The forward thinking mainframe for the twenty first century

IBM System z10 Enterprise Class

Highlights

- ***Delivering new levels of energy efficiency***
- ***Just-In-Time deployment of resources***
- ***Unprecedented capacity and virtualization to meet consolidation needs***
- ***Specialty engines offer an attractive alternative when running new workloads***

The future runs on System z

In today's world, IT is woven in to almost everything that a business does and consequently is pivotal to a business. Some of the key requirements today are the need to maximize return on investments by deploying resources designed to drive efficiencies and economies of scale, managing growth through resources that can scale to meet changing business demands, reducing risk by reducing the threat of lost productivity through downtime or security breaches, reducing complexity by reversing the trend of server proliferation and enabling business innovation by deploying resources that can help protect existing investments while also enabling those new technologies that can aid in business transformation.

The IBM System z10™ Enterprise Class (z10 EC) delivers a world class enterprise server designed to meet these business needs. The z10 EC provides new levels of performance and capacity for growth and large scale consolidation, improved security, resiliency and availability to reduce risk and introduces just in time resource deployment to help respond to changing business requirements. As environmental concerns raise the focus on energy consumption, the z10 EC is designed to reduce energy usage and save floor space when consolidating distributed servers. Specialty engines continue to help users expand the use of the mainframe for a broad set of applications, while helping to lower the cost of ownership. The z10 EC is at the core of the enhanced System z™ platform that delivers technologies that businesses need today along with a foundation to drive future business growth.

Powerful, but not a power consumer

Power and cooling discussions have entered the budget planning of every IT environment. As energy prices have risen and utilities have restricted the amount of power usage, it is important to review the role of the server in balancing IT spending. To assist in energy planning, Resource Link™ provides tools to estimate server energy requirements before a new server purchase. And once the z10 EC is installed and operational, the mainframe power monitoring tool, introduced on the System z9® servers, provides power and thermal information via the System Activity Display (SAD). The tool offers an energy consumption point-in-time reference. With a z10 EC, this information can be fed into IBM Systems Director Active Energy Manager™ (AEM) for Linux® on System z V3.1. AEM for Linux on System z will allow tracking of trends for both the z10 EC as well as multiple server platforms. With this trend analysis, a data center administrator will have the data to help properly estimate power inputs and more accurately plan data center consolidation or modification projects.

Workload consolidation can help to balance IT budget spending. The z10 EC is designed to reduce energy usage by greater than 80% and save floor space by greater than 85% when used to consolidate x86 servers. With increased capacity the z10 EC virtualization capabilities can help to support hundreds or thousands of virtual servers in a single 2.83 square meters footprint. When consolidating on System z you can create virtual servers on demand; achieve network savings through HiperSockets™ (internal LAN); provide security to enable and support new and existing applications; improve systems management of virtual servers; and most importantly, consolidate software from distributed processors to fewer consolidated processors.

Scale to support a changing IT world

The z10 EC provides a record level of capacity over the previous System z servers, achieved by both increasing the performance of the individual processor unit (PU) as well as increasing the number of PUs per server. The z10 EC is expected to deliver up to approximately 50% more capacity on average for a n-way processor compared to the IBM System z9 Enterprise Class (z9™ EC) and approximately 70% more capacity on a fully configured server than a z9 EC Model S54, for average LSPR workloads running z/OS 1.8.

The z10 EC is built using IBM's modular multi-book design that supports one to four books per server. Each z10 EC book contains a multi-chip module (MCM), which hosts the newly redesigned CMOS 11S processor units, storage control chips and high speed interfaces for I/O. The new quad core processor chip targets high frequency and will be introduced at 4.4 GHz and can help improve the execution of CPU intensive workloads on the z10 EC. The memory and books will be interconnected with a point-to-point symmetric multiprocessor (SMP) network for improved performance and availability. This approach facilitates the high-availability and dynamic capabilities that differentiate the z10 EC from other servers.

The z10 EC has five model offerings between 1 to 64 configurable processor units (PUs) and can support up to 64 PUs in a single z/OS® image (with z/OS V1.9). All models have the machine type of 2097. Four models (E12, E26, E40 and E56) have 17 PUs per book and the high capacity z10 EC Model E64 has one 17 PU book and three 20 PU books. The second two digits of the model number indicate the number of customer orderable PUs on the z10 EC—for example the E12 is a 1 to 12-way server.

Each z10 EC will have up to two spare PUs and there is a graduated scale up of System Assist Processors (SAPs) used for I/O processing, depending on the number of books installed in the server. The customer orderable PUs can be characterized as Central Processors (CPs); Integrated Facility for Linux (IFL) processors; System z10 Application Assist Processors (zAAPs); System z10 Integrated Information Processors (zIIPs); Internal Coupling Facility (ICF) processors; or additional SAPs. The z10 EC has subcapacity processors available on servers configured with twelve or fewer CPs.

The z10 EC Models E54 and E64 supports up to 1.5 TB of real memory. This is three times the maximum memory available on the z9 EC. The increased available memory of the server can help to benefit workloads such as DB2®, WebSphere® and Linux that perform better with large memory configurations. In addition to the customer purchased memory, an additional 16 GB of memory will be installed for the Hardware System Area (HSA). The HSA memory is entirely fenced from customer memory.

High speed connectivity and high bandwidth out to the data and the network are critical in achieving high levels of transaction throughput and enabling resources inside and outside the server to maximize application requirements. The z10 EC has a new host bus interface with a link data rate of 6 GB using the industry standard InfiniBand® protocol to help satisfy coupling, cryptography, I/O and LAN requirements; for ICF and server-to-server connectivity, for Crypto Express2 with secure coprocessors and SSL transactions, for I/O connectivity using ESCON®, FICON® or FCP, for LAN connectivity using the new OSA-Express3[5] 10 Gigabit Ethernet feature or OSA-Express2 Gigabit Ethernet and 1000BASE-T Ethernet.

The z10 EC can utilize up to four channel subsystems (CSSs), each with up to 256 channels. I/O constraint relief using Multiple Subchannel Sets (MSS) can help support larger I/O configurations.

The introduction of DS8000™ V3.1, combined with z/OS V1.10, can help address z/OS storage constraint issues by offering a new Extended Address Volume (EAV) capacity to enable volume growth past the current 65,520 (55.7 GB) cylinder capacity limit. With z/OS V1.10, you will be able to define up to 262,668 cylinders (223 GB) per Extended Address Volume. The DS8000 HyperPAV function will allow dynamic, real-time scaling of I/O rates against these larger volumes.

Just in time deployment of IT resources

Infrastructures must be more flexible to changing capacity requirements and provide users with just-in-time deployment of resources. Having the 16 GB dedicated HSA on the z10 EC means that some preplanning configuration changes and associated outages may be avoided. IBM Capacity Upgrade on Demand (CUoD) provides a permanent increase in processing capacity that can be initiated by the customer. IBM On/Off Capacity on Demand (On/Off CoD) provides temporary capacity needed for short term spikes in capacity or for testing new applications. Capacity Backup Upgrade (CBU) can help provide reserved emergency backup capacity for all processor configurations.

A new temporary capacity offering on the z10 EC is Capacity for Planned Events (CPE), a variation on CBU. If unallocated capacity is available in a server, it will allow the maximum capacity available to be used for planned events such as planned maintenance in a data center. The three-day CPE contract can be purchased at a fixed price.

The z10 EC introduces a new architectural approach for temporary offerings that can change the thinking about on demand capacity. One or more flexible configuration definitions can be used to solve multiple temporary situations and multiple capacity configurations can be active at once. This means that On/Off CoD can be active and up to three other offerings can be active simultaneously.

By having flexible and dynamic configuration definitions, when capacity is needed, activation of any portion of an offering can be done (for example activation of just two CBUs out of a definition that has four CBUs is acceptable). And if the definition doesn't have enough resources defined, an order can easily be processed to increase the capacity (so if four CBUs aren't enough it can be redefined to be six CBUs) as long as enough server infrastructure is available to meet maximum needs.

All activations can be done without having to interact with IBM—when it is determined that capacity is required, no passwords or phone connections are necessary. As long as the total z10 EC can support the maximums that are defined, then they can be made available. A new z10 EC feature now makes it possible to add permanent capacity while a temporary capacity is currently activated, without having to return first to the original configuration.

The activation of On/Off CoD on z10 EC can be simplified or automated by using z/OS Capacity Provisioning (available with z/OS V1.10 and z/OS V1.9). This capability enables the monitoring of multiple systems based on Capacity Provisioning and Workload Manager (WLM) definitions. When the defined conditions are met, z/OS can suggest capacity changes for manual activation from a z/OS console or the system can add or remove temporary capacity automatically and without operator intervention.

Providing protection

Protection of the IT infrastructure continues to be important. The z10 EC PU chip has on board cryptographic functions. Standard clear key integrated cryptographic coprocessors provide high speed cryptography for protecting data in storage. CP Assist for Cryptographic Function (CPACF) supports DES, TDES, Secure Hash Algorithms (SHA) for up to 512 bits, Advanced Encryption Standard (AES) for up to 256 bits and Pseudo Random Number Generation (PRNG).

System z is investing in accelerators that provide improved performance for specialized functions. The Crypto Express2 feature for cryptography is an example. The Crypto Express2 feature can be configured as a secure key coprocessor or for Secure Sockets Layer (SSL) acceleration. The tamper-resistant cryptographic coprocessor is certified at FIPS 140-2 Level 4.

Always available

Everyday the IT system needs to be available to all users—customers that need access to the company website, line of business personnel that need access to the system, application development that is constantly keeping the environment current and the IT staff that is operating and maintaining the environment. If applications are not consistently available, the business can suffer.

The z10 EC continues our commitment to deliver improvements in hardware Reliability, Availability and Serviceability (RAS) with every new System z server. They include microcode driver enhancements, dynamic segment sparing for memory as well as the fixed HSA. The z10 EC is a server that can help keep applications up and running in the event of planned or unplanned disruptions to the system.

IBM System z servers stand alone against competition and have stood the test of time with our business resiliency solutions. Our coupling solutions with Parallel Sysplex® technology allow for greater scalability and availability. The new InfiniBand Coupling Links (planned to be available 2nd quarter 2008) on the z10 EC are rated at 6 GBps and provides a high speed solution to the 10 meter limitation of ICB4 since they will be available in lengths up to 150 meters. GDPS® and the new Basic HyperSwap™ (available with z/OS V1.9) solutions help to ensure system failures are invisible to employees, partners and customers with dynamic disk-swapping capabilities that ensure applications and data are available.

GDPS is designed to provide a comprehensive end-to-end continuous availability and/or disaster recovery solution for System z servers, Geographically Dispersed Open Clusters (GDOC) is designed to address this need for open systems. When available, GDPS 3.5 will support GDOC for coordinated disaster recovery across System z and non-System z servers if Veritas Cluster Server is already installed.

Specialty engines offer an attractive alternative

The z10 EC continues to support the use of specialty engines that can help users expand the use of the mainframe for new workloads, while helping to lower the cost of ownership.

The zIIP is designed to support selected data and transaction processing and network workloads and thereby make the consolidation of these workloads on to System z more cost effective. Workloads eligible for the zIIP (available with the z10 EC and System z9 servers running z/OS V1.7 or a later release) include remote connectivity to DB2 to help support these workloads: Business Intelligence (BI), Enterprise Relationship Management (ERP), Customer Relationship Management

(CRM) and Extensible Markup Language (XML) applications. The zIIP (with z/OS V1.8) also supports IPSec processing, making the zIIP an IPSec encryption engine helpful in creating highly secure connections in an enterprise. In addition, zIIP (with z/OS V1.10, when available) supports select z/OS Global Mirror (XRC) disk copy service functions.

The zAAP is designed to support new application technologies, such as z/OS Java™ and z/OS XML processing and helps make running these new application technologies on z/OS more cost effective. Workloads eligible for the zAAP (with z/OS V1.7) include all Java processed via the IBM Solution Developers Kit (SDK) and XML processed locally via z/OS XML System Services.

The z10 EC offers the IFL to support Linux and open standards. Linux brings a wealth of available applications that can be run in a real or virtual environment under the z10 EC. An example is the z/VSE™ strategy which supports integration between the IFL, z/VSE and Linux on System z to help customers integrate timely production of z/VSE data into new Linux applications, such as data warehouse environments built upon a DB2 data server.

Numerical computing on the chip

Speed and precision in numerical computing are important for all our customers. Each core on the PU of the z10 EC has its own hardware decimal floating point unit, designed to improve performance of Decimal Floating Point over that provided by the System z9. Decimal calculations are often used in financial applications and those done using other floating point facilities have typically been performed by software through the use of libraries. With a hardware decimal floating point unit some of these calculations may be done directly and accelerated.

Liberating your assets with System z

Enterprises have millions of dollars worth of mainframe assets and core business applications that support the heart of the business. The convergence of SOA and mainframe technologies can help liberate these core business assets by making it easier to enrich, modernize, extend and reuse them well beyond their original scope of design.

The z10 EC, along with the inherent strengths and capabilities of a z/OS environment, provides an excellent platform for being an enterprise hub. Innovative System z software solutions from WebSphere, CICS®, Rational® and Lotus® strengthen the flexibility of doing SOA.

Evolving for your business

The z10 EC is the next step in the evolution of the System z mainframe, fulfilling our promise to deliver technology improvements in areas that the mainframe excels in—energy efficiency, scalability, virtualization, security and availability. But a change and revolution is also taking place. The redesigned processor chip helps the z10 EC make high performance compute-intensive processing a reality. Flexibility and control over capacity gives IT the upper edge over planned or unforeseen demands. And new technologies can benefit from the inherit strengths of the mainframe. This evolving technology delivers a compelling case for the future to run on System z.

Benefit	Feature/Function
Availability/Reliability	• CICS subspace group facility • CICS subsystem storage protect • Concurrent Book Add • Concurrent ESCON, FICON, 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-E • Concurrent power and thermal maintenance • Dual Support Elements • Dynamic Change to Partition Cryptographic Coprocessor Configuration • Dynamic Channel Path Management • Dynamic I/O Reconfiguration • Dynamic memory sparing • Dynamic Oscillator Switchover • Dynamic LCSS Add • Dynamic Subchannel Set Add • Dynamic Partition Add • 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 • FICON Express4 Pluggable Optics for individual servicing • Fixed HSA • Frame Bolt Down Feature • Hybrid cooling • Multipath IPL—ESCON (CNC), FICON (FC) with z/OS • N+1 power supply technology • OSA-Express2 Link Aggregation Support • OSA-Express2 Network Traffic Analyzer • Partial memory restart • Point to Point SMP Fabric • 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

Benefit	Feature/Function
Security	• Advanced encryption standard (AES) 128, 192, 256 • Certified for LPAR isolation • Configurable Crypto Express2 (secure coprocessor or SSL acceleration) • CP Assist for Cryptographic Function • Crypto Express2 FIPS 140-2 Level 4 Certified • Data Encryption Standards (DES), Triple DES • Designed to meet Common Criteria Evaluation Assurance Level 5 (EAL5) certification for the security of its logical partitions • 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), -384, -512 • SSL Acceleration for Linux® and z/OS • Tamper-proof Cryptographic Support
Capacity on Demand	• API for Capacity Provisioning Management • API for On/Off CoD activation • Capacity Backup for both full and subcapacity CPs • Capacity Backup for zAAP, zIIP, IFL, ICF and SAP • Capacity for Planned Event (CPE) • Capacity Upgrade on Demand • Customer Initiated upgrades • On/Off Capacity on Demand • More than 200 configuration records may be staged on Support Element • Up to four active configurations stored on SEEPROM
Specialty Engines	• Integrated Facility for Linux (IFL) • Internal Coupling Facility (ICF) • System z10 Application Assist Processor (zAAP) • System z10 Integrated Information Processor (zIIP)
I/O Connectivity	• InfiniBand® (IFB) host bus (6 GBps each); 24 IFBs for I/O HCA2-C Fanout • IBM ESCON CTC native and basic mode • FCP support for SCSI devices by Linux, z/VM® and z/VSE (disks) • Fibre Connection (FICON) 1, 2, 4, Gbps auto-negotiation • Fibre Channel Protocol (FCP) 1, 2, 4 Gbps auto-negotiation • FICON CTC • FICON full duplex data transfer • Full fabric FCP support • IBM ESCON half duplex data transfer • Multiple Image Facility (MIF) • Multiple Subchannel Sets (MSS) • N_Port ID virtualization (NPIV) for FCP • QDIO designed for high speed networking • Up to four Logical Channel SubSystems (LCSS)

Benefit	Feature/Function
Networking	• IBM HiperSockets IPv6 • OSA for NCP (OSN) • OSA Layer 3 VMAC • OSA-Express2 Layer 2 Support • OSA-Express Integrated Console Controller (1000BASE-T Ethernet) • OSA-Express2 (Gigabit Ethernet, 10 Gigabit Ethernet, 1000BASE-T Ethernet) • OSA-Express3 (10 Gigabit Ethernet)[5]
Cluster Systems	• Dynamic CF Dispatching • Dynamic ICF Expansion • Shared ICFs and CPs • Transparent ICF sparing • System-Managed CF Structured Duplexing • Sysplex Distributor • GDPS • Parallel Sysplex® clustering technology • 12x IB-DDR (6 GBps) • InfiniBand Coupling links[5] • Internal Coupling channel (IC) • Integrated Cluster Bus-4 (ICB-4) • InterSystem Channel-3 (Peer mode only) (ISC-3) • MBA and HCA-O Fanout • ETR–Sysplex Timer attachment (standard) • Server Time Protocol (STP) • NTP Client support for STP • z/VM Virtual Parallel Sysplex
Performance	• Compare-and-move extended • DB2® sort assist • Flexible Memory Options • Hardware-assisted data compression • Hardware Decimal Floating Point • HiperDispatch • 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 • OSA Dynamic LAN idle • Performed Locked Operations for enhanced IP performance • Up to 1.5 TB memory

Benefit	Feature/Function
Management	• (SE) maintenance • HMC Panel Wizard • HMC and SE IPv6 Support • Internal Battery Feature • Power/thermal • IBM Systems Director Active Energy Manager (AEM) for Linux on System z Support • LPAR Group Capacity Limits • 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 z10 Enterprise Class (2097) at a glance

Processor Unit (PU) types: CP/IFL/ICF/zAAP[1]/zIIP[1]			
Model	Minimum	Maximum	Increments
E12	1/1/1/0/0	12/12/12/6/6	1/1/1/1/1
E26	1/1/1/0/0	26/26/16/13/13	1/1/1/1/1
E40	1/1/1/0/0	40/40/16/20/20	1/1/1/1/1
E56	1/1/1/0/0	56/56/16/28/28	1/1/1/1/1
E64	1/1/1/0/0	64/64/16/32/32	1/1/1/1/1

Coupling Links	
ISC-3[2]	48
IC	32
ICB-4[3]	16
Maximum # Links	64[4]
InfiniBand Coupling Links[5]	32

Channels	
Minimum: 0/0/0/0/0/0/0	ESCON/FICON Express4/FICON Express2[6]/FICON Express[6]/ OSA-Express3[5]/OSA-Express2/HiperSockets
Maximum: 1024/336/336/120/48/48/16	ESCON/FICON Express4/FICON Express2[6]/FICON Express[6]/ OSA-Express3[5]/OSA-Express2/Hipersockets
Increments: 4/4/4/2/2/2/1/1	ESCON/FICON Express4/FICON Express2[6]/FICON Express[6]/ OSA-Express3[5] 10 GbE[5]/OSA-Express2 GbE, 1000BASE-T/ OSA-Express2 10 GbE/HiperSockets

Fanouts per server[7]		
Server Maximum	32/64/1024	Server/ports/CHPIDs
HCA2-O Maximum	16/32/64	Server/ports/CHPIDs
HCA2-C Maximum	12/24/1024	Server/ports/CHPIDs[8]
MBA Maximum	8/16/16	Server/ports/CHPIDs

IBM System z10 Enterprise Class (2097) at a glance

Cryptographic[9]		
Crypto Express 2	Optional up to 8 features (16 PCI-X adapters), minimum order is 2 features	
Processor Memory		
Model	Minimum	Maximum[10]
E12	16 GB	384[11] GB
E26	16 GB	752 GB
E40	16 GB	1136 GB
E56	16 GB	1520 GB
E64	16 GB	1520 GB
Upgradeability	Upgradeable within the z10 EC family Upgrading to the E64 from other z10 EC models will require a planned outage Upgradeable from IBM System z9 Enterprise Class (z9 EC) and IBM eServer™ zSeries® 990 (z990)	
Physical Configuration	Model E12, minimum[12]	Model E64, maximum[13]
Weight	1248 kg (2807 lbs)	2271 kg (5110 lbs)
Footprint	2.83 Sq meters (30.44 Sq ft)	2.83 Sq meters (30.44 Sq ft)
Service	5.73 Sq meters (61.60 Sq ft)	5.73 Sq meters (61.60 Sq ft)
Input	9.7 kW	27.5 kW
Heat	33.1 KBTU/hr	93.8 KBTU/hr
Air Flow Nominal[14]	CFM 1155 m^3/m	CFM 2465, m^3/m
Height	201.32 cm (79.26 inches)	201.32 cm (79.26 inches)
General	Conforms to EIA guidelines for frames	
Software		
z/OS:	z/OS V1.7 (plus zIIP web deliverable) and subsequent releases	
z/VM:	z/VM 5.2 and subsequent releases	
Linux on System z:	Red Hat RHEL 4 and subsequent releases, Novell 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:	z/TPF 1.1	

For more information

For more information about the IBM System z10 Enterprise Class, contact your IBM marketing representative or IBM Business Partner or visit the following IBM Web site:

ibm.com/systems/z/hardware/z10ec/

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Produced in the United States
February 2008

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

[2] ISC-3 Peer mode only

[3] ICB-4 Not available on E64

[4] 64 external and 32 internal

[5] Planned availability 2nd quarter 2008

[6] Available only when carried forward on an upgrade

[7] There are 8 fanouts per book; up to 16 ports per book

[8] Number of CHPIDs dependent upon I/O feature and number of channel subsystems

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

[10] Excludes the standard fixed size of 16 GB HSA

[11] Full installed capacity can not be used until second book is installed due to 32 GB increments for memory between 256-512 GB

[12] Model E12 with one I/O cage and no Internal Battery Feature (IBF)

[13] Model E56 with three I/O cages and IBF with a combined max of 64

[14] Airflow is designed to increase as the local ambient room temperature increases. Nominal airflow assumes 77 degrees F ambient.

ZSD03005-USEN-01