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HP Professional

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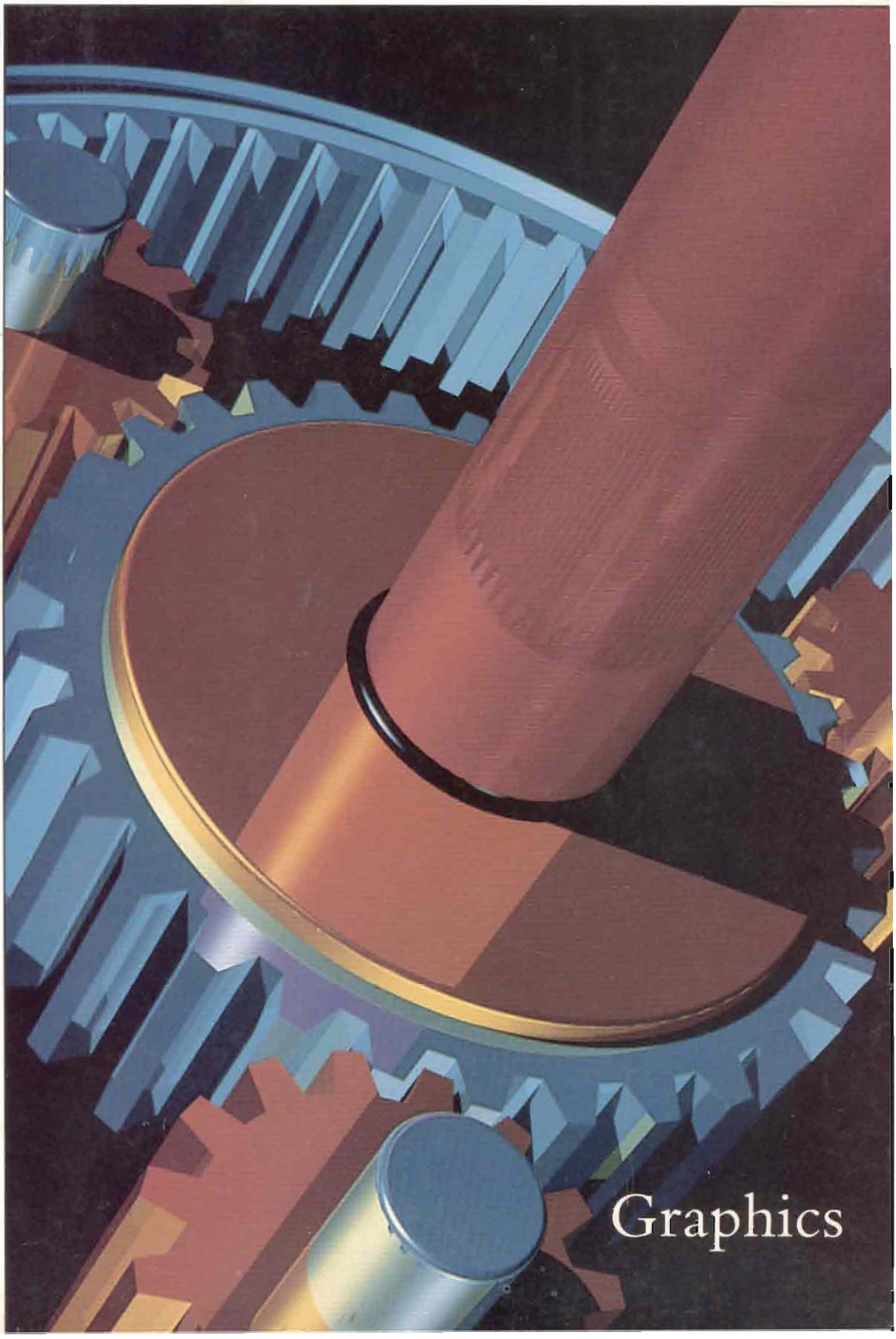
JULY 1989



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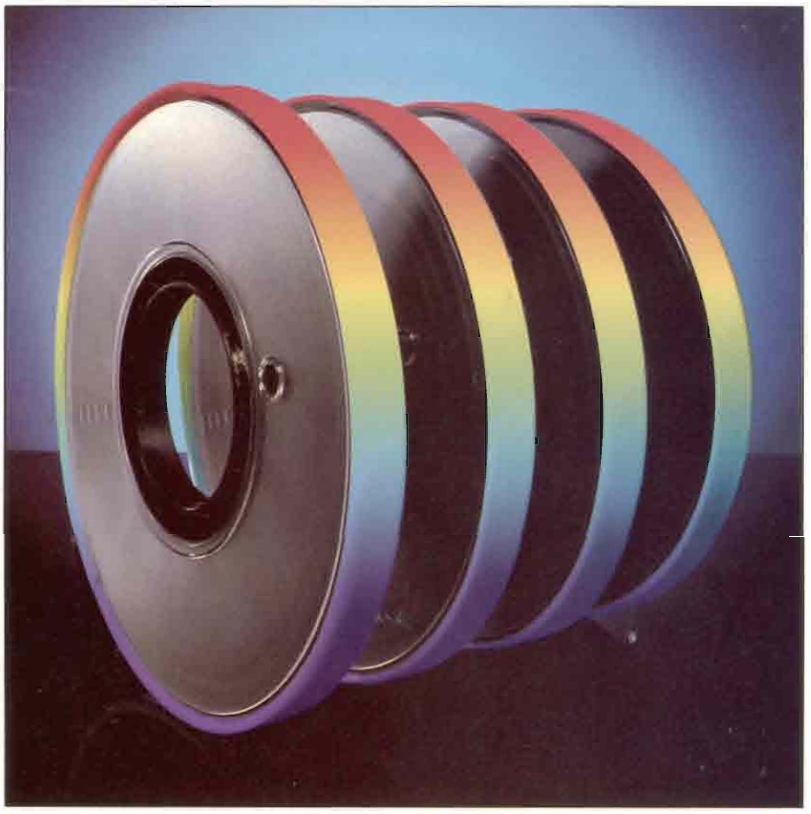

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BackPack/XL

System backup on a 900 Series HP 3000 is a big job ... and with inevitable file expansion, it gets bigger all the time. BackPack™/XL is a high-speed and unattended backup alternative that can keep backup chores under control. BackPack/XL runs over twice as fast as HP's TRANSPORT mode STORE, and faster than native mode as well. BackPack/XL also reduces tape use by half, and supports unattended backup. This approach reduces or eliminates user downtime.

BackPack/XL uses the same tape format as BackPack/V, so tapes created on a 900 Series HP 3000 can be restored on a stack system, and vice versa. HP's native mode STORE produces tapes which can't be restored on a stack HP 3000, and TRANSPORT mode, which produces compatible tapes, is very slow.

Use the system backup approach that's as dazzling as your new HP hardware. Call for your free demo today.

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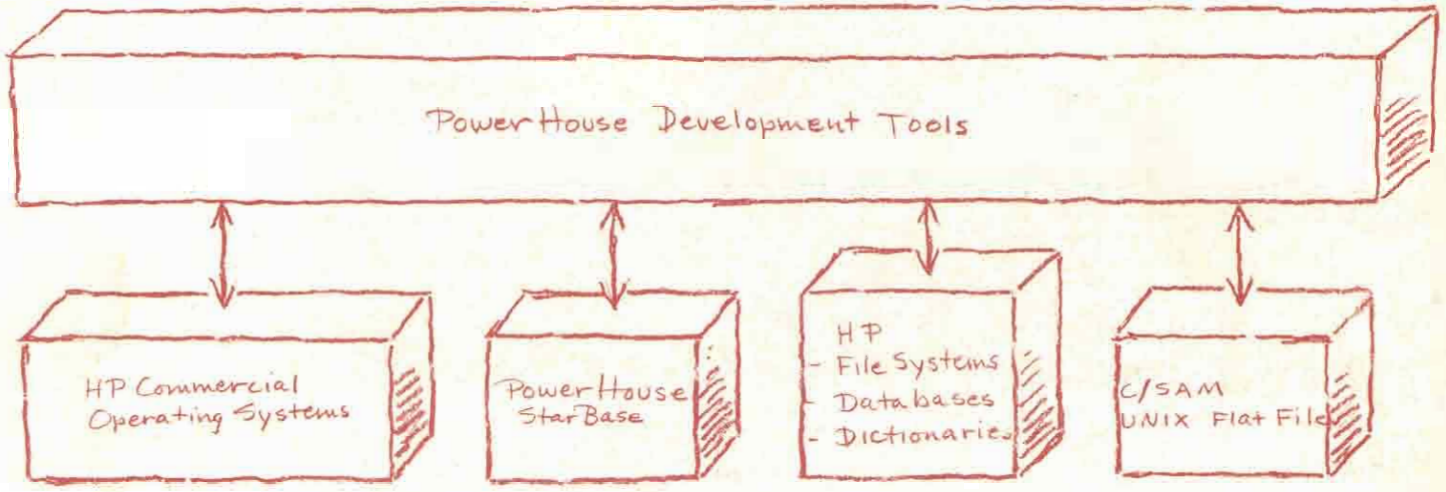
Only PowerHouse integrates every HP commercial operating system, including HP-UX.®



When you implement the PowerHouse solution, you integrate your HP environment.

That, in a nutshell, is the strength of the PowerHouse® solution.

Unlike common database approaches, which chain you to a captive environment, the PowerHouse solution acknowledges a simple, salient *business* fact: you've spent time and money getting to where you are today. Far from expecting you to abandon your current applications, as common 3rd party databases do, our solution preserves and enhances the investment you've already made in HP hardware and software.

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Perhaps most interesting of all, PowerHouse StarBase™, our new RDBMS, will soon support HP's Precision Architecture Systems. Creating a distributed data management environment that offers you unparalleled performance, flexibility and freedom.

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Now that you know all this about PowerHouse, the only thing that remains for us to tell you is the number at which we can be reached. It's 1-800-426-4667.

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Our high capacity intelligent tape system for HP 1000, 3000, and 9000 computers offers up to 2.3 GBytes of storage on a single compact 8mm video cartridge tape. Use it off-line for unattended multiple disk backup (up to 11 MBytes per minute) and restore operations, or on-line as a directly connected tape drive (HP 7974 emulation).

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Expand Your Horizons

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BPA ABP

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** SUPERDEX is a trademarked product name of Bradmark Computer Systems for the SI-IMAGE package developed and implemented by Dr. Wolfgang Matt.*

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Computer Systems Inc.

CIRCLE 106 ON READER CARD

Would You Buy Your Watch a Piece At a Time?

VISIMAGE PC Puts It All Together

Report Writing

Simple and detailed reports are easy to create. The unique painting facility allows users to draw the report layout directly on the screen. VISIMAGE PC provides all the functions of a powerful report writer, simply designed for the end user.

PC/HP3000 Access

VISIMAGE PC includes a new communication package designed by Walker Richer and Quinn that allows you to access HP3000 data using any PC network. Users have access to IMAGE databases, KSAM, MPE and SD files. VISIMAGE comes complete with interfaces to OMNIDEX, DICTIONARY/3000 and POWERHOUSE dictionary. Sophisticated features allow the DP department to retain total control over security, confidentiality and system resource usage.

On-line Tutorial

VISIMAGE PC's ease of use is enhanced by a tutorial mode for novice users. Pop-up windows guide the users through each step. Very quickly you will become an expert at reporting and downloading data.

Downloading

Your HP3000 data can be automatically downloaded to the PC. All the major PC formats are supported, making your data available to spreadsheets, word processing and other productivity tools (e.g. LOTUS 1-2-3, DBASE III, etc.).

Windows

VISIMAGE PC combines the power of VISIMAGE with the flexibility of a window environment. Pull-down menus and pop-up windows give the user easy access to timely information. Use the mouse to design the layout of your report or "click" the items you want to select. VISIMAGE PC runs on all IBM compatibles, using MS-DOS or OS/2, with a basic configuration.

VISIMAGE PC puts all the pieces together giving users a complete solution. Call today for a demo diskette to learn how VISIMAGE PC can benefit you and your company.

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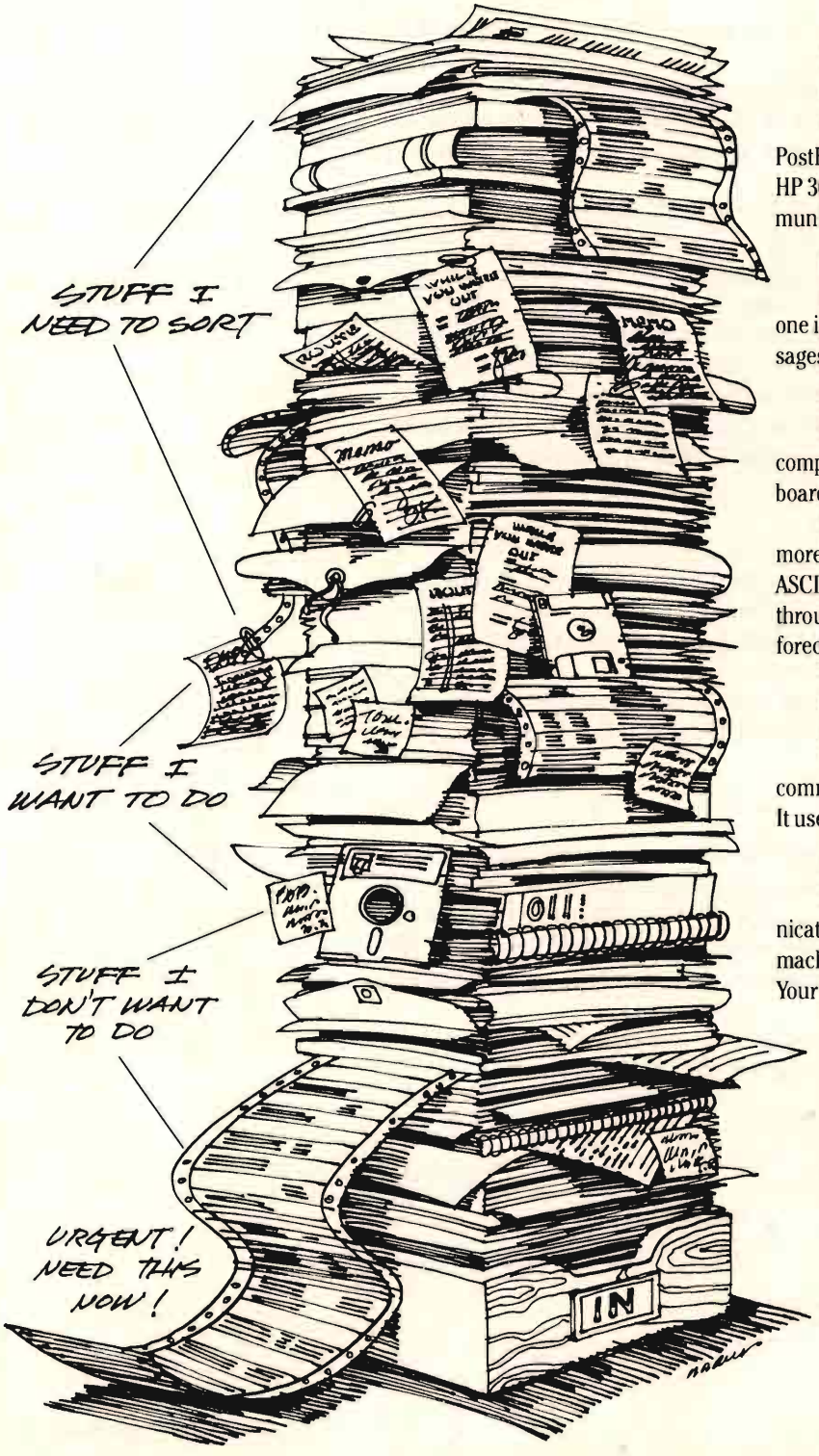
CIRCLE 186 ON READER CARD

Is this how your office communicates?



Put away the routing slips and join the computer age!

Office automation begins with communication. PostHaste is a complete electronic mail system for the HP 3000 with all the features you need to break down communication barriers and increase the flow of information.

Easy is important!

PostHaste's softkey interface is easy enough for everyone in the office to use. Use PostHaste to send phone messages, office memos, reports, even PC or host data files.

So is power!

PostHaste has the basics that are so crucial: read, send, compose, forward, file and print messages. Build bulletin boards and personal distribution lists.

PostHaste's integration with Reflection breaks down more barriers. PC and Macintosh users can share simple ASCII files and PC or host data files just by mailing them through Post Haste. Next time you need to pass around the forecasts you made in Lotus, try PostHaste!

High performance electronic mail.

PostHaste offers all the functions you need for effective communication without sacrificing system performance. It uses a minimum of disc space and CPU cycles.

Quick, pass the message!

So, if you want to improve the way your office communicates, reduce paper clutter and endless trips to the copy machine, call us today for your PostHaste demo tape. Your office will thank you.

POSTHASTE

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CIRCLE 240 ON READER CARD

The Global Sandbox

The times have changed. HP can no longer sit back in its complacent, high-quality, high-margin world and build instruments and a few computers.

It's abundantly clear to industry watchers that there are going to be only a few survivors and lots of casualties in the computer world. The days of the "BUNCH" getting fat on cast-off market share are all over. By this time next year, the price of a workstation mip will be flirting with $250.

If you want to play in the 1990s, you're in a global sandbox with some pretty big and rough rich kids. Look at them: IBM with infinite money, the best R&D on the planet, who wrote the book on computer marketing. DEC with billions and billions in cash, no real long-term debt, the world's best networking and clusters, and the guts to throw its VAX architecture to the winds and buy into the mips world. And don't forget Japan, Inc. waiting there, controlling the world prices of DRAM chips and ready to build UNIX system toasters just like they build VCRs.

HP's first problem was visibility. They cured that in mid-April. Now, as the clear No. 1 in workstation market share, they have to be noticed. Hopefully, that attention will not be like the attention Unisys now is getting as it continues its inexorable slide (the sum of two declining numbers . . .).

Internal Problems

Real growth must follow numerical growth. This is the hard part and the part that will test John Young's mettle. The job is so large because he still is faced with the problems at home; making one company out of the several divisions and healing the fault line that still gapes between commercial and technical.

The world won't wait for HP to slowly cure these internal problems. Nor will the other kids in the sandbox. HP has needed an East Coast presence for ages. Now they have a good, big one. All they have to do is use it.

Decisive Steps

HP was a distant fourth in workstation market share. Now they are first. The market will be watching for decisive steps that consolidate and strengthen that position. Even with Apollo, HP doesn't have a low-end chip technology that competes with MIPs. Perhaps they should buy Data General as well to pick up their new line of 88000 boxes to fill that gap? Remember, this is a world that will have 60 mip desktop low-end machines next year. And one of them will be in blue.

As the song goes . . . "these are the days of miracles and wonder . . ." Races, I am told, are only won by the swift. That should read, the swift and the courageous.

EMC's FALCON XP: The only disc subsystem with 64K of write cache.

Lightning strikes twice! EMC has taken the fastest disc subsystem for your HP 3000 and made it even faster. In recent independent benchmark testing the Falcon, without write cache, won the race over HP's Eagle drives. Now we've added 64K of non-volatile write cache to the controller to bring you the FALCON XP, a lightning-quick solution to your I/O bottlenecks.

Now with twice the read cache and 16 times the write cache available from HP, the FALCON XP can address any size read or write. This means you'll get even faster system response time — **up to 7-20% faster than any drive offerings to date!** And, with the FALCON XP you can still take advantage of EMC's other features like our proprietary caching algorithm, which allows you to tune cache domains to fit your application and guarantee maximum performance.

Call today to find out how the FALCON XP can cut through your I/O bottlenecks. It's a winning decision! For more information, contact your local EMC representative or call: **1-800-222-EMC2 X2288.** (In Mass., 508-435-1000.)

CIRCLE 113 ON READER CARD

EMC²

The System Enhancement Company.

INDUSTRY WATCH

Tom Halligan

The Paperless Government

If you intend to do business with the government in the future, you should become familiar with the acronym CALS. In short, CALS (Computer-Aided Acquisition and Logistical Support), is a Department of Defense program setting standards for electronic interchange of information.

In essence, CALS will drastically change the manner in which companies prepare proposals and documents for the government. And, CALS standards could become the foundation upon which both DoD and civilian agencies will base their next generation automation strategies.

CALS is a suite of standards being developed by the DoD that will mandate how products are specified, proposed, built and documented. Within the next seven years, the government and its contractors will spend $10 billion to become CALS compliant.

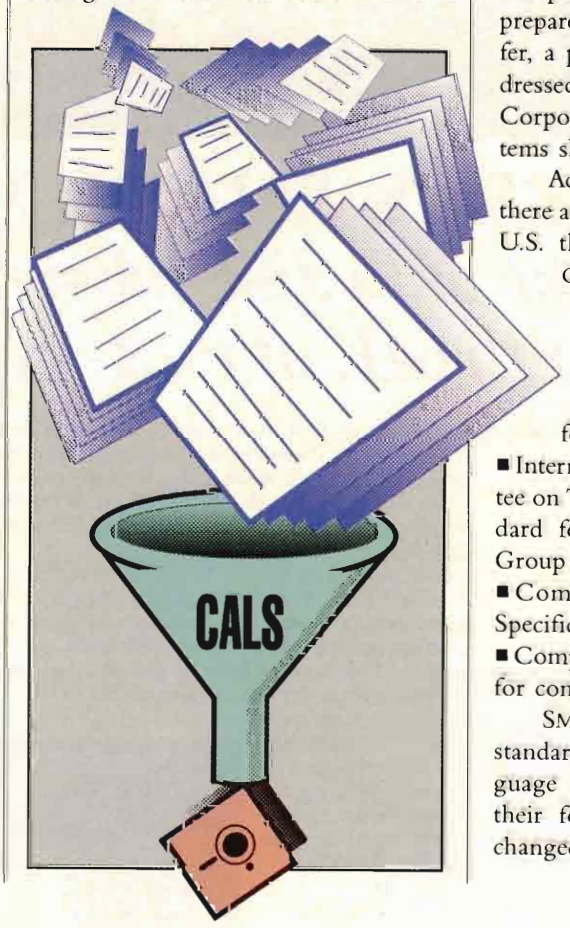
Under the program, the government, especially the DoD, hopes to save considerable time and money once contractors comply with CALS. The program is expected to greatly reduce the time and cost of converting paper-based information to a digital format. It's designed to enable and accelerate integration and use of digital technical information for system acquisition, design, manufacture and support.

Currently, most technical documents are supplied to the government on paper. In order to update or modify designs, procure spare parts, or purchase additional systems from competitive suppliers, the government must convert paper documents into a consistent electronic form.

Once the CALS program is fully enacted, contractors will be required to deliver their drawings, schematics and technical manuals in electronic form. This will greatly reduce the avalanche of paper that is burying government agencies.

Consider the following examples:

- Each of the Navy's smaller surface warships must store 41,000 pounds of paper . . . that's 20½ tons of paper to help operate and administer the ship.
- For each F18 fighter jet manufactured, more than 16,000 pages of information is created.
- The estimated life cycle cost to change the documentation for two washers on a fighter jet is an estimated $56,000.
- Kodak Corp. estimates that the total number of new documents produced each year will grow to 1.6 trillion by 1995.
- Some 38 billion documents are misfiled each year, costing an average of $120 each to retrieve them.



The DoD initiated CALS in 1985 to combat the threat of fragmation, or "islands of information" that isolate unconnected computer systems. "Since all government contractors will have to submit proposals in electronic form, CALS will revolutionize the way these companies and the subcontractors prepare documents," said Barry Schaeffer, a publishing consultant, who addressed the CALS program at the recent Corporate Electronic Publishing Systems show in Chicago.

According to InterConsult Inc., there are an estimated 50,000 sites in the U.S. that will have to comply with CALS standards.

To date, CALS standards for technical manuals are:

- Standard Generalized Markup Language (SMGL) for texts.
- International Consultative Committee on Telegraphy and Telephony Standard for Group 4 Facsimile (CCITT Group 4) for scanned images.
- Computer Graphics Exchange Specifications (IGES) for vector images.
- Computer Graphics Metafile (CGM) for computer-generated graphics.

SMGL, the most commonly used standard, is a document tagging language that ensures documents retain their formatting when they are exchanged between computer systems.

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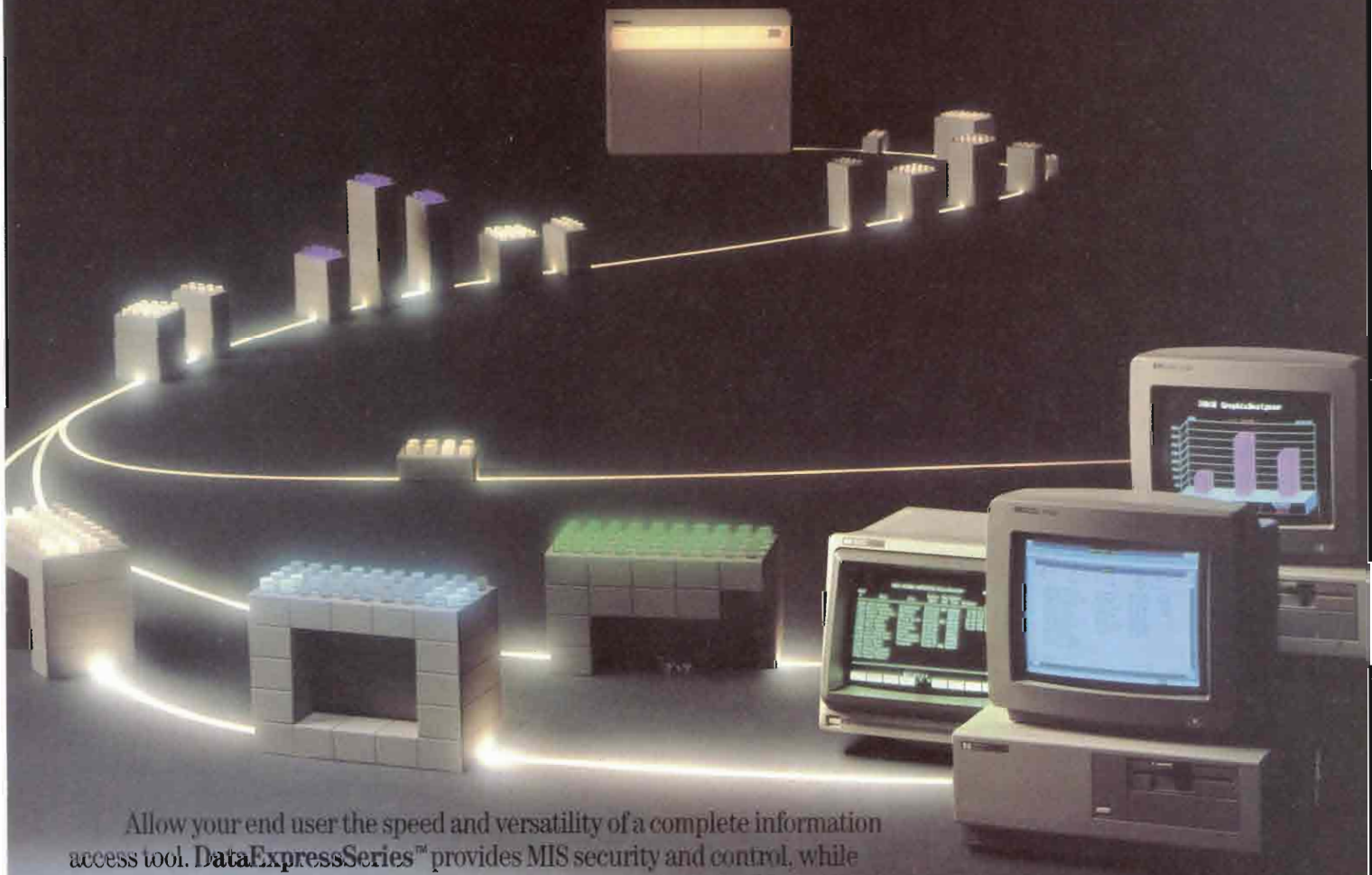
Transforming your HP 3000 data with speed is elementary.



Allow your end user the speed and versatility of a complete information access tool. **DataExpressSeries**™ provides MIS security and control, while extending to end user new levels of self reliance and productivity. It's designed to ignite powerful solutions to all your HP 3000 data interchange needs. It's an easy system to learn. And it's easy to use.

As your link to HP 3000 data, DataExpressSeries accesses IMAGE, KSAM, MPE and SD files, downloading to PC applications such as spreadsheet, word processing and database. **DataExpressSeries** is designed to complement all major PC software, including Lotus 1-2-3, Excel, and Word Perfect, to name a few. The **ReportDesigner** module has been engineered so that your end users can create sophisticated, customized reports. And your staff can generate full-color, two and three-dimensional graphics with the **GraphicDesigner** module.

With DataExpressSeries modules, you have a powerful information center that works with your environment. Our **Interfaces** allow you to take advantage of your investment in PowerHouse, HP Dictionary, RELATE, and Omnidex.

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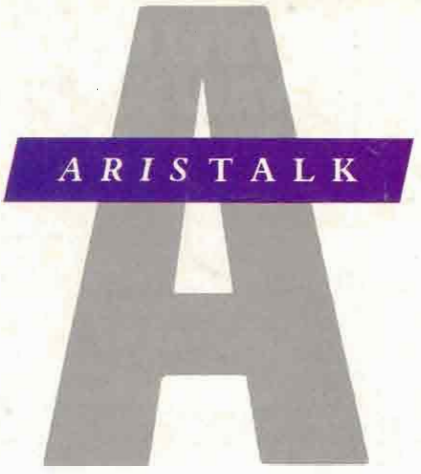

ARIS/BB

How To Use HP Professional's New Bulletin Board

In case you haven't heard, ARIS/BB, our Automated Reader Information Service Bulletin Board is up and running.

To help you find your way around ARIS/BB, follow these instructions:

1. Know your *HP Professional* subscription number. The second line of your label contains your subscription number. An example would be #012345/3# xxx. 12345 is the subscription number. If you tossed your label, call the Circulation Department at (215) 542-7008.

2. Settings — PC or Terminal: seven data bits, one stop bit and space parity. VT100 emulation: eight data bits, one stop bit and no parity. Baud rates of 300, 1,200 or 2,400.

3. Dial the number nearest to you:
(215) 542-9458 — Pennsylvania
(818) 577-9100 — Southern California
(415) 873-2135 — Northern California
(617) 863-5010 — Massachusetts

4. After the modems "CONNECT," hit your [Return] key several times. You'll be asked to key in your last name and then your subscription number. [Return] after each entry, and wait for the Welcome screen.

The Welcome screen gives you information on how to proceed into the bulletin board. Changes and improvements to ARIS/BB also will be posted there, so be sure to read the Welcome each time you dial in.

Quick Notes

[Return] from any menu backs you up one menu. 0 from any menu sends you to the Main Menu. CTRL-Z executes a message. CTRL-C cancels a message.

SIG Identification

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11 .....Networking
12 .....Site Management
13 .....System Performance
14 .....System Security
15 .....Disaster Recovery

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33 .....HP-UX
34 .....MS-DOS

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23 .....PCs
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25 .....RISC/HP-PA
26 .....Communications/Networking
27 .....Laser Printers/Font Cartridges

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A Brief Menu Rundown

Product Information will lead you to our advertisers' product listings. You can call up listings under hardware or software categories.

Under Subscriber Information, you'll be able to change your mailing address and order back issues, reprints and other Professional Press publications.

Communicate with fellow subscribers/experts by entering the Message Center, under Reader Forum. If you care to reply to or leave a message, you'll be asked to choose a text editor. EDT and TPU are products of DEC. If you aren't familiar with these, choose the No Editor option. When entering your message under No Editor, type carefully. You can correct typos only on the line you're on. Use a [Return] at the end of each line of your message. Do *not* use tabs; they'll be stripped out. You can enter a meassage in any of the SIGS listed in the SIG Identification Box.

*ARIS*TALK

*ARIS*TALK, a new department in *HP Professional*, is a sample of conversations pulled from the Message Center for those unable to dial in. You'll find a small sample here.

A useful option under Reader Forum is Programs For Download. Downloading programs to your system saves you from keying in tedious procedures yourself. A program you see in the magazine that has the ARIS symbol (A) above it, shows you that the program can be downloaded.

An entire list of articles published in *HP Professional* can be found under Cumulative Index. Search by an author's name to get a list of his published works. To search by title, you don't need to know the full title, just one word will be enough. Try CIM, and you'll get a list of all the articles where CIM appears in the title.

Send a message to *HP Professional*'s editors with Letter To The Editor.

Writer's Guide leads you to our Editorial Calendar and Author Guidelines.

Be sure to give ARIS/BB a try, and

Continued on page 91.

With SpoolMate you don't have to fly blind when distributing reports

That's because SpoolMate takes the guesswork out of report distribution.

With SpoolMate you can design your own distinctive banners for the front and back of each report. You decide the layout and content of the banners, and SpoolMate will automatically insert them with each report. Customized banners along with user-defined distribution lists ensures that the right number of copies always gets to the right people.

SpoolMate also gives you a lot of flexibility in printing, increasing your efficiency and throughput. At the device level, for example, you can reserve certain printers for large spool files, and other printers for small files. SpoolMate can also direct individual report copies or groups of copies to the same or different printers, connected to the same or different computers. Configuring a single printer as a "multi-copy" device allows you to print all copies of a spool file consecutively on the same printer.

We could go on and on. About spool file archiving. Print job audit trails. Multiple-CPU distribution of spool files. And much more.

But all it takes is one look at SpoolMate in action. Call us today at (408) 245-3000 for a 30-day demonstration or to find out more.

CIRCLE 141 ON READER CARD

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RADAR–system performance measurement
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A Model For Electronic Democracy

Santa Monica Residents Utilize Read-Only Access To Municipal Information

Santa Monica is by no means a typical city. One third of the residents have personal computers at home and almost one fourth have modems, too. Although Santa Monica's working population is almost double its residential population, use of its Public Electronic Network (PEN) is restricted to residents of the city.

Santa Monica may not be a typical city, but Hewlett-Packard hopes it will be an exemplary one. Neither HP's donation of an HP 9000 Model 840 minicomputer and about 30 Vectra PCs, nor Metasystems Inc.'s donation of the software were charitable contributions. Santa Monica isn't the first city to use a computer and menu-driven software to give citizens read-only access to municipal information, but, these companies hope that other cities will follow Santa Monica's example.

For a city to have a PEN there must be an extra computer just for the citizens' use. A computer used for a citizen's access to government must be separate and stand alone in order not to pose a security threat to a city's internal operations.

An element of Santa Monica's PEN is its three interactive features: electronic access to city hall resources, electronic conferencing with other citizens and a variety of library services.

Residents of Santa Monica can send electronic mail to city hall. Current policy is that these messages are answered within 24 hours. When the response comes in, it's displayed on the user's screen. City council members are accustomed to using E-mail for corresponding with one another, but providing quick response to citizens' comments and questions could prove challenging.

The conferencing capability functions like an electronic bulletin board. When the PEN went on line in February, 1989, the first five categories were:

- Ideas: suggestions about other ways the PEN can be used.
- PENhelp: questions about how PEN works.
- Crimewatch: exchange of information about crime in the community and prevention strategies.
- Youth: activities and issues.
- Planning: issues about development.

Soon, citizens will be able to reserve a library book electronically. There also is a quick reference service for getting information from a reference librarian.

Santa Monica's PEN already has become very popular. Over 500 users signed up in the first two weeks. Word of how the system works has traveled to Japan, and several California cities have joined the race to be the second city to have a PEN. —*Peggy King, West Coast Editor.*

HP Broadens Interest In Enterprisewide Networks

Products Designed For Greater Performance, Integration And Control

Hewlett-Packard has expanded the company's platform for enterprisewide networks with a major T-1 multiplexer support program and six HP X.25 Private Packet Network product capabilities.

These products are designed to give users cost-effective access to higher performance and greater integration and control of multivendor communications in a wide-area-network (WAN) environment.

The company also reported that four international HP users, The Stock Exchange of Singapore, Hertz-Europe, SGS-Thomson Microelectronics and Longs Drug Stores Corp. successfully have developed enterprise networks with the use of the HP X.25 Private Packet Network.

The HP X.25 Private Packet Network, based on the CCITT X.25 international standard, is a private, packet-switching network that can carry data communication among computer systems and devices from multiple vendors, including HP and IBM.

NCGA's 10th Annual Conference Showcases Latest Computer Graphics Technology

HP Announces Performance Enhancement And Interactive Graphics Package Within X Window System

NCGA's 10th annual conference and exposition brought nearly 26,000 attendees to the Philadelphia Civic Center this spring to see the industry's latest in computer graphics technology.

More than 240 companies participated in the show, which included audio-visual, CADD/CAM/CAE/CIM, factory floor graphics, future hardware and software directions, automated mapping and videotechnology exhibits.

Hewlett-Packard made several announcements during the three day conference, including a 70 percent increase in 2D graphics workstation performance and the introduction of an interactive 2D and 3D graphics within the X Window System.

The performance improvement was achieved by enhancing HP's existing CHX integer-based graphics accelerator included on the HP 9000 Series 300 and 800 CHX workstations. The workstations now will support primitives such as polyrectangles and polycircles to add performance for vector intensive applications.

Interactive 2D and 3D graphics now are supported in the X Window System wiith the latest version of HP-UX (6.5).

The interactive 2D and 3D graphics with the X Window System is available on the HP 9000 Series 300 and 800 workstations as well.

This introduction is the result of the integration of HP's Starbase graphics library and the X Window System. Interactive graphics within X11 allow users to run multiple applications using HP Starbase and industry-standard GKS graphics libraries within the X Window System environment.

Also during NCGA, HP announced the endorsement of the Texas Instrument TIGA-340 (Texas Instrument's Graphics Architecture), the defacto industry standard for PC graphics.

TIGA is a low-level graphics API (application programmatic interface) for DOS. It standarizes interfaces between applications and graphics hardware. TIGA reduces the redundant effort required to develop custom drivers for every graphics card and application-software combination.

HP has offered its CAD software on competitive hardware platforms for the first time with its announcement of HP ME10d, a high-end software package for mechanical design and drafting that runs on IBM, Compaq and HP Vectra PCs.

The ME10d is a full-function DOS version of HP's UNIX system software, which is sold on HP 9000 industrial workstations.

The package provides a drawing-exchange format (DXF) translator for transferring data to and from other CAD packages. Databases also can be shared among HP's 2D and 3D UNIX system packages on the 9000 family.

The ME10d is a software package for mechanical design and drafting and is full function DOS version of HP's UNIX system software.

HP Announces Plans For Apollo Division

Timetable Set For Changes To Both UNIX System Platforms

At a May press conference in Boston, Hewlett-Packard announced that the Apollo acquisition was completed and Apollo became a division of HP's Workstation Group. David Perozek, who for 16 years headed HP's Medical Products Group in Andover, MA, was named general manager of the Apollo Division. Although Apollo headquarters will remain in Chelmsford, MA, Perozek will report to Bill Kay, general manager of the Workstation Group in Sunnyvale, CA.

Brian Moore, general manager of the Computer Manufacturing and Planning Group in San Diego, has been appointed to the interim job of merger general manager. He and his team will oversee the consolidation of product groups, field service and sales organizations, distribution channels and technologies.

The acquistion of Apollo has caused HP to realign its priorities for new product development and enhancement. At least five hardware and software development programs that were underway at HP and Apollo have been "redirected" (either scrapped or postponed) to make way for the consolidation of the two companies' product lines and technologies.

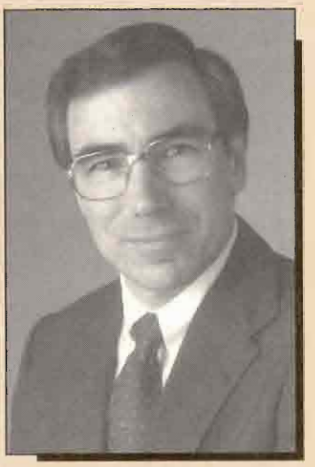
HP announced a timetable for changes to the two UNIX system platforms in the combined product line. By late 1989, an API (application program interface) based on OSF's MOTIF will be available on HP-UX and Apollo's Doman/OS platforms. By late 1990, OSF/1 also will be available on both platforms. By 1991, there will be compilers and a graphics API common to both platforms. By 1992, the two platforms will be merged to form a single platform that complies with OSF/2.

Apollo's NCS network for distributed processing will be available on HP-UX one year earlier than HP had originally planned. NCS will be used to provide connectivity between workstations and the Series 800 line of minicomputers. NCS will be enhanced with extensions to HP's MAP networking products and Apollo's Token Ring (802.5) networking.

Both HP and Apollo have a series of workstations based upon 68020 and 68030 processors from Motorola. Currently, HP's Motorola-based workstations use a proprietary bus and Apollo's use a PC-AT bus. By 1990, these products will be combined to form one family and all workstations in the family will use an industry standard bus.

The largest development effort will go to rebuilding HP-PA to incorporate features of Apollo's PRISM architecture such as its superior scalar performance and floating point arithmetic. By 1991, the RISC workstations will have similar packaging, a common bus and common peripherals.

In the area of graphics software, HP's Starbase graphics at the high end and Apollo's GSR, GMR and GPR at the low end will be combined into a common family by 1991. The common family will include one graphics applications programming interface, OSF graphics libraries and upgrade maintenance for current libraries. HP and Apollo also will merge their graphics hardware technologies. —*Evan Birkhead, Boston correspondent.*



Dave Perozek: New Apollo Division General Manager.

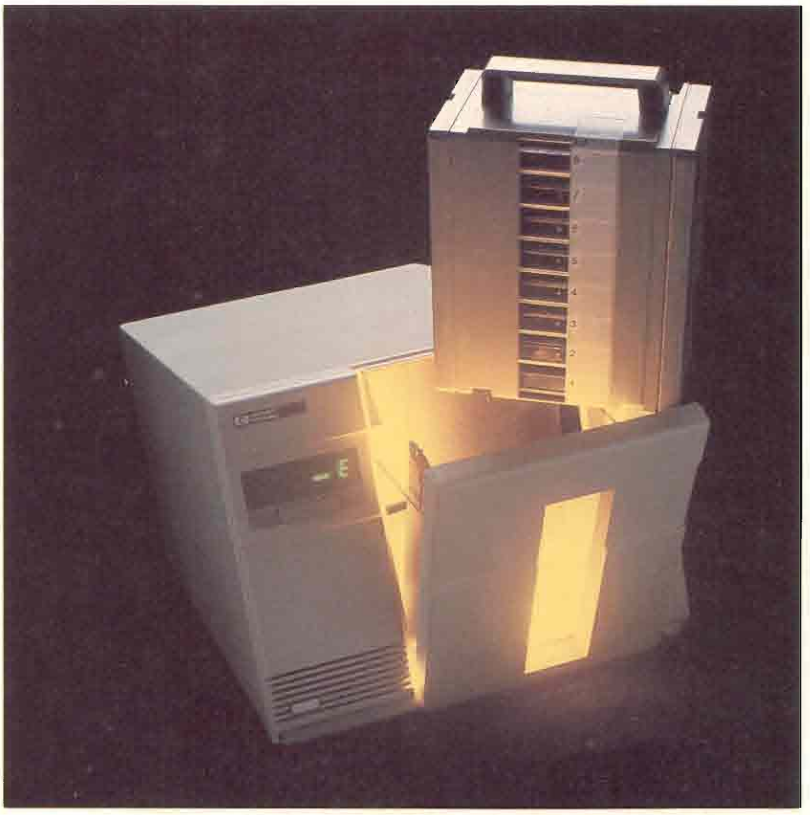
Independent Maintenance Suppliers To Form International Association

Parsing Group Votes To Join NCSN

The Parsing Group, a coalition of independent computer maintenance vendors, ended its latest session with a vote to seek membership in the National Computer Service Network (NCSN) as a "group member" within that organization. The new entity will be called Independent Maintenance Suppliers (IMS).

The NCSN's overture to the Parsing Group to join as a united front met with the unanimous support of those attending the meeting (Avila Beach, CA). Members include, national and international third-party maintenance vendors such as Control Data Engineering Services, General Electric Computer Service and Granada Computer Services, as well as the small regional service vendors such as SMS Computer Inc.

Representatives of service firms from New Zealand and The Netherlands, as well as Europe, Canada and the U.S., formed the Parsing Group in order to discuss common problems in dealing with the computer manufacturers, obtaining parts, documentation and training, and to enhance the image of the independent maintenance industry. The group is proposing to the NCSN that two board of director positions be opened



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Micro BackPack™ is a backup solution for any cartridge-based HP 3000 which doubles cartridge capacity, cuts backup time, and reduces the need for operator intervention. Micro BackPack is an ideal solution for Micro 3000 systems, where the combination of high-speed, high-capacity disc drives with a slow cartridge tape unit can create a backup bottleneck. Even on the smallest system — an LX with 81 MB of disc — a full dump with HP STORE may not fit on 1 cartridge. And a GX with 608 MB may require 9 or 10 cartridges.

With Micro BackPack, the daily backup at smaller sites will fit on one cartridge, which can be loaded on the way out the door in the evening. At a large site, the number of cartridges required is cut in half, saving about half an hour for each cartridge eliminated.

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to the new IMS membership and that the NCSN consider identifying itself as a truly international organization. They also are requesting that the NCSN assign action committees to promote special areas of interest to the independent maintenance industry.

Parse Inc. (San Luis Obispo, CA) originally created the group as a means of communicating with its customer base. —*Ron Levine, Field Service Editor.*

TQC's Test Management Shell Developed For HP

TMS Automatically Generates And Executes Test Programs

Test Quality Co. announced a follow-on contract with Hewlett-Packard for the Test Management Shell (TMS), a software productivity tool recently developed by TQC for HP. TMS is a CASE tool that automatically generates and executes test programs defined by the user through simple menus, and is fully integrated with TekBase, TQC's full featured technical relational database and analysis product. The contract will provide HP with the necessary benchmarks for TMS product enhancements.

For further information, contact Test Quality Co., 2316 Walsh Ave., Santa Clara, CA 95051; (408) 986-8880.

Circle 376 on reader card

NET And HP Combine Technical Assistance Efforts

Network Problems Resolved With Mutual Experience

Network Equipment Technologies Inc. announced an agreement with Hewlett-Packard that will assure coordinated resolution of network problems experienced by their mutual customers.

Although both companies remain independent contractors to their mutual customers, the agreement calls for each company to provide technical assistance to the other in the process of supporting customer networks containing both NET and HP products.

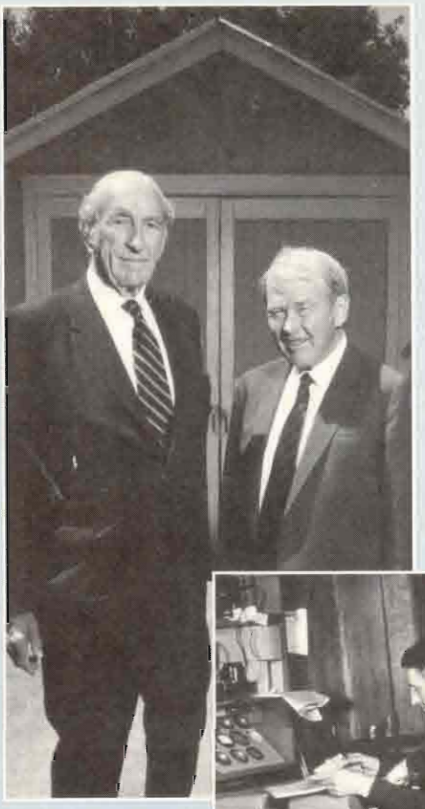
If one company suspects that a network fault is caused by the other's products, it can initiate coordinated problem resolution notification of the company, mutual confirmation of the failure diagnosis and cooperation to resolve the customer's problem.

In those cases where a problem is not being resolved in a satisfactory manner, escalation to both companies' senior-level personnel allows additional resources to be mobilized.

Both NET and HP will provide training and product documentation to each other's personnel to assure mutual understanding of products and product interactions.

For more information, contact Network Equipment Technologies Inc., 800 Saginaw Dr., Redwood City, CA 94063; (415) 366-4400 or (415) 780-5267.

Circle 374 on reader card



Dave Packard (left) and Bill Hewlett visit the garage for the first time since 1939, where they developed an audio oscillator (below).

Packard's Garage Named Historic Landmark

Noted As Birthplace Of Silicon Valley

The one-car garage where Hewlett-Packard was founded in 1939 was dedicated in May as a state historic landmark and the birthplace of Silicon Valley.

The garage at 367 Addison Ave., Palo Alto, CA was recognized as the beginning of the world's first high-technology region during a ceremony at the site attended by approximately 300 people.

The garage is the eighth state landmark in the Stanford area of Palo Alto and second recognizing the city's role in the development of the electronics industry.

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HP Lists Common Stock

Now Trading On International Exchanges

Hewlett-Packard has listed its common stock on the international stock exchanges in London, Frankfurt, Zurich and Paris.

HP's stock already is traded on the New York Stock Exchange (symbol; HWP) and the Tokyo exchange.

HP's European activities include manufacturing in West Germany, France, Spain and the U.K. as well as R&D activities located within its manufacturing centers and at HP's European Research Center in Bristol, U.K.

NewWave Developer Kit Enhanced To Improve Application Writing

New Menus, Icons And Improved Encapsulation Facility Are Included

Hewlett-Packard has enhanced its NewWave developer kit to include new tools to help software developers write applications for HP NewWave.

The new developer kit supports all of the features in the March 1988 release plus several enhancements. There are additional tools and supporting software for "agents," or task automation. Agents can record routine tasks a user does on a computer and then perform those tasks automatically, even if the task involves many applications or other computer-systems services.

Also included is a faster way for developers to integrate existing MS-DOS and Microsoft Windows applications into the HP NewWave environment. Tools to help developers build their own computer-based training lessons, which may include animation, graphics and illustrations simulating any application or subject are also a part of the enhanced version.

In addition, HP has made improvements, to the appearance of HP NewWave, including new icons and menus that make the interface more intuitive to users. This differentiates them from the icons for files that contain information. These changes are part of HP NewWave Office, the graphical user interface component that represents the user's office. They don't affect any other aspects of the HP NewWave environment.

Developers can take advantage of these improvements without rewriting applications already in progress.

The new version adds full support for agents, including the ability to translate a user's actions into an agent task language. This language, or list of commands, can be edited by the users.

HP Participates In QFD Symposium

Statistician Presents Case Study Using QFD On A Software Project

Khushroo Shaikh, an HP statistician who has been a leading proponent and trainer for Quality Function Deployment, addressed the first annual Symposium on QFD held in June at the Hilton Inn, (Novi, MI). Her presentation entitled "Thrill Your Customer — Be a Winner" recounts her experiences in bringing QFD to HP's Industrial Application Center (IAC) in Sunnyvale, CA.

Dr. Shaikh's presentation was a case study in the use of QFD on a software project. In 1986, Dr. Shaikh and 15 of her co-workers led the U.S. effort when they received formal training in QFD at a course given by G.O.A.L. (Growth Opportunity Alliance of Lawrence). Other HP engineers and managers took courses in QFD from A.S.I. (American Supplier Institute). G.O.A.L., A.S.I. and the American Society for Quality Control co-sponsored the symposium. *—Peggy King, West Coast Editor.*

HP Granted Distribution Rights To Aldon Products

Productivity And Quality Assurance Tools Used Companywide

Hewlett-Packard and Aldon Computer Group signed an agreement granting HP a companywide, internal license to use HARMONIZER and S/COMPARE, adding to a previous agreement for companywide use of COMPARE and ANALYZER.

This agreement allows HP internal distribution rights for these Aldon products for use by any of its divisions.

HP sites will be able to use the productivity and quality assurance tools to create an audit trail of all changes made to source programs, apply local custom changes to new releases of applications software and assist in debugging by identifying differences between versions of programs.

For more information, contact Aldon Computer Group, 428 13th St., Suite 500, Oakland, CA 94612; (800) 825-5858 or (415) 839-3535.

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Note: *If you have any questions regarding a Hewlett-Packard announcement mentioned in* ***News & Trends****, please contact the Hewlett-Packard sales office listed in the white pages of your telephone directory.*

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ServerJet II Expands Ability Of LaserJet II

ASP Computer Products Inc. has released the Turbo version of ServerJet II, a network that expands the capabilities of the HP LaserJet Series II printer by allowing five computers to access the printer simultaneously. Data received from the computers is stored in the ServerJet's own internal memory (256K, expandable to 512K or 1.25 MB), then sent to the printer on a first come, first serve basis. Users can download print jobs and free up their computers even when the printer is printing another document.

The Turbo version incorporates an advanced utility that allows standard serial ports to transfer data at 57,600 baud. With this feature, several users can transfer serial data at a speed comparable to that of a parallel port, in effect overcoming parallel distance limitations. The turbo ServerJet allows multiple users to share the LaserJet at long distances.

The SimpLAN ServerJet II is a user installable board and plugs directly into the "Optional I/O" slot at the back of the HP LaserJet II printer. No user training is required; each user operates as if directly connected to the printer. Cost is $495.

Contact ASP Computer Products Inc., 1026 W. Maude Ave., Suite 305, Sunnyvale, CA 94086; (408) 746-2965.

Circle 383 on reader card

RQM Gage Enhances RQM Software

Automated Technology Associates (ATA) has announced RQM Gage systems, a preconfigured, drop-in version of ATA's Real-time Quality Management (RQM) software, for the HP 9000, Series 800 and 300 computers.

In addition to the drop-in data acquisition options for gaging and simple device applications, RQM Gage includes all the standard RQM features for alarming, exception reporting, data management, information system and analysis. Other features include, reproducibility and repeatability studies, process capability studies, first article inspection, regular production control checks, machine maintenance management, periodic part checks and process change control management.

Contact ATA, 9000 Keystone Crossing, Indianapolis, IN 46240; (317) 573-9000.

Circle 400 on reader card

SASI Offers Finite Element Analysis Program

Swanson Analysis System Inc. (SASI) has made the ANSYS finite element analysis program on 80386-based personal computers. The entire range of capabilities of this software previously ported only to workstations, minicomputers and mainframes and in subsets to PCs will be available. The lease price will be less that $1,000 a month.

SASI will be releasing the latest update of the ANSYS program, Rev. 4.4 on the PC. A range of features, including nonlinearties, magnetics, composites, coupled filed analyses, the entire element library and the enhanced user interface will all be present.

Preliminary testing indicates the minimum configuration needed to run the ANSYS program on a PC will be a 80386-based system, a math coprocessor, a parallel printer port, PC DOS or MS-DOS (Rev 3.3 or 4.0) a minimum of 4MB memory and a minimum hard disc size of 40MB. Personal computers that currently offer this configuration include IBM PS/2, Model 70 and above, COMPAQ DESKPRO 386 the HP Vectra and compatibles.

Contact Swanson Analysis Systems Inc., Johnson Rd., P.O. Box 65, Houston, PA 15342-0065; (412) 746-3304.

Circle 382 on reader card

Q-Calc RealTime Aids Application Development

UniPress Software Inc., a UNIX system software developer and distributor, has released Q-Calc RealTime, a real-time spreadsheet designed as an easily integrated module for real-time application development. Q-Calc RealTime users working in UNIX and XENIX workstation environments receive instantaneous second-to-second updates in cell values from an electronic online data source, allowing them to continuously monitor new financial data, automatically calculate new values and receive alert messages.

For MIS/DP departments or VARs who need to create real-time applications, Q-Calc RealTime is an easy-to-integrate-building block. RealTime provides the familiar Lotus-like interface to users and accepts both Lotus-developed files and macro libraries. It provides graphics as well as Lotus style keystrokes and screen display. By posting electronic dataline information, Q-Calc RealTime provides users with a spreadsheet that's current at all times and can be used both for analysis and as a monitor.

Priced from $1,495 per workstation, Q-Calc RealTime is available from UniPress for the HP 9000/300 workstation.

Contact UniPress Software, 2025 Lincoln Hwy., Edison, NJ 08817; (201) 985-8000.

Circle 397 on reader card

MacPrint 1.1 Supports HP Printers

Insight Development Corp. announced MacPrint 1.1, an upgrade to its MacPrint device management software that adds full support for HP DeskJet, DeskJet Plus and LaserJet Plus printers, as well as providing increased paper handling and font support.

This version provides all supported printers with the capability to print envelopes and print in landscape mode. In addition, it includes four fonts designed and licensed by Agfa Compugraphic. Ranging in size from nine to 96 points, these fonts are equivalent to Time, Helvetica, Courier and Symbol. MacPrint also includes Font Mapper, which creates Macintosh screen fonts. These fonts match the printers internal fonts, all HP font cartridges and third-party font cartridges. MacPrint can be used with the Macintosh Plus, Macintosh SE and Macintosh II the product is also capable of driving the LaserJet Series IID and the LaserJet II printers.

Contact Insight Development Corp., 2200 Powell St., Suite 500, Emeryville, CA 94608; (415) 652-4115.

Circle 396 on reader card

Tektronix Offers Fourier Analyzer

Tektronix Inc. has released the 2622 Personal Fourier Analyzer. Designed for analysis of signals up to 20 KHz, the 2622 provides complete signal acquisition and processing. It offers many of the advanced analysis features of Tektronix' 2630 Personal Fourier Analyzer in a compact and affordable package.

Using the PC as a smart terminal, the 2622 combines the PC's high quality, low-cost color graphics, keyboard and mass storage with its own dedicated signal processing hardware and software. This produces a high-quality measurement system with measurement performance that's totally independent of the PC being used. It also allows the PC to provide a interactive user interface using only a standard RS-232 link with the 2622.

The 2622 provides turn-key spectrum, frequency response (network) and waveform analysis of analog signals. Price $7,950.
Contact Tektronix Inc., 1350 Dell Ave., Suite 104, Campbell, CA 95008; (800) 234-1256.

Circle 378 on reader card

Rack-Mounted Electronic Loads Tester From Kikusui

Kikusui International's new PLZ Series Electronic Loads can be customer-configured to test multiple-output switching power supplies, batteries, capacitors and process control I/O ports.

The rack-mounted loads are specially configured for system applications and/or where sliding resistors and other conventional loading devices are unsuitable or fail. A single-rack-mount, for example, accommodated up to eight 50-watt, four 150-watt, two 300-watt or various combinations. Depending upon the current capability, input voltages may range from less than 2.2V to 60 V. The rack mount frame includes fans and a power supply control unit.

Protection circuits guard against overvoltage, over current, overpower, overheating and reverse input connection. Built-in alarm lights flash when the protective circuitry operates and produces an output signal.

The constant current, constant voltage and constant resistances modes may be remotely controlled using external voltage. Computer control is available using GPIB bus (IEEE 488-1978) option.

Input power requirements are 115/230 VAC, 50/60 Hx single phase. Power consumption is approximately 12 VA.

Price depends upon the particular configuration and options. Process start at $455 for the PLZ50WU (50 watts), $950 for the PLZ150WU (150 watts) and $1,430 for the PLZ300WU (300 watts). A rack mount frame, required equipment, is priced at $490.
Contact Kikusui International Corp., 19601 Mariner Ave., Torrance, CA 90503; (213) 371-4662 or (800) KIK-USUI.

Circle 365 on reader card

Intelligent Interfaces' MicroPrint 45H Interface Converter.

PING/3000 XL Monitors System Performance

Strategic Systems Inc. (Seattle, WA) has released another component of its Performance Tool Box, PING/3000 XL a system performance monitoring and logging tool.

This product offers you the ability to monitor overall system performance on MPE XL based systems. The product is positioned as an entry-level online monitor and features a subset of screens offered by SSI's PROBE/3000 XL product.

PING/3000 XL operates on all MPE XL operating systems on the full range of machines from the Series 925 to the Series 955 running on operating system versions A.10.17 and greater.

A Global Overview Display, Process Overview Display and Process Detail Display are provided to assist the PING/3000 XL user in isolating system and process bottlenecks.

Logging of information can occur with the product executing in batch mode. Log data can then be used by SSI TREND/3000 tool to generate graphic trend analysis reports.

PING/3000 XL is priced according to CPU size with licensing fees ranging from $995 on the Series 925 to $1,795 on the Series 955.
Contact Strategic Systems, 11050 5th Ave. NE, Suite 101, Seattle, WA 98125; (206) 362-2231.

Circle 389 on reader card

MicroPrint 45H Connects PCs To HP Peripherals

Intelligent Interfaces Inc., announced the availability of its MicroPrint 45H Interface Converter that permits computers with a standard parallel printer interface to connect to devices with an HP-IB interface. Now, PC users with IBM, NEC, Epson and other compatibles, or high-end 286/386 workstations can use HP printers and plotters without plug-in cards, hot keys or other tricks that result in system crashes. The unit is available for $199.
Contact Intelligent Interfaces Inc., P.O. Box 1486, Stone Mountain, GA 30086-1486; (404) 381-9891 or (800) 842-0888.

Circle 367 on reader card

Cascade Assists Project Management

Project Systems Consultants Inc. has released Cascade, an interactive, graphics-based workstation tool for project management and performance measurement.

Cascade uses graphic or menu-driven commands and displays any number of screen windows for direct comparison of data. Cost and schedule data can be held in the database and presented at any level of detail in the form of a work breakdown, organization breakdown or cost breakdown structure. Cascade then displays relationships, tracks performance and produces reports on work scope, organization, estimates, budgets cost accounts, schedules and earned value.

Cascade specializes in support of the cost/schedule control system criteria based on the U.S. Department of Defense guidelines for managing major government projects. It's written in C and is based on the UNIX-operating system and Oracle relational database, with X-window Version 11 as the graphical interface. Cascade is currently available on HP 9000/300, HP 9000/800. Contact Project Systems Consultants Inc., 2450 Fondren, Suite 300, Houston, TX 77063; (713) 974-1155.

Circle 394 on reader card

TEI Provides Graphic User Interface

Technical Economics Inc. (TEI), developer and marketer of the VMS and UNIX system based VUE Project Management System, has announced a graphic user interface that provides pull-down menus and pop-up windows for users of both graphic and non-graphic terminals.

The VUE Project Management System is designed for both beginning and experienced project managers. Users can begin entering project information and generating reports immediately. By automating their schedules, VUE allows users to see the impact of updates and make revisions as often as needed. VUE's multiproject capabilities enable users to consolidate multiple projects for standardization across organizational boundaries. Summary reporting allows management to choose the level of report detail across multiple projects. VUE highlights critical from non-critical activities throughout its report and indicates available float time for each activity. VUE also offers resource leveling, a custom report writer, Postscript laser printer support and an advanced cost module.

VUE runs under MS-DOS, UNIX and MS operating systems and has file transfer capabilities. VUE is available on a 30-day trial basis.

For more information contact Technical Economics Inc., 1650 Solano Ave., Berkeley, CA 94707-; (415) 525-7774.

Circle 380 on reader card

PowerHouse PC Supports LANs

Cognos Inc. has introduced new versions of PowerHouse PC that support LANs and additional host communications.

The new versions of PowerHouse PC, an application environment for the IBM PC/AT and compatibles and 386-based run on networks supporting the OS/2 LAN Manager from Microsoft and the MS-DOS-based PC LANs including Novell, 3Com, Ungermann-Bass, Banyan and the IBM Token-Ring based products.

PowerHouse PC LAN support offers a number of benefits, including the ability for multiple users to jointly develop application and share PowerHouse applications and files across Digital, Data General and HP midrange systems. The locking feature of the product automatically preserves data integrity.

The new DOS EXT single user version gives PowerHouse PC users the ability to access up to 16 MBs of memory. This allows users to concurrently operate Terminate, Stay Resident (TSR) programs with PowerHouse PC providing a more highly integrated PC application environment.

Contact Cognos Inc., 3755 Riverside Dr., Ottawa, Ontario K1G 3Z4; (613) 738-1338, ext. 4306.

Circle 377 on reader card

Information Management Problems Solved With CMF

Expertware Inc. announced release 3.0 of the Configuration Management Facility (CMF). This release is a functional upgrade incorporating enhanced database security options, additional automated version and release reporting capabilities and direct user interface and documentation management capability.

CMF provides a solution to information management and release problems. The product supports the management and control of software, hardware, logistical information and documentation. CMF integrates traditional configuration management functions with problem reporting and tracking, baseline and release management capabilities, flexible and integrated templating, form management support and automated documentation directly from the controlled files of CMF. It operates on all versions of UNIX and VMS platforms.

Contact Louis M. Picinich, Expertware Inc., 3235 Kifer Rd., Suite 220, Santa Clara, CA 95051-0804; (408) 746-0706.

Circle 398 on reader card

Faxlink Automates Telefax Communication

Minisoft Inc. is offering Faxlink for the HP 3000.

Through Faxlink, anyone performing any type of work task can effectively communicate by using telefaxes.

Features include, terminal entry of fax messages, programmatically sending fax messages, retransmission of a message if a transmission fails, notification of status to the send via HP Desk, ability to send one message to several recipients, hard copies of messages provided if desired, printing of logos or other info on faxes, faxes sent to recipients are letter quality, multiple outgoing fax lines can be configured and send fax messages from HP Desk Manager.

Contact MiniSoft Inc., 16315 NE 87th, Suite B101, Redmond, WA 98052; (206) 883-1353.

Circle 386 on reader card

DBAUDIT Helps Keep Tabs On Database Transactions

Robelle's DBAUDIT is intended to help system managers keep tabs on HP 3000 database transactions through use of Image logfiles. You can use it to monitor a specific user, a troublesome dataset, a dial-in terminal port, or a suspect application program, and see just what changes are being made to your databases. Because transaction dumps can be sorted by up to five keys, including dataset field values, you can use the as audit reports instead of writing custom programs.

Highlights of version 1.9 include: extract command copies transactions into MPE files, commands may be continued using & at the end of the line, set command to delete portions of the report's summary statistics, pause and display commands to annotate use files and more.

DBAUDIT is compatible with MPE XL and logfiles generated by Turbo IMAGE/XL. Contact Robelle Consulting Ltd., 8648 Armstrong Rd., R.R. #6, Langley, B.C. Canada V3A 4P9; (604) 888-3666.

Circle 379 on reader card

Continued on page 86.

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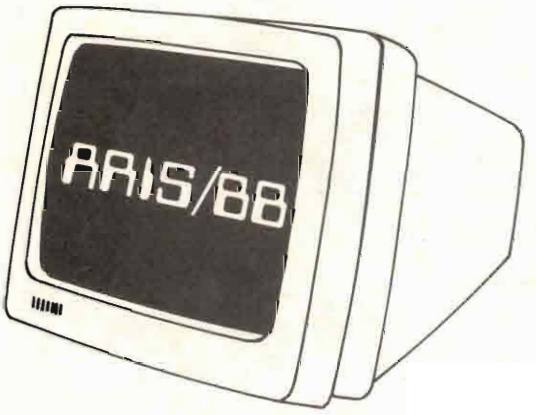

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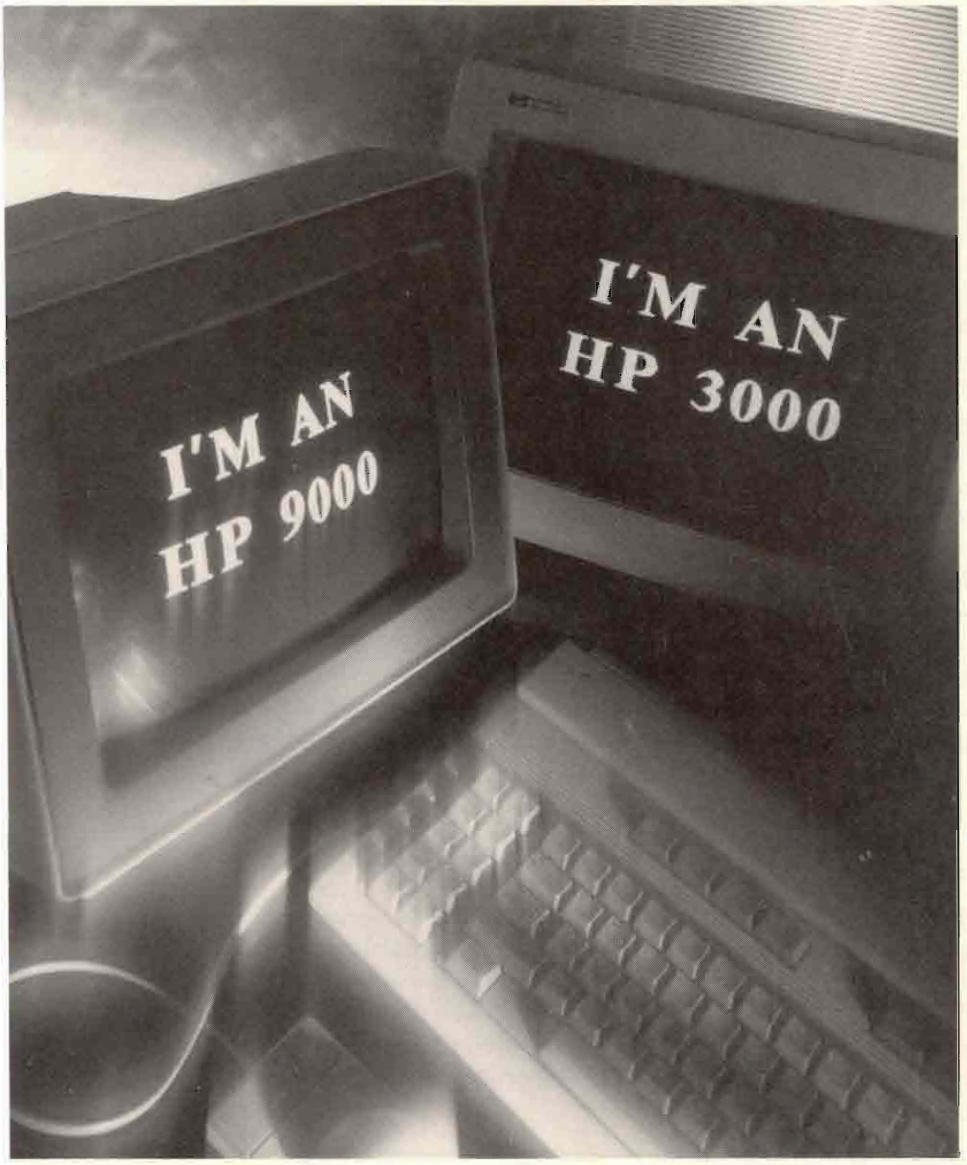

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There Is A Better Way

CIRCLE 237 ON READER CARD

CAE Tools For Engineers In The Fast Lane

DRIVING SPICE

[BY KIM G. HELLIWELL]

Engineers wishing to simulate analog circuits historically have turned to a version of SPICE (Simulation Program For Integrated Circuit Emulation) and used it as a standalone design aid. However, in many ways, using SPICE alone is like trying to get to your destination by using a car's engine—without the rest of the car.

Today's advanced CAE systems, on the other hand, give engineers a complete design vehicle that is easy to control and capable of going the full distance, quickly and efficiently.

No one can argue the importance of SPICE in the evolution of circuit design. In fact, versions of the original Berkeley-developed program are used as the core of even the most advanced CAE systems. But in these systems, SPICE is used strictly as the simulating engine, completely transparent to the user.

Advanced analog CAE systems function in the same way the engineer always has worked: First the schematic is pieced together, then the design is tested with familiar bench instruments. However, the latest tools go even further. They allow the engineer to analyze designs in greater detail, and with greater variation, than could be done with standalone SPICE or normal bench instruments.

Traditional Methods

MANY ENGINEERS STILL are simulating circuits using SPICE on a mainframe or supercomputer. In doing so, the engineer must deviate from normal circuit design methods. Before performing simulation, the circuit must be converted into a complex net list format. This is a tedious process. All nodes on the circuit must be numbered, then a file has to be created to describe how the circuit's components are connected. All of this is done using the computer's operating system and a text editor. These activities bear

little resemblance to the familiar steps taken in the design of a circuit. The level of detail required for the accurate simulation of analog circuits using standalone SPICE may overwhelm the novice user. A model of a bipolar transistor, for example, can have 42 parameters, only a few of which can be gathered from data sheets or measured information.

> The efficiency and usefulness of the computer-based tool is affected by the presentation of output as much as the ease of input processes.

Entering the net list is time-consuming. In the simulation of a typical analog circuit, as much as 70 percent of the total simulation time can be spent creating the net list. Because of the complexity of the format required, entry errors are common, and one wrong node could result in the unpleasant discovery that a simulation left to run all night was a wasted effort. Because every circuit description entered in code has to be checked, finding errors is difficult.

The lack of models also has been an inhibiting factor for engineers using SPICE alone. (There are no existing characterized devices available for SPICE 2, for example.) Circuit parameters must be characterized in great detail to approximate the circuits behavior as closely as possible. Once these parameters have been entered, they're difficult to modify, and even minor changes in certain parameters may diminish the accuracy of the simulation.

In any computer-based tool, the efficiency and usefulness of the tool is affected by the presentation of output as much as the ease of input processes. The output generated by SPICE comes in the form of raw numerical data, which is difficult to analyze and discuss with other engineers.

It's possible to obtain line-printer plots of SPICE simulations. But circuit measurements are difficult to make on these plots and accuracy can be affected by the resolution of the plot. The linear interpolation used in generating a line printer plot — a form of numerical aliasing — often obscures the fine details of transient behavior. An engineer not expecting to see these details might assume that they don't exist if they aren't apparent on the first plot. If the engineer is looking for this kind of detail, it could take several resimulations, each with a different resolution, to reveal the expected waveform.

At some point in the simulation process, engineers discover one of the major problems with public domain simulation tools: lack of support. Unlike the CAE tools developed by private companies, SPICE is offered strictly as an unsupported program.

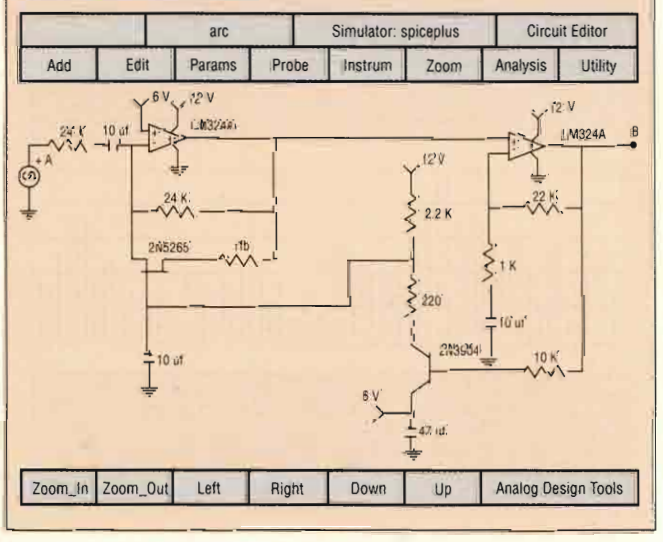
Of all the differences between standalone SPICE and today's CAE design systems, the user interface is the most obvious. As is typical of many early computer-based tools, the mainframe program forces the engineer to deviate from proven, familiar design processes to create a representation of the design that the computer will understand. This acts as a barrier between the engineer's knowledge and experience.

Advanced Design Tools

THERE ARE MANY SPICE enhancement programs available today, each of which has solved several of the problems encountered by the designer using standalone SPICE. However, state-of-the-art analog design tools go beyond SPICE. Although the simulator is used by the system, the user doesn't interact with it directly.

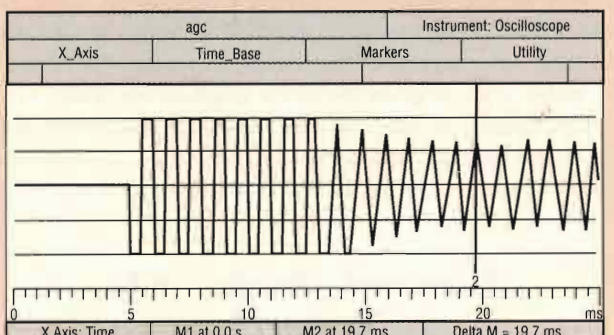
Utilizing an advanced CAE system, the engineer first uses a circuit editor and a mouse to sketch the circuit on the workstation display and assign voltage and current probes (see *Figure 1*). Designers select components from a simple menu,

Figure 1.



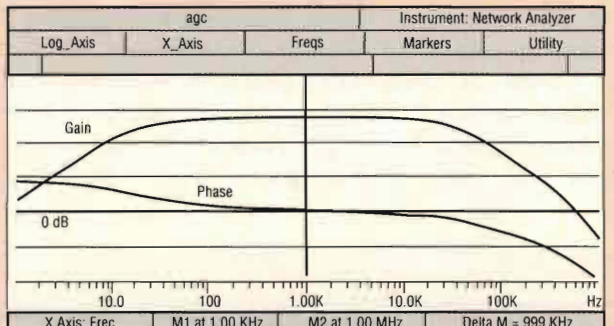
Using a menu and a mouse, components quickly can be pieced together as they are here for this automatic-gain-control (AGC) circuit. This becomes the breadboard to which probes are attached for testing and analysis.

Figure 2a-c.



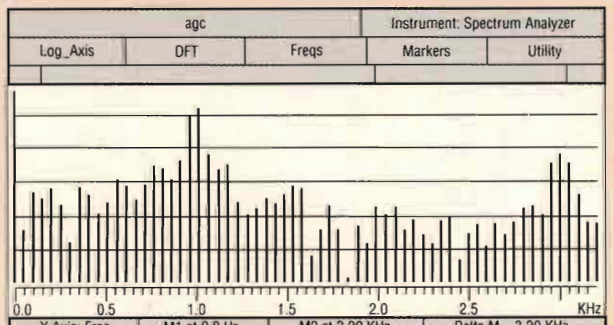
X Axis: Time	M1 at 0.0 s	M2 at 19.7 ms	Delta M = 19.7 ms

			Font	Display	Scale/div	Func	Value
1	Scope Set	OFF	-1-	B	5.00 V	MAX M1-M2	10.0V
2	Scope Set	OFF	-2-	A	200 mV	M2	-456mV
3	Scope Set	ON	-3-	B	2.00 V	M2-M1	2.51 V
4	Scope Set	OFF	-4-			OFF	



X Axis: Frec	M1 at 1.00 KHz	M2 at 1.00 MHz	Delta M = 999 KHz

			Font	Display	Cmplx	Scale/div	Func	Value
1	Net Set	ON	-1-	B	MAG	10.0 dB	3dB BW	44.5 KHz
2	Net Set	ON	-2-	B	PHASE	90.0 deg	M1	-181 deg
3	Net Set	ON	-3-		MAG		OFF	
4	Net Set	OFF	-4-		MAG		OFF	



X Axis: Freq	M1 at 0.0 Hz	M2 at 3.20 KHz	Delta M = 3.20 KHz

			Font	Display	Cmplx	Scale/div	Func	Value
1	Spec Set	ON	-1-	scope	MAG	10.0 dB	OFF	
2	Spec Set	OFF	-2-	scope	MAG	10.0 dB	OFF	
3	Spec Set	OFF	-3-	scope	MAG	10.0 dB	OFF	
4	Spec Set	OFF	-4-	scope	MAG	66.6 dB	OFF	Data N/A

Simulated bench instruments allow engineers to make complex measurements of circuits. Instruments offered include an oscilloscope (top), network analyzer (middle) and spectrum analyzer (bottom).

the system automatically displays the standard symbol for each component and prompts the designer to enter component values. Component symbols are moved easily to their proper position and connected to other components using the mouse. The net list is created automatically by the simulator embedded in the system. The circuit drawing then becomes the breadboard to which the engineer attaches familiar test instruments for time and/or frequency domain measurements (see *Figure 2a-c*).

Frequency sweepers and network analyzers carry out frequency domain tests. Function generators and oscilloscopes are used to perform time domain tests. Dc multimeters obtain dc voltage and current values, and spectrum analyzers measure the harmonic content of a waveform. The instrument display windows in CAE systems function like real test instruments. Any setup that appears on the screen can be modified instantly using these simulated instrument displays.

The simulator is accessed transparently through these instruments. To obtain analysis results, the designer simply instructs the software to start analysis. Specified tests are performed and results are displayed on the screen. Multiple windows allow the designer to examine results on the display instruments while keeping the circuit diagram in view.

In-Depth Analysis

OTHER ANALYSIS TOOLS BUILT into advanced CAE systems perform tests that would be impossible using standard test instruments and breadboards. Statistical analysis tools can include a Monte Carlo analysis function and a sensitivity/worst case analysis tool. Using these tools, the designer attaches instruments to the circuit, assigns new or changed tolerances to components, saves the values and immediately runs a statistical analysis.

The Monte Carlo Analysis function in these design packages graphs the combined effect of variations in component tolerance on the performance of a circuit. The sensitivity tools determine the sensitivity of circuit performance to changes in the value of each individual component and then calculate worst-case conditions.

Both passive component values and semiconductor parameters can be given tolerances and then, using statistical tools, the effects of these variations can be analyzed. "What if" analysis is one of the most powerful concepts introduced by computer modeling. Performing a number of these types of analyses is too time consuming to be practical when using standalone SPICE. In fact, many of the analyses that an advanced CAE system can perform are beyond the capability of standalone SPICE. New parametric plotting tools, for example, make it possible to easily vary circuit parameters over an arbitrary range and quickly see graphs of the resulting curves. The designer uses pop-down menus to define and vary

parameters, such as component values (resistors and capacitors) and power supply voltages. It's also possible to modify device parameters, including Beta or Vbe mismatch. The plots produced by a parametric plotter can graph voltage versus voltage, rise time, overshoot and bandwidth measurements, among others.

Another useful instrument available in today's analog CAE packages is a safe operation analysis tool, which makes it possible for the engineer to simulate the actual operating constraints of real circuits. This goes a step beyond the simple functional descriptions of components that most simulators offer. The operating conditions of all components, including passive components and semiconductors, can be determined. Maximum operating conditions for semiconductor devices are stored in device model libraries. If a circuit element exceeds safe operating conditions, the software alerts the designer graphically in the schematic editor window that the component will fail.

Model Device Libraries

THE BREADTH AND DEPTH of a model library make all the difference in an analog CAE system. There are thousands of discrete devices and many more integrated circuits available than a designer actually needs. Because it's impractical to characterize each of these components, CAE vendors have provided a broad range of devices, accurately characterized and modeled that the user may easily modify. Many packages allow the engineer to use a mouse, menus and the keyboard to assign new model values and tolerances.

For example, a designer could use a JFET from a CAE library to create a new JFET with a voltage threshold that is 50 percent higher than the original JFET in the library. To build the new JFET, the engineer would use the first JFET as a template and enter 1.5 x DEF for the value of VTO (where DEF is the device currently defined in the model library).

The designer also may want to define special subcircuits for use as building blocks in subsequent designs. A new circuit can be created and assigned a new symbol using a prestored set of symbols supplied with the CAE system or specifically created by the user. Once the new subcircuit is created, it can be used in new circuits in the same way as other modeled devices.

Accuracy of models is essential to the designer working on analog circuits. CAE software manufacturers assure accuracy by checking simulated results against manufacturer-supplied data. Device models now offered by CAE system manufacturers can include diodes, bipolar transistors, CMOS transistors, JFETs, MOSFETs, voltage reference diodes, voltage regulators, sample-and-hold amplifiers, optocouplers, op amps, controllers, comparators, buffers, analog switches, function blocks and logic devices.

Device data books offered by CAE vendors, which show the performance of simulated devices, are a useful design tool. The data on each device includes maximum operating conditions, thermal characteristics and the plots of characteristic curves. Controllers are shown in simulation with other circuits in controlled conditions. The curves shown are equivalent to those given in data books for actual circuits. The designer can compare a real data book to the CAE device data book to check accuracy limitations.

Integration With Other Simulators

THERE ARE VARIOUS SIMULATORS available to engineers, each with a special set of strengths and weaknesses. In addition, many companies have developed their own simulators. It's a waste of time, effort and knowledge for an engineer to discard an in-house simulator if many years have been invested in its development. (Of course, sometimes its appropriate to upgrade an older simulator.) In any case, advanced CAE systems often can be integrated with a variety of simulators. Simulation integration kits are now available that allow an existing simulator (in-house or commercial) to be integrated with the advanced user interface, analysis tools and model libraries provided by the CAE company.

Intuitive Design

STANDALONE SIMULATORS DO LITTLE to amplify the conceptual and intuitive strengths of analog designers. In fact, they tend to cloud the design process and burden the designer with detail work. Advanced analog CAE tools are designed to take advantage of the designer's ability to see circuit behavior on the workstation display in the same way that it exists in the designers mind. Because advanced CAE systems allow circuit behavior characteristics to be changed easily, the designer can go with the flow when pursuing an optimum design, rather than be interrupted with tedious tasks during the design process.

Today's analog CAE tools have taken the struggle out of using SPICE. The engineer can use familiar methods to design and test a circuit in a software-based system, while maximizing the processing power of SPICE. The new CAE tools also give the engineer analysis capability that couldn't be obtained with previous methods, while maximizing the investment made in existing CAE tools. *—Kim G. Helliwell is manager of simulation development at Analog Design Tools, Sunnyvale, CA.*

Selecting The Right Application

Computer Graphics

[By Danielle Forsyth]

Computer graphics is changing the way people interact with their desktop workstations. Graphics systems are being used to simulate real world objects and virtual events in the virtual world of the computer screen. The user interface is becoming an increasingly large part of applications and using more and more of the system processing power for graphic manipulations. Computer graphics are making systems easy to use, eliminating costly prototypes, giving users access to a world not previously accessible to them.

Several forces have converged to accelerate the demand for graphics workstations. First, computing power continues to increase while the price of processing continues to decrease. Graphics subsystems provide these increasingly powerful desktop systems with the graphics processing power previously reserved for research systems.

For example, 3D graphics workstations, priced at $65,000 only a year ago now are available for under $15,000. Second, the price of associated graphics peripherals — plotters, scanners, laser printers and storage continues to decline. Finally, dramatic improvements in graphics software provide more realistic images that can be manipulated faster and easier than ever before. The increased affordability and power of computer graphics has, in turn, spawned more complex applications and even greater demands from users for a wide range of graphics applications and systems addressing the complete spectrum of price/performance options.

Evaluating systems that will be able to meet your short-term and long-term graphics requirements is not an easy task. As graphics become more and more

important in application performance, users need some way of evaluating graphics performance. Vectors and polygons-per-second don't always provide an accurate view of application performance. This article is intended to acquaint you with graphics terminology and help you to evaluate graphics systems that will meet your application needs.

HP HAS BEEN PRODUCING graphics workstations for approximately 10 years, starting with the 9845C in 1978. At that time, the term "workstation" had not been coined. HP continued to develop new products and now has a very complete range of graphics workstation products for a wide range of applications (*see Figure 1*).

The SRX and TurboSRX 3D graphics accelerators are provided in external boxes. Both products come in a range of configurations for different applications. The graphics subsystems run on a range of processors from the HP 9000 Series 300 and 800 HP-UX product families.

HP graphics workstations have a range of devices used for input and output. These include digitizers, scanners, keyboards, track balls, printers, plotters and video.

In order to choose the CPU and graphics subsystem that are most appropriate for you, you must evaluate which systems are supported by the application software that you want to use. Once you have done this, you must evaluate which systems provide the capability that you want at a price that

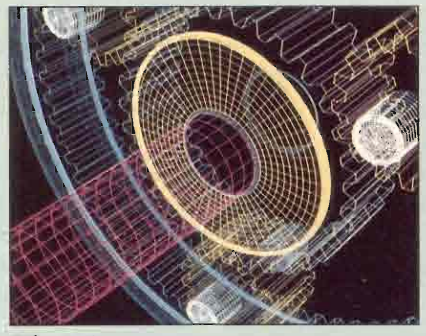


Photo 1.

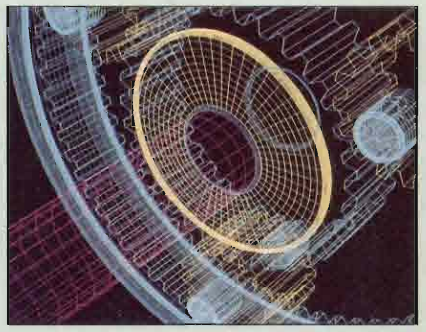


Photo 2.

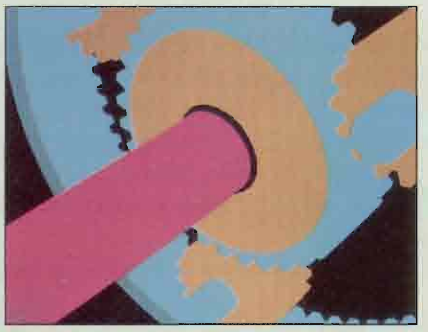


Photo 3.

Photo 4.

Photo 5.

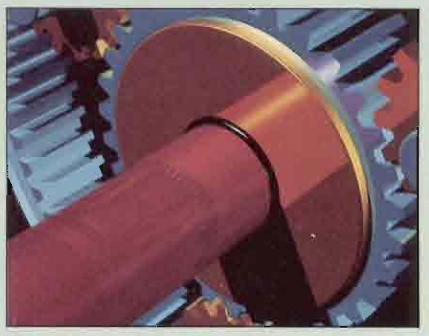


Photo 6.

[GEARS SEQUENCE]

These gears were created using HP's ME-30 Mechanical Design software. Different attributes were added to provide the user with a more realistic view of what the model would look like.

1. The first image is a wireframe representation. It's difficult to understand exactly what the model will look like.
2. In this image, depth cuing, a technique that gives the viewer the perception of depth has been added. The lines that are further from the viewer appear to be dimmer.
3. Flat shading has been added. Now the object is "solid." Flat shading applies a single color and intensity for each polygon.
4. A single light source has been added. At this point, the object is much more realistic looking but the color differences between polygons are visible.
5. Gouraud shading has been turned on. Gouraud shading is a much more complex shading technique. The shading for each pixel within a polygon is now calculated. By using this shading technique, the user is able to see a very realistic view of what the object would actually look like if it were to be manufactured.
6. Now the gear has been Ray Traced. Ray Tracing is an advanced rendering technique that is used to calculate reflected, refracted and transmitted light in a scene.

> To choose a CPU and graphics subsystem you must evaluate which systems are supported by the application software that you want to use.

you can afford. Some applications are ideally suited for 2D while others require 3D. Over the last several years, application suppliers have made more and more extensive use of the graphics capability. Some applications are migrating from monochrome to color, others from 2D to 3D. Almost all applications are making more extensive use of graphical user interfaces.

Graphics hardware is critical to graphics workstation performance but graphics and user interface software play a key role in performance, availability of applications, integration into a multivendor computing environment and ease of use.

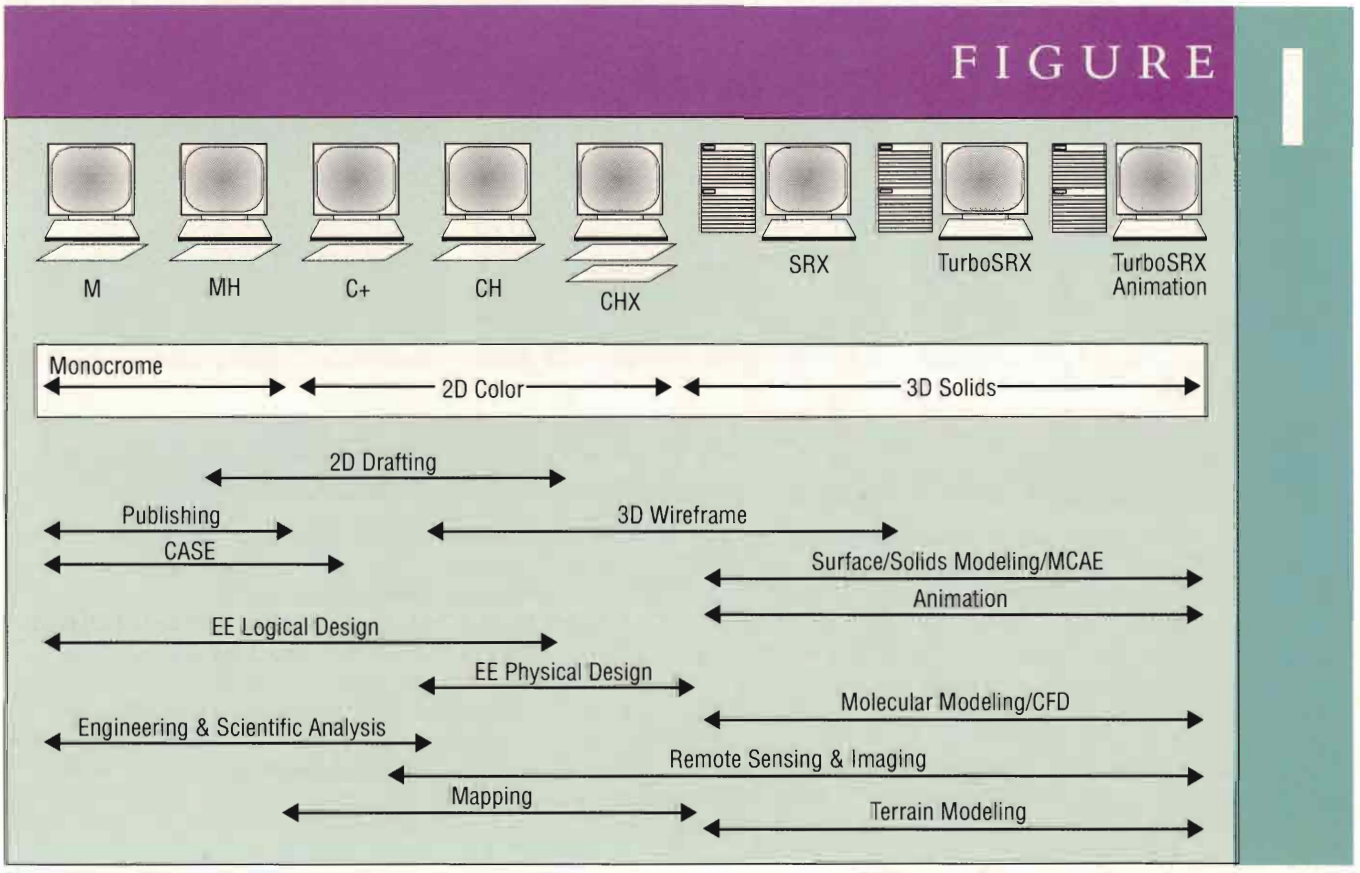
HP has developed easier-to-use workstations and is driving development of X windows and OSF/Motif, emerging user interface standards. HP also is driving graphics library standards. The interface between the graphics workstation hardware and the application is referred to as the Application Program Interface (API).

How Are Computer Graphics Created?

PICTURES ARE CREATED BY using an application package. The application package translates the data that is input by the application user into graphics *primitives*. Primitives are basic shapes used to construct graphical objects. Different applications use different primitives. *Figure 2* shows a list and description of some graphics primitives.

Primitives are used by the application to create the picture. But in order to make the picture look realistic, you need to be able to specify *attributes* for the picture. Simple attributes include color and line type. More complex attributes include

FIGURE 1



HP's complete range of graphics workstations.

SAYS WHO?

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lighting, shading and shadows. The sequence of images on page 33 shows the model that was created. After the model was created, attributes were added.

Once all of the attributes have been added, the picture is described as *rendered*. Rendering is most often used to describe the process of making a picture look realistic. In these images different attributes have been added until the image looks very realistic.

Trends in Graphics Workstations

PERFORMANCE OF WORKSTATION CPUs and graphics subsystems have continued to increase at an incredible rate. In addition to these performance increases, the quality of graphics has improved and realistic 3D graphics are now available at affordable prices (*see Figure 3*).

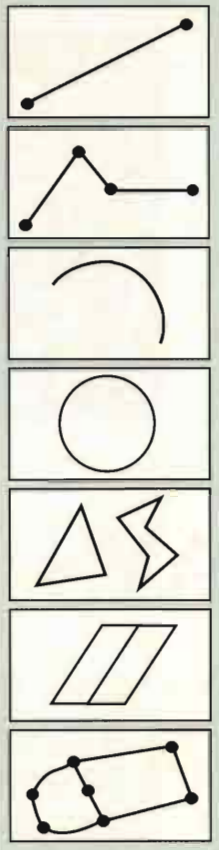
Realism is often achieved with little to no performance penalty since the calculations are done in the graphics subsystem. One of HP's performance features is its 2D and 3D graphics systems that offload the graphics calculations (the calculation of the primitives described earlier) to the graphics subsystem. This allows the application user to choose the processing power and the graphics subsystem which are most appropriate for their application. In addition, HP calculates many of the attributes in the graphics hardware. This allows the user to get the performance needed without compromising the quality of the image. In 3D graphics, realistic models are required to make good design decisions. Scientists require accurate models, motion and the ability to input data from scanners, satellites, supercomputers and mainframe systems. In 2D graphics, interactive speed is an absolute requirement.

EVALUATING GRAPHICS WORKSTATION performance is difficult. A graphics workstation is composed of many pieces and each application will utilize the different workstation components in a different way. The four critical elements to hardware performance are:

- processor performance (CPU)
- graphics subsystem performance
- system I/O, local discs, peripherals
- network performance

Obviously, evaluating CPU performance alone will not provide the user with a good understanding of system performance. An understanding of overall hardware performance is essential. But, an understanding of the hardware performance is not all that matters. The application performance is really the critical measure and application performance depends on hardware performance, software performance (graphics library, user interface, compilers and operating system) and the way that the application software is written. The only way to evaluate and compare graphics workstations is to compare application performance. Benchmark numbers do not describe the entire system performance and most benchmarks are done on the CPU alone. New benchmarks are currently being developed for graphics systems which should give users a much better understanding of graphics performance. It is essential to look at graphics performance on graphics intensive applications — and most applications are making more and more extensive use of the graphics system.

FIGURE 2



Vector: A line connecting two points. Vectors are used in the creation of 2D models.

Polyline: A series of connected vectors.

Arc: Part of a circle.

Circle: A polygon where every point is equal distance from the center point.

Polygon: A bounded area with greater than 2 sides.

Mesh Primitives: Multiple polygons sharing at least one side in common. Mesh primitives allow less data to be stored and manipulated.

Non-Uniform Rational B-Splines (NURBS): A relatively new technique used to accurately model the surfaces of an object using control points. The control points can be easily manipulated. The data storage requirements and manipulation time are drastically reduced by using NURBS. NURBS are supported by some leading 3D mechanical engineering software suppliers.

Evaluating Graphics Performance

GRAPHICS SUBSYSTEMS HAVE changed over time. Originally they were used simply for the display of data or models. Now, graphics subsystems display the models and do many of the graphics calculations. These complex calculations can be offloaded from the CPU to the

> Graphics and user interface improvements are changing how people interact with their systems.

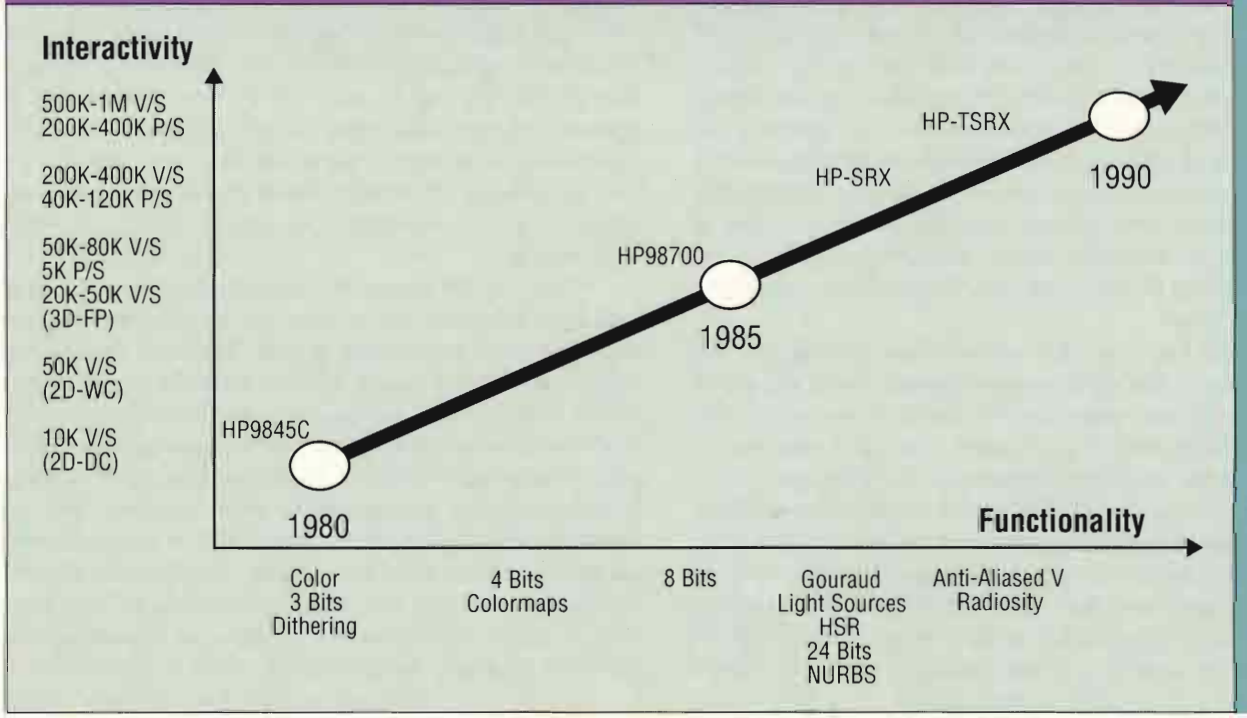
graphics subsystem to free the CPU to do tasks that it is tuned to do, while the graphics subsystem performs the computation intensive graphics operations. Application suppliers who utilize this capability see dramatic performance improvements. These performance improvements and the ability to see accurate, realistic models are being demanded by graphics application users.

Since graphics systems are capable of doing calculations (calculating primitives), graphics workstation vendors typically specify performance in terms of the number of vectors or polygons that a graphics system can draw. These are predefined vectors and polygons though. It is very difficult to translate these generic performance numbers into graphics performance for your application and data. Most users need longer vectors, many sided polygons and attributes that are not specified in the benchmarks. In order to get a more accurate understanding of application performance for graphics intensive applications, several vendors have joined together to endorse NCGA's Performance Measurement Software. This software was developed through the Graphics Characterization Project — a joint project among HP, DEC, IBM, Apollo, Intergraph, Silicon Graphics, Sun and Tektronix. The software was developed to provide customers, software developers and computer manufacturers with a standard method of measuring graphics system performance.

The project will allow users to put their own data into a described format and watch the difference in speed on graphics workstations from all of the manufacturers who are endorsing the project. This will allow workstation users to understand the *real* graphics performance for their application.

Graphics and user interface improvements are bringing workstations and PCs to new application users and changing the way that people interact with their systems. —*Danielle Forsyth works in graphics product marketing for Hewlett-Packard, Fort Collins, CO.*

FIGURE 3



Performance of workstation CPUs and graphics subsystems has continued to increase.

The Evolution Of CAD

Intelligent CAD Leaves The Drawing To Machines

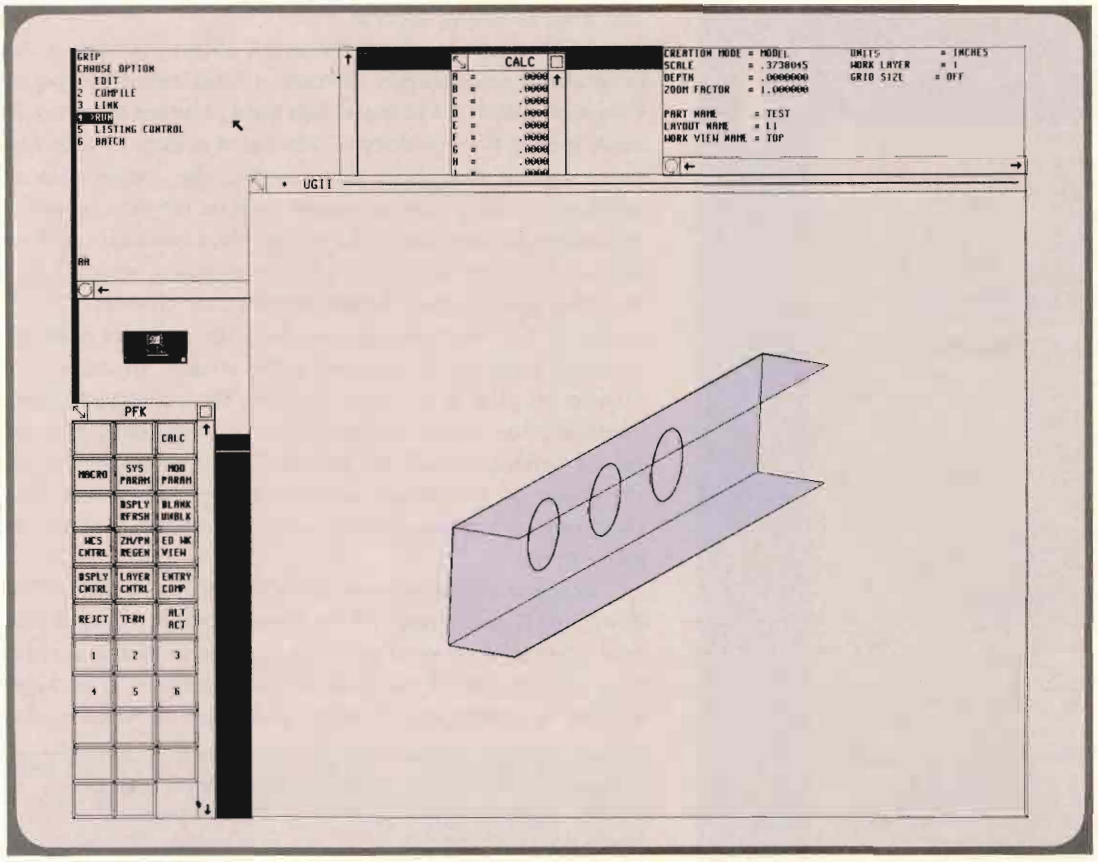
During the past decade, computer-aided design (CAD) has evolved from being a way to automate the production of mechanical drawings with 2D drafting packages to a way to automate the design of parts and entire products. In the past five years, software developers and engineers at aerospace and industrial equipment companies have taken CAD one step beyond capturing geometry. Intelligent CAD systems capture design attributes, rules and data structures that can generate the geometry of a part or a machine through the use of parametric design. Parametric design is a process that begins with a design concept and ends by creating a specific object or a class of objects that are implicitly related. When design variables get modified during the design process, the geometry of the object also is redefined.

The marriage of CAD and artificial intelligence (AI) technologies such as object-oriented programming and expert systems shells has made it possible for CAD systems to capture knowledge about a part (design rules and constraints) in addition to the geometry. Traditional CAD packages merely automate drafting, but intelligent CAD systems capture design specifications so that similar parts need not be redesigned from scratch. In an intelligent system, the object-oriented database stores objects that represent the design rules and the geometry of a part can be generated from these requirements. A high-level, non-procedural language (usually a version of LISP or a language with a similar syntax) allows domain experts to do programming.

[BY PEGGY KING]

Intelligent CAD systems automate the design process by providing toolsets, object-oriented databases and high-level languages, but an engineer's creativity is still essential. There is no expert system that has the judgment and understanding required to automate the creation of design concepts. Nor is it likely that companies will devote research funds to projects that attempt to replace what is for most engineers the favorite part of their job and the task they do best. Automating the tedious and time-consuming task of performing successive iterations to optimize designs has far more potential for increasing design and manufacturing productivity than would any attempt to automate the creative aspect of design engineering.

There are two approaches to intelligent CAD. At the high end, a general system can automate the design process in ways that go beyond automating specific functions. In 1984, five years after CAD packages became available on microcomputers, ICAD Inc. (Cambridge, MA) introduced the first system that stores product information as a data structure of rules and requirements rather than as a geometric construct. The design information then is extracted to create drawings and this information also generates parts lists, bills of materials, process plans and other documents. A part designed with the ICAD System becomes part of a family of possible parts that know how to design themselves. For example, an engineer can use the ICAD System to design a flange. Inherent in the design of the flange are rules for how many bolts are needed. Inherent in the design of these



After objects created in the Nexpert database are sent to GRIP, GRIP recreates the geometry so that Unigraphics II can generate 3D drawings of parts.

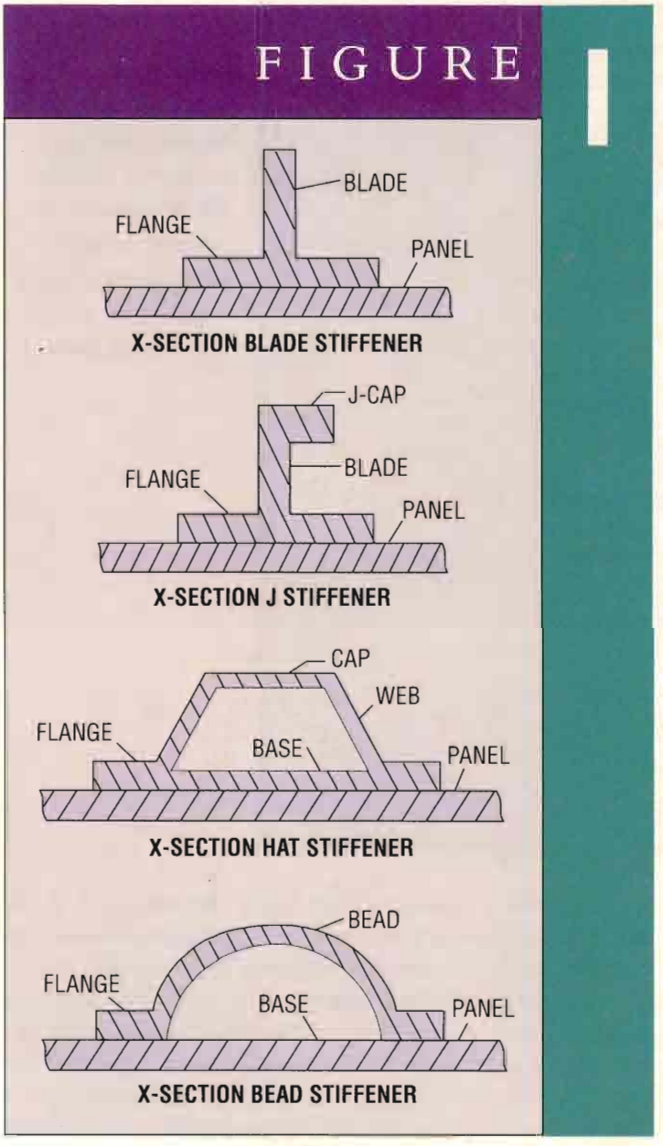
bolts is the knowledge of how many threads are needed and what diameter the bolts should be.

This level of automation doesn't come cheap; the ICAD System software costs about $95,000 when the Surface Designer module is included. Add the cost of LISP-based hardware from Symbolics or Sun workstations with Franz LISP compilers, and it's not surprising that the current customer base is restricted to a handful of aerospace and industrial equipment companies with large-scale projects. Currently, ICAD is porting its software to the HP Model 9000, Series 300 workstations. When the port is completed next year, the software will run on top of the Franz LISP compiler. ICAD also has formed a joint marketing agreement with McDonnell Douglas (Hazelwood, MO) for selling Unigraphics, a 3-D CAD package that runs on HP and Apollo workstations.

Wisdom Systems (Chagrin Falls, OH), a division of McDermott International Inc., began selling feature-based design software when the Concept Modeler, originally developed for use within McDermott, became commercially available in January 1987. At McDermott, the software ran on specialized Symbolics hardware, but Wisdom has made the software available on a variety of platforms that use Common LISP from Lucid (Menlo Park, CA) including Apollo's DN3500 and DN4500. The port to HP Series 300 workstations was completed in June 1989. HP Common LISP 2, HP's version of Lucid's Common LISP, is the compiler used by the system. A license for a development workstation costs $65,000 and the cost for licensing each delivery workstation is $20,000.

The technology for intelligent CAD is still in its formative stages. In 1989, a company that wants to automate the design process must choose between an expensive, integrated product that can be used for a variety of applications or a "homegrown" system for automating a specific task. I spoke with two engineering groups that had devised their own intelligent front ends with interfaces to a CAD system. In both instances, the domain-specific application was viewed as a pilot program to help the company or division prepare for more extensive automation of its design process. With a combination of off-the-shelf CAD products, analysis programs and expert systems shells, a development team can design a workable system by writing interfaces between the products. After the design engineer formulates the concept for a machine or part and uses an expert system shell to create a database of objects, he still can use the same CAD packages that were in use before the process was automated. With an automated system, the CAD system generates output drawings from information stored as attributes rather than as geometry.

The payback from automating even a small portion of the design and redesign process is so great that companies or divisions can realize the benefits of a shorter redesign cycle and



Stiffener types available to engineers.

fewer iterations between design engineers and analytical engineers by devising their own limited systems.

According to Marketing Director David Gayman, more than half of ICAD's prospective customers are companies and divisions that have tried to put together their own systems, with varying degrees of success. The Helicopter Division of McDonnell Douglas in Mesa, Arizona, and Lamb-Cargate in New Westminister, British Columbia, a supplier of finishing equipment to the pulp and paper industry, both designed intelligent CAD systems to automate specific tasks instead of waiting for integrated systems like ICAD and Wisdom's to become affordable. In both cases, the short-term benefits met expectations and the project team leaders want to make use of intelligent CAD applications in other aspects of their design and manufacturing process.

McDonnell Douglas Helicopter Company funds research in strategic technologies through a fund called Corporate Common CAD/CAM projects. This fund provided the development money for a prototype rule-based system to automate the design of composite parts used in the construction of helicopters. The prototype system runs on HP 9000, Series 300 workstations. One reason that HP graphics workstations were chosen over the Silicon Graphics machines, which had a friendlier user interface, is that HP's Starbase Graphics Library can be linked to C programs such as the graphics number-cruncher required for analyzing the weight, thickness and number of plies in a composite part. The prototype system automates the design of three types of composite parts: flat panels, stiffened panels and beams. Curved panels are beyond the scope of the project because the system doesn't have interfaces to a finite element analysis package used to size those parts.

Nexpert, the expert system shell from Neuron Data (Palo Alto, CA) is at the heart of the system. Nexpert was chosen over other expert system shells because it is written in C rather than LISP so that it's possible to have interfaces to packages written in FORTRAN. Another advantage of Nexpert over

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LISP-based expert systems is that Nexpert creates the object-oriented database as an ASCII file, which makes it portable to various applications in the system.

Experts in the design of composite parts, with the help of software engineers experienced in the use of expert system shells, specify the rules for design of parts. The end user never sees the Rule Editor or Rule Network screens that developers use to create the knowledge base. Some of these rules can be represented by simple (closed form) equations, but more complex specifications require an interface to an analysis package. The design considerations that require structural analysis are linked to McDonnell Douglas' own analysis processor via the Nexpert's C callable interface library. McDonnell Douglas engineers also developed a geometry processor written in C. Object and rule information can be transferred to this processor via its interface with Nexpert.

The end user sees a system that looks like the Unigraphics II CAD system used by all McDonnell Douglas mechanical engineers. The difference is that the engineer doesn't have to create the drawing or perform strength and weight calculations. The GRIP programming interface within Unigraphics provides an interface between Nexpert's design system and Unigraphics II. After objects created in the Nexpert database are sent to GRIP, GRIP recreates the geometry so that Unigraphics II can generate 3D drawings of the parts (*Screen 1*).

Engineers using the expert design system can specify a panel or beam by telling Unigraphics II the coordinates, the dimensions of the panel or beam, the loads, the materials, the ply orientations and, in the case of stiffened panels, the number and type of stiffeners (*see Figure 1*). The system will perform the sizing, determine the minimum weight and calculate the number of plies that are needed for that weight. The automated aspects of this system reduce the time it takes to design a part because the calculations are done automatically and fewer iterations of the design are required when parts are sized by the system. This system enables engineers to do trade-off studies of weight vs. strength much sooner than was possible when the programs that did calculations weren't part of an integrated system.

Because the prototype project was a success, the designers of this system are considering new ways to use the same system for manufacturing applications. For example, this system (minus Unigraphics because no geometry would be required) can be used to do manufacturing cost estimating and process planning for composite parts. Experience with the prototype system also will prepare software engineers and domain ex-

perts for working with ICAD now that McDonnell Douglas and ICAD Inc. have agreed to work together to integrate Unigraphics with the ICAD system.

While the McDonnell Douglas group wanted a C-based system because of interfaces to various analytical modules, the engineers at Lamb-Cargate wanted a LISP-based system because of the power and flexibility of the language. The Computer-Assisted Mechanical Expert System (CAMES) uses Goldworks, an expert system and Golden Common LISP from Gold Hill (Cambridge, MA). The CAMES system drives AutoCAD Version 10, a CAD system from Autodesk Inc. (Sausalito, CA). CAMES runs on an 80386 personal computer with at least 6 MB of RAM. The Vectra RS/20 could run the system because of its extended RAM.

CAMES is used to design large customized machines for handling gigantic rolls of paper. About 300 machines are designed each year from specifications that are based on two generic machines. In the development stage, software engineers and experienced mechanical designers and engineers captured the knowledge for producing these machines using Goldworks' Common LISP and an object-oriented database for storing complex specifications as objects with attributes.

When there is a machine to be designed, the system is "loaded" with the design rules and information for producing drawings for the weld shop, the assembly shop, and the customer site. An interactive front end to CAMES queries the end user in order to determine the customer's specifications for the machine. This set of queries takes about six minutes and generates a file approximately 1,000 bytes long (1 KB). The processing for the machine design is done in batch mode at night. In the morning, the mechanical designers can pick up the output for the machines and bills of materials that were done the night before. The system can design up to 10 to 15 customized machines and generate up to 30 drawings a day.

> HP is well positioned to become a leading platform for automated design systems.

About half of the machines designed by CAMES are ready for production with no modifications; the other half require about 10 percent of the engineering to be done manually. Before CAMES, it took an average of 15 engineering hours to design each machine using a CAD system. Now engineers spend an average of an hour and a half per machine. Once the machine has been engineered, it's ready for manufacture because the CAMES system output for each machine is a manufacturing package consisting of two E-size drawings generated in AutoCAD and two bills of materials generated from the object-oriented database in Goldworks.

Although drawings from AutoCAD 10 are easy to modify, Lamb-Cargate plans to make its next implementation of CAMES independent of AutoCAD so that engineers can use whatever CAD package best suits the project at hand.

The automated design systems that Lamb-Cargate and McDonnell Douglas Helicopter Company devised incorporated CAD packages that were familiar to their designers. Unless a company purchases an integrated system like ICAD or Wisdom's, the workstation chosen as a platform for intelligent CAD should support expert system shells, LISP compilers and a wide range of CAD and analysis applications.

Now that Apollo workstations are part of the product line, HP is increasingly well-positioned to become a leading platform for various kinds of automated design systems.

By next year, both ICAD and The Concept Modeler will run on Series 300 workstations. Also by next year the new 68040-based workstation with its integrated floating point unit will have the horsepower needed to make ICAD run well without special LISP hardware. These systems require a LISP compilers. Common Lisp compilers from Lucid, Franz

(Berkeley, CA), Gold Hill and Ibuki (Mountain View, CA) each run on one or more of the HP and Apollo workstation platforms.

Companies planning to use an expert system shell as the front end of a CAD system running on an HP workstation have a choice of expert system shells from Neuron Data, Intellicorp (Mountain View, CA), Inference Corporation (Los Angeles) or Gold Hill. Products are available for Vectras, Series 300 workstations and HP-PA machines.

Up until 1988, doing CAD on HP workstations meant using HP's ME-10 and ME-30. Things changed rapidly after the joint marketing agreement with McDonnell Douglas for Unigraphics last year. In 1989, the list of mechanical engineering alliances grew to include CAD and analysis products from Structural Dynamics Research Corporation (SDRC; Milford, OH) and the ANSYS analysis package from Swanson Analysis Systems, and Patran analysis products from PDA Engineering (Costa Mesa, CA). Now that the Apollo acquisition is final, expect to see companies with CAD or analysis packages for Apollo workstations port their products to HP workstations.

For companies planning to devise their own design automation systems, it takes more than a large selection of applications to make HP a preferred workstation vendor. If the CAD package, the finite element modeler, and the analysis subsystems don't work together, it doesn't matter that all run on the same platform. Minor incompatibilities between products can cause major headaches for companies trying to write their own interfaces as part of their design automation environment. For example, if function names mean one thing in the CAD system and another in the analysis package, one of the systems will have to be changed before the two packages will work together. It will be up to the workstation vendors to assure that software packages from different companies can work together.

HP has been active in standards efforts and selective in choosing value added business partners. The company has the clout to insist that its business partners in mechanical design and expert system software modify existing products and design future products to be compatible with others that run on the same workstation platform. If HP sets a new standard for compatibility and software VABs follow suit, customers who choose hp platforms will have the advantage of standards. If HP can then create or promote standard interfaces between design automation products, customers will be forever grateful.

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Graphics For Video And Animation

VIDEO/300

[BY ANDY BARLOW]

Creating graphics for video and animation is one area of computer graphics that recently has seen tremendous growth. Hewlett-Packard, in cooperation with Folsom Research Inc., (Folsom, CA) now offers the most powerful, yet one of the lowest cost solutions in this area. No longer is this capability just for the broadcast industry. Today, its application has spread to other industries.

The Video/300 is an interface card that plugs into any Series 300 DIO-II slot. It provides a link between HP graphics and all standard video formats.

The Video/300 is a two-card, single-slot boardset that's user-installable. It gives any user of a Series 300 workstation the ability to output to standard video formats such as television, video tape recorders, disc recorders or projection systems. At first, only the broadcast industry wanted this capability. Now, users in nearly every discipline are demanding it.

Two modes of operation are available with the Video/300 boardset. One mode is real-time, full-screen compression. The other mode is 1:1 "window" conversion.

In the real-time, full-screen compression mode, the entire high-resolution image (1,280 x 1,024) is filtered (to prevent aliasing), compressed and converted to RS-170A (640 x 480) video. The image then is output in realtime to any video recorder or television without affecting the monitor and without changes in the application software. Some solutions require that the computer image be placed in a 640 x 484 window before it's converted. With the Video/300, the full high-resolution screen can be used.

THERE ARE MANY FIELDS where this has proven to be a benefit. The most common is in marketing. For many software suppliers, such as SDRC (Milford, OH) or Deneb Robotics (Troy, MI) it's very important to demonstrate the capabilities of the software with graphics. Yet, it's sometimes difficult to move computer equipment from site to site. The ability to create images and animate them in the home office, record the results on video tape and carry the videotape to the potential customers gives the sales rep more flexibility and lowers costs.

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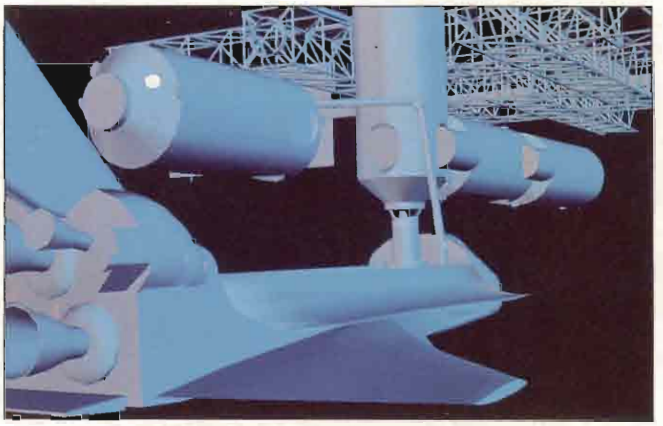
Shown is a Series 300 TurboSRX running software from Deneb Robotics and outputting the results to a standard Sony NTSC monitor using the Video/300 interface card.



TRW has used Wavefront Technologies software to simulate the deployment and docking of space vehicles.

This picture shows the video out boards in front of the Series 300. The image on the screen is satelite information taken from the GOES satelite. The image on the left is the 1280 x 1024 computer output. The image on the right is the NTSC video out.

bility and lowers costs.

Existing software customers also find the ability to record images beneficial. Some engineers and designers need to document or "sell" design concepts easily to upper level manage-

> The video out capability is used in the automobile industry, engineering and university settings.

ment. Recording the images on videotape or projecting the images on a projection system offers a convenient way to sell concepts at a board meeting or in an individual's office.

For example, TRW has a group whose charter is to help people visualize engineering concepts as well as concepts in applied science and physics. Together with Wavefront Technologies Software, (Santa Barbara, CA) this group has developed videos of space craft deployment, mission scenarios, manufacturing processes and communication jamming schemes. This is important to TRW because Congress now places increasing importance on the congressional two-hour orals for proposals. Because many of the concepts are difficult and must be communicated in a short time, the video has proven to be a particularly effective method. To date, TRW has won all the proposals in which Wavefront and video out were used.

Automobile suppliers also use the video out capability to sell proposals to General Motors or Ford.

The video capability has proven to be a unique alternative for documentation. For example, companies in the power industry use the video out capability to monitor and record the distribution of power networks. The ability to quickly store and retrieve power grids at different points in time offers an attractive and economical solution to traditional disc storage.

Another use of the video out capability is in university settings. Advanced research in graphics usually requires the ability to record results for comparison at a later date. The video out capability is an effective way to do that. It's also useful to communicate new concepts to fellow researchers.

The other mode is a 1:1 "window" conversion. Located on the Video/300 is a 24-bit frame buffer that allows users to port non-compressed 640 x 484 frames from host memory directly to the frame buffer. From there, the video is output at a RS-170A timing rates in RGB and encoded into composite video. This mode is ideal for animation of single-frame broadcast-quality applications. To use this mode, application software suppliers must make minor modifications to their

[Video Terms]

Sometimes the terms used in this industry can be confusing. Below is a short, non-technical description of some of those terms.

Genlock — A circuit in devices such as a video card or a camera that permits the device to synchronize itself to other devices. It's particularly important for a video out card to have this circuit when the card is used in the broadcast industry. A user might want to televise the video out card in action. With the genlock circuit, the camera can be synchronized with the video out card to prevent scrolling on the television screen.

NTSC — National Television Standards Committee. This is one of several types of composite video formats. Others include SVHS, Beta-Cam, M-II, PAL and SECAM. NTSC uses RS-170A timing rates and it's the broadcast standard used in the U.S., Canada, Japan and other countries. U.S consumer video equipment uses NTSC format.

Composite Video — The result of encoding red, green, blue and sync signals together in some combination, for ease in recording or broadcasting. Once the composite signal reaches the display device (television set or monitor) it's "decoded" back into RGB and sync for display. All TV sets are RGB devices with an internal decoder.

PAL — The composite television standard predominantly used in Europe.

Video Out — The capability to send a video signal to a VCR for copying, to a TV monitor for viewing, to a video projector, or to specialized equipment that can further change or improve the signal.

Interlaced — The "weaving" together of the odd and even lines of the TV picture.

VHS — (Video Home System) The format that defines how the image is recorded on the tape. Tapes also come in various widths to fit various video tape machines. VHS is a ½-inch tape and covers nearly three fourths of the home market. Most tape machine can work with only one width of tape and one format. Generally, the wider the tape is, the higher the picture quality is and the more expensive the tape is.

Beta — A format introduced by Sony that comprises about one quarter of the home VCR market.

Beta-CAM — A composite video format used by video professionals. The RGB signal is encoded into separate luminance and chrominance.

¾U — Another format widely used in schools and industry.

RS170A — The standard video timing specification for the U.S., Canada and Japan. Specifically, it describes a 30Hz frame rate, 60-field rate interlaced signal with a horizontal scan frequency of 15.724 KHz.

RGB — Red, green, blue and sync. Instead of sending out a video signal that has the colors mixed, this format sends each color on a separate wire to maximize the picture quality.

Frame Buffer — Special memory to store images.

> With Video/300, there's no delay from the display of the image to the television.

code. Wavefront Technologies, for example, supports both the compressed mode and the 1:1 "window" conversion mode.

The Video/300 offers full-screen computer images of 1,280 x 1,024 that can be compressed to 640 x 484 size or standard television size. It also can support the output in real time. This means there's no delay from the display of the image to the television. Finally, the image on the computer screen isn't affected during the output. This means that the user can continue to work as the images are recorded, thus increasing his productivity.

With the Video/300, RS-170A, RGB and NTSC outputs are available. RS-170A refers to the timing standard. It means the output is 30 frames/sec. and is interlaced. The RGB output is excellent for projection systems. NTSC is used for U.S. and Japanese television. In the near future, the European standard (PAL) will be offered.

Finally, the Video/300 is genlockable. This feature allows you to network to other video devices and keep all the video devices synchronized to prevent scrolling. At less than $5,000 it's not difficult to find a unique way to use this board set.

—Andy Barlow is graphics marketing engineer, Hewlett-Packard, Fort Collins, CO.

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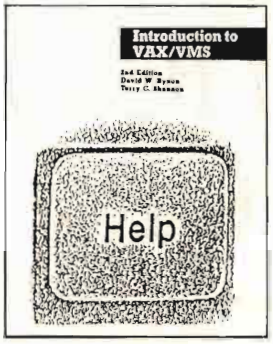

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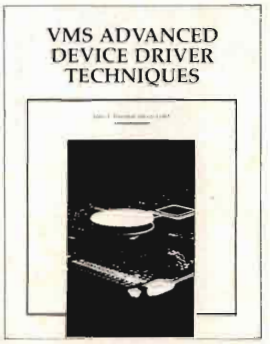

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THE WORKSTATION WAR HEATS UP

HP Fuels The Fire With Its Acquisition Of Apollo

INDUSTRY

Mike Carl

1989 will be remembered as the year the workstation market began to heat up, as Hewlett-Packard bought Apollo Computers, and competitors lowered prices, increased performance, functionality and ease-of-use.

DEC first turned up the heat in January when it introduced its DECstation 3100. With its No. 2 position in the worldwide workstation market (source: Datapro) being threatened by the strong demand for low-cost, high-performance UNIX system workstations, DEC introduced its first workstation based on a third-party processor, namely, MIPS Computer System's R2000 RISC processor. The 3100 offers an impressive 14 MIPS at a base price of $11,900.

Next, Sun came out with five new workstations, and the market got hot. In its biggest roll-out ever, Sun delivered a large, sophisticated selection of graphics capabilities and many of the ease-of-use features found, before now, only in PCs. Three of Sun's new workstations and servers are important additions to its SPARC family of RISC processors, with the SPARCstation 1 advertising 12.5 MIPS at a cost of $8,995.

According to Sun President and CEO, Scott McNealy, the computing world of tomorrow will use the power and performance of RISC and the UNIX system along with the ease-of-use features that ushered in PCs during the 1980s.

On the same day in April that Sun rolled out its new workstations, HP rocked the market with an offer to acquire a controlling share of Apollo Computer Inc.

At first glance, HP's purchase of Apollo seems surprising for two basic reasons. One, HP doesn't have a history of making acquisitions of this magnitude. And two, HP already holds a leading position as a workstation seller and innovator.

Taking a closer look, however, there are a number of smart reasons for the purchase: the obvious being increased workstation market share. Using Dataquest numbers, HP leap frogs both DEC at 18.6 percent and Sun at 28.3 percent with a combined HP and Apollo market share of 30.4 percent. Apollo also gives HP increased solutions for its customers through Apollo's nearly 2,000 application software packages that include Mentor Graphics with its dominant presence in CAD/CAM/CAE.

In Apollo, HP gains approved vendor status in many major accounts including General Motors/Electrical Data Systems, as well as leadership in network and work group computing.

Similar Features

Other integration issues facing HP and Apollo only can be answered with time. Take for instance both companies line of workstations based on the Motorola 680X0 processor. Apollo offers nine models of workstation using the 680X0. The DN3500 series is Apollo's midrange product and uses a 25-MHz MC68030 processor. Standard RAM is 4 MB, expandable to 32 MB. The Apollo Domain Network interface is standard, the display can be either 15- or 19- inches worth of color or monochrome, and the system can be configured with a local or remote hard disc of 155-, 348- or 696-MB. System expansion is accomplished via the DN3500's PC/AT-compatible bus. An optional PC/AT compatible Intel coprocessor board is available to run MS-DOS software. Standard software is Domain/OS. Domain is a single operating system providing a choice of UNIX System V, 4.3BSD or Apollo's proprietary Aegis operating system. The DN3500 can have a floppy disc or magnetic tape drive for

software-loading and backup purposes. DN3500 prices range from $11,800 to $19,890.

Comparable to the DN3500 is the HP 9000 Model 360. The 360 possesses an MC68030 and MC68882 floating point coprocessor both clocked at 25 MHz with a standard 4 MB of RAM that can be expanded up to 16 MB. Built-in interfaces include HP-IB, HP-HIL and Ethernet LAN. This workstation can be configured with monochrome monitors of either 12-, 17- or 19-inch or color monitors of 16- or 19-inch and with either hard discs that range from 81 MB to 571 MB or as a diskless mode. On the 360, system expansion is accomplished via HP's Direct I/O — II (DIO II) bus. All Series 300 systems support both a DOS coprocessor (a DIO accessory card with related software) and Soft PC Synthetic Hardware (MS-DOS system emulation software). The standard operating system is HP-UX, which is a balance of System V, BSD4.3 and HP enhancements. For the installation and back-up of software, either a cartridge or magnetic tape unit must be cabled. The price for a Model 360 is $12,995.

Clearly, the DN3500 matches the HP 9000 Model 360 almost feature for feature. The question must then be: Which of the two workstations will HP be promoting in the 1990s?

The strategy is to continue providing 680X0 based platforms that maintain both the Domain/OS and HP-UX environments. Specifically, this strategy includes introductions of 68040-based workstations for both HP and Apollo and a program to allow both HP and Apollo customers to upgrade to 68040-based products. With migration to the OSF environment and the passing of time, the combining of similar hardware platforms is certain to take place.

Apollo Is Network Computing

In the area of networking, common feature support is a windfall for HP and Apollo products. As such, HP and Apollo systems fully support ARPA/Berkeley services, through the TCP/IP protocol and IEEE 802.03 (Ethernet) local-area networks, as well as the Network File System (NFS). In addition, the above services give Domain/OS users access to networking capabilities on HP systems, such as MAP 3.0, LAN Manager and NFS 3.2 connections. In a similar fashion, HP-UX users have additional connectivity through Apollo systems, like IBM Token Ring, LU 2.1 and Channel Attach.

Even before the acquisition of Apollo was being considered, HP recognized Apollo's Network Computing System (NCS) as the key to a new generation of network-based applications. Following that belief, HP licensed and ported NCS to HP hardware to unite HP systems with other vendors' systems to create distributed applications. NCS, a de facto standard for network computing, is available for Alliant, Convex, Cray, DEC (VMS and Ultrix operating systems), IBM, Multiflow, Prime, Pyramid, Stellar, Sun and of course Apollo and HP systems. NCS consists of a set of software products that provide distributed computing among heterogeneous systems. With the distributing of individual program modules within an application, NCS lets you execute the module on the computer best suited to handle it. NCS supports concurrent programming and it allows an application run individual procedures in parallel on machines throughout the network.

The NCS product includes three major components:

- A remote procedure call (RPC) facility developed specifically for performance, portability and network independence.
- A compiler that converts high-level interface descriptions of the remote procedures into C source code.
- A set of software tools that lets applications determine at runtime which machine can provide the necessary services.

Today and into the future, NCS will lend a common interface for distributed application development based on Apollo and HP network technologies as well as industry standards. And with the combined backing of HP's and Apollo's R&D and marketing, NCS can only enjoy a bright future as a leading-edge industry standard.

Competing Products

In the networking arena HP clearly gains by joining forces with Apollo. Computer-aided engineering solutions are, however, a different story. In CAE, HP offers Electronic Design System (EDS) on its 680X0 based workstations, which compete directly with Mentor Graphic's schematic capture, simulation and layout applications, which run exclusively on Apollo. It's certainly hoped and believed that Mentor Graphics will continue to support Apollo hardware after the HP acquisition.

According to Michael A. Gallup,

TABLE I

RISC Architecture Characteristic	HP-PA	PRISM
A reduced number of instructions	X	X
Instructions implemented in H/W	X	X
Instructions have a fixed size	X	X
Instructions are pipelined	X	X
64-bit addressing capability	X	X
Separate data & instruction caches	X	X
Optimizing compilers	X	X
Support for multiple coprocessors	X	X

Comparison of HP And Apollo RISC Architectures

vice president of product marketing and programs at Apollo, Mentor represents 11 percent of Apollo's business and its single largest customer. However, it's highly unlikely that Mentor will tolerate direct competition from the same single manufacturer it buys hardware from.

It's interesting to note that months before the purchase of Apollo, Mentor began a selective search for a second hardware platform on which to port its software. Among the second source companies under review by Mentor is HP. The consolidation of Apollo and HP products could certainly aid HP's chances of becoming Mentor's second source. At this time though, Mentor hasn't selected a candidate, and is still assessing several hardware platforms. For its part, HP has demonstrated an ability to coexist with key value-added businesses such as McDonnell-Douglas who offers a competing CAD application on HP workstations. The Mentor issue aside, HP has overnight become not only the number one workstation vendor, but has gathered the largest installed base of electronic design systems.

Another issue that has stirred some hot coals in the HP and Apollo community is the future of the respective RISC processors.

Although *Table 1* reveals that HP's Precision Architecture (HP-PA) and Apollo's PRISM architecture are closely related RISC implementations, they diverge on one significant point. Apollo currently sells the Series 10000 (PRISM machine) as a multiprocessor with up to four CPUs, whereas HP-PA hasn't come to market as a multiprocessor at this time. The two architectures also target different markets. HP-PA on the high-end HP 9000 Series 800 is aimed at the multi-user software development market. The HP 3000 MPE XL machines are tuned for transaction processing in the commercial market. Whereas the Apollo Series 10000 is advertised as a "Personal Supercomputer" that can fit easily under a scientist's desk and churn-out tasks like computer-aided molecular design, and scientific data visualization. HP-PA does, however, offer the HP 9000 Model 835 Turbo SRX that overlaps the Series 10000 on several application levels. Even with the Model 835 and Series 10000, HP plans to offer high-end graphics products for both Apollo and HP workstations. The future for both architectures is unclear, except that HP has promised to continue offering high performance products that protect hardware investments and provide a growth path to new technologies and a standards based OSF environment.

Paths Cross At OSF/1

The foresight of both HP and Apollo to realize the importance of software standards and take the lead in building the OSF eventually will put the problem of different hardware platforms to rest.

Presently, however, both HP and

Apollo feature unique operating systems that are based on the UNIX operating system. Both HP-UX and Domain/OS combine the latest advanced functionality from Berkeley and AT&T. Both meet the System V Interface Standard (SVID) and provide a migration path to the POSIX standard. Their systems support a variety of communication products (i.e., NFS, TCP/IP, Ethernet and X.25) that promote the sharing of programs and data in a heterogeneous computing environment. HP and Apollo each designed their operating system to handle both disked and diskless workstations. Both companies have enhanced ease-of-use by simplifying system administration (e.g., HP's System Administration Manager (SAM), Apollo's single password system or registry) and creating native language extensions.

Some features of Domain/OS you might not be familiar with include Access Control Lists and the Domain/Delphi documentation retrieval system. Apollo felt the standard UNIX system file protection scheme was inadequate in giving a specific user more or less file access than the "group" or "other" permission settings, or in restricting access to a file so that it only can be accessed from a specific node.

Apollo's solution to the above problem is Access Control Lists, which are lists of access rights that are attached to files. To determine the rights of a user to a file, the operating system searches the list for the first entry that applies. With the Domain/Delpha documentation retrieval system, the Apollo user has a mouse-driven interface to system documentation. Users can browse through a global table of contents or do keyword searches. Domain/Delphi also lets users create reference lists of frequently viewed documents to speed access to needed information.

The HP-UX and Domain/OS environments continues to be supported and enhanced until the marketplace migrates to the standard OSF environment. When HP and Apollo first offer an OSF/1 product, the release will be targeted at independent software vendors to provide a complete OSF/1 development platform so their applications work with future releases. Follow-on releases of HP's OSF/1 will offer increasing levels of functionality allowing existing HP-UX and Domain/OS customers to begin migration to the OSF environment.

Today, most eyes are focused on the workstation market, not only because the players are full of surprises, but because they are accelerating the workstation to new heights. *—Mike Carl is a learning products engineer for Hewlett-Packard's Workstation Group in Sunnyvale, CA.*

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NTEGRATING HP AND APOLLO

Although The Deal Is Done The Merger Is Just Beginning

INDUSTRY

Bill Sharp

On the eve of the official completion of the Hewlett-Packard purchase of Apollo Computer Inc., Bob Weinberger, Apollo's director of Systems Product Marketing, was ecstatic.

"We've been conducting meetings over the past four weeks with 100 of the top R&D people from both companies," said Weinberger. "We are now in the final stages of developing a joint product plan that extends out into the 1990s and protects the investments of both existing HP and Apollo customers. We are thrilled about this process."

Behind closed doors, some of the very brightest engineering minds in the computer business from two of its most successful firms are grappling with some very challenging marketing questions:

- How do you effectively meld two similar, yet different, workstation computer families without alienating significant numbers of important customers?
- How do you accomplish this union with enough speed to stay ahead of such powerful players as Sun and DEC?
- Can you keep all the different bells and whistles developed by both HP and Apollo for their workstations without running up production and support costs?
- Which of those clever features such as an AT bus will stay and which will depart as the product lines gradually merge?
- Will all the 68000 products on both sides survive for a while, or will some of the favorites of HP or Apollo customers see the axe immediately.
- How do you deal with two (count 'em, two) RISC technologies in one company?

HP is preparing to make a public announcement that would perhaps shed some light on many of these questions. In the very near future, current HP workstation users can expect to hear from salespeople about just how well some current Apollo products would fit into their environment. But in order to make sense of it all, HP users need to bone up on at least the basics of Apollo products. You've already read about some of the 68000-based models and what options they offer (*HP Professional*, June, Industry Watch, pg. 10). But how is the hardware structured? What about them is similar to or different from the structure of HP 9000 products? And just what is this DN10000 we've heard about?

Pioneers

Apollo is not a newcomer to the workstation computer business. The firm is, in fact, considered by many to have invented workstations. Apollo was the dominant vendor before Sun made its meteoric rise. Apollo is well known for producing well-designed products with technical innovation.

When Apollo was founded in 1980 to produce computer workstations, HP was still aiming its small computers at instrument controller and scientific computation markets. Apollo grew rapidly for its first several years, then slowed as competition from Sun grew more and more effective and HP bounced back in the hotly contested workstation market.

It would be easy to assume from the press exposure that Sun went skipping away with the workstation market, leaving other players wondering what happened. However, Weinberger seeks to set the record straight.

"Both Apollo and HP are head and shoulders above the rest of the computer workstation industry with 68000-based prod-

ucts," he says. "Both announced and delivered 68030-based, 4-MIP, 25-MHz systems (HP Model 360, Apollo DN 3500) long before competing firms in July of last year. HP announced first, and Apollo was the first to ship the systems in volume, essentially a tie.

"They reversed this position with the 33 MHz versions last December, as Apollo announced first, and HP was the first to ship in volume (HP Model 370, Apollo 4500)," he adds.

Both Apollo and HP have been rapidly evolving 68000-based workstation technology, says Weinberger. Together, they constitute by far the leading vendor of 68000-based systems. He cites as evidence that Sun announced its own two 68030-based systems on April 12, "almost a year after HP and Apollo began shipping them."

Weinberger sees Sun as working hard to push its new proprietary SPARC architecture at the expense of its own 68000-based systems, with the result that it has reached market much later than its competitors. To make matters worse for Sun, he says, "68030-based systems are catching and passing up some of their SPARC-based systems. We believe they held up their 68030 products until they had a SPARC-based system that would outperform it, to avoid embarrassment. No one considers them to be in the lead on 68000-based products anymore."

Architecture

Apollo currently sells three workstations based on Motorola 68000 chip sets, and one based on its proprietary PRISM architecture. I'll save PRISM for last.

Apollo's DN 3000, 3500 and 4500 workstations all share the same basic architecture and enclosure. The biggest difference between them is the central processing unit (CPU). A 12-MHz 68020 is the heart of the DN 3000, which established a price-performance standard when it was introduced in 1986 and still anchors the low end. Floating point processor is the 12 MHz MC68881. On-board memory is 4 to 8 MB of RAM. Performance is 1.5 MIPS.

The DN 3500 CPU is the 25-MHz 68030 teamed up with a 25-MHz 68882 floating point coprocessor for faster computation speed. This system is designed to be cost effective for large numbers of customers, while allowing expandability. On-board memory is more expandable at 4 to 32 MB of RAM. Performance is 4 MIPS. The DN 4500 was designed to provide the highest possible 68000-based performance, and to be expandable as well. It uses a 33-MHZ 68030, augmented with 64 KB of external cache on the processor board, and a 33-MHz version of the 68882 floating point processor. On board is 8 to 32 MB

of interleaved memory to provide greatly expanded memory bandwidth. Performance is 7 MIPS.

All three of these systems provide a high-speed 32-bit interface between the CPU and mass memory. Both the 3500 and 4500 include an additional high-speed interface that supports an optional floating point accelerator and the next-generation 3D graphics option.

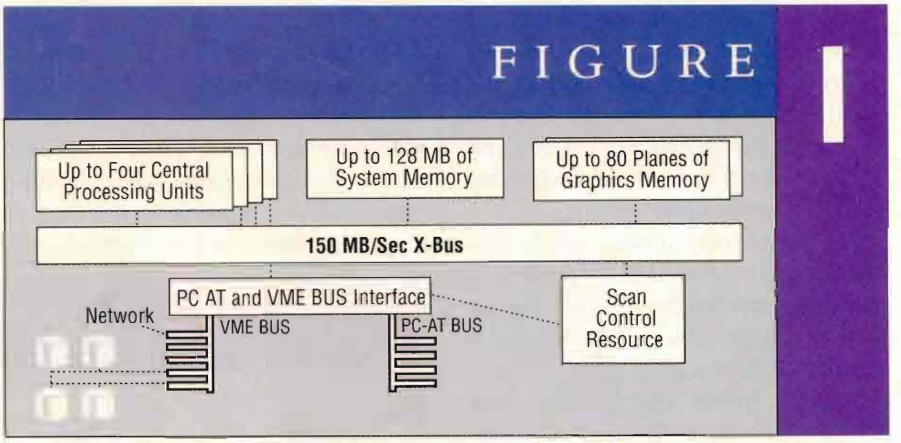
All other peripherals plug into a standard 16-bit IBM PC/AT style bus on all three of these systems. This bus is one of the competitive strengths of the Apollo systems. It allows users to take advantage of the large numbers of low-cost, AT-compatible PC products, and link them to a high-powered workstation. The DN3000 comes with eight AT-compatible bus interfaces, while the DN3500 and DN4500 each come with seven.

An RS232 serial IO port is standard for the DN3000 workstation, while the 3500 and 4500 each come with three. Mass memory for Apollo workstations includes ESDI-standard Winchester hard disc drives, as well as 5¼-inch floppy discs, based on standard PC-type technology. Hard discs for the DN3000 are available in 72-, 155- and 348-MB sizes. Both the 3500 and 4500 are available with 155-, 348- and 696-MB sizes. Removable media for all three workstations includes the 5¼-inch floppy drive with 1.2-MB capacity, and 60-MB¼-inch cartridge tape.

Apollo works with vendors of disc controllers to get the most performance possible, even writing microcode at times, says Weinberger. Because they push the market for faster performance, Apollo is typically first out with new disc designs. Apollo systems tend to be smaller than comparable HP systems because the mass memory is included within the system enclosure.

Graphics

Graphics is one of the battlegrounds of the workstation marketplace, and Apollo systems come suitably equipped to grapple with the best. Displays come in 15- and 19-inch sizes with 1024 x 800 resolution, with four or eight bit planes in the color options. Apollo, like HP, uses 2D and 3D graphics acceleration to speed the mind-numbing calculations that make 3D color graphics possible.



The Series 10000's components work together to deliver high system performance.

Operating System

Apollo's Domain/OS provides three operating environments within one operating system. These include Apollo Aegis, UNIX System V.3 and Berkeley 4.3. POSIX compliance is expected soon.

Networking

Apollo has been serious about standards for just as long as HP and supports industry and de facto standards including:

- X Window System
- GKS, PHIGS and CORE in graphics
- UNIX V.3 and Berkeley 4.3
- Ethernet, MAP token bus, IBM Token Ring
- DECnet, TCP/IP, OSI, LU6.2, SNA, X.25
- PC-AT- and VME-compatible buses
- Network Computing System, Network License Server

Network Computing System (NCS) is something you will likely hear more about in the near future. NCS allows each CPU on the network to share its computational load with other CPUs on the same network. NCS polls other nodes and farms out work to any CPU that has excess capacity at that moment. Apollo licenses NCS kernel software.

"Users can access not only data on the network, but also the computational resource itself," says Weinberger. "This includes not just other Apollo workstations, but mainframes and workstations from other vendors. This concept, by the way, fits very well into concepts like cooperative computing environments that HP strongly supports."

According to Weinberger, "HP and Apollo place great emphasis on interoperability of computer systems, using technologies like NCS. HP has done some very exciting work in object management, and we will combine these technologies to provide some powerful new capabilities for our customers."

Weinberger touts Apollo's "network independence." Apollo systems will accommodate one or more of the three networks they support, including Ethernet, token ring or IBM Token Ring, as noted above. Users also can link to two separate token rings, for instance, with one serving as a gateway.

Hey, what about the DN10000? Let's put it this way: what Precision Architecture is to HP, PRISM (DN10000) is to Apollo. And, even more significant, PRISM is faster than HP-PA.

This computer is not only dramatically different from the other Apollo computers, but is dramatically different from anything out on the market in its price performance range.

Numbers

The workstation market loves numbers, and for the DN10000 and DN10000VS,

those numbers are impressive indeed. The CPU is rated at 15 to 30 MIPS, which compares with 7 MIPS for the DN4500, or XX MIPS for the latest high-end HP-PA system. And, users can link together up to four CPUs in one 10000 system. Peak performance is 36 double-precision MFLOPS with one CPU.

Central Processing Unit

DN10000's CPU can include one to four PRISM processors of full 64-bit architecture, along with some other very powerful goodies, including:

- Integer processor
- Dual ECL floating point processors (ALU and Multiplier)
- 32 x 48 8-port floating point register file (1.2 GB/sec bandwidth)
- 128 KB, 64-bit-wide instruction cache
- 64 KB, 64-bit-wide data cache

System Architecture

PRISM's system architecture is built around the 150 MB/sec X-bus, which ties together up to four CPUs with 8 to 128 MB of interleaved system memory, up to 80 planes of graphics memory and the PC-AT and VME bus interfaces. The system also includes a dedicated diagnostic bus.

The 10000 supports one to four internally mounted ESDI Winchester hard drives of 348 MB or 700 MB capacity, for total internal capacity of up to 2.8GB.

Flavors

"Apollo 10000 systems come in two flavors," says Weinberger. "The 10000DN is a compute server, and the 10000VS is a visualization system optimized for high-performance 3D graphics. We see the VS as particularly well suited for applications in mechanical and electronic design and molecular modeling. The DN is for compute-intensive applications that don't require the high-performance graphics of the VS.

"Both these systems provide a level of floating point performance that far exceeds any other workstation on the market. The 10000 runs at 5.8 double-precision Linpack MFLOPS, compared to 1.6 for a DECstation 3100, or 2.0 for an HP 835. And those numbers are for one processor — the 10000 can support up to four in a system."

When asked to compare the performance of the 10000 systems with that of HP-PA, Weinberger noted that the lower performance of the HP-PA systems is due primarily to its having been designed for the commercial marketplace as well as scientific applications.

"For PRISM, we really chose to focus on high-performance floating point as our target, and we optimized for that target." —*Bill Sharp is a freelance writer for Fresh Air Communications, Newburyport, MA.*

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BUS CONTROL

IEEE 488 DOS Drivers Allow Bus Control From Spreadsheets

SOFTWARE

Steve Lekas

Control of instruments on the IEEE 488 bus gradually has become an intimidating task because of difficult-to-understand subroutine CALLS required by the plug-in cards available for microcomputers. It's a problem made even more widespread as the PC entered the computing and instrument control mainstream.

Unlike the first, easy-to-operate dedicated controllers (developed by Hewlett-Packard) for the IEEE 488 bus, the software for today's PC-based controller hasn't been tightly coupled with applications software, and manufacturer-supplied IEEE software support historically has been poor.

Fortunately, the latest generation of software supporting these cards uses the DOS driver mechanism (built into the operating system) to function under a number of languages as well as under popular application programs like Lotus 1-2-3 and Symphony, Borland's Quattro and even DOS itself. The driver uses spreadsheet macro commands to collect data and place it directly into spreadsheet cells where the full calculated power of these familiar programs can be brought to bear directly — without additional data entry steps.

Back To The Future

A decade of the IEEE 488 standard has brought the technology for bus control full circle: from the initial, clean, concise implementation of the HP dedicated controller, to the language-dependent PC card, then back to versatility and convenience under today's DOS driver approach. HP had set the original industry standard for programming and operating the bus, integrating the command set of high-level functions into its controllers' BASIC language. This made variable handling, error checking and overall IEEE/BASIC interaction easy to handle.

Cost, availability and the appearance of an incredible amount of MS-DOS software prompted the switch from dedicated controller to PC IEEE plug-in cards. But the PC solution was never easy for the user. The CALLS needed to operate the boards were limited to the language chosen by the manufacturer, with no provision for integration with other software packages such as spreadsheets. The call libraries were different from the familiar HP BASIC commands and they didn't offer the same tight coupling between the language and the IEEE bus. Language-dependence made it necessary to develop a unique call library for every language supported. This, coupled with poor error checking, large initialization routines and mandatory memory allocation for variables, made the cards difficult to use.

Why Not A Spreadsheet?

The power of advanced spreadsheets to process data and execute custom programs (macros) from within the spreadsheet environment has encouraged engineers and scientists to develop many applications under Lotus 1-2-3, Borland's Quattro and other similar programs. Even experienced programmers find it easier to develop number-crunching applications within the format of a commercial spreadsheet than to compose a custom program from scratch. The problem has been the difficulty in getting the raw data from the instrument into the spreadsheet. Lotus attempted to close this gap by developing Lotus Measure, a data-acquisition add-on. But after limited success (perhaps the result of its high cost and incompatibility with popular spreadsheets), they discontinued the program and sold all rights to an interface manufacturer.

Now, an IEEE DOS driver along with the spreadsheet's own macro language can be used to control instruments and bring data directly into spreadsheet cells. Complex statistical and analytical results then can be obtained using the mathematic operators built into the spreadsheet. For example, the average of a column of raw values can be calculated, placed in a cell and used to generate a column of raw data minus the average, next to the original column of data. This eliminates any offset from the raw values, essentially acting as a high-pass filter. Spreadsheets

FIGURE 1

```
1   {INITIALIZE}                                  Call the INITIALIZE routine
2   {MENUCALL GETFUNCTION}                        Use a menu to get DMM function
3   {GETNUMBER "ENTER THE SAMPLE RATE...",SRATE}  Ask user for sample rate
4   {CALC}                                        Update cells with user replies
5   {WRITELN ("OUTPUT DMM;"&DDC)}                 Set up the DMM
6   {FOR E1,1,200,1,READONE}                      Get 200 values from DMM
7   {CLOSE}                                       Close the driver
8   {CLAC}                                        Update the spreadsheet
9   /GAF..F200~BG1..G200CH1.. H200VQ              Graph the 3 columns of results
10
11
12  -this is the INITIALIZE routine starting at A13
13  {OPEN IEEE,M}                                 Open the driver
14  WRITELN RESET}                                Reset the interface
15  {WRITELN CLEAR}                               Clear the device on the bus
16  {RETURN}                                      Return to the calling program
17
18
19  -this is the READONE routine starting at A29
20  {WAIT @NOW+@TIME(0,0,SRATE)}                  Pause for SRATE seconds
21  {WRITELN "ENTER DMM"}                         Tell DMM to send a value
22  {READLN E2}                                   Place the value in cell E2
23  {PUT F1,F200,0,E1-1,@VALUE@MID(E2,0,6)}       Convert E2 to a value and put in column F
24  {RETURN}                                      Return to the calling program
25
26
        A                    B                    C
27  -this is the custom menu called GETFUNCTION
28  OHMS                 AMPS                 VOLTS                Menu selections
29  GET RESISTANCE VALUES GET CURRENT VALUES  GET VOLTAGE VALUES   Selection descriptions
30  {LET DDC,"F1X"}      {LET DDC,"F2X"}      {LET DDC,"F3X}       Menu Action
33  METER DDC                                 SAMPLE PERIOD        Labels for identification
34  F1X                  5                    Values from user interaction. Cell A34 was named
                                              DCC, Cell B34 was named SRATE
```

A spreadsheet macro example

[Striving For Seamless Integration Onto Dos]

The term "driver" often is used loosely to include any software that controls an interface board. But if it isn't a true DOS driver, it doesn't carry the benefits of DOS driver. Some IEEE 488 software products exhibit many of the characteristics of DOS drivers, such as loading at power up, stating resident in memory, and having an identifying line in the CONFIG.SYS file that reads something like: DEVICE=IEEE. But the test of whether or not the driver is truly a DOS driver is to write to it from the DOS Prompt using the DOS "ECHO" command and redirect the output to the installed driver:

```
DOS> ECHO CLEAR 16 > IEEE
```

The parameter "IEEE" on the command line is actually the river, not a file. This command sends the string "CLEAR 16" to the IEEE driver, clearing the instrument at address 16. If DOS chokes on this command, a bogus driver has been installed and none of the benefits of IEEE/spreadsheet integration described earlier apply. To send a command to the device on the bus, use the following command:

```
DOS> ECHO OUTPUT 16;R3FOX>IEEE
```

Here, the driver's OUTPUT command, along with data, for the instrument at address 16 is sent to the driver via the DOS ECHO command. Since DOS treats the IEEE driver like a file, input and output can be performed by the driver from the DOS prompt. To read device data on the bus from the DOS prompt, type:

```
DOS> ECHO ENTER 16 >IEEE
DOS> TYPE IEEE
```

This will print data from the device directly below the TYPE commands, just as if it were read from a file called IEEE.

After installation, the DOS device driver becomes part of the operating system, and all applications will interface with the driver in a uniform fashion. Because the driver is integrated tightly into the system, operations such as error checking and variable management are performed automatically.

can be filled with dependent cells that are updated simultaneously as the raw values (independent cells) are changed.

Interfacing Ease Via DOS Device Drivers

The DOS driver concept originally was developed to eliminate the device dependencies from MS-DOS processes. For example, the COM driver (the PC serial port driver) is used to eliminate the device dependencies of the serial interface hardware from an application. The IEEE DOS driver takes this concept one step further by not only hiding the idiosyncrasies of the plug-in card, but also hiding the details of operating the IEEE 488 bus.

Like all DOS drivers, the IEEE DOS driver can be accessed from virtually any environment. From the DOS perspective, the driver is just like a file. It can be opened, written to (commands and data) and read from (instrument data). The driver accepts high-level HP BASIC system commands, translates them and performs appropriate actions on the bus. The details of communicating with the bus are transparent to the user.

Any programming language that can open, close, read and write a file can access the IEEE driver through the

language's built-in file management capability. The BASIC language uses its OPEN command to initiate contact with the driver:

```
10 OPEN "\DEV\IEEEOUT" FOR OUTPUT AS #1
20 OPEN "\DEV\IEEEIN" FOR INPUT AS #2
30 PRINT #1, "ENTER 16"
40 INPUT #2, A$
50 PRINT A$
```

After the communication channels are open for I/O, communication with the driver begins. The word ENTER is part of the driver command set, returning instrument data to the user. All interaction with the IEEE system through the driver uses the file I/O commands that are built into BASIC.

Macros: The Spreadsheet Power Base

The key to the power of modern spreadsheets lies in the capabilities of the built-in macros and @FUNCTIONS. Now, file and device I/O can be handled within the spreadsheet, using the IEEE DOS driver to perform instrumentation control and data acquisition. The spreadsheet macro command set provides for operation such as prompting for user input, looping and branching, assigning call values, trapping errors and performing file I/O.

A DOS driver must report any error encountered during its processing to the application that invoked it. All driver errors are reported to the spreadsheet environment, which in turn reports the error to the user. This allows a spreadsheet macro writer to write error handling routines using the ONERROR macro commands. Errors encountered during the processing of the macro transfers control of the system to an error service routine written by the user.

Many language-based instrument control applications simply collect data and manipulate or graph the results. Through the use of spreadsheet macros and the IEEE 488 driver, these tasks are accomplished easily and quickly within the spreadsheet. For example, assume that a programmable DMM is connected

to each PC/AT through a GPIB interface card. In this case, during installation of the IOtech Driver 488 and the GP488B IEEE interface card, the EOL terminator was set to CR, the multimeter was named DMM at Address 16, and the DMM terminators were set to CR. The macros then are typed directly into the spreadsheet cells, with the application broken up into subroutines for greater readability.

The first part of the program is the main body of the application (*Figure 1*). All of the lines in the program are in Column A. Using the menu selections /RNC (Range Name Create) selections of the spreadsheet are assigned names for program readability and portability. Because the main body of the application is named \A, pressing Alt-A will invoke it.

Although the original intent of the spreadsheet was to emulate the paper ledger of the accountant, scientists have found some imaginative uses for the clerical tool. Now with the addition of data collection from scientific instrumentation, new ideas will begin to emerge. — *Steve Lekas is affiliated with IOtech Inc., Cleveland, OH.*

Would you like to continue to see articles on this topic?
Circle on reader card
yes 340 no 339

[Tapping The Instrument Communications Channel]

The file I/O capability of a spreadsheet's macro command set allows access to the IEEE driver, opening a direct channel of communication between the IEEE 488 bus and the spreadsheet. Using the driver commands, the spreadsheet sends and receives data directly from the instruments on the bus. The spreadsheet sends commands to the driver in almost the same fashion as do high-level languages. Using the macro commands OPEN, WRITELN and READLN, nearly all of the bus capabilities can be accessed.

The macros are written directly into the spreadsheet. The driver commands are embedded in the spreadsheet WRITELN commands, and the READLN command is used to retrieve that data expected from the driver. The macro OPEN command initiates communication with the driver.

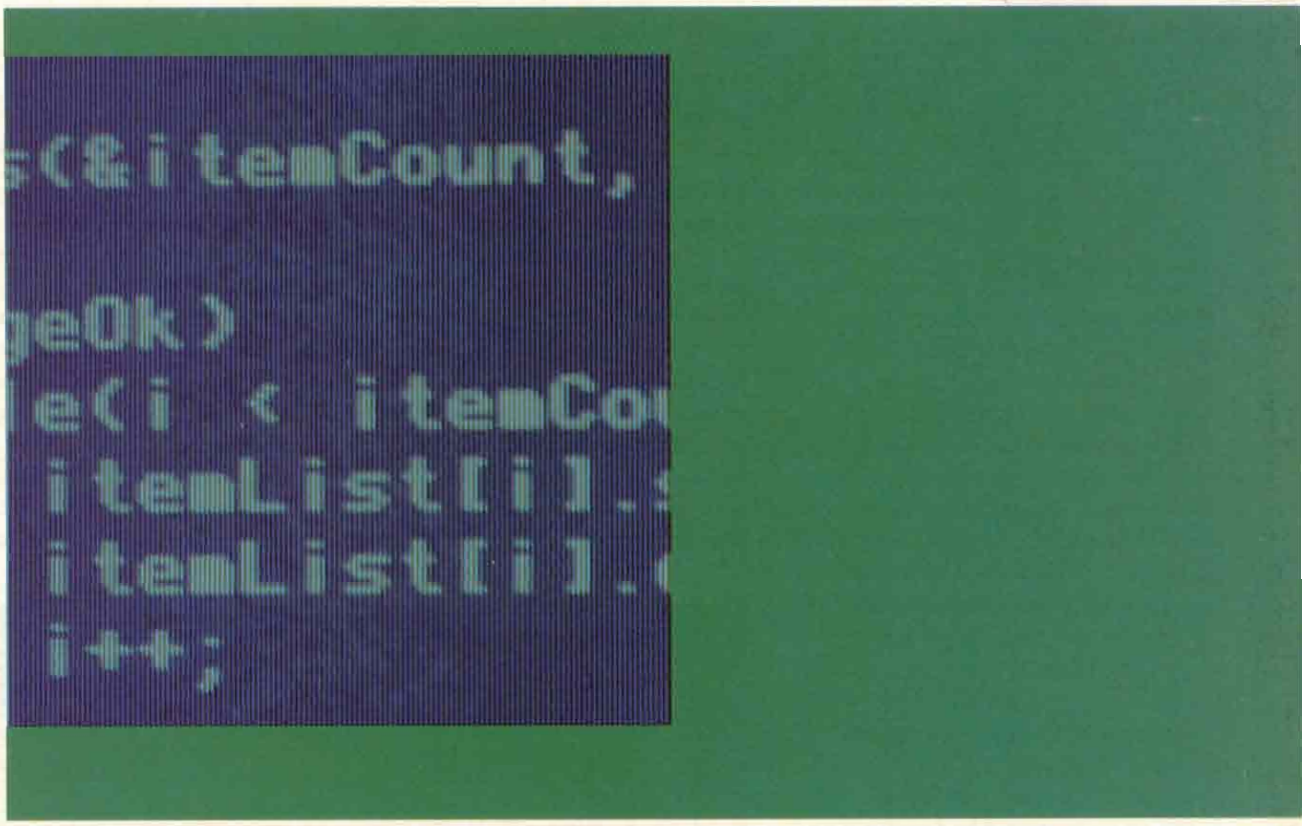
Subsequent WRITELN and READLN commands will read and write data directly for the driver. The READLN command will place the data received into a specified cell in the spreadsheet. After the instrument on the bus has been instructed to return a data value, the READLN commands will retrieve that value from the driver and place it in a cell in the spreadsheet. A list of values in a file is brought into the spreadsheet in the same fashion.

After "opening" the driver, all of the commands within its commands set are available. These include the most common operations on the bus, such as sending device-dependent commands to instruments, polling, triggering and reading data from the instruments. These operations are performed by:

```
{WRITELN "OUTPUT DMM;F1R0X}     (WRITELN :TRIGGER DMM"}
{WRITELN "SPOLL DMM'}           {WRITELN "ENTER DMM"}
{READLN E23}                    {READLN E24}
```

OUTPUT is a driver command that sends data to the specified IEEE device. In the previous example, the device-dependent command "F1R0X" is being sent to a devise called DMM (digital multimeter). The serial poll byte from that same device is then placed in cell E23 by the READLN command. The ENTER command requests data from the DMM device. The subsequent READLN command places the returned value in cell E24. The driver command set handles all bus protocol and overhead, including addressing the instruments, asserting the signal lines and all bus commands.

The Consumer's Guide to Buying a C Compiler for the HP 3000.



The release of Spectrum has sparked new interest in C among HP 3000 users. If you're adding a C compiler to your software shopping list, here are four criteria to consider.

- Is the compiler strictly ANSI-standard, ensuring the ability to run programs on both classic and Spectrum HP 3000s?
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- Does it work like all other HP 3000 compilers, providing accesses to the MPE file system and intrinsics and producing standard USL files?
- Does it provide a reliable programming environment through function prototyping?

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CIRCLE 238 ON READER CARD

HP-UX

Andy Feibus

Vi Text Editing

This month's column is the first of two columns discussing the **vi** text editor. Here I'll discuss the **vi** commands that you may find useful when creating a text file, whether that file contains program code or documentation for the final product.

The **vi** editor is based on the **ex** line-oriented editor. Many commands you can execute in **vi** are, in reality, **ex** commands. Within **vi**, all **ex**-based commands are performed outside of insert mode and begin with a colon (:).

If you haven't already started using **vi**, refer to the **vi** section of the *HP-UX Concepts and Tutorials: Text Editors and Processors* manual.

Once you feel comfortable with basic text insertion (the **i** and **a** commands) and deletion (the **dd** and **x** commands), the remainder of this column provides an overview of some of the more useful **vi** commands used to create and change text files. Full descriptions for each of these commands may be found in the *Text Editors and Processors* manual.

Vi commands can be grouped into four groups: cursor movement, text manipulation, configuration commands and complex commands. The first two groups are discussed below. The other two groups will be discussed in next month's column.

Cursor movement within **vi** can be accomplished using many possible **vi** commands. Some of these commands are found in *Table 1*.

To determine where in the file the cursor is presently located, use ^**G** (**vi** informs you of the present cursor location and length of the file at the bottom of the screen).

Your terminal may be configured to permit the arrow keys to act as cursor movement keys. If so, don't attempt to use these keys while in insert mode, because these keys may transmit an ESC character, which terminates insert mode.

Within pattern searches (the / and ? commands), certain special characters may be used to match one or more search characters. Two of these special characters are * (match any number of characters) and . (match exactly one character). To use either of these characters in a search (as actual characters and not as special characters), precede them with a backslash (\).

Table 2 shows a sampling of the commands that are used to manipulate the text in a file.

Any of these commands may be preceded by a number to cause the command to effect more than one item. For

TABLE 1

h	Move left one character. This is the same as the backspace key.
j	Move down one line.
k	Move up one line.
l	Move right one character.
^U	Move up one-half screen.
^D	Move down one-half screen.
w	Move to the next "word."
b	Move to previous "word."
/text	Move forward in file to first location of "text."
?text	Move backward in file to previous location of "text."
n	Repeat the last search (/ or ? command).
N	Repeat last search, but switch direction.
G	Move to beginning of last line of file.
:#	Move to the beginning of line # in the file.

Basic cursor movement commands.

TABLE 2

x	Delete the character at the cursor location.
dw	Delete the current "word".
dd	Delete the current line.
cw	Change the current word. Marks the current word for deletion (shown by placing a $ at the end of the word) and places the user into INSERT mode to replace the word with other text. End the replacement by using the ESC key.

Commands used to manipulate text in a file.

example, **4dd** deletes four lines; **2cw** permits change to the next two words. Other text manipulation commands are found in *Table 3*.

When text is deleted or yanked, the text is placed into a **vi** buffer. This buffer may be placed either into one of the 26 *named* buffer areas that **vi** maintains or onto the *buffer history stack*.

All named **vi** buffers are referenced by prefacing a delete, yank or put command with "<**name**>, where <**name**> is one of **a** through **z** and is the name of the buffer. For example, to cut five lines from one section of the file and paste them into another section of the file, move the cursor to the first of those five lines and type **"a5dd**. Then, move the cursor to the beginning of the line above the location where the lines are to be pasted and type **"ap**.

To place text onto the buffer history stack, use the yank or delete command without naming a buffer (i.e., without the "<**name**> syntax). To get the topmost item on the stack, use the **p** command without naming a buffer. Up to nine text buffers are maintained in the stack. These buffers may be referenced individually by using the buffer names **1** through **9** (e.g., **"3p**). Only the topmost item on the stack may be accessed without using the "# prefix.

Named buffers are handy if you have a complex command to execute more than once, such as a complex substitution. On a line separate from the rest of your text, type the command exactly as you would execute it (including the **:** prefix, if necessary). Then place the cursor anywhere on this line and type:

"<name>yy

where <**name**> is the name of a buffer in which to place this command. To execute the command, use the following **vi** command:

@<name>

To undo the last change you made with a **vi** command, use the **u** command. To undo all changes you made to a single line, use the **U** command. To redraw the **vi** screen (in case of a problem with your terminal), type ^**L**. To insert a control character, like ESC, into a file, press ^**V** before pressing the control character.

When editing a large file, you may find it difficult to remember where certain information is located in the file. For example, you may wish to refer to a section of code as you develop another section of code. To move quickly to the reference code, use a *marker*, which is an invisible placeholder in the file that isn't retained between file editing sessions.

A marker is specified by moving the cursor to the location to remember and executing the **vi** command:

```
m<name>
```

where **<name>** is the name of the marker (**a** through **z**). Although markers are named the same as buffers, the two items are entirely unrelated. To jump to a marked location, use:

```
'<name>
```

where ' is an accent grave. The cursor is placed at exactly the same spot as the marker.

A marker also may be used as either a beginning or ending boundary. For a delete, change or yank operation, the current cursor location becomes the other boundary. For example, to delete all text between the current cursor location and the marker **q**, use:

```
d'q
```

Named buffers are handy for complex commands.

Next month: **vi** configuration commands, some "complex" **vi** commands and editing multiple files. —*Andy Feibus is a freelance software consultant, Atlanta, GA.*

TABLE 3

D	Delete until the end of the current line. This command is the same as d$.
R	Replace the text starting at the current cursor location with other text. End the replacement by using the ESC key.
r	Replace a single character at the current cursor location.
d/text	Delete until "text" is located (forward) in the file.
A	Append text to the end of this line.
J	Join the current line with the next one.
:s/old/new/	Text substitution. Refer to the *Text Editors and Processors* manual for a complete description of all the possible forms of the substitution command.
#yy	Copy (yank) the lines into the vi buffer area. If an integer # is not specified, only one line is copied; otherwise, # lines are copied.
p	Place the text from the buffer area (containing the last yank or delete command) into the file after the current cursor location (if the buffer area contains a complete line, it is inserted after the current line). The command P places the buffer before the cursor location.
~	Change the case of a letter (uppercase to lowercase or vice-versa).
.	Repeat the last text manipulation command (not the :s command, however).
&	Repeat the last substitution (:s) command.

More text manipulation commands.

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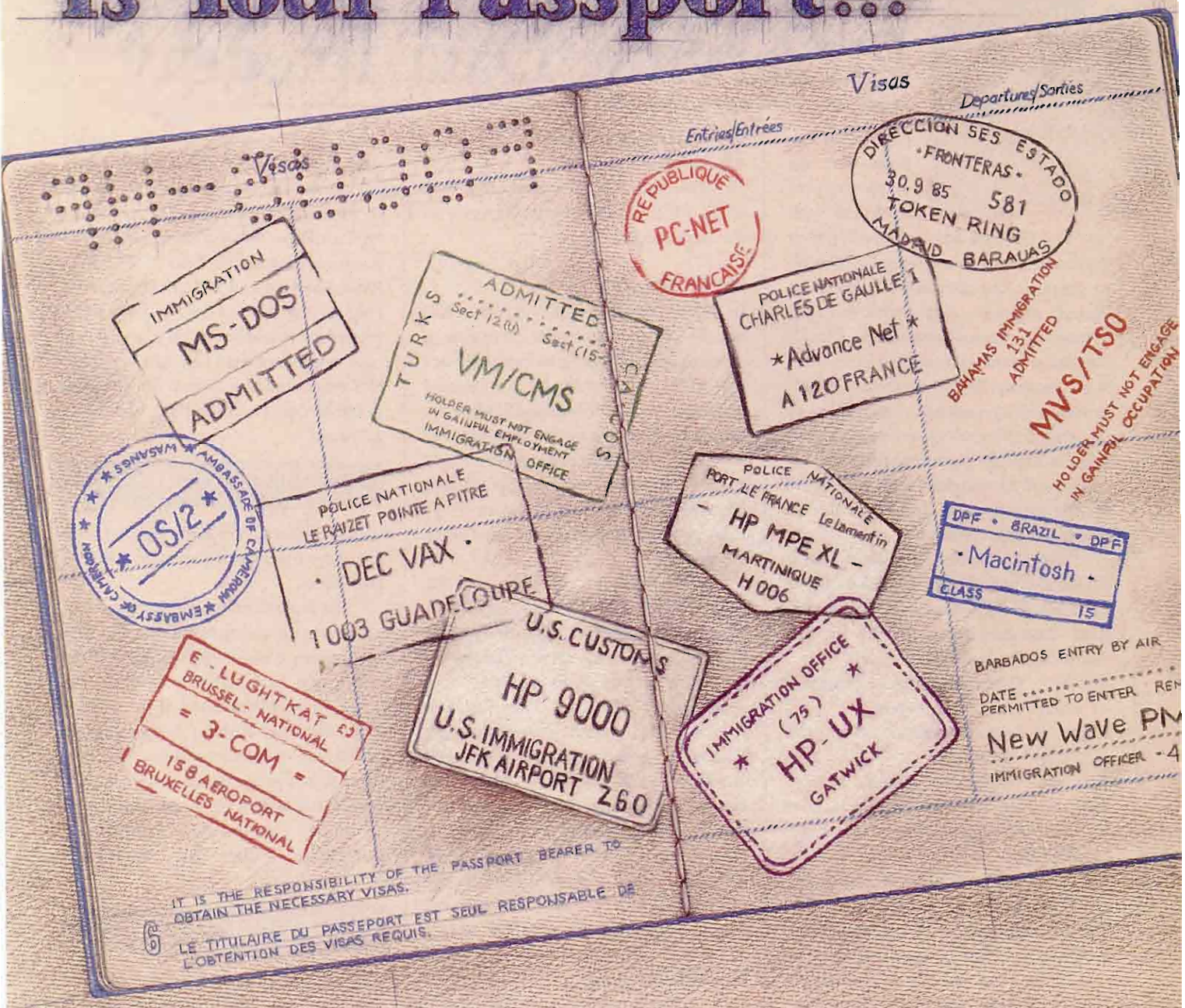

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CIRCLE 171 ON READER CARD

RDBMS

Fabian Pascal

Preserving Data Integrity

Current database users are extremely preoccupied with easy and fast data access. However, they don't seem to be as concerned with how to preserve the integrity of data, even though efficient, easy access to inaccurate or inconsistent data doesn't amount to much. It's not that users don't want integrity. What's surprising is their willingness to undertake the burden of insuring it themselves, even though the most technically proficient programmer can't hope to compete with the DBMS on the effectiveness and reliability of integrity enforcement.

Integrity rules (or constraints) define the permissible database operations for adding, changing or deleting data. Examples of such rules for our PROJECT database (*Table 1*) are:

- Rule A: There shouldn't be duplicate or unidentifiable employees.
- Rule B: Salaries must be within the $15,000-$75,000 range.
- Rule C: Salaries are within $15,000-$68,000 for San Francisco employees, and within $18,000-$75,000 for D.C. employees.
- Rule D: No more than 70 employees can be hired for the project.
- Rule E: Employees always should be assigned to existing departments.

Note: Data security is a necessary but insufficient condition for data integrity. Databases can be corrupted by errors of improperly and properly authorized users alike.

A closer inspection of the rules above reveals that there are five types of data integrity:

- Entity (or Table) Integrity
- Domain Integrity
- Column Integrity
- User Defined Integrity
- Referential Integrity

This month I'll discuss the first four types. I'll cover Referential Integrity in the next column.

Entity Integrity

Entity (or Table) Integrity (EI) is a class of rules which insures that every row in a database table can be individually accessed by the DBMS. In a relational database, unique row identification by primary key (PK) values is the only way in which the system can translate every logical user requests into an unique physical disc location. Consequently, EI rules prohibit any duplicate or missing PK values.

Rule A is an EI rule for the EMPLOYEES table. If there were identical rows in EMPLOYEES, or if some EMP#s were missing, there would be no way for a user to point the DBMS to a specific row, short of knowing and resorting to internal disc addressing schemes, something that relational databases were specifically devised to avoid. Moreover, if databases properly reflect reality, EI rules are one way to achieve this. Surely there aren't two completely identical employees in the real world, and unidentifiable employees shouldn't exist in the database.

Domain Integrity

In a previous column I explained domains as a kind of multicolumn extended data types. They are independently defined ranges of values of a specific data type (character, numeric, dates, etc.), from which more than one column can draw values. A domain's properties are inherited by all the columns that draw their values from it and constrain their data, thus enforcing Domain Integrity (DI) rules.

Rule B is an example of a domain rule. If the EMPLOYEES table was split in two and the results stored separately in San Francisco and D.C., a domain PAY could be defined for the PROJECT database as seen in *Table 2*. The SF_EMPL.SALARY and DC_EMPL.SALARY columns are defined over it. Then PAY's properties would be passed onto the two columns. More than just data type, size and range could be defined for domains. A PROJ# domain could be defined with a "mask" :

```
CHARACTER 6 [AA9999]
```

to insure that all columns defined over it contain the correct sequence of letters and digits.

An important task of domains is to insure comparability of columns for data operations. Assume that the PROJECTS.ERESP and ACTIVITIES.ACTCODE columns were both defined as INTEGER 3 in the database. Without domains, a user mistakenly could compare (using <, >) them in a join operation, unnecessarily consuming system resources. But if each of the two columns were defined over a separate domain (e.g., EMP# and ACTCODE)

```
INTEGER 3 [0-100] <> NOT ALLOWED
```

then such operations wouldn't be executed by the DBMS unless explicitly overridden by the user.

Column Integrity

Rule C shows why there is a need to have integrity constraints supported not just at the domain, but also at the column level. While all salaries in the data-

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Hewlett-Packard recently acquired the worldwide rights, with unrestricted usage for their own company, to two advanced tools, HIBACK and DBTUNE from HI-COMP.

This partnership provided sufficient reason for Klaus Stamer, General Manager of Hewlett-Packard in North Germany (photo right) to personally present Uwe Hinrichs of HI-COMP Hinrichs GmbH with a special certificate.

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base must fall within an overall range ($15,000-$75,000), within that range there are specific additional rules for San Francisco and Washington salaries (*see Table 2*). Consequently, Column Integrity (CI) makes it possible to define such constraints for individual columns, beyond their domain level constraints.

User Defined Integrity

There are kinds of arbitrary rules that usually characterize business environments. Some are determined by management policies, others by government laws, etc. User Defined Integrity (UI) insures that users can apply them to the database as needed.

Enforcing a rule like Rule D

TABLE I

DEPT#	DNAME	MGR#	RDEPT
A00	COMPUTER SVCS DIV.	10	
D01	DEV. CENTER		A00
D11	MFG. SYSTEMS	60	D01
D21	ADM. SYSTEMS	70	D01
E01	SUPPORT SVCS	50	A00
E11	OPERATIONS	90	E01
E21	SOFTWARE SUPPORT	100	E01

DEPARTMENTS Table

EMP#	ENAME	DEPT#	HIRED	SALARY
100	Spenser	E21	6/19/80	26150
150	Adamson	D11	2/12/72	25280
160	Pianka	D11	10/11/77	22250
310	Setright	E11	9/12/64	15900
250	Smith	D21	10/30/69	19180
260	Johnson	D21	9/11/75	17250

EMPLOYEES Table

PROJ#	PNAME	ERESP	STAFF
MA2110	PROGRAMMING	60	9.00
MA2111	PROGRAM DESIGN	220	2.00
MA2112	ROBOT DESIGN	150	3.00
MA2113	PROD CONT PROGS	160	3.00
OP1010	OPERATION	90	5.00
OP2010	SYSTEMS SUPPORT	100	1.00
AD3112	PERSONNEL PROG	250	1.00
AD3113	ACCOUNT PROG	270	2.00

PROJECTS Table

ACT#	ACTCODE	ACTNAME
10	MANAGE	Manage/Advise
30	DEFINE	Define Specs
40	LEADPR	Lead Program/Design
60	LOGIC	Describe Logic
70	CODE	Code Programs
80	TEST	Test Programs
130	OPERAT	Oper Computer Sys
140	MAINT	Maint Software Sys
160	ADMDB	Adm Databases
170	ADMDC	Adm Data Comm
180	DOC	Document

ACTYPES Table

PROJ#	ACT#	EMP#	START	TIME
MA2112	60	150	1/1/82	1.00
MA2112	180	150	7/15/82	1.00
MA2113	60	160	7/15/82	1.00
OP1010	130	310	1/1/82	1.00
AD3112	70	250	8/15/82	0.25
AD3112	180	250	8/15/82	0.50
AD3112	80	250	10/15/82	0.50
AD3112	60	250	1/1/83	1.00
AD3113	80	260	3/1/82	0.50
AD3113	180	260	4/15/82	1.00
AD3113	70	260	6/15/82	0.50

ASSIGNMENTS Table

PROJ#	ACT#	STAFF	BEGIN	END
MA2112	70	2.00	1/01/82	7/01/82
MA2112	180	1.00	7/01/82	2/01/83
MA2113	60	1.00	2/15/82	9/01/82
AD3112	60	0.75	1/01/82	3/15/82
AD3112	70	0.75	1/01/82	10/15/82
AD3112	80	0.35	8/15/82	12/01/82
AD3112	180	0.50	8/15/82	1/01/83
AD3113	70	1.25	6/01/82	12/15/82
AD3113	80	1.75	1/01/82	4/15/82
AD3113	180	0.75	3/01/82	7/01/82
OP1010	130	4.00	1/01/82	2/01/83

ACTIVITIES Table

PROJECT Database

became critical in my own experience with a government Personnel Management System. The number of various types of political appointments were preset to specific maximums by law. It would've been very beneficial to be able to express a Rule D constraint as follows:

```
MAX(COUNT(EMPLOYEES.EMP#) < = 70
```

But because the particular DBMS with which the system was designed didn't enforce integrity, including UI, insuring that the system obeyed the legal constraints was relegated to quite complicated application programs. The end result was that the law wasn't enforced, and more than the legally allowed number of appointments frequently were detected in the database. This brings me to an important point.

Whose Job Is It?

Real world databases have many tables, keys, data relationships and rules. The complexity is daunting. Even a simple database like PROJECT reveals that. Without a systematic, complete, reliable, efficient and easy mechanism to enforce all the rules for all database operations

TABLE 2

EMP#	ENAME	DEPT#	HIRED	SALARY
100	Spenser	E21	6/19/80	26150
150	Adamson	D11	2/12/72	25280
160	Pianka	D11	10/11/77	22250

SF_EMPL Table

EMP#	ENAME	DEPT#	HIRED	SALARY
310	Setright	E11	9/12/64	15900
250	Smith	D21	10/30/69	19180
260	Johnson	D21	9/11/75	17250

DC_EMPL Table

The Distributed EMPLOYEES Tables

and users, you can rest assured that the accuracy and consistency of the data will deteriorate rapidly.

Nonrelational DBMSs rely on application developers to enforce integrity. For every application that adds, changes or deletes data, long and complicated programs must be written to insure that integrity rules aren't violated. Given the number and complexity of rules and applications, and the nature of programming, this is burdensome and very unreliable. It's extremely easy to err in writing the code, or to omit some rules. Moreover, there's no sound way to validate the correctness and completeness of the code.

Worse, when the data or rules change, not only is it necessary to revise all that code, but it must be done for each of the affected applications separately. Just figuring out which applications are affected is a major problem. The rules are buried in various programs and aren't readily visible. Conflicts, errors, etc., can't be detected and corrected.

Because this approach is inefficient and frequently ineffective, relational DBMSs enforce integrity rules centrally. With that, the responsibility for, and burden of, integrity enforcement is shifted from users to the DBMS where it rightly belongs. The system stores the rules in its catalog and uses built-in intelligence to automatically enforce them for all relevant applications at run time. Users easily can query the catalog to inspect the rules and, if changes are necessary, they're made once in the catalog, not repeatedly in programs.

DBMSs that don't enforce integrity centrally in the database (therefore letting users worry about it in applications) offer no real practical solution to integrity and shouldn't claim that they're relational. *—Fabian Pascal is a Washington, D.C., microcomputer analyst and consultant specializing in relational database management and SQL, and is affiliated with Codd & Date Inc.*

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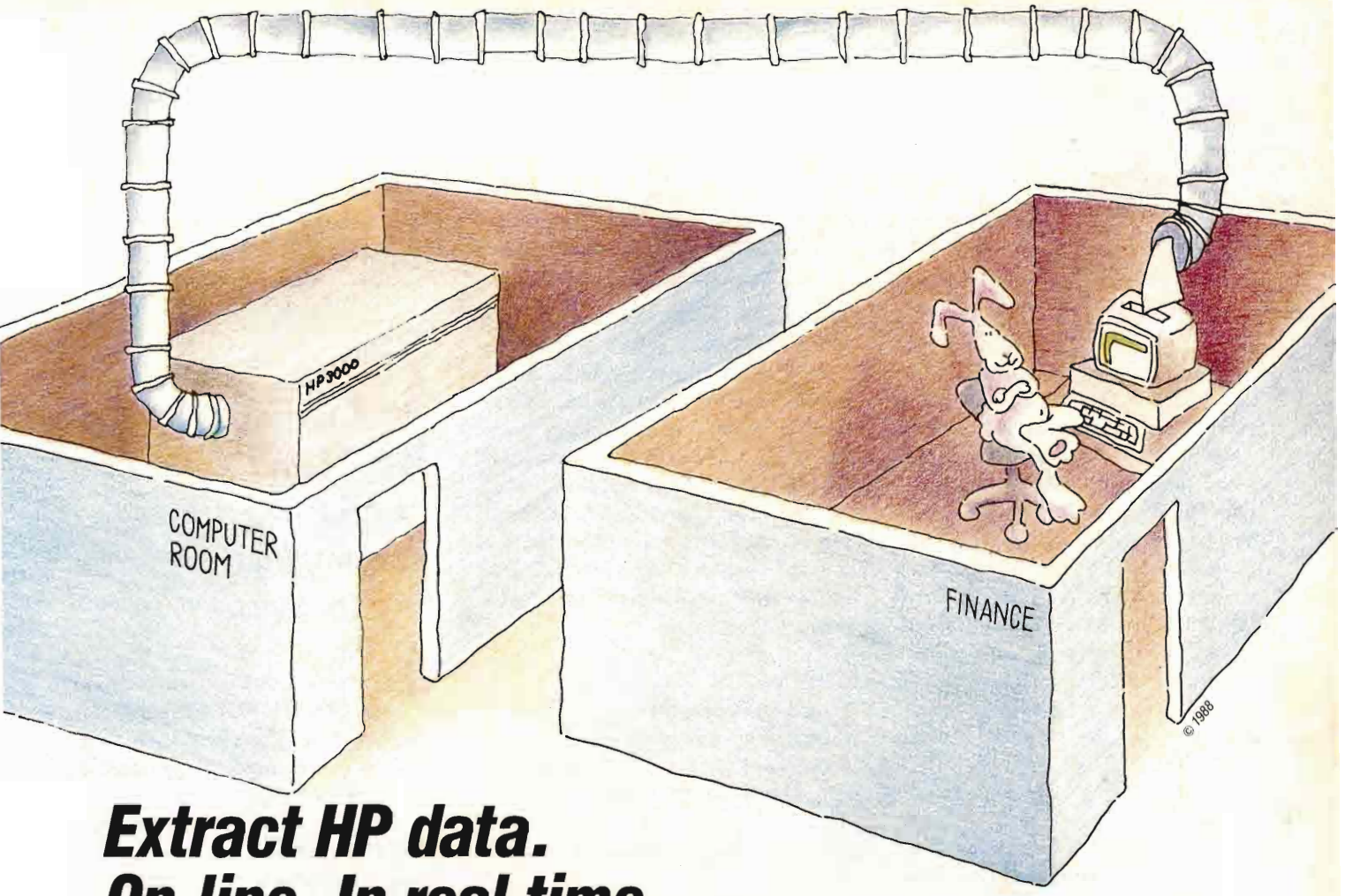

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PC TIPS

Miles B. Kehoe

Graphics Programming

Last month I described the process of starting up your PC and what goes on inside of MS-DOS to get PAM or the standard MS-DOS command program running. I had intented to describe some of the options beyond the SHELL statement in the CONFIG.SYS file, but because the focus of this issue is graphics, I'll diverge and show you a neat little graphics program you can try on your system. If you don't have BASIC or C on your system, you might want to download the entire program from HP Professional's Bulletin Board, ARIS/BB.

Fractals

In case you haven't noticed, fractals are very much in vogue among scientists and engineers, and the fad hasn't missed graphics programmers. Fractals are found throughout nature, and can be used to allow stunning simulations of the real world by using a series of functions. Clouds, mountain ridges, even heart irregularities can be analyzed and simulated in terms of fractals.

While Julia curves and Mandelbrot sets are complex ways to create fractals, there's a very easy way to create a pattern with trivial mathematics and programming.

Fractals are popular among scientists, engineers and graphics programmers.

The Problem

Start with a blank sheet of paper. Mark three points randomly on the sheet, forming the vertices of a triangle. Mark one point A, one point B and one point C. If you did poorly in high school geometry, I promise this is as complex as it gets.

Now that you have marked the initial three points, pick a fourth point on the sheet of paper. We'll call this point D, although we won't need it for long. Pick one of the original three points at random: One easy way is to roll a die. If you roll a one or two, pick point A; a roll of three or four picks point B; and a roll of five or six picks point C.

Make a mark on the paper half way

GRAPHICS.DOC

Program 1.

```
    Triangle in Turbo C

#include <dos.h>
#include <math.h>
#include <stdio.h>
#include <stdlib.h>

union REGS regs;

int set_video_mode();
void put_pixel();

int save_mode;
int i, j;

int   seed;
int   x1, y1,
      x2, y2,
      x,  y;
int   points;
int   px[6];
int   py[6];


char far *screen_start_addr;
char far *screen_byte;

static char mask[8] = { 0x80,
                        0x40,
                        0x20,
                        0x10,
                        0x08,
                        0x04,
                        0x02,
                        0x01  };


/*     Begin main function    */
       :        :        :
```

Program 2.

```
    Triangle in GW-BASIC

1000 ' Sierpinsky Triangle Demonstration
1010 ' Microsoft GW-BASIC on HP Vectra
1020 '
1030 DIM PX[6]
1040 DIM PY[6]
1050 DEF FNRAND(M) = INT(RND(1)*M) + 1
1060 CLS
1070 KEY OFF
1080 PRINT"Enter the number of points to plot";
1090 INPUT": ", POINTS
1100 W = 650          ' BASIC Uses lower screen res
1110 H = 200
1120 SCREEN 2
1130 FOR I=1 TO 3
1140   PX(I) = FNRAND(W)
1150   PX(I+3) = PX(I)
1160   PY(I) = FNRAND(H)
1170   PY(I+3) = PY(I)
1180 NEXT I
1190 LINE (PX(1), PY(1))-(PX(2), PY(2))   ' Draw the outline
1200 LINE (PX(2), PY(2))-(PX(3), PY(3))
1210 LINE (PX(3), PY(3))-(PX(1), PY(1))
1220 ' Now we have the three points A, B, and C
1230 X = FNRAND(W)
1240 Y = FNRAND(H)
1250 ' Now we have point D.  Pick a point to work with.
1260 FOR I=1 TO POINTS
1270 P = FNRAND(6)
1280   X1 = PX(P)              ' Roll the die
1290   Y1 = PY(P)
1300   X2 = INT((X1-X)/2 + X)  ' Find the half-way point
1320   Y2 = INT((Y1-Y)/2 + Y)
1340   PSET(X2, Y2)            ' Plot it
1350   X = X2                  ' And use it as the new value for 'D'
1360   Y = Y2
1370 NEXT I
1380 A$=INPUT$(1)              ' Let the user view the triangle
1390 SCREEN 0                  ' Reset the screen
1400 PRINT"All done"
1410 END
```

['FRACTALOGY']

With many computer-graphics applications it's sufficient to use smooth, rounded edges to resemble animate and inanimate objects. We know, however, that several objects, such as mountains, clouds and coastlines have irregular contour, and although it would be easy to depict natural phenomenon, such as these with smooth curves, it would be a great injustice if a graphics application couldn't simulate their detail. What's needed is a way to incorporate this "controlled irregularity" within an application. The use of fractals is one way.

A fractal is an object that's irregular on all sides regardless of the scale in which it's being examined. Fractals are said to have infinite detail. Fractal objects are considered geometric entities that can't be represented using Euclidean geometry. Basic Euclidean geometry provides simple rules stating that finite and infinite curves are 1D, finite and infinite surfaces are 2D, and volumes are 3D. Fractals, however, have *fractional* dimension.

Simply, smooth curves are 1D objects whose length can be defined between two points. A fractal curve contains an infinite amount of detail at each point along the curve, so you can never determine its length. The closer you look, the more detail is apparent and the larger the fractal curve becomes.

Fractal geometry, the study of fractals in space, was developed by B.B. Mandelbrot in the 1950s. He determined that fractals are created in two ways. One way is to consider the limit of a sequence of polylines and polygons. The other is to consider the limit of repeated applications of mathematical functions to generate the coordinates of points.

The first method described is a *geometric* fractal, a fractal that repeats self-similar patterns over all scales. The other, a *random* fractal, is similar to a geometric fractal except the patterns are no longer perfect. The pattern appears irregular at all scales.

Fractals can be generated by using random numbers. Random, meaning unpredictable, like the roll of the dice. Actually, simple probability equations prove that coin tosses and dice rolls are predictable events, so this isn't considered true random number generation.

Keep in mind that the result of Kehoe's problem is a geometric fractal that's been created using only three random numbers. To generate a truly random fractal, you need to use a truly random number processor with a long period. You don't, however, always need random numbers to create fractals: They're deterministic, a result of a "sequence of causes."

As you see from Kehoe's example, random generation of fractal objects requires considerable computation time to determine all the testing points required to prove that the pattern will emerge. There is, however, a growing trend toward the use of fractals in computer graphics and animation. —*Andrea J. Zavod*

References:

Computer Graphics, Prentice Hall, 1986.
Numerical Methods and Software, Prentice Hall, 1989.
Computer Graphics Software Construction, Prentice Hall, 1989.

between point D and either A, B, or C depending on your roll. This new dot becomes point D. Repeat the process. Roll a die again, and make a mark half way between the new point D and the point selected by the number on the die.

. . . random generation of fractal objects requires considerable computation time.

When I first heard this problem, I imagined that the end result would be a triangle filled with dots. After all, the points are all selected at random. However, if you perform this task either by hand or by computer, you will see a pattern emerging after a few dozen points.

Program 1 contains the Turbo C program that performs this simulation. *Program 2* contains the GW-BASIC solution to the same problem.

The pattern created by this program is called a Sierpinski Triangle and seems to be unique to three-sided figures. I've tried a few combinations of figures with other numbers of sides and all I have found is random pattern. I invite you to play with the number of sides and the proportions: four sides and one-third the distance between points; five sides and one-fourth the distance, etc. So far, nothing interesting.

If you enjoyed this program and wish to learn more about fractals I suggest the following references:

Gleick, James. *CHAOS: Making a New Science. New York: Penguin Books, 1987*

"The Mandelbrot Set," *Scientific American*, August 1985, pp. 16-32.

Next month, back to basics! —*Miles B. Kehoe is an online support manager for Verity Inc., Mountain View, CA.*

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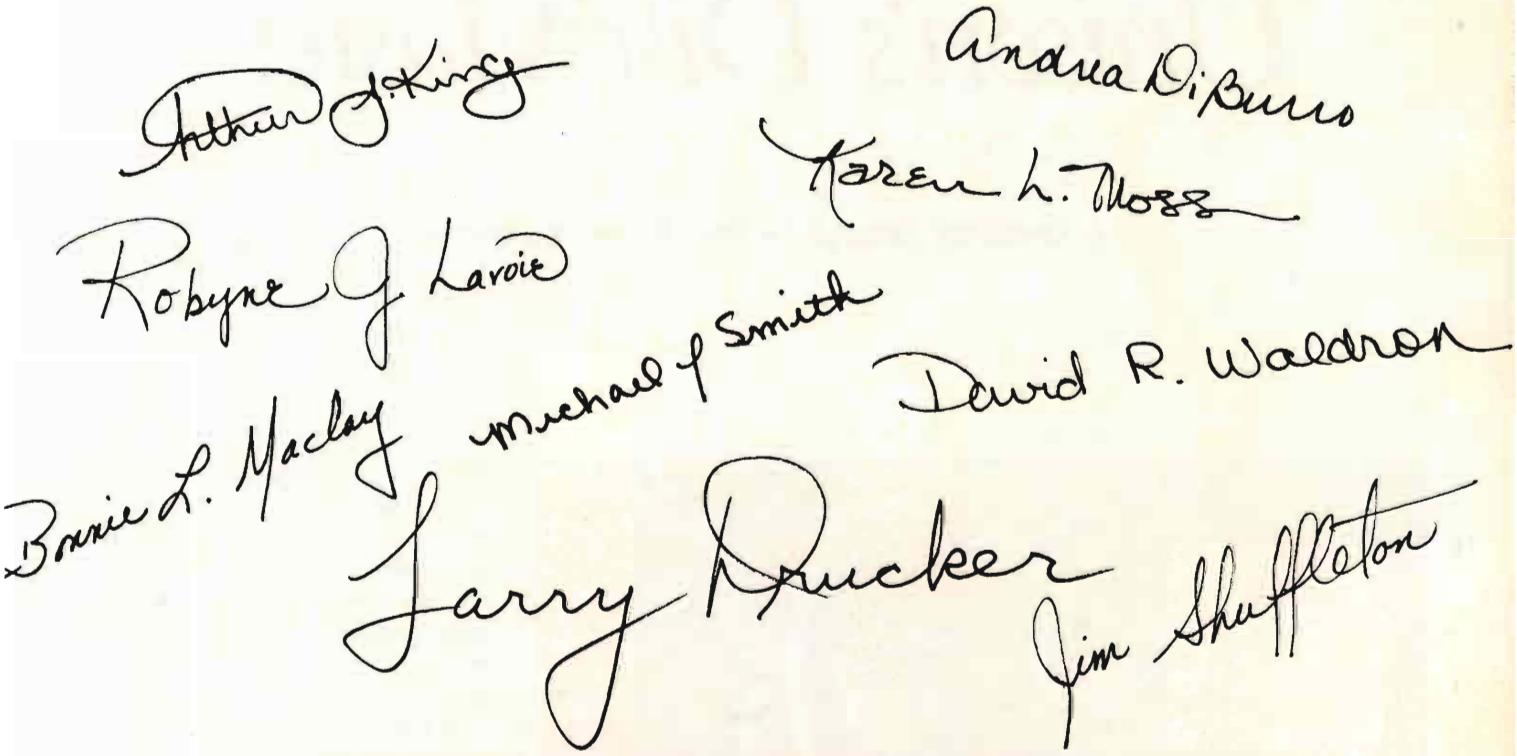

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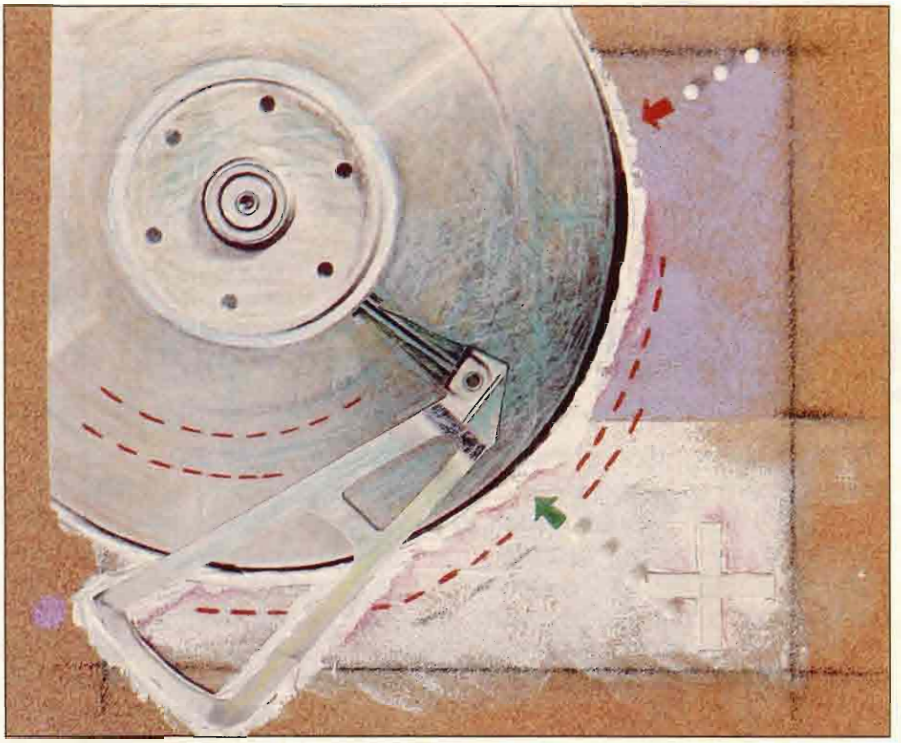


JOEL MARTIN

For many years, mainframe environments have had tools available to manage disc space usage. HP 3000 users historically have relied on the very few commands and utilities shipped with MPE or have tried to bend third-party tools to the task. Now, HP 3000 users have a tool in DiscMaster, the disc space management system, from Unison Software (Sunnyvale, CA).

Features

DiscMaster isn't a single utility. It's a complete system for managing disc space in MPE V and MPE XL environments.

Unlike a utility-based approach, DiscMaster allows you to define a sophisticated policy for disc space management that allows you to determine whether each file surveyed should be acted upon by DiscMaster. After policy definition, a disc space survey is run so that DiscMaster can recommend recovery actions. You initiate recovery actions after review and modification of the survey recommendations. A com-

plete set of reports provides summary and detail information both post-survey and post-regain of disc space.

There are four types of space recovery actions that DiscMaster can perform on a file: trim, compress, archive (with optional purge) and purge. A recovery action can be performed automatically on a file if the file meets the aging criteria you have defined for that particular action type.

Trimming of files returns space to MPE beyond the last record in the file. Files can be trimmed automatically if they haven't been modified in the number of days you specified as the aging boundary for the trim operation when you defined your system's disc space management policy. Trimming also can be done on an ad hoc basis on any user defined fileset, but in no case will DiscMaster trim IMAGE, KSAM, PROG, SL, RL or USL files.

Compression of files also can be performed automatically for each file

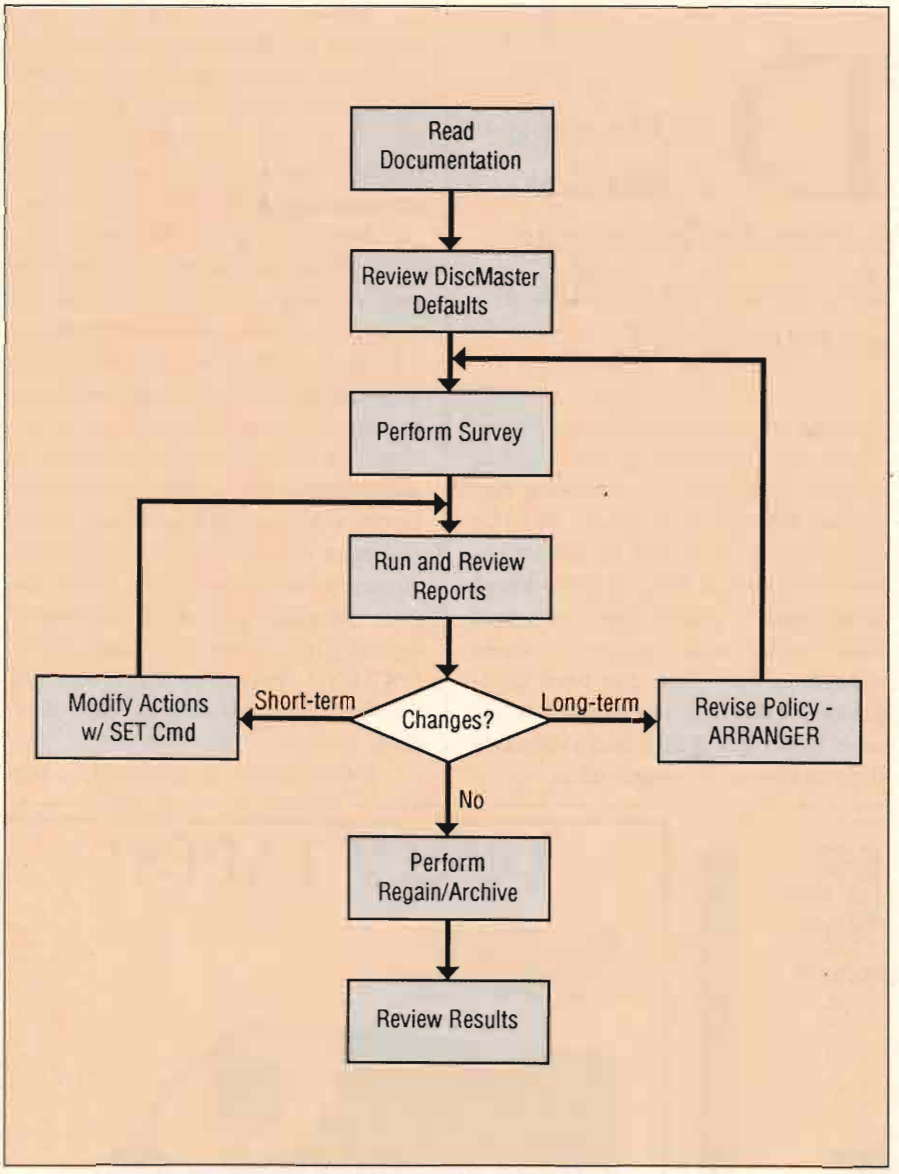
DiscMaster is a complete system for managing disc space in MPE V and MPE XL.

that hasn't been accessed in a number of days greater than that specified as part of your disc policy. Compressed files become encrypted privileged files (file type PRIV) so they can't be accessed or read without first being decompressed. (Compression even secures unsecured files, further enhancing your system security.) After a file has been compressed it can be decompressed at any time. Compressed files retain the name they had prior to compression.

Whether a file is archived is determined by the file's access date and the number of days aging for archival. Archiving isn't available as an ad hoc function — an MPE store and purge can largely fill that need. Files can be purged automatically after archival if desired.

File purging can be done automatically when files have reached their maximum age, or files can be purged on an ad hoc basis. DiscMaster provides a facility to purge filesets as well as files through wildcard matching. Unlike the trim, compress and archive recovery actions, the filesets that are candidates for purging must be specified prior to any recovery of space by DiscMaster. (Trim, compress and archive operate on all files surveyed unless the file or fileset has been specifically excluded.) Examples of typical purge filesets include work files ("K" files) created by Edit/3000, old OUTPUT files, and MPE log files older than 30 days.

Information on trimmed, com-



A quick survey of the defaults may help to define disc space policy.

pressed, archived and purged files is stored in DiscMaster log files rather than in a database. Therefore, the number of files in your survey or recovery action will not cause problems with dataset capacities within the DiscMaster databases. No information is retained on files that are modified or purged on an ad hoc basis.

DiscMaster offers two primary programs, ARRANGER and COMMAN. ARRANGER is an interactive forms-based program to document or review the components of your disc space policy. Individual functions within ARRANGER can be grouped into function sets for use by individuals other than the system manager. CONMAN is the program that performs the recovery actions, generates reports and allows you to perform short-term changes to your disc space policy. CONMAN can be run interactively or in batch.

The number of days aging before a file is candidate for trimming, compressing or archiving is set through the CDPO (Change Disc Policy Options) screen of ARRANGER. For each action type you can specify a number of days aging up to 9999, or slightly over 27 years. Type files PROG, KSAM or IMAGE can be globally excluded from compress and archive actions by specifying so on the CDPO screen. (Trimming of PROG, KSAM and IMAGE files isn't allowed under any conditions as noted earlier.)

Other elements of your disc policy will include the named filesets to be excluded from one or more recovery actions (Exclusion Filesets), the names of the reports you wish to be run automatically after a survey is performed and the definition of function sets. (Fileset names throughout DiscMaster can include wildcards.)

A disc space survey can be performed on a single account or on all accounts and at a detail or summary level. Summary level surveys don't give information on specific files, and therefore can't recommend recovery actions. However, they do provide information for several bar graph reports of how disc space is distributed. Summary surveys take much less time than detail surveys.

After the survey job completes, there are a variety of reports you can run. Bar graph summary reports show space distribution by age, file size and other factors. Reports that display individual files show what recovery action is recommended, if any, that would be consistent with your disc space management policy defined earlier. One report allows you to see a list of files in descending order of the number of estimated recoverable sectors. Another report lists the files excluded (by you or by the DiscMaster defaults) from recovery consideration. Still another report lists the files that require less space than allocated whether or not a recovery action is recommended. Some of the reports are twins that provide the same information sorted in a different order. Any or all of the survey reports can be flagged to print automatically after a survey is performed. Subsets of the surveyed files can be chosen for reporting by specifying a fileset name,

fileset age or fileset size when the report is requested.

Much of the information available on the reports also is available online with the SHOWFILE command of CONMAN, though SHOWFILE doesn't display subtotals of the estimated space to be recovered for the fileset specified.

Following the survey, you can make refinements to your disc space policy as appropriate to your environment in order to strike a balance between access convenience and effective disc space usage. (It would be wise to involve your users and programming staff in defining disc policy.) Files that never should be archived, compressed, trimmed or purged (the group that contains the boss's files, for instance) are identified as Exclusion sets using the ARRANGER program.

At any time you can change the list of reports that automatically are produced following a survey.

Installation And Set-Up

Installing DiscMaster was very straightforward, though the process is a bit unique. A single program file is restored to the PUB group of the SYS account and then run to start the installation. The program submits a series of six jobstreams to build the CCC account (if it doesn't already exist), restore the files and build and load the two databases used by DiscMaster. This approach is even simpler than the standard approach of restoring, editing and submitting a jobstream, but the undocumented submission of six jobs by the install program caught me off guard.

DiscMaster's installation accommodates any other Unison data center management products that may be installed without requiring edits to the jobstreams.

Following installation of the files, the ARRANGER program is run to identify your CPU and company and to identify the archive device, generally a tape drive. At this point you also can associate a list of ARRANGER functions to a password of your chosing, thereby allowing a level of restricted access to

the ARRANGER functions of DiscMaster for some of your users.

Overall, installation and initial set-up are straightforward and take very little time.

Test Results

With so many different disc space policy issues to consider, the task ahead may seem overwhelming. I can hear the groaning of operations managers across the country, "I don't have enough things to do? Now I have to spend a week defining disc space policy?" Don't be intimidated. DiscMaster is supposed to save you time as well as disc space, so all policy parameters have clear and well-chosen default values. I found the process to be quicker by running a survey before defining policy (see *Figure 1*).

I performed a detail survey on a single large account of 7,100 files and over 1,340,000 sectors. The survey took just less than an hour to complete. By necessity the survey takes a large amount of CPU time, so be sure to run it at an off-peak hour as the DiscMaster manual suggests.

After the survey job finished, I ran a variety of the reports. The bar graph summary reports (space distribution by age, space distribution by file size, etc.) ran very quickly. Reports that display individual files took a few minutes for my 7,000 plus files. (In the interest of speed the summary reports don't summarize the detail records but operate off separate records in the survey log file.) In addition to the bar graph reports, there are reports to list the files that were surveyed and their recommended recovery action (in descending order of the number of estimated recoverable sectors, if you like), list the files excluded (by you or the defaults) from recovery consideration, and to list the files that require less space than allocated whether or not a recovery action is recommended. Some of the reports have twins that provide the same information sorted in a different order. Any or all of the survey reports can be flagged to print automatically after a survey is performed. Subsets of the surveyed files can be chosen by specifying a fileset name, age or size when the report is requested.

Without changing the DiscMaster defaults, the estimated regain for my 1,340,000 sector account was a sizable 386,700 sectors — approximately 28 percent. By changing the default aging number of days or compressing all USL files, our online storage could easily have been reduced to as little as 800,000 sectors — a 40 percent savings (see *Figure 2*). Of the 7,100 files surveyed, 981 or 14 percent, were candidates for some type of recovery action.

The greatest space savings in our environment was with USL files. DiscMaster's compression facility reduced the storage space of each USL file by 54 to 96. In many cases the survey estimate of the space to be regained by compression proved conservative.

MPE XL users can take greater advantage of the trim feature of DiscMaster than MPE V users because MPE XL will allocate additional space when you write to a "full" file. This automatic "untrim" facility isn't part of MPE V.

Ease Of Use

The ARRANGER program can take some getting used to — the menu box operation and function key usage isn't as intuitive as I would have liked. ARRANGER provides separate inquiry and change screens though they appear and operate as similarly as possible. (The change screens allow inquiry as well as addition, deletion and modification.) Even after reading the Appendix on ARRANGER I didn't feel entirely comfortable using the screens until I had worked with the functions a few times.

The CONMAN program is a model of ease-of-use. The only problem you might encounter is remembering the names of reports and the parameters for each command. Fortunately the quick reference card is more than up to the task here. Further enhancing the ease of use of CONMAN is an effective redo command and a very good online help facility.

One area where the ease of use

could be improved would be to have predefined UDCs for running CONMAN and ARRANGER and for compressing and decompressing files. The product as shipped requires that you run each program via the MPE RUN command. The CONMAN program allows any command to be passed to CONMAN at run time through an INFO= string that would permit the creation of separate UDCs for individual CONMAN commands, if desired. (This facility would also permit the abusive use of UDCs for each CONMAN comm and that may be why vendor defined UDCs weren't provided.)

I had thought that the inability to move from ARRANGER into CONMAN (or from CONMAN into ARRANGER) might prove a nuisance but in practice I didn't find I needed such a facility. Once your disc policy is established using ARRANGER your interaction with DiscMaster will be largely by using CONMAN alone.

Documentation

The DiscMaster documentation is exceptional, particularly for the product's first release. The documentation set includes a user guide, demonstration guide, two quick reference cards, a schedule of training classes and a copy of Unison's "DCM (Data Center Management) Trends" newsletter.

The user guide has six sections — introduction, installation, operation, reports, ARRANGER reference and CONMAN reference — followed by an index and reader comment form. It's packaged in a three ring binder, which makes it easy to add note pages or update the material. The text of the manual is well supported with screen samples, tables, charts and other descriptive graphics. The user guide could benefit from an appendix with some sample approaches to disc management using DiscMaster, but some of this information is in the demonstration guide.

DiscMaster purchasers also will receive a copy of the spiral bound, 45 page demonstration guide with the DiscMaster product, a very welcome idea. The demonstration guide provides a quick and effective overview of the product functionality. The DiscMaster space management model (survey disc space, modify survey recommended actions, regain space, modify disc space management policy) is more effectively presented in the demonstration guide than in the user guide. I would suggest a reading of the demonstration guide prior to reading the User Guide.

One area of documentation that's so often overlooked is internal documentation within the text files that form part of the product, and here the staff at Unison has done a commendable job. Both the database schemas and the PASCAL and COBOL definition files for the EXTRACT process are well documented. Should you be inclined to write some of your own DiscMaster reports you will have a head start.

Help Facility

Online HELP is available for both the ARRANGER and CONMAN programs. The HELP facility of ARRANGER is easy to use and never more than a function key away. The help text was consistent with both the functioning of the screens and the documentation. Explanation of the products features is very good. The CONMAN HELP facility is modeled on the MPE help facility. Help can be requested for a command, a command parameter, a command example and on a command's operation. The CONMAN HELP facility also was consistent with the documentation and the functioning of the program.

Errors And Error Handling

While using DiscMaster I was unable to note a single software bug or functional problem (yes, you read that correctly), but I did note a couple of "bugs" related to the trapping of user errors. As noted earlier, the function key usage within ARRANGER is less intuitive than I would have liked. In several instances I received the error message "Inactive key. Press ENTER, NEXT, PREV, CHAIN or EXIT." after pressing the CHAIN function key. A rereading of the documentation and a call to technical support helped me correct my error.

Technical Support And Support Policies

Technical support is available from 7 a.m. until 6 p.m. Pacific Time. Technical support staff were knowledgeable about the product and returned my calls promptly.

Unison charges only one maintenance fee per site regardless of the number of copies of DiscMaster installed. DiscMaster is sold with an unconditional 30-day, money-back guarantee.

At the present time DiscMaster is the only product designed for managing disc space under MPE V and MPE XL. In spite of the lack of competition the product is very robust and has a large number of well-implemented features.

At a first copy price of $9,000 for a Series 950 license down to $1,600 for a Micro3000 XE license, DiscMaster is an excellent value. If you have a disc space problem or anticipate growth in your disc requirements, this product could save you a lot of work. —*Joel Martin is an associate director in Development Computing Services at Harvard University, Cambridge, MA*

DiscMaster

SYSTEM REQUIREMENTS: HP 3000, MPE V, MPE XL

PRICE: Valued priced according to CPU size; $1,600 — 9,000

Unison Software

HEADQUARTERS:
675 Almanor Ave.
Sunnyvale, CA 94086
(408) 245-3000

FOUNDED: 1979

PRODUCT LINE: DiscMaster, Maestro, SpoolMate, Tapes, Allocate, Radar

CIRCLE 295 ON READER CARD

The leading HP terminal emulator for the Mac is now the only Windows-based emulator for the PC.

Session for Windows: The next generation in HP terminal emulation is here.

Four years ago, Tymlabs pioneered the development of Session™ for Macintosh, an HP terminal emulator for the see-and-point desktop environment. Packing a sophisticated feature set into an intuitive, enjoyable and productive user interface, our Mac products have won acclaim from users and critics alike.

Building on the foundation of Microsoft® Windows for the PC, Vectra, and compatibles, we have been able to bring the power and ingenuity of our Mac-based emulators to Windows users as well. On both Mac and PC platforms, Session makes terminal emulation a full partner with today's desktop applications. For example, you can extract data from a database on your HP host and display it on your "terminal screen" (your Session window). Using the mouse or keyboard commands, you can copy the information into your PC or Mac-based spreadsheet, perform a few calculations, then paste the results into a memo which you send out via HPDESK. You can even run multiple concurrent sessions on the host, leaving HPDESK or a lengthy compile running in one window, while you go on to other HP-based activities in another.

If this sounds like the solution you've been waiting for, don't wait any longer. Whether your organization has PCs, Macs, or both, you can standardize on Session for all your emulation needs. And because Windows is the stepping stone to HP NewWave and OS/2 Presentation Manager, Session protects your investment in software and training as you move to these powerful new environments.

Tymlabs

CIRCLE 165 ON READER CARD

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S/Compare-Harmonizer 5.2 For HP 3000 And XL Systems

Aldon Computer Group has announced S/Compare-Harmonizer release 5.2 for the HP 3000 and XL systems. This is a software system that simplifies the integration of in-house changes into new release of packaged or distributed software. When a new release is implemented, it identifies the changes made locally and the changes made by the vendor. It then integrates the versions into a new composite output file.

The new Annotate and Composite options allow users to define what code changes S/Compare-Harmonizer automatically will carry forward into the new production version and it handles even more of the upgrade process without user intervention.

A free trail copy and technical specifications are available.

Contact Aldon Computer Group, 428 13th St., Suite 500, Oakland, CA 94612; (800) 825-5858 or (415) 839-3535.

Circle 385 on reader card

HOLMES/3000 — A System Occupation Monitor

Quality & Results (Belgium N.V.) has released a new software product called HOLMES/3000, a system occupation monitor that returns information about jobs, processes, program files, data files, database, system tables and overall system resource consumption. Because of its extensive selection criteria and reporting features it can be used as a performance monitoring and or multipurpose troubleshooting tool.

Like some other tuning tools, this product refreshes its screen after a certain amount of time, uses the MPE Measurement Interface and also directly accesses many system tables, including other users' stacks. HOLMES has several contexts or reporting environments including database, caching, used file and job context.

For more information contact Quality and Results, Jan Van Rijswijcklaan 49 - 2018 Antwerpen, Belgium; 03/237.79.06

Circle 391 on reader card

Touchstone Supports OS/2, UNIX and VMS

EEsof Inc. has released Version 2.99 of Touchstone, its microwave simulator program that works on both standalone and integrated environments. Workstations that support Touchstone 2.00 include IBM PCs and compatibles under OS/2; Apollo, Sun and HP workstations under UNIX and the DEC VAX series under VMS.

Touchstone 2.00 software from EEsof Inc. supports OS/2, UNIX and VMS workstation environments.

Touchstone 2.00 features include nodal-based simulation of microwave circuit performance, including gain, noise figure, circuit stability and circuit yield based upon manufacturing statistical measurements. Complex circuits can be tuned and circuit element optimized from within the program to predict "what if" simulations of manufactured performance with changed parameters. Model libraries for a vast library of transmission-line elements and analog/rf/microwave components.

Touchstone 2.00 is available on the Apollo and HP 9000 Series 300 plaforms. Price depends upon platform, configuration and options.

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

Circle 384 on reader card

KLA/Express 5.00.D Operates Under MPE V

KLA & Associates announced the release of KLA/Express 5.00.D containing more than 40 new features and enhancements including: group name recognition for all session/job entries, a job scheduler/controller, monitoring screen with filters and graphics capabilities, 4000 lines of interactive help and more. It operates under both MPE V and Native Mode MPE XL.

A graphics display also will paint a picture showing you how your configuration looks to the operating system and warn you of any potential problems.

Contact KLA & Associates Inc., P.O. Box 14854, Clearwater, FL 34629-4854; (813) 784-5976.

Circle 395 on reader card

'Bessel etc.' Runs Under HP BASIC/UX And HTBasic

The math package Bessel etc. now runs under HP BASIC 5 or HP BASIC/UX systems on HP Series 200/300 computers and under HTBasic on IBM compatible computers. The program file contains mathematical functions and subprograms that includes cylindrical and spherical Bessel functions and their derivatives with complex arguments (HP BASIC 5 and UX). The package consists of a set of SUB and FN routines (complied for HP BASIC 5). Sample driver programs and a graphics program also are included.

Price is $295 for HP BASIC 5, BASIC/UX version and $195 for HTBasic. Contact Image Acoustics Inc., P.O. Box 6, N. Marshfield, MA 02059; (617) 834-6376.

Circle 393 on reader card

Reflection® runs through more PC-to-HP networks

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Reflection 1 PLUS for the Macintosh ($299) provides HP 2392A emulation.

Reflection 3 PLUS for the Macintosh ($399) emulates HP 2393A graphics and HP 2392A terminals.

Reflection 7 PLUS ($449) emulates HP 2627A color graphics and Tektronix 4014.

Reflection reaches even more networks and hosts with Reflection Complements, including:

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CIRCLE 142 ON READER CARD

Shipping and applicable taxes are added to quoted prices. Reflection is a registered trademark of Walker Richer & Quinn, Inc. Other brand and product names are trademarks of their respective holder.

Create Graphical Displays With DataViews

DataViews, comprising DV-Tools and DV-Draw dynamic graphic software, provides workstation-based development tools to companies that want to develop an interactive graphics interface for network monitoring and control, rapid prototyping, process monitoring and control, instrument panel simulation, real-time financial service, medical analysis and military command, control and communcation (C3I).

Written in C and running on 32-bit workstations, DV-Tools is a subroutine package for developing custom color graphical displays of dynamic real-time data and for integrating these displays into application programs.

DV-Draw the editor embedded in DV-Tools enables you to draw a representative picture of all powerful components of the process to be displayed.

Using DataViews package, you can create graphical displays that contain extensive interactive components. The interaction utilities provide complete programmer control over what input and output will be available, where on the screen the I/O will occur and how the user will interact with the system (menus, locator devices, typing, etc.) A cut-and-paste option allows you to move an icon complete with its associated data sources and interfaces, without additional programming.

Contact V.I. Corp., Amherst Research Park, Amherst, MA 01002; (413) 253-3482.

Circle 366 on reader card

Collier-Jackson Expands General Ledger System

Collier-Jackson has enhanced its HP 3000 general ledger system to provide greater financial reporting flexibility through a new look and feel similar to a spreadsheet design.

The release, which enables integration with Access Technology's 20/20 spreadsheet, includes a mnemonics feature employed to define groups of accounts for report selection. These groupings can be made one time then accessed on multiple reports without the need to redefine individual account selections.

User-defined reporting formats offer adjustable column widths and up to 26 printable columns. Figures can be rounded or expressed as actual dollar amounts.

Calculations can be based on an expanded number of columns, and the ability to specify a column as a percentage, dollar or statistical value has been added. Another feature allows users to define columns as departments, divisions and companies.

Contact Collier-Jackson Inc., 3707 West Cherry St., Tampa, FL 33607; (813) 872-9990.

Circle 399 on reader card

OCS's Automated Disc Space Management System

Operations Control Systems has announced OCS/SPACECONTROL, an automated disc space management system for the HP 3000 MPE and MPE XL environments. It's available as a standalone product or fully integrated with the OCS/LIBRARIAN file management and version control system.

The space management system allows users to recover as much as 40 percent of their disc space across a network. The system consists of three main components; inquiry, archiving and retrieval. The system can determine which files must be retained and which are no longer needed. It provides space compression, space optimization and archive management.

Contact OCS, 560 San Antonio Rd., Palo Alto, CA 94306; (415) 493-3393.

Circle 387 on reader card

Softool's CCC Offers Automated Environment

Softool Corp. has reported that its Change and Configuration Control (CCC) software product is available for the HP 9000 Series 300 and 800.

Running under the HP-UX operating system, CCC offers HP users an automated environment for their change and configuration management requirements. Change management controls the changes to individual components within each version of information. Configuration management provides control over complete versions and the interrelationships between changes. It also provides the methodology needed to move a complete software product systematically through the various phases of the software life cycle.

With its native command language, macro language and build facility, CCC provides these features: tracks changes to any machine-readable information (e.g. code in any language, objects, executables, command procedures), providing total control; allows only authorizing changes to be incorporated into the software, ensuring product integrity; maintains a complete audit trial of changes, permitting complete status accounting and recreation or prior versions; manages changes activities taking place on different versions

of the information, increasing efficiency and coordination; merges parallel configurations, allowing changes to be applied from one evolving version to another; and controls and reports dependencies between components, ensuring that all parts of the product are kept up to date.

Contact Softool Corp., 340 South Kellogg Ave., Goleta, CA 93117; (805) 683-5777.

Circle 392 on reader card

Printer Products Offers POS System

Printer Products has introduced a multifunction POS system, incorporating the Motorola 68000 microprocessor. The S868, is an enhanced version of the S830 terminal.

The S868 maintains the multifunction capabilities of the S830 and offers a single-board computer with a ROM based multitasking, real-time operating system capable of diskless applications. Compiled application software, written in C, is supported by the operating system and may reside in ROM or be loaded by RS232C or disc. With the inclusion of battery-backed CMOS RAM for PLU, the terminal permits stand-alone diskless operations.

For more information contact Printer Products, 25 Denby Rd., Boston, MA 02134; (617) 254-1200.

Circle 370 on reader card

JetFax Delivers Fax Output On Laser Printer

Hybrid Fax Inc. introduced its JetFax desktop facsimile product, which delivers plain-paper fax output on a laser printer, eliminating the need for thermal paper.

JetFax enhancements include a delayed polling and an automatic copy reduction option. The delayed polling feature enables JetFax users to "call out" to receive faxes from remote locations automatically, at user-specified times.

JetFax's new image reduction feature enables users to "shrink" incoming faxes if desired — up to 12 percent in increments of one percent.

For more information, contact Hybrid Fax Inc., 1733 Woodside Rd., Ste. 335, Redwood City, CA 94061; (415) 369-0600.

Circle 269 on reader card

WRQ Ships PostHaste VI.I

Walker Richer & Quinn has announced the shipment of version 1.1 of PostHaste, an integrated electronic mail system for the HP 3000 host computer.

The new release of PostHaste enables you to transfer both ASCII and Binary files to the host computer. The transferred files then can be distributed to any or all PostHaste users.

User defined commands can be run from the command line, enabling you to switch between PostHaste and other host programs.

Contact Walker Richer & Quinn, 2825 Eastlake Ave. East, Seattle, WA 98102; (206) 324-0350.

Circle 363 on reader card

Bering Industries Presents Multipac II

Bering Industries has introduced Multipac II, a removable Bernoulli disc and fixed hard drive combination for HP computers. The

Multipac II features a 20 MB 5¼-inch Bernoulli drive in combination with either an 80 MB or 180 MB hard disc drive in a single, compact package.

Multipac II is designed for applications requiring large amounts of data storage or the safe storage of classified data. It's also useful for engineering environments requiring shared data at different locations.

Contact Bering Industries, 240 Hacienda Ave., Campbell, CA 95008-6687; (408) 379-6900.

Circle 390 on reader card

FOCMAN 4.0 Enhances Project Management System

Information Builders Inc., designers of the FOCUS fourth generation language database management system, announced the availability of Release 4.0 of FOCMAN, the FOCUS-based project management system.

In this release, online context sensitive help now is available for all input fields, allowing users to request online assistance specific to whatever field they are currently inputting. In addition, screens and reports have been reformated to upper and lower case and utilize color and highlighting attributes. Resource tracking is enhanced in Release 4.0 with matrices now displaying seven resources per screen and search facilities for utilized resources.

For more information contact Information Builders Inc., 1250 Broadway, New York, NY 10001; (212) 736-4433.

Circle 368 on reader card

Quantic Laboratories Expands Greenfield Family

Quantic Laboratories has introduced an enhanced Greenfield family of CAE tools for the analog simulation of digital circuits and a new Greenfield3d program.

Greenfield is a general purpose simulator of printed circuit boards, cables, connectors, hybrid and integrated circuits and other interconnect media operating under high speed switching conditions. It has capabilities to simulate circuits including systems of multiconductor, coupled transmission-lines. The necessary electromagnetic field analysis is done with nominal user involvement.

The Greenfield family includes E.Z. Greenfield, a 2-D field solver that produces circuit models for multiconductor transmission-lines, vias, corners, steps and crossovers. It also includes a time-domain circuit solver that produces cross-talk and signal waveforms.

The updated Greenfield version 2.02 is based on a new algorithm, which handles bigger circuits and provides faster solutions. In addition, the enhanced program includes a functional switch as as circuit component. It also supports, with multitasking, broader network simulation capabilities and enhanced SPICE interface.

Contact Quantic Laboratories Inc., Suite 200, 281 McDermot Ave., Winnipeg, Canada, R3B 0S9; (204) 943-2552.

Circle 381 on reader card

Note: *For more information about HP products, contact the Hewlett-Packard sales office listed in the white pages of your telephone directory.*

Continued from page 12.

communicate any questions or problems you encounter by sending a message to DEAR_SYSOP, under User's Guide. You'll automatically see a reply the next time you dial in. *—Anne Schrauger, Editorial Systems Coordinator*

BASIC OVERHEAD REDUCTION

QUERY:

Ralph Kissel *(SIG 41/MESS 2):* Does anyone know how to reduce the overhead incurred when using the BASIC Transfer statement? It takes 4 ms to set itself up and this is hurting performance in my real-time closed-loop system.

MSDS SOFTWARE ANYONE?

QUERY:

David Criswell *(SIG 48/MESS):* My medium-sized manufacturing company is looking for software to manage and generate Material Safety Data Sheets (MSDS) on the HP 3000. If anyone knows of any companies or individuals to get in touch with, please let me know via this BBS.

Thanks in advance.

TOP-OF-THE-LINE SUPPORT WANTED

QUERY:

Kenneth Fullett *(SIG 33/MESS 2):* We own an HP 840, which is networked to many Series 300 HP computers. The latest features from HP always seem to be for the less costly HP 300, rather than the HP 800 series. I find this disturbing. For example, the 300 support for X Windows release X10 and now X11 version 1 is available long before we'll see it on the 800. I don't invest in the top-of-the-line computer expecting to get secondary support for new products and new technologies.

I would like to know the opinions of other users on this topic.

REPLY:

Steve Wu *(SIG 33/MESS 9):* The X11 Window System is available on HP 9000 Series 800. ■

Continued from page 10.

SMGL separates the structure and contents of documents and databases from the physical representation on screens or paper.

The DoD has created a specific set of tags as part of the CALS standards, which are document-type definitions and processing instructions. They allow DoD contractors to electronically create manuals conforming to these specifications.

The SGML standard has been in development for the past eight years under the umbrella of the International Standards Organization (ISO) and the American National Standards Institute (ANSI), groups that previously have established most industry standards.

In March, SGML became part of the Federal Information Processing Standards (FLIPS), required for use in text processing systems created for, by, or acquired by all federal agencies. The three CALS graphics standards already are used by a number of vendors.

"Many electronic publishing systems, especially WYSIWYG (What You See Is What You Get) systems, have their own formats for handling graphics," said David Goodstein, president of InterConsult Inc. "Suppliers of electronic publishing systems need both to develop experience with the new CALS specifications and develop products that meet those needs. Government contractors must become knowledgeable about CALS requirements to ensure they purchase the right electronic publishing systems," Goodstein says.

However, Schaeffer cautioned that companies shouldn't run out and buy a system just to become CALS compliant. "If a system makes sense for you, buy it. But don't buy it if you don't need it because we don't know yet what is CALS compatible." ■

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If you would like reprints of any article or advertisement, contact Reprint Resources, 155 Commerce St., Fort Washington, PA 19034 (215) 643-9143, FAX (215)643-9164.

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CIRCLE 220 ON READER CARD

ADVERTISERS INDEX

[CALENDAR]

[JULY]

24-25: Symantec Corp. is holding a workshop for Time Line Version 3.0 users in San Fransisco, CA. Cost $400. Contact Training and Consulting Division, (415) 898-1919.

31-8/4: Cincom Systems Inc. is hosting CinterAct'89 in Orlando, FL at the Buena Vista Palace in Walt Disney World Village. For more information contact Ronald R. Hank, (513) 662-2300 ext. 2203.

[AUGUST]

4-5: The Oregon Regional Users Group, ORERUG is holding its annual meeting at the Newport Hotel, Newport, OR. This year's topic is "Future Strategies." Contact Lois Anderson, (503) 683-5700.

10-11: SERUG, (Southeastern Regional Users Group) is holding a two day meeting and vendor show at the Hyatt-Regency in Savannah, GA. Meeting fee $40 per day. Contact Tom Brightwell, 2381 High Forest Court, Atlanta, GA 30136; (404) 729-1903.

[SEPTEMBER]

6-8: Optical Information Systems ninth annual conference and exposition for Worm/Erasable Optical Storage and Digital Document Image Automation held at the Hyatt Regency Crystal City, Washington National Airport, Arlington, VA. For more information contact Marilyn Reed, (800) 635-5537.

20-22: Expert Systems 89, the ninth annual technical conference of the British Computer Society Specialist Group on Expert Systems held in London at the Cumberland Hotel. For more information contact Fiona Pearson, ES89 Secretariat, Clearway Int'l., 9 Pavilion Parade, Brighton, England BN2 1RA; 0273 694079/697149.

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CIRCLE 180 ON READER CARD

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Adager helps you build prototype databases (which, by definition, you will change a myriad times, adding and deleting paths, changing search fields from one type and length to another, converting masters to details or details to masters, and so on). Thanks to Adager, you will be able to do all this magic without the need for a database reload (something that Adager obsoleted more than a decade ago, back in 1978).

Do you need to keep a database running reliably?

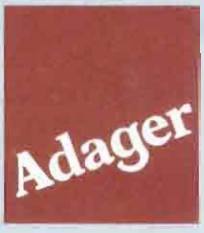
Adager helps you with routine maintenance tasks (such as changing dataset capacities or blocking factors, repacking datasets with awesome speed while preserving chain chronologies, diagnosing and fixing broken chains, and so forth).

Do you need to make a database run at its best?

Adager assists you in dealing with your two main challenges: maximizing database throughput (i.e., the number of transactions per second) and minimizing database response time (i.e., the number of seconds per transaction).

Get. Keep. Make. Magical words indeed.

But the magic of Adager goes beyond words. Adager has the kind of magic you like: The magic of numbers. How can you get a feeling for the magic Adager numbers? Simply request your BARUG benchmark kit, which is for you to keep with our compliments. Once you make this decision, your database life will never be the same.



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