The IBM zEnterprise EC12 - proven hybrid computing designed to manage multiple workloads, with the simplicity of a single system

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At a glance

A major market shift is occurring across the globe today. Clients are beginning to build up their use of social computing and mobile technologies as integral parts of their enterprise solutions, placing increased demands on data as they look for new ways to protect, analyze, and use data, while simultaneously reducing IT costs. The demand for smarter solutions that leverage data are stressing enterprises to achieve higher service levels and heightened levels of availability and performance, and to deliver more completely secured solutions, especially as they invest in new service delivery models like Cloud. The new IBM zEnterprise EC12™ (zEC12™) has up to 50% more total system capacity, new availability and security enhancements, and a robust hybrid infrastructure, to offer an enterprise-class system designed for the needs of today's smarter computing solutions. While maintaining IBM's core workload strategies of data serving and transaction processing, the IBM® zEnterprise® EC12™ is designed to do so much more. It is excellent as a scalable and secure data repository for the enterprise, it is ideally suited as a private enterprise cloud, and it is also a cost-effective solution for large-scale consolidation. With IBM zEnterprise EC12, DB2® for z/OS® , and the IBM DB2 Analytics Accelerator (IDAA) you can run your online transaction processing (OLTP) and data warehouse as one integrated workload in real time. The IBM zEnterprise EC12 includes a Central Processor Complex (CPC), the zEnterprise BladeCenter® Extension (zBX) Model 003 with support for POWER7® and x86 blades and the IBM WebSphere® DataPower® Integration Appliance XI50 for zEnterprise (DataPower XI50z), and the zEnterprise Unified Resource Manager (zManager) which provides System z® governance and management to the infrastructure.

Today's announcement extends System z leadership with:

- Improved total system capacity in a 120-core design (up to 101 cores are client-configurable)
  - Optimization and scale improvements starting at the core
  - Massive scalability for secure data serving and transaction processing and large-scale consolidation
  - Increased scalability with 60 available subcapacity settings
- Hexa-core 5.5 GHz processor chips design with a boost in performance for all workloads
  - Second-generation out-of-order design
  - Larger cache sizes to optimize data serving environments
  - Data compression and cryptographic coprocessors on the chip

  - Transactional Execution Facility designed to offer increased scalability and parallelism to drive higher transaction throughput
  - New Decimal-Floating-Point Zoned-Conversion Facility that can help to improve performance applications compiled with the new Enterprise PL/I compiler
- Up to 3 terabytes (TB) of available real memory per server for growing application needs (with up to 1 TB real memory per LPAR)
  - Improved availability in the memory subsystem with Redundant Array of Independent Memory (RAIM)
- New Crypto Express4S cryptographic adapter
  - Support for the PCIe I/O drawer configuration
  - Support for digital signatures with new PKCS #11
  - Support for American Express EMV (Europay, Mastercard, Visa) cards
- New IBM zAware cutting-edge pattern recognition analytics for fast insight into system health
- New Flash Express® adapter card designed to help improve availability and performance
- Energy efficiencies in the data center
  - New non-raised floor option, offering flexible possibilities for the data center
  - Optional water cooling, providing the ability to cool systems with user-chilled water
  - Optional high-voltage DC power, which can help System z clients save on their power bills
  - Top exit power and I/O cabling designed to provide increased flexibility
- Unified Resource Manager, enabling management and virtualization of heterogeneous workloads. Unified Resource Manager manages the deployment of heterogeneous hardware resources based on individual workload requirements by providing:
  - Performance management
  - Integrated private data network
  - Virtual server lifecycle management
  - Hypervisor management
  - Integrated operational controls
  - Management as System z firmware
- Full upgradability to IBM zEnterprise EC12 from z196 and z10™ EC, and full upgradability within the zEC12 family

For ordering, contact your IBM representative, an IBM Business Partner, or IBM Americas Call Centers at 800-IBM-CALL (Reference: YE001).

Overview

Today we are introducing the IBM zEnterprise EC12, our next generation in the evolution of hybrid computing. The new IBM zEnterprise EC12 (zEC12) offering consists of the IBM zEnterprise EC12 Central Processor Complex (CPC), the new IBM zEnterprise BladeCenter Extension (zBX) Model 003, and the IBM zEnterprise Unified Resource Manager.

The IBM zEnterprise EC12 CPC is designed with improved scale, performance, availability, and security, making the IBM zEnterprise EC12 an ideal platform for cloud computing, running integrated OLTP and data warehousing, and deploying IBM's smarter computing industry solutions. The new 120-core design delivers massive scale across all workloads and enables cost saving consolidation opportunities. The IBM zEnterprise EC12 is designed to be a worldwide leader as a fast and scalable enterprise system and is based on IBM's newest hexa-core 5.5 GHz application-tuned out-of-order superscalar chip, delivering over 78,000 millions of

instructions per second (MIPS) in a single zEC12 footprint. The new microprocessor design delivers a boost to performance for all workloads.

Several new architectural facilities have been added to the hardware. IBM zEnterprise EC12 will be the first general-purpose large-scale enterprise server with a Transactional Execution Facility, designed to help eliminate software locking overhead that can impact performance. Transactional Execution will offer increased scalability and parallelism to drive higher transaction throughput. IBM's Java™ Runtime Environment is planned to exploit the Transactional Execution Facility in an upcoming maintenance roll-up (see Statement of general direction). The XL C/C++ compiler is planned to provide hardware built-in functions to enable applications to use the Transactional Execution Facility with a PTF at general availability. In z/OS V1.13, the XL C/C++ support is intended to be used for development and testing. The new IBM Enterprise PL/I compiler is planned to exploit the new Decimal-Floating-Point Zoned-Conversion Facility for increased efficiency to improve performance. The Enhanced-DAT2 facility will enable exploitation of new 2 GB page frames by Java and others, offering increased efficiency for large memory structures to improve performance. The new Runtime Instrumentation Facility is designed to provide managed runtimes and just-in-time compilers with enhanced feedback on application behavior, allowing for improved self-tuning. Java is planned to exploit a significant set of the new instructions available on IBM zEnterprise EC12 (zEC12) servers. These changes to Java are designed to enhance array bounds checking, and help the system fetch data and instructions operate more efficiently (see Statement of general direction).

The new IBM System z Advanced Workload Analysis Reporter (IBM zAware) is an integrated, self-learning, analytics solution that helps identify unusual behaviors of workloads running on z/OS LPARs. IBM zAware is intended to help you to accelerate problem determination and improve service levels. It uses machine learning to help your organization gain visibility into system behavior, helping you to optimize service, respond to problems quicker, and increase availability.

For companies that require superior availability and performance, Flash Express is uniquely designed to automatically strengthen availability and performance, even during periods that stress your system paging, such as during collection of system diagnostics, start of day processing, or other transitional periods.

Cryptographic hardware on the IBM zEnterprise EC12 can help to protect data privacy and sensitive custom applications. Today we are introducing the new Crypto Express4S card, IBM's latest tamper-resistant cryptographic coprocessor. The card is suited to applications requiring high-speed security-sensitive cryptographic operations for data encryption and digital signing, and secure management and use of cryptographic keys.

IBM zEnterprise EC12 is designed with an environmental focus to help improve data center efficiencies. It has a new radiator-based air-cooled system designed for more efficient cooling and improved maintenance. For clients looking to build economical disaster recovery data centers, IBM zEnterprise EC12 offers a non-raised floor option with overhead power and I/O cabling. For greener data centers, IBM zEnterprise EC12 has optional water cooling and High Voltage DC power which allow a bold step into the future of cooler computing without changing the footprint.

With the zBX infrastructure, IBM zEnterprise EC12 can support a multi-platform environment having mainframe, UNIX™ , and x86 technologies in a single system. The zBX can also support the IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise which can be used to help simplify, govern, secure, and integrate XML and IT services by providing connectivity, gateway functions, data transformation, protocol bridging, and intelligent load distribution. Unified Resource Manager brings System z governance to the distributed side, transforming the way resources are managed and deployed. It provides infrastructure awareness to optimize the system resources in accordance with the policies assigned to that particular workload.

In the near future we plan to deliver additional capabilities which include support for image management, advanced energy management, CPU management of System x® blades, and availability improvements with automated site recovery

of zBX resources (see Statement of general direction). As the adoption of hybrid computing continues to gain momentum IBM zEnterprise EC12 will continue to evolve to address client demands and to keep pace with the rapidly changing technology landscape. Our vision includes considering the delivery of new advanced virtualization capabilities, support for select blades, and support for zBXs on future generations beyond zEC12. This is an exciting evolution that will enable the benefit of hybrid computing on IBM zEnterprise EC12 for years to come.

Key prerequisites

Refer to the Hardware requirements and Software requirements sections of this announcement.

Planned availability date

- September 19, 2012
  - Features and functions for the IBM zEnterprise EC12
  - IBM zEnterprise EC12 Models H20, H43, H66, H89, and HA1
  - z10 EC upgrades to IBM zEnterprise EC12 radiator-based air-cooled
  - z10 EC upgrades to IBM zEnterprise EC12 water-cooled
  - z196 air-cooled EC upgrades to IBM zEnterprise EC12 radiator-based air-cooled
  - z196 air-cooled EC upgrades to IBM zEnterprise EC12 water-cooled
  - z196 water-cooled EC upgrades to IBM zEnterprise EC12 water-cooled
  - IBM zEnterprise BladeCenter Extension Model 003 (feature #0502)
  - zBX Model 002 upgrades to zBX Model 003 to a new IBM zEnterprise EC12
  - z196 with zBX Model 002 upgrades to IBM zEnterprise EC12 with zBX Model 003
  - IBM zAware (feature #0011, #0101, and #0102)
  - Flash Express (#0402) - hardware orderable August 28, 2012, and deliverable starting September 19, 2012; planned availability of z/OS exploitation of functionality is December 14, 2012
  - TKE 7.2 LIC (#0850) on z196 and z114
- November 7, 2012
  - Features and functions for the IBM zEnterprise BladeCenter Extension Model 003
  - zBX Model 002 upgrades to a Model 003 on an existing IBM zEnterprise EC12
  - 14 ft 380-415V 3PH line cord (#8976)
  - 380-415V 3PH Top Exit line cord (#8977)
- December 7, 2012
  - Model conversions for IBM zEnterprise EC12
- December 14, 2012
  - z/OS V1.13 support for Flash Express , available at

    http://www.ibm.com/systems/z/os/zos/downloads/
- December 31, 2012
  - MES features for Models H20, H43, H66, H89, and HA1
- First quarter 2013
  - zBX Model 003 move from one IBM zEnterprise EC12 to another IBM zEnterprise EC12
  - DataPower Blade remove or move from one zBX to another zBX
  - z/OS support for 2 GB large pages and dynamic reconfiguration for Flash Express

Description

Business innovation is about transforming business processes, technologies, products, and services to enable growth and gain competitive edge. In facilitating innovation, successful organizations examine their existing business model and the IT infrastructure required to support it. Typically there is a mix of technologies, chosen to provide support for particular workloads and business processes. Being heterogeneous makes sense, as long as there are no issues with management and integration. The IBM zEnterprise System (zEnterprise) offers a proven hybrid computing design that can help you manage and integrate workloads on multiple architectures with the simplicity of a single system.

The newest member of the zEnterprise family is the IBM zEnterprise EC12 (zEC12), which is designed to deliver new levels of performance and capacity for large-scale consolidation and growth, support for the next generation of digital signature security support, cutting-edge pattern recognition analytics for fast insight into system health, and new environmental capabilities such as the non-raised floor option on radiator-based air-cooled systems. Well-integrated designs for the IBM zEnterprise EC12 (zEC12) and the z/OS operating system yield immediate exploitation benefits, with support for hardware features including Flash Express , hardware transactional memory, IBM zAware, and encryption technologies. Other System z-based operating systems including Linux™ on System z , z/VM® , z/VSE® , and z/TPF also provide immediate support for and exploitation of a number of hardware features. In addition, zEC12 supports heterogeneous platform requirements with the new IBM zEnterprise BladeCenter Extension (zBX) Model 003 and IBM zEnterprise Unified Resource Manager for extending management strengths to other systems and workloads running on AIX® on POWER7 , Linux on IBM System x , and Microsoft™ Windows™ on IBM System x servers.

The IBM zEnterprise EC12 is designed to provide:

- Up to 25% faster uniprocessor performance as compared to z196
- Up to 50% system capacity performance improvement over z196 80-way
- 101 cores to configure (versus 80 on z196)
- 161 capacity settings (versus 125 on z196)
- Up to 3 TB RAIM memory
- Radiator-based air-cooled system design
- z/Architecture® enhancements designed to enable performance improvements in Linux , Java , and DB2

- Enhanced cache design
- zBX Model 003 upgradeable from zBX Model 002
- IBM zAware for improved problem determination
- OSA-Express4S 1000BASE-T included in PCIe Gen2 I/O infrastructure
- 8 GBps host bus supporting PCIe Gen2 I/O infrastructure
- Crypto Express4S with new FIPS 140-2 Level 4 certification and PKCS #11 support for digital signatures
- Flash Express to handle paging workload spikes and improve availability
- Non-raised floor (NRF) option for flexibility in data center integration
- Continuation of optional water cooling and DC power
- Optional overhead power and overhead cabling
- Hypervisor updates
- Storage manager updates
- The proprietary service state package

The performance advantage

IBM's Large Systems Performance Reference (LSPR) method is designed to provide comprehensive z/Architecture processor capacity ratios for different configurations of Central Processors (CPs) across a wide variety of system control programs and workload environments. For IBM zEnterprise EC12, the z/Architecture processor capacity indicator is defined with a 4XX, 5XX, 6XX, or 7XX notation, where XX is the number of installed CPs.

In addition to the general information provided for z/OS V1.13, the LSPR also contains performance relationships for z/VM and Linux operating environments.

The performance of an IBM zEnterprise EC12 (2827) processor is expected to be up to 1.25 times the performance of a z196 (2817) based on workload and model. The largest IBM zEnterprise EC12 (2827-7A1) is expected to provide up to 1.5 times the capacity of the largest z196 (2817-780).

The LSPR contains the Internal Throughput Rate Ratios (ITRRs) for the IBM zEnterprise EC12 and the previous-generation zSeries® and System z processor families based upon measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user may experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated.

For more detailed performance information, consult the *Large Systems Performance Reference* (LSPR) available at

https://www-304.ibm.com/servers/resourcelink/lib03060.nsf/pages/lsprindex?OpenDocument

Managed in the cloud

From consumers to IT service providers, cloud is becoming the preferred service delivery vehicle in the industry. For businesses, cloud computing promises greater business agility and performance at a lower cost than today's IT infrastructures. Further cost savings, flexibility, and performance benefits can result from architecting the IT infrastructure with purpose-built components that help eliminate the traditional fixed-hardware boundaries of CPU, memory, network, and storage.

IBM zEnterprise is designed to create a centrally managed and controlled set of IT resources that provide an ideal private enterprise cloud for the rapid and flexible delivery of high value services. zEnterprise and the Tivoli® suite of service management products offer a robust set of cloud management capabilities allowing greater control and automation of cloud resources. New accounts and existing

System z customers alike have the option of building their own customized cloud infrastructure using the function-rich z/VM virtualization management infrastructure. This advanced virtualization combined with zEnterprise's unmatched workload management ensures that business-oriented service level agreements are achieved while driving system resources near 100%. The value derived from IT can be identified through advanced accounting and charge back enabling allocation of IT costs to the business processes they support. These leading enterprise computing capabilities combine with a flexible and efficient resource deployment model which allows new and existing services to coexist and to be rapidly deployed with cloud technologies.

IBM Cloud Ready for Linux on z provides an image and Software-based Cloud Service Delivery with integrated provisioning, monitoring, service catalog and service desk, storage management, and HA, along with services to have a cloud service management solution to get a private cloud on IBM zEnterprise EC12 (zEC12) up and running quickly.

Slow down server sprawl

Virtualization on System z offers industry-leading and large-scale IT optimization capabilities to help drive down the costs of managing and maintaining the tremendous proliferation of servers in distributed infrastructures. Single server simplicity means savings from software licensing, simplified administration and management, improved business continuity, and environmental savings of floor space and energy consumption. With up to 101 client-configurable cores usable for virtualization on the hardware level and larger IFLs, the zEC12 can help clients to become more efficient by "doing more with less." Plus the use of integrated blades offers an added dimension for workload optimization.

With these capabilities, many workload types can be easily consolidated onto IBM System z . Linux on System z can run all types of workloads, such as business intelligence and analytics with Cognos® and SPSS® , data warehousing and data serving with InfoSphere® , DB2 , Informix® , Oracle Database and others, collaboration with the Lotus® suite, Enterprise Content Management (ECM), as well as SAP, Oracle E-Business Suite, Java- and WebSphere-based applications.

The IBM zEnterprise Unified Resource Manager brings end-to-end management to this heterogeneous virtual environment, to provide energy monitoring and management, goal-oriented policy management, increased security, virtual networking, and data management, consolidated in a single interface that can be tied to business requirements.

Built for data centers of the future

Energy-efficient IT continues to be part of essential business practices. Business leaders continue to look for ways to reduce costs by minimizing energy usage. Technology can be part of the solution. The zEC12 can help provide better control of energy usage in the data center. A static power savings mode allows for turning off engines that are not being used. And the query maximum potential power mode can help when doing total data center energy use management. Unified Resource Manager monitors and provides trend reporting of energy efficiency for the entire heterogeneous infrastructure. Application programming interfaces (APIs) allow integration between Unified Resource Manager and the broader ecosystem of management tools.

The zEC12 offers solutions that can help reduce wattage and power usage across an entire data center. There is an option for high-voltage DC power, which can eliminate the need for a Universal Power Supply (UPS) inverter and Power Distribution Unit (PDU). Top exit I/O cabling and power cabling can improve flexibility in the data center by helping to increase air flow in a raised-floor environment. The zEC12 offers a water cooling option that offers energy savings without compromising performance. The zBX has an optional rear door heat exchanger to help reduce energy consumption. And, the zEC12 server can be installed and run on a non-

raised floor, a new option for data center designs, particularly for disaster recovery solutions.

Next-generation availability

The IBM zEnterprise EC12, along with z/OS and its middleware stack, have earned a well-deserved reputation for industry-leading reliability and high availability (HA), and the zEC12 is no exception. Many types of planned outages, such as planned maintenance, upgrades, or configuration changes, are avoided through support for nondisruptive configuration changes and dynamic replacement capabilities. Unplanned outages are mostly avoided or their effects are mitigated through robust support or recovery after a failure. This support can help limit the scope of an outage's impact, mask the effects completely, or dynamically restart a failed element after an unrecoverable error. The zEC12 continues to offer fault-tolerant memory through Redundant Array of Independent Memory (RAIM) to support memory availability.

Flash Express is designed to help improve availability and handling of paging workload spikes when running z/OS V1.13 with the planned z/OS V1R13 RSM Enablement Offering web deliverable. Using Flash Express can help availability by reducing latency from paging delays that can occur at the start of the workday or during other transitional periods. It is also designed to help eliminate delays that can occur when collecting diagnostic data during failures. Flash Express can therefore help organizations meet their most demanding service level agreements, enabling them to compete more effectively. Flash Express is designed to be easy to configure, and to provide rapid time to value.

IBM zAware: With IBM zEnterprise EC12 (zEC12), IBM introduces a new technology, IBM zAware, based on machine learning developed by IBM Research. IBM zAware is designed to use near real-time continuous learning algorithms, providing a diagnostics capability intended to help you quickly pinpoint problems, which in turn, can help you to more rapidly address service disruptions. IBM zAware uses analytics to intelligently examine z/OS messages to find unusual patterns, inconsistencies, and variations. Large z/OS operating system environments can sometimes generate more than 25 million messages per day. This can make manual analysis time-consuming and error-prone when exceptional problems occur. IBM zAware provides a simple graphical user interface (GUI) to help you find message anomalies quickly, which can help speed problem resolution when seconds count.

Availability requirements also mean that IT departments must be agile so they can respond rapidly to change. It may be necessary to coordinate changes in people, processes, and technology. The zEC12 continues to build on the zEnterprise capacity on-demand offerings that simplify modifications. Permanent and temporary capacity is available to help satisfy capacity requests that are long-term or short-term (such as capacity spikes or for testing new applications). Defining processor cores as 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.

The proprietary service state package

During the warranty period, the zEC12 includes call home features and other IBM proprietary diagnostic support. IBM proprietary hardware maintenance support is available after the warranty period through an applicable IBM hardware maintenance agreement.

Security that lets you sleep

The IBM zEnterprise EC12 is designed for Common Criteria Evaluation Assurance Level 5+ (EAL 5+) certification for security of logical partitions. This means that the IBM zEnterprise EC12 is designed to prevent an application running on one operating system on one LPAR from accessing application data running on a different operating system image on another LPAR on the server.

Many experts believe that the best way to secure information is to encrypt it. Cryptography is in the "DNA" of IBM zEnterprise System hardware, and so is providing exceptional performance and function using Crypto Express4S cryptographic coprocessors and accelerators that are individually specialized to address various encryption needs. On the processor core two kinds of protection are available:

- Processor-based encryption with keys visible to applications.
- Protected key support that protects sensitive keys from inadvertent disclosure. The keys are not visible to the application or the operating system.

Security for the Internet with Secure Sockets Layer (SSL) transactions and secure coprocessing is delivered with a new feature, **Crypto Express4S,** which is installed into the PCIe I/O drawer introduced previously on zEnterprise servers.

The IBM zEnterprise EC12 meets standards for digital signatures with new support for PKCS #11, which will soon replace handwritten signatures in all industries. This capability will be important for smart cards or other mission-critical applications such as online banking. The IBM zEnterprise EC12 also supports Elliptic Curve Cryptography (ECC), a modern public-key algorithm that many experts believe provides the same or better security, with much shorter key lengths and less processing overhead, than RSA keys. This technology is appropriate in resource-constrained environments such as mobile phones and smart cards which may have limited space for saving of storage keys. Additional standards for the banking and finance industry, such as ANSI and ISO, are also supported by the IBM zEnterprise EC12.

Enhancements to Advanced Workload License Charges

Coinciding with the announcement of the IBM zEnterprise EC12 server, IBM is introducing three enhancements, called Technology Transition Offerings, to Advanced Workload License Charges (AWLC) for eligible z/OS and z/TPF software programs running on an IBM zEnterprise EC12. The three Technology Transition Offerings are Technology Update Pricing for Advanced Workload License Charges (AWLC) and two revised Transition Charges for Sysplexes program variations.

Technology Update Pricing for AWLC extends the software price/performance provided by AWLC for IBM zEnterprise EC12 servers. The revised Transition Charges for Sysplexes programs provide a transition to Technology Update Pricing for AWLC for sysplex customers who have not yet fully migrated to IBM zEnterprise EC12 servers. This ensures that aggregation benefits are maintained and also phases in the benefits of Technology Update Pricing for AWLC pricing as customers migrate.

For information, refer to Software Announcement 212-320, dated August 28, 2012 , Technology Update Pricing for AWLC offers price and performance advantages for the IBM zEnterprise EC12.

Cryptography enhancements for security-rich protection

A cryptographic feature supporting PCIe Gen2 - Crypto Express4S

Crypto Express4S represents the newest-generation cryptographic feature and is designed to complement the cryptographic capabilities of the CP Assist for Cryptographic Function (CPACF).

This new feature resides in the Peripheral Component Interconnect Express Generation 2 (PCIe Gen2) I/O drawer, a native PCIe Gen2 environment first introduced in July of 2011. The Crypto Express4S feature has been designed to provide port granularity for increased flexibility with one PCIe adapter per feature.

Crypto Express4S remains a tamper-sensing and tamper-responding, programmable cryptographic feature providing a secure cryptographic environment. It continues to support all of the cryptographic functions available on the Crypto Express3 feature.

Crypto Express4S PCIe adapter - a coprocessor or an accelerator

The PCIe adapter contains a tamper-resistant hardware security module. It can be configured in one of three ways using the Hardware Management Console (HMC) panels:

1. IBM Common Cryptographic Architecture (CCA) coprocessor
2. IBM Enterprise PKCS #11 (EP11) coprocessor
3. Accelerator

When the PCIe adapter is configured as a CCA or an EP11 coprocessor, it supports the following:

- Secure key transactions
- Federal Information Processing Standard (FIPS) 140-2 Level 4 certification
- User-defined extension (UDX) services to implement custom cryptographic functions and algorithms (applies only when configured as an IBM CCA coprocessor)

When the PCIe adapter is configured as an accelerator, it is optimized for Secure Sockets Layer (SSL) acceleration and clear key RSA operations.

The Crypto Express4S feature is exclusive to the IBM zEnterprise EC12 environment. It is supported by z/OS , z/VM , z/VSE , z/TPF, and Linux on System z . Refer to the Software requirements section.

IBM Enterprise PKCS #11 (EP11)

A new configuration option is available when defining the Crypto Express4S feature as a coprocessor. This option, called IBM Enterprise Public-Key Cryptography Standards (PKCS) #11 (EP11), is designed to provide open industry-standard cryptographic services. EP11 is based on PKCS #11 specification v2.20 and more recent amendments that leverage the IBM Crypto Express4S feature and provide enhanced firmware capabilities. This firmware is designed to meet the rigorous FIPS 140-2 Level 4 and Common Criteria EAL 4+ certifications. The new Crypto Express4S configuration option is designed to meet public sector and European Union requirements where standardized crypto services and certifications are needed.

EP11 supports secure PKCS #11 keys - keys that never leave the secure boundary of the coprocessor unencrypted. The prior PKCS #11 implementation, which supported only clear keys, was provided by z/OS . Key protection was accomplished solely by Resource Access Control Facility (RACF®) dataset protection. With EP11, keys can now be generated and securely wrapped under the EP11 Master Key, all within the bounds of the coprocessor. Thus, EP11 provides enhanced security qualities when using PKCS #11 functions. EP11 is exclusive to IBM zEnterprise EC12 and is supported by z/OS and z/VM . Refer to the Software requirements section.

Common Cryptographic Architecture (CCA) enhancements

When the Crypto Express4S PCIe adapter is configured as a CCA coprocessor, CCA functionality supported on the Crypto Express3 feature is available and supported by z/OS , Linux on System z , and z/VM . Also when the Crypto Express4S PCIe adapter is configured as a CCA coprocessor the following new cryptographic enhancements are supported:

- **Improved wrapping key strength.** In order to comply with cryptographic standards, including ANSI X9.24 Part 1 and PCI-HSM, a key must not be wrapped with a key weaker than itself. Many CCA verbs allow the client to select the key wrapping key. With this release, CCA allows you to configure the coprocessor to ensure that your system meets these key wrapping requirements. It can be configured to respond in one of three ways when a key is wrapped with a weaker key: ignore weak wrapping (the default), complete the requested operation but

return a warning message, or prohibit weak wrapping altogether. This Crypto function is exclusive to IBM zEnterprise EC12 and is supported by z/OS and z/VM . Refer to the Software requirements section.

- **DUKPT for Message Authentication Code (MAC) and encryption keys.** Derived Unique Key Per Transaction (DUKPT) is defined in the ANSI X9.24 Part 1 standard. It provides a method in which a separate key is used for each transaction or other message sent from a device. This makes it so that an attacker who is able to discover the value of a key would only be able to gain information about a single transaction and not about any that preceded it or that follow it. The keys are derived from a base key that is initially loaded into the device, but then erased as soon as the first keys are derived from it. Those keys, in turn, are erased as subsequent keys are derived.

  The original definition of DUKPT only allowed derivation of keys to be used in encryption of personal identification number (PIN) blocks. The purpose was to protect PINs that were entered at a point-of-sale (POS) device and then sent to a host system for verification. Recent versions of X9.24 Part 1 expanded this so that DUKPT can also be used to derive keys for MAC generation and verification, and for data encryption and decryption. Three separate variations of the DUKPT key derivation process are used so that there is key separation between the keys derived for PIN, MAC, and encryption purposes.

  This Crypto function is exclusive to IBM zEnterprise EC12 and is supported by z/OS and z/VM . Refer to the Software requirements section.

- **Secure Cipher Text Translate2 (CTT2).** CTT2 is a new data encryption service that takes as input data encrypted with one key and returns the same data encrypted under a different key. This service has the advantage that it provides the ability to securely change the encryption key for cipher text without exposing the intermediate plain text. The decryption of data and reencryption of data happens entirely inside the secure module on the Crypto Express4S feature.

  This Crypto function is exclusive to IBM zEnterprise EC12 and is supported by z/OS and z/VM . Refer to the Software requirements section.

- **Compliance with new random number generation standards.** The standards defining acceptable methods for generating random numbers have been enhanced to include improved security properties. The Crypto Express4S coprocessor function has been updated to support methods compliant with these new standards. Now, random number generation in the Crypto Express4S feature when defined as a coprocessor conforms to the Deterministic Random Bit Generator (DRBG) requirements defined in NIST Special Publication 800-90/90A, using the SHA-256 based DBRG mechanism. The methods in these NIST standards supersede those previously defined in NIST FIPS 186-2, ANS (X9.31), and ANS (X9.62). With these improvements, client applications can help to meet the timeline outlined in Chapter 4 of NIST SP800-131 for switching to the new methods and ceasing use of the old methods.

  This Crypto function is exclusive to IBM zEnterprise EC12 and is supported by z/OS and z/VM . Refer to the Software requirements section.

- **CCA Enhancements for applications supporting American Express EMV cards.** Two changes have been made to the CCA application programming interface (API) to help improve support of payment card applications for American Express EMV cards. The Transaction_Validation service is used to generate and verify American Express card security codes (CSCs). This release adds support for the American Express CSC version 2.0 algorithm. The PIN_Change/Unblock verb is used for PIN maintenance. It prepares an encrypted message portion for communicating an original or replacement PIN for an EMV smart card. The verb embeds the PINs in an encrypted PIN block using information supplied. With this CCA enhancement, PIN_Change/Unblock adds support for the message.

  This crypto function is available on IBM zEnterprise EC12 and select z196, z114, z10 , and z9® servers and is supported by z/OS and z/VM . Refer to the Hardware requirements section and the Software requirements section.

Trusted Key Entry (TKE) 7.2 Licensed Internal Code (LIC)

The following functions are supported in the TKE 7.2 LIC:

Support for the Crypto Express4S feature when the PCIe adapter is configured as an EP11 coprocessor. The TKE workstation is *required* in order to manage a Crypto Express4S feature that is configured as an EP11 coprocessor. The TKE smart card reader (#0885) is mandatory. Two items must be placed on the new smart cards:

1. Master key material: The Crypto Express4S feature has unique master keys for each domain. The key material must be placed on a smart card before the key material can be loaded.
2. Administrator signature keys: When commands are sent to the Crypto Express4S feature, they must be signed by administrators. Administrator signature keys must be on smart cards.

Support for the Crypto Express4S feature when the PCIe adapter is configured as a CCA coprocessor. Crypto Express4S (defined as a CCA coprocessor) is managed in the same way as any other CCA-configured coprocessors. A Crypto Express4S can be in the same crypto module group or domain group as a Crypto Express4S, Crypto Express3, and Crypto Express2 feature.

New Data Encryption Standard (DES) operational keys. Four new DES operational keys can be managed from the TKE workstation (#0841). The key types are:

- CIPHERXI
- CIPHERXL
- CIPHERXO
- DUKPT-KEYGENKY

The new keys are managed the same way as any other DES operational key.

New Advanced Encryption Standard (AES) CIPHER key attribute. A new attribute, "key can be used for data translate only," can now be specified when creating an AES CIPHER operational key part.

Creation of corresponding keys. There are some cases where operational keys need to be loaded to different host systems to serve an opposite purpose. For example, one host system needs an exporter key encrypting key; another system needs a corresponding importer key encrypting key with the same value. The TKE workstation now allows nine types of key material to be used for creating a corresponding key.

Support for four smart card readers. The TKE workstation supports two, three, or four smart card readers when smart cards are being used. The additional readers were added to help reduce the number of smart card swaps needed while managing EP11-configured coprocessors. EP11 can be managed with only two smart card readers. CCA configured coprocessors can be managed with three or four smart card readers.

The strategic network connection to the data center - OSA-Express4S

Scalability for the enterprise - 10 Gbps and 1 Gbps over fiber; 10 Mbps, 100 Mbps, and 1 Gbps over copper: With multiple link data rate options using fiber optic cabling or copper cabling, you have the ability to maintain an end-to-end Layer 2 network with the newest family of Ethernet interfaces - OSA-Express4S.

OSA-Express4S 1000BASE-T Ethernet: The newest member of the family of OSA-Express4S features is now available to support your copper infrastructure. It joins the other OSA-Express4S features, 10 Gigabit Ethernet and 1 Gigabit Ethernet for multimode and single mode fiber optic infrastructures announced July 12, 2011.

The OSA-Express4S 1000BASE-T Ethernet feature is supported exclusively in the PCIe I/O drawer, with increased infrastructure bandwidth over the I/O cage and the I/O drawer, as well as increased granularity and capacity. Refer to Hardware Announcement 111-121, dated July 12, 2011 .

The channel path identifiers (CHPIDs) remain the same. Refer to the Publications section for documentation.

Channel subsystem enhancement for I/O resilience

The IBM zEnterprise EC12 channel subsystem incorporates an improved load balancing algorithm designed to provide improved throughput and reduced I/O service times, even when abnormal conditions occur. For example, degraded throughput and response times can be caused by multi-system workload spikes, resource contention in storage area networks (SANs) or across control unit ports, SAN congestion, suboptimal SAN configurations, problems with initializing optics, dynamic fabric routing changes, and destination port congestion.

When such events occur, the channel subsystem is designed to dynamically select channels to optimize performance and minimize imbalances in I/O performance characteristics (such as response time and throughput) across the set of channel paths to each control unit. This is done by exploiting the in-band I/O instrumentation and metrics of the System z FICON® and zHPF protocols.

This channel subsystem enhancement is exclusive to IBM zEnterprise EC12 and is supported on all FICON channels when configured as CHPID type FC. This enhancement is transparent to operating systems.

z/OS support for the IBM zEnterprise EC12 (zEC12)

z/OS V1.12 and later releases with PTFs, and z/OS V1.10 and z/OS V1.11 with the Lifecycle Extension for z/OS V1.10 (5656-A01) or the Lifecycle Extension for z/OS V1.11 (5657-A01) with PTFs, provide support for IBM zEnterprise EC12 (zEC12). See the Software requirements section for information about minimum support levels. You can use current HOLDDATA and the SMP/E REPORT MISSINGFIX command to help you identify which PTFs are needed on current z/OS systems.

In addition, z/OS provides exploitation of many of the IBM zEnterprise EC12 (zEC12) features and functions, including Flash Express , hardware transactional memory, improved channel load balancing, a new I/O processing delay measurement, Coupling Facility write-around support, and 100-way symmetric multiprocessing (SMP) support in a single LPAR.

Flash Express exploitation is planned to be provided with z/OS V1.13 on December 14, 2012, with the z/OS V1R13 RSM Enablement Offering web deliverable. With this new function, z/OS is designed to help improve system availability and responsiveness by using Flash Express across transitional workload events such as market openings, and diagnostic data collection. z/OS is also designed to help improve processor performance by supporting middleware such as IMS™ , with its exploitation of pageable large (1 MB) pages. Exploitation is planned for:

- z/OS V1.13 Language Environment® when used with a run-time option.
- Java , with the IBM 31-bit SDK for z/OS , Java technology Edition, V7.0.0 (5655-W43) and SDK7 IBM 64-bit SDK for z/OS , Java Technology Edition, V7.0.0 (5655-W44). For more information about Java , see Statement of general direction .
- The IMS Common Queue Server, which is designed to use pageable large pages for selected buffers when running IMS 12 (5635-A03) on an IBM zEnterprise EC12 server (zEC12) with the PTF for APAR PM66866.

z/OS V1.13 with PTFs and the z/OS V1R13 RSM Enablement Offering web deliverable, planned for availability in the first quarter of 2013, is designed to help improve processor performance by enabling middleware to use 2 GB pages. Exploitation is planned for the IBM 31-bit SDK for z/OS , Java technology Edition,

V7.0.0 (5655-W43) and SDK7 IBM 64-bit SDK for z/OS , Java Technology Edition, V7.0.0 (5655-W44). For more information about Java , see Statement of general direction . Also, along with that support, z/OS will be designed to make the pageable link pack area (PLPA) and common page data sets optional, used only for quick and warm start IPLs.

z/OS V1.12 and later releases with a PTF, and z/OS V1.10 and z/OS V1.11 with the Lifecycle Extension for z/OS V1.10 (5656-A01) or the Lifecycle Extension for z/OS V1.11 (5657-A01) with a PTF, also provide support for FICON channel-to-channel adapter support for GRS Rings. You can migrate your existing ESCON® CTC links to FICON before installing an IBM zEnterprise EC12 (zEC12) to help simplify your migration.

z/OS V1.13 with PTFs also provides support for hardware transactional memory on IBM zEnterprise EC12 (zEC12). Transactional memory provides atomic processing for multiple storage areas, which can reduce serialization overhead for exploiters. Java exploitation is planned with IBM 31-bit SDK for z/OS , Java technology Edition, V7.0.0 (5655-W43) and SDK7 IBM 64-bit SDK for z/OS , Java Technology Edition, V7.0.0 (5655-W44). For more information about Java , see Statement of general direction .

IBM zEnterprise EC12 (zEC12) servers incorporate improved channel load balancing algorithms, designed to provide more consistent I/O rates across the channel subsystem and help improve I/O response times, even when abnormal conditions occur. In support of this new function, z/OS V1.12 and V1.13 with a PTF also provide an updated health check based on an I/O rate-based metric, rather than on initial control unit command response time.

A new interrupt delay time measurement is available on IBM zEnterprise EC12 (zEC12) servers. With z/OS V1.12 or z/OS V1.13 and a PTF, planned for availability in the fourth quarter of 2012, RMF™ is designed to report on interrupt delay time to help you determine whether I/O processing delays are occurring. This new measurement is designed to measure the time between when primary status is presented to the channel subsystem and when the operating system clears the primary status to begin processing the interrupt. RMF is also designed to write this information to new fields in SMF type 74 subtype 1 and SMF 79 subtype 9 records.

IBM DB2 11 for z/OS (5615-DB2) running on z/OS V1.12 or z/OS V1.13 with the PTF for APAR OA37550 on IBM zEnterprise EC12 (zEC12) servers with CFLEVEL 18 is planned to exploit new z/OS function to allow batched updates to be written directly to disk without being cached in the Coupling Facility in a Parallel Sysplex® . This is designed to keep the data in the cache that is used by online transactions more current, which is expected to help improve performance during batch update periods. Also, this can help avoid application stalls that might sometimes occur during large concurrent batch updates. This function is also planned to be made available on IBM zEnterprise 196 (z196) servers with CFLEVEL 17 and an MCL.

z/OS V1.12 and z/OS V1.13 running on IBM zEnterprise EC12 (zEC12) servers support up to 100 processors configured in a single LPAR. z/OS supports combinations of general-purpose processors (CPs), zIIPs, and zAAPs.

z/OS V1.13 with a PTF adds XL C/C++ compiler support for new instructions and facilities available on IBM zEnterprise EC12 (zEC12) servers. New ARCH(10) and TUNE(10) compiler options can be used to optimize code that is intended to run on these servers.

Advances in cryptography available on IBM zEnterprise EC12 (zEC12) servers are planned to be available on September 19, 2012, with the Cryptographic Support for z/OS V1R12-V1R13 web deliverable, available at

http://www.ibm.com/systems/z/os/zos/downloads/

The new ICSF functions are intended to help banking and finance sector clients meet standards and provide better cryptographic security with:

- DUKPT for MAC and Data Encryption

- A new cipher text translate CCA verb
- Support for wrapping keys with strong keys
- Random Number Cache

Similarly, ICSF has enhancements designed to provide new functions for public sector clients, including industry-standard APIs for System z for better interoperability with other platforms to help improve application portability and simplify system setup:

- Enterprise Security PKCS #11 Hardware Security Module (HSM) support for Crypto Express 4S
- FIPS on Demand to verify FIPS 140-2 Level 1 compliance at the application level

Last, ICSF is designed to improve I/O performance for the public key data set (PKDS) and PKCS #11 token key data set (TKDS), and to provide a random number cache to help improve performance for applications that use random number generation functions. For more information about which features and functions are supported by different levels of ICSF, see the Software requirements section.

Additional information about z/OS functions made available in PTFs can be found at

http://www.ibm.com/systems/z/os/zos/zosr13H_update

IBM continues to support running zAAP workloads on zIIP processors ("zAAP on zIIP"). IBM plans to provide a PTF for APAR OA38829 for z/OS V1.12 and z/OS V1.13 in September, 2012 to remove the restriction that prevents zAAP-eligible workloads from running on zIIP processors when a zAAP is installed on the server. This is intended only to help facilitate migration and testing of zAAP workloads on zIIP processors.

Access to a Parallel Sysplex environment

Parallel Sysplex is a synergy between hardware and software - a highly advanced technology for clustering designed to enable the aggregate capacity of multiple z/OS systems to be applied against common workloads. z/OS combined with IBM zEnterprise EC12, z196, z114, and z10 machines, Coupling Facilities, Server Time Protocol (STP), and coupling links (InfiniBand, ISC-3), allows you to harness the power of multiple systems as though they were a single logical computing system.

Coupling links provide a path to transmit/receive Coupling Facility (CF) data as well as Server Time Protocol (STP) timekeeping messages. The CF data may be exchanged between z/OS and the CF or between CFs.

InfiniBand coupling links are high-speed links, up to 6 GBps for 12x InfiniBand and up to 5 Gbps for 1x InfiniBand:

- 12x InfiniBand can be used for short distances - up to 150 meters (492 feet). 12x IFB links support up to 7 subchannels (devices) per CHPID.
- 1x InfiniBand are used for longer distances - up to 10 km (6.2 miles) unrepeated. 1x IFB links support up to 32 subchannels (devices) per CHPID.

There are two types of Host Channel Adapters (HCAs) that can be used for IFB links: HCA2 and HCA3. Each supports 1x and 12x InfiniBand links.

HCA3-O SR fanout for 12x InfiniBand: 12x InfiniBand coupling links utilize the Host Channel Adapter 3 optical (HCA3-O) fanout. The HCA3-O fanout has two ports/links and is compatible with the HCA2-O fanout.

HCA3-O LR fanout for 1x InfiniBand: 1x InfiniBand coupling links utilize the Host Channel Adapter 3 optical long reach (HCA3-O LR) fanout. The HCA3-O LR fanout has four ports/links and is compatible with the HCA2-O LR fanout, which has two ports/links.

Two protocols - 12x IFB and 12x IFB3 - for the new generation of 12x InfiniBand coupling links: There are now two protocols supported by the HCA3-O for 12x IFB feature - 12x IFB and 12x IFB3.

- **12x IFB3 protocol:** When HCA3-Os are communicating with HCA3-Os and have been defined with four or fewer CHPIDs per port, the 12x IFB3 protocol is utilized. The 12x IFB3 protocol is designed to provide less latency than the 12x IFB protocol.
- **12x IFB protocol:** If more than four CHPIDs are defined per HCA3-O port, or HCA3-O features are communicating with HCA2-O features on zEnterprise or System z10® servers, links will run with the 12x IFB protocol.

The maximum number of all HCA2 and HCA3 fanout features is limited to 16 per system.

InterSystem Channel-3 (ISC-3) links support a link data rate of 2 Gbps. ISC-3 is supported at the same distance as 1x InfiniBand.

Internal coupling links (ICs) can also be used for internal communication between Coupling Facilities (CFs) defined in LPARs and z/OS images on the same server. ISC-3 links can not be ordered on an IBM zEnterprise EC12, but can be carried forward from a System z10 or z196.

Note: The InfiniBand link data rates do not represent the performance of the link. The actual performance is dependent upon many factors including latency through the adapters, cable lengths, and the type of workload. Systems Lab Services can assist your migration to PSIFB coupling links by providing services to assess the impact of the migration or to assist with the implementation of the migration.

STP - time synchronization for Parallel Sysplex

Server Time Protocol (STP) is designed to allow events occurring in different servers to be properly sequenced in time. STP is designed for servers that have been configured in a Parallel Sysplex or a basic sysplex (without a Coupling Facility), as well as servers that are not in a sysplex but need time synchronization.

STP is a server-wide facility that is implemented in the Licensed Internal Code (LIC), presenting a single view of time to Processor Resource/Systems Manager™ (PR/SM™). STP uses a message-based protocol in which timekeeping information is passed over externally defined coupling links between servers.

The STP design introduced a concept called Coordinated Timing Network (CTN), a collection of servers and Coupling Facilities that are time-synchronized to a time value called Coordinated Server Time.

A CTN can be configured in two ways:

- STP-only CTN which does not require a Sysplex Timer® .
- Mixed CTN (External Time Reference (ETR) and STP) which requires a Sysplex Timer . The Sysplex Timer provides the timekeeping information in a Mixed CTN. Even though the IBM zEnterprise EC12, z196, and z114 servers do not support attachment to a Sysplex Timer , they can participate in a Mixed CTN that has a z10 synchronized to the Sysplex Timer . This maintains the capability for enterprises to concurrently migrate from an existing ETR network to a Mixed CTN and from a Mixed CTN to an STP-only CTN.

Parallel Sysplex enhancements

Reporting and monitoring improvements: The RMF Postprocessor Coupling Facility Activity and the Monitor III CFSYS report can be used to monitor resources associated with the Coupling Facility and CF links. They both have now been extended to indicate channel path details for each of the Coupling over InfiniBand (CIB) link types. This includes:

- Indication whether the CHPID is running in a "degraded" status
- Channel path type
- HCA adapter and port number
- Calculated length of each of the links

This information can help with monitoring and tuning of the Parallel Sysplex .

Refer to the Software requirements section.

Scalability improvements: As data sharing workloads continue to grow, the Parallel Sysplex infrastructure needs to anticipate the increased requirements for coupling resources. To do this, we have increased configuration limits to support larger data sharing environments.

- The maximum number of 1x IFB3 coupling links has been increased from 48 to 64. This helps configurations that require additional connectivity for coupling and STP communication.
- Up to 101 ICF engines can be ordered on a single server across multiple Coupling Facility LPARs. This helps environments that use a server hosting multiple Coupling Facilities to support multiple Parallel Sysplexes. There is still a limit of 16 ICF engines for a single Coupling Facility LPAR.

Strengthened resiliency: IBM zEnterprise EC12 and CFCC Level 18 provide improved serviceability and protection of Coupling Facility structures with:

- Capabilities to nondisruptively capture and collect extended diagnostic structure data from Coupling Facility structures that have encountered an error. This item is being rolled back to CFLEVEL 17 on z196 and z114.
- Verification of local cache controls for a Coupling Facility cache structure connector. This is performed during registration of connection interest in a data item against lost cross-invalidation signals. This item is being rolled back to CFLEVEL 17 on z196 and z114.

Performance enhancements: CFCC Level 18 delivers new function to help improve performance. This includes:

- Elapsed time improvements when dynamically altering the entry/element ratio or the size of a cache structure.
- DB2 conditional write to a group buffer pool (GBP). IBM DB2 11 for z/OS (5615-DB2) running on z/OS V1.12 or z/OS V1.13 with the PTF for APAR OA37550 on IBM zEnterprise EC12 servers with CFLEVEL 18 is planned to exploit new z/OS function to allow batched updates to be written directly to disk without being cached in the Coupling Facility in a Parallel Sysplex . This is designed to keep the data in the cache that is used by online transactions more current, which is expected to help improve performance during batch update periods. Also, this can help avoid application stalls that might sometimes occur during large concurrent batch updates. This function is also planned to be made available on IBM zEnterprise 196 (z196) servers with CFLEVEL 17 and an MCL.
- CF Storage class and castout class contention avoidance by changing the way serialization is performed on the individual storage class and castout class queues to reduce storage class and castout class latch contention.

Refer to the Software requirements section.

NTP authentication: Security is enhanced when using the HMC as an NTP client to help ensure the time stamps are untampered. The HMC now adds Symmetric Key and Autokey authentication to help improve security when the HMC goes through the firewall to access time stamps from an NTP server.

IBM zEnterprise BladeCenter Extension (zBX) Model 003

The IBM **zEnterprise BladeCenter Extension (zBX) Model 003** continues to support workload optimization and integration for zEnterprise . As an optional feature attached to the zEC12 via a secure high-performance private network, the zBX can house the IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise (DataPower XI50z), and select IBM BladeCenter PS701 Express blades or the IBM BladeCenter HX5 (7873) blade for increased flexibility in "fit for purpose" application deployment. The zBX is tested and packaged together at the IBM manufacturing site and shipped as one unit, relieving you of complex configuration and setup requirements. With a focus on availability, the zBX has hardware redundancy built in at various levels: the power infrastructure, rack-mounted network switches, power and switch units in the BladeCenter chassis, and redundant cabling for support and data connections. Best of all, support for the zBX is with System z hardware maintenance services (24x7 with a System z Support Specialist Representative) and the System z maintenance strategy is extended to DataPower XI50z and any installed blades.

zBX model conversion: The zBX Model 003 may be attached only to IBM zEnterprise EC12. A zBX Model 002 attached to a z196 at the time of an upgrade to IBM zEnterprise EC12 is converted to a zBX Model 003 unless it is moved to another z196 or z114 prior to the upgrade. The model conversion during the upgrade to IBM zEnterprise EC12 is completed at no charge. You have the option to reduce, retain, or increase the entitlements which enable the IBM Blades and the DataPower XI50z, herein referred to as entitlements, on the CPC and their respective blades. The base BladeCenter infrastructure will remain the same when a Model 002 is converted to a Model 003 even if you choose to reduce the entitlements of the CPC. During a conversion if you decide to increase the number of entitlements, the base BladeCenter infrastructure may increase. No credit is issued for reductions during these movements and increases in entitlements may be purchased during this upgrade. The zBX Model 002 may only be converted to a zBX Model 003 during an upgrade to IBM zEnterprise EC12. The zBX Model 003 cannot be converted to a zBX Model 002.

zBX movements: As with the zBX Model 002, the zBX Model 003 movement from an IBM zEnterprise EC12 requires the purchase of new entitlements on the receiving IBM zEnterprise EC12. The IBM zEnterprise EC12 from which the zBX Model 003 is detached retains the Blade entitlements. No credit is issued for reductions during these movements and increases in entitlements may be purchased. The base BladeCenter infrastructure of a zBX will remain the same unless you order additional entitlements on the receiving IBM zEnterprise EC12. It may require additional BladeCenters to support the new entitlements. If a zBX is added to a CPC that has inherited entitlements, there will be a choice to reduce these inherited entitlements with no credit being issued, to match the zBX infrastructure or the attaching zBX may have additional zBX infrastructure added to support the entitlements. The zBX BladeCenter hardware must always support the entitlements on the CPC, unless there is no zBX attached. System z currently supports zBX Model 002 movement from and to a z196 or z114 within a customer site and plans to support similar movement of zBX Model 003 in first quarter 2013.

IBM WebSphere DataPower Integration Appliance XI50 for DataPower XI50z(s) can be removed from a zBX Model 002 and moved to another zBX Model 002 or zBX Model 003. Movements can only be between zBX Model 002s or upwards to a zBX Model 003, or between zBX Model 003s, but not downward from a zBX Model 003 to a zBX Model 002. You have the option to remove the DataPower XI50z(s) during a zBX movement and place it in the protective packaging provided by IBM . The support for the movement of DataPower XI50z(s) is planned to be available in first quarter 2013.

zBX Virtualization/Configuration data: Virtualization/Configuration data can only be saved (imported) from a z196 or IBM zEnterprise EC12 that has a Driver 12 Ensemble and can only be restored (exported) to an IBM zEnterprise EC12 with a Driver 12 Ensemble. This statement applies to a complete zBX or individual DataPower XI50z(s).

The innovative **IBM zEnterprise Unified Resource Manager** handles the job of managing system resources across the entire environment. It can help achieve throughput goals by providing hardware and platform management for the system as a whole. By presenting resources simply as a single virtualized heterogeneous system, the Unified Resource Manager provides "workload context" that can be used to identify and optimize the physical and virtual system resources that support an application. This allows the Unified Resource Manager to have workload awareness: the ability to inspect, report, and manage all connected resources (no matter which platform or operating environment) used in the service of the defined workload.

Unified Resource Manager dynamically adds virtual storage to configurations for the IBM BladeCenter HX5 (7873) blade in the zBX Model 003. Dynamic addition of virtual storage was previously available for IBM BladeCenter PS701 blades in the zBX.

Hardware Management Console (HMC)

HMC Security

- STP Broadband Security

  The **Customize Console Date/Time** task now supports authentication for the HMC's NTP communication with external NTP time servers. Authentication methods include both symmetric key and autokey with public key encryption.

Change Management

- Install and Activate by MCL Bundle Level

  The **Change Internal Code and Single Step Internal Code Changes** tasks now support the installation and activation of MCLs to a specified bundle level.

HMC Hardware

- Removal of Modem Support from the HMC

  Modem support was removed from the HMC. Remote Support and STP connections are now supported exclusively by the broadband capabilities of the HMC. The **Customize Outbound Connectivity** task (Internet Settings tab) was updated with a new option for external addressing mode: Hostname or IP.

Refer to the Hardware requirements section for a list of HMC system support.

Accessibility by people with disabilities

A US Section 508 Voluntary Product Accessibility Template (VPAT) containing details on accessibility compliance can be requested at

http://www.ibm.com/able/product_accessibility/index.html

Section 508 of the US Rehabilitation Act

IBM zEnterprise EC12 servers are capable on delivery, when used in accordance with IBM's associated documentation, of satisfying the applicable requirements of Section 508 of the Rehabilitation Act of 1973, 29 U.S.C. Section 794d, as implemented by 36 C.F.R. Part 1194, provided that any Assistive Technology used with the product properly interoperates with it.

Product positioning

The newest member of the System z family, the IBM zEnterprise EC12 (zEC12), is designed to deliver new levels of performance and capacity for large-scale consolidation and growth. From the microprocessor to the software that exploits it, the zEC12 is designed for analytics by being able to efficiently store, manage, retrieve, and analyze vast amounts of data for business insight without unnecessary cost or complexity. zEC12 continues our concentrated focus on security and encryption, seeking to protect data that's at rest or in transit across the network. New fraud detection solutions use high-speed analytics to deliver greater savings potential the sooner fraud is detected. IBM zAware and Flash Express deliver new creative availability solutions to help maximize service levels. zEC12 continues to focus on energy efficiencies in the data center with options for water cooling and high voltage DC power as well as the new non-raised floor option.

In addition, the zEC12 supports heterogeneous platform requirements with the updated IBM zEnterprise BladeCenter Extension (zBX) Model 003 and IBM zEnterprise Unified Resource Manager. These allow the zEC12 to extend management strengths to other systems and workloads running on AIX on POWER7 , Linux on IBM System x , and Microsoft Windows on IBM System x .

Statement of general direction

Removal of support for connections to an STP Mixed CTN: The IBM zEnterprise EC12 will be the last high-end server to support connections to an STP Mixed CTN. This includes the Sysplex Timer (9037). After zEC12, servers that require time synchronization, such as to support a base or Parallel Sysplex , will require Server Time Protocol (STP), and all servers in that network must be configured in STP-only mode.

Removal of support for Ethernet half-duplex operation and 10 Mbps link data rate: The OSA-Express4S 1000BASE-T Ethernet feature is planned to be the last copper Ethernet feature to support half-duplex operation and a 10 Mbps link data rate. The IBM zEnterprise EC12 servers are planned to be the last IBM System z servers to support half-duplex operation and a 10 Mbps link data rate for copper Ethernet environments. Any future 1000BASE-T Ethernet feature will support full-duplex operation and auto-negotiation to 100 or 1000 Mbps exclusively.

Removal of ISC-3 support on System z : The IBM zEnterprise EC12 is planned to be the last high-end System z server to offer support of the InterSystem Channel-3 (ISC-3) for Parallel Sysplex environments at extended distances. ISC-3 will not be supported on future high-end System z servers as carry forward on an upgrade. Previously we announced that the IBM zEnterprise 196 (z196) and IBM zEnterprise 114 (z114) servers were the last to offer ordering of ISC-3. Enterprises should continue migrating from ISC-3 features (#0217, #0218, #0219) to 12x InfiniBand (#0171 - HCA3-O fanout) or 1x InfiniBand (#0170 - HCA3-O LR fanout) coupling links.

Removal of OSA-Express3 support on System z : The IBM zEnterprise EC12 is planned to be the last high-end System z server to offer support of the Open System Adapter-Express3 (OSA-Express3 #3362, #3363, #3367, #3370, #3371) family of features. OSA-Express3 will not be supported on future high-end System z servers as carry forward on an upgrade. Enterprises should continue migrating from the OSA-Express3 features to the OSA-Express4S features (#0404, #0405, #0406, #0407, #0408).

Removal of FICON Express4 support on System z : The IBM zEnterprise EC12 is planned to be the last high-end System z server to offer support of the FICON Express4 features (#3321, #3322). FICON Express4 will not be supported on future high-end System z servers as carry forward on an upgrade. Enterprises should

continue migrating from the FICON Express4 features to the FICON Express8S features (#0409, #0410).

Removal of Crypto Express3 support on System z : The IBM zEnterprise EC12 is planned to be the last high-end System z server to offer support of the Crypto Express3 feature (#0864). Crypto Express3 will not be supported on future high-end System z servers as carry forward on an upgrade. Enterprises should begin migrating from the Crypto Express3 feature to the Crypto Express4S feature (#0865).

IBM Java exploitation of IBM zEnterprise EC12 (zEC12) functions: IBM plans for future maintenance roll-ups of IBM 31-bit and 64-bit SDK7 for z/OS Java Technology Edition, Version 7 (5655-W43 and 5655-W44) (IBM SDK7 for z/OS Java), to provide exploitation of new IBM zEnterprise EC12 features, including: Flash Express and pageable large pages, Transactional Execution Facility, Miscellaneous-Instruction-Extension Facility, and 2 GB pages. In addition, IBM SDK7 for z/OS Java is available for use by IBM middleware products running Java , such as IBM IMS 12 (5635-A03), IBM DB2 10 for z/OS (5605-DB2), and the Liberty profile of IBM WebSphere Application Server for z/OS v8.5 (5655-W65); and is planned for use by a future release of CICS® Transaction Server for z/OS .

IBM System z Integrated Information Processor (zIIP) and IBM System z Application Assist Processor (zAAP) simplification: IBM zEnterprise EC12 is planned to be the last high-end System z server to offer support for zAAP specialty engine processors. IBM intends to continue support for running zAAP workloads on zIIP processors ("zAAP on zIIP"). This is intended to help simplify capacity planning and performance management, while still supporting all the currently eligible workloads. In addition, IBM plans to provide a PTF for APAR OA38829 on z/OS V1.12 and V1.13 in September 2012 to remove the restriction that prevents zAAP-eligible workloads from running on zIIP processors when a zAAP is installed on the server. This is intended only to help facilitate migration and testing of zAAP workloads on zIIP processors.

IBM plans to provide **new capability within the Tivoli Integrated Service Management family of products** designed to leverage analytics information from IBM zAware, and to provide alert and event notification.

CPU management for System x blades: IBM intends to deliver workload-aware optimization for IBM System x Blades in the zBX. This allows virtual CPU capacity to be adjusted automatically across virtual servers within a hypervisor, helping to insure that System x resources in the zBX are executing to the defined SLAs.

Automated multi-site recovery: IBM intends to deliver automated multi-site recovery for zBX hardware components based upon GDPS® technologies. These capabilities will help facilitate the management of planned and unplanned outages across IBM zEnterprise EC12.

IBM Systems Director offerings: IBM intends to deliver new functionality with IBM Systems Director offerings to support IBM's zBX. Such planned new capabilities will be designed to provide virtual image management and enhanced energy management functions for the Power Systems™ and System x blades.

DB2 continues to deliver extremely high availability, security, and resiliency with its deep integration with z/OS on System z servers. Beyond the existing DB2 support for zEC12, DB2 plans further enhancements designed to improve performance in two ways: 1) using pageable large (1 MB) pages and Flash Express and 2) enabling support of 2 GB pages.

IBM intends to update CICS Transaction Server for z/OS , providing new application, platform, and policy capabilities that can help clients build private clouds from new and existing CICS applications. This capability is intended to assist CICS clients to deploy new and updated CICS applications faster, more easily, and with greater levels of confidence. For more information, refer to Software Announcement 212-321, dated August 21, 2012 .

IBM's statements regarding its plans, directions, and intent are subject to change or withdrawal without notice at IBM's sole discretion. Information regarding potential future products is intended to outline our general product direction and it should not be relied on in making a purchasing decision. The information mentioned regarding potential future products is not a commitment, promise, or legal obligation to deliver any material, code, or functionality. Information about potential future products may not be incorporated into any contract. The development, release, and timing of any future features or functionality described for our products remain at our sole discretion.

Product number

Description	Machine type	Model	Feature
IBM zEnterprise EC12	2827	H20 H43 H66 H89 HA1	
MTU 1 - D			0001
MTU 100 - D			0002
MTU 1 - V			0003
MTU 100 - V			0004
GTU 1 - D			0005
GTU 100 - D			0006
GTU 1 - V			0007
GTU 100 - V			0008
GTU 1000 - D			0009
GTU 1000 - V			0010
HMC			0091
I/O Cage ISC-D Airflow			0113
I/O Cage Full Card Airflow			0114
1 CPE Capacity Unit			0116
100 CPE Capacity Unit			0117
10000 CPE Capacity Unit			0118
1 CPE Capacity Unit-IFL			0119
100 CPE Capacity Unit-IFL			0120
1 CPE Capacity Unit-ICF			0121
100 CPE Capacity Unit-ICF			0122
1 CPE Capacity Unit-zAAP			0123
100 CPE Capacity Unit-zAAP			0124
1 CPE Capacity Unit-zIIP			0125
100 CPE Capacity Unit-zIIP			0126
1 CPE Capacity Unit-SAP			0127
100 CPE Capacity Unit-SAP			0128
CPC - Radiator			0147
CPC - Water			0149
Fanout Airflow			0165
PCIe Fanout			0169
HCA3-O LR fanout for 1x IFB			0170
HCA3-O fanout for 12x IFB			0171
HCA2-C Fanout *			0162
ISC-Mother Card *			0217
ISC-Daughter Card *			0218
ISC-3 link on F/C 0218 *			0219
IFB-MP Daughter Card *			0326
STI-A8 Mother Card *			0327
Manage FW Suite			0019
Automate/Adv Mgmt FW Suite			0020
Ensemble membership			0025
zBX Detach			0030
zBX Attach			0031
Manage FW DP			0047
Manage FW Pwr Blade			0048

Manage FW IBM System x Bl	0049
Automate FW DP	0050
Automate FW Pwr Blade	0051
Adv Mgmt FW System x Blade	0053
Automate FW IFL	0054
IBM zAware	0011
IBM zAware CP 10 pack	0101
IBM zAware DR CP 10 pack	0102
STI-A4 Mother Card	0328
PCIe Interconnect Card	0400
FlashExp zOS est avail 12/12	0402
OSA-Express4S 1 GbE LX	0404
OSA-Express4S 1 GbE SX	0405
OSA-Express4S 10 GbE LR	0406
OSA-Express4S 10 GbE SR	0407
OSA-Express4S 1000BASE-T	0408
FICON Express8S 10Km LX	0409
FICON Express8S SX	0410
Month Indicator	0660
Day Indicator	0661
Hour Indicator	0662
Minute Indicator	0663
TKE workstation	0841
TKE 7.2 LIC	0850
Crypto Express4S	0865
Addl smart cards	0884
TKE Smart Card Reader	0885
UID Label for DoD	0998
STP Enablement	1021
EMEA Special Operations	1022
4 GB Mem DIMM(5/feat)	1614
16 GB Mem DIMM(5/feat)	1615
32 GB Mem DIMM(5/feat)	1618
LICCC Ship Via Net Ind	1750
32GB Preplanned memory	1990
16GB Preplanned memory	1996
32GB FTR Converted memory	1897
32GB Memory Capacity Incr	1898
16GB Memory Capacity Incr	1899
16GB FTR Converted memory	1900
32 GB Memory	2425
64 GB Memory	2427
96 GB Memory	2429
128 GB Memory	2431
160 GB Memory	2433
192 GB Memory	2435
224 GB Memory	2437
256 GB Memory	2439
320 GB Memory	2441
384 GB Memory	2443
448 GB Memory	2445
512 GB Memory	2447
608 GB Memory	2449
704 GB Memory	2451
US English	2924
France	2928
German	2929
Spanish - Non Spain	2930
Spain	2931
Italian	2932
Canadian French	2935
Portuguese	2978
Brazilian Portuguese	2979
UK English	2980
Norwegian	2983
Sweden Finland	2987

Netherlands	2988
Belgian French	2989
Denmark	2993
Swiss French, German	2997
Luxembourg-Belgium ordered	5560
Iceland-Ordered in Denmark	5561
China-Ordered in Hong Kong	5562
Flat Panel Display	6096
Balanced Power Plan Ahead	3003
BPD Pair	3008
BPR Pair	3009
Internal Battery IBF-ED	3213
Fill and Drain Kit	3378
Universal Lift Tool/Ladder	3759
Serv Docs Optional Print	0033
CPACF Enablement	3863
I/O Cage	4007
I/O Drawer	4008
PCIe I/O Drawer	4009
14ft Water Hose	7801
Top Exit w/Power	7901
FQC Bracket & Mounting Hdw	7922
LC Duplex 6.6ft Harnesses	7927
Taiwan:	
Top Exit I/O Cabling **	7942
Non Raised Floor Support **	7998
Side Covers	7949
3-in-1 Bolt Down Kit	8000
3-in-1 Bolt Down Kit-W	8001
Bolt Down Kit, NRF	8002
Line Cord Plan Ahead	2000
380-520V DC TE cord BPE-1	8947
200V 3Ph TE cord BPE-1	8952
380-520V DC TE cord BPE-2	8953
200V 3Ph TE cord BPE-2	8955
14ft 200V 3ph cord	8993
480V 3ph TE cord	8950
14ft 480V 3ph line cord	8983
14ft 380-520V DC line cord	8963
14 ft 380-415V 3PH	8976
380-415V 3PH TE Cord	8977
Multi Order Ship Flag	9000
Multi Order Rec Only-NB	9001
Multi Order Rec Only-MES	9002
RPO Action Flag	9003
Downgraded PUs Per Request	9004
On/Off CoD Act IFL Day	9888
On/Off CoD Act ICF Day	9889
On/Off CoD Act zAAP Day	9893
On/Off CoD authorization	9896
On/Off CoD Act Cap CP Day	9897
Perm upgr authorization	9898
CIU Activation (Flag)	9899
On Line CoD Buying (Flag)	9900
On/Off CoD Act zIIP Day	9908
On/Off CoD Act SAP Day	9909
CBU authorization	9910
CPE authorization	9912
OPO sales authorization	9913
1 MSU day	9917
100 MSU days	9918

10000 MSU days	9919
1 IFL day	9920
100 IFL days	9921
1 ICF day	9922
100 ICF days	9923
1 zIIP day	9924
100 zIIP days	9925
1 zAAP day	9926
100 zAAP days	9927
1 SAP day	9928
100 SAP days	9929
Site Tool Kit	9968
Weight Distribution Kit	9970
Height Reduce Ship	9975
Height Reduce for Return	9976
CP4	1905
CP5	1906
CP6	1907
CP7	1908
IFL	1909
ICF	1910
SAP (optional)	1911
zAAP	1912
zIIP	1913
Unassigned IFL	1914
Additional CBU Test	6805
Total CBU Years Ordered	6817
CBU Records Ordered	6818
Single CBU CP-Year	6820
25 CBU CP-Year	6821
Single CBU IFL-Year	6822
25 CBU IFL-Year	6823
Single CBU ICF-Year	6824
25 CBU ICF-Year	6825
Single CBU zAAP-Year	6826
25 CBU zAAP-Year	6827
Single CBU zIIP-Year	6828
25 CBU zIIP-Year	6829
Single CBU SAP-Year	6830
25 CBU SAP-Year	6831
CBU Replenishment	6832
Capacity for Planned Event	6833
OPO Sales Flag	6835
OPO Sales Flag Alteration	6836
0-Way Processor CP4	7400
1-Way Processor CP4	7325
2-Way Processor CP4	7326
3-Way Processor CP4	7327
4-Way Processor CP4	7328
5-Way Processor CP4	7329
6-Way Processor CP4	7330
7-Way Processor CP4	7331
8-Way Processor CP4	7332
9-Way Processor CP4	7333
10-Way Processor CP4	7334
11-Way Processor CP4	7335
12-Way Processor CP4	7336
13-Way Processor CP4	7337
14-Way Processor CP4	7338
15-Way Processor CP4	7339
16-Way Processor CP4	7340
17-Way Processor CP4	7341
18-Way Processor CP4	7342
19-Way Processor CP4	7343
20-Way Processor CP4	7344
1-Way Processor CP5	7350
2-Way Processor CP5	7351
3-Way Processor CP5	7352
4-Way Processor CP5	7353
5-Way Processor CP5	7354

6-Way Processor CP5	7355
7-Way Processor CP5	7356
8-Way Processor CP5	7357
9-Way Processor CP5	7358
10-Way Processor CP5	7359
11-Way Processor CP5	7360
12-Way Processor CP5	7361
13-Way Processor CP5	7362
14-Way Processor CP5	7363
15-Way Processor CP5	7364
16-Way Processor CP5	7365
17-Way Processor CP5	7366
18-Way Processor CP5	7367
19-Way Processor CP5	7368
20-Way Processor CP5	7369
1-Way Processor CP6	7375
2-Way Processor CP6	7376
3-Way Processor CP6	7377
4-Way Processor CP6	7378
5-Way Processor CP6	7379
6-Way Processor CP6	7380
7-Way Processor CP6	7381
8-Way Processor CP6	7382
9-Way Processor CP6	7383
10-Way Processor CP6	7384
11-Way Processor CP6	7385
12-Way Processor CP6	7386
13-Way Processor CP6	7387
14-Way Processor CP6	7388
15-Way Processor CP6	7389
16-Way Processor CP6	7390
17-Way Processor CP6	7391
18-Way Processor CP6	7392
19-Way Processor CP6	7393
20-Way Processor CP6	7394
1-Way Processor CP7	7401
2-Way Processor CP7	7402
3-Way Processor CP7	7403
4-Way Processor CP7	7404
5-Way Processor CP7	7405
6-Way Processor CP7	7406
7-Way Processor CP7	7407
8-Way Processor CP7	7408
9-Way Processor CP7	7409
10-Way Processor CP7	7410
11-Way Processor CP7	7411
12-Way Processor CP7	7412
13-Way Processor CP7	7413
14-Way Processor CP7	7414
15-Way Processor CP7	7415
16-Way Processor CP7	7416
17-Way Processor CP7	7417
18-Way Processor CP7	7418
19-Way Processor CP7	7419
20-Way Processor CP7	7420
401 Capacity Marker	8641
402 Capacity Marker	8642
403 Capacity Marker	8643
404 Capacity Marker	8644
405 Capacity Marker	8645
406 Capacity Marker	8646
407 Capacity Marker	8647
408 Capacity Marker	8648
409 Capacity Marker	8649
410 Capacity Marker	8650
411 Capacity Marker	8651
412 Capacity Marker	8652
413 Capacity Marker	8653
414 Capacity Marker	8654
415 Capacity Marker	8655
416 Capacity Marker	8656
417 Capacity Marker	8657
418 Capacity Marker	8658

419 Capacity Marker			8659
420 Capacity Marker			8660
501 Capacity Marker			8666
502 Capacity Marker			8667
503 Capacity Marker			8668
504 Capacity Marker			8669
505 Capacity Marker			8670
506 Capacity Marker			8671
507 Capacity Marker			8672
508 Capacity Marker			8673
509 Capacity Marker			8674
510 Capacity Marker			8675
511 Capacity Marker			8676
512 Capacity Marker			8677
513 Capacity Marker			8678
514 Capacity Marker			8679
515 Capacity Marker			8680
516 Capacity Marker			8681
517 Capacity Marker			8682
518 Capacity Marker			8683
519 Capacity Marker			8684
520 Capacity Marker			8685
601 Capacity Marker			8691
602 Capacity Marker			8692
603 Capacity Marker			8693
604 Capacity Marker			8694
605 Capacity Marker			8695
606 Capacity Marker			8696
607 Capacity Marker			8697
608 Capacity Marker			8698
609 Capacity Marker			8699
610 Capacity Marker			8700
611 Capacity Marker			8701
612 Capacity Marker			8702
613 Capacity Marker			8703
614 Capacity Marker			8704
615 Capacity Marker			8705
616 Capacity Marker			8706
617 Capacity Marker			8707
618 Capacity Marker			8708
619 Capacity Marker			8709
620 Capacity Marker			8710
400 Capacity Marker			8716
701 Capacity Marker			8717
702 Capacity Marker			8718
703 Capacity Marker			8719
704 Capacity Marker			8720
705 Capacity Marker			8721
706 Capacity Marker			8722
707 Capacity Marker			8723
708 Capacity Marker			8724
709 Capacity Marker			8725
710 Capacity Marker			8726
711 Capacity Marker			8727
712 Capacity Marker			8728
713 Capacity Marker			8729
714 Capacity Marker			8730
715 Capacity Marker			8731
716 Capacity Marker			8732
717 Capacity Marker			8733
718 Capacity Marker			8734
719 Capacity Marker			8735
720 Capacity Marker			8736
IBM zEnterprise EC12	2827	H20	
Model H20 - Air Cooled			1095
Model H20 - Water Cooled			1099
A Fr Water Single Node			4025
A Fr Radiator Single Node			4026
IBM zEnterprise EC12	2827	H43	
Model H43 - Air Cooled			1096
Model H43 - Water Cooled			1100

IBM zEnterprise EC12	2827	H66	
Model H66 - Air Cooled			1097
Model H66 - Water Cooled			1101
IBM zEnterprise EC12	2827	H89	
Model H89 - Air Cooled			1098
Model H89 - Water Cooled			1102
IBM zEnterprise EC12	2827	HA1	
Model HA1 - Air Cooled			1106
Model HA1 - Water Cooled			1145
IBM zEnterprise EC12	2827	H43	
		H66	
		H89	
		HA1	
800 GB Memory			2453
896 GB Memory			2455
1008 GB Memory			2457
1136 GB Memory			2459
1264 GB Memory			2461
1392 GB Memory			2463
A Fr Water Multi Node			4022
A Fr Radiator Multi Node			4024
21-Way Processor CP7			7421
22-Way Processor CP7			7422
23-Way Processor CP7			7423
24-Way Processor CP7			7424
25-Way Processor CP7			7425
26-Way Processor CP7			7426
27-Way Processor CP7			7427
28-Way Processor CP7			7428
29-Way Processor CP7			7429
30-Way Processor CP7			7430
31-Way Processor CP7			7431
32-Way Processor CP7			7432
33-Way Processor CP7			7433
34-Way Processor CP7			7434
35-Way Processor CP7			7435
36-Way Processor CP7			7436
37-Way Processor CP7			7437
38-Way Processor CP7			7438
39-Way Processor CP7			7439
40-Way Processor CP7			7440
41-Way Processor CP7			7441
42-Way Processor CP7			7442
43-Way Processor CP7			7443
721 Capacity Marker			8737
722 Capacity Marker			8738
723 Capacity Marker			8739
724 Capacity Marker			8740
725 Capacity Marker			8741
726 Capacity Marker			8742
727 Capacity Marker			8743
728 Capacity Marker			8744
729 Capacity Marker			8745
730 Capacity Marker			8746
731 Capacity Marker			8747
732 Capacity Marker			8748
733 Capacity Marker			8749
734 Capacity Marker			8750
735 Capacity Marker			8751
736 Capacity Marker			8752
737 Capacity Marker			8753
738 Capacity Marker			8754
739 Capacity Marker			8755
740 Capacity Marker			8756
741 Capacity Marker			8757
742 Capacity Marker			8758
743 Capacity Marker			8759
IBM zEnterprise EC12	2827	H66	

		H89	
		HA1	
1520 GB Memory			2465
1760 GB Memory			2478
2016 GB Memory			2479
2272 GB Memory			2480
44-Way Processor CP7			7444
45-Way Processor CP7			7445
46-Way Processor CP7			7446
47-Way Processor CP7			7447
48-Way Processor CP7			7448
49-Way Processor CP7			7449
50-Way Processor CP7			7450
51-Way Processor CP7			7451
52-Way Processor CP7			7452
53-Way Processor CP7			7453
54-Way Processor CP7			7454
55-Way Processor CP7			7455
56-Way Processor CP7			7456
57-Way Processor CP7			7457
58-Way Processor CP7			7458
59-Way Processor CP7			7459
60-Way Processor CP7			7460
61-Way Processor CP7			7461
62-Way Processor CP7			7462
63-Way Processor CP7			7463
64-Way Processor CP7			7464
65-Way Processor CP7			7465
66-Way Processor CP7			7466
744 Capacity Marker			8760
745 Capacity Marker			8761
746 Capacity Marker			8762
747 Capacity Marker			8763
748 Capacity Marker			8764
749 Capacity Marker			8765
750 Capacity Marker			8766
751 Capacity Marker			8767
752 Capacity Marker			8768
753 Capacity Marker			8769
754 Capacity Marker			8770
755 Capacity Marker			8771
756 Capacity Marker			8772
757 Capacity Marker			8773
758 Capacity Marker			8774
759 Capacity Marker			8775
760 Capacity Marker			8776
761 Capacity Marker			8777
762 Capacity Marker			8778
763 Capacity Marker			8779
764 Capacity Marker			8780
765 Capacity Marker			8781
766 Capacity Marker			8782
IBM zEnterprise EC12	2827	H89	
		HA1	
2528 GB Memory			2481
2784 GB Memory			2482
3040 GB Memory			2483
67-Way Processor CP7			7467
68-Way Processor CP7			7468
69-Way Processor CP7			7469
70-Way Processor CP7			7470
71-Way Processor CP7			7471
72-Way Processor CP7			7472
73-Way Processor CP7			7473
74-Way Processor CP7			7474
75-Way Processor CP7			7475
76-Way Processor CP7			7476
77-Way Processor CP7			7477
78-Way Processor CP7			7478
79-Way Processor CP7			7479
80-Way Processor CP7			7480
81-Way Processor CP7			7481

82-Way Processor CP7			7482
83-Way Processor CP7			7483
84-Way Processor CP7			7484
85-Way Processor CP7			7485
86-Way Processor CP7			7486
87-Way Processor CP7			7487
88-Way Processor CP7			7488
89-Way Processor CP7			7489
767 Capacity Marker			8783
768 Capacity Marker			8784
769 Capacity Marker			8785
770 Capacity Marker			8786
771 Capacity Marker			8787
772 Capacity Marker			8788
773 Capacity Marker			8789
774 Capacity Marker			8790
775 Capacity Marker			8791
776 Capacity Marker			8792
777 Capacity Marker			8793
778 Capacity Marker			8794
779 Capacity Marker			8795
780 Capacity Marker			8796
781 Capacity Marker			8797
782 Capacity Marker			8798
783 Capacity Marker			8799
784 Capacity Marker			8800
785 Capacity Marker			8801
786 Capacity Marker			8802
787 Capacity Marker			8803
788 Capacity Marker			8804
789 Capacity Marker			8805
IBM zEnterprise EC12	2827	HA1	
90-Way Processor CP7			7490
91-Way Processor CP7			7491
92-Way Processor CP7			7492
93-Way Processor CP7			7493
94-Way Processor CP7			7494
95-Way Processor CP7			7495
96-Way Processor CP7			7496
97-Way Processor CP7			7497
98-Way Processor CP7			7498
99-Way Processor CP7			7499
100-Way Processor CP7			7500
101-Way Processor CP7			7501
790 Capacity Marker			8806
791 Capacity Marker			8807
792 Capacity Marker			8808
793 Capacity Marker			8809
794 Capacity Marker			8810
795 Capacity Marker			8811
796 Capacity Marker			8812
797 Capacity Marker			8813
798 Capacity Marker			8814
799 Capacity Marker			8815
7A0 Capacity Marker			8816
7A1 Capacity Marker			8817
zBX	2458	002	
DP Blade Detach			0055
DP Blade Attach			0056
zBX	2458	003	
zBX model 003			0502
DP Blade Detach			0055
DP Blade Attach			0056
10 GbE HSS switch			0605
Mgmt TOR switch			0607
IEDN TOR switch			0608

Service Docs Optional Print			0033
HMC			0091
Power 3Ph delta w/cord			0520
Power w/o cord			0521
60A/208V 1Ph Cord			0531
63A/230V 1Ph Cord			0532
32A/380-415V 3Ph Cord			0533
Rear door heat exchanger			0540
Std front door			0541
Std rear door			0542
Acoustic rear door			0543
Chassis counter weight			0544
Rack height reduction			0570
Primary zBX rack			0601
Expansion zBX rack			0602
zBX configured chassis asm			0603
Fibre channel ESM switch			0606
DataPower blade			0611
System x blade			0613
Pwr blade enablement			0612
8 Gb SW optical module			0615
ESM filler plate			0618
Rack filler plate			0619
1000 mm cat6 cable			0620
15 ft cat6 cable			0624
3200mm cat6 cable			0625
10GbE 1m DAC cable			0626
10GbE 3m DAC cable			0627
10GbE 7m DAC cable			0628
10GbE LR 10km SFP			0632
10GbE SR SFP			0633
1000BASE-LX 1310nm 10km SFP			0634
1000BASE-SX 850nm 550m SFP			0635
Month indicator			0660
Day indicator			0661
Hour indicator			0662
Minute indicator			0663
US English			2924
France			2928
German			2929
Spanish non-Spain			2930
Spain			2931
Italian			2932
Canadian French			2935
Portuguese			2978
Brazilian Portuguese			2979
UK English			2980
Norwegian			2983
Sweden Finland			2987
Netherlands			2988
Belgian French			2989
Denmark			2993
Swiss French, German			2997
Luxembourg-Belgium ordered			5560
Iceland-Ordered in Denmark			5561
China-Ordered in Hong Kong			5562
Flat panel display			6096
RPO action flag			9003
IBM zEnterprise 196	2817		
		M15	
		M32	
		M49	
		M66	
		M80	
TKE 7.2 LIC			0850

IBM zEnterprise 114	2818		
		M05	
		M10	
TKE 7.2 LIC			0850

Features that may carry forward on an upgrade:

The following features are not orderable on the
IBM zEnterprise EC12 models.

If they are installed at the time of an upgrade to the
IBM zEnterprise EC12 they may be retained.

Description	Machine type	Model	Feature
IBM zEnterprise EC12	2827	H20	
		H43	
		H66	
		H89	
		HA1	
Ethernet switch			0070
HCA2-O fanout for 12x IFB			0163
HCA2-O LR fanout for 1x IFB			0168
Crypto Express3			0864
FICON Express4 10KM LX			3321
FICON Express4 SX			3322
FICON Express8 10KM LX			3325
FICON Express8 SX			3326
OSA-Express3 GbE LX			3362
OSA-Express3 GbE SX			3363
OSA-Express3 1000BASET-EN			3367
OSA-Express3 10 GbE LR			3370
OSA-Express3 10 GbE SR			3371
6ft 250V Line Cord, Chi			8992
6ft 480V 30A Line Cord, Chi			8994

Notes:
1. Memory DIMMs do NOT carry forward.
2. Support Elements do NOT carry forward.

* Available only via RPQ:
   feature # 0162, 0217, 0218, 0219, 0326, and 0327

** Not supported in Taiwan: feature # 7942 and 7998

Model conversions

Model conversions - Hardware upgrades

From M/T	From Model	To M/T	To Model		Description
z10 EC to IBM zEnterprise EC12 radiator-based air-cooled					
2097	E12	2827	H20	(*)	E12 to H20 rad
2097	E12	2827	H43	(*)	E12 to H43 rad
2097	E12	2827	H66	(*)	E12 to H66 rad
2097	E12	2827	H89	(*)	E12 to H89 rad
2097	E12	2827	HA1	(*)	E12 to HA1 rad
2097	E26	2827	H20	(*)	E26 to H20 rad
2097	E26	2827	H43	(*)	E26 to H43 rad
2097	E26	2827	H66	(*)	E26 to H66 rad
2097	E26	2827	H89	(*)	E26 to H89 rad
2097	E26	2827	HA1	(*)	E26 to HA1 rad
2097	E40	2827	H20	(*)	E40 to H20 rad
2097	E40	2827	H43	(*)	E40 to H43 rad

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2097      E40   2827     H66  (*)   E40       to H66 rad
2097      E40   2827     H89  (*)   E40       to H89 rad
2097      E40   2827     HA1  (*)   E40       to HA1 rad
2097      E56   2827     H20  (*)   E56       to H20 rad
2097      E56   2827     H43  (*)   E56       to H43 rad
2097      E56   2827     H66  (*)   E56       to H66 rad
2097      E56   2827     H89  (*)   E56       to H89 rad
2097      E56   2827     HA1  (*)   E56       to HA1 rad
2097      E64   2827     H20  (*)   E64       to H20 rad
2097      E64   2827     H43  (*)   E64       to H43 rad
2097      E64   2827     H66  (*)   E64       to H66 rad
2097      E64   2827     H89  (*)   E64       to H89 rad
2097      E64   2827     HA1  (*)   E64       to HA1 rad

z10 EC to IBM zEnterprise EC12 water-cooled
2097      E12   2827     H20  (*)   E12       to H20 water
2097      E12   2827     H43  (*)   E12       to H43 water
2097      E12   2827     H66  (*)   E12       to H66 water
2097      E12   2827     H89  (*)   E12       to H89 water
2097      E12   2827     HA1  (*)   E12       to HA1 water
2097      E26   2827     H20  (*)   E26       to H20 water
2097      E26   2827     H43  (*)   E26       to H43 water
2097      E26   2827     H66  (*)   E26       to H66 water
2097      E26   2827     H89  (*)   E26       to H89 water
2097      E26   2827     HA1  (*)   E26       to HA1 water
2097      E40   2827     H20  (*)   E40       to H20 water
2097      E40   2827     H43  (*)   E40       to H43 water
2097      E40   2827     H66  (*)   E40       to H66 water
2097      E40   2827     H89  (*)   E40       to H89 water
2097      E40   2827     HA1  (*)   E40       to HA1 water
2097      E56   2827     H20  (*)   E56       to H20 water
2097      E56   2827     H43  (*)   E56       to H43 water
2097      E56   2827     H66  (*)   E56       to H66 water
2097      E56   2827     H89  (*)   E56       to H89 water
2097      E56   2827     HA1  (*)   E56       to HA1 water
2097      E64   2827     H20  (*)   E64       to H20 water
2097      E64   2827     H43  (*)   E64       to H43 water
2097      E64   2827     H66  (*)   E64       to H66 water
2097      E64   2827     H89  (*)   E64       to H89 water
2097      E64   2827     HA1  (*)   E64       to HA1 water

z196 air-cooled to IBM zEnterprise EC12 radiator-based air-cooled
2817      M15   2827     H20  (*)   M15 air   to H20 rad
2817      M15   2827     H43  (*)   M15 air   to H43 rad
2817      M15   2827     H66  (*)   M15 air   to H66 rad
2817      M15   2827     H89  (*)   M15 air   to H89 rad
2817      M15   2827     HA1  (*)   M15 air   to HA1 rad
2817      M32   2827     H20  (*)   M32 air   to H20 rad
2817      M32   2827     H43  (*)   M32 air   to H43 rad
2817      M32   2827     H66  (*)   M32 air   to H66 rad
2817      M32   2827     H89  (*)   M32 air   to H89 rad
2817      M32   2827     HA1  (*)   M32 air   to HA1 rad
2817      M49   2827     H20  (*)   M49 air   to H20 rad
2817      M49   2827     H43  (*)   M49 air   to H43 rad
2817      M49   2827     H66  (*)   M49 air   to H66 rad
2817      M49   2827     H89  (*)   M49 air   to H89 rad
2817      M49   2827     HA1  (*)   M49 air   to HA1 rad
2817      M66   2827     H20  (*)   M66 air   to H20 rad
2817      M66   2827     H43  (*)   M66 air   to H43 rad
2817      M66   2827     H66  (*)   M66 air   to H66 rad
2817      M66   2827     H89  (*)   M66 air   to H89 rad
2817      M66   2827     HA1  (*)   M66 air   to HA1 rad
2817      M80   2827     H20  (*)   M80 air   to H20 rad
2817      M80   2827     H43  (*)   M80 air   to H43 rad
2817      M80   2827     H66  (*)   M80 air   to H66 rad
2817      M80   2827     H89  (*)   M80 air   to H89 rad
2817      M80   2827     HA1  (*)   M80 air   to HA1 rad

z196 air-cooled to IBM zEnterprise EC12 water-cooled
2817      M15   2827     H20  (*)   M15 air   to H20 water
2817      M15   2827     H43  (*)   M15 air   to H43 water
2817      M15   2827     H66  (*)   M15 air   to H66 water
2817      M15   2827     H89  (*)   M15 air   to H89 water
2817      M15   2827     HA1  (*)   M15 air   to HA1 water
```

```
2817      M32   2827     H20  (*)   M32 air   to H20 water
2817      M32   2827     H43  (*)   M32 air   to H43 water
2817      M32   2827     H66  (*)   M32 air   to H66 water
2817      M32   2827     H89  (*)   M32 air   to H89 water
2817      M32   2827     HA1  (*)   M32 air   to HA1 water
2817      M49   2827     H20  (*)   M49 air   to H20 water
2817      M49   2827     H43  (*)   M49 air   to H43 water
2817      M49   2827     H66  (*)   M49 air   to H66 water
2817      M49   2827     H89  (*)   M49 air   to H89 water
2817      M49   2827     HA1  (*)   M49 air   to HA1 water
2817      M66   2827     H20  (*)   M66 air   to H20 water
2817      M66   2827     H43  (*)   M66 air   to H43 water
2817      M66   2827     H66  (*)   M66 air   to H66 water
2817      M66   2827     H89  (*)   M66 air   to H89 water
2817      M66   2827     HA1  (*)   M66 air   to HA1 water
2817      M80   2827     H20  (*)   M80 air   to H20 water
2817      M80   2827     H43  (*)   M80 air   to H43 water
2817      M80   2827     H66  (*)   M80 air   to H66 water
2817      M80   2827     H89  (*)   M80 air   to H89 water
2817      M80   2827     HA1  (*)   M80 air   to HA1 water

z196 water-cooled to IBM zEnterprise EC12 water-cooled
2817      M15   2827     H20  (*)   M15 water to H20 water
2817      M15   2827     H43  (*)   M15 water to H43 water
2817      M15   2827     H66  (*)   M15 water to H66 water
2817      M15   2827     H89  (*)   M15 water to H89 water
2817      M15   2827     HA1  (*)   M15 water to HA1 water
2817      M32   2827     H20  (*)   M32 water to H20 water
2817      M32   2827     H43  (*)   M32 water to H43 water
2817      M32   2827     H66  (*)   M32 water to H66 water
2817      M32   2827     H89  (*)   M32 water to H89 water
2817      M32   2827     HA1  (*)   M32 water to HA1 water
2817      M49   2827     H20  (*)   M49 water to H20 water
2817      M49   2827     H43  (*)   M49 water to H43 water
2817      M49   2827     H66  (*)   M49 water to H66 water
2817      M49   2827     H89  (*)   M49 water to H89 water
2817      M49   2827     HA1  (*)   M49 water to HA1 water
2817      M66   2827     H20  (*)   M66 water to H20 water
2817      M66   2827     H43  (*)   M66 water to H43 water
2817      M66   2827     H66  (*)   M66 water to H66 water
2817      M66   2827     H89  (*)   M66 water to H89 water
2817      M66   2827     HA1  (*)   M66 water to HA1 water
2817      M80   2827     H20  (*)   M80 water to H20 water
2817      M80   2827     H43  (*)   M80 water to H43 water
2817      M80   2827     H66  (*)   M80 water to H66 water
2817      M80   2827     H89  (*)   M80 water to H89 water
2817      M80   2827     HA1  (*)   M80 water to HA1 water

IBM zEnterprise EC12 radiator-based air-cooled to IBM zEnterprise EC12
radiator-based air-cooled
2827      H20   2827     H43  (*)   H20 rad   to H43 rad
2827      H20   2827     H66  (*)   H20 rad   to H66 rad
2827      H20   2827     H89  (*)   H20 rad   to H89 rad
2827      H20   2827     HA1  (*)   H20 rad   to HA1 rad
2827      H43   2827     H66  (*)   H43 rad   to H66 rad
2827      H43   2827     H89  (*)   H43 rad   to H89 rad
2827      H43   2827     HA1  (*)   H43 rad   to HA1 rad
2827      H66   2827     H89  (*)   H66 rad   to H89 rad
2827      H66   2827     HA1  (*)   H66 rad   to HA1 rad
2827      H89   2827     HA1  (*)   H89 rad   to HA1 rad

IBM zEnterprise EC12 water-cooled to IBM zEnterprise EC12 water-cooled
2827      H20   2827     H43  (*)   H20 water to H43 water
2827      H20   2827     H66  (*)   H20 water to H66 water
2827      H20   2827     H89  (*)   H20 water to H89 water
2827      H20   2827     HA1  (*)   H20 water to HA1 water
2827      H43   2827     H66  (*)   H43 water to H66 water
2827      H43   2827     H89  (*)   H43 water to H89 water
2827      H43   2827     HA1  (*)   H43 water to HA1 water
2827      H66   2827     H89  (*)   H66 water to H89 water
2827      H66   2827     HA1  (*)   H66 water to HA1 water
2827      H89   2827     HA1  (*)   H89 water to HA1 water

zBX Model 002 to zBX Model 003
```

```
2458      002   2458     003  (*)   002       to 003

(*) Parts removed or replaced become the property of IBM and must
    be returned.
```

Feature conversions

The feature conversion list for IBM zEnterprise EC12 is available now in the *Library* section of Resource Link® . This list can be obtained at Resource Link by accessing the following website

https://www.ibm.com/servers/resourcelink/lib03011.nsf/pages/2097to2827featureconversion s?OpenDocument

Using the instructions on the Resource Link panels, obtain a user ID and password. Resource Link has been designed for easy access and navigation.

Business Partner information

If you are a Direct Reseller - System Reseller acquiring products from IBM, you may link directly to Business Partner information for this announcement. A PartnerWorld ID and password are required (use IBM ID).

https://www.ibm.com/partnerworld/mem/sla.jsp?num=112-155

Publications

The following publications are available now in the *Library* section of Resource Link :

Title	Order number
zEnterprise EC12 System Overview	SA22-1088
zEnterprise EC12 Installation Manual - Physical Planning (IMPP)	GC28-6914
PR/SM Planning Guide	SB10-7156
IOCP User's Guide	SB10-7037
Functional Matrix	ZSW0-1335
zBX Installation Manual for Physical Planning 2458-003	GC27-2619

The following publications are shipped with the product and will be available at planned availability in the *Library* section of Resource Link :

Title	Order number
zEnterprise EC12 Installation Manual	GC28-6913
zBX Installation Manual 2458-003	GC27-2618
zEnterprise EC12 Service Guide	GC28-6915
zBX Service Guide	GC28-6884
zEnterprise EC12 Safety Inspection	GC28-6912
zBX Safety Inspection	GC28-6889
Systems Safety Notices	G229-9054
Systems Environmental Notices and User Guide	Z125-5823
System z Statement of Limited Warranty	GC28-6883
License Agreement for Machine Code	SC28-6872
License Agreement for Machine Code Addendum for Elliptic Curve Cryptography	GC27-2612
Service Guide for TKE Workstations	GC28-6901

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Title	Order number
Application Programming Interfaces for Java	API-JAVA
Application Programming Interfaces	SB10-7030
Capacity on Demand User's Guide	SC28-2605
Common Information Model (CIM) Management Interface	SB10-7154
CHPID Mapping Tool User's Guide	GC28-6900

Hardware Management Console Web Services API (V2.12.0)	SC27-2617
Hardware Management Console Operations Guide (V2.12.0)	SC28-6919
zEnterprise EC12 Parts Catalog	GC28-6916
SCSI IPL - Machine Loader Messages	SC28-6839
Service Guide for HMCs and SEs	GC28-6861
Stand-Alone IOCP User's Guide	SB10-7152
Support Element Operations Guide (V2.12.0)	SC28-6920
Hardware Management Console Operations Guide for Ensembles (V2.12.0)	SC27-2622
Ensemble Performance Management Guide	GC27-2607
Ensemble Planning and Configuring Guide	GC27-2608
Introduction to Ensembles	GC27-2609
IBM Advanced Workload Analysis Reporter (IBM zAware) Guide	SC27-2623
OSA-Express Customer Guide and Reference	SA22-7935
FICON CTC Reference	SB10-7157
Maintenance Information for Fiber Optic Links	SY27-7693
Planning for Fiber Optic Links	GA23-1406

The following publications are shipped with the zEnterprise BladeCenter Extension product and will be available at planned availability in the *Library* section of Resource Link :

Title	Order number
zBX Service Guide	GC28-6884
zBX Installation Manual 2458-003	GC27-2618
zBX Safety Inspection	GC28-6889
System z Statement of Limited Warranty	GC28-6883
Systems Safety Notices	G229-9054
Systems Environmental Notices and User Guide	Z125-5823

Publications for IBM zEnterprise EC12 can be obtained at Resource Link by accessing the following website

http://www.ibm.com/servers/resourcelink

Using the instructions on the Resource Link panels, obtain a user ID and password. Resource Link has been designed for easy access and navigation.

The following Redbooks® publication is available now:

Title	Order number
IBM zEnterprise EC12 Technical Introduction	SG24-8050

The following Redbooks publications will provide additional information, once they become available:

Title	Order number
IBM zEnterprise EC12 Technical Guide	SG24-8049
IBM System z Connectivity Handbook	SG24-5444
IBM zEnterprise EC12 Configuration Setup	SG24-8034

To download these Redbooks publications, go to

http://www.redbooks.ibm.com/Redbooks.nsf/pages/zEnterprise?Open

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- Strategy, Design, Optimization and Integration
  - IBM IT Transformation Strategy and Design Services (6950-92B)
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  - IBM Data Center and Facilities Strategy Services - data center strategy and plan (6948-76T)
  - IBM Infrastructure Strategy and Design Services for Cloud - cloud infrastructure strategy and design (6948-94Z)
  - IBM Workload Transformation Analysis for Cloud (6948-17D)
  - IBM Server Optimization and Integration Services - server consolidation and virtualization (6948-39T)
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  - IBM Implementation Services for Parallel Sysplex Middleware (6948-84A)
  - IBM Healthcheck Services for System z (6948-39J)
  - IBM Middleware Strategy and Design (6948-74G)
  - IBM Networking Strategy and optimization services (6950-92Y)
  - IBM Networking Integration Services - for data center networks (6948-76K)
- Implementation & Migration
  - IBM will provide services capability to help clients implement IBM zAware. For more detail, clients should contact their IBM sales representative.
  - IBM Implementation Services for System z (6948-75A)
    - -- zEnterprise setup and migration (6948-L96)
    - -- z/VM and Linux implementation (6948-L30)
    - -- z/VM and Linux performance assessment (6948-K61)

  - -- zBX and Unified Resource Manager (6948-L66)
  - -- Network virtualization for zBX (6948-M35)
  - -- Server time protocol (6948-J56)
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- – IBM Migration Services for System z (6948-75B)
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- – IBM Facilities Cabling Services - ESCON to FICON Migration (6948-97D)
- – IBM Implementation Services for Power Systems BladeCenter - Power® Blades (6948-84Z)
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- – IBM Data Mobility Services (6950-94Y)

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  - – IBM Server Managed Services (6950-94G)
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  - – IBM Hardware Maintenance Service (6950-95A)
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  - – IBM Support Line Software Usage Support (6942-62D)
  - – Support Line for zOS, and Linux , including Linux Subscription (SoftwareXcel in US): Support Line Service Offering ID 6950-95B
  - – SWMA for AIX , VIOS, PowerVM® SWMA: Software Maintenance Service Offering ID 6950-95B
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For details on available services for IBM zEnterprise EC12, visit:

- System z product services

  http://www-935.ibm.com/services/us/en/it-services/server-product-services-for-system-z. html
- Server services

  http://www-935.ibm.com/services/us/en/it-services/server-services.html
- System z services

  http://www-935.ibm.com/services/us/index.wss/itservice/imc/a1030882
- Data center services

  http://www-935.ibm.com/services/us/igs/smarterdatacenter.html
- Cloud services

  http://www.ibm.com/cloud-computing/us/en/

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http://www.ibm.com/services/learning/index.html

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    - -- z/VM and Linux for IBM System z Security and Compliance
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    - -- System z Virtualization Infrastructure Assessment
    - -- z/VM Single System Image and Live Guest Mobility Services
    - -- Advanced System Management Services for VM and Linux for System z
    - -- Oracle RAC Accelerator for Linux on System z
    - -- Linux on IBM System z Services and Training Kits
    - -- z/VM and Linux Migration and Currency
  - z/OS Infrastructure, Performance and High Availability
    - -- NEW: zAware Enablement Starter Kit
    - -- Parallel Sysplex InfiniBand (PSIFB) Impact Assessment
    - -- Parallel Sysplex InfiniBand (PSIFB) Migration Services
    - -- Planning for Parallel Sysplex Enablement
    - -- High Availability Planning and Design
    - -- System z Currency and Migration Jumpstarts
    - -- DFSMShsm Health Check
    - -- z/OS Environmental Health Inspection
    - -- System z Platform Performance Diagnosis and Remediation
  - Middleware and Data Serving Solutions
    - -- CICS Healthcheck
    - -- CICS CPSM Jumpstart
    - -- DB2 Performance Assessment
    - -- DB2 Healthcheck
    - -- DB2 Installation

- -- DB2 Release Migration
- -- DB2 Backup and Recovery
- -- DB2 Data Sharing Enablement
- -- DB2 Security Assessment
- -- SAP on IBM System z Services
- -- Java Performance Optimization for IBM System z
- -- Application Modernization
- -- SAP on System z Services
- -- ACI Installation Services
- -- WebSphere MQ Healthcheck
- -- WebSphere for z Installation Jumpstart
- -- WebSphere for z Administration Assistance
- -- WebSphere for z Architecture and Planning
- -- WebSphere for z Network Deployment
- -- WebSphere for z Healthcheck
- -- Network Architecture Design
- -- Network Implementation
- -- Network Health Check

– Security

- -- z/OS Security Health Check
- -- Security Key and Certificate Review
- -- zSecure™ Component Installation and Basic Customization
- -- z/OS PKI Services Enablement
- -- TKLM Tape & Disk Encryption Services
- -- System z Security Architecture Review
- -- ISKLM v1.1 for z/OS Tape & Disk Encryption Services
- -- Trusted Key Entry Enablement

- **zEnterprise Services**
  - – zEnterprise Ensemble Enablement JumpStart Assistance for zBX Blades
  - – zEnterprise Ensemble Enablement JumpStart Assistance for z/VM
  - – zEnterprise Ensemble Acceptance for zBX Blades
  - – zEnterprise ISAS 9700 Services
  - – zEnterprise Ensemble Enablement Jumpstart Assistance for DataPower X150z Blades
  - – zEnterprise Ensemble Enablement Customer Services
  - – zEnterprise Ensemble API Custom Exploitation Services
  - – zEnterprise IBM DB2 Analytics Accelerator (IDAA) Services
  - – Implementation Services for zEnterprise Starter Edition for Cloud
  - – Solution Edition for Cloud Computing
- **Cross Platform Services**
  - – Data Center Services
    - -- Active Energy Manager Implementation Jumpstart
    - -- Active Energy Manager Implementation Jumpstart with Tivoli Monitoring for Energy Management
    - -- Data Center Thermal Analysis and Optimization
    - -- IBM Measurement and Management Technologies (MMT) Data Center Thermal Analysis
    - -- Data Center MMT Maintenance Services

  - -- IT Systems Energy Efficiency Assessment
  - -- Dynamic Infrastructure® Workshop
  - -- Power/Cooling Trends and Data Center Best Practices
  - -- Data Center Baseline Cooling Assessment
  - -- Data Center Contamination and Remediation
  - -- Data Center Facility Energy Analysis and Optimization
  - -- Data Center Containment Services
  - -- Data Center Co-Generation Design Services
  - -- Data Center Recirculation Barriers
  - -- Air / Liquid Cooled Data Center Implementation Services
- IT Optimization and Virtualization
  - -- Fit for Purpose Workshop
  - -- Workload Optimization Analysis and TCO for System z
  - -- Rapid Workload Optimization Assessment and TCO for System z
  - -- Cloud IT Optimization Assessment
  - -- IT Optimization Assessment
  - -- IT Systems Rationalization Study
  - -- IT Systems Energy Efficiency Assessment
  - -- Storage Energy Analysis
  - -- Storage Energy Efficiency Workshop
  - -- Storage Efficiency Study
  - -- Storage Optimization Study
  - -- Storage Optimization Workshop

- **Education**
  - Updated: IBM System z : Technical Overview of Hardware and Software
  - Basic z/OS Tuning Using the Workload Manager (WLM)
  - IBM System z Hardware Management Console (HMC Operations)
  - Writing REXX Programs for z/OS
  - z/OS System Operators
  - Parallel Sysplex Implementation Workshop
  - Introducing z/OS UNIX System Services
  - Fundamental System Skills in z/OS
  - Advanced z/OS Security: Crypto, Network, RACF and Your Enterprise
  - Parallel Sysplex Operations and Recovery
  - An Introduction to the z/OS Environment
  - Maximizing WebSphere Performance on z/OS
  - Linux Implementation for System z
  - Advanced Solutions for Linux on System z
  - Sysplex Training

To find out more about the IBM System z portfolio and other related products and services, contact systemz@us.ibm.com or visit

http://www.ibm.com/systems/services/labservices

Specified operating environment

Physical specifications - IBM zEnterprise EC12

Physical specifications - AIR-cooled machine

Dimensions (rounded to the nearest 0.1 in or 0.1 cm):

	Depth	Width	Height
System with ALL covers			
- Inches	73.5	61.6	79.3
- Centimeter	186.7	156.5	201.3
- Inches (O/H IO cable exit)	73.5	72.7	84.8
- Centimeter (O/H IO cable exit)	186.7	184.7	215.3
System with covers and reduction			
- Inches	50.0	61.6	70.3
- Centimeter	127.0	156.5	178.5
Each frame with one side cover and without packaging			
- Inches	50.0	30.7	79.3
- Centimeter	127.0	78.0	201.3
Each frame on casters with one side cover and with packaging (domestic)			
- Inches	57.4	32.4	79.8
- Centimeter	130.6	82.2	202.6
Each frame with one side cover and with packaging (ARBO crate)			
- Inches	63.4	36.5	87.6
- Centimeter	130.6	92.7	222.5

Approximate weight:

	New Build Minimum System Model H20 One I/O Drawer	New Build Maximum System Model HA1 Max # of I/O Drawers
System with IBF feature		
- kg	1370.0	2508.0
- lb	3019.0	5530.0
- kg (O/H IO cable exit)	1456.4	2594.0
- lb (O/H IO cable exit)	3462.0	5720.0
System without IBF feature		
- kg	1267.0	2204.0
- lb	2793.0	4860.0
- kg (O/H IO cable exit)	1353.0	2290.0
- lb (O/H IO cable exit)	2983.0	5050.0

To ensure installability and serviceability in non-IBM industry-standard racks, review the installation planning information for any product-specific installation requirements.

The DC Power feature has no effect on the machine dimensions and weight.

Physical specifications - WATER-cooled machine

Dimensions (rounded to the nearest 0.1 in or 0.1 cm):

	Depth	Width	Height
System with ALL covers			
- Inches	77.5	61.6	79.3
- Centimeter	196.9	156.5	201.3
- Inches (O/H IO cable exit)	77.5	72.7	84.8
- Centimeter (O/H IO cable exit)	196.9	184.7	215.3
System with covers and reduction			
- Inches	75.0	61.6	70.3
- Centimeter	190.5	156.5	178.5
Each frame with one side cover and without packaging			
- Inches	54.0	30.7	79.3
- Centimeter	137.2	78.0	201.3
Each frame on casters with one side cover and with packaging (domestic)			
- Inches	61.4	32.4	79.8
- Centimeter	140.8	82.2	202.6
Each frame with one side cover and with packaging (ARBO crate)			
- Inches	68.0	36.5	87.6
- Centimeter	141.0	92.7	222.5

Approximate weight:

	New Build Minimum System Model H20 One I/O Drawer	New Build Maximum System Model HA1 Max # of I/O Drawers
System with IBF feature		
- kg	1429.0	2567.0
- lb	3150.0	5661.0
- kg (O/H IO cable exit)	1515.0	2654.0
- lb (O/H IO cable exit)	3340.0	5852.0
System without IBF feature		
- kg	1326.0	2263.0
- lb	2924.0	4991.0
- kg (O/H IO cable exit)	1412.0	2350.0
- lb (O/H IO cable exit)	3114.0	5181.0

To ensure installability and serviceability in non-IBM industry-standard racks, review the installation planning information for any product-specific installation requirements.

The DC Power feature has no effect on the machine dimensions and weight.

Physical specifications - IBM zEnterprise BladeCenter Extension

Dimensions:

	Depth	Width	Height
Each rack with standard covers as installed:			
- Inches	43.3	25.5	79.8
- Centimeter	109.9	64.8	202.7
Palletized rack (Americas)			
- Inches	51.0	32.9	78.8
- Centimeter	129.5	91.2	200.0
Palletized rack (Asia Pacific)			

- Inches	51.0	32.9	83.6
- Centimeter	129.5	91.2	212.5

Approximate weight per rack:

	Maximum System Model 003 with 28 blades per rack
- kg	582
- lb	1280

Operating environment - IBM zEnterprise EC12

Operating environment - AIR-cooled machine

Temperature: 10° to 32°C (50° to 89°F) for all models up to 900 meters; maximum ambient reduces 1°C per 300 meters above 900 meters

Relative humidity: 8% to 80%

Wet bulb (caloric value): 23°C (73°F) - Operating Mode

Maximum dew point: 17°C (62.6°F) - Operating Mode

Electrical power:

- 27.3 kVA (typically 0.997 PF at 200V)
- 27.8 kVA (typically 0.978 PF at 380V)
- 28.7 kVA (typically 0.958 PF at 480V)
- 26.3 kW (at 400V dc)

Capacity of exhaust: 6370 cubic meters / hour (3800 CFM)

Noise level:

- Typical configuration (Model H43)
  - Declared A-Weighted Sound Power Level, LWAd(B) = 7.8
  - Declared A-Weighted Sound Pressure Level, LpAm(dB) = 59
- Maximum configuration (Model HA1)
  - Declared A-Weighted Sound Power Level, LWAd(B) = 8.1
  - Declared A-Weighted Sound Pressure Level, LpAm(dB) = 62

Leakage and starting current: 70 mA / 170 A (approximately 100 microseconds)

To ensure installability and serviceability in non-IBM industry-standard racks, review the installation planning information for any product-specific installation requirements.

Operating environment - WATER-cooled machine

Temperature: 10° to 32°C (50° to 89°F) for all models up to 900 meters; maximum ambient reduces 1°C per 300 meters above 900 meters

Relative humidity: 8% to 80%

Wet bulb (caloric value): 23°C (73°F) - Operating Mode

Maximum dew point: 17°C (62.6°F) - Operating Mode

Electrical power:

- 26.6 kVA (typically 0.996 PF at 200V)
- 27.1 kVA (typically 0.978 PF at 380V)

- 28.0 kVA (typically 0.958 PF at 480V)
- 25.6 kW (at 400V dc)

Capacity of exhaust: 5950 cubic meters / hour (3500 CFM)

Noise level:

- Typical configuration (Model H43)
  - Declared A-Weighted Sound Power Level, LWAd(B) = 7.9
  - Declared A-Weighted Sound Pressure Level, LpAm(dB) = 60
- Maximum configuration (Model HA1)
  - Declared A-Weighted Sound Power Level, LWAd(B) = 8.0
  - Declared A-Weighted Sound Pressure Level, LpAm(dB) = 61

Leakage and starting current: 70 mA / 170 A (approximately 100 microseconds)

To ensure installability and serviceability in non-IBM industry-standard racks, review the installation planning information for any product-specific installation requirements.

Operating environment - IBM zEnterprise BladeCenter Extension

Temperature: 10° to 32°C (50° to 89°F) for all models up to 900 meters; maximum ambient reduces 1°C per 300 meters above 900 meters

Relative humidity: 8% to 80%

Wet bulb (caloric value): 23°C (73°F) - Operating Mode

Maximum dew point: 17°C (62.6°F) - Operating Mode

Electrical power (all values are maximums for the specified solution size; power factor is approximately unity for all cases):

- 12.1 kW, 14 blades
- 21.7 kW, 28 blades
- 31.3 kW, 42 blades
- 40.9 kW, 56 blades
- 50.5 kW, 70 blades
- 60.1 kW, 84 blades
- 69.7 kW, 98 blades
- 79.3 kW, 112 blades

Acoustical noise level for 28-blade configuration and standard door set:

- Declared A-Weighted Sound Power Level, LWAd (B) = 7.9
- Declared A-Weighted Sound Pressure Level, LpAm (dB) = 61

Acoustical noise level for 28-blade configuration and acoustic rear door (#0543):

- Declared A-Weighted Sound Power Level, LWAd (B) = 7.5
- Declared A-Weighted Sound Pressure Level, LpAm (dB) = 57

Acoustical noise level for 56-blade configuration and standard door set:

- Declared A-Weighted Sound Power Level, LWAd (B) = 8.1
- Declared A-Weighted Sound Pressure Level, LpAm (dB) = 63

Acoustical noise level for 56-blade configuration and acoustic rear door (#0543)

- Declared A-Weighted Sound Power Level, LWAd (B) = 7.7
- Declared A-Weighted Sound Pressure Level, LpAm (dB) = 59

Acoustical noise level for 112-blade configuration and standard door set:

- Declared A-Weighted Sound Power Level, LWAd (B) = 8.3
- Declared A-Weighted Sound Pressure Level, LpAm (dB) = 65

Acoustical noise level for 112-blade configuration and acoustic rear door (#0543):

- Declared A-Weighted Sound Power Level, LWAd (B) = 7.9
- Declared A-Weighted Sound Pressure Level, LpAm (dB) = 61

Hardware requirements

The hardware requirements for the System z and its features and functions are identified. **A new driver level is required.** HMC (V2.12.0) plus MCLs and the Support Element (V2.12.0) are available on September 19, 2012.

You should review the PSP buckets for minimum Machine Change Levels (MCLs) and software PTF levels before IPLing operating systems.

HMC system support

The new functions available on the Hardware Management Console (HMC) version 2.12.0, as described, apply exclusively to zEC12. However, the HMC version 2.12.0 will also support the systems listed in the table below.

Family	Machine type	Firmware driver	SE version
z114	2818	93	2.11.1
z196	2817	93	2.11.1
z10 BC	2098	79	2.10.2
z10 EC	2097	79	2.10.2
z9 BC	2096	67	2.9.2
z9 EC	2094	67	2.9.2
z890	2086	55	1.8.2
z990	2084	55	1.8.2
z800	2066	3G	1.7.3
z900	2064	3G	1.7.3

Peripheral hardware and device attachments

IBM devices previously attached to IBM System z10 , z196, and zSeries servers are supported for attachment to IBM zEnterprise EC12 channels, unless otherwise noted. The subject I/O devices must meet the FICON and Fibre Channel Protocol (FCP) architectures to be supported. I/O devices that meet OEMI architecture requirements are supported only using an external converter. Prerequisite Engineering Change Levels may be required. For further detail, contact IBM service personnel.

While the zEC12 supports devices as described above, IBM does not commit to provide support or service for an IBM device that has reached its End of Service effective date as announced by IBM .

Note: IBM cannot confirm the accuracy of performance, compatibility, or any other claims related to non-IBM products. Questions regarding the capabilities of non-IBM products should be addressed to the suppliers of those products.

Information on switches and directors qualified for IBM System z FICON and FCP channels can be found in the *Library* section of Resource Link

http://www.ibm.com/servers/resourcelink/

EMV enhancements to the Common Cryptographic Architecture (CCA) for applications supporting American Express cards applies to the following:

Family	Machine type	Firmware driver
z10	2097,2098	79F
z9	2094,2096	67L
z114	2818	93G
z196	2817	93G

Software requirements

IBM zEnterprise EC12 requires at a minimum:

- z/OS V1.13 with PTFs.
- z/OS V1.12 with PTFs.
- z/OS V1.11 with PTFs (compatibility support only)[1] .
- z/OS V1.10 with the Lifecycle Extension for z/OS 1.10[2] with required maintenance (compatibility support only).
- z/VM V6.2 with PTFs.
- z/VM V6.1 with PTFs.
- z/VM V5.4 with PTFs.
- z/VSE V5.1 with PTFs.
- z/VSE V4.3 with PTFs.
- z/TPF V1.1.
- Linux on System z distributions:
  - SUSE Linux Enterprise Server (SLES): SLES 11 and SLES 10.
  - Red Hat Enterprise Linux (RHEL): RHEL 6 and RHEL 5.
- zBX Support Plan:
  - For POWER7 blades located in IBM BladeCenter Extension Model 003

    http://www.ibm.com/common/ssi/cgi-bin/ssialias?infotype=SA&subtype=WH&appname=STGE_ZS_ZS_USEN&htmlfid=ZSY03019USEN&attachment=ZSY03019USEN.PDF
  - For IBM BladeCenter HX5 blade installed in IBM BladeCenter Extension Model 003

    http://www.ibm.com/common/ssi/cgi-bin/ssialias?infotype=SA&subtype=WH&appname=STGE_ZS_ZS_USEN&htmlfid=ZSL03128USEN&attachment=ZSL03128USEN.PDF

[1] z/OS V1.11 supports IBM zEnterprise EC12 System, however, z/OS V1.11 support will be withdrawn September 30, 2012. After that date, the IBM z/OS Lifecycle Extension for z/OS V1.11 (5657-A01) is required for IBM zEnterprise EC12 System. Speak with your IBM representative for details. No exploitation of new IBM zEnterprise EC12 System function is available with z/OS V1.11. Certain functions and features of the IBM zEnterprise EC12 System require later releases of z/OS . For the complete list of software support, see the PSP buckets and the Software requirements section. For more information on the IBM Lifecycle Extension for z/OS V1.11, see Software Announcement 212-025, dated April 11, 2012 .

[2] z/OS V1.10 support was withdrawn September 30, 2011. However, with the z/OS Lifecycle Extension (5656-A01), z/OS V1.10 supports the IBM zEnterprise EC12 System. Speak with your IBM representative for details. No exploitation of new IBM zEnterprise EC12 System functions is available with z/OS V1.10. Certain functions and features of the IBM zEnterprise EC12 System require later releases of z/OS . For the complete list of software support, see the PSP buckets and the Software requirements section. For more information on the IBM Lifecycle Extension for z/OS V1.10 see Software Announcement 211-002, dated February 15, 2011 .

FICON Express8S (CHPID type FC) when utilizing FICON or Channel-To-Channel (CTC), requires at a minimum:

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM V5.4.
- z/VSE V4.3.
- z/TPF V1.1.
- Linux on System z distributions:
  - SLES 11 and SLES 10.
  - RHEL 6 and RHEL 5.

FICON Express8S (CHPID type FC) for support of zHPF single-track operations requires at a minimum:

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 with PTFs (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 with PTFs (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM 6.2 with PTFs for guest exploitation.
- Linux on System z distributions:
  - SLES 11 SP1.
  - RHEL 6.

FICON Express8S (CHPID type FC) for support of zHPF multitrack operations requires at a minimum:

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 with PTFs (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/VM V6.2 with PTFs for guest exploitation.
- Linux on System z distributions:
  - SLES 11 SP2.
  - RHEL 6.1.

FICON Express8S (CHPID type FCP) for support of SCSI devices requires at a minimum:

- z/VM V5.4 with PTFs.
- z/VSE V4.3.
- Linux on System z distributions:
  - SLES 11 and SLES 10.
  - RHEL 6 and RHEL 5.

FICON Express8S (CHPID type FCP) support of hardware data router requires at a minimum:

- Linux on System z distributions:

  - IBM is working with its Linux distribution partners to include support in future Linux on System z distribution releases.

T10-DIF support by the FICON Express8S and FICON Express8 features when defined as CHPID type FCP requires at a minimum:

- z/VM V5.4 with PTFs for guest exploitation.
- Linux on System z distributions:
  - SLES 11 SP2.
  - IBM is working with its Linux distribution partners to include support in future Linux on System z distribution releases.

OSA-Express4S GbE LX (#0404) and GbE SX (#0405) require at minimum:

CHPID type OSD with exploitation of two ports per CHPID:

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM V6.1.
- z/VM V5.4 with PTFs.
- z/VSE V4.3.
- z/TPF V1.1 PUT 4 with PTFs.
- Linux on System z distributions:
  - SLES 11 and SLES 10 SP2.
  - RHEL 6 and RHEL 5.2.

CHPID type OSD without maximum port exploitation (one port on the PCIe adapter is available for use):

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM V5.4.
- z/VSE V4.3.
- z/TPF V1.1.
- Linux on System z distributions:
  - SLES 11 and SLES 10.
  - RHEL 6 and RHEL 5.

OSA-Express4S 10 GbE LR (#0406) and 10 GbE SR (#0407) require at a minimum:

CHPID type OSD:

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).

- z/VM V5.4.
- z/VSE V4.3.
- z/TPF V1.1.
- Linux on System z distributions:
  - SLES 11 and SLES 10.
  - RHEL 6 and RHEL 5.

CHPID type OSX for access control to the intraensemble data network (IEDN) from IBM zEnterprise EC12 to Unified Resource Manager functions:

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 with PTFs (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 with PTFs (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM 6.2.
- z/VM V6.1 with PTFs.
- z/VM V5.4 with PTFs to define, modify, and delete OSX CHPID types when z/VM is the controlling LPAR for dynamic I/O.
- z/VSE V5.1.
- z/TPF V1.1 PUT 4 with PTFs.
- Linux on System z distributions:
  - SLES 11 SP1 (maintenance update) and SLES 10 SP4.
  - RHEL 6 and RHEL 5.6.

OSA-Express4S 1000BASE-T Ethernet (#0408) requires at minimum:

CHPID type OSC supporting TN3270E and non-SNA DFT with exploitation of two ports per CHPID:

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM V5.4.
- z/VSE V4.3.

CHPID type OSD with exploitation of two ports per CHPID:

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM V6.1.
- z/VM V5.4 with PTFs.
- z/VSE V4.3.
- z/TPF V1.1 PUT 4 with PTFs.
- Linux on System z distributions:
  - SLES 11 and SLES 10 SP2.
  - RHEL 6 and RHEL 5.2.

CHPID type OSD without maximum port exploitation (one port on the PCIe adapter is available for use):

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM V5.4.
- z/VSE V4.3.
- z/TPF V1.1.
- Linux on System z distributions:
  - SLES 11 and SLES 10.
  - RHEL 6 and RHEL 5.

Inbound workload queuing for Enterprise Extender (CHPID type OSD):

- z/OS V1.13 with PTFs.
- z/VM V5.4 with PTFs for guest exploitation.

Checksum offload for IPv6 packets (CHPID type OSD):

- z/OS V1.13 with PTFs.
- z/VM V5.4 for guest exploitation.

Checksum offload for LPAR-to-LPAR traffic for IPv4 and IPv6 packets (CHPID type OSD):

- z/OS V1.13 with PTFs.
- z/VM V5.4 for guest exploitation.

Large Send for IPv6 packets (CHPID type OSD):

- z/OS V1.13 with PTFs.
- z/VM V5.4 for guest exploitation.

CHPID type OSE supporting 4 or 2 ports per feature:

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM V5.4.
- z/VSE V4.3.

CHPID type OSM for intranode management network (INMN) :

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 with PTFs (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 with PTFs (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM 6.2.

- z/VM V6.1 with PTFs.
- z/VM V5.4 with PTFs to define, modify, and delete CHPID type OSM when z/VM is the controlling LPAR for dynamic I/O.
- Linux on System z distributions:
  - SLES 11 SP2 and SLES 10 SP4 (maintenance update).
  - RHEL 6 and RHEL 5.2.

CHPID type OSN for OSA-Express for NCP (does not use ports; all communication is LPAR-to-LPAR):

- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.11 with PTFs (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 with PTFs (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM V5.4.
- z/VSE V4.3.
- z/TPF V1.1 PUT 4 with APARs.
- Linux on System z distributions:
  - SLES 11 and SLES 10.
  - RHEL 6 and RHEL 5.

RMF coupling channel reporting requires:

- z/OS V1.13 with PTFs (with the Resource Measurement Facility™ (RMF) feature enabled).
- z/OS V1.12 with PTFs (with the RMF feature enabled).

CFCC Level 18 conditional writes to a DB2 group buffer pool (GBP) requires:

- z/OS V1.13 with PTFs.
- z/OS V1.12 with PTFs.
- z/VM 5.4 with PTFs for guest exploitation.
- DB2 11 with PTFs.

Crypto Express4S (#0865) Toleration, which treats Crypto Express4S cryptographic coprocessors and accelerators as Crypto Express3 coprocessors and accelerators, requires at a minimum:

- z/OS V1.13 with PTFs.
- z/OS V1.12 with PTFs.
- z/OS V1.11 with the Cryptographic Support for z/OS V1R9-V1R11 web deliverable installed with additional PTFs (the z/OS Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 with the Cryptographic Support for z/OS V1R9-V1R11 web deliverable installed with additional PTFs (the z/OS Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM 5.4 with PTFs for guest exploitation.
- z/VSE V5.1 with PTFs.
- Linux on System z distributions:
  - SLES 11 SP1 (maintenance update) and SLES 10 SP4 (maintenance update).
  - RHEL 6.2 and RHEL 5.8.
  - For secure-key cryptography with Linux on System z , CCA 4.2 is available. For details see

    http://www.ibm.com/security/cryptocards/pciecc/ordersoftware.shtml

Crypto Express4S (#0865) support of X9.8 Pin, 64 Bit, HMAC, CKDS Constraint Relief, PCI Audit, ECC HW Support, CBC Key Wrap, and PKA RSA OAEP with SHA-256 algorithm, requires at a minimum:

- z/OS V1.13 with PTFs.
- z/OS V1.12 with the Cryptographic Support for z/OS V1R10-V1R12 web deliverable installed with additional PTFs.
- z/OS V1.11 with the Cryptographic Support for z/OS V1R10-V1R12 web deliverable installed with additional PTFs (the z/OS Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 with the Cryptographic Support for z/OS V1R10-V1R12 web deliverable installed with additional PTFs (the z/OS Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).
- z/VM 5.4 with PTFs for guest exploitation.
- Linux on System z distributions with CCA:
  - SLES 11 SP1 (maintenance update) and SLES 10 SP4 (maintenance update).
  - RHEL 6.2 and RHEL 5.8.
  - CCA 4.2, see

    http://www.ibm.com/security/cryptocards/pciecc/ordersoftware.shtml

Crypto Express 4S (#0865) support of Expanded key support for AES algorithm, enhanced ANSI TR-31 Secure Key Exchange, PIN block decimalization table protection, PKA RSA OAEP with SHA-256 algorithm, or additional Elliptic Curve Cryptography (ECC) functions requires at a minimum:

- z/OS V1.13 with the Cryptographic Support for z/OS V1R11-V1R13 web deliverable installed with additional PTFs.
- z/OS V1.12 with the Cryptographic Support for z/OS V1R11-V1R13 web deliverable installed with additional PTFs.
- z/OS V1.11 with the Cryptographic Support for z/OS V1R11-V1R13 web deliverable installed with additional PTFs (the z/OS Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support)
- z/VM 5.4 with PTFs for guest exploitation.
- Linux on System z distributions with CCA:
  - SLES 11 SP1 (maintenance update) and SLES 10 SP4 (maintenance update).
  - RHEL 6.2 and RHEL 5.8.
  - CCA 4.2, see

    http://www.ibm.com/security/cryptocards/pciecc/ordersoftware.shtml

Crypto Express 4S (#0865) exploitation including: Enterprise Security PKCS #11-Hardware Security Module (HSM), DUKPT for MAC and Data Encryption, Cipher Text Translate CCA Verb, PKDS/TKDS Constraint Relief, Random Number Cache, FIPS on Demand, or Wrapping Keys with Strong Keys, requires at a minimum:

- z/OS V1.13 with the Cryptographic Support for z/OS V1R12-V1R13 web deliverable installed.
- z/OS V1.12 with the Cryptographic Support for z/OS V1R12-V1R13 web deliverable installed.
- z/VM 5.4 with PTFs for guest exploitation.

XL C/C++ support of ARCH(10) and TUNE(10) parameters requires at a minimum:

- z/OS V1.13 with PTFs.

Transactional memory requires at a minimum:

- z/OS V1.13 with PTFs.

IBM zAware requires at a minimum:

- z/OS V1.13 with PTFs.

  Note: z/OS V1.13 LPARs on prior server generations (for example, z196, z114, or z10) can provide data to the IBM zAware LPAR if they have the PTFs installed and are configured to exploit IBM zAware.

Flash Express requires at a minimum:

- z/OS V1.13 with PTFs and the z/OS V1.13 RSM Enablement Offering web deliverable installed. The web deliverable is planned to be available at

  http://www.ibm.com/systems/z/os/zos/downloads/
- Linux on System z distributions:
  - IBM is working with its Linux distribution partners to include support in future Linux on System z distribution releases.

2 GB Large Pages requires at a minimum:

- z/OS V1.13 with PTFs and the z/OS V1.13 RSM Enablement Offering web deliverable installed. The web deliverable is planned to be available at

  http://www.ibm.com/systems/z/os/zos/downloads/

z/OS global resource serialization (GRS) support for FICON CTCs requires at a minimum:

- z/OS V1.13 with PTFs.
- z/OS V1.12 with PTFs.
- z/OS V1.11 with PTFs (the IBM Lifecycle Extension for z/OS V1.11 (5657-A01) is required for support).
- z/OS V1.10 with PTFs (the IBM Lifecycle Extension for z/OS V1.10 (5656-A01) is required for support).

Planning information

Customer responsibilities

Information on customer responsibilities for site preparation can be found in the Library section of Resource Link at

http://www.ibm.com/servers/resourcelink

Installability

The average installation time for a zEC12 is approximately 22 installer hours. This does not include planning hours. This assumes the Pre-Installation Configuration Service, a full System Assurance Product Review, and implementation of the cable services have been performed. See your IBM representative for details on these services.

Security, auditability, and control

The zEC12 uses the security and auditability features and functions of host hardware, host software, and application software.

The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communications facilities.

IBM Electronic Services

IBM has transformed its delivery of hardware and software support services to help you achieve higher system availability. Electronic Services is a web-enabled solution that offers an exclusive, no-additional-charge enhancement to the service and support available for IBM servers. These services are designed to provide the opportunity for greater system availability with faster problem resolution and preemptive monitoring. Electronic Services comprises two separate, but complementary, elements: Electronic Services news page and Electronic Services Agent.

The Electronic Services news page is a single Internet entry point that replaces the multiple entry points traditionally used to access IBM Internet services and support. The news page enables you to gain easier access to IBM resources for assistance in resolving technical problems.

The Electronic Service Agent™ is no-additional-charge software that resides on your server. It monitors events and transmits system inventory information to IBM on a periodic, client-defined timetable. The Electronic Service Agent automatically reports hardware problems to IBM . Early knowledge about potential problems enables IBM to deliver proactive service that may result in higher system availability and performance. In addition, information collected through the Service Agent is made available to IBM service support representatives when they help answer your questions or diagnose problems. Installation and use of IBM Electronic Service Agent for problem reporting enables IBM to provide better support and service for your IBM server.

To learn how Electronic Services can work for you, visit

http://www.ibm.com/support/electronic

Terms and conditions

IBM Global Financing

Yes

Warranty period - IBM zEnterprise EC12

One year

Warranty period - IBM zEnterprise BladeCenter Extension

One year

An IBM part or feature installed during the initial installation of an IBM machine is subject to a full warranty effective on the date of installation of the machine. An IBM part or feature that replaces a previously installed part or feature assumes the remainder of the warranty period for the replaced part or feature. An IBM part or feature added to a machine without replacing a previously installed part or feature is subject to a full warranty effective on its date of installation. Unless specified otherwise, the warranty period, type of warranty service, and service level of a part or feature are the same as those for the machine in which it is installed.

Extended Warranty Service - IBM zEnterprise BladeCenter Extension

zBX provides increased service over normal blades with the following characteristics:

- IBM intends to deliver the enhanced System z model of service and support for all IBM blade products that are supported for use in the zBX. The enhanced service and support for IBM Blades is intended to be available when the blades are installed in a zBX and activated via a unique System z feature code (feature #0612 and #0613) This service model includes 24x7 on-site support, including

FRU replacement by the client's local Service Support Representative (SSR), during the zBX's warranty period. As such, a customer who installs supported IBM blades and acquires the requisite feature code on the zBX will receive the benefits of the zBX warranty service. This practice is valid unless the customer removes the blade and requests to have such service delivered according to the blade's entitlement.

- Warranty service upgrades and post-warranty IBM maintenance contracts should not be purchased by customers when ordering an IBM blade for installation in a zBX since System z is providing the higher level of service for blades while they are installed in a zBX.
- For all hardware that will be installed in System z servers serviced by IBM during their warranty period or under a post-warranty IBM maintenance service contract, there must be an active software maintenance agreement (SWMA) in place in order to service the software under its control. For example, for each POWER7 blade in the zBX (feature #0612), there must be an active PowerVM EE SWMA in place. Failure to maintain SWMA may result in IBM not being able to service that particular #0612.
- The IBM blades will be customer supplied and customer installed in this zBX solution.

Warranty service

The specified level of maintenance service may not be available in all worldwide locations. Additional charges may apply outside IBM's normal service area. Contact your local IBM representative or your reseller for country- and location-specific information.

IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

The following service is available as warranty for your machine type.

- 24 hours per day, 7 days a week, same day response

Warranty service upgrades

The specified level of maintenance service may not be available in all worldwide locations. Additional charges may apply outside IBM's normal service area. Contact your local IBM representative or your reseller for country- and location-specific information.

IBM On-site Service: IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

The following service is provided.

- 24 hours per day, 7 days a week, same day response

Usage plan machine

No

IBM hourly service rate classification

Three

When a type of service involves the exchange of a machine part, the replacement may not be new, but will be in good working order.

Field-installable features

Yes

Model conversions

Yes

Machine installation

Installation is performed by IBM . IBM will install the machine in accordance with the IBM installation procedures for the machine. In the United States, contact IBM at 1-800-IBM-SERV (426-7378).

Graduated program license charges apply

No

Licensed internal code

IBM Licensed Internal Code (LIC) is licensed for use by a customer on a Specific Machine, designated by serial number, under the terms and conditions of the IBM Agreement for Licensed Internal Code, to enable a Specific Machine to function in accordance with its Specifications, and only for the capacity authorized by IBM and for which the customer has acquired licenses. You can obtain the agreement at

http://www.ibm.com/systems/support/machine_warranties/machine_code.html

or by contacting your IBM representative.

Specific Machine LIC Type Model: 2827-H20, 2827-H43, 2827-H66, 2827-H89, 2827-HA1

Terms for use of IBM zAware: The terms for use of IBM zAware are specified in the IBM Customer Agreement, Attachment for the IBM zAware Offering (in the US, form number Z125-8993-US). Each enterprise is required to sign this contract one time within a given country before IBM will accept an order for its first-ever instance of the IBM zAware enablement feature (feature #0011).

Elliptical Curve Cryptography technology (ECC) is included with the IBM zEnterprise EC12 cryptography features. This technology is delivered through the machine's Licensed Internal Code, and requires license terms in addition to the standard IBM License Agreement for Machine Code (LMC) referenced above. These additional terms are delivered through the LMC's Addendum for Elliptical Curve Cryptography, which is available at

http://www.ibm.com/systems/support/machine_warranties/machine_code_cryptadd.html

The terms of this ECC Addendum are included with the LMC when a cryptography feature is included in the IBM zEnterprise EC12 order, or when a cryptography feature is carried forward as part of an MES order into IBM zEnterprise EC12.

Acceptance-By-Use Machine: No.

Educational allowance

A reduced charge is available to qualified education customers. The educational allowance may not be added to any other discount or allowance.

Prices

For all local charges, contact your IBM representative.

Products

Description	Mach type	Mod	Feat	**	EW MMMC fe indicator	Init/ MES
IBM zEnterprise EC12	2827	H20		**	X	
		H43		**	X	
		H66		**	X	
		H89		**	x	
		HA1		**	X	
MTU 1 - D			0001	**		MES
MTU 100 - D			0002	**		MES
MTU 1 - V			0003	**		Both
MTU 100 - V			0004	**		Both
GTU 1 - D			0005	**		MES
GTU 100 - D			0006	**		MES
GTU 1 - V			0007	**		MES
GTU 100 - V			0008	**		MES
GTU 1000 - D			0009	**		MES
GTU 1000 - V			0010	**		MES
HMC			0091	**		Both
I/O Cage ISC-D Airflow			0113	**		Both
I/O Cage Full Card Airflow			0114	**		Both
1 CPE Capacity Unit			0116	**		Both
100 CPE Capacity Unit			0117	**		Both
10000 CPE Capacity Unit			0118	**		Both
1 CPE Capacity Unit-IFL			0119	**		Both
100 CPE Capacity Unit-IFL			0120	**		Both
1 CPE Capacity Unit-ICF			0121	**		Both
100 CPE Capacity Unit-ICF			0122	**		Both
1 CPE Capacity Unit-zAAP			0123	**		Both
100 CPE Capacity Unit-zAAP			0124	**		Both
1 CPE Capacity Unit-zIIP			0125	**		Both
100 CPE Capacity Unit-zIIP			0126	**		Both
1 CPE Capacity Unit-SAP			0127	**		Both
100 CPE Capacity Unit-SAP			0128	**		Both
CPC - Radiator			0147	**		Both
CPC - Water			0149	**		Both
Fanout Airflow			0165	**		Both
PCIe Fanout			0169	**		Both
HCA3-O LR fanout for 1x IFB			0170	**		Both
HCA3-O fanout for 12x IFB			0171	**		Both
HCA2-C Fanout *			0162	**		Both
ISC-Mother Card *			0217	**		Both
ISC-Daughter Card *			0218	**		Both
ISC-3 link on F/C 0218 *			0219	**		Both
IFB-MP Daughter Card *			0326	**		Both
STI-A8 Mother Card *			0327	**		Both
Manage FW Suite			0019	**		Both
Automate/Adv Mgmt FW Suite			0020	**		Both
Ensemble membership			0025	**		Both
zBX Detach			0030	**		MES
zBX Attach			0031	**		Both
Manage FW DP			0047	**		Both
Manage FW Pwr Blade			0048	**		Both
Manage FW IBM System x Bl			0049	**		Both
Automate FW DP			0050	**		Both
Automate FW Pwr Blade			0051	**		Both
Adv Mgmt FW System x Blade			0053	**		Both
Automate FW IFL			0054	**		Both
IBM zAware			0011	**		Both
IBM zAware CP 10 pack			0101	**		Both
IBM zAware DR CP 10 pack			0102	**		Both
STI-A4 Mother Card			0328	**		Both
PCIe Interconnect Card			0400	**		Both
FlashExp zOS est avail 12/12			0402	**		Both

OSA-Express4S 1 GbE LX	0404	**	Both
OSA-Express4S 1 GbE SX	0405	**	Both
OSA-Express4S 10 GbE LR	0406	**	Both
OSA-Express4S 10 GbE SR	0407	**	Both
OSA-Express4S 1000BASE-T	0408	**	Both
FICON Express8S 10Km LX	0409	**	Both
FICON Express8S SX	0410	**	Both
Month Indicator	0660	**	Both
Day Indicator	0661	**	Both
Hour Indicator	0662	**	Both
Minute Indicator	0663	**	Both
TKE workstation	0841	**	Both
TKE 7.2 LIC	0850	**	Both
Crypto Express4S	0865	**	Both
Addl smart cards	0884	**	Both
TKE Smart Card Reader	0885	**	Both
UID Label for DoD	0998	**	Both
STP Enablement	1021	**	Both
EMEA Special Operations	1022	**	Both
4 GB Mem DIMM(5/feat)	1614	**	Both
16 GB Mem DIMM(5/feat)	1615	**	Both
32 GB Mem DIMM(5/feat)	1618	**	Both
LICCC Ship Via Net Ind	1750	**	MES
32GB Preplanned memory	1990	**	Both
16GB Preplanned memory	1996	**	Both
32GB FTR Converted memory	1897	**	MES
32GB Memory Capacity Incr	1898	**	Both
16GB Memory Capacity Incr	1899	**	Both
16GB FTR Converted memory	1900	**	MES
Line Cord Plan Ahead	2000	**	Both
32 GB Memory	2425	**	Both
64 GB Memory	2427	**	Both
96 GB Memory	2429	**	Both
128 GB Memory	2431	**	Both
160 GB Memory	2433	**	Both
192 GB Memory	2435	**	Both
224 GB Memory	2437	**	Both
256 GB Memory	2439	**	Both
320 GB Memory	2441	**	Both
384 GB Memory	2443	**	Both
448 GB Memory	2445	**	Both
512 GB Memory	2447	**	Both
608 GB Memory	2449	**	Both
704 GB Memory	2451	**	Both
US English	2924	**	Init
France	2928	**	Init
German	2929	**	Init
Spanish - Non Spain	2930	**	Init
Spain	2931	**	Init
Italian	2932	**	Init
Canadian French	2935	**	Init
Portuguese	2978	**	Init
Brazilian Portuguese	2979	**	Init
UK English	2980	**	Init
Norwegian	2983	**	Init
Sweden Finland	2987	**	Init
Netherlands	2988	**	Init
Belgian French	2989	**	Init
Denmark	2993	**	Init
Swiss French, German	2997	**	Init
Luxembourg-Belgium ordered	5560	**	Init
Iceland-Ordered in Denmark	5561	**	Init
China-Ordered in Hong Kong	5562	**	Init
Flat Panel Display	6096	**	Both

Balanced Power Plan Ahead	3003	**	Both
BPD Pair	3008	**	Both
BPR Pair	3009	**	Both
Internal Battery IBF-ED	3213	**	Both
Fill and Drain Kit	3378	**	Both
Universal Lift Tool/Ladder	3759	**	Both
Serv Docs Optional Print	0033	**	Both
CPACF Enablement	3863	**	Both
I/O Cage	4007	**	Both
I/O Drawer	4008	**	Both
PCIe I/O Drawer	4009	**	Both
14ft Water Hose	7801	**	Both
Top Exit w/Power	7901	**	Both
FQC Bracket & Mounting Hdw	7922	**	Both
LC Duplex 6.6ft Harnesses	7927	**	Both
Top Exit I/O Cabling **	7942	**	Both
Non Raised Floor Support **	7998	**	Both
Side Covers	7949	**	Both
3-in-1 Bolt Down Kit	8000	**	Both
3-in-1 Bolt Down Kit-W	8001	**	Both
Bolt Down Kit, NRF	8002	**	Both
380-520V DC TE cord BPE-1	8947	**	Both
200V 3Ph TE cord BPE-1	8952	**	Both
380-520V DC TE cord BPE-2	8953	**	Both
200V 3Ph TE cord BPE-2	8955	**	Both
14ft 200V 3ph cord	8993	**	Both
480V 3ph TE cord	8950	**	Both
14ft 480V 3ph line cord	8983	**	Both
14ft 380-520V DC line cord	8963	**	Both
14 ft 380-415V 3PH	8976	**	Both
380-415V 3PH TE Cord	8977	**	Both
Multi Order Ship Flag	9000	**	Both
Multi Order Rec Only-NB	9001	**	Both
Multi Order Rec Only-MES	9002	**	MES
RPO Action Flag	9003	**	MES
Downgraded PUs Per Request	9004	**	Both
On/Off CoD Act IFL Day	9888	**	MES
On/Off CoD Act ICF Day	9889	**	MES
On/Off CoD Act zAAP Day	9893	**	MES
On/Off CoD authorization	9896	**	Both
On/Off CoD Act Cap CP Day	9897	**	MES
Perm upgr authorization	9898	**	Both
CIU Activation (Flag)	9899	**	MES
On Line CoD Buying (Flag)	9900	**	Both
On/Off CoD Act zIIP Day	9908	**	MES
On/Off CoD Act SAP Day	9909	**	MES
CBU authorization	9910	**	Both
CPE authorization	9912	**	Both
OPO sales authorization	9913	**	Both
1 MSU day	9917	**	MES
100 MSU days	9918	**	MES
10000 MSU days	9919	**	MES
1 IFL day	9920	**	MES
100 IFL days	9921	**	MES
1 ICF day	9922	**	MES
100 ICF days	9923	**	MES
1 zIIP day	9924	**	MES
100 zIIP days	9925	**	MES
1 zAAP day	9926	**	MES
100 zAAP days	9927	**	MES
1 SAP day	9928	**	MES
100 SAP days	9929	**	MES

Site Tool Kit	9968	**		Both
Weight Distribution Kit	9970	**		Both
Height Reduce Ship	9975	**		Both
Height Reduce for Return	9976	**		MES
CP4	1905	**		Both
CP5	1906	**		Both
CP6	1907	**		Both
CP7	1908	**		Both
IFL	1909	**	x	Both
ICF	1910	**	x	Both
SAP (optional)	1911	**		Both
zAAP	1912	**	x	Both
zIIP	1913	**	x	Both
Unassigned IFL	1914	**		Both
Additional CBU Test	6805	**		Both
Total CBU Years Ordered	6817	**		Both
CBU Records Ordered	6818	**		Both
Single CBU CP-Year	6820	**		Both
25 CBU CP-Year	6821	**		Both
Single CBU IFL-Year	6822	**		Both
25 CBU IFL-Year	6823	**		Both
Single CBU ICF-Year	6824	**		Both
25 CBU ICF-Year	6825	**		Both
Single CBU zAAP-Year	6826	**		Both
25 CBU zAAP-Year	6827	**		Both
Single CBU zIIP-Year	6828	**		Both
25 CBU zIIP-Year	6829	**		Both
Single CBU SAP-Year	6830	**		Both
25 CBU SAP-Year	6831	**		Both
CBU Replenishment	6832	**		MES
Capacity for Planned Event	6833	**		Both
OPO Sales Flag	6835	**		Both
OPO Sales Flag Alteration	6836	**		MES
0-Way Processor CP4	7400	**	x	Both
1-Way Processor CP4	7325	**	x	Both
2-Way Processor CP4	7326	**	x	Both
3-Way Processor CP4	7327	**	x	Both
4-Way Processor CP4	7328	**	x	Both
5-Way Processor CP4	7329	**	x	Both
6-Way Processor CP4	7330	**	x	Both
7-Way Processor CP4	7331	**	x	Both
8-Way Processor CP4	7332	**	x	Both
9-Way Processor CP4	7333	**	x	Both
10-Way Processor CP4	7334	**	x	Both
11-Way Processor CP4	7335	**	x	Both
12-Way Processor CP4	7336	**	x	Both
13-Way Processor CP4	7337	**	x	Both
14-Way Processor CP4	7338	**	x	Both
15-Way Processor CP4	7339	**	x	Both
16-Way Processor CP4	7340	**	x	Both
17-Way Processor CP4	7341	**	x	Both
18-Way Processor CP4	7342	**	x	Both
19-Way Processor CP4	7343	**	x	Both
20-Way Processor CP4	7344	**	x	Both
1-Way Processor CP5	7350	**	x	Both
2-Way Processor CP5	7351	**	x	Both
3-Way Processor CP5	7352	**	x	Both
4-Way Processor CP5	7353	**	x	Both
5-Way Processor CP5	7354	**	x	Both
6-Way Processor CP5	7355	**	x	Both
7-Way Processor CP5	7356	**	x	Both
8-Way Processor CP5	7357	**	x	Both
9-Way Processor CP5	7358	**	x	Both
10-Way Processor CP5	7359	**	x	Both
11-Way Processor CP5	7360	**	x	Both
12-Way Processor CP5	7361	**	x	Both
13-Way Processor CP5	7362	**	x	Both
14-Way Processor CP5	7363	**	x	Both
15-Way Processor CP5	7364	**	x	Both
16-Way Processor CP5	7365	**	x	Both

17-Way Processor CP5	7366	**	x	Both
18-Way Processor CP5	7367	**	x	Both
19-Way Processor CP5	7368	**	x	Both
20-Way Processor CP5	7369	**	x	Both
1-Way Processor CP6	7375	**	x	Both
2-Way Processor CP6	7376	**	x	Both
3-Way Processor CP6	7377	**	x	Both
4-Way Processor CP6	7378	**	x	Both
5-Way Processor CP6	7379	**	x	Both
6-Way Processor CP6	7380	**	x	Both
7-Way Processor CP6	7381	**	x	Both
8-Way Processor CP6	7382	**	x	Both
9-Way Processor CP6	7383	**	x	Both
10-Way Processor CP6	7384	**	x	Both
11-Way Processor CP6	7385	**	x	Both
12-Way Processor CP6	7386	**	x	Both
13-Way Processor CP6	7387	**	x	Both
14-Way Processor CP6	7388	**	x	Both
15-Way Processor CP6	7389	**	x	Both
16-Way Processor CP6	7390	**	x	Both
17-Way Processor CP6	7391	**	x	Both
18-Way Processor CP6	7392	**	x	Both
19-Way Processor CP6	7393	**	x	Both
20-Way Processor CP6	7394	**	x	Both
1-Way Processor CP7	7401	**	x	Both
2-Way Processor CP7	7402	**	x	Both
3-Way Processor CP7	7403	**	x	Both
4-Way Processor CP7	7404	**	x	Both
5-Way Processor CP7	7405	**	x	Both
6-Way Processor CP7	7406	**	x	Both
7-Way Processor CP7	7407	**	x	Both
8-Way Processor CP7	7408	**	x	Both
9-Way Processor CP7	7409	**	x	Both
10-Way Processor CP7	7410	**	x	Both
11-Way Processor CP7	7411	**	x	Both
12-Way Processor CP7	7412	**	x	Both
13-Way Processor CP7	7413	**	x	Both
14-Way Processor CP7	7414	**	x	Both
15-Way Processor CP7	7415	**	x	Both
16-Way Processor CP7	7416	**	x	Both
17-Way Processor CP7	7417	**	x	Both
18-Way Processor CP7	7418	**	x	Both
19-Way Processor CP7	7419	**	x	Both
20-Way Processor CP7	7420	**	x	Both
401 Capacity Marker	8641	**		Both
402 Capacity Marker	8642	**		Both
403 Capacity Marker	8643	**		Both
404 Capacity Marker	8644	**		Both
405 Capacity Marker	8645	**		Both
406 Capacity Marker	8646	**		Both
407 Capacity Marker	8647	**		Both
408 Capacity Marker	8648	**		Both
409 Capacity Marker	8649	**		Both
410 Capacity Marker	8650	**		Both
411 Capacity Marker	8651	**		Both
412 Capacity Marker	8652	**		Both
413 Capacity Marker	8653	**		Both
414 Capacity Marker	8654	**		Both
415 Capacity Marker	8655	**		Both
416 Capacity Marker	8656	**		Both
417 Capacity Marker	8657	**		Both
418 Capacity Marker	8658	**		Both
419 Capacity Marker	8659	**		Both
420 Capacity Marker	8660	**		Both
501 Capacity Marker	8666	**		Both
502 Capacity Marker	8667	**		Both
503 Capacity Marker	8668	**		Both
504 Capacity Marker	8669	**		Both
505 Capacity Marker	8670	**		Both
506 Capacity Marker	8671	**		Both
507 Capacity Marker	8672	**		Both
508 Capacity Marker	8673	**		Both
509 Capacity Marker	8674	**		Both

510 Capacity Marker	8675	**		Both
511 Capacity Marker	8676	**		Both
512 Capacity Marker	8677	**		Both
513 Capacity Marker	8678	**		Both
514 Capacity Marker	8679	**		Both
515 Capacity Marker	8680	**		Both
516 Capacity Marker	8681	**		Both
517 Capacity Marker	8682	**		Both
518 Capacity Marker	8683	**		Both
519 Capacity Marker	8684	**		Both
520 Capacity Marker	8685	**		Both
601 Capacity Marker	8691	**		Both
602 Capacity Marker	8692	**		Both
603 Capacity Marker	8693	**		Both
604 Capacity Marker	8694	**		Both
605 Capacity Marker	8695	**		Both
606 Capacity Marker	8696	**		Both
607 Capacity Marker	8697	**		Both
608 Capacity Marker	8698	**		Both
609 Capacity Marker	8699	**		Both
610 Capacity Marker	8700	**		Both
611 Capacity Marker	8701	**		Both
612 Capacity Marker	8702	**		Both
613 Capacity Marker	8703	**		Both
614 Capacity Marker	8704	**		Both
615 Capacity Marker	8705	**		Both
616 Capacity Marker	8706	**		Both
617 Capacity Marker	8707	**		Both
618 Capacity Marker	8708	**		Both
619 Capacity Marker	8709	**		Both
620 Capacity Marker	8710	**		Both
400 Capacity Marker	8716	**		Both
701 Capacity Marker	8717	**		Both
702 Capacity Marker	8718	**		Both
703 Capacity Marker	8719	**		Both
704 Capacity Marker	8720	**		Both
705 Capacity Marker	8721	**		Both
706 Capacity Marker	8722	**		Both
707 Capacity Marker	8723	**		Both
708 Capacity Marker	8724	**		Both
709 Capacity Marker	8725	**		Both
710 Capacity Marker	8726	**		Both
711 Capacity Marker	8727	**		Both
712 Capacity Marker	8728	**		Both
713 Capacity Marker	8729	**		Both
714 Capacity Marker	8730	**		Both
715 Capacity Marker	8731	**		Both
716 Capacity Marker	8732	**		Both
717 Capacity Marker	8733	**		Both
718 Capacity Marker	8734	**		Both
719 Capacity Marker	8735	**		Both
720 Capacity Marker	8736	**		Both
IBM zEnterprise EC12 2827 H20				
Model H20 - Air Cooled	1095	**	x	Both
Model H20 - Water Cooled	1099	**	x	Both
A Fr Water Single Node	4025	**		Both
A Fr Radiator Single Node	4026	**		Both
IBM zEnterprise EC12 2827 H43				
Model H43 - Air Cooled	1096	**	x	Both
Model H43 - Water Cooled	1100	**	x	Both
IBM zEnterprise EC12 2827 H66				
Model H66 - Air Cooled	1097	**	x	Both
Model H66 - Water Cooled	1101	**	x	Both
IBM zEnterprise EC12 2827 H89				
Model H89 - Air Cooled	1098	**	x	Both
Model H89 - Water Cooled	1102	**	x	Both
IBM zEnterprise EC12 2827 HA1				
Model HA1 - Air Cooled	1106	**	x	Both

Model HA1 - Water Cooled			1145	**	x	Both
IBM zEnterprise EC12	2827	H43 H66 H89 HA1				
800 GB Memory			2453	**		Both
896 GB Memory			2455	**		Both
1008 GB Memory			2457	**		Both
1136 GB Memory			2459	**		Both
1264 GB Memory			2461	**		Both
1392 GB Memory			2463	**		Both
A Fr Water Multi Node			4022	**		Both
A Fr Radiator Multi Node			4024	**		Both
21-Way Processor CP7			7421	**	x	Both
22-Way Processor CP7			7422	**	x	Both
23-Way Processor CP7			7423	**	x	Both
24-Way Processor CP7			7424	**	x	Both
25-Way Processor CP7			7425	**	x	Both
26-Way Processor CP7			7426	**	x	Both
27-Way Processor CP7			7427	**	x	Both
28-Way Processor CP7			7428	**	x	Both
29-Way Processor CP7			7429	**	x	Both
30-Way Processor CP7			7430	**	x	Both
31-Way Processor CP7			7431	**	x	Both
32-Way Processor CP7			7432	**	x	Both
33-Way Processor CP7			7433	**	x	Both
34-Way Processor CP7			7434	**	x	Both
35-Way Processor CP7			7435	**	x	Both
36-Way Processor CP7			7436	**	x	Both
37-Way Processor CP7			7437	**	x	Both
38-Way Processor CP7			7438	**	x	Both
39-Way Processor CP7			7439	**	x	Both
40-Way Processor CP7			7440	**	x	Both
41-Way Processor CP7			7441	**	x	Both
42-Way Processor CP7			7442	**	x	Both
43-Way Processor CP7			7443	**	x	Both
721 Capacity Marker			8737	**		Both
722 Capacity Marker			8738	**		Both
723 Capacity Marker			8739	**		Both
724 Capacity Marker			8740	**		Both
725 Capacity Marker			8741	**		Both
726 Capacity Marker			8742	**		Both
727 Capacity Marker			8743	**		Both
728 Capacity Marker			8744	**		Both
729 Capacity Marker			8745	**		Both
730 Capacity Marker			8746	**		Both
731 Capacity Marker			8747	**		Both
732 Capacity Marker			8748	**		Both
733 Capacity Marker			8749	**		Both
734 Capacity Marker			8750	**		Both
735 Capacity Marker			8751	**		Both
736 Capacity Marker			8752	**		Both
737 Capacity Marker			8753	**		Both
738 Capacity Marker			8754	**		Both
739 Capacity Marker			8755	**		Both
740 Capacity Marker			8756	**		Both
741 Capacity Marker			8757	**		Both
742 Capacity Marker			8758	**		Both
743 Capacity Marker			8759	**		Both
IBM zEnterprise EC12	2827	H66 H89 HA1				
1520 GB Memory			2465	**		Both
1760 GB Memory			2478	**		Both
2016 GB Memory			2479	**		Both
2272 GB Memory			2480	**		Both
44-Way Processor CP7			7444	**	x	Both
45-Way Processor CP7			7445	**	x	Both
46-Way Processor CP7			7446	**	x	Both

47-Way Processor CP7			7447	**	x	Both
48-Way Processor CP7			7448	**	x	Both
49-Way Processor CP7			7449	**	x	Both
50-Way Processor CP7			7450	**	x	Both
51-Way Processor CP7			7451	**	x	Both
52-Way Processor CP7			7452	**	x	Both
53-Way Processor CP7			7453	**	x	Both
54-Way Processor CP7			7454	**	x	Both
55-Way Processor CP7			7455	**	x	Both
56-Way Processor CP7			7456	**	x	Both
57-Way Processor CP7			7457	**	x	Both
58-Way Processor CP7			7458	**	x	Both
59-Way Processor CP7			7459	**	x	Both
60-Way Processor CP7			7460	**	x	Both
61-Way Processor CP7			7461	**	x	Both
62-Way Processor CP7			7462	**	x	Both
63-Way Processor CP7			7463	**	x	Both
64-Way Processor CP7			7464	**	x	Both
65-Way Processor CP7			7465	**	x	Both
66-Way Processor CP7			7466	**	x	Both
744 Capacity Marker			8760	**		Both
745 Capacity Marker			8761	**		Both
746 Capacity Marker			8762	**		Both
747 Capacity Marker			8763	**		Both
748 Capacity Marker			8764	**		Both
749 Capacity Marker			8765	**		Both
750 Capacity Marker			8766	**		Both
751 Capacity Marker			8767	**		Both
752 Capacity Marker			8768	**		Both
753 Capacity Marker			8769	**		Both
754 Capacity Marker			8770	**		Both
755 Capacity Marker			8771	**		Both
756 Capacity Marker			8772	**		Both
757 Capacity Marker			8773	**		Both
758 Capacity Marker			8774	**		Both
759 Capacity Marker			8775	**		Both
760 Capacity Marker			8776	**		Both
761 Capacity Marker			8777	**		Both
762 Capacity Marker			8778	**		Both
763 Capacity Marker			8779	**		Both
764 Capacity Marker			8780	**		Both
765 Capacity Marker			8781	**		Both
766 Capacity Marker			8782	**		Both
IBM zEnterprise EC12	2827	H89 HA1				
2528 GB Memory			2481	**		Both
2784 GB Memory			2482	**		Both
3040 GB Memory			2483	**		Both
67-Way Processor CP7			7467	**	x	Both
68-Way Processor CP7			7468	**	x	Both
69-Way Processor CP7			7469	**	x	Both
70-Way Processor CP7			7470	**	x	Both
71-Way Processor CP7			7471	**	x	Both
72-Way Processor CP7			7472	**	x	Both
73-Way Processor CP7			7473	**	x	Both
74-Way Processor CP7			7474	**	x	Both
75-Way Processor CP7			7475	**	x	Both
76-Way Processor CP7			7476	**	x	Both
77-Way Processor CP7			7477	**	x	Both
78-Way Processor CP7			7478	**	x	Both
79-Way Processor CP7			7479	**	x	Both
80-Way Processor CP7			7480	**	x	Both
81-Way Processor CP7			7481	**	x	Both
82-Way Processor CP7			7482	**	x	Both
83-Way Processor CP7			7483	**	x	Both
84-Way Processor CP7			7484	**	x	Both
85-Way Processor CP7			7485	**	x	Both
86-Way Processor CP7			7486	**	x	Both
87-Way Processor CP7			7487	**	x	Both
88-Way Processor CP7			7488	**	x	Both
89-Way Processor CP7			7489	**	x	Both

767 Capacity Marker			8783	**			Both
768 Capacity Marker			8784	**			Both
769 Capacity Marker			8785	**			Both
770 Capacity Marker			8786	**			Both
771 Capacity Marker			8787	**			Both
772 Capacity Marker			8788	**			Both
773 Capacity Marker			8789	**			Both
774 Capacity Marker			8790	**			Both
775 Capacity Marker			8791	**			Both
776 Capacity Marker			8792	**			Both
777 Capacity Marker			8793	**			Both
778 Capacity Marker			8794	**			Both
779 Capacity Marker			8795	**			Both
780 Capacity Marker			8796	**			Both
781 Capacity Marker			8797	**			Both
782 Capacity Marker			8798	**			Both
783 Capacity Marker			8799	**			Both
784 Capacity Marker			8800	**			Both
785 Capacity Marker			8801	**			Both
786 Capacity Marker			8802	**			Both
787 Capacity Marker			8803	**			Both
788 Capacity Marker			8804	**			Both
789 Capacity Marker			8805	**			Both
IBM zEnterprise EC12	2827	HA1					
90-Way Processor CP7			7490	**		x	Both
91-Way Processor CP7			7491	**		x	Both
92-Way Processor CP7			7492	**		x	Both
93-Way Processor CP7			7493	**		x	Both
94-Way Processor CP7			7494	**		x	Both
95-Way Processor CP7			7495	**		x	Both
96-Way Processor CP7			7496	**		x	Both
97-Way Processor CP7			7497	**		x	Both
98-Way Processor CP7			7498	**		x	Both
99-Way Processor CP7			7499	**		x	Both
100-Way Processor CP7			7500	**		x	Both
101-Way Processor CP7			7501	**		x	Both
790 Capacity Marker			8806	**			Both
791 Capacity Marker			8807	**			Both
792 Capacity Marker			8808	**			Both
793 Capacity Marker			8809	**			Both
794 Capacity Marker			8810	**			Both
795 Capacity Marker			8811	**			Both
796 Capacity Marker			8812	**			Both
797 Capacity Marker			8813	**			Both
798 Capacity Marker			8814	**			Both
799 Capacity Marker			8815	**			Both
7A0 Capacity Marker			8816	**			Both
7A1 Capacity Marker			8817	**			Both

Description	Mach type	Mod	Feat	**	EW fe	MMMC indicator	Init/ MES
zBX	2458	002		**		X	
DP Blade Detach			0055	**			MES
DP Blade Attach			0056	**			MES

Description	Mach type	Mod	Feat	**	EW fe	MMMC indicator	Init/ MES
zBX	2458	003		**		X	
zBX model 003			0502	**			Both
DP Blade Detach			0055	**			MES
DP Blade Attach			0056	**			Both
10 GbE HSS switch			0605	**			Both
Mgmt TOR switch			0607	**		X	Both
IEDN TOR switch			0608	**		X	Both
Service Docs Optional Print			0033	**			Both
HMC			0091	**			Both
Power 3Ph delta w/cord			0520	**			Both

Power w/o cord			0521	**			Both
60A/208V 1Ph Cord			0531	**			Both
63A/230V 1Ph Cord			0532	**			Both
32A/380-415V 3Ph Cord			0533	**			Both
Rear door heat exchanger			0540	**			Both
Std front door			0541	**			Both
Std rear door			0542	**			Both
Acoustic rear door			0543	**			Both
Chassis counter weight			0544	**			Both
Rack height reduction			0570	**			Both
Primary zBX rack			0601	**			Init
Expansion zBX rack			0602	**			Both
zBX configured chassis asm			0603	**		X	Both
Fibre channel ESM switch			0606	**			Both
DataPower blade			0611	**		X	Both
System x blade			0613	**		X	Both
Pwr blade enablement			0612	**		X	Both
8 Gb SW optical module			0615	**			Both
ESM filler plate			0618	**			Both
Rack filler plate			0619	**			Both
1000 mm cat6 cable			0620	**			Both
15 ft cat6 cable			0624	**			Both
3200mm cat6 cable			0625	**			Both
10GbE 1m DAC cable			0626	**			Both
10GbE 3m DAC cable			0627	**			Both
10GbE 7m DAC cable			0628	**			Both
10GbE LR 10km SFP			0632	**			Both
10GbE SR SFP			0633	**			Both
1000BASE-LX 1310nm 10km SFP			0634	**			Both
1000BASE-SX 850nm 550m SFP			0635	**			Both
Month indicator			0660	**			Both
Day indicator			0661	**			Both
Hour indicator			0662	**			Both
Minute indicator			0663	**			Both
US English			2924	**			Both
France			2928	**			Both
German			2929	**			Both
Spanish non-Spain			2930	**			Both
Spain			2931	**			Both
Italian			2932	**			Both
Canadian French			2935	**			Both
Portuguese			2978	**			Both
Brazilian Portuguese			2979	**			Both
UK English			2980	**			Both
Norwegian			2983	**			Both
Sweden Finland			2987	**			Both
Netherlands			2988	**			Both
Belgian French			2989	**			Both
Denmark			2993	**			Both
Swiss French, German			2997	**			Both
Luxembourg-Belgium ordered			5560	**			Both
Iceland-Ordered in Denmark			5561	**			Both
China-Ordered in Hong Kong			5562	**			Both
Flat panel display			6096	**			Both
RPO action flag			9003	**			Both

Description	Mach type	Mod	Feat	**	EW fe	MMMC indicator	Init/ MES
IBM zEnterprise 196	2817	M15 M32 M49 M66 M80					
TKE 7.2 LIC			0850	**			Both

Description	Mach type	Mod	Feat	**	EW MMMC fe indicator	Init/ MES
IBM zEnterprise 114	2818	M05 M10				
TKE 7.2 LIC			0850	**		Both

Features that may carry forward on an upgrade:

The following features are not orderable on the
IBM zEnterprise EC12 models.

If they are installed at the time of an upgrade to the
IBM zEnterprise EC12 they may be retained.

Description	Mach type	Mod	Feat	**	EW MMMC fe indicator	Init/ MES
IBM zEnterprise EC12	2827	H20			X	
		H43			X	
		H66			X	
		H89			X	
		HA1			X	
Ethernet switch			0070	**		MES
HCA2-O fanout for 12x IFB			0163	**		MES
HCA2-O LR fanout for 1x IFB			0168	**		MES
Crypto Express3			0864	**		MES
FICON Express4 10KM LX			3321	**		MES
FICON Express4 SX			3322	**		MES
FICON Express8 10KM LX			3325	**		MES
FICON Express8 SX			3326	**		MES
OSA-Express3 GbE LX			3362	**		MES
OSA-Express3 GbE SX			3363	**		MES
OSA-Express3 1000BASET-EN			3367	**		MES
OSA-Express3 10 GbE LR			3370	**		MES
OSA-Express3 10 GbE SR			3371	**		MES
6ft 250V Line Cord, Chi			8992	**		MES
6ft 480V 30A Line Cord, Chi			8994	**		MES

Notes:
1. Memory DIMMs do NOT carry forward.
2. Support Elements do NOT carry forward.

* Available only via RPQ:
   feature # 0162, 0217, 0218, 0219, 0326, and 0327

** Not supported in Taiwan: feature # 7942 and 7998

Model conversions

Model conversions - Hardware upgrades

From	Model To	Returned parts	Continuous maintenance
z10 EC to IBM zEnterprise EC12 radiator-based air-cooled			
E12	H20	Y	Y
E12	H43	Y	Y
E12	H66	Y	Y
E12	H89	Y	Y
E12	HA1	Y	Y
E26	H20	Y	Y
E26	H43	Y	Y
E26	H66	Y	Y
E26	H89	Y	Y
E26	HA1	Y	Y

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 E40    H20         Y                Y
 E40    H43         Y                Y
 E40    H66         Y                Y
 E40    H89         Y                Y
 E40    HA1         Y                Y
 E56    H20         Y                Y
 E56    H43         Y                Y
 E56    H66         Y                Y
 E56    H89         Y                Y
 E56    HA1         Y                Y
 E64    H20         Y                Y
 E64    H43         Y                Y
 E64    H66         Y                Y
 E64    H89         Y                Y
 E64    HA1         Y                Y

z10 EC to IBM zEnterprise EC12 water-cooled
 E12    H20         Y                Y
 E12    H43         Y                Y
 E12    H66         Y                Y
 E12    H89         Y                Y
 E12    HA1         Y                Y
 E26    H20         Y                Y
 E26    H43         Y                Y
 E26    H66         Y                Y
 E26    H89         Y                Y
 E26    HA1         Y                Y
 E40    H20         Y                Y
 E40    H43         Y                Y
 E40    H66         Y                Y
 E40    H89         Y                Y
 E40    HA1         Y                Y
 E56    H20         Y                Y
 E56    H43         Y                Y
 E56    H66         Y                Y
 E56    H89         Y                Y
 E56    HA1         Y                Y
 E64    H20         Y                Y
 E64    H43         Y                Y
 E64    H66         Y                Y
 E64    H89         Y                Y
 E64    HA1         Y                Y

z196 air to IBM zEnterprise EC12 radiator-based air-cooled
 M15    H20         Y                Y
 M15    H43         Y                Y
 M15    H66         Y                Y
 M15    H89         Y                Y
 M15    HA1         Y                Y
 M32    H20         Y                Y
 M32    H43         Y                Y
 M32    H66         Y                Y
 M32    H89         Y                Y
 M32    HA1         Y                Y
 M49    H20         Y                Y
 M49    H43         Y                Y
 M49    H66         Y                Y
 M49    H89         Y                Y
 M49    HA1         Y                Y
 M66    H20         Y                Y
 M66    H43         Y                Y
 M66    H66         Y                Y
 M66    H89         Y                Y
 M66    HA1         Y                Y
 M80    H20         Y                Y
 M80    H43         Y                Y
 M80    H66         Y                Y
 M80    H89         Y                Y
 M80    HA1         Y                Y

z196 air to IBM zEnterprise EC12 water-cooled
 M15    H20         Y                Y
 M15    H43         Y                Y
 M15    H66         Y                Y
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 M15    H89         Y                Y
 M15    HA1         Y                Y
 M32    H20         Y                Y
 M32    H43         Y                Y
 M32    H66         Y                Y
 M32    H89         Y                Y
 M32    HA1         Y                Y
 M49    H20         Y                Y
 M49    H43         Y                Y
 M49    H66         Y                Y
 M49    H89         Y                Y
 M49    HA1         Y                Y
 M66    H20         Y                Y
 M66    H43         Y                Y
 M66    H66         Y                Y
 M66    H89         Y                Y
 M66    HA1         Y                Y
 M80    H20         Y                Y
 M80    H43         Y                Y
 M80    H66         Y                Y
 M80    H89         Y                Y
 M80    HA1         Y                Y

z196 water to IBM zEnterprise EC12 water-cooled
 M15    H20         Y                Y
 M15    H43         Y                Y
 M15    H66         Y                Y
 M15    H89         Y                Y
 M15    HA1         Y                Y
 M32    H20         Y                Y
 M32    H43         Y                Y
 M32    H66         Y                Y
 M32    H89         Y                Y
 M32    HA1         Y                Y
 M49    H20         Y                Y
 M49    H43         Y                Y
 M49    H66         Y                Y
 M49    H89         Y                Y
 M49    HA1         Y                Y
 M66    H20         Y                Y
 M66    H43         Y                Y
 M66    H66         Y                Y
 M66    H89         Y                Y
 M66    HA1         Y                Y
 M80    H20         Y                Y
 M80    H43         Y                Y
 M80    H66         Y                Y
 M80    H89         Y                Y
 M80    HA1         Y                Y

IBM zEnterprise EC12 radiator-based air-cooled to IBM zEnterprise EC12
radiator-based air-cooled
 H20    H43         Y                Y
 H20    H66         Y                Y
 H20    H89         Y                Y
 H20    HA1         Y                Y
 H43    H66         Y                Y
 H43    H89         Y                Y
 H43    HA1         Y                Y
 H66    H89         Y                Y
 H66    HA1         Y                Y
 H89    HA1         Y                Y

IBM zEnterprise EC12 water-cooled to IBM zEnterprise EC12 water-cooled
 H20    H43         Y                Y
 H20    H66         Y                Y
 H20    H89         Y                Y
 H20    HA1         Y                Y
 H43    H66         Y                Y
 H43    H89         Y                Y
 H43    HA1         Y                Y
 H66    H89         Y                Y
 H66    HA1         Y                Y
 H89    HA1         Y                Y
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zBX Model 002 to zBX Model 003
 002    003         Y               Y

(*) Parts removed or replaced become the property of IBM and must
    be returned.
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Feature conversions

Contact your IBM representative for feature conversion prices.

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Corrections

(Corrected on July 25, 2013)
Text was revised in the "Description" and "Software requirements" sections.

(Corrected on June 20, 2013)
Feature names were revised.

(Corrected on April 30, 2013)
Feature names were corrected for feature numbers 0101 and 0102.

(Corrected on August 30, 2012)
A reference to a website was removed.