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HP Professional

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MARCH 1988

- UNIX Dominates The Growing Workstations Market
- X Window, Part 3
- Programming Languages

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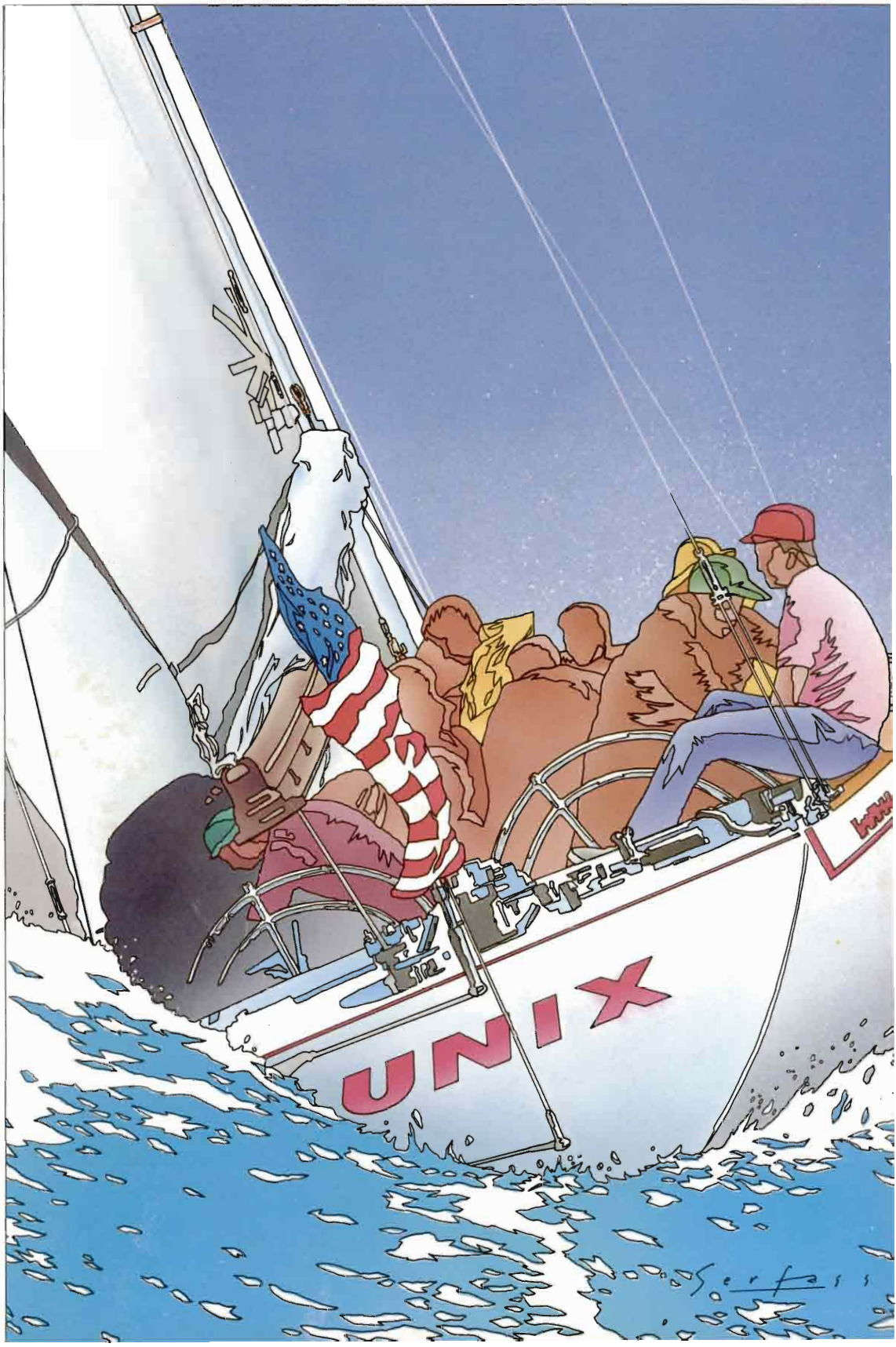

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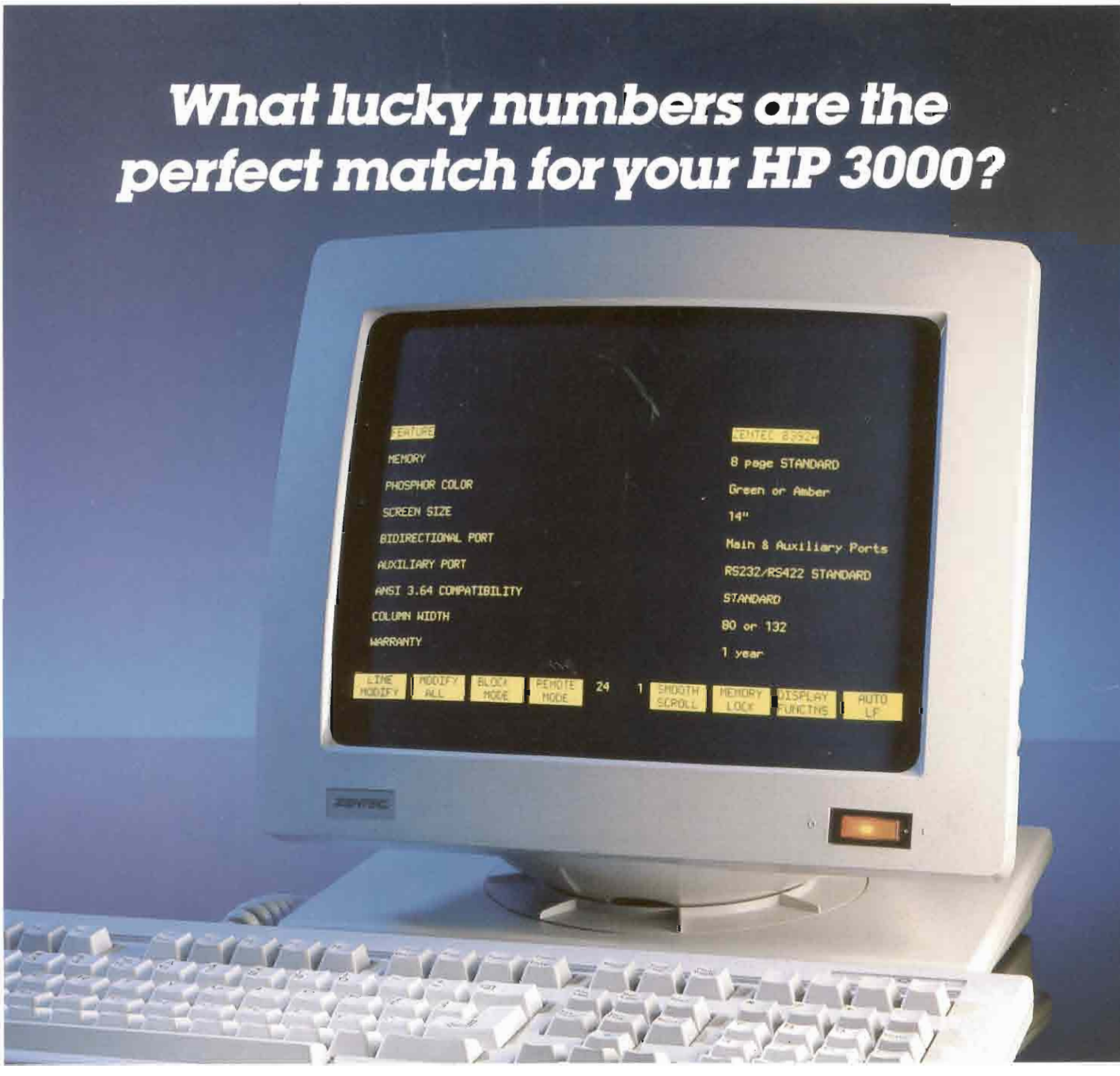

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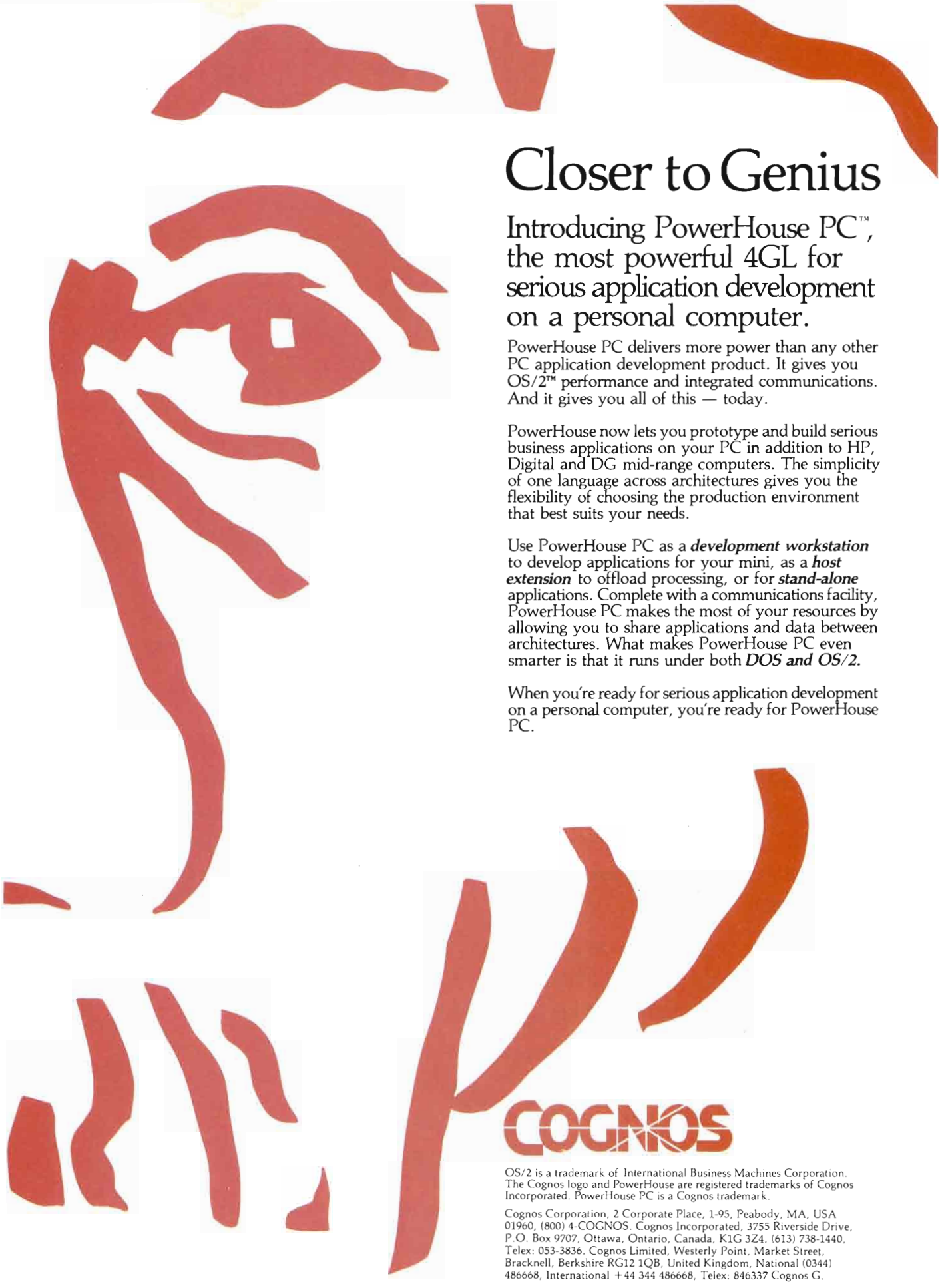

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A Summit But No Treaty

A summit meeting with Vittorio Cassoni of AT&T was held at a New York hotel during the last week of January with representatives of HP, DEC, Apollo and other leading vendors who license UNIX. After the meeting, vendor spokesmen said there were no assurances that release 4 of AT&T's System V would remain non-proprietary.

The Sun is setting on the land of UNIX. Ever since Sun and AT&T became entangled via a 20 percent stock purchase, there have been rumblings that maybe UNIX is no longer the land of the free. It seems that AT&T has developed a new vision of UNIX that is somehow linked with the Sun Sparc chip set.

This is not unlike the lease on Hong Kong.

I've always wondered just who is going to pay for the subsequent releases of UNIX. It seemed to me that too much of the income from UNIX licenses was going into corporate bottom lines instead of further development. Some form of shakeout (shakedown?) was inevitable. After all, how long should AT&T provide an "open" operating system to a world in which DEC is making hay with a closed VMS (hay = $billions)? Now that AT&T has bought a piece of an accomplished computer maker, why carry on helping the competition?

Also, how can UNIX ever survive in a world in which Digital is pouring hundreds of millions into aggressive VMS development, following one plan and heading one way? If the enhancements to a release of UNIX have to filter through myriad committees of many vendors before they reach the common core release, how can there be a plan or even a steady direction?

One wonders just how air-tight the license agreements between AT&T and the various vendors really are. It's too late for the vendors to transition to Berkeley. What recourse do the users who bought their licenses from these vendors in good faith have? Sounds like the litigation event of the decade. I've heard much grandstanding about open systems and standards for years now. Let's see how fast all that noble talk unravels.

Perhaps the answer for HP lies in those standards. What UNIX needs is a fully funded third-party developer that isn't a computer manufacturer. Perhaps such an organization could be forged by the X/OPEN committee. In the face of the current bad news, this might be "mission critical."

These developments add a new meaning to the disclaimer we are always forced to add whenever we print the word UNIX:

"UNIX is a trademark of AT&T."

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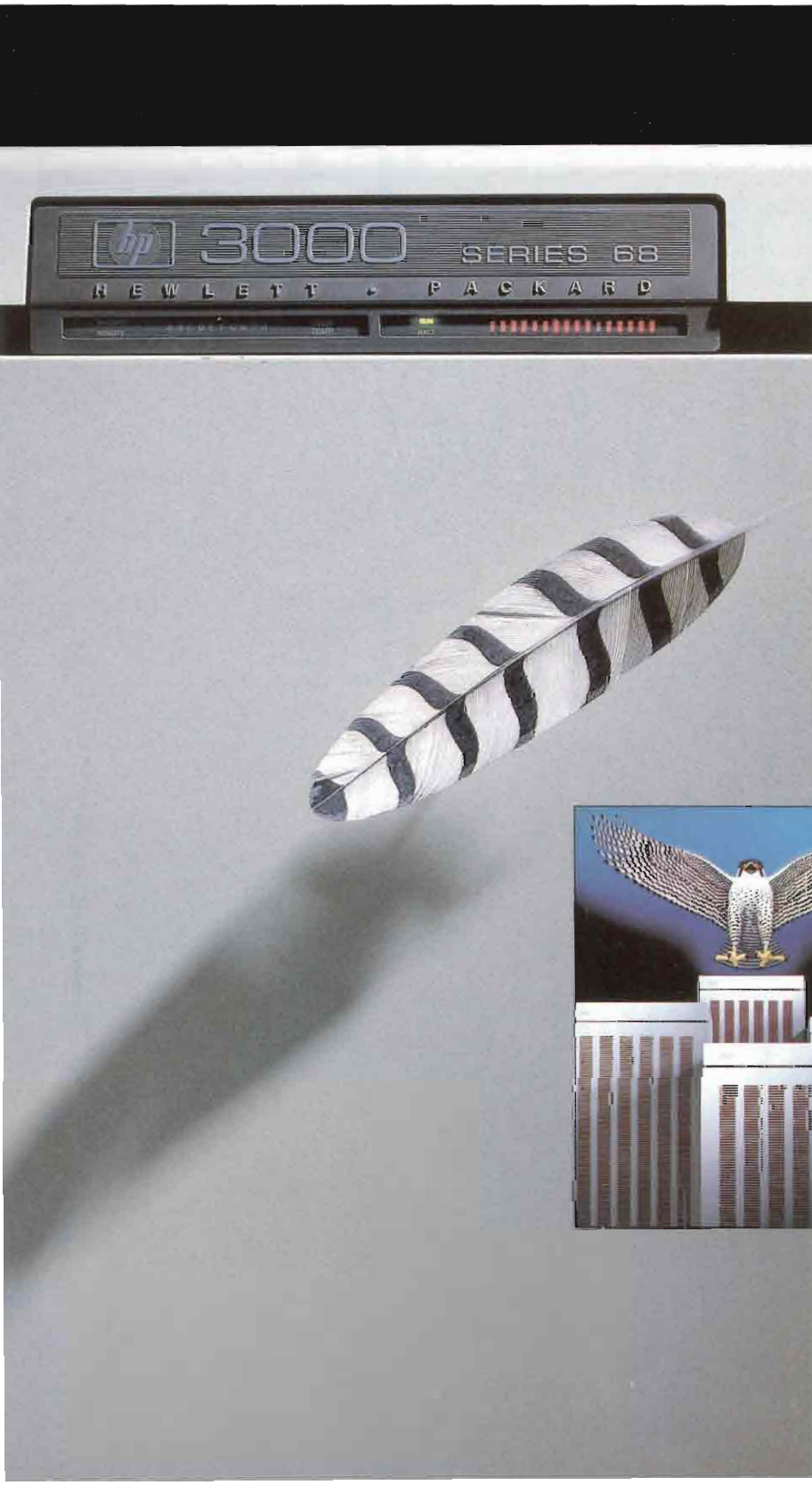

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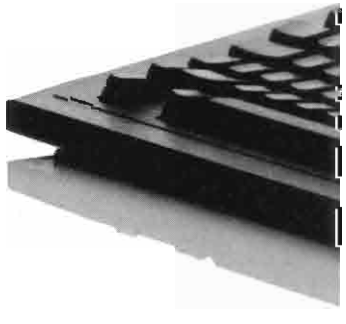

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Series 80s For EEs

I was pleased to see that Don Person, in his article, "Survival Training" (December 1987), suggested donating old HP 85 computers to a school computer laboratory. In December 1985, I equipped an undergraduate laboratory with eight HP 87 computers. This lab is the last required lab class taken by all electrical engineering majors. They study automatic test equipment with the IEEE 488 interface. They also use 16-bit parallel and RS-232 interfaces.

We would be interested in acquiring gifts of old HP 85, 86 and 87 computers, ROMS, interfaces, etc., for use in this laboratory.

Ronald B. Standler
Pennsylvania State University
University Park, PA

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In Search Of 85s

This letter is in reference to Don Person's article, "Survival Training: What To Do With Your HP 85" (December 1987).

Our department feels exactly the same as you do. The HP 85 is the finest computer for teaching BASIC programming and instrument control.

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The computers and the instruments are then used in the sophomore courses as well as in our new Upper Division junior and senior courses. We also use IBM PCs for those Upper Division courses that require special software (e.g., PALASM, SPICE, 8086 ASSEMBLER).

Originally we used a less expensive computer in the freshmen year and the HP 85s in the follow-up years. Last year we had to replace the freshmen computers and, after much soul searching, we decided to buy more HP 85s, even though we knew they probably would be discontinued by HP. The choice also was more difficult because the HPs cost about twice as much as the IBM PCs. We felt, however, that the HP 85 was the best computer for beginning students. We have about 45 HP 85B computers — 25 in our freshmen lab and 20 in another lab that is shared by sophomores and Upper Division students. There are several other labs that we would like to equip. We also can use non-working units for spare parts. We also need ROMS (particularly MATRIX and PRINTER/PLOTTER ROMS), ROM drawers, manuals and other peripheral equipment.

Perhaps some of your readers would like to donate their HP 85s if they are not using them any more. (Phone: 516-420-2589) We will put them to good use.

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THE TRUTH

It was very interesting for me to read Q&A in the December 1987 issue, especially the question on "Sizing Up A Disc File." The way the file system builds files is certainly a mysterious enough topic, with plenty of confusion to go around. The answer given did an admirable job of trying to clear up some of this confusion. And, needless to say, I was quite flattered by your reference to my *Thoughts and Discourses on HP 3000 Software* book (available free from us here at VESOFT). The part of it that is most relevant to this topic is probably our "The Truth About Disc Files" paper.

There were a few minor inaccuracies in the answer that I feel I ought to point out. For those who want to verify my comments, I tested this out on MPE version G.B3.00, the V-MIT release of MPE V/E. It may be that both of us are right, but for different releases of MPE.

First, the RECSIZE (Record Size) parameter must be a non=-zero integer in the range -32,766 to 16,383 (rather than -32,767 to +32,767). Saying:

```
:BUILD X;REC=16384,1,F,ASCII
```

will get you:

```
INVALID RECORD SIZE SPECIFICATION (FSERR 10)
```

Saying:

```
:BUILD X;REC=-32767,1,F,ASCII
```

will get you:

```
INVALID RESULTANT BLOCK SIZE (FSERR 11)
```

(somewhat surprising in light of the fact that a record size of -32,767 is actually the same as 16,384, since the 32,767-byte record size is divided by two and rounded up to get the word record size).

Second, the answer quite aptly points out that buffered I/O (the default way of accessing a file) places its own restrictions on the size of a file block; if you access a file with buffered I/O, the file system has to read at least one entire block of the file into a buffer data segment.

Once upon a time, the maximum size of a file system buffer data segment was 8,192 words, which meant that with the file system default of two buffers, each block has to be at most 4,096 words long (unless you were willing to always access the file NOBUF). If you tried to open a file in such a way that #BUFFERS * BLOCKSIZE was greater than 8,192, you'd get the infamous file system error 57 (OUT OF VIRTUAL MEMORY?!?).

Eventually the maximum buffer segment size was raised to about 14,000 words that the Q&A mentions; however, the file system also was smart enough to allocate only as many buffers as could fit inside the maximum size. Thus, if you tried to access a 14,000 words/block file with the default two buffers, the file system would let you access it, but would give you only one buffer (since two buffers of 14,000 words each wouldn't fit in the data segment).

In V-MIT (and I believe even for a few earlier releases), you can build a file with a block size of up to 32,640 words (more about this later). For instance, you might say:

```
:BUILD X;REC=16320,2
```

building a file with two records of 16,320 words each per block. Try building this file and then reading or writing it with FCOPY (which always uses buffered I/O as a default). You'll see that, at least on V-MIT and later, it works.

What, then, are the constraints on block size? Well, for one, although you can talk about negative block sizes (meaning block sizes in bytes), the block size is, to the best of my knowledge, always stored on disc and returned by the file system as a positive number of words. I believe that you can't either specify or get a negative block size.

A file's block size may be from 1 to 32,640 (not 32,767) words. If you tried to build a file with block size of 32,768 or more; e.g.:

```
:BUILD X;REC=8192,4
```

you'll get the message:

```
INVALID RESULTANT BLOCK SIZE (FSERR 11)
```

Continued on page 16.

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What if you attempt to build a file with block size of 32,767 (or any other size between 32,641 and 32,767)? Try saying:

```
:BUILD X;REC=4681,7          (4681*7 = 32767)
```

and you'll get the error:

```
INSUFFICIENT SPACE FOR USER LABELS (FSERR 107)
```

There is a one-byte field in a file's file label called "sector offset to data" which indicates the distance (in sectors) from the file label to the first sector of the first data block. Since this is a one-byte field, its maximum value is 255. This, incidentally, is why a file can have at most 254 user labels — if a file had 255 user labels (one sector each, as all user labels always are) plus a one-sector file label, then the sector offset to data would be 256, which would be too large.

In any event, a file's data (everything except the file label and the user labels) must start in its own block. If the block size were greater than 255 sectors, then the sector offset to the first data block again would have to be greater than 255 sectors. Therefore, the maximum block size is 255*128 = 32640 words.

Another interesting point: To be precise, the block size is not just RECSIZE * BLOCKFACTOR; rather, if the RECSIZE is an ODD number of bytes, it has to be rounded up to the next highest even number before multiplying. Thus, if the record size is three bytes (-3) and the blocking factor is 10, then the block size is not 30 bytes; rather, the record size is rounded up to four bytes (two words), so the block size becomes 20 words.

Curiously enough, I made exactly the same mistake — stating that the block size is exactly equal to the record size times the blocking factor — in my "Truth About Disc Files" paper. Even more curious is that, in one particular case, MPE makes exactly the same mistake, too! Let's try a little experiment:

```
:BUILD X;REC=-3;DISC=120000
:LISTF X,2
```

What do we see?

```
FILENAME CODE ------------LOGICAL RECORD----------  ----SPACE----
              SIZE  TYP       EOF    LIMIT R/B     SECTORS  #X MX

X              2W  FB          0    120000 64         235   1  8
```

Whoops! We didn't specify "ASCII" on the :BUILD, so the file was built as a binary file, with a record size calculated in words. Thus, the file has a record size of two words = four bytes. Not what we want.

Let's try again:

```
:BUILD Y;REC=-3,,,ASCII;DISC=120000
:LISTF Y,2
```

We now see:

```
FILENAME CODE ---------LOGICAL RECORD-----------     ----SPACE----
              SIZE  TYP       EOF    LIMIT R/B     SECTORS #X MX

Y              3B  FA          0    120000 85         354  1  8
```

MPE tried to set the blocking factor to the maximum number of records that can fit into one sector. Since a sector is 256 bytes long, it divided 256 bytes by three bytes and got a blocking factor of 85. Why, then, does Y take 354 sectors where X (whose record size is actually 33 percent larger than Ys) takes 235 sectors?

Well, if we run LISTDIR5 and do a >LISTF Y, we'll see that Y actually has a block size of 170 words. In reality, the file system calculates the block size to be the record size in words multiplied by the blocking factor; in this case, it's 2 * 85 = 170. In its attempt at fitting as many records into a sector as possible, MPE tried to put in too many. As a result, it wastes 256-170 = 86 words out of each 256-word block — almost 34 percent of the total space of the file!

Incidentally, our own MPEX doesn't make the same mistake. If you say:

```
:RUN MPEX.PUB.VESOFT
%!ALTFILE X+Y,BLKFACT=BEST
```

both X and Y will be set to have the optimal blocking factor of 64.

The answer also indicates that if you write a record into the last record of a file, all intervening extents will be allocated. Although this is quite plausible (and, in fact, may be the way the system ought to work), it isn't quite true. Try it yourself. Type:

```
:BUILD X;DISC=1023,8
```

and then run a small program that does an FWRITEDIR into record number 1022 (the highest possible record number in this file). Then, do a :LISTF X,2, and you'll see:

```
FILENAME CODE ---------LOGICAL RECORD-----------     ----SPACE----
              SIZE  TYP       EOF    LIMIT R/B     SECTORS #X MX

X             128W  FB       1023    1023   1         256  2  8
```

The EOF is 1023, seeming to indicate that the file is completely written. However, the number of allocated extents is only two, and the number of sectors in the file is only 256! If you do a LISTDIR5 "LISTF X;MAP" or an MPEX "%!LISTF X,4", you'll find that indeed only the first and last extents are

Continued on page 80.

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NEWS & TRENDS

N&T

CSI Celebrates 20th Anniversary In HP Marketplace

Dealer Of New & Remarketed HP Equipment

This year, Computer Solutions Inc. (CSI, Orange, NJ) celebrates its 20th year in the Hewlett-Packard marketplace.

Gerald O. Heath, President, began the company in 1968 as a time-sharing firm. CSI then expanded into hardware sales, service and software. Today, it is a leading dealer of new and remarketed Hewlett-Packard equipment and referenced vendor of educational software under the HP+ software supplier program.

CSI's facilities include corporate headquarters in Orange, NJ, and a branch office in Torrance, CA. A $3 million inventory of HP 1000 and HP 3000 CPUs and peripherals includes both the older and more current HP product lines.

DISC Provides OMNIDEX For Spectrum

Means Faster Retrieval Speeds

Dynamic Information Systems Corporation (DISC, Denver, CO) announced that its information management product, OMNIDEX, now is available to customers wishing to use it on the newly released Spectrum class machines.

Native-mode programs developed for the Spectrum machines now directly can call OMNIDEX intrinsics. Several large customers, including Distribution Resources Corporation (Englewood, CO) and Houghton-Mifflin (Burlington, MA) successfully have been using OMNIDEX and its related products IMSAM and DBMGR on their newly installed Spectrums and receiving full technical support from DISC.

In a recent benchmark, OMNIDEX ran a test report over seven times faster on a Micro3000 than the same report on an IBM 3081.

HP Chooses Brock Control Systems To Automate Telemarketing Centers

Software Installed In 5 HP Locations

Brock Control Systems (Atlanta, GA) has installed the Brock Activity Manager Series in the first of five Hewlett-Packard Company locations. The Brock automated telemarketing and account information management system will be installed in HP's Customer Information Center in Cupertino, CA, and Installed Base Telesales Centers in Atlanta, GA; Rolling Meadows, IL; Palo Alto, CA; and Rockville, MD. The total number of HP users of Brock software will be more than 100.

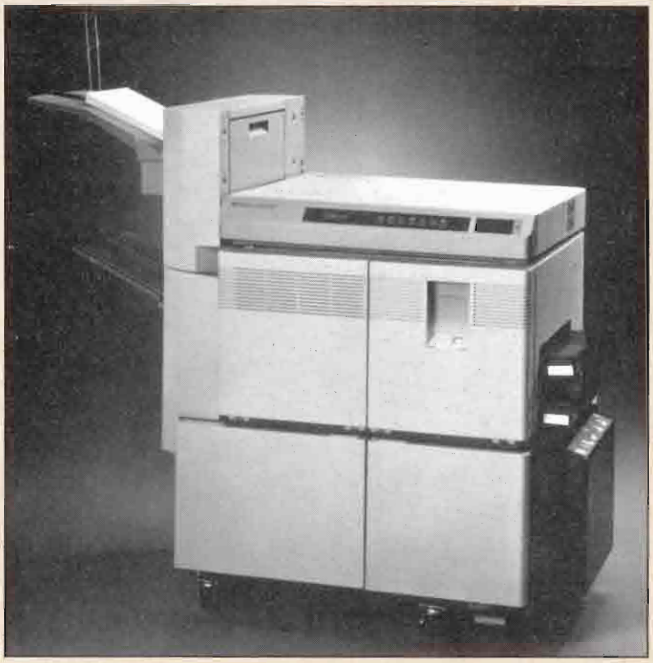
The Brock Activity Manager Series is a multiuser software system designed to automate telemarketing, account management and customer support information and activity. Version 5.0 of the Brock Activity Manager Series is currently installed in more than 120 companies across the country.

"We chose the Brock software because it handles multiple contacts, selling situations and sales cycles at a single site," said Janice A. MacKanin, Information Systems Manager at HP's Customer Information Center.

Currently, the Brock software is targeted for two functional areas within HP: the Customer Information Center and the Installed Base Telesales Centers. The HP Customer Information Center provides one 800 number that customers may call to receive information about HP products. Telemarketers and technical support representatives at the CIC provide assistance, fulfill literature requests, answer questions from online information databases and manage prospect history through the Brock software.

Installed Base Telesales Centers will maintain customer sales information databases in the Brock system. By accessing these databases, the customer reps will use Brock software for follow-up sales and to maintain a close relationship with customers.

The Brock software is compatible with the HP 9000 Series 800 engineering computers, which have the HP-UX operating system. Brock will be operational on the HP 9000 Models 840 and 850 superminicomputers, which use HP Precision Architecture.



Designed for PC networks, multiuser systems and minicomputers, the HP LaserJet 2000 printer from Hewlett-Packard prints 20 pages per minute and has 67 internal character sets.

LaserJet 2000 Makes Debut

Targeted To Multiuser Environments

Earlier this month, HP announced the HP LaserJet 2000 printer, the first HP LaserJet-compatible printer specifically targeted to multiuser environments.

Designed for use with personal computer networks, departmental systems and minicomputers, the HP LaserJet 2000 printer has 20-page-per-minute print speed, advanced paperhandling features, increased graphics memory and 34 internal fonts.

The new printer, comparable in size to a small departmental copy machine, is available in three configurations.

The standard Model 2684A features compatibility with the de facto industry standard HP Printer Command Language (PCL); 1.5 MB RAM; full-page, 300-dpi raster graphics; two 250-sheet input bins and a 1,500-sheet correct-order output bin.

Model 2684P has the same features as the standard model, plus a third paper-input bin that holds 2,000 sheets of 8 1/2-inch or European A4 paper.

Model 2684D features automatic two-sided (duplex) printing, enabling users to print two pages of information for the price of a single page. It also has a third 2,000-sheet paper-input bin.

According to Douglas K. Carnahan, general manager of HP's Boise, Idaho, Division, marketing headquarters for the HP LaserJet printer family, the LaserJet 2000 has a monthly print volume of up to 70,000 pages at a cost per page of roughly two cents, approximately half that of the current HP LaserJet printers.

Like all other printers in HP's laser printer family, the LaserJet 2000 supports HP's PCL language. As a result, more than 500 HP and Value-Added software programs that run on the HP LaserJet, LaserJet Plus, LaserJet 500 Plus and LaserJet Series II printers are compatible with the HP LaserJet 2000 printer.

The standard HP LaserJet 2000 printer, Model 2684A, is $19,995. HP Model 2684P, which includes the input bin, is $21,995. Model 2684D duplex HP LaserJet 2000 printer is $24,995. The 1-MB add-on memory module is $750. Printer interfaces are $500 each.

RetroTech Modernizes Material-Handling Equipment For York International

Contract Provides HP 1000 System Replacement

RetroTech Inc., a Fairport, NY, engineering company, recently completed a material-handling equipment modernization for York International (Madisonville, KY).

The air-conditioning manufacturer contracted with RetroTech to replace the electrical controls on the three double-deep Automated Storage/Retrieval System (AS/RS) machine controls and the inbound/outbound conveyor.

The existing controls were replaced with Modicon 884 programmable controllers. A new D.C. motor and Fincor 3220 regenerative drive controller system replaced the existing SCR drive control and AC motor system to provide a state-of-the-art, off-the-shelf, ramp-controlled longitudinal drive system. An array of Banner SM502 photocells was used to read reflective-taped, binary-encoded positioning targets for the longitudinal and vertical axis.

The original paper inventory control system, which consisted of a mylar punch card envelope and reader system, allowed a part number ticket to be matched to a rack location.

The new HP 1000 system replacement monitors all S/R machine activity and tracks inventory in and out of the system. User-friendly screens assist operators in storing, retrieving and diagnosing system activities. The HP 1000 also enables York International to link the automated warehouse to the HP 3000 host system using AMAPS. The host link allows improved scheduling and provides real-time flexible manufacturing capabilities to York's operations.

RetroTech Inc. has completed seven other similar contracts and currently has two more in progress.

Tymlabs Ports BackPack To Precision Architecture

Spectrum Version Promised In '88

An HP 3000 Series 950 was installed at Tymlabs Corporation in December 1987, and shipments of Precision Architecture versions of Tymlabs' products already have begun.

"We are extremely impressed with the improvements HP has made in the reliability and performance of MPE XL over the last 12 months. The 950 will undoubtedly become the preferred upgrade path for large customers," said Tymlabs' president Morgan Jones.

The conversion of Tymlabs' product line to run on the Precision Architecture systems is reported to be running smoothly thus far, with compatibility-mode versions of PreView, Menu Processor, Math/3000 and Payroll/Personnel already shipping.

The new 950 is connected to Tymlabs' three other HP 3000 systems over a LAN via NS/3000. The first project for which the system is being used is the porting of BackPack, the firm's high-speed and unattended system backup utility, to the Precision Architecture environment. Since BackPack is a system-level program whose operations are integrated with those of the operating system, Tymlabs felt they needed a 900 Series on site to completely do the job.

Winston Kriger, technical director, reported that "by having the full range of HP hardware right here on site, we shorted our testing cycle, since the operation of new product versions can be tested on almost all possible HP 3000 configurations here in our own computer room. And if a customer runs into trouble, our tech support team can immediately reproduce the problem on the same equipment. This helps us determine whether the source of the problem is software, firmware or hardware."

Tymlabs chose the 950 over the less expensive 930, since the 950 will be the system of choice for larger customers who need the most power HP has to offer. It's the best machine for the BackPack development team to use because they work on schemes to increase data compression and improve performance.

Tymlabs is committed to delivering a Spectrum version of BackPack in 1988, which will deliver the same performance advantage as BackPack provides on the stack-based HP 3000s with equivalent or improved functionality. Tymlabs plans to provide a tape format that will allow interchangeability of data between MPE V and MPE XL systems, within the limits imposed by Hewlett-Packard.

The HP 64700 emulators and analyzers mark HP's entrance into the entry-level microprocessor-development market.

HP Offers Entry-Level Microprocessor Development Tools

Combines New Emulator Technology With Logic-Analyzer-On-A-Chip

Hewlett-Packard has combined new emulator technology with its logic-analyzer-on-a-chip to create a new family of high-performance microprocessor-development tools at prices comparable to other entry-level emulators.

The HP 64700 series consists of standalone, in-circuit emulators and emulation analyzers for the industry's most popular 8- and 16-bit microprocessors. Emulators and analyzers for the Z80, MC68000, 80186 and 80188 microprocessors are available initially, with other products planned. A fully integrated external timing/state analyzer also is available as an option.

With the introduction of the HP 64700 series emulators, HP believes it is the first vendor to offer entry-level microprocessor-development tools for engineers in small design teams with a migration path to a high-performance development environment for the largest development teams.

The HP 64700 series can be run with most computer systems or a basic terminal. Special user interfaces are available for PCs and compatibles including the HP Vectra PC, and HP 9000 Series 300 workstations.

The HP 64700 series introduces several features for the entry-level emulation market such as:

- *a comprehensive software- and hardware-migration path from an entry-level to a high-performance microprocessor-development environment;*
- *greatly improved cable lengths and innovative probing technology;*
- *triggering capabilities in the emulation and external analyzers that feature eight-level sequenc-*

ing, time tags and prestore;

- *an optional 16-channel external analyzer that can function as an independent 100-MHz timing analyzer as well as a 25-MHz state analyzer;*
- *synchronized operation and cross-triggering with other HP 64700 and HP 64000-UX emulators/analyzers;*
- *real-time code-coverage analysis implemented in hardware to provide a history of the memory addresses that are written to or read from during program execution;*
- *a high-speed RS-422C serial interface to improve emulator download and upload times;*
- *a dual-bus architecture complemented by dual-port emulation memory to ensure non-intrusive, real-time emulation; and*
- *hybrid foreground or background emulation monitors to ease emulator setup while offering full target-system support.*

Prices for 8-bit emulation support range from $8,900 for the emulator and emulation analyzer to $12,250 for the emulator, emulation analyzer, PC interface and assembler/linker.

HP To Introduce MC68030-, MC68882-Based Workstations

Continues Relationship With Motorola

Hewlett-Packard has announced its plans to introduce engineering workstations based on the Motorola MC68030 processor and MC68882 floating-point coprocessor.

These systems will extend the performance of the HP 9000 Series 300 workstations and servers, while preserving object-code compatibility in HP-UX, which adheres to AT&T's UNIX System V Interface Definition Issue 2.

In addition, HP will offer a CPU-board upgrade with the MC68030, available for HP 9000 Models 330 and 350. The Model 350 employs the 25-MHz MC68020, while the Model 330 employs the 16.6-MHz MC68020. Both computers utilize the same chassis and power supply. A Model 330 to 350 CPU-board upgrade now is available.

The MC68030-based systems and CPU upgrade are expected to be available in mid-1988. Performance of the new systems will be higher than that of the Model 350, which is rated by HP at 4.0 MIPS. The upgrade price for the Model 350 can be expected to be lower than the Model 330 upgrade, reflecting the differential that exists between both models.

The Series 300 and Series 800 share a common HP-UX operating system and common graphics standard.

"HP has been a close strategic partner of Motorola," said Jack Browne, Motorola 68000 marketing manager. "HP has helped define and verify the 68030 processor. Also, Motorola is working with HP to provide a higher clock rate 68030 than has been announced to date."

HP's Vectra CS First Portable Equipped With AutoSync Modem

Eliminates Need For SDLC Board

Hewlett-Packard's Vectra CS PCs are the industry's first portables to be equipped with a Hayes AutoSync 2400 bps modem. This patented Hayes technology allows users to communicate synchronously without using a Synchronous Data Link Control (SDLC) board.

The modem was demonstrated for the first time at the Communication Networks Conference and Exposition in Washington, D.C., January 26-28.

Hayes developed the modem, the HP Model D1003A, for installation in an expansion slot in the HP Portable Vectra CS computers. It provides both asynchronous and synchronous communications capabilities in one device. By communicating synchronously using a PC's standard asynchronous communications port, the modem eliminates the need for an SDLC board in the PC. Providing both asynchronous and synchronous capability in one modem lowers communications equipment costs and enables users to communicate in virtually any environment.

All high-speed Hayes modems implement Hayes AutoSync, including the company's new 2400 bps and 9600 bps V-series modems. Hayes AutoSync is a feature developed by Hayes that's covered by U.S. Patent No. 4,700,358, issued October 13, 1987, for "Asynchronous/Synchronous Modem."

The Hayes AutoSync feature enables the modem to automate the execution of an asynchronous to synchronous data conversion once the telephone connection is established. This conversion is initiated using software that implements the Hayes Synchronous Driver (HSD).

HP's Vectra CS personal computer is the industry's first portable to be equipped with a Hayes AutoSync 2400 bps modem.

INDUSTRY WATCH

HP PRO Staff

In Support Of UNIX

Lewis Platt, HP executive vice president in charge of the Technical Systems Sector, spoke of HP's commitment to UNIX standards during his plenary speech at UniForum, February 8-11, at Infomart in Dallas.

"HP has a strong continuing commitment to work with other members of the industry and independent standards organizations to create and maintain a set of openly developed standards for the benefit of our customers and the industry. . . . We are not interested in any actions that would compromise the value of UNIX as a standard," said Platt.

His presentation and HP's prominent appearance at the show reaffirmed the company's plans to vigorously promote UNIX across its product lines — both technical and commercial systems. Platt expressed his optimism about the success of UNIX.

"All the signs seem to point up. Acceptance by academia, by vendors, by governments and by customers seems to increase daily. There are predictions of dizzying growth rates into the next decade. . . .

"But the vision of UNIX as a major universal operating system is endangered," he added. "If newer releases of UNIX are developed with a target architecture in mind, with features determined unilaterally, its performance will be compromised on all but that target architecture."

Platt's concerns were in response to the position of AT&T on the future development of UNIX standards, particularly in regard to the "possible dependency on a proprietary chip." He stressed HP's commitment to continuing discussions with AT&T in order to keep the development and standards-setting process open.

SUPPORTING PLATT'S PROMISE of his company's position, HP announced at UniForum that it will make its key office-system products — including the HP NewWave application environment — available on HP computers running UNIX.

In making this announcement, HP believes it is the first major systems vendor to commit to offering its complete family of office services software for both a proprietary and an open operating system.

According to Robert J. Frankenberg, general manager of HP's Information Systems Group, development of the UNIX-system office products will occur in three parallel phases:

- *HP's host-based office and communication services will be ported to HP-UX, which adheres to AT&T UNIX System V Interface Definition 2, and supported by personal computers running the HP NewWave application environment.*
- *HP will provide an X Window interface through which MS-DOS and OS/2 systems will be able to run UNIX-system applications.*
- *The HP NewWave environment will be ported to HP-UX and made available on UNIX system workstations.*

"Once HP NewWave is on a UNIX system, all workstations connected to the networked system will have a common look and feel, and have access to the same office services," Frankenberg said. "It won't matter what workstation or host operating system is used. Whether it's MS-DOS, OS/2, UNIX, HP-UX or MPE, customers will have a common application environment.

Office services from HP's Personal Productivity Center to be ported to HP-UX include communications software for electronic mail, document conversion and the electronic exchange of documents; the sharing of expensive computer resources such as disc drives, tape backup drives, printers and plotters; and the ability to quickly access data from a wide range of sources across a network.

Also at UniForum, HP announced the first HP terminal for personal-computer-based multiuser environments. It also introduced a terminal that can be used for UNIX systems as well as general-purpose ASCII applications.

When connected to a PC running XENIX, the new HP 700/44 ($575) can use the same programs as the PC, including MS-DOS applications. Like the new line of Vectra PCs, the HP 700/44 keyboard has the IBM PC character set and enhanced PC keyboard layout.

Up to 32 terminals can be connected to the HP Vectra RS/20 and up to 16 terminals can be connected to the Vectra ES/12.

Designed for business, technical and manufacturing applications, the new HP 700/43 display terminal is an enhanced version of the HP 700/41 unveiled in August 1987.

With four pages of memory, 80- and 132-column modes, 58 programmable keys and 12 emulation modes, the HP 700/43 terminal offers more features at a lower U.S. list price ($475) than competing ASCII terminals by IBM, Wyse Technology, TeleVideo and ADDS.

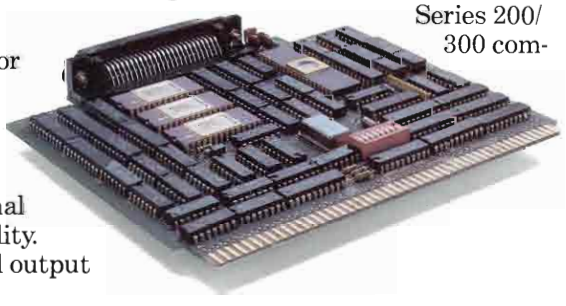
HP also enhanced its HP 700/71, IBM 3191-compatible terminal by increasing the refresh rate from 64 Hz to 72 Hz and by adding the soft-white screen option at no additional cost. ■

A TO D SIMULTANEOUSLY

Infotek introduces AD300—the first 32-channel analog/digital converter board for HP 9000 Series 200/300 with four-channel simultaneous sampling.

- 32 channels single-ended/16 channels differential allow complete event sampling.
- Up to four-channel simultaneous sampling for optimum accuracy and control.
- 200 kHz sample rate.
- 64K on-board buffer for highest speed without (or with) DMA.
- Board-level design for maximum economy.
- Programmable external voltage trigger for flexibility.
- Programmable digital output port permits communication with outside instruments.
- HP GPIO protocol—no special software—for fast, easy programming.
- Maximum performance in a single I/O slot.

Data acquisition has never been so fast, accurate or easy to perform—at such a low cost. The new Infotek AD300 offers the most sophisticated analog-to-digital conversion for all HP 9000 Series 200/300 computers, and costs many thousands of dollars less than stand-alone converters. Its microprocessor control and 64K on-board buffer reduce the load on the host computer—while GPIO protocol compatibility and a simple, three-step programming procedure reduce the load on the operator!



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INFOTEK SYSTEMS

ENTER 272 ON READER CARD

NEW PRODUCTS

CONTEXT 1.0 Provides Knowledge Access

LatiCorp Inc. recently announced CONTEXT 1.0, a knowledge access system that delivers precise information.

CONTEXT 1.0's applications include publishing, software development, word processing management, and legal, medical and scientific research. It allows any ASCII files, C sources (text, strings and comment fields), and formatted word processing documents to be searched without structuring and defining fields in advance.

CONTEXT 1.0 uses the inverted indexing method. Searches may use Boolean, proximity, limiting and ranging operators, a synonym thesaurus, stop lists, dates, values and user-defined fields. It can support approximately two billion documents in each collection or group of documents. One, two or three collections can be searched simultaneously and may span physical volumes such as disc drives.

CONTEXT 1.0 operates in networks of departmental computers running under the UNIX and MS-DOS operating systems. It is written in C and supports a variety of terminals, monitors and printers, including the HP 9000, IBM PC/AT under DOS and SCO XENIX, the VAX line under ULTRIX 2.0 and Sun 3 under Sun OS.

Contact LatiCorp, Inc., 185 Berry St., San Francisco, CA 94107; (415) 543-1199.

Enter 900 on reader card

DATA-NET Enhances Laser Printing

Integrated Marketing Corp. (IMC) has announced several enhancements to its DATA-NET peripheral sharing systems.

Four different models of the DATA-NET series ($795 and up) allow users to connect a variety of computers and peripherals in a network environment. The enhanced products have evolved over the past three years to meet the changes in plotting applications, desktop publishing software and file conversion from the 5¼-inch to the emerging 3½-inch format standard.

Each of the DATA-NET ports individually can be selected by the user as input or output ports, while any and all ports can be designated as the chosen output.

Users of DATA-NET for printing and plotting applications may use the suite of EPROM-resident software commands to perform the whole gamut of printing tasks, including pause to change paper, simultaneous operation to different printers by more than one user, next-available printer output, printing of collated copies, and holding lengthy report data in the buffer without locking out other users (printing is performed when the document is complete). DATA-NET's ability to handle bidirectional signals also makes it possible to perform plotting and desktop applications.

The six- and eight-port DATA-NET systems are available in a combination of serial and parallel configurations. Each model comes with a standard memory buffer of 256K RAM memory, which is user compatible to 1 MB. DATA-NET ports can be configured by users with their own personality for uninterrupted operation until a change is required, eliminating the need for daily setups.

The DATA-NET peripheral sharing systems are 100 percent compatible with HP laser printers and compatibles, IBM, DEC, Apple, DOS, UNIX and XENIX computer systems, protocols and operating systems. Contact Integrated Marketing Corp., 1031-H E. Duane Ave., Sunnyvale, CA 94086; (408) 730-1112.

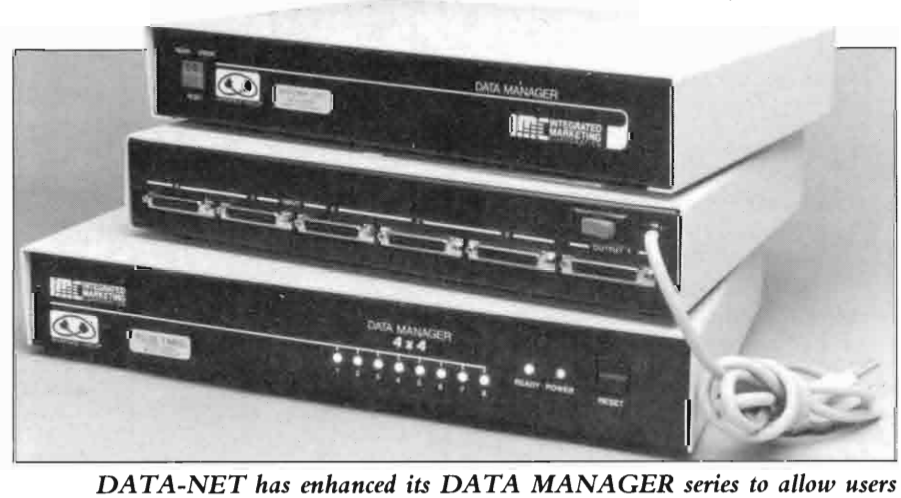
Enter 901 on reader card

Esprit Introduces PC-Compatible LAN Term

For users seeking to run PC applications on their desktop as well as share resources and files in a local area network with the same convenience as a terminal, Esprit Systems introduces the LAN TERM processing terminal.

The LAN TERM ($1,095) includes an 8-10 MHz 8086-compatible CPU to run DOS, XENIX and PICK applications, and a built-in ARCnet interface for easy integration into a Novell Netware-based network.

An RS-232 port for direct connection to a host, mouse or other



DATA-NET has enhanced its DATA MANAGER series to allow users to connect a variety of computers and peripherals.

serial device, and a parallel port for access to a printer also are included.

The LAN TERM's on-board 8-10 MHz NEC V-40 microprocessor is the heart of a single-card PC-compatible architecture that includes an AT-compatible keyboard and an EGA-quality display.

The LAN TERM includes 768K RAM, allowing users to access up to 640K RAM to run spreadsheets and CAD applications such as Lotus 1-2-3 and AutoCAD. The remaining 128K RAM easily supports the network software and terminal emulation functions. An Intel 8087-2 coprocessor is optional.

Contact Esprit Systems Inc., 100 Marcus Dr., Melville, NY 11747; (516) 293-5600.

Enter 925 on reader card

Esprit's new PC-compatible LAN TERM processing terminal.

TRAX/COBOL Provides Source-Level Debugging

Corporate Computer Systems Inc. recently announced its TRAX/COBOL Debugger, the first software package on the HP 3000 to provide source-level debugging, a sophisticated multiwindow user interface and debug capability for V/PLUS applications.

Rather than inserting DISPLAY statements and recompiling, TRAX lets you interact with the executing COBOL source. You can stop program execution, print and change user identifiers and even single-step execute without recompiling. With TRAX, bugs are simpler to find and existing applications are easier to understand and maintain. Programs become more self-documenting because you can trace the logic flow through the actual application operating on real data.

TRAX's secret is its multiwindow operator interface. TRAX divides the CRT into two primary windows and several optional secondary windows. The initial interface view consists of the command window and the source display window. Additional windows can be requested if you require more information, yet all are active at the same time. You can restack windows to bring the most important information to the front of the display.

With TRAX, you can debug a V/PLUS COBOL application using a single terminal. TRAX provides a way to see and interact with your V/PLUS screen as well as debug the underlying COBOL application simultaneously, yet all interaction remains at the source code level.

Three different types of program breakpoints are provided with TRAX: simple, iterative or conditional. Commands may be attached to breakpoints so that they're executed when the breakpoint is struck. It provides single-step mode where individual source statements are executed on each terminal carriage return. Single-step operations either can single-step into routines or over them. TRAX also gives you full assembly level support.

Contact Corporate Computer Systems Inc., 33 West Main St., Holmdel, NJ 07733; (201) 946-3800.

Enter 906 on reader card

EEsof Releases CAT Enhancement

EEsof has released ANACAT Version 1.1, an advanced, computer-aided test (CAT) software program for the calibration, measurement, management, de-embedding and embedding of vector network analyzer data.

One new feature of ANACAT 1.1 is its time-domain output, which allows users to view analyzer data in both time and frequency domains. Additionally, time-domain output now can be observed in either RF or baseband format and for either impulse or step response. Time-domain gating also can be performed.

ANACAT 1.1 ($7,500) is available on the HP 9000 Series 300 (HP-UX) and the IBM PC XT/AT and compatibles.

With newly incorporated macro commands, users now can automate any set of keystrokes, including complete test procedures. With the enhanced view menu, data display can be normalized to any measurement and labels can be customized or blanked to secure classified data.

ANACAT 1.1 easily displays measurements of one- to six-port devices and supports HP 8510, 8753, and 3577 vector network analyzers; HP 662x family of programmable BIAS supplies and the HP 4145 semiconductor parameter analyzer; Wiltron 360 network analyzer and Sun Electronics' TC01 temperature chamber controller including any temperature chamber connected or retrofitted to that controller.

Contact Donn Mutch, EEsof, Inc., 5795 Lindero Canyon Rd., Westlake Village, CA 91362; (818) 991-7530.

Enter 902 on reader card

PROJECT MANAGER Converted To HP 3000

TEI Inc. has announced that PROJECT MANAGER/3000, a project management package, is being converted to run on the HP 3000. PROJECT MANAGER has been available on a DEC VAX and many UNIX workstations for five years under the name VUE and has over 200 installations. It's also available for IBM PCs and compatibles.

PROJECT MANAGER also will be available running under MPE/XL in the near future. An HP 9000 version will be available

Continued on page 82.

Adager is quick and clean.

How do you measure "quick"? By means of a benchmark which YOU can run on your own computer, at your convenience.

The BARUG Database Shootout provided a well-known benchmark, which includes a Turbo-IMAGE database and a list of transformations. Upon request, we will send you a tape with the database, the requirements, and an Adager-generated stream. If you prefer to specify the transformations using another sequence, you can generate your own stream file, automatically, by running Adager with "parm=8" in session mode. Naturally, if you cannot stand the thought of batch processing, you can just run Adager OnLine. You will enjoy duplicating the benchmark on any machine of your choice. Here are our results, for your reference.

Adager runs the BARUG benchmark in:

2 hours 29 minutes on an HP3000 Series 42 with disc caching,

1 hour 14 minutes on a Series 70 with disc caching,

46 minutes on an HP3000 Series 930,

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How do you feel "clean"? For starters, please consider this: You receive a small Adager tape that you install in a couple of minutes on ANY HP3000 computer running IMAGE/3000 or Turbo-IMAGE under MPE or MPE-XL.

A program that runs on a Series II (vintage 1976), on a Series 950 (vintage 1987/1988), and on any HP3000 in between, definitely qualifies as "clean". But besides just running, Adager runs well. Adager is good, clean fun!

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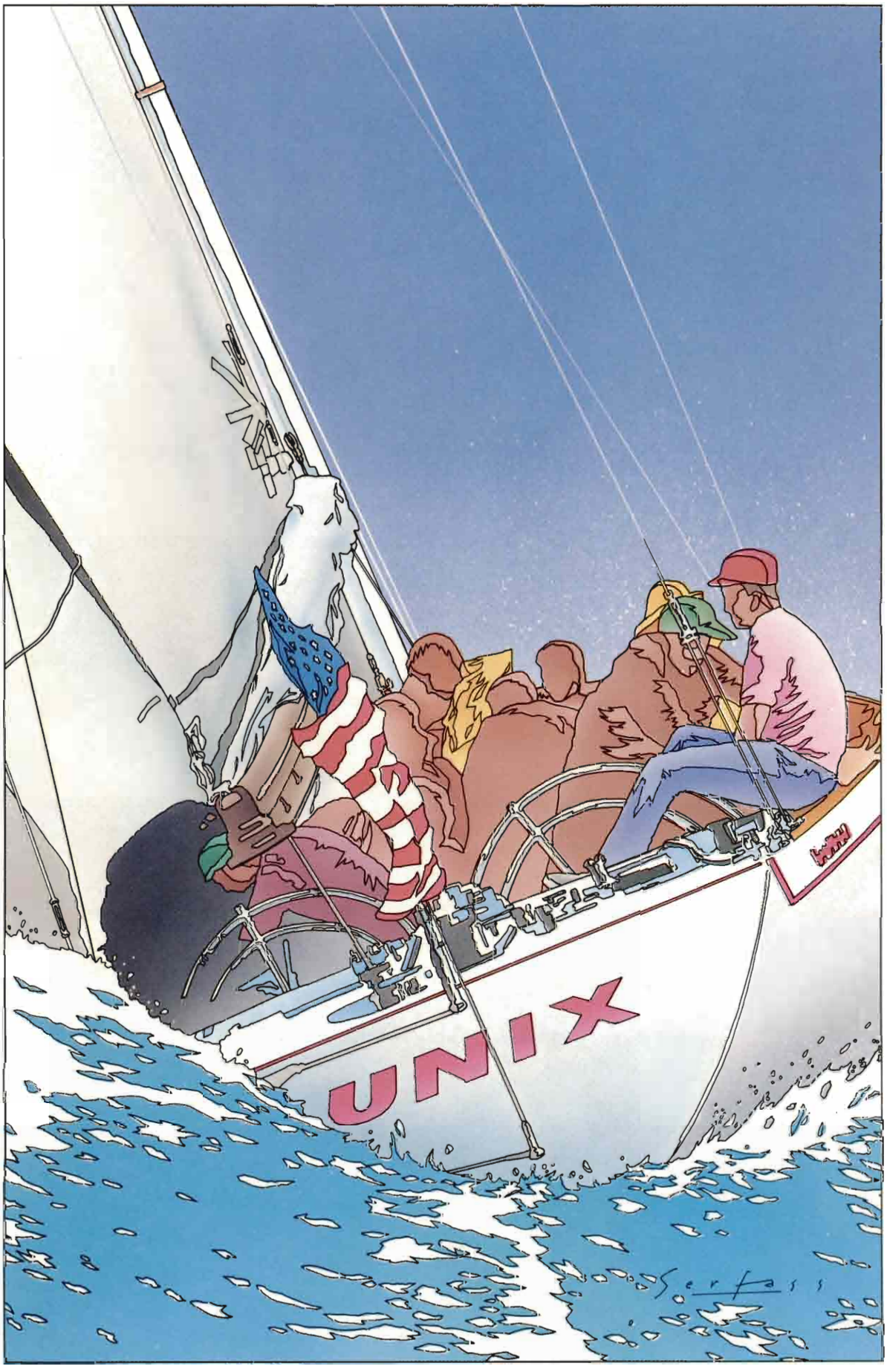

UNIX

Choosing A Proprietary Operating System

UNIX: The Right Solution?

[By Ken F. Sellers]

A new concern for both the computer buyer and computer sales representative has been introduced by the availability of UNIX as an operating system. The computer buyer rarely had any options regarding operating systems; he simply took whatever his computer vendor gave him.

The computer sales representative now has the added responsibility of selecting which operating system to propose to a prospective client and being able to justify that selection. A clearer understanding of both UNIX and proprietary operating systems may help both.

Since the first computer systems were created, the operating system has promoted the systems programmer, concerned the applications programmer and totally mystified the application user. The computer industry, without deception, kept its secrets shrouded in a mist of new, highly technical phrases and "buzzwords" that required specialists to interpret for the businessman who constantly was looking at new technology to improve profitability.

Most operating systems were created by the equipment manufacturers to optimize the interpretation of users' needs into the actions of the equipment necessary to supply those needs. In fewer words, because the equipment was created by the manufacturer, it required a unique operating program. As competition between computer manufacturers increased over the years, it became increasingly necessary for the operating system to offer greater speeds, functions and marketability — at greater costs.

Thanks to "Reverse Engineering" and a steadily growing and improving

engineering and technical work force, this generation of computer users saw many of the equipment manufacturers' subassemblies turned over to a second tier of manufacturers that then supplied those components. As good entrepreneurs, these new businesses began to offer similar (if not duplicate) components to the competition. Then the uniqueness formerly supplied by the equipment was gone and had to be provided by the operating system, which offered a wide variety of application software unavailable on other operating systems.

These circumstances created a continuing cycle of inventiveness in equipment and operating systems that made an end user's equipment and application software obsolete on a rather frequent basis. The dwindling prices in equipment were replaced by selling new operating systems, new application software and training services. It was obvious to many industry watchers that, as users grew more knowledgeable, the old practices of the manufacturers had to give way to a new era that justified the user's investments through a longer product life span, less expensive equipment upgrades or portable application software. Old ideas weren't as marketable anymore.

> Major computer manufacturers involved with the standardization processes have built their success on equipment innovation and proprietary operating systems.

In 1969 at AT&T's Bell Laboratories, the systems programming staff developed what they believed to be the optimum operating system for supporting program development. Originally written in a second-generation assembly language, UNIX later was rewritten in C, a higher level language, coincidentally developed at Bell Labs. The initial intent for UNIX was strictly as an internal tool for development.

AS THE LEVEL of Bell Labs' efforts grew, many nonprofit and academic organizations were authorized to utilize this new operating environment. After wide acclaim by these users, UNIX was first marketed by AT&T as a "technical" operating environment in 1981.

Though not the first operating system developed by someone other than a computer equipment manufacturer, UNIX was being offered by AT&T and was, because of its creation in C (a relatively portable programming language), touted as the solution to the problems created by the proprietary operating environments of the major computer manufacturers. Since 1981, AT&T has joined the ranks of the computer manufacturers and, as would be expected, uses UNIX as the operating system.

Between the original product in 1981 and the first System V, AT&T struggled with delivery of a bug-free UNIX due to a lack of compatibility between new versions, a common difficulty of operating system suppliers.

While AT&T was experiencing these problems, one of its authorized academic users, The University of California at Berkeley, had taken UNIX Version 7 and began enhancements that were released as BSD (Berkeley System Distribution) in 1983. BSD offered additional functionality regarding a faster file system, support of virtual memory and demand paging as well as Berkeley's unique networking environment.

To AT&T's credit, the folks there subsequently recognized the inconsistencies of their past efforts and agreed to establish "System V" as the basis for a standardization of the product. In addition, they've established a standard for the interface between the operating system and applications called SVID (System V Interface Definition) and SVID compliance tests called the System V Verification Suite.

An article by Jeremy Young and Tom Manuel in the October 15, 1987, issue of *Electronics* opened with "The position of UNIX as a world standard appears all but assured now." The statement suggests that there's still some doubt about UNIX or the standards.

To many within the industry, the standardization process requires review by others, not just AT&T, since the standards should support a variety of long-term goals not necessarily shared by AT&T. As a result, several U.S. and international organizations have been formed to promote various elements of the standardization of UNIX.

Standardization in Europe is being led by X/OPEN Co., a group of 11 computer makers including Hewlett-Packard, AT&T, DEC and UNISYS of the U.S. In Japan, the government now sponsors a project called Sigma, which includes manufacturers and end users as members and is supposed to define a UNIX System V-derived development environment.

In Santa Clara, CA, /usr/group/ has been involved in many standardization efforts such as real-time processing and security functions. An earlier /usr/group/ project now has been merged into the IEEE 1003 Committee. This committee has drafted a standard known as "1003.1 Posix." Posix (Portable Operating System for Computing Environments) combines AT&T's System V and elements of BSD Version 4.2 into a standard programming interface.

Intel, Interactive Systems Corp. and Microsoft, Inc., in a venture begun by AT&T, are working together to port UNIX to Intel's 80386 microprocessor and allow it to process programs written for Microsoft's XENIX and its popular MS-DOS. The expected result is a standard UNIX for all 386-based systems that will run 386-based programs without porting or recompilation.

Based on the membership and success of groups like X/OPEN and IEEE, it may appear that standardization of UNIX is feasible. Vesa Kousa, a product manager in the Information Systems Division of Finland's Nokia Group, has been quoted as observing, "These organizations are working so slowly that development is passing them by."

Whether the effort is appropriately paced certainly is a valid concern. However, it's probably more appropriate to question how so many large corporations, many of their end users (in the case of /usr/group/) and the product author (AT&T) will be able to protect their self interests and serve the industry's need while participating in multiple committees (on multiple continents) formed to study the subject.

Why is the computer industry so enthused by the potential of UNIX as a standard that most of the larger equipment manufacturers are spending so much backing these "standard committees"? John Gosch, author of "UNIX: A Big European Push" in *Electronics* (October 15, 1987) writes, "Users like UNIX as a standard because it promotes portability in software. That means they aren't tied to any particular vendor — they can buy the best hardware for their particular purposes. Software vendors' interests converge neatly with those of users. They can write one version of an application and sell it to anyone with a UNIX-based system, instead of adapting each application to a host of different proprietary operating systems."

Gosch continues, "For hardware vendors, a UNIX standard promotes connectivity — it makes it much easier for them to link different machines. What's more important, though, is that promoting software portability and connectivity — in effect, establishing that all hardware is created equal — makes a UNIX standard a potent weapon against dominance by IBM Corp."

Better Ideas

CAN UNIX REALLY BECOME the standard operating system of the future? It's hard to believe that our computer technology, which has come so far so fast, won't generate some new and, most surely, better ideas in the not-too-distant future.

However, the efforts aren't necessarily in vain. To quote John Totman, UNIX product manager for ICL, from Gosch's article: "UNIX is not necessarily the best system technically to create this open environment — but it is available, it does the job, and its use is already widespread."

A similar, but unrelated standards group, the Automotive Industry Action Group, was formed to identify areas of standardization within the auto industry in order to reduce domestic industry costs and promote greater productivity. The goal: to become more competitive with off-shore suppliers. The results, to date, are not such that Ford, GM and Chrysler all are operating identically. However, many elements of manufacturing and product shipment significantly have been improved, and not just for the Big Three.

Standards developed by the AIAG benefit most suppliers to the auto companies, as well as manufacturing in general. The AIAG only has targeted elements of manufacturing that appear to be void of emotional defenses — simple things that almost everyone would agree could be done the same way by most companies without affecting the unique identity of any company. Operating System Standards ultimately must be addressed by X/OPEN, IEEE and others in the same manner.

After a historical review of operating systems and UNIX, plus an analysis of the push for UNIX as a standard, the conclusion may be reached that both system buyer and seller aren't so much interested in whether or not there's a standard, but in the benefits derived from the development of common bonds between the many large computer manufacturers involved. Using this background information, it's now possible to discuss how the computer buyer and computer sales representative may evaluate UNIX.

With UNIX being proposed as The Standard Operating System, it's also appropriate to describe the "proprietary operating systems" with which it competes. Most of the major computer manufacturers involved with the standardization processes have built their success primarily on equipment innovation and unique proprietary operating systems. Most of these companies, while supporting UNIX in various degrees, aren't abandoning their proprietary offerings.

The continuing advantages of proprietary operating systems are performance, consistency and familiarity. As an industry, progressing from machine language to fourth-generation languages, it has been apparent that, as each generation has provided programmer productivity improvements, it has been at the cost of program efficiency.

Similarly, proprietary operating systems are written to obtain the optimum performance from the equipment design and configuration. This is possible because both the operating system and equipment design are related to the same technological goal and development staff. As evidenced by the inability of UNIX to gain support at the mainframe equipment level, proprietary operating system performance is still a meaningful element in many buyers' decisions.

While many computer users have been irritated in the past by being "locked in" to a vendor by a proprietary operating system, there are others who find comfort in using the same vendor resources (programmers, system analysts, systems programmers, service representatives and others) because they can

be assured of the same quality and consistency of those resources. Internally, these users are able to develop a computer user and support personnel that aren't required to be constantly retrained or replaced when upgrading to the next higher level of computer power.

Because of their length of service, proprietary operating systems support many application software programs that have been time-tested and solidly debugged but remain relatively inflexible regarding change. So, in the eyes of many, the proprietary operating system solution isn't in danger of being eliminated by UNIX. It's obvious, though, that most proprietary operating system-related equipment manufacturers also are gearing up to provide UNIX-based solutions. Why?

> The UNIX market will grow at a compound annual rate of 32 percent, more than twice that of the rest of the computer industry.

International Data Corporation, a market research company, estimated worldwide UNIX sales in 1986 at $6.2 billion. They've also estimated that the UNIX market will grow at a compound annual rate of 32 percent, more than twice that of the rest of the computer industry. 1991 is expected to see a worldwide sales volume for UNIX-based systems at $33 billion. This translates into market share in 1986 of six percent, and in 1991, a projected 22 percent. Obviously, these gains in market share relate to associated losses for proprietary operating system-related equipment.

IN ADDITION TO the growing market for UNIX-based systems, the list of computer equipment manufacturers now offering UNIX-based solutions to various degrees, reads like a "Who's Who" of the world's computer industry: Hewlett-Packard, IBM, DEC, AT&T, UNISYS, Amdahl, Data General, Altos, NCR, Honeywell-Bull, ICL, Nixdorf, Olivetti, Philips, Siemens and NEC.

More buyers are designating UNIX as a requirement. The Air Force, which had issued a Request For Proposal for approximately 22,000 UNIX-based systems worth around $3 billion, recently won a court case allowing them to use UNIX as a selection criteria on that contract. General Motors has begun to impose similar selection criteria in its computer purchases.

It's really not too difficult to understand why many of the computer manufacturers are on the UNIX "bandwagon." It makes sound business sense. However, it's still unclear to most computer buyers how to decide between UNIX and other operating system offerings.

It shouldn't be a revelation to discover that the advice offered to computer buyers that follows and the recommended sales approach to computer sales representatives are the same. Both the buyer and sales representative have the same goal — a satisfied, referable buyer. Each new computer buyer first must examine the primary motivation for making a change. That motivation often directs the buyer into different research paths.

If the buyer has an application software system that adequately addresses both current and future business needs, the most appropriate action is to research only computer equipment that will allow retention of the application software and business data. Ultimately, there can be no greater cost to the computer buyer than the purchase of new software when the old software is aqequate. New software calls for changes in the operation of a business, personnel training and data conversion or reentry costs — all of which are costly and not required if the buyer still can utilize the old software. Generally, this is the case with custom written systems maintained and supported by an internal technical staff.

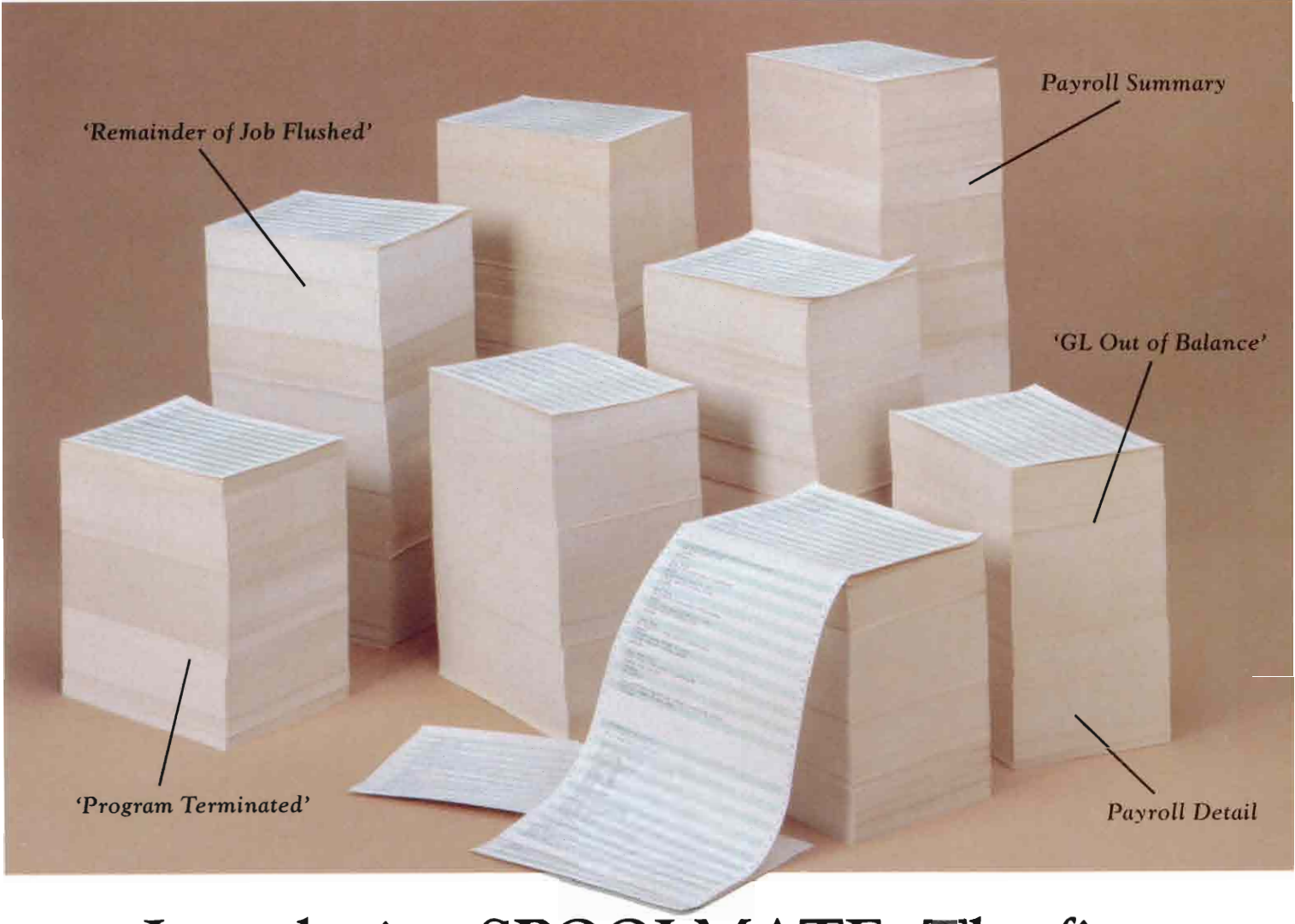
If currently using a proprietary operating system-based computer, the buyer probably will find the options limited to the incumbent supplier and that supplier's limited range of upgrade options. On the other hand, if the same buyer currently uses a UNIX-based solution, the list of options includes most suppliers of UNIX-based computer equipment.

The first option exercised should be to review the upgrade availability within the incumbent supplier's equipment offerings, as this generally is the least costly solution. It's always appropriate to review other UNIX vendors' capabilities to supply the desired equipment and associated costs if a new model or product line is being proposed by the incumbent.

The buyer who doesn't have adequate software already will have reviewed the possibility of retaining his computer equipment while purchasing new software. If the equipment he wishes to keep is proprietary operating system-based, he'll probably encounter a limited, though quality, group of software offerings from which to select.

If the equipment is UNIX-based, the number of application software packages available most likely will be larger (and growing larger annually at a pace probably equaling or exceeding the annual growth rate of UNIX itself) but perhaps less well-tested.

With the large number of well-established software sup-



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[HP's UNIX OBJECTIVES]

HP's recent announcement to expand its HP-UX program to include the business marketplace is a step toward reaching its objective of becoming the industry leader of UNIX-based business solutions. It has all the elements necessary to be successful. First, it offers a broad compatible product family. Second, it can leverage off the marketing and support programs that already exist for its current business customers.

A third key element is experience. HP already is a major vendor in the business marketplace. Finally, it is committed to standards and to the UNIX operating system.

HP offers a broad family of compatible systems which all use the HP-UX operating system, HP's implementation of AT&T UNIX System V. HP can provide customers with an HP-UX solution for situations ranging from one user to as many as 128 users.

The HP 9000 Series 800s are the new HP Precision Architecture family and are object code compatible. The Model 825S can connect up to 64 users, the Model 840S can connect up to 128 users, and the Model 850S can connect up to 102 users. The number of users that can be connected to the Model 850 will be increased significantly in a future release of HP-UX.

The HP 9000 Series 300 is based on the Motorola 68XXX family. The Series 300 also runs HP-UX and is source code compatible with the Series 800. The Model 310 can connect up to 16 users, but is positioned as a single user workstation. The Models 330 and 350 can connect up to 32 users. The maximum number of connected users is limited by the UNIX license.

With the expansion of HP's HP-UX program to include business customers, HP now offers those customers a choice: MPE and HP-UX. HP doesn't see this as a contradiction, rather it views HP-UX solutions as a complementary alternative, with HP-UX appealing to a different set of customers.

The expansion of the HP-UX program to the business marketplace doesn't change HP's stance toward MPE. MPE remains a strategic operating environment. With an installed base of over 30,000 MPE systems, HP 3000 customers have a tremendous amount invested in MPE solutions. For these customers, MPE compatibility is very important.

A second differentiator is the design of MPE. Designed specifically for online transaction processing in a business environment, it contains a very rich business features set and has unsurpassed price/performance in this environment. The final differentiator is the wealth of third-party business solutions currently available. HP has been marketing MPE for 15 years. During that time it has recruited a very large number of third parties.

HP considers HP-UX as a second strategic operating environment for business customers. It will appeal to customers looking for an industry standard solution and/or UNIX compatibility. Two examples of such customers are the Regional Bell Operating Companies, which have a significant investment in UNIX software, and the U.S. Government, which generally specifies SVID compliance in over 70 percent of the RFPs issued.

Finally, HP-UX on the Series 800 has the capability to do real-time processing. Customers who require real-time capabilities will want HP-UX-based solutions.

In the past, the business and technical marketplaces had been easily differentiated. With today's increased need for integration, the dividing line is becoming less clear (if not downright invisible). HP is in a unique position to capitalize on this.

HP has been selling systems to business customers for over 15 years. It introduced its first business system, the HP 3000, in 1972. The installed base of the HP 3000 currently exceeds 30,000.

For over 30 years HP has been selling technical solutions. In recent years, UNIX has established itself as the de facto standard in the technical marketplace.

Hewlett-Packard began selling HP-UX in 1982. It also was one of the first companies to offer UNIX as a strategic operating environment on its systems. Over the years, the company has learned a lot. HP-UX has been enhanced considerably over time while maintaining adherence to the existing UNIX standard.

At HP the policy is to continue to adhere to standards where they exist and at the same time continue to push forward. While some of our competitors are announcing "Berkeley and AT&T" merged functionality, HP quietly continues to press on. It accomplished that years ago.

HP does more than merely adhere to standards. It actively participates in the *setting* of standards. If you wait for standards to be formulated, you're always a step behind. Instead, HP's policy is to continue to develop the HP-UX operating environment and propose its value-added extensions as the basis for the standard. Examples of HP's adherence to standards include:

- *HP-UX is AT&T SVID compatible.*
- *Its networking products are OSI compliant.*
- *It actively supports de facto standards such as SNA and NFS.*
- *All the languages are ANSI compatible; its Allbase and SQL/300 DBMS products use the SQL industry standard interface.*
- *GKS and CG-VDI (Starbase) Graphics.*

Examples of where HP-developed extensions have been adopted or proposed as the basis for the standard include:

- *NLS used as a model for the definition of the X/OPEN Internationalization standard.*
- *Real-time extensions have been proposed to the IEEE as the model for the definition of the UNIX real-time standard.*
- *HP actively has supported and funded the development of X Window.*

Some examples of HP's leading this movement include:

- *It actively participates on all eight usr/group committees.*
- *Member of X/OPEN; HP participates on all 10 X/OPEN committees.*
- *Member of IEEE; co-chairs the P1003.1 POSIX committee, participates on all the committees.*
- *Member of International Standards Organization.*
- *Founding member of the Corporation for Open Systems.*

To summarize it all, HP is very well positioned to assume a leadership position in the market for UNIX-based business solutions. It is committed to standards and has a comprehensive background of experience and a superior set of products. — *Cynthia McCulley is product marketing manager in HP's Commercial Systems Division of the HP-UX Business Systems Program.*

pliers in the industry today, the new computer buyer needing both new software and new equipment must place the highest priority on selecting a software package that best fits the business needs of the company.

The most appropriate means of evaluating many software packages with regard to a business' needs is to develop three "needs" lists. The first list should represent the minimum functions required to equal the desired capabilities from the old system. The next list should contain the functions that were missing from the old package that caused the dissatisfaction and, thus, would be required in any new system. The last list should reflect any other function necessary to complete the optimum application package for the business. These functions, if not present, shouldn't have any negative impact on the business operations.

> The purchasing choice must reflect the appropriate application software solution and a choice between the proprietary system or the UNIX system.

It will be highly improbable that any software package will meet both lists one and two completely, but comparing each software offering to these lists should define the top two or three options. The computer equipment associated with the top options then should be reviewed.

When beginning the computer equipment review, it will be important to make an early decision on the relative values of a proprietary operating system versus UNIX in the specific business environment.

Each proprietary operating system has specific operating advantages. These should be reviewed and understood as desirable or undesirable based on the benefit to the business.

Flexibility Of UNIX

IF THERE'S A desire to obtain greater flexibility of UNIX, it should be realized that the flexibility comes at a minor performance cost. However, with the ever-decreasing price of equipment, that cost may be negligible.

The flexibility provided by UNIX also may be evaluated in terms of business requirements. The connectivity value often referred to in UNIX will be of business benefit if the ability to have CAD/CAM, data collection, graphics, bar coding, spreadsheets, word processors and other systems (from a wide variety of vendors) integrated with the application software is important. Proprietary operating systems allow integration only with items supplied by the same vendor.

UNIX allows multiple application software systems to reside and execute simultaneously on the same system, providing new opportunity in multicompany corporate environments. Another UNIX value is the ability to add equipment, generally terminals and printers that aren't manufactured by the computer equipment manufacturer, without great technical expertise. This very frequently results in lower costs to the buyer.

A critical element in reviewing computer equipment for purchase is the ability of the equipment manufacturer to provide for the business growth of the buyer, not only within the chosen model, but also above that model's capabilities. In a UNIX-based system, that growth requirement may be met with another supplier's solutions.

Finally, if a UNIX-based solution is preferred, the buyer should examine the UNIX experience level of the software supplier, since the quality of the application probably will be related to that experience. In addition, the computer manufacturer should show evidence of aggressively addressing the UNIX market rather than taking a "me too" defensive posture.

An aggressive computer manufacturer normally would have a UNIX-based product line that runs only UNIX solutions, rather than applying UNIX on top of product lines originally built to work with a proprietary operating system.

A Viable System

FOR BOTH BUYER and sales representative, UNIX certainly is a viable operating system for use in any business. In reality, it's neither more nor less technical in nature than other excellent operating systems. The purchasing choice must reflect first and foremost the appropriate application software solution and then a choice between the specific performance environment of a proprietary operating system, or the flexibility and adaptability of the UNIX operating system. Business growth and the associated costs of future system changes also must be evaluated.

Should UNIX be purchased because one day it will be "the standard"? Certainly not! However, it won't hurt to have an operating system supported by so many industry specialists. That's the next best thing to insurance for protecting a long-term investment. —*Ken F. Sellers is director of consulting services, PILOT Systems, Inc., Brookfield, WI.*

The Growing Workstations Market

Dominated By UNIX

UNIX was first designed and implemented in 1969 at Bell Laboratories in Murray Hill, NJ, by Ken Thompson on a DEC PDP-7. This makes it very old for an operating system. Yet somehow it always has been considered an avant-garde system — the bizarre and unconventional, a unique trade-off between power and expressiveness.

UNIX isn't a static system, it's amorphous by design and can be expanded or contracted at will. It transcends hardware restrictions and is almost a formalism of operating system design. Since 1969 it has evolved through the contributions of thousands of individuals and has kept up with changes in software and hardware.

UNIX is especially popular in research and development centers and academic institutions. Furthermore, the ever-widening single-user, high-powered, graphics-oriented workstations market is dominated by UNIX as the operating system of choice.

It's very interesting to note why this is so. Perhaps by noting the trends in the historic evolution of UNIX the workstation environment, we can predict the future evolution of the operating environment for computer users.

The graphics workstation is the most personal of the creative and development-oriented environments available and it's bound to grow in popularity. To understand the UNIX phenomenon and its link to workstations, we must understand the fundamentals of UNIX. Is UNIX contradictory?

[By Dr. Michael M. Dediu]

Understanding UNIX

AT FIRST UNIX seems very contradictory. It's simple in concept, yet beginners find it very difficult to use. It's very small in code compared to other systems, yet it always seems to require more disc space than there is available, no matter the installation. It is cryptic to interact with, yet we're told it is elegant in design. It seems to have no hardware support, yet it's used in the most graphics-oriented and hardware-dependent environments.

First, let's look at its perceived deficiencies. UNIX seems to be plagued with many difficul-

ties, any of which easily could hinder its acceptance:

- *UNIX doesn't have the flavor of any other operating system.*
- *It has very little, if any, corporate support.*
- *It's extremely cryptic and difficult to master.*
- *It never seems to be standard in any way.*
- *There always are several versions floating around.*
- *Many versions are bug-ridden, slow and cumbersome.*
- *Its documentation is at best cryptic; at worst nonexistent.*
- *It has very little security and few system management tools.*
- *It doesn't support some of the most basic data processing tasks such as transaction processing.*
- *It doesn't have a user-friendly, screen-oriented interaction.*
- *It has very poor terminal and printer support.*

To understand why, despite (or, perhaps, because of) these deficiencies, UNIX became what it is today, we must understand why UNIX was developed and for whom.

> UNIX is amorphous by design and can be expanded or contracted at will.

UNIX was one of the first operating systems incorporating the three fundamental characteristics we now readily expect. UNIX is:

- *multiuser*
- *interactive*
- *time-sharing.*

UNIX was emerging just when these concepts of machine sharing were moving from the description to the implementation stage. It wasn't the first time-sharing system, but it used the desirable concepts in a new and practical way.

The reasons for having a time-sharing system are obvious: Users (in this case, programmers and researchers) could share information and increase productivity and the efficient use of the computing machine at a time when its cost was a premium.

WHEN DISCUSSING WORKSTATIONS, the idea of time-sharing seems obsolete since there's only one user and no sharing is necessary. We shall see, however, that the constructs of UNIX allow it to use the sharing concept in a different way — allowing the single user to multitask his activities. The idea is that sharing between users can be abstracted to sharing between processes for the same user. Here we see the use of fundamental and sound principles of computer science applied so that they transcend hardware restrictions. A good idea is never obsolete.

Having noted the utility of UNIX as a time-sharing system, we also must understand the original purpose of UNIX as in its use. The designers' objective was to create a computing environment where the staff of the Computer Science Research Group at AT&T Bell Labs comfortably and effectively could pursue their programming research.

This description is fundamental in understanding UNIX. By definition, it's predominantly an environment for research. This doesn't mean that it can't be used for other tasks; in fact, it excels in most functions. However, UNIX is an operating system primarily suited for software development. It provides the programmer with the best environment for the design and implementation of programs.

This description lends itself naturally to the workstation environment, even though the workstation user may not be developing programs. The workstation user is a developer of new ideas and the UNIX environment lends itself to providing the necessary tools.

Looking at the above-mentioned deficiencies, it's clear that some of them appear as advantages to the researcher/developer. A flexible system can be molded to comfort, a lack of security aids in the sharing of information, which is essential if things are to get done.

The UNIX system is carefully designed to be modular, in good programming style. The concept is that at the high level, UNIX is composed of many (more than 200 standard) small programs or utilities, each of which does one and only one task, but it's done in the most efficient and elegant way.

However, the program/utility also should be flexible to the point where its function changes. This is done in two ways. The utility could be given many parameters which extend its functionality; or the source code is provided to allow the user to both learn how things were done, and perhaps to change them, maybe improving them.

The latter method seems extremely risky, since the whole system could thus be rewritten and possibly destroyed. This is, however, the problem of the user. The developers assume responsibility and competence on the part of the user, again assuming that the user is a programmer.

The cryptic nature of UNIX isn't accidental. UNIX developers assumed the users to be competent and careful. They didn't expect casual users, but intensive and knowledgeable ones.

UNIX is cryptic because it's succinct. The reason the names of the utilities are small (less than four letters) is to eliminate unnecessary typing. It's assumed that the user is very intimate with the system and would be very irritated at having to type a long command many times. This leads to the classic trade-off between expressiveness and functionality. The clearer the command seems, the longer it is.

As an example, consider one of the simplest commands in any operating system — list the contents of a directory. In VMS and MS/PC-DOS, the command is "DIR" for directory. In UNIX, however, it is "ls", supposedly a mnemonic for list. "Ls" is more difficult to remember than "DIR" when think-

ing "directory." However, "ls" is easier to type.

UNIX is flexible enough to allow the user to change the name of any utility by using the "alias" command. "ls" can be changed to "dir" by "alias dir ls". Now by typing "dir", the "ls" command is activated. Aliasing can be turned off by "unalias". Aliasing also aids in shortening a long command line. These are small examples of the flexibility of UNIX. The flexibility of the "ls" command is in its options.

"Ls" has the following syntax:

```
ls [ -acdfgilqrstulACLFR ] name ...
```

This is typical of the manual descriptions in the documentation of UNIX. It specifies that "ls" has several options activated by typing "ls -x" where x is one or a combination of the letters within the brackets above. (UNIX is very case sensitive; an uppercase letter has no relation to a lowercase letter. A is completely different from a.) The "name ..." part implies that one or more filenames can be given to check if that file is in the directory. From the 18 different options (which can be combined in any number of ways), it's clear that a simple "dir" command can be much more.

Most of the options have to do with the way the output is formatted. If only "ls" is issued, the directory is only an alphabetically sorted list of names appearing across the screen. An "ls -laF" command will list all files vertically in columns giving information on size, degree of protection, whether the names are directories, executable files or text files and more. This flexibility resolves one of the problems stated earlier in that UNIX can be considered very sparse and yet it's very rich. If the options are removed, "ls" is austere, but we can customize it with "alias" to have 10 or more different ways of listing our directory.

The standard can be set by the superuser (system manager) so that when each user logs in, the "ls" defaults to "ls -laF". So it happens that incompatibilities arise. One installation may have all the commands changed. This is possible, but it's extremely bad practice. Again, the users are expected to resolve their own problems. If standards are enforced, flexibility is lost. Therefore, a lack of standards can be a blessing in disguise. It's a matter of taste. The designers of UNIX simply let loose a powerful system that can be abused. As with any programming language, how it's used is up to the programmers. The compiler writers provide only a tool.

The power of UNIX is such that applications can be developed as simply a front-end to the user so that no

operating system interaction need take place. This is one of the reasons the workstations use UNIX. The applications they run easily and quickly are prototyped and executed.

The reason UNIX can run on so many machines is that since it is a software development environment, the easiest programs to write are those written to run on UNIX. Thus, efficient programs are written with proficiency in the three most popular languages in UNIX: C, FORTRAN and LISP — compilers for which proliferate. In fact, a common program to write on a UNIX machine is what else, but an operating system. And what operating system is easy to write, but UNIX itself.

Most UNIXs available on the market were written in 95 percent C code on UNIX machines. UNIX has a habit of reproducing itself at the hands of skilled and disciplined programmers. Of course, new utilities, compilers and application programs also are developed very quickly. Compilers compile themselves and operating systems reproduce themselves. The possibilities are limitless.

The easiest way of introducing UNIX to a new computer is to get a copy (or write your own) of UNIX in C and port it onto the new machine using the available old operating system and C compiler, resulting in executable code. Then reboot the machine using UNIX, which was just compiled, throwing away the old operating system.

Now bring in all the utilities you can get and you're all set. Of course, there are many things that could go wrong, but experienced programmers find solutions.

Another standard feature of UNIX is its use of ASCII. The UNIX user communicates in ASCII, uses ASCII files and produces ASCII programs. The input and output of most programs is ASCII. There are few files that can't be read by the user.

This standard file interface allows the creation of a very characteristic and powerful UNIX feature: the UNIX pipe. When running a series of programs with interdependent I/O, we can "pipe" the output from one program into another, imagining data as a flow of water. Programs can be chained together and data preprocessed, postprocessed and formatted with the utilities of choice.

Suppose we wanted to print a list (long format) of all the C programs in all our subdirectories, and have the output appear on the screen one screenful at a time. This is very simple:

```
"ls -laFR *.c | more"
```

is all we need. The output of the "ls" command (described above) with the R option (recursive search of directories) on all programs with extension ".c" is piped through a socket "|" to the input of the program that lists ASCII information one screenful at a time prompting for paging.

Piping is a very powerful feature that results in increased throughput, since no intermediate files have to be created. This concept is very important in a multitasking workstation. Pro-

cesses (jobs) can interact in inventive ways by piping their output or input.

The flexibility of the user interaction is extended by the use of shells or command interpreters in UNIX. The UNIX C-shell or the Bourne shell are two popular choices. Unlike other systems, UNIX gives the user a choice of two or more operating system command interpreters. These interpreters are almost as powerful as full languages. Complex programs can be written. The syntax and semantics are similar to those of C, hence the portability and ease of use.

The UNIX system allows the user to create many processes running concurrently with very little effort. By specifying a command and following it with an "&" character, the user places the process in the background while still interacting with the terminal in his shell.

A "^Z" within any process such as while editing a document will place the current process in the background and turn control over to the parent process. The "fg" (foreground) command brings it back. Shells and processes are created within each other ad infinitum. Of course machines have limitations and an error message may occur at some point.

The UNIX system allows the user to create many processes running concurrently with little effort.

Processes And Multitasking

THE EASE OF CREATING processes and files in UNIX is very notorious. On a time-sharing system, one user may monopolize the CPU with abandon, frustrating the others. This doesn't affect the workstation user except in slowing down his own applications. Files also can be created easily in UNIX. The output redirect ">" can take any output (including that destined for the terminal) and redirect it to a file, such as:

```
"ls > directory.today"
```

which takes the listing of the directory and outputs it to a file named directory.today. This can create a file explosion and even result in a message being printed in the System V.2 administrator's guide:

"Making files is easy under the UNIX operating system. Therefore, users tend to create numerous files using large amounts of file space. It has been suggested that the only standard thing about all UNIX systems is the message-of-the-day telling users to clean up their files."

So, the problem of UNIX being a disc hog is only a result of users having the freedom of creating many files. In UNIX, the average state of disc use is around 90 percent.

The UNIX environment, when applied to graphical interface workstations, is very impressive. The large screens, high power and high resolution of the graphics on workstations allow for the generation of many windows on the screen. Each window can be a process in UNIX and within each window shells can be created with multitasking actions. The time-sharing, multitasking environment of the mainframes now allows the single user to perform several tasks at once.

An example of the use of UNIX on workstations is the Magic VLSI design program running on a Sun or MICROVAX GPX/II workstation. VLSI design requires the use of a drawing space for the layout and emulation or testing of the chip on another space. The two spaces can be windows. In one window the emulator is producing error messages and the user is looking at the layout in the other to spot the physical faults. Debugging techniques such as these, are possible for many design tasks including programming.

Interestingly enough, many of the UNIX text processing utilities are exceptionally good for documents. Researchers often are called on to present papers and documents, so there are utilities available for typesetting and laser printing, document formatting, table and graph generation and the best text editors in the world (emacs and gemacs). These practical tools are very valuable to the commercial users as well and should prove popular with the proliferation of laser printers.

UNIX Utilities

UNIX CONTAINS A large number of utilities for different applications. For example, there are text manipulation tools such as "grep" (for selecting lines from a file according to specific criteria), "ed", "sed", "tr", "rpl", "awk" (for selectively changing the contents of a file), "sort" and "uniq" (for rearranging the order of lines in a file). Other utilities are for formatting documents, such as "nroff" (a text formatter), "troff" (a version of "nroff" for phototypesetter), "eqn" (for setting mathematical equations) and "tbl" (for tabular layout).

There exist interactive arithmetic calculators, such as "bc" and "dc". The utility "make" is for managing large amounts of program source-text; "lex" and "yacc", for building compilers and other computer language products; "who", for finding out who's using the system; and "mail" for communication between users. The shell has facilities to create new tools.

UNIX also has very good communication features aiding in the networking process. Workstations almost always are networked to improve information sharing.

EVERY MAJOR COMPUTER MANUFACTURER has workstations with their implementation of UNIX. For example, IBM has a UNIX workstation, the RT PC, with its Aix (Advanced Interactive Executive UNIX). Aix versions that are subsets of the RT Aix will run on the PS/2 Model 80 and 370 processors. These versions aren't exact subsets, because parts of Aix are written specifically for the RT PC's reduced instruction set processor architecture, and aren't compatible with other processors.

IBM intends to develop a version of Aix for the PS/2 Model 80 that supports Microsoft Corporation's MS-DOS applications as a task. There's also XENIX on the IBM PC, and IBM offers IX/370 for its 370 family of mainframes, along with PC/IX and Series/1 IX. But these three implementations of UNIX are quite different and incompatible. There are many versions of UNIX. For instance, IBM created a version called Acis, for the RT PC, which is sold mostly to universities.

HEWLETT-PACKARD'S VECTRA RS/16 and RS/20, which are 80386-based workstations, are for the user who needs power. UNIX can be ported to the 80386 architecture and it will appear soon enough. The 80386 processor allows for multitasking in support of UNIX.

The HP 9000 Series 300 family of technical workstations includes a selection of processors, display systems, interface and memory cards, operating systems and peripherals. Based on the Motorola 68010 and 68020 processors, the Series 300 is derived from an object code compatible with the earlier 200 systems.

Series 300 technical workstations can run any of four operating systems: BASIC 5.0, PASCAL 3.2, MS-DOS and HP-UX, which provides a superset of UNIX for multiuser, multiprocessing applications, with real-time enhancements. An Application Execution Environment (AXE) is available for single-user execution of HP-UX applications.

UNIX provides an environment for tool-using and tool-building. In any type of application — business, documentation, research, engineering, software development — UNIX can help with a large set of utilities, and with the facility of creating new tools.

UNIX has emerged into one of the most popular operating systems running on almost all varieties of computers (from the smallest PC to the largest mainframe and to the fastest Cray). It's very portable and reproduces quickly. It runs well on networks and is robust. It has a bright future even as an operating system for ultra-high-speed parallel or multiprocessor computers. — *Dr. Michael M. Dediu is president of Dediu Computer Consultants, Tewksbury, MA.*

X WINDOW

Much More Than Just A Windowing System, Part 3

This is the third in a series on the X Window system (also called X) as implemented on Hewlett-Packard computers. The first article in the series (January 1988) presented the background and use of X from a user's viewpoint. Part 2 of the series (February 1988) provided an example of programming in the X environment without the use of tools. This part is concerned with user interfacing within X and Hewlett-Packard's Xray library.

Of great concern to application developers is the need to provide their application with a user interface that is intuitive and therefore easy to learn and use. Most often the interface solution is graphical in nature, using icons, menus and a mouse to point and click. This immediately puts the developer into a bind. To warrant the investment in such an interface, the application must run on many vendors' hardware.

Of course, since every vendor's hardware is different, the developer finds himself with a major hardware interface problem that forces compromise in the finished product. Typically, the developer is forced to write software that begins at the hardware performance level for the least capable hardware; i.e., he builds to the lowest common denominator. In addition, as the vendor's hardware is updated, the drivers developed for each must be changed.

The user doesn't benefit either. Quite often, a software product isn't available on his hardware because the software vendor cannot justify the investment of additional development and maintenance. Furthermore, the user is faced with products from many different vendors, each with its own user interface and personality which increases training costs and user frustration.

What we have is a situation in which the great power of the computer age is wasted by incompatibility. Everyone loses. The need for a standard is clear.

The X Window system has the potential of being that standard for graphics workstations (not ASCII terminals). One aspect of X is that it defines a common programming interface for the display of graphical information. This is achieved by making different vendors' hardware look the same to application software through an interface program called the display server.

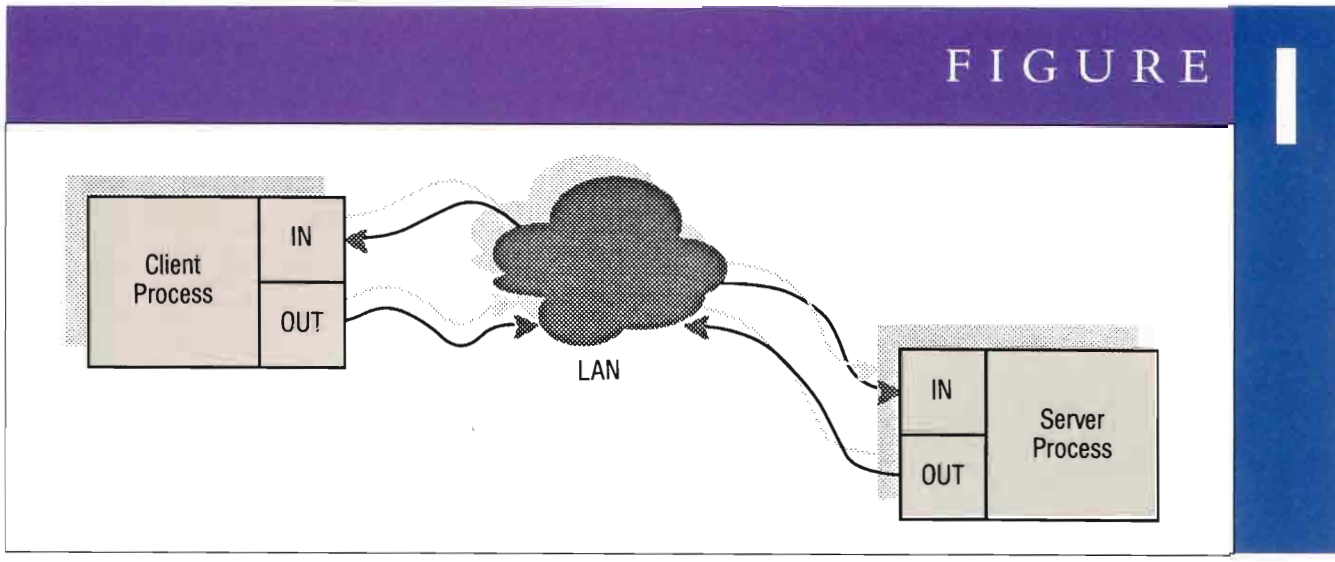
The display server accepts standard format messages which request various server functions including graphics-drawing capabilities and bitmap display manipulations. This capability of X, if seriously adopted by enough vendors, has the promise of resolving the hardware interface problem for most applications developers. The X standard provides much more than a standard graphical hardware interface; however, that's where it's going to make its initial contribution.

X also has the potential of establishing a standard for graphical user interfaces; however, at this time it hasn't been done. As expected, the vendors of these applications are excited about X because it allows them to write one display driver to use for all hardware that supports X. Also, as expected, each developer uses his own, very different graphical interface. In one application, the left mouse button performs the same function for which a different application used the right mouse button.

The X standard is a multivendor windowing system; it doesn't specify a user interface. A user interface defines the methods or techniques used for obtaining input from and providing output to the user. A good one leaves the user in control and is consistent — it *always* works the same way.

X WINDOW

Ken Fullett



A simple X model.

User interfaces span from the typed command to the spoken word and even use the movement of the eye. Regardless of the technique used, the consistency is the most important aspect of any quality interface.

With X, the user interface standard is left up to program developers so as not to limit their capabilities. If X is too restrictive, it risks not being accepted by the community.

However, the news is not all good. The use of the mouse buttons vary greatly among applications. The right mouse button activates a menu in some, with the left or middle button used on others. This problem is particularly annoying because of the multitasking environment in which the applications are used.

At an X workstation, you can have several applications active at once with each displaying its own window. With the mouse cursor positioned in one window, the function of the mouse buttons is different from their function while the mouse cursor is positioned in a second window.

BEFORE CONTINUING, it would be useful to review some terminology. Recall that the X system is based on a client-server relationship depicted in *Figure 1*. The server is responsible for input and output at a workstation consisting of hardware for a display, keyboard and mouse.

The computer running the X server program is called the display-server. A client makes request to, and receives user input from, the display-server via a local area network (LAN). The client program may be run locally on the same computer as the X server or it may run on a remote computer that also is on the LAN. In either case, the computer running the client process is called the application server.

The organization of the X software environment, its programs, libraries and software tools, is illustrated in *Figure 2*.

At the bottom of the figure is the X server program for the display-server that is unique to each type of hardware. The program is responsible for managing the hardware and presenting a common programming interface to the developer regardless of the underlying hardware. For the HP 300 Series workstations, this program is called Xhp.

On the client side of the LAN are the basic tools for program development contained in a function library called Xlib. This library creates the programming interface to the X server. Xlib handles the necessary network interface so the programmer may think in terms of a display keyboard and mouse attached to an X workstation. A program uses functions within the library to send input and output requests to the X server.

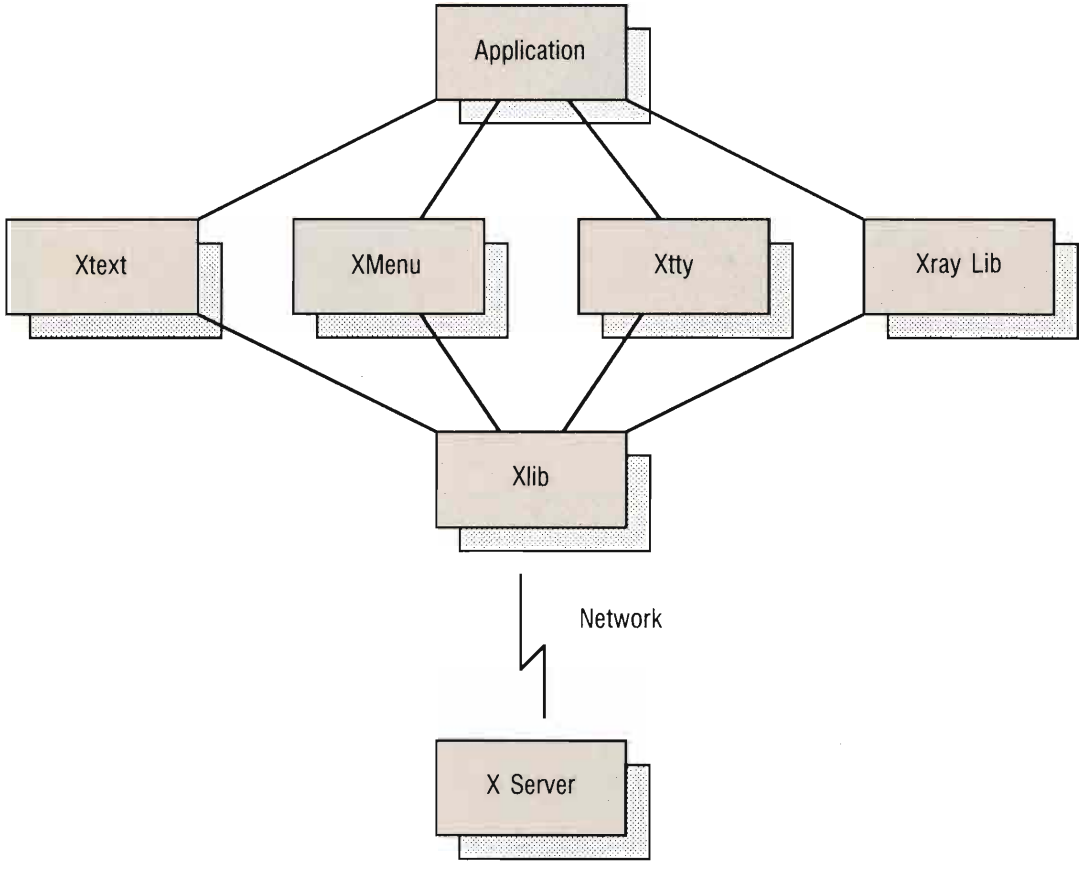
In Part 2 of this series, a sample program that generated the image of a telephone keypad and accepted keypad key presses was written using the functions of Xlib. As shown, programming at this level can be quite time consuming.

The next layer of software shown in *Figure 2* is what I'll call the tool layer. At this layer, libraries are constructed that provide complete user interfaces and various other programming tools. Much development activity is expected here. With the HP version of X come the tool libraries Xtty, Xtext, XMenu and Xray.

Xtty and Xtext are libraries for managing text-only windows. Xmenu is a library that provides pop-up menus. Xray, also called Xrlib, is an HP contribution to X providing user interface tools — one of many user interface libraries to come.

The software applications developer is free to use any of these libraries for the creation of an application. This is why X isn't a user interface

FIGURE 2



Software organization for X.

standard; there are simply no restrictions in how X may be used.

HP's Xray library is one solution to the user interface standard. Xray provides the tools necessary for obtaining input from the user. It does this by providing a set of functions called field editors. Each field editor is used to obtain a different type of input from the user. There are field editors for providing the user with a set of choices where he must choose one from many (a particular color from a set) or several from many (files to erase).

The current list of field editors, with a few graphical examples, are shown in *Figure 3*. The field editors are combined to create a form called a panel that may be filled in by the user. The user may edit each entry in the panel, called a field, hence the name field editor.

Before continuing with the details of the Xray library it's necessary to review some aspects of Xlib by referring to *Figure 1*.

Recall that user actions at the X workstation (keyboard presses, mouse movement and rearranging windows) cause messages called events to be placed into the client's input queue. By examining the events, the client decides the appropriate action.

Xlib defines many different types of events. For example, if the user presses the left mouse button in the client's window, the X server will put a MouseButton event into the user's input queue.

A typical technique for programming a client in this environment is an event loop. The client program waits for events, processes each event as it enters, and waits again. With this concept in mind, let's examine the Xray library.

THE XRAY LIBRARY is object-oriented where each field editor is an object. With this approach, each type of editor has a single function that is called to manage all aspects of the type. The

function handles creation, drawing, current state (active or inactive) and user input to the field.

You can create more than one of each type of field editor. Just as you can create many rectangles with a function that generates rectangles, using the field editor function you can create many field editors. Each is called an instance of the field editor type.

In the C programming language, all field editor functions take the form shown here:

```
XrEditor *XrEditorName
  (instance, message, data)
xrEditor *instance;
INT32 message;
INT8 *data;
```

To create an instance, modify an instance or process an X event, the field editor function is called with different messages:

MSG_NEW — generates a new instance of the editor.

MSG_SIZE — determines the rectangular screen area required.

MSG_MOVE — moves the instance of the field editor.

MSG_GETSTATE — returns the current state of the editor.

MSG_SETSTATE — sets the editor state.

MSG_REDRAW — redraws the editor.

MSG_EDIT — processes an event received from the X server.

MSG_FREE — removes the editor instance and all its resources.

Each message is accompanied by *data* appropriate to the message type.

To create an instance of a field editor, you must first collect all the information necessary for describing the particulars of the instance to be created. For example, to create a radio button editor, you must choose the number of buttons, define the labels to appear on each button and specify a default selection, the colors to use for drawing and the rectangular area within a window in which the instance to be created should be drawn.

Once all of this information is gathered, the new instance is created by passing this information to the field editor function with the message MSG_NEW. In exchange, the field editor function will return an instance code which you can use to differentiate each instance (this is actually a pointer to data describing the instance).

Once the field editor is drawn on the screen, it will occupy a known rectangular area within a window. If the user tries to access the graphical image of the field editor with a mouse button press or the press of a keyboard key, an X event will be generated and placed on the end of the client's input queue.

The X event includes the X,Y coordinate where the cursor was positioned on the screen when the event occurred. If there are multiple field editor instances within the window, the instance the user was trying to access is determined by comparing the rectangle occupied by each instance with the coordinate contained in the X event.

Once the instance that generated the X event is determined, the event is given to the field editor's function with MSG_EDIT to process the X event. For example, if the X event for a mouse button press was detected within the rectangle occupied by a radio button editor instance, then this event is passed to the radio button field editor for processing.

If the field editor function determines that the event occurred within one of the circles depicting a radio button, three things happen:

1. The field editor will make this selection the current state.
2. The instance is redrawn to reflect the new state.
3. An Xray event is pushed onto the front of the input queue.

The third action is important because it allows the event loop model for a program to be retained. In the case of the radio button, the event that is pushed onto the queue contains the number of the new button selected. The event is of a new type specific to the Xray library, but conforms to the Xlib format of an event so you can tell them apart.

Thus far, the model for using the field editors within a client program is:

1. Read an event off the input queue using an Xlib function.

2a. If it's an X event, determine in which field editor instance the X event occurred and send it to the appropriate field editor function with a MSG_EDIT. This may generate an Xray type event that is pushed onto the front of the client's input queue by the field editor function.

2b. If the event is an Xray event, it's processed as needed by the application.

3. Repeat with Step 1.

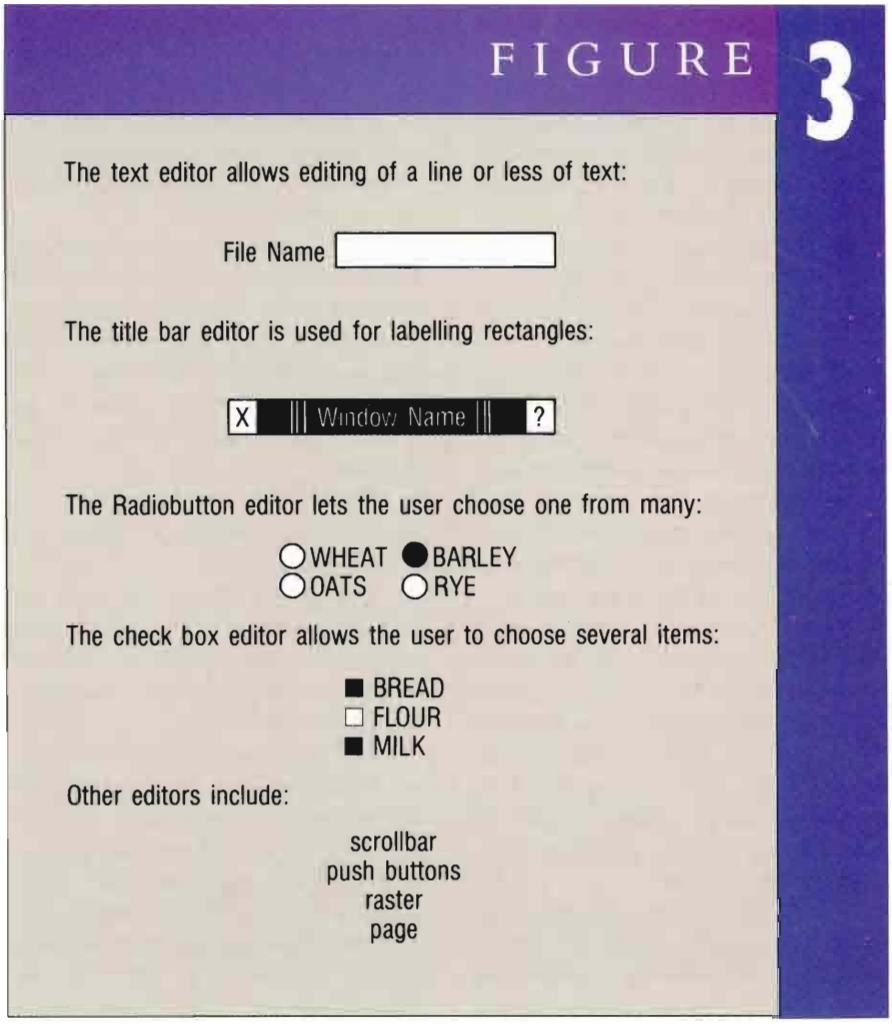
This is one way to deal with the field editors and is more difficult than required. The Xray library provides additional functions to make it simpler to work with field editors.

The Xray function called XrInput( ) can be used to obtain the next event off the input queue. Before the event is passed to the client's program for examination, XrInput( ) uses other Xray functions to pass the event to the appropriate field editor instance, thus performing Step 2a above. If the X event doesn't belong to a field editor instance, it's returned by XrInput( ) to the client process.

The Xray library isn't difficult to use once the underlying concepts are understood. Its major drawback is the amount of information that must be gathered to create a panel. Rather than entering the information to create a field editor instance using text, a graphical editing program is needed that can be used by application developers to design and draw a panel using a mouse for an input device.

On the plus side, the types of field editors can be expanded by the application developer. There's enough information in the documentation to design your own field editors. This includes grouping existing field editors together to create a new type.

Xray cannot address a user inter-



The Xray field editors.

face standard unless it's adopted by X developers. A toolkit called Xtools that's being developed for X, but isn't yet available, may become the de facto standard because it originates from the same place as X itself. For the moment, Xtools isn't available and developers are moving their software to X with little guidance on user interface standards.

HP ISN'T QUITE KEEPING PACE with current versions of the X standard. X11 is the current version available from MIT while HP is still shipping X10. The problem is that Xlib has been changed significantly with the X11 release. This requires that code be changed to use X11.

Although HP hasn't committed to a release date for X11, which has been available since late last year, they should be able to catch up by June or July of this year. If you're interested in the differences between X10 and X11, you can consult your HP sales representative.

You can obtain the source code and some documentation for the X system directly from MIT for a nominal charge. If you're serious about X, this may give you some insight into its operation.

If you purchase X11 from MIT, it will not be directly usable on your HP computer because a version X11 server for HP hardware isn't provided. However, you'll receive a reel tape containing 19 MB of source code. Your HP sales representative may be able to help you here.

HP is presently supporting two windowing standards: the proprietary system called Windows/9000 and X. Windows/9000 is included with standard HP-UX while X Window is sold separately. HP's stated commitment to standards and the financial burden of supporting two different systems requires them to discourage the use of their proprietary system in favor of X. They've already provided the capability to run Windows/9000 applications under X. Next, I'd hope for a program to help existing applications convert from Windows/9000 to X. Finally, as a demonstration of their commitment, I'd hope they'd include X at no extra cost with all versions of HP-UX.

Everyone is excited about the ability of X to provide a standard hardware interface. We need to get excited about the promise X offers for a standard user interface on workstations. The X standard needs to go a little farther and specify a standard for a graphical user interface. At a minimum, the user interface guidelines and recommendations provided within X must be extended.

The need for standard user interface toolkits clearly is present. What's needed, quickly, is a toolkit that's so powerful and easy to program that it becomes a de facto standard. However, it's needed today — before the window on X closes. — *Ken Fullett is a scientist in the Transponders Dept., Comsat Laboratories, Communications Satellite Corporation, Clarksburg, MD.*

The source code tape and documentation are available from:

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LANGUAGES

David Goldstein

The last two issues of *HP PROFESSIONAL* have featured a discussion of various popular computer languages currently being developed and used.

However, if your company already possesses a sophisticated computer installation and has invested a substantial amount of money to acquire a trouble-free library of routines, then the prospect of totally rewriting existing pieces of software may not seem so attractive.

Even after considering new features that might be added and the increased efficiency offered, the costs of hiring new or re-educating existing personnel for the new language often seem prohibitive, especially since these costs are incurred before the software is even examined. These factors can make the prospect of designing, implementing, documenting and maintaining to reimplement an existing piece of software rather bleak.

Fortunately, there's an attractive solution. If the software to be developed already exists, but needs major rewriting for functional enhancements, efficiency requirements or future savings in maintenance costs (maintenance, on average, comprises well over half the cost of a program over its life cycle), one alternative is to continue using the software's existing code, but incorporate sophisticated features from other languages via extensions. Dozens of companies offer packages to provide such extensions as library routines that interface directly to high-level languages.

Examples of efficient graphics, object-oriented programming and database querying extensions will be presented here. These extensions are sophisticated, often optimized, library routines.

The use of libraries to provide programming functions is not a new concept. However, when radically new programming techniques are introduced, more functionality might be added than would be obtained by even changing languages, since the benefits of both languages can be combined.

Also, a smaller learning curve is required to use the new functions, since the knowledge used in creating the existing version can be incorporated in future developmental stages. This factor, in turn, decreases the algorithmic complexity involved in developing the new version and allows old code to be incorporated, thereby decreasing the cost of documentation.

Finally, using subroutine libraries to affect changes permits incremental development, since increasingly sophisticated versions can be created from previous stable ones over time.

RECENTLY, A NUMBER of graphics-oriented languages/packages have been introduced. These pieces of software allow users to create intricate graphics for CAD/CAM applications, presentations and desktop publishing with a minimum amount of effort involved.

Graphically based languages and packages typically offer users and programmers a variety of primitives, such as point, line, filled and unfilled polygon and text drawing. These functions are offered in user-defined languages such as HP's Device-independent Graphics Language (DGL). Since DGL can be embedded in C, calls can be executed when needed to provide any function so desired.

Whether a filled polygon is to be used for a CAD/CAM application, graphic molecular modeling, desktop publishing or animation is entirely up to the programmer. However, if your dedicated graphics language or software

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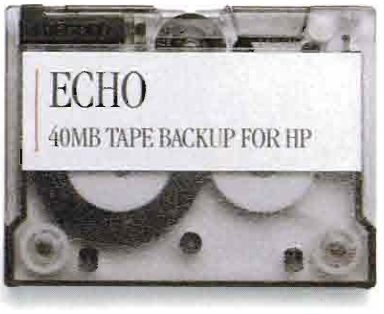

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[Device-independent Graphics Language (DGL)]

The Device-independent Graphics Language (DGL) is one of a variety of C callable subroutine packages available on the market that can be run as a graphics-specific language.

The command set of DGL supports a wide variety of commands in a device-independent manner, so changing hardware often has little effect on a program's useability. Because of the transparency of hardware to application programs, many routines return an error flag that can be examined to determine where an error might have occurred. The DGL commands include:

Command Name	Function
zbegn	Begin processing graphics commands.
zdint	Initialize the device.
zdend	Stop using a device.
zend	Stop using DGL.
zmove	Move to an x,y coordinate.
zmark	Draw a marker. A variety of predefined markers are available. Markers can be used to mark places on a graph or chart or as very quickly displayed small shapes. Markers are affected by zcolr, so they can even be used for animation by drawing a marker and then redrawing it in the background color.
zcolr	Specify the next drawing color.
ztext	Draw specified text at current cursor location.
zcsiz	Specify character size for drawing text.
zaspk	Set the aspect ratio (ratio of x,y distances).
zwind	Work with a new window of the screen for world coordinates.
zdlim	Set the display limits.
zpoly	Draw an unfilled polygon. Filled and unfilled polygons of virtually any size can be drawn, thus allowing curves to be constructed.
zlstl	Draw a line using a predefined style (dashed, solid, thick, etc.).
zpgdd	Draw a filled polygon, with or without a surrounding border.

package does not support a function you need (including often forgotten, but important functions like trigonometric functions and random number generation), you may be out of luck.

Programs created using graphics library languages tend to be of the following form:

- *Declare device used*
- *Set up world coordinates*
- *Set up window viewing*
- *Perform drawing desired*

Many common graphics routines, such as drawing text on a graphics screen, would be excrutiating to develop from scratch, yet for any reasonable degree of flexibility, features of commonly used programming languages are required.

Much of my most recent work has been in machine perception/image processing (the more subtle dual-to-graphics), so the readily-available *Program 1* is a C program that calls an imaging subroutine library to perform simple thresholding (removing points in an image of a lesser intensity than a given threshold). This program, a library subroutine, makes use of an imaging package "pm" [hence the statements of the form pm__(name)].

More complicated procedures involving convolution, edge detection, smoothing, region growing, histogram creation and stereo matching are available in the library that my colleagues and I have created.

In the January 1988 issue of *HP PROFESSIONAL*, I addressed database-specific languages. These languages commonly are used to perform database queries and obtain statistics on the data when one cares not about the mathematical foundations of the statistics or the intricacies of data storage and retrieval, but only that the information is accurately and efficiently obtained. These languages come in a variety of forms, ranging from command-line interpreters to graphically oriented depictions of everything stored in the system.

Although database languages are extremely powerful and efficient and perform a wide variety of tasks very difficult to implement, they suffer from the same flexibility problems as mentioned above. Further, most of these languages fail when posed the now-classic database problem.

Suppose we have the relation expressing mothers and children of people:

Child	Mother
Tom	Mary
Mary	Jane
Tim	Gretta
David	Sarah
Joel	Sarah

This problem illustrates a major shortcoming of many languages — their lack of "transitive closure." Transitive closure, or the ability to discern all relationships of the form:

```
if
   if A is true then B is true
      and
   if B is true then C is true
then
   if A is true then C is true
```

is the feature of many generic programming languages that allows us to tackle

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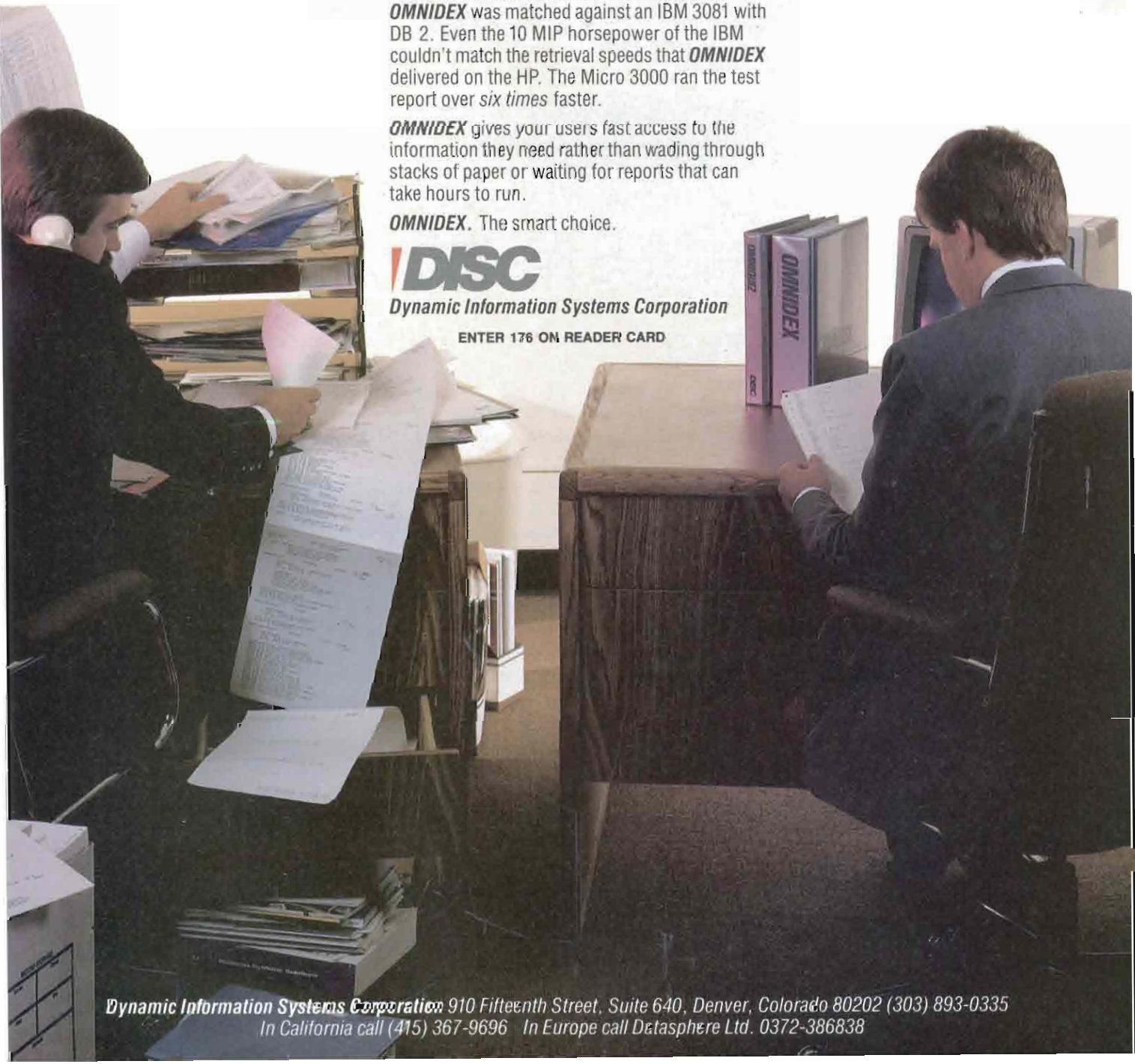

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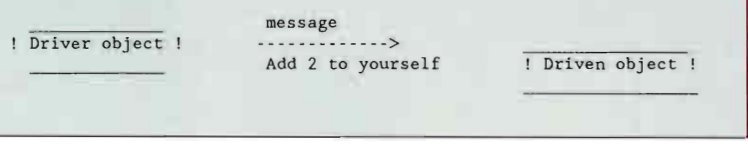
FIGURE 1

```
Object: euclideanshape
        area:
        perimeter:
        center:
        perimeter:

Object Rectangle:
        instance: euclideanshape
        area: (y2-y1)*(x2-x1) OR length*width
        perimeter: (y2-y1)+(x2-x1)*2 OR length*width*2
        center: (y2+y1)/2,(x2+x1)/2

mySquare
        instance: Rectangle
        x1: 5
        x2: 10
        y1: 5
        y2: 10
```

FIGURE 2



open-ended problems. Yet, many special-purpose languages are designed to handle very narrow domains, and so do not have the inherit constructs to use error handling, loops and sophisticated logical functions.

Manufacturers of several database languages, forseeing problems, offer two versions of their products. One version is the typical highly functional, attractive user-interface, database-specific language package. The other version, conversely, offers very little in the way of user-interface, but all the database manipulation power of the full-blown package. However, this second version, comprised of a series of subroutines, is accessible via some high-level language. By combining the database algorithms of the database-specific language with the general problem-solving capabilities of a language (such as C or PASCAL, which have the transitive closure property), a tremendously powerful tool is available.

An example of using the tool EQUEL, providing QUEL subroutines to be called via C, is shown in *Program 2*. This query produces statistics normally requiring far more time and space than would be necessary in QUEL alone, exhibiting one more advantage of combining the two languages: Database languages tend to create many large, temporary relations with computing results, while generic programming languages are excellent at efficiently performing well-understood computations.

OBJECT-ORIENTED PROGRAMMING has been one of the most widely talked-about topics in recent years. There are a variety of object-oriented programming languages available, probably the most famous being Smalltalk.

Object-oriented languages share the basic capability to treat problems not as sub-problems to be solved, functions for computation or procedures to be executed, but as a series of "black boxes," each of which performs a specific function. Control is exercised over these "objects" by having each module be of a certain type with very limited courses

Object-oriented languages treat problems as a series of "black boxes"...

of action, while data flows via messages that pass between "boxes."

Object-oriented programs exhibit a variety of desirable traits. First, since the problem is viewed as chunks or "objects," programming is easily modularized and can be adapted to run in parallel. Inheriting information without explicit denotation is a tremendously desirable characteristic and forms the basis of many sophisticated expert and planning systems. For example, an object-oriented language might represent a square in the manner (pseudo-code) shown is *Figure 1*.

Because of inheritance, asking about the mySquare's area, perimeter or center would yield the correct results, even though nowhere have we specified mySquare.center = 7.5,7.5.

Unfortunately, however, object-oriented programming does have its drawbacks, and one major disadvantage is that it tends to be far less time-efficient than programming with more general purpose languages. The concept of message passing requires even the most simple operations to be accompanied by a message, as in *Figure 2*. These messages require resources to be spent in their sending.

Fortunately, as was the case with both database and graphics-oriented languages, there's a version of C

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available incorporating many of the features of object-oriented programming, C++. C is, computationally, a tremendously efficient language, but can become rather unstructured. Conversely, object-oriented programming offers a rich structure with which to develop sophisticated applications. By using C++, you gain features like inheritance, natural modularization of problems, and the transparent understanding of data-flow common to object-oriented programming, but with the efficiency of C for more power to perform your intensive number-crunching.

The common theme throughout this article has been to explore all your possibilities, but not to re-invent the wheel. If an application is being built for the first time, be bold, intelligent and innovative in your approach, but if some version of the software already exists, consider the trade-offs. Redesigning a piece of existing software in a new language may require new personnel, documentation and algorithms and generally discards much of the clever, careful thought that went into the existing implementation. However, much of this effort often can be saved if the current implementation is simply extended via libraries or more sophisticated versions of the same language.

—David Goldstein is an independent consultant based in Elkins Park, PA.

Program 1.

```
#include        <stdio.h>
#include        <local/pm.h>
#define         FALSE       0
#define         TRUE        not(FALSE)

char            *malloc();
unsigned char   *dthresh();

/*
   Name:        thresh - threshold command.
   Function:    Perform a threshold on the picture. Floating pmpic are not
                supported.  This program is a modification of the given
                sample thresholding program.
    Syntax:     thresh [-s] [-p] [-o ofile] [-t ithresh] [-i ifile]
    Notes:      -s option not operational yet
*/

/* The options string contain all legal flags.  The ':' after the letter
   tells getopt() to set optarg to the string following the flag. */
#define OPTIONS "pso:t:i:"

main(argc,argv)
int     argc;
char    **argv;
{
        extern char *optarg;            /* Option argument pointer      */
        extern int optind;              /* Option index, argv[optind]   */

        FILE    *ifs,                   /* Input file stream            */
                *ofs;                   /* Output file stream           */
        u_int   thresh = 100,           /* Threshold value              */
                preserve = FALSE;       /* Preserve intensities?        */
        char    *cmd,                   /* Command name from argv[0] */
                *cmt,                   /* What we did to the picture */
                *ofile  = NULL,         /* Name of output file for fopen() */
                *ifile  = NULL;         /* Name of input file for fopen() */
        int     c,                      /* Next command line flag */
                errflag = 0;            /* Command line parser error flag */

        cmd = argv[0];                  /* Remember the command name */
        cmt = pm_cmt(argc,argv);        /* Copy command line into a string */


        /* Parse the command line.  Optarg() returns '?' if it gets
           a flag which is not in OPTIONS. Process input stream options too. */

        while (( c = getopt (argc, argv, OPTIONS)) != EOF)
        {
                switch (c)
                {
                  case 'o': ofile = optarg; break; /* get output file name */

                  case 'i': ifile = optarg; ifs = fopen(ifile,"r"); break;
                  /* open input file as set file stream */

                  case 's': ifile = "stdin"; ifs=stdin; break;
                  /* use stdio for input */

                  case 't': thresh = atoi(optarg); break; /* get threshold*/

                  case 'p': preserve = 1; break; /* keep object intensities*/

                  case '?': errflag++; break;
                }
        }


/* If there was an illegal flag, spit out summary of the syntax and exit. */
        if (errflag)
        {
           fprintf(stderr,"%s [-i ifile] [-p] [-o o
        if (ofile)
        {
                ofs = fopen(ofile,"w");
                if (ofs == NULL)
                {
                        perror(cmd);
                        exit(1);
                }
        }
        else
        3       ofs = stdout;



/* If pm_do_thresh bombs, it returns -1.  Be prepared to print an error
   message.  Exit(1) is an error code for the shell. */

        if (pm_do_thresh(ifs,ofs,thresh,cmt,preserve))
        {
                fprintf(stderr,"%s: cannot filter %s\n",cmd,ifile);
                exit(1);
        }

        exit(0);
}
/* Main processing subroutine.  Allocate memory, read in the picture, process
  it, add the comment to the pmpic, and write it out.  */

p3m_do_thresh(ifs,ofs,thresh,ncmt,preserve)
FILE    *ifs;
FILE    *ofs;
u_int   thresh, preserve;
char    *ncmt;
{
        pmpic   *pm1,*pm2;

/* Pm_read with NULL for its second argument, tell it to do the memory
   allocation.  If pm_read bombs, it returns NULL.  Probably because the file
   couldn't be read, or there was a loose pointer that screwed up malloc. */

        pm1 = pm_read(ifs,NULL);
        if (pm1 == NULL) return(-1);

/*  Allocate memory for the thresholded picture.  It is really not needed for
    pmthresh, but someday you may do to something more complicated and then
    you can just steal this code. */

        pm2 = pm_prep(pm1,NULL);
        if (pm2 == NULL) return(-1);

/* Do the treshold on pm1, return the threshold picture in pm2.
   Here we assume that the image is a 256 x 256 x 8bit image. */

        if (d_thresh(pm1->pm_image,pm2->pm_image,thresh,preserve) == NULL)
           return(-1);

/* Add the comment to the newly thresholded picture, so you can tell how the
   image was created. */

        if (pm_addcmt(pm2,ncmt) == NULL) return(-1);

/* Write the picture. */
        pm_write(ofs,pm2);
        return(0);
}


/* Return the thresholded picture in image2, and NULL if there was an error. */

unsigned char *dthresh(image1,image2,thresh,preserve)
unsigned char   image1[][256];
unsigned char   image2[][256];
unsigned int    thresh, preserve;
{
        int     i, j;


        for (i = 0; i < 256; ++i)
          for (j = 0; j < 256; ++j)
            if (preserve)  /* preserve original intensities of objects */
              image2[i][j] = image1[i][j] < thresh ? 0 : image1[i][j];
            else           /* set objects to pure white */
              image2[i][j] = image1[i][j] < thresh ? 0 : 255;

        return(image2[0]);
}

----------------------------
```

Program 2.

```
/* This program computes standard deviations using EQUEL
(embedded QUEL)  This particular example calculates standard deviations of
each supplier for the number of parts he supplies relative to mean number
of parts supplied by suppliers in a part-supplier database.
We also inform the user if a supplier has no standard deviation to
calculate and skip his calculations in order to save processor time.

This calculation can be made entirely within QUEL, but shows several of the
languages drawbacks

- calculati

Q3UEL is the engine for the database package INGRES.  All lines beginning with
## are needed by QUEL.

sX - Denotes supplier number X
sp - The name of the relation containing the quantities of parts sold by a
     supplier
*/

main()

{
##      int     N,REALSUP;
##      int     PART;
##      char    SN[3],*SNS[10],STEMP[3];

##      ingres  parts

/* Get number of suppliers, and number of suppliers who actually supply */

##      retrieve (N=countu(s.name))
##      retrieve (REALSUP=countu(sp.snum))
        printf("The number of suppliers is %d\n",N);
        printf("The number of sp suppliers currently supplying parts is %d\n",REALSUP);
        printf("(so the number of suppliers with no standard deviation to calculate is %d)\n",
                (N-REALSUP));

/* Calculation standard deviation */
##      retrieve (SN=sp.snum,PART=sum((((sp.qty-(sum(sp.qty by sp.snum)/
##      count(sp.qty by sp.snum)))**2)/count(sp.qty by sp.snum)) by sp.snum))
##      {
                printf("The standard deviation for %s is %d\n",SN,PART);
##      }
##      exit
}

Data:

s   Supplier relation
    Format is supplier number, name, town of location
-----------------------------------------------------------------------
s1,Smith,London
s2,Jones,Paris
s3,Blake,Paris
s4,Clark,London
s5,Adams,Athens


sp  Supplier-parts relation
    Format is supplier number, part number, quantity of part supplied
-----------------------------------------------------------------------
s1,p1,325
s1,p2,210
s1,p3,400
s1,p4,200
s1,p5,110
s1,p6,103
s2,p1,300
s2,p2,400
s3,p2,200
s4,p2,200
s4,p4,300
s4,p5,400
s5,p1,0


Output:

The number of suppliers is 5
The number of sp suppliers currently supplying parts is 4
(so the number of suppliers with no standard deviation to calculate is 1)
The standard deivation for s1 is 11389
The standard deivation for s2 is 2500
The standard deivation for s3 is 0
The standard deivation for s4 is 6666
```

■

RETRIEVAL AND DISPLAY

The Use Of Computer Graphics To Display Information

CAD

Dr. Michael M. Dediu

Information is the essential ingredient in decision making. The need for improved information retrieval and display in recent years has been made critical by the steady growth in size and complexity of organizations and data. In this article, I'll present various aspects of retrieving and displaying digital and graphic information.

This area embraces a broad spectrum of topics, such as information system theory and design, man-machine relationships, language data processing, artificial intelligence, mechanization of library processes, non-numerical applications of digital computers, storage and retrieval, automatic publishing, command and control, information display and so on.

The term information retrieval, as it is commonly used, refers to the activities involved in searching a body of literature (which may include images) in order to find items (i.e., documents, words, images) that deal with a particular subject area. An information retrieval system is a tool or device that organizes a body of literature in such a way that it can be searched conveniently.

Most information retrieval systems don't store and search documents themselves. Rather, they store some representation of each document: a bibliographic citation (with perhaps an abstract) together with one or more indicators of subject content. These indicators may be numeric or alphanumeric codes from a classification scheme, subject headings, keywords or descriptors selected from a thesaurus.

Information retrieval systems have existed for a very long time, at least as long as we have had printed indexes or the catalogs of libraries in book or card form. The term information retrieval itself, however, appeared around 1950. The first application of computers to information retrieval occurred in the 1950s. Computers have been used in full text searching for some time.

Titles, titles plus abstracts, or the complete text of a document collection can be stored and searched by computer.

SEARCHES ARE CONDUCTED on any combination of words occurring in the stored text. A retrieval system that operates on words occurring in titles, abstracts or text may be referred to as a natural language or free text system. If the complete text of a collection is available for searching in digital form, the system is best termed a full text retrieval system.

Natural language searching systems are of two principal types. In the first type, the database is stored on magnetic tape and the complete text is searched sequentially. The second type is not searched sequentially. Instead, the computer is used to construct a text concordance that shows exactly where each word occurs (document number, line number, word number) in the database. Searches are conducted in this concordance.

A technique of great importance is word fragment searching; i.e., the ability to search on parts of words (prefixes, suffices or infixes). Also important are word distance indicators or metric operators, which allow the searcher to specify how close two words must be in text before they are considered to be related.

In an associative retrieval system, strengths of association are computed for each term in the database with every other term, based on the extent to which the two terms occur together in documents. A search strategy may consist merely of an unstructured list of terms representing the subject matter sought.

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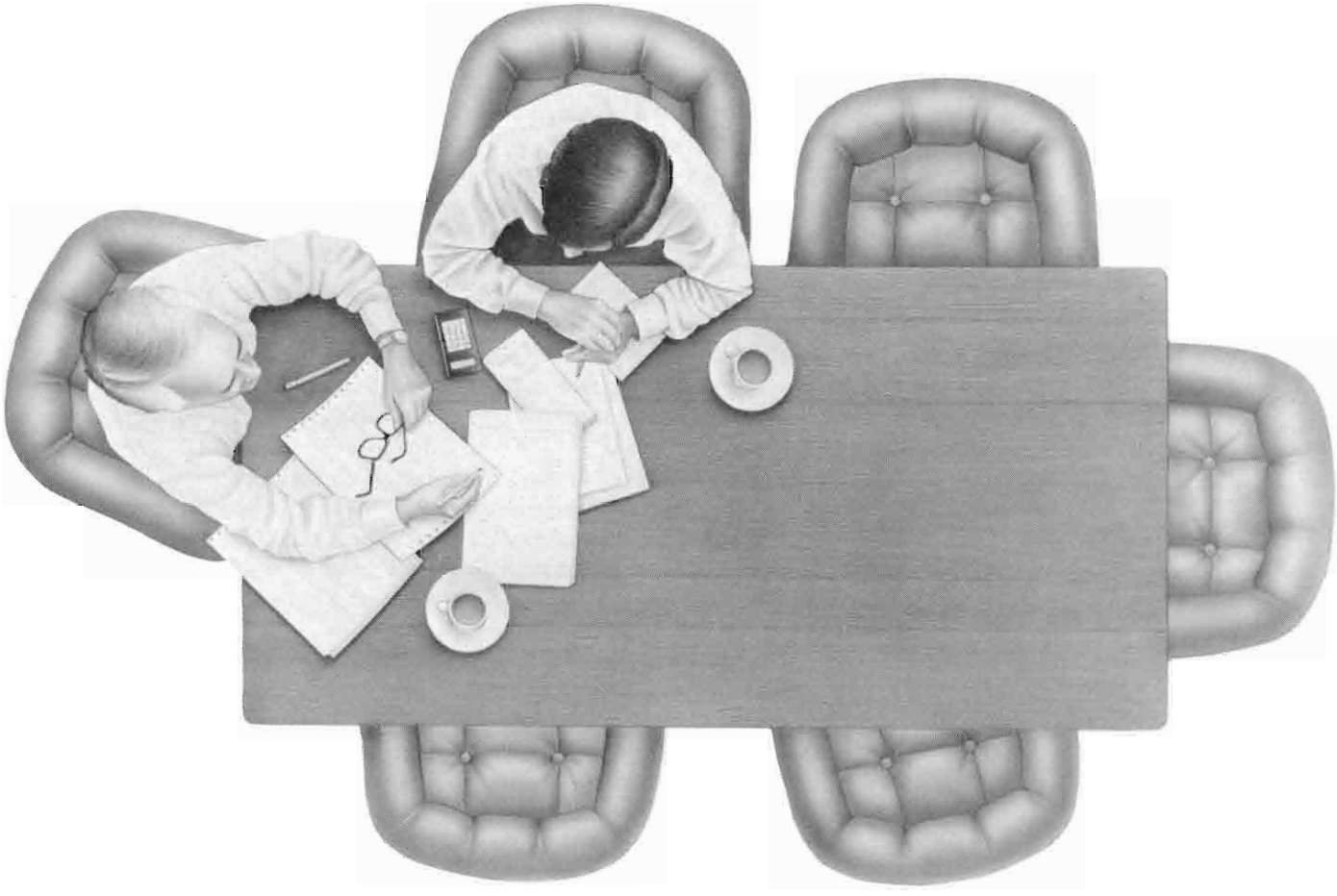

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Important factors that significantly affect the performance of all information retrieval systems are indexing policy and practice, vocabulary control, searching strategies and interaction between the system and its users.

THE REPLACEMENT OF PAPER as a drafting medium is perhaps one of the most widely claimed advantages of a graphics system. A graphics system that presents the proper tools for image creation and manipulation can make a user much more productive. For instance, in an engineering drawing environment, repetitive construction components don't have to be redrawn, but can be instantaneously called for from storage using a retrieval technique.

Computer graphics are an essential tool for designers in many disciplines, such as engineering drawing, art work, fashion, textiles, carpeting and similar areas. For example, complex fabric patterns involving several figures can be generated automatically by the computer graphics system. These patterns can be displayed in any combination to determine the overall effect, and many alternative designs can be tried in less time than is required to draw a single pattern manually.

This type of computer assistance promotes the designer's imagination and creativity. With a sophisticated graphics system, the computer design can be sent directly to production via control programs that manufacture fabrics.

A technique such as the example above in which designer and computer blend into a problem-solving team often is referred to as computer-aided design.

One of the first decisions that must be made regarding graphics display concerns how the screen area is to be used. In many applications, the screen simply isn't large enough to accommodate menus, prompts and other messages.

The need to optimize the use of screen space normally will call for a screen division into at least four windows: one for a menu, a second containing the status messages, a third for prompts and a fourth as the drawing area. Here the windows are rectangular screen regions whose positions and dimensions are set by the user. The boundaries of the windows can be tailored to each graphics program.

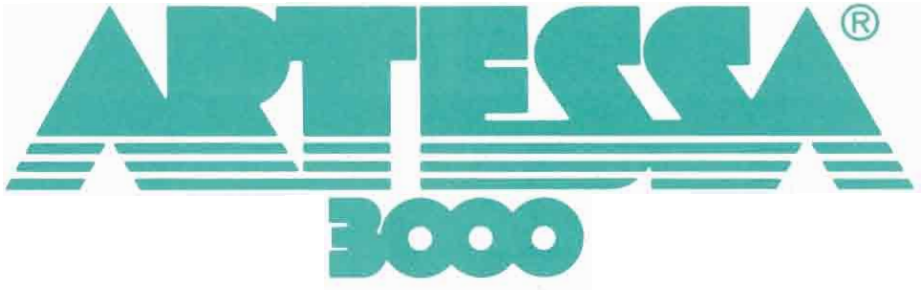
In designing graphics commands, we must pay special attention to conventions familiar to the user. At the same time, we must be as economical as possible to the use of screen space. This often leads to a situation where we cannot exactly match standard graphics conventions. If it happens, it is necessary to experiment with different representations in order to find one that satisfies the user.

A utility command is used to save only the picture on the screen, excluding any status messages and other command menus displayed on the screen. Therefore, the technique used in saving the picture is different from just saving the total screen image. Approximately 15K of diskette storage is needed for any one picture.

Another utility command can be used to retrieve an image file from a diskette into the drawing area on the screen. This command will not erase any contents already on the screen. Thus an image file can be called and superimposed on the current screen image. This is a very powerful feature in creating a picture based on repetitive elements.

The principal argument in favor of the use of graphic displays is their effectiveness in displaying information. This poses a problem for the user interface designer: How should information be presented on the display in a manner that promotes the most effective interaction between user and computer? This is the central issue in information display as a component of user-interface design.

THE 3-D VIEWING PROCESS produces additional complexity in obtaining the graphics image on the screen. This is because the display screen is a 2-D space. We cannot actually display 3-D objects,



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only their projections. Projectional transformations generally are quite expensive computationally; they also are slow in execution, depending on the programming language and on the hardware. HP computers are very efficient for computer graphics.

Since generating a perspective view of a given object may require the projectional transformation of a large number of points, some use a special case of central projection, the parallel projection. The use of parallel projection will not simplify the programming effort, but will keep the resulting execution time within reasonable limits.

The most common types of parallel projections often are referred to as orthographic projections — projections in which the projection plane is perpendicular to a principal axis (the direction of projection). Orthographic projections often are used in engineering drawings to depict machine parts, assemblies and buildings, because distances and angles can be measured from them.

One of the weaknesses of using only orthographic projections is that the 3-D nature of the projected object can be difficult to perceive, because each projection depicts only one face of the object. You can circumvent this difficulty to some extent, however, by providing a rotated view of the object.

When a great deal of retrieved information must be displayed to the user, it should be presented in a structured form, so the user can perceive and understand it with no confusion. The information can be structured by dividing the viewing surface into different areas, where different specific types of information can be presented.

Prompts, system status, commands and the graphical representation itself each have their own areas. This provides an organized display presentation and allows the user to locate relevant information.

A zoom capability is very useful in 3-D object manipulations. This feature permits the user to decrease visual clutter by enlarging a small area of the display to expose details not otherwise distinguishable.

The ability to zoom (or "window") in or out from a given part of the drawing area also partially overcomes the physical limitations of the screen size. When an enlarged part of the original drawing is being displayed, however, the original drawing must be retained in some way so that the enlarged portion can be placed in its overall context.

The area for retaining the original drawing is referred to as the viewing area and the area for displaying the transformed drawings is called the work area. A small square inside the viewing area can indicate which part of the overall drawing is being shown. (This can be done even more effectively with

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two monitor displays — one for the overview, the other for the enlarged portion. This is the approach commonly used in a sophisticated CAD environment.)

The file structure of a 3-D object consists of four data elements for each vertex of the object, the world coordinates (x,y,z) and a flag. The flag simply identifies whether the vertex being defined is the starting point for drawing the object. One can assign 0 if the vertex is the starting point; otherwise, we assign 1. If the flag of the current vertex is 0, no attempt will be made to draw a line from the previous vertex (if any) to the current vertex. Otherwise, a line will be drawn between the two vertices.

AN IMAGE THAT REPRESENTS a surface can be presented as a sequence of wire-frame curves. Obviously, the image obtained by the program depends on the function selected. In plotting a 3-D function, you may use a crosshatched square in lieu of the wire-frame curve. Crosshatched squares often produce a more pleasing image than the wire-frame curve, one that shows the significant characteristics of the surface.

The mathematical functions that perform the various stages of viewing transformations are rather complex. Consequently, the system and user interface needed for 3-D object displays require a quite laborious design effort. The most difficult aspect is the design of the overall screen layout. The zooming feature helps the HP user control the object size. Good computer graphics enhance our capability and creativity.

Application In Business Forecasting

Many production and inventory managers need to forecast a seasonal time series. The Winters' method is widely used for this and is frequently applied to other practical problems including financial planning, investment analysis, facilities planning and marketing.

With this method, historical data is retrieved to determine the underlying process generating the variable of interest (assuming that the process is stable), and then, using this knowledge, to extrapolate the process into the future. The statistical logic is clearly stated and the operations are mathematical.

Information retrieval and computer graphics play an important role in the development of an automated forecasting system based on the Winters' method.

Information retrieval and computer graphics play an important role in the development of an automated forecasting system based on the Winters' method. The forecasting technique can be an exponential smoothing procedure that's best used to forecast a time series with a linear trend and multiplicative seasonal variation.

Winters' method requires the HP user to specify values for the smoothing constants in the model for the forecasting system. The smoothing constants act as weighting factors, thereby controlling the number of past realizations of the time series that affect the forecast. For instance, small smoothing values give more weight to past observations (which are stored and must be retrieved); this makes the forecasting system respond slowly to changes in the parameters of the time series. Larger values of the smoothing constant include less historical data; consequently, the forecasting system responds more rapidly.

Several approaches serve as a rational basis for selecting the smoothing constant. The forecast generated by each combination must be compared to the actual observations in the historical time series. The combination minimizing the sum of squared forecast errors is the set of smoothing constants used in the actual forecasting.

For example, if three years of monthly observations are available, the program will use the first two years to optimize the smoothing constants, and then simulate a forecast for each month of the remaining year to see how the optimum smoothing constants respond to new data. As a general rule, smoothing constants range between 0.01 and 0.3. If the results of a set of trials indicate an optimum value greater than 0.3, then the validity of the model should be questioned.

We must accept the fact that no forecasting system ever can produce perfect forecasts of future observations. There always will be some difference between the forecast for a period and the actual realization for that period. This difference is usually referred to as the forecast error or residual for that period.

When forecasting is made over several periods, a series of error values is obtained, one for each time period. A summary of these errors provides a basis for measuring the accuracy of the forecast.

Two methods are frequently used as a measure of forecast accuracy. One method is to compute the mean absolute deviation. Another method is to compute the squared error for each period and average these squared errors for the number of forecasted periods. The basic difference between these two measures is that the mean squared error penalizes a forecasting technique much more for larger errors than for small errors.

These measures can be used in two ways. First, they can be used to select a forecasting method that produces the most accurate predictions of future values. A common strategy is to simulate historical data and compare the performance of the various methods in

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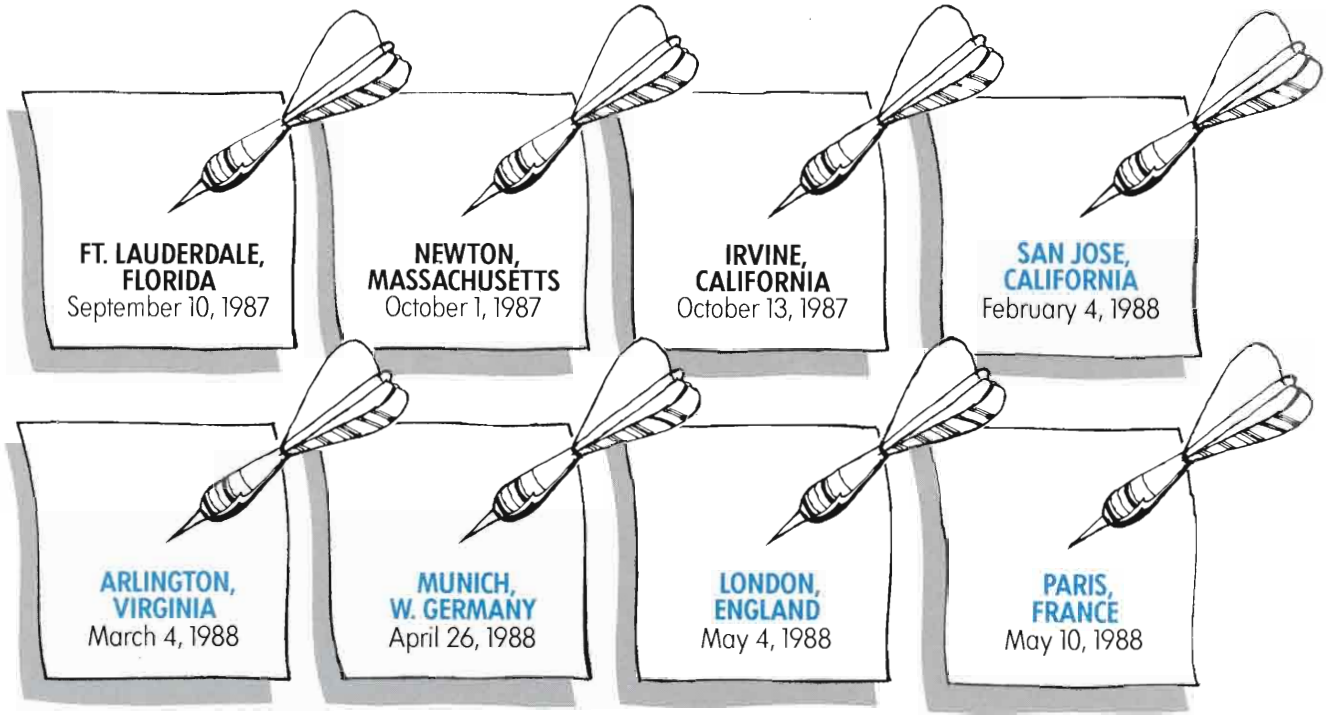

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forecasting that historical data.

Second, these measures can be used to monitor the accuracy of an installed forecasting method. A monitoring device may be needed, because a specific forecasting method, based on past observations, may not remain valid in the future. The underlying data pattern might change in the course of forecasting. Thus, it's common to use a tracking signal test for each period.

The tracking signal is a statistical constant computed by dividing an estimate of the expected forecast error. If the tracking signal deviates from zero by more than a prescribed amount, we must determine whether the forecasting model should be modified to better represent the time series process. The tracking test is a useful modification to the Winters' model.

Having obtained an estimate of future forecast at a certain period, it is useful to make probability statements about the accuracy of the estimated value. To do so, you can compute an interval that has a stated probability of containing the actual future value. This range is called a prediction interval. This statistical term is often used in lieu of confidence interval, which has the same statistical interpretation, but is based only on the data used to fit the forecasting model.

The Winters' method is an exponential smoothing technique that is best used to forecast a time series with linear trend and multiplicative seasonal variation, but it also can be used to forecast a time series having no trend.

The use of an appropriate forecast method depends on the user's knowledge of how to analyze the underlying data pattern and monitor the performance of the chosen forecasting technique. No information retrieval technique, computer graphics or any computer software can replace the essence of human judgment in forecasting; they simply help the HP user in making a better decision.

Application To Economic Analysis

Computer simulations often produce large amounts of output, because users want to vary the model's constraints, relationships or input conditions. This ability to vary conditions is precisely what makes simulation valuable.

In developing a risk analysis model, the information retrieval techniques and interactive computer graphics can facilitate the understanding of simulation results.

As models become more complex and users pose more questions, the amount of data to be retrieved and the output can become enormous and the task of interpreting the results overwhelming. At the same time, failure to try enough conditions may leave the analyst without an adequate understanding of the model's behavior.

When you must interpret large amounts of output from a simulation based on a certain information retrieval technique, the computer graphics is an important tool. In developing a risk analysis model, the information retrieval techniques and interactive computer graphics can facilitate the understanding of simulation results.

The principal determinants of economic worth in engineering projects are the cash flow streams. Cash flows are projected at the time the project is first proposed and are considered to be subject to probabilistic deviation from their

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expected values. Variations in the outcomes of the future events have been of primary concern to most decision makers in evaluating investment proposals. The variation from the judgmental estimates often is named risk.

Often the variance or standard deviation is used as the principal measure of risk, thereby summarizing the spread of a statistical distribution. We also might compute the probability that the net present value of a project will be negative.

Another way of expressing this is the probability that the present value of cash inflows will be less than the present value of the cost of the project. To derive this probability, we need at least part of the statistical distribution of present values. This is obtained by introducing the concept of risk analysis.

Risk analysis is defined as the process of developing probability distributions for some measure of the merit of an investment proposal. To do this, probability distributions are required for random variables, such as cash flow, the planning horizon and the discount rate. The probability distributions then are aggregated analytically or through simulation to obtain the desired probability distribution for net present value.

Information retrieval is extensively used for catalogs, library references, stock quotations, news and entertainment programs. The databases usually are page-oriented and often are maintained expressly for videotext in dedicated computers. Data retrieval is the prime application of teletext.

A major area in which information retrieval and computer graphics have just begun to be applied is the home computer business. In the future, every home will have an information retrieval system connected to a huge international database and, using an efficient and very fast computer graphics technique, everybody will be able to display, in a relaxed and cozy atmosphere, any type of information in a highly attractive and useful format. — *Dr. Michael M. Dediu is president of Dediu Computer Consultants, Tewksbury, MA.*

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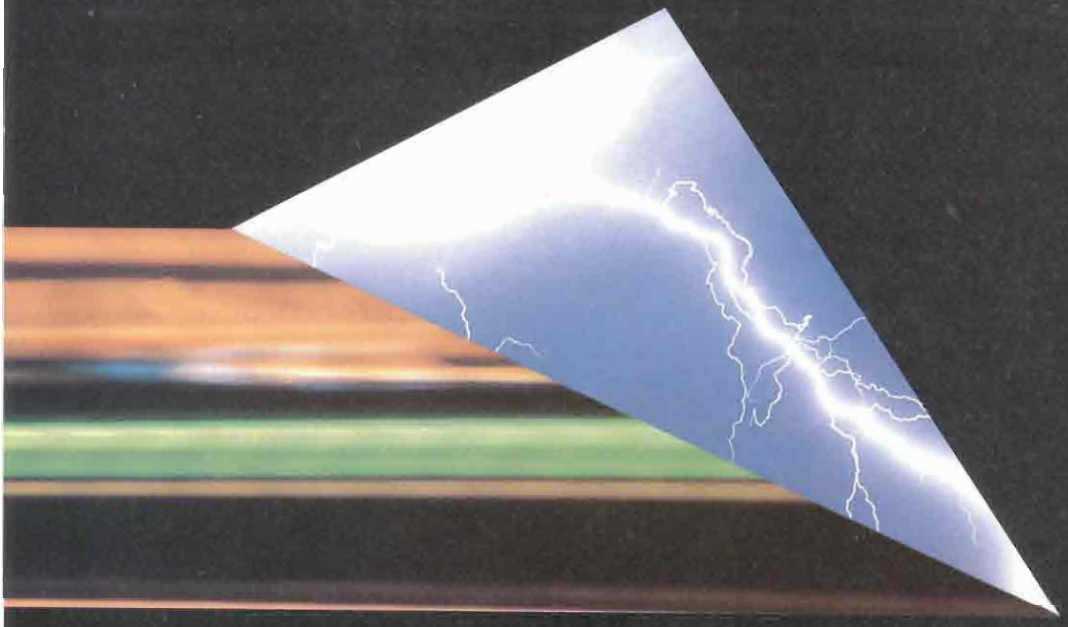

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DEVELOPMENT

Lisa Burns Hartman

Application Testing

I'm sure many of you have had the following experience: You're working on a new application, due to be delivered in a week. Because of the tight schedule, all you're able to do is get a clean compile on some of the modules and run a few test cases through the others. As a result, you go into the live installation knowing that much of your code has never been run, and certainly that you've never run the complete system together.

Sure enough, the conversion process to install your new system falls over several times, and the project team is up all night trying to fix it. Finally, the database is loaded, but the online system has several major problems, causing program aborts and unpredictable data record contents. ...

You know the rest. Your test site personnel are angry, the users are disappointed in your system and don't trust it, and the project team is demoralized. What could you have done differently to prevent this kind of occurrence? Software inspections or walk-throughs would've helped you catch some of these problems, and better management support of adequate schedules would've given you more time. But perhaps the most important thing you could've done was to TEST that conversion job and TEST that online module.

In this article, I'll discuss the levels of testing performed in our shop, and give you some advice about setting them up in your environment. Finally, I'll talk about how project teams in our area have performed testing and the results we've achieved.

We do three, and sometimes four, different levels of software testing in our MIS department. We call the first level of testing unit testing. This is the lowest level of testing and tests a single, newly developed module or single change to an existing program. The purpose of unit testing is to verify that the module being tested performs according to its requirements. In our shop, unit test plans follow a standard testing process and are documented so that they'll be easily repeatable if additional changes are made, if defects are discovered, or if the tests are repeated as part of the next level of testing, system testing.

System testing is begun when all coding and unit testing is completed for a new project or update to an existing project. This level of testing integrates all modules to be released to users. System testing also includes testing of all system interfaces. All online and batch functions are tested in an environment as close as possible to that of production.

For some of our projects, an intermediate level of testing between unit and system test may be performed. This level of testing, called integration testing, incorporates the interface between two or more new modules in a system.

The final test of a system, of course, is when your users get their hands on it. We call this test an Alpha test. Sometimes, especially for new systems, the first phase of an Alpha test consists of a parallel run, where new software is installed on a separate machine or account and run at the same time and with the same data as the live system. The results of the two systems then are compared.

Other systems may go to their Alpha test directly into production. The users then simply do their job functions using the new software, carefully monitoring the results.

"So," you say, "how do I go about doing these various levels of testing?" First, sit back and design the process you'll use for the tests. Let's think about unit testing first.

As you prepare to revamp the process of testing individual modules in your shop, you should consider the following questions:

- *Who should perform the testing?*
- *What tools will be used?*
- *Which conditions and cases will be covered?*

First, you'll need to decide who should perform the testing. Some teams have the programmer who wrote the module test it. This certainly is the easiest approach, but may lead to missed test cases. You might consider having another programmer who is familiar with the system, but didn't write the code, perform the test. Alternately, user representatives or users themselves may execute tests. This is especially good for ensuring that your software is easy to use. Users may not be the best choice for running a sophisticated conversion job, however.

Next, you should decide what tools you'll use in your testing. A good set of tools might consist of a test plan outline document, problem tracking log, file compare utilities and test file naming and tracking conventions. A written test plan ensures that no cases are forgotten, and since it's documented, it can be repeated when a module is changed. The problem tracking log ensures that all bugs are noted and fixed before the system is released. The file compare utility allows easy checking of database and flat file contents against known good results.

Finally, by organizing your test data files, source code and object code files by group and filename, you'll easily be

FIGURE

TEST PLAN FOR ORDER NUMBER TABLE CONVERSION JOB
Module tested: Conversion job
Release affected: G.00.00
November 27, 1987

A. OBJECTIVE

The purpose of this test is to ensure that order numbers in the OMSTBL database are properly converted to the new order number format. The three fields affected are LAST-USED-NUM, BEGINNING-NUM and END-ORD-NUM in the ORDER-NUM-TABLE dataset. The current order numbers are stored with a leading zero. The zero should be at the end of the order number.

B. EXECUTION STEPS

1. Record what is currently in the ORDER-NUM-TABLE.

PROCEDURE:

Use QUERY to go into the OMSTBL database. ORDER-NUM-TABLE = dataset. Do a FIND ALL ENTITY-CD-SF. Report all entries found to a line printer.

EXPECTED RESULTS:

Listing is produced of current entries in ORDER-NUM-TABLE.

ACTUAL RESULTS:

2. Convert ORDER-NUM-TABLE entries.

PROCEDURE:

Stream CABCONVJ and check the $STDLIST to ensure that all steps completed successfully.

EXPECTED RESULTS:

Job completes successfully.

ACTUAL RESULTS:

3. Verify that the new ORDER-NUM-TABLE entries are correct.

PROCEDURE:

Use QUERY to go into the OMSTBL database, ORDER-NUM-TABLE dataset. Do a FIND ALL ENTITY-CD-SF and report all entries to a line printer.

EXPECTED RESULTS:

Listing of current entries is produced.

ACTUAL RESULTS:

PROCEDURE:

Compare this listing to the one created in step 1.

EXPECTED RESULTS:

All Fields should be exactly the same except LAST-USED-NUM, BEGINNING-NUM and END-ORD-NUM. In the first listing, these three fields should have a zero in the first position, then five numbers after it. In the second listing, those same five numbers should be the first five characters, followed by a zero in the sixth position.

ACTUAL RESULTS:

able to ensure that you're testing and ultimately installing good code.

The question of which conditions and cases should be covered is perhaps the most important question for unit testing. You may decide, for a critical system, that all of your code should be tested and that you'll track path execution coverage using a Path Flow Analysis (PFA) tool. For other systems, you may decide that production data cases plus a few boundary conditions constructed by your programmers will be adequate to catch a majority of defects.

File naming and release procedures are especially critical during system test.

Cases and conditions should be chosen according to the specifications for your modules. Be sure to include no input, too much input, and erroneous input in your test plans. Obviously, the more tests you run, the more resources you'll need to invest. This is a decision you'll have to reach with your project management. Remember, however, that it's much better for YOU to catch and fix a problem than for your user to find it, so the more testing the better.

The answers to the questions above will allow you to design an effective unit test process. Now it's time to think about system testing. In addition to the three questions we answered for unit testing, we need to pay particular attention to the system test setup.

Your system test process should include an installation step where all necessary files are placed into the test environment. Ideally, this step should include the same procedures as you'll use when you move your new software onto your users' machine during the Alpha test.

Remember that you should include all interfaces and external databases that you'll need for the test. Your goal should be to get as close as possible to your users' environment. The more data files and interface modules you can steal production copies of, the better off you'll be when it comes time to Alpha test.

NOW YOU KNOW HOW to go about testing in your particular environment, and it's time to write a unit test plan. This should include:

- *A test objective.*
- *Step-by-step procedures for running the test.*
- *Expected results for each step.*
- *Area to record actual results for each step.*

A sample test plan with each of these is shown in *Figure 1*.

The person executing this test should record the results of each step in the "ACTUAL RESULTS" section. If the actual results differ from those expected, a problem log should be completed. A sample is included in *Figure 2*. Problems identified on this log sheet should be corrected and the test plan then should be re-executed. This process is repeated until all expected results are obtained.

The process of writing and executing unit tests should be completed for each module in a new system, or for each change in an update to an existing system. Once unit testing is completed, it's time to conduct a system test. The system test plan should include the following:

- *A description of all modules in the system in the case of a new system, or a description of each change in the case of an update.*
- *Steps to follow in assembling the test environment.*
- *Objective for each step.*
- *Steps to follow in the complete test.*
- *Expected results for each step.*
- *Area to record actual results of each step.*

Excerpts from a system test plan are shown in *Figure 3*. During the system test, you may repeat some or all of the unit test plans developed earlier. At this point, especially if they were run by the original programmer at unit test time, you may wish to have a second test person execute the unit tests.

In addition to the unit tests, be sure to push data through your entire data flow, from data entry to reporting and through each of your interfaces. Test all major functions within your system. For system updates, you'll want to ensure that your new enhancements and defect corrections didn't create new bugs!

For some testing, you may need to include personnel from other project teams. This will be especially important for interface testing. Be sure these programmers know that they'll be involved and how much time they'll need to allot for this effort. Explain what data you'll provide to them and what kind of data or reports you need back from them. Will they run this data through their own test system? Will they desk-check the file? How soon will you need the results? Be sure they know what's expected and when.

As you execute the system test, follow the error-logging described above to track defects and their correction if actual results don't match those expected. File naming and release procedures are especially critical during system test. You'll want to be sure that the corrected modules moved into the system test environment are also the ones you take with you to the user machine!

Once your system test is completed, or as it's in progress, you may want to sit down with your users and discuss how to conduct the Alpha test. For a new system, users may want to conduct a parallel. For a system with a lot of data entry, this can be a big time commitment. Decide how data will be entered into both the live and the test systems and how the data will be compared.

If you're going live immediately, discuss how to test each module or change, and how results will be recorded. Also, establish clear communi-

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FIGURE 2

PROBLEM LOG FOR ORDER SYSTEM RELEASE G.00.00

Date: MARCH 15, 1987 Severity (H,M,L): M

Person: LISA BURNS HARTMAN Priority (H,M,L): H

Screen or job affected: FIND CUSTOMER SCREEN

What happened:
CUSTOMER LOOKUP SEARCH ROUTINES DO NOT WORK. A KSAM ERROR "BLANK ARGUMENT" IS PRODUCED. PROBLEM IS RELATED TO USING CUSTOMER INTERFACE VERSION B.03. WORKS CORRECTLY WITH VERSIONS B.04, B.05. WITH B.03, NO KEY IS BEING MOVED TO THE KSAM BUFFER.

What should have happened:
SEARCH SHOULD WORK FOR ALL VERSIONS OF CUSTOMER INTERFACE.

Where should this error have been detected:
ERROR SHOULD HAVE BEEN CAUGHT DURING INSPECTION OF UNIT TEST PLAN.

PROBLEM RESOLUTION

Date: March 17, 1987
Person: Lisa Burns Hartman
Description of Resolution:
PATCH INSTALLED ON 3/17. MODIFICATIONS TO OMS2470. FUTURE TESTS SHOULD INCLUDE ALL VERSIONS OF CUSTOMER INTERFACE FILE.

cation paths with your users in case a problem is discovered. Who on the development team should be contacted? How quickly can a fix be expected? How long will the test last? How will user sign-off be obtained? These questions should be answered up front, so no surprises are encountered come Alpha.

In our shop, we've found the steps listed above to work very well in producing excellent Alpha test results and very happy users.

For an update to a new system, testing takes between 20 percent and 30 percent of our construction time and is done as coding for a particular change or enhancement is completed. This means that unit tests are being written, inspected and executed throughout our typical six-month development cycle for a system update.

The last two months of development for an update are spent in testing. First, unit tests are completed, then the last four to six weeks are spent in system testing. No code changes, except those required to correct defects found in system testing, are made in those last four to six weeks.

Finally, we take our code to the user site, and it's installed and run there for about one month before being signed off.

For a new system, unit tests are done as modules are completed, with some integration testing done as modules are linked together. Because of this extra level of testing, percent of time spent in testing may be slightly higher for a brand new system, between 25 percent and 35 percent of the total development time. Then, just as for an update, a system test is run for four to eight weeks.

Finally, user testing is completed at an Alpha site, with a new system typically running parallel to production for a few weeks before going live at the Alpha site.

AFTER THE ALPHA TEST is completed, our project team meets to discuss what could've been done better in our development and testing process. The recommendations from this meeting will be used as we begin our next project. Through these debriefing sessions, we've found the following points to be especially important when planning and executing tests:

■ *Ensure that your test environment matches the one you'll find at your user site.*

Problems frequently are caused by

FIGURE 3

SYSTEM TEST PLAN — ORDER SYSTEM UPDATE G.00.00

A. Changes to be tested:

SR#	Description
12345	Renumber order numbers in ORDER-NUM-TABLE.
50789	Add new edit to check order type.
67542	Show product shipments in transit on status display.

B. Assembling test environment:

1. Set up MKTING account on test machine.
2. Set up ORDERD, ORDERP, ORDERJ groups in MKTING account. Follow security specified in standards manual.
3. Ensure availability of the following interface software:

CUSTOMERS	Version B.03. Load offices 2417, 2403.
PRODUCT	Version A.04. Load Product lines 99, D3, 58.
CENTRAL	Load test environment matching 3/15 production version.
MPE	Version G.A2.B0 (U—B MIT)

4. Load previous version of order system (F.03.00).

5. Following installation procedures, load new version of order system (G.00.00).

C. Testing steps.

1. Test new order edit.

PROCEDURE:
Follow unit test plan 50789.

EXPECTED RESULTS:
See unit test plan.

ACTUAL RESULTS:

2. Ensure current reports still run.

PROCEDURE:
Run JOB5, JOB6, JOB7.

EXPECTED RESULTS:
Reports are produced.

ACTUAL RESULTS:

PROCEDURE:
Use QUERY to dump STATUS dataset contents. FIND ALL STATUS NE SPACES; REPORT ALL. Compare to reports produced by JOB5, JOB6, JOB7.

EXPECTED RESULTS:
Reports match database contents.

ACTUAL RESULTS:

testing with incorrect versions of interface files, interfacing software or utility programs during unit and system testing. These problems can be very frustrating to debug. Be sure that your test files are correct. If you can, make copies of the files you need from your users' machine. Allow enough time in your testing schedule to set up an accurate environment on your test machine or in your test account.

■ *Ensure that boundary conditions are covered.*

What will your program do if it encounters no input at all? If it encounters too many records? If it can't obtain access to an interface file? These are cases to watch out for and to be sure to include in your unit and system test plans.

■ *Be sure that test cases match reality.*

In addition to watching for boundary conditions, be sure your test cases are an accurate reflection of how your program will be used in production. Test using data taken from your user site if possible. For an online system, you may wish to have users try out your programs using data they bring from their daily work.

■ *Allow enough time.*

Be sure the programmers on your project have enough time built into the schedule to perform adequate unit and system testing. Also, if you require assistance from programmers from other projects or departments, be sure they understand your testing schedule and can support it.

The time we invest in testing, although significant, pays off. We've found that by carefully writing and executing test plans, we've greatly reduced the number of problems encountered at the user site. For our project, we typically find under five defects during user testing. None of these are typically serious defects and can be corrected quickly.

I hope that the information in this article allows you to implement improved testing procedures in your own shop. I've worked on projects where little or no testing was done, and the results usually matched the situation I described at the start of this article! I've also been fortunate enough to work on projects where the programmers took a disciplined, structured approach to unit and system testing, similar to the one described above. The testing effort pays off 10-fold in bug-free code, smooth installations, and very happy users. I plan to keep testing! *—Lisa Burns Hartman manages an internal business software programming team at Hewlett-Packard corporate headquarters, Palo Alto, CA.*

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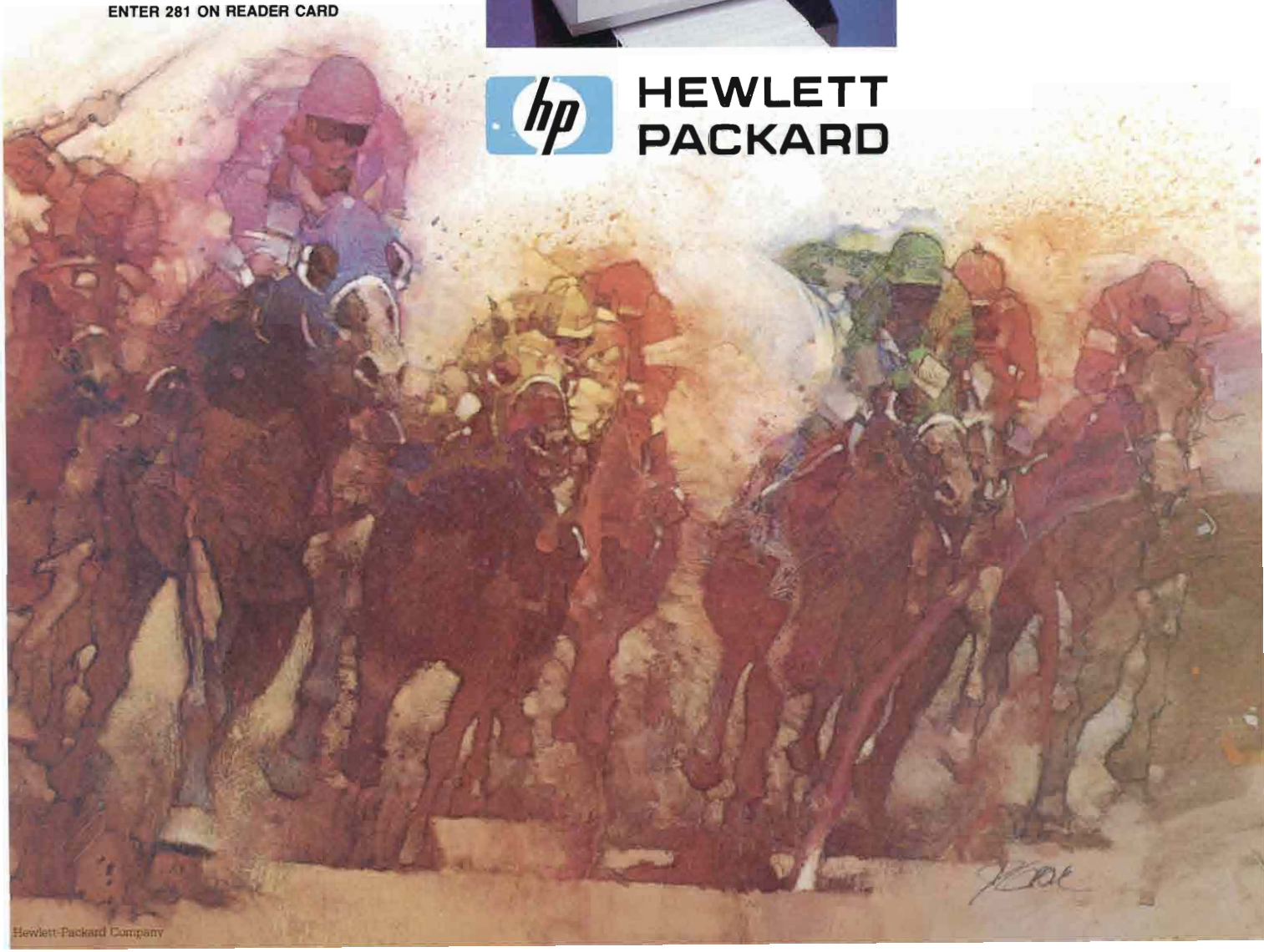

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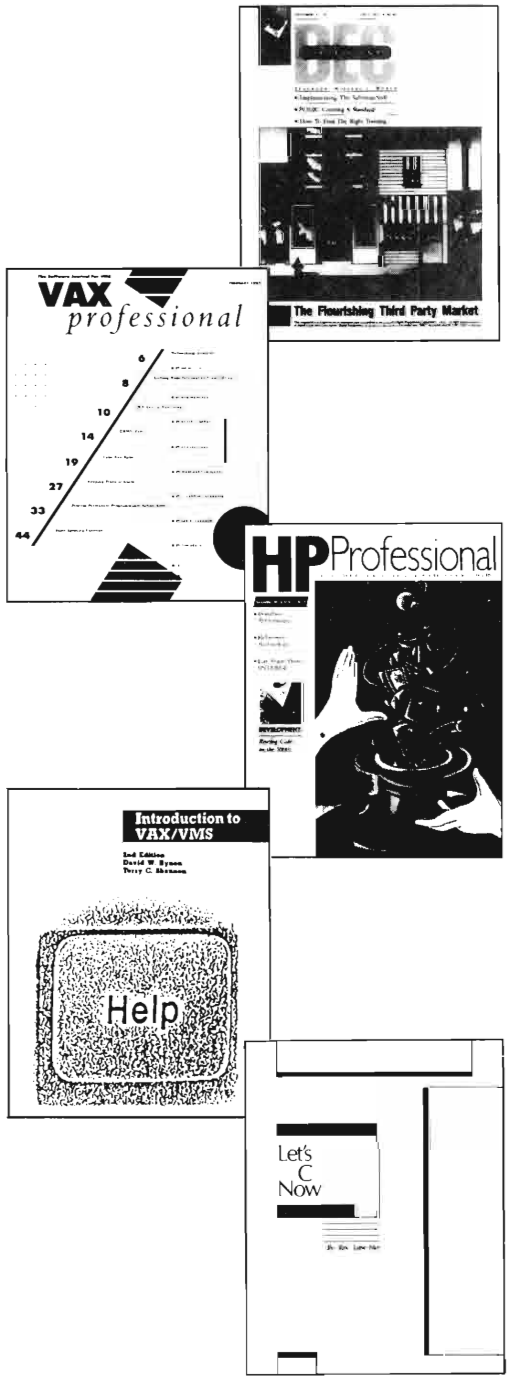

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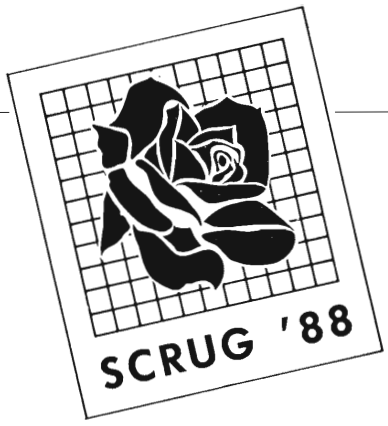

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What would you think such an extensive and comprehensive conference would be worth? Well, look at some of the mail you get for other conferences. Education such as this typically costs $150 - $200 per day! Now, here's the good part: SCRUG charges only $175 for the entire 3-day conference! There is no extra charge to attend the 4GL Show & Tell or roundtables; (there is an extra charge to attend the pre-conference tutorial).

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To get more information and a registration package, call Karen Zimmerman at (213) 453-5664 or write SCRUG, P.O. Box 84219, Los Angeles, CA 90073.

OPINION

Greg Goebel

Reality Dictates That HP Move Away From The BASIC-Only Computer

Looking Back, Looking Forward

On November 1, 1987, the last Series 80 products — the HP 85B and the HP 86B — were removed from HP's price lists. Our organization had built up a large inventory of these products on the last run of the production line before it was closed and dismantled, but that inventory was bought out with surprising speed. Except for the old junkers sitting around the plant, Series 80 was no more.

As an HP online support person whose duties partly include supporting Series 80, I felt a small sense of relief. Series 80 had lived several years longer than anyone expected it would, and support was becoming more and more difficult. Third parties that supported Series 80 either had gone out of business or had forgotten about the product. HP lab people who were familiar with Series 80 either had left town or had, like the third parties, forgotten about it. We support folks increasingly were being left to our own resources.

Furthermore, it was astonishing that machines with a 625-KHz, 8-bit CPU that (effectively) only ran BASIC and, in the case of the HP 85B, had all of 64K RAM (of which only 32K could be used to run programs) could be sold at all. I recall trying to deal with one irritable customer who demanded of me: "Why does a machine like this cost so much?" (I don't recall what I replied; all I recall clearly is the sense of dread that comes from being confronted with such open-ended questions.)

Nonetheless, I deal with Series 80 with respect. The machines were well-engineered; I sat down to tinker with an HP 85 a few weeks ago and was pleased with its ease of use. The machines were popular, profitable and useful; they were put to an amazing set of applications.

It is, as a result, not surprising that there was a loud clamor at the obsolescence of Series 80 by its dedicated users. Since I'm familiar with many of these users, I sympathize with them, but to a limit.

Series 80 was an idea whose time had come and, like its contemporaries, CP/M and the Apple II, gone. The era of BASIC-only computers is over and I doubt that it ever will come back. (There are minor flaws in this theory. The Apple II lingers on in its latest incarnations, and pocket computers using BASIC appear to be reasonably popular. But as generalizations go, it seems to me to be a good one.)

I can't swear to the course of a vehicle I'm not driving, but I see no prospect in my own surroundings for building another generation of BASIC-only machines. HP's current work is to port Rocky Mountain BASIC to the Vectra PC (and to UNIX, though I have little involvement in that and can't discuss it).

There are a number of good reasons why this is so.

First, there are major barriers to selling a PC that's not fully compatible with DOS. In many major corporations, the users are required to buy fully compatible DOS machines.

Second, using an existing PC as the basis for a BASIC workstation greatly simplifies design and manufacture. People who aren't familiar with the industrial production of complicated products often are astounded to learn the amount of time, effort and money it takes to get those products out the door.

Producing a computer involves several iterations of design and prototyping. At each stage of this process, parts need to be specified and designed, purchased and fabricated, put together and tested. By the time the product reaches "week zero" (introduction to manufacturing), a huge number of tediously detailed specifications have been generated and volumes of expensive parts have been purchased. Time-consuming and expensive testing and qualification must be performed. The fact that in the real world the process is never completely smooth only makes the problem greater.

As a result, using existing parts and designs greatly reduces the production risks. And, as a corollary, it's very difficult to justify such a commitment for a specialized product that appeals only to a relatively narrow market.

Third, using an existing PC as the basis for a BASIC workstation lowers the cost of production and marketing. The cost of parts, not surprisingly, decreases with volume (as long as the supply is plentiful); increasing the sales of a product by offering a common family of products to as wide a range of customers as possible provides much greater efficiencies of scale than would the sale of several largely different products.

Furthermore, the cost of PC parts generally declines over time, due to increasing volume of overall PC sales, persistence of competition among PC parts suppliers, and continuous technology improvements. This means the PC itself becomes cheaper over time. A more specialized product that relies on unique low-volume parts will, over the long run, find its costs escalating as its parts supplies dry up, which is one of the

main reasons HP obsoleted Series 80.

The availability of parts for PCs also means that the manufacturer isn't dependent on a single supplier (a situation that places the manufacturer at the mercy of the supplier).

The overhead of marketing is similarly reduced, since marketing can focus on a single product or group of products, providing coherent advertising and other promotional efforts.

Fourth, using a PC makes support much easier. The need to completely train support personnel on a new product is reduced as they may have or are obtaining training. Knowledge of how to use PCs (in greatest detail) is commonly available; the Waldenbooks store near my residence has two full racks of computer books, mostly focused on PCs. That would be impossible for a specialized product.

The fact that the product is sold in reasonable volume makes a commitment to support much easier. When HP introduces a product, it is, in a sense, "stuck with it." It has to provide a certain level of support to maintain its credibility with the customers. I've seen HP pump resources to support unpopular products that everyone knew would never provide a good return on the investment. In other words, not only is there a risk associated with production and manufacture, but also with support. Using a PC helps minimize that risk.

Fifth, and most important, there's plenty of good software at low prices available for PCs. In the days of Series 80, HP couldn't possibly provide adequate software for a non-standard product. Even if it could, it couldn't sell it at competitive prices.

THESE ARE GOOD ARGUMENTS from HP's point of view, but a little thought shows that many are good arguments from a user's point of view, too. A user with a PC has a product that's better supported and probably better built than a more specialized product, with an unrestrained variety of high-quality software accessories at the lowest possible prices.

HP's current efforts to port Rocky Mountain BASIC to the Vectra PC has drawn fire from some quarters, but consider the PC-305 Vectra CS/Rocky Mountain BASIC workstation in detail.

The PC-305 incorporates a low-cost PC CPU board, as well as a BASIC processor board. However, the apparent redundancy of this approach isn't as great as it sounds. The BASIC processor board uses the resources of the PC CPU board — its serial port, parallel printer port, real-time clock, disc controller — as its own. The only redundancy is that both boards have their own CPU and RAM.

The additional cost of DOS over BASIC is small and, given what DOS offers, not necessarily a liability. The cost of the base model of a PC-305 (monochrome display with no hard disc) is similar to that of a comparably equipped HP 86. Once accessories are added, the cost comparison shifts decisively in favor of the PC-305.

Even if a user regards DOS as a liability, that user doesn't need to worry about it much, as the team that designed the PC-305 went to great lengths to allow the PC-305 to boot straight into BASIC, so a user never has to worry about DOS.

Finally, the effort to port RM BASIC to the Vectra is still in its early stages. Assuming the current level of effort is sustained (which is a good assumption, though second-guessing the management can be risky), the RMB/Vectra system will continue through greater refinements and, presumably, cost improvements.

Series 80, for better and, yes, for worse, is the past. As far as I can see, realities dictate that HP move away from the BASIC-only computer to a richer, if admittedly more complicated, environment. But is that so bad? A good close look may reveal the advantages of the new ways. — *Greg Goebel is a support engineer for HP's Corvallis Workstation Operation, Corvallis, OR.*

Continued from page 16.

allocated and there's a six-extent "hole" in the middle.

Needless to say, this condition doesn't happen very often. One place where it occurs "naturally" (rather than by an explicit effort on the part of too-tricky programmers) is in USL files. If you :LISTF a few of your USL files, you may see some in which the EOF is greater than the number of sectors. All USL files have record size 128 words, so it would appear that a file with EOF 100 would take up at least 101 sectors; however, since USL files often have "holes" in them, the sector count actually may be less than the EOF.

Finally, the Q&A quite correctly points out that "all extents will be of equal size except the last one, which may be shorter than the rest." I'd like to elaborate a bit on the ramifications of this fundamental MPE file system rule.

Try entering the command:

```
:BUILD X;DISC=321,32
```

You've explicitly asked for a file with room for 321 records organized into up to 32 extents. Instead, when you :LISTF it, you see that the file was built with 30 extents.

Is MPE just being cranky? Does it take pleasure in this insubordination? Actually, there's a good reason for this. Remember, all extents must be of equal size except the last one, which may be shorter. You've asked for a file of up to 321 records, each one sector long (the system default). This means a total of up to 322 sectors (321 data sectors plus one file label sector).

How many sectors can fit into each extent? Well, take 322, divide by 32, and ROUND UP (as the Q&A says). This means each extent is to be 11 sectors long. However, 32 extents of 11 sectors each will yield not 322 sectors, but 352 sectors; even if the last extent is only one sector long, that still leaves us with 31*11+1 = 342 sectors.

To have a 322-sector file with 11-sector extents, we must have 29 (322 divided by 11) extents of 11 sectors each and one extent of three sectors. Therefore, the file can have at most 30 extents. It is impossible for the file system to build a file with room for 321 records *and* have each extent be the same size except for the last (which may be shorter) *and* have a maximum of 32 extents.

I hope that these points may clarify things a bit for you. In any case, I'm very happy to see *HP PROFESSIONAL* tackling complicated technical questions like this, and look forward to more interesting articles in the future.

Eugene Volokh
VESOFT, Inc.
Los Angeles, CA ■

Continued from page 25.

sometime this month. The PC version currently is available.

The project is designed to plan, analyze and report on small or large complex projects. The Critical Path Method is used to analyze projects. PROJECT MANAGER includes online processing, Gannt and PERT charts, I-J or precedence notation, time scale network diagrams and resource leveling to help plan and analyze projects.

Reporting options include graphics output for laser or dot matrix printers and plotters. PROJECT MANAGER also includes 14 standard management reports, or users can develop their own reports with an integrated report writer.

Other features include: Multi-Project option (99 projects with up to 297,000 activities), Micro to HP 3000 data exchange, forecasting for resource, cost and risk analysis, work breakdown structure and a cost module.

Contact Michael P. Sweeney, TEI Inc., E. 3151 29th Ave., Spokane, WA 99223; (509) 534-7225.

Enter 903 on reader card

Kentek Introduces K-4 Duplex Printer

Kentek Information Systems Inc. has introduced the K-4, a 24-page-per-minute duplex printer. The K-4 prints by host command on both sides of sheets up to 8½ inches by 14 inches and delivers 1 MB RAM, 300-dpi resolution output in page sequence.

The controller, based on a Motorola 68000 microprocessor, simultaneously manages four full bit-mapped pages while maintaining the full rated speed of the printer even for complex jobs.

Paper handling for the K-4 (under $19,000) is via two standard input cassettes — a 550-sheet primary cassette and 250-sheet secondary cassette, each handling 16- to 24-lb. stock and specialty papers, including labels and transparencies. A 1,200-sheet primary cassette, 550-sheet secondary cassette and 15-bin sorter with stacker also are available.

On the output side, a 550-sheet tray is standard, and a 1,500-sheet output stacker is optional. Both output trays can be jogged to separate jobs.

The printer provides full-page resolution graphics, image rotation and text and graphics merge, in portrait or landscape and reverse-portrait or landscape format. Standard interfaces for the K-4 are serial RS-232 and RS- 422, and parallel Centronics. Data-products parallel and video interfaces may be added.

Contact Kentek Information Systems, Six Pearl Ct., Allendale, NJ 07401; (201) 825-8500.

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PC Publisher Kit Supports HPGL

IMAGEN Corporation recently announced support by its PC Publisher Kit Line for Hewlett-Packard Graphics Language (HPGL), a language commonly used for plotting applications.

The PC Publisher Kits, comprised of a raster-image processor on a card that resides in an IBM PC or compatible, are high-performance enhancements for laser printers. Complete desktop publishing capabilities including full-page graphics and powerful font capabilities can be provided for their users.

The PC Publisher Kit now supports four major printer control languages including HP's PCL and HPGL, IMAGEN's DDL and Adobe Systems' PostScript. The kit also supports numerous printer emulations such as Diablo, Epson and NEC to provide compatibility with applications supporting those printers.

In addition, support for the Microsoft Windows environment is provided under the high-performance DDL language. This provides compatibility with major application programs, such as Aldus Corporation's PageMaker. Direct DDL support is also provided by Xerox Corporation's Ventura Publisher.

The PC Publisher Kit is targeted to users within the installed base of LaserJet and other Canon-based laser printers who require complete control over page content; faster document printing; full-page graphics; scaleable, rotateable fonts and other more powerful font capabilities than possible with the basic printer. The HPGL compatibility option ($149) will allow the Kit to be used in scientific and engineering applications such as AutoCAD, which previously required a plotter for output.

Contact IMAGEN Corp., 2650 San Tomas Expwy., P.O. Box 58101, Santa Clara, CA 95052-8101; (408) 986-9400.

Enter 909 on reader card

MPROLOG Available For MPE XL, 800 Series

Brant Computer Services Limited has released MPROLOG on the HP 3000 MPE XL Series and the HP 9000 Series 800. In conjunction with MPROLOG, Brant is also releasing TWAICE, an Expert System Shell developed in MPROLOG.

MPROLOG is an advanced, modular implementation of the PROLOG programming language, which is especially suited to the development of artificial intelligence applications, including expert or knowledge-based systems.

MPROLOG features a complete program development environment and allows programmers to build and test independent modules that later can be combined into more complex systems. Source compatibility across all versions means that a project begun on the PC can be transported easily to a more powerful architecture as it evolves.

TWAICE is a full-function Expert System Shell for creating sophisticated rule-based systems that model human expertise. It escapes many of the restrictions and limitations normally found in shells with the ability to access MPROLOG and external pro-

K-4 prints on both sides of the paper at 24 sides per minute.

cedures directly. TWAICE features the same portability as MPROLOG, allowing applications to be developed on one machine and delivered on another.

MPROLOG was developed and is maintained by Logicware Inc. of Toronto, Ontario.

Contact Karen Hopmans, Brant Computer Services Ltd., 2605 Skymark Ave., Mississauga, Ontario, Canada L4W 4L5; (416) 238-9790.

Enter 904 on reader card

Arkwright Improves Overhead Transparencies

Arkwright, Inc., now has available its improved DATA/VIEW Pen Plotter Transparency Film that has eliminated the grey background, providing increased color intensity and high-image resolution and definition.

The new Pen Plotter film is optically clear, .004 (4-mil) polyester that provides rapid drying and high resistance to smears and fingerprints. Eliminating the need for duplicate sets of pens, the new Pen Plotter film is compatible with both water-based and solvent inks. The superior ink-receptive surface of the new overhead transparency film provides fine image definition, well-defined color separation and low pen wear.

Arkwright's Pen Plotter Transparency film ($41.75—$61.75) is available in standard 8½-inch by 11-inch and A4 sheet sizes.

Contact Arkwright, Inc., Marketing Dept., Main St., Fiskeville, RI 02823; (800) 942-5900. In Canada, contact Arkcan Graphics, 1690 Dellbrook Ave., Pickering, Ontario, Canada, L1X 2B1; (416) 427-9212. In Europe, contact Arkwright Inc., P.O. Box 220, 5900 AE Venlo, Holland; Telephone 077825315.

Enter 914 on reader card

Bradford Business Systems Enhances WP Packages

Bradford Business Systems Inc. recently announced enhancements to the SPEEDEDIT full-screen editor and SPEEDDOC word processing packages.

The enhanced release of SPEEDEDIT now supports UDC commands. UDCs are handled differently than they are under MPE, but its files are compatible with MPE UDCs and can take advantage of existing UDCs. SPEEDEDIT UDCs can contain MPE as well as SPEEDEDIT commands and have various predefined variables available to pick up various filenames and other settings.

SPEEDEDIT now supports the new HP 700 Series terminals. This support includes the 132-column mode of operation and proper terminal identification.

Another feature of this release is the access to the new BBS-LIBRARIAN product, which allows users to easily check files in and out of a central library as a standalone operation or as an automatic extension of SPEEDEDIT.

Since SPEEDEDIT is an integral part of the SPEEDDOC word processing system, these enhancements also apply to SPEEDDOC.

SPEEDEDIT and SPEEDDOC run on all models of the HP 3000, including the Spectrum series.

Contact Bradford Business Systems, Inc., 25301 Cabot Rd., Suite 201, Laguna Hills, CA 92653; (714) 859-4428.

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DATA/VIEW Pen Plotter Transparency Film has increased color intensity.

Software BackPlane Supports TPS

Atherton Technology recently announced that its integration portability platform, the Software BackPlane, now supports Interleaf's Technical Publishing Software (TPS).

TPS now can be used in an integrated software development environment enabling users to create software documentation and automatically establish traceability with other software life-cycle components.

The Software BackPlane is an Integrated Project Support Environment (IPSE) that increases software development productivity by linking the various software tools used in large-scale development projects. It provides management control services to monitor, track and coordinate activities across the entire system development life-cycle and also provides portability services to fully integrate tools across multiple CPUs.

When Interleaf TPS is run in conjunction with the Software BackPlane, many tasks are automated and users can access and share data with other software development phases, such as analysis and design code development, compilation and test, via the Software BackPlane's object-oriented database.

The Software BackPlane provides TPS users with three important integration features. First, it provides a consistent user environment regardless of the applications being used. Second, the Software BackPlane has a "versioning" feature specifically designed for environments where many people are working in parallel on a single project.

Finally, the Software BackPlane provides link facilities. For example, it can formalize the relationship between a requirement in a document and its associated design. Then, if a requirement changes, the Software BackPlane automatically notifies those involved in design and testing to assure compliance throughout the project development environment.

Contact Atherton Technology, 1333 Bordeaux Dr., Sunnyvale, CA 94089; (408) 734-9822.

Enter 916 on reader card

PSP/Plus Supports LaserJet Printers

OPT Inc. has released a new version of PSP/Plus, a software package that provides system-level laser printer support for the HP LaserJet family of printers, including the HP LaserJet 2000.

Release A.01.00 of PSP/Plus now provides full environment file support for LaserJet printers. Users can print electronic forms and downloadable fonts with the convenience of a file equation without changing their application software. HP 2680 and HP 2688 users can use the same environment files for LaserJets as for their larger printers.

The new release also provides the ability to create simplified environment files (terminal-type) for LaserJet control, and a reduction-printing facility that puts two, four, or eight line-printer pages on a single letter-sized sheet of paper. Legal and ledger-size paper is supported on the LaserJet 2000 in both single-sided and duplex printing applications.

In addition, PSP/Plus supports downloadable fonts, electronic forms and graphics on LaserJet family printers, as well as all standard HP Laser printer control intrinsics. Contact Vicki Toback, OPT Inc., 299 W. Foothill Blvd., Suite 230, Upland, CA 91786; (714) 985-1581; (800) 858-4507.

Enter 908 on reader card

Entek Announces Software For HP Systems

Entek Scientific Corporation recently announced several new software products that operate on HP's Series 200/300 computers, the Vectra PC, MS-DOS, PCs and compatibles.

The Entek software line includes EPRAN, EMODAL, ESMOD, EFORCE, ESIM, EMONITOR, EXAMINE, EMAP and ETREND. It supports HP 3561A, 3562A, 3565A (Paragon), 3582A, 5420A and 5423A Spectrum Analyzers.

EPRAN provides data acquisition for Spectrum Analyzers, data block-oriented signal processing and data processing. It operates in Entek EASY under HP BASIC. User programming facilities on several levels are included for customizing the program including macros, softkey redefinition, command mode and user programs written in BASIC, PASCAL or assembler.

EMODAL characterizes the dynamic behavior of complex mechanical structures in terms of natural frequencies, damping and mode shapes.

ESMOD analytically computes the effect that various structural changes would have on the dynamic behavior of a structure.

EFORCE computes the complex dynamic response of a test structure to a set of arbitrary forcing functions. The forced response of the structure tells the engineer how a structure will react in various operational environments.

ESIM maps the sound field radiation pattern of a noise source as a function of frequency and computes the total sound power emitted by the source.

EMONITOR involves periodic monitoring of critical machine parameters to detect and correct pending machine problems. It increases warning time before mechanical failures.

EXAMINE is a first-line troubleshooting tool that quickly diagnoses large quantities of spectral data to isolate defective components in complex machinery.

EMAP is a signal analysis product aimed primarily at rotating equipment analysis including order tracking and spectrum mapping. It's capable of transferring about 12 spectra per second from the Paragon to the computer, which provides for analysis of machine problems during rapid changes in operating condition.

ETREND complements the EPRAN multichannel data acquisition and block operation routines with an extensive set of graphics routines that provide for spectrum or time history waterfall mapping, sorting, order tracking, trending and managing large sets of data blocks.

Contact Entek Scientific Corp., 4480 Lake Forest Dr., Suite 316, Cincinnati, OH 45242; (513) 563-7500.

Enter 910 on reader card

CAM Upgrades ViewPoint

Computer Aided Management Inc. (CAM) has begun shipping an upgrade to ViewPoint, its PC project management program. The upgrade performs five to 10 times faster, supports EGAs in 43-line mode and is configureable for international use.

CAM ported the new release, ViewPoint 3.0, to Microsoft's C compiler series. Version 3.0 uses better data buffering and intelligent recalculation to perform typical calculations five to 10 times faster. Almost every operation is twice as fast and many have gone from taking several minutes to several seconds. Intelligent recalculation was achieved by designing improvements to the scheduling algorithm, the basic calculation operation in the system.

The 43-line mode approximately

doubles the amount of information displayed at once with an EGA. A full year's calendar can be displayed at once, as can twice as many bars in the Gantt or network chart. Basic internationalization includes configureable number formats, date formats, currency symbols and formats, ability to input and output foreign character sets, and support of European paper sizes.

Other enhancements include increased memory efficiency, easier RAM-disc use, and the ability to easily find networks in the ViewPoint network tree. With this release, CAM will support all DOS local area networks.

The new release will support PostScript devices, HPGL plotters, remote plotter support on networks, and a variety of new printers and plotters. Additionally, ViewPoint Graphics 3.0 has several improvements to the plots and user interface.

Contact Computer Aided Management, 24 Professional Center Pkwy., San Rafael, CA 94903-2703; (415) 472-5120.

Enter 918 on reader card

CUSTOMIZATION EXPRESS Increases Productivity

Eagle Consulting & Development Corporation recently announced CUSTOMIZATION EXPRESS, a product designed to increase the productivity of users of HP Application Dictionary/Monitor-based manufacturing products, particularly MM/3000 and PM/3000.

CUSTOMIZATION EXPRESS contains some 30 modules in one integrated and menu-driven online development, upgrade and maintenance utility. It extracts, compares and reports critical application definition information.

This package reduces the time needed to perform customization tasks, increases the accuracy of customization, educates application support personnel, documents application customization and helps resolve application-related problems.

CUSTOMIZATION EXPRESS performs such functions as comparing VPLUS formsfiles to Application Dictionary formats, and reporting transaction, screen and terminal activity information from application log files.

It has been developed to solve inherent difficulties in the support, maintenance and customization of HP Application Dictionary-based products.

Contact Eagle Consulting & Development Corp., 170 Kinnelon Rd., Suite 3, Kinnelon, NJ 07405; (201) 838-5006.

Enter 912 on reader card

AST TurboLaser/PS Emulates LaserJet+

AST Camintonn Digital Division recently announced the AST Turbolaser/PS, an eight-page-per-minute laser printer with a resident PostScript controller and an optional board for HP's LaserJet Plus, LN03 and Diablo 630 ECS emulation. It is designed to produce both high-quality text and graphics.

AST TurboLaser/PS ($4,595) is equipped with the most up-to-date revision of Adobe's PostScript page description language for faster, more flexible printing and more fonts that include 35 typefaces from the Mergenthaler, International Typeface Corporation and Letraset libraries.

With PostScript, these fonts can be scaled to any size, rotated to any angle and shaded with various patterns for special artistic effects. AST TurboLaser/PS combines the advantages of PostScript with the Ricoh 4081 engine, which uses white-write technology to optimize the range of grey scale shades, to make black appear blacker and white appear whiter.

AST TurboLaser/PS provides LN03 emulation with RS-232C connectivity and a choice between a DataProducts or Centronics parallel interface for compatibility with this environment. This board will be available both as a field upgrade for the AST TurboLaser/PS and as an add-in option installed in the printer. With this upgrade, the printer provides HP LaserJet Plus, PostScript, DEC and Diablo ECS 630 compatibility. The operator can easily select the emulation with either software commands or with an external switch. In addition, the AST TurboLaser/PS has an RS-422/AppleTalk port, which also makes it compatible with the Apple, IBM and DEC environments.

The AST TurboLaser/PS 12.5 MHz controller board incorporates a 68000 microprocessor, 3 MB RAM and 1 MB ROM. Full-page graphics are printed at 300-dpi resolution.

Contact AST Camintonn Digital Div., 2121 Alton Ave., Irvine, CA 92714-4992; (714) 553-0247.

Enter 911 on reader card

Numonics Unveils Model 7191 Plotter

Numonics Corporation, a computer graphics peripheral company, recently introduced the new leader of its plotter line, the Model 7191 eight-pen plotter. It's faster and offers more storage capacity than any previous Numonics plotter.

The Model 7191 accepts all standard media from sizes A to E and features dual processors and a 500K buffer. This represents a major increase in memory storage capacity when compared to the standard 60K buffer. It's built for speed, accuracy and high performance, and produces plots at speeds up to 25 ips.

The Model 7191 offers four different pen types — liquid ink, ball point, fiber tip and ceramic. Acceptable media types include paper, vellum, mylar and bond. Two RS-232C interfaces and one IEEE-488 interface are standard. The plotter's control language is HPGL.

Contact Numonics Corp., 101 Commerce Dr., Montgomeryville, PA 18936; (215) 362-2766.

Enter 913 on reader card

Electronic Data Director Increases Flexibility

Computer Accessories Corporation has introduced Electronic Data Director, the first four-channel electronic data switch in its Data Communications product line. The new Electronic Data Director increases the flexibility of larger microcomputer systems by allowing four computers to share one peripheral, such as a laser printer.

The Electronic Data Director is easy to install and operate with no special hardware or software to configure. It automatically scans each computer port for data to be printed and then sends the data to the printer. To the user, it appears as if each computer is directly connected to the printer. There are no switches to turn and no software codes to send.

Product features include an automatic form feed insuring that each printout starts on a clean page and not on the last page of a previous printout. It also has a selectable "timeout" button that enables users to delay the disconnecting of the printer for 15 or 60 seconds before it resumes scanning the four computer ports.

The Electronic Data Director is available in parallel and serial versions. Its serial model automatically will adjust itself to the baud rate of the computer and printer so there's no concern about serial protocol. With an Electronic Data Director, computers and peripherals in parallel can be placed up to 30 feet away from each other.

Contact Computer Accessories Corp., 6610 Nancy Ridge Dr., San Diego, CA 92121; (619) 457-5500.

Enter 915 on reader card

Matrix Plotter Provides Image Plotting

Insight Development Corporation has developed a new software utility program that can be used to rasterize complex graphics images and format them for output on ordi-

AST TurboLaser/PS is an eight-ppm laser printer with a resident PostScript controller and an optional board for LaserJet Plus emulation.

nary matrix printers. This utility allows users of scientific and engineering application software to obtain hardcopy output from low-cost matrix printers, in many cases eliminating the need for more costly pen plotters typically used in these systems.

The Matrix Plotter is designed for applications that are used on DOS-based PCs and require an HP 7470A, 7475A or ColorPro plotter for output. Versions of the utility can control a variety of matrix printers including the Toshiba 300 series, the Epson Matrix printers and compatible units. The program accepts the drawing vectors used by plotters and converts them into the high-resolution, raster-oriented, bit-mapped images required by the matrix printer. The resultant image is printed at the printer's full resolution, allowing plots containing significant detail to be printed on higher resolution 18- and 24-pin matrix printers.

The Matrix Plotter will allow CAD/CAM, business and scientific graphics programs to use the matrix printer for plotting and will reduce the cost of output in these applications. The utility is self-configuring and doesn't require an installation program or any configuration file modifications. Once loaded into the system, Matrix Plotter becomes a transparent "bridge" between the application package and the attached printer.

Contact Insight Development Corp., 1024 Country Club Dr., Suite 140, Moraga, CA 94556; (415) 376-9451.

Enter 920 on reader card

MDSS Offers Four Report Writers

MDSS, Inc., recently announced the addition of a fourth report writer/query facility. MDSS users now can choose one of four different facilities to access corporate data online and to print reports.

The latest and fourth facility supported by MDSS is Infocentre's EasyReporter.

The styles of report writer/query systems supported by MDSS are:

- *Quiz*, a text-oriented report writer. To get data out of the system, the user makes requests in English-like statements in appropriate sequence. Users usually have some experience in programming languages such as BASIC.
- *Inform*, an unsophisticated method to view data requiring less than 15 minutes of training. This method doesn't provide the functionality of a text-oriented report writer/query facility.
- *EasyReporter*, a menu-driven, non-text-oriented, report writer/query facility that gives a non-technical user the ability to select desired data files through a series of menus. It provides appropriate arithmetic functions and print-out formats and can format these into text languages to display the data on the screen.
- *Query*, the oldest of these, provided by Hewlett-Packard. Programmers are most comfortable with this report writer system.

Contact MDSS, Inc., 300 East Ohio Bldg., 1717 East 9th St., Cleveland, OH 44114; (216) 861-8100.

Enter 919 on reader card

CAMM-2 Creates Engraving Workstation

Roland DG has introduced an extension to its CAMM product line of computerized machine tools. The CAMM-2 is a compact engraving machine that can transform an ordinary CAD system into a professional-quality engraving workstation.

The CAMM-2 has a total working area of 8½ inches by 5½ inches, a maximum speed of 71 inches per minute, and a resolution of 0.0004 inches per step. The CAMM-2 has two sets of controlling commands. The first set is compatible with Roland DG's CAMM-3 milling machine. The second set of commands is compatible with HPGL plotter protocol. By manually setting the depth of cut, users can output to the CAMM-2 just like they do to their plotter.

A 20-character, two-line LCD display with interactive software allows users to quickly modify all operational settings including workpiece origin, Z-axis origin, speed and depth of cut, and communications protocols. Standard Centronics Parallel and RS-232C Serial interfaces provide links to all types of software.

Contact Roland DG, 7200 Dominion Cir., Los Angeles, CA 90040; (213) 685-5141.

Enter 917 on reader card

MD-GRAFTEXT Uses HP Laser Printers

Maersk Data A/S has released an enhanced version of MD-GRAFTEXT, the software product that allows users to print advanced text documents generated with DCF/SCRIPT and DisplayWrite/370 on non-IBM laser printers. The enhanced version includes handling of scanned images in text documents.

One of the major advantages of MD-GRAFTEXT is the utilization of low-priced, Hewlett-Packard (or compatible) laser printers instead of the more expensive IBM printers (IBM 38xx). Thus, laser printers can be fitted into the IBM network as departmental printers.

MD-GRAFTEXT allows users of IBM mainframe word processing to create and print documents with a variety of fonts, thus gaining a document appearance compared to an ordinary, typed document. Any graphics produced with one of the GDDM-based graphics software packages for IBM mainframes also can be included in the text. Images scanned into the computer with an IBM 3117/18 scanner can be printed as part of a text document.

Contact Maersk Data Inc., Giralda Farms, P.O. Box 883, Madison, NJ 07940; (201) 514-5000; or Maersk Data A/S, Titangade 11, DK-2200 Copenhagen N Denmark; Phone +45 1 83 82 11.

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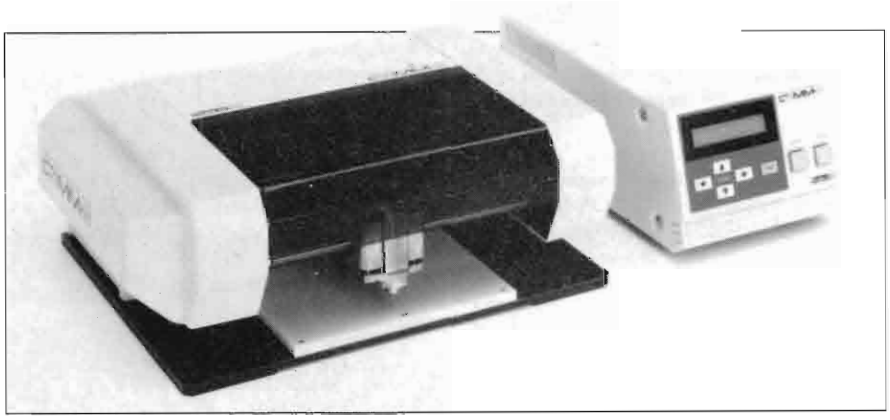


CAMM-2 turns an ordinary CAD system into an engraving workstation.

IEM's Buffer/Converter Speeds Communication

IEM, Inc., recently introduced its high-speed Buffer/Interface Converter. This device facilitates communication between host processors and primary-address devices (one-way communication devices, such as printers and plotters) in two ways:

The unit buffers data from the host processor and transfers it to the receiving devices, enabling the host computer to be used for other tasks while the information is being transferred.

The unit has a number of input ports (RS-23, Centronics and [optionally] HP- IB) and the same number (and types) of output ports. Any port on the input side can be connected to any port on the output side. This allows data transmission from HP-IB to Centronics, HP-IB or RS-232; from Centronics to Centronics, HP-IB or RS-232; etc.

The Buffer/Interface Converter ($1,425 to $2,850) can be ordered with a 1-, 2- or 4-MB buffer capacity. The copy mode feature enables text copying under control of the buffer unit. It can produce multiple copies of a single text item without processor control. Several units can be attached to increase the overall buffer capacity.

Up to six devices can be connected to the unit (four, without the optional HP-IB interface ports), though only one input and one output port can be active at any given time. Switches in the Buffer/Interface Converter are used to designate the active ports. Independent switches for each port control its interface characteristics and I/O capabilities. The HP-IB and Centronics ports support DMA on both the input and output sides.

Contact IEM, Inc., P.O. Box 8915, Fort Collins, CO 80525; (303) 223-6071 or (800) 321-4671.

Enter 923 on reader card

CDS Offers Total Scheduling

Software Technology Inc. (STI) recently enhanced Critical Date System (CDS) software. CDS enables firms with up to 99 employees to schedule and track dates for clients. It allows users to distinguish between critical dates, such as filing deadlines, and non-critical dates. CDS can handle up to a million date entries in all.

A new feature of CDS is a scheduling program that automatically locates an available time slot for any desired date transaction entry. The program is useful for scheduling activities requiring the involvement of several employees. The user simply selects a range of dates, a range of employees and a time frame, and CDS displays the earliest available time slot for the date entry.

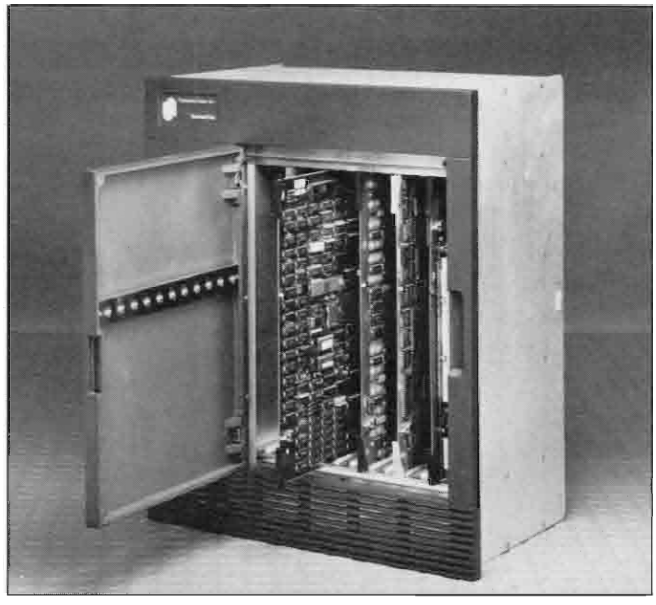
The improved CDS ($300) also includes a program that displays a six-week calendar showing the number of critical date entries and the total number of entries for each day.

CDS can generate reports by employee, or by a range of clients, for a selected range of dates and activities including critical dates, non-critical dates or both. All reports can be displayed on the screen, printed or saved to a disc file.

CDS is a menu-driven system that runs on all PC-compatibles utilizing PC-DOS or MS-DOS.

Contact Ken Merkt, vice president of marketing, Software Technology, Inc., Lincoln Trade Center, 6101 South 58th, Suite B, Lincoln, NE 68516; (402) 423-1440.

Enter 922 on reader card



Acess/One's "hot card" insertion enables network managers to add or exchange system modules as needed.

Access/One Provides Platform For Networking

Ungermann-Bass, Inc. has developed Access/One, a new system architecture that provides MIS and telecom directors with the only standard platform for the delivery of network services to their diverse network users.

Access/One ($10,000—$25,000) connects asynchronous and 3270 terminals, PCs and other distributed devices via Ethernet and token ring over common twisted-pair wiring.

Access/One provides the platform upon which protocols, application services and network management run. It satisfies the need for both local access and corporate manageability. The system also provides a practical platform for the integration of application services such as OS/2, LAN Manager, mixed PC and Macintosh connections.

Access/One uses a structured wiring architecture, which takes advantage of common twisted-pair telephone wiring to provide end users with cost-effective access to data communications networks.

Contact Ungermann-Bass Inc., 3900 Freedom Cir., Santa Clara, CA 95054; (408) 496-0111.

Enter 927 on reader card

New Paradox Taps 386 Processor

Borland International Inc. recently introduced its new Paradox 386 relational database management system (DBMS) with the most advanced, comprehensive database support available for Intel's 80386 microprocessor technology.

Paradox 386 ($895) is suitable for various database applications such as investment portfolio analysis, lead tracking systems in a corporation's field operations, or large inventory/order entry systems. It already has been tested in these types of environments with the result that financial institutions, airlines, large manufacturers and other types of organizations are looking to adopt Paradox 386 as a new database solution.

Paradox 386 maintains database file sharing and application compatibility across a network where different versions of Paradox may be installed on top of a variety of operating systems running on a mixture of hardware. It is among the first relational DBMS products to break through the 640-KB barrier. It takes advantage of the 80386 processor through use of the 32-bit instruction set to speed performance of typical database operations; and by breaking through the 640K barrier using the large memory address space provided by the 80386 architecture.

Paradox 386 uses up to 16 MB as efficiently as other applications that typically use 640K. This is accomplished by using the larger linear address space of the 80386 processor, in contrast with more limited use of memory provided by the Lotus/Intel/Microsoft Expanded Memory specification.

Contact Borland International Inc., 4585 Scotts Valley Dr., Scotts Valley, CA 95066; (408) 438-8400.

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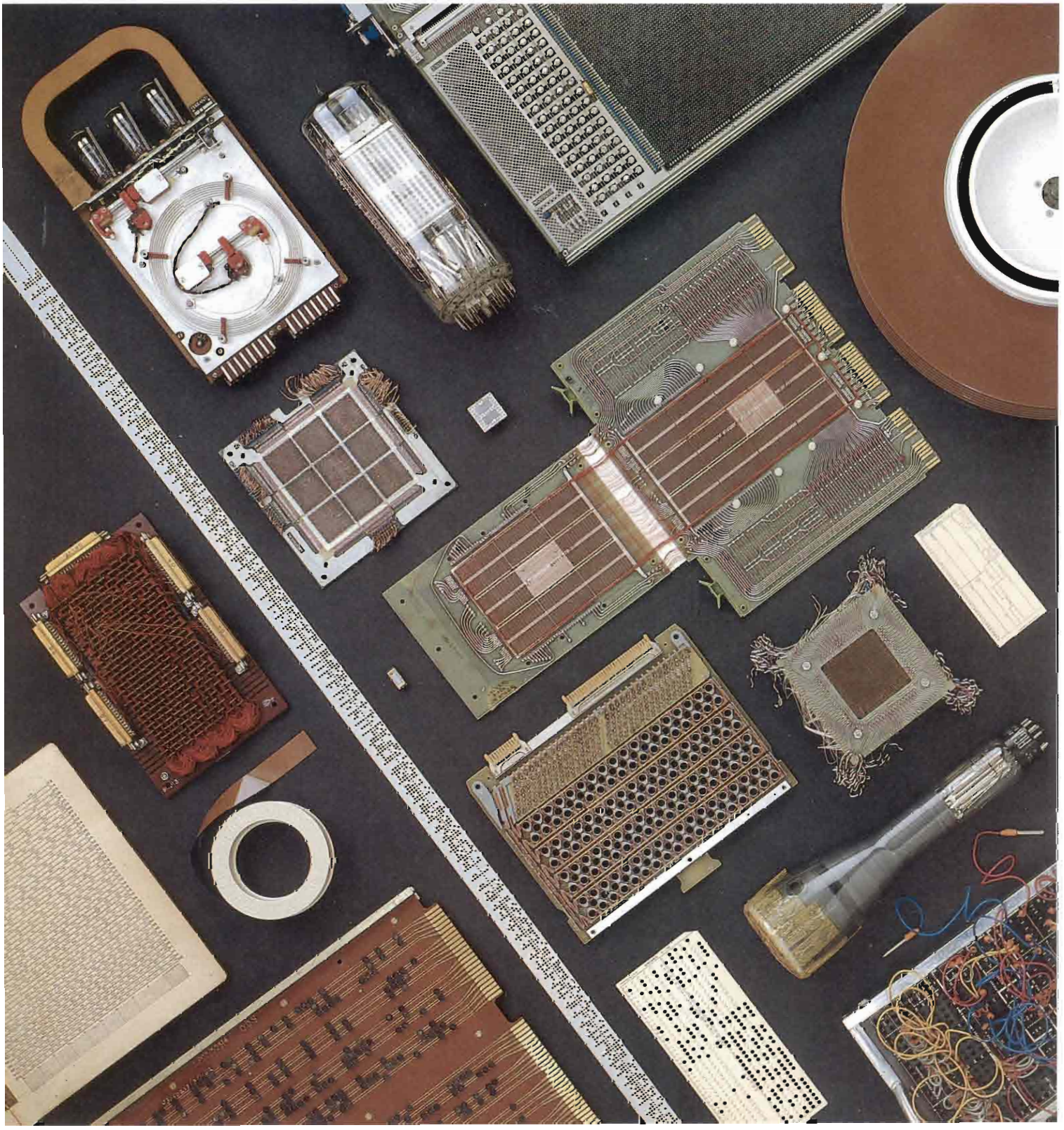

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[CALENDAR]

[MARCH]

20-24: NCGA '88, Anaheim, CA. Ninth annual conference and exposition of the National Computer Graphics Association. Contact NCGA, 2722 Merrilee Drive, Suite 200, Fairfax, VA 22031; (800) 225-NCGA or (703) 698-9600.

25: SCRUG (Southern CA Regional Users Group) Seminar on HP Computer-to-Computer Networking Capabilities, Fullerton, CA. Taught by Peter Hansen of Hughes Aircraft. To cover the networking of CPUs on the HP 3000, HP 9000, HP 1000, Vectra and Macintosh. $125 fee includes lunch and course notes. Contact Karen Zimmerman, SCRUG Office Manager, P.O. Box 84219, Los Angeles, CA 90073; (213) 453-5664.

28-31: 16th Annual Interface '88 Conference and Exposition, McCormick Place, Chicago, IL. Also, World Congress on Computing (WCC). Sponsored by McGraw Hill's *Business Week* and *Data Communications* magazines. Over 400 exhibitors will display communications and computer-related products and systems. Interface Conference will focus on network design/implementation-management issues and trends. Call (617) 449-6600.

[APRIL]

6-7: Performance Maximization Seminar, New York. HP 3000-related seminar sponsored by Volz Associates (Winthrop, MA). $525 includes all course material, lunches and refreshments. Discounts are available for three or more attending the same session from the same company. Contact Charles H. R. Volz, Volz Associates, Inc., 15 Pauline St., Winthrop, MA 02152-3011; (617) 846-3837.

18-20: Interex HP 1000 Users Conference, Lyon, France. Contact Interex, Conferences, 680 Almanor Ave., P.O. Box 3439, Sunnyvale, CA 94088-3439; (408) 738-4848; Telex: 4971527.

[MAY]

9-10: Performance Maximization Seminar, New York. For information, see April 6-7 entry.

17-20: SCRUG '88 Technical Conference and Vendor Show, The Pasadena Center, Pasadena, CA. Pre-conference tutorial for new users May 17 (extra charge). Two-day vendor show May 18 and 19. Conference fee $175 for full conference, $75 per day. Call Karen at (213) 453-5664 or write P.O. Box 84219, Los Angeles, CA 90073.

30-June 3: The International HP Users Conference, Goteberg, Sweden. Write Box 266, S-421 23 V. Frolunda, Goteberg, Sweden.

31-June 3: NECRUG Ninth Annual Eastern American HP Users Conference, The Trump Plaza, Atlantic City, NJ. Fee for members $275 if you register by April 29; $315 thereafter. Early/late non-member fees, $300/$400. Exhibitors call Jeri Fuller, U.S. Mortgage Insurance Co., (215) 825-4666.

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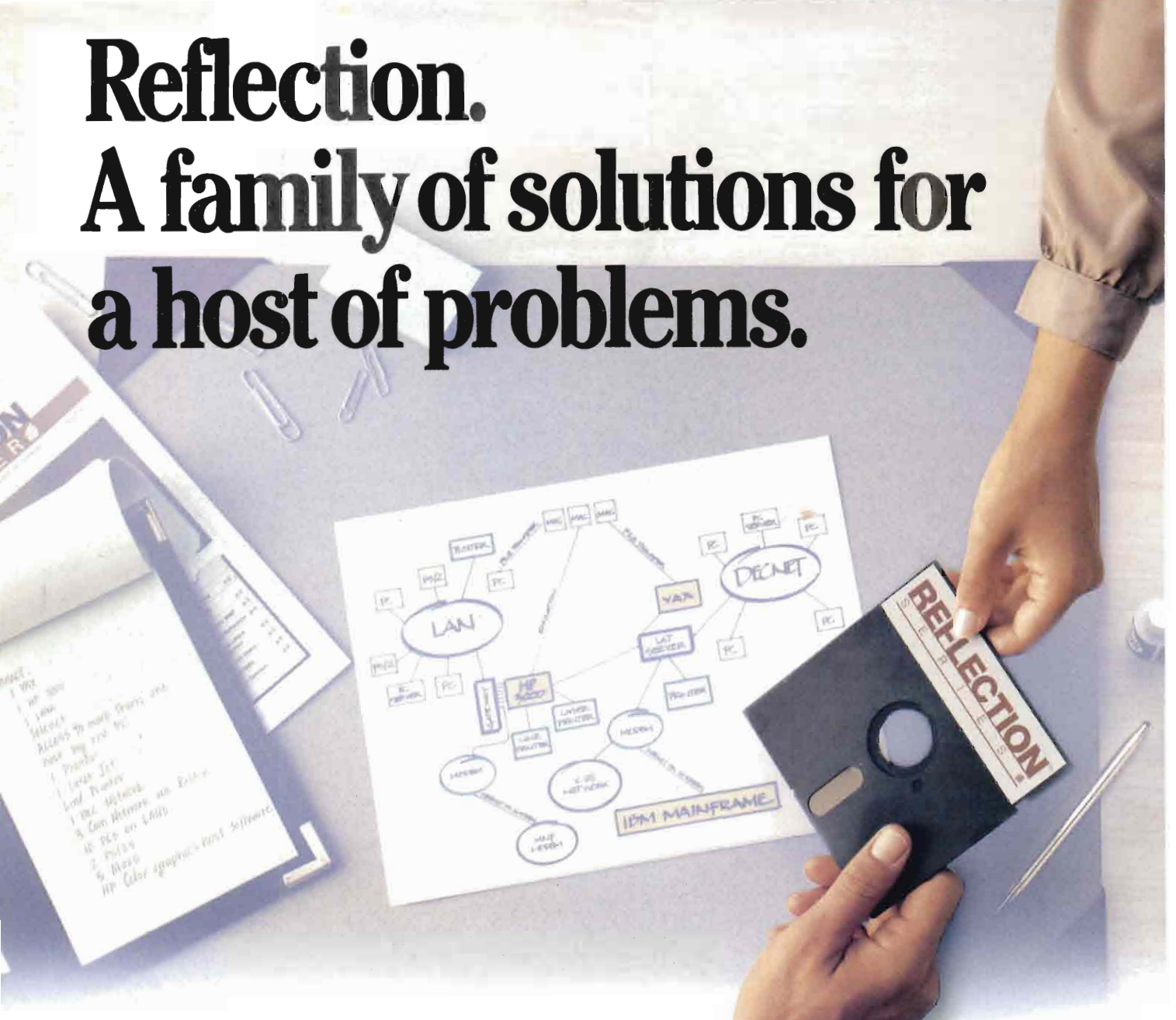

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