STORAGE

DEC ESE20

- Building X Hardware Platforms
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MAY ■ 1989

DEC Professional

An Independent Magazine from Professional Press

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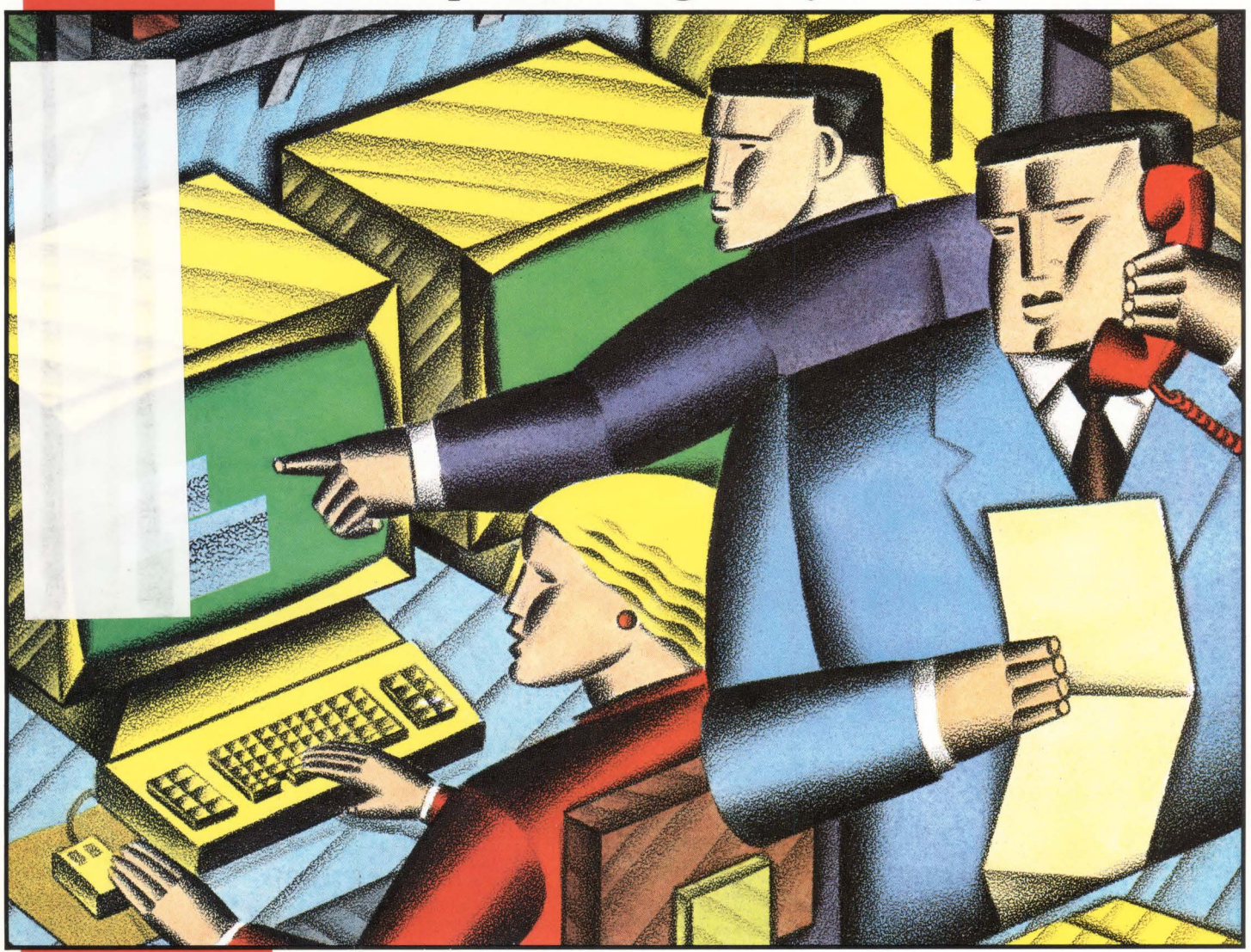

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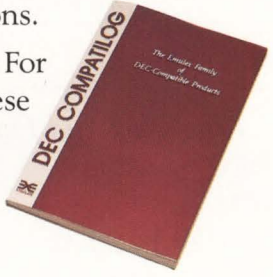

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This month's cover is the work of Mark Anderson, Metairie, LA.

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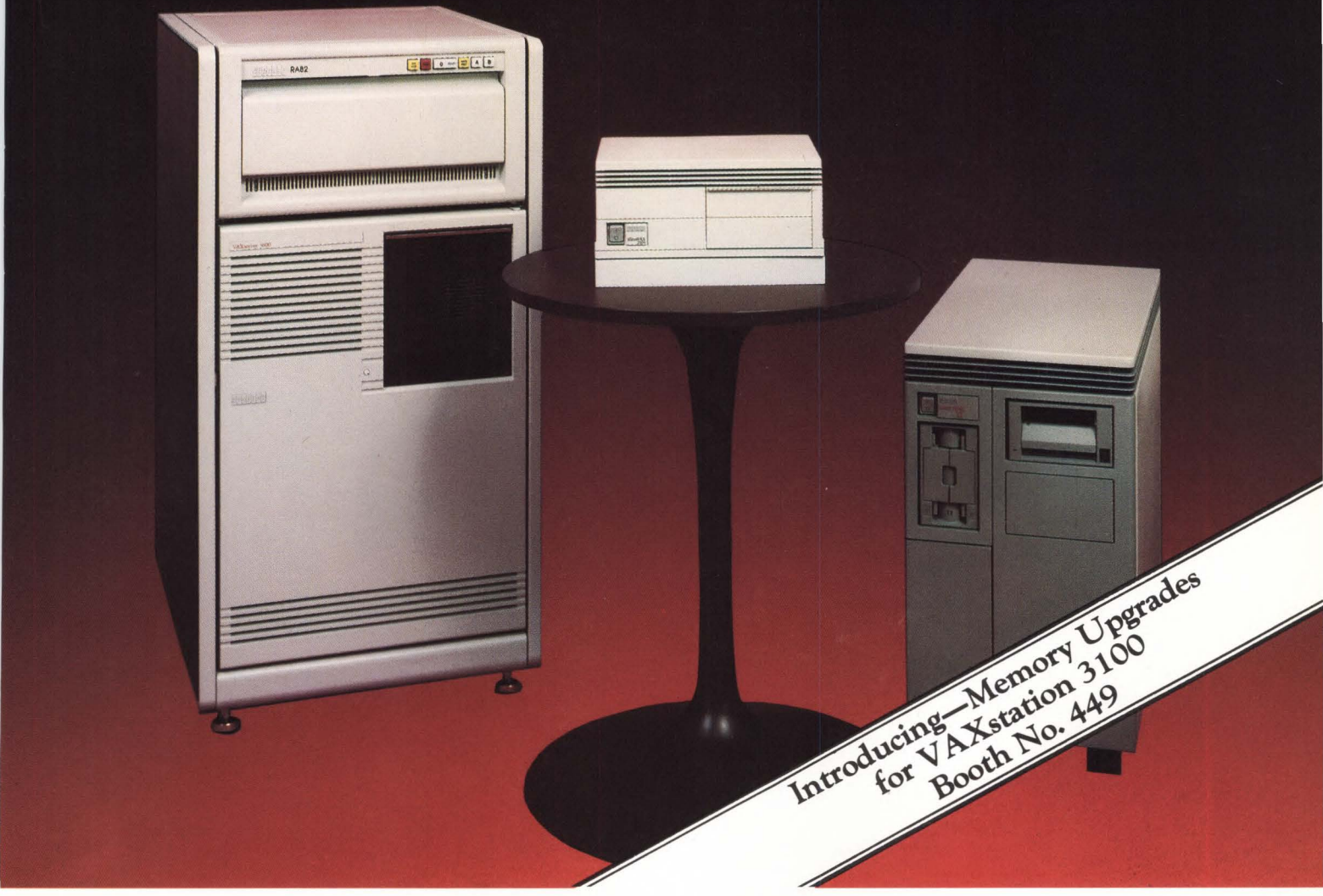

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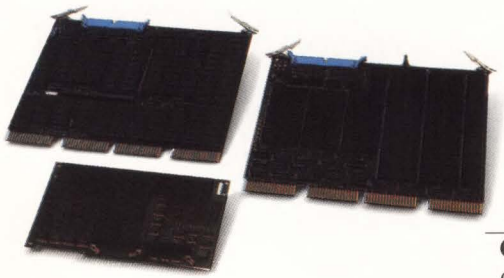

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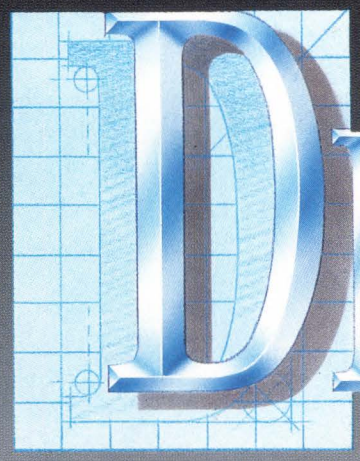

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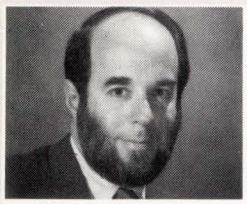

PUBLISHER

Carl B. Marbach

Too Much Too Soon

I've watched our computer system struggle lately under the burden of more and more software — more operating system features, options and programs. We have more mips, processors and gigabytes than ever, but we're serving fewer people. It's a simple fact: To run VMS and serve terminals or workstations connected to our VAX requires much more power than it did when one PDP 11/70 could handle 60 users. If a VAX 11/780 was roughly the equivalent of the old 11/70, then why do our 8250, MicroVAX II, 750 and three VAXstation 2000s struggle to keep 60 active users satisfied?

The answer is that we're doing more at each user station. But have the software engineers gone past the hardware's power to provide these services? How big is VMS and how much overhead does it extract from your processor? I remember the fictitious IBM machine announced in the late 1960s that had so much overhead from the wonderful operating system that it spent 99 percent of its time scheduling itself and one percent serving the users. Are we building a computer environment that works for an 8800 or a 6310 but bogs down with an 8250?

I remember in 1965 watching George Holmes build the monitor for the PDP-6 computer at the Medical School Computer Facility at the University of Pennsylvania. Holmes built a time-sharing monitor that took 9K words (bytes were variable length then) out of the 64 KW total memory available. It left 55 KW for the users who had to sign up for memory. This was because there was no disk for swapping and no virtual memory, and the very simple monitor only let you use part of the computer's memory, while it shared the CPU among the three users.

Communications among jobs consisted of users yelling across the room, "Can I have 30K for about five minutes?" But it worked. Programs ran and jobs got done in a wonderful interactive manner that DEC has kept alive.

Today, VMS comes to us prebuilt. You can't have a 9 KW version, and while we have no exact numbers, it's big and it consumes a lot of CPU cycles. And it's about to get worse.

DECwindows and workstations will add considerably to overhead and to what a user can do on our computer systems. Do we have the horsepower to do all the things that our operating environment is giving us? While the price/performance curve is moving in the right direction (for us), is the cost/user curve moving the same way? How much more will it cost me to serve the same 60 users on my VAXcluster today that we used to serve with the 11/70? You may argue that while it's more expensive, those users are doing more things more productively. But is it worth it? And, do we need what we're being given? Is VMS too big, fat, unoptimized and just too much for many of the VAX processors?

When you factor out the disk and memory improvements (DEC didn't do these), how much have we been helped by the "improvement" in VAX processors when you couple it with the "improvement" in VMS? While we have lots more mips, how many more users can we serve? I'd like to add another metric to the current measures of machine performance: the O/M. It's a measure of the overhead (O) in mips relative to the mip rating of the computer. An O/M of 1 would be the value of the mythical IBM computer that had nothing left for users, while an O/M of .1 would indicate that 90 percent of the computer was available for useful work. The lower the O/M, the more of a computer is available.

If we assume that a normal VMS system consumes .5 mips, then a 5-mip 8530 would have an O/M of .5/5 or .1, while a MicroVAX II at 1 mip would have an O/M of .5/1 or .5. Thus, 50 percent of a MicroVAX II is consumed with VMS, while only 10 percent of an 8530 is similarly consumed.

If VMS becomes even more complicated, the problem multiplies rapidly. These numbers dictate a need for much faster processors as the operating-system overhead increases. Is it any wonder that the value of the 8200/8300 series is falling fast under the weight of increased VMS overhead? As the O/M for an 8200 approaches 1, the computer becomes valueless.

Current thinking is that, with DEC windows, overhead will increase significantly. After all, handling the 14 mips of a DECstation 3100 won't be easy or free. The CPU cycles to service that hungry processor will have to come from somewhere. The addition of many more workstations will add measurably to the file-serving needs of the host processor, and the ability of DECwindows to use host CPU cycles will increase the overhead of any cluster dramatically.

I'll finish writing this on the VAX, check the spelling, then MAIL it to the home office editors and send a copy to another editor 3,000 miles away via our Ethernet bridge to another cluster member. I'll then check my calendar, review our latest financial projections and look at our circulation database.

I should back up my PC's hard disk to the VAX, check for MAIL messages, send MAIL to department heads about my upcoming trip and graph some data I've been working on by printing it on one of six laser printers.

Did I do all of this when we had the 11/70?

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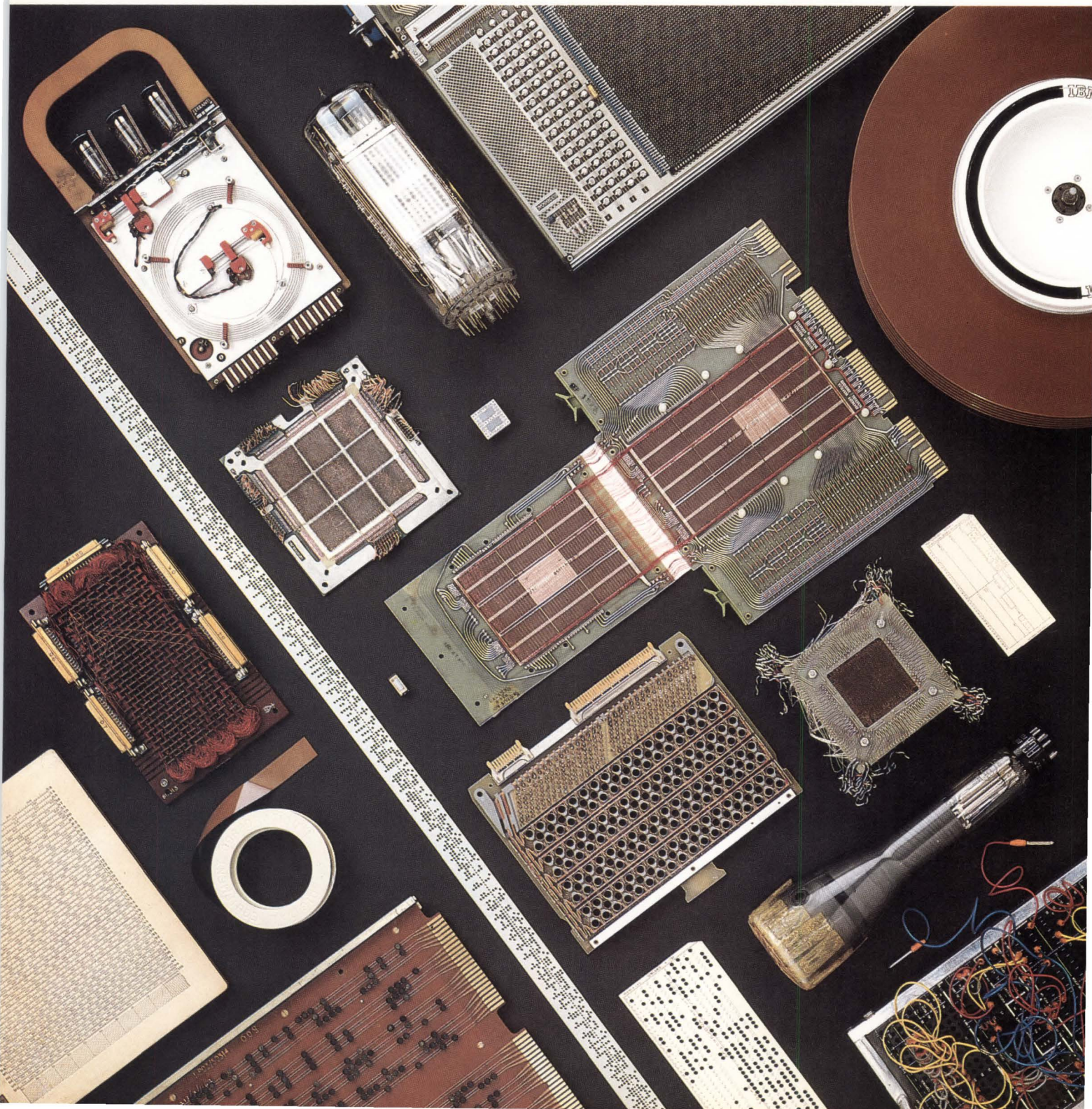

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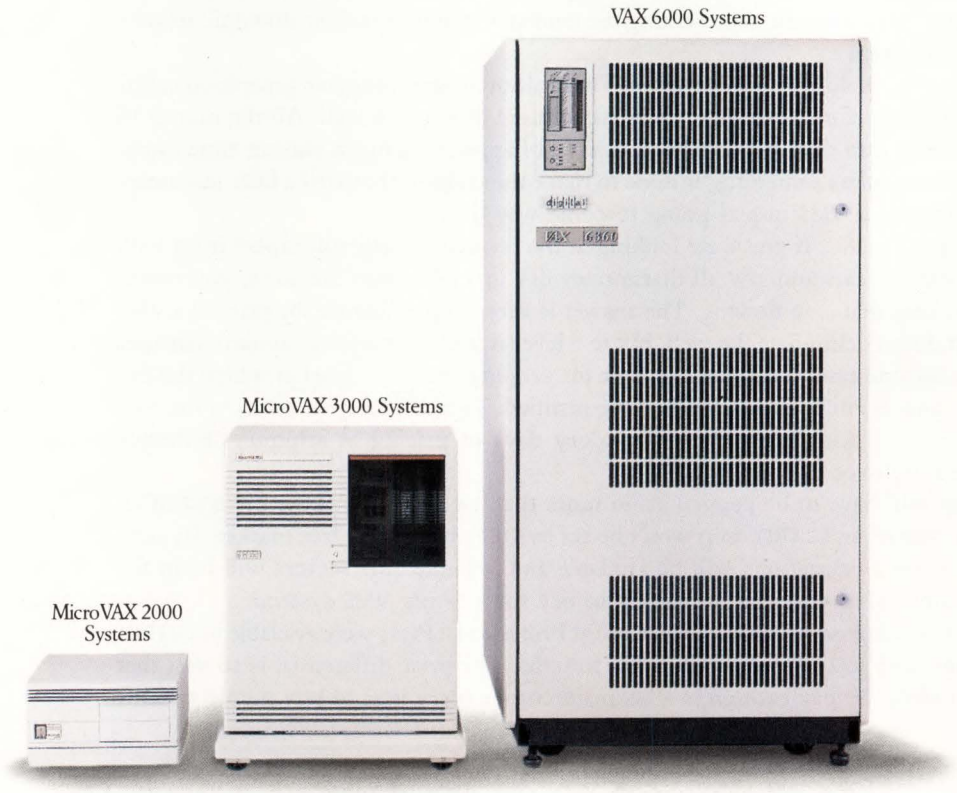

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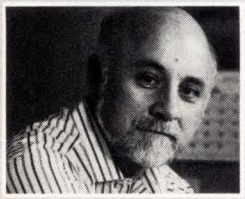

EDITORIAL

Dave Mallery

Hey Buddy, Wanna Buy A Mip?

Much has been said about the relative value of a VMS mip versus an ULTRIX mip. However, when the rhetoric is stripped away, the question is as simple as a college physics problem.

Everyone loves VMS. It's elegant, mature, broad in scope and robust in language. Unfortunately, it's also vastly overpriced.

Remember the concept of a potential well in physics. That's the field whose graphical representation resembles a tornado, representing the tendency of things to flow downhill toward something attracting them.

The same equations hold true in economics. The creation of the computer generation called RISC and its vast price/performance superiority has created just such a well. All the money in the industry will flow into that well. Further, this will happen in a much shorter time frame than you might guess, unless something is done to make the walls of that well a little less steep. That's why the price of a VMS mip is going to come way down.

Pretend that you're DEC. If you were looking at the revenue stream you expect from VMS support for the next 10 years and saw all that money dry up eight years too soon, you might consider tactics to keep that cash flowing. The answer is very simple: Reduce the price of a VMS mip to a level that doesn't eliminate the well, but to a level at which an average system manager still can make a plausible case to his management for keeping VMS — a level at which the expense of elegance and depth of feature still can be justified. There's plenty of room in the cost of these machines for price adjustments. The glory days of pricing at arbitrary IBMesque performance levels are over.

The VMS mip will have to be pegged at no more than two to three times the cost of an ULTRIX mip. The cost of an ULTRIX mip won't be set by DEC, but by the free market. By next spring, 60- to 100-mip workstations will be available and 300-mip SMP servers will be in the offing. At that point, what will you be willing to pay for a 5-mip VMS system?

If the word processing package and 4GL we use at Professional Press were available in ULTRIX today, we'd change over to ULTRIX within a few months. The price differential is so vast that it would be irresistible. We pay enough in VMS maintenance every year to buy whole systems with the savings.

Sometimes, eras end abruptly.

Price Reductions

At DEC's 38/3900 announcement on April 10, some startling price adjustments were made. The machines cost only 5 percent more than their predecessors, yet they deliver 50 percent more power. In my calculations, that's a 10x advantage — just what I've been talking about. There also were reductions in the cost of layered products (on the order of 45 percent).

There are many ways to reduce the cost of VMS in both hardware and software. DEC has at least three new generations of submicron CMOS in the works. Each generation can lengthen the pipeline, increase on-chip cache for VAX implementations and deliver substantive clock-rate increases.

Whether this silicon wizardry can deliver performance increases on a steeper curve than the current 50 percent per year remains to be seen.

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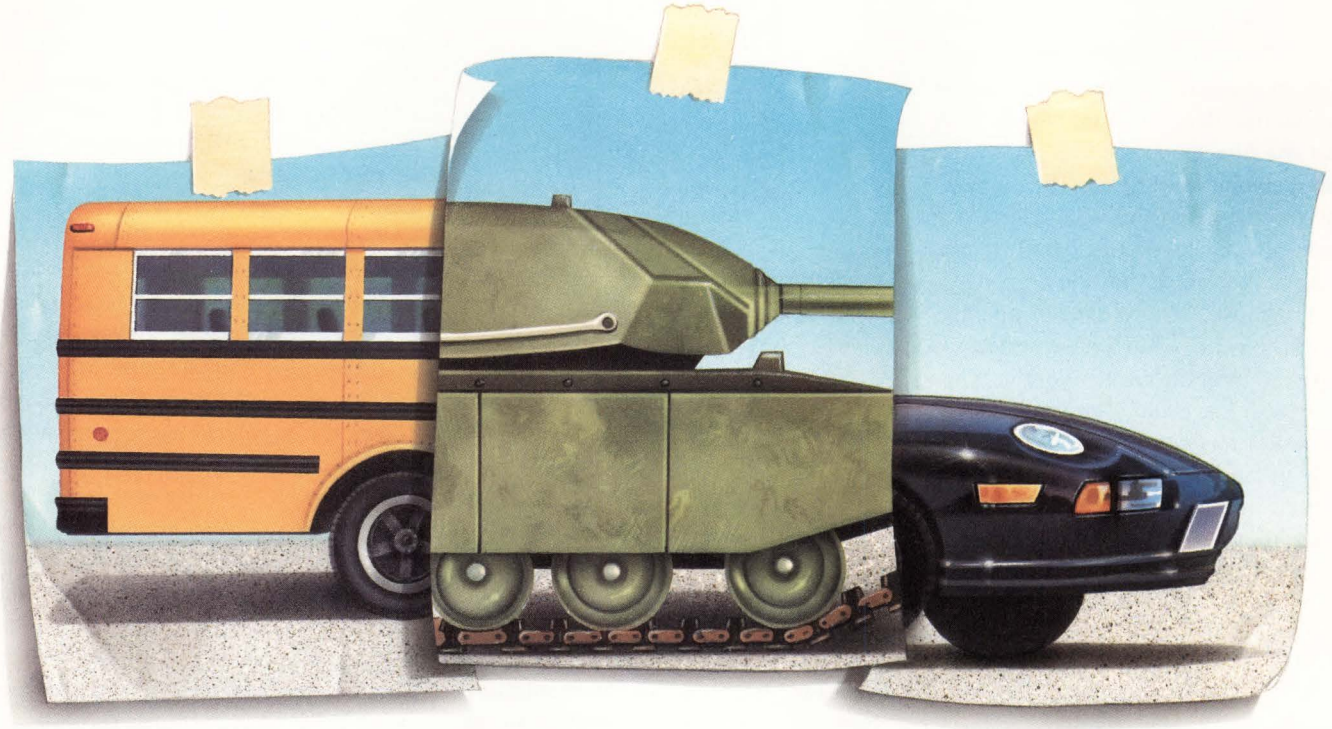

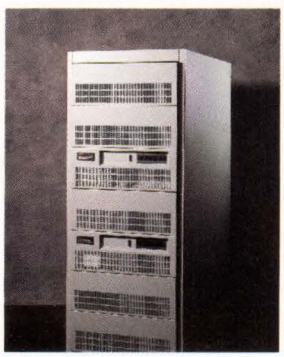

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CIRCLE 157 ON READER CARD

LETTERS

POWDER PUZZLE

For some time, we were puzzled by a fine white powder that collected on the filters of the equipment and the closed-loop air-handling system. The powder was so fine that it was making its way past the filters into the VAX. A chance comment by an employee's father-in-law that he had a problem with a fine white powder collecting on his furniture at home solved the mystery.

Because the closed-loop air-handling system didn't have perfect integrity, during the winter months, when air was dry, we added moisture to the computer to maintain a relative humidity of approximately 50 percent. It turned out that our ultrasonic humidifier was broadcasting the particulate matter in the water.

R.S. Philbrook
Marion, Massachusetts

MULTIPROTOCOL NETWORKS

In "Multiprotocol Networks" (January 1989), author Bill Hancock presents a misleading and incorrect view of how the data-link protocol DDCMP is used within the Digital Network Architecture (DNA). DDCMP is never used as a data-link protocol in communication between two DECnet nodes on an Ethernet or any other LAN medium. The use of DDCMP within DECnet is to accomplish reliable point-to-point or multipoint communication across synchronous or asynchronous serial lines. It's never used in communication across a LAN, as stated in the article, nor is the HDLC protocol. In addition, under Phase IV, Layer 4 (transport), not DDCMP, is responsible for reliable data transfer across a DECnet logical link.

Alan MacInnes
Lowell, Massachusetts

Bill Hancock: Mr. MacInnes is correct as to the erroneous suggestion that DDCMP is used as a data-link protocol in DECnet Phase IV on Ethernet. He is further correct in pointing out that the End Communications Layer (Layer 4) is tasked with the responsibility of guaranteeing delivery of packets. However, DDCMP and X.25 protocol modules in Phase IV are quite capable of retransmission and message sequencing, which tends to provide an error-controlled environment and reduce the amount of work Layer 4 performs.

The intent of the paragraph in question wasn't to mislead the reader and there was never any direct mention that DDCMP was used on a LAN. A badly worded sentence concerning the use of HDLC in Phase V, however, could be misconstrued as implying the same.

In regard to Mr. MacInnes' statement that HDLC is never used as a data-link protocol on a LAN: Presently there are two proposals to the ISO (possible addenda to ISO 8886, Data Link Service Definition) on exactly that issue as well as a proposal via ANSI to allow the use of X.25 HDLC LAPB (ISO 7776) and possibly CCITT Q.921 (LAPD) as data-link services on LANs. Further, because LLC capabilities in the LAN ISO standards don't provide for quality of service (QOS) facilities, there's also activity to incorporate HDLC or a like capability to allow user-initiated data-link-protocol selection on a connection request on LANs to provide selected levels of QOS. Current LAN LLC (ISO 8802/2 and IEEE 802.2) doesn't provide for QOS, so there's a distinct possibility that the use of HDLC or derivatives thereof (in coordination with the Network Layer) will be incorporated to allow QOS. ■

Please 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.

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It's a wonder that complex software ever works. The process of creating it is inherently error-prone. A number of people separately create and constantly change a series of components that may be inter-dependent (perhaps even in unrecognized ways). Then they create the final product by combining the components.

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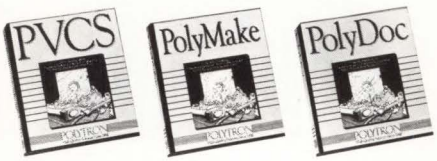

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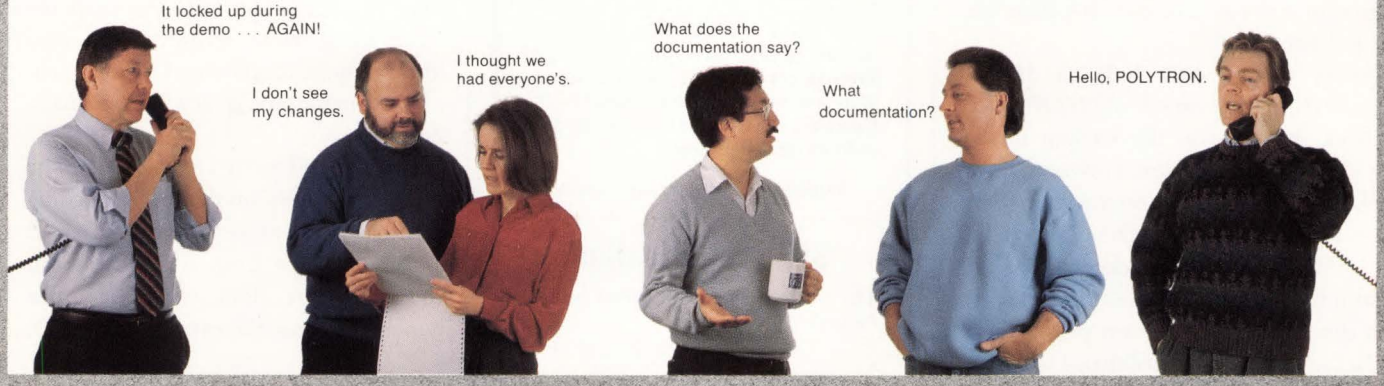

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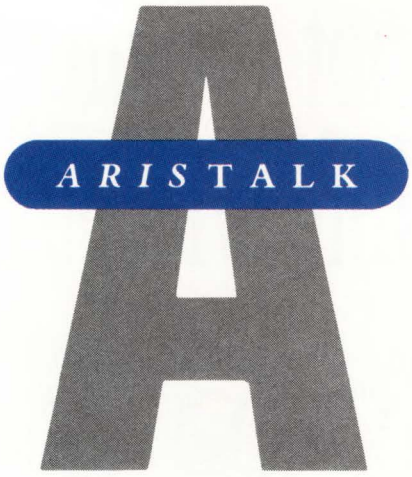

BACKUP/VERIFY

QUERY:

Philip Gravel *(SIG 12/MESS 249):* What useful purpose does the /VERIFY qualifier serve on the BACKUP command? It primarily turns up block and end-of-file mismatches for files being modified during BACKUP or for directories that have files created in or deleted from them.

Considering the verification pass doubles the backup time, it seems to be a steep price to pay just to find out that files and directories were changing during the backup. Files and directories always are changing on a system in use.

REPLIES:

Marty Chamberlain *(SIG 12/MESS 250):* The /VERIFY qualifier to the BACKUP command isn't designed as a tool simply for showing you what files were modified during your backup. Its big mission is to compare the contents of the output saveset with the contents of the files being backed up. This will tell you if the data on the backup tape matches the data on the source media. If you have bad tapes, this qualifier will alert you to problems with the backup that might be missed by the drive and controller. Depending on the importance of the backup, the /VERIFY qualifier is good insurance if you can spare the time. It's a judgment call.

Philip Gravel *(SIG 12/MESS 252):* I understand the purpose of /VERIFY is to check the data on the backup media with the source version. However, most of the errors I observe on the verify pass are end-of-file mismatches.

With redundancy checks that are built into hardware and software today, is the backup verification pass a relic? Backing up a nearly full RD54 to TK50s with the verification pass can take three or four hours. That shoots half of a working day and renders the system unavailable if it's a standalone backup. If it's a judgment call and I don't find the verify information useful, then I don't need to do it. Are other system managers using the verify option?

Phil Anthony *(SIG 12/MESS 254):* When I was system manager for a pair of VAXs, I insisted on BACKUP/VERIFY. Backups were done on Sunday afternoons when nobody was supposed to be on the system. The operators who did the backups were instructed that if any nonrecoverable errors occurred during the operation, the job should be aborted and restarted. A handful of times over the three years I was there, the verify pass uncovered errors that weren't flagged during the backup pass. The company felt that data integrity was worth far more than the operators' time.

Bob Zisek *(SIG 12/MESS 257):* I've used BACKUP/VERIFY to test the reliability of new and/or cheaper tapes. It pointed out some errors on the tape, and because of this, we didn't use them. Had we ordered them, who knows what backup disaster could have been waiting. I too think it's a judgment call. Time is also a valid consideration.

Phil Anthony *(SIG 12/MESS 259):* I agree that it's a judgment call. The tapes we were using were whatever the tape library chose to give us. I've also seen a brand-name tape go south after a half-dozen uses.

Richard B. Gilbert *(SIG 12/MESS 255):* The /VERIFY qualifier on the BACKUP command helps to ensure that you've created a readable tape from which you can recover your data if it becomes necessary. I hate the extra time it takes,

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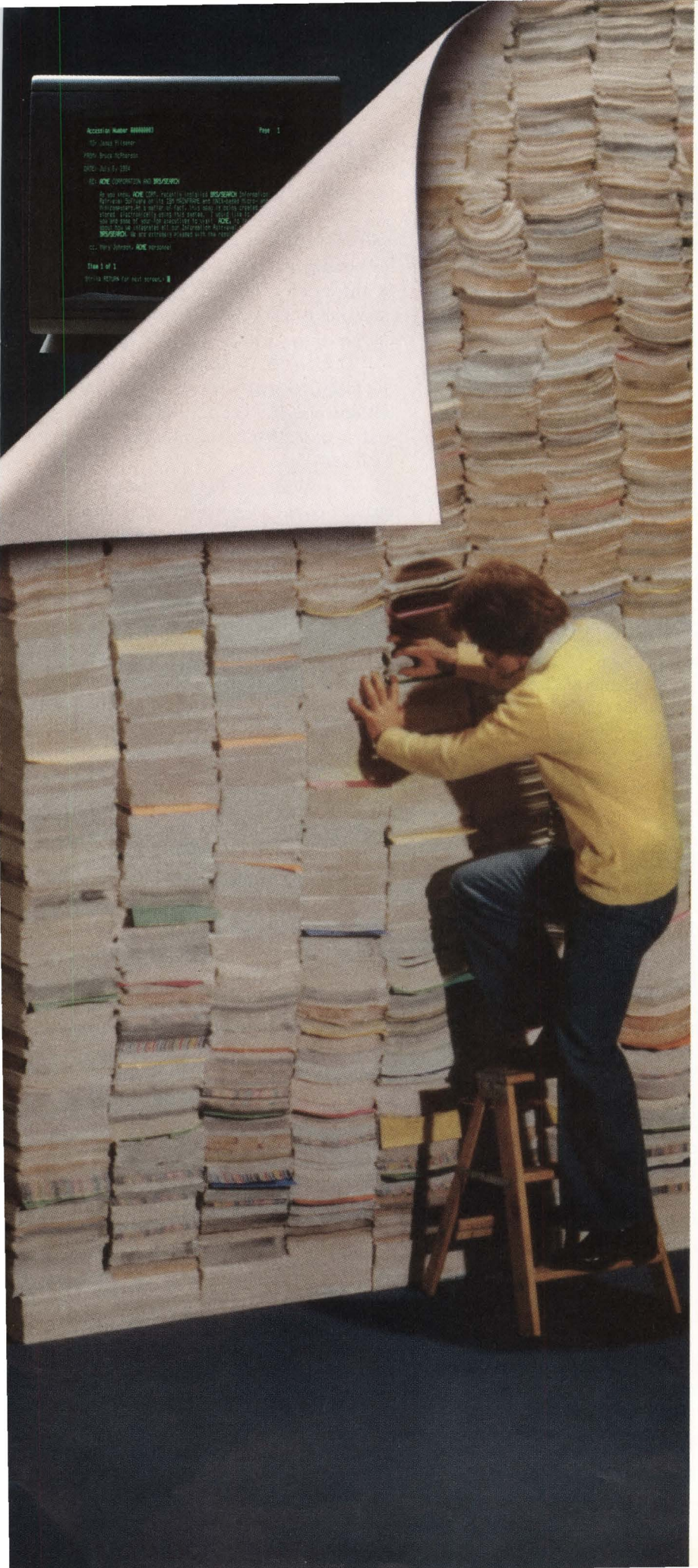
SIG Identification

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

12.....Site Management
41.....Applications



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but if the tape isn't readable and I need it, I'm in deep trouble.

/VERIFY serves no purpose during a restore as long as you have CRC checking enabled. You definitely should have CRC checking turned on, but that's another story.

NO FORMFEED

QUERY:

Jay Beller *(SIG 41/MESS 297):* Can I send printer control strings through a queue without the symbiont generating a trailing formfeed — lots of blank sheets?

I'm running VMS 4.5 and want to send setup strings to an HP LaserJet, as well as download fonts. From the printer's perspective, these files don't print text on the page, therefore, there's no need to eject after printing. The print symbiont always sends a formfeed at the end of the job to clear out the printer.

I looked through a lot of VMS documentation and came up with two methods: Put the setup strings in a device control library and use the /SETUP qualifier when printing or write my own version of the print symbiont.

I set up the library and associated it with the queue. Printing with the /SETUP qualifier worked fine, but I still got that blank page from the control string. A small paragraph in the release notes for VMS 4.4 indicates that placing a <FF> character at the start of the control string will suppress the page eject but only for recognized control strings. I tried this and still got a blank page, and assume HP's escape sequences aren't recognized as standard.

I tried the second method. Using the PSM$ utility reference in the *Routines* manual, I created a modified version of PRTSMB.EXE in FORTRAN. I was trying to replace the Job Completion routine with one that doesn't send a formfeed to the printer. There's no $PSMDEF definition in the FORSYSDEF.TLB. I looked in the LIB.MLB and found the MACRO entry, but it didn't contain definitions for status that my subroutines have to return, such as PSM$__FUNNOTSUP and PSM$__EOF. I was fumbling in the dark when my subroutine had to return a PSM$__FUNNOTSUP status to a PSM$K__START__STREAM request.

Through trial and error, I managed to get the symbiont to do something other than return a "(JBC) unexpected termination" message. However, it still sent a formfeed.

Can anybody help, or suggest another method? Right now I have a small procedure, which stops and deletes the queue, writes to it directly and inits and starts it again. This requires privileges and is too sloppy to be an effective long-term solution.

REPLIES:

Jay Beller *(SIG 41/MESS 298):* No sooner had I finished entering my previous message than an idea came to mind. Because the symbiont or job controller will suppress formfeeds when the control string from a library is recognized as a standard escape sequence, I tricked it into treating the non-standard HP escape sequence as a private ANSI sequence. The format is:

```
<ESC>P laserjet escape sequence goes here <ESC>\
      i.e, landscape mode <ESC>P<ESC>&l1O<ESC>\
```

Print commands are of the format:

```
PRINT/SETUP=LANDSCAPE file.ext
```

I still need a method of printing soft font files without getting an eject at the end. For those unfamiliar with soft fonts, they can be between 25,000 and 100,000 bytes. Several usually are shipped at once.

Brian Desantis *(SIG 41/MESS 299):* Have you tried the /NOFEED qualifier either when initializing the queue or directly in the PRINT command? I'm not sure it would work, but it's worth a try. I, too, have a LaserJet (Series II) hooked up to my VAX, but I don't use it heavily enough to look for ways to save paper. I usually use it from a Mac SE. The Mac doesn't send a trailing formfeed, so it must be something from the print symbiont.

Jay Beller *(SIG 41/MESS 301):* The PRINT/NOFEED command won't solve my problem with trailing formfeeds.

The print symbiont normally sends a formfeed when your print job exceeds the bottom margin, as well as at the end of the printed file, if there was any outstanding text sent to the printer since the previous formfeed.

The /NOFEED qualifier suppresses the formfeed sent when exceeding the bottom margin. The formfeed sent at JOB__COMPLETION isn't affected by /NOFEED.

A critical use for the /NOFEED qualifier on the laser printer is that when you create documents with embedded control sequences, you may find that your output is split onto two pages. I first saw this happen when trying to print laser labels. Assuming that your bottom margin is 63 lines, your document may have 50 lines of text and 25 lines of control sequences. When you print the file, a <FF> would be inserted after the 63rd line, regardless of the fact that the LaserJet hasn't reached its 63rd line. If you use PRINT/NOFEED, the entire 75 lines would be sent without any <FF> characters. Using /NOFEED with a multiple-page document will require you to put your own formfeed characters into your document.

Brian Desantis *(SIG 41/MESS 302):* What about the /TRAILER qualifier in the PRINT command, such as PRINT/NOTRAILER or PRINT/TRAILER=0? Also, check to see if it's set in the INITialization of the queue, INIT/QUE/DEFA=(FEED,TRAILER).

Do you use system device control libraries (SYSDEVCTL) in defining printer forms? I know that my printer will print one blank page before printing the file. I'm not sure if the setup codes I use are on that page, but I assume so.

Does the printer queue have a /RESET qualifier to determine what to do after printing the file? If so, it may be sending codes on that last page to reset the printer, such as mine does beforehand. ■

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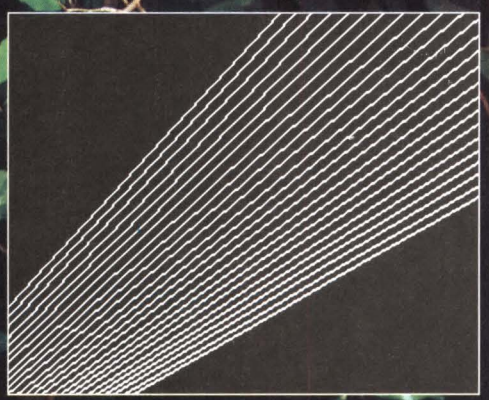

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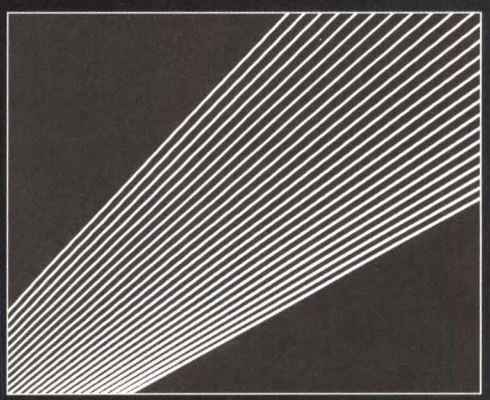

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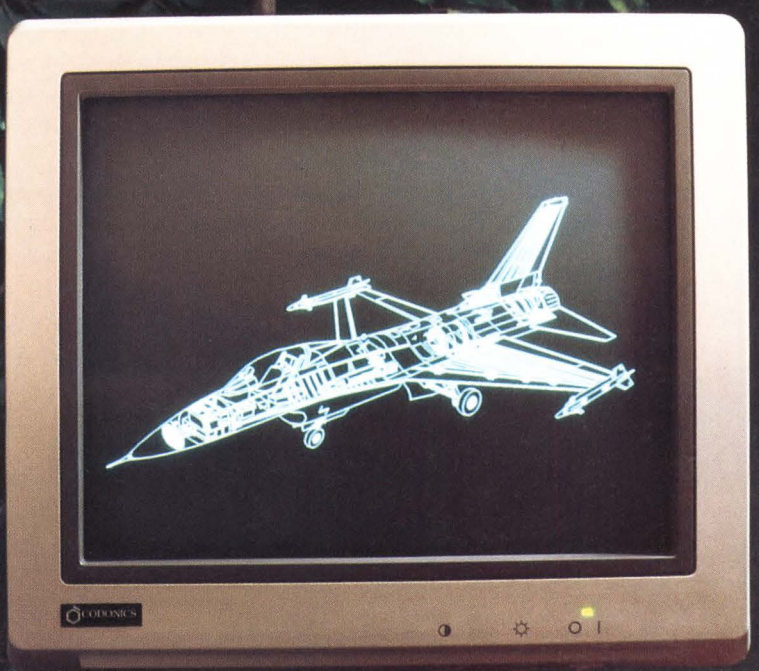

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PRODUCT WATCH

8mm Goes HSC

Micro Technology's High-Capacity Tape Subsystem Provides Unattended Backup

Micro Technology Inc. of Placentia, California, offers a tape subsystem that makes unattended backup a reality for managers of HSC-based VAX systems.

The MA-24 is a high-capacity 8mm helical-scan cartridge tape unit designed to be compatible with DEC's HSC40, HSC50 and HSC70 Hierarchical Storage Controllers. The MA-24 plugs directly into an HSC5X-CA card via a Micro Technology MA-90 SCSI-to-STI interface. The MA-24 is expected to be compatible with DEC's new HSC5X-DA card.

The MA-24 combines the 256-KB buffer of each drive with the 512-KB buffer residing on the MA-90 controller to ensure that streaming operations continue uninterrupted. The MA-90's buffer is divided into pairs of 64-KB FIFO pingpong buffers, one pair for each tape drive, to achieve a sustained streaming data rate of 246 KB per second. Peak transfer is rated at 1.5 MB per second. Buffer access time is rated at 400 microseconds.

Each MA-24 can back up 2 GB of data in approximately three hours. Micro Technology has configured the drives so that one master and three slave drives can be connected to each port of the HSC5X-CA card. A fully configured card supports 16 drives, providing 32 GB of unattended backup.

The new capabilities of the MA-24 allow system managers to take advantage of the HSC's off-line copy utility. This utility uses no VAX resources to do backup. The particular advantage with the MA-24 is that tape changing is reduced significantly when compared with doing the same operation with nine-track tapes.

MTBF for the MA-24 is 20,000 hours. Mean Time To Repair (MTTR) is 30 minutes.

The MA-24 is easy to use. A digital readout on the front panel displays ECC error-correction information. A digital display tells you how much tape remains and shows you read/write indicators, a tape-load indicator and a diagnostic indicator.

Stacking MA-24 units to achieve faster backup should be no problem. Each box is 5¼ inches high, 17¼ inches wide and 25¼ inches deep. A two-drive configuration weighs 34½ pounds.

Prices for the MA-24 range from $18,500 for a single drive to $153,000 for a 16-drive configuration. An 8-GB configuration with one master unit and three slaves costs less than $40,000.

For more information, contact Micro Technology Inc., 1620 Miraloma Ave., Placentia, CA 92670; (800) 999-9MTI.

Circle 378 on reader card

—David B. Miller

Micro Technology Inc.'s MA-24 8mm tape unit can connect directly to an HSC5X-CA card.

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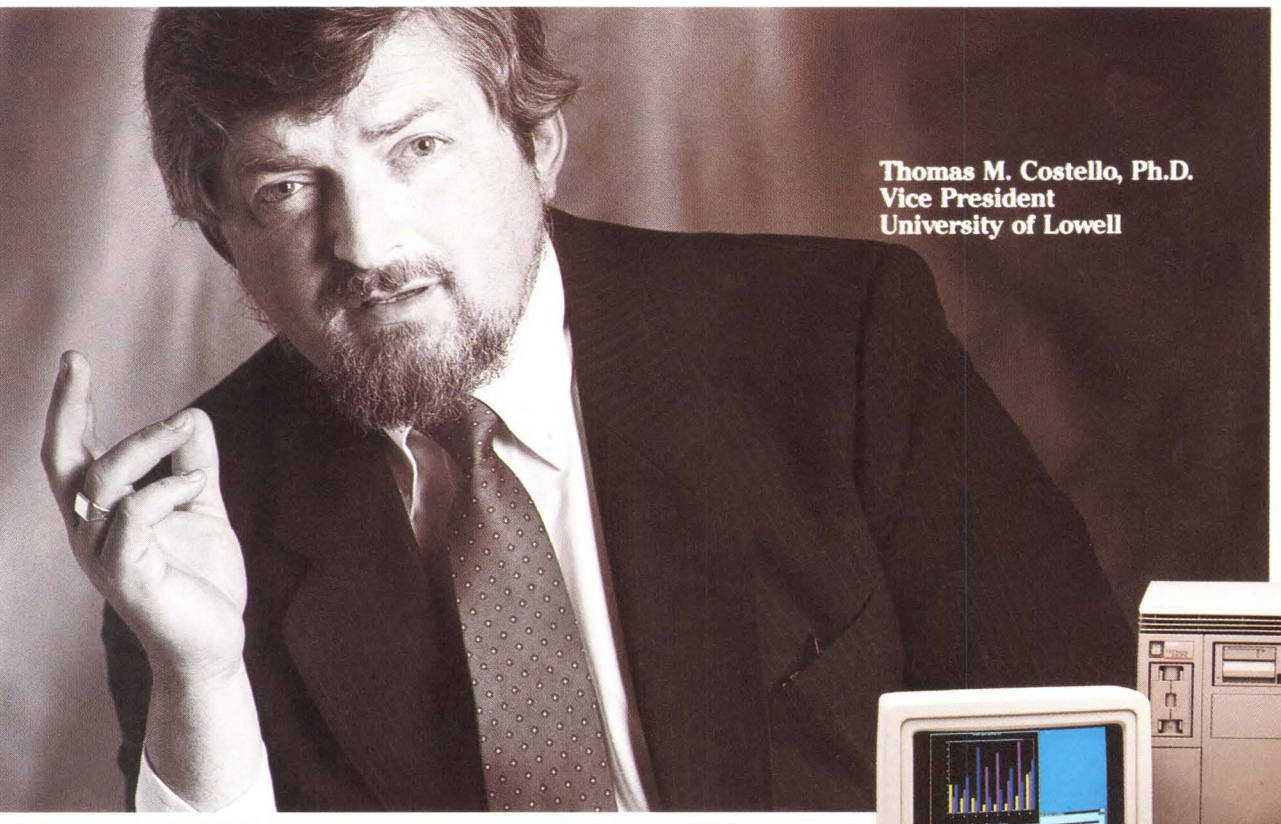

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CIRCLE 156 ON READER CARD

Intelligent Conversation

Intelligent Business Systems' EasyTalk Eases Pain Of Database Queries

User interfaces to database systems often are difficult to use unless you take the time to learn the language. Learning a database query language can be time-consuming in itself. Busy professionals have neither the time nor the desire to engage in such an activity.

If you own a VAX and run Oracle on it, relief is on the way. Intelligent Business Systems' EasyTalk, scheduled for release on May 9, offers an information retrieval and presentation system that requires only a knowledge of English. No knowledge of the database's structures or of its Structured Query Language (SQL) is required.

EasyTalk's Query System accepts conversational English statements and parses them into components. An expert system, a natural language interface and a query language processor combine to process the English statements into an SQL retrieval request that's applied against the database. You needn't see the SQL statements at all, unless you elect to. An easy-to-use reporting system then formats the retrieved data for presentation to the user.

For example, rather than remembering SQL statements and syntax, a sales manager simply could enter SHOW YEAR TO DATE HARDWARE SALES BY SALESMAN AND CUSTOMER to retrieve that information from his database. A statement such as GIVE ME THE TOP SALESPEOPLE FOR MAY also could be valid. EasyTalk understands such concepts as YEAR TO DATE, GIVE ME and TOP.

The target database can be at any level of complexity. Behind the scenes, EasyTalk can search for and retrieve information from multiple tables and present you with the needed reports.

Prior to use, an organization's database administrator and application experts use EasyTalk's Developer's Toolkit to build an expert-system knowledge database that contains the concepts and rules EasyTalk uses to interpret queries. The knowledge database, which is an Oracle database, can grow and change. It's easily modified to contain knowledge tailored to the applications it serves.

The Developer's Toolkit also provides facilities to maintain system users and analyze the system's data dictionary.

EasyTalk employs a flexible system of natural language representation. Representations are canonical; each can be parsed to a single meaning, thus avoiding the confusion even humans experience with terms that have more than one meaning.

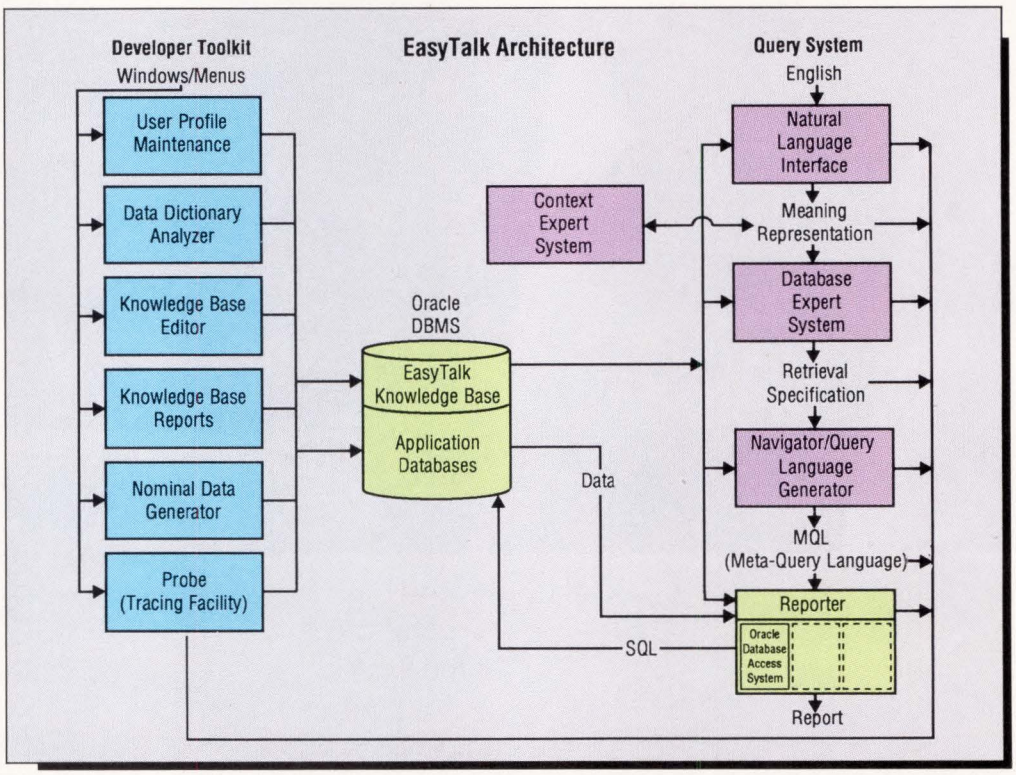
Although restricted to Oracle databases at present, EasyTalk's representation system is database independent. English queries are parsed first into a meta-language before a specific SQL statement is generated. This will allow EasyTalk to be used with other databases in the future.

EasyTalk can be set up easily by the company's database administrator. No special knowledge of expert systems or natural language processing is required.

For more information, contact Intelligent Business Systems, Milford Place Corporate Cntr., 185 Plains Rd., Milford, CT 06460; (203) 878-7960.

Circle 430 on reader card

— David B. Miller



EasyTalk combines natural-language, expert-systems and relational-database technologies to provide an easy-to-use English interface to Oracle databases.

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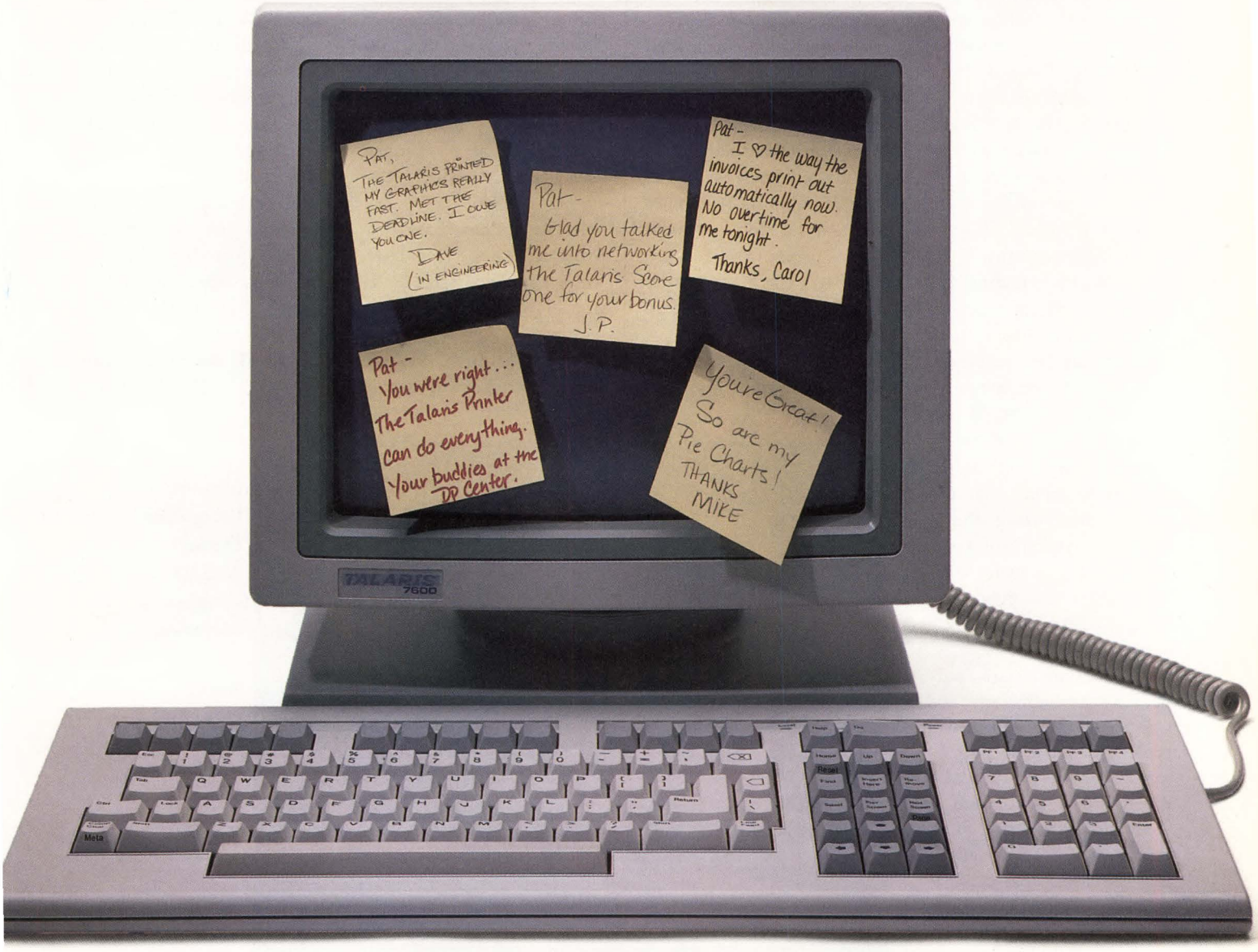

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TALARIS SYSTEMS INC.

Windows From Network Computing Devices

NCD's X Window Display Station Combines X Window Interface With Terminal Functionality

If the gap between the X Window System and your pocketbook looks impossible to bridge, windowing terminals such as Network Computing Devices Inc.'s NCD16 can fill the void.

The NCD16 is a high-resolution, compact desktop unit based on the X Window System. It's priced far below many X Window System-capable workstations.

Instead of running applications itself, the NCD16 is dedicated to display and communications functions. At the same time, windowing is fully functional, according to X Window System standards. It's suited for environments that can benefit from using the X Window System but typically don't have many users who need to run applications or store information on local workstations.

"Network users, particularly the engineering and scientific community, typically run complex applications on UNIX- or VMS-based hosts and need a sophisticated display function at their desks to output the results of those applications," comments Judy Estrin, NCD executive vice president.

"To get a display with multiple windows and high resolution, these users have had to buy PCs — and add high-resolution monitors — or diskless workstations at $5,000 and up," says Estrin. "But a large part of what they're paying for is the machine's application processing power, which often goes unused."

The NCD16 features a 16-inch diagonal, square-format, monochrome monitor. Refresh rate is 70 Hz. Resolution is 1,024 x 1,024 pixels at 105 dots per inch. An "overscan" feature eliminates the black border that surrounds the image on many display stations.

A 12.5-MHz MC68000 microprocessor forms the processing core of the terminal. A graphics co-processor assists with display functions. In addition to the processors, the system board contains from 1 to 4.5 MB of dynamic RAM.

One asynchronous RS-232 port, supporting data rates of up to 38.4 Kbps, is provided. In addition, a choice of ThickWire or ThinWire Ethernet, or an additional serial port, is offered. The additonal connectors are provided as a plug-in module and can be changed as needs dictate. The NCD16 supports TCP/IP.

The unit has a base footprint of 13 x 13 inches. There's no need for a cooling fan, so noise is eliminated.

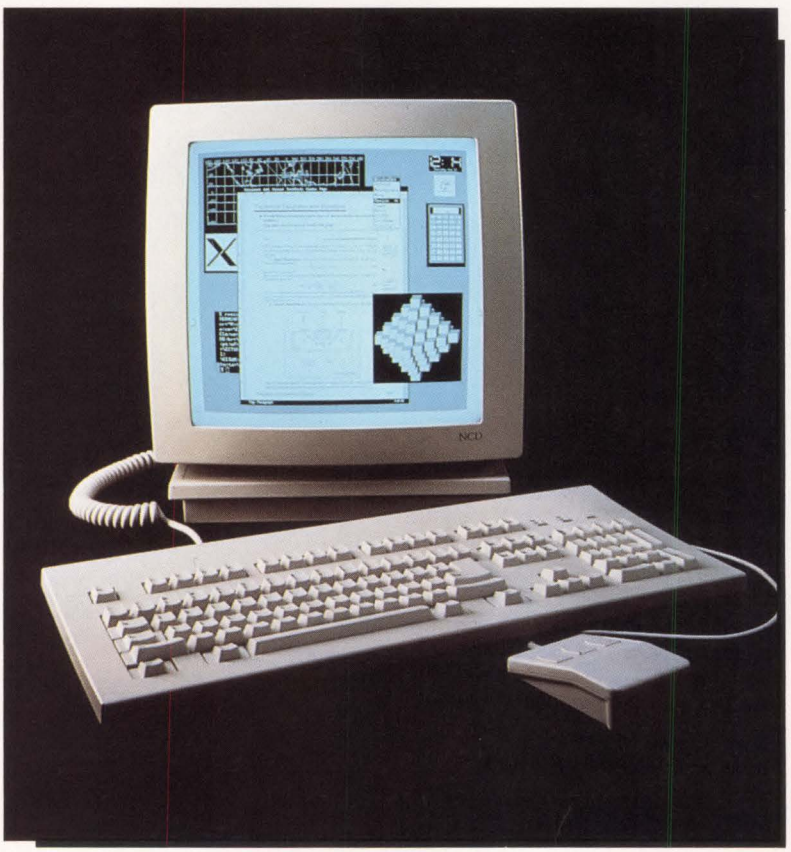
X Window System server software, optimized by NCD, can be downloaded from any network host supporting the TFTP file-transfer protocol. A PROM loading option is also available. The NCD16 supports the display server portion of the software. Thus, the NCD16 can provide display services for any networked host that supports X Window System applications.

Prices for the NCD16 with one RS-232 serial port, one Ethernet interface, a monitor, base, keyboard, mouse and required software start at $2,550.

For more information, contact Network Computing Devices Inc., 350 N. Bernardo Ave., Mountain View, CA 94043; (415) 694-0650.

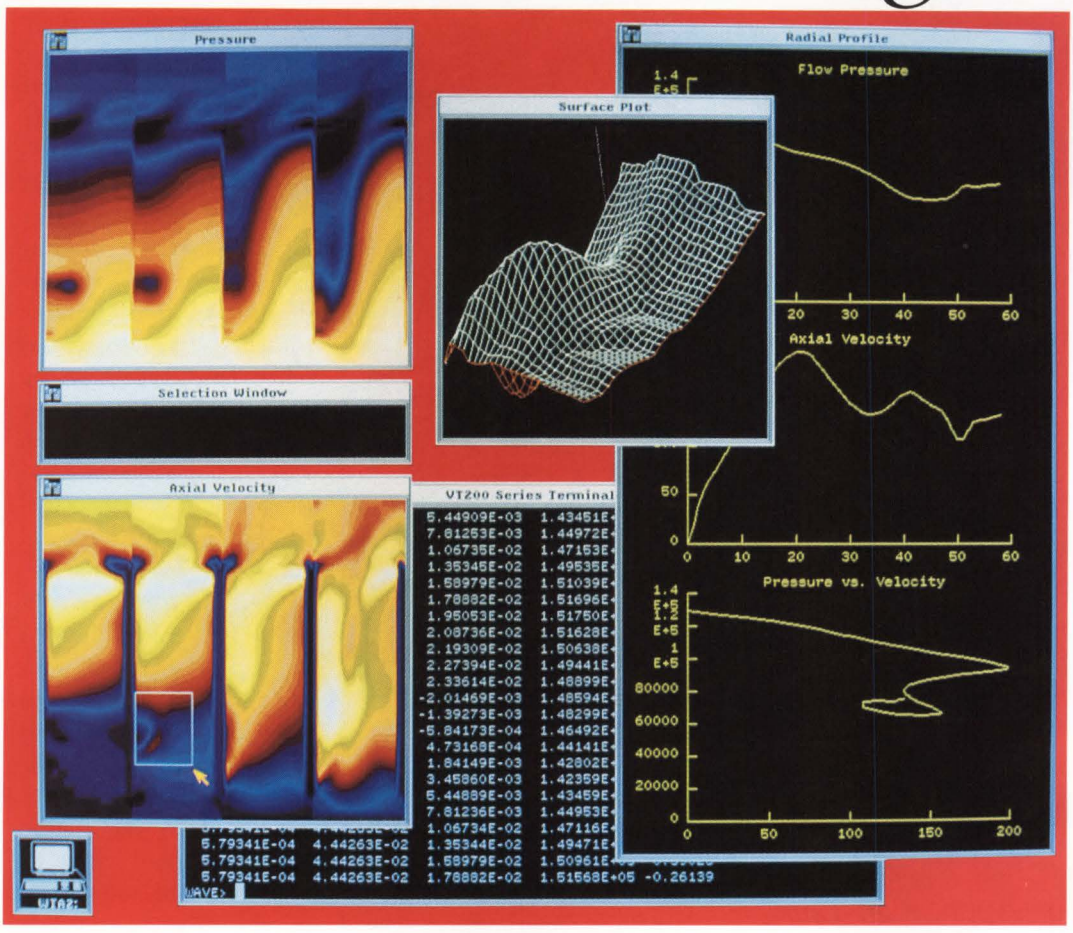
Circle 437 on reader card

— David B. Miller



Network Computing Devices' NCD16 is a high-resolution, compact desktop unit based on the X Window System.

Better Science Through Pictures



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

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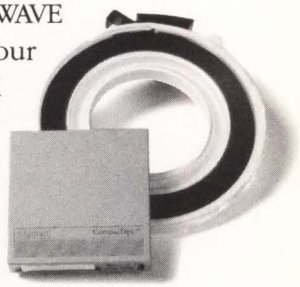

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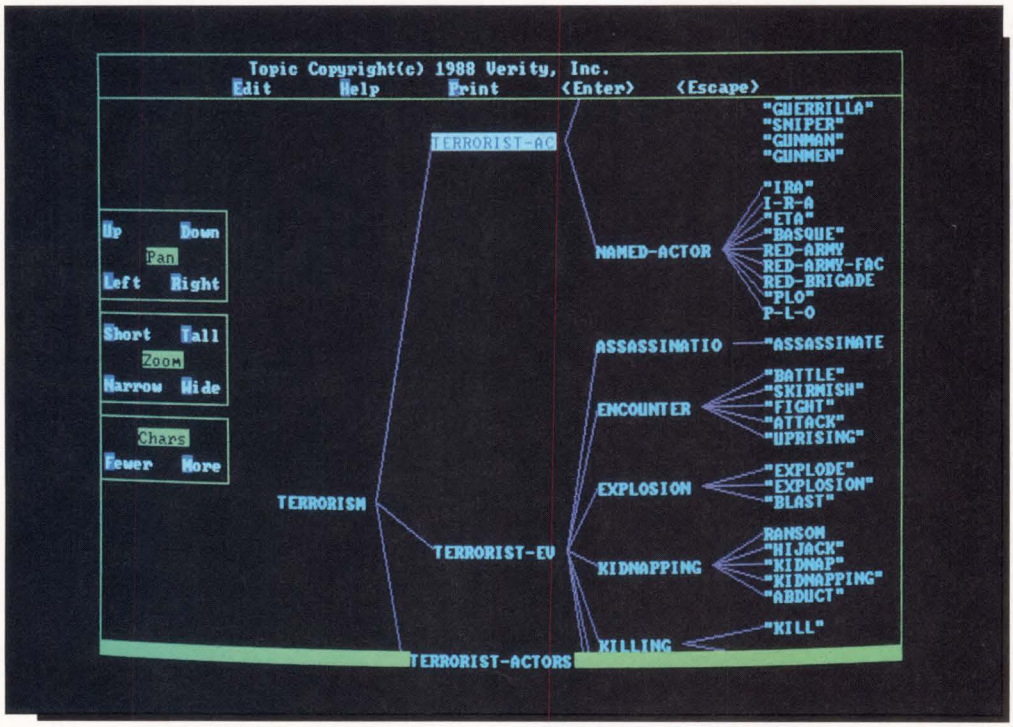

Verity's SQL-based text-retrieval system finds input search words and concept-related words.

Topic's Connectivity Scheme

Verity's Document-Retrieval System Uses SQL Bridges For Application Links

After a year of delivering Topic, its text retrieval system, Verity Inc. of Mountain View, California, has joined the big leagues of software development. With Topic, you graphically build topics to describe an area of subjects or concepts you need retrieved. This is done with an object-oriented querying tool.

The search objects aren't strings of words but a hierarchical outline that describes the concept using several possible topics and subtopics. The process, called Concept Retrieval, reportedly achieves a 95 percent accuracy rate for recall. From the user-specified information, Topic generates a list of documents.

Topic also functions as a document-management system, retrieving documents stored as free text in on-line flat files or inside an RDBMS structure. Topics then are ranked numerically according to relevance by a system of determining relative weights.

The process previously was accomplished by keyword searches and later by sifting and sorting procedures written with a Boolean logic retrieval language. Accuracy rates hovered close to 50 percent.

Written in C, Topic runs on VAX/VMS, MS-DOS and UNIX systems from Sun and Pyramid. It's optimized to perform retrievals in a networked environment. The minimization of traffic improves speeds across a network. The system sends text over the network, brings in information that it needs and saves it locally.

This architecture is a classic implementation of the client-server architecture of distributed computing environments. The library of topics resides on the client and each user has his own copy of topics.

After completing software integrations with major RDBMS systems, Verity signed joint marketing agreements with newly compatible vendors Oracle, Sybase, Relational Technology and Informix Software. The SQL-based bridges to each will cost approximately $2,500.

These relationships should foster activity in other areas. "Informix announced intended support for BLOBS [Binary Large Objects] several months ago," says Stephen Hill, Informix's director of product marketing. "We recognize, as Verity has, that there are many types of data our customers would like to store and manage in databases — things such as facsimiles, spreadsheets and word-processing documents."

On the hardware side, Verity has entered into a strategic alliance with Pyramid. The software also supports workstations and servers from Mips Computer Systems Inc. and the ULTRIX-based DECstation 3100. Topic will range in price from $12,500 to $20,000 on the Mips Computer Systems' processors. Network server software ranges from $9,000 to $66,000, depending on the size of the processor. Multiuser licenses range from $7,500 to $55,000.

The program is CGA and EGA compatible, and Verity is expected to announce an X Window System interface. Topic is available in two configurations: networkable or standalone multiuser. Besides DECnet, networks supported by Topic include Novell, TOPS, NFS and 3Com.

For more information, contact Verity Inc., 1550 Plymouth St., Mountain View, CA 94043; (415) 960-7600.

Circle 568 on reader card

—Evan Birkhead

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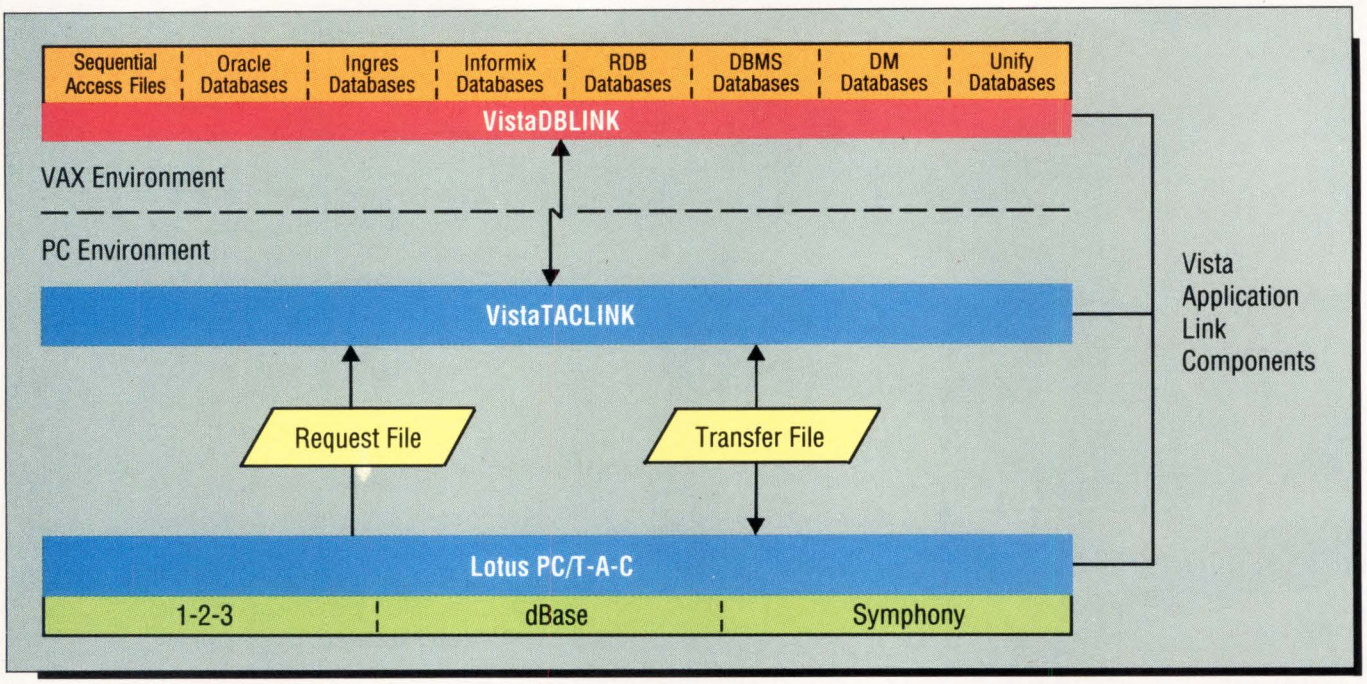


CDC's Vista Application Link lets Lotus 1-2-3, dBase and Symphony users access VAX data in various database formats.

Your Vista To VAX Data

CDC's Vista Application Link Provides Transparent Access To VAX Data

You like the idea of using PCs to run Lotus 1-2-3 and dBase applications. However, the bulk of your data resides in a database on your VAX. How do you get the data from the VAX to your PCs without rekeying it? Control Data Corporation's (CDC's) Vista Application Link can bring relief.

As part of its overall Transparent Computing Environment, CDC has introduced the Vista Application Link to allow users of Lotus 1-2-3, Symphony and dBase to access, in a transparent way, data stored on their company's VAXs in a number of popular formats. In addition, sophisticated users can use Lotus 1-2-3 macros and menus to allow for ad hoc interaction with the host system.

Three components make up the package. Lotus PC/T-A-C, a Lotus add-in program supplied by CDC, provides the interface to the PC's application software. Specialized versions of PC/T-A-C are available for Lotus 1-2-3, Symphony and dBase. VistaTACLINK and VistaDBLINK, the other two components, provide PC and VAX interfaces and communications control.

Eight VAX interfaces are available to accommodate a variety of VAX databases. These include DBMS, Rdb, Oracle, Ingres, Informix, Unify and IM/DM. Sequential files also can be accessed via the Sequential Access Method (SAM) connection.

Vista Application Link gets VAX-resident data by first building a request file on the PC. The request file is uploaded to the host. VistaDBLINK is invoked to process the request. A transfer file containing the requested data is downloaded to the PC. The data file then is imported into the PC application.

Vista Application Link resulted from CDC's participation in Lotus Development Corporation's The Application Connection (T-A-C) program. Its major benefit to users is its ability to allow VAX hosts to store and manage large databases while allowing Lotus 1-2-3, Symphony and dBase users to access that data. They also can download portions of VAX-resident data to their PCs.

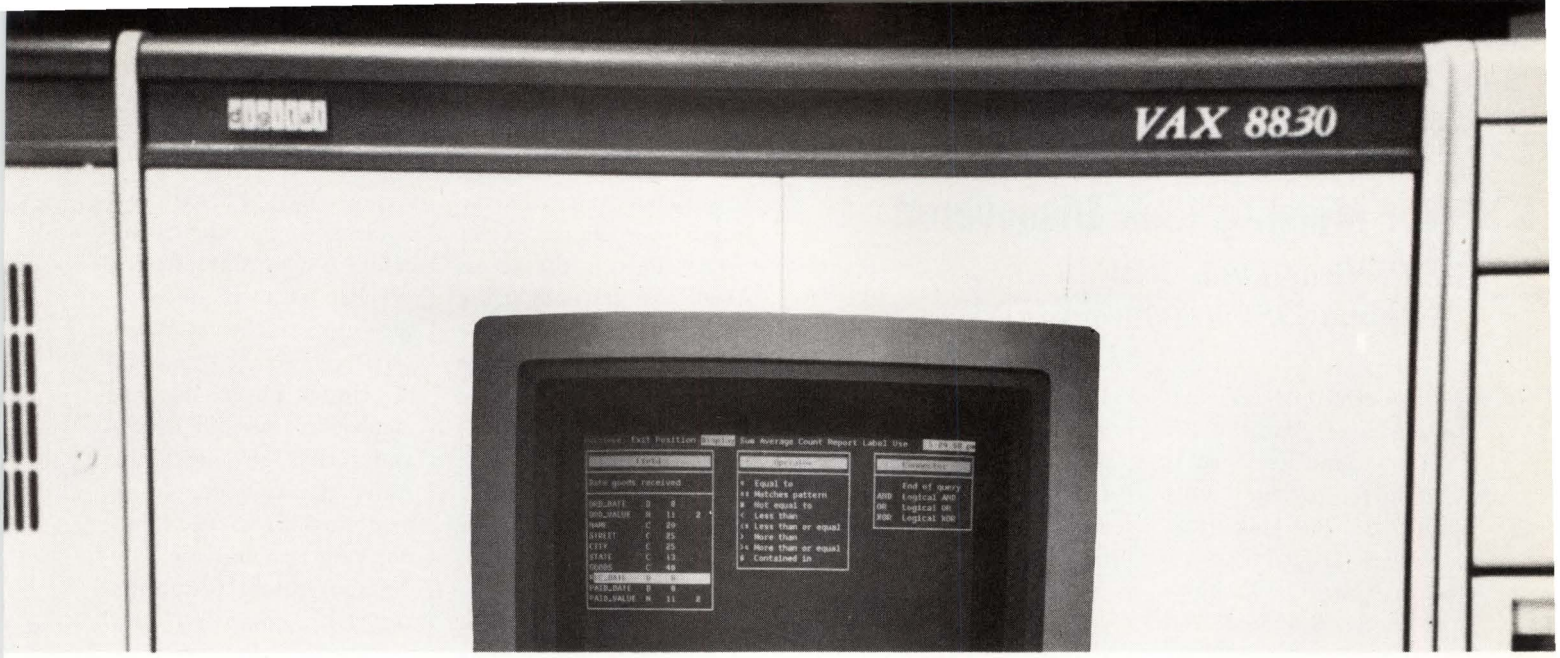
For sites with both PC- and VAX-based applications, Vista Application Link can reduce data entry and improve productivity. Additionally, users familiar with Lotus 1-2-3 and dBase don't have to learn new applications. Users never leave the Lotus 1-2-3 or dBase environment.

Vista Application Link operates on IBM PC, XT, AT and PS/2 microcomputers and compatibles running Lotus 1-2-3, Symphony or dBase. VAX systems running VMS or ULTRIX can be accessed. Prices range from $2,000 to $40,000, depending on system configuration.

For more information, contact Control Data Corp., 9111 Edmonston Rd., Ste. 200, Greenbelt, MD 20770; (301) 982-9550.

Circle 427 on reader card

—David B. Miller



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PDP Missing Link Discovered

PDPs Share Disks With Northwest Digital Software's Link

Loyal PDP-11 owners now can enjoy many of the same benefits their VAXcluster-owning colleagues do. The Link, from Northwest Digital Software Inc. of Newport, Washington, lets two or more PDP-11 processors running RSTS/E share disk information. Transparent access to data residing on up to eight disks attached to any CPU in the cluster is possible. Users and applications can take advantage of full file protection and privilege capabilities as well as other features, such as record locking, RMS, data caching, open modes and monitor calls. No change to existing software is required.

Standard DEC DR11 parallel DMA interfaces are used to establish The Link. Standard terminal interfaces or DECservers can be used to connect users to each processor. Peripherals other than disks aren't shared. Access to non-disk peripherals is available to all nodes by using intelligent switching hardware.

Data can be accessed across a cluster in a unidirectional or bidirectional fashion. A unidirectional configuration requires only one pair of DR11 interfaces. Adding another pair of DR11 interfaces will enable bidirectional disk sharing. Each node in the cluster can access disks attached to up to four other nodes (see Figure).

When a request for data is made from a disk on a remote node, it's intercepted by The Link. The Link sends the request to the server node across the DR11 interface. The request is processed on the system doing the file serving. Use of logical names keeps requests directed to the proper disk on the server system. Remote file access behaves as it would if the disk were attached to the local system. User account privileges are enforced in regard to file access and protection. Record size for file transfer can be up to 8,192 bytes long. The next release will remove all restrictions on the record size of any transfer. RMS access can be done without modification.

Data transfers between two systems are rated at approximately 1 MB per second on UNIBUS systems and approximately 0.5 MB per second on Q-bus systems.

Managing a PDPcluster isn't a difficult task. System startup and shutdown are performed essentially the same way as with standalone systems. There are only two requirements to note. The server systems must be started to the point of running The Link file server program before remote nodes can access disks on the server. Also, all files on shared disks must be closed before system shutdown.

You aren't required to set up accounts and privileges on each node in the cluster, but it's recommended to ease file access and privilege checking. Although user accounts can't be created across The Link, non-user accounts can.

Compiled programs and DCL command files residing on a shared disk are executed by making a copy of the program, using PIP, across The Link to a local disk on the remote system. BASIC-PLUS source files can be executed across The Link without restriction.

Environments in which several processes run concurrently will see performance improvements in the PDPcluster configuration, because the timesharing load is divided among processors.

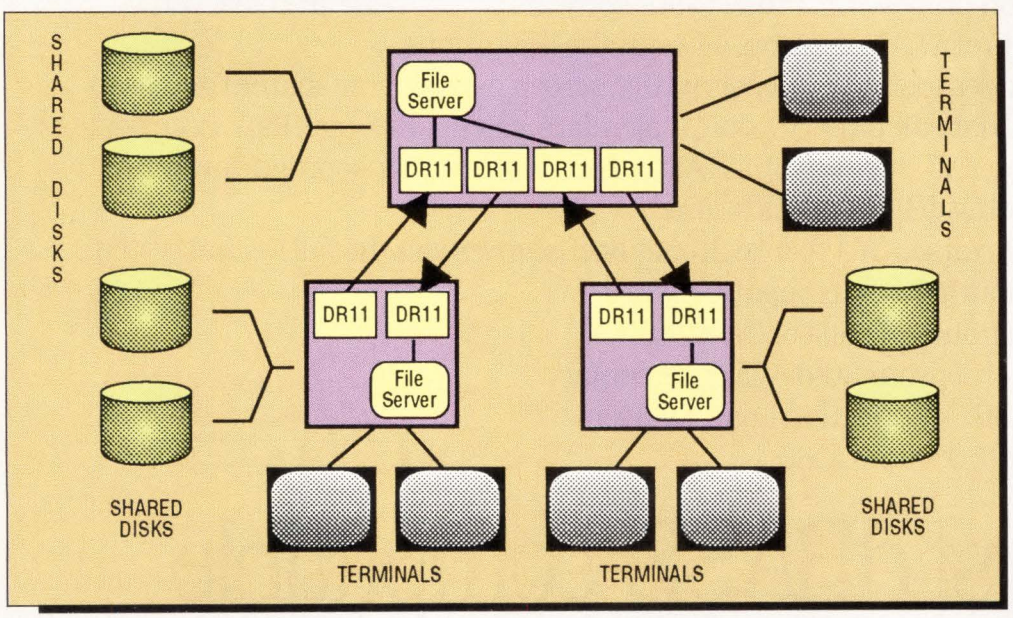
Minimum hardware requirements include PDPs with 1 MB or more of memory, DR11-Ws for UNIBUS systems or DRV11-WAs for Q-bus systems and two BC08R or BC06R cables for each interprocessor link.

RSTS/E version 9.2 or later or Micro/RSTS version 2.1 or later is the required software. Software versions needn't be consistent across the cluster. Any combination of versions is permitted.

For more information, contact Northwest Digital Software Inc., Box 1797, W. 405 Walnut, Newport, Washington 99156-1797; (509) 447-5631.

Circle 396 on reader card

— David B. Miller



This configuration of The Link lets two or more PDP-11 processors share all disks.

EM4105 is a sophisticated Tek 4105/DEC VT220 terminal emulator that converts your IBM PC into a color graphics workstation. EM4105 costs thousands less than a dedicated graphics terminal.

4105 EMULATION

EM4105

- *16/64 colors*
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And, EM4105 includes all the features of DCS's popular VT220 emulator, EM220.

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Other DCS emulators: EM220 — DEC VT220 Emulation
EM4010 — Tek 4010/VT220 Emulation

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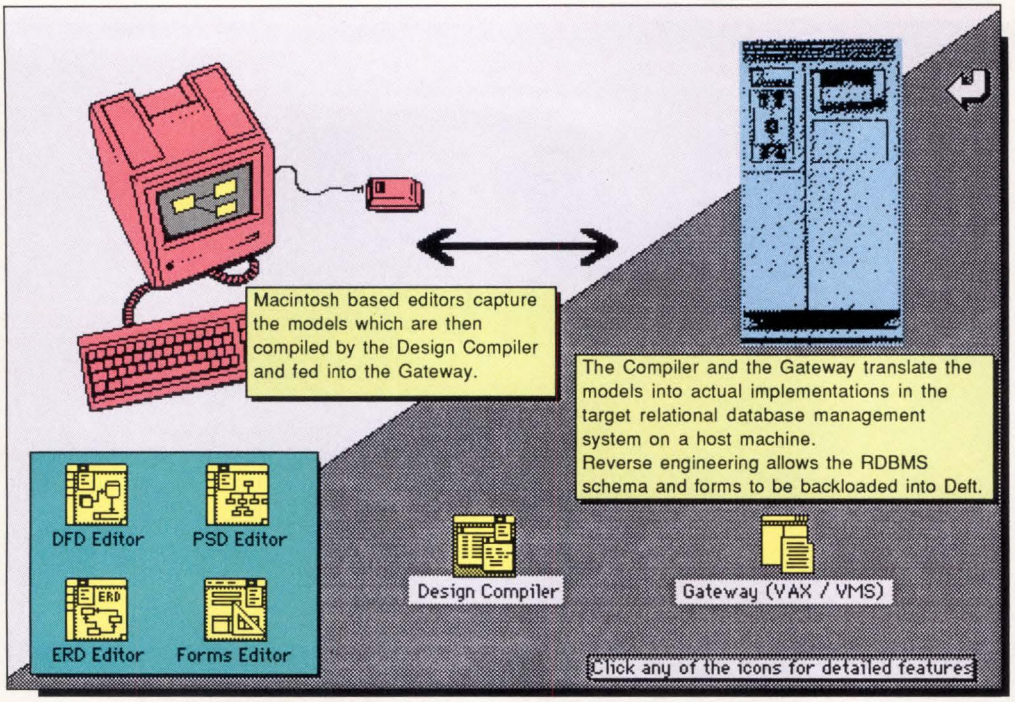


Front-end design is done on the Mac. An application is generated on the VAX.

A Deft Move

Deft Inc.'s Package Of CASE Tools Takes Advantage Of Mac And VAX Environments

The use of CASE tools to reduce the backlog and ease the generation of quality software systems has grown in recent years. When used properly, automated software tools can save development time, reduce development costs and produce better software systems.

However, CASE tools shouldn't be so difficult to master that their purpose is defeated. Deft Inc. of Toronto, Ontario, has developed a CASE system that provides a powerful set of CASE tools that's easy to learn.

The total Deft environment consists of a Mac connected to a VAX. The Mac is used to do the front-end design work, such as generating Data Flow Diagrams (DFDs), Entity Relationship Diagrams (ERDs) and Program Structure Diagrams (PSDs). The VAX can accept the designs created on the Mac to generate applications using VAX-based databases such as Ingres and Rdb/VMS.

Deft's DFD Editor features the Yourdon and Gane & Sarson methodologies for creating DFDs. Methodology rules can be checked on-line. Diagrams can be drawn with an unlimited number of process levels and data flows. Flows can be populated automatically as they're generated.

In addition, multipage diagrams can be produced, and a diagram's graphics and text can be exported to many Mac applications. Reports generated about a diagram can be integrated into PageMaker.

The ERD Editor supports logical and physical design. Diagrams can be drawn that follow the Chen/Bachman, Martin or IRM methodologies. Primary and secondary keys and addresses are indicated on-screen. Deft's key definitions correspond to the RDBMS on the host that will be used for database and application generation. A flexible reporting system can produce detailed reports on the diagram and the data residing in the system's data dictionary. As with the DFD Editor, graphics and text produced by the ERD Editor can be exported to Mac applications.

Deft's PSD Editor uses the Jackson methodology of structured program design. Subroutines and reusable code are supported. In addition to visual desk checking, methodology rules are checked on-line. An unlimited number of levels of task explosion is supported.

Forms are an integral part of many software systems. Deft's Forms Editor allows a developer to lay out custom forms, which include fields with various video attributes and editing and validation checks. Fields can be rearranged easily to suit the needs of the developer. Because they're generated on the host RDBMS, Deft forms can be used for more than just prototyping purposes. They become part of the production system.

After the required charts, diagrams and forms are completed, the Design Compiler is used to prepare the system to be uploaded to a VAX host via Deft's Gateway module. The Design Compiler checks for diagram completeness and for the proper use of design methodology. After a system meets the Design Compiler's criteria and all errors are eliminated, an object file is produced. This object file is used to generate schemas and forms that can be used with the host's target database. For Ingres databases, the Gateway also can be used to go the opposite way. Deft can use existing database schemas to generate a data dictionary and ERDs on the Mac for maintenance and reverse-engineering purposes.

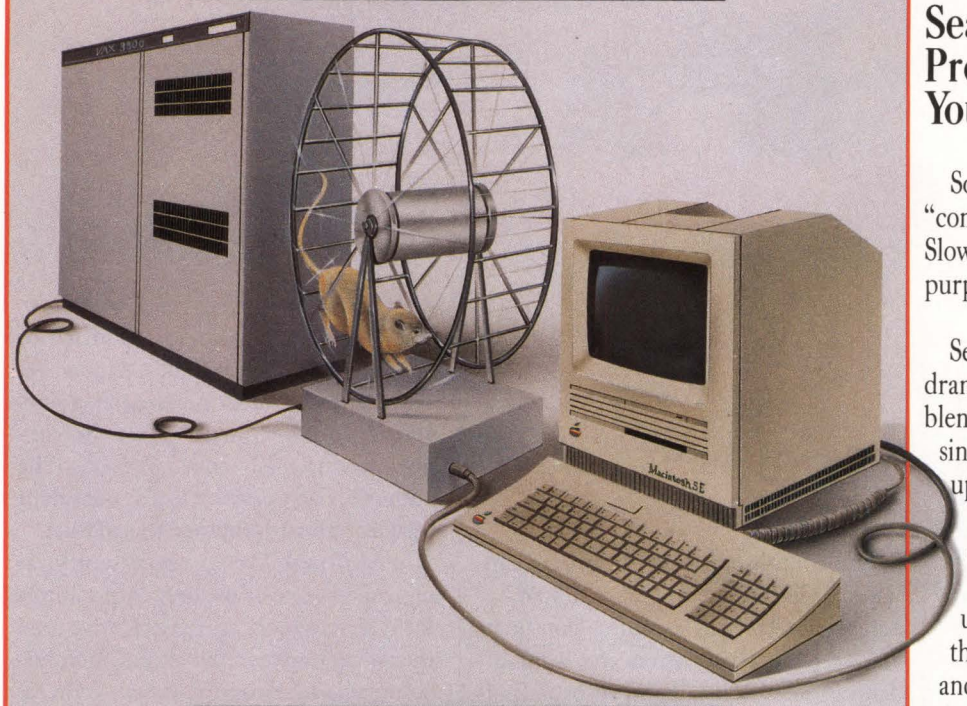
Mac modules are priced from $2,900 to $9,000. VAX modules are priced from $15,000 to $20,000.

For more information, contact Deft Inc., 557 Dixon Rd., Ste. 110, Rexdale, Ontario, Canada M9W 1H7; (416) 249-2246.

Circle 441 on reader card

—David B. Miller

"Connectivity"



SequeLink™

SequeLink: First To Give Macs Seamless Co-operative Processing With Your Server DBMS.

Some people's concept of Mac/VAX "connectivity" is decidedly mousey. Slow, limited and, for all practical purposes, one-directional.

SequeLink is a totally unique and dramatically better solution. It fully blends both client and server into a single architecture, transparently updating both sides of the partnership. Preprogrammed SQL statements define bidirectional data flow to keep system-wide information up-to-the-second accurate. Think of the possibilities! You'll have OLTP and Decision Support applications using the Mac's friendly human interface, combined with all the power and security you now have on your VAX's RDBMS.

Through SequeLink's cached no-wait architecture, Mac users have transparent access to most popular RDBMS's—Ingres, Oracle, Rdb, Sybase—all with the simple click of an icon. They can concurrently manipulate multiple SQL commands within multiple connections, even on multiple servers. And doing so won't tax the system's overall performance. In fact, it'll improve it.

Best of all, SequeLink performs its feats with ease of implementation, proven reliability and measurable economy. So not only will you be doing a better job managing the corporate data, but corporate resources as well. Which should go over very well with top management.

If you want more than just connectivity, connect with TechGnosis.

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BOOKSHELF

THE ENTREPRENEUR AND THE ENTERPRISE

In 1957, two young engineers rented space in an unused woolen mill and, with $70,000 in venture capital and a good idea, began what's now the world's second-largest computer manufacturing company, hot on the trail of industry-leader IBM. Those two men were Ken Olsen and Harlan Anderson and, 32 years later, at age 63, Olsen is still at the helm. His company's products, his unique management style and his penchant for a low profile have made him an industry legend. In a formidable effort, writers Glenn Rifkin and George Harrar analyze DEC and attempt to capture the essence of the man whose spirit pervades his company.

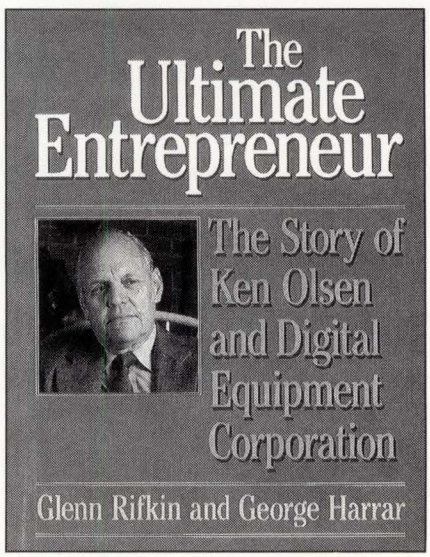
The Ultimate Entrepreneur: The Story of Ken Olsen and Digital Equipment Corporation chronicles DEC's history from its conception through its development into a multibillion-dollar, international business. But the book's title perhaps more accurately should read *The Story of Digital Equipment Corporation (and Ken Olsen)*. Those looking for insight into the personal life of Olsen or for Olsen's pronouncements on the computer industry, past and future, may be disappointed. Not surprisingly, the book wasn't sanctioned by DEC, and DEC employees were dissuaded from providing information.

Rifkin and Harrar, however, have done their homework: Not a moment in DEC's history, it seems, has been omitted. The book begins at DEC's inception in 1957, when venture capital was a new idea and computers were 30-ton machines in sealed rooms. From the innovative labs at MIT came a man with the idea that computers should be accessible by all people, not just engineers. With a vision and a lot of dedication, DEC made a profit its first year, and within three years introduced the PDP-1, the first of a product line that would last some 20 years.

DEC continued to produce important products throughout the 1970s and, with the announcement of the VAX architecture in 1977, DEC had established itself as an important presence for the 1980s. Curiously, however, Olsen failed to take his idea of an accessible computer the next step to personal computing. DEC's missed opportunities in this arena have cost DEC billions and have been a continued thorn in its side. The book examines the events that conspired to keep DEC from the forefront of what should have been its territory, and how Olsen and his company have responded to the challenge this market has presented.

As DEC grew in size and profits at an amazing rate, it battled with the difficulty of adjustment. The book interviews key executives, many of whom are no longer with DEC, who give insight into those turbulent years. We get a glimpse of Olsen's unusual management style, of a man who would publicly berate his vice presidents, but who nonetheless commanded from them respect and almost familial dedication. We get an inside view of what led to DEC's Black Tuesday on October 18, 1983, when its stock plunged 21 points and the press turned against the corporation it had once praised. The authors also cover DEC's confident turnaround to recapture the market.

Although DEC consistently is reported as one of the best corporations for which to work, at the executive level this wasn't always the case. Olsen encouraged an entrepreneurial style of management that ultimately produced superior products but often set one department against another. DEC's matrix became a model for corporate management, an innovative approach that, while it often threatened to ruin the company and has developed and



The Ultimate Entrepreneur ***documents DEC President Ken Olsen's creation and continued leadership of his computer company.***

The Ultimate Entrepreneur
Glenn Rifkin and George Harrar
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changed over the years, has been key to DEC's success.

More often than not, Olsen isn't presented in the most flattering light. He's depicted as a man who drives his executives to the breaking point, who meddles into every aspect of a project's development and whose bull-headedness leads him to circumvent his own company's goals or to misread important industry developments.

While Rifkin and Harrar's contentions are documented, it seems to me that a man who can manage an organization for more than 30 years and lead it to the number two spot in a cut-throat market must be doing something right. Perhaps this tainted view is the result of interviews with many former DEC employees who left the company on less-than-favorable terms. Still, most of the people interviewed consider Olsen a great man.

Rifkin and Harrar have been in the computer industry for some time as editors of *Computerworld*, a fact that becomes apparent in their writing style. Sentences are written in a short, clipped style, and few stray from a simple noun-verb construction. This works fine for a newspaper, but gets a bit tiring in any other forum. Still, the copy moves along at a good pace, a nice feature in a book of 332 pages.

The volume of material presents a structural problem: Transitions from one topic to another, from one time period to another, seem a bit arbitrary. Also, some information is repeated. And perhaps we're given *too* much information. For example, are we really interested in a four-paragraph description of what companies occupied the mill before Olsen and Anderson rented it?

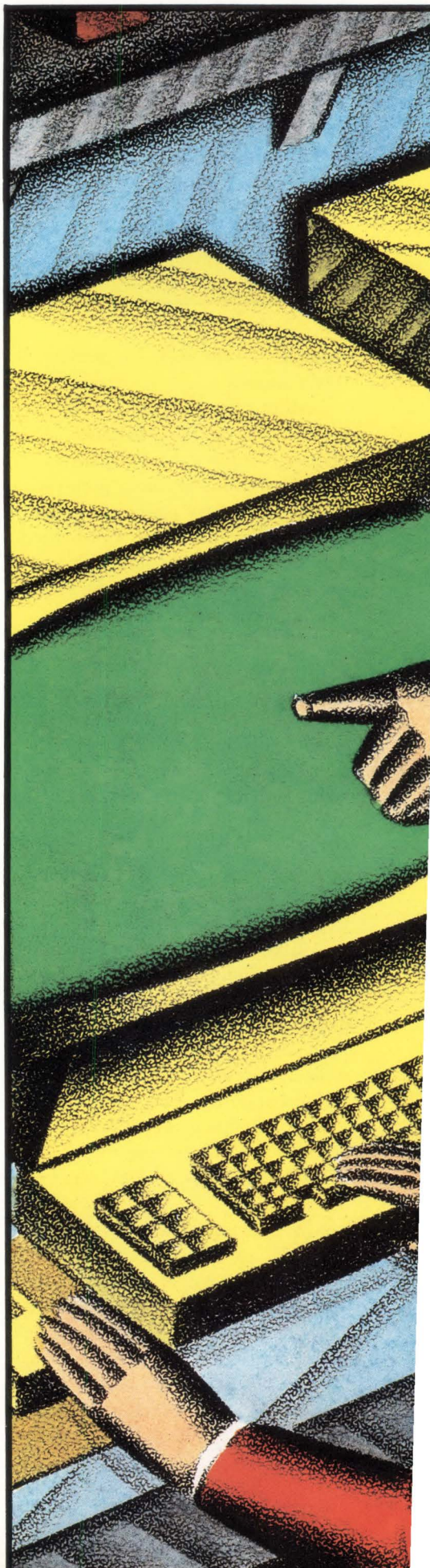
In spite of its flaws, the book presents a fascinating and analytical view of the development of DEC and the computer industry as a whole. Those interested simply in obtaining an overview of computer industry history — the important people, companies and products, how they began and how they relate to and react against one another — will leave this book rewarded. Appendices of important people and companies, as well as a complete index, make this a valuable reference tool. It's worth reading, a fine tribute to a notable company and the man behind it.

—Reviewed by Eric Schoeniger

BUILDING X HARDWARE PLATFORMS

Devices to bring X onto the desktop.

BY BRADFORD T. HARRISON

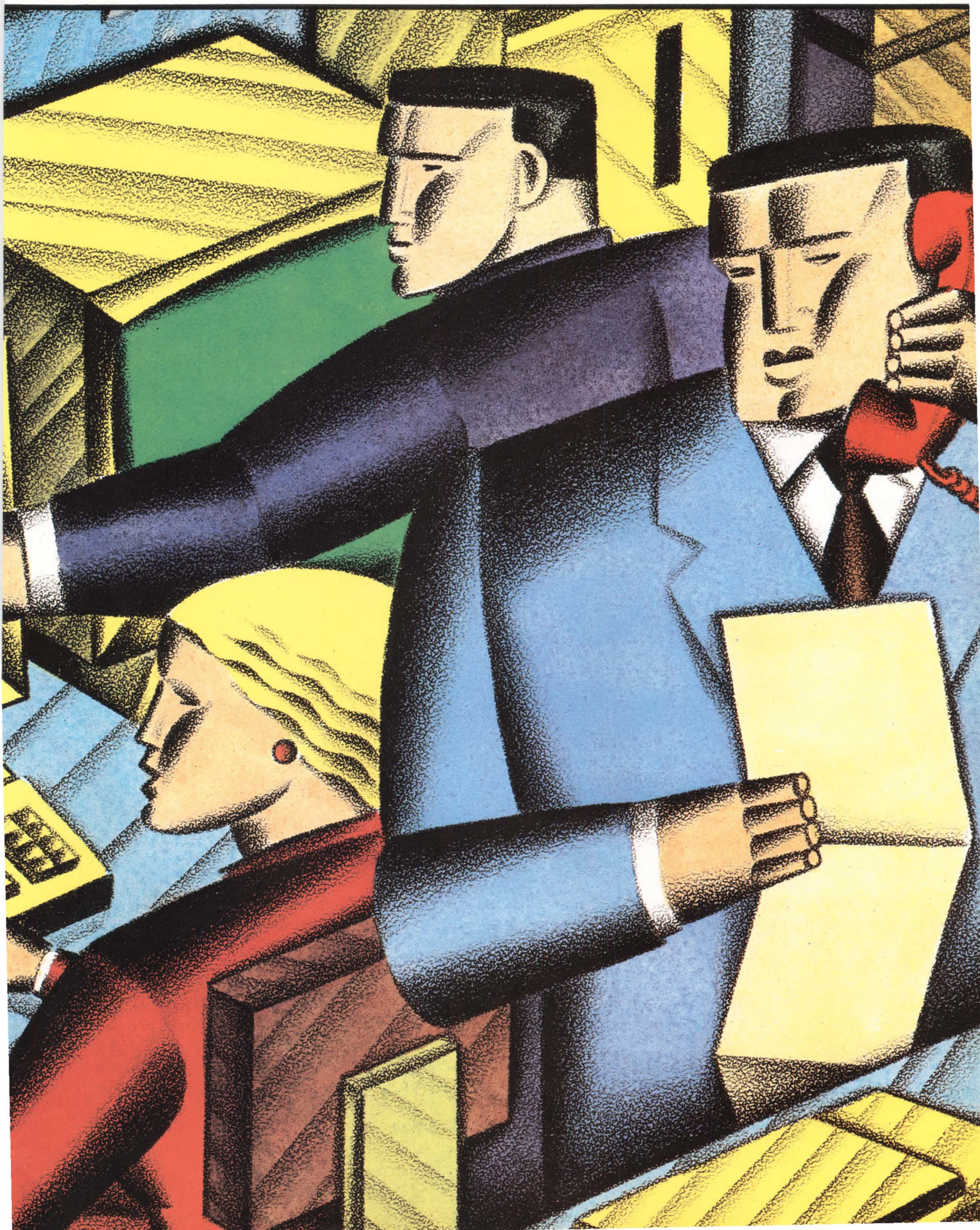


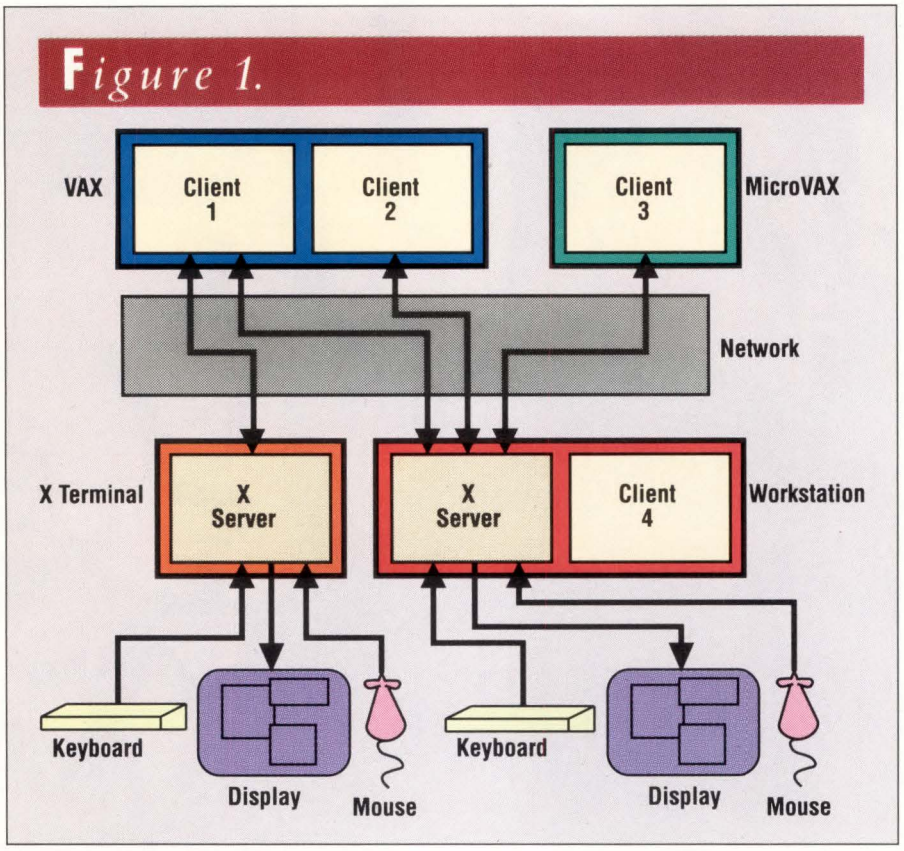
ALTHOUGH THERE'S RELATIVELY little application software available for support of the X Window System standard, and although final agreement among all major players hasn't yet been reached in regard to user interface and toolkit standardization, DEC customers can feel comfortable bringing X into their environments. The success of X already has been ensured.

There are several reasons for this. The most important is that the design of X is acknowledged universally to be superb. Technically, it's outstanding, yet it incorporates the flexibility required of a standard that's destined to be implemented in a variety of ways by individual users and computer companies. Key to X's success, this flexibility doesn't interfere with compatibility among equipment from a variety of vendors or with later generations of equipment.

As defined by MIT, X is totally upward compatible. The worst that can happen in an environment in which two different implementations of X are running simultaneously is that the user will have a difficult time mentally switching among the different rules for interaction with the applications. In a worst-case scenario, this could result in damage to data files, but that would be an extreme.

Acknowledgement of the value of X has caused widespread acceptance of the standard among computer companies. OSF and UNIX International are implementing or have announced plans





Client-server communications.

to implement the standard. These implementations aren't in all cases the same, but that doesn't matter. The important point is that everyone implements the primitive layers of X in the same way, and that's done the moment a developer decides to implement the standard.

X success also is ensured by the fact that DEC is deeply committed to the standard. VMS version 5.1 incorporates DECwindows into the operating system — a bold move, and a sure sign that DEC isn't going to relax until X has been accepted by software developers industrywide. DEC also is offering DECwindows for use with ULTRIX and, soon, an MS-DOS server.

Fueled by all the activity surrounding X, the X hardware platform is growing rapidly. X terminals, X workstations and X PCs are moving onto networks. Developers and in-house programmers are gaining proficiency in X programming environments. And, as occurred with the Mac, users and programmers are beginning to wonder how they ever got along without a windowing interface.

The Need For X

At the most basic level, X has replaced standard alphanumeric computing and the restrictions it placed on the computer industry. The split between ASCII and EBCDIC has caused many problems in systems integration and networking. But, as standards, ASCII and EBCDIC have allowed for basic communications between computers and peripherals from different vendors.

As more customers demand windowing displays, ASCII and EBCDIC, as display standards, will follow the punched-card reader into oblivion. Alphanumeric information will continue to be stored in these formats, but all computer display will occur according to the X bit-mapped display standard. This will open not only use of windows and graphics industrywide, but support for any alphabet in the world.

X is providing a common user interface across the network and, potentially, around the world. And just in time, because the trend from centralized to distributed computing has confused many users by requiring them to learn new environments on remote computers.

Breakthroughs in microelectronics and communications technology are putting networked processors on every user's desk or at every user's station, and everyone throughout the organization is being asked to become proficient on many systems. Users are being given access to any resource on the network, but users will take advantage of these resources only if they have an easy way to work with them.

X allows the network to appear as one large system to the user. He can display and manipulate multiple windows on his terminal or workstation. The process displayed in each window can run on a separate processor on the network. He can display the output of a solids-modeling program running on a Cray supercomputer 10,000 miles away, while at the same time use local word processing software. He doesn't care what make of machine is running his application. He knows only that the processor power is available and that he's able to work with any process from his terminal.

In the DEC environment, these capabilities are available on both DECnet and TCP/IP networks. There's a greater number of non-DEC products available for TCP/IP networks, but this is because TCP/IP is easier to implement. All players soon will support DECnet, if they don't already.

How X Works

X is part graphics protocol, network protocol and application interface specification. It provides a mechanism by which an application located anywhere on the network graphically interfaces to the user and displays the results of its computations on his display. Its closest

predecessors are the industry-standard graphics protocols.

Graphics protocols are required, because graphics data, which is bit-oriented, can be so voluminous that its transmission would saturate any serial link, and the graphics file size would be too large to store and access conveniently. In the past, this link most commonly has been the RS-232 serial link between a terminal and its host, transferring data at rates of 19.2 Kbits per second.

Transmission at this speed is fine for alphanumeric information, which is then converted into characters and numbers for output onto a row-by-column grid. But for graphics applications, some time would be required just to display a single screen of graphics.

Therefore, graphics protocols are used to construct graphics on the screen of the terminal. The protocol is translated by the terminal and the display is constructed much faster than if information about each individual pixel were transmitted. For example, the de facto Tektronix 4010/4014 standards are the most widely implemented to get the foundation of a graphic on the screen. The Tek 41xx protocols then take the process several steps further: The 4105 adds color and the 4107 and 4125 protocols specify the more complicated segment graphics protocols.

There are also standards for three-dimensional graphics, of which PHIGS is the best known. Some standards, such as GKS, were developed to be programmer friendly and device independent. After they're implemented, they're converted into the standards used by a given output device for transmission to that device.

X is radically different as a graphics protocol. X requires two parts: server and client (see Figure 1). Servers and clients can exist within the same device or can be spread among different devices in the network. A client is an application program that directs its output to a server and receives input regarding user actions from the server. The server

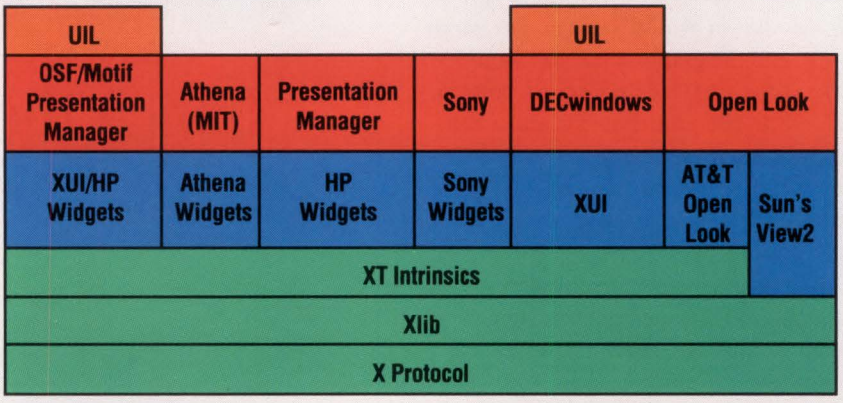
displays output onto the screen of the device that it's handling and receives input from the keyboard and mouse for transmission back to the client. There may be several servers running on a given host, servicing multiple X displays.

The server consists of three parts: an interface to the operating software of the device on which it's being used; a device-independent layer that communicates with supported clients; and an interface to the specific devices supported. The server communicates directly with the display's graphics memory (no device drivers and no other graphics protocols are used), and operating system device drivers are used for mouse and keyboard operations. If the monitor (screen) isn't built into the device, as in an X terminal, then a video port is used to support it, as in most workstations.

Servers must be ported to each processor supported. The MIT X11 specification (the current version) gives very specific guidelines regarding how the server works. Because the server deals with the most primitive level of the X architecture, the protocol is exactly the same for every implementation. There can be no room for interpretation — with one exception.

If a vendor wants to incorporate an extension into his server, he may do so, but only according to X guidelines. Clients then may query the server, to see what extensions it supports, and use those extensions. Two examples of extensions are the DEC PHIGS and PostScript extensions in the DECwindows servers. If the DECwindows server is communicating with a client that doesn't support these extensions, the client and user will never know.

Figure 2.



The layers of X.

The Layers Of X

Figure 2 shows the layers of X. The bottom layer, that of the primitive X protocol for transmission between server and client, is the only one that fully applies to both client and server. Above that exist the X implementation layers.

The Xlib layer consists of routines that make it much easier for a programmer to manipulate the X protocol. Then comes the realm of the toolkits. The Xt intrinsics layer defines the structures and conventions by which the object-oriented components (or widgets) of the X toolkits may be manipulated. Above that exist the specific toolkits. Toolkits make it much easier for the programmer to build applications than if he had to rely directly on Xlib calls or coding the X protocol directly — a method virtually no applications programmer would use.

At the top of the hierarchy are the specific windowing implementations that dictate the look and feel of the X environment by providing an extremely high-level, programmer-friendly method of assembling widgets. Programmers using these implementations need not concern themselves with determining the specifics of the user interface, because they're already determined. Also, above the DECwindows and OSF/Motif implementations, there's a User Interface Language (UIL) developed by DEC to facilitate manipulation of widgets by programmers.

Because virtually all X applications make use of Xlib, a high degree of isolation from specific operating environments is assured, providing a high degree of portability of code among machines. Also, both the Xlib and tool-

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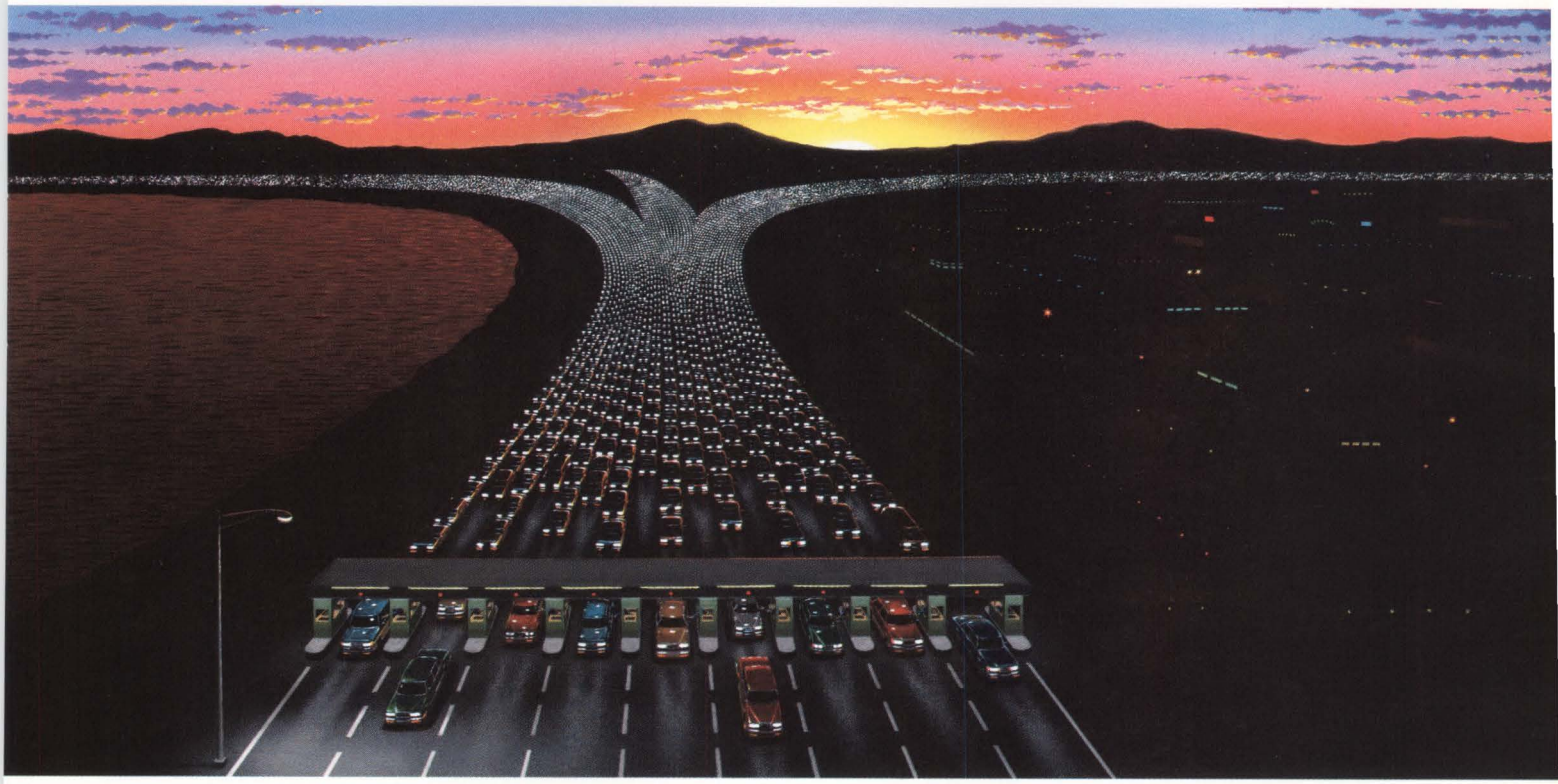

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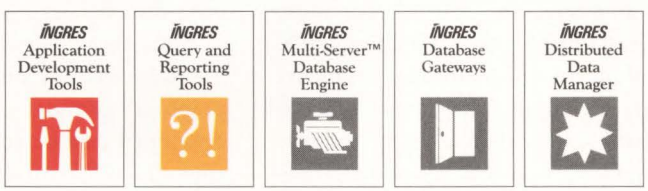

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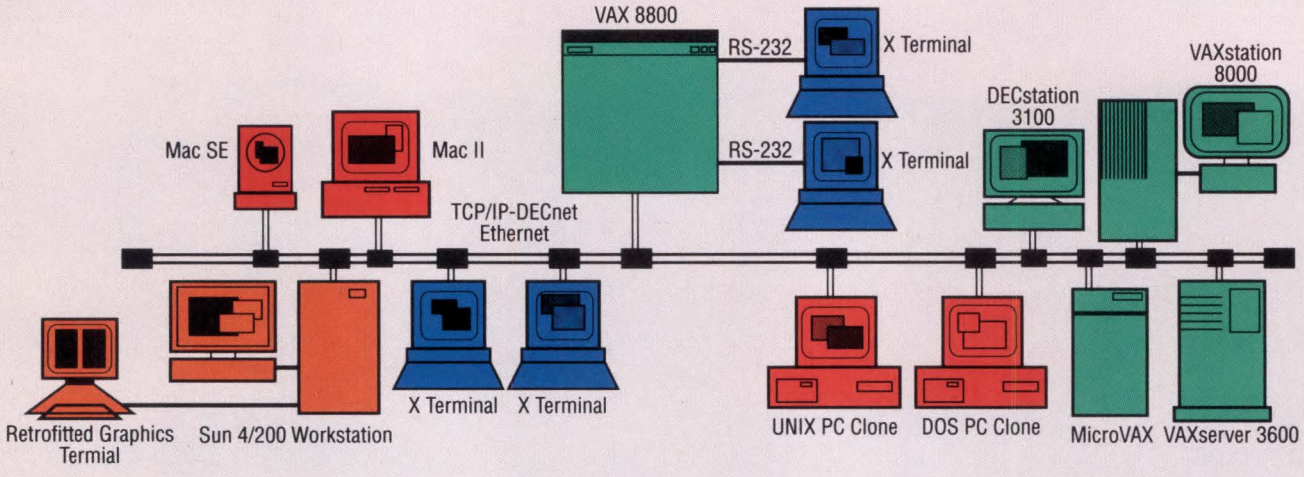
Figure 3.



Hypothetical X net.

kit layers can be called from most high-level languages. Thus, implementation of X is occurring in virtually all programming environments.

Application Clashing

There are, however, some problems. Besides the possibility of a variety of methods of user interaction simultaneously being required by a user's display, a user also may have to deal with incompatible window managers. Window managers are client programs charged with the responsibility of owning and managing the root window (the window in which all other windows exist on the user's display) and drawing the background and menu bar on the display. The window manager also determines how requests are fielded from other clients to create and use windows on the display under its control.

Only one window manager can control a server's display at any given time. If more than one window manager is being implemented on the network, the user can choose which window manager he wants by running that window manager client program on a host. If he later wants to change window managers, control can be shifted and the characteristics of the display are immediately changed according to the conventions of the new manager.

But for the most part, implementation of X on a multivendor network is surprisingly consistent. And with the recent development of the OSF/Motif standard, a multivendor environment supported by all members of the OSF will be completely consistent. This standard hasn't yet been adopted by UNIX International (which favors Sun's Open Look), but the fact that it has been developed at all and involves so many substantial companies holds great hope for agreement among vendors on all layers of the X model.

Configuring The Graphical Net

X is making its presence felt most strongly in the environment in which graphics got its big start in the first place: technical and scientific computing networks. Workstations, especially from DEC and Sun, are offering the most powerful windowing capabilities, but X is spilling over into all other segments of the computer industry, as well. Figure 3 shows a hypothetical network that illustrates the components of the growing X hardware platform.

X terminals contain a server only and support a transceiver for direct connection to a TCP/IP network. Fourteen- and 16-inch screens are available, with addressable resolution as high as 1,024 x 1,024 (a megapixel). Although the high-performance connection is made directly to the network, it's also possible to connect an X terminal directly to an RS-232 port and use a public domain utility called serial line interface protocol (SLIP) to transfer the X protocol packets across the link between the host and the terminal. Additionally, some terminals support an alphanumeric terminal emulation mode so that the terminal may be used during the migration to X.

Vendors are attempting to position X terminals somewhere between workstations and standard alphanumeric terminals or between terminals and suitably configured PCs. But X terminals are a new type of device. An X terminal is an eye into the network, tapping directly into the Ethernet cable.

Another interesting piece of X hardware revolves around the traditional graphics terminal. One vendor has developed custom serial protocols that allow RS-232 connection of a traditional

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graphics terminal to a Sun workstation for support of X display. This solution turns the Sun computer into a multiuser system, providing one or more users with their own retrofitted graphics terminals. However, the servers still reside in the Sun, and the additional protocol layer, plus the relatively slow RS-232 port, affect operation enough that applications are no longer those for which a Sun is normally bought.

The IBM PC and clones have found a comfortable spot on the X network, as well. Some vendors have developed server software to transform a PC or PS/2 into a fully compatible X server. Additionally, if the PC is running under UNIX, client capabilities and a software development platform become available.

Certainly not to be forgotten is the Mac, which fits into the X environment in a very natural way. Some products are making direct use of the Mac's own toolbox for creating the X display. Many routines are very similar between the Mac's user interface and X.

Implementation of the X server on a Mac occurs under the Multifinder, so both Mac and X applications may be used concurrently. Server support for the Mac II is also available.

The Mac can be used on both TCP/IP and DECnet networks, opening the machine to many environments. Technical users will use an X Mac to collect drawings and create reports, or a Mac II may be used for many design, testing and modeling applications.

Workstations Unbound

It's in the realm of the workstation that X will make its greatest strides over the next several years. Machines ranging from the Mac II to the VAXstation 3540 will be exploited most efficiently in the X environment. Single, large processors and supercomputers will be added to the network to increase the horsepower available to the users.

Here's where the richest array of applications will be found — applications that make the graphical use of windows incidental to the graphics of the application. At the high end are the compute-intensive tasks, such as finite element analysis, solids modeling and image processing, leveling off to the less rigorous but still demanding CAD, software engineering and computer-aided publishing.

ALTHOUGH INDUSTRY ANALYSTS are hesitant to make projections about sales volume of X terminals and products, it's clear that a technology of industry-shaking potential is on the horizon. There are ample signs that X is about to take hold. *—Bradford T. Harrison is a free-lance writer specializing in DEC systems.*

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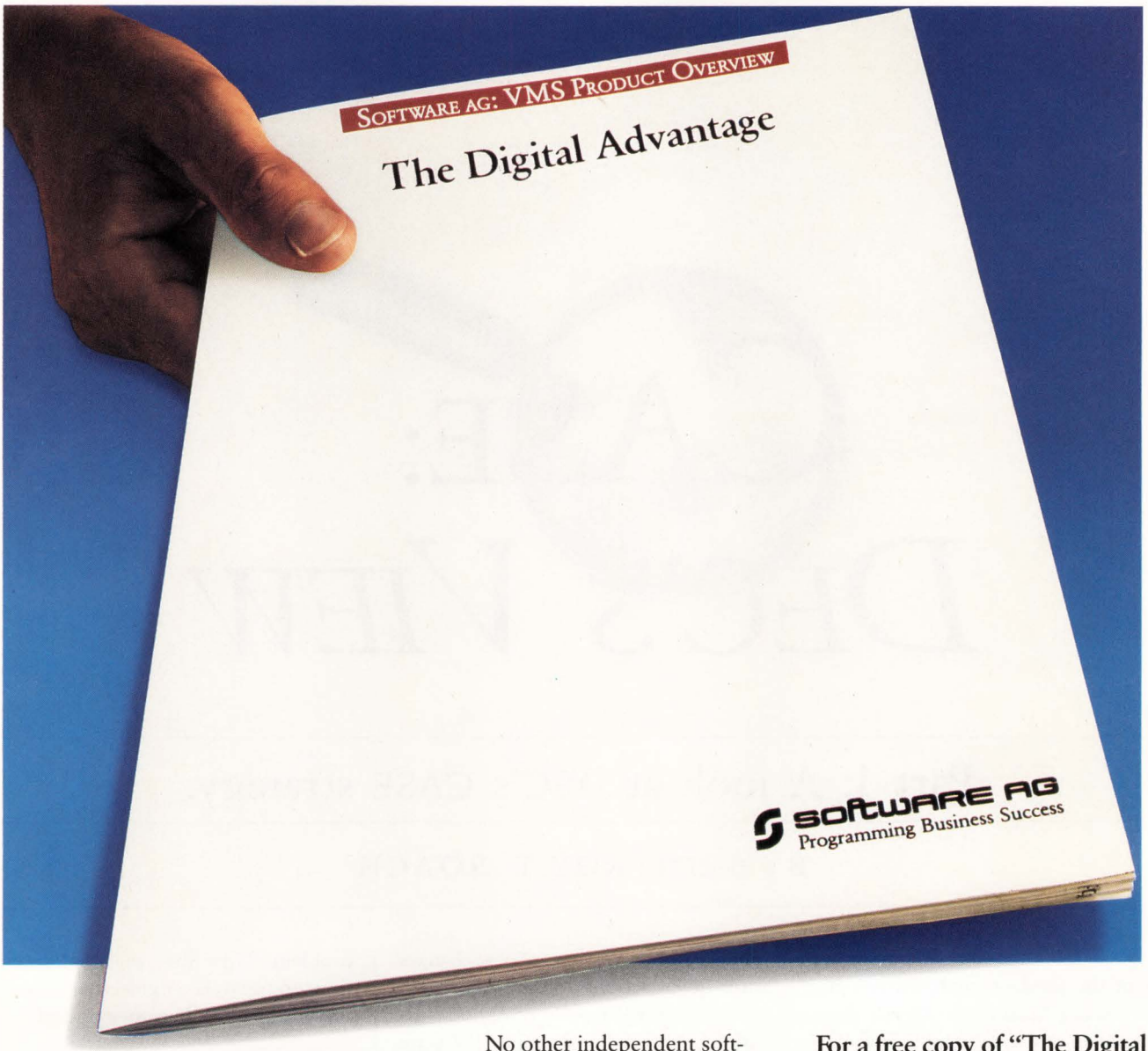

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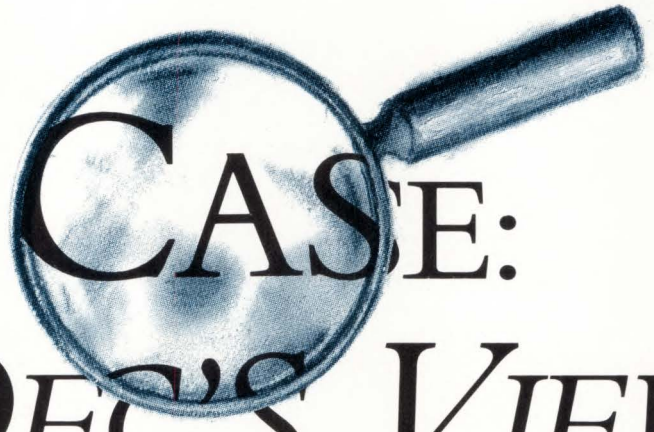


CASE: DEC'S VIEW

Part 1: A look at DEC's CASE strategy.

BY GEOFFROY T. ROACH

SOFTWARE IS BECOMING an important part of the products and services that drive today's businesses. There's more recognition of the value of software as a strategic resource. While software is becoming more important, it's also becoming more complex. Software systems today provide capabilities not dreamed of a few years ago. In an attempt to meet these demands, CASE has emerged.

DEC realizes that its customers are being faced with major challenges in their respective marketplaces. These challenges are brought about by changes such as mergers and acquisitions, increased globalization and uncertain regulatory environments. These changes force quick actions.

To meet the rapidly changing conditions, technologists and software developers, in turn, are facing new challenges. Their challenges revolve around increasing not only the productivity of the software-development process and reducing the time-to-market of new applications, but also increasing the quality of the delivered product. Software becomes a more integral part of products and services and the organization in turn requires more software for its own management. The pace of introduction of new technology into organizations represents additional problems. Therefore, the implementation of software engineering to meet these challenges becomes critical.

DEC And CASE

To help its customers meet these changing needs, DEC, in conjunction with other software vendors, offers a complete CASE solution. The tools and services offered by DEC, under VMS and UNIX, provide the CASE environment necessary to meet these software challenges.

DEC's commitment to CASE is illustrated by the results achieved in its software operations. From 1983 to 1986, output per programmer at DEC has

doubled, and the typical size of a software-development team has been cut from eight to five. At the same time, quality has increased an order of magnitude (see Figure 1).

DECwindows, as announced in January 1989, wouldn't have been possible without the use of CASE tools. More than 3 million lines of code were impacted and more than 70 percent of that code is common to VMS and UNIX. Many of the CASE tools have been updated to generate and test DECwindows-based applications. This effort was performed in less than two years and required the coordination of many teams.

ONE OF THE most controversial areas in the marketplace is the definition of CASE.

DEC's Definition

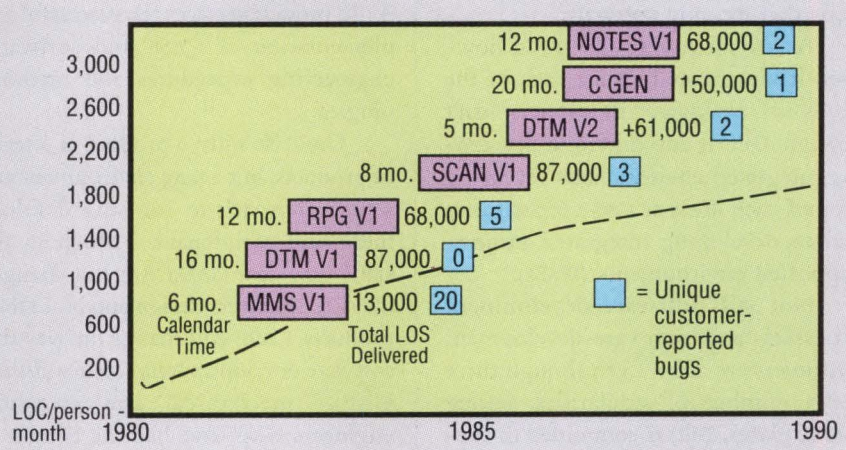
One of the most controversial areas in the marketplace is the definition of CASE. As defined by DEC, CASE is composed of integrated software tools and services that implement software-engineering practices.

Software engineering is composed of three major components (see Figure 2). The first consists of methods or the manner in which software-engineering tasks are performed. These methods are the technical approaches to developing software. Methods cover such areas as analysis, design, coding, testing and software maintenance. These methods then are coupled with the second major component, which is procedures.

Procedures, the management harness supporting the methods, include such items as project tracking, project control, software quality assurance, software configuration management, and metrics and measurements. Although many of these methods and procedures began development in the early 1970s, only recently have the tools necessary to successfully implement these methods and procedures been available.

The third component is tools and the supporting environments necessary to automate software-engineering practices. These consist of not only the analysis and design tools that are normally associated with CASE, but also of products that cover documentation, coding and testing, communication, application and code generation, 4GLs, expert system shells, configuration management, data management, and proto-

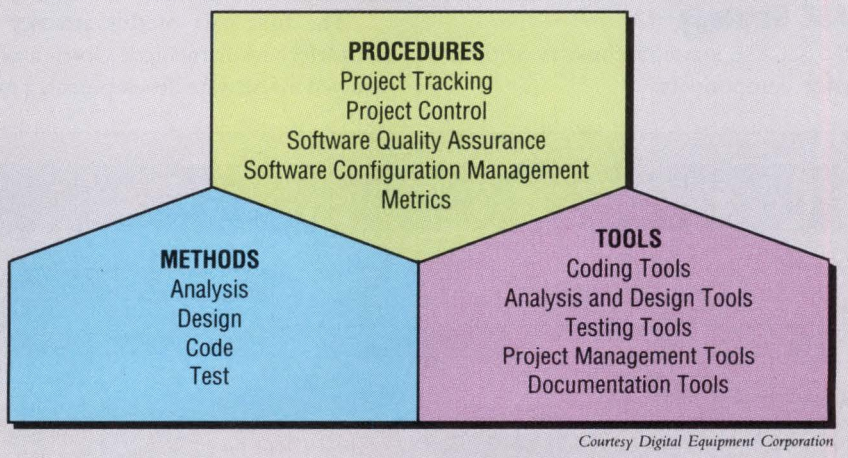
Figure 1.



Courtesy Digital Equipment Corporation

Engineering productivity, including implementation and alpha/beta test.

Figure 2.



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Software engineering: interlocking technologies.

typing and simulation. CASE combines different types of tools and technologies toward the goal of successfully increasing both software quality and the productivity of people within the organizations that develop software.

As we move into the 1990s, however, having tools to meet each of the needs of software developers isn't enough. DEC is committed to developing integrated environments revolving around such areas as CASE repositories and to developing integrated project-supported environments (IPSEs).

Not all software-development processes and software-development customers are alike. Even though there are a number of similarities among marketplaces, DEC is committed to supplying CASE solutions that address different customer needs. These include the commercial and information systems (IS) marketplaces, the technical marketplace, the embedded systems marketplace, and government and defense-related systems.

CASE Strategy

DEC's CASE strategy consists of three major components.

1. To provide a comprehensive range of CASE tools under VMS and UNIX.
2. To integrate those tools in a single, consistent, open-development environment.
3. To provide services for successful implementation of CASE and software-engineering procedures and methodologies.

CASE isn't just a product or a series of products, but a new environment and a new approach to software development and maintenance. Much in the same way that CAD/CAM has changed the way engineers design and build their products, CASE will change the way that software developers build their software. Unlike mechanical and electrical engineers who have had the benefit of many decades of sound engineering principles, the discipline of software engineering is still in the process of development. More important, it's just starting to be assimilated into the mainstream. Therefore, the DEC strategy encompasses more than CASE tools only.

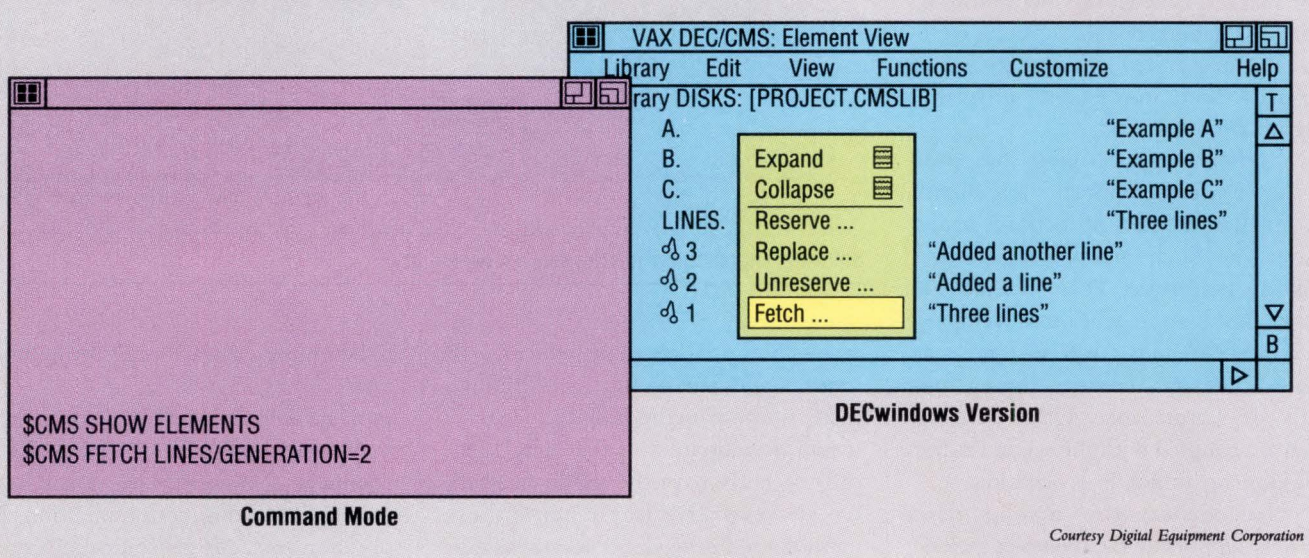
The first part of this strategy is completely implemented. Given a task involved in software development, a tool or function can be found to automate that task.

These tools have a proven track record in software engineering and have been shown to have a positive impact on software quality and development productivity. Each of the tools is being enhanced to add additional functions and to take advantage of new simpler-to-use human interface technology, such as DECwindows. But the basic foundation of CASE is in place and will serve as a platform from which to build future solutions. These solutions will span UNIX, VMS, MS-DOS, IBM mainframes and other systems.

Integration, the second component of the strategy, is a source of much promise. To tie the tools together into an environment that eliminates redundancy, enhances communication and enables the sharing of common information is an important goal.

Integration can mean several things. First, the use of a common user interface and tools that are designed specifically to exploit the interface is critical (see Figure 3). By using an interface driven by windows, icons, mice, pull-down menus and scroll bars, the tools

Figure 3.



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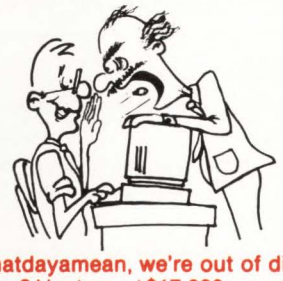

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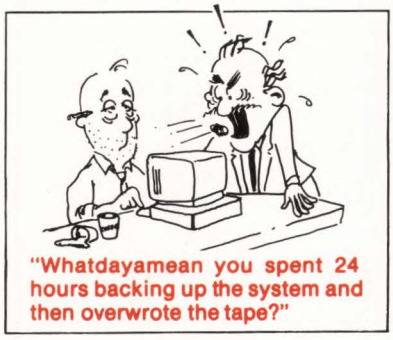

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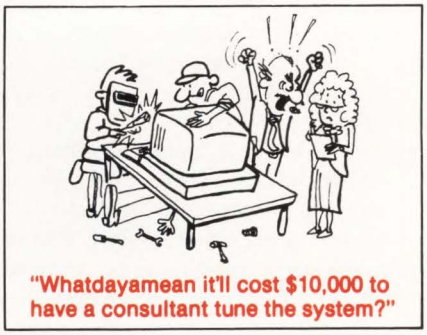

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aren't only easier to use, but they also introduce a degree of consistency. This consistency can lead to more rapid adoption of the tools and to adoption of more functions within the tools. "Ease of use begets use" is a phrase that holds true, and the common user interface provided by DECwindows and CASE tools helps make these tools easier and faster.

Other components of integration revolve around the sharing of information among tools. This integration consists of two aspects: data integration and process integration. For IS, data or, perhaps more appropriately, metadata, integration consists of sharing information about software definitions through a common repository. This type of integration is critical to the needs of IS departments in which the application portfolio consists of many applications built around a series of common databases (see Figure 4).

This repository for the IS space in the form of the VAX Common Data Dictionary/Plus (CDD/Plus) can eliminate the need for disparate data definitions for each CASE tool and can enforce common data definitions across the software-development life cycle. The publication of a standard open interface and the development of a dictionary toolkit enable not only DEC but also third-party tools to use the capabilities of an active, distributed CASE

DEC's Software-Technology Partnerships

DEC's strength as a software company extends into high-level software architectures. But most of the expertise goes unseen or isn't marketed in the guise of off-the-shelf applications. Much of it is layered on top of other software products or used only in the design process.

Where is DEC's computer-aided software engineering (CASE)? It's hidden in all its software markets: Computer-integrated manufacturing (CIM), engineering systems, business and office systems, corporate systems and laboratory data products all have CASE foundations. There's a consistent use of CASE across these industries.

DEC's forte has been in integrating technologies such as CASE, AI and expert systems into its higher-profile products such as Rdb. Integration of DEC's high-level software also is taking place with many third-party software manufacturers.

Integrated Applications

CASE systems, including VAX RALLY and the six integrated tools of VAXset, are used extensively by DEC's software engineers. In fact, CASE tools were the primary coding devices used in the development of DECwindows. DEC's CASE solutions also have a significant relationship to DEC's transaction processing and networking products. Sources in the AI-development group at DEC maintain that the company is the biggest vendor and the biggest user of CASE.

DEC also is working actively with third-party software vendors to market and develop other technologies. For example, the approach to software engineering at DEC combines CASE with expert systems. Expert systems basically are translated into information systems and can be used as packaged tools. DEC considers Nexpert Object from Neuron Data Inc. to be an important component of its overall high-level software architecture.

Nexpert is an inference engine, an expert system shell written in C that integrates with DEC databases to provide an environment for writing expert systems. With its graphical user interface, the applications developer integrates the shell with the database by specifying it on an option screen.

From there, Nexpert can define, query and update the database at run time. In return, the database can call on the expert system application. This allows the developer to embed expert systems on other traditional database applications.

Another AI developer, Artificial Intelligence Technologies, has developed an expert system that layers over Rdb. The Mercury Knowledge Base Environment simplifies the user interface to Rdb and makes extractions and other actions within Rdb windows and files easier. When using a mouse, for example, data areas need only be defined and clicked on.

Database Integration

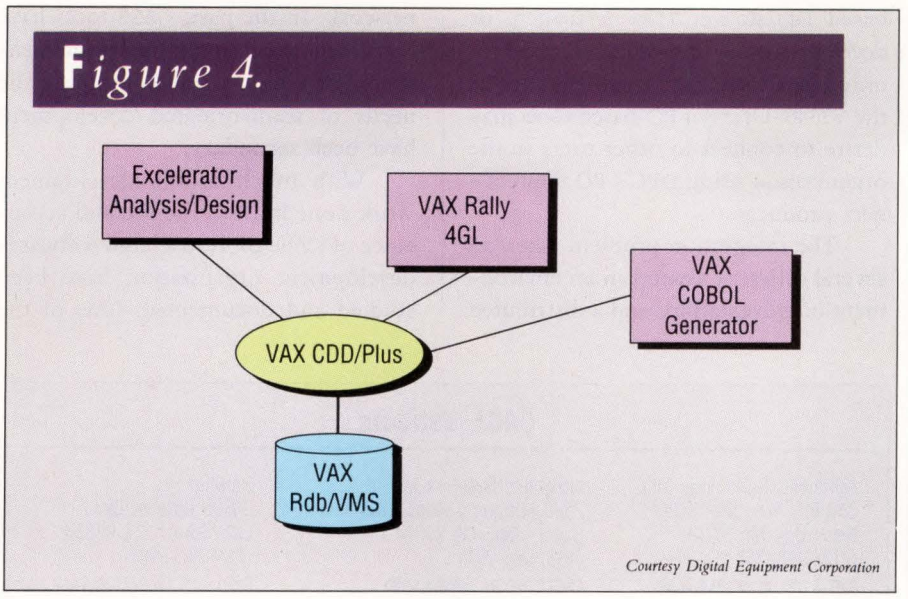
CDD/Plus, the new version of VAX Common Data Dictionary, has become the center of DEC's application-development environment. Most of the information that developers need resides on databases within CDD/Plus. To extract and move this information, DEC uses the Excelerator CASE engine from Index Technology Inc.

Because no one, DEC included, can build all of the tools in the life cycle, Excelerator is an important part of the overall CASE/IS strategy. The two-way integration in this instance puts the extracted CDD/Plus information in an Excelerator dictionary. Excelerator then uses this information for analysis and design by generating system-design diagrams, such as data models, data-flow diagrams and structure charts.

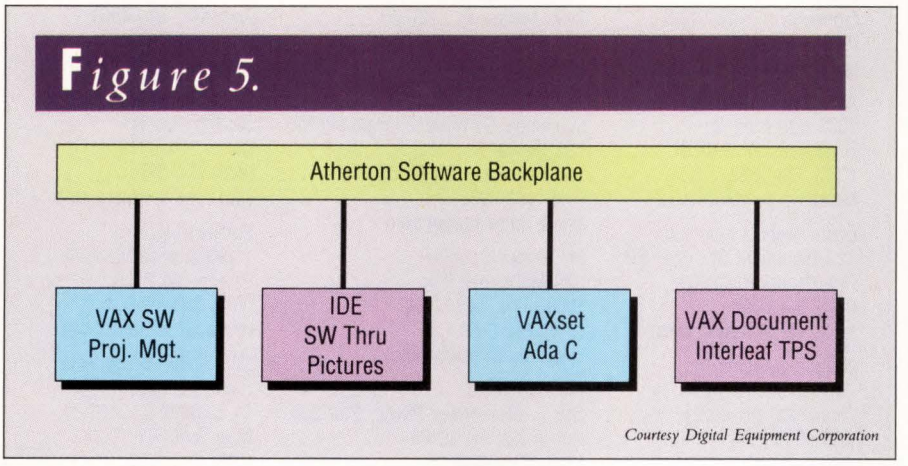
Co-developed software tools resulted from DEC's relationship with Cullinet Software. The products, targeted at application developers, include three software systems called Enterprise:Builder, Enterprise:Generator and Enterprise:Expert.

By interfacing with Rdb, Enterprise:Builder lets developers build prototype applications using form and report layout designs. It incorporates menu design and integration of security and coordinates testing and production environments. Enterprise:Generator takes the components built with Enterprise:Builder and produces non-procedural, high-level specs to build programs in COBOL, BASIC, FORTRAN and C.

Enterprise:Expert is the most unique of the three, as it can develop applications in DECvoice, a voice-processing platform. The voice either can request or provide data and even can communicate via telephone. It's like consulting with an expert system that speaks with a digitized voice. *—Evan Birkhead*



Integration: data.



Integration: process.

repository. DEC's VAX RALLY, VAX COBOL Generator, Rdb/VMS and tools from Index Technology and Signal Technology are only a few of the products that use this repository.

The integration of the software-development process and the sharing of procedural and control information is especially critical in aerospace and defense. Unlike the IS world, software in this area consists of programs, data and documentation that must be delivered as a single product and actually may run in environments that are totally different from the development environment. Standards in this arena indicate how software is to be developed and mandate the deliverables. Tracking projects from requirements through coding and testing to documentation and relating all of the components is a necessity.

DEC, in conjunction with Atherton Technology, Interactive Development Environments and other companies, has begun to deliver on the first stages of an IPSE (see Figure 5). Although still in their early trial stages, these solutions are installed and operable at several aerospace companies.

Through its Cooperative Marketing Program (CMP), DEC works with third-party software vendors to add capabilities to the CASE environment. Having product, consulting and service expertise in various areas allows these companies to work with DEC to build and integrate products.

The tools and the environment are supplemented by DEC's implementation, consulting and software-assessment services, the third part of its CASE strategy. Through its service organizations and CASE Solution Integration Centers, DEC helps customers with training, integration services and project-management assistance.

VMS And UNIX

When choosing a CASE environment, the question of VMS versus UNIX often arises. Which is better depends largely on the needs of a particular installation, but some general guidelines follow. A component of DEC's CASE strategy is to deliver similar capabilities under VMS and UNIX and to interconnect the two via shared standards.

The CASE environment under UNIX is geared to installations committed to using open standards. These installations seek vendor independence; require a commitment to POSIX, X/Open or OSF conformance; or need to support UNIX applications and other UNIX software-development tools. Many organizations also mandate UNIX as a corporate strategy. DEC supports this by providing a comprehensive development offering comprising the standard UNIX software-development environment along with enhanced tools and compilers. Historical market use and trends show that most DEC UNIX customers come from the engineering, technical and embedded systems fields.

With the release of DECwindows, the UNIX environment has become even more powerful and easier to use. Graphical versions of the UNIX debugger (dbx), the UNIX file compare utility (diff) and two editors, including emacs, bring new capabilities to our UNIX software-development environment.

VMS users are found in these marketplaces and in the commercial or

IS fields. These customers tend to develop applications that need functionality in file-system management and I/O performance. These applications are complemented by the availability of high levels of security, data integrity and system availability. Much of the powerful networking and network services, connectivity to the IBM and Cray worlds, and many applications are available under VMS. The historic needs of commercial customers require tools such as CDD/Plus and VAX Rdb/VMS availability under VMS.

DEC is proceeding to bridge the VMS and UNIX worlds with products such as DECwindows, Compound Document Architecture (CDA), DECnet/OSI and POSIX. Many CASE tools are available under VMS and UNIX. These include many of the programming, testing and configuration-management tools and products from Interactive Development Environments, Cadre, Atherton Technology and others. With VAX software engineering tools (VAXset) under VMS and the UNIX programming environment, DEC provides functionality in language editors, static source-code analysis, performance analysis, coverage analysis, configuration management, system building, testing and tool building.

Workstations And Networks

The computing platforms in which DEC's CASE solutions operate are an important consideration for the software developer. The use of workstations and systems in a distributed network is a base that provides capabilities for team-oriented development. These systems run both VMS and UNIX and can be tied together in either local area networking configurations or can participate in a larger corporatewide network.

DEC's desktop systems can be optimized for the needs of the developer. Some developers may require the power, the large screen and multiple full-size windows of the VAXstation 3100. Others, doing very large, complex development and using UNIX, may require the price/performance of the RISC-based DECstation 3100. Managers or developers using text-oriented tools may only require standard terminals such as the VT340. Users of PC-based tools may desire to connect to other users in the organization using DEC's PC interconnect products.

The integration problem takes on several different aspects in an environment of workstations and a distributed network. In the past, CASE tools have been focused on single-user implementation of single-point solutions. The needs of team-oriented development have been secondary.

With much of the development work done in DEC, the use and acceptance of CASE tools in a large software-development organization have been studied and documented. One of the

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keys to increasing productivity and quality is the sharing of information about all aspects of the software-development life cycle. This information must be shared among project team members and among the tools that the team will use. For these reasons, much of the work done at DEC in conjunction with third parties is focused on both the back-end integration of tools to share information and the front-end generation of common user interfaces. Additionally, the built-in networking capabilities and the ability to link distributed data files and databases form a base from which to perform tool integration.

Heterogeneous Environments

Woven throughout DEC's CASE environment is the support of heterogeneous computing and development platforms. In the technical marketplace, VAX/VMS systems have long been used to develop applications that run not only under VMS but also on a variety of microprocessor-based systems. A full complement of editors, cross compilers, debuggers and testing tools, from such companies as Boston Systems Office and Tektronix-MDP division, is available to enable software engineers to use VMS and UNIX. VAXset has been enhanced to include the development of applications for targets ranging from Intel and Motorola processors to large Cray processors.

In the commercial world, many installations are realizing that the use of PC-based analysis and design tools is simply not enough. DEC is extending its CASE solutions to provide an environment that will use all of the richness of the VMS CASE environment and at the same time deliver applications that run on IBM mainframes under CICS, DB2 and other operating systems. By using the power of not only the DEC tools but also networking, workstations and tools from such vendors as Netron and Cullinet, DEC can provide a more effective development environment for IBM mainframe-based applications.

Editor's note: Part 2 of this article will focus on specific CASE products offered by DEC.

—Geoffroy T. Roach is a Digital Equipment Corporation marketing executive in the CASE/IS program, Corporate Systems Group, Marlborough, Massachusetts.

Assistance for this article was provided by Michael Kendall, Engineering Systems Group, and Shirley Ann Stern, Corporate Systems Group, Digital Equipment Corporation.

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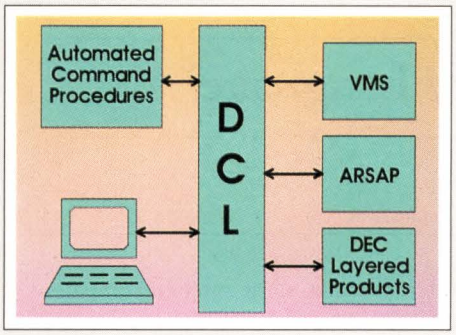

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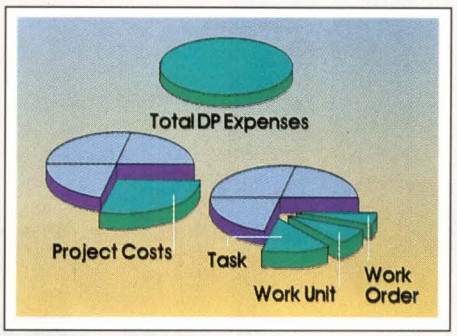

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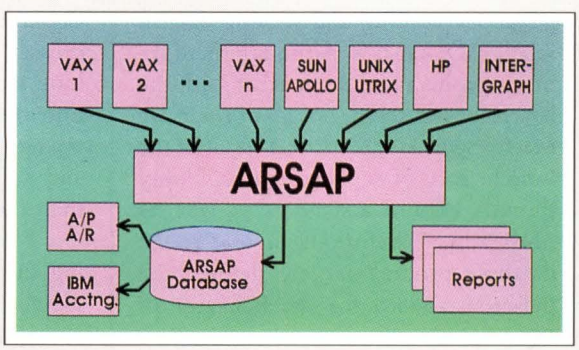

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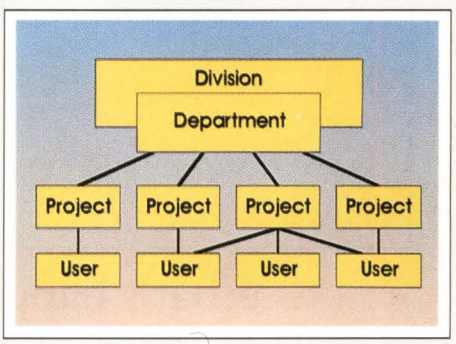

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SQL UPDATE

What's happening to Structured Query Language?

BY PHILIP A. NAECKER

THE STATE OF Structured Query Language (SQL) is one of considerable contradiction. SQL is a standard, but there's virtually no complete implementation of that standard and most SQL implementations are at least somewhat incompatible. SQL may be the best way to access relational databases, but it's also arguably one of the worst ways. As computer software goes, SQL is old: There was a recognizable version of what we call SQL developed by IBM in 1974. But it's also one of the newest and hottest areas in computing today. SQL was originally intended as an English-like language for end users to access their own data, but in most real-world applications SQL is hopelessly inadequate as a tool for end users.

Welcome to the wonderful and surreal world of data manipulation!

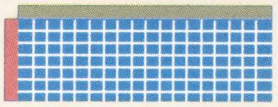
SQL is a data-manipulation language for reading and writing data in relational databases. Although there are many products on the market with the letters SQL in them, not all of them are exactly SQL. This is partly a result of the long history of SQL and that SQL only recently became a standard in 1986, as ANSI X3.135. Before 1986, IBM's DB2 database product largely defined the defacto standard for the behavior of SQL, and it's still an important measure of compatibility among SQL implementations.

The SQL2 standard is currently under discussion, so the situation is still far from static. Indeed, there are nearly as many dialects of SQL as there are implementations. IBM alone has several different and to some extent incompatible SQL dialects within its product set. Because the list of new features to be addressed in SQL2 is very long, it doesn't look as though all of them will make it into the standard, resulting in a protracted period with language subsets and supersets being the norm rather than the exception.

Nonetheless, many vendors are doing their best to produce an SQL implementation that's as standardized and compatible as possible. Depending on your "standard" (SQL, SQL2 and DB2 are common measures), you're likely to find several vendors that do a respectable job of portability. And many vendors, DEC included, are making SQL readily available as a means of gaining acceptance for their database systems. DEC

Figure 1.

RELATIONS



The operand in relational algebra is a relation, or table. A relation comprises rows and columns. In file-oriented computer language, rows and columns are analogous to records and fields.

CLOSURE

Relational operations are said to be closed, which means that any operation on relations will produce new relations. This is very important, because it means that relational operations can be nested.

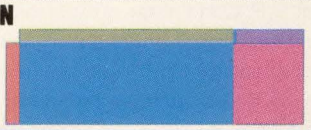
SELECTION

Selection is the operation of choosing just certain rows. Selection operations usually are based on familiar Boolean logic, such as in the SQL statement fragment "EMPLOYEES WHERE LAST_NAME = NAECKER". Selection operations can be very complex and can include Boolean logic on many fields and between fields in a relation. (The SQL SELECT operator actually does more than the Selection operation, including Projection.)

PROJECTION

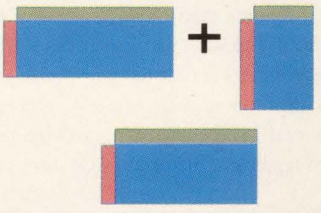
Projection limits tables to just certain columns. The SQL statement "SELECT EMPLOYEE_NUMBER, COST_CENTER FROM EMPLOYEES WHERE LAST_NAME = NAECKER" projects the employees relation to just employee number and cost center. It also implements the Selection operation to restrict the rows to just those for Naecker.

UNION



The Union operation is like a file append. It concatenates two tables with the same number of rows.

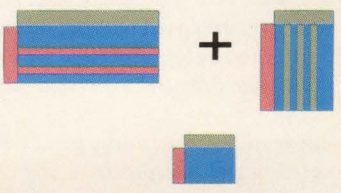
PRODUCT



The Product or Cross Product operation produces a table that's the combination of the two operand tables. Consider part of an employee database, with tables for employees and offices:

Employees		Offices	Cross Product	
1 Phil	A	A Pasadena	1 Phil	A Pasadena
2 Linda	B	B SpringHouse	1 Phil	B SpringHouse
3 Lou	B		2 Linda	A Pasadena
			2 Linda	B SpringHouse
			3 Lou	A Pasadena
			3 Lou	B SpringHouse

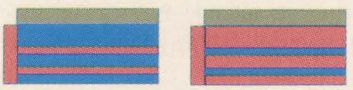
JOIN



The Product isn't often directly useful in relational databases. Instead, it forms the basis for a more frequently applied operation, the Join. The Join operation is the result of the combination of Projection, Selection and Product operations. There are several kinds of Joins, including Natural Joins, Outer Joins and Equijoins. A Natural Join is shown by:

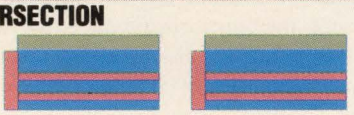
Employee			Offices	Join
1 Phil	A	A Pasadena	1 Phil	Pasadena
2 Linda	B	B SpringHouse	2 Linda	SpringHouse
3 Lou	B		3 Lou	SpringHouse

DIFFERENCE



Difference finds rows in one table that aren't in another table. Typically, Difference is used on the table that results from Projection and Selection operations, such as finding the employees who aren't assigned to any office.

INTERSECTION



Intersection is the logical opposite of Difference. It finds rows in two tables that match.

A quick primer in relational algebra.

now ships SQL free as part of the development package of its Rdb RDBMS.

End Users And SQL

The idea that true end users (call them information consumers if you like) will use SQL doesn't seem to carry much weight any more. A year ago, knowledgeable computer-industry analysts and others made statements such as, "We'll all be speaking SQL pretty soon." Although it seemed like a good idea when SQL was invented, there are a number of problems that prevent true end users from making much progress using SQL for database access.

You can teach end users how to write SQL queries. They may not like it much, but they can do it. Many users currently use SQL to access their data in products from PCs to mainframes.

Unfortunately, almost all useful databases are reasonably complex. They become complex for many reasons, not the least of which is that the world the database seeks to model is itself complex. In relational databases, complexity can be measured by the number of relations and fields (tables and columns in SQL lingo) in the database. Typical real-world databases have tens of tables and tens or even hundreds of columns. After a database becomes even a little complex, a whole series of problems with end-user access via SQL begins to surface.

Dr. Steven P. Shwartz, senior vice president, advanced development, at Intelligent Business Systems, classifies the problems with end-user access into problems of syntax, structure and semantics. Problems with syntax in SQL are minor for simple databases. But for real-world databases, the syntax can become very stilted. What's worse, creating the proper syntax requires considerable knowledge of exactly how the database is put together, information that end users typically don't have.

Knowledge of the tables and columns in the database is required to solve the problem of structure (see Figure 2). In relational databases the most common operations are record selection (performing Boolean operations on the data such as LAST_NAME EQUAL "NAECKER"), joins (combining information from different tables) and summarization (rolling up like data to perform counts, totals and the like).

Describing each of these operations in SQL requires a precise understanding of the structure of the database. Performing them efficiently is even harder, and may require an understanding of the particulars of the database-management system and how it handles indexes and searches. SQL is supposed to isolate the

Understanding SQL

Originally, SQL was intended as both a programmer's tool and an end-user query language. SQL isn't really a language at all, a fact that some observers highlight by calling it a sublanguage. Interactive SQL uses common English words, such as SELECT, FROM and WHERE, to describe the data to be retrieved or stored in the database. But SQL is hardly English-like.

SQL foremost is relational in nature: It has many attributes that make it reasonably adept at manipulating data in relational databases. Using SQL, you describe what data is of interest, not how to retrieve that data. The relational database is responsible for choosing the best retrieval strategy, taking advantage of any indexes or other aspects of the structure of the database.

Relational databases were invented by Dr. E.F. Codd in the early 1970s. The relational model has firm foundations in mathematics, based on set theory and formal logic. Dr. Codd derived a mathematical representation of data and encoded that representation in two new mathematical forms: relational algebra and relational calculus. The firm mathematical footing of relational databases is a main reason for their power and flexibility (see Figure 1, page 59).

SQL embodies many of the goals of Dr. Codd's relational theory. For example, SQL supports the concept of "empty" or "null" fields — not just fields with a value of zero (for numeric fields) or blank (for text) but fields that have no value at all. SQL also supports numeric operations on data aggregates such as SUM, AVERAGE and COUNT. Powerful pattern matching (a LIKE verb) and cursors (record-by-record access, such as might be used in COBOL when reading a file) make SQL very useful for many business applications.

Most SQL implementations have several programming interfaces, as well as the interactive component. You can write programs with embedded SQL statements. These are SQL statements that are embedded in and intermixed with another language, such as FORTRAN or COBOL. Such programs generally are processed by a precompiler that turns the SQL statements into subroutine calls and generates subroutines that do the work of database access.

You can write dynamic SQL. This consists of SQL statements generated as text on the fly and sent to the SQL system for parsing and interpretation and ultimately to the database system to access data. The recent SQL2 work has also specified something called a SQL module language. This provides the ability to write "subroutines" that contain only SQL statements and no host-language statements at all. These subroutines, or modules, then can be called from another language just like any other subroutine.

As if the basic modes of using SQL listed above (interactive, compiled, dynamic and module-language forms) weren't enough, there are many products that have some components of or are extensions to or incorporate SQL. Many RDBMSs include SQL as either their primary or a secondary query language, often with extensions to take advantage of particular features in their databases. Some versions of SQL include special statements for report writing or handling special datatypes. Many products generate SQL from a completely different interface, such as a menu, fill-in-the-blanks model, natural language or some kind of specialized data-access language.

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Figure 2.

```
SELECT EMPLOYEE_NUMBER, EMPLOYEE_NAME FROM EMPLOYEES
 WHERE OFFICE_CODE = A
```

This statement prints out the name and employee number of employees in the office indicated by the code "A".

```
SELECT E.EMPLOYEE_NUMBER, E.EMPLOYEE_NAME, O.OFFICE_NAME
 FROM EMPLOYEES E, OFFICES O
 WHERE E.OFFICE_CODE = O.OFFICE_CODE
```

This statement prints out the employee number and name as well as office name. It uses the OFFICES table to translate the office code into an office name.

```
SELECT FIRST_NAME, LAST_NAME, BIRTHDAY FROM EMPLOYEES WHERE
 BIRTHDAY >= ALL (SELECT BIRTHDAY FROM EMPLOYEES)
```

This statement uses a subquery (inside the parentheses) to find the oldest employee. In the case of the subquery, the result of the SELECT isn't printed, but instead is used as an argument in a Boolean operation.

```
SELECT E.FIRST_NAME, E.LAST_NAME FROM EMPLOYEES E
 WHERE UNIQUE (SELECT * FROM DEGREES D
 WHERE D.EMPLOYEE_NUMBER = E.EMPLOYEE_NUMBER)
```

This SQL statement uses the Unique predicate to find employees who have exactly one college degree.

Some examples of SQL statements.

user from decisions about the efficiency of searches, but because data may be stored multiple times in the database in different forms, this goal is often unachievable.

For example, although sales totals for each salesperson, district, region, product and product line could in theory be calculated from the raw sales transactions in the database, to do so for on-line queries would often make the application unacceptably slow. Instead, most databases store accumulators such as salesperson year-to-date, salesperson month-to-date, district year-to-date, district month-to-date, and so on.

But given this sort of aggregate style in a database, it's difficult to teach users rules such as "This month's sales total can be found here, but for last month's sales total you need to look there" and "You can get the sales total for the district here, but if you want to restrict the information to just Products X and Y, you'll need to look at the detailed transactions." Cases such as these, essentially problems of navigating the database, are nearly endless in real-world situations.

Semantic problems, the last of Shwartz's three classes, revolve around knowledge of the implicit context needed to use the database correctly. For example, you might not be able to use a database properly to perform accounting unless you also know the current month in the fiscal year, the date the fiscal year started, and so on. Problems of aggregate data also appear in this category.

What To Do?

How do we meet the needs of all those information consumers that SQL was supposed to address? Why are so many software companies developing SQL products and why is there so much SQL standards activity? Clearly there wouldn't be the current flurry of standards activity and marketing of SQL products if SQL were in its death throes. SQL is being used heavily. It just isn't being used heavily by end users typing SQL statements on their keyboards.

There are a number of tools available to generate SQL from interfaces other than an empty command line. These tools are a large part of the motivation behind the standardization of SQL and potentially the solution for end users. These tools run the gamut from forms or menu interfaces (based on the Query By Example methodology), graphical representations of the database to spreadsheets (dBASE has an SQL interface), natural language processors with AI, and various kinds of SQL generators.

At a very basic level, all of these tools work the same. You're presented with a view of the data (perhaps pictorially or via columns and rows in a spreadsheet) and use whatever command paradigm is available to generate a query. You might graphically point at icons representing various items in the database, for example, or you might "draw" a mockup of the report you want produced.

In some systems, you can look at the generated SQL and tune it if you like. Most systems let you save a query after you've generated it.

One system will convert natural language queries into SQL and pump the generated SQL into a relational database to obtain the data the user requests. In this use, SQL is actually a relatively small component of the entire product. There's a tremendous amount of very sophisticated technology, including AI software, tools for extracting "nominal data" (basically keywords) from the database, and sophisticated user interfaces. SQL also is used in the tools, because the tools extract information from the database for use in parsing the natural language queries.

We're beginning to see the emergence of an entire class of products based on the concept of an "SQL server." An SQL server is just a database with an SQL front end that talks to the network. Such a server allows, for ex-

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ample, PCs using a very PC-like interface to generate SQL statements, pump them over the network to a mini or mainframe and get the results back to the PC program for further manipulation before display. You can expect to see a great deal more activity in this area, including action from big players such as DEC and IBM.

As you might imagine, the difference in usability among systems such as these and straight SQL is potentially very large.

When SQL Isn't

Because all of these tools generate SQL, you might think, "Great — now I can pick any interface and use it with any relational database. I don't care which interface the user wants, as long as it generates SQL. Also, I can just write my application programs using standard SQL, and I'll be able to preserve that code if we change databases." This is indeed the implicit promise in the standardization efforts. Wouldn't it be grand if it were true? Unfortunately, it isn't.

For starters, the basic SQL language isn't all that portable. As mentioned above, there are many dialects of SQL. Every relational database vendor has done a more or less complete implementation of either the 1986 SQL standard or something between the 1986 standard and the soon-to-be SQL2 standard. However, there are also a number of supersets — functions and extensions added by vendors to support their own database implementation.

Most vendors are attempting to move toward the SQL2 standard, and there seems to be some consensus that SQL2 is at least shaping up to be a good beginning. However, there are some problematic things in the standard. For example, scrollable cursors are a nifty idea. They provide a way to move forward and backward in a record stream that's derived from rows in the database. However, the current proposed SQL2 draft says that scrollable cursors are read only. That seriously limits their usefulness, because one of the best things you can do with scrollable cursors is to let users scroll through their data, making modifications as they go. Unfortunately, it isn't exactly clear what should happen if you modify the rows from which the cursor is derived and then scroll backward. Do you see the original data? Do you see the changed data?

The same is true of views. Views are a cornerstone of the relational model and result from a simple-sounding relational principal: The result of a relational operation on any relation shall be another relation. For example, if you select just the programmers from the Employees Relation, then you should be able to do any operation on the Programmers Relation that you could do on the Employees Relation. Views also can result from join operations, so you can create view relations that are the combination of two or more actual relations. For example, you could create a table with the columns EMPLOYEE_NAME and DEPARTMENT_NAME from one table that has the employee's name and department number (but no department name) and another that has department number and department name.

But SQL doesn't provide for the update (modification) of views, and because update is one of the basic relational operations of SQL, then the law stated above doesn't hold. This is more than just a passing limitation of SQL, because it strikes at the heart of the relational model.

Another weakness in SQL is its limited support for transaction control. Transactions are fundamental units of work, such as "transfer this money from my checking account to my savings account," that are guaranteed to either complete fully or fail completely. You'd be very unhappy if such a transaction completed only partially and your checking account was debited, but the money never appeared in your savings account.

The 1986 standard didn't support transaction control very well at all. SQL2 at least adds some control, but only for a single transaction per process. There's no way to keep track of multiple transactions — no transaction handle by which to identify transactions and act on them independently. In a language that ultimately will be used for OLTP, a lack of more complete transaction syntax clearly will be a problem.

THE BAD NEWS is that simply embedding SQL in your program doesn't guarantee very much portability.

This leads to another weakness of SQL: its lack of extensibility. Because SQL has a rather stiff syntax, adding new keywords and syntax to the language in the future could be quite difficult without breaking existing code or at least changing the results it provides. There's no provision in the standards for "escapes" to specific implementations that would allow different implementations to add functionality in a way that will be guaranteed not to collide with the standard in the future.

Ambiguity in how certain complex SQL queries are resolved is a weakness often recounted by academics and database developers. It's hard to determine precisely how widespread a problem this really is, because there are many other barriers to the porting of SQL-based applications between database systems. This class of problems revolves around what are called subqueries. Subqueries are intermediate queries, the results of which are used as arguments in upper queries. A commonly used example of a subquery is this: Print all employees who have a salary greater than the average salary in their job classification. The subquery involves computing the average salary for the employee's job classification.

For simple cases such as this, the results from all good database systems

will be the same. However, the SQL standard doesn't fully address how complex subqueries are to be handled. The cases can get complex quickly, and it's difficult to tell *a priori* which queries will execute identically on two different database systems and which won't.

Most database implementors I've talked to minimize the importance of the subquery differences as a barrier to portability of SQL applications and tools, however. They point instead to a number of more important portability concerns. One is a lack of standardized system tables — system metadata (literally data about data) or system relations. Another is the widespread use of language supersets and subsets (usually mixed in a single product). The only way that you could get truly portable SQL would be to use a least-common-denominator approach, but that would leave you with a seriously crippled language.

The lack of standardized system tables is a serious barrier for implementors of high-powered SQL-based tools for end users, too. Ideally, a tool such as a graphical interface or a natural-language interface would be able to generate calls to the database to obtain information about the tables in the database and their columns. All relational databases must store the description of the database itself, called metadata, in relations in the database, called system tables. However, because SQL doesn't specify a standard for the structure of the system tables, there's no way for tools to obtain this information directly using standard SQL. Instead, the tool must be customized to work with each database implementation. Furthermore, the SQL statements to maintain the system tables aren't themselves standardized, so there's even further room for conflict among database implementations.

Can We Play, Too?

You might be thinking, "I'm glad I don't have to worry about all those problems. I just use SQL to provide portable data manipulation language in my programs." In this area, there's both good and bad news.

The bad news is that simply embedding SQL in your program doesn't guarantee very much portability. For one thing, it can be difficult to avoid using any extensions in the language that your first vendor might provide or to avoid using any "standard" features that the second vendor has opted not to provide. However, even if you can get past the least-common-denominator problem, you aren't home yet.

If you embed SQL in your programs, you must preprocess the programs to generate code that performs

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the database access. The code generated by the preprocessor is, in most cases, database specific. Thus, you must recompile with the second database system to use its data. If you want to get data from two SQL-compatible database systems, you may have a great deal of work ahead of you to access both systems from a single program.

The good news is that SQL module language is designed to help alleviate these problems. In SQL module language, the SQL code lives in a separate source file outside your 3GL code. Instead of mixing, say, COBOL and SQL, you have routines written in COBOL that simply call routines written in SQL. Thus, only the SQL module language routines must be changed when you change database systems, and only the SQL module language source code must be compiled by the database system. By simply linking in the correct modules, you could access either or both of two database systems.

SQL module language has other advantages, too. To use embedded SQL, you must use a language for which a precompiler exists, typically COBOL, FORTRAN and PASCAL. In the future, however, it often will include Ada. If you want to use SQL with several vendors' database systems, the least-common-denominator situation will further restrict your available languages. However, by using SQL module language you can eliminate the need for a precompiler, which will allow you to use any languages that you wish to use for your application.

SQL module language also lets you get to certain SQL data items, called SQL descriptor areas (SQLDAs), from languages that can't directly access pointer-based data structures. Finally, SQL module language lets you avoid the problems associated with writing in two languages at the same time. You can have SQL programmers write SQL code and 3GL programmers write 3GL code, with a clean interface in between. For sites concerned with standards, the result is that you have two standard languages in use instead of a single non-standard hybrid containing both 3GL and SQL statements.

DEC is among the few SQL vendors that have implemented the SQL module language. But as SQL2 moves toward broader acceptance, it seems likely that the SQL module language will be more widely available. Even then, it may not be a panacea. The SQL module language is pretty low level: There are no iterative or branching constructs. Thus, each module really does just one SQL statement. The result is that you may have many modules in a typical application program. Just naming and keeping track of them can be a problem.

SQL module language also may be a move in the wrong direction, making the data access more separate from the code that processes the data. It means that users must call subroutines to retrieve data items, not being sure that they're calling those subroutines correctly or that the data the subroutine is returning is the data they want. In many ways this is moving in a direction opposite from what many software engineers want. Software engineers want the database to be more knowledgeable about the application so that it knows more about what reasonable data looks like and how a particular view of the data is used.

Some of the problems of SQL vendors in SQL module language are pretty serious, too. For example, if you provide SQL on many different machines and operating systems, what low-level language should the SQL module language compile into: Macro, PASCAL, object code? How do you know what languages are available on that platform?

There's also good and bad news in the area of database definition. So far, we've principally looked at the data-manipulation aspects of SQL. However, SQL also has a data-definition component. The data-definition component deals with the original definition of the database, tables, columns, indexes, and so on.

The good news here is that the simple stuff will tend to be quite portable among SQL implementations. The bad news, unfortunately, is that you'll rarely want to do just the simple stuff. For example, DEC's implementation of SQL lets you define powerful performance assists for your database in the form of storage areas (putting different parts of your database on different disks) and using B-tree or hashed indexes. The SQL statements to define these structures aren't very portable, but you'll often want to use them to obtain the best performance from your database. Even simple things, such as defining an index, aren't standardized with the SQL1 standard.

Other relatively non-portable SQL definition issues include database security definition (using the database system to control access to the data), data types (especially data types such as dates and very long integers), error handling, recursion (you can't have it, according to the SQL1 standard), and the size of and characters used in variable names. For example, the error codes that are returned by SQL will likely be different from implementation to implementation, with very few error codes common to multiple platforms.

Given the tremendous promise of stronger standards and all the problems of the current implementations of SQL, you can expect to hear about changes in SQL for quite some time to come.

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ROUNDTABLE

DECwindows

A Look At What This Interface Means For The System Manager, The User And The Industry.

Continuing our series of editorial roundtables, DEC PROFESSIONAL *technical editors gathered in February for a teleconference to discuss the myriad issues engendered by DECwindows and the X Window System.*

Participants included Publisher Carl B. Marbach, Editorial Director Dave Mallery, DCL Editor Kevin G. Barkes, Workstations Editor David W. Bynon, Macintosh Editor Al Cini, Senior Technical Editor David B. Miller and Technology Editor Philip A. Naecker. The discussion was moderated by Managing Editor Lou Pilla.

Pilla: DECwindows isn't just a technical architecture, it's also a business architecture. I'd like to begin the discussion by asking for your comments on that thought.

Bynon: DEC plans to migrate every application it has to DECwindows, and that includes business applications, starting with ALL-IN-1 and business software. It's very in-depth and detailed, but by no means does it stop at the technical level.

Naecker: This is a business-driven approach to computing from DEC's point of view. It isn't simply neat from a techie point of view. DEC will "DECwindowize" literally every product that has a user interface.

Mallery: Does that imply the advent of a DEC X Window System terminal with a price tag below $1,000? Because that's the only way DEC will make it universal.

Barkes: I think we'll see that happen in the next few months, when DEC introduces its Ethernet-based terminal. DEC doesn't really have a choice but to do that, because its been beaten to it by two or three companies.

Marbach: But nobody's at $1,000. The price tag looks much more like $2,000 than $1,000.

Bynon: But look at DEC's purchasing and manufacturing power.

Mallery: How attractive for DEC to replace the entire installed base of terminals.

Barkes: The limiting factor in implementing DECwindows in a business environment isn't the hardware or the architecture. DEC will have to compete on a price basis. As far as software licensing goes, DEC will have difficulty dealing with some of the PC MS-DOS-based platforms, at least at present. DEC will have a much easier time migrating current VAX users to workstations than trying to sell a workstation against a PC network or a similar platform. That's going to change. DEC learns quickly — well, in the case of PCs, perhaps not quickly — but it does learn.

Naecker: I disagree. Typical PC configurations that I see cost $3,000 at the low end. There are many PCs and Mac IIs that are in the $5,000 to $6,000 range, and there are several in the $10,000 range. So I'm not sure that a $1,000 price tag is significant for companies that have been buying PCs and Macs for their user interface and their functionality.

This is a business-driven approach to computing . . .

Barkes: But I'm talking about software prices. As far as hardware goes, DEC certainly has shown that it can be competitive in the workstation arena. The only thing potentially limiting DEC, at least up front, is the way in which it licenses its software.

Bynon: Haven't we seen the prices for workstation software coming to a reasonable level?

Naecker: I think so. The full-functioned word processing text-publishing-equivalent package costs about $1,000. DECwrite costs about $1,000. It's a PageMaker kind of competitor. You'll see nearly point-for-point functionality to PageMaker, for example, in version 2.0.

Barkes: But it isn't PageMaker. There will be resistance as long as identical products aren't available at comparable prices. After the applications appear, prices will have to stay competitive with the PC and Mac platforms.

Software Attraction

Marbach: Isn't it critical for DEC to attract third-party software vendors? For example, the Mac has thousands of products available. Without that, can DECwindows be successful? Until there's the plethora of software available for DECwindows that's available for PCs and the Mac, it won't be successful.

Bynon: But there's such a push for that to happen, it almost certainly will.

Cini: History doesn't necessarily bear that out. DEC has a reputation for cannibalizing its third parties, which has left some key developers nervous. Also, DEC's strategy is to enlist the big boys, such as Lotus and Microsoft. But small developers made the Mac successful. To succeed, DECwindows needs their help, too.

Naecker: Don't forget that DECwindows is essentially the same as what OSF offers as Motif. DEC has stated that it will make DECwindows identical. Hewlett-Packard has made similar statements. So you won't be writing for a DEC platform anymore. You'll be writing for all X- and

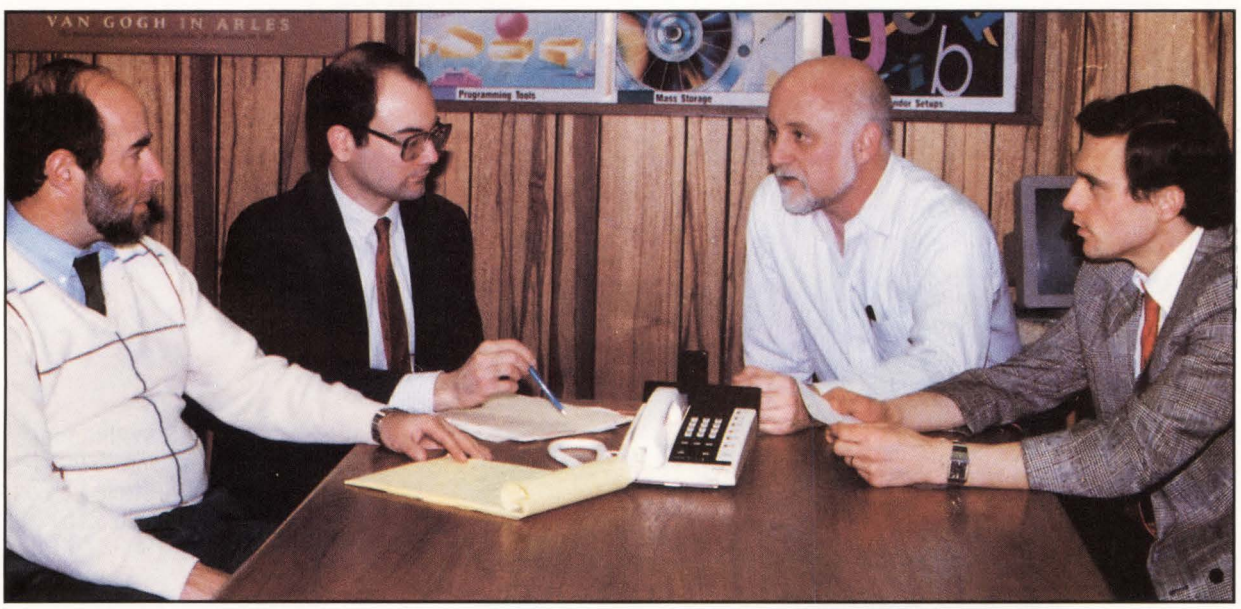

Photo By Sue Ann Rainey

Among the *DEC PROFESSIONAL* editors who gathered for a roundtable on DECwindows were Spring House, Pennsylvania-based Publisher Carl B. Marbach, Managing Editor Lou Pilla, Editorial Director Dave Mallery and Senior Technical Editor David B. Miller.

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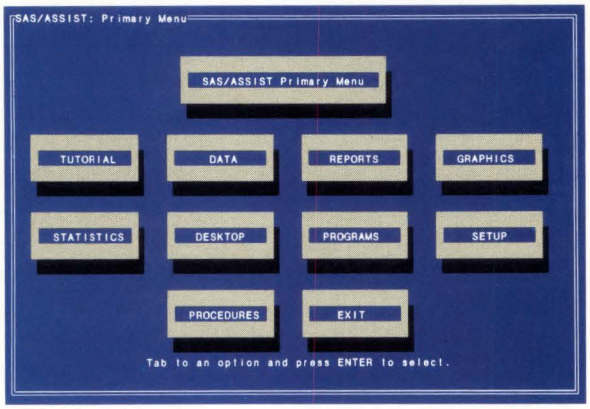

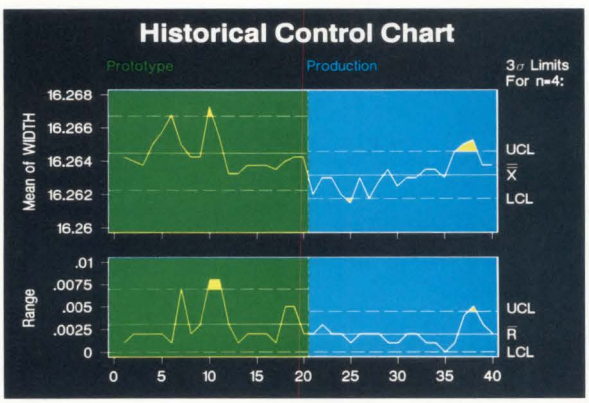

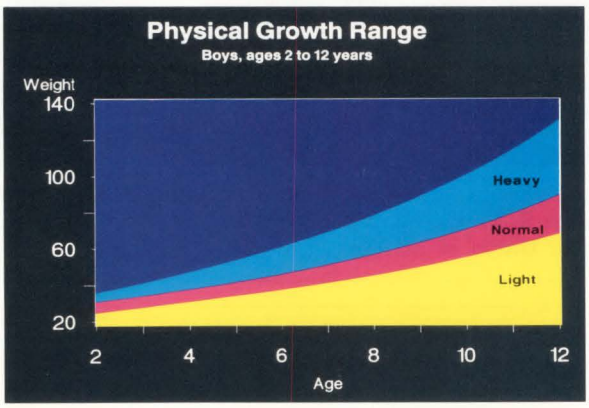

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Bynon: It isn't just DECwindows, it's the entire X Window System scheme. DECwindows just adds some frills to the X Window System.

Marbach: But give me a single example of Mac or PC software that exists for this interface. Why isn't there any?

Naecker: The standard was just announced in December. That's the OSF Motif.

Marbach: Exactly, and that's an example of why it's inferior to the micro world. If this were the micro world, it would have been released to developers six months ago so that when the software and the standard were brought out, there would be applications for it.

Bynon: But DEC made the XUI interface available at minimal cost to those who wanted to convert their product to the DEC platform.

Marbach: You just made my point. Where's a single piece of software for this interface?

Naecker: I think you're being unrealistic. These aren't PC applications that people are building. A successful X product must have a robustness and an ability to distribute across a network and work with standards that far exceed any PC or Mac product.

Barkes: The problem is that although people are aware of the technical superiority of X, the cost of developing X-compliant software is such that there has to be an accompanying release of X and an incredible market push, not only by DEC, but also by a Microsoft- or Ashton-Tate-type entity.

Many business's computing needs are adequately handled by PC AT-class machines. There's a difference between a $2,000 AT and a $5,000 Mac.

Naecker: But the Mac didn't have any significant software other than what Apple delivered for months after it first came out.

Marbach: It was in some respects an abject failure until there was that software.

Barkes: The Mac didn't catch on until it became the platform for desktop publishing. Many software houses still haven't ported their code to the Mac.

DECwindows really needs a VAXstation 3100 and a minimum of 8 MB of memory to perform well . . .

DECwindows needs a critical-mass product — like PageMaker on the Mac or Lotus 1-2-3 on the PC — to break out of the engineering/development workstation market and penetrate the current PC/Mac market.

Bynon: Aren't we looking at the wrong issue, though? Isn't the purpose of X and DECwindows to allow you to use software that's already available on other platforms from the workstations you currently have? Isn't the spin-up phase going to be long and drawn out, because DECwindows is a complex entity to program for and the interfaces will use such things as VAXforms?

Naecker: It isn't easy for even a sophisticated application developer to build an X application that will satisfy the standard and the needs of a very demanding workstation user.

Marbach: Haven't we then taken a step backward? Haven't we been trying to make it easier to program and to make programmer productivity higher with CASE tools and 4GLs and databases?

Mallery: It's the same as Mac programming. For the best and brightest to become a good Mac interface programmer, there's a three- to four-month learning curve of zero productivity while he relearns everything he thought he knew about programming.

Naecker: That's exactly the case here. The first ISVs got a glimpse of DECwindows last spring and most of them didn't get it until September. We're just getting to the point at which vendors say, "OK, VMS version 5.1 will be released in February, so we better have our DECwindows-compliant products by March."

Who's On First?

Pilla: Who will be the first users of DECwindows?

Naecker: Current workstation users will be first. It's immediately applicable to anybody who has a workstation, because the human interface part replaces what you had before.

Pilla: Won't this cause a lot of people to look at new hardware buys, because they think their hardware won't run their applications anymore? Can we expect an onslaught of sales for DEC?

Mallery: Those VAXstation 2000s and VAXstation IIs have to be beefed up to handle it. Am I wrong in saying that a VAXstation 2000 is completely obsolete if you want to run DECwindows?

Bynon: Unless you want to pay for the memory. But who's going to pay $8,000 for a memory board to bring it up to what DECwindows requires to perform well? DECwindows really needs a VAXstation 3100 and a minimum of 8 MB of memory to perform well, although you certainly can run it on smaller machines.

Naecker: That's if you want to be the client and the server. If you just want to be the client and limp along at maybe 6 MB, you can make it go.

Barkes: In other words, a standard VAXstation 2000 essentially is usable as just an X terminal.

Bynon: The problem is that DECwindows uses a new process for absolutely everything. By the time you get logged in with a minimum of you, a terminal window, the session manager and the display manager, you have seven processes.

Mallery: So DECwindows is really a ploy to sell 3100s?

Bynon: No, DEC's performance standard always has been that if you have a performance problem, buy more memory. You need massive quantities of memory to run DECwindows effectively.

Naecker: Processor power certainly is going up by leaps and bounds, and it doesn't make sense to constrain your applications to old measures of how much processor is available. Having $850 mips in a 14-mip package clearly doesn't matter too much if it takes a few cycles to paint some screens if that's what gives you programmer and user productivity.

Marbach: The hardware costs still will pale compared to the end-user costs of using this kind of thing. What's going to happen to end-user productivity using windows?

Bynon: Mine has gone way up, other than that I run out of memory and the machine becomes a dog. You have a learning curve with these products, but every product feels the same. After you've learned the windowing system, you never open a book again.

Marbach: How soon will we have 10, 20 or 50 percent windowing devices?

Bynon: It's going to be a long phase-in period. We've seen people replacing terminals with PCs and Macs for years now. For a long time there will be a detached-base terminal community, because their applications, just like RSTS applications, never moved over to the other side. The power-user community will change over as soon as their applications become available.

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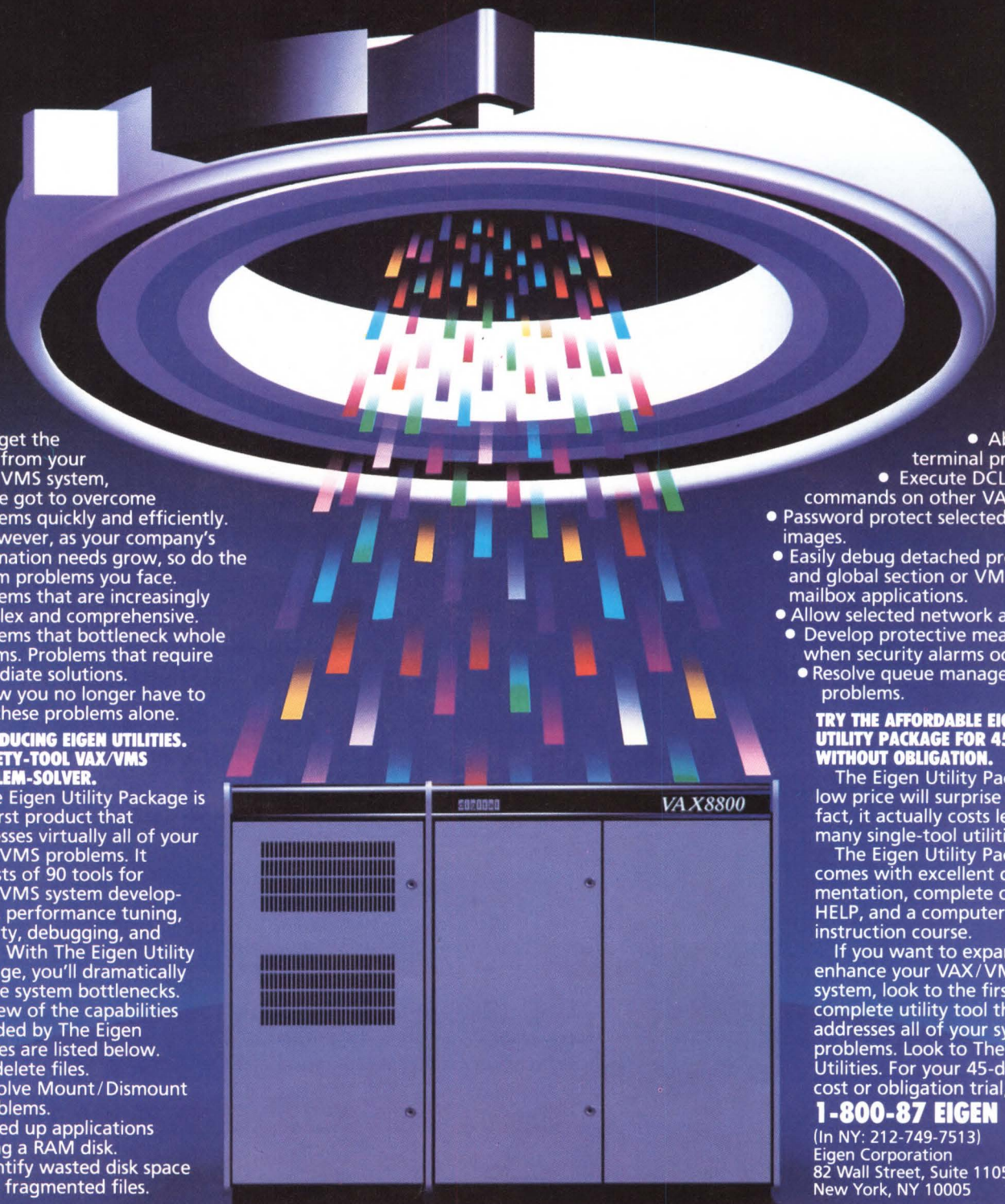

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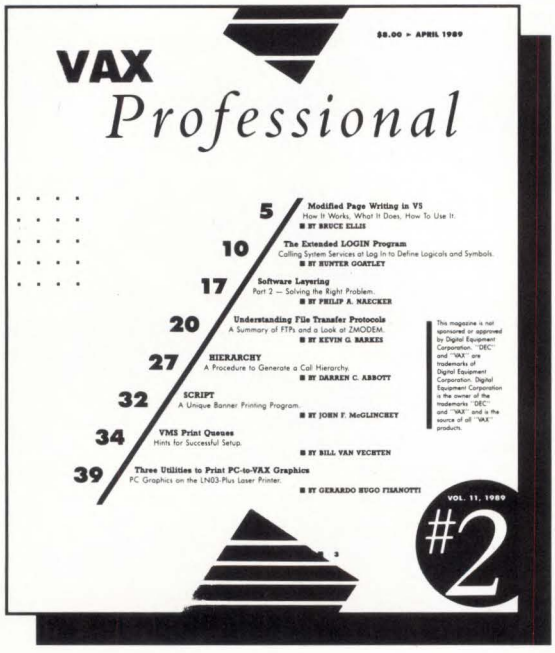

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Interoperability

Mallery: Clearly, there will be no problem windowing between AIX machines and other OSF-member machines. But the SAA standard for Presentation Manager goes much wider than that across the IBM spectrum, both into the AS/400 world and the mainframe world. That's where I begin to wonder. I'd love to hear some reassuring words.

Naecker: Let me tell you what X assumes. It requires only that you have an environment in which you can compile the servers or all the tools — unless you want to rewrite the entire X environment in another language. You also need a reliable byte stream to another node that you want to do X display. It doesn't care what transport mechanism you use.

Mallery: It doesn't care about SNA?

Naecker: It doesn't care whether it's SNA or DECnet on Ethernet or whether its from your own protocol. X doesn't care what the transport mechanism is, it just wants a reliable byte stream on which the bytes come back in the order they were sent, and a bit-mapped screen. If you have that, you can implement DEC X.

Mallery: A lot hinges on that for the future of interoperability.

Naecker: There are some interesting things happening in that area. For example, one weakness of X is that although it runs on many kinds of hardware, it isn't hardware independent. In other words, an X application has to know a lot about the hardware that it's running on. It has to know things such as what color model it uses or how many planes of color it has. X isn't a hardware-independent display system such as hardware-independent graphics models and other systems.

So, an application developer on an IBM might build it to run only with IBM-style displays that use the IBM color model or some other color model. And it might not work very well on another system. But if he builds it robustly and tries to accommodate all the flavors, he'll probably be able to do so.

Marbach: What do you think are some of the potential weaknesses in this system?

Bynon: Its weaknesses will be overcome by CASE tools very soon, which will help you develop X applications. It isn't so much that X is difficult to deal with as it is graphic workstations are difficult to deal with. The widgets are already there. That's already been done for the programmer. More than anything, it's getting used to dealing with two environments: a client environment and a server environment. And they have to cooperate. The client programmer can't dictate to the server what that display is supposed to look like, because that display belongs to the user, not to the program operating beneath it.

Naecker: Programmers are used to taking control: In effect, the program tells the user what he can do and the user just answers questions. In X,

The hardware costs still will pale compared to the end-user costs . . .

DECwindows and Motif, it's the other way around. The user controls how big the window is, and if he says make it bigger, you have to make it bigger.

Bynon: It means that programmers have to be more thoughtful and more complete in their programs and how they interact with the user. Last week, I developed a program simply to open a window and receive input and give output back to the user. What would have taken 10 lines in a FORTRAN program with traditional I/O took five or six pages in a FORTRAN program using X. The reason is that you have to set up a complete environment for the user, whereas before you didn't have to do that.

Mallery: This is similar to the Mac world, in which the effort of making things simple is made once, albeit with difficulty, by the programmer up front. The reward for that comes over the life of the software. And there are marvellous tools in the Mac world for developing programs.

Miller: We see tools like that already being developed. I was amazed to see that at DEXPO East. One person I

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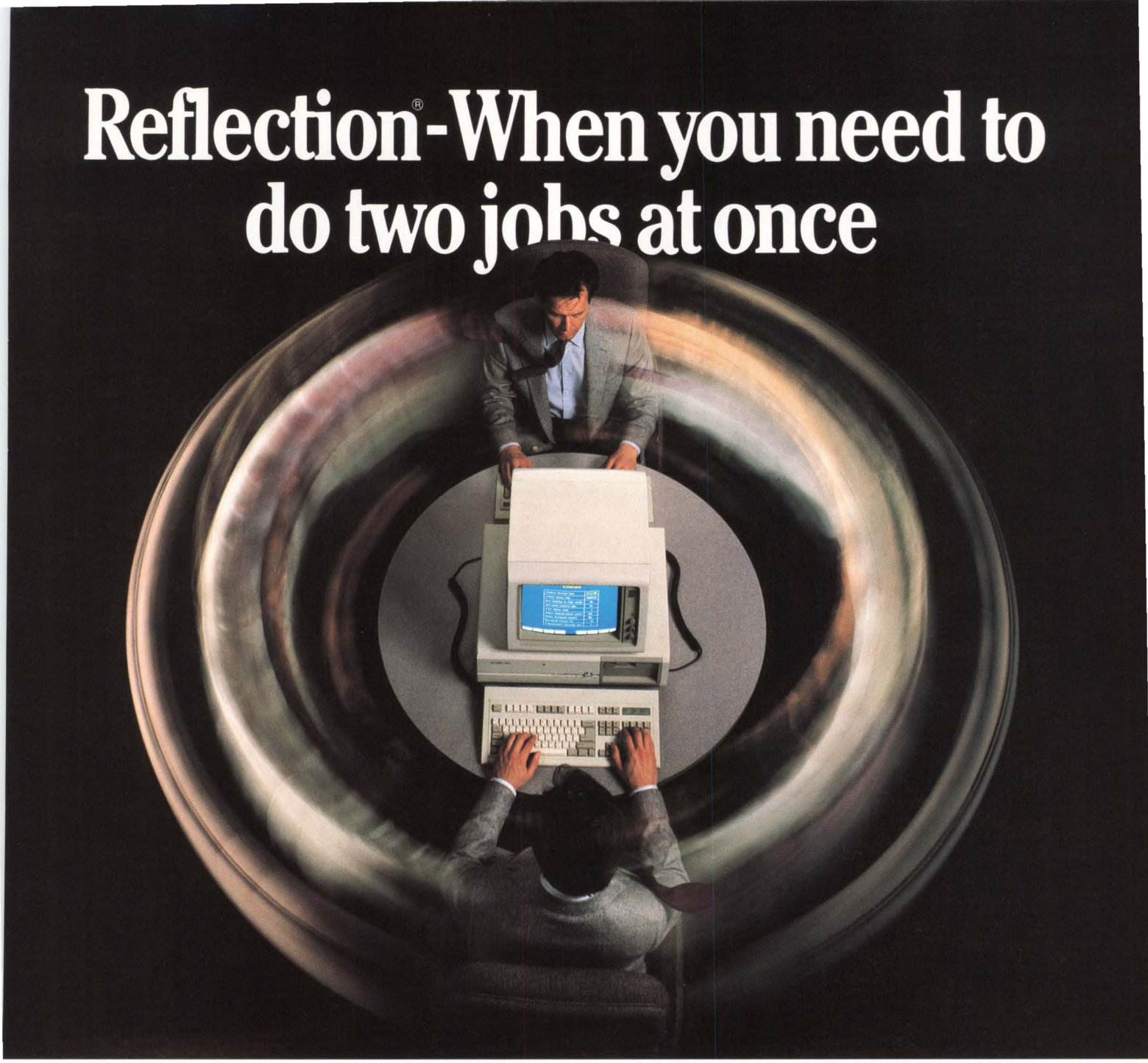

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spoke with didn't write one line of code when he demonstrated an application, yet there was a full application developed in about five minutes before my eyes.

Hardware Issues

Bynon: What's the impetus now to buy a VAXstation rather than, say, the DECstation 3100? If we're looking at running applications that are on larger machines, why do we care what the workstation is? Why do we care that it's running ULTRIX instead of VMS?

Naecker: That's exactly why DEC introduced the DECstation. DEC knows you won't care. You want an engine for very large applications, and the DECstation 3100 is by a factor of three or four the fastest X server. If you're displaying X and running things that are elsewhere and you want fast graphics performance with perhaps some local compute, it's a tremendous box to use. If you're doing software development, you may want to move to VMS. But ULTRIX is catching up rapidly there, too.

Bynon: Do you really need to have the VMS machine? If your interface is the workstation, isn't the idea to have the fastest workstation you can put your hands on?

Barkes: For those comfortable with VMS or who have a big investment in VMS, the VAXstation is very attractive. It's a true personal VAX. But if I'm looking strictly at bang-per-workstation-buck, I'd have to go with the DECstation.

Mallery: When does VMS become irrelevant?

Bynon: I think that VMS and ULTRIX will merge into a new standard. It's going to be the industry-compliant operating system, whatever that turns out to be.

Mallery: VMS is becoming POSIX compliant. But is ULTRIX going to become VMS compliant?

Naecker: I don't think so. I don't see any move by DEC to do away with the things that make VMS what it is.

Marbach: Hewlett-Packard says that if you want standards computing, you need UNIX, but if you want high-volume transaction processing and commercial data processing, the proprietary systems are better. Is the theory that UNIX will be great for standards, but VMS will be a better commercial operating system?

Naecker: For the near future, yes. Will DEC never implement a TP system for ULTRIX? Don't bet on it.

Mallery: After mip power becomes irrelevant, you can make anything work.

Marbach: Not necessarily. Just because something will do an instruction doesn't mean those instructions are suited for transaction processing.

Naecker: I don't think DEC believes that any more. While it's true that DEC isn't going to port all of the VMS utilities and layered products to make a full-function environment overnight, over a period of time it probably will start building things that are more standard compliant. For example, DECforms is a committee product. It's soon to be an ANSI standard and there's no reason DEC couldn't build a DECforms for ULTRIX. Notice that the product isn't named VAXforms.

Mallery: That's right. It's going to be very difficult a year and a half from now to argue with a 100-mip chip set from Mips Computer Systems that costs $300, quantity 1,000. That's enough to justify all kinds of changes.

Naecker: DECwindows may well be a way to keep access to existing applications and the existing VMS environment as you move to a higher-performance environment. It's like terminal emulation on PCs. DECwindows in many ways is a way to drag along your old applications and give them a performance boost, a user in-

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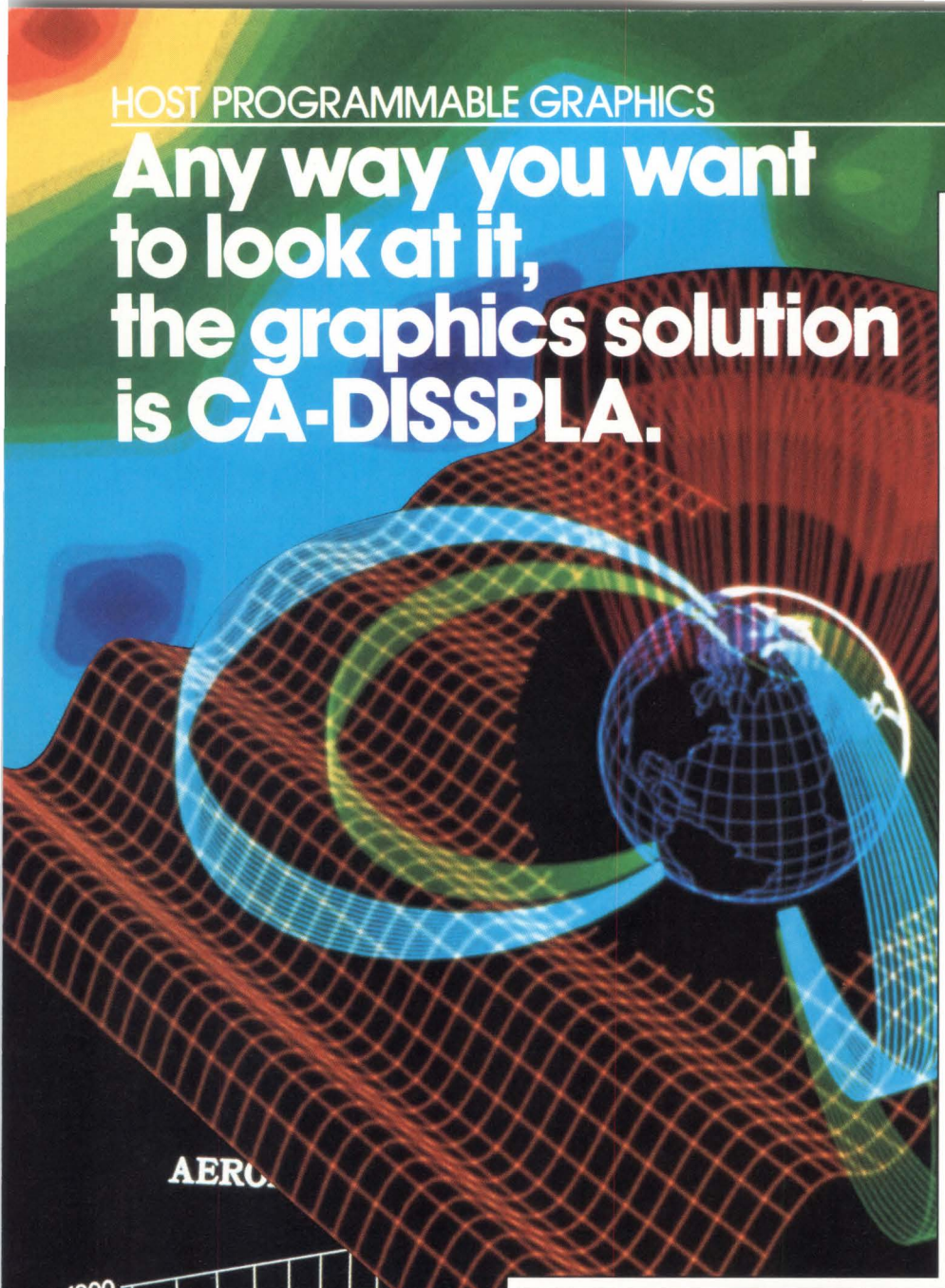

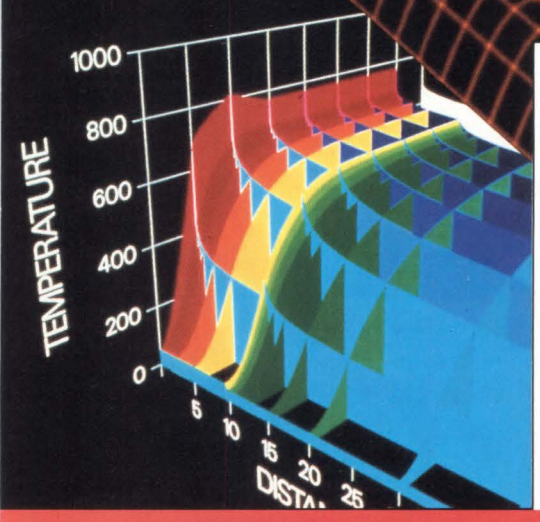

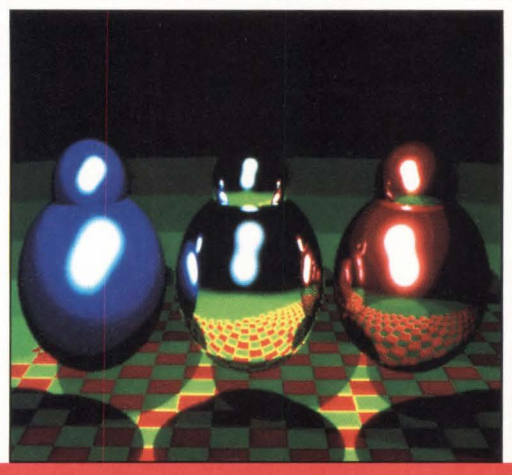

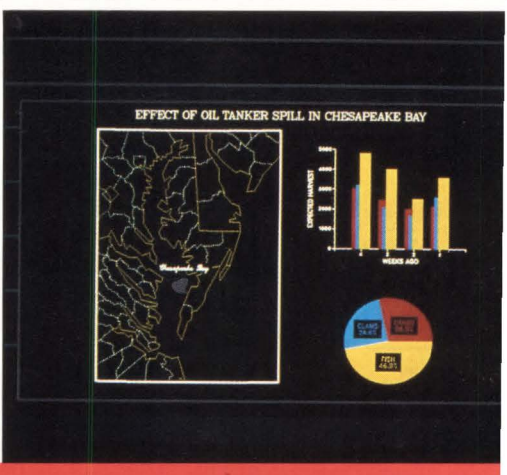

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terface boost, without abandoning them as you move to a newer architecture.

Marbach: If you're a VAX system manager, what do you have to be concerned with and what kind of time frame should you be looking at for DECwindows?

Naecker: Everybody had better have at least a workstation on which to see what the impact is to them and start developing the applications to get on the learning curve. You're probably late if you're just now getting a workstation. They probably could use workstation-level compute and user interface for at least the system manager if for no one else.

Bynon: Ultimately, the critical issue is learning about DECwindows: what's available, what will be available and how it will impact your organization. You don't have to rush right out and buy a workstation. But look at how workstations will play a role in computing in your organization and start to spin up the learning curve.

Barkes: It's important to find out about windows. But don't assume that you'll have to throw out your VT220s and replace them with workstations. You'll see workstations appear in organizations very quickly for system managers and programmers. But at least in traditional applications, the guy who signs the check won't want to replace a VT220 with a workstation when a VT220 at present is capable.

I maintain that the price of software on a per-workstation basis will be one of the major marketing problems you'll have trying to sell outside the traditional DEC marketplace into the generalized business marketplace, which currently is dealing with PCs.

Naecker: But a lot of people using Macs were low-end terminal users and are now power users. The Mac interface was an enabling technology. It enabled them to do the kinds of work they didn't tackle with a non-graphical interface. There's a whole class of users that couldn't or wouldn't use Macs and that's a ripe target for DECwindows and X in general.

Marbach: I like the enabling technology idea. The most important thing about DECwindows is that it won't only make people currently using computers more productive, it will also bring to computing people who have heretofore been afraid of or on the fringe of it. The more pervasive the computer becomes, the more productive we can make it. That's the future.

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ARCHITECTURE

OLTP AS DEC SEES IT

By Elaine L. Appleton

Part 2: Achieving Throughput And Efficiency.

At DEXPO East '89, held at Manhattan's Passenger Ship Terminal, DEC Corporate Consulting Engineer Roger Heinen gave the keynote address. Talking about the difference between raw CPU power and the ability of humans to use it, he said, "If CPUs reach 100 mips, but networks, data management level, application interface and core applications can't take advantage of it, you don't have a balanced architecture. It's the equivalent of cars with 1,000-horsepower engines in a society in which the speed limit is 55. It won't get you from this pier to LaGuardia or Kennedy Airport one iota faster."

Mips have never been a thorough measure of miles per hour when it comes to computer use. This has never been more evident than when discussing on-line transaction processing (OLTP), which has required the development of entirely different benchmarks: transactions per second (tps). Rather than simply measuring how many mips the CPU can provide, the controversial tps metric makes an effort to measure how many atomic processes can be completed in one second by a highly complex system. Like the 1,000-horsepower car in a 55 mile-per-hour speed zone, a CPU is limited by the components to which it's linked. Usually, the speed zone is the database.

A 1,000-horsepower CPU employed as a transaction processing engine can limp along like a 1970 Volkswagen, given an inefficient database that provides too many communications bottlenecks. DEC, in its effort to become the top racer in this year's Indy 500 OLTP race, is trying to provide ways around database bottlenecks.

Transaction-processing power is linked to a number of database criteria, many of which are echoed throughout the entire OLTP system. These include capacity for a very large number of users, availability (OLTP systems are viewed as mission critical), data integrity, and data security.

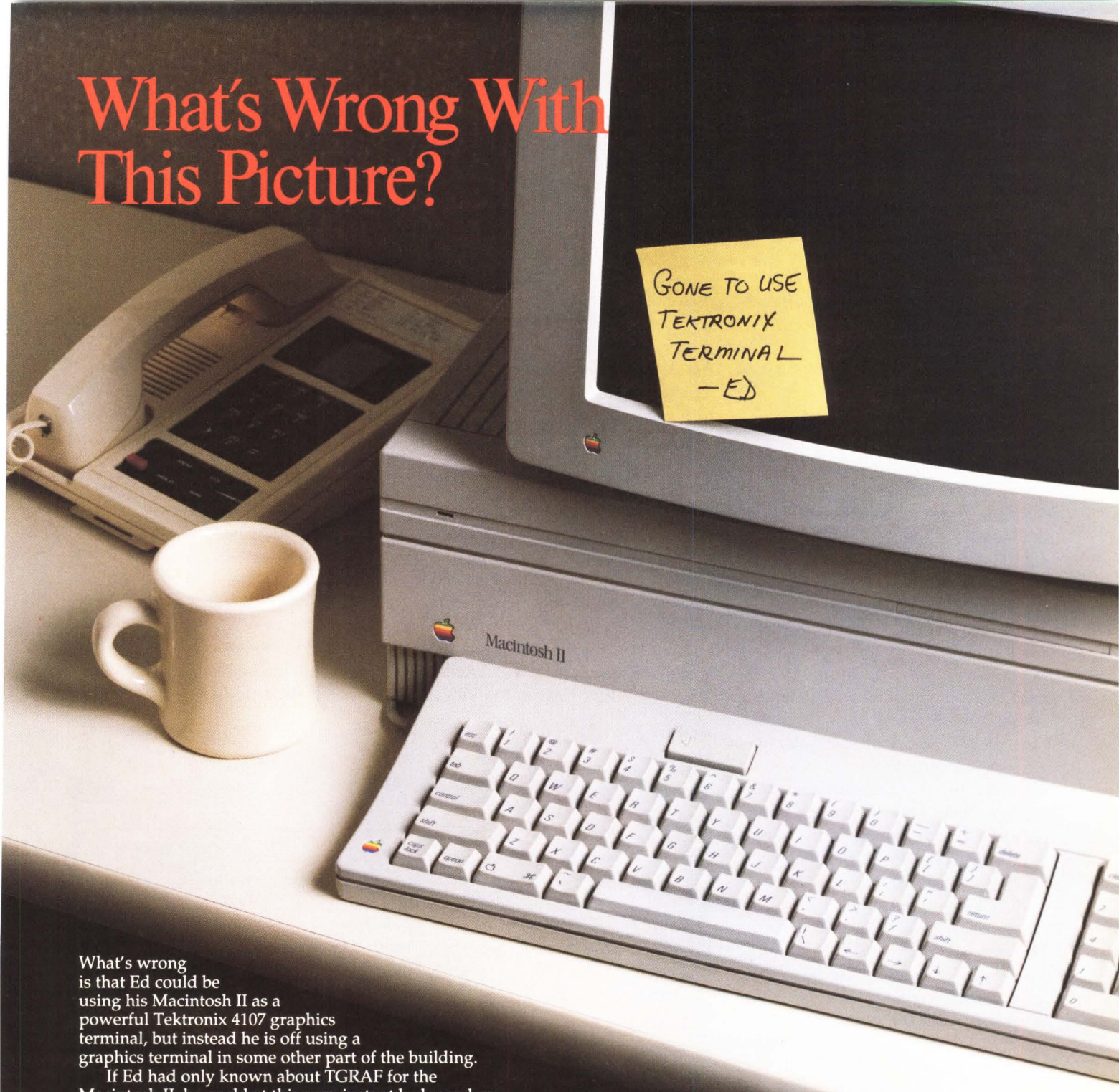
Database Size

To talk about sheer database size is to oversimplify. Theoretically, a database size is physically limited only by the size of your disks, says DEC's Victoria Farrell, marketing manager for database systems. But like an endless supply of stew served to the world's hungry from only one locale, a single, enormous database file can't be used very well.

In DEC's most recent upgrade of its relational database, Rdb/VMS, it has added features that make it easier for many users to access the same data at the same time without sacrificing data integrity or efficiency. One of these additions is multifile support. "Prior to [this addition], Rdb had been one big file with obvious I/O bottlenecks occurring if you had lots of users going after the same tables. All the system relation data could become a bottleneck, as well. By going to multifile, you can have one table in one file and one in another," says Farrell.

"Are they heavily accessed?" she asks. "Get them on different disks." The ultimate goal of multifile support is to spread the database evenly across disks to greatly reduce

What's Wrong With This Picture?



What's wrong is that Ed could be using his Macintosh II as a powerful Tektronix 4107 graphics terminal, but instead he is off using a graphics terminal in some other part of the building.

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I/O bottlenecks, putting, say, 20 percent of your TP database across five disks (see Figure 1). Like a school district sending children to five different schools, you don't have to know exactly where each class is. But it makes life a lot easier if you can assign similar classes to the same facility. With multifile database support, you can control the placement of the tables.

Says Farrell, "That's really key. Before, we could span multiple volumes by defining several volumes in VMS as a bound volume set by doing so initially at SYSGEN time. When it came time to build your database, you'd start writing to a disk. It would fill up and then it would start writing to a different disk, and so on. But you had no control over the placement of specific tables. Now you do."

DEC offers a performance-monitoring and tuning utility that Farrell says provides insight into database allocation, among other things. "It shows you things such as which tables are being accessed heavily. By using that and spreading your data, you can really improve your performance," she says. This utility was introduced with Rdb version 2.3 with little fanfare. Now, the company is beginning to realize its usefulness as new RDBMS features begin to work with it.

Other schemes help place data in the most useful geographical locations. One of these new features is coincidental records clustering. This allows you, at database design time, to place records together on pages or disks according to use. For example, says Farrell, "If you most frequently access the data by searching for an employee and all of his related job history, you'd want to cluster those records on the same page. If, however, you usually access it by getting all the employees in a single department, you'd want to cluster those on the same page."

With Rdb V3, DEC added multiple-record access schemes such as hash-index capability — formerly the sole province of flat-file managers such as RMS — and multi-attribute retrieval, which allows you to search for a record based on two indexes simultaneously. An example of the latter would be, "Search for all former personnel who resigned after January 1, 1988, and whose salaries were higher than $30,000 per year." Previously, this would have used either an index on salary or an index on termination date. Now, Rdb can use both indexes to satisfy the query. Again, says Farrell, the performance-monitoring and tuning utility is helpful here, because, "Now you can identify the bottlenecks and you have a lot more knobs to turn to fix them."

There are other ways to increase OLTP throughput by tuning a database. For instance, you can avoid flushing whole pages at a time through the database. Says Dave Kellogg, marketing support manager at Relational Technology Inc., an OLTP DBMS vendor, "You should flush enough information through the database so that if a rollback is necessary, everything is OK. This cuts database I/O by orders of magnitude."

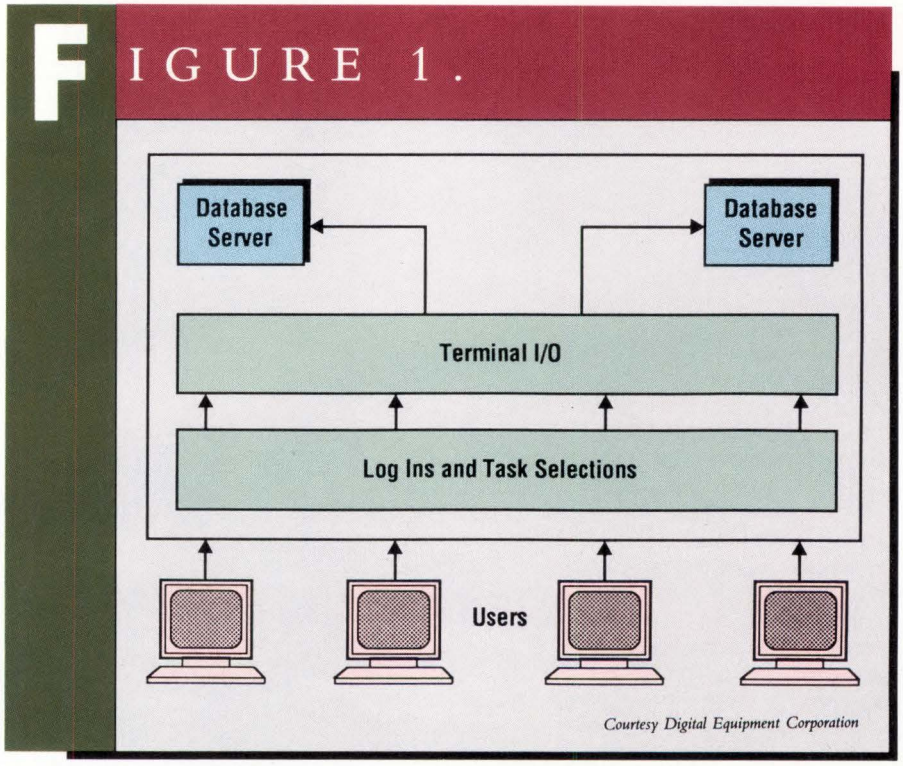
Kellogg also suggests doing group commits, which he says cuts log I/O exponentially. "If one commit equals one log file, and the log file lives on one disk," he says, "then transactions per second are limited by how many I/Os can go to the device holding the log file. If you do group commits, this eliminates the I/O bottleneck.

"This means you're making the DBMS CPU bound, not I/O bound. You add processors until you get where you want to be, for instance, 100 tps."

Is It Safe?

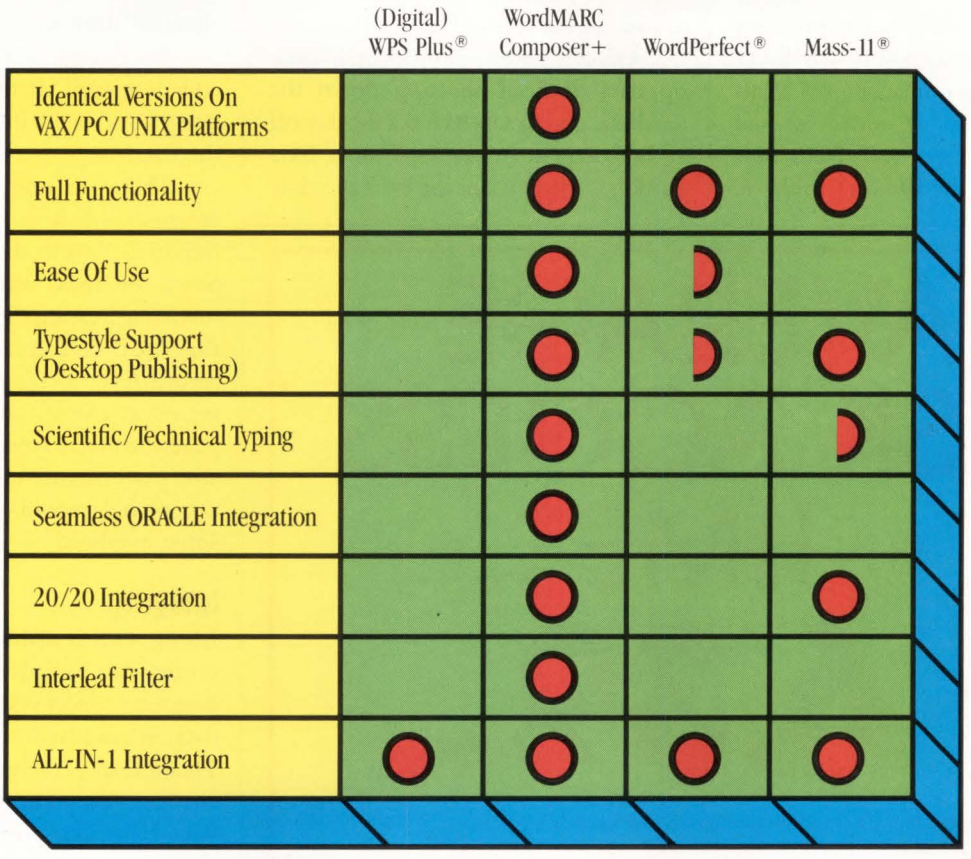
Flexible access schemes and records clustering reduce the size of the database to manageable proportions, not by actually decreasing numbers of records or tables, but by breaking them down geographically and conceptually into controllable chunks. Efficiency wins. However, without knowing that you can back up all of this data, you'd still be

FIGURE 1.



In DEC's multifile solution, which spreads the database across disks to increase throughput, users don't need to know where their data resides. The transaction generator (at terminal I/O) directs input to various database servers. The servers then direct it to the disks.

THE WORD IS OUT.



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stuck at DEC's previous de facto database limitation of a gigabyte of data.

Says Farrell, "Theoretically, you could make an Rdb database as big as the disks could hold, but the problem was you couldn't manage it. We didn't have a real backup utility before." With Rdb V.3, the company added on-line backup, and now says the de facto limit is 50 GB or so — the size that could be backed up in a single shift.

Availability is crucial to OLTP. Workers in a computer-integrated factory or traders at a bank can't afford to lose access to their data.

On-line backup allows you to back up data without shutting down the database, giving OLTP clerks the day off and shutting down the application. Says Farrell, "You can run the backup while they're processing the data in the database. It also supports incremental backup. You only have to back up those sections in the database that were changed since the last backup."

An on-line verify capability was added as well, letting you check the integrity of data without bringing down the database.

There are numerous ways to increase availability of an OLTP system to hundreds, even thousands of users. Some of these methods also work toward increasing throughput. One way that DEC implements is to support record-level locking, which locks one record at a time, rather than an entire page at a time. Depending on your page size, performance can improve. On the other hand, record-level locking incurs some overhead.

Integrity

Along with availability, OLTP demands on-line data integrity even more than do decision support systems. For one thing, data is read and updated constantly. Theoretically, there's no time to make changes safely and check for accuracy later. However, availability and data integrity coexist rather uneasily. Consider the problem of creating a report from data while, in another part of the system, OLTP clerks are typing away merrily, updating the very data you're attempting to use.

As discussed in Part 1 ("OLTP As DEC Sees It," March 1989), the monitors ACMS and DECintact include data-integrity safeguards, such as journaling and error logging. Databases also should include functions to preserve the integrity of the data. Keep in mind, however, that in this case we're discussing only DEC's relational database, not its CODACYL-compliant database, DBMS.

Like the monitors, Rdb is capable of before and after image journaling. Security is provided, as with VMS, through access control lists that limit users' use of utilities and access to tables and views. Rdb also provides constraints to guarantee referential integrity.

For instance, says Farrell, you might

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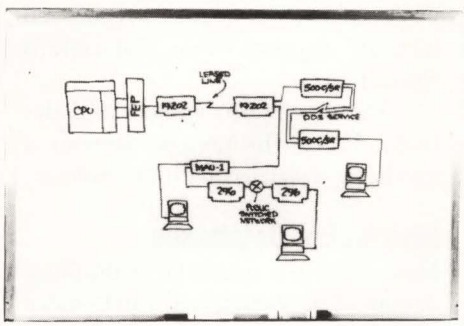

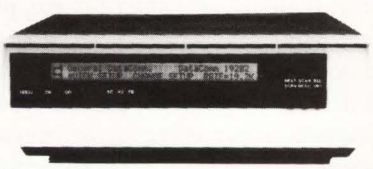

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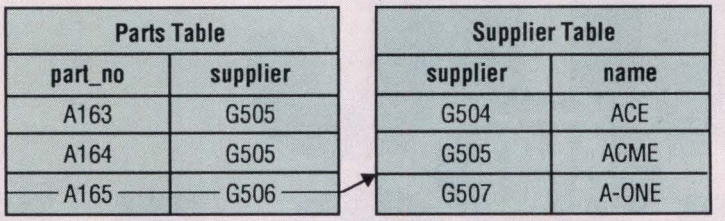
FIGURE 2.



Parts Table	
part_no	supplier
A163	G505
A164	G505
A165	G506

Supplier Table	
supplier	name
G504	ACE
G505	ACME
G507	A-ONE

Courtesy Digital Equipment Corporation

Rdb/VMS currently offers referential integrity with constraints. Here, in a design to keep the database consistent, it's impossible to enter "A165/G506" from the Parts Table into the database because that code doesn't exist in the Supplier Table.

set up a situation in which a user can't enter a new employee with a job code that doesn't exist in a job-code table (see Figure 2). Alternatively, the same user can't delete an entry in the job-code table if an employee with that job code exists anywhere in the database. Presumably because of the large number of users and the sizable amounts of information being fed into the database, Farrell says, "This is more important in OLTP than in any other type of application."

That's all well and good, but you're at your terminal trying to create a quarterly report, and you want to make sure all the numbers are accurate before sending it over the network to headquarters. Unlike the old days before transaction processing went on-line, you aren't working with batch-processed data — this is live. One way to solve the problem is by freezing data with time stamps. DEC calls this "snapshot" capability.

Farrell provides a historical perspective: "Before, you would have had to lock the whole database for the duration of all of your reads in your report creation to maintain that consistency of data from the start to the end of your transaction.

"If you're in read snapshot mode and somebody updates the record, they'll take the old value, time-stamp it and write it out to the snapshot file. You come along and read that record. Your transaction reads the time stamp . . . and goes to the last occurrence in the snapshot file. It checks that time [stamp] and keeps moving back through the snapshot table until it finds the record that was the value at the time the read transaction started, and it takes that value."

When you finish reading the data you need for your quarterly report and turn off snapshot mode, that table is cleaned out.

The concept isn't without its drawbacks, one of which is a fair amount of overhead associated with the process.

Distributed Databases

Many of these concepts lie on the foundation of a distributed DBMS-based OLTP system, rather than one that relies on a single database residing in a host computer. DEC, among other vendors, believes that distributing your data and networking the entire OLTP system provides numerous advantages. These include the ability to make productive use of data for decision support in remote locations; more efficient, manageable data access; and fewer I/O bottlenecks as a result of having more pathways into the data.

However, truly distributed computing is as yet mostly a theory. Often, what people believe is distributed is actually use of local databases. For instance, says Farrell, a distributed system will treat partitioned databases differently than will a local, networked system. If you perform a query on a partitioned database in which some records reside on machine A and some on machine B, a distributed environment will treat this as a logical, single database and will answer your single query. If, however, you're using local databases, you must query as many times as you have partitioned that database, i.e., five queries for five separate boxes.

Farrell cautions that this example is one of extremes, and that there are "probably a lot of configurations in between these two."

The idea of distributing data is seductive — it provides power, flexibility and ease of use all at the same time. Seductive has a connotation of dangerous, however, and that's the way many MIS directors view the concept. Security seems to be far more difficult to implement in a distributed system.

Indeed, says Farrell, "When I talk to customers, literally everyone is interested in hearing what our plans are for distributed database and what our philosophy is, and so on. Virtually no one is implementing it. One of the reasons is security: It's scary in terms of security and maintaining control.

"In this case, the technology probably is moving as fast or maybe even faster than the need and the ability to plan and manage the system."

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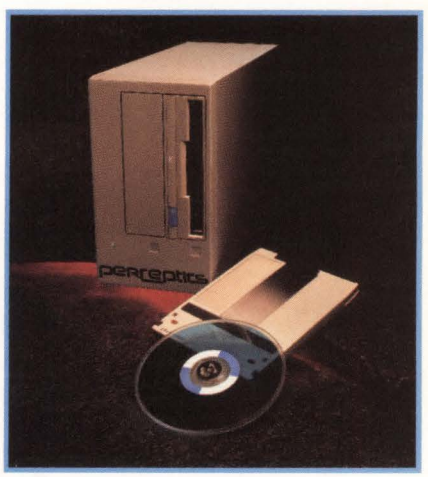

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CASE TOOLS

TEAMWORK GETS THE JOB DONE

By David B. Miller

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Today's large, complex software systems place great demands on analysts and designers. Often, many analysts and designers are needed to finish a project. CASE tools, used properly, can simplify project development. The Teamwork family of CASE products, from Cadre Technologies Inc. of Providence, Rhode Island, can go a long way to alleviate the burden of keeping a project organized.

The Teamwork family consists of modules for System Analysis (SA), Information Modeling (IM), Real Time System Analysis (RT), System Design (SD) and Teamwork/Access, which provides access to related software-development packages, project-management systems and document-production systems.

Although I'll concentrate primarily on the SA module, all Teamwork components work, look and feel similar. The interface to each module is the same. All the modules you buy are installed simultaneously. As you work through the package, certain menu choices might not be available if they pertain to packages you don't own.

We tested Teamwork/SA version 2.3.1 on our VAXcluster.

System Architecture

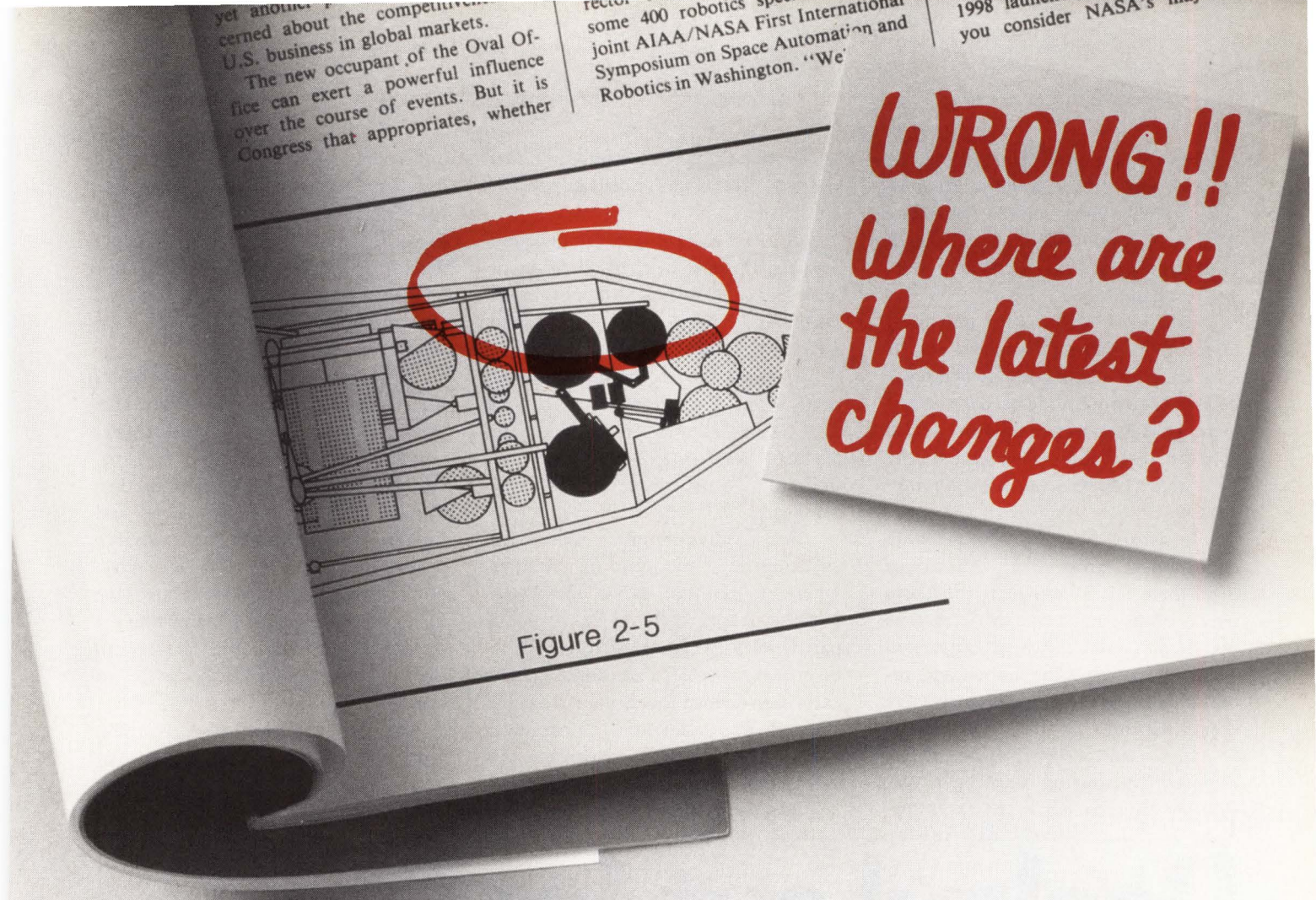
The Teamwork architecture consists of one or more Teamwork clients, the Data Controller (DC) Server and the project database.

Teamwork clients can be disk-based or diskless VAXstations. They can run all of Teamwork in standalone mode, be part of an LAVc or be connected to a host via DECnet.

The DC Server handles requests from its clients via DECnet mailboxes. The DC Server can reside on the same VAXstation as the client process. It also can run on a different VAXstation in an LAVc, or it can reside on any other VAX to which client VAXstations are attached via DECnet. We chose to use our MicroVAX II, FRODO::, as the DC Server node and the Lab's VAXstation 2000, SAURON::, as the client node.

The project database is controlled by the DC Server. For VAX/VMS systems, Teamwork uses VAX Rdb/VMS. The database holds all the information pertaining to the various diagrams you can create and also holds the project's data dictionary. Relational Technology Inc. and Cadre have been working together to provide ways of transferring Cadre project data to an Ingres database, after which you can take advantage of Ingres tools to develop your application further. Although formal agreements with other relational database companies haven't been made at this point, other Cadre users have contributed software for general use that allows similar data transfers from Cadre to other popular RDBMSs, such as Oracle.

You have some homework to do before installing the system. Running Teamwork on



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CIRCLE 170 ON READER CARD

a single VAXstation in standalone mode requires a tape drive, 6 MB of memory and 23,000 free blocks on the disk where Teamwork resides. Cadre recommends two disk drives to increase system performance.

In an LAVc, client nodes only need to meet the memory requirement. A local disk for paging and swapping is helpful. The boot node needs 16 MB of memory and 23,000 free disk blocks. All software installation takes place on the boot node. This was our configuration choice.

In a non-clustered, DECnet-only environment, your client VAXstations need the 6 MB of memory, the 23,000 blocks of disk and a tape drive, because you need to install the client software on each VAXstation. The boot-node requirements are the same as in an LAVc configuration.

In regard to software, Teamwork requires VMS version 4.6 or later, VAX Rdb/VMS version 2.3 or later, DECnet (except for standalone configurations) and VAX Workstation Software version 3.0 or later.

A number of process quotas and privileges need to be checked. Many of mine had to be increased. For example, Teamwork requires a FILLM of 100 and a BYTLM of 75,000.

In standalone configurations, you need WORLD, SYSNAM, SYSGBL and SYSLCK privileges in addition to NETMBX and TMPMBX. Other configurations only require the last two privileges.

A few system parameters also need checking. Page and swap files need to be a minimum of 24,000 and 12,000 blocks, respectively. The SYSGEN parameter VIRTUALPAGECNT needs to be at least 24,000. To accommodate an extra user-defined font beyond the eight allowed by VAXstation Workstation Software, you need to increase the SYSGEN parameter PROCSECTCNT by 4.

After checking the minimum requirements, VMSINSTAL is used to install the package. You can place the software on a disk of your choice. The project database can reside on the same disk or on a different disk. Cadre supplies a verification program you can run after installation to do a final check on your system's parameters.

The supplied printer-configuration file can be modified to suit your site. You can add definitions for the printers you have. The configuration file contains the directions you need to do this. Teamwork supports PostScript and Interleaf file formats. When you need to print something, for instance a Data Flow Diagram (DFD), you can spool the file to one of the printers defined in the printer-configuration file or you can store the diagram as a PostScript file for later printing.

For non-standalone configurations, you need to create DECnet proxy accounts for each client VAXstation. You also need to make sure the Rdb monitor

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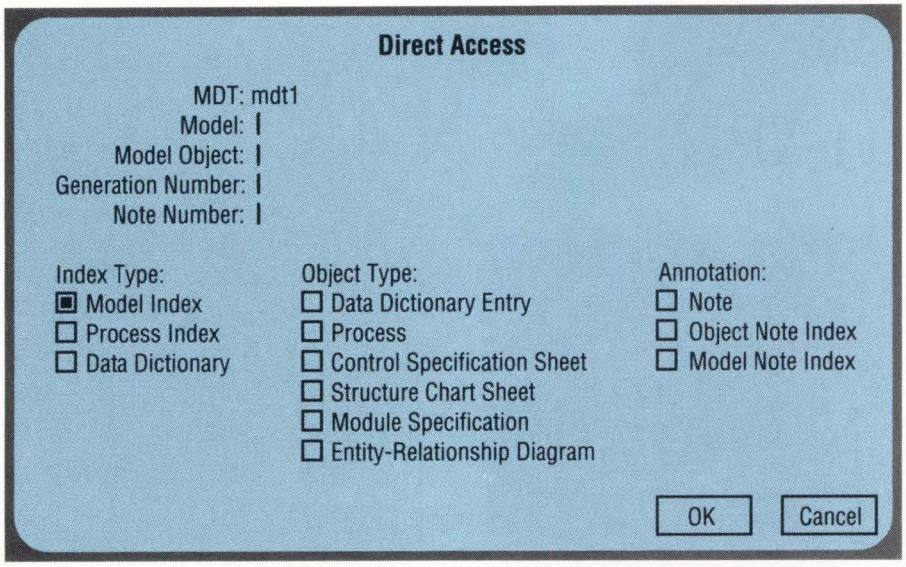
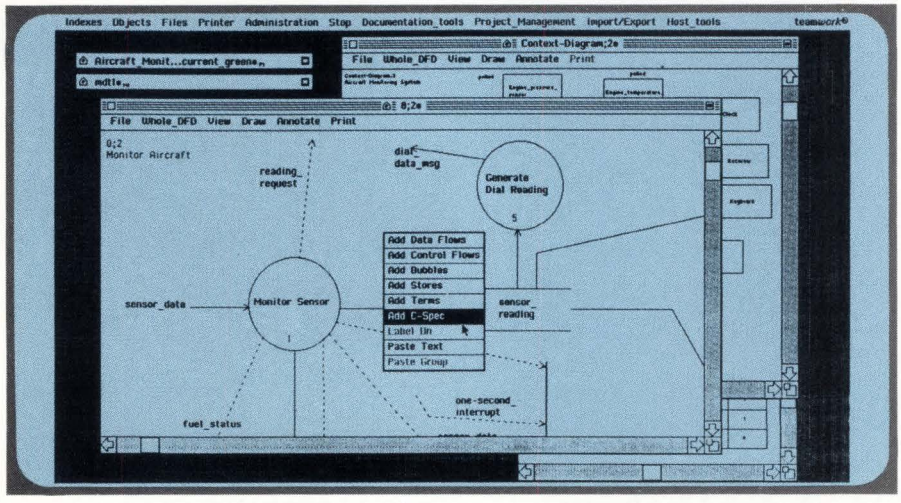


Screen 1: The Direct Access screen is the gateway to using any of your installed Teamwork modules to work on a system model in your project database.



Screen 2: The DFD Editor allows you to draw Data Flow Diagrams that follow the Yourdon/DeMarco system-analysis methodology. The diagram's data can be entered automatically into the model's project database.

is started. A command file to define Teamwork symbols needs to be executed. Finally, you start the DC Server. Typing TEAMWORK on your VAXstation should get things under way.

Using Teamwork

Teamwork is a menu- and mouse-driven program. The interface resembles that of the Mac. Windows can be stacked, moved, resized and closed as with a Mac. Horizontal and vertical scroll bars are used to access data that isn't visible in the current window. Pop-up and pull-down menus are used heavily.

Drawing a DFD will help you learn or at least see many of Teamwork's other features, including the data dictionary, Entity Relationship Diagrams (ERDs), Program Specifications (P-Specs) and the Documentation Production Interface (DPI).

The Direct Access window (see Screen 1) is the starting point for working with any Teamwork product. The Model Index is toggled on by default. It lists all the models in the project database and allows you to create new ones. A model consists of a hierarchical set of DFDs that are refined until they're represented as P-Specs. Teamwork/SA lets you start with a context diagram at the top level and work down to the P-Spec level.

Each DFD in the model is identified with a unique number and title. Child DFD and P-Spec numbers are separated from parent DFDs by decimal points. For example, the ID number 1.4 is the number associated with the fourth child of DFD number 1.

Two DFDs have special meanings. A DFD numbered -1 or that has a title beginning with "context" will be considered the model's context diagram. The DFD numbered 0 will be considered the root DFD. Bubbles you create in this diagram will receive integer numbers automatically. In subsequent lower-level DFDs, bubbles are assigned numbers with decimal points to let you know there's a parent DFD for them.

As you change and save DFDs, new versions, or generations, are created. You can have up to 32,767 generations of a diagram. The last 16 generations are always available to you immediately. Old versions of diagrams can't be changed. However, you can recall an old version, do some editing and save it as a new version.

Six object types are available when drawing DFDs: data flows, data stores, bubbles, terminators, text blocks and name blocks. Teamwork/SA's symbols and methodology support the Yourdon/DeMarco approach to structured analysis.

After naming and numbering the current DFD, you're placed into the DFD Editor (see Screen 2). To draw objects, you first access an Empty Space Menu, so named because you need to click the mouse button on an empty part of the window. There are different types of Empty Space Menus, depending on where you are in the Teamwork system.

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Shown below are three traditional UPS configurations. Each has its advantages and disadvantages.

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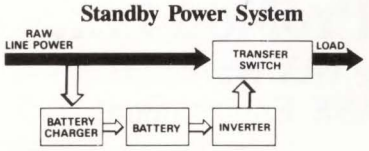
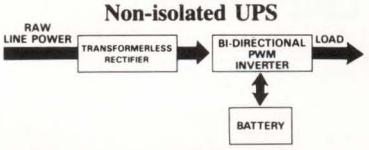


Advantages:
- Low cost
- Inverter normally off
- High efficiency

Disadvantages:
- No derived neutral
- Break in transfer
- Poor isolation
- Poor brownout protection
- Poor high line protection
- Poor lightning protection

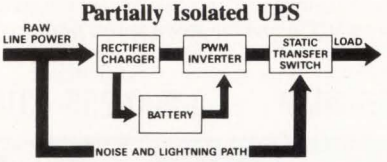
Non-isolated UPS



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

Disadvantages:
- No derived neutral
- Poor isolation
- Inverter on continuously
- Poor lightning protection
- Non-linear load

Partially Isolated UPS



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

Disadvantages:
- Break in transfer to line
- Poor isolation
- Poor lightning protection
- Non-linear load
- Poor efficiency
- Expensive

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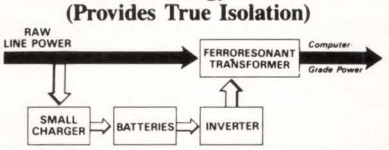

FERRUPS uses a ferroresonant transformer which is on-line continuously to provide outstanding isolation and eliminate spikes, sags, noise and brownouts. If power fails, the inverter takes over. Because of the flywheel effect of the ferro transformer, there is absolutely no break in output power. FERRUPS provides continuous on-line computer-grade uninterruptible power.

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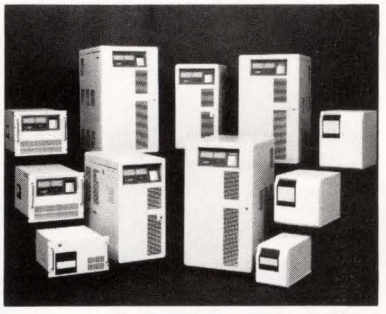

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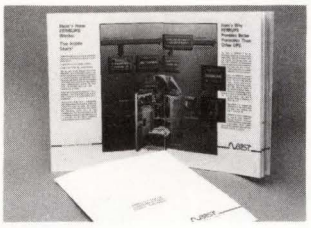
Alarm Messages: Low Battery, Near Low Battery, High Battery or DC Bad, Low Run Time Left, Low AC Out, High AC Out, Output Overload, Ambient Over Temp, Heat Sink Over Temp.



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CIRCLE 103 ON READER CARD

From the Empty Space Menu, within the DFD Editor, objects you choose to draw stay active until you cancel with the right mouse button or choose another object. You can place objects anywhere in the window. Teamwork/SA makes sure you don't overlap objects. Bubbles are numbered automatically. Bubbles and other DFD objects can be connected with data flows or control flows. They can be bent to fit around other objects. Flows also can have their direction changed.

Clicking on an object lets you delete or move objects for a better fit inside the window. Any flows connected to moved objects automatically will move to the new location. Clicking on a bubble also will allow you to create a child process for that bubble. A child process can be another DFD or it can be a P-Spec, signaling the end of that branch of the model. If the child is a P-Spec, you can invoke the P-Spec editor directly from the DFD to create a program specification for the parent bubble. P-Specs automatically can be entered into the project data dictionary. If your company has a standard P-Spec format, you can set up a template P-Spec that will be used each time one is created. This will save you the trouble of re-entering data.

Associating Text

After placing objects on the screen, you associate a block of text with them. The names you supply will form the basis for an entry for that object in the project's data dictionary. In addition to drawing a DFD, the DFD Editor lets you perform a number of other valuable functions via its other menus.

The View menu in the DFD Editor lets you reduce the diagram by a factor of two down to 1/8 scale if you need to see more objects in the window. You also can view the DFD with or without flows. This can help reduce some of the clutter on large, complex diagrams.

The Draw menu in the DFD Editor lets you determine if flows that connect objects point to the center of each connected object.

Notes about the DFD can be created with the Annotate menu. Rather than write them on scraps of paper that invariably get lost, Teamwork notes are saved with the diagram and object to which they belong. All notes you create for a model also can be accessed outside the specific diagram in which they were created by using Teamwork's Note Index (NI) Editor.

The Whole__DFD menu lets you access parent DFDs for all DFDs that aren't Context Diagrams. It also allows you to restore a DFD as it was before the last edit. Two major functions of the Whole__DFD menu are diagram checking and data dictionary data entry.

Diagram checking can be set up to

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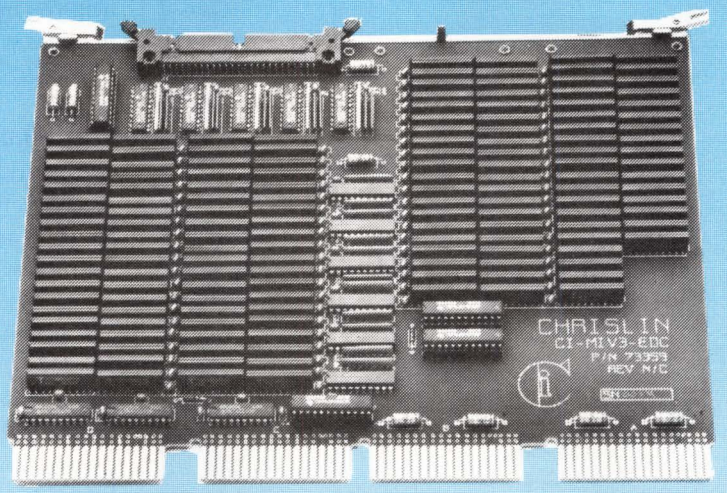

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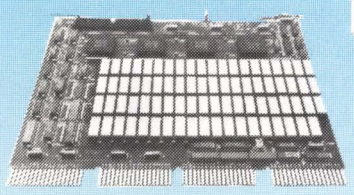

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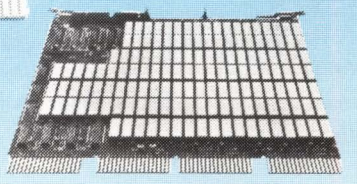

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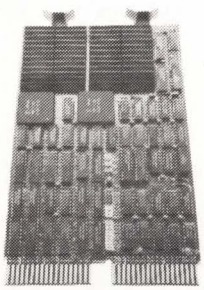

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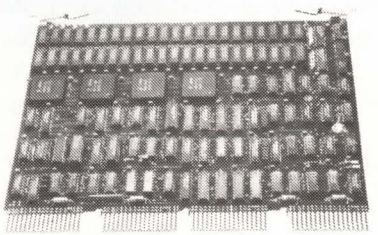

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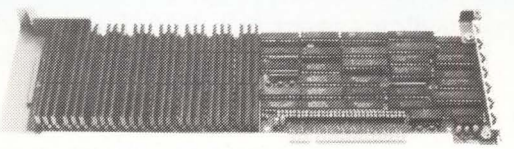

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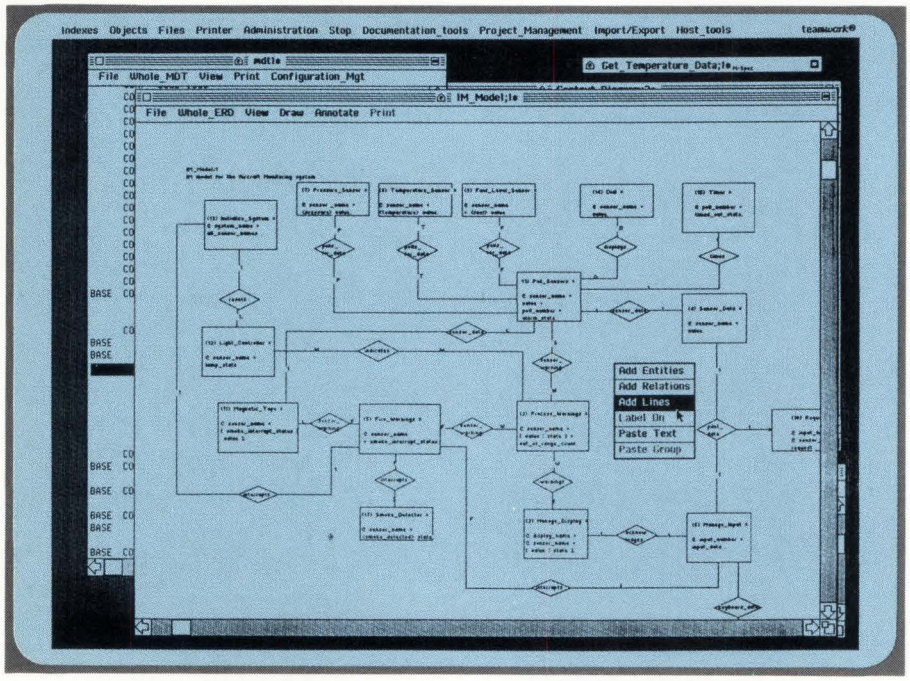

Screen 3: Cadre's Entity Relationship Diagram (ERD) Editor lets you create ERDs following Chen's methodology.

inspect syntax only, to check syntax and balance child processes, or to do all of the above plus check control specifications. Either a single-level or entire subtree check can be performed. Data-dictionary entries can be expanded to three levels, or you can check an unlimited number of levels. A report is generated that can be spooled automatically to a printer, or it can be viewed on screen, allowing you to make corrections to your diagram while viewing the report.

The checking procedure looks for errors, such as bubble numbers and titles that are too large, missing flows, and flows that are bound on both ends to the same object. Errors are reported only. No automatic corrections are made.

Automatic data-dictionary entry makes it convenient to build your data dictionary without having to retype information. The procedure moves to each object in the diagram and makes an initial entry into the project data dictionary. Later, you can assign a definition to each entry by using the Data Dictionary Editor and Data Dictionary Entry Editor. These functions are available from the diagram by clicking on an object. They're also available outside the diagram.

Clicking on an object's name pops up a menu that grants you access to other Teamwork modules. For example, you can click on an object's name to view and modify its data-dictionary entry, its ERD or to show any child entries. You also can manipulate, copy or delete the text.

Finally, the Print menu lets you send diagrams directly to any printer you've set up in your printer-configuration file. Or, you can generate a PostScript file and print it later.

Teamwork/SA's diagramming feature is flexible and easy to use. Its ability to create basic data-dictionary entries will save you time. The ability to access other Teamwork modules will help you make changes to items in those modules without leaving your diagram. You don't lose your train of thought.

The Whole Environment

Teamwork/SA concentrates on System Analysis. The other Teamwork modules round out the front-end CASE environment.

As an addendum to Teamwork/SA, Teamwork/RT is geared toward system development in real-time environments. Teamwork/RT follows the Boeing/Lear-Seigler real-time structured-analysis approach. It allows you to create Control Flow Diagrams (CFDs), Process Activation Tables (PATs), Decision Tables (DTs) and State Event Matrices (SEMs). Control flows and Control Specifications (C-Specs) can be derived. Teamwork/SA and Teamwork/RT complement each other. DFDs in Teamwork/SA and CFDs in Teamwork/RT can share the same data dictionary. The data dictionary is expanded to allow for the additional object types available with Teamwork/RT.

A model of retained data can provide another valuable view of the entire system. Teamwork/IM lets you build data models using Chen Entity Relationship Diagrams (ERD). Using Teamwork/IM, a common project library agreeable to everyone working on the system can be created. An example of an ERD is shown in Screen 3.

Structured design is a job for Teamwork/SD. Teamwork/SD follows the

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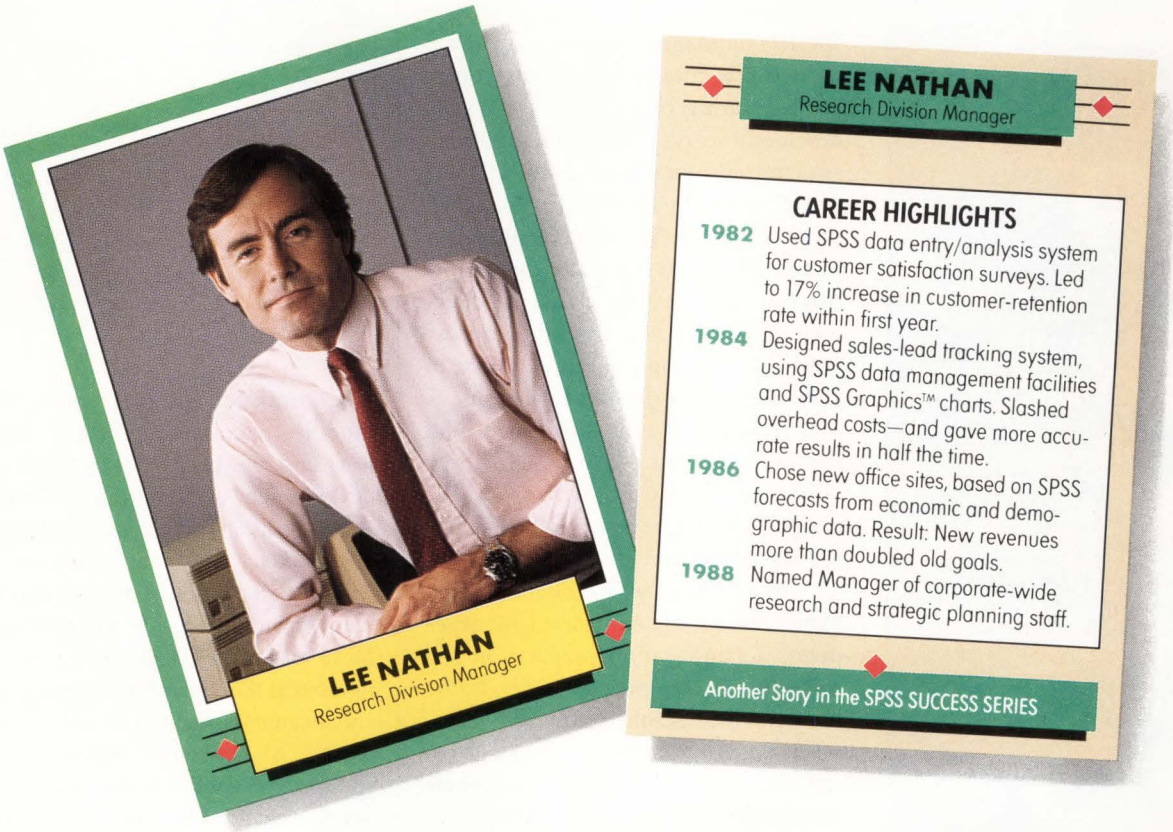

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Editor's note: Teamwork version 3.0.3 was released at the time of this writing. V3.0.3 enhancements include Model Configuration Management, which provides support for model baselining, parallel development efforts and easy detection of differences among models of different design teams. An Ada source-code generation module is now available. Teamwork/SD has been enhanced to include additional symbols to support Transaction Centers, Iteration and Data Hiding. Teamwork/DPI can create structured documents using document production systems other than Interleaf.

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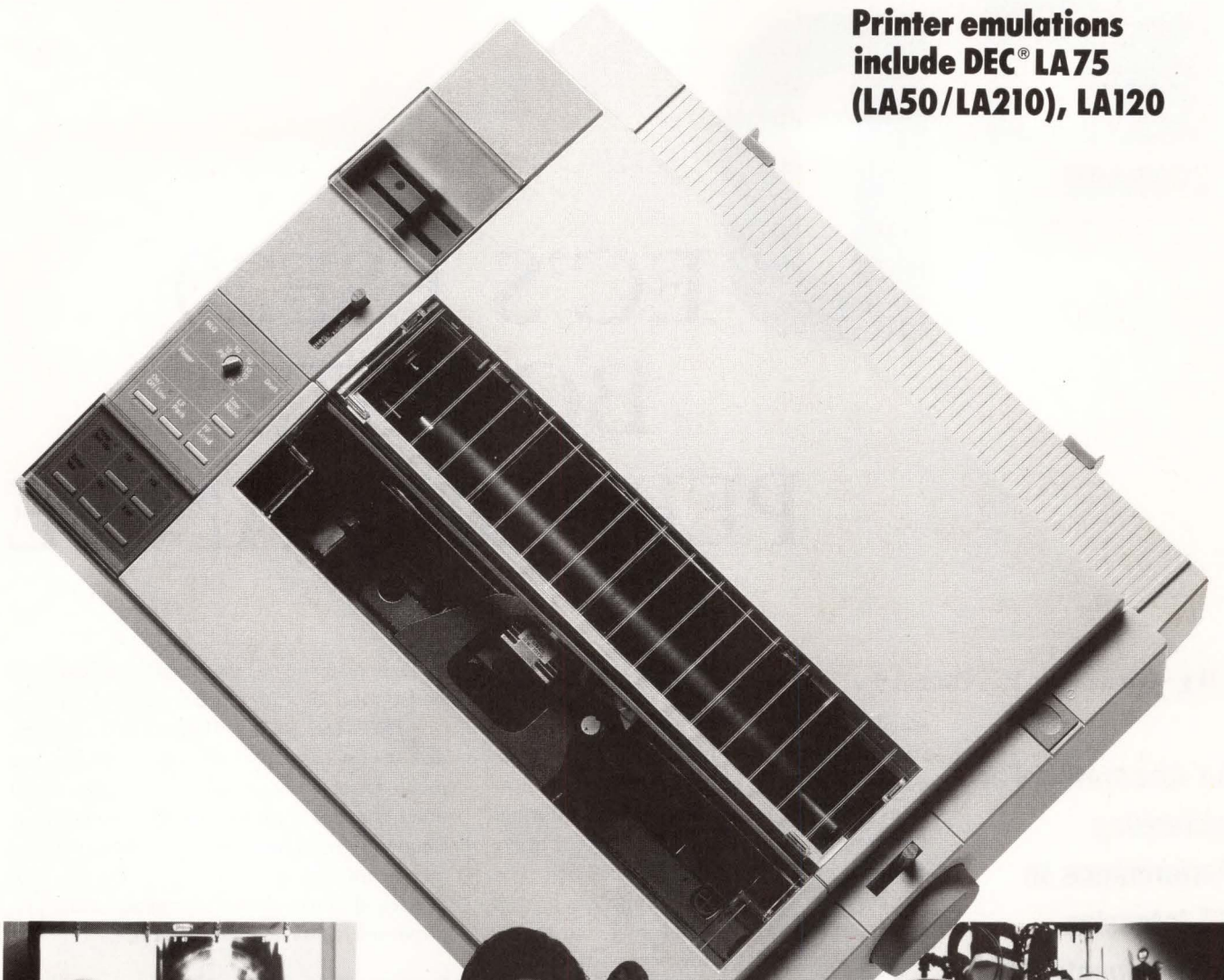

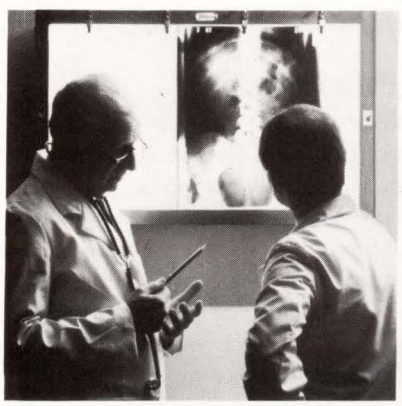

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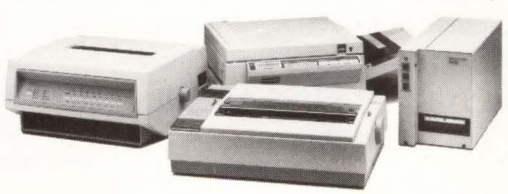

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STORAGE

DEC'S ESE20 BOOSTS PERFORMANCE

By Charles F. Cassidy

An Alternative For Increasing Performance In I/O-Intensive Environments.

In many data-intensive applications, disk I/O speed is the gating factor that constrains overall system performance. On-line transaction processing (OLTP) and other commercial applications push a tremendous amount of information through systems, which puts very heavy demands on magnetic disk devices. Scientific and engineering applications also can be disk I/O intensive. They often rely on highly iterative access to large matrices of data to perform complex design and modeling functions.

For these environments, breaking the disk I/O logjam can have a dramatic effect on system performance. Eliminating disk bottlenecks releases other computing resources so that they can be used more effectively. When disk queues are shortened, for example, CPU utilization typically increases. Ultimately, solving the I/O problem increases the effective capacity of the overall system to perform work. User response times improve, throughput increases and more users can be supported.

A new, very fast storage device can help you eliminate disk I/O bottlenecks and boost system performance. DEC's ESE20 solid-state disk (SSD) employs DRAM as the storage medium to achieve an access time of less than 3 ms. At this speed, an ESE20 can support more than 300 I/O requests per second, a dramatic increase over the 30 to 50 I/O requests per second typical of a traditional magnetic disk.

ESE20 technology complements magnetic disk technology by offering a smaller but much faster storage system. A single ESE20 unit has a capacity of 120 MB. By moving your frequently used hot files to an ESE20, you can reduce the demand on your magnetic disk devices, eliminate disk I/O bottlenecks and improve overall system performance.

Testing Performance

DEC conducted a variety of tests using ESE20 devices in engineering, laboratory, OLTP and telecommunications applications. Figure 1 shows the results of some of these tests. When data and/or programs were moved from traditional magnetic disk devices to ESE20 units, performance improvements ranged from 5.3 to 400 percent. Performance was measured in terms of elapsed time to complete a job, user response time, or predicted number of users supported, depending on the application. In applications using elapsed time as the performance metric, the average improvement was 28.7 percent. For the tests measured in terms of response time, the average improvement was 49 percent.

For each application, DEC first ran a test with the data and programs stored on magnetic storage devices. DEC then moved the data, and in some cases the programs, to one

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FIGURE 1.

Application Environment	Test	CPU Environment	Magnetic Drives Replaced	Data Moved To ESE	Percent Improvement On ESE	Measured In
ENG.	FinElMod1	VAX 8550	1	Data Files	5.3%	ET
	FinElMod2	VAX 8550	1	Data Files	24.7%	ET
	FinElMod3	VAX 8550	1	Data Files	14.8%	ET
	FinElMod4	VAX 8550	1	Data Files	30.5%	ET
	FinElMod5	VAX 8550	1	Data Files	21.0%	ET
LAB	QuanChem	VAX 8550	1	Data Files	26.0%	ET
OLTP	MorgTrad	VAX 8700	1	Entire Applc	78.6%	ET
	SPG_COM	4-node 8650 VAXcluster	10	2 databases	40.0%	RT
	WIC	4-node 8650 VAXcluster	6	6 of 7 files	58.0%	RT
TLCOM	Electronic Message	3-node 8700 VAXcluster	1	Master Files	400.0%	NO

ET = elapsed time RT = response time NO = number of users

Comparison of test runs.

or two ESE20s, and ran an identical test. The results in Figure 1 represent a comparison of the test runs.

The engineering and laboratory tests included five finite element modeling/analysis and one quantum chemistry application, each run single stream on a VAX 8550 system. When the user files were moved from a magnetic disk to an ESE20, the elapsed time for the job to complete dropped by an average of 20.4 percent.

Moving data to an ESE20 improves elapsed time in many scientific and engineering applications because of the nature of the I/O these applications perform. Often, disk I/O time and CPU time in scientific computing can't be overlapped because the data requested from the disk is needed to complete calculations currently in progress. The application, therefore, must wait for the requested data to be delivered to continue processing.

For this "synchronous" type of I/O, a savings in I/O time results in an equal savings in elapsed time. For example, a 20-ms savings per disk I/O for 1,000 I/Os results in a 20-second savings in total elapsed time. In contrast, for applications using asynchronous I/O, a decrease in I/O time results in a somewhat smaller decrease in elapsed time, because compute time and I/O time are partially overlapped.

In the Mortgage Trading tests, a database application running under ULTRIX was used to generate a set of reports. The results listed in Figure 1 show a decrease in elapsed run time to generate the reports of 78.6 percent — from 3.25 minutes to .72 minutes — when the entire application was migrated from a magnetic disk drive to an ESE20. This dramatic improvement reflects a reduction in I/O queue length and, therefore, in total I/O service time. In the real world, this improvement can translate directly to greater productivity.

SPG_COM is a synthetic workload that simulates a commercial environment at varying user levels. In the SPG_COM benchmark, two databases at 41 MB each were spread across 10 magnetic disks in the original test. Moving the two databases to a single ESE20 resulted in a 40 percent performance improvement in response time at the 352-user level. When 400 users were simulated and the databases were moved to two ESE20 devices, the improvement jumped to 57 percent.

For the Warehouse and Inventory Control (WIC) system, moving application files to two ESE20s yielded a significant improvement in throughput, measured in transactions per hour. WIC performs tasks such as order entry, logging receipts and querying inventory files to manage the movement of inventory into and out of a warehouse.

DEC conducted tests on a four-node VAXcluster at user levels from 200 to 600. As the number of users increased, the disk I/O request rate increased and the improvement with the ESE20 units became more pronounced. At 520 users, throughput improved by 57 percent. At 600 users, throughput improved by 74 percent. In a real production environment, magnetic disks alone wouldn't support 600 users, because disk saturation would cause unacceptable performance. The ESE20 makes it possible for WIC to support 600 users at acceptable performance levels.

The Electronic Messaging application generated the most dramatic performance improvement. This application consisted of running DEC's Telecomm/400 on a three-node VAXcluster. Telecomm/400 is a public electronic mail system that's built on top of the X.400 electronic mail standard and X.25 network standard. When an ESE20 was used instead of a magnetic disk to hold the Telecomm/400 master index

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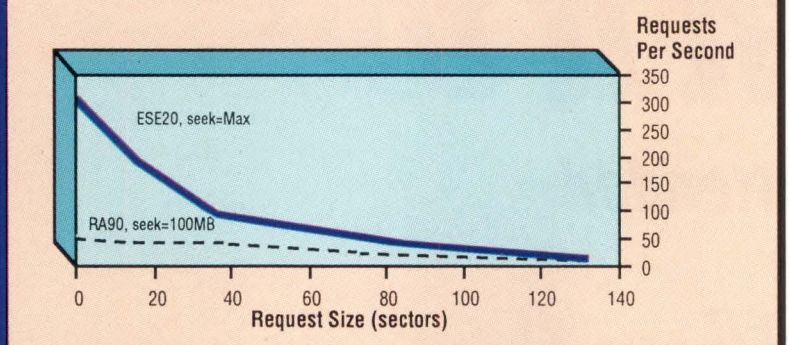
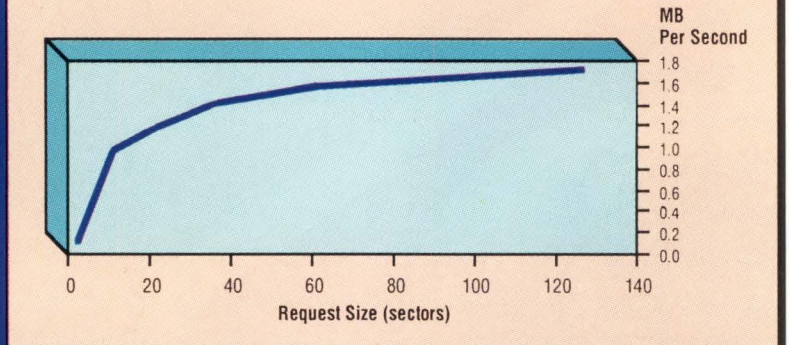
FIGURE 2.



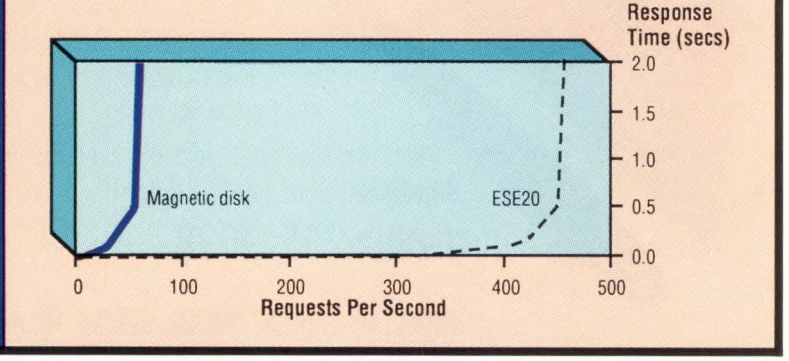
Comparison of request rate vs. request size, ESE20 vs. RA90.

FIGURE 3.



Data rate vs. request size, ESE20, seek = Max.

FIGURE 4.



Comparison of response time vs. I/O demand for typical VMS timesharing I/O workload.

files, the number of users supported rose from 125 to 500, an increase of 400 percent.

Can You Benefit?

What's the basis of these performance improvements, and how do you know what kind of improvement to expect if you install an ESE20? Figures 2 and 3 help answer the first part of this question. These charts show raw device performance data obtained from an I/O exerciser program called IOX. IOX stresses an I/O system to its limits by maintaining a user-specified number of requests queued at the device. For the tests represented in these figures, random seeks were performed over the entire device and the queue length was held at one. That is, the system attempted to keep one operation in progress and one operation pending in the queue at all times. The figures show the results of identical tests conducted on an ESE20 and on a magnetic disk drive.

In Figure 2, the ESE20 I/O request rate is significantly greater than the rate supported by a magnetic disk (seeking over a 100-MB range), especially for smaller request sizes. This difference is because of the very fast access time of the ESE20 relative to magnetic disk. The improvement is more pronounced for smaller request sizes, because access time has a larger impact on the request rate when the request size is small. When a disk is hit by many requests for small amounts of data, the device-access time and the ability of the controller to process commands are the factors that constrain performance. Therefore, a faster access time has a significant impact on disk throughput for small requests.

In contrast, when a disk incurs fewer requests for much larger blocks of data, performance is limited by the ability to move data across the wire. In this environment, a magnetic disk, such as the RA90, provides better price/performance, because its data rate (or bandwidth) is similar to the ESE20 for large

request sizes. Figure 3 demonstrates this point. Note that the maximum data rate for the ESE20 for large transfers is approximately 1.7 MB per second, the same as the spiral-transfer rate of the RA90. Applications that perform large sequential transfers, therefore, should use magnetic disk. Double buffering in main memory and the use of asynchronous I/O will help ensure that the actual transfer rate is close to its maximum potential.

The improved performance shown in the previous application benchmarks is a function of the ESE20 characteristics that you see in Figures 2 and 3. Put simply, the ESE20 can push I/O requests through faster and, therefore, can respond more quickly to applications requesting stored information.

Figure 4 depicts this capability graphically. It shows the response time for "disk" accesses to an ESE20 and to a magnetic disk at varying levels of I/O request intensity. The seek ranges and request sizes used in this model are taken from measurements of a VAXcluster system in a general time-sharing environment. You can see that as the I/O demand approaches 50 requests per second for the magnetic disk, the disk response time rises rapidly because of building queues. The ESE20 response time, in contrast, remains low until well over 400 requests per second.

How do you know what kind of improvement to expect? The answer to this question requires a close look at your application environment. How much performance improvement you get is determined by application characteristics such as disk I/O request rate and queue length. If your application environment involves a low level of disk I/O, your system performance obviously won't improve significantly when you move data or programs to an ESE20. However, if your applications are I/O bound, an ESE20 can be very effective in enhancing performance.

In general, your applications are I/O bound if they generate disk I/O requests to a single disk faster than 30 requests per second and have disk queue lengths greater than two. (Applications with lower I/O rates or queue lengths also may be I/O bound, depending on the nature of the I/O.) You can measure these parameters using software products such as VAX Performance Analyzer (VPA), System Performance Monitor (SPM) or the VMS MONITOR. They provide statistics such as disk request rate, service time, response time and queue length. In addition to giving you disk-level statistics, VPA version 2.0 provides file-level data that can help you identify specific hot files that are causing bottlenecks.

The percentage of improvement you'll see depends on several factors but

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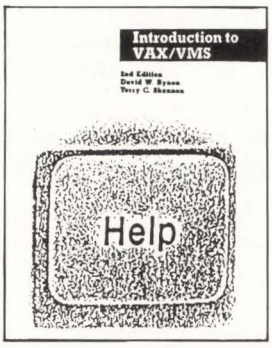

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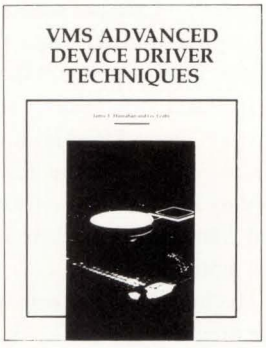

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is probably most dependent on the I/O intensity of your applications. Typically, the more I/O requests the application generates per second, the greater the performance improvement you'll see with an ESE20. The WIC and SPG_COM tests demonstrate this phenomenon. As the user levels are increased, the applications become more I/O intensive, and moving files to the ESE20 generates more dramatic performance improvements.

As we've discussed, the I/O request size is also important. For typical VMS file system activities, the average request size is small — three to four sectors. Specific applications vary in the size of the I/O they perform and therefore should be analyzed.

Before you decide to purchase an ESE20, you also have to examine the compute load of your CPUs. You need enough unused CPU capacity to take advantage of the I/O performance improvements provided by the ESE20. A utilization level less than 70 percent is recommended to ensure sufficient CPU power. VPA, SPM and VMS MONITOR provide CPU-utilization statistics and CPU plus I/O overlap time.

In some I/O-intensive applications, DEC's storage arrays — especially the new SA550 and SA650 — can be effective in boosting performance. Performance improvement is achieved with storage arrays by spreading multiple files with a high aggregate I/O-request rate across multiple spindles of the array. This eliminates bottlenecks at any single disk. To take advantage of this technique, you have to allocate files strategically to spread the activity across the drives evenly. In this context, VPA V2.0 can be helpful in identifying hot files.

The ESE20, in contrast, provides high single-stream performance. It relies on the superior speed of a single "spindle" for performance improvement. This characteristic makes the ESE20 effective for applications in which heavy demand on one file is greater than the capacity of a single magnetic disk. An ESE20 is also extremely effective for applications with heavy demand on a limited number of files, or files that have to reside on the same disk device. For example, all files in a directory must reside on the same volume. An entire directory can be moved to an ESE20 to eliminate a disk bottleneck. However, to take advantage of a storage array, the organization of the application files would have to be modified to create multiple directories.

An ESE20 is ultimately a system-performance booster, and as such you'll evaluate it primarily by its ability to achieve performance results in your application environment. You'll also want to consider data-sharing requirements, protection of data during a power loss and data reliability and availability.

Plug And Play

The ESE20 is efficient in a clustered environment as well as for a single proc-

The ESE20 is a Digital Storage Architecture (DSA)-compliant device that's accessed through DEC's HSC version 3.9 or its KDA and KDB controllers.

essor. The ESE20 is a Digital Storage Architecture (DSA)-compliant device that's accessed through DEC's HSC version 3.9 or its KDA and KDB controllers. Accessed through the HSC, it supports efficient sharing across nodes in a cluster in the same way a traditional magnetic disk does. In contrast, RAM disk requires Mass Storage Control Protocol (MSCP) service, which incurs significant overhead, to support sharing among nodes.

Installation and use of an ESE20 is simplified by DSA compliance. To the operating system and your applications, an ESE20 looks like any DSA magnetic disk device. (An ESE20 is supported by VMS version 5.1 and ULTRIX version 3.1.) It's accessed by standard $QIO and RMS methods through the DUDRIVER provided with the operating system. No special driver or operating system changes are required. You don't have to rewrite your applications or implement any special backup or operational procedures to use the ESE20.

Because the ESE20 uses DEC's Standard Drive Interface (SDI), it requires no more effort to install than a magnetic disk drive. And because the DSA compliance is built in rather than added on using an adapter, the need for additional protocol translations and any accompanying performance overhead is eliminated.

Data Retention And Reliability

The ESE20 protects stored data during a power failure. If you're using an ESE20 to hold critical information that you can't replace, this non-volatility feature is crucial. The ESE20 data-retention subsystem is made up of an internal hard disk, a controller and a standby power supply (SPS). It automatically senses a power interruption, switches to the SPS and saves the data from the DRAMs to the internal hard disk. When the power is reinstated, the subsystem begins restoring the saved data to the DRAMs. Selective restoration makes the data available to applications immediately. The first data requested by the controller is the first data restored.

The data-retention subsystem also lets you take the ESE20 off-line manually without losing stored data. Using this feature, you can remove the ESE20 from active use for maintenance or service with no loss of data. You initiate a save or restore using the RUN/LOAD switch on the console. The system understands the difference between a manually initiated procedure and one caused by a power failure. For a manually initiated procedure, it continues to use the normal power supply rather than switching to the SPS.

Data reliability and availability are other characteristics of the ESE20. DRAMs used in DEC memory products, including the ESE20, are subjected to stringent device qualification programs.

To ensure the integrity of your data, the ESE20 implements two levels of error-control codes. A Hamming Code provides correction of single errors and detection of double and many triple errors at the memory-board level. The Reed-Solomon ECC, provided by DSA controllers, further enhances reliability at the controller level. This dual-level ECC provides three times the data integrity of Hamming Code alone — **statistically more than 100,000 hours (11 years) between uncorrectable errors.**

An ESE20 is also dual ported to ensure data availability in case of a disk-controller failure. The ESE20 provides connectivity to two controllers through its dual ports. If one controller fails, the ESE20 automatically switches to a second controller, thus making its stored data available to your applications.

To enhance data reliability further, shadowing also is supported by VMS on the ESE20. Shadowing consists of maintaining identical copies of data on a set of two or more storage devices. If one ESE20 fails, the data is available on another ESE20 device. Because shadowing requires investing in additional ESE20 units, this approach typically is used only when very high availability is needed.

The capacity of a single ESE20 is 120 MB, but several units can be bound together logically to accommodate files larger than 120 MB. One or two ESE20 units can be housed in a single 60-inch cabinet providing a total capacity of 240 MB in a cabinet. Only one SPS is needed per cabinet.

THE ESE20 PROVIDES an effective alternative for boosting system performance in some I/O-intensive application environments. Monitoring and evaluating your applications and your systems are the first steps to using the ESE20 effectively. As a smaller-capacity, higher-speed device, the ESE20 is designed to complement magnetic disk in the overall storage hierarchy. By identifying hot files and moving them to the ESE20, you can eliminate I/O bottlenecks and improve the use of all of your system resources. *—Charles F. Cassidy is principal engineer, electronic storage development, at Digital Equipment Corporation, Shrewsbury, Massachusetts.*

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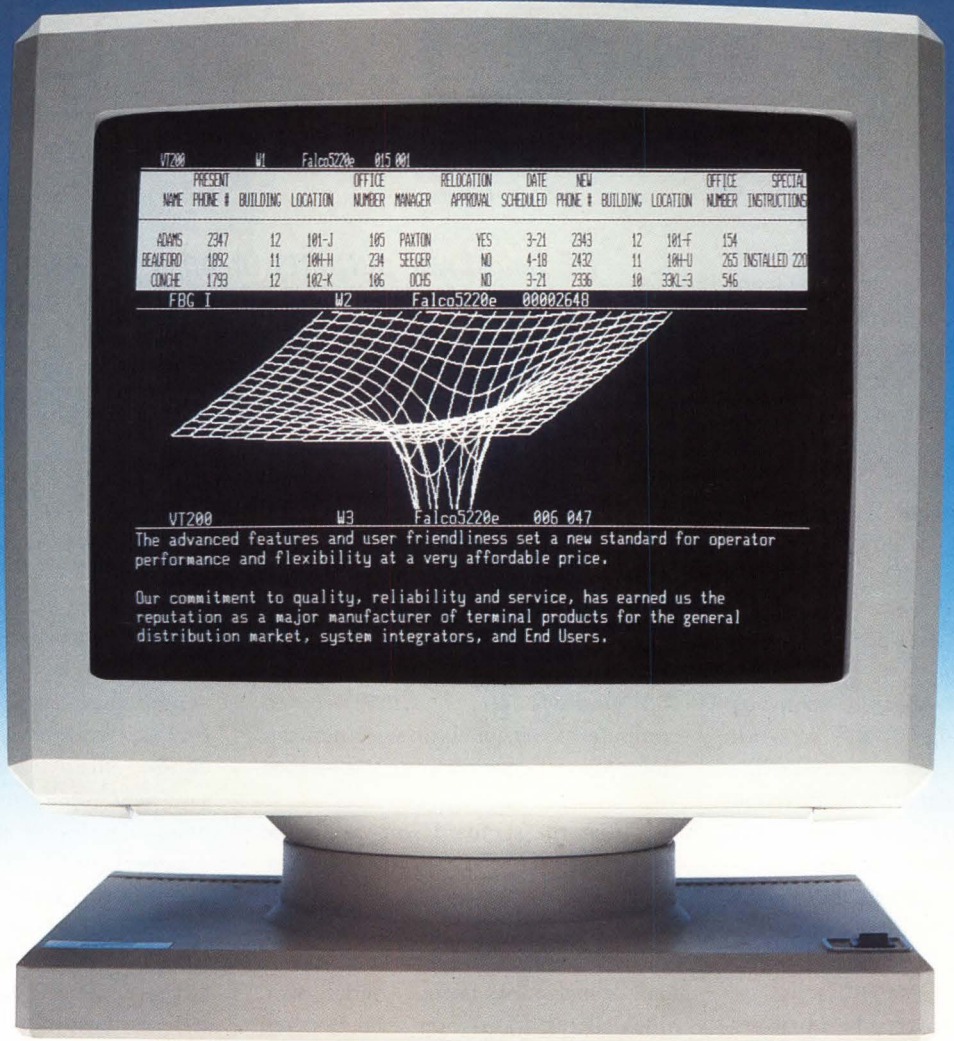

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ENVIRONMENTS

Elaine L. Appleton

Learning To Say UNIX

Many years ago, I held a summer job leasing apartments. Among other strictures, we were forbidden to use the word unit when describing what management euphemistically called apartment homes. Unit, it seemed, held a negative connotation.

The same thing is happening to the word UNIX. Executives at DEC carefully avoid the word. Instead, they adhere to the phrase open systems. However rapidly we may be moving toward the advent of systems that heed no barriers to application and data portability, we aren't there yet. For now, we still have to find ways to get discrete operating systems — including UNIX — to work with one another. Today, it looks like there are two fundamentally different ways to hook ULTRIX and VMS together: DECwindows and recently introduced system internals that work with various networking protocols.

DECwindows

DECwindows purports to be a panacea for most ULTRIX/VMS/MS-DOS portability problems. At the system level, DEC already offers products that provide file transfer, application sharing and e-mail between VMS and ULTRIX. But DEC's future lies with DECwindows, which disguises system calls from the user. In some cases, it even disguises much system-level design from the application developer, according to DEC.

Having a common user interface across different operating systems should bring benefits to the user (and his MIS director) who wants access to VMS- and ULTRIX-based applications. Rather than learning command-line structures for different operating systems, the user need only learn how to maneuver around DECwindows. How does this let you share data, send mail or use applications running on a different operating system than resides on your machine? DEC says it's easy if you have ULTRIX Worksystem Software (DEC's name for DECwindows on an ULTRIX-based computer or terminal) on your desktop and DECwindows on your VMS-based VAX.

> ***"DECwindows purports to be a panacea for most ULTRIX/VMS/MS-DOS portability problems."***

With the standard software come several utilities written for X User Interface (XUI), the application programming interface (API) at the heart of DECwindows. Among these utilities is mail, which in its friendly, iconic way hides all the translation needed when ULTRIX and VMS mail services pass your message from one to the other. "At the core," says VMS Marketing Manager Phil Auberg, "some differences still exist and probably always will, because VMS and ULTRIX users like to handle their mail differently."

Application sharing is another story. Although DECwindows mail is here today, most applications are just now being written to the XUI API. After they're written to conform to these specifications, applications should run on any DECwindows platform, living up to MIT's X Window System objective that this interface of the future be hardware, network and operating system independent. DEC is working on a long-term project to port its application software — hundreds of products — to DECwindows. As Auberg says, though, this isn't easy: "We're migrating applications written for single systems into a distributed environment."

Although more than 300 software vendors have agreed to write packages for DECwindows, developers must climb a steep learning curve. Auberg says new application tools for XUI are being developed that will lessen the drudgery of X programming. But no specific time frames are forthcoming.

The good news is that because there's some potential compatibility between iconic user and programming interfaces with the concept of Smalltalk, we may see new tools that allow object-oriented programming, which makes sense in this type of environment. (Smalltalk, a language pioneered in the '70s by Xerox PARC of Palo Alto, California, was the precursor to commercial object-oriented programming languages.) The future may not be too long in coming to the somewhat beleaguered application developer, and what arrives may ease the pain.

Pre-DECwindows

We are, however, still talking about the future for those of us still bound to the command-line interfaces of VMS and

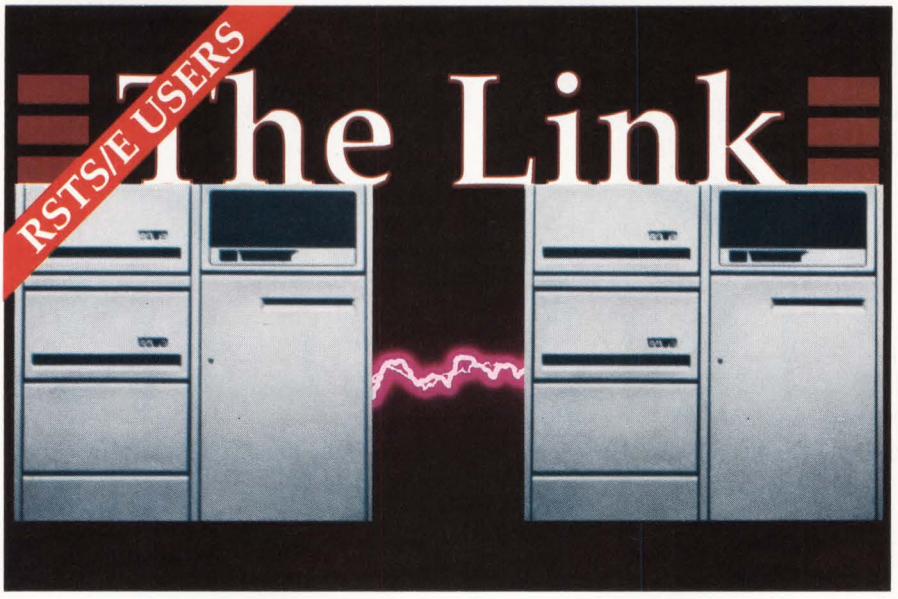

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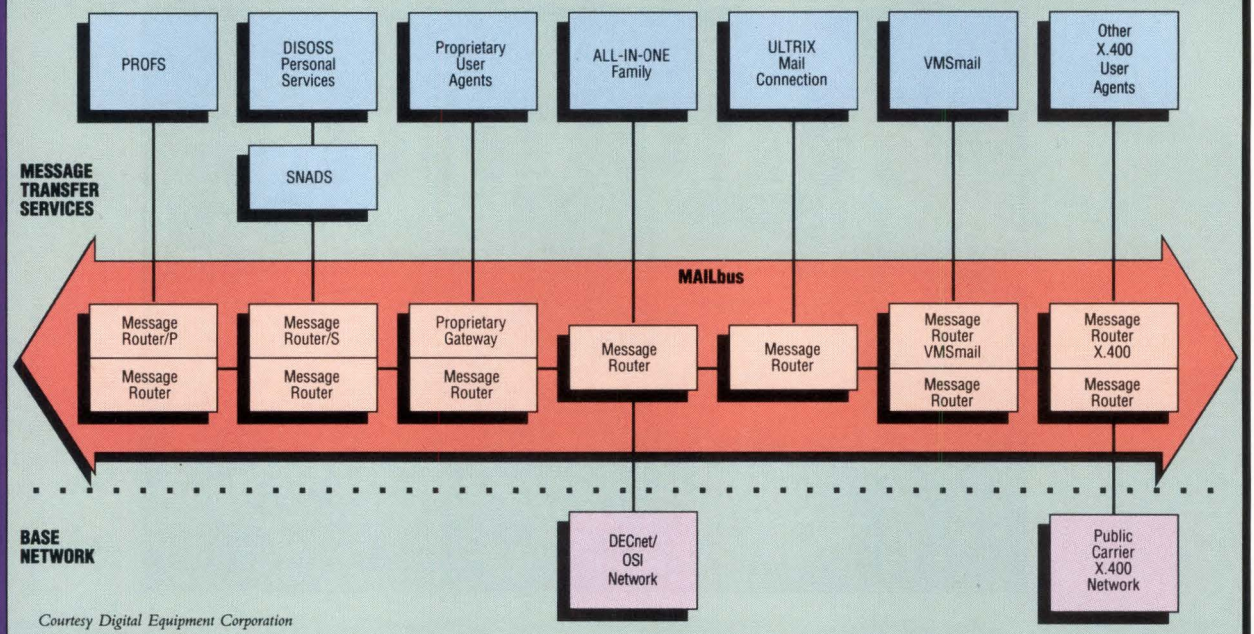
FIGURE.



ULTRIX Mail Connection provides access to the Message Router on the DEC MAILbus, using an enhanced version of "sendmail" as a transfer agent. Through the MAILbus, it allows ULTRIX users to send mail to and receive it from users of non-DEC as well as VMS mail systems.

ULTRIX. In ULTRIX-32 version 3, DEC added several hooks into VMS that you can use without starting over with DECwindows. These are:

1. The VMS/ULTRIX Connection
2. The ULTRIX Mail Connection
3. DECnet-ULTRIX version 3.

Based on the DEC client/server approach, VMS/ULTRIX Connection allows you, as an ULTRIX client, to access VAXcluster resources via TCP/IP or NFS, which this product adds to VMS. The VAXcluster, or single VMS system, acts as an NFS server to numerous workstations running ULTRIX. DEC says that one major advantage of this product is that it allows access from ULTRIX to such high-availability data-management services as volume shadowing.

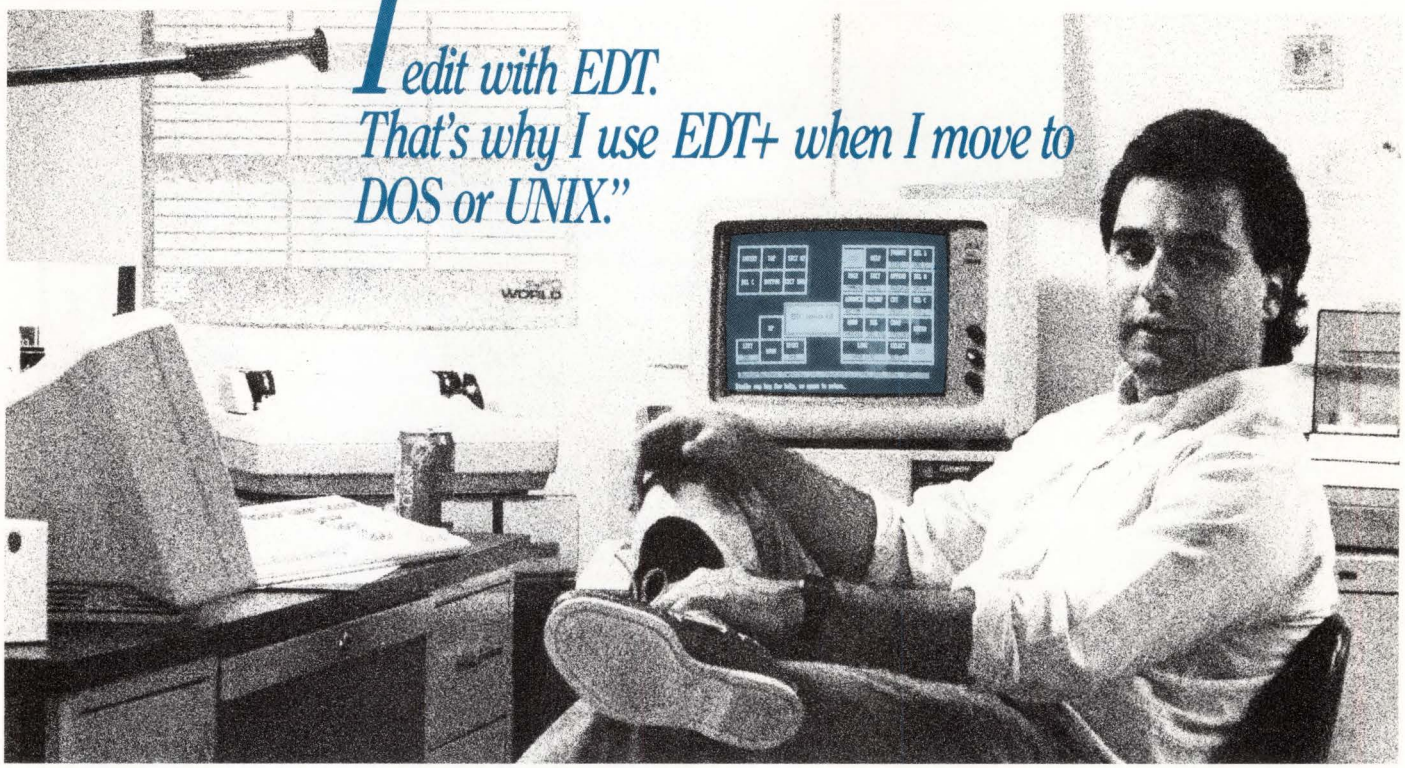
The ULTRIX Mail Connection is a bridge to DEC MAILbus message transfer service via the VMS Message Router (see Figure). The Connection is said to allow ULTRIX Mail users to correspond with users of several e-mail systems, including ALL-IN-1, VMS Mail, other X.400 systems, IBM PROFS and DISOSS/Personal Services and non-DEC UNIX-based mail systems.

DECnet-ULTRIX V3 is basic. Designed to allow ULTRIX users to create networks that link ULTRIX to any operating system in an Ethernet environment (DECnet Phase III/IV), it supports the VAX 6210/6220 and VAX 8810/8820. According to DEC, services provided via this route include task-to-task communications, terminal emulation, file transfer, mail and network-management routines for networkwide resource sharing as outlined by the Digital Network Architecture (DNA). Users of non-DEC UNIX operating systems can access DECnet via the TCP/IP protocols provided. A significant part of DECnet-ULTRIX is the Internet Gateway, which is designed to provide two-way communication between DECnet and TCP/IP-based networks.

While DEC refutes the idea that any single piece of hardware ever will be capable of simultaneously running VMS and ULTRIX, the company does say that the two operating systems are getting closer together. DECwindows could be a generic way to bring any operating systems closer together. Specific ULTRIX internals are designed for closer communication between the two DEC systems.

In January, DEC stated its intention to add POSIX compliance to VMS, not as a layered product but as an inherent part of the operating system. When this takes place, the two systems will be more closely related than the second or third cousins they now seem to be.

Their familial relationship soon may not matter. If DEC and other vendors, such as Apollo, AT&T and



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OSF Versus AT&T

The original goal of the UNIX operating system developed at AT&T's Bell Labs was portability. UNIX was portable to the extent that it easily could be taken off the shelf and translated to countless hardware platforms. Eventually, however, true portability among systems was lost because of extensions and other optimizations made to each platform over the years.

This loss prompted DEC President Ken Olsen, who has sold more UNIX-based systems than anyone, to lash out at his competition, specifically AT&T. UNIX vendors claiming systems portability were selling snake oil, he said. No one ever came up with a compelling argument to dispute him.

Now, more than a year after he made those comments, Olsen is a catalyst in the rapid development of the Open Software Foundation (OSF), some 70 members strong. OSF's charter states that it is dedicated to "the open acquisition, development and licensing of open software." In other words, DEC and others, such as IBM and HP, are on the verge of making UNIX portable again.

UNIX War

The creation of OSF turned the UNIX battlefield, once littered with many small players, into a two-sided war. The war was triggered in January 1988, when AT&T purchased 5 percent of Sun Microsystems, the red-hot vendor of UNIX-based workstations, with an option to purchase an additional 15 percent.

The response of the remaining major UNIX players was, in May 1988, the creation of OSF. The original seven founders were Europe-based Groupe Bull, Nixdorf and Siemens, and U.S.-based Apollo, HP, IBM and DEC. They promised to develop a truly open version of UNIX, based on standards set by IEEE POSIX, ISO, the X/Open consortium and the X Window System, among others. This version of UNIX would be upwardly compatible across unlike hardware platforms.

The new operating system, OSF/Motif, would be based on IBM's UNIX look-alike, AIX-3. Industry skeptics abounded. Many analysts saw an organization with a paper-thin mandate intent on taking control from AT&T. Some suspected that a new operating system wasn't even in the works.

The OSF vendors thought that AT&T and Sun would gain an unfair advantage, because AT&T supplied Sun with source code optimized for the Sun platform before public distribution. Indeed, the spread of UNIX-based systems over the previous five years largely was the result of momentum built up from the free licensing of UNIX over the past 20 years.

AT&T Retaliates

AT&T says that it plans to assume no such control, and that UNIX code will remain publicly available. Nevertheless, AT&T has collected its own adherents into a formidable team, including many Pacific Rim heavyweights. In November 1988, the Archer Group became UNIX International (UI), with AT&T, Sun and Control Data among the original members. Today there are more than 50 UI members.

According to its chairman, Donald Herman, the principal objectives of UI are to preserve the integrity of the original UNIX, guide its future development and ensure that it continues as an industry standard.

That might sound more like marketing and posturing than research and development, especially in light of OSF's commitment to develop an entirely new, albeit patchwork, technology. But, AT&T is busy developing the next version of UNIX.

System V release 4.0, due in two or three months, will be the first version to test AT&T's publicly available stance. Release 4.0 reportedly will be upwardly compatible with three of the major UNIX derivatives: System V, Berkeley BSD and Microsoft Xenix.

The goal of both consortiums is to develop an open, standard operating system to which each of its members can write proprietary extensions while remaining compatible. This has resulted in many companies — vendors of software applications in particular — joining both organizations.

The Cold War

AT&T and Sun briefly considered joining OSF, but eventually rejected the idea in favor of the Archer Group. In a letter to OSF members, OSF President Henry Crouse said, "the central obstacle to AT&T's joining OSF is its insistence that the OSF Board of Directors mandate System V Release 4 in its entirety as OSF/1 [Motif], rather than permitting users to select the best available technologies through the open process."

Meanwhile, OSF maintains that it's trying to devise an open operating system based on market-driven standards, not necessarily to compete with System V. In fact, both sides publicly have admitted that the best way to design a universal UNIX would be cooperation between the two. But for now, two new versions of UNIX are under way.

Crouse concluded that "further discussions with AT&T would be non-productive and [OSF has] decided to suspend them." Crouse even claimed that OSF extensively re-evaluated the selection of IBM's AIX-3 as the core technology, and concluded that it's a technically superior base for OSF/Motif.

According to the OSF study, major advantages of AIX-3 are:

1. A re-engineered kernel that is both preemptable and pageable.
2. Its modularity and its use of dynamically loadable kernel modules.
3. Its support for real-time applications.
4. Superior disk volume management.

Further, OSF is confident enough in its implementations of the POSIX and X/Open standards to conclude that current UNIX System V applications will be supported by OSF/Motif.

OSF/MOTIF AND SYSTEM V will be similar only in the underlying code structure and some fundamental commands. The graphical user interface to each will look substantially different, although the final versions of the operating systems from both OSF and UNIX International will comply with the specified standards, such as IEEE. OSF's interface will be a combination of look-and-feel technology from DEC, HP and Microsoft. UI says it will continue to support Sun's Open Look, although at print time that seemed somewhat tenuous.

The bright side is that two versions are better than 100 versions. At last, portable UNIX is on the horizon.—*Evan Birkhead*

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Hewlett-Packard — which have endorsed MIT's X Window System as an interface standard — have their way, the user won't know or care which operating system underlies his applications. Says Auberg, "We chucked a lot of money into DECwindows to develop a totally heterogeneous environment, so the operating system should have no importance to the user and minimal importance to the application developer."

He forecasts, "In a few years, application developers will be writing to a common API that's independent of the operating system, as XUI is, and there will be only a small percentage of application developers who will really care what the operating system is."

Then, perhaps, UNIX-based systems will become open systems. Until then, DEC officials and the rest of the industry might dare to use the forbidden word and call UNIX what it is, rather than what they would like it to be. ■

WORKSTATIONS

Getting Started With DECwindows, Part 1

David W. Bynon

Several DECUS symposia and quite a few months have gone by since DEC first announced the age of DECwindows. I lose my patience quickly, and quite frankly, I was getting tired of waiting for the illusive panes. Just as I had succumbed to putting up with VWS and UIS forever, DEC announced the release of VAX/VMS version 5.1 (the real VMS version 5.0) and DECwindows for VMS. I was also privy in January to using a prerelease version of DECwindows, which was loaded on a friend's VAXstation 3100 (how sweet it is!). A few weeks later, my VMS V5.1 update kits arrived.

I was like a kid in a toy store with my first experience with DECwindows: Everything had to be played with or touched. I must admit, though, the experience was a bit odd. After all, I've been hacking DCL commands at the $ prompt for the better part of a decade now. Invoking DCL commands with a mouse is easy but a little queer. You almost can forget DCL command syntax, because dialog boxes prompt you for everything.

But don't be fooled! Anyone who thinks he can forget DCL, MS-DOS or the UNIX shell because DECwindows is here is wrong. DECwindows for VMS will keep DCL programmers fully employed, as facilities such as FileView heavily depend on DCL command procedures to get their work done. I suspect DECwindows for ULTRIX-32 and MS-DOS will rely on their native user interface just as much.

As DEC system users, we're trying to make our computing experience easier and more enjoyable through graphical user interfaces. In this endeavor, DECwindows is a major advancement. At the same time, PC and Mac users are trying to make their computing experience more useful through networking. It's ironic, isn't it?

> ***"The X Server provides an interface between the user and the application program he wants to run."***

DECwindows Features

Before getting started with DECwindows, it's important to understand exactly what it's supposed to do for you. Here are some of its features:

1. An easy-to-use graphical user interface (GUI).
2. The GUI is common among all implementations.
3. Easy (transparent) access to network resources.
4. Application portability.

Each item is important, although in different ways to each of us. It's important to me to have a common graphical interface, because I work with so many different computers and operating environments. In the DEC environment, easy access to network resources has been with us for many years, so transparent access is the next logical step. And finally, software developers don't just want software portability, they need it. Competition between software developers is fierce.

DECwindows is a network-based GUI built on the MIT X Window System. Its architecture is based on the premise that an application will run on one computer (the client), while the user interface is handled by another (the server). This client/server relationship is reversed from the traditional role, or at least as we think of it. Most DEC client/server models use a large host as a resource (disk, file, print) server for a smaller computer or workstation.

In DECwindows, as in other client/server models, the server (called the X Server) provides a resource service to its clients. The X Server software runs on the user's workstation, where the graphics display and keyboard are located. The services provided to a client system (which runs the application) are low-level graphics, windowing and user input functions, i.e., mouse, keyboard, graphics tablet, and so on. The X Server relies on low-level routines (primitives) that must be written for each workstation platform on which it will execute. The X Server itself doesn't directly manipulate the hardware.

The X Server provides an interface between the user and the application program he wants to run. The application may be remote (located on another system) or local. Further, it isn't necessary for the application to be running on a compatible system. In other words, an X Server running on a VAXstation using VMS can present an application running on a remote ULTRIX-32 client.

The scenario for the DECwindows client/server model is actually quite simple: The user of the X Server worksta-

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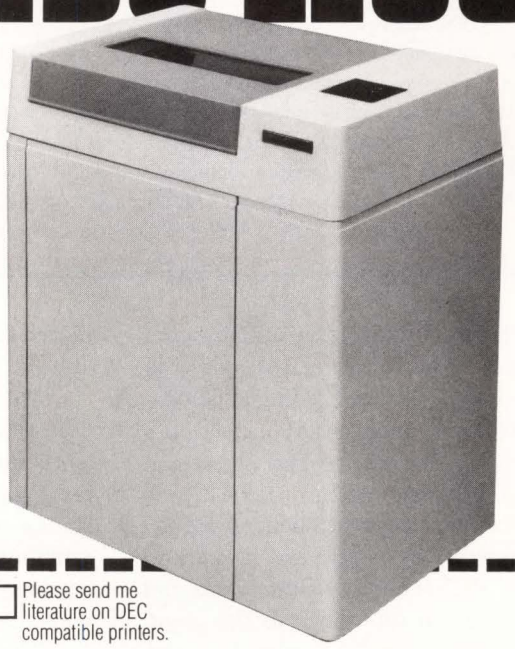

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Window Pains

The battle to build an industry-standard window system has software developers, system integrators and end users in a frenzy. The heat is on for integrators and developers to convince the user community to use their products. The user community, however, still is struggling to understand the role graphical user interfaces (GUIs) will play in the future of computing. Digging through the maze of offerings makes the search for the right user interface harder.

To confuse the issue further, there are two basic schools of thought: that of the PC industry and that of the minicomputer and high-end workstation industry. The PC mavens insist that PC LANs are the future, while the high-end workstation and minicomputer industry sees the future as distributed resources, including PCs.

The battle rages into the application software market as well, because the winner of the windows race will be the application developers of the most-supported platform, i.e., UNIX, VMS, MS-DOS, OS/2, and so on. At some point (maybe years from now) there will be a winner, and we'll all be forced to change.

The question is, "How do I choose the right user interface?" The answer hasn't been easy or cheap, as there are so many answers from which to choose.

In my environment of Tandy 4000 PCs, VAXstations and MicroVAX servers, I'm forced to live with what's here now. Many of my software tools, such as PageMaker and AutoCAD, run under less-than-ideal window systems (MS-Windows and VWS) for our "distributed" environment.

I'd be satisfied with MS-Windows on the PCs, but the 386 version won't work with DEC's DECnet-DOS/PCFS. Because of this, I'm wasting valuable memory and suffering from poor software performance.

Ultimately, I'll switch over completely to the DECwindows system. I'm testing it now and it works well, but the applications I need aren't available under DECwindows yet. And that's what hurts the most, because when I make the switch, I'll suffer a heavy investment loss in MS-Windows and VWS software.

The situation is critical. We're being forced to put up (the money) or shut up.

tion requests application support from a client, the client instructs the server to take actions, such as opening a window or displaying data, and the client does the work requested. The client and server cooperate using a defined protocol. This allows the client to tell the server what to display and how to do it and the server to report events and screen information back to the client. The server owns the display, however, not the client, and the workstation user may manipulate the windows at any time.

Getting Started

DECwindows is installed on each system that is to participate in the DECwindows environment. At startup time, DECwindows looks for the presence of workstation hardware. Drivers are loaded based on the configuration of the system.

VT terminal users will never notice that DECwindows is on the system. They aren't affected. To workstation users, the change is dramatic. The workstation user is prompted with a DECwindows dialog box to log in. An account name and password must be entered to log in and begin a session.

The DECwindows log in process uses the LOGINOUT image to verify authorization, map the appropriate rCLI and establish SYS$INPUT and SYS$OUTPUT, as a normal VMS log in would. When a user has been verified through the system-authorization file, the workstation log in process, which uses the workstation device name for its process name, is renamed to match the account being logged in.

Unlike a DCL user, the DECwindows user's parent process doesn't execute DCLTABLES. Instead, the parent process executes DECW$SESSION. This is the DECwindows session-manager image.

The session-manager process (at log in time) is responsible for establishing your default environment. It starts the window-manager process, which you see on your screen as the icon box, sets up screen colors and default values, then starts VUE and DECterm processes for you.

By the time the log in is complete and you can start working, three to seven processes will have been created. Depending on the workstation you're using and your log in options, the log in process may take from five to 10 seconds on the VAXstation 3100 to a minute or more on the VAXstation 2000.

After getting you logged in and set up, the session manager has three important functions: session control (quitting and pausing), creating FileView (VUE) and creating DECterm processes. DECwindows FileView lets you access DECwindows applications and DCL commands, while DECterm lets you directly access DCL and other VMS applications not written for DECwindows.

If you've used other windowing systems, such as MS-Windows or the Mac, DECwindows will feel natural. The typical window functions and controls work as you might expect. If this is your first workstation experience, you have a number of new mouse terms to become familiar with. Graphics are used to represent physical knobs, switches and buttons that we use everyday on our TVs, stereos and toasters.

The workstation mouse is used to manipulate the graphical controls. When you click on a control, it provides input to the application. Controls are labeled to indicate their purposes. There are four basic types of controls: toggle buttons (labeled rectangles), radio buttons (small circles), push buttons (small squares) and scales.

Controls are used within widgets, which are DECwindows user interfaces.

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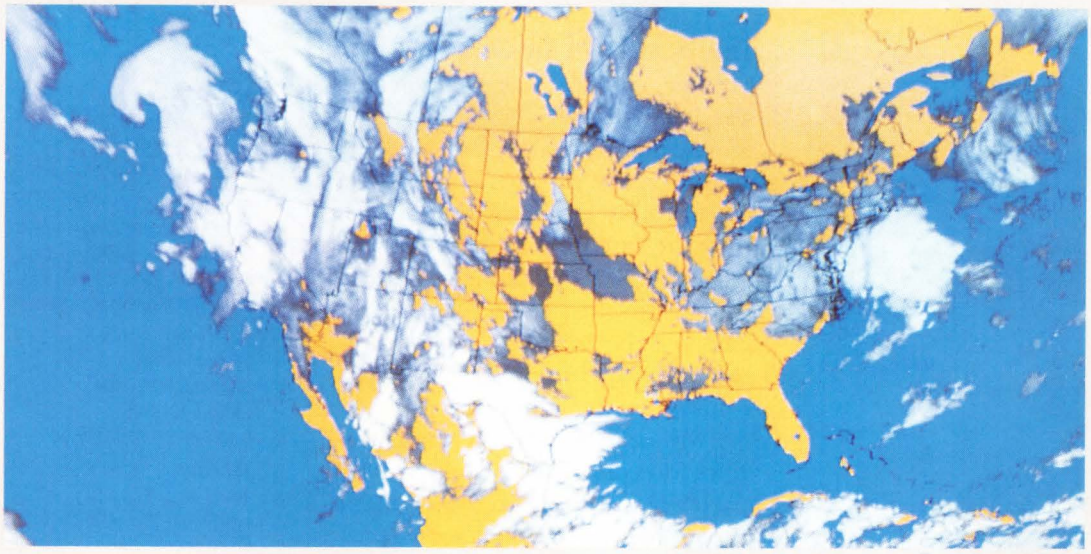

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Some widgets are completely mouse driven, while others accept both keyboard and mouse input. Common widgets you'll encounter are pop-up menus, pull-down menus, scroll bars, dialog boxes and control panels.

The Reality Of DECwindows

My first impression of DECwindows was, "Wow, what a great product!" because the initial offering of windows, widgets and WYSIWYGs is so robust. But after a while, you discover that not all of the DCL commands you use are offered by FileView. You either have to go down to the DCL level or take the time to write and test command procedures and update menus. The latter is a time-consuming process.

My second impression of DECwindows had connotations of the proverbial Rover as it consumed every available resource my VAXstation II and VAXstation 2000 had to offer. Memory, disk I/O, CPU — DECwindows was using them up.

You quickly realize why DECwindows was announced with the VAXstation and DECstation 3100 systems. You need the power of these newer workstations. I can see how the resource consumption is warranted, because I'm more productive under DECwindows than DCL. This is odd, because most of the programs I'm using are written for DCL, not for DECwindows.

Another question comes to mind: How much more productive will I be when all of my applications have been converted to DECwindows? I presume the answer is more (if not much more), but how long will I have to wait?

After completely exploring the abilities of DECwindows on the workstation, I was curious about running a remote application. This is supposed to be the true benefit of the X Window System.

Running remote applications works, and it works well. So well, in fact, that I wore a grin for a half-hour after I first used the feature. I'm disappointed, however, by DEC's method of task execution.

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As explained by the documentation, to start a remote task you must create a DECterm window (on your local workstation), establish a terminal connection (via $SET HOST) to the remote host, direct program output (via $SET DISPLAY) to your workstation and then run the program. So much for transparent access to applications.

FileView is a powerful tool, but you'd better be prepared to spend some time writing DCL and ULTRIX-32 procedures to get the most out of it. In Part 2, you'll get an in-depth look at FileView for VMS and how to take advantage of its power with DCL command procedures. ■

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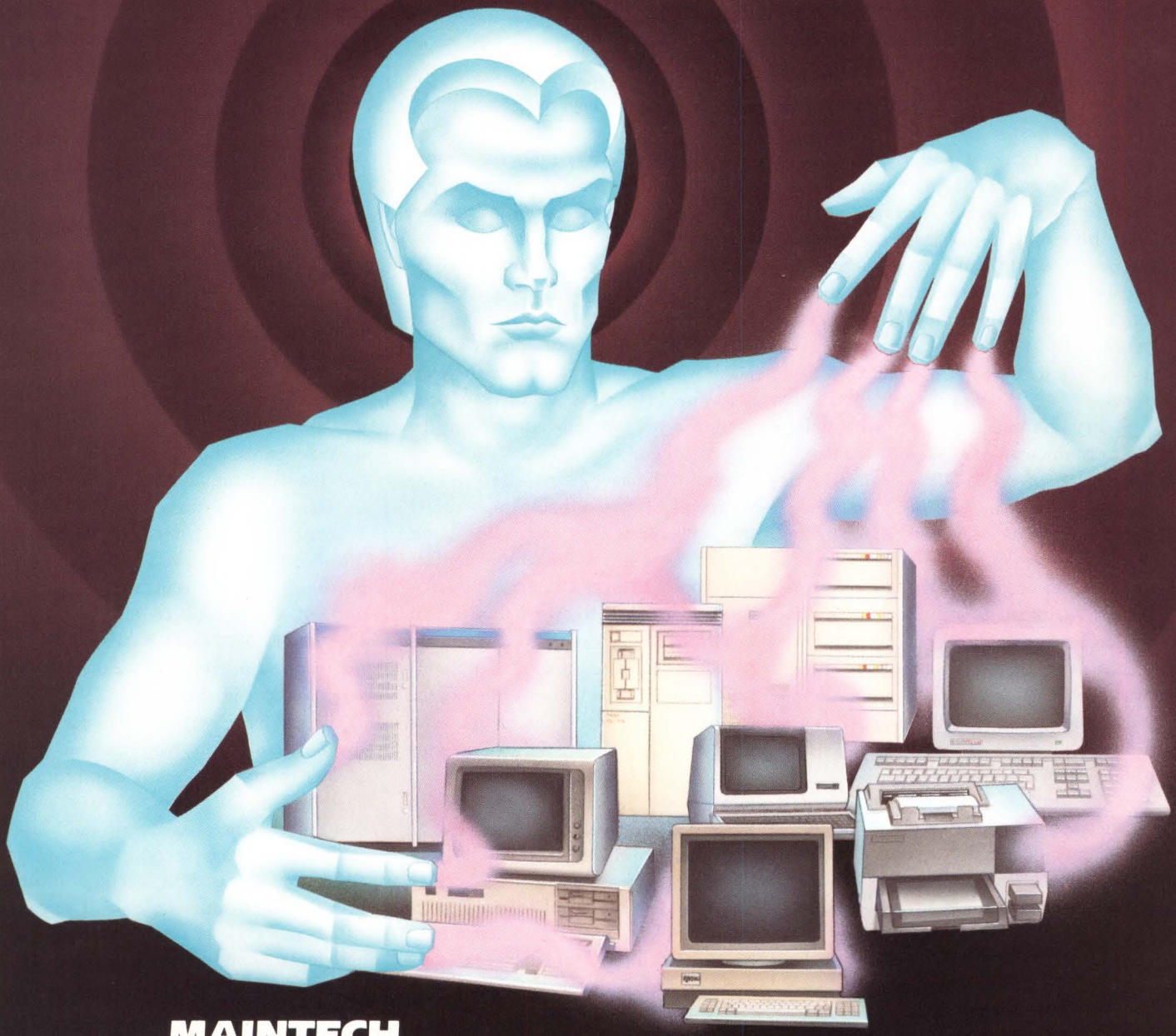

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FIELD SERVICE

Ron Levine

Service In The Next Decade

As we approach the 1990s, field service is continuing to change. Gone are the days when one-vendor systems dominated, data processing departments ran one or two shifts on five-day weeks, and one on-site FE could handle anything that went awry. Today's systems, with their multivendor equipment, complex networks and 24-hour, seven-day operations, require a very different kind of service.

To gain some insight into what will occur in the service arena over the next few years, *DEC PROFESSIONAL* asked Frank D'Alessio, vice president and general manager of Maintech, to share his thoughts on the trends, changes and type of service the 1990s is likely to bring. Maintech is a division of Volt Delta Resources Inc., specializing in maintenance of DEC systems. D'Alessio has been part of the field service industry for more than 20 years. From box troubleshooting repair on PDPs to total systems support on the first VAXs to today's full line of remote diagnostics, D'Alessio has been a part of the services evolution.

DEC PROFESSIONAL: How do you see the DEC field service marketplace taking shape over the next few years?

D'Alessio: I see the major players, such as Maintech, Control Data and Sorbus, putting on a big push — letting DEC know they're in it for real. I think DEC is just beginning to realize this, and as a result it's making strategy changes.

DEC PROFESSIONAL: What kinds of changes?

D'Alessio: Until now, DEC didn't consider third-party maintenance vendors (TPMs) a big threat. Most concentrated on cast-off PDPs and low-end VAXs. Now, the major players are into high-end VAXs, have new diagnostics and extensive technological capabilities. As a result, DEC views them as a more serious challenge. DEC knows it will have to pay more attention to its customers' wants and be more receptive to mixed-vendor equipment in its service contracts to retain revenues.

DEC PROFESSIONAL: What are your thoughts on recent DEC warranty changes?

D'Alessio: I don't agree with your assessment that the new warranty program is a strategic move to cut out the TPMs ("Behind DEC's New Warranty Program," January 1989). I don't feel the independents had a major opportunity under the old system anyway. As a rule, customers will stay with the manufacturer until they know the product is solid. This usually requires about a year or two of use before that confidence is instilled. But after that level of confidence in the product is established, the customer is willing to deal with a TPM.

DEC PROFESSIONAL: So why the warranty program change?

D'Alessio: I think DEC is attempting to put a level of maintenance concern in the customer's mind, to force the user to think about maintenance. DEC knew that very few high-end system service sales would go to the independents because of the natural concern about a new product. This forces the user to let DEC Field Service show its wares.

DEC PROFESSIONAL: Do you see a continuing role for the local TPM?

D'Alessio: Yes. They'll continue to serve in niche markets on specialized products and applications. The small, local and regional service vendors understand intimately the nature of the selected application and will continue to support older hardware. These smaller firms can't afford the huge capital outlays and investment required in remote diagnostics, spares, training, and so on, for new lines and won't likely be competing for business against the national firms. Where the nationals focus on products out two to three years for service opportunities, the locals go after six-year-old and older products.

Frank D'Alessio, vice president and general manager of Maintech.

DEC PROFESSIONAL: What do you think the independents must offer customers to stay successful in the 1990s?

D'Alessio: First, we must all understand that box fixing alone won't make it. The greater reliability in today's and future systems ensures this. MTBFs will continue to increase greatly, and extended and even lifetime warranties from the OEMs will become more prevalent. Hardware repair will be less of a technical chore and more of a pull-and-replace commodity operation. The revenues from box fixing will decrease continually and rapidly.

The independent service providers of the future will have to implement a strategy of umbrella services to the customer to remain competitive against DEC and to remain solvent. We can provide such things as product installation services, develop and market software

utility and application products for the operations manager, and provide operating system software maintenance. We also can change from a competitive posture to one of an alliance with selected OEMs, distributors and dealers. This way we can provide warranty and end-of-life maintenance services to their customers.

Service vendors must develop and market alternatives to the manufacturer's remote diagnostic capability. This already is being done successfully. The customer wants a balance between the remote watchdog and the availability of on-site professionalism. Many service providers are overselling what can be done via remote analysis. There's still a need for the on-site professional, not only to correct the problem, but to give the customer that feeling of not being alone with his trouble. This instills confidence in the supplier.

Over the next few years, greater MTBFs, lifetime warranties, expert systems analysis software, networking/clustering/fault-tolerant configurations, closed architectures versus open architectures, and aggressive and competitive TPMs will be the items affecting the bottom line of all service providers. Add on some kind of comprehensive umbrella services and there's a great deal for the service vendor to consider when providing service and for the user to consider when contracting.

DEC PROFESSIONAL: What major changes do you foresee in the dispatching of service by the TPMs?

D'Alessio: We won't try to be all things to all users. For instance, Maintech has pinpointed the multisystem, multivendor critical systems account user for many years. In the future, I think many more service providers will be identifying specific segments to target. By focusing on narrow markets, it's possible to provide the extended services uniquely required by that segment. Thus, the service provider can do well in landing these targeted maintenance opportunities.

DEC PROFESSIONAL: I'd be remiss if I didn't ask you about your thoughts on dealing with DEC in the future.

D'Alessio: I don't think that any single independent can effectively take on DEC. There will have to be a consensus of opinion on how to do it. This is very difficult to achieve because, while we have a common problem in dealing with DEC, at the same time we're competing with each other. Somehow the TPMs have to develop a strategy to combat issues such as closed architecture, parts shut-out and documentation availability.

Many independents are divisions of larger companies that buy a lot of equipment from DEC and are interested in maintaining good relations with them. On the other hand, DEC realizes that these same firms have tremendous purchasing power and in many instances are some of DEC's primary customers.

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It's a two-way street and a very complicated issue.

DEC PROFESSIONAL: Will the user in the 1990s see a more open DEC-oriented service market?

D'Alessio: Yes. More maintenance choices will be available to the user of DEC-based systems. Of course, this will make pricing much more competitive. The relationships with DEC are complex, and for that reason we shouldn't see an all-out war against DEC like that in the IBM service market years ago. Things won't change immediately, but they'll continue to evolve.

DEC PROFESSIONAL: What about legal issues? Isn't that a concern?

D'Alessio: Yes. The monopoly statutes are complex, and there's no telling which way rulings may go in the various pending litigations against DEC or if there will be definitive rulings at all. So we must settle with DEC on our own, at least for the immediate future.

One thing to consider is how taking on DEC affects our parent companies' relationship with DEC. Another issue is more complicated — the possible legal ramifications of an attempt of the independent maintenance industry to band together against DEC.

DEC PROFESSIONAL: What about cost of service in the 1990s? I realize this can't be answered in dollars and cents off the cuff, but can you give us an idea of some of the cost-cutting measures you foresee that will hold down service costs?

D'Alessio: Keeping costs under control so that we can provide a quality product at the lowest cost possible is a concern throughout the maintenance industry. Of course, opening the DEC services market to increased competition will drive prices down, especially in the high-end systems area in which DEC has very limited competition.

A major force that will aid in price control is the advent of a strong independent depot, or fourth-party maintenance, industry. The continued rapid growth of these depots will eliminate the sole dependence on the manufacturer for parts, maintenance and documentation that many independents have today. It also will allow the TPMs to reduce their inventory requirements with the assurance of still having access to a needed part. This will be a major cost savings, both in carrying costs and the prices the independents now are charged for spares.

Many new diagnostic tools are now and will later be available to the field service vendors. The AI and expert systems software being developed by the fourth-party industry, which until now have been mostly DEC priority products, will reduce our service costs greatly. This will be reflected in savings to the user.

It's possible, and maybe very probable, that in the '90s the third- and fourth-party vendors will join together to co-bid service opportunities. This will aid the service vendors in knowing their full costs of parts, spares and other support charges when bidding a contract. This should be reflected in lower prices, as the need for a safety net is reduced.

DEC PROFESSIONAL: What about labor? It has long been the major cost in service. Will its cost decrease as a result of technical advances within the industry over the next few years?

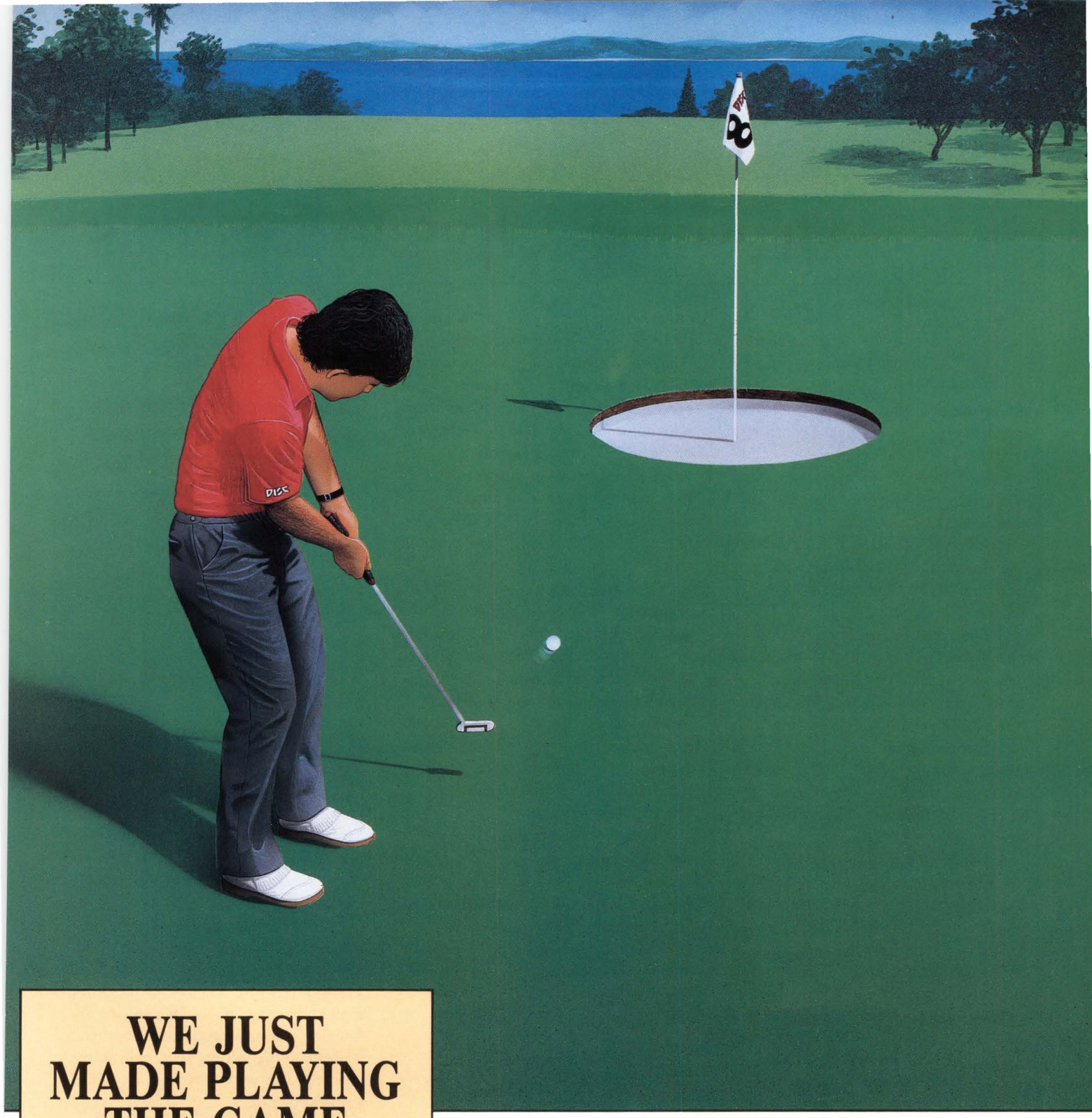
D'Alessio: I see labor as being a steadily decreasing component of service cost. While in the '90s it will require a higher level of system technician to deal with the increased complexity of the machines, fewer field personnel will be needed.

Remote analysis and fault-known dispatching will be the norm. Fewer highly trained technical FEs will be needed, as most will be at customer support centers doing the initial analysis. Lower-level technicians can be dispatched to the site to change the failing component or make the necessary adjustment. Usually they'll have the problem diagnosed by the center, and they'll have the required part with them.

Manufacturers are putting more intelligence into the systems and into the test equipment. This smarter equipment and the continuing improvement in diagnostics software will eliminate the need for many FEs. Further, not as many FEs will have to be so highly trained. This will change labor from the predominant cost factor in the service contract to a lesser player.

DEC PROFESSIONAL: Are you saying that the FE is going the way of the transistor?

D'Alessio: Absolutely not. We'll need the on-site FE, but we'll require fewer highly trained, top-level FEs. I believe that the industry in general and DEC in particular have been overselling what can be accomplished via remote analysis. Too much faith has been put in this absentee-troubleshooting technique. It's an aid to the FE, not a replacement. The user still wants to see the FE at his site, and I think in the future he may even see that FE more often than today. By giving the site FE the remote analysis tools and other support that can come from a centralized center, we can equip him to handle tomorrow's systems better. But that one-on-one human contact between the service vendor and the user has more importance than has been realized up to now. ■



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DCL DIALOGUE

Kevin G. Barkes

Brushing Up On Lexicals

Nothing invokes terror in the heart of a beginning DCL command procedure writer more than lexical functions, those arcane constructs beginning with F$ and frequently ending with a tangle of acronyms. This probably can be attributed to the less-than-friendly-sounding moniker to which they're attached. The term "lexical function" sounds vaguely sinister, like the deeds practiced by a super villain.

The truth is actually much more mundane. The functions are so named because the DCL command interpreter processes them during the first, or lexical, phase of command processing. This phase also is referred to as the command input scanning phase. Thus, lexicals could have been called command input scanning functions, so things could have been worse.

Lexical functions provide DCL with an impressive array of capabilities. Through calls to various system services, command procedures employing lexicals can return vast quantities of information concerning a system and the processes existing on it, as well as perform manipulations on strings.

DEC has added lexical functions to DCL in each major release of VMS. In version 5.0, the f$getqui( ) function was included, a marvelous lexical that can return literally hundreds of items of information about a system's batch and print queues.

Lexicals also provide a sort of "carbon dating" method of determining the length of time a DCL programmer has been working with VMS. Those who, out of habit, use a combination of sys$disk: and f$directory( ) instead of f$environment("default") immediately flag themselves as dinosaurs from pre-4.0 versions of VMS, as do those who continue using f$logical( ) instead of f$trnlnm( ). But I digress.

Lexicals aren't as impenetrable as they seem. There are four parts to a lexical function: the f$, which alerts DCL that a lexical is entering the command stream; the name of the function itself; a set of parentheses ( ) that may contain arguments or may be empty; and the argument or arguments for the function.

The syntax for calling a lexical from DCL is, in many cases, much simpler than the equivalent system service call in a high-level language. I've seen programmers write code that spawns a DCL subprocess and executes a lexical, rather than make a system service call in the "native" language.

F$time( ) is an example of a simple lexical. It returns the system time in the format dd-mm-yyy hh:mm:ss.cc. It has no arguments, but the parentheses are still required.

Lexicals can be used in the same way symbols are used. It's not necessary to assign the value of a lexical to a symbol prior to its use:

```
$ time = f$time()
$ write sys$output "The time is ''time'."
```

is the same as:

```
$ write sys$output "The time is ''f$time()'."
```

or:

```
$ write sys$output "The time is "+f$time()+"."
```

Because lexicals can be used as if they were symbols, one lexical can serve as one or more arguments to another lexical, such as:

> ***Through calls to various system services, command procedures employing lexicals can return vast quantities of information.***

```
$ string = "This is a string.  "
$ write sys$output f$length(f$edit(string,"trim"))
16
```

In this example, the f$edit function trims the trailing spaces from the text contained in the symbol "string" and f$length returns the size of the remaining text.

The rules for using lexicals are simple and clearly stated in DEC's *DCL Concepts* manual:

1. Don't enclose lexicals in quotation marks. When you do, DCL treats the function as a string and doesn't evaluate it. Refer to the f$time( ) example above for the proper way to use lexicals within a quoted string.
2. Enclose the argument list in parentheses (see f$edit, above).
3. If an argument contains a string, enclose it in quotes.
4. If an argument contains a symbol, integer or other lexical function, don't enclose the value in quotes.

Note the following examples,

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which all produce the same result on output:

```
$ string = " is a test   "
$ arg = "trim"
$ wso = "write sys$output"
$ wso "This "+f$edit(string,arg)+"."
This is a test.
$ wso "This ''f$edit(string,arg)'."
This is a test.
$ wso "This ''f$edit("is a test   ","trim")'."
This is a test.
```

You can abbreviate lexical names to their shortest non-ambiguous length. For example, f$d( ) is a legitimate call to f$directory( ). f$e isn't legal, because DCL can't determine whether you wish to use f$edit( ), f$element( ), f$environment( ) or f$extract( ). "Legitimate" calls would be f$ed( ), f$el( ), f$en( ) and f$ex( ), respectively.

Why the sudden interest in lexicals? Many of the reader-submitted command files I've been getting recently either use lexicals improperly or forsake them entirely, and I'm trying to nudge you in the proper direction.

One reader who exploits the power of lexical functions is Dan "Vern" Hellwig of Aetna Life & Casualty in Hartford, Connecticut. Vern's procedure, DISK.COM (see Figure) uses lexicals to their fullest advantage to provide a graphical display of disk use.

The only modification necessary is the device name; Vern's system uses dual-ported disks, hence the "$1" prefix to the "DUA" disk name. Also, the procedure assumes the disks are all of the same type and on the same controller. If your site is different, you'll have to rework the processing loop to accommodate the changes.

DISK.COM makes good use of the f$fao( ) function, a lexical that always has confounded me. FAO, by the way, stands for formatted ASCII output. My pet name for it is f$schwartz( ). Pardon the commercial plug.

Communications

Lately, I've been swamped with letters and reader procedures, which has slowed my already abysmal response rate. I answer all letters, though, so please be patient. The fastest way to contact me is via electronic mail, where you'll get an immediate reply. In order of response time, the best electronic methods are:

1. Calling my bulletin board system, SYS$OUTPUT, at (412) 854-0511. Go to message area four and leave a message to the sysop.
2. Via CompuServe Easyplex, ID 72067,341.
3. Via BIX, username kevinbarkes.
4. On ARIS.

Submitters please note that .COM file uploads to my SYS$OUTPUT board aren't considered for inclusion in this column unless specifically requested. Make sure you include your full name, address and phone number at the end of the file, as well as a statement that you're the author of the software. The BBS supports virtually all file transfer protocols.

Procedures shouldn't contain embedded non-printable ASCII codes. Use symbols instead. Procedures supplied on magnetic media are processed faster than those that we have to rekeyboard. We can take all media but prefer DSDD 360 KB MS-DOS disks.

For a listing of all DEC-related FidoNet BBS systems in the U.S., send a stamped, self-addressed #10 (standard business) envelope to BBS List, Kevin G. Barkes Consulting Services, 4107 Overlook St., Library, Pennsylvania 15129. Don't forget the stamp. And you only need to send a regular business envelope, because it's only a two-page list.

This list is also available on-line on SYS$OUTPUT. Look for DECBBS.LST in the VAX, Rainbow or new uploads area, or ask your local FidoNet sysop to file request it from 1:129/38. *—Kevin G. Barkes is an independent consultant in VAX systems software, management, tuning and training, based in Library, Pennsylvania.*

FIGURE.

```
$! DISK.COM - Graphic display of disk usage
$ v = F$Verify(0)                                          !Disable SET VERIFY
$ norm[0,32] = %x6D305B1B                                  !normal rendition
$ bold[0,32] = %x6D315B1B                                  !bold rendition
$ Write sys$output F$FAO("!20<Disk Device!> !50*-")        !Output heading line
$ unit_number = 0                                          !Start with unit 0
$loop:                                                     !Loop through disks
$ device_name = "$1$DUA" + F$String(unit_number) + ":"     !Build device name
$ If .NOT. F$GetDvI(device_name,"EXISTS") -                !If nonexistent device
  Then Exit 1 + 0*f$verify(v)                              !exit restoring VERIFY
$ unit_number = unit_number + 1                            !Increment unit number
$ if .NOT. F$GetDvI(device_name,"MNT") -                   !Skip devices that are
  Then GoTo loop                                           !not mounted
$ logvolnam = F$GetDvI(device_name,"LOGVOLNAM")            !Get logical name
$ If F$Locate(P1,logvolnam) .eqs. F$Length(logvolnam) -    !If P1 (optional) isn't
  Then GoTo loop                                           !a substring, skip it
$ media_name = F$GetDvI(device_name, "MEDIA_NAME")         !Get device type
$ freeblocks = F$GetDvI(device_name, "FREEBLOCKS")         !Get free block count
$ maxblock   = F$GetDvi(device_name, "MAXBLOCK")           !Get maximum blocks
$ percent    = (maxblock-freeblocks) * 100 / maxblock      !Calculate percent used
$ If percent .GE. 0 -                                      !Make percent_bar
  Then percent_bar = F$FAO("!#*|",percent/2)               !
$ If percent .LT. 0 -                                      !Known VMS bug, to fix
  Then percent_bar = bold + "Device error" + norm          !disk must be remounted
$ If percent .GE. 70 -                                     !If device getting full
  Then percent_bar = bold + percent_bar + norm             !highlight percent_bar
$ Write sys$output -                                       !Output detail line
        F$FAO("!20<!AS !AS !> !AS!UL%", -                  !
        media_name, logvolnam, percent_bar, percent)       !
$ GoTo loop                                                !end loop
```

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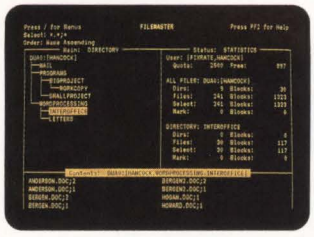

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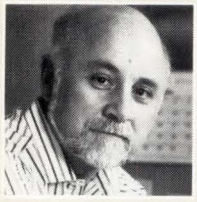

Cluster Chronicles: Clustration

Dave Mallery

After much measuring and remeasuring, and after bringing in outside experts for opinions, we're convinced that our LAVc never will be a mainframe. In a nutshell, we have 6 mips and 85 MB of real memory, half of which is consumed in overhead. As you add more satellites and users, while trying to maintain a single server, the serving load builds up to the point of total strangulation. Each increment of satellite load adds an equivalent increment of load on the server.

Tuning such a system has a lot in common with brass polishing on the Titanic.

If the answer is to get rid of serving, then the solution is to go back to a big uniprocessor or a CI cluster in which there's significant bandwidth available, and you're rid of the MSCP serving monkey on your back.

We'll always have an LAVc for development users and others. So, we'll have a mixed-cluster solution.

Here's the plan. First, we'll disconnect any machine that can stand alone. BILBO::, our venerable 11/750, goes first. He gets to run ARIS in his declining years. That means that we must move the remaining volumes he was serving to the cluster over to THORIN::, our 8250.

As soon as that has stabilized, we'll upgrade THORIN:: to an SMP 8350. If we see a reasonable improvement, we'll consider another 8350 and an HSC. By then, 8350s should be nearly free on the used market.

Incidentally, we bought another MicroVAX II for the Lab. This machine is dedicated to the Lab bench. Its dual role is to be available for tear-down at no notice and to receive the latest version of VMS the day it arrives. It also will be able to be a boot node for any workstation in-house. It gives us a test bed for checking out release transitions with our third-party software before we have to commit it to the production system. If you've been watching prices, you know it didn't cost much more than a big 386, even with a license.

Next on the acquisition list is our ULTRIX server. It will be hard to resist a DECsystem 3100. Like it or not, ULTRIX will be a permanent feature in our world, starting right now.

CONTENTS

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from the lab

Walker Richer & Quinn's Reflection 4 Plus

David B. Miller

Reflection 4 Plus, from Walker Richer & Quinn Inc. of Seattle, Washington, is a terminal-emulation package for PCs and compatibles providing emulations of DEC VT241 and Tektronix 4014 terminals. It includes DEC VT340 ReGIS color graphics commands and 16-color support. We ran version 3.33 of Reflection 4 Plus on an AST 286 PC and a Wyse 286 PC.

Our copy of Reflection 4 Plus was distributed on three 5¼-inch floppies. The menu-driven installation procedure was easy to follow. After initial installation, you can change Reflection settings through the various setup menus. Multiple configuration files can be saved to disk and loaded when needed. Configuration files contain setup parameters for data communications, terminal characteristics, graphics, printer configuration, and so on.

Operations

Reflection makes extensive use of your PC's function keys. F1 through F8 are used to navigate through Reflection's menu system. Input screens, such as those for terminal setup and file transfer, are easy to use. An extensive keyboard-mapping facility allows you to create the keyboard of your choice if you don't like the default layout.

An example ReGIS screen generated by Reflection.

Communicating with a host VAX can be accomplished in many ways. A number of network connections are supported in addition to direct connect or through a modem. Reflection supports LAT with PCSA or DECnet-DOS. Walker Richer & Quinn's own RLAT driver also can be used to communicate via LAT. Reflection supports RAF from Datability and a host of other major brands of networking hardware and software. We made successful connections by connecting the AST directly to a VAXstation 2000 serial port. We also used Fel Computing's Mobius running on the Wyse 286 PC with a 3Com Ethernet card installed in it.

Reflection can be run in background mode, allowing you to take full advantage of your PC. For example, you can begin a file transfer from Reflection, then use the hotkey sequence ALT-rightSHIFT to place Reflection in the background. You can then use your PC to run other applications while the file transfer proceeds.

By default, a 20-KB buffer is set aside for Reflection's display memory. You can use this memory to view data that scrolls off the screen while Reflection runs in background mode. Keystrokes are available to allow you to

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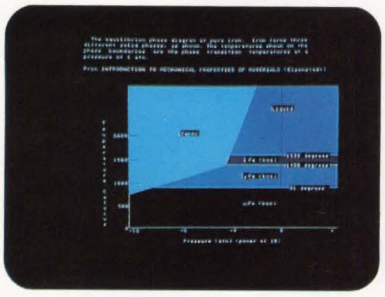

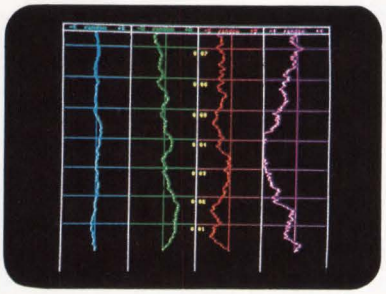

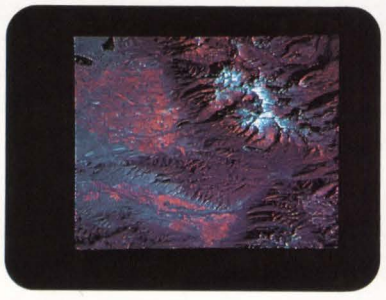

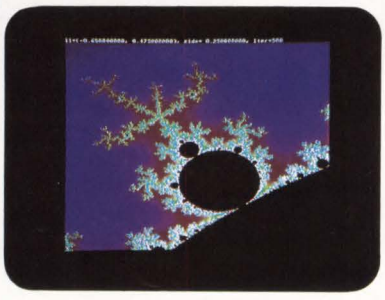

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	VCX8	Q & U	512 x 512	48 x 80	256
	VCX24	Q & U	512 x 512	48 x 80	16 million
	VCM	Q	1024 x 1024		256
	VCW	Q	512 x 640	48 x 80	256
	VRC	Q & U		24 x 80 48 x 80	64 64
MONOCHROME	VRH	Q	1024 x 1024	64 x 128	
	VRS	Q	512 x 512	48 x 80	
	VRG	Q	512 x 512	32 x 64	
	VRA	Q & U		24 x 80 48 x 80	

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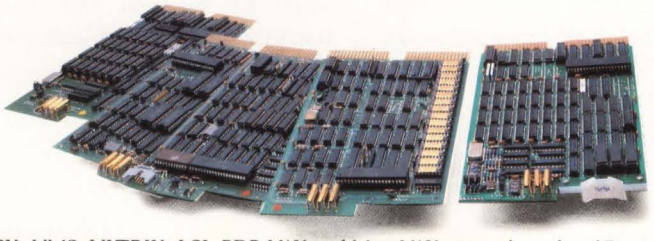

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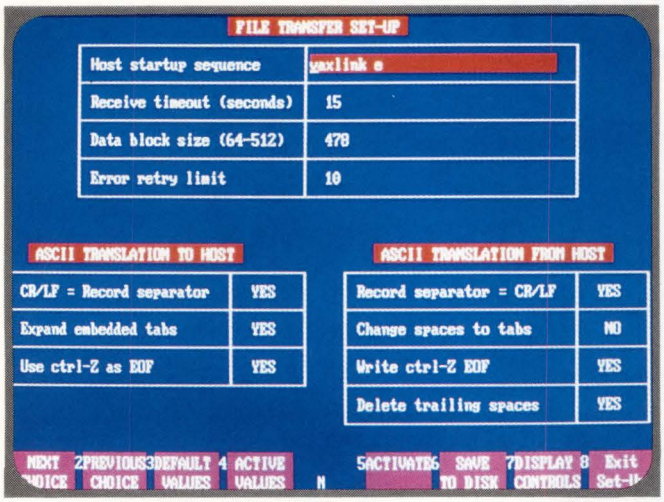
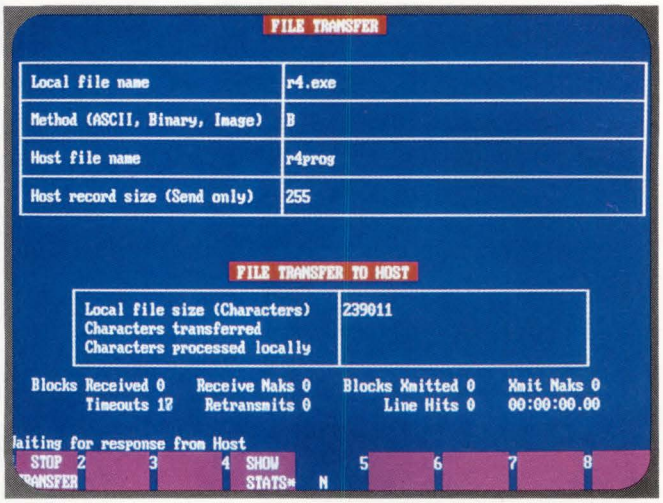


Screen 1: Reflection's File Transfer Setup screen lets you change a number of file transfer parameters.



Screen 2: During file transfer you can observe related transfer statistics, such as blocks received.

scroll through the screen display. The contents of display memory can be dumped to your PC's disk. On the other hand, text files on disk can be read into display memory. Display memory can be sent to a printer.

Host output can be sent to a disk file, a printer or both. You have the option of displaying and capturing the incoming host data simultaneously or allowing the data to pass through to the receiving devices without it appearing on your screen.

PC function keys F1 through F8 can be programmed. Softkey sequences can be kept local to your PC or transmitted to your host. Each softkey definition can be up to 80 characters long. You can display special control characters while defining a softkey to make programming them easier. Softkeys can be defined by your host system.

File Transfer

In addition to XMODEM and KERMIT file transfers, you can send and receive files to and from your VAX by using Reflection's own proprietary protocol.

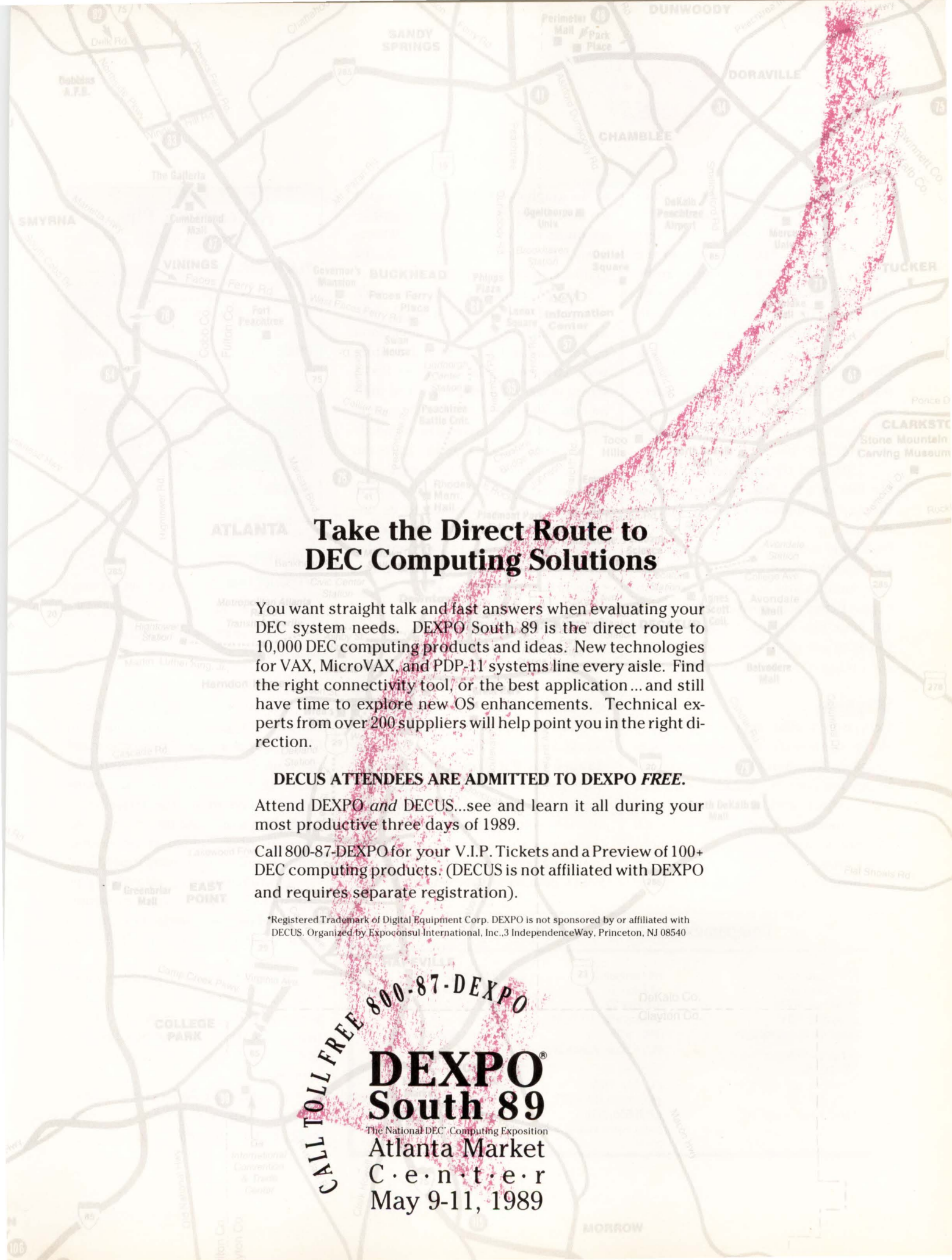
Reflection supplies the program VAXLINK.EXE, which you can upload to your VAX from Reflection's floppies. If many users need to transfer files, you can establish logical names to point to the directory in which VAXLINK.EXE resides.

Before transferring files, you can alter file transfer parameters through the File Transfer Setup screen (see Screen 1). You can govern the length of the receive timeout, the size of the data packet and the number of retries you want your system to perform. You also can specify how tab characters, carriage-return/line-feed characters and end-of-file characters are to be treated.

Transferring a file requires accessing the File Transfer menu and supplying the needed information (see Screen 2). Reflection's protocol supports ASCII, Binary and Image file transfers. Transfer statistics, such as blocks received, number of timeouts and number of NAKs, can be monitored during the transfer.

A number of switches can be appended to the host file name when transferring files from your PC to the VAX. For example, the /C switch submits an ASCII file as a DCL command file on completion of the transfer. The /F switch, used for Binary file transfers, creates the host file with fixed-length records. A third example is the /S switch, which spools an ASCII file to a printer on completion of the transfer. Another switch lets you transfer WordPerfect document files, which are usable by either the PC or VAX versions of WordPerfect. There's also a switch to transfer DECdx files and a switch that appends VAX directory information to the file on the PC. When sent back to your VAX, the file will be recreated properly.

Reflection's BACKUP and RESTORE utilities allow you to do mass uploads and downloads easily and quickly. The File Transfer menu has a choice for BACKUP/RESTORE operations. A command file leads you through the process. You supply the PC directory and the names of the files you want to transfer. You also can supply the name of the VAX-resident file that will contain the PC files being BACKed UP. Reflection transfers the designated PC files to a single file on your VAX in a special BACKUP format. A BACKDIR utility lets



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you get a directory of the PC files residing within the VAX BACKUP file.

RESTORE lets you go in the opposite direction. Files residing on the VAX in special BACKUP format can be transferred back to your PC. The same command file is used to do both BACKUP and RESTORE operations.

BACKUP and RESTORE create log files on your PC of what was done. BACKUPs and RESTOREs can be selective; you don't have to BACK UP entire PC directories or RESTORE an entire VAX BACKUP file.

I BACKed UP and later RESTOREd the files in a PC disk directory whose file sizes amounted to 240 KB. During normal business hours, the BACKUP took eight minutes and 51 seconds. The subsequent RESTORE operation required nine minutes and 20 seconds. You can expect better performance if you BACK UP your files during off hours. Both BACKUP and RESTORE use Reflection's own transfer protocol VAXLINK.EXE.

Graphics

Reflection 4 Plus supports VT330/340 ReGIS commands and Tektronix 4014 graphics. Minimum hardware requirements for your PC include an EGA or VGA adapter with at least 256 KB of video memory. A minimum of 320 KB of RAM is required. Also, an enhanced color monitor is needed.

Reflection automatically will switch to the graphics emulation type needed for the current application. Each graphics mode has a separate keystroke sequence to let you switch between the graphics and text modes.

ReGIS emulation provides such features as 16 colors, polygon fill commands, shading, patterns, rubberband cursors, and double-high and double-wide characters. The complete ReGIS screen of 800 x 400 pixels is scaled to fit on the 640-x-350-pixel PC screen. Macrograph support also is included.

In Tektronix 4014 mode, images can be scaled from the 1,024-x-78-pixel Tektronix screen to fit on the PC screen. The image can be zoomed to its unscaled version. Simple keystroke commands are used to scroll the unscaled image so you can see the portions that can't fit on the PC's screen.

Command Language

An extensive command language is provided to allow you to perform many Reflection functions without accessing the menu system. For example, the BACKUP and RESTORE functions can be invoked directly rather than by going through the File Transfer menu. Some of Reflection's commands, such as DIR, operate in much the same manner as MS-DOS commands. Not all MS-DOS commands are included in the Reflection language. However, Reflection's SHELL command lets you exit to DOS to access all MS-DOS commands.

The command language is useful for such things as creating command files to automate log in procedures and file transfers. Multiple command files can be chained together to cause uninterrupted execution. The inclusion of control keywords and the ability to use variables allow you to create flexible command files to automate procedures.

Documentation is extensive. Appropriate examples, such as sample command files, are provided to help you learn a particular facet of Reflection quickly.

If graphics isn't a pressing need, you can use Reflection 2 Plus, which provides the same features as its big brother, without the graphics features. Reflection 2 Plus emulates a VT220 terminal.

In either case, Reflection should be on your "look-see" list if you're shopping for terminal emulators.

Companies Mentioned In This Article

AST Research Inc.
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Datability Software Systems Inc.
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Tektronix Inc.
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Wilsonville, OR 97070
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CIRCLE 415 ON READER CARD

3Com Corp.
3165 Kifer Rd.
Santa Clara, CA 95052
(408) 562-1508
CIRCLE 416 ON READER CARD

Wyse Technology
3571 N. First St.
San Jose, CA 95134
(408) 433-1000
CIRCLE 580 ON READER CARD

Reflection 4 Plus Version 3.33

PLATFORMS: IBM PCs or 100 percent compatibles with 320-KB RAM minimum, EGA or VGA video card with 256-KB video memory minimum. PC/MS-DOS version 2.0 or later for PCs, version 3.0 or later for ATs

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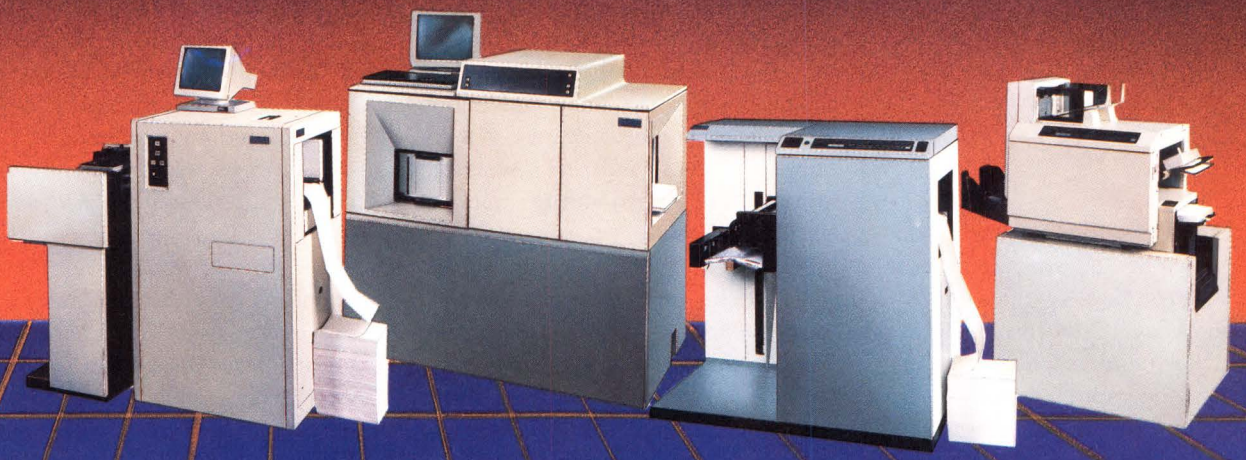

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Sun Microsystems' Sun386i

Philip A. Naecker
Ali Diba

The Sun386i, from Sun Microsystems of Mountain View, California, is an excellent choice for users who need access to the DOS operating system but are unwilling to give up a multitasking operating system, a workstation environment and network connectivity. It offers an environment rich with many tools for software developers, yet hides the difficult-to-use UNIX operating system by providing a versatile windowing and icon-driven user interface. The Sun386i is a UNIX-based workstation capable of running multiple DOS applications simultaneously with UNIX applications.

The Sun386i provides a good cross-development system for those writing applications for the DOS platform. At the same time it offers a way out for heavy DOS users deeply invested in DOS but bound by the limitations of the DOS operating system. This machine starts where DOS leaves off by providing "multiDOSing" (running multiple copies of DOS simultaneously, as opposed to multitasking) and UNIX networking power. It fits nicely into existing DEC environments running VMS or ULTRIX, because software is available to implement the DECnet and TCP/IP networking protocols (see Figure 1).

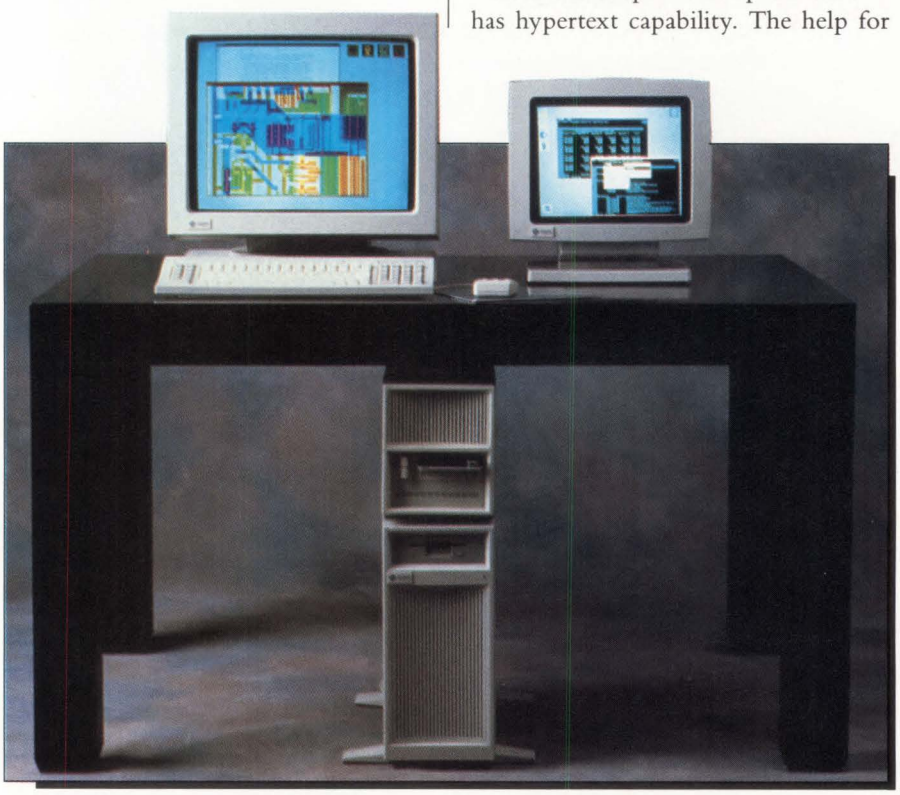
Installing The System

Setting up a Sun386i system is a straightforward project that takes less than an hour, even if you read and follow the installation manual. The instructions are very clear and cable connections are obvious. The SunOS operating system software is divided into two packages: Application SunOS and the Developer's Toolkit. Application SunOS contains the operating system, utilities and commands and is separated into the core system and the optional clusters. The core system includes the kernel and the most common utilities, such as file management, electronic mail, help and the DOS operating system. It's preloaded on the disk. Clusters aren't preloaded but are supplied on diskettes or ¼-inch tape so that they can be installed on the system selectively.

The Developer's Toolkit is made up of program-development utilities, such as the C compiler, a Source Code Control System (SCCS), a linker, an assembler and several debuggers. In addition, libraries are available for specific development needs, such as graphics or System V development. There's also a set of libraries available for those interested in monitoring program performance and code optimization.

The core system occupies 21 MB and the cluster options take up about 14 MB. The Developer's Toolkit would take another 19 MB. Because the core system is preloaded on the drive, you can start the system immediately. In fact, Sun claims that the installation of a new system takes about 30 minutes. The system we used had some optional clusters preloaded, as well, and didn't involve any software installation. Sun provides a *Quick Start* manual for unpacking and setting up a system.

The Sun386i is an easy workstation to learn and operate. It features extensive on-line help via a Help Viewer that has hypertext capability. The help for



The Sun386i workstation is available in configurations exceeding 3 mips (Sun386i/150) and 5 mips (Sun386i/250).

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The MegaServe's standard interfaces include Dataproducts parallel or Centronics parallel, SCSI, RS-232 and RS-422. So it will work—without missing a stroke—on almost any current system. For Ethernet systems, the MegaServe even has both interfacing hardware and host software.

With its Postscript interpreter and scalable fonts, MegaServe is perfect for both single-user and network applications. And for the ultimate in compatibility, it even emulates the DEC® LN03 Plus, the H-P LaserJet II,® the Diablo® 630 ECS and the Tektronics® 4014.

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The MegaServe keeps 43 fonts resident; a built-in Winchester disk manages Postscript fonts and can endow any of them with attributes ranging from bold or underline, to shadow, faint and reverse print.

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FIGURE 1.

Processor	Intel 80386 with an Intel 80387 floating-point processor Sun386i/150: 20 MHz — 3 mips with dynamic memory, 4 mips with cache memory Sun386i/250: 25 MHz — 5 mips
Memory	Sun386i/150: 4 MB of RAM Sun386i/250: 8 MB of 32-bit RAM Both can be upgraded to 16 MB of RAM Expanded Memory: Lotus-Intel-Microsoft memory version 3.2 8 MB per DOS Window allocated from SunOS virtual memory
Display Option	Monochrome: 15 and 19 inches — 1,152- x 900-pixel resolution Color: 14 inches — 1,024- x 768-pixel resolution 16 and 19 inches — 1,152- x 900-pixel resolution 256 distinct colors from a choice of more than 16.7 million shades
DOS Windows	IBM monochrome, CGA color, Hercules monochrome emulated in DOS EGA, VGA with an optional VGA card
Disk Storage	3 1/2-inch 1.44-MB diskette drive 91- and 327-MB SCSI hard disk
Tape Storage	5 1/4 inches full-height, 60-MB formatted
I/O Interfaces	Ethernet Serial port Parallel port SCSI
AT Bus	3 AT slots 1 XT slot
Keyboard	107 keys — DOS and UNIX function keys
Mouse	Three-button optical mouse SunView three button Microsoft two button
Operating System	SunOS: Extended version of the the UNIX operating system based on 4.3/4.2 BSD and System V.3. MS-DOS or PC-DOS 3.3 or earlier

Source: Sun386i Overview

The Sun386i combines the features of a high-performance Sun workstation, including the SunOS, with full MS-DOS compatibility in a platform that provides for UNIX system ease of use.

any item can be invoked easily by pointing to the item with the mouse and pressing the Help key.

This results in a small alert box containing a brief description of the item. A button also is provided to escape into the Help Viewer for more detailed help information. The Sun386i has probably the best implementation of help available in a windowed environment.

The standard software includes a number of powerful and easy-to-use programs, such as an e-mail tool, a text editor, a network administration tool and a file and disk manager called Organizer. Organizer is used to navigate the local and remote file and directory systems.

The Sun386i's user interface makes excellent use of mouse clicks and other window-management techniques. The operation of a three-button mouse may take some getting used to, but for those familiar with the Mac icon paradigm, the environment will be very comfortable. However, the Sun386i's window operation is quite different from the Mac's.

On the Mac, you're always working with one application. The pull-down menus for that application appear at the top of the screen. On the Sun386i (as in DECwindows and other windowing systems), you have multiple windows. Each has its own commands and all are active at the same time. Instead of a pull-down menu bar at the top of the screen, you simply click in any window to pop up a menu of options available for that application. A click on the border of the window produces a window-management pop-up common to all windows.

Files appear as icons on the desktop. For example, executable files appear as gears, text files as pages of text, PC windows as PC icons, and so on. The user interface from the screen color to the shape of the icons can be modified according to the user's preferences.

Compared to low-end workstations, such as the VAXstation 2000, the windowing performance of the Sun386i is very fast. The machine is very responsive for window operations, such as resizing and moving windows.

Several documentation packages are available for the Sun386i. The *Owner's Set* is a standard part of the hardware package. It includes a *Quick Start* guide with illustrations on setting up the system; *System Setup and Maintenance*, which contains more detailed information on setting up the system and soft-

Terminal emulation doesn't have to be this way.

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

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

But what does that get you?

Peace of mind. The PowerStation keyboard takes the frustration out of switching between a DEC terminal and a PC *because each key is right where you'd expect it to be.* And our "Gold Key" version makes ALL-IN-1 and WPS a breeze.

Savings. If you think you can't afford both emulation software *and* a keyboard, think again! The PowerStation can actually save you money by eliminating the time you waste every day translating between VT and PC keystrokes. And with the PowerStation, *startup training costs are virtually eliminated.*

Consistency. The PowerStation keyboard provides a consistent interface for both VT emulation and regular PC applications. In emulation mode you get the 105-key functionality of a real DEC keyboard and in PC mode you get a super enhanced keyboard. *And* you can use the PowerStation on virtually any PC! Move between an XT, AT, PS/2, AT&T PC and a DEC terminal *without missing a keystoke.*

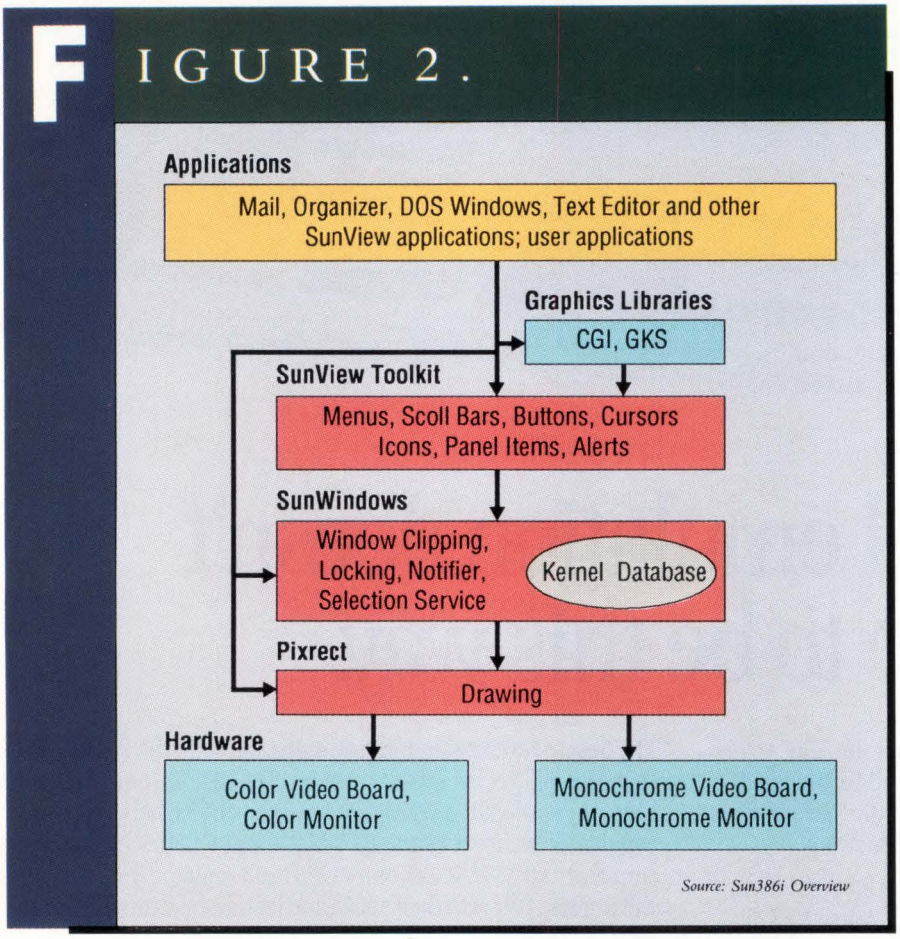
The best in terminal emulation software. With the PowerStation keyboard you get the fastest, most precise, DEC terminal emulation software available: ZSTEM. You have the choice between two popular software packages: ZSTEM 240, our VT241/VT340 graphics emulator and ZSTEM 220, our VT220 text emulator. Both packages will impress you with their speed and feature-by-feature accuracy.

To top it off, the PowerStation gives you all this at a surprisingly low price. But find out for yourself why Digital Review Labs says "the PowerStation 240 is a godsend." Call us at 800-663-8702.

KEA

KEA Systems Ltd., 2150 West Broadway, Suite 412
Vancouver, B.C., Canada V6K 4L9
Telephone: 604-732-7411 Fax: 604-732-0715

CIRCLE 119 ON READER CARD



Sun386i window and graphics tools.

ware installation; a *User's Guide* that provides information on the use of the software tools; *Advanced Skills*, which covers features for customizing the Sun386i's environment; and *SNAP Administration* for system and operations management. There are also the *Owner's Supplement* set and *Developer's Supplement* set documentation, available separately.

Developing Applications

The Sun386i workstation offers a rich programming and software-development environment. This includes a C compiler bundled with SunOS and optional FORTRAN and PASCAL compilers and other development tools, such as a network-based source-code and document-management system. The C compiler includes several extensions and enhancements, such as support for structure assignments and type casting of constant expressions.

Sun FORTRAN is an enhanced FORTRAN 77 compiler with VAX/VMS extensions and an IEEE-standard floating-point package. There are also many extensions that VAX FORTRAN users have been requesting for a long time, such as bit fields, Boolean operators and POINTER data types.

A differentiating feature of the Sun386i is its ability to do cross development for DOS-based systems. Because you can use the SunOS utilities while working in the DOS environment, the Sun386i is an excellent workstation for PC software developers. For example, the same code fragment can be compiled and tested using both DOS- and UNIX-based compilers on the same machine.

The SunOS symbolic debugger is an extended version of the 4.3 BSD dbx tool. It's window-based and is very powerful and easy to use.

Many of the tools available in the UNIX environment (such as MAKE) can be used for DOS application development, as well. In fact, most UNIX shell commands can be issued directly at the DOS prompt. For example, if you prefer the UNIX ls over the DOS DIR command, you can use ls and get the UNIX-style directory listing. We found the ability to use UNIX commands in DOS windows to be one of the most powerful features of the Sun386i. This capability even extends to redirection of I/O (piping) between the DOS and the UNIX environments.

For developers interested in graphics applications, Sun offers SunCGI, based on the Computer Graphics Interface, and SunGKS, based on the Graphics Kernel System standard (see Figure 2). SunCGI is included with the Developer's Toolkit, but SunGKS must be ordered separately. A device-independent raster operation graphics library (Pixrect) is also provided to support drawing routines that are common to all Sun workstations. Pixrect is the lowest-level device-independent graphics support on the Sun386i.

Developers of windowing applications can use the Sun Visual/Integrated Environment for Windows (SunView) on the Sun386i to build applications that make use of the windowing and user-interface features found in the standard SunOS system. Developers working

with network window systems can use Sun's Network/extensible Window System (NeWS), developed at Sun, or the X Window System, developed at the Massachusetts Institute of Technology, for creating applications that can be distributed across systems on a network. Sun plans to merge the NeWS X protocol version 11 in a future release that will provide for running SunView, X11 and News applications simultaneously on the same screen (see Figure 3).

Companies Mentioned In This Article

Autodesk Inc.
2320 Marinship Way
Sausalito, CA 94965
(415) 332-2344
CIRCLE 544 ON READER CARD

Hercules Computer Technology
921 Parker St.
Berkeley, CA 94710
(415) 540-6000
CIRCLE 391 ON READER CARD

Massachusetts Institute Of Technology (MIT)
77 Massachusetts Ave.
Cambridge, MA 02139
(617) 253-1000
CIRCLE 434 ON READER CARD

Intel Corp.
3065 Bowers Ave.
Santa Clara, CA 95051
(408) 987-8080
CIRCLE 440 ON READER CARD

Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
(617) 577-8500
CIRCLE 408 ON READER CARD

Microsoft Corp.
16011 N.E. 36th Way
Redmond, WA 98052
(206) 882-8080
CIRCLE 410 ON READER CARD

Running DOS Applications

The Sun386i can run DOS simultaneously with UNIX applications on separate windows on the screen. A DOS window can be started by typing the DOS command in the UNIX command window or by selecting the DOS Window from the desktop. A DOS application can be started by either selecting an icon in the Organizer and clicking a mouse button or by typing the PC application in either the DOS or the SunOS command window.

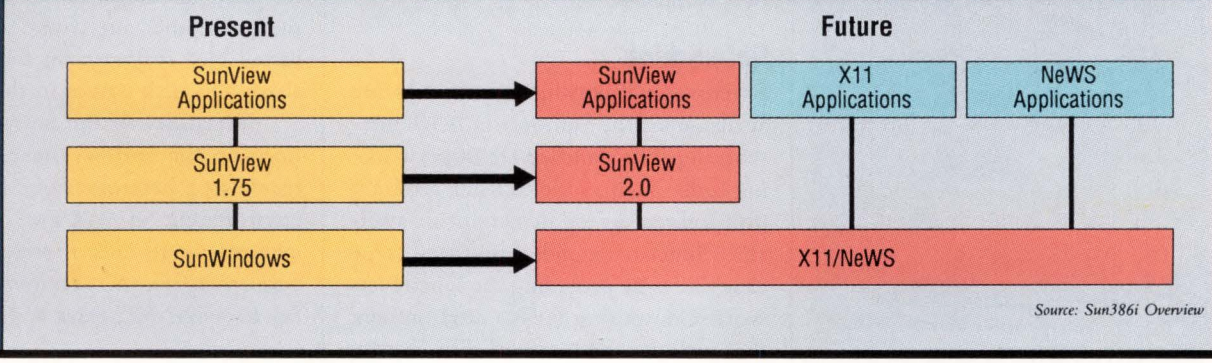
Many window operations, such as cut and paste and window sizing, are available in the DOS windows just as they are in the windows running UNIX applications. For example, you can copy a table of numbers from the mail window into a spreadsheet, such as MicroSoft Excel, in the PC window. Graphics cut and paste is possible only between certain UNIX applications.

Graphics applications that use CGA, monochrome or Hercules cards can run using the software emulation of these cards under the Sun386i without any additional hardware. An option card must be added to use EGA or VGA graphics output.

Applications running under a DOS window have a full 640 KB of memory allocated from the virtual memory on the Sun386i. In addition, up to 8 MB of extended memory (using the Lotus-Intel-Microsoft version 3.2 extended memory specification) is available to applications that can take advantage of it. The full amount of standard and extended memory is available to each application running in a DOS window, regardless of the number of simultaneous DOS applications. A special pseudo-disk drive is available that emulates the PC drives to the sector and track level. This could be used for software applications that have hard-disk-based copy-protection schemes.

The mouse can be operated in either the SunView or the MicroSoft mode in a PC window, even to run applications under the Microsoft Windows version 2.0 environment. Sun has its own MS-Windows driver that replaces the drivers supplied by Micro-

FIGURE 3.



SunView applications and X11/NeWS.

DEC PROFESSIONAL DP LABS TESTING CENTER

soft to enhance the display and mouse performance.

Applications running in a Sun386i DOS window can share files and spooled printer resources with UNIX system applications. For printing, the printer resource can be a networked printer connected to a remote system.

There are some limitations to DOS applications run on the Sun386i. Applications that access the protected mode 80286 instructions or use hardware-dependent features don't run in DOS Windows. Although number-crunching applications run well on the Sun386i, applications that require frequent updating of the graphic images are slowed because of the software emulation involved in the display of the images.

We wanted to see how an industry-standard graphics application such as AutoCad would perform on the Sun386i. AutoCad for the Sun386i runs as a UNIX application, although in theory you can use a VGA card and run it (more slowly) as a PC application. The software arrived on 3½-inch floppies. Installation was straightforward.

AutoCad runs in two windows on the Sun386i. One is a text window containing commands and error messages. The other is a graphics window. You can manage the windows using standard Sun386i window-management techniques, and you can change the size of the windows as an AutoCad configuration parameter.

Networking

Extensive networking capabilities are available for the Sun386i via TCP/IP networking. The standard UNIX networking tools, such as file transfer program (ftp) and remote log in (rlogin) are available. Sun has extended many of these capabilities by providing the Open Network Computing (ONC) environment that includes the Network File System (NFS), Yellow Pages (a distributed name lookup service) and Remote Procedure Call (RPC) capability.

RPC allows you to write client-server applications where the processing portion of an application is done on a networked server and the results displayed on the client workstation.

For connectivity to non-TCP/IP nodes, Sun provides a family of products called SunLink that implements other networking protocols. SunLink DNI implements the DECnet protocol for connectivity with nodes running DECnet. This is an important product for using the Sun386i in a DEC environment. Another alternative would be to install NFS software on the VAXs and share NFS disk drives in the network.

Versatility of the networking options on the Sun386i makes it fit very nicely in a heterogeneous networking environment of VAX/VMS or ULTRIX systems. *—Ali Diba is principal software engineer at James M. Montgomery Consulting Engineers Inc., based in California.*

Sun386i

PRICE: For full configurations, from $18,740 (91 MB) to $20,990 (327 MB)

SUN MICROSYSTEMS INC.

HEADQUARTERS:
2550 Garcia Ave.
Mountain View, CA 94043
(415) 960-1300

FOUNDED: 1982

PRODUCT LINE: Network-based workstations and servers, UNIX operating system

REVENUES: $1,051,618,000 (1988)

OWNERSHIP: Public

BRANCHES: Three manufacturing facilities, 76 U.S. and 44 international sales offices and 18 international distributors

CIRCLE 442 ON READER CARD

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GrayMatter's ScriptMaster/ Spooler

David B. Miller

Taking full advantage of the capabilities of PostScript printers is what ScriptMaster, from GrayMatter Software & Consulting Inc. of Seattle, Washington, is all about.

Implemented as a standard VMS print symbiont, ScriptMaster/Spooler provides the synchronization and error reporting capabilities that the VMS PRTSYM symbiont can't supply for PostScript printers.

We tested ScriptMaster/Spooler version 2.0a on our VAXcluster.

Installation And Configuration

VMSINSTAL is used to copy the media to a disk directory of your choice. The next installation step requires setting up queue characteristics for PostScript fonts and the available list of paper sizes. A supplied command file, CHAR_DEF.COM, makes this easy.

Another command file, Q_MGR.COM, makes it easy to define print queues for the PostScript printers on your system. The only data you need to supply are queue name, what terminal or LAT port to use and baud rate.

ScriptMaster/Spooler can print PostScript files as well as ASCII text files. ASCII files are translated to PostScript before being printed, allowing you to take advantage of PostScript features such as font style. PostScript files require no translation and can be sent directly to the print queue.

Files can be printed using the standard PRINT command with the ScriptMaster/Spooler qualifiers you need to select the desired characteristics for the print job. All VMS PRINT command qualifiers are supported, with the exception of /WRAP and /PAGES. As an alternative to the PRINT command, a menu-driven system invoked with the SCRIPT command can be used to print ASCII files (see Screen).

For example, to print the ASCII text file TEST.FILE in the PALATINO_ITALIC font on legal-sized paper with a 1.0-inch left margin, you simply type:

```
PRINT/QUEUE=AST
 /CHAR=(PALATINO_ITALIC,LEGAL)
 /LEFT_MARGIN=1.0IN TEST.FILE
```

The /QUEUE=AST qualifier will differ depending on your configuration. In the Lab, we used an AST Turbolaser/PS for our PostScript printer and we created the queue AST using Q_MGR.COM for ScriptMaster/Spooler print jobs.

Using the SCRIPT menu system instead of the PRINT command, you'd have to enter the file name (FI), primary font name (FO), paper size (PA), left margin (LM) and queue name (QU) menu choices. Typing GO initiates printing.

As you can see in the screen of the SCRIPT menu, you have a lot of control over the appearance of a document. Besides the expected choices for margins, you can direct headings and page numbers to be printed on every page. You can control the character point size and vertical spacing. Processing options, such as flag and trailer pages, also can be specified. If you use a group of settings frequently, you can save them in a separate library file and load them when necessary. This allows system managers to define different groups of settings for different types of print applications. Users simply load the group they need.

Printing PostScript files is done best by using the PRINT command. When I tried the SCRIPT menu system to print a PostScript file, I got a listing of the PostScript code rather than the image. However, this is a good way to get a PostScript listing without the

ScriptMaster Print Menu V2.0

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FI	File	LETTER.TXT			
HE	Heading	<none>			
FO	Font	Courier	SC	Scale	10pt
F2	Sec. scale	Courier	S2	Sec. scale	10pt
PA	Paper	Letter	VS	Vt. Spacing	12pt
OR	Orientation	Portrait	TW	Two-up	No
LM	Left margin	.25in	NU	Numbering	No
RM	Right margin	.25in	NP	No. prefix	<none>
TM	Top margin	.5in	NL	No.location	Center
BM	Bottom margin	.5in	HL	Hd.location	Center
QU	Queue	SYS$PRINT	FP	Flag page	No
JN	Job name	LETTER	TP	Trailer page	No
FN	Form name	DEFAULT	NT	Notify	No
PR	Priority	100	DE	Delete	No

Enter GO when settings are as desired.

Script>

Screen: An example of the SCRIPT menu system for printing ASCII text files.

printer translating it into a PostScript image.

ScriptMaster/Spooler V2.0a supports more than 30 PostScript fonts, distributed among the Avant Garde, Bookman, Courier, Helvetica, New Century Schoolbook, Palatino, Times and Zapf Chancery font families. Paper sizes supported include letter, legal, tabloid and ledger, as well as the European A4 and B5 sizes. Your PostScript printer will determine the extent to which you can take advantage of the supported fonts and paper sizes.

SCRIPTMASTER/SPOOLER easy to use, whether you choose the command line format or the SCRIPT menu. It can help you take better advantage of the PostScript printers on your system.

AST Research Inc.
2121 Alton Ave.
Irvine, CA 92714
(714) 863-1333
CIRCLE 576 ON READER CARD

ScriptMaster/Spooler Version 2.0a

PLATFORMS: VAX/VMS systems, VMS version 4.5 or later

PRICE: $693 to $1,890 for a four-printer license. $1,260 to $2,980 for an unlimited-printer license

GRAYMATTER SOFTWARE & CONSULTING INC.

HEADQUARTERS:
1300 Dexter Ave. N., Ste. 550
Seattle, WA 98109-3542
(206) 281-8800

FOUNDED: 1984

PRODUCT LINE: System utilities for VMS- and RSTS-based systems

OWNERSHIP: Private

CIRCLE 575 ON READER CARD

C.Itoh's Megaserve CIE 45 Printer

David B. Miller

One service *DEC PROFESSIONAL* provides its vendors is the telemarketing lead card. Lead cards provide names and addresses of potential customers who circle the product numbers you see at the end of articles and advertisements. Needless to say, we generate a lot of lead cards on a daily basis.

Our growing need to turn out high-quality lead cards rapidly outstripped the capabilities of eight-, 15- and even 20-page-per-minute laser printers. We went looking for a workhorse that not only could meet our current needs but also could give us some breathing room for awhile.

Last fall, at DEXPO West 88, we looked at the Megaserve CIE 45 from C.Itoh Electronics Inc. of Irvine, California. A short time later, we had one in-house.

C.Itoh's Megaserve CIE 45 emulates a number of popular printers and prints at a rate of 45 pages per minute.

Shapes And Sizes

The Megaserve CIE 45 is an ion deposition printer, providing 300- x 300-dpi output resolution at a rate of 45 pages per minute.

The printer is compact — 27 x 24 x 23 inches. The optional stand adds 24 inches to the height. The printer's 180 pounds were appreciated by those who carried it into the building. Other printers of this power often weigh much more and require more room.

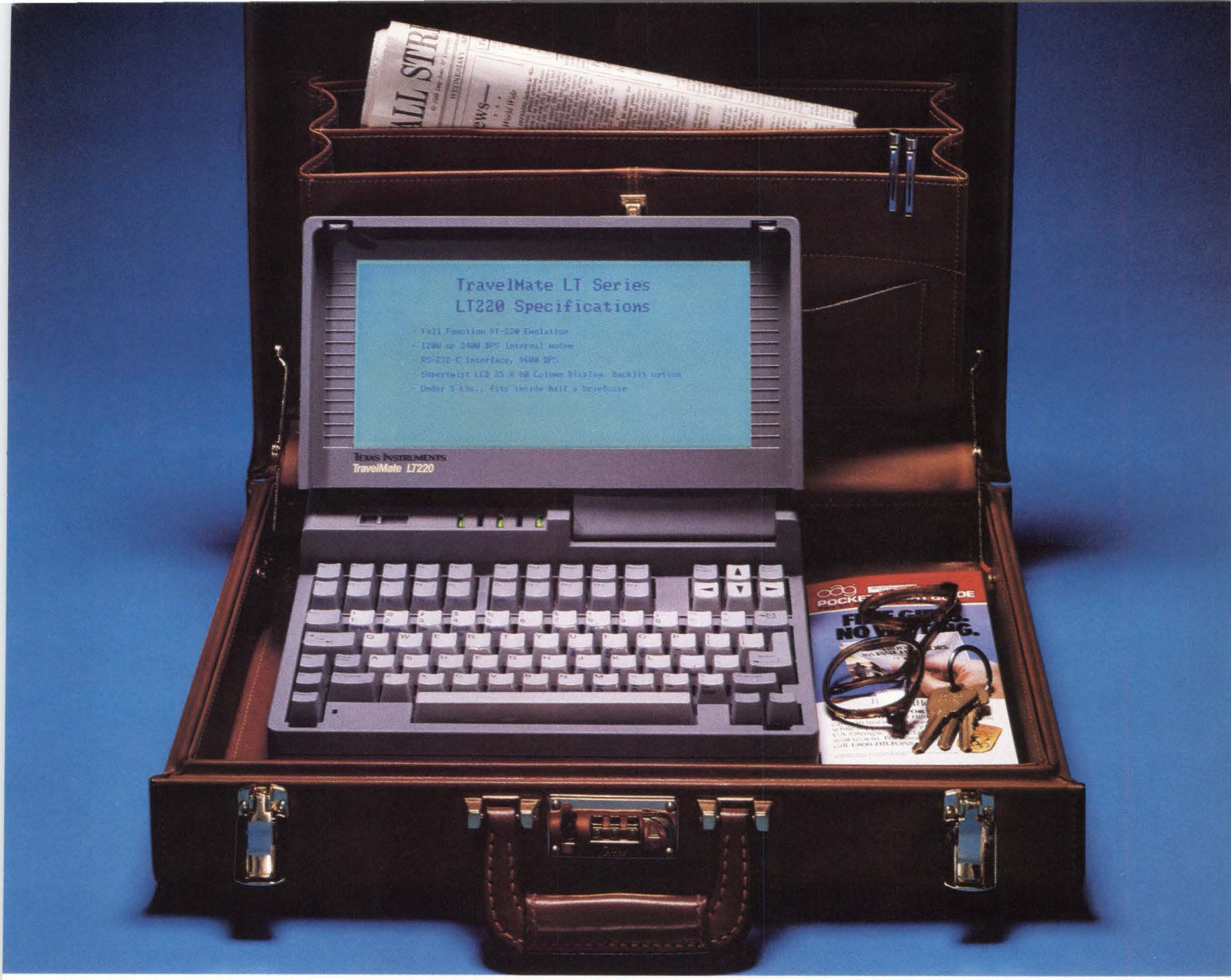
Legal- and letter-sized paper can be used. Our CIE had the optional 2,000-sheet input bin in addition to a 500-page bin. Output is stacked either face-up or face-down in one of two 500-sheet trays.

Operating at less than 58 dB(A), the printer could be used in some office environments. You'll know it's there, however, if your environment is very quiet.

Printer features can be selected by software control. Many features, such as page orientation, feeder bin selection, number of copies to make, and font style, are accessible through the CIE 45's control panel.

The printer's internals can be accessed easily by pulling down its side cover. C.Itoh recommends that the developer unit be cleaned daily under heavy use or after every ream of paper under light use. The erase rod, used to erase the latent electrostatic image on the drum, needs to be rotated to expose a new erase wire once every 100,000 sheets. It can be rotated four times before replacement is required. Other maintenance consists of changing the toner and the ion cartridge as needed. The paper pickup rollers only need to be changed at 400,000-page intervals.

Paper jams are normally easy to correct, although, as with all printers of



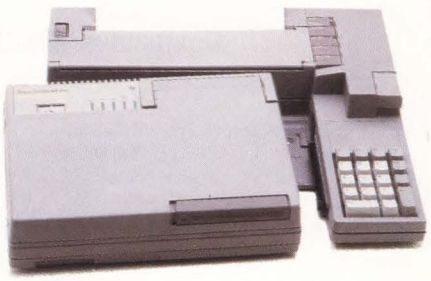
TI's new TravelMate™ LT220. It's the closest thing to carrying a VAX™ in your briefcase.

Texas Instruments introduces the LT220 lap-top terminal — the next best thing to being there when you need remote access to your company's VAX.

The LT220 provides full VT220 emulation in a 4.8-lb. package, without sacrificing functionality. It features a 25-line screen that's easy to read. It even has a full-function keyboard like the one on a VT220.

The terminal communicates at 1,200 or 2,400 bps through one of its optional internal modems. For hard copy, just slide the LT220 into one of its optional cradles to add an ink-jet or thermal printer.

New credit-card-sized memory cards



let you create, update and store files. They're also handy for programming the LT220 to your specific application.

Like its Silent 700™ predecessors, the LT220 sets new standards for portability, durability and reliability. All of which makes it the perfect tool for anyone who's ever wished for a VAX in their briefcase. In short, this may be the best little terminal in the world.

So go ahead. Take the first step toward improving your productivity today. Call Texas Instruments for more information or to arrange a demonstration of the LT220. **Phone toll-free, 1-800-527-3500.**

TEXAS INSTRUMENTS

this size, paper can jam in more than one place. We experienced one jam that required removing the large paper bin. The jammed page tore and a piece of it

> ***The printer supports 43 resident fonts, including grayscale and pattern fonts.***

lodged in a place we couldn't access by lowering the front cover or through the paper bin. It's advisable not to be too hasty when trying to clear paper jams.

Communications And Emulations

RS-232, RS-422, parallel, SCSI and Ethernet interfaces are supported. We chose the Ethernet version. Print symbiont software, called TLAP, was supplied to establish the connection between the printer and our VAXcluster.

The printer supports 43 resident fonts, including grayscale and pattern fonts. The fonts are available in any orientation and with any special attributes. A Winchester disk option is available for holding additional fonts.

Using the Talaris-based EXCL command language, the printer can produce bar codes and vector and raster graphics in addition to normal text. For files in the older QUIC format, QuickChange can be used to convert QUIC files to EXCL files. You can choose a number of other emulations from EXCL or from the printer's control panel.

The list of emulations currently includes DEC LN03, Tektronix 4014, Diablo 630 ECS, Hewlett-Packard LaserJet Series II and PostScript.

We're particularly excited about the EXCL capability. We use Talaris printers in the office for heavy production jobs. It was a relief to install the printer and run our applications with no change in software.

The documentation was extensive and clear. The concise *Key Operator Handbook* presented all the basics of keypad operation and periodic maintenance. The *Programming Technical Manual* described the EXCL programming language and the codes needed for the various emulations. Also included were appendixes describing the interface options, an ASCII conversion table, a standard font summary, a list of error codes and a troubleshooting guide.

WE'RE EXPERIENCING a few sporadic problems. Occasionally, the printer places copy on only a small portion of a page, then spews a blank page, losing the data for the page that was supposed to be printed. A second problem places a pattern across the page to be printed instead of the text that's supposed to go there. A ROM upgrade from C.Itoh should correct the problem.

If you're not familiar with ion deposition printers, you might be surprised at the slight sheen your paper will acquire after printing completes. The high pressure needed to fuse the toner to the paper makes the paper slightly smoother and shinier than it was before entering the printer.

We're pleased to have the C.Itoh Megaserve CIE 45 up and running so quickly. It's going to boost our production effort significantly.

C.Itoh Megaserve CIE 45

PLATFORMS: Serial, parallel, SCSI or Ethernet interfaces

PRICE: Megaserve 30, $21,995; Megaserve 45, $29,995; optional stand, $350; optional 2,000-sheet input bin, $1,295

C.ITOH ELECTRONICS INC.

HEADQUARTERS:
2505 McCabe Way
Irvine, CA 92714
(714) 660-4903

FOUNDED: 1858

PRODUCT LINE: Printers, terminals

REVENUES: $124 billion (1988)

NET EARNINGS: $202.5 million (1988)

OWNERSHIP: Public (Japan only)

BRANCHES: 20 U.S.

CIRCLE 569 ON READER CARD

Companies Mentioned In This Article

Digital Equipment Corp.
146 Main St.
Maynard, MA 01754
(508) 897-5111
CIRCLE 403 ON READER CARD

Epson America Inc.
23530 Hawthorne Blvd.
Torrance, CA 90505
(213) 373-9511
CIRCLE 468 ON READER CARD

Hewlett-Packard
3000 Hanover St.
Palo Alto, CA 94304
(415) 857-1501
CIRCLE 406 ON READER CARD

Qume Corp.
500 Yosemite Dr.
Milpitas, CA 95035
(408) 942-4000
CIRCLE 466 ON READER CARD

Talaris Systems Inc.
P.O. Box 261580
San Diego, CA 92126
(619) 587-0787
CIRCLE 465 ON READER CARD

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

Xerox Corp.
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(800) 832-6979
CIRCLE 467 ON READER CARD

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No matter what computer universe you operate in ... DEC, IBM, HP or all 3 ... Professional Press covers your arena with the definitive publication in your field. Plus, Professional Press publishes three reference books dealing with topics of interest to today's computing professionals.

HP Professional

A monthly magazine available free of charge to qualified buyers of Hewlett-Packard products, HP Professional is the only publication written for professional users and managers of both HP's commercial and technical computer systems. Solutions-oriented editorial, product reviews and the on-line bulletin board, ARIS/BB, make it the choice of over 35,000 HP-computing pros.

VAX Professional – The Technical Journal for VMS Systems

This paid-subscription, bimonthly publication is the only technical journal dedicated solely to users of VAX/VMS. Subscriptions include access to an on-line bulletin board, programming models and program down-loads, systems information and practical articles on software applications.

DEC Professional

DEC Professional is the only magazine serving DEC computing professionals. And it's the only publication of any kind offering DEC computing professionals solutions-oriented editorial, hard-hitting commentary, the on-line bulletin board, ARIS/BB, and fact-filled product reviews that help simplify the jobs of the 95,000+ subscribers who receive the magazine free of charge.

MIDRANGE Systems – The Independent Newspaper for IBM Multiuser Computing

The only high-quality, full-color tabloid serving IBM System/3X and AS/400 users, it's the free biweekly news source for 35,000 computing pros who use and buy IBM midrange equipment. MIDRANGE Systems provides timely information on industry news and trends, new products, hardware and software, plus how-to features and more.

Introduction to VAX/VMS, Second Edition

This self-teaching text explains and illustrates how to use VAX/VMS systems. Easy to learn for the computing novice ... an excellent reference for VAX/VMS pros. Covers the basics and teaches systems and programming as well, plus glossary and appendices. Written by David Bynon and Terry Shannon.

Let's C Now

A complete guide to learning C language in two volumes. Over 300 pages in 26 chapters in a self-instructing workbook format. All the information needed to become proficient in C. Plus chapter summaries, glossary and author Rex Jaeschke's hints and suggestions.

VMS Advanced Device Driver Techniques

A manual of step-by-step instructions on how to design, implement and debug device drivers for the VMS Version 5 operating system from two recognized experts in the field, Lee Leahy and Jamie Hanrahan. Covers simple VMS device drivers, full duplex and state machine-based drivers and VAX BI drivers, as well as advanced debugging strategies and techniques.

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Texas Instruments' TravelMate LT220

Evan Birkhead Before our on-line evaluation of the TravelMate LT220 laptop terminal began, it was put to an unexpected test. A burst sprinkler system in Professional Press' Lexington, Massachusetts, office caused several ceiling tiles to give way. The resulting downpour soaked the LT220, knocked it to the ground and swept it into the hallway.

After less than a week of drying out, the LT220 performed flawlessly. The phone cable, power cord and wall transformer were undamaged. The modem was easy to set up and it dialed smoothly. The screen display, which was propped open during the flooding, was clear. The screen, incidentally, is very readable compared to other laptops.

Small Package

The LT220 is remarkably small. You might not find some of the keys from your VT220 at first, but with minor exceptions they're all there. I recommend that you travel with the *User's Manual* as a reference the first few times on the road. The arrow keys and the PF function keys have been moved to the top rows, and such keys as Find, Select and Insert have been realigned. In addition, two of the extraneous punctuation keys (for | \ and ~ ') have been moved to the lower right corner of the keyboard.

There are only 10 function keys, but striking the Alternate key allows the F1 through F10 function keys to emulate the VT220's F11 through F20 function keys. The Alternate key changes the function of half the keys on the keyboard.

There are five status LED indicators and a brightness gauge.

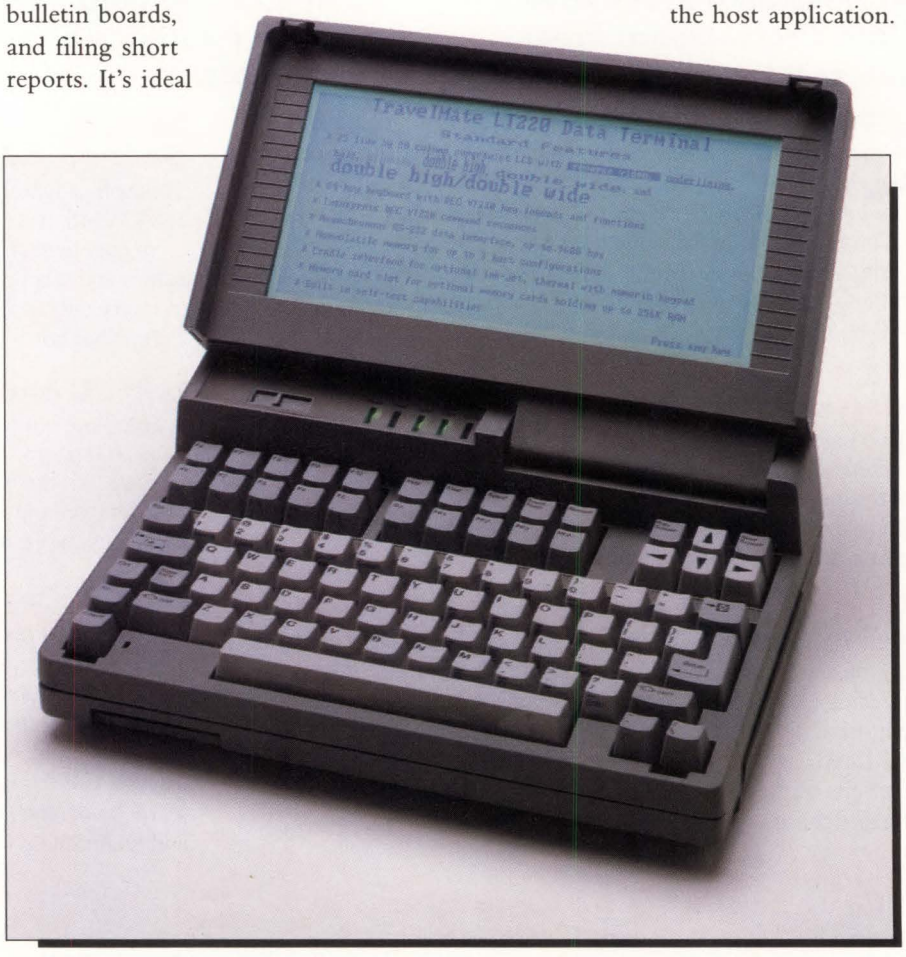
The keypad portion comes optionally with a cradle that plugs into a specially designed port on the keyboard. A tiny printer (ink-jet or thermal) that plugs into the back of the unit is also optional.

The screen has 25 lines including status lines. It's best for sending and receiving mail, checking for information on networks and bulletin boards, and filing short reports. It's ideal for business trips.

The left side of the keyboard features the power switch, a modem phone jack, the transformer cable connector and an RS-232 serial port. The optional parallel interface is on the right side.

The terminal has a slot for Multifile memory cards with 64 or 128 KB of non-volatile RAM. Located at the front of the terminal, this allows you to create, store, run and edit additional files.

There are three primary modes of on-line operation: Set-Up, which establishes communications parameters; Command, from which you power up the modem and perform diagnostics (this is where the Multifiles are accessed, as well); and On-Line, which runs the host application.



The diminutive LT220, from Texas Instruments, features a 25-line screen and communications at 1,200 or 2,400 bps.

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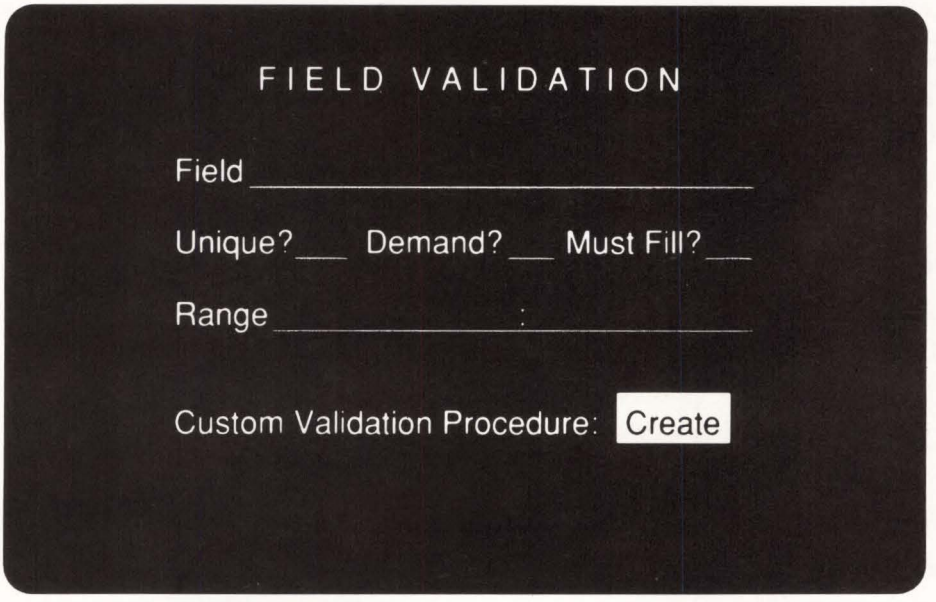

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Set-Up mode was as easy as selecting some options, such as 1,200 or 2,400 bps. Command mode got confusing at times, but I got used to the pattern for dialing and answering. On-Line mode

> ***"Creating a new entry is as simple as hitting F6 and following input instructions."***

will seem slow if you're used to 9,600 baud. All the menus were easy to sift through. For travelers, there's a phone number designer that saves you time in inputting phone numbers. It permits all sorts of space for a pause character and office dialing codes. This is also good for entering long-distance service codes. For example, # and * are tone dial codes, W is a wait character and , is a pause character.

Hitting ALT-DO puts you in command mode. Then, hitting D in the main menu gives you the Dial/Answer/Connect screen. This lets you select which system to dial into, which port you'll use, and functions such as Auto Answer, Manual Answer, Originate and Hangup. You also can dial the number manually, rather than calling one stored in memory.

F3 takes you to the Setup menu from either Online or Command mode. This menu lets you name and configure a phone number. It also has the local menus for setting parameters on the terminal, keyboard, screen and printer. Creating a new entry is as simple as hitting F6 and following input instructions. Entries, or what Texas Instruments calls Systems, are selected from internal memory by hitting F9. The Config System menu allows you to set logon sequences, communications parameters, phone numbers, user-defined function keys, answerback messages, and some miscellaneous items such as horizontal tab positions.

The Communication Parameters menu is reached by typing C at the Config System menu. This provides you with just as many receive and transmit options as you get in Set-up mode on your standard VT220 terminal. For example, you have three baud rate options, receive = transmit, VT emulation modes, parity, stop bits, busy signal defaults and character sizes. This is also where you select your modem port, either the RJ-11 or the 9-pin EIA connector.

DYNAMITE IN A small package is the LT220's selling point. If travelling light is your main concern, there's enough functionality in this box to execute most of your daily operations. ■

TravelMate LT220

PLATFORMS: Any VAX you can dial into. The LT220 emulates a VT220

PRICE: $899. The optional printer costs $549 and the optional keypad costs $99. The printer and keypad cradle together cost $599

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GUESS WHO WROTE THE BOOK ON TCP/IP NETWORKING WITH VMS.

No other company has more TCP/IP solutions for networking of VAX/VMS environments than Excelan, not even DEC.

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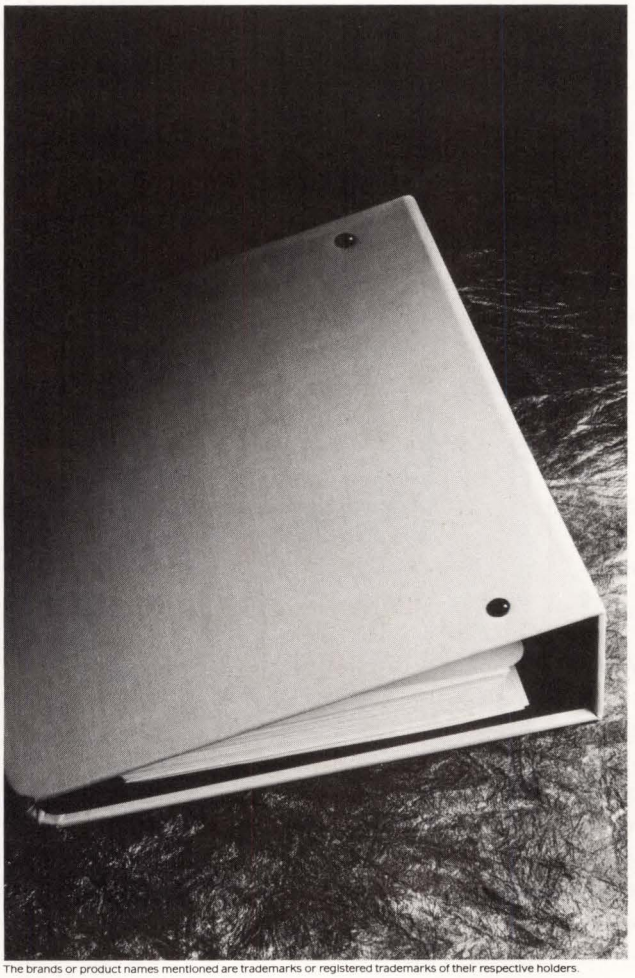
Excelan's MultiNet is our hardware independent, TCP/IP implementation, which allows users to run multiple network media and protocol stacks, including all DEC Ethernet adapters.

Both LAN Service for VMS and MultiNet also support third party programming through QIO, or Berkeley Sockets, as well as the standard networking applications.



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In addition Excelan's LAN Service NFS is the optimum TCP/IP VMS Server implementation of Sun's Network File System (NFS). It applies VAX power to distributed applications through an NFS environment, giving users unlimited file space, not to mention full connectivity across the network environment.

All of which goes to prove our point. No one has more solutions or experience in networking DEC environments on Ethernet via TCP/IP than Excelan, the company that networks networks.

If you would like more information on how Excelan can network VAX's to just about anything, go by the book, call 1-800-243-8526. Or write to us at 2180 Fortune Dr., San Jose, CA 95131.

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THE MAC CONNECTION

Al Cini

A Mac View Of VMS System Management

VAX/VMS system management, particularly of networked or clustered systems, has never been easy. To regulate functions such as user accounts, DECnet, batch and print queues and file security, VMS offers numerous, often confusing utilities and dozens of functionally overlapping commands. If these operations could be organized behind a single, consistent, human-oriented interface, a VMS system manager's job would be much simpler.

The Central System Manager (CSM), from Integrated Solutions, offers such an interface through the friendly windows of a Mac. CSM allows a VMS system manager to monitor and control the activities of a VMS network from a single Mac. More than just a "super-$SHOW SYSTEM" product, CSM provides simple Mac-oriented front ends for various VMS control functions. It can be completely site customized to manage and control even locally written VMS software.

Inside CSM

CSM consists of three components. Its front-end Mac software controls CSM's various VMS system-management windows and dialog boxes while communicating with a VAX/VMS-resident back end — CSM Master (CSMMAS) — over an asynchronous line. The dialog between these two parts of CSM controls the Mac's screen, while CSM's third element — CSM Remote (CSMREM) — installed on each VAX in the cluster or network, provides information about its particular VAX environment to CSMMAS via task-to-task DECnet. A typical CSM-managed VAX/VMS network, therefore, consists of a single Mac running the Mac end of CSM connected to a VAX/VMS system running CSMMAS through an ordinary, asynchronous terminal port. The system-monitoring and control portion of CSM, CSMREM, runs on each VAX in the network.

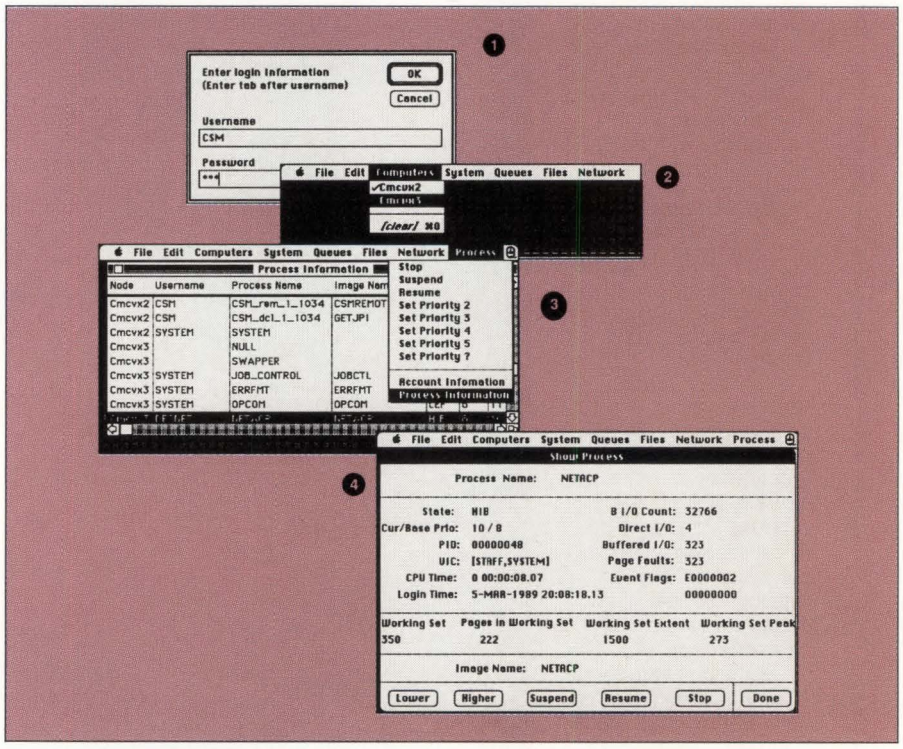
CSM is licensed for each VAX in a network or cluster, and each node is priced based on the system's size as measured by VAX Units of Performance (VUPS). Pricing ranges from $1,495 for managing a single MicroVAX.

CSM At Work

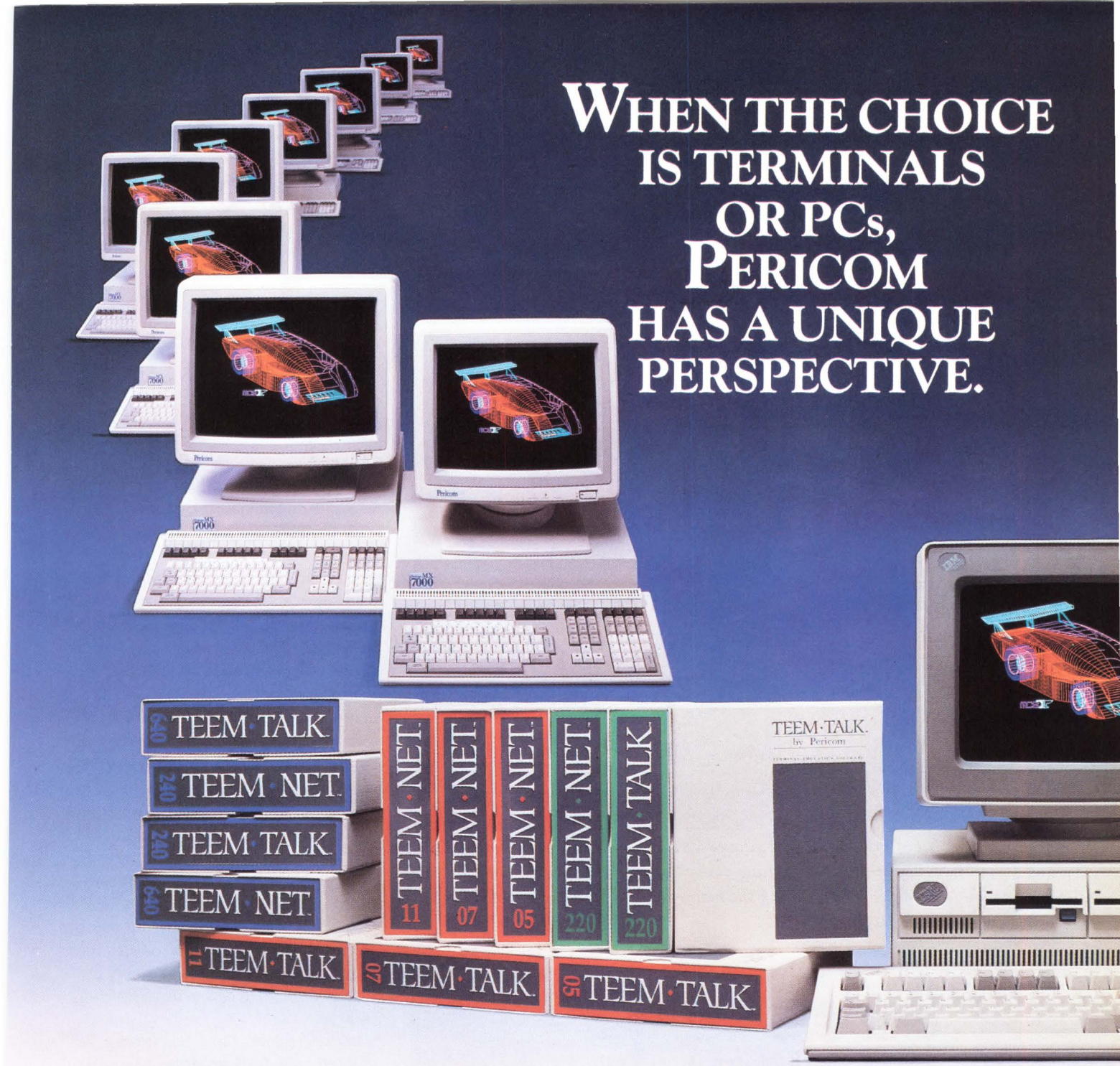
To use CSM, a system manager first must log into the VAX/VMS master system running the CSMMAS software. CSM provides a log in dialog for this purpose that can be modified to accommodate intervening terminal servers or port selecters.

After log in, the CSMMAS software running on the master VAX reads the VAX-resident CSM database, which consists of several editable text files, and uses this information to populate the menu bar and control the windows on the Mac-based end of CSM. CSM takes a few minutes to set itself up, but given a 9,600-baud line between the Mac and the VAX it performs pretty quickly after it's initialized.

Starting with CSM's Mac menu bar, a system manager first selects which



Screen 1: (1) Example CSM session begins with CSM log in. (2) VAX systems to be managed are selected from CSM's Computers menu. Current Processes then is selected from the System menu. (3) A particular process can be selected and controlled. (4) CSM's Show Process dialog box presents process information and accepts management functions.



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After all, it makes a lot of sense to buy terminal emulation software from a company that knows something about emulating terminals. Or vice versa.

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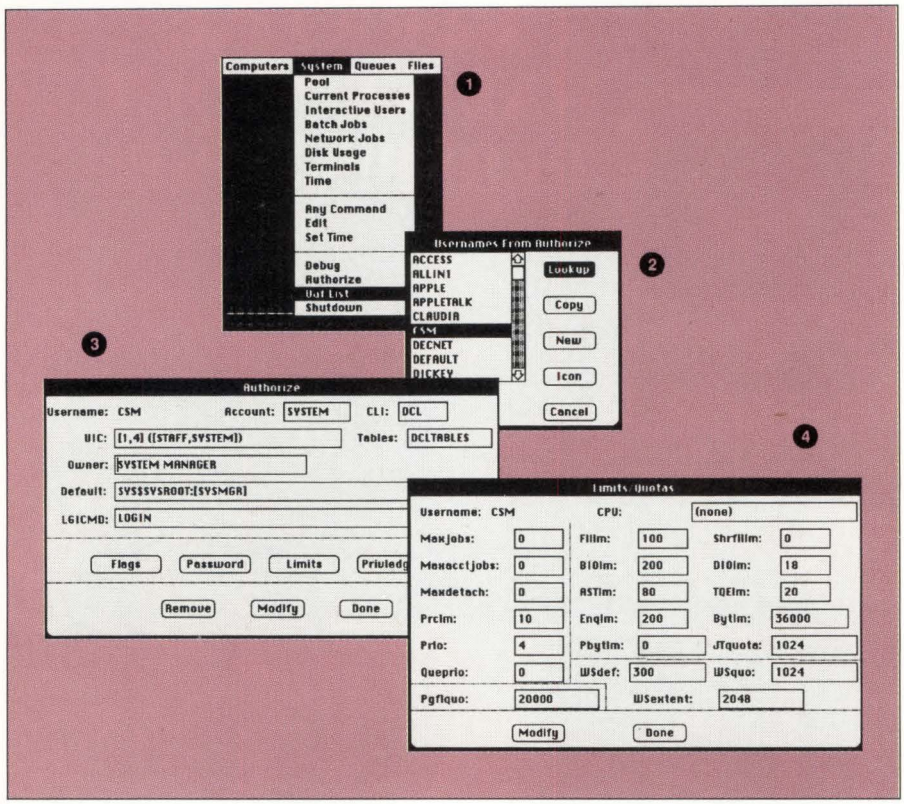
VAX systems a given control or monitoring function should apply to. To simplify the management of networked systems further, CSM allows the system manager to organize specific VAX nodes into named groups. Selecting a group by its name then implicitly selects all of its VAX systems.

The CSM user next selects a system-management function from a CSM menu. A window or dialog box then appears, presenting the requested information or offering the appropriate control options. Any CSM-requested operation then is initiated on each selected VAX (asynchronously for performance reasons) via the CSMREM software running there.

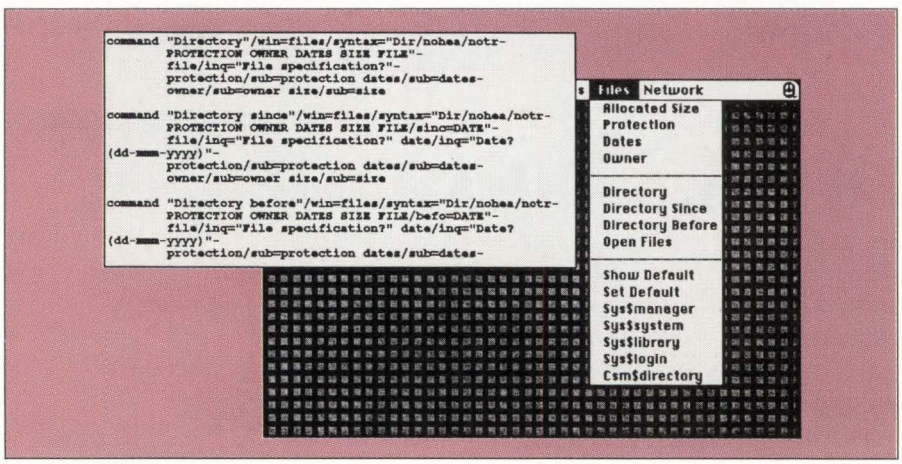
CSM's monitoring and control functions naturally follow the flow of a system manager's job. For example, a VAX manager might ask for a system status, select a process from the status-display window, then ask to suspend or change the priority of the selected process (see Screen 1), all through different windows and menus on the same screen, without the usual jumping from command to command in VMS.

Particularly for new VMS system managers, CSM is at its best when presenting VMS control options through its specially formatted Mac dialog boxes. CSM's user-authorization interface, for example, shows a user's account information through clearly formatted on-screen forms instead of the busy and confusing listing produced by VMS' standard AUTHORIZE utility. Changing a user's account record is done with a few mouseclicks and keystrokes in CSM and is much easier than navigating through AUTHORIZE's dozens of command qualifiers (see Screen 2).

No doubt about it, mousing around your VMS accounts, queues and processes with CSM seems simple. But it takes more than Mac point-and-click skills and vague VMS familiarity to use CSM effectively. CSM is born to be tailored, and CSM tailoring is a fairly technical process.



Screen 2: (1) A list of the users for the selected VAX system is requested through CSM and (2) returned through a CSM scrolling dialog box. (3) The selected user's account information is displayed and, by using the mouse to press the Limits button, (4) the user's quotas are displayed.



Screen 3: The relationship between commands in a CSM database file and the options presented within a CSM menu is shown. Site-specific commands can be incorporated into CSM by editing the appropriate CSM database files on the VAX.

Tailoring CSM

Unlike the usual Mac point-and-click applications it resembles, several CSM features, such as the list of DECnet node names that appears under its Computers menu, must be tailored from time to time by the VAX system manager. CSM tailoring involves editing CSM's VAX-

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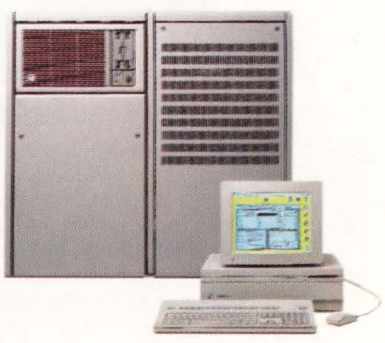
Perhaps that's why 80,000 DEC users gave us the coveted Digital Review Target Award. Not just once, but the last two years running. What's even more impressive is the fact that ours is the *only* Macintosh/VAX software ever to receive the award at all.

But then, no one else can give you products like ours. Such as AlisaTalk, a software solution that puts AppleTalk on your VAX with no special hardware or software.

TSSnet, which lets your Mac talk over DECnet networks.

And SequeLink, which gives Macs access to VAX/VMS host SQL databases.

So when you want the right Mac-VAX connections, there's only one place to contact: Alisa.



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resident database, which can be a technical process.

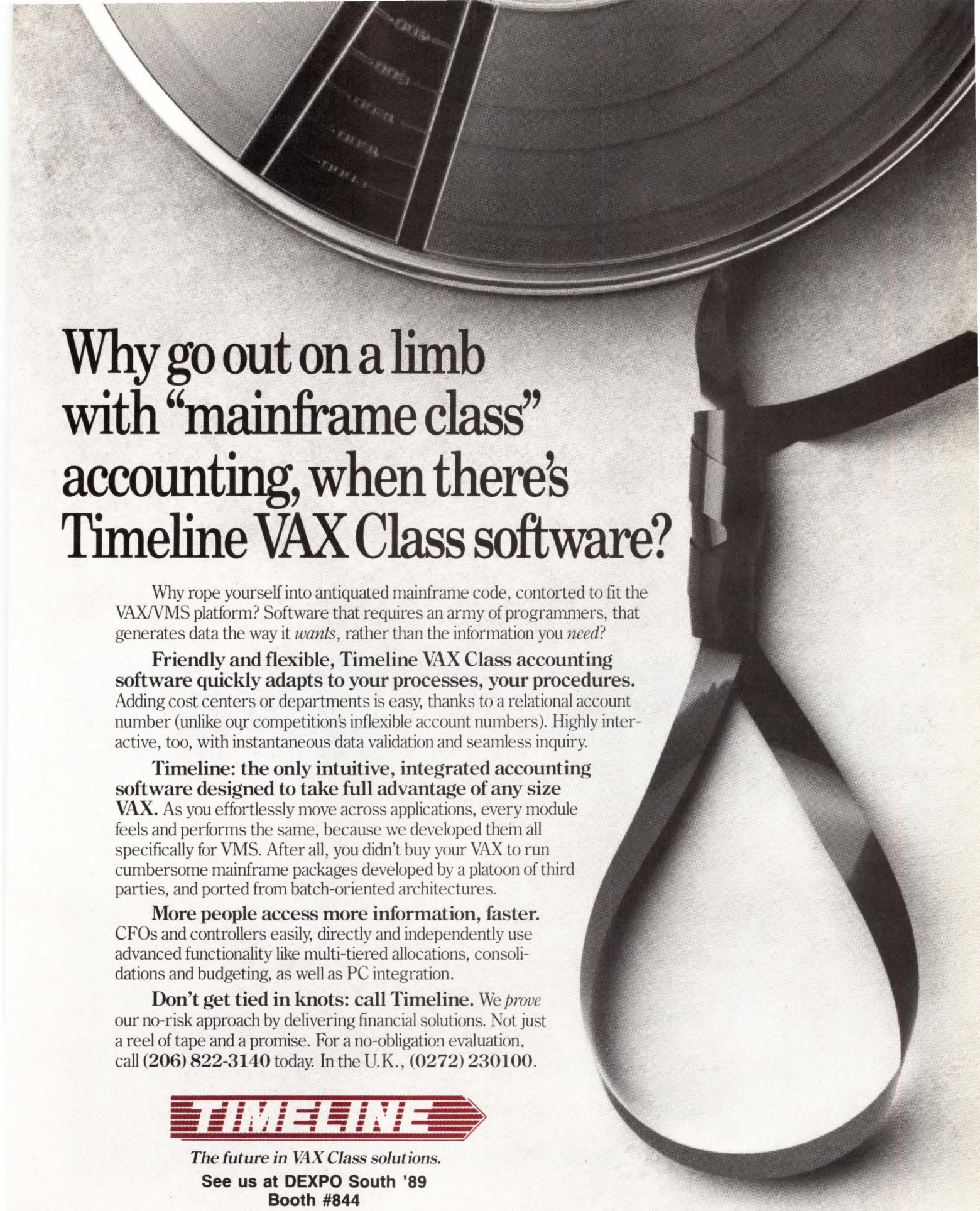
The CSM database is found within a directory that's automatically created as a byproduct of CSMMAS installation via the logical name CSM$FILES. The database consists of a collection of editable text files whose filenames (each with a .CSM extension) generally denote which CSM feature the file controls.

The syntax within CSM's files is DCL-like, with each text line consisting of a command, one or more parameters, and associated qualifiers (see Screen 3). "Include" commands help to organize the database by allowing cross-file references.

CSM's configuration files are very powerful, but far from self-documenting. Thus, CSM's great strength becomes one of its biggest weaknesses: CSM can be tailored to suit any VAX/VMS management environment, but the tailoring doesn't come easily. Unfortunately, the complexities of CSM's configuration database aren't adequately tamed in the current version's documentation. A more lucid manual with more examples is planned for a future CSM release.

CSM was developed using Apple's MacWorkStation development tool for the Mac. Therefore, to some extent, future releases of CSM will track future MacWorkStation developments. A future release of CSM will support communication between the client Mac and the CSMMAS-equipped server VAX using Apple's AppleTalk LAN protocols in addition to its present terminal-line interface. Future releases also are likely to be easier to tailor, with streamlined command syntax and improved documentation.

Despite a few rough edges, CSM is worth a VAX system manager's consideration. If you have a Mac, if you've been looking for an easier way to manage your VAX and if you're tired of waiting for relief through DEC's promised DECwindows system-management interface, you'll find a comprehensive solution to your problem in CSM. ■



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PRODUCTS

PacerShare Offers File-Serving Functionality

Pacer Software Inc. announced PacerShare, AppleShare-compatible file server software for VAX/ULTRIX version 3.0 systems. PacerShare enables a VAX, MicroVAX or VAXstation running ULTRIX to function as a file server for a Mac network.

By implementing the AppleTalk Filing Protocol (AFP) on a VAX/ULTRIX system, PacerShare offers ULTRIX users file-serving functionality equal to that provided in the VAX/VMS environment. A Mac user can transparently use AppleShare to store files on a VAX where they can be accessed by ULTRIX and other Mac users. Files stored on the VAX system appear to the Mac user as icons that can be accessed in the familiar Mac style. ULTRIX users see files residing on the VAX with the normal UNIX interface and can directly access these files. Access to files stored on the VAX conforms to ULTRIX system security.

Pricing of PacerShare is an extension to PacerLink, an integrated package for linking Macs and IBM PCs into multiple host environments. PacerLink with PacerShare starts at $2,400 and is based on the number of concurrent sessions.

To find out more, contact David Ryter, Pacer Software Inc., 7911 Herschel Ave., Ste. 402, La Jolla, CA 92037; (508) 898-3300. Stop by Booth No. 2414.

Circle 412 on reader card

All of the companies that appear in this month's Products are DEXPO South 89 exhibitors. Their booth numbers are indicated, so plan to visit them.

Multiflow Exhibits Trace /300 Series

Multiflow Computer Inc. will exhibit its new Trace /300 family of departmental supercomputer systems at DEXPO South 89. The Trace family includes the Trace 7/300, 14/300 and 28/300 computer systems, capable of executing up to seven, 14 and 28 simultaneous instructions per machine cycle, respectively. The systems achieve more than four times the peak computational performance and I/O

Atlanta will be home to DEXPO and DECUS this May.

performance of Multiflow's Trace /200 family of computer systems.

The Trace 28/300 executes 28 computing operations for each clock cycle. The Trace /300 Series departmental supercomputers are designed for use in a wide range of compute-intensive applications.

For more information, contact Mike Bernhardt, Multiflow Computer Inc., 175 N. Main St., Branford, CT 06405; (203) 488-6090. Stop by Booth No. 3012.

Circle 490 on reader card

DSD Shows C-Plan And C-Calc Plus

DSD Corporation will show enhanced versions of C-Calc Plus spreadsheet and graphics software and C-Plan project management and control systems at DEXPO South 89.

C-Calc Plus provides spreadsheet users with large worksheet size, extensive built-in functions, board-room quality graphics and reports, links to Lotus and other systems, and a PC-style user interface. Version 2.0 features include cell pointing, Powerlink with real-time input and updating, shareable index for multiuser access and ALL-IN-1 support. It operates on VMS and UNIX systems. C-Plan lets project managers plan, track and report projects of all sizes. C-Plan provides unlimited project size, superior graphics, WHAT-IF analysis, resource management, budget-to actual variance reports, and produces Gantt, CPM and PERT network charts. Version 2.0 includes work-breakdown structure, earned value, shareable resources and enhanced custom report-writing capabilities. It's available on VMS systems.

C-Calc Plus licenses start at $950. C-Plan licenses start at $4,500.

For more details, contact Bill Cyr, DSD Corp., 18912 N. Creek Pkwy. #105, Bothell, WA 98011; (206) 485-7564. Stop by Booth No. 929.

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Tachion-I Uses PTD Technology

KineticSystems Corporation announced a CAMAC high-speed data acquisition system. Based on the modular CAMAC (IEEE-583) standard for Computer Automated Measurement and Control, the Tachion-I system is designed for large transient recording applications needing immediately accessible high-speed, real-time data. Tachion-I offers a net throughput to disk of up to five million samples per second, using high-performance parallel transfer disk (PTD) technology and a VAX/VMS host processor.

This system can be used in a wide var-

DEXPO South 89

Enjoy spring and DEXPO South 89 this year in Atlanta. DEXPO South will be held Tuesday, May 9, through Thursday, May 11, at the Atlanta Market Center. Approximately 250 suppliers of DEC computing hardware, software, systems and services will exhibit, and 7,000 visitors are expected to attend.

DEXPO South debuts include add-ons for the DECstation 3100, 88000 RISC CPU accelerators for the VAX and MicroVAX, plus a variety of VAX-to-DOS and VAX-to-Mac communication tools, windowing breakthroughs and new UNIX/VMS interfaces. Be on the lookout for new products in every aisle.

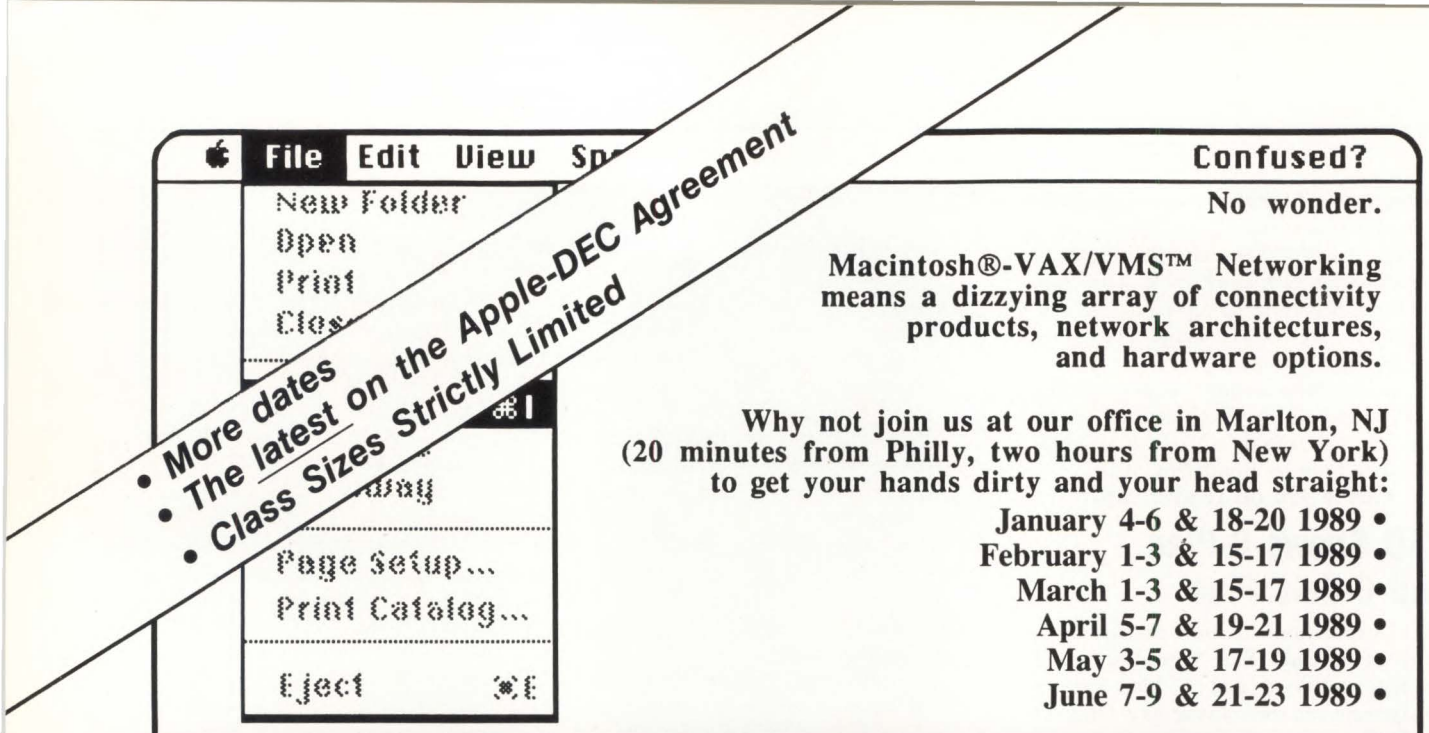
DEXPO South 89 is located only five minutes from the DECUS U.S. Chapter Spring '89 symposium, held May 8 through 12 at the Georgia World Congress Center. Admission to DEXPO is free to anyone attending DECUS. DECUS attendees must bring their DECUS credentials with them to DEXPO in order to qualify for free admission. Free shuttle bus service will run continuously between DEXPO and DECUS during the show.

Professional Press will be exhibiting at Booth No. 623. We hope you join us. To find out more about DEXPO South 89, contact Expoconsul International Inc., 3 Independence Way, Princeton, NJ 08540; (609) 987-9400.

If time permits, a tour of the City of Atlanta and surrounding area is a must. Southern hospitality is part of the charm of visiting local museums and galleries, parks, shops and restaurants.

Atlanta's downtown is ideal because of its accessibility. Points of interest include the Peachtree Center; the Omni Complex; the State Capitol, with its priceless gold dome; surrounding parks; and Georgia State University.

DEXPO South 89, the place to be this spring.



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CIRCLE 106 ON READER CARD

iety of large data acquisition applications requiring high net throughput where the data bandwidth either exceeds or otherwise would be limited by the host computer I/O bus or disk bandwidths. Applications range from vibrational analysis of aircraft parts to shipboard analysis of underwater acoustics. A complete single-crate Tachion-I system includes a CAMAC front end consisting of a modular list-sequencing crate controller, timer-sequencer, FIFO buffer memory, and parallel bus crate controller with Q-bus interface.

To find out more, contact KineticSystems Corp., 11 Maryknoll Dr., Lockport, IL 60441; (815) 838-0005. Visit Booth No. 848.

Circle 492 on reader card

TurboWindows Expands One-Terminal Capability

EEC Systems announced TurboWindows for DEC users who want to expand their one-terminal capability. TurboWindows turns standard VT100/102/220/320 monitors into a multiwindow environment and lets you move between windows with a single keystroke.

TurboWindows is ideal for systems managers monitoring user and system performance; for programmers looking at different files simultaneously; for debugging, compiling and linking; for dual activity, such as printing without locking up the terminal; and for multiple file editing and merge. It's licensed on the basis of the total number of users on the system and is easily installed using VMSINSTAL.

The product is priced from $160 to $200 per terminal. Multiple-license discounts are available.

Find out more by contacting EEC Systems Inc., 327 Boston Post Rd., Sudbury, MA 01776; (508) 443-5106. Stop by Booth No. 543.

Circle 497 on reader card

Summus Adds Eight-Inch Drives

Summus Computer Systems added a line of eight-inch fixed disk drives to its range of high-capacity data storage devices. It will show these drives, which connect directly to DEC system disk controllers, at DEXPO South 89.

Because the SUM-11 drives are plug-compatible at the disk level with RA-series drives, they provide higher-performance replacement or augmentation of system storage. They're fully transparent to DEC hardware and operating system software and are compatible with Q-bus, UNIBUS, VAXBI and HSC controllers. They feature an average seek time of 18 ms and a data transfer rate of 2.4 MB per second. Up to 8 GB of storage are available in one 60-inch cabinet, which also can include four 8mm GigaTape 2.3 drives for unattended backup.

The half-rack SUM-117 drive pricing starts at $18,000; the full-rack SUM-119 pricing starts at $28,800.

For more information, contact Dave Meitzen, Summus Computer Systems, P.O. Box 219270, Houston, TX 77218; (713) 492-6611. Stop by Booth No. 2009.

Circle 493 on reader card

Down To Earth Works As Standalone System

Digital Information Systems Corporation announced a new version of its Down To Earth Accounting System, which now offers 4GL attributes. It features an extensive on-line help system for every field, pop-up windows, pull-down menus, hot keys and user-defined soft keys. Other capabilities include 401(K) and serial number/lot number tracking.

Down To Earth is a comprehensive set of 13 separate modules that work well as a standalone system but that can be incorporated into a vertical application. The source code is available and can be tailored for custom packages easily. It runs on MS-DOS, VMS, UNIX, Xenix, TSX, LANs and other operating systems. The modules include Report Writer, Accounts Payable, Accounts Receivable, General Ledger, Payroll, Inventory, Sales Analysis, Job Cost, Order Entry, Bill of Materials, Item/Resource Scheduling and Purchase Order.

Obtain more details by contacting Beth Callahan, Digital Information Systems Corp., 11070 White Rock Rd., Rancho Cordova, CA 95670; (916) 635-7300. Stop by Booth No. 3210.

Circle 500 on reader card

CI Provides VAX Market Information

Computer Intelligence (CI) announced the availability of detailed information about planned and installed VAX equipment and services at user sites in the U.S. and Canada. This information can be used to analyze the market and is updated monthly.

Detailed VAX information includes installed and planned VAXs, MicroVAXs, VAXstations, operating systems, application and system software. VAX use for commercial or engineering/scientific purposes is monitored and available as part of the service. The database can be accessed by clients via On-Line, in hardcopy reports or machine-readable formats. You can target the information you need to identify buying intentions, determine competitive activities and plan for future products.

To learn more, contact Computer Intelligence, 3344 N. Torrey Pines Ct., La Jolla, CA 92037; (619) 450-1667. Visit Booth No. 131.

Circle 495 on reader card

Spreadsheet Interfaces With ALL-IN-1

Stone Mountain Computing Corporation announced a full interface to ALL-IN-1 for Graphic Outlook release 5.0. Users of ALL-IN-1 can mail spreadsheets, access the Interrupt Menu, Scratchpad and other ALL-IN-1 features and use familiar ALL-IN-1-style menus for worksheet selection and retrieval.

Graphic Outlook fully integrates spreadsheet functions with high-quality graphics, drawing color and monochrome bar, pie line, scatter and high-low plots, as well as 3-D surface plots on most graphic devices. A low-resolution graphics feature draws bar charts and line plots on VT220-type terminals. The program reads and writes Lotus 1-2-3 and Symphony spreadsheet files and includes a Lotus command mode under which the command structure closely parallels that of Lotus 1-2-3. It reads DATATRIEVE databases and many forms of ASCII files.

Two- and six-user licenses are available at a lower cost than the single-CPU, unlimited-use license fee. The product also may be rented.

To obtain more information, contact Bob Else, Stone Mountain Computing Corp., P.O. Box 1369, Goleta, CA 93116; (805) 968-3838. Visit Booth No. 604.

Circle 504 on reader card

Outpost Enhances PostScript Printers

ECAP Systems Inc. announced that it will demonstrate its Outpost product at DEXPO South 89. Outpost is a menu-driven process for use with PostScript printers. It accepts an ASCII file as input and sends it to any defined printer process attached to a PostScript printer.

Saved.

Laserdrive 5¼" Removable 810 MB WORM Cartridges: How they'll change the way you store data.

Save Time.

Just plug and play. The Laserdrive Model 840 looks just like a Winchester to your MicroVAX II host. No overhead. No special utilities. No wasted time. Performance over three times faster than other optical disk sub-systems. Fast access, streaming and data caching. 810 MB formatted cartridges make backup and archiving fast and painless. And no waiting to get them. They're available today!

Save Money.

Half the cost per MB of conventional magnetic tape! And the Model 840's data security and compactness will save you a fortune in data distribution, archiving and use.

Save Peace of Mind.

Data integrity and security that will have you sleeping like a baby. Media life of 10 years for data that can't be written over or erased.

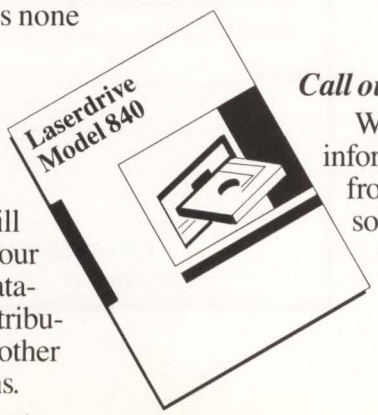
Save On-board Memory.

Unlike other optical disk subsystems, the Model 840 uses none of your host's memory.

Save Critical Data.

No solution even compares. Simple to install and use. Easier and more secure than tape. The Model 840 will change the way you handle your CAD/CAM, engineering, database, archiving, software distribution, financial, imaging and other storage-intensive applications.

The Laserdrive Model 840 Optical Disc WORM Cartridge System.



Call our hotline today!

We'll send you a Model 840 information kit that will save you from outmoded data storage solutions forever!

Call 1-800-952-6300.

Ask for Dept. L53.

LASERDRIVE LIMITED

MicroVAX II is a trademark of Digital Equipment Corporation.

CIRCLE 257 ON READER CARD

By including user-modifiable font and format controls, you can produce typeset-quality output from any application. Outpost prints documents in any of the 35 standard PostScript fonts in any mixture of fonts and sizes. It prints in landscape or portrait on any paper size.
Learn more by contacting Eric Covington, ECAP Systems Inc., 83 Ste. Euphemie, Casselman, ON K0A 1M0; (613) 764-3889. Visit Booth No. 1108.

Circle 501 on reader card

Rapidstore Features Random Access

Alphatronix Inc. introduced a backup utility software package for its Inspire series for VAX workstations. The Inspire system and Rapidstore software combine to make a high-storage rapid backup system based on erasable optical technology.

Rapidstore uses advanced data buffering techniques to run erasable optical drives at peak efficiency. The software features optical random access to stored files. DIRECTORY and COPY commands can be used to locate and recover individual or groups of files. Backups from several days can be stored on one 650-MB optical disk, because each backup is isolated in its own directory tree. The resulting disk can be used with all VMS commands as well as applications software without modification. The Rapidstore backup disk is a normal DEC Files 11B disk.

Rapidstore runs with Inspire systems attached to VAX-based workstations under VMS version 4.4 to 5.0. The software costs $1,900 for Q-bus and $2,900 for UNIBUS. To find out more, contact Patti Sigmon, Alphatronix Inc., 4900 Prospectus Dr., Ste. 1000, Research Triangle Park, NC 27709; (919) 544-0001. Stop by Booth No.2101.

Circle 524 on reader card

Accu-Tech Cable Offers Data Wiring Systems

Accu-Tech Cable Inc. offers modular twisted-pair voice and data wiring systems that allow users to communicate through dissimilar hardware over the same medium. Station moves can be made without rewiring or loss of system manageability. The systems are compatible with DEC, IBM, Wang, AT&T and others.

Accu-Tech also offers electronic wire and cable, data cable assemblies, connectors, patch panels, tacks, wallplates, baluns, adapters and associated hardware.
For more information, contact Accu-Tech Cable Inc., 645 Hembree Pkwy., Roswell, GA 30076; (404) 751-9473. Stop by Booth No. 2624.

Circle 502 on reader card

Accent R Tool Set Manages Data

NIS Inc. will demonstrate its latest release of Accent R 4GL and the Accent R tool set for VAX/VMS systems. The Accent R tool set simplifies the application developer's job and lets novice users visually manage their data. The tools are written in the Accent R structured programming language and generate compiled Accent R programs that can be modified to meet exact requirements.

The tool set consists of Express, a manager's guide for designing databases and managing information; DataPaint II, a screen generator that lets you create windowed screen programs without writing code; Reporter, a report generator that produces complex reports in minutes; and MenuMaker, an applications integrator that automatically creates menus that direct the

execution of applications. Accent R's 4GL is a complete replacement for 3GLs such as COBOL, FORTRAN and C. It provides a 10:1 reduction in the number of lines of code without sacrificing application performance.

Accent R and the Accent R tool set range in price from $4,620 to $227,780, depending on CPU.

For more information, contact Mary von Raesfeld, NIS Inc., 1190 Saratoga Ave., San Jose, CA 95129; (408) 985-7100. Stop by Booth No. 2309.

Circle 505 on reader card

Quickware Triples PDP-11 Throughput

Quickware Engineering & Design Inc. is manufacturing processor upgrade boards that triple the throughput performance of the PDP-11 UNIBUS series computers. These processor upgrades are plug-and-play systems that require no hardware or software changes. They operate with all DEC operating systems and require no patches. They're available with 2 or 4 MB of on-board DRAM ECC memory. PDP-11 users can keep their present peripherals and software while obtaining VAX-type performance.

Prices start at $4,900.

Learn more by contacting George Tetu, Quickware Engineering & Design Inc., 225 Riverview Ave., Waltham, MA 02254; (617) 647-3800. Stop by Booth No. 121.

Circle 503 on reader card

Interlink And IBI Develop Interface

Interlink Computer Sciences and Information Builders Inc. (IBI) announced a worldwide cooperative marketing agreement to facilitate integration of the products of both companies. With Interlink Computer Sciences' assistance, Information Builders has developed an interface called the Focnet/Interlink Interface that enables Focus software to use an Interlink Gateway for connectivity between their VAX and IBM database products over DECnet.

The Focnet/Interlink Interface lets you access data across VAX and IBM systems at high speeds. Focnet provides access to all IBM-resident files and databases from their VAX. You can work with these files as if they were locally available. With the Focnet/Interlink Interface, you can have file transfer speeds of 1 Mbps and support up to 256 simultaneous users. The Interlink 3732 Model 450 gateway can support two channel-attached mainframes.

For additional information, contact George Saupe, Interlink Computer Sciences Inc., 47370 Fremont Blvd., Fremont, CA 94538; (415) 657-9800. Visit Booth No. 824.

Circle 527 on reader card

Software Partners/32 Exhibits VSM

Software Partners/32 Inc. will exhibit the VAX/VMS Virtual Storage Manager (VSM) at DEXPO South 89. VSM manages space on a disk drive so that space on the drive seems virtual. It suspends job processing while it works to offload files from disk to make more space. Based on criteria defined by the system manager, VSM searches for files that can be removed from disk. Directory entries of outswapped files are left on the disk, but their data is transferred to tape, optical disk or other offloading media. After disk space is cleared, job processing continues. Outswapped files and off-line locations show up in standard DIRECTORY commands.

Software Partners also will exhibit

Tapesys version 5.0, the VAX/VMS tape management system; Thruway version 2.2, the VAX/VMS remote device access system; and Jobsys version 2.1, the VAX/VMS distributed job management system.
For more information, contact Software Partners/32 Inc., 447 Old Boston Rd., Topsfield, MA 01983; (508) 887-6409. Visit Booth No. 2105.

Circle 506 on reader card

TSSnet Version 1.3.2 Supports LocalTalk

Alisa Systems Inc. announced that its TSSnet version 1.3.2 implementation of DECnet for the Mac now supports DECnet using LocalTalk cabling. Macs connected directly to LocalTalk can use TSSnet to access DECnet's VMS Mail and Network File Transfer services. Previously, TSSnet required a direct Mac connection to Ethernet and wouldn't function over LocalTalk.

The Kinetics FastPath is now capable of routing DECnet between LocalTalk and Ethernet networks. With TSSnet and a Kinetics FastPath, Mac users can communicate with any DECnet node on either LocalTalk or Ethernet.

Kinetics will offer the DECnet routing software with FastPath at no extra charge. Learn more by contacting Suzanne Young, Alisa Systems Inc., 221 E. Walnut St., Ste. 175, Pasadena, CA 91101; (818) 792-9474. Visit Booth No. 2425.

Circle 508 on reader card

Collier-Jackson Integrates With 20/20

Collier-Jackson will demonstrate the integration of its VAX general-ledger system with Access Technology's 20/20 spreadsheet at DEXPO South 89. The recent development marks the first product integration by companies within CompuServe Inc.'s software products division.

Collier-Jackson develops, installs and supports a growing family of on-line software for the VAX series of minicomputers. Its product line includes financial accounting, human resource management and newspaper management systems for cross-industry business applications. Collier-Jackson is a subsidiary of CompuServe Inc. CompuServe's software products division also includes CompuServe Data Technologies, a 4GL/DBMS developer.
For more information, contact Jim Douglas, Collier-Jackson Inc., 3070 W. Cherry St., Tampa, FL 33607; (813) 872-9990. Visit Booth No. 852.

Circle 511 on reader card

Peritek Supports Multiple Displays

Peritek Corporation announced X Window System software for its VCK high-resolution graphics controller boards. The software, which is the latest X11 release from MIT, supports multiple displays on VAX or MicroVAX computers running ULTRIX version 2.2 or later. Input functions are supported for mouse and keyboard.

The Peritek VCK controller is a single-board product that provides a 1,024- x 1,024- x 8-bit/pixel image. It accelerates graphics operations by means of an on-board graphics controller. A three-board set supports 1,024- x 1,024- x 24-bit true-color applications.

The X Window System software is available for a one-time license fee of $750. To learn more, contact Jill Collins, Peritek Corp., 5550 Redwood Rd., Oakland, CA 94619; (415) 531-6500. Visit Booth No. 610.

Circle 499 on reader card

PV-WAVE Displays 4-D Data

Precision Visuals Inc. will feature a new interactive graphics software package at DEXPO South 89. Precision Visuals' Workstation Analysis and Visualization Environment (PV-WAVE) is an interactive visual analysis system for visualizing, analyzing, exploring and presenting technical data.

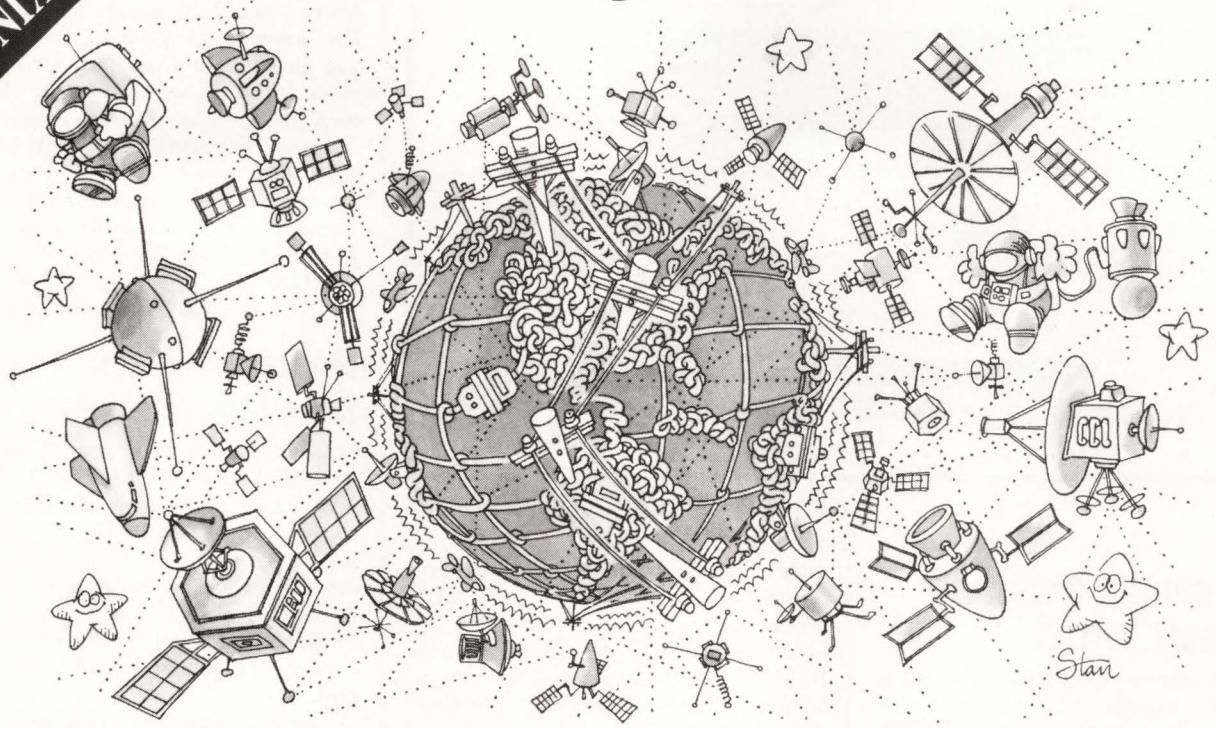
In a single integrated environment, a researcher can navigate through even the largest of datasets, reduce and filter the data into manageable subsets, visually distinguish and analyze key features and trends, and translate results into publication-quality charts, graphs, contour maps, surface plots and images. Users can combine traditional computational analysis and graphics with image-processing techniques to look at their data in a variety of non-traditional ways. PV-WAVE is available on Sun and DEC workstations as well as VAX/VMS minicomputing systems.

Prices start at $3,350 for media and documentation.
For more information, contact David Prawel, Precision Visuals Inc., 6260 Lookout Rd., Boulder, CO 80301; (303) 530-9000. Visit Booth No. 3423.

Circle 521 on reader card

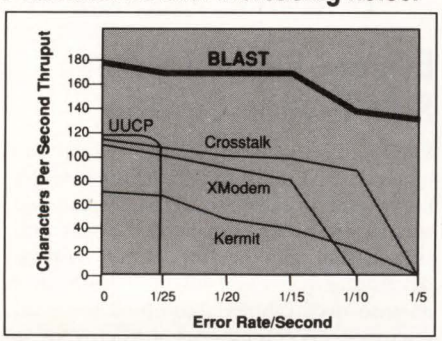
Now available for UNIX/Xenix!

In a Noisy World...



BLAST Communications Software Gets Your Data Through it All!

Performance with increasing noise.



Noise simulation tests run with a 30K binary spreadsheet file at 1200 baud between IBM-PC's, using BLAST II, rev. 8.1. Comparable or better results on Mac, VAX, and others.

In today's world of noisy phone lines, complex switches, and satellite-routed calls, you need rugged communications software to get your data safely through everything, everytime.

BLAST's protected pipelining protocol won't slow to a snail's pace, drop data or disconnect due to noise. Static interference or PBXs — your valuable data quickly BLASTS through it all, saving you time and money, *without any add-on boards or other expensive hardware*. And, BLAST is X.25/DECNET/MNP compatible!

Link VAXs, PCs, MACs, and UNIX/Xenix anywhere

BLAST guarantees fast, 100% error-free file transfer and terminal emulation among VAXs, PCs, MACs, UNIX, Xenix, and others. Unite them all with *one* easy-to-use interface, *one* set of commands, *one* protocol, and *one* scripting language.

Auto-dialing and modem management sequences are built-in so you can easily set up polling, data collection, order entry and other *unattended* communications applications between *hundreds* of remote sites, all at a fraction of what you'd expect to pay. Plus, a "Private Network" feature locks out unauthorized users for data security beyond simple passwords.

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Bankers Trust, Blue Cross, Exxon, Nabisco, and many others have chosen BLAST to cut through the noise. And now, leading communications products vendors specify BLAST, as well. Find out what BLAST can do for you. Give us a call today.

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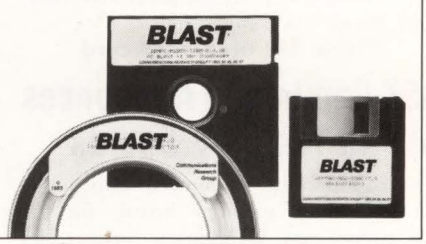
DEC	VAX/VMS; PDP/RSX; RT-11
DATA GENERAL	RDOS; AOS; AOS/VS
WANG	VS
PRIME	PRIMOS
HEWLETT-PACKARD	3000/MPE; 1000/RTE
HARRIS	VOS
TANDEM	LXN
UNISYS	BTOS, CTOS, UNIX
IBM-PC & PS/2	MS-DOS
APPLE	MACINTOSH
UNIX/XENIX	AT&T; Altos; NCR; Sun HP; VAX & mVAX; 386 PCs.

Many others available; please inquire.

Prices start at $250



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CIRCLE 174 ON READER CARD

MDB Systems Inc.'s Data Shuttle 2000-RA.

Data Shuttle 2000-RA Connects To DEC

MDB Systems Inc. announced a new version of the Data Shuttle 2000 for the DEC RA add-on market. The Data Shuttle 2000-RA is a rack-mountable configuration that connects directly to UDA-50, KDA-50, KDB-50 and HSC-50/70 controllers. It's RA compatible and replaces or supplements DEC's RA drives. A single cable connects the Data Shuttle to the DEC controllers. No software modifications or patches are required.

The Data Shuttle 2000-RA features two removable shock-protected disk drives housed in removable canisters. Disks are mounted in the canisters on tuned isolators that attenuate a 100 G shock to less that 20 Gs. Each canister can house an ESDI disk drive with capacities up to 760 MB unformatted and up to 1.5 GB with both drives. An integral controller board matches the characteristics of the SDI interface to ESDI disk drives. The controller board allows for standalone off-line formatting and verification.

The price of the Data Shuttle 2000-RA chassis is targeted at $12,500. Empty disk canisters cost $485.

For more information, contact Amos R.L. Deacon Jr., MDB Systems Inc., 1110 W. Taft Ave., Orange, CA 92665; (714) 998-6900. Visit Booth No. 111.

Circle 518 on reader card

AST Camintonn Announces Add-In Memory Boards

AST Camintonn announced two high-density add-in memory boards for the MicroVAX and VAXstation 3xxx series Q-bus computers.

The CMX-3251, a standard DEC quad-wide module with dualwide daughterboard design, provides 32 MB of 39-bit ECC memory using low-power 1 Megabit ZIP DRAM technology. It plugs directly into the BA213/215 backplane, allowing you to achieve maximum memory capacity in fewer slots. The CMX-3251 emulates two logical 16-MB memory modules. The MicroVAX/VAXstation 3500 and 3600 support up to two CMX-3251 modules, while the MicroVAX 3300 and 3400 support one CMX-3251.

The CMX-2451 is a 24-MB add-in memory board and is compatible with all MicroVAX and VAXstation Q-bus backplanes. For systems that have space limitations for a motherboard/daughterboard combination, this board emulates an 8- and 16-MB board on a single low-profile module.

To obtain more information, contact Sonny Burkett, AST Camintonn, 2121 Alton Ave., Irvine, CA 92714; (714) 553-0247. Stop by Booth No. 2503.

Circle 509 on reader card

Interlan Announces DECnet-DOS Drivers

Interlan Inc. announced two software drivers that allow its datalink controller products to operate with DECnet-DOS. DECnet-DOS permits any PC to be used as a workstation on DECnet and provides network resource sharing by using Digital Network Architecture (DNA) protocols. With the addition of DECnet PCSA/Client software, users are provided with enhanced DOS utilities, access to network services and local or remote printer support.

The drivers operate with Interlan's NI5210 and NI9210 datalink controllers. The NI5210 is designed for the IBM PC XT/AT or compatibles and the NI9210 is for PS/2 Micro Channel PC models. The controllers have interfaces for Ethernet, thin Ethernet and shielded or unshielded twisted-pair media, allowing users to establish DECnet networks using any of these media.

Each version of DECnet-DOS software costs $75.

To find out more, contact Susan Crum, Interlan Inc., 155 Swanson Rd., Boxborough, MA 01719; (508) 263-8655. Visit Booth No. 1120.

Circle 516 on reader card

Mobius Provides Seamless Interface

FEL Computing will display Building Around Mobius at DEXPO South 89. FEL will feature applications that have been constructed with the Mobius PC and VAX Integration System as the communications vehicle. It will show PC/VAX systems built by its customers and used in production situations. The demonstrations will highlight a variety of Mobius PC/VAX integration features.

Mobius is a software concept that provides a seamless interface between PCs and the VAX. It includes terminal emulation, file transfer, printer support, task-to-task communications and a rich set of tools. Mobius operates with Ethernet or ASCII connections.

For additional information, contact Kathryn Merriam, FEL Computing, 10 Main St., Williamsville, VT 05362; (802) 348-7171. Visit Booth No. 2418.

Circle 513 on reader card

Everest Cabinet Offers Side-To-Side Cooling

Everest Electronic Equipment Inc. announced the unshielded model EH9646-JA microsystems cabinet, a DEC-compatible assembly featuring extended side panels with side-to-side cooling for larger systems development. This 60-inch-high and 36-inch-deep cabinet accommodates small microsystems components, a MicroVAX, a BA23 expander, deep disk drives and any other device requiring more than what conventional cooling provides.

Options and accessories include a rear distribution panel for I/O connections, a 24-amp power controller, a side panel kit, a rear door, stabilizers, a rack-mount kit, and more.

Obtain additional information by contacting Barry Holman, Everest Electronic Equipment Inc., 1800-G MacLeod Dr., Lawrenceville, GA 30243; (404) 995-8688. Stop by Booth No. 3226.

Circle 514 on reader card

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CIRCLE 144 ON READER CARD

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Supra V2 Portable Across DEC And IBM

Cincom Systems Inc. announced Supra version 2, which provides a seamless implementation of any organization's information infrastructure. Supra V2 is built on the ANSI/SPARC-recommended Three-Schema Architecture and is portable across IBM, DEC and UNIX platforms. It includes a highly productive implementation of SQL and will serve as the foundation for a Single Systems Image implementation of a fully distributed DBMS. It executes in a client/server distributed environment.

Major components include a distributed relational data manager, dynamic physical data manager, global directory and heterogeneous data management processor. Productivity tools of Supra V2 include Easy, a language-free forms-driven DBMS interface; Spectra, a relational query/report writer; I/SQL, an interactive SQL interface; and a DB2-compatible SQL implementation with ANSI/ISO SQL extensions.

Pricing depends on component configuration, operating system and processor size. Entry-level pricing ranges from $5,000 to $31,000 of VAX/VMS.

For complete details, contact Cincom Systems Inc., 2300 Montana Ave., Cincinnati, OH 45211; (513) 662-2300. Stop by Booth No. 2006.

Circle 510 on reader card

ZSTEM Provides VT240/340 Features

KEA Systems Ltd. announced ZSTEM 240 version 2.1. This package provides total VT240 graphics terminal emulation with VT340 enhancements on the IBM PC and successors. Version 2.1's enhancements include increased VT340 support, an easy-to-use install procedure, VT640 compatibility, enhanced video and network support, a hotkey command and LK250/VAXmate foreign keyboard support.

Mouse and graphics tablet support are the latest additions to ZSTEM 240's list of VT340 features. This support includes multiple input mode, programmable locator device buttons and locator reports. Version 2.1 can display the VT340's full resolution of 800 x 480 pixels on standard VGAs, in addition to many extended adapters. ZSTEM 240 contains all the graphics and text features of the VT240 terminal: double-high/double-wide characters, true smooth scrolling, national/multinational support and downloadable fonts.

The single-package price is $295.

For more details, contact Eric Alexandre, KEA Systems Ltd., 2150 W. Broadway, Ste. 412, Vancouver, BC V6K 4L9; (604) 732-7411. Stop by Booth No. 1112.

Circle 517 on reader card

Demac Enhances Disk-Management Software

Demac Software will exhibit new releases of its entire family of VAX/VMS disk-management software, which includes Squeezpak, Pakmanager and Securepak, at DEXPO South 89.

Squeezpak is an on-line file-compression and optimization utility designed to reduce file and free-space fragmentation and boost system performance. It now features improved defragmenting of files and better file handling.

Pakmanager is a disk manager that iden-

tifies wasted space and the causes of lost performance. It now can analyze any system or node on a DECnet using the Network Access option. This option enables the system manager to centralize disk analysis and reporting.

Securepak is an integrated set of reporting, query and modelling functions that pinpoints weaknesses in a VAX security configuration. It now includes password management and control, improved reporting of network dialups and remote access controls, and improved disk and account auditing.

To obtain additional information, contact Jacques Guerette, Demac Software, 1260 Old Innes Rd., Ottawa, ON K1B 3V3; (800) 267-1590. Visit Booth No. 1107.

Circle 526 on reader card

Clustor 1 And 2 Connect VAXs

System Industries announced two low-cost, entry-level shared storage subsystems for VAX and MicroVAX systems. Providing direct connection to MicroVAXs and VAXs, the Clustor 1 and Clustor 2 subsystems offer good price/performance.

Clustor 1 and Clustor 2 can connect up to four VAX or MicroVAX CPUs and up to four disk drives. Unlike network-only clustering products, Clustor series subsystems offer a high-speed 2.5-MB-per-second disk-to-bus transfer rate for all drives and CPUs on the system. A Clustor 1 or Clustor 2 configuration with four SI93 disk drives with a formatted capacity of 906 MB each would deliver a shared storage subsystem with 3.6 GB on-line storage. For I/O-intensive applications involving large numbers of data retrieval operations, Clustor 2 adds System Industries' proprietary Disk Cache Processor and Performance Monitoring Unit.

Prices for complete Clustor 1 configurations including the controller, disk drives, cabling cabinet, installation and one-year warranty start at $35,000. Clustor 2 configurations start at $50,000.

Learn more by contacting Brian Edwards, System Industries, 560 Cottonwood Dr., Milpitas, CA 95035; (408) 432-1212. Stop by Booth No. 631.

Circle 414 on reader card

Target->Batch Offers Multiple Schedule Types

Target Systems Corporation announced version 3.0 of Target->Batch, its job-scheduling software for VAX/VMS systems. Version 3.0 adds many features for increased power. Schedules-at-a-Glance now includes a zoom mode that allows authorized users to view

System Industries' Clustor 1 entry-level storage system.

the individual schedules of all jobs within a selected time increment and plan a batch queue and CPU use accordingly.

Version 3.0 also adds these features: on-hold job submission for operator release; a selection of multiple schedule types, including monthly, weekly, daily and hourly; job restart capability; and VMS mail notification of job status. Additional new features include audit-tracking of job performance statistics and on-line process and queue display for both local and remote nodes. Target->Batch features full task-to-task DECnet support, including VAXcluster and LAVc, for fast, efficient and secure network use with multiple VAXs.

Target->Batch costs from $1,495 to $27,995 per CPU.

For complete details, contact Kate Brady, Target Systems Inc., 33 Boston Post Rd. W., Marlboro, MA 01752; (508) 460-9206. Visit Booth No. 3016.

Circle 522 on reader card

Vitalink Announces TransLAN 320

Vitalink Communications Corporation announced TransLAN 320, a new member of its TransLAN family of remote bridges. Like its higher-speed counterparts, TransLAN III and TransLAN 350, TransLAN 320 remotely connects Ethernet or 802.3 LANs using standard data-communications lines. TransLAN 320 supports one or two remote links at speeds of up to 64 Kpbs in single, parallel or full-mesh link configurations.

Using TransLAN 320, Vitalink customers can expand their networks to include sites that until now were considered too small to justify the purchase of a TransLAN. TransLAN 320 economically extends the features and routing capability of the larger-capacity bridges to these sites. Up to eight TransLAN 320s can be linked remotely to the larger TransLAN III or TransLAN 350. TransLAN 320 is fully compatible with Vitalink's other TransLAN products and the 802 WANmanager.

The product costs $9,750, including software.

For complete details, contact Randy Fardal, Vitalink Communications Corp., 6607 Kaiser Dr., Fremont, CA 94555; (415) 795-6178. Stop by Booth No. 939.

Circle 530 on reader card

SmartStar 4GL Adds CASE Capabilities

Signal Technology announced that an application development environment for DEC systems can be teamed with Excelerator, from Index Technology. The teaming of these software products automates the entire software-development lifecycle, from initial prototype to production application. The products will be demonstrated at DEXPO South 89.

The key to pairing these products is CDD/Plus, which provides the bridge for import and export of data to and from Smartstar and Excelerator file structures. VAX CDD/Plus is the linchpin for many other VMS information-management products as well, including the VAX Rdb/VMS RDBMS. With VAXlink in place, data also can be accessed from an IBM mainframe. Because both companies participate in DEC's CMP, you're ensured of a 4GL/CASE solution that's certified by DEC.

Find out more by contacting David W. Baum, Signal Technology Inc., 5951 Encina Rd., Goleta, CA 93117; (805) 683-3771. Stop by Booth No. 547.

Circle 547 on reader card

Gold Key Provides LN03 Internal Fonts

Gold Key Electronics Inc. announced an HP LaserJet-compatible font cartridge. The Gold Key Font Cartridge can be plugged into any of the LaserJet series of printers and provides the full set of LN03 internal fonts: Courier, Prestige Elite and Letter Gothic. With the cartridge, you can get the complete DEC multinational, technical and VT100 linedraw character sets just as they appear on the screen of your DEC terminal.

The cartridge is designed for use with the Switchmate Intelligent Printer Switch LN03 emulation. Together, the Switchmate and the cartridge produce total compatibility between LaserJet and DEC software applications such as WPS-Plus, ALL-IN-1 and

DECmate. With the cartridge plugged into the standard font cartridge slot in your printer, the Switchmate's LN03 emulation provides full support for legal applications in portrait and landscape and gives you the complete Roman-8 character set in Courier and Prestige Elite.

The Gold Key Font Cartridge costs $299.

More information is available by contacting Deirdre B. Branch, Gold Key Electronics Inc., P.O. Box 186, Goffstown, NH 03045; (603) 625-8518. Visit Booth No. 2616.

Circle 496 on reader card

Emulex Subsystems For MicroVAX 3500/3600

Emulex Corporation announced disk and tape subsystems for the MicroVAX 3500/3600. The QD3400850 and QD3401230 SMD/E disk storage subsystem offer configurations with one to four drives. Formatted storage capacities range from 741 MB for a single-drive subsystem to more than 4 GB for a four-drive subsystem.

The removable subsystem with the QD24 ESDI disk controller is based on the same 5¼-inch drive technology that Emulex offers in its other Q-bus and UNIBUS removable subsystems. The ER2E-III subsystems contain one or two Portable Drive Modules (PDMs) with a choice of 160, 338 or 663 MB of formatted storage capacity per PDM. The EMS-III kit is an internal storage subsystem that's physically mounted in the BA213 enclosure. Like the removable subsystems, the EMS-III is offered in one- and two-drive models, with a choice of three drives. Formatted capacities range from 160 MB to more than 1.3 GB.

For complete details, contact Katrina Adney-Leslie, Emulex Corp., 3545 Harbor Blvd., Costa Mesa, CA 92626; (714) 662-5600. Visit Booth No. 613.

Circle 405 on reader card

Information Builders Enhances Level5/VAX

Information Builders Inc. announced Level5/VAX release 1.7. This application-development tool supports the full line of VAX/VMS systems. In addition to the existing Level5 Read/Write Interfaces to Focus, RS1 and RMS files, release 1.7 adds an optional Read/Write Interface to Rdb, giving users direct access to DEC's relational database.

Level5/VAX features an advanced system for direct database access. It offers VAX users time and interval processing facilities that make the software ideal for real-time process monitoring and control applications in industrial and scientific sites. The Production Rule Language allows developers to express knowledge in simple English phrases. Problem-solving logic consists of a series of IF/THEN/ELSE statements.

One-time license fees for Level5/VAX release 1.7 range from $1,200 on a VAXstation and $3,200 on a MicroVAX 2000 to $58,400 on a VAX 8978.

More information can be obtained by contacting Kendra R. Bonnett, Information Builders Inc., 1250 Broadway, New York, NY 10001; (212) 736-4433. Stop by Booth No. 305.

Circle 550 on reader card

Raxco Adds System Software Products

Raxco Inc. added three products to its VAX/VMS system software offerings: Rabbit-4 Disk Management System, Rabbit-10 Datarchiver and Rabbit-11 Virtual Disk/Caching System.

Rabbit-4 provides information the system manager needs to manage disks. It's valuable to sites with one disk or an entire disk farm. Rabbit-10 is designed to put you — whether you're a system manager, applications programmer or general user — in control of files on disk. It features an easy-to-use interface and the ability to archive files in groups to make retrieving files for a related project simple. Rabbit-11 allows users to create virtual disks and implement advanced caching facilities. Together, these features minimize I/O to disk, reducing system response time.

For more information, contact Denise Hudson, Raxco Inc., 2440 Research Blvd., Rockville, MD 20850; (301) 258-2620. Visit Booth No. 2208.

Circle 546 on reader card

Trimm DA 5 Allows Flexibility

Trimm Industries announced the DA 5, a 5¼-inch peripheral enclosure for mounting a full- or half-height peripheral. Two mounting locations allow peripherals to be front-mounted for media access or to be embedded behind the front bezel. The bezel provides a recessed ID area for OEM logo and removable cover panels that allow half- or full-height peripheral access.

The DA 5 is available with either ST506/ESDI or SCSI/IPI I/O configurations that allow the integrator maximum configuration flexibility. A fully regulated 50-watt continuous power supply and low-noise dc cooling fan are provided, along with a low-noise filter with two-pole protection, an on/off switch, a voltage selecter and an IEC connector. Options for the DA 5 include a complete shock-mount kit for full-height peripherals and a resistor harness assembly for use with peripherals requiring less than 1 amp at +5V. Styled after the VAXstation 2000, the DA 5 is a solution for single-driven peripheral expansion. It carries full agency approval to UL 478, CSA and TUV.

Find out more by contacting Erika Zemby, Trimm Industries, 11949 Sherman Rd., N. Hollywood, CA 91605; (818) 983-1833. Visit Booth No. 233.

Circle 494 on reader card

Simpact Announces Marketing Agreement

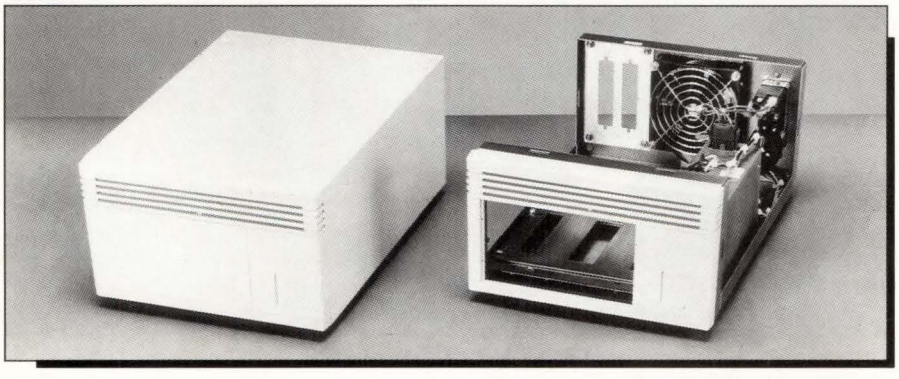
Simpact Associates Inc. and Systems Strategies Inc. announced a marketing and distribution agreement whereby the companies will provide a complete set of turnkey solutions for connecting VAX systems to IBM mainframes and midrange systems.

The products include ULTRIX and VMS versions of SNA 3270, SNA Remote Job Entry (RJE), and SNA 3270 Application Program Interface (API). The SNA 3270 interface connects VAX systems to IBM mainframes and midrange systems over SNA by emulating an IBM 3270 cluster controller with attached devices. The SNA RJE interface emulates IBM 3770 RJE workstation, enabling VAX systems and IBM mainframes to transfer files. The SNA 3270 API allows system developers and OEMs to build interactive VAX applications that automatically communicate with IBM mainframes over SNA.

Pricing for the software and intelligent communications processor ranges from $8,975 to $23,000, depending on VAX system configuration.

Learn more by contacting Steve L. Adams, Simpact Associates Inc., 9210 Sky Park Ct., San Diego, CA 92123; (619) 565-1865. Stop by Booth No. 1127.

Circle 528 on reader card



Trimm Industries' DA 5 peripheral enclosure.

Mac220 Provides VT220 Features

White Pine Software announced the Mac220, a VT220 text terminal emulator for the Mac. Mac220 provides complete VT220 features implemented using standard Mac interface guidelines. It supports the Apple Extended Keyboard, giving you complete access to VT220-style function keys and keypad.

Mac220 includes special text-handling features, such as text selection, cut and paste, and support for DEC's international character sets and Dynamically Redefinable Character Sets (DRCS). Mac220 has enhanced laserwriter printer support, such as auto print mode and printer controller mode. It features a review buffer that allows you to scroll back through text that has scrolled off the screen. The product supports large monitors to allows exact emulation of the VT220 screen, 132-column mode and the ability to increase the vertical window size to more than 24 lines.

More information can be obtained by contacting Scott Darling, White Pine Software, 94 Rt. 101A, P.O. Box 1108, Amherst, NH 03031; (603) 886-9050. Visit Booth No. 2117.

Circle 531 on reader card

Mitek Systems Contracts Harris

Mitek Systems Corporation announced that Harris Customer Support Division has been contracted to provide national service and support for Mitek's family of networking products. Mitek products offer balanced solutions for connecting and operating multivendor LANs and WANs and include IBM/SNA-to-Ethernet connectivity solutions. Mitek's M2030 and M2130 network servers permit user access to existing programs and applications in both SNA and Ethernet environments.

Support from Harris begins when you place a toll-free call to a Harris network specialist dedicated to network support. The specialist accesses a problem-analysis system that uses a Harris-developed AI engine to assist in remote diagnosis of network problems. If you require on-site assistance, the specialist contacts the 24-hour Harris Customer Support Control Center, which dispatches an FE from one of the 160 U.S. service centers. Mitek is an IBM Business Partner and will exhibit in the IBM booth at DEXPO South 89.

Obtain more information by contacting Catherine Milburn, Mitek Systems Corp., 2033 Chennault, Ste. 100, Carrollton, TX 75006. Stop by Booth No. 501.

Circle 545 on reader card

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CIRCLE 183 ON READER CARD

Cognos Teams With Access Technology

Access Technology Inc. and Cognos Inc. announced the 20/20 Database Connection for PowerHouse, Cognos' 4GL application development language. Both companies will sell the 20/20 Database Connection, provide product support services and work closely in the development of marketing programs.

The 20/20 Database Connection is an extension to 20/20, an integrated spreadsheet software package for multiuser computers. Providing a seamless bridge between 20/20 and PowerHouse, it was designed to give spreadsheet users a quick, easy way to retrieve information directly from a PowerHouse application into a 20/20 spreadsheet for reporting and analysis. English menus and prompts guide users through each step of building a query. After each query is completed, the database information is placed directly into the spreadsheet, which in turn is formatted automatically for the appropriate data type. The initial release is for the VAX computing community.

The 20/20 Database Connection for PowerHouse is available from both companies at prices ranging from $800 for the MicroVAX 2000 to $17,000 for the VAX 8978.

To find out more, contact Geoff Spillane, Access Technology Inc., Two Natick Executive Park, Natick, MA 01760; (508) 655-9191. Stop by Booth No. 740.

Circle 523 on reader card

Touch Technologies Lowers Prices

Touch Technologies Inc. announced special pricing for its Dynamic Load Balancer for DEC's smallest VAXs. Dynamic Load Balancer is a system-software performance solution that uses a Touch Technologies algorithm to tune VAX systems dynamically by altering both SYSGEN dynamic parameters and process-specific resource allocations.

Dynamic Load Balancer runs on any VAX/VMS system regardless of size or configuration, including Intergraph systems. Memory-limited, CPU-bound and I/O-bound systems will benefit from Dynamic Load Balancer. It does its best work on VAX systems that are experiencing memory saturation or page faulting or are out of CPU cycles. Within 20 minutes of installation, a VAX system will experience better interactive response, faster image activations, fewer hard page faults and the ability to accommodate increased numbers of interactive users.

VAXstation 2000 and 3100 users can license Dynamic Load Balancer at $895 for a primary license and $595 for all secondary licenses.

Complete details can be obtained by contacting Touch Technologies Inc., 9990 Mesa Rim Rd., Ste. 220, San Diego, CA 92121. Stop by Booth No. 1134.

Circle 548 on reader card

Mass-11 Fax Processor Provides High Resolution

Microsystems Engineering Corporation introduced Mass-11 Fax Processor, software that lets you send faxs from your VAX terminal to any fax machine in the world. The Fax Processor works in tandem with Biscom Inc.'s Faxcomm 1000 Plus, a hardware unit that attaches to the VAX. Microsystems' software enhances the functionality of the hardware by providing a menu-driven interface within Mass-11 that lets users queue faxs and specify delayed delivery to take advantage of off-peak phone rates. It also provides accounting information for internal departmental charges.

Using Mass-11 Fax Processor, documents can be transmitted 40 percent faster than traditional methods. Because there's no scanning involved, the resolution is 200 percent better, allowing graphics to be faxed with high quality.

The product ranges from $995 for the MicroVAX II to $2,875 for the 8800 series. Learn more by contacting Microsystems Engineering Corp., 2400 W. Hassell Rd., Ste. 400, Hoffman Estates, IL 60195; (312) 882-0111. Stop by Booth No. 3310.

Circle 519 on reader card

Informix Connects DBMS DOS To UNIX

Informix Software Inc. announced that applications developed with Informix-4GL and Informix-SQL now can run across networks of PCs and UNIX-based machines. Informix-NET PC is the network that allows the Informix user interface on PCs to communicate with UNIX database servers across TCP/IP networks.

Informix's two-process architecture is ideal for networks of heterogeneous machines. The front-end application process, handled by the PC, is used to develop and run database reports, forms or queries. The database engine on the UNIX server handles all reads and updates to the database. This two-process architecture on the network improves database performance by retrieving only the data requested, making queries faster and allowing more users to access the data. Users must use TCP/IP protocols provided by Sun Microsystems' PC-NFS over Ethernet or RS-232C lines.

Informix-NET PC is priced at $195 per DOS PC.

Find out more by contacting Kay Feallock, Informix Software Inc., 4100 Bohannon Dr., Menlo Park, CA 94025; (415) 322-4100. Visit Booth No. 2209.

Circle 515 on reader card

V-Server Products Improve Throughput

Virtual Microsystems Inc. announced the addition of two 80386-based systems to its V-Server family. The V-Server386 and V-Server386/Plus feature an Intel 80386 host processor that provides higher performance, improved system throughput and improved control of traffic over DECnet.

Virtual's V-Server family is based on a standalone hardware and software platform containing two to eight independent, 286-based board-level PCs. The baseline V-Server supports off-the-shelf MS-DOS-based PC applications. The V-Server/Plus features a configurable backplane that allows VAX users to run standard PC applications and those that require add-in boards, such as data communications, fascimile, terminal emulation and CD-ROM disk address.

V-Server386 and V-Server386/Plus systems are available in four-user configurations and are priced at $15,500 and $17,500, respectively.

To find out more, contact Wendy Ledamun, Virtual Microsystems Inc., 1825 S. Grant St., Ste. 700, San Mateo, CA 94402; (415) 573-9596. Visit Booth No. 729.

Circle 529 on reader card

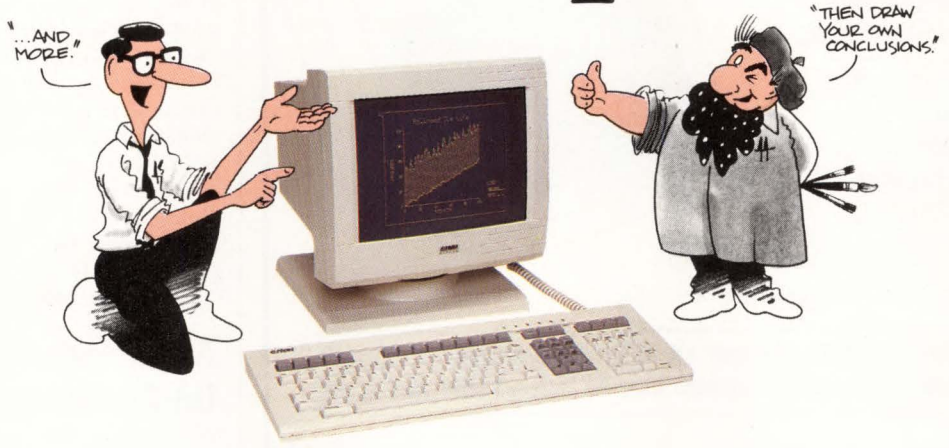
Z-Line Provides Power Conditioning

Pulizzi Engineering Inc. announced the Z-line power distribution and control systems. The TPC 115-10/MTD system provides power conditioning and control as well as cost savings.

The multiple time-delay powerup capabilities provide controlled power to the computer system to prevent high-inrush current problems. This can cut down on startup current so that a single-phase system can be used instead of a three-phase unit. A breaker closer to the operating current of the system can be used instead of a larger breaker to handle the startup current.

Other features of the Z-line TPC 115-10/MTD are EMI/RFI filtering, spike/surge protection, remote control and emergency shutdown. The time-delayed remote, which activates four seconds after the switched one and two sections sequence up, will power up the next Z-Line system down

"Picture DEC graphics for $1300 less than DEC prices."



If it weren't so darned expensive, the DEC® VT330 would be a nice graphics terminal. And if it only did graphics, the DEC VT320 would have a nice price.

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Competent, compatible, affordable.

At $699, the CIT328 is compatible both with your budget and with the DEC VT320, VT220, VT100, VT52 and Tektronix® 4010/4014 software. It's also compatible with the DEC Office Connect® interface standard and the VT131's local block editing mode.

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Feature	VT320	CIT328	VT330
Tektronix Graphics	No	Yes	Yes
Sixel Graphics Hard Copy	No	Yes	Yes
ReGIS Graphics	No	No	Yes
Block Transmission Mode	No	Yes	Yes
Dual Host/Dual Sessions	No	No	Yes
Display Refresh Rate	60 Hz	70 Hz	60 Hz
Text Pages of Memory	1	4	6
DEC Office Connect	Yes	Yes	Yes
RS423/RS232	Opt	Yes	Yes
Desk Top Accessories	No	Yes	No
Tilt and Swivel	Opt	Yes	Yes
Price	$545	$699	$1995

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Circle 498 on reader card

CompuServe Upgrades System 1032/AF

CompuServe Data Technologies announced System 1032/Application Facility (AF) version 1.5. System 1032/AF is a menu-driven, screen-based facility that automates application programming and maintenance. The facility generates System 1032 4GL code for complete screen-based database applications from design specifications.

The upgrade increases the sophistication of generated applications while making application development easier. New features include enhanced field validation, variable-length text and a screen painter. Immediate field validation provides additional capabilities. Applications can include lookups that validate newly entered field data against existing data in another dataset.

System 1032/AF is an add-on module to System 1032 4GL/DBMS. Prices range from $600 for a VAXstation 2000 to $36,000 for a VAX 8840.

To find out more, contact Leslie Scott, CompuServe Data Technologies, 1000 Massachusetts Ave., Cambridge, MA 02138; (617) 661-9440. Stop by Booth No. 431.

Circle 549 on reader card

Arrow Has CDC On-Site Warranty Service

Control Data Corporation and Arrow Electronics Inc. announced a service program that allows Arrow to offer Control Data's on-site warranty service for its DEC-compatible subsystems.

In the 1-2-3 program, you select the type and quantity of Control Data disk products and Dilog Q-bus or UNIBUS controllers. Arrow configures the system according to the needs of the site. Control Data installs the system and provides on-site warranty service for one year. Following the terms of the on-site warranty service, you can elect to continue maintenance services with Control Data.

Arrow's disk/tape subsystem offerings include add-in 5¼-inch kits of up to 766 MB, tower configurations of up to 4 GB and 5¼-inch removable subsystem of up to 1.2 GB.

For additional information, contact Pat Williams, Control Data Corp., 8100 34th Ave. S., Minneapolis, MN 55425; (612) 851-4131. Visit Booth No. 223.

Circle 402 on reader card

Standard Memories Announces Pincomm 3000S

Standard Memories, a unit of WesPac Technologies Corporation, announced an add-in memory board. The Pincomm 3000S is a 16-MB memory board completely form, fit and functionally compatible with MicroVAX/3000 series and MicroVAX/3000-series-based workstations.

Based on 1-MB DRAM technology, the Pincomm 3000S is available in both 8- and 16-MB versions. The 8-MB version is upgradeable to 16 MB. The Pincomm 3000S is equivalent to the MS650BA memory board and can be used with DEC boards already present in the system. Each memory data word stored by the product is 39 bits wide, consisting of 32 data bits and seven ECC bits.

The Pincomm 3000S carries a lifetime warranty and is backed by a 24-hour replacement program.

For more details, contact Standard Memories, a unit of WesPac Technologies Corp., 9 Whatney, Irvine, CA 92718; (714) 583-7500. Stop by Booth No. 723.

Circle 438 on reader card

PowerHouse Supports VAX/VMS V5.0

Cognos Inc. announced a new version of its PowerHouse application-development and data-management system and a series of related products for VAX computers. PowerHouse version 5.12 supports VAX/VMS version 5.0 and Rdb/VMS version 3.0.

In addition, PowerHouse V5.12 supports other products, including PowerHouse Architect, a prototype-generating product with automatic documentation capabilities; PowerHouse PC, a PC version of PowerHouse that supports several LAN protocols and host connections to VMS; PowerHouse StarBase, an RDBMS; and 20/20, an integrated spreadsheet program from Access Technology Inc., as well as the 20/20 Database Connection.

PowerHouse V5.12 is priced from $5,000 to $200,000, depending on hardware configuration.

For complete details, contact Wendy Rajala, Cognos Inc., 3755 Riverside Dr., Ottawa, Ontario, Canada K1G 3Z4; (613) 738-1338. Stop by Booth No. 732.

Circle 423 on reader card

Odesta's GeoQuery Supports CL/1

Odesta Corporation announced support for Network Innovations' CL/1 connectivity platform. GeoQuery is a business-mapping software package. Using interactive maps, Mac users can view, manipulate and analyze their business data in a geographic context. By providing its own built-in geographics knowledge, GeoQuery automatically creates smart maps that accurately classify and pinpoint the location of real-world data.

By supporting CL/1, GeoQuery gives you transparent access to SQL-based relational databases on VAXs such as VAX/Rdb, Sybase, Ingres, Informix and Oracle. GeoQuery also can access and manipulate data from database and spreadsheet software such as Odesta's Double Helix II and Microsoft's Excel. CL/1 is a standard, SQL-based connectivity language that provides transparent access to host-based data from within PC applications.

For more details, contact Michael Demeyer, Odesta Corp., 4084 Commercial Ave., Northbrook, IL 60062; (312) 498-5615. Stop by Booth No. 2303.

Circle 479 on reader card

Burcom And EasyEntry Show At DEXPO

Applied Information Systems Inc. will display the Burcom Digital/Unisys communications system and the EasyEntry data entry applications generator at DEXPO South 89.

Burcom release 3.0 provides an enhanced network gateway between VAX/VMS or PDP-11/RSX systems and Unisys mainframes. Burcom software provides file transfer, program-to-program communications, print spooling, and emulation of Unisys MT983, TD830 and ET1100 terminals using standard DEC terminals. It fully supports VMS V5.0 SMP and DECnet environments.

EasyEntry is a data entry applications generator for the VAX, PDP-11, Professional, Rainbow and IBM PC. It supports heavy data validation, rekey verification, file searches, math computations, windowing and color. You can store data in indexed or sequential files, perform keyed or non-keyed searches, call records to the screen, and modify or reverify data.

For more information, contact Applied Information Systems Inc., 500 Eastowne Dr., Ste. 207, Chapel Hill, NC 27514; (800) 334-5510. Visit Booth No. 602.

Circle 404 on reader card

SAS/Access Links SAS System To Oracle

SAS Institute Inc. announced the SAS/Access Interface to Oracle, which links the SAS System with Oracle Corporation's Oracle database. The interface allows users of the SAS System under VMS to take advantage of the relational database features of Oracle and the analysis and presentation features of the SAS System.

The interface lets you extract data from an Oracle database and put it into an SAS data set. It runs in interactive or batch mode under version 5.18 of the SAS System under VMS. The software is a modular component of the SAS System, an integrated system for data management, analysis and presentation. The SAS System features include data entry, retrieval and management; report writing and graphics; statistical and mathematical design and analysis; business planning, forecasting and decision support; project management and operations research; and applications development.

SAS software is licensed on an annual basis with fees based on machine classification. The first-year license fee for the SAS/Access Interface to Oracle ranges from $1,725 to $6,100.

Learn more by contacting Mike Truell, SAS Institute Inc., SAS Circle, Box 8000, Cary, NC 27512; (919) 467-8000. Stop by Booth No. 213.

Circle 435 on reader card

Texas Instruments Doubles Speeds

Texas Instruments Inc. announced the availability of the Motorola 68030 32-bit symmetric processor on its 1500 computers. The 68030 processor operates at twice the speed of the 68020 chip used in other 1500 models.

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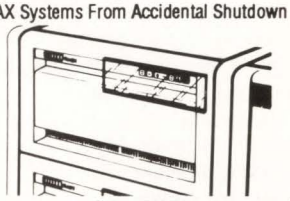

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BACK END

John C. Dvorak

Trend Analysis — A Waste Of Time

Incident #1: As I looked at the PC running in the vendor booth, I saw the distinctive UNIX prompt.

"Are you running UNIX?"

"No, DOS!" said a voice.

"Oh, you have a UNIX nerd in the company who feels obliged to change the DOS prompt to a UNIX prompt, right?"

"Right!"

Incident #2: As I listened to my *Billy Joel's Greatest Hits* compact disk, I suddenly realized how old-fashioned and dated his music sounds. The Beatles sound dated too. The Rolling Stones, meanwhile, still sound good.

Incident #3: As I played with a new piece of software, I instinctively went to the WordStar control-key diamond to backspace and erase a character. Nothing happened.

It was actually the Billy Joel stuff that led me to the point of this column.

Simply put, conventions, trends and even standards stem from leadership. Leadership stems from activity. After the progenitor of a trend abrogates the responsibility of maintaining the trend, the trend goes off in a new direction unless taken over by a protégé and further maintained.

I'll now try to explain what this has to do with computers. I conclude that the old music that we can endure and find pleasant is music whose direction (trend if you will) still has ties to the present. This usually means that the artist who produced the old stuff is still influential in the music industry. The old Beatles music sounded fine as long as Paul McCartney kept the sound alive. He stopped in his tracks, and suddenly it doesn't sound good anymore.

When was the last time Billy Joel had a hit? Listen to his old stuff, and it's hard to take. Meanwhile, Mick Jagger has remained an influence, so it's no coincidence that the old Rolling Stones music still sounds good. It has a direct link to the present.

Technology and its trends aren't much different from those of pop culture. Trend maintenance is the key. UNIX continues to hang in there, because the die-hard UNIX and C hacks have stuck with it. With protégés such as Bill Joy at Sun and the Mach people at Carnegie-Mellon, it won't disappear. As old and decrepit as UNIX seems to be, it's still talked about more than any other subject in the computer business.

Meanwhile, the WordStar diamond is going the way of the dinosaur. The originators of the concept have long since disappeared from the scene and abandoned the trend toward its use.

In some ways, I'm arguing that you never should take a vacation, that all progress is based on trends and, if you're influential, then you constantly must maintain and promote the influence. This is what happened with UNIX, and why its day still may come. The boosters still are boosting.

The importance of this concept has little to do with UNIX, however. It has to do with the entire computer scene and its basic ethereal quality. If you accept my premise and use it to understand the way trends fluctuate, then you must admit that trends can be controlled and understood.

It's like the phenomenon that we've all experienced concerning clubs or even newsletters. Usually, it's one person who's the gung-ho go-getter running things in a successful club. After he quits, the club languishes or dies.

This also happens in business. My favorite example is the little newsletter that's a blockbuster when one person is publishing it. When that person leaves or turns it over to someone else, it goes downhill. Only if the new person is a rah-rah protégé will the institution improve or even maintain its old flair.

Trends, like a club, business or newsletter, are an institution. This means that the person responsible for the trend in the first place must maintain the trend if it's to continue. Conversely, if there's a trend, then there's someone behind it, and it's usually one person. Therefore, we can determine that the viability of the trend is related directly to the viability of the trend inventor and/or the person responsible for trend maintenance. It boils down to the fact that trends are so closely linked to people that we can forget about the trend and just follow the people.

This tells me that since the unfortunate exit and death of Don Estridge at IBM, one-time director of Entry Systems, the IBM PC trend is dead. Only momentum is keeping it alive. This also tells me that since the departure of Mitch Kapor of Lotus, the company no longer will set the agenda for desktop computing.

Because old personalities are still in place, we can expect that DEC will continue to dominate the minicomputer market and that Sun will continue to dominate the workstation market. Undoubtedly, Bill Gates at Microsoft will dominate the world of software.

The most important things to know about the computer industry are the personalities and influencers in the business. Trends mean nothing. Just ask Billy Joel. ■

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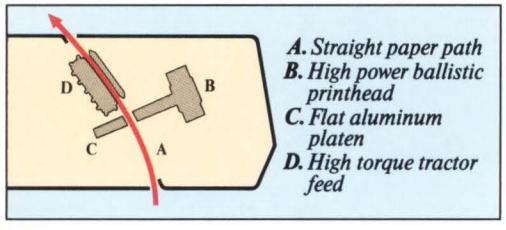

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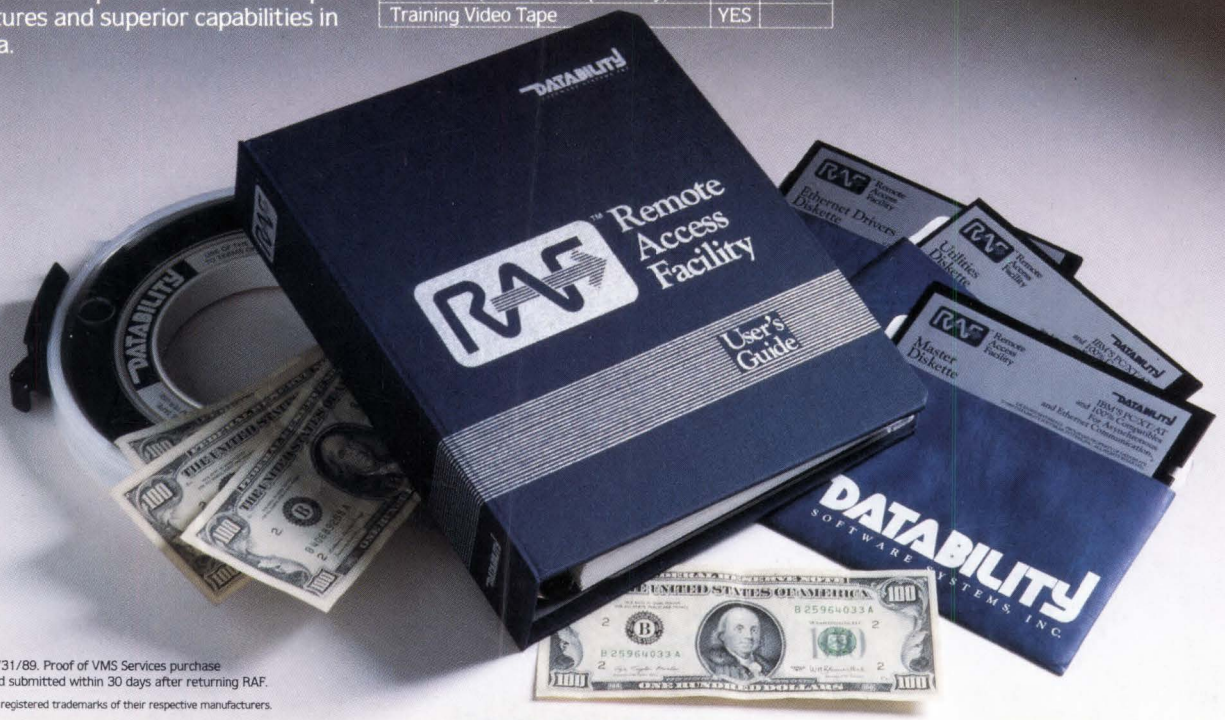

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