DECWATCH

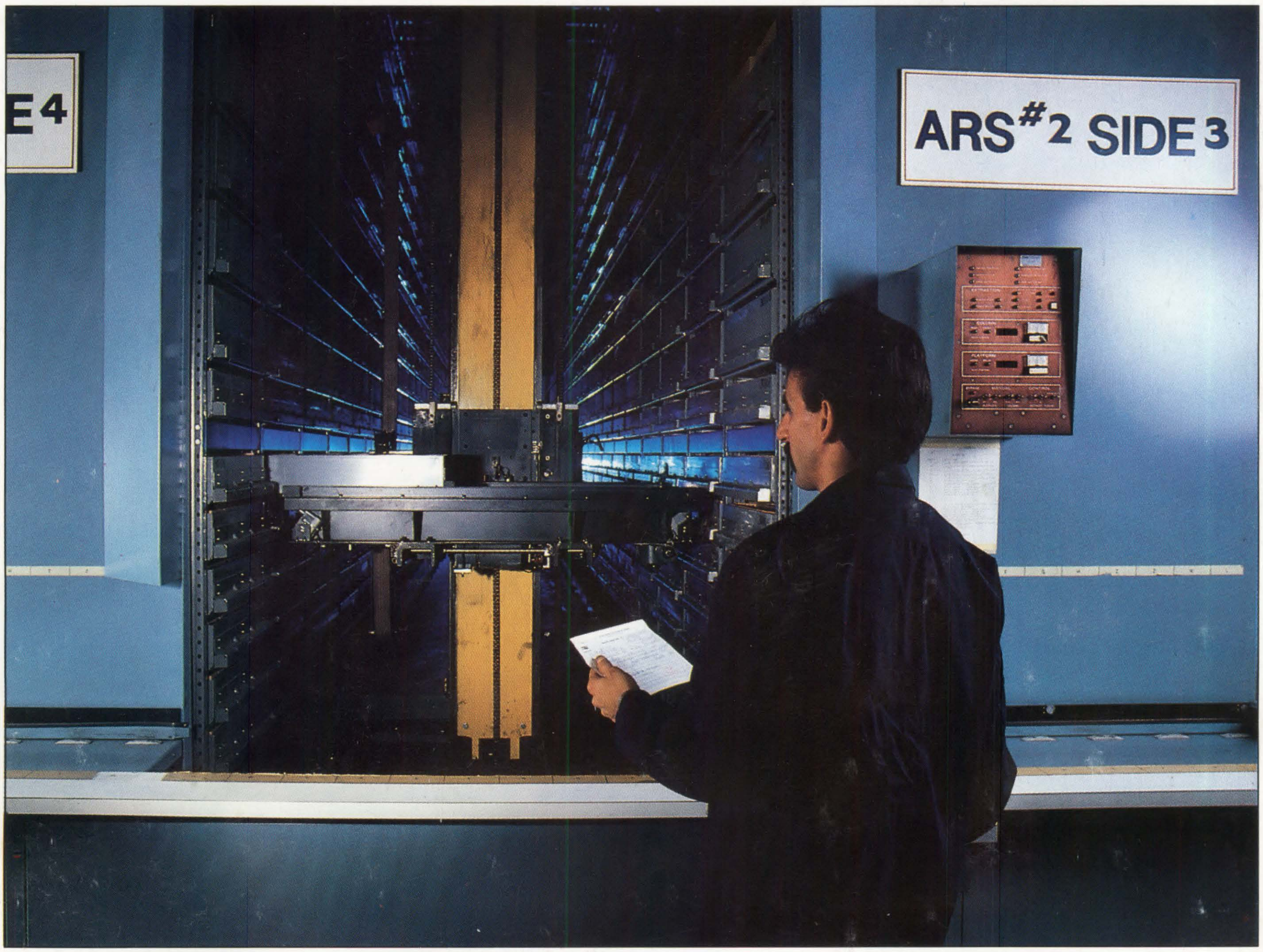
VAX 8800

MAY ▪ 1988 VOL. 7, NO. 5 ▪ $4.00

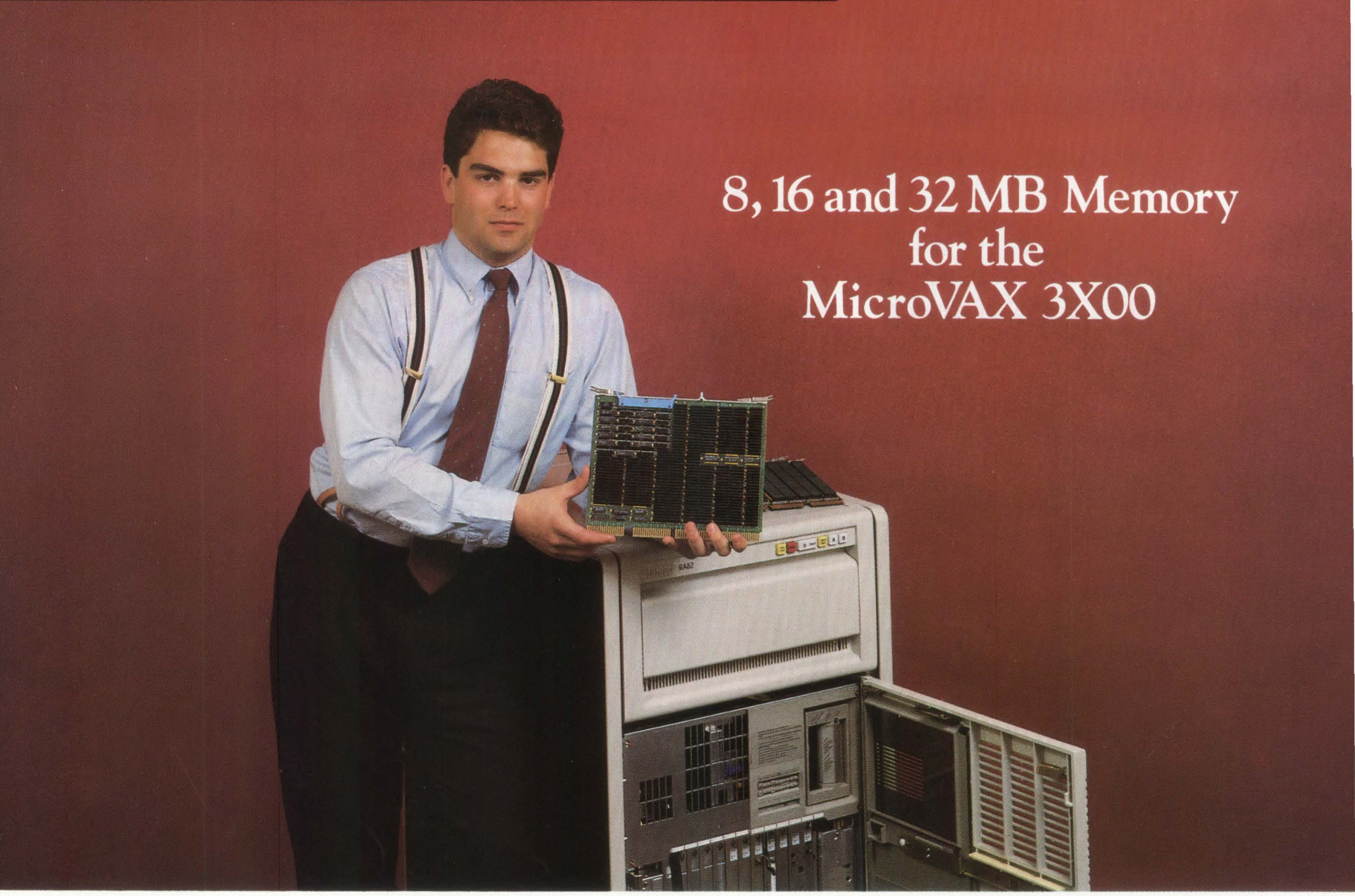
DEC PROFESSIONAL

A Professional Press Publication

- Manufacturing: Buy, Make, Sell
- The MicroVMS Merge
- Expanded Mac/VAX Section



Manufacturing



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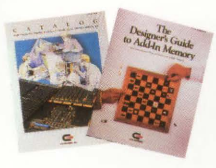

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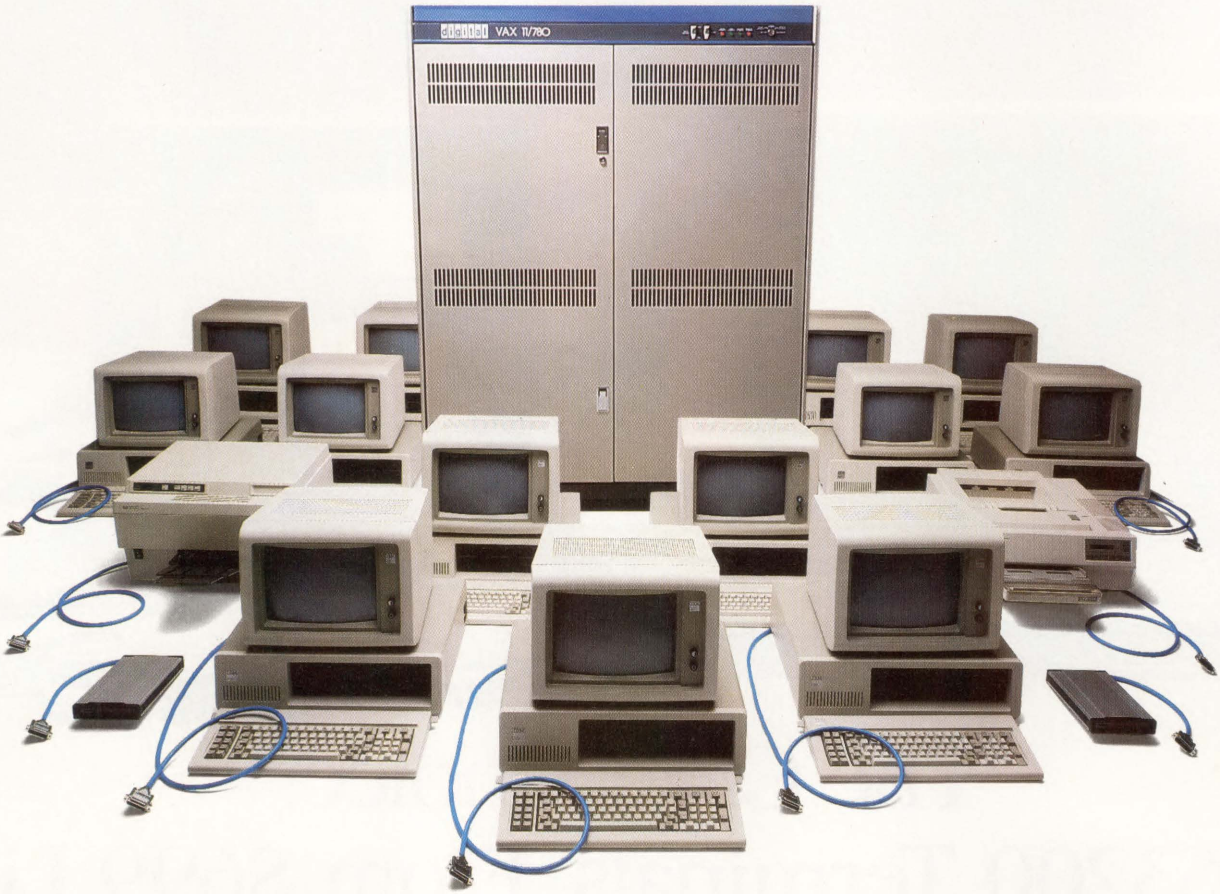

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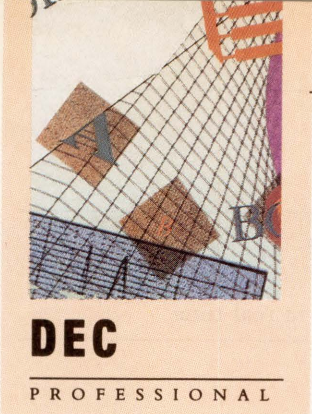

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MAY 1988 VOL. 7, NO. 5

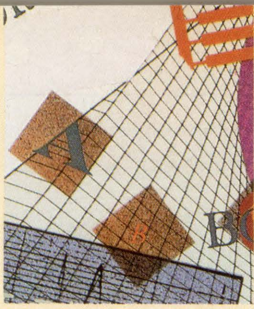
MANUFACTURING

ARTICLES

Continued on page 4.

The lab seal indicates that the product reviewed has been tested by one of our experts in our Laboratory and Testing Center.

ON THE COVER:
Cover photo courtesy of the TRW Customer Service Division of TRW. Automated Retrieval System (ARS) units have the capacity to locate up to three different port numbers at the same time (see "Robots: Past, Present, And Future," page 156).



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Continued from page 3.

The ARIS symbol on an article indicates that the program segments are available electronically on our Automated Reader Information Service. Dial (215) 542-9458.

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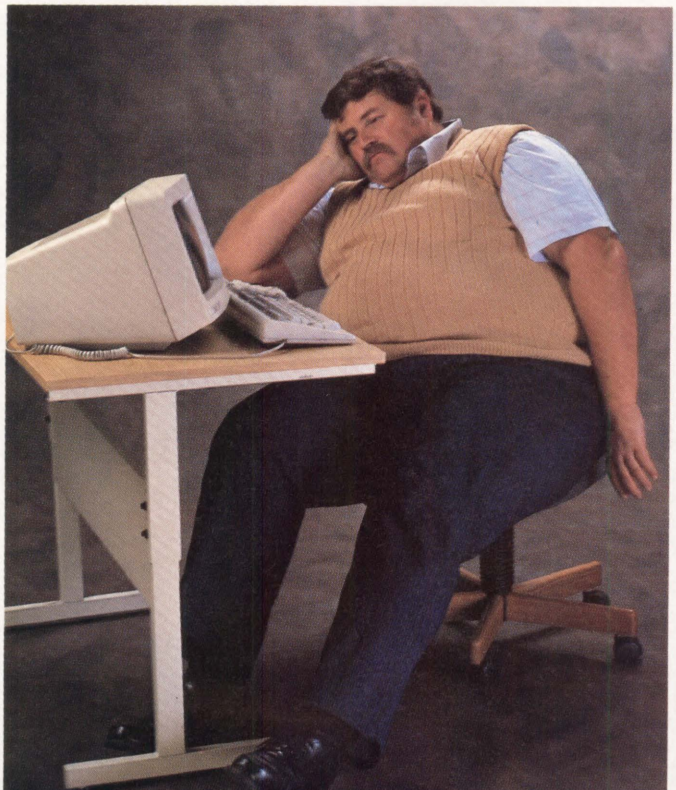

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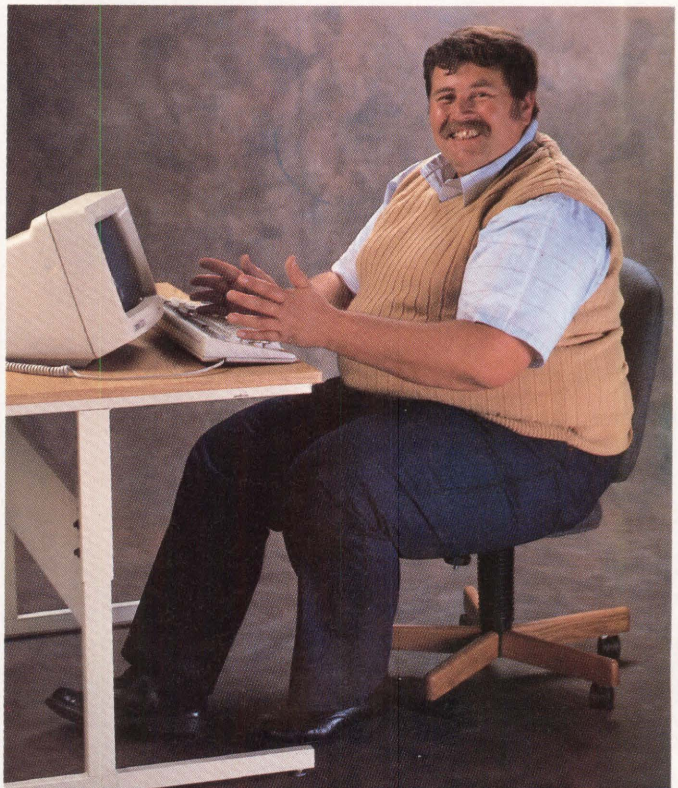

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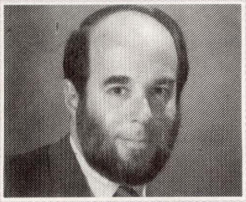


PUBLISHER

Carl B. Marbach

Why Did DEC Make A Deal With Apple?

In a much publicized event, Apple Computer and Digital Equipment Corporation announced a joint program to connect Macintosh computers to VAX computers. The appearance of Ken Olsen and John Sculley in the same room seemed strange to long-time DEC-watchers who have suspected for some time that Ken Olsen didn't like the kids from California. Steve Jobs wasn't DEC's idea of a chief executive.

Has John Sculley changed the perception of Apple, or has DEC changed the way that it thinks about Apple? Although John Sculley has changed Apple, and DEC now knows that Apple isn't just flash-in-the-pan, there's more to the agreement than just these things.

Ken Olsen now says, "Digital wants to own the desktop." It may want to, but it hasn't always accomplished its goals. It failed in the personal computer market with the Rainbow, and the current PC called the VAXMATE isn't going to take the desktop away from any competitor. The VAXSTATION is a nice piece of engineering but lacks the software to be a general-purpose workstation for the desktop. So, although DEC wants to own the desktop, it has no products for that purpose.

When DEC announced the VAXMATE, it also introduced its network integration kit that allowed PCs to connect to DEC Ethernet networks. An add-in board for the PC made the physical connection to the Ethernet, and MS Services for VMS handled the software for almost seamless integration of PCs into DEC networks.

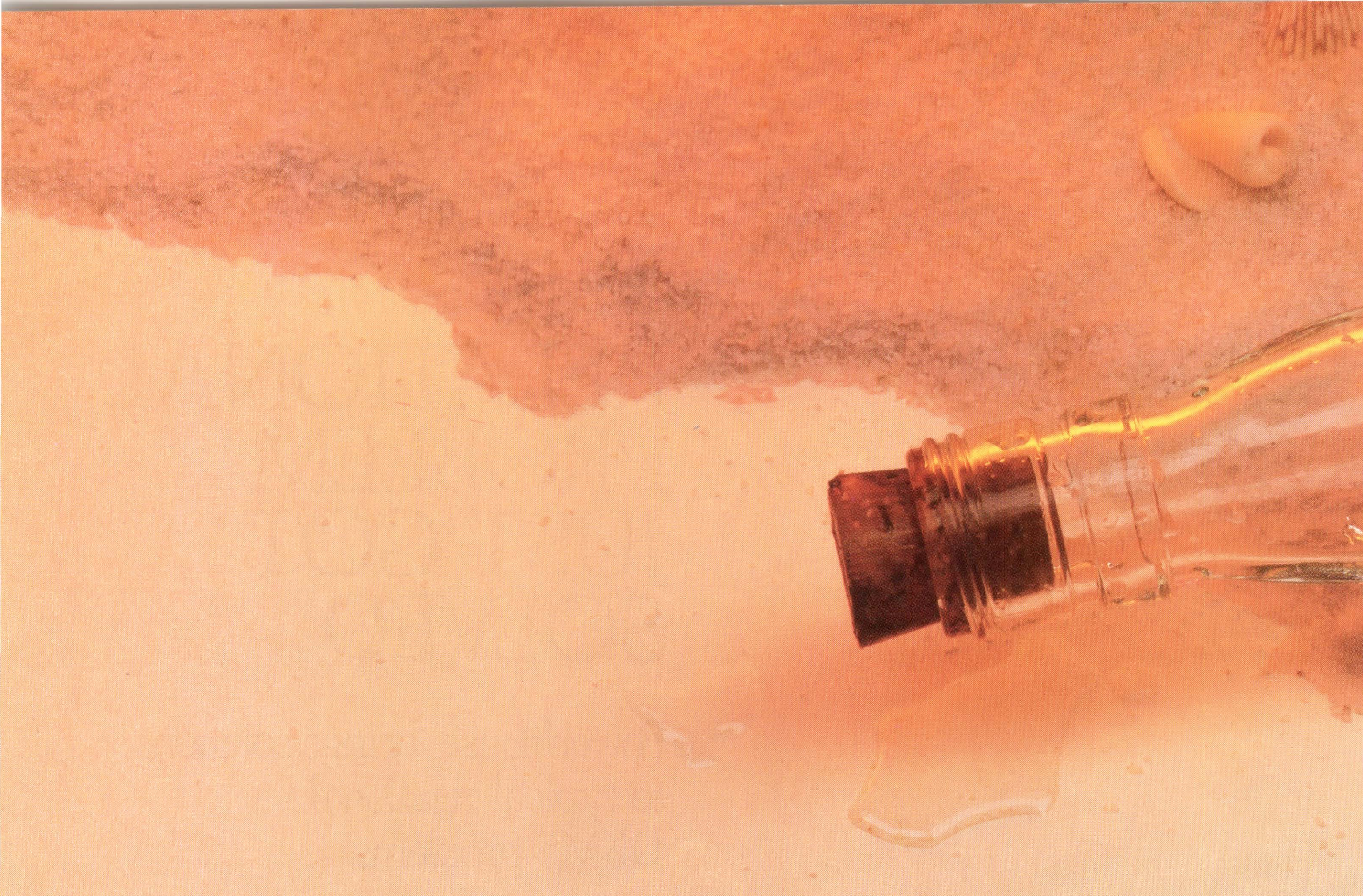
Now, the Apple announcement is going to legitimize Macintosh Ethernet/AppleTalk physical connections, and the upcoming developers conference will announce the software rules for almost seamless integration of Macintosh computers into DEC networks.

So, DEC won't own the desktop, but it will own the connections to it. This is preferable to giving up the networking to either Novell or IBM in the PC world, or letting AppleTalk rule the desktop in the MAC world. If DEC has its way, and it looks like it will, the desktops all will have Ethernet cables. The DEC strategy is to have all desktops within reach; i.e., to have them connect to DEC computers.

In the future, DEC plans to compete with both the PC and the Macintosh with a low-end VAXSTATION with X Window and improved software. I've said, "The good thing about a VAXSTATION is that it's a VAX, and the bad thing about the VAXSTATION is that it's a VAX." It's good because it can run all the VAX software and bad because all that VAX software isn't designed for a workstation and doesn't take advantage of its special features like the mouse and graphic capabilities.

When or if DEC has a competitive desktop workstation product, it will be simple to connect to the desktop connections pioneered by Apple and IBM; after all, they'll be DEC-Ethernet connections.

The winners in this strategy are the users who get to pick the best workstation for the job. The loser is the company who thought that it wasn't competing with DEC for the desktop.



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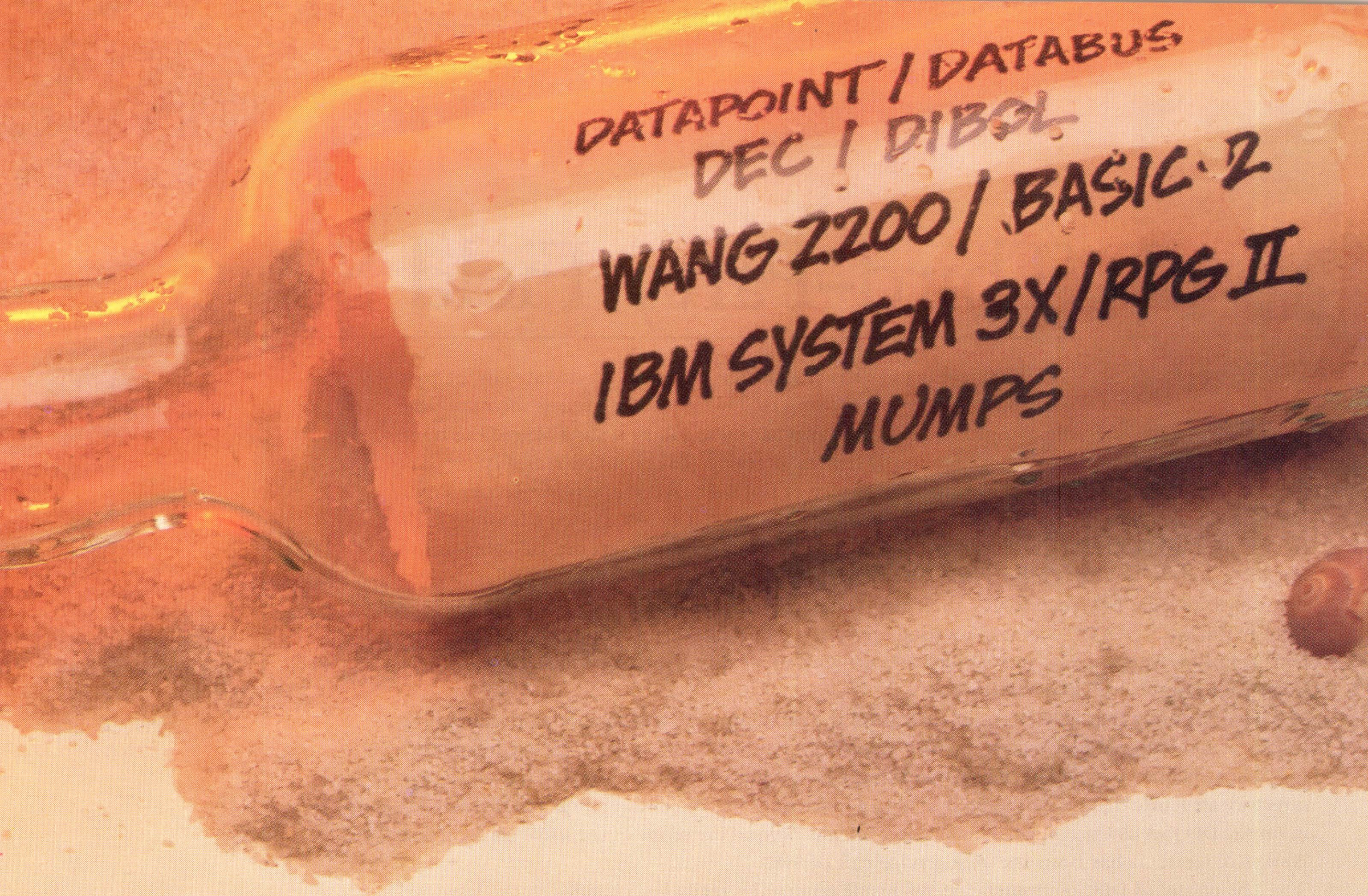
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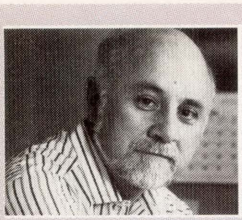


EDITORIAL

Dave Mallery

Third-Party Field Service

A flood of companies has entered the DEC field service area in the past year. Smart money never seems to flow into an area unless there are clear opportunities. Let's look at what these might be and where the traps lie. My contention is that field service has changed radically.

I'd like to cite, as an example, our only service call of 1988. We had just gotten our LAVC up and running. After about a week, we found that the VAXSTATION 2000 started rebooting itself frequently during the day, accompanied by several error messages from the DEQNA on the MICROVAX II. It looked as if there was a problem in the MICROVAX 2000. Several other devices that cohabited the Ethernet at that time also were acting flaky. The upshot was that the DEQNA in the MICROVAX II was at the wrong revision level for LAVC support. All the other problems simply were caused by its inability to cope with more than a moderate load. (Professional Press isn't known for moderate loads!)

The resources that DEC brought to bear on the problem were robust and far-reaching. We had local and regional networking experts along with national VMS support. (These folks don't touch boards; they live and breathe networking.) They found a few fine points in our clustering directory structure that needed to be shifted to a more supportable configuration and then zeroed in on the DEQNA as the culprit. This service call was beyond the scope of the usual card-carrier. And, I reiterate, it has been the *only* service call of 1988.

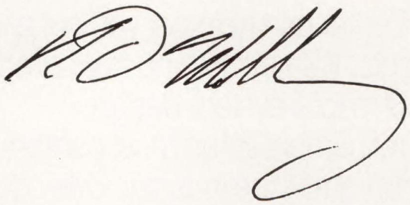
The nature of DEC computer systems inside companies really has changed in the last year, and the direction of change is just a hint of what's to come. In a year or two, almost any nontrivial installation will have one or more local area clusters. These really are computers with an Ethernet bus. Problems in one machine propagate, creating strange symptoms elsewhere that look like problems.

Service outfits wishing to enter the DEC market should be prepared for whole areas of expertise that were rare or nonexistent a few years ago. The Ethernet is the new bus. There's no such thing as an isolated computer, and the few that remain will become increasingly rare. Real network savvy and experience is critical. As VMS continues its progress, each new release will have lots of gotchas buried in it, and there will be no excuse for lack of total currency.

Entire networks will become the object of the service contracts. With the exponentially increasing reliability of the newest machines, you'll need the networks to have anything to fix!

In addition to simple LAVCs, service organizations will have to maintain groups of networked PCs and file servers cohabiting the same LAN.

So, rather than making a fast buck by undercutting DEC on the cost of a well-equipped card carrier arriving in under four hours, the third-party service supplier of the future must provide a panoply of expert services that range from detailed release-dependent knowledge of the operating system hardware gotchas, through networking — from the soldering iron through the satellite.



LETTERS

TIMELY AND USEFUL

The article on Graphics Standards in your December issue, while quite timely and useful, contains several errors that I would like to correct. GKS bindings for ADA and PASCAL are complete and soon will join FORTRAN as published ANS documents. BASIC included the GKS functions as part of the language and, therefore, doesn't require a binding. MUMPS, LISP and C bindings are available and are proceeding at various stages through the standards approval process. The Task Group on Language Bindings was unaware of a binding for either COBOL or PL/1.

Edward McIntosh
Jackson, Mississippi

V.A.S.T. UPDATE

Thank you for your review of *RABBIT-9 (V.A.S.T.)* in the February issue. Although you fairly recognized its immediate value, your speculations on version 5.0 of VMS and its relevance to *RABBIT-9* may be misleading to your readers.

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.

Please let me help clarify.

We hear that DEC will improve memory management in version 5. As *RABBIT-9* uses VMS's memory management in the standard way, our product will improve with VMS, and we welcome the change. The real advantage our product has over stock VMS in memory management is that it can vary the SYSGEN parameters every two seconds. This flexibility lets us be more aggressive in the way we tune than could be tolerated with the static tuning that is normally performed. Until DEC implements automatic continuous dynamic SYSGEN parameter tuning, *RABBIT-9* will improve the tuning of any VMS system.

In regard to our patent application, our purpose is not to "force DEC's hand." In fact, we do not believe that our application is relevant to anything DEC is developing. Rather, we wish to protect ourselves from third-party developers. We are confident that when they figure out what we have done in addition to tuning memory management, they will want to do it themselves.

William R. Davy
Author, *RABBIT-9 (V.A.S.T.)*
Dublin, Ohio

A SLIGHT IMPROVEMENT

Program 1 in last December's DCL Dialogue is wonderful, simple and to the point (see "DCL Stocking Stuffers" by Kevin G. Barkes, page 160). A slight improvement that will permit it to do arithmetic in any radix is to enclose p1 in apostrophes. Then, if you type rad "4 + 3" or even rad 4+3, it will print 7 in all 3 radices.

Dr. Stephen Baron
Baltimore, Maryland

THE VOTES ARE IN

You have my vote! The photo on page 114 of the March issue is, indeed, the "Kluge of the Year." It is also wrong.

Thin and ThickWire Ethernet can be joined effectively (I did it a year ago and ran the net for eight months before cleaning it up), but you've made a

fundamental error. Don't use the 50 ohm load and tee, and the connection is "according to Hoyle." With the load, you've done terrible violence to Ethernet's spec. Just use a type N male to BNC female adapter, and plug'er up.

Of course, you'll have to deal, as I did, with the folks who disconnect the cable from the tee on their PCs rather than the tee from the PC, thus breaking the Ethernet, but that can be avoided by soldering the cable connector and tee together, or by passing a cord across the tee and holding it to the cable on both sides by shrink tubing.

I thoroughly enjoy and appreciate your magazine and work.

Andrew J. Lyke
Hixson, Tennessee

Dave Mallery: Load and all, it worked. We abandoned it rapidly as soon as we got the MESTAs.

DECUS AUSTRALIA

The DECUS Australia Symposium will be held August 21-26 at Conrad International, Surfers Paradise, Queensland. This year's convention theme is "Technology Creating Leisure."

The six-day convention will feature 20 technical specialists from the U.S., user presentations and a DEC Exhibition.

For complete information, contact Carolyn Bennett, DECUS Australia, Locked Bag 26, Chatswood NSW 2067, Australia; (02) 412-7144.

A RECOMMENDATION

Concerning the article "Who's On First" by Mitchell Kaufman and William Ellis (January 1988), the macro program to get a value for the number of interactive users was omitted. However, it can be written in FORTRAN and included in the existing source code as shown below:

```
EXTERNAL SYS$GW_IJOBCNT
INTEGER   STATUS
STATUS = LIB$MOVC3(2,SYS$
  GW_IJOBCNT,NUM_ INTERACTIVE)
TYPE *,'Total number of interactive users
  =',NUM_INTERACTIVE END
```

The program must be linked with the system symbol table to define the external symbol:

```
$ LINK SHOUSERS,SYS$SYSTEM:
  SYS.STB/SELECTIVE_SEARCH
```

Neither this link nor the access to the memory location requires privilege. Also, please note that the symbol is misspelled in the article and should be:

```
SYS$GW_IJOBCNT
```

Alan MacArthur
Renton, Washington ■

CORRECTION

The article on page 92 of the March issue, "Installing A Cluster" by Betty Steele Adukoski, was inadvertantly published with a line missing. The second paragraph of the second column on page 92 should read:

> The VAX 8530 is not designed to support any MASSBUS devices. This meant the existing MASSBUS disk drives would need to remain on the VAX 11/785 until they could be replaced. Users connect to the VAX 8530 through Ethernet. The existing UNIBUS terminal ports also would remain on the VAX 11/785 until they could be replaced by terminal servers.

We apologize for any confusion this may have created.

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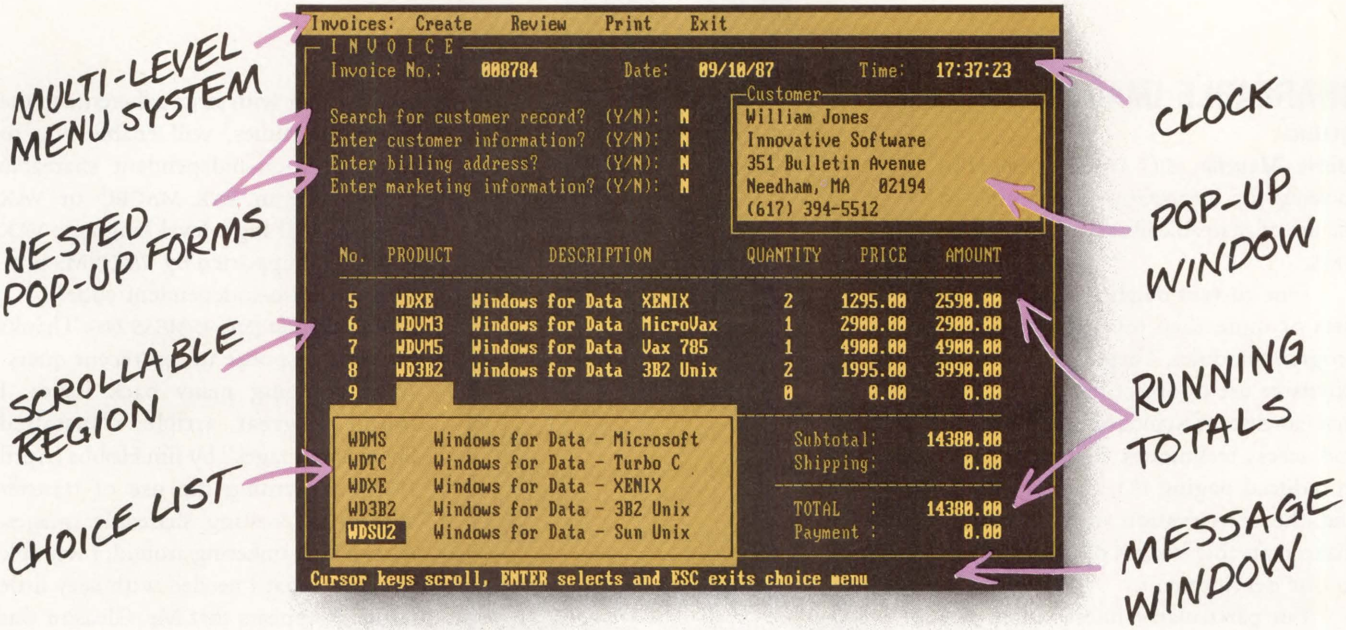
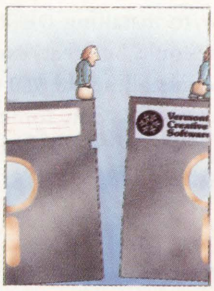
Uncommon Screens



If you program in C, take a few moments to learn how Windows for Data can help you build a state-of-the-art user interface.

- ☑ **C**reate and manage menus, data-entry forms, context-sensitive help, and text displays — all within windows.
- ☑ **P**rovide a common user interface for programs that must run on different machines and operating systems.
- ☑ **B**uild a better front end for any DBMS that has a C-language interface (most popular ones do).



FROM END TO BEGINNING

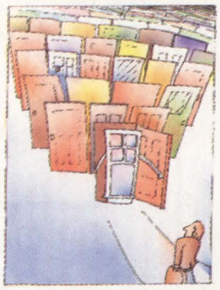
Windows for Data begins where other screen packages end, with special features like nested pop-up forms and menus, field entry from lists of choices, scrollable regions for the entry of variable numbers of line items, and an exclusive built-in debugging system.

NO WALLS

If you've been frustrated by the limitations of other screen utilities, don't be discouraged. You won't run into walls with Windows for Data. Our customers repeatedly tell us how they've used our system in ways we never imagined — but which we anticipated by designing Windows for Data for unprecedented adapatability. You will be amazed at what you can do with Windows for Data.

YOU ARE ALWAYS IN CHARGE

Control functions that you write and attach to fields and/or keys can read, compare, validate, and change the data values in all fields of the form. Upon entry or exit from any field, control functions can call up subsidiary forms and menus, change the active field, exit or abort the form, perform almost any task you can imagine.



OUR WINDOWS WILL OPEN DOORS

Our windows will open doors to new markets for your software. High-performance, source-code-compatible versions of Windows for Data are available for **PCDOS (OS/2** soon), **XENIX, UNIX,** and **VMS.** PCDOS versions are fully compatible with Microsoft Windows, TopView, and DESQview. **No royalties**.

You owe it to yourself and your programs to try Windows for Data. If not satisfied, return for a full refund. Call for **DEMO.**

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ARISTALK

SHAREABLE IMAGES

QUERY:

Mario Manella *(SIG 45/MESS 236):* I'm looking for information pertaining to the use of shareable library images under VMS.

Our current database system consists of more than 650 tasks and 2,500 program modules. These modules make extensive use of object library routines that consist of standardized functions and access techniques. The advantages in reduced paging I/O, memory usage and the conservation of disk storage make shareable images of great interest to our development.

I'm particularly interested in any publications/guidelines available for the creation of position-independent code under VAX MACRO (other languages if applicable). Also, if there are any programs written to flag position-dependent code, they would be of interest as well. Although some VAX manuals discuss these techniques, there must be some documentation dealing with the creation of shareable images under different programming languages.

Because about 50 percent of our program images come from library routines, we feel that the use of shareable images could improve their performance. Any help or information in these areas would be appreciated.

REPLIES:

Lee K. Gleason *(SIG 45/MESS 239):* None of the high-level compilers produce PIC. BLISS, like MACRO, can produce PIC, if you're careful. But, while desirable, PIC isn't required for creating a shareable library.

Richard B. Gilbert *(SIG 45/MESS 243):* I beg to differ. Page 31 of *VAX/VMS Linker Reference Manual* states, "Since the VAX instruction set and addressing modes lend themselves to convenient generation of position-independent code, their use, together with strict adherence to the above guidelines, will enable you to write position-independent shareable image code in VAX MACRO or VAX BLISS-32. All high-level language VAX compilers supported by VAX/VMS produce position-independent code."

Mario Manella *(SIG 45/MESS 245):* Thanks for your response to my recent query. After scanning many back issues, I found a great article, "Installed Shareable Images" by Jim Hobbs (April 1987), concerning the use of transfer vectors in creating shareable images. After a little tinkering around, I was able to create what I needed with very little effort. It appears that Mr. Gleason was correct in stating that PIC isn't necessary for the creation of shareable images. Thanks to both of you for your help.

How To Use ARIS

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

To log in, you'll need your subscriber number (it's on your mailing label). Then, just set your terminal to seven data bits, one stop bit and space parity, or eight data bits, one stop bit and no parity, and dial (215) 542-9458. Baud rates: 300, 1200 or 2400.

SIG Identifications

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

31 ....Migration issues
37 ....VMS
42..........Communications/File transfer
45...........Programming Languages/AI

FILE TRANSFER

QUERY:

Bruno Jugovic *(SIG 42/MESS 332):* I have a MICROVAX 3600 coming in on Monday. I need a way to transfer programs and data from a 750 (without DECNET) to the 3600 (DECNET) at will during the next two months of moving the business from one to the other. DEC has only come up with installing DECNET on the 750. This would be great, except that we will be deinstalling the 750 two weeks after the transfer. Can someone help me with this? I'm a little new at the transfer business.

REPLIES:

John Pullins *(SIG 42/MESS 333):* Bruno, take a look at the VAXNET program available on the recent DECUS VAX SIG tapes. It will allow you to log in to your old system from your new system over

a normal RS232 connection and to transfer files back and forth between the two systems. VAXNET needs only to be installed on the new system end if all the files are in ASCII format, because you can TYPE a file on the old system while it's being captured to a file on the new. If you need to transfer object code, VAXNET has other protocols available.

I'm currently using VAXNET to talk to the ARIS system from our VAX 8530 at work, to which I am connected via modem on a Macintosh Plus at home. (The 8530 is the only machine in this link that needs VAXNET.) The software is excellent, but the best thing about it is the price. It's free.

Bruno Jugovic *(SIG 42/MESS 335):* Thanks for the information, John. It sounds exactly like what I need. The price is definitely unbeatable. Does it work for RMS index files as well?

Richard B. Gilbert *(SIG 42/MESS336):* Bruno, obtain a disk controller that will support the disks of one system on the other system. Then, a straightforward COPY command will move immense amounts of data. If you have RA series disk drives on both systems, you won't even need a controller; just take in the cables that used to go to the 750 and plug them into the MICROVAX 3600.

If you can't do that, go with DECNET. Transfer over asynchronous lines will likely take you the whole two-month conversion period, if you have large amounts of data to transfer. The DECNET license and any necessary hardware to bring up a synchronous link or an Ethernet link will cost a bundle, but I think you will find that trying to use asynchronous lines will cost more.

BATCH STOPPING

QUERY:

Khalid Baig *(SIG 37/MESS 512):* Is there any way to stop a process from a batch job? The problem is that I can't pass the process identification (pid) number to the stop command by using any symbols. The lexical functions can give you the pid that has to be stopped, but then how do you use that in the command STOP /ID = PID?

REPLIES:

Brian DeSantis *(SIG 37/MESS 515):* Why do you want to stop from batch; is it because of the lack of privileges on your account? You can use system logical names. Interactively define them to be the pid to stop, or define it to 0 when you don't want a pid to stop, like this:

```
$start:
$ pid = f$trnlnm("stop_pid" , "lnm
$system)
$ if pid .nes. "0" then goto stop
$ wait 0:05:0.0
$ goto start
$stop:
$ stop/id = " "pid' "
$ wait 0:05:0.0
$ goto start
```

This will check to see if the pid is defined.

Interactively, you should first define/system stop_pid 0 to reset the pid. When you want to stop a pid, use DEFINE/SYSTEM STOP_PID 0000546; it will be stopped sometime in the loop (I use the waits to keep down CPU time). But, stopping the process interactively would be much easier.

Richard B. Gilbert *(SIG 37/ MESS 522):* Khalid, I believe that you can use something like the following:

```
$ pidsym = F$LEXICAL(....
$ STOP /ID = 'pidsym'
```

The apostrophes enclosing pidsym force DCL to substitute the value of pidsym for the symbol.

VAX TO HP

QUERY:

Don Boelling *(SIG 31/MESS 2):* I would like to know if anyone has a software utility that will allow file transfer and remote login from VAX to HP 3000 (68 series). We've tried several schemes. HASP+ and MRJE (2780/3780) work. But it's not as foolproof as we would like.

REPLIES:

Bob Wilson *(SIG 31/MESS 27):* Try KERMIT. If you can't find an HP 3000 version, put together a minimal KERMIT port to a non-VAX system.

In 1984, I put together a VAX/SEL KERMIT port for ASCII file transfers. I wrote all the software on the VAX, tested it on the VAX using two VAX ports tied together with a NULL modem cable and did final integration on the SEL.

The only problem occurred when the SEL treated a ? character within a block of text, at 9600 baud, as a BREAK key. The fix was to change the VAX KERMIT to put a .1 second pause before and after each ? in a KERMIT packet.

Usable KERMIT speeds are ½ of the line rate (using KERMITs available in 1984.) There was talk of a full-duplex and windowing KERMITs, but I don't know if anything was ever done.

Phil Anthony *(SIG 31/MESS 28):* If there isn't an HP 3000 version of KERMIT on the University of Toledo KERMIT bulletin board, there's certainly one on the Columbia University tape. And windowed or full-duplex KERMIT does exist, but to the best of my knowledge, only on PCs. (Both sides have to follow the windowing protocol for it to work, of course.)

Also, my experience is that KERMIT gives you about 60 percent of rated line speed transferring binary files and about 70 to 75 percent for ASCII. This assumes that eighth-bit quoting is unnecessary; i.e., that both systems can handle 8-N-1. If they can't, your 50-percent figure may be right for binary transfers.

Incidentally, when connecting the systems directly and transmitting at 19.2K, I've found that the limiting factor on speed isn't the line but the receiving system's ability to process incoming characters quickly enough. Both VMS and MS-DOS have given me trouble with overruns; RSTS and XENIX generally seem to handle the character stream better. ■

PRODUCT WATCH

Mitek Provides Workable Multivendor Connectivity Solutions

Mitek Addresses The Need For VAX-To-System 36/38 Connectivity Through TCP/IP Networks

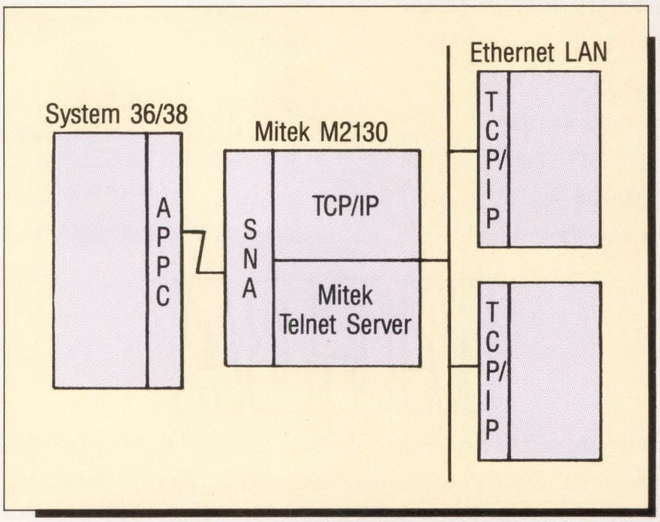
With the growth of PCs, engineering workstations and LANs, a key concern among corporations and users is connectivity. A cohesive networking solution is one that links different computer systems to each other and to the mainframe computer. The demand and need for connectivity between Digital's VAX and IBM's system 36/38 is on the rise.

According to Phil Callahan, vice president of marketing, "Companies need to justify the sizable investments they've made in software for both Digital's VAX and IBM System 36/38, as well as hardware expenditures. Because the competition is so strong in the mid-range market, it's not uncommon for an end user to have both an IBM System/38 and a VAX. A typical scenario is a VAX on the shop floor in the production area and a System 38 in the finance area. But the two departments need to communicate, quickly and efficiently."

With the great amount of attention directed toward connectivity, Mitek has introduced the TCP/6.2 product line that extends connectivity solutions for the IBM System 36/38, DEC and non-DEC environments. Cleve Graves, Mitek's technical marketing manager commented, "TCP/IP solutions can run over standard Ethernet using DEC Ethernet boards and TCP/IP software. The TCP/6.2 can run concurrently with DECNET, and the significance of this is that DEC, non-DEC and IBM can form a single solution."

Mitek's first feature from the TCP/6.2 product line, the Telnet application, allows users connected to an IBM System/3X host, which is attached to an Ethernet LAN, to access a remote TCP/IP host. This host can be a minicomputer, workstation, or any device from any vendor linked to a TCP/IP network that provides a Telnet server. The Telnet Server lets any TCP/IP Telnet device on the TCP/IP network emulate an SNA 3270 to an IBM host. Terminal servers are among the devices that do that emulation.

Mitek's second feature from the TCP/6.2 line, the FTP application, allows users connected to an Ethernet LAN to send and receive files to other hosts attached to a TCP/IP network. According to Don Anselmo, president of Mitek Systems, "These new applications for System 36/38 users extend the functionality for both new and existing systems by providing a turnkey solution for TCP/IP connectivity. There are tremendous opportunities for productivity gains through these connectivity solutions, and the TCP/6.2 product line allows the realization of those gains."



Telnet Server for the System 36/38.

The benefits of extending connectivity solutions to the multivendor environment are varied. Users can communicate information across different networks, between different vendors' computers and among all computers in a network. Other features include no modifications to the computer's operating systems, a minimum amount of programming and use of existing computer data and application.

For further information, contact Mitek Systems Corp., 2033 Chennault Dr., Suite 100, Carrollton, TX 75006; (214) 490-4090.

Enter 509 on reader card

Printronix's P9012 Line Printer Hums At An Efficient High Speed

With Five Modes And Three Graphic Modes, The P9012 Redefines Multifunctionality

The P9012 matrix line printer, earmarked as the flagship product, from Printronix Inc. of Irvine, California, offers new levels of printing performance and reliability. Its built-in interfaces, comprehensive control panel and packaging design contribute to easy installation and use.

Compared to band printers of the same performance range, the advantages of the P9012 include multipart print quality, printing versatility and graphics, high reliability and lower costs.

With five print modes and three graphics modes, the P9012 redefines multifunctionality. You can choose from a variety of resident international character sets plus downloadable character sets, print them in pitches ranging from five characters per inch to 17.1 cpi, and combine them in the same print line. Character attributing capabilities, referred to as Dynamic Font Selection, include underlining, superscript/subscript printing and elongated, shadow, bold, expanded and compressed print.

The key to this enhancement in functionality is the use of a variable speed hammer bank shuttle system. This enables the P9012 to produce multiple print densities, resulting in greater print quality with higher throughput.

The Printronix P9000 Series printers take the efficiency of stored energy hammer bank technology a step further. The technology permits higher reliability and more uniform print density than traditional band printers that use ballistic hammers and solenoid coils. Because of uniform dot density and precise dot placement, the print quality is improved on up to six-part forms.

The P9012 is targeted at high-volume batch oriented applications. However, there are two key features that expand applications for the P9012.

First is the printer's acoustics. It's rated at less than 55 dba, making it the quietest 1200 lpm line printer in the industry. Because of the quiet operation, the P9012 can be used in offices as a departmental and network print server as well as in computer room installations.

Second is the P9012's graphics capabilities. This opens the door for on-site printing of bar codes, electronic forms and engineering and business graphics. The graphics function is an advancement over band printer capabilities.

Another feature is the autoranging power system. Input voltage selection for 110V or 220V applications is configured automatically, eliminating the need to change fuses or voltage taps. Plug in the P9012 anywhere in the world, and the proper voltage will be applied. Also, operators have easy access to the hammer bank for cleaning and maintenance. If service is required, the P9012's modular design provides for rapid fault isolation. Diagnostic self-tests and operational status information are accessed easily with the use of the control panel and a 32-character message display.

With Centronics, Dataproducts and RS232C Interfaces resident, the P9012 is compatible with a broad range of computer systems. Connections for all three of these interfaces are mounted on the printer, providing the operator with easy selection of the active interface. Optional interfaces for IBM coax and twinax attachment also are available.

Printronix's Intelligent Graphics Processor (IGP-40) option enables the P9012 to produce bar codes, labels and business forms easily. The IGP can be programmed to generate a form, store its image, overlay the form with data and electronically merge the form and data in a single print pass.

The P9012 lists for $12,995.

For more information, contact Printronix Inc., 17500 Cartwright Rd., Irvine, CA 92713; (714) 863-1900 or (800) 826-3874.

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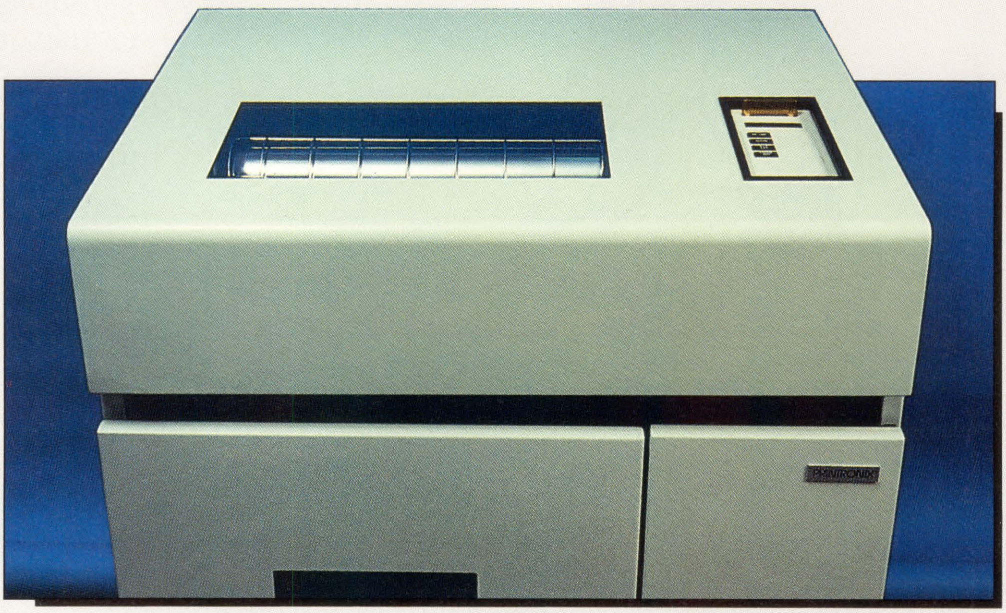
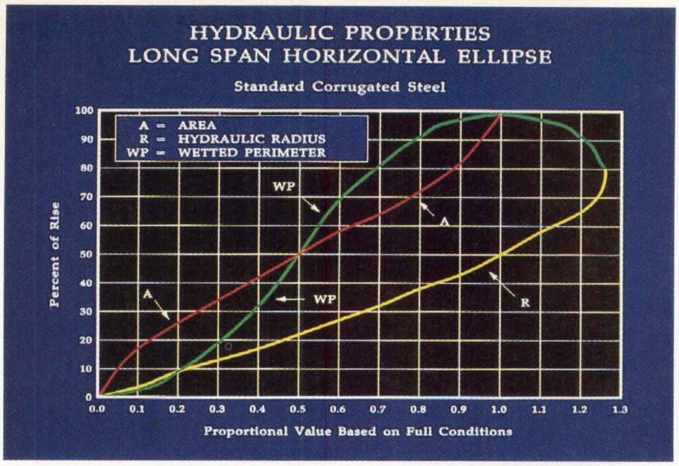
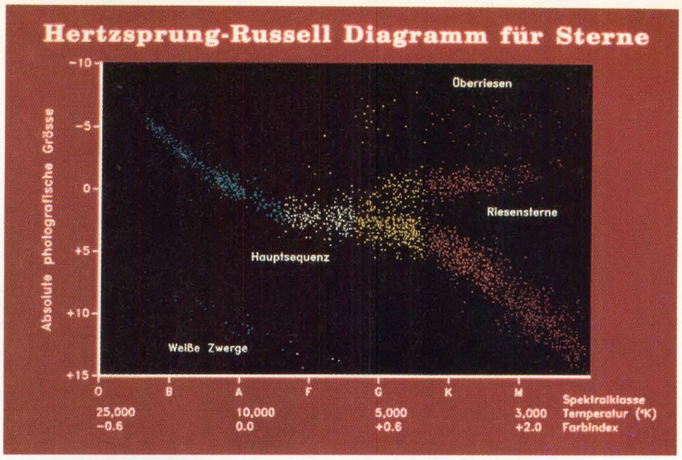


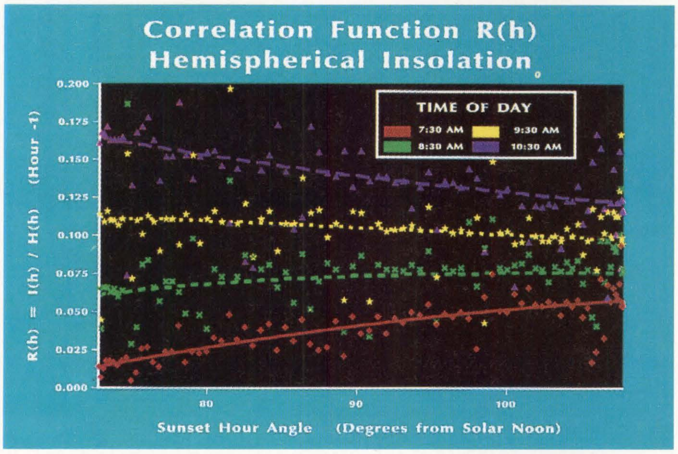
The P9012 features a straight-through, enclosed paper path for easy loading.



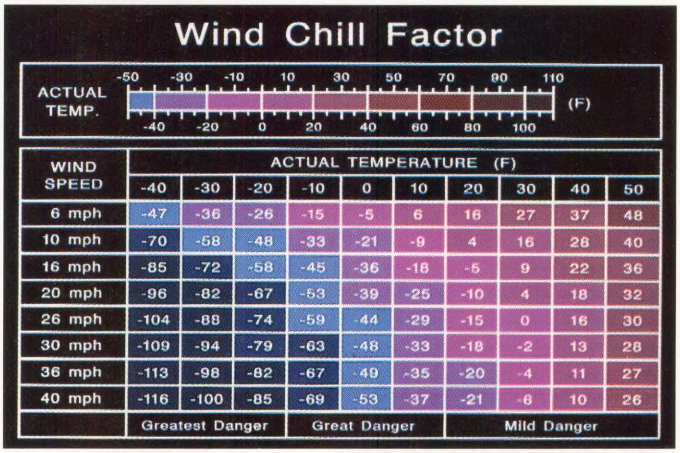
PicSure Plus' curve smoothing clarifies data representation. Shielding adds a professional look.



European text fonts offer a global graphics solution. Multiline annotations aid data interpretation.



Large datafiles can be read directly from disks. User retains complete control over all chart elements.



PicSure Plus' menus allow easy data entry/editing. Extensive color table control for dynamic graphics.

Precision Visuals' PicSure Plus™

Practical Presentation Graphics for Your VAX

The Need

You need PicSure Plus™ if your work requires: ☐ Producing technical presentations or reviewing data ☐ Supporting a cross section of graphics users, from novice to expert ☐ Building custom user interfaces for specific applications ☐ Accessing and charting information from databases ☐ Pushbutton access to stored charts, datasets, command files, and metafiles ☐ Managing graphics production while maintaining device independence.

The Product

PicSure Plus is an interactive graphics system for producing charts and graphs. Prompting menus guide novice or occasional users in creating line, bar, scatter, pie, text, and table charts. Experienced users can access PicSure Plus features by entering commands, or building tailored menus for specific applications and environments. These user-interface options offer a flexible gateway to the most powerful set of charting functions available today.

The Features

☐ Powerful prompting menu interface speeds chart building for novice and occasional users ☐ Integrated command interface available for more advanced users ☐ Interactive positioning of all chart elements ☐ Directory keeps track of saved charts, datasets, command files, and metafiles—so users don't have to understand the computer's file system ☐ On-line tutorials and instant HELP facility for new users ☐ Easily combine multiple charts into a single image ☐ Draw charts simultaneously on multiple graphics devices for high production chart building ☐ Symbol creation for building flowcharts or illustrations ☐ Merge and annotate images created with other Precision Visuals products ☐ Read up to 10,000 datapoints from system files, or from other software packages ☐ Powerful numeric functions to perform arithmetic and statistical operations on your data ☐ Programmer's interface for accessing custom subroutines, databases, and the operating system ☐ Automatic layout and text sizing for word charts.

The User Interface

Users can move from prompting menu mode to command mode and back again, anytime. PicSure Plus also offers special commands for building prompting menu sessions. These user interface tools help you automate the production of frequently used charts, or design custom interfaces for end users.

The Environment

PicSure Plus runs on the entire VAX family, as well as a wide range of minicomputers and mainframes. Compose graphs on terminals and get hardcopies on laser printers, inkjet printers, pen plotters, and film recorders.

The Offer

PicSure Plus is the only graphics software solution with the range of features for even your most sophisticated charts, combined with user interfaces for the first-time user, occasional users, and experts. If you need functionality and ease-of-use in your graphics software, get the full story on PicSure Plus, and let us arrange a test drive.

Call Chris Logan at:
303/530-9000.

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Precision Visuals, Inc.
6260 Lookout Road
Boulder, Colorado 80301 USA
303/530-9000
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Precision Visuals International
West Germany
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Canoga-Perkins Extends Ethernet Family

Expander Model 8806 Increases Area Coverage Of Ethernet Four Times

Model 8806 Ethernet Expander.

Specializing in fiber optic and T1 technologies, Canoga-Perkins of Chatsworth, California, expands its Ethernet family by four products, including the Model 8806 Ethernet Expander. It extends the distance between transceivers and controllers of any Ethernet network.

Depending on the quality of the two twisted pairs, the 8806 allows data transmission up to 250 meters.

Replacing the four twisted-pair AUI cable with two twisted pairs, the 8806 simulates full AUI cable characteristics for the transceiver and controller. This allows the Ethernet V1.0, V2.0 or IEEE 802.3 to run on the IBM, or similar, cabling system.

The 8806 consists of two units, one at each end of a customer supplied twisted-pair cable. One unit interfaces with the transceiver; the other with the controller. The transceiver-side unit provides the power through an external power supply.

The 8806 supports 10 Mbps transmission rate, including SQE test, ac/dc coupling, back-to-back frames and signal compatibility with all Ethernet standards.

Because of the high data rates incorporated in the Ethernet LAN, special care must be taken with the wiring setup. The ability to transmit Ethernet signals on a two twisted-pair cable depends on several factors: the quality of the twisted-pair wire, wiring distances, electrical interference and method of interconnection.

Canoga-Perkins suggests the following recommendations for cable selection:

1. Use shielded cable and ensure a secure shield connection at both the 8806/C and 8806/T.
2. Use data-graded twisted pairs.
3. For a construction of two twisted pairs with one overall shield, have different lay lengths to reduce crosstalk.
4. Use a conductor size of 22 or 24 AWG.
5. Have DC resistance that is less than 100 ohm/km.
6. Make sure mutual capacitance is 50 pF/m nominal or less in each pair.
7. Determine that each conductor's insulation is polyethylene or Teflon to reduce pair capacitance.
8. Be sure the characteristic impedance level is between 100-150 ohm nominal at 1-50 MHz.
9. Remember that using unshielded cable is possible, but it might increase the EMI levels in the environment.

For further information, contact Canoga-Perkins, 21012 Lassen St., Chatsworth, CA 91311-4241; (818) 718-6300.

Enter 512 on reader card

A Command Performance By *CHARM*

WorldWide Data Presents CHARM, *The C Source Application Generator*

Canned application generators or 4GLs leave designers with limited flexibility, because the applications can't access any data structures other than their own. This limitation forces designers to build interfaces between systems, import and export files among systems, convert data structures and duplicate files with shared data to be accessed by two different systems. These problems cost disk space and wasted skills for the programmer and end users.

Until now, users of these generated applications were caught in the three traps of this situation. They ran slow applications limited to a single machine type, a single database access system and a single insufficient language. The solution was to devise an optimal system that had to: use commonly

accepted language; employ powerful DBMS technologies; use acceptable, easy-to-use interfaces; meet the skill level of the novice and experienced designers; and maintain the freedom of choice among various packages and tools.

The solution was *CHARM*, the application generator from WorldWide Data of New York, New York. It produces standarized, accessible, portable, well-documented and efficient C source code. *CHARM* is a totally integrated application generator for UNIX and VMS environments.

C is one of the most advanced programming languages available, is accepted by a wide user base, operates under all operating systems and is the most portable language in use. C's execution time is faster than almost any other high-level language.

Because *CHARM* produces C source code and the makefiles for compilation, as well as a fast executable native code, designers are free from any run-time module's speed limitations and can modify the code to meet specific needs. Through a built-in feature, *CHARM* maintains those modifications in later regenerations.

Fully featured, flexible applications can be designed without auxiliary programming. *CHARM* uses a uniform PC-style windowing interface. Users can build data entry and retrieval screens, batch programs and reports without writing a single line of code.

CHARM includes enhanced B+ tree-based and hash-based file access methods as an intrinsic part of the product. However, unlike any of the other application generators of DBMSs, it implements the relational model as defined by its originators in an unprecedented way. *CHARM*'s RDBMS consists of two layers: the low-level file access routine library and the RDBMS interface library, which is independent from it.

Because of this structure, application designers using *CHARM* to generate source code can access any file management system that acts like an RDBMS. To implement access to a new RDBMS, designers have to put in a new RDBMS library.

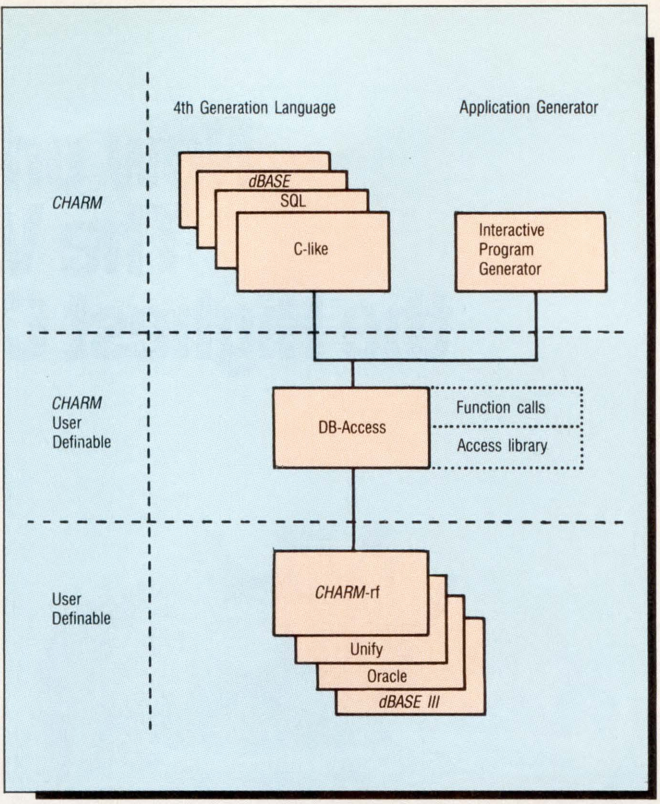
To make it easier, *CHARM* provides a set of skeleton files containing the source code generated to perform these RDBMS calls. The function calls can be changed in these skeletons to refer to the new library. For example, the skeleton's statement:

```
rf_get_equal(file,key)
```

can be changed to:

```
XXdbms_GE(file,key)
```

Now designers can not only use their favorite RDBMS, but access files within their source programs using more than one file access method. Thus, a single application simultaneously incorporates files built through several different database management systems.



CHARM ***separates the three aspects of the application into distinct conceptual units.***

CHARM also has a 4GL data access language interface (DALI) that is C-like and context sensitive. DALI maintains C's syntax and style, while removing the need to deal with pointers, file opening and closing, and other annoying aspects of low-level programming. When *CHARM* generates the program, the sections that the designer writes in DALI are translated into C and integrated with the rest of the application.

Because DALI is context sensitive, it does its job with only 20 constructs and verbs, and without unnecessary overhead as OPEN and CLOSE FILE, or BEFORE and AFTER FIELD statements.

CHARM's DALI code automatically knows its environment. Designers can enter their favorite editor directly from the access screens to write the DALI modules for that particular field or screen. Designers also can write larger programs in DALI from outside *CHARM*.

The structure of separating the RDBMS into the access library, the RDBMS itself and the 4GL, gives *CHARM* flexibility.

CHARM separates the three aspects of the application into distinct conceptual units (see diagram):

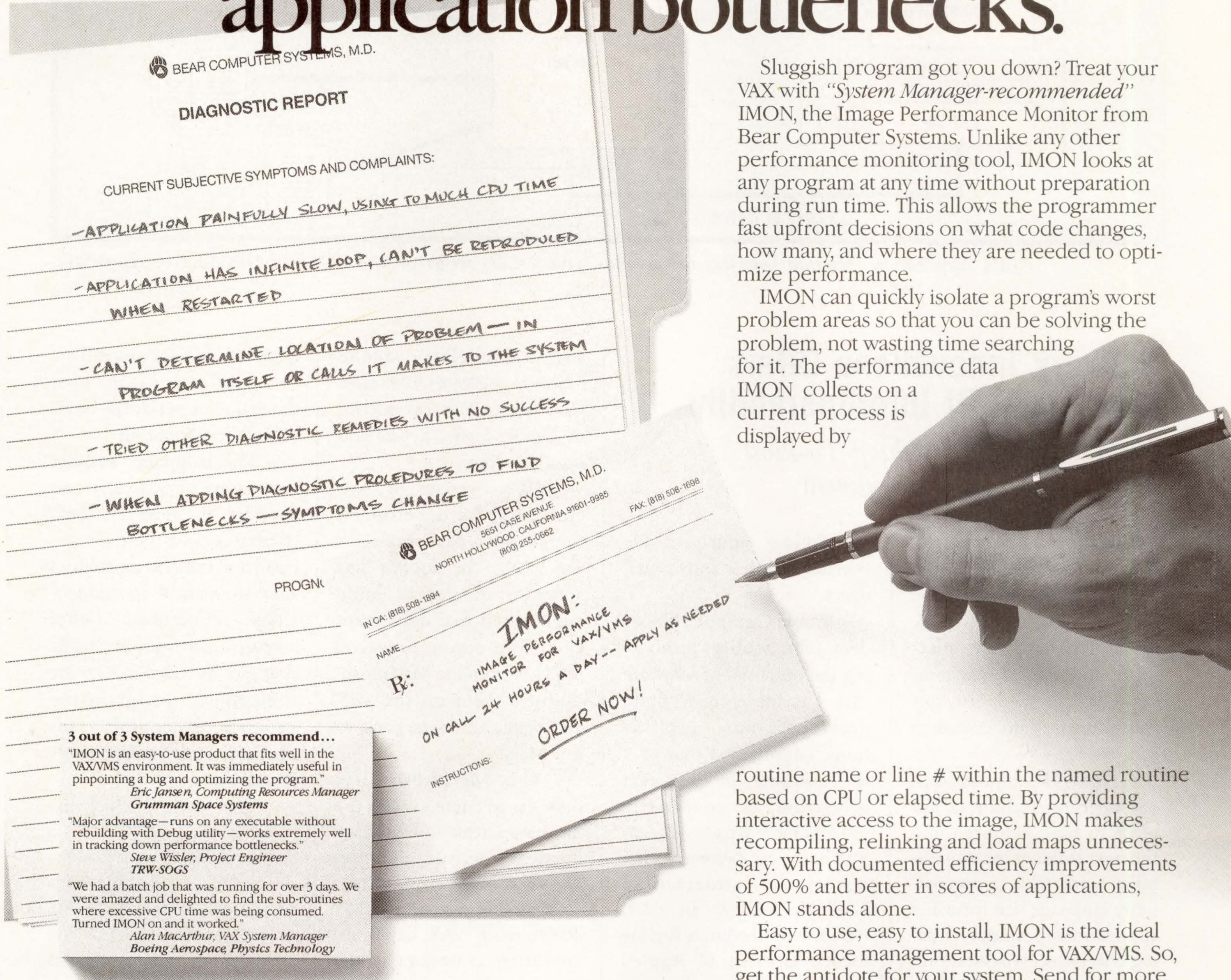
1. The access language, which WorldWide Data will provide in a variety of versions.
2. The access method, which designers can redesign using the skeleton files included in *CHARM*.
3. The database, which can be created through *CHARM* or through any tool.

For further information, contact WorldWide Data, 39 Broadway, New York, NY 10006; (718) 438-2807.

Enter 508 on reader card

—*Suzanne Garr*

The programmers' antidote to VAX/VMS application bottlenecks.



Sluggish program got you down? Treat your VAX with *"System Manager-recommended"* IMON, the Image Performance Monitor from Bear Computer Systems. Unlike any other performance monitoring tool, IMON looks at any program at any time without preparation during run time. This allows the programmer fast upfront decisions on what code changes, how many, and where they are needed to optimize performance.

IMON can quickly isolate a program's worst problem areas so that you can be solving the problem, not wasting time searching for it. The performance data IMON collects on a current process is displayed by routine name or line # within the named routine based on CPU or elapsed time. By providing interactive access to the image, IMON makes recompiling, relinking and load maps unnecessary. With documented efficiency improvements of 500% and better in scores of applications, IMON stands alone.

Easy to use, easy to install, IMON is the ideal performance management tool for VAX/VMS. So, get the antidote for your system. Send for more information or call the problem-solving specialists at Bear. The Bearware line of software for VAX/VMS is so effective, you'll wonder how your system ever managed without it.

3 out of 3 System Managers recommend...

"IMON is an easy-to-use product that fits well in the VAX/VMS environment. It was immediately useful in pinpointing a bug and optimizing the program."
Eric Jansen, Computing Resources Manager
Grumman Space Systems

"Major advantage—runs on any executable without rebuilding with Debug utility—works extremely well in tracking down performance bottlenecks."
Steve Wissler, Project Engineer
TRW-SOGS

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Alan MacArthur, VAX System Manager
Boeing Aerospace, Physics Technology

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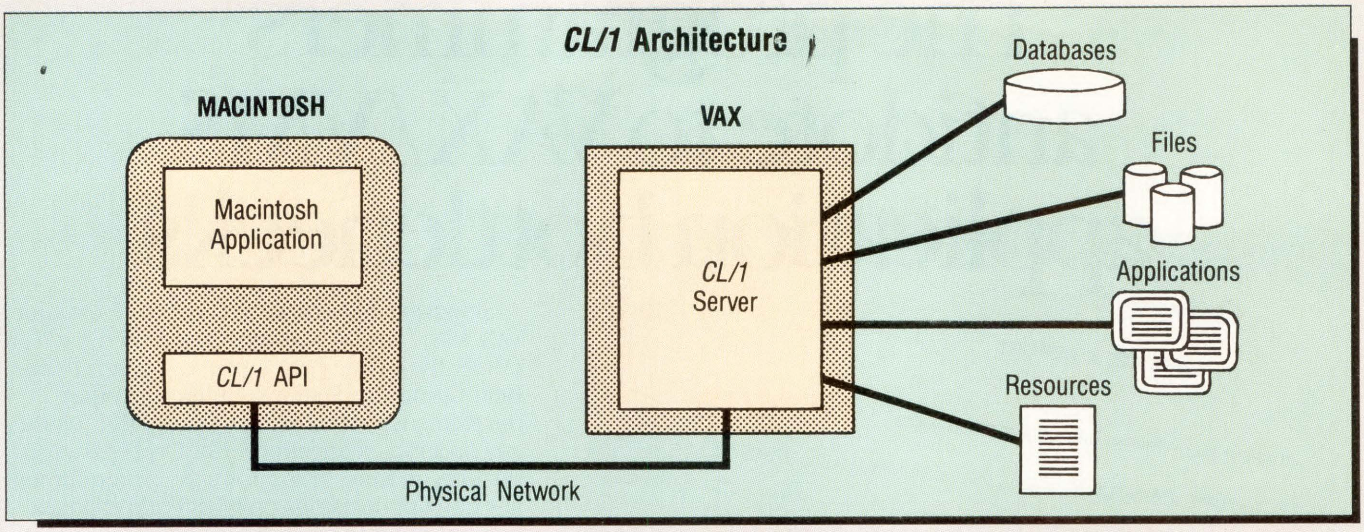

CL1's *Application Program Interface corresponds with a* CL/1 *server on the VAX over DECNET or AppleTalk.*

Network Innovations Offers New Level Of Interoperability

CL/1 *Creates A Desktop-To-Host Software Design Environment*

If interoperability is not yet in your vocabulary, it will be shortly. It means we've reached an age where dissimilar hardware platforms and operating systems can coexist, while various applications can exchange data freely.

Network Innovations, of Cupertino, California, appears to have ventured into the next stage of interoperability with *CL/1*, a connectivity language that furnishes applications developers, using Macintosh workstations, with the ability to access and implement databases, applications and other resources residing on VAXs. It surpasses current one-dimensional Mac-to-VAX connectivity solutions such as terminal emulators, file transfer facilities and virtual disks.

Apple Computer President John Sculley, promoting the potential of software that lets developers build desktop-to-host applications, commented that *CL/1* is "ushering in the next generation of cooperative processing." Apple's recent purchase of Network Innovations underscored Sculley's interest in *CL/1*, which will become a fundamental element of Apple's VAX connectivity strategy.

Although first applied to *HyperCard*, Apple's own database manager, *CL/1* already has been implemented on several third-party Macintosh applications packages including Lotus' *Modern Jazz*, Blyth's *Omnis SQL*, Acius' *4th Dimension* and Ashton-Tate's *dBASE Mac*. On the VAX DBMS side, *CL/1* supports access queries to *Oracle*, *Ingres*, *Sybase* and Digital's *Rdb*.

CL/1 consists of two elements: a developer's toolkit and a *CL/1* server for the VAX. The toolkit lets software developers build applications that implement *CL/1*. The server processes requests from the Macintosh, executes them on the VAX and sends the data back to the Mac.

The Macintosh user only has to contend with the database screen and interface he uses. When using *CL/1* on *dBASE Mac*, for example, the screen is a regular *dBASE Mac* screen with VAX databases appearing as options to the system. When called, the VAX data is formatted into the *dBASE Mac* setup.

"All of these Macintosh databases are written to the Application Program Interface (API) that *CL/1* provides," explained Ron Arons, who coordinates Mac-to-VAX connections for Ashton-Tate. "So, differences in host databases or networks don't affect the user at all."

The language includes extensions of SQL that add support to non-relational databases, and file management and transfer capabilities that are critical to connectivity applications. Other software connectivity technologies included in *CL/1* are the APPC program-to-program communications protocol and the OS/2 LAN Manager.

The toolkit, which includes the *CL/1* API, a redistribution license and a year of technical support, is priced at $35,000. VAX/VMS servers, which must be installed on each host, range in price from $3,000 on a MICROVAX to $23,975 for a VAX 8978.

For more information, contact Network Innovations Corp., 20863 Stevens Creek Blvd., Cupertino, CA 95014; (408) 257-6800.

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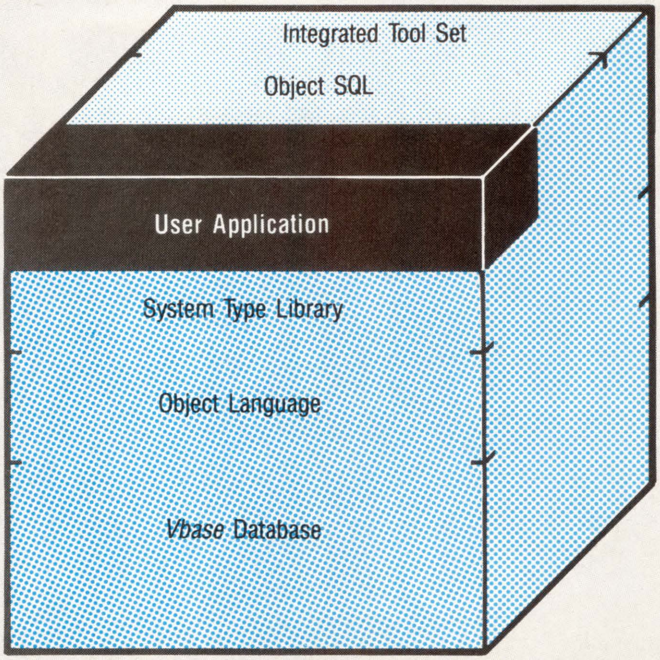
—Evan Birkhead

Multiuser *Vbase 1.0* Is Ready On VAX/VMS And Sun UNIX

With Its Integrated Application Development Language, Ontologic's Object-Oriented Database Is Even Suitable For CASE Designers



Integration of object databases allows a* Vbase *application to reference internal and external data and code.

An object-oriented database allows programmers to build more efficient data structures by letting them focus on abstract application models rather than on tedious codes and implementation details.

The technology, which recently has received significant development funding, is being commercially promoted on its relative strengths versus application development methods using relational databases. The ability to write software in terms of application-specific units offers dramatic improvements throughout the software development process, believes Ontologic, formerly Mosaic Technologies, which is among the front-runners in the race to implement object-oriented programming methods.

Others include Servio-Logic of Portland, Oregon; Stepstone Corporation (formerly PPI Inc.) of Sandy Hook, Connecticut; and Graphael, which is based in France. *Postgres* from Relational Technology and *Iris* from Hewlett-Packard are relational database extensions directed toward a similar user market.

Ontologic produces an object-oriented application development system called *Vbase*, currently available in Release 1.0, a multiuser program specifically designed for VAX/VMS and Sun workstations. Future versions of *Vbase* will target workstations from Apollo and IBM.

Vbase is a system modeling software that incorporates object, or conceptualization, methodology. The software environment is composed of four facilities:

1. A database that stores objects.
2. An object language. The *Vbase* object database actually combines the object language with database functionality. The proprietary C Object Processor Language (COP) is based on C and is used to implement the operations of objects defined using a proprietary Type Definition Language (TDL). This allows the developer traditional database functionality within an object paradigm, according to Mark Fourman, Ontologic's international marketing manager.
3. A query facility based on SQL.
4. A System Type library that stores object types that can be used as application building blocks. In this library, data types can be defined by the user and active objects, not just data, can be stored physically. During application development, *Vbase* is capable of integrating text, graphics and geometric figures in the same model.

The idea behind *Vbase* is to use object technology to extend relational database applications by adding complex data structures.

Vbase was given its initial workout at 50 beta sites, including major universities, CAD companies, CASE developers, aerospace industries, automobile manufacturers and other CIM users. Other interested software markets could include configuration management and project management developers.

According to some CAE software producers, who often don't feel that relational best suits their needs, it's likely that future CAD and CAE applications will be built entirely on objects. This could happen as early as the next generation of releases. Less subdued supporters of object methodology claim that object databases will eventually surpass relational systems in commercial database markets.

Depending on CPU type, *Vbase* prices range from $10,000 at the workstation level, to $20,000 on a MICROVAX II and up to $80,000 on an 8600. That includes one CPU license and COP. For more information, contact Ontologic Inc., 47 Manning Rd., Billerica, MA 01821; (617) 667-2383.

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Hewlett-Packard Targets Laser Printer To Multiuser Environments

HP LaserJet 2000 Printer Makes An Impact On The Page-Printer Market

Hewlett-Packard is paving the way in the multiuser environment with its first product targeted to this market, the HP LaserJet 2000 printer. The printer is designed for a number of multiuser computing environments, such as PC networks and multiuser systems including DEC's VAX computers and Data General's MV computers.

The HP LaserJet 2000 printer with its 20-page-per-minute print speed offers advanced paper-handling features, increased graphics memory and 34 internal fonts.

Comparable in size to a small departmental copy machine, it's available in three configurations:

1. The standard Model 2684A features compatibility with the industry-standard HP PCL printer language; 1.5 MB RAM; full-page, 300 dots-per-inch raster graphics; two 250-sheet input bins and a 1,500-sheet correct-order output bin.
2. Model 2684P has the same features as the standard model plus a third paper-input bin that holds 2,000 sheets of 8.5-inch or European A4 paper.
3. Model 2684D features automatic two-sided duplex printing, enabling users to print two pages of information for the price of a single page. Also, it has a third 2,000-sheet paper-input bin.

According to Douglas K. Carnahan, general manager of HP's Boise, Idaho Division, "With its high speed, extensive software support and ease of use, the LaserJet 2000 printer should have a strong impact on the growing market for mid-range shared-office printers.

"It has a monthly print volume of up to 70,000 pages at a cost per page of approximately one cent, better than half that of the current HP LaserJet printer."

According to the market research firm of Dataquest, San Jose, California, the 11- to 20-page-per-minute printer market is expected to reach approximately $550 million (43,000 units) this year.

The HP LaserJet 2000 printer supports HP's PCL printer language. As a result, more than 600 HP and value-added software programs that run on the LaserJet, LaserJet PLUS, LaserJet 500 PLUS and LaserJet Series II printers are compatible with the LaserJet 2000 printer.

In addition to the high-volume paper-input bins and 1,500-page correct-order output stacker, the LaserJet 2000 printer supports the following six paper sizes: letter, legal, ledger, executive, European A4 and A3. Users can choose the appropriate paper size remotely from the application software.

To save printing time and paper supplies, the printer's intelligent formatter and advanced paper path can recover from paper jams without reprinting the entire document.

RS232-C/422, Centronics and Dataproduct's Short and Long Line interfaces are available for the LaserJet 2000 printer. The printer's 1.5-MB standard RAM is expandable in 1 MB increments to a total of 5.5 MB. This added memory is useful for applications requiring duplex graphics, extensive downloadable fonts and 11 x 17-inch graphics.

In the 20-page-per-minute laser printer market, the LaserJet 2000 printer offers an extensive selection of internal character sets. It supports 34 resident fonts, including a variety of type faces. Additionally, automatic font rotation allows fonts in limited orientation (e.g., portrait only) to be printed on the LaserJet 2000 printer in either portrait or landscape orientations.

A number of special symbol sets, such as DEC technical, mathematical, scientific and international symbology, are available for different typefaces, as well as different type sizes ranging from 8 to 14 point. In a multiuser setting, this ensures access to a variety of font offerings.

In addition, the LaserJet 2000 printer simultaneously can support up to three different laserjet-compatible cartridge fonts as well as downloadable soft fonts and electronic forms.

The 1-MB add-on memory module is $750 and printer interfaces are $500 each.

The standard HP LaserJet 2000 printer, Model 2684A, lists for $19,995. HP Model 2684P, which includes the third 2,000-sheet input bin, lists for $21,995, and Model 2684D duplex HP LaserJet 2000 printer lists for $25,695. All printer models have a 90-day warranty. For further information, contact Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303; (800) 367-4772.

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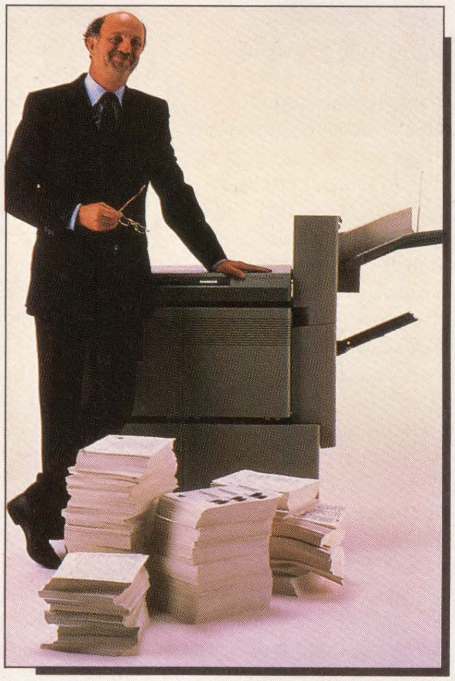

The HP LaserJet 2000 printer is designed for PC networks, multiuser systems and minicomputers.

Virtual Microsystems Enters PC Applications Arena With DECNET Server

80286-Based Shared Bus, Licensed Standards At The Heart of V-Server's *Philosophy*

Virtual Microsystems Inc., best known for its Bridge System series of connectivity boards, has decided to pursue the competitive MS-DOS server market with the *V-Server*, a system built on a 286-based network processor, not the industry-prominent 386. With software residing on the VAX host and the AT-sized *V-Server* system box, the unit is designed to let VAX users access PC software applications from either its terminals or VAXSTATION front ends. Through the *V-Server,* files are stored in PC format on VAX disks.

Because it's upwardly compatible with Bridge modules, the *V-Server* easily shares its network space. The two can share PC applications and data files residing on the VAX and can be accessed interchangeably by a terminal user.

Virtual's approach to PC applications serving is twofold: *V-Server* implements the 286, so each user is independent and theoretically experiences no performance degradation, whereas the 386 is multiuser; and Virtual licenses industry-standard products for the *V-Server*, including Digital's DECNET version 5.0, the PCSA networking card and VMS Services for MS-DOS. Over DECNET, the *V-Server* uses I/O routines from VMS, resulting in higher response speeds and less VAX overhead, according to the company. With the Digital card, the *V-Server* attaches directly to the Ethernet, Thin- or ThickWire.

"We frequently see the PC on Ethernet," summarizes Gianluca Rattazzi, Virtual's president, "but not necessarily accessing onto a VAX." He intends to direct his marketing efforts toward commercial VAX sites with a need for transparent access to applications.

Rattazzi feels the 286 approach is "closer to the networked PC philosophy," maintaining that network performance isn't affected when more than one user is on the system and crashes don't result from malfunctions in single nodes.

The *V-Server* is responsible for running the DECNET software and orchestrating network processing and I/O flow. Each client processor runs at 12 MHz and can be configured with 1 MB RAM, upgradable to 4 MB in a multiclient arrangement. It includes a serial port and a 1.2-MB floppy drive and controller. The *V-Server* supports up to 24 virtual disks with 32 MB each.

The backplane is compatible with an AT and has 12 slots. Five additional client processors can be added for each *V-Server* that's added to a network.

An important component of Virtual's new VAX-to-desktop strategy will be its OEM agreement with Ungermann-Bass, manufacturer of Net/One and Access/One networking products. Robert Laughlin, the DEC Connect manager at Ungermann-Bass, said that his company will license Virtual's network coprocessor technology, "based on the fact that VMI's methodology has no significant drain on the VAX host."

In addition to its PC-based LAN, Ungermann-Bass reportedly developed the first LAN product with Ethernet support for the PS/2.

The *V-Server* is priced at \$11,500 for a basic three-user configuration. For more information, contact Virtual Microsystems Inc., A Rossdata Company, 1825 S. Grant St., Suite 700, San Mateo, CA 94402; (415) 573-9596.

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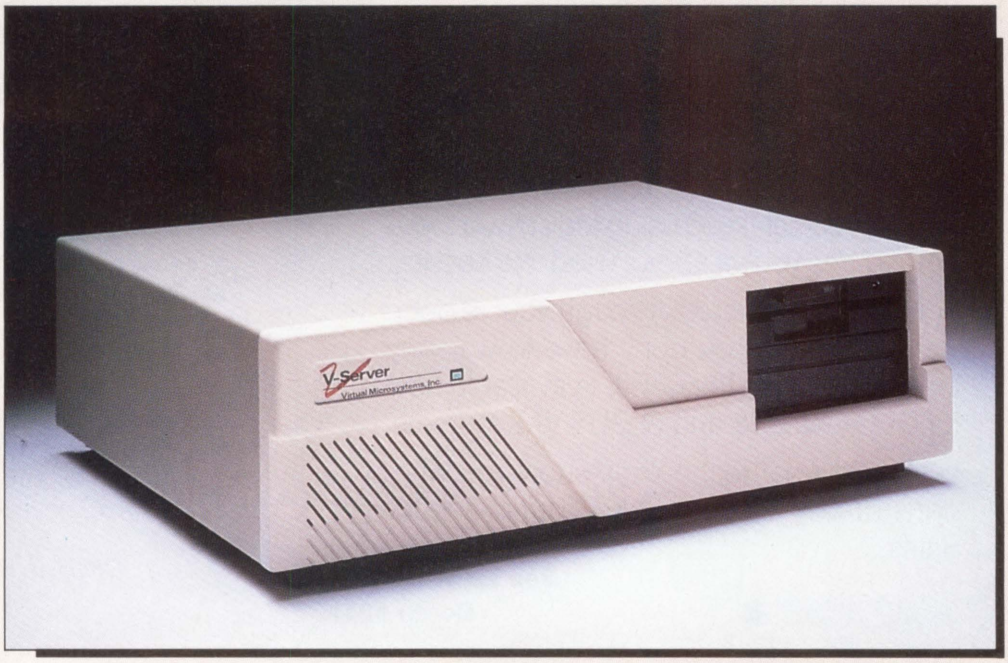
—Evan Birkhead



The V-Server *carries three-to-eight concurrent users.*

Computer Integrated Manufacturing

UNTIL NOW, organizations have suffered from a lack of practical, manageable implementation plans.

BY SUE ANN HAWLEY

FOR 15 YEARS, CIM has been championed as the savior of U.S. manufacturing ills by applying computers, networks and software to optimize the manufacturing process. The concept has grown to represent a broad-based information system, capturing data throughout engineering and manufacturing, and reaching out to encompass the entire organization.

Now there's an effort, called inter-organizational CIM, (I-CIM), to bring subcontractor vendors, suppliers and customers into the CIM loop. This integrates factory floor production to engineering, purchasing, accounting, upper management and external organizations, resulting in productivity gains from such an enterprise-wide integration of information.

However, the practical implementation of this solution has suffered. The technology is available, but the implementation and, more frequently, the integration is lacking. In many instances, independent manufacturing functions have been automated as isolated operations, called islands of automation. Anticipated productivity improvements haven't been realized because of the inability to bridge these islands. Lack of standardization in communications and networking has prohibited progress toward widespread computer integrated manufacturing.

There also are restraints on the human side. Incorporating new technology can present a dramatic change in the culture of an organization. Tom Glisczinski, president of Intercim, a CIM software firm in Burnsville, Minnesota, explains, "Managers are traditionally looking for sure things, like measurable ROI. The benefits from CIM are less tangible, softer. It is understandably difficult for organizations to face the prospect of redoing their entire manufacturing concept."

Typically, upper management hasn't had experience in factory automation. Regarding computer integration, the factory floor has been one of the more conservative departments in an organization. Its domain has been execution as opposed to innovation. Organizations as a whole have suffered from a lack of practical, manageable implementation plans. "Now that foreign manufacturers are realizing productivity and quality gains by applying some of these concepts, we are finding that we're not prepared to compete," says Glisczinski.

So, both the CIM vendors and users look for technology that can diminish the challenge of implementation and integration. Implementation becomes a management issue, and integration means tying hardware, networks, software, old machines, new machines and a variety of vendors. Those manufacturers with successful installations cite reducing the complexity of integration, through standardization, as the key to success. Boasting the beauty of a single-architecture approach, the CIM integration area is where DEC shines.

USAF Flying With CIM

With promises of lower costs, improved quality, higher throughput and flexible production, CIM is an attractive path to take. So, when the U.S. Air Force (USAF) wanted its suppliers to improve their manufacturing processes, it looked to CIM.

The USAF relies on the F-16 jet fighter. Built to USAF specifications by General Dynamics in Fort Worth, Texas, the USAF is funding 81 percent of a $13 million Advanced Machining System at General Dynamics. In implementing a CIM system for machined part fabrication, the Air Force "shares the cost and the risk inherent in such a project," explains Captain Brian Wilson. Looking for ways to reduce costs by advancing technology, the Manufacturing Technology Division at Wright Patterson Air Force Base in Dayton, Ohio, set forth these objectives in creating a totally unmanned, paperless production environment:

1. Reduce production span time, inventory requirements, direct and indirect labor.
2. Reduce lead time to prepare for production of aircraft.
3. Establish a link between engineering and shop floor functions.
4. Integrate technical and management information to control production better.

Westinghouse Electric, as prime contractor, is responsible for overall coordination and integration of General Dynamics' Flexible Machining System (FMS), a portion of the total Advanced Machining System. Westinghouse is supplying the VAX-based, system-controlling software and subcontracting to other vendors for machine tools, material handling systems and inspection cells.

> ... upper management hasn't had experience in factory automation ... the factory floor has been one of the more conservative departments in an organization.

The FMS uses distributed processing to update manufacturing data, employs AI techniques for scheduling and automatically controls a completely unmanned manufacturing cell. For this control system, DEC was chosen by Westinghouse and General Dynamics. Westinghouse, like many software vendors, develops a lot of software for the VAX. "We work with DEC, because it's easier for us," says Jim McMahon, program manager in Westinghouse's Automation Division. "Because of VMS compatibility, we can move our software from one VAX platform to another with relative ease.

"General Dynamics wanted DEC because of its tradition of support. In this project, DEC has provided three on-site support people and an inventory of spare parts to General Dynamics.

DEC's Standing

According to CIMdata Inc., a research and consulting firm in Wellesley Hills, Massachusetts, the total U.S. CIM market is $23 billion. It estimates the computer/workstation/terminal category of that market to be $6.4 billion, with DEC holding approximately $2 billion.

What has contributed to DEC's 30 percent market share? "DEC's superior networking architecture," claims Don Bell-Irving, manager CIM application marketing at DEC. "The challenge in CIM is not just automation; it's integrating those islands of automation, tying functions that have been automated using hardware and software from a variety of vendors."

"To be viable in this market, a CIM software vendor needs to offer a solution to address the entire range of applications within its customers' organization," says Bell-Irving. A vendor can focus on developing software applications within its own area of expertise and look to DEC for complementary software and hardware devices. "That's our ticket," says Bell-Irving. "It makes us a valuable partner to the vendor."

A Case History

CIM software vendors are finding that a partnership with DEC is a necessity rather than a luxury. One vendor found that 60 percent of the market was closed off, because it didn't have a DEC-based solution. "We had an IBM offering and it wasn't enough," says Mike Viola, vice president marketing and sales for Intercim Corporation. "When I met prospective customers, many would ask for software to operate on their Digital equipment. We had a good IBM solution, but so many of our prospects already were committed to Digital. If Intercim wanted to be in this business, we had to have a DEC offering as well as IBM."

Intercim Corporation, formerly XTAL Corporation, had been implementing CIM software solutions to Fortune 1000 companies for five years.

CIM At Cummins Engine

Cummins Engine Inc. in Columbus, Indiana, is one of this country's world-class manufacturers, ranking 160 in the Fortune 500 list of manufacturers. Its diesel engines are specified by more than 50 percent of the customers ordering heavy duty trucks in North America.

To fuel its success, Cummins adopted a strategic direction of "art to part" — interfacing CAD to CAM, machine tools, gauging and feeding information back to CAD. The catch here is integrating across boundaries of different equipment, operating systems and departments.

To meet this challenge, Cummins established an Advanced Manufacturing Technology group to implement CIM throughout the organization. Senior CIM Engineer Steven Sellin explains the Cummins strategy, "To be responsive and cost-effective, our manufacturing flexibility is key." So with business objectives of cost, quality and delivery, Cummins has instituted a company-wide effort to introduce manufacturing technology and integrate it to the design and engineering phases. "We understand the need to integrate and that's the function of the CIM group at Cummins."

At Cummins, a large number of machine tools relied on a tape system to transfer programming information. This manual system served a large number of different machine tools and operators. The physical nature of the tape system left room for error. If the tapes weren't returned for updating after each run, the data wouldn't be current for the next run. Also, tapes can be misplaced. Cummins' goal was to eliminate tapes and develop a standard interface to the various numerical-controlled programming systems.

Both Intercim, a Minneapolis-based CIM software vendor and DEC played an important part in automating and integrating this process. "Intercim didn't require specialized hardware but provided software to interface to the machines," explains Sellin. "We already had a lot of DEC equipment in place, and we could continue with a standard network. With this approach, we cost effectively put Intercim's software in a large number of locations. It gave us a friendly, menu-driven interface that brings the operator up to speed quickly. Now, on any machine tool, our operators work with the same interface."

But the company was losing business to competitors who could supply VAX-based installations. It needed a DEC-based offering to survive, and developing one from scratch was out of the question.

According to Jim McGuire, Intercim's CEO, "The cost of developing our own DEC-based products was prohibitive in terms of both dollars and time. We estimated that an in-house development effort would take two years. So, we decided to look for an existing product line that we could combine with our own IBM-based line," continued McGuire. "That's when we found the opportunity to merge XTAL with Manufacturing Data Exchange (MDX), an established vendor of DEC-compatible software." The merger took place in November, 1987. "It took a complete restructuring of the company," admits McGuire, "but now Intercim is a viable contender in the competitive CIM market.

Issues For Users

For users on the factory floor, DEC is the hardware platform of choice, regardless of industry, from the processing of chemicals and petroleum to the discreet manufacturing operations of automotives and electronics. VAX-based CIM installations are found primarily in the Fortune 500 size corporations. Although small to mid-size manufacturing facilities would benefit from the automation CIM provides, the large organizations need it to survive. "The large corporations tend to have the problems in integration that DEC solves so well," says Bell-Irving.

Yet these same large organizations currently are stymied by the debate over a standard communications protocol.

FOR USERS ON the factory floor, DEC is the hardware platform of choice . . .

The controversial Manufacturing Automation Protocol (MAP), touted by General Motors and its suppliers, has divided the major CIM vendors. But today Digital insists it is an active supporter of MAP and has plans to develop and market future MAP products.

The MAP debate doesn't distract Westinghouse. As McMahon explains, "We have our own direct data highway to VAX, and we also have a protocol converter that gets us to MAP."

DEC's Role

The enterprise-wide concept of CIM calls for integration across all levels of an organization. DEC's product strategy for the CIM market addresses all these levels with unit control, area control, plant-wide and corporate-wide systems. Emphasizing information flow, DEC defines CIM as "automating and integrating the entire manufacturing enterprise from factory floor through the manufacturing office. Although DEC's strategy is comprehensive across an organization, its installations haven't followed suit.

Typical manufacturing scenarios reveal that the organization is divided into three levels, with the prominence of any one vendor changing from one level to the next. "At the control level, it's a mixed bag; a variety of vendors. But when you move to the manufacturing cell level, it's mostly DEC," says

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McMahon of Westinghouse. Above that, IBM gains favor in administrative and control functions like Material Resource Planning (MRP).

The large manufacturing organizations, dominated by IBM at the administrative level, are the same organizations providing DEC with the largest installed customer base in factory automation. Manufacturing people are comfortable with DEC, as is administration with IBM. DEC may have the technology, but the politics aren't resolved yet.

Obstacles

The CIM market, for all the research and theoretical promise, hasn't exploded. Manufacturing has yet to leap ahead with the technology that's currently available. Many cite manufacturing's reputation for being slow to adopt new technology. But vendors and users disagree. "It's true that the technology has been available, but implementable solutions haven't," says Intercim's Viola. "The industry hasn't lived up to its potential, because vendors haven't come to their customers with viable, manageable plans to implement CIM."

"The real payoff comes in integrating the entire enterprise," says Bell-Irving. "However, when a customer decides he wants CIM, it doesn't mean he'll automate his entire organization all at once. Customers have been automating piece by piece, which is okay as long as there is a plan to guide them through the process."

Developing a plan means defining the overall problem, evaluating the potential solution and understanding the benefits. More than just hardware and software, the plan means communicating with all groups in the organization who will be affected, who could benefit from CIM. "Organizations considering CIM need to get both the input and the ownership of all participants before they go shopping for technology," recommends Viola.

It also means bringing together two disparate cultures, MIS and factory floor. MIS expects problem definition, requirements and specifications, as it would in any implementation. Often the factory floor is technology driven instead. And upper management hasn't been prepared to develop a plan that considers these and other human issues, in addition to the technical issues.

Across industry, the right solution will be requirements driven rather than technology driven. The practical solution will be built and implemented in manageable, measurable steps to maximize productivity gains and minimize disruption. The best solution will be extendable over time to reach further into the organization as resources and technology permit. *—Sue Ann Hawley is a marketing communications consultant for software companies in Bloomfield, Michigan.*

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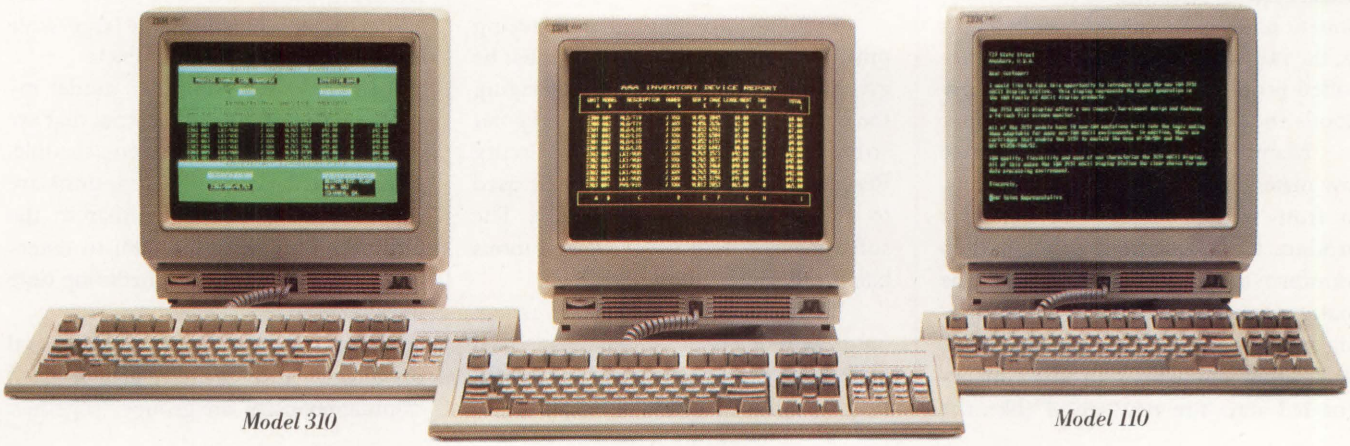

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Buy-Make-Sell

Computerized Manufacturing Planning

MODELING THE manufacturing process can lead to efficiency and savings. BY JOHN STANEFF

MANUFACTURING IS BASED on a continual cycle of buy, make and sell. Component parts and materials are brought in, the plant massages them into a value-added product, and then sells the new goods to a consumer.

Manufacturers generally purchase raw materials from other manufacturers, or from miners (those who extract a product from a natural source), then transform them into finished goods. The material used may be pig iron for making steel, sheet steel for making desks, or another company's product incorporated into the new good (like the machine screws used to assemble a desk).

Each area of the manufacturing pinwheel — buy, make, sell — must be given equal attention when managing the manufacturing operation. Computer software, called Manufacturing Resource Planning (MRP), may be used to aid the management activity. The software seeks to achieve a harmonious balance between the phases.

Today's MRP software is an outgrowth of a body of work also called MRP. Here the initials stand for Material Requirements Planning. This work has been a mainstay of computing in manufacturing since the mid-1970s, with earlier implementations on large-scale computers since the mid-1960s.

In MRP, the computer model inverts a series of bills of material that are called out by the production schedule. The inverted product descriptions are examined in a manner similar to the Critical Path Method (CPM) to determine detail component scheduling time lines.

Components common to several products, and which are needed "simultaneously," are grouped together.

Parts needed, but for which an on-hand supply is sufficient, are excluded from further scheduling because they can be drawn from stock. Parts bought from suppliers are ordered for carefully timed delivery. Parts that must be made are scheduled into work centers. The process identifies such snags as inadequate supplies of raw materials, missed production dates and projected manpower shortages.

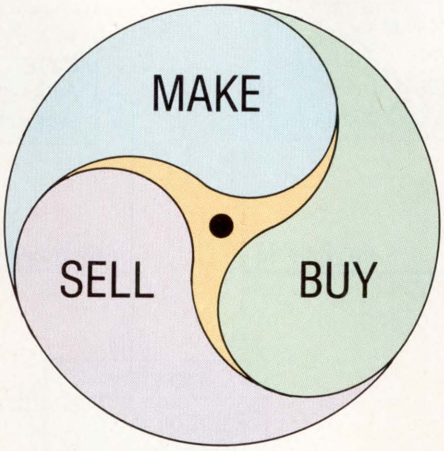
Bills Of Material

To produce a good from its various components, the manufacturer must have a picture in mind of that completed product. A typical way to represent the product is to begin with a drawing of the finished product, then to "explode" that with a hierarchy of drawings that represent component parts and assemblies. This process is similar to using a structure chart to describe a computer program. The actual representation may be on paper (tracings), or within a computer using computer aided design (CAD) software.

This obviously is a tedious process, especially when the number of individual components for a product climbs into the hundreds and thousands. There's tremendous pressure to "standardize," to use common parts and subassemblies across several products. The pressure is one of economics; the manufacturer can't afford a production-line mistake where a wrong part was used, nor can he often afford to stock all possible sizes of machine screws. Manufacturers frequently select a standard size of screw, or bolt strength, or drawer size, and stay with that standard as long as possible. Resistance to change is built into the manufacturing process as a matter of self preservation.

Even with standardization, the number of assemblies and products made by the manufacturer often will make it difficult to stay on top of the volume of data about parts and assemblies. Typically, each part and assembly is numbered to that starting with the end product; the production planner can find all components by finding the drawings called out at each new level in the hierarchy.

Because of standardization, many parts and assemblies are called out in this way for different end products. Combining the standard parts into a large



production run often is done by seat-of-the-pants guesswork in manual scheduling.

The hierarchy of parts and assemblies making up a product is called its bill of material. This can be computerized easily using two data structures. First, an item record calls out descriptive information about the part or assembly, and may include inventory or purchase information as well. Second, a product structure record calls out linkage information that specifies each higher up level for which the item is used.

Computerized algorithms then can be used to call out all of the component parts and assemblies for a product, or to call out all the products that use a standardized part or assembly. Use of a computerized bill of material can be an aid to further standardization as the product designers discover very similar parts or assemblies and uncover their separate uses.

Master Schedule

Manufacturing ties up liquid assets (cash) into goods that must be sold in order to regain the initial asset and, hopefully, a profit. The idea is to tie up cash only in a product that will turnover or sell.

Two schedules combine to become the "master schedule." These are scheduled sales and scheduled production. The manufacturer must guess in advance at the future sales of each finished good. Individual customers remain unknown; that they will buy is the only certainty. Ensuring that enough customers will buy to meet a schedule is the responsibility of Marketing and Sales.

The sales schedule usually is shown as a forecast and an actual sales volume. The forecast is used to predict stock levels and to know when to issue a production job order. The actual sales volume is a check on the forecast and supersedes the forecast when warranted.

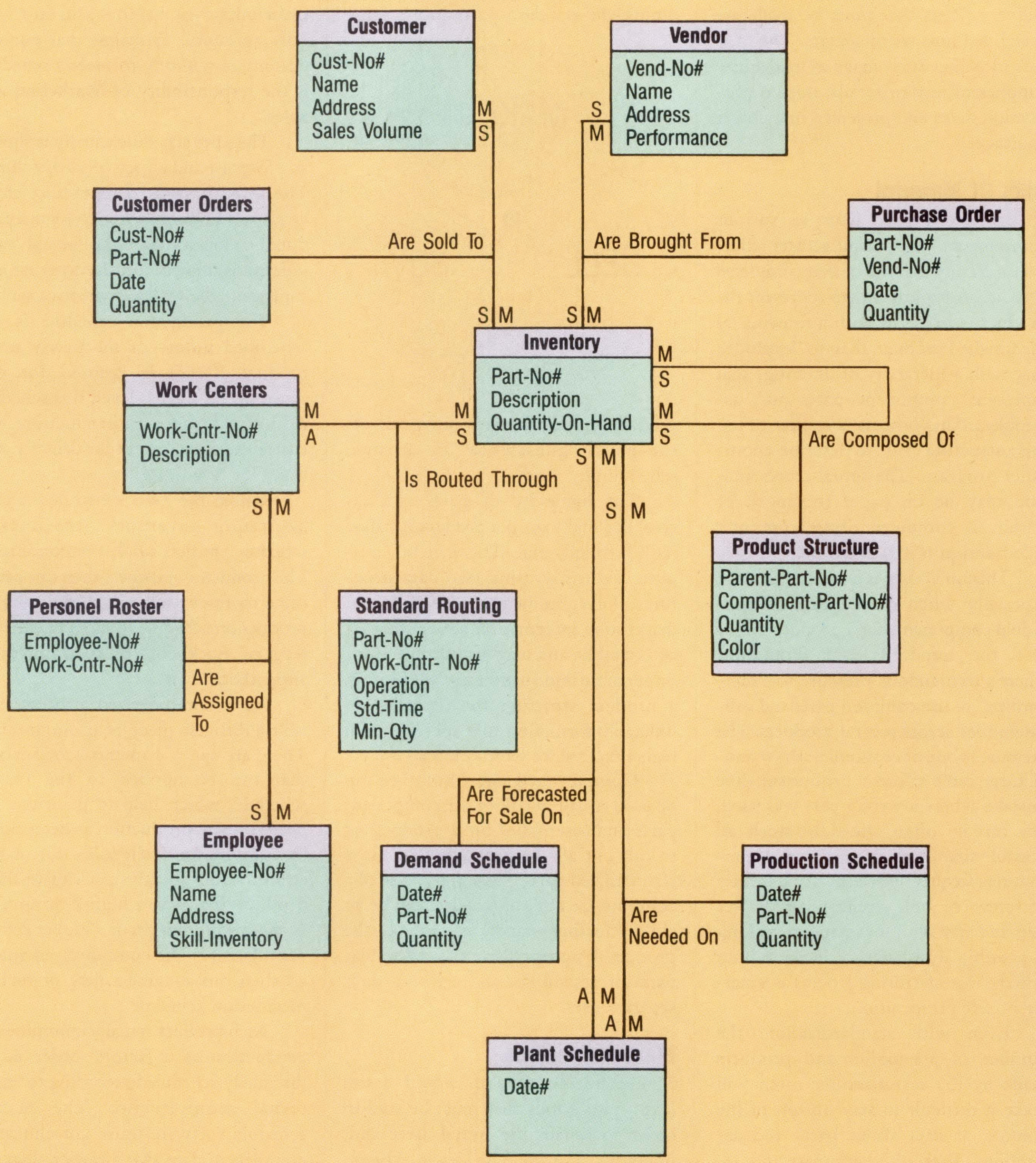
The production schedule is the scheduled inflow of the newly made product. Detail is ignored for this schedule. At a gross level, this schedule is used as a check on production; will customers need to wait for delivery, and if so, for how long?

Using the two schedules, and a beginning inventory, the master schedule predicts stock-out conditions. The production planners then can determine to reschedule either the sales or production schedule to moderate the effects of stock outs or to avoid them altogether.

As a computerized process, this isn't a difficult piece of programming. There are specific methods of analysis that can be applied to the master schedule, which help to prioritize the need for new production as determined by the master schedule. An A-B-C stratification quickly can isolate those products that have a higher turnover, a higher profit margin or a higher cost of manufacture. The computerized analysis then can suggest a new or revised production schedule.

Each product actually committed to production as a factory order is individually scheduled according to its internal requirements. The master schedule software must not allocate a completion date that's earlier than the shortest critical path of production for the finished item. This lead time is a limiting factor for sales schedules; you

Figure.



Entity relationship diagram for the computerized manufacturing planning model.

can't sell what you don't have, so you "lay low" on an out-of-stock product until it's again available.

Inventory Control

Knowing how much of a product to make is a function of expected sales and known production. It also is affected by knowing the current stock on hand.

Stock on hand represents an investment in goods and materials that quickly needs to be converted into cash. Except at the highest levels (finished goods), inventory stock is used up only by including it into a new finished good. Making or buying additional quantities of an inventoried item depends on the level of turnover. For instance, one size machine screw may be used in a thousand different assemblies and constantly be purchased, while a special drawer slide may be used in one or two unusual products and rarely needed.

Inventory, then, is really a multitiered concept. There are parts and materials awaiting inclusion into assemblies. There are assemblies awaiting customer orders for special products, so that they can be assembled to order. There are finished goods awaiting customer purchase.

Each level of inventory may be accounted for differently in the inventory system. It may be that each level is taxed differently with respect to the amount of value added. For instance, a fully built desk, in a box and awaiting shipment, may have a value as a finished product that's based on its expected sales price. In another instance, drawers, pedestals and desk tops may be valued at cost as incomplete parts. Whether for tax purposes or not, the value of inventory is different in these two cases because of the amount of labor invested. The finished product certainly has more labor in it.

Computerizing inventory data usually is a matter of adding appropriate fields to the item record. Each part, assembly and product is inventoried, as are raw materials. Once inventoried, the quantities on hand are easily checked by computer to determine whether or not certain items must be purchased or produced.

As seen earlier, issuing a new-product job order causes the computer to analyze each part in the bill of material to check its current on-hand (inventory) status as compared to the job order's need. The inventory records track this need under a "committed" value. The quantity committed is the number of the item so far allocated to production job orders (aside from finished goods items). So, the amount to make must be a combination of specific needs, production commitments, and current stock on hand.

From a profit-and-loss perspective, inventory also monitors standard and actual cost of goods produced. A computerized inventory system can monitor specific component items easily through the manufacturing process and post completed average cost to the inventory record. These numbers then are used to show an over/under report that details the company's experience in producing items versus what it had expected to experience. The over/under report shows variance from standard cost and can be an effectual means of controlling the production process.

Subsequent to completion of an assembly, or a finished good, all component costs can be "rolled up" into the completed item to produce a basis for the individual cost of goods produced. Analysis of an over/under report for finished goods that also shows expected sales volumes in an A-B-C stratification can serve to help set or adjust product selling prices.

KNOWING HOW much of a product to make is a function of expected sales and known production.

Critical Path Analysis

If you can envision the hierarchical chart of a bill of material somehow laid on its side, you can see that a CPM network has been made. Some paths of the hierarchy are longer than others; some paths of the hierarchy take longer to follow when building the product. Often, portions of the hierarchy need not be considered because the parts and assemblies represented already are inventoried.

When the structure is drawn, the individual quantities of components are multiplied out to the lowest levels. For instance, if a desk requires four drawers of one type, it also requires four times the number of drawer slides, and drawer fronts, etc. Because other drawer types also may be needed, there's a certain amount of accumulation of quantities that can be made for multiple occurrences of the same part. These summed counts are substituted for the first use encountered for the part, and all other uses are marked as following completion of the part.

The remaining chart, with common usage of parts indicated and components already on hand deducted, is now ready to be scheduled. The CPM method is employed to determine the critical path through the chart. The amount of time required, then, is the best case for scheduling. After applying necessary purchasing lead time, which may adjust the critical path, the earliest time the product could be produced is determined from the moment of issuance as a job order.

It's possible that the product can't be produced within the constraints of the production schedule, even if all other production were to cease. This data can be used to adjust the master schedule, causing a recomputation of all MRP processes, or to highlight areas where expediting and specialized make-to-order

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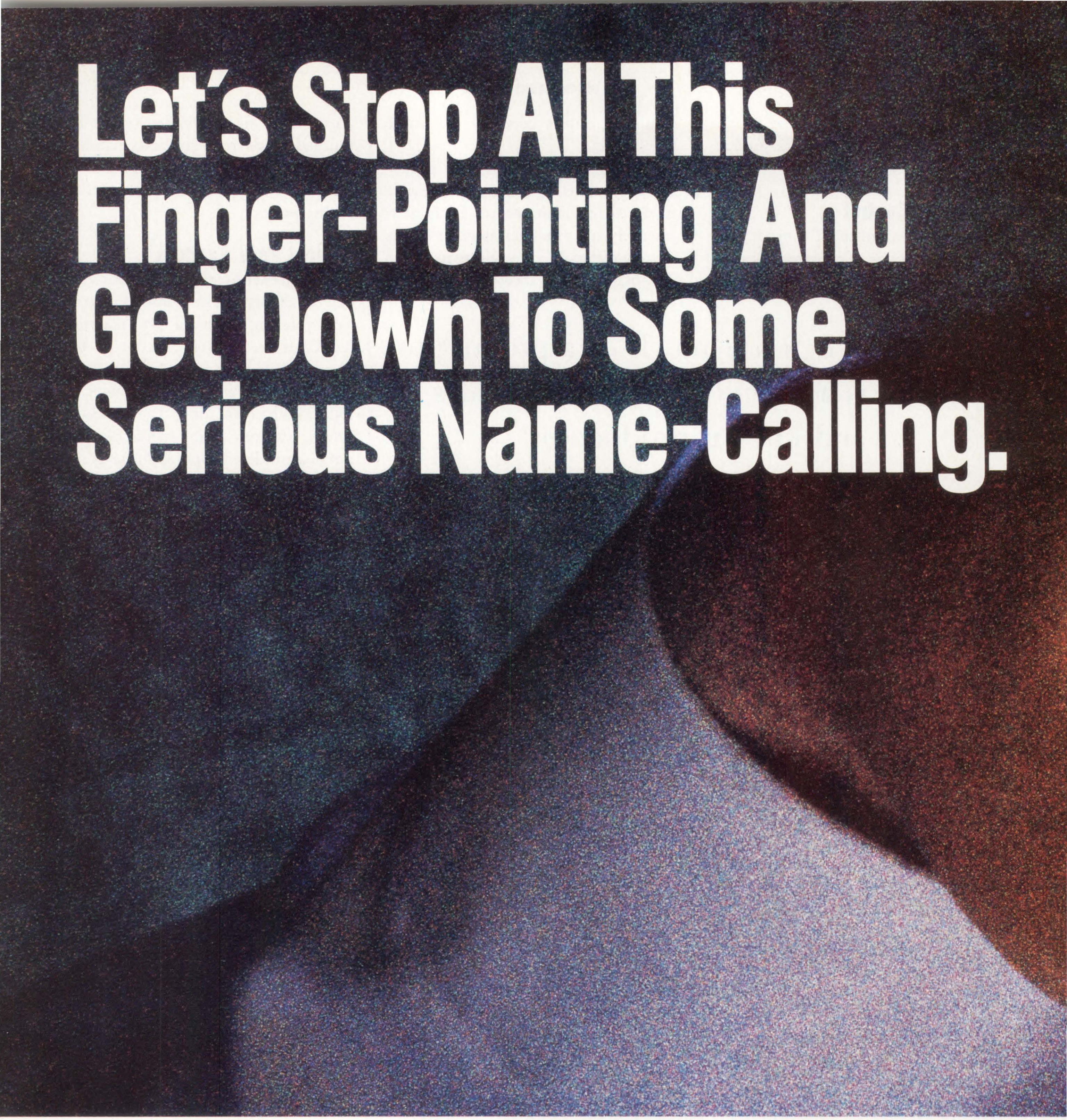

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processing will be necessary.

The computerization of this process is fairly complex, blending bills of material, small levels of accumulation, inventory records, production and purchasing lead times, and the critical path method. Such things as labor and material shortages or equipment malfunction will throw the schedule out of line. So, the CPM analysis is simply an estimate of the time required.

STOCK ON HAND represents an investment in goods and materials that quickly needs to be converted into cash.

Accumulations

The process of standardization easily can bring significant economy to a manufacturing process, but only if each need for the standardized component isn't filled individually. To avoid this, manufacturers may use various methods.

In one method, a safety stock level is set and monitored for an inventoried item. Whenever the inventory stock drops below that level, the manufacturer automatically issues a purchase or production order to replenish the stock on hand. Such orders usually are written to an economic order quantity, which represents the most efficient amount to acquire considering costs of acquisition and inventory storage.

Computerizing the safety stock strategy is of moderate difficulty and involves setting flags in item records and tracking safety stock and economic order quantity fields. Its calculations and order triggers appear in regular analysis of the inventory and whenever a product is scheduled into production. Of concern to this method is accurate recording of use when the stock on hand is lowered.

Another method for accumulation is to scan the production job orders to identify and sum occurrences of standardized parts. There are some obvious difficulties with regard to positioning the bounds of the period being scanned, and some less obvious difficulties associated with job cost accounting that's product oriented. (To what job do you charge the excess quantity?).

The actual accumulation process isn't difficult: Each part scheduled is put on a list along with its quantity and due date. The list is sorted by part and date. The accumulation by period then is a simple matter of summing up. Use is a matter of drawing from a temporary work-in-process inventory (usually kept on a skid somewhere on the factory floor). When the accumulation is finished and to be implemented, some care must be taken to back up the start date for the now larger quantity of items.

Computerizing this process is relatively straightforward. The snag of cost accounting can be overcome by producing the part to a separate work-in-process job number and distributing the average cost to the initial jobs as the inventory is depleted.

Standard Routings

As a bill of material details what components go into a finished product, a "standard routing" details the steps necessary to build the product. Each part and assembly in a product has its own set of routing steps. At each step some new operation is performed on the item, carrying it along until it achieves its own identity. Once completed, it may become part of a higher level assembly.

A routing details the individual steps required to obtain an item. For example, a drawer bottom may need to be cut from sheet stock, then have holes punched in it and the sides bent up to provide support channels. The standard routing describes these steps and also details the standard time necessary to do each step. The specific work centers where the operation is to be performed are noted, as is unique tooling.

The source of information for standard routing is initially the product designer. The drawing calls out specific operations necessary to make a part or assemble an assembly. Production scheduling will amend the routing by specifying exact operation codes and tool identification. Cost accounting and product scheduling will specify the standard times for each operation.

In a computer system, this file is ancillary to the item file; not all items are routed and most routed parts have multiple steps.

Shop Floor Control

The process of scheduling the component parts and assemblies through the factory during their manufacture is called shop floor control. Each scheduled part or assembly is constructed in accordance with its standard routing. Parts queue up at work centers and are processed according to a prioritization scheme (due date). Completed parts, at one workstation, are transferred to the next work center called out in their routing. When the routing is complete, the parts or assemblies wait in work-in-process inventory until needed in a higher assembly, or until they're stacked in a warehouse as a make-to-order or finished good.

Scheduling on the shop floor differs from production in a major way. The production schedule sets priorities; shop floor scheduling carries out those priorities and is subject to a wide variety of anomaly. At any given time the shop floor may be on or seriously off target. The real world of physical goods, uncooperative equipment and labor is the domain of production scheduling and of the shop foreman.

At an individual workstation, a laborer may track time spent on setup and operation for a given part on a given

job. This data is used later to contrast the standard cost to actual cost, to determine the efficiency of production and the accuracy of standard costs, and to track the job's progress through the factory. This data can be used to point out factory errors (missed operations, quantity shortages, etc.) as well as over or under optimistic production schedules.

From a computerization perspective, shop floor scheduling is forward looking. Production planning, as well as most of MRP, is backward looking to determine a start date that facilitates a given completion date. Shop floor scheduling works from what's available now and moves steadily forward until its stock of work is completed.

A computer model that not only looks at the current and next shift, but also predicts future cycles based on current work center performance, can help production management identify upcoming bottlenecks and isolate areas that could benefit by better production planning.

Purchase Order Writing

Almost all of the materials used in manufacturing are purchased from someone else. By determining what parts are needed, when they are needed, and which of those are purchased items, the manufacturer determines which parts to order. Further, if a vendor's past performance (delivery time, quality of goods supplied, etc.) is tracked, it's possible to predict how long it will take to obtain delivery on any given part.

In a manner similar to that described earlier, production control can sum up all of the purchased parts needed over a set period of time. The accumulation then combines parts needed across all jobs, and groups them together with other parts normally purchased from the same vendor.

By backing up the length of the longest lead time item in the list, the manufacturer can issue a purchase order ahead of time for the whole list of parts. The order can specify that individual items are to be delivered on certain specific dates (to minimize our inventory carrying costs).

Conceptually, this process is the same as writing up work-in-process jobs for the factory; a changed "factory code" shows an outside vendor as the "plant." The differences emerge when there's a need to expedite an order or when deliveries aren't made on time. For these cases, the system issues mini-work orders to Purchasing for specific tracing activities on earlier orders.

> THE INVENTORY monitoring process needs access to some form of conversion factor that allows easy cross reference between the two systems of measure.

Specialized Inventory Controls

There are several specialized inventory controls:

1. Raw Materials — Some inventories, like steel or other maleable raw materials, require special tracking. Often the material is sold by one measurement (e.g., weight) while it's used by another length. The inventory monitoring process needs access to some form of conversion factor that allows easy cross reference between the two systems of measure.

The special inventories also may require unique functions, like slit coil tracking from masters. For instance, coil steel is sold in coils that are 48 inches wide. A special mill called a slitting mill is used to cut master coils down to specific widths useful to the factory. Whenever a slit coil is in use and found to be defective, it's useful to know the identities (by coil number) of the other slits made from the original master coil. A process similar to bill of material software can be used to implement this feature.

2. Finished Goods Inventory — Items that are packaged and awaiting sale to a customer are finished goods. They represent an investment in product and usually are accounted for at market value. It's important to track these with care. It's also important not to oversell because an unexpected shortage can do damage to the manufacturer's reputation. Accurate inventory information ties into sales records, sales forecasts and master scheduling.

3. Make-to-Order Inventory — Items that can be packaged quickly into finished product, for shipment in response to sales, are make-to-order. These items usually are left partially complete and may consist of largely "standardized" parts and assemblies.

They are accounted for differently because less labor is used to create them, and also because they often can be combined with other parts and assemblies to produce alternate finished products. It's usually better to assemble an infrequently sold product from parts in a make-to-order bin than it is to pirate a finished product or manufacture a full lot.

These procedures operate on a common database. The Figure shows an entity relationship diagram of the various components of that database. The integrated data structures are based on a central item (inventory) file that has been amended to represent product bills of material hierarchically. Other structures radiate out from the inventory file, and represent the various operating entities of MRP.

Editor's note: For more on bill of materials and shop floor scheduling, see Mr. Staneff's articles "BOMP — Bill of Materials Processor," *VAX PROFESSIONAL* (February 1985), and "Stable Marriage Scheduling," *VAX PROFESSIONAL* (April 1986). *—John Staneff is an independent software consultant in Ellensburg, Washington.*

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Configuration Management

For Software Manufacturing

AUTOMATING a CM system requires close examination of your existing system and extensive evaluation of your future needs. BY DARCY F. YOUNG

CONFIGURATION MANAGEMENT PROBLEMS are common across companies. The environment of each company can, however, influence the magnitude of certain problems. The Engineering Support Department of Scientific Calculations Inc., a division of Harris Corporation, Fishers, New York, installed and developed a new configuration management (CM) system over the period of one year. This article examines the methods used to determine the requirements for the new system and the solution.

Scientific Calculations licenses CAD/CAM software for printed circuit design. The company's products consist of more than 850,000 lines of code and run on several different computers. The majority of the code is FORTRAN, but other code does exist written in ASSEMBLER and C. The company releases a product upgrade to customers approximately every nine months. There are also some prereleases or special releases containing specific high-priority projects. These special release configurations must be integrated into a general release.

The development life cycle comprises several phases, each of which is the responsibility of one or more groups. One group writes the specifications, several groups perform coding and debugging, another reviews code for compliance with company standards, and another is responsible for system testing. In addition, there is a configuration management group.

All functional changes applied to the software are defined as projects and tagged with project codes. These codes indicate the development group responsible for implementing the change. A product release then, is a collection of specified projects.

THE ORIGINAL CM system had evolved over several years. Tools were added as they became necessary to facilitate project development.

The Old System

The original CM system had evolved over several years. Tools were added as they became necessary to facilitate project development. Under our original system, VAX directories were used to separate project files that were in different stages of their life cycles. The first directory level contained files in the development stage for projects that programmers had completed. These projects were available for testing. The second level, a directory parallel to the first, contained files in the test stage for projects that had been approved by testers for compliance with specifications. Final full integration testing took place on this level. The final level, another parallel directory, contained files in the product stage (i.e., code that was last released).

A data file was associated with each directory level. It could be edited and contained information relating files to specific projects. If a single file was modified for more than one project, there was an entry in the data file for each project, but only the latest version of the file, containing the changes made by both projects, actually resided on the directory.

When a project was ready to move from one level to the next, hardcopy forms were filled out and submitted to the CM group, which moved the files belonging to the project and updated the modules to include the new files.

The CM group also was responsible for controlling the build (link) procedures, because the source code files were used in many different modules. A programmer would submit a hardcopy form to the CM group requesting that new entries be made to build command files.

Problems

In attempting to define the requirements for our new CM system, we closely examined the old one and found some major problems:

1. VAX directories — The practice of placing files on single VAX directories for the development and testing stages had introduced several problems:

a. Previously changed versions of files were overwritten with newer versions. Straight-line development of files was required; the system did not support parallel development.

b. All changes, even those to fix problems found in testing, had to be introduced to the CM system at the development level directory.

c. Projects that were developed in a specific order became tied together, causing delays in projects reaching testers.

d. Programming teams were responsible for remembering to move all pieces of a project from their own directories to the development directory when programming was complete. If pieces were forgotten, the test module for the first level was unusable.

2. Using hardcopy forms for communications — Communications by way of hardcopy forms, VAX mail and verbal discussions generated problems. Often the forms were incomplete or bypassed completely by verbal requests.

3. Reliance on one key individual — One individual had developed the CM system over several years. Had he left or not been thorough in tracking down each partial request, the development and testing environments and modules would have been unstable.

4. Loose code ownership — Many files that were loosely owned by one development group, were used by others in their executable modules. Any programmer could change any file, no matter to whom it belonged.

5. Source code conversion — Because the product code was executed on different computers, a programming team was responsible for converting the code from the development machine to the others. The conversion effort took place while normal product development continued. Both the conversion and the development teams needed to modify the same code and merge their changes at a later time. This environment required parallel development, which the CM system couldn't support.

6. Overwriting files — The straight-line development of files caused overwriting of previous versions of files. A second change to a file, a second project in the line of development, physically overwrote the first, causing the loss of the first version with only one project's change. Therefore, a file existing on either the development or test level could contain changes from any number of projects.

7. Control of module build procedures — Modifying the build command files was a tedious task for the CM group because it had to be done manually. Release projects aimed at streamlining modules should have been undertaken but weren't, because programmers couldn't change the build command files easily.

8. Tracking of test rejections — The system provided no way to track test rejections. If the test group found problems with a project, it was returned to the programming group. The programmers then had to fit the project back into the serial development of files. Fixing a simple problem often took longer than necessary, because the programmer would have to wait for the required files to become available. Also, the project with the problem was left on the test level, while the fix for the rejection was being introduced to the development level.

AFTER REVIEWING the existing system's problems, we interviewed managers, programmers and testers for additional requirements for the new system.

Additional Requirements

After reviewing the existing system's problems, we interviewed managers, programmers and testers for additional requirements for the new system. The following requests were made:

1. Provide enforcement of project plans — Managers wanted the ability to schedule projects and define project teams. They requested that the CM system enforce their authority in three ways:

a. It must ensure adherence to schedules. The CM system must not allow work to begin on a project until all stated priorities are complete.

b. The CM system must enforce the use of defined teams by verifying access privileges to team members.

c. The new system must prevent changes to code by groups outside the manager's control, unless those changes are allowed specifically by the manager responsible for the code.

2. Provide automatic notification — Both programmers and testers requested that automatic notification be used to speed projects from development through testing and to warn programmers of potential integration problems. Specifically, the standards review group should be notified as soon as a project is completed and waiting for standards review.

Likewise, the test group should be informed when a project has passed the standards review and is available for testing. Also, because the CM system logs all file claims by project, it should notify leaders of effected projects when parallel development of any file is initiated, because merging of the changes made in parallel will be necessary. With this notification, programmers from the different projects could work together to ensure that the changes are compatible.

Definition

With these observations and with the information collected, we were able to define the following requirements:

1. Store each project's changes to files — The new CM system would have to store every project's version of a file, not just the latest one. Programmers need the ability to trace the exact history of a file's development and simply and safely remove any given changes. Testers need the means to isolate projects when testing them for adherence to specifications.

2. Allow parallel development — The CM system would have to allow multiple projects to change the same files at the same time. It also would have to ensure that the changes made in parallel are merged to a single version for integration testing and release.

3. Provide a method for planning projects — The system would allow a manager to define priorities between projects. It also should allow programmers and testers to define integration dependencies between projects. Finally, the CM system must enable a manager to assign project teams, including a project leader.

4. Reduce paperwork and dependency on verbal communications — The CM system automatically should track project development and update executable modules as projects move into testing. It also should notify key people when major milestones in the development life cycle are reached. This automatic notification is necessary when moving projects among groups responsible for different phases of the life cycle, from project completion to standards verification to testing.

5. Track and control changes — The system should ensure that a user has

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proper privileges both to claim a file for modification and to return the file after changes are made. To claim files outside a project's code ownership, special privileges must be attained from a manager responsible for that code. In addition, the new system must track all file claims and code modifications to guarantee that the manager has ready access to this information and to ensure that all pieces are returned before the project is declared complete.

THE COMMANDS are provided to users through (DCL) and FORTRAN programs.

6. Give development groups control of module builds — Development groups should have control over both the content of executable modules and the methods used to build those modules.

7. Track and control test rejections — The CM system should allow testers to name a rejection and have the system track changes made to fix it. Fixing a rejection requires the programmer to update a completed project. It's a special type of code change and should be tracked as such. The system should ensure that any projects based on or developed from the faulty project also are updated.

8. Provide a complete, integrated system — All commands and tools related to the CM system would have to follow a single convention for input and messages, providing a cohesive shell.

The Solution

Scientific Calculations' staff developed a solution satisfying these requirements. To implement it, the company purchased the *Change and Configuration Control (CCC)* software product from Softool Corporation, Goleta, California, and built a customized shell around it. The shell allows us to interface to CCC through batch command procedures.

Each command is a high-level one geared to a specific need. The commands are provided to users through Digital Command Language (DCL) and FORTRAN programs.

The shell we built allows us to view project development composed of the following phases:

1. Planning projects — At the beginning of each product release cycle, managers review the projects targeted for the next release. Some preliminary investigations by programmers have been made to estimate the time required to complete each project. At this stage, managers may plan a strategy for completing the projects. This phase employs four different commands.

2. Beginning work on a project — Before any modifications to source files can be made for a given project, that project must be declared open. Also, special privileges can be granted at this time. This phase employs two distinct commands.

3. Developing a project — Once planning is complete and a project started, the project team may begin to modify the source code and create new source code to implement the project. This phase employs five distinct commands.

4. Completing a project — There are several steps necessary to ensure that a project is completed correctly. At completion, any parallel development must be resolved and merged into a single stable version. A total of five different commands provide an orderly process through which a project moves from the programmer's area to a stable development level environment.

5. Updating a project — If project problems are discovered by either the standards verification group or the test group, the project team must perform an update to correct the problems. This phase employs two distinct commands.

This CM system was designed to answer problems specific to Scientific Calculations. However, our experience can point the way to anyone undertaking the implementation of a configuration management system. —*Darcy F. Young is a senior software enginner with Scientific Calculations Inc., Fishers, New York.*

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CENTRUM

By Lori A. Snyder

Polygen's *Centrum* Helps Manage The Research And Technical Data Needed For More Effective Scientific Work.

Centrum is a technical information management system specifically designed for use by chemical and pharmaceutical researchers. The *Centrum* system provides a unified environment in which the scientific researcher can record and manipulate data while producing a typeset-quality document from that data. *Centrum* was developed by Polygen Corporation, Waltham, Massachusetts, and runs on Digital Equipment Corporation's VAX line of computers and Sun Microsystems' 3/60 workstation. On the Digital platform, *Centrum* runs under both the ULTRIX and the VMS operating systems, and it runs under Berkeley UNIX on the Sun workstation.

The type of environment that *Centrum* provides isn't new; similar environments are commonplace in the electronic design and software development industries. *Centrum*, however, is said to be the first such environment specifically designed for the chemical and pharmaceutical researcher.

In the electronic design environment, the schematic serves as a definition of the problem and a means of communication among members of the design team. In the research environment, the scientific paper contains all the information gathered during a project and serves as a means of communication. Thus, *Centrum* provides an integrated method of producing the scientific paper, which previously had been produced by cutting and pasting information from many sources.

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The Centrum System

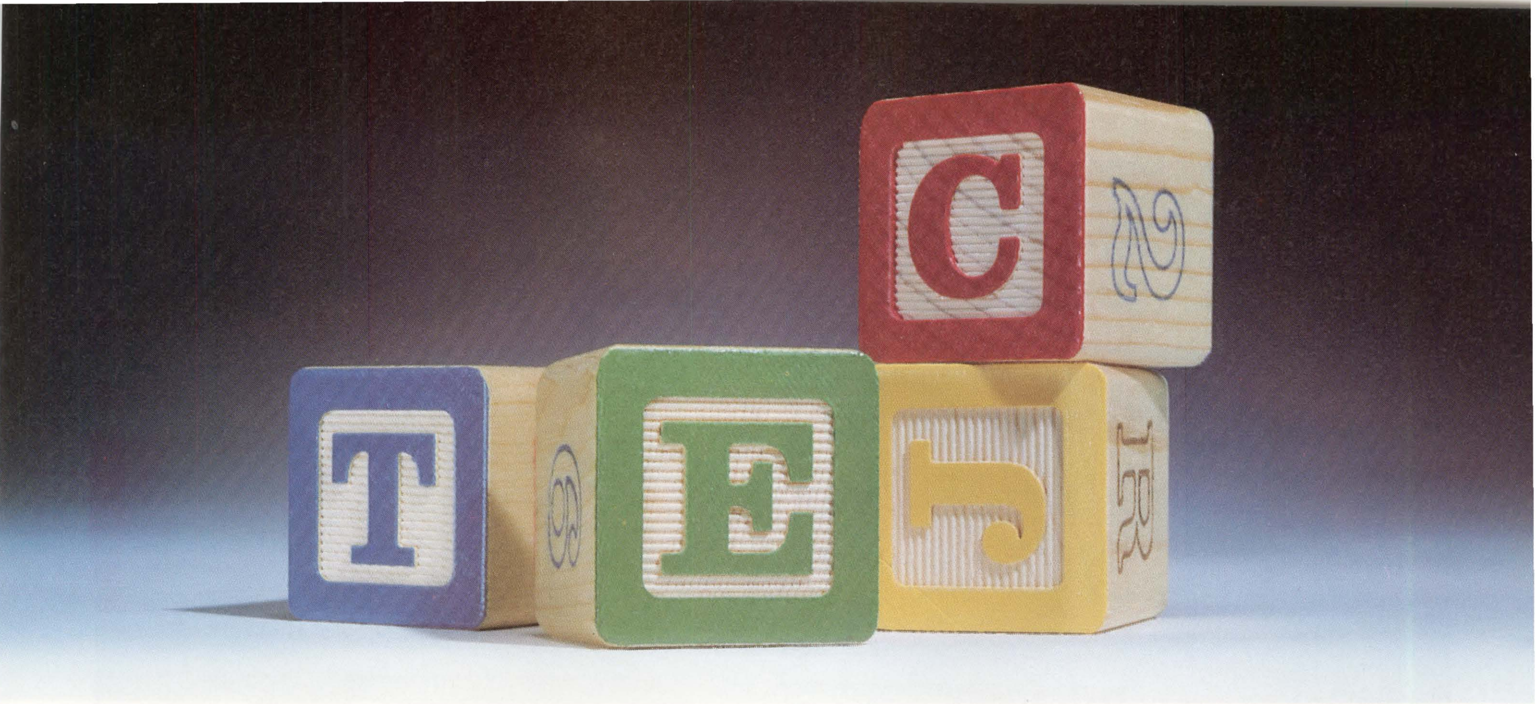
The *Centrum* system is menu driven; the user selects activities or options from the menu, either by pointing to them with the mouse or by typing a letter (see Screen 1). Menus appear, even for yes or no responses, so the amount of typing required is minimal.

Centrum's windowing environment, which is based on the X Window standard, is similar to a Macintosh, although there are some differences. According to Polygen, *Centrum*'s pop-up menus, which allow you to take your finger off the mouse button while selecting an item, are easier to use than the Macintosh's pull-down menus, which require you to keep the mouse button depressed until the item has been selected. As with many popular windowing environments, *Centrum* allows multiple windows that can be opened, closed, overlapped, changed in size, moved around and set aside.

The system is designed for use with or without a mouse, and the absence of a mouse doesn't cause any loss of function. For example, to resize a window without a mouse, the WINDOW, EDIT and arrow keys are used. With a mouse, you simply point to the window border and stretch or shrink it as desired. If the system has a mouse, it can be used for all operations except those for which text input is required.

Composing A Document

The word centrum means focal point or center of attention. As the scientific paper or document is the centrum of the system, the Document Composer is one of the key functions.



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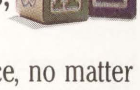

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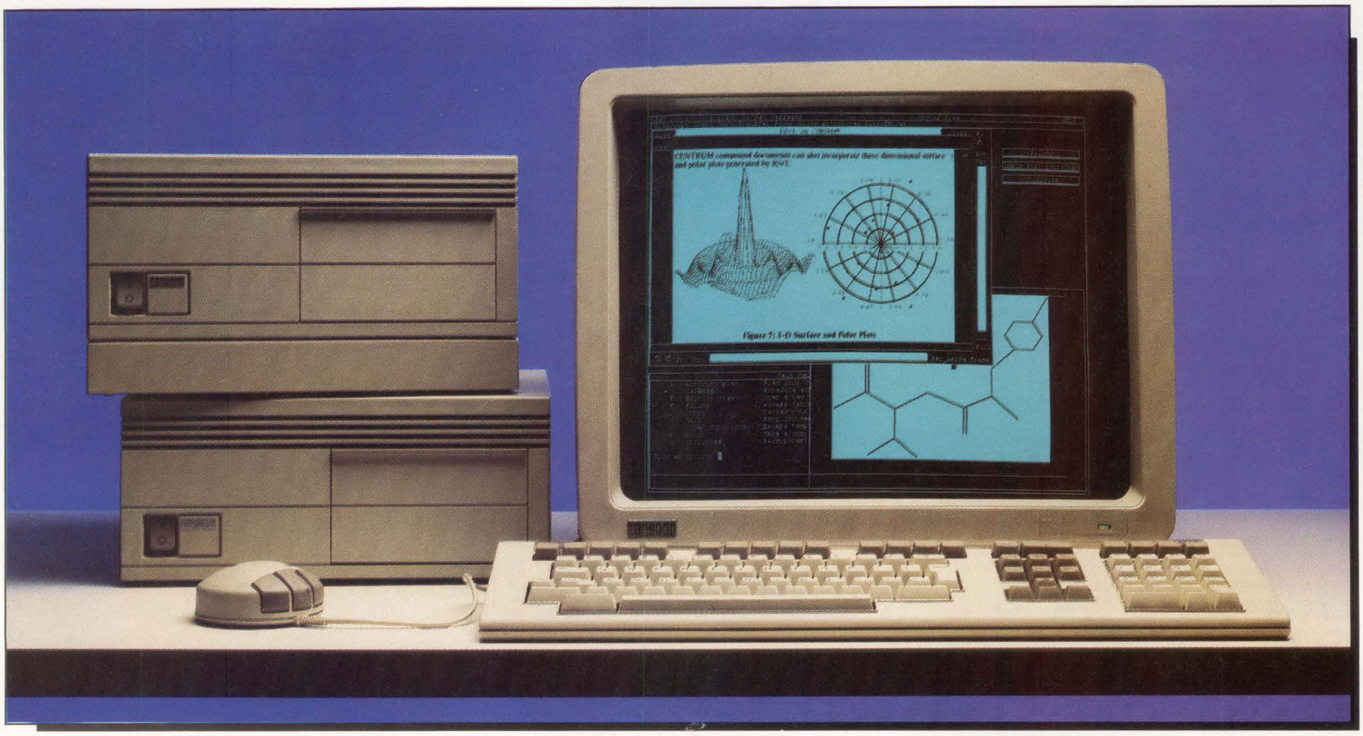

Centrum *running on a VAXSTATION.*

The Document Composer is a word processor with some special features that make it a sophisticated tool.

Information from other *Centrum* applications can be incorporated into it, creating what's called a compound document. The Document Composer is a true what-you-see-is-what-you-get word processor; a hardcopy will look exactly like what is on the screen. The Document Composer contains standard templates, called style guides, that help format frequently used documents such as memos, letters and overhead slides.

The Graphics Editor

The Graphics Editor lets you create pictures; e.g., pie charts, flow charts, logos and reaction diagrams. It contains a library of parts that are likely to be used repeatedly; you also can add your own parts to a custom library for future use. The Graphics Editor lets you create the basic geometric shapes, such as lines, rectangles and ellipses, as well as text and free-form strokes (see Screen 2). Multiple fill patterns and line styles and thicknesses are available. Objects can be modified and manipulated once placed; i.e., an object can be moved, copied, deleted or mirrored.

ChemNote

ChemNote, which also is called the Chemical Structure Editor, allows the research chemist to construct and examine molecules graphically (see Screen 3). It provides a user-friendly front end to CHARMm and QUANTA, two sophisticated molecular modelling programs from Polygen.

ChemNote automatically can convert a molecule constructed in 2-D stick form to a more realistic 3-D representation. It can calculate a variety of information about the molecule, including bond length and angle, atom distance, dihedral angle and van der Waals collisions.

ChemNote contains chemical intelligence; it won't allow you to make certain molecular constructions that are chemically incorrect. For example, it will issue a warning, if you place a single bond where there should be a double. Like the Graphics Editor, ChemNote contains a library of commonly used molecules, such as amino acids.

Centrum contains a spreadsheet package that's similar to *Lotus 1-2-3*. It lets *Lotus* input data be used without alteration. A spreadsheet can contain up to 9,999 rows x 702 columns of data and allows you to store up to 28,000 cells of numbers, formulas or text. As with all *Centrum* packages, spreadsheets can be incorporated into the Document Composer.

Centrum has a typical database package; it lets you add, change and sort records; delete entries; and search for a particular piece of information. Again, database documents can be incorporated into the document composer.

Centrum provides terminal emulation capabilities that let you upload and download data and graphic files from other computers. It includes emulation capabilities for Tektronix 4010 and 4014 terminals, as well as VT100 and VT640 terminals. It also has a table editor that

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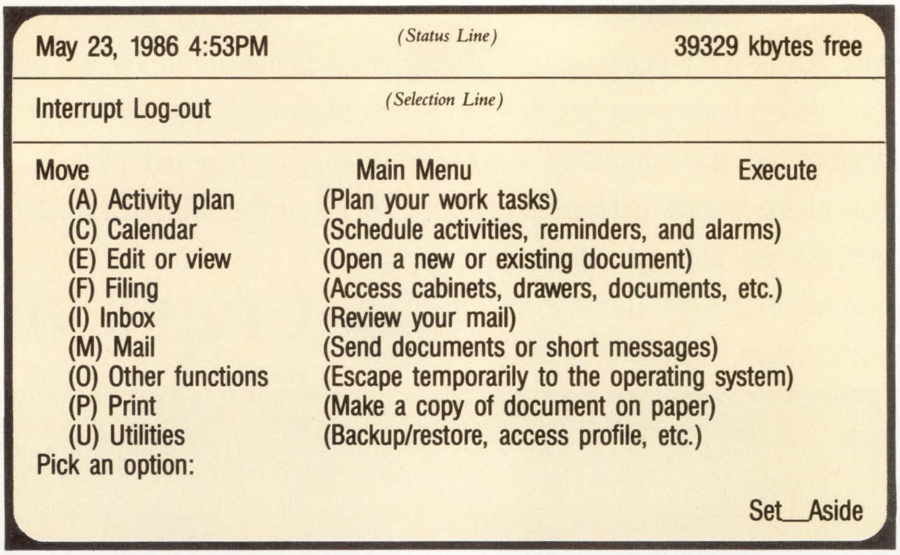
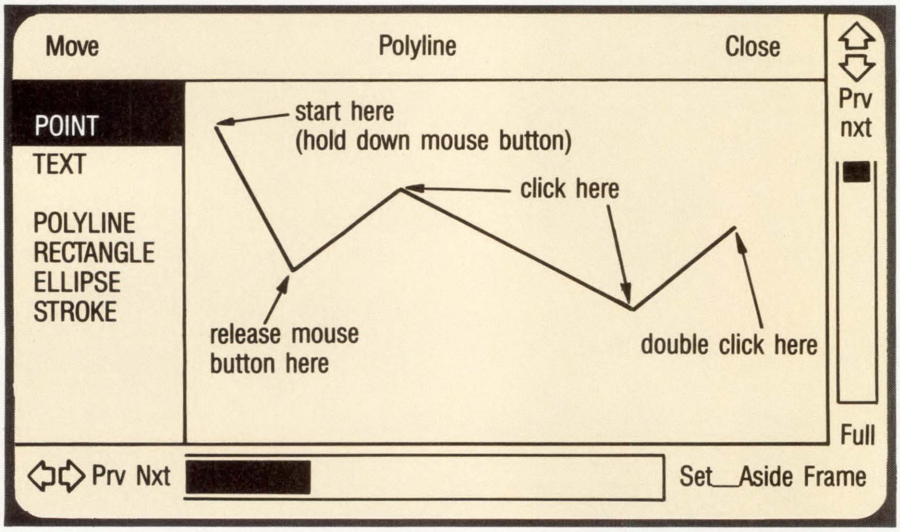
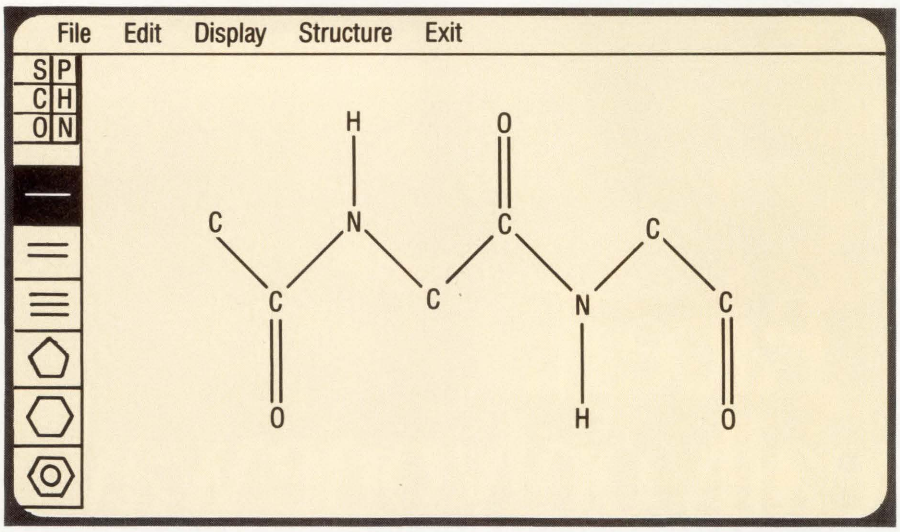


Screen 1: **Centrum's** *main menu.*



Screen 2: Graphics editor display.



Screen 3: A 2-D molecule is shown in this ChemNote display.

allows researchers to create publication-quality tables. The emulation package automatically can be set up so that you get logged onto the other computer and placed in the desired directory; you need not know the other operating system's commands.

Centrum Evaluated

I conducted the *Centrum* product evaluation on a VAXSTATION 2000 with 6 MB of memory and a RD54 disk (more than 100 MB), running ULTRIX version 2.0-1.

With the *Centrum* system, you never need to interact directly with the operating system. After you log on and type CENTRUM, you don't see ULTRIX again until you exit *Centrum*. Any operation needed to be done to a *Centrum* document, such as creating, copying or deleting, is done from the Filing option of the main menu. Even electronic mail and the calendar functions are options of the main menu.

Centrum's filing cabinet analogy for organizing files further isolates the user from the operating system. Each user is given a personal filing cabinet (a home directory) which subsequently can be divided into drawers, folders, sections and subsections (subdirectories).

At first, I found it confusing to have to make filing cabinet analogies to name my files; I was comfortable with naming and moving among nested subdirectories. After working with the filing system for a while, I began to accept the fact that it was trying to simplify things.

One nice feature of not interacting directly with the operating system is that when you delete a file, that file moves to an area called the wastebasket where it can be "uncrumpled" (restored) if desired. This allows you to change your mind about deleting a file, a comfort that isn't provided by most operating systems.

Centrum's windowing environment is straightforward and easy to use. Windowing operations, such as opening, closing, moving, resizing and setting aside, can be performed intuitively. A

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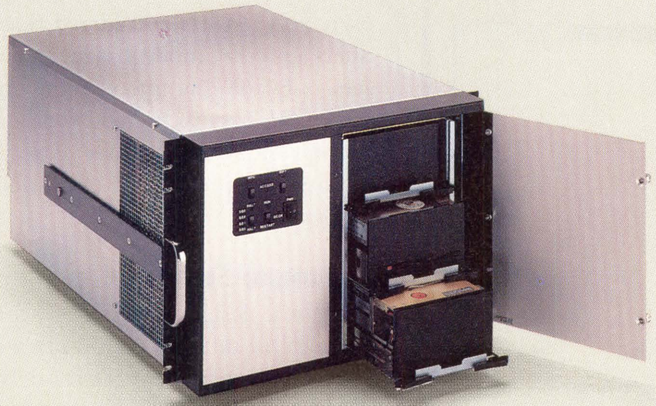

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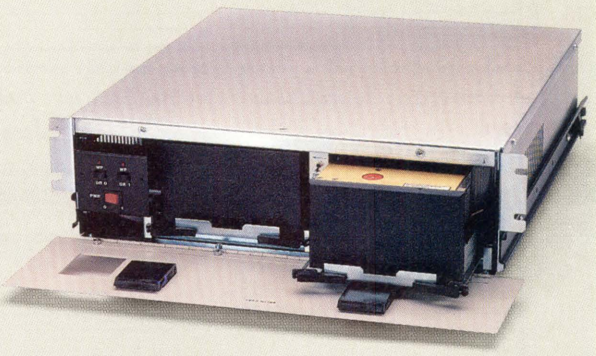

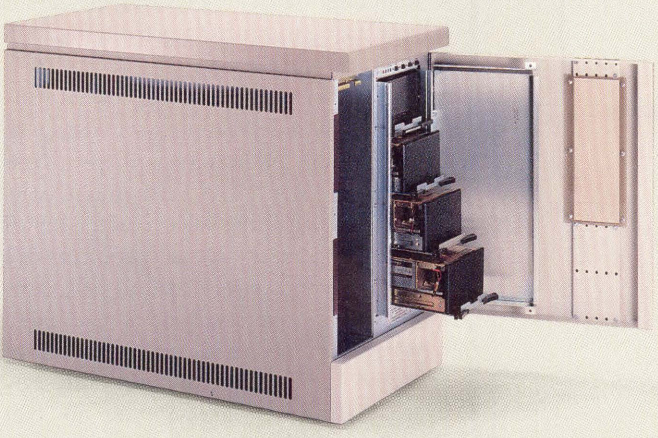

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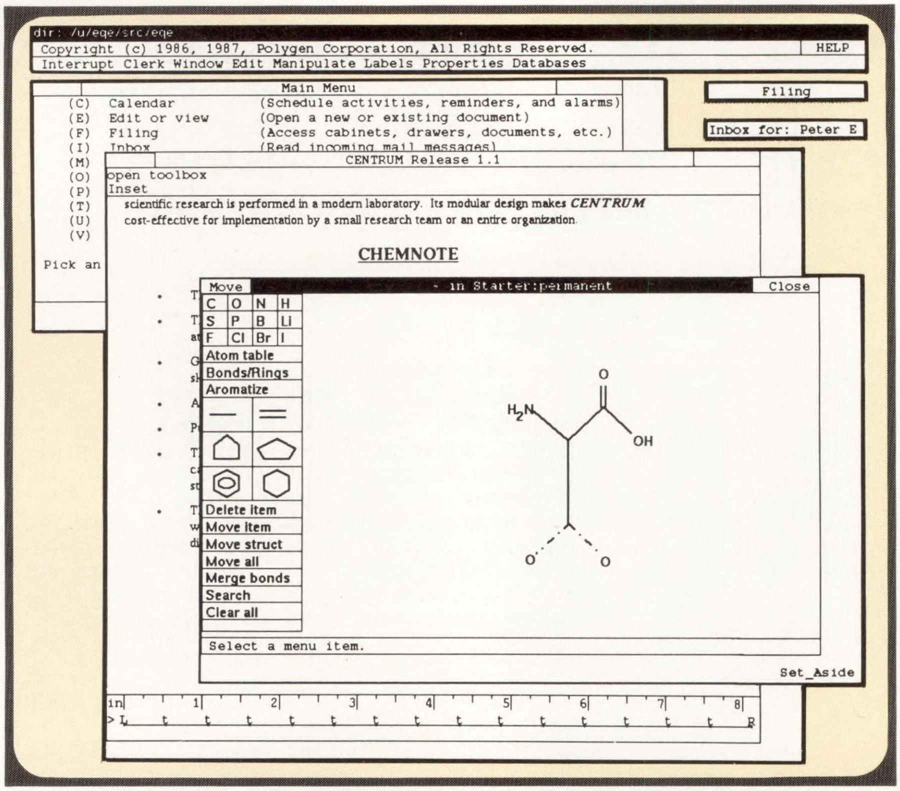
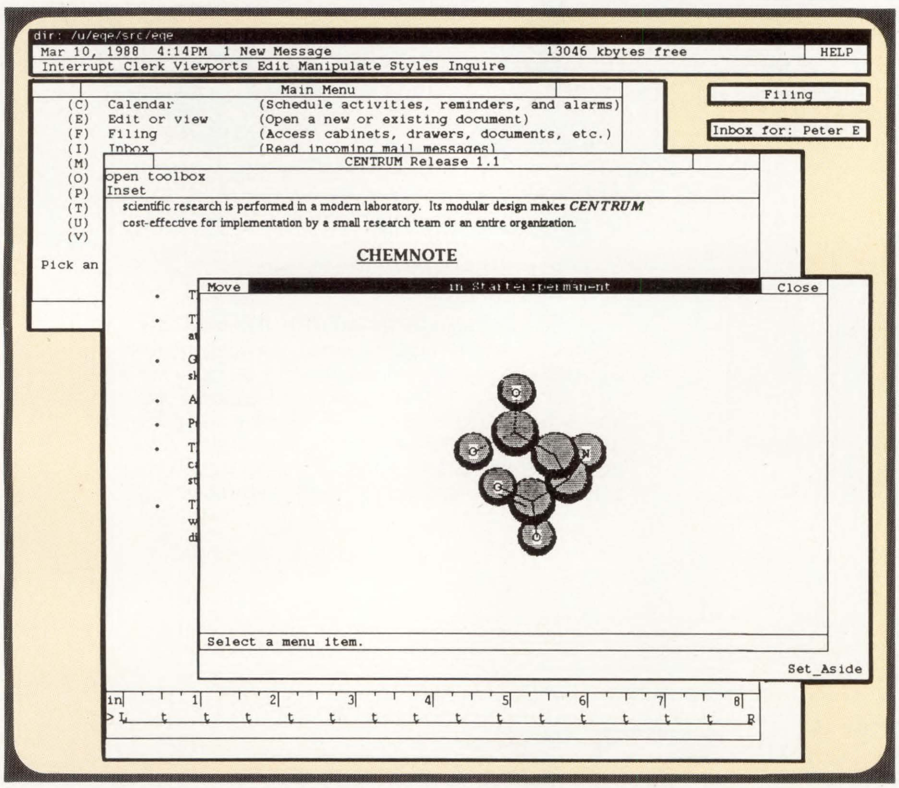


Screen 4: **A Centrum** *document can contain both text and graphics, in this case a molecule created in ChemNote.*



Screen 5: **Centrum's** *multiwindowing capability permits documents to be open simultaneously. The rectangles in the upper right corner are tasks that have been set aside.*

nice feature of the *Centrum* system is that processing occurs in windows that have been set aside; therefore, windows containing lengthy tasks need not clutter the screen.

Centrum's extensive menus are helpful to a novice, but they could become a nuisance for the experienced user. Polygen has considered this and offers a prompt mode in which the user sees only the one line prompt on the screen. It's easy to switch in and out of prompt mode, so you can display the options of a menu if you occasionally need them.

ChemNote Evaluated

Centrum is designed specifically for the chemical or pharmaceutical researcher, but ChemNote is the product's only application that other disciplines can't use.

I thought a good way to begin reviewing ChemNote would be to create my own original molecule. After several attempts, the system still wouldn't let me write my molecule. Each try was met with a different warning. I gave up my attempts at creativity and copied a molecule from the manual.

I learned a lot about the system during my experimentation; it has a much better understanding of chemistry than I do. By issuing those messages, it was trying to protect me from my own chemical ignorance.

ChemNote checks for several conditions, as the molecule gets written to disk. It will tell you when there are too many van der Waals hard-sphere contacts and when the valence of the molecule is incorrect. Valence problems can occur when a single, instead of a double (and vice versa), bond is placed and when there are an incorrect number of atoms or bonds on the molecule.

ChemNote allows you to edit molecules; i.e., move, add or delete atoms and bonds. When you move an atom that has bonds attached to it, the bonds move in a rubber-banding effect.

Molecules can be rotated about both the x and y axes, so you can view

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them from any angle. Unfortunately, the rotation happens so quickly that it's hard to get a good look at a rotating molecule. The molecule can be stopped at any point, however, which makes this problem less severe.

Document Composer

Because the purpose of *Centrum* is to produce a document, the Document Composer is probably its most important application. Information from other *Centrum* applications can be incorporated or inset into the Document Composer to form a compound document.

Insets can be either local or independent. Independent insets are a powerful concept; any changes made to the inset material will be reflected automatically within the compound document. For example, if a molecule had been incorporated into a compound document as an independent inset and that molecule subsequently was changed using ChemNote, those changes automatically would appear in the compound document. Polygen uses the term living document to describe this powerful feature.

Conversely, local insets exist only as part of the compound document; i.e., they don't have a separate file name. As with independent insets, though, all functions of other applications are available when creating a local inset.

Centrum lets you go from one application to another quickly and easily. If, for example, you point with the mouse and click on a reaction diagram, while in the Document Composer, the reaction diagram will be opened in the Graphics Editor in a new window. The compound document remains open but is no longer in the active window. This feature saves you from having to close an application and return to the main menu to start a new application.

Bottom Line

The two questions that remain are whether *Centrum* is easy to use and whether it's useful. While *Centrum* isn't a difficult system to use, it isn't trivial to use either. Some of the stumbling blocks I encountered probably would have been avoided had I been trained formally by Polygen, as a new user normally would.

However, there are so many features, it still would take time to learn exactly what you wanted to do with the system. Bob Olszewski, *Centrum* product manager, doubts that anyone will use all the capability of the system, and that after two days of formal training, a user would feel quite comfortable in producing a compound document. Olszewski added that Polygen plans to announce a new release of *Centrum* this month. The new version offers some new features, including a forms editor and database integration, scientific equation editor and reaction diagram editor, that will make the product easier to use.

As for *Centrum*'s usefulness, I asked Susan Leiby and Elaine Chang, chemical engineers at Mobil Corporation in Paulsboro, New Jersey, for help. They both agreed that the product would be useful to them in their environment and, if given the opportunity, they would buy it. And, that's the bottom line.

Author's note: Thanks to Mobil Corporation's Susan Leiby and Elaine Chang for contibuting their time and expertise to this review.

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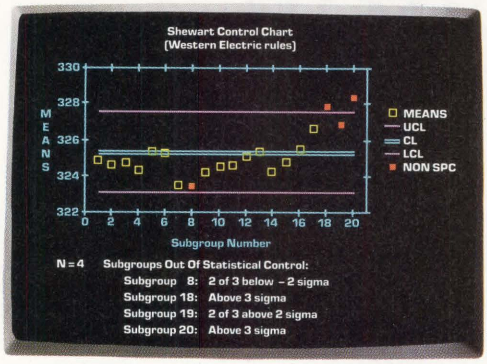

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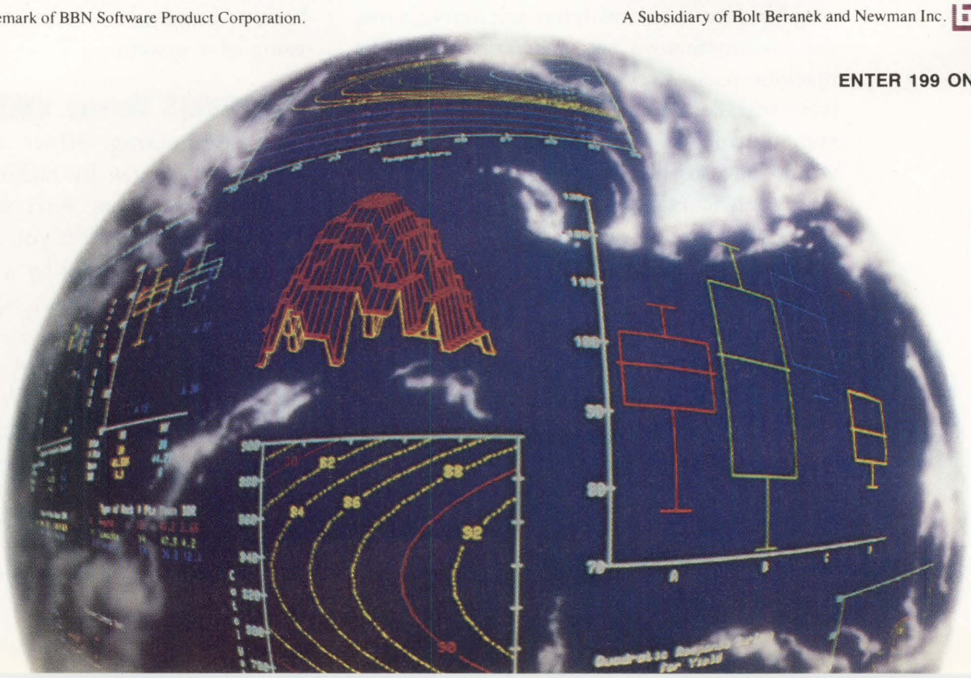

VAX

THE VMS/ MICROVMS MERGE

By Kathleen D. Morse

Why The MICROVMS Product Was Developed And Why It's Being Merged Into VMS.

The introduction of MICROVAX hardware opened new markets for VAX/VMS. A VAX/VMS system cost less than $20,000 and required no more than standard office environmental conditions. It was affordable by single users such as scientists, researchers, lawyers, dentists, accountants, etc. These new users rarely had much computer expertise, never had a computer room with a system manager and operator, and rarely knew anyone experienced in VAX/VMS to whom they could turn for advice.

The VMS Development Group realized that this system would revolutionize the world of VAX/VMS. Until the advent of MICROVAX systems, documentation consisting of 20 three-ring binders was considered acceptable; now, the documentation set was larger than the machine itself. Previously, VAX/VMS systems were installed, managed and maintained by system managers and operators; now, the user would have to be his own system manager, operator and maintainer.

VMS Development also faced technical problems caused by the type of peripherals available at the introduction of MICROVAX I. The system disk was too small to hold the VMS system files, let alone provide room for user files. The only distribution medium available was the RX50, a 400-KB floppy disk, a substantial change from the usual VMS distribution medium, consisting of nine-track magtape. With a single disk system configuration, the VMS tailoring procedures (ones that allow movement of some VMS system files off the system disk) broke, as the tailoring design depended on the availability of two disks.

Software pricing computed in part according to CPU capacity also was affected, now that a system approximately the speed of a VAX 11/780 cost one-sixth the price. How could the value of software to the user be measured in order to set a price? CPU capacity became only a small part of the measure of the usefulness of a system. Backplane limitations, number of disks, terminals, etc., became important factors in determining the value of a system.

MICROVMS Versus VMS

The engineering effort used to create MICROVMS began by tackling the technical problems one by one. First, what would fit on a 10-MB system disk? If you assumed that the system would be used by a single user or a small project team, only a subset of the large variety of VMS utilities would be needed. What were those utilities? Given the size and cost of the MICROVAX, turnkey systems (systems dedicated to running a single application) probably would be common. Could half

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> The first step was to determine which files would be required for a turnkey system.

the available disk space be left for user files? That seemed a reasonable goal.

The first step was to determine which files would be required for a turnkey system. Because much of the application development for MICROVAX systems would be done on larger VAX systems, programs linked under full VMS had to run under MICROVMS. Therefore, MICROVMS would have to stay synchronized with VMS releases so that inconsistencies between shareable images (i.e., the run-time libraries) wouldn't occur. Thus, VMS maintenance releases would have to be installable on MICROVMS systems.

Other basic system maintenance, such as backups and file and directory manipulation, also would be required. This set of capabilities became the BASE MICROVMS kit. We didn't assume that utilities required by timesharing systems (such as account management, disk quotas, etc.) were necessary. Nor did we assume that every system would be in a network, used for program development or need the VMS HELP library.

After the BASE MICROVMS files were identified, the rest of the VMS files were categorized. Files that were required for DECNET became one class. General-purpose utilities (i.e., MAIL and DIFFERENCES) for use by different types of users were grouped into a second category called COMMON UTILITIES. The help library was subsetted, and its text was rewritten and targeted at users with less computer expertise. It was expected that some systems would want to set up individual user accounts and monitor such things as disk or CPU use. These utilities were classed as the SECURE USER ENVIRONMENT option.

The MICROVAX system also was affordable by small software vendors. The challenge was to fit programming support onto the 10-MB Winchester disk. First, programming was broken into two types: user programming and system programming. System programming requires intimate knowledge of VMS data structures (i.e., drivers or performance monitoring tools) or execution in kernel mode, while user programming uses standard VAX language features and run-time library routines and executes in user mode (application programs).

System programmers were assumed to be VMS experts who would be able to tailor their system disk with ease, because the 10-MB disk couldn't hold both the system programming and user programming files. However, there still was insufficient room on the system disk to hold all the user programming utilities and leave space for user files. To solve this problem, the VMS object library, STARLET.OLB, was stripped of all object modules that are linked into run-time shareable images (*RTL.EXE or *SHR.EXE) for a savings of 2,200 blocks.

Some files, such as MASSBUS or CI drivers (500 blocks), were discarded entirely as they weren't useful on MICROVAX systems. Others that would be used by less than one percent of all customers also were removed, such as BLISS libraries (3,200 blocks) and the User Environmental Test Package (11,000 blocks).

Cookbook-Style Documentation

Meanwhile, the VMS writers were designing a documentation set that would be sufficient for installing and using a turnkey system. Cookbook installation instructions had to be written. System management duties had to be condensed and documented with specific examples tailored to single-user or small time-sharing environments. Pictures of how to open the floppy drive, the way to insert a diskette and warnings not to remove the black jacket from the floppy are examples of documentation created for MICROVMS manuals.

The manuals were structured into two guides, the *MICROVMS User's Guide* and the *MICROVMS Primer*. The *Primer* included information for someone who needed to create files and send mail. The *User's Guide* included installation, system management and more thorough utility information.

The manuals were made more approachable and friendly by reducing the binder size. Logical names were set up in MICROVMS startup procedures for all peripherals, which were more descriptive than the physical device names (such as $TAPE1: instead of MUA0:). The MICROVMS manuals used these logical names when describing how to use various peripherals for backups, layered product installations, etc.

The *MICROVMS User's Pocket Reference* contained a summary of all commands for several commonly used utilities as well as DCL. One of the nicest features was that it included keypad layouts for the utilities, at a time when keypads were becoming standard as utility interfaces.

Last, sample FORTRAN programming guides were written as examples of how to simplify language manuals. These were expected to be prototypes for future editions of other VMS language manuals. A *MICROVMS Programming Pocket Reference* also was produced.

Simplifying System Management

Many system management duties are repetitive, such as incremental backups or adding user accounts. Frequently, VMS system managers write their own DCL command procedures to handle these tasks. Why shouldn't MICROVMS provide such command procedures? Thus, ADDUSER.COM (add a user account with appropriate Access Control List Identifiers and a user disk directory), BACKUSER.COM (backup user files), RESTUSER.COM (restore user files), etc., came into existence. Later, a manager menu command file was added

to point to the various system management command procedures, as customers indicated that they didn't realize these procedures existed.

Other system management tasks are performed once by the system manager, often by adding new commands to site-specific procedures. MICROVMS easily could provide sample site-specific files showing the system manager how to set up different options. A site-specific startup file, SYSTARTUP.COM, was created that included commands to do such things as start print or batch queues, provide a system welcome message, start DECNET, install privileged utilities, etc.

These sample commands were commented out, because many systems wouldn't want these features; for example, batch queues. Other template files created were SYLOGIN.COM (system-wide login command file), LOGIN.COM (system manager's login command file), EDTINI.EDT (editor initialization file for system manager). For example, the system manager's LOGIN.COM contained symbols for invoking the system shutdown procedures or rebooting the system (SHUTDOWN, REBOOT), meaning the user didn't have to answer 20 questions asked by the shutdown procedure when he turned the system off for the night.

Another feature aimed at simplifying system management was the concept of tied terminals for open systems. This feature enabled the terminals to log into user accounts automatically when they were powered on. MICROVMS was set up so that all terminals, except the console terminal, automatically were logged into a sample account called USER.

Turnkey systems probably would use tied terminals to avoid teaching customers about accounts and login procedures. Each terminal would be dedicated to a particular menu, running only the programs needed by the particular user. A secretary's terminal would have one menu, while a manager's terminal would have another. This is termed an open system, as nothing prevents the secretary from accessing the manager's terminal and thus his menu.

Sample accounts were other features in MICROVMS aimed at simplifying system management. USER was a non-privileged account, which could be copied to create other such accounts.

RX50 Distribution Medium

Use of floppy diskettes as a distribution medium and the restrictive size of the system disk were the major constraints molding the design of the installation and tailoring mechanisms. Although the simplest installation procedure would have been to install one BACKUP saveset containing a bootable system disk, this would have meant inserting more than 35 floppies — both a time-consuming and an impossible process, as the system disk had insufficient space to hold all the VMS files. The MICROVMS installation procedure had to be a tailor-on mechanism that would allow users to choose only the files that they needed.

There were other important considerations: installation time and simplicity. Restoring a BACKUP saveset would be the fastest way to install the files that all users would need; i.e., the BASE kit. After this bootable, run-time environment was installed, the system could be booted, allowing MICROVMS options to be installed using the standard VMS procedure VMSINSTAL.COM, which installs VMS maintenance updates or Digital layered products, such as COBOL or FORTRAN.

Because the available system disk space might not be sufficient for an entire option such as PROGRAMMING, the installation procedures would have to be a form of tailoring, thereby allowing the user to install pieces of the option instead of the entire option. Thus, the MICROVMS options were organized into numerous savesets, each containing one tailorable unit. Each option (USER, UTIL, NET, PROG, SYSP) would start on a new floppy, so a user wouldn't have to insert all the floppies in the MICROVMS kit to install the last tailorable unit.

A tailor-off utility also was pro-

vided, so that you could remove an option or tailorable unit from the system disk if it was no longer needed.

MICROVMS Licensing

MICROVMS licensing diverged from the standard VMS licensing scheme. A new measurement of software value was defined, consisting of the number of users on the system. Thus, a MICROVMS system being used as a workstation could be licensed as a single user system, while a time-sharing system could be licensed in incremental numbers of users (eight, 16, etc.). An unlimited use license was also available.

This scheme quickly led to the obvious question: What's a user? It was easy to describe this concept in human terms: "A user is a person accessing the system through a terminal." However, it was a bit more difficult to interpret this into programmable terms. Such questions as, "Is a user a batch job? a network job? a remote terminal (SET HOST)? a LAT terminal? a workstation window?" had to be answered.

The answers all went back to the definition of a person accessing the system. If one person was doing multiple things, for example, workstation windows, batch jobs or network jobs, those would be counted as one user. If multiple people were being represented, each would count as a separate user; e.g., LAT terminals or hard-wired terminals. If there was any doubt about the answer, we would assume multiple people; e.g., remote terminals (SET HOST).

MICROVMS didn't contain all the files that were on the VMS kit. The installation procedures were different, providing a tailor-on capability. MICROVMS was distributed on floppies, while VMS was distributed on magtape. The documentation was styled in cookbook format and greatly reduced. System management was aided by the addition of sample procedures and user accounts. Licensing was done by user instead of by CPU capacity.

MICROVMS has its pros and cons. Having separate products introduced some problems, while solving those

> Having separate products caused duplication of effort in a number of areas.

unique to MICROVAX systems.

Having separate products caused duplication of effort in a number of areas. Two different installation and tailoring procedures meant customers and field support personnel had to learn two methods. Maintenance of two sets of tailoring and installation procedures proved costly.

Two documentation sets seemed like a good idea, but who should get which set? Experienced MICROVMS customers often needed the full VMS documentation. VMS customers wanted to purchase the simplified MICROVMS manuals for some of their users, such as university students. Now two sets of manuals had to be updated at every new release.

VMS customers frequently would purchase MICROVAX systems and want files that weren't included on the MICROVMS kit, such as example files. In each release, the classification of files in and their location in a MICROVMS option was changing.

Each new VMS release added more functionality to VMS. This meant an ever-increasing number of RX50 floppies, almost doubling the number in the original MICROVMS V1.0 kit. Installation time was taking longer. More system disk space was required just to hold the BASE kit. Managing the interactions between components (MAIL and editors, for example), to determine what had to be in which kit and what constituted a tailorable entity, was increasingly difficult.

As systems got faster and larger, deciding which VMS product to offer on each new system became more complicated. A single CPU could be used in multiple systems: VAXSTATION 3200, MICROVAX 3600 or VAXSERVER 3602. While the VAXSTATION 3200 is a single-user system, the MICROVAX 3600 is three times faster than the first VAX, the 11/780.

Larger system disks and expanded physical memory (which had arrived with the MICROVAX II) were doubling in size every year. New distribution media (TK50, TK70) was available instead of floppy diskettes. Even floppies had grown with the introduction of the 1.2-MB RX33.

Another new VMS product had emerged, Local Area VAXCLUSTERS. VMS now provided the ability to boot a workstation system over the Ethernet off a cluster boot node (time-sharing system). That meant that VMS, instead of MICROVMS, would be running on many of the single-user systems. It was no longer necessary to have a backup device (tape) or a system disk available on every system. Files could be stored and backed up on the boot node.

The VMS writers had reorganized the VMS documentation set into a series of reference manuals (large three-ring binders) and guides (smaller, MICROVMS-size books). A *VMS User's Manual* had been written, analogous to the *MICROVMS User's Manual.*

Customers liked the sample system management files in MICROVMS and were asking that they be included in VMS. A tailoring survey had shown that most customers used the tailor-off procedure included in MICROVMS and few were using the tailor-on capabilities.

What Merging Means

Hardware, software, documentation and customer input seemed to indicate that MICROVMS packaging has outlived its usefulness. Was MICROVMS a mistake? Absolutely not. Without MICROVMS, there would have been no way to ship the MICROVAX I and early MICROVAX II systems. MICROVMS was a new method for packaging, pricing and documentation that was targeted at new markets for VAX and VMS.

What does the VMS/MICROVMS merge mean? In simple terms, it means resolving the differences between VMS and MICROVMS so that there's only one product, VMS. Some features in MICROVMS were acclaimed by all VMS users; these will be added to VMS. Other features were not liked and will be discarded. Some things will be rewritten, such as new tailoring procedures, taking the best features from both VMS and MICROVMS.

Features Moving Into VMS

The sample system management files will become VMS template files. For example, VMS will include a SYSTARTUP.COM file, which serves as a starting point for site-specific setup for a new system manager. A duplicate copy of this file, SYSTARTUP.TEMPLATE, also will be included, so a working version will exist on the system.

Other template files include SYLOGICALS.COM (device logical name definitions from UVSTARTUP.COM), SYLOGIN.COM (system-wide login command file), LOGIN.COM (system manager's login command file), etc. The other MICROVMS procedures will be moved to the examples directory, with a pointer to MGRMENU.COM left in the system manager's LOGIN.COM.

The VMS documentation will include a *VMS User's Manual*, which can be ordered separately from the entire documentation set. It contains more information on DCL and utilities than the *MICROVMS User's Guide,* but less information on system management.

The tailoring and installation procedures have been rewritten. With the discontinuation of RX50 distribution media and the new larger system disks, the tailoring design is now to tailor files off rather than tailor on. With this design, installation time can be improved by using only three savesets (the format of the VMS binary kit). The first saveset is analogous to the MICROVMS BASE kit, a run-time environment that can be installed on small disk systems. For small disk systems, tailor-on is still

possible; it just doesn't perform as quickly as tailor-off procedures.

The other two savesets are similar to the old VMS LIBRARY and OPTIONAL savesets. The LIBRARY saveset contains the utilities and libraries needed for program development, as well as those utilities not contained in the first saveset. The OPTIONAL saveset contains system programming tools, sample drivers, BLISS libraries, etc., files needed by a small percentage of VMS users.

The revamp of the installation and tailoring procedures also has allowed long-needed performance improvements, such as converting the data file that drives the procedures (VMSKITBLD.DAT) into an ISAM file.

The tailoring mechanism is now a program, instead of DCL procedures, that improves the performance of tailoring. The tailoring classes and subclasses are similar to those in MICROVMS. It has been enhanced with more prompting, disk free space checking and other niceties.

Best of all, all VAX and MICROVAX systems now will use the same procedures for installation and tailoring.

All files will be shipped for all VAX and MICROVAX systems. For ex-MICROVMS users, the ability to tailor-on still exists and the MICROVMS-specific files are still there, so a MICROVMS-like environment can be created.

The sample user accounts have been removed, as no one used them. The ability to create tied terminals still exists, with a command file showing how to set them up. However, VMS will not automatically tie any terminal to a particular account as MICROVMS did.

Licensing of VMS software by number of users will be made available on VMS to MICROVAX users.

The VMS documentation has been subsetted, so fewer manuals are shipped with MICROVAX systems than with VAX systems. However, all manuals are aimed at users of either system, rather than being targeted at only MICROVAX systems.

MICROVMS was born out of limitations of system disk size and distribution media. The tailoring tools, template files and documentation developed for MICROVAX systems have proved useful for all VMS users. Licensing policies have evolved, as chip technology has brought the computer power to the user's desktop. As MICROVMS merges back into the VMS product, it will pass into the annals of history, but the best features still remain, integrated into the VMS product.
—Kathleen D. Morse is a consulting software engineer for Digital Equipment Corporation, Nashua, New Hampshire.

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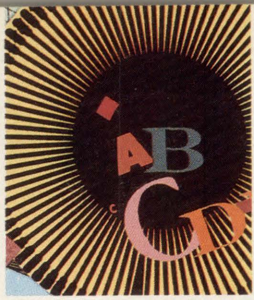

PRINTERS

DEC HAS THE COLOR

By David B. Miller

DEC's LJ250 Printer Is A Quality Text/ Color Graphics Printer.

With the increasing popularity of do-it-yourself color graphics in the scientific and business fields, the need for more and better quality color graphics printers is growing. Digital is addressing this need with the DEC LJ250, one entry in a series of DEC Companion printers, along with the LA50 and LA75 that take advantage of ink-jet technology by producing text and/or color graphics.

The 10-pound LJ250 is light and easy to carry. It has a 17- x 1-inch footprint and is 3½ inches high, allowing it to fit into small places. Interface options include standard RS232 25-pin, DECCONNECT and Centronics parallel. A separate power module resides externally.

Installation And Use

Setup requires plugging in the power module, connecting the interface cable, and loading the paper and ink cartridges. Prongs for the power cord and the serial connector are situated so that the cables enter the printer vertically rather than through the back. While a DECCONNECT interface with a flexible phone-type cord works well, I hesitated to replace the plastic lid when using a stiffer cable for fear something might be bent or distorted when the lid bent the cable.

Use standard ink-jet paper to get the highest quality output. Regular paper causes the ink to spread too much, resulting in fuzzy characters. Pin fed and hand fed paper also can be used. Because tractor pins are located on the platen, the loading procedure can be difficult. Adjustment for paper width only can be done from the right tractor because the left can't be moved. The paper feed mechanism works smoothly, but the paper gets caught easily if not positioned properly behind the unit. The LJ250 also accepts transparency film.

Loading the ink is simple. Cartridges are primed at the left rear of the unit and easily fit into their respective slots at the front through a lift-up hatch. Color coding prevents you from placing the cartridges into their holders backward. Indication of an out-of-ink condition is the degradation of print quality within approximately one page of text. There's no empty gauge available, but the output quality remains consistent up to the time the ink wells run out, as opposed to nylon ribbons, which gradually fade, resulting in lighter copies.

Configuration

The control panel contains membrane-type buttons for Power, Ready, Form Feed and Protocol Mode. Another button toggles the printer between DEC and Hewlett-Packard PaintJet Mode. At the rear, along with the interface and power module connections, is a bank of pencil switches to change configuration settings for form length (11- or 12-inch); baud rate (4800 or 9600); word length; buffer control; protocol upon power up (DEC or HP); and character set (PC-8 or Roman), in HP mode only. Switch settings take effect upon next power up. A print-out of the switch settings is obtained by turning on the power while holding the Ready and Form Feed but-

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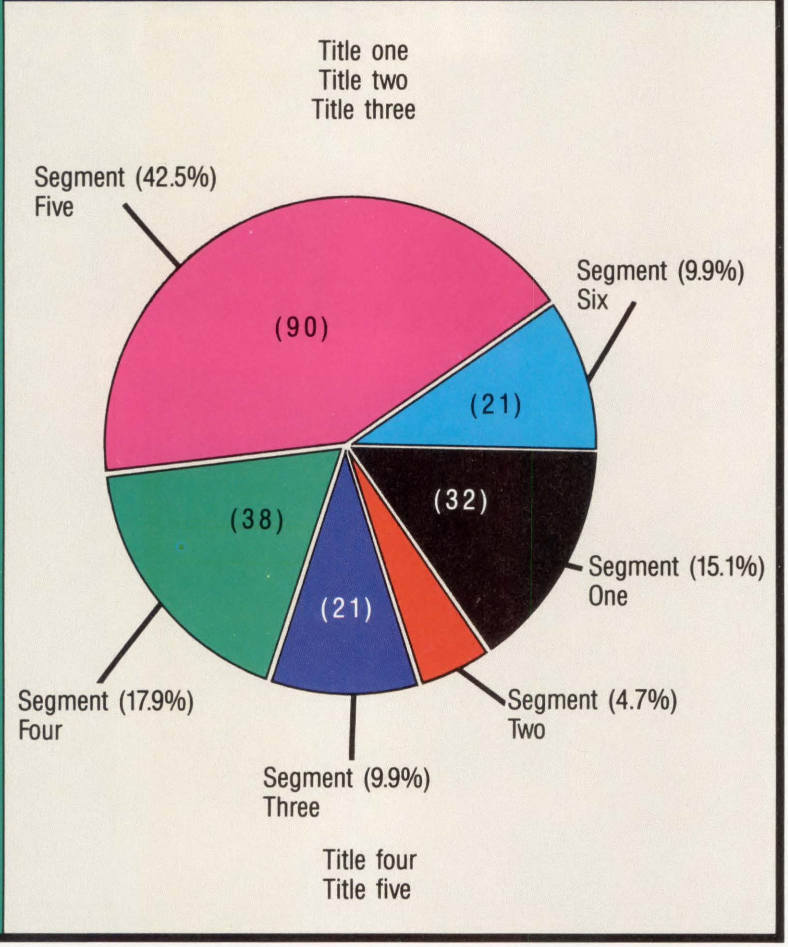
FIGURE 1.



Vibrant color charts, graphs and transparencies are possible with the LJ250.

tons on the control panel.

Software-selectable settings include text color; character set; pitch (10, 12 or 18 cpi); line (80, 96, 144 characters per line, depending on pitch); page length (one to 252 lines with a 21-inch limit); vertical line spacing (2, 3, 4, 6, 8 or 12 lpi); margins; word wrap; line termination (LF and CR combinations); perforation skip; and graphics resolution up to 180 dots per inch.

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The LJ250's two self tests are useful in determining the proper Alpha Mode and color operation.

Printing Text

Because the LJ250 is compatible with other LA series printers, printing text files poses no surprises. The full range of text highlighting features, such as underlining, boldface, italics, super- and subscripts, overstrike and double-wide characters, is available. Text also may be printed in color by sending the appropriate escape sequence from a program or word processor. An LA50 or

> A full range of text highlighting features, such as underlining, is available.

LA75 printer driver will work well with the LJ250 for word processing purposes.

At 90 characters per second (167 characters per second burst speed), the LJ250 isn't going to light any fires, but it's no slouch either. The biggest advantage is that it's quiet. There's no daisy wheel rat-tat-ta-tat or dot matrix screaming, just a silent whoosh as the cartridges move across the paper.

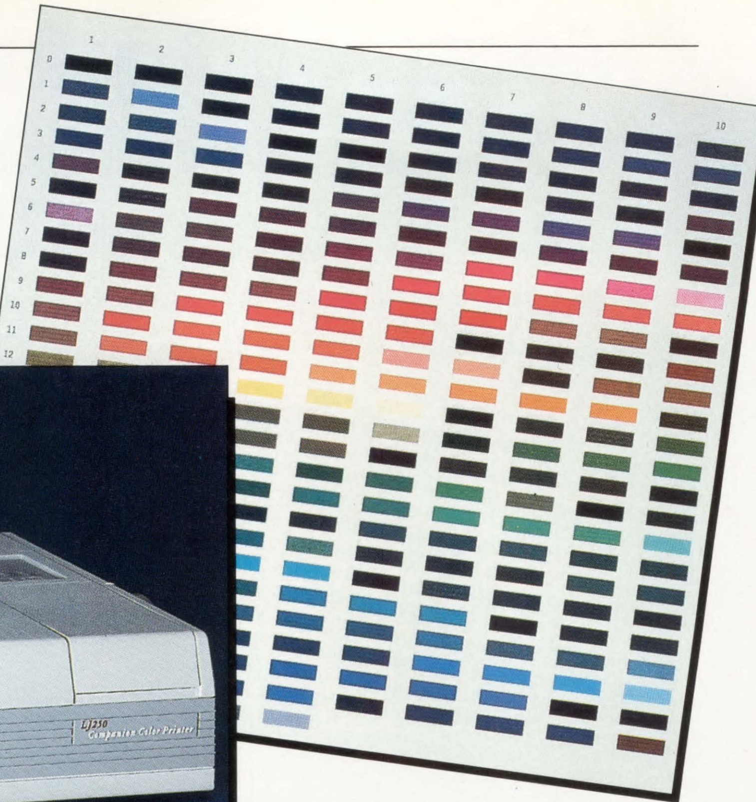
The 15 x 15 dot matrix produces fine, consistently dark, letter-quality text, comparable to the LA75's Letter Quality Mode.

Color

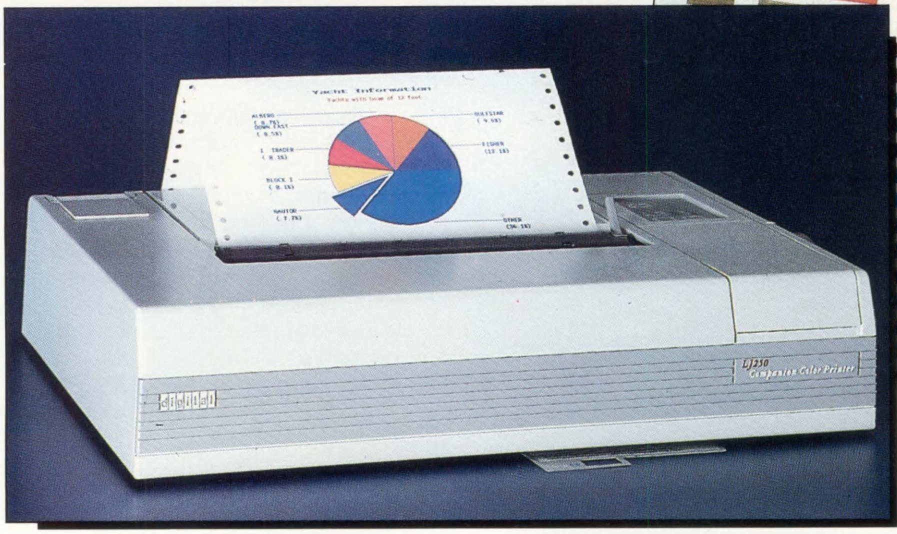
The LJ250 excels in the color department. Its 256-color palette produces quality color and shading. The color print speed is 16.7 inches per second at 180 dots per inch for graphics and 36 characters per second at 10 cpi for color text.

Printing graphics files is done by performing a screen dump from a VT240, 241, 330 or 340. However, the printed result may not match the screen display in size and aspect ratio. The TYPE command also may be used to print graphics data, as well as graphics produced by programming, as long as the files contain SIXEL graphics. ReGIS files must be converted to SIXEL files before printing, if the screen dump method isn't used. The conversion utility, RETOS, can be used to convert ReGIS graphics files to SIXEL files.

In the HP PCL Mode, the LJ250 can print color graphics produced on IBM PCs and compatibles, or the VAXMATE through direct programming or third-



The LJ250 excels in the color department. Its 256-color palette produces quality color and shading.



party application programs. The only requirement is to get a Hewlett-Packard PaintJet driver. More software packages are supplying this driver as the PaintJet gains popularity (see Figure 1).

Satisfaction with the speed of graphics printing is a matter of relativity. Computer graphics students at Beaver College, Glenside, Pennsylvania, were happy with the speed of the LJ250 as compared to an older DEC dot matrix graphics printer. On the other hand, the pie chart shown in Figure 1 took approximately five minutes to complete. That may be slow, but the quality and vibrancy of the resulting color is worth the wait.

Brilliant color transparencies can be produced in the Transparency Mode. This mode can be software selected by sending the appropriate escape sequence or, from the control panel, by powering up the LJ250 while depressing the DEC/PCL mode switch. DEC recommends a drying time of five minutes before projecting the transparencies. No indicator light is available for the Transparency Mode, so you'll have to observe the printer making two passes across the film to be sure the proper mode has been selected.

Programming

The LJ250 is a programmer's delight. DEC's programming guide provides the necessary control and escape sequences needed for programming in Text Mode, as well as in SIXEL graphics and HP PCL modes. DEC's technical set and a number of international character sets are available.

Maintenance

Little maintenance is required, but you must make sure that the ink-jet printer is loaded with the proper side of the paper facing out and that the dried ink is kept from interfering with the metal ink-jet cartridge connectors. Paper dust, ribbon fragments, misfiring dot matrix pins and broken daisy wheels won't be a problem. However, watch for clogged nozzles (a special cartridge wiping surface is provided for unclogging) and jammed paper. A complete trouble-shooting checklist is provided in the user's manual.

Documentation

The documentation set includes a wire-bound user's guide and a separate programming manual, which provides print codes for DEC and Hewlett-Packard PCL modes. A help card is affixed to the bottom of the printer which slides out when needed.

The LJ250 produces bright color graphics and letter-quality print. The ability to switch personalities between DEC and the Hewlett-Packard Mode is an advantage, because it lets the printer connect to PCs and DEC equipment. If you're looking for a high-quality text/color graphics printer, the LJ250 may suit your needs.

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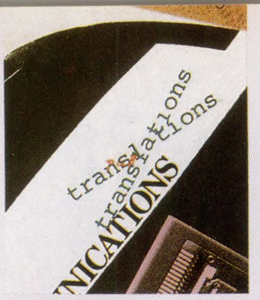

COMMUNICATIONS

POLLY WANT A *PARROT*?

By Donna Barron

MicroProducts' *Parrot* Lets You Record An Interactive Session In Real Time.

At first glance, PC-to-VAX communications and desktop presentations appear to make an unlikely software combo. Yet these two areas are precisely where MicroProducts Inc. of Boca Raton, Florida, has aimed *Parrot*. Or, more specifically, it's where *Parrot* has allowed MicroProducts to go.

MicroProducts recently introduced *Parrot* to the public but has been using the software in-house for more than two years. The package, which runs on an IBM-type personal computer, is an anomaly for MicroProducts, which normally develops and sells large transaction processing systems for DEC mainframes and minicomputers. Before the company developed *Parrot*, explaining software changes to its clients required sending an entire delegation to the installation site to provide demonstrations and local training. Now, MicroProducts sends a *Parrot* presentation. If it knows a client has a PC on site, all it needs to send is a *Parrot* and a disk-based presentation.

Parrot is a tool for creating customized training and demonstration diskettes. However, it doesn't operate like most existing desktop presentation software products that require you to create individual screen images and then string them together into a presentation that can be displayed like a slide show. With *Parrot* you log onto the VAX and record an interactive session in real-time.

Parrot is a small program. It comes on a single diskette with a brief and attractive manual that walks you through the installation on either a floppy or hard drive, and provides a short description of each function and menu selection. In addition to the hardcopy manual, there's a complete online help manual included on the diskette.

Recording Mode

Parrot contains three modes: Recording, Edit and Show. In the Recording Mode, *Parrot* acts as a VT100/220 emulator that lets the PC contact and talk to the VAX. The software provides VT220 function key mapping and includes a pop-up online mapping schedule to remind you which PC keyboard keys are mapped to which VT220 keys while you're working.

Because MicroProducts found that it needed to exchange data often with clients, a file transfer function was built into *Parrot* that works like a standard communication program for sending and receiving files. Transmission parameters are set by toggling through selections in the easy-to-use parameter file. In addition to providing communications selections, the parameters file also lets you customize the colors of your *Parrot* screen display (if you have a color monitor and define several other minor program specifications).

All commands in the Recording Mode are executed through the *Parrot* Functions Menu, which is activated by pressing the F10 key. Once the connection to the host is made, you tell *Parrot* when to begin and it starts recording what's displayed on your screen. You can have it capture the syntax necessary to log on

or off the host or to locate a program. You can show exactly what the host-based program looks like when you call it up, what happens when you make various menu selections, how and where data should be entered, how to exit the program and how to log off the host computer when finished. As with a video camera, the record function can be turned on and off, so you can record an entire session or only those parts you need.

You can send a screen image to the printer with the print screen option or output onto the screen and printer at the same time via the print on/off selection. You also can dump any screen to the disk and use the file as a graphic image with your word processing or page layout program. This is useful if you're creating documentation for the host-based software. *Parrot* automatically highlights all of your keyboard entries so that when you play back the session, you'll be able to distinguish your entries from the program text.

Edit Mode

Once the recording session is completed, you can go into *Parrot*'s Edit Mode. In this mode, each screen appears in freeze frame so you can review and make changes. For example, you can save the screen just as it is and move onto the next or you can delete the entire screen. You can jump directly to the end of the session or search for a specific text string and move to the point where that string appears.

If you have more than one *Parrot* session on your disk, you can open a second session and copy screens from there into the session you're currently working on, or append one session to the end of another to create an extended presentation. The main Edit Menu appears in the center of the screen and tends to block your view of the screen. However, this can be removed temporarily so you can view the entire screen. As you move forward through the screens or pages of the recording, *Parrot* automatically saves each page.

Unfortunately, the program doesn't allow you to move backward to previous pages when in the Edit Mode, which can be inconvenient. If you've forgotten to do something or want to change an earlier edit, you have to exit to DOS, reopen the file and start paging through from the beginning. Another inconvenience is that, while the program tells you which page you're working on, it doesn't indicate how many pages there are in the entire file.

Detailed editing is done from within the Edit Submenu. By using the Edit Submenu commands, you can move from field to field within each

Parrot
MicroProducts Inc.
370 W. Camino Gardens Blvd.
Boca Raton, FL 33432-9921
(305) 392-9800
Hardware Environment: *Parrot* runs on the VAX and PDP lines. Also, Data General, Hazelton 1500 and Tandon mainframe computers. Free (800) telephone support for 30 days.
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screen, a flashing arrow shows you where you are, adding pauses at each place on the screen that you wish to highlight. You can incorporate pauses of fixed time length or pauses that will require the viewer to strike a key to continue the playback. You also can add help text boxes that the viewer can activate in order to get more information while the demonstration is paused on a particular field or function taking place.

Parrot lets you assign section labels to different areas of your presentation. Using section labels as search strings lets you move quickly through your session as you edit it, and allows the viewer to jump directly to a particular part of the final presentation. This is useful in cases where the viewer will be going through the presentation in stages, perhaps over several days, or where he may wish to review only a certain area of the presentation.

Help text can be created in a word processing program and stored in ASCII format or composed on the fly via a desk accessory such as Borland's *SideKick*. While help text appears in a window on the screen, it's not limited to the size of the window. The viewer can scroll freely through help text windows to see text not immediately visible. You can allow *Parrot* to decide where to place help windows on the screen or you can determine whether they will appear on the right or left.

If your computer supports graphics, you can enhance your *Parrot* presentation with computer graphics created with Z Soft Corporation's *PC Paintbrush*. It's also possible to incorporate into your Parrot presentation's word processor and spreadsheet files, saved in text format, which are wider than the screen. By creating a report file, you can add documents up to 132 characters wide.

Show Mode

You play back or show your presentation in the Show Mode. Menu selections in this mode also are accessed through the F10 key. Once you specify which file you wish to view, the program automatically will begin presenting screens

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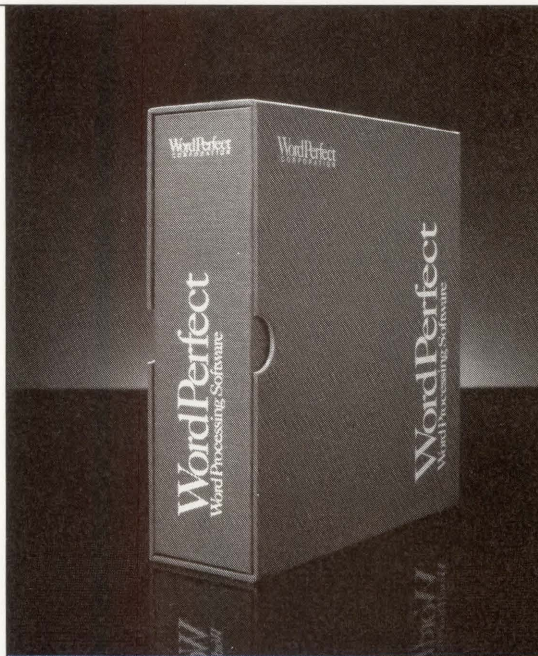

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as they appeared in the original session or as you have edited them.

Where you have installed pauses, for example, the cursor will stop and a note saying "Pause" will appear on the screen. If you have inserted a PAUSE-UNTIL-KEYSTROKE command, the action will stop and a prompt will appear saying, "Press any key to continue." Where you've added help messages, a prompt will appear advising the viewer to press H if he wants more information. Pressing H will bring the help window on screen and the viewer can scroll through the text on the screen and then proceed when he's done. Graphics will stay on the screen until the Return key is pressed.

The viewer can jump directly to a particular section of the show, page forward or backward through screens using Page Up and Page Down keys or switch to another show on the same disk. While *Parrot* shows are interactive, allowing the user to physically end pauses and request help, they also can be set to function automatically with no viewer intervention. The viewer can pause the show manually at any time and for as long as needed.

Because *Parrot* can mimic an interactive session with a host computer, it's well suited for demonstration and training purposes. Not only is *Parrot* portable, but it makes it possible to create presentations of host-based software, which are graphic and contain textual explanation so that the demonstrator or salesperson doesn't need to be facile in handling computers or competent with the software.

As a training tool, *Parrot* provides a way to offer new employees online training in an off-line environment. Users can learn at their own pace and review functions and procedures until they feel competent to work with the software. —*Donna Barron is a free-lance writer from Hollywood, Florida.*

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WORD PROCESSING

IT★OS

By David B. Miller

A Word Processing Package That Performs Graphics Integration And Mathematical Functions.

As offices become more automated, demands are being placed on application programs to function as word processors. Users expect them to do more than text editing, and word processing vendors are trying to meet that demand by incorporating more non-word processing features, such as graphics integration and mathematical functions, into their software without sacrificing ease of use. One such package is *IT★OS* from Intermation Corporation, Pasadena, California. Recently I tested version 6.1.

Installation

Installation went well, with the exception of defining printers; that was confusing and required reading between the lines and experimentation. The installation guide seemed to be a draft from a larger document, because some of the tables and examples referenced in it didn't exist, causing some of the confusion. Inexperienced system managers may need more detailed instructions; puzzled users can call Intermation's helpful staff. Cleanup operations involved both modifying the system startup command file to ensure that *IT★OS* would be restarted automatically if the system were ever shutdown, and entering proper SET TERMINAL commands for printer ports.

Entering IT★OS started the program and a list of terminal definitions appeared. The opening menu (Create, Edit, Print) presented the current operations for the document, allowing me to create a document, print, assign a password or exit.

I could access subsequent menus by pressing Return. Separate screens display available choices for document Index Operations, allowing for management of documents in various directories; Copy; Insertion; Spelling Corrector, which also includes *IT★OS*'s document conversion facilities; List Processing, for mail merge operations; Background Processing Control, to control printing operations; and User Defined Keys, for MACRO definition. I found that menu choices may be entered from any screen, even though they don't appear on the one in use. I couldn't find a way to access a specific menu screen, bypassing those in between, nor to return to a prior menu without flipping through the others.

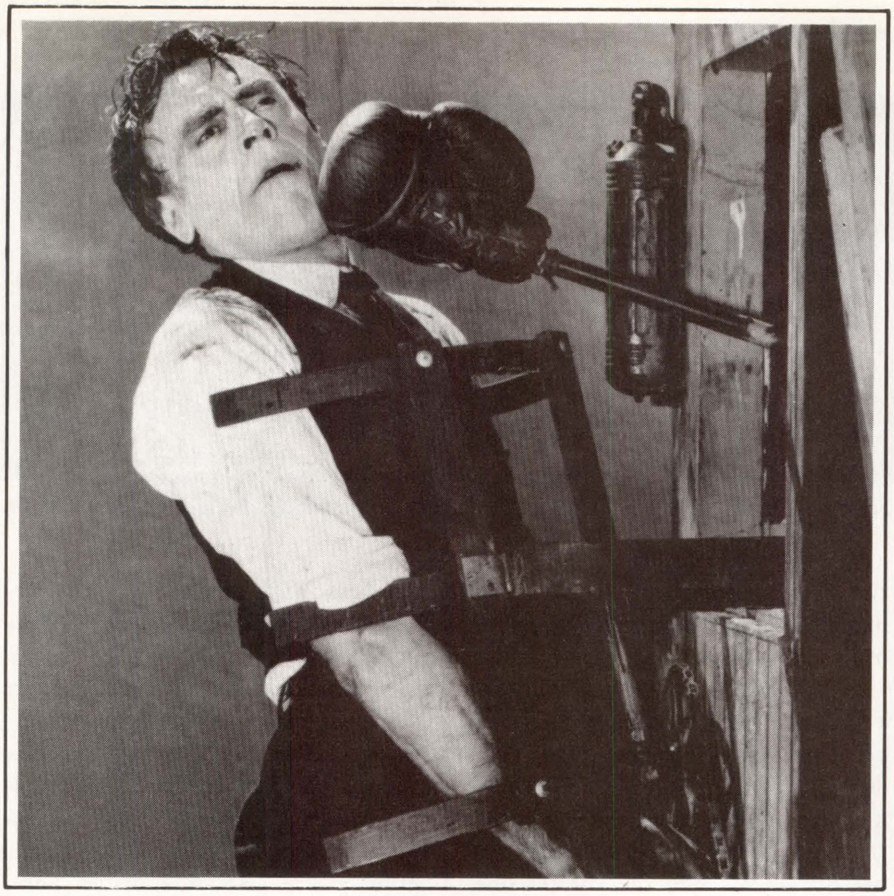
Creating, Editing, Saving

When creating a new document, the initial screen is displayed and editing begins below the ruler line labeled with an L on the left, indicating single line spacing and the left margin, and an S indicating "semi-right justification" and the right margin. You can store 10 rules for later recall.

After you've established the initial ruler lines and formats, you can begin to enter text. A typical editing screen with optional status information display is shown in Screen 1.

Initially in insertion mode, *IT★OS* uses the usual wordwrap feature, but this can be overridden temporarily for words you wish to keep together.

Because *IT★OS* is keyboard driven, it pays to have a keyboard map handy for reference. Those used to a WPS keyboard will find the



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GOLD Key-oriented commands familiar. In addition to the normal directional arrows for character and line movement, the edit keypad keys have assignments which when used with the Advance and Backup keys allow movement by words, lines, sentences, paragraphs, pages and tab stop. There is a search capability that can be used in either case-sensitive or non-case-sensitive modes and begins in the direction selected by Advance or Backup. A cut and paste feature allows you to remove or relocate portions of text and automatically reformat the paragraphs.

```
Document : itos.review                                  Page :  1
Line :       5  Column :    1          Mode : Advance   Font : Stand

Entering ITOS started the program and a list of terminal definitions appeared. The
opening menu (Create, Edit, Print) presented the current operations for the docu-
ment allowing me to create a document, print, assign a password or exit.

      Subsequent menus are accessed by pressing RETURN.
L---T----T----T----T----T--------------------S-------------------------
....:....1....:....2....:....3....:....4....:....5....:....6....:....7....:....8
```

Screen 1: Typical* IT*OS *editing screen display with status and ruler lines turned on.

Libraries

*IT*OS* provides Abbreviation Libraries which are established as separate files and contain blocks marked off by unique two-character abbreviations. There's no limit to the amount of text allowed in each block as long as all blocks are named appropriately. Parts of the text library can be called in while the current document is active, or the library may be selected before calling up the main document, so that it's ready for use.

Paragraph Libraries allow you to enter a designator of up to 50 characters per block rather than two. This extra descriptive information can be helpful if shorter abbreviations aren't suitable. *IT*OS* also permits the insertion of entire documents into the current one, whether or not they reside in the current directory, as long as all file protections are set correctly.

Text highlighting functions are available, including boldfacing, underlining, centering, overstriking, case swapping, superscripting and subscripting. More sophisticated formatting features, such as changing fonts, pitch and print quality, also are available. These formatting commands insert special codes into an *IT*OS* document but remain invisible during normal editing. To see them, press PF1-V. Repressing PF1-V lists the available character modifiers for various pitches, fonts and proportional spacing. At this point, you could select a code that allows the character under the current cursor to be modified. Blocks of text can be treated similarly, affording flexible formatting and customizing sections of documents.

Other special features are available by defining them in what *IT*OS* terms Control Blocks. These are non-printing blocks of text containing commands that control the document's format for features such as headers and footers, special print commands, non-printing comments, multiple column printing and calculation features. An example of control block use is defining a paragraph numbering scheme (see Screen 2).

```
This is a typical control block definition:

------------------------------------- Start of Control Block -------------------------------------
N
<CH> <1,N,1>
<S> <1,A,A>
<SS> <1,a,a>
------------------------------------- End of Control Block -------------------------------------

It will be used to number chapters, subchapters and subsubchapters.
```

***Screen 2:** One typical application of* IT*OS*'s central block formatting is that of numbering chapters or paragraphs.*

Pressing PF1-[starts the control block definition. N informs *IT*OS* that this control block will be used to define paragraph numbering until another control block with the N command is encountered. CH, S and SS are markers for chapter, subchapter and subsubchapter respectively. The actual markers you use are up to you. 1-N-1, 1-A-A and 1-a-a define the numbering scheme for each marker. The first number 1 ensures that chapters, subchapters and subsubchapters are grouped together.

N, *A* and *a* determine the numbering scheme: *N* for numeric, *A* for uppercase alphabetic and *a* for lowercase. When the time comes to do the numbering, rather than type the actual number, the marker is typed with an appropriate character to cause incrementing, if desired. For example, the text:

<CH> *IT**OS* REVIEW
<S> INSTALLATION
< +S> USAGE
<SS> SPECIAL FEATURES

would look like this when printed:

1 *IT*OS* REVIEW
A INSTALLATION
B USAGE
a SPECIAL FEATURES

The plus sign causes incrementing, no plus sign keeps the current value, and an equal sign forces numbering back to the original value of the first plus sign.

Printing

*IT*OS*'s printing facility lets you stop and restart or halt printing between page breaks. The Document Settings and Print Menus list the parameters that can be modified before printing begins. These include language (if more than one is installed), font style, automatic page breaking (which ignores any page markers placed in the document), page size, margins, number of copies and range of pages to print. Nine sets of print parameters, in addition to the default, may be saved for future recall.

A listing of the date, time, owner, document name and print parameters may be printed with the document. Even- and odd-numbered pages can be printed separately. And for running off dittos and transparencies, the entire document can be printed extra dark. Because *IT*OS* considers printing a background process, certain jobs may be given higher priority, stopped, restarted, canceled, etc.

Spell Checker

*IT*OS*'s spell checker is easy to use. Choose SP from any main menu, and type the name of the file to be checked. A count of the words checked is displayed until a mismatch is found; then a menu appears allowing you to replace or ignore this single occurrence or all occurrences of the word throughout the document. You have the option of adding the word to the dictionary. You also can save (or not save) the changes made through the spell checking process. With *IT*OS*, you'll need a dictionary if the spelling is unknown; alternative words aren't offered.

Calculator

*IT*OS* has sophisticated calculation features that allow computations and their results to be obtained while editing, and then saved in the document, a very useful tool if you write proposals and documents involving calculations.

There are two flavors of computing capability:

1. Calculator mode — The numeric keypad becomes a calculator for num-

```
L---.--------------.----------.----------.----------.----------S---------------------------
------------------------------------- Start of Control Block ------------------------------------
P
BEGIN
ROUND
FORMULA <:D1> + <:D2> = <:D3>999,999.99
FORMULA <:D1> + <:T1> = <:T1>999,999.99
FORMULA <:D2> + <:T2> = <:T2>999,999.99
FORMULA <:D3> + <:T3> = <:T3>999,999.99

------------------------------------- End of Control Block ------------------------------------

      34.23            35.21              69.44
      12.45            89.67             102.12
      23.78           123.786            147.57
        .67              .987              1.66
       1                2.1                3.10
------------------------------------- Start of Control Block ------------------------------------
P
SUBTOTAL
------------------------------------- End of Control Block ------------------------------------
      72.13           251.75             323.88
       1                2                  3.00
       3                4                  7.00
------------------------------------- Start of Control Block ------------------------------------
P
TOTAL
------------------------------------- End of Control Block ------------------------------------
      76.13           257.75             333.88
------------------------------------- Start of Control Block ------------------------------------
P
END
------------------------------------- End of Control Block ------------------------------------
```

Screen 3.* IT*OS*'s powerful math capabilities allow for the definition of spreadsheet-like row and column formulas, which are recalculated automatically if any figures are changed. Note that :Dn parameters indicate row figures at the decimal tabs, and :Tn indicates the calculation of column totals. Any required formatting is done by following a parameter with patterns of 9s with necessary commas, dollar signs and decimal points, COBOL style.

> File transfer and conversion capabilities include copying *IT*OS* documents between work areas, transferring from *IT*OS* to ASCII and vice versa.

bers of up to 13 digits, which appear from right to left. The typical math symbols +, -, /, * and = are used to carry out the calculations.

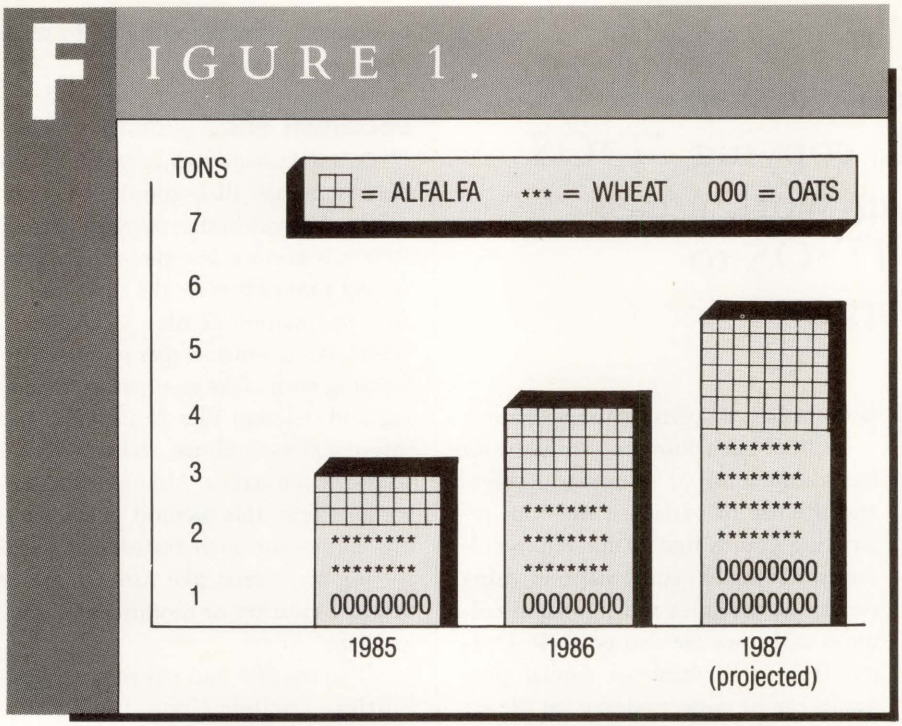
2. Column and row mode — *IT*OS* can perform row and column calculations including totals, subtotals, rounding, truncation, special formatting (COBOL programmers should look carefully at Figure 3) and averages. The control blocks are used with ruler lines, and set up with decimal tab stops to create the table format and perform the operations.

Other calculation features allow for the computation of columnar averages and the use of variables, thus not restricting you to figures entered in columns. Complex computations using constants, variables and figures in columns and rows are also possible. Output from accounting or similar programs can be converted to a list file for performing computations using those figures; the files can be placed in a form document, eliminating the need to do each one individually.

Document Management

*IT*OS*'s document management system doesn't create files simply by user-specified names in the current directory. Rather, it keeps a document index containing a list of files for the current work area and names all files ITDCMT.xxx where xxx is some integer number. Performing such tasks as copying, renaming and deleting files is accomplished through *IT*OS* utilities, accessed via the second menu screen. Although cumbersome at first, this method of file naming allows for such features as index sorting on criteria like name, number, version, creation or modification dates and size.

File transfer and conversion capabilities include copying *IT*OS* documents between work areas, transferring from *IT*OS* to ASCII and vice



IT★OS's *Diagram Editor makes bar charts and other drawings simple to create.*

versa. Transferring extended ASCII files allows the retention of some special features, like bolding and underlining.

IT★OS's ability to convert list files to data files for use by other programs is a powerful feature. By creating a conversion specification document, *IT★OS* will transfer the data contained in the list into the format specified in the conversion specification file. This file contains the names of the fields in the list file records, their data type and the number of bytes in that field to transfer to or from the data file. When conversion finishes, the result will be either a list file or data file containing records in the correct format for input to the appropriate software.

List Processing

IT★OS list processing involves the creation of three documents: data, form and selection. Creating the records for the data file is straightforward. Each field is placed on a separate line with field names enclosed in angle brackets (< >) followed by contents, as in:

```
<Company>DEC PROFESSIONAL
<Street>921 Bethlehem Pike
<City>Spring House
<State>PA
<Zip>19477
< >
```

Empty angle brackets and double RETURNs separate records. The form document uses the same field names placed in the appropriate area of the file, also enclosed in angle brackets.

The selection document controls which records from the list file are to be processed, for example:

```
IF <State> = PA
AND <Zip> = 12345 OR LESS
BUT NOT IF <City> = Itosville
THROUGH
Wordsberg
THEN PROCESS RECORD
```

Many "program language-like statements" are available to control the selection process. OR, OR MORE and compound IFs are available, giving you control over record processing. A self-test option provides a logic check of the selection document before invoking it. Merging can be directed to the printer immediately or to a disk file for printing later.

Other options include the ability to create tables from a list document. *IT★OS* can mark text in the form document as non-repeating, so that when the merge takes place, information from the list file is merged with the form document without forcing page breaks to occur, and the same form text is printed for each record.

List documents can be sorted using a Sort Specification Document, similar to a selection document. Sort parameters include alphabetic, numeric, ascending, descending, length (which tells *IT★OS* to look at only the first n characters of a field rather than the whole thing) and position (the position within the key field to consider first in the sort rather than the first position in the field). Several fields may be specified as primary and secondary keys.

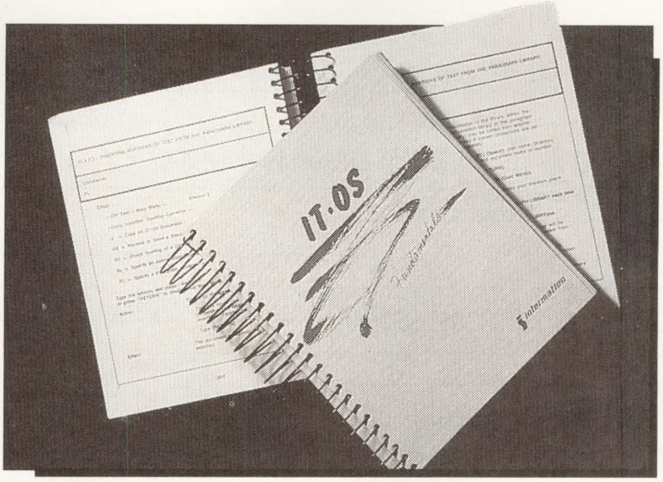
List processing is used to create tables of contents. Assuming a document includes paragraph numbering, the *IT★OS* TC command extracts the previously marked titles and headers from the document and creates a list file for you. After the list file is generated, a form file controls the table's appearance. You can control the appearance by defining separate formats for chapter, subchapter, heading lines, etc. The selection document (necessary in *IT★OS* for any merge) only needs the words THEN PROCESS RECORD, because the table of contents will include all the records in the list file.

In addition to allowing graphics

files to be inserted into the document, *IT*OS* provides limited graphics capabilities of its own through the Diagram Editor. Lines and boxes can be drawn and filled in with characters and other graphics. Vertical and horizontal labels may be added to charts and graphs. With the right printer, you can generate charts similar to the one in Figure 1.

After you've entered the diagram mode, *IT*OS* provides short and long menus to help guide you through the process. The menus display choices to select characters, draw lines and boxes, do fills of areas, and join and move things around. Arrow keys are used to do the drawing in the specified direction. Diagram screens are limited to 22 lines, and breaks occur automatically between each diagram. Automatic centering occurs unless changed by the user.

The keypad changes mode as different diagramming options are used. For instance, when using the Fill Area option, the keys represent graphics characters rather than diagram functions. With practice, sophisticated diagrams can be drawn quickly. Diagram mode is useful for drawing simple charts when graphics from a spreadsheet program aren't necessary or available.

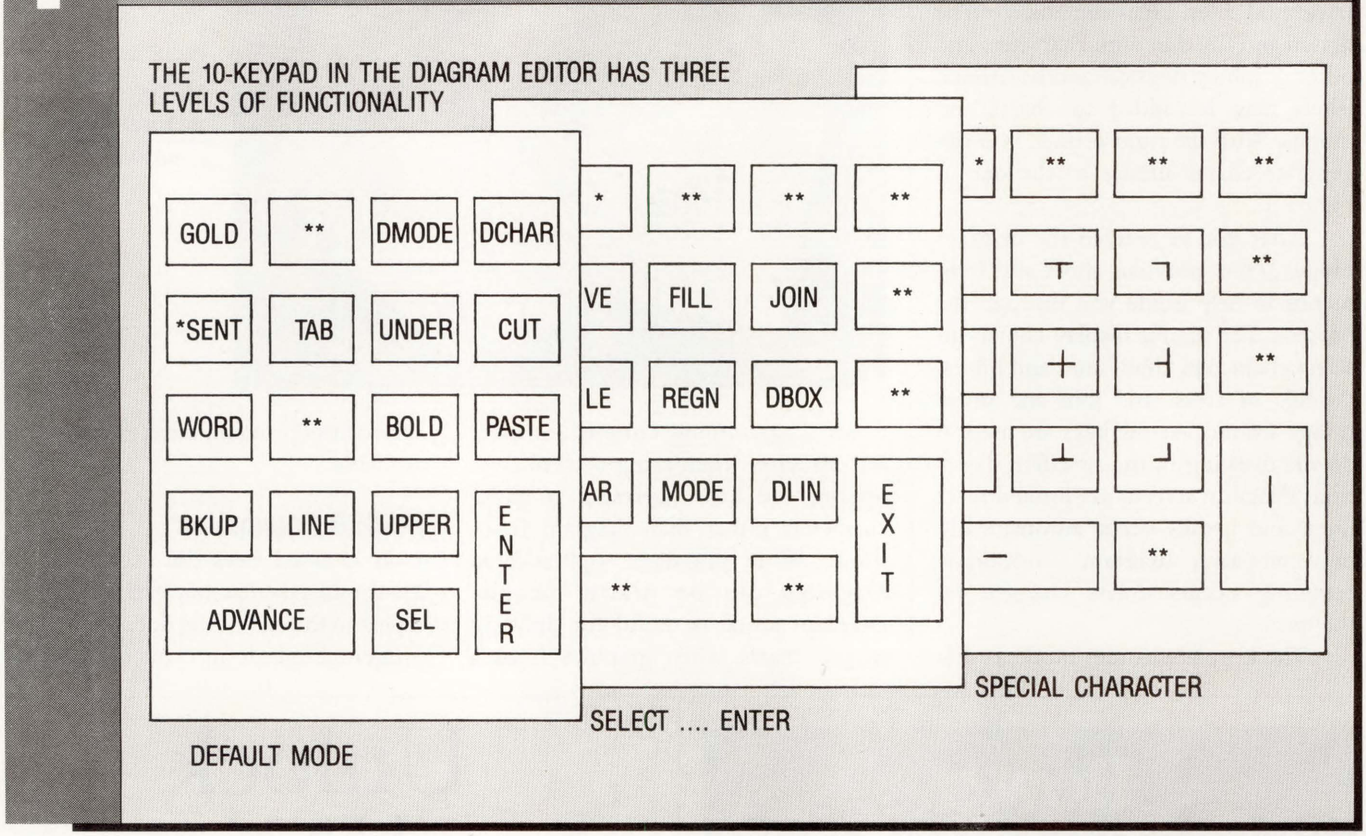


The fundamentals guide is intended more as a reference manual than a tutorial.

MACRO Economics

User Defined Keys can execute up to 255 commands that may execute once or repeat to the end of the document. This program can be looped and is interrupt-

FIGURE 2.



The three keypad modes within the Diagram Editor.

able so that the user can enter text or other commands during MACRO execution. Also, if 255 commands aren't enough, multiple MACRO keys can be chained, providing more power and flexibility. Up to 99 UDKs may be created, more than enough for even the most prolific user.

Help!

Extensive, online help is available from within a document or any menu. Pressing HELP on a VT220 or PF1-H on a VT100 puts you in Help mode. If help is requested from inside a document, a menu appears listing help categories from which you may choose one. The next screen displays the available functions for that category; e.g., moving the cursor. For help on a specific function, enter the keystrokes needed to accomplish it, and *IT*OS* will provide detailed descriptions and examples to guide you. Requesting Help from a menu provides detail on each of the choices from that screen.

Documentation

Intermation provides a wirebound fundamentals guide of more than 600 pages. The documentation is presented in well-defined steps and is intended more as a reference manual than a tutorial.

*IT*OS*'s pocket reference guide contains short descriptions of all main menu commands, ruler settings, main keyboard keys, keypad keys, view mode symbols and what they mean along with a complete VT220 keyboard diagram.

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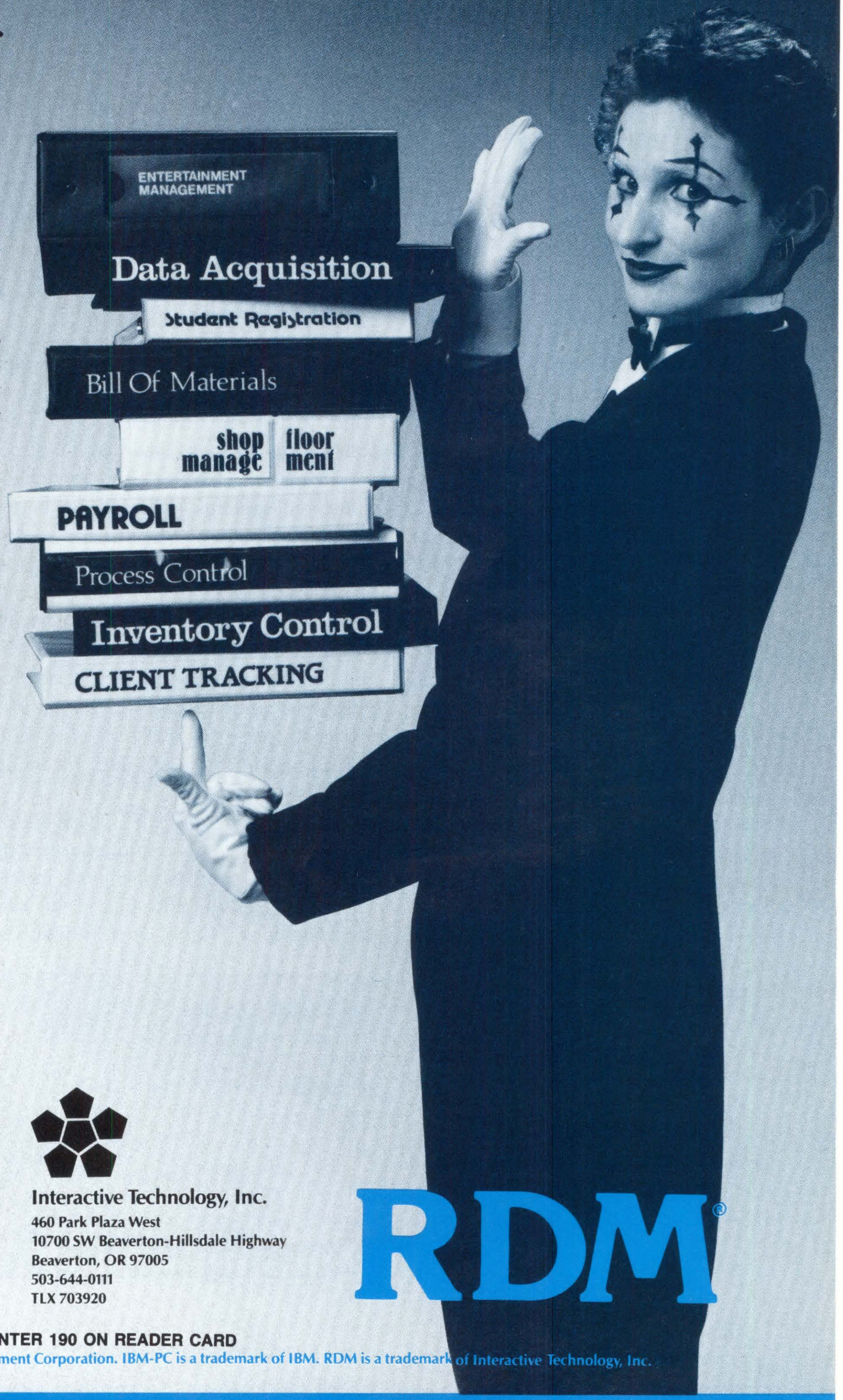

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DEC WATCH

Evan Birkhead

The Big Picture

Savoring a different role — that of a maverick monopoly buster — DEC entered the new year with some different ideas to topple the leaders at all levels of computing. At the low end, Ken Olsen went with the strategy, "Two heads are better than one." DEC teamed up with Apple to battle IBM at the micro level and with Evans & Sutherland to contend with Sun at the workstation level. The team concept has been used before. It was an extension of 1987's diplomatic front-end pact with the goliath supercomputer producer Cray, which permanently anchored the VAX as a player at the highest end.

With those typically non-DEC areas seemingly in hand (stirring controversy, if not praise), and with the MICROVAX II safely on top in its nebulous market, DEC went back to the drawing board at the mid-range, where it has had the bloodiest slugfests with IBM. (That is, the mid-range, according to what DEC currently is calling the mid-range.) Based on its supercomputer gateway and a mainframe-class single-processing machine that DEC sources tantalizingly hinted could be released as early as the beginning of 1989, it seems that DEC now has a new definition of mid-range.

Whether you think it's cocky, condescending or fully imagined, DEC now calls its mid-range the new series of VAX multiprocessors that rivals low-end IBM 3090 throughput power.

If it sounds like a matter of semantics, it is. DEC's introduction of the newest VAX family, the 8800s, involved redefining and realigning the present high-end VAX line, the third such realignment in three years. In fact, Bill Demmer, vice president of mid-range VAXs, provided onlookers with the first assessment of the VAX 8800, the long-awaited Polarstar, which everyone expected to be presented as a high-end VAX. "Rest assured," Demmer justified, with more than a touch of irony, "this is not the highest performance system Digital ever will announce."

Spin-Off Of The 8700

Technically, it wasn't even the highest performance system to date, although the 8800s leave the current top-of-the-line mainframe clustering solutions (8974 and 8978) in the dust in price/performance. But DEC says that these clustered systems still will be better suited for certain types of industries, which were called "high availability and fault-tolerant applications."

For comparison, an 8978 has twice the performance of an 8842, which will be the standard off-the-shelf cluster of two 8800 family processors. It also has twice the performance of the maximum configuration of four multiprocessing 8800s.

The 8800 family is basically building blocks of CPUs combined in a VMS sphere that supports symmetric multiprocessing, a capability that in this case permits up to four CPUs to function in concert as one, and allows incremental increases in processing power.

> **"The 8800 family is basically building blocks of CPUs combined in a VMS sphere . . ."**

The basic starting block is the VAX 8700, fueled in this incarnation by either a MICROPDP-11 or a MICROVAX II engine, depending on your configuration.

The series has five family members:

1. The 8810, which is basically a renamed 8700.
2. The 8820, which is two 8810s, much like the current dual-processing 8800.
3. The 8830, which is three.
4. The 8840, which is four.
5. The 8842, which is a preconfigured cluster of two 8820s.

The 8820s share data through regular cluster file sharing, using HSCs, etc. (All 8800s are clusterable.)

An 8820 was reported to produce 1.9 times the performance of the 8810; an 8830, 2.8 times; and an 8840, 3.7 times. DEC avoided quoting mips and mops.

"High performance is much more than just CPU cycles," defends Demmer. "You need to balance performance with efficient software, more I/O and larger memories."

Where Is VMS 5.0?

DEC deserves a lot of credit for this innovative approach to achieving mainframe-sized numbers (see Figure). Only one year ago, symmetric multi-

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Price: $592,000 for the base 8810 configuration, upgradable in $280,000 increments to an 8840. An 8842 preclustered system costs $1.7 million.
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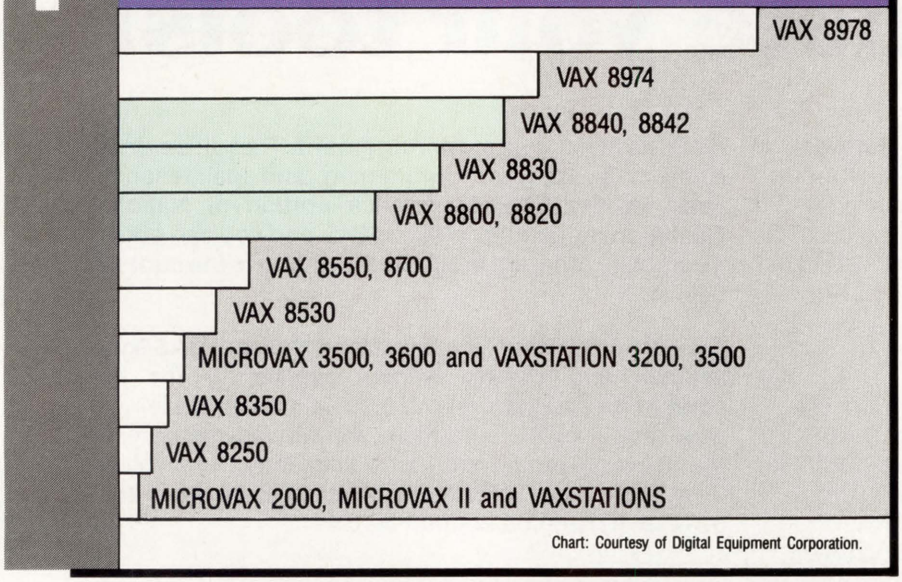
FIGURE 1.



This diagram illustrates the relating throughput performance of the entire VAX family. New CPUs are indicated by shaded bars.

processing (SMP) appeared to be a futuristic capability that didn't appear marketably feasible as part of an operating system, but DEC has joined Prime Computer and a few others as technological leaders in this area.

As another advantage, DEC stressed the lack of personnel needed to support an 8800 cluster. The cost of an 8842 includes resident software support by a DEC engineer, who stays on-site for the first six months after the system is purchased.

On the down side, most analysts were expecting the 8800s to be the debut processors for pure VMS version 5.0, not version 2 of its field test version. Version 5.0 now is expected with the next generation of VAXs, possibly the next MICROVAX, and Demmer says that version 5.0 VMS with SMP soon will be available for the 8300, 8350 and 8800.

Despite its shortcomings regarding the facilities we were expecting in VMS 5.0, this lame duck version of VMS will be remembered for producing SMP capability and for combining clustering with SMP in the VAX 8842.

"VMS with symmetric multiprocessing support maximizes the potential of each processor by balancing the workload across all processors," explains Demmer. "Each processor does its share of work automatically, without involving the user or the system manager."

DEC says 5.0 will have online transaction processing and extra facilities that support SMP and asymmetrical multiprocessing (ASMP), which was used in the high-end VAXs announced two years ago. The company also said it's "committing to the future availability of ULTRIX" for the new machines.

Two solutions packages are also standard with the 8800s. These include a startup and service package for starting a VAXCLUSTER, and a high data availability package that has redundant access, volume shadowing and a new HSC.

Inside The Cabinet

Beta users report that the system pays for itself with its ease of expansion. When you buy an 8820, for example, you get the whole cabinet (two VAXBI channels, 128 MB of memory) and an upgrade requires more hardware added inside this cabinet. Additional I/O and memory increases linearly with the number of processors you add. By the time you've built your cabinet into an 8840, you can support the following incremental expansions:

1. 8810 — 48-MB main storage, one BI-bus, one Ethernet adapter and one VAX-CLUSTER adapter.
2. 8820 — 128 MB, two BIs, one Ethernet and one CI.
3. 8830 — 128 MB, two BIs, two Ethernets and one CI.
4. 8840 — 128 MB, two BI, two Ethernets, one CI, an HSC70 and a 2.5 GB SA482.
5. 8842 — two 8820s, an HSC70 and an SA482.

Therefore, the total ceiling configuration can include up to 512 MB, six BI channels and a 50 percent increase in I/O.

Although analysts were worried about it running high-intensity programs such as U.C. Berkeley SPICE, DEC says that it already has an installation running SPICE in stream mode.

Delivery is expected to be a big problem. Two simulation software companies, Structural Dynamics Research Corporation of Milford, Ohio, and Intera-ECL of Denver, Colorado, already have decomposed applications optimized for 8800 multiprocessing, and as many as a dozen are expected to follow. However, there are still skeptics.

In a change of recent policy, DEC declared that it's delivering the 8800s "immediately." This left many buyers and analysts scratching their heads, particularly those who had ordered MICROVAX and VAXSTATION 3500s last year and haven't seen delivery yet.

Overall, DEC has greater momentum than the competition in devising a general-purpose computing strategy at all levels. If IBM has the bigger picture, then it's evidently comparing itself to DEC. With this announcement, and a few imminent improvements to the MICROVAX II and the VAX high-end (DEC's *high* high-end), DEC will prove that it has a firm grip on the big picture. ■

TRAINING

C Language Training On Video Tape

Philip Margolis

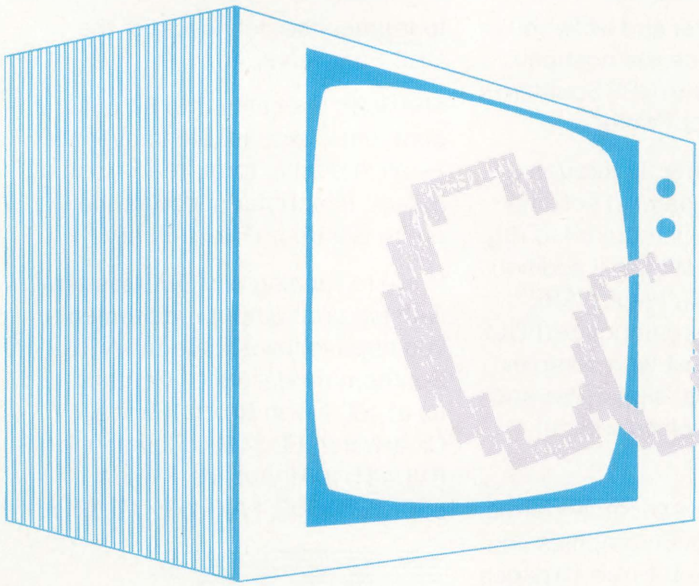
It used to be that the only way to learn how to program in C was to delve through a copy of Kernighan & Ritchie's *The C Programming Language*. Many programmers refer to this book as the bible, because it's the definitive description of C but also, I suspect, because using the book to learn the language involves a fair amount of praying. Today, there are dozens of books covering practically every facet of the C language, and in most colleges, C courses are standard offerings in computer science programs. There are also numerous companies that offer C training seminars, and as evidence that C is finally being accepted as a general-purpose programming language, there are even C training videos.

Two such products are *C Language for Programmers* from AT&T and *C Video Workshop* from Hands-On Learning Corporation. Both are directed toward experienced programmers who are unfamiliar with the C language. Each package is based on a set of video tapes and a workbook. In addition to the core material, *C Language for Programmers* includes six weeks of telephone support to help you through the course. *C Video Workshop* includes a diskette containing program examples and a copy of Tom Plum's textbook, *Learning To Program in C*.

C Language For Programmers

As you might expect from the company that invented C, the tapes by AT&T are technically competent, but the style is reserved.

The course is divided into 12 modules. In each module a professional narrator, complete with hush puppies and a flannel sweater, describes a C topic. To drive home the point that this is a training tape, the course is set in an empty classroom. On one of the desks sits a terminal on which program examples are displayed. As the narrator discusses examples, relevant sections of code are highlighted. Disappointingly, this is about the full extent of the graphics used in the course.



The video covers all of the main areas of the C language, including the preprocessor, bit manipulation, I/O and many of the new features proposed by ANSI. The workbook summarizes most of the points made on the video and contains some useful tables and exercises.

What it lacks is creativity. Rarely does it take advantage of its medium to graphically illustrate a point. Watching the video is like sitting in on a class taught by a competent but unimaginative professor.

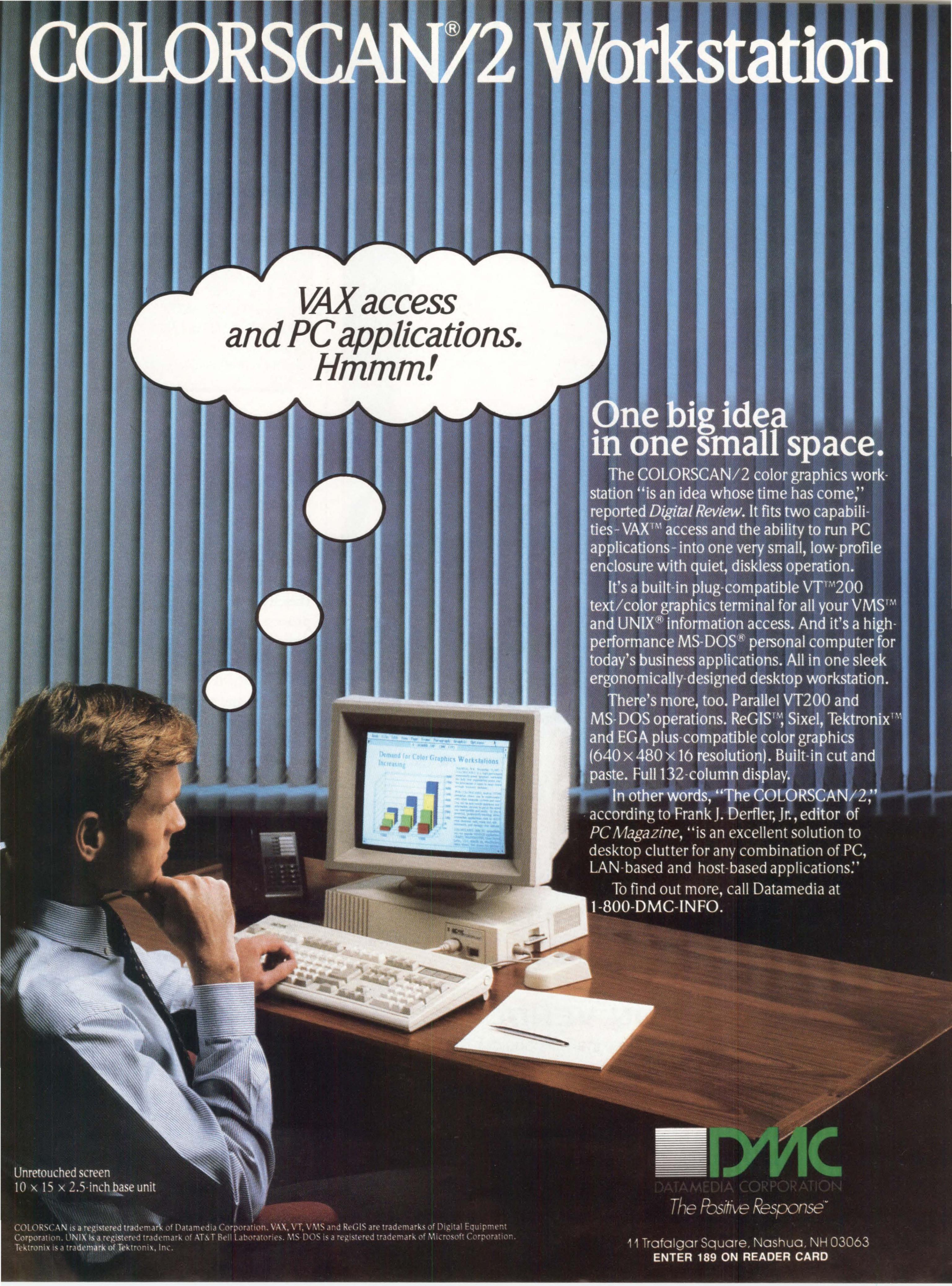
C Video Workshop

If creativity were the sole criteria for training programs, *C Video Workshop* would be hard to beat. Unfortunately, much of the energy that goes into making these videos entertaining comes at the expense of technical accuracy and breadth.

The course is divided into six medium-length modules. Each module covers a lot of territory. For example, Module 3 covers arrays, strings and I/O.

There are two narrators who introduce and explain topics. When they show program examples, though, the scene switches to a cozy, fireplaced living room with Joe Programmer sitting at a terminal. Joe Programmer is intended to represent the target audience, an intelligent and experienced programmer looking at C code for the first time. After going through an example, the camera switches back to the pair of narrators who provide further explanation.

Periodically, especially in the later modules, certain topics are illustrated by actors who represent various components of a program. In one of the more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effective segments, the actors represent functions inside a computer to show how arguments are passed on the stack.

In general, the presentation style is varied and interesting, but unfortunately, the actual content of the course is sketchy. Major topics, such as the preprocessor, barely are covered. Other topics, such as function prototypes and bit manipulation aren't mentioned at all. Many of the topics discussed are oversimplified and some of the style hints are dubious. For example, the video encourages the use of the comma operator to separate assignments, a practice frowned on by most C programmers.

C Language for Programmers costs $2,100 and *C Video Workshop* sells for $995. If the purchase price seems too high, you may wish to rent the videos. *C Language for Programmers* is $300 for one month and the Hands-On Learning version is $195 for two weeks. It's important to note that these prices don't entitle you to make copies of any of the material, including the workbooks. Whether you rent or buy, you may want more than one person to use the course. If each person would like his own workbook, you may purchase additional copies. AT&T sells its version for $25 and Hands-On Learning charges $65 (this includes Plum's textbook).

—Philip Margolis is a business writer based in Boston, Massachusetts.

LET'S C NOW

Rex Jaeschke

Calling VAX C From Other Languages

Editor's note: In this issue, Mr. Jaeschke again delves into the VAX Calling mechanism. This time, he discusses the differences between the CALLS and the CALLG VAX instructions, both of which are used by VMS languages when they call external procedures.

The standard argument passing mechanism for C functions is by value. A copy of each actual argument passed is put on the stack, where it can be manipulated by the called function without fear that these modifications will have any effect on the original argument. In fact, we treat formal arguments as automatic objects defined within the called function. Note, though, that arrays are passed by reference.

This is part of the definition of C, and it will work in any environment in which we call C from C. The key qualifier here is "call C from C." Things change when we begin to interact with other language environments, because those environments can impose further restrictions on the interface mechanism. That's the case with VAX FORTRAN, VAX LISP and any other VAX language that uses the CALLG instruction for external procedure linkage.

CALLS Versus CALLG

The VAX has two main procedure CALL instructions, CALLG (call with general argument list) and CALLS (call with stack). They can be used as necessary, with a routine using one or the other, or both, as appropriate. VAX language compilers use one or the other with VAX FORTRAN and LISP using CALLG, and VAX C (and other languages) using CALLS. Both calling methods are sanctioned by the VAX Architecture Calling Standard.

Let's look at how procedure linkage works on the VAX. When control is passed to a subroutine, the argument pointer register (AP) points to a data block of the following form:

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

The argument count **n** is an unsigned byte in the first byte of the argument list. The maximum number of arguments, therefore, is 255. The high-order three bytes in the first longword are reserved by DEC for future use. Each argument on the stack takes up a longword and may represent either a value, the address of a data object or piece of executable code, or the address of a descriptor.

The difference between CALLG and CALLS is that CALLS generates this block on the stack at run time, and CALLG causes AP to point to a block already in existence, possibly created at compile time. Specifically, CALLG doesn't recreate the parameter block dynamically each time the procedure is called, but CALLS does; herein lies the problem.

A Simple Demonstration

The following function called **copy** is my version of the library routine **strncpy**. I've added some trace print calls to enhance the explanation. The classic way to implement this function is to decrement the formal argument **count** and increment the formals **in** and **out** as shown here. Note that the C examples use the new style function definition syntax recommended by the Proposed ANSI C Standard.

```
void copy(int *in, int *out, int count)
{
        printf("count starts at %d\n", count);
        printf("in = %x, out = %x\n", in, out);

        while (count){
                printf("%d\n", count);
                *out++ = *in++;
                --count;
        }
}
```

This works when called from C or any other language, using the CALLS linkage instruction. However, it won't work with the following FORTRAN program. This FORTRAN program is unrealistic, because it copies the array **in** to the array **out** three times in succession; however, it will serve the purpose of this exercise. Note that because FORTRAN passes by address by default, we need to explicitly pass 10 by value.

```
program ftest1

implicit none
integer in(10), out(10), i

do i = 1, 3
        call copy(in, out, %val(10))
end do

end
```

The output generated is:

```
count starts at 10
in = bdc, out = c04
10
9
8
```

```
7
6          count starts at 0
5          in = c04, out = c2c
4          count starts at 0
3          in = c04, out = c2c
2
1
count starts at 0
in = c04, out = c2c
count starts at 0
in = c04, out = c2c
```

That isn't quite what you might have expected, because **count** is set to 10 at the start of the first loop but not for the second or third. On closer inspection, we also can see that the addresses of **in** and **out** have changed after the first loop. The address of **in** in the second and third loops is the same as the address of **out** in the first loop. All is not well, but why? To answer that, let's look at the machine code generated by both the FORTRAN and C compilers. (Use /list/machine compilation switches on the compilers.)

```
void copy(int *in, int *out, int count)
{
/* copy: */
/*       .entry   copy,^m<r2> */
/*       subl2    #4,sp */
/*       movab    $CHAR_STRING_CONSTANTS,r2 */

         printf("count starts at %d\n", count);
/*       pushl    12(ap) */
/*       pushal   (r2) */
/*       calls    #2,PRINTF */

         printf("in = %x, out = %x\n", in, out);
/*       pushl    8(ap) */
/*       pushl    4(ap) */
/*       pushal   20(r2) */
/*       calls    #3,PRINTF */

         while (count){
/*       tstl     12(ap) */
/*       beql     sym.2 */
/*       tstl     r0 */
/*       nop         */
sym.1:

                  printf("%d\n", count);
/*       pushl    12(ap) */
/*       pushal   39(r2) */
/*       calls    #2,PRINTF */

                  *out++ = *in++;
/*       movl     8(ap),r1 */
/*       addl2    #4,8(ap) */
/*       movl     4(ap),r0 */
/*       addl2    #4,4(ap) */
/*       movl     (r0),(r1) */

                  --count;
/*       decl     12(ap) */

                  }
/*       bneq     sym.1 */
/* sym.2: */

         }
/*       ret         */
```

See how the three arguments are modified directly by the addl2 and decl instructions as we expect, because this list is supposed to be a copy of the real arguments. The **copy** function expects the argument list to be set up as follows, and it finds it this way:

```
-----------------------
|      0      |   3   |  <-- ap
-----------------------
|   address of in     |  ap + 4
-----------------------
|   address of out    |  ap + 8
-----------------------
|       count         |  ap + 12
-----------------------
```

In FORTRAN code:

```
0050    .PSECT  $LOCAL
0050    .LONG   ^X00000003
0054    .ADDR   IN
0058    .ADDR   OUT
005C    .LONG   ^X0000000A

0000    .PSECT  $CODE

0000  FTEST1::
0000    .WORD   ^M<IV,R11>
0002    MOVAL   $LOCAL+^X50, R11

0009    MOVL    #1, R12
000C  L$1:

000C    CALLG   $LOCAL+^X50(R11), COPY

0013    AOBLEQ  #3, R12, L$1

0017    MOVL    #1, R0
001A    RET
```

the argument block is allocated statically at compile time in PSECT $LOCAL at offset 0x50, and the argument pointer is set to point here by the CALLG instruction.

Note that the argument list isn't reinitialized on each iteration of the loop. Therefore, at the end of the first loop, **count** has been decremented to 0. Because it's still 0 on subsequent loops, it tests false, so no copying is done.

Likewise, at the end of the first loop, the pointers **in** and **out** point to the character beyond the end of their respective arrays. Because the array **out** is stored in memory immediately following the array **in**, the pointer **in** points to the start of the array **out**.

Forcing FORTRAN To Reload The Arguments

Part of the problem is that **count** never gets reset to 10 for each loop. The following program solves this:

```
program ftest2

implicit none
integer in(10), out(10), i, n

n = 10
do i = 1, 3
        call copy(in, out, %val(n))
end do

end
```

This produces the following output:

```
count starts at 10
in = bdc, out = c04
10
9
8
7
6
5
4
3
2
1
count starts at 10
in = c04, out = c2c
10
9
8
%SYSTEM-F-ACCVIO, access violation, reason mask=00,
virtual address=00000000, PC =0000106D, PSL=03C00000
%TRACE-F-TRACEBACK, symbolic stack dump follows
module name     routine name line       rel PC

FC1             copy         8          0000004D
FTEST2          FTEST2       8          00000017
```

The count is reset to 10 for each loop; however, the program aborts while executing the second loop. This is because the addresses being passed still are being modified accumulatively for each loop. The first loop copies **in** to **out**, while the second tries to copy 10 bytes from **out** to the area beyond **out** that we don't own, causing the access violation. The offending statement is ***out + + = *in + + ;** because it's attempting to write outside the program's address space.

The code generated from the FORTRAN compiler is interesting. The argument block has space for the count, but it's initialized to 0 at compile time. It's set to 10 at the start of each loop at run time, even though the assignment statement is outside the loop.

```
0050     .PSECT   $LOCAL
0050     .LONG    ^X00000003
0054     .ADDR    IN
0058     .ADDR    OUT
005C     .LONG    ^X00000000

0000     .PSECT   $CODE

0000  FTEST2::
0000     .WORD    ^M<IV,R11>
0002     MOVAL    $LOCAL+^X50, R11

0009     MOVL     #1, R12
000C  L$1:

000C     MOVL     #10, $LOCAL+^X5C(R11)
0010     CALLG    $LOCAL+^X50(R11), COPY

0017     AOBLEQ   #3, R12, L$1

001B     MOVL     #1, R0
001E     RET
```

Passing Addresses By Value From FORTRAN

To ensure the argument block is completely initialized at run time, each loop can use the following FORTRAN code:

```
program ftest3

implicit none
integer in(10), out(10), i, n
integer in_addr, out_addr

n = 10
in_addr = %loc(in)
out_addr = %loc(out)
do i = 1, 3
        call copy(%val(in_addr), %val(out_addr), %val(n))
end do

end
```

The output produced is:

```
count starts at 10
in = bdc, out = c04
10
9
8
7
6
5
4
3
2
1
count starts at 10
in = bdc, out = c04
10
9
8
7
6
```

```
5
4
3
2
1
count starts at 10
in = bdc, out = c04
10
9
8
7
6
5
4
3
2
1
```

The corresponding machine code for ftest3 is:

```
0050    .PSECT  $LOCAL
0050    .LONG   ^X00000003
0054    .LONG   ^X00000000
0058    .LONG   ^X00000000
005C    .LONG   ^X00000000

0000    .PSECT  $CODE
0000  FTEST3::
0000    .WORD   ^M<IV,R2,R3,R11>
0002    MOVAL   $LOCAL+^X50, R11
0009    MOVAL   IN(R11), R12
000D    MOVAL   OUT(R11), R2
0011    MOVL    #1, R3
0014  L$1:

0014    MOVL    R12, $LOCAL+^X54(R11)
0018    MOVL    R2, $LOCAL+^X58(R11)
001C    MOVL    #10, $LOCAL+^X5C(R11)
0020    CALLG   $LOCAL+^X50(R11), COPY

0027    AOBLEQ  #3, R3, L$1

002B    MOVL    #1, R0
002E    RET
```

The argument list block is reinitialized before each CALLG, and the program works fine. However, the cost has been to write some very unwieldy FORTRAN code.

The Solution

There's a more elegant solution: Modify the C function to accommodate the CALLG instruction, as follows:

```
void copy(int *in, int *out, int count)
{
        int *incopy = in;
        int *outcopy = out;
        int countcopy = count;

        printf("count starts at %d\n", count);
        printf("in = %x, out = %x\n", in, out);

        while (countcopy){
                printf("%d\n", countcopy);
        *outcopy++ = *incopy++;
        --countcopy;
        }
}
```

By making copies of the formal arguments and modifying those copies, there's no need to know whether CALLS or

CALLG were used, because we never try to modify the formal argument list. While this solves the problem, it's contrary to established C programming practices, and it may seem unreasonable to seasoned C programmers.

However, if you want to have a C library that's callable by other VAX languages, follow the VAX linkage model. The *VAX Architecture Handbook* says, "The argument list must be treated as read-only data by the called procedure." Unfortunately, you won't find this in the VAX C manual.

Another VAX hardware manual says that an argument list can be passed in either of two ways: by passing only its address [CALLG] or by passing the entire list on the user stack [CALLS]. The first method is used to pass long argument lists or lists that you want to preserve, and the second is used when calling procedures that don't require arguments or when building an argument list dynamically.

Despite this explanation, each VAX language seems to use only one of the CALL instructions. Note that FORTRAN calls its intrinsic functions using the JSB instruction, and future versions of VAX C (possibly beginning with V3.0) also will provide a mechanism to generate JSB linkage.

In the meantime, if you're calling C from C, it's OK to modify formal arguments. However, this violates the VAX standard linkage model and should be taken into account as appropriate.

While researching this article, I was reminded of another problem. The code:

```
void copy(int *in, int *out, int count)
{
        while (count){
                *out++ = *in++;
                --count;
        }
}
```

isn't quite the same as:

```
void copy(int *in, int *out, int count)
{
        while (count--)
                *out++ = *in++;
}
```

In the first case, **count** is only decremented if it's true (hopefully, it's positive). In the second case, even when **count** is zero and tests false, it's decremented, so it becomes -1. If we call this from FORTRAN twice in a row, **count** will be -1 at the start of the first loop. Because -1 tests true, we get an infinite loop that results in an access violation. This is only true when CALLG is used; for CALLS, the two examples are equivalent. Although it's generally safe to use the second method, it's not maximally portable.

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

DCL DIALOGUE

Fortune Cookies For The Masses

Kevin G. Barkes

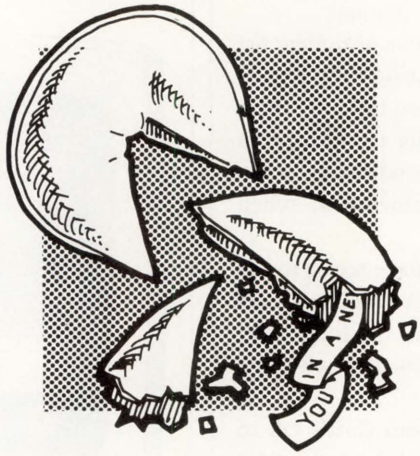
As an independent consultant, you never know what type of challenges await you. Clients want the darndest things. One of them asked for a DCL-based fortune cookie program. He was tiring of the messages in his current public-domain COOKIE, but as a MICROVAX user in an office environment, he had no languages available to him, except DCL.

Charging a client to produce something this frivolous was distressing, so I produced it on my own time, made it public domain, and placed it on my BBS system where it can be copied and distributed freely. It's currently on ARIS, so feel free to download it and have fun.

When invoked, a fortune cookie program produces a random quotation. This poses two interesting problems for the DCL version: how to store the quotations, and how to access them randomly.

I dismissed the use of indexed files because of their susceptibility to damage. I had visions of getting all sorts of calls from unwitting users who edited the indexed quote file with a text editor and totally whacked the file structure. Of course, the same thing is possible if the library file is edited, but a user is more likely to recognize a VMS file in text library format to be something other than a normal file.

I settled on using a text library, with the numbers 1, 2, 3, etc., as module names. The module can be called by the randomly generated number. By using lexical functions, I generated the library module number by extracting the ones and hundredths of seconds fields of the current time. This approach permits modules numbered from 0 to 999, or 1,000 possible quotes.



BAKE.COM

First, cookies have to be prepared before being consumed, and the DCL variety isn't any different. BAKE.COM reads in a plain text file containing the quotes and produces a text library (see Program 1).

To run BAKE.COM, you need to do three things: assign the name COOKIE_JAR to the file that will contain the library; assign the name OLDCOOKIES to the file where old COOKIE_JARs will be copied; and be certain the quote file COOKIE.IN exists in the directory where BAKE.COM is invoked. Also, make sure you give full file specifications, device, directory, name and extension to the files. COOKIE.IN, the quote file, requires no special formatting, except that there must be blank lines separating each quote.

When invoked, BAKE.COM sets up environmental conditions and checks for the existence of needed files. The present cookie library is copied to another file for safekeeping, and then deleted. BAKE reads COOKIE.IN, generates temporary files one at a time, assigns them numerical module numbers and adds them to the text library file. This isn't an efficient procedure, but its infrequent use didn't warrant spending an enormous amount of time on optimization. Besides, the price is right.

COOKIE.COM

COOKIE extracts a quote from the library and displays it on the user's terminal (see Program 2). If it can't find the cookie jar, it exits immediately. Otherwise, it generates a random number, and tries to pull a quote from the library. This method has one major drawback. What if the cookie jar has less than 1,000 quotes or a gap exists in the module numbers? COOKIE circumvents this problem by checking the status of the LIBRARY/EXTRACT command. If it fails, it divides the COOKIE number by two and tries again; it will continue to do this for five iterations, and then give up.

For example, assume the random number generated is 840. You don't have 840 quotes in your library; the extract fails. But, COOKIE will divide 840 by 2, producing 420, 210, 105, 52 and 26 before giving up. You can make COOKIE run faster by dividing by a larger number, (three or four probably are more efficient). Also, you can increase the size of your library by duplicating entries if you're short on pithy sayings.

The quotes file from my BBS, SYS$OUTPUT, is available for download by calling (412) 854-0511. It contains approximately 260 entries, but be forewarned, the quotes were compiled by someone who feels Tom Lehrer is the greatest composer and lyricist of our time. Speaking of bulletin board systems, because of the lead time involved in producing *DEC PROFESSIONAL*, BBS

numbers published can become outdated quickly. To circumvent this problem, you can get a listing of most of the VAX, PDP-11 and Rainbow-oriented BBS systems by sending a stamped, self-addressed business-sized envelope to: BBS List, Kevin G. Barkes Consulting Services, 4107 Overlook Street, Library, PA 15129.

In the months ahead I'll feature some nifty user-submitted procedures. If you'd like to join in the fun, send your submissions to me at the above address. I prefer submissions on magtape, because I don't have the time to rekey all the material we get.

And please, no more default-changing command files. I received a letter from a reader who boasted the ultimate utility, requiring only a single parameter in order to operate. The command file is:

```
$ SET DEFAULT 'P1'
$ EXIT
```

Easy to debug, and it works! *—Kevin G. Barkes is a specialist in VAX systems software, management, tuning and training, in Library, Pennsylvania.*

PROGRAM 1.

```
$! BAKE.COM
$! Generates text library file for COOKIE.COM
$! (see information at bottom of file)
$!
$! The following logical name assignments must be made:
$!      COOKIE_JAR  (Text library)
$!      OLDCOOKIES (Old copies of text library)
$!
$! Set error handling:
$       SET NOON
$!
$! Hand!e control-c:
$       ON CONTROL THEN GOTO DONE
$!
$! Save current messaging level, then disable messages:
$       SAVE_MESSAGE = F$ENVIRONMENT("MESSAGE")
$       SET MESSAGE  /NOF/NOI/NOS/NOT
$!
$! Make a few symbol assignments:
$       WSO := WRITE SYS$OUTPUT
$       TOP_OF_FILE = 1
$       COOKIE_COUNT = -1
$!
$! Stop if we can't find the cookie file:
$       IF F$SEARCH("COOKIE.IN") .EQS. "" THEN GOTO NOCOOKIES
$       DELETE/NOCONFIRM/NOLOG COOKIE.TMP;*
$!
$! Stop if we can't find our cookie jar or place to put old cookies."
$       IF F$TRNLNM("COOKIE_JAR") .OR.  -
        F$TRNLNM("OLDCOOKIES") .EQS. "" THEN GOTO NO_LOGICAL
$!
$! Delete the old library and create a new one:
$       COPY/NOLOG 'F$TRNLNM("COOKIE_JAR")' 'F$TRNLNM("OLDCOOKIES")'
$       DELETE/NOCONFIRM/NOLOG 'F$TRNLNM("COOKIE_JAR")';*
$       LIBRARY/CREATE/TEXT COOKIE_JAR
$!
$ OPEN_COOKIE:
$       OPEN/READ/ERROR=DONE/END=DONE INFILE COOKIE.IN
$!
$ OPEN_LIBRARY:
$       OPEN/WRITE/ERROR=DONE/END=DONE OUTFILE COOKIE.TMP
$       HAS_TEXT = 0
$!
$ LOOP:
$       READ/END=DONE/ERROR=DONE INFILE RECORD
$       TESTRECORD = F$EDIT(RECORD,"TRIM")
$       IF TESTRECORD .NES. "" THEN HAS_TEXT = 1
$!
$! The following line takes care of blanks lines at the top of cookie.in:
$       IF TOP_OF_FILE .AND. TESTRECORD .EQS. "" THEN GOTO LOOP
$       IF TESTRECORD .NES. "" THEN TOP_OF_FILE = 0
$       IF TESTRECORD .EQS. "" THEN GOTO INSERT
$       WRITE OUTFILE RECORD
$       GOTO LOOP
$!
$ INSERT:
$       CLOSE OUTFILE
$!      If there's nothing in the file, don't do anything:
$       IF .NOT. HAS_TEXT THEN GOTO TOSS_COOKIES
$       COOKIE_COUNT = COOKIE_COUNT + 1
$       WSO "Adding cookie #''COOKIE_COUNT'... "
$       LIBRARY/INSERT/TEXT COOKIE_JAR COOKIE.TMP /MODULE='COOKIE_COUNT'
$       SAVE_STATUS = $STATUS
$       IF SAVE_STATUS THEN WSO "Cookie added!"
$       IF .NOT. SAVE_STATUS THEN WSO "Oops.. cookie not added."
$       WSO ""
$!
$ TOSS_COOKIES:
$       DELETE/NOCONFIRM/NOLOG COOKIE.TMP;*
$       GOTO OPEN_LIBRARY
$!
$ NOCOOKIES:
$       WSO "Input file COOKIE.IN not found."
$       GOTO DONE
$!
$ NO_LOGICAL:
$       WSO "The logical names COOKIE_JAR and/or OLDCOOKIES is unassigned."
$!
$ EXIT:
$       CLOSE INFILE
$       CLOSE OUTFILE
$       DELETE/NOCONFIRM/NOLOG COOKIE.TMP;*
$       SET MESSAGE 'SAVE_MESSAGE'
$       EXIT
$!***********************************************************************
$! BAKE.COM
$! Copyright c 1988 by Kevin G. Barkes Consulting Services
$! Non-commercial reproduction and distribution permitted.
$! This procedure provided "as-is".  No warranty expressed or implied.
$!
$! Kevin G. Barkes Consulting Services
$! 4107 Overlook Street
$! Library, PA 15129
$! 412-854-2550        (Voice)
$! 412-854-0511        (SYS$OUTPUT BBS)
$! 412-854-4707        (Facsimile)
```

PROGRAM 2.

```
$! COOKIE.COM
$! Extracts messages at random from the cookie jar
$! (see information at bottom of file)
$!
$! The logical name cookie_jar must be assigned for this procedure to work.
$       IF F$TRNLNM("COOKIE_JAR") .EQS. "" THEN EXIT
$       IF F$SEARCH("COOKIE_JAR") .EQS. "" THEN EXIT
$!
$       SET NOON
$       ON CONTROL THEN GOTO EXIT
$       COOKIE_COUNT = 0
$!
$! Save message level, then disable messages:
$       SAVE_MESSAGE = F$ENVIRONMENT("MESSAGE")
$       SET MESSAGE /NOF/NOI/NOS/NOT
$!
$! Get the cookie number:
$       COOKIE = F$INTEGER(F$EXTRACT(17,4,F$CVTIME())-".")
$!
$! Try to get a cookie:
$ GET_COOKIE:
$       LIBRARY/TEXT COOKIE_JAR /OUT=SYS$OUTPUT: /EXTRACT='COOKIE'
$!
$! If we were successful, exit:
$       IF $STATUS THEN GOTO EXIT
$!
$! Increment the cookie count and exit if we've wasted too much time:
$       COOKIE_COUNT = COOKIE_COUNT + 1
$       IF COOKIE_COUNT .EQ. 5 .OR. COOKIE .EQ. 1 THEN GOTO EXIT
$!
$! Divide the cookie number by 2, and try again...
$       COOKIE = COOKIE / 2
$       GOTO GET_COOKIE
$!
$ EXIT:
$       SET MESSAGE 'SAVE_MESSAGE'
$       EXIT
$!***********************************************************************
$! COOKIE.COM
$! Copyright c 1988 by Kevin G. Barkes Consulting Services
$! Non-commercial reproduction and distribution permitted.
$! This procedure provided "as-is".  No warranty expressed or implied.
$!
$! Kevin G. Barkes Consulting Services
$! 4107 Overlook Street
$! Library, PA 15129
$! 412-854-2550        (Voice)
$! 412-854-0511        (SYS$OUTPUT BBS)
$! 412-854-4707        (Facsimile)
```

MANAGING YOUR MICROVAX

Capacity Planning And System Design, Part 1

David W. Bynon

In 1983, I learned that Digital had reduced the VAX architecture to two quad Q-bus boards. By mid-1984, I had received and installed my first MICROVAX I system, packaged in a BA23. As I remember, Digital received an additional $10K for providing 4 MB on a single board.

The MICROVAX I wasn't very exciting (mostly because it was a slug), but the idea of having a VAX beside your desk was. And, I knew then, as I do now, that this machine was only the beginning.

At first, it was simple to choose a MICROVAX system. If you needed an entry level one- to four-user system, the MICROVAX I was the selected system. If you needed a five- to eight-user system, you went with a MICROVAX II in the BA23 chassis. At the high end, for eight to 16 users, you could choose a MICROVAX II in the BA123 configuration.

Digital now manufactures three basic MICROVAX CPUs in dozens of configurations. From the one- to eight-user MICROVAX 2000 systems to the one- to 100-user MICROVAX 3000 systems, MICROVAX configurations are myriad and often confusing. Determining the one that's right for your application isn't always simple, and you can't always rely on your sales representative to be correct.

The Line Up

At the bottom, Digital manufactures the MICROVAX 2000. It's based on the same CPU chip set (78032 microprocessor and 78132 FPU) as its larger brother, the MICROVAX II. What distinguishes the MICROVAX 2000 from all other VAX systems is its single circuit board design.

There's a misconception that the MICROVAX 2000 is a busless system. It has several circuit paths that provide for internal expansion of memory, video subsystem, Ethernet, async/sync communication ports and a circuit path for external expansion of storage devices.

The external path implements the SCSI bus interface; however, a standard Digital device driver isn't available. For this reason, the MICROVAX 2000 only is expandable with Digital peripherals or Digital equivalent peripherals. Note: As of this writing, two memory manufacturers have produced expansion memory, and several OEMs are selling equal disk drives for the MICROVAX 2000.

In the middle of the line up is the four-year-old MICROVAX II, the most popular VAX to date and probably for some time to come. The MICROVAX II interfaces with its peripherals using a backplane variation based on Digital's well-known Q-bus, the Q22-bus. The Q22-bus accommodates 22-bit addressing and a full 32-bit local memory interconnect, implemented in the C and D rows of the first three backplane slots. DEC refers to this modification as the CD interconnect.

The Q-bus and the relatively low cost of the MICROVAX II are the reasons for its great success. When the MICROVAX first was introduced, dozens of OEMs already were manufacturing controllers, memory and add-on peripherals for DEC LSI systems, which used the original Q-bus backplane. It was, in most cases, very simple to modify these same devices to work with the MICROVAX. In fact, many needed no modifications.

> **"Determining the one that's right for your application isn't always simple, and you can't always rely on your sales representative to be correct."**

The MICROVAX II is available in three basic cabinet configurations: the BA23, which has an eight-slot backplane and room for two 5¼-inch peripherals; the BA123, with a 12-slot backplane and room for five 5¼-inch peripherals; and the H9642, an equipment rack for one or two horizontally mounted BA23 chassis and two 14-inch drives. Because of the variety of storage devices, memory expansion and interfaces available, many variations of the MICROVAX II are possible, with only a handful offered as standard line items.

Finally, the new kid on the block, the MICROVAX 3000, is Digital's most powerful MICROVAX processor. The MICROVAX 3000, currently available in two chassis configurations (3500 and 3600), is a technological progression of

TABLE 1.

	MICROVAX 2000	MICROVAX II	MICROVAX 3000
RELATIVE CPU PERF.	1	1	2.6 TO 4.2
CPU TYPE	78032(ZMOS)	78032(ZMOS)	78034(CMOS)
FPU TYPE	78132(ZMOS)	78123(ZMOS)	78134(CMOS)
CPU CACHE	NONE	NONE	1 KB
SECONDARY CACHE	NONE	NONE	64 KB
MEMORY (MB)	2-16(PARITY)	1-16(PARITY)	2-32(EEC)
BACKPLANE SLOTS	NONE	8, 12 OR 16	8 OR 12
DISK STORAGE	42-318 MB	71 MB - 3GB	159 MB - 3GB
DISKLESS SUPPORT(LAVC)	YES	YES	YES
ETHERNET SUPPORT	YES(DESVA)	YES(DEQNA)	YES(DEQNA)
TK50 SUPPORT	YES	YES	YES
TK70 SUPPORT	NO	YES	YES
TU81 SUPPORT	NO	YES	YES
CONCURRENT USERS	1-8	1-24	1-96

MICROVAX system comparison chart.

the MICROVAX II. The MICROVAX 3000 is based on the Q22-bus backplane and can take advantage of the same peripherals and controllers as the original MICROVAX I/II systems.

The advances of the MICROVAX 3000 computer were made in its new Complementary-symmetry Metal-Oxide Semiconductor (CMOS) logic microprocessor (78034), floating point accelerator (78134) and high-speed memory. This new CPU produces a system with 2.6 to 4.2 times the processing capability of the MICROVAX II, depending on the operations.

Matching The Iron With The Application

One of the greatest things about designing MICROVAX systems is that there's more than one way to design a system for the job. For example, you may need a system that can process up to three million instructions per second (mips), which logically would point you toward a MICROVAX 3000 system. However, the same amount of work could be accomplished using three MICROVAX 2000s clustered with a MICROVAX II. The possibilities are nearly endless.

How then do you design the system that's right for your application? The answer lies in knowing what your options are, answering the right questions and the process of elimination.

System Options

Table 1 displays a comparison of MICROVAX system options and support. These values, by the way, weren't taken from Digital. DEC's comparisons always are based on its own configurations and options, not necessarily the true capability of the CPU. For example, I increased the memory capability of the MICROVAX 2000 and the storage capability of the Q-bus systems to reflect what other equipment manufacturers produce for these systems. Use this chart as your basis for system capability and options.

The Questions

The most difficult part is coming up with the right questions and their answers. Those presented here are not the only questions that must be answered. They're simply the most logical ones and those that work for me.

1. How many concurrent users will there be?

This question is of primary importance, because it will eliminate one or more of the MICROVAX processors. If you must support 12 concurrent users, a single MICROVAX 2000 immediately would be eliminated as a viable system.

2. What is the working set size required for your applications?

You must know the largest working set size (memory allocation) for any of the applications you'll be using, as this is the basis of your system's memory requirement. For example, if the largest working set requirement is 1024 blocks (.5 MB) and you'll have 16 concurrent users, your user memory requirement will be about 8 MB.

3. What is the static memory requirement?

To finish computing your memory requirements, you must know how much memory the VMS operating system and other detached processes will consume. This is difficult to figure unless you have been around MICROVAX systems for a while. However, here are some statistics: On average, VMS permanently will allocate 2500-3800 blocks (1.1 to 1.8 MB), DECNET will require about 300 blocks (.15 MB) and LAVC servers will eat 450 to 500 blocks (about .25 MB). So, an additional 2 to 3 MB of memory is needed for the operating system.

4. What will be your immediate online storage requirement?

Whatever you estimate, you'll be wrong. However, it's always better to have storage in which to grow than to not have enough. Plan big rather than small. If you have database applications, calculate the file sizes by multiplying the record sizes times the maximum number of records. For example, a database with a record length of 128 bytes that has 5,000 records will require 625 KB of storage.

In addition to calculating storage requirements for user files and databases, consider the operating system and applications. For instance, VMS will consume about 20 MB on the average MICROVAX page, swap files will need 10 digital™ Cooperative Marketing Program

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to 15 MB, Rdb/VMS will take 5 MB, and *ALL-IN-1* will take 11 to 12 MB and an additional page file. Also, remember that if you underestimate your on-disk storage requirement, you'll be penalized by poor performance because of disk fragmentation as you approach disk capacity.

5. Is storage/memory expandability a requirement?

If your answer is yes, make sure the system you choose will accommodate your future expansion. For example, if your immediate memory requirement is 14 MB, and you plan to add six more users in a year, with an average working set size of 0.6 MB, a single MICROVAX 2000 or MICROVAX II won't accommodate your growth requirements.

6. Do you have a computer room?

If you answer no, rule out an H9642-based system with RAxx drives. The reason is simple: The RAxx drives are too noisy and generate too much heat for the typical office.

7. Must processing power come from a single CPU?

If you can answer no to this question, you're in luck, because it means you can take advantage of a Local Area VAX-CLUSTER (LAVC). An LAVC is the most flexible system you can configure in terms of capacity, physical layout and expansion. For instance, if you must support 40 to 50 concurrent users, you might use four satellite MICROVAX 2000s that receive storage services from a MICROVAX II.

8. Is high availability a requirement?

If high availability is a necessity, an LAVC will be a requirement. High availability in an LAVC is achieved using two or more boot nodes and removable media. The removable media is needed if one of the boot nodes goes down, because the media can be remounted on an alternate boot node.

9. Do you have CPU-intensive applications?

If your answer is yes, you have several things to think about. First, is the CPU-intensive application your primary one? If so, determine a penalty the system will incur that's related to the number of in-

FIGURE 1.

Number Of Concurrent Users:	7
Major Application:	*ALL-IN-1*, DATATRIEVE, Accounting
Data Storage:	Office correspondence, personnel database (100 people), accounting files
Terminals:	13
Printers:	2
Computer Environment:	Office building, two floors, no computer room
Future Expansion:	Four additional users in 12 months Three additional users in 18 months

The requirements for a sample application.

teractive users the system can handle. For example, if you're doing data analysis, which by nature is CPU intensive, with a package such as *SAS* or *RS/1*, you must guess at the CPU load. If your data analysis is small, the CPU load will be sporadic, and the concurrent user capability of the processor would decrease by only a small percentage. However, if your heavy CPU usage application has a high rate of activity, the concurrent user capacity will decrease dramatically.

One method of combating CPU-intensive applications within a multiuser/multiapplication environment is to build an LAVC system and segregate the CPU-intensive applications to their own satellite node. In this way, the CPU hogs aren't affecting the interactive users.

10. Will your application be disk I/O intensive?

The answer to this question will determine your disk subsystem requirements. If it's yes, don't consider using drives of the ST506 interface (Digital RDxx). In reality, an ST506 drive is suited to single users or low disk activity applications. Look for storage subsystems with a high I/O bandwidth such as the RA81 or RA82. In non-DEC solutions, SMD-, ESDI- or SCSI-based subsystems offer the best performance.

Also, if you have a disk I/O-intensive application, plan to use multiple drives, even if the storage you need is available on a single drive. The reason is load balancing. Two identical drives on a good controller can seek, read and write twice as much data as a single drive. If your disk-intensive application is of a repetitive nature (i.e., database management, word processing, etc.), you'll benefit from a disk controller or subsystem that employs cache memory. Cache is used to store the most recently accessed disk data. If the same data is requested again soon, it can be found rapidly in the cache memory without having to read the physical disk.

11. Will you be expanding your Digital system with other vendor equipment?

If so, you must know the criteria for your planned expansion. For instance, if you'll be using a third-party disk or tape subsystem, you must know whether the system you purchase will have the space and power to handle it.

Process Of Elimination

The scenario in Figure 1 lists the requirements for an application. The system must be designed to accommodate that application.

In the scenario, the number of concurrent users borderlines the abilities of the MICROVAX 2000. However, there are two key factors that play against it: future expansion requirements and the major application. A MICROVAX 2000 can't produce the I/O throughput to support seven or more *ALL-IN-1* users. The MICROVAX II processor will be an excellent choice for this application.

The minimum amount of memory needed to support this system is computed easily by adding the total working set sizes for the largest application (a 1024 block WSQUOTA is average for an *ALL-IN-1* user) and adding 2 MB for fixed overhead, such as VMS and system data structures, for a total for this seven-user system of 5.5 MB minimum. As the MICROVAX II CPU only has 1 MB of memory on board, it must be supplemented. Because of the future expansion requirement, it will be better to purchase slightly more memory than is needed now. I would suggest a single 8-MB array, leaving room for an additional 8-MB array.

Computing the storage requirement for this system won't be clear cut, and you should leave a door open for easy expansion. The software (VMS, *ALL-IN-1,* FMS, CDD, DATATRIEVE and an accounting package) will require 60 to 75 MB of storage, according to the product installation manuals. The page file size can be computed with the formula PAGEFILE = (WSMAX * CONCURRENT USERS). For this system, the working set maximum will be about 2500 blocks, requiring a minimum page file of 8.5 MB.

The system swap file should be at least 60 percent of available system memory, or about 5.5 MB. If you expect more than occasional swapping activity, the swap file should be much larger. For each *ALL-IN-1* account, a minimum of 5 MB per user should be allocated. This is enough room for the users schedul-

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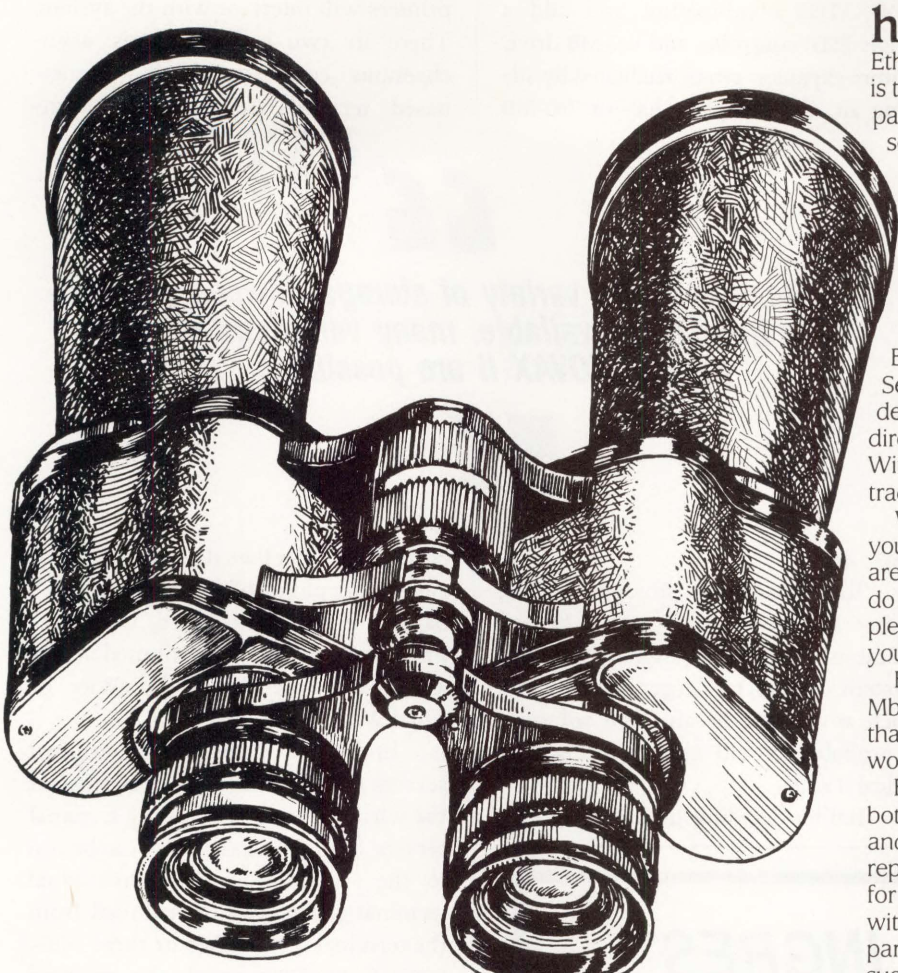

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ing databases, dictionaries and several hundred documents or mail messages. Finally, we have the DATATRIEVE and accounting databases for a company of 100 people. The accounting software manufacturer requires a minimum of 25 MB to use its system, so a conservative estimate would be 50 MB. A personnel database, using 500 byte records, will require 5 MB. This puts the minimum immediate storage requirement at 139 to 179 MB, and future growth is required.

An RA81 or RA82 is out of the question, because the system must be installed in an office. The Digital RD54 (159 MB) could be used, but it doesn't have the throughput capability needed for good *ALL-IN-1* performance. Thus, you're left choosing a disk subsystem from another manufacturer. In this case, I would suggest an ESDI subsystem using two 150-MB drives. A single 300-MB drive would be less expensive, but two drives will improve system performance. If you're purchasing the system from DEC, it must include a storage device. In this case, I would choose the RQDX3/D53 combination and add a single ESDI controller and 150-MB drive. Future expanion can be facilitated by adding an aditional 150-, 300- or 750-MB ESDI drive.

To backup the storage devices, either a TK50 or TK70 would be applicable. If this is a high-production system, consider a larger tape system, such as a TU81 or an OEM solution. I probably would choose the economical TK50.

Before deciding on anything else, determine how the 13 terminals and two printers will interface with the system. There are two basic methods: asynchronous controllers and Ethernet-based terminal servers. The asynchronous controllers (DHT32, DVZ11 or DHV11) are plugged into the computer's backplane or motherboard, while terminal servers can be distributed across an Ethernet backbone (ThinWire or ThickWire).

In the case of this system, terminal servers would be my choice because of the wiring situation. By using terminal servers, a single coaxial cable can be run to the second floor with individual terminal cables, then distributed from the terminal server. Two or three DECSERVER 100s/200s would be required depending on the terminal and printer distribution. Use of the terminal servers will require a DEQNA Ethernet controller.

After determining the CPU, memory, storage, backup and terminal connections, choose a chassis for mounting it all. There's only one to consider, the BA123. The BA23 wouldn't provide enough storage peripheral space or power, and an H9642 cabinet would be overkill. For this configuration, the BA123 would provide room for an additional 5¼-inch storage device, and it only would have five of its 12 backplane slots filled.

In Part 2, I'll continue with a discussion on LAVC capacity planning and configuration. ■

"Because of the variety of storage devices and interfaces available, many variations of the MICROVAX II are possible . . ."

NETWORKING EDITOR

Bill Hancock

Understanding An NCP, Part 2

Editor's note: In this final installment regarding an NCP, Networking Editor Bill Hancock describes the LINE and CIRCUIT parameters, how NCP can be used to adjust the performance and other nuances of interest. Part 1, which described the EXECUTOR command, appeared in the March issue.

After configuring the EXECUTOR command, the next step in network database configuration is setting up the LINE and CIRCUIT parameters. LINEs are hardware controllers; you can touch and feel them. There's one LINE per physical device port, and that LINE has certain characteristics, such as a specific buffer size suitable for the particular LINE device involved (you wouldn't want a large buffer size for dialup async lines where errors run rampant, and a small buffer size with Ethernet LINEs is a waste of horsepower) and the number of preallocated buffers of the selected size (more buffers for faster lines).

If you're an end node (one that doesn't route DECNET traffic to other nodes), you will have only one LINE on your node. Routing nodes may have many LINE devices of differing types, such as DMC-0 for the first DMC/DMR/DMV or UNA-0 for the first UNIBUS Ethernet controller. Each LINE should be considered, and the proper buffer size, buffer quantity and other parameters should be set to allow optimal functioning of the device in the networked environment.

One problem with LINEs is the number of buffers to allocate. In many situations, the network is configured with the default number of line buffers, which is fine for low-speed lines. But, in the case of Ethernet, keeping the number of buffers too small will cause buffer allocation failures, because Ethernet sends things in bursts that frequently can cause a good deal of traffic to hit a node at a random interval.

> **“Only allocate additional buffers if you aren't in a memory-tight environment or where you don't care about network performance.”**

If an Ethernet LINE were to have, say, 20 or more buffers preallocated, such problems might be prevented. By allocating additional buffers, throughput is increased, but so is memory utilization. Only allocate additional buffers if you aren't in a memory-tight environment or where you don't care about network performance.

CIRCUITS

There's no hard rule as to how many CIRCUITS there will be on any particular node. The actual number depends on the type of LINE and the network technology being used by the node on the network. For instance, Ethernet has one DECNET CIRCUIT per LINE. Over that CIRCUIT, many logical links (connections to or from other DECNET nodes) may be active.

However, if the Computer Interconnect (CI) is being used as a DECNET device, there's one LINE (CI-0) and a separate CIRCUIT for each DECNET node on the cluster (CI-0.1, CI-0.2, CI-0.3, etc.). Each CIRCUIT on the CI may allow multiple logical links over it to a particular DECNET cluster node.

On other types of networks, such as X.25 (PSI), there may be one LINE, and each logical link also has its own CIRCUIT associated with it. The whole problem is compounded if the node is a routing node and has multiple types of LINEs on it, each of which has its own way of seeing LINEs and CIRCUITS.

The DECNET manager figures this out by reading the documentation. It discusses the number of CIRCUITS supported on a LINE and the number of logical links per CIRCUIT, but usually in a cursory manner that requires some digging to understand and figure out. A CIRCUIT is a logical structure that the network uses to control logical access to a particular system based on the LINE logical composition. There's one CIRCUIT per Ethernet LINE and there can be more than one Ethernet controller per VAX system.

Ethernet is viewed by the DECNET network as a direct access device in a manner similar to a DMR-11. In reality, Ethernet is a multiaccess device made so by the intelligence in the Ethernet class device driver. DECNET doesn't realize that XEA1:, the device it thinks is the actual Ethernet controller, is a chunk of software in a virtual driver that manages the access to the hardware, so that

> ***The DECNET database configuration method is common to most of the server and gateway products Digital offers, but is not universal to all DEC products.***

multiple programs may communicate simultaneously with the Ethernet. In other words, DECNET thinks that it owns the Ethernet hardware when, in fact, it's being faked out by a driver.

In the case of the CI, such trickery is less obvious. The CI is viewed by DECNET as a multidrop network where there's one master and many slave nodes on the network. Each node has a separate circuit to and from the master to allow communications between them. Therefore, the Ethernet requires only a single CIRCUIT to allow communication over the hardware LINE. In the case of CI, because it logically looks different from Ethernet, its CIRCUIT composition is somewhat different.

Ancillary Function Configuration

After the EXECUTOR, LINES and CIRCUITS have been configured, it's time to configure any other ancillary functions the network may need to perform, such as what to do when servicing LOAD requests. DECNET-VAX includes a download subsystem that consists of various components including the Maintenance Operations Protocol (MOP), Maintenance Operations Modules (MOM), direct-line access driver (NDDRIVER.EXE), and various interfaces to NETACP, NML and the event logger necessary to support downline system and task loading operations for RSX-11S, VAX ELN, terminal servers, router servers and gateways.

Many devices in the DEC networking arsenal require that their operating kernel be sent to them via the network upon remote system powerup. DECNET supplies load services to nodes requesting load assistance, provided the database includes the information necessary to recognize a certain node's load request and the information to properly send the appropriate system load file to the system requesting load assistance.

This type of information is loaded into the DECNET database by command procedures that are provided by DEC with the hardware on the network that will be loaded. For instance, terminal servers have a file called DSVCONFIG.COM in their software distribution that asks the network manager some basic information about a terminal server such as the DECNET node address of the server, what type of server it is, node name and the Ethernet hardware address, located on a sticker on the back of the server.

Following the question-and-answer session, the command procedure issues the appropriate NCP DEFINE commands to the DECNET database to configure the terminal server into the DECNET database. In this manner, the next time a load request appears on the network from that particular Ethernet address, DECNET will know what file to load into the remote and execute a proper download to the remote server.

The DECNET database configuration method is common to most of the server and gateway products Digital offers, but is not universal to all DEC products. In those situations where a remote is to be loaded when it requests a load, appropriate LOAD information may be included manually in the DECNET database, so that the node is loaded upon request.

After the database configuration is complete with local node information, it's common to include remote node names and addresses for easy access to remote systems without having to specify node numbers when connecting to a remote system. Many sites use the DEFINE NODE NCP command to define a remote node's name and address to the DECNET database. This can get tedious, however, if there are hundreds of DECNET nodes on a network.

A quicker way is to use the NCP COPY KNOWN NODES command and allow the configured database on a particular DECNET node to be copied to the local node. If one or two nodes are kept up-to-date with all the pertinent network node information, this simplifies the problem of keeping all databases current.

I usually use a batch procedure that updates node addresses on all nodes that need to know such information. I make the changes to the database and then fire up a command procedure that submits itself to batch and copies my local database to a list of nodes that has been created from the database on the local system. This keeps my network databases up-to-date on all nodes. If it's run at night, there's no interference with normal daily operations on the network.

In most situations, this will be more than adequate, because most users don't get around to pouncing on a particular node until a day or two after it has been announced. Remember that the DECNET databases on other nodes can be updated with the proper node information for new nodes even before the nodes may be active, so there's no reason to wait until a node is installed and functional.

Statistics

NCP is useful for more than just network database configuration. Each component in DECNET (LINES, CIRCUITS, EXECUTOR, etc.) has statistical information that's collected and logged in the form of characteristics and

> ***Learn to use NCP to configure, monitor and manage your DECNET network. With a little time and patience, you can figure it out.***

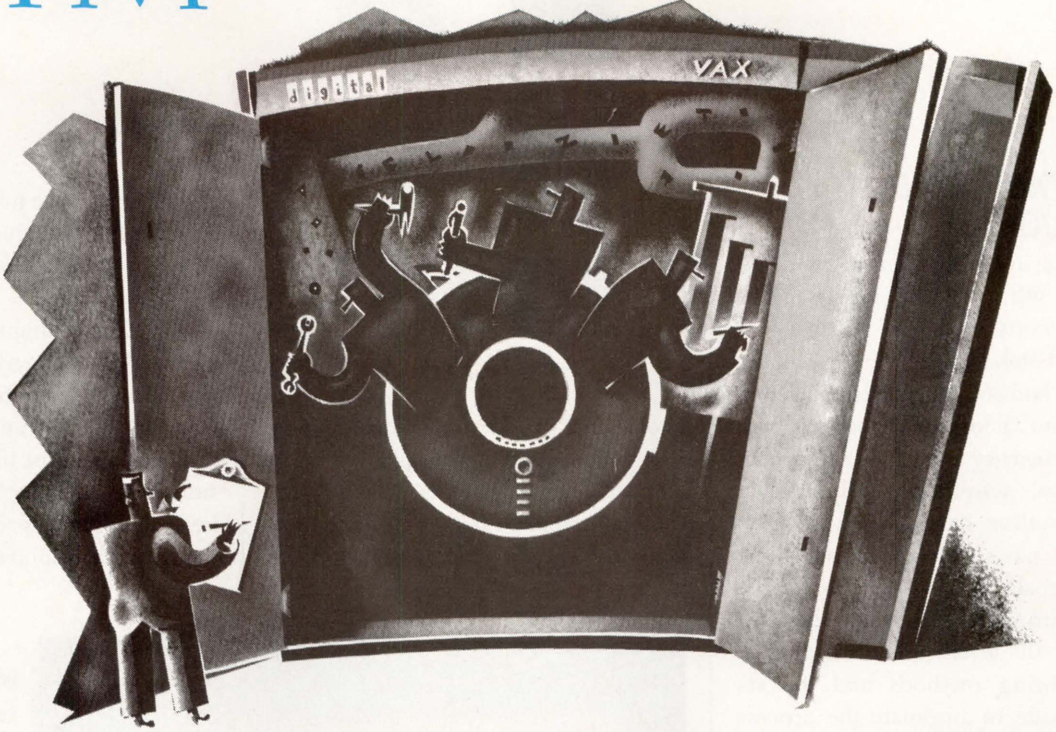
counters. With NCP, such counters for each component may be examined for statistical information (for example, NCP> SHOW KNOWN CIRCUIT COUNTERS), error information, say, on Ethernet collisions (NCP> SHOW LINE UNA-0 COUNTERS), and other pertinent information useful to figure out traffic loading metrics, error summaries, etc.

The problem with many of the statistics is the issue of what's pertinent. That problem usually is corrected by understanding the relevant LINE technology well. Another problem is that the statistics can be accessed from program control, but it's a major hassle. As a result, it's difficult to play "what if" games with network statistics.

I have a procedure set up in one of my PCs to issue NCP commands to the network and allow the information to be captured in the local disk on the PC. I either import the data into a spreadsheet template (such as on *Lotus 1-2-3* or *Excel*) or into a database where I can add numbers, keep historical and trend information and other useful but usually difficult-to-collect information. In this manner, I can use NCP to provide the information I need to understand what the network is trying to tell me.

NCP is a powerful tool and can provide the network manager with useful statistics and allow control of the network. Don't view NCP as the "end-all" utility; it isn't. It allows the network manager to tune the network on a node-by-node basis from one spot and customize DECNET for optimal use at selected nodes in the corporation.

You don't need to become an NCP guru. DEC is planning to replace it with NCL in Phase V DECNET, which is somewhat different in syntax and functionality from NCP. Learn to use NCP to configure, monitor and manage your DECNET network. With a little time and patience, you can figure it out. *—Bill Hancock is vice president of Engineering at ERI Training, New York.*



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MANUFACTURING INTELLIGENCE

Manufacturing Intelligence by Paul Kenneth Wright and David Alan Bourne, focuses on the artificial intelligence behind manufacturing and the hardware and software systems needed to carry out factory processes with the greatest efficiency and least involvement from outside sources, typically human.

The authors have divided the book into four parts. Part 1 discusses the general goals and objectives of the manufacturing industry and the role AI plays at all levels. The history of manufacturing methods and the attempts made to automate the process also are addressed in light of current efforts.

To build the machine equivalent of a human manufacturing system, hardware and software must adequately be able to emulate the functions of the human brain, eyes and hands. Part 2 discusses the general principles of automated manufacturing systems design in regard to these points. It's fascinating to read about the factors and influences involved in getting these three major pieces to work harmoniously.

The authors present a clear picture of the problems and challenges involved, as well as a better understanding of how difficult it is to imitate human functions effectively. Take, for example, the act of grasping. The number of grasp choices, the proper angle, pressure, motion and wrist action all play a part in accomplishing the task. A heavy industrial gripper can't be designed exactly as a human hand, because fingers and other delicate mechanisms could be damaged. The industrial robotics designer must take all these things into consideration.

A fine craftsman builds on the knowledge acquired through years of experience. This knowledge allows him to carry out a number of fine motor tasks and to adjust to new and different situations. In Part 3, Wright and Bourne investigate this problem within the range of a manufacturing machine's

Manufacturing Intelligence
Paul Kenneth Wright and
David Alan Bourne
Addison-Wesley Publishing Company
Reading, MA, 1988
352 pages
Price: hardbound, $40.95
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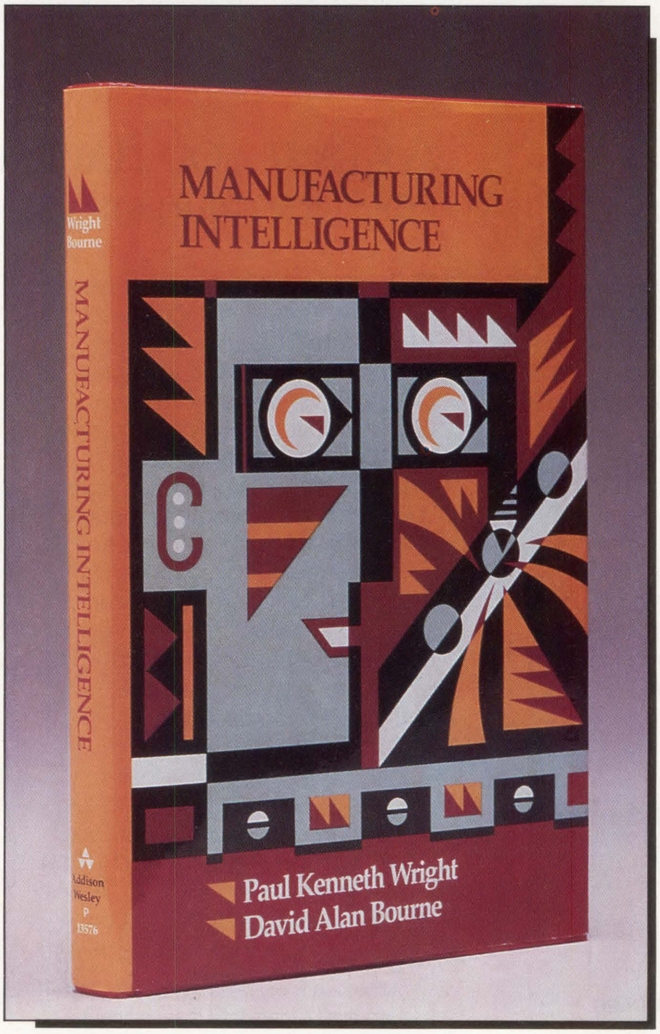

Manufacturing Intelligence, *by Paul Kenneth Wright and David Alan Bourne, explores the progress toward the development and implementation of manufacturing intelligence in the factory.*

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software. Also discussed are preliminary setup plans needed to make the process efficient.

Further discussion centers around the expert system team and how an intelligent manufacturing system can be programmed to think and act as a human craftsman, not only in terms of carrying out the actual process but also in regard to the initial approach to the problem. For example, a human wouldn't try to grind a part to within a small tolerance the first time. He'd use a number of passes to work the material down to size gradually. Robotic systems must do the same to generate a quality product.

In Part 4, the authors conclude with a question and answer discussion of manufacturing in the year 2000. They explore what industry can expect to experience in the next 30 years in terms of intelligent manufacturing and the kinds of machinery and tools that will be available in factories and plants.

—Reviewed by David B. Miller

DIGITAL TECHNICAL JOURNAL

For a behind-the-scenes account of some of Digital's more recent hardware and software developments, look at the *Digital Technical Journal*. Published twice yearly by Digital in Hudson, Massachusetts, this journal is packed with interesting and useful technical information straight from the horse's mouth.

Each issue is approximately 100 pages and is laid out in a technical journal format: title, abstract, two-column wide article and references. Each author's biography is included.

According to the editorial in the first issue, "The *Digital Technical Journal* bridges a gap in the information published about Digital's products by providing an explanation of their technological foundations. In the past, such explanations appeared in papers written by Digital's engineers for various periodicals. Unfortunately, anyone wanting concise technical details had to search through the gamut of literature."

They no longer have to search. The first five issues are available and a sixth, addressing system productivity tools, is ready for release as we go to press. The titles and a brief look at what each contains follow.

VAX 8600 Processor — Number 1, 1985. Order number EY-3435E-DP.

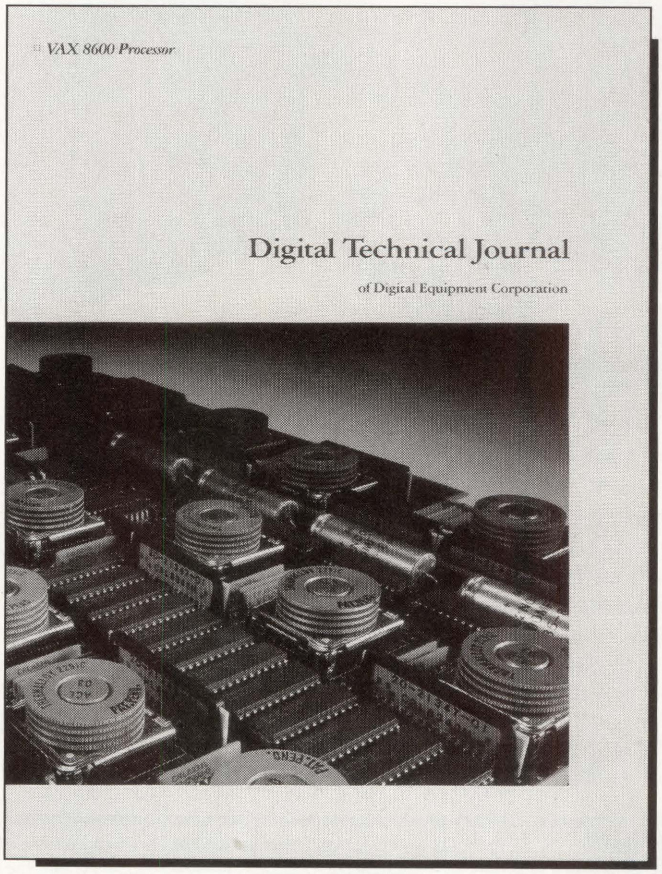
1. An Overview of the VAX 8600 System.
2. The VAX 8600 I Box, A Pipelined Implementation of the VAX Architecture.
3. The F Box, Floating Point in the VAX 8600 System.
4. Packaging the VAX 8600 Processor.
5. Signal Integrity in the VAX 8600 System.
6. Cooling the VAX 8600 Processor.
7. Designing Reliability into the VAX 8600 System.

MICROVAX II System — Number 2, March 1986. Order number EY-3474E-DP.

1. The MICROVAX 78032 Chip, A 32-bit Microprocessor.
2. The MICROVAX 78132 Floating Point Chip.
3. Developing the MICROVAX II CPU Board.
4. The Evolution of the Custom CAD Suite Used on the MICROVAX II System.
5. The Making of a MICROVAX Workstation.
6. The RQDX3 Design Project.
7. The Evolution of Instruction Emulation for the MICROVAX Systems.
8. The TK50 Cartridge Tape Drive.
9. Porting ULTRIX to the MICROVAX System.

Networking Products — Number 3, September 1986. Order number EY-6715E-DP.

1. Digital Networking Architecture Overview.
2. Performance Analysis and Modeling of Digital's Networking Architecture.
3. The DECNET/SNA Gateway Product — A Case Study in Cross Vendor Networking.
4. The Extended Local Area Network Architecture and LANBRIDGE 100.



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5. Terminal Servers on Ethernet Local Area Networks.
6. The DECNET-VAX Product — An Integrated Approach to Networking.
7. The DECNET-ULTRIX Software.
8. The DECNET-DOS System — The Evolution of Network Management Products.
9. The NMCC/DECNET Monitor Design.

VAX 8800 Family — Number 4, February 1987. Order number EY-6711E-DP.

1. An Overview of the Four Systems in the VAX 8800 Family.
2. The VAX 8800 Microarchitecture.

Digital Technical Journal
Richard W. Beane, editor
Digital Equipment Corporation
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3. The CPU Clock System in the VAX 8800 Family.
4. Aspects of the VAX 8800 C Box Design.
5. The Memory System in the VAX 8800 Family.
6. Floating Point in the VAX 8800 Family.
7. The VAX 8800 Input/Output System.
8. The VAXBI Bus — A Randomly Configurable Design.
9. A Logical Grounding Scheme for the VAX 8800 Processor.
10. The Simulation of Processor Performance for the VAX 8800 Family.
11. VMS Multiprocessing on the VAX 8800 System.
12. A Parallel Implementation of the Circuit Simulator SPICE on the VAX 8800 System.
13. The Impact of VAX 8800 Design Methodology on CAD Development.
14. Online Manufacturing Data Access on the VAX 8800 Project.

VAXCLUSTER Systems — Number 5, September 1987. Order number EY-8258E-DP.

1. The VAXCLUSTER Concept: An Overview of a Distributed System.
2. The System Communication Architecture.
3. The VAX/VMS Distributed Lock Manager.
4. The Design and Implementation of a Distributed File System.
5. Local Area VAXCLUSTER Systems.
6. VAXCLUSTER Availability Modeling.
7. System Level Performance of VAX 8974 and 8978 Systems.
8. CI Bus Arbitration Performance in a VAXCLUSTER System.

The Journal is edited by Richard W. Beane. —*Reviewed by Rex Jaeschke.*

RSX CLINIC

MONITORING SPM

QUESTION: *What ever happened to SPM-11?*

REPLY: SPM-11, the RSX System Performance Monitor, has had a troubled existence because of the way Digital has made the product available to users. It always has been marketed as a software service rather than as a layered product.

Digital's official position is that SPM-11 is available on a strictly "as is" basis and can be obtained through the local office Software Services or Field Service. SPM isn't sold to the customer as a software product but provided (or used) as part of a consulting agreement. Consequently, there's no license for SPM, and any charges or conditions on its use are at the discretion of the local office.

SPM is still around, and a version exists for RSX-11M-PLUS version 4.0. Getting it is a matter between you and your local Software Services manager.

VAXING RSX

QUESTION: *When do you think DEC will implement RSX-32, putting RSX on the VAX?*

ANSWER: At the risk of disappointing some of my RSX colleagues, I think the chances of this happening are practically zero. I've heard this question before, usually at DECUS sessions, prefaced by the phrase, "Because the VAX can't do real time, ..." I seriously question that premise. I've seen the VAX running VMS doing real time in electric power nets, wastewater plants and steel mills.

Of course, VMS can't do real time while supporting general users and doing clustering and DECNET routing, but neither can RSX. To do dedicated real-time applications on RSX, many of the RSX subsystems, such as user accounting, are turned off.

An RSX-32 system isn't necessary. Tools to implement a real-time application on the VAX exist. VMS serves well in those systems that can tolerate the VMS overheads, and VAXELN serves well in applications where the hardware performance is a serious consideration.

I've participated in many discussions where the idea of an RSX-32 has been discussed with Digital. The discussion can be summarized as:

"I want the RSX that I know and love implemented on a VAX. But the subdirectories in VMS are really neat, so put them in too. Take out all those overheads, but keep the interprocess protections. And, I must have more security than RSX gives me."

The conversation continues, until the operating system being described is really VMS.

There's also another consideration. It takes DEC approximately three years to develop an operating system to its first release and another three to seven years for that product to become stable. Are you willing to wait that long? Probably not.

REAL-TIME MERITS

QUESTION: *Which is better at doing real-time applications, a VAX or a PDP-11 running RSX?*

ANSWER: Both VMS and RSX are adept at doing real time, and each has its appropriate range of real-time applications.

The term real time doesn't conjure up a single image. The spectrum of real-time systems is broad, and the requirements that some real-time systems make of their CPU are different from others. A system that detects particle interactions in a high-energy accelerator would have a different CPU requirement than a system that controls the traffic lights in a busy downtown area, yet both are called real time.

After comparing interrupt latencies between VAXs and PDP-11s, many choose PDP-11s. They have a superior timing in this department. The comparison begs the question, "Is this measurement significant for the application I'm to design?" If your application has a one- to five-second response time requirement, a variation by a few microseconds in interrupt response time will be insignificant.

Interrupt latency comparisons can be a paper tiger, used because no other hard data is available. I'll take DEC to task for not providing adequate performance and benchmark data on either RSX or VMS systems, so that detailed comparisons can be made on more realistic bases.

The decision between a PDP-11 and a VAX for real time often becomes economic rather than technical. A large existing base of applications already installed on PDP-11s can dictate that a PDP-11 be used for the next installation. An "All-Digital" mandate from an unenlightened management can dictate a VAX solution, because DEC doesn't have a C compiler for RSX.

A PDP-11-based solution will be less expensive than an equivalent VAX solution today, but who knows what tomorrow's MICROVAX prices will be? The price of the machine and its system software may be a minor consideration compared to the availability of trained technical software people, and the number of people who know RSX is dwindling.

Please mail your questions to RSX Clinic, DEC PROFESSIONAL, *Professional Press, Box 503, Spring House, PA 19477-0503. Questions also can be submitted through ARIS.*

CLUSTER CHRONICLES

The Trials And Tribulations Of ThinWire

Dave Mallery

When you assemble an LAVC, you've committed yourself and your company to 52 ohm coaxial cable, known as RG58/U, and all its foibles.

The connectors are the worst headache. We messed around with solderless twist-on connectors from the local Radio Shack for a while but soon learned the wisdom of buying a proper crimping tool and crimp connectors. Because your cluster depends on the connectors making and keeping a reliable connection, the right tool isn't just a good idea, it's imperative.

We found the right tool for us in one of the legions of catalogs that accumulate. A Paladin PA4010 kit from Time Motion Tools in El Segundo, California, included a crimper, a stripper and an assortment of crimp connectors. The accompanying photos show the steps in attaching a connector. With the crimp, you can count on the connector staying in place.

ThinWire forces you to allow too much vulnerability at the user's desk. A ThinWire Ethernet must be terminated at all times. A terminator is a 52-ohm resistor inside a connector. It keeps the coax free of reflected signals that confuse all the receivers.

In a simplistic arrangement, anyone can crash the cluster by disconnecting (thereby unterminating) the cable from the tee connector at the rear of his VAXSTATION.

The solutions that allow you to limit the damage are rather expensive. One is the DEMPR or ThinWire DELNI. This device fans out the network into isolated segments. You can mess up one segment without taking down the network. The price for one from Digital is about $3,000. Several promising third-party alternatives are emerging; we're trying to get one or more to test and evaluate in the *DEC PROFESSIONAL* Lab.

There are also some clever tee connectors. These connections are impossible to remove, save the right way. The line stays terminated, and your network stays up.

There's even a neater way. Keep the tee connector in the wall, out of reach, giving the user a simple stub of coax to the wall outlet that he can connect or disconnect at will. DEC sells a most expensive DECONNECT wall plate that delivers the above coax plus terminal and phone connections. Mod-Tap has an equivalent. There are several cheaper varieties in the various catalogs. The economics (and aesthetics) are up to you.

We wired our building for Mod-Tap before ThinWire came to DEC.

> **Companies Mentioned In This Article**
>
> Paladin Corporation
> 3543 Old Conejo Rd., #102
> Newbury Park, CA 91320
> (805) 499-0318
> ENTER 482 ON READER CARD
>
> Mod-Tap System
> 285 Ayer Rd.
> P.O. Box 706
> Harvard, MA 01451-0706
> (617) 456-3500
> ENTER 578 ON READER CARD
>
> Xyplex, Inc.
> 100 Domino Dr.
> Concord, MA 01742
> (617) 371-1400
> ENTER 580 ON READER CARD

> **"ThinWire forces you to allow too much vulnerability at the user's desk."**

We're working on distributing the ThinWire to the areas of the building where it's needed, while keeping the Mod-Tap installation (which also carries our voice transmissions) intact. Clearly, a Digital Ethernet Multiport Repeater (DEMPR) equivalent will be necessary to protect the network.

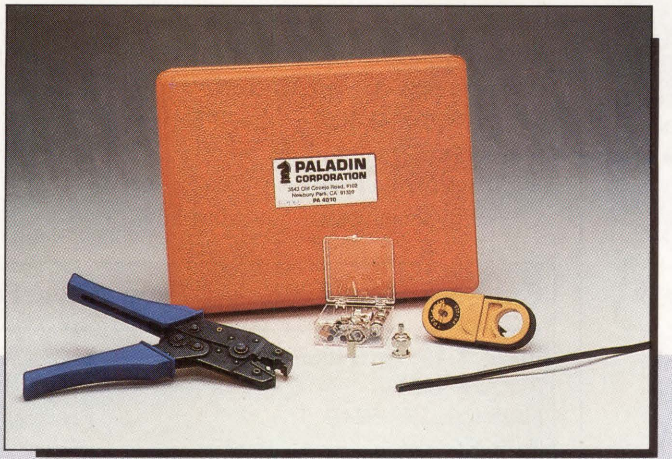
Cluster Report Card

The system has been performing amazingly well. There are 80 ports on the Xyplex system and eight more DHU ports on FRODO::. The seven ARIS lines are in use most of the time. A second programmer is running on GOLLUM:: (MICROVAX 2000) via the serial port. With 16 MB, she presents no discernable load to the programmer working on the big screen. We also can LAT into GOLLUM::, but LAT use is low and limited to the PCs.

We'll install our Xyplex MaxServer 5000 in a week or so. It will have 96 ports and redundant Ethernet boards. I'm planning to add 2 GB to the system on FRODO::. Backup is beyond belief; 6250 bpi became obsolete years sooner than expected.

We're struggling with some of the

The Paladin tool kit includes (L to R) the crimp tool, connectors and a stripping tool.



The stripper has two modes: one for the exterior sheath, the other for the interior insulation.

After stripping, the center pin crimps on; don't forget to slip the outer crimp sleeve onto the cable.

The final crimp is applied to the sleeve, bonding the cable shield permanently to the connector. This connector won't come off unless you cut it off.

helical scan drives. They're fine when used on the same machine as the data but worthless when trying to do backup over the coax. Because the Ethernet bandwidth is a fact of life, you'll need helical scan drives on each disk farm.

As an aside, isn't it amusing how we no longer think of disk space in units smaller than 1 GB? That has to do with Parkinson's Law, I believe.

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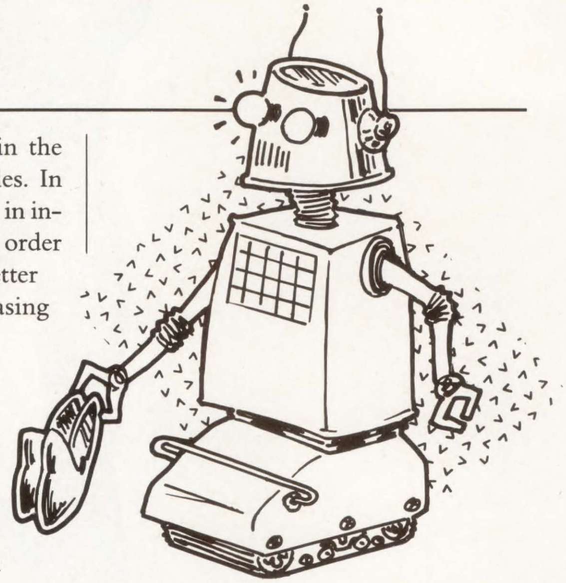
FIELD SERVICE

Robots: Past, Present And Future

Ron Levine



Many think of a robot as a metal humanoid with a ray gun who's able to perform fantastic feats. Robots have always been a source of entertainment in the movies and on TV. In *The Day the Earth Stood Still*, a robot received top billing. *Robocop* and *West World* captured the imagination of the American people. *Battlestar Galactica* and *Star Trek* used encounters with robot-like creatures in outer space for many story lines. And who can forget C3P0 and R2D2 from *Star Wars.*?

Like the submarine, rocketship and astronaut, the robot has stepped off the science fiction pages and into the real world. Today, the U.S. government is building robots for use in outer space. The Pathfinder Space Program will use robots for planetary exploration. On Earth, robots are employed in industry for more mundane tasks.

The robot, and the specialized high-tech field of robotics, is playing a major role in the factory automation endeavor. After all, present-day robots are no more than mobile computers capable of movement and physical activity. While not as glamorous as their movie counterparts, nor capable of performing or thinking on their own, as R2D2 did, they are becoming a vital link in the automation of plants and factories. In field service, robots are being used in inventory warehousing, to improve order filling efficiency and to make better use of available space (i.e., increasing storage capacity).

Robotics In Inventory Management

To explore how robotics technology is being used in the service business, I visited the TRW Customer Service Division facility in Fairfield, New Jersey. Here, TRW employs four robots for inventory warehousing and handling chores. Watching them work is impressive. The robots, known within TRW as the Automated Retrieval Systems (ARS), are fully integrated into a common working environment. While one robot is storing inventory, another is selecting parts to fill a just-entered order. At the same time, another is transporting previously retrieved items to the staging area, and a fourth robot is returning a parts bin to its correct position within the storage area; all under the control of one operator.

TRW spokesman, Bill Fredell, says that the company purchased its first ARS unit in 1981. From then on, the use of robots has increased steadily, as the company's business has expanded. TRW has found that ARS technology enables it to cope with expanding inventory and an increasing workload, without adding more warehouse space or personnel.

Robots In Inventory Control

TRW has experienced the following benefits during the seven years that its inventory control staff has been using robotics:

1. Handling Efficiencies — As its field service and related support businesses have grown, fulfilling parts orders and restocking inventory hasn't required more resources. Today, TRW accesses 625 different part numbers daily. Each access represents an order that can amount to one single unit or more than 500 units. Thousands of parts are handled daily with TRW's ARS technology.
2. Personnel Efficiencies — Prior to installing ARS technology, TRW required nine parts handlers to complete 600 different part number item orders each day. Today, 625 line-item orders are handled by four people.

A side benefit of the use of robotics has been the standardization of parts stocking and eye-level labeling, significantly reducing the margin of errors during order filling.

3. Space Efficiencies — Space requirements for inventory storage and inventory handling also have been reduced dramatically thanks to the use of automation. While the business has grown substantially since 1981, no new or additional inventory spaces have been acquired. This is because robotic technol-

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MARKETS SERVED: Customers — OEMs, VARs, dealers, end-users; geography — national

IN BUSINESS SINCE: 1971

PRICING: Fixed on contracts; time and materials on others

ENVIRONMENT/MARKET SPECIALTY: Multivendor, DEC-based critical applications systems.

Maintech, a division of Volt Delta Resources Inc., is one of the oldest vendors of maintenance services to the DEC-based, mixed-equipment systems market around today. Providing third-party field service and repair since 1971, Maintech has kept a low profile and as a result may not be known to many of our readers.

Frank D'Alessio, vice president of this division, states that Maintech's specialty and expertise is maintaining multivendor systems in the critical applications markets. Past contracts have included field service, maintenance, repair and support responsibilities for the Bell Telephone Company's 911, 411 and directory publications systems.

Maintech is backed by its $500 million parent company, Volt Information Sciences Corporation, and has immediate access to software operations and design engineering support. The solving of integration and compatibility problems within mixed-vendor environments, including the design of proprietary interfaces when none are available off-the-shelf, can be handled in the Maintech service contract.

Maintech maintains a complete parts inventory for all products serviced. Diagnostics used by field service are a combination of in-house written test and troubleshooting programs and purchased TRW software packages. For customers requiring depot repair services only, Maintech provides replacement parts on an exchange basis or an average repair turnaround time of two to five days.

Maintech employs more than 130 FEs and maintains 11 offices. With more than 500 systems under contract, last year's revenues were approximately $16 million, almost exclusively from the servicing of DEC-based mixed-vendor systems.

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ogy includes inherent space efficiencies.

What TRW now stores in 3,200 square feet with its ARS equipment would require 22,000 square feet of standard, shelved warehouse space. The space efficiencies also can be seen in an analysis of cubic feet usage. ARS operates within 18,300 cubic feet of storage space. Standard warehousing techniques would require 57,500 cubic feet.

4. Security Benefits — Robotics technology means secure storage. Since all bins are closed, parts stay where they belong. The flexibility of the ARS technology allows certain areas of the system to be secured with access allowed only by supervisory personnel. This is an important feature when storing sensitive information or highly valuable or proprietary parts.

5. Environmental Protection — ARS technology provides clean and dust-free storage. All bins and drawers are closed. Parts are protected from ordinary environmental contaminants.

Larry Feld, TRW marketing communications project manager, states, "Our experience with robotics and automation has been nothing but positive. And the ARS technology will continue to be part of the company's support backbone. Currently, more than four million spare parts, including assemblies and small units, are stored at the company's ARS installation. While this is only a fraction of the total of more than 10 million parts inventory carried, it represents more than $22 million worth of spares that have been assigned to the robots."

The company executives with whom I spoke are very supportive of the inventory ARS, and have found the use of robotics technology extremely beneficial in supporting field service and related support functions.

I might add that none of the executives had a ray gun held to their heads, nor did the robots take over plant operations or hold humans captive! ■


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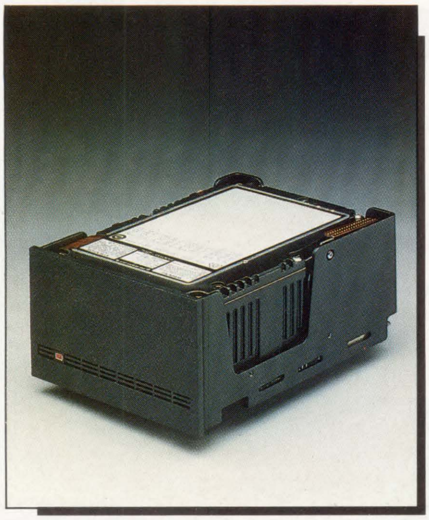
FROM THE LAB

David W. Bynon

Micropolis 1500 Series

The advances in magnetic disk technology are slowing down at an incredible rate. However, each small step is monumental in terms of long-term performance and reliability. The Micropolis 1550 series disk, from Micropolis Corporation, Chatsworth, California, looks like every other 5¼-inch drive. But it wasn't until I installed the device and performed a series of tests that I could discern any true performance difference from its competition.

The 1550 is a 382-MB Winchester disk drive that implements the serial mode of the Enhanced Small Device Interface (ESDI). According to Micropolis, the 1550 is capable of a sustained data transfer rate of 10 MBits/sec, with an average access time of 18 ms. That's fast in any terms, especially for a 5¼-inch device. In addition to this performance, Micropolis claims a mean time between failures of 30,000 hours.



The 1550 382-MB Winchester disk drive claims a mean time between failures of 30,000 hours.

This means that the drive should run for approximately three and a half years before you need to worry about it.

In the lab, the Micropolis 1550 was impressive. It's silent and runs cool to the touch, unlike some of the other 5¼-inch drives I've tested, which sing, pop and get hot enough to cook your eggs. It performs well too. My standard benchmark program reported the following:

```
$ BENCHMARK DUB3: /ALL

Benchmark statistics on drive
    DUB3:
    Average access time is 31.3 ms
    Average transfer rate is 462.17 KB/sec
    Estimated controller/VMS overhead
    is 8.59 ms
$
```

The benchmark program measures average access time by randomly accessing 256 logical blocks on the disk. A timer is started to mark the elapsed time required to perform the 256 read operations.

The drive's average transfer rate is measured by randomly reading 256 arbitrary blocks of data, 0-64 KB in length. The throughput value is the total number of kilobytes read, divided by the time in seconds to perform the operation.

The most difficult value to arrive at is the controller/VMS overhead. The benchmark program estimates this value by finding the minimum block displacement, on a single track, which permits the drive to perform two read operations in a single disk rotation. The rotational distance, in milliseconds, between the first read location and the displaced read location is the estimated controller/VMS overhead. The overhead value is important because it gives you a better idea of the true performance of the drive.

Micropolis 1550
Micropolis Corporation
21123 Nordhoff St.
Chatsworth, CA 91311
(818) 709-3300
Price: $3,195
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In this lab, for instance, we can speculate that the average access time of the Micropolis 1550, under our test conditions, is approximately 22 ms (31.3 ms — 8.59 ms), not the reported 31 ms.

The 1550 is one drive in a family of Micropolis storage devices. The same Head/Disk Assembly (HDA) is available with an SCSI interface, Model 1570, which has a higher data transfer rate than the 1550. At the high end, Micropolis produces the 1560 and 1580, which are 765-MB ESDI and SCSI devices, respectively. The 1560 and 1580 have a claimed average access time of 16 ms.

The OEM, systems integrator and large quantity end user will appreciate the reliability and field service ability of the 1500 series drives. The mean time to repair is a miniscule 15 minutes. To test this claim, I removed the 1550 from the lab system and broke down the drive to get to the innermost field-replaceable part, the HDA. My simulated replacement, system to bench to system, took 21 minutes, including bringing the system down for the drive removal and then back up again.

If you're looking for reliable, high-capacity, high-performance 5¼-inch drives, consider the Micropolis 1500 Series. It's an excellent choice. ■

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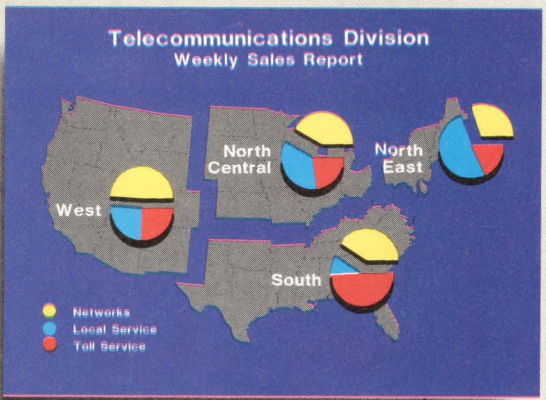

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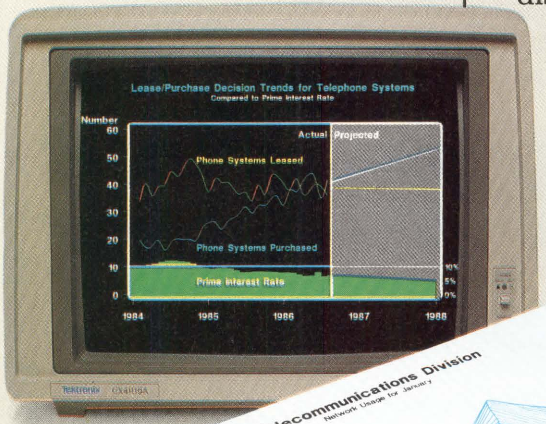
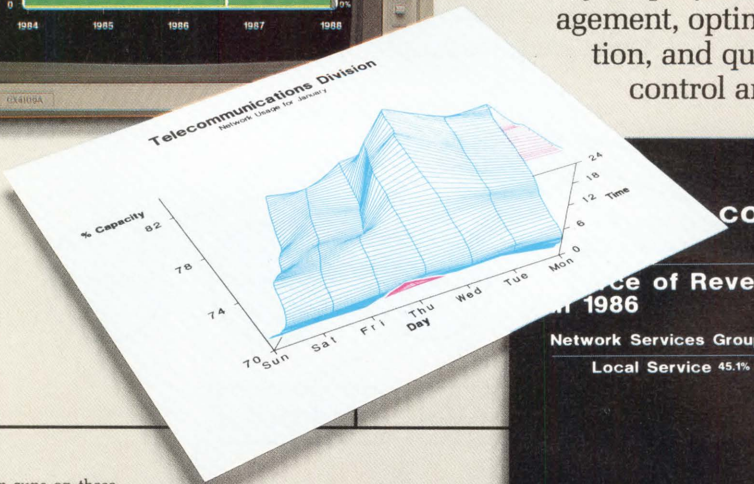
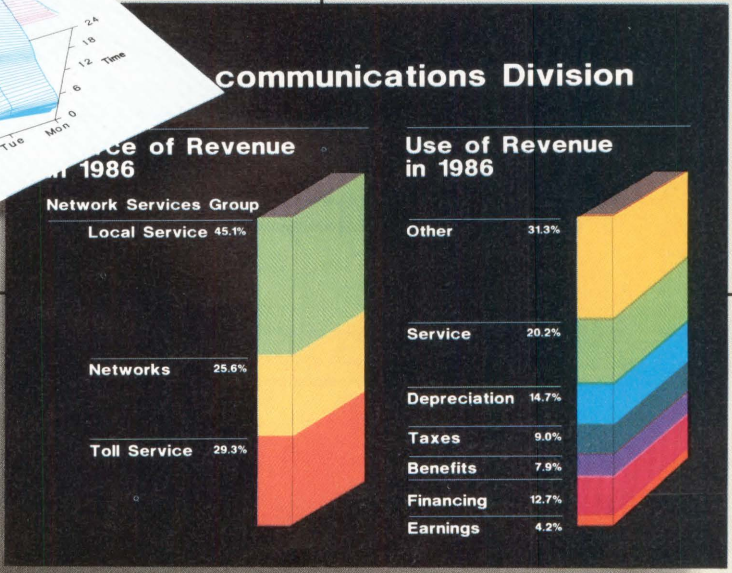






The SAS System runs on these minicomputers: Digital Equipment Corp. VAX™ 8xxx and 11/7xx series under VMS,™ and MicroVAX II™ under MicroVMS™; Prime Computer, Inc. Prime 50 series under PRIMOS®; and Data General Corp. ECLIPSE® MV series under AOS/VS. The SAS System also runs on IBM 370/30xx/43xx and compatible machines under OS, CMS, DOS/VSE, SSX, and ICCF; IBM XT/370 and AT/370 under VM/PC; and IBM PC XT and PC AT under PC DOS. Not all products are available for all systems.

FROM THE LAB

Getting Into A *JAM*

Michael G. Gonzales

The *JYACC Application Manager (JAM)* from JYACC Inc. of New York, is a complete authoring system for sophisticated applications. The tools and library functions included in *JAM* make building sophisticated applications easy. Moreover, *JAM* is an application environment. It allows menu-driven integration of existing programs and operating system commands with a consistent user interface.

JAM is a prototype in that screens, windows and menus comprising applications can be created easily by non-programmers. Non-programmers also can create the control logic that links the screens and menus.

JAM promotes parallel development. It allows for easy documenting and provides convenient means for dealing with changing requirements. Hence, *JAM* may be viewed as a methodology.

In designing an interactive application with *JAM*, the first step is to break down the application into screens and groups of screens. One of two possible scenarios will occur. Things might fall into a simple tree structure like the one shown in Figure 1. Or, if the structure of the application is more complicated, two screens could share a subscreen. There are links both ways in the menu tree (see Figure 2).

At this point, you're ready to start up *JAM* and create screens. Often, you'll want to create several variations on the same idea and compare them. *JAM* permits you to do this easily.

The next step is to create links between the screens to direct control flow and data in the application. A prototype application, called the application shell, is created. It will look like the finished product.

After the application shell has been created, you can begin the refining process. This might involve showing the application to a number of people, soliciting suggestions and making changes on the spot. *JAM* makes it easy to make and revoke changes, in links between screens and the screen layouts themselves. Thus, several different organizations might be tried. The net effect is that the user interface is thrashed out before coding begins.

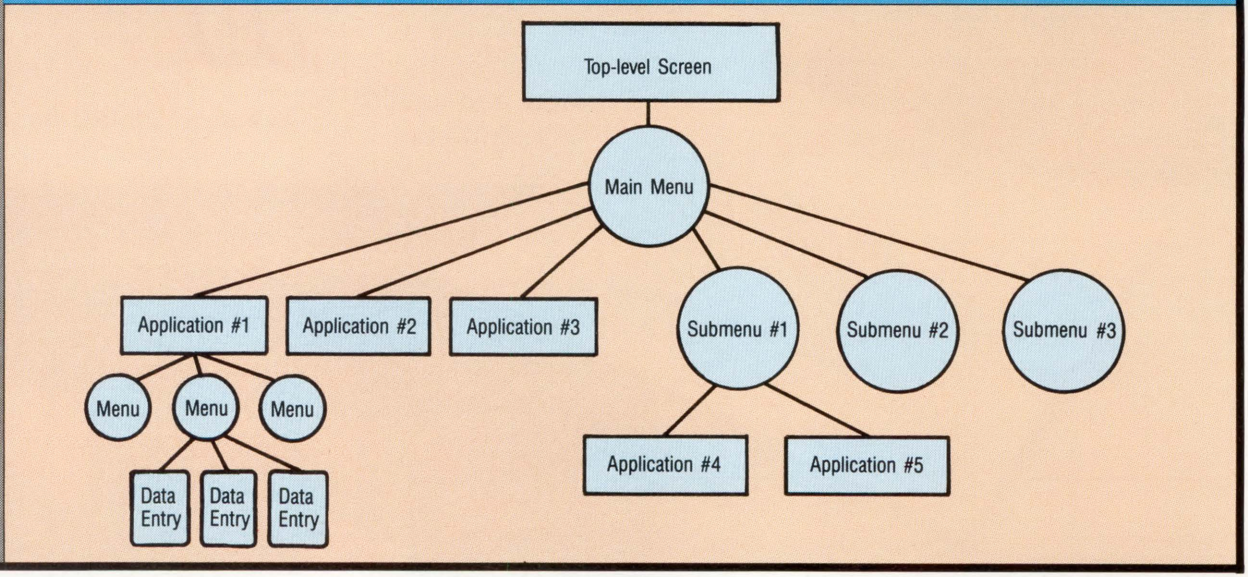
After deciding on the application shell, processing routines are added, and the application is finished.

JAM Components

The major components of *JAM* are the following:

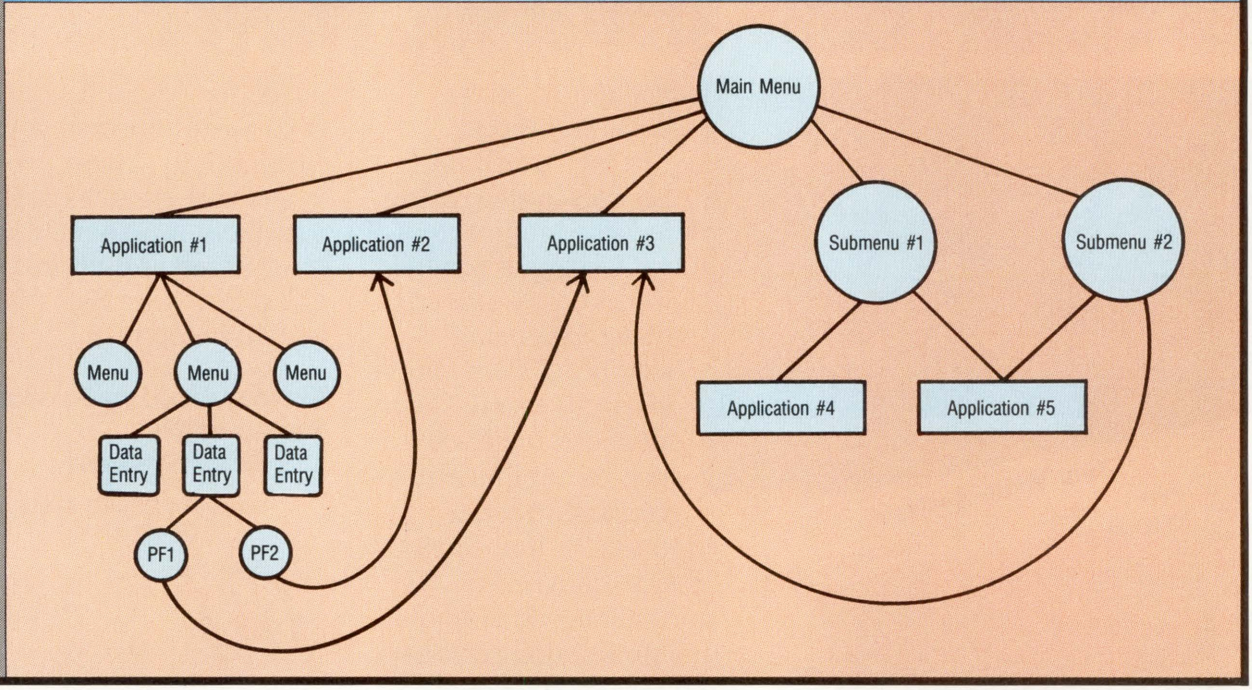
1. Screens — Screens are the basis of an

FIGURE 1.



Tree structure of screens.

FIGURE 2.



Complex structures of screens.

application designed with *JAM*. Both data entry and menu screens may be displayed either as forms, covering the whole display, or as windows, covering only a part of the display.

2. Control Links — Two types of actions trigger control links: menu selection and function keys. There are four possible responses to these actions: bring up a new screen, overlay a window, invoke a program or call your own function.

3. Data Links — *JAM* allows named data items to be shared among various *JAM* screens and transactions. In this sense, the data belonging to these transactions is linked. This makes it possible, for example, for application code to reference data entered on a screen that's no longer being displayed.

4. Programs — *JAM* provides several types of hooks for hanging application code. In addition to the control links described, there's an attached function field edit. This specifies a routine to be called whenever you tab through a field. The code may be either separate or part of the currently running *JAM* application. The main difference is that code within an application can share control and data links but separate code can't.

The following are some *JAM* utilities:

1. JXFORM is an authoring utility and is used for defining screens and control links. It includes a screen editor and a data dictionary editor.
2. JAMMAP creates a cross-reference listing of all the *JAM* screens in a directory.
3. FORM2ASC provides for the creation of memory-resident screens.
4. CONVFORM does format conversions of screens to meet requirements of different machines and operating systems.

JAM is well documented. The documentation consists of three main parts: *User's Guide* explains how you can create applications; the *Programmer's Guide* describes how to write code that will fit in with *JAM*'s library and runtime environment; and, the *Utilities Manual* explains all the utilities in detail.

JAM's application shell prototyping is a winner. It's an extremely powerful, yet easy-to-use tool. In addition, *JAM* applications are portable; that is, they look the same on micro-, mini- and superminicomputers. Overall, *JAM* is a worthwhile addition to the software tool chest. — *Michael G. Gonzales is assistant professor of computer and information science at Gwynedd Mercy College, Gwynedd, Pennsylvania.*

JAM
JYACC Inc.
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macvax

PacerShare

Why settle for a Macintosh as your *AppleShare* file server, when you can have a VAXCLUSTER?

BY JOSEPH P. DALLATORE

IT'S BIG NEWS. Ken Olsen said it at MacWorld, and John Sculley said it at DEXPO East: Apple and DEC are going to cooperate. In August, a select group of developers from Apple, DEC and some significant others will meet at the Apple/DEC Developer's Conference to define the details and explore the future of this most desirable alliance. An avalanche of distributed Macintosh/VAX products is sure to follow. Indeed a few products, like Odesta Corporation's *Helix/VMX*, already seem to have been designed with a detailed vision of the future.

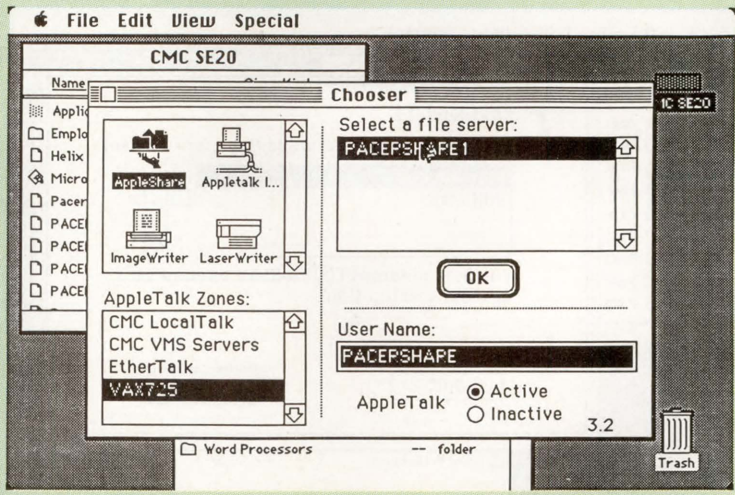
The idea of connecting a Macintosh to a VAX by using a terminal emulation package has a quaint ring to it. This frontier already has been tamed, so you won't win any medals for bravery. You already have a choice of good emulators that produce pleasing results. But, there are a lot of VAX folks around who still haven't seen the power of the Mac in action.

Using a VAX as a file server is old hat. White Pine, Alisa Systems, Pacer Software and others sell VAX/VMS software products that provide VAX-based file servers. However, products have differing features; the user interface and the look and feel of the product are different for each.

APPLESHARE

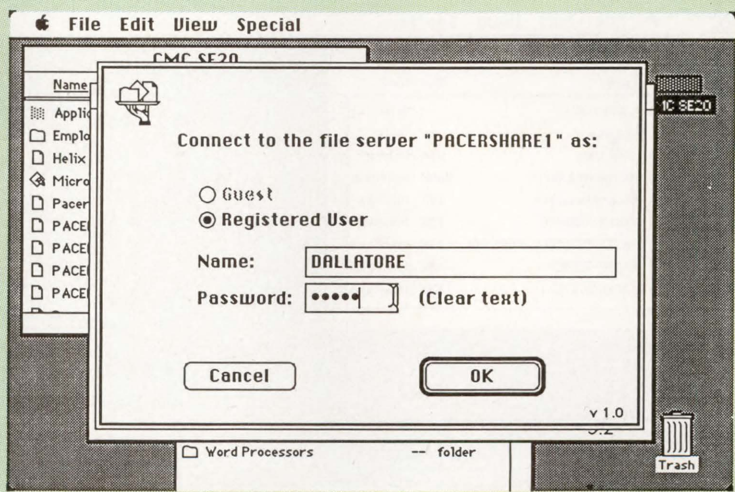
APPLE COMPUTER provides file server software for the Macintosh called *AppleShare*, but it runs only on a Macintosh. *AppleShare* is the first implementation of an architecture of network file access protocols designed by Apple, known as AppleTalk Filing

SCREEN 1.



Selecting an *AppleShare* server from the CHOOSER.

SCREEN 2.



Logging into the *PacerShare* server.

Protocols (AFP). *AppleShare* defines the way a client (individual user) Mac and a server (shared) Mac communicate to accomplish remote file access over an AppleTalk network.

When a Mac running the *AppleShare* client software is connected to an AppleTalk network that includes one or more *AppleShare* servers, the Mac user can locate, select and access the files on a server through a series of Macintosh dialog boxes (see Screens 1 through 4). Once selected, the remote-server volumes appear on the Macintosh desktop as file icons and are used in the same way as locally attached Mac disk drives. *AppleShare* includes a security scheme to control who can gain access to which files and provides a server administrator function to handle these functions on a server.

Apple has published complete specifications for both AppleTalk and AFP and now is cooperating with several vendors who intend to implement *AppleShare* file servers on non-Macintosh hosts.

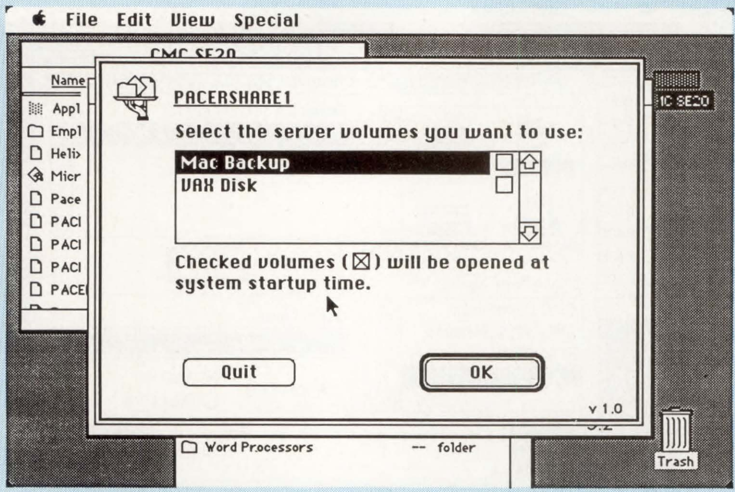
Among the first to implement an AFP-compatible file server on VAX/VMS is Pacer Software of Westborough, Massachusetts. Pacer markets *PCLINK,* which recently was renamed *PacerLink*. Pacer's AFP software, *PacerShare*, is offered only as an upgrade to *PacerLink*, because it relies on pcLINK_ACP, the same PNP device driver on the VAX that *PacerLink* uses to communicate with Macintoshes over Ethernet.

PACERSHARE

I'VE BEEN USING a late field test version of *PacerShare* in an environment that consists of a backbone Ethernet hosting two VAXs, several types of Macintoshes and a PC equipped with Apple's PC AppleTalk card and software. The VAXs are connected directly to Ethernet, along with some of the Macs. Other Macs and the PC are connected in small LocalTalk (AppleTalk at 230.4 kbps) networks with Kinetics' FastPath AppleTalk to Ethernet bridges, which are used to provide the connection between LocalTalk and the backbone Ethernet.

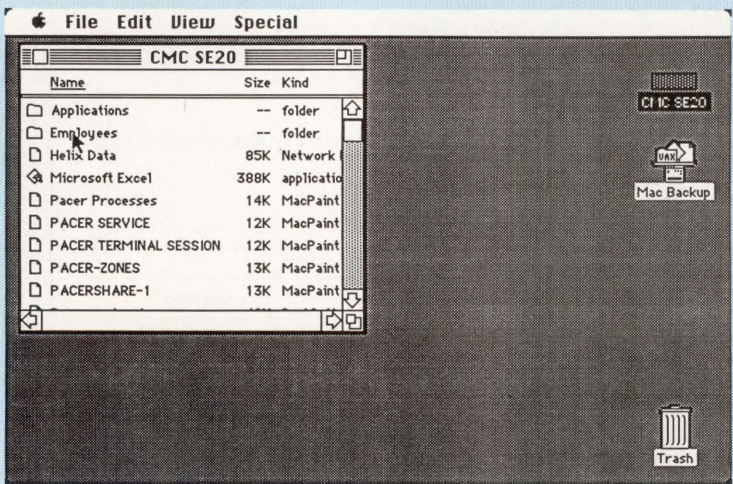
PacerShare resides exclusively on the VAX, while the Macs and PCs use Apple's standard software. *PacerShare* is installed using VMSINSTAL. The instructions are complete and easy to follow, but read them carefully before you begin. Some of the quotas and limits of the SYSTEM account (the account that starts the file server) and the account of every *PacerShare* user must be modified to prevent sending VMS processes into the twilight zone, RWAST, to be exact.

SCREEN 3.



Selecting a volume on the server.

SCREEN 4.



The volume appears on the desktop, ready to use.

Pacer recommends the following for each user process: ASTLM = 100, FILLM = 100, WSQUO = 1000 and BYTLM = 30,000 for the process that starts the server. I also found it necessary to raise BIOLM and DIOLM to 10 to eliminate an occasional hung-process condition during testing.

After installing *PacerShare*, the Volume Information database must be created before starting the server. This is done by running a VMS program, AFP_CONFIG, which creates and maintains the VOLUMENAMES.AFP file in the system's PCLINK directory. This file contains information about the server, such as its name, the names of the virtual disk volumes in the server, and where the files reside on the VAX disks.

As an option, you can declare a password for each volume, which then will be required when a Mac user tries to access the volume. To give you an idea of AFP_CONFIG's capabilities, the entire HELP screen is shown in Screen 5. Each command individually prompts you for every piece of information it requires.

Pacer's VAX software rarely behaves like typical VMS utilities, and AFP_CONFIG is no different. Everything was fine once I stopped trying to type:

```
>ADD Volname/DEV = ddcu/DIR
   = [xxx]
```

and accepted a dialog like this:

```
>ADD <cr>
Volume name? Volname<cr>
Host pathname of root directory of
   volume? ddcu::[xxx]
Read only ('y' or 'n')?
```

I wanted AFP_CONFIG to behave more like Authorize because it's like Authorize. On the other hand, in the coming age of the personal MICROVAX, not every *PacerShare* customer will have, or be an expert, VMS system manager. The prompting dialog is easier for the less technical customers.

Once VOLUMENAMES.AFP has been created, the server can start. The command file PCLINK_AFP creates two detached processes: PCLINK_VO, the volume overseer; and PCLINK_ADMIN. Add PCLINK_AFP to your system startup file, and your VAX will be a bonafide *AppleShare* file server!

Screens 1 through 4 show the process of connecting a Macintosh to a Volume hosted by the VAX. Connecting to a moderately loaded MICROVAX II via *FastPath* takes approximately 20 seconds. A *PacerShare* user creates a VMS network process (the name and password supplied must be those of a valid VMS account on the server VAX). Once logged on, the user sees the name of every volume on the server.

To access a volume, the Mac user selects it by name and provides the volume password. The user then accesses files in the volume. Because each user accesses the *PacerShare* server from a personal VMS process, and *PacerShare* maintains the data for each Macintosh file in a single VMS file, *PacerShare* servers can benefit from as much VMS security as they care to implement.

SECURITY

APPLESHARE'S SECURITY SCHEME is simple and easy to administrate. Files are protected at the server and volume level by passwords and at the folder (directory) level by two classes of access: View and Change. Unlike VMS, *AppleShare* provides no method of access control for individual files.

But *PacerShare* users have individual VMS processes, each with individual UICs and identifiers. So, although Pacer doesn't provide direct access from the Macintosh, sites with strict security requirements can provide an *AppleShare* server with the added benefits of the VAX's superior file security features.

A security-conscious *PacerShare* site can create resource identifiers and grant them to individuals as necessary, while protecting individual files and folders with access control lists based on resource identifiers. With *PacerShare*, security-conscious sites can have *AppleShare* servers, while extending the limited security features of a Macintosh-based *AppleShare* server.

PacerShare
Pacer Software Inc.
7911 Herschel Ave., Ste. 402
La Jolla, CA 92037
(619) 454-0565
Price: $2,400 for five-user license
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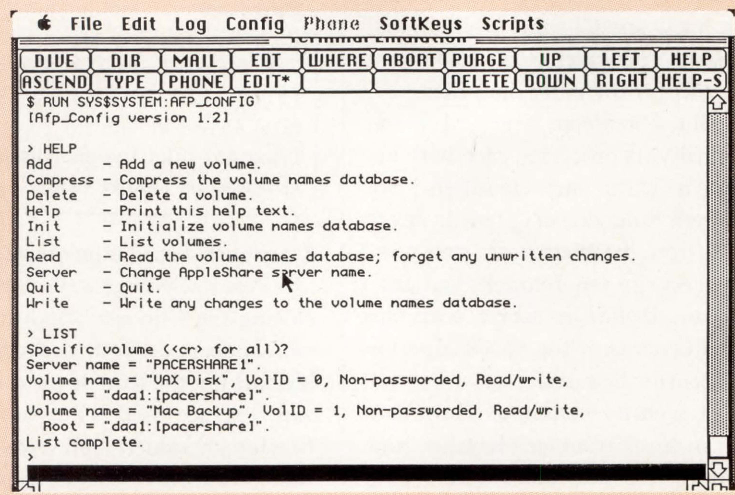
After selecting a file server and closing the Chooser window, a new icon appears on your desktop. Double clicking the icon opens the server, and you see VMS subdirectories as Macintosh folders and VMS files as Mac documents. Macintosh files contain two parts: a data fork and a resource fork. The VMS file is the data fork, and one additional file within a subdirectory contains the resource forks for all the files in the folders.

PacerShare offers a few VAX-

SCREEN 5.



ASP_CONFIG commands.

specific features. For example, each Mac file is maintained by *PacerShare* as a VAX file within a special server subdirectory, and any VMS files located within a *PacerShare* subdirectory appear on a Mac's screen.

So, a file created by a VAX program, such as a DATATRIEVE report, will appear on the Mac desktop display.

Because the file wasn't created by a Mac, there's only a data fork; and *Pacer* will depict the file with a generic document icon. A Mac user accessing the volume will be able to rename or delete the file without any special transfer or conversion steps. Depending on the format of the data contained within the file, it often will be possible to use the data within Macintosh applications, as well.

A PC with an AppleTalk card installed can access *AppleShare* server volume and manipulate the files stored there, but only as standard MS-DOS volumes and files. *PacerShare*, as an implementation of *AppleShare*, should be able to support PCs in the same fashion as a Mac-based *AppleShare* server. However, the field test version proved shaky in this area. Pacer hopes to have this feature working smoothly by the release date.

For application programs that run in the VMS, MS-DOS and Macintosh environments, or application programs that share a standard interchange format across operating systems, a *PacerShare* server on the VAX that could provide a common file storage facility for all three environments would be a selling advantage. Pacer plans to support the 3COM card in the PCs. But in the near future, AppleTalk cards and a *FastPath* will be the only way to connect PCs to *PacerShare*.

The marriage of *AppleShare* and VMS, provided by *PacerShare*, is an important interim step toward the interoperability that Apple's CEO, John Sculley, has been talking about so much lately. *—Joseph P. Dallatore is a senior software engineer with Computer Methods Corporation, Marlton, New Jersey.*

Editor's note: A special thank you to Computer Methods Corporation and Kinetics Inc. for supplying the necessary equipment to prepare this series of articles on MAC/VAX connectivity.

Companies Mentioned In This Article

Alisa Systems Inc.
221 E. Walnut Ave. Suite 175
Pasadena, CA 91101
(818) 792-9474
ENTER 562 ON READER CARD

Apple Computer Inc.
20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010
ENTER 563 ON READER CARD

Digital Equipment Corporation
146 Main St.
Maynard, MA 01754
(617) 897-5111
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Kinetics Inc.
2500 Camino Diablo
Walnut Creek, CA 94596
(415) 947-0998
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Odesta Corporation
4084 Commercial Ave.
Northbrook, IL 60062
(312) 498-5615
ENTER 566 ON READER CARD

3COM Corporation
3165 Kifer Rd.
Santa Clara, CA 95052-8145
(408) 562-6400
ENTER 568 ON READER CARD

White Pine Software Inc.
94 Route 101A
P.O. Box 1108
Amherst, NH 03031
(603) 886-9050
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The Emerging Second-Party System Vendor

Quick. Name a third-party vendor of computer products. AST Research? Systems Industries? Oracle Corporation?

Right. Now, name a second-party vendor. How about a first-party vendor?

Not so easy, is it? Since the birth of our industry, customers have come to rely on a single, monolithic supplier of computer hardware and software for all their computing needs, namely IBM.

But, recent trends in computing are shattering buying habits. As vendors define and embrace independent standards, like the ISO's Open Systems Interconnect (OSI) network model and Adobe's *PostScript* page composition language, they make it possible for their products to work together.

Witness the recent technology partnership between Apple and DEC. Not an announcement of anything new, it was simply a bilateral endorsement of various third-party products and approaches that had been in place for three years, all based on DEC and Apple's independently developed policy of adherence to non-proprietary connectivity standards. This brings us back to our original question.

These days, any hardware or software manufacturer who makes a credible and connectible product is a third-party vendor.

The real first party in a computer purchase transaction is the customer, the person with the problem in search of a computer solution. From the first-party point of view, all third-party solutions are equally workable and valid. A true first party is both ill-equipped and not inclined to research and select from among the various third-party product alternatives.

Enter the increasingly important party of the second part. The successful second party stands between the customer and the vendor, advocating the customer's problem and appraising the vendors' products as possible solutions for it. The second party is the system integrator, consultant or MIS manager who matches third-party products to first-party problems.

Where is this leading? Our industry is gradually becoming less polarized around IBM and more polarized around customers and their problems. In response, our industry's middlemen have to adjust their attitudes.

Corporate information systems departments must stop trying to legislate valid solutions in their companies. Instead, they must begin to learn and live with the growing number of competitive alternatives this new climate will offer. The success of future MIS and ISD executives will be based on how they adjust, adapt to change and introduce it into their companies, rather than on how they resist it.

Computer dealers and resellers are going to have to become true systems integrators. The dealer of the future will be the place where a customer can get answers, not just discounts. *—Al Cini*

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The Best-connected

Mac to Mac

Kinetics advances the connectivity frontier with Ethernet for the Macintosh. Now you get truly faster AppleTalk so your Macintoshes can communicate as high-speed personal workstations. And because we're compatible with the new EtherTalk standard, you can use your standard AppleTalk software packages including file and disk servers, multi-user database systems, and electronic mail.

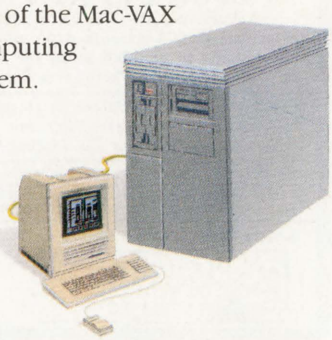
Enter the high-end of AppleTalk networking with the Kinetics EtherPort SE. With this internal Ethernet option card for the Macintosh SE, choosing Ethernet for applications networking is as easy as clicking a control panel selection.

For the SCSI-based Macintosh, including the Macintosh Plus, you can have direct access to Ethernet through the SCSI device chain. Just add on the Kinetics EtherSC, our outboard Ethernet controller.

And to mix-and-match Macintoshes on Ethernet with Macintoshes on AppleTalk Personal Network cabling, the Kinetics FastPath AppleTalk-Ethernet gateway connects the two networks. The FastPath acts as a bridge between networks, providing full support for AppleTalk zones.

Mac to VAX

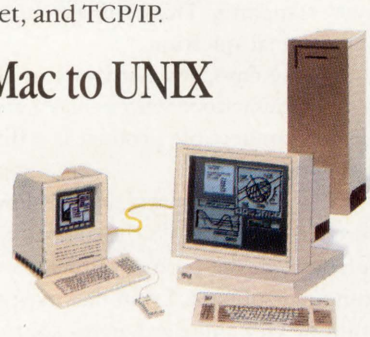
Ethernet is the network of choice in the DEC world. And the Macintosh fits naturally into the DEC world with Kinetics products for the Apple-DEC connection. Your Macintosh on an AppleTalk network, or connected directly to Ethernet, now becomes a vital part of the Mac-VAX computing system.



Let the VAX be a file server for the Macintosh. Let the Macintosh be a terminal for the VAX. Share printing resources along both networks. And access the world-wide services of DECnet.

Kinetics products provide the foundation for the best third party packages adding network values and building on AppleTalk, DECnet, and TCP/IP.

Mac to UNIX



Put together the versatility of the Macintosh and the portable, programmable power of UNIX, and you have an ideal network team. Kinetics unites the two with K-Talk, Kinetics' own AppleTalk for UNIX.

Products

Keyword Enhances KEYpak

Keyword Office Technologies has enhanced KEYpak, the document interchange level integration for the Macintosh and VAX computer family.

Keyword's VAX-based KEYpak Editable Document Exchange (EDE) software permits Mac users preparing documents using Microsoft Word to exchange fully revisable documents with other Macintosh, MS-DOS workstations and VT terminal users running different word processing systems. KEYpak provides transparent document interchange, while preserving total document revisability.

Keyword's KEYpak + 1 is the ALL-IN-1 User Interface program that allows seamless integration of KEYpak EDE services with ALL-IN-1. Macintosh workstations connected under VAX-based ALL-IN-1 environment can use the KEYpak + 1 user interface to facilitate seamless and transparent document interchange.

More information can be provided by contacting Keyword Office Technologies, 2816 11th St. N.E., Calgary, AB T2E 7S7; (403) 250-1770.

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Mt Xinu Introduces XINET

Mt Xinu has announced XINET connectivity software that links networks of Macintosh workstations with VAX and MicroVAX computers running UNIX system software based on the Berkeley (4BSD) versions.

Mac users can store shareable files on VAX or MicroVAX disks anywhere on an Ethernet network. These files appear as familiar Macintosh icons that can be opened, launched or dragged to copy or delete. Mac users also can maintain multiple terminal windows to any UNIX-based VAX, MicroVAX or other computer on an Ethernet network. Under MultiFinder, these terminal sessions can run simultaneously with regular Macintosh applications. UNIX system timesharing users can spool print files to PostScript-based laser printers, such as Apple's LaserWriter II family on Apple's LocalTalk network.

Find out more by contacting Mt Xinu, 2560 Ninth St., Ste. 312, Berkeley, CA 94710; (415) 644-0146.

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MakeEasy Simplifies Mac Access To VAXs

Alisa Systems Inc. has introduced MakeEasy, a software product that provides Macintosh computer users with access to applications and services on DEC computers. MakeEasy incorporates the user-friendly Macintosh interface, based on graphics, menus, windows and icons, to provide a simple and easy-to-learn VMS interface for Mac users.

MakeEasy simplifies the control of a VAX and minimizes training expenses by using a Finder-like environment that presents VMS files and directories as folders and icons on the Macintosh desktop. VAX programs are started by icon double-clicking and files are copied to or from the Macintosh workstation by icon dragging.

Learn more by contacting Alisa Systems Inc., 221 E. Walnut St., Ste. 175, Pasadena, CA 91101; (818) 792-9474.

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Omnis SQL Connectivity Pack Announced

Blyth Software's latest product, Omnis SQL Connectivity Pack, is a complete Macintosh-to-minicomputer relational database solution. The Omnis SQL Connectivity Pack provides true application-level connectivity, giving Mac users transparent access to the data processing power of minicomputer database management systems through a customized Omnis relational database application.

Prices for the Omnis SQL Connectivity Pack range from $3,500 for the MicroVAX II System to $23,750 for a VAXCluster 8978 System, plus $295 per desktop station.

For further information on the Omnis SQL Connectivity Pack, contact Lynne Simonfy, Blyth Software Inc., 1065 E. Hillsdale Blvd., Ste. 300, Foster City, CA; (415) 571-0222.

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Technology Concepts Has DECnet For The Mac

Technology Concepts Inc. is shipping CommUnity-Mac, which offers file server capabilities through compatibility with VAX/VMS Services from DEC.

CommUnity-Mac is compatible with Macintosh Plus, SE and IIs. It includes remote file access to transfer files to or from the Mac to other DECnet or CommUnity systems, VAX/VMS mail for sending and receiving mail between Macintoshes and VMS systems, compatibility with DEC's VMS, ULTRIX and RSX-11M operating systems, task-to-task communications for Mac-to-DEC and Mac-to-Mac programming, etc.

For more information, contact Technology Concepts Inc., 40 Tall Pine Dr., Sudbury, MA 01776; (617) 443-7311.

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TOPS/VMS Provides Real-Time Translation

Sun Microsystems Company recently previewed a version of the TOPS Network for VAX running VMS. TOPS Networks enable Macintosh and MS-DOS computers to transparently share files, disks, printers and peripherals over low-cost, AppleTalk-compatible twisted-pair cabling. TOPS/VMS enables VAXs to act as file servers to Macintosh and MS-DOS computers, with TOPS providing real-time translation between VMS, DOS and the Macintosh.

Other TOPS products include TOPS Terminal, TOPS FlashCard, TOPS NetPrint, TOPS Repeater and TOPS TeleConnector. To learn more about TOPS and its products, contact TOPS, 2560 Ninth St., Ste. 220, Berkeley, CA 94710; (415) 549-5900.

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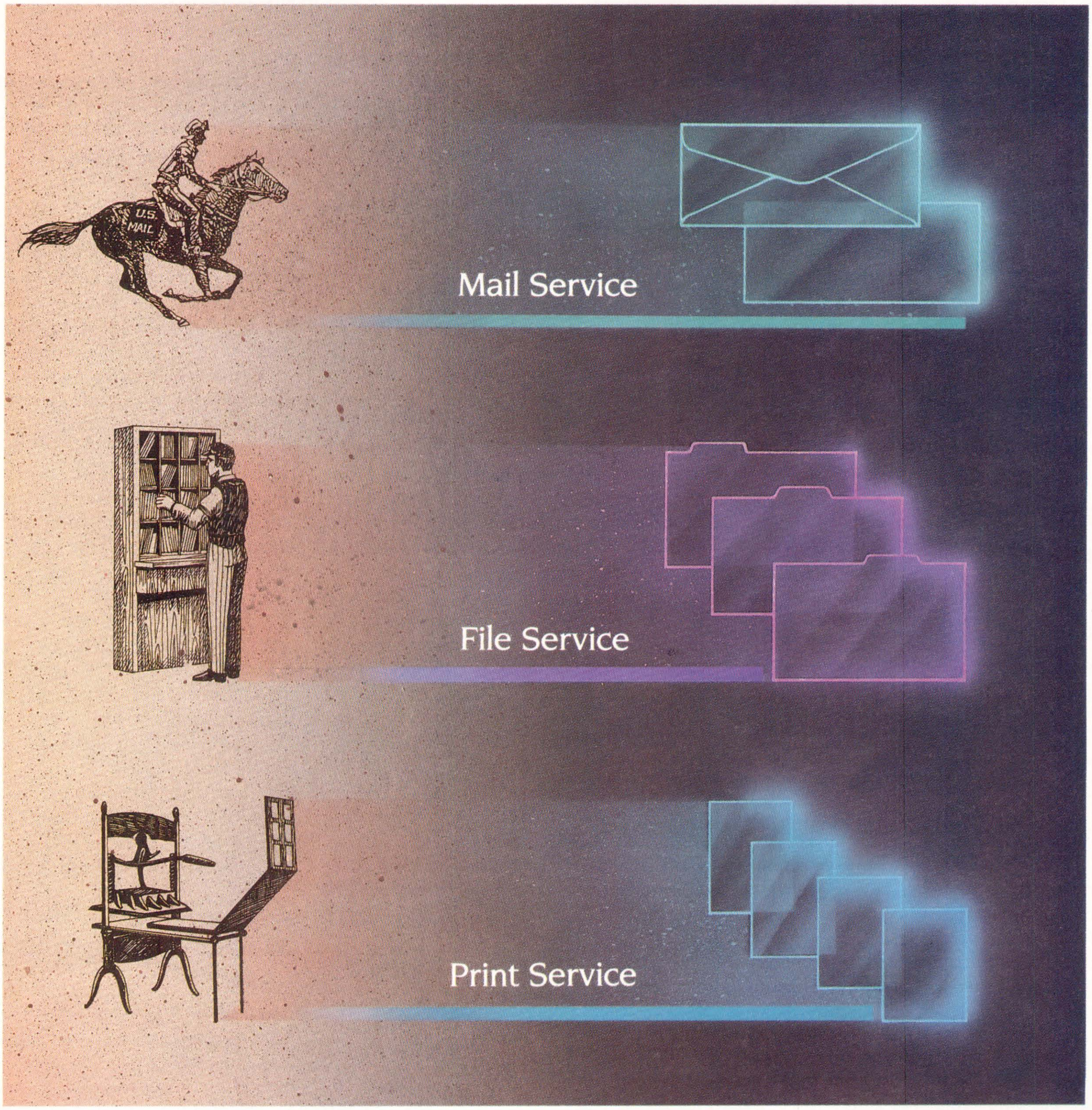
DECnet and AppleTalk: The Macintosh Connection



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- Uncomplicated file access and transfer between your Macintosh and VAX . . .
- Faster laser printing of your Macintosh and VAX files . . .

  and
- Solutions to your system networking needs

Contact Alisa Systems, Inc. at (818) 792-9474 to receive our brochure describing networking solutions. DECnet for the MAC (TSSnet™) and AppleTalk for the VAX (AlisaTalk™)

ALISA SYSTEMS

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Telos Introduces MacNOW For ALL-IN-1

Telos Corporation has introduced MacNOW. It works with ALL-IN-1 to perform functions such as electronic mail, word processing, file cabinet management, file transfer, terminal emulation and user scripts. Users work off-line at a networked Macintosh, thereby offloading the CPU processing requirements from the VAX and improving overall system performance. The host acts as a file server allowing storage and access to documents as well as electronic mail. These OA functions are performed with the standard Macintosh interface of pull-down menus, icons, dialog boxes and a mouse.

Find out more about the product by contacting Telos Corp., 3420 Ocean Park Blvd., Santa Monica, CA 90405; (213) 450-2424.

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Ethernet, AT&T Coexist With LattisNet

SynOptics Communications' LattisNet family of products enables Ethernet to operate on installed star topology cabling systems typically used for PBX communications. This means that a single cabling system can be used throughout a site to support both Ethernet and products from Apple, DEC, IBM, etc. By avoiding the requirement for two cabling systems, both installation expense and on-going support costs are reduced.

The company's patented technology that's incorporated in its LattisNet product line allows Ethernet to coexist with either IBM or AT&T cabling systems, whether the media is fiber optic, shielded twisted pair or unshielded twisted pair. SynOptics communications products provide the customer with an alternative to the significant expense of installing two parallel but incompatible networks.

Learn more by contacting SynOptics Communications Inc., 329 N. Bernardo Ave., Mountain View, CA 94043-5223; (415) 960-1100; FAX: (415) 960-3693.

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Apple Acquires Network Innovations

Apple has acquired Network Innovations Corporation. Network Innovations develops and markets standard connectivity products that address the difficulty in linking desktop computer applications to data in incompatible minicomputer and mainframe systems.

CL/1 is a connectivity language for building desktop-to-host applications. CL/1 is a universal, high-level, SQL-based data access language for software developers to provide transparent access from desktop applications to data on host systems. The first CL/1 connection, a Mac-to-VAX link, provides transparent access from within Macintosh applications to databases, files and applications running on VAX minicomputers.

Obtain more information from Apple Computer Inc., 20525 Mariani Ave., Cupertino, CA 95014; (408) 996-1010.

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Developers Of BLAST Unveil MacBLAST

Communications Research Group has a new telecommunications package, MacBLAST for the Macintosh workstation. MacBLAST comes with standard terminal emulation, including VT100/220. It also supports the Multi-Finder for background file transfers and lets users switch between Macintosh and remote operations.

Other features include auto-dialing and auto-login to remote computers; automated modem support and easy-to-use scripting, allowing the user to design sophisticated systems around BLAST. MacBLAST features pull-down menu interface and mouse support, and allows full connectivity with more than 30 different operating systems and 100 different computers.

Prices range from $195 (Macintosh), $250 (PC) to $895 (minis).

Find out more by contacting the Communications Research Group, 5615 Corporate Blvd., Baton Rouge, LA 70808; (504) 923-0888.

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KaleidaGraph Joins VersaTerm Family

KaleidaGraph recently was released by Peripheral Computers and Supplies as part of its VersaTerm family of products, which support the Macintosh computer as a workstation integrating with various mini/mainframe computers, including VAX.

KaleidaGraph provides a natural productivity extension for business, engineering and scientific users. Data can be input from a mainframe or local application, edited and transformed, then plotted and analyzed. KaleidaGraph has a programmable macro calculator, user-definable input data formats and a customized plot as a template for new data. Transformed data is displayed and analyzed graphically by six built-in curve fitting functions using 10 plot types.

KaleidaGraph sells for $179.

For more information, contact Peripherals Computers & Supplies Inc., 2457 Perkiomen Ave., Reading, PA 19606; (215) 779-0522.

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White Pine And Telos Team With Pacer

Pacer Software Inc. has two corporate alliances aimed at increasing the product options available to Macintosh users in a VAX Ethernet environment. Using Pacer's Modem Port Redirector software, Macintosh communications programs designed for use over serial line (RS-232) connections to a VAX now can be used transparently in configurations where the Macintosh workstation is connected directly to Ethernet or an AppleTalk network that is bridged to Ethernet. Both White Pine Software, developer of the Mac240 VT240 graphics terminal emulator, and Telos Systems Development, developer of the MacNOW package of software tools for ALL-IN-1, have licensed the Pacer Redirector software.

The Mac240 and MacNOW can communicate over Ethernet to any VAX running PacerLink. Supported hardware configurations include the Kinetics FastPath AppleTalk/Ethernet bridge and direct Macintosh Ethernet connection products from Apple, Kinetics and 3COM.

Find out more by contacting Pacer Software Inc., 7911 Herschel Ave., Ste. 402, La Jolla, CA 92037; (619) 454-0565.

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Ada MacHost Uses Mac-to-VAX Applications

EVB Software Engineering Inc. has announced the Ada MacHost, allowing a software engineer to create Ada applications on a host machine (such as a VAX), which can interact with the Macintosh environment.

Ada MacHost appears to the software engineer as a set of Ada packages, which allow the user to create and manipulate all the items in the Macintosh environment. Thus, from within an Ada application, the software engineer can create a dialog window, display this window on the Macintosh and respond to any interactions a user might have with the dialog window.

Ada MacHost is available for a VAX under VMS, but it will be ported to a number of host systems.

Learn more by contacting EVB Software Engineering Inc., 5320 Spectrum Dr., Frederick, MD 21701; (301) 695-6960.

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PRODUCTS

CIS Offers VAX System Software Products

Computer Information Systems Inc. is featuring two new products, Quantum PM and Quantum I/O.

Quantum PM collects and reports configuration, CPU, I/O and memory statistics for performance analysis, system tuning and capacity planning. Quantum PM lets the system manager define, adjust, modify and delete statistic groups used in collecting and reporting data. Reports are flexible and can be tailored to management's need.

Quantum I/O is a layered product consisting of a set of routines written in MACRO32, which permits faster I/O processing. With Quantum I/O, anyone programming in the general-purpose VAX languages can make I/O programming easier and improve program performance.

For more information, contact Computer Information Systems Inc., 165 Bay State Dr., Braintree, MA 02184; (617) 848-7515. Stop by Booth No. 705.

Enter 402 on reader card

CJ/PERSONNEL Reduces Burden Of Cobra

Collier-Jackson's CJ/PERSONNEL system has been enhanced for compliance with the Consolidated Omnibus Budget Reconciliation Act (COBRA). This release includes features to track eligibility, monitor payments and check the status of COBRA plans. The system calculates the costs of each plan and provides extensive tracking and recording capabilities.

Other system enhancements streamline employment history with each transaction automatically sequenced according to effective dates. Any number of future-dated transactions can be applied to current employee files.

Find out more by contacting Collier-Jackson Inc., 3707 W. Cherry St., Tampa, FL 33607-2596; (813) 872-9990. Stop by Booth No. 1217.

Enter 404 on reader card

VAX/VMS Spreadsheet Size Expanded

Stone Mountain Computing has announced release 4.7 of Graphic Outlook, which allows worksheet sizes up to 9,999 rows and 702 columns. This release introduces new efficiencies in the handling of worksheet data, speeding up formula recalculation and reducing the size of stored worksheets.

It reads and writes LOTUS and Symphony spreadsheets. Using "Lotus Mode," the command structure closely parallels that of LOTUS 1-2-3. The program fully integrates spreadsheet functions with high-quality graphics, drawing color and monochrome bar, pie, line and scatter plots, as well as 3-D surface plots on most graphics devices. A low-resolution graphics feature

More than 7,000 DEC buyers are expected to attend DEXPO Spring '88, which is being held at the Cincinnati Gardens, May 17-19. All of the companies mentioned in "Products" this month are exhibitors, and we have included their booth numbers. Please stop by and visit Professional Press at booth number 1123. We enjoy meeting our readers.

draws bar charts and line plots on VT100-type terminals.

Demonstration tapes are available from Stone Mountain Computing Corporation, P.O. Box 1369, Goleta, CA 93116; (805) 968-3838. Visit Booth No. 1215.

Enter 405 on reader card

Cortex Releases New Integrated Case Product

Cortex Corporation has released CorVision, an integrated CASE product, that improves software development productivity by as much as 600 percent, relative to traditional manual programming. CorVision automates the design, programming and maintenance of software on VAX computers.

Developers quickly can build production applications that share data with other VAX/VMS-based applications. Applications developed with CorVision use DEC's RMS file system and Rdb relational database. They also support VAXclusters and standard VMS datatypes.

For further information, contact Cortex Corporation, 138 Technology Dr., Waltham, MA 02154; (617) 894-7000. Visit Booth No. 318.

Enter 406 on reader card

Random Corporation Displays The Colleagues

Random Corporation will display Colleague and Colleague PLUS. Colleague is a battery-powered VT52/100/220-compatible laptop terminal offering a full (25 x 80) screen, full travel keyboard, internal 300/1200 baud modem and serial port speeds of up to 19,200 bps.

Colleague PLUS has off-line word processing with data capture and send capability. Other PLUS features include screen-snap, record and playback.

Colleague is priced at less than $1,000. Colleague PLUS costs $1,295.

To obtain further information, contact Random Corporation, 581 Northland Rd., Cincinnati, OH 45240; (513) 825-0880. Stop by Booth 501.

Enter 401 on reader card

AIS Exhibits EasyEntry

Applied Information Systems Inc. will display a new version of the BURCOM Digital/Burroughs communications system. BURCOM 3.0 provides enhanced file transfer, security, print routing and diagnostics, as well as support for DECnet, VT300 terminals, the DMB-32 interface and Burroughs ET1100 terminal emulation.

AIS also will exhibit EasyEntry, a data entry applications generator for the VAX, PDP-11, Professional, Rainbow and IBM PC. EasyEntry supports heavy data validation, rekey verification, file searches, math computations, windowing and color. Users can store data in indexed or sequential files, perform keyed or non-keyed searches, call records to the screen and modify or reverify the data. EasyEntry can be used as a stand-alone applications generator or be integrated with other software packages.

For more information, contact Applied Information Systems Inc., 500 Eastowne Dr., Ste. 207, Chapel Hill, NC 27514; (800) 334-5510. Visit Booth No. 1116.

Enter 407 on reader card

Trimm Has New Rackmount System Enclosures

Trimm Industries has introduced a new range of rackmount system enclosures. The Trimm DA23 is a Q-bus-compatible 5¼-inch system enclosure. A 350-watt continuous power supply offers the integrator more power to drive DEC-compatible modules. Chassis slides and tilt-up and locking card-cage enhance the serviceability of the enclosure. CD and Q22 backplanes also are available.

Some features are DEC-compatible slide plates for mounting two 5¼-inch peripheral devices, I/O panel with A, C and D size module openings and bridges to allow up to five B size openings. A full-featured control console offers all Q-bus functions, plus two Write Protect/Ready switches, disk access indicator, key activated power switch with system security position and advanced cooling with audible Thermal Protection Alarm. Learn more by contacting Trimm Industries, 11949 Sherman Rd., N. Hollywood, CA 91605; (800) 272-3557 in CA and (800) 423-2024 outside CA. Visit Booth No. 1148.

Enter 400 on reader card

117 Typefaces Available For The LN03 Printer

Compugraphic Corporation, supplier of fonts for the DEC LN01 and LN03 laser printers has announced 78 new proportional typefaces for the LN03 printer. Compugraphic also offers the Courier, Elite and Modern typefaces at larger point sizes to accommodate headline and display applications.

Most of the Compugraphic library is available in sizes ranging from six- to 36-point, in a choice of character sets to suit specific applications. Compugraphic also offers 26 monospaced designs, including OCR-A and OCR-B.

For further information, contact Font Technologies, A Division of Compugraphic

DEC PROs At DECUS

Join *DEC PROFESSIONAL* editors at the Spring DECUS Symposium, May 16-20. Check your DECUS schedule for times and locations of the following speakers:

Kevin G. Barkes, DCL Editor:
- "Utility Development In DCL"

Bill Hancock, Networking Editor:
- "Understanding Ethernet"
- "DECNET-To-VAX Networking"
- "What Is Network Performance, Anyway?"
- "VAX-To-Mac Networking

James A. McGlinchey, RSX Editor:
- "RSX Wizards Confess"
- "Personal PDP-11s"

Philip A. Naecker, West Coast Editor:
- "Building A Run-Time Library"
- "Performance Management For DATATRIEVE Applications"
- "Common Data Dictionary Performance Optimization"

DEC PRO editors also will be offering Presymposium presentations:

Rex Jaeschke, C Editor:
- "Advanced C Language Tips"

James A. McGlinchey, RSX Editor:
- "Application Development Under RSX"

Philip A. Naecker, West Coast Editor:
- "Effective Utilization Of The Distributed Computing Environment"

Corp., 90 Industrial Way, Wilmington, MA 01887; (617) 658-0200. Stop by Booth No. 1012.

Enter 410 on reader card

Clearpoint And EEC Make Joint Announcement

A powerful new version of TurboDisk-Plus Model II, consisting of Clearpoint Research Corporation's 16-MB QED/16 memory board and EEC Systems' TurboDisk-Plus Software V2.2 has been announced jointly by both companies.

The new TurboDisk-Plus Software V2.2 features RAM Disk Shadowing, which guarantees data integrity in the event of power loss to both machine and the RAM Disk. The RAM Disk also can pinpoint those files that consume the most I/O resources on the VMS system. The I/O analysis system automatically produces a report indicating those files that should be placed on the RAM Disk.

Further information is available from Clearpoint Research Corp., 99 South St., Hopkinton, MA 01748; (617) 435-5395. Visit Booth No. 308.

Enter 411 on reader card

DDA Represented At DEXPO

Members of the Digital Dealers Association (DDA) will be at DEXPO Spring. Primary objectives of the DDA are to promote an orderly secondary market for Digital products and to maintain high ethical and professional standards throughout the industry.

Meetings are held twice each year and a newsletter, *DDA NEWS*, is published quarterly. The network of information among members and an increasing number of services are other benefits for members.

For additional information, contact Digital Dealers Association, 107½ S. Main St., Ste. 202, Chelsea, MI 48118; (313) 475-8333. Stop by Booth 906.

Enter 409 on reader card

RA Subsystems Are DEC-Compatible

DILOG has announced two disk drive subsystems with fixed or removable disk drives that are compatible with the RA series of disk drives from DEC.

The Fixed Disk RA (FDRA) subsystem series provides high storage capacity (up to 2.3 gigabytes per unit) while the Quick Disconnect RA (QDRA) subsystem is for use in applications where data security, high reliability and portability are required.

Both can be attached directly to the KDA-50 Q-bus controller, the KDB-50 controller for the BI-bus, the UDA-50 controller for the UNIBUS or the HSC-50/70 controller for CI cluster systems. Both subsystem families are cost-effective alternatives to RA drives or to share a controller with installed RA drives to protect existing drive investments.

An FDRA subsystem with two 576-MB ESDI drives costs $28,802. A QDRA subsystem with two 288-MB ESDI disk drives costs $22,884.

To learn more, contact DILOG, 1555 S. Sinclair St., Anaheim, CA 92806; (714) 937-5700. Visit Booth No. 1139.

Enter 412 on reader card

System Industries Releases SI59

System Industries has announced the SI59 Cartridge Tape Subsystem, which manages more than 2 gigabytes of formatted data on a single 8mm cartridge. The SI59 combines removable, rewriteable magnetic media with a compact, integrated drive and high-performance controller to meet the large storage capacity needs of sophisticated application systems.

This subsystem is integrated into System Industries' multi-featured storage solutions, which are packaged in a variety of cabinet configurations. It's compatible with DEC's Q-bus-based computers.

To learn more, contact System Industries, 560 Cottonwood Dr., Milpitas, CA 95035; (408) 432-1212. Stop by Booth No. 1147.

Enter 414 on reader card

EMC Completes ARCHEION Optical Disk Family

EMC Corporation has announced an optical subsystem that emulates a magnetic disk to complete its ARCHEION optical disk family.

Offering up to 56 gigabytes of online storage, the Archeion/Database package allows users to view the subsystem as an RA series disk drive. The system is addressed with standard disk commands, eliminating the need for extensive user training.

Similar to Archeion's Archiving system, The Database system is VAX compatible. It attaches to all Q-bus, UNIBUS and BI-bus computers. The system's controller plugs directly into the VAX backplane using a standard SCSI interface.

For more information, contact EMC Corp., 171 South St., Hopkinton, MA 01748; (800) 222-EMC2. Stop by Booth No. 1600.

Enter 413 on reader card

System 1032/AF Unlocks Programmer Productivity

CompuServe Data Technologies has announced its new System 1032 Application Facility. System 1032/AF is a menu-driven, screen-based application generation system that makes defining, generating and maintaining database applications faster and easier. It provides a structured, yet flexible, environment where applications are developed and maintained visually. It accommodates a variety of application design styles. System 1032's data dictionary catalogs the data structures, screens, menus and custom code.

System 1032/AF-produced applications can integrate virtually all VAX software and facilities to create a single, comprehensive system with System 1032 as the core.

The cost to license System 1032/AF ranges from $600 for a VAXstation to $24,000 for a VAX 8800.

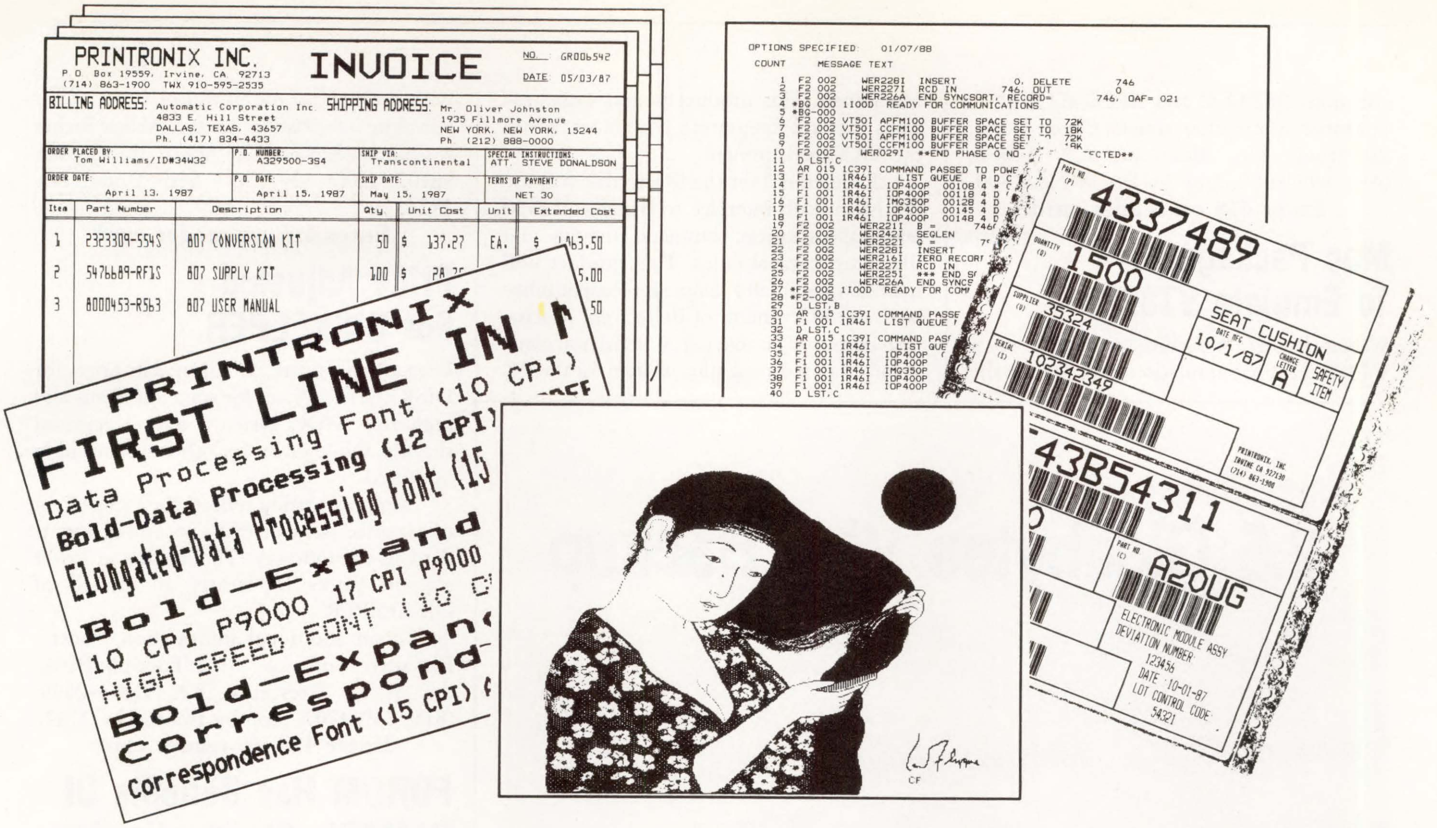
For more information, contact CompuServe Data Technologies, 1000 Massachusetts Ave., Cambridge, MA 02138; (617) 661-9440. Stop by Booth No. 1122.

Enter 415 on reader card

Oracle DBMS Runs On Mac II Under A/UX

Oracle Corporation has announced that its SQL-based ORACLE RDBMS, 4GL tools and decision-support software are available on the Macintosh II running Apple's version of the industry standard UNIX, called A/UX.

SQL*Net, a major component of the SQL*Star architecture, allows ORACLE users on the Macintosh to seamlessly connect to data stored on the corporate mainframe, a UNIX workstation, or a departmental VAX. SQL*Net supports Ethernet (TCP/IP) and DECnet protocols. Future releases will support a variety of communications protocols such as AppleTalk, Asyn-



INTRODUCING THE P9012.

IT'S FAST.

Up to 1200 lines per minute. The P9012 delivers band printer speed, plus versatility the competition can only dream about.

IT'S QUIET.

You'll have to watch the P9012 perform, because you won't hear it. At 55 dBA, it's the quietest line printer you can buy. So, put it anywhere. In the computer room. In the office. In the library. And with auto-ranging power, the P9012 automatically adapts to any power source in the world.

IT'S VERSATILE.

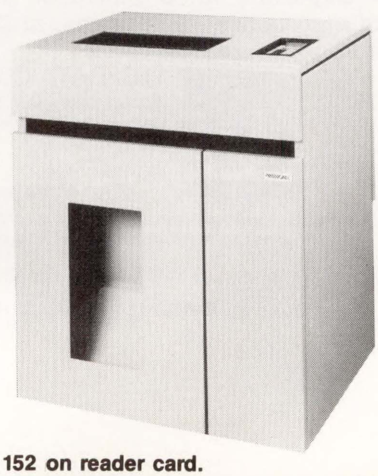
While other printers strive for "multi-functionality," the P9012 gives you "full-functionality." Plus the best print quality in the high speed line printer world–straight through six parts.

Choose from 210 resident character sets in a wide selection of character style and pitch. Then select from five text modes and print at up to 1200 lines per minute.

Print bar codes, logos and forms. Engineering and scientific graphics, business graphics and drawings, all at up to 150 inches per minute. Beautifully.

IT'S THE PERFECT PRINTER FOR YOUR DEC SYSTEMS.

The Printronix P9012. Give it any print job.
It just prints on. And on. And on...



See Us At COMDEX Spring '88 in Atlanta, Booth #2934

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For additional information, enter 150 on reader card. To have a salesman call, enter 152 on reader card.

chronous RS232-C and APPC (LU6.2).
For more information, contact Oracle Corp., 20 Davis Dr., Belmont, CA 94002; (415) 598-8000. Stop by Booth No. 1800.

Enter 418 on reader card

Mac Package To Emulate VT320

Walker Richer & Quinn is developing a VT320 terminal emulation package for the Macintosh. This product targets organizations that are integrating Macintoshes into the VAX environment.

Reflection 2 for the Macintosh will use the Macintosh interface to provide VT320 terminal emulation, command language and file transfer capabilities. This product will maintain command language compatibility with the PC version of Reflection. Macintosh users will be able to run Reflection command language programs written for the PC with little or no modification.

For more information, contact Walker Richer & Quinn, 2825 Eastlake Ave. E., Seattle, WA 98102; (206) 324-0350. Visit Booth No. 1824.

Enter 416 on reader card

Price Adjusted For DISKEEPER

Executive Software has adjusted its prices for DISKEEPER. Prices for some medium- and high-end VAX systems have decreased slightly, while prices for other systems have increased.

Support pricing reflects the "15 percent of list price" scheme that's becoming a standard in the industry. This results in lower support prices for nearly all models of DISKEEPER.

To obtain additional information, contact Executive Software, 3131 Foothill Blvd., Ste. F, La Crescenta, CA 91214-2699; (818) 249-4707. Stop by Booth No. 1712.

Enter 419 on reader card

FORUM Has Benefits Of CAMAC's Standardization

KineticSystems Corporation will exhibit FORUM. Conforming to the international CAMAC standard (IEEE-583) for Computer Automated Measurement And Control, Digital-based FORUM offers engineers and researchers all the benefits of CAMAC's standardization and field-proven concepts, including modular flexibility, limitless expansion, system longevity and computer independence.

Using CAMAC's open-end architecture, FORUM combines KSC's new K-SCAN process control software, a choice of DEC computers and wide selection of field-proven CAMAC process I/O modules. With FORUM, it's simple to design and implement systems tailored to a user's need. It offers the ability to start small and add I/O points, upgrade computers or extend the distributed highway as needs grow.

For more information, contact KineticSystems Corp., 11 Maryknoll Dr., Lockport, IL 60441; (815) 838-0005. Visit Booth No. 340.

Enter 432 on reader card

R-7 V3.0 Positions Files & Directories

RAXCO Inc. has announced the RABBIT-7 V3.0 (R-7 V3.0) software release.

R-7 V3.0 analyzes and intelligently places files, directories and free space for

optimal throughput increases, shorter seek distance and supercharged throughput; centers free space (this consistently builds and maintains the largest possible pool of contiguous free space); warehouses seldom-used files at a disk's outer regions (this slashes seek time and focuses disk head movement; surrounds centered free space with "volatile" files (this focuses creation/deletion activity, keeping both newly created files and free space contiguous longer); etc.
Learn more by contacting RAXCO Inc., 2440 Research Blvd., Rockville, MD 20850; (301) 258-2620. Stop by Booth No. 529.

Enter 417 on reader card

LAN DETECTOR Unveiled By MICOM-Interlan

MICOM-Interlan has introduced the LAN DETECTOR, a sophisticated protocol analyzer for troubleshooting and evaluating the performance of any Ethernet or IEEE 802.3-based LAN. This hardware/software package can be installed on an IBM PC AT or compatible machine and supports a wide range of industry-standard protocols including Novell's NetWare, TCP/IP, Sun Microsystem's NFS, ISO/MS-Net, XNS/MS-Net and DECnet.

Prices start at less than $11,000. For more information, contact MICOM Systems Inc., 155 Swanson Rd., Boxborough, MA 01719; (617) 263-9929. Visit Booth No. 511.

Enter 427 on reader card

CDSA Offers Discounts At DEXPO Spring

C.D. Smith & Associates Inc., (CDSA) is exhibiting at DEXPO Spring. CDSA specializes in the VAX product line and buys, sells and rents new and used VAX systems, options and CPUs. CDSA maintains an extensive inventory of VAX-related items.

Persons considering selling or purchasing a VAX system or option should visit C.D. Smith & Associates Inc. It will be offering specially priced VAX systems and options to qualified buyers during the show. For additional information, contact C.D. Smith & Associates, Inc., 12605 East Freeway, Ste. 318, Houston, TX 77015. Stop by Booth No. 812.

Enter 431 on reader card

MARK 12 Enhances NAG FORTRAN Library

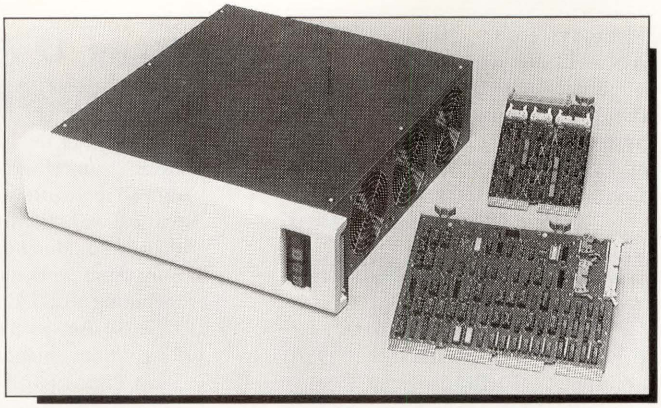
MARK 12 of the NAG FORTRAN Library, from Numerical Algorithms Group Inc. (NAG) provides 688 FORTRAN mathematical and statistical subroutines for more than 80 computer/operating system combinations from workstations to supercomputers, including all DEC systems. NAG has added 175 new user-level routines. Among these are 97 routines including Level 1 and Level 2 Basis Linear Algebra Subprograms (BLAS) to enhance performance on vector and parallel computer systems.

Mark 12 of the NAG FORTRAN Library is a comprehensive, integrated library of numerical algorithms for computational science and engineering. The Online Information Supplement and Graphical Supplement also are available to complement the NAG FORTRAN Library.

Details are available from Numerical Algorithms Group Inc., 1101 31st St., Ste. 100, Downers Grove, IL 60515; (312) 971-2337. Stop by Booth No. 826.

Enter 435 on reader card

Upgrade your PDP-11/34 to an 11/73 with MDB's Transverter-73 system.



MDB Introduces Late-Life Kicker

The Transverter-73 System, from MDB Systems Inc., allows users of PDP-11/34 computers the capability to upgrade their systems to use 11/73 CPUs and memory, thus extending useful computer life and reducing maintenance costs of the older systems.

The Transverter-73 System has a rear-loading 5 1/4-inch rack mountable chassis, an 11/73 CPU and 1 MB of block mode memory. It also uses the MDB Bus Interpreter (Transverter) that's provided in a specific configuration for this application. The Transverter is a two-board set consisting of one quad-size and one dual-size module. The boards are installed into the UNIBUS and Q-bus backplanes. It has an integral bus repeater, so the interconnecting cable length doesn't subtract from the maximum allowable physical bus length of either system.

The Transverter-73 System costs $6,590.

For more information, contact MDB Systems Inc., 1110 W. Taft Ave., Orange, CA 92665; (714) 998-6900. Stop by Booth No. 1026.

Enter 447 on reader card

The 3308/S Offers Better Print Quality

IMAGEN Corporation announced an addition to its ImageServer XP line of laser printer systems. The 3308/S Laser Printers System consists of a Canon eight-page-per-minute LPB-TX laser printer making engine, performance optimized Raster Image Processor (RIP), host/network interface and system software.

The 3308/S allows direct network connectivity and uses IMAGEN's Multiple Language Support (MLS) software. MLS allows the 3308/S to be used with most application programs by supporting multiple page description languages. The 3308/S can accept output written in IMAGEN's imPRESS page description language or UltraScript, IMAGEN's PostScript-compatible emulator. Emulations for several other printer control "standards" also are included.

The 3308/S costs $10,950.

Learn more by contacting IMAGEN Corp., P.O. Box 58101, Santa Clara, CA 95052-8101; (408) 986-9400. Visit Booth No. 2100.

Enter 425 on reader card

Compu-Share Integrates With All-IN-1

Compu-Share Inc. announces complete integration with ALL-IN-1. The company's line of accounting products supports the OA functions of ALL-IN-1. These products now interrupt from any CSI application to access the ALL-IN-1 interrupt menu, report output to ALL-IN-1 folders, invoke the ALL-IN-1 calculator from any CSI screen form and print any CSI screen to the ALL-IN-1 scratch pad.

ALL-IN-1 integration is available with Compu-Share's new VAX product line.

To learn more, contact Compu-Share Inc., 5214 68th St., Lubbock, TX 79424; (806) 794-1400. Stop by Booth No. 1134.

Enter 403 on reader card

V10.06 Of ACCENT R Announced By NIS

National Information Systems Inc. has announced the release of version 10.06 of the ACCENT R Total Applications Development Environment with major enhancements in performance plus new statements, commands and system fields.

ACCENT R's Screen Management Facility, which enables users to develop fully customized screens, has been enhanced to include new menu and form navigation tools. Another enhancement lets users share source code to help manage their development libraries. Other new statements, commands and fields have been added that give more power and control for application developments and more flexibility in ACCENT R startup.

More information may be obtained from National Information Systems Inc., 1190 Saratoga Ave., San Jose, CA 95129; (408) 985-7100. Stop by Booth No. 336.

Enter 433 on reader card

Access Technology Demonstrates 20/20

Access Technology Inc. will demonstrate the 20/20 Database Connection. The 20/20 Database Connection provides DEC users with a quick, easy way to retrieve information from several VAX databases and provides the ability to bring it back into the 20/20 spreadsheet for analysis. This lets users access their data without using a query language or setting up intermediate files.

For more information, contact Access Technology Inc., 6 Pleasant St., S. Natick, MA 01760; (617) 655-9191. Visit Booth No. 432.

Enter 434 on reader card

BUILD-A-COURSE Fits Users' Needs

Bernstein & Associates Inc., a VAX/VMS training firm, announced BUILD-A-COURSE. BUILD-A-COURSE is a method of tailoring a VMS course to fit users' exact needs by letting them design their own curriculum. This service lets users choose among several different modules and lets them put together a course and a manual that's right for them.

For more information, contact Bernstein & Associates Inc., 3 Dunwoody Park, Ste. 103, Atlanta, GA 30338; (404) 392-1488. Stop by Booth No. 828.

Enter 437 on reader card

HYPER-CACHE Increases PDP-11/70 Performance

Digital Data Systems Inc., and Setasi Research and Development are showcasing their third enhancement product for PDP-11 systems. The companies are introducing HYPER-CACHE for the PDP-11/70.

HYPER-CACHE replaces cache modules presently in the PDP-11/70 systems. Used with the PEP-70, the HYPER-CACHE increases PDP-11/70 performance dramatically.

The HYPER-CACHE is 100 percent transparent to system hardware and software (other than performance).

For more information, contact Digital Data Systems Inc., 1551 N.W. 65th Ave., Ft. Lauderdale, FL 33313; (305) 792-3290. Visit Booth No. 504.

Enter 439 on reader card

SYNERGIST Gives Users Latest Technologies

SYNERGIST is an application development architecture, from Gateway Systems Corporation, that blends the power of the PC and host. It allows the programmer to speed development and provides the end user with faster, more efficient execution. It allows users to design applications that can run on PCs connected to an HP3000 or a VAX or on a standalone PC.

SYNERGIST minimizes development time and effort by automating many traditional coding tasks. Development of an application can be completed in four steps and ready for execution.

To learn more, contact Gateway Systems Corp., 2400 Science Parkway, Okemos, MI 48864; (517) 349-7740. Stop by Booth No. 218.

Enter 438 on reader card

TOLAS V6.3 Demonstrated By GSI Transcomm

GSI Transcomm will be conducting demonstrations of its TOLAS distribution and financial management software system. TOLAS V6.3, which uses the VMS operating system, is compatible with all VAXs. It takes advantage of the VAX Information Architecture and uses the Common Data Dictionary as a central storage facility for data definitions. TOLAS can be used in conjunction with DEC's many RMS-layered software products, such as ALL-IN-1.

Some features include functions for kit processing, invoice consolidation and future order processing.

License fees for individual TOLAS V6.3 software modules range from $3,000 to $43,000, depending on VAX CPU size.

For more information, contact GSI Transcomm, 1380 Old Freeport Rd., Pittsburgh, PA 15238; (412) 963-6770. Stop by Booth No. 1625.

Enter 450 on reader card

American Digital Products Upgraded

American Digital Systems has introduced the higher capacity versions of its original MasterDisk Series 5 products. The high-capacity products range from 369 MB for a one-drive system, up to 1.475 gigabytes for a four-drive system. MasterDisk products are available for Q-bus and UNIBUS computer systems.

For the same price that customers can purchase a 152-MB drive, they now can upgrade their system by exchanging their 152-MB drives for 369-MB drives. This gives users 217 more megabytes per drive. For more information, contact American Digital Systems Inc., 75 Union Ave., Sudbury, MA 01776; (617) 443-7711. Visit Booth No. 1608.

Enter 440 on reader card

IMSL Libraries Ready For VAXs And MicroVAXs

IMSL Inc. has created three distinct but coordinated libraries of FORTRAN subprograms from its original IMSL Library. The original IMSL Library has been expanded and divided into MATH/LIBRARY, STAT/LIBRARY and SFUN/LIBRARY. The IMSL Libraries allow the professional problem solver to choose from more than 800 mathematical and statistical subprograms.

The IMSL Libraries' annual license fee on the VAX and MicroVAX I & II ranges from $1,400 to $3,500 for the initial year and from $900 to $2,500 for annual renewal. Learn more by contacting IMSL Marketing

Services Division, 2500 ParkWest Tower One, 2500 CityWest Blvd., Houston, TX 77042-3020; (713) 782-6060. Stop by Booth No. 808.

Enter 441 on reader card

SMS 1000 Model 38 Is A Microcomputer System

Scientific Micro Systems Inc. has announced its SMS 1000 Model 38 system compatible with the DEC LSI-11 computer. The SMS 1000 Model 38 is a complete microcomputer system based on Q-bus architecture. The Model 38 is a powerful tabletop computer that has a Winchester hard disk drive, an LSI-11/23 or LSI-11/73 CPU, four or eight serial ports, a selection of removable media and a five-slot quad-height Q-bus backplane. The system supports high-performance real-time operating systems such as RT-11, RSX-11M and RSX-11M-PLUS, and time-sharing operating systems such as RSTS/E, UNIX and TSX-PLUS.

SMS 1000 Model 38 is priced between $3,000 and $17,000.

Obtain additional information from SMS Inc., 339 N. Bernardo Ave., Mountain View, CA 94043; (415) 962-5459. Visit Booth No. 1135.

Enter 445 on reader card

MBA Servers Offered In Two Models

MBA Systems Automation announced the XXXNET series terminal servers for the VAX/VMS environment. XXXNET terminal servers are offered in two major models of L-series and S-series. The L-series are configured as leaf node servers and can be connected to dedicated leased lines (1200 baud to 56 KB) to support as many as 64 remote terminals each. Functionally, the L-series terminal servers can perform the function of DEC terminal servers and the TRANS-LAN boxes.

Each S-series terminal server can support up to six remote L-series terminal servers and can communicate with 128 other S-series terminal servers on Ethernet links. These remote terminal servers can be interconnected using standard Ethernet devices. Obtain more information by contacting MBA Systems Automation, 611 E. Weber Rd., Columbus, OH 43211; (614) 447-0100. Visit Booth No. 535.

Enter 436 on reader card

Numerix Debuts Attached Vector Processor

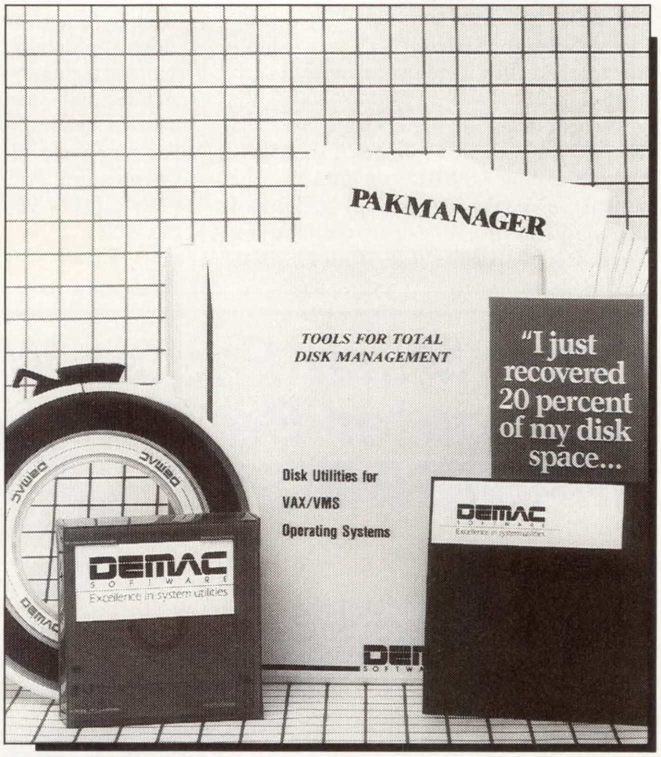
Numerix Corporation has announced its 2nd generation, 32-bit Attached Vector Processor (AVP) combining low cost, large memory and small size. Also announced is an Integrated Software System (IVP) that reduces the time and effort required to implement an application.

The NMX-332 is a 32-bit Attached Vector Processor that can attach to a VAX host via Q-bus, UNIBUS or VAX BI. The system can process at 24 Mflops (millions of floating point operations per second) using a synchronous architecture. It uses CMOS (2 micron) gate array technology that provides a reduction in overall system size and manufacturing cost, while maintaining the architectural system features to ensure software compatibility with the NMX-432.

For complete details, contact Numerix Corporation, 20 Ossipee Rd., Newton, MA 02164; (617) 964-2500. Stop by Booth No. 800.

Enter 430 on reader card

PAKmanager, from DEMAC, allows proper disk space management.



PAKmanager Arrests Space Stealers

DEMAC Software has introduced PAKmanager. PAKmanager lets a VAX manager instantly generate detailed reports that identify space stealers such as unnecessary duplicate files, aged files, excessive multiversion files, overallocated blocks and expired files. The best aspect of PAKmanager is its ability to instantly provide the VAX manager with valuable information needed to better manage valuable disk space.

PAKmanager has an easy-to-use screen menu interface, an optional DCL command line interface for experienced users, a complete online help facility and a clear, concise user manual.

For further information, contact DEMAC Software, 18300 Von Karman, Ste. 700, Irvine, CA 92715-9966; (800) 267-3862, ext. 64. In CA, call (800) 634-6552, ext. 64. Visit Booth No. 606.

Enter 448 on reader card

ULTRIX Support For VAX BIs Announced

Simpact Associates Inc. has announced ULTRIX-supported native VAX BI communications products for VAXs. This family of protocol interfaces includes X.25, X.25DDN, HDLC, ADCCP, SDLC, BSC, DDCMP and MAP.

The interfaces are based on Simpact's multiport, single-slot ICP1632 front-end processor. Previously announced communication interfaces for the VAX BI computers require the use of a UNIBUS-compatible front-end processor and DEC's UNIBUS adapter for the VAX BI bus. The use of the native-mode ICP1632 can result in throughput improvements of up to 6:1.

Learn more by contacting Simpact Associates Inc., 9210 Sky Park Ct., San Diego, CA 92123; (619) 565-1865. Visit Booth No. 208.

Enter 449 on reader card

Henco Will Show INFO-DB+ 3.31

Henco Software Inc. will showcase INFO-DB + revision 3.31. Users now have direct access to MASS-11 files without conversion, as well as WordMARC Composer formats. Concordance time has been divided by a factor of 10, and program execution is 2 to 4 times faster.

INFO-DB + runs on all VAX systems under VMS, including the MicroVAX 3500/3600 systems.

For complete information, contact Henco Software Inc., 100 Fifth Ave., Waltham, MA 02154-7527; (617) 890-8670. Stop by Booth No. 1015.

Enter 442 on reader card

HOOPS V2.0 For VAX, MicroVAX And VAXstation

Ithaca Software will be introducing release 2.0 of HOOPS, its object-oriented 3-D graphics development system. Release 2.0 supports UIS and DEC Window, VMS, MicroVMS and ULTRIX.

HOOPS features include hierarchical graphics database, hidden line/surface removal, multiple light source rendering, input event manager and device independence.

For more information, contact Ithaca Software, The Clinton House, Ithaca, NY 14850; (607) 273-3690. Stop by Booth No. 404.

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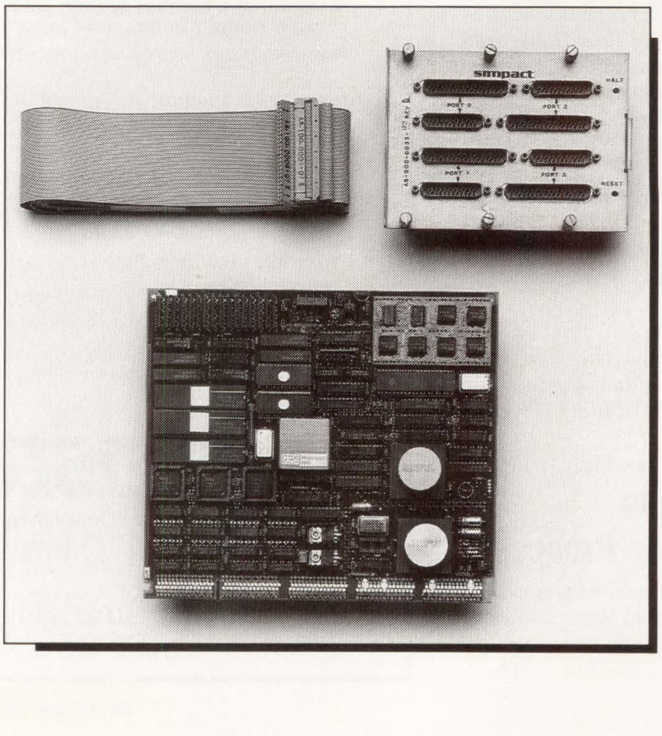

ULTRIX-supported VAX BI communication products from Simpact Associates Inc.

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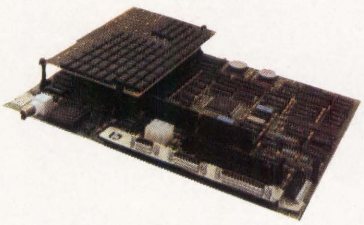
DEC

MicroVAX 2000-Compatible



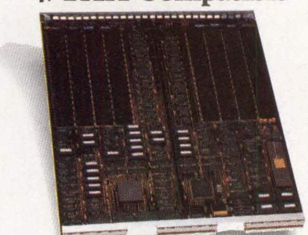
The **MV2000/16 MB*** nearly triples the density offered by DEC. Achieve identical processor and memory performance to the full configuration MicroVAX II —at half the cost!

MicroVAX II-Compatible

The **MV2RAM/16 MB*** places the full system memory capacity on one board. Designed to run cooler and draw less power for maximum board life and reliability, the MV2RAM supports jumperless addressing and parity error checking.

SUN

Sun 3/2XX and 4/2XX-Compatible

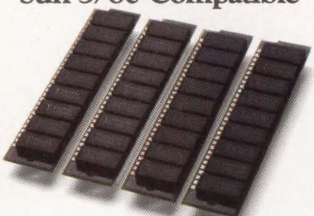


The **SNX2RAM/32 MB*** delivers the Sun 3/2XX system maximum on a single board. It also offers the enhanced functionality of a microprocessor-managed "on-board hotline" for local and remote diagnostics.

Sun 3/1XX-Compatible

The **SNXRAM*** fits up to 28 MB in just one slot, freeing four slots for peripherals. Using the latest one megabit DRAMs, you get the highest density plus increased reliability.

Sun 3/60-Compatible



The **SNX60**, comes in 4 MB SIMM sets that upgrade your Sun 3/60 to an expansive 24 MB. Each SIMM is one MB of reliable Clearpoint memory with a 1 megabit DRAM to support parity checking.

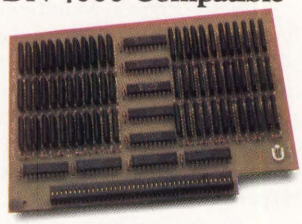
VME

For VMEbus local memory or RAM disks

Offering maximum flexibility, the **VMERAM** supports 24 and 32 bit addressing and 8, 16 and 32 bit data transfers. Compatible with VMEbus Rev.C specs, the VMERAM is available in 16, 8, 4 or 2 MBs.

APOLLO

DN 4000-Compatible



Bring your DN 4000 up to its 32 MB capacity with the **DNX4RAM*** Available in 8 MB boards, Clearpoint's cost-effective memory provides Apollo-equivalent performance with lifetime product support.

DN 3000-Compatible

The economical 1 or 2 MB **DNXRAM** memory offers Clearpoint's quality engineering and manufacturing with performance identical to Apollo.

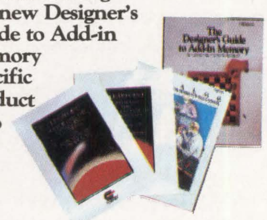
IBM

RT PC-Compatible

Supporting the upgraded RT models 6150 and 6151, the low-cost **RTRAM** is available in 4 or 8 MB boards.

Call or write for

- **Clearpoint's Product and Services Catalog**
- **the new Designer's Guide to Add-in Memory**
- **Specific product info**



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Odesta Ships GeoQuery

Odesta Corporation has begun shipping GeoQuery, a software product for the geographic analysis of computer-based information. Using its own built-in geographic knowledge, GeoQuery automatically creates "smart maps" that accurately classify and pinpoint the location of real-world data. Through these maps, users can access and manipulate information from their database in a geographic context.

Using Apple's Multifinder operating system, GeoQuery can run on the same Macintosh as Odesta's Helix VMX network client and use information from VAXs. Also, an interface to Apple's HyperCard is included, providing users with a business-oriented, geographic context for their HyperCard information.

Odesta GeoQuery is priced at $349. For more information, contact Odesta, 4084 Commercial Ave., Northbrook, IL 60062; (312) 498-5615. Visit Booth No. 1808.

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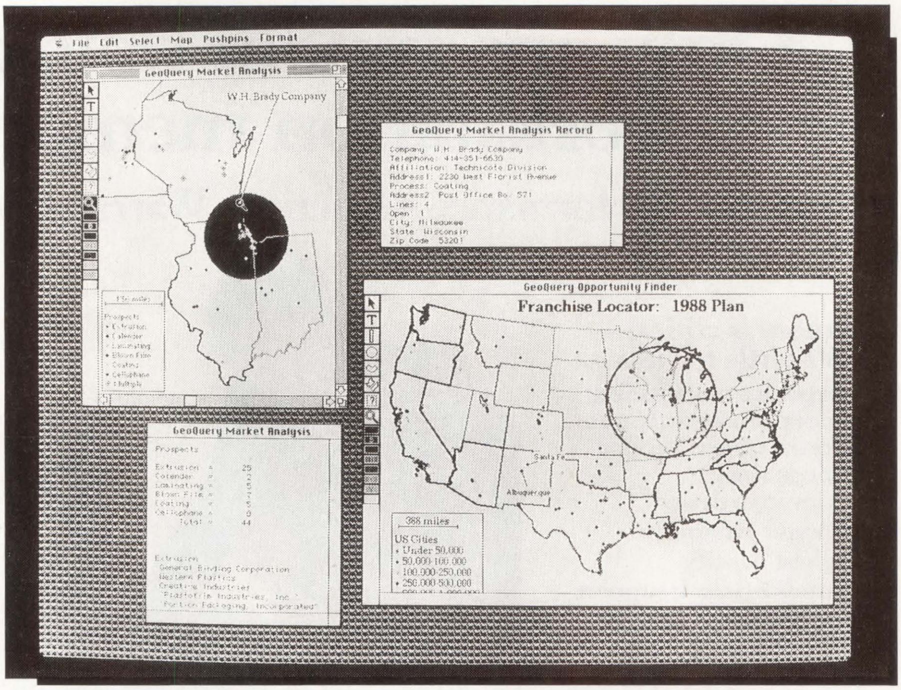

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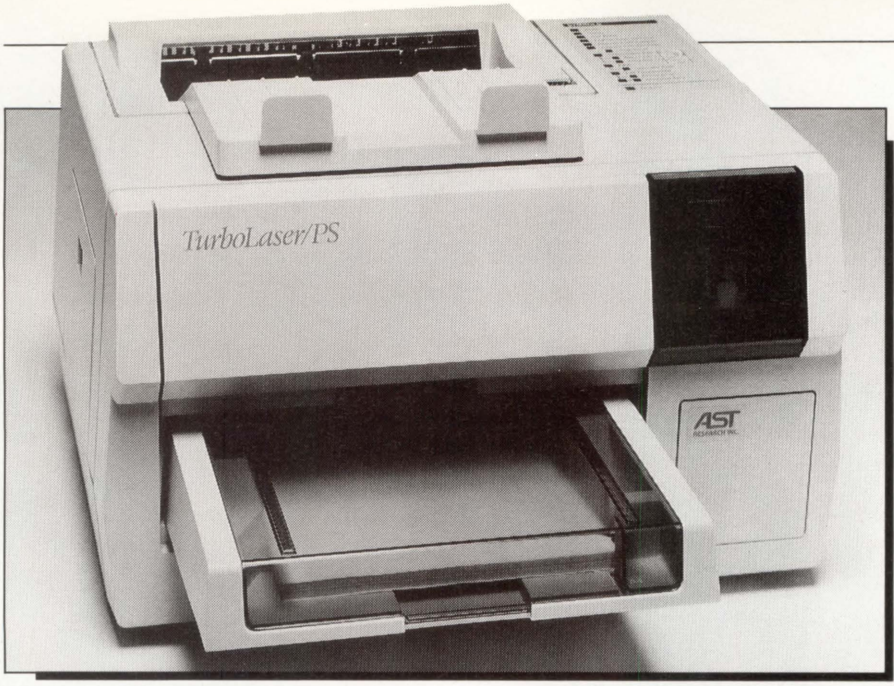

AST Camintonn Digital Division's TurboLaser/PS.

AST TurboLaser/PS Has DEC LN03 Emulation

AST Camintonn Digital Division has announced the AST TurboLaser/PS, an eight-page-per-minute laser printer with a resident PostScript controller and an optional board for LN03, Diablo 630 ECS and HP LaserJet Plus emulation. AST TurboLaser/PS produces high-quality text and graphics.

AST TurboLaser/PS has an up-to-date revision of Adobe's PostScript page description language, V47, for faster, more flexible printing, with more fonts. The fonts include 35 typefaces from the Mergenthaler, International Typeface Corporation and Letraset libraries.

AST TurboLaser/PS provides DEC LN03 emulation with RS-232C connectivity, and a choice between a DataProducts or Centronics parallel interface for compatibility with this environment. This board is a field upgrade for the AST TurboLaser/PS and as an add-in option installed at the factory. With this upgrade, the printer provides PostScript, DEC, Diablo ECS 630 and HP LaserJet Plus compatibility.

Find out more information by contacting AST Camintonn Digital Division, 2121 Alton Ave., Irvine, CA 92714-4992; (714) 553-0247. Visit Booth No. 614.

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IBI Has FOCUS For VAX 4GL/DBMS

Data-maintenance support for VAX RMS files is part of the complete FOCUS for VAX 4GL/DBMS from Information Builders Inc. The new RMS support will be included in FOCUS for VAX at no additional charge. IBI also announced complete data maintenance for Rdb databases, complementing the existing read-only interface available for DEC's relational database.

The READ/WRITE capability for RMS will be part of the basic FOCUS system with prices ranging from $6,800 on the MicroVAX 2000 to $88,500 on the VAX 8800. The Rdb READ/WRITE interface is available from $1,695 to $18,825. Current users of FOCUS for the VAX will receive the RMS READ/WRITE capability at no charge.

For more information, contact Information Builders Inc., 1250 Broadway, New York, NY 10001; (212) 736-4433. Stop by Booth 428.

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WINGS V1.3 Gives Full Project Management Power

AGS Management Systems Inc. has released V1.3 of the WINGS Project Management System. WINGS is an online real-time project management system that provides full project management power including planning, scheduling, resource management, progress tracking and report reduction.

A premier feature of V1.3 is the WINGS USERGANTT. The USERGANTT is a flexible, gantt-generating facility that lets the user define, maintain and produce customized gantt reports immediately, through a standard mainframe line printer, IBM MS-DOS PC (or compatible) or the IBM ink jet printer (or compatible). It also has enhanced security options and a number of processing facilities that allow user flexibility when processing.

WINGS is available for the IBM, VAX or MICROVAX (VMS) or AT&T 3B (UNIX) Systems.

For more information, contact AGS Management Systems Inc., 880 First Ave., King of Prussia, PA 19406; (215) 265-1550. Visit Booth 1034.

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RAF Fully Integrated With ViewMATE

Datability Software Systems, developer of Remote Access Facility (RAF), now has a seamless interface with ViewMATE, offering a complete, PC-based workstation.

RAF functionality is fully integrated with ViewMATE. ViewMATE allows users to have multiple simultaneous sessions to multiple hosts, all visible and active on a 19-inch, high-resolution monitor. It comes with a large monitor and the MultiVIEW graphics board, which drives the monitor. There is an independent video processor on the board so that it doesn't load down the local PC processor, because all window and session management is performed by the MultiVIEW board.

More information can be obtained by contacting Datability Software Systems, 322 Eighth Ave., New York, NY 10001; (800) 342-5377 or (212) 807-7800. Visit Booth No. 1508.

Enter 452 on reader card

SPSS Has New Software Interface Programs

SPSS Inc. has introduced three new software interface programs. The new products are SPSS-X Capture for Oracle, SPSS-X Capture for Ingres and SPSS-X Capture for RdB.

The Capture products complement the family of existing SPSS-X Capture products. These include SPSS-X Capture for DATATRIEVE, SPSS-X Capture for SQL/DS, SPSS-X Capture for the HP 3000 and SPSS-X Capture for DB2.

Contact the company for more information at SPSS Inc., 444 N. Michigan Ave., Chicago, IL 60611; (312) 329-3500. Visit Booth No. 1038.

Enter 453 on reader card

SUMMUS Displays GigaBox And GigaTape

SUMMUS Computer Systems is showing its GigaTape helical scan 8mm tape subsystem featuring 2.33 gigabytes unattended backup capacity. It is integrated with GigaBox, a high-capacity data storage subsystem providing up to 1.5 gigabytes of online disk storage.

The GigaTape subsystem has a data rate

of 246 Kbps. Powerful error-correcting code (ECC) ensures an error rate of less than one in 10 bits read. With a 20,000-hour MTBF, GigaTape is reliable. Proprietary controller firmware provides TMSCP protocol and VMS software compatibility.

Available in Q-bus or UNIBUS, the GigaTape starts at $5,495 for Q-bus kit models.

For further information, contact SUMMUS Computer Systems, P.O. Box 820549, Houston, TX 77282-0549; (713) 589-9772 or (800) 255-9638. Visit Booth No. 832.

Enter 454 on reader card

Dyna Five Exhibiting Line Of Enclosures

Dyna Five Corporation is exhibiting its line of DEC-compatible enclosures for MicroVAX II and MicroPDP-11 systems. The enclosures include System Enclosures in pedestal, tabletop and rackmount configurations for business, scientific and industrial environments. Expansion Enclosures, designed to provide more backplane slots, power and peripheral mounting space, allow MicroVAX II and Micro PDP-11 users to double or triple their system size. BA11 Compatible Enclosures provide low-cost packaging with full eight-quad or 16 dual-slot backplanes, front or rear loading.

Dyna Five Corporation's SE102P.

Peripheral Enclosures provide the range of voltages and currents for mixing and matching 5¼- and 8-inch peripherals. Additional information can be obtained from Sam Lane, Dyna Five Corp., 7 Morgan, Irvine, CA 92718; (714) 770-2790. Visit Booth No. 348.

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White Pine And Pacer Sign Agreement

White Pine Software announced an agreement with Pacer Software to integrate White Pine's terminal emulation product Mac240 into Pacer's Pacerlink software. The agreement provides users of Pacer software access to full DEC VT240 text and graphics emulation provided by Mac240 over a network connection.

Using Pacer's Redirector software with Mac240 on the Macintosh, users can log into a VAX host running PacLink over a network connection. Either a direct Ethernet connection using an Ethertalk card (from Apple) or EtherTalk SC (Kinetics Corporation), or a Kinetics Fastpath Appletalk to Ethernet gateway can be used. The full capabilities of Mac240's ReGIS and Tektronix 4010/4014 graphics, along with VT220, VT100 and

VT52 text capabilities will be available. Mac240 is available from White Pine Software, 94 Rt. 101A, P.O. Box 1108, Amherst, NH 03031; (603) 886-9050. Visit Booth No. 706.

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Emulex Subsystem Has 760 MB

Emulex Corporation has new versions of its removable storage subsystem and embedded micro subsystem with capacities of 760 MB per module.

The Emulex Removable Subsystem (ER2), aimed at applications requiring portable, modular data storage, is available in two models. The ER2E/760 is a subsystem that connects to DEC's Q-bus computer systems through Emulex's high-performance QD21 controller. The ER2S/760, using the SCSI interface, connects to DEC's Q-bus, UNIBUS, or IBM's PC XT/AT via the appropriate Emulex host adapter. Both models offer total subsystem capacities to 1.3 gigabytes.

Prices are $15,620 for ER2E/760, $14,430 for the ER2S/760, $12,530 for the PDM/760 and $10,705 for the EMS/760. More information is available by contacting Emulex Corp., 3545 Harbor Blvd., P.O. Box 6725, Costa Mesa, CA 92626; (714) 662-5600; outside CA, (800) EMULEX 3. Visit Booth No. 1115.

Enter 459 on reader card

Dove Announced FastNet II For The Macintosh II

Dove Computer Corporation announced the FastNet II, an intelligent communications controller designed to take advantage of the high-performance of the Macintosh II.

Macintosh II users now can communicate over Ethernet at the higher speeds required for distributed multiprocessing, multitasking applications. FastNet II, operating at up to 10 MHz, is a 68000-based NUBUS Ethernet controller that provides high performance and high reliability for a broad set of networking protocols such as DECnet, TCP/IP and StarLAN.

The FastNet II is available for $899. For further information, contact Dove Computer Corp., 1200 North 23rd St., Wilmington, NC 28405; (800) 622-7627 or in NC call (919) 763-7918. Visit Booth No. 141 or 858.

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603CRK Protects Against Power Disruptions

The new 80 KVA Three-Phase Uninterruptible Power System, from LorTec Power, is 50 percent smaller than previous designs and offers compact power protection for large minis and small mainframes.

The 80 KVA (64 kW with 0.8 power factor) three-phase UPS, Model 603CRK provides clean, continuous power for computer-based equipment and other critical electronic systems. It can handle both three-phase and single-phase loads simultaneously.

The unit is compatible with small- and medium-sized mainframes, including IBM 4300 and DEC 11/70 Series computers.

For more information, contact LorTec Power Systems Inc., 145 Keep Ct., Elyria, OH 44035; (800) 222-2600. Visit Booth No. 145.

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RIPS V3.0 Simplifies Image Processing

Perceptics Corporation has significant enhancements to its Resident Image Processing Software (RIPS) for its Model 9200 series of image processors. Version 3.0 of RIPS provides powerful and easy-to-use image processing. It provides significant new functionality without sacrificing user friendliness.

Some of the major enhancements in V3.0 are the plot of the intensity profile along an arbitrary line within the image, "time lapse" capture of a sequence of video images, either to internal image memory or to host computer disk files, additional real-time digitization options, such as frame averaging with background subtraction and continuous "jump" averaging, and region of interest operations, such as gray-scale statistics.

RIPS V3.0 interfaces to VAX and MicroVAX computers.

For more information, contact Perceptics Corp., P.O. Box 22991, Knoxville, TN 37933-0991; (615) 966-9200. Visit Booth No. 519.

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INGRES Supports Novell's Netware

Relational Technology announced that INGRES, its RDBMS, now supports Novell's Netware in the VAX/VMS, PC and other computing environments. Novell also announced that it will deploy the Novell NetWare networking system in the VAX/VMS operating environment.

Under the terms of the agreement, Relational Technology will provide technical direction and information on new environments where NetWare will be deployed. Novell will provide Relational Technology with a series of networking protocols on which task-to-task communications can be executed.

Obtain more information by contacting Relational Technology Inc., 1080 Marina Village Pkwy., Alameda, CA 94501; (800) 4-INGRES. Visit Booth No. 1011.

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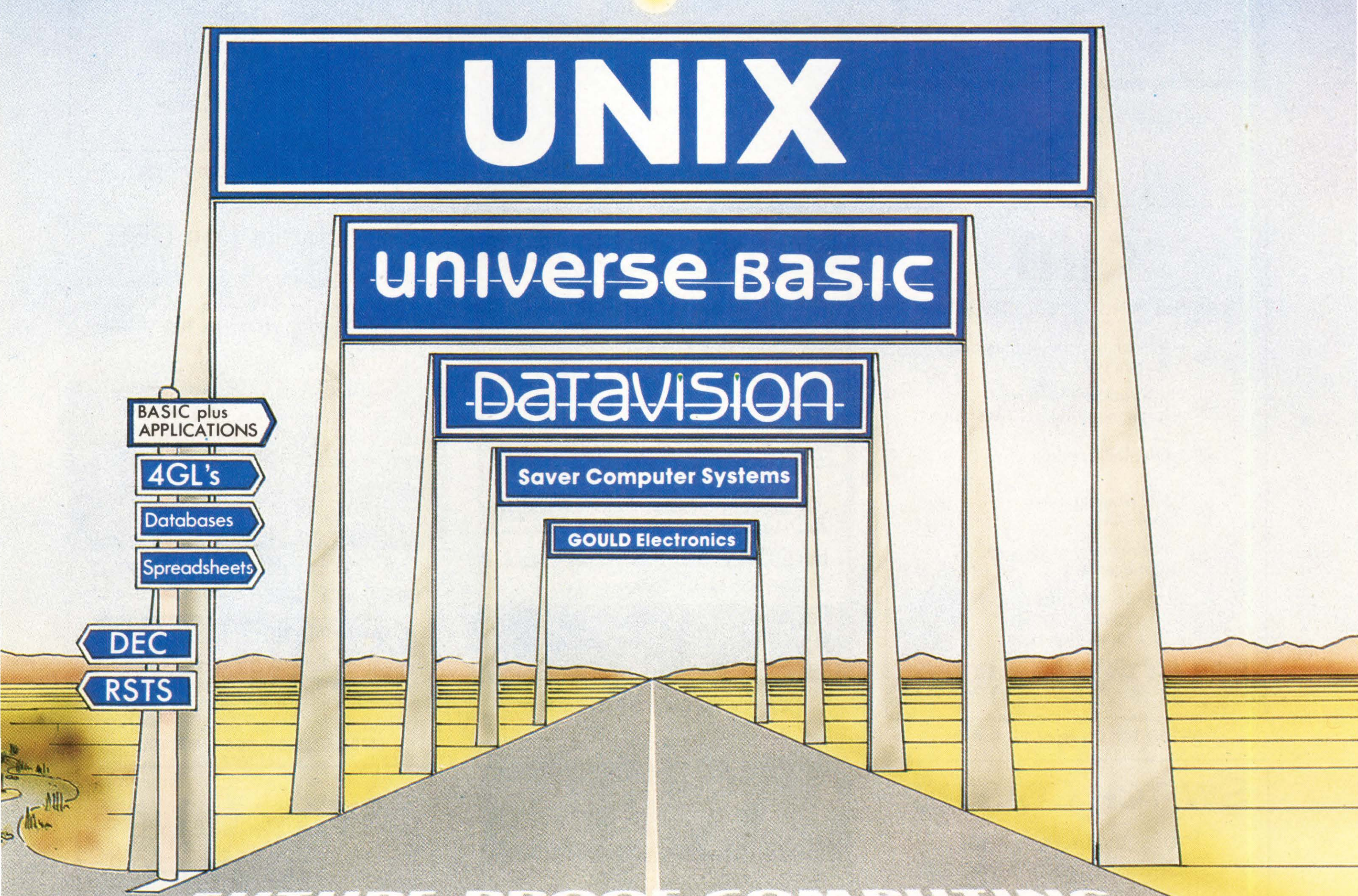

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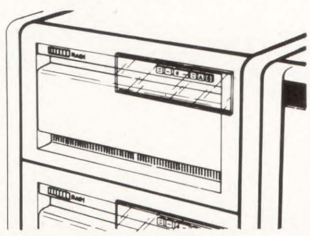

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FONTMASTER-220: Create custom fonts for your VT220 or use one of the many provided. Fonts can be used in existing application or DEC product. VAX version $50.00 if you supply media, $75.00 without/specify. Maris Software, 901-6595 Bonsor Avenue, Burnaby, BC, Canada, V5H-4G5, (604) 437-3273, (604) 438-5267.

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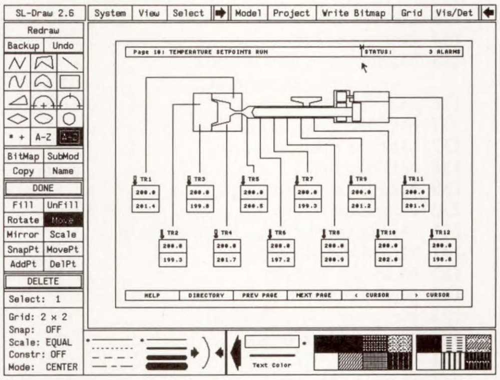
PROGRAMMER/ASSISTANT DP MANAGER WANTED: Minimum 2 years experience programming. Fluent in C, knowledge of Dibol a plus. VAX/VMS background a plus. Must be familiar with major PC software. Will be involved in creating new software applications. Salary commensurate with experience and qualifications. Send resume to: Admarketing Inc., 1801 Century Park East, Suite 2000, Los Angeles, CA 90067, Attn: Stelios (213) 203-8400.

NEW SL-GMS (3.0)

THE SIMPLEST PATH TO DIRECT GRAPHICAL MODELING

- **Dynamic visualizations of processes and information**
- **Coherent binding of graphics to your own database variables**
- **Rapid screen and interface development for preview and production**
- **Compatible with GKS, CGI, IRIS GL, X and DECwindows**

The Sherrill-Lubinski Graphical Modeling System (SL-GMS 3.0) is an off-the-shelf software product designed to speed up your development of interactive graphics. With it you can build your own screens, displays or custom graphical interfaces.



Helping you at the lowest level

SL-GMS is fully compatible with standard graphics packages such as GKS, CGI, IRIS, Graphics Library and CORE, among others. Normally to exploit the versatility of standard packages a great deal of code has to be written to control the graphics functions at the low level. SL-GMS (3.0) eliminates this step to give users unprecedented speed and directness. Without time consuming development or study of low-level graphics functions you can easily create anything from simple screens to fully articulated dynamic visualizations.

SL-GMS handles the tasks of creating, modifying, saving, filing and displaying graphics. All calls to standard display packages are made for you by SL-GMS.

Your screens can be driven from a great variety of data streams such as external real-time sources, direct conversational input, deeper underlying models, mathematical expressions and from SL-GMS scripts for quick design evaluation and simulation.

SL-GMS supports 2D modes of operation in an integer coordinate system. It has all standard graphics primitives, including splines and bit maps, and offers hierarchical models and groups.

This high-level graphics management approach takes all the time and work out of handling graphical data objects. As a result you write much simpler programs to bring up screens, make changes and access objects by names you choose.

Using SL-GMS (3.0)

The **Graphical Model Editor (SL-DRAW)** is shown above, composing a process visualization screen. SL-DRAW allows you to edit, modify, combine and file screen icons and objects which are supplied by SL-GMS—or you can easily create your own. By making appropriate menu selections or by drawing with the mouse, display screens are composed effortlessly. Attributes such as line style, width, and color may be quickly selected or changed. Objects can be moved, scaled, rotated, or mirrored. Libraries of user-defined graphics symbols may be created and referenced from many different screens.

In its dynamics mode SL-DRAW contains additional menu options which allow you to make direct associations between the iconic objects on a screen and variables in your data base. The coherent binding of icon to dynamic variable is instantaneous. The dynamic behavior of each object may be completely specified from the editor and is stored with the objects when they are saved on disk. From SL-DRAW you can also engage "GMD-run", a Preview Utility which lets you animate and evaluate your screen displays without leaving the editor. This entire construction process of your user-interface is completely codeless.

As an alternative The **Graphical Modeling Language Interpreter** (SL-GML), may be used to exercise different screen scenarios. Using the simple SL-GMS command language, screen data files may be loaded and redisplayed. Sequences of attribute or position changes may be applied to objects by name. This allows you to experiment easily with the look and feel of graphics screens before binding the screens to your real-time program variables.

The **Graphical Modeling Function Library** (SL-GMF) consists of all the functions needed to impart and alter the attributes of objects or icons you have created with SL-DRAW. The Graphical Model Dynamics Function Library (SL-GMD) contains a powerful set of procedures and functions to support the codeless binding of icons as they are created with SL-DRAW directly to application variables. The automatic invocation of these functions permits the change of any or all icon attributes, e.g., shape, appearance, size, color, position, orientation, visibility. SL-GMD also allows formulas and expressions of variable combinations to control icons and displays.

Creating graphics display screens in this way eliminates the work necessary to attach even complex graphics to your applications. This is especially true if your requirement must maintain compatibility with **any** graphics standard . . . including new ones like X Window.

SL-GMS (3.0) Architecture

SL-GMS is a solid and robust environment for working with graphics screen development. This is the result of its design and its maturity.

It is a true, object-oriented, integrated, coherent, hierarchical-modeling system with all its components—SL-DRAW, for example—built up from combinations of its own graphics primitives and from functions in the SL-GMF library. All dynamic coherent-binding functions are contained in SL-GMD. These functions are organized according to classes and subclasses.

SL-GMS has particular value to many developers because of its strict underlying architecture, managed and controlled by the Object-Oriented Environment (SL-OOE). This is itself a library of versatile object-management functions, used within SL-GMS, and which is made accessible to interested users for application program development. SL-OOE also contains a program utility to define the user structural-framework and organize program code into strict hierarchical classifications. SL-GMS uses run-time class-information to provide the functionality present in object-oriented programming systems, such as messages to objects, dynamic binding, encapsulation, class inheritance, and so on. SL-OOE does not require the use of any language extensions or any special compilers.

Useful object management functions include: 1) an automatic facility for debugging and tracing function calls invoked on every object, 2) automatic archival and retrieval of arbitrary data structures, and 3) automatic "dumping" of object data.

The system contains a separate object layer called SL-GWS—Graphics WorkStation function library—to insure and simplify the transportability of SL-GMS to the widest variety of systems and devices.

SL-OOE together with the graphical function library (SL-GMF), can be seen as functionally similar to the emerging Programming Hierarchical Interface Graphics Standard, PHIGS. The structural differences, however, allow SL-GMS to be much more extensible than PHIGS with the same functionality. And SL-GMS contains the editor SL-DRAW and the coherent-binding capability. But SL-GMS can easily interface to PHIGS through the SL-GWS layer for users with this requirement.

While written in C, SL-GMS (3.0) is uniquely hospitable to other languages and code. It is extremely adaptable and is easily embedded, in part or in whole, in a user's application program.

Complete SL-DRAW source-code is offered at a low price, so that you may customize the editor to your particular requirements. For example, you may want to change the layout of SL-DRAW menus, or offer a different set of attributes or primitives to the user. You may need to have special symbols available at all times. Users often reconfigure SL-DRAW and add functionality relevant to their own applications, data bases or simulations.

License Prices and availability.

Development Configurations		Components
SL-GMS	$ 9,500	(SL-DRAW/GML/GMF)
SL-GMS-D	12,500	(above, plus SL-GMD)
Run-Time Licenses (Optional)		
SL-GMS	$ 2,400	(SL-GMF)
SL-GMS-D	3,600	(SL-GMF plus GMD)
Source code (Optional)		
SL-DRAW	$ 9,500	
SL-GML/GMF	55,000	
SL-GMD	20,000	

Available: UNIXbsd 4.2, 4.3,
System V, Ultrix, DEC-VMS
GKS level 2c (DEC Version 3.0 and others)
CGI, CORE, IRIS GL, X Window, DECwindows
Silicon Graphics IRIS 40/70, SUN3, SUN4,
VAX, MicroVAX

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Sherrill-Lubinski
Suite 110 Hunt Plaza
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Corte Madera, California 94925

415/927-1724

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DEC PROFESSIONAL

BACK END

John C. Dvorak

The Future Of Business

"People! People!" shouted the director as he clapped his hands. A former Broadway choreographer, he turned to directing commercials after a scandal struck his company.

He was seating a group of six computer executives for one of those New Age commercials — the kind where people sit around the table as if they're at work. They gab about how great their company is and how fabulous the products are. Meanwhile, the assembly line is falling apart, because the supervisors are gabbing instead of working.

"People," said the director, "this commercial is an experiment. We're going to use "real people" in this discussion. I want you to start talking as you would at work. We're going to film the whole thing and edit it to make the commercial. Trust me on this. I did those great Wang commercials." He modestly put his hands over his cheek bones. "I just love the name of that company!"

Another fellow holding a megaphone moved the two women at the table in a little closer and yelled, "Roll 'em." Within seconds one woman, a DEC sales rep, rolled back her chair.

"Cut!"

"I can't sit next to Mr. Jenkins. He reeks of garlic," she insisted.

Jenkins, the UNIX guru, was told to move next to Johnny Tong, the VMS guru. Tong had a cold and couldn't smell the garlic.

"Roll 'em!"

"Can you imagine the gall of AT&T to join forces with that creepy little Sun Microsystems," chimed Ben Fogerty, systems support supervisor.

"It's sick. It makes me want to puke. The irony is that most people run UNIX on DEC machines," said Sally the receptionist.

Jenkins continued, "It's a plot to change the nature of UNIX, so it performs better on certain CPUs."

Tong chimed in, "Who cares? UNIX is awful."

"It's universal, you moron!" retorted Jenkins.

"Says who, fatso?" replied Tong.

"Cut!! People! People!" screamed the director. "This isn't what we had in mind. Let's get rid of petty grievances and talk about the company. Jones, you're the X Window expert. You start by talking about DECWINDOWs. Roll 'em!"

Jones began, "DECWINDOWs is the best solution to the interface debate. It can be used to define any interface the user desires. What we've done is provide the tools for any user to. . . . "

Fogerty jumped in with, "What do you mean we? Do you have a mouse in your pocket?"

Jones was startled, "Excuse me?"

Fogerty continued, "You heard me, pipsqueak. Can DECWINDOWs be used to implement SAA?"

Jenkins joined in, "As long as I can run my UNIX applications in a window, who cares what it does, Fogerty? We know you're quitting to work for IBM anyway. Why don't you just get out of the studio. SAA is lousy."

Fogerty retorted, "It was a simple question."

Sally tried to clear the air. "Is anyone here on the X/Open committee? Let's talk about that."

Tong volunteered, "I used DECWINDOWs to design a NeWS lookalike running under VMS, which configures to emulate X/Open following the SAA standards under AIX on an IBM 4XXX under VM. The window reveals an MS-DOS application."

Fogerty said, "Wow! Does it work?"

Tong answered, "I'm still waiting for the prompt."

"Cut! People! People!" The director now was fretting. "Horace! It's obvious we can't use real people. Get the actors."

The group of real people, still arguing, were escorted out of the studio, and six actors were brought in to read from a script. The commercial finally was finished.

The scene was a brightly lit room with two women and four men sitting around a table. A woman spoke first, "So I showed him the plan: DECWINDOWs under VMS running UNIX, DOS, an MVS application and all the while exchanging data with a Macintosh over DECNET."

One of the male actors perked up. "Wow! Was he impressed?"

"Impressed!" she continued. "He took out his checkbook and said, 'How much?' I told him to hold his horses. He needed an RPO or an RFP for a system like this. I gave him a form RPC-129087, and he thought that was very professional."

"Not an RPC-129088B?" said the actor.

They all looked at each other, about to laugh. She spoke again. "The RPC-129088B is specific to machines not using coax. Remember memo D5-334582 from last year?"

"I didn't get that memo," he said.

"We figured. Jenkins, if you want to stay ahead in this game, you have to keep track of the memos. That's what it's all about!"

Superimposed on the screen were the words:

THE NEW DEC: Paper Power — When Gibberish Is Not Enough!

digital
VAX 8550
Datasouth