



■ Security Alert:
The Keys To
System Security

■ Souping Up
Shareable Logical
Name Tables

■ A Forecast For
DEC Computing
In The 1990s

DECwindows™

OptimaX 200

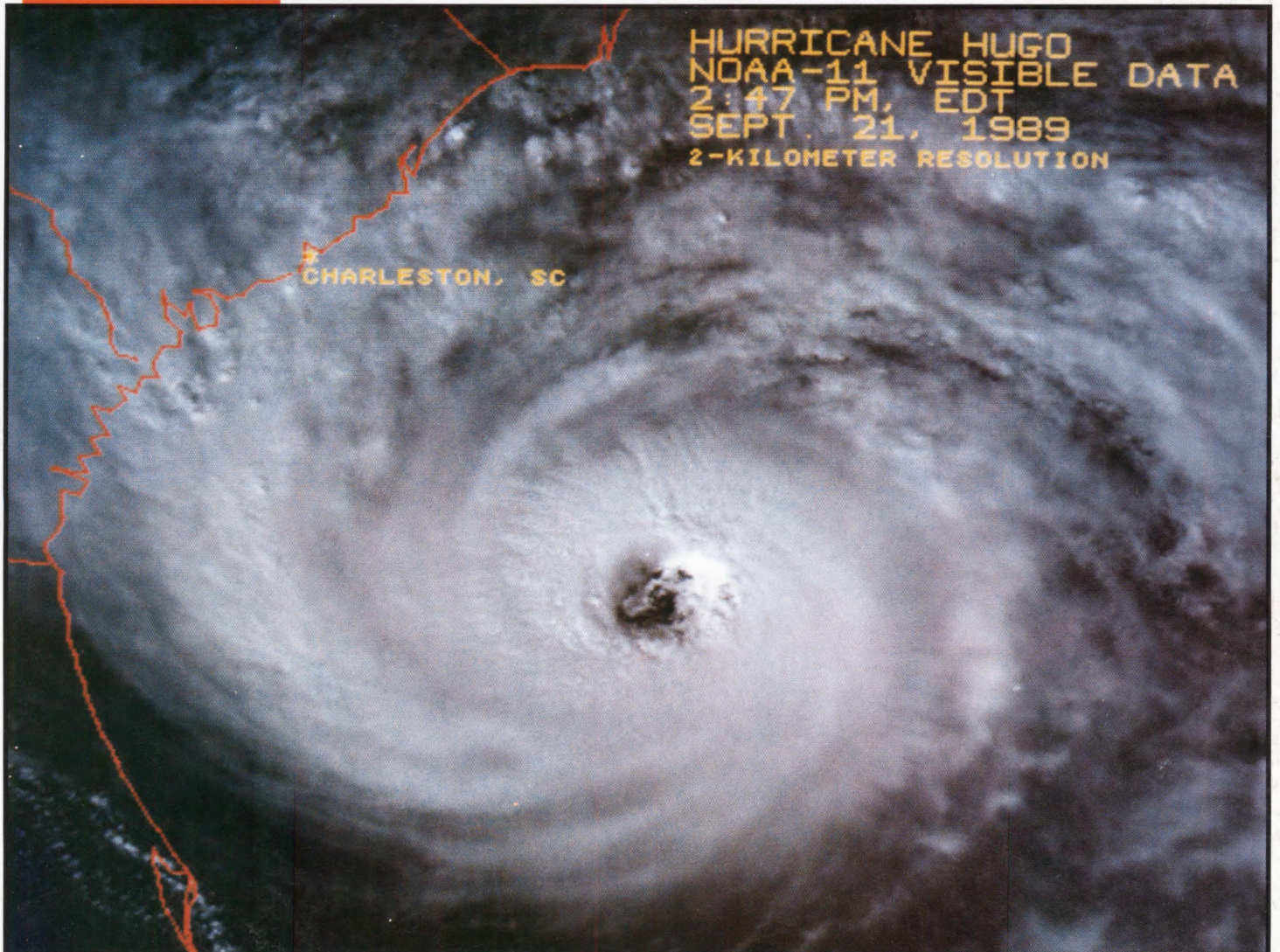
DECEMBER ■ 1989

DEC

\$4.00 ■ VOL. 8., NO. 13

Professional

An Independent Magazine from Professional Press



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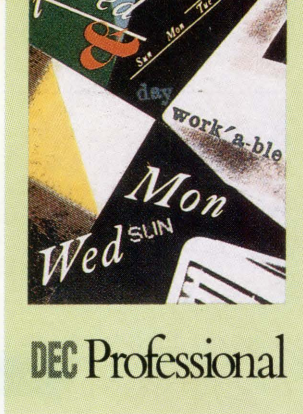
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CIRCLE 374 ON READER CARD



C O N T E N T S

DECEMBER 1989

VOL. 8, NO. 13

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by Ron Levine

If your enterprise runs critical data processing operations on minicomputers, it's imperative that a working, consistently updated and tested disaster recovery plan be implemented. If the system goes down, the time it takes to return it to operational status could decide the survival of your company.

50 SECURITY ALERT

by David W. Bynon

Many computer professionals don't pay enough attention to information theft, hackers and unauthorized use of system resources. The keys to system security include establishing a security policy and monitoring system activity.

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16 SPECIAL REPORT: TECHNOLOGY TIMELINE

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62 ROUNDTABLE: INTO THE NEXT DECADE

Recent announcements from Digital — such as the VAX 9000 and the use of RISC technology — suggest changes in the company's strategy. *DEC PROFESSIONAL* editors gathered recently for a roundtable discussion to examine evolving Digital technologies, its position in the industry and its plans for the 1990s.

68 TOOLS: SHAREABLE LOGICAL NAME TABLES

by Tracy E. Schreiber

Because Digital never has provided programmers with the tools needed to build, maintain and use shareable logical name tables, their potential hasn't been realized. The programs and techniques discussed in this article are tools to help application developers and system managers perform these tasks.

78 INTERFACES: PC DECWINDOWS

by Dennis Giokas and Jim Peterson

Software developers are betting on the success of X, which offers portability and a powerful networking architecture that allows for distributed processing. Digital's PC DECwindows program enables software developers to write DECwindows applications for VMS and ULTRIX systems that display on MS-DOS PCs.

ON THE COVER:

This satellite image from the National Oceanic and Atmospheric Administration shows Hurricane Hugo as it approaches the South Carolina coast September 21.

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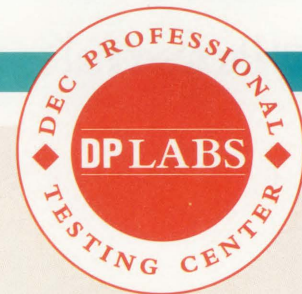
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by George T. Frueh 96

GraphOn Corporation's OptimaX 200 system gives you the flexibility and power of DECwindows. The OptimaX 200 can be connected to the host using a standard RS-232 interface, terminal server or modem. You can place it anywhere you'd place a standard VT terminal.

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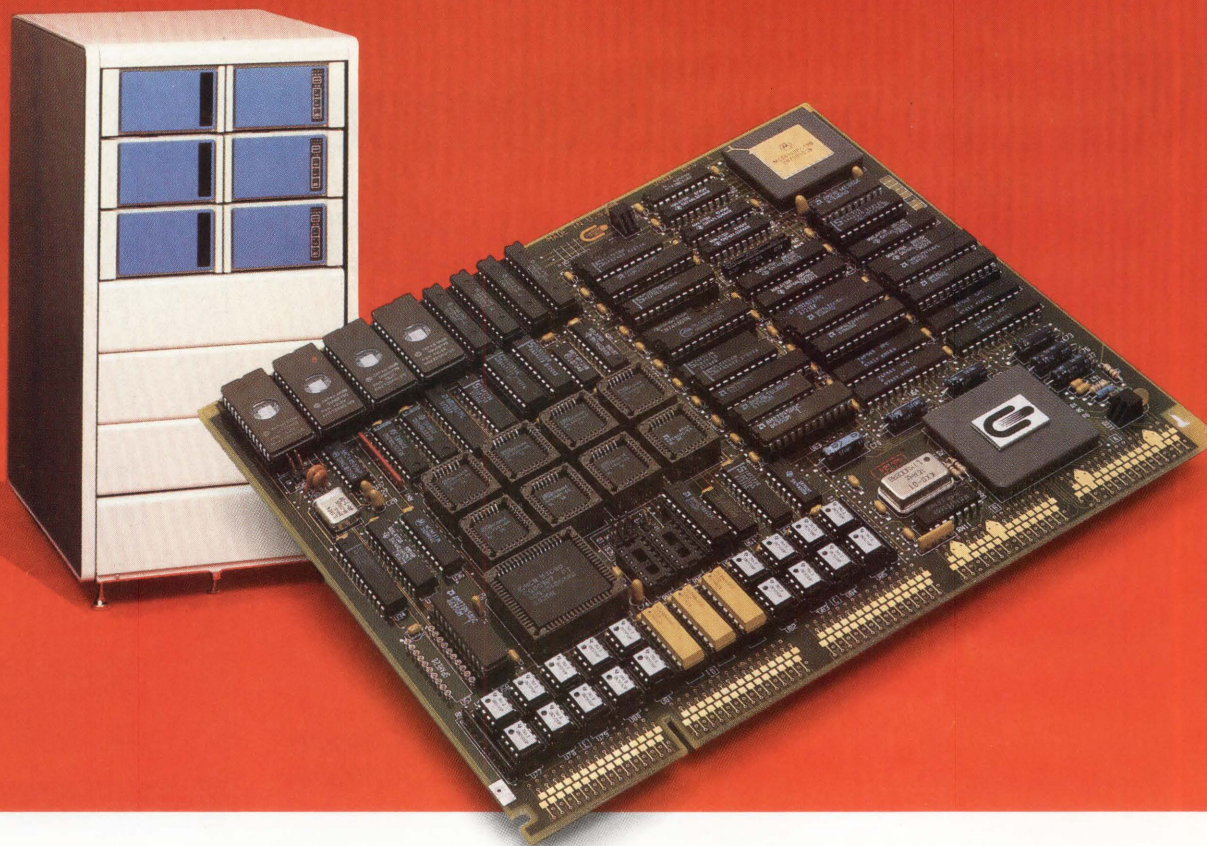
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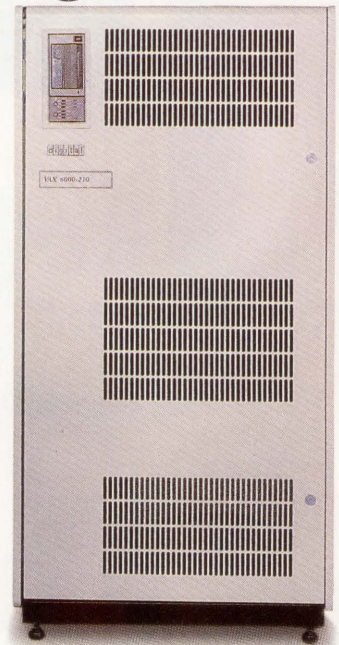
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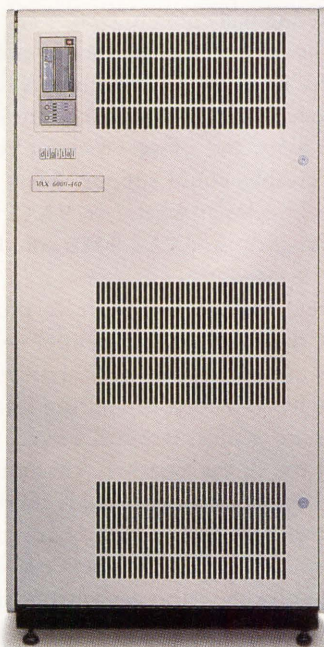
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PUBLISHER

Carl B. Marbach

DEC And Professional Press: A 10-Year Look Back

I wasn't always a publisher. There was life before DEC *PROFESSIONAL*, and a long time ago there was life without DEC computers and without computers at all. That simply means I have a history, and every once in a while it's good to reflect on that history. With Professional Press marking its 10th anniversary of DEC-specific publishing, it's time to look back on a decade of publishing and my 23 years with DEC computers.

It's tempting to start with the VAX 9000, but that's like reading the last page of a novel first — it puts the wrong perspective on the story. A continuing thread I've observed for the past 23 years is that we produce enabling technologies long after many remark, "What could be next? Surely we've done it all."

In the beginning, computers were reserved for those who had big budgets or a do-it-yourself attitude. The group I first worked for had just stopped using an analog computer in favor of a digital computer when I came onboard. The analog computer used a series of resistors, capacitors and meters for input and output. It could simulate some numerical functions, perhaps as many as 10 at a time. The FORTRAN version of the simulator that ran on a 36-bit PDP-6 could handle hundreds of simultaneous equations, a real breakthrough.

The PDP-6 gave way to the virtual memory PDP-10, with disks instead of DECTapes. It served more than the three-person PDP-6, and everyone had as much memory as he needed (well, almost). Timesharing had arrived. However, the computer was expensive and small, and even medium-sized companies couldn't play because of cost and a lack of commercial software. Random access to the disks wasn't well-used, and indexed ac-

cess was unknown.

The PDP-11 changed everything. Thought by many to be the PDP-8 replacement, it became the first timeshared minicomputer when a small educational timesharing system called Resource Sharing Timesharing System (RSTS) was introduced, serving four users on a 32-KW PDP-11/20. It grew to support up to 63 users on the late great PDP-11/70.

But a 63-user setup wasn't the same as an airline reservation system or a large company's transaction processing system, and the PDP-11 was out of memory. Its 16-bit architecture couldn't address enough bytes to get any bigger. DEC's next computer was the Virtual Address Extension computer, just a VAX to us. Memory constraints disappeared, and the operating system, VMS, had built-in functions that wouldn't fit before. RMS worked for instead of against us, and we couldn't imagine life before keyed access.

VMS grew to unthought-of proportions. Clusters, symmetric multiprocessing, terminal servers and networking quickly became part of the machine, adding functionality while using memory and performance. Older models creaked under the strain, but new VAXs produced the horsepower needed.

Sadly, from 1975 to 1985 DEC didn't change as much as its computers did. Although field service slugged it out successfully in the trenches and engineering produced a stream of improved products, sales and marketing continued to act like the old DEC. That is, DEC computers were bought — but not sold.

A certain arrogance at DEC is fostered, at least in part, by its exceptional success. After all, it's a \$12 billion company that has sustained growth rates in double digits. But I haven't seen the attitude change necessary to compete in the big leagues with IBM's slick, efficient and proud sales and marketing people. Maybe, like other enabling technologies, better sales and

marketing will come to DEC.

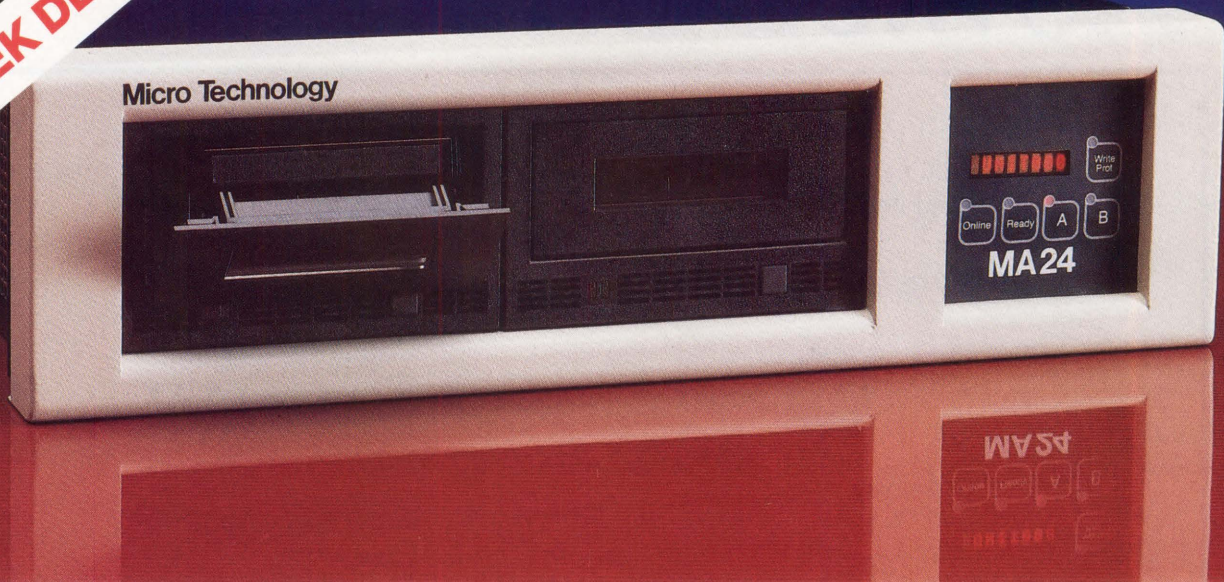
The VAX 9000 is another monumental change in DEC computing. A single-processor VAX 9000 can support 500 to 1,000 users, and a four-processor version conceivably could support 3,000. The mind boggles at what a 16-VAX cluster of four-processor VAX 9000s could support: 48,000 users!

DEC has had the vision to produce tools that exploit the technology and allow us to do things with computers we couldn't do before. Embracing Ethernet was pure genius, terminal servers made good use of the network, clustering allowed modular growth and redundancy, and the VAX architecture is proving its robustness. I hope DEC's next move isn't just to give the customer what he needs, but to help him decide what he needs and work with him to solve his problems and enhance his business.

Journalists watch what happens, but at *DEC PROFESSIONAL* we live what happens. Our company has grown from a lone PDP-11/40 to a three-VAX cluster with at least six other VAXs on our network. Our Lab can test almost any product made for the DEC market, and our 125-person team with offices in five cities uses the VAX network to run Professional Press. We're already planning what new VAX processor and related equipment we'll buy in 1990.

From programmer to publisher, it's been great to be part of it with all of you. My mother used to tell my father as he left for work, sometimes in the middle of the night, "Have fun." Thanks to DEC, the fine people at Professional Press, hard work and all of you who are reading this, for the past 10 years I've heeded my mother's words.

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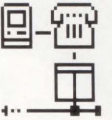
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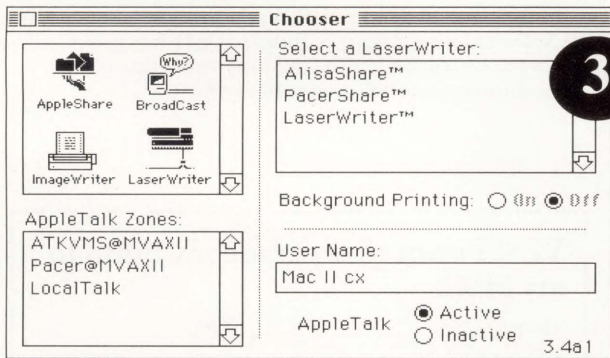
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CIRCLE 106 ON READER CARD

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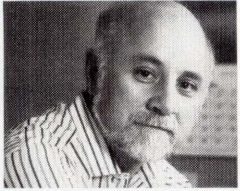
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CIRCLE 375 ON READER CARD



EDITORIAL

Dave Mallery

From CRISCo To Vector Conjecture

You should know about two sleepers hidden in the tons of material that made up the VAX 9000 announcement in October.

First, and most important, is the "RISCification" of the VAX architecture. The VAX architecture is clearly defined as implementation-independent. The designers of the VAX 9000 cast the majority of the simple VAX instructions in silicon, abandoning microcode (DEC's mainstay since the PDP-11/40) so that they execute in a single cycle.

This means that the VAX 9000 is a RISC machine in execution but not in instruction-set simplicity. The smaller set of complex instructions, such as polynomials, executes in parallel with the single-cycle instructions using traditional microcode.

Pulling this off required acres of silicon and probably contributed greatly to the overall project budget. But it wasn't accidental. There was probably no other way to squeeze the performance boost out of the silicon.

You may be saying, "So what? I can't afford a VAX 9000 anyway." That may be the case, but you'll be able to afford what DEC will do next with all that engineering.

The VAX 9000 is built out of ECL logic: very fast, reasonably hot and not very dense. DEC currently is finishing the next several generations of CMOS technology. When you do complex RISC (CRISCo) architecture in CMOS, you get reasonably fast, cool and *very* dense silicon. There are no real obstacles to building the next generation of midrange

VAXs as CRISCo machines — and they will be a lot cheaper than the high-end VAX 9000 implementation.

In one shot, DEC has saved your company's investment in VMS (How many lines of code?), its own investment in VMS, and VMS itself. And DEC may have ensured its own survival.

Vectors For The Masses

The second big change is that DEC added 63 vector instructions to the VAX instruction set. This may have a subtle, long-term effect on the industry. This eventually will be the first general-purpose machine in the non-3090 world to offer vector capacity in your FORTRAN program.

Until now, vectors were in supercomputers, which most of us can't afford. Even if one were in your budget, you had to stand on your ear to get stuff back and forth. Now it's as close as your next line of code. This should change the kind of computing that gets done and cause vectors to be used for more-ordinary jobs. It's like VAX Mail — a nonhierarchical flatland.

Professional Press On uucp

Professional Press now is connected to the worldwide uucp mail network. This means we can send and receive electronic mail from readers worldwide, including you. We also receive and post news items to USENET, the distributed news system running on thousands of computers throughout the world.

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DECUS uucp). The term uucp stands for UNIX-to-UNIX-copy, but the term has expanded to include mail systems that use the uucp method for interchanging mail messages. We also use NEWS on our VAXs to read USENET NEWS. NEWS, like many other useful programs, is available over the network after you have a uucp connection.

To send a mail message to someone at Professional Press, use an address such as "mallery@propress.com". If you don't already have access to the uucp mail network (you probably do if you're in a university or large company that uses networked UNIX systems), get DECUS uucp from the DECUS library or ask a friend if he or she has it. You'll be glad you did. But be warned: USENET NEWS is highly addictive!

Editor's note: For more information on UUNET, circle 544 on reader card.

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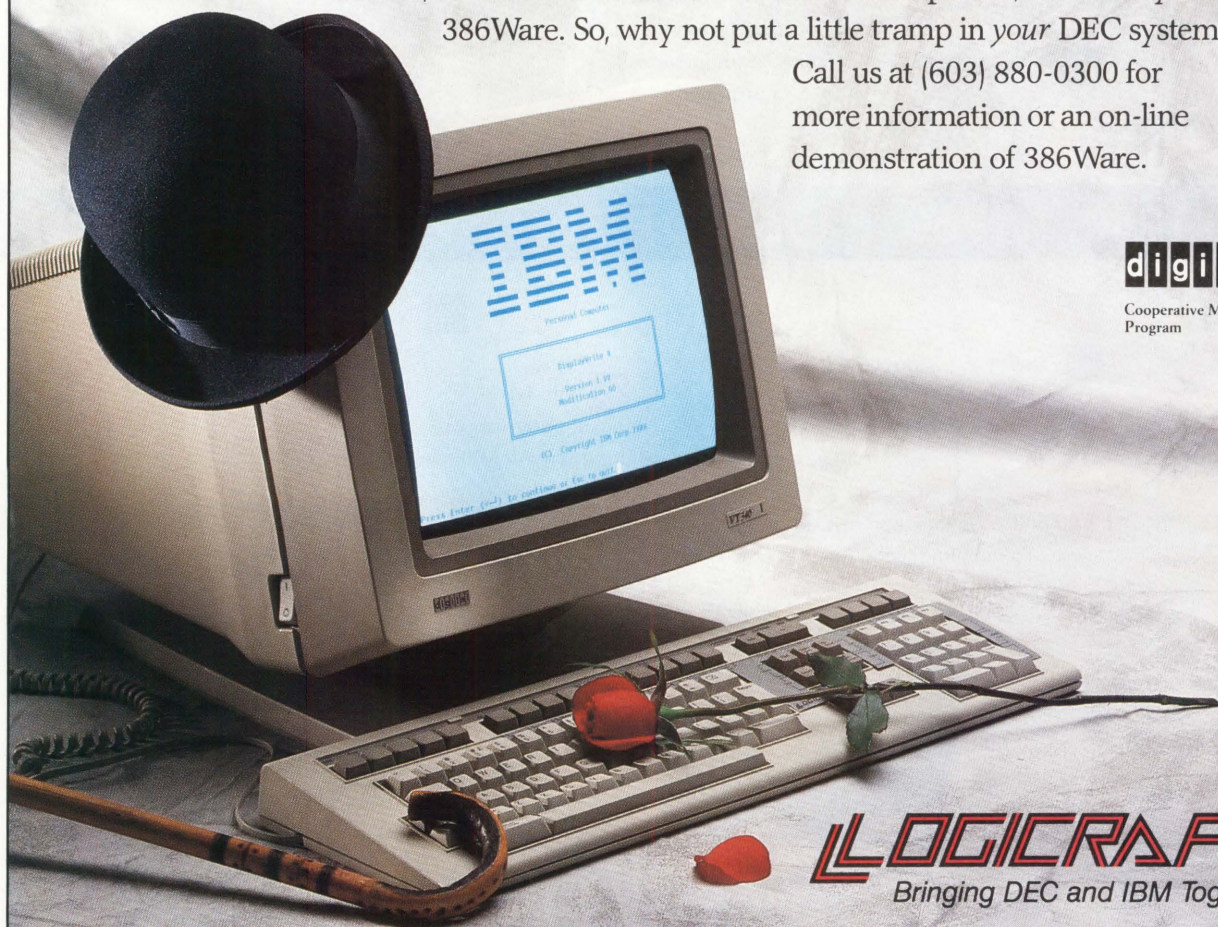
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TECHNOLOGY TIMELINE

In celebration of 10 years in the computer industry, Professional Press, publisher of *DEC PROFESSIONAL*, *VAX PROFESSIONAL*, *HP PROFESSIONAL* and *MIDRANGE SYSTEMS*, presents a timeline of milestones in the history of Digital, Hewlett-Packard and IBM computing. The timeline includes major events in Professional Press' 10-year publishing history.

DEC

IBM

HP

'79 *RSTS PROFESSIONAL* introduced at the San Diego DECUS meeting. The quarterly publication reached 10,000 subscribers.

'77 The VAX-11/780 is the first member of the VAX computer family.



'81 Digital breaks the \$3 billion mark in sales.

'66 HP's first computer is developed as a controller for its family of programmable instruments.

'57 DEC founded.

'39 HP founded.

'77 System/34.

1910 1940 1960 1965 1970 1975 1980 1981

'14 IBM founded.

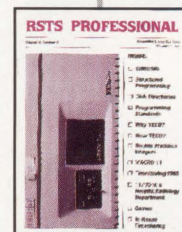
'60 The PDP-1 is the world's first small interactive computer.

'60 The HP oscilloscope makes use of a sampling technique to view faster digital waveforms.



'72 The HP 3000 minicomputer uses one operating system, MPE, and expands performance in business applications.

'78 System/36 is a follow-up to System/34.

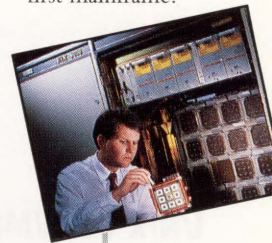


'80 *RSTS PROFESSIONAL* becomes bimonthly.

Compiled by Nadina R. Chapman, editorial assistant, DEC Professional, and Andrea J. Zavod, assistant editor, HP Professional. Photos courtesy Digital Equipment Corp., Hewlett-Packard Co., and IBM Corp.



'89 The VAX 9000 is Digital's first mainframe.



'87 From The Lab:

This column devoted to products tested and evaluated in our Laboratory and Testing Center appears in *DEC PROFESSIONAL* (1987), *HP PROFESSIONAL* (1989) and *MIDRANGE SYSTEMS* (1989).

'89 The DECstation 3100 takes Digital into RISC-based computing.

'85 The MicroVAX II is a powerful supermicrocomputer that incorporates the revolutionary "VAX-on-a-chip."

'87 The VAXstation 2000 is Digital's lowest-cost workstation.

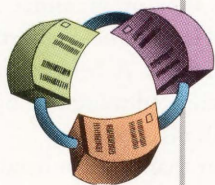
'89 HP celebrates its 50th anniversary. The garage in which the company started is named the birthplace of Silicon Valley.

'83 VAXclusters are introduced, a process for linking VAX processors in a loose processor coupling.

'85 *VAX/RSTS PROFESSIONAL* becomes *VAX PROFESSIONAL*, a bimonthly technical journal for VAX/VMS users that reaches 10,000 subscribers.

'87 *HP PROFESSIONAL* introduced. This monthly publication for professional users and managers of HP's commercial and technical computer systems reaches 35,000 subscribers.

'89 HP purchases Apollo Computer and becomes leader in the workstation market.



'85 Professional Press publishes its first book, *Introduction To VAX/VMS*, by Terry Shannon. This self-teaching text explains how to use VAX/VMS systems.



'89 OfficeVision is the first step in IBM's all-encompassing SAA strategy.

'83 System/38.

1982 1983 1984 1985 1986 1987 1988 1989

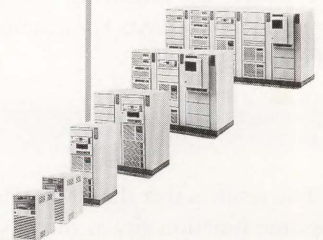
'82 Digital celebrates its first 25 years, during which more than 360,000 computers were shipped.

'84 The HP LaserJet is a personal desktop laser printer.

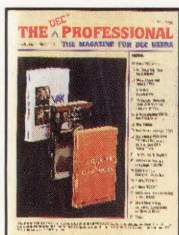


'86 Introduction of the VAX 8800 and midrange VAX 8200/8300.

'86 Local Area VAXcluster systems extend distributed computing to the workgroup.



'82 *DEC PROFESSIONAL* introduced. This monthly solutions-oriented magazine for DEC computing professionals reaches more than 98,500 subscribers.



'84 The VAX 8600 is the first of a new generation of VAXs and the highest-performance system in Digital's history.



'86 ARIS/BB: An on-line bulletin board for *DEC PROFESSIONAL* (1986), *VAX PROFESSIONAL* (1986) and *HP PROFESSIONAL* (1989) subscribers.

'88 AS/400 unveiled as a long-anticipated upgrade to the Systems/3X.

'88 HP NewWave software environment allows development of advanced, easy-to-use end user products.

'88 *MIDRANGE SYSTEMS* introduced. This biweekly news-oriented tabloid for IBM System/3x and AS/400 users reaches 40,000 subscribers.



LETTERS

UNIX VS. VMS

I was disappointed with Philip E. Bourne's ULTRIX column "Process Handling And Input/Output" (September 1989). The section on pipes and I/O redirection is an excellent description of the advantage and flexibility that UNIX users have over their VMS counterparts. Bourne's comparison of UNIX and VMS process handling, however, leaves something to be desired.

While the examples Bourne uses are factually and technically correct, his conclusions and description of the UNIX advantage in process handling don't appear to be based on architectural limitations of VMS. Bourne's affinity for UNIX has led to a one-sided example and potentially misleading conclusions. If he had reordered the activities in his example, the UNIX advantage wouldn't exist. In fact, the VMS advantage in process manipulation would become apparent.

Consider the following example as a substitute for the VMS commands shown in Figure 3 [p. 114]:

```
$ SPAWN/NOWAIT FORTRAN MYFILE.FOR  
$ TYPE MYFILE.FOR
```

The result is that the VMS user enjoys the same functionality as the UNIX user with one less command. This doesn't even consider creating a symbol for SPAWN/NOWAIT or using the shortened form of the FORTRAN or TYPE command.

You might argue that my example is as contrived as Bourne's. However, the point isn't whether VMS and UNIX users think alike, but whether UNIX has the functional advantage that Bourne states.

Bourne states, "When VMS spawns a

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subprocess, the parent process almost always hibernates until control is returned to the parent process. Only one process is active at any time." He continues, "A VMS user requiring extensive multitasking either uses batch queues or, if a workstation is available, opens multiple windows, one for each task." These statements ignore the fact that a VMS user requiring extensive multitasking could simply (and consciously) spawn off multiple concurrent processes.

Further, the thought that "running tasks will continue to run when you log out" is horrifying to many VMS veterans. A runaway job that wasn't specifically detached from a user process could be an expensive waste of system resources and a system management nightmare. I was thankful to read that not all versions of UNIX support this potentially irresponsible behavior.

The VMS advantage in process manipulation is allowing the user to have maximum flexibility in determining his style of computing. A VMS user is free to be frugal with system resources or

invoke all the functionality a UNIX user enjoys by default. The point is one of style, not capability.

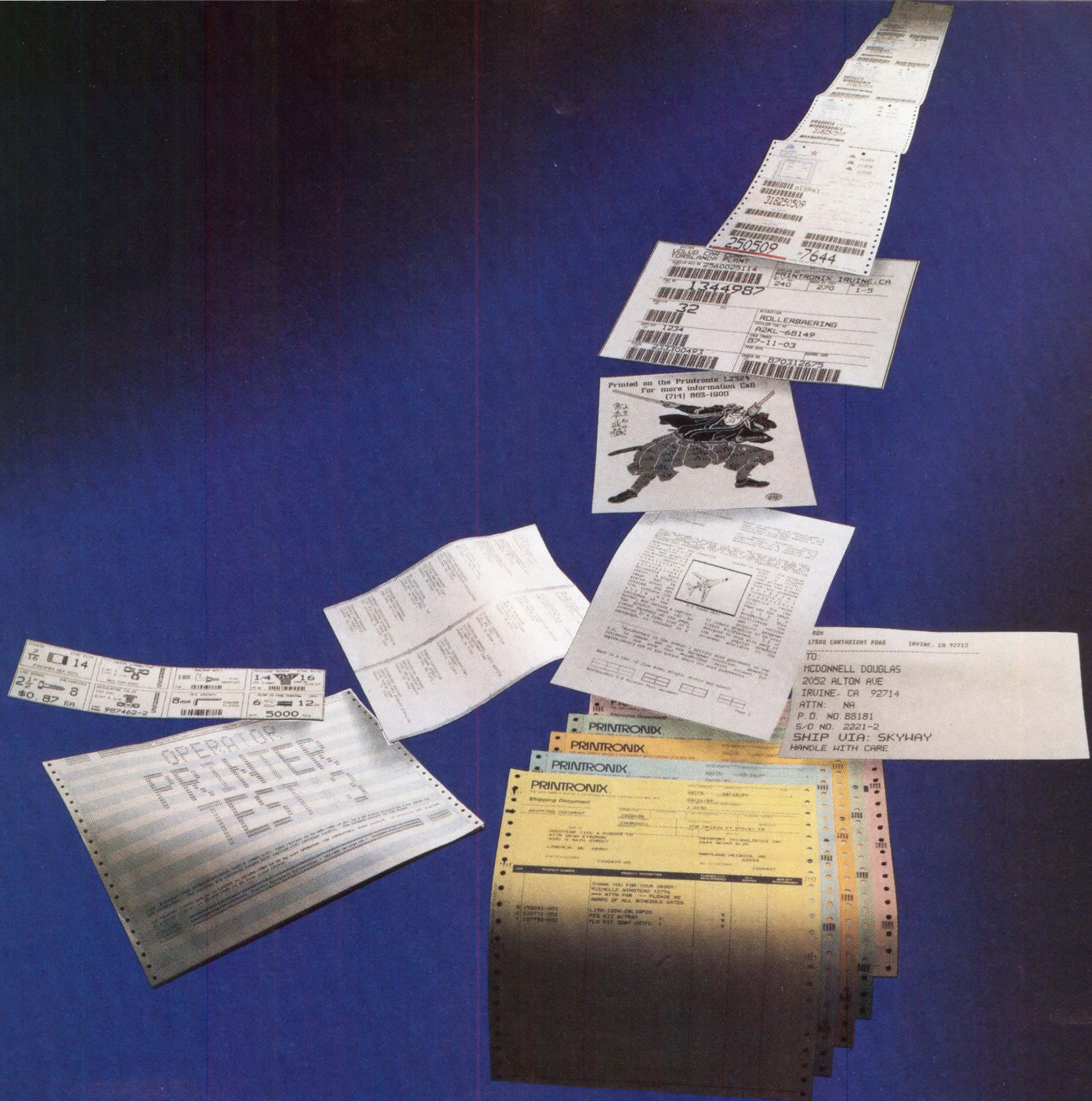
Anthony Abbattista

Chicago, Illinois

Philip E. Bourne, Ph.D.: I in no way favor UNIX over VMS — both have good and bad features. I contend, however, that tomorrow's user/programmer/system manager will have to be comfortable in both environments. A belief that all results are best achieved using one operating system spells disaster.

UNIX is better than VMS at handling a number of interactive processes. But it has to be, because ULTRIX, at least, has the disadvantage of not supporting batch queues. The VMS command SPAWN/NOWAIT is as straightforward and useful as the UNIX equivalent, and it was an oversight not to mention it. However, you can't manipulate the five interactive processes shown in Figure 4 [p. 116] as simply in VMS as in UNIX. When I monitor the interactive habits of VMS and UNIX users, I observe a greater willingness on the part of the UNIX user to use multiple processes. That's what really counts.

Mr. Abbattista states it's horrifying to VMS veterans that running tasks will continue to run when you log out. He has missed the point. Because ULTRIX doesn't support batch queues, how else can you cope with a CPU-intensive application? UNIX has poor enough security without leaving terminals running unattended processes. The alternative is to forego family and friends and sit at the terminal all night. Most of us do that enough already. ■



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PC-TO-MICROVAX COMMUNICATION

QUERY:

David Beorn (SIG 11/MESS 437): What's the best way to talk to a MicroVAX with a PC? I'm looking at PCSA, but DEC can't tell me how much overhead is involved for the PC. The PC runs a real-time process and needs to get signals from the MicroVAX to indicate how to proceed. There will be only a small amount of communication during the real-time process, then the PC will upload the data to the MicroVAX for data crunching, printing and archiving.

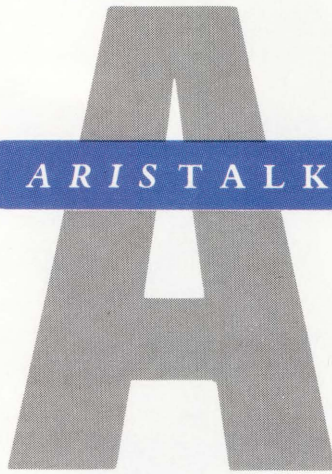
REPLIES:

Ed Bass (SIG 11/MESS 439): We use PCSA to allow PCs to act like VT220s and for fast file transfer capability. However, PCSA seems to be a PC memory hog, and we've had problems with software compatibility between PCSA and other PC software, e.g., the PC package won't run at the same time PCSA is active. If you go the PCSA route and want speed, do it over Ethernet rather than async through the COM port. Test everything carefully to make sure it doesn't mess up your critical real-time software.

Bill Naddy (SIG 11/MESS 440): PCSA would be overkill if you just want to do file transfer. PCSA is a network server package that allows you to set up shared/private disks on the VAX, boot the PC off the VAX, and so on. For a few hundred dollars you could install DECnet on one of your PCs and Ethernet connect to your VAX for file transfers at about 100 times faster.

Ralph Brandt (SIG 11/MESS 442): PCSA is a memory hog. DEC promises that the next release will be better.

If you run PCSA on a nonsupported clone, you might have trouble. Some of our clones can't do a soft reboot; the DEPCA gives an error. They have to be powered off and back on. We've had some success using PCSA for terminal



How To Use ARIS/BB

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To log in, you'll need your subscription number from your mailing label. Set your terminal to seven data bits, one stop bit and space parity, or eight data bits, one stop bit and no parity. Set your terminal emulation to VT100 and dial:

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SIG Identification

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

- 11 Clustering/Networking
- 13 System Performance
- 28 Laser Printers
- 42 Data/File Transfer

emulation on 125 PCs, including 50 PS/2 Models 50 and 70. We use the LK250 keyboard on all, because WPS is user-friendly.

Go carefully into any use of PCSA. It's a powerful product in spite of its shortcomings.

DECWINDOWS DECISIONS

QUERY:

Grant MacDonald (SIG 13/MESS 237): I installed DECwindows on a MicroVAX II, which serves diskless VAXstation 2000s. After all the hype from DEC and the user community, I told our users that this would be the greatest thing since sliced bread. What a pig. Creating windows usually takes more than 30 seconds. We only have 4 MB per station (DEC recommends 6 MB), and it does quite a bit of swapping at startup. I did a little tuning, but it doesn't look good. The users are screaming for their workstation software to be installed again. Have any of you installed DECwindows? If so, how do you feel about it?

REPLIES:

Robert G. Schaffrath (SIG 13/MESS 238): The problem you're describing isn't new. DEC recommends a minimum configuration of 6 MB, but you're better off with 12 MB. A major problem is that the CVAX chip is too slow to handle the amount of processing required for the windows environment. Don't forget that besides running DECwindows, you're running VMS, which also takes a fair amount of processing power. I won't use DECwindows until DEC releases an equivalent to the VAXstation 3100, 35xx series based on the new Rigel CPU (the VAX 6400 series) chip. You'll need all seven VUPS to get a decent response.

Finally, DECwindows is most likely the future direction of VMS. Even though it's slow now, developing in it is probably a smart move. Going back to the old workstation software will leave you



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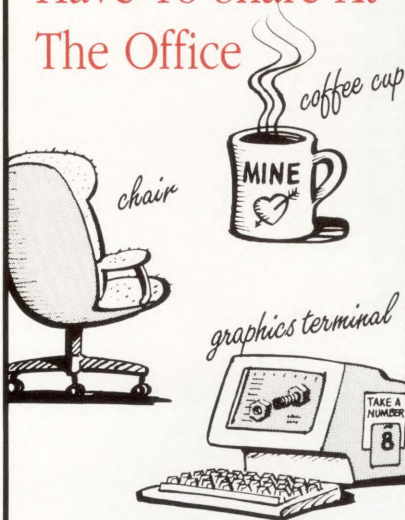
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CIRCLE 296 ON READER CARD

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FIGURE .

```

$ ! Weather Station Control (TAKE 1)
$ ALLOCATE TXAO: STATION           ! Gets and assigns logical name.
$ OPEN/READ/WRITE COMMAND STATION ! Opens a channel.
$ WRITE COMMAND ":WI:windspeed"   ! Example of giving a command.
$ READ COMMAND windspeed          ! Gets the reply from the station.
$ WRITE SYS$OUTPUT "Windspeed is ",windspeed ! Writes the reply
$ CLOSE COMMAND                   ! When finished talking to station.
$ DEALLOCATE STATION              ! When finished session with station.
$ EXIT                             ! Th' th' That's all, Folks!
$ !
$ ! This is just an off-the-cuff try at controlling a weather station.
$ ! If it doesn't work, try playing with the /PROMPT qualifier of the
$ ! READ command.
    
```

working with an obsolete environment. Become familiar with DECwindows now and avoid the Christmas rush.

Dick Kramer (SIG 13/MESS 252): I've been running DECwindows on a VAXstation 3100 for a couple months and love it.

I believe your problems are caused by two things: memory and processor speed. My DEC field engineer tried DECwindows on his VAXstation 2000 with 6 MB and had the same comments as you. He was surprised at how well it performed on my VAXstation 3100.

LASERWRITER CONNECTION

QUERY:

Sherry Kappel (SIG 28/MESS 76): Has anyone had success in connecting an Apple LaserWriter (specifically the 2NT) to a VAX?

REPLIES:

Phil Gravel (SIG 28/MESS 77): We have an Apple LaserWriter NTX connected to a terminal server port. It's available as a printer to several VAXs that have queues set up to print to it.

Richard B. Gilbert (SIG 28/MESS 78): I understand that people have connected a LaserWriter to a VAX using the DEC ScriptPrinter (LN03R) symbiont. This takes a little hacking to make it work and isn't supported by DEC. If you already have software that generates PostScript output, you wouldn't need the ScriptPrinter symbiont, unless you also want to print ASCII text and Sixel, ReGIS and Tek 4010/4014 graphics.

Robert G. Schaffrath (SIG 28/MESS 85):

VAX ScriptPrinter software doesn't support any printers other than the LPS40 and the ScriptPrinter (LN03R). We have LaserWriters as well as a ScriptPrinter. Although both devices support PostScript, the ScriptPrinter has several extensions that are used by the ScriptPrinter software. These extensions can be found in Chapter 3 of the *LN03R ScriptPrinter Programmer's Supplement*. If you're performing pure PostScript, you can hook the LaserWriter directly to the system. The primary benefit of ScriptPrinter is its ability to translate ReGIS and Tektronix graphics and flat ASCII text into PostScript so it prints like a standard LN03.

The LN03 Image Printer (LN03Q) is also supported by the ScriptPrinter software.

WEATHER TALK

QUERY:

Fran Shields (SIG 42/MESS 633): I have a device (weather station) I'd like to "talk" to. The specifications indicate that I can send a command, such as GETTEMP, to the device, and it will send back the requested information. I should be able to COPY FILE_WITH_COMMAND.DAT TXA0: to send the command to the device using TXA0:. I think I should be able to READ the information. Can anyone fill in the blanks or suggest the best approach? I'd like to use DCL to accomplish this task.

REPLY:

Comet (SIG 42/MESS 637): See the Figure. Good luck and happy trails. ■

IS VAXCLUSTER BACKUP TYING YOU UP?



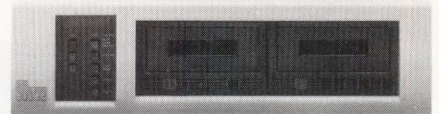
Backing up a VAXcluster with reel-to-reel tape can tie you up for hours. On the other hand, DILOG's RTA 8mm tape subsystem can back up your VAXcluster completely unattended.

Each 8mm cartridge holds up to 2.3 gigabytes of data—equivalent to 15 reels of tape. Just pop in a cartridge when you leave the office, and when you return in the morning, your backup is done.

Need even more capacity? You can connect up to four drives (one master and three slaves) to each tape data channel. For example, a fully configured HSC5X-CA will handle 16 tape drives—over 32 gigabytes of data.

DILOG RTA drives offer all the functionality of a TA-79, and are fully HSC compatible. They can even share the same data channel card with installed DEC tape drives.

If you'd like to untangle VAXcluster backup, call DILOG today.



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(714) 937-5700

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CIRCLE 127 ON READER CARD

Emulex Targets UNIX And Desktop

Company Enters These Markets With Terminal Servers And Workstation Storage Devices

Recognized as a DEC enhancement company and a presence in the SCSI and communications markets, Emulex Corporation also is positioning itself in the UNIX and desktop arenas. It recently introduced terminal servers and workstation storage devices for DEC and other environments.

The Performance 4000-V (P4000-V) terminal server is a low-cost version of the P4000, an Ethernet terminal server compatible with DEC's LAT protocol. The two base models — one with 12 ports, the other with 16 ports and modem control — are expandable to 28 or 32 ports by adding a 16-port expansion box. The 16-port model supports a Centronics- or Dataproducts-compatible parallel printer port.

The P4000-V uses a proprietary dual-processor architecture. Throughput is 19.2 Kbps for 32 ports and 38.4 Kbps for 16 ports. In local mode, it supports command-line recall and editing as well as enhanced displays, pause, automatic date/time loading and wait flags for suspended sessions. It also supports all DECserver security features. The 16-port P4000-V is priced at \$3,900.

Emulex enters the UNIX and non-DEC networking world with the P4000-T terminal server. It provides the same features as the P4000 and is also fully compatible with TCP/IP standards. It supports up to 32 serial ports and one parallel printer port.

The 12-port model supports partial modem control. The 16-port model can have 16 lines with partial modem control or 12 lines with partial and four with full modem control. The 16-port model includes a parallel printer port. A 16-port expansion unit is available for both configurations.

The P4000-T includes remote console support (TCP port 2048) as well as name server and gateway support. It supports raw TCP mode, allowing you to bypass the P4000-T TELNET protocol when connecting

to another TCP/IP node.

The 16-port P4000-T is priced at \$3,900. The 16-port expansion unit is priced at \$2,185.

In the desktop arena, Emulex offers add-on workstation storage products for Sun and DEC environments. The subsystems feature a SCSI interface.

The WZ15 Fixed Disk Subsystem contains a 5 1/4-inch Winchester drive with a 380-MB or 760-MB capacity. Average seek time is 18 ms.

The embedded SCSI controller features the Emulex SCSI Processor (ESP) VLSI chip supporting both synchronous (up to 4.8 MB per second) and asynchronous (up to 4 MB per second) data transfer. Emulex's implementation of zone cylinder defect management eliminates missed

FOR MORE INFORMATION

Emulex Corp.
3545 Harbor Blvd.
Costa Mesa, CA 92626
(714) 662-5600
Circle 483 on reader card

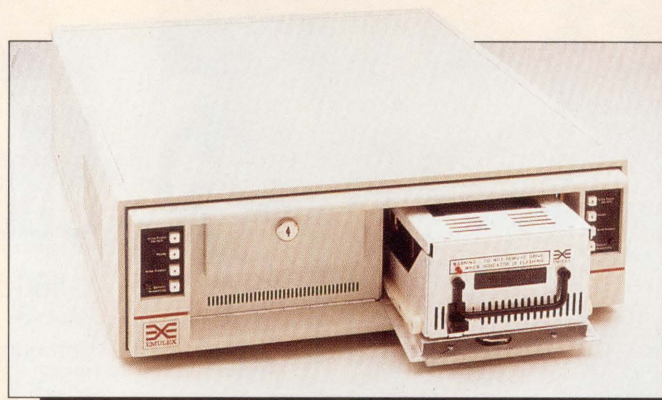
revolutions when a logical block is reassigned.

The Emulex ER2Z Removable Disk Subsystem accommodates one or two Portable Drive Modules (PDM) in a desktop cabinet. Each PDM contains a 5 1/4-inch 380-MB or 760-MB Winchester ESDI drive. Average seek time is 18 ms.

Two fully independent controllers use the ESP chip. Spin-down power interlock is included, preventing removal of a PDM until the drive is spun down. Key-lockable access doors are available as options. Each PDM port has its own power supply. The ER2Z has a switch-selectable auto disk spin-up mechanism.

The WZ15 and the ER2Z support the VAXstation 2100/3100 and MicroVAX 3100 using VMS and the DECstation 2100/3100 using ULTRIX. Adapters are available for Q-bus and UNIBUS.

The 760-MB WZ15 is priced at \$6,700. The ER2Z is priced at \$8,700 with one 760-MB PDM.

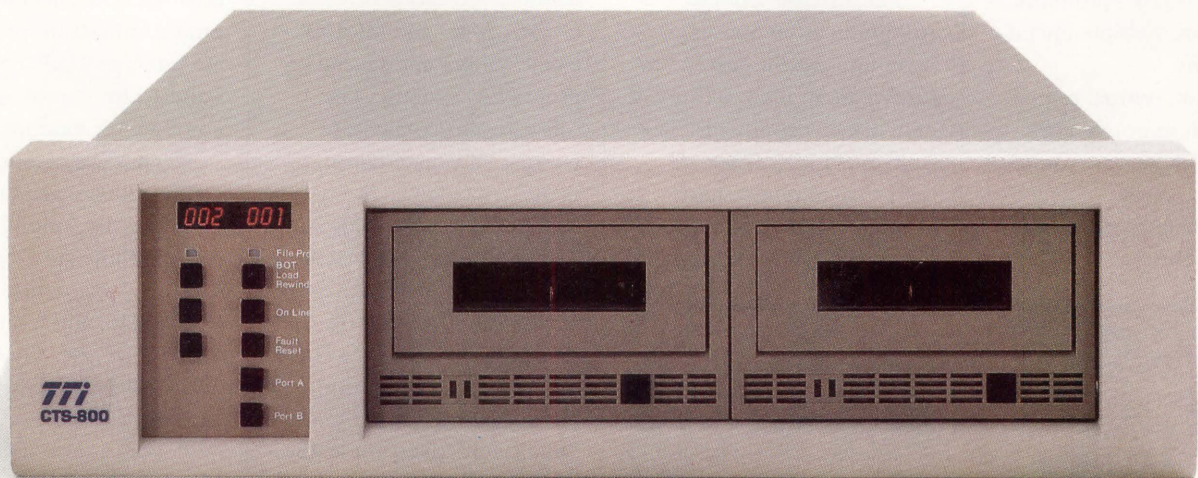


The Emulex ER2Z Removable Disk Subsystem accommodates one or two Portable Drive Modules in a desktop cabinet.

Backing up a VAXcluster can be reel slow.



Or real fast.



You decide.

You can stick with your TA-79 and back up at a snail's pace.

Or you can switch to TTI's CTS-800 Series and accelerate the entire backup process.

You can stand around all day (or night) loading reels—15 reels in all—to back up 2.2GB on your VAXcluster.

Or you can insert just one 8mm cartridge in a CTS-800 Series drive and let it back up those 2.2GB of data completely unattended.

Need really high capacity? Up to four tape drives can be connected to a single port on your HSC40/50/70 controller. So with a fully loaded HSC5X-CA card, you can back up 32GB overnight... completely unattended. That's real efficiency.

And upgrading to a high performance TTI backup subsystem is really easy. The CTS-800 is a plug and play swap with TA drives and 100% HSC compatible too.

TTI's CTS-800 Series Tape

Subsystems. It's the VAXcluster backup subsystem with un-reel performance.

For more information, call the leader in unattended backup systems, TTI, at 714-744-1030.

Or write to: Transitional Technology, Inc., 1411 N. Batavia, Suite 203, Orange, CA 92667.

TTI
TRANSITIONAL
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European Sales Office. Transitional Technology, Suite 2, Kennett House, 108/110 London Road, Headington, Oxford OX3 9AW. Phone: 0865 741345.

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CIRCLE 261 ON READER CARD

The Growing CommUnity Chest

Technology Concepts Adds Computers And Functions To Its DECnet-Compatible Network

Originally developed by several of the designers of DECnet, CommUnity is Technology Concepts' DECnet Phase IV- and Ethernet-compliant networking software. It's compatible with VMS, ULTRIX and RSX and provides DECnet/Ethernet end-node capabilities, such as:

1. Remote file access and transfer in both directions.
2. Task-to-task communications across multiple operating systems.
3. Network-virtual terminal, which remotely logs into the DECnet or CommUnity.
4. Use of DECnet's network management.

The primary difference between CommUnity and DECnet is that CommUnity supports operating systems from a variety of computer vendors. At press time, Technology Concepts revealed that Data General's UNIX-based Aviiion systems and FPS Computing high-volume computers now are licensed to run on CommUnity.

The XA2000 series of computers from Stratus Computer also is licensed to participate in CommUnity network environments. The fault-tolerant XA2000s are high-throughput systems sold to such industries as financial services, telecom-

munications, manufacturing, and retail and distribution.

Some 37 computer manufacturers and systems integrators now are officially licensed by Technology Concepts, which is backed by Bell Atlantic. A host of other systems, which need only minor operating system adjustment and extensions, are expected to be added in the coming year. The list includes producers of UNIX-, Mac- and MS-DOS-based systems and several proprietary systems. The software also connects to existing DECnet environments.

The Stratus XA2000s can link to a VAX-based DECnet or CommUnity system without the addition of hardware or software to the VAX host. In the Stratus environments, CommUnity will be sold under the name DNS/2000.

A third party, Incotel, adapted CommUnity for Stratus' VOS, the XA2000 operating system, and will distribute DNS/2000 under a separate agreement with Stratus.

William H. Thompson, Stratus senior vice president, expects the licensed product to "open doors to new business opportunities for us in companies where Stratus'

FOR MORE INFORMATION

Technology Concepts Inc.
40 Tall Pine Dr.
Sudbury, MA 01776
(508) 443-7311
Circle 510 on reader card

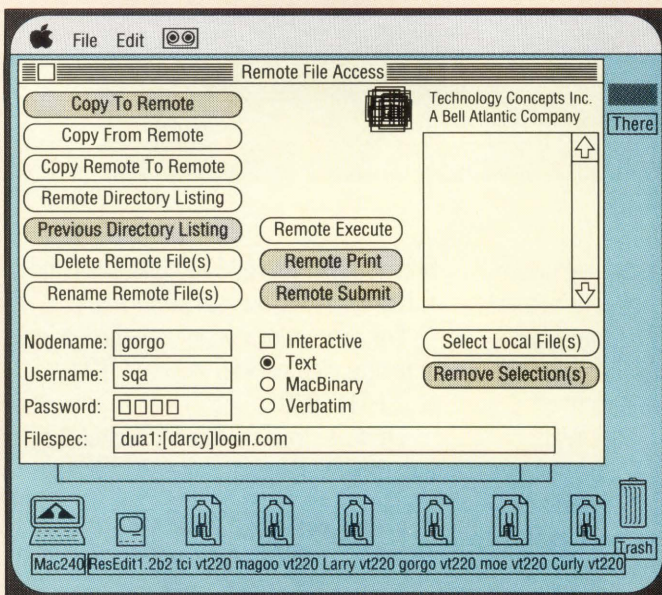
Stratus Computer Inc.
55 Fairbanks Blvd.
Marlboro, MA 01752
(508) 460-2000
Circle 509 on reader card

continuous availability and online transaction processing are musts and DECnet is a standard for computer-to-computer communication."

Technology Concepts recently added several new functions to CommUnity. Among these are CommUnity-UNIX, which features VMS MAIL, and CommUnity-Mac, which offers Mac-to-Mac networking capabilities.

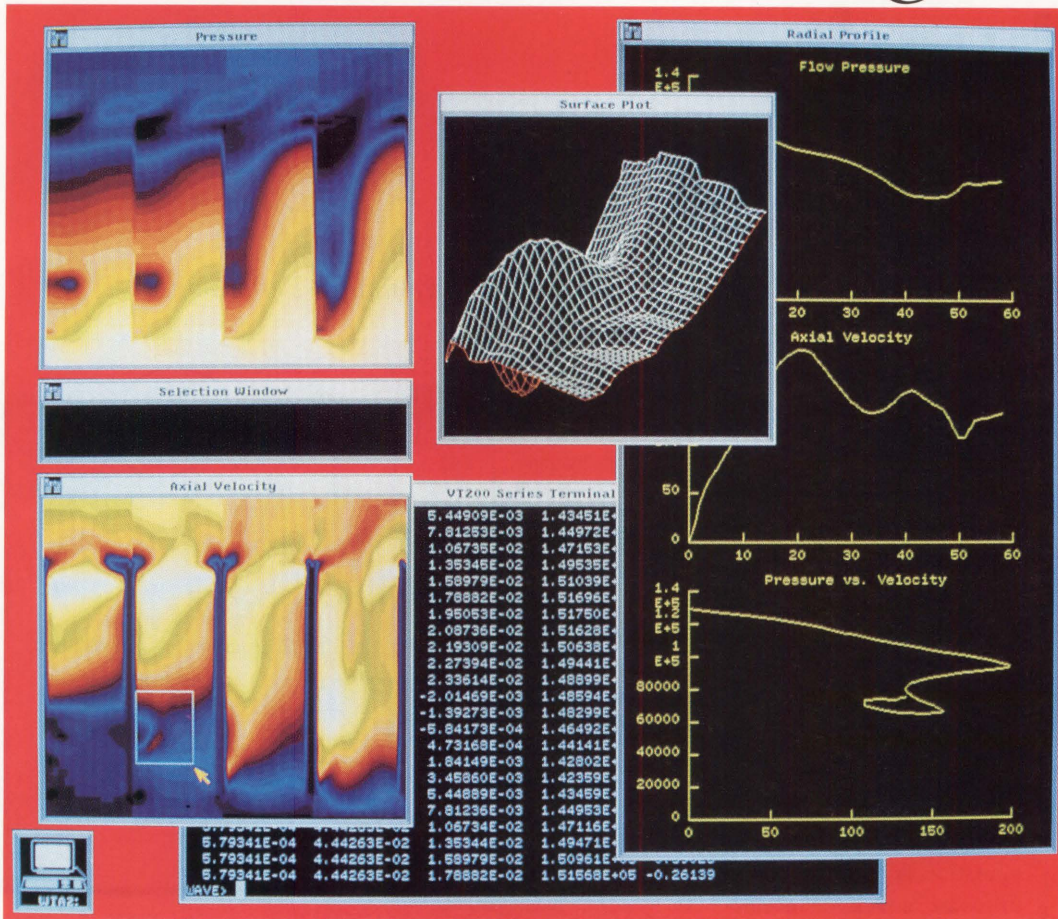
New features of CommUnity-UNIX V4.0 include bidirectional VMS Mail integration, remote printer support, SUBMIT and EXECUTE utilities, and incoming proxy support, which lets network users access applications without knowing remote passwords.

The Mac version features a capability called File Access Listener (FAL) that lets Ethernet users copy files and read directory listings to or from a remote Mac.



CommUnity-Mac features file access facilities that let Mac users log into VAX files.

Better Science Through Pictures



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

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The Network Supercomputer

VXM Technologies' PAX-1 System Uses TCP/IP To Provide Supercomputer Performance

VXM Technologies' PAX-1 software can turn a TCP/IP network of heterogeneous computers into a parallel processing network supercomputer. With PAX-1, a 25-node network consisting of 55 percent PCs and Macs, for example, can generate processing power equivalent to an IBM 3090/180 mainframe. A PAX-1 network of 25 RISC workstations can pack the punch of a Cray X-MP/14se supercomputer.

With release 2.0, PAX-1 features a hardware as well as a software component. The hardware component consists of a communications box that provides a 224-megabit-per-second bandwidth LAN. The PAX-1 LAN provides each attached computer system with data transfer rates of 32 megabits per second. These speeds permit the creation of powerful network parallel processing applications.

The PAX-1 LAN uses your computer's SCSI port. It can share the SCSI port with other attached peripheral

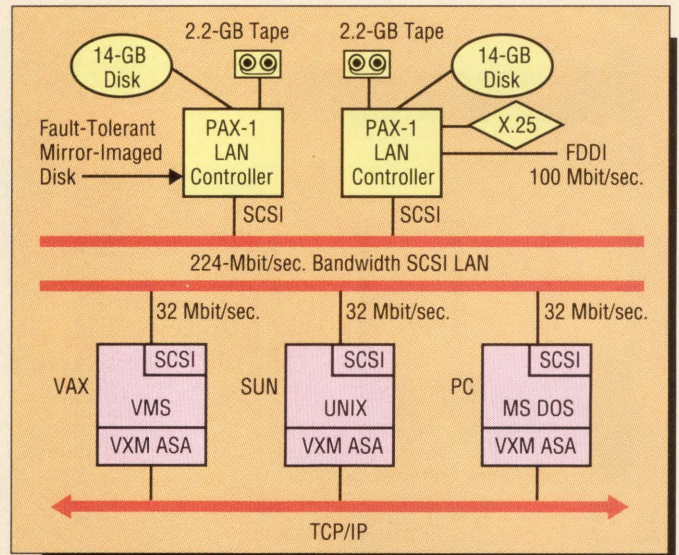
erals on the computer. In addition, attached nodes run TCP/IP over Ethernet simultaneously.

The central controller unit comes with a channel adapter for connecting seven nodes. The PAX-1 LAN controller can be expanded to handle up to 3,000 nodes. It also can be linked into WANs or fiber optic network backbones.

In addition, the PAX-1 LAN controller comes pre-configured with a network operation system (NOS) in firmware, a rack for mounting seven additional eight-inch HSMD disk drives, a controller for optical tape or optical disk, and eight serial printer ports.

The NOS allows the PAX-1 LAN to be used for print spooling, data archiving, file locking/security and high-speed file transfer. NOS features can be used for PAX-1 parallel processing applications and other applications and systems. Remote monitoring of the locking/security features is provided.

Up to 3,000 attached client nodes of mixed systems (such as Sun, DEC and MS-DOS PCs) can access multiple PAX-1 LAN servers simultaneously for either network parallel processing or data transfers among



A sample configuration of VXM Technologies' PAX-1 system.

other applications.

To help manage and control the nodes, PAX-1 includes the VXM Automated Systems Administrator (ASA). This software component can start, stop and manage systems, peripherals and applications across the PAX-1 system. It also can create, distribute and reformat files and handle security issues.

If the cable length between the PAX-1 LAN controller and the attached nodes exceeds 70 feet, a multiaccess unit (MAU) is required. Each MAU provides ports for attaching seven systems. A single twisted-pair, coax or fiber

optic cable connects the attached systems to the PAX-1 LAN controller.

Hardware options include an MAU, expansion cards, up to two 2.2-GB tape backup systems, up to 17 GB of magnetic disk, and a fault-tolerant system.

A complete system with PAX-1 SCSI LAN controller, NOS and VXM ASA costs \$24,900. Each attached node requires SCSI LAN software drivers and VXM ASA; prices range from \$1,050 for a VAXstation to \$6,950 for a VAX 8830 and higher. A 1-GB fault-tolerant disk subsystem costs \$52,900; a 1-GB nonfault-tolerant disk subsystem costs \$17,900.

FOR MORE INFORMATION

VXM Technologies
 Box 9121 Kenmore Station
 Boston, MA 02215
 (617) 730-8490
 Circle 468 on reader card

IF YOU'RE NOT BACKING UP WITH MEGATAPE, YOU'RE MISSING THE BUS.



THE ONLY VAXBI BUS BACKUP DEVICE YOU CAN BUY.

It's sort of ironic that so many big, powerful VAX systems have to get by with little, slow cartridges or reel-to-reel drives for disk backup.

Wouldn't it be great if somebody offered a high-capacity cartridge drive with a direct, high-performance attachment to the VAXBI Bus?

Now, somebody does. Presenting MegaTape's GT-88/6 8mm cartridge subsystem. A breakthrough that lets high-end VAX users enjoy the enormous capacity of 8mm without bus adapters or other bottlenecks. The result is far greater capacity and convenience than 9-track streamers—at a fraction of the cost.

Each GT-88 cartridge stores up to 2 gigabytes of data, costs around \$10, and fits easily into your shirt pocket.

Exabyte-compatible data formatting lets you interchange cartridges with virtually any other 8mm subsystem.

MegaTape's proprietary MBI-102 controller is completely TMSCP-compatible, and lets your system zip through backup chores using your standard VMS or Ultrix backup utilities.

NOW: 8MM ON VAXBI BUS. ANOTHER MEGATAPE EXCLUSIVE!

The GT-88/6 subsystem for the VAXBI Bus offers something else that's crucially important, too: support capability built on nearly a decade of advancing the state of the backup art.

So if you'd like your VAX backups to really fly, there's only one place to catch the Bus: MegaTape.

P.S. We also offer the industry's "best buy" QBUS and Unibus subsystems, too!

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MEGATAPE CORPORATION

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THE GREAT LEAP FORWARD IN BACKUP.

Return Of The Financials

Piedmont Systems Debuts Integrated System Of Accounting And Manufacturing Application Packages

The assets of White Hat Systems Inc., which produced and sold a VAX/VMS-based set of financials programs written in the late 1970s and early 1980s, have been purchased by Piedmont Systems Inc. In addition to buying the software and related rights, Piedmont, with new corporate support, will continue to support White Hat customers and expand its product line.

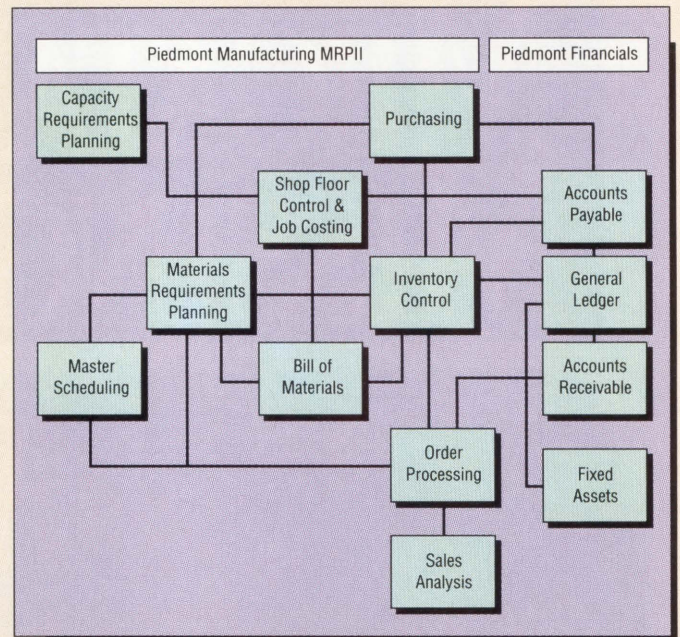
The customers, which are predominantly in manufacturing, already are benefiting from Piedmont's initial additions that were released with Piedmont Software Information Systems V5.4, which encompasses all of the Piedmont applications. These programs include the Piedmont MRPII system, which integrates manufacturing, distribution and financial management, and revised Piedmont Financial applications modules (see Figure).

These primary module sets are tied together by Piedmont software interfaces, including a report

generator with up to 999 allocations, interfaces to spreadsheets including 20/20, and other programs that link specified modules that need to share data with one another at different levels. The functions of these programs include electronic data interchange, automated data collection and windowing/inquiry/modify.

The entire program is suited for inventory control managers and contains some elements of project management systems. You can interactively define and customize fields to fit your specific product lines and planning needs. Using screen codes, you can go directly to the menu you need, rather than descending through the menu system. You also can set passwords for each module.

There are four fundamental modules in the Piedmont Financials system. General Ledger has eight basic options. It maintains the chart of accounts and shares data with the other three major modules. Accounts Receivable maintains the customer database and performs functions such as credit management. Accounts Payable logs all purchasing histories and



A sample VAX/VMS-based manufacturing installation using Piedmont Systems' manufacturing information system.

maintains the vendor database. Fixed Assets uses multiple depreciation methods and keeps up to six separate sets of books.

There are 10 interrelated modules under the Piedmont MRPII umbrella. In approximate hierarchical order, these are Order Processing, Materials Requirements Planning, Bill of Materials, Inventory, Order Entry and Sales Analysis, Purchasing, Resource Requirements Planning, Capacity Requirements Planning, Master Scheduling and Shop Floor Control.

In addition to new software programs, the company plans to provide a system tune-up program; complete applications planning and support; software installation and testing; user training and documentation; customization and enhancement services; and design of interfaces to external systems.

The programs are written in BASIC, and DATATRIEVE can be used as a report generator. Prices for the Piedmont MRPII start at \$16,000 for low-end VAXs. Consulting services are available at an additional cost.

FOR MORE INFORMATION

Piedmont Systems Inc.
P.O. Box 606
Middleton, MA 01949
(508) 774-4223
Circle 495 on reader card

INTRODUCING THE TERMINAL SERVER YOU THOUGHT DEC WAS GOING TO ANNOUNCE.

16-Port DECserver Due This Summer; Uses LAT, TCP/IP

MAYNARD, Mass. — DEC is slated to announce this summer a 16-port terminal server that supports both LAT and TCP/IP, according to sources.
The introduction of the DECserver 300

The MAXserver 1000 Series.

You thought DEC™ was going to deliver both LAT™ and TCP/IP in the same 16-port box. And you thought it was going to be priced very affordably.

Well, DEC didn't do it. But Xyplex®, the leader in multi-protocol communication servers, did. Introducing the MAXserver™ 1000 Series. It's got every feature you were hoping for. Including LAT and

TCP/IP, and a great price. Plus it's got a lot of other features DEC never even dared to offer:

- An incredibly compact package that's 1/3 the size of the DECserver™ 300.
- A network connection that can tell whether it's thickwire or ThinWire™ and adjust automatically.
- A self-loading version that's host-independent so your VAX™ works less.
- All with Xyplex's 3-year warranty, the best in the industry.

And in case you want just LAT after all, we've still got DEC beat. The MAXserver 1000 Series includes a LAT-only version. For hundreds of dollars less than DEC. And with the ability to grow into TCP/IP later.

So if you want the industry's best 16-port terminal server, forget DEC.

The real news is at Xyplex. To learn more, call our toll-free number today. Or write Xyplex, Inc., 330 Codman Hill Road, Boxborough, MA 01719.

1-800-338-5316



Xyplex

Broader Horizons For Vista

Datability Software Systems' Network/Terminal Server Adds TCP/LAT And X.25 Services

Many sites use Datability Software Systems' Vista VCP-1000 box strictly as a terminal server, but it should be thought of as a general communications platform. Each of Vista's Ethernet connectivity functions is performed by intelligent Network Interface Cards (NIC). Each card is powered by a 10-MHz Intel 80186 processor and an 82586 Ethernet coprocessor.

Datability recently added the following single-board options to the Vista, increasing the types of services users can access:

1. A dual LAT and TCP/IP NIC connects Vista users to VAX/VMS networks running the LAT protocol or UNIX and ULTRIX hosts (e.g., Sun, Hewlett-Packard or DEC) via the TCP/IP protocol. Datability has offered LAT compatibility for some time and will probably continue to package its proprietary system with Vista. Like the LAT protocol, the TCP protocol was rewritten from scratch.

In a typical application, a PC/AT user plugged into a DECserver 100 or other terminal server via LAT can create a path to Sun servers or workstations running TCP via the Protocol Gateway Card described below. He simply LAT-connects to a service within the Vista server.

The card has connections

for standard Ethernet, Thin-Wire and Synoptics unshielded twisted-pair (RJ45) cable connections. It has 512 KB of RAM, 128 KB of

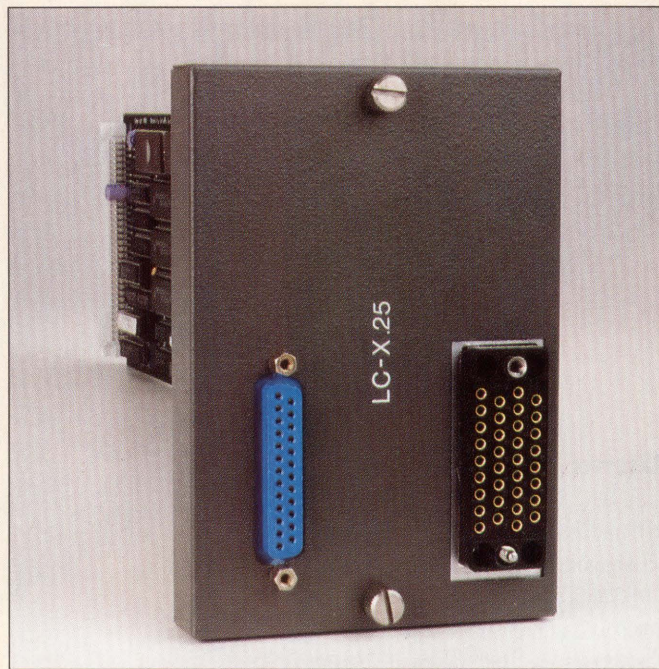
Vista users into WANs. You can type VISTA> C X25PAD to connect with the PAD program and follow other VAXlike commands to con-

capabilities to the UNIX machines.

2. A PC-based software package called RP Server that lets PC printers be configured as VMS system printers. Over LAT, a VAX print queue can print on a PC-based printer.
3. A PC package called RP Spooler that lets PC users on a LAN request a network printer. If the printer is busy, the request spools locally on the PC until it's queued. This product is used in conjunction with RP Server to establish a bidirectional set of print capabilities. Both programs support OS/2 and DOS 2.0 and later.

4. MacRAF, a Macintosh- and VAX-based version of Datability's LAT-compatible Remote Access Facility that lets Mac users share VAX files over Ethernet and perform data processing services on the VAX. These include file services, print services and automatic log in.

Vista's terminal services include 8-, 16- and 32-port line cards. Pricing for the VCP chassis starts at \$1,000. A chassis configured with NIC and various line cards costs up to \$3,199.



Datability's X.25 Line Card connects Vista users into WANs.

nonvolatile static RAM and 256 KB of ROM.

2. A Protocol Gateway Card complements the NICs by providing 16 gateways that let you communicate in two directions through the Vista. For example, VT terminals can communicate with Sun workstations and vice versa. This card links the LAT and TCP/IP environments for the LAT and TCP/IP card.
3. An X.25 Line Card with X.25-CCITT standard Packet Assembler/Disassembler (PAD) functionality connects

tend with the X.25 network. The card has 1/2 MB of DRAM.

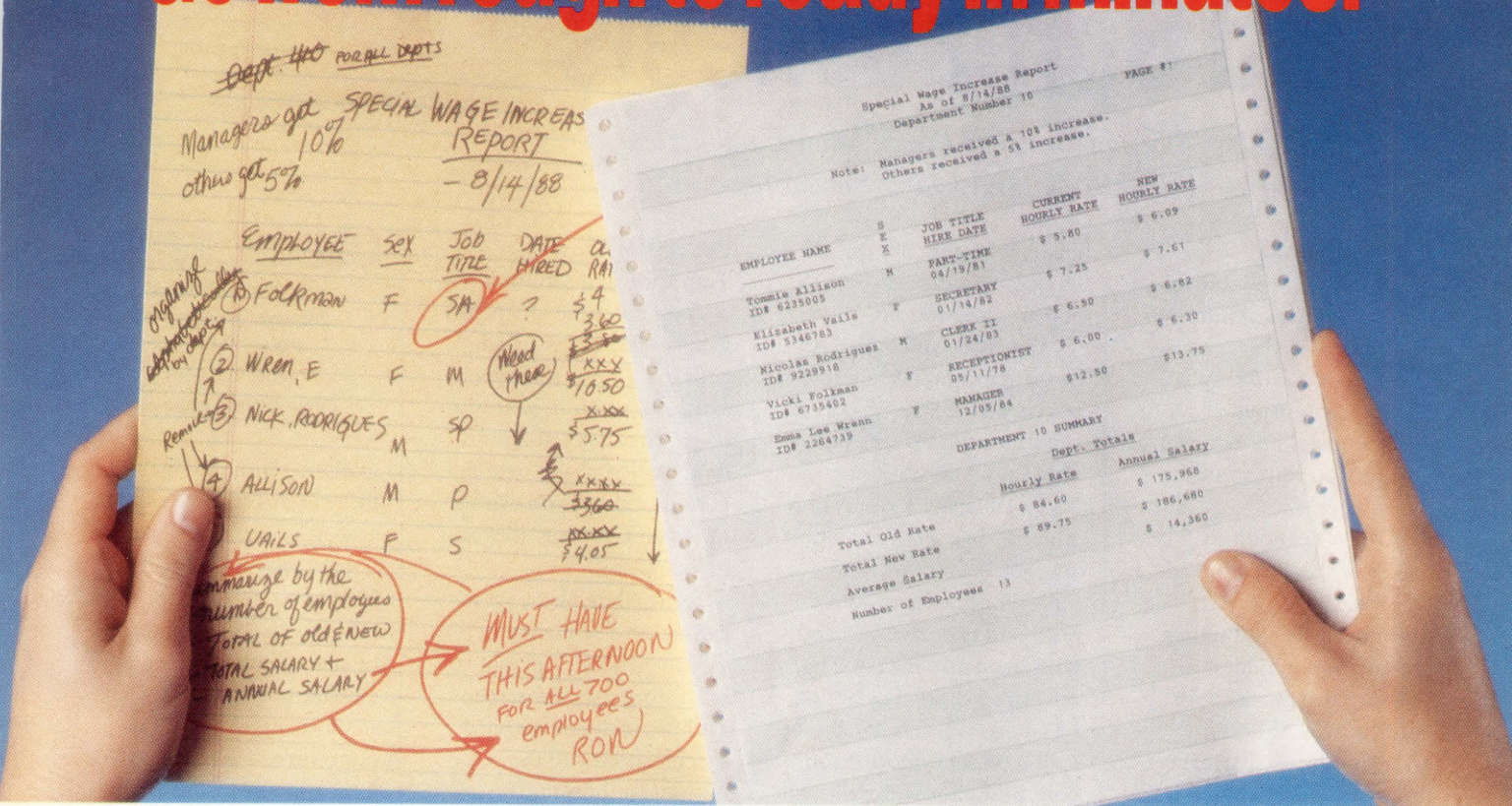
Datability also has added to the Vista environment a variety of software services that expand its connectivity base. These include:

1. A Host-LAT interface that's installed on Sun UNIX machines and that soon will run on other UNIX CPUs. The interface lets Sun machines host LAT terminal servers, delivering all LAT

FOR MORE INFORMATION

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 322 Eighth Ave.
 New York, NY 10001
 (212) 807-7800
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Go from rough to ready in minutes.



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IQ—Not Just “Another Report Writer”

IQ is a sophisticated decision support tool—built from the ground up to be easy enough for End Users and powerful enough for DP professionals.

Everyone Can Become More Productive

When you put IQ to work on your VAX applications—everyone becomes more productive.

End users can create their own custom reports and graphs by easily retrieving, sorting, calculating and formatting information. Technical managers and developers can create production reports in a fraction of the time normally required. They spend less time supporting users or creating ad hoc reports, and more time on urgent development issues.

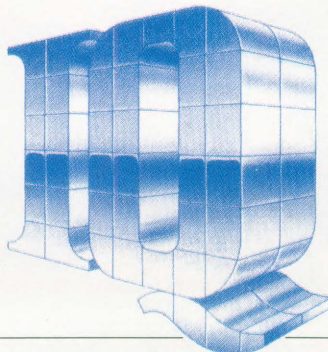
Ease of Use—A lot of Software Companies Talk About It...

IQ Defines It With:

- A windows-like menu style
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Don't rewrite a line of code!

IQ integrates with your existing applications providing a consistent user interface for a wide variety of programs for many VAX databases and of course RMS files.



Optimized For VMS

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- VMS sorting facility
- DSRI for efficient Rdb access

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IQ Puts You In Smart Company

IQ is the number one choice of over 400 software companies that remarket it under their own trade names. Every day thousands of VAX users put IQ to work—turning data into information.

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CIRCLE 238 ON READER CARD

Vivid Spreadsheets

Access Technology's Vivid Business Presentation Graphics Software Works With 20/20 And Other Spreadsheets

Even a casual user of spreadsheets knows how valuable it is to see numerical information represented graphically. Charts, tables and graphs presented on paper, slides or transparencies put confusing information into an understandable form.

Access Technology, maker of the 20/20 spreadsheet for the VAX, has introduced Vivid, business presentation graphics software that works with 20/20 as well as Lotus 1-2-3 and other spreadsheet programs. "We wanted it to be easy for first-time users to create and enhance graphs," says Brad Borkin, project manager. "Users of VAXs will feel comfortable with Vivid's keyboard layout, which borrows heavily from that of ALL-IN-1 and 20/20."

The software, which can be purchased standalone or integrated with 20/20 V2.3, can be installed as a menu item under ALL-IN-1. It lets you create more than 30 chart types, including such standards as pie and column and such esoteric styles as data fit and stacked area.

Vivid lets you control colors, backgrounds, text styles, fill patterns, logarithmic axes, axis scales and labels, logos, and so on. It includes 16 text options, simple versions of typeset styles. You can annotate

charts with text, logos, circles, drawings, arrows, clip art and captions.

You also can control input and output. When integrated with 20/20, Vivid can import data from Ingres, Oracle and Sybase using the 20/20 Database Connection. The package lets you import any ASCII data file using live links. For graphics, it imports and exports CGM and GKS standard formats. The software exports PostScript, HPGL, ReGIS and ASCII files.

To present information, you must choose how it will appear. You can place multiple charts on a single page, for instance, but do you want the charts in hardcopy, transparency or 35mm slide form? Vivid allows all three, supporting slide output through the Rascol 3 (TK3) Film Recorder.

Vivid's top menu lets you select from Chart, Help,

Quit, Slide Show, Templates and Utilities.

You compose charts in Chart, selecting style, fill patterns, colors, text type, axes, and so on. If you want to produce a set of consistently styled charts over a period of time, you can set up a standard chart format in Templates.

With Slide Show, you can set up a sequence of previously produced graphs to tell a story on your screen. Utilities includes terminal specifications and the setup options for output devices. Help is context-sensitive and occurs throughout the program; a few lines of assistance appear on every screen to help with data and chart manipulation.

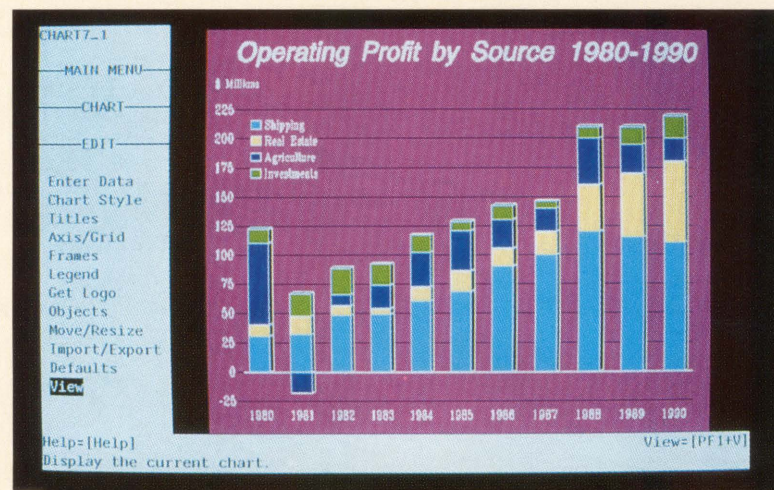
Vivid runs on VMS V4.7 or later. Plans include ports to UNIX and DOS, as well as DECwindows support. The package supports numerous

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graphics terminals, including the VT125/240/241/330/340 as well as terminals from GraphOn and Tektronix. You also can use it on VT100/220/320 terminals or with graphics terminal emulators on a PC. It supports up to 16 colors customized from more than 3 million choices. A hue, lightness and saturation (HLS) system lets you choose those characteristics for each color and name the color created.

During an introductory promotion until January 12, Vivid will cost \$800 for a VAXstation, from \$2,400 to \$7,600 for a MicroVAX, and up to \$48,000 for other configurations.



Vivid allows the design of several chart styles and lets you select and label a variety of frames, grids, colors and fonts.

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- **Portable across video adapters!** ZSTEM 240 supports all standard video adapters: VGA, EGA, CGA, MCGA, AT&T, Hercules and many extended adapters. No matter what adapter/monitor combination you use, ZSTEM 240 displays double-high/double-wide characters, 132 columns,

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*American Digital Systems' MasterDisk/Data-Library
Provides A Centralized Repository For Large Quantities Of Data*

Without a standardized method for storing and managing archive files, the costs of storing, distributing and managing large quantities of archive data can strain your company's resources.

Enter the MasterDisk/Data-Library from American Digital Systems Inc. This complete file storage management system for data acquisition and archiving serves as a centralized file repository and catalog system for large quantities of data. It can attach directly to multiple systems through a high-performance data network (see Figure).

The objective is to provide a centralized storage system that minimizes data duplication, allows companywide online access to files, provides reliable backup of local user files and reduces the operational resources needed to support archival operations.

The MasterDisk/Data-Library can connect to a DEC-based Ethernet serving all network members or to a Hyperchannel network in a multivendor host environment providing accessibility from various hosts and operating systems.

The product is an integrated hardware and software system designed with unlimited capacity for managing large quantities of data. It consists of three integrated subsystems:

1. MasterDisk/Data-Library Hardware.
2. MasterDisk/Data-Library Host-to-Host Communication Software.
3. MasterDisk/Data-Library File Transfer Applications Software.

The hardware consists of a dedicated high-performance DEC computer with high-capacity storage devices. Typical storage configurations include a number of disks and high-density cartridge tapes. Additional storage media such as optical disk, DAT and helical scan tape can be supported. Files automatically are buffered on disk to optimize performance.

Communication software is installed on each host attached to the MasterDisk/Data-Library. It provides the user interface and allows two application programs in

separate hosts to communicate without regard to network configuration. It facilitates file transfer, job transfer and transaction processing in a single-vendor or multivendor environment at or near native channel speeds.

The file transfer application software allows mainframes to transfer large amounts of data among other processors supporting host-to-host communication software on the network. These file transfers can take place between multivendor mainframes and operating systems at the processors' native channel speeds.

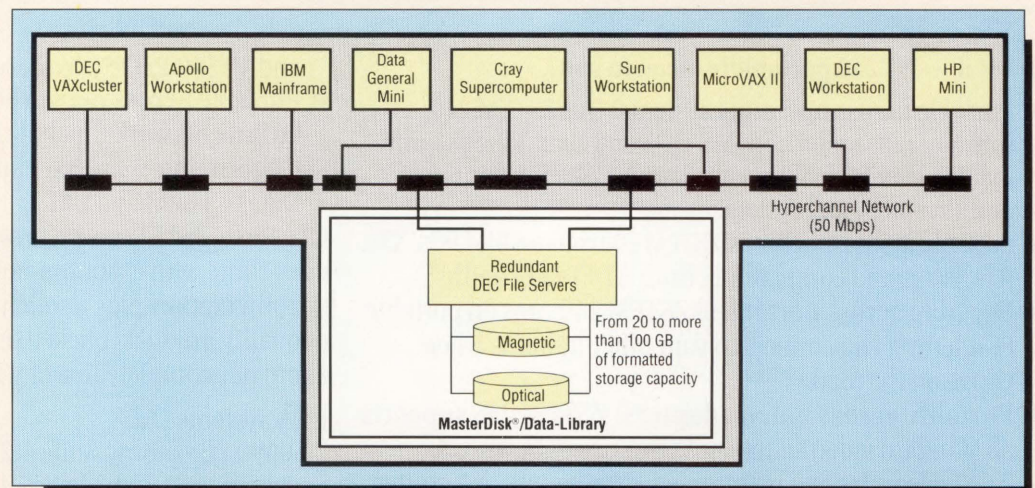
MasterDisk/Data-Library provides unlimited file storage capabilities accessible to all users and computers on the network. You can store files, retrieve, backup,

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archive, inspect or modify directory information directly from your host. Directory information and files can be accessed through system calls and program interfaces in batch and interactive modes. File names are stored in a directory structure that permits metacharacters or wildcarding for manipulation of file groups.

Prices start at \$245,000 for a single-processor system with 25 GB of formatted user data, including processor, communication software, disk/processor cabinets, cables, documentation and diagnostics.



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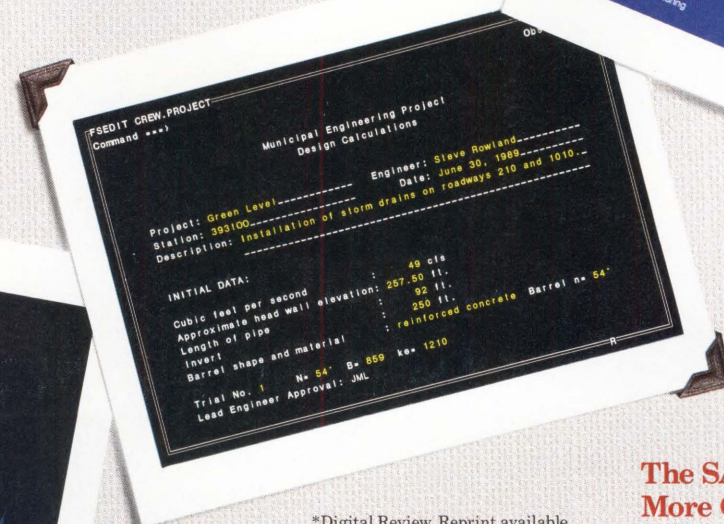
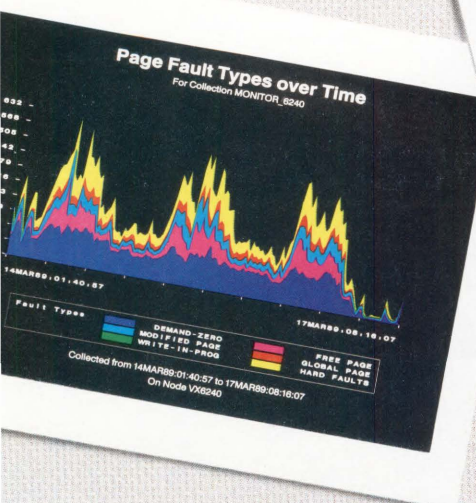
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**TARGET
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NOMINEE

A satellite image of a hurricane, identified as Hurricane Opal, with a 2-kilometer resolution overlay. The hurricane's eye is visible in the center. A red line indicates the coastline of the United States, with Charleston, SC marked. The text in the top right corner provides the satellite name (NOAA-11 VI), time (2:47 PM, EST), date (SEPT. 21), and resolution (2-KILOMETER RESOLUTION).

HURRICANE
NOAA-11 VI
2:47 PM, EST
SEPT. 21,
2-KILOMETER RESOLUTION

CHARLESTON, SC

**Dispelling
Disaster**



How well you plan for a disaster could determine the survival of your company.

COPING WITH THE EFFECT of disasters on a company's data processing operations has long been a concern of mainframe users. Managers of these systems traditionally regard DP operations, data and the associated hardware and software as assets that must be protected. Mainframe managers who have critical applications requirements and who have weathered a disaster know how important an in-place contingency recovery plan is. They've witnessed first-hand the confusion, panic, damage to business and general upheaval that follows a disaster.

Today, an increasing number of critical applications run on minicomputers. As a company's dependence on the minicomputer system grows, so does its reliance that the system always will be available. Not only are minis commonly used to run everyday business functions, but many are engaged in vital income-generating activities. The people responsible for these systems must follow the lead of their mainframe counterparts and provide contingency plans to protect their company's vital DP operations.

The type of disaster recovery program and technology required by minicomputer users is directly related to the kind and amount of exposure the company could suffer if a DP disaster occurred. Ask yourself, How long can I be without my DP services before extensive damage is done to my company? The answer determines if a disaster recovery plan is needed and, if so, what type it should be. That is, how critical is it to keep your DP operations up and running without interruption?

Defining Disaster

Disasters needn't be spectacular, headline-grabbing calamities such as tornados, explosions, the recent San Francisco earthquake or Hurricane Hugo. Most DP disasters aren't so dramatic. The most common DP disasters result from combinations of accidents and negligence, such as a coffee spill



BYRON LEVINE

on a vital diskette, which leads to the discovery that backup copies of data were never made. Other DP disasters occur without damage to the equipment or data files. Instead, something happens that precludes access to the data center.

For example, a law firm based in New York — a DEC client — was prevented from using its DP center when a building inspector ordered the air conditioning system shut down for several days while wiring was changed to conform with local codes. The law firm declared a disaster under the terms of its Digital contract. It moved key personnel and data files/software to a hot site, where it operated for 2 1/2 days. Because the company had a one-day warning of the impending shutdown, its DP services weren't interrupted, and business continued to operate smoothly.

Another Digital customer, a financial services company based in San Francisco, was locked out of its DP center indefinitely by the EPA when asbestos was discovered in the building. The facility was sealed and access denied for several

months. The company found an alternative site, activated its disaster recovery agreement and lost only two business days before full DP operations were restored.

A Comdisco Disaster Recovery Services client in Chicago was denied access to its computer center because of a bomb threat. The building was evacuated and alternative processing facilities had to be found.

In these examples, there was no damage to the computer systems — the hardware, software and data files were intact. However, access to the centers was impeded by external events that resulted in their loss of use.

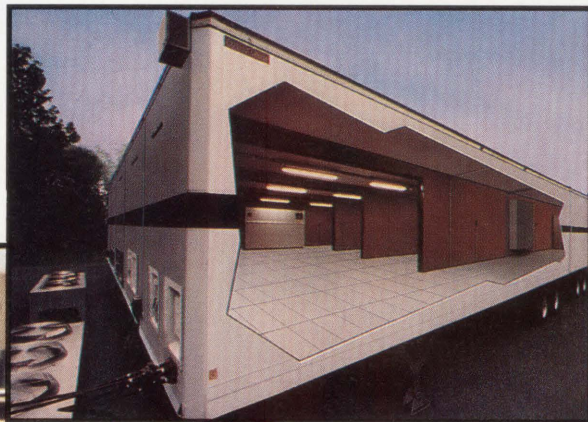
Of 18 recent disasters declared by Comdisco customers, only two involved loss of hardware/software. "For the others, their DP centers were simply made unavailable due to events which had nothing to do with computer failures. Having replacement systems available would not have solved the problem,"

says Chuck Gladfelter, director of marketing at Comdisco.

What's a disaster? For most companies, a DP disaster occurs any time DP services are unavailable. This could be caused by a system fault (hardware or software failure, unusable data files), loss of the center's facilities (because of fire, flood, and so on) or lack of access to the processing system (caused either by physical barriers to the facility or a simple telecommunications failure). Any condition that interrupts DP operations is a disaster from which you must recover.

What's At Stake

Some institutions and businesses, such as those in the financial sector, are required by law to have disaster recovery plans in place and to have them tested periodically. They implement disaster recovery

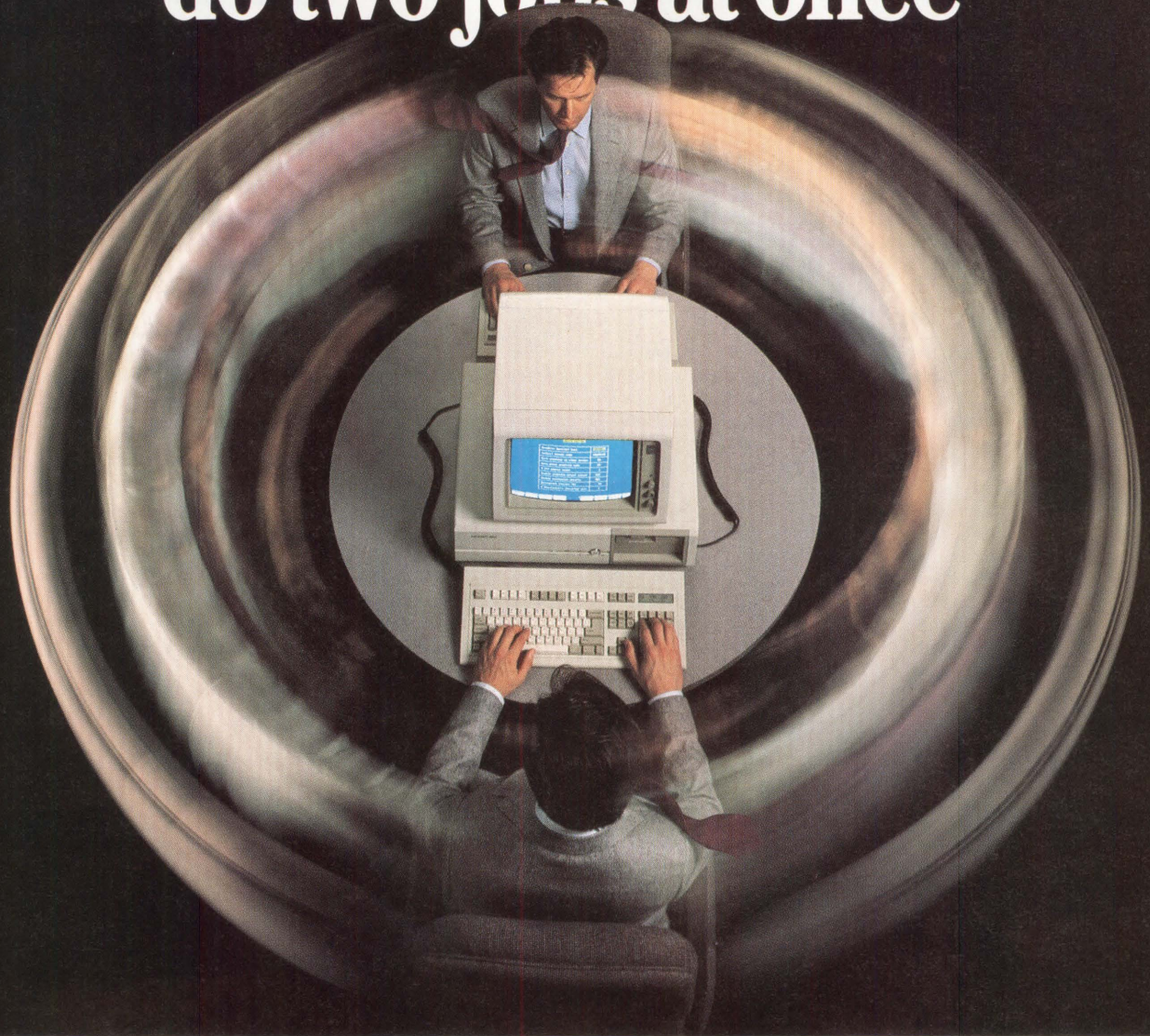


This mobile disaster recovery center, above, provides a 2,000-square-foot computer-ready environment, including a raised floor and a fire-protection system. Hot sites, such as that pictured at left, are complete data centers ready to take over your operation in the event of a computer disaster. Here, a clustered 8700/8810 resides behind a network control center that can handle communication needs.

Courtesy Comdisco Disaster Recovery Services Inc.

Courtesy Provident Recovery Systems.

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You can do the work of two when you use Reflection terminal emulation software.

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plans to comply with the law.

Others find it harder to justify such a plan. The reason for this resistance is twofold.

1. Cost — Disaster recovery is a bottom-line expense that does nothing to increase income or productivity. It's easy

to say, "What are my chances of having a disaster this year? We'll implement it next year." True, chances of a flood or an earthquake may be slim. But what are the chances of a disk crash, a backup failure or an upgrade that wreaks havoc with your system? Unfortunately, these disas-

ters aren't so unusual.

2. Workload — Resistance to a disaster recovery plan sometimes comes from the DP department, which should know its value. The extra workload associated with a viable plan (e.g., providing for current backups, storing them off-site,

Crises On The Coasts



Shortly before midnight on September 21, Hurricane Hugo hit the South Carolina coastal city of Charleston with such force that it has been called the worst natural disaster to hit that coastline in more than 10 years. During the next few hours, Hugo traveled up the coast, turning everything in its path into a replica of demolished Charleston.

This could have brought businesses to a halt for weeks if computer systems in the area were put out of commission. We asked several DEC facilities in the hardest hit parts of the city for their stories. We found that because of the advance notice, as well as the high percentage of underground (and thus naturally protected) phone lines and the quick response of the DEC staff, most of their systems were unscathed.

When word of the pending hurricane came out, DEC's field managers arranged for alternative communications, spare parts, equipment and personnel to be moved into the storm area from nearby locations. One credit union asked for assistance in protecting its site. With DEC's help, everything was moved off the floor, covered and disconnected, and the building's power was shut down. Although the building sustained major storm damage, the computer equipment remained protected and came up without problems on restart.

In Sumter, South Carolina, phone communications were knocked out. DEC sent engineers from its nearby Columbia office to canvass DEC sites door-to-door to assess damage and provide aid. One tech school was impressed, especially when technicians arrived without being called. The school credits DEC's immediate action in drying the equipment with its 100 percent system restart.

Most of those companies hardest hit, were in communities of small businesses that depend on one or two low-end systems for their operations. They generally don't have disaster recovery plans or the technical manpower to deal with major disruptions. Typical of these is a small florist in the Charleston area whose DEC PC was submerged by flooding. DEC service took the PC apart, dried it, and repackaged and reinstalled it.

The majority of DEC systems in the region escaped devastation through precautions taken when users and DEC staff worked side by side. Also, a check of the major disaster recovery companies operating in the affected area showed no known DEC disasters.

Hurricane Hugo fulfilled the gloomiest predictions. But many businesses, as well as the people and communities that depend on them, are well on their way to recovery. One resident told us, "Charleston will be back, and it won't take as long as you think."

Earthquake Emergency

As field service operations barely recovered from the emergency status alert caused by Hurricane Hugo on the Southeast coast, a major earthquake rumbled through San Francisco and the surrounding Bay Area. Digital again was pressed into an emergency service situation to meet its own and its customers' needs. Unlike hurricanes, earthquakes give no warning and therefore don't allow time to prepare a site, protect equipment or implement an orderly data processing shutdown. Earthquakes are "come as you are" disasters, and the damage to equipment and sites can be expected to exceed that inflicted by other forces of nature.

DEC withstood a hit at its major distribution facility in San Jose, California, and responded by immediately shipping more than \$6.5

million in inventory to a public warehouse in the area to be used as needed by local FEs and customers. The earthquake occurred at 5:04 p.m. PST, on Tuesday, October 17; DEC's supplies were received early Thursday.

More than 50 additional FEs were sent by Digital to the devastated area to aid the local field force, with 300 more placed on standby. Customer response activities were diverted from Santa Clara, California, to Dallas to free local communications lines and relieve local field personnel of administrative duties. An emergency command center was established at the Colorado Springs, Colorado, Customer Support Center to prioritize and respond to customer requests.

Although many alerts were activated under disaster recovery plans, no disasters were declared as we went to press. At that time, DEC had the following three alerts pending:

1. A legal firm, which had its building condemned, put DEC on standby for recovery activities. Digital employees worked throughout the night to reconfigure a system and prepare a site in New Jersey for emergency use. Although its Northern California building was damaged, the company was allowed to re-enter it the next day; the equipment was restarted and booted up without problems.

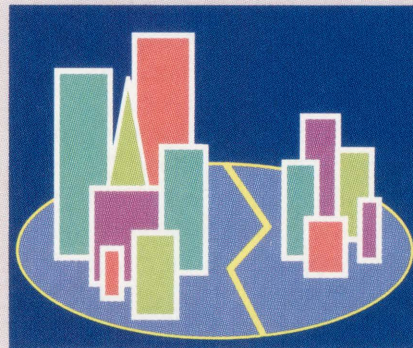
2. A high-tech company had a section of floor give out, causing its MicroVAX to fall through. The computer was repositioned, restarted and it came up.

3. A local office of an insurance company was put out of commission when it couldn't enter its facility because of the loss of its terminals. DEC prepared 80 terminals for immediate shipment the next day, but the equipment wasn't needed, as the company's terminals became accessible and were found undamaged.

On Tuesday and Wednesday many businesses were closed so that inspectors could survey the damage to buildings. In most cases the data processing equipment came back up. However, Digital expects to replace a lot of hardware through claims under its Recover All Insurance program.

DEC sites, under contract to Comdisco Disaster Recovery Services, declared two alerts — but no disasters by press time. One client had its computer system thrown over during the earthquake. The DEC field service uprighted the equipment and waited for power to be restored by the utility. Everything worked when the system was rebooted. The alert remained in effect for a few days, because communications lines in the San Francisco area were unstable, keeping Comdisco facilities on standby.

The second alert was also because of phone-line problems. When the local utility company restored power, the system hardware came up, but the customer was forced to limp along because of communications problems. This alert lasted until phone lines began working normally.



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Digital Disaster Plans

Digital offers four programs to assist its customers with disaster planning and recovery.

Recover-All Service — A supplement to your Digital on-site service agreement, this plan provides for the repair or replacement of your computer equipment and specified software, along with the cost of a temporary operating location and restarting your operation. This is an insurance policy that includes service as well as asset recovery. There's no deductible and no depreciation expense. Recover-All includes all Digital and non-Digital equipment covered under your field service agreement. Turnaround time averages two days for small disasters and fewer than five days for major system replacements. This added protection costs about 9 percent of the basic monthly charge of your service agreement.

Restart Service — This provides a fully equipped hot site and support for those who can't afford any interruption in their data processing operations. Standby equipment for most VAX and PDP-11 configurations and staff are available to aid in the restoration of your DP function within hours of a disaster. Customizing for special configurations and remote access are available at Digital's hot sites in Chicago and Parsippany, New Jersey. Restart Service costs range from less than \$1,000 to \$20,000 on a fixed monthly basis.

Recovery Planning Assistance Services — This standard package details guidelines and methodology for creating a disaster recovery contingency plan. It provides a template for disaster planning and a checklist for do-it-yourself plans.

Contingency Planning and Customized Recovery Services — This plan overlaps with the Recovery Planning Assistance Services plan but adds the services of a Digital consultant with recovery planning experience to assist you in contingency planning. Instead of doing it yourself, a Digital consultant will use the information in the plan to implement the program for you.

periodic testing and updating of the recovery plan) makes it less than appealing to an already overworked DP manager and staff.

On the other side of the cost and workload issues is the question, Can I afford *not* to have a recovery plan in place? This can be answered with other questions: What's the exposure of the company? How much will downtime cost? Can the company survive an extended DP interruption?

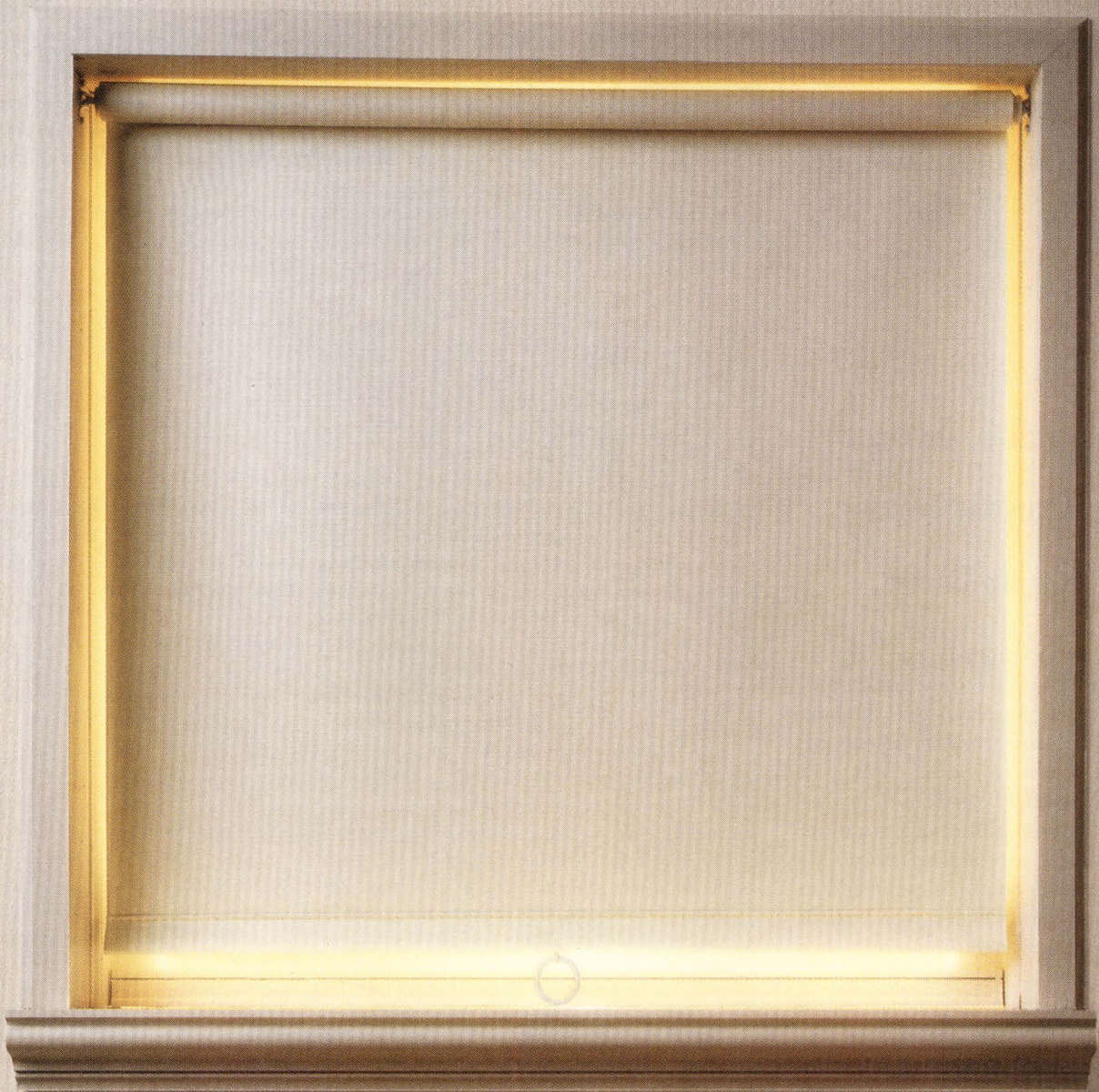
According to statistics quoted by National Computer Systems, "The average maximum downtime for all types of industry before major loss of business occurs is 4.8 days." If your company's financial exposure and survival don't warrant a disaster recovery plan, what about the possibility of being personally liable for information processing damages? Federal law holds executives liable for not protecting their data and computer systems in financial fields. And lawsuits have been brought in other industries by disgruntled stockholders and creditors against executives responsible for a company's well-being under the Prudent Man Rule.

Executives have been charged with negligence and not exercising ordinary and prudent precautions in safeguarding valuable assets, e.g., DP operations.

An issue often overlooked by those new to critical applications processing is the ability of your key suppliers to recover from a DP disaster, states Robyn McHugh, Digital's recovery services business manager. The interruption of the flow of essential goods and services anywhere in your pipeline can be just as devastating to your company as an internal disaster. You're well-advised to question your major suppliers about their recovery capability.

Technology And Strategy

A range of plans is available from a variety of sources to protect Digital users from unexpected DP interruptions. The type of plan needed is directly related to how long the company can cope without its automation processes. If they're critical to the company, some level of disaster recovery is needed. If, however, the company can replace its DP services with a manual system until the comput-



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ers are back online, then a disaster recovery plan probably isn't required for the DP department.

A strategy for formulating a recovery plan follows:

1. Address the entire business environment and not just the DP center. Computer operations in most companies are weaved into the business's main-stream and aren't a separate entity.

AFTER THE PLAN is in place, update and test it on a regular basis.

2. Ensure that a corporatwide commitment is made to the recovery plan. Resources such as personnel and funding, as well as top management involvement, are vital to a recovery plan.

3. Identify individual personnel and define their responsibilities and authority during a disaster recovery operation. Alternative lines of communication and an emergency chain of command (with built-in contingencies) should be spelled out on a companywide basis.

4. Define which operations are critical and must be protected immediately. Prioritize the remaining operations in terms of which can be lost for a short time and which can be lost for an extended time.

5. After the plan is in place, update and test it on a regular basis. Your business isn't static, and the disaster recovery plan it depends on shouldn't be, either.

Plan Pickings

The main types of disaster recovery programs available include hot sites, cold sites, equipment replacement, data recovery and data protection.

Hot sites are designed for those who can't afford to be without their DP operations at any time. These complete data centers are equipped with the systems and communications lines needed to take

The UPS Of Power Protection

A large number of service calls are related to power problems. Power problems wreak havoc during data processing operations by producing intermittent system errors, keyboard lockups, interference with communications, and simply by causing strange behavior in your computer system.

Power disturbances are also a leading cause of DP disasters. When these power interruptions are long or prevalent, they're no longer annoyances. They're operational calamities.

The possibility of a power-related disaster is greatly reduced by incorporating an uninterruptible power supply (UPS) into your configuration. A UPS isolates the load (your computer system) from the source power (the utility company) and acts as a middleman in supplying clean, reliable and continuous input power. Computers operate over a very narrow input voltage range. Thus, fluctuations in this range for only a few milliseconds can cause major problems or damage to the system. Power line protection is vital to the health of your system.

Although various types of UPSs are available, only true online devices with sine wave output can fully protect the system. Online UPSs supply power to the load 100 percent of the time. They continuously convert utility input power to DC and back to AC to power the system. They act as generators, always providing power, and don't have to be switched on and off, thus saving precious milliseconds during power failures. And that power is always fully conditioned and regulated.

When purchasing a UPS, your main concerns should be:

1. How well the unit emulates ideal utility line power.
2. Is the unit's output a pure sinusoidal waveform? The output amplitude and frequency must match the user specifications precisely.

Other features to look for:

1. Audible and visual alarms for notification of power problems.
2. Adjustment-free operation (no maintenance required).
3. Long-life maintenance-free battery with reserve time under a full load.
4. A UPS that's microcomputer-based.
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You can calculate the rating of the UPS device needed by listing all equipment to be protected by the UPS, listing the wattage rating for each device and calculating the total watts required. You then can select a UPS with a wattage rating equal to or greater than the total requirement.

Some UPS devices work in conjunction with probes for environmental monitoring of the computer center. These units provide power conditioning and distribution and sensing of site hazards such as fire, water and humidity. An orderly system shutdown is activated whenever a previously set threshold is exceeded.

Editor's note: For a listing of power protection devices, including vendors and equipment specifications, consult the DEC PROFESSIONAL Hardware Buyers Guide. For information about the Guide, contact Lea Smith at (215) 957-1500.

over immediately as the client's processing site. This data center, along with the customer's data, programs and staff, becomes a mirror image of the client's regular DP site when a disaster is declared.

Cold sites, sometimes called shells, are ready-to-use computer centers without the computer systems in place. They

have power, communications lines and an operational environment ready on a standby basis for a client that needs to move its computer systems and staff to an alternative site. This setup is for those who can afford a few days of downtime during a DP interruption.

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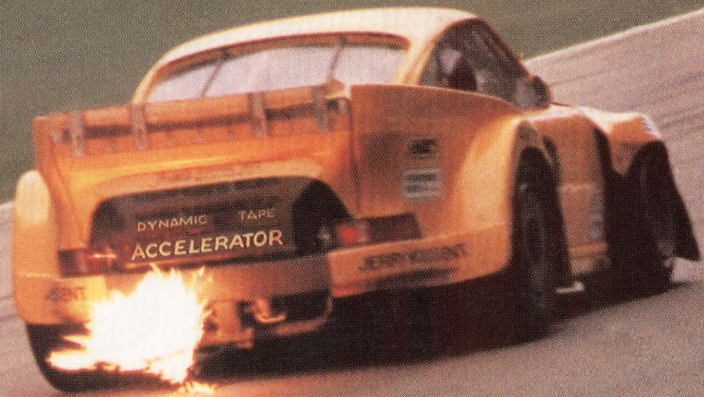
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ASIDE FROM DISASTER RECOVERY VENDORS, consultants can help formulate a companywide plan and aid in its implementation.

are similar to homeowner's insurance policies. They protect the client against loss of computer equipment and facilities. Damaged components (including specified software) are repaired or replaced, and expenses for such things as temporary locations and transportation are reimbursed.

Data recovery services aid the user in recovering lost data, rebuilding disks and removing contaminants from media.

Data protection agreements provide for safe storage and backup of operational software and data files off-site.

Mobile disaster recovery centers, the newest innovation, are offered by Granada Computer Services in the U.K. and Provident Recovery Systems in the U.S. Granada's Disaster Recovery Divi-

sion provides mobile backup support for high-end minis from 10 manufacturers, including Digital. It receives about two disaster-related calls per month, according to Alan Penny, a company spokesperson.

Provident Recovery Systems was the first to introduce the mobile shell environment concept in the U.S., states Deborah Godfrey, executive vice president. At the time of disaster, Provident facilities are delivered to a predetermined site at or near your existing data center.

The transport trailers are installed, wired and operational as soon as the customer's system is added (the trailers can accept any type of computer system). The mobile units are self-contained and include air conditioning, fire protection,

power panels, communications capabilities, humidity control and, if needed, diesel-generated power. The mobile center is custom designed, with raised computer flooring that can be joined to provide from 600 to 3,500 square feet of operational space.

Aside from disaster recovery vendors, consultants can help you formulate a companywide plan and aid in its implementation. Also, do-it-yourself plans can guide you through creating and installing a workable disaster contingency plan if you choose to go it alone.

NO MATTER WHICH path you select, it's imperative that a working, consistently updated and tested disaster recovery plan be implemented in critical applications areas. If your mini is taking on the responsibility of a mainframe, it must be defended as a mainframe. If it goes down, the time it takes to return the computer system to operational status could decide the survival of your company.

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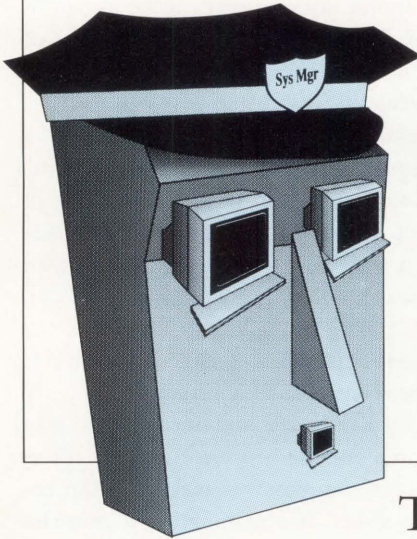
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SECURITY ALERT!

The keys to system security are establishing a security policy and monitoring the activity. DAVID W. BYNON

THE INTERNET DISASTER of 1988 made some system managers realize that their years of screaming, "Batten down the hatches!" weren't without cause. Some industry experts believe the computer virus and hacker scare is blown out of proportion. But the estimated \$89 million Internet disaster is only the first lesson in what hackers and viruses can do.

Unfortunately, many computer professionals haven't paid enough attention to the problems of destructive software, file browsers, software and information theft, hackers and unauthorized use of system resources. The sad fact is that most security problems occur within our own user communities, not by hackers and viruses. If we leave ourselves open to attack, attack will come.

System security tasks fall into two categories: preventative and corrective security measures. The preferable preventative measures address issues such as physical security, software sources, and protection of communication devices, private information and critical system files. Corrective security measures include plugging newly discovered security holes,

restoring files or disks after they've become corrupt or destroyed, controlling users who are misusing system resources and protecting your system against skilled hackers hell-bent on breaching security.

Security Policy

Establishing a security policy is the key to preventative and corrective security. It's a simple document that outlines potential security problems, security rules and enforcement. It should be used as a basic tool to guide, among other things, the assignment of new user accounts, the use of passwords, default file protection and user access. The security policy should clearly outline the organization's computer-use policy for users. The policy should be distributed to all users, and regular checks of the file system and accounting logs should be made to ensure compliance.

A typical security policy will describe such things as:

1. Who should have access to valuable/sensitive information.
 2. From whom valuable/sensitive information should be protected.
 3. How valuable/sensitive information should be protected.
 4. How valuable information will be restored if it's destroyed or deleted.
 5. How the system will be protected physically.
 6. Who should have access to the system and when.
 7. How users can access the system.
 8. Who's responsible for system security.
- From this information, the plan can describe the methods to be used to protect the system and its information. For example:
1. Default file and directory protection.
 2. Application of Access Control Lists.
 3. User log in times and access methods.
 4. Backups and off-site storage.
 5. Physical security devices, such as locks and alarms.
 6. Special devices, such as port controllers, call-back units and encryption.
- If the system is isolated from the outside world and has a small user community with similar work interests, then a relatively lax security policy can be employed. If the system is large, has a high public profile and many different user



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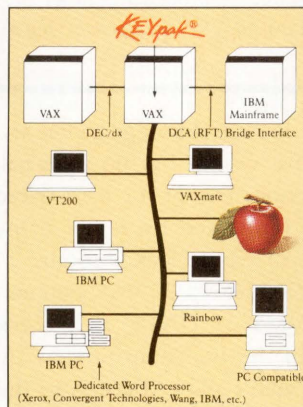
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CIRCLE 273 ON READER CARD

Auditing With VMS V5.2

Auditing in the VMS environment is based on two key elements: security alarms and surveillance procedures. Security alarms are events that you request to be recorded. Surveillance procedures are routine jobs set up to monitor system events not protected by security alarms. In each case, the information is recorded for later analysis and corrective action.

Through VMS' SET AUDIT facility, you can log events generated from ACLs, selected types of file access, installation of images, log in and log out activity, failed log in attempts and volume mounts and dismounts. All other forms of auditing must be performed through the use of DCL commands, most notably ACCOUNTING, DIRECTORY, SHOW and MONITOR.

VMS V5.2 brought with it many security enhancements, most notably an audit server. Although the audit server doesn't improve the overall security of VMS, it enhances security performance and reduces audit analysis tasks. This is especially true in VAXclusters.

By default, VMS V5.2 security auditing is enabled for a small set of critical-event classes. The event audit trail is written to the audit log. The audit server uses what Digital calls an audit server database to oversee security. The database contains information about events to be audited, the location of a security archive file, event timers and information used to monitor the consumption of system resources. The audit server database is updated with the SET AUDIT command.

Working in conjunction with the new audit server is the Audit Analysis Utility. The Audit Analysis Utility (\$ANALYZE/AUDIT) improves the security administrator's ability to review security events. Prior to VMS V5.2, all security-related events were logged in the operator log file. Using the SECAUDIT command procedure, security information could be extracted from the operators log, but the process was slow.

These security enhancements are a welcome addition to VMS and prove Digital's commitment to security.

groups or contains sensitive information, then the security policy must be more restrictive.

The primary responsibility for complying with the security policy falls on the user community — provided it has received a copy of the policy, and the policy has been explained. However, the responsibility of ensuring that adequate protection is in place and enforcing the security policy belongs to the security administrator.

Physical Security

The most secure computer system is one that's locked in a room and has no external connections. Some situations require this security measure, but it isn't the norm.

In all cases, however, the primary security of a system relies on good physical security. If you can prevent access to the machine, either by keeping it behind locked doors or by having no external connections (such as networks or mo-

dem), you can almost guarantee security. A secure system has no external data connections except for hard-wired terminals (protected by a user name and password) kept in locked rooms.

Unfortunately, all VAX systems (running VMS or UNIX) are accessible through the bootstrap process. An attacker who's allowed access to the machine can reboot the system and enjoy full control. For this reason, you must ensure that the machine isn't accessible.

The security policy should define the methods and devices used to secure the system physically from tampering and theft. The system manager and operators are responsible for defending the machines, but the security administrator is responsible for ensuring that security controls are used properly.

System File Security

The security policy also should define the system resources to be protected and the degree of protection. Adding this infor-

mation to your security policy is a good idea, because it makes you think about where the system's weaknesses are.

All multiuser operating systems have key files, such as an accounting or password file, that must be protected. Protecting these files is usually easy — simply apply the appropriate file protection.

If your security requirements are higher than average, more measures must be taken to ensure that protected files haven't been violated. This isn't hard. If the operating system offers a security alarm feature, it should be used on critical system resources. But don't go overboard. This kind of security feature can add a lot of processing overhead.

If the system doesn't have a security alarm feature or if you need more protection, write a program to check files for tampering. This is done easily with a file integrity database that contains key file information such as the key file name, checksum, file ID, creation date, date last modified, owner, size and file protection. After a baseline database with this information has been created, it can be used in the future to validate file integrity.

The suggested way to use the file integrity database is to have a program read a record from the database and compare it with the current file information. The program should only report files that don't match their database record. To be effective, this reporting should be done on a regular basis, i.e., weekly, biweekly or monthly. If you modify a file being tracked, update the file integrity database immediately. This small chore can be worked into procedures or scripts used to manage the system.

Software From Strangers

Another aspect of system security pertains to the software you load. Any software you load can have security traps added by the developer or by an enemy who may hold the software before you get it. The typical scenario is that the software will load and run correctly, but some part of it contains a breach. When software is run by someone with system privilege or superuser status, the breach is activated. With this type of software, either

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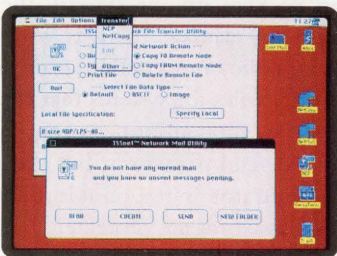
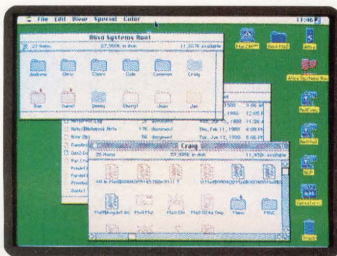
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the machine is attacked or a modification is made to the system to permit the perpetrator to break in.

It's unlikely that this problem will occur with commercial software, but uncertified software is suspect. Free software available from public bulletin boards or user interest groups is especially ques-

tionable.

The problem with most software attacks is that you usually can't detect the problem until after the damage is done. Be extremely prudent when adding unknown software to your system. If possible, examine the source code, compile it on the target machine, and test the

software in a controlled environment.

A good security policy will define acceptable sources of software and procedures for testing unknown software before loading it on a critical system. Part of this procedure should be to log the source of all software.

The best way to identify a virus is to maintain a checksum database of all executable files. Most computer viruses attach themselves to executable files that run with privileges or superuser status.

The bottom line is: Don't accept software from strangers!

Friends And Neighbors

When a computer system is shared, you must make decisions involving community access, i.e., how much you want users to share information. Normally, on a small computer system in which users share a strong community of interest, the system manager will make each user a member of the same group. Under this condition, users can share files at the group level, while individuals can protect files for their own use. On larger systems, in which many unrelated user communities exist, different groups should be created.

The security policy should define groups, default group protection and file sharing among groups. Users should know the group boundaries and the types of files they should protect from group and world access. The user community must be made aware that most security problems are internal.

The heart of any multiuser system security scheme is the log in name and password. If potential outside attackers can be kept off the system, they can't cause any damage. This is why the security policy must define strict password security rules for systems that can be accessed by modem or network. Each user must defend passwords, but the security administrator is responsible for making sure passwords are protected.

Unfortunately, most users don't want to change passwords often, nor do they want to remember difficult-to-guess passwords. So, the security administrator must ensure that passwords are aged and

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CIRCLE 344 ON READER CARD

Security, Step By Step

To fix an actual or attempted security breach, follow three basic steps:

Step 1: Fly low, stay cool and face the facts. Don't announce to the world that you've had a break-in or what you're going to do about it.

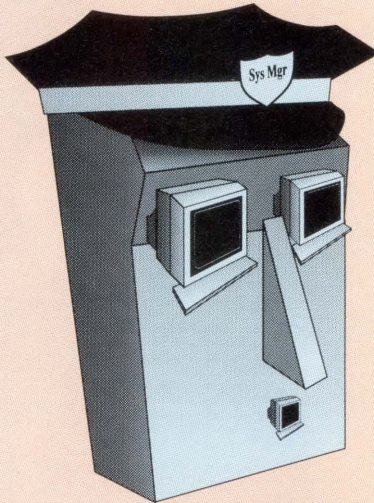
The first reaction to a suspected attack usually is denial. And why not? We always can think of good reasons for things that are a little odd. But never deny an attack or its importance.

Step 2: Identify the perpetrator. This is easy if the hacker is authorized and you have adequate alarms set. If you think you have a hacker with an authorized account, enable file auditing on all files. This will simplify identification. If the system is in a network, you'll have to inspect the log files that were created at the time of the file access violation.

Identifying the unauthorized hacker, one who doesn't have an account, is difficult. This is usually the case because most sources are anonymous, as from a dialup line. Usually, the only way to catch someone trying to break in is to continue letting him attempt entry while establishing his identity.

Step 3: Prevent security violations of the same kind. For example, if you believe that an authorized user is attempting to break into other accounts, pre-expire all user account passwords, use a password generator for all user accounts and disable user accounts after repeated log in failures. If you think that someone is trying to break in through a dialup line, shut off the modem and have the phone number changed immediately. And, if you haven't already done so, protect the dialup lines with a system password or modem security device.

If you believe that your system has been infiltrated by a Trojan Horse, virus, data diddler or worm program, your recovery procedure should be drastic. Immediately back up all important information, then initialize or reformat all of your storage devices. If possible, boot from an alternate system disk before performing the backup. Operating system software, utilities and user software should be reloaded from the original distribution. Unless you're certain that backups haven't been affected, don't restore from backup media.



that appropriate passwords are used. This usually is done by defining a password expiration date (30 days for high security, 60 to 90 days for moderate security) and a minimum password length (at least eight characters). On high-security systems, a password generator should be used.

Auditing: The Ultimate Defense

After implementing a system security policy, some method of enforcement must be applied. This is done through auditing your own controls.

Why should you audit your own security measures? For explanation, con-

sider a farmer who puts up a fence to keep rabbits from eating his carrots. Does the farmer assume that the fence is keeping the rabbits out? No, the farmer knows that some rabbits will try to dig under the fence. The farmer regularly checks the fence for holes where rabbits have tried to dig through. When holes are found, he fills them. These same "fence checks" are required for good computer security.

Security auditing is the act of logging events as they occur for later analysis. This isn't to be taken lightly. It requires forethought and diligence. You must know what your threats are, and you

must check your audit trail regularly to ensure security hasn't been broken. A definition of your known or potential security threats should be included in your security policy. Don't be an ad hoc security administrator. Anticipate potential weaknesses before they become a security breach. Also, let users know what the potential security risks are. An informed user is a better user.

Where the operating system is unable to log events, such as a user logging in after hours or from a dialup line, system utilities must be used. Most multiuser operating systems, such as UNIX and VMS, maintain accounting information about user activity. The system accounting database is a wonderful source of information for locating actual or potential security problems.

Auditing is dictated by the security policy. For example, if the security policy cited user access time as a security concern, then user access times must be audited.

Security auditing should consist of automated procedures and random checks. For instance, a batch job that runs early each morning could search the accounting database for attempted break-in activity, users who logged in after hours, unusually high CPU consumption and improper file protection. The results could be sent by electronic mail for review when you log in. Perform such random checks as searching for unauthorized accounts, unfamiliar software in system directories and unexplained jobs running in batch.

The greatest asset a security administrator can bring to the system is knowledge. The more he knows about the system, the better he can protect it.

Security Breaches

A security breach can be internal or external. Internal and external security breaches are different problems, but they should be dealt with similarly.

Internal breaches can range from a user deleting a file that should have been protected from them to someone browsing through files and directories for employee records or trade secrets. These

Thinking Laptop PC's?

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We all know the laptop PC can be complex. The PC is a computer which requires a lot of training and support. Its moving parts may increase the likelihood of failure. The programs that run on PC's must be licensed, updated and distributed. Controlling information on each PC can be an intricate task.

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violations should be dealt with swiftly. In severe cases, the user's account should be disabled while an investigation takes place.

An external security breach usually starts with a hacker who wants to expand his skills at your expense. Most often, the hacker will break into your system,

snoop through as many files and directories as possible, then leave without causing damage. Most hackers are aspiring computer professionals who enjoy

Guarding Your UNIX/ULTRIX System

"The probability that an operating system will have security openings increases by the number of people who have designed the system," says Ted Prindle, Digital's ULTRIX senior product manager. Like most members of the UNIX community, Prindle admits that UNIX, designed and developed by numerous people, never has been applauded for its security features — a fact highlighted by last year's Internet virus. What can you do as a system administrator to secure your UNIX or ULTRIX system?

Because there are few security defaults within UNIX, you'll have to take the initiative and set up a security program that monitors potential problems. The first and most important thing you can do, says Prindle, is to guard your superuser password closely and change it frequently. Unlike VMS, ULTRIX doesn't provide password naming or aging, and this extends to superuser passwords.

Many tip-offs will tell you if an unauthorized user is perusing your system. Because your console always records what's happening on your system, you should be alerted immediately if it's turned off. This is probable evidence that someone is trying to break in, says Prindle.

If you're the only person with a superuser password, only you should be logging in to the root. You can monitor for root log ins by writing a simple script that periodically counts these procedures.

Be careful of trusted hosts — remote machines that have privileged access. A superuser on a trusted host can log in as a superuser on your root. This is a dangerous practice, says Prindle.

Even more dangerous are guest accounts. Guest account passwords usually aren't difficult and allow an easy way for anyone to gain access to your system. Prindle warns against this practice, despite the convenience it sometimes provides.

With ULTRIX, watch for multiple log in failures — again, you can write a simple script that will monitor such attempts. A typical way to gain access to a UNIX system is to guess passwords until one is found. Because UNIX doesn't demand that passwords be a certain length (VMS requires passwords to be at least eight characters), many passwords are easy to acquire with simple programs. Multiple log in failures can be a warning that someone is playing guessing games with your system.

Keeping The Gates Closed

You should audit your UNIX/ULTRIX security the way companies audit their financial records. Computer security can be more valuable than your financial records, yet it sometimes takes a back seat to what seem to be more pressing issues. Your audits should adhere to a policy and should check for warning signals.

Prindle also suggests that you write a program that compares your online dictionary with your passwords, because passwords should never be actual words. Similarly, a program that compares passwords to log in names will turn up inappropriate passwords. Although passwords that equal or are similar to log in names are

easy to remember, this practice can welcome data diddlers to your computer system.

If you discover security problems and need outside help, one source to which you can turn is the Computer Emergency Response Team (CERT) at Carnegie-Mellon University. CERT, which was formed following the Internet virus, operates a hotline free of charge at (412) 268-7090. Digital is active in this council, disseminating information to the group when it discovers solutions to UNIX or ULTRIX security holes. Digital also implements patches discovered by other CERT members, says Prindle.

Sole Responsibility

If it sounds as if you as a system administrator have sole responsibility for the security of your system, take heart. ULTRIX V4.0, due in early 1990, will include security enhancements. Among them are capabilities similar to the Kerberos authentication and Hesiod naming conventions being developed at MIT. "Combined, the two conventions provide additional security in that access to the machine and use of the machine's resources are verified," says Prindle.

The Kerberos authentication server uses dynamic session keys that must be updated periodically so that a hacker counting on static user authorizations would be confounded. "When you ask for resources to be consumed, the Kerberos process asks, 'Who are you? Are you allowed to do this, and if so, how much are you allowed to do?' It verifies that you are who you say you are," says Prindle.

The Hesiod naming convention is a more robust extension to the Berkeley "bind" capability. It deals with the password file, alias file and aliases. Without Kerberos, says Prindle, Hesiod is simply a naming server that provides a centralized capability for naming and passwords. Together, Hesiod and Kerberos should constitute a powerful UNIX security guard.

Along with Hesiod and Kerberos, DEC is considering adding security functions that now exist in VMS, such as requirements for longer passwords. Like VMS now, a future version of ULTRIX eventually will provide the U.S. Government Orange Book C2 level of security, the lowest coded security level. Currently, no unmodified version of UNIX, including ULTRIX, is codified via U.S. Orange Book rules.

DEC eventually intends to offer ULTRIX at the B1 security level. Prindle cautions, however, that the higher B levels of security put more restrictions on the openness that's characteristic of UNIX and that most vendors will offer B-level versions at higher prices. Users who need such security — most often, federal users and contractors — will expect to pay more and do more work to use the secured version. Applications that sit on B-level UNIX will need to know how to get permissions from the operating system. Despite these problems, Prindle estimates that many vendors will offer B-level releases in 12 to 24 months.

—Elaine L. Appleton, UNIX editor

the challenge of bypassing security for the fun of using a minicomputer or mainframe. However, there are perpetrators whose purpose is to steal information or damage the system.

In a typical break-in scenario, the hacker gets the number for your modem or network from a former employee (or he may be a former employee) or a network of hackers. He also could get the number by random dialing (most companies have a base number and several sequential numbers, e.g., 2100, 2101, 2102). The hacker then determines what type of system you have. VMS and UNIX are notorious for giving this information away, e.g., Username: = VMS.

After the operating system is known, the hacker can attempt a break-in. Typical account names are tried until an unprotected account or an obvious password is discovered. The hacker then can browse through the system within the privilege and protection boundaries of the hacked account. Unfortunately, hackers trade phone numbers and account information, so if one finds you, you soon may be hacked by others.

Most break-ins and attempts are detected easily by regularly auditing log in failures. Typically, many log in failures will be logged as someone tries to guess a password, or users will report unexplained log in failure messages. VMS and UNIX can report the time of the last log in, and this feature should be used.

VMS and UNIX break-in security is good, but both have a track record of not being absolutely fail-safe. No general-purpose operating system is.

SYSTEM SECURITY IS a 24-hour job. You either have it or you don't. Take time to evaluate your security risk. If you don't have a formal security administrator, appoint one. If you don't have a security policy, put one in place. Above all, don't take your good fortune for granted. Sooner or later, the bug will bite you, and your job may be what gets the worst infection.

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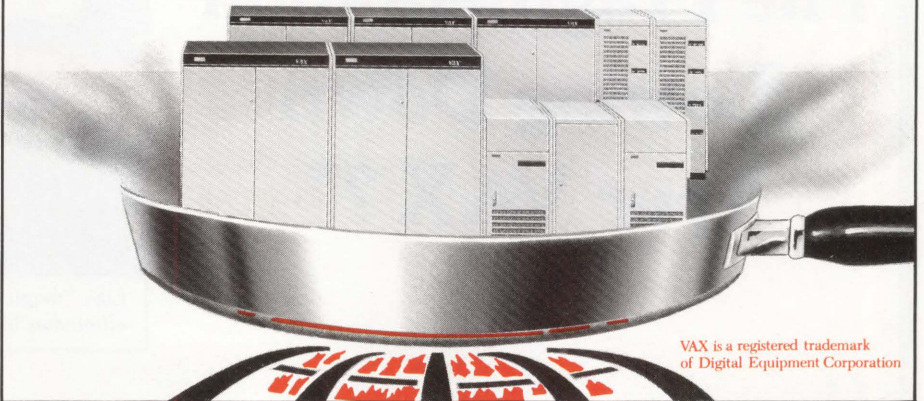
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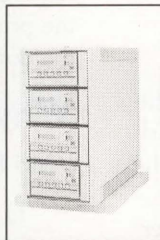
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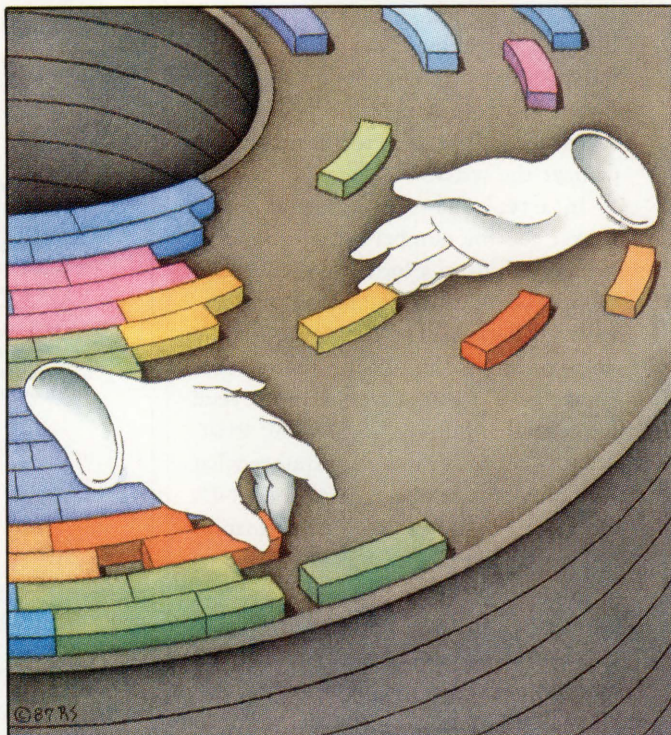
“How Badly Is File Fragmentation Slowing Down Your VAX™?”

Users of Digital's VAX/VMS™ systems have long complained of performance problems stemming from the gradual fragmentation of disk files. Every VAX/VMS Files-11 ODS-2 disk tends to fragment with use. It might take a month or it might take only a few days, but sooner or later the disk will have to be defragmented.

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How Does Fragmentation Occur?

VAX/VMS tries to allocate space for a file as close to the beginning (logical block number zero) of the disk as possible. It does so even if there is plenty of free space near the end of the disk and placing the file near the beginning requires that the file be split up into many pieces. In other words, the file is created by VMS™ in a badly fragmented condition even though there is plenty of free space further along on the disk in which the file could have been created contiguously.



Like “magic hands” Executive Software's **DISKEEPER/Plus**™ eliminates file and free space fragmentation on your disks.

An exception to this is that VMS draws space first from the extent cache, which matches the free space near the beginning of the disk until users begin deleting files. Space freed up by deleted files is added to the extent cache and so could be allocated to new files. When extent cache space is used up, the extent cache is reloaded from the spaces nearest the beginning of the disk.

When you consider the long-term effects of this allocation strategy on a disk in continuous use, you can readily see that fragmentation can become extreme. Before **DISKEEPER/Plus**, the recommended remedy for disk fragmentation was to backup the fragmented disk to tape (or another disk), reinitialize the disk and restore the files from the backup save-set. Unless you are fortunate enough to have a spare disk drive available, this roll-out, roll-in procedure on a large disk takes four to six hours — per disk, per week (or however frequently your installation requires defragmentation). Even with a spare disk drive, the procedure requires taking the disk out of service for the duration.

Why does VAX/VMS Fragment Files?

VMS fragments files for 2 reasons:

- 1) It always must file all the data at the beginning of the disk and
- 2) It must always fill in any existing free space located at the beginning of the disk first (no matter how small that free space is).

With these two conditions inherent in the make-up of VMS there is no getting around the fragmentation problem.

How Does Fragmentation Affect Performance?

Every disk has fragmentation unless it has just been defragmented and not used since. A file fragmented into two pieces can take twice as long to access as a contiguous file. A three-piece file can take three times as long, and so on. Some files fragment into hundreds of pieces in a few days' use. Imagine the performance cost of 100 disk accesses where only one would do! Defragmentation can return a very substantial portion of your VAX to productive use.

What to Do About Fragmentation

There are only three ways to handle the fragmentation problem on your system.

1. Don't let the users on the system — ever.

We have found this solution is very unpopular due to the fact if there are no users on the system, then the need for a computer system is not a high priority. This results in no jobs for VAX Managers and technicians.

Not recommended.

2. Spend late nights or weekends doing the mundane chore of backup and restore (knowing you will only have to do this activity again as soon as your users start turning into an angry mob because the cursor isn't moving).

Now, you may already be choosing backup and restore as your solution. There's just one catch: this "solution" does not free *you* from having to do the work. You still have to stand around (after hours) and do backup and restore.

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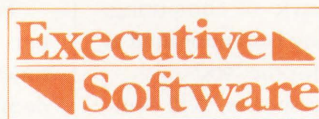
- How many of my files are fragmented?
- Which are my most badly fragmented files?
- What is the average state of file and free space fragmentation on my disks?
- What is my total free space?
- What are my total split I/Os?

(The answer to this question is the most meaningful indicator of the actual cost of fragmentation on your VAX!)

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ROUNDTABLE

INTO THE NEXT DECADE

Looking To The 1990s, *DEC PROFESSIONAL* Editors
Forecast The Next Stage In Digital Computing.

Recently, *DEC PROFESSIONAL* experts gathered for a roundtable discussion of Digital's technical strategies for the 1990s. Participants included Editorial Director Dave Mallery, Technology Editor Philip A. Naecker and Workstations Editor David W. Bynon. The discussion was moderated by Managing Editor Lou Pilla.

Pilla: OLTP and the VAX 9000 have been on many people's minds recently. How will the shift to this sort of computing affect DEC's strategy in the '90s? What are the holes in the product line, and what products can we expect to see? Will DEC be able to adapt to this style of computing, which the company has enunciated as a main direction for the '90s?

Mallery: The question is, Will computing shift to an OLTP model? It certainly won't shift at Professional Press. Are we only talking about DEC's

penetration or attempted penetration into very large accounts?

Naecker: DEC thinks the computing workload will shift. In the era of very cheap desktop mips and DECwindows, it's more cost-effective to distribute computing workload from a hardware and personnel point of view. Mips are cheaper and people are more expensive, which means a distributed style of computing that puts the mips closer to the users. Today, the easiest way to get distributed computing is to use a transaction processing style of computing.

For example, Professional Press inputs and maintains mailing data in a timesharing environment in which a dumb terminal and a minicomputer represent the front and back ends. The mini is putting up the forms — the human interface — to the key

operators and storing the data, sorting it, producing reports, and so on.

DEC believes that, to get the most out of your compute dollar and to take the best advantage of compute in the future, you should change that application over time or make the next version of it more distributed. By that I mean a PC or workstation doing front-end work with basic validation, offloading from the machine all human interface activities. That work can be done locally — the keystroke processing and I/O to the screen, the mousing and moving the cursor around. After the record is processed and validated, the back end stores it and produces reports, mailing labels and batch-type jobs.

Mallery: But why should you do this?

Naecker: Because you can provide

DEC Network Group will provide anything other than a top-notch product, and probably with such things as a network management utility simi-

lar to what IBM has. I can't imagine that DEC will disrupt its forward momentum in networking.

Managers buying computers in the next few years should put them on extremely short depreciation schedules. If you can, get a short-term lease...

lar to what IBM has. I can't imagine that DEC will disrupt its forward momentum in networking.

Purchase Plans

Pilla: What should users keep in mind as they plan hardware and software purchases during the next five to 10 years?

Mallery: Managers buying computers in the next few years should put them on extremely short depreciation schedules. If you can, get a short-term lease, because we aren't through with rapid generation-hopping, nor are we likely to be for some time. Otherwise, you'll get stuck with 750s.

Pilla: You'll hang onto the old technology because you can't get rid of it for financial reasons.

Mallery: You can't get rid of it because its book value is still high enough that the CFO will lose his job if he writes it off.

Pilla: The alternative is to wait and never make a decision because you don't know what's coming down the line, except that you know it will be better and cheaper.

Bynon: I'm not sure that's the right track. You shouldn't buy a system for a three-year period because it will be outdated. You should choose your software applications and then forecast as many years out as you can for how

you can foresee.

Mallery: But if you have an 8840 that you've been happily upgrading until about six months ago, you're an unhappy person today. The monthly maintenance is unmanageable, it has a very small street value and it's passing into obsolescence.

Bynon: You're suggesting that we shouldn't buy computers, but that we should timeshare, because 12 months down the road the machine we just bought will be obsolete. It's similar to saying that you should buy a new car every year because the one that you bought a year ago doesn't have the gadgets the new one has. Companies can't buy a machine and discard it after one year because a new machine has twice the horsepower and costs half as much.

Naecker: They may have to. Tax issues aside, if the pure economics are such that it isn't worth keeping it, companies won't keep it. The big factor is that newer machines have substantially lower maintenance costs.

Bynon: There's always a tradeoff point. But a machine's lifespan is longer than three or even five years.

Mallery: You can move a machine to a less critical position in the hierarchy and add the new machine on top, but that isn't always true with large machines. I just think there's a real

problem with a lifespan that's greater than three years.

Naecker: The point most people miss is that development time on typical projects is far greater than the generation time on new generations of hardware. When people design a software product or an application in-house, they tend to design for the current generation of the machine. That's not very wise, because by the time you finish an in-house product, you're on a new generation machine with a new standard for performance and cost-effectiveness. You should design your applications for resource use consistent with what resources will be available and how much they'll cost when you're done the project.

Mallery: You should develop your application on some old clunker machine and postpone hardware acquisition until you're in late beta test.

Naecker: We need to stop thinking of applications as \$RUN MY PROGRAM.EXE, because that isn't what applications will look like in the 1990s. DEC's belief is that applications will consist of many parts running potentially on many machines — a database part running on a database machine, a compute part running on a compute server, a back-end part running on a back-end mainframe-class machine, a network part running on the network, a human interface part running on a human interface device. When you make this change in mind-set, you realize that you can find a use for older machines in the data center as some kind of server.

The DEC environment of the '90s will be as different from the '80s as today's environment is from that of the '70s. Our job is to adapt to that environment rather than do things the same way we did them 10 years ago.

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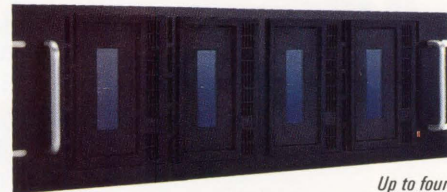
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SHAREABLE LOGICAL NAME TABLES

By Tracy E. Schreiber

Shareable Logical Name Tables Offer Great Potential To Application Developers And System Managers. Here's How To Take Advantage Of Them.

Users have been able to create and modify shareable logical name tables since the release of VMS V4.0. However, because Digital has never provided programmers with the tools needed to build, maintain and use shareable logical name tables, their potential hasn't been realized. I've custom built the tools needed to perform these tasks. These tools include:

1. Command procedures to build and maintain the tables.
2. Files to store the list of tables to be built at system boot.
3. Programs needed to create and modify the search list that accesses the tables.

The command procedures and programs included in this article are available for download from ARIS/BB.

Using shareable logical name tables has many benefits. For example, the logicals needed for a project can be grouped in one or more tables. This allows each user to include or remove all the logicals using simple commands (such as \$ ADD_LOGICAL_TABLE and \$ REMOVE_LOGICAL_TABLE) instead of a separate assign or deassign for each name.

Using this technique, everyone immediately sees any changes made to the table logicals. Each user doesn't have to redefine all the logicals by re-executing a command file. As a

result, the amount of time a task spends initializing and manipulating logicals is greatly reduced. Because shareable table logicals are translated after user-defined logicals, conflicts are avoided. And the shareable nature of logical name tables allows them to be easily modified without user intervention. Consult the *DCL Dictionary* Volume 2 in your VMS documentation set for more information about logical name tables.

Creating Tables

A command procedure is executed at system boot time that creates all the tables and puts them in LNM\$SYSTEM_DIRECTORY (see Figure 1). This procedure should be run early in the boot sequence so that subsequent procedures and batch jobs have all the necessary tables available. First, this procedure opens the file LOGICAL_TABLES.DAT (see Figure 2). This file contains:

1. The list of tables to be created.
2. The location of the definitions.
3. What qualifiers are to be used with the CREATE/TABLE command. This file should be maintained by the system manager or an operator. The same file can be used on all the nodes on a cluster, or you can use separate files to have different tables for each node.

Each table file should have the format shown in Figure 3. The first field is the logical name, the second is the equivalence name and the

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third includes any qualifiers that you want to associate with the DEFINE/TABLE command.

After the program in Figure 1 has

When a table is created, you must be able to modify it.

opened the LOGICAL_TABLES file, it goes through the list of logical tables and creates each one, storing the logicals the users have provided in their definition files.

Modifying Tables

When a table is created, you must be able to modify it. Figure 4 shows how to do this. Make the desired changes to the appropriate logical table definition file and ask the operator to run this procedure. Because you're working with system logical tables, someone with SYSPRV and CMKRNL privileges must run the procedure. The following syntax is used when executing the procedure:

```
$ @modify_table "table_name"
```

The procedure looks through the list of tables in the logical tables file until it finds one that matches the table provided on the command line. It then re-creates the table and defines all the logicals specified in the corresponding definition file. The changes take effect immediately, and anyone currently using the table will see these changes.

Using Tables

After they're created, anyone on the system can use these tables. (To protect certain tables, use Access Control Lists.) To use these tables, include them in a search list used by the system to translate any

FIGURE 1.

```

$ !++
$ !
$ ! DCL Name: LOGICAL_TABLES.COM
$ !
$ ! Version : V1.0
$ !
$ ! Facility: Logical Tables Maintenance Routines
$ !
$ ! Abstract: Procedure to create logical name tables on reboot. The system manager maintains
$ ! a file with the following format:
$ !
$ ! table_name | file_spec | qualifiers
$ !
$ ! | - field delimiter
$ ! table_name - name to be given to the table
$ ! file_spec - file containing logical definitions to put in the table
$ ! qualifiers - CREATE command qualifiers
$ !
$ ! Users provide the the above information and maintain the specified file.
$ ! The logical file has the following format:
$ !
$ ! logical_name | equivalent_name | qualifiers
$ !
$ ! | - field delimiter
$ ! logical_name - specifies the logical name string
$ ! equivalent_name - specifies the equivalence name of the logical
$ ! qualifiers - DEFINE command qualifiers
$ !
$ ! The logic of the command file is this:
$ !
$ ! 1. Open the logical name table file
$ ! 2. Read in a table line
$ ! 3. Find table name equal to input table name
$ ! 4. Open the logical definition file
$ ! 5. Update the logical table
$ ! 6. Read in a logical line and parse
$ ! 7. Define logical and put into table
$ ! 8. Repeat 5 & 6 until end - close file
$ ! 9. Repeat 2 through 7 for each input until done
$ !
$ ! Please note that this procedure requires SYSPRV and ENABLE access since it
$ ! defines logicals in shareable tables.
$ !
$ ! Environment: User Mode, Not AST-reentrant
$ !
$ ! Creation Date: 19-SEP-1985 11:59:42.12
$ !
$ ! Authors: Jim Vitale & Tracy Schreiber
$ !
$ ! Modified By:
$ !
$ ! YES - 2-NOV-1988 14:15:06.88
$ ! Added some extra error handling after the CREATE and DEFINE commands.
$ !
$ !
$ ! This procedure must complete
$ SET NOON
$
$ ! Initialize symbols
$ reply_spec = "REPLY/BELL/USER=(JIM,NICK,DAT,STEVE,CAMERON)"
$ mail_spec = "MAIL NL: "@COMPGR_DIST" /SUBJECT="
$
$ err_open_tables = "%LNT-F-OPENLIST, logical name table file LOGICAL_TABLES.DAT not opened, please check
now!"
$ err_read_tables = "%LNT-E-READLIST, error reading entry after !AS in LOGICAL_TABLES.DAT. please check
now!"
$
$ err_open_values = "%LNT-F-OPENTABLE, error opening file !AS for logical table !AS, please check now!"
$ err_read_values = "%LNT-F-READTABLE, error reading file !AS after !AS, please check now!"
$
$ err_create_table = "%LNT-F-CRETABLE, error executing CREATE/NAME, TABLE command for table !AS"
$ err_define_log = "%LNT-E-DEFINELOG, error defining logical !AS in table !AS"
$
$ create_table = "%LNT-I-CRETABLE, creating logical table !AS using logicals from !AS"
$ success = "%LNT-S-LOGSADD, logicals successfully placed in table !AS"
$
$ ! Open the logical name table file
$ OPEN/READ/ERROR=ERR_OPEN_TABLES LOG_TABLES SYS_COM:LOGICAL_TABLES.DAT
$
$ ! Loop through all the tables specified in the table file
$ TABLE_LOOP:
$
$ READ/END=END_TABLES/ERROR=ERR_READ_TABLES LOG_TABLES table_data
$
$ table_data = F$EDIT(table_data, "COMPRESS, TRIM, UPCASE, UNCOMMENT")
$ IF table_data .EOS. "" THEN GOTO TABLE_LOOP
$
$ table_name = F$EDIT(F$ELEMENT(0,"",table_data),"TRIM")
$ file_spec = F$EDIT(F$ELEMENT(1,"",table_data),"TRIM")
$ qualifiers = F$EDIT(F$ELEMENT(2,"",table_data),"TRIM")
$
$ WRITE SYS$OUTPUT F$FAO(create_table, table_name, file_spec)
$
$ CREATE/NAME TABLE/PARENT=LNM$SYSTEM_DIRECTORY'qualifiers' 'table_name'
$ IF .NOT. $STATUS THEN GOTO ERR_CREATE_TABLE
$
$ OPEN/READ/ERROR=ERR_OPEN_VALUES LOG_VALUES 'file_spec'
$
$ ! Loop through all the logical specifications
$ VALUE_LOOP:
$
$ READ/END=END_VALUES/ERROR=ERR_READ_VALUES LOG_VALUES logical_data
$
$ logical_data = F$EDIT(logical_data, "COMPRESS, TRIM, UNCOMMENT")
$ IF logical_data .EOS. "" THEN GOTO VALUE_LOOP
$
$ logical = F$EDIT(F$ELEMENT(0,"",logical_data),"TRIM")
$ equivalent = F$EDIT(F$ELEMENT(1,"",logical_data),"TRIM")
$ qualifiers = F$EDIT(F$ELEMENT(2,"",logical_data),"TRIM")
$
$ DEFINE/TABLE="table_name"qualifiers' 'logical' 'equivalent'
$ IF .NOT. $STATUS THEN GOTO ERR_DEFINE_LOG
$
$ GOTO VALUE_LOOP
$
$ END_VALUES:
$
$ CLOSE log_values

```

Continued on page 72.



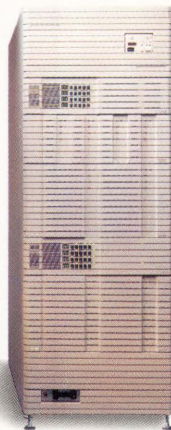
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 **SYSTEM INDUSTRIES**

FIGURE 1 . . . continued

```

$                               WRITE SYS$OUTPUT F$FAO(success, table_name)
$
$                               GOTO TABLE_LOOP
$
$ END_TABLES:
$
$   CLOSE log_tables
$   EXIT
$
$ ERR_OPEN_TABLES:
$
$   WRITE SYS$OUTPUT F$FAO("!" + err_open_tables + "!")
$
$   'mail_spec' ***F$FAO(err_open_tables)***
$   'reply_spec' ***F$FAO(err_open_tables)***
$
$   SET NOVERIFY
$   EXIT
$
$ ERR_READ_TABLES:
$
$   'mail_spec' ***F$FAO(err_read_tables, table_data)***
$   'reply_spec' ***F$FAO(err_read_tables, table_data)***
$
$   GOTO TABLE_LOOP
$
$ ERR_CREATE_TABLE:
$
$   'mail_spec' ***F$FAO(err_create_table, table_name)***
$   'reply_spec' ***F$FAO(err_create_table, table_name)***
$
$   GOTO TABLE_LOOP
$
$ ERR_OPEN_VALUES:
$
$   'mail_spec' ***F$FAO(err_open_values, file_spec, table_name)***
$   'reply_spec' ***F$FAO(err_open_values, file_spec, table_name)***
$
$   GOTO TABLE_LOOP
$
$ ERR_READ_VALUES:
$
$   'mail_spec' ***F$FAO(err_read_values, file_spec, logical)***
$   'reply_spec' ***F$FAO(err_read_values, file_spec, logical)***
$
$   GOTO VALUE_LOOP
$
$ ERR_DEFINE_LOG:
$
$   'mail_spec' ***F$FAO(err_define_log, logical, table_name)***
$   'reply_spec' ***F$FAO(err_define_log, logical, table_name)***
$
$   GOTO VALUE_LOOP

```

logical specified.

The best way to define a search list is to create the logical LNM\$PROCESS in SUPERVISOR mode and assign it the list of tables to be searched. The logical LNM\$PROCESS is used because all products always reference it.

There are other logicals (e.g., LNM\$

FILE_DEV) that products such as DATA-TRIEVE only use when translating file names. This would mean that only file logicals could be stored in logical name tables, which would greatly limit their usefulness. LNM\$PROCESS is defined in SUPERVISOR mode so that it will be propagated to subprocesses.

To help define and modify the LNM\$PROCESS search list, you can use the programs in Figures 5 and 6. Figure 5 shows a program that lets you add tables to your search list, while the program in Figure 6 lets you remove them. Both programs use CLD interfaces, allowing for a DCL-type command syntax as well as

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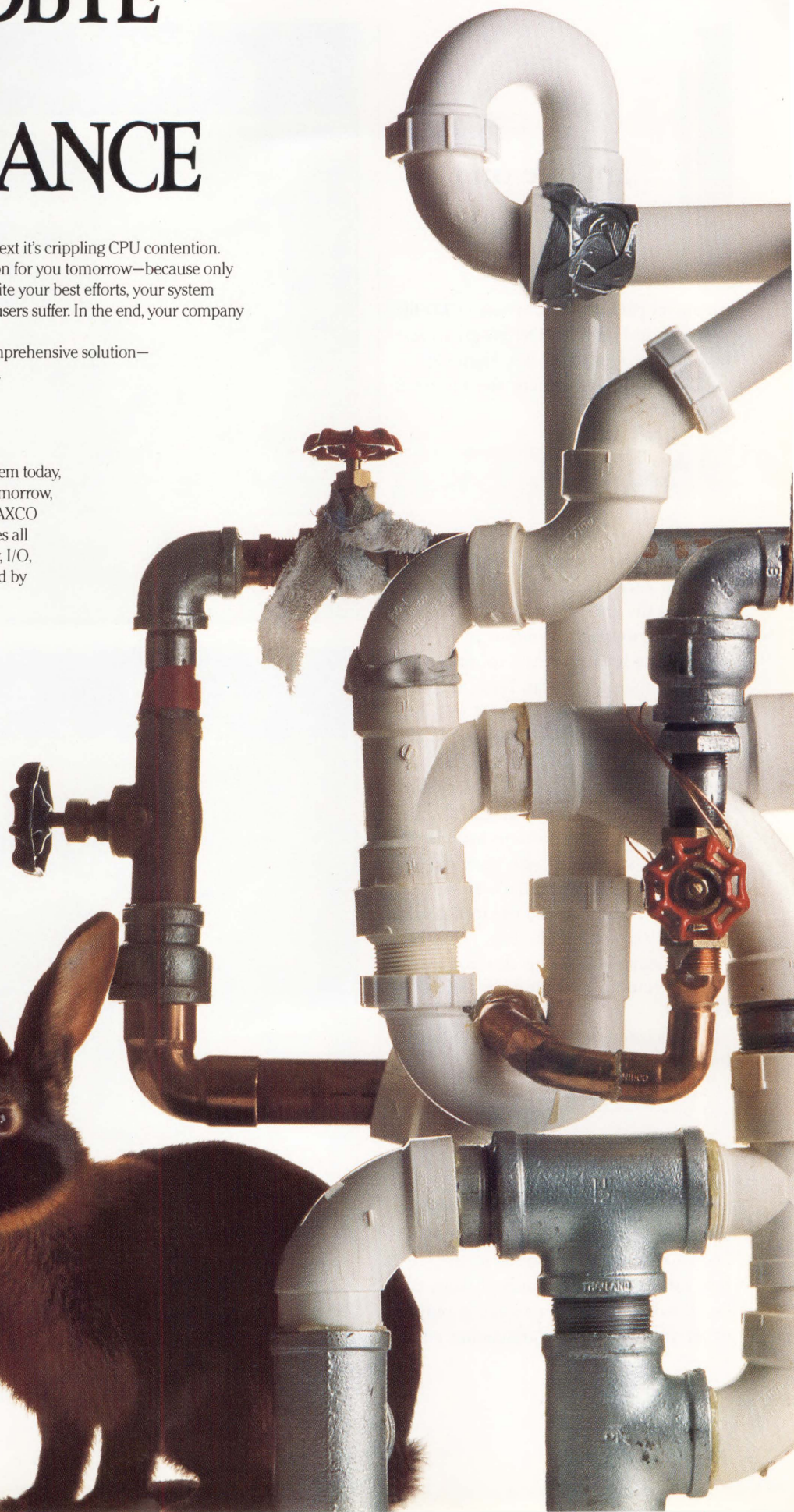
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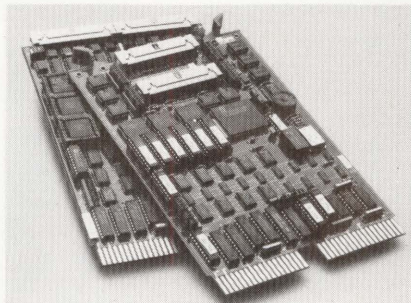
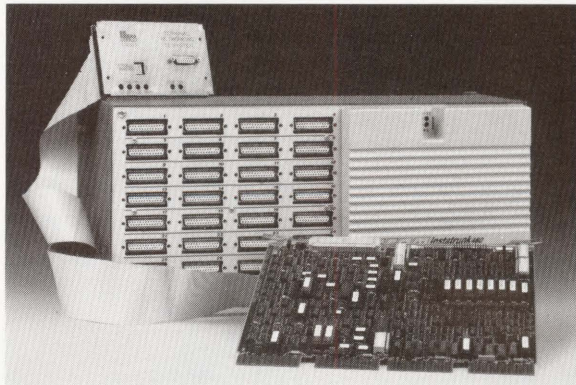
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are stored in a new list. Last, the logical LNM\$PROCESS is defined to include only the tables remaining in the list.

Using this search list as a basis, Figure 10 shows the result of a remove

operation.

The programs and techniques discussed in this article are excellent tools for application developers and system managers. —Tracy E. Schreiber is an inde-

pendent software consultant in Newport Beach, California

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FIGURES 4-10.

Figure 4.

```

.
.
$ input_table_name = ""P1"
$ IF P1 .EQS. "" THEN INQUIRE input_table_name "Logical table name"
$
$ input_table_name = F$EDIT(input_table_name, "COMPRESS, TRIM")
$
$ OPEN/READ/ERROR=ERR_OPEN_TABLES LOG_TABLES SYS_COM:LOGICAL_TABLES.DAT
$
$ TABLE_LOOP:
$
$   READ/END=ERR_END_TABLES/ERROR=ERR_READ_TABLES LOG_TABLES table_data
$
$   table_data = F$EDIT(table_data, "COMPRESS, TRIM, UPCASE, UNCOMMENT")
$   IF table_data .EQS. "" THEN GOTO TABLE_LOOP
$
$   table_name = F$EDIT(F$ELEMENT(0, " ", table_data), "TRIM")
$   file_spec = F$EDIT(F$ELEMENT(1, " ", table_data), "TRIM")
$   qualifiers = F$EDIT(F$ELEMENT(2, " ", table_data), "TRIM")
$
$   IF table_name .NES. input_table_name THEN GOTO TABLE_LOOP
.
.

```

Figure 5.

```

.
.
!
! Functional Description:
!
!   This routine translates the old LNM$PROCESS search list and
!   adds unique table names to the end of the list.
!
! Calling Format:
!
!   CALL ADD_OLD_TABLES_LIST(tables, search_list, count)
!
! Formal Argument(s):
!
!   tables
!   VMS Usage: char_string
!   type:      character string
!   access:    write only
!   mechanism: by descriptor
!   List of tables to add to search list.
!
!   search_list
!   VMS Usage: vector_longword_signed
.
.

```

Figure 6.

```

.
.
RECORD /item_list/ search_list(-1:127)
! Get the tables already in the search list
CALL GET_CURRENT_SEARCH_LIST(tables, tablen, count)
! Remove specified tables from the list
CALL REMOVE_TABLES_FROM_LIST(tables, count)
! All logicals should have the TERMINAL attribute
search_list(-1).length = 4
search_list(-1).code = LNM$ATTRIBUTES
search_list(-1).buffer = %LOC(LNM$M_TERMINAL)
search_list(-1).return = 0
! Store valid tables back in the search list
DO I = 0, count
  IF (tables(I) .NE. ' ' .AND. tablen(I) .GT. 0) THEN
    search_list(total).length = tablen(I)
    search_list(total).code = LNM$STRING
    search_list(total).buffer = %LOC(tables(I))
    search_list(total).return = 0
    total = total + 1
  END IF
END DO
.
.

```

Figure 7.

```

!++
! Version:          V1.0
!
! Facility:        Logical Tables Maintenance Routines
!
! Abstract:        This command definition file defines commands
!                  used to add tables from the search list LNM$PROCESS.
!
! Environment:     User Mode, Not AST-reentrant
! Creation Date:   28-OCT-1985 11:59:42.12
!
! Author:         Tracy Schreiber
!
! Modified By:
!
!--
MODULE LOGICAL_TABLES
IDENT "Version 1.01"
!
! Set the image to be run, initial qualifiers, and parameters
DEFINE VERB ADD _LOGICAL_TABLE
  IMAGE "SYS_EXE:ADD_LOGICAL_TABLES"
  PARAMETER P1, LABEL=TABLES, PROMPT="Table", VALUE(REQUIRED,LIST)
!
! Set the image to be run, initial qualifiers, and parameters
DEFINE VERB ADD _LOGICAL_TABLE
  IMAGE "SYS_EXE:ADD_LOGICAL_TABLES"
  PARAMETER P1, LABEL=TABLES, PROMPT="Table", VALUE(REQUIRED,LIST)

```

Figure 8.

```

.TITLE          Message File for the logical table messages
.IDENT          'Version 1.00'
.FACILITY      LNT 6/PREFIX=LNT_
.
.SEVERITY      WARNING
.
INVTABLE      <IAS is an invalid logical name table>/FAO_COUNT=1
NOTINLIST     <IAS logical name table is not in your search list>/FAO
.END

```

Figure 9.

```

$ add_logical_tables asr_sy_table,asr_sec_table
$ show logical/table=lnm$process_directory
  (LNM$PROCESS_DIRECTORY)
  "LNM$GROUP" = "LNM$GROUP_000050"
  "LNM$JOB" = "LNM$JOB_8083F440"
  "LNM$PROCESS" [super] = "LNM$PROCESS_TABLE"
  = "ASR_SY_TABLE"
  = "ASR_SEC_TABLE"
  "LNM$PROCESS" [kernel] = "LNM$PROCESS_TABLE"
  "LNM$PROCESS_DIRECTORY" [table] = ""
  "LNM$PROCESS_TABLE" [table] = ""

```

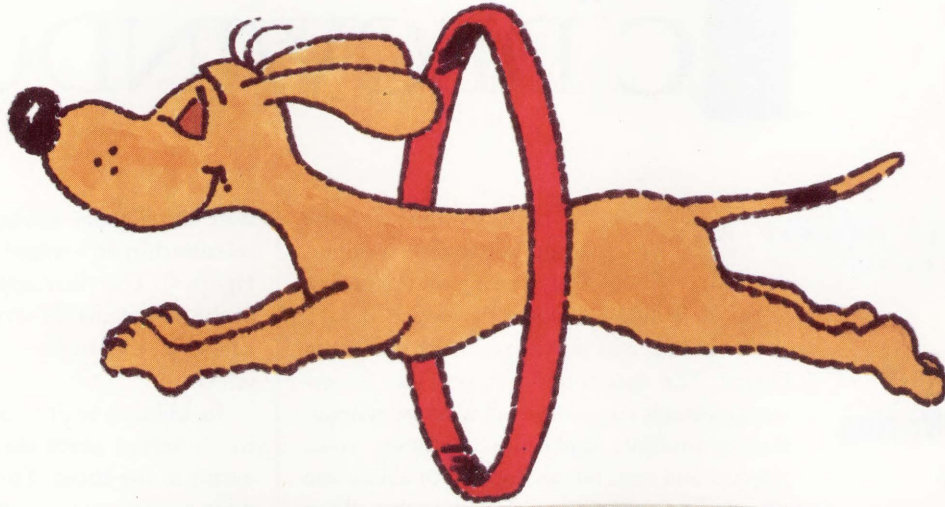
Figure 10.

```

$ remove_logical_tables asr_sec_table
$ show logical/table=lnm$process_directory
  (LNM$PROCESS_DIRECTORY)
  "LNM$GROUP" = "LNM$GROUP_000050"
  "LNM$JOB" = "LNM$JOB_8083F440"
  "LNM$PROCESS" [super] = "LNM$PROCESS_TABLE"
  = "ASR_SY_TABLE"
  "LNM$PROCESS" [kernel] = "LNM$PROCESS_TABLE"
  "LNM$PROCESS_DIRECTORY" [table] = ""
  "LNM$PROCESS_TABLE" [table] = ""

```

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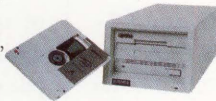


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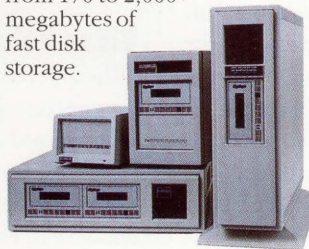


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P C DECWINDOWS

By Dennis Giokas And
Jim Peterson

What You Should Know When Writing DECwindows Applications For VMS And ULTRIX Systems That Display On MS-DOS PCs.

Many computer users and software developers are betting on the success of the X Window System, developed at MIT with funding and participation in part from Digital. The system not only provides the essential features common to all window systems, such as multiple application windows, color graphics and text, but also offers portability and a powerful networking architecture that allows for distributed processing. Functions performed by applications running on the local workstation — or on any processor across a network — are transparent to the user.

Digital's PC DECwindows program (its implementation of X for PCs) presents traditional Digital in-house and third-party software developers with a broad new audience. Through the use of the MS-DOS DECwindows Display Facility, software developers can write DECwindows applications for VMS and ULTRIX systems that will display on MS-DOS PCs.

The X Window System and DECwindows are based on the X11 network protocol, which makes it possible for applications to run on one computer while displaying on another. This is accomplished through an X server, which is software that operates on a workstation or PC. It lets you access X applications running on another computer such as a VAX or workstation.

You can write DECwindows applications for low-end X servers without sacrificing performance or function on the high-end X servers. If you're familiar with how the server operates, you won't have difficulty developing your DECwindows application for display on a PC.

X Servers

The X architecture defines a division of computing between the application and the soft-

ware driving the workstation. A client/server relationship is formed by this division (see Figure 1). The client application makes requests of the server and the server controls the display hardware, e.g., making a window appear on the screen.

In addition to performing graphics requests, the X server sends the keyboard and mouse events to the client. The server also sends window events such as exposures to the client (when part of a window is uncovered and the application must perform an update).

Thus, the X server can be thought of as a very smart terminal. However, it has more responsibility than a standard terminal, because it performs high-level graphics requests and manages connections to multiple applications. From the application's perspective, it's a "black box" that processes window and graphics requests.

Before an X application can make requests of an X server, it must establish a connection with the server. After that's established, the application and the server exchange information about their physical characteristics.

The split between client and server means that the application doesn't have to worry about writing to the physical device hardware. But the application occasionally must be aware of the physical characteristics of the device.

Video Values

When developing a DECwindows application, you needn't pay attention to the fact that it will be displayed on a remote computer. You must, however, consider the physical characteristics of the computer display, such as the aspect ratio and screen resolution.

Information about the the server's video characteristics, including screen size, number of horizontal and vertical pixels and number of colors, is available from the connection setup (when the application makes the connection with the server). From this information, the aspect ratio can be computed. The aspect ratio, which determines the squareness of the pixels, is the ratio of horizontal to vertical dots per inch.

Most video systems have a 1:1 aspect ratio, but some, such as the IBM Enhanced Graphics Adapter (EGA) and Hercules, have a 4:3 aspect ratio. Applications that must have their graphics rendered realistically on the screen must compensate for video systems that don't have a 1:1 aspect ratio.

An application can compensate for non-1:1 aspect ratio by multiplying the horizontal dimension of graphics by the aspect ratio or by dividing the vertical dimension of graphics by the aspect ratio. For example, if a 60 x 60 square is

desired, it can be achieved on a 4:3 video system by drawing a rectangle that has dimensions 80 x 60 or 60 x 45.

Special consideration should be given

super-VGAs can support an 800 x 600 resolution.

Most PCs don't have high-resolution graphics systems. However, there are

Windows are of little use if they aren't on the screen. The application should size and place its windows properly so that they're completely viewable.

to PCs that have low-resolution screens. The EGA video for PCs, at 640 x 350, is probably the lowest resolution useful for an X server.

The Video Graphics Array (VGA) and Multi-Color Graphics Array (MCGA), which are available on the IBM PS/2 and on most new IBM compatibles, offer higher a resolution at 640 x 480. Some

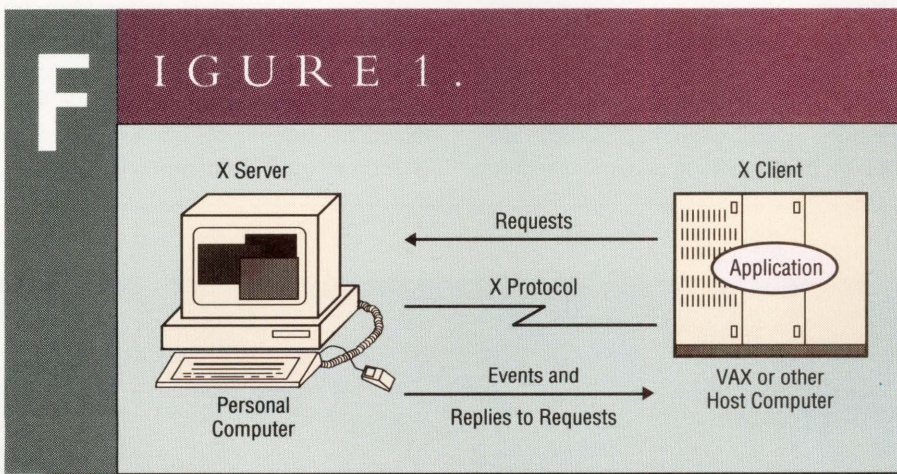
some exceptions for IBM-class machines. Princeton Graphic Systems, for example, has a 1,600 x 1,200 display adapter for PCs. This is a higher resolution than most workstations provide. Applications that are aware of the display resolution can compensate for low-resolution screens and take advantage of high-resolution screens.

Windows are of little use if they aren't on the screen. The application should size and place its windows properly so that they're completely viewable. This is particularly important for windows that aren't managed by a window manager. Fonts also can be selected to suit the screen resolution (see Box, "Low-Resolution Lowdown").

Bit And Byte Order

Among the most important information passed to the X server is the byte order of the client. This is needed by the server so it can interpret the data in the client's requests properly. If the byte order of the client is different from that of the X server, the server will swap bytes in the data as the requests come in. The application doesn't have to worry about this, because it's handled by the server after the connection is made.

The bit and byte order of images, on the other hand, must be handled by the client. As part of the connection information, the bit and byte ordering re-



X Window System architecture.

X Object	Memory
Window	1/2 KB
Graphic Context	1/4 KB
Pixmap	(X * Y * Z)/8 bytes
Font	5 to 15 KB

Approximate memory required on the server for commonly used X objects.

quired for images is supplied by the server. The application must take the server's bit and byte order into consideration when generating images to be displayed or when interpreting images captured from the server.

IBM-compatible PCs have the same byte order as the VAX and Digital's RISC computers, but the bit order within the bytes is reversed. The order of the bits within the bytes in an image must be reversed by the application for the server to display it correctly. Otherwise, the image on the screen will be distorted.

A Better Mouse

The mouse is the most common pointing device on X servers. It's reasonable for an X application to expect the server to have a mouse, but it shouldn't require that the mouse have three buttons.

A Microsoft mouse has two buttons, a Mac mouse has one. If an application requires the second and third buttons, you should provide an alternate keyboard sequence or menu commands. It isn't the server's responsibility to emulate a second or third button.

Some keyboards that are expected to interface with DECwindows applications (e.g., PC- and Mac-style keyboards) are different from the LK201 keyboard on

Digital workstations. Most PC and Mac keyboards have fewer keys than the LK201. Again, if your application uses a key that may not be present on all keyboards, you should provide an alternate key sequence or menu commands.

Many keys have different names and generate different KEYSYMs (a key symbol representing a key in X). Applications should provide the user with mechanisms to change key bindings and provide alternate mechanisms to perform functions, such as with a mouse.

Using Memory

Most X requests cause the server to allocate memory for new data structures. Because of this, the amount of memory required by the X server depends on the application. Figure 2 shows the approximate memory required on the server for commonly used X objects. The numbers can vary depending on the server implementation.

MS-DOS X servers are restricted to 640 KB for server code and data. This is adequate to run only some X applications, because this fixed amount of memory can be exhausted very quickly. Some servers make limited use of expanded memory or disk swapping, but it's difficult to manage these schemes without

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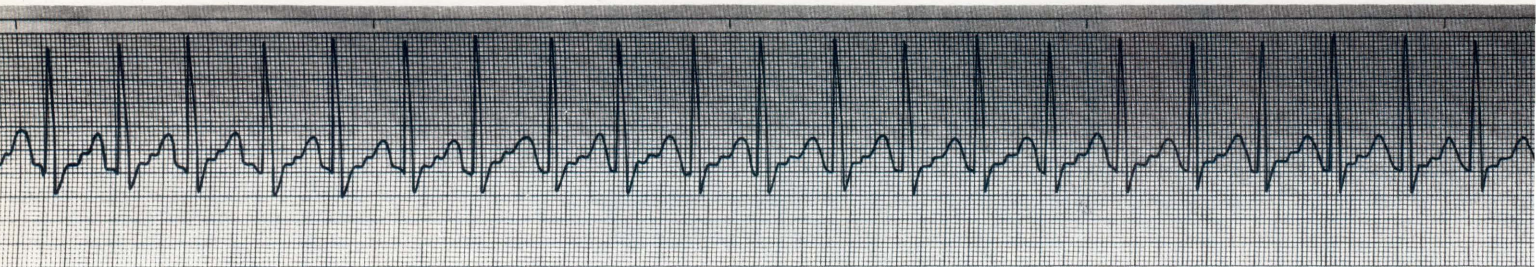
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Princeton Graphic Systems
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hardware assistance or a significant performance loss.

The wave of MS-DOS X servers that will hit the market next year will use DOS extenders to address extended memory (memory greater than 1 MB) directly and use the 80286 and 80386 microprocessors' virtual memory capabilities.

Virtual memory is better than no memory, but there's no substitute for physical memory. Even with virtual memory, performance will degrade with excessive swapping of code and data. The X server could even run out of virtual



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In other words, the company that proved that the VAX is the perfect platform for a

memory if the swap device were full. Therefore, applications shouldn't squander the X server's memory resource.

When an X server can't service a request because of memory limitations, it returns a BadAlloc error. Applications should watch for these errors and take appropriate action, such as indicating to the user that the application doesn't have sufficient resources to continue. Resources needed by the application to exit gracefully should be allocated when the application starts. If possible, an application may want to continue running with reduced functionality if a large data allocation fails.

PERSONAL COMPUTERS SOON will outnumber workstations as X display devices. They can compete with workstations in CPU performance and video resolution. With the emergence of DOS extenders as a viable means of providing virtual memory, PC-based X servers of the future will have few memory restrictions. PCs should be viewed as an opportunity for in-house and third-party software developers to reach a large base of users that otherwise would be missed.

High-end X displays will be the norm in the future. But don't neglect a very large installed base of PCs in the low-end

Low-Resolution Lowdown

Here's a checklist for developing PC DECwindows applications on low-resolution screens:

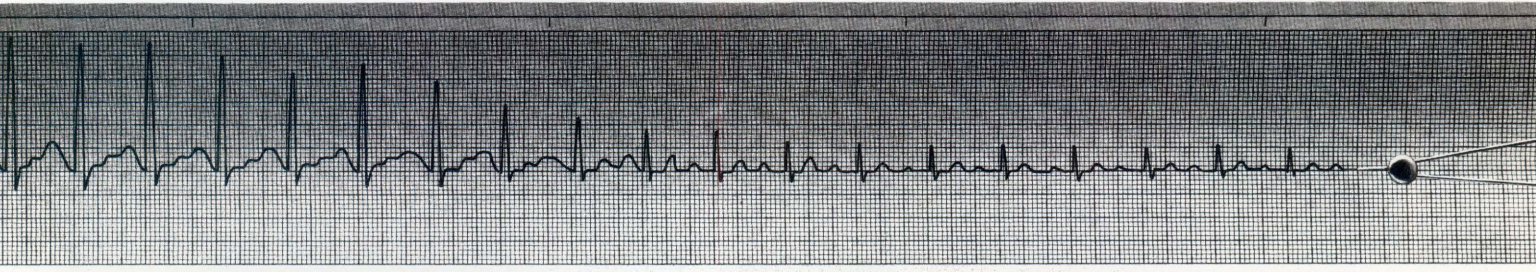
1. Is the application useable on a small screen? Does the user become so frustrated with it that he chooses not to use it?
2. Do all dialog and message boxes fit on the screen? When initially placed on the screen, are they completely viewable? Some boxes can't be resized. Are those in your application sized appropriately for the smallest screen? Are all the controls in these dialog boxes accessible to the user, particularly the command button to dismiss the dialog?
3. Are all menu commands accessible? Pull-down menus, pop-up menus and hierarchical submenus may get clipped by a screen boundary, depending on the window placement. Does your application or toolkit account for this? Does the main menu bar wrap if the window is too narrow to accommodate all the commands?
4. Are all push buttons accessible? Do push buttons in a button box wrap if the window is too narrow to accommodate all the buttons?
5. Some applications may create more than one top-level window. If so, is the user aware of this and can he move easily among these windows?
6. The window manager and/or application should configure the initial instance of a top-level window so that it's fully visible on the screen. Does the initial size and placement of the window account for screen geometry? Does the window manager let you move a nonresizable window about the screen, particularly dialog boxes, so that all parts of the window can be made viewable?
7. Are scroll bars presented when the window is smaller than the data being viewed?
8. Are pixmaps used by the applications aesthetically pleasing on small screens?

market. Make your applications user friendly by considering the low-end X server's device characteristics. —Dennis Giokas is principal software engineer and supervisor of the PC DECwindows Group, and Jim Peterson is principal software engineer for

Digital's Personal Computing Systems Group in Littleton, Massachusetts.

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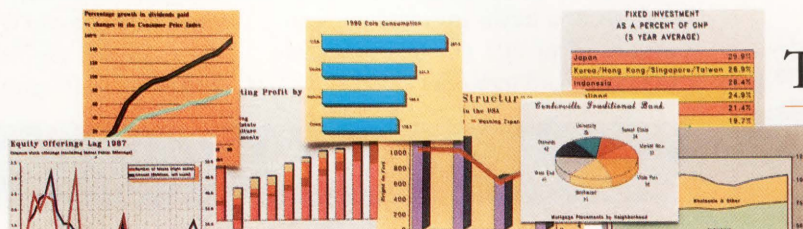
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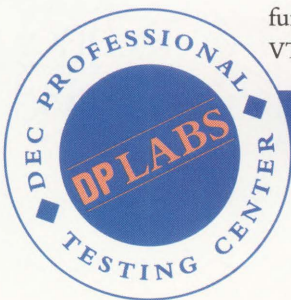
Consisting Of Five Different Terminal-Emulation Software Packages For PCs And Compatibles, Pericom's Teemtalk Provides A Full Range Of Features And Delivers Impressive Graphics.

Teem Players

Teemtalk, from Pericom of Lawrenceville, New Jersey, consists of five different terminal-emulation software packages for PCs and compatibles. These five software packages, Teemtalk-05/07/11/220/241, provide DEC VT52/100/220 terminal emulations. In addition, versions 05, 07 and 11 provide Tektronix emulations and version 241 supports ReGIS color graphics.

Teemtalk hardware includes Teemtext, a slot-in alpha card, and Teemtouch, a keyboard combining the functions of an IBM PC, Tektronix and VT220 keyboard into one.

We evaluated Teemtalk-07 software in the DP Lab using Pericom's MX 7000 series 80386-based PC with the Teemtext alpha card and the Teemtouch keyboard. Teemtalk-07 provides emulation of



GEORGE T. FRUEH

Tektronix 4010/4014/4207, DEC VT52/100 and partial VT220 terminal emulation. (Without the Teemtext alpha card, the VT220 terminal emulation doesn't support double-height/-width facilities.)

The Command Line

The command line for loading Teemtalk from MS-DOS may include options. Options begin with a hyphen (-) followed by a lowercase letter. All options must be separated by a space.

We placed our command line with options in a .BAT file called TTEXT.BAT. TTEXT.BAT consisted of:

```
tt07vp -a32,32,8 -kkeybustt.tek
-m500 -se:ttseg.mem -ctt07vp.nv
```

When TTEXT.BAT executed, the file tt07vp was loaded first. This is an executable file and specifies VGA display adapter.

The -a32,32,8 alignment option allows the graphics screen to be aligned against the alpha screen on the Teemtext alpha card. This parameter shifts the alpha screen right by 32 pixels and down by 32 pixels and selects color percentage 8.

The -k option specifies keyboard style and nationality. The first six letters after the -k option follow IBM PC keyboard-naming standards. The last two letters, tt, specify Pericom TEAMTOUCH keyboard type. The .tek following -kkeybustt is the

filename extension.

The -m option specifies the size of segment memory in KB increments. We specified 500 KB of segment memory.

The -s option allows specifications of an alternative DOS file to be used for extended segment memory storage. This is useful when more than one user is using Teemtalk on a shared network file system. The e: specifies logical drive e as a RAM disk, and the ttseg.mem is the segment memory name.

Finally, the -c option allows saving configuration setup parameters within a file. Our setup parameters were saved in tt07vp.nv.

Getting Started

When you load Teemtalk, a colorful sign-on banner appears briefly. This is followed by a blank screen with a blinking underline cursor in the upper-left corner. This is Teemtalk's Tek emulation mode.

Teemtalk provides a help screen when you load Teemtalk. You can enter these help screens at any time by pressing ALT-H, or view a brief summary of them by pressing ALT-?.

Teemtalk lets you suspend to DOS by pressing ALT-TD. To return to Teemtalk from DOS you type exit. Teemtalk uses ALT key combinations extensively to

enter and leave various modes.

Teemtalk has two setup modes: quick setup and primary setup. Quick setup mode is menu-driven and supported by help screens. You enter or exit it at any time by pressing ALT-V (see Figure 1).

The items HOST, TERMINAL, DIALOG, KEYBOARD, PRINTER, GIN and PPORT are located across the top row. You can use the page up and page down keys to highlight one of these seven items at a time. When you highlight an item, information pertaining to it is shown on the screen below in a series of fields.

In Figure 1, HOST has been selected from the top row of the menu. In the fields listed below, COM1 has been selected for host communications with a baud rate of 9,600. Characters transmitted contain one stop bit. You can change a selected item in a field with the arrow keys.

In Figure 2, TERMINAL has been selected. The second field, terminal emulation mode, shows that Tektronix emulation mode has been selected. Farther down, the screen shows that the terminal type to report to host is the Tektronix 4111. The quick setup mode section within Teemtalk's documentation explains each field for the seven menu items.

Primary setup mode isn't menu-driven and is designed for those who

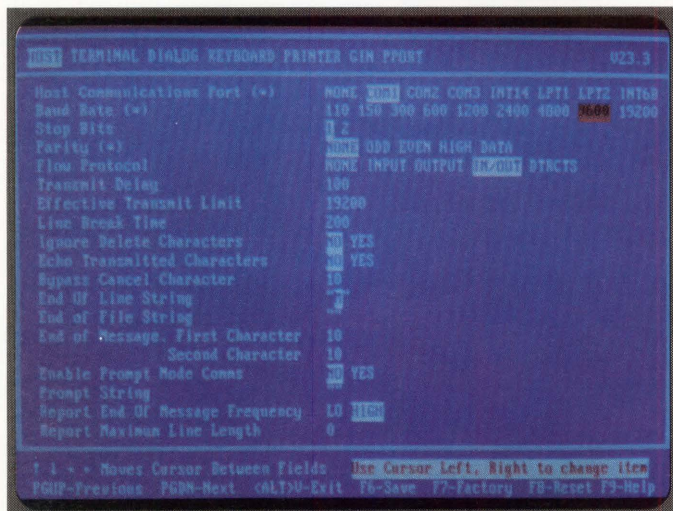


Figure 1: Teemtalk's quick setup mode screen with HOST selected.



Figure 2: Teemtalk-07 provides emulations of DEC VT and Tektronix terminals.

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(0908) 560022

FOUNDED: May 1985

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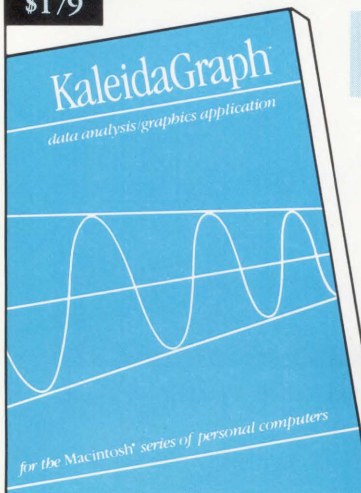
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have programming knowledge. You can enter or exit it at any time by pressing ALT-S. An asterisk (*) appears when you're in the primary setup mode. Tektronix escape codes can be entered here. A programmer's manual describing the function of all the primary setup commands is available separately from Pericom.

Graphics And Menus

Teemtalk-07 supports Tektronix color graphics. Figure 3 is an example of Tektronix graphics output produced using Uniras software.

Pressing ALT-R causes Teemtalk to prompt you for a command file to load. You load files with MS-DOS commands.

After you load a graphics file, you can manipulate it on the screen using Menu Mode. You can use a mouse or the keyboard arrow keys to select items within the menus.

The Zoom/Pan Menu, entered by

pressing ALT-M, provides CAD functions. You can use the ZOOM and VIEW functions together to select and enlarge a portion of a drawing, creating a new view.

The RESTORE function lets you restore up to four previous views in sequence. The OVERVIEW function redisplay the original view of an image after a ZOOM operation. The PAN function redraws an image using a selected point of the image as the center of the screen.

Other functions available within the Zoom/Pan menu are BORDER, VIEW-UP, VIEW-DOWN and DEFAULT.

The Color Menu lets you alter colors by changing Hue/Lightness/Saturation (HLS) or Red/Green/Blue (RGB) coordinates of a drawing. This menu shows the color index values and the index number for the color established by the cursor's current position.

Teemtalk-07 contains 157 predefined fill patterns that can be used by the FILL-PATTERN primary setup command for filling polygons.

Network Communications

Connection to a network host can be made through Ethernet simultaneously while loading Teemtalk or while the program is running.

Teemtalk supports network protocols such as DEC's LAT and CTERM and Network Research's Fusion. It also supports RS-232 and functions with networks operating via the MS-DOS INT14 driver, such as Novell.

We connected Pericom's MX 7000 PC running Teemtalk-07 via Datability Software Systems' Vista VCP-1000 communi-

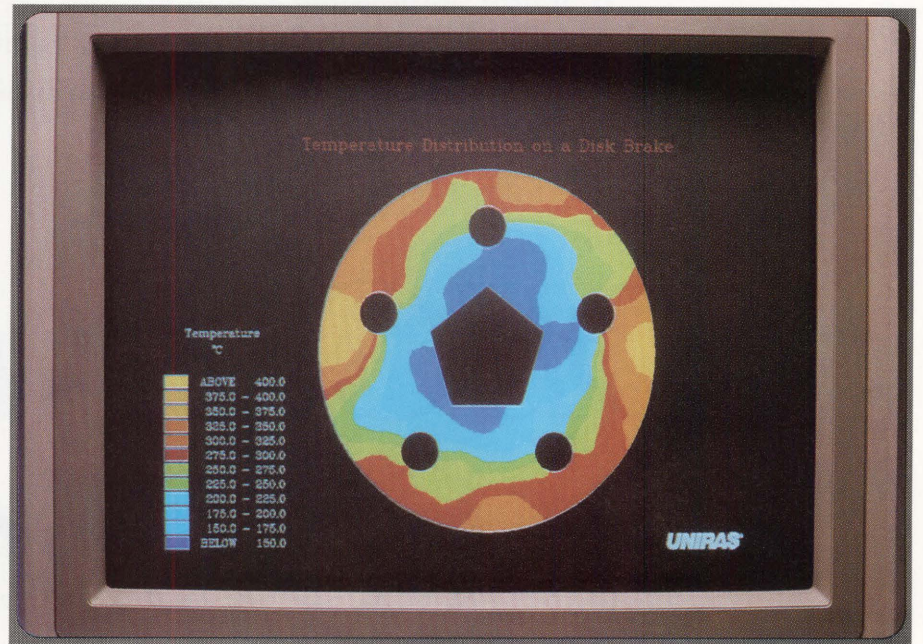


Figure 3: Sample screen display of Tektronix graphics.

cations server to our VAXcluster. Connection to the Vista server was made through the COM1 serial port of the PC using RS-232 with a data rate of 9,600 baud. The Vista server is connected to the VAXcluster via ThinWire Ethernet.

Teemtalk software will run on an IBM PC-AT 286/386, XT, PS/2 or compatibles running MS-DOS V2.0 or later.

Hardware requirements include a display adapter and monitor suitable for use with the version of Teemtalk software purchased. EGA and VGA display adapters must have a minimum of 256 KB of graphics memory. A minimum of 640 KB of system memory and a serial port for host communications are required.

To fully use the software capabilities of Teemtalk, Pericom recommends an

extra serial port for a mouse or digitizer and a parallel Centronics port for interfacing to a parallel printer. Teemtalk software contains serial printer drivers. Teemtalk supports a variety of mice and digitizers including the Microsoft-compatible IBM PC mouse and Summagraphics Bitpad Plus.

Teemtalk supports printers such as Tektronix's TEK4695, Hewlett-Packard's HP-LaserJet and Pericom's Inkjet MX132. You can configure mice and printers quickly using the quick setup menu.

The documentation is informative and describes in detail the software installation procedure, menu operations, setup modes, network communications and ALT key sequences. A problems-and-remedies section is provided in the appendix.

Teemtalk-07 is a straightforward, easy-to-use terminal-emulation package. The quick setup mode menu displays clear, uncomplicated screens. The Tektronix and ReGIS graphics renderings are colorful and impressive. If you're looking for a terminal emulator loaded with features and excellent graphics capabilities, you should consider Teemtalk. ■

Companies Mentioned In This Article

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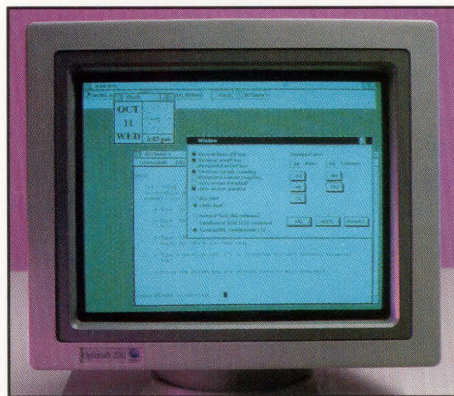
GraphOn Corporation's OptimaX 200 Gives You The Flexibility And Speed Of DECwindows While Occupying The Desktop Space Of A Terminal.

DECwindows on the Desktop

If you've used DECwindows, you probably have found it to be a great timesaver. You can open many windows on one screen, each running a different application.

With the OptimaX 200 system, GraphOn Corporation is helping to bring DECwindows capabilities to desktops. OptimaX 200 provides complete support of the X Window System version 11.

The system consists of an OptimaX 200 12 x 12 x 15-inch display device, a 7 x 12-inch keyboard, a mouse and the OptimaX software V1.0 running on the host. The display device incorporates the 68000 microprocessor and features a page-white 14-inch nonglare CRT, 800-x 600-line resolution and a refresh rate of 75 Hz. The system can be placed any-



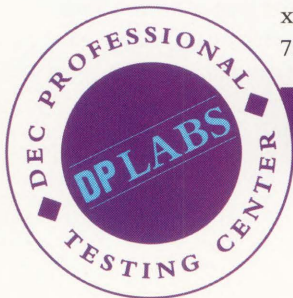
where you'd place a VT terminal.

Also available is a 512-KB memory option. This option provides more efficient font storage when running publishing application software and also is

targeted to provide support for the X Window Backing Store function by January 1990.

Installation

OptimaX software can be installed on any VAX running VMS V5.1 with DECnet and DECwindows installed. GraphOn recommends at least 6 MB of main memory for the first DECwindows user and 2 MB for each additional user. OptimaX software is distributed on TK-50 cartridge tape and nine-track 1,600-bpi magnetic tape. We used the



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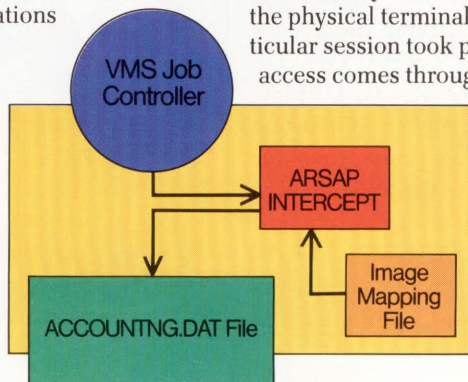
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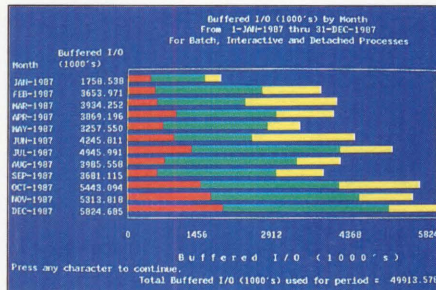
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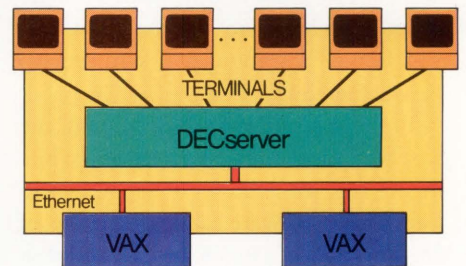
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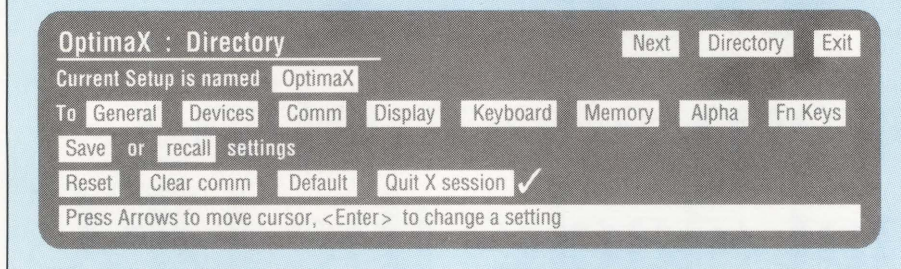
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Figure .



Setup mode on the OptimaX 200.

nine-track magnetic tape for our software installation.

GraphOn provides complete software installation instructions in its *Tape Installation Guide*. After you're logged into the SYSTEM account, you can install the OptimaX software. It requires 1,000 blocks of disk space, one global section and 650 global pages. GraphOn recommends using the system disk (SYSSYSDEVICE).

To run DECwindows, your Pipeline quota must be set to 10,000. The OptimaX server communicates with clients via DECnet links.

In the traditional X environment, the X server runs on a workstation, while clients run on a host on the network. The server software takes advantage of the workstation's memory and local disk capacity.

As a terminal, the OptimaX 200 has no local disk, nor does it have limitless memory. Therefore, GraphOn split the X server into two parts. Low-level drawing functions and mouse and keyboard management are done by the terminal. The remaining server functions, such as window management, network communications and X protocol handling, are placed on the host. So in the OptimaX 200 world, host systems handle clients and high-level server functions.

Those using DECwindows with OptimaX software may need authorization quotas adjusted. GraphOn recommends minimum quotas for each OptimaX user.

Those who want to use the OptimaX 200 should include the following com-

mand in their login command procedures:

```
@xgo_root:[bin]login
```

An on/off switch, AC power cord connection and three serial ports labeled A, B and C are located on the back of the OptimaX 200 terminal. Technical specifications and pinout descriptions of the ports are explained in the *User's Guide*.

All three serial ports conform to the EIA RS-232-C specification. Port A, a male DB-25 connector with 16 active pins, is the default port for host communication. Port B, a male DB-25 connector with nine active pins, is the default port for an input device such as a mouse. Port C, a male DB-9 connector with six active pins, is the default port for a serial printer.

The OptimaX 200 can be connected to the host using a standard RS-232 interface, a terminal server or modem.

Terminal Setup

The OptimaX 200 first executes its startup self-test routines, followed by a blinking cursor in the top left corner of the screen.

To access terminal setup mode, you press F3 (see Figure). Setup mode consists of eight setup screens: General, Devices, Communications, Display, Keyboard, Memory, Alpha and Function Keys. Setup screens are positioned along the bottom six rows of the screen display.

You select a setup screen by using the number keys along the top row of the keyboard or by using a mouse. For example, to access the Communications

setup screen, press 4.

The OptimaX Directory provides a quick way to access the setup screens with a mouse and enables you to save and recall terminal parameters. To select a setup screen with a mouse, position the cursor over the desired setup name from the OptimaX Directory and press one of the mouse buttons.

Communications setup lets you specify baud rate, word size, parity and half- or full-duplex for each of the three ports. Alpha setup establishes all functions unique to VT100/220 emulations. The setup screens and their parameters are fully described in the *User's Guide*.

Using DECwindows

After the OptimaX 200 has been set up to communicate with your host, log in and type STARTLOGIN from the DCL prompt. The OptimaX 200 displays the familiar DECwindows start session screen. From here you type your username and password.

The screen blanks and a small watch appears until DECwindows' Session Manager and FileView are displayed. The watch becomes a screen pointer that's manipulated using the mouse. You're now in the world of DECwindows.

We connected the OptimaX 200 to our VAXcluster via a Xyplex communications server. Connection to the Xyplex

OptimaX 200

PLATFORMS: DEC system running VMS
DECwindows

PRICES: \$1,395. Three-button mouse, \$125;
512-KB factory-installed memory option, \$295;
10-foot RS-232 cable for VAX, \$35; OptimaX
software for VAX/VMS, \$395

GRAPHON CORPORATION

HEADQUARTERS:
1980 Concourse Dr.
San Jose, CA 95131
(408) 435-8400

FOUNDED: 1982

PRODUCT LINE: Monochrome and color
terminals

CIRCLE 472 ON READER CARD

FROM THE LAB

server was made using port A of the OptimaX 200. Our serial data format consisted of eight data bits, no parity and one stop bit.

A MicroVAX II VAXcluster member served as the host for the OptimaX 200. We experimented using 9,600 and 19,200 baud between the Optimax 200 and the host and found our waiting time to be nearly halved when operating at the higher baud rate.

Following the creation of Session Manager and FileView, we created a terminal window and several DECwindows applications. Terminal response time was lengthy while creating the terminal window and applications. We attribute the delay to running DECwindows on a 1-mip MicroVAX II and not the performance of the OptimaX 200. For efficient response time, GraphOn recommends a higher-mip host when running DECwindows.

The OptimaX 200 provides VT100/220 emulation and supports such graphic

input devices as the GraphOn mouse, Summagraphics' MM1201 digitizer and Summamouse. We used the GraphOn mouse and found it more difficult to zero in on icon boxes with the pointer than with the standard corporate mouse.

A serial printer can be attached to any of the serial ports. You use the setup mode to configure the protocol that will be used with the printer. Printers supported include the LA-50/75 and LN03, HP LaserJet+ and Okidata 192/193.

A single OptimaX 200 terminal can be configured to communicate with three hosts using the three serial ports, although only one host can be accessed at a time. This is done by cabling from the hosts to the OptimaX 200's serial ports. When you want to change hosts, redefine the port connected to that host as the main port using setup mode. You can't change hosts in the middle of a DECwindows session, because DECwindows puts the terminal in a unique configuration.

Function keys can be programmed

Okidata
532 Fellowship Rd.
Mount Laurel, NJ 08054
(609) 235-2600

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Summagraphics Corp.
60 Silvermine Rd.
Seymour, CT 06483
(800) 221-9244

CIRCLE 474 ON READER CARD

Xyplex Inc.
330 Codman Hill Rd.
Boxborough, MA 01719
(508) 264-9900

CIRCLE 475 ON READER CARD

with escape sequences to download setup with a new main port. An appendix in the *User's Guide* provides a summary of these sequences.

WHETHER YOU'RE THINKING about increasing your number of DECwindows users or you're a newcomer to the world of windows, the OptimaX 200 will link you to multiple concurrent programs through the power of DECwindows. ■

Allied Telesis adds more functionality in the DECnet environment.

Allied Telesis is a specialist in Ethernet building blocks, adding more modular plug-in functionality and allowing more configuration options. Allied Telesis AT-5000 is a unique Multimedia Concentrator offering IEEE 802.3 Ethernet based repeaters, transceivers, fiber optics and MAC layer bridge options. Repeater and transceiver modules can be mixed within the same chassis. ATI also offers single, dual, and multiport transceivers and repeaters.



Allied Telesis Inc.

627 National Avenue
Mountain View, CA 94043
(415) 964-2771
FAX: (415) 964-0944

Excellence in Connectivity

MAC-LEVEL
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REPEATER
CENTRE.COM
5000
DELNI
EQUIVALENT

CIRCLE 358 ON READER CARD

DIGITAL WATCH

Evan Birkhead

The Mainstream Mainframe

If you read the fine print in DEC's media blitz following

the VAX 9000 announcement, you may have noticed a few discreet changes. Somewhere along the line, the company stopped calling itself "the world's second-largest computer manufacturer" and started using the bolder "the world's leading manufacturer of networked systems." Although the earlier moniker openly acknowledged IBM's superiority, the newer calls attention to DEC's dominance in its home territory, departmental computing.

With the computer industry starting to rebound from a decline, the fundamental message DEC needs to impress on this multivendor world is its networking prowess. Currently, DEC is attempting to translate its success at the departmental level into sales in the corporate data center using much the same strategy it used at the midrange. That means networking, clustering and, perhaps most significantly, the interoperability of dissimilar databases and applications.

The nuclear warhead in DEC's arsenal is the VAX 9000 mainframe. The VAX 9000 fits into networks, expands like any VAX, with SMP, and can be clustered with a new CI interface technology called the CIXCD. Using a combination of CISC and RISC concepts, most instructions can execute in one 16 ns cycle (see Figure 1).

Although the VAX 9000 doesn't use a traditional mainframe architecture, calling it a mainframe is fair, because the federal government has specified a legal definition of mainframe based on bandwidth size and I/O throughput speeds, which the VAX 9000 exceeds. In fact, when fitted with its late-to-materialize

vector processors, the VAX 9000 will meet the government's definition of a supercomputer, according to DEC President Ken Olsen.

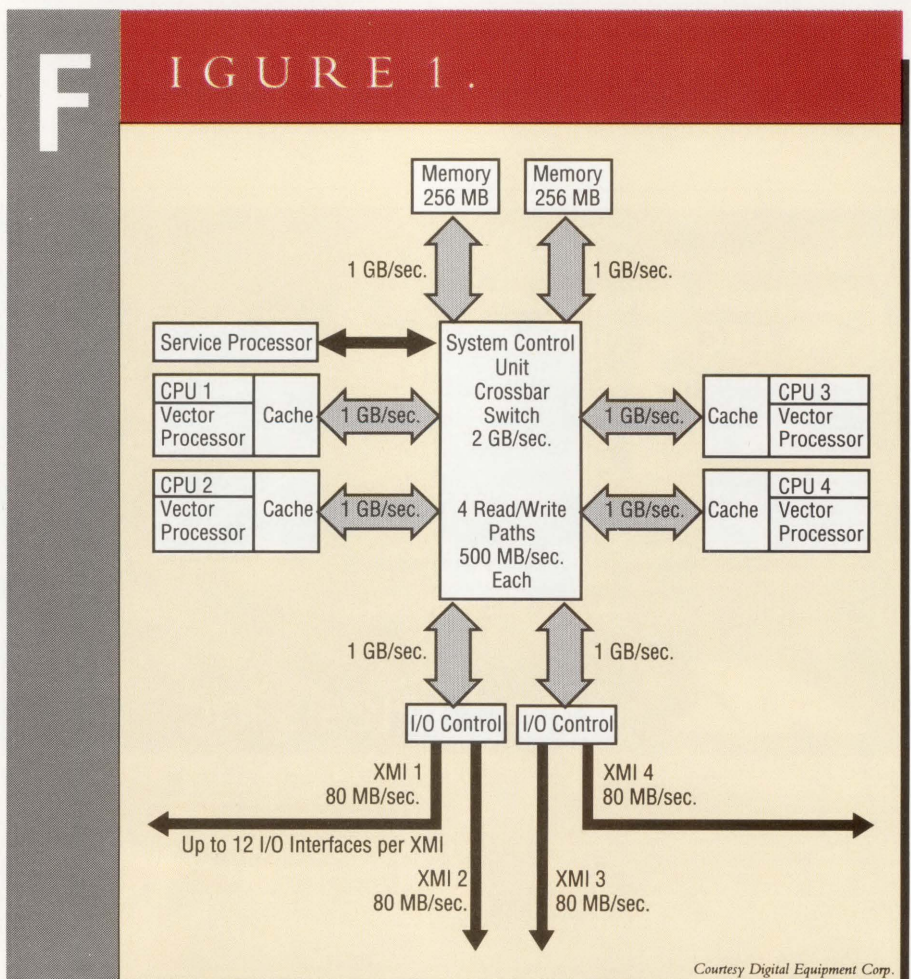
DEC must promote the mainframe buzzword, because the company now is readily identifiable only with the midrange. Further, mainframe suggests commercial data processing capabilities that exponentially exceed midrange throughput.

The low-end VAX 9000 Model 210

operates at 30 VUPS, while the top-of-the-line quad-processor Model 440 attains 117 VUPS (see Figure 2). With add-on vector processors, the systems will rival IBM's 3090 line for less than half the price in many cases.

Battling IBM

The corporate data center is the Big Blue jugular. On the day of the VAX 9000 introduction, IBM tried to steal the stage by announcing 3090s with an 8 percent in-



The VAX 9000's internal system "bus" is a crossbar switch control unit capable of four simultaneous 500-MB-per-second data transfers.

crease in processing power, twice the storage capacity and memory on 4-mega-bit chips. A new generation of IBM mainframes isn't expected for more than two years.

But DEC, which is less than one-fourth the size of IBM, won't dent IBM's armor with even a large penetration into the market. Estimates of IBM's control of the mainframe-class user market reach 90 percent, and estimates of its dominance in OLTP, the fastest-growing mainframe market segment (and practically the only segment growing at all), reach 70 percent. Aside from the VAX 9000, DEC claims a \$2.5 billion transaction processing market share. Tandem is the only other notable player in the OLTP arena.

DEC will compete against IBM for only a small share of the flat mainframe market. But as Olsen is quick to remark, the market is huge. "Instead of batch, everything is more and more transaction processing," he insists.

At least initially, DEC will target mainstream DEC customers, not IBM customers. Anticipated sales to between 10 and 20 percent of its existing user base alone will mean large profit margins for the VAX 9000 product line in fiscal year 1990. DEC's strategy is to pursue OLTP and scientific numbers-crunching sites, and it should find the most eager check-writing audience among its own user base. Many customers are outgrowing their VAX 6000-based clusters right on cue.

But DEC executives confess to bigger thinking. DEC is confident it can penetrate the IBM data center for two reasons. First, VAXcluster technology already has put DEC on the map at many predominantly IBM sites. The *Fortune* 1,000 companies live in a multivendor world, and IBM and DEC overlap in virtually all 1,000. Second, DEC has established a degree of software and hardware connectivity with IBM 3090 mainframes and databases that surpasses the level of interoperability IBM has achieved with its own midrange.

Midrange customers that have grown

Industry Watch

First-Quarter Earnings — Despite forecasts to the contrary, revenues for DEC's first quarter of fiscal year 1990 were up 6 percent over last year, although earnings dropped. The hot-selling MicroVAX 3100 was afforded much of the credit.

VAX Upgrades — After a whirlwind year of redefining its entire line of processors, DEC established a pricing schedule for upgrading existing software/hardware licenses to the MicroVAX 3000 and VAX 6000. The program already is being implemented by the field service division. The upgrades are designed for the installed base of the MicroVAX II and 2000, the 11/7xx series and the VAX 82xx/83xx. Prices start at \$12,600 to upgrade to the MicroVAX 3000 and at \$126,000 to move to the VAX 6000.

IBM Makes Its CASE... — IBM's new application development strategy for SAA, called AD/Cycle, brings IBM up to par with DEC's CASE/IS as an all-encompassing approach to automating the application development life cycle. The initial implementation is on the PS/2, but the midrange is expected to follow in the summer.

IBM established AD/Cycle business partnerships with more than 30 software tools and services vendors, including a handful better known in the DEC market. These include Index Technology, which makes the Excelerator series of CASE products, and Cadre Technologies, which offers a version of Teamwork for OS/2. IBM also acquired a minority equity position in Index Technology.

Index Technology and Cadre are integral figures in DEC's CASE partnership program. The message was clear and repercussions were felt within DEC — IBM intends to become a competitive applications software player.

...And DEC Responds — Within a few weeks, DEC responded to the CASE challenge by announcing a series of software improvements to its CASE platform:

- DECdesign V1.0 is an object-oriented graphical design package for the front end of the CASE life cycle.

- VAXset V9.0 features a new program design facility.

- DATATRIEVE V5.0 runs DECwindows.

OSI In The Sky — IBM and DEC have become voting members of the OSI/Network Management Forum, bringing the number of members to 15. The organization is developing networking standards.

The first test of the International Standards Organization's (ISO) Open Systems Interconnect (OSI) applications running on an Integrated Services Digital Network (ISDN) was conducted at the Mather Air Force Base, California, by the National Institute of Standards and Technology (NIST). The experiment successfully executed messaging and file transfer applications among several LANs and a WAN. The ISDN standard is used to send and receive voice, data and pictures simultaneously over the same line.

NIST's OSINET is an experimental network that's testing commercial products for OSI compatibility, and NIST is maintaining a database of the compliant products. DEC, IBM, HP and Unisys are participating.

License To Sell — EMC now offers a three-year warranty on its VAX-compatible disk-drive series. One-year warranties in the subsystem industry became commonplace during 1986 and 1987.

Everything Under The Sun — Sun Microsystems recently made available the specifications for the SBus, the high-powered bus architecture of the SPARCstation 1. The specs, which will permit the development of add-in boards and processors, are without licensing restriction. For \$300, developers can obtain the specs with design principles and protocols, guidelines for writing UNIX device drivers and application notes with examples of slave and master interfaces. Sun reports that more than 125 companies are looking into the technology. Are you listening, VAXBI purveyors?

Evolution of the i860 — A method of parallel processing on the Intel i860 microprocessor has been developed by Intel and supercomputer vendor Alliant Computer Systems. The Parallel Architecture Extended (PAX) software is an extension of the i860's binary library, plus a rule set for developing parallel applications for the i860.

Sequential To Parallel — Two distinct technologies from separate vendors have emerged that allow applications written for sequential software programs to run on parallel architectures. The solutions, conversion tools from Scientific And Engineering Software (SES) and Concurrent Computer, restructure software inherent to parallelism and optimize language tools such as FORTRAN and COBOL. The systems may affect the future of many existing commercial applications. Concurrent's E/SP runs on the Concurrent 3200 family of multiprocessors. SES' SEPAR is based on an existing set of high-level software modules.

Companies Mentioned In This Article

Alliant Computer Systems Corp.
1 Monarch Dr.
Littleton, MA 01460
(508) 486-4950
CIRCLE 432 ON READER CARD

Cadre Technologies Inc.
222 Richmond St., Ste. 301
Providence, RI 02903
(401) 351-5950
CIRCLE 516 ON READER CARD

Computer Associates Int'l Inc.
711 Stewart Ave.
Garden City, NY 11530
(516) 227-3300
CIRCLE 517 ON READER CARD

Concurrent Computer Corp.
106 Apple St.
Trinton Falls, NJ 07724
(201) 758-7000
CIRCLE 518 ON READER CARD

EMC Corp.
171 South St.
Hopkinton, MA 10748
(508) 435-2541
CIRCLE 519 ON READER CARD

Index Technology Corp.
1 Main St., 9th Fl.
Cambridge, MA 02142
(617) 494-8200
CIRCLE 535 ON READER CARD

Intel Corp.
3065 Bowers Ave.
Santa Clara, CA 95051
(408) 987-8080
CIRCLE 534 ON READER CARD

McCormack & Dodge
1225 Worcester Rd.
Natick, MA 01760
(508) 655-8200
CIRCLE 536 ON READER CARD

Scientific and Engineering Software Inc. (SES)
1301 W. 25th St., Ste. 300
Austin, TX 78705
(512) 474-4526
CIRCLE 537 ON READER CARD

Scientific Micro Systems Inc.
777 E. Middlefield Rd.
Mountain View, CA 94043
(415) 964-5700
CIRCLE 538 ON READER CARD

Sun Microsystems Inc.
2550 Garcia Ave.
Mountain View, CA 94043
(415) 960-1300
CIRCLE 539 ON READER CARD

Tandem Computers Inc.
19333 Valico Pkwy.
Cupertino, CA 95014
(408) 725-6000
CIRCLE 558 ON READER CARD

UIS Inc.
6600 Katella Ave.
Cypress, CA 90630
(714) 895-1633
CIRCLE 541 ON READER CARD

Unisys Corp.
P.O. Box 500
Blue Bell, PA 19424
(215) 542-4011
CIRCLE 540 ON READER CARD

to require mainframe-style systems should prefer to upgrade their systems with clusterable VAXs rather than with a separate IBM environment. Because mainframe system tuning and applications are different ball games from midrange tuning and applications, DEC has allied itself with software names that are familiar to IBM customers, such as Computer Associates, McCormack and Dodge, and Andersen Consulting.

Trickle-Down Theory

The best news about the VAX 9000 for the majority of DEC's customers — those with less than \$1.2 million in their wallets — is that the breakthrough technologies that made the mainframe possible will begin to appear in affordable VAXs during the next year.

Some probable contenders:

1. Multichip Units (MCU) — Faster data rates on a cooler, smaller chip were made possible by a breakthrough in semiconductor packaging. DEC's High-Density Signal Carrier (HDSC) performs the functions of four PCBs in the VAX 9000 in a 4 x 4-inch area. They're mounted on path connectors called MCUs.

2. System Control Units (SCU) — The VAX 9000's SCU is the CISC/RISC 2-GB-per-second crossbar switch shown in Figure 1. "The high-speed switch of our high-end architecture will begin to be used in our midrange," reports DEC technical consultant Joe Zeh.

F

FIGURE 2.

VAX 9000 Model	210	410	420	430	440
VAX 9000 Processor					
Relative Performance x VAX 11/780	30	30	Up to 59	Up to 88	Up to 117
Processor Cycle Time	16 ns	16 ns	16 ns	16 ns	16 ns
Number of Processors	1	1	2	3	4
Processor Technology	ECL/MCU	ECL/MCU	ECL/MCU	ECL/MCU	ECL/MCU
Memory					
Max. Memory Supported	512 MB	512 MB	512 MB	512 MB	512 MB
Min. Memory Supported	256 MB	256 MB	256 MB	512 MB	512 MB
Architectural Max. Memory Limit	2 GB	GB	2 GB	2 GB	2 GB
Max. Memory Bandwidth	2 GB/sec.	2 GB/sec.	2 GB/sec.	2 GB/sec.	2 GB/sec.
Memory Type	ECC	ECC	ECC	ECC	ECC
I/O Bus Capacity					
Max. I/O Throughput	80 MB/sec.	160 MB/sec.	160 MB/sec.	320 MB/sec.	320 MB/sec.
XMI Channels	1	2	2	4	4
XMI Slots	12	12	24	48	48
Max. VAXBI Channels	4	8	8	14	14
Max. VAXBI Slots	20	40	40	70	70
Mass Storage Capacity					
Max. Local Disk Capacity	48 GB	105 GB	105 GB	220 GB	220 GB
Max. VAXcluster I/O Servers (HSCs)	150	150	150	150	150
Vector Processing					
VAX 9000 Model	210VP	410VP	420VP	430VP	440VP
Max. Vector Processors Supported	1	1	2	3	4
Peak Vector Performance (Mflops)	125	125	250	375	500
Vector Performance (Linpack 100 x 100 DP)	18	18	n/a	n/a	n/a
Vector Performance (Linpack 300 x 300 DP)	40	40	n/a	n/a	n/a
Vector Performance (Linpack 1,000 x 1,000 DP)	80	80	158	235	312
VAX 9000 Model	210	410	420	430	440
Scalar Performance (Linpack 100 x 100 DP)	8	8	n/a	n/a	n/a
Communications					
LAN Support	Standard	Standard	Standard	Standard	Standard
Max. Ethernet Adapters	4	8	8	16	16
Starting Price	\$1,240,000	\$1,690,000	\$2,220,000	(Upgrade)	\$3,920,000

VAX 9000 pricing and estimates for selected specifications.

Courtesy Digital Equipment Corp.

3. The CIXCD Interface — It runs on the XMI and expands with multiple star couplers.

4. A new memory structure — The VAX 9000's high-performance memory has a capacity of 512 MB (with dual MS900-BA boards) and a read/write bandwidth of 2 GB per second. This helps it integrate with the new vector processors. It uses 1-megabit DRAMs on up to four 64-MB extended hex memory modules.

BESIDES THE VECTOR boards, DEC also introduced several key peripherals that will come standard with the VAX 9000 (see Figure 3). These include a disk striper that increases transfer speeds to 80 MB per second and the KDM70 controller, which runs disk and tape drives. A flurry of advanced system software programs accompanied the release of a new version of Rdb (see Figure 4).

Sixty major applications software producers in the DEC market announced plans to support the VAX 9000, but the intent of the list was only to generate publicity. The fact is that any of the 6,500 available VAX applications should run virtually unmodified on the new platform.

The warranty and personnel support are extensive, even by DEC standards, and may be difficult for the company to meet in light of recent internal attrition. Every Support Implementation Plan will be negotiated individually but inevitably will involve an expensive handful of on-site DEC staff for planning, training and system management.

The VAX 9000 Model 210 will ship in the spring, and the higher-end versions and vector processors won't be available until late summer. Although this delivery schedule is disappointing, the VAX 9000's influence should be felt this year. Olsen feels the credit should be attributed to the much-maligned VAX/VMS: "The software, the operating system is what the people buy," he explains. "It's the software that measures the company. The VAX [9000] is just the implementation of it." ■

FIGURE 3.		
Product	Description	Price
Integrated Vector Processor	With 63 new vector instructions and support for up to 6 VAXBI channels, this single-board option is ready for the VAX 6000 and eventually will be available for the VAX 9000.	\$57,000 and up
KDM70 Disk/Tape Controller	For the VAX 9000's XMI bus, this contains SA-series storage, an (IBM) TA90 tape drive, two RA90s and an ESE20.	\$23,700 and up
VAX Disk Striping Driver	For VMS systems, this device adds parallel I/O to DSA standard disks and controllers for improved throughput.	n/a
CIXCD VAXcluster Interface	Connects the VAX 9000 to existing VAXclusters via the CI interface from an XMI slot. Features a 4x performance increase over the CI.	\$35,000
LANcontroller 400	XMI-compatible Ethernet controller with a CVAX processor designed for the VAX 9000.	\$7,000
DECserver 250	Ethernet LAN server for multiple parallel and serial printers. Available in VMS and ULTRIX versions.	\$4,025

Pricing schedule of peripherals introduced for the VAX 9000.

FIGURE 4.		
Product	Description	Price
VAX Data Distributor V2.1	For Rdb/VMS or DB2, this subset distributor now features SQL database transfer management.	From \$803 to \$36,682
VAX FORTRAN high-performance option V1.0	Enhances the FORTRAN compiler with vectorizable code. For use with the new vector boards.	From \$289 to \$9,832
Rdb/VMS V3.1	Supports VIDA for DB2 and can be stored on CD-ROM.	From \$2,817 to \$128,456
V-X PACS	System management and resource accounting package available from DEC or UIS, the program's producer.	n/a
Data Center Monitor V1.1	Monitors VMS and non-VMS network activities, including network, system, process and external, from one terminal.	Dependent on Configuration
Digital Extended Math Library (DXML)	For use with the new vector boards, includes basic scientific and engineering subroutines. For VMS and ULTRIX.	n/a

Pricing schedule of system software introduced for the VAX 9000.

C++, Without The Hype

Editor's note: This month, C Editor Rex Jaeschke introduces us to the much publicized language C++. Along with his usual technical discussion, he includes a few of his

own (sometimes tongue-in-cheek) opinions. This is the first of a series of articles on this subject. Future columns often will contain C and C++ sections.

Every four or five years we're inundated with facts and opinions about some new software technology that will "save us all." We're up to our necks in hype about UNIX and C. We had a spell during which artificial intelligence was on top, but now the real savior has arrived: the C++ language.

C++ isn't just a better version of C. Rather, it will give us nice quality assurance tools built into a language and will force us to write well-structured code. Not only will we be able to do all of those quick and dirty low-level things as in C, but we'll also be able to master the concepts of data abstraction and more easily handle the complexities of large project management, debugging and maintenance.

The claims above aren't mine. Whenever I investigate a new software phenomenon, I'm skeptical. I'm no less so with C++. I'm not converted. But I'm becoming an active participant, because many of my consulting and seminar clients ask about C++.

Language Lesson

In the early 1980s, Bjarne Stroustrup, a researcher at AT&T's Bell Labs, wanted a version of C that provided something he called classes. For our discussion, a class is a user-defined object much like a structure in C. However, not only can we define the subparts of a class object, we also can declare information about which functions can operate on that class.

Stroustrup was influenced by the language Simula67. He also borrowed from C's ancestor BCPL and a little from Algol68.

According to promotional literature, "C++ is a superset of C that retains the efficiency and notational convenience of C while providing facilities for type checking, data abstraction, operator overloading and object-oriented programming."

For most of its life, C++ has been implemented as a preprocessor that accepted a C++ source program and translated it into a C source program. Then you compiled and debugged that C source. If C++ produces C, why can't you do the job in C to begin with? It isn't that simple, because the C generated isn't necessarily pretty. It's better to work in a higher-level language and have it expand into the underlying primitives rather

than work with the primitives directly.

The preprocessor approach is changing, however, as more native compilers are introduced. They produce object code directly. Also, numerous vendors of C++ translators are hard at

“

...C++ is here to stay as a tool for implementing object-oriented programming.

”

work on native-mode debuggers. Some have had to write new or modify existing linkers, because C++ can require fairly long unique external names for identifiers, particularly functions.

Let's Speak English

Throughout this series, I'll try to remain practical by showing small code fragments and explaining how they differ from C and the advantages and disadvantages of each. If you have access to a C++ implementation, you can play along with me. If you don't, that's no big deal, because if you know C, you can extrapolate somewhat. Of course, there's no substitute for trying it yourself. (For the most part I'm using Zortech C++ on a 386 running DOS.)

I'll avoid verbose terminology. The term object-oriented programming appears everywhere in the literature, but it's explained using other equally obscure terms. Words such as polymorphism, multiple inheritance and derived classes aren't what working programmers and designers understand or need to know.

A few months ago, a fellow C columnist also was investigating object-oriented programming. He was having difficulty with the basic definitions and asked anyone who came across an object to send it to him so he could learn what an object was. I feel the same way at times. However, thoroughly understanding what C++ stands for isn't a prerequisite to understanding this series.

It's clear from the user and vendor momentum that C++ is here to stay as a tool for implementing object-oriented programming. With the advent of an ANSI (and probably ISO) C++ standard, the discrepancies among implementations should dis-

appear. AT&T recently defined C++ V2.0 and rewrote accompanying documentation. This new release probably will serve as the basis for any standards activity.

The fact that major software development companies such as Apple, Microsoft and DEC are getting involved as vendors or users of object-oriented tools has added credence to the idea that this isn't a short-term venture.

Introduction To Classes

A class is one of the main concepts underlying C++. Put simply, a class is a special kind of structure. It's best explained by example:

```
// Structures versus classes

#include <stdio.h>

struct circlea {
    long xorigin;
    long yorigin;
    unsigned long radius;
};

class circleb {
public:
    long xorigin;
    long yorigin;
    unsigned long radius;
};

main()
{
    static struct circlea circle1;
    circleb circle2;

    circle1.xorigin = 5;
    circle2.yorigin = 6;

    printf("circle1.radius = %lu\n", circle1.radius);
    printf("circle2.radius = %lu\n", circle2.radius);

    printf("sizeof(struct circlea) = %lu\n",
        (unsigned long) sizeof(struct circlea));
    printf("sizeof(class circleb) = %lu\n",
        (unsigned long) sizeof(class circleb));

    printf("sizeof(circleb) = %lu\n",
        (unsigned long) sizeof(circleb));
}

circle1.radius = 0
circle2.radius = 158337394
sizeof(struct circlea) = 12
sizeof(class circleb) = 12
sizeof(circleb) = 12
```

A class is defined much like a structure, except the **class** keyword is used instead. When I talk about what a structure looks like, I use the term template, reserving the term structure for an object of such a type. However, this isn't needed with C++, because a class only applies to a type and never can be confused with an object of that class type. Therefore, class always refers to the type declaration, never to an actual object.

One difference between C and C++ is that C always requires the use of the keyword **struct** (or **union**) when referring to a structure (or union) type. In C, the type of **circle1** is **struct circlea**. In C++, the keyword **struct** can be omitted, although

C++ Compiler Vendors

AT&T
185 Mount Hope Church Rd.
McLeansville, NC 27301
(919) 279-7000
CIRCLE 525 ON READER CARD
Product: AT&T C++ source license

Cobalt Blue
2940 Union Ave., Ste. C
San Jose, CA 95124
(408) 723-0474
CIRCLE 526 ON READER CARD
Product: FORTRAN-to-C/C++
converter FOR_C++
Platforms: Sun-3 and XENIX/386

Comeau Computing
91-34 120th St.
Richmond Hill, NY 11418
(718) 849-2355
CIRCLE 527 ON READER CARD
Platforms: XENIX, UNIX

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in this example it isn't. The keyword **class** can be omitted (and is) when declaring an object of that type. This feature lets the programmer use user-defined types more naturally by using their type name without the preceding **struct**, **union** or **class** keyword.

One potential problem with structures is that any code in their scope can access the structure as a whole, as well as accessing all members directly by name. The code can freely access them indirectly, given a pointer. For example, all parts of a global structure are available to all functions without qualification. Similarly, all parts of a static structure defined outside a function are available in the parent source file. C provides no way to limit who can access members within that structure.

The problem then becomes a lack of discipline. If you can get at any member of a structure in scope, you do so, usually in a haphazard way. The way in which you interface with such

objects isn't controlled, making debugging and maintenance more difficult. If you could limit the ways in which objects could be accessed, debugging cases in which these objects get inadvertently overwritten becomes easier. It's also easier to maintain the code, because you only need to look at those functions with access to learn about the underlying object.

A class lets you partition the members in an object of that class into two groups: private and public. This is done using the **public** keyword so that it looks like a C-style label as shown above. Members below the public boundary are public and can be accessed like structure members. However, most class members are made private, so access to them is restricted.

The line beginning with `//` is a comment. This is a line-oriented comment that terminates at the end of that source line. In addition, C++ supports the free-form comment style using `/* ... */`. `//` was reintroduced, having been originally in BCPL, one of C's ancestors. Many C compilers support this style, and it's likely that a future version of the ANSI C Standard will adopt it. You can nest `//`-style comments inside `/* ... */`.

I recently came across the following cute piece of code. When executed, it will tell you if you're compiling under C or C++. I haven't found a use for it yet, but the way it works is interesting. I'll leave its meaning as a reader exercise:

```
#include <stdio.h>

main()
{
    printf("Running on %s\n", 1/** ... */2
          ? "C++" : "C");
}
```

Data Privacy

In the following example, some class members are private, while one is public:

```
// Public data versus private data

class circle {
    long xorigin;
    long yorigin;
public:
    unsigned long radius;
};

main()
{
    circle c;
    void f(circle *);

    c.xorigin = 5; // error
    c.radius = 6;

    f(&c);
}

void f(circle *p)
{
    p->xorigin = 5; // error
    p->radius = 6;
}
```

Although object `c` is in scope, we can't access the member

`xorigin` directly. Even when we pass the address of `c` to function `f`, we're prohibited from accessing that member, because it's no longer public. On the other hand, the public

“

A class is one of the main concepts underlying C++.

”

member `radius` is accessible directly and indirectly by name.

How can we access the private members? To answer this, we need to learn about member functions.

Private Functions

C permits two levels of function visibility: **static** and **extern**. A **static** function is callable from anywhere inside the source file in which it's defined, while an **extern** function is globally callable. C++ provides a much finer granularity of access to functions, as you'll see in the next example. Specifically, the designer of a class can limit access to members of objects of that class to a specified set of functions:

```
// Introduce member functions

#include <stdio.h>

class circle {
    long xorigin;
    long yorigin;
    unsigned long radius;
public:
    void init(long, long, unsigned long);
    void print(char *);
};

main()
{
    circle c1;
    circle c2;

    c1.init(5, 4, 10);
    c1.print("c1");

    c2.init(2, 9, 5);
    c2.print("c2");
}

void circle::init(long xo, long yo, unsigned long rad)
{
    xorigin = xo;
    yorigin = yo;
    radius = rad;
}

void circle::print(char *name)
```

```

{
    printf("Object %s has contents:\n", name);
    printf("\txorigin = %ld\n", xorigin);
    printf("\tyorigin = %ld\n", yorigin);
    printf("\tradius = %ld\n", radius);
}

```

```

Object c1 has contents:
xorigin = 5
yorigin = 4
radius = 10
Object c2 has contents:
xorigin = 2
yorigin = 9
radius = 5

```

In this case, all the object members are private. However, there are two function prototypes in the public section. This may look unusual, because it appears as if an object of that class contains those functions. This isn't the case, however. These functions, called member functions, are declared as being the *only* functions that can access the private members directly.

ANSI C borrowed the idea of function prototypes from C++ and then added a little to it. Specifically, ANSI C added the ellipses notation ... at the end of a variable-length argument list, whereas C++ simply had a comma followed by the right parenthesis. Also, in C++, a declaration of the form **int f()** means that **f** takes no arguments, whereas in ANSI C the keyword **void**

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would be needed here. C++ now supports **void** in this context. So be careful if you're putting old-style C code into a C++ compiler. Declarations of this form probably will cause errors somewhere if you attempt to call such functions with arguments.

We've established that the private members can be accessed only from the functions **init** and **print**. How do we call those functions? If anyone can call them from anywhere, we haven't achieved much protection.

The key lies in the expression **c1.init(5, 4, 10)**. This is a call to the member function **init**. It looks strange to C programmers to call a function using such a notation, but given the way in which a class is defined, it makes perfect sense. To reference a member, use the dot operator. If that member is a function, call it using the () function call operator.

The radical approach that C++ uses here isn't simply the notation. The important and different concept here is that you

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Publications

The C++ Report

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16-page report with few ads

From the same publisher:

Journal of Object-Oriented Programming

1 yr., 6 issues, \$49

C++ was originally defined in:

The C++ Programming Language, by Bjarne Stroustrup. Addison-Wesley, 1986. ISBN 0-201-12078-X. 325 pages.

Standards Activity

Serious effort has been made during the last year to form an ANSI Standards committee for C++. Some months ago, SPARC, the ANSI committee that considers new standard work items, approved the C++ proposal. The designation for the committee will be X3J16. (ANSI C is X3J11.) For more information about C++ standards activities, contact convener:

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Conferences

The annual USENIX C++ has been held for several years and is the biggest technical event. Proceedings are published and back issues are available.

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can't call that member function unless you're operating on an object of that class. Specifically, **c1.init()** calls the **init** function to operate directly on the object **c1**. Similarly, **c2.init()** invokes **init** to operate on object **c2**. The object drives the function, not the other way around, as we're used to. Now, perhaps, you can get a feel for the term object-oriented programming. The program is driven by the objects.

As you'd expect, **c1.print()** and **c2.print()** call **print** to

operate on the objects **c1** and **c2**, respectively.

How do we define these member functions? The syntax must be different, because presumably we also can have a regular function of the same name. In fact, perhaps we could have two members functions by the same name, each for a different class. The solution is to include the class name to qualify the function name, i.e., **circle::init** and **circle::print** declare that these two functions are member functions for the class **circle**.

The bodies of these functions contain a surprise. Nowhere do we qualify to which object we're referring. We simply use the member names within that class without preceding them with a dot or arrow operator. (This is impossible within C except with the **offsetof** macro in **stddef.h**. In all other contexts, a member name must be qualified explicitly with a structure or union expression or a pointer to such an object.)

No qualification is needed, because when the function is called, the call is qualified by the object on which it's to operate. When the function executes, it "intuitively" knows on which object it's operating. Therefore, the programmer needn't get involved. (In future articles I'll discuss how this is implemented and how to access the "current object" by name using the keyword **this**.)

Let's look at an example in which the same name isn't only used for member functions for different classes but also is used as a regular function name:

```
// Disambiguating duplicate function names
#include <stdio.h>

class circle {
    long xorigin;
    long yorigin;
    unsigned long radius;
public:
    void init(long, long, unsigned long);
    void print(char *);
};

class square {
    long xorigin;
    long yorigin;
    unsigned long xlen;
    unsigned long ylen;
public:
    void init(long, long, unsigned long, unsigned long);
    void print(char *);
};

void print(char *); // public function

main()
{
    static circle c;
    static square s;

    c.print("Circle c");
    s.print("Square s");
    print("Text");
}
```

```

void circle::print(char *name)
{
    printf("Object %s has contents:\n", name);
    printf("\txorigin = %ld\n", xorigin);
    printf("\tyorigin = %ld\n", yorigin);
    printf("\tradius = %lu\n", radius);
}

void square::print(char *name)
{
    printf("Object %s has contents:\n", name);
    printf("\txorigin = %ld\n", xorigin);
    printf("\tyorigin = %ld\n", yorigin);
    printf("\txlen = %lu\n", xlen);
    printf("\tylen = %lu\n", ylen);
}

void print(char *text)
{
    printf("Public function: %s\n", text);
}

Object Circle c has contents:
    xorigin = 0
    yorigin = 0
    radius = 0
Object Square s has contents:
    xorigin = 0
    yorigin = 0
    xlen = 0
    ylen = 0
Public function: Text

```

We now have three functions called **print**: two member functions for classes **circle** and **square**, respectively, and one regular function not tied to a class.

Because all three functions are **extern**, the compiler must assign each a unique name behind the scenes, so when separately compiled modules are linked together the correct version is called.

The compiler I'm using constructed external function names of **__circle_print**, **__square_print** and **_print**. Each member function name was prefixed with its parent class name. Because class and function names can be long (at least 31 characters), this makes for large external names, possibly exceeding the limit recognizable by the linker and other development tools. (The same function name can be used to designate different functions even within the same class, thus requiring more qualification when constructing external names.)

NEXT MONTH WE'LL continue to look at private functions and how to overload functions.

Readers are encouraged to submit C-related comments and suggestions to Rex Jaeschke, 2051 Swans Neck Way, Reston, Virginia 22091 or via e-mail to uunet!aussie!rex. —*Rex Jaeschke is an independent consultant, author and lecturer. He's DEC PROFESSIONAL's representative on the ANSI C Standards Committee and the U.S. Representative for ISO, as well as editor of the Journal of C Language Translation, a quarterly publication for C implementers. His new book, Mastering Standard C, is now available from Professional Press. To place an order, call Trish Dunkerley at (215) 957-1500.*

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The Magic Of Mach, Part 2

Editor's note: Developers of the Mach operating system focused

their efforts on four features: interprocess communication, virtual memory management, networking and parallel process support. In Part 2 of a two-part series, UNIX Editor Elaine L. Appleton discusses networking and parallel process support.

In a computing world that's looking toward distributed processing, operating systems and networks must work ferociously if performance is to equal concept. In 1984, the Defense Advanced Research Projects Agency (DARPA) first funded the research efforts of Carnegie-Mellon University (CMU), Pittsburgh, on Mach, a multiprocessor-oriented operating system. DARPA believed that computing in the future would be distributed not only across parallel processors sharing the same bus but also across processors sharing the same network.

One of the most desirable functions of networked applications is transparency. If you're running a remote application or writing files, you shouldn't have to know where on the network that application is running and where those files are being written.

Mach tries to achieve transparency over a network in several ways. One way is via an efficient memory scheme that's strictly protected through the inheritance mechanism. Because memory only can be shared through the parent/child inheritance process (the same process known to UNIX users), shared memory will never cross a network boundary, according to Mach development-team members Avadis Tevanian Jr., currently

working for Next, and Richard Rashid, CMU associate professor and the most notable figure associated with Mach development.

The Mach kernel doesn't define which network protocol needs to be used, nor does it recognize networks. Rashid and Tevanian feel that as far as the kernel is concerned, messages always are passed between tasks on the same host. A server maintains communication between machines transparently, and messages sent to a port on a remote machine are sent to the network server, which passes that message to its proper location.

The flexibility afforded by not defining the network protocol within the kernel lets developers work with whatever is most convenient. At CMU, Mach users employ the TCP/IP facility found in the Berkeley 4.3BSD interface, which is binary-compatible with Mach.

Mach currently supports two other protocols: the transaction-level Versatile Message Transaction Protocol from Stanford University, Palo Alto, California, and a connectionless protocol called Delta-T, defined at Lawrence Livermore Labs, Livermore, California. You could add support for ISO or other protocols, says Rashid, although CMU hasn't done so yet.

Network servers provide flexibility and the ability to support a variety of protocols without having to reprogram the operating system. But there are drawbacks. Because the server is potentially on the path of any communication, it adds overhead, says Rashid. He notes, however, that CMU has circumvented some of that difficulty by implementing a fix

that allows messages to bypass the server after connection has been established. This lets you send messages directly over the network.

Mach's performance depends heavily on the protocol used, and this can be a drawback. Nick Seidenman, president of



the UNIX development company RMR Technologies, feels that using Mach on Ethernet networks would be extremely slow.

"We wanted to be able to deal with a variety of types of multiprocessing and a variety of high-speed networks," says Rashid. "We're beginning to see these types of machines out in the marketplace."

He admits that the scheme "makes more sense with high-speed networks such as Fiber Distributed Data Interface. Some commercial companies are selling gigabit networks." Now, he says, "We find that the biggest overhead is the protocol itself."

What's the reason for the network bottleneck? The network effectively acts as a cache memory for memory object pages, says Rashid. Because of this procedure, the amount of memory moved from one place to another, called cache line-size, is the size of the page. In other words, the overhead is large, meaning that you need powerful networks to handle the load. Additionally, the more

local the data, the better performance you'll get on a network.

Aid To Networking

As noted in Part 1, Mach's interprocess communication (IPC) scheme relies on message passing. Messages are ordered collections of typed data consisting of a fixed message header and a variable-size body. Bodies may contain inline data,

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...Mach's interprocess communication (IPC) scheme relies on message passing.

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pointers to data, and capabilities (such as send and receive) for ports.

“The way Mach implements message passing and virtual memory allows Mach to support a shared memory server, called local area memory at CMU,” explains Rashid. Mach creates a memory object that can be shared by any two programs on a network and creates a memory space that can be used by anything on the network. Memory objects are tied into IPC.

“This is a way of creating the illusion of shared memory on a network with full consistency without having the hardware to support this,” Rashid continues. The ability extends to tightly coupled multiprocessors, one type of device for which Mach was intended. “You can move large amounts of data within a machine between two programs without having to copy that data,” says the Mach proponent.

In contrast to UNIX's machine-dependent virtual memory management scheme, Mach's machine-independent virtual memory management system allows data or messages to be shared between processes by mapping that data from one process's address space to that of another. In many configurations, this

allows the system to avoid copying data.

Parallel Process Support

One way in which Mach works with multiprocessors (and particularly with tightly coupled devices) is through its parallel processing scheme. Because threads within a task theoretically execute in parallel, according to Tevanian, they may “execute in parallel on multiprocessor machines.” He continues, “Multiple threads is an attractive mechanism for utilizing the parallelism afforded by tightly coupled shared memory multiprocessors.”

The task/thread architecture isn't original to Mach. It was prevalent in many operating systems around the time that UNIX was made public and has been used since then. Tandem Comput-

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ers used it in 1980 with its introduction of Pathway, and Mach developers used it in 1984 when working on an earlier version of Mach called Accent. Data General's AOS/VS operating system made use of tasks and threads. And they're found as an extension to the UNIX kernel on Convex Computer's multiprocessors.

"In a sense, going to threads is almost a step backward, because many operating systems used [threads and tasks] when UNIX was developed. All of a sudden, UNIX didn't," says Seidenman. As a simple concept, these abstractions make sense in multiprocessing environments, in part because any thread that can be scheduled is placed on the next available processor for execution.

"Tasks, threads and memory objects are represented as ports. You send messages to them and get messages back," says Rashid. Although multiple messages can be sent to ports, only one message can be read from a port at a time.

"Because the operating system itself is defined as a Mach task with multiple threads of control, any function provided by the kernel could be equally well-provided by something else, which is how we extend the interprocess communication system over the network. The port to which you're sending a message could be held not by the program you're talking to but by the network server, and you don't have to know this. Likewise, if you're manipulating a task or thread on another machine, you don't have to know that," notes Rashid.

In this way, transparency could occur with sequential processes. The beauty of

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CMU would like to believe that Mach will become the next standard platform.
”

this concept is that fine-grained parallelism speeds computing, and transparency goes hand in hand with that performance. The Mach mechanisms for virtual memory, IPC and scheduling are designed to provide fine-grained parallelism.

An Academic Exercise?

You may see this as a performance-tuning exercise destined to remain in academic research labs, but that would be a mistake. About 120 commercial companies and laboratories have licensed the code, which is free to academia, government and industry. The interest for Digital lies not only in the virtual memory management scheme to be adopted by the OSF but also in the flexibility that allows the system to work with interfaces in use now and interfaces to be developed. The system also supports Berkeley UNIX and MIT's X Window System, according to CMU. Mt. Xinu spokesperson Alan Tobey says, "There is no reason why it could not run under OSF/Motif or DECwindows."

The next step is developing applications that show off Mach's capabilities to the user. That isn't to say there are no

applications well-suited for Mach's magic. Currently, CMU does all of its research on Mach and has AI projects running on Mach. DARPA, known for its work in AI, packet switching and computer timesharing, reportedly is funding a project to develop a B3 level of security around Mach that's potentially more secure than UNIX. Potential purchasers, such as Ford Aerospace, Newport Beach, California, have stated publicly their interest in commercially supported versions. Although it will make few public statements about Mach, Digital has been partially funding Mach development for many years.

CMU would like to believe that Mach will become the next standard platform. "What I'd like to see in the next year or two is for it to go beyond just supporting BSD UNIX. I'd like to see it used as a means by which different operating systems can communicate with each other, either within the same machine — two operating systems running simultaneously — or different machines," says Rashid.

In the long term, says Rashid, researchers at CMU have a dream of many machines providing a single operating system environment or of providing aggregates of machines that look to application builders to be one system. Mach is a shimmering steppingstone on the way to this vision.

Industry watchers believe Mach has potential for success. Says Seidenman, "This is how an operating system should work. If you know anything about operating systems, you look at Mach and say, 'Of course it should work this way. Why didn't [UNIX] work this way all along?'" ■

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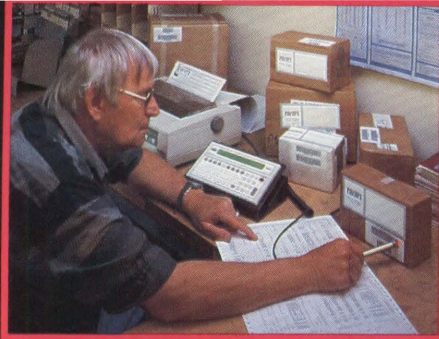
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WORKSTATIONS

David W. Bynon

Office Automation For The Techie

Don't be surprised if you're at a loss for words when someone asks you to define office automation (OA). The term has such a broad meaning that it lacks a clear definition.

Information Edge, 2nd Ed., by N. Dean Meyer and Mary E. Boone (Carswell Legal Publishers, Agincourt, Ontario, 1987) defines office automation as "tools for thinking." That hits the nail on the head, because OA is more than just electronic mail, spreadsheets and word processing.

Lately, I've approached OA with a new set of tools that I call my office information toolkit. Because I'm a techie, you can bet these tools have something to do with a workstation. When I first put DECwindows on one of my VAXstations, I looked at the base applications, said to myself, "Not bad," then continued to use ALL-IN-1. I've been using ALL-IN-1 for so long that it's hard to imagine using anything else.

At a recent computer show, I caught the bug that PC system integrators refer to as Mac-envy (meaning that one is envious of the point-and-shoot/cut-and-paste Mac interface). When I returned to my office, I started playing with DECwindows' base applications again. I discovered a new way to organize my work.

DECwindows' base applications include Calculator, Notepad, Cardfiler, Clock, Calendar, Mail and Paint programs. Two other programs, the Bookreader and DDIF Viewer, also are included, but few applications presently are available for them.

The Value Of Information

Information is a valuable commodity. However, information that's disorganized

or inaccessible isn't worth the disk space on which it's stored.

Lately, a number of PC products have been released that help manage information. The idea behind these products is to provide a readily accessible scratch pad with the capability to search for words. As you receive important information, you type it into the scratch pad, then go about your business. Later, you can use the utility's search capability to find and edit your notes. DECwindows' Notepad is a similar utility.

The DECwindows Notepad is a simple window editor that you can start, then iconify until you need it. When I log in, Notepad is one of the first applications I start. Each day I start a new file using the date as the file name (e.g., 12DECEMBER89.TXT). When I need to make a note, I click on the Notepad icon, then enter the time, a keyword and my note.

To find a note, I use Notepad's search capabilities, which is why I start each note with a time and keyword. After I've found what I need, I use the Navigate function to move the cursor back to the bottom of the note pad. This way, it's always ready for me to make a new entry.

Without a way to organize the notes further, my system wouldn't work for long. This problem is taken care of by my next tool, the Cardfiler. It's the electronic equivalent of an address file.

The Cardfiler is a great way to file and keep track of information. Every entry I make in my Notepad is valuable. Each day I look through my notes for information that must be filed on a card. The cut-and-paste capability of DECwindows is used to move the information. It's quick and easy.

I organize my cards by top-

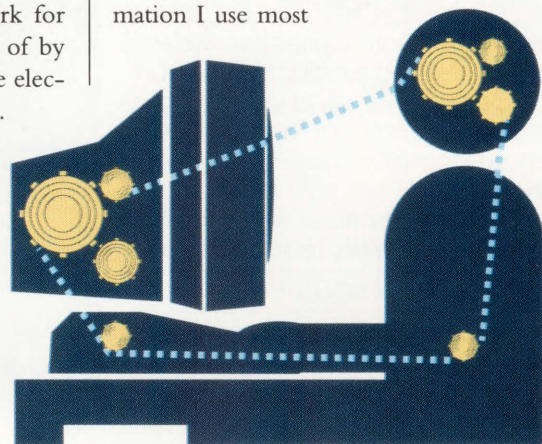
ics such as PHONE, PEOPLE, CONTRACTS, EVENTS, C, FORTRAN, MACRO and UIL. Because you can open a new card file with a double click on the mouse, you're encouraged to have a lot of them.

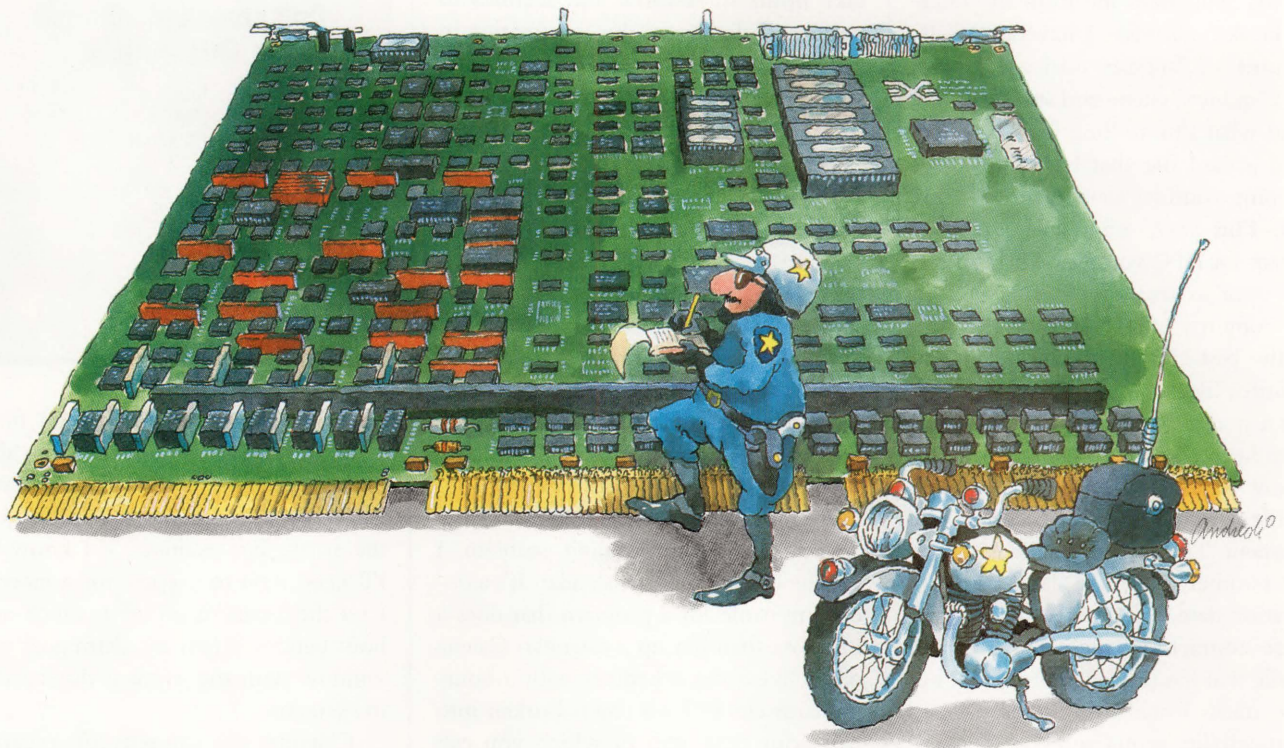
Finding a card after you've filed it is easy if you stick with your conventions. For example, I file phone numbers using the person's surname or an organization's name.

Another technique I use is templates. For example, when I create a PHONE card, I use a card titled AAA—TEMPLATE as my template. The title ensures that the template will be the first card in the file, because cards are filed alphabetically. To use the template, I double click on the template in the card index. This opens the card as a window. Then, from the Card pull-down menu I select Duplicate, which creates a new card with the template's information. The final step before putting the information in the card is to rename it.

As a programmer, the Cardfiler is a dream come true. For years, my desk had been cluttered with reference books, programmer cards and snack cake wrappers. I continue to fight my way through the wrappers, but the rest is gone.

I put the reference information I use most





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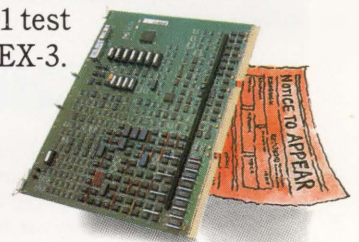
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on cards. This frees me from the reference book nightmare. I have an ASCII-chart card, a C language card, a DCL card, an X Window System card and a "Where to find what I'm looking for" card. I've started a card file that has handy programming routines that I know I'll use again. This way, when I'm writing a program for DECwindows, for example, and I want to create a List Box widget, I can copy my LISTBOX WIDGET card into the paste buffer, then paste it into my source file.

As a system manager, I use the Card-filer to keep track of software, hardware and how to do things. In a HARDWARE card file, I have a card for each piece of equipment. The card tracks the hardware serial number, purchase date, warranty expiration date, location, last service and service contact. I have a SOFTWARE card file that has similar information, but it also tracks installation difficulties and incompatibility problems.

Like most system managers, I perform periodical or once-in-a-lifetime tasks that

take hours to research and seconds to perform. I document this information in my HOW TO card file. If you're a busy system manager, you can see that this technique is useful.

Keeping Pace With Time

According to the authors of *Information Edge*, managers spend between 35 and 69 percent of their business day in meetings. To keep track of meetings and schedules, managers use everything from calendars to the skills of personal secretaries. As a manager, consultant, programmer and writer, I need a scheduling tool that works the way I do. This isn't easy, because I mix all of these activities.

To solve my scheduling problem, I use the DECwindows Calendar. It's a deceiving name for a program that does a lot more than put up a calendar. Calendar is like a day scheduler with a built-in alarm clock. Each day is broken into half-hour time slots in which you can schedule your day.

With Calendar, I can schedule an

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event weeks in advance, then forget about it. Calendar lets me set up an alarm in conjunction with the scheduled event. I have a reasonable level of control over the alarm. For example, if I know that I'll need time to prepare for a meeting, I set the alarm to go off as much as an hour before. When the alarm goes off, a window with the event is displayed on my screen.

Calendar also can schedule recurring events. You simply enter the event once, then tell Calendar if the alarm is daily, weekly or monthly.

Pictures And Words

The last tool in my toolkit is VMS Mail. Combined with DECwindows, Mail suddenly is transformed into Super Mail.

One feature DEC added to the X Window System when it created DECwindows was the ability to display Adobe's PostScript and DDIF files. Workstation users now can send and receive graphics. This has profound implications.

I send graphics to other workstation users from the DECwindows Paint program or the Session Manager Print Screen menu. When I mail a DDIF file to someone, it's displayed in his Read window when he reads it. He doesn't have to do anything special. If the user receiving the picture wants to modify it, he can use the Paint utility. To do so, he uses the Extract choice on the File menu and specifies DDIF as the output file format.

You might want to try some of these techniques to see if they improve your productivity. I bet that they do. ■



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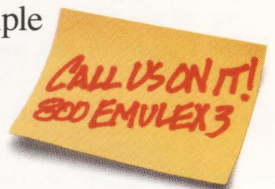
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Philip E. Bourne, Ph.D.
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UNIX And VMS Editors Contrasted

Editor's note: We continue our introduction to UNIX for VMS

users with a discussion of the most popular UNIX editors.

If the comparison of two operating systems incites a religious war, then a discussion of the editors available for each is enough to start a small skirmish. Everyone has his favorite editor. VMS users familiar with EDT, TPU or EVE are no exception and are sure to contribute to the skirmish after their first encounters with a UNIX editor. Nevertheless, after the novice UNIX user appreciates the fundamental differences that exist between the VMS and UNIX editors — the source of most negative comments — the power of UNIX editors will emerge.

UNIX offers several editors, each slightly different but with underlying similarities: **ex**, **edit** and **ed** are line editors; **sed** (stream editor) is a non-interactive editor; **awk** is a utility for modifying files based on pattern recognition; and **vi** is a full-screen editor.

We begin our discussion with **ex**, the most powerful of the UNIX line editors and the one most like EDT when used in line mode. A discussion of **sed** follows. **sed** uses an **ex**-like syntax to batch-edit one or more files, i.e., **sed** reads an input file and produces a modified output file — there's no interactive updating of the files' contents. **awk** extends the features of **sed**. **awk** has no analogy in VMS and therefore isn't discussed here. To achieve the functionality of **awk**, the VMS user must write a high-level language program. See the box, "Additional Reading," for references to **awk**. Finally, we discuss **vi**, the most commonly used UNIX screen editor. **vi** doesn't use the keypad and is troublesome to the VMS

EDT user when first encountered.

EDT and, more recently, TPU emulators are available for some versions of UNIX. Further, EMACS, a programmable editor available for most versions of UNIX, can be made to look and feel like EDT. Any of these options is satisfactory for the occasional UNIX user. However, VMS users intending to use UNIX on a regular basis are advised to learn at least **ex** and **vi**, because these are powerful editors with much to offer.

ex And EDT Compared

Let's compare the major **ex** and EDT line-mode commands and itemize the major similarities and differences (see Figure 1):

1. **ex** uses a one- or two-character ab-

breivation to specify commands. The full command name isn't acceptable. That is, **g** defines a global change, but **gl**, **global**, and so on aren't recognized.

2. By default, **ex** doesn't display line numbers. The command **n** displays line numbers for a specific command (compare VMS EDT, which displays line numbers). The **ex** commands **set number** and **set nonumber** (not shown) toggle line numbering on and off for all subsequent commands. **set** is an example of a command that changes the whole **ex** environment. It's often placed in the hidden file **.exrc**, which is executed for each invocation of **ex**.

3. The **w** (write) command writes the whole file back to disk. If **w** isn't followed by a new filename, the original

FIGURE 1.

ex Command	EDT Equivalent	ex Meaning
a (append)		Append lines after the current line
c (change)	CHANGE	Change specified lines
co (copy)	COPY	Copy lines to a new location
d (delete)	DELETE	Delete specified lines
e (edit)		Set edit buffer to contain a specified file overwriting original contents
f (file name)		Display a specified file
g (global)	ALL	Apply command to whole file
i (insert)	INSERT	Insert lines before the current line
j (join)		Join two lines to make one
l (list)		List, include non-displayed characters
m (move)	MOVE	Move lines to a new place (cut and paste)
n (number)	(default)	Include line numbers
p (pointer)	TYPE	Display specified lines
q (quit)	QUIT	Leave editor without saving changes
r (read)	INCLUDE	Read a file into the editing buffer
s (substitute)	SUBSTITUTE	Substitute new character string for old
w (write)	EXIT	Write contents of edit buffer to file
W (write)		Append buffer contents to alternative existing file
/string/	TYPE 'STRING'	Search forward for string
?string?	TYPE - 'STRING'	Search backward for string
=		Show current numeric value of . or \$

A comparison of ex and EDT commands.

6
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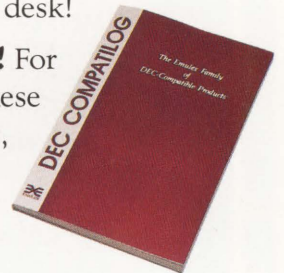
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FIGURE 2.

	VMS	UNIX
example:	\$ EDIT/EDT MYFILE.DAT	% ex myfile.dat
	1 This is line 1	"myfile.dat" 59 lines, 1,971 characters
	*	:
	* T 5	: 5 p # display line 5
	* 5:10	: 5,10 # display lines 5-10
	* T WHOLE	: 1,\$ # display whole file
	* T ..END	: ,,\$ # display from current
		# line to end
	* T 1:5;10:20	: 1,5 10,20 # display lines 1-5
		# and 10-20
	* T -1:END-10	: -1,\$-10 # display from one
		# before the current
		# line to the 10th
		# from the last line
	* INSERT	: a # insert text
	[enter here]	[enter here]
	CTRL-Z	.
	*	# terminate insert
	* D 3	: d 3 # delete three lines from .
	* D 1:10	: 1,10 d # delete lines 1-10
	* T "STRING"	: /string/ # find string
	* s/a/b/1:5	: 1,5 s/a/b/g # global substitute
	* s/?/~/	: s ~/~/ # substitute /
	* MOVE -3:. TO END	: -3,. m \$ # move four lines to end
	* COPY -3:. TO END	: -3,. co \$ # copy four lines to end
	* EXIT	: wq # exit saving changes
	* QUIT	: q! # quit without saving
		# changes
	* INCLUDE NEWFILE.DAT	: r newfile.dat # read external file
	* WRITE A.DAT 1:10	: 1,10 w a.dat # write external file

Examples of *ex* commands. Anything following # is a comment.

F

FIGURE 3.

```
VMS
UAF> LIST/BRIEF
%UAF-I-LSTMSG1, writing listing file
%UAF-I-LSTMSG2, listing file SYSUAF.LIS complete
UAF> EXIT

[copy file SYSUAF.LIS to UNIX system]

% head -4 SYSUAF.LIS
Owner      Username  UIC      Account  Privs   Pri  Directory
sue allen   ALLEN    [51,1]   GRUNB   Group   5    DUA1:[ALLEN]
allen krasna ALLENK   [1,31]   SYSTEM  All     5    DUA3:[ALLENK]

% cat sed.script
1,$s/ \(\.....\) \. * \) \ \. * \) \ \. * \) \ \. * \) \$ / \2::0:\3:\1:\.dir:\bin\csh/
1,2d

% sed -f sed.script SYSUAF.LIS > passwd.new

% head -2 passwd.new
ALLEN      :0:51:sue allen      :/dir:/bin/csh
ALLENK     :0:31:allen krasna   :/dir:/bin/csh
```

An example of *sed*.

version of the file is overwritten (compare EDT, which creates a file with a higher version number). After the file has been written, the user is still in the editor and then can quit (**q**). The command sequence **wq** writes the file and then quits the editor — an example of command grouping that isn't valid for EDT.

4. Unlike EDT, **ex** has no resequence command. **ex** automatically resequences the line numbers after each command. For example, if a line is added between lines 1 and 2, EDT refers to that line as 1.1, whereas **ex** refers to it as 2 (the original line 2 becomes line 3).

5. **ex** has a **l** (list) command that displays non-printable characters, such as tabs and carriage return/linefeeds.

See Figure 2 for examples of **ex** commands. Note the following features of the commands:

1. The **ex** prompt is a colon (compare the EDT asterisk).
2. Both **ex** and EDT use a period to signify the current line.
3. Both **ex** and EDT assume the current line as the default.
4. If a command isn't given, **ex** assumes **p**.
5. Input to **ex** is terminated by a period as the first character of a new line (compare EDT CTRL-Z).
6. EDT **D 3** deletes line 3. **ex d 3** deletes three lines — the current line and the two following. Beware!
7. If a search string isn't found, the search will wrap to the beginning of the file (see the description of string searching under **vi**).
8. **ex** uses **\$** to signify the last line of a file (compare EDT END). **\$** is a metacharacter, a special character used in regular expressions. As we'll see in the discussion of **sed**, regular expressions make powerful editing tools.
9. Preceding any character by a backslash causes it to be taken literally. For example, preceding a slash by a backslash permits the slash to be used as part of the search string and not as a string delimiter.
10. If, after making changes, you attempt

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FIGURE 4.

vi Command	EDT Equivalent	vi Meaning
arrow keys	arrow keys	Move cursor right or left, up or down
\$	[2]	Move to the end of the line
^	backspace (F12)	Move to the beginning of the line
CTRL-F	[4][8]	Scroll file forward one screen
CTRL-B	[5][8]	Scroll file backward one screen
#CTRL-F	[4][8]...	Scroll file forward # screens
#CTRL-B	[5][8]...	Scroll file backward # screens
w	[4][1]	Move forward one word
b	[5][1]	Move backward one word
#w	[4][1]...	Move forward # words
#b	[5][1]...	Move backward # words
fx	[4][PF1][PF3]x	Move forward to next character x
Fx	[5][PF1][PF3]x	Move backward to next character x
,	[PF3]	Repeat fx
)	[PF3]	Repeat Fx
(Move forward one sentence
/string	[4][PF1][PF3]string	Move backward one sentence
?string	[5][PF1][PF3]string	Search forward for string
#G	[PF1][7]T#	Search backward for string
		Move to line number #

vi cursor-movement commands.

F

FIGURE 5.

vi Command	EDT Equivalent	vi Meaning
i		Insert text before the cursor
a		Append text after the cursor
o	[PF1][0]	Open blank line after current line
O		Open blank line before current line
ESC		Terminate input mode
x	[.]	Delete character at cursor
X	backspace	Delete character before cursor
d		Delete starting at the cursor
dd	[PF4]	Delete current line
c		Delete starting at cursor followed by insert
cc	[PF4]	Delete current line and insert
r	[.]	Overwrite single character
R		Overwrite until terminated by ESC
p	[PF1][6]	Paste deleted or yanked text after cursor
P		Paste deleted or yanked text before cursor
y	[.]...[6]	Yank (copy) text into alternative buffer
yy	[.]...[6]	Yank (copy) current line into alternative buffer

vi action commands.

to quit (**q**) without writing the modified file, a warning is given. **q!** overrides this warning, quitting the editor and leaving the original file unchanged.

Batch Editing — sed

sed uses the **ex** syntax to perform complex edits on one or more files and is

particularly useful for files too large for interactive editing. **sed** makes one pass through the file for each editing command specified. By default, the result is sent to the terminal. However, output is redirected easily to a file. The editing commands can be part of the **sed** command line or, for complex edits that are to be used subsequently, can be kept in

a file called a **sed** script. The use of **sed** is illustrated best by an example that builds on the **ex** syntax discussed above (see Figure 3).

The system administrator faced with creating a UNIX account for every user of a VMS system first creates an ASCII output file, **SYSUAF.LIS**, from the VMS User Authorization File (UAF). After copying **SYSUAF.LIS** to the UNIX system, **sed** is used to create a modified file **passwd.new** with a format that closely resembles that of the **/etc/passwd** file, the UNIX equivalent of **SYSUAF.DAT**. The editing commands used by **sed** are contained in the file **sed.script** and invoked using the **f** option to **sed**. Without the **f** option, **sed** assumes that the editing commands are part of the command line, as in the command **sed "1,10d" foo**. Let's look at the editing commands contained in the **sed** script as displayed with the command **cat sed.script**.

Line 1: A complex string substitution performed on each line in the file (**1,\$s**) that's for every user of the VMS system. First, the input string (note that each input argument is contained in parentheses): **\(.....\)** is the first argument, the first 21 (.) characters of the record. A period signifies any character. **\(.*\)** is the second argument, any number of characters (.* up to the first blank. **\(\.*\)**, is the third argument, any number of characters following a [and before a ,, and so on for each argument. Then, the output string: argument 2, followed by **::0:**, followed by argument 3, followed by **:**, followed by argument 1, followed by **:\dir:\bin\csh**, finally followed by the closing delimiter, **/**.

Line 2: **1,2d** removes the first two header lines from the file.

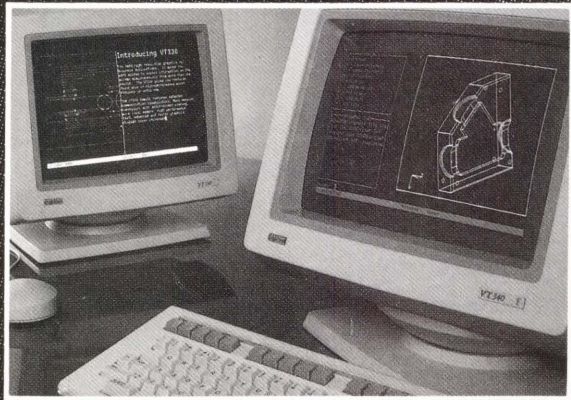
Each of the arguments from line 1 of the **sed** script is an example of regular expressions — the use of special characters to define the characteristics of a string. Once again, note that, for example, the regular expression is **(.*)**. The backslashes are included so that the special characters are taken literally when

The Competition is Good.

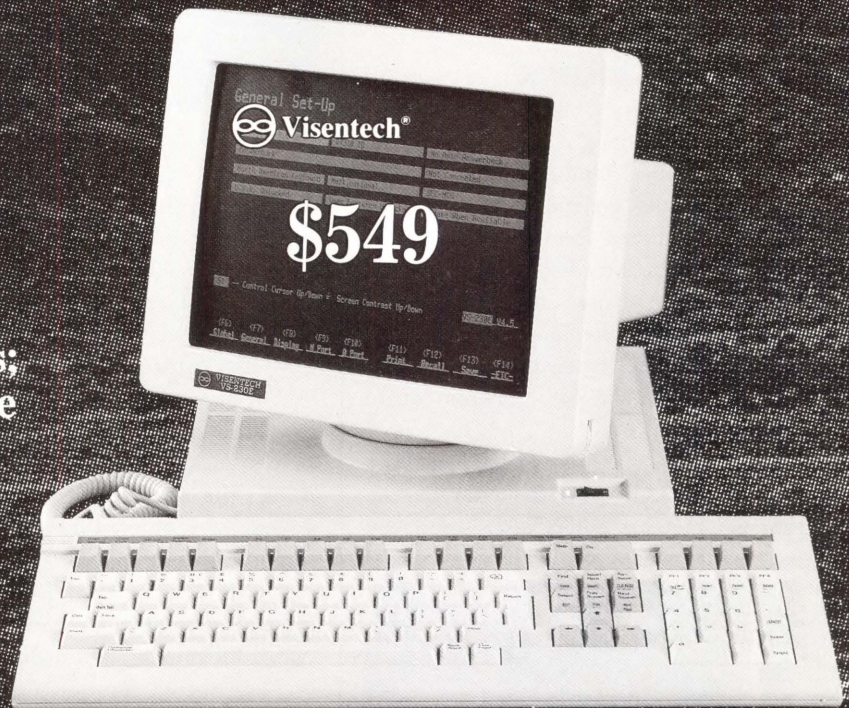
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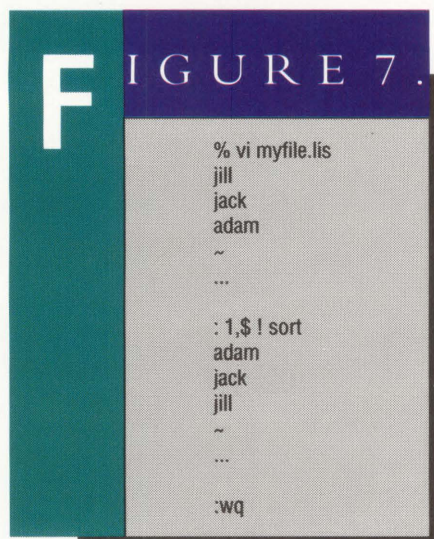
the command is defined but are interpreted as special characters when the command is executed. The expression `(.*)`, any number of characters terminated by a blank, is an example of a construct not easily achieved in VMS.

Finally, the UNIX command `head -2 passwd.new` displays the first two lines of the modified file. After running `sed`, the file `passwd.new` can be appended to the existing `/etc/passwd` file after minor modification such as the inclusion of the user's home directory. Hence, `sed` provides a shortcut to the extensive editing necessary to add a number of VMS users to a UNIX system.

vi And EDT Compared

`vi` is part of every UNIX implementation and functions on just about any video display terminal. Unfortunately, you pay a price for this generality. `vi` makes no use of the special features of individual terminal types, including the keypad. For example, the `vi` user enters `x` to delete the character at the cursor, whereas the EDT keypad user enters the keypad character `[.]` (keypad keys are shown in square brackets).

However, what would happen if the `vi` user wishes to enter the letter `x` at the cursor? He first enters insert mode by



Filtering with `vi`.

vi command	EDT Equivalent	vi Meaning
<code>dw</code>	<code>[-]</code>	Delete from cursor to beginning of next word
<code>d#w</code>		Delete from cursor # words
<code>d)</code>		Delete from cursor to beginning of next sentence
<code>d(</code>		Delete from cursor to beginning of previous sentence
<code>d\$</code>	<code>[PF1][2]</code>	Delete from cursor to end of line
<code>#dd</code>		Delete # lines
<code>cw</code>	<code>[-]</code>	Delete word and insert
<code>c#w</code>		Delete # words and insert
<code>c)</code>		Delete from cursor to beginning of next sentence and insert
<code>c(</code>		Delete from cursor to beginning of previous sentence and insert
<code>cc</code>	<code>[PF4]</code>	Delete current line and insert
<code>c#w</code>		Delete # words and insert
<code>c\$</code>	<code>[PF1][2]</code>	Delete to end of line and insert

vi commands combining movement and action.

entering `i`, then `x`, and lastly `ESC` to escape insert mode. The `vi` user must toggle between two modes: insert and passive. EDT is always in insert mode. This represents the biggest hurdle for the EDT user learning `vi`.

For example, after inserting text, the new `vi` user immediately hits the arrow keys to move the cursor. Being in insert mode, the ASCII representation of the arrow key is entered into the file — he forgot to first escape from insert mode to passive mode by hitting the `ESC` key. Figure 4 presents the commonly used `vi` cursor movement commands.

Note the similarities and differences between `vi` and EDT cursor-movement commands:

1. Lines can be addressed by line number (for example, `#G`). Thus, `ex` commands can be issued from `vi` just as EDT line-mode commands are issued from EDT keypad mode. This is achieved by preceding the `ex` command with a colon (the `ex` prompt). The `ex` command line then will appear at the bottom of the screen.
2. When searching forward for a string, unlike EDT, which stops at the end of the file, `vi` will wrap to the beginning and continue searching. Thus, although you searched forward, the screen displayed may be before the starting point. A simi-

lar argument applies to searching backward.

Accompanying cursor movement commands are `vi` action commands for deleting, inserting and otherwise changing text. These are compared to their EDT counterparts in Figure 5.

Note that repeating a command, for example `dd`, causes that command to be applied to the whole line rather than, in the case of `d` at least, from the cursor to the end of the word.

Now we come to the real power of `vi` — the ability to combine just about any movement and action command. The result is an extensive command set. Figure 6 illustrates the more common commands combining action and movement.

A final example of `vi` that exemplifies the power and complexity of this editor and illustrates how different components of the UNIX operating system perform cooperatively is shown in Figure 7.

The file `myfile.lis` contains a list of names. Note the `~`, which signifies that the blank lines on the screen aren't part of the file but that the file is fewer than 24 lines in length. The end of buffer symbol (`[EOB]`) serves the same function

Additional Reading

In addition to the discussions found in the UNIX documentation, the following texts are recommended:

El, L.M. *Editing in a UNIX Environment: The vi-ex Editor*. Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1985.

For information on **sed** and **awk**:

Lamb, L. *Learning The vi Editor: The Nutshell Handbooks*. Newton, Massachusetts: O'Reilly and Associates Inc., 1987.

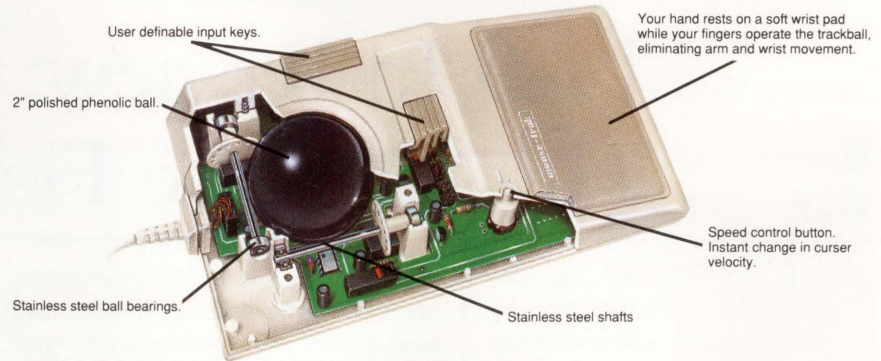
Tare, R.S. *UNIX Utilities: A Programmer's Reference*. New York: McGraw-Hill, 1987.

in EDT. The important command line is **1,\$! sort**. It filters all lines of the file through **sort**, which by default sorts on the first (and in this case only) field of each record. The sorted list then is written and the editing session terminated with the command sequence **wq**. That is, all or part of a file can be passed to a command that acts as a text filter with the result being written back to the same place in the file. This is a powerful feature.

VMS EDT USERS shouldn't be deterred by the apparent complexity of the various UNIX editors. Like a spoken language, you can communicate effectively knowing only a subset of the available vocabulary. The cross-reference tables presented here should give you a head start.

Information regarding hints and kinks useful to VMS users grappling with UNIX will be received gratefully. Send it via e-mail to SYSTEM@CUMBG.BITNET or pbourne@cunixc.cc.columbia.edu. —Philip E. Bourne, Ph.D., a senior associate of the Howard Hughes Medical Institute, is author of *UNIX for VMS Users*, published by Digital Press. Janie Weiss is the systems manager of the Health Sciences Computer Facility at Columbia University.

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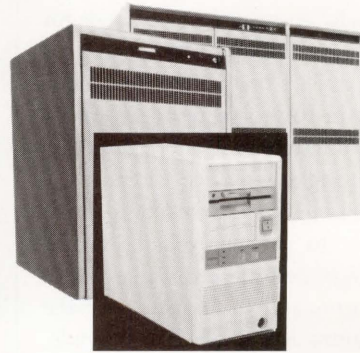
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FIELD SERVICE

Ron Levine

1989 In Review: Through The Field Glasses

The maintenance industry saw a turbulent year in 1989, confusing for both vendors and users. There was a deluge of new service offerings from DEC and TPMs, acquisitions and mergers among independents, and many new products to support the maintenance effort. Competition for your maintenance dollar was never stiffer.

For the independent service industry, 1989 has been a year of troubled waters. Many users view these vendors as unstable for the long haul. This user view, if unchanged, could have a devastating effect on the independent maintenance industry. Many TPM/depot customers could return to DEC for maintenance or go the self-maintenance route.

DEC is now tough competition, because it finally answers user demands for multivendor, multisystems support. Further, DEC realizes that it's no longer the only game in town. In response, independents are retrenching and redirecting their marketing and service efforts.

By becoming more price-competitive and flexible in its maintenance terms, DEC has decreased the profit margins of its competitors and the revenues of the service industry as a whole. For example, independent maintenance industry revenues are projected to have decreased to \$1.5 billion for 1989 from \$1.7 billion for 1987, according to Mike MacNaughton, project director and TPM conference chairman at Frost and Sullivan, New York.

While margins have decreased, self-maintenance programs are gaining favor with many users. One reason is that many customers using outside service vendors are concerned about the long-

term commitment of their maintenance providers. As a result, they'll take a hard look at their service relationships when contracts fall due. Customer concerns may cause major problems in the early 1990s for independent service suppliers.

Merger Mania

Why are many users of independent services worried? Look at some recent shakeups in the industry:

Bell Atlantic (owner of Sorbus, the nation's largest TPM) has been buying everything in sight during the last couple of years. Since its acquisition of Sorbus, it has purchased Camerx, CPX, Dynservice Network and ESS. Bell Atlantic announced in August that these latest additions to its stable of maintenance providers will be merged into a new fourth-party service division. Four providers are now one, and future directions, service offerings and pricing structures are unknown.

In October, Bell Atlantic announced the purchase of Control Data's third-party computer maintenance division, the largest TPM in the DEC market. Included in the purchase was Control Data's customer base and nationwide maintenance facilities, which were merged with Sorbus. The acquisition provides Sorbus with expertise in workstation and high-end mainframe technologies and makes Sorbus the largest TPM in both the DEC and IBM markets.

Two other independent service vendors, FDR Field Service and Iverson's Maintenance Division, fell victim to the takeover trend and are now part of Decision Data Services, itself formed last year by the merger of Decision Industries

Maintenance Group and Momentum Technologies. The result is that four more vendors are now one.

As Decision Data Services moves into the DEC market for the first time, British Columbia Telephone is pulling out of the DEC services market. Where McDonnell Douglas Field Service is headed is anybody's guess. The only thing for sure is that it's for sale.

Likewise, it's persistently rumored that TRW Customer Service Division is for sale. Unisys TPM services, at least in the DEC market, seem to have come to a complete stop.

From the user's vantage point, this is an industry in turmoil. While users' perceptions may or may not be valid, the fact is that this is how many view their independent service/depot vendor. This perception must be successfully challenged by the independent service industry if it's going to remain a viable force in the service business in the coming decade.

Bright Spots

All was not difficulty and dilemmas for the independents this year. One TPM, Maintech, a division of Volt Delta Resources, bucked the trend of decreased margins and tarnished images. Maintech showed increased profits and won several large contracts for its services. Among its user base, which is concentrated in the critical



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applications niche, Maintech has an overwhelming perception of stability.

Further, TRW Customer Service Division enjoyed a revenue growth of more than 30 percent within the DEC services market. Despite rumors of its sale, TRW is in an acquisition mode and is looking at a number of possible takeovers. Its new MicroVAX 2000/3000 and VAX 8000-series service and product offerings should improve its bottom line.

Another plus for the independents is that there are more fourth-party firms (independent depots/repair centers) in the DEC marketplace than before. This will greatly lessen the TPMs' and users' dependence on DEC. And these firms support not only older equipment but also the latest DEC lines with spare parts, diagnostics, training and remote support.

Lastly, the Parsing Group, a consortium of TPMs worldwide, seemed to pull itself above internal bickering and made concrete plans to enhance the image, credibility and market share of the TPM industry. The Parsing Group was created by Parse Inc., which manufactures and sells DEC and Data General diagnostic packages to independent maintenance vendors.

At its final meeting in 1989, the Parsing Group voted to become a group

member of the National Computer Service Network (NCSN) of Lee's Summit, Missouri (see "DEC Targets The Low End," July 1989). This increases NCSN's power (it now has more than 250 members) and allows one voice to speak for the entire TPM industry.

What About DEC?

DEC made a major move into the low-end service field with its Desktop Service Solutions program. It can handle a site's requirements from PCs to high-end VAXs, providing the customer with one-call service. DEC has made considerable advances in service by strengthening its Customer Support Centers (CSC) and upgrading AI and expert system troubleshooting tools.

DEC contract customers have benefited in 1989 from a wider selection of service offerings, while self-maintainers will get more mileage from increased support programs. In October, DEC announced two new programs aimed at self-maintainers. Node Service provides the right to use new versions of kernel software, and the Digital Assisted Services Program provides a complement of products and services for self-maintainers.

In view of stiff competition from

TPMs, DEC has generally held the line on service contracts this year. Some users report cost decreases in service contracts.

On the down side, this was the first

“
**DEC has made considerable
advances in service...**

”
year of DEC's downgraded warranty program. This cost some users fees in areas of service/support that once were free.

Field Service Firsts

Many new or improved products were introduced in 1989 for the field service arena. Two of the most important introductions were for diagnostics and network testing, areas of special concern at many DEC sites.

On the diagnostic front, Parse Inc. released a series of MicroVAX and VAX 8000-series diagnostics on a rental basis. These products aren't licensed per CPU but can be used on any number of systems without additional fees. The Proact series from Control Data, numerous exercisers and the BI series from TRW, and the remote RX Link offering from ESS are a few of the new or upgraded testing tools available to field service vendors and self-maintainers.

A network tester, the TMT-1, funded and developed jointly by DEC and Beckman Industrial, is possibly the most important new test equipment this year (see "The Network's Physical Exam," September 1989). With networking quickly becoming the corporate norm, a device such as this will be a mandatory field service tool. Its ability to monitor and test the entire network and pinpoint to within inches any problems along the network makes it a valuable tool for installing and troubleshooting LANs.

We'll soon report on a self-maintainer support group with a whole new twist. But that's for next year. For now, happy 1990 from the field. ■

Companies Mentioned In This Article

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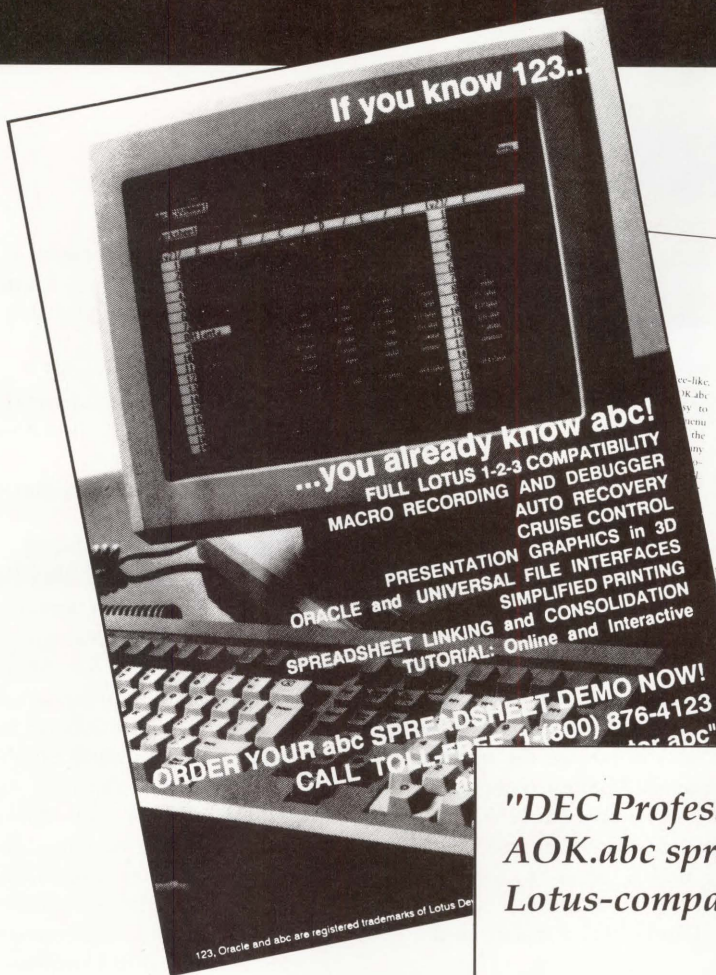
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AOK Software Products' AOK.abc Spreadsheet

David B. Miller Transferring applications from one system to another can be a nightmare. While retaining old systems for backup during transfer isn't easy if the new system differs significantly from what you are accustomed to. AOK Software Products Inc., a division of Advent Online Knowledge Systems, Schaumburg, Illinois, has made this task easier, at least in the area of spreadsheets. AOK.abc is a spreadsheet package that is particularly...



Similarities
 A Lotus trademark is its tree-like, menu-driven user interface. AOK.abc mimics this system, so it's easy to follow. Use / to access the main menu and the escape key to work back up the menu tree. There are no surprises, any differences that result from accommodating VMS functions are handled well. Worksheets created with abc have that Lotus look about them (see Screen 1).
 Worksheet data is entered in the Lotus tradition. Textual data is preceded by the familiar Lotus' for left justification. Centering and right justification are accomplished with the usual Lotus ^ and " label prefixes. Entry of numeric data, formulas and functions follows Lotus conventions. Formulas start with + or (), and functions begin with @. AOK.abc provides 9999 rows and 302 columns for data entry and uses a sparse matrix storage technique to eliminate wasted space.
 Operations on cell ranges, such as moving, copying and formatting, work in the familiar Lotus style.

"DEC Professional is helping to make the AOK.abc spreadsheet more than just another Lotus-compatible spreadsheet for the VAX."

Brian F. Danaher
 President
 AOK Software Products, Inc.

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Inquiries Came in Immediately

According to Brian F. Danaher, President of AOK Software Products, "Requests for information came in immediately after readers saw the DP Labs review of the AOK.abc spreadsheet in DEC Professional."

Leads Turned into Sales

Mr. Danaher goes on to say, "We received 44 leads, generated 9 demos and 4 sales, all within 30 days after the issue was released."

"This indicates to us that the quality of the leads is very good. Decision makers made the inquiries and implemented the spreadsheet of choice, AOK.abc."

The Bottom Line . . .

"AOK Software Products looks forward to a prosperous future in the VAX/VMS market and DEC Professional will be a part of our success formula."

DEC Professional

P PRODUCTS

Formation V1.1 Supports Application Interfaces

Aspen Scientific announced Formation V1.1, a windowing tool for MS-DOS, OS/2, UNIX and VMS. It supports sophisticated application interfaces such as overlapping windows, many menu styles and dialog boxes.

In source-code form, Formation is easily transported to many operating systems. The source code is compatible with MS-DOS, OS/2, UNIX System 5, UNIX look-alikes such as SCO XENIX System V/386, and VMS. Formation supports a variety of menu interfaces — pull-down, pop-up and Lotus-style — and provides dialog boxes for sophisticated user-to-application input. Dialog boxes support scrolling text prompter, option buttons, check boxes, command buttons and scrolling list boxes.

Prices are \$399 for the source-code bundle supporting MS-DOS, OS/2, UNIX and VMS (\$50 extra for Formation/VMS modifications distributed on tape) and \$159 for the binary bundle supporting MS-DOS and OS/2.

For more information, contact Aspen Scientific, P.O. Box 72, Wheat Ridge, CO 80034; (303) 423-8088.

Circle 400 on reader card

SCSIwatch Creates Virtual Front Panel

CMD Technology announced SCSIwatch, a VAX tape-monitor utility that helps you monitor tape activity and status through a virtual front panel directly on the VAX terminal.

SCSIwatch runs under VMS V4.X and 5.X and supports all SCSI tape devices that run under DEC's Tape Mass Storage Control Protocol. Devices supported include Exabyte 8mm cartridge drives, Sony and Gigatrend DAT drives, 1/2-inch tape cartridge, nine-track tape and all other tape devices connected via a CMD SCSI host adaptor. The product

creates a front panel interface on any VAX terminal that displays real-time device data for up to seven devices simultaneously. Data shown includes device name, vendor ID, drive revision number, drive status, remaining available tape, percentage ECC and retry, and current drive operation. It runs as a spawned VMS process, so you can use the terminal while monitoring the SCSIwatch display.

The utility is priced at \$250.

For more information, contact CMD Technology, 3851 S. Main St., Santa Ana, CA 92707; (714) 549-4422.

Circle 402 on reader card

HP Offers PostScript For LaserJet IID Printer

Hewlett-Packard announced a PostScript accessory for the HP LaserJet IID printer. The cartridge contains the PostScript page-description language, licensed from Adobe, and 35 Adobe typefaces.

With the PostScript cartridge, the HP LaserJet IID combines Adobe-licensed PostScript and HP PCL printer-language support for meeting a broad base of business-office printing needs. The PostScript cartridge, which can be used on any HP LaserJet IID printer, is a host-independent solution. The cartridge gives IBM PC-compatible users connectivity to PostScript-capable output devices such as typesetting and 35mm-slide-making equipment and alternative computing environ-

ments, including workstations on UNIX. The PostScript cartridge can be inserted into either of the two font cartridge slots on the HP LaserJet IID printer.

The cartridge costs \$995.

For more information, contact Hewlett-Packard, 3000 Hanover St., Palo Alto, CA 94304; (415) 857-1501.

Circle 403 on reader card

Infinity Series Features Multiwindows And Multitasking

Falco Data Products Inc. announced the Infinity Series of high-resolution display terminals. The series includes five ANSI/ASCII and graphics terminals that feature a 70-Hz refresh rate and a 400-line borderless display.

The terminals include Falco's Virtual Terminal Windows, which lets you configure multiple windows with different line and character counts, including combinations of 80- and 132-column screens and graphics, for setup and operation of multihost and multitasking operations. The terminals include a 10 x 16 character cell and a graphics resolution of 560 pixels x 400 lines on a 14-inch display. They support the Tektronix 4010/14 graphics standard and can be configured with serial and/or parallel ports, increased graphics resolution and extended paging and graphics memory. ANSI versions are VT52/100/200/300-compatible.

ANSI or ASCII display terminals cost \$595, ANSI or ASCII graphics terminals cost \$645, and the Multi-Personality Graphics display terminal costs \$695.

For more information, contact Don Staub, Falco Data Products Inc., 1294 Hammerwood Ave., Sunnyvale, CA 94089; (408) 745-7123.

Circle 415 on reader card

Clyde Digital Distributes The Security Toolkit

Clyde Digital Systems announced an agreement with Cubic Systems Pty. Ltd. of Sydney, Australia, to become North American distributor of The Security Toolkit, a security-analysis software product for VAX/VMS. The product will be supported fully by Clyde Digital with a user hotline and maintenance service.

The Security Toolkit verifies access controls, analyzes user authorization databases, checks directory, device and queue protection, assesses network security and summarizes

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MUA1	EXABYTE		READ	OK	2090.897	0.168

overall security adequacy. It acts like a camera, providing a snapshot of a system's security status as often as it's needed.

Perpetual site licenses and one-year walk-around licenses are available. Prices are based on configuration and number of CPUs. For more information, contact Richard Bos, Clyde Digital Systems, 371 E. 800 S., Orem, UT 84058; (801) 224-5306.

Circle 401 on reader card

ART-IM Based On DECwindows Standard

Inference Corporation announced two DECwindows versions of its ART-IM expert system building tool for VAX computers and DECstations running under VMS and ULTRIX. ART-IM/VMS V2.0 and ART-IM/ULTRIX are hybrid rule and object-oriented tools for building information-intensive knowledge-based applications. Both are based on DECwindows and provide transparent integration with standard DEC applications in distributed computing environments and portability to major IBM environments.

ART-IM's DECwindows interface improves ease-of-use for application developers and users. Developers can use a DECwindows-based interface to examine and modify the expert system knowledge base as they build their application. Developers also can build DECwindows interfaces for users. The development and user interfaces support pull-down menus, windows, push buttons, dialog boxes and mouse and keyboard interaction.

Prices range from \$10,000 to \$60,000 for development.

For more information, contact Trini Cemo, Inference Corp., 5300 W. Century Blvd., Los Angeles, CA 90045; (213) 417-7997.

Circle 413 on reader card

IMSL Releases Interactive Documentation Facility

IMSL Inc. announced the Interactive Documentation Facility for use with the IMSL Libraries: Math/Library, Stat/Library and Sfun/Library.

The product provides online access to comprehensive user documentation for the IMSL Libraries. Users of the IMSL Libraries now have instant online access to IMSL product documentation. For larger networks, comprehensive IMSL documentation is now available at a lower cost. Using the menu or command mode, the Interactive Documentation Facility enables quick and accurate selection of the appropriate subroutines from the almost 800 available in the IMSL Libraries.

Features include customizing capabilities for the user, identification of subroutines via keyword search and GAMS classification, direct output to files, history buffer, review commands and online help.

For more information, contact Bob Walker, IMSL Inc., 2500 ParkWest Tower One, Houston, TX 77042; (713) 782-6060.

Circle 416 on reader card

Pathway Enhances Corporate Connectivity

The Wollongong Group Inc. announced its first seven PathWay products and its first hardware-connectivity solution. The PathWay family is designed to bridge the gap between LANs and other computers in the corporate environment.

PathWay incorporates existing Wollongong Integrated Networking Solutions (WINS) desktop products: WINS/TCP for DOS and WINS/TCP for 386 Streams. It includes client and server products for most common platforms, including DOS, OS/2, UNIX System V, VAX/VMS, the Mac, AT&T 3B computers, Sun workstations and NCR Towers. It extends the PC LAN services across the corporate network and gives desktop computer users access to the multivendor resources on the corporate network. Standard networking protocols such as NETBIOS, SMB and TCP/IP are used to incorporate a company's existing LANs into the corporate network.

For more information, contact Dick Miller, The Wollongong Group Inc., 1129 San Antonio Rd., Palo Alto, CA 94303; (415) 962-7250.

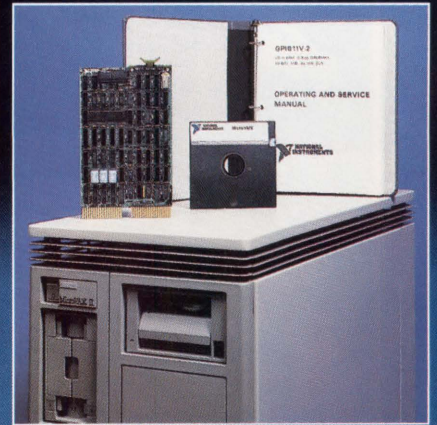
Circle 412 on reader card

Infotron Expands Intelligent Network Solution

Infotron Systems Corporation announced the addition of the NX3020 feeder multiplexer to the Infostream NX T1/E1 Network Exchange product line. This extends the capabilities of the NX4600/NX3200 to remote locations that require high link speeds yet have low numbers of I/O devices.

The NX3020 features a single link that operates at speeds up to 72 Kbps. It has seven I/O channels that operate synchronously or asynchronously at speeds up to 64 Kbps. It supports an analog voice channel at 32 Kbps ADPCM. Options include an integrated DSU/CSU and a four-channel expansion module. The DSU/CSU operates at 9.6 Kbps, 19.2 Kbps or 56 Kbps. Infotron's intelligent network solution lets you build NX networks with more than 1,500 nodes and provides an

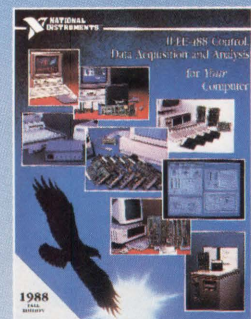
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The base price is from \$2,150 to \$3,000, depending on configuration. For more information, contact Ed DiMingo, Infotron Systems Corp., Cherry Hill Industrial Cntr., Cherry Hill, NJ 08003; (609) 424-9400.

Circle 404 on reader card

Jupiter Display Station Supports X Window System

Jupiter Systems announced the first in a family of high-performance, window-oriented, network-based desktop display devices. The Model 310 Color Graphics Network Display Station features X server software and fully supports X.

Featuring 8 bits per pixel, the Model 310 provides a choice of 256 simultaneous colors from a palette of 16 million. It was designed to provide text, graphics and imaging in a window environment. It provides resolution of 1,280 pixels x 1,024 lines for a total display of 1.3 million pixels. The screen is refreshed at 60 Hz non-interlaced on a contrast-enhanced 19-inch monitor. Based on Motorola's 4-mip MC68030 processor, the standard model has 4 MB RAM. X software can be downloaded

into the display station from a network boot server and is available in EPROM for bootless operation. The Model 310 provides connection for regular and thin Ethernet. TCP/IP network protocol is supported.

For more information, contact Al Metcalf, Jupiter Systems, 1100 Marina Village Pkwy., Alameda, CA 94501; (415) 523-9000.

Circle 417 on reader card

QMS Announces Color PostScript Printer

QMS Inc. announced a color PostScript printer. The QMS ColorScript 100 Model 10 is targeted at users who need full-color 300-dpi output in letter or A4 sizes (or legal/special A4 sizes) for presentation, business graphics and graphic-design applications.

The product features a 16-MHz, 68020 MPU-based internal controller that can image a letter-size page of PostScript graphics and text. The controller comes with 4 MB RAM and 1 MB ROM. An optional 1-MB RAM expansion board adds memory for legal/special A4-size page imaging, and an optional 4-MB RAM expansion board provides virtual memory for downloading fonts and legal/special A4-size page imaging. A downloadable

HP 7475A plotter (HP-GL) emulation is also optional. The printer comes with QMS-PS utility software, printer utility programs providing simplified startup, testing and operation for PostScript-language printers.

The product is priced at \$9,995. For more information, contact Robert Owens, QMS Inc., 1 Magnum Pass, Mobile, AL 36618; (205) 633-4300.

Circle 422 on reader card

Maintech Announces New Product And Service

Maintech announced MC-220, the single-window version of Master Console, and its entry into the disaster recovery market with Contingency Backup Service (C/BS).

MC-220 has the functionality of the 16-window version but doesn't require a dedicated VAXstation hardware platform. It runs on any VAX with VMS V4.0 or later using a VT220 or compatible as the host terminal. It supports input via DECnet, Ethernet or RS-232 using ASCII data.

C/BS is available to all Maintech maintenance clients. It provides services custom-designed to meet off-site computing needs. Users are limited to six per system to optimize

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For more information, contact Charles Wimberly, Maintech, 1133 Avenue of the Americas, New York, NY 10036; (212) 827-2603.

Circle 418 on reader card

MultiSessions Features Hot-Key Interface

Networking Dynamics Corporation announced MultiSessions V1.6. MultiSessions software was designed to provide non-terminal server users of VAX/VMS with the capability of running multiple sessions from any VT-style terminal.

The software features user-specifiable features, including a hot-key interface that can be used to specify arbitrary control sequences of one or more keystrokes. These can be used to switch among sessions, start new sessions, repaint the screen or capture the current screen's contents on a printer or into a file. The product lets the system manager limit the number of

sessions each user can start. When you log off one of your sessions, the software automatically connects to and redisplay the screen for the next session.

MultiSessions is priced from \$649 to \$8,899, depending on CPU.

For more information, contact Networking Dynamics Corp., 1234 N. Edgemont St., Ste. 214, Los Angeles, CA 90029; (213) 668-0077.

Circle 419 on reader card

Nexpert Architecture Supports Distributed Processing

Neuron Data announced Nexpert Object, an expert system shell, in a client/server architecture across major hardware platforms. The separation of the user interface from AI processing provides delivery of distributed AI applications that optimize computer resources; centralized maintenance of AI applications; and distribution of large-scale applications over several processors.

You can deliver user applications and knowledge processing capabilities with PC DOS clients accessing Sun servers; Mac clients accessing OS/2 servers; DOS clients accessing VAX servers; and Mac, DOS and OS/2 clients

accessing mainframes. Applications consist of the knowledge base (rules and objects developed by the user), AI Library (inference engine) and user interface. In standalone mode, all three components are delivered on the same computer.

The development version on DEC and UNIX workstations costs \$8,000.

For more information, contact Rico Bum-baca, Neuron Data, 444 High St., Palo Alto, CA 94301; (415) 321-4488.

Circle 420 on reader card

Odesta Enhances Double Helix Performance Optimization

Odesta Corporation announced Double Helix V3.0. It gives more power to Mac users and applications developers.

Features include enhanced performance and query optimization; support for the Network Innovations' CL/1 connectivity platform; extensions to the Double Helix user interface to include Hypercard-style features; and application development tools that simplify the creation of complex applications. Query optimization has been improved so that performance is up to 120 times faster. In

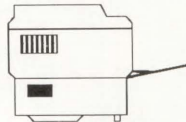
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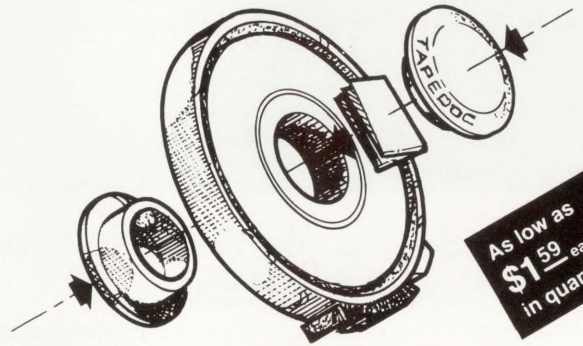
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a multiuser environment, multithreaded searching capabilities allow workgroups to optimize and process query requests in a round-robin timesharing fashion. Double Helix solves information management problems. It runs in standalone and networked client/server environments of Mac and Mac-to-host-based systems. It's available for the Mac Plus, SE or II running operating system V.6.0 or later.

Double Helix V3.0 is priced at \$595.

For more information, contact Julie Lyon, Odesta Corp., 4084 Commercial Ave., Northbrook, IL 60062; (312) 498-5615.

Circle 406 on reader card

PacerPost Extends Microsoft Mail To VAX/VMS

Pacer Software Inc. announced PacerPost, a software package that enables VAX/VMS to function as a Microsoft Mail-compatible server and gateway. PacerPost extends Microsoft Mail into the VAX/VMS environment while enabling Mac and MS-DOS users to communicate using Microsoft's mail capabilities.

Based on Microsoft Mail V2.0, PacerPost takes advantage of VAX/VMS' high performance, user security, ease of message backup and flexibility of VAX-based mail server administration. It runs across the VAX line, so you can select a CPU based on mail user population and message volume. PacerPost's set of mail gateways running on a VAX provides micro-computer users with transparent access to VMS Mail, ALL-IN-1 Mail and Message Router. Message Router architecture provides connections to a range of mail systems, including those that adhere to the international X.400 standard.

PacerPost consists of two separately licensed components. The mail server and VMS Mail gateway is priced from \$2,000. A combined Message Router and ALL-IN-1 gateway capability is priced from \$4,000.

For more information, contact Pacer Software Inc., 7911 Herschel Ave., Ste. 402, La Jolla, CA 92037; (619) 454-0565.

Circle 421 on reader card

Ingres V6.3 Manages Data, Knowledge And Objects

Relational Technology Inc. announced Ingres V6.3, which lets you customize your information management system to fit your needs. Ingres manages data and enables effective management of knowledge and objects unique to the industry in which it's used. It provides control of information resources by enabling

tailored MIS solutions.

Ingres combines a client/multiserver architecture, compiled database procedures, online backup and two-phase commit to deliver performance beyond OLTP requirements. Online backup enables users to back up the database without removing it from service. V6.3 includes two new packages. The Knowl-

edge Management Extension lets you manage the knowledge of how your business works. A rules system stores referential integrities and lets you program functional business rules into the information management system. The Object Management Extension features user-defined datatypes, enabling the DBMS server to manage nonconventional datatypes and to

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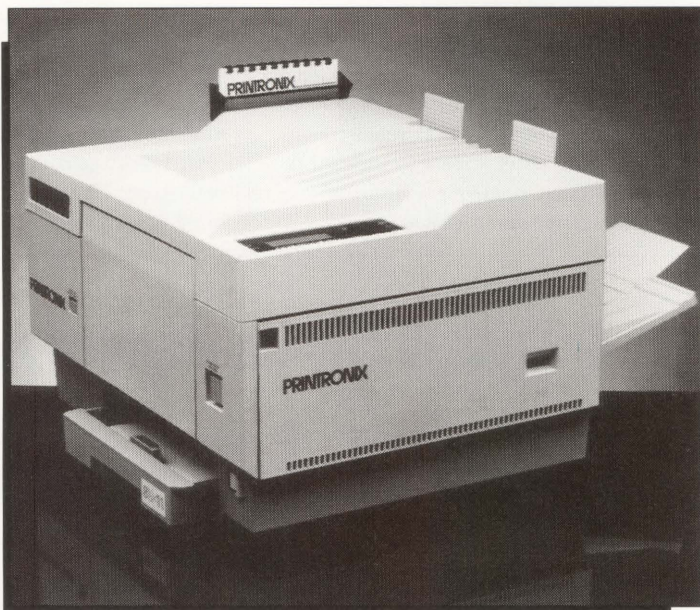
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workstation or
network
environments.**



process them using standard SQL. For more information, contact Kevin Gallagher, Relational Technology Inc., 1080 Marina Village Pkwy., Alameda, CA 94501; (415) 748-3400.

Circle 426 on reader card

Printronix Designs PostScript Page Printer

Printronix Inc. announced the L1212 PostScript page printer for workstation or network environments. It combines the dual-processor RIPS 80186 PostScript Controller with the

RISC Weitek chip set for fast PostScript processing and Adobe font compatibility.

The L1212 combines an engine speed of 12 ppm, a recommended duty cycle of 25,000 pages per month and 300-X 300-dpi resolution. White-write engine technology provides black fill-in with no lines or streaking. Fine line degradation associated with some white-write engines has been eliminated. The L1212's PostScript-compatible RIPS controller provides compatibility to industry-standard software, including the library of typefaces from Adobe. In addition to downloadable fonts, font flexibility includes 35 LaserWriter Plus-compatible fonts. Standard interfaces include Centronics parallel or RS-232 serial.

The L1212 is priced at \$7,995.

For more information, contact Jill Green, Printronix Inc., P.O. Box 19559, Irvine, CA 92713; (714) 863-1900.

Circle 408 on reader card

Syntek CASE/AP Contains Integrated CASE Tool

Synthesis Computer Technologies Inc. announced Syntek CASE/AP V3.2, a rapid prototyping system for the VAX/VMS/COBOL environment.

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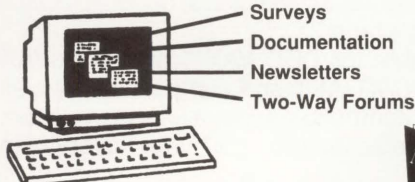
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Syntek CASE/AP contains an integrated CASE tool for recording data and process specifications, management of changes and graphic- and list-oriented communication of specifications for business systems. These specifications may be used to generate fully operational prototypes on demand. Users, system analysts and technical personnel can review prototype operation, modify the specification via the CASE interface and generate a new prototype. The cycle can be iterated until a satisfactory system is generated. Library facilities for code reuse and systems maintenance are integrated into the package along with a complete screen-formatting subsystem and comprehensive access-control features.

For more information, contact Synthesis Computer Technologies Inc., 5199 E. Pacific Coast Hwy., Ste. 601, Long Beach, CA 90804; (213) 494-4069.

Circle 411 on reader card

InstaGate1500 Provides Communications Options

Micom Communications Corporation announced InstaGate1500 Terminal Server Gateway, a solution for Micom Instanet Data PABX users who require interconnectivity to DEC Ethernet LANs or for Ethernet LAN users adding WAN options or seeking cost-effective local data distribution.

Providing DEC LAT and Reverse LAT (bidirectional) functionality, the InstaGate1500 Gateway, when connected to the Data PABX, provides a variety of communications options to the Ethernet LAN user. Supporting connect requests to and from the Ethernet system, it allows asynchronous terminals or PCs attached to the Data PABX to connect to computers on Ethernet or other networks. Additional connectivity options include X.25 networks, dial-up modem pools, T1 trunk lines, DDS access lines, trunk lines to remote multiplexors and access to IBM mainframes via Bisync or SDLC protocol converters.

InstaGate1500 costs from \$164 to \$265 per port, depending on the application.

For more information, contact Richard Borden, Micom Communications Corp., 4100 Los Angeles Ave., Simi Valley, CA 93063; (805) 583-8600.

Circle 405 on reader card

Forms Accelerator Improves Oracle Performance

Performance Technologies Inc. announced the Forms Accelerator, a software accelerator

and performance monitor for Oracle. Running transparently with Oracle's SQL*Forms, the Forms Accelerator improves system performance and programmer productivity with no programming changes.

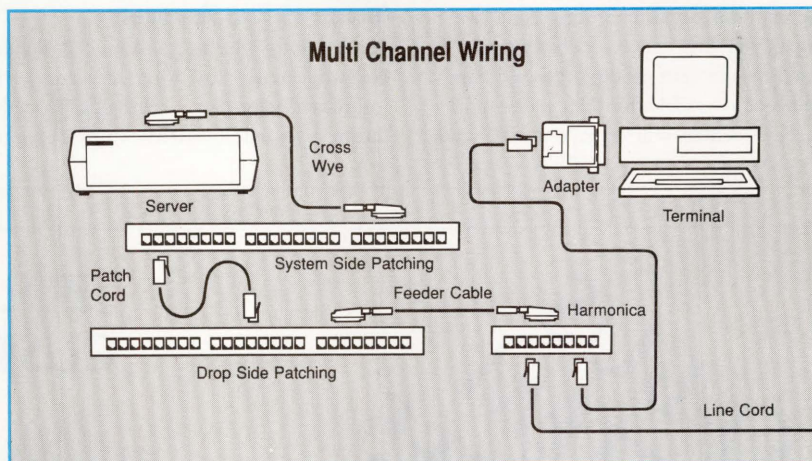
The Forms Accelerator decreases the CPU use of SQL*Forms-based applications. It gives

database administrators control over SQL*Forms' memory use. If memory is available, the amount of cached SQL statements can be increased to improve performance. The performance monitor feature provides programmers and support staff with information about their applications so they can debug,

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tune and troubleshoot from the early development stages through production. It gives developers system information about indexing, SQL tuning, paging and I/O on an SQL statement-by-SQL statement basis. The Forms Accelerator runs on all versions of SQL*Forms, Oracle V5.0 and V6.0, and most hardware platforms.

For more information, contact David Skriloff, Performance Technologies Inc., 276 Chestnut Hill Ave., Ste. 9, Boston, MA 02135; (617) 787-1776.

Circle 407 on reader card

Software Partners/32 Announces Delphi And SDI

Software Partners/32 Inc. announced Delphi, a data center management system, and SDI, a VAX/VMS security system.

Delphi manages tasks, users, equipment and the inter-relationships among these components of the data center. Its hardware and software management module allows the system manager to model what effect a disruption in the data center will have on users and

hardware. Delphi's problem/request management module lets you submit problems or requests and receive notification of their resolution. Delphi keeps track of time spent on projects and tasks and maintains a file cabinet of information on users, vendors and hardware components.

SDI provides security managers with tools to keep their VAX/VMS systems secure. Functions include activity tracking, which allows the security manager to track attempts to open files, create processes, enable special privileges and allocate devices. It can be used to monitor and control users' terminals.

For more information, contact Software Partners/32 Inc., 447 Old Boston Rd., Topsfield, MA 01983; (508) 887-6409.

Circle 409 on reader card

Raxco's Rabbit-5 V4.5 Improves File Recovery

Raxco Software Inc. announced Rabbit-5 High Speed Backup V4.5. Features include improved tape-drive recovery procedures during saves, additional in-progress logging of

save activities, a multitasking journal database and an enhanced writelock check of the database during a save.

Rabbit-5 is a high-speed backup-management system that performs systemwide and incremental backup and restore functions for the VAX/VMS environment. It offers flexibility and functionality such as error-checking procedures that minimize CPU consumption, a tape librarian that enables automatic tape selection and tape labeling, and flexible save/restore options. V4.5 has a more robust tape-drive recovery capability, including medium offline, tape position lost, parity, and controller errors. A new command allows for file access and modification while Rabbit-5 is writing to tape. R5Q, a journal database query program used to search for specific files and savesets, now features a friendlier front end and improved large journal handling.

For more information, contact Denise Hudson, Raxco Software Inc., 2440 Research Blvd., Ste. 200, Rockville, MD 20850; (301) 258-2620.

Circle 423 on reader card

Q-BUS SYSTEM PACKAGES

Zoltech's modular design allows literally thousands of configurations to be built with its V-series family of system chassis. Zoltech will deliver anything from empty metal shells to completely tested turnkey systems: You decide what you want to do and Zoltech will do the rest. Q-Bus and VME systems are our specialty, but we also do custom designs.

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CIRCLE 264 ON READER CARD FOR Q-BUS

ZIM V3.0 Increases Database Access Speed

Sterling Software, Zanthe Systems Division, announced ZIM V3.03 for VAX/VMS. ZIM is a fully integrated development environment based on the entity-relationship data model. A seamless, uniform language, it offers a comprehensive set of tools for the development of application solutions.

ZIM V3.03 increases database access speed up to 900 percent. It makes direct use of the VMS Record Management Services (RMS) to improve performance, particularly in multiuser systems. Features enable the developer or user to fine-tune many RMS file parameters to meet application requirements. Performance enhancements include general improvements in the handling of variable-length records, read-only transactions and concurrency control. Configuration options let you customize file growth factors. Language features include CASE statements, local procedures and exception handlers.

For more information, contact Christopher Turnbull, Sterling Software, Zanthe Systems Div., 38 Antares Dr., Ste. 1200, Ottawa, ON K2E 7Z2; (613) 727-1397.

Circle 410 on reader card

Overseer V4.0 Includes Identifier Management

Ergodic Systems announced Overseer V4.0, a project accounting platform for VAX/VMS. Overseer supports project accounting, chargeback and activity-based system management and administration and now includes identifier management and dynamic UAF linkage.

Overseer lets system managers associate

identifiers for application programs. Thus, program identifiers are granted only during program execution. This supports granting access to sensitive data via a designated application without giving access to outside users. Source-code changes, image installation or other privileges aren't required. Overseer-managed identifiers can be given for discretionary distribution by project managers and automatically can associate disk use with individual projects, subprojects and users. The UAF feature lets system managers establish Overseer-managed projects that receive selected attributes, such as UIC and default directory, from the user's VMS UAF profile. Overseer is supported on all VAXs and VMS V4.4 and later.

The product is priced from \$2,500 to \$10,000.

For more information, contact Steven Duff, Ergodic Systems, 15760 Ventura Blvd., Ste. 1020, Encino, CA 91436; (714) 380-9719.

Circle 414 on reader card

VAX SoftCost-Ada Contains Revised User Interface

Reifer Consultants Inc. announced a VAX/VMS version of SoftCost-Ada, an Ada software cost-estimation package.

VAX SoftCost-Ada contains a revised function key-driven user interface that makes the package's touch and feel compatible with other VAX software products. It includes a factor sensitivity feature that lets you view the impact of cost driver changes on your estimate costs and schedules. Its interface to VAX Software Project Manager lets you export your resource estimates from SoftCost-Ada to the VAX Software Project Manager. Its sub-

project setup capability lets you assign unique names to subprojects and specify the applicability of project-level factors and sizing methods. The product is based on analysis of more than 100 completed Ada projects that used Ada, MAPSEs, APSEs and object-oriented design techniques to generate more than 30 million source lines of code.

The product is available for MicroVAX and standalone VAXs at an annual fee of \$12,000 for one to four users.

For more information, contact Reifer Consultants Inc., 25550 Hawthorne Blvd., Ste. 208, Torrance, CA 90505; (213) 373-8728.

Circle 424 on reader card

Datability Eliminates Need For Parallel Printer Ports

Datability Software Systems Inc. announced a serial-to-parallel converter that lets parallel printers connected to Datability's Vista terminal server operate at distances of more than 500 feet. This eliminates the need for parallel printers to be within 10 feet of terminal servers providing parallel support.

The converter permits a long-distance connection to a parallel printer from any of Vista's RS-423 ports. Its hardware/software architecture converts the serial connection to parallel for the printer. Vista's architecture provides full-speed support of parallel printing devices such as HP LaserJet printers and full-fledged system line printers through a Centronics or Data Products interface.

For more information, contact Leslie Schinto, Datability Software Systems Inc., 322 Eighth Ave., NY, NY 10001; (212) 807-7800.

Circle 490 on reader card

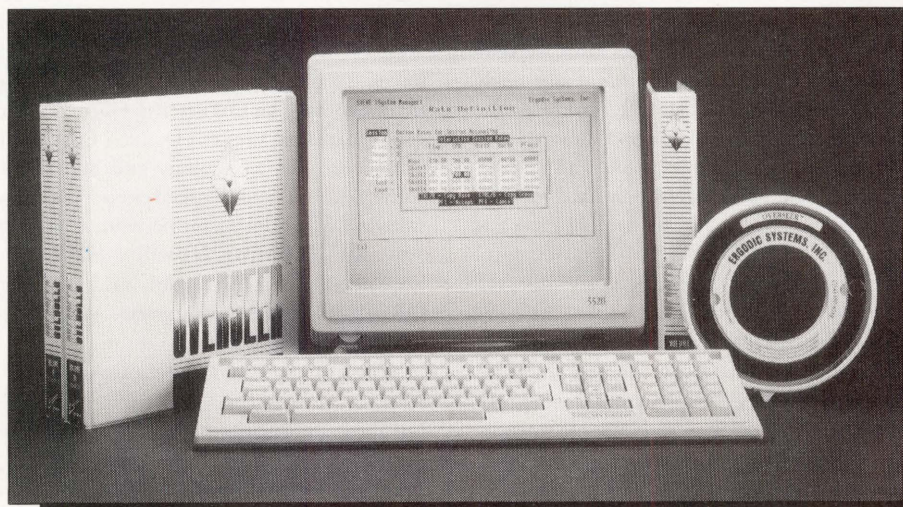
The SAS System Runs On Solbourne Workstations

SAS Institute Inc. announced the SAS System for Solbourne Computer's Series4 workstations under SunOS.

The SAS System under SunOS includes components with capabilities for data entry, retrieval and management; report writing and graphics; statistical and mathematical analysis; and applications development. Additional components are under development. Under SunOS, the SAS System also runs on Sun-3 and Sun-4 workstations. Other UNIX-based workstations running the SAS System are HP's 9000 series 800 and series 300 under HP-UX.

For more information, contact Hilary Yeo, SAS Institute Inc., SAS Cir., Box 8000, Cary, NC 27512; (919) 467-8000.

Circle 429 on reader card



Ergodic Systems' Overseer project accounting platform.

35mm Express/LAN Displays ReGIS Files On VT340

Business & Professional Software Inc. announced a version of its 35mm Express desktop presentation software that runs on a DECnet LAN.

35mm Express/LAN creates graphics for output as 35mm slides, overhead transparencies and paper handouts. It lets you output visuals to ReGIS files and display these files on VT340s. Player, an adjunct to the software, lets you use the VT340 as a fully functional presentation preview device. The VT340 becomes a presentation projector, and you can project ReGIS file graphics on screen using function keys. 35mm Express/LAN outputs to several DEC peripherals, including the LJ250/LJ252 companion color printers, LNO3R ScriptPrinter and LNO3 PLUS full page bit-map graphic laser printer, LA75 companion printer, PrintServer 20, PrintServer 40 Plus and LVP16 Pen Plotter. The software outputs to many dot-matrix, inkjet, thermal and laser printers and film recorders.

The product costs \$2,495 for a six-user license.

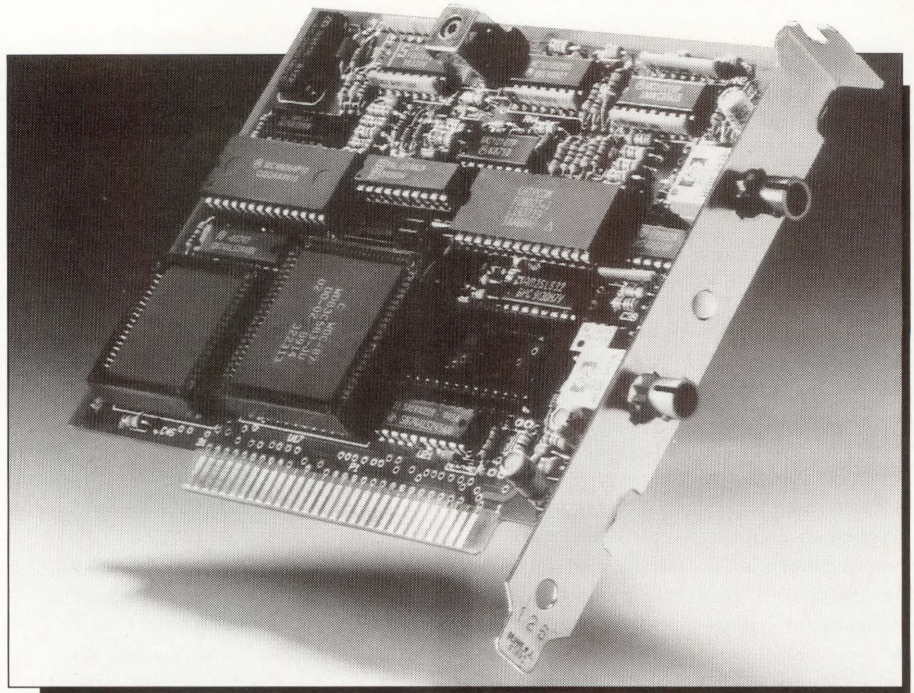
For more information, contact David Solomont, Business & Professional Software Inc., 143 Binney St., Cambridge, MA 02142; (617) 491-3377.

Circle 479 on reader card

Terastore 1408 Accesses 1.68 Terabytes Of Storage

Dexcom Inc. announced U.S. distribution rights for the Terastore 1408 mass storage system. The product is a compact AI-driven robotic mass storage system that can access 1,680,000 MB (1.68 terabytes) of read/write tape storage in many online configurations.

The system consists of modules that interconnect to form clusters of robotically accessed tape storage in and drive units. AI software controls adaptive robotic arms that locate, mount and demount high-capacity cassettes in less than 10 seconds. Through DAT technology, the equivalent of six 10 1/2-inch reels of 6,250-bpi tape or IBM 3480 cartridges can be stored on a Terastore cassette measuring 2 1/8 x 2 1/4 x 7/16 inches. Seven read/write drives can be housed in the product. Each provides recording densities of 61,000 bpi along 1,869 helical scanned tracks per inch for a formatted capacity of 1,200 MB per cassette. The product provides storage and access for 1,208 cassettes. Error detection and correction circuitry



Chipcom Corp.'s ORnet/PC Fiber Adapter Card.

provide an error rate less than one in 1,000 trillion bits (one in 1E15) at a transfer rate of 1.5 Mbps (burst). Standard interfaces link the product to most mainframes, minis or micros. For more information, contact Dexcom Inc., 217 Montgomery St., Syracuse, NY 13202; (315) 422-9246.

Circle 487 on reader card

CorVision Automates Four Software Life-Cycle Phases

Cortex Corporation, producer of application development software that uses Integrated Computer-Aided Software Engineering (I-CASE) technology, announced CorVision V4.32. It's a fully integrated application development environment for VAXs.

CorVision is an I-CASE tool that lets software developers generate production-ready applications automatically. It automates the last four phases of the software life cycle — design, code generation, testing and maintenance. V4.32 offers several enhanced features. The menu-driven screen painter increases screen painting flexibility and the range of attributes that can be specified. An improved interface to Rdb lets you maintain the database automatically. You can develop applications that execute in any foreign language. Documentation includes terminal and workstation interfaces. The workstation software lets you develop applications more than twice the size of those developed with previous versions.

For more information contact Howard Exton-Smith, Cortex Corp., 138 Technology Drive, Waltham, MA 02154; (617) 894-7000.

Circle 485 on reader card

Chipcom Offers Low-Cost Fiber Optic Connectivity

Chipcom Corporation announced a low-cost way to bring fiber optic Ethernet to the desktop. The ORnet/PC Fiber Adapter Card eliminates the need for an external transceiver and AUI cable, reducing cost per connection by up to 25 percent.

The ORnet/PC Fiber Adapter Card is designed for use with Chipcom's ORnet Fiber Optic Star Coupler. ORnet PC lets network PC users take advantage of the high level of data security, noise immunity and longer distance capability offered by fiber optic networks. The ORnet/PC Fiber Adapter card is based on Western Digital's EtherCard Plus controller technology and SuperDisk software. The SuperDisk diskette provides software drivers for major network operating systems, including Novell's NetWare, DECnet-DOS, UNIX and XENIX. The ORnet/PC card also will operate with IBM's OS/2 Extended Edition.

The ORnet/PC Fiber Adapter Card costs \$795.

For more information, contact Pamela Herbert, Chipcom Corp., 195 Bear Hill Rd., Waltham, MA 02154; (617) 890-6844.

Circle 480 on reader card

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CIRCLE 131 ON READER CARD

uFAX Provides Send And Receive Capabilities

Synergy Software announced uFAX, a fax management system for UNIX-based office systems. The product seamlessly integrates with your existing business. It provides complete, unattended Group III fax send and receive capabilities through the UNIX system, allowing any user to send and receive his own faxes as simply as printing a file.

The product includes a set of user, administration and integrator tools and utilities. Operating in the background, it's transparent to UNIX system users while it controls fax traffic. The system administrator can control which users have access to uFAX, thus providing system security. The product can be used from any ASCII terminal on the UNIX system. You can send, receive, display and print faxes and maintain a personal fax phone directory. The product includes a queue manager that allows the control and viewing of fax documents in the fax queue and provides information about each fax document. You can control the queue facilities for your own fax, or the fax administrator can manage the fax queuing system.

For more information, contact Synergy Software, 2457 Perkiomen Ave., Reading, PA 19606; (215) 779-0522.

CIRCLE 431 ON READER CARD

Exide Electronics Expands Powerware UPS Family

Exide Electronics announced two intelligent power processors, Powerware System 50 and System 150, in its family of UPSs.

Powerware systems are based on a common application adaptive architecture. Multiple computers from diverse vendors can be supported by a single Powerware UPS. When power fails, Powerware systems automatically alert supported computers and begin an orderly shutdown. Powerware systems can be upgraded on-site if additional power protection is needed. All systems are designed to minimize the damaging harmonic distortion produced by computer power supplies, eliminating the need to oversize the UPS to support peak loads. The Powerware System 50 meets power requirements of 20kVA to 50kVA for the IBM 9370 and VAX 8600. The Powerware System 150 handles loads of 100kVA to 150kVA for the IBM 3090 and 8800 VAXcluster.

Powerware System 50, including battery support, costs from \$28,600. Powerware System 150 costs from \$61,200.

For more information, contact Karin Cram, Exide Electronics, 3201 Spring Forest Rd., Raleigh, NC 27604; (919) 872-3020.

CIRCLE 477 ON READER CARD

ScriptServer V3.0 Handles Print Spooling Functions

GrayMatter Software & Consulting Inc. announced the ScriptServer Printing System V3.0. Formerly ScriptMaster, ScriptServer is a printing system that provides a seamless interface between PostScript printers and VAX/VMS.

ScriptServer V3.0 handles print spooling functions and acts as a filter to convert straight ASCII text to Adobe PostScript output on DEC and non-DEC PostScript laser printers. ASCII files are translated to PostScript code before you print, giving you access to the language's extensive typeface and graphics capabilities. The software supplies error reporting functions and synchronization, overcoming limitations of the VMS print symbiont. A menu-driven SCRIPT facility provides a user interface for printing options such as typefaces, job priority, paper size, orientation and margins, giving you more control over the printed page.

Licenses cost from \$495 for VAXstations to \$3,995 for a VAXcluster.

For more information, contact T.J. Balzarini, GrayMatter Software & Consulting Inc., 1300 Dexter Ave. N., Ste. 550, Seattle, WA 98109; (206) 281-8800.

CIRCLE 476 ON READER CARD

Farallon PhoneNET System Simplifies Networks

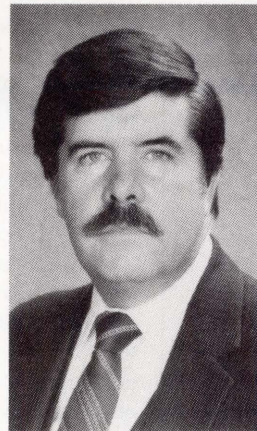
Farallon Computing Inc. announced a PhoneNET system architecture with an "ethernet" strategy that adds Ethernet to the PhoneNET system and simplifies AppleTalk networks. PhoneNet lets you choose a LocalTalk or Ethernet connection.

There are several new PhoneNET offerings. The StarConnector for LocalTalk networks is designed to connect AppleTalk devices in a star configuration. The StarConnector EN simplifies network connection for Ethernet-equipped Macs, IBM PCs, Next machines, Sun workstations and 802.3-compliant Ethernet devices. The StarController EN is a 12-port retiming Ethernet repeater that you can interconnect to support up to 1,024 users. The StarCommand 2.0 network management software, bundled with StarController, monitors LocalTalk and Ethernet networks.

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CIRCLE 118 ON READER CARD

The StarConnector costs \$29, the StarConnector EN costs \$195 and the StarController EN costs \$2,495.

For more information, contact Wendy Keough, Farallon Computing Inc., 2201 Dwight Way, Berkeley, CA 94704; (415) 849-2331.

Circle 491 on reader card

Filemaster V1.1 Features Custom Hotkeys

Hancock Software announced Filemaster V1.1 for VAX/VMS. Enhancements include the ability to customize hotkeys for any frequently used application.

Using Filemaster's multiwindow display, you can find a file and then launch into the appropriate application with that file via a single keystroke. Using this function, you could scroll through a list of files, simultaneously peeking at the contents of each file. You also can find the occurrence of any text string in a file. Using this function, you could select any set of files using up to 18 selection criteria, then scan through them to find occurrences of a particular code segment. These features are designed for system managers and high-end users who manage and work within large, networked file systems.

Single-CPU pricing ranges from \$495 to \$7,950, depending on VAX model.

For more information, contact Ivor Kaklins, Hancock Software, 115 Watertown St., Watertown, MA 02172; (617) 924-0017.

Circle 467 on reader card

BGS Announces VAX Performance Products

BGS Systems Inc. announced its performance analysis and capacity planning tools for VAXs. The Best/1-VAX family includes Capture/SPM for VAX/VMS performance analysis and Best/1-VMS to perform What-If modeling for VAX/VMS tuning and capacity planning.

Capture/SPM reads and analyzes VMS performance data and generates reports that show usage of hardware devices for individual VAX CPUs and VAXclusters. Best/1-VMS reads performance models built by Capture/SPM and performs What-If analysis for VAX CPUs and VAXclusters. Capture/SPM resides and runs on VAX/VMS in batch mode. Best/1-VMS resides and runs on IBM MVS or VM hosts.

Pricing for typical VAX installations is from \$20,000 to \$40,000, with special packaging available for multiple CPUs and sites.

For more information, contact Tim Grieser,

BGS Systems Inc., 128 Technology Center, Waltham, MA 02254; (617) 891-0000.

Circle 489 on reader card

Houtzeel Adds Surfaces Module To APT System

Houtzeel Manufacturing Systems Inc. announced that it has added a Sculptured Surfaces Programming Module to its APT NC part-programming system.

The module, available with the HMS-APT V2.0, is an implementation of the Computer-Aided Manufacturing International (CAM-I) Sculptured Surfaces Module. It lets programmers define contours, cavities and other complex sculptured surfaces as standard APT surfaces for use as part, drive and/or check surfaces. It has been optimized in the HMS-APT to operate in the MS-DOS environment. HMS-APT provides 3-D, five-axis programming with single-pass processing and structured programming language. It features tool-path display and a lathe module. It's compatible with VAX systems and UNIX workstations.

The Sculptured Surfaces Module is optional for the HMS-APT. A single-user license costs \$850.

For more information, contact Stephanie Houtzeel, Houtzeel Manufacturing Systems Inc., P.O. Box 1268, Waltham, MA 02254; (617) 890-2811.

Circle 478 on reader card

Recital V6.0 Supports SQL Plus And Rdb

Recital Corporation announced Recital V6.0, an RDBMS and 4GL for the VAX/VMS, DEC RISC and UNIX environments. V6.0 comes with new documentation and adds support for native SQL and a bridge to DEC's Rdb relational database.

V6.0 supports read, write and update access to Rdb. As a result, Recital's bridge architecture provides access to data stored in Rdb. Rdb, RMS and Recital databases can be joined to create unique views. Recital allows corporations to leverage existing knowledge bases, even at the user level, to access data for building applications on top of Rdb. Recital's 4GL, programming language and SQL can be used to access Rdb. DECnet and distributed and clustered Rdb databases are supported. V6.0 is available on VAX/VMS, ULTRIX, ULTRIX RISC and other UNIX computers, including 386 UNIX System V3.2.

For more information, contact Tony Gian-

nelli, Recital Corp., 85 Constitution Ln., Danvers, MA 01923; (508) 750-1066.

Circle 425 on reader card

CAPLIB V3.0 Provides More Than 250 Programming Tools

Resources Planning Associates Inc. (RPA) announced the Computer Aided Planning Library (CAPLIB) V3.0. CAPLIB provides more than 250 programming tools to facilitate building custom, interactive software. This software can use a range of complex spatial and temporal data, incorporate user-generated mathematical models and integrate color graphics presentation capabilities. CAPLIB is available for PC DOS and VAX/VMS environments.

CAPLIB V3.0 offers an expanded set of cartographic data exchange utility programs, support of desktop publishing formats and enhancements to the menuing and user message system. It features the introduction of RPA's color transparency operations on low-cost EGA/VGA displays, provision of an icon generator and new window routines.

For more information, contact Marshall Taylor, Resources Planning Associates Inc., Cornell Business and Technology Park, Langmuir Bldg., Ste. 231, Ithaca, NY 14850; (607) 257-4305.

Circle 427 on reader card

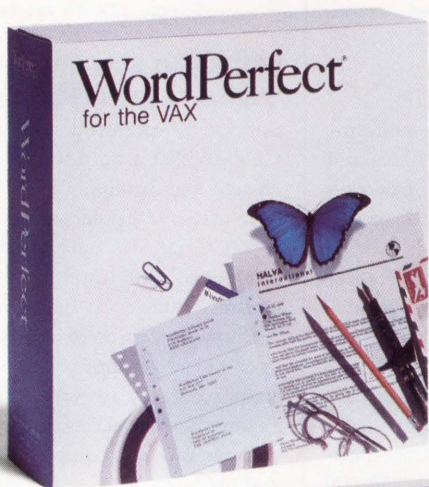
Blast II V8.4 Offers VT100/220 Terminal Emulation

Communications Research Group Inc. announced Blast II V8.4 software for UNIX and SCO XENIX systems. It includes file transfer, terminal emulation and file management features for connecting UNIX and XENIX systems to other computers with no extra boards or hardware.

Features include data compression, PC-style sliding-bar menus, script language, automated dialing and log on, and auto-search, which locates communications ports from a user-specified list. It offers identical menus and interfaces for UNIX and XENIX, matching Blast for PC, Mac, VAX and others. It also offers terminal emulation and keyboard remapping for the VT100/220 and others.

UNIX and XENIX Blast cost \$395 per copy. Blast for Macs, PCs, minis and mainframes costs from \$195 to \$5,500 per copy. For more information, contact Polly Henderson, Communications Research Group Inc., 5615 Corporate Blvd., Baton Rouge, LA 70808; (504) 923-0888.

Circle 486 on reader card



The world's best just got better... Introducing WordPerfect 5.0 for the VAX.

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CIRCLE 159 ON READER CARD

Sola Offers Interface Between UPS and NetWare

Sola, a unit of General Signal, announced that Novell Inc. has approved an interface between Sola UPSs and Novell NetWare networking software. The interface capability, optional with Sola's regulating offline UPS (SPS/R) and online Mini-UPS/2, alerts NetWare-linked networks of power failures.

In the event of a blackout, the Sola unit protecting the network's file server sends a signal to the NetWare board and supplies power from the battery. System users at workstations protected by UPSs are alerted via an on-screen message and are advised that the file server will shut down. Sola's interface-capable UPSs come with a built-in interface and two types of external connecting cables. They can be linked to the network file server's 3 1/2mm port or mouse port. The Sola-to-Novell interface applies to NetWare 68B running on IBM AT, PS/2 or compatibles. The Mini-UPS/2 is available in 500- and 1,000-VA outputs. The SPS/R regulating offline UPS is available in 500-, 1,000- and 1,500-VA outputs.

For more information, contact Bill Harder, Sola, a unit of General Signal, 1717 Busse Rd., Elk Grove Village, IL 60007; (708) 439-2800.

Circle 430 on reader card

Boston Business Computing Moves VMS Users To UNIX

Boston Business Computing Ltd. announced VMS-compatible software packages designed to help VMS users coexist with or move to UNIX systems. Vnet, Vmail and Vbackup provide VMS compatibility across such applications as communications, electronic mail, and data storage and retrieval.

Vmail is an emulation of VMS Mail for UNIX systems. It features more than 90 percent of the VMS Mail commands and qualifiers. With Vmail, you can access distribution lists and send carbon copies.

Vnet extends the functionality of DCL by providing access to DECnet via Ki Research's DEKnet software, an implementation of DECnet for UNIX systems. With Vnet, UNIX systems act as DECnet Phase IV end nodes, accessing VAX data files, storage facilities and system resources.

Vbackup is an emulation of VMS BACKUP for UNIX systems. With Vbackup, you can read and write VMS BACKUP tapes on a UNIX system using VMS syntax.

For more information, contact Edward J. Gaudet, Boston Business Computing Ltd., 3 Dundee Park, Andover, MA 01910; (508) 470-0444.

Circle 466 on reader card

SI350 Series Subsystems Increase Performance

System Industries announced high-performance disk subsystems for MicroVAXs and VAXstations. The SI350 Series is based on System Industries' 3 1/2-inch disk drives, which feature next-generation disk drive technology for increases in performance, reliability and capacity per footprint. The subsystems provide nearly 2 GB of online formatted capacity.

SI350 drives feature an average seek time of 12.5 ms and latency of 6.95 ms for an average access time of 19.45 ms. Data transfer rate is 4 Mbps and MTBF is 150,000 hours. The drives offer 320 MB in a standard 3 1/2-inch form factor. The subsystems come in two configurations: the Model 4 with 1.28 GB and the Model 6 with 1.92 GB formatted capacity. Rack-mount and tabletop versions are offered. An optional SI59 8mm tape subsystem that can back up the contents of an SI350 Series subsystem without operator intervention is available.

The Model 4 costs \$21,900, and the Model 6 costs \$28,800. The SI59 unattended backup option costs \$5,750.

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

Circle 488 on reader card

KES V2.6 Features Improved Developer's Interface

Software A&E Inc. announced the Knowledge Engineering System (KES) V2.6. KES is a productivity tool used to design knowledge-based applications that provide cost-effective, reliable solutions to business problems such as data analysis and classification, process control, interpretation, diagnostics and configuration.

V2.6 provides increased power and flexibility, making it easier for developers to build working knowledge-based applications. Features include increased functionality, an improved developer's interface and an incremental parser. The developer's interface has debugging and browsing features and enables the developer to modify or change the knowledge base interactively. The incremental parser allows the developer to parse

in smaller segments.

For more information, contact Ricki Kleist, Software A&E Inc., 1600 Wilson Blvd., Ste. 500, Arlington, VA 22209; (703) 276-7910.

Circle 428 on reader card

CCC/BASIC Aids In Configuration Management

Softool Corporation recently announced CCC/BASIC, an automated solution to change and configuration management for development/maintenance environments.

CCC/BASIC operates through a small number of easily used menus and panels. It controls changes to individual components within each version of an application, as well as complete versions of an application, while supporting any software life cycle model. Features include access controls to ensure that sensitive data isn't compromised and that only authorized changes are incorporated; tracking and migration of components of an application as a single unit throughout the software life cycle; and easy creation of new baselines to serve as starting points for further development and maintenance.

CCC/BASIC is available for VAX/VMS. Prices range from \$2,700 to \$56,000.

For more information, contact Jim Sterne, Softool Corp., 340 S. Kellogg Ave., Goleta, CA 93117; (805) 683-5777.

Circle 465 on reader card

Unify's SQL/A Tutor Provides SQL Training

Unify Corporation announced a computer-based training package that provides an intermediate knowledge of SQL in four hours.

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The Unify SQL/A Tutor costs \$199.

For more information, contact Ann Shukla, Unify Corp., 3870 Rosin Ct., Ste. 100, Sacramento, CA 95834; (916) 920-9092.

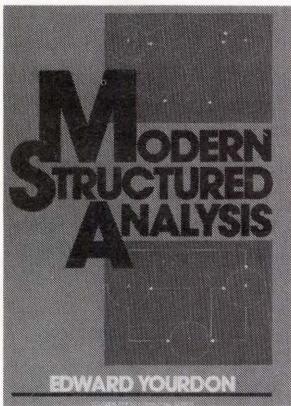
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Modern Structured Analysis

If you're an artist, you'd probably give your left ear for the opportunity to learn from a master like van Gogh. If you're a system analyst or systems developer, what would you sacrifice for the opportunity to be enlightened by the king of methodologies, Ed Yourdon?

Fortunately, only \$34 and some time are required. Yourdon has come forward with the "official" statement of his methodology in the 672-page *Modern Structured Analysis*, published by Prentice-Hall.

Classic systems analysis has changed since it gained widespread acceptance in



Ed Yourdon offers his philosophy on system analysis in Modern Structured Analysis.

the 1970s. *Modern Structured Analysis* primarily focuses on current modern approaches to systems analysis as well as on the impact that recent developments such as automated CASE tools have had and will have on the industry.

Modern Structured Analysis is divided into four parts and a group of appendixes.

Part 1 introduces the basics of systems analysis and design. Why is systems analysis important? What's a system? What comprises a system? Should all systems be automated? How does a system life cycle operate?

Yourdon answers these questions by providing an overview of systems in general, whether they're machine-based, man-made or systems that occur in na-

ture. He discusses the people involved in an automated system. A quick overview of the tools used by analysts is presented, followed by a discussion of the project life cycle and the activities included in it.

In Part 2, Yourdon discusses in more detail the modeling tools generally used by analysts. He shows how to derive dataflow diagrams, entity-relationship diagrams and the central data dictionary. He discusses state transition diagrams and explains methods for balancing the various models and how to use them effectively for system design.

Throughout the discussion, emphasis is placed on effective use and proper selection of the methods needed for different types of projects. In addition to analysis tools, Part 2 contains a chapter on project management and tools to keep analysis tasks on time.

Yourdon investigates the entire analysis process in Part 3. He first presents the classic modeling approach and discusses the reasons new methods are needed. Emphasis is placed on building new systems with a minimum amount of investigation of the old system.

By discussing the environmental, behavioral and essential models of a system, Yourdon ties together the prior discussions of data flow diagrams, entity-relationship diagrams and the creation of a data dictionary. Also presented in Part 3 are implementation issues such as the user interface, screen and forms design and report formats.

Part 4 starts with a discussion of system design, the step of the development cycle that falls between analysis and implementation. Enough system design

considerations are presented to help you understand what a system designer must do to create an efficient design. The programming and testing phases are discussed from the system analyst's point of view. Also considered are program maintenance and how system analysts can impact the maintenance cycle by creating maintainable systems. Finally, Yourdon offers his ideas on the future of structured analysis — what impact new technologies will have on it and how awareness of it will increase as experienced managers, comfortable with computers, begin to assume management positions in industry and government.

The appendixes cover the current crop of automated design tools and what companies produce them, how to make reasonable estimates of the resources required to develop a system, how to do cost-benefit calculations, how to perform beneficial system walk-throughs and inspections and how to conduct interviews to gain the maximum amount of information to get your analysis effort started on the right foot.

Two case studies of system analysis round out the publication: One is business-oriented, the other is an example of a real-time design.

Yourdon's style of writing makes *Modern Structured Analysis* enjoyable. Numerous exercises at the end of each chapter make the book suitable for reference and classroom use. Those involved in system analysis will benefit from reading and studying *Modern Structured Analysis*. —David B. Miller

Modern Structured Analysis
Edward Yourdon
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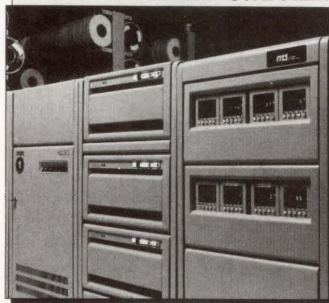
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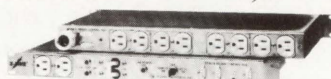
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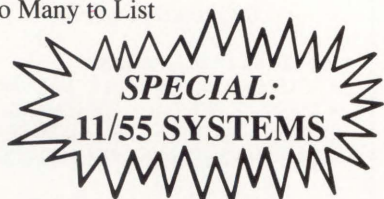
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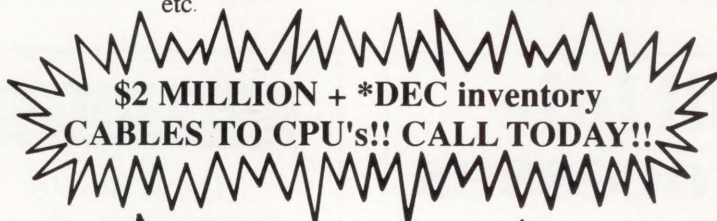
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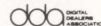
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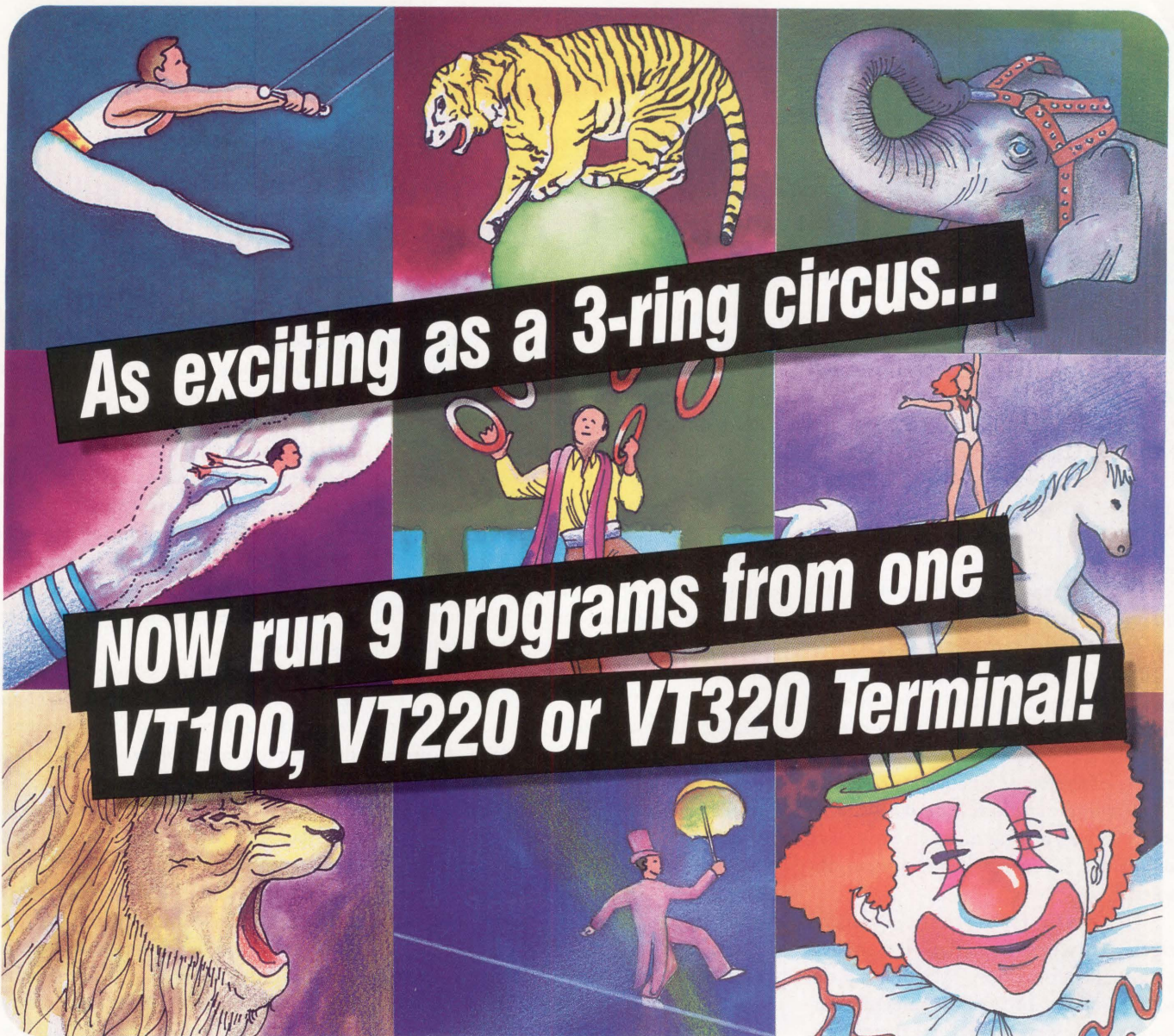
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The Trials Of Telecom

I ruined my summer writing a tome called *Dvorak's Guide to PC Telecommunications* (Osborne/McGraw-Hill). I hope everyone who has a PC will buy the book and its two disks loaded with software, including a full-featured telecom program called Telix-SE.

I figure I can plug this book in this column if I attach some interesting anecdotes. I have more than a few.

The most annoying aspect of writing this book was the attitude that the big East Coast publishers had toward telecommunications and modems. A honcho at one of the biggest publishers told me, "Telecommunications is dead." Another said, "Who's buying modems nowadays, didn't the fax machine make them obsolete?"

This was par for the course. I couldn't figure out where these people were getting their information. When I told this to the officers of various modem companies, they were aghast. For them, business is booming, especially with high-speed modems as people discover the merits of 9,600 bps and V.32.

Of course, the honchos at these modem companies are part of the problem. Modem manufacturers have failed to promote their product in the business world.

For example, I recently asked a leading modem company for backgrounders on high-speed modems. Backgrounders are documents that explain technologies. They're the bread and butter of public relations. "We don't have any backgrounders," the PR person told me. I was amazed.

Research shows that most modem users are pretty sophisticated. Take this group away and what's left are modem-phobic computer users who are scared to death of the things.

Those who use modems are experienced. They accept that there's more to hooking up a modem and going online than plugging something in and typing GO! They know that they may have to fiddle around with different telecommunications programs, various communications parameters and even switch settings on the modem.

Standard Solution

The modem scene is a difficult one, because it hasn't languished long enough to be standardized. This concept is peculiar, but hear me out.

Years ago, when I was editor at a computer publication, we received fax transmissions from our New York office. These then had to be rekeyed.

Once, when I was in New York, I used the fax to send something to California. It was a laughable machine — the quality of the output stunk, literally and figuratively! Over the years these expensive machines languished. No one wanted to use them unless he had to. Further, two identical machines were needed for the system to work. I figured that electronic mail, then in its infancy, would swamp the facsimile machine.

Those were the days of the CP/M computer and the MODEM7 telecommunication protocol for file transfer. I thought this was the way to go. You could send the file directly to another computer for editing. No rekeying.

Well, I was wrong. The problem was modem illiteracy. People were becoming computer literate, but they weren't modem or telecom literate. It was im-

possible even to talk someone through the complicated setup procedure necessary to get a phone link simply to say hello from machine to machine.

It's still difficult to link up. I've had to send columns and articles to publications around the country. There's always a way to do it electronically, but it's never the same and never as easy as it should be. To this day, I find oddball requirements and data processing managers who haven't a clue about telecommunications.

In the meantime, standards committees took the fading fax technology and wrapped it in a common set of paradigms that resulted in the ubiquitous Group III fax standard. The Japanese pounced on this standard and started making cheap fax machines for the small businessman and the public at large.

There are more than five million fax machines in the United States, up from a few thousand before the standards. It's estimated that there are 10 million modems, and only one million are used.

An idiot can operate a fax machine. A modem requires some brains and knowledge. But with a modem you can access remote databases, download ASCII text for editing, transfer bit-mapped full-color images and automate information gathering. A fax just makes a crude copy of a document and transmits it to a remote location. Which of the two technologies do you think is more vital?

Anyway, the project is over and the book is out. I hope it fills a need. Heaven knows, the people who should be filling the need — New York publishers, magazines or modem makers — have no intention of doing so. I guess it's too much work, and hey, who wants to ruin a summer? ■

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