The server built to help optimize your resources throughout the enterprise

IBM System z9 Enterprise Class

Highlights

- ***Strengthening the role of the mainframe as the data hub of the enterprise***
- ***New versatile capacity settings designed to optimize capacity and cost***
- ***IBM System z9™ Integrated Information Processor (IBM zIIP) is designed to improve resource optimization and lower the cost of eligible work***
- ***Continued improvement in IBM FICON® performance and throughput***
- ***On demand innovative technologies to help meet ever-changing business demands***

A "classic" might just be the best

Today's market finds that business needs are changing, and having a competitive advantage isn't always about having more or being bigger, but more about being smarter and responding faster to change and to your clients. Often, being reactive to change has led to infrastructures with mixed technologies, spread across an enterprise, that are complex and difficult to control and costly to manage. Integration of applications and data is limited and difficult. Using internal information to make insightful decisions for the company can be difficult because knowing you are using the "best" data—that which is most current and complete—may not be possible.

In many situations, investments have been made in disparate technologies that may fall short of meeting their goals. Merging information from one branch to another may not be possible and so company direction is set with

only a portion of the data at hand, and in a global economy that can really hurt. Companies need to be able to regain control and create a unified infrastructure. The objective is to find a strategic platform to standardize on, one that's able to integrate and support a large and diverse set of applications, and one that has resources that can be shared and optimized for maximum use. And of course the goal includes the ability to scale as the company grows, providing a safe and security-rich level of resource protection.

The System z9 mainframe is perfect to take on that role. While having classic strengths on which its reputation was formed, it continues to be a leader in areas such as data management, availability, security and resiliency, virtualization and integration. Its ability to support many open and industry standards, with comprehensive support for Service-Oriented Architecture, makes it an ideal platform for deploying new workloads or for interoperating with new workloads on alternative technologies.

The System z9 Enterprise Class (z9 EC), formerly the System z9 109 (z9-109), provides tight collaboration with IBM storage and IBM software to help achieve advanced I/O function and performance. And while the z9 EC can scale to offer a large capacity mainframe in a single footprint, some customers have requested the z9 EC innovative features with more flexibility in customizing and sizing the capacity of the general purposes processors (CPs) that reside in the server. These customers want more options as they weigh business demands and costs, trying to achieve the right balance. The new subcapacity models of the z9 EC satisfy these requests. These enhanced capabilities illustrate that the z9 EC is a classic that doubles as an advanced solution designed to support the IT infrastructure needed for today's on demand business.

Information on demand is the core of your business

Data is at the core of every business. Being able to integrate and merge data from different databases can enable businesses to provide timely, current and correct information to their clients. This type of delivery allows a business to be responsive and flexible to its clients' requests. Taking this a step further, a business may benefit from being able to analyze the information for insight, research or simulations. This can help set corporate strategy and allow a business to have a competitive edge.

But data management can be a big project. It needs to be available globally; it must be kept up in real time and accessible 24x7. At the same time, it needs to be protected from unauthorized access and to comply with new regulations. The IBM System z™ mainframe family has a strong heritage in data serving, and its architecture is designed for massive data access, whether across the Internet, to storage devices, or to remote backup sites. Scalability, availability, security—these are all core competencies of the mainframe.

The z9 EC, like the predecessor IBM mainframes, includes dedicated I/O processors (the System Assist Processor or SAP) to manage thousands of concurrent data accesses. It provides more available channel bandwidth and FICON channels than the IBM eServer™ zSeries® 990 (z990). The new MIDAW Facility on the z9 EC can help improve FICON channel efficiency and throughput. The new enhanced book availability, redundant I/O interconnect, channel subsystem enhancements and enhanced driver maintenance can increase the z9 EC's availability, helping to protect not just the mainframe but also its applications from unplanned as well as planned outages.

The new System z9 Integrated Information Processor (IBM zIIP) specialty engine is designed to help improve resource optimization and lower the cost of portions of eligible workloads. IBM DB2® for z/OS® V8 and above will exploit the zIIP capability for portions of eligible workloads. The zIIP can help to strengthen the System z9 mainframe as the data serving hub, helping customers to more fully leverage their valuable assets. In addition to supporting portions of DB2 workloads, IBM plans to announce an enhancement to the z/OS Communications Server that allows the IPSec processing to take advantage of zIIP specialty engines. It is anticipated that the zIIP will help reduce the overall cost of IPSec processing.[1]

Versatile design for optimized sizing

Offered on our IBM S/390® and zSeries midrange servers since 1999, subcapacity general purpose processors have allowed customers to choose a server sized to best meet business requirements. This granularity and flexibility has been dramatically extended in the midrange mainframe line in the past few years and is now being offered on the z9 EC. On the z9 EC, subcapacity processors are available on servers configured with eight or fewer general purpose processors. With the z9 EC four book design, additional available processors within the server can be characterized as specialty engines (ICFs, IFLs, zAAPs or zIIPs) or for Capacity Backup Upgrade (CBU).

Although there is no change to the total number of available processors on the z9 EC, customers will be able to choose from four different subcapacity settings when they run with eight or fewer general purpose processors. The z9 EC will now have a new lower entry that is 66% smaller than the current z9 EC entry and will offer 24 new capacity settings. Once the requirement for general purpose processors exceeds eight, all general purpose processors will be full capacity. All functions and features of the z9 EC are available when running with subcapacity processors.

All mainframe customers now have the option of selecting a server that meets both total capacity requirements as well as being able to select the number of general purpose processors that best fits their application and processing requirements.

Optimizing for better resource utilization

The IBM System z9 Integrated Information Processor (IBM zIIP) was announced in January 2006. The zIIP's execution environment will accept eligible work from z/OS 1.6 and above, which will manage and direct the work between the general purpose processor and the zIIP. DB2 for z/OS V8 and above will exploit the zIIP capability for eligible workloads.

The zIIP is designed so that a program can work with z/OS to have all or a portion of its Service Request Block (SRB) dispatched work directed to the zIIP. Types of eligible work that access DB2 and that can have portions of their work be directed to the zIIP include CRM (Customer Relationship Management), ERP (Enterprise Resource Planning), BI (Business Intelligence) and data warehousing applications.

In addition to supporting portions of DB2 workloads, IBM plans to announce an enhancement to the z/OS Communications Server that allows the IPSec processing to take advantage of zIIP specialty engines. It is anticipated that the zIIP will help reduce the overall cost of IPSec processing.[1]

[1] All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Enabling with FICON

The z9 EC will now include FICON Express4 to help improve capacity and performance with the next generation of FICON/FCP. This new feature may reduce the cost of storage operations and infrastructure and shorten backup windows with faster channel link speeds. The FICON Express4 channel is designed to improve performance of FICON channel reads or writes for unidirectional transfers and total throughput for a mix of reads and writes.

With four channels per feature, FICON Express4 is designed to provide improved performance and supports 1, 2 or 4 Gbps link data rate, auto negotiated. With enhanced availability features, the new FICON Express4 feature supports pluggable optics for individual servicing of each of the four channels on a feature.

On demand innovation to meet changing business demands

In the highly unpredictable world of on demand business, businesses need to be able to get what they need—when and how they need it. And pay for only what is used. IBM Capacity on Demand for the IBM System z is designed to achieve those goals.

It is a must to have the flexibility to rapidly increase or decrease computing capability as requirements change. This may be a permanent capacity increase for planned growth or a temporary capacity increase for seasonal or unpredictable peak periods. When properly configured, the z9 EC provides the capability to quickly and non-disruptively activate "extra" processor capacity that is built directly into the server. IBM Capacity Upgrade on Demand (CUoD) provides a permanent increase in processing capacity, and IBM On/Off Capacity on Demand (On/Off CoD) provides temporary capacity increases that allow you to revert to the previous processing level whenever it's required. Up to 100 On/Off Capacity on Demand (On/Off CoD) configurations (records) may be stored on the z9 EC Support Element for added flexibility.

Add on other features and programs like Concurrent Memory Upgrade, Capacity Backup Upgrade (CBU) and Customer Initiated Upgrade (CIU), and there is a great deal of flexibility in these on demand solutions.

Availability and security for an on demand world

The z9 EC is focused on providing high availability by helping to reduce both planned and unplanned outages. When properly configured, outage reductions may be achieved as a result of the z9 EC improved non-disruptive replace, repair, channel subsystem enhancements and upgrade functions for memory, books and I/O as well as the capability, in select circumstances, to download Licensed Internal Code upgrades non-disruptively.

Integrated clear key encryption security-rich features on the z9 EC include support for Advanced Encryption Standard (AES), Secure Hash Algorithm-256 (SHA-256), and Pseudo Random Number Generator (PRNG). Performing these functions in hardware may help to contribute to improved throughput, and the z9 EC advanced virtualization technologies can create a solid foundation for flexible integration of business and information management. The configurable Crypto Express2 feature is a System z9 exclusive on IBM mainframes and is supported by z/OS, z/VM®, z/VSE™ and Linux® on System z. z/VSE offers support for clear-key SSL transactions only.

Protecting sensitive data is a growing concern for companies around the globe. The importance of securing critical business data and customer information reaches to the corporate boardroom. Being unable to protect these assets may result in high out-of-pocket costs and, more importantly, may also result in lost customer and investor confidence. Announced in September 2005 and updated in January 2007, the IBM Encryption Facility for z/OS 1.2 leverages mainframe encryption services for the creation of encrypted tapes. Customers can use z/OS centralized key management to provide a highly secure exchange of encryption keys when exchanging data with trusted business partners. As of August 29, 2006, the IBM System Storage™ TS1120 Tape Drive includes data encryption capabilities within the drive itself, helping to avoid the need for host-based encryption of data—and the concurrent drain on host performance—or the use of specialized encryption appliances.

Flexibility and choice in operating systems

Delivering the technologies required to address today's IT challenges takes much more than a server; it requires all of the system elements to be working together. For many years IBM has designed and developed its server technology in collaboration with the other IBM system elements. The result of this collaborative approach to system design for the IBM System z9 means we can deliver technologies that are designed to exploit each other's strengths, which helps enhance the capabilities of the total system and deliver greater value to the on demand business enterprise.

Our mainframe operating systems provide the solid software foundation to the system design. The z9 EC is able to manage numerous operating systems on a single server, including z/OS, z/VM, z/VSE, TPF, z/TPF and Linux for System z9 (31-bit and 64-bit distributions). The operating systems are designed to support existing application investments to help realize the benefits of the z9 EC. In fact, z/OS with the z9 EC is designed to automatically adapt to support the relevant 24-bit, 31-bit and 64-bit addressing schemes.

While the z9 EC supports these different operating systems, its most advanced features are optimized via z/OS. z/OS delivers high qualities of service for enterprise transaction and data and can extend these qualities to new applications using the latest software technologies. It provides a highly secure, scalable, high-performance base on which to build and deploy Internet and Java™ technology-enabled applications, providing a comprehensive and diverse application execution environment.

Specialty engines for better integration of new with old

The System z9 continues to extend and support the use of dedicated processors for specialized workloads, which can help provide better optimization of resources as well as offer price/performance improvements to users.

The System z9 Application Assist Processor (zAAP) allows for strategic deployment and integration of new workloads on the very same platform as heritage applications and core business databases in a highly cost effective manner. A zAAP can help simplify and reduce server infrastructures, which can provide both operational and performance advantages over a physically separated multi-tier solution. A zAAP may help to increase system productivity by reducing the demands and capacity requirements on general purpose processors. These resources may then be available for reallocation to

other System z9 workloads and help to lower the overall cost of computing for the IBM WebSphere® Application Server and other Java technology-based solutions through hardware, software and maintenance savings.

The introduction of the Integrated Facility for Linux (IFL) in 2001 allowed the mainframe to support new workloads and open standards. Linux provides an open, economical application enabling platform with a wealth of available applications. The System z platform provides users with the ability to "scale out," deploying large numbers of virtual Linux servers to provide high levels of service while at the same time helping reduce expense and complexity.

The Internal Coupling Facility (ICF) was introduced in 1997 and helps to cut the cost of Coupling Facility functions by reducing the need for an external Coupling Facility. IBM System z Parallel Sysplex® technology allows for greater scalability and availability by coupling mainframes together. Using Parallel Sysplex clustering, System z servers are designed for up to 99.999% availability. Having a Parallel Sysplex also allows for centralized data sharing across mainframes. With the Server Time Protocol (STP) feature (planned to be available January 31, 2007) on the server, designed to maintain time synchronization with other System z9, z990 and z890 servers, the z9 EC can be coupled into a Sysplex without the requirement for an external IBM Sysplex Timer®. STP is also designed to support up to a 100 km wide Parallel Sysplex without the need for an intermediary site to house a remote Sysplex Timer.

Now, with the zIIP available on System z9 servers, the ease and economy of the specialty engine can help break down the walls between transactional data stores on the mainframe and BI, ERP, CRM applications that run on distributed computers. Furthermore, combining the qualities of service provided by the z9 EC, z/OS and DB2 for z/OS V8 and above, with the cost effectiveness of data access via zIIP, may help reduce the need for many local copies of data and the additional IT complexity that scenario brings.

Enhancing flexibility with z9 EC and SOA

There is a growing recognition in the IT industry of the potential benefits of Service-Oriented Architecture (SOA) for building new applications. Over the years, many IBM customers have employed and developed business applications running on z/OS, using a combination of CICS®, IMS™ and DB2 for z/OS. Consequently, the inherent strengths and capabilities of a z/OS environment running on a z9 EC can make it an ideal platform from which to develop, deploy and manage applications as customers move to a SOA.

The use of the IBM SOA products, such as the new IBM WebSphere Developer for System z V7.0 may assist in the quicker and easier generation of Web and user interfaces for core business. IBM WebSphere Process Server for z/OS V6.0, is designed to help enable the integration of diverse "services" such as multiple core applications, new applications or other packaged applications within the same workspace. The IBM WebSphere, Rational® and Tivoli® products feature the latest technology in middleware and management tools designed to help improve operational efficiency.

Choosing to deploy SOA on the z9 EC may help enhance application re-use and may help reduce the cost and risk of new development projects and bring flexibility and responsiveness to the way customers are able to tackle business challenges or opportunities.

Regain control of your IT infrastructure

Many enterprises are realizing that the mainframe, which is at the core of their infrastructure today, is a critical element of their on demand operating environment. Its core strengths of scalability, security, resiliency and availability, as well as its data serving capabilities work together to enhance the role of the mainframe as the data hub across the IT enterprise.

Yet strength is not measured by the power and hardware features alone. Strength is also derived from the ability of the z9 EC to help create a unified infrastructure utilizing SOA and open computing standards designed to enable integration of existing resources and to build and deploy effective applications. It's also derived from the teaming of I/O capabilities with IBM's storage products to create an environment that is optimized to work together.

IBM provides world class mainframe technology to help today's enterprises respond to changing business conditions quickly and flexibly. By creating a unified infrastructure with a strategic platform designed to help integrate IT assets and consolidate data, businesses may reduce cost and complexity and streamline the flow of information. This unified approach returns control of the infrastructure to the data center, which in turn may benefit from the innovation and efficiencies inherent in System z technology.

Benefits	Features/functions
Availability	• CICS subspace group facility • CICS subsystem storage protect • Concurrent Book Add • Concurrent channel, OSA-E and Coupling Link maintenance • Concurrent Hardware Management Console (HMC) and Support Element • Concurrent Licensed Internal Code (LIC) maintenance for CP, SAP, SE, PR/SM™, LPAR, HMC, OSA-Express2 • Concurrent power and thermal maintenance • Dual Support Elements • Dynamic Channel Path Management • Dynamic I/O Reconfiguration • Dynamic memory sparing • Dynamic Oscillator Switchover • Enhanced Application Preservation • Enhanced Book Availability • Enhanced Driver Maintenance • Enhanced Dynamic Reconfiguration Management • Enhanced Firmware Simulation • Failure Containment for MBA • Fault Tolerant Interconnect Design • FICON Purge Path Extended • Frame Bolt Down Feature • Hybrid cooling • Multipath IPL • N+1 power supply technology • OSA-Express2 Link Aggregation Support • OSA-Express2 Network Traffic Analyzer • Partial memory restart • QDIO Diagnostic Synchronization • Redundant I/O Interconnect • Remote operations support • Sparing for Storage Protect Preservation Keys • System Assist Processor (SAP) reassignment and sparing • System-Initiated CHPID Reconfiguration • Transparent CP Sparing

Benefits	Features/functions
Security	• Advanced encryption standard (AES) • Certified for LPAR isolation • Configurable Crypto Express2 (secure coprocessor or SSL acceleration) • CP Assist for Cryptographic Function • Designed for FIPS 140-2 Level 4 • EAL5 certified • LDAP support for HMC user authentication • Open Architecture Distributed Transaction Enablement • Pseudo random number generator (PRNG) • Remote key load for ATMs • Secure hash algorithm-256 (SHA-256) • SSL Acceleration for Linux and z/OS • Tamper-proof Cryptographic Support
Capacity on Demand	• Administrative On/Off CoD Testing • API for On/Off CoD activation • Capacity Backup (for both full and subcapacity) • Capacity Upgrade on Demand • Customer Initiated upgrades • On/Off Capacity on Demand • Up to 100 configuration records may be stored on System Element
Specialty Engines	• Integrated Facility for Linux (IFL) • Internal Coupling Facility (ICF) • System z9 Application Assist Processor (zAAP) • System z9 Integrated Information Processor (zIIP)
I/O Connectivity	• IBM ESCON® CTC native and basic mode • FCP LUN Access Control • FCP support for SCSI devices by Linux, z/VM and z/VSE (disks) • Fibre Channel Protocol (FICON) 1, 2, 4 Gb auto negotiations • FICON CTC • FICON full duplex data transfer • Full fabric FCP support • IBM ESCON half duplex data transfer • Multiple Image Facility (MIF) • N_Port ID virtualization (NPIV) • QDIO • Up to four Logical Channel SubSystems (LCSS)
Networking	• IBM HiperSockets™ • OSA for NCP (OSN) • OSA Layer 3 VMAC • OSA-Express (Gigabit Ethernet, 1000BASE-T Ethernet, Fast Ethernet) • OSA-Express and OSA-Express2 Layer 2 Support • OSA-Express Integrated Console Controller (1000BASE-T Ethernet) • OSA-Express2 (Gigabit Ethernet, 10 Gigabit Ethernet, 1000BASE-T Ethernet)

Benefits	Features/functions
Cluster systems	• Dynamic CF Dispatching • Dynamic ICF Expansion • Geographically Dispersed Parallel Sysplex • Integrated Cluster Bus-3 • Integrated Cluster Bus-4 • Internal Coupling Channel • InterSystem Channel-3 (Peer mode only) • Parallel Sysplex clustering technology • Server Time Protocol • Shared ICFs and CPs • Sysplex Distributor • System-Managed CF Structured Duplexing • Transparent ICF Sparing • z/VM Virtual Parallel Sysplex
Performance	• Compare-and-move extended • DB2 sort assist • FCP Enhancements • Hardware-assisted data compression • Hipersorting • IBM Hiperbatch™ • IEEE binary floating point support for advanced IBM Lotus® Domino® and Java performance • Long Displacement Facility • Modified Indirect Data Address Word (MIDAW) Facility • Multiple Subchannel sets (MSS) • OSA Dynamic LAN idle • Performed Locked Operations for enhanced IP performance • Up to 512 GB memory
Management	• (SE) maintenance • Internal Battery Feature • Power/thermal • LPAR Group Capacity • ESCON sparing • Cancel I/O Requests • Power Monitoring Display • Power Estimation tool
z/Architecture	• Intelligent Resource Director • Superscalar Processor • Tri-modal addressability • Up to 60 LPARs each with 64-bit central memory addressability

IBM System z9 Enterprise Class (2094) at a glance

Processor Unit (PU) types: CP/IFL/ICF/zAAP[5]/zIIP[5]			
Model	Minimum	Maximum	Increments
S08	1/1/1/0/0	8/8/8/4/4	1/1/1/1/1
S18	1/1/1/0/0	18/18/16/9/9	1/1/1/1/1
S28	1/1/1/0/0	28/28/16/14/14	1/1/1/1/1
S38	1/1/1/0/0	38/38/16/19/19	1/1/1/1/1
S54	1/1/1/0/0	54/54/16/27/27	1/1/1/1/1
Coupling Links			
ISC-3	48		
IC	32		
ICB-3	16		
ICB-4	16		
Max # Links	64[1]		
Channels			
Minimum	0/0/0/0/0/0/0	ESCON/FICON Express4/FICON Express2/FICON Express/OSA-Express2/OSA-Express/HiperSockets	
Maximum	1024/336/336/120/48/48/16	ESCON/FICON Express4/FICON Express2/FICON Express/OSA-Express2/OSA-Express/HiperSockets	
Increments	4/4/4/2/2/2/1/1	ESCON/FICON Express4/FICON Express2/FICON Express/OSA-Express2/OSA-Express – GbE, 1000BASE-T/OSA-Express2 – 10 GbE/HiperSockets	

IBM System z9 Enterprise Class (2094) at a glance

Cryptographic4	Crypto Express 2 – optional up to 8 features (16 PCI-X adapters), minimum order is 2 features	
Processor memory		
Model	Minimum	Maximum
S08	16 GB	128 GB
S18	16 GB	256 GB
S28	16 GB	384 GB
S38	16 GB	512 GB
S54	16 GB	512 GB
Upgradeability	Upgradeable within the z9 EC family Upgrading to the S54 from other z9 EC models will require a planned outage Upgradeable from IBM eServer zSeries 900 (z900), z990 and IBM System z9 Business Class (z9 BC) Model S07	
Physical Configuration	**Model S08, minimum[2]**	**Model S38, maximum[3]**
Weight	1212 kg (2672 lbs)	2003 kg (4407 lbs)
Footprint	2.49 Sq meters (26.78 Sq. ft)	2.49 Sq. meters (26.78 Sq. ft)
Service	5.45 Sq meters (58.69 Sq. ft)	5.45 Sq. meters (58.69 Sq. ft)
Input	6.3 kW	18.3 kW
Heat	21.5 KBTU/hr	62.4 KBTU/hr
Air	CFM 905, m^3/m	CFM 1965, m^3/m
Height	194.1 cm (76.4 inches)	194.1 cm (76.4 inches)
General	Conforms to EIA guidelines for frames	
Software		
z/OS:	z/OS 1.6 and subsequent releases	
z/VM:	z/VM 5.1 and subsequent releases	
Linux on System z:	Red Hat RHEL 4 and subsequent releases, SUSE SLES 9 and subsequent releases, Linux as z/VM guest	
z/VSE:	z/VSE V3.1, V4.1	
TPF:	TPF 4.1	
z/TPF:	zTPF 1.1	

[1] 64 external and 32 internal

[2] Model S08 with one I/O cage and no IBF

[3] Model S38 with three I/O cages and IBF with a combined max. of 64

[4] Initial order of Crypto Express2 requires 2 features, maximum of 8 features

[5] If ordering a zAAP or a zIIP, one or more general purpose processor (CP) per the specialty engine is required. One general purpose processor can satisfy the requirement for either or both of the specialty engines.

For more information

For more information about the IBM System z9 Enterprise Class, contact your IBM marketing representative or IBM Business Partner, or visit the following IBM Web site:

ibm.com/systems/z/z9ec/

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