inch floppy.

Although most laptops use the same floppy, the floppy is formatted differently than the Mac format and, therefore, is incompatible from a data and format point of view. The Mac and MS-DOS file structures are substantially different.

You can solve the problem by using a file transfer and conversion program called MacLink, from Dataviz. A program runs on both the Mac and the laptop, and the two systems can exchange files. The program also will do some file conversions on known, popular formats to allow their use among systems.

On my larger systems, I usually run the TOPS distributed file system so that my UNIX, Mac and PC systems can communicate on Ethernet. By using the

MacLink product, I easily can move files between the Mac Plus on the network and my laptop.

One quick way to move data is to install a 3 1/2-inch drive on an XT in my network, insert the floppy with the data on it and use a COPY operation to put the data files on the distributed file system. Such drives cost about \$120, including controller and cables, which is about what you'll pay for a communication program and cable between the laptop and a desktop PC. Traveling Software's Laplink is useful in transferring data, as it allows the laptop drives to be slaved to a host desktop PC. This makes copying data a breeze.

Moving files between DEC systems and laptops usually boils down to using KERMIT or XMODEM protocols. Most MS-DOS communications (comm) programs have at least one of the protocols and many have both. KERMIT and XMODEM programs are available in the public domain, so this isn't a big expense. In fact, comm programs with both protocols are available on many DECUS SIG tapes.

Transferring files can have some gotchas, if you're not careful, and you might need to experiment before you attain reliable use.

Some "text" file formats on PCs include "soft" carriage returns (CR) and line feeds (LF) that many VAX and PDP

Moving files between DEC systems and laptops usually boils down to using KERMIT or XMODEM protocols.

systems will allow to run to the end of the terminal buffer. If such files are transferred to a DEC system and edited, most editors such as EDT and EVE claim "Record is too large for user buffer" and other nasty things.

If you tell a laptop comm program to insert a CRLF at 80 characters automatically, the comm program sometimes takes such instructions literally. Lines will be exactly 80 characters long, frequently cutting words in half to meet the transfer requirements levied on the comm program.

Some comm programs allow you to set the line transfer length and permit either character splits or word splits, but character splits also permit split words. Word splits force the comm program to look for interword spaces and insert the CRLF at the most convenient space near 80 characters. This can help solve the problem of word wrapping and lack of proper CRLFs.

Don't be deceived if everything looks OK when you TYPE out a file. Frequently, the terminal driver automatically will wrap the file properly when the TYPE command displays file contents on your terminal.

The combination of characteristics necessary to move text and other files to your DEC system from your laptop

will vary, depending on what application created the file and what transfer protocol is being used to move the file. What works well with most protocols is saving a file in a standard TEXT format on the laptops with hard carriage returns in the file at the end of each line. When a file is created on a word processor and saved in some transportable format, things can get strange.

Disks

Another issue in the selection of a laptop concerns the number of disk drives on the unit and the support of a hard disk. Two disk drives, preferably the 720-KB 3½-inch rigid floppy drives, are more than adequate for 95 percent of my uses. I've worked on systems with a single floppy disk, but I find myself doing the floppy shuffle.

Some of the newer laptops, such as the Datavue Spark and Toshiba 1000, include only a single floppy drive. The Toshiba compensates partially by including MS-DOS in ROM. This means that the system doesn't require the floppy drive to bootstrap, although you still can elect to boot from the floppy. Two drives also make floppy backups, software installation, upgrades and file manipulation easier.

Some systems, such as the Tandy Model 102, allow connection of external floppy drives, but this requires toting around such parts as cables and power supplies. Other systems, such as some of the Grid systems, use non-volatile bubble memory instead of a floppy. Although this sounds reasonable, it's less convenient than a built-in floppy, and you become heavily dependent on the system's communication capability.

Some laptops include a 3 1/2-inch hard disk drive where a second floppy drive could be installed. When a hard drive is installed, other problems surface. They include the following:

1. Does the hard drive automatically park the read/write heads on laptop power-down, or must a special program be run to ensure that the heads are parked so they won't crash the disk if the unit is dropped?

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***An important issue when choosing
a laptop is the selection of
software that will run on it.***

2. Are disk support utilities included with the system?
3. Is the drive shock-mounted, and will it withstand a fall?
4. Is there a backup utility to copy hard drive contents to floppies easily? Backups on portable hard drives are critical, because there is a greater possibility of damage to a laptop than to a desktop PC.
5. Is the drive hard to fix? Does the laptop have to be sent away for repair, and, if so, for how long?
6. Will the hard drive work from a battery? If it will, what's the battery life expectancy when using the hard disk?

The number and kinds of drives you need depend on your laptop use. Most of the time, I use word processing and telecommunications. I occasionally run DECNET-DOS if I'm communicating with one of my VAXs.

Two 720-KB floppies move data around and run almost any application I wish. My biggest complaint with floppies is that they access and store information slowly. This can get irritating during program development when doing compile or link operations.

Batteries

Many systems provide a built-in battery that powers the system for a given time, from 30 minutes to 15 hours per charge. The time period depends on the type of screen being used (electroluminescent screens and gas plasma screens use a lot of power), the number of accesses to the disks and the age of the nickel cadmium battery.

Nickel cadmium batteries, while rechargeable, have a specific life span. As

they age, they no longer work as long. Gradually, they wear out and must be replaced. Some of the nickel cadmium packs are very reasonably priced. Others can cost \$70 to \$100.

Look for laptops with easy-to-remove battery systems so you can swap the battery. That way, you can keep one battery in the system and another fully charged battery as a backup.

Printers

A recent addition to the paraphernalia I tote around is a Diconix 150 ink-jet portable printer. Weighing about two pounds, it's a delight to use. The Diconix emulates either an IBM graphics printer or an Epson printer and can be powered by battery or AC outlet. The 150 is very quiet and prints acceptable text and graphics.

The ink-jet cartridge gets clogged from time to time, however, and the ink reservoir must be gently poked to get ink flowing again. Also, the type of paper used has a dramatic effect on print quality. Absorbent papers, such as a rag bond, work best. If you use glossy or hard paper, the ink may streak. Some computer stores carry ink-jet paper for such printers.

Software

An important issue when choosing a laptop is the selection of software that will run on it. Although many laptops use MS-DOS, others are MS-DOS compatible but run their own ROM-based operating system.

On my NEC Multispeed, I need to do many different chores. My most-used piece of software is WordPerfect 4.2 for MS-DOS, which I use for word

processing and document creation. I prefer WordPerfect for a number of reasons.

For one thing, when WordPerfect is started up, it remains memory resident for almost all functions. This conserves battery power by reducing the number of disk accesses. For another, WordPerfect supports many file formats, so it's easy to exchange documents from multiple system types. Also, WordPerfect is robust and has journaling. That's extremely important when the battery starts to give up or the laptop crashes.

In 1987, WordPerfect introduced WordPerfect Executive. It includes an appointment calendar, a word processor similar to WordPerfect, a spreadsheet that is Lotus 1-2-3 compatible, a phone book and a menuing system for customizing the user interface. It comes with both 5¼-inch and 3½-inch floppies, a well-written installation guide and a variety of keyboard templates for various laptops.

WordPerfect Executive is designed for laptops. For example, much of the documentation shows how to perform the program's functions on laptops.

For most users of laptops, Executive, coupled with a good communications program, such as Crosstalk, provides most of the features you want for office and technical business applications.

For programmers, a laptop allows you to keep working on programs when you're away from the office. I recently started using Borland International's Turbo C compiler so I could finish a project I was writing in C for a VAX.

My biggest problem was how to get compatibility in screen manipulation, as the PC does screen I/O differently from most VAX screen applications. Another problem was support of a compiler. Turbo C works well on a laptop, as much of the compilation process works in memory, which reduces disk access and accelerates the process.

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compatibility, I bought the CURSES Window Development Package for MS-DOS from Aspen Scientific. The package provides support for the UNIX System V and VAX C compiler CURSES routines. CURSES, a fairly standardized set of callable functions for screen I/O, is available as part of the VAX C compiler. Using the inclusive functions with the MS-DOS Turbo C compiler, I completed my project in a timely fashion.

Also, most of the code ran transparently on the laptop or on the VAX without conversion of code. With this capability, the laptop serves as a reasonable developer's tool. For many small and medium-sized code efforts, my laptops have been useful and productive.

When considering a software pur-

***A laptop can
be productive in the
DEC environment.***

chase for a laptop, run the application on the laptop before you purchase the software. An application that runs well on a desktop PC can run into excessive disk access or load time when the application is started on a laptop. Look for disk accesses both at the start of the program and during execution.

WHEN CONSIDERING A LAPTOP, make sure to look at the screen to determine readability. Also type on the keyboard to be certain that it feels comfortable.

Make sure the system allows for expansion and also includes necessary ports, as well as battery replacement capabilities. Check into maintenance, as laptops are subject to greater abuse than other systems and most likely will need maintenance at some time.

Consider the purchase of a laptop system as you would any other system purchase. Set goals, select a system that's useful for your needs and carefully select software and hardware.

Properly configured and used, a laptop can be productive in the DEC environment. It also can be a lot of fun.

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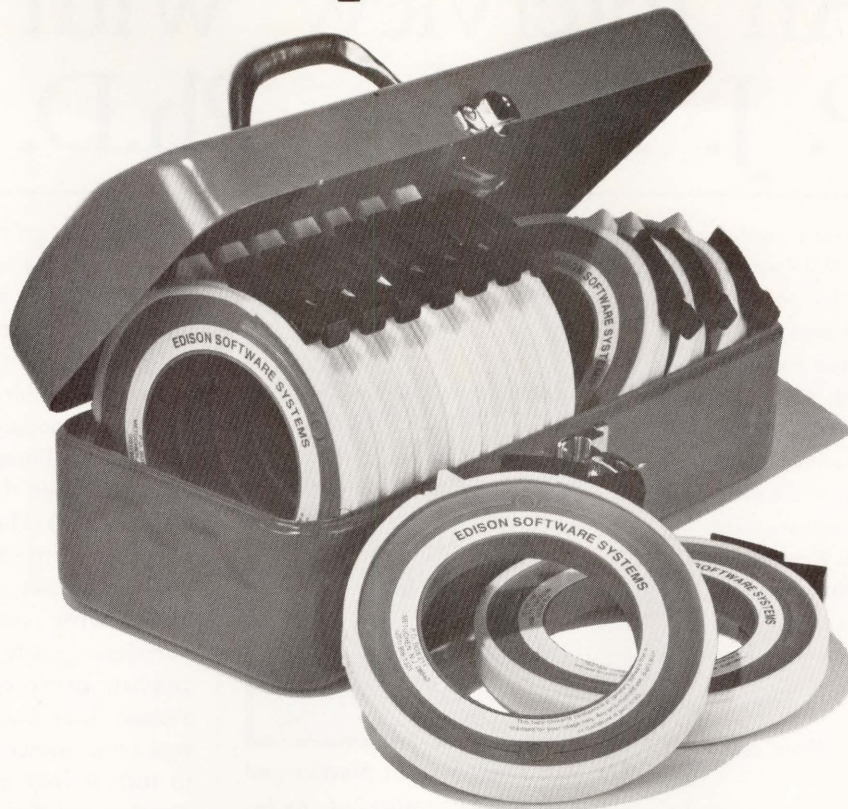
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Rex Jaeschke

An Interview With P. J. Plauger, Ph.D.

*Editor's note:
Dr. P. J. Plauger
is the founder
and president of*

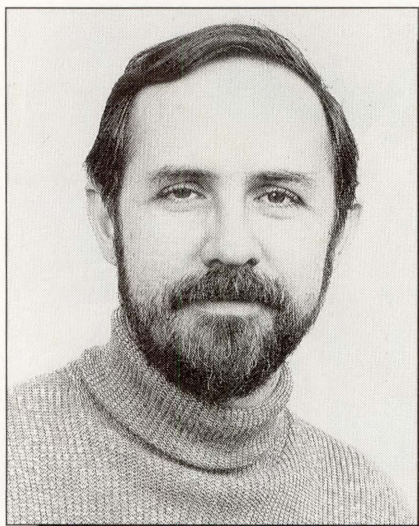
Whitesmiths Ltd., an international vendor of C and PASCAL development tools. Dr. Plauger also is secretary of the ANSI C Standards Committee and convener of the ISO C Standards Committee. He's one of the most responsible forces in the C community. His books, cowritten with Brian W. Kernighan, are best sellers. The following interview was conducted by DEC PROFESSIONAL's C editor and ANSI C representative, Rex Jaeschke.

DEC PRO: You wrote one of the first C compilers outside AT&T, correct?

Plauger: When I left Bell Labs, I went to work for Yourdon Inc., a consulting and seminar firm. We landed a contract with GenRad to do a PDP-based C compiler, which, as far as I know, was the first commercial C compiler outside AT&T. I wrote and delivered that compiler by late 1976 with the final version being completed in 1977. That's where I got the idea that there might be a serious market for C compilers.

DEC PRO: Was this for RSX-11M?

Plauger: Yes, on an 11/40 with 256 KB of memory. By mid-1978, I had left Yourdon and founded Whitesmiths. I immediately set out to rewrite that PDP-11 C compiler with the notion of making it portable to other architectures. Fortunately, early in the process, Fischer and Porter offered us a contract. We had to deliver a C compiler for their



Dr. P. J. Plauger is the founder and president of Whitesmiths Ltd., an international vendor of C and PASCAL development tools.

PDP-11, the Intel 8080 and various other machines.

Practice Makes Perfect

DEC PRO: What mistakes did you make the first time that you didn't make the second?

Plauger: Any number in the C compiler. The biggest mistake was assuming that it wouldn't be practical to store the symbol table in memory, so from the outset, I engineered the Yourdon compiler to keep a symbol table on disk. That made it profoundly slow. I also learned a lot about the distinction between pointers and arrays; I had to pay my dues in getting that right. It was probably the biggest flaw in its logic. But fundamentally, that was a design issue.

DEC PRO: You've stated on numerous occasions the problem of arrays not being first-class objects. Please explain.

Plauger: The great strengths of a design also contain the seeds of its weakness. You have to start with some conjecture, make some fundamental decisions and do something with it. Dennis Ritchie's approach was clever. He found a way of melding the notion of pointer arithmetic with the usual notation for subscripting. His guise to do that was first to define $a[i]$ as $\ast(a + i)$. Then he said, "Well fine, now that we're adding an integer to an array designator, what does that mean? I know what I want it to mean." So by introducing early a ruse that any time you have an expression where you want a scalar thing (and in the early days, C was a pure scalar language), the rule is to turn it into a pointer to the first member and give it the type of the first member.

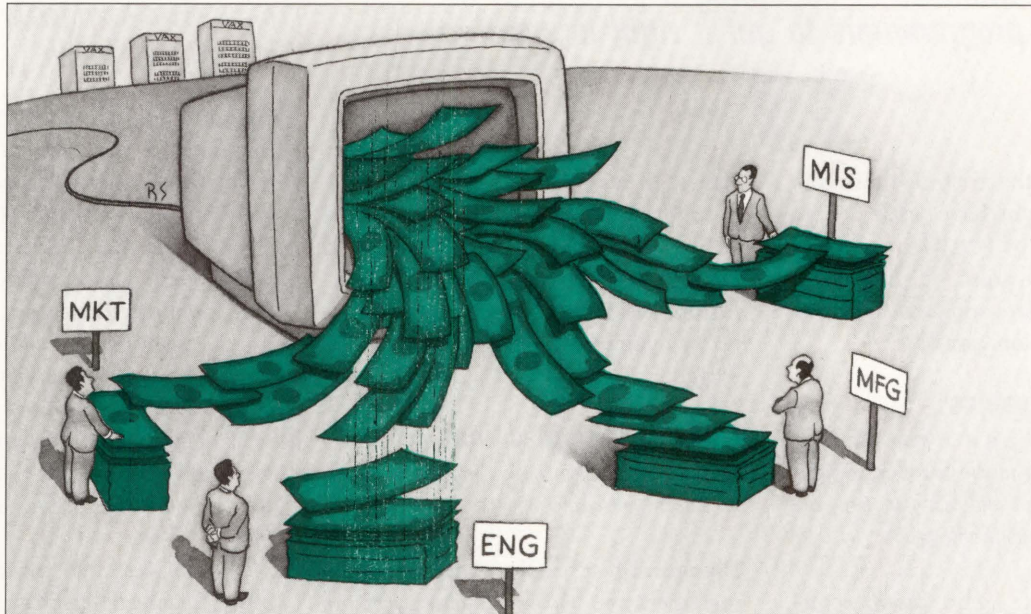
This design decision was fundamental. It was so successful in giving you nice notation and making it easy to use arrays that it confused people. The design errors crept into the first version of the UNIX Portable C Compiler (PCC) because of it.

We now have enough terminology to say that there are several kinds of expressions in C: lvalue and rvalue expressions, function designators and void expressions. In those days, the understanding was that lvalues, rvalues and function designators were off to one side. Only recently in the C Standard has there been any clear distinction about when lvalues must become rvalues.

I fought long and hard in the early days of the C Standard to clarify that you meaningfully can take the address of an array. That changes the point in the processing of expressions and types where you make this transition. I made the mistake in the Yourdon compiler but

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This fundamental blurring between arrays and pointers is so pervasive and insidious that the chances of educating a generation of C programmers to get it right is small.
”

got it right in the first Whitesmiths compiler. When you have smart people (like the writers of PCC) who can get confused on this point, it shows you both how successful and how insidious this design decision can be.

Wording For Lvalues

DEC PRO: *I recall you were responsible for a lot of the wording in the Standard regarding lvalues, and as it stands now, an array expression is a non-modifiable lvalue.*

Plauger: Correct. Again this was controversial. Larry Rosler (then AT&T's representative and editor of the draft Standard) felt that what we now call a modifiable lvalue should be called just an lvalue, as it was in the early days of the draft. The controversy concerned the commoner notation. Now an lvalue is a recipe for designating an object or locating an object. A subset of those are modifiable lvalues; i.e., they are recipes that are permissible to use on the left side of an assignment operator.

An lvalue is essentially an object designator. It's a shorthand for object designator. Of course, you rule out **const** objects as modifiable lvalues. The other thing you arbitrarily rule out is arrays. The reason I say arbitrarily is that it's possible and sensible to write *array = expression*. But this fundamental blurring between arrays and pointers is so pervasive and insidious that the chances of educating a generation of C programmers to get it right is small.

We have the capability of putting

arrays in as first-class objects. I've thought about it and backed off. The only reason I wouldn't want arrays to be first-class objects is because the confusion level is high enough, and there's no way you're going to get people to get it right.

C On Various Machines

DEC PRO: *Do you think C reflects its origins on DEC hardware?*

Plauger: Most people point at the auto-increment and autodecrement operators as proof that C is glorified PDP-11 assembly language. I think that's a red herring. VAXs, the 680x0 family, and even the National Semiconductor machines have autoincrement and decrement addressing modes. Also, C provides a full set of pre- and postincrement/decrements, whereas the addressing modes on a PDP-11 provide only for predecrement and postincrement. It's misleading to say that is proof that C is glorified PDP-11 assembly language.

Where the PDP-11 heritage shows up is in the notion that you have a large flat address space or two at most. C is a 2½ address space language. You have functions, data objects and register variables, flitting off in a secret place. But the flatness of the address space permeates C; it's unavoidable. The notion that pointers are essentially **unsigned ints** permeated C for the first 10 years of its existence. Only in the last four to five years have we seen a concerted effort to weed it out in the process of moving C to interesting architectures. Probably the major heritage is flat address space. Otherwise, I would say that C is a

remarkably machine-independent language, given its roots.

DEC PRO: *Regarding the common reference/definition linkage model: Some linkers, such as that provided with VMS, can't tell the difference between an external definition and a reference. I guess we've blessed that as a common extension.*

Plauger: Being one of the pioneers in moving C to varied machines, I hit this problem early, when people in AT&T were hitting it on their IBM machines. That's when AT&T settled on the notion that *extern* means reference and the absence of *extern* means tentative definition. Unfortunately, I came to a different conclusion: that the way to help the compiler figure out how to talk to not very bright assemblers and linkers was to say that the presence of an initializer told you whether it was a definition or not.

I still feel that my approach is a more elegant description, but unfortunately the usage on the 370 was widely imitated. It became much more common usage. I give high marks to Rosler and Tom Plum, the ANSI C vice chairmen, among others, for coming up with an excellent compromise.

C Versus FORTRAN

DEC PRO: *There has been some discussion that Ritchie originally meant to emulate the FORTRAN COMMON model, which isn't the way the Standard has developed.*

Plauger: Yes he did, and no it hasn't. We have a more restrictive model, which is originally what was in *The C Programming Language* by Brian W. Kernighan and Dennis M. Ritchie (K&R). There's a mention in K&R that some implementations may have to be this restrictive, pointing at the 360 and 370 implementations. The trouble is that you can't even piggyback on FORTRAN capabilities. Most existing assemblers and linkers were designed to coexist more or less with FORTRAN, but each one solved the COMMON block declaration

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There are a lot of powerful things you can do in the way of writing interrupt routines in C on the DEC machines.

”

problem of FORTRAN in a different way. Most were often quite restrictive. You could have the notion of equating a COMMON block in FORTRAN with an external data object in C, but this could have severe limitations, because some implementations permit only 64 concurrent COMMON blocks.

DEC PRO: *The only volatile object we've defined in the Standard library is **errno**. Regarding shared libraries, I guess you would need to provide each user with an impure version of it.*

Plauger: One problem with the library is that there are a number of places where static memory is required; e.g., **strtok**. Whitesmiths has made sure that our libraries are shareable by distilling out the private memory, making sure that you can allocate it on a per process basis, in a lot of environments, and making sure the library knows to go to that memory.

DEC PRO: *One thing about the Standard that has been debated at length is what you can portably say about interrupts through the signal mechanism; i.e., practically nothing. Because a DEC environment is interrupt driven, whatever you do is going to be non-portable anyway, philosophically as well as syntactically.*

Plauger: Exactly, but that's no harm. The Standard has been crafted carefully, so that while you can write powerful, non-trivial, strictly conforming pro-

grams that are portable, it's OK to write machine-dependent or system-dependent C that still is conforming. That's an important use for C. There are a lot of powerful things you can do in the way of writing interrupt routines in C on the DEC machines.

Performance

DEC PRO: *There seems to be a lot of opportunity for optimization in the Standard, and given the VAX architecture with many interesting instructions, etc., what kind of performance can we expect from ANSI C compilers?*

Plauger: Given what happened at the last three ANSI C meetings regarding aliasing, I've changed my expectations. I used to feel that one day C would be an equally good assembly language, but now feel that C will generate better programs than you can do by hand, because you can optimize so aggressively in ways that no assembler programmer would dare do. That has to be the goal now. The steam hammer has to beat John Henry, not just match him.

DEC PRO: *Would you comment on pragmas, the Pandora's box of the C Standard? There's a potential problem in that a compiler is required to ignore any pragma it doesn't recognize. Yet, what does recognize mean? How is Whitesmiths handling this?*

Plauger: We have our own internal standards. There are certain pragmas that are common to all our compilers and others that are implementation specific. I agree that the characterization of pragmas is a Pandora's box. Any pro-

gram that contains pragmas can't be called strictly conforming, despite some feeble attempts to write the Standard in such a way that it's true in principle. The first thing you want to do to make it a strictly conforming program is to look at all the pragmas and make sure you're comfortable with throwing them away.

DEC PRO: *As a quality of implementation issue, do you now, or is it your intent to, identify via an informational message, pragmas that are and aren't being accepted?*

Plauger: We already have gone to multiple levels of diagnostic, where one of the lowest levels is tolerant of traditional and other types of C code. The highest level is more restrictive than the Standard requires. In principal, it's Standard conforming, but you better watch out, because it may not be what you want.

DEC PRO: *The Standard has no support for complex arithmetic. Why?*

Plauger: I believe that the Standard was right in drawing the line there. The committee was inventive in putting in prototypes, but putting in anything else as elaborate as complex arithmetic would have been exceeding the charter of the committee. This isn't to say that it's not important, and I applaud Cray Research for having put forth a good model. I hope that many vendors imitate that model, so that the next C Standard will include it. But we need more experience; we need more prior art.

Character Sets

DEC PRO: *I think you probably have as much experience as anybody in terms of supporting deficient character sets, at least less than what we assume there is in ASCII. Also, your compilers have supported digraphs for a number of years. Any comments on ANSI C's trigraphs?*

Plauger: The trigraphs are awful when it comes to reading programs. They

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make it barely possible to encode programs, but that doesn't make them readable. I've asked a couple of times to put readable alternatives in for at least the most important punctuation. Whitesmiths does have good prior art for that. Years ago, we solved the problem of representing C in a restricted character environment. It wasn't ISO 646, though. Consequently, many of our digraphs involve characters that aren't in ISO 646, so they don't solve the problem.

Unfortunately, that puts us in the position of having to be inventive with any digraphs we introduce at this point, and no one has been willing to sit still for the invention. We may either have

to live with C programs that have vowels with funny punctuation over them in place of braces or that have barely readable digraphs, or we'll need pretranslators.

DEC PRO: *Presumably the only way this could affect the mainstream DEC market is if you had a deficient terminal character set like the old ADM3s.*

Plauger: I think the major impact will be in European areas where people using the ISO 646 character set have commandeered a number of the important punctuation characters.

DEC PRO: *In its marketplace, DEC supports a number of international character sets with its terminals. We have the notion in ANSI C of the locale and various mechanisms to handle that. Are you relatively happy with that in view of the fact that you also serve that market through your international affiliates?*

Plauger: DEC has led the way and is one of the pioneers in the area of providing good character set support for Western European alphabets. For instance, when Whitesmiths and DEC entered into a joint marketing agreement for the now-outdated Pro series, DEC insisted that our C compiler and libraries support various character sets. This has to help DEC with its international presence. It's just a continuation of what it pioneered in.

DEC PRO: *I expect that in the near future we're going to see DEC provide both vector and parallel processing. Any comments on how C is positioned to move into that arena?*

Plauger: If we follow through on what we began at the December '87 meeting and end up with a good consensus on good rules for alias restrictions and guidance for vectorizers, I can't imagine a better general-purpose language than

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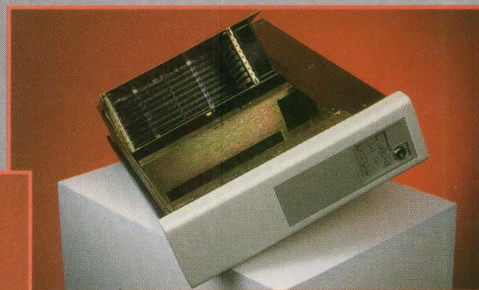
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C for doing this kind of work. It will outstrip FORTRAN. But a lot still depends on the issues that have yet to be resolved.

Note: The **noalias** keyword added at the December 1987 meeting was removed at the April 1988 meeting after considerable controversy. It also resulted in Dennis Ritchie attending his first ANSI C meeting to object in person. At this stage, no support peculiar to either vectorizing or parallel processing is included in the draft Standard.

Grading C++

DEC PRO: *What are your impressions of C++? Is it a possible successor to C from either an implementer's or programmer's point of view?*

Plauger: I'll make a brash statement: I'm not always good at making wise business decisions, but there are certain

areas where I feel I bat 1,000 on a technical projection. I knew the Intel 432 wasn't going to go anywhere, and I knew the IBM PC was, and I knew Ada was going to have its difficulties. I simply have difficulty understanding C++.

I've tried it several times. It has been out for several years and hasn't spread like wildfire through the community. Instead, it has caught on among the avant-garde. It's possible that C++ will be a slow growing phenomenon like UNIX. My technical instincts say that although the price is right, it's a bit too complicated. Besides, ANSI X3J11 stole its thunder by taking the juiciest parts for itself; e.g., function prototypes. If prototypes had not been added to C, I would be coding in C++. But the fact that they're there takes away most of the reason I would want to go to C++. The complexity of the rest of C++ puts me off. C++ probably isn't going to be a

good successor to C, but it's going to be an interesting sideline.

DEC PRO: *What will influence the C Standard beyond the one we're drafting?*

Plauger: There's no question that the next C Standard will be influenced by more concepts from C++, as it will be influenced by those common extensions you've been working so hard to round up and publicize. The goal is to look back over several years of existing practice and see what else should be picked up.

Readers are encouraged to submit any C-related comments and suggestions to Rex Jaeschke, 2051 Swans Neck Way, Reston, VA 22091. —Rex Jaeschke is an independent consultant, author and lecturer. He is the C language editor of DEC PROFESSIONAL and is our representative on the ANSI C Standards Committee.

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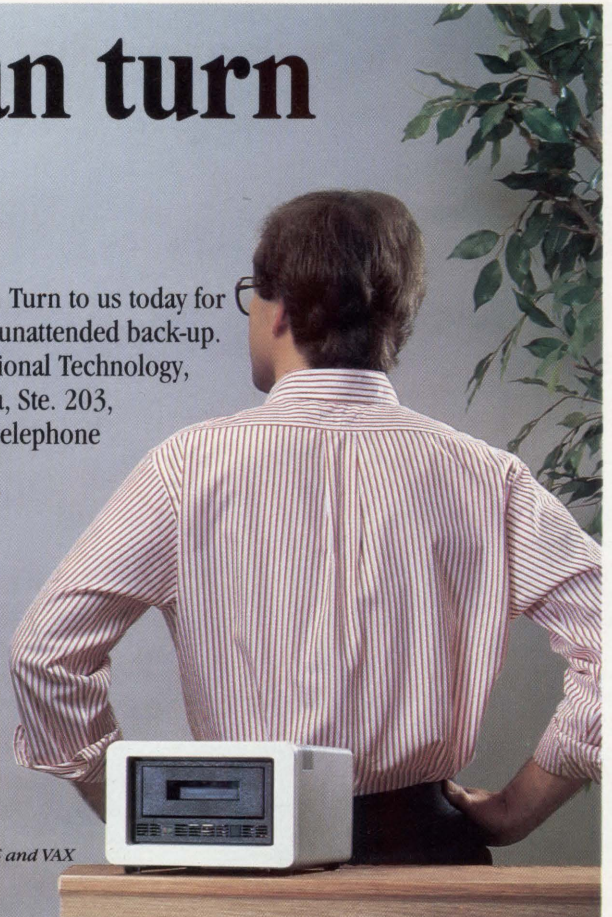
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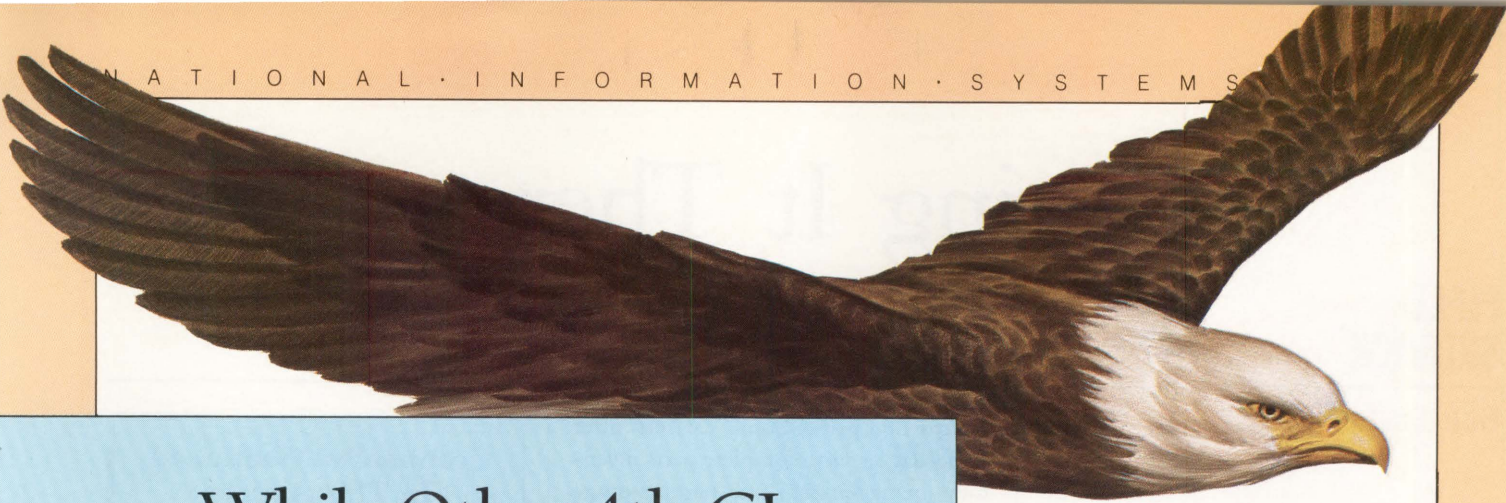


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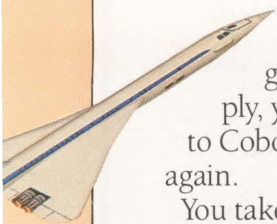
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All respondents listed UPS as their first choice, and all were satisfied with UPS service. When the customer was allowed the option of specifying the carrier (i.e., when the customer was paying the freight directly), UPS was again the choice.

Shipping parts when time is critical requires fast, reliable service. Although expensive, cost shouldn't be the major concern. Getting the needed part to the troubled site and good customer relations are more important. Our survey reveals that the most-used shipping services for emergency parts transportation are Federal Express Corporation, Emery & Purolator Worldwide Courier And Cargo, and Airborne Express.

Federal Express seems to have a lock on customer confidence, as all but one survey respondent listed it as the first choice for emergency shipment. Some of our respondents use Federal Express exclusively, while others use it in combination with Airborne, Emery & Purolator or UPS Air. Still others use

Companies Mentioned In This Article

Airborne Express
P.O. Box 662
Seattle, WA 98111
(800) 426-2323

CIRCLE 553 ON READER CARD

Emery & Purolator Worldwide
Courier And Cargo
Old Danbury Rd.
Wilton, CT 06897
(203) 762-8601

CIRCLE 554 ON READER CARD

Federal Express Corp.
P.O. Box 727
Memphis, TN 38194
(800) 238-5355

CIRCLE 555 ON READER CARD

Federal Express Parts Bank
3861 Knight Rd.
Memphis, TN 38118
(800) 238-5345

CIRCLE 556 ON READER CARD

SonicAir Parts Bank
15150 N. Hayden Rd.
Scottsdale, AZ 85260
(800) 528-6052

CIRCLE 557 ON READER CARD

United Parcel Service (UPS)
51 Weaver St.
Greenwich Office Park 5
Greenwich, CT 06836
(203) 622-6000

CIRCLE 558 ON READER CARD

Yellow Freight System
10990 Rowe Ave.
Overland Park, KS 66211
(800) 458-3323

CIRCLE 440 ON READER CARD

a secondary carrier only when package parameters exceed Federal Express limits.

Federal Express offers overnight or second-business-day delivery within the United States and to and from Puerto Rico and Canada. International delivery schedules vary by destination. Federal will pick up at the sending location for a small fee, or the package can be deposited at a depot or auxiliary substation. Federal Express drop boxes also can be found at business centers around the country.

Federal Express uses a central shipping staging point to route packages to destinations. All packages are transported through either its hub in Memphis, Tennessee, or, for a Western mailing and destination, through its West Coast hub in Oakland, California. Site delivery for overnight mailings is promised, in most areas, by 10:30 a.m. the following day if received by a specified deadline. Deadlines vary depending on locality and proximity to an airport.

Emery & Purolator Worldwide Courier And Cargo is the second favorite emergency carrier. It's an overnight carrier but offers same-day delivery for an extra charge. Emery & Purolator is a door-to-door, worldwide carrier. In most larger cities, delivery is promised by 10:30 a.m. the following day for overnight mailings if shipment is received by roughly 5:00 p.m. Cut-off time varies by geographic area. Shipments are routed through the company's hub in Dayton, Ohio. Most respondents use Emery for shipments that exceed Federal Express weight limits.

Airborne Express is another favorite emergency carrier. It, too, has overnight delivery but offers same-day delivery for an extra charge. Packages can be deposited at various locations or held for site pickup. In most cities, overnight delivery is promised between 10:30 a.m. and 12:00 noon the following day if shipment is received by about 4:30 p.m. Although Airborne has no weight limits, only packages weighing less than 100 pounds are guaranteed for overnight

delivery. All shipments received are routed through the company's hub in Wilmington, Ohio.

The parts senders in our survey were satisfied with services rendered by shippers. Shippers usually met promised delivery time and got the package to the right destination. Sometimes size and weight limitations or differences in drop-off locations and pickup schedules forced a selection of one shipper over another. Some senders preferred to let the receiver decide how the part was to be shipped and then charge accordingly. Cost, as always, was a factor, but confidence in the transporter was most important.

Other Innovative Approaches

Some shippers, to improve parts delivery time, have turned over their inventory to a shipping service. Parts banks, which are actually independent

warehouses and distribution channels run by some shipping services, provide stocking and transporting capabilities at carrier facilities. Some also offer complete inventory management and control functions. Here's a look at how two leading parts banks operate.

Federal Express Parts Bank —

The Federal Express Parts Bank provides clients with a centralized warehouse and inventory management system at its Memphis, Tennessee, location. Robert Gray, parts bank manager, states, "Any request for parts coming into the parts bank can be filled and the package sent on its way on the next flight out of Memphis within one hour." The average response time from the receipt of an order to arrival at the destination airport is six hours, including both local and coast-to-coast service. Some sites will receive orders in two hours. Federal Express says that this six-hour average

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window satisfies most maintenance and service contracts. The Federal Express Parts Bank operates continuously, every day of the year. Cut-off time for overnight delivery is 1:00 a.m. CST.

With its centralized stocking facil-

ity, all inventory is available for immediate shipping. Federal Express provides a full inventory management and parts accounting system for its customers. Both large and small companies use the Federal Express Parts

Bank for domestic and international shipping.

Recently, Federal Express formed the Contract Distribution Services Division to manage all or part of a client's inventory, warehousing and distribution needs. This division can be used for a one-time product distribution or to design a custom, central inventory/distribution facility.

The Contract Distribution Services Division can ensure that time-sensitive parts always are standing by for the next flight out. The shipping schedule also can be coordinated with a just-in-time delivery program.

SystemLine, a Federal Express affiliate in the United Kingdom, operates a counterpart to the U.S. parts bank in Crick, England. An additional parts bank is being installed in Brussels, Belgium. Both warehousing facilities are for European customers.

SonicAir Parts Bank— SonicAir Parts Bank's service, called Field Support Bank, also operates 24 hours a day. SonicAir offers same-day delivery — local warehouse city delivery within 60 to 90 minutes and deliveries anywhere in the United States in four to six hours.

The warehousing of parts at SonicAir is decentralized but under central control and dispatch. SonicAir feels that by stocking inventory at key geographic locations around the country, it can provide a transport service that's more efficient, thus saving coast-to-coast shipping time and charges.

SonicAir's Field Support Bank doesn't work on a route basis but is organized to meet individual customer needs. Currently, eight parts depots operate in the U.S. and three internationally. Three additional U.S. locations are planned. Additional warehouse facilities are added if they're required for a specific customer. The Field Support Bank also provides clients with a complete inventory management program and weekly inventory reports.

SonicAir delivers to any U.S. city and most international cities and doesn't charge extra for p.m. or weekend service. ■

Shipper Statistics

Airborne Express

Packages accepted for shipment:

Size Maximum — must fit into an aircraft

Weight Maximum — none (No minimums)

Pricing:

\$14 minimum for an overnight letter. Other prices determined by weight and destination

Services:

Pickup at sending site (for a small charge)

Drop-off at Airborne Express depots and substations

Emery & Purolator Worldwide Courier And Cargo

Packages accepted for shipment:

Size Maximum — 105 inches long x 84 inches deep x 70 inches high

Weight maximum — none (No minimums)

Pricing:

\$14 minimum for an overnight envelope. Other prices determined by weight and destination

Services:

Door-to-door pickup and delivery

Federal Express Corporation

Packages accepted for shipment:

Size Maximum — 130 inches total

Weight Maximum — 150 pounds (No minimums)

Pricing:

\$8.50 minimum to \$135 maximum for standard air (second-business-day delivery)

\$11 minimum to \$240 maximum for overnight delivery

Services:

Pickup at sending site (for a small charge)

Drop-off at Federal Express depots and substations, drop boxes and auxiliary stations

United Parcel Service (UPS)

Packages accepted for shipment:

Size Maximum — 130 inches total

Weight Maximum — 70 pounds (No minimums)

Pricing:

Local — \$1.34 (1 pound minimum) to \$6.07 (70 pounds maximum)

Other — \$1.91 (1 pound minimum) to \$24.79 (70 pounds maximum)

Services:

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Drop-off at UPS receiving stations or other mailing facilities

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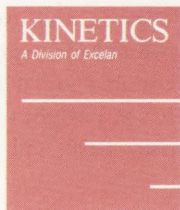
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CIRCLE 266 ON READER CARD

Kevin G. Barkes

Is DEC WIMPing Out On DCL?

"While we're going to maintain and improve DCL in-

definitely, we're changing our focus a bit in the system management area. In the future, the real focus in system management will be in the DECWINDOWS environment. ... In the future, the real enhancements will be in DECWINDOWS."

That observation, stated by a DEC representative at the Spring DECUS in Cincinnati, threw many DCL enthusiasts into a tizzy. Was DEC giving DCL and the good old command line interface the heave-ho? By embracing a Windows, Icons, Menus and Pulldowns (WIMP) interface, was DEC somehow intimating that DCL would become a relic, an arcane tool used only by DECie-techies on VT52s?

At a DEC PRO editorial meeting last year, a fellow editor, extolling the virtues of WIMPish interfaces, announced that DCL was gasping its last breaths. "In a year, you'll be out of a job," he told me.

To paraphrase Mark Twain, the reports of DCL's demise are greatly exaggerated.

Smoke And Mirrors

In my DCL training classes, I liken VMS windowing software to the *Wizard of Oz* and show a transparency of users cowering before an intimidating image labeled DECWINDOWS. Off to the side is a nondescript little booth labeled DCL. The wizard image is saying, "Pay no attention to that man behind the curtain."

Graphical interfaces on VMS obscure DCL's presence. But like the little man in the booth, my favorite command language interpreter is there, do-

The cost differential between a workstation and dumb terminal shrinks when you consider the capabilities of each.

ing a lot of the work while the flashy displays attract all the attention.

Why WIMP?

The \$ prompt has worked well for the last 10 years, so why is DEC placing such a major thrust behind graphical interfaces? The answer is money. DEC makes more profit on workstations than on dumb terminals, so it has the incentive to get as many users as possible hooked on mice and menus.

But there are other valid considerations. Although the command line always will be around, the market is moving toward graphical interfaces. In the microcomputer world, it's almost impossible to find new application software that doesn't use WIMP as its user interface. Because the line between high-end micros and low-end minis is becoming more nebulous each day, DEC can't afford not to provide a familiar-appearing gateway into its systems.

DECWINDOWS, when it officially arrives, will provide significant enhancements to user efficiency and ease of use. For end users running simple tasks, such as word processing and other turnkey operations, a WIMP environment makes a lot of sense.

Such users are managed easily in the DECWINDOWS environment. System managers can tailor a user's window to provide him with only those functions and commands needed to per-

form assigned tasks. The WIMP interface can be an impenetrable barrier between the user and DCL, insulating the non-technical types from the wilds of VMS and preventing costly mistakes.

On the other hand, WIMPs can be a paradise for the programmer, system manager and, yes, the DCL fanatic. The ability to open multiple windows and perform numerous tasks simultaneously will result in increases in efficiency and productivity. The cost differential between a workstation and dumb terminal shrinks when you consider the capabilities of each.

Seizing The Opportunity

For DCL adepts, the disappearing \$ should be viewed as a golden opportunity. New entrants into the VMS environment will be spared the ongoing struggle with the syntax of DCL commands; on the downside, they will have little exposure to the nuts and bolts of dealing with DCL.

Old-timers easily will be able to look at a DECWINDOW, create or modify a command file or add new qualifiers to commands on the menu. They'll be the new wizards, and users will view them with awe and admiration.

WIMPs? Bring 'em on, I say! They prove the future of DCL is a bright one. As long as VMS exists, DCL will be there.

As for being out of a job . . . well, when DEC comes up with a way to put icons in a .COM file, I'll begin to worry.

Introducing VMS 5.0

The mass release of VMS 5.0 should recently have arrived at your door. There are many new and enhanced commands, but the move to 5.0 should be less traumatic than the jump from 3.x to 4.0, at least from the DCL standpoint. Here's the quick lowdown on what's new in DCL.

IF-THEN-ELSE. DCL finally has an ELSE statement. It will reduce the contortions in which procedure writers have had to engage for the past decade.

The "classic code" — plain-vanilla IF-THENS — will continue to function as they have in the past. When used with the new ENDIF command, THEN becomes a verb in a new "block IF" construct:

```
$ IF SOME__VALUE .EQ. 1
$ THEN
$     @SOMEPROCEDURE1
$     @SOMEPROCEDURE2
$ ENDIF
```

When you throw in the new ELSE statement, you have:

```
$ IF SOME__VALUE .EQ. 1
$ THEN
$     @SOMEPROCEDURE1
$ ELSE
$     SOME__COMMAND
$ ENDIF
```

ENDIFs are necessary to close the new IF-THEN/IF-THEN-ELSE blocks. Only ENDIFs can have a label specified on the same line. The IF, THEN and ELSE commands can't be truncated, but you can shorten ENDIF to ENDI if you're a performance junkie.

It's possible to nest up to 15 IF statements, but procedures can't branch out of the current command block into the middle of another command block.

New SETS. The command SET AUDIT has a new /FAILURE__MODE qualifier to deal with how to proceed when resource limitations prevent the performance of security audits. The system can wait until it can perform the check, continue or even crash itself.

The SET QUEUE/ENTRY command is superseded by a new SET ENTRY command that modifies jobs pending in a queue. SHOW ENTRY provides a quick way to obtain information about a user's batch and print queue entries; qualifiers to the command accept lists of items, making it less tedious to learn the status of pending jobs.

Note that queue management has been completely reworked in V5. ACLs now are supported, and DEC now claims significant improvement in the job controller.

SET HOST/DUP is a more general type of SET HOST/HSC, with /SERVER and /TASK qualifiers.

SET HOST/BUFFER permits the user to set the size of the protocol message sent between the terminal and remote processor from 140 to 1024 bytes, with 1010 being the default.

Even niftier, SET HOST/RESTORE saves the original terminal characteristics before a remote session and restores them when the session is over.

SET PROCESS/SUSPEND temporarily stops a process.

SET TERMINAL now knows about VT3xx terminals.

New SHOWS. The SHOW QUEUE command has a host of new qualifiers, making it easier to obtain specific data about queue operation and status.

SHOW CPU is a privileged command that returns information on VAXs running in an SPM environment.

The items displayed by the SHOW TERMINAL command have been modified slightly.

Additional Changes. A new SYSMAN utility speeds up cluster management and consolidates several system management functions.

The RENAME command now re-

quires the process running it to have DELETE access to the file being handled.

The RECALL/ERASE command wipes out the contents of the recall buffer.

The SEARCH command has been given qualifiers making its command form more in line with other file manipulation utilities. SEARCH now supports /BEFORE, /AFTER and /SINCE. Other qualifier changes include /FORMAT, which controls how form feed characters are displayed, and /HIGHLIGHT, which causes the targeted text to be highlighted in the output display.

The new F\$GETQUI lexical function helps DCL programmers who need to obtain information about batch and print jobs. Additional items have been added to the F\$GETSYI and F\$GETDVI lexicals as well.

In the utilities area, MAIL, BACKUP, MONITOR, AUTOGEN, VAXTPU and several other facilities have been reworked, enhanced or modified.

It's going to be an interesting fall for system managers.

BBS Reorganized

When this appears, my SYS\$OUTPUT BBS should be reorganized completely. I'm adding 30 MB of online storage, breaking down the VAX file section into more digestible subtopics and performing other housekeeping chores. SYS\$OUTPUT now carries the VAX, PDP-11 and RAINBOW national echomail message areas, so the current DEC world is covered. New users now have immediate, if somewhat limited, download privileges; call (412) 854-0511.

For a list of all DEC-related FidoNet BBS systems in the U.S., send a self-addressed, stamped envelope to: BBS List, Kevin G. Barkes Consulting Services, 4107 Overlook Street, Library, PA 15129.

The listing also is available online on SYS\$OUTPUT. —*Kevin G. Barkes runs an independent consulting firm near Pittsburgh, PA, specializing in VAX system management, configuration and training.*

Evan Birkhead

Financial Fortress

IBM has been busy this year protecting itself with one

VAX killer after another. One of them is the AS/400 and another is the 9370.

But in this war, hardware just

**“
ACTs are a different
breed of sales tool.
”**

represents a strategy session. The front line, where battles will be won or lost, is software applications. It may take awhile for the VAX killers to catch up in that area.

If DEC's sales for the last four years are any indication, distributed processing and clustering swiftly is becoming the preferred technology for applications in retail banking, administrative financing and trading, as well as on Wall Street. Mainframes and networked PCs are taking a back seat at these sites.

While IBM has been redesigning its line of computers, DEC has been targeting an IBM strong suit, financial applications. That hits IBM where it hurts most. Analysts agree that much of IBM's declining market share at the midrange can be attributed to DEC's momentum in an industry it hadn't previously tapped.

DEC's secret weapon in the financial fight is its Application Center for Technology (ACT) located in Manhattan, the heart of IBM's home turf and strongest territory. The center is armed

with experts in retail and commercial banking, as well as trading and MIS. It opened in June 1987.

“Our potential clients in New York are much different than the traditional DEC customer,” explains ACT's manager, Manny Barreto, referring to DEC's more technical users in science, engineering and government. “But this is the fastest-growing part of our company.”

Life On Madison Avenue

ACTs are a different breed of sales tool. There soon will be 17 nationwide, and the application theme of each mirrors a prominent area industry, such as manufacturing in Detroit and telecommunications in Atlanta. The function of each is to demonstrate applications within a facility that replicates the home environ-

ment of the potential customers.

At the Manhattan ACT, customers are given demonstrations by invitation only. Barreto schedules five to eight visits each day. The staff of 17 comprises a systems manager, office personnel and consultants who are experienced financial officers. There are no salespeople.

Customers visiting the center — usually a CEO with vice presidents and MIS staff — are given the royal treatment: mahogany conference tables, videotaped presentations, the works. The setting is intended to make the executives feel at home.

The center, located in a skyscraper at 54th Street and Madison Avenue, is down the street from the IBM and AT&T buildings and in the shadow of the Citicorp building. DEC owns the 24th

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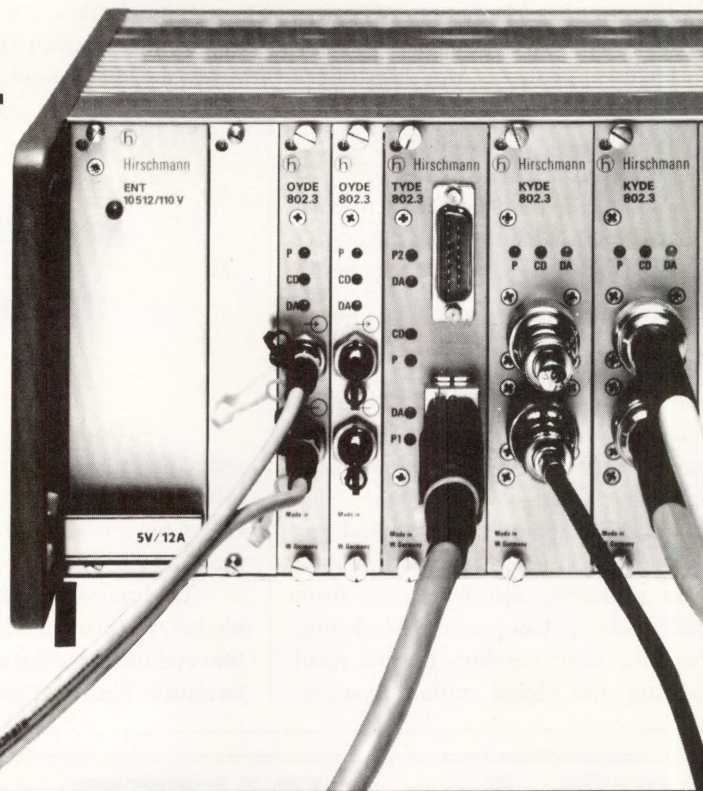
In addition, its modular design enables you to intermix transmission media cards without affecting the larger network — eliminating the down-time that usually occurs with link expansion and diagnostics.

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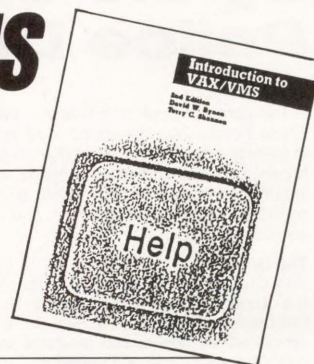
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floor, and the demonstration area is surrounded by windows.

Before the Manhattan ACT was established, DEC's presence in New York City consisted of area sales offices and an office applications center downtown. Now, there are 25 DEC locations in greater New York.

So far, the strategy seems to have paid off. DEC has already felt the impact on its image and corporate pocketbook, claims Barreto.

The Hardware

The 10,500-square-foot center includes four conference rooms, a computer room, staff offices and 12 application/demo areas.

Each area highlights tailored applications, including hundreds of software packages, mostly drawn from DEC's pool of Cooperative Marketing Program (CMP) vendors. Besides retail banking and global trading systems,

there are desktop publishing systems, office applications and MIS solutions.

In each area, TV monitors show videos that explain the basics of the hardware and the fundamental problems

Manhattan is the only ACT with an 8974 demo. The system is capable of adding information to and extracting it from a central database and is linked to actual ongoing market activity from Reuters,

**“
So far, the strategy seems to have paid off.
DEC has already felt the impact on
its image and corporate pocketbook . . .
”**

and tasks in that environment. This is followed by a personal demo that accesses on-line software packages running on the cluster.

The trading area is the most realistic section, featuring a wide array of DEC, IBM and other workstations and several terminals clustered through an 8974.

Knight-Ridder and others. An electronic ticker, wired to the New York Stock Exchange, is high on the wall in front of the workstation platform.

DEC demonstrates networking capabilities throughout the center. SNA, MS-DOS and Wang VS are tied into a LAN with DECCONNECT. Some VAXs, including VAXSTATION 3600s and a VAX 6220, run ULTRIX applications. The whole cluster is tied into DEC's worldwide corporate network.

Internally, the network uses DESTA, ThinWire and ThickWire. Externally, there's a patch panel for satellite uplinks. Unannounced products aren't shown at ACT, says Barreto, only working solutions.

For IBM applications and development, the center also is linked to an IBM 4300 at a DEC site in Littleton, Massachusetts. IBM terminals are hooked to IBM mainframes. There's even an Etherneted PS/2.

“We also have a Wang machine to show the interconnect between Wang, IBM and Digital,” notes Barreto.

Among the storage devices are four SA482s and three RA82s. A laser printer is accessible from anywhere on the network.

It's all linked with equipment commonly used in financial institutions to connect multivendor hardware to an Ethernet, such as Logcraft 386ware and Cardware.

“It's a DECWORLD for the world of finance,” Barreto comments. “This

We Are WANTED By the Chino Police Department

The Situation:

In the game of cops and robbers, crime analysts within the Chino Police Department needed to enhance their ability to identify existing and emerging crime patterns, forecast future criminal incidents, rapidly correlate diverse information from a variety of data sources, and then, confidently, generate queries and reports from correlated data.

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becomes a home for Digital to partner with CMPs."

Other Strategies

DEC is backing up the Application Center for Technology with CMP agreements and research and development in several areas of electronic finance architectures. For example, DEC steadily is becoming a respected authority as well as a platform source in electronic funds transfer. It's asserting itself as a path-clearer for networked banking standards.

DEC is marketing a blanket solution it calls Computer Integrated Financial Services (CIFS). Like CIM and other

computer-integrated strategies, CIFS is a standards-based approach to integrating architectures with existing hardware investments.

An important complement to CIFS will come from DEC's CMPs. A CMP agreement with IntraNet Inc. will promote IntraNet's corporate funds transfer package for VAXs. Profile, an integrated banking system from Sanchez Computer Associates, is also a CMP product.

Other VAX-based banking systems supported by DEC include products from Pegasystems, Banking Decision Systems, Berman Technologies Corporation, Money Management Systems Inc. and Cognitive Systems Inc.

Banks are buying it. DEC's New York neighbors, Citicorp and Chemical Bank, are among its *Fortune* 500 financial customers. Citicorp is in the second year of a three-year, \$30 million deal with DEC to install a VAX-based global trading system.

"The goal of applying technology

to global trading is clear," explains Harold Rich, head of technology for Citicorp. "Any customer of Citicorp can trade any product on any exchange or dealing room, anyplace in the world, in any currency, any time of day."

DEC believes that trading is the fastest-growing financial area. A DEC survey of senior executives in the securities industries reveals that 25 percent have made an investment in trading systems, followed by 17 percent for back office, and 12 percent for retail brokerage systems. DEC plans to pursue the trading market heavily.

BUT THE FINANCIAL INDUSTRY as a whole will continue to be a major focal point for DEC. The distributed, global nature of the industry makes it a nice fit.

In fact, DEC already is playing a major part in financial automation. At the annual stockholders meeting held shortly after Black Monday last fall, DEC President Kenneth Olsen commented, "People were concerned about the role of computers in the crash," referring to complaints that automated systems contributed to the quick plummet in stock prices. "But I understand our systems performed quite well." ■



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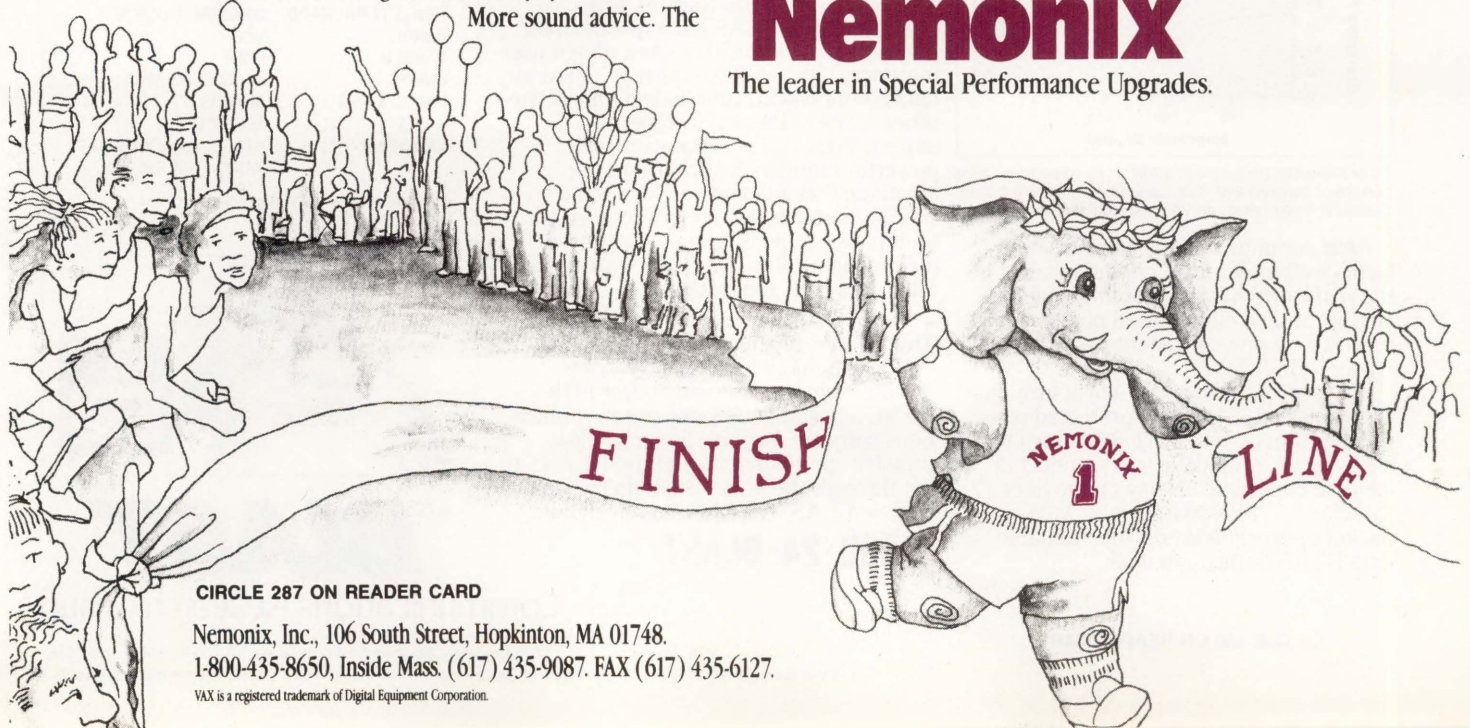
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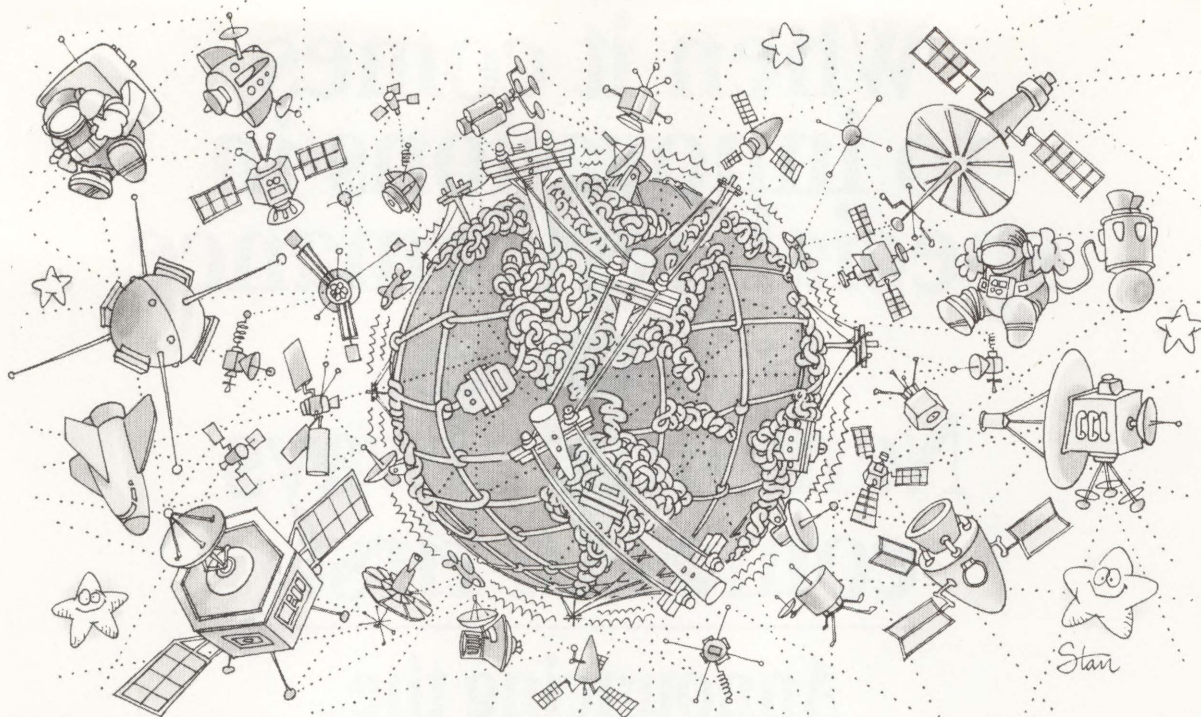


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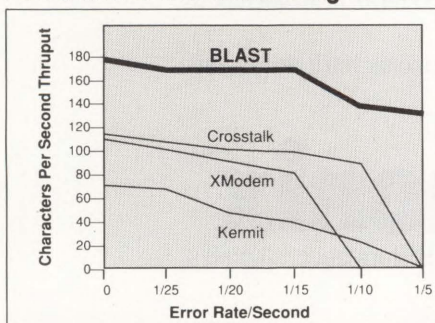
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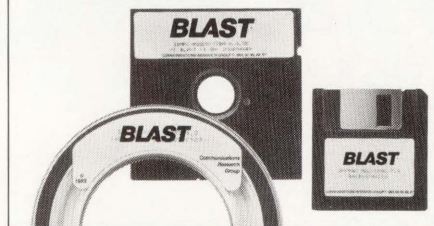
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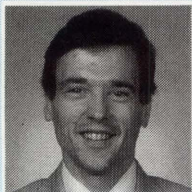
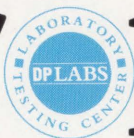
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from the lab



David B. Miller

From Spreadsheets To Storage

House duo of Daves: Dave Mallery, our editorial director; and yours truly, technical editor. From the computer treasure chest this month we review:

Abc Or 1-2-3?

Lotus 1-2-3 set the defacto standard for spreadsheet packages. Although Lotus Development Corporation hasn't yet offered its package for the VAX, other companies are offering their own Lotus-like products.

In addition to working and looking like 1-2-3, these packages can include features that Lotus doesn't have at the moment. Another factor to consider is how well the package handles unavoidable differences between PC and VAX products, such as different keyboards and displays, and different ways of printing output.

This month, we take a look at one such product, AOK.abc, from AOK Software Products Inc. How well does AOK mirror Lotus's features and functionality? How easy is it to use and how fast can you make the transition from PC to VAX? AOK claims that if you know

Lotus 1-2-3, you'll have no problem learning abc. We took them up on that claim and put abc to the test.

More Is Better

More memory, larger disks, faster throughput, higher speeds for data transfer — isn't anyone satisfied anymore? Control Data Corporation (CDC) helped quench our thirst for "more" when we tested a CDC Sabre disk drive.

When formatted, the Sabre stores 1.05 GB of data. Its average seek time is 16 ms. One of its best features is its size — only eight inches wide and five inches high. You won't know what to do with all the space vacated by your larger drives.

Keeping those bits and bytes moving quickly and in the right direction requires a competent data traffic cop. In a separate review, Dave Mallery talks about Andromeda Systems' ESDC Cache Controller, which we used to wield our Sabre.

The Andromeda offers MSCP emulation. Performance features include seek optimization

to reduce head movement, a 1 MB cache expandable to 16 MB that boasts a hit rate of 80 percent, and an adaptive readahead caching scheme that reads additional blocks beyond the requested data when the probability is good that those blocks will be needed next.

Finally, are your Macintosh II applications becoming memory hungry? We'll show you how we upgraded our Macintosh II with Clearpoint Research Corporation's MC2RAM/D memory modules and satiated its memory hunger — at least for now.

I hope you enjoy reading about these products as much as we enjoyed testing them.

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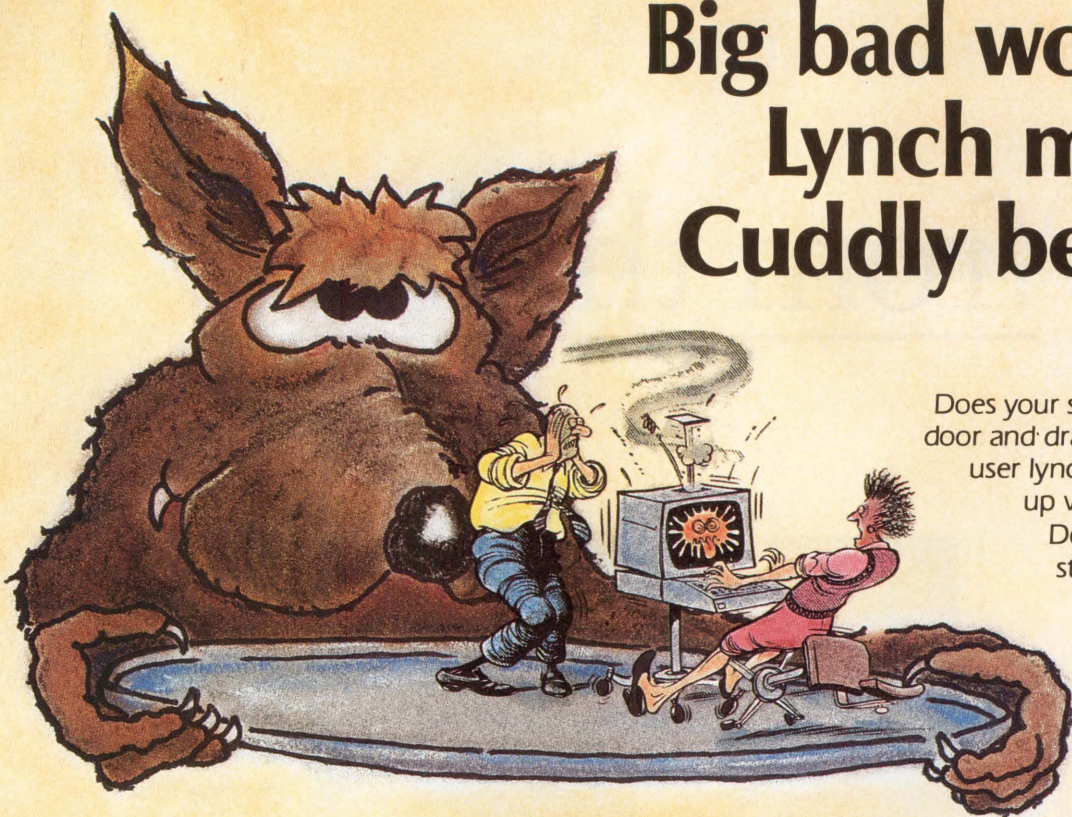
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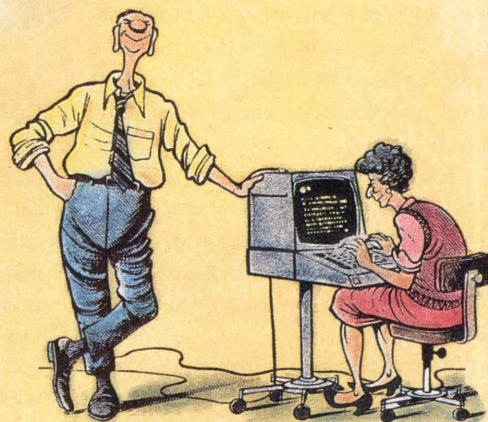
Big bad wolves? no. Lynch mobs? no. Cuddly bears? YES.



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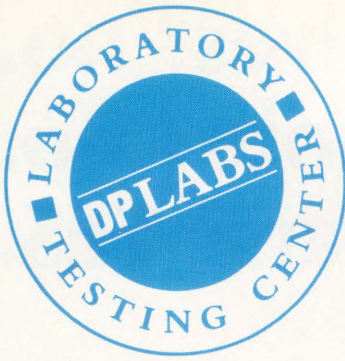
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from the lab

CDC's Sabre

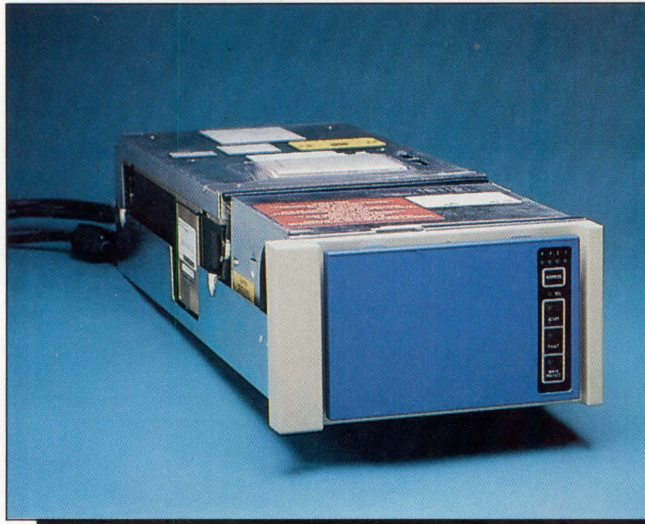
Dave Mallory

Back when men were men, talked octal and bought removable disk drives, the state of the art in drives was the venerable Control Data Corporation (CDC) 9766, sometimes known as RM05 in DEC circles. For about five years, from the late 1970s, these wonderful old boat anchors were the mainstay of our businesses. The linear motors that drove the heads on those drives had magnets that would pull the pens out of your shirt pocket.

The world then moved on to sealed Winchester, but CDC of Minneapolis, Minnesota, seemed to stay put. It was soon left behind as the flocks of Eagle Winchester from Fujitsu landed on our shores.

The road back to dominance in the disk drive market has been long and hard, but it looks like CDC has paid its dues and is now a major contender. The new Sabre 9720-1230 drive has convinced me.

This drive is an electromechanical wonder. It's light, extremely quiet, produces little heat, and you can fit 2 GB in a 5½-inch rack-mount tray. As I write this, I've just promoted the drive from boot node system disk to USER1:, our busiest user disk. This disk is home base to almost all of our interactive users and by far the busiest place in the cluster.



The CDC Sabre 9720-1230 drive is an electro-mechanical wonder. It's light, extremely quiet, produces little heat, and you can fit 2 GB in a 5½-inch rack-mount tray.

I received the drive directly from CDC with the same level of documentation that a system integrator would receive; i.e., a binder about four inches thick that fully spells out the breadth and depth of the device. Critical to the installation are the mechanical instructions for assembly of the units together into a tray and the switch settings for sectoring and other options. The unit we received was from the first real production run, so there were many addenda, and many of the addenda were important (e.g., totally different switch assignments and sector settings).

Proper sectoring is dictated by the choice of controller. We used the Andromeda ESDC cache controller from Andromeda Systems and followed the suggestions in its documentation. (See "Andromeda Systems' ESDC Cache Controller," on page 113).

By the time you read this, the settings will be available from the con-

troller manufacturers and you'll be liberated from any hacking. We used 86 sectors of 586 bytes each. The drive has 1,635 cylinders of 15 heads. The formatted DU driver size is 2,107,860 blocks or 1.05 GB.

Before introducing the drive to the cluster, I set it up on an old MICROVAX I in the Lab. The machine couldn't sup-

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port the controller for real operations but could supply power and light while the firmware on the controller formatted and verified the disk. It took 24 hours of verifying before I found the majority of bad spots that were enumerated in the factory bad list. I found the long-term verifying to be a strong confidence builder.

The drive has a diagnostic control panel with LCD readout. A number of drive-resident diagnostics can be initiated from the panel, simplifying repair. The display normally shows the current cylinder (in hex) and a window in the cover would be a big improvement. That way, you could get more information about the drive at a glance.

The only change I made to the installation procedure was to install gasket material between the power supply (in front) and the drive in the rear. The drive relies on the air expelled from the power

module for its cooling. I improved the air flow to the drive by closing the gap between the two units, attaching the gasket material with duct tape. I feel that the drive would be better served by a small exhaust fan on the rear.

As this is written, we've been using the disk for about a week. It's more than half full, because it received the contents of a 600 MB Fujitsu, and Parkinson's law holds firmly in our Lab!

Because the majority of the users are on this node, and they're no longer getting the majority of their disk service over the Ethernet, the improvement in performance is tangible. When measured on a monitor, our cable use decreased from the midteens to about five or six percent average.

This drive has a rather revolutionary feature that contributes greatly to its MTBF figure. About every 12 minutes, in conjunction with a requested seek, the drive will sweep its heads over the surface of the disk. This materially reduces the particle count within the HDA and, therefore, materially raises the reliability. The sweeping will consume about 11 seconds in 13 hours.

The only controller-related trick is to tell the controller that the drive is dual-ported. Then, when the drive is unavailable during a sweep, the controller will simply wait and not report the drive off-line. We discovered this feature when the drive would go into mount verify every 12 minutes when we first attached it.

Cabling the drive has its good and bad points. The drive uses the newer round shielded extended SMD cables. CDC supplies a wonderful rugged cable anchoring mechanism for the back of the drive. Solid castings grip the cables and securely ground the shielding to the frame.

The controller end is the opposite. The B cable is round (fat) and can't get into the connector unless you leave the slot above the controller vacant with a

short bus grant card. (Vacant slots are a premium here.) What's needed is a bulkhead assembly for the back of the MICROVAX and old-fashioned flat SMD cables for inside the box.

The Sabre is the kind of drive that a system manager can love. It's large enough to be credible, yet small enough to pack at state-of-the-art levels.

Andromeda Systems' ESDC Cache Controller

Dave Mallory

When I decided to test Control Data Corporation's (CDC) Sabre 9720-1230 Drive, I wanted a controller that matched its speed and features (see "CDC's Sabre," page 112). Volkswagen engines in Ferrari chassis never do well.

The CDC Sabre drive operates at a cool 3 MB/sec. transfer rate on the Q-bus. You have to slow it down to run on an HSC!

I've always been interested in the Andromeda because of its cache. The cache we have from System Industries (SI) greatly prolonged the lives of disks on our 750, providing remarkable access and performance over the long haul. The Andromeda ESDC cache controller, from Andromeda Systems of Canoga Park, California, is a formidable product not only for its cache, but also for many other intelligent features, such as built-in performance monitoring.

This new CDC disk marks an at-

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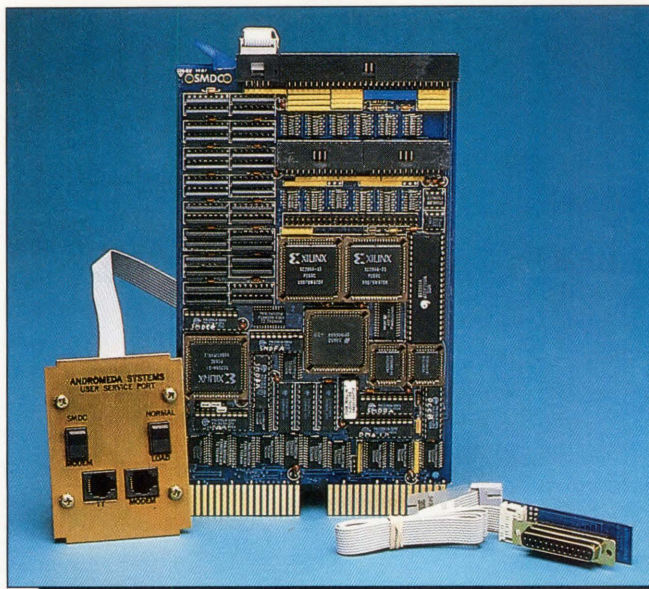
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tempt at a new configuration in our cluster. Rather than serving all the disk structures from the farm on the 750, we decided to try spreading the storage out across several nodes, greatly reducing the service overhead for the users on that node.

Ultimately, we want to remove the 750 and its noise and heat from the computer room. The first step is to replace the 2 GB of 750 storage. Clearly, a caching controller for FRODO:: (MICROVAX II) would be a big plus if



The Andromeda ESDC cache controller comes with two console options: direct single connection (on left) and the fancier switched-bridging panel kit that can be used with a modem for firmware downloads.

we're trying to replace the cache controllers on the 750.

One promised upgrade from Andromeda is a piggyback board loaded with memory that will expand the cache from the 1 MB on the board to larger quantities. We found that upgrading the cache on the SI from 2 MB to 8 MB made a difference. This upgrade is currently on hold at Andromeda, pending the return of reasonable DRAM prices. Meanwhile, the 1 MB of cache does a fine job.

Physically, the controller is a dual-high card. It has a fair amount of surface-mount technology, coupled with high-density programmable Logic Cell Arrays from Xilinx Inc. Firmware upgrades to the controller are available over phone lines from a computer at Andromeda. This eliminates costly PROM upgrades in the field.

I recently spent a few hours with the Andromeda folks at their booth at DEXPO. As we went through the demonstration, I suggested that they change the display on their cache monitor to include an actual numerical count of recoverable errors. The feature

was available through an upload a few days later.

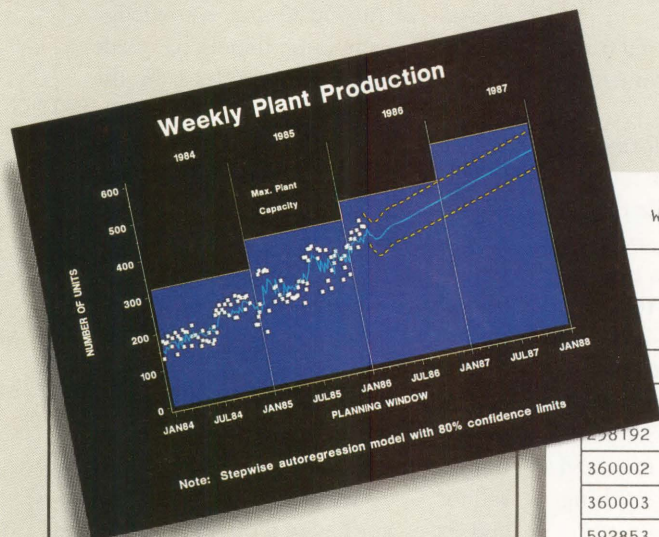
The only jumper on the card selects the CSR address. All other configuration is done interactively with a program on the board using a terminal at 1200 baud connected to the single serial port. We had to change the CSR so that the drive could be DUCn: (the third MSCP controller).

The configuration dialog covers such items as the number of DU units per drive and the physical geometry of the drive (e.g., heads, cylinders). It's repeatable for the second physical drive (maximum of two physical drives per card). The caching is toggled from this menu, as well as the number of blocks for read-ahead. The on-board performance monitor also is toggled from this menu.

The performance monitor is a very usable feature. When first started (for the first 100 I/Os), it's rather high in overhead. After that (about five seconds on our system), the overhead is greatly reduced as the on-line display is updated only on multiples of 100 commands. I

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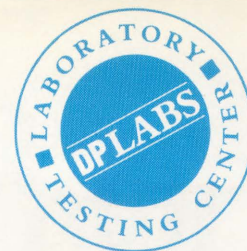


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Rejected Lot Statistics



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especially appreciate the elegance of the display, given that it's entirely in firmware, and you only need a VT200 series as a display unit.

Another menu option does the formatting and verifying. I did this off-line, using a MICROVAX I in the Lab for power. I especially like the fact that the recording of bad blocks is incremental and that the verifying is restartable.

I allowed the unit to run its verification for 24 hours (because it was off the cluster). The listing from CDC showed a total of 67 flaws but only four defective tracks. These lists are made by state-of-the-art test equipment and analyze the entire surface of each track. Once a track is formatted, some of these flaws may no longer be important, as they're located between sectors or in the short tail sector.

In 84 passes, I found a total of 28 of the 67 flaws. The last flaw was found on pass 66. I never found one of the four

defective tracks. I suppose if the verification routine reads and writes that track 84 times with multiple patterns, you can expect it to work.

I'll keep the listing and see if it turns up. I expect to be using this controller and drive for a long time.

My first attempts at performance measurement were somewhat futile. I made a 10,000-block relative file on the CDC and on a Fujitsu 2333 with an Emulex QD33 controller. The time to copy it to the null device was the same (15 seconds) across a number of tries. I then raised the file size to 50,000 blocks but was unable to determine any meaningful difference between the two combinations. Both disks were mounted normally with RMS XQP caching enabled.

Testing later under absolute unloaded conditions, there was a repeatable three-second improvement with the Andromeda. In a year of I/O, five percent is a significant amount of time (approximately 400 hours).

The Andromeda ESDC cache controller is a fine, fast controller that delivers a well-rounded feature set from setup to production.

AOK Software Products' AOK.abc Spreadsheet

David B. Miller

Transferring applications from one system to another can be a nightmare. You struggle to learn new procedures while retaining old systems for backup. Learning transfer isn't easy if the new

system differs significantly from what you're accustomed to.

AOK Software Products Inc., a division of Advent Online Knowledge (AOK) of Schaumburg, Illinois, has made that transition easier, at least in the spreadsheet area.

AOK.abc is a spreadsheet package for the VAX that is practically identical in look and feel to Lotus 1-2-3. AOK's advertisements claim that if you know Lotus, you already know abc. Believe it, because you won't notice much difference.

Similarities

A Lotus trademark is its tree-like, menu-driven user interface. AOK.abc mimics this system, so it's easy to follow. Use / to access the main menu and the escape key to work back up the menu tree. There are no surprises; any differences that result from accommodating VMS functions are handled well. Worksheets created with abc have that Lotus look about them (see Screen 1).

Worksheet data is entered in the Lotus tradition. Textual data is preceded, by the familiar Lotus' for left justification. Centering and right justification are accomplished with the usual Lotus ^ and " label prefixes. Entry of numeric data, formulas and functions follows Lotus conventions: Formulas start with + or (), and functions begin with @. AOK.abc provides 9,999 rows and 702 columns for data entry and uses a sparse matrix storage technique to eliminate wasted space.

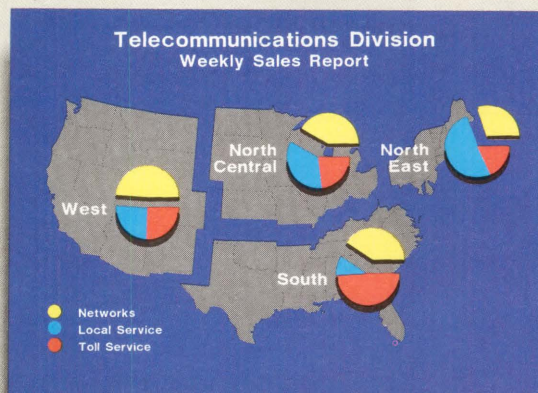
Operations on cell ranges, such as moving, copying and formatting, work in the familiar Lotus fashion of nailing down a corner of the desired range with the period key, highlighting the range by moving the cursor to an opposite corner, and performing the desired operation on the marked cell range.

File operations allow you to save

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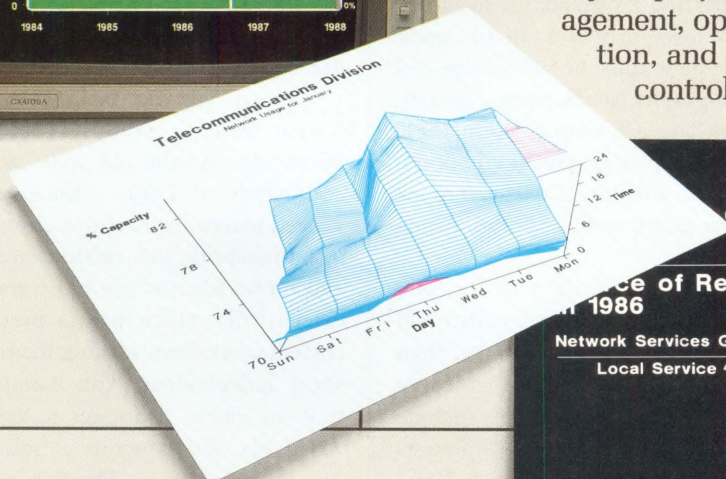
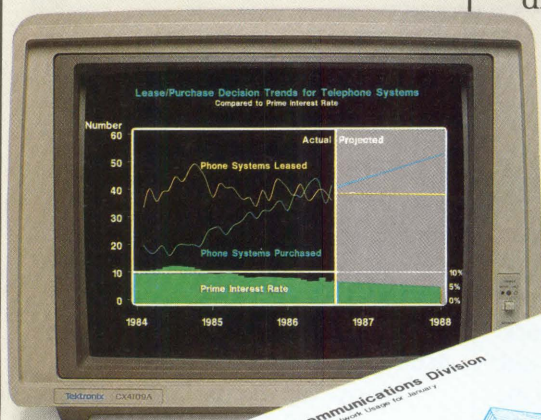
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parts of a worksheet to separate files. Worksheets in other formats, such as 2020, ASCII, DIF, VisiCalc and Lotus, can be imported to and exported from abc using the Translate function. Work-

**“
With its range of data
extraction and query
commands, abc provides
the same database
capabilities as Lotus.
”**

sheets created with Lotus on a PC can be transmitted to a VAX via KERMIT or DECNET DOS. AOK.abc then translates the Lotus file into its own format.

In our Lab, worksheet files transmitted via KERMIT were accepted by abc without complaining. But files transferred with Polygon's Poly-XFR file transfer utility and those created and transferred on our Logicaft 386ware MS-DOS server were not accepted. The transfers went without a hitch, but abc had trouble importing the file.

An additional file-handling feature allows worksheets with the same size and layout to be consolidated into one large worksheet with provisions for adding, subtracting, multiplying, dividing or replacing matching cell addresses. For instance, a company with various departments that have their own worksheets could generate a companywide total worksheet.

Print operations include the usual Lotus options for headers, footers, margin changes and cell format type. Printer setup strings can be stored in an external file or entered in cell A1 of the worksheet. Worksheets can be displayed on your terminal, written to an output file or queued to your line printer. Non-

abc :DEMO** A12:'Doe, John Calc Insert	Menu																	
Worksheet Range Copy Move File Print Graph Data Translate Utilities Quit																		
Global Insert Delete Erase Titles Window Status																		
[v2]/ A / B / C / D / E																		
1																		
2																		
3																		
4																		
5																		
6	FICTITIOUS, INC. PAYROLL																	
7																		
8 NAME	DEPT.		HOURS		RATE		GROSS											
9							PAY											
10																		
11 Doe, John	MIS		42.0		9.00		387.00											
12 Smith, A.	MIS		56.0		12.75		816.00											
13 Smith, B.	SALES		39.0		22.50		877.50											
14 Jones, X.	MARKET		35.0		20.50		717.50											
15 Jones, Y.	MIS		40.0		14.85		594.00											
16																		
17 TOTALS							3392.00											
18																		
19																		
20																		

Screen 1: AOK.abc's worksheet layout and menu system should look familiar to Lotus users.

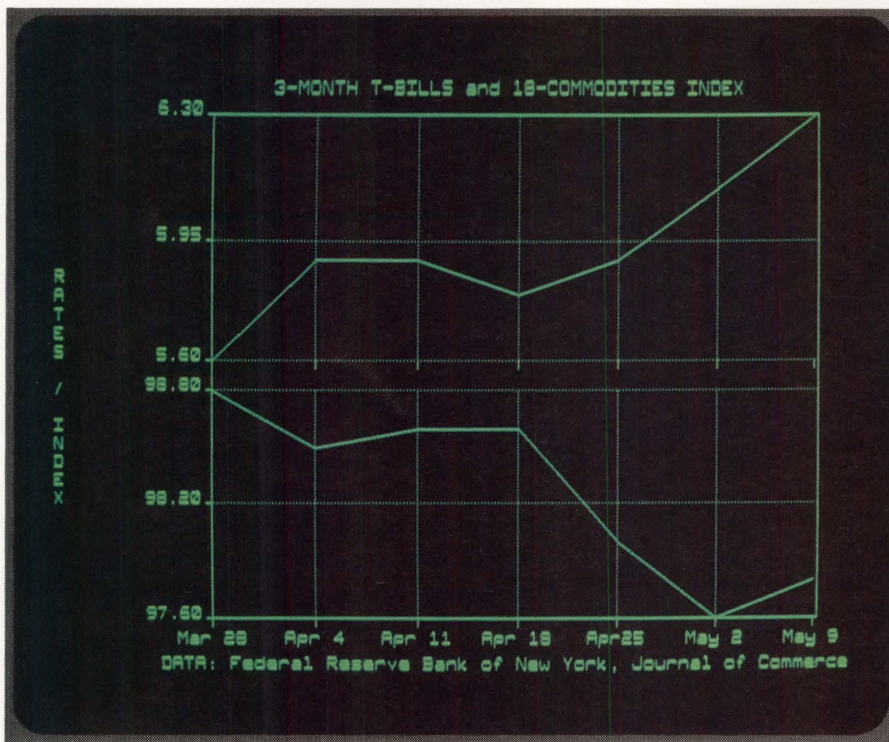
contiguous ranges can be specified to print scattered pieces of a worksheet.

With a few exceptions, graph options mimic Lotus. Bar, pie, line, stacked-bar and XY graphs are included. AOK.abc also provides hi-lo stock market-type graphs, best-fit curve and multiline graphs (see Screens 2 and 3). You must have a Tektronix-compatible terminal to display graphs. If you don't, a Graph Check feature allows you to inspect your graph settings before printing the image.

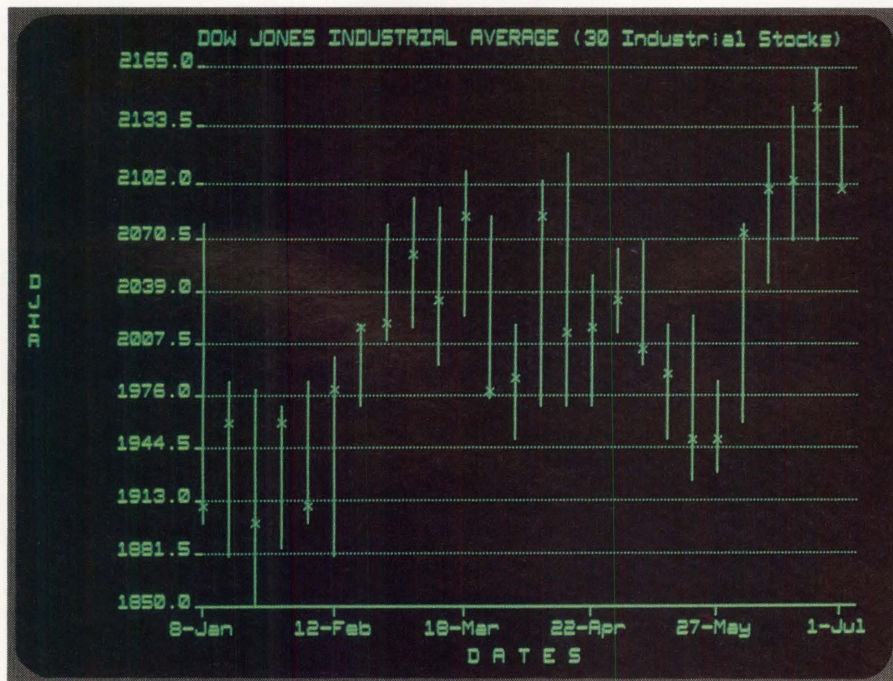
To save a graph file with abc, you must choose the type of printer that will be used to print the picture, rather than use the simple save option provided by Lotus. Supported printer lines include Printronix, Okidata, Epson, HP plotters and LaserJet, QMS and LN03. A PostScript output option would be desirable in a future release.

With its range of data extraction and query commands, abc provides the same database capabilities as Lotus. Each abc database can hold the maximum of 9,999 records of 702 characters each. One primary and 16 secondary keys can be defined for sorting purposes.

Macro support includes the new format macro commands of Lotus release 2.0 and the old style /X macro commands of Lotus release 1A. Advanced macro instructions allow looping, branching, I/O, subroutine calling and more. Macros can be stored in an external file rather than as part of the current worksheet, making them worksheet independent. You can use the built-in macro debugger to create an ASCII file that contains a trail of executed macro steps. This file can help



Screen 2: Another example of AOK.abc's graph capability is this multiline graph.



Screen 3: A stock market hi-lo graph is an AOK.abc feature not provided by Lotus.

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Cambridge, MA 02142
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you work out the kinks in your macro programs.

Differences

As to differences between 1-2-3 and abc, keyboard layout was the major one I found. More than 40 terminals and keyboard configurations are supported. To help, a key map with keycap labels for your terminal is provided. This was one of the few things that reminded me I wasn't using Lotus.

Navigating the worksheet can become tedious while the screen refreshes after moving the cursor. For example, the screen had to be repainted after moving to a column of the worksheet off the screen. I'm accustomed to the almost instantaneous screen shift when using a PC. Increasing the terminal's baud rate helped alleviate this problem. AOK recommends that you keep your column widths narrow to fit more columns on the screen.

A one-page appendix in the documentation lists other differences between abc and 1-2-3. Many are features in abc that aren't found in 1-2-3.

Other Features

A number of SPEC (for SPECial) functions provide capabilities that include single and multiple regression analysis, averages of various sorts, and trend analysis, to name a few. The source code for the special functions is provided in FORTRAN and can be compiled before use. There are many built-in trigonometric and mathematical functions included that should help those involved

AOK.abc

PLATFORMS: VAX systems, supports over 40 terminals and many popular printers

PRICE: \$1,250 to \$7,800. Multiple CPU discounts and cluster licenses are available. Demonstration fee of \$75 is applicable toward purchase. Universal File Interface and ORACLE RDBMS Interface list for \$900 and \$2,500 respectively

AOK SOFTWARE PRODUCTS INC.

HEADQUARTERS:

1305 Wiley Road, Suite 102
Schaumburg, IL 60173
(312) 884-7123

FOUNDED: 1987

PRODUCT LINE: Lotus-like spreadsheet for the VAX. Optional products include the Universal File Interface and ORACLE RDBMS Interface

OWNERSHIP: Private

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in engineering and science.

Using a Utility menu option, you can spawn to DCL from the middle of the worksheet, perform DCL functions and then return to abc. This proved useful, because I could save a graph file, spawn to DCL, print it and return to the worksheet. Another Utility function allows macros to be created by recording keystrokes as they're typed, an alternative to creating macros in the traditional way as a series of labels.

A file of more than 40 parameters is included to let you customize abc. These allow you to decide, for example, whether to add a trailing blank to numeric input, to set the default to automatic recalculation and to append the .PRN suffix to print files.

An auto recovery feature saves your keystrokes in a separate file and can be

used to regain your worksheet should a catastrophe occur before you save the file by normal means.

If you have data stored in a database that you'd like to analyze using abc, an optional product, the Universal File Interface (UFI) is available. The UFI provides commands to import an ASCII flat file created by your database program and parse each line into a format suitable for spreadsheet use.

Documentation

Documentation is written clearly and geared toward Lotus users. Those unfamiliar with spreadsheets will need another text, because abc's documentation only addresses the menus and what they do. If you're familiar with Lotus 1-2-3, you'll need the manual only to look up features specific to abc. With so many Lotus texts available, there's no need for an abc-specific work.

USERS FAMILIAR with Lotus will be running abc immediately. The demo package is priced at \$75, but it's worth the cost if you're seriously considering migrating spreadsheet work from PCs to the VAX (or vice versa). Thus, you can be absolutely sure that abc will meet your needs.

If you're considering a VAX spreadsheet and you'd like to retain the Lotus standard, take a look at AOK.abc. It's Lotus for the minicomputer market.

Clearpoint's MC2RAM/D

Dave Mallery

Mac IIs are becoming ubiquitous. Our first one is dedicated to page makeup in the art department.

The first thing you find out about

a Mac II is that you need more memory. Apple supplies a MultiFinder that allows you to initiate multiple applications and switch between them with a click of the mouse. As soon as you're making art inside a drawing package and moving it to Pagemaker, you need MultiFinder. As soon as you need MultiFinder, you need lots of memory.

Clearpoint Research Corporation of Hopkinton, Massachusetts, makes two varieties of Macintosh memory modules: the MC2RAM/D and the MC2RAM/S2. We reviewed version D, the one made with one-megabit chips.

Version S2 is made with 256K-bit surface mounts and is more economical. However, they both go in as described. We added 4 MB of Clearpoint to the 1 MB supplied with our Mac II.

MC2RAM/D

PRICE: MC2RAM/D — \$510 MC2RAM/S2 — \$450

NOTES: The MC2RAM/D will also run on the Macintosh SE without a CPU Accelerator Board

CLEARPOINT RESEARCH CORP.

HEADQUARTERS:

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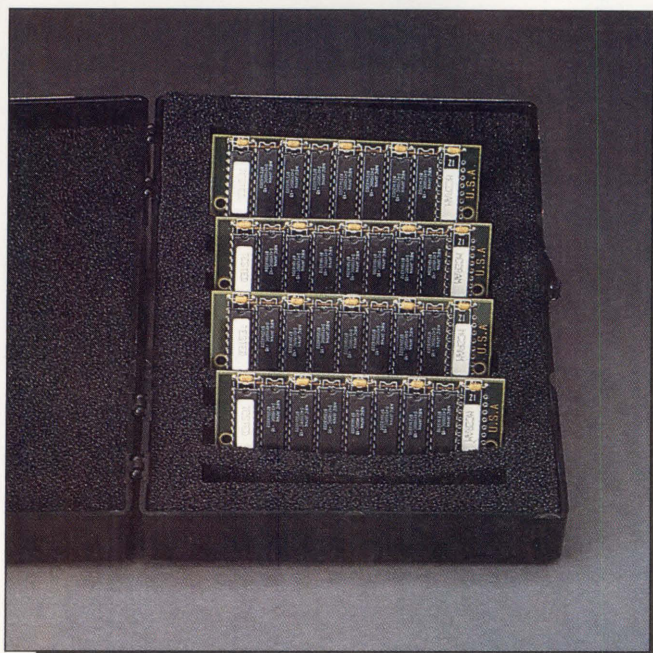
FOUNDED: 1982

PRODUCT LINE: Plug-in and custom-designed add-in computer products

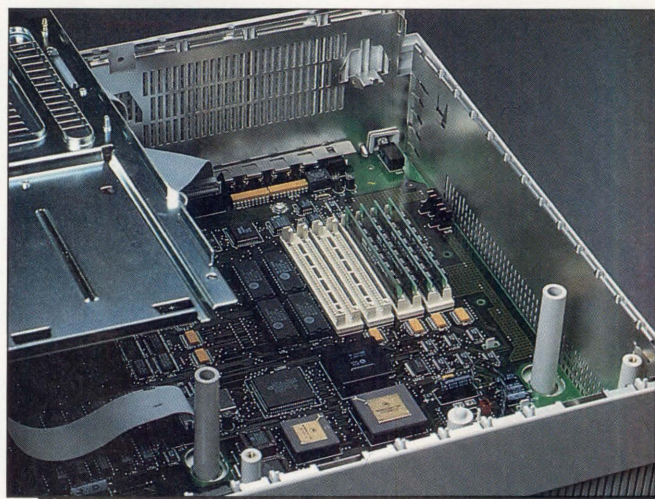
REVENUES: \$17,785,000

NET EARNINGS: \$844,000

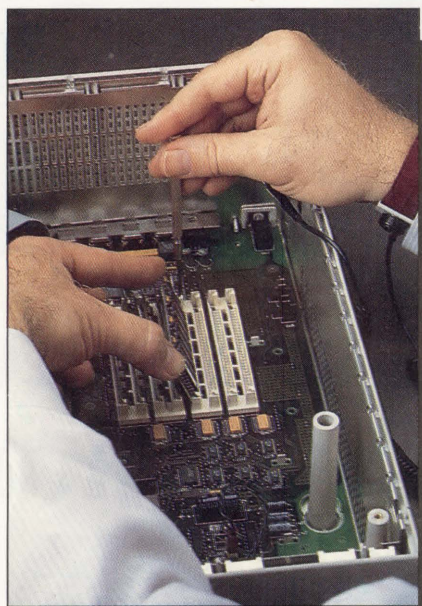
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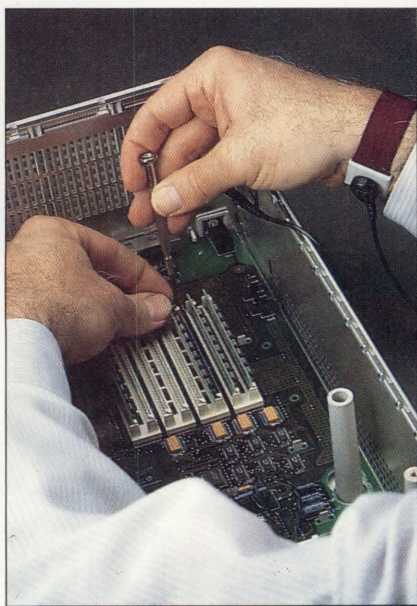
Clearpoint supplies 4 MB in a static-proof box. At the current price of DRAMs, every precaution is required!



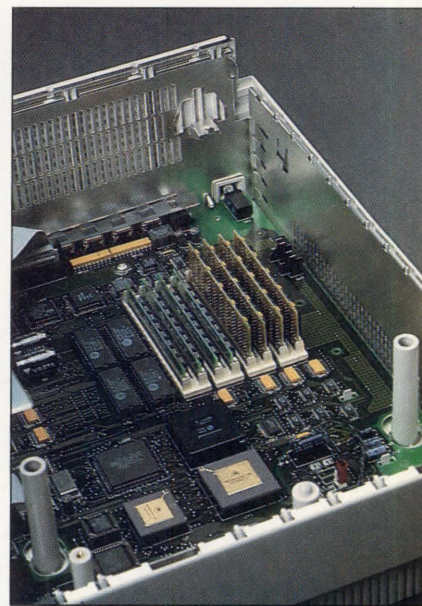
You gain access to the Mac II motherboard by removing a few screws and tipping the disk carrier plate over to the left. Four ¼-MB memory modules are in place from the factory. These must be moved to the four empty slots to the left and the four new 1 MB modules inserted in their place.



I found that a little persuasion from a fine screwdriver helped with the latches.



The new modules are inserted in the four right-hand slots. They go in at an angle and then are rotated to the vertical.



The finished job: 5 MB and ready for MultiFinder!

S O L U



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AlisaShare: More Than File Serving

Why should you use a VAX as a Macintosh file server?

After all, a VAX system is more expensive than a conventional, dedicated Macintosh AppleShare file server, costs more to keep, and is more complicated to use. AppleShare under VAX/VMS doesn't seem to make sense.

A VAX, however, can be more than just a file server. It can run database packages, commercial applications, file backup/recovery software and program development, and serve up Macintosh files at the same time.

That's what AppleShare on the VAX is all about. AppleShare is about sharing files, not just among Macintosh users, but among Macintosh, VAX and even IBM PC users — the same data files, viewed three ways.

Newly announced by Alisa Systems Inc. of Pasadena, California, AlisaShare is AppleShare file server software that runs under the VAX/VMS operating system. It can deliver certain kinds of VAX data files directly to Macintosh or IBM PC users without intermediate conversion.

Importance Of Being AppleShare

Some background in AppleShare file server network protocol is necessary to understand AlisaShare. Part of Apple's OSI-based suite of network protocols, AppleShare lets client workstations access the disk space of server computers through their native file systems. To Macintosh users, AppleShare servers appear through the familiar windows of the Mac's Finder. To IBM PC users, AppleShare servers appear as standard

MS-DOS disks. To speak AppleShare, client and server software is required on the user and server ends of the network connection. Ethernet or LocalTalk (Apple's twisted-pair LAN) networking hardware also is required.

AppleShare products include client software for the Macintosh operating system and PC/MS-DOS, and server software that runs on a dedicated Macintosh. To encourage AppleShare-compatible third-party products, Apple documents its AppleShare protocol and offers it under a license to software developers.

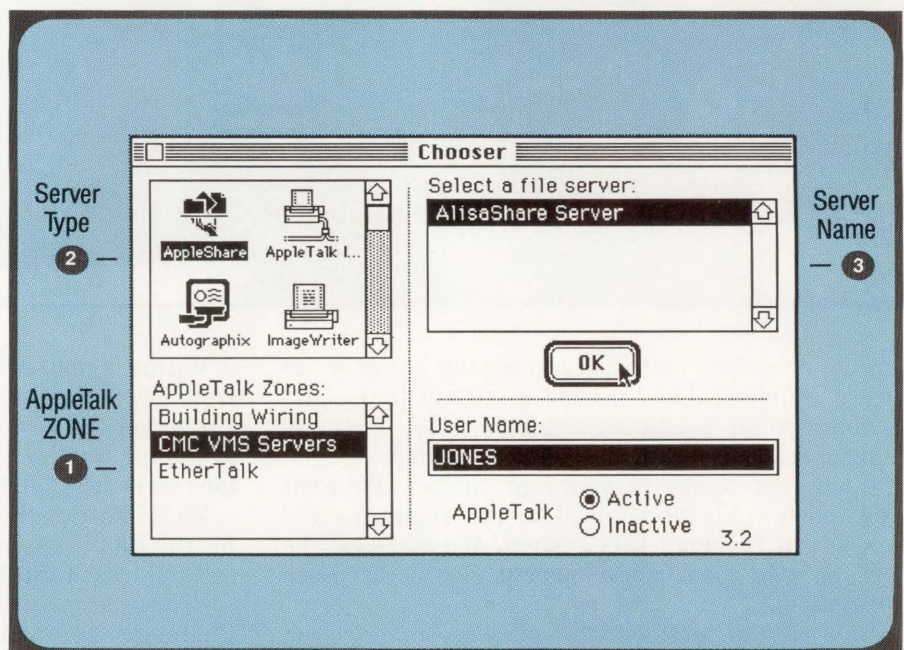
Numerous competing protocols, such as NFS, offer file services similar to those of AppleShare. But AppleShare makes sense as the Apple-endorsed file server approach. AppleShare servers

work with standard Apple client software, and in a large, distributed LAN, Apple-standard client software can mean higher reliability and lower network maintenance costs.

Further, standard AppleShare offers several application-specific features, such as data record locking. Vendors are likely to exploit these in developing advanced, multiuser Macintosh applications.

What's AlisaShare?

AlisaShare is AppleShare-compatible server software that, under the VAX/VMS operating system, equates standard VAX/VMS devices, directories and files to Macintosh server volumes, folders and files. Alisa ships AlisaShare with a Macintosh workstation software distribution diskette from Apple, which



Screen 1: An AlisaShare user selects an AlisaShare file server on the network by (1) selecting the VAX, which appears as an AppleTalk zone in the network; (2) selecting AppleShare file services on the target VAX; and (3) selecting the specific AppleShare server.

WHEN APPLE AND DIGITAL WANTED TO TALK, THEY CAME TO US.

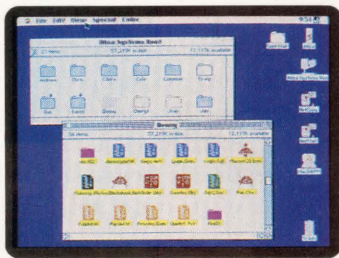
For good reason.

Because we make it simple for Apple Macintosh and Digital VAX systems to join the same network.

And open the lines of communications.

For instance, we utilize AppleTalk for VMS, the sole published standard platform for networking on the VAX. We're also the one company that offers complete solutions.

Such as AlisaTalk™, which puts AppleTalk on the VAX. And includes AlisaShare™, the *only* 100% AppleShare, VAX/VMS based, full-function file server.

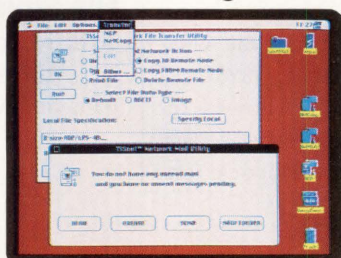


TSSnet™, a package for the Mac that lets it communicate over DECnet networks as a Phase IV end node.

And SequeLink™, which allows Macs access to Digital system host SQL databases.

We can also hook you up with Kinetics FastPath, EtherPort II, EtherPort SE, EtherSC, and everything in between.

So when you want the right Mac-VAX connections, call or write to Alisa Systems.



The talk of the computer industry.

Alisa Systems Inc.
We keep everybody talking.



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221 East Walnut Street, Suite 175 Pasadena, CA 91101 (818) 792-9474



Connect to the file server "AlisaShare Server" as:

☐ Guest
☒ **Registered User**

Name:

Password: (Clear text)

AlisaShare Server

Select the server volumes you want to use:

Alisa DUBO vol	<input type="checkbox"/>	↑
Alisa DUAO vol	<input type="checkbox"/>	↓

Checked volumes (☒) will be opened at system startup time.

v 1.0

Screen 2: AlisaShare server login procedure. Note that username and password correspond to account entry in SYSUAF.DAT.

can be installed on any number of client Macs.

Apple sells MS-DOS workstation software separately, along with a special LocalTalk interface card for IBM PC XT/ATs and most clones. An IBM Microchannel-compatible version is under development.

In operation, AlisaShare servers use AppleShare's name-binding protocol to register themselves on the network. In turn, Macintosh users select from several

available servers using the CHOOSER desk accessory (see Screen 1). VAX systems running AlisaShare appear as AppleTalk zones and may offer print spooler and other network services, as well as AppleShare.

Before AlisaShare grants access to its server volumes, it validates the user's supplied username and password combination (see Screen 2) using the VMS user authorization database (SYSUAF.DAT). Valid users will be allowed to select any or all of perhaps several server volumes, which then will appear on

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their Macintosh desktop as disk icons (see Screen 3).

Macintosh users with the appropriate access privileges can treat AlisaShare server volumes almost exactly as they would a locally connected hard disk. Certain functions, however, such as changing the name of the volume, aren't permitted. AlisaShare server volumes are mapped to the appropriate VMS disk directories by an editable ASVOLUME.DAT parameter file (see Figure 1).

Any non-copy-protected Macintosh file can be exchanged between Macintosh systems through an AlisaShare server. Where a common "presentation" format like ASCII text is used, files can be exchanged directly between VAX and Mac users (see Screen 4).

AlisaShare's ability to deliver text files directly from a VAX to a Macintosh user offers many possibilities for decision support and electronic publishing applications. Reports produced from a VAX database overnight, for example, can be included directly into Mac spreadsheets the next day, without having to log onto the host VAX.

File Structure

To deliver transparent AppleShare services, AlisaShare addresses several fundamental Macintosh and VAX/VMS file



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PacerLink connects your Macintoshes and IBM PCs to your VAX over serial line, remote modem, AppleTalk or Ethernet configurations. It integrates full functionality into one product: terminal emulation, file transfer, virtual disks, and print services. And you get even more when you extend PacerLink with the add-on file server and graphic terminal emulator.

PacerShare VAX/VMS file server provides Macintosh and IBM PC file sharing via Ethernet or AppleTalk bridged to Ethernet. It transparently integrates the micro and VMS file systems.

PacerGraph gives your micros VT240 and VT241 graphic terminal emulation, including ReGIS and Tektronix 4010/4014 support.

PacerPrint provides VAX PostScript print spooling.

Kinetics hardware combined with Pacer's software gives you high speed Macintosh to host interconnect over Ethernet.

Our connectivity solutions are in place at over 1500 sites. And we want yours to be the next. Give us a call and let us show you how we can integrate your minis and micros into one well-connected package.

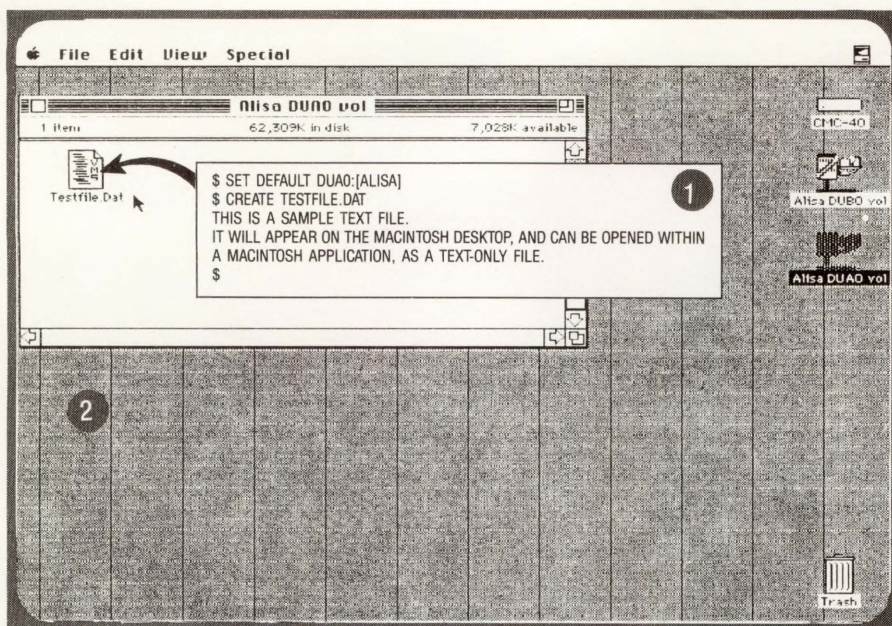


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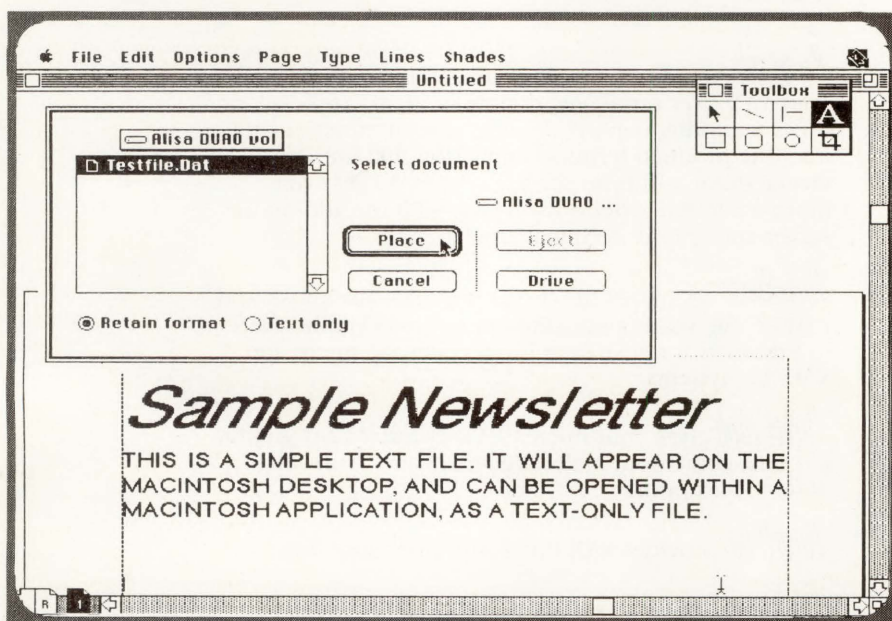
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Screen 3: VAX/VMS text file \$CREATED in AlisaShare directory (1) appears in the Macintosh Finder window as a text-formatted document (2).



Screen 4: VAX/VMS text file (see Screen 3) PLACED directly into an Aldus PageMaker document.

structure differences.

Under the Mac's operating system, two kinds of information comprise a file. A file's resource fork contains the file's attributes, such as the icon under which it appears in the Finder. Its data

fork contains the actual application data.

To represent these two faces of a Macintosh file under VAX/VMS, AlisaShare employs an "Apple Double" file storage scheme, storing each Macintosh file as two different RMS files. A Mac file's data fork is found in the direc-

Under the Mac's operating system, two kinds of information comprise a file.

tory that corresponds to its volume or folder, and its resource fork is stored in a special VMS subdirectory ([.ASRESOURCES]) under this directory. The ASRESOURCES subdirectory is created and maintained automatically by AlisaShare and never appears in the Finder window of a client Macintosh.

Files created by VAX software in AlisaShare directories are analyzed by AlisaShare, and files that contain text automatically are given appropriate Macintosh file attributes. Macintosh users then can use Mac editors and word processors to read and modify these files. Binary data interchange, however, will require a conversion utility. Macintosh and VAX users who need to exchange word processing documents between Microsoft Word and MASS-11, for example, may need to use a document conversion product like KEYPAK from Keyword Office Technologies Ltd.

File Security

With AlisaShare, a single VMS process acts as the AppleShare file server for all of the host VAX's networked clients (see Figure 1).

This process, running with the SYSPRV privilege, uses standard VMS User Identification Codes and system/owner/group/world protection masks to simulate AppleShare's user-group folder protection scheme. AlisaShare even supports AppleShare features for which there are no corresponding VMS security constructs, such as drop box folders

**File Edit View Special****Confused?**

New Folder
Open ⌘O
Print
Close

Get Info ⌘I

Duplicate
Put Away

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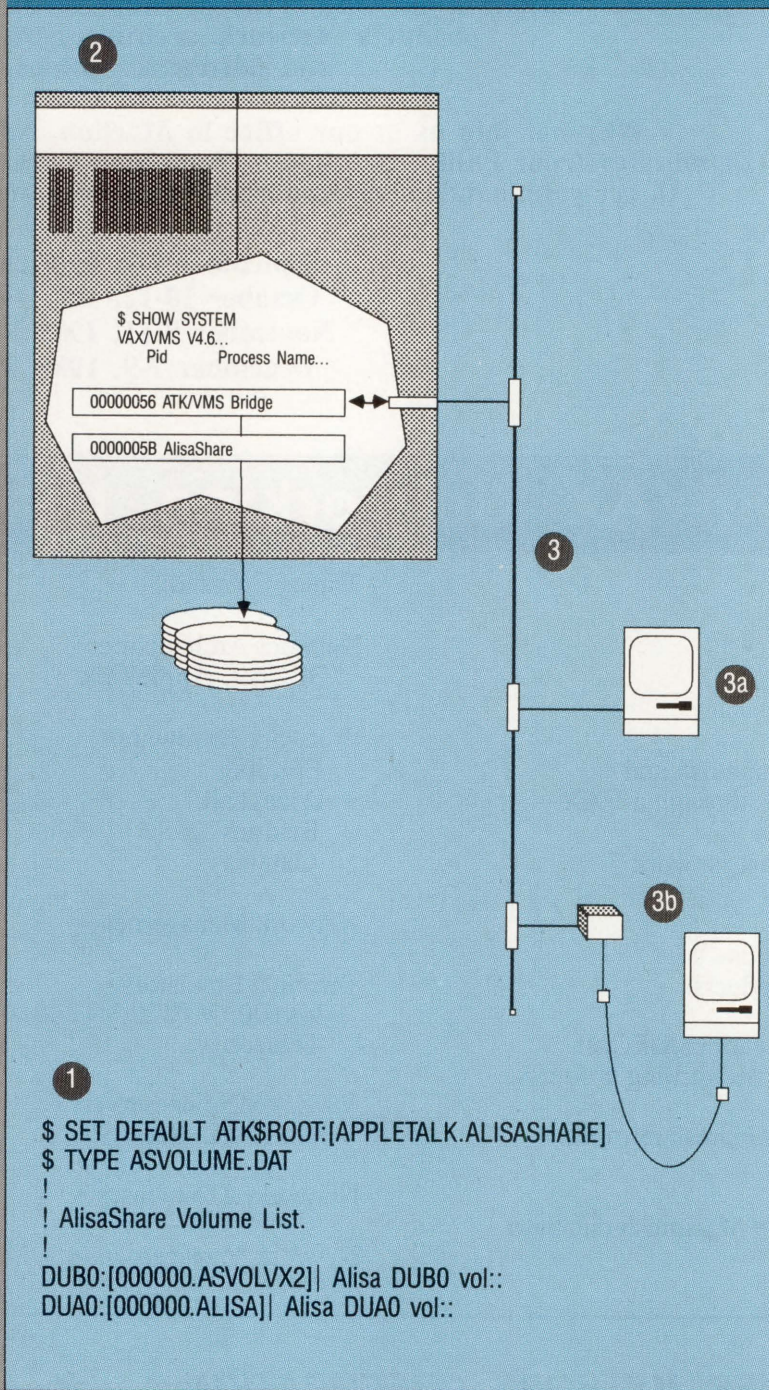
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FIGURE 1.



Controlled by parameter files such as (1) above, the AlisaShare file server process communicates via AppleTalk for VMS (2) with Macintosh users (3) either directly connected to the Ethernet (3a) or indirectly connected via a Kinetics FastPath (3b).

AlisaShare

SPECIAL REQUIREMENTS: AppleTalk for VMS package; AppleShare 1.1 or 1.2 workstation software for Mac; Ethernet for VAX; connections via direct Ethernet or LocalTalk

PRICE: AlisaTalk, \$4,700 to \$14,400 depending on VAX CPU

ALISA SYSTEMS INC.

HEADQUARTERS:

221 E. Walnut St., Ste. 175
Pasadena, CA 91101
(818) 792-9474

FOUNDED: 1982

PRODUCT LINE: AlisaTalk, which includes AlisaShare AFP File Server, AlisaPrint Systems and AlisaTerminal Virtual Terminal; Alisa ADP; Alisa TSSNET; and SequeLink

OWNERSHIP: Private

BRANCHES: London, England

CIRCLE 400 ON READER CARD

that will accept documents from users but reject their requests to look inside.

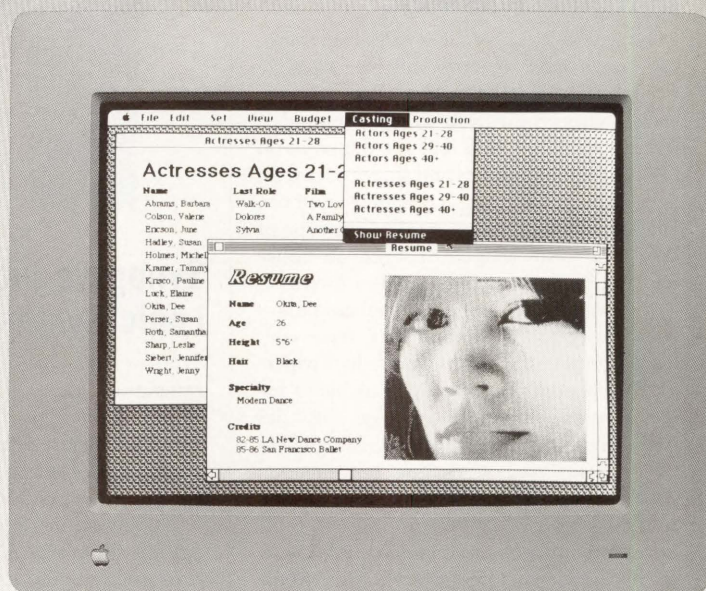
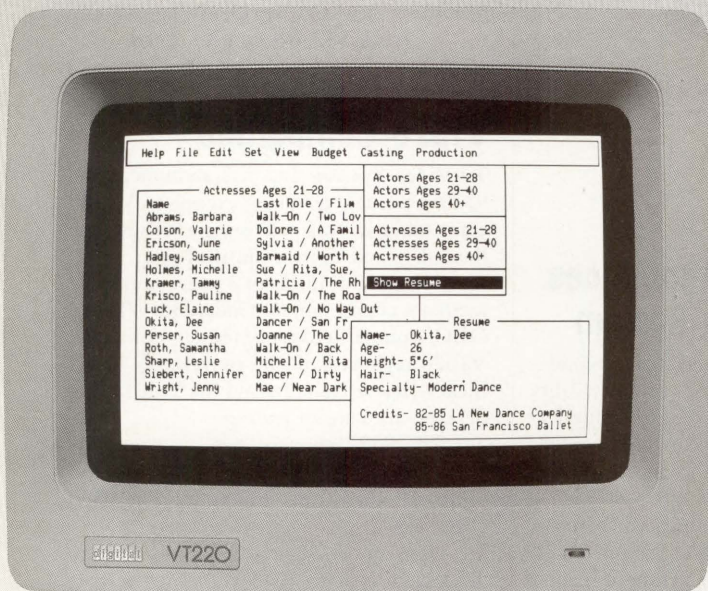
By the same token, however, AlisaShare necessarily ignores certain advanced VMS file security features like Access Control Lists, which can limit the product's applicability in certain security-sensitive computer environments. AlisaShare's single-process file server approach also precludes the use of VMS's process accounting facilities to bill personal computer clients for server access.

ALISASHARE, WHICH EFFECTIVELY replaces Alisa's older AlisaTalk file server product, significantly outperforms its predecessor. Informal tests suggest that file transfers run almost twice as fast under AlisaShare. Other common server operations, such as file enumeration (the time it takes to open a folder in the Finder), run several times faster.

AlisaShare doesn't just serve VAX files to Macs. It cleverly and effectively integrates the necessarily different VAX/VMS and Macintosh file systems. ■

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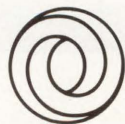
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CIRCLE 144 ON READER CARD

Sales And Marketing Software Available

Marktrieve PLUS is a new sales lead tracking and market analysis software package from IDSC Rental Company Inc. that increases sales productivity in the corporate or multiuser environment. The software runs on DEC or HP computers and shares data with a company's existing computer systems. Marktrieve PLUS can adapt to any type of office. It also adapts to both in-house telephone sales and outside sales forces.

Advanced sales- and lead-tracking functions generate daily action lists, trace sales leads, contacts and orders, and reduce paperwork. This data is centrally available to increase management control over the sales force. The system performs advertising effectiveness analysis, works to generate and verify forecasts and analyzes salesperson results.

For more information, contact Ed Lucia, IDSC Rental Co., 350 Harvey Rd., Manchester, NH 03103; (603) 645-6677.

Circle 505 on reader card

VACCELERATOR Is For Q-bus, UNIBUS VAXs

Avalon Computer Systems Inc. has a new high-speed shared memory interface for its VACCELERATOR attached processor for Q-bus and UNIBUS VAX computer systems. The new capability makes the parallel execution of portions of complex applications possible by allowing the VAX to share memory with multiple VACCELERATORS for high-speed communication and coordination.

To move current applications to the VACCELERATOR, users must recompile existing FORTRAN, C or PASCAL programs with Avalon-provided compilers. They then will execute transparently on the VACCELERATOR.

The Q-bus VACCELERATOR equipped with 4 MB of on-board memory, a 64-KB cache memory and Weitek 1167 Floating Point Accelerator costs \$11,900. The UNIBUS model comes with 4 MB of memory standard and 8 or 12 MB as an option. For more information, contact David Chandler, Avalon Computer Systems Inc., 425 E. Colorado St., Ste. 710, Glendale, CA 91205; (818) 247-2216.

Circle 501 on reader card

Synopsys Inc. Announces Logic Synthesis System

Synopsys Inc. has announced its second-generation logic synthesis product, the Design Compiler. The Design Compiler translates hierarchically defined, sequential designs into logic gates and automatically optimizes the resulting circuits.

Logic synthesis is an advanced technology that improves ASIC and custom VLSI circuit design productivity. Synthesis incorporates two fundamental processes: design translation and optimization. The translation process creates a gate-level implementation from a language-specified description of a design. The optimization process improves the circuit to meet user-specified constraints, such as area and speed.

Design Compiler pricing begins at \$35,000 for a single user license.

For more information, contact Bob Dahlberg, Synopsys Inc., 1500 Salado Dr., Mountain View, CA 94043; (415) 962-5000.

Circle 513 on reader card

9320 Terminal Is VT320 Compatible

TeleVideo Systems Inc. has announced the 9320 terminal, featuring complete VT320 compatibility, while offering greater software flexibility and more command sets.

The 9320 features two pages of display memory, connection to standard RS-423 and DECconnect environments, enhanced VT320 keyboard, tilt and swivel base, 70-Hz flicker-free refresh rate and the Video Desk desktop accessories package.

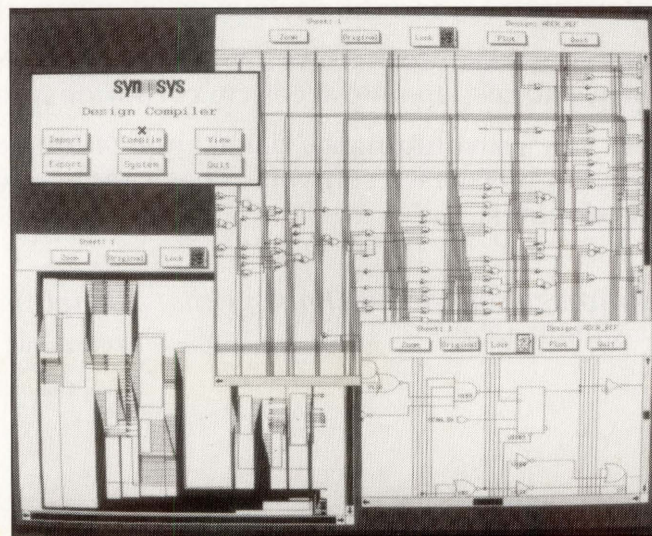
The 9320 contains 64K of program-mable ROM space, enabling OEMs and VARs to add further functions. The 9320 costs \$499.

To learn more, contact Mardi Garren, TeleVideo Systems Inc., 1170 Morse Ave., P.O. Box 3568, Sunnyvale, CA 94088-3568; (408) 745-7760.

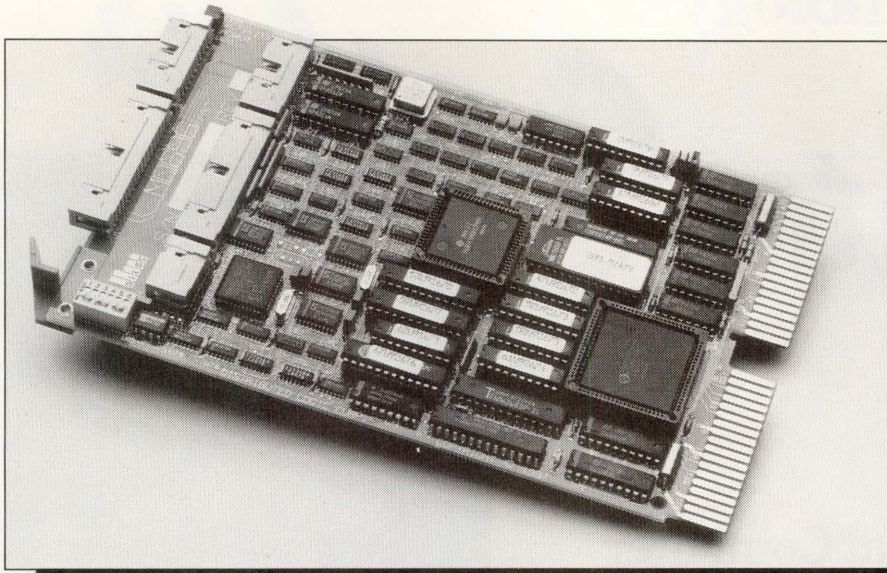
Circle 502 on reader card

ManuPlan Gains Broader Acceptance

Network Dynamics Inc. has announced SimStarter, a simulation code generator that



Synopsys Inc.'s logic synthesis tool, the Design Compiler.



DILOG's new MQ696 multipurpose disk controller.

makes model files created with ManuPlan available to Siman, the standard simulation language of the manufacturing marketplace.

ManuPlan is a rapid modeling approach to optimizing the manufacturing process. It runs on the IBM PC or VAX, along with any FORTRAN 77 optimized system.

ManuPlan can model alternative factory designs or manufacturing scenarios without the lengthy time requirements associated with pure simulation exercises. SimStarter extends this capability into the simulation modeling process itself by making previously developed models available to SiMan.

SimStarter runs on all implementations of ManuPlan and costs \$6,500. ManuPlan costs \$7,000 on the VAX.

To learn more, contact Network Dynamics Inc., 1218 Massachusetts Ave., Cambridge, MA 02138; (617) 547-2036.

Circle 506 on reader card

Intel Enhances FASTPATH Capabilities

Intel Corporation has enhanced capabilities for its FASTPATH product line that enable the FASTPATH control unit to link an IBM System/370 concurrently to diverse environments.

Now each FASTPATH control unit can connect an IBM System/370 simultaneously to a TCP/IP network, as well as to either a VAX, a MAP/OSI network, a custom Ethernet network or to ASCII devices.

A FASTPATH control unit with Flex-LINK connectivity software now can manage simultaneous connections from an IBM System/370 processor to up to four VAXs or to a VAX and a TCP/IP network.

The connection to the VAX is through the high-speed DR11W/DRB32W interface.

To learn more, contact Phyllis Stern at Intel Corporation, 3065 Bowers Ave., P.O. Box 58065, Santa Clara, CA 95052-8065; (602) 869-3778.

Circle 507 on reader card

DILOG Introduces The MQ696

DILOG now has a disk controller that enhances the configuration flexibility of MicroVAX and MicroPDP-11 computers by permitting the interfacing of ESDI Winchester disks and SA450 floppy disk drives on the same controller.

The MQ696 multipurpose disk controller interfaces up to two Enhanced Small Disk Interface Winchester disk drives, with data transfer rates as high as 2.5 MB per second (20 MHz), and up to two SA450-compatible floppy disk drives to Q-bus computers made by DEC. The controller supports 5.25-inch Winchester drives and either 5.25- or 3.5-inch format floppy drives and is compatible with RX50/RX33 drives and media.

The new controller is priced at about \$1,550.

For further information, contact Judie Dutton, DILOG, 1555 S. Sinclair St., Anaheim, CA 92806; (714) 937-5700.

Circle 508 on reader card

MAP-4000 Delivers 40 MFLOPS

CSPI has introduced the MAP-4000, a MicroVAX-based, low-cost application accel-

erator providing 40 MFLOPS of single-precision (32-bit), and 20 MFLOPS of double-precision (64-bit) floating point performance.

The MAP-4000 is a board-level product that plugs directly into the MicroVAX and is available at \$18,995 with 2 MB of memory or \$22,500 with 8 MB of memory (and is expandable to 256 MB).

For more information, contact Phil Blake, CSPI, 40 Linnell Circle, Billerica, MA 01821; (617) 272-6020.

Circle 503 on reader card

EDC Memory For MicroVAX II

Chrislin Industries Caribe has introduced the CI-MIV8-EDC module for the MicroVAX II computer system. The memory is available with 8 MB, error detection and correction on a single card. It corrects single-bit and detects double-bit errors. It also includes CSR register where memory errors are logged, so you easily can do on-site repair to the board.

The memory is completely hardware- and software-compatible with MicroVAX II systems.

For more information and current product pricing, contact Christine L. Seese, Chrislin Industries Caribe Inc., P.O. Box 1657, Canovanas, PR 00629-1657; (809) 876-5202 or 876-6160.

Circle 504 on reader card

OmniSys Simulates Microwave Systems

EEsof Inc. has announced OmniSys, a powerful new computer-aided engineering program that simulates microwave systems. OmniSys uses component vendor catalog data, internal component models and external file component data to simulate linear and non-linear microwave systems in the frequency domain and linear control loops in the frequency and time domains.

OmniSys is available on the VAX series. Pricing starts at \$12,000.

For further information, contact Donn Mutch, EEsof Inc., 5795 Lindero Canyon Rd., Westlake Village, CA 91362; (818) 991-7530.

Circle 511 on reader card

RA 8-1100 Connects To DSA Controllers

System Technology Associates introduced the model RA 8-1100 magnetic disk storage drive, which plugs directly into any DEC Digital Storage Architecture (DSA) interface controllers.

The RA 8-1100 drive has a capacity of

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Newton, MA	Feb. 15, 1989

European Locations

London, England	May 11, 1989
Frankfurt, W. Germany	May 17, 1989
Paris, France	May 23, 1989



1.1 GB formatted and features a 16.5 millisecond average seek time. The drive is designed for tabletop or rack mount, weighs 27 pounds, and is one-fourth the size of the DEC RA 82. The RA 8-1100 plugs into the DSA via DEC's Standard Disk Interface cable and operates with all standard software. There are no special interface boxes to cable to or maintain. Current controller attachments include the UDA50, KDA50, KDB50, HSC50 and HSC70.

The RA 8-1100 is offered in a variety of GIGA-RIG cabinet packages. A single drive is priced at \$19,900.

For further information, contact Stewart R. Stafford, System Technology Associates, 15111 Mintz Lane, Houston, TX 77014; (713) 440-8340 (within TX) and (800) 553-5124 (outside TX).

Circle 510 on reader card

XYPLEX Terminal Server Card For MAXserver 5000

XYPLEX Inc. enlarged its communications server lineup with an eight-port Terminal Server Card that supports RS-423C connections. The RS-423 Terminal Server plugs into XYPLEX's MAXserver 5000, which offers

VAX/VMS and TCP/IP telnet connectivity. The card increases MAXserver terminal connection distances to 1,000 feet over shielded twisted-pair cable. The longer distance capability lets users deploy RS-423 terminals, such as the VT300 series, throughout a building from a MAXserver located in a central wiring closet.

The new card is compatible with most RS-232 devices, which operate within RS-232 distance specifications. It also features built-in memory and a 1 mips processor for high throughput. Highly visible front-panel LEDs show active connections and indicate when data is being transmitted.

The RS-423 Terminal Server Card is priced at \$1,395.

To learn more, contact Jay Woodruff, XYPLEX Inc., 100 Domino Dr., Concord, MA 01742; (617) 371-1400.

Circle 512 on reader card

CRYPTOFLEX Speeds Encryption For VAX

BySoft has introduced its CRYPTOFLX data encryption software for VAX computers. CRYPTOFLX uses a rapid all-software method to encrypt any RMS file ac-

cording to the DES standard. On VAX 780 or MicroVAX II, CRYPTOFLX will encrypt or decrypt a 100 KB file in 15 seconds. On faster CPUs, CRYPTOFLX shows a corresponding increase in performance. CRYPTOFLX will operate in electronic code book or cypher chaining mode and has built-in key management and key generation features. CRYPTOFLX is available on 9-track tape, diskette or TK50, and is priced at \$600.

To obtain more information, contact BySoft, Box 4171, Postal Station E, Ottawa, ON K1S 5B2.

Circle 515 on reader card

Emulex Modem Features Dial Backup

Emulex Corporation has a new 14.4 Kbps leased-line modem that automatically establishes a temporary dial-line connection when the primary leased-line connection fails.

The Performance 1000 Dial Backup modem provides an affordable solution for applications that can tolerate only short interruptions in point-to-point data communications. Following a leased-line failure, the

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CIRCLE 248 ON READER CARD

Performance 1000 Dial Backup Modem immediately dials two numbers to establish a full-duplex, two-line 14.4 Kbps link over the switched telephone network.

The new modem uses trellis-coded modulation under the CCITT V.33 standard for full-duplex, 14.4 Kbps operation. The trellis-coding scheme reduces error rates, allowing reliable operation over both conditioned and unconditioned lines.

The Performance 1000 Dial Backup modem is priced at \$1,995.

For more information, contact Emulex Corp., 3545 Harbor Blvd., P.O. Box 6725, Costa Mesa, CA 92626; (714) 662-5600; outside CA (800) EMULEX 3.

Circle 514 on reader card

GX-2000 Performs Variety Of Functions

Modgraph Inc.'s GX-2000 high-resolution monochrome graphics terminal now can perform a variety of functions simultaneously via a new multitasking capability. The four available graphics pages of the GX-2000 can be written to/from the host, printed, transmitted or examined in parallel.

With single-keystroke operations, the

user can move among various pages and functions. Slower operations like printing can be done in background mode or queued, making true throughput very fast.

The GX-2000 has a resolution of 1024 x 780, a 15-inch flat amber or green screen, emulates both the Tektronix 4010/4012 graphics terminal and the VT220. It's priced at \$1,295.

More information is available from Modgraph Inc., 149 Middlesex Turnpike, Burlington, MA 01803; (800) 327-9962; in MA (617) 229-4800.

Circle 518 on reader card

Burr-Brown Introduces TM8500/8550 Series

Burr-Brown's new TM8500/8550 series of compact, multifunction microterminals for data entry and display applications accepts data both manually and through automatic identification interfaces.

The base unit, containing display and keyboard, features a backlit 80-character LCD and a high-reliability, elastomeric keyboard. The TM8500 provides a standard 51-key alphanumeric arrangement while the TM8550's 23-key numeric arrangement pro-

vides wider key spacing and function label areas.

Keyboard function may be redefined logically (non-volatile) by the programmer, and keycaps may be easily rearranged. Two banks of function key memories provide a total of 32-40 character function strings that may be stored in a terminal's non-volatile RAM. A built-in host communications port provides a jumper-selectable RS-232 or RS-422 interface. Auxiliary modules are available to add RS-232, digital I/O, printer and direct machine monitor interfaces. The RS-232 auxiliary port may be used to connect serial printers, CRTs, voice I/O equipment, etc., to the data collection system.

The TM8500/8550 series base units are priced at \$1,095 in unit quantities.

Learn more by contacting Ed George, Applications Engineering, Burr-Brown Corp., P.O. Box 11400, Tucson, AZ 85734; (602) 746-1111.

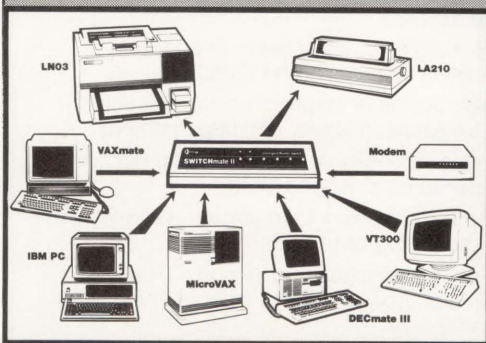
Circle 517 on reader card

Raytheon's Model 860 Based On Commercial VAX

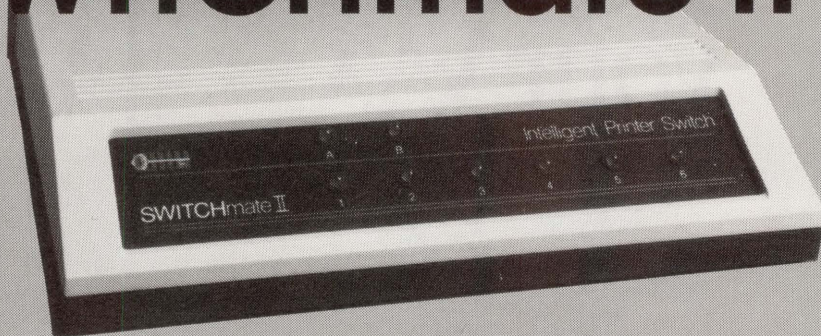
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puter based on commercial VAX computer technology. The Model 860 is being produced by Raytheon under license from DEC.

Fully compatible with the most advanced commercial VAX architecture, including the VAXBI bus, the Model 860 allows users to develop and test software on commercial VAX computers and field it on a Mil-Spec VAX computer. It can be used with existing operating systems, applications packages, development tools and compilers, including DEC's Ada compiler.

The superminicomputer is available with one, two or three CPUs that provide 32-bit-wide performance. The Model 860 also offers as much as 4800 KWHETS throughput and up to 48 MB of memory. For additional information, contact Marketing Dept., Raytheon Company, Mil-Spec Computer Operation, 528 Boston Post Rd., Sudbury, MA 01776; (617) 443-9523.

Circle 516 on reader card

RS-232 Connects To RS-530/EIA-530

Telebyte Technology Inc. has introduced models 62-1 and 62-2 RS-232-to-RS-530/EIA-530 converters. These devices allow

equipment containing RS-232 interfaces to be connected to new systems employing EIA-530.

The 62-1 RS-232 port interfaces to a DTE device where the 62-2 RS-232 port interfaces to a DCE device. Each model provides conversion for the entire EIA-530 interface, which includes 10 Category I circuits and three Category II circuits. The electrical interface of the EIA-530 port fully complies with RS-422, as well as MIL-STD-188-114 Type 2. The Model 62-1/2 passes data at a rate up to 1 MHz. The mechanical interface of the 62-1 features a male, DB-25 connector on the 530 port and a female, DB-25 connector on the 232 port. For the 62-2, the sexes of the connectors are reversed.

For further information, contact Telebyte Technology Inc., 270 E. Pulaski Rd., Greenlawn, NY 11740; (800) TELEBYTE; in NY (516) 423-3232.

Circle 519 on reader card

RS232D Adapter Designed For MMJ Connectors

Cable Management Systems Inc. has an RS232D Modular Adapter designed for the DEC MMJ crimp-style connector. Similar

in performance to the modular adapter p/n H8571C, the product features 0.63 inch-wide, single-piece construction of ABS high-impact plastic. It's available in kit form, or pinned per RS232D specifications.

The Modular Adapter designated male or female DB25-MMJ-6W is priced at \$12.95.

For further information, contact Aldo Falossi, Cable Management Systems Inc., 17955 Skypark Circle, Ste. F, Irvine, CA 92714; (714) 261-2622.

Circle 524 on reader card

QED 11/90 Triples Performance

Quickware Engineering and Design Inc. has announced the QED 11/90. The 11/90 improves the PDP-11/04/34's performance by up to 300 percent without sacrificing peripherals or software, yet requires no backplane changes. It can be installed quickly to provide PDP-11/70-class performance without hardware or software changes.

The QED 11/90 replaces the PDP-11/04/34 processor board set, as well as the older PDP-11 UNIBUS CPUs. It's menu-driven for easy setup, and has a standard 16K

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Load: Software disk driver with formatter/partitioner on diskette media.

Modify: Config.sys file and reboot.

Voila! You now have a micro computer system that looks like a minicomputer and possesses the power, reliability and properties of a mainframe.

For further information, contact:

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CIRCLE 187 ON READER CARD

cache memory that yields a 95 percent hit rate. The QED 11/90 executes the full PDP-11/84 instruction set including floating point operations. This provides complete software compatibility with RSTS, RSX, RT11, TSX-Plus, ULTRIX, XENIX and MUMPS.

It's a two-board set that comes in two configurations: 2 MB of error-correcting memory for \$6,900 or 4 MB of error-correcting memory for \$8,500.

To learn more, contact Quickware Engineering and Design Inc., 225 Riverview Ave., Waltham, MA 02254; (800) 237-1185; in MA (617) 647-3800.

Circle 520 on reader card

ATA Services Updates TRANSPRO

ATA Services, the computer services subsidiary of the American Trucking Associations, has updated its TRANSPRO series. The new version offers many new features, including TRANSPRO modules.

The TRANSPRO family includes freight billing, freight accounting, freight settlements, revenue analyses, freight manifesting, interline payables, vehicle maintenance,

fuel and miles tax reporting and electronic data interchange. TRANSPRO is available for the VAX using VMS, AT&T 3B2 series, IBM PC, XT, AT, using DOS operating system and NOVELL Netware for PC networks.

Learn more by contacting Peter Gourlay, ATA Services, 2200 Mill Rd., Alexandria, VA 22314; (800) 322-ATAS; in VA, (703) 838-1999.

Circle 525 on reader card

The Tesselator Is User And Computer Friendly

The Tesselator Color Graphics generator, from ABB Industrial Systems Inc., is user and computer friendly. This allows users to design their own unique symbols, displays interactively and it interfaces easily with the host computer.

The Tesselator is flexible. It supports multiple operator stations, multiple CRTs, multiple keyboards, color and alphanumeric printers and redundant host computer connections.

The graphic functions support trending, bar charts, 16 foreground colors, 64 background colors, windowing, scrolling, 896 unique symbols, Local Display Storage

and a whole lot more more.

ABB also offers a complete software package to allow immediate connection to VAX or PDP computers. This Display Management System software incorporates many functions for organizing and controlling the updates to Tesselator graphics.

For more information, contact Tom K. Engstrom, ABB Industrial Systems Inc., 16250 W. Glendale Dr., New Berlin, WI 53151; (414) 785-3242.

Circle 526 on reader card

Analog Design Tools Ports Analog Workbench

Analog Design Tools' Analog Workbench CAE software is compatible with VAXstation. The Analog Workbench software uses the windowing capability offered under DEC's implementation of the X Window System under the VMS operating system.

The Analog Workbench CAE program now runs on the following VAXstations: VAXstation II, VAXstation II/GPX, VAXstation 3200, and the VAXstation 3500, all running under the VMS operating system and the X Window System. Over 1,400 accurately modeled devices are included in the

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Analog Workbench library. Specific tool kits include the IC Design Tool Kit, the Circuit Design Tool Kit and the Power Design Tool Kit.

The price of the Analog Workbench ranges from \$14,500 to \$60,000.

Obtain more information by contacting Barbara Wagner-Jauregg, Analog Design Tools, 1080 E. Arques Ave., Sunnyvale, CA 94086; (408) 737-7300.

Circle 527 on reader card

Amethyst Adds Software To 4GL Line

Amethyst Computer Resources has added CUPID90 to its line of 4GL VAX-specific software. Technical highlights of this latest version of CUPID are installation via VMSINSTAL, a single executable image to remove image activation overhead and implementation of a shared executable library, allowing threaded and re-entrant code for efficient memory usage.

To find out more, contact J. Harrison, Amethyst Computer Resources Ltd., Goliath Way, Hermitage Industrial Estate, Coalville, Leicester UK LE6 3FD; (0530) 812458.

Circle 528 on reader card

Centaurus Subsystem Simplifies Integration

Ampex Corporation has a new parallel transfer disk (PTD) subsystem based on the Ampex Centaurus Winchester disk drive. The Centaurus subsystem consists of a high-

speed disk processor with 16-bit parallel or VME data interfaces, one-to-four 800 MB (formatted capacity) PTD drives, a variety of host computer adapter cards (Q-bus, UNIBUS, Multibus, VERSAbus, VME Bus and PC/AT), and software drivers to support the VMS, UNIX and PC-DOS operating systems.

With a sustained throughput of 16 to 18 MB/sec, Centaurus, in a single spindle (drive) configuration, supports real-time color digital video (512 x 512, 30 fps). The system also will support ultrahigh-resolution B/W video and can be configured to support high-resolution (up to 100 MB/sec.) real-time color video.

To learn more, contact Ampex Corp., 401 Broadway, Redwood City, CA 94063; (415) 367-2011.

Circle 523 on reader card

ACP 5100 And 6100 Connect DEC Systems

Advanced Computer Communications enhanced its MicroVAX and VAX single-board communications processors. Both the ACP 5100 and 6100 now connect DEC systems over satellite and ground links at T1 transmission rates of 1.544 Mbps.

The ACP 5100 for MicroVAX and 6100 for VAX feature extended frame sequencing and selective reject to tailor these boards to applications where high throughput is required, but delays between frame acknowledgements are lengthy. Extended frame sequencing enables ACC's processors to

transmit up to 127 data frames before requiring acknowledgement. The ACP 5100 and 6100 support the International Standards Organization's HDLC LAPB protocol, which is compatible with CCITT's X.25 Level 2 recommendations. HDLC LAPB provides a reliable full-duplex synchronous link with error checking and correction.

The ACP 5100 costs \$4,200; the ACP 6100 costs \$6,490.

Obtain more information by contacting Advanced Computer Communications, 720 Santa Barbara St., Santa Barbara, CA 93101; (805) 963-9431.

Circle 529 on reader card

DDS Menu System Produces Flexible Menus

Software Solutions Company has an enhanced menu and office organization software system. The DDS Menu System designs flexible end user menus in minutes, allowing users to be brought on-line more quickly with less training. Any DCL commands can be executed from the menu, and built-in security allows the DDS Menu Manager to control the environment of the users.

Users can run several functions simultaneously through the pull-down windowed interface. Program execution can be suspended while an operating system command or other program is executed. Upon completion of the external command or program, control is returned to the original application at the point where it was suspended. The built-in office organizer software includes a calendar, an appointment scheduler, a calculator and a message and reminder system.

The DDS Menu System can be used alone, with existing applications or with Software Solutions' 4GL development package. The DDS Menu System runs on any VAX/VMS system and is priced at \$495.

For further information, contact Charles Howard, Software Solutions Co., 2210 San Joaquin St., Fresno, CA 93721; (209) 486-4750.

Circle 533 on reader card

Precision Visuals Expands TEXTPRO Family

Precision Visuals Inc. has added five new fonts to the TEXTPRO family of typefaces. One consists of Greek symbols and the other four of mathematical symbols. ISO international characters also have been added to existing fonts for use in foreign-language applications. New aspect ratio and kerning settings also have been added to improve the appearance of TEXTPRO fonts.

TEXTPRO is intended for use with



The Ampex Centaurus PTD subsystem.

Precision Visuals' DI-3000, PicSure Plus and DRAW products. TEXTPRO runs under the VAX/VMS operating system, IBM VM/CMS and MVS/TSO and all common variants of UNIX.

Prices start at \$1,500, including documentation.

To learn more, contact Chris Logan at Precision Visuals Inc., 6260 Lookout Rd., Boulder CO 80301; (303) 530-9000.

Circle 530 on reader card

Gimpel Software Introduces Generic Lint

Gimpel Software has introduced Generic Lint, a diagnostic facility for C. It can be used on mainframes and minicomputers, including VAX/VMS, UNIX, Versados, OS-9 and IBM VM/CMS-MVS.

Generic Lint is a generalized version of the PC-Lint, which operates in the MS-DOS environment. Generic Lint finds bugs, glitches and inconsistencies that a compiler working on one module at a time will miss. It finds argument/parameter mismatches, uninitialized variables, unaccessed variables, variables assigned but not used, suspicious macros and more. Generic Lint provides four kinds of errors: fatal, syntactic, warning and informational. It's fully customizable in that all error messages can be inhibited selectively, the size of scalars can be altered and format of error messages can be adjusted.

More information can be obtained by contacting Anneliese Gimpel, Gimpel Software, 3207 Hogarth Lane, Collegeville, PA 19426; (215) 584-4261.

Circle 532 on reader card

NMX-464 Enhances VAXstation 8000

Numerix Corporation announced the NMX-464 Attached Vector Processor (AVP) for the VAXstation 8000. The NMX-464 is fully supported with a FORTRAN IVP software system, a traditional attached processor FORTRAN development system, more than 400 Math Library functions and diagnostic software support. Both FORTRAN environments include an optimizing compiler, which supports many of the VAX FORTRAN extensions, and a screen-oriented debugger. The IVP software also provides a seamless software environment for application development where vector processor transparency is initially more important than performance.

The dual-precision hardware capabilities of the NMX-464 allow the compiler to select the correct precision for each segment of code based on the required precision of the user-declared variables.

Data transfers between the host and the

attached vector processor occur at 4 MB/sec via the VAXBI DMA interface. The system has 64K words (128-bits) of program memory and various data memory configurations ranging from 4 MB to 64 MB.

For further information, contact Numerix Corp., 20 Ossipee Rd., Newton, MA 02164; (617) 964-2500.

Circle 535 on reader card

CoWare Supports RT-11 And TSX-Plus

Talisman Systems has announced the CoWare software package. CoWare supports the RT-11 and TSX-Plus operating systems on an LMSI-JFEP11 single-board PDP-11 coprocessor attached to a MicroVAX. With CoWare and the MDB coprocessor, a com-

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PVCS uses "reverse delta storage" which saves disk space and speeds retrieval of versions of any file in the project database. A delta is the set of differences between any revision and the previous revision. PVCS can rapidly recreate complete versions of any file whether it is the most recent revision of a module or the original version of the entire project. Differences are automatically detected and stored.

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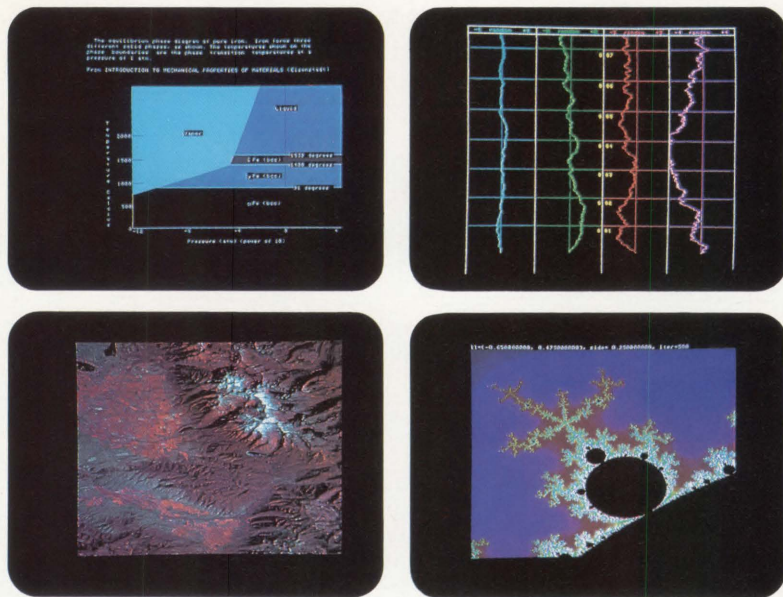
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Price is from \$3495 to \$4485. A complete package with software and monitor goes for \$6,500.

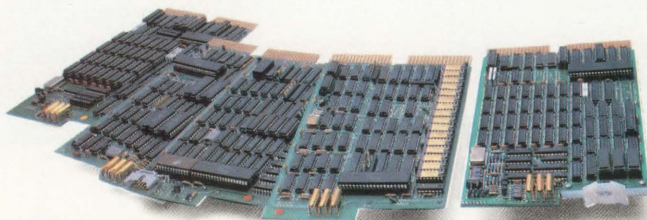
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	VCX8	Q & U	512 × 512	48 × 80	256
	VCX24	Q & U	512 × 512	48 × 80	16 million
	VCH	Q	512 × 512		256
	VCG512	Q	512 × 512		16
	VCG640	Q	512 × 640		8
	VRC	Q & U		24 × 80 48 × 80	64 64
MONOCHROME	VRH	Q	1024 × 1024	64 × 128	
	VRS	Q	512 × 512	48 × 80	
	VRG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

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



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plete RT-11 or TSX-Plus subsystem is available to VMS users. This allows full RT-11 or TSX-Plus capability while enjoying the benefits of VMS. Under CoWare, VMS disks and printers are used to support the system and applications running on the coprocessor.

CoWare supports full RT-11 and TSX-Plus capabilities including program development. By adding CoWare and the coprocessor to a MicroVAX, the system becomes a self-contained package capable of running either VMS or PDP-11 programs. CoWare is available as a separate package or as part of a hardware/software solution that includes CoWare, a coprocessor and an RT-11 license. To obtain more information, contact Talisman Systems, 1142 Manhattan Ave., #255, Manhattan Beach, CA 90266; (213) 318-2206.

Circle 534 on reader card

WATFILE/Plus V3.5 Offers Power And Ease

WATCOM Products Inc. introduced V3.5 of its WATFILE/Plus Data Manipulation System. With WATFILE/Plus, users can access and analyze data with a combination of power and simplicity. Common-sense commands readily store, retrieve, combine, summarize, and report information. V3.5 enhancements include full-screen editing, additional commands and several other new features to make data manipulation fast and easy. Full-screen editing means multiple revisions can be made quickly and conveniently.

V3.5 of WATFILE/Plus is available for the IBM PC and PS/2 with DOS, VAX/VMS and IBM 370 VM/SP CMS. Several licensing options are available. Single-copy price for the PC implementation is \$395 for commercial use; \$295 for education.

Find out more by contacting Mike Paola, WATCOM Products Inc., 415 Phillip St., Waterloo, ON, N2L 3X2; (519) 886-3700.

Circle 536 on reader card

Interfaces Link SAS With RDBMSs

Software Interfaces Inc. has interfaces linking SAS Institute Inc.'s SAS System and the following RDBMSs: Rdb (VAX/SQL), ORACLE and INGRES. These bi-directional interfaces transfer data directly between an RDBMS and the SAS System. Organizations now can combine the power of a database management system with the statistical and reporting tools of the SAS System. The SAS to RDBMS links transfer existing SAS data sets to an RDBMS. They also store the results of a prior statistical step or combine the interfaces with the SAS System to form a data loading facility for the RDBMS.

The interfaces are especially beneficial to multiple VAX sites. These sites now can take advantage of an RDBMS running on one VAX and the SAS System running on a different VAX. OSTAT is compatible with ORACLE*NET and ORACLE*STAR. ISTAT is compatible with INGRES*NET and INGRES*STAR. This combination lets organizations link RDBMS on a system run-

ning UNIX with the SAS System on VAX/VMS.

The interfaces are priced from \$2,500 to \$7,500, depending on CPU type and configuration.

For additional information, contact Software Interfaces, 13831 N.W. Freeway, Ste. 355, Houston, TX 77040; (713) 460-0707.

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DISKWATCHER Eliminates File Bottlenecks

Innovative Computer Technologies has a Disk File Performance Monitoring tool for VAX/VMS. DISKWATCHER features summary reports that allow the user to eliminate file I/O bottlenecks within the context of a process or a disk device. The displays and reports produced assist the user in evenly distributing activity within a group of disks by balancing I/O on a per file basis.

DISKWATCHER supports on-line display and reporting of activity as well as the recording of collected data for later display and/or analysis. BATCH operation is fully supported for data collection and report generation.

To find out more, contact Doug Rapien, Innovative Computer Technologies, 2097 Nipigon Dr., Oakville, ON L6H 4G3; (416) 338-2131.

Circle 531 on reader card

Poly-STAR V2.0 Supports Poly-VISION

Polygon Inc. has added V2.0 to its poly-STAR package. V2.0 supports poly-VISION, which permits the full resolution of a VT240 or VT241 to be displayed on an EGA-equipped PC.

V2.0 includes a utility for remapping the keyboard and support for the LK250 keyboard. The remapping utility allows poly-STAR users to rearrange the terminal emulation keyboard. The LK250 is plug compatible with any PC, PC XT or AT, but has the exact keyboard layout of a VT2xx terminal. Because the DEC keyboard has more keys than even IBM's enhanced keyboard, it's easier to use the terminal keyboard for PC operation than to use a PC keyboard for terminal operation. In addition to terminal emulation enhancements, V2.0 has added the KERMIT file transfer protocol to the poly-XFR protocol in earlier versions.

Poly-STAR V2.0 is priced at \$299. The poly-VISION option, for users with EGA, is \$29.

More information can be obtained by contacting Richard A. Redelfs, Polygon Inc., 1024 Executive Pkwy., St. Louis, MO 63141; (314) 576-7709.

Circle 544 on reader card

VMS TCP/IP Release 3.0 Boosts Performance

Communication Machinery Corporation has VMS TCP/IP Release 3.0 for VAX and MicroVAX. When used in conjunction with CMC's ENP-40 UNIBUS and ENP-50 Q-bus Ethernet processors, this software lets

DEC users interoperate with a variety of workstations and PCs that support TCP/IP. CMC's processors offload the communications burden from the host system, leaving the host free to process user applications. By offloading the CPU, the user can delay the purchase of a bigger and more expensive host system.

The combination of the software with CMC's ENP-40 and ENP-50 offers users a significant performance advantage. For example, the ENP-40 has a file transfer rate in excess of 1.7 megabits per second.

For further information, contact Charles Marchand, Communication Machinery Corp., 125 Cremona Dr., Santa Barbara, CA 93117; (805) 968-4262.

Circle 538 on reader card

ASIC Design Kit For Xilinx Gate Arrays

Valid Logic Systems announced an ASIC design kit for Xilinx Inc.'s user-programmable gate arrays, including the XC 2000 and the XC 3000 Logic Cell Array families. ASIC designers now can use Valid's electronic design automation (EDA) software to design and verify its Xilinx programmable gate array designs. With Xilinx user-programmable gate arrays, designers can implement logic designs without the delays and risks of conventional gate arrays.

The Xilinx Design Kit costs \$7,500.

To obtain more information, contact Valid Logic Systems, 2820 Orchard Pkwy., San Jose, CA 95134; (408) 432-9400.

Circle 539 on reader card

DataViews 6.0 Allows Dynamic Data Display

V.I. Corporation has expanded its line of DataViews graphics software products. DataViews 6.0 allows the interactive, dynamic display of data in real-time graphics and allows users to design their own interface and control application programs. DataViews 6.0 provides enhanced cut-and-paste capabilities, whereby screen graphics, along with data feeds and interfaces, can be moved without more programming. This update includes 39 graph types, vector text for increased text manipulation capabilities, grids in graphs, improved time axis labeling and enhancement in interaction handlers.

DataViews software runs on a wide variety of engineering workstations with UNIX or VMS operating systems, including Sun, DEC, MASSCOMP, Silicon Graphics, Hewlett-Packard, IBM, Intel 386, Harris and Apollo, with support for graphics devices from DEC, Tektronix, Ramtek and Raster Technologies.

DataViews 6.0 is priced at \$7,700 for

DV-Draw and \$17,700 for DV-Tools. Runtime licenses start at \$3,000.

To learn more, contact Deborah Huiskens, V.I. Corp., Amherst Research Park., Amherst, MA 01002; (413) 253-3482.

Circle 540 on reader card

OPUS 3n1 Takes Multiple Hosts

Esprit Systems announced the OPUS 3n1 terminal with dual ports, All-In-One keyboard, and Express Windows. OPUS 3n1 users can simultaneously run any two of thousands of applications written for DOS-, XENIX-, VMS-, ULTRIX-, and PICK-based hosts, supporting the ASCII, ANSI, or PC-Term protocols. The OPUS 3n1 is compatible with PC/DOS, UNIX, UNIX/DOS, Xenix, PICK, Novell, VMS, ULTRIX, and the Software Link's MultiLink Advanced and PC-MOS/386.

The All-In-1 keyboard integrates the appropriate keypad legends to support the VT220, ASCII and enhanced IBM AT layouts simultaneously, allowing users instant access to independent CPUs with dissimilar protocols from a single keyboard.

The OPUS 3n1 costs \$599.

For more information, contact Tom Sullivan, Esprit Systems Inc., 100 Marcus Dr., Melville, NY 11747; (516) 293-5600.

Circle 541 on reader card

PCS/XNS And PCS/TCP Allow Access For PCs

3Com Corporation has announced two new software products. PCS/XNS and PCS/TCP provide low-cost access for 3Com PC networks to corporate mini- and mainframe computers through terminal emulation and file transfer services. Both products are fully compatible with 3Com's DOS-based 3+ network operating system and support 3Com's OS/2-based 3+ Open software.

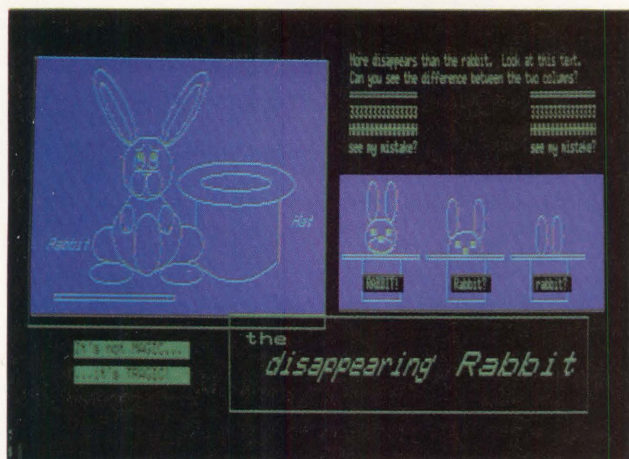
PCS/XNS and PCS/TCP software are designed for use with 3Com's Ethernet and Token Ring network adapters as well as 3Com's 3Station, an 80286-based dedicated network workstation with built-in Ethernet connectivity. Both products run on PCs configured with 3Com's TokenLink, TokenLink Plus, EtherLink, EtherLink II, EtherLink Plus or EtherLink/MC (for IBM PS/2 Micro Channel computers) adapters or with 3Station network workstations.

Single-user versions of PCS/XNS and PCS/TCP are \$175 and \$300 respectively. Server-based versions (for unlimited users) are \$875 and \$1,525 respectively.

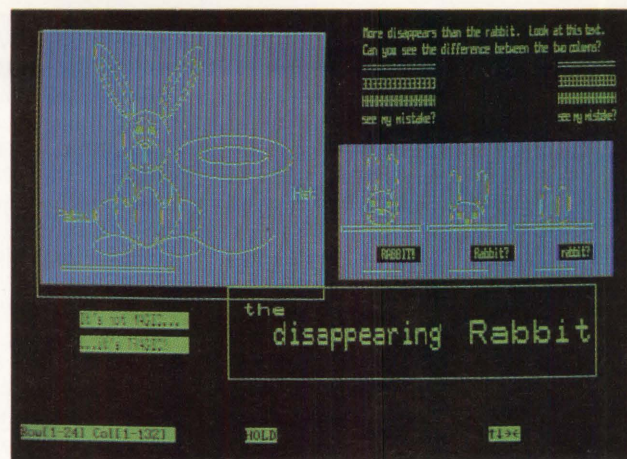
To learn more, contact Leah Rappaport, 3Com Corp., 3165 Kifer Rd., Santa Clara, CA 95052-8145; (408) 562-1508.

Circle 546 on reader card

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



▲ DEC™ VT240™



▲ SmarTerm® 240 v. 2.0b

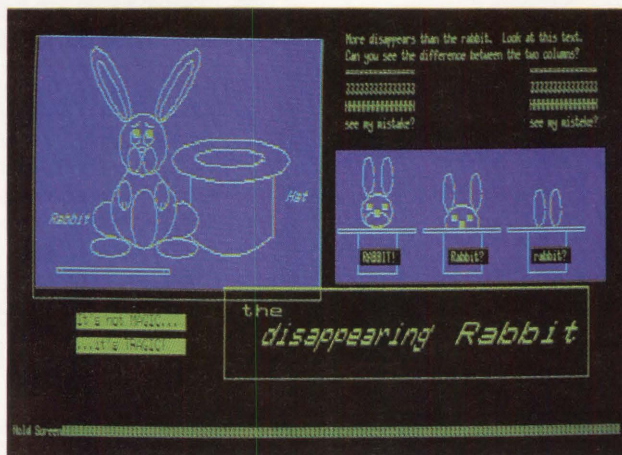
Stop Pixel Dropout

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

Some VT Emulators chop off part of the picture to make your ReGIS™ graphics document fit onto your PC screen. Even worse, some emulators claim to give you the full view while randomly dropping more than 38,000 pixels from the screen—wherever and whenever they feel like it. That's more than 20% of your data!

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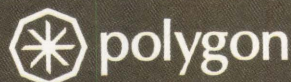


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1024 Executive Pkwy.
St. Louis, MO 63141
FAX 314-275-9185

M/SQL Merges SQL And MUMPS

InterSystems Corporation has introduced a high-performance relational database manager and application generator that integrates two ANSI standard languages: SQL and MUMPS. M/SQL harnesses relational database technology to give application developers flexibility and productivity. Its features include a relational data dictionary, ANSI SQL capability integrated with an ANSI standard procedural language, a completely window-based application generation environment, and a knowledge-based optimizer.

The merger of SQL and MUMPS provides a fully integrated non-procedural and procedural language environment. Applications are ported easily, and M/SQL runs on a wide range of hardware from single-user PCs to large mainframes and networks.

For new customers, prices range from \$1,500 to \$120,000.

Additional information can be obtained by contacting Paul Grabscheid, InterSystems Corp., One Memorial Dr., Cambridge, MA 02142; (617) 621-0600.

Circle 547 on reader card

COLORSCAN/2 Combines IBM PCs With VT240

Datamedia Corporation's COLORSCAN/2 is a multifunction workstation that combines the power of an IBM Personal System/2-, PC XT- or PC AT-compatible computer with the flexible communications and graphics capabilities of a VT240. The workstation can switch from a VT240 session, where the user is accessing a corporate database, to a full-function PC that runs MS-DOS business programs four times faster than an IBM PC XT.

The COLORSCAN/2 incorporates full graphics capabilities and connectivity of both VT terminals and IBM PCs. It's fully compatible with the VT240 color graphics terminal. The workstation features an 8 MHz, Intel 8086-compatible NEC V30 microprocessor, 768 KB of parity-protected DRAM, 8 or 32 KB of standard battery-backed CMOS RAM, 192 KB of ROM and a proprietary EGA chip set with 256 KB of DRAM.

For further information, contact Datamedia Corp., 11 Trafalgar Sq., Nashua, NH 03063; (603) 886-1570.

Circle 545 on reader card

MASS-11 Calendar Schedules And Plans

Microsystems Engineering Corporation has an electronic scheduling system that can run standalone or integrated with MASS-11 Word Processing. MASS-11 Calendar offers a full array of scheduling functions. Conflict-Resolution View can determine scheduled and non-scheduled times of everyone invited to a meeting. It can schedule a meeting on a definite day or suggest dates available based on a range of times provided by the user. Once the time is selected, Calendar sends an invitation to each user. Before sending electronic invitations, Calendar can verify that the conference rooms, video equipment, speakers and other resources needed will be available at that time.

You can use the One-Month View to display the number of events and reminders for each day in a given month.

MASS-11 System requirements are VAX/VMS and IBM XT/AT, PS/2 or compatible. To learn more, contact Microsystems Engineering Corp., 2400 W. Hassell Rd., Ste. 400, Hoffman Estates, IL 60195; (312) 882-0111.

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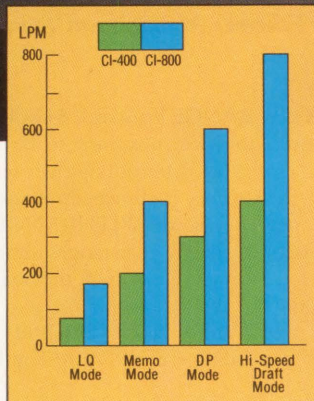


We built something special into our PowerLine CI-400 and CI-800 dot matrix printers that opens a whole new page in output opportunities. It's a fourth mode called Hi-Speed Draft. And it lets you get more out of your printer and your business than ever before.

It also makes any line printer with three speeds look old-fashioned and awkward. And a thing of the past.

Our four-speed PowerLines can print just about anything your business needs. The CI-400, for example, prints out 400 lines per minute for high-speed data processing assignments. On another line, tight and accurate letter quality at 85 lpm. In between you get 300 lpm for crisp, high-contrast bar codes and graphics, and a convenient 200 lpm memo mode.

The CI-800 PowerLine takes four speeds even



further. For greater flexibility at 170, 400, 600 and 800 lines per minute.

No matter what mode you're in, both printers use C. Itoh's proprietary long-life print head design, and a small dot wire to fill those hard-to-reach corners for corporate letter quality correspondence and solid

industry-specified bar codes.

All of which means you don't have to use one printer for one job and a different printer for another. Because the four speeds are all-in-one. Ready and waiting for your commands.

Our PowerLine CI-400 and CI-800 line printers. You'll quickly like what they can do. In four very powerful ways.

For more information on our PowerLine family of line printers, contact C. Itoh Electronics, (714) 757-4492 for the nearest reseller in your area.

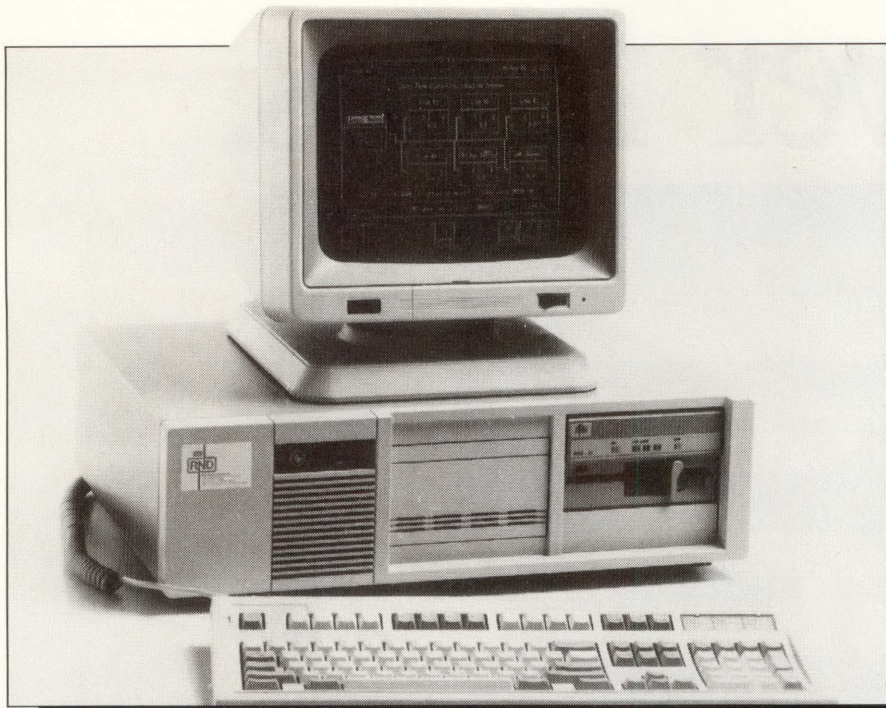
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RAD Data Communications' Remote Ethernet Management Station.

RAD's REM Controls Bridge/Router Networks

RND, a subsidiary of RAD Data Communications, has introduced the Remote Ethernet Management Station (REM), a dedicated control station that controls and monitors a bridge/router network.

From a central site, network managers can view performance and troubleshoot any of RAD's Remote Ethernet Bridges. The REM can monitor serial links between bridges, observe a LAN connected to a particular bridge and regulate actual bridge performance.

Prices start at \$5,950.

For more information, contact Beverly Cohen, RAD Data Communications, 151 W. Passaic St., Rochelle Pk., NJ 07622; (201) 587-8822.

Circle 542 on reader card

CA-STRATAGEM 6.1 Increases Speed

Computer Associates International Inc. announced CA-STRATAGEM Release 6.1. CA-STRATAGEM is a corporate planning environment that combines multidimension data management, financial modeling and statistics, fourth-generation applications development and management reporting (including graphics).

Significantly increased speed has been developed for CA-STRATAGEM operations involving SET, UPDATE and TOTAL com-

mands. A new RANGE keyword, ALSOBY, enables users to select positions to be included in a range by determining their relationship to another defined dimension. Another new keyword, WITHRANGES, enables users to specify that ranges should be respected during evaluation of the bound expression.

Licenses range from \$46,800 to \$115,080, depending on hardware configuration.

Learn more by contacting Susan D'Elia, Computer Associates International Inc., 711 Stewart Ave., Garden City, NY 11530-4787; (516) 227-3300.

Circle 548 on reader card

NP638 Aids Users Of OS/2 LAN Manager

Micom Interlan has announced the NP638, a new hardware/software product incorporating the OSI protocol and Micom Interlan's protocol processor board. With this product, users of OS/2 LAN Manager can use LAN Manager features including network administration and management, remote program execution, user logon security and station-to-station messages.

The NP638 has 512 KB of RAM for packet buffering and protocol processing. The controller uses an 82586 coprocessor and is designed for the IBM PC AT bus. The NP638 supports Ethernet, Thin Ethernet and unshielded twisted-pair media.

The product sells for \$995.

To find out more, contact George Jones, Micom Interlan Systems Inc., 155 Swanson Rd., Boxborough, MA 01719; (617) 263-9929.

Circle 549 on reader card

OPTIFILE Offers Optical And Magnetic Drives

KOM Inc.'s OPTIFILE optical disk solution can combine optical and magnetic disk connectivity to the host computer with a single compact host adapter board. Both optical and magnetic devices are supported on the SCSI bus. This offering is a dual-size card that provides two MSCP controller ports for the Q-bus and UNIBUS system. Port A provides MSCP emulation for magnetic disk drives (DU driver), while Port B provides a SCSI pass-through mode for the OPTIFILE ZB driver.

This option is ideal for MicroVAX applications that have restricted backplane space. The board replaces the need for two, but maintains high performance. It supports the maximum SCSI data transfer rate of 1.5 MB/sec., allowing the optical drives to reach maximum speed.

More information is available by contacting Linda Bradley, KOM Inc., 145 Spruce St., Ottawa, ON K1R 6P1; (613) 238-7766.

Circle 550 on reader card

Development Product Has Expert System

Exsys Inc. has introduced an intelligent software development product, EXSYS, that employs an expert system to increase speed and quality of applications software development. EXSYS enables organizations to develop quality applications quickly and in conversational English.

Applications produced by EXSYS stantly are transportable instantly. Also, the database is a unified structure that is the system specification. Thus, a simple database inquiry is all that's needed to postulate a change. EXSYS researches the application, simulates the change and prints an impact report, in English, which explains everything in the system affected by the change. End users can understand the report and participate in decisions regarding that change. Although non-trivial, at more than 500,000 lines of C code, learning EXSYS is equivalent to learning a sophisticated WP System. EXSYS runs on VAX and Data General minicomputers.

A single-user license starts at \$30,000. For more information, contact David Pullman, Exsys Inc., 405 Lexington Ave., 39th Fl., New York, NY 10174; (212) 983-4646.

Circle 551 on reader card

all agree . . .

REPORT CARD

Dynamic Load Balancer

9.7

	Unacceptable	Poor	Satisfactory	Very Good	Excellent
Ease of Learning/Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Ease of Use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Error Handling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Value	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

SUMMARY: The Load Balancer's performance significantly improves the performance of a heavily

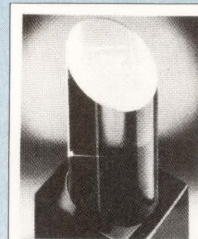
loaded system. Documentation is clear, brief and to the point. Use of the product is effortless once it is installed. The product functions without apparent errors and has no adverse side effects on other system functions. Telephone support for 90 days is included in the price of the product. Installation uses the BACKUP program rather than VMSINSTAL, but is very simple nonetheless. The product is an excellent value, given the cost of alternatives.

DETAILS: The Dynamic Load Balancer is available for a 30-day demonstration period, including documentation and telephone support, for \$69.95. Single first copy distributions are priced at \$1,495, while subsequent copies cost \$1,195. The product runs on any VAX under VMS.

Digital News
October 19, 1987

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1 9 8 9
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—YUMA REGIONAL MEDICAL CENTER
- "Overall response time has improved forty percent!"
—UNIVERSAL SEWING SUPPLY
- "System performance has improved sufficiently to allow us to defer an emergency purchase of a 32 mb memory upgrade."
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dDCN5620 Links GE-FANUC To BITBUS

DATeM Ltd. released the newest member of its dDCN5000 family, the dDCN5620 CCM2 SERIAL GATEWAY. The dDCN5620 provides a link between the GE-FANUC Series 1, 3 and 6 Programmable Controllers and the BITBUS-distributed control network. It allows up to 250 GE-FANUC PLC units to be networked over a high-speed SDLC-based communications network and provides an integrated BASIC interpreter and auxiliary RS232 serial and Centronics parallel ports. A BITBUS network can be implemented using low-cost twisted-pair wiring. RS-485 transmission provides high noise immunity to as many as 250 BITBUS-compatible modules, at speeds up to 2.4M baud.

The unit has 32 KB of firmware, 32 KB of battery-backed static RAM, 8 KB of variable memory space, a high-speed tokenized DCBASIC interpreter and iDCX-51, a compact, event-driven, multi-tasking executive allowing for unsupervised data acquisition.

The dDCN5620 (D Connectors) is priced at \$1,100. The dDCN5620/S (Screw Terminals) is priced at \$1,250.

For further information, contact DATeM Ltd., 148 Colonnade Rd., Nepean, ON K2E 7R4; (613) 225-5919.

Circle 552 on reader card

Talaris Creates LN03 Cartridge

Talaris Systems Inc. announced a font cartridge for use with the LN03 Plus emulation included in Talaris Printstations. This font cartridge contains 66 fonts, which provide all the fonts contained in seven DEC font cartridges for the LN03 or LN03 Plus laser printers.

The Talaris LN03 font cartridge includes proportional fonts from the Times, Triumvirate, and ITC Souvenir font families in ASCII, supplemental and publishing character sets. Type styles include text, bold, italic, bold italic, demi, light and light italic. Point sizes range from 8 point to 24 point. For compatibility with the LN03, users can select fonts within the LN03 Plus emulation in the same way they can select fonts in LN03 laser printers. These fonts also can be selected from the Printstation's native EXCL mode. Because of the advanced controller architecture and font format used by the Talaris Printstation Control System, users of the fonts in native EXCL mode can select any one of the Printstation's 10 special font attributes.

The Talaris LN03 font cartridge is priced at \$795.



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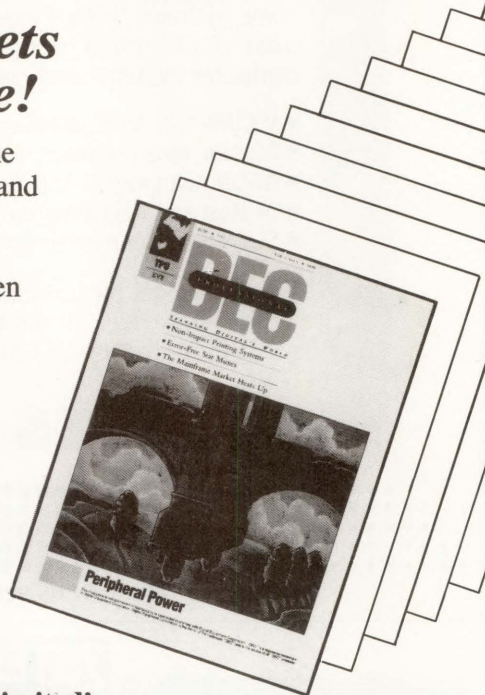
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For further information, contact Janice Kall, Talaris Systems Inc., P.O. Box 261580, San Diego, CA 92126; (619) 587-0787.

Circle 439 on reader card

CSD Extends IMPCON Family With CIMPLAN

Computer Systems Development Inc. (CSD) has added CIMPLAN to its IMPCON product family. The new package automates engineering data management, develops quotes and estimates, performs process planning and offers a link directly to the sales order processing and production management functions of manufacturing operations.

The IMPCON family supports a broad range of computer-integrated manufacturing and computer-integrated business applications for job shop, build-to-order, build-to-stock or complete MRP II operations. The system optionally includes asset management, contract costing, bar coding, warehouse management, time and attendance tracking and links to business systems. IMPCON operates on VAX/VMS.

Prices start at \$30,000, depending on software configuration and host computer. For more information, contact Maggie Guscott, Computer Systems Development Inc., 910 Boston Post Rd., Marlborough, MA 01752; (617) 460-0330.

Circle 521 on reader card

V5.0 Enhances Mac Communication

Pacer Software Inc. has announced PacerLink V5.0, a new release of its Mac-to-VAX communication software. V5.0 features a user interface with a multiwindow terminal emulation capability that enables Mac to concurrently interact with multiple VAX sessions. It also can map VT terminal attributes to colors on a Macintosh II and display 132-column format on the Mac screen.

PacerLink communication to VAX can be via asynchronous connection, Kinetics FastPath LocalTalk/Ethernet bridge or direct Mac Ethernet connection. PacerLink uses the standard AppleTalk protocol suite for network communication. There are no VAX hardware requirements except a standard Ethernet controller card.

PacerLink pricing is server based, so that only the VAX portion of the software is licensed, allowing unrestricted distribution of the IBM PC and Mac software. Pricing starts at \$2,000 per VAX.

Find out more by contacting David Ryter, Pacer Software Inc., 7911 Herschel Ave., Ste. 402, La Jolla, CA 92037; (619) 454-0565.

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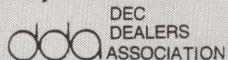
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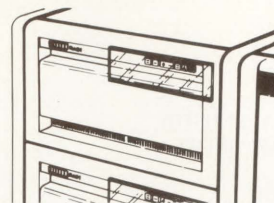
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BACK END

John C. Dvorak

The PC Revolution: An Update

When speaking to large groups, I'm frequently

asked, "Where does the desktop computing revolution stand?" Today, people want to know four things about the PC scene.

Should I buy an IBM, IBM clone or an Apple Macintosh?

This has become a question of economics. If you want to get into the IBM camp, buy the least expensive but most powerful clone you can find. Users who find the Mac world more to their liking have little choice but to pay the piper and buy a Mac. All these machines will serve almost any desktop need.

Should I purchase an XT, AT or 80386?

It's interesting how Apple gets left out of this discussion. This question is even more complicated (or less, depending on your perspective) now that Intel has released its 16-bit version of the 80386 chip dubbed the 386SX.

Anything but an 80386 is a potential white elephant. While some seers believe that the fast 80286 machines using Harris CMOS parts will supplant the 8088s and become the common workhorses of the future, I disagree. The 386SX is the workhorse. Soon, the 8088s and the 286s will be functional as terminals and simple word processors, but that's all.

Any fancy software we'll see in the 1990s will be 80386 specific. The limitations of the 640 KB barrier on the other machines will die and take the machines with them. You've been warned.

If you're wondering why you'll need all this memory, imagine a machine with a built-in FAX, OCR scanner, phone machine, video controller and PostScript drivers. The memory requirements rise high.

Should I move to OS/2 or stay with MS-DOS?

This issue won't go away until users run into a brick wall, which is where MS-DOS is headed. Users have to start thinking in terms of a 16-MB minimum configuration for desktop systems and accept that new operating systems will be as large as the entire system size of the previous generation. This means the OS will be 640 KB or larger. When PC users look back, they discover that the current MS-DOS files including COMMAND.COM and the two hidden files MSDOS.SYS and IO.SYS are 87 KB, far larger than the "huge" 64 KB 8080 and Z-80 systems of the past.

Bill Gates, head of Microsoft, has said many times that the 640 KB boundary was established because a system that was 10 times larger than any previous system was expected to hold its own for a decade or more. It held up for six years, and now users are moaning about the 640 KB limitation. Gates has since given up thinking in terms of limitations, and an operating system that's 1 MB or larger is conceivable. In

If we're to think big, expect an operating system that's 16 MB or larger within the next two decades.

fact, if we're to think big, expect an operating system that's 16 MB or larger within the next two decades.

With this in mind, we must accept that OS/2 or something better (but still large) will emerge as the new standard in the 1990s. This will happen no matter how much complaining we hear from the conservatives.

Do I need a network?

If you have to ask, you don't need one. I'm amused by the number of PC users who feel they should be part of a network for no particular reason. Although the network has its place in an office that's loaded with PCs used for order entry, invoicing and receivables, it's not worth the hassle in other environments. In many offices, the implementation of a complex network leads to the most useless notion ever conceived, the diskless workstation. Terminal makers and others promote this device as some sort of cost-saving convenience. In reality, it's an expensive terminal that's completely useless if the network crashes.

The answer about the direction of the desktop computing revolution is simple: more of the same. Look for PCs that are faster, smaller, cheaper and still personal. ■



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