

SPECTRUM
PROGRAM ISSUE

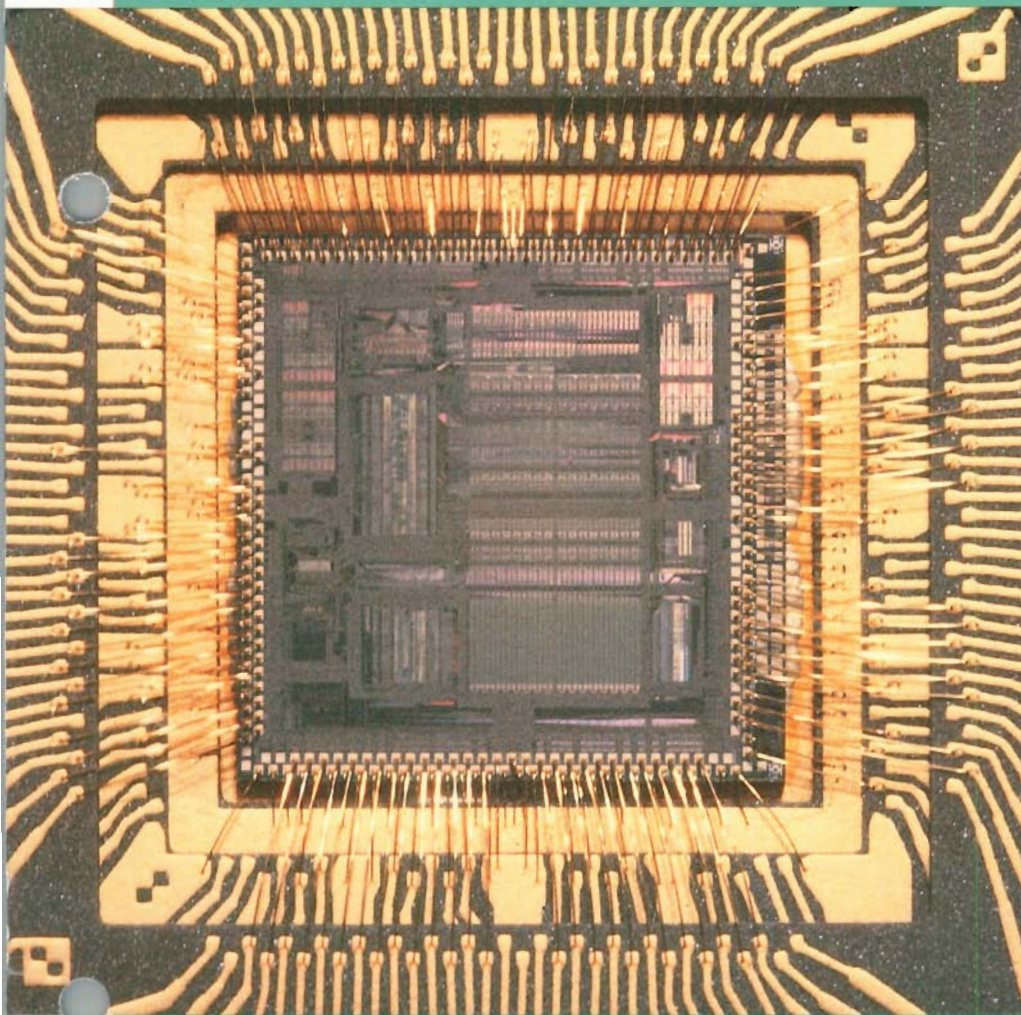


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Computer Advances

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HP Precision Architecture: the powerful heart of HP's new computer family



HP Precision Architecture, the foundation for HP business and technical computers planned through the next decade, will set new standards in price/performance, reliability, and cost of ownership

High-precision simplicity: HP's new computer architecture can be implemented in a variety of circuit technologies, including this 1-micron NMOS-III chip to be used in the new HP 3000 Series 950 computer.

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The Spectrum program develops a new foundation for HP computers

By John Young

Several years ago HP Laboratories was charged with developing an architecture for our computers that could unify the broad range of HP's product types, sizes, and application areas. I am pleased to announce the success of this effort, code named "Spectrum program," and the unveiling of an innovative, new computer architecture.

We call it HP Precision Architecture, because that's precisely what it is. It's an engineered architecture based on the extensive measurements we did to evaluate the utility of each feature. It was designed from the beginning to make significant contributions in price/performance, range of application, and compatibility with current systems.

HP Precision Architecture will be at the heart of our major computer product lines—the HP 3000 business computers, HP 9000 engineering computers, and HP 1000 real-time "automation engines." One of our key goals was to ensure ease of migration from our current systems to those based on our new architecture, which is why our new products will fit comfortably into the growth plans of our installed base of customers.

HP improves upon reduced-instruction-set-computer technology. In developing HP Precision Architecture we kept the design simple, using many of the

concepts popularly known as RISC, for reduced-instruction-set computer. However, HP Precision Architecture goes well beyond RISC. It is the combination of many advances (including those of RISC technology) that ultimately provides the advantages of our new architecture. (See *Special Report* on page 6.)

Making integrated information management possible. HP Precision Architecture is a scalable architecture, which means that it can be applied to everything from desktop to mainframe-class machines and across all major applications, both commercial and technical. Going with a single, scalable architecture for all our computers is HP's response to the fundamental concerns of our customers.

You need compatibility and the ability to exchange information over networks. You need to access and use information from anywhere in your organization—an elusive ability we call "integrated information management." You also require lasting value in your computer purchases. That means compatibility among systems and a clearly-defined growth path that protects your sizable investments in software.

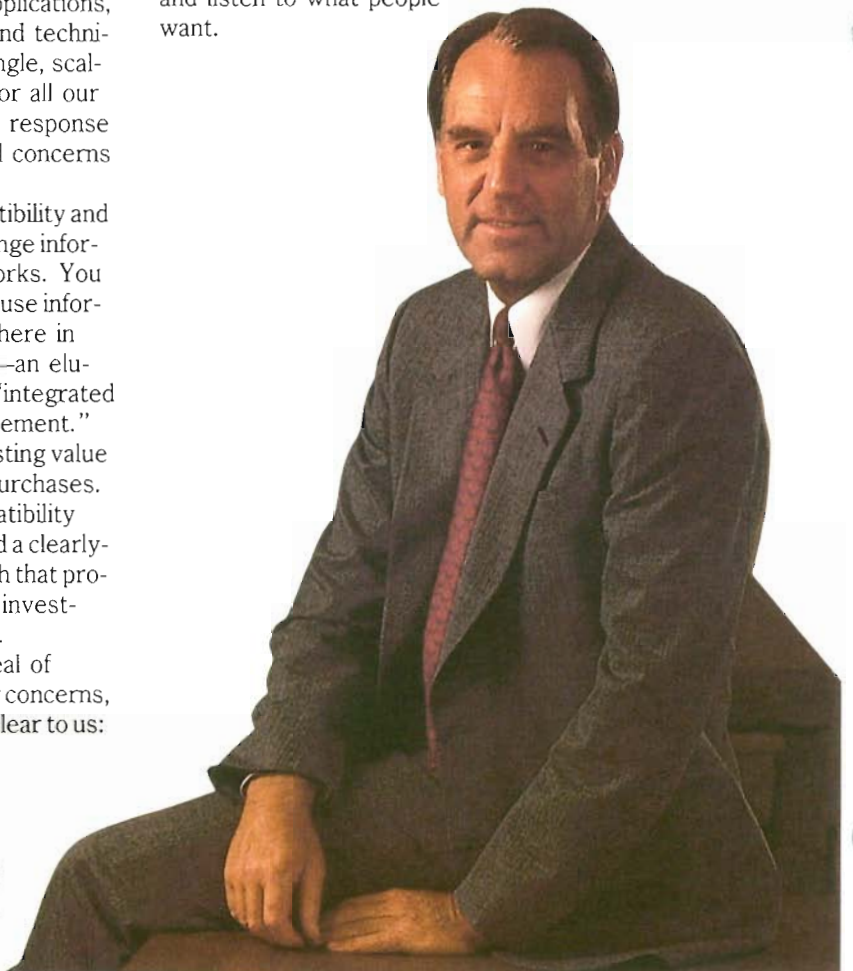
After a great deal of thought about your concerns, one thing became clear to us:

the ability to offer a range of computing products, scalable in size and across a wide variety of applications—all based on a single, innovative architecture—would greatly reduce the technological barriers to integrated information management and enhance the lasting value of our customers' systems. That's what HP Precision Architecture makes possible.

We could have settled for something less ambitious. We could have taken a quicker path to the marketplace. Instead we've chosen to rethink our basic assumptions about computing and listen to what people want.

A new foundation for HP's computers. The ultimate significance of the Spectrum program for our customers is that we can bring truly integrated information management closer to reality with our new, unified foundation for HP computing products. And over the coming months and years, we'll have the capability of building a breadth of compatible system solutions—from desktop to mainframe-class machines—on this foundation. 

John A. Young
President and Chief Executive Officer
Hewlett-Packard Company



HP Precision Architecture: the powerful heart of HP's new computer family

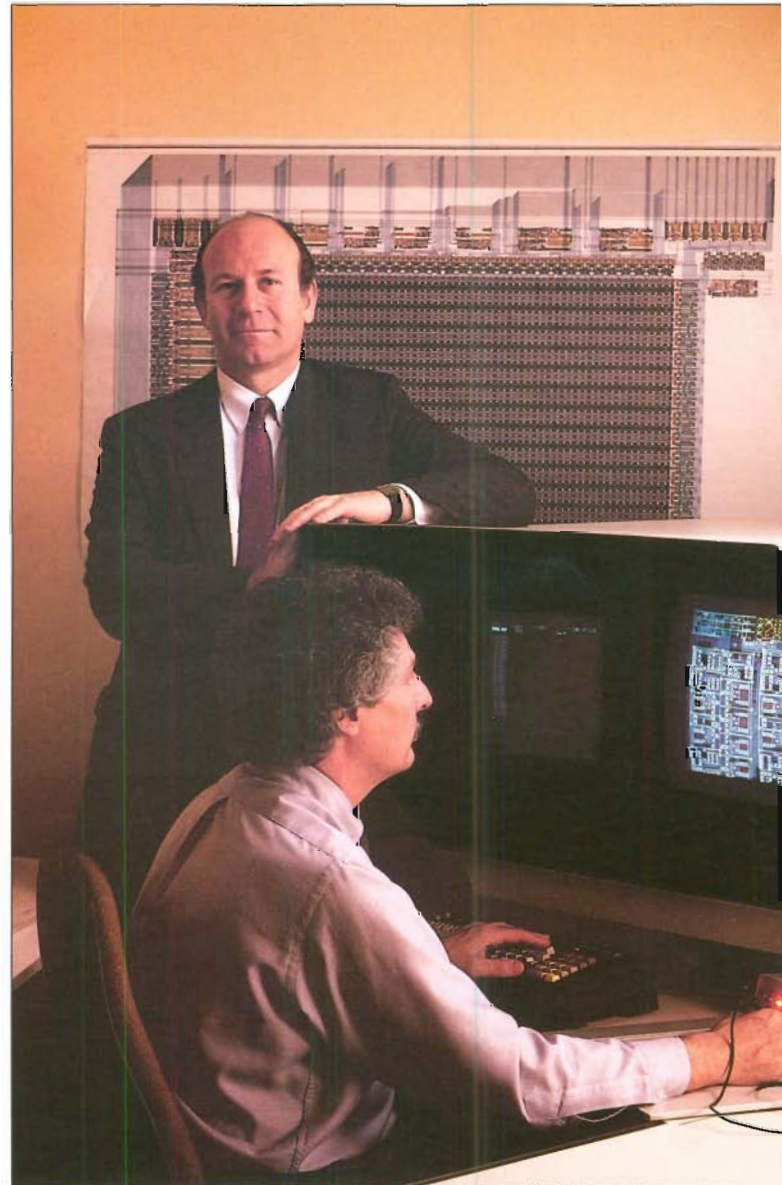


Developed as part of HP's Spectrum program, a series of new computers—based on the new HP Precision Architecture—will serve both business and technical applications, extending HP's current product lines to new levels of performance.

The first products using the new architecture are high-end extensions of the HP 3000 business computers: the Series 930 and 950 are fully compatible with earlier HP 3000 models, yet offer system throughput up to three times greater than the current top-of-the-line HP 3000 system, the Series 68.

Technical products based on HP Precision Architecture include new systems tailored for manufacturing and engineering applications. They will extend the HP 1000 and HP 9000 product lines and will serve such applications as computer-integrated manufacturing (CIM), factory automation, and computer-aided engineering (CAE).

In the following pages, we look at some of the new and planned business and technical systems that will provide a spectrum of productivity solutions for years to come.



"The reduced-complexity, high-precision architecture developed by the Spectrum program will enable HP computer systems to converge to a single architecture," says Joel Birnbaum (standing), vice president and director of Hewlett-Packard Laboratories. Seated is Frank Carrubba, director of HP's Measurement Systems Center.

Next-generation HP 3000s offer high performance and compatibility

Incorporating the new HP Precision Architecture, the newest members of the HP 3000 family offer dramatic increases in performance per dollar, while remaining compatible with previous HP 3000 system and application software.

The new HP 3000 Series 930 and 950 systems are the first in a line of planned business systems and advanced capabilities that promise to set new industry standards—for business-computing systems and for the protection of customer investments in existing solutions.

Compatible growth path. The success of the HP 3000 family of computers over the past decade has been due to the competitive price/performance the line offers, and to customers' confidence that HP will continue to offer smooth upgradability from system to system.

Introduced along with the Series 930 and 950 products is the new HP 3000 Series 70, which is based on conventional HP 3000 architecture and provides a high-performance bridge to HP Precision Architecture*.

The Series 930, 950, and 70 join the HP 3000 family to provide a compatible growth path that extends from inexpensive distributed office systems—such as the Series 37—to high-end database hosts that can handle the business-computing needs of an entire company. While conventional architectural approaches are reaching their potential limits in terms of price and performance, the advanced technology of the Series 930 and 950 offers HP 3000 owners a growth path for many years to come.

Breakthrough design delivers high performance. The high performance of the new Series 930 and 950 systems is achieved through the implementation of the new HP Precision Architecture, based on a reduced-instruction-set-computer (RISC) design (see *Special Report*, page 6).



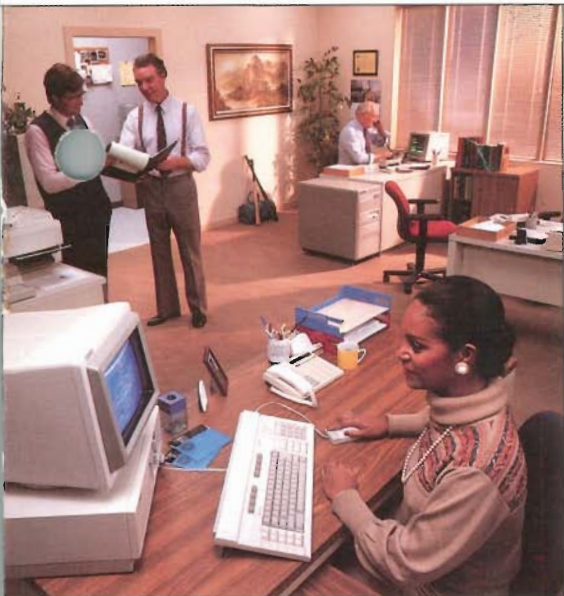
The new HP 3000 Series 930 and 950 systems have the processing power to act as a major node or central computer in a large company's distributed data processing network or to meet the dedicated stand-alone application needs of a smaller company.

The HP 3000 Series 930, although based on the simplest of integrated circuits (TTL), is a 4.5 MIPS (million-instructions-per-second) computer. It supports up to 24 megabytes of main memory and delivers approximately two times the system throughput of the Series 68. With enough power to support a division of a large corporation, the Series 930 is on a performance level with the IBM 4381-2 mainframe.

Series 950, the highest-performance member of the HP 3000 family, is designed around a 6.7 MIPS VLSI (very-large-scale-integration) processor. It supports up to 64 megabytes of main memory and delivers approximately three times the system throughput of the Series 68.

Common operating system protects your software investment. The HP 3000's innovative MPE operating system is the same operating system the HP 3000 started with. As operating system technology has developed over the years, we've expanded and improved MPE while maintaining full compatibility with earlier versions.


MPE XL, the Series 930 and 950 operating system, continues this tradition of software protection. It is enhanced to take advantage of the high performance provided by the HP Precision Architecture, while maintaining compatibility with prior versions of MPE running on other HP 3000 systems.



The evolving technology of HP 3000 computers, combined with the very latest advances in information management offer the ideal solution to your company's information needs.

Getting maximum value from information resources. HP ALLBASE XL, a database management system new and unique to the Series 930 and 950, and HP's new resource management tool, System Dictionary, are at the center of an advanced family of integrated information management software for the HP 3000 family*.

ALLBASE XL offers software developers a flexible combination: both the performance of network access by industry-standard means and the productivity of relational access to data in a single system. System Dictionary acts as a central information resource for documenting HP 3000 system data, programs, files, user access, and network configurations.

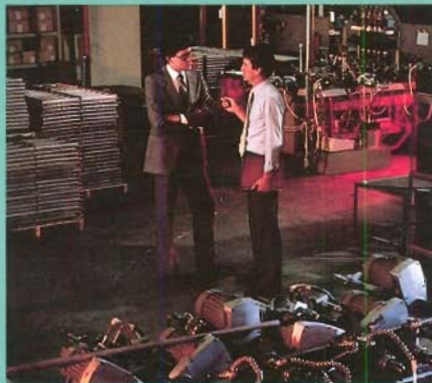
Expanded networking links companywide information resources. With HP AdvanceNet local-area network (LAN) hardware and software, the new systems fit seamlessly into existing networks of HP 3000 and IBM systems. For example, this gives Series 930 users the flexibility to access files, databases, and applications located on other HP 3000 systems connected to a LAN, and to use the communications capabilities of these systems to access other remote systems and information. 

*For more HP 3000 news, please see New Products, beginning on page 7.

Building technical solutions on HP Precision Architecture

HP's "Automation Engines" to have UNIX operating system*

A new high-performance computer system for computer-integrated manufacturing (CIM) applications, based on HP's new Precision Architecture, will provide up to three times the performance of the current top-of-the-line



A-Series model, A900. The new real-time computer, scheduled for introduction in mid-1986, will use the HP-UX operating system, which is compatible with AT&T's System V version of the UNIX operating system.

With a UNIX operating system, manufacturers can gain immediate access to a growing number of applications-software packages, and take advantage of extra programming power to create user-friendly "shells," enabling workers to use computers easily without being computer experts.

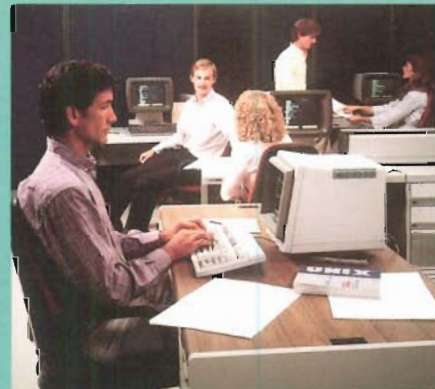
High-performance complement to the HP A-Series. The new system's increased power and speed will make it equal to more demanding manufacturing applications, complementing the A-Series computers, HP's premier products for workcell and supervisory-control applications. The new high-performance system will be offered as an Area Manager for applications such as computer-aided process planning (CAPP), statistical quality control, and quality data management, analysis, and reporting. The system also will provide the performance needed for process management and plantwide, process-control applications.

*UNIX is a trademark of AT&T Bell Laboratories

Powerful new extension to the HP 9000 Computer

The first HP Precision Architecture engineering computer, scheduled for introduction in mid-1986, will further strengthen the HP 9000 family with two times the throughput of the high-end Series 500.

The new computer system will complement the HP 9000 Series 500 and 300 high-end workstations, offering next-generation architecture and performance to engineers working on complex design and research programs. The first models of the new systems will be sold to solutions suppliers and volume end-users to develop computation-



intensive solutions such as design simulations, mechanical modelling, or scientific analyses — applications which are often beyond the capability of individual workstations in a networked system. Because the new HP Precision Architecture system will be fully compatible with the HP 9000 family, it will be ideal for these complex computational tasks.

Smooth applications portability. The new precision architecture technical computer will use HP-UX, the operating system common to the entire HP 9000 family of engineering workstations. Smooth portability of UNIX operating systems applications is assured because HP-UX adheres to the AT&T System V Interface Definition. By writing applications conforming to this definition, engineers will be able to take advantage of changes in technology and still preserve their software investment.

Inside the Spectrum program:

Designing a high-precision architecture

Understanding the inner workings of a computer or — even more so — a computer system is not a simple matter. It's like looking at an intricate maze of electronic structures inside a forest of acronyms surrounded by a river of technical terminology. That stands up pretty well as a metaphor for the way computers have developed over the past 30 years, gaining performance by adding complexity.

Over the past few years, however, HP computer scientists have begun to question this direction. To confirm the indications of early university research, they measured the actual performance of billions of instructions in thousands of business and scientific application programs. A number of their surprising findings form the basis of the new HP Precision Architecture.

Balance and simplicity. One way of looking at this innovative architecture is to survey the principal differences between the traditional and newer approaches to computer design.

- Traditional architectural design has concentrated on improving the basic design of CISCs — complex-instruction-set computers — by adding complexity to gain performance.
- Today, many computer scientists emphasize rigorous measurement of every function. They point to reduced-instruction-set-computer (RISC) architecture as one way of reducing complexity while improving performance and reducing cost.

HP's new computer architecture takes advantage of the best of both approaches, and goes well beyond them in a large number of respects. In this sense, HP Precision Architecture is a new species, unique not only because of the integration of such approaches but also because every feature in its design was measured and compared against specific design criteria.

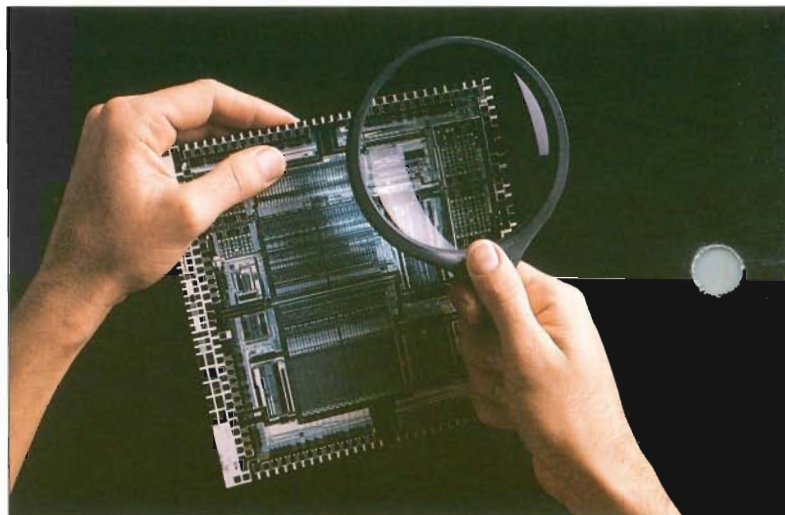
Guidelines to the design were:

- Keep it simple.
- Make it flexible and adaptable to new technologies.
- Achieve an optimum balance between performance and price.
- Ensure compatibility with existing systems.

In reaching for these goals, HP designers also took note that the common measure of performance—millions of instructions per second (MIPS)—overlooks what should be the real test of system performance, namely maximum throughput of work done.


Applying these principles, Spectrum program engineers found that most computers spend most of their time executing a small number of simple instructions repetitiously. The 80 percent or so of complex instructions are used infrequently.

This led them to shift the placement of the most frequently used instructions closer to the heart of the central processing unit, embedding them in hardware rather than microcode (software). Here they can be implemented with much greater speed. Instructions are short, of uniform length, and quite specific. Complex commands are generated by assembling these simple instructions in sequences. In this limited sense, HP Precision Architecture conforms to the RISC concept of design. However, the reduced instruction set was not the goal but simply a by-product of the search for the most efficient cost/performance ratio.



HP Precision Architecture design decisions were based on measurements of the way computers actually process information.

Beyond RISC. In fact, more than two-thirds of the engineering achievement behind HP's new computer systems is linked to features that don't involve reduced-instruction-set technology. In the central processing unit, for example, innovative contributions have been made in optimizing compilers, storage, input/output and addressing systems, as well as features that enhance compatibility. In the systems area, HP's designers have developed highly efficient new operating and data-management systems, and a very broadly functioning network system.

HP Precision Architecture is an "open" architecture that can be implemented in a wide range of circuit technologies. There are few if any known limits to where it can be applied today, and technologies of the future as far as that can be seen will only expand its opportunities. 

Advanced new HP 3000 software tools streamline information resources management

New software products for the HP 3000 family provide an advanced set of integrated information management tools for your business needs.

At the center of these new information products are the HP ALLBASE XL advanced database management system and the System Dictionary.

New and unique to the HP 3000 Series 930 and 950, ALLBASE XL combines HP SQL and HP IMAGE database interfaces to offer both the performance of network access *and* the productivity of relational access to data in a single database management system.

The HP 3000 System Dictionary boosts productivity by providing a common source for data definitions



HP offers a full line of software products to address information-management needs throughout your organization.

that improves programming efficiency and streamlines information system management.

Other new high-productivity software products for the HP 3000 include:

- **HP Business Report Writer/V**—a powerful screen-driven, report-writing system. It allows users to combine information from several sources into a single report and of-

fers the flexibility needed to track a broad range of business details. It is available on all HP 3000 models.

- **HP TurboIMAGE DBChange/V**—an easy-to-use tool for modifying data structures and expanding the capacity of the current HP 3000 TurboIMAGE databases.

Together, these capabilities enable your data-processing staff to respond to more data requests faster, so your organization gets maximum value from all your information resources.



The new HP 3000 Series 70: high-performance bridge to HP Precision Architecture

The new Series 70 answers the immediate performance needs of high-end HP 3000 computer users. It can provide 20 to 35 percent processor throughput improvement over the HP 3000 Series 68, while putting you in the best position to move to the power and performance of the new HP 3000 Series 930 and 950.

The Series 70 computer includes a 128 Kbyte memory cache, microcoded MPE operating system instructions, MPE enhancements, 8 Mbytes standard memory, and TurboIMAGE database management system.

20 percent lower price.

While performance alone would be sufficient to set the



The HP 3000 Series 70 (background), shown with the new Series 930 and 950 computers, is a powerful system for large business applications.

Series 70 apart as an attractive system, HP has provided an additional incentive to buy: the new computer is priced at 20 percent below today's Series 68. This provides a price/performance improvement of up to 45 percent.

Field upgrades for installed Series 68 and Series 64. Field upgrade products are available for both Series 64 and Series 68, giving you an easy transition to the power of the Series 70. These products include a memory option that provides a 4 Mbyte increment at 20 percent less than the list price for add-on memory.

■ **PROFS Link.** To provide customers with access to multi-vendor office solutions, HP has enhanced HP DeskManager, which includes software for electronic mail, word processing, electronic filing, and time management. A new software program called HP Office-Connect-to-PROFS (IBM's professional office system) enables DeskManager users to exchange electronic mail with any system running IBM's bisynchronous office-support mainframe software. No additional office software is required on the IBM system.

■ **Environmental Protection.** Researchers at the Environmental Protection Agency (EPA) research lab in Corvallis, Oregon, use the HP-41 handheld computer to control instruments used in experiments to determine the effect of airborne pollutants on the growth and yield of plant crops. The scientists use HP-41 systems to control the flow of pollutant gas into plant growth chambers according to a complex time concentration profile. Information is collected and transmitted error-free to the host computer for analysis.

■ **Telecom Agreement.** HP and M/A-COM, a large US telecommunications equipment company, have announced a joint marketing agreement to sell and support private X.25 data-communications networks worldwide. (X.25, an international standard for computer networking, is the basis of HP's long-term AdvanceNet strategy to provide complete wide-area networking solutions.) The agreement is part of a broader cooperative strategy between HP and M/A-COM, which was chosen last fall as the supplier for HP's own private X.25 packet switching network.

New Products continued

New network products link HP 1000s, 3000s, and 9000s

The new HP LAN/1000 Link and HP Network Services (NS/1000)—the first local-area network products for the HP 1000 family of technical computers — enable programmers to transfer HP 1000 files to and from HP 3000 and HP 9000 systems. LAN/1000 Link and NS/1000 support one of the major goals of HP's AdvanceNet strategy, which is to deliver integrated, easy-to-use, data-communications products across all HP computer families.

LAN/1000 Link provides performance and economy. Up to 100 HP 1000, 3000, or 9000 computers may be connected to a single local area network cable segment. Each system requires only one interface card to communicate directly with every other system on the network. Communication costs are lower in multi-system networks and performance improvements are significant: as much as a 140 percent increase in performance when communicating between HP 1000 systems, and a two-to-six times improvement when communicating from an HP 1000 system to an HP 3000 system.

High-performance support. NS/1000 provides high-performance, user-friendly support for the high-speed LAN/1000 Link. Now programmers can easily transfer files among HP 1000, 3000, and 9000 processors without worrying about technical details of error checking and message routing. NS/1000 also allows peer-to-peer interprocess communication between HP 1000 A-Series systems.

New HP 2567B and 2564B enhance HP's line of EDP printers

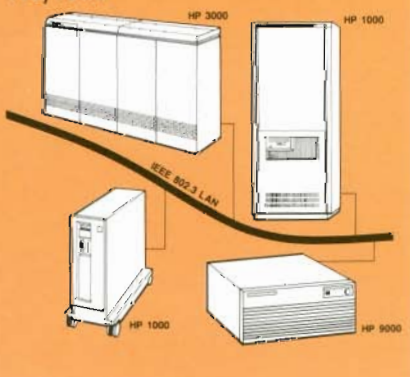
HP continues to expand its line of EDP printers with two new dot matrix printers. The HP 2567B—the industry's first 1200 line-per-minute dot matrix printer—is a full-featured, work horse printer that can also print at 1600 lpm with an optional "high-speed draft" character set. At the same time, HP strengthens the heart of its EDP printer product line with the new HP 2564B, a medium-duty, full-featured 600 lpm printer.

HP's EDP printer line offers the industry's most reliable print and space output. More features, such as OCR, bar codes, compressed print, and graphics give your capital investment more leverage than band printers.



The new HP 2567B and 2564B printers enhance HP's existing product line, giving you the broadest EDP printer selection offered by any mini-computer vendor.

NS/1000



NS/1000—HP Network Services for the HP 1000—expands HP AdvanceNet with the ability to link HP 1000 A-Series computers to HP 3000 and 9000 systems.

To find out more about Hewlett-Packard or its products and services, please call your local Hewlett-Packard sales or service office. Note: Not all HP computer products are sold and supported in all countries.