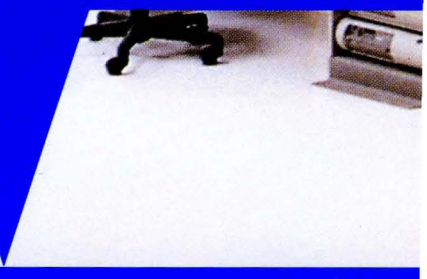
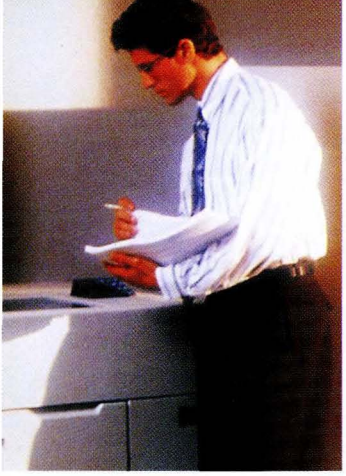
IBM

IBM Enterprise System/9000

Introducing a new computing family





A new computing family offering a wide range of systems

The IBM Enterprise System/9000 (ES/9000)* family is based on the newest proven technologies, and offers a comprehensive computing range to meet today's needs for high power and availability.

The new IBM ES/9000 processor models are part of IBM's System/390 computing platform, which includes enhanced system hardware and new operating system software. The powerful ES/9000 family incorporates innovations such as four-megabit chips and high-speed channel technology to generate new possibilities in computing. This technology complements broadened system and network management capabilities, and enables strategic applications to meet your specific business requirements.

The ES/9000 family's 18 models – successors to the proven IBM Enterprise System families ES/9370, ES/4381, and ES/3090* – provide a solid foundation for increased computing performance and function. The family's performance range spans a 100-fold growth from the compact, rack-mounted Model 120 to the powerful Model 900.

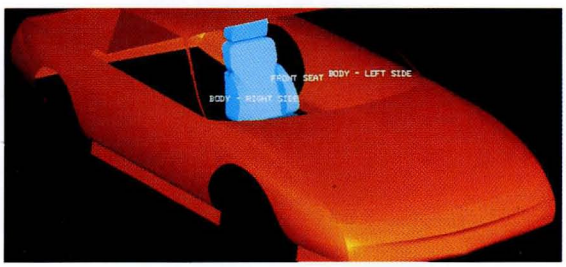
System/390 introduces new platforms and functions, including a new channel subsystem architecture, IBM Enterprise System Connection Architecture (ESCON), which implements a fibre-optic channel connection permitting new application opportunities in some cases, and shared applications in others.

All models in this powerful family share the following common architecture, features and functions:

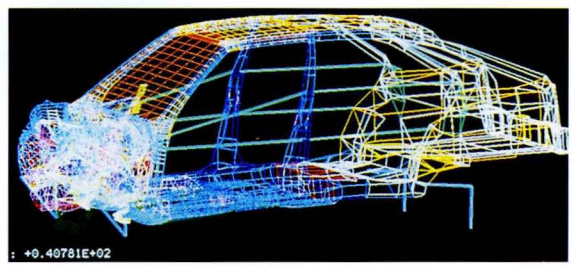
- IBM Enterprise Systems Architecture/390 (ESA/390)
- Processor Resource/Systems Manager (PR/SM)
- ESCON architecture
- Multisystem management support
- Common operating systems
- Enhanced price performance.

This rich set of common functions offers a solid foundation for your enterprise solutions today, as well as for tomorrow's growth requirements.

The demands of customers for high-performance computing are met by the new functions of the IBM ES/9000 family



. . . the engineer develops a vehicle design . . .

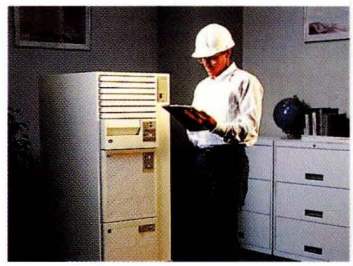


. . . the protection of passengers is assessed with the aid of crash test simulation . . .

ESA/390: gateway to enterprise-wide applications

The Enterprise Systems Architecture/390 (ESA/390), which underlies the ES/9000 family, offers a broad range of capacity as well as growth potential. To operate your system, IBM has enriched and enhanced the established System/370 operating systems with the introduction of Virtual Storage Extended/Enterprise System Architecture (VSE/ESA), Virtual Machine/Enterprise System Architecture* (VM/ESA) and the enhancement to Multiple Virtual Storage/Enterprise System Architecture (MVS/ESA). These three ESA/390 systems operate on all System/390 processors.

The newly announced VSE/ESA operating system will offer improved support for increased real and virtual memory, providing more application flexibility. This operating system's strong affinity with MVS/ESA helps to make application development and use easier.

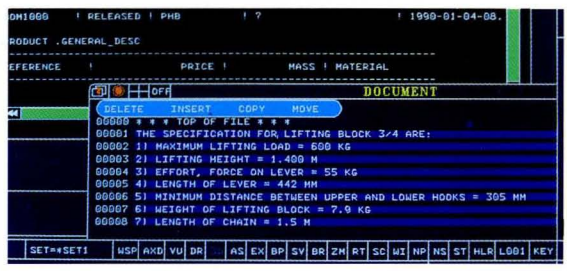


The VM/ESA operating system enhances and makes uniform three current IBM VM products VM/SP, VM/SP HPO and VM/XA. Building on their capabilities, VM/ESA allows a single VM to be run across the ES/9000 family. This uniformity is complemented by new levels of performance and throughput as well as by improved systems management and user productivity.

A new version of the MVS/ESA operating system adds dramatic new function over previous versions, including:

- Enhanced management of multiple systems (Sysplex)
- The ability to add or remove dynamically I/O resources from systems in use (Dynamic Reconfiguration Management)
- Single point of control
- Enablement of Systems Application Architecture (SAA)*-based distributed and cooperative processing
- Increased system availability

. . . market analysis assesses potential sales . . .



. . . and the production programme is planned

Logical partitioning for configuration flexibility and economy

The ability to partition a physical processor into logical images enables your enterprise to consolidate workloads, enhancing the flexibility of your processor configuration. You can also use logical partitioning to create migration platforms, allowing regular workloads to run concurrently with your test or conversion efforts. This hardware feature, known as Processor Resource/Systems Manager (PR/SM) is now standard on all ES/9000 models. PR/SM allows VSE/ESA to operate on all ES/9000 processors, and it also enables you to run multiple preferred guest systems under VM/ESA, VM/XA and VM/SP.

The integration of CAEDS* in enterprise communications allows the engineer to take factors such as standards, parts lists and costs into consideration when constructing a new model of a car

For applications with high availability requirements, PR/SM can be used in conjunction with MVS/ESA Version 4 and the OPC/ESA program product to provide automated restart of a failed production partition. Manual delays can be eliminated or greatly reduced, providing significant potential availability improvements.

Connections to facilitate communication within - and beyond - the enterprise

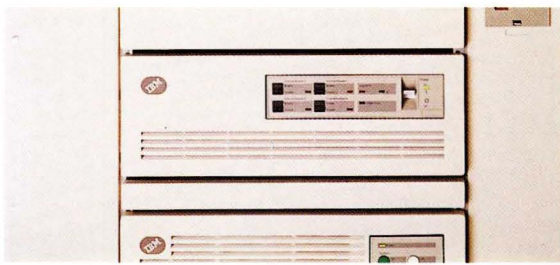
The IBM ES/9000 family enables your enterprise to communicate through standard protocols with both workstations and other host systems, linking your various enterprise workgroups and facilitating communication with your business partners. You can, for example, electronically distribute your product catalogue to your dealers or distributors.

The available protocols complementing your System/390's networking capability include TCP/IP, OSI, and IBM 3172 controller support for Ethernet (parallel channel environment), as well as IBM Token-Ring local area network protocols. In addition, multi-vendor devices can be attached to host processors by means of the Fibre Distributed Data Interface.

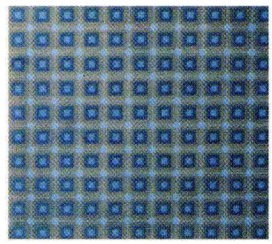
Complementing your enhanced networking capability, the IBM NetView* product family increases your network control through enhanced automated procedures and flexible dynamic network configuration capabilities. As a result, you can increase system availability by reducing the likelihood of system service disruptions.

Such system products and functions provide growth path alternatives through distributed systems, and address the cooperative processing needs of individual work environments.

All System/390 family models share a common channel implementation and offer both serial and parallel channel capabilities. As a result, a wide range of IBM I/O devices can be channel-attached to System/390 systems, and phased migration can be achieved.



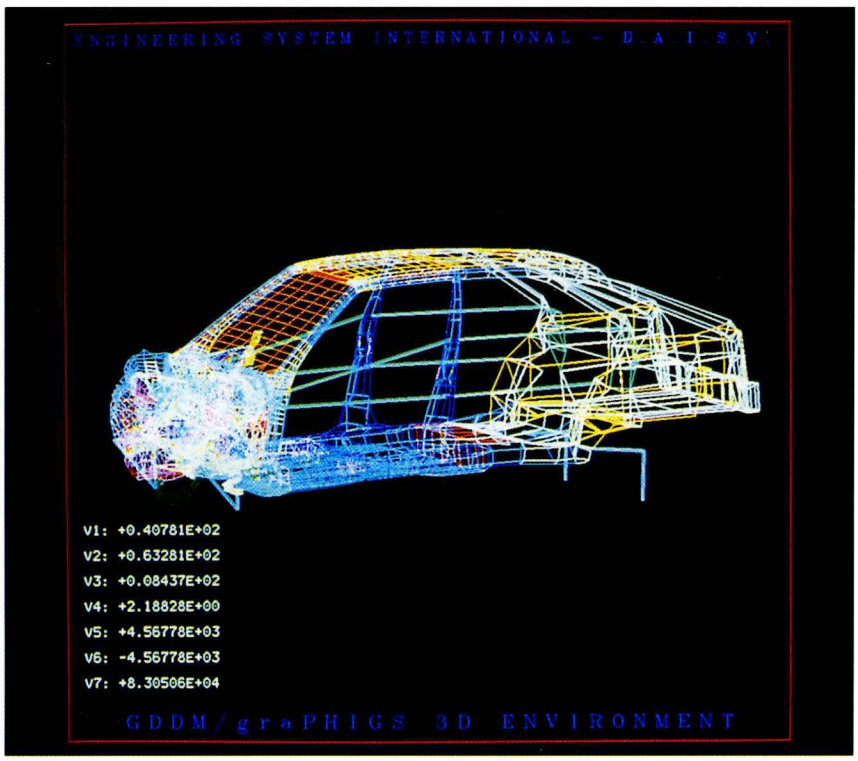
Advanced channel architecture



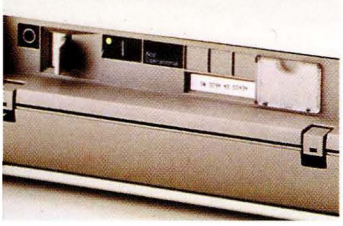
The new ESCON channels, which transmit data at up to 10 MB/sec., extend the boundaries of the traditional information processing centre to give you far greater flexibility in systems configuration. The new ESCON architecture, a new medium and storage interface, and a broad range of products and services support our ESCON channels. These new serial channels significantly increase the distance across which devices can be connected.

Dynamically and at high speed, a new ESCON Director (ESCD) switching device connects any host to its dependent devices or to other hosts. Together with the new fibre-optic cabling, the ESCD enables you to reduce cable bulk and physical line requirements significantly, simplifying system planning and installation as well as eliminating many space constraints.

The ESCDs enable you to choose where you wish to locate your resources – where space within your office complex or work environment permits – up to distances of 9 kilometres (5.4 miles) with two ESCDs. The current limit is 122 metres (400 feet). To accommodate these longer distances, the ESCD can be remotely managed via host-system software called the ESCON Manager (ESCM).



As early as in the design phase, the effectiveness of passenger protection can be assessed using simulation



ESCON's fibre optic technology breaks through traditional computing centre barriers, opening up a wealth of new possibilities for configurations

Fibre-optic technology, the physical medium used in this advanced method of channel connectivity, allows data to be transmitted much faster than today's 4.5 MB/sec. data rate – up to a maximum of 10 MB/sec. In addition, you can locate remote functions and disaster-backup equipment far more flexibly than before. ESCON connections also enable you to dynamically add or remove I/O resources while your system remains available to users.

Co-existence and migration are simplified between ESCON and existing System/370 environments by using IBM ESCON Converters (ESCC). The ESCC Model 1 allows you to attach a serial channel to a non-serial control unit, enabling orderly conversion while protecting your existing investment. The ESCC Model 2 permits an ESCON-capable 3990 Model 2 or 3 Storage Control Unit to attach to a System/370 parallel channel.

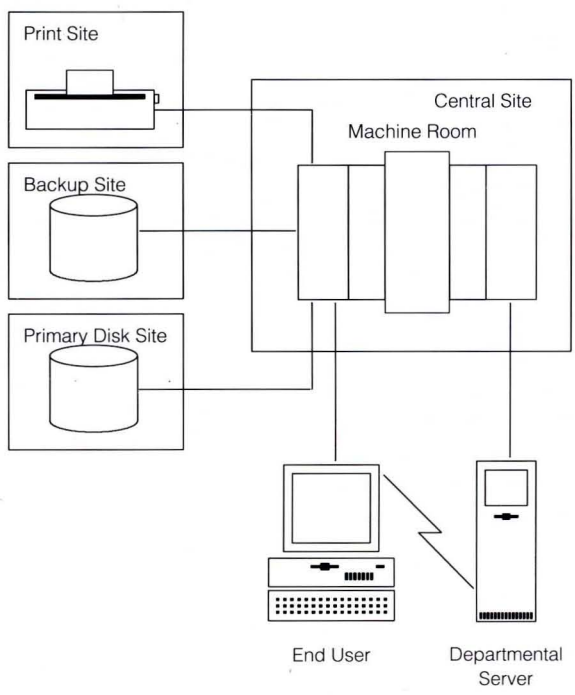
IBM's latest storage devices, the IBM 3490 Magnetic Tape Subsystem and 3990 Model 2 and 3 Storage Control Units can all be upgraded to operate with ESCON adapters. Two new models of the IBM 3174 Establishment Controller are also capable of attaching to ESCON channels. ESCON channel attachment is also available to the 3172 Interconnect Controller, providing a remote channel-to-channel communication function.

Working together with MVS/ESA SP Version 4.2 Dynamic Reconfiguration Management, the new ESCON channels can significantly reduce the system outages formerly encountered when systems were reconfigured or new devices added.

Additional computing support for a broad range of needs

IBM makes available vector computing options on selected models, and additional systems software to address specific application environments and requirements.

ESCON Configuration Example



Only common architectures can provide the right basis for trend-setting and innovative future applications

Vector Facility available for more processor models

Information systems users who employ mathematical modelling in their computing applications often seek added processing power for improved response time. This is true in business areas as diverse as financial modelling, finite-element computing and simulation.

For example a manufacturer may use a computer-aided design (CAD) application to develop a model and simulate its operation. The IBM ES/9000 family includes an optional integrated vector capability on selected models, which results in faster feedback on test results. Such rapid feedback can allow engineers to increase their productivity, as well as improve product quality, by using simulation to redesign critical parts when necessary.

Centralised management of local and remote systems

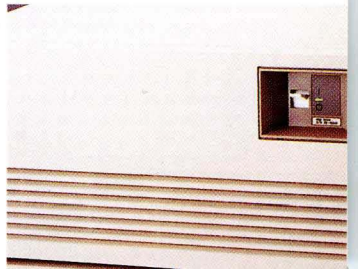
The ES/9000 family models take steps toward your information system requirements for 'lights out' operation and effective control over multiple concurrent systems. The family models offer features and functions for remote location management and coordinated timing for multiple systems. NetView Version 2, IBM's platform for automation, and related systems management products enable you to automate your enterprise and manage multiple systems from a single point of control.

Selected system models can now be remotely power-controlled and environmentally monitored with the ESCON Monitor System (ESCMS), eliminating the need to activate and deactivate power manually at a remote location. Instead, the power can be turned on and off automatically or manually from remote locations. Once a remote system is powered on, the Target System Control Facility can be used in conjunction with NetView to initialise and control multiple target systems remotely from a single point of control.

Multisystem configurations often require that internal time-of-day clock settings be closely coordinated. Now, a cluster of selected systems can use the IBM Sysplex Timer to ensure that accurate time reference data is shared.

New security options protect sensitive information assets

Practically every enterprise needs to protect the sensitive information it transmits and stores. The water-cooled models of the ES/9000 family provide the optional Integrated Cryptographic Feature. Implemented in tamper-resistant hardware, this new security option allows sensitive information to be encrypted by the sending processor and decrypted by the receiving processor. This optional feature provides high performance and can be used in conjunction with the IBM Resource Access Control Facility (RACF) security platform.



MUMPS
The ANSI-standard Massachusetts General Hospital Utility Multi-Programming System (MUMPS) is implemented in the high-level programming language of IBM MUMPS/VM, a versatile programming system that allows users to develop base application programs. IBM MUMPS/VM also includes a comprehensive data base management facility and a flexible operating system. IBM MUMPS/VM is supported on all Models of the ES/9000 family.

Current operating systems
Support for non-ESA operating systems is dependent on model. For specific release levels and model support, check with your IBM marketing team.

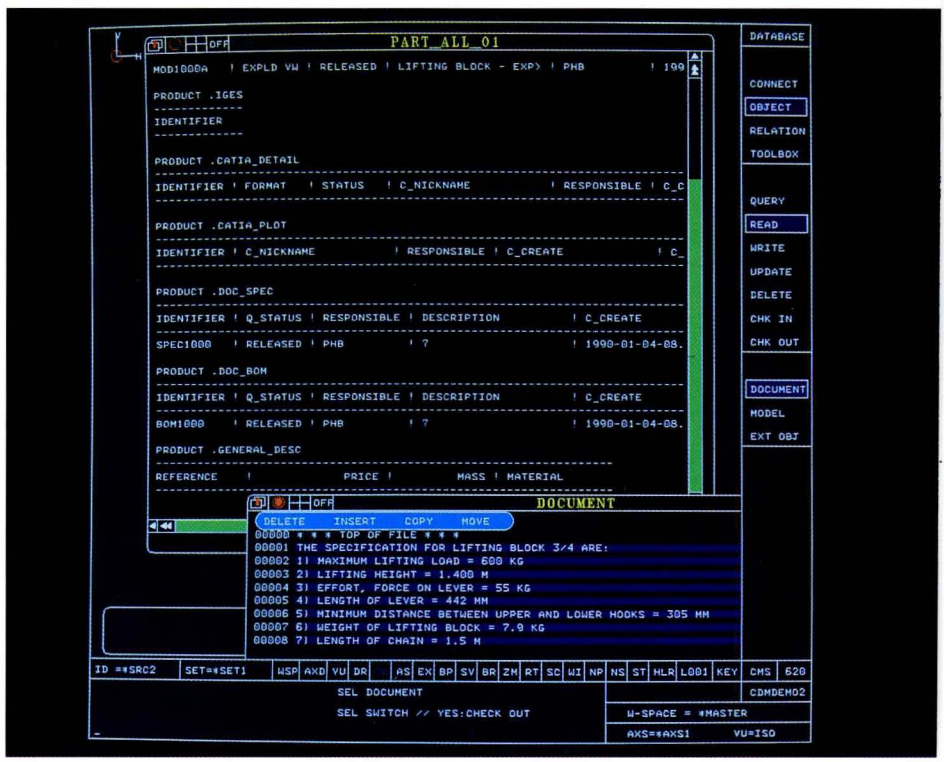
Technology for the '90s - and beyond
IBM technological leadership rests on the belief that customer satisfaction is the basis for success. The ES/9000 family delivers, in a single architecture, the broadest performance range available in the information processing industry. Underlying the ES/9000 family's design are multiple functional elements. These performance-optimised units work independently and in parallel for efficient operation.

Other technological elements in the family include:
- High-density packaging for fewer components
- Thermal Conduction Modules (TCMs)
- Bipolar and CMOS chips
- One-megabit and four-megabit storage chips
- Dynamic reconfiguration capabilities
- Remote service facility
- Extensive error-checking and correction enhancements
- Automatic problem-analysis invocation

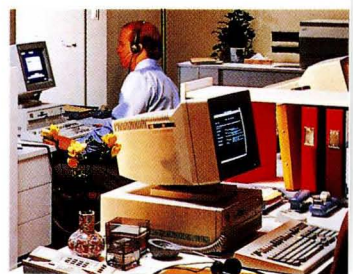
Versatile models to accommodate your business growth
The ES/9000 family encompasses 18 models, including powerful, economical entry systems as well as high-performance ones. The growth path within the family includes both rack-and frame-mounted, air-cooled and water-cooled models:
- Air-cooled rack-mounted models 120, 130, 150 and 170
- Air-cooled frame models 190, 210, 260, 320, 440 and 480
- Water-cooled models 330, 340 and 500 to 900

Air-cooled, rack-mounted models
The four powerful, economical entry systems in the ES/9000 family are based on a new complementary metal oxide semiconductor (CMOS) technology offering high density (from 40,000 to 80,000 circuits per chip) and low power consumption. The increased chip density reduces the number of chips required comparable to current systems, such as the IBM ES/9370. This increased density enables greater functionality in rack-mounted systems, as well as improved reliability.

The circuit switching time on the chips in these models has been reduced to less than a nanosecond. This allows the cycle time to be reduced, creating an impressive speed improvement over the capability of the IBM ES/9370.

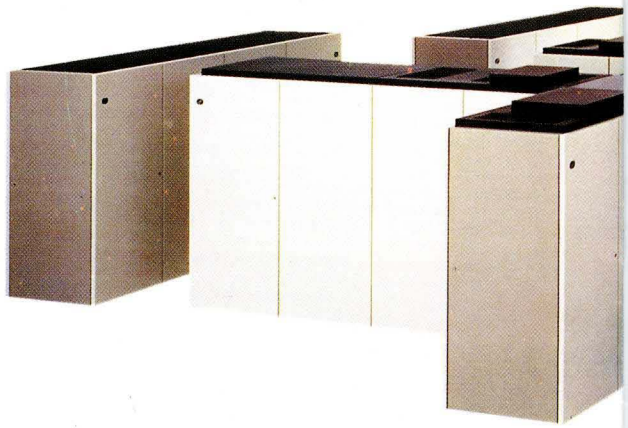


The planning of production capacity incorporates capacity scheduling and optimum use of production facilities

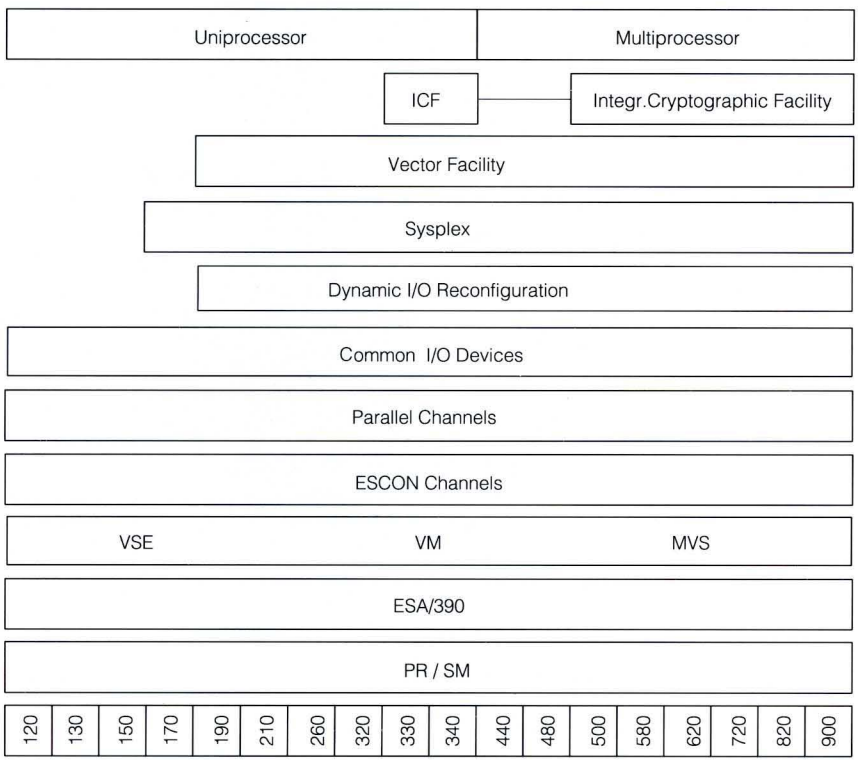


Rack-mounted ES/9000 models contain a compact processor and channel design. This compactness provides new reliability and serviceability and eases your upgrade from IBM ES/9370 processors. A two-sided circuit board used in the rack-mounted design reduces the number of cables needed by integrating the hardware.

Air-cooled frame models
The six ES/9000 air-cooled frame models provide performance, function and technology that was previously available from IBM only in water-cooled processors. These models pack the power of a small IBM ES/3090 mainframe into a footprint the size of an IBM ES/4381 processor.



The functions of IBM's ES/9000 family of processors



Demanding mathematical applications need systems with extra power in order to keep run times short

These models use leading-edge CMOS and bipolar technology, which provide a high-function Differential Current Switch (DCS) circuit design, and 128K CMOS Static Random Access Memory and an enhanced air-cooled TCM. The DCS circuit design was chosen for the air-cooled models because it provides high performance at a lower power rating. This is a critical requirement in a high-speed air-cooled machine. The main advantage DCS provides over emitter-coupled logic (ECL) is the ability to operate the logic with approximately one-third the signal voltage, which allows for substantial power reduction.

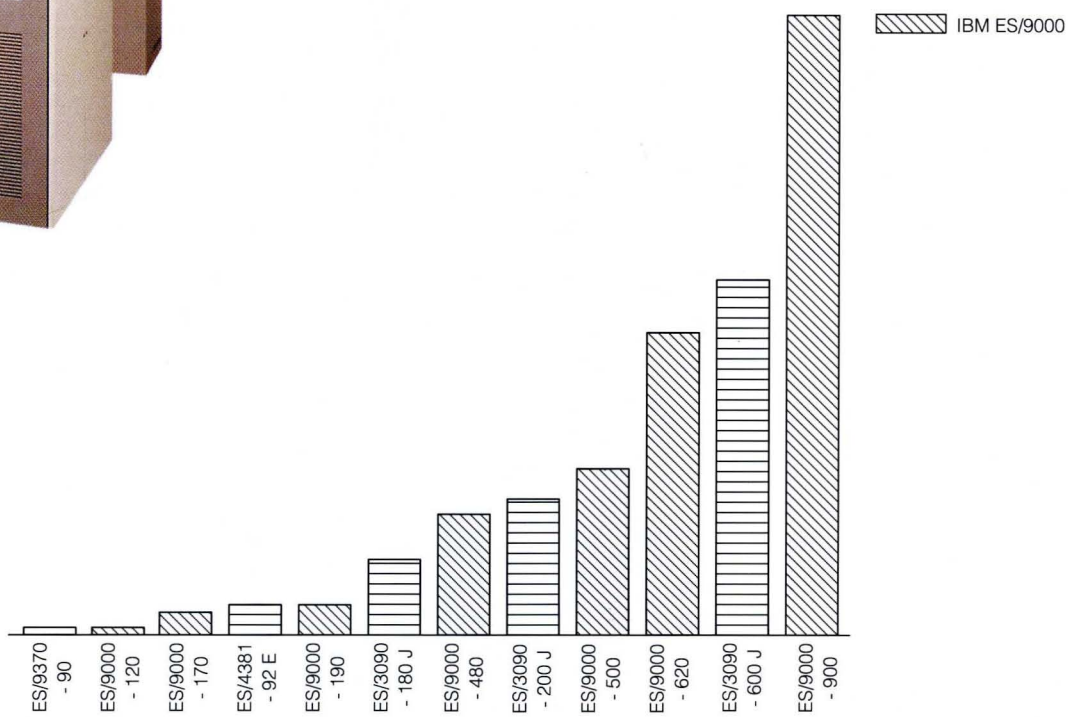
High-performance CMOS chips are used for the high-speed buffer, central storage and expanded storage. The CMOS chip requires only one-sixth of the power and provides twice the density of bipolar chips. This leads to significant system performance gains while reducing the total number of TCMs required. The ES/9000 air-cooled frame models utilise four TCMs to provide the same function as 21 TCMs provided for the ES/3090.

This new air-cooled TCM incorporates several design enhancements over previous TCMs. Three key design changes have been incorporated which result in improved heat dissipation to allow air cooling. These changes are:

- The cooling media has been changed from helium to a mineral oil-like fluid
- Larger copper pistons are used to improve cooling
- Aluminium finned heat sinks are mounted directly over the TCM.

(Continued on back page)

Dynamic growth: a comparison of the performance of IBM ES/9000 models with the IBM ES/9370, the IBM ES/4381 and the IBM ES/3090



Water-cooled frame models
All water-cooled models of the ES/9000 family have enhanced power systems which improve serviceability and availability. Certain models of the ES/9000 family use new bipolar chip logic and high speed buffer storage providing the high-switching speeds needed for top performance. These chips employ both ECL and DCS circuit designs. Used together on a chip, these two logic designs match speed requirements with appropriate logic circuits. New high-speed buffer storage chips are faster and denser than ones previously used. These advances in chip technology provide improved computing power and availability as well as significantly reduced cycle times.

Newly redesigned TCMs incorporate several changes from earlier versions. Made of glass ceramic, a new substrate allows signals to run faster than current substrates. To accommodate denser chip packaging and increased heat dissipation, a high-conduction thermal design provides significant improvements in cooling. At the same time, the increased circuit density enables a reduction in the total number of TCMs required. Each board holds six TCMs. A central processor contains four TCMs, allowing the Vector Facility option or the Integrated Cryptographic Feature to be placed on the same board as the central processor.

Increased reliability, availability, and serviceability
Architecture, design, packaging and technology together benefit overall processing in several ways. Distance reductions made possible by the denser chips contribute to better performance and higher availability. The packaging's 'replaceable technology' approach enables IBM to offer new technology or function through a TCM exchange, providing you with additional growth alternatives for your strategic computing needs.

Find out more
If you would like more information about the System/390, the new ES/9000 processor models and the common architecture and application platforms, please contact your IBM marketing representative.

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