IBM zEnterprise System

Highlights

- A "System of Systems," design that embraces the integration and management of multiple technology platforms—mainframe, UNIX and x86—to dramatically improve productivity of today's multiarchitecture data centers
- Supports z/OS®, Linux on System z®, z/VSE®, z/VM®, z/TPF, AIX®, Linux on IBM System x®, and now Microsoft Windows operating environments
- Unique hybrid computing capabilities powered by the industry's premier enterprise server, providing breakthrough innovation, virtualization and unrivalled scalability, reliability, and security
- Rapidly deploy services using prepackaged solutions and preintegrated technologies designed to meet the needs of specific workloads

The demands of customers, partners, employees—and the demands of a fast moving market—are stretching the limits of today's data centers. Add to this the management and integration challenges data centers face as they invest in the next generation of smart applications and it is clear something new is needed. Smarter computing systems—systems that raise the bar on efficiency, performance and cost savings while lowering management complexity.

The IBM® zEnterprise™ System (zEnterprise) offers a revolutionary system design that addresses the complexity and inefficiency in today's multiarchitecture data centers. The zEnterprise extends the strengths and capabilities of the mainframe—such as security, fault tolerance, efficiency, virtualization and dynamic resource allocation—to other systems and workloads running on AIX® on POWER7®, Linux on System x and now Microsoft Windows —fundamentally changing the way data centers can be managed.

The zEnterprise is a workload-optimized, multiarchitecture compute system capable of hosting many workloads integrated together, and efficiently managed as one single entity. It is designed to deploy and intelligently manage workloads across both mainframe and distributed technologies with the same tools, techniques and a single management interface.

The zEnterprise System includes a central processing complex (CPC)—either the zEnterprise 196 (z196) or the zEnterprise 114 (z114), the IBM zEnterprise BladeCenter® Extension (zBX) with its integrated optimizers and/or select IBM blades, and the zEnterprise Unified Resource Manager.

At the core of the zEnterprise System is the z196 or z114—the next generation mainframe that provides new levels of performance, security, capacity for growth and dramatic infrastructure simplification capabilities. Both the z196 and z114 are designed to work seamlessly with system software, middleware and storage to be the most robust, cost effective, efficient and reliable data serving and transaction processing environment.

The zBX is an infrastructure component that hosts both general purpose blade servers and appliance-like workload optimizers which can all be managed as if they were a single mainframe. The zBX utilizes a private high speed internal network that connects it to the central processing complex, which reduces the need for networking hardware and provides inherently high security. The zBX allows the zEnterprise to extend its strong portfolio to support AIX on Power and Windows or Linux on System x.

The IBM zEnterprise Unified Resource Manager integrates multiarchitecture platform resources as a single virtualized system and provides unified and integrated management across the zEnterprise System with the same tools, techniques and resources for consistent, automated and reliable service delivery. The Unified Resource Manager can auto-discover new server, network and storage resources, load the virtualization environments, and prepare system resources for use. It can identify system bottlenecks or failures among disparate

systems and if a failure occurs it can dynamically reallocate system resources to keep applications running smoothly. It can dramatically simplify operations across the various application environments. The Unified Resource Manager also provides energy monitoring and management, goal-oriented resource management, increased security, virtual networking, and information management, all integrated into a single easy-to-use interface—dramatically simplifying operations across multiple application environments.

New application programming interfaces (APIs) allow integration between Unified Resource Manager and the broader ecosystem of management tools. This capability will allow service automation tools to be able to gain access to functions such as discovery, monitoring and provisioning for the heterogeneous resources owned by zEnterprise.

Extending out by bringing applications closer to their data

Today's businesses need to accelerate deployment for new applications and optimize the work across their infrastructure. Many organizations are battling growing infrastructure complexity with many tiers and nodes of independent resources spread over the corporate network. Businesses are quickly realizing that system management information does not typically offer an end-to-end view. Automation policies are limited to tier and node boundaries. Each "island" of resources speaks a different language with a different protocol. Redundancy is pervasive as they all create copies of data. Security is a concern and management of all these technology silos consumes the majority of IT budget.

With the zEnterprise System, IBM delivers the next generation of enterprise computing—a multiarchitecture platform that offers tighter integration between the database on System z and the applications that need access to that data but run on distributed platforms.

How did IBM do it? Our basic building blocks, the z196 and z114, are ideal for virtualization which can allow you to optimize the overall IT environment and regain control of it through a hardware consolidation strategy

The zEnterprise servers are also designed to attach and enable the zBX infrastructure to support a unified multiplatform environment. The zBX can host and integrate various blade server resources and special purpose workload optimizers including:

- The WebSphere® DataPower® Integration Appliance XI50 for zEnterprise (DataPower XI50z)
- The IBM Smart Analytics Optimizer for DB2® for z/OS, V1.1
- Select general purpose blades including IBM BladeCenter PS701 Express and IBM BladeCenter HX5 blades

Managing everything is the Unified Resource Manager. It can help to deliver and facilitate end-to-end virtualization and workload management, providing the ability to optimize resource deployment according to individual workload requirements. Now you can run applications and workloads that span z/OS, Linux on System z, z/VM, AIX on POWER®, Microsoft Windows and/or Linux on System x—and manage them all under a single umbrella.

Maximizing the Business Value of your Data

Today's business environment is experiencing a revolution, and information is at the heart of it. Maintaining a competitive edge means using all the information at your disposal to create actionable insights that drive smarter decision making. Because data warehousing forms the foundation for business analytics systems, IT departments must ensure that their strategy and infrastructure is in alignment with their goals, as well as the goals of the business as a whole. With zEnterprise, IBM data warehousing and business analytics solutions provide an end-to-end solution on a single platform that is capable of scaling to meet the breadth of business user requirements for complete and accurate business information—quickly and securely, with outstanding availability and performance.

New solutions including the IBM Smart Analytics System and the IBM DB2 Analytics Accelerator for zEnterprise can now help you more efficiently store, manage, retrieve and analyze vast amounts of data for business insight, without creating unnecessary cost or complexity.

The IBM Smart Analytics System 9700 (for z196) and the IBM Smart Analytics System 9710 (for z114), provide a unique, deeply integrated and optimized, ready-to-use

analytics solution that can quickly turn information into insight. Through optimization and integration of the hardware, software and storage the Smart Analytics System enables an environment that is sized and tuned to deliver analytical insights across your organization. DB2 for z/OS is the heart of this offering, and it has been developed solely for the zEnterprise environment, taking full advantage of the hardware components such as the IBM System z Integrated Information Processor (zIIP), integrated hardware compression, and microcode to maximize the performance of analytical workloads. Now, you can deploy critical information across your organization with confidence, allowing you to maximize the value of your server investments, while consolidating analytic workloads alongside your transactional applications, without impacting your throughput rates.

Additionally, you can enhance your data analytics capabilities with the new IBM DB2 Analytics Accelerator for z/OS V2.1—a high performance analytics accelerator appliance add-on for zEnterprise which is designed to provide the timely delivery of analytic information to decision makers across the enterprise, faster than ever before. It combines the best of both worlds: legendary DB2 for z/OS performance for transactional queries and the industry leading Netezza performance for analytical queries.

You can see immediate value through this fast and easy to deploy appliance that typically requires no application changes to capitalize on the extreme acceleration of business analysis. It transparently speeds the most complex analysis with a wide variety of applications and tools such as Cognos 10 BI. By integrating a cost-effective massively parallel architecture into the DB2 for z/OS database, IBM provides an environment designed for speed, within an architectural framework that capitalizes on the availability, security and reliability of the zEnterprise System.

Together, you have all the tools necessary to transform your business into an information-driven, proactive business that is prepared to meet and conquer the challenges of today's dynamic economy. Coupling these analytical offerings, with the zBX and its ability to consolidate application servers that run on Linux, Windows, AIX you can provide a centralized approach, delivering information across your organization, in an easy to manage environment that empowers your business users for the 21st century.

Transforming the way assets are managed and deployed

The zEnterprise System is the only platform that allows the definition of z/VM guests and distributed blades as virtual servers within a tightly integrated and centrally managed enterprise computing environment. Virtualization means fewer physical resources are required to meet peak workload demands. And the virtualization and integration of heterogeneous platforms brings new collaboration of technical resources together. Packaged hardware can reduce the complexity of ordering and installing a system. But the real value is in the integrated, advanced management of all the virtual servers using the Unified Resource Manager.

With the Unified Resource Manager, you are able to apply some of the fundamental strengths of the System z environment to a multiplatform infrastructure—think of it as governance taken to the next level. When new server, network and/or storage resources are installed, the Unified Resource Manager will be able to run discovery and identify them, add them to the inventory, and turn them on or off. It can also perform a physical configuration of the resources and establish a plan for disaster recovery (backup or restore). And from a serviceability standpoint, the resources such as z/VM guests and general purpose blades will be able to monitor

themselves and log errors that occur—with time stamps to keep data and transaction integrity. A notification of an issue can be sent to operations and a "call home" is placed to the IBM System Service Representative to come out and take a repair action.

Every IT department wants to make the best use of its resources and maintain the highest possible throughput to meet Service Level Agreements. Unified Resource Manager manages your resources to user specified business service level objectives. It can define a group of virtual servers that support an application. With the ability to monitor and manage the group, dynamic adjustments can be made to ensure that all applications are provided sufficient resources.

Next generation technology delivers unprecedented performance and scale

The z196 and z114 are at the cornerstone of the zEnterprise "systems of systems" model and deliver immense scale for consolidation and world-class secure data serving and transaction processing capabilities.

TThe z196 is the premier high end server and the flagship of the IBM systems portfolio. It contains 96 of the world's fastest, most powerful microprocessors running at 5.2 GHz and is capable of executing more than 50 billion instructions per second. With up to 80 configurable processors, the z196 can scale to over 52,000 MIPS (Millions of Instructions Per Second) of compute capacity in a single footprint.

The z114 is designed as an entry level mainframe server and on ramp for any growing business looking to exploit mainframe technologies. The z114 continues the heritage in mainframe qualities of service with increased flexibility and performance in a lower cost package. System resources are powered by up to 14 powerful microprocessors split between two infrastructure drawers. With a new two-model structure and up to 10 configurable cores (max of 5 CPs, zIIPs, zAPPs, or up to 10 IFLs or ICFs) running at 3.8 GHz, the z114 offers a more granular cost structure and significant improvements in packaging, performance and total system scalability over prior generations.

The zEnterprise microprocessor chips in the z196 and z114 offer a high-frequency design that leverages IBM leadership technology with more cache than other chips and a new execution sequence that delivers world-class per-thread performance. There are 100 new instructions that will help to deliver CPU-centric performance. For CPU intensive workloads additional gains of 25 to 30 percent[2] can be achieved via compiler improvements. And like the z10™ processor chip, there are data compression and cryptographic processors right on the chip.

The z196 and z114 are the first servers in the industry to offer fault tolerant memory through Redundant Array of Independent Memory (RAIM)—similar to what is known in the disk industry as Redundant Array of Independent Disk (RAID). The increased available capacity and memory on the server can help to benefit throughput on workloads such as DB2, WebSphere and Linux. Beyond the customer purchased memory, there is an additional memory for the Hardware System Area (HSA). The HSA holds the I/O configuration data for the server.

High-speed connectivity out to the data and the network are critical in achieving sufficient levels of transaction throughput and enabling resources inside and outside the server to maximize application performance. The host bus interface of the z196 and z114 is designed to help satisfy clustering, security, SAN and LAN requirements. To help secure sensitive data

and business transactions, the z196 and z114 are designed for Common Criteria Evaluation Assurance Level 5 (EAL5) certification for security of logical partitions. As of August 2011, the z196 has secured the certification and we are in the application process for the z114. Security for secure sockets layer (SSL) transactions and secure co-processing is delivered with Crypto Express3. IBM now also offers an industry standard PCIe I/O drawer for FICON and OSA-Express multimode and single mode fiber optic environments designed to deliver increased capacity, port granularity, infrastructure bandwidth, and reliability.

Best of breed virtualization for today—and for the future

Virtualization technology of the mainframe is provided by software and hardware working together. z/VM—the software side—and LPAR technology—the hardware side—provide leadership virtualization that means you can do more with less. The z/VM hypervisor offers a base for organizations that want to exploit IBM virtualization technology on one of the industry's best-of-breed server environments. z/VM offers the highest levels of resource sharing, I/O bandwidth, and system availability, resulting in nearly 100 percent utilization of the system resources nearly at 100 percent of the time. Test and development servers can run side by side on the same hardware as production, helping to improve resource utilization and offer significant operational advantages.

Both the z196 and z114 have been design for increased capacity over prior generations. With the number of available processor cores per server and reduced energy usage and floor space, they are designed to be a perfect fit for consolidation and infrastructure simplification. Depending on the workloads, the z196 virtualization capabilities can support an average of 47 distributed servers on a single core, up to thousands on a single system. The z114 can support an average of 30 distributed servers on a single core, and hundreds on a single system.

The new hybrid capabilities of the zEnterprise provide a cloud based virtual server environment for deploying applications that have affinity to data hosted on the System z but run on AIX, Linux on System x and Microsoft Windows. The virtual servers can be created and associated with a pool of resources that are then grouped with System z virtual servers to define a workload for which coherent management and performance policies can be defined and enforced. This is designed to give you better end-to-end application integration with System z transaction processing, messaging and data serving capabilities.

So why run and manage the complexity of hundreds or thousands of stand-alone servers when zEnterprise can do the work more efficiently, in a smaller overall footprint, with less networking and at a much lower cost? Less power. Less space. Less impact on the environment—zEnterprise.

A new world of application support

System z is optimized to provide best-of-breed support for mission-critical data and mixed workloads. Data processing requires exceptional single-thread performance, so the z196 and z114 have been engineered with a strong threading model and robust cache in support of the processing of data—as opposed to a throughput computing design targeting more generic applications. This strategy allows either system to deliver exceptional data management capabilities while also accommodating mixed applications that have close affinity to this data.

There will always be situations where end-to-end application logic is best served by a set of closely federated heterogeneous resources that includes System z and other processor types. For example, there are particular industry processes where a distributed topology is the de facto standard. Even when most processing is performed on System z, some critical software element might not be available and must be deployed on a distributed server.

The zEnterprise BladeCenter Extension (zBX) is an infrastructure that hosts and integrates optimizers and blade servers—supporting AIX on POWER, Linux on System x and now Microsoft Windows applications. This feature enables application integration with System z transaction processing, messaging and data serving capabilities over a private high speed internal network that connects it to the z196 and/or z114. This reduces the need for networking hardware and provides inherently high security with exclusive management capabilities enabled by the Unified Resource Manager.

Optimizers are specialized appliances that are dedicated to particular workloads. An optimizer is made up of hardware and software packaged together and designed to be highly integrated with z/OS workloads running on the z196 or z114. The new IBM DB2 Analytics Accelerator for z/OS V2.1 is one example of an optimizer, and within the zBX, there are two other optimizers available:

The first is the DataPower XI50z for zEnterprise is a multifunctional appliance that can be implemented to provide XML and non-XML message hardware acceleration, streamline and secure valuable service-oriented architecture (SOA) applications, or provide drop-in integration for heterogeneous environments by enabling core Enterprise Service Bus (ESB) functionality including routing, bridging, transformation and event handling. The second is the IBM Smart Analytics Optimizer V1, which can offer query performance for business analytics.

Additionally there are select IBM BladeCenter PS701 Express and IBM BladeCenter HX5 blade servers which can also be installed into the zBX to facilitate tight integration of key AIX, Windows and Linux workloads that have affinity to System z applications and data, allowing for improved efficiency and security and simplified operations across all these application environments. They represent the most flexible and cost-efficient blade solutions available in the market.

Workloads across all industries can exploit the capabilities provided by the zEnterprise hybrid computing architecture model. In banking there are components across retail and wholesale banking that rely on several architectures to execute, but the core of most banking relies on System z and z/OS. Insurance typically maintains Claims processing on System z but reaches out to the internet for interaction with consumers, utilizing UNIX and Intel. Government is relying more and more on the web based capability to reach out to consumers and improve the rate of return for taxes, accurate payment of social benefits and even census-based reporting. And these examples run in retail, healthcare and telecommunications as well.

Specialty engines, affordable technology for workload optimization

System z specialty engines help deliver greater efficiencies and expand the use of the mainframe for a broader set of applications, while helping to dramatically improve mainframe economics.

These integrated and aggressively priced technology offerings provide a cost-effective, specialized application execution environment. They can be used independently or complement each other to optimize workload execution and lower costs by enabling you to purchase additional processing capacity without affecting IBM software pricing and the MSU rating of the IBM System z model designation. This means that adding a specialty engine will not cause increased charges for IBM System z software running on general purpose processors and may even help reduce the utilization and demands on general purpose processors possibly lowering your overall MSU requirements and associated IBM software costs.

The System z Integrated Information Processor (zIIP) is designed to support and run data and transaction processing and network workloads and to make the consolidation of these workloads on to System z more cost effective. Workloads eligible for the zIIP include remote connectivity to DB2 to help support:

- Business Intelligence (BI)
- Enterprise Resource Planning (ERP)
- Customer Relationship Management (CRM)
- Extensible Markup Language (XML)

z/OS V1.11, together with DB2 for z/OS Version 8 or DB2 9 DB2 utilities, now offers additional capabilities for exploiting zIIPs. DB2 utilities sorting fixed-length records using IBM's memory object sorting technique can have a portion of the workload redirected to a zIIP when one is available. In addition to supporting remote connectivity to DB2 (via DRDA® over TCP/IP) the zIIP also supports DB2 long-running parallel queries—a workload integral to Business Intelligence and Data Warehousing solutions. A solution from IBM Global Business Services (GBS), IBM Scalable Architecture for Financial Reporting (SAFR), a highly efficient and scalable business intelligence reporting solution, can be enabled for the zIIP. The zIIP (with z/OS V1.8 and above) 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 and above) supports select z/OS Global Mirror (formerly called Extended Remote Copy, XRC) disk copy service functions. z/OS V1.10 introduced zIIP Assisted HiperSockets™ for large messages. To provide even greater flexibility, z/OS v1.11 is enhanced with a new capability that can enable zAAP eligible workloads to run on zIIPs. This capability can allow you to run zIIP and zAAP eligible workloads together on just one specialty engine.

The System z Application Assist Processor (zAAP) is designed to support the strategic integration of Java™ technology-based web applications and XML-based data interchange services with core business database environments and helps make running these new application technologies on z/OS much more cost effective. Workloads eligible for the zAAP (with z/OS V1.8) include all Java processed with the IBM Solution Developers Kit (SDK) and XML processed locally via z/OS XML System Services.

The Integrated Facility for Linux (IFL) processors offer support for Linux and open standards creating a great opportunity for consolidation and infrastructure simplification. Linux brings a wealth of available applications that can be run in a real or virtual environment within System z. 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 (all of which are supported as a guest

on z/VM 5.4 with z/VM mode partitions). If you need a stand-alone Linux environment, both the z196 and z114 can be configured as an IFL only server offering.

The Internal Coupling Facility (ICF) processor was introduced to help 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 percent availability.

Solution Editions offer workload integration with new levels of affordability

With the new Solution Edition Series, zEnterprise is delivering bottom-line priced solutions for many of the key workloads you may need, without compromising qualities of service.

A Solution Edition is a packaged offering that brings together key components of hardware, software and maintenance, all at a single, affordable, bottom-line price. Each Solution Edition is tailored to meet key business needs and designed to help you get maximum value from your current IT infrastructure in the fastest possible time and at the lowest cost.

The Solution Edition Series includes numerous offerings for deployment across key workload areas such as cloud computing, payments, web and application serving ERP, Linux, security, high availability, and even application development.

Contact your IBM Sales representative for more information on how the System z Solution Edition Series can help deliver the value your business needs at an affordable cost.

Improve your agility to respond to change

Along with having multiple technologies to manage, IT departments must be agile so they can respond rapidly to change. It may be necessary to coordinate changes in people, processes and technology.

Both the z196 and z114 servers will continue to build on the System z capacity on-demand offerings that simplify making modifications. Permanent Capacity Upgrade can be initiated by the customer using Resource Link via CIU (Customer Initiated Upgrade). Temporary capacity is available with IBM On/Off Capacity on Demand (On/Off CoD) when satisfying short-term spikes in capacity or for testing new applications when needed. Capacity Back-up (CBU) can help provide reserved emergency capacity for multiple processor configurations. And Capacity for Planned Events (CPE), a variation on CBU is available when there is unallocated capacity available in a server, CPE will allow up to the maximum capacity available to be used for planned events such as planned maintenance in a data center. A three-day CPE contract can be purchased at a fixed price based on the amount of capacity you need to turn on.

Helping to manage energy usage

Power and cooling discussions continue to be part of any IT budget planning. As energy prices have risen and utilities have restricted power usage for some, you need to review the role of the server in balancing IT spending. A zEnterprise System can help take better control of energy usage in the data center. Unified Resource Manager will monitor and provide trend reporting of energy efficiency for the entire heterogeneous infrastructure. A static power savings mode allows for turning off engines that are not being used. And the query max potential power mode will help when doing total data center energy use management.

There is value in reducing wattage and power across the entire data center and zEnterprise offers solutions that can help. There is an option for high-voltage DC, which can eliminate the need for a Universal Power Supply (UPS) inverter and Power Distribution Unit (PDU). Top exit I/O cabling can improve flexibility in the data center by helping to increase air flow in a raised-floor environment. The z196 offers a water cooling option that doesn't increase the system footprint and offers energy savings without compromising performance, and the zBX has an optional rear door heat exchanger to reduce energy consumption.

New system. New freedoms. New value.

The zEnterprise System is a revolutionary mainframe—a truly integrated hardware platform that is able to span and intelligently manage workloads across mainframe and distributed technologies to give you the freedom to innovate in your business, the freedom to take full advantage of existing investments and the freedom to save. The multiplatform system managed with the zEnterprise Unified Resource Manager brings integration of governance to manage risk across the infrastructure—integration that will help to accelerate insight for the business, integration of processes to increase business agility, and integration of people to enable new business innovation.

For more information

To learn more about zEnterprise, please contact your IBM marketing representative or IBM Business Partner, or visit: **ibm.com**/systems/zenterprise

While IBM is the industry leader in the application of technology to drive business performance, IBM Global Financing can help you acquire the IT solutions that your business needs in the most cost-effective and strategic way possible. We'll partner with you to customize an IT financing solution to suit your business goals—regardless of size, industry or location, and facilitate management of assets throughout their lifecycle. IBM Global Financing is your smartest choice to fund critical IT investments and propel your business forward. For more information, visit: **ibm.com**/financing

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[1] "Based on measurements and projections for CPU intensive workloads as provided by multiple C/C++ compiler level improvements when going from XL C/C++ V1R9 to V1R12"

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