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ANSI Update

DEC PROFESSIONAL

A PROFESSIONAL PRESS PUBLICATION

- The Technical Workstation Market
- VLSI Architecture For 3-D Graphics
- Natural Language Interfaces

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Workstations: Power to the People

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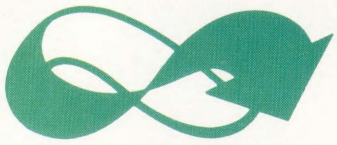

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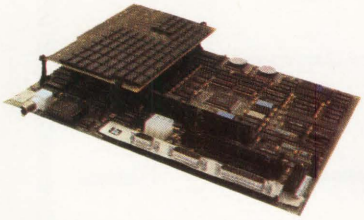

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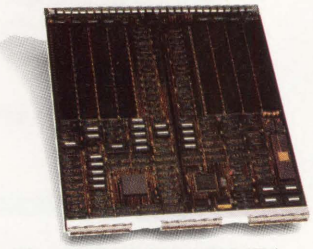

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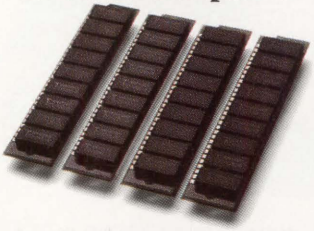

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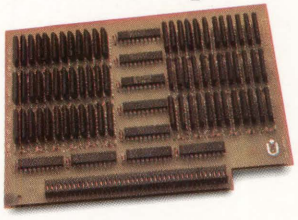

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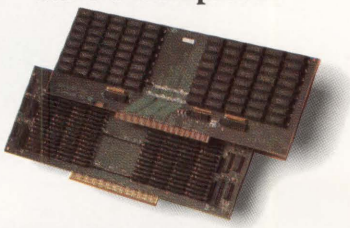

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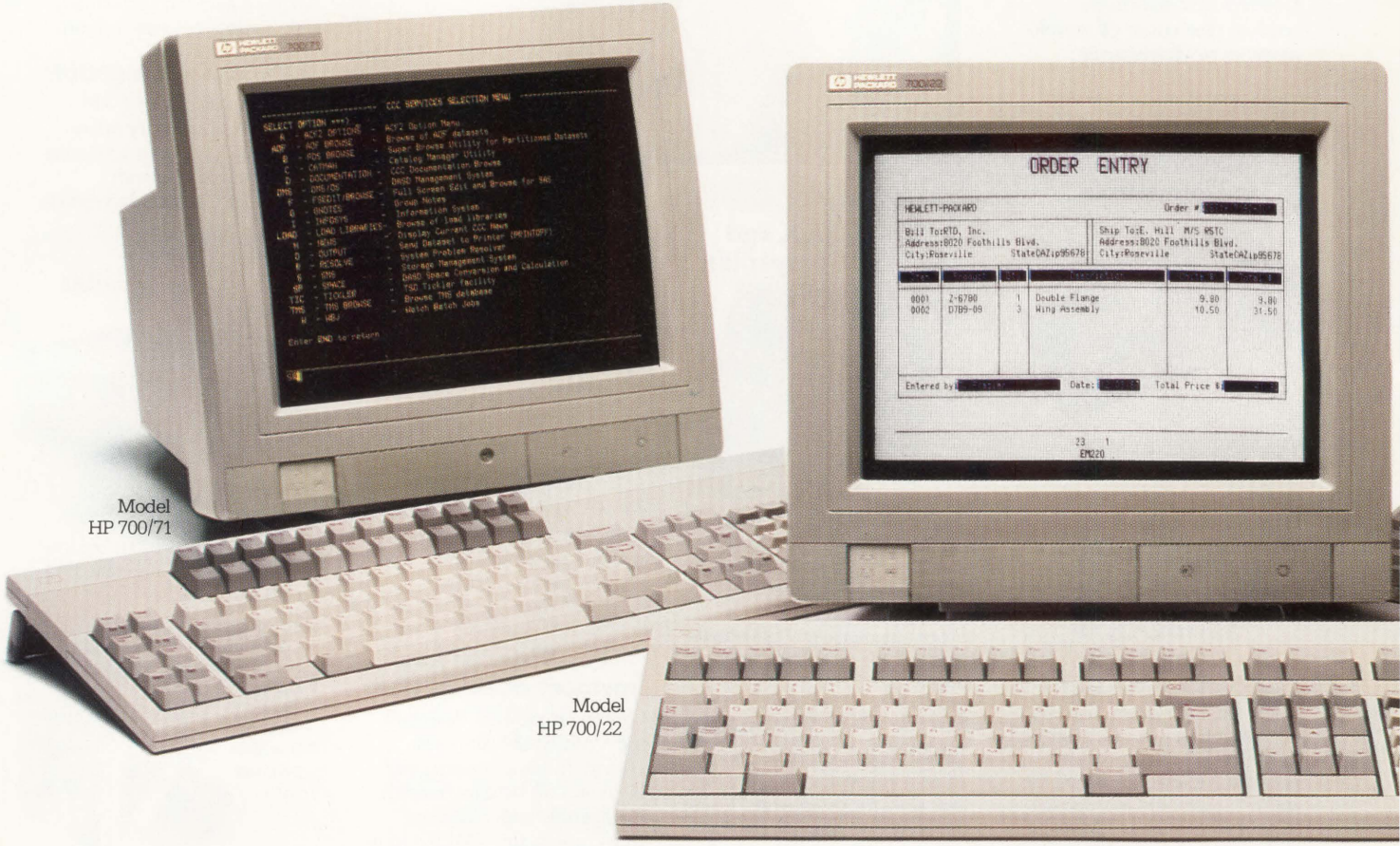

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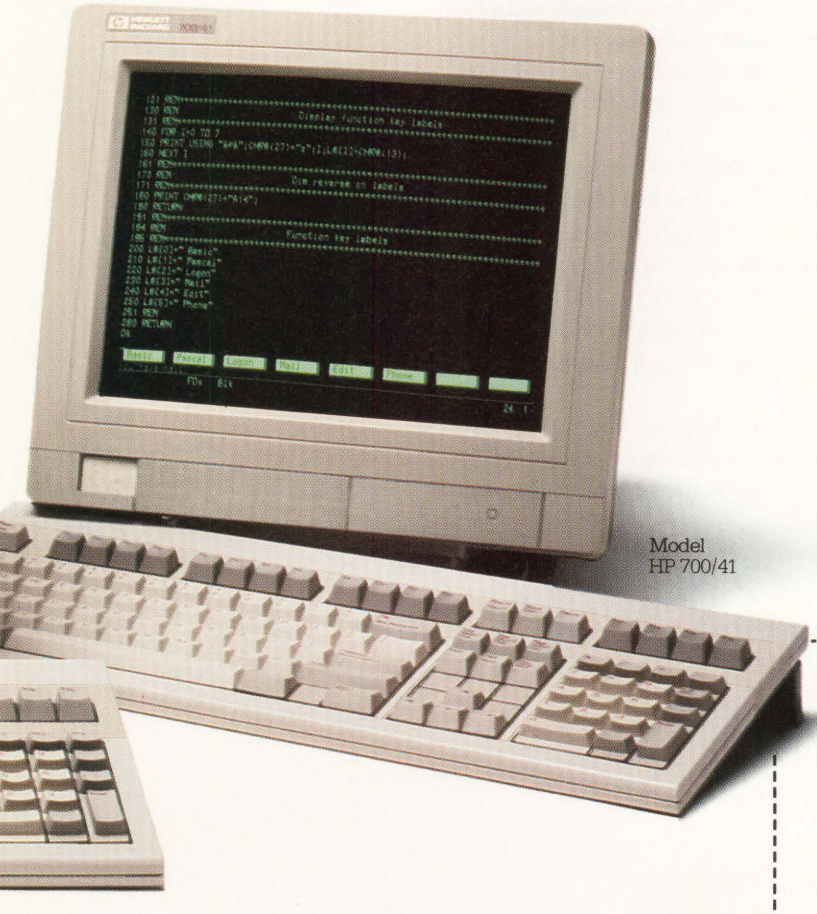

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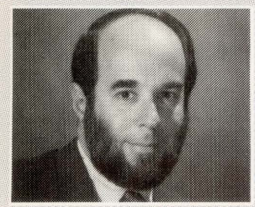

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What Is A VAXSTATION?

Positioning of a product is not an exact science. Often the market decides the position rather than the manufacturer. A MICROVAX housed in a desktop cabinet, equipped with a large CRT, robust graphics capability and a mouse is called a VAXSTATION; it runs UNIX, ULTRIX or VMS, but what is it? DEC calls it a desktop VAX. Unfortunately, that doesn't help us much.

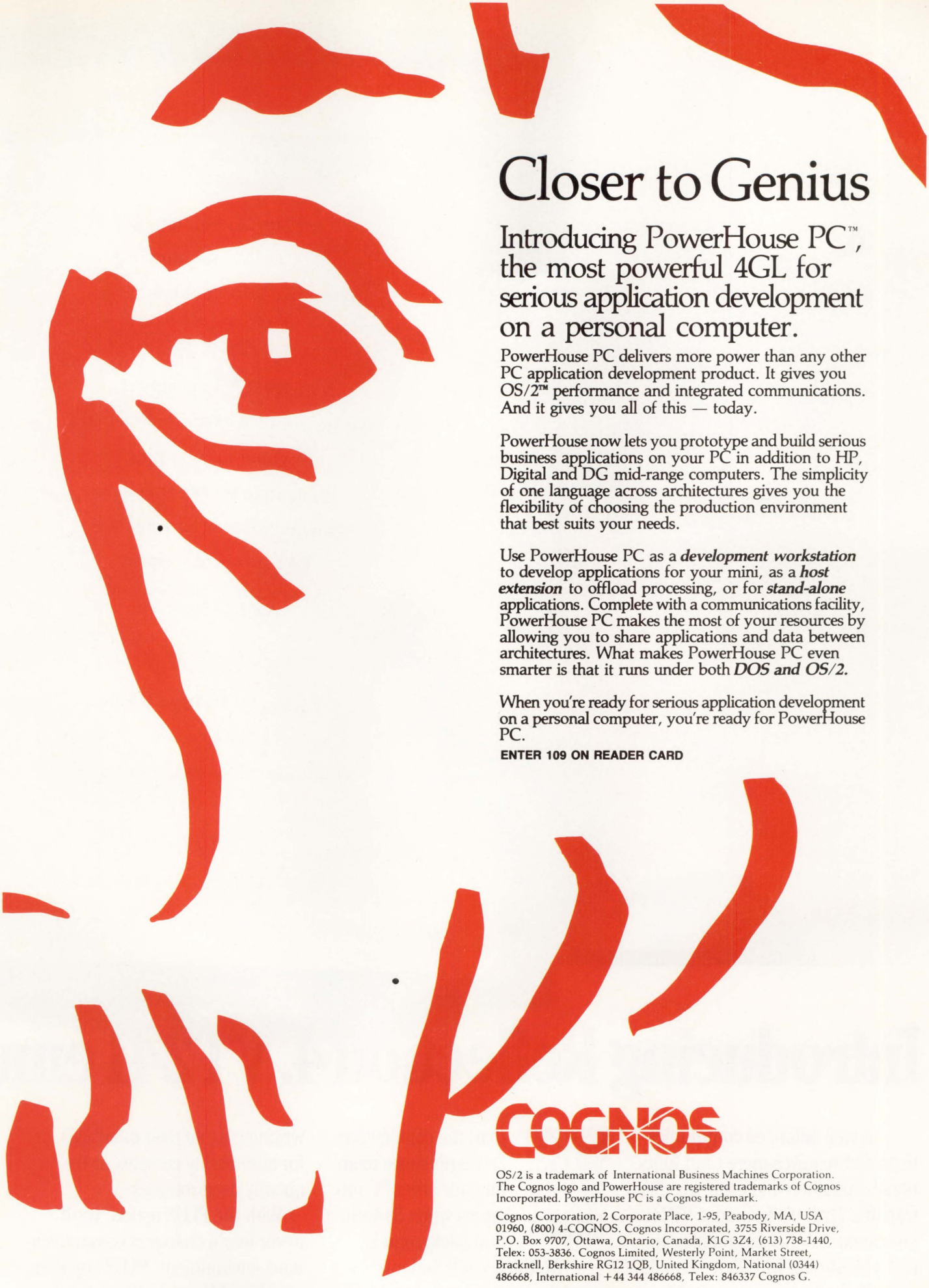
The VAXSTATION runs VMS, so that makes it a powerful computer ready to support and compute intensive applications. If you have a network (Ethernet will do), then adding this unit is as easy as plugging it in. In this configuration you can distribute compile and link development processess to programmers' desks giving them fast response and maximizing productivity. The natural multitasking of VMS lets programmers do several things simultaneously; compile, debug, print and edit. As a VMS engine, the VAXSTATION is a winner.

The VAXSTATION runs UNIX and ULTRIX, so that makes it a powerful UNIX engine to run UNIX applications. Many C programmers aren't happy unless they're in a workstation environment in UNIX and supported by the many application development tools that operating systems provide. Also, there are many UNIX applications supported by the VAXSTATION.

The VAXSTATION is a VAX, but without software it's just iron. A PC on a desktop is useful because of the productivity software available, not because it's great hardware. A Macintosh computer is what it is because of superior presentation, the amount of software available and the price. For the desktop VAX to be successful it's going to need plenty of software, a good user interface, and the price must be reasonable.

These are things DEC never has done well. The Rainbow failed, the Professional computers were misplaced, the VAXMATE never came out of its shell and now is obsolete. Everytime the market tries to tell DEC what it wants and needs on the desktop, DEC tells us how it knows better what we want; after all look at how well DEC has done with minicomputers. The success of *ALL-IN-ONE* is seductive: We've won the desktop in the office with *ALL-IN-ONE*. But an office product that's built around VT-220 functionality isn't a personal workstation, comparing *ALL-IN-ONE* to a Macintosh could replace the apples-to-oranges cliche; it simply can't be done.

The desktop remains in an elusive position for DEC. It's not too late, but you only get so many chances and DEC has lost the first two. DEC needs new ideas and better thinking in the software department, more workstation software and a better price for the software, or it will strike out with desktops.



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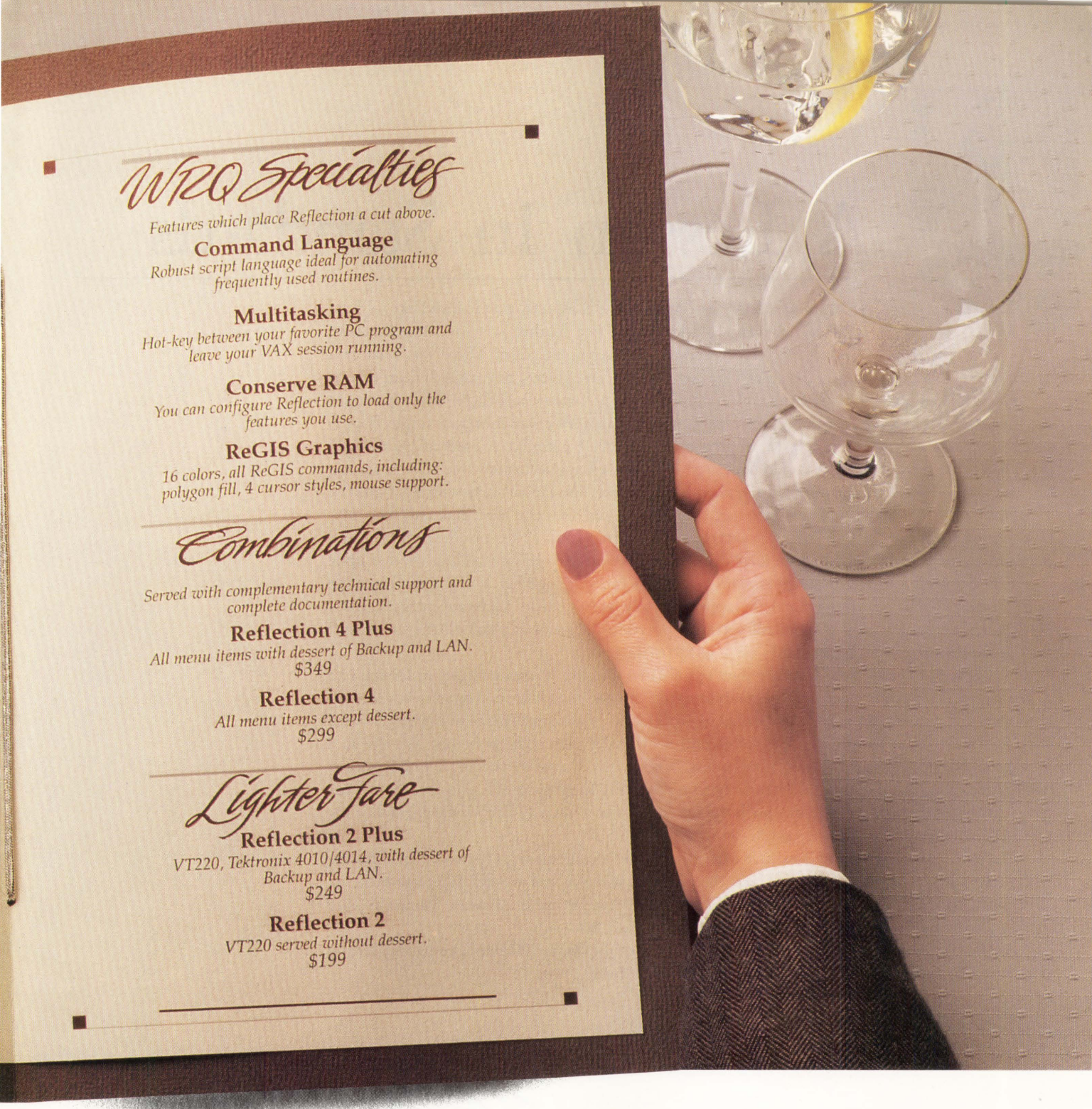

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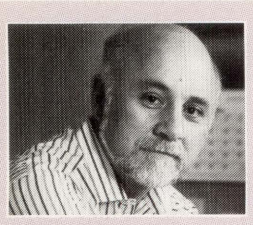


EDITORIAL

Dave Mallery

A Lesson In Standards

I had an interesting lesson in standards recently that I would like to share with you. I went to a computer flea market at a local motel where approximately 100 vendors were set up at tables. There was total grid lock in the aisles. The scene would have given a fire marshall heart failure.

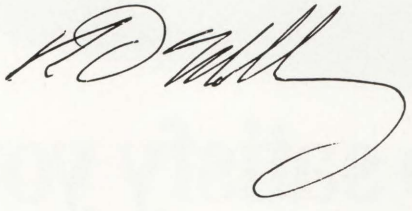
Anyway, I elbowed my way from table to table buying pieces here and there. When I brought the lot home, I assembled a nifty 12 MHz baby AT with an EGA color monitor, single floppy, serial port, case and power supply for approximately $1,200. I plugged in 1 MB of 150 ns RAM that I had lying around (a purist would have used 100s). It took approximately one hour to assemble, and worked perfectly the moment I applied power. It was like the old days with the UNIBUS.

Now, with the addition of an Ethernet controller, I can skip the hard disk and have MS-DOS served from the cluster. There are several products that support this, both from DEC and the third-party market. Now that we have made the transition to ThinWire, adding another node is trivial. So with a little elbow grease and courage, I can put together a first class executive workstation to replace my terminal for approximately $1,500 before software licenses. It's a DECNET node, so my mail is handled; yet it's a powerful PC, so I can run all the great stuff that probably never will be available on a VAXSTATION.

The beauty of standards, whether they're informal like the PC architecture, or formal like X Windows, is that they ensure interoperability. You can get components from any source that conforms and connect them with a reasonable expectation of success. This is why Digital failed with PCs and why attempts to close architectures ultimately fail. Like it or not, we live in a world that has become accustomed to openness. When you tell a savvy corporate purchaser today that he can't do something a certain way, you're usually kissing the sale goodbye. Standards perform another great service. They push the market and accelerate the downward spiral of the cost/performance curve. We the people win.

Currently, we're installing our first Mac-II in the art department. It'll also be an Ethernet DECNET node, yet all of its mips can bear the problem at hand: line art and full-page makeup. With both the Mac and the PC, all of the files can be served from the cluster, forever freeing us from the dangers of data lost on the crashed, isolated PC.

For the last five years, I've been reading about all of the above. It looks like payday finally is arriving because I see it being plugged in all around me.



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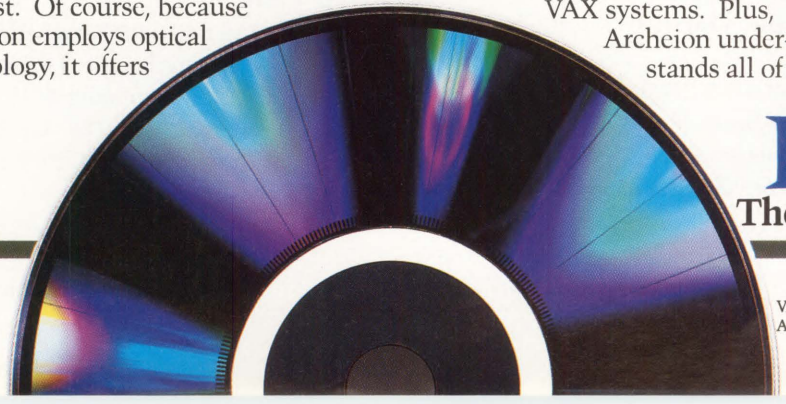

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LETTERS

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

ART APPRECIATION . . .

"The Art Of Programming" by Charles Connell (December 1987) is its own best illustration. It's short, simple, comprehensive and elegant.

But, I would like to add two minor points to the section about defensive coding. First, when adding a new feature, it's necessary to test not only the new feature but the whole program. The new code that was added and tested might cause an error elsewhere.

For example, when you're closing files at the end of your program, your error handler might transfer control to the file-deleting subroutine. Second, when testing your boundary conditions, don't stop at testing for highest and lowest values. Test the first, second, last and next-to-last iterations of a loop; the records in a file; or lines in a scrolled area. Remember to test the elements in the middle of your domain.

Connell's article should be required reading for anyone who considers himself a programmer.

James Finnigan
Peekskill, New York

. . . MORE ART APPRECIATION

I would like to comment on the suggestion to "Find a Simple Algorithm" in the article, "The Art Of Programming" by Charles Connell (December 1987). A simple algorithm can exist only for a module that's asked to do a well specified task. In searching for a simple algorithm, it's important to consider the possibility that the task isn't divided properly and that a set of simple algorithms can solve the problem.

Sometimes the solution to achieving simplicity is to insist that the problem be posed differently. One of the benefits to managing a computerized system is that it forces a rational system. We can lose part of this benefit by choosing to turn requests into complex, difficult-to-maintain software. Maybe we can't say no to the request, but we can point out the cost.

Bruce C. Brown
Fermi National Accelerator Laboratory
Batavia, Illinois

MY FAVORITE MAGAZINE

Is there any difference between *DEC PROFESSIONAL* and *VAX PROFESSIONAL*? If there is, which one is best suited for a VAX/VMS system manager in terms of new products, tidbits on DCL programming, networking, etc.

I currently get *DEC PROFESSIONAL*, one of my favorite magazines, because of its usefulness and pertinence.

Daniel Servranckx
Software Kingtics Ltd.
Stittsville, Ontario

DEC PROFESSIONAL *is a monthly magazine that focuses on the total DEC industry. Containing articles on technology, programming, networking and connectivity, industry trends and products,* DEC PROFESSIONAL *addresses the issues pertinent to the professional and his growth in the industry.*

VAX PROFESSIONAL *is a software journal for VMS users. Published bimonthly, it contains in-depth technical articles for the more experienced VAX user. Most articles contain source code, which is available for downloading from ARIS.*

For more information enter 499 on the reader card.

A SHORTER PROGRAMMING APPROACH

The article "REPLY/LOG In Batch Mode" Perry Bret Wischow (December 1987) is an elegantly short programming approach to issuing REPLY/LOG from a batch job. However, there is a shorter non-programming solution.

The following two lines of DCL will accomplish the same thing as Mr. Wischow's MACRO-32 solution:

```
$ DEFINE/USER SYS$COMMAND OPAO:
$ REPLY/LOG
```

This works because REPLY uses the definition of logical SYS$COMMAND to determine which terminal is running it. This technique also can be used to issue operator commands from any other terminal. For example, you can disable operator status, which accidentally was left enabled at a non-operator's terminal.

Carl W. Houseman
Genicom Corporation
Waynesboro, Virginia

RSTS FAN

I was pleased to find a RSTS-related article in your magazine because I manage a network of PDP-11s running RSTS, in addition to our VAXCLUSTER. Unfortunately, Lawrence F. Koolkin's basic

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premise in "Caching In On RSTS/E" (November 1987) is incorrect. Namely, Koolkin says that the result of the SET CACHE/ALL command is that it ". . . caches all read requests . . . for a particular file depending on the file's UFD entry or the OPEN MODE specification."

The behavior that he describes in the article is what happens when the SET CACHE/FILE is in effect: Only individual files that are opened with a caching MODE or with a UFD entry for caching will be cached. The *RSTS System Manager's Guide* p. 11-18 says:

"If you use SET CACHE/ALL, all read requests are cached. The *type* of caching (sequential or random) for a particular file is determined by the file's UFD entry as specified in the SET FILE command or by an OPEN MODE specification."

The SY/W display that he mentions is tied closely to the modes with which a file is opened. This explains why the SEQ and RND tags only appear on files that are opened with an OPEN MODE to specify caching, and the UFD file entry provides a way for the system manager to force the system to apply those modes on behalf of users who normally don't have the requisite privileges to use those modes.

This is strengthened by the fact that when caching for all files is enabled, SEQ and RND tags don't appear for all file openings, but only for those that were opened by programs using the OPEN MODE or UFD entry method. The SHOW CACHE command also reveals in its display of K used for data caching that this is the case.

Thank you for a great magazine.

Edward Finneran
The Public Schools of Springfield Massachusetts
Springfield, Massachusetts

A CASE FOR EPOS

The article "CASE For Sale" by Sue Ann Hawley (December 1987) was well written with true observations in terms of the CASE market attracting a high level of interest, while also causing confusion. Maybe this was the reason why our company with its CASE environment EPOS was omitted from the list of key vendors, despite its 350 major installations worldwide (80 percent in the DEC VAX world). EPOS offers comprehensive integrated life cycle support, including interfaces to other tools, and has been proved in numerous medium-to large-scale projects to increase software quality and productivity.

Peter Lempp
SPS Software Products & Services Inc.
New York, New York

Anyone wishing more information on EPOS may either circle number 479 on the reader card, or contact the company at 14 E. 38th St., 14th Fl., New York, NY 10016; (212) 686-3790.

A CLARIFICATION

I wish to correct a statement in the article "*Diskeeper*" by David W. Bynon (see "From the Lab," December 1987). Mr Bynon states, "When a new file is created, VMS looks for free space starting at the beginning of the disk volume." This isn't how VMS allocates space.

VMS caches the BITMAP.SYS and keeps a pointer to the last allocated cluster. When space is deleted or allocated by creating/extending, the pointer will locate the last allocated/deallocated cluster. On a subsequent allocation, the file will start/extend near the last cluster used/released. The only time Mr. Bynon's statement is correct is after the disk is initialized. As a disk grows into maturity, random events will determine, in an almost last-in, first-out way, where VMS allocates the next space.

I believe this allocation scheme receives unjust criticism. Remember the user-friendly philosophy of VMS design. It relieves the novice user from learning disk allocation procedures and minimizes the overhead for such a design. The trouble lies in the fact that most developers stay novice users when it comes to using disk space.

We must learn to prevent file fragmentation through, but not limited to, the following:

1. Planning disk file layouts.
2. Using better pack cluster sizes.
3. Using CREATE/FDL to preallocate and place files.
4. Including the allocate and extend clause on opens for all files that aren't preallocated.
5. Adjusting default SYSGEN parameters such as RMS_EXTEND_SIZE.
6. Using defragmenters and disk reorganization procedures.

To answer Mr. Bynon's question, "Why has Digital never designed a VMS defragmentation utility?" I say that Digital has done a good job of providing the necessary tools to prevent and control the problem. Many may not like what they see, but they also may not know how to use them.

I know that most of us have inherited a less than optimum system and it's nice to have a mixture of cures such as *Diskeeper* available to help until we can get the patient into a more enlightened regime.

William L. Baker
Dollar General Corporation
Scottsville, Kentucky ■

CORRECTION

In the article titled "Turbo Prolog" (December 1987), the vendor's name, Borland International Inc., was spelled incorrectly. *DEC PROFESSIONAL* regrets the error.

For more information, contact Borland International Inc., 4585 Scotts Valley Dr., Scotts Valley, CA 95066; (408) 438-8400.

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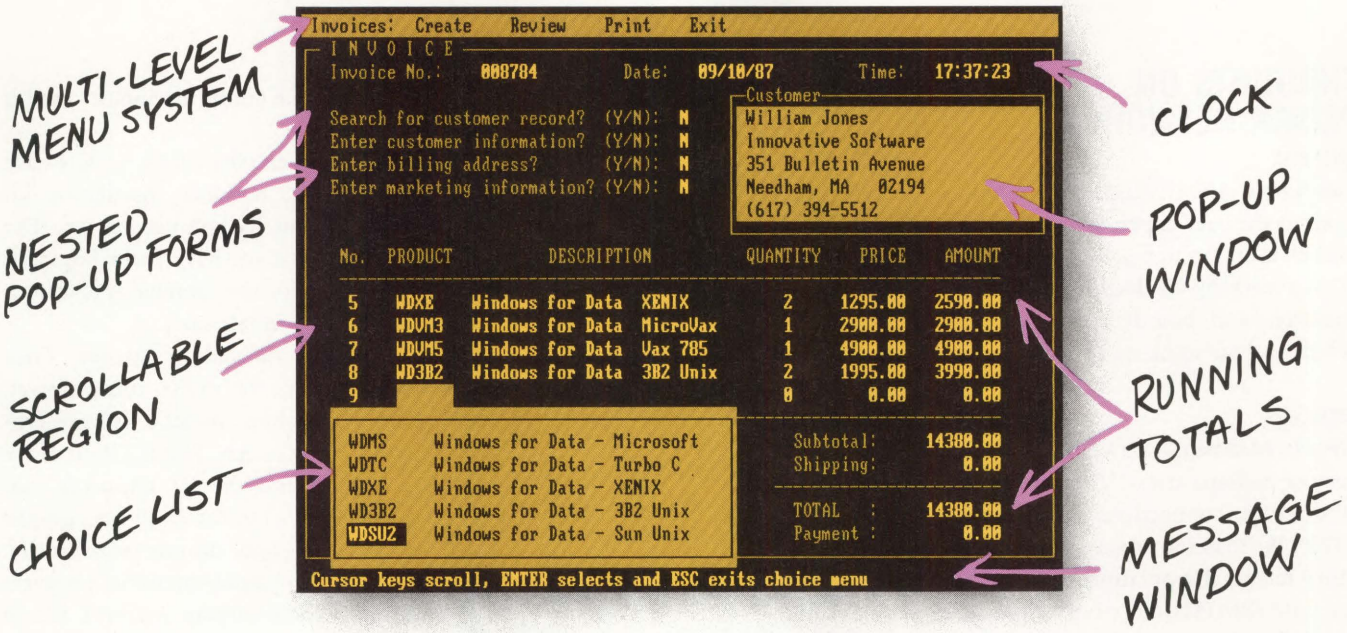

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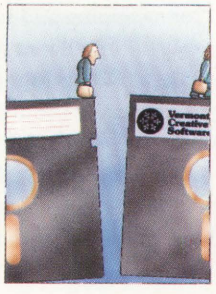

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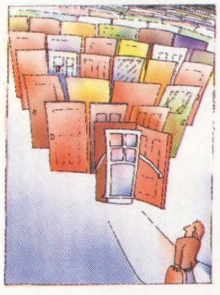

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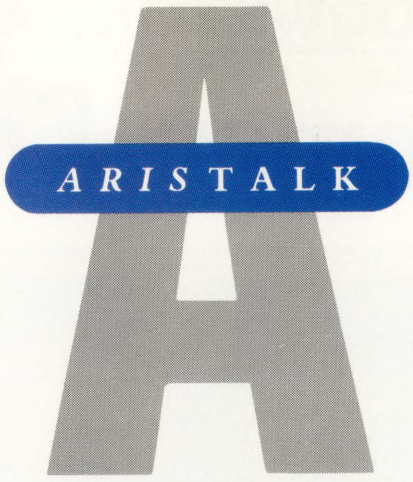

THOUGHTS ON PC/VAX NETWORKING

QUERY:

Judith Reed *(SIG 11/MESS 200):* I'm interested in the user experiences and opinions of users on non-DECNET DOS-to-PC networking packages. What other packages and boards are you using? What do you think of them?

REPLIES:

Terry L. Maddox *(SIG 11/MESS 202):* Public Service Indiana uses *VTERM* to enable PC-to-VAX connections, emulating a VT220. We're in the process of evaluating other terminal emulation packages for use with IBM PCs and would appreciate any feedback you could provide regarding your experiences in this area.

Pete Reck *(SIG 11/MESS 205):* We're evaluating a number of options for our PC-to-VAX networks. Currently we're using ThinWire Ethernet to 3COM cards in the PCs. DECNET-DOS is installed on each node and seems to work fine for file transfers, important for our applications. There are a lot of vendors appearing now with PC/VAX communication products, including harware and software. It's getting hard to weed them out.

We have plans to review *PCSA* (DEC) and *CommUnity-DOS* (Technology Concepts Inc.) in the near future. If you have a VAX, you have a license for *PCSA* already; you just have to purchase the media. But from what we heard at DECUS, *PCSA* has some major limitations; i.e., file tranfers aren't supported. DEC did say that 3COM cards will be *PCSA*-supported in VMS V5.

Our future applications will rely on a good network communications package that includes fast file transfers, task-to-task operations and the ability to communicate freely between nodes.

You may wish to read *"CommUnity-DOS"* (December 1987, page 110). The article briefly discusses hardware involved in one configuration. I found it interesting.

Bob Thompson *(SIG 11/MESS 215):* I have one DEC-PC network installation kit on order, but haven't used it yet. The cardware that we have from Logicraft works well for non-graphic applications (*Lotus 1-2-3, dBASE,* etc.).

Forget *Autocad* or games. They work but are 100 to 500 times slower, because graphics are done with sixel repaints of the screen. This is a limit of the serial link and the VT terminals, not cardware. It's OK for *Lotus 1-2-3* graphs because you only do one occasionally.

For any alpha-numeric program (monochrome display adapter), it's an excellent solution. We support 150 Logicraft users with less hassle than 15 real PC users. Of course, we saved the cost of a PC over a terminal.

We also use *Dataware* for PCs to put virtual disks on the VAX. Its work performance is ho-hum (slow floppy), but it's cheap.

How To Use ARIS

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

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

KERMIT is available.

SIG Identifications

Here's a list of the SIG categories referenced in this month's *ARIS*talk:

11 .....Clustering/networking
44 .....Migration Issues

LAVC PERFORMANCE

QUERY:

Steve Smith *(SIG 11/MESS 187):* We've just installed a LAVC with a 780 as a boot node and a MICROVAX II as a satellite with a local RA81 for swapping and paging. We're currently running batch jobs only on the MICROVAX. When I look at Monitor modes at any time, the Interrupt stack is around 30 percent of the CPU time. The 780 is slower now than when we added the MICROVAX. Is this normal or is there something that I missed?

REPLIES:

Rod Luciuk *(SIG 11/MESS 187):* I'm experiencing similiar problems with a 750 and a MICROVAX 2000 with RD32 local

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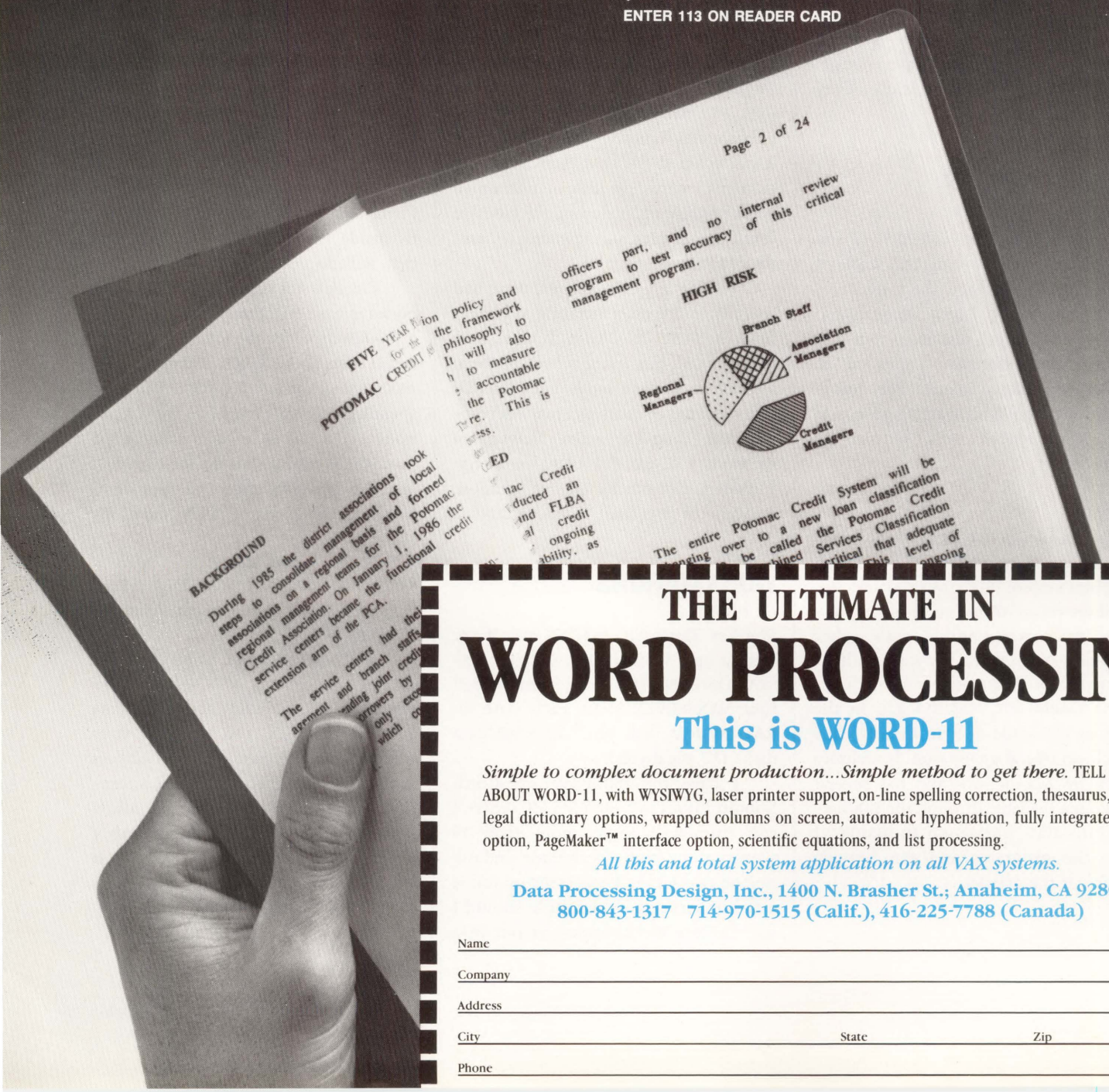

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disk. Have you discovered the source of your problems? I'm installing another site in a similiar manner. Yes, our 750 also seems slower.

John F. McGlinchey *(SIG 11/MESS 204):* The system can be slower. You're putting more load on it with clustering until you balance your users. Also, you may have been in a CPU-short situation, such that another CPU isn't enough yet to handle your load.

Suggestions: If you're using the MSCP server, like I am, check the number of buffers that you're giving it. If you have the memory, double the buffers until you get better disk response.

Increase your system's memory as much as possible. Memory is cheap these days, and you can't have enough.

Check your LRP allocations. They probably aren't enough.

FRACTALS FACTS

QUERY:

John David Bliss *(SIG 44/MESS 28):* I'm doing research involving the work of Beniot B. Mandelbrot, the founder of Fractal Geometry. I have accumulated various theoretical resources, but I'm lacking the information needed to render these fractal images. Any information dealing with fractals, Julia sets and Mandelbrot sets would be appreciated.

REPLIES:

Judith Moore *(SIG 44/MESS 29):* I've implemented Mandelbrots on a Grinnell graphics system (512 x 480 x 8) and also printout via an AT and color inkjet plotter. I'm corresponding with other graphic types on the subject of chaos and graphics. Please share your findings.

Chris Gould *(SIG 44/MESS 32):* In the August 1987 issue of *Byte*, there's a fine article on fractal generation. It includes work by Mandelbrot and has several programs available through the BIX network to draw fractals on an IBM PC. I have the programs and can provide copies of the articles.

Eli J. Boyajian *(SIG 44/MESS 187):* Contact Homer Smith at Artmatrix, Box 880, Ithaca, NY 14851. He offers a selection of photos, cards and, I think, even a video relating to fractals. Also, for a nominal fee, he will send you a listing of FORTRAN subroutines that apparently were used in generating his images.

There's a newsletter devoted to the Mandelbrot Set M, called *AMYGDALA*, published by Rollo Silver, Box 219, San Cristobal, NM 87564, containing contributions from other folks who are trying to learn more about M.

I've found the volume by Peitgen and Richter, *The Beauty of Fractals*, to be excellent. It's published by Springer-Verlag, ISBN 3-540-15851-0. You also might check *The Art of Graphics for the IBM PC* by McGregor and Watt, published by Addison-Wesley. Although it's directed at the IBM PC audience, it contains a wealth of information on all types of graphics, including fractals. I've found the programming examples easily adapted.

As for my M exploits, I've had reasonable success generating M images on a VAXSTATION-II/GPX. It takes time to create one, but on the whole, it's been interesting. Peitgen and Richter describe other techniques, such as binary decomposition, Yang-Lee zeros, Newtonion methods, etc., which I'd also like to try. However, I'm not up on my notation, so some of it is hard to understand.

WORKSTATIONS

QUERY:

Ray Van Tassle *(SIG 11/MESS 209):* We're setting up a workstation with 40 VAXSTATION 2000s. DEC has recommended four VAXSERVER 3600s, each with an RA82 system disk plus six RA82 data disks (3.7 gigabytes).

I have the following questions: Should I hold out for VMS 5.0, where I can (rumored) serve more than 13 workstations from a boot node, and use one or two larger VAXs (8500 or so); is a Q-bus server good enough; should I use diskless workstations or put in a disk for swapping/paging; if so, what disk — RD53, RD54 or other; how about the data disks; is DEC coming out with something better; should I go with non-DEC disks; if so, what is a good one?

REPLY:

Steve Thomas *(SIG 11/MESS 210):* I'd like to make some comments on your large-scale VAXSTATION 2000 LAVC. First, in general, DEC's MICROVAXs are much cheaper than the larger computers. I've also heard the rumor that DEC will be allowing its upper product line to be boot nodes for its 2000s. I'm not sure it would be cost effective to do this, given that something comparable to a MICROVAX 3600 costs about $300,000 (8350).

I'm sure that you don't want a MICROVAX 3600. Buy a MICROVAX 3500 for less or a TK70, but don't buy that over-priced boat-anchor RA82! There are many third-party drives that outperform, cost less and are smaller (i.e., to fit inside the MICROVAX 3500 boxes) that will do your job.

I'm also not sure that buying boot nodes is cost effective. Somebody sells a 300-MB drive for the MICROVAX 2000, and it costs about $5,000. If you get four 3600s for about $100,000 each, you'll be spending $10,000 each node for a boot node. DEC already has announced standalone configurations for the 2000. You also may have to buy a floppy drive for the members, but it still would probably be cheaper.

I also have experience with a MICROVAX 2000 on a LAVC. Disk I/O for paging is slow; it makes you wish for more RAM.

With this in mind, you may want to buy one central VAX (like a less-expensive MICROVAX II) for central data files. On this VAX, you could put your massive data library, and all 40 members in the NET could use this VAX as a common file server. This would allow higher performance and probably would be cheaper. ■

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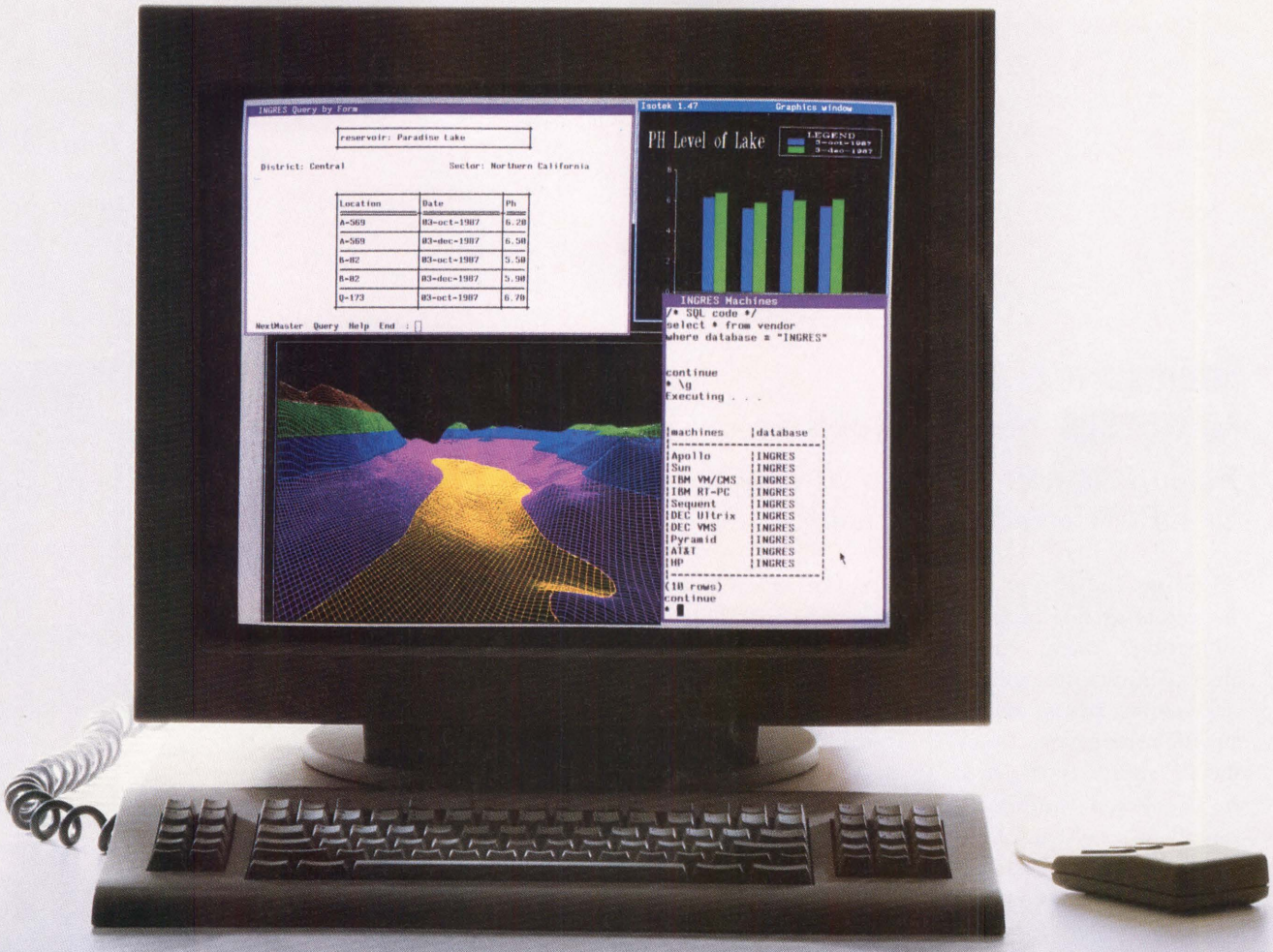

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Enclosure Line-Up Addresses Many Needs

Trimm Industries Enhances Its Line Of DEC-Compatible Enclosures

Trimm Industries enhances its line of DEC-compatible system enclosures with disk storage and rack-mount system enclosures. The storage enclosure line-up addresses the need for 5¼-, 8- and 9-inch rack-mount disk systems. The 5¼-inch peripheral chassis, called the DA50, has mounting and power for four 5¼-inch peripherals. Power is provided by four individual 50-watt supplies, for reliability and servicing. Each 5¼-inch drive is mounted using a slide mount system for easy installation and access.

The 8- and 9-inch disk storage enclosures, called the DA80 and DA90 respectively, provide mounting for two storage peripherals side by side. The customer has a choice of DEC-styled or squared-edged front bezel. A 270-watt power supply is optional for 8-inch drive systems.

Trimm Industries' Q-bus system enclosures, the DA23 and DA523, address the industry's need for more backplane space and rack-mount design. The DA23 is equipped with an eight-slot Q22 backplane (CD interconnect for MICROVAX systems available). The chassis has a 350-watt power supply and mounting for two 5¼-inch peripherals.

The DA523 is built around a 12 slot Q-bus backplane with CD. The system enclosure has mounting room for five 5¼-inch peripherals. It's powered by a 500-watt power supply.

The system enclosures both incorporate Trimm Industries' console control with write protect/ready functions, key-lock power and console protection switch and thermal protection alarm. An RQDX signal distribution board is available for systems using DEC's RQDX2 or RQDX3 controllers.

For further information, contact Trimm Industries, 11939 Sherman Rd., North Hollywood, CA 91605; (218) 875-2830.

Enter 451 on reader card

—David W. Bynon

The 4540 graphics terminal, from Micro-Term Inc., is a member of the ForeSight Edition.

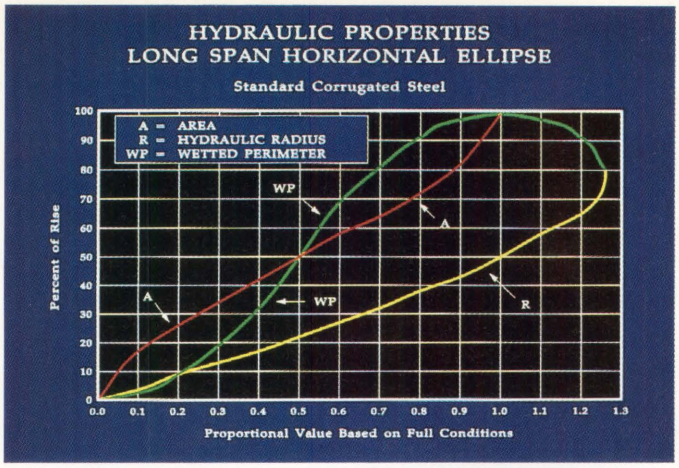
The ForeSight 4540 Represents Solution By Innovation

Micro-Term's Graphics Terminal Combines Technology With Style

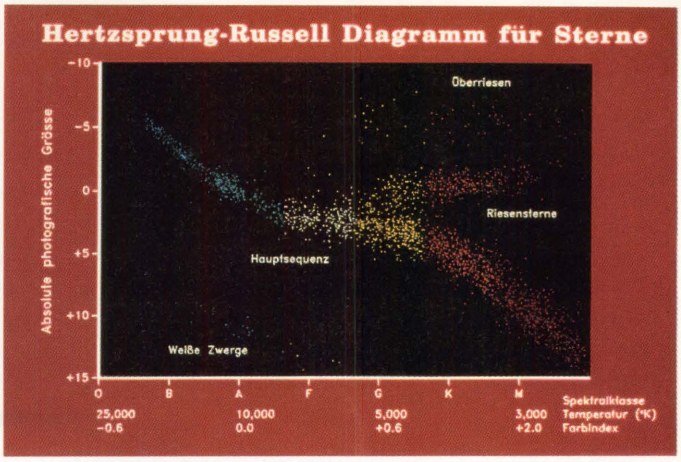
ForeSight 4540, a high-speed graphics terminal, from Micro-Term Inc., combines DEC VT220 emulation, with ReGIS and Tektronix 4010/4014 graphics compatibility, on a fully overscanned, reverse-video, soft white phosphor.

The ForeSight 4540 demonstrates speeds at least twice as fast as the DEC VT330, and has a viewable resolution of 800 x 500, with a 60 Hz non-interlaced refresh rate. The 4540 offers either a VT220 style or VT100 style graphics keyboard, with dedicated pan and zoom keys.

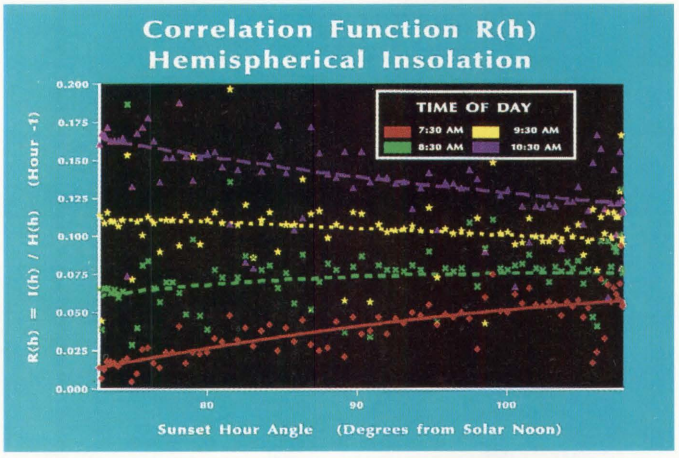
The terminal features 14-inch display, with 24 lines of either 80 or 132 characters, plus a 25th status line, on an overscanned monitor, with true reverse video graphics. The 4540 uses a 20 x 20 character cell in alpha-numeric mode, plus pixel



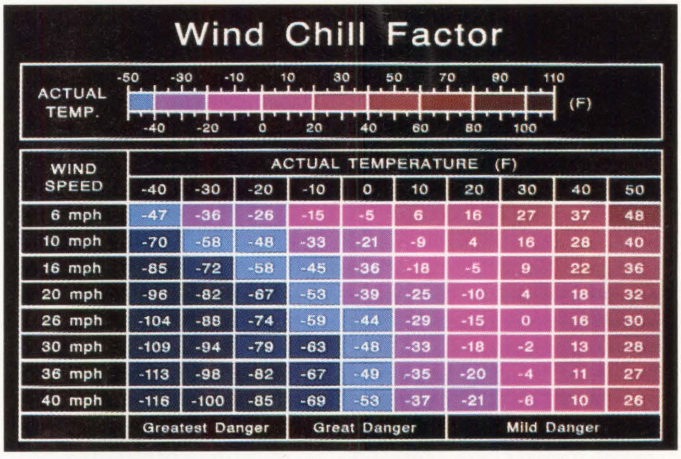
PicSure Plus' curve smoothing clarifies data representation. Shielding adds a professional look.



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



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



WIND SPEED	ACTUAL TEMPERATURE (F)									
	-40	-30	-20	-10	0	10	20	30	40	50
6 mph	-47	-36	-26	-15	-5	6	16	27	37	48
10 mph	-70	-58	-48	-33	-21	-9	4	16	28	40
16 mph	-85	-72	-58	-45	-36	-18	-5	9	22	36
20 mph	-96	-82	-67	-53	-39	-25	-10	4	18	32
26 mph	-104	-88	-74	-59	-44	-29	-15	0	16	30
30 mph	-109	-94	-79	-63	-48	-33	-18	-2	13	28
36 mph	-113	-98	-82	-67	-49	-35	-20	-4	11	27
40 mph	-116	-100	-85	-69	-53	-37	-21	-6	10	26
	Greatest Danger			Great Danger			Mild Danger			

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

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The Product

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

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

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

The Environment

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

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

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drawn graphics characters in many different sizes. It has a multihost, multisession feature that enables the unit to perform as two separate terminals at different baud rates, with separate communication protocols and independent setup menus.

The keyboard features 77 keys arranged similar to a standard typewriter, plus an 18-key auxiliary keypad, six editing keys, separate pan and zoom keys, four cursor control keys, 15 user-programmable and host-downloadable keys.

Seven pages of alphanumeric memory are standard on the 4540, with one page of graphics display memory. Graphics attributes include full-screen cross hair cursor, multiple levels of gray scale, and upper- and lowercase graphics text with true descenders. The ForeSight 4540 comes with a 24-month warranty (90 days on site), and lists for $1,495. For further information, contact Micro-Term Inc., 512 Rudder Rd., St. Louis, MO 63026; (314) 343-6515. **Enter 457 on reader card**

Scribe Systems Leads The Way With *STEPS*

The STEPS *Environment Is A Networked Electronic Publishing System*

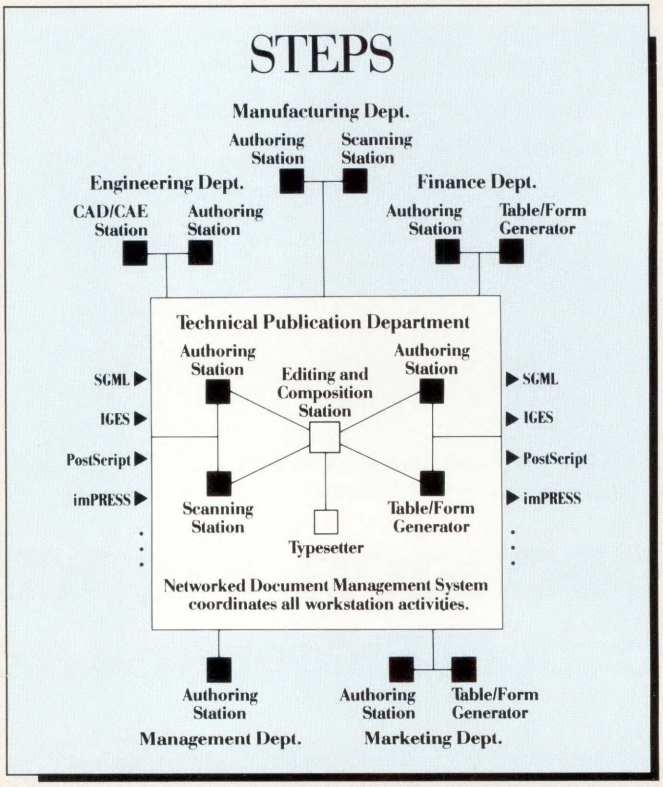
Scribe Technical Electronic Publishing System (STEP), from Scribe Systems, Pittsburgh, Pennsylvania, is a fully networked publishing system consisting of workstations that are used by a variety of people cooperating in the task of producing a document on the system.

The *STEPS* approach differs from other proprietary electronic publishing systems for technical documentation because it's an open architecture designed to support the integration of users' existing text and graphics generation systems with STEPS components to form an integrated multiuser environment.

According to Kelly Hickel, president of Scribe's parent company, S.A.Y.'s Technology Group, "Because the *STEPS* architecture is based on industry standards throughout, we have the flexibility to work with customers according to their needs, providing large hardware and software solutions or specialized software engineering, or some combination of the two."

The architecture includes a document management system that allows the editor and other contributors to track the complete information concerning each component of any given document, including its due date, storage locations, authors, version information and current status. Portions of a single document may be created by many authors simultaneously or over a period of time, each using distinct software and hardware systems. To merge all of the contributed portions into a single document, the forms must be translated into a single format for document composition and final editing on an editing/composition station.

Overall, *STEPS* may be viewed as having an editor at a central composition station where final assembly and integration of the proposal is completed. Inputs to the editor are created at other stations, and may be prose sections, scanned images, CAD/CAM drawings, parts lists or contributions of other types.



The* STEPS *approach allows the documentation environment to change as new documentation products become available.

STEPS includes automated global functions such as pagination, footnotes, tables of contents, figure numbers, spacing and font management.

The *STEPS* environment is based on an evolving family of standards in the area of hardware, I/O devices, networking, page description languages, documentation formats and government requirements. In addition to the standard functions, Scribe System's implementation of SGML features full interchangeability between SGML and other document formats.

For further information, contact Scribe Systems, Suite 240, Commerce Court, 4 Station Square, Pittsburgh, PA 15219; (412) 281-5959. **Enter 456 on reader card**

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The 4300 Series Of Graphics Workstations Spans The Spectrum Of Performance

Tektronix Keeps Pace With The Graphics Market With Eight New UNIX-Based Workstations

Computer graphics and the surrounding computing environment are experiencing an explosion. Graphics have become more sophisicated. The computing platform for graphics started out on a mainframe or supermini, but has now moved to a workstation or personal computer. Tektronix is addressing this explosion with eight UNIX-based, high-performance 4300 series of graphics workstations.

The 4300 Series products range from a 3-D, true color graphics workstation to a 3-D wireframe graphics system, both with optional 3-D stereoscopic viewing. The products achieve the fastest graphics application throughput and drawing speeds of any standalone graphics workstations, 450,000 2-D vectors per second, 340,000 3-D vectors per second and 20,000 Gouraud shaded polygons per second.

Featuring smooth and dynamic motion, the high-end workstations produce vivid and accurate shaded solids through the simultaneous display of their full palette of 16.7 million colors. Targeted applications for the workstations include CAM design, engineering and analysis, molecular modeling, medical imaging, kinematics, visual simulation, animation and similar applications requiring intensive graphics performance.

For reliability and compatibility, the 4300 Series workstations incorporate industry standards, including Motorola's 68020 processor, UTek, Tek's implementation of bsd 4.2 UNIX, with System V extensions, X Windows, Network File System, Ethernet LAN with TCP/IP protocol and Tek's PLOT 10 graphics software. These standards are balanced with Tek's proprietary pipelined graphics architecture, featuring custom gate arrays and a separate display list memory, to maximize total graphics application performance.

For 2-D applications such as drafting, design, cartography, presentations and electronic engineering, Tektronix offers the 4320 Series graphics workstations with dedicated 2-D graphics hardware, as well as the 4310 Series graphics workstations with bit-mapped displays.

All standard configurations for the workstations include 86-MB hard disks, 4 MB RAM, C, LAN support, X Windows and IBM PC emulation. Optional features include additional RAM, larger disks (150 MB and 300 MB), FORTRAN, PASCAL, LISP, PROLOG and a variety of I/O options.

According to a company spokesperson, the 4300 Series has no MAP capability and no trade-in program for current clients. RISC products are being explored for the future.

Tektronix also features five 4200 Series graphics terminals based on the dedicated graphics hardware found in the workstations. The three 4230 Series 3-D graphics terminals and two 4220 Series 2-D graphics terminals offer a standard Ethernet LAN connection as well as RS232. According to Jerry Ramey, general manager for Tek's Graphics Workstation Division, "The series can be upgraded. This is critical in Europe where graphics is just beginning to take off."

For further information, contact Tektronix Inc., Wilsonville Industrial Park, P.O. Box 1000, Wilsonville, OR 97070; (503) 685-3837. **Enter 453 on reader card**

The 4337 (foreground), shaded surface 3-D system, and the 4335, a 3-D graphics workstation, combine industry computing standards with parallel graphics and compute processors.

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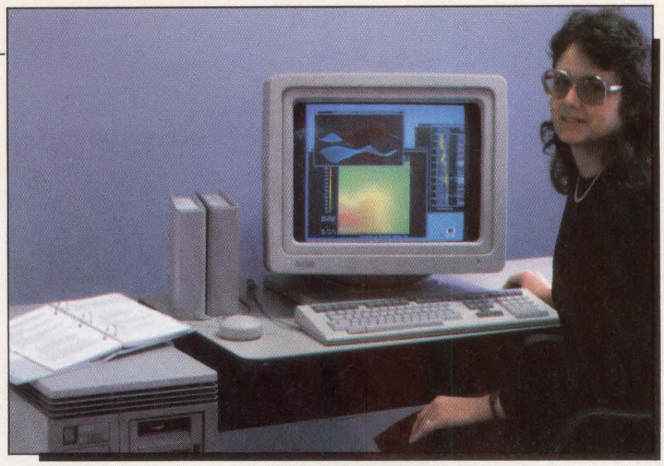
Precision Visuals Designs High-Performance Graphics Tool

GFX-4000 *Graphics Software Offers Greater Functionality And Usability*



The* GFX-4000 *terminal supports window-manager environments on workstations.

Precision Visuals has designed a high-performance graphics tool product for technical and engineering workstations. The product, called *GFX-4000*, includes most of the functionality specified in the proposed PHIGS standard, with additional features specifically tailored for workstations.

GFX-4000 extensions to PHIGS include additional output primitives, more input functions, multiple simultaneous views, raster operations, hidden-line and hidden-surface removal, a data presentation utility and CGM metafile support.

GFX-4000 was implemented in C primarily because of C's performance advantage over FORTRAN, its level of support among workstation vendors and the degree to which C is standard across workstation vendors. It has both a C and a FORTRAN Application Program Interface (API), allowing the *GFX-4000* to look like a C product to C programmers or a FORTRAN product to FORTRAN programmers.

Unlike PHIGS, *GFX-4000* can open multiple graphics windows on a graphics workstation from the same process, thus highly integrating the graphics system with native workstation window managers.

GFX-4000 also differs from PHIGS in the manner in which views are associated with structures and structure traversals. In both PHIGS and *GFX-4000*, a new view of a structure automatically will be redisplayed whenever the structure is edited. However, in PHIGS views are embedded in a structure. This means that many PHIGS implementations will always update the views referenced by a structure whenever a structure traversal occurs (typically caused by a structure edit), even if the intent is to update only a single view.

GFX-4000, on the other hand, associates views with a workstation window manager window, such as VWS window. A structure then is explicitly associated with a view. This is useful when an application uses multiple views in a workstation window and only one view, perhaps a menu, needs frequent updating. PHIGS implementations may cause all views to be updated at once, whereas *GFX-4000* allows the application to update views selectively.

The primitives defined in PHIGS are polyline, polymarker, fill area, fill area set and text. *GFX-4000* adds triangle, rectangle, parallelogram, quadrilateral, circle, elipse and general figure.

Shell primitives added in *GFX-4000* include rectangular solid, parallelepiped, circular cone, circular cylinder, circular frustum, sphere, torus, extrusion of a general figure, path sweep of a general figure and rotational sweep of a general figure.

To support window-managed environments, provisions are made for window events such as popping, moving, resizing, deleting and forming icons from windows. *GFX-4000* can detect the movement of a cursor across a window boundary and change the shape of the cursor to indicate a new operation (e.g., window scrolling).

Unlike PHIGS, *GFX-4000* allows multiple graphics windows in a single process. *GFX-4000* allows the application to control the window creation, management, etc., but will create a default window if one hasn't been created for graphics.

GFX-4000 provides a set of functions, as defined by X Windows, for reading, writing and manipulating raster data. On-screen pixmaps are exhibited on the display surface of the workstation. Off-screen pixmaps aren't visible on any virtual display surface. *GFX-4000* supports raster operations for both on-screen and off-screen manipulations. The operations take place using the native workstation raster format to maximize performance. Utility functions are provided to convert to and from device coordinates and pixel locations.

Hardcopy device drivers supported by *GFX-4000* include PostScript devices, QMS, Imagen, Talaris and DEC LN03 Plus laser printers, Tektronix 4510/4692 ink jet plotters, Hewlett-Packard HPGL plotters and Versatec plotters.

The initial workstation platform supported by *GFX-4000* is the DEC VAXSTATION family, the 2000, II, II/RC, II/GPX, 3200 and 3500, running VMS and VWS window management system. The single CPU price is $3,500, which includes full media and documentation. Single CPU RTU packages start at $2,950, including documentation. Run-time version pricing begins at $1,250 for a single CPU license, with a 10-pack of run-time licenses priced at $9,950. For further information, contact Precision Visuals Inc., 6260 Lookout Rd., Boulder, CO 80301; (303) 530-9000.

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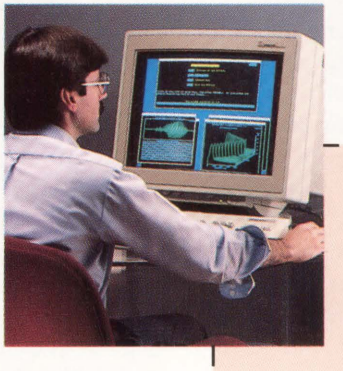

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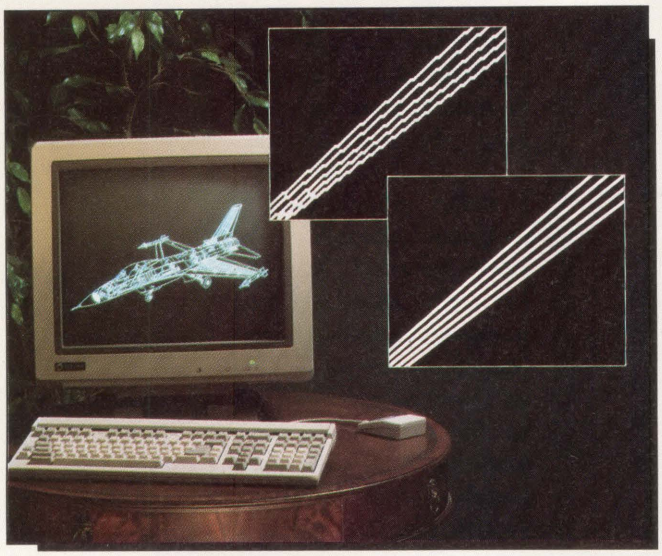

Monochrome graphics terminal, with true-line technology, pans and zooms with display list cache.

Codonics Aims Straight With A No Jaggies Graphics Terminal

The True-Line Display Versus The Jaggies; Codonics Gives You The Straight Edge

A new 4096, true-line monochrome terminal from Codonics is the first DEC VT320/220/100, Tektronix 4010/4014 compatible, raster graphics terminal to produce lines without "jaggies." The terminal has the ability to display a graphics image with an effective resolution of 16,000 x 12,000.

The image quality rendered on the 4096 true-line graphics terminal is beyond the current limits of what is referred to as high resolution. Images created on the 4096 terminal can be displayed without the undesirable artifacts known as the jaggies. Lines displayed appear as straight, continuous vectors, much like vectors found on storage tube displays.

According to Mike Kolberg, Codonics marketing manager, "Essentially, the terminal creates lines of the same width as those created by a 1024 x 1024 display." It does this by using multiple pixels of varying sizes. The result is that circular and diagonal lines can be drawn without any jagged edges.

As an added benefit, the addressability of the 4096 is an actual 4096 x 4096. Endpoints can be positioned anywhere on the screen to within 1/4096 of the screen size in both axis. Other graphics terminals truncate down to a 1024 x 780 grid which greatly degrades accuracy. The increase in accuracy found on the 4096 is apparent when drawing fonts and small details. Now, lines can be positioned precisely where the application software intends them to be.

True pan and zoom functions offer local display capabilities to see fine detail of any portion of the displayed image. The graphics terminal maintains a 256-KB vector display list standard with an additional 500 KB or 1 MB available. A display list cache facilitates instantaneous redraw when multiple zooms are performed.

A high-density drawing mode is incorporated for viewing extremely dense images. In this mode, images viewed on 1024 x 780 pixel displays, that normally would have appeared cluttered, now can be viewed. "Our high-density drawing mode allows you to plot data that is too dense for other displays. This one feature has opened the doors for applications that could not have existed before this technology was available," says Kolberg.

The Codonics 4096 features alphanumeric capabilities and offers flawless DEC VT320/220/100 emulation with high-definition fonts. The alphanumerics display incorporates true-line technology to generate fonts with a near typeset quality appearance. A special 66-line x 132-column mode has been added to enable you to view, edit and scroll a standard full page of text. Other standard features include status line with clock calendar, four independent levels of 15 programmable, non-volatile function keys, up to 64 pages of off-screen scrollable alphanumerics, and four independent setup menus to facilitate multiple host configurations.

The display offers a 19-inch diagonal, non-glare CRT with a 73 Hz non-interlaced, flickerless video refresh rate. This provides you with the highest quality display available without the concerns of eyestrain or fatigue. Other ergonomic features include a 114 degree deflection CRT and detachable graphics controller, making the 4096 ideal for the desktop environment.

Included with the Codonics 4096 graphics terminal is a three-button mouse used for controlling the cross-hair cursor, pan and zoom functions, setup menus, system control menus and real-time 2x magnifier. "At Codonics we recognize that the mouse has become a universal pointing device. Therefore, it has been incorporated not as an add-on option, but as a standard feature for the serious graphics user," comments Kolberg.

The Codonics 4096 communications interface includes the following standard features: three bidirectional RS232C serial ports, current loop, RS422 and a Centronics compatible parallel printer port. Optional ports include a video interface, light pen and Ethernet interface with TCP/IP protocol.

For further information, contact Codonics Inc., 18001 Englewood Dr., Middleburg Heights, OH 44130; (216) 243-1198.

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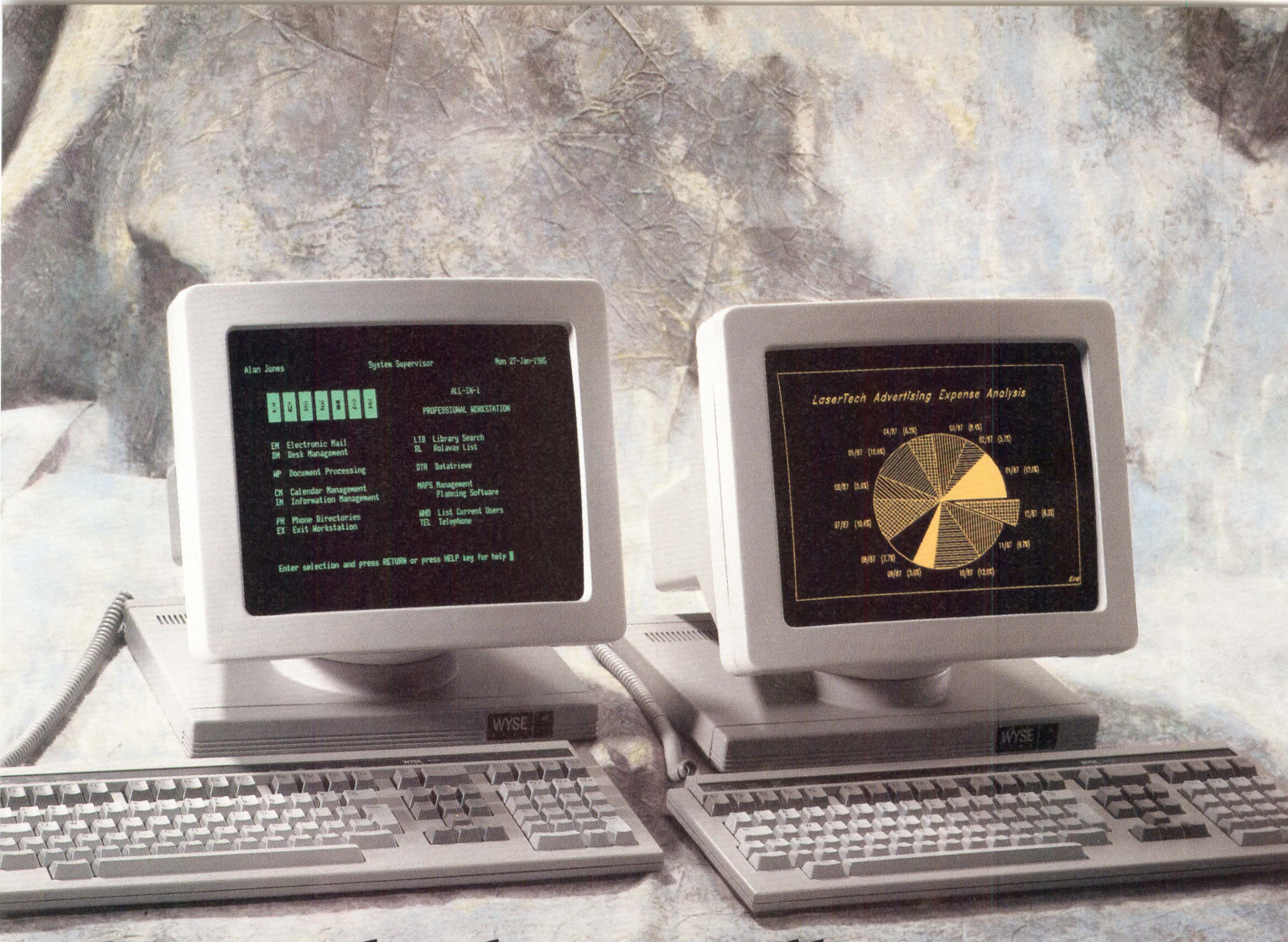

Now the best seller comes in an illustrated edition.

With the WY-85 at left, Wyse authored the best selling alternative to DEC's VT-220. It's fully compatible with the VT-220, but loaded with features that make it even more compatible with the people who use it.

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Our new WY-99GT at right further illustrates Wyse's continuing drive to improve on a standard. It features the same advantages as the WY-85. Plus graphics, with full Tektronix 4010/4014 compatibility, and high resolution characters.

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And there's a happy ending. The WY-85 is just $599, the WY-99GT $649. Both are made, serviced, and supported by the company that ships more terminals than anyone but IBM.*

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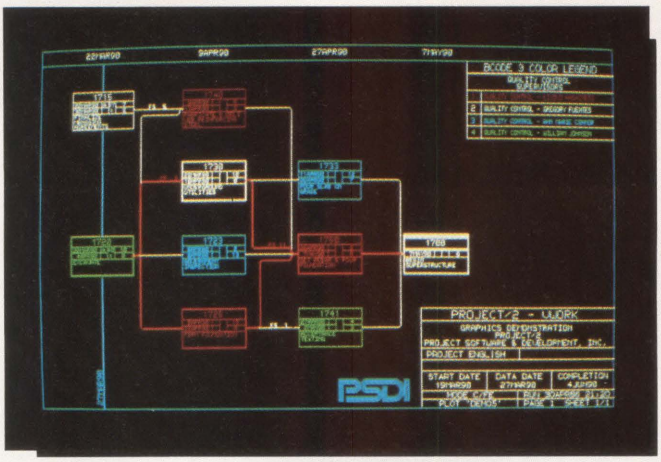
Project/2 Leads The Way To Greater Problem Solving

Project Management Software Helps You Control Your Information System



Project/2 ***network diagram shows the predecessor/successor relationships between project activities.***

Project management is the key to providing managers with information, not data; increasing profitability and productivity; and giving managers a greater scope for planning and problem-solving. PSDI, of Cambridge, Massachusetts, has addressed these concerns and many more with *Project/2* software. It offers a complete solution to project management needs by integrating scheduling, cost, graphics and relational database software. Also, it provides the tools to plan, schedule and control any project, and can be integrated with existing corporate systems such as financial and material tracking.

According to Robert L. Daniels, PSDI president and founder, "With *Project/2*, VAX users have a powerful, proven project management system that operates in a distributed environment. The 4GL and RDBMS functionality is ideal for customizing screens and integrating with other corporate applications."

Project/2, made up of four basic modules for scheduling control, cost control, graphic formatting and decision-supporting reports, meshes with the standard project life cycle format of concept, planning, implementation and phase-out. You may choose any one of these modules at the point in the life cycle where they fit your application.

At the heart of the *Project/2* system is the Schedule Manager. It's a full-featured scheduling system that provides the basic tools to plan, schedule and control any project. It consists of the Basic Schedule Manager, plus the following three additional options: report writer, multiproject and advanced scheduling.

The Basic Schedule Manager schedules project activities using either Activity-on-Node or Activity-on-Arrow techniques. The project is time- phased, using the Critical Path Method. It allows for multitiered scheduling and hammocking to view the project from either detailed or summary levels.

In* Project/2** ***the histogram shows the total labor usage on a daily basis, with each color showing a separate craft.

The Graphics Manager module provides visual tools used in project presentations for clear and effective display of information. They include GANTT charts, logic bar charts, network diagrams, histograms, line graphs and work breakdown structures.

The *Project/2* Cost Manager can be used as a standalone system or as part of an integrated system with one or more of the software's managers. The Cost Manager has the following five components: modeling, entering data, manipulating data and performing calculations, reporting and interfacing with other systems.

The fourth module is the Relational Database Manager (RDP). It provides the tools to develop project management-related applications, such as configuration management, drawings and inventory control, labor accounting, records management and more. With RDP you can create additional datasets, link them to the scheduling and cost datasets, interactively query them and generate ad hoc reports. RDP has the following four components: query language module, screen module, report writer module and utility functions.

"We believe that *Project/2* is the most functional project management system in the VAX environment today, integrating cost, schedule, graphics and relational database capabilities," says Daniels.

PSDI offers application-specific training in communications, equipment and software for on-site applications and telephone assistance as well as field consulting on an as-you-need-it basis. For further information, contact PSDI Inc., 20 University Rd., Cambridge, MA 02138; (617) 661-1444.

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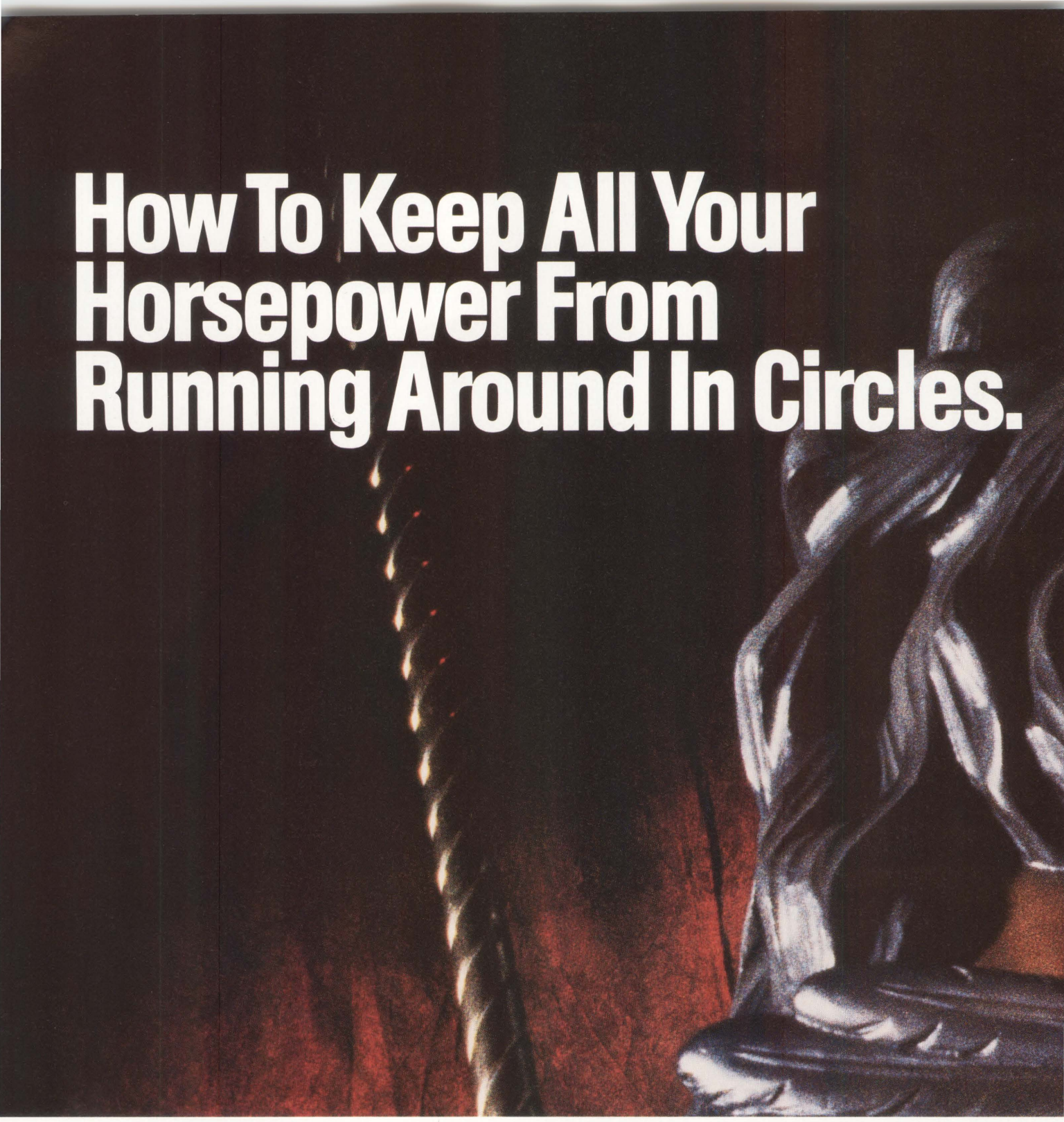

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To Workstation Or Not To Workstation

Is there A Question?

BY PHILIP A. NAECKER

A WAG ONCE said, "There are two groups of people: those that divide people into two groups and those that don't." At a recent seminar on X Windows, one of the instructors divided computer users into two groups: "Those that use workstations and those that will soon use workstations." Although the instructor was joking, he also presented a lot of arguments for his case, and the impact of his statements was significant.

Here was a senior Digital software engineer, a member of DEC's Western Software Engineering Labs and a seemingly feet-on-the-ground type, talking about a revolution in DEC-style computing that will rival the VAX in its impact. Even in an environment where every computer development is labeled revolutionary, it appeared that windowing workstations would have a major impact on the industry.

Of course, there aren't many respected computer industry observers who think that workstations will disappear from the computer scene and we'll all be using character cell terminals, DECTALK boxes or something else. But there's some debate about how soon workstations will be priced so that they become the interface of choice for most computer users.

There are many VAX users, MIS directors and system managers who are buying workstations in significant numbers today and have many more on order. The purchasers of workstations believe that the improved user interface of a workstation increases the productivity of the user, often a highly paid professional.

However, there are also those who think that workstations aren't going to make an impact any time soon and aren't purchasing workstations yet in any significant numbers. "After all," they say, "why purchase workstations when a terminal will let the user do the job just as well and much more cheaply?" Well, maybe so. But maybe not.

What's DEC Up To, Anyway?

In recent months, there has been a number of signs that DEC is preparing for a big push into workstations. Consider the following events:

1. In January 1987, Digital announced that it would adopt the X Windows standard for all present and future workstation platforms. Although there haven't been many public statements regarding the DECWINDOWS program (DEC's implementation of X), DEC has said that DECWINDOWS will run under VMS, ULTRIX and MS-DOS. The three environments will have nearly identical user interfaces, all based on the X Win-

dows protocol and libraries. (See box on page 46.)

2. There has been a steady stream of changes in marketing, licensing and pricing that have made DEC workstations (especially VMS VAXSTATIONS) considerably more attractive in terms of cost effectiveness.

3. Last September, Digital announced DECNET System Services (DSS), a new family of layered software products that connect distributed VAXs, including workstations, into a tightly integrated computing environment. DSS provides for file sharing and print queue sharing much like that available in clusters, but DSS is distributable over wide area networks, dissimilar operating system versions and different system management domains. (Look for an article on DSS in next month's *DEC PROFESSIONAL*.)

4. At the last two DECUS Symposia, Digital representatives have intimated that new workstation interfaces are coming for many components of VMS, starting with the system management environment. The magic words have been, "Digital intends to separate form from function in various components of the operating system." In other words, DEC will provide a DECWINDOWS interface to many components of VMS, as well as other interfaces.

5. There are persistent rumors and oblique statements by Digital representatives that many VMS layered products are being extended to take advantage of the DECWINDOWS environment. These changes might include, for example, replacing command-line interfaces with pull-down menus like the Macintosh or using DECWINDOWS for distributing the application, so that the CPU-intensive part of an application runs on a bigger VAX elsewhere in the network.

The people at Digital don't have their heads in the sand regarding workstations. They've noticed the success of Sun, Apollo and Apple, and they certainly intend to have a serious effort in the workstation market. Let's take a look at how DEC will likely put together all the pieces to make a cohesive workstation program.

Table 1.

Standard VAXSTATION 2000 Components
MICROVAX II CPU with floating point (about 0.9 mips)
Ethernet controller
4 MB memory
Workstation hardware (monitor, mouse, graphics hardware)
VMS license
DECNET end-node license
LAVC cluster software license
Workstation software license

Table 2.

Cost Comparison: Terminals versus Workstations		
Item	**VAXSTATION-based Solution**	**8550-based Solution**
Processors	$150,000	$700,000
Workstations	200,000	N/A
Terminals	N/A	31,000
Software	70,000	210,000
Total (not including HSCs or peripherals)	$420,000	$941,000

DEC clearly believes that workstations aren't just for design professionals any more. The DECWINDOWS program is to provide a consistent, easy-to-use, point-and-push interface to the entire computing environment, not just a single application program like CAD. High-level graphics of the kind normally associated with CAD or with scientific computing isn't a requirement of the DECWINDOWS or X Windows philosophy. X Windows simply provides a mechanism to deliver high-performance graphics to the workstation.

The DECWINDOWS interface is designed for and targeted at the general computer user who wants to use the messy-desk paradigm of computing, with perhaps dozens or even hundreds of active windows, each running a separate application such as electronic mail, editing, operating system functions, desk accessories, applications and terminal emulators.

But DEC's workstation approach isn't limited to DECWINDOWS. Nor is it simply DECWINDOWS plus VAXSTATIONS in all its flavors. In classic DEC engineering style, it looks like DEC is going to build on its networking strength and on the breadth of the VAX architecture to construct a broad workstation solution that can span nearly the entire computer market space. In DEC's view of the world, workstations are simply the delivery vehicle for applications and the operating environment, but the actual cargo often isn't located

properly on a workstation.

The centerpiece of DEC's workstation strategy isn't a workstation at all; it's the VAXCLUSTER. The cluster provides a central, highly available repository for enterprise-wide data and large-scale resources. Clusters can be configured to grow in neat, modular units, with changes in hardware essentially transparent to the outside world. Clusters provide a convenient place to hang a few extra mips, gigabytes, high-performance tape drives or special-purpose hardware.

Surrounding the cluster is an Ethernet providing local-area connectivity to workstations throughout the site. VMS workstations currently have two ways to gain access to resources on the central cluster, either by participating as cluster members or by using DSS. Using DSS, the file and print resources of the cluster can be made available to applications on workstations without the need for joining the management domain of the cluster. This avoids the associated organizational overhead and the difficulty caused by cluster state transitions when there are large numbers of workstations in a cluster.

DECWINDOWS will provide a whole new mechanism for accessing the resources of the cluster from workstations, and it will work equally well on any flavor workstation. Instead of porting the data from the cluster to the workstation, in the DECWINDOWS model, both the data and application remain on the cluster; only the display is sent to the workstation. DECWINDOWS provides a way to run an application on the cluster with the output on the workstation.

The only thing that DECWINDOWS requires is a reliable byte stream from the cluster to the workstation and a bit-mapped display. The reliable byte stream can be supplied by DECNET or TCP/IP running over Ethernet in a LAN. It also can be provided by DECNET in a wide area network, and that's another key component in DEC's workstation approach, the network.

Digital has very strong networking capability, with a consistent networking architecture and interface spanning LANs, WANs, packet networks and a wide variety of hardware and operating systems. The DECWINDOWS program will capitalize on and complement the DECNET program. Like DECNET, DECWINDOWS will span operating systems in a consistent fashion, tying them together and expanding their power.

How Much Does It Cost?

In the Digital approach, workstations will be used to deliver applications across the network and therefore will be appropriate to nearly every user. If Digital is correct, and the target audience is a very broad one, the next question is, "How can I afford it?"

The problem is that "it" is hard to define. There are two parts to the question of cost: What's the absolute cost or cost per user (cost per seat in CAD terminology) and; what's the cost effectiveness of the entire system (human/workstation/application/etc.)?

Unfortunately for Digital, it has at least one big marketing hurdle to overcome if it's to bring the gospel of workstations to the typical DEC environment: To be able to calculate the actual cost of a workstation solution to a computing environment requires more understanding than does calculating the cost of a single CPU solution.

For one thing, there are more components in a distributed workstation-based computing environment: workstations, networks, central CPUs, distributed system software licenses, etc. For another thing, it's possible to put these systems together in almost any configuration. The days of "choose one of the following three configurations" are gone forever.

Furthermore, the comparison of the throughput and reliability of distributed versus centralized systems requires a high level of technical sophistication to consider such factors as load leveling, network performance, failure modes and redundancy, and single job stream performance.

As an example of the complexity of comparing the two approaches, consider two configurations for servicing a group of engineers building and using compute-intensive design software. Let's say that the primary purpose of the machines is to service the design engineers and software developers, but that there are also about 30 lower use terminals doing word processing, accounting, electronic mail, etc. Let's look at the relative cost of a configuration based on a small VAXCLUSTER with many VAXSTATIONS and another based on a VAXCLUSTER with two fast machines, say VAX 8550s.

A minimally configured VAXSTATION 2000 is available for less than $4,000 ("street" price) and includes all the components shown in Table 1.

If you haven't got a VAX on your Ethernet from which to boot, you can put a disk on this machine for about $1,000 (third party) and a TK50 tape subsystem for backup for about $5,000. The prices for third-party memory are coming down, with 8 MB boards in the $5,000 range.

"See?" says the MIS director. "You've configured yourself a VAXSTATION that looks like it costs $4,000 but actually costs $15,000 when you include all the hidden costs." Digital's response is simple: "If you don't want those parts, don't buy them. You don't need them to make a completely useful and well-performing workstation." Digital doesn't want you to purchase all those extra components; they want you to integrate your VAXSTATIONS into a distributed VAX computing environment.

Solutions

So, this computing solution shapes up like this: Put in a bunch of VAXSTATIONS, say one for each of the 20 design engineers. If some of those machines are color workstations, and you put extra disks on most of them, and some of them get fat memory expansions, you might spend $200,000 on the machines and the network. That's about $10,000 per mip.

Add a small VAXCLUSTER with perhaps two small machines, say VAX

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8250s, and two HSCs to provide high-availability access to the disks and tapes. The 8250s will cost you perhaps $150,000 and provide about 3 mips of throughput. If you choose VAXSERVER 3500s instead of 8250s, you lose the advantages of the HSC (volume shadowing, for instance), but gain a Q-bus architecture and more mips per dollar. Either way, the configuration looks about the same: high-availability access to disks in the middle with workstations hung out along the Ethernet.

The point is that the machines and network in this configuration will cost about $350,000, for which you get the attributes listed in Table 3.

Still dubious, are you? Look at the alternative: a VAX 8550-based cluster with no workstations. For this configuration, you'll need at least two machines, because you want to be sure you can keep running if one goes down. Even so, you lose half of your computing power if one machine is down, even for regular maintenance. The processor cost of each machine is about $350,000 or about $50,000 per mip.

The cost of the HSC and peripherals are the same in either configuration. However, if you go with the VAX 3500 implementation of a workstation system, the disks might be much

Table 3.

Feature Comparison: Terminals versus Workstations

Item	VAXSTATION-based Solution	VAX 8550-based Solution
Dollars Per Mips	$10,000	$50,000
Processor Availability	High. A single failure reduces system performance by at most 1.5 mips.	Moderate. A single failure cuts available CPU in half.
Single Job Stream Performance	Poor. At most, it applies 1.5 mips to a single job. A single low-cost VAXSERVER 3500 could raise that to 3.0 mips, all of which is available if DECWINDOWS is used to distribute the applications.	Excellent. Seven mips can be applied to individual jobs.
Engineer Productivity	High. Windowing workstations offer good graphics. Software development environment is enhanced. New workstation tools are coming out all the time.	Moderate. There's good job turnaround, but a non-windowing environment and smaller terminals.
Management Complexity	Moderate. It's higher if each machine is managed separately, but the same if the entire system is managed as a cluster of VAXSTATIONS.	Low. It's a single management domain.
Isolation	High. Each user is unaffected by the use of the machines by other users.	Low. Other users may hog machine.
Configurability	High. Individual machines easily can be added or removed from network without impact on others.	Moderate. Adding or removing machines from the cluster can be relatively difficult.
Timesharing Throughput	It's about equal if there's heavy use of interactive capabilities. It's poorer as more CPU-intensive work takes place, like links, compiles, simulations, etc.	It's better for heavy CPU-intensive work but about equal if it's a heavy interactive load.

cheaper (third-party Q-bus ESDI disks are quite cost-effective) and all that you lose is some of the availability features and shadowing capability of the HSC.

In the no-workstations solution, you'll need bunches of terminals on DECSERVERS. If you consider just the design engineer's terminals (the others are the same in either solution), you need 20 terminals, including some with graphics, for an average cost of $1,200, plus DECSERVER ports at $350 per port. Because the typical engineer's terminal might be more like $2,500, and you'll probably want more than one terminal for those doing heavy software development, this $1,550 per engineer is pretty conservative.

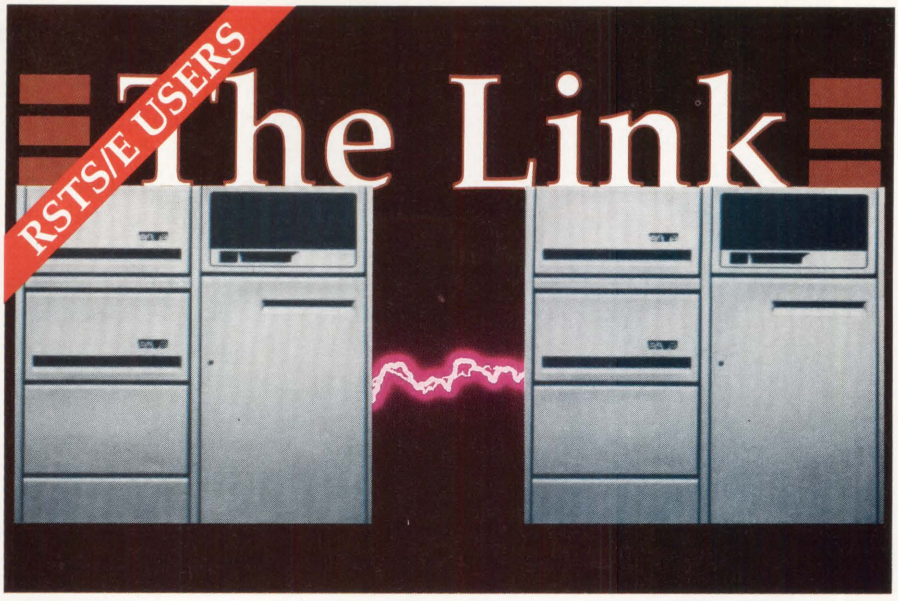
Then there's software: A software package on the 8550 costs 14 times what it costs on the VAXSTATION 2000. Because not everyone needs every package, there may be some price advantages to buying software only for the workstations that need it, rather than buying it for the whole cluster. Of course, some packages, like compilers or rarely used packages, can be purchased for the central cluster machines or for one workstation and shared among the workstations.

Table 2 shows the cost comparison between the two alternatives. The costs don't include the cluster hardware or the peripherals themselves; those are the same in the two alternatives. Note that if you don't need high availability or disk shadowing, the cost of the VAXSTATION-based solution can drop relative to the cost of the cluster with dual HSCs and CIs.

Of course, there are factors other than cost to consider. Table 3 lists some of the factors that differentiate the two alternatives.

What Gives?

A careful examination of Tables 2 and 3 demonstrates the major difference between the two computing approaches. The big-machine alternative provides very good single-job performance. So if your application needs to minimize the time required to perform a single



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task (like a simulation or design solution), the answer is probably a cluster of fast processors. This is also true if you have a highly variable job load that's difficult to balance across a number of processors.

On the other hand, if your job mix has many employees doing editing, a few doing software development, and some doing miscellaneous batch jobs, you can get more mips for your bucks by installing a bunch of VAXSTATIONS. After all, you don't need to use part of a 7-mips machine for staff running word processing, editing and mail. They'll get nearly identical response from a 1-mips machine. Also, by getting all those interrupts off the bigger machines in the central cluster and dedicating them to single job processing, the bigger machines will run faster, too. Of course, the biggest benefit to the workstation approach is that you get a high-performance software development and engineering environment for those high-performance users who need that resource.

Finally, you could make a hybrid of these two solutions. Put one small (say, 8250) and one large (say, 8550) machine in the cluster. That way, you get high availability and volume shadowing (two machines, two HSCs), as well as high performance for a single job stream (from the 8550). But you can keep most of your development and editing work on the VAXSTATIONs providing an additional 20 mips of general-purpose computing power for less than the cost of an 8550.

Given these alternatives, the Digital model for workstations shapes up like this:

1. Use workstations to leverage the software development tools and improve user productivity. Use ULTRIX or MS-DOS workstations where necessary, but push VMS workstations to keep a common software development environent and single management domain.
2. Depending on the size and business requirements of the organization, there may or may not need to be a central location with a high-availability VAXCLUSTER, large disks and/or high-performance processors.
3. Within a site, connect all the processing resources, terminals and printers with an Ethernet. Run LAT, DECNET and possibly other protocols on the Ethernet. Connect geographically distant locations using DECNET and DECNET System Services.
4. There are two kinds of systems within the network: servers and clients. The central cluster may contain file servers, disk and tape servers, possibly compute servers, database servers and other specialized hardware or software. Client nodes, basically workstations and terminal servers, will access those resources transparently using LAT, DSS, DECWINDOWS and other layered products.
5. Provide workstations to those users who need the advantages of bit-mapped graphics or easy-to-use interfaces, but still allow access to all functionality from traditional character-cell terminals and DCL procedures. This is the essence of the "separate form from function" statement from Digital.

Do you give anything up by going with the workstation approach? Not really. You always can add a fast processor if you need one, and DECWINDOWS will make sure that it's available to all the users on the network. For example, you can add a 3-mips VAX 3000-class machine for $50,000 to $70,000, so if you don't need the blinding performance of a 8700 but still want good single job response, that's a much cheaper solution.

Remember, a VAXSERVER has a single-user license, but that's all you need in a workstation environment. Now does it make sense that Digital is charging an arm and a leg for a MICROVAX 3000 license? DEC doesn't want you to put users on them; it wants you to buy workstations.

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The Sleeping Giant Wakes Up?

DEC And The Technical Workstation Market.

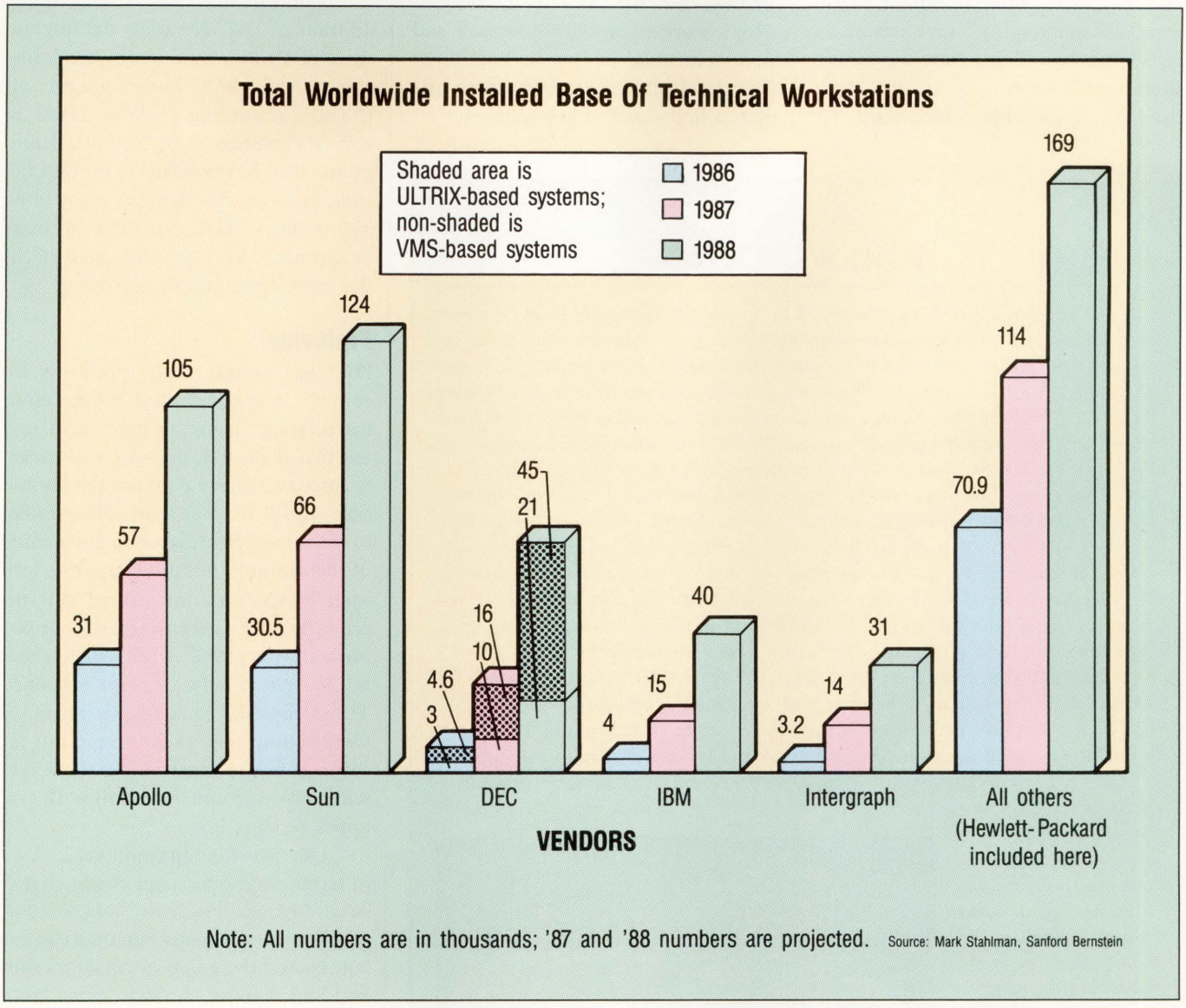
BY LORI A. SNYDER

THE TECHNICAL WORKSTATION market primarily consists of users performing electrical and mechanical design and simulation. These applications comprise approximately 38 percent of the overall workstation market, and are the largest single segment. Most vendors and market analysts agree that Apollo Computers, Sun Microsystems, Hewlett-Packard and DEC are the top four technical workstation vendors. IBM and Apple Computers are competitors on the low end of the workstation market, while Silicon Graphics competes on the high end with its sophisticated graphics capabilities. Intergraph, although not considered a major competitor, has a surprisingly large marketshare.

The technical workstation was introduced in the early 1980s first by Apollo, then by Sun a year later. Users enjoy the convenience of having these dedicated and powerful computers on their desktops compared to traditional use of corporate minicomputers or mainframes on a timesharing basis. Today, Sun and Apollo continue to be market leaders.

Why UNIX?

UNIX has emerged as the most popular operating system for technical workstations. "The technical workstation market is overwhelmingly a UNIX marketplace," comments Mark Stahlman, a research analyst from the investment firm of Sanford Bernstein. The reasons for the predominance of UNIX are closely tied to the success of Sun Microsystems. Sun has convinced users that the way to protect their software investment is to build it under a portable environment, namely the UNIX operating system. That way, if a user's hardware vendor goes out of business, the user can port his software to another vendor's hardware with relative ease. As Vicki Brown, an analyst with Interna-



tional Data Corporation, puts it, "Sun has been very effective in marketing UNIX by riding on people's fear of hardware obsolescence." Other workstation vendors have followed Sun's lead by offering UNIX for their products.

Apollo, which started out with a proprietary operating system called Aegis, is now shipping 80 percent of its workstations with UNIX, and only 20 percent with Aegis, according to Robert Herwick, a senior analyst at Hambrecht and Quist. Hewlett-Packard introduced its version of UNIX for workstations, called HP-UX, in 1982. Because good hardware tends to attract software, there is currently a vast amount of software available to run under UNIX. "Within a couple of years, all technical computing, from Cray to personal computers will be done under UNIX," says Stahlman. Currently, the use of UNIX for technical workstations is a trend that has a great deal of momentum.

DEC And UNIX

DEC has spent billions of dollars developing VMS, its proprietary operating system. Still, the increasing popularity of UNIX prompted DEC to offer a version of UNIX, called ULTRIX, to those customers who were demanding UNIX. ULTRIX for DEC's workstations has been available since January 1986. DEC currently is shipping about a third of its workstations with ULTRIX, the rest with VMS.

DEC's position on UNIX is a bit of a dichotomy. On one hand, DEC has an enormous investment in VMS; on the other hand, DEC wants to keep those customers who want a supported version of UNIX from DEC. Stahlman feels that DEC hasn't been an aggressive UNIX vendor, and that ULTRIX developments haven't kept pace with developments in UNIX. "Until DEC puts UNIX on an equal footing with

VMS, DEC won't bring its full force into any UNIX marketplace," says Stahlman. He adds, however, that DEC also has an enormous investment in ULTRIX, and that it's improving. According to Brown, DEC has the same number of people working on ULTRIX research and development as it has on VMS R&D. That kind of resource investment implies a high-level of commitment.

DEC WINDOWS

DECWINDOWS, which was announced in January 1987 and is scheduled for release sometime in 1988, will provide a uniform user interface for systems running under the VMS, ULTRIX, and MS-DOS operating systems. Accordingly, it will provide the ability to accommodate heterogeneous devices, as long as those devices are capable of running DECWINDOWS. Sandy Friedman, a strategic marketing manager in DEC's workstation group, feels that users are currently saying, "We don't care what operating system, we care what application," and it may be a UNIX, MS-DOS, Cray, etc., application. DECWINDOWS allows a user access to any application that runs under a supported operating system. ULTRIX, VMS and MS-DOS will be supported initially, with others being added.

DECWINDOWS will make the choice of an operating system less important because users will be able to have multiple operating systems co-existing on the same network. In other words, a user will be able to run UNIX, MS-DOS and VMS applications concurrently on the same workstation. As Vicki Brown, an analyst with IDC, puts it, "DECWINDOWS will make the VMS versus ULTRIX issue a moot point."

DECWINDOWS is based on the X Window System which was developed at the Massachusetts Institute of Technology (MIT) with funding and participation by DEC and IBM. X Windows has emerged as an industry standard, and runs on a variety of workstations, including those from DEC, IBM, and Hewlett-Packard.

The X Window System takes advantage of the networking capabilities of workstations; processing can occur on devices throughout the network transparently to the user. For example, a user can execute a very compute-intensive application on a Cray supercomputer and receive the real-time results over the network on his local workstation.

X Windows differs from traditional windowing systems (known as kernel-based architectures) which restrict all application processing and graphical display to the local workstation. The X Window System features a network-based architecture that allows true distributed processing. And, in the words of Friedman, "The world is evolving to be a distributed computing environment."

Stahlman feels that the clearest indication of DEC elevating the importance of UNIX would be for the company to make VAX clustering a part of ULTRIX. According to Peter Hack, a software engineer in DEC's workstation group, DEC has no plans to do this; he adds, however, that there are many utilities within ULTRIX that allow the user to approach, but not completely reach the capabilities of VAX clustering.

Problems

DEC has several major problems to combat in the technical workstation marketplace. Its foremost problem, the one that all the industry analysts I spoke to agreed upon, is a poor price/performance ratio. "DEC falls short of being able to meet the performance requirements of demanding technical workstation users," says Stahlman. Some current products offer performances of approximately 10 mips, while the latest MICROVAX is only a 3 mips machine. Technically, DEC could market a 10 mips workstation; however, according to some industry analysts, a 10 mips workstation could cannibalize DEC's upper product line.

DEC is behind the industry leaders in terms of graphics and connectivity. According to Herwick, DEC's GPX graphics are adequate, but DEC clearly lags behind the graphics capabilities of Sun and Apollo. Herwick ranks DEC third in terms of connectivity, with Apollo and Sun ranking first and second, respectively.

DEC also lags behind the leaders in support of standards. ULTRIX, which DEC describes as Digital's enhanced native-mode UNIX system, is not a standard environment. According to Herwick, DEC has committed the resources to move to a standard implementation of UNIX within a year or two. DEC maintains that ULTRIX is true UNIX because it's based on Berkeley 4.2, contains Berkeley 4.3 enhancements, and conforms to AT&T's System V Interface Definition (SVID). However, it's questionable whether an operating system that contains enhancements can really be

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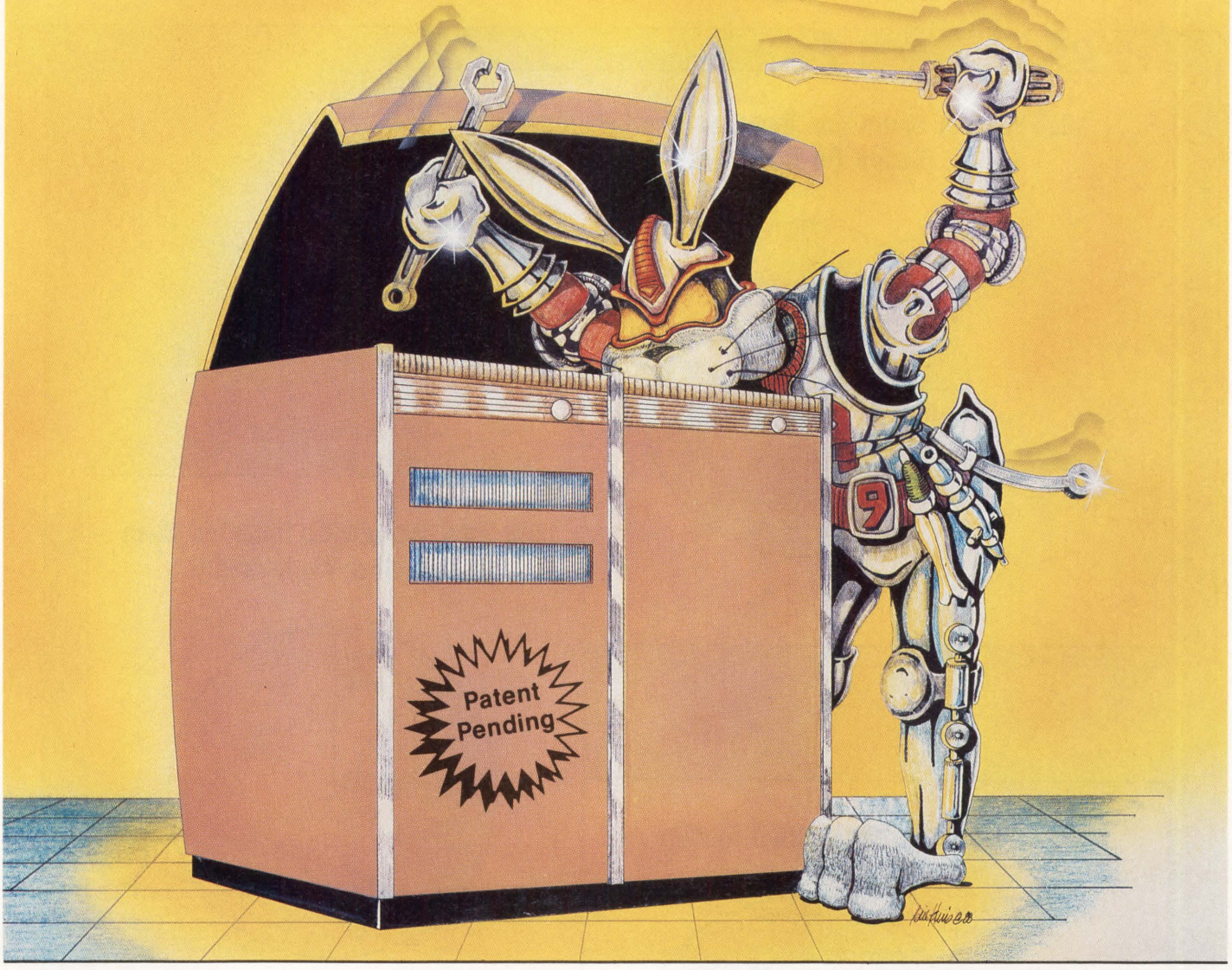

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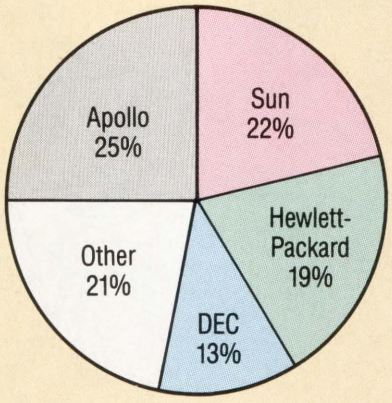
considered standard. DEC does support POSIX and X Windows, two other industry standards, but both of these standards rapidly are falling behind actual product development, according to Stahlman. Finally, before DEC can become known as a proponent of standards, it will have to change its purported attitude that "everything interesting is proprietary."

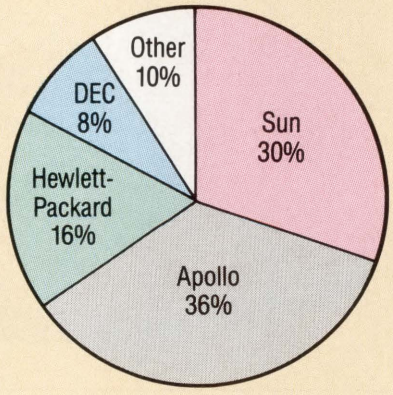
According to Herwick, another problem DEC faces is that customers aren't happy with ULTRIX. "ULTRIX is like driving a Model T. It's not very satisfying," says Herwick. Specifically,

1986 Market Share For Technical Workstations (Based On Revenues)



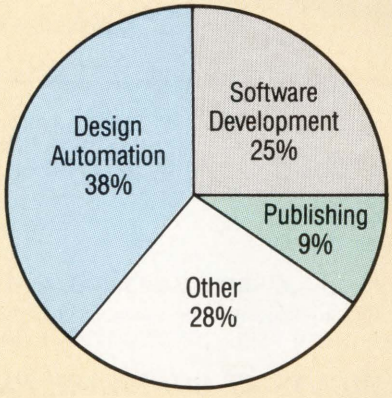
Source: Brad Smith, Dataquest Inc.

1986 Total Worldwide Installed Base Of Technical Workstations



Source: Vicki Brown, International Data Corp.

1986 Workstation Market



Source: Brad Smith, Dataquest Inc.

Herwick feels that ULTRIX is less robust, less friendly, and more limiting than UNIX. DEC, of course, differs on this point. According to DEC's Hack, DEC's ULTRIX customers are happy; some customers who have used UNIX for a long time are reporting that ULTRIX is their favorite implementation of UNIX. In fact, Hack says, the University of California at Berkeley currently is using ULTRIX on a large number of computers. Hack maintains that the opinion that ULTRIX users are unhappy is an "incorrect market perception." At a minimum, DEC needs to alter the market's perception of ULTRIX. Stahlman feels that the people who have ULTRIX are probably happy, but there just aren't a whole lot of people for whom ULTRIX is an obvious choice.

Outlook

According to industry analysts, the outlook for DEC in the technical workstation marketplace seems bleak. "DEC is far behind Sun and Apollo today, and every month it becomes more difficult to keep up. As the marketplace grows, installed bases become more committed and the gap widens," says Stahlman. Stahlman also adds that, "In order to outpace Sun and Apollo, it's not enough for DEC to just match them, DEC has to do more." And doing more than Sun and Apollo is no easy task. As analyst Herwick puts it, "DEC can't move fast enough to keep up with Sun."

Brown is more optimistic about DEC's future in the technical workstation marketplace. Brown feels that DEC is definitely catching up, and refers to DEC as a "sleeping giant." Since about July 1987, DEC has been shipping more workstations per month than either Sun or Apollo. As of December, DEC was shipping approximately 4,000 units per month, while Sun and Apollo were shipping between 2,000 and 2,500 units per month, according to Brown. This level of sales primarily can be attributed to DEC lowering the price of the VAXSTATION 2000 in June. Brown estimates that the percentage of UNIX-based workstations DEC ships will grow to 40 or 50 percent over the next three to five years as DEC's ability to penetrate new accounts increases.

"Distribution and manufacturing prowess will be two key factors of success for workstation vendors," says Brown, and she has serious concerns about Sun's and Apollo's capabilities in these areas. DEC has proved itself strong in manufacturing, but its distribution strength remains to be seen. Also, DEC will be making significant improvements in graphics with the introduction of 3-D capabilities next year; this should help DEC's high-end sales potential.

DEC may have some problems to overcome in the technical workstation marketplace, but its commercial market presence is looking better than ever. "DEC will sell a large number of workstations to non-technical VMS customers, and the MICROVAX 2000 and 3000 will be a huge success," says Stahlman. DEC agrees. According to Sandy Friedman, a strategic marketing manager in DEC's workstation group, DEC's less than $5,000 price tag on the MICROVAX 2000 has opened up the electronic publishing, finance, insurance and banking industries. DEC sees a huge potential in these markets; as Friedman puts it, "The ramp is very steep in commercial spaces."

As is expected, the analysts who study the technical workstation market don't all share the same opinions. Everyone agrees that DEC has some problems to overcome in the technical workstation marketplace; these problems, however, are not unsolvable. DEC has enormous resources, an excellent reputation and a good chance of turning things around. DECWINDOWS is a product that could revolutionize current computer environments. In any event, I think we'll be seeing the Digital logo on both technically and commercially used workstations for many years to come.

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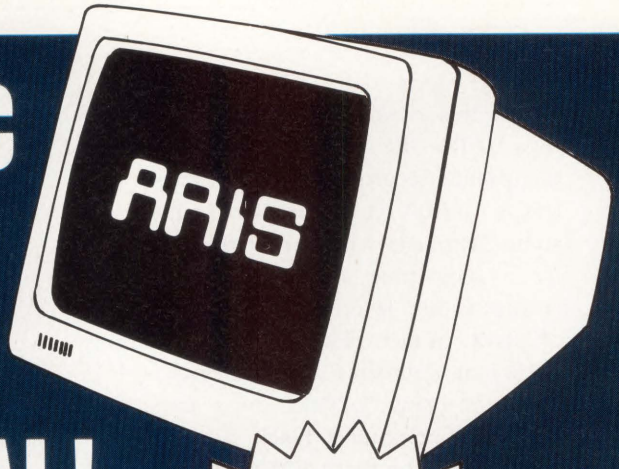

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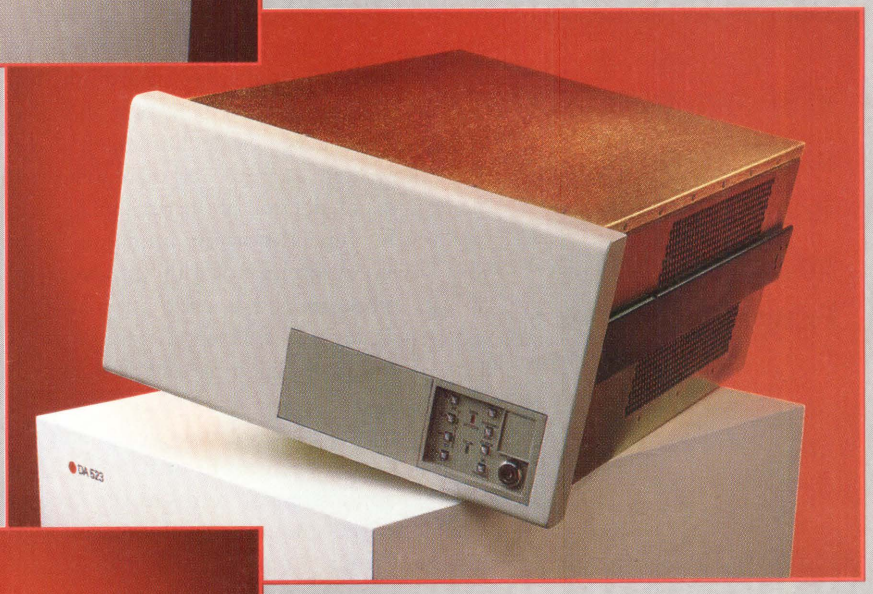

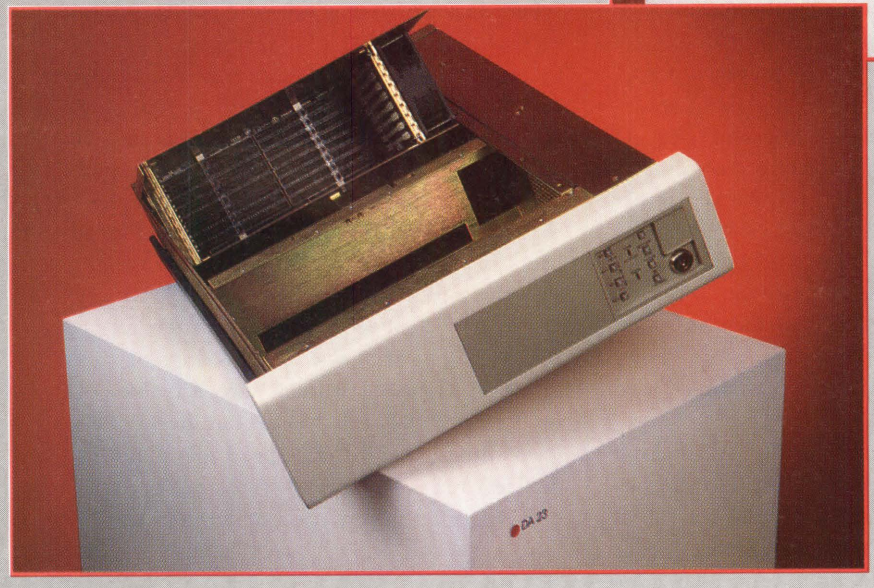

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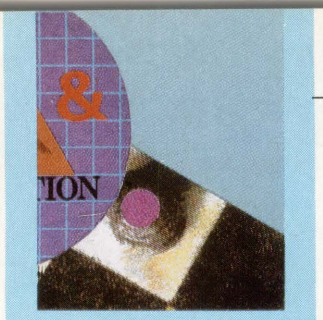


GRAPHICS

ANALYZING VLSI CHIPS

By Ron Levine

VLSI Architecture In 3-D Graphics Terminals Provides Increased Functionality.

Some recent breakthroughs in the architecture of graphics terminals are making sophisticated 3-D modeling a more practical tool for DEC users. New firmware and proprietary Very Large Scale Integrated (VLSI) chips allow users to create and manipulate 3-D renderings in a fraction of the time previously required by general-purpose minicomputers. This is favorably impacting the productivity of DEC users, and it's helping DP managers responsible for scientific, engineering and industrial projects to get more out of their host computers.

Scientific, CAD/CAM and government applications have been more demanding than business applications in terms of the need to display charts, graphs, 3-D physical models and renderings requiring a high degree of visual realism, formulas and graphical information. These and other highly graphic-intensive environments are the biggest beneficiaries of the new graphics terminals.

Much of the technical software currently in use was developed for DEC systems. As a result, DEC users have been working with and advancing 2-D and 3-D graphics for more than two decades in order to study physics, chemistry, mathematics and engineering design automation, and for computer-based training.

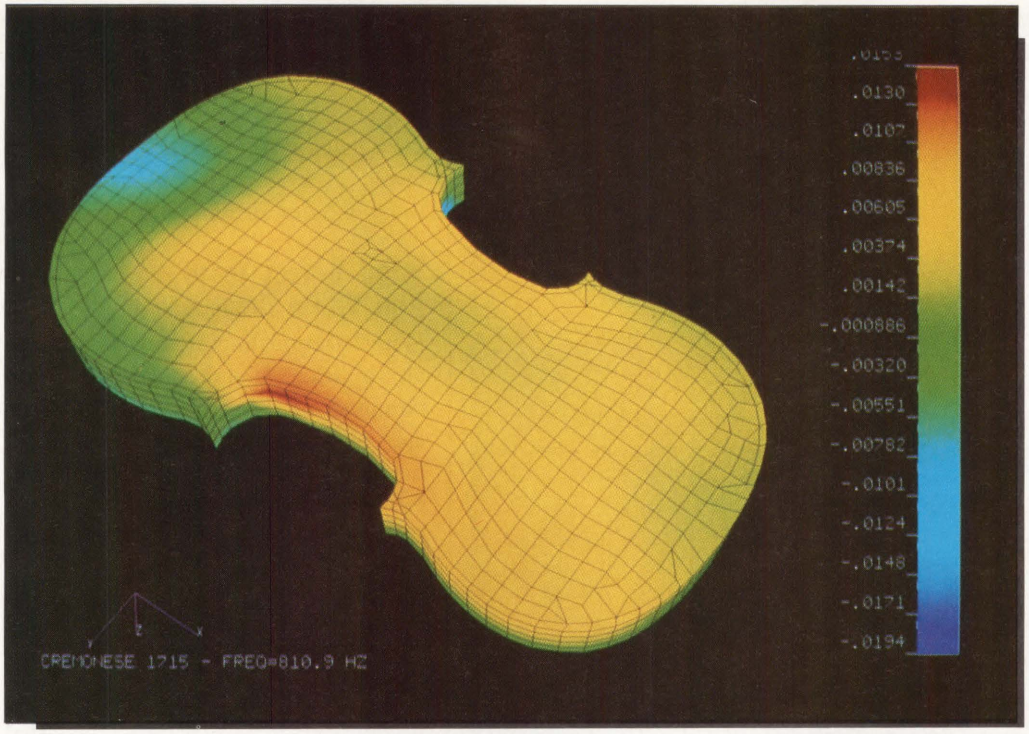
Hardware system advances are making 3-D imaging more practical through special-purpose architecture employing VLSI technology. This architecture provides order of magnitude computation improvement. The payoff is productivity. Routine work can be done faster, graphic displays can be understood more easily, and more complex applications can be tackled.

Why VLSI Technology?

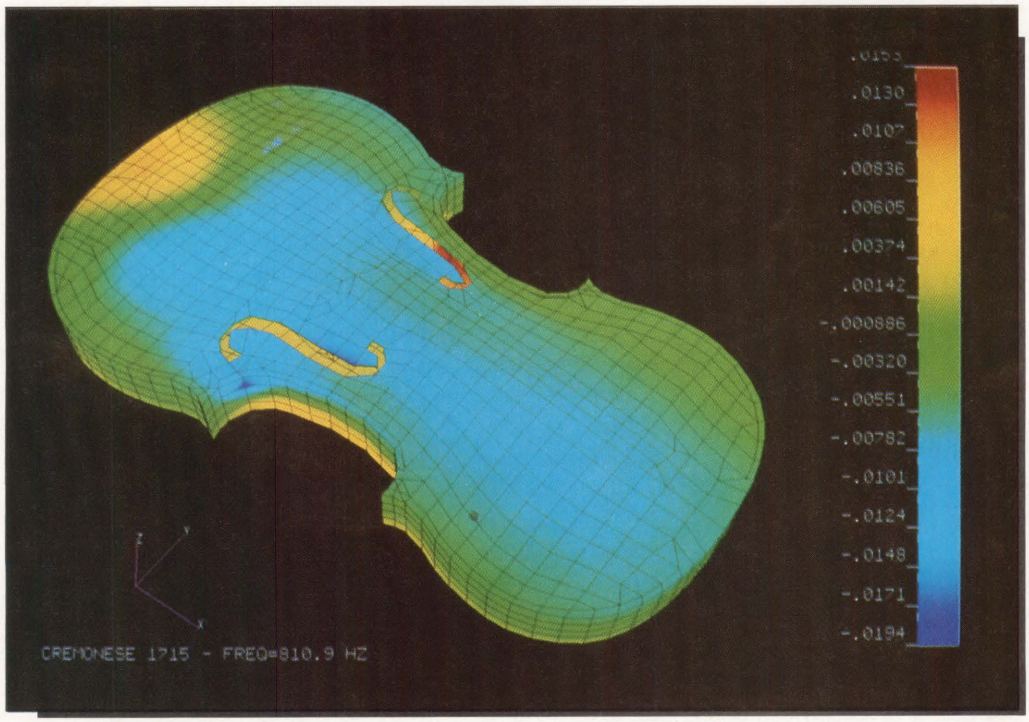
VLSI offers a means of obtaining new levels of performance beyond the traditional hardware solutions. The typical 3-D graphics display pipeline consists of a number of arithmetic operations, all processing intensive. After logic within this area is targeted for performance increases, a custom VLSI solution can be implemented.

For example, engineers at Megatek Corporation, a San Diego-based manufacturer of graphics terminals, examined the graphics pipeline to identify bottlenecks and determine where a speed-up in processing power would increase overall system performance. Because their 7000 series of graphics terminals already were high-performance devices, employing such state-of-the-art techniques as dedicated hardware for matrix transformation and digital vector generation (DVG), engineers discovered that it was a challenge to improve on their present capabilities. Going the VLSI design route was the logical approach.

A new VLSI series of graphics terminals, the Megatek 9000, was the product of this research. These terminals are capable of rendering 200,000 full 3-D vectors per second (two times the vector speed of previous devices) and 20,000 full 3-D polygons per second (six times the polygon drawing power of



Stress contour of a violin created by PDA Engineering's **PATRAN Plus** *software system. The model is made up of approximately 2,000 3-D smooth-shaded polygons that are displayed locally by the Megatek 9300 graphics terminal.*



After the 2,000 3-D model is displayed, it can be manipulated locally by the graphics terminal without the aid of the host CPU. This shows the stress contour map created in the photo above, rotated locally in real-time to its reverse side.

What Is VLSI?

Very Large Scale Integrated (VLSI) technology currently is the latest implementation of integrated circuit design. Like its forerunners, Small, Medium and Large Scale Integration, (SSI, MSI and LSI), VLSI refers to the density of logic gates and circuits that can fit on a single chip.

To qualify for the VLSI designation, the chip design must include at least 10,000 components. In reality, many VLSI chips are comprised of 100,000 or more components.

What does VLSI architecture mean for you, the user? In the past, hardware designs required several LSI chips to carry out tasks. For example, separate LSI chips were required for an Arithmetic Logic Unit (ALU), the control units and gate arrays. However, now all these functions and several custom ones required by the hardware design may be placed on a single chip, increasing power while reducing physical size and power requirements. The results are that chips with greater component density in closer physical proximity will have the potential for increased processing power at faster speeds.

As you read the accompanying article, you'll realize how VLSI design is a tremendous boon to applications from graphics to number crunching. Custom chips can be designed and placed into a box no larger than a terminal or PC, bringing all the accompanying power and capability to the desktop and relieving the burden from an attached minicomputer or mainframe.

Understanding VLSI in terms of the VL is simple; the technology is complex. Adding to the confusion, different manufacturers approach development in different ways. As a result VLSI design contains some inherent problems.

First, how do you reduce the size of the components? Once that feat is accomplished, how do you connect them correctly? After connections are established, will they maintain reliability? Even with all that processing power on the chip, what good is it if you don't have the I/O capacity to use it? Therefore, pin and connector technology also must keep pace with the rest.

These issues have been addressed and met satisfactorily, to some degree, with the advent of better design and manufacturing techniques, but as time goes on, chip designers continue to work on new and better ways to develop even denser, more reliable components.

Where will it end? Will you ever see the day of Super Colossal Humongous Scale Integration? As long as the technology and application demand continues to grow and scientists have words to describe it, you can expect increasingly powerful circuit designs to be implemented.

—David B. Miller

the non-VLSI terminals). Although in the past, up to 12 hours were required to produce a picture on a large computer, VLSI terminals can produce many pictures quickly while providing dynamic motion, thus making the display easier to understand.

While 2-D and 3-D modeling is available without VLSI designs, VLSI-generated images are more realistic. In the past, one image per frame was the norm. Now, many images per frame are possible, making fast, dynamic motion; i.e., motion that is easier to visualize.

Another benefit of VLSI designs is that new performance gains, with all the corresponding bells and whistles, are possible without using a lot of expensive real estate because of the limited number of new chips needed. This holds down costs and allows the implementing of more features at lower prices.

There are two parts to all graphics applications. Phase one is the analysis itself, which has nothing to do with the graphics. This phase determines how objects react in the environment, according to the laws of physics.

In phase two, the data obtained in phase one is conveyed to the user in the form of graphics output. This is where the VLSI design advantages come in. Using this technology, the images go faster, generate dynamic motion and thus are easier to comprehend and relate.

Wind Tunnel Tests And Violin Design

With 3-D modeling, if you can imagine an application, you can do it within computer memory. You can fly an image of an airplane through a wind tunnel in real-time, testing its reactions in different environments. You can change the environment or the design of the airplane, or both, by turning a knob or pushing a button and observing the effects.

The scientist or engineer is able to visualize what is happening and make instant adjustments: changing the visual perspective by rotating the model so it can be seen from different angles; making the model translucent in order to observe what's happening on the other side; clipping or looking inside the model; adding colors and shading; or using simulated light to make the visualization more realistic, easier to analyze or simply to create a more pleasing image.

Three-dimensional modeling frequently is used to solve problems related to the studies of oceanographics, seismics, acoustics, planning satellite orbits and simulating flight paths, to name just a few of the more typical scientific and military applications. The problem encountered with 3-D imaging is that this type of 3-D graphics has a vociferous appetite for computer power — the crunching of numbers.

Imagine that you're a modern-day Stradivarius: You're using computer graphics as a tool for designing your new violin and are looking at the stress contour. Your violin model display is made up of 2,000 polygons translated

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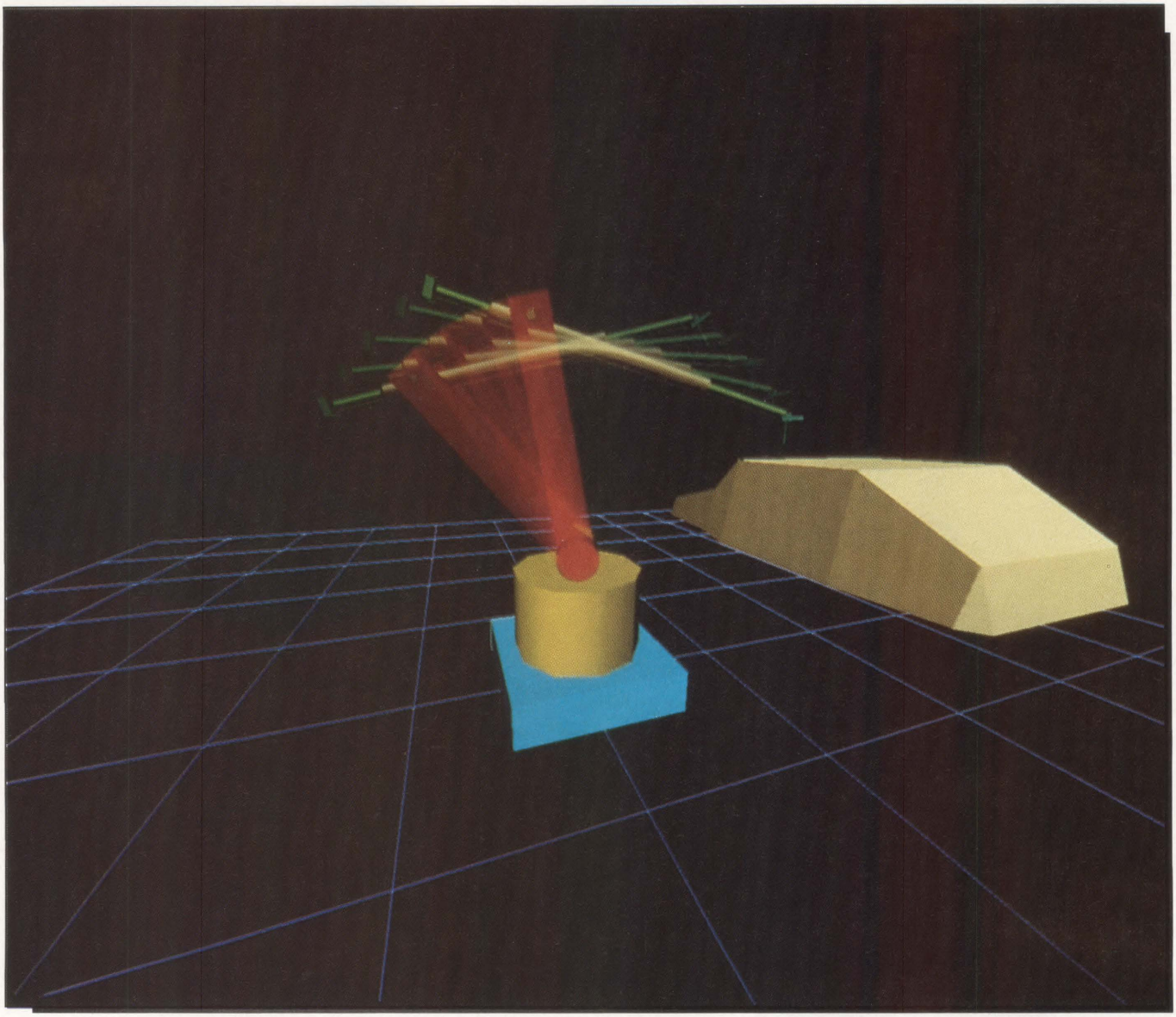

A manufacturing application using a robot arm in a hierarchical display list created by Megatek's* Apprentice *FORTRAN graphics package. Each section of the robot arm is controlled independently, allowing the user to visualize a complete simulation of a robotics application. The robot arm is manipulated locally in real-time by the graphics terminal.

into photons on the CRT screen representing the data as a graphical 3-D display. You want to rotate the violin image to look at the back of the stress contour. Your computer will have to perform a few mips to move the model.

In fact, it takes approximately 10 mips. Typically, it would take 25 seconds to achieve this one simple rotation with an interactive computer graphics workstation linked to a MICROVAX II, if you aren't using the host for any other task at that time. Beyond visualizing the model, the application could allow design modifications, and if you're using the host as a multipurpose machine, this process could slow down your ability to interact with this violin model.

Multiply that one task by the thousands of "what-if" questions that go into a design project of this type, and consider the impact on user productivity. This one job also could slow down all jobs in the host queue. It's for this reason that many DEC DP managers have resisted providing users with sophisticated 3-D workstation capabilities. PCs don't provide the horsepower needed to run complex 3-D graphics. The graphics terminal is the logical solution to this host crunch.

Enter The Graphics Terminal

The computer graphics terminal provides a viable alternative. These special-purpose machines are designed to perform all calculations locally after 3-D positional data is put into the pipeline

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by the host. This takes the burden off the host computer.

The first of these surface-rendering computer graphics systems became available around 1985. In 1987, a new generation of 3-D terminals evolved. These are powerful VLSI devices. For example, according to Robert Varga, vice president of marketing at Megatek, its 9300 Graphics System provides the capability to generate up to 20,000 fully transformed, smooth-shaded polygons per second for advanced surface-rendering displays.

Intelligence in the graphics terminal permits the movement of objects on the screen and the downloading of geometric information from the host into the terminal. Movement and display of images at the local level take the load off the host processor. When data is off-loaded in this fashion, it allows more terminals to be hooked-up to one system without degrading operations. The system's cost also is spread out over more users.

Varga went on to state that special floating point, multiplying hardware and proprietary VLSI chips provide the user with the ability to perform between eight and 15 million floating-point calculations per second. The system multiplies and adds simultaneously in two directions, allowing the DEC user to calculate 100,000 vectors per second and put them on the screen.

In contrast, the MICROVAX II has the capacity to perform approximately .8 million floating-point calculations per second, assuming that the host isn't being used to perform any other tasks. In order of magnitude, the graphics terminal is 10 times more powerful when it comes to visualizing and manipulating complex 3-D images on the screen.

50 To 100 Times More Efficient

In real-life situations, the computer graphics terminal is between 50 to 100 times more efficient. Referring to the violin problem, using a host with an online workstation, it took our modern-day Stradivarius at least 25 seconds to rotate the violin from front to back. With one of the new computer graphics terminals, using VLSI technology, the user can rotate the violin and perform all other functions in real-time. For example, rotation is done by turning a valuator knob. As the knob is turning, the violin is being rotated.

For combat training of pilots, the terminals can be used to create realistic visualizations of flight paths over friendly and hostile territories.

The impact on the potential productivity of the user is significant because there's no wait time. There are creative and time-saving factors to consider. Because there are no delays, the flow is smoother. Think how important this could be to a pilot training on a 3-D graphics simulator where reaction time is important.

Furthermore, as many as four 3-D graphics terminals can share one computer, or one or two 3-D graphics terminals can share a host with a number of online users, all without bogging down the system. In the past, some DP managers were concerned about linking a computer graphics terminal to a mainframe because of the drain on processing power. Now, it's possible to provide users with a capability to do powerful 3-D simulations in an interactive mode while posing no more of a load on the system than running a database program.

Visualization Of Data

A typical simulation could involve planning the use of a robotic arm in a manufacturing application. The designer creates a display list in a hierarchy and allows the terminal to do the calculations. This permits the designer to visualize each movement of the arm before a prototype is built. A defense contractor planning to use this robotics capability could use the graphics display as part of a presentation to support its data.

For training applications, an instrument panel can be displayed on the screen as though you were looking at the real thing. Or, it's possible to do real-time tracking of telemetry data coming from 100 different sources and put 100 different icons on the screen that are associated with moving targets. These are tracked with pinpoint precision and use locally controlled pan and zoom capabilities. The user can zoom in on a target and see what it is.

Target recognition in defense applications is a logical use of the new graphics terminals. For combat training of pilots, the terminals can be used to create realistic visualizations of flight paths over friendly and hostile territories. Pilots can monitor the flight path on the simulator or control it as part of a training exercise. With fast VLSI graphics, the 3-D modeling display can show exactly when or if two objects will collide.

There are also applications supporting numeric control (NC) manufacturing. The NC programmer needs to calculate the axis and movements of cutting tools in relation to the raw material that the tools are shaping into a part. Typically, it takes a programmer eight to 10 passes before a trial is set up and run correctly. With 3-D graphics, the programmer can visualize the tool cutting the raw material and see the finished product.

Translucency gives the programmer the ability to see through the tool to fine tune the mathematics. The difference is that you're shaving pixels in real-time

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instead of metal. There are examples of NC 3-D graphics applications where the number of iterations have been cut to two or three.

This type of 3-D graphics application involves saving the time of a skilled and well-paid person, optimizing the NC program and possibly getting the finished product up and running faster. Visualization also can help the user avoid the cost of building a physical model.

Some of the new generation of computer graphics systems provide a capability for generating a mixture of pixels, symbols and text. This is important for C^3I applications where map background (pixel data), force deployment (graphic symbols) and message annotation (text) are used with vector data for terrain contours, physical boundaries, flight paths, etc.

More Speed And Functionality

The new generation of graphics terminals includes processing speeds of up to 200,000 fully transformed vectors per second. Users can select up to 256 colors from a palette of 16.7 million, and both objects and areas can be enhanced with polygon fill. Other features include depth cueing, X, Y, and Z axis clipping, orthographic and true perspective transforms and backface testing for hidden surface removal.

Dual buffering of both the graphics and four overlay planes allows dynamic updating without visible redraw.

That's a significant feature. Earlier computer graphics terminals aren't fast enough to paint or shade polygons, and rotate the object simultaneously. So, they paint and reload objects in the frame buffer, and then rotate them. Dual buffering always displays one object and loads another simultaneously, providing a smooth rotation.

Surface patterns, textures and meshes are completely programmable with the new generation of computer graphics terminals. Other features to look for include translucency, the ability to simultaneously use Gouraud, Phong and flat shading, and movable spectral and reflective light sources. These features allow the user to create realistic 3-D images, and they're productivity tools.

Another productivity tool is true hidden surface removal, imbedded in the hardware, rather than being provided by the host. This means that the terminals automatically remove graphics information between the image on the screen and the user in real time, while the 3-D image is being rotated and manipulated in other ways. The alternative is to use the host to perform this task, which would be a comparatively slow and expensive procedure.

Additional Terminal Features

Many of the new VLSI terminals work with most host processors through DRIIW, DECNET or Ethernet local area networks, or RS232 interfaces. Using the Megatek 9300 series of new terminals as an example, display and editing features available include 60 Hz non-interlaced 1,280 x 1,024 raster scan displays for sharp, flicker-free resolution, the ability to perform display list editing, local task programming and processing, and various setup and configuration functions. Most of the newer terminals offer VT100 emulation and DEC VT220 compatible keyboards.

Some vendors customize their graphics systems by adding a touch panel or other features, modifying the software or pipeline, or by subtracting features that aren't needed. Other terminal vendors provide an ability for placing user-definable characters in their hardware and keep them locally in the system without downloading.

What The Future Holds

According to Michael Bailey, director of advanced development at Megatek, you can anticipate that VLSI terminal performance will improve annually by a factor of two, and that involves the speed with which you can see a picture on the screen. By 1990, anticipated 3-D vector speeds will be in the realm of two to five million vectors per second. We'll see shaded polygon speed in the 500,000-per-second range.

Bailey went on to state that speed may not be the most important selling point in the future. "Once we reach a very high vector-per-second speed, say 2,000,000 or more, another 100,000 or so vectors per second will not make a difference to most users. It may be that good software, customer service and support will be the keywords of the 1990s."

Perhaps the biggest breakthrough will come in the area of improved CRT screen resolution at an affordable price. By 1995, 2,000 x 2,000 dot screens should be viable economically for use with graphic terminal display systems.

What will be gained by incorporating the coming hardware breakthroughs with software innovations? For one thing, DEC users will be able to handle more complex models with more realistic visualizations.

The computer pioneers today are leading the way across industry boundaries to reach more professionals. In time, the aerospace industry will have simulations to let pilots train before the aircraft is built, and architects will be able to walk you through your new house before the foundation is dug. We'll be able to simulate the future before we live it.

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UNIX

LETTERWRITER GRAPHICS

By Jin Mazumdar

A Simple Program To Print High Resolution Graphics On VMS And UNIX Systems.

Almost all dot matrix printers provide a way by which the user can fire any of its pins selectively and the DEC Letterwriter is no exception. You can draw graphs on this device using simple programs. DEC maintains compatibility between its printers and so the program works on the LN03 as well.

The program shows a simple PASCAL code for a plotting routine. It assumes that there's only one y value corresponding to each value of x and that the values are integers. The resolution of the graph would be NUMXDOTS x (6.NUMLINES). It prints the dot graph horizontally so that the x-axis is perpendicular to the direction of paper movement.

Under UNIX, this program serves as a simple filter for use with any program that generates the points. If the UNIX installation has a filter allowing escape characters to pass through, you get graphs quickly.

For example, a partial output of program Damp.P to generate points for a damped sinusoidal curve would look like this:

1	138	6	198
2	151	7	207
3	163	8	216
4	175	9	224
5	187	10	231

Under UNIX, you can get a plot of it as follows:

```
pix damp.p | pix plot.p | 1pr
```

where our plot program is a file plot.p.

The figure indicates the output of such a plot. This program is inefficient and could be refined, but it does print a graph with a decent resolution. *—Jin Mazumdar is director of the Computer Science Laboratory at the State University of New York in Fredonia, New York.*

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PROGRAM.

```
program plot(input,output);
const
   NUMXDOTS = 1000;
   NUMLINES = 50;

type
   tyxaxis = array[1..NUMXDOTS] of integer;

var
   xaxis : tyxaxis;
   i,j : integer;
   ln : integer;

procedure oneline (line : integer);

var
   i : integer;

begin
   for i := 1 to NUMXDOTS do
      if (xaxis[i] > line * 6) or (xaxis[i] <= (line - 1) * 6)
         then write('?')
         else case (line * 6 - xaxis[i] + 1) of
                1 : write('@');
                2 : write('A');
                3 : write('C');
                4 : write('G');
                5 : write('O');
                6 : write('_');
              end;
end;

begin
   for i := 1 to NUMXDOTS do
      xaxis[i] := 0;
   while not eof do begin
      read(i);
      readln(j);
      xaxis[i] := j;
   end;
   writeln;
   write(chr(27));
   write('P1q');
   for ln := NUMLINES downto 1 do begin
      oneline(ln);
      write('-');
   end;
   write(chr(27));
   write('\');
end.
```

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GRAPHICS WITH PERICOM

By David B. Miller

Pericom Takes Aim At The Graphics Market With Greater Functionality And High-Performance Color.

Once thought of as only the realm of CAD/CAM and other sophisticated design and engineering applications, color graphics now is finding applications in business and finance. At the same time, traditional fields such as engineering continue to need better quality graphics equipment. Users are no longer settling for single color charts and graphs; greater demands are continually being made to produce clear, crisp and vibrant color output.

As the graphics market heats up, vendors of hardware and software continue to try to meet the challenge of providing high-quality products at lower costs, that meet the needs of a variety of users.

The Pericom MX7100 Graphics Terminal, manufactured and distributed by Pericom PLC, Milton Keynes, U.K., is an entry-level model in the MX7000 series, which is comprised of six intelligent color graphics terminals and three PC-based workstations.

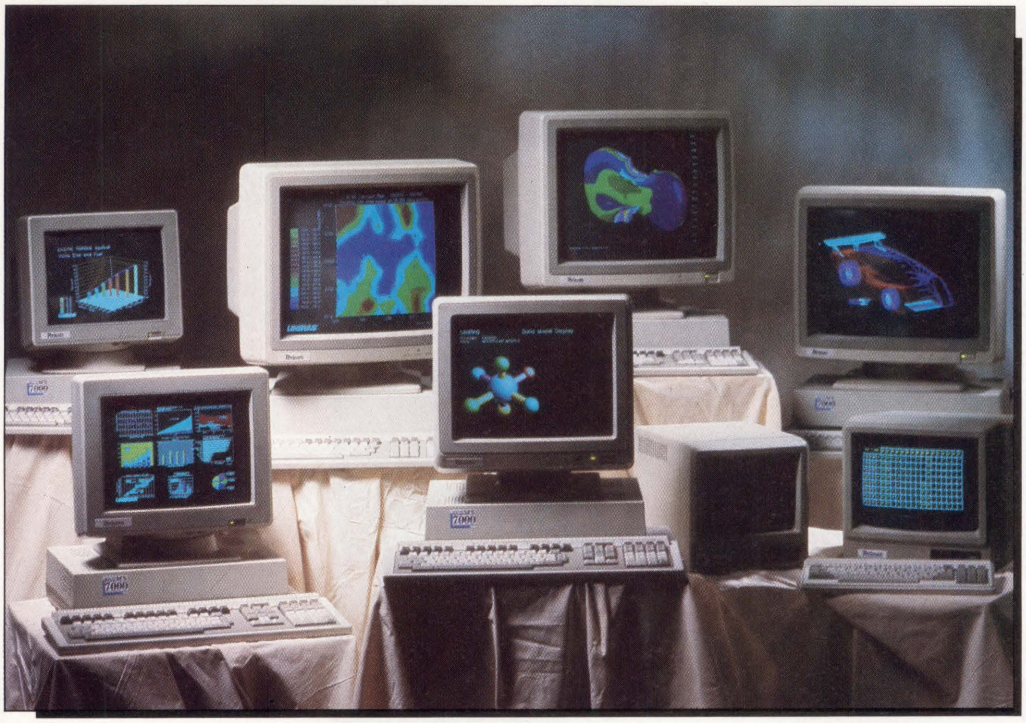
The small footprint CPU box measures 4 x 15¾ x 12¼ inches. The keyboard sports a standard VT220 key layout and measures 1¾ x 20½ x 7¾ inches. The NEC Multisynch monitor fits neatly on top, adding 14½ inches to the MX7100's height including the swivel base. The entire unit weighs approximately 22 pounds.

CPU power is obtained from a Motorola 68000 running at 12 MHz. Drawing speed comes in at approximately 1.5 million pixels per second and the screen's refresh rate is a non-interlaced 60 Hz. Segment memory of 256 KB is standard and may be upgraded to 1.75 MB allowing for powerful local graphics operations.

Many ports are available at the rear of the unit. The RS232 line port supports baud rates of 75 to 38,400 with split transmit/receive capability. Two more RS232 ports support baud rates of 75 to 19,200. Each can support a printer, digitizer or mouse. A full Centronix parallel port and RGB video out port round out the available I/O selections. Background printing is supported. Options include graphics input devices such as joysticks, optical or mechanical mouse and digitizer pads.

The ports at the rear of the unit are marked clearly regarding their function so no guesswork goes into setting up the MX7100.

Two setup modes are employed. In the Alpha mode, the Setup screen, accessed by pressing the Setup key, looks like a VT-series setup screen menu system. Parameters for a number of display columns, auto wrap, cursor style, terminal ID, newline character, tabs and the like are set here. The setup may be saved in non-volatile memory, the default factory settings may be restored, or the last saved setup may be recalled by pressing SHIFT/S, SHIFT/D or SHIFT/R.



MX7000 Series from Pericom comprises six intelligent color graphics terminals and three PC-based workstations.

A host of more than 200 commands is available in Primary Setup mode, entered by pressing CTRL/Setup. These commands allow for configuring communications parameters such as baud rate and data format, graphics input and output device configuration, hardcopy setup and a wide variety of graphics display parameters. Each primary command is entered as a key word followed by the appropriate parameters. For example, after pressing CTRL/Setup, entering the STATUS command causes the display of all current settings for all Primary Setups. The STATUS command followed by the name of another parameter such as COMMUNICATIONS displays only the current settings of one or a group of related parameters. These setups also may be saved in non-volatile memory and activated automatically upon startup.

Self-Test Diagnostics

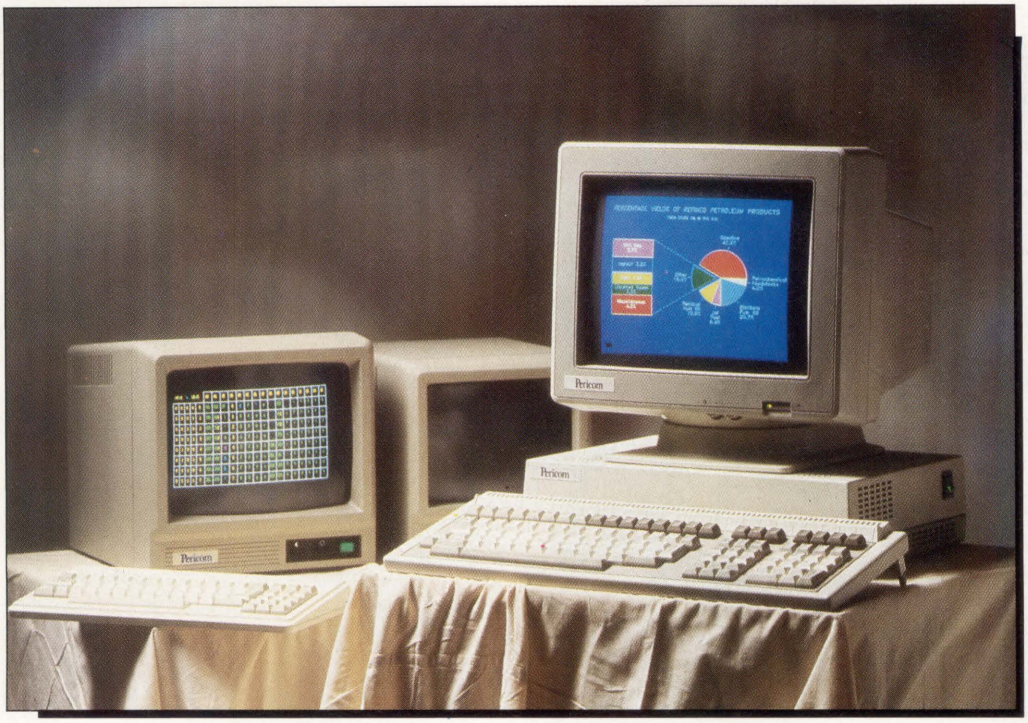
A full range of self-tests are run upon power up. Five status lights located on the keyboard indicate any trouble. After initial self-test, the firmware may report textual error messages if other problems are found.

The MX7100 fully emulates the VT52, VT100 and VT220 terminals, displaying 24, 32 or 48 lines of either 80 or 132 characters. Up to eight colors out of 256 may be displayed simultaneously. Supported character attributes include flashing, underline, double high and double wide. A number of national as well as ASCII and DEC line drawing character sets are supported. A custom character set of up to 94 characters may be defined by the user and loaded into volatile memory for special applications.

The VT220-style keyboard has 20 programmable function keys as well as special keys for hard copy output, screen erasure, panning, zooming, etc. A series of lights mounted above the top row of the standard portion of the keyboard indicate on/off line status and keyboard lock. Five of the total eight will be used in later firmware releases.

For graphics, Tektronix 4107 and 4107A as well as DEC VT240 and VT241 terminals using ReGIS are emulated. Software written for the Tektronix 4010 terminal also may be used with the MX7100. Display resolution is 640 x 480 pixels and 16 colors out of 256 may be displayed simultaneously. Retrographics VT640 and Westward W3220 protocols also are supported, providing for the satisfaction of a wide variety of graphics requirements.

The full range of Tektronix graphics commands are supported in their escape sequence format and many can be carried out by enter-



The MX7100 terminal offers the unique concept of separate-stacked or rack-mounted logic.

ing a Primary command string within primary setup. These commands allow for definition of colors, fill regions (the MX7100 provides 157 predefined fill patterns for you), graphics text, number of graphics surfaces and their priorities as well as drawing shapes such as lines and arcs and performing pixel operations. Graphics input may be carried out using the keyboard cursor keys if another device is not attached.

In any emulation, Menu Mode may be selected, allowing for modification of color modes and indexes without resorting to a Primary Setup command, definition of fill patterns, zooming or panning. You may switch between zoom and pan, enabling the enlargement of a specific region first, then allowing you to pan across that specific piece.

Documentation

The MX7100's ring-bound documentation is very comprehensive with separate sections for each type of emulation as well as the usual divisions for the index, setup, diagnostics, etc. Explanations of commands are clear and in some sections (e.g., printer setup) repeated, eliminating the need to keep 10 fingers in various parts of the manual.

There are separate appendixes for escape sequences, grouped by terminal emulation type, setup commands and command function summaries that supply manual page numbers for convenience. Also included are sections listing error messages and screen coordinate information.

The first paragraph in the documentation asks you to read the next few pages because it explains how to find information contained in the rest of the manual. It's wise to do so because of the size and scope of the documentation; it will eliminate unnecessary searching and thumbing through pages. The writers of the manual have a tendency to describe some features that currently aren't supported by the firmware, and tell you so in the last sentence of the section.

The Pericom MX7100 is a full-featured, flexible and nicely executed piece of graphics hardware. Its low price is attractive considering its wide range of emulation capabilities. The MX7000 series is a new series of graphics terminals, designed from scratch. You can look forward to any product Pericom will bring to the graphics market. *—David B. Miller is associate director of computer services at Beaver College in Glenside, Pennsylvania.*

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The Priory
Cosgrove
Milton Keynes
MK19 755
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Terminal Emulation, The Right Way.

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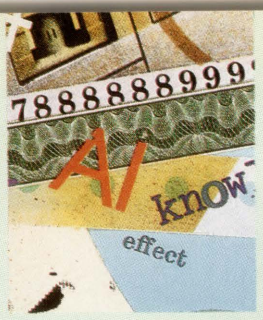

AI

NLIs LEAD THE WAY

By Klaus K. Obermeier, Ph.D.

Why (Almost) Nobody Buys Them But Everybody Should.

Martians, after a brief visit to our planet would depart with at least two misconceptions about human life: first, that diet drinks make people gain weight, and second, that only the elite of computer users are capable of teaching their programs to speak in English. Most humans believe the first misconception is wrong, but seem to have difficulty with rejecting the second. Here's why.

Current natural language interfaces (NLIs) encounter three major barriers before being fully accepted in the software market: a technology barrier compounded by language-related and computational problems, a utility barrier consisting of the limited applicability and useability of first-generation mainframe NLIs (mostly as front ends to DBMSs), and a psychological barrier erected by unrealistic user expectations and job displacement fears.

The central problem for natural language processing programs is the transformation of potentially ambiguous input into an unambiguous form that can be used internally by a computer program. NLIs used as front ends to DBMSs "translate" the English input either into an intermediate form and then into the DBMS-specific query language or directly into the query language of the back end DBMS. Major problems arise if there's more than one potential interpretation of the input, for example, "List all the employees broken down by sex," or if the input is incomplete, "if u cn rd ths u r smrt."

The two specific problems NLIs encounter as front ends to DBMS are synonymity and ambiguity. Synonymity is the many-to-one mapping of English expressions onto one element in the DBMS. Ambiguity is the one-to-many mapping of English expressions onto various data elements in the DBMS (see Figure 1). Designing an NLI means choosing among various options of what linguistic information should be processed (the meanings of the words, the structure of the sentence), and how the implementation is accomplished in the program. Currently, three perspectives on processing (parsing) NLI input for DBMS interfaces exist:

1. The Engineering Perspective — The analysis of language consists of describing a limited number of recurring patterns. A sentence is analyzed successfully if a stored pattern matches part of the sentence and corresponding action is taken. *ELIZA,* an early program, relied on fewer than a hundred patterns to simulate the interaction between a patient and a Rogerian psychologist. For example, sentences containing the word *always* would trigger one of the following responses from *ELIZA*: "When?" "Really?" or "Can you think of a specific example?" Thus, the sentence, "I always think of my parents." would always trigger a plausible response like "Really?" The example in Figure 2 shows how context-dependent *ELIZA* is given another domain; the result is at best humorous. The advantage of a simple pattern matcher is its economy and transparency, whereas in

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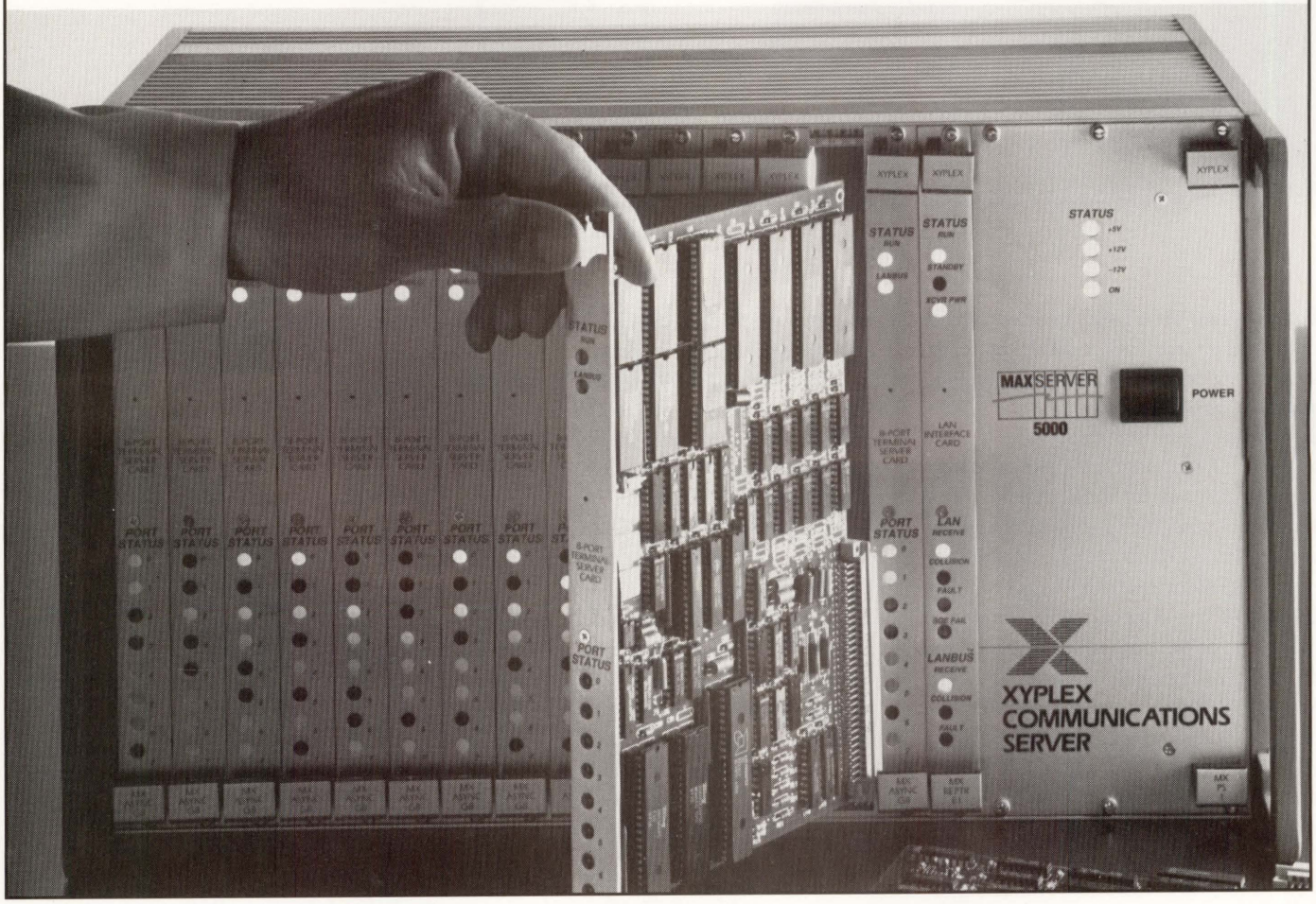

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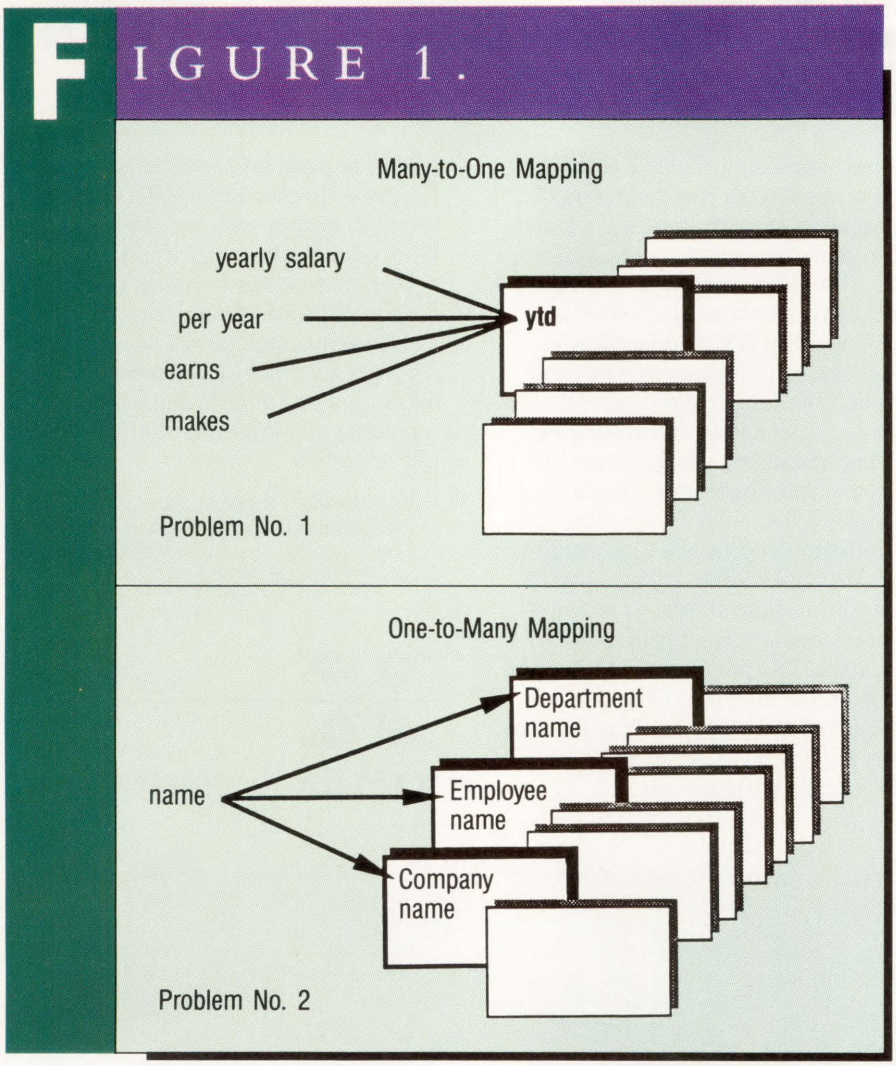


Two problems for NLIs.

domains that aren't well defined or that defy anticipating all possible patterns, systems built on the engineering perspective fail miserably.

2. The Linguistic Perspective — The analysis of language consists of determining the structural details of a sentence based on grammar. Linguists are known for their parse trees; their approach is characterized by the linear processing of the structure (as opposed to meaning) of one sentence at a time. The humor is in the eye of the beholder. The example in Figure 3 arises much to the chagrin of the NLP program having to contend with a host of ambiguous structures for each sentence.

3. The AI Perspective — The analysis of language consists of using extensive real-world knowledge to truly understand language. The processing of language is focused on larger contexts; the program is geared more toward modeling the use than the structure of language.

Drawbacks consist in the extensive requirements of knowledge and in the customization of each domain (see Figure 4). Nevertheless, there still are breakdowns of the AI-based systems; e.g., one "understanding" program interpreted the headline: "World Shaken — Pope Shot" as "Earthquake In Italy — One Dead," much to the dismay of all involved.

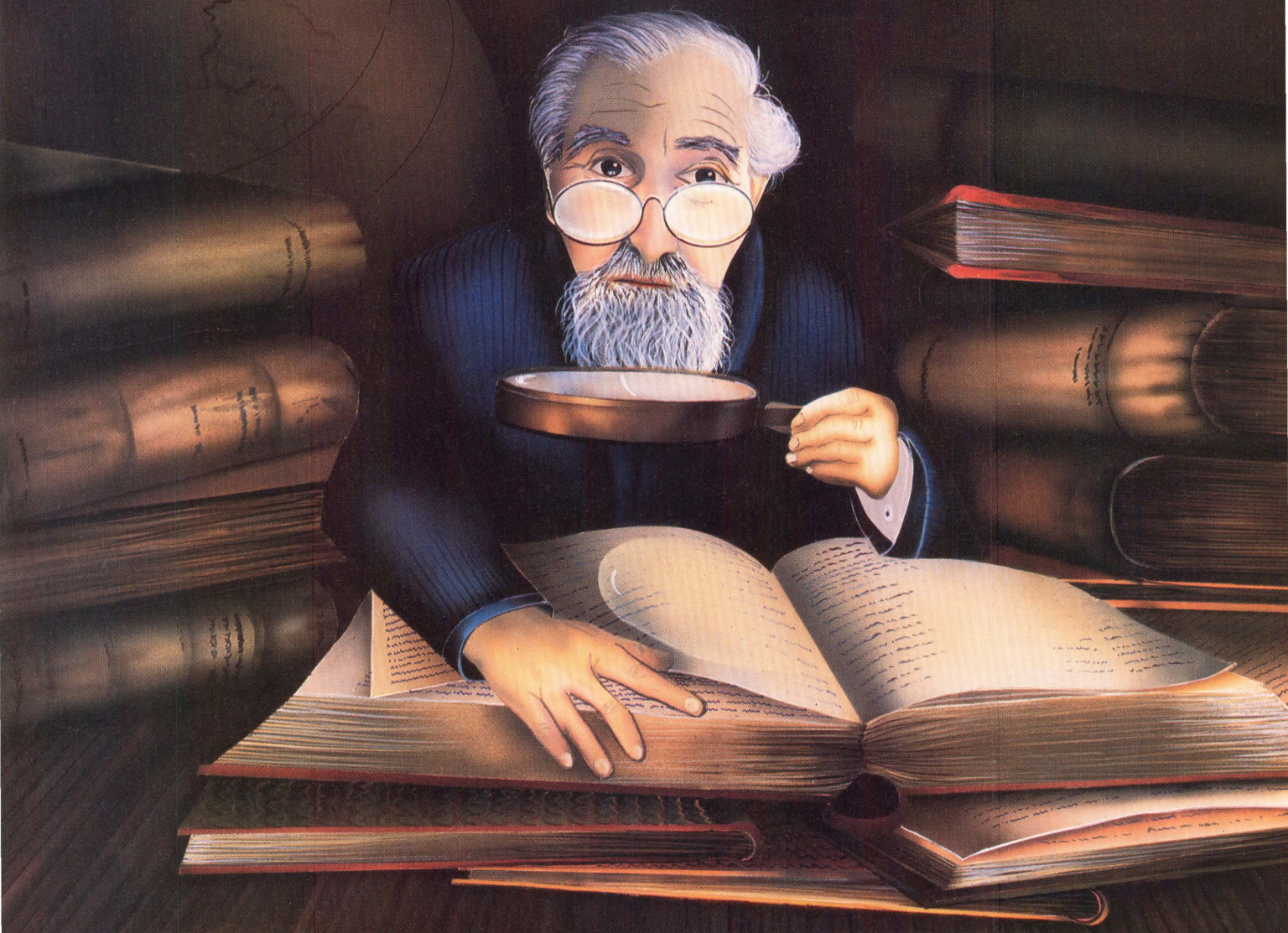
Once a choice is made of *what* to process in theory, the *how* becomes very important for the real-life computer implementation. Top-down and bottom-up are the most popular techniques for implementing NLIs. The labels are almost self descriptive: Top-down systems start with the top-most level of analysis, usually the sentence, trying to match the words and their word classes (e.g., noun, verb) to grammar rules that prescribe how to concatenate word classes into larger chunks (e.g., noun phrases consisting of determiner-adjective-noun). Bottom-up systems start by combining words first, and then building up larger chunks. These days, pure NLIs are built around popular techniques that use little tricks to overcome implicit pitfalls and drawbacks of truly top-down or bottom-up algorithms.

The two most common techniques for the NLI market are augmented transition networks (ATNs) and chart parsers. A simple example of traversing the network for a noun phrase is shown in Figure 5. After the words in the sentence are identified as nouns, verbs, etc., the ATN algorithm matches the word class of each word with the embedded grammar. If more than one possible analysis "path" is found, the ATN goes ahead with one option, returning to the point where the last option started if the previous one failed. The chart of the same noun phrase is shown in Figure 6. The more bottom-up oriented chart algorithm gives every possible combination of elements without selecting or trying one over the others. A chart contains all possible combinations, most of which are implausible interpretations of the sentence.

NLI — The Products

NLIs have a brief history in the commercial marketplace. *INTELLECT*, based on first generation technology and theories dating back into the late 60s

Would You Read The Whole Dictionary To Find The Definition Of One Word?



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STATUS

You Have It Or You Don't

FIGURE 2.

Hello HOW DO YOU DO? PLEASE STATE YOUR PROBLEM	Hello HOW DO YOU DO? PLEASE STATE YOUR PROBLEM.
I want a good example for my book. YOUR BOOK? Yes, my book about computers. Can you help me? I didn't mean to be. YOU SAY YOU DIDN'T MEAN TO BE? That's right. What do you know about computers? DO COMPUTERS WORRY YOU? Not at all. I think they can be very useful. CAN YOU ELABORATE ON THAT?	I have been very depressed lately. YOU SAY YOU HAVE BEEN VERY DEPRESSED LATELY? Yes. YOU ARE BEING SOMEWHAT SHORT WITH ME. What about my mother beating me? TELL ME MORE ABOUT YOUR FAMILY.
APPLICATION: ADVISORY SYSTEM	APPLICATION: ROGERIAN PSYCHOLOGY

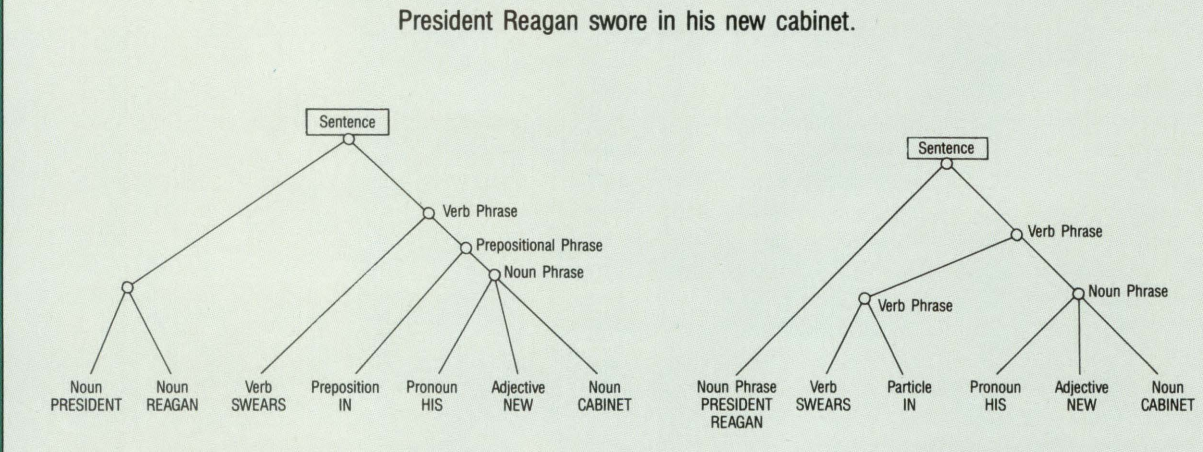
The engineering perspective from **ELIZA.**

(e.g., *ATN*), was commercially introduced in 1980. *Q&A*, a PC-based product, was released in 1985 after major investments, staff reorganization and change of application. *Q&A* now features an NLI as part of an integrated package including a DBMS and word processor. *NLQ* Battelle's natural language query system and the first PC-to-mainframe link NLI, was released in 1987.

The marketplace consists of three classes of systems: mainframe based; integrated PC packages; and the most recent trend, the PC-to-mainframe link. Mainframe-based NLIs turned out to be slow, memory intensive and hard to use and maintain. Integrated PC packages containing NLI/DBMSs are slow, limited and cumbersome. The reason is that they rely on extensive syntactic or semantic preprocessing, building up multiple analyses per input string.

The new era of PC-to-mainframe NLI links brought numerous advantages. The speed increased as a function of separating the processing tasks. The utility increased because users now could work with their favorite spreadsheets and report writers in conjunction with mainframe DBMSs. The overall integration of mainframe and PC-based software helps alleviate computer anxiety and ultimately will curb James

FIGURE 3.



The linguistic perspective.

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FIGURE 4.

Script: RESTAURANT
Track: Coffee Shop
Props: Tables
Menu
F-Food
Check
Money

Roles: S-Customer
W-Waiter
C-Cook
M-Cashier
O-Owner

Entry conditions: S is hungry.
S has money.

Results: S has less money.
O has more money.
S is not hungry.
S is pleased (optional).

Scene 1: Entering

S **PTRANS** S into restaurant
S **ATTEND** eyes **to** tables
S **MBUILD** where to sit
S **PTRANS** S **to** table
S **MOVE** S **to** sitting position

The artificial intelligence perspective.

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Columbus, OH 43201-2693
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Cupertino, CA 95014
(408) 253-9600
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Martin's "invisible" backlog of what you always wanted to ask your corporate DBMS but were always incapable of asking.

Another advantage is the cost factor. With the prices of DBMSs for mainframes starting at $15,000 and up, NLIs in the price range of the upper 50s are not marketable on a grand scale; PC-links with much lower costs will be.

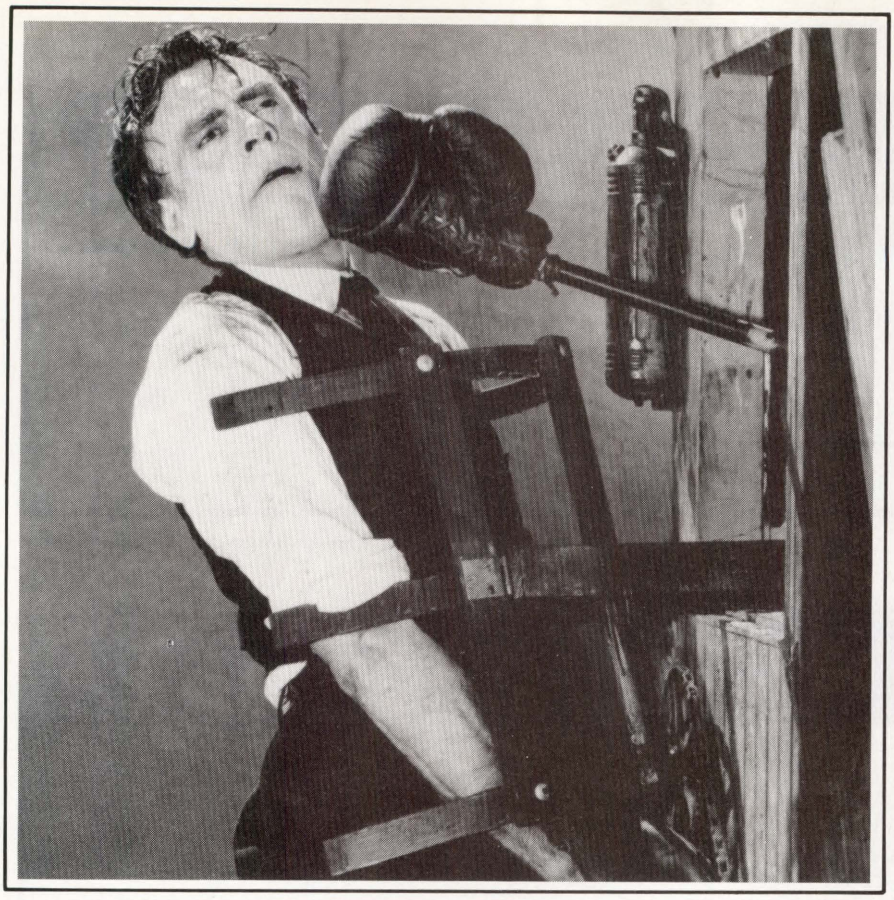
The competition to NLIs is mostly screen-oriented, menu-driven interfaces especially useful for data entry but stifling and limited for retrieval. Fourth-generation languages still require extensive training in the syntax and knowledge of how to extract and combine pieces of data for retrieval. Speech interfaces aren't yet contenders for the DBMS interface market because they're too impractical. Despite all the temporary problems, NLI products are increasing their markets, especially when becoming more powerful, transportable and available in commonly used environments, especially PCs.

NLI — The Utility Barrier

Despite advantages to NLIs, frustration exists on the part of the user as well as the database administrator in charge of setting up the NLI. Take the allegedly best, most successful PC package, or in fact, almost any mainframe NLI, and you'll find it annoying. Some have over-correcting spell checkers: "By 'all' do you mean 'Allen' in your dictionary, or 'all' in mine?" Others are too slow: "Please wait — your request is complex and will take a bit more time than usual to complete."

There is also frustration on the part of the data processing person who's stricken with an admiration for computerese. He's called on to install and maintain the system while keeping the user happy. After going through a crash course on morpho-syntactic lexicography, he's often ready to ask for demotion or assistance, but not to set up a system that is there for the asking by everybody.

NLIs are meant to be used by "intelligent agents" who know English at least on an elementary school level, and who know what retrieval tasks they have to perform. Anyone asking an interface to a shipping database to list all the lotharios over age 40 is defeating the purpose of an NLI. The same question, however, may be appropriate for a cautious female connected to a DBMS of a dating service. Idiot-proofing NLIs isn't only impractical and uneconomical, it also takes away resources better spent elsewhere on improving the system. Moreover, as Edwin Hutchins pointed



With some databases writing a complex application can be a punishing experience.

VAX programmers can take it on the chin if they try to create applications using a database without a complete fourth-generation language.

You'll find them working in cumbersome, time-consuming third-generation ways.

The alternative is FOCUS—a complete fourth-generation language with its own powerful database manager.

FOCUS includes all the productivity tools your programmers need. They can write any application completely in FOCUS, without lapsing into any other language.

You can expect FOCUS to improve programmer productivity by a factor of ten or more.

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From the first day, programmers can learn as they earn using a window-driven interface. Even old hands find this technique useful for super-quick prototypes.

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FOCUS presents a common language in the DEC VAX, IBM 370, Wang VS, UNIX and PC/PS environments. Applications are fully portable, and so are programmers' skills.

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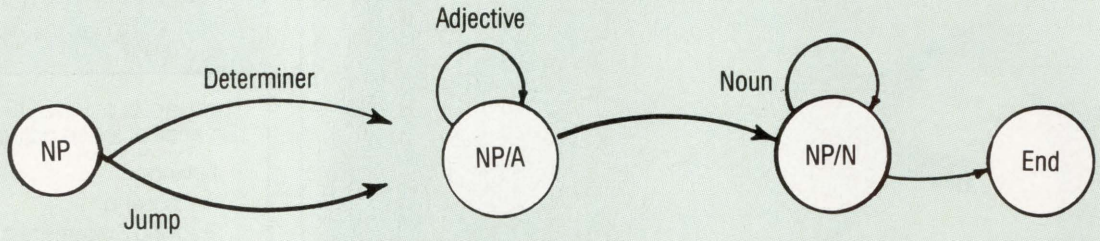
FIGURE 5.



ATN diagram for a noun phrase.

FIGURE 6.

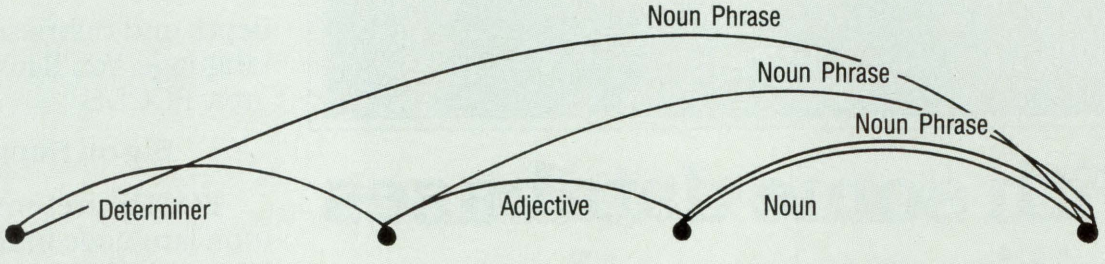


Chart diagram for a noun phrase.

out, mass idiocy will result in an artifact suitable for idiots.

NLI — Psychology

Hype raises expectations and lowers appreciation of the actual achievements of innovations, not just NLI technology:

"Computer understands you."

"Goodbye keyboards!"

Movie-goers no longer are fazed by Hal the talker and Sally the walker. Users now have a blase approach to modern technologies and are unwilling to be patient enough to optimize the computer. Educating the user while demystifying the technology may bring a much needed change in user attitudes, especially toward NLIs.

In terms of job displacement, fears of dehumanization abound, but many MIS directors will see the silver lining. Rather than eliminating jobs, the new and more powerful interfaces will open up new possibilities, because now, more casual users will approach the computer and its databases with more specialized requirements. The notion of losing your job as an MIS person because intermediaries are becoming superfluous should vanish quickly once the huge potential of NLIs is tapped and turned into tremendous productivity gains.

Natural language interfaces, some of which once embodied parlor tricks and snake oil slogans, are starting to make an impact on the ever growing computer market. Just when screen-oriented menu mafia predicted the exodus of the NLIs, just as the fourth-generationists claimed victory for English-like interfaces and just when high-tech grammarians are despairing over parse tree mangle, the new generation of PC-to-mainframe-link NLIs are arriving, with better user support, total connectivity and higher productivity. For fast, friendly and effective access to your DBMS, natural language is leading the way. —*Klaus K. Obermeier, Ph.D., is projects manager for Battelle's AI Group, Columbus, Ohio.*

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Enter On Reader Card
High 408 Medium 409 Low 410

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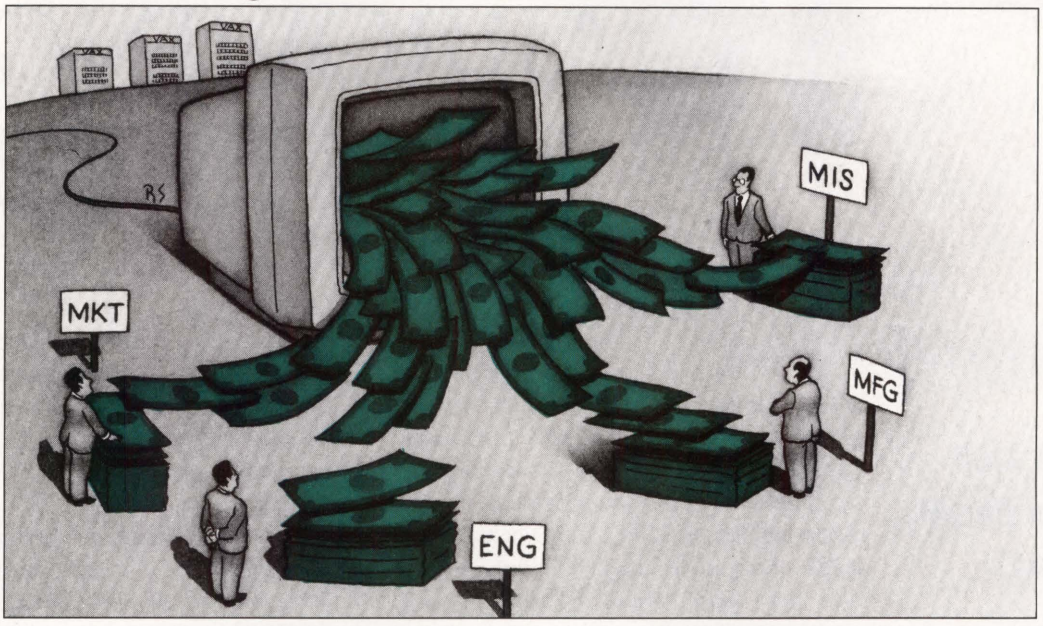

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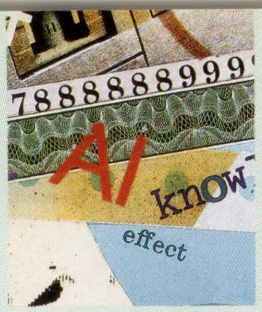

AI

NARROWING THE FIELD

By Lawrence L. Baldwin

Choosing A LISP Workstation For AI Development.

These days shopping for a workstation that is suitable for artificial intelligence (AI) development in LISP can be an expensive proposition. Less than a year ago, serious LISP development was limited to workstations that cost between $25,000 and $60,000. Those who needed a good development environment and high performance paid high prices to purchase LISP machines, such as Symbolics or TI Explorers.

In 1987, many computer manufacturers introduced low-end, high-powered workstations at comparatively lower cost. Companies such as DEC, Apple Computer, Sun Microsystems and Apollo Computer revealed base systems with approximately one mips of processing power for under $10,000. Although these workstations are capable of performing LISP development, each is tailored for different environments. This article examines the VAXSTATION 2000, Apple's Mac II and the Symbolics 3620 and specifies environments that suit them.

VAXSTATION 2000

The VAXSTATION 2000 can be configured with 6 MB of memory and at least 150 MB of hard disk. The performance is adequate (one mips) and the price moderate. Of course, buying DEC also means you can get fantastic software and hardware support. DECNET and clustering provide ways to establish work groups and file servers easily. The availability of VMS or ULTRIX ensures an industry-standard operating system. By having a busless system, the VAXSTATION's expansion is limited. Because VMS uses approximately 2 MB of memory and LISP 1 MB, it isn't long before you constantly start paging. If the virtual size of the application is more than 10 MB, the VAXSTATION only would be appropriate if it were expanded to 16 MB with memory from third-party vendors such as Clearpoint.

VAX LISP V2.2 is one of the oldest LISPs around and the most complete, stable and dependable. The development environment is adequate but could be better. Although VAX LISP uses windows, they're not integrated as elegantly as on the Symbolics or Mac II. Development tools, such as an inspector, also would be good additions. Most important, VAX LISP can build standard executable images, making it easy to deliver to customers who can't wait to buy a LISP license. Though costly, the VAX LISP is solid, and well maintained.

Symbolics 3620

At the low end, Symbolics 3620 also is expensive. The user interface is great with mouse-driven menus providing access to all relevant system commands. Expansion capabilities are good; a 3620 can be expanded up to 16 MB of memory and more than 300 MB of disk. Software and hardware support isn't as reliable as DEC, but is still acceptable. DECNET and TCP/IP are available, solving most networking problems.

Symbolics' LISP provides a development environment that's fully mouse driven. Because the edit/debug cycle is so well in-

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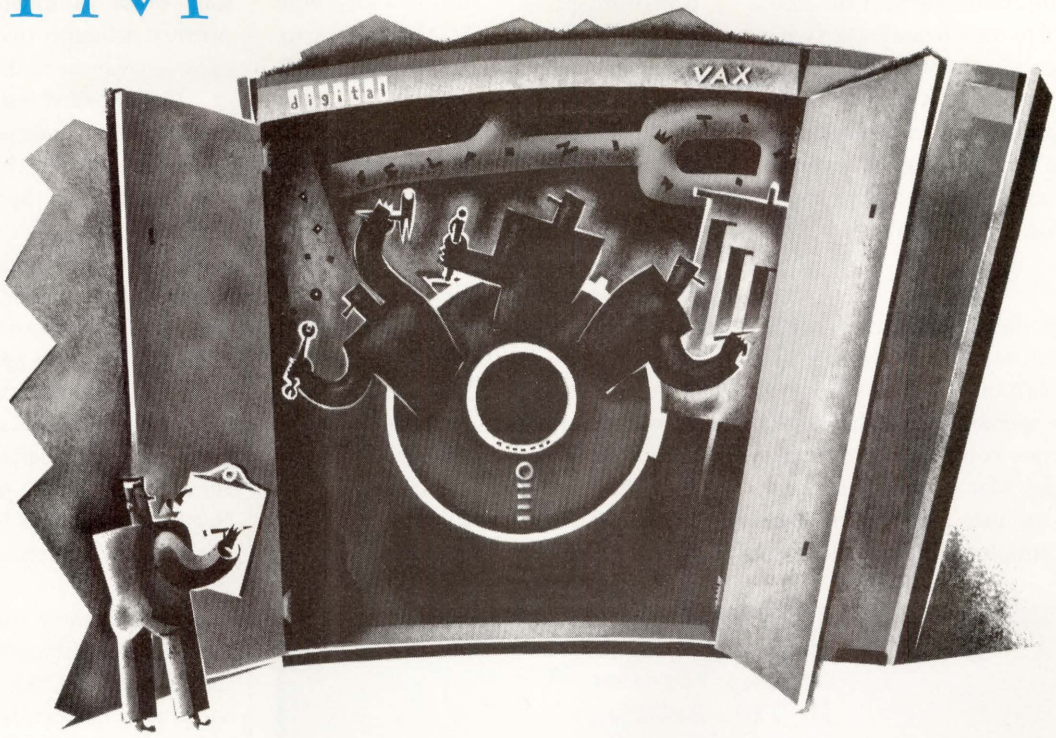

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tegrated, it's possible to develop a code considerably faster than with conventional environments. Because the 3620 is microcoded to understand LISP syntax, performance is great, comparable to a VAX 8600 running VAX LISP. Although delivering a product on a Symbolics will provide the best price for performance, customers usually are reluctant to purchase specialized hardware.

Mac II

Mac IIs are inexpensive. Even with a good 19-inch monitor, 100 MB of hard disk and 8 MB of memory, you'd have a hard time spending more than $10,000. Although not considered an industry standard, the Mac operating system is very easy to use. Establishing work groups is simple with AppleTalk and *AppleShare*. Although AppleTalk is slow, fast Ethernet boards already are available from third-party vendors and soon will be available from Apple. Networking to other machines is widespread, but still needs refinement.

Based on TI's Nubus, the Mac II is expandable. With five slots and National Semiconductor Corporation's 16-MB expansion boards, you easily could fit in 64 MB of memory. Many vendors have disk drives ranging in size from 20 MB to one gigabyte. Hardware and software support isn't as consistent as with Symbolics and DEC, but as long as equipment is purchased from a reputable dealer, you're likely to be satisfied.

The best LISP available for the Mac II is Allegro Common LISP 1.1 from Coral Software Incorporated. Allegro rivals the development environment found on LISP machines costing four times as much. The window-oriented debugger makes the edit/debug cycle as efficient as the Symbolics 3620.

Code loaded into Allegro is compact; the same code can require 30 percent more space when loaded into a VAXSTATION or Symbolics. Overall, performance with this LISP is better than a VAXSTATION but not as good as a Symbolics. Currently, Allegro can use only 8 MB of memory, making only small applications appropriate for this LISP. Each time a development session is started, all the files in the system must be loaded from scratch, which sometimes can take 15 minutes or more. Regardless of these limitations, which Coral plans to rectify, Allegro is still a bargain.

Each of these workstations fulfills the needs of different development environments. The VAXSTATION 2000 provides adequate performance, a dependable LISP and consistently good service and support. It's a good choice for projects requiring conservative hardware at moderate cost. The Symbolics 3620 provides superior performance, good service and support, but requires that buyers rely on a relatively small company. The 3620 is appropriate for projects with large budgets and programmers who can use its productivity tools.

The Mac II with Allegro Common LISP combines the best of DEC and Symbolics workstations: good performance and an innovative LISP at minimal cost. The Mac II is an alternative for small projects with limited budgets, willing to gamble on Apple's and Coral's success. *—Lawrence L. Baldwin is a software engineer with Cognitive Systems Inc. in New Haven, Connecticut.*

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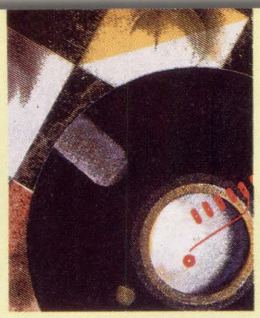


SOFTWARE

TRAVERSE

By David B. Miller

Whether You're A Novice Or An Expert, *Traverse* Allows You To Create A Custom Operating Environment With Ease.

Computer interfaces on the human level haven't kept pace with the changing user population. Communications between man and machine remain relatively primitive. They require users to memorize and type a series of cryptic and sometimes lengthy commands and read equally confusing informational messages and other output resulting in user frustration and inefficient resource use.

For computers and operating systems software to be used effectively their power, capabilities and method of operation must be presented to users of all levels of expertise in an understandable way. In the micro world, programs such as GEM *Desktop* and Microsoft's *MS-DOS Manager* as well as *dBase III+*'s Assistant provide interfaces that any user can understand as opposed to the typical one- or two-character system prompts and confusing typing requirements.

What about the VMS user? It's a known fact that official VMS system managers have the entire DCL dictionary memorized (including qualifiers), and are thoroughly knowlegeable in all systems software at their site. However, that same prerequisite isn't typically required of other users of the system. Yet, many sites' users need to perform many tasks involving the use of DCL and other applications software. A $ prompt and VMS HELP aren't enough to allow effective use of system resources. How can inexperienced users avoid some of the confusion and frustration without bogging down the experienced user with nonessential details?

Enter *Traverse*, a software package developed by Visitech Graphic Resources Incorporated of Calgary, Alberta, Canada. The primary purpose is to allow the creation of a custom operating environment usable by anyone on the system, whether a novice or expert. It's flexible and easily modified so that all elements of the computer system, such as DCL commands, software packages and in-house developed software, can be tied together in a unified network and viewed through a consistent user interface, resulting in more satisfied users. It provides enough information for novices while being terse enough not to hinder professionals. Different groups of users also may have their own environments created rather than forcing everyone on the system to look through one set of eyes.

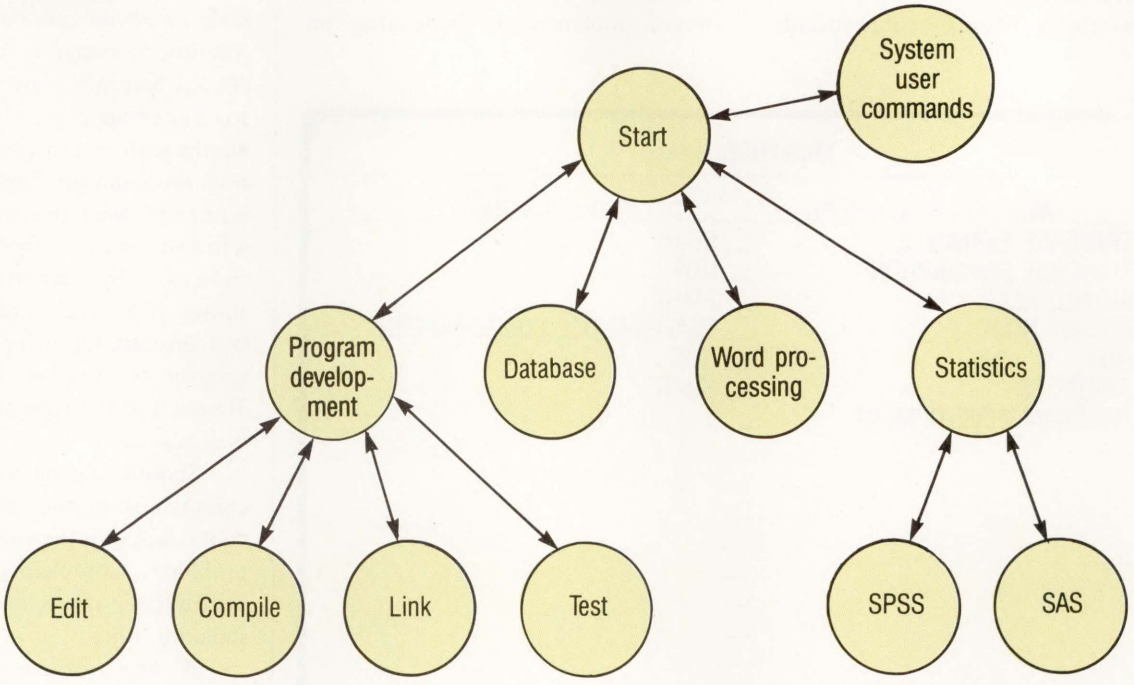
Conceptually, this network follows the familiar tree model. Each node of the tree represents a choice to be made or a function to be carried out. The tree represents a typical user configuration (see Figure 1). After the start node is passed, you're presented with nodes representing pathways leading toward program development, word processing, statistics and database applications. These paths, in turn, may take you down other corridors until the desired function is invoked. The mechanics of this process remain invisible; you only need to know what choices to make from the appropriate menu.

I tested V1.2.0 of *Traverse* to determine how effective it is in molding the system environment to accommodate all sorts of users.

Installation

Installation takes approximately 15 minutes. It requires establishing directories for the product's executables and work files and establish-

FIGURE 1.



A simple conceptual view of how* Traverse *treats the system environment. Each node in the tree can lead to others or can initiate some action.

ing the user account to which mail and complaints can be directed. A number of logicals, each beginning with "IMS" for Interaction Management System are defined automatically at installation. A final task involves establishing a few other logical names and symbols not done by the installation process to allow the program's invocation. You may have to have your own Job Table size increased to accommodate *Traverse*'s logical assignments. Visitech recommends a minimum size of 1,536 bytes.

Using Traverse

Let's assume that a *Traverse* environment has been established by the system manager. After entering TRAVERSE at the system level, you're presented with a simple two-windowed screen with an Available Choices window on the left and a Decision History window on the right (see Screen 1). Selections are made from the Available Choices window by using the Up and Down arrows and Return keys. The Decision History window keeps track of where you've been. Each of the choices displayed in the windows represents one node in the environment tree. If desired, you also may make a decision choice from the right window, not being restricted merely to the Available Choices side of the tracks. A key factor is that the screen display provided by *Traverse* remains consistent no matter where you may be within the interface tree so that there are no surprises along the way.

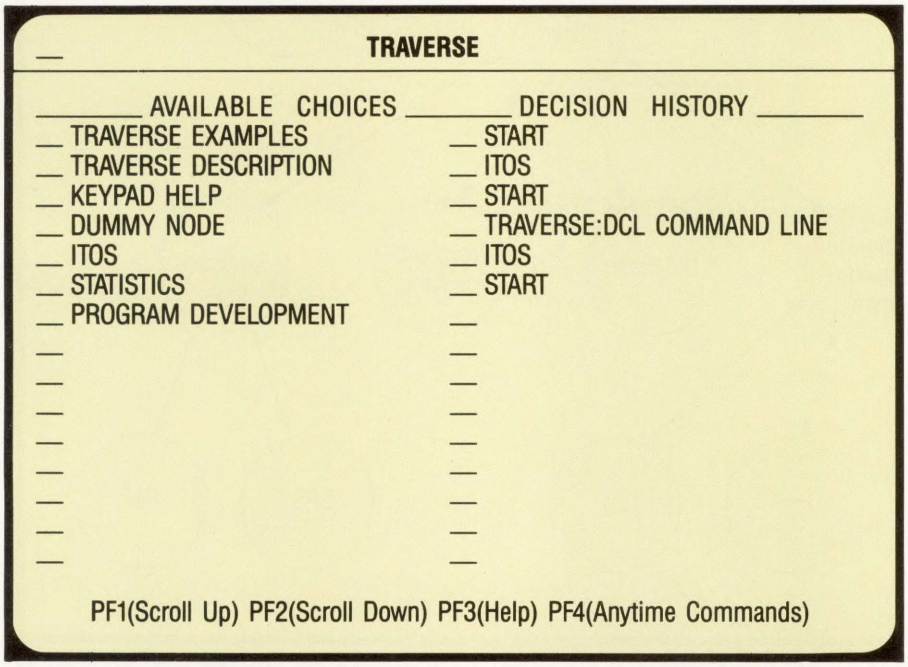
To select an option, move the cursor to the first character of the line desired and press Return. One of two things will happen. If the chosen node is a transition node, the screen will display another set of choices using a

screen similar to the first one. For example, choosing *Traverse* Examples sends the user to another window from which new functions can be executed. On the other hand, an action node will perform the indicated function and return to the *Traverse* display. These functions include the execution of DCL commands, VMS MAIL and other layered products, compiling programs or running in-house applications software. The degree of customization and tailoring is totally flexible and under the control of the system implementor. Depending on how the network is established, you can proceed to make choices, execute function nodes, etc., until wishing to terminate the session.

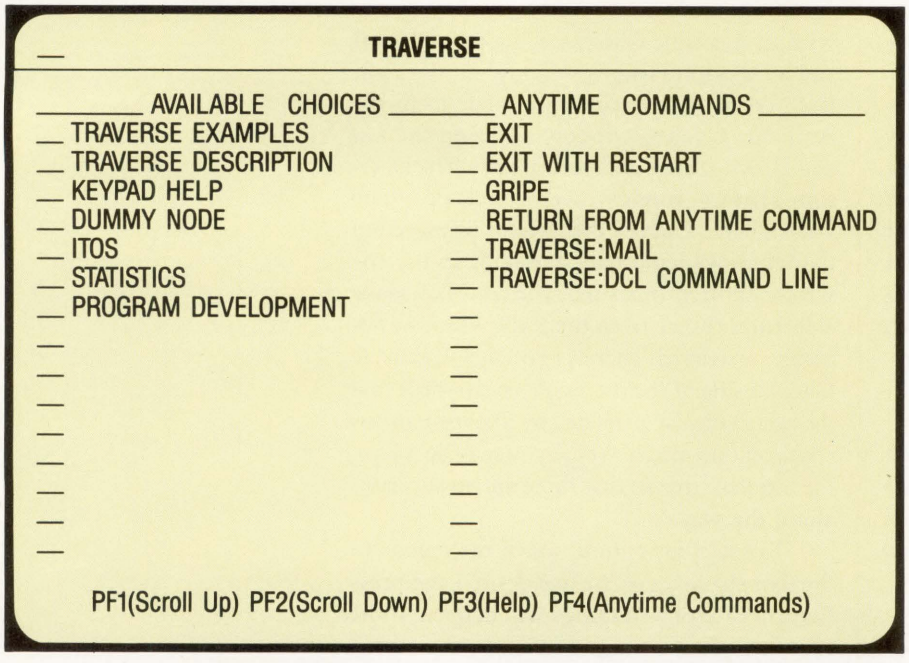
Other features include online help through PF3 which provides aid for the node or action currently selected and Anytime Commands available through PF4 (see Screen 2). Anytime Commands are named appropriately because they may be performed anytime during a session. Invoking the Anytime Command feature replaces the Decision History window with currently available choices. One Anytime Command allows you to go temporarily to the DCL prompt. Upon logging out of that subprocess, control is returned to *Traverse* and the regular *Traverse* screen is displayed.

Should anyone have a reason to complain about the system at his site, a GRIPE facility is provided to record any problems. Complaints and praise are mailed to the system manager you at installation time.

A nice feature, particulary for systems involving many possible avenues, is one that allows a *Traverse* session to be restarted from a point other than the beginning. The Anytime Command EXIT WITH RESTART, causes the current context to be saved in a file that is used at the next *Traverse* session to recreate the steps taken before the interruption. A separate command RESTART allows the session to pick up at the end of the previous one.



Screen 1:* Traverse *screen shows available nodes and the trail of where you've been.



Screen 2: Anytime Commands can be accessed any time during a session.

Branching Out

Customizing an existing network or creating a new one is accomplished through the use of the commands LAYOUT, MODIFY and EDIT. But first, a basic understanding of the *Traverse* environment is required.

The Tree file contains one record for each environment definition, known as Node files or trees, on the system. Multiple environments may be defined

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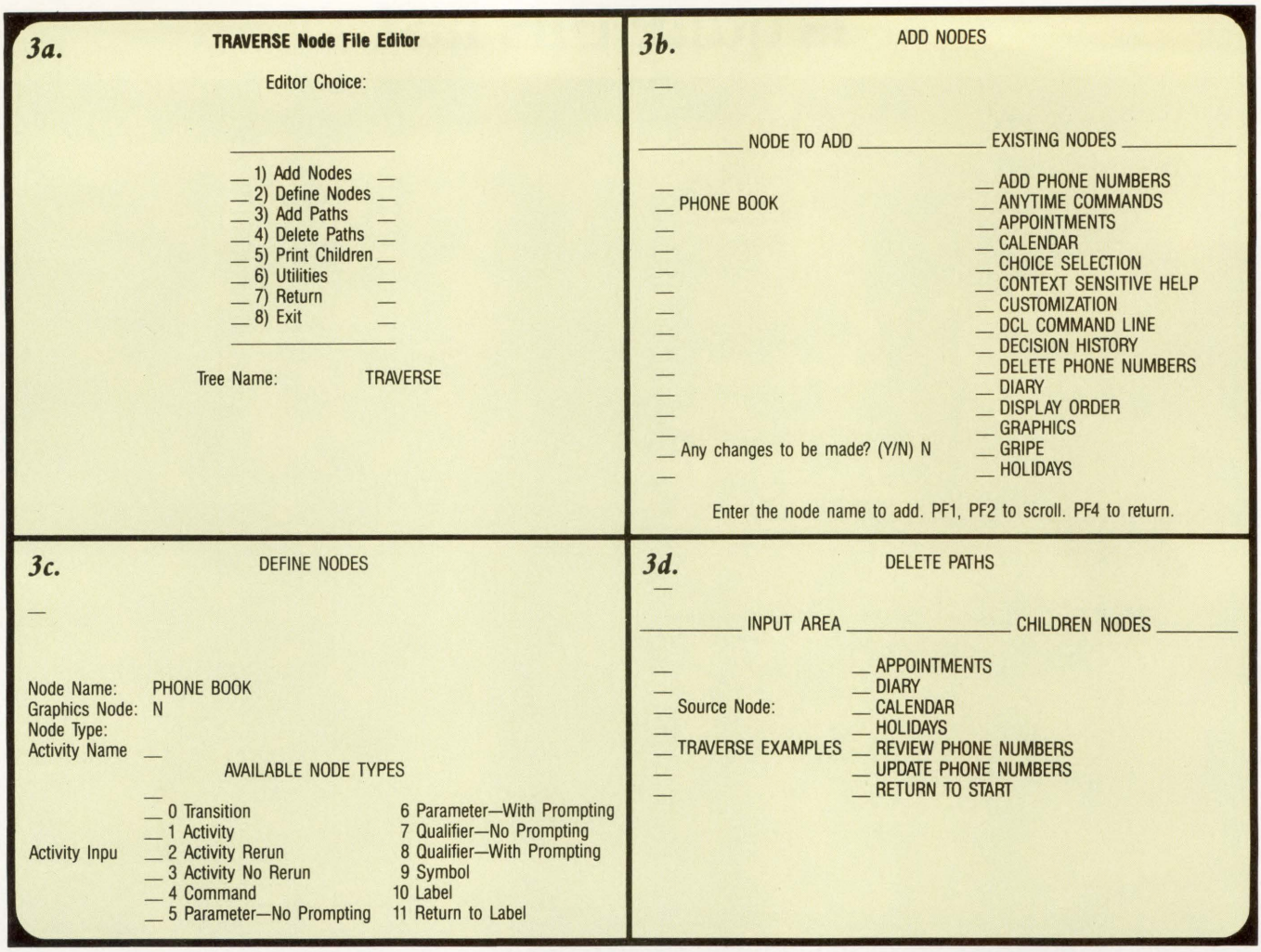

Screen 3: Adding a node to the network involves defining its type and a path(s) to and from it.

depending on the types of users on the system. For example, different trees may be defined for persons who primarily do program development, statistics or system management. This way, any one user doesn't have to work his way through all the possible choices available on the system; only those of concern to him are displayed.

Node files, then, contain all the choices available in that particular tree. In addition to creating separate Tree files for each environment, a particular Node file can be customized to allow restricted views by certain groups and users. For example, a tree that is defined primarily with program development in mind can be tailored to restrict programmers needing PASCAL utilities access to those facilities, and C programmers access to only C language facilities. The underlying interface structure remains the same, but the view of the tree as seen by others can be altered. These customizations are optional and are at the discretion of the system manager.

To create an environment tree follow these four steps:

1. Define the names and locations of the Node files (Trees) — This includes adding the tree name to the system Tree file through the Tree File Edit Menu. The locations of the entire tree and any customized versions for particular groups or users are defined here. Also, the Tree File Edit Menu allows the updating and deletion of trees as well as listing all the defined environments on the system. One record per tree exists in the system Tree file.
2. Create a Node file (Tree) for each record in the Tree file — The Node File Editor is invoked to create an individual tree whose location is defined in the first step. Existing nodes are displayed in the right window to avoid the attempt to define a duplicate one. Once an appropriate name is chosen (remember, the user population will be reading this node name and must understand what selection that choice does), the node must be defined by assigning a type to it. The type determines the behavior of the network when that node is chosen. The following are available node types:
   a. Transition node (type 0) — This acts

as a decision node, allowing access to the children under it. No action is taken other than to allow other paths to be taken.

b. Activity node (type 1) — An activity node corresponds to a command file written by the network's manager, which is executed upon selection of that choice. An optional file name that can act as input may be specified when the node is defined. So, every activity node and every Anytime Command that is added must have a Command file associated with it. It's important that these command files are written properly and with well-defined error handling and termination procedures so that network integrity is maintained.

c. Command node (type 4) — A DCL command verb is executed when one of these is defined.

d. Parameter nodes (types 5 and 6) — In association with a Command node, parameter nodes can be defined to attach DCL command parameters to a selected DCL command node. *Traverse* accesses the Command node and builds the entire DCL command by connecting any selected Parameter nodes to it. Type 6 Parameter qualifiers allow for user prompting; type 5 Parameter nodes don't.

e. Qualifier nodes (types 7 and 8) — Similar to Parameter nodes, DCL Qualifiers can be defined with or without prompting which can be attached to a DCL Command node. It's possible to first choose the desired command, then any required parameters and qualifiers needed. While this may seem like a long involved process, it provides help to less experienced users of the system.

f. Label nodes (type 10) — This acts as a return point to provide for looping in the network environment. Label nodes are stacked and unstacked in a last in, first out fashion.

g. Return to Label node (type 11) — Encountering this causes control to return to the most recently stacked label node to facilitate looping in the network environment.

If an activity node is defined, the environment manager specifies the Command file name to be executed upon choosing that node and optionally invoking the TPU editor to create that command file. Testing the network doesn't require that all command files must be completed, but of course all command files must be operable before official network use can begin.

3. Create the paths between the nodes — Once some or all nodes are defined, they must be connected by defining the path between them. This is done after entering option three of the Node File Edit Menu. Place the cursor on the source node, press Enter. Do the same

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with the destination. *Traverse* will indicate the successful completion of the path. An Existence Check may be performed optionally to ensure that a destination node does exist. If the Existence Check is not used, *Traverse* will create a node by the entered destination name as well as a path to it. A maximum of 28 paths out of an existing node are permitted.

> GRIPE can be routed to multiple destinations . . .

Paths also may be deleted (option four). Choosing the source node results in the display of all destination nodes. Position the cursor on the node to be deleted and press Return.

Once a tree is established, the Utilities option of the Node File Edit Menu can be used to compress a Tree file which roots out child nodes with no parents. Help headers can be created in the tree help file for each node so that appropriate help is available upon pressing PF3 when positioned at that choice. The Utilities menu also provides options to delete nodes, reorder a node's children (normally ordered alphabetically) and rename nodes. Appropriate changes then are made in the tree's Help file automatically.

4. Test the Node file — The Layout module allows the network manager to step through the system flow to check for errors in logic. The command files required for each action node in the system need not be written in order to do the test.

Customizing A Node File

Traverse's Modify module provides the capability to customize a previously created Node file for you or a group of users. The result of invoking Modify is a file containing a list of paths to be added to or deleted from the specified tree. Upon starting *Traverse* for the tree in question, the /INITIALIZE qualifier initiates the updating of the node file using the list created by the Modify module. As mentioned above, the main node file isn't altered, only the view that the specified individual or group gets is changed.

Anytime Commands can be custom tailored. Environment managers may add their own Anytime Commands by appending them to an ASCII text file and making sure the user job logical IMS_ANYTIME is defined to point to that file.

When a node is created, a help header also is created for it in the associated .HLP file. Additional help text can be added to the file and placed in the appropriate .HLB file for the tree.

In addition to the above, GRIPE can be routed to multiple destinations, system flow can be altered in the event of an unexpected error condition, command procedures can be set up to provide additional information upon completion and the above mentioned Label nodes can be set up to provide for iterative capabilities.

Documentation

I had mixed feelings about the supplied documentation. It required reading between the lines to determine exactly what to do. The documentation is written with the experienced system manager in mind, although once into the system, it's not difficult to determine what to do from the *Traverse* screen.

If I were to suggest a change to the documentation, it would be to provide more examples and sample display screens. For example, a sample screen display of the Node File Edit Menu would help in the discussion of the Layout module when referring to individual options.

The short tutorial provided enough information to get started, but probably not enough to help the novice. A system manager should expect to spend some time training users or writing some instructions once the network is set up.

The *Traverse* system interface is easy to use. It provides a clear and consistent view of the various facets of VMS, layered products and any site dependent applications. While advanced users, or those with good memories and typing skills may opt to go it alone with the DCL prompt and VMS HELP, others will find *Traverse* to be a real aid in sorting out the complexities of system use.

However, the paths available to the user and how various processes are accessed are controlled completely by the person in charge of creating the network. Ease of system use could be undermined by the creation of a network that isn't logically designed by a system manager aware of the user population at his site. Like a high-level programming language, *Traverse* provides tools for the creation of a custom system environment but takes some planning and forethought to put those tools to proper use. A poorly designed network can cause as much frustration as none at all.

Is there a future for a product like *Traverse*? Yes. If properly configured, *Traverse* allows a manager to provide users of all levels of experience with a friendlier system environment. *—David B. Miller is associate director of computer services at Beaver College in Glenside, Pennsylvania.*

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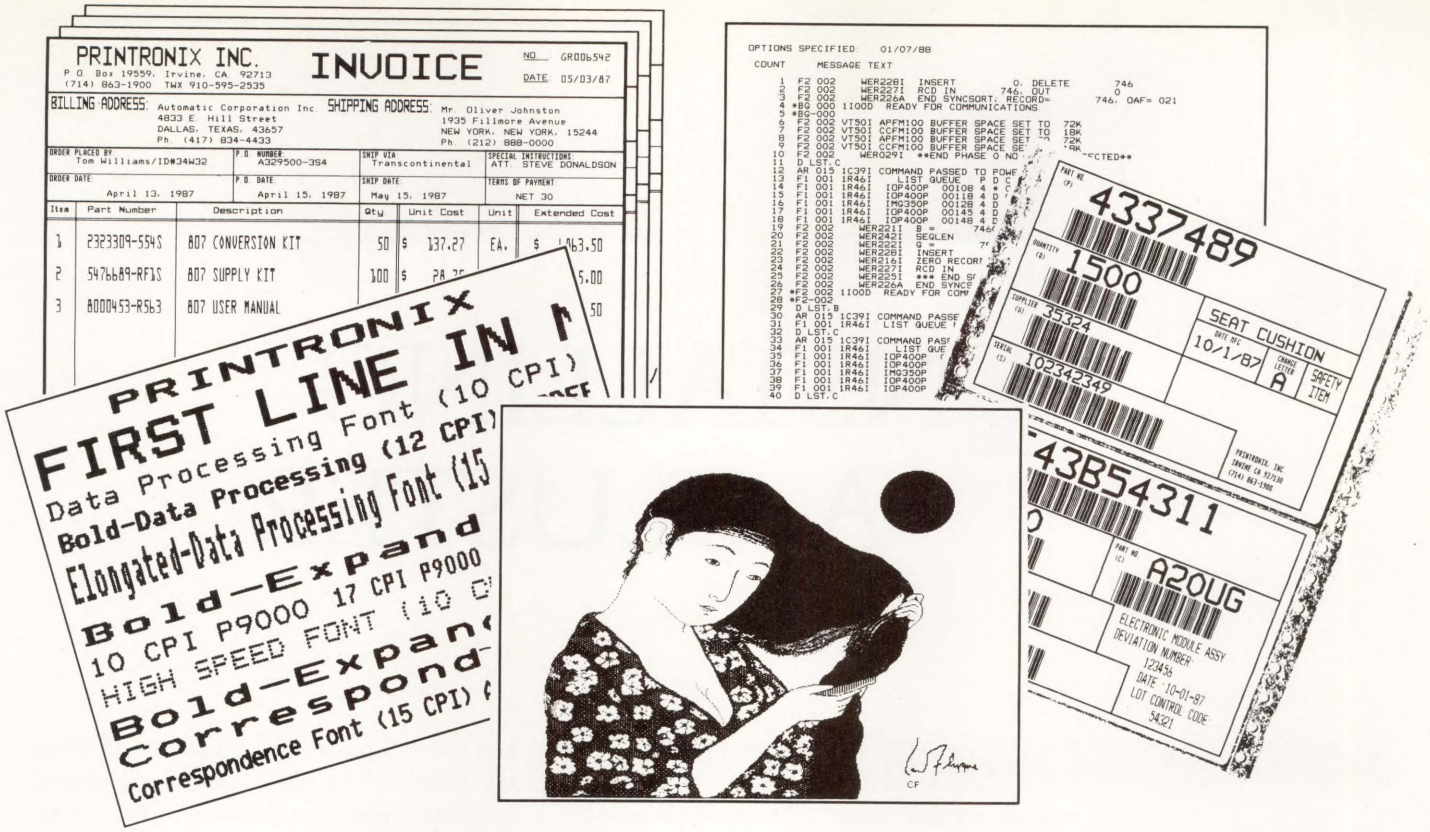

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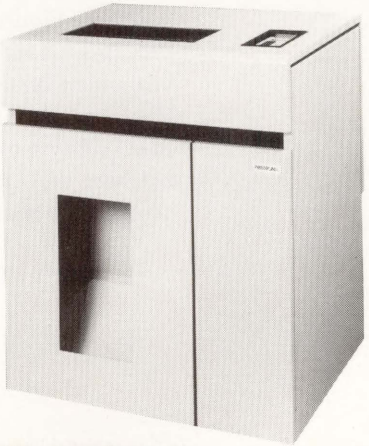

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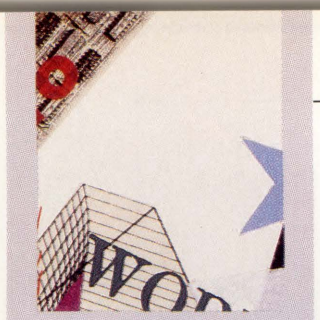

VAX

INSTALLING A CLUSTER

By Betty Steele Adukoski

Things Your Mother Never Told You.

You've heard the old saying, "The things your mother never told you"? I recently clustered a VAX 11/785 to a VAX 8530. In preparation for the upgrade, I attended Digital's training session "VAXCLUSTER Management." The session covered a gold rush of valuable information, and I left feeling confident that I could tackle my first cluster installation. But the session combined with my eleven years in DP failed to prepare me for an actual cluster installation.

Our workload had saturated the VAX 11/785 with 5.12 GB of MASSBUS data storage and more than 150 UNIBUS terminal ports (see Figure 1). The VAX 11/785 operates on a Synchronous Backplane Interconnect (SBI), a single bus that connects the processor, memory controllers, MASSBUS and UNIBUS adapters.

We added the following hardware to form the cluster: a VAX 8530 with 16 MB of memory, CI cables, star coupler, HSC50, CI780, DEUNA, four RA81 disk drives and 64 terminal server ports (see Figure 2). Clustering interconnects VAX processors to provide an interactive environment of shared resources.

The VAX 8530 includes a high-speed VAXBI I/O subsystem and a memory array bus that balances the CPU, I/O and memory activity across three bus structures. The CI buses connect the VAX processors and the HSC50 to the star coupler. The star coupler is the central connection point for all nodes in the cluster. The Hierarchical Storage Controller (HSC) is an intelligent mass storage subsystem that provides shared access to the RA81 disk drives. Terminal servers connect through Ethernet, allowing users to access both processors. The VAX 11/785 required a CI780 controller to connect to its CI bus, and a DEUNA to interface to Ethernet.

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

I chose a homogeneous VAXCLUSTER for our environment with a single user authorization file (UAF). A homogeneous cluster allows the user to transparently share the same resources on both nodes. I also set up a common system disk so that both VAX processors would use the same operating system. The homogeneous environment and the common system disk allow the cluster to be managed and maintained as a single system.

I assigned the common system disk as a quorum disk. A two-node cluster must maintain a quorum of two to prevent partitioning. If a quorum disk is assigned a vote, the remaining processor will keep functioning in the event one crashes.

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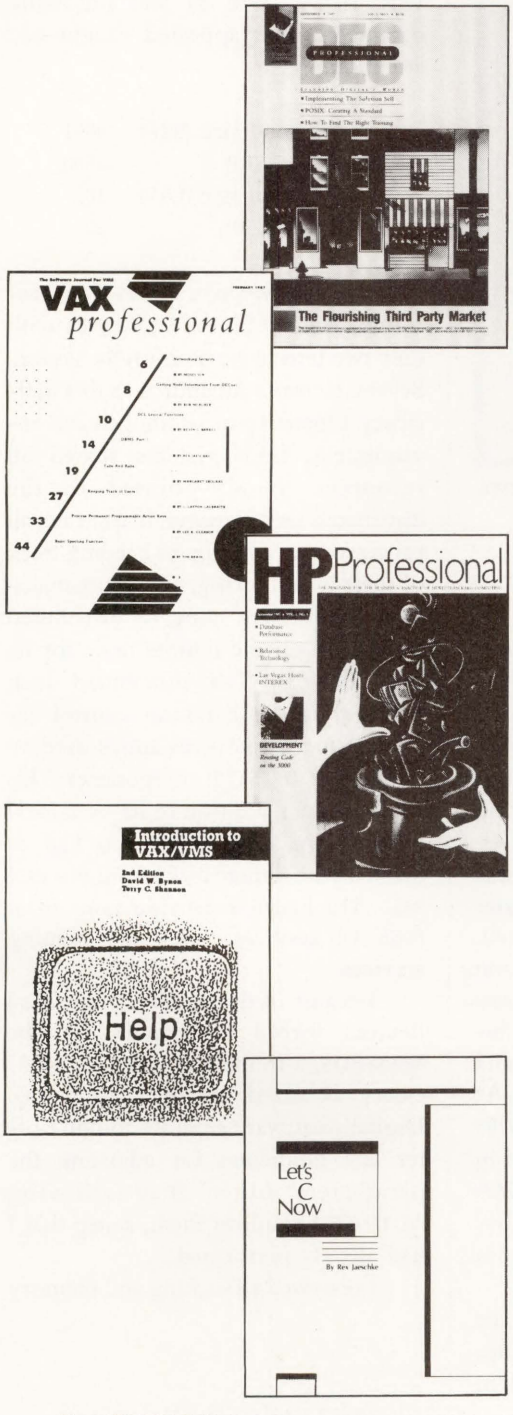

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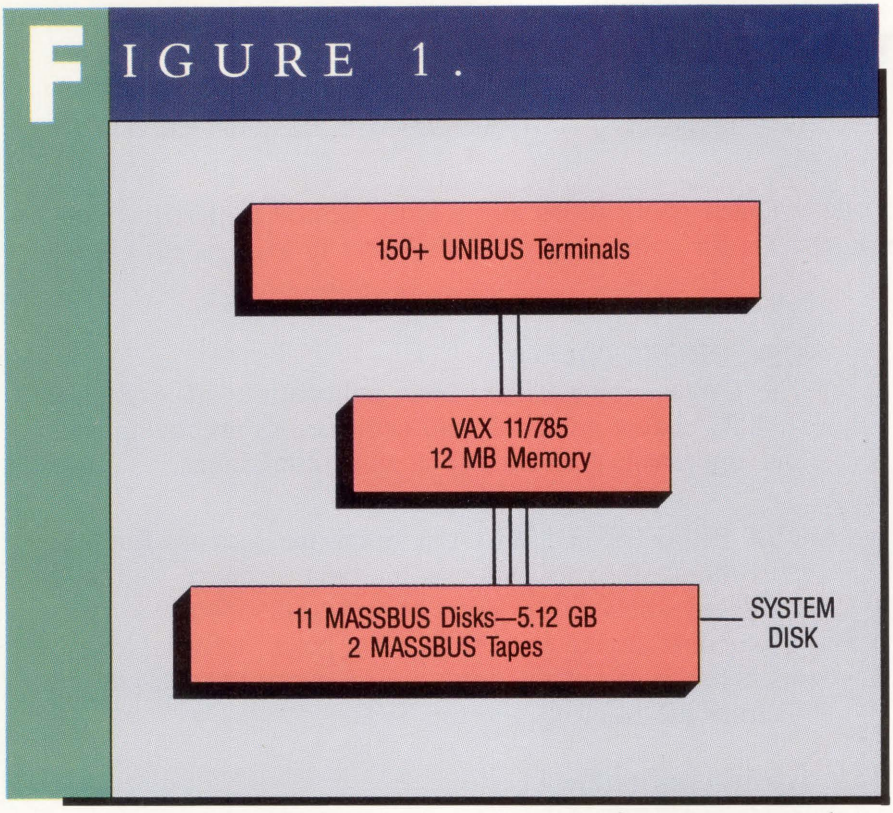


System configuration prior to cluster.

I set the following cluster SYSGEN parameters on both processors:

SCSNODE	VAXn
VAXCLUSTER	1
QUORUM	2
VOTES	1
DISK QUORUM	HSC$DUAO
QDSKVOTES	1

I ran AUTOGEN and reviewed the newly generated parameter settings after rebooting both systems. I found the following parameters modified on the VAX 11/785:

IRPCOUNT from 1120 to 1307
SRPCOUNT from 3500 to 1848
LRPCOUNT from 10 to 22
NPAGEDYN from 460,000 to 640,000
PAGEDYN from 520,000 to 630,000
LOCKIDTBL from 850 to 1600
RESHASHTBL from 1024 to 2048

These parameters are used by the distributed lock manager, a VMS cluster feature that provides synchronized resource sharing among the nodes. Knowing the higher SRPCOUNT was necessary for our single system environment, I returned this parameter setting to 3500.

I performed two cluster test sessions before attempting the live cluster implementation. Both tests went well. I had anticipated a successful transition of the cluster upgrade. But my confidence faded when more than eight interactive users logged in at one time and tried to perform I/O intensive jobs. As more users logged in, the VAX 11/785 ceased to function, freezing everyone in the middle of their processing. The VAX 8530 users continued to process, but with long intermittent performance pauses.

Local Field Service tried to free the VAX 11/785 by forcing it to crash. But, as users began to access the system again, the second cluster attempt produced the same suspended results. Again, Field Service crashed the cluster. Diagnostics uncovered no hardware failures. I kept the users off the systems and with the help of Field Service, began troubleshooting for software problems.

We went through several performance commands, until one of us did a $SHOW MEMORY/POOL/FULL on the VAX 11/785. Two of the following parameters that appeared caught our attention:

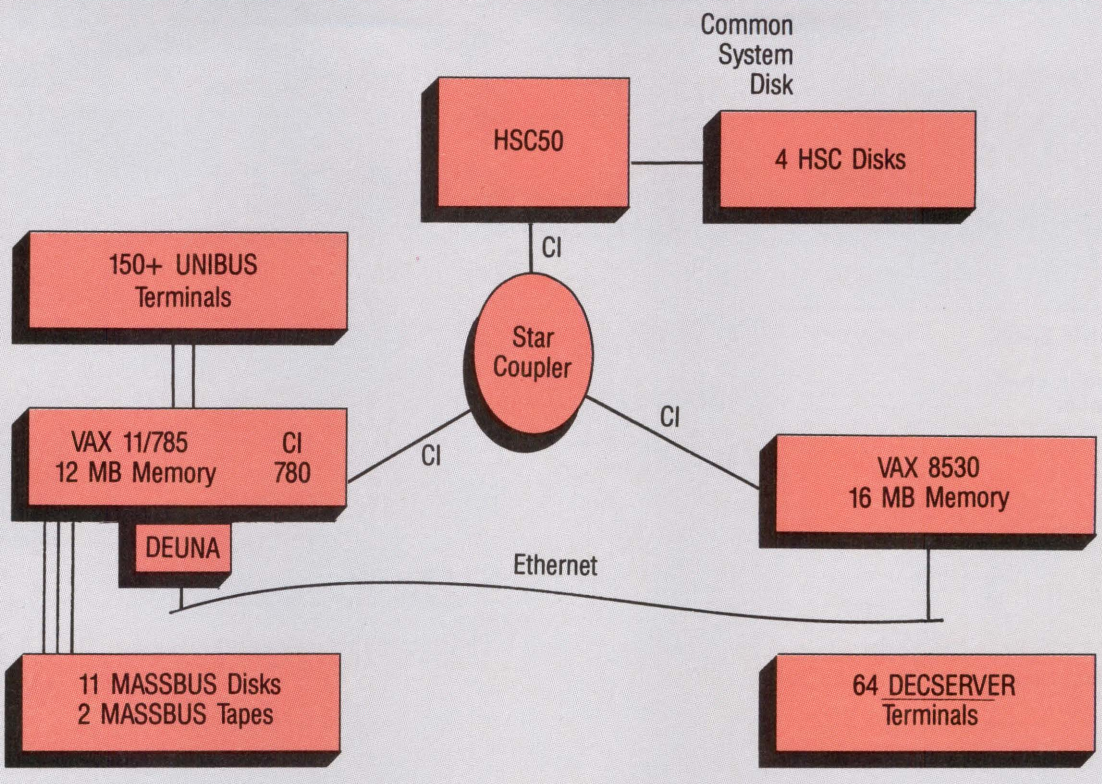
Current total size (SRP)	4021
Initial size (SRP)	3500
Current total size (LRP)	30
Initial size (LRP)	22

We discovered a heavy lock resource demand on the VAX 11/785 with only two interactive users on the system. Several factors contributed to this deficiency. Operating in a homogeneous environment, both systems shared all resources. It all pointed to the distributed lock manager. In a cluster, all processors, in addition to keeping track of their local locking, also must maintain a redundant copy of distributed locks held on the remote node for its local devices. The distributed lock manager is the common control for cluster shared resources and is used by all the VAXCLUSTER components. This meant that in addition to its own local locking, the VAX 11/785 also had to maintain the remote locks from the VAX 8530. The heaviest demand came from RMS, I/O services, MSCP and queuing services.

Because of the number of physical devices forced to remain on the MASSBUS, a tremendous locking deficiency occurred on the VAX 11/785. Digital's software support couldn't offer any guidelines for adjusting the parameters other than allowing AUTOGEN to adjust them, a step that I had already performed.

I reviewed all locking and memory

FIGURE 2.



Cluster system configuration.

FIGURE 3.

	STANDALONE	CLUSTER AUTOGEN	ADJUSTMENTS	FINAL
IRPCOUNT	1,120	1,307	1,307	1,307
SRPCOUNT	3,500	1,848	5,000	9,000
LRPCOUNT	10	22	50	50
NPAGEDYN	460,000	640,000	640,000	640,000
PAGEDYN	520,000	630,000	1,650,000	1,700,000
PAGEFILES	60,000		90,000	95,000
LOCKIDTBL	850	1,600	2,600	5,000
RESHASHTBL	1,024	2,048	2,048	3,000
MEMORY ALLOCATED TO VMS	2,000 pages	8,000 pages		
INTERACTIVE USERS	60			
PRINT/BATCH QUEUES	22			
MEMORY	12 MB			

Standalone vs. cluster parameters for 11/785.

Digital NEWS & digital review both agree . . .

REPORT CARD

Dynamic Load Balancer

9.7

	Unacceptable	Poor	Satisfactory	Very Good	Excellent
Ease of Learning/ Documentation	☐	☐	☐	☐	■
Performance	☐	☐	☐	☐	■
Ease of Use	☐	☐	☐	☐	■
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Value	☐	☐	☐	☐	■

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DETAILS: The Dynamic Load Balancer is available for a 30-day demonstration period, including documentation and telephone support, for $69.95. Single first copy distributions are priced at $1,495, while subsequent copies cost $1,195. The product runs on any VAX under VMS.

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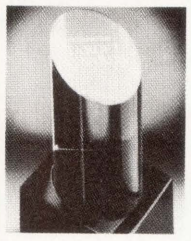

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settings, and adjusted them until the cluster would function without freezing. I increased SRPCOUNT from 3,500 to 5,000, LRPCOUNT from 22 to 50 and LOCKIDTBL from 1,600 to 2,600. After 20 interactive users logged onto the cluster, the VAX 11/785 exceeded PAGEDYN. I had to increase PAGEDYN from 630,000 up to 1,650,000 before all of the 60 interactive users could access the entire cluster at an adequate performance level.

Although I managed to get all the necessary users on the cluster, I realized performance problems were far from over. A $SHOW SYSTEM had processes in RWAST, a $MONITOR STATES showed processes in Mutex and Misc Resource Wait, and a $MONITOR PROCESS showed processes RWPB. All these indicated the VAX 11/785 had too small a page file. To correct this deficiency, I had to increase the page file from 60,000 to 90,000 pages.

By the time I finished tuning the system, many of the VAX 11/785 parameters had been increased as much as five times from their standalone settings (see Figure 3). All cluster documentation stated that the overhead of the new cluster components would increase the use of memory from 2,000 pages to 8,000 pages for VMS, which it did. But, most of the parameters I adjusted robbed even more from the 12 MB of memory of the VAX 11/785.

I know there are other installations facing the same problem of needing to upgrade, but unable to make the migration in one big step. Prior to your live cluster implementation, I encourage you to review your SYSGEN parameters, particularly those I have encountered as bottlenecks. And don't depend on AUTOGEN to do all your adjustments. Plan to lose more than just the 8,000 pages of physical memory on each clustered node that has locally connected devices. Where feasible, budget to replace your locally connected MASSBUS and UNIBUS devices as soon as possible.

Implementing a cluster into an existing environment isn't a small endeavor, but with thorough preparation and consideration of other site's experiences, it can be both rewarding and worthwhile.

And if problems occur and upgrade doesn't go as you had planned, don't feel alone. Considering the heavy resource imbalance I experienced, neither AUTOGEN nor my mother would have been much help. *—Betty Steele Adukoski is a Florida-based free-lance writer.*

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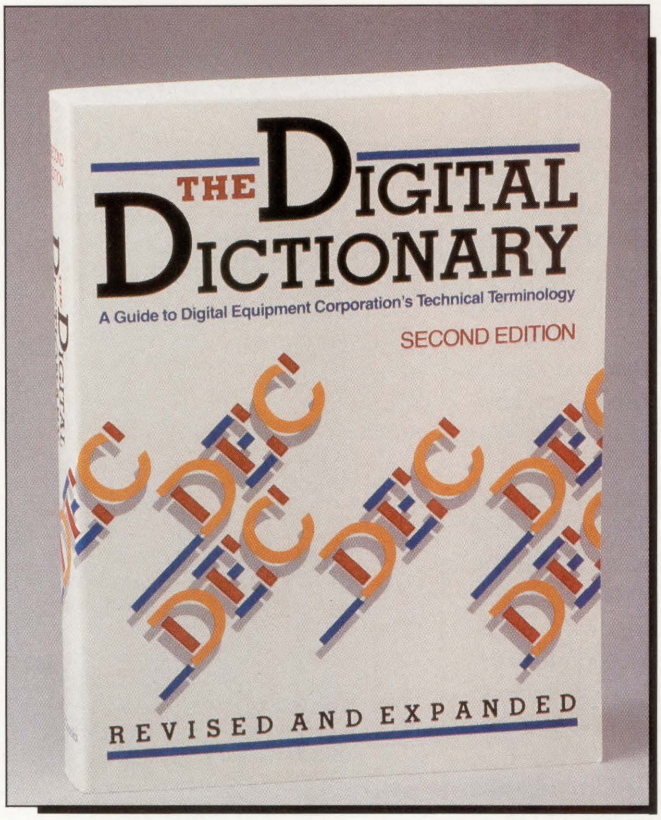
The Digital Dictionary



Digital Press' dictionary of DEC-specific language is a welcome step toward standardization.

Does language change because of experience or is the quality of experience itself determined by language? Regardless of your response to this classic chicken and egg question, we have some low-cholesterol ways to circumvent the issue.

- Language does in fact change.
- The scope of these changes is too extensive for the disinterested mind to digest without help.
- Language can become too cumbersome and complex to communicate the experiences we wish to relate.
- As we learn more and more about less and less, the number of people we can communicate with becomes fewer and fewer, but to them, it's necessary to communicate more and more.
- As our areas of endeavor become narrower and narrower, and as we learn more and more, we create sublanguages or dialects that convey our experience with greater specificity, but often become foreign to others.
- Language is so significantly interwoven with the development of the technology itself that it's necessary to learn the language of technology to understand the content.

Any dictionary of an organic, evolving language can be no more than a snapshot of the language at any given time because language is a quickly moving target. But a worthy dictionary project can monitor, record and even stimulate change and growth in a language. It's an important landmark in the development of discourse.

The Digital Dictionary now is celebrating its second edition. Editor Robert E. Marotta and staff, collectively called Digital's Dictionary Committee, have fanned out across the world of DEC computing, collecting words like butterflies in little nets, and then pasting them into catalog form. The goal is to standardize terminology in a way that promotes effective communication, and to monitor the changes that take place in the language over time.

It's a monumental task that's destined for obsolescence the minute it's printed. And because most editorial questions concern new word constructions and not old ones, the inevitable omissions can be as important as the butterflies that they do catch.

"Howdyaspell *thickwire*?" one editor shouts to another. Well, if you looked in a recent *edu*, a Digital magazine for the educational market, you'd find that it has a capital *T* and a capital *W*; i.e., ThickWire. The same is true of ThinWire. But you wouldn't know that from *The Digital Dictionary* because there are no entries for these common networking terms.

Perhaps the best way to determine the success of an enterprise such as this is to decide whether it helps its targeted market. The Dictionary is described as a reference tool for people who communicate information about Digital's computer systems and related products. Presumably, this means its for editors, writers, ad people, PR pros and salespeople in the DEC marketplace. There is no question that this volume

> ***Any dictionary of an organic, evolving language can be no more than a snapshot of the language at any given time . . .***

will have a positive impact in these environments. *The Digital Dictionary* lists and defines words, acronyms, abbreviations and mnemonics that are inside and outside the Digital environment. Key terms from other environments, which often are used in comparison (like IBM's CICS online transaction processing system), also are represented. In general, items listed include terms describing systems, products and concepts used in DEC parlance.

The Dictionary is divided into two sections: a glossary of technical terms that comprises the bulk of the book, and a list of abbreviations, acronyms, mnemonics and expansions. Appendixes include style and formatting guidelines with a bibliography of other authoritative sources. The final appendix includes an unnecessary list of recommended common English words to describe DEC equipment. Included are words such as class, clause, clean, cleaner, clear, clearance and clerk. At the end is a mail-in card for reader comments. This is essential for an endeavor such as this, where neologisms and permutations often spring up.

If *The Digital Dictionary* is viewed as an exhaustive, comprehensive authority on ElectroEnglish, it's destined for insufficiency. Like the mythic Sisyphus, doomed to roll a boulder up a hill only to have it roll to the bottom just as he nears the top, Editor Marotta has committed himself to this type of perpetual purgatory. But, if the volume is seen as a brave, new exploration into the massive jungle of computer terminology, it's like Tarzan swinging down from the vines for beleaguered editors and others deep in the dense, dark, depths of Digital Land. — *Bruce Feldman, formerly associate editor of* DEC PROFESSIONAL, *is a Pennsylvania-based writer.*

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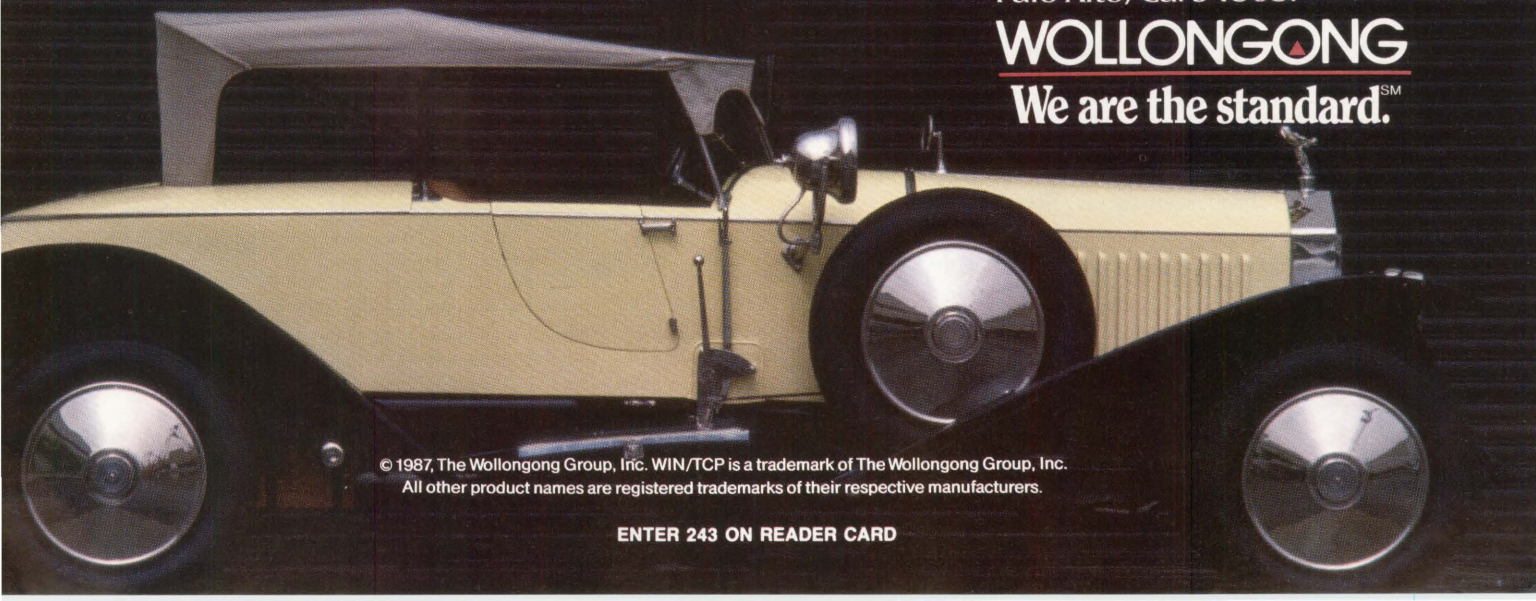

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Understanding An NCP, Part 1

NETWORKING EDITOR

Bill Hancock

Editor's note: This is the first of a two-part series, explaining an NCP. In this installment, Bill Hancock decribes an NCP and its EXECUTOR command.

DECNET-VAX is a useful product, especially when used with a network. If you have DECNET-VAX enabled and you're not connecting to another system, you're either using the SET HOST logging facility, or someone told you that it had to be turned on.

One problem with DECNET-VAX is trying to understand the intricasies of configuring the network databases. DECNET comes with a command procedure, NETCONFIG.COM (it should be called NETCONFUSE.COM), that's supposed to help the system manager. However, it only provides the requirements to get the network up and running on a particular node. NETCONFIG.COM uses the Network Control Program (NCP) to provide the proper configuration commands to DECNET, so that the node will react in the desired manner. Unfortunately, NCP, an important utility, is not easily understood.

In this article, we'll explore NCP, some of its more popular commands, how it can be used to adjust the network performance and other nuances of interest. You may be both dismayed and surprised at what you can do with it.

The Purpose Of NCP

NCP is used with DECNET on VAX and other DECNET implementations. Its purpose is to:

1. Set up parameters for the operation of the network.
2. Allow the network manager to monitor information from the network.
3. Display network counters, errors and other statistical information.
4. Control and manage other network nodes in a similar manner as the host (EXECUTOR).

To provide connectivity, NCP uses a series of database files that contain the basic configuration information necessary to set up, start up and control the network. These files, located in SYS$SYSTEM:, are displayed easily by typing in the following command:

```
$DIR SYS$SYSTEM:*NET*.DAT
```

The files that appear contain information regarding network proxies, node database, line database, circuit database, error logging database, etc.

Because NCP affects different components, different privileges are required as the network databases and running system are modified. At a minimum, the network manager will require SYSPRV and OPER privileges. When the network software is started, DETACH, CMKRNL and SYSNAM will be required.

Understanding NCP

To understand NCP, some basic theory on DECNET-VAX databases is required. DECNET-VAX consists of the following basic components:

1. Network hardware drivers (Device Driver Modules or DDMs).
2. The network database and database handler mechanism (the *NET*.DAT files, NCP, Network Management Listener [NML] and the online database handler, NETACP).
3. The DECNET virtual device (NETDRIVER.EXE that appears as device NET:).
4. The downline system loading components (NDDRIVER.EXE, the MOM process, etc.).
5. Network support utilities (OBJECTS — MAIL, PHONE, File Access Listener [FAL], Data Access Protocol [DAP], Network Management Listener [NML], etc.).
6. Error logging and control (event logger).
7. Program access facilities (network access routine libraries).

The type of network node a system has been configured to handle will depend on how much of the network kit will be loaded onto a particular system. Standalone network systems with predefined software and minimal network interface will require only a few components. Full-blown network routing nodes with all kinds of services will require the entire kit.

Whatever the configuration, it's critical to have a network database that tracks who is trying to connect to whom. Network databases are configured by using NCP to set up lists of commands that the network will execute during network initialization and loading. These commands are stored in the *NET*.DAT files in SYS$SYSTEM:.

After the databases are configured, the network virtual device driver is loaded via SYSGEN, and the network database handler is created as a detached process (NETACP.EXE). After NETACP is created, it reads the network database files in SYS$SYSTEM: and properly configures tables in memory (this is called the VOLATILE database; the files are called the PERMANENT database) to perform the defined functions. The network software is running on the node. The local node EXECUTOR state is changed from OFF to ON, and the network is ready to connect to other systems on the network.

NETWORK DATABASES INITIALLY are configured using SYS$MANAGER:NETCONFIG.COM. The network configuration command procedure is designed to simplify the basic configuration commands necessary to configure available network hardware into the database, provide basic node identification information, and enable circuits, lines and the EXECUTOR to connect and allow basic traffic handling on the network.

Unfortunately, the network configuration procedure doesn't allow for loading the names of other nodes into the database and the tweaking of certain parameters for optimal communications throughput on the network. To adjust such parameters requires the use of NCP and selected command qualifiers.

NCP is run by typing in the DCL command $RUN SYS$SYSTEM:NCP. You can take the shortcut of $MCR NCP or define a DCL symbol for NCP ($ NCP == "RUN SYS$SYSTEM:NCP"). In any case, NCP is invoked; it gives an NCP> prompt and is ready for action.

NCP commands generally are split into three types of commands: volatile database commands, permanent database commands and additional commands that affect the network but not necessarily either database (such as the LOOP command). All NCP commands usually can be abbreviated to three characters, except for those commands that are still ambiguous at three characters, such as LINE and LINK. To be sure that NCP knows what kind of command or qualifier you want, use at least four letters for abbreviations.

Volatile database (i.e., the database that's used when the network software is running and active) commands have a SET, SHOW or CLEAR preceding the qualifiers. Some commands, such as COPY KNOWN NODES, can affect the database and don't require one of these words. Permanent database commands are prefixed with a DEFINE, LIST or PURGE command. By specifying the first word in the command, NCP knows on which database you wish to take action and will do so as requested.

Not all NCP commands are prefaced with those words, just those commands that actually will modify, request information from, or clear out information in the respective databases. Additional commands to DECNET, from NCP, usually affect items such as counters, downline loads, loopback tests and remote node connection activities; i.e., CONNECT VIA or DISCONNECT KNOWN LINKS.

When configuring the network database for a node, first configure the permanent database. This is done in four steps:

1. Configure node information such as node name and number (EXECUTOR).

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2. Configure virtual connection information (CIRCUIT).
3. Configure physical connection information (LINE).
4. Configure downline system loading information (LOAD).

The EXECUTOR node in a DECNET network executes the commands that are being requested. When a node first is fired up, the EXECUTOR is the local computer system that's executing NCP commands. After the network is active, the EXECUTOR node can be not only the local system, but any node that a system or network manager desires, provided that the NCP command SET EXECUTOR NODE nodename is executed before any desired commands are typed in.

Executing Commands

I use the SET EXECUTOR NODE command to manage remote nodes without having to log in to a particular node. The only catch is that the account used on the remote system must have sufficient privileges to execute any commands you attempt. By default, the defined DECNET account on the remote system will be used. If you wish to use a more privileged account, include the proper access control information on the SET EXECUTOR command:

```
NCP> SET EXECUTOR NODE ERIDAL
  "NETMGR SUPERNET"
```

where NETMGR is the username desired, and SUPERNET is the password for the username.

There are other ways to pass the same information in NCP, and this is what makes NCP both powerful and confusing. Another way to get the same result would be:

```
NCP> SET EXECUTOR NODE ERIDAL
  USER NETMGR PASSWORD SUPERNET
```

There are still other ways to execute the same command. Not only is NCP important to network control and database manipulation, it's confusing to the new user who doesn't understand that the same command can be executed a variety of ways, and each will work.

When you're finished on another node, it's easy to get back. One way is to exit NCP and get back into it, but this is inefficient. A better way is to issue a CLEAR EXECUTOR NODE command that disconnects the session from the remote node and makes the local node the EXECUTOR node again.

The CLEAR EXECUTOR NODE command is useful if you botch a SET EXECUTOR NODE command. Even if an error is made, the CLEAR EXECUTOR NODE will need to be issued after the SET EXECUTOR NODE command to en-

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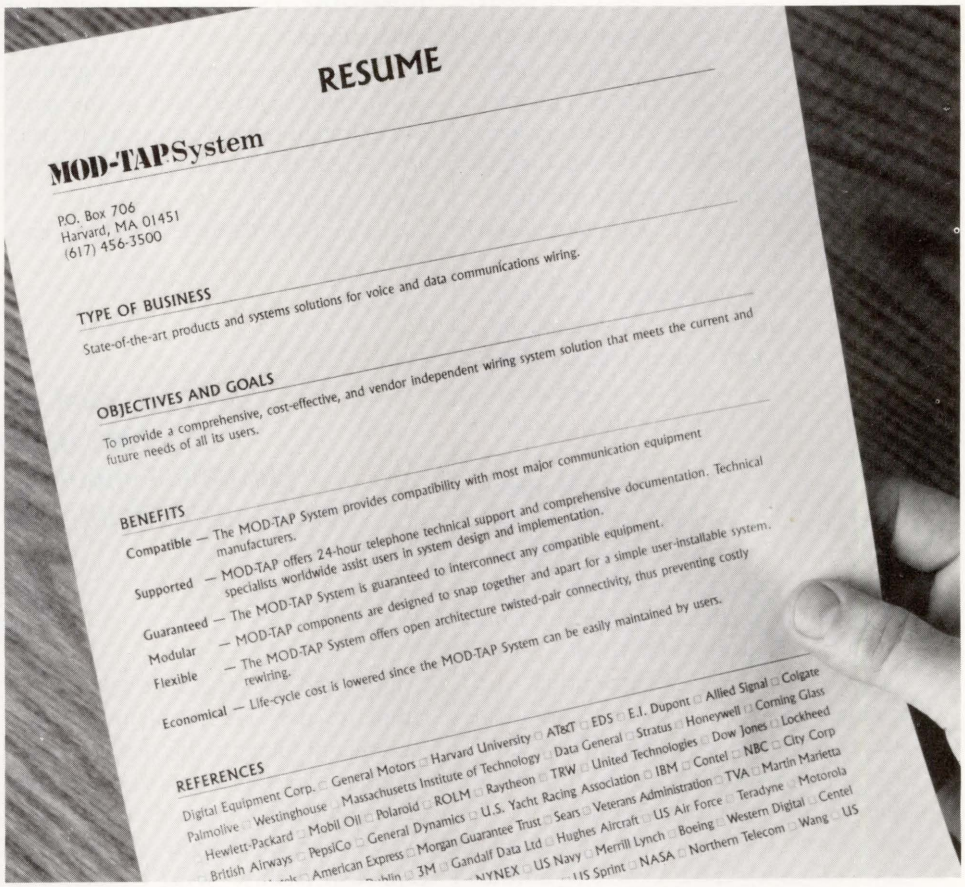
sure that future commands will be executed in the right place. Sometimes NML gets confused and still will attempt to execute NCP commands on a remote node, even if there was an error on the SET EXECUTOR NODE command, so always rescind the command after an error.

EXECUTOR information, necessary to allow a node to function properly, consists of the following information:

1. The NAME of the node.
2. The node ADDRESS (including AREA number).
3. Whether the node is ROUTING or NON-ROUTING (an end node). If the node is ROUTING, you also may want to specify routing TYPE (if the node is an intra-area router) and ROUTER PRIORITY (if the node is on Ethernet and there's more than one routing node. The highest router priority on an Ethernet segment within the local area becomes the DESIGNATED ROUTER. If this is a small, non-powerful node, and there are many DECNET connection requests on the network, the designated router can get busy. Remember, the ROUTER PRIORITY parameter, while affecting the EXECUTOR, is a CIRCUIT parameter).
4. Proxy access control.
5. Default buffer sizes for transmission (SEGMENT BUFFER SIZE) and reception of data packets (BUFFER SIZE) if the LINE/CIRCUIT buffer sizes haven't been defined (they usually will override these settings).
6. Maximum allowed number of circuits, lines, routing hops, message visits (to keep packets from wandering forever around the network), retransmissions, buffers allocated, areas recognized, end nodes allowed and total range of node numbers (MAXIMUM ADDRESS). A common problem that DECNET managers run into is trying to define nodes that have node numbers greater than 255. By default, DECNET-VAX comes configured for 255 node addresses assigned in an incremental way. If a node number, say 300, is defined, a SHOW NETWORK DCL command may show the node, but it will be impossible to connect to it. To correct the problem, change the MAX ADDRESS parameter to the highest known address.
7. Network state (ON or OFF) at network initialization and load time.

Although not all of these parameters are necessary to the configuration and activation of the network, it makes the management and control of the network easier when they're defined properly.

In the next installment, we'll look at the LINE and CIRCUIT parameters and how NCP can be used to adjust the network performance and other nuances of interest. ■



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ALL-IN-1 Product Integration, Part 1

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David W. Bynon

One of *ALL-IN-1*'s benefits to system managers, programmers and product developers is the ease with which products can be integrated. This month, and in Part 2, I will discuss the methods used to integrate products, even those that are different from *ALL-IN-1* itself.

The term integration is illusive, because it can, and does, have many different meanings when talking about *ALL-IN-1*. So, we need to define the various levels of integration that *ALL-IN-1* provides.

Level 1 — The first integration level, and the simplest, invokes a command procedure that invokes the desired executable program or command procedure. The command procedure runs as a subprocess to your *ALL-IN- 1* process. In this level of integration, the changes to *ALL-IN-1* take only minutes to perform. Adding a named data entry to a form or creating a new form will invoke the command procedure.

Level 2 — The next integration level still involves the use of a command procedure, but to a greater extent. The command procedure, opened by *ALL-IN-1*, can be used to communicate with the *ALL-IN-1* process. So, second-level integration allows *ALL-IN-1* and the other products to pass information back and forth, such as the names of files, records, system information, *ALL-IN-1* user information, etc.

Level 2 integration is easy to accomplish. However, it's more time consuming and requires a moderate level of understanding of VMS command procedures and *ALL-IN-1*. Here, again, the only change to *ALL-IN-1* is to the named data of a form or the creation of a new form.

Level 3 — Level 3 integration, while not the final level, is the most complicated. It involves use of the *ALL-IN-1* FILE CABINET for a product's file management.

The FILE CABINET facility isn't complicated. In fact, once learned it's simple to use. The problem with integrating products in this manner is that you must develop scripts to collect and pass information back and forth between your application and the FILE CABINET facility. What's more, you must make your application fit into a defined file type, such as ASCII, TEXT, WPS, etc. This may not be easy if your application creates odd binary, unreadable files.

Level 4 — The final level of *ALL-IN-1* integration involves linking your product, the object module, with that of *ALL-IN-1*. While not difficult, this method is controversial. First, to link with *ALL-IN-1*, you must create an entry in the address table used to call (invoke) your product. This isn't much of a problem, except that the *ALL-IN-1* developers wrote it in BLISS. So, you must have a BLISS compiler to perform this integration. Second, because the table belongs to DEC, you can't, or shouldn't, distribute it with your product. Finally, your code, unless written as shareable modules, will increase the size of the *ALL-IN-1* image, A1.EXE.

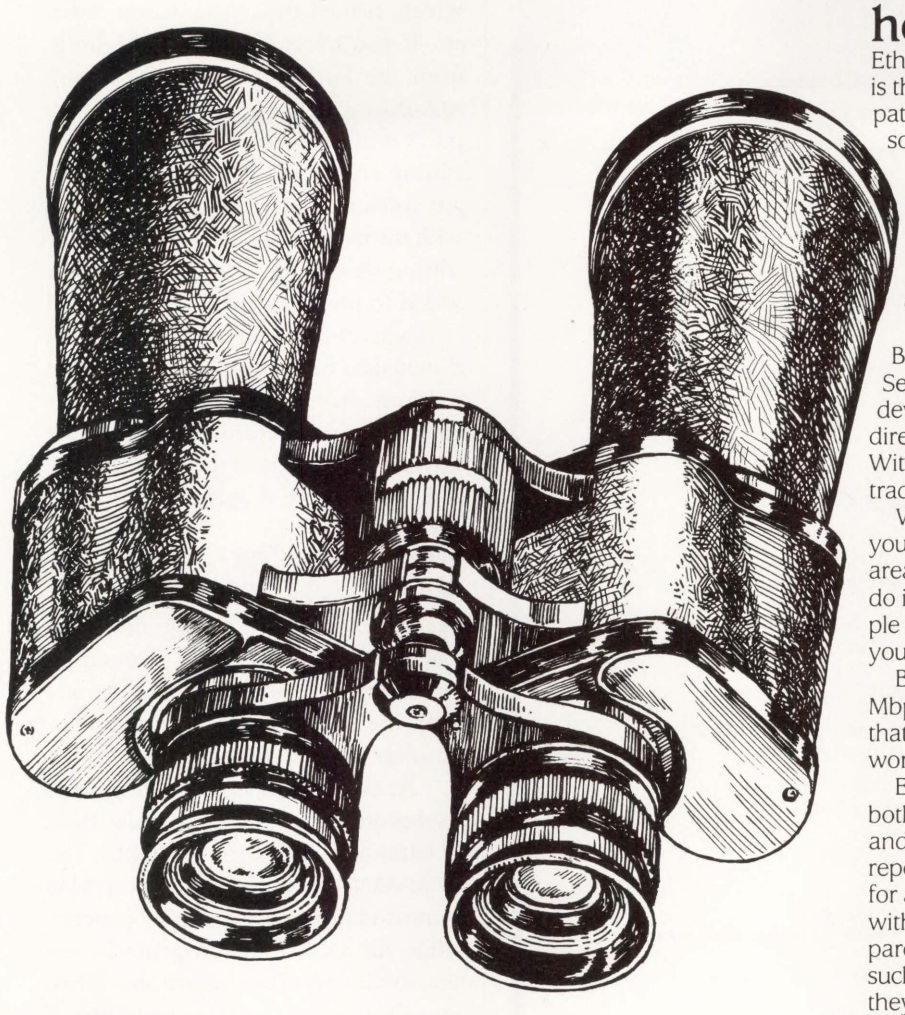
> ***The final level of* ALL-IN-1 *integration involves linking your product, the object module, with that of* ALL-IN-1. *While not difficult, this method is controversial.***

ALL-IN-1 Integration Tools

As robust as *ALL-IN-1* is, it lacks features, especially when it comes to *ALL-IN-1* program development and product integration. Current functions built into *ALL-IN-1* are limited to forms development, DATATRIEVE domain definition and simple file editing and maintenance. There are no provisions for code or module management.

In most cases, *ALL-IN-1* forms development is the primary tool used for product integration. You access the Forms Development menu by entering the command FD from any *ALL-IN-1* menu. The Forms Development menu provides functions for creating, editing, copying and deleting FMS forms in a FMS forms library.

There are two methods of form editing, screen and named data. When you select screen mode editing, you will be thrown into FMS, as if you had accessed FMS from DCL. The same FMS menu will be presented, allowing you



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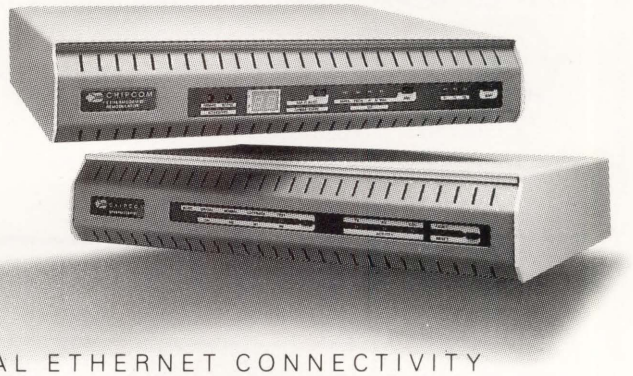

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PROGRAM.

```
------------------------------------------------------------------------------
Procedure 1 -- A1_VMSMAIL.COM
------------------------------------------------------------------------------

$!--------------------------------------------------------------
$! A1_VMSMAIL.COM
$!
$! COPYRIGHT(C), 1987, DAVID W. BYNON, ALL RIGHTS RESERVED
$! THIS PROCEDURE MAY BE COPIED FOR NON-PROFIT USE ONLY
$!--------------------------------------------------------------
$!
$ oambx = "write oamailbox"
$ if "''p1'" .eqs. "SEND" then goto send
$ if "''p1'" .eqs. "DELETE" then goto delete
$ if "''p1'" .eqs. "PRINT" then goto print
$!
$! *** Read, Read New, and Index routine ***
$!
$       if "''p1'" .nes. "READ" then goto 10
$       oambx "OA FORM VM_MESSAGE\GET OA$FORM_DISPOSE"
$       @dclmailbox:
$       if "''result'" .nes. "2" then exit
$!
$! Write a command procedure to put the output in a file
$!
$ 10:
$       gosub clear
$       if "''p1'" .nes. "READ" then message = ""
$       p2 = p1
$       if "''p1'" .eqs. "NEW" then p1 = "READ"
$       open/write mail vms_mail_command.com
$       write mail "define/user sys$output vms_mail_output.txt"
$       write mail "run sys$system:mail"
$       write mail "''p1' ''message'"
$       write mail "exit"
$       close mail
$!
$! Execute the commands to MAIL
$!
$       @vms_mail_command.com
$!
$! If command is READ NEW, search the output file for
$! "You have x new messages" string. If not found cleanup and exit
$!
$       if "''P2'" .nes. "NEW" then goto 20
$       open/read msg vms_mail_output.txt
$       read msg record
$       read msg record
$       close msg
$       if f$locate("new message",record) .eq. f$length(record) then -
          goto cleanup
$!
$! Display MAIL's output using ALL-IN-1, then delete the file we created
$!
$ 20:
$       oambx "OA LIST VMS_MAIL_OUTPUT.TXT"
$       @dclmailbox:
$       goto cleanup
$!
$! *** Send mail routine ***
$!
$ Send:
$       oambx "OA FORM VMSEND\GET OA$FORM_DISPOSE"
$       @dclmailbox:
$       if "''result'" .nes. "2" then exit
$       if "''file_name'" .nes. "" then goto send_file
        gosub clear
$!
$! Start edit session
$!
$       define/user sys$input sys$command
$       define/user sys$output sys$command
$       edit vms_mail_output.txt
$!
$! If user quit from the edit session return now
$!
```

Continued.

to access all parts of the FMS form; i.e., screen, named data, field access order, etc. If you select Named Data Editing from the Forms Development menu, *ALL-IN-1* will extract the named data portion of the form, convert it to your editing style (EDT, WPS, WPSPLUS) and put you into a full screen editing session with the named data. When you exit the editing session, the named data will be added to the form again. This method is much easier than trying to access named data from the FMS menu, which is forms driven. In either case, forms editing is slow, because *ALL-IN-1* must extract the form from the forms library and then replace it again.

Investigating The *ALL-IN-1* Subprocess

Because most product integrations use a VMS subprocess as the integration mechanism, it's imperative that we address the *ALL-IN-1*-to-subprocess relationship in some detail.

ALL-IN-1 facilitates the creation of a subprocess via several functions, DCL, COMMAND and GET OA$DCL. The COMMAND function executes a VMS command procedure in the subprocess, while the DCL function provides interactive access to the subprocess. When any of the above functions are called, if a subprocess hasn't been created (opened) already, a call to the *ALL-IN-1* function OA$SUB_OPEN is made. You can call OA$SUB_OPEN at any time to force the creation of a subprocess. Conversely, the function OA$SUB_CLOSE will delete the subprocess. After *ALL-IN-1* has created the subprocess, it sends it a login command procedure called OAINI.COM. This command procedure may be common, in which case it must be in OA$LIB, or private, by residing in OAUSER. OAUSER is searched first.

To communicate with the subprocess, *ALL-IN-1* creates three VMS mailbox structures, OAMAILBOX, DCLMAILBOX and SYS$INPUT. They are created and opened with the subprocesses; no additional steps are required to use them.

The SYS$INPUT mailbox is im-

plemented internally to *ALL-IN-1* for subprocess input; i.e., terminal input to the subprocess is via the mailbox SYS$INPUT. For this reason, some DCL commands, such as INQUIRE and READ SYS$INPUT, won't work. There are ways, through *ALL-IN-1* functions, to get around this limitation.

The OAMAILBOX and DCLMAILBOX mailboxes are used to pass data, records, return codes, messages, etc., between the subprocess and *ALL-IN-1*. The two mailboxes allow the subprocess to call *ALL-IN-1* to perform functions and return the results. Writing to OAMAILBOX passes commands to *ALL-IN-1*, while reading DCLMAILBOX causes *ALL-IN-1* to execute the commands and return the results. For example, the following commands issued in the subprocess would command *ALL-IN-1* to get the current date and display it:

```
$ WRITE OAMAILBOX "OA GET
  OA$DATE"
$ @DCLMAILBOX:
```

The command prefix "OA" is required when passing a command from the subprocess. Also, notice the colon on the DCLMAILBOX device name. It's required so DCL doesn't think DCMAILBOX is a file name.

One of the interesting and useful features of the *ALL-IN-1*-to-subprocess relationship is its ability to share symbols. The DCLMAILBOX and SYS$INPUT mailboxes are used to send *ALL-IN-1* symbols to the subprocess, while OAMAILBOX can be used to create *ALL-IN-1* symbols from within the subprocess. In the following example, the subprocess invokes an *ALL-IN-1* argument form to get a file name to be printed from the user. The argument form assigns the user's input (contents of a field) to the symbol "FILE" using the *ALL-IN-1* Field Processing command

> ***"The DCLMAILBOX and SYS$INPUT mailboxes are used to send ALL-IN-1 symbols to the subprocess, while OAMAILBOX can be used to create ALL-IN-1 symbols from within the subprocess."***

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PROGRAM... continued

```
$       if f$search("VMS_MAIL_OUTPUT.TXT") .eqs. "" then exit
$!
$! Mail the file the user created, then delete it
$!
$       mail vms_mail_output.txt 'VMSUSER'/subject="''SUBJECT'"
$       goto cleanup
$ Send_File:
$       mail 'file_name' 'VMSUSER'/subject="''SUBJECT'"
$       exit
$!
$! *** Delete and Print routine ***
$!
$ Delete:
$ Print:
$       gosub get_msg_no
$       gosub clear
$!
$!
$! Write a command procedure to put the output in a file
$!
$       open/write mail vms_mail_command.com
$       write mail "define/user sys$output vms_mail_output.txt"
$       write mail "run sys$system:mail"
$       write mail "read ''message'"
$       write mail "exit"
$       close mail
$!
$! Execute the commands to MAIL
$!
$       @vms_mail_command.com
$!
$       oambx "OA LIST VMS_MAIL_OUTPUT.TXT"
$       oambx "OA YESNO_PROMPT Is this the message you want to ''p1' [Y/N]?:"
$       oambx "OA GET OA$FORM_DISPOSE"
$       @dclmailbox:
$       answer = result
$       oambx "OA$FLD_STAY"
$       @dclmailbox:
$       if "''answer'" .eqs. "0" then goto cleanup
$!
$! Write a command procedure to delete or print the message
$!
$       delete vms_mail_command.com;*
$       open/write mail vms_mail_command.com
$       write mail "define/user sys$output nl:"
$       write mail "run sys$system:mail"
$       write mail "read ''message'"
$       write mail "''p1'"
$       write mail "exit"
$       close mail
$!
$! Execute the commands to MAIL
$!
$       @vms_mail_command.com
$!
$! Cleanup the files we created
$!
$ Cleanup:
$       if f$search("VMS_MAIL_*.*") .eqs. "" then exit
$       delete vms_mail_*.*;*
$       exit
$!
$! Get Message Number Subroutine
$!
$ Get_Msg_No:
$       oambx "OA FORM VM_MESSAGE\GET OA$FORM_DISPOSE"
$       @dclmailbox:
$       if "''result'" .nes. "2" then exit
$       return
$!
$! Clear display subroutine
$!
$ Clear:
$       oambx "OA CLEAR\OA$FLO_CLEAR_VA"
$       @dclmailbox:
$       return
```

/PUT_SAVE = FILE.

```
$ WRITE OAMAILBOX "OA FORM
  FILE_NAME \ GET OA$FORM_
  DISPOSE"
$ @DCLMAILBOX:
$ IF " ' 'RESULT' " ".NES."2" THEN EXIT
$ PRINT 'FILE'
```

Notice the mystery symbol "RESULT." RESULT is one of several common DCL symbols created by *ALL-IN-1* functions. In this case, the GET function returns the value of the *ALL-IN-1* symbol OA$FORM_DISPOSE. By checking OA$FORM_DISPOSE, you can determine if the form was completed or if the user wants to exit. Other *ALL-IN-1* functions, such as COMPUTE, LOGICAL, PROMPT and WAIT, store values in RESULT.

Also, you should be pleased to know that command procedure parameters P1-P8 can be passed to the subprocess. This will be most useful when calling a command procedure from an *ALL-IN-1* menu form, as in the following named data example:

```
1 Name: .TYPE
MENU
2 Name: S
COMMAND MAIL SEND
3 Name: D
COMMAND MAIL DELETE
4 Name: R
COMMAND MAIL READ
```

In this example, the named data invokes a procedure called MAIL.COM, which must test the value of P1 to perform the appropriate function, Send, Delete, Read. One final note about passing parameters P1-P8: Parameters must be literal strings, because symbols won't be translated.

Integrating A VAX/VMS Utility

Our lesson wouldn't be complete without integrating a product. For this I've chosen VAX/VMS MAIL. I chose MAIL because it's a typical VMS utility that isn't inclined to this type of adaptation. If successful, I figure any VMS utility or

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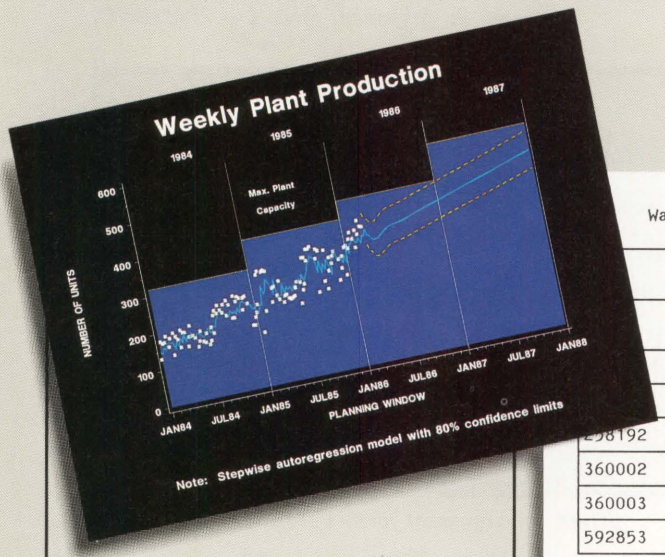

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	Quantity on Hand	Quantity on Order	Projected Reorder Date
	123980	10000	THU, FEB 12, 87
	89450	5000	FRI, FEB 20, 87
298192	20110	1000	MON, MAR 30, 87
360002	8585	0	TUE, FEB 10, 87
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40	6	1	6	3.5	33
50	6	3	8	5.5	66
60	6	4	9	6.5	83
70	7	4	10	7.0	85

* Computer Intelligence, January 1986.

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```
                    VMS Mail

  S    Send
  R    Read
  D    Delete
  P    Print
  I    Index
  RN   Read New

  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

  Enter selection and press RETURN
```

Screen 1: Menu form VM.

```
;;.TYPE;;
MENU /USER=USER/DATE=DATE/CHOICE=
    CHOICE/CLEAR/GET=DAY,OA$DAY
;;S;;
COMMAND A1__VMSMAIL SEND  \CLEAR\FORCE
;;R;;
COMMAND A1__VMSMAIL READ  \CLEAR\FORCE
;;RN;;
COMMAND A1__VMSMAIL NEW  \CLEAR\FORCE
;;P;;
COMMAND A1__VMSMAIL PRINT  \CLEAR\FORCE
;;I;;
COMMAND A1__VMSMAIL DIRECTORY  \CLEAR\FORCE
;;D;;
COMMAND A1__VMSMAIL DELETE  \CLEAR\FORCE
```

Screen 2: Menu form VM named data.

```
                Send VMS Mail

  To: XXXXXXXXXXXXXXXXXXXXX
Subj: XXXXXXXXXXXXXXXXXXXXX
File: XXXXXXXXXXXXXXXXXXXXX
```

Screen 3: Argument form 1 — VMSEND.

```
;;.TYPE;;
ARG /OVERLAY
;;VMSUSER;;
/PUT__SAVE=VMSUSER
;;SUBJECT;;
/PUT__SAVE=SUBJECT
;;FILE__NAME;;
/PUT__SAVE=FILE__NAME
```

Screen 4: Argument form VMSEND named data.

```
          Message Number: 9999
```

Screen 5: Argument form VM__MESSAGE.

```
;;.TYPE;;
ARG /OVERLAY
;;MESSAGE;;
/PUT__SAVE=MESSAGE
```

Screen 6: Argument form VM__MESSAGE named data.

VAX application can be integrated. The integration procedure and forms take a full day to prepare.

MAIL integration is performed with a single command procedure, called A1__VMSMAIL.COM, and three FMS forms, VM, VMSEND and VM__MESSAGE. After completing the forms, I installed them in OA$LIB:OAFORM. Once the forms are installed, the menu can be invoked by entering VM, which is the name of the menu form, from the main menu.

There are several problems with this integration method that stem from one basic issue. Each time a function is invoked (i.e., Send, Delete, Read), MAIL is invoked to perform the function and then exited. Because of this, no environment is preserved. This forces you, in some cases, to invoke MAIL twice, once to collect information and another to perform the task. If you have a better solution, I'd like to see it.

The *ALL-IN-1* subprocess and a VMS command procedure are the fastest and least complex methods of integrating a product with *ALL-IN-1*. In Part 2, I'll continue with *ALL-IN-1* integration techniques, and explore an integration with the *ALL-IN-1* FILE CABINET. *—David W. Bynon is a VAX systems consultant in Silver Spring, Maryland.*

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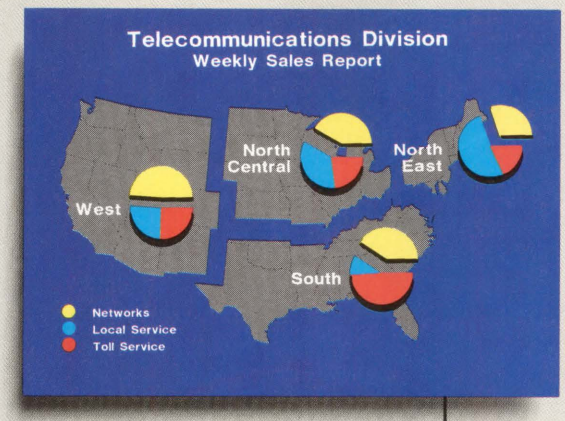

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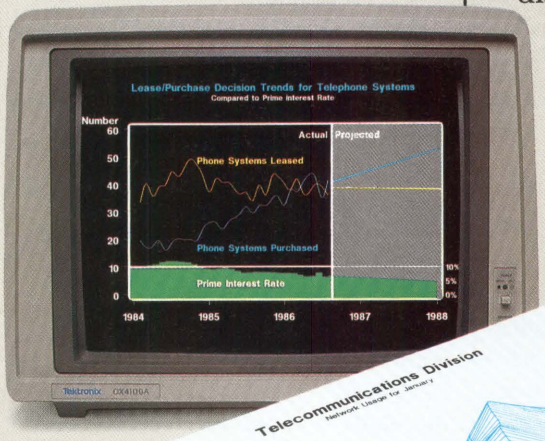

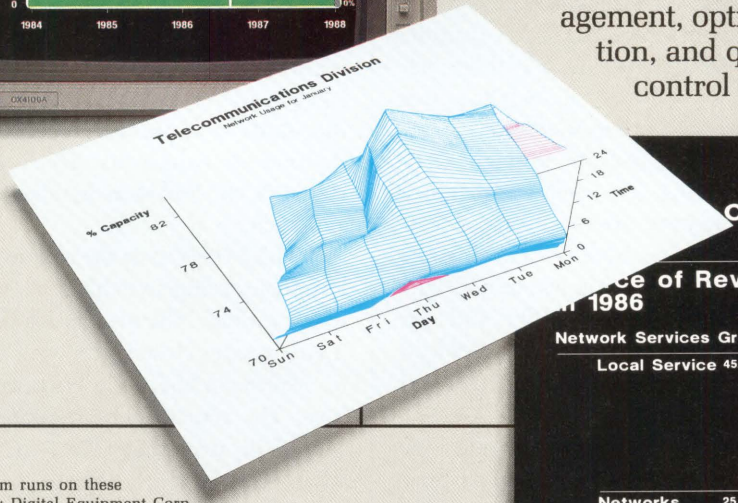

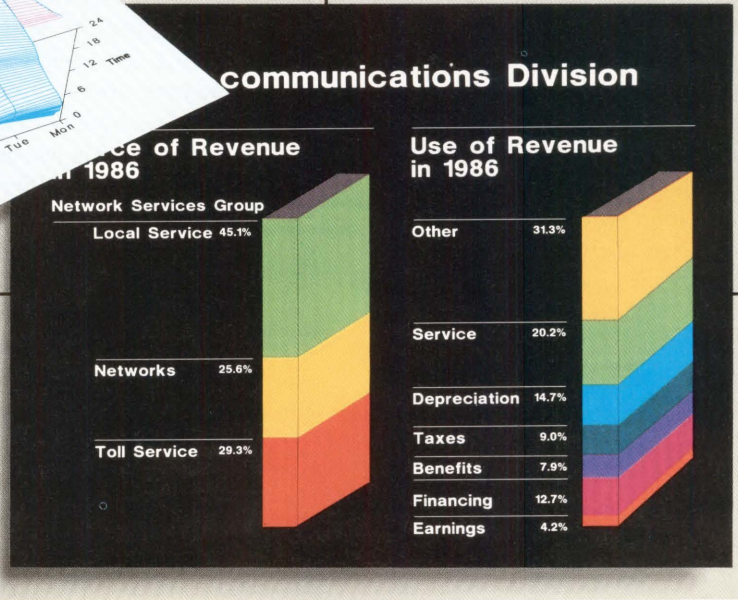

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CLUSTER CHRONICLES

Dave Mallery

What To Do Before You Unroll The Coax, Part 1

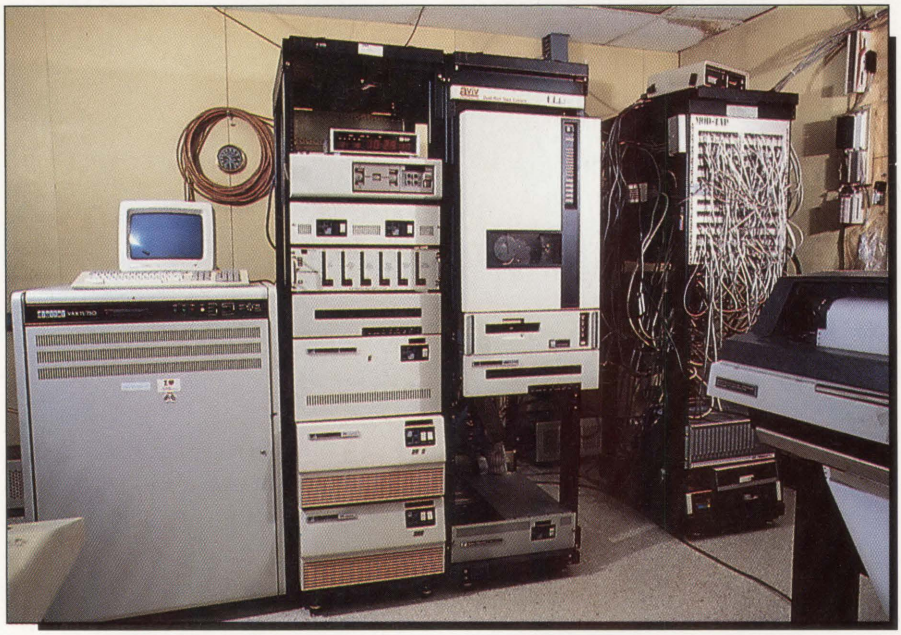
As I promised last month, here's the first chapter of our "Cluster Chronicles." As I write, we're running three nodes, 750, MICROVAX II and VAXSTATION 2000. Performance is far beyond my expectations. Already, we can see dozens of ways to improve on our first cut. This installment covers precluster considerations.

Unless you are installing a cluster right out of the box and never had a VAX before, you currently are running a non-clustered single VAX, or a group of single VAXs. There's a long list of caveats that we encountered in our migration that we'd like to share with you to make yours a little easier.

From a distance, your problems will lie in the following areas: environment (space); system space (availability of backplane and power); terminal serving/switching; software licensing; software revision level and the current on-disk logical structure, including all the sedimentary layers of junk you have accrued over the years.

I'll describe our versions of the above problems and their solutions. Sometimes some of the simplest problems can be the most maddening and cause the greatest delay. Others are just a pain.

Our computer room always has been too small. Fortunately, VAXs keep getting smaller. We started by just piling the MICROVAX II on top of the 750, hoping that it would somehow be absorbed. John McGlinchey, our MIS manager had a better idea. We retrieved a few H960s from storage and reracked the lot (see Photo 1). Judging from the available space in the cabinets, we can add a few more MICROVAX IIs and a gig or so before we run out of space again.



Here's our reracked computer room. The two H960s contain our MICROVAX II (FRODO::) and our 2.4-gigabyte disk farm. The Xyplex cluster controllers are stacked behind the MODTAP patch panels. There's room for several more gigabytes.

System space was a different problem. There were lots of empty slots in the 750's UNIBUS backplane. However, there wasn't enough DC power available to plug in the DEUNA, and there was nothing we could extract at first to free up the amps. The candidates for extraction were a pair of vintage DHV emulating cards. The catch was that they were being used. We had been converting to Xyplex terminal servers for some time. The only solution was to finish the conversion, bite the bullet and get enough controllers to take the DHV load off before we could remove them and insert the DEUNA.

Another gotcha emerged. We needed dial-in lines that weren't on a server so we could implement asynchronous DECNET for our far-flung correspondents. We were unable to get a good connect over a server, because the lines always would disconnect during the transition to DDCMP. We had to remove the DHVs to get room for the DEUNA. We ended up putting an eight-line DHU into the MICROVAX II for dedicated functions like asynch DECNET, the Precision Standard Clock, and such.

This brings us to the next problem: terminal serving/switching. There are a few solutions. The problem is that in a homogeneous cluster, you want users to be placed on the node with the least load. The actual node you end up on should be irrelevant. Your old hard-wiring to a DHV port has to go. There are solutions that range from fairly cheap to expensive. The solution that

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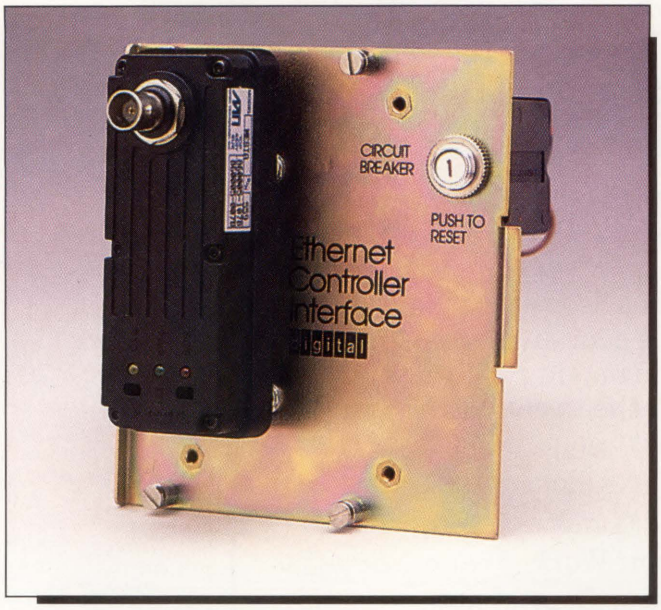
must be avoided at all cost is SET HOST via DECNET. At the low end, if you have a two-node cluster, you always can use an a-b switch at each terminal to move around.

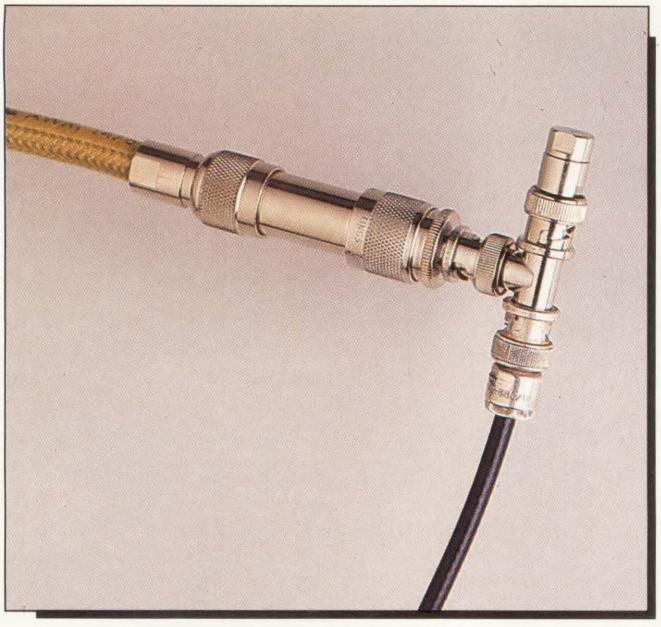
The next level is a Data PBX switch such as the ones made by Equinox. These switches can perform limited load balancing and are considerably cheaper than a full-blown DECSERVER installation. DECSERVERS are next. They do many intelligent things with load balancing and use the LAT protocol within VMS. LAT often is maligned, but clearly it's the mainstream, and as such, will get loads of attention from DEC. Finally, there's the high-end solution (at least in performance) using terminal servers from Xyplex. These have the advantage of servicing keyboard interrupts within the server rather than inside VMS.

Terminal distribution is another issue. Most single processor installations have an existing wiring snarl left over from their predecessor PDPs filling one corner of the room. You can take this opportunity to clear it all away, stringing coax and servers throughout the building, or you can leave it in place and pile the servers up in the corner with the snarl. I always prefer having most of my Ethernet problems occur in one room. We hope to replace our pile of Xyplex servers with their new server box in the future.



This is a Micro Technology Inc. MESTA clinging to a DEUNA distribution panel. We have one on BILBO:: (750) and FRODO:: (MICROVAX II). It provides a direct transition to ThinWire and eliminates the thick cable.

In the same vein, you must decide whether to go with thick or thin coax. The thick version is more expensive, harder to handle and can be a bit longer than the thin version. We opted for ThinWire, because we saw that we were going to be installing nodes that used ThinWire nodes, that weren't VAXs like the Logicraft 386, MAC IIs, Talaris 1590, etc. Also, distances anywhere within the building aren't greater than 200 feet. We got a few MESTAs from MTI and clamped them on the back of the two older VAXs and eliminated all the cable mess (see Photo 2).



This gets the "Kluge of the Year" award. You can make a Thin- to ThickWire transition using only cable adapters. The penalty is that your ThinWire loses about one-third of its legal length, but otherwise it works.

Software licensing is a nightmare. First of all, no one understands it. Since DEC has fired most of its customers (translate: relegated us to distributors), we're cut off from first-hand information. No one really seems to care anyway, so buy something to soothe your conscience. We bought an end-node DECNET license for our 750 and a router upgrade for the MICROVAX II, which already had an end-node. We bought an LAVC upgrade for both. We didn't buy the media/documentation. We borrowed the media and bought the documentation from DECDIRECT.

Fortunately, the MICROVAX 2000 comes fully licensed.

Now we come to the software revision level. The MICROVAX II had 4.6 and the 750 had 4.5 and there was a big gotcha. We had to wait for a patch from System Industries to bring the DRDRIVER up to snuff before we could GEN 4.6 on the 750, which is loaded with CMI bus controllers. The project was delayed for two weeks awaiting the patch. We had to have 4.6, because the LAVC support is in the distribution kit.

The next soft problem really is hard! DEC has been telling us (and we

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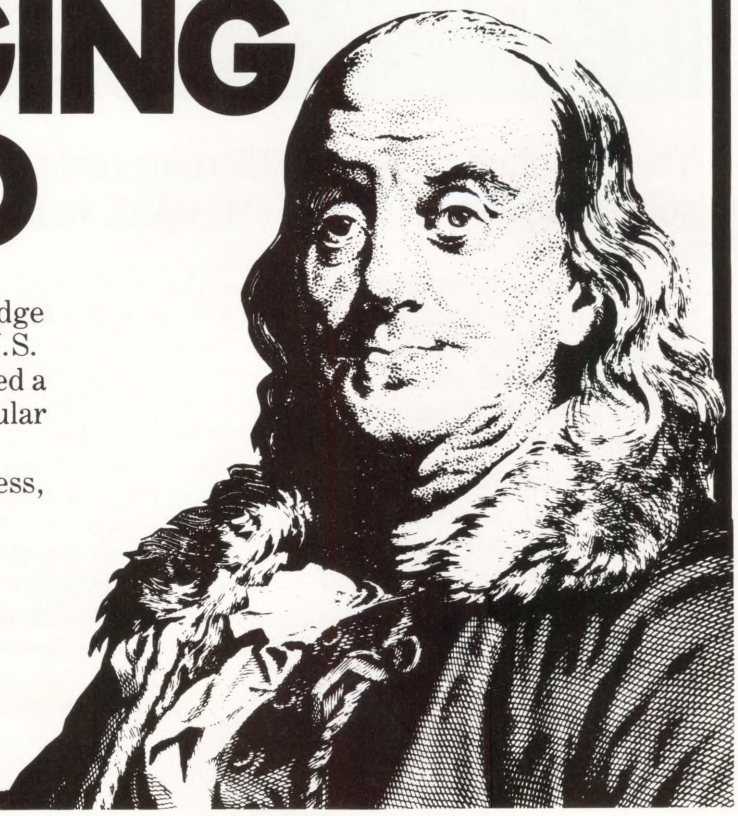

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have been ignoring them) for approximately five years that we better have all logical names in our in-house software when we refer to a disk device. Well, this is payday. We had to go back over approximately 200 programs and recompile them with logicals. One nice feature of a cluster is that you will find the ones you missed real fast once you come up! Many midnight mips were consumed in the process.

Actually, the transition to a cluster was completed in two steps. First, McGlinchey brought the 750 up as a cluster of one. This allowed the logical names to change to their new form: BILBO$DRB2:, etc. This provided an ideal test bed for making sure that the software would run. Also, we could install DECNET in this mode and start educating the users to the concept of node name. We were in this mode for at least a week and were very busy fixing things in that period.

In Part 2, I will cover the lessons learned before and after the initial cluster startup.

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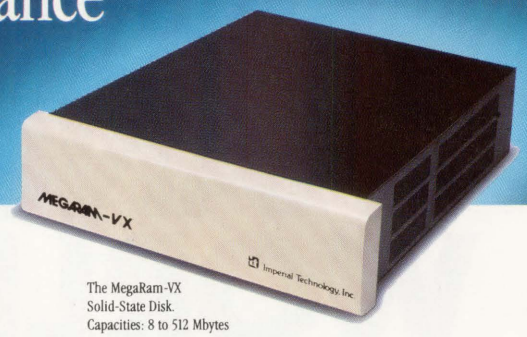

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DCL DIALOGUE

Kevin G. Barkes

Cannibalism For Fun And Profit

Those wishing to become thoroughly versed in DCL look at all command procedures, even ones that might seem totally unrelated to their primary areas of interest. The reason is simple: Most good DCL command files contain chunks of code that can be "cannibalized"; lifted from the original procedure and modified for some other purpose.

This month's reader-supplied command file serves two purposes: its intended function, recording time spent editing files; and as a minilibrary of DCL routines.

Marc McCune of the Financial Press Division of R.R. Donnelley & Sons Inc. of Pittsburgh, Pennsylvania, wrote EDIT_AGAIN.COM to help him keep track of time spent editing typesetting files and to provide a simple method of repeatedly editing the same file. Following each editing session, the procedure writes out a .TR (time record) file showing the name of the file edited, the start time, finish time and elapsed time. This makes EDIT_AGAIN of great value to people desiring a painless way to log their efforts.

More important, the procedure is loaded with lots of DCL tricks. We've covered many of them in previous columns, but Marc's thrown in a few newer concepts that bear examination.

To use the procedure, define a symbol in your login command file. Marc uses the EVE interface, so his definition is:

```
$ EVE :== @EDIT_AGAIN.COM
```

The initial code turns off verification and error messages, but permits tracing by defining the logical name EDIT_TRACE to any non-null string. The logical name M_SCR can be redefined to any convenient directory; this is where the procedure will store its time record (.TR) files. (Astute readers will note we're heeding DEC's advice not to use the reserved $ character in logical names.)

The command line parser looks at the P1 parameter passed to the procedure to determine what actions should be taken, then checks to make certain the specified file name is legal. An EDIT command with no parameters causes the editor to call up the last file accessed. If everything checks out, the time card is punched; a .TR file is created in the M_SCR directory with the same name as the file being edited. Should an error occur, the appropriate action is taken. If you prefer an editor other than EVE, make the appropriate changes in the lines that invoke it.

Of special interest are the subroutines that obtain and calculate the time values. These would be useful in a large number of applications; I recommend examining them in detail and extracting them for use in other procedures. For example, they would be helpful in benchmarking the performance of discrete sections of a command file. Modifying them for such purposes would be an almost trivial matter.

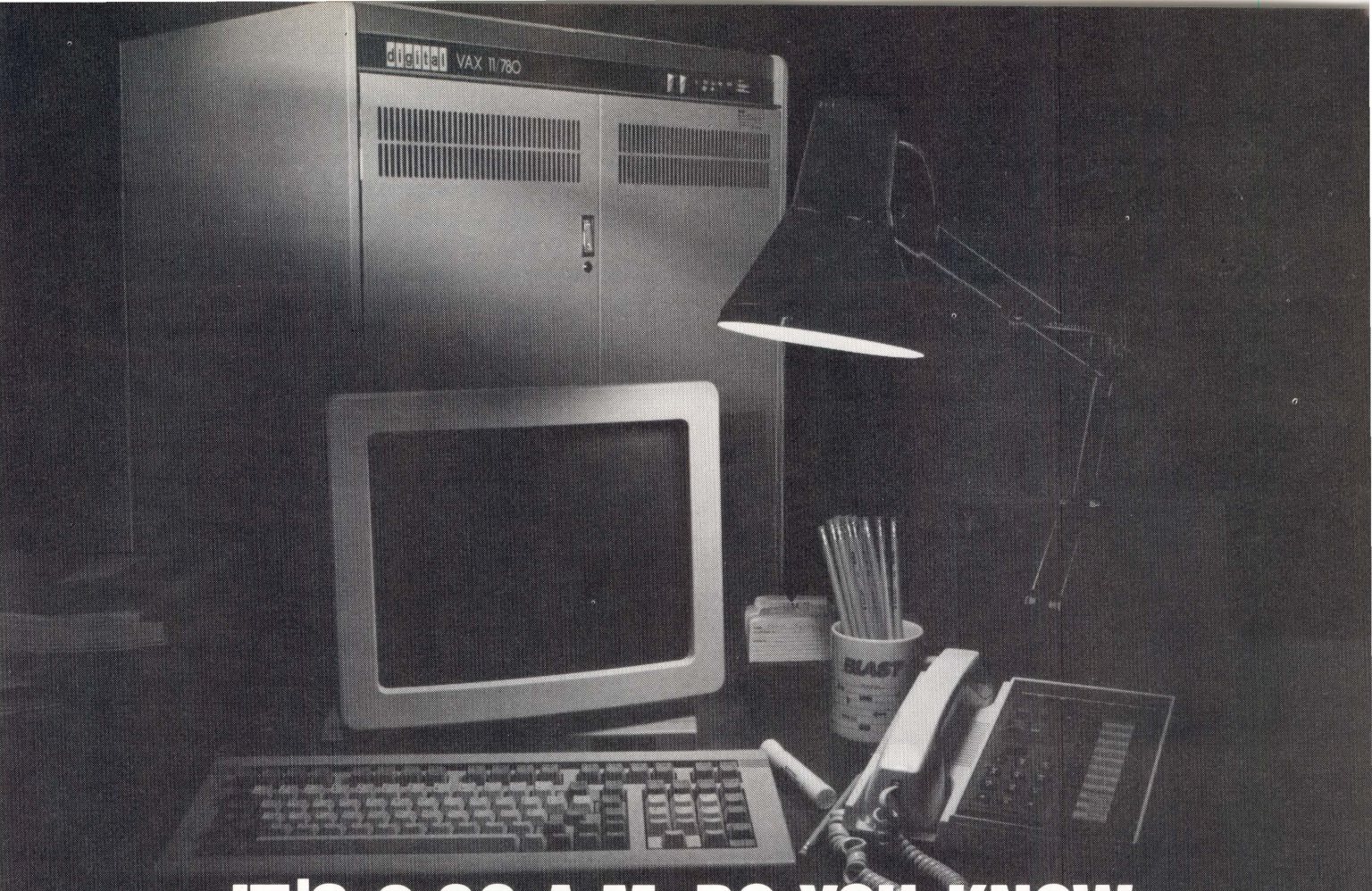
By altering the way in which the .TR files are written and maintained, it would be easy to write all the entries to a single file that then would be processed by another procedure in order to generate cumulative elapsed times for all files edited by a user or group of users. A quick SORT and judicious use of a few lexicals will make the task easy.

> **"The command line parser looks at the P1 parameter passed to the procedure to determine what actions should be taken, then checks to make certain the specified file name is legal."**

Toggling Screen Width

Jonathan W. Eveland of the Milwaukee Metropolitan Sewerage District, Milwaukee, Wisconsin, submitted a procedure that "toggles" the terminal screen width (see Program 2). I condensed it a bit, leaving only nine lines of code (eight, if you don't count the continuation of the PTERM symbol assignment. Counting EXIT isn't fair).

"Instead of using two (or more) symbols to manage terminal width," Jonathan explains, "the user needs only one symbol. When invoked, VT changes the screen width from 80 to 132 columns or from any column width to 80 columns. Additionally, if the user specifies



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the width as a parameter, VT will set the screen to that width."

Jonathan discovered that the screen width is the terminal's default buffer size, a value that can be returned by the F$GETDVI lexical function.

The PTERM symbol assignment returns the physical device name of the terminal. If we break down the line into separate lexicals, we see:

1. F$GETJPI("","MASTER_PID") — This makes certain the process identification number returned is that of the parent process and not a subprocess without a terminal association.
2. F$GETJPI(master pid,"TERMINAL") — This returns the name of the user terminal.
3. F$GETDVI(terminal,"TT_PHYDEVNAM) — This returns the actual physical terminal name, necessary in case the user is logged in at a virtual terminal.

We stuff the current terminal width ("DEFBUFSIZ") in the symbol OLD. If the current screen width is 80, the terminal width is changed to 132; if it isn't

PROGRAM 1.

```
$! EDIT_AGAIN.COM --- Comments at end of file
$   save_verify = 'f$verify(0)'
$   org_mes = f$environment("message")
$   set message/nof/noi/nos/not
$   edit = ""
$!  "switch" to turn on procedure verification:
$   if f$trnlnm("edit_trace") .nes. "" then $set verify
$   on control_y then goto ABORT
$   on error then goto EXIT
$   bell[0,8]   = 7
$   wso := write sys$output
$   set terminal/noline     ! disable CTRL/C definition on VT220 F6 key
$   assign sys$login m_scr  ! logical for record directory
$!  parse command line:
$   if p1 .eqs. "" .or. -               ! re-edit or...
     p1 .eqs. "," then goto TEST_NAME  ! re-edit with new qualifiers
$   if f$extract(0,3,p1) .eqs. "REC" then goto RESTORE_FILE
$!
$  TEST_NAME:
$   if p1 .eqs. "" .or. p1 .eqs. "," then p1 = REDIT
$   if f$parse(p1) .nes. "" then goto GET_SPEC
$  BAD_NAME:
$   wso bell,bell,p1," is an invalid file specification. Please try again."
$   wso ""
$   goto NORMAL_END
$!
$  GET_SPEC:
$   file_spec   =  f$parse(p1,,,"name")
$   file_ext    =  f$parse(p1,,,"type")
$   extension   =  f$extract(1,3,file_ext)
$   file_name   =  file_spec+"_"+extension
$!
$! ----------| PUNCH THE TIME CLOCK |----------
$! /error is used to catch anything f$parse misses (like "*")
$   open/write/error=bad_name outfile m_scr:'file_name'.tr
$   mode := begin
$   gosub get_time
$   redit == p1
$!
$!-------| START OF SESSION TIME-STAMP |-------
$   write outfile ""
$   write outfile "File edited:         ",F$PARSE(P1)-";"
$   write outfile "Edit session started ",BEGIN_TIME
$   close outfile
$!
$  EDIT_FILE:
$   define/user_mode sys$input sys$command
$   edit/tpu/sec=evesecini 'redit' 'p2' 'p3' 'p4' 'p5' 'p6' 'p7' 'p8'
$   goto EXIT
$!
$  RESTORE_FILE:
$   define/user_mode sys$input sys$command
$   edit/tpu/recover/section=evesecini 'redit'
$   goto EXIT
$!
$! --------| CONTROL_Y TRAP |-------
$  ABORT:
$   wso bell
$! ---- if there is a NEW file designation, then redefine the redit symbol
$   if p1 .nes. "" then redit == p1
$   wso redit," Aborted by user."
$   goto normal_end
$!
$  EXIT:
$! ----------| PUNCH THE TIME CLOCK |----------
$   open/append outfile m_scr:'file_name'.tr
$   mode := end
$   gosub get_time
$!
$   gosub seconds
$   gosub minutes
$   gosub hours
$   total_seconds = f$string(end_seconds - begin_seconds)
$   if f$length(total_seconds) .eq. 1 then total_seconds = "0"+total_seconds
$   total_minutes = f$string(end_minutes - begin_minutes)
$   if f$length(total_minutes) .eq. 1 then total_minutes = "0"+total_minutes
$   total_hours   = f$string(end_hours   - begin_hours)
$   if f$length(total_hours) .eq. 1 then total_hours = "0"+total_hours
$   total_time    = total_hours+":"+total_minutes+":"+total_seconds
$!
$!-------| END OF SESSION TIME-STAMP |-------
$   write outfile "Edit session ended   ",END_TIME
$   write outfile "                     "
$   write outfile " TOTAL EDITING TIME: ",TOTAL_TIME
$   close outfile
$!
$  NORMAL_END:
$   set terminal/line/insert
$   close outfile
$   set message 'org_mes'
```

PROGRAM 1. . . . *continued*

```
$   exit_verify = f$verify(save_verify)
$   exit
$!
$!----------------------
$  WARNING:
$   wso bell,bell,p1," is an invalid file specification.  Please try again."
$   exit_verify = f$verify(save_verify)
$   goto normal_end
$!
$!-------------------| SUBROUTINES |-------------------
$  GET_TIME:
$   time          = f$cvtime(,,"time")
$   'mode'_time   = f$extract(0,8,time)
$   'mode'_hours  = f$integer(f$cvtime(TIME,,"hour"))
$   'mode'_minutes = f$integer(f$cvtime(TIME,,"minute"))
$   'mode'_seconds = f$integer(f$cvtime(TIME,,"second"))
$   return
$!-------------------------------------------------------
$  SECONDS:
$   if end_seconds .lt. begin_seconds then -
     end_minutes = end_minutes - 01
$   if end_seconds .lt. begin_seconds then -
     end_seconds = end_seconds + 60
$   return
$!-------------------------------------------------------
$  MINUTES:
$   if end_minutes .lt. begin_minutes then -
     end_hours = end_hours - 1
$   if end_minutes .lt. begin_minutes then -
     end_minutes = end_minutes + 60
$   return
$!-------------------------------------------------------
$  HOURS:
$   if end_hours .lt. begin_hours then -
     end_hours = end_hours + 12
$    return
$!
$!----|  EDIT_AGAIN.COM   by M. McCune   |-------------
$!
$! This is a command procedure to simplify repeated editing of the
$! same file using the vaxtpu EVE text editing interface and to
$! record time spent in each editing session.
$!
$! Install symbol in login.com  -----  EVE :== @EDIT_AGAIN.COM
$!   from vms $ prompt, the syntax is:
$!     EVE mydir:foo.bar <return>
$!   to easily call up the same file for a re-edit, just type:
$!     EVE <return>
$! To change the default 'edit' file, use step 1 with a new filename
$!-------------------------------------------------------------------------
$! -- VARIABLE DIRECTORY --
$!              redit          = file to be re-edited
$!              begin_time     = start time of editing session
$!              end_time       = ending time of editing session
$!              mode           = either 'BEGIN' or 'END'
$!              'mode'_hours   }
$!              'mode'_minutes } -- 'BEGIN' or 'END' time broken down
$!              'mode'_seconds }
$!              total_time     = total elapsed time of editing session
$!-------------------------------------------------------------------------
```

PROGRAM 2.

```
$! VT.COM
$ V = 'F$VERIFY(0)'
$ PTERM  = F$GETDVI(F$GETJPI(F$GETJPI("","MASTER_PID"),-
          "TERMINAL"),"TT_PHYDEVNAM")
$ OLD   = F$GETDVI(PTERM,"DEVBUFSIZ")
$ NEW = 80
$ IF OLD .EQ. 80 THEN NEW = 132
$ IF P1 .NE. 0 THEN NEW = P1
$ SET TERM/WIDTH='NEW' 'PTERM'
$ V = F$VERIFY(V)
$ EXIT
$! Jonathan W. Eveland
```

80, it's set back to 80; and if the user supplied a parameter, its value is used instead.

Posting Online

The use of bulletin board systems increases in the cold winter months, and it seems the number of VAX/Rainbow BBSs is growing as well.

The boards listed here are all FidoNet nodes, an international network of more than 2,000 public systems. These sysops (system operators) feature public message and file areas containing scads of information on Rainbows and/or VAXs. They all carry echos, a common message area that's repeated around the country to all participating nodes. So, it doesn't matter where you're located; the board carrying the VAX echo in California has the same messages as the one in Massachusetts (give or take a day or so for transfer time).

The format for the listings is board name, phone number, location, FidoNet address and SYSOP:

Beach City RB, (213) 376-9567, Redondo Beach CA, 1:102/139, Dan Cannon. The Truk Board, (617) 631-3304, Marblehead MA, 1:101/111, Mark Bornstein. PCLUG, (314) 576-2743, St. Louis MO, 1:100/22, Ken Kaplan. VAXCAT, (603) 424-0923, Merrimack NH, 1:132/777, Mark Buda. DEC User, (412) 469-2468, Pleasant Hills PA, 1:129/15, John Vukovic. The Pot of Gold, (703) 359-6549, Fairfax VA, 1:109/483, Kurt L. Reisler. Glacier Peak Rainbow, (206) 644-8431, Bellevue WA, 1:343/3, Gary Stebbins. And, of course, you can call reach me at SYS$OUTPUT, (412) 854-0511.

While you're perusing the boards, remember ARIS (see ARISTALK, page 20). It's a gathering place for DEC experts and has a ton of information online. Especially nifty is the cumulative index that facilitates finding topics in earlier *DEC PROFESSIONAL*s. Check your magazine's mailing label for your subscription number and call (215) 542-9458.

—Kevin G. Barkes is a specialist in VAX systems software, management, tuning and training, in Library, Pennsylvania.

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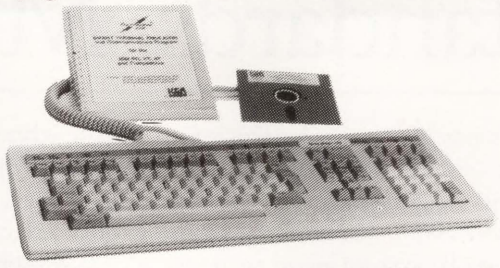

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LET'S C NOW

Rex Jaeschke

ANSI And ISO C Standards Meetings

Editor's note: Mr. Jaeschke has been representing DEC PROFESSIONAL *at ANSI and ISO C Standards meetings since September 1987. In this article, he reports on his activities at those meetings and the expected impact the standards will have on the C and DEC environments. He will resume his series with "Function Prototypes, Part II" in the April issue.*

Perhaps the best known standards organization in North America is the American National Standards Institute (ANSI). It produces standards for anything from nuts and bolts to audio tape characteristics. From my perspective, the more interesting standards are those relating to computing, and specifically, those relating to programming languages. Each standard has an official designation. X3 standards relate to computing, X3J to programming languages and X3J11 is for the C language.

The Committee's History

X3J11 first met in mid-1983 and was convened by Jim Brodie, then employed at Motorola in Phoenix, Arizona, and now head of his own consulting firm. Committee chairman since the group's inception, Brodie began the group because he had to write a C compiler, and he couldn't find an adequate (i.e., complete) definition of the language and library. His boss, who had experience with other language standards, told him that if there was no standard, he should make one. All he had to do was fill out a few application forms, announce the group's existence and start making a standard.

It's not quite that simple, although the history of X3J11's deliberations has been far less stormy than that of many other standards (FORTRAN's 8X is one example).

Purpose Of X3J11

The primary purpose of X3J11 is to consolidate existing practice, keep the spirit of C and define new capabilities that appear to be needed, particularly those necessary to keep up with new hardware and software technologies. Because members represent large client bases with millions of lines of C, we're not always able to do what's right. Sometimes we just have to leave things as they are or use what we call rubber teeth. We make a rather weak statement to declare our intent, realizing that there are numerous things about C that we cannot or dare not change.

Portability is a major concern. The standard must allow reasonably powerful yet portable (and non-portable) programs to be written. So there's a constant juggling and compromising act. When I asked Brodie to describe his role as chairman, he replied, "It's somewhere between a lion tamer and an orchestra conductor."

X3J11 has formal and informal representation with various other standards committees. These include graphics, SQL, POSIX (the portable operating system interface based on UNIX) and the European (and also U.S.) vendor consortium X/OPEN. So apart from standardizing C, we must juggle numerous technical and political issues with other standards bodies and in the case of POSIX, there's considerable overlap.

Membership

Besides Brodie, the other officials are Tom Plum, who acts as vice chairman, and P.J. Plauger, who is the secretary and international representative. Anyone from anywhere (not just the U.S.) may attend meetings and/or join the committee. There are two classes of membership: voting and observing. An observing member attends meetings sporadically, if at all. He joins to receive copies of the mailings and keep current with the standard's activities. Observer status costs about $150 per year.

Voting members pay $200 per year and typically attend meetings on a regular basis. In fact, to vote, you (or your company's designated alternate) must attend two of every three meetings. This mechanism prohibits people from voting without the benefit of the discussions at recent meetings. Because draft standards can change significantly from one meeting to the next, this is a reasonable attendance requirement. Attendance, by the way, is indicated by a member's presence when the attendance sheet is passed around each morning. Strictly speaking, you must attend for three of the five meeting days to be considered present.

Each company is allowed one vote on any issue. However, alternate and observing members from the same company may attend and participate in any debate. Wholly owned subsidiaries are considered part of the parent company and aren't allowed a vote. For example, both Lattice and the SAS Institute were voting members, but when SAS acquired Lattice, it was permitted only one vote.

Membership consists of a wide range of companies and individuals. The major hardware and system software houses are represented. They include AT&T, Alliant, Amdahl, Apollo, Apple, Borland, Charles River Data Systems, Computer Innovations, Concurrent Computer, Cray Research, DEC, Data General, GE, Gould, HCR, Harris, Hewlett-Packard,

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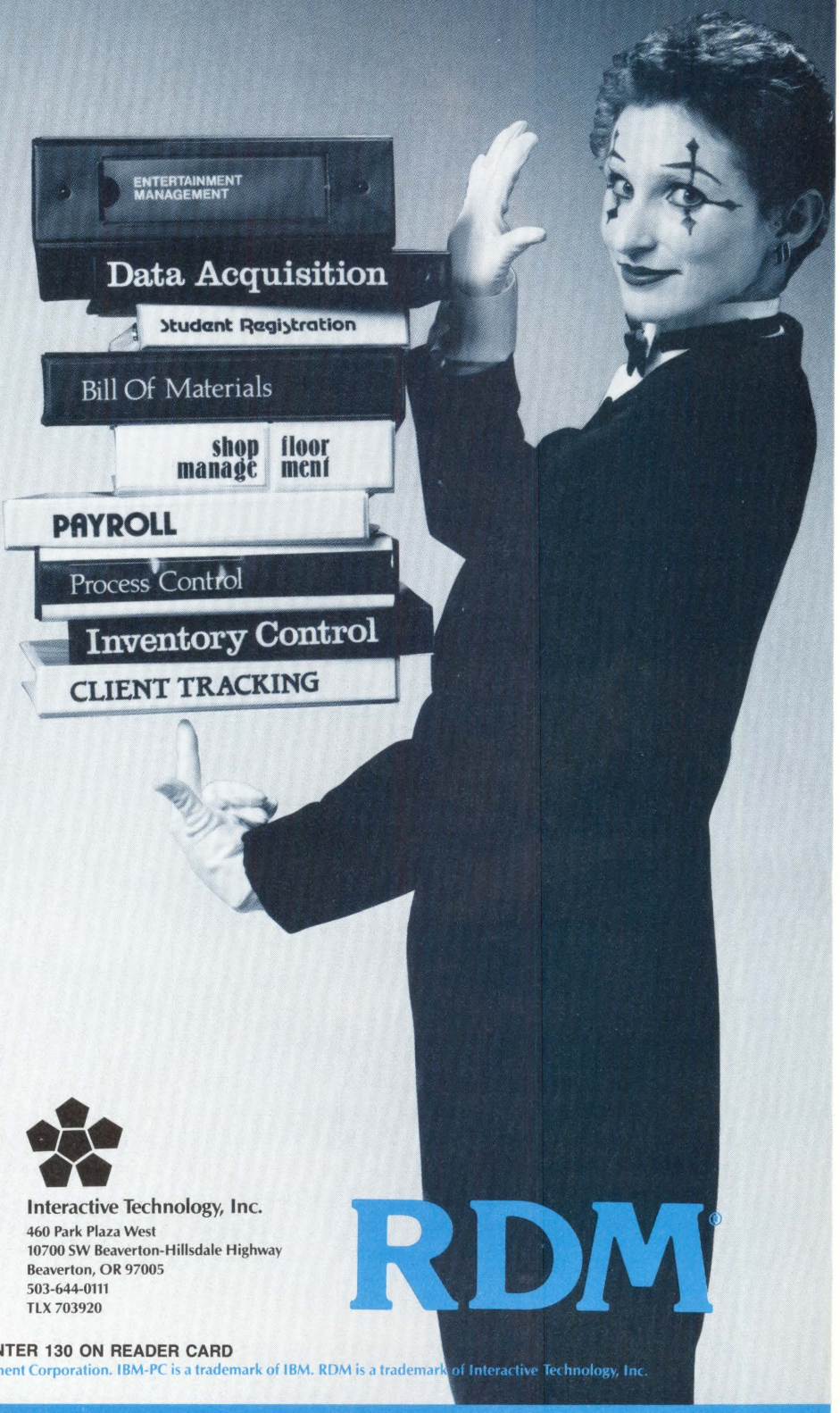

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Contrary to other standards committees, such as FORTRAN, X3J11 is dominated by compiler writers (i.e., implementers) who have a customer base to support and defend. Although a few large users and academic institutions are members, they aren't regular meeting attendees and have had little impact on the standard's direction. However, this isn't to say that the standard ignores users; the vendors don't want to do something that their users won't like or use.

Voluntary Effort

Contrary to popular belief, it's not necessarily a privilege to serve on a standards committee. You're not invited or appointed by some sacred authority to "go and deliver the pagan programmers and implementers from their programming sins." No, what it takes is time, money and enthusiasm. You pay to be a member, pay to get to meetings and to eat, drink and get a little merry, take the week off (and for many of us that means without pay) and spend time between meetings reading all the documentation in the mailings, critiquing the most recent draft standard and writing new papers for the next meeting.

ANSI standard activities are voluntary, and no one receives any honorariums. Every postage stamp and sheet of paper is donated by members, who also give large amounts of their time. Each meeting is hosted by one or more members. The host finds a hotel or conference facility that has meeting space and accommodations for about 50 people for a week. He arranges for morning and afternoon drinks and snacks and takes care of the photocopying that seems to be required during each meeting. Most important, he has to come up with a directory of the best restaurants in town.

At the end of each meeting, a volunteer agrees to do the next mailing. This involves duplicating, hole punching and mailing about 500 pages to 350 people.

First Public Comment Period

In September 1986, we submitted the draft standard for its first public comment period. This lasted for four months, from November 1986 through March 1987. Until that time, a simple majority was needed to get something into the standard. However, after public comment had begun, a two-thirds majority was required to change the draft.

That public comment generated about 30 or 40 letters and raised 400-500 points, many of which were quite reasonable and substantial. Under ANSI rules, we're obliged to respond formally in writing to each public comment, and we must provide an explanation satisfactory to the submitter. We cannot answer simply, "Thank you for sharing that with us." We must be constructive and make sure everyone gets a fair hearing.

The need to respond led to the generation of a response document. Because many answers were the same or similar, a database of canned answers was created. Managing and generating the actual responses was completed by volunteers between meetings.

To stave off questions during the public comment period, the draft standard was accompanied by the rationale document. This explains what was included and left out and why. It also talks about K&R, UNIX and the other sources from which ideas were adopted or adapted. It's like a users guide for the more formal standard itself. Like the draft editor, the rational editor has to pay close attention during meetings, so he can revise his document to reflect the wishes of the formal votes in committee.

What Next?

At the December 1987 meeting in Austin, Texas, the draft again was voted out for formal public review. (It took us three meetings to analyze and respond to all the previous public comments.) It was cleaned up substantially and enhanced over the one issued a year earlier. The two-month public review period ends April 12.

We'd like to be able to vote out the draft as a formal public standard at the upcoming meeting in Nashua, New Hampshire. However, for that to occur, we have to get through all the public comments at that meeting, and we have to make no substantive changes to the draft. If we make substantive changes, we have to go out for another two month public review, and the process is repeated until we get it right.

At this stage, the vast majority of voting members are happy with the current state of the draft standard. However, if there are more public comments than we can handle in a week, we will be delayed another meeting (or more), even if there are no substantive changes made as a result. The earliest that we could vote out a standard is April 1988, with ratification by the X3 parent body within three to six months.

The ISO C Standard

Recently, I attended the third meeting of ISO/TC97/SC22/WG14, otherwise known as the ISO Working Group for the ISO C language standard. The meeting, held at Vrije University in Amsterdam, on November 16 and 17, was attended by representatives from the Netherlands, Denmark, U.K., France, Finland and the U.S.A.

The convener of WG14 is P.J. Plauger, president of Whitesmiths and secretary of the ANSI C X3J11 Standards Committee. Plauger acted as meeting chairman and I assumed the duties of secretary.

By and large, the international community is satisfied with

ANSI's efforts to date in producing a C standard that will suffice for both U.S. and international needs. However, there were several specific objects. The British Standards Institute (BSI), U.K.'s equivalent to ANSI, still had a number of issues outstanding, many of which pertained to the preprocessor.

The main show stopper, however, was France's indication that it would vote against any ISO C standard that didn't force parentheses to group in all circumstances. Currently, compilers are permitted to ignore grouping parentheses in associative and commutative expressions such as a + (b + c) and (a * b) * c.) This is by no means a new issue and it has been the subject of debates and votes on several occasions within X3J11. However, each time, the attempt to force grouping was defeated. It was voted on again at the December 1987 meeting in Texas, and this time it passed. (For your information, I voted for it each time the issue was debated.)

The main outcome of the two-day meeting was a draft of all major concerns that was forwarded to the December ANSI meeting for consideration. Because it's the stated intent of the X3J11 committee to have the same standard for both ANSI and ISO, the concerns of the international community must be taken seriously.

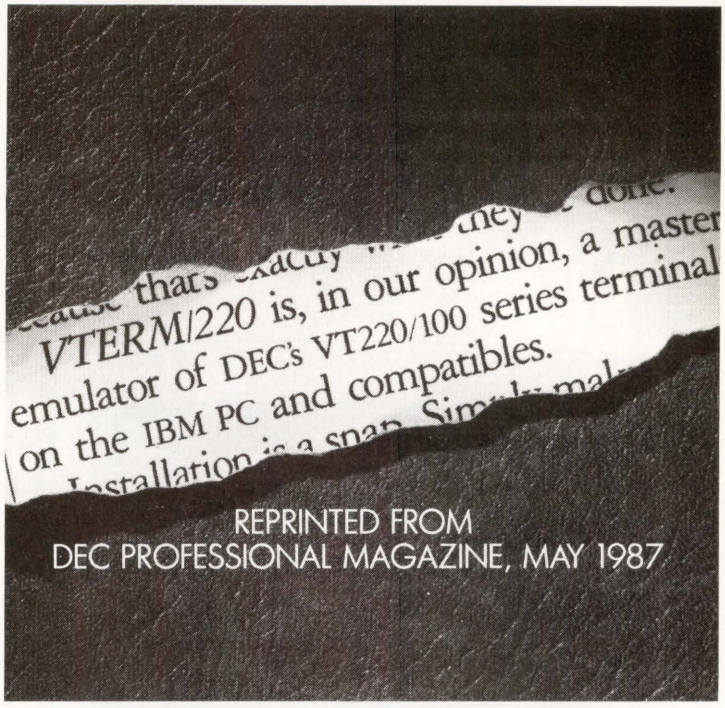
ANSI, ISO And DEC

I'm happy to say that the draft standards allow a very reasonable and powerful C implementation to be built for DEC proprietary hardware and operating systems. I expect that DEC will have an ANSI-conforming version of VAX C eventually. But don't hold your breath, because support for other internal hardware releases, etc., will take precedence over ANSI support. The current release of VAX C is V2.4. I expect one or two minor releases before V3.0, which is not likely to be ANSI/ISO-conforming. My guess is that conformance will come with V4.0, sometime in mid- to late 1989, provided we've finalized the standard by then.

DEC is represented on X3J11, both with its own representatives and others like Plauger and myself, who perform DEC-related activities. In fact, several changes have been made to the standard to accommodate the VAX hardware and VMS software environments. (In a recent column, I discussed how the VAX stack was limited when passing structures and unions by value. The stack may consist of 255 longwords at most.) Other things have been done to accommodate VAX C, because it's a one-pass compiler.

The big announcement is that DEC currently is working on its own C compiler for its proprietary PDP-11 operating systems, and I believe it will be a full ANSI/ISO implementation. So who said the PDP-11 was dead? Look for solid support for the PDP-11 series through the end of this century and not just with C, perhaps even PASCAL and MODULA 2 as well.

Regarding ULTRIX, starting with V2.0, two C compilers were bundled, pcc and vcc. Pcc is the original UNIX-based compiler written by Steve Johnson while vcc is VAX C ported to ULTRIX. The VMS linker also was ported to ULTRIX as LK



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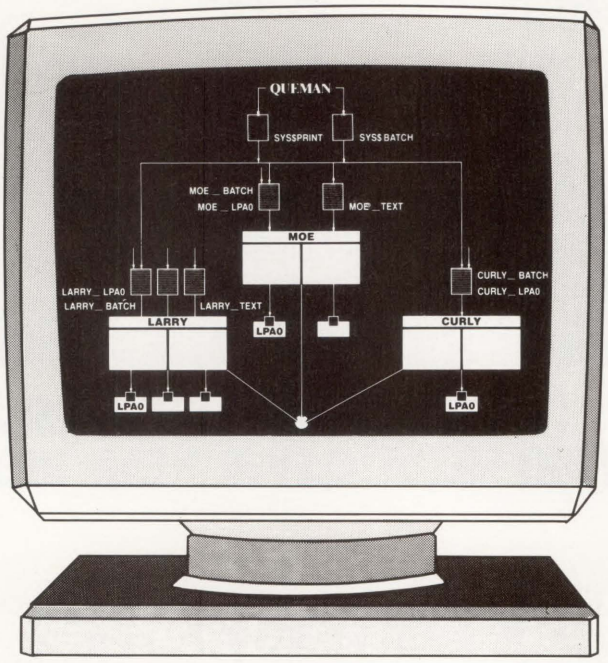

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so that VMS object modules can be linked under ULTRIX. This approach means that more layered product objects on VMS can be moved to ULTRIX without requiring each language compiler to run in native mode on ULTRIX, a smart strategy.

VAX C and vcc are really the same product, so moving code between them should be quite easy, except for perhaps some operating system-specific library calls. My guess is that as soon as the ULTRIX kernel can be compiled with vcc, pcc will be relegated to the back seat. There's no point developing and maintaining two ANSI/ISO-conforming compilers when one will suffice, particularly when pcc is someone else's product to begin with. I doubt, though, that pcc will be dropped from the ULTRIX distribution in the foreseeable future, because so much code depends on it. It makes no sense to convert all that code to vcc just to get the same results.

Future Meetings

The X3J11 meetings for 1988 are as follows: April 18-22, Nashua, New Hampshire; August 15-19, Cupertino, California; December 12-16, Seattle, Washington.

The next ISO C meeting is scheduled for June 13-14, 1988, at the offices of BSI in London.

I plan to attend all of these meetings.

To join X3J11, contact the Vice Chairman Tom Plum at Plum Hall Inc, 1 Spruce Ave, Cardiff NJ 08232, (609) 927-3770.

To get a copy of the latest ANSI draft and rationale documents, call Global Engineering Documents, Inc., Santa Ana, California, at (800) 854-7179 or (714) 540-9870. Single copy price: $65.00; international price, $84.50.

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

Correction

An error occurred in the first program segment on page 110 in the January "Let's C Now" column, titled "Arrays and Subscript Zero." The line that reads:

```
pd = (double *) malloc (NUMELEM);
```

should read:

```
pd = (double *) malloc (NUMELEM * sizeof(double));
```

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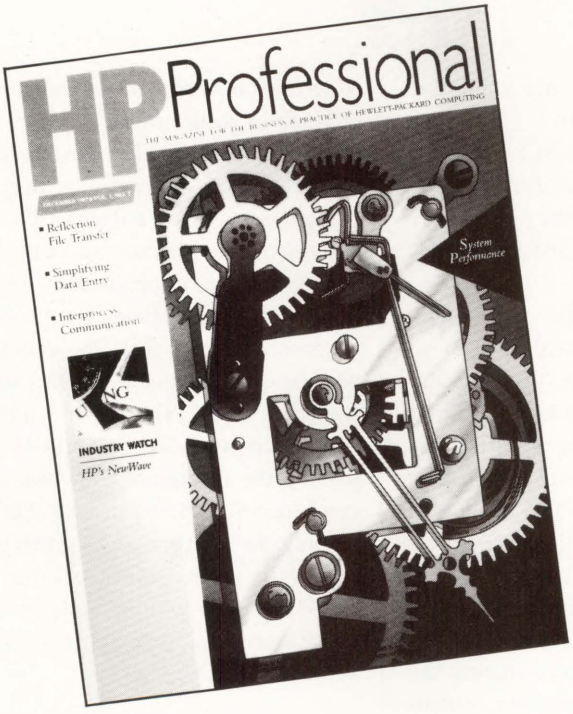

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FROM THE LAB

Kevin G. Barkes

Dynamic Load Balancer

Do you contemplate retirement while waiting to log on to your heavily loaded VAX? Does it take less time to walk to the other side of the building to personally deliver a message than it does for MAIL to come up when invoked? Do you spend more time with AUTOGEN than you do with your family? Does the term "response time" cause you immediately to assume a fetal position?

If you answered yes to more than one of these questions, you're probably the system manager of a VAX whose use has exceeded projections (and your capital budget as well).

Until recently, the only quick fix to this problem was the acquisition of hardware, memory, disks, or even a faster CPU. This can be frustrating when a thorough analysis of resource utilization indicates that performance degradation can be blamed on a small number of system hogs that can't be regulated properly through available VMS control mechanisms.

The major stumbling block managers face in tuning a system is that the stated goal is to optimize the SYSGEN parameters for an average load, which is quite frequently a mathematical figment of the imagination. A CPU with scores of interactive users performing varying tasks has characteristics that change on a minute-by-minute (or second-by-second) basis. There's no practical way for a system manager to compensate for these rapidly changing resource demands.

Put simply, many performance problems would disappear if VMS could be made more intelligent and responsive to demands placed on it.

> ***DLB uses an enhanced algorithm to more equitably distribute CPU time and physical memory by constantly altering dynamic SYSGEN parameters and individual process resource allocation.***

Touch Technologies of San Diego, California, offers *Dynamic Load Balancer (DLB)*, which addresses the problem by working smarter, not harder.

Supercharging VMS

DLB uses an enhanced algorithm to more equitably distribute CPU time and physical memory by constantly altering dynamic SYSGEN parameters and individual process resource allocation. The program is written in BLISS-32, the same language as the operating system.

Running as a detached process on VAXs using VMS 4.0 or higher, *DLB* uses approximately 5 KB of dynamic pool. It does no I/O to disk, instead storing the information it needs in two system logical names. Its author claims *DLB* uses only about five minutes of CPU time a day to work its magic; during our testing on a saturated 11/750, *DLB* actually consumed a bit more than seven minutes. But considering the vast improvement in response time that was realized, we're not going to quibble about a few minutes.

DLB has three operating modes: normal, worry and panic. The program automatically chooses its mode based on system load and available memory. In normal mode, *DLB* looks at the system every 90 seconds; it does sampling every 30 seconds in worry mode and every six seconds in panic mode.

DLB learns the resource requirements of processes as they run, compares them to current CPU load, and distributes memory and CPU cycles in such a way as to prevent any one process from monopolizing the processor. It accomplishes this by modifying process-specific characteristics such as working set size and SYSGEN parameters such as QUANTUM (controlling the amount of CPU time a process receives), WSINC and WSDEC (controlling the number pages given to and removed from the working set), GROWLIM and BORROWLIM (controlling the working set extent mechanism) and several others.

DLB In The Real World

One of my clients was experiencing severe performance problems on his 11/750 system. DEC's response was, naturally, to recommend the purchase of an 8250 and to relegate the 750 to the scrap heap.

This was not a viable solution; the client couldn't justify the purchase of another system. I performed the typical performance enhancement steps, installing images, adjusting working set sizes to optimum levels, distributing files

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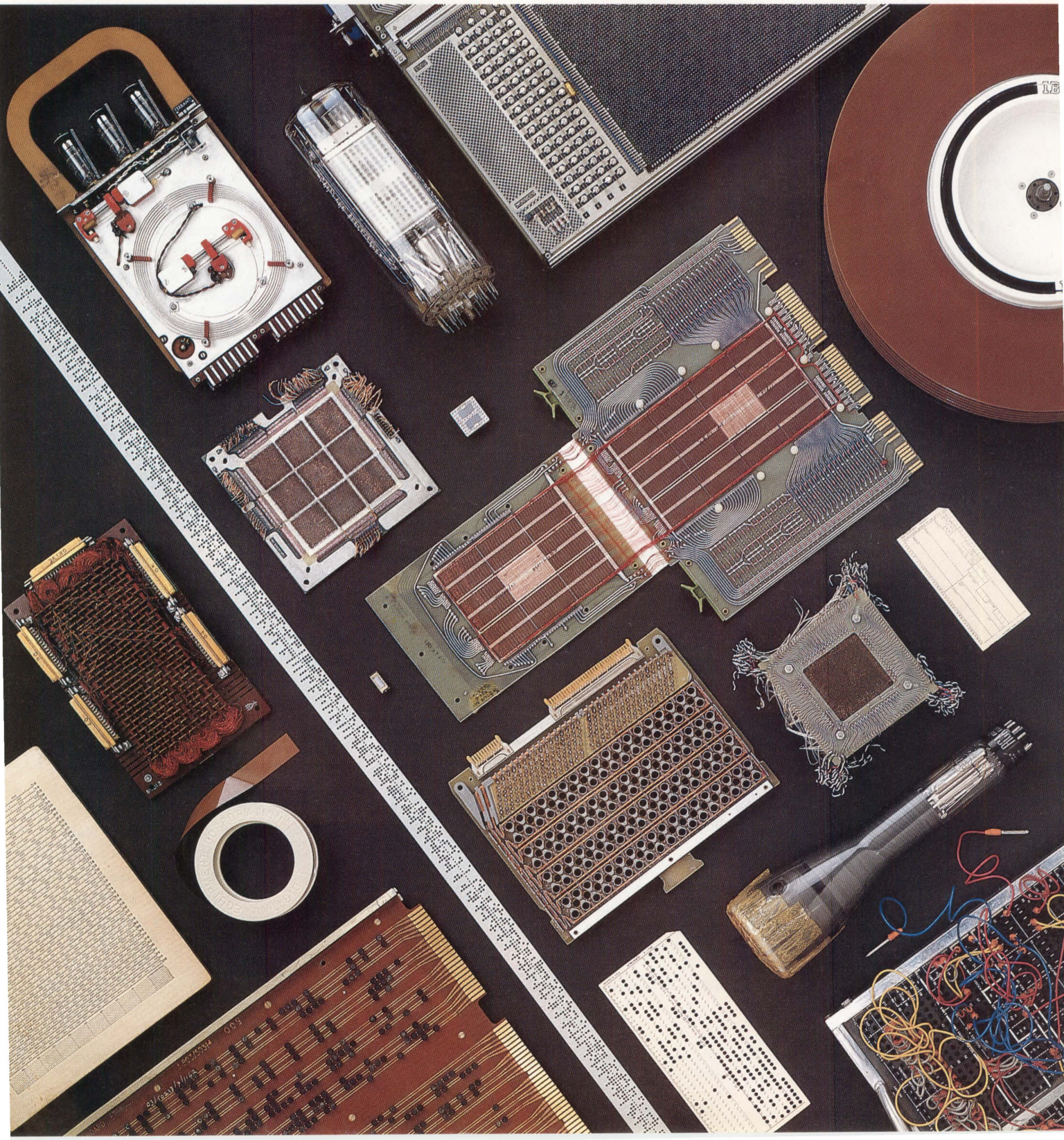

across drives, etc. Performance did improve, especially during times of moderate load.

But the system still came to a virtual standstill during peak load periods. It wasn't unusual for a login to take more than two minutes, and waits of a minute or more to edit a modest file with EVE were common.

The problem was simply one of overloading; the old 10 pounds in a five-pound bag syndrome. When a CPU- intensive program was run with more than 30 users on the system, the 750 seemed to wander away slowly.

Figuring I had nothing to lose, I fished TTI's press release out of the pile on my desk and called. The demo tape arrived via Federal Express the next day. A 30-day evaluation package costs $69.95.

Installation was straightforward and the documentation clear. Create a directory on the system disk, restore the backup saveset and edit the system startup file to call the command procedure that invokes *DLB*.

The next step involved modifying 15 SYSGEN parameters: MPW_HILIMIT, MPW_LOLIMIT, MPW_WAITLIMIT, SYSMWCNT, IRPCOUNT, IRPCOUNTV, WSMAX, NPAGEDYN, NPAGEVIR, PAGEDYN, VIRTUALPAGECNT, LRPCOUNT, LRPCOUNTV, SRPCOUNT and SRPCOUNTV. Actually, only six parameters required changing; the remainder already met or exceeded the recommended values.

The major changes were the MPW_ values that control how VMS manages the modified page list. MPW_HILIMIT and MPW_WAITLIMIT were set to 2,500, and MPW_LOLIMIT was increased to 1,250. This essentially turns control of the modified page list over to *DLB*.

For *DLB* to modify process parameters efficiently, wholesale changes had to be made to all user accounts in the UAF. Being a coward at heart, I made a backup copy of SYSUAF.DAT before changing everyone's WSDEFAULT to 250, WSQUOTA to 750 and WSEXTENT to 3,000.

The only major problem came during the final step. *DLB* makes extensive use of the page and swap files as a filter for process control. The program needs both files to be twice the size of the physical memory of the CPU; in the case of this 8-MB VAX, that's 32,768 disk blocks for each file. The manual warned that smaller values could cause processes to go into various wait states.

Touch Technologies provides a sample program to use for saturating the system for benchmarking purposes.

There was insufficient space on the disks to install secondary paging and swapping files, and the system disk was fragmented sufficiently to prevent extending the existing files. A backup/restore cycle was required to free up enough contiguous space to complete the installation.

After a quick reboot, *DLB* was up and running. Touch Technologies provides a sample program to use for saturating the system for benchmarking purposes, but users were clamoring to get on the system. A live test would have to do.

Watching the system with MONITOR/PROCESS/TOPCPU initially revealed little. *DLB* would pop up every minute or so as tti_dlb, but that was it. It wasn't until the system hit peak load that the value of *DLB* became obvious.

Instead of one or two processes hoarding half the CPU, no single process received more than 10 percent. Both soft faults and hard faults were reduced significantly (hard faults by more than 50 percent), based on comparisons to the previous day's statistics at the same load period. The free page list never dropped below 1,100 pages during the

Mopping The Deck On The Titanic

Our 15-MB 750 was a mess. We'd been building up to an LAVC for many weeks and the last week before the cluster had to be the ultimate cruelty man could inflict on machine. The poor thing was taking up to 80 seconds to start MAIL!

The utilization was about 40 active users running everything under the sun including large doses of *MASS-11*, screen-intensive circulation data entry, DECNET, bunches of ARIS and a few batch jobs thrown in for fun. No better baseline for a product that proposes to improve the impossible!

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3. Actual available memory in SHO MEM.
4. Jobs in compute mode from nearly 20 seconds to seven or eight seconds. Not only can you measure it, you can feel it.

No other hardware modifications were made to the machine during the test. The only changes were the SYSGEN parameter changes mandated in the installation instructions. We're looking foward to trying the LAVC configuration on machines that are pushed, but not dying! —*Dave Mallery*

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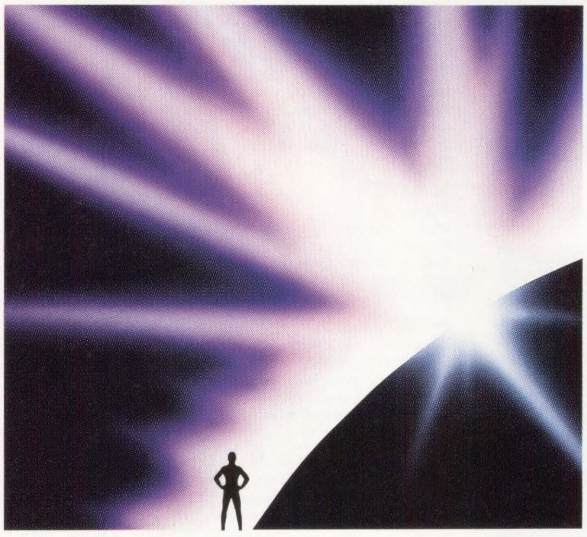

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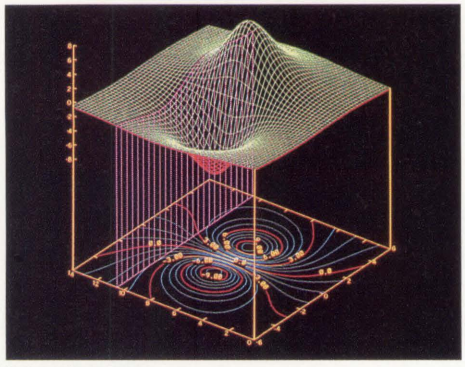

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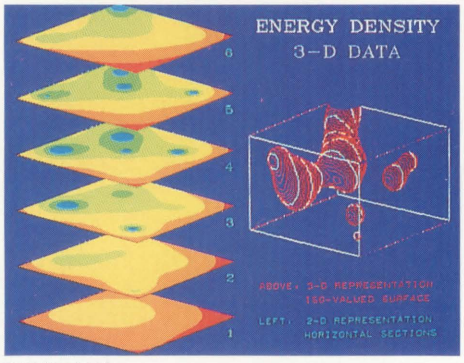

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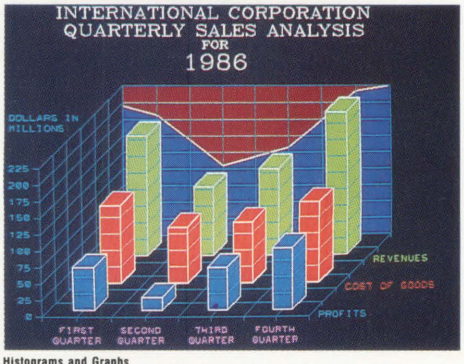

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two-hour monitoring period; it had sunk as low as 300 pages the previous day.

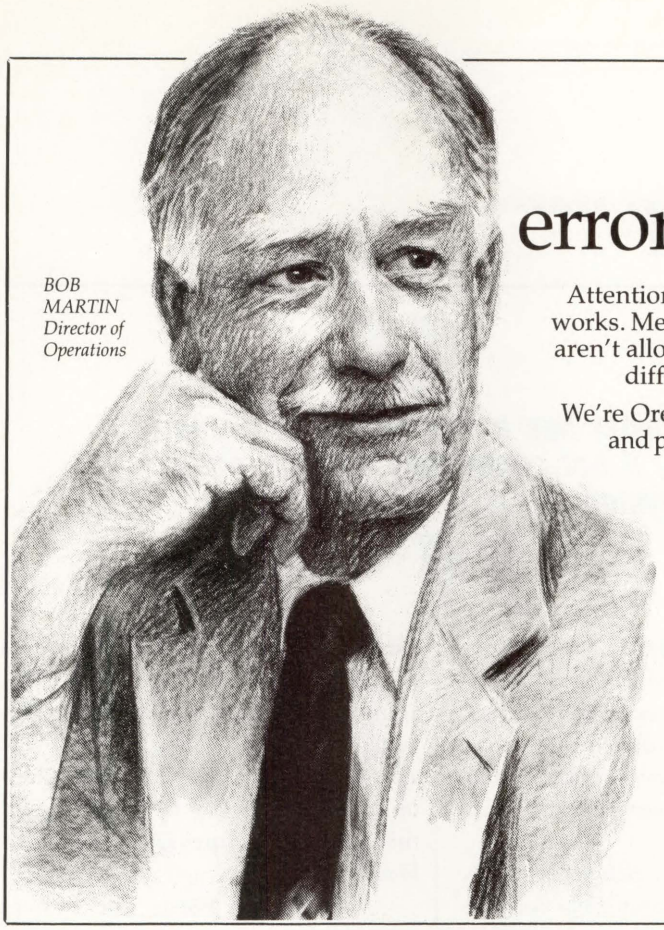
A login that required a minute and a half to execute took less than one minute. Response time, while certainly not subsecond, was a respectable three to four seconds for the SHOW MEMORY command. A SPAWN MAIL command that took 47 seconds to execute without *DLB* required 34 seconds with the software operating; that's an improvement of roughly 30 percent and somewhat higher than the 25 percent claimed by the company.

DLB, in this instance at least, improved interactive user response time sufficiently to delay the acquisition of additional hardware. Although the system still was slow during high load, it never appeared to come to a complete halt. Users found the difference to be noticeable and commented favorably to that effect.

It should be noted that *DLB* didn't pull CPU cycles out of thin air; it just distributed available resources more equitably.

I would expect 750 and 780 sites to be the primary market for *DLB,* although the software will run on any VAX. The price is reasonable, especially when considering the cost of the hardware necessary to provide a similar increase in performance.

Thanks to *DLB,* users of ancient technology VAXs will be able to defer the purchase of newer CPUs for a bit longer. As the local field service rep commented while doing the PM on the old 750 warhorse, "Sales is calling this 750 'The thing that wouldn't die.' " That pleases the system manager to no end.■



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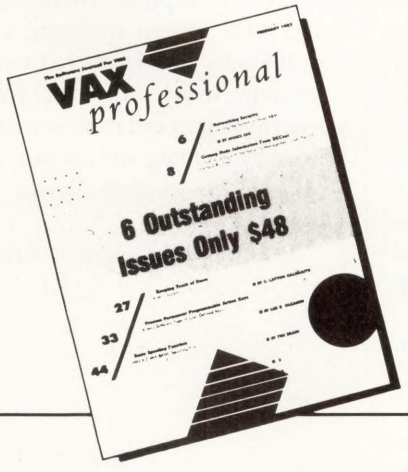

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3/88

FROM THE LAB

V-X Master

David W. Bynon

There's an ongoing debate among many of us as to what constitutes a workstation. The term is used loosely to mean many different things. However, to many of us, a workstation is a piece of hardware combined with some software to make someone more productive. That's what *V-X Master*, from American Management Company of Lexington, Massachusetts, does for the VAX system manager's workstation.

V-X Master is a menu-driven VAX/VMS system management package and menu development tool. I discovered *V-X Master* at the annual Federal Computer Conference in Washington, D.C., late last year. Michael Cline, vice president of American Management Company, was reeling in the crowd with his giant color demo. "What a catch," I thought. "VAX sites with limited or inexperienced systems management will love it."

To understand what makes *V-X Master* a productive tool for VAX system managers, you first must look at the heart of the product, *Menu Master*. *Menu Master* is a VAX/VMS menu development package. American Management Company markets *Menu Master* by itself or as a bundled package with *V-X Master*. *V-X Master* is a product within a product.

Menu Master provides an open architecture for application developers and system managers. It can be used to customize *V-X Master*'s menus and functions or to build new menu systems for your own applications. Best of all, every *Menu Master* menu looks, works and feels the same, making user training a snap.

> **V-X Master *has a rich set of functions to aid, if not completely control, daily system management of a VAX.***

Menu Master understands that some accounts are captive while others, which may use the very same menus, are interactive. *Menu Master* detects captive accounts and shuts down features that would compromise user captivity, such as access to DCL.

V-X Master has a rich set of functions to aid, if not completely control, daily system management of a VAX or MICROVAX system. No single system is too large or too small for *V-X Master*.

The Main Menu divides management tasks into six distinct sections: SYSTEM MANAGEMENT, USER MANAGEMENT, PORT/INTERCONNECT MANAGEMENT, QUEUE MANAGEMENT, DISK MANAGEMENT and SECURITY MANAGEMENT. Each section has one or more menu selections. For instance, DISK MANAGEMENT has two menu selections: Disk Space and Back Up the System. Selecting any of these menu choices presents another menu. Screens 1 and 2 represent the types of menus presented by *V-X Master*.

A key ingredient of *V-X Master* is its documentation. It's contained in a single two-inch-thick volume that is well written and easy to understand. The documentation explains how to use *V-X Master* and *Menu Master* but, more important, it documents the tasks, responsibilities and functions of a VAX system manager.

In this single volume is enough useful information to assist a new system manager in bringing up and managing a MICROVAX or non-cluster VAX system. To a new or inexperienced VAX system manager, the *V-X Master* documentation will be far more useful than Digital's entire set of *VAX/VMS Handbooks*.

V-X Master assists the system manager by providing an easy-to-use interface to VAX/VMS management utilities and commands, such as AUTHORIZE, BACKUP, MONITOR and ACCOUNTING. These facilities are typically time consuming and frustrating to learn. *V-X Master* puts them at your instant disposal simply by selecting menu options and providing input to questions, such as a user's name, disk name or a time. Using *V-X Master*, a novice can outperform the seasoned professional in daily tasks such as adding new users, disk backups and reporting.

When the *V-X Master* demo kit arrived, I was skeptical. After all, a seasoned VAX system manager, such as myself, doesn't need to be led around by a whimpy menu. After all, real VAX system managers can recite the DCL dictionary by memory and do most of their work on the console device. I was wrong.

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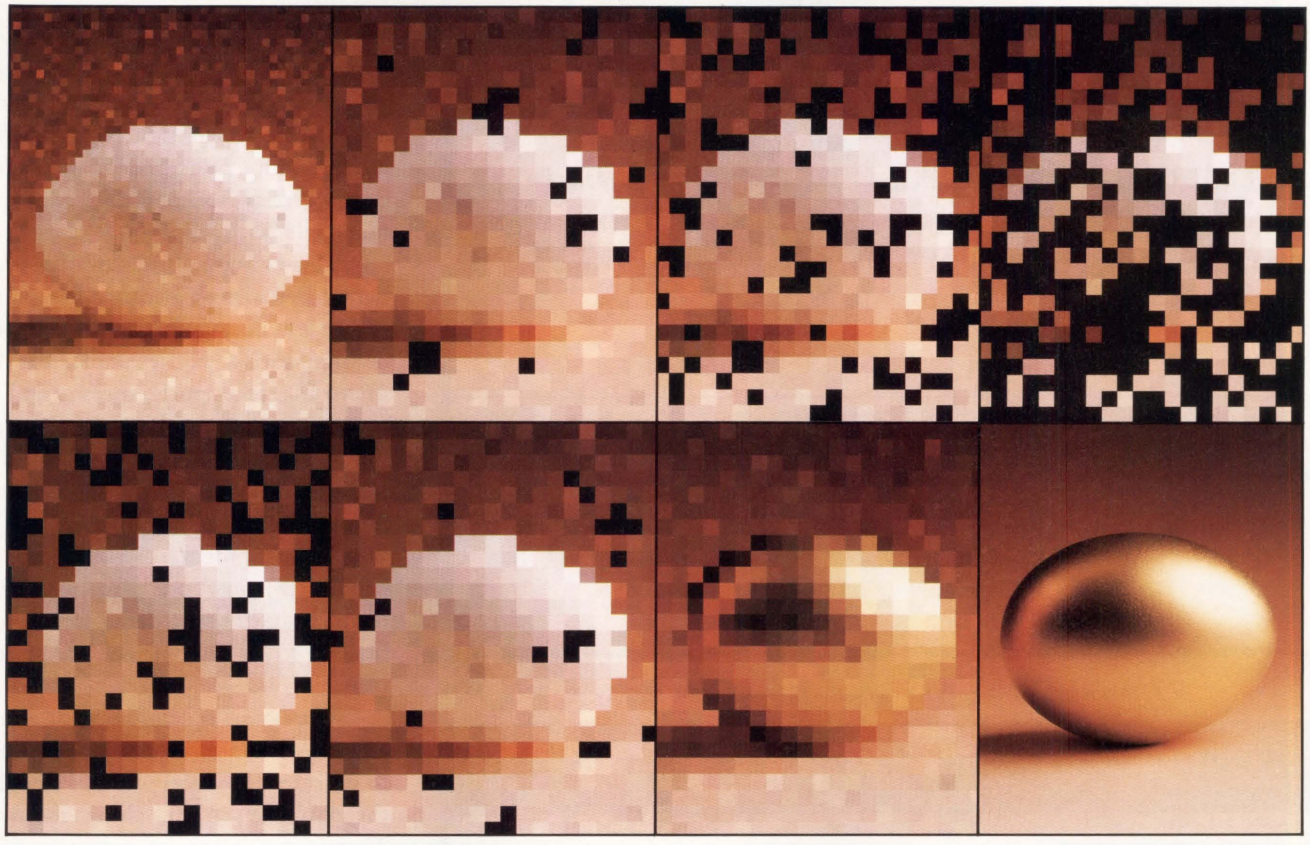

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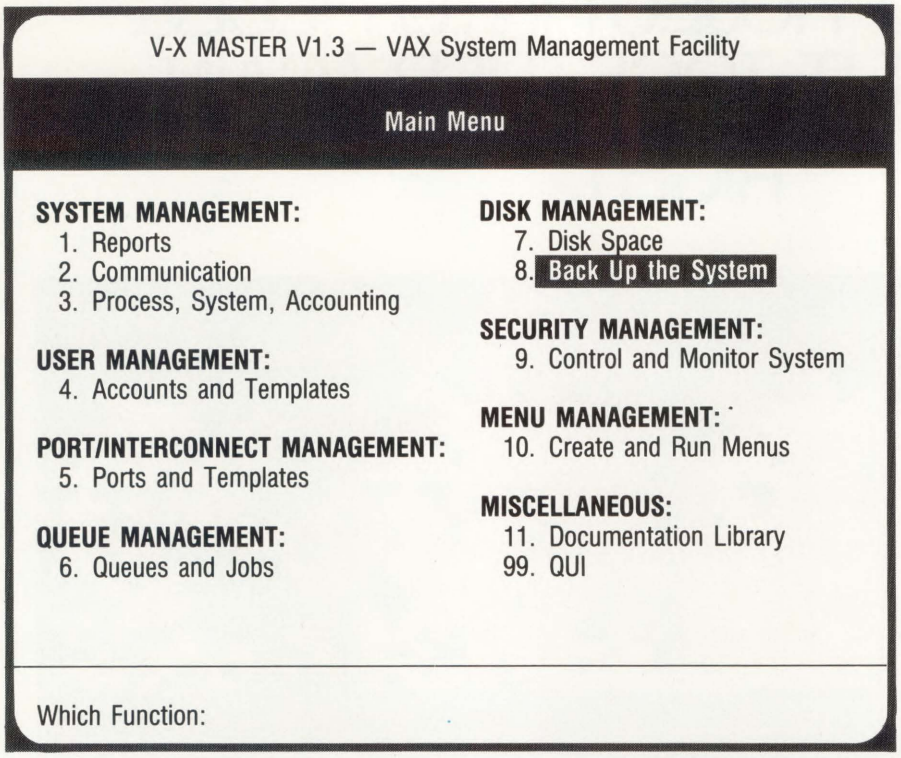
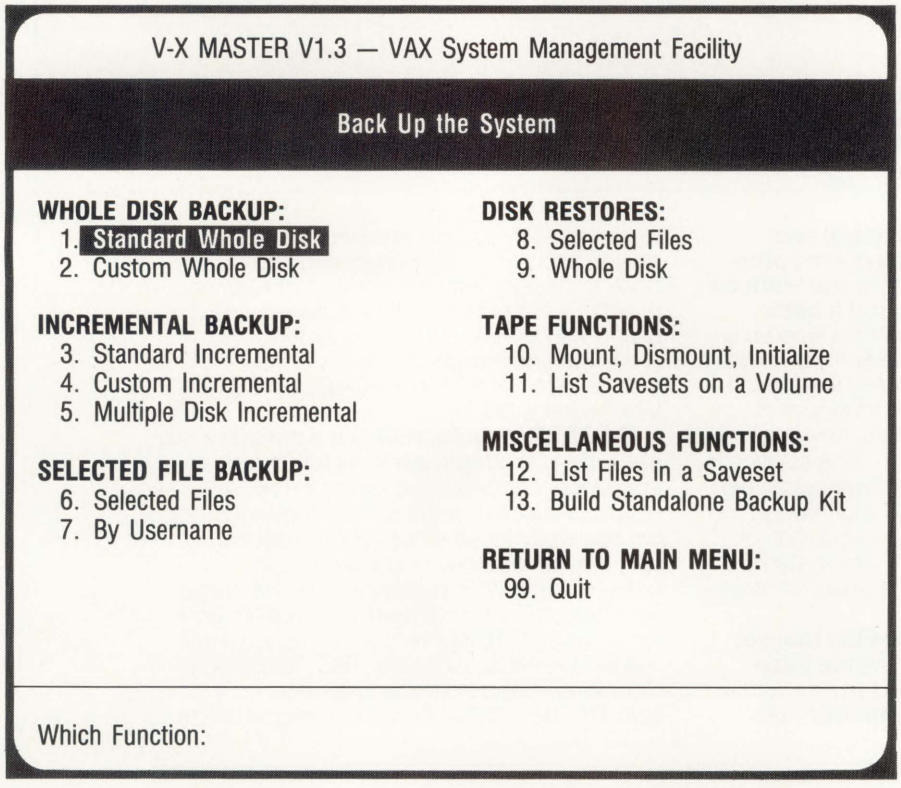


Screen 1: Choices available from Main Menu.



Screen 2: Choices available to back up the system.

become the mirror image of a good system manager. *V-X Master* can be taught the special needs of any system by including menu selections to your procedures or programs. With *V-X Master*, the system manager doesn't have to worry about taking time off or going on vacation; anyone can take care of the system.

V-X Master also is equipped with some advanced features that the seasoned veteran will appreciate. To name a few, there are configuration libraries, an expert mode, shareable image activation, a screen capture facility and command file post processing.

The configuration libraries are a handy mechanism because they allow the system manager to define and store configurations. For example, the *V-X Master* file stores port templates and information about your system's serial ports. The port templates are used to define port characteristics; i.e., baud rate, number of data bits, parity, etc. In this way, a port, for a particular type of equipment, only needs to be defined once. Also, the port definition file can be used to set up your ports at startup time.

The expert operation mode allows anyone who is familiar with *V-X Master* to execute a function without stepping through each menu along the way. There are a couple of methods. First, *V-X Master* allows you to stack commands by separating them with semicolons (;). Second, *V-X Master* treats any command that it doesn't understand as a VMS global symbol, translate it and use the resulting character string as input to *V-X Master*. It makes using *V-X Master* a little bit faster and very flexible.

I was disappointed that *V-X Master* didn't include management functions for DECNET or clusters. So, I decided to add the functions. It was time consuming but very simple. I now have functions to add and remove DECNET nodes, define lines and circuits, shutdown and startup DECNET and so on.

Cluster functions include adding and removing members, changing quorum and changing the cluster password. Also, I included more reporting and monitoring features. I'm pleased with the results. I hope future versions of *V-X Master* include functions for network management, cluster management and multisystem management.

Many new MICROVAX or small VAX sites, which would derive the most benefit from this software, may have trouble justifying its cost. Consider this: Most VAX and MICROVAX system managers spend about 20 percent of their time developing and testing command procedures to manage their system. Based on the average VAX system manager's salary, that adds up to from $6,000 to $9,000 per year, far more than the $3,500 price tag for a MICROVAX II *V-X Master* license.

Still not convinced? Then consider that *V-X Master* provides many of the same services of a VAX/VMS DECSTART package at a fraction of the cost. And, *V-X Master* stays with you. The Digital DECSTART software specialist leaves.

If you're interested in the menuing capability only, *Menu Master* can be purchased separately for a mere $700 to $4,700, depending on the size of your CPU. Multiple CPU discounts are available for both *Menu Master* and *V-X Master*.

V-X Master isn't the most exciting software in the world, but then again, system management isn't very exciting. *V-X Master* is software for the system manager who needs to get the job done, whether he knows how to do it or not. *V-X Master* is workstation software for VAX system managers. ■

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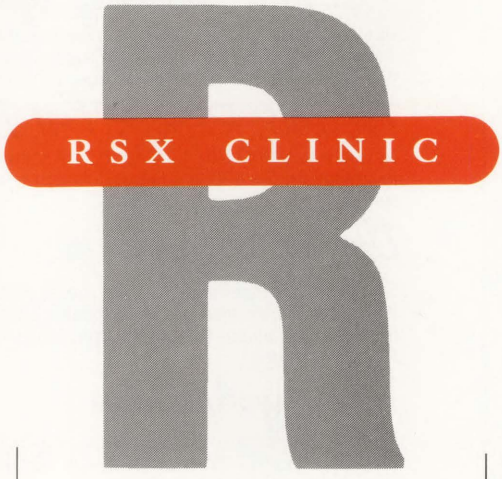

FAST MAPS

QUESTION: *We want to use the fast mapping feature of RSX-11M-PLUS V3.0. We routinely use IOT instructions to abort our MACRO-11 programs when they get into trouble. Will we have to change them?*

REPLY: You must go through your code and convert the existing IOT instructions to proper exits before you can incorporate fast mapping into your code.

We've all been taught in MACRO-11 classes to use IOT instructions as an "instant abort" mechanism, but this technique usually is left in the classroom where it belongs. Real RSX software should recover properly from errors or at least exit with status, not just throw up its hands and abort.

This use of IOTs rules out the use of fast mapping, a high-speed memory mapping technique in RSX-11M-PLUS V3.0. Your task issues an IOT instruction to initiate fast mapping. An IOT that's been planted in the code for the purpose of causing an instant abort now will cause a call to the fast map routines. Because the fast map routines do minimal error checking (that's one reason they're so fast), they'll probably attempt to do a memory remap using whatever parameters appear in the registers and on the stack. The results, as the manuals say, are unpredictable.

By James A. McGlinchey

I respond to those questions that are interesting and applicable to the general RSX user. Please mail your questions to: RSX Clinic, *DEC PROFESSIONAL*, P.O. Box 503, Spring House, PA 19477-0503. Questions also can be submitted through ARIS.

VINTAGE SYSTEM

QUESTION: *Can the CPU size be changed in RSX-11M version 2 without doing a SYSGEN? I would like to add more memory but don't have the required disks to do a SYSGEN and can't locate anyone who has them. If I update the operating system to be able to do a SYSGEN, I also will need to get disk drives with larger capacity and update some purchased software. Our system is a PDP-11/34, with three RK05s, 80K words of memory and some special UNIBUS equipment.*

REPLY: If you're still using RSX-11M version 2, your system is about 10 years old. In most cases you can add memory to an RSX system, even one of this vintage, without doing a SYSGEN. Plug in the new memory and boot your system. RSX will determine the memory size when it boots. An RSX-11M system generation must be done if your total memory, after the upgrade, exceeds 128K words; i.e., you leave the 18-bit memory space and enter the 22-bit memory space. Because you're using an 11/34, you don't have a problem because the maximum memory you can have on your 11/34 is 128K words.

The answer to your real question isn't that simple, and brings up the issue of upgrading RSX systems. You have many options available to you, some more expensive than others. I'll list the more realistic ones in order of increasing cost.

1. Expand the existing system to its limit at minimum cost. Expand your memory to 128K words and reboot. It has 128K words of memory, may run a little faster and can support a few more users. This is the cheapest option available, and is practically the only option if you insist on staying with RSX-11M version 2.
2. Upgrade to current RSX; add more disk and memory. In addition to the 64K memory, you need to upgrade those RK05s, if only because RSX is no longer distributed on RK05s. RSX still supports RK05s, but RK05-based distribution kits are no longer available. A fairly low-cost option is to upgrade to RL02 disks. You'll need an RL02 controller and two, preferably three, disk drives. You'll find

that the RLs are faster and more spacious than the RKs. Lots of RL02s are available on the used equipment market at bargain prices. DEC will install and service this equipment.

While you're at it, get rid of those DL-11s in your backplane and replace them with a DZ-11 terminal multiplexer. DZs are available from used computer outlets at low prices. Because you already have an RSX license (although it's probably burnt-stick-on-parchment), you can purchase an updated operating system kit for less than the full license cost. There's no sense upgrading to anything but the current release, which is version 4.2, patch level D.

All other upgrade options require replacement of major pieces of your system.

3. Upgrade processor to J-11; add disk; upgrade to M-PLUS. This option involves replacing your PDP-11/34 processor card set with one of the third-party single board CPUs based on the DEC J-11 chip set. Several vendors can supply these CPU replacements. They all have some high-speed on-board memory that can take you into the .5- to 1 MB-memory range. Your system then would take on the functional appearance of a PDP-11/84. Work out the field service arrangement beforehand; you'll need to establish who fixes what in such a system.

You'll want to add more disk, and going to the RLs is also realistic. It doesn't make sense to stay with RSX-11M when you have a J-11-based CPU. You can upgrade your operating system to RSX-11M-PLUS inexpensively if you specifically request the RSX-11M to RSX-11M-PLUS upgrade license. An added benefit occurs here: You'll avoid doing SYSGENs entirely if you go with the RSX-11M-PLUS pregenerated kit, which is distributed on RL02s.

4. Upgrade the processor to a PDP-11/44. The used-computer market is loaded with 11/44s at reasonable prices. Find one with .5 to 1 MB of memory on it. The RL02s are again an acceptable option, but you might find an RM02 or an RA80 cheaper. You'll need a tape for backups if you go this route. TS11s and TU80s are good. Upgrade to RSX-11M-PLUS. You'll need a full distribution kit if you go with the RM02s; the RA8x disks are supported on the pregenerated kit.

Your PDP-11/34 has depreciated to nothing and used computer shops get more for boat anchors than they do for your 11/34. Unload it somehow and go for the hot setup.

5. Start over. If you must stay in the UNIBUS family, go for a PDP-11/84 with at least 1 MB of memory, a DHU-11 terminal multiplexer, an RA60 or RA81 disk, a TS05 tape drive and RSX-11M-PLUS.

My choice would be a PDP-11/83, 2 MB of memory, a KDA-50 disk controller, RA60 disk, TSV05 tape and RSX-11M-PLUS. I'd interface that special UNIBUS gear with a Q-bus converter, available from several vendors.

I've chosen examples from a wide range of options that are available to you in the PDP-11 family. I hope these help. Your 11/34 has served you well, but it's time to move on.

HIS DISK RUNNETH OVER

QUESTION: *Our disk is filling up with accounting files! What are they? Can we delete them?*

REPLY: Resource accounting is an optional feature of RSX-11M-PLUS and MICRO/RSX. Every time your system is booted, resource accounting is started. A new version of LB:[1,6]ACNTRN.SYS is created and opened into which all accounting transactions, such as user LOGON/LOGOFF and task activation, are logged.

The accounting file contents can be listed using the SHOW/ACCOUNTING command or the [126,24]ACNTRN.CMD file with DATATRIEVE. If you have no further use for your old accounting files, you may safely delete them from the disk. You also might think about an archiving procedure for your old accounting files. ■

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Learning To Talk LocalTalk

Untangling Apple's And DEC's LAN Hardware Products.

BY AL CINI

WELL, IT'S OFFICIAL. On January 15, 1988, in what may turn out to be this year's most eagerly awaited "surprise" event, Digital Equipment Corporation and Apple Computer came together in spirit. Beginning immediately, these companies jointly will explore ways to make their most popular products, the VAX and the Macintosh, work and play together.

As usual, the rumors that preceded the announcement proved off target. One of the announcement's delightful revelations devastated a persistent, pernicious rumor that Apple would dump its AppleTalk networking protocols in favor of DECNET.

The joint announcement declared that the two companies would work together to build bridges between AppleTalk and DECNET/OSI networks. The right way to network Macintosh computers, said DEC, is AppleTalk.

"A Tale of Two Protocols" (November 1987) discussed AppleTalk's logical networking protocols. Here, we'll focus on the physical aspects of AppleTalk, now implicitly endorsed by DEC for Apple product connectivity.

LOCALTALK: AN APPLETALK LAN

EVERY MACINTOSH COMPUTER and LaserWriter printer that Apple ever shipped has included the hardware necessary to join an AppleTalk network at no extra charge. Physically, a device joins an AppleTalk network using a single twisted-pair LocalTalk cable (Apple recently renamed its cable products from AppleTalk to LocalTalk, to prevent confusion with AppleTalk's suite of protocols). In LocalTalk, a twisted-pair drop cable leads from the device (through its serial port, using either a circular-8 or DB9 connector) to a special transformer, which isolates the network from static and noise from the connected device. The two ports in the transformer allow its daisy-chained interconnection with other devices on the network, using a shielded twisted-pair of wire. On this simple and inexpensive twisted-pair bus platform, Apple's LocalTalk product supports

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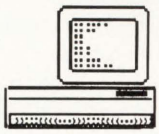

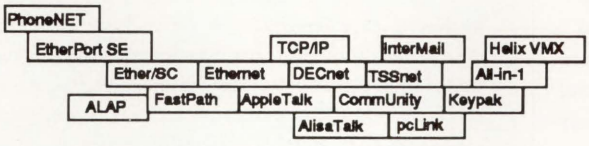

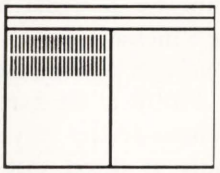

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up to 32 devices, with the ends of the daisy chain up to 1,000 cable feet apart.

Inside the networked device, a driver and receiver sample the network at 4.3-microsecond intervals, which supports transmission rates of 230.4 KB per second. Like Ethernet, the commonly interconnected devices sense the line for a signal before transmitting a message packet, Carrier Sense Multiple Access (CSMA).

Unlike Ethernet, the hardware won't allow two devices that signal simultaneously to detect that their packets have collided. Therefore, LocalTalk-connected devices avoid collisions by waiting for an adjusted pseudo-random period of time before transmitting a packet. Called Collision Avoidance, it accounts for LocalTalk's classification as a CSMA/CA bus-structured network.

LOCALTALK VS. ETHERTALK

THE GENERAL CHARACTERISTICS of LocalTalk invite further comparison with Digital's preferred LAN connectivity solution, Ethernet. Like LocalTalk, Ethernet is a bus-structured networking scheme that permits the interconnection of several devices through a common wire. And, like LocalTalk, Ethernet can carry AppleTalk protocol packets.

AppleTalk networks can be formed by connecting Macintosh systems through interfaces like Apple's EtherTalk card (for the Mac II, $650), or by using products like Kinetics' EtherPort II (also for the Mac II, $750) or EtherPort SE (for the Mac SE, $750) cards. Kinetics also makes the Ether/SC SCSI-to-Ethernet interface controller ($1,250) for the Macintosh Plus.

Apple marketing calls its family of Ethernet connectivity products, EtherTalk. They take their place beside LocalTalk within Apple's broad AppleTalk networking family. Future Talk products are certain to include Token Ring and other Open Systems Interconnect physical layers.

Unlike LocalTalk, Ethernet uses coaxial rather than twisted-pair cables, and its improved resistance to noise supports blinding bit transfer rates of 10 megabits per second, rather than LocalTalk's comparatively pokey 2,000 to 3,000 bits per second. Ethernet cable costs more, but it runs faster. For years, people have been justifying the significant incremental cost of Ethernet on its promised performance edge.

But is it really faster? Transfer performance comparisons of file server products like Apple's *AppleShare,* using both LocalTalk and Ethernet network hardware, show that for small files, like word processing documents, Ethernet outperforms LocalTalk by less than 30 percent.

DECNET/OSI Is Fulcrum Of Digital/Apple Agreement

Five years of casual conversations and serious summits between Apple Computer's John Sculley and Digital's Ken Olsen have culminated in an official relationship between the two companies. Speculation of a pending agreement had been growing for the past year and was heightened by Olsen's admission at DECWORLD last September that he had been discussing the possibilities with Sculley.

The basis of the agreement will be a standards commitment by both companies to the DECNET version of the Open Systems Interconnect (DECNET/OSI). Using this communications protocol, Macintoshes and AppleTalk networks can be carried as nodes on DECnet networks. Digital's Network Applications Support system currently accommodates gateways to Cray supercomputers and SNA networks, and the UNIX, MS-DOS and OS/2 operating systems.

As a result, Digital's desktop strategy now will include the Macintosh family in addition to the VAXSTATION family, because as Olsen said, "Customers either want Digital or they want Apple." Sculley, whose Mac will profit from its newfound compatibility with a huge population of VAXs, said, "This is the relationship that I've wanted more than any."

Meanwhile, Digital established a Macintosh program office within its Personal Computing Systems Group. "We have customers with thousands of Apples tied to our network today," justified Olsen. "This is a big investment by people on both sides."

The announcement, staged at Macworld in San Francisco and in Boston a few days later, wasn't a product introduction. It was a statement of policy and a promise for cooperative R&D for Mac/VAX integration.

In Boston, Digital displayed a Macintosh and other nodes running simultaneously on Ethernet. The Mac link was provided by third-party hardware and software products already in use in hundreds of sites across the country. These types of solutions have been on display at trade shows and a few of Digital's Application Centers for Technology (ACTs). A jointly developed interface, a merging of DECNET and AppleTalk, and some type of co-marketing and support agreement are expected to be announced in August.

Sculley commented that the two companies' intent to develop products that integrate Mac workstations into VAX networks represents "the dream alliance" of the computer industry.

A Digital spokesman said that Digital drew the line with the Macintosh announcement, pointing out that Digital isn't enthusiastic about establishing standards relationships with Sun Microsystems or Apollo Computer because workstations from those manufacturers are considered "too competitive."

—Evan Birkhead

As the size of the served file grows, Ethernet's performance advantage also grows, but only about as high as 130 percent. In many applications, therefore, Ethernet's 40-to-1 signaling rate advantage may translate to a mere 2.3-to-1 practical edge over LocalTalk. When you consider the cost of coax versus twisted-pair wiring, and the price of an Ethernet controller at each workstation, the ratio of Ethernet's hardware costs over LocalTalk adds up to much more than its 2-to-1 speed edge.

DOWN WITH ETHERNET?

BEFORE YOU TRADE your Ethernet cable drills for RJ11 cable crimpers, let's take another look at the performance numbers. When you compare the transfer performance between individual devices, Ethernet stacks up to be only a little faster than LocalTalk. But, when dozens or hundreds of devices start talking simultaneously, Ethernet's transfer performance stays relatively constant, while LocalTalk's goes way up.

As the number of signaling devices grows, LocalTalk's signaling speed becomes a bottleneck faster than Ethernet's does. Although Apple's LocalTalk offers an excellent price-performance ratio for small networks, Ethernet wins for connecting large numbers of devices.

Obviously, somewhere between LocalTalk and Ethernet, there's a killer network. Could it be twisted-pair Ethernet? Twisted-pair Ethernet is an implementation of Ethernet's hardware and low-level packet layers using inexpensive twisted-pair wires, developed as an alternative to the high cost of stringing ThinWire coaxial cable to the personal computers and workstations in a large organization.

This cheaper solution reduces cabling costs, but it still requires an expensive Ethernet controller on each connected device. What's more, some restrictions on its use, such as maximum cabling distances and required shielding, preclude its use in many environments, particularly in old buildings with few, widely dispersed wiring closets.

AN OBVIOUS CONCLUSION

THE JOINT DIGITAL/APPLE announcement stated that the two companies intend to work together to develop bridges between Apple and Digital networks. Unfortunately, the press release stated that no specific products can be announced now. A planned joint DEC/Apple developers conference will be held in August 1988 to get the ball rolling on these kinds of products. However, we can't expect to see such products delivered in less than a year, and we can't anticipate whether these products will be hardware or software.

The good news is that many third parties have been delivering all sorts of Macintosh/VAX connectivity products into the growing marketplace between these two technologies since the Mac's birth in 1984. In fact, the joint Apple/DEC announcement legitimizes existing products more strongly than it hints of new ones. Among the many companies offering products to connect Macintosh and VAX products is Kinetics, who makes a unique LocalTalk/Ethernet gateway device called *FastPath* ($2,500).

A KILLER (HYBRID) NETWORK

WOULDN'T IT BE NICE if you could use LocalTalk to interconnect a small number of Macintosh workstations, say 10 or so, as a work group, and then connect this work group with others like it, and with VAX systems or other hosts, through a common backbone Ethernet? That's what *FastPath (KFPS)* does.

FastPath is a Kleenex-box-sized controller with three ports on it. One port is for power and plugs into a standard wall socket. The other ports connect to a LocalTalk and an Ethernet network, allowing the box to reformat and forward packets between devices on either cable, thereby forming an internetwork.

KFPS acts both as a bridge and a gateway. For high-level AppleTalk protocols, it's a bridge, implementing Apple's Routing Table Maintenance and Name Binding Protocols. Listening for communication packets through its two ports, it eventually "learns" which networks house which sending and receiving devices.

Using information downloaded to it by the network manager when

Companies Mentioned In This Article

Apple Computer Inc.
20525 Mariani Ave.
Cupertino, CA 95014
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Computer Methods Corp.
525 Route 73
South Marlton, NJ 08053
(609) 596-4360
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Digital Equipment Corp.
146 Main Street
Maynard, MA 01754
(617) 897-5111
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Farallon Computing Inc.
2150 Kittredge St.
Berkeley, CA 94704
(415) 849-2331
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Kinetics Inc.
2500 Camino Diablo
Walnut Creek, CA 94596
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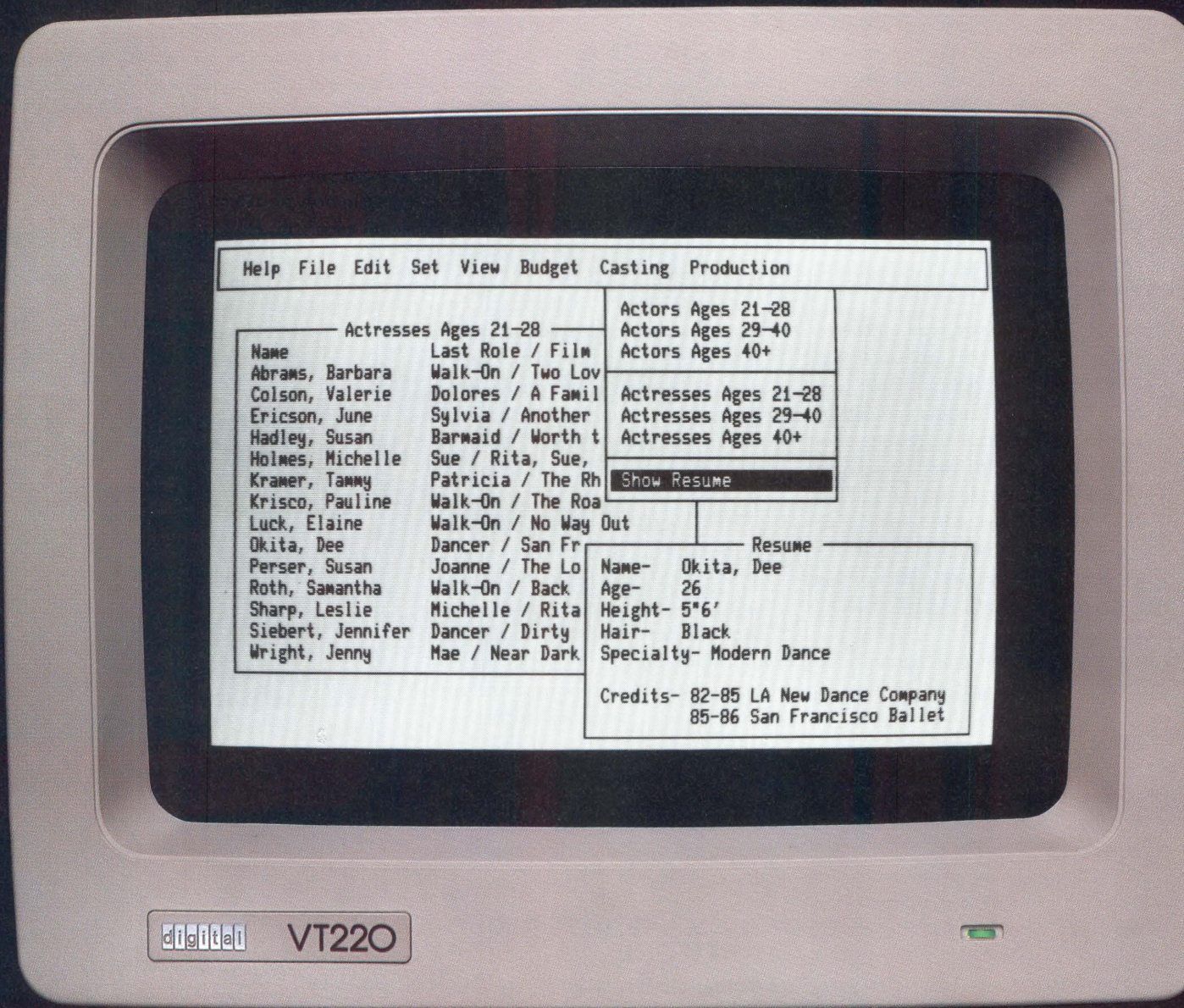
HELIX VMX

The Best of



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Helix VMX gives you a revolutionary, visual application development environment that lets you rapidly develop VAX-based software. These applications can be used from either Macintoshes or VT terminals.

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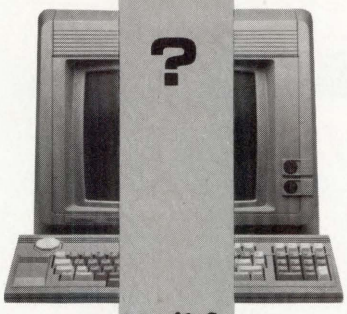
Why Bother With A Graphics Terminal ?



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it was installed, it associates mnemonic names with the networks it bridges, allowing users to select named services within named networks using familiar Macintosh tools like CHOOSER. Finally, it regularly calls out and listens for other AppleTalk network bridges, building and maintaining the routing table that it uses to forward packets among them.

For a work group, *KFPS* eliminates the need for expensive Ethernet interfaces at each workstation. Instead, the built-in LocalTalk connectors found in each device, interconnected using LocalTalk wires, can be ported into the Ethernet world through a single *FastPath* for less money.

As long as the size of the work group is kept small, the LocalTalk bottleneck problem won't outweigh its cost advantages. Optimal workgroup size will depend on your budget and how frequently the workstations and printers converse over the network, usually ranging between 10 and 40 devices. The odd workstation requiring Ethernet's performance edge can be connected using an Ethernet interface and still share resources with various LocalTalk-connected network nodes through their respective *KFPS* bridges.

Apple's LocalTalk cabling products have their limitations, though. For one thing, they restrict work group size to 31 devices (they only support 32, and *FastPath* counts as one). In addition, although less expensive and easier to string than Ethernet, LocalTalk cabling costs can mount if the workstations and printers are distributed behind lots of walls. If only there were a way to use the existing twisted-pair telephone wire to carry LocalTalk traffic.

ENTER FARALLON

FARALLON'S *PHONENET* FAMILY of AppleTalk-compatible networking products replaces the LocalTalk cables between networked devices with standard telephone cables, and they extend the maximum running distance between the ends of the network from 1,000 to 3,000 feet. AppleTalk networking Farallon-style uses a single twisted-pair of ordinary phone wire, between a *PhoneNet* connector (about $60 each) on the Macintosh or LaserWriter at one end and a punch-down block in a telephone wiring closet at the other end. Two or more such twisted-pairs, punched down into common terminals, form what Farallon calls a passive star network.

Punch down a *FastPath* into those same terminals and, for peanuts, it can open an Ethernet, with its VAX equipment, to the passive star's Macintoshes and LaserWriters. Expensive Ethernet cable must be run only to the wiring closets, rather than to each connected device. And, because Farallon's equipment is less sensitive to noise than twisted-pair Ethernet, standard RJ11 or RJ45 phone wire, or spare pairs, available in existing cables, can be used to make the connection, at an aggregate distance of up to 3,000 feet.

Organizations with more widely dispersed networks can interconnect with Farallon's *Star Controller* (approximately $1,700). This active star device accepts and boosts signals from as many as 12 separate twisted-pairs, each of which can stretch up to 3,000 feet to a Macintosh or printer. Coupled with a corresponding *KFPS,* a Farallon *Star Controller* makes an effective Macintosh concentrator.

Editor's note: A special thank you to Computer Methods Corporation and Kinetics Inc. for supplying the necessary equipment to prepare this series of articles on MAC/VAX connectivity. ■

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PRODUCTS

Teleos Introduces T100U UNIBUS Controller

Teleos Communications Inc. has introduced its T100U UNIBUS Controller. The T100U provides cost-effective, high-performance communications between VAXs through T1 lines.

The T100U is compatible with AT&T ACCUNET T1.5 service. It also enables direct connection to the T1 network without the need for more external hardware and provides a full duplex data transfer rate of up to 1.536M bps (192 KB per second) over a T1-compatible transmission system.

Major functions include parallel-to-serial and serial-to-parallel conversion, data formatting and deformatting, intelligent buffer management using Direct Memory Access (DMA) transfers and VAX cluster-to-VAX cluster wide area networking.

For pricing and additional information, contact Teleos Communications Inc., 2 Meridian Rd., Eatontown, NJ 07724; (201) 389-5700.

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Network Use Easier With Tokenstar PC Card

Telegence Corporation introduced three significant enhancements to the Telegence Tokenstar 3301 PC card, including a hot key that lets users communicate with other computers or devices while engaged in a variety of tasks such as file capture and file dump enhancements for communicating with printers and host ports.

The hot key allows a user working in processing or Lotus software, for example, to switch instantly to Tokenstar communications. The file dump gives PC users the ability to share resources such as printers. With file capture, users can open a "Capture" file and save all incoming data from a selected source.

Telegence also has added binary file transfer capability to the VT emulator. The software has been modified to make it compatible with DEC's ALL-IN-1.

To find out more, contact Telegence Corp., 5655 Lindero Canyon Rd., Ste. 722, Westlake Village, CA 91362; (818) 707-3200.

Enter 501 on reader card

PHIGS Software Offered For VAX Systems

DEC has introduced VAX PHIGS V1.0, an implementation of the Programmers Hierarchical Interactive Graphics System, an ANSI draft standard for 3-D device-independent graphics software. VAX PHIGS software comprises a sophisticated 3-D graphics support system that controls the definition, modification and display of hierarchical graphics data.

Running under the VMS operating system, VAX PHIGS software is a subroutine library packaged as a set of VMS shareable images. It manages the organization and display of graphical data stored in a conceptually centralized database and is device independent; i.e., the same program can generate graphical output on a variety of hardware devices without modification to the source code.

VAX PHIGS software is licensed at $3,500.

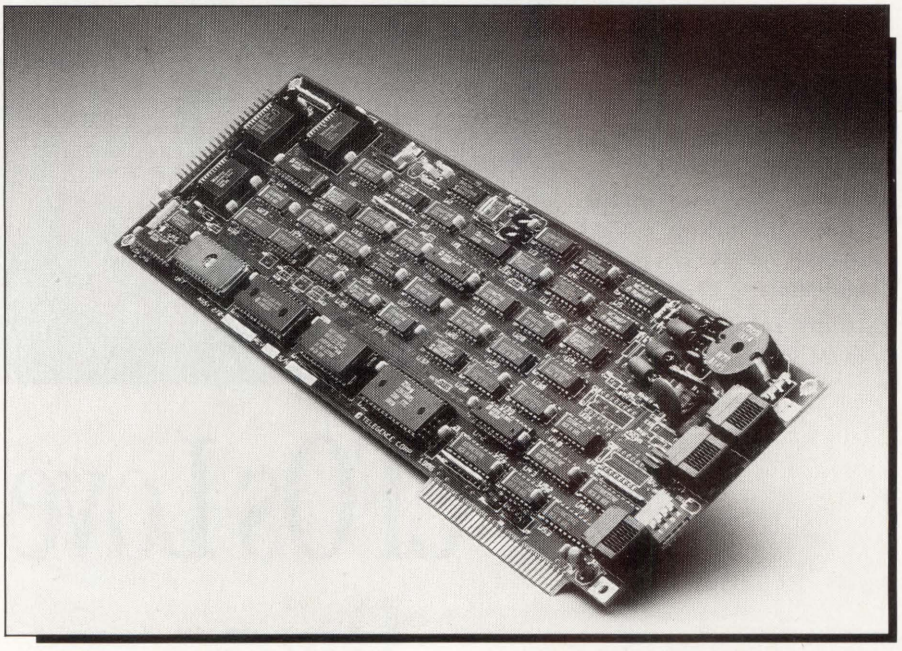
For more information, contact DEC, Maynard, MA 01754-2571; (800) DEC-INFO.

Enter 503 on reader card

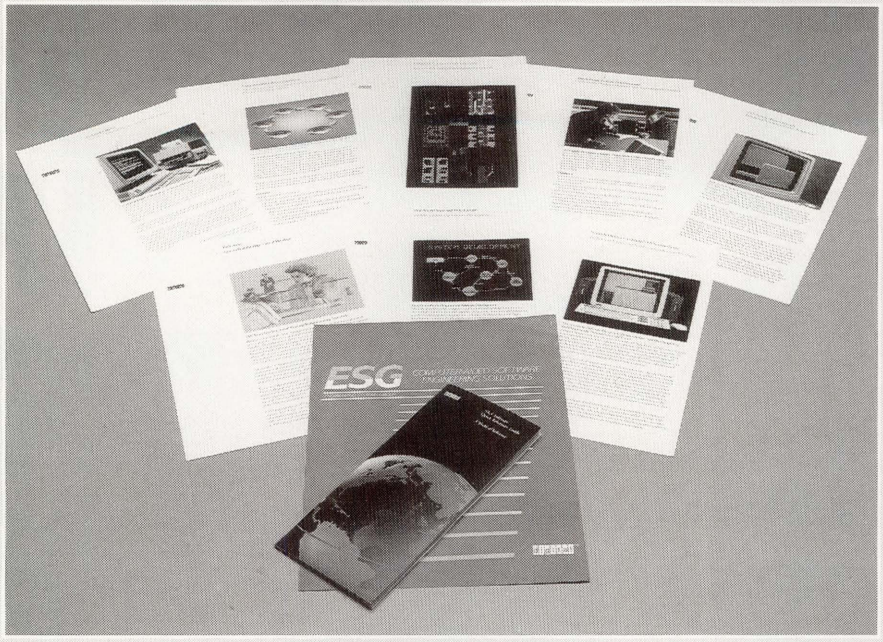
FILETAB-D Developed For VAXs And PDPs

Progeni Systems Inc. has announced FILETAB-D, a 4GL systems development tool for VAXs and PDPs. FILETAB-D is a programming language with automatic report generating facilities built in. The use of these facilities allows many of the standard programming tasks required in a DP environment to be completed fast and efficiently.

FILETAB-D has its own high-level syntax to specify procedural logic in addition to the built-in logic cycle of the report writer. It offers simple syntax, unrestricted data handling, automatic fixed logic and decision table-based representation of processing re-



Telegence Tokenstar 3301 PC card.



CASE Literature Kit Available From DEC

A free CASE literature kit is available which includes a reference guide to VAX computer software and several data sheets describing software engineering tools from DEC and other CASE vendors for use on VAXs.

Write on company letterhead to Media Response Manager, DEC, 444 Whitney St., NR02-1, Northborough, MA 01532-2599, requesting part number EJ-30559-73.

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quirements, clear diagnostics and comprehensive, interactive debugging.

FILETAB-D is priced from $8,000 to $52,000.

Interested DEC end users should contact Progeni, 706 W. Broadway, Ste. 203, Glendale, CA 91204; (818) 956-0251.

Enter 504 on reader card

Conversion Package Saves Time

CompuServe Data Technologies announces the release of a System 1022-to-System 1032 conversion package. It facilitates the migration of System 1022 DBMS databases and applications from DECsystem mainframes to System 1032 4GL/DBMS on the VAX.

There are three components to the conversion package: a dataset converter, program converter and training/consulting. The dataset converter translates data definitions and data into System 1032's format. The program converter automates translating System 1022 programs to System 1032's 4GL.

The package costs $30,000.

For more information, contact Paul Zellweger, CompuServe Data Technologies, 1000 Massachusetts Ave., Cambridge, MA 02138; (617) 661-9440.

Enter 507 on reader card

Helix VMX Includes VT Terminals

Odesta Corporation announced that Helix VMX, its VAX/Macintosh database networking system, now includes VT terminals.

Helix VMX applications created on a Macintosh and hosted by a VAX may be accessed online from both Macintosh workstations and VT-type terminals. The multiwindowed Helix interface is carried over to the VT terminal automatically. The effect of a change made to the networked database from any terminal or Macintosh is seen instantly on any other terminal or Macintosh on the network.

Helix VMX allows users to create customized database applications on a Macintosh and run them without modification on MicroVAX or VAX computers while retaining the graphical application interface at the desktop device level.

Learn more by contacting Odesta Corp., 4084 Commercial Ave., Northbrook, IL 60062; (312) 498-5615.

Enter 505 on reader card

V4.0 Of VAX COBOL Software Announced

DEC has announced version 4.0 of its VAX COBOL software product. The VAX COBOL compiler is a high-performance, high-level implementation of the COBOL language used for commercial application development. VAX COBOL software runs under VMS and MicroVMS operating systems and is fully integrated with the VAX Information Architecture.

Among the ANSI 1985 features added in version 4.0 to make the VAX COBOL compiler eligible for federal validation under the ANSI 1985 COBOL Standard are NOT conditionals, the REPLACE statement and the CLASS clause.

VAX COBOL software is supported on any valid VAX, MicroVAX or VAXstation system configuration, and is licensed from $1,200 on the VAXstation, to $28,690 on the VAX 8800.

For further information, contact DEC, Maynard, MA 01754-2571; (800) DEC-INFO.

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RMVLUG Hosts 2nd DECUS Regional Conference

The Rocky Mountain VAX Local Users Group (RMVLUG) is hosting the second DECUS Regional Conference in Denver, Colorado, March 31-April 1, 1988.

The advance registration fee of $125 includes continental breakfast and buffet lunch both days, a copy of the program abstract volume, and admission to any of the more than 80 technical presentations. Technical sessions will emphasize VAX/VMS systems in single-node, networked, and cluster configurations.

For a registration kit or additional information, contact Paula Sharick, 1490 Wildwood La., Boulder, CO 80303; (303) 499-5700.

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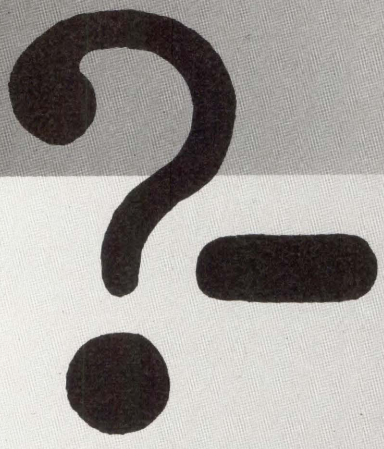
IF/Prolog



Must Prolog lose it's best features when it communicates with other languages?

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For more information call:
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IF/Prolog offers:
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James River Adds Laser Envelopes

James River Corporation has added Pro-Tech Laser Envelopes to its Pro-Tech Laser Specialties line of products for laser printing. Pro-Tech Laser Envelopes are for laser-generated letters and documents. Graphics and text can be printed on front and flap in one pass, and the envelope's oversized flap accommodates large documents. Also, heat resistant adhesives prevent presealing and protect the printer.

Learn more by contacting James River Corp., Groveton Division, Groveton, NH 03582; (603) 636-1154.

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PacerShare Lets VAX Be AppleShare File Server

Pacer Software Inc. has announced PacerShare, a software product that lets any VAX/VMS system function as an AppleShare-compatible file server. AppleShare is Apple Computer's standard file serving product for Macintosh networks. Through implementing the Apple Filing Protocol on a VAX system, Pacer's product enables a VAX to act as a large file server for a Macintosh network. The Macintosh mouse and graphical interface can be used to directly peruse the VMS file system, create directories, move directory trees or access any VMS file type from within a standard Macintosh application.

With PacerShare, a VAX can function as a server in an AppleShare network. The VAX file system is viewed from the Macintosh as a series of hierarchical volumes with VAX directories being represented as folders, and individual files can be accessed by both Macintosh and VAX applications.

To learn more, contact Pacer Software, Inc., 7911 Herschel Ave., Ste. 402, La Jolla, CA 92037; (619) 454-0565.

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QUICKENTRY Provides Data Entry For dBASE

Fox & Geller has released QUICKENTRY, a data entry system for dBASE users. QUICKENTRY is a standalone product that lets anyone quickly and easily enter data into dBASE databases. It doesn't require dBASE to run, or any knowledge of dBASE, and is geared toward secretaries and administrative users.

QUICKENTRY uses 1-2-3-style menus to help users create data entry forms and enter data. Comprehensive, on-screen help minimizes the need to refer to the user manual. Data entry features include Carry-over Fields and a Ditto Key, password security, 10 data field types, browsing, searching and records editing functions. Databases created are standard .DBF files, 100 percent compatible with dBASE III PLUS, Clipper, FoxBASE+, dBXL and Quicksilver.

QUICKENTRY is priced at $99.

To find out more about the product, contact Fox & Geller, 604 Market St., Elmwood Park, NJ 07407; (201) 794-8883.

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Ridge 5100 Is 4GL RISC Supermini

Ridge Computers recently introduced the Ridge 5100. The single-CPU 5100 system uses parallel instruction execution to provide performance of 14 million Whetstones per second for floating-point operations, and 14

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FILE-PACER

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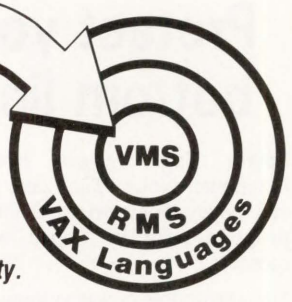

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times the performance of the VAX 11/780 in integer operations.

The 5100 system's performance can support 128 active users and also provide an effective server environment for lower cost, commodity microprocessor-based workstations. In departmental computing applications, access to the system is via terminals, PCs or workstations.

Ridge's 5100 sells for $109,000 (16 MB main memory, 300 MB disk), to $148,000 (32 MB main memory, 1.2 gigabytes disk) for typical configurations. The 5100 upgrade for 3200 systems sells for $55,000.
Contact Ridge Computers, 2451 Mission College Blvd., Santa Clara, CA 95054; (408) 986-8500.

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V1.1 Expands LANWatch's Usefulness

FTP Software Inc. has announced the availability of version 1.1 of LANWatch, FTP's software network analyzer.

Version 1.0 displayed all Ethernet traffic, but only recognized TCP/IP packets in detail. Version 1.1 expands LANWatch's usefulness by adding DECnet, Novell, XNS and SNAP to the list of protocols that LANWatch recognizes. Version 1.1 also extends LANWatch to Token Ring on Proteon's 10-Mbit/sec ProNET-10. Version 1.0 was Ethernet-only.

LANWatch monitors network traffic by capturing packets as they pass and storing them for later examination. It's useful for network troubleshooting, monitoring and protocol development.
Find out more by contacting FTP Software Inc., P.O. Box 150, Kendall Square Branch, Boston, MA 02142; (617) 868-4878.

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ASCII Spell Checker Supports 10 Languages

Intermation Corporation has announced the release of its ASCII spell checker, available separately for English, Spanish and eight European languages. OS*SPELL will accept any file in ASCII format, including word processing packages like WordPerfect, WPS Plus and Intermation's IT*OS.

OS*SPELL has an 87,000-word English dictionary and allows the user to create personal dictionaries of unlimited size. The user is able to see the incorrectly spelled word on-screen in the context of the sentence, then choose from a menu of options to replace various types of occurrences. If the user chooses to replace a misspelled word, the system will search through the dictionary and provide a list of the probable and possible correct spellings of the word from which the user can choose.

OS*SPELL is available for VAX/VMS. The package is priced at $850.
To learn more, contact Intermation Corp., 234 East Colorado Blvd., Pasadena, CA 91101; (818) 796-9371.

Enter 513 on reader card

Banyan Unveils VINES On A VAX

Banyan Systems Inc. recently debuted a version of its virtual network operating system (VINES) on the MicroVAX II. VINES is a totally integrated PC networking system with comprehensive network services available on a range of platforms from PCs to optimized servers to minicomputers.

Written under UNIX, VINES features

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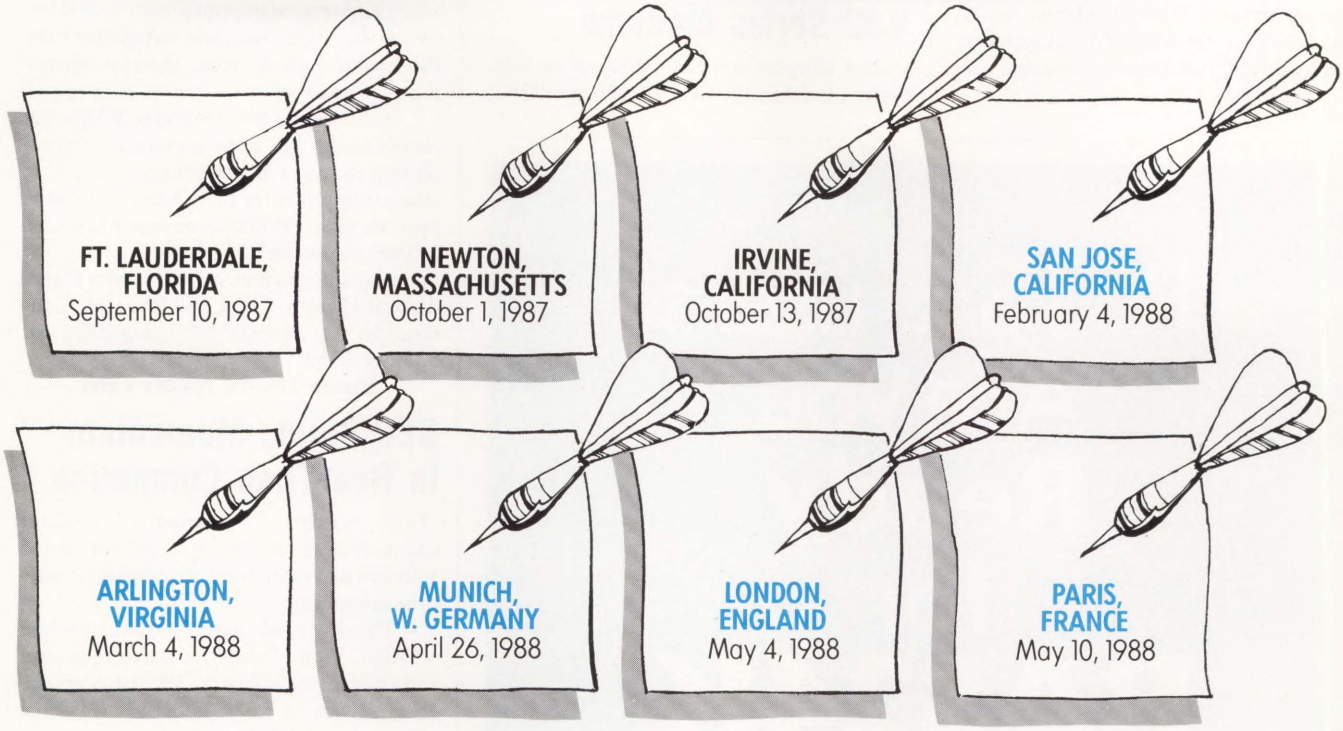

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In Europe contact: Invitational Computer Conferences, C.J. Nicholl & Associates, Ltd., 37 Brompton Road, London SW3 1DE, England—Tele.: 01-581-2326—Telex: 888068 CJNAD G.

Ask about the OEM Peripheral Series and the PC Reseller Series of the Invitational Computer Conferences.

network services like DOS file- and print-sharing, system administration including StreetTalk services, server-to-server communication and Banyan electronic mail.

PCs are connected to the MicroVAX's internal Q-bus structure via Ethernet. Any Banyan-supported Ethernet adapter can be used in the PCs; the MicroVAX II supports an internal DEQNA Ethernet communications controller.

For an opportunity to learn more, contact Banyan Systems Inc., 115 Flanders Rd., Westboro, MA 01581; (617) 898-1000.

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Codex Enhances V.32 Series Modems

Codex Corporation has enhanced its V.32 Series modems, the Codex 2250 and 2260, with Phase Roll Compensation (PRC). Phase Roll, or far-end frequency offset, is the variation in the phase of the far-end echo with respect to the originating modem's representation of the echo. By compensating for the frequency offset that may be encountered when different carrier equipment is used between the originating and answering sites, PRC reduces block errors, thereby enhancing performance.

New pricing for the Codex V.32 Series modems also has been announced. Representing close to a 30 percent price reduction, single unit prices for the Codex 2250 (4800 bps) and 2260 (9600 bps) are now $1,795 and $1,995, respectively.

For more information, contact Codex Corp., Maresfield Farm, 7 Blue Hill River Rd., Canton, MA 02021-9903; (617) 364-2000, ext. 5339 or 5352.

Enter 516 on reader card

DEC Builds Momentum In Real-Time Computing

DEC recently announced product enhancements for VAX systems and related software that extends its capabilities for real-time computing.

The new products are version 1.2 of the VAXlab system family for data acquisition and analysis, including the VAXlab Software Library; version 3.0 of VAXELN real-time software; and DECscan/ELN driver.

Configured with a MicroVAX system, VAXlab version 1.2 system now can be used more effectively for data acquisition at the low-end of the computing spectrum. VAXELN version 3.0 software complements and extends VMS software for real-time computing. For scientific, technical and computer-integrated manufacturing applications, VAXELN version 3.0 offers speed, efficiency and reduced implementation time. To learn more, contact DEC, Maynard, MA 01754-2571; (617) 467-2332.

Enter 517 on reader card

QUEMAN Allows Control Of Batch Queues

Data Center Software has announced the release of QUEMAN, the VAX queue manager. QUEMAN is a powerful program that allows complete control of batch queues, print queues and print forms. QUEMAN has full-screen displays with simple commands that have the ability to detect and correct any problem that may occur.

QUEMAN monitors and manages both batch and print queues. Its simple command line interface allows you to locate and control queue problems fast. It has merge, pause, reset, start and stop batch queues.

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QUEMAN lets you delete, change destination, change form, hold, release and restart print jobs.
For further information, contact Data Center Software, 218 Maple St., Danvers, MA 01923; (617) 777-1221.

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Raster Develops Geophysical Graphics

Raster Technologies Inc. has introduced the Model One/85S, a high-resolution, color graphics subsystem that allows interactive display and manipulation of seismic data in a variety of formats. The Model One/85S, which is designed for the most demanding 2-D geophysical imaging and graphics applications, delivers outstanding performance and can display 64 traces of 1022 samples each in 1.55 seconds.

Prices start at $21,500 for a configuration that includes 256 color display and no local trace storage.
To learn more, contact Raster Technologies Inc., 2 Robbins Rd., Westford, MA 01886; (617) 692-7900.

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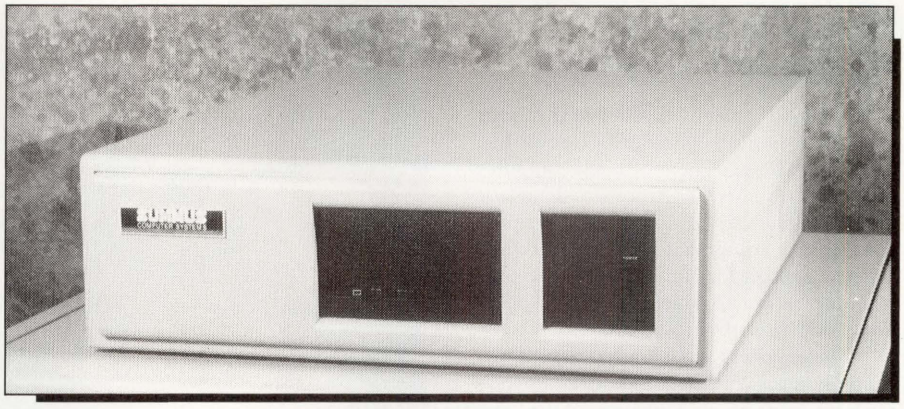

Summus' GigaBox compact data storage subsystem.

Summus Releases GigaBox

Summus Computer Systems introduced a new line of high-performance compact data storage subsystems. The GigaBox is a turnkey solution to VAX and MicroVAX end users who require large volume data storage and high-speed access.

The GigaBox is available in Q-bus or UNIBUS models in pedestal, world-box, 40-inch cabinets, rack-mounted or kits. Backup is accomplished with a tape backup subsystem available from Summus. With a 2 gigabyte capacity, the GigaTape subsystem can be integrated with the GigaBox.
For further information, contact Summus Computer Systems, P.O. Box 820549, Houston, TX 77282-0549; (800) 255-9638.

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Protective Covers For Many Applications

A new line of protective covers with various applications is available from Datacover Inc. The covers are designed to shield computer and machine switches from accidental or deliberate interference. A controls cover protects precise equipment settings. A switch cover is available for numerical machine controls protection. A shield for CRTs offers protection from flying objects.

These covers shield all types of industrial, metalworking, office, data processing and medical equipment switches and controls. Many sizes and designs are available to fit switches of all styles in all types of locations. If a standard cover doesn't fit the application, covers can be made, no tooling required. Datacovers are available in clear or smoked acrylic plastic.

For additional information, contact Robert Zeiss, Datacover Inc., 793 Industrial Ct., Bloomfield Hills, MI 48013; (313) 332-7997.

Enter 509 on reader card

Protective covers for switches and controls from Datacover Inc.

DILOG Announces SQ716 Host Adapter

DILOG has introduced the SQ716 Host Adapter, which provides a small computer systems interface (SCSI) for connecting up to seven disk drives to any MicroVAX II, LSI-11 or other Q-bus computers from DEC.

The SQ716 Host Adapter can interface both asynchronous SCSI disk drives with data transfer rates up to 1.5 MB per second and synchronous SCSI drives with transfer rates up to 3.0 MB per second. This adapter supports the SCSI differential cable option, which permits longer cable lengths between the computer system and peripheral devices. It also has features that provide easy configuration, increased data integrity and enhanced system performance. All in a smaller, dual-height module that uses less power than such previous controllers.

The SQ716 Host Adapter sells for $1,795.

To learn more, contact DILOG, 1555 S. Sinclair St., Anaheim, CA 92806; (714) 937-5700.

Enter 521 on reader card

Key-To-Disk Subsystem Available For VAX/VMS

Evans, Griffiths & Hart Inc. is distributing a demo kit of KDSS, a comprehensive key-to-disk subsystem to clients who need to try out a data entry system that can run in conjunction with other applications, and KDSS is compatible with all VAX models.

KDSS is suitable for both heads down and source data entry. Validations may be performed on both input and output, allowing the user to customize the KDSS software to meet specific needs. Reformatting capabilities during the output allows batches to be prepared for sending to a mainframe, for in-house printed reports, or both. Features include batch balancing, check digits, key verification, operator statistics reports, log file, automatic entry of data into a batch from a disk file, supervisory capabilities, etc.

For further information, contact Evans, Griffiths & Hart Inc., 55 Waltham St., Lexington, MA 02173; (617) 876-0670.

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LAN WorkPlace Announced By Excelan

Excelan Inc. has announced the LAN WorkPlace, a family of desktop networking products that brings to the desktop a high level of systems networking capability and power that goes beyond the solutions Excelan traditionally has provided at the departmental level. These new products will integrate many dissimilar desktop computers with larger departmental resources.

The LAN WorkPlace lets all desktop computers use industry standard operating systems to communicate concurrently with a wide range of servers and dissimilar departmental computers without using gateways. The open architecture and the variety of application interfaces allow an ongoing availability of emerging software products for the LAN WorkPlace.

To obtain further information, contact Excelan Inc., 2180 Fortune Dr., San Jose, CA 95131; (408) 434-2226.

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SpecTerm Is Terminal Emulation Software

SpecTerm from Meridian Technology Inc., is a terminal emulation software package for the IBM PC/XT/AT, VT100, VT52, TEK 4014, TVI-920 and IBM 3101. SpecTerm has enhanced graphic capabilities, providing emulation properties for both Tektronix and ReGIS graphics on a PC.

SpecTerm is cost efficient. It includes features such as powerful command language, auto script file execution, support of high-speed modems, KERMIT and Xmodem protocols, and user-friendly, menu-driven operation.

For further information, contact Meridian Technology Inc., 7 Corporate Pk., Ste. 100, Irvine, CA 92714; (714) 261-1199.

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Alis Available On VMS

Applix Inc. has announced the availability of its Alis office automation system on the VMS operating system. Its network services can link office workers using UNIX with those on VMS, as well as those on MS-DOS, allowing an organization to have one integrated office system operating across a range of diverse hardware and software systems.

Applix now is able to offer the VAX marketplace a state-of-the-art integrated office-automation system. Alis features advanced multiwindow capabilities, and allows users to create compound documents combining text, graphics, spreadsheets and other forms of information while leaving them fully editable.

Alis on VMS prices start at $3,000 and depend on the system configuration.
For additional information, contact Applix Inc., 112 Turnpike Rd., Westboro, MA 01581; (617) 870-0300.

Enter 523 on reader card

ALL-IN-1 Version Of SPSS-X Announced

SPSS Inc. announced an ALL-IN-1 version of the SPSS-X data analysis system for VAX systems. This version lets users use SPSS-X as a layered ALL-IN-1 product or as a VMS application.

Among its features are the ability to use the ALL-IN-1 file cabinet system and gold key commands, as well as the ability to import and export files from/to VMS from within ALL-IN-1. SPSS-X provides all the scripts and forms necessary to integrate it with the ALL-IN-1 office automation system, eliminating the need for the system manager to develop them. SPSS-X is an interactive data analysis system for all major mainframes and minicomputers. Its ALL-IN-1 integration is easy to use, flexible and can be customized to meet site-specific needs.

SPSS-X is specifically tailored to run on all VAX computers.
To obtain more information, contact SPSS Inc., 444 N. Michigan Ave., Chicago, IL 60611; (312) 329-2400.

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Varityper Offers New VT600 Configurations

Varityper has announced two new configurations of its VT600, a 600 dot-per-inch PostScript-compatible plain paper typesetter.

The VT600Plus uses Adobe PostScript type fonts, providing a direct upgrade path for Apple LaserWriter Plus users. The VT600S provides users of Varityper's Signature Series Publishing System access to high-quality plain paper output. The VT600Plus has all the standard features of the VT600 and has 31 Adobe PostScript type fonts, preloaded in the system's Winchester Disk. For backup purposes, the VT600Plus includes Apple Macintosh compatible diskettes containing the Adobe type styles.

Varityper has listed the VT600Plus at $14,495. For VT600 users wishing to upgrade, the full VT600Plus is $995.
To learn more, contact Varityper, 11 Mt. Pleasant Ave., E. Hanover, NJ 07936; (201) 887-8000.

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UNIX™ & VMS™ Together in UNITY.®

Important Facts

- Runs on any VAX with VMS.
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VMS is the system of choice for most **VAX**™ users. But **UNIX** systems are rapidly becoming the accepted standard. Increasing in popularity, UNIX tools have set new standards for software development making UNIX applications very common. To get the best of both worlds without disturbing VMS or bringing in new hardware, HCR provides the solution with **UNITY.**

Based on UNIX System V.2, **UNITY** runs under VMS, simultaneously providing both environments. **UNITY** is equipped with complete UNIX programming tools including C and Fortran, transparent access between UNIX and VMS files, and even "uucp" for linking to other machines. **UNITY** facilitates communication between VMS and other UNIX machines in your company, providing a means for VMS and UNIX users to obtain applications from both systems. VAX **UNITY** under VMS allows programmers to use their favorite utilities from each system in order to create the most efficient software. As a result of HCR's professional understanding of programming needs, system software products such as **UNITY** are designed to give developers maximum productivity.

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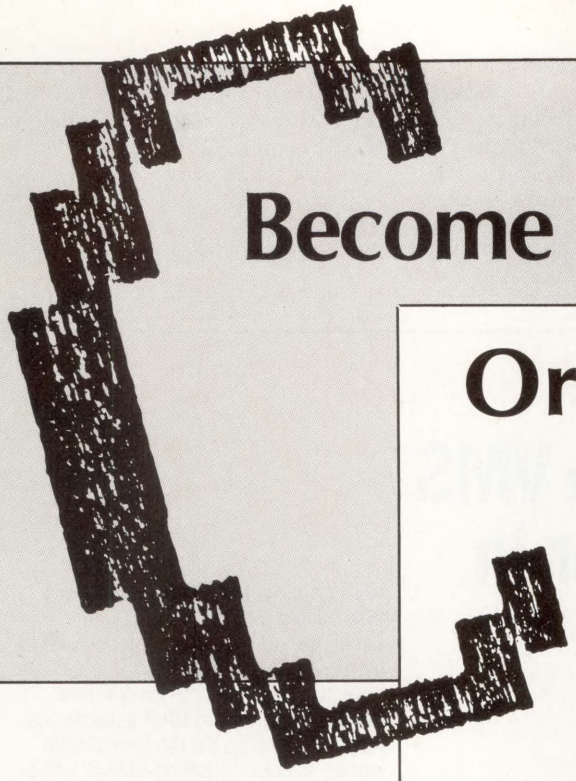

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KEYSTEP Releases New Products

KEYSTEP Corporation recently released Streamline micro-link software and SOFTERM PC, a communications and terminal emulation package.

Streamline is a PC-to-VAX interface that helps PC users extract and download data from the VAX in formats for Lotus, dBASE, DIF, etc. On the VAX, Streamline provides its standard menu-driven interface for Oracle, Ingres and DATATRIEVE. The package also is available with VT220 terminal emulation which runs memory resident on the PC.

SOFTERM PC emulates 45 popular asynchronous terminals and it supports seven file transfer protocols, including KERMIT and Xmodem. Its utilities and functions include a full-screen text editor, background operation, Seamless Remote Virtual-Disk, scripting, keyboard remapping and more.
For more information, contact KEYSTEP Corp., 7580 W. 16th Ave., 3rd Floor, Lakewood, CO 80215; (303) 238-7710.

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Imagen Debuts UltraScript

Imagen Corporation recently debuted UltraScript, which provides support for applications software compatible with the PostScript page description language. UltraScript uses type fonts licensed from Linotype Corporation and other type foundries.

UltraScript is the latest component in Imagen's announced strategy of providing support for multiple page description languages on its printer products. Compatibility with multiple languages allows Imagen's printers to be used with a greater number of application packages than possible with printers that support only a single language. It also allows the user to choose the application incorporating the lanuguage that provides the best performance for a particular printing task.
Learn more by contacting Imagen Corp., 2650 San Tomas Expwy., P.O. Box 58101, Santa Clara, CA 95052-8101; (408) 986-9400, FAX: (408) 727-3725.

Enter 380 on reader card

DECnet VAX License For PC Integration From DEC

DEC has announced more cost-effective, networked integration of PCs with a change in the DECnet-VAX and DECnet for PCs software licensing policies, as well as new entry-level PC integration packages for the MicroVAX.

DECnet-VAX software licenses now include the license for VAX/VMS Services for MS-DOS software, making every VAX computer running DECnet a licensed PC server, at no extra cost. DEC's PC Client software license now includes the DECnet-DOS software license.

The newly configured integration packages for MicroVAX II and MicroVAX 2000 computers allow DEC customers to tie PCs into a network using a MicroVAX as the PC server.

These new packages, priced at $3,000 give customers a new, more cost-effective entry-level price for PC integration.
For more information, contact DEC, Maynard, MA 01754-2571; (800) DEC-INFO.

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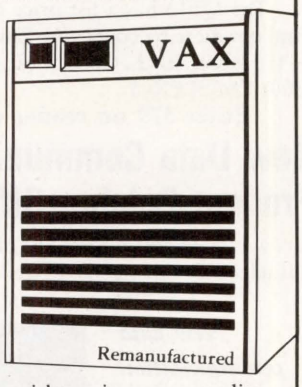

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M8373	256K X 39 Bit MOS	$195

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The QT13 Supports Q-bus Computers

Emulex Corporation has announced the QT13, a dual emulation tape coupler that interfaces industry-standard half-inch tape transports to Q-bus computers.

The dual-size tape coupler contains a comprehensive set of self-diagnostics that can be initiated either through the host console or through an on-board terminal port, without powering down the CPU. Adaptive DMA, host type (PDP-11 or MicroVAX), and 22-bit addressing are all switch-selectable options.

The QT13 supports the Pertec drive interface. It also handles tape interface data rates up to 1 MB per second, allowing the user to choose from a variety of tape transports, with speeds from 12.5 to 140 ips and tape densities from 800 to 6250 bpi.

The QT13 has a list price of $1,095. Find out more by contacting Emulex Corp., 3545 Harbor Blvd., Costa Mesa, CA 92626; (800) EMULEX-3.

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New Data Communication Product Catalog Offered

A new catalog covering its line of data, fiber and telecommunications products has been announced by South Hills Electronics.

The catalog is indexed into 15 separate sections covering cable systems, switches, converters, connectors, modems, multiplexers and other related products required to install, expand and modify computer communications systems.

New to the catalog this year is an eight-page section on multimode fiber optic products, including connectors, cables, test equipment, tools and accessories.

For more information, contact South Hills Electronics, 760 Beechnut Dr., Pittsburgh, PA 15205; (800) 548-7240 in PA, or (800) 245-6215 outside PA.

Enter 381 on reader card

CMS Enters DEC Mass Storage Market

CMS Enhancements Inc. (NASDAQ, ACMS), has announced that it's expanding its hard disk subsystem product line to address select models of DEC's supermicrocomputers. CMS introduced four hard disk subsystems for the MicroVAX II and MicroPDP-11, ranging in capacities from 71 MB to 320 MB.

Products introduced include the MVS-70 and the MVS-160, two hard disk subsystems that are functionally equivalent to DEC's RD53 and RD54 drives for the MicroVAX II and MicroPDP-11. Also introduced are the MVE-155 and MVE-320, two high-performance, high-capacity ESDI hard disk subsystems for the MicroVAX II. For further information and prices, contact Allen G. Taylor, vice president of marketing, CMS Enhancements Inc., 1372 Valencia Ave., Tustin, CA 92680; (714) 259-9555, ext. 258.

Enter 388 on reader card

C.Itoh Debuts Faster Ion Deposition Printer

The Image Systems Division of C.Itoh Electronics Inc. has announced the debut of its new 45-page-per-minute MegaLine series ion deposition printers and a series of font products for its MegaPro series.

The current MegaLine/30 ion deposition printer with its 30 ppm line printer emulation now is joined by the new MegaLine/45 which features 45 ppm line printer emulation. C.Itoh also has introduced a full line of font products for the MegaPro series including font disks, custom font cards and a font editor.

Both the MegaLine and MegaPro series printers run on the full line of DEC computers including all MicroVAX, VAX, VAXcluster, PDP-11, DECsystem and VAXmate systems.

To obtain further information, contact C.Itoh Electronics Inc., 19300 S. Hamilton Ave., Torrance, CA 90248; (213) 327-9100.

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Brock Activity Manager Series V5.0 Available

Brock Control Systems recently released the Brock Activity Manager Series version 5.0. This is a family of high-level software tools that address the information management requirements of small- and large-scale, multiuser, multicampaign, sales, telemarketing and customer support programs.

Modules for Account Management, Customer Support, and Telemarketing can be purchased as an integral, turn-key system or as individual system modules for installation on existing computer hardware. This multiuser package lets organizations plan, implement, track and manage both individual reps and entire sales, marketing, telemarketing and after-sale customer support campaigns.

Brock's software packages are written in C and run on business systems including DEC, AT&T, Compaq, Hewlett-Packard, IBM, NCR and Unisys under ULTRIX, UNIX, VMS and XENIX.

Learn more by contacting Brock Control Systems, 1600 Parkwood Circle, Atlanta, GA 30339; (800) 221-0775.

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New data communication product catalog from South Hills Electronics.

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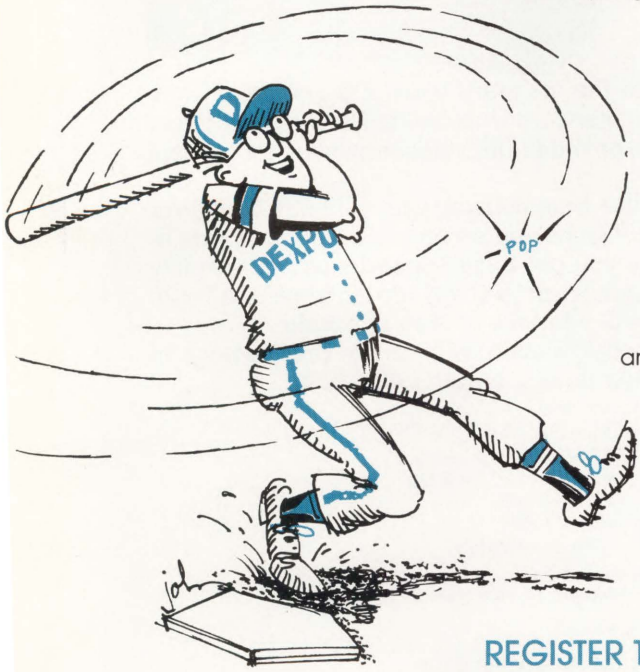

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Tasco Announces New Voltage Monitor

The AC Monitor from Tasco Ltd. is designed to monitor the line voltage and indicate all types of power line variations and failures. The unit indicates operating voltages of 100 to 130 volts AC. Alarms are provided for low voltage, power failure, high voltage and spike. The unit is intended for users of computers, voltage sensitive devices, and industrial equipment. It may be used to locate the source of voltage variations, spike and other line problems.

This small solid state unit requires no batteries and comes with a full one-year warranty. The AC Monitor sells for $138. Additional information is available by contacting Tasco Ltd., 2875 W. Oxford Ave., Ste. 5, Englewood, CO 80110; (303) 762-9952.

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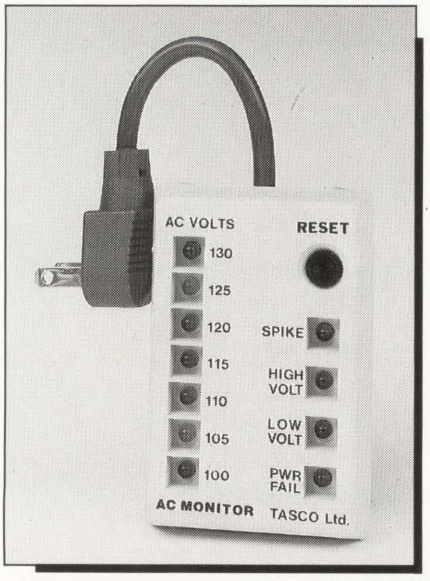

New voltage monitor from Tasco Ltd.

WordPerfect Releases Two New Products

WordPerfect 4.2 and WordPerfect Office recently were released by WordPerfect Corporation. The new WordPerfect 4.2 version for the VAX includes features that provide side-by-side and parallel columns, tables of authorities, line numbering, and an automatic hyphenation dictionary. Documents can be edited while in reveal codes. The updated version supports in excess of 200 printers, including the PS 40 and LNO3R printers. Speed enhancements also have been included.

WordPerfect Office, the new OA package, incorporates electronic mail, calendar, scheduler and phone message system. Each is fully compatible with WordPerfect and fully integrated through a flexible "shell" menu.

Cost for WordPerfect 4.2 and WordPerfect Office varies from $1,000 on the VAXstation to $29,000 on the VAX 8978. To find out more, contact WordPerfect Corp., 266 West Center, Orem, UT 84057; (801) 227-5500.

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Saber-C Helps Prototype And Debug Software

Saber Software Inc. announced the release of Saber-C, an integrated development environment that helps users quickly prototype and debug software written in C. The package provides software developers with features similar to those found in sophisticated LISP programming systems. Saber-C is for UNIX

2.5 Gigabytes VAX Backup

Gigastore works with the standard VMS, DCL Backup Command and all Qualifiers or standard Unix Dump/Restore Command and all Arguments. It also provides DEC tape emulation for general purpose use.

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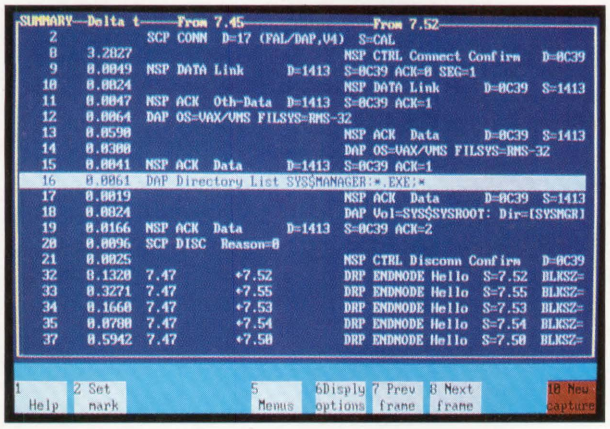
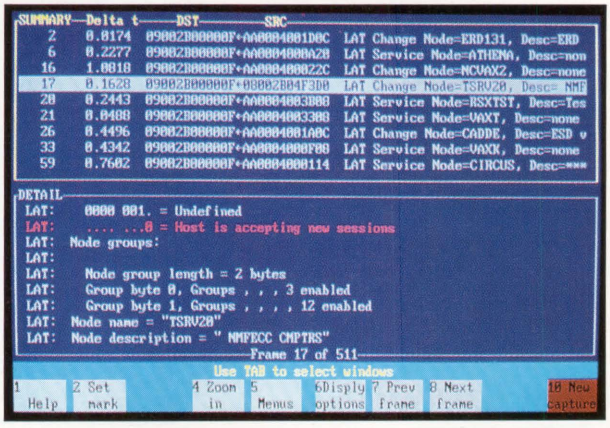


Unveil what protocols hide!
The Sniffer's DECnet protocol interpreter handles key protocols, including SCP, NSP, and DRP, as shown in this SUMMARY analysis of Ethernet frames. You can CAPTURE information based on lower level protocol content, node addresses, pattern matching, and/or frame error conditions, then instantly DISPLAY information in the format you prefer for analysis and understanding.



Peer into network activity at will!
Go below the SUMMARY view to see the DETAIL behind all network packets. The Sniffer sheds light where darkness reigned. Even LAT is fully decoded. Now you can tune and adjust your network configuration to meet your requirements. Get the most out of your network investment by seeing what's actually happening... before you invest more in your network.

Yes, your DECnet™ has secrets. Secrets like excessive retransmissions, or unexplained timeouts.

And you're paying for them. With lower network performance, high network maintenance costs, inefficient network planning and expansion, or even network downtime.

The Sniffer:
A complete system for network analysis that delivers big benefits: Better LAN performance, maintenance, and planning. Payback is often a matter of weeks.

Enter The Sniffer. Exit network secrets.

Attach the Sniffer™ to your LAN, and turn it on. You'll feel at home with the Sniffer's intuitive menu structure after just a few minutes.

Capture all the information on the network.

Or, using the menus, select various triggering and filtering combinations, to home in on areas you want to analyze closely.

And in moments, you'll see your LAN's protocol and traffic information laid out in the display format you choose for analysis and action.

The Sniffer takes you inside the critical networking protocols.

All the key DECnet protocols: LAT, MOP, DRP, SCP, NSP, DAP, and NICE. And there are software modules for TCP/IP, Sun protocols (including NFS), ISO/MS-Net, XNS/MS-Net, and Novell NetWare,® with more on the way.

Do you have multiple LANs? The Sniffer can have multiple personalities. So you don't need to buy a different system for each LAN.

What made The Sniffer the industry leader in only 2 years?

Network complexity. The bigger the network, the greater the consequences of network secrets.

The Sniffer's protocol capabilities, intuitive menu, display/reporting features, and multiple LAN personalities are unmatched by any other network instrument.

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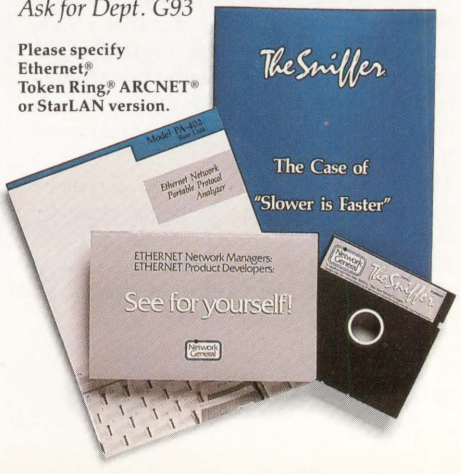

Network General

1945A Charleston Road
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and ULTRIX on DEC and Sun computers.

Saber-C has several tools: an industrial-strength C interpreter; a customizable, source language debugger; a comprehensive static and run-time program checker; an automated project builder; and an editing facility that can be used with any standard text editor. These tools have been integrated to create a highly interactive development environment that supports the entire development cycle, from creating a program to final-stage testing and debugging.

Prices start at $995 for MicroVAX and Sun workstations, with discounts available for network configurations.

Free evaluation kits and complete price information can be obtained by contacting Saber Software Inc., 30 J.F.K. St., Cambridge, MA 02138; (617) 876-7636.

Enter 385 on reader card

Disk Unit Compatible With DEC TU58

Walton Data Systems recently announced the Digifiler T58. This Digifiler is compatible with the DEC TU58 tape storage unit and allows an increase in the speed of operation of the system.

The Digifiler T58 provides a low-cost method for storage and retrieval of DEC information for the DEC equipment. It uses 3.5-inch floppy disk drives as the storage method and transfers data over a serial link using the same protocols as the DEC equipment. Two types of interfaces are available for the system: an RS232 link, which emulates the DEC TU58 but optionally has the addition of a hardware handshake as an alternative to the XON/XOFF data rate control; and a bi-directional parallel interface, which uses the same command and data structure as the serial interface.

To learn more, contact Walton Radar Systems Ltd., Aircraft Esplanade, Farnborough Rd., Farnborough, Hants, England GU14 6TG; 0252-549657, Telex: 858614.

Enter 389 on reader card

DS Series Offers Higher Performance And Capacity

A family of high-capacity, high-performance eight-inch fixed disk drives that allows VAX users to add more storage capability and upgrade their systems with direct plug-compatible replacements for DEC's 14-inch RA series fixed disk drives, was announced by Century Data Inc.

The DS series is transparent to VAX systems and gives VAX users a higher capacity, higher performance, lower cost alternative to the RA series 456-MB 14-inch drives supplied by DEC. The Century drives incorporate an embedded SDI interface, and are 100 percent compatible with DEC's UDA 50 (UNIBUS), KDA50 (Q-bus), KDB50 (VAXBI bus) and HSC50/70 cluster controllers.

Single-unit pricing for the eight-inch DS2600 starts at $14,500. Single-unit pricing for the 716-MB DS2800 starts at $17,100. Find out more by contacting Century Data Inc., 2055 Gateway Place, San Jose, CA 95110; (408) 298-5756.

Enter 526 on reader card

Digifiler T58, from Walton Data Systems, is compatible with the DEC TU58 tape storage unit.

V3.0 Of DEX Document Exchange Released

Systems Compatibility Corporation has announced version 3.0 of DEX Document exchange with 16 word processing document conversions and advanced functionality.

Files converted with DEX Document Exchange maintain function and format codes (e.g., underlining, centering, bolding, headers, footers, indents, tabs, etc.) that are contained in the source document. Among the additional features in version 3.0 are font support between word processors, side by side and serpentine columns, and footnotes.

Pricing for DEX Document Exchange version 3.0 is based on CPU size and includes all 16 conversion modules for one price: $2,000 for Size I systems (MicroVAX II through VAX 11/750), $4,000 for Size II systems (VAX 780 through 8300), and $6,000 for Size III (VAX 8500 through 8900). Current users under the maintainance program receive free upgrades to version 3.0.

Additional information is available from Systems Compatibility Corp., 401 N. Wabash, Ste. 600, Chicago, IL 60611; (312) 329-0700.

Enter 391 on reader card

RA-70 Compatible Disk Drives Announced

EXSYS Storage Systems Inc. has announced an RA-70 plug-compatible disk subsystem. The RAC-380 and RAC-760 use compact industry-standard 5¼-inch disks to offer the equivalent of over 13 gigabytes of formatted disk space per cabinet. This gives Series 8000 VAX users a low-cost, high-performance alternative to DEC RA drives and doubles the storage of any currently available disk subsystem in the DEC plug-and-play-compatible market.

The EXSYS RAC Series of drives may be attached directly to DEC DSA controllers, eliminating the space requirements for separate converter units as required by other DEC-compatible vendors.

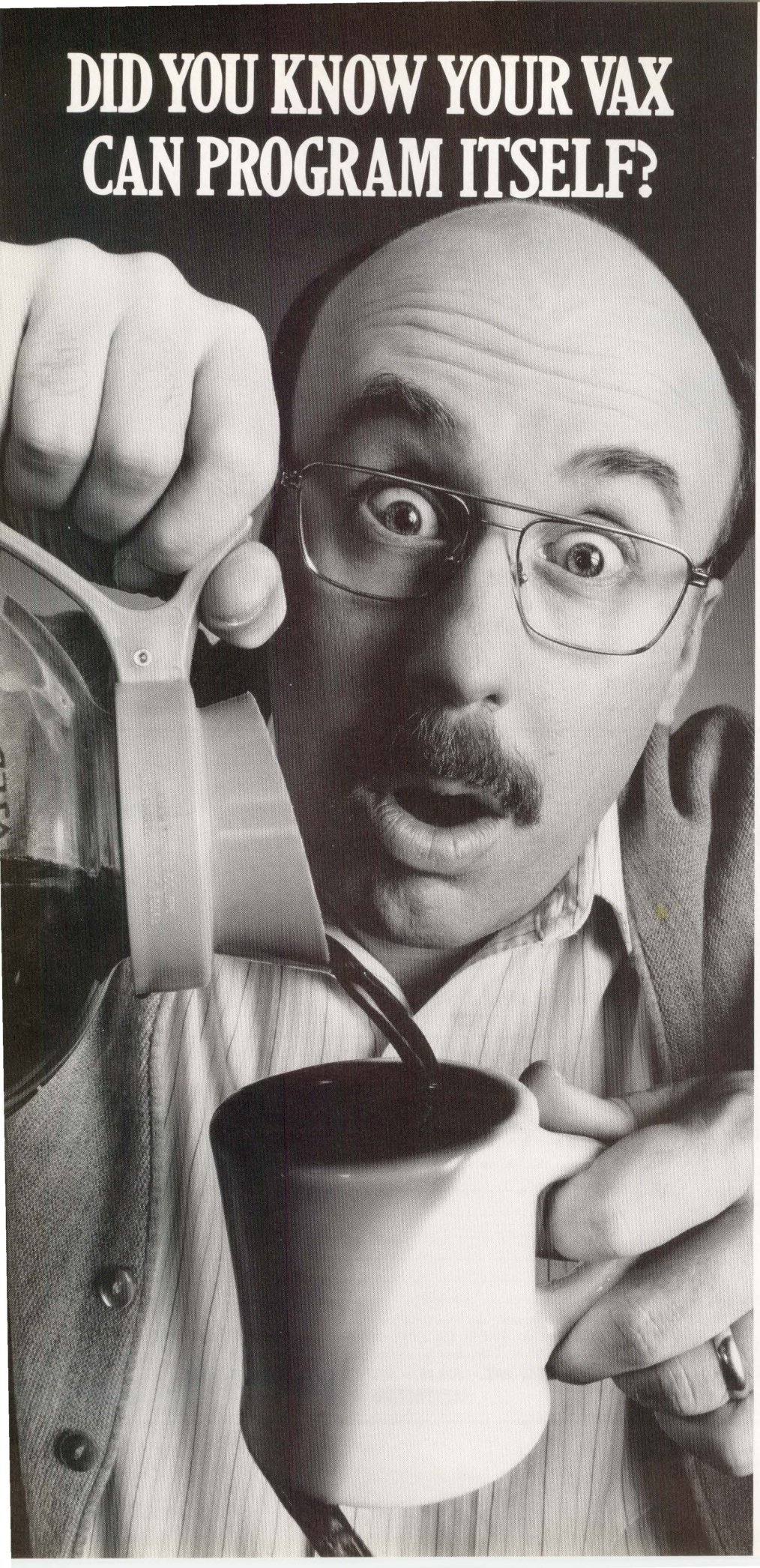
For more information, contact EXSYS Storage Systems, 1340 Tully Rd., Ste. 301, San Jose, CA 95122; (408) 292-0343.

Enter 392 on reader card

MTC Supports VT220 Terminal Emulation

StarSoft Technologies Inc. introduced the MultiTerm Card (MTC), a terminal emulation board for the IBM PC or compatible that supports full VT220 terminal emulation.

DID YOU KNOW YOUR VAX CAN PROGRAM ITSELF?



HOLD ON, THERE'S MORE

Your VAX can also automatically document what it programs. And deliver fully integrated production applications in the same time it takes an analyst to just write design specs. And always produce bug-free code.

Programming itself is just one of the new skills your VAX will acquire when you use CorVision to automate the design, coding and maintenance of application software.

NOW WE'LL REALLY POUR IT ON

CorVision from CORTEX Corp. is a fully integrated CASE product for the VAX. It provides a standardized application life cycle environment that seamlessly couples a graphics-based application design tool with a code generator.

With CorVision, developers use diagrams and pictures to describe applications. The code generator automatically translates these graphics into error-free, fully documented executable code that runs on any VAX VMS system. The generated applications are 100% compatible with DEC's RMS and Rdb. And they can be easily customized with any native VAX 3GL, or CorVision's own 4GL.

CorVision dramatically improves programmer productivity—our customers report gains of 6:1 and more. It provides a standardized methodology for application development. It has the power to handle large, complex commercial applications. All of which translates to one simple message: Users get applications that are delivered on time, perform as expected, and change as their needs change.

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Cortex Corporation
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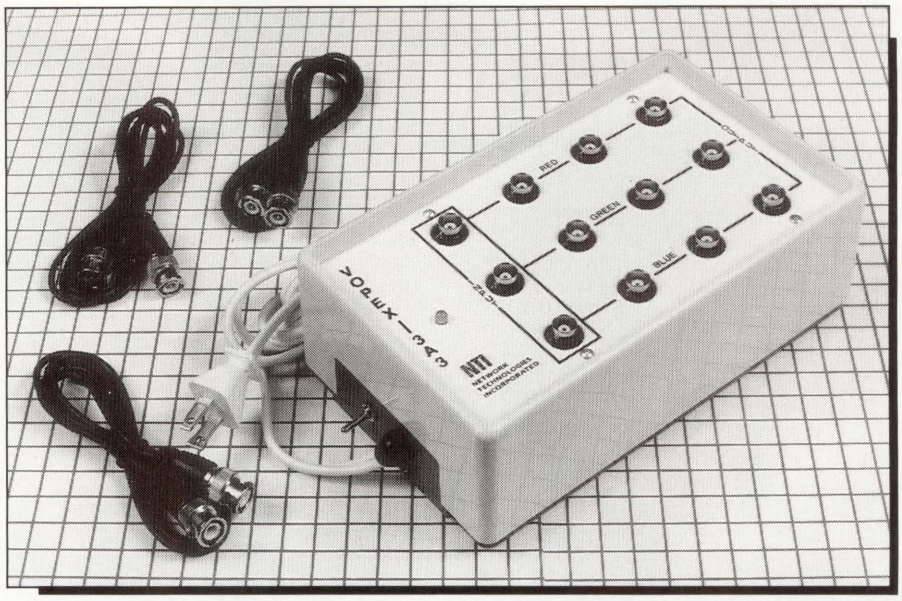
The MTC, and its accompanying software, provides the flexibility of using DOS applications and terminal applications all in one PC at one desk. This product is designed for use in an IBM PC XT/AT or compatible.

The board unit lists for $495 and includes a one-year warranty on parts and labor, a file transfer program, and one terminal emulation package. Additional software terminal emulation packages cost $200. Obtain more information by contacting StarSoft Technologies Inc., 14884 Berry Way, San Jose, CA 95124; (408) 377-6949.

Enter 393 on reader card

VOPEX-3A3 Used With MicroVAX 2000s

Network Technologies Inc. has introduced the VOPEX-3A3, a video output port expander to be used with MicroVAX 2000 workstations. The VOPEX-3A3 permits building a Video LAN consisting of a single computer driving up to three high-resolution analog color monitors located up to 100 feet from the computer. Each monitor displays identical information. This networking provides a cost-effective way to share computer data. It is ideal for training, CAD/CAM/CIM, presentations, process control, trade shows, etc.



R.H. Blake's VOPEX-3A3 is a MicroVAX video port expander.

Through the included six-foot interface cable, the VOPEX-3A3 accepts the output signals from the MicroVAX 2000. It amplifies and rebroadcasts the signals through three sets of individually buffered RGB outputs. Designed with 100 MHz bandwidth amplifiers, even 1,000-line monitors show no loss of color and graphics resolution at monitors up to 100 feet from the computer.

Learn more about VAX/VMS

Send for Introduction to VAX/VMS, 2nd Edition . . .

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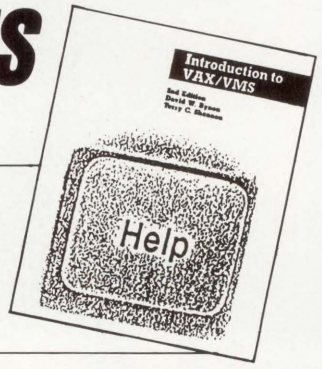

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The VOPEX-3A3 sells for $649.
For further information, contact Network Technologies Inc., 19145 Elizabeth St., Aurora, OH 44202; (800) RGB-TECH.

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Logicraft Releases New Version Of 386Ware

Logicraft Inc. has announced a new release of its 386Ware DOS server, which enables up to eight concurrent users on a VAX to access PC software. This version includes a 1.2 MB floppy disk drive, load balancing between servers and enhanced resolution for Lotus graphics. Communication speed between 386Ware and the VAX host also has been doubled.

Load balancing ensures optimum performance on systems containing two or more 386Ware servers. 386Ware automatically will select the best server on the network for providing DOS capability unless users specify which server they wish to access.

386Ware for four concurrent users is priced at $10,995, for eight concurrent users it's $15,995, and the 386Ware diagnostics package costs $795.
Learn more by contacting Logicraft Inc., 22 Cotton Rd., Nashua, NH 03063; (603) 880-0300, Telex: 703961.

Enter 395 on reader card

RAM Disk Boards From See First Technology

See First Technology's RAM Disk boards are available for MicroVAX users. Users can start with a one-board system (RDC-16) that contains 16 MB of 1 MB DRAMS plus an MSCP controller (Mass Storage Controller Protocol). An additional two boards (RD-32) that contain 32 MB of 1 MB DRAMS each can be added easily into the backplane, thus providing users with up to 80 MB of RAM Disk for rapid access of applications using graphics, image processing, simulation, transaction processing or database management. Other uses for the RAM disk are with mapping, software development, telecommunications and message switching.

The price of the RDC-16 RAM disk board is $12,000. The price of the RD-32 RAM disk board is $18,000.
For more details, contact See First Technology Inc., 3255-7 Scott Blvd., Ste. 103, Santa Clara, CA 95054-3013; (408) 748-7717; FAX: (408) 748-7621.

Enter 396 on reader card

MCBA Debuts Labor Performance Package

MCBA Inc. has unveiled its Labor Performance (L/P) software package for VAXs. This

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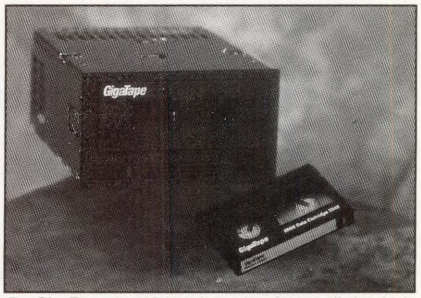

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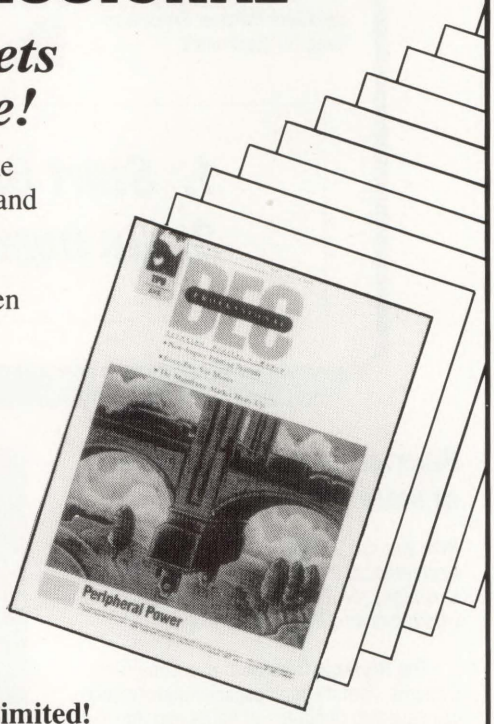

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Display Controller Produces Crisp Images

Univision Technologies Inc. has announced the UDC-800-Q Series 2048 x 1536 x 8 + 1 bit graphic overlay high-resolution photographic quality image display controller. This controller is for critical applications requiring crisp, photographic quality display, addressing markets such as high-resolution medical imaging, surveillance, publishing, office automation, CAD/CAE, etc.

By using the Intel 82786 graphic controller and video RAM memory, fast operations such as polygon, line drawing, bit-block copies and multifont text can be achieved. The memory is dual ported, thus facilitating fast host access.

Single quantity pricing for the UDC-800-Q is $6,995.

For additional information, contact Univision Technologies Inc., 12 Cambridge St., Burlington, MA 01803; (617) 273-5388.

Enter 525 on reader card

TRAQ-1 Integrates QA Functions

The Gibson-Graves Company Inc. has announced the TRAQ-1 System, a multiuser system that operates on the MicroVAX and VAX computers under the VMS operating system. It features specific modules for analyzing quality data for raw materials, manufacturing, and both batch and lot-oriented finished materials. The system also provides full database query and reporting capabilities.

The basic TRAQ-1 software package lists for $25,000 for a single-machine license. The purchase price includes installation and configuration support.

For further information, contact Gibson-Graves Co. Inc., 261 South St., Box 1078, Wrentham, MA 02093; (617) 384-7164.

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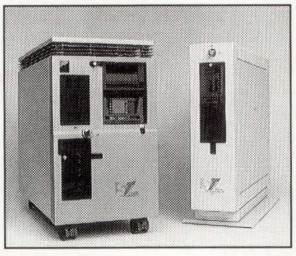

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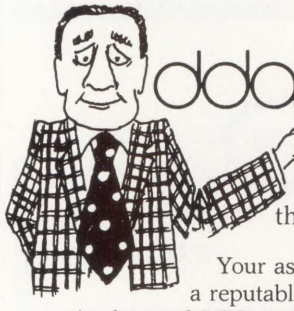

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BACK END

John C. Dvorak

I Had A Dream

I guess we all have funny dreams once in a while. Last week, I had the funniest ever. I figured that because it was about personal computers, you might be interested.

It started in 1981 or so, when IBM announced its personal computer. It had a cassette drive and ROM BASIC, and we all knew it would become the turkey that it is. All the success of the DEC Rainbow and DEC PRO machines was lost in this dream. DEC didn't take over the personal computer market at all in my dream — IBM did! Can you imagine anything so silly?

Some funny things happened in my dream. As you know, since the introduction of the DEC minicomputers, there hasn't been one strong competitor except Apple and its non-standard Macintosh. During my dream, there were all sorts of machines from all over the world making clones and souped-up versions of the IBM PC. Even the processor chips kept improving. There was some firm making a machine using a chip called the Intel 80386 running at an incredible 24 MHz. That'll be the day!

DEC has shown throughout its history that processor speed isn't important. After its success with the 8088-based Rainbow, DEC proved this once and for all when it brought out a Z-80-based Rainbow PDQ for the home market. As someone blithely pointed out during the press conference announcing this little puppy, "File compatibility is all the user cares about. All this nonsense about which CPU is the best or fastest is just that — nonsense."

But the dream and its world of high-powered CPUs was amusing. Another thing that turned up was third-party software. It was incredible. It was mad. The whole country had gone software crazy. Millionaires were made overnight. *Time* magazine had the computer as man of the year. I vaguely remember that some kid became a billionaire in software. Is this a laugh riot or what?

The notion that microcomputer third-party software would be a big moneymaker has been disproved over and over again by real software companies like MSA and Cullinet. The real dough is in expensive support for expensive minicomputer packages. Now we all know that, thanks to DEC.

I wish I were better at remembering the details in this dream, but I do remember a thing called *Lotus 1-2-3* that was some sort of program that worked like the old *VisiCalc*. It was ridiculous. The guys made millions of dollars selling something with a name like *Lotus*. It must have been something I ate.

There was also a slew of database managers, none as good as the DEC Rainbow Filer, but all making people rich. I figured I must be concerned with money since the stock market collapse, and that caused this dream.

Here's another laugh. For all these computers, you could buy diskettes from any Jack on the street for, say, 35 cents. Talk about living dangerously. Thank goodness DEC dominates the scene with its policy of selling only the best preformatted diskettes for $5 each. And, remember that $5 is a good deal. I understand that's about what it costs to make a floppy diskette with all its complex coatings. Can you imagine buying any old floppy off the street and formatting it yourself? Hah! That'll be the day.

Let's face it. If IBM dominated the microcomputer scene in any way, it would screw it up. IBM would do everything wrong and others would have to come in to clean up the mess. I guess that's why there were so many products and magazines. They were all cheap fixes for a botched job. Thank goodness that Ken Olsen and DEC saved us from such a fate.

As I sit here at my newest Rainbow GTO with its speedy 8088 chip and 16 colors, I'm amazed at what it does. I can't get along without the newest DEC line editor and text formatter. Now I only need five codes instead of six to insert a word into my document. It sure saves retyping! The best part is the price. At $1,295, it's setting a new standard for low prices in software.

And, let's not overlook the great operating system CP/M-86 V8. It includes (free) an extra boot disk and a utility to recover lost files when a BDOS error is encountered that crashes the system. What more could you ask for?

But this is beside the point. We all know what a wonderful world of computers it is, thanks to DEC and its powerful micros and wonderful support. The support is especially good and quite handy when the machine dies every so often.

But, this dream . . . uh, hey wait. Something's wrong. I seem to be dazed. Was it IBM or Data General that took over the business? No, wait. It wasn't a dream. . . . Yeah, that's it. Gosh. Everything's backward. I'm sorry. IBM did take over the microcomputer scene. I had a dream about a world where DEC took over, and we were stuck with $1,295 line editors and clunky machines and, gasp, CP/M-86!

Hold it. I'm sorry again. It wasn't a dream. It was a nightmare.

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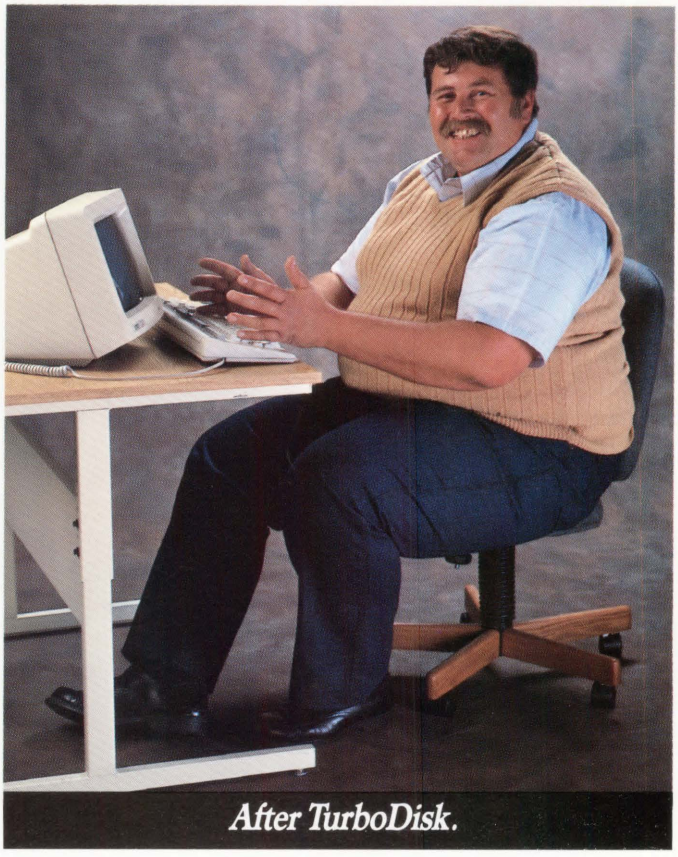

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