Solutions for Today...

Foundation for Tomorrow

The Platform for Application Growth
IBM ES/3090 S Processor Family

- Enterprise Systems Architecture/370 (ESA/370)
  - Architecture base into the ’90s
- Extensive granularity
- Numerous upgrade paths
- Up to 21-fold growth
- Up to 2560MB Processor Storage
- Up to 6 Vector Facilities
- 3.0/4.5MB/sec. Data Transfer Rate
- Up to 128 channels
- Multi-image management options
- Largest single system image
- Asymmetrical configuration option

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IBM ES/3090 S Processor Family

### Upgrade Performance Comparison (ITR)

<table>
<thead>
<tr>
<th>Model</th>
<th>MVS/ESA Commercial</th>
<th>Numerically Intensive Computing</th>
<th>VM/XA SPX CMS</th>
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<tbody>
<tr>
<td>From-To</td>
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<td>Vector</td>
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<tr>
<td>100S-240S</td>
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</table>

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using IBM Benchmark Workloads.

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IBM Enterprise Systems Architecture/370

The Base for Growth into the ’90s
IBM ES/3090 S System Design

**Processor Storage**

- Thermal Conduction Module (TCM) – enhanced cooling
- Multilayer Ceramic Substrate (38 layers)
- Denser TCM Board
- Cycle time 18.5 ns – 15 ns
- New logic chip-imbedded arrays

**Chip**
- 2360/612

**TCM**
- 100/132

**Board**
- 6/9 TCMs

**Frame**
- 2 Boards

**Circuits**
- Chip Sites

**Emitter**
- Coupled

**Logic (ECL)**

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**IBM Technology Leadership:**

- TCM continues to have the densest logic module packaging in the industry in commercial mainframes
- First one-megabit chip in production systems
- ES/3090 Models use 2nd generation one-megabit chip

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100S, 120S, 150S, 170S, 180S may have 64Kb chips in Central Storage
100S, 120S, 150S, 170S and 250S may have 288Kb chips in Expanded Storage

*Writeable Control Store, 2360 circuits/chip and 8Kb High Speed Buffer Chip are available in 180S, 200S, 280S, 300S, 380S, 400S, 500S and 600S*
IBM Enterprise Systems Architecture/370 (ESA/370)

- A new architecture for:
  - Processing increasing amounts of data
  - Avoiding constraints to further growth
  - Maximizing system efficiency through use of Expanded Storage
- ESA/370 is the architectural base into the '90s
  - An evolutionary step beyond S/370 Extended Architecture
  - Unique to the IBM ES/3090 and IBM ES/4381 Model Groups 90E, 91E and 92E
  - Supported by MVS/ESA and VM/XA SP software for guest usage

MVS/ESA (MVS/SP V3 and MVS/DFP V3)

- Runs on all IBM ES/3090 Models and IBM ES/4381 Model Groups 90E, 91E and 92E
- MVS/SP V3 is easy to install and use
- Offers powerful addressing capability through creation of multiple 2GB data spaces
- Maximum benefits derived through use of Expanded Storage
- Provides the base for improved performance and response time by reducing I/Os
- Improves data integrity by allowing separation of programs and data
- Improves I/S professional productivity
- Enables application growth
- Provides significant operational value
- Allows for automatic management of data within the storage hierarchy
- Simplifies DASD migration

IBM ES/3090 S Multi-Image Management

- Physical partitioning with ES/3090 multiprocessor models
- More granularity on multiprocessors through asymmetry
- Logical partitioning through ES/3090 Processor Resource/Systems Manager (PR/SM) feature
  - Complements physical and software partitioning
  - Provides up to 7 logical partitions*
  - Provides up to 14 logical partitions on MP Models operating in Physically Partitioned Mode**
- Comprehensive SCP support
- High performance through event driven scheduling
- Uses existing skills
- Flexible systems resource utilization
  - Processor/Vector Facilities can be dynamically shared or dedicated, with granularity as small as a portion of a single processor
  - Processor storage is dedicated and can be partitioned in 1MB increments at activation
  - Channels can be dynamically dedicated or reconfigured, with a granularity of one channel
- One PR/SM feature per side required on ES/3090 S Models
- Software partitioning through VM/XA SP
  - Enhanced through PR/SM feature
    - Up to 6 preferred guests
- Used for diverse production workloads, consolidation, migration, test, development, maintenance and backup/recovery
- Provides cost reduction, resource balancing, workload isolation, physical backup, and lower cost entry multiprocessing

* Up to 4 logical partitions on 100S, 120S, 150S, 170S and 250S
** Up to 8 logical partitions on 250S
IBM ES/3090 S Expanded Storage

- Optional extension of ES/3090 Central Storage
- Expanded Storage provides an effective base for data in memory
- Up to 2560MB of ES/3090 S Model Processor Storage (combination of Central Storage and Expanded Storage)
- More granularity on multiprocessors through asymmetry
- Immediate benefit to subsystem and user program with no program changes required
- 4K pages synchronously moved to or from Central Storage
  - Page movement orders of magnitude faster than channel attached devices
- Single and double-bit error correction and detection of triple and some multiple bit errors for increased system availability
- Significant performance improvements ... some customer experiences:
  - External paging load reduced 50%
  - Response time improved 67%
  - Transactions volumes increased 30%
  - Job elapsed times reduced
- Benefits when used with MVS/ESA
  - Reduced I/Os
  - Provides a base for improved performance, including response time
    - High performance spaces (Hiperspaces)
    - High performance SORT (DFSORT Hipersorting)
- Improved MVS/ESA performance in terms of response time, transaction volumes, and number of users through use of Expanded Storage and subsystems such as DB2, IMS, TSO and CICS.
- Significant performance improvements through use of expanded storage for minidisk caching and logon directories (VM/XA SP)
- Improved VM/SP HPO and VM/XA performance by paging into Expanded Storage
- Partitioned use of Expanded Storage by VM/XA SP

IBM ES/3090 S Vector Facility (1)

- Optional extension to each Central Processor
- Incremental investment: up to six on Model 600S
- 171 vector instructions
- Up to 15-fold performance growth in vector throughput
- High-speed divide and doubled section size (Model 180S, 200S, 280S, 300S, 380S, 400S, 500S and 600S)
- Growing number of enabled applications are available in the areas of seismic, structures, fluids, computational chemistry, and others*

VM support

- VM/SP HPO Release 5
- VM/XA SP
  - Exploitation of expanded storage for applications with large working sets
- AIX/370

MVS support

- MVS/SP Versions 2 and 3
- Data in virtual for selected data sets
- RMF for vector statistics

Application Support

- SCENAD - full screen menus, ISPF support
- VS FORTRAN Version 2.3
  - Automatic vectorizing capabilities
  - Interactive Vectorization Aid
  - Multitasking facility for multiple processor execution of a single job
- Assembler H Version 2
- VS FORTRAN V2.1
  - Parallel FORTRAN (PRPQ)
- Engineering and Scientific Subroutine Library (ESSL)
- FORTRAN translation tool
- IBM FORTRAN Language Conversion Program
- APL2 direct support of Vector Facility
- Mathematical Programming System Extended/370 (MPSX/370) Vector Facility support with up to two times performance improvement over scalar

* See Catalog of Engineering and Scientific Application Programs, G320-6739
Internal Throughput Rate Comparisons
Static Structural Analysis-NASTRAN

- Scalar
- Vector

(100S Scalar - 1.0)

37-fold Throughput Increase

1 NASTRAN is a registered trademark of the National Aeronautics and Space Administration
BCCL12 (NASTRAN Static Structure Analysis)
### IBM ES/3090 S Physical Characteristics

<table>
<thead>
<tr>
<th>Units</th>
<th>100S</th>
<th>150S</th>
<th>170S</th>
<th>190S</th>
<th>250S</th>
<th>300S</th>
<th>350S</th>
<th>400S</th>
<th>500S</th>
<th>600S</th>
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<td>Heat Output (kBTU/hr) To water</td>
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*Approximate weight figures.

### IBM ES/3090 S MVS Control Program Support

#### MVS

<table>
<thead>
<tr>
<th>Function</th>
<th>MVS/System Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support for ESA/370</td>
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</tr>
<tr>
<td>Data Spaces</td>
<td>☐</td>
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<tr>
<td>TSO/E REXX &amp; CLISTs</td>
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<td>Virtual LOOKASIDE Facility</td>
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<tr>
<td>Expanded Storage*</td>
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<tr>
<td>VIO Expanded Storage Support*</td>
<td>☐</td>
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<tr>
<td>Hiperspace*</td>
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<td>VSAM Buffers in Hiperspace*</td>
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<td>Hipersorting*</td>
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<tr>
<td>Data in Virtual</td>
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<tr>
<td>Data Windowing Services*</td>
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<tr>
<td>Central Storage Utilization</td>
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<tr>
<td>Constraint Relief Below 16MB*</td>
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<tr>
<td>CICS Data Tables</td>
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<tr>
<td>Support for 512MB</td>
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<tr>
<td>Multi-address Space Access</td>
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<td>Global Resource Serialization</td>
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<tr>
<td>Up to six-way Single Image Support</td>
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<tr>
<td>Vector Facility – Compile/Execute</td>
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<tr>
<td>FORTRAN Multitasking Facility</td>
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</tbody>
</table>

*Additional Value from Expanded Storage

- Function Supported
- Function Enhanced

The IBM ES/3090 Processor Complex Installation Manual – Physical Planning, GC22-70801, should be used for detail planning.

Figures for power consumption, heat output, space requirements, and weight include IBM 3097 Power and Coolant Distribution Units, 3092 Processor Controller, and 3906 Processor Unit as minimum and maximum configuration. Includes Channels, Central Storage, Expanded Storage, and Vector Facility.
### IBM ES/3090 S VM Control Program Support

<table>
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<td>31-bit Addressing</td>
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<td>Up to 6-Way Single System Image</td>
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<td>MVS/ESA Guest Support</td>
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<td>AIX/370 Guest Support</td>
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<td>VSE and V51 Support</td>
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<td>Multiple Preferred Guests Support</td>
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<td>Start Interpretive Execution (SIE)</td>
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<td>VMA under SIE</td>
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<td>3990-3 Support</td>
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<td>Logon and IPL Enhancements</td>
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### IBM Interconnect Products (1)

**3044 Fiber Optic Channel Extender Link**

- Introduces fiber optic technology as a transmission medium for attaching I/O control units, switching units and channel-to-channel interfaces to block multiplexer channels.
- Consists of two units interconnected by up to 2 km of fiber optic cable. (C02 attaches to channel and D02 to remote control units).
- Provides "near local" response time to "remote" users.
- Support speeds up to 4.5 MB/sec.
- Supports 50/125 or 62.5/125 micron fiber.
- Supports DASD and tape.

![Diagram of 3044 Fiber Optic Channel Extender Link](image-url)
3088 Multisystem Channel Communication Unit

- Provides the capability of interconnecting up to eight processor channels and up to 252 logical CTCA Links
- Data streaming capability providing up to 4.5MB/sec transfer rate
- Interprocessor cable distances of up to 245 meters
- Up to two simultaneous data transfers
- Early channel disconnect allowing enhanced channel utilization
- Compatibility with existing S/370 CTCA facilities

3814 Switching Management System

- Provides automated switching of control unit interfaces and processor channels
- Consists of 3814 switching units, operator consoles, and optional hardcopy printers
- Can create up to a 128-node switching matrix (8x16 or 16x8) and can control up to 128 control unit two-channel switches
- A single control point for I/O switching and control unit two-channel switches is provided
- Configurations can be stored for control unit switching (up to 464) and control unit two-channel switches (up to 327)
- Power sequencing for attached control units (up to 16 per 3814) is allowed
- Security protection is controlled by three or four levels of passwords

MVS/ESA + ES/3090 Benefits

- Productivity
- Ease of Use
- RAS
- Function
- Constraint Relief
- Performance
- Data in Memory
IBM ES/3090 Total System Solution

MVS/ESA, DFSMS, and ES/3090 S Models

What customer environments benefit from MVS/ESA, DFSMS, and the ES/3090 S models?

Customers may receive benefits up to:

- More transactions
  - TSO/E 33%
  - IMS 56%
  - CICS 52%

- More transactions
  - DB2 270/sec
  - 120% more

- More transactions
  - Vector ITRR 1.4 x faster

- DASD utilization
  - DFSMS 20% better

- System programmer productivity
  - DFSMS 20% improvement

- Application programmer productivity
  - DFSMS 7% improvement

- Restart time
  - JES2 90% reduction
  - JES3 76% reduction

- Channel busy
  - DFSORT 46% less

- Number of I/Os
  - CICS/IMS 10-50% less
  - DFSORT 85% less

- Tape mounts
  - DFSMS 60% less

- Data base load time
  - DB2 32% less

- MVS availability
  - 75% improvements

- Global CPU utilization
  - JES3 47% reduction

- More transactions
  - DB2 5 x faster

- Complex data base queries
  - CICS Data Tables 95%

- Elapsed time
  - DFSORT 25% reduction

- Shared Catalog I/O
  - DFP 23% less

Based on laboratory measurements in comparison to MVS/XA and prior releases/versions of DFSORT, DB2, JES2 and JES3 on ES/3090 E processors without system-managed storage. MVS/ESA CICS/MVS Data Tables results are compared to MVS/ESA CICS/MVS measurements without Data Tables. These results may not be additive and actual customer results may vary.
Design
- Uni-, dyadic-, triadic processors, two-, three-, four-, five-, and six-way multiprocessors
- ESA/370 capable
- Supports data in memory
- Enhanced System Control Element (SCE)
- Scalar, vector and parallel processing
- Large processor storage
- Processor Resource/Systems Manager feature
- Additional fast-path capability
- Integrated Vector Facility
- Asymmetrical configurations of Central Processors, Expanded Storage, Channels and Vector Facilities

Architecture
- Supports three architectures
  - ESA/370, 370-XA, and S/370

Technology
- TCM - densest logic module packaging on commercial mainframes
- 2nd generation 1-megabit memory chip
- Fastest, densest 32K-bit SRAM - (3 ns) bipolar chip in production
- Faster, denser logic chip with imbedded arrays
- Writeable control storage (WCS)

Performance
- Instruction execution overlap
- High performance multiply
- Vector Facility – doubled section size and high-speed divide
- Expanded storage
- 64/128 KB high-speed buffer
- 64-bit data paths
- Powerful, flexible RISC I/O processor
- SIE support

Availability
- Dedicated microprocessor for each channel
- Circuit design dedicated to availability
- Double bit error correction in expanded storage
- Remote Support Facility

Growth
- Up to 21-fold performance growth within the ES/3090 S family
- Up to 2,560MB of processor storage
- Up to six Vector Facilities
- Up to 128 channels
- Largest available commercial single-system image

For further information, see your IBM marketing representative
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MVS/ESA™
MVS/XA™
PR/SM™
ES/3090™
ES/4381™
Hipersort™
VM/XA™
CICS/MVS™
IMS/ESA™
AIX™/370

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