

The IBM z13

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At a glance

IBM z13™ delivers a data and transaction system reinvented as a system of insight for digital business. Today's announcement extends IBM z Systems™ leadership with:

- Enhancements for creating an exceptional client experience
 - Improved ability to meet service level agreements with new processor chip technology that includes simultaneous multithreading, analytical vector processing, redesigned and larger cache, and enhanced accelerators for hardware compression and cryptography
 - Better availability and more efficient use of critical data with up to 10 TB available RAIM memory
 - Validation of transactions, network management, and assignment of business priority for SAN devices available with updates to the I/O subsystem
 - Continued management of heterogeneous workloads with IBM® z BladeCenter Extension (zBX) Model 004 and IBM z Unified Resource Manager
- IT infrastructure with new economics
 - New consolidation savings with 40% more total capacity in the same footprint, improved scaling and connectivity for coupling, improved sharing capabilities for networking and cryptographic features, and increased LPAR support.
 - Large memory on z/OS® which can be used to improve transaction response times, lower CPU costs, simplify capacity planning and ease deploying memory-intensive workloads. The IBM z13™ offers up to 10 TB memory.
 - Potential to lower client costs, and to improve performance and availability by supporting the sharing of switches between FICON® and FCP.
 - Technology Update Pricing for IBM z13.
- Trustful, reliable, and secure operations to lessen business risk
 - Stronger and faster protection and integrity of data across an enterprise cloud environment with new Crypto Express5S cryptographic adapter
 - Enhanced public key support for constrained digital environments using Elliptic Curve Cryptography (ECC) for users such as Chrome, Firefox, and Apple's iMessage
 - Ability to minimize reformatting of databases with new exploitation of VISA format preserving encryption (FPE) for credit card numbers
 - Faster insight into the health of your Linux™ system with new IBM zAware pattern recognition analytics extended to Linux on z Systems™
- Full upgradability to IBM z13 from IBM zEnterprise® EC12 and zEnterprise 196, and full upgradability within the IBM z13 family

Overview

New market forces are changing the face of every industry, requiring almost every business to transform. Successful leaders see possibilities by embracing digital business. This means supporting existing clients with new services and offerings, while providing an environment that helps previously underserved businesses and citizens to gain access to products, services, and societal benefits. A successful journey through your transformation requires an underlying IT infrastructure that is efficient, secure, adaptive, and integrated. This IT infrastructure must be designed to handle the explosive growth of increasingly mobile clients and employees, able to leverage new and vast amounts of data, and able to provide deeper real-time insight at the point of the greatest business impact, and it needs to do this with a secure and resilient cloud-ready infrastructure.

Today, along with announcing a new server, the IBM z13, IBM is also announcing a new family name for its System z® server family. IBM System z has been renamed to IBM z Systems. This new name will encompass every IBM Mainframe from S/360 through the new z13, and all future systems. The name change serves to signal evolution of the product line, positioning of expanding capabilities, and the role of the mainframe in the new digital era of IT.

The IBM z13 provides the infrastructure that will help differentiate you as a refined digital business. It offers the capacity and processing power to improve business performance and growth. It helps better protect sensitive transactions to minimize business risk and client exposure, and it helps to deliver on service level agreements for an exceptional customer experience. New economic efficiencies allow the IBM z13 to offer more throughput and capabilities with less impact to the IT budget.

z/OS V2.1 running on IBM z13 sets the groundwork for digital business by providing the foundation you need to support demanding workloads such as operational analytics and clouds alongside your traditional mission-critical applications. z/OS V2.1 continues to support the z Integrated Information Processor (zIIP) which can take advantage of simultaneous multithreading. z/OS V2.1 is designed to support the new vector extension facility (SIMD) instructions available on IBM z13 servers to provide a powerful framework for development of new Business Analytics workloads, porting math-intensive workloads from other platforms, and accelerating Business Analytics workloads on IBM z13.

z/OS features many I/O-related enhancements such as extending the reach of workload management into the SAN fabric. With enhancements to management and operations, z/OS V2.1 and z/OS Management Facility V2.1 can help systems administrators and other personnel handle configuration tasks with ease. Recent Mobile Workload Pricing for z/OS can help reduce the cost of growth for mobile transactions processed by programs such as IBM CICS® Transaction Server for z/OS, IMS™, and DB2® for z/OS. Also refer to the preview announcement for z/OS V2.2, Software Announcement [JP15-0006](#), dated January 14, 2015, which describes additional new capabilities that extend the value of the platform.

The new 141-core design delivers massive scale across all workloads and enables cost-saving consolidation opportunities. z/VM® V6.3 has been enhanced to exploit simultaneous multithreading offered on the new processor chip. When running on IBM z13, z/VM supports twice as many processors (up to 64) or as many as 64 threads for Linux workloads. With support for sharing OSA-Express Port Groups across z/VM systems within a central processor complex (CPC), z/VM V6.3 delivers increased optimization of OSA-Express and reduced cost of ownership for IEEE 802.3 Link Aggregation networking environments.

The IBM z13 brings a new approach for enterprise-grade Linux with offerings and capabilities for availability, virtualization with z/VM, and a focus on open standards and architecture with new support of KVM on the mainframe (see [Statements of General Direction](#)). Best of all, many of our clients have IBM zEnterprise EC12 (zEC12) and IBM zEnterprise 196 (z196) servers, which can be upgraded to the IBM z13 for the greatest levels of investment protection.

Today's announcement extends IBM z Systems leadership with:

- Up to 40% more total system capacity compared to the zEC12.
- Up to 10 terabytes (TB) of available Redundant Array of Independent Memory (RAIM) real memory per server.
- Cryptographic performance improvements with new Crypto Express5S.
- Economies of scale with simultaneous multithreading delivering more throughput for Linux and zIIP-eligible workloads.
- Improved performance of complex mathematical models, perfect for analytics processing, with Single Instruction Multiple Data (SIMD).
- IBM zAware cutting-edge pattern recognition analytics for fast insight into system health extended to Linux on z Systems.
- A reduction in elapsed time for I/O-bound batch jobs with new FICON Express16S versus FICON Express8S.
- Support for larger memory configurations planned to be supported on z/OS systems, which can be used to improve transaction response times, lower CPU costs, simplify capacity planning and ease deploying memory-intensive workloads. (The IBM z13 offers up to 10 TB memory.)
- I/O service time improvement when writing data remotely using the new zHPF Extended Distance II.
- Support for up to 256 coupling CHPIDs, which provides enhanced connectivity and scalability for a growing number of coupling channel types.
- IBM Integrated Coupling Adapter (ICA SR), which offers greater short reach coupling connectivity than existing link technologies and enables greater overall coupling connectivity per IBM z13 than prior server generations.
- Capability to extend z/OS workload management policies into the SAN fabric.
- New rack-mounted Hardware Management Console (HMC), helping to save space in the data center.
- Nonraised 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 IBM z Systems clients save on their power bills.
- Optional top exit power and I/O cabling designed to provide increased flexibility.
- New IBM z BladeCenter Extension (zBX) Model 004 in support of heterogeneous resources managed by IBM z Unified Resource Manager.

Key prerequisites

Refer to the [Hardware requirements](#) and [Software requirements](#) sections of this announcement.

Planned availability date

- March 9, 2015
 - Features and functions for the IBM z13
 - IBM z13 Models N30, N63, N96, NC9, and NE1
 - z196 air-cooled EC upgrades to IBM z13 air-cooled
 - z196 air-cooled EC upgrades to IBM z13 water-cooled
 - z196 water-cooled EC upgrades to IBM z13 water-cooled
 - z196 with zBX Model 002 upgrades to IBM z13 and zBX Model 004 standalone
 - zEC12 air-cooled EC upgrades to IBM z13 air-cooled
 - zEC12 air-cooled EC upgrades to IBM z13 water-cooled
 - zEC12 water-cooled EC upgrades to IBM z13 water-cooled

- zEC12 with zBX Model 003 upgrades to IBM z13 and zBX Model 004 standalone
- zBX Model 002 upgrades to zBX Model 004 (#0512) standalone
- zBX Model 003 upgrades to zBX Model 004 (#0512) standalone
- Field installed features and conversions on IBM z13 that are delivered solely through a modification to the machine's Licensed Internal Code (LIC)
- Limited options to increase or decrease IBM BladeCenter HX5 blade server or IBM BladeCenter PS701 blade server entitlements on zBX upgrades to Model 004 standalone
- March 13, 2015
 - z/VM V6.3 exploitation support for simultaneous multithreading (SMT)
- April 14, 2015
 - TKE 8.0 LIC (#0877) on zEC12 and zBC12
 - TKE Workstation (#0847) on zEC12 and zBC12
 - TKE Smart Card Reader (#0891) on zEC12 and zBC12
 - TKE additional smart cards (#0892) on zEC12 and zBC12
 - 4767 TKE Crypto Adapter (#0894) on zEC12 and zBC12
 - Fill and Drain Kit (#3380) for zEC12
 - Fill and Drain adapter kit (#3379) for zEC12
 - Universal Lift Tool/Ladder (#3105) for zEC12 and zBC12
 - Universal Lift Tool upgrade kit (#3103) for zEC12 and zBC12
- May 30, 2015
 - Limited MES features for zBX Model 004 standalone
- June 26, 2015
 - MES features for IBM z13 Models N30, N63, N96, NC9, and NE1
 - z/VM V6.3 support for Multi-VSwitch Link Aggregation
 - Support for 256 Coupling CHPIDs
 - HMC STP Panel Enhancements: Initialize Time, Set Date and Time, Time Zone, View-Only Mode
 - Fibre Channel Protocol (FCP) channel configuration discovery and debug
 - Improved High Performance FICON for z Systems (zHPF) I/O Execution at Distance
 - IBM zAware support for Linux on z Systems
- September 25, 2015
 - FICON Dynamic Routing
 - Forward Error Correction (FEC) for FICON Express16S
 - Storage Area Network (SAN) Fabric I/O Priority

Description



The newest member of the IBM z family, the IBM z13 (z13), is designed from the chip level for data serving and transaction processing. There is unmatched support for data including a strong, fast I/O infrastructure, cache on the processor chip to bring data close to processing power, security and compression capabilities of the coprocessors and I/O features, and the 99.999% data availability design of our coupling technologies. The IBM z13 intelligent design delivers new levels of performance and capacity for large-scale consolidation and growth. The IBM z13 is designed to provide:

- Up to 10% faster uniprocessor performance as compared to zEC12
- Up to 40% system capacity performance improvement over zEC12 101 way
- 141 cores to configure (versus 101 on zEC12)
- 231 capacity settings (versus 161 on zEC12)
- Up to 10 TB RAIM memory to improve transaction response times, lower CPU costs, simplify capacity planning, and ease deploying memory-intensive workloads
- z/Architecture® enhancements designed to enable performance improvements in Linux, Java™, and DB2
- Enhanced cache design which is designed to provide twice as much second level cache and substantially more third and fourth level caches compared to the zEC12, helping to avoid untimely swaps and memory waits while maximizing the throughput of concurrent workloads
- New features and functions for the Storage Area Network:
 - The newest generation of FICON features, FICON Express16S 10KM LX and FICON Express16S SX, are designed to support a link rate of 16 Gbps with reduced latency for large read/write operations and increased bandwidth.
 - Forward Error Correction (FEC) capabilities have been added to the FICON Express16S channels which allows those channels to operate at higher speeds, over longer distances, with reduced power and higher throughput, while retaining the same resiliency and robustness that clients have come to expect from their FICON channels.

- FICON Dynamic Routing enables exploitation of Storage Area Network (SAN) dynamic routing polices in the fabric to lower cost, improve performance, and simplify systems management for supporting I/O devices.
- Storage Area Network (SAN) Fabric I/O Priority extends the z/OS Work Load Manager to the SAN fabric providing improved resilience and autonomic capabilities.
- High Performance FICON for z Systems (zHPF) has been enhanced to allow all large write operations (> 64 KB) at distances up to 100 km to be executed in a single round trip to the control unit thereby not elongating the I/O service for these write operations at extended distances.
- Improved channel subsystem (CSS) scalability supports six logical channel subsystems (LCSS), four subchannel sets (to support more devices per logical channel subsystem), and 32K devices per FICON channel.
- Support for up to 256 coupling CHPIDs per CPC to provide enhanced connectivity and scalability for a growing number of coupling channel types
- IBM Integrated Coupling Adapter (ICA SR) which offers greater short reach coupling connectivity than existing link technologies and enables greater overall coupling connectivity per CPC footprint than prior server generations
- Flash Express® to handle paging workload spikes and improve application availability
- IBM zAware support for Linux on z Systems for improved problem determination
- Cryptographic performance improvements with Crypto Express5S and CP Assist for Cryptographic Function (CPACF)
- Improved performance of complex mathematical models, perfect for analytics processing, with Single Instruction Multiple Data (SIMD)
- z/VM support for IBM z13 including:
 - Improved price performance with support for multithreading technology for Linux workloads
 - Support for twice as many processors - 64 threads when simultaneous multithreading (SMT) is enabled or 64 cores when SMT is not enabled
 - Increased availability and reduced cost of ownership in network environments by sharing OSAs across z/VM systems
- zBX Model 004 standalone upgradability from zBX Model 002 and zBX Model 003
- Full upgradability to IBM z13 from IBM zEnterprise EC12 and zEnterprise 196, and full upgradability within the IBM z13 family

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 z13, 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 V2.1, the LSPR also contains performance relationships for z/VM and Linux operating environments.

The performance of an IBM z13 (2964) processor is expected to be up to 1.1 times the performance of a zEC12 (2827) based on workload and model. The largest IBM z13 (2964-7E1) is expected to provide up to 1.4 times the capacity of the largest zEC12 (2827-7A1).

The IFL and zIIP processors on the IBM z13 also provide an optional IBM z13 multithreading technology capability; with the multithreading function enabled, the performance capacity of the IFL is expected to be up to 1.3 times the performance capacity of these processors on the zEC12; the performance capacity of the zIIP processors is expected to be up to 1.4 times the performance capacity of these processors on the zEC12.

The LSPR contains the Internal Throughput Rate Ratios (ITRRs) for the IBM z13 and the previous-generation IBM z Systems 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

<http://www.ibm.com/servers/resourcelink/lib03060.nsf/pages/lspindex?OpenDocument>

Simultaneous multithreading (SMT)

Incremental throughput is achieved partly because the new processor chip offers intelligently implemented 2-way simultaneous multithreading. Simultaneous multithreading (SMT) allows two active instruction streams per core, each dynamically sharing the core's execution resources. SMT will be available in IBM z13 for workloads running on the Integrated Facility for Linux (IFL) and the IBM z Integrated Information Processor (zIIP).

Each software Operating System / Hypervisor has the ability to intelligently drive SMT in a way that is best for its unique requirements. z/OS SMT management consistently drives the cores to high thread density, in an effort to reduce SMT variability and deliver repeatable performance across varying CPU utilization - thus providing more predictable SMT capacity. z/VM SMT management optimizes throughput by spreading a workload over the available cores until it demands the additional SMT capacity.

Next-generation availability

The IBM z13 continues the drive for continuous reliable operation provided by its predecessors with the following Reliability, Availability and Serviceability (RAS) improvements:

- Improved soft error resilience in the processor cores
- Lane shadowing, hardware buffer retry, and independent channel recovery which are designed to improve the DIMM interface
- Continued use of RAIM in the main memory to protect DRAM
- Improved robustness in the level 3 and level 4 cache
- Improved FRU isolation with the addition of integrated time domain reflectometry logic to chip interfaces
- RAS changes to adjust to the new CPC drawer structure
- Enhanced integrated sparing designed to reduce the complexity and number of repair actions

Flash Express is designed to help improve availability and handling of paging workload spikes when running z/OS V1.13 with the z/OS V1.13 RSM Enablement Offering web deliverable, and this function is integrated in z/OS V2.1. With this support, 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 exploitation of pageable large (1 MB) pages. Flash Express can also be used in coupling facility images to provide extended capacity and availability for workloads making use of Websphere MQ Shared Queues structures, as previously announced for zEC12. 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 and BC12, IBM introduced a new technology, IBM zAware, based on machine learning developed by IBM Research.

The new version of IBM zAware introduces a new generation of technology with improved analytics to provide better results. The previous version of IBM zAware required message streams with well-formed message IDs; now IBM zAware can process message streams that do not have message IDs. This opens up new possibilities going forward with the ability to handle a broader variety of unstructured data.

IBM zAware delivered on IBM z13 builds on previous IBM zAware function with:

- Support for Linux on z Systems message log analysis
- Support for native or guest Linux on z Systems images
- The ability to process message streams with no message IDs
- The ability to group multiple systems that have similar operational characteristics for modeling and analysis
 - Recognition of dynamic activation and deactivation of a Linux image into a group, and appropriate modeling and analysis.
 - Aggregated Sysplex view for z/OS and system views.
 - User-defined grouping. For Linux on IBM z Systems, the user can group multiple systems' data into a combined model: by workload (one for all web servers, one for all databases, and so on); by "solution" (for instance, one model for your cloud); or by VM host.
- Heat map display which provides a consolidated/aggregated/higher level view with the ability to drill down to detail views
- Improved usability and GUI functional enhancements addressing many customer requirements
 - Enhanced filtering and visualization, with better use of GUI real estate
 - Improved UI navigation
 - Display of local time in addition to UTC time
 - Enhancements based on IBM One UI guidelines
- Enhanced analytics
- More robust data store
- Expanded browser support with Mozilla Firefox 31 and Internet Explorer 9, 10, and 11

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 lead to better availability and a more efficient system. IBM zAware uses analytics to intelligently examine z/OS or Linux on z Systems messages to find unusual patterns, inconsistencies, and variations. Large 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) and APIs to help you find message anomalies quickly which can help speed problem resolution when seconds count.

Common Criteria Evaluation Assurance Level 5+ (EAL 5+) certification

The IBM z13 is designed for Common Criteria Evaluation Assurance Level 5+ (EAL 5+) certification for security of logical partitions. This means that the IBM z13 is designed to prevent an application running on one operating system image on one LPAR from accessing application data running on a different operating system image on another LPAR on the server.

Common Cryptographic Architecture (CCA) enhancements

VISA Format Preserving Encryption (VFPE)

Support for VISA Format Preserving Encryption (VFPE) algorithms in CCA-based callable services. This support will rely on the Crypto Express5S coprocessor. Format Preserving Encryption (FPE) refers to a method of encrypting data such that the resulting cipher-text has the same format and length as the input-clear text. This helps allow legacy databases to contain encrypted data of sensitive fields without having to restructure the database or applications. Supported are functions for the VISA Data Secure Platform (Visa DSP) with Point to Point Encryption technology. Three new Visa DSP-related callable services are added to the CCA API. In addition to VFPE, support for the Visa DSP standard TDES encryption method is also available.

Greater than 16 Domain support

Support to allow a cryptographic coprocessor to be shared across more than 16 domains, up to the maximum number of LPARs on the system. This support relies on enhanced firmware available with a minimum microcode level for the Crypto Express5S coprocessors. With the adjunct processor (AP) extended addressing (APXA) facility installed, the z Systems crypto architecture can support greater than 16 domains in an AP. Customers will have the flexibility of mapping individual LPARs to unique crypto domains or continuing to share crypto domains across LPARs.

Trusted Key Entry (TKE) 8.0 Licensed Internal Code (LIC)

The following functions are planned to be supported in the TKE 8.0 level of LIC:

The Crypto Express5S Coprocessor support: TKE 8.0 is required for managing Crypto Express5S cryptographic coprocessors and manages them through the same Crypto Module notebook functions as previous generations of Cryptographic modules. The configuration migration tasks feature of the TKE is planned to be enhanced to also support the Crypto Express5S coprocessor. You can use TKE 8.0 to collect data from previous generations of Cryptographic modules and apply the data to Crypto Express5S coprocessors.

FIPS Certified Smart Card: A FIPS certified smart card, part number 00JA710, is now included in the smart card reader and additional smart cards optional features. The new smart card part number is 00JA710.

Crypto Coprocessors with more than 16 domains: TKE 8.0 is planned to allow the management of domains beyond the current limit of 16. This support will require the latest levels of code on the IBM z13 to allow more than 16 domains on the Crypto Express5S. This support is only available with z13.

Full function migration wizard for EP11: The full function migration wizard is designed to provide the ability to quickly and accurately collect and apply data to the Crypto Express features configured as EP11 coprocessors. This wizard previously supported CCA, however Crypto Module Group support has been removed: Crypto Module Groups are no longer supported on TKE 8.0. All group management must now be done from a Domain Group.

New master key management functions: TKE 8.0 is planned to allow support of two new master key management functions which are available when managing any type of master key:

1. Generate a set of master key parts wizard-like feature which allows you to create a new key part for each of the different types of master keys.
2. Load all new master keys wizard-like feature which allows you to load a new key for each of the different types of master keys.

Smart Card Readers Available indicator: TKE 8.0 is planned to now display a window title that will include information if the smart card readers are available if the application or utility has access to smart card readers.

Configure Displayed Hash Size: TKE 8.0 is planned to support a configuration to allow the administrator to set the display length of certain hash values displayed on the TKE workstation. Hash types that can be affected by this function are: MDC-4, SHA-1, AES-VP, and ENC-ZERO. The Configure Display Hash Size utility is only available when you have signed on with the Privileged Mode Access user ID of ADMIN.

ECC Authority Signature Keys: TKE 8.0 is planned to allow a user to select a key strength of 320-bit ECC key when creating an Authority Signature Key that is to be assigned to an Authority Index on a Crypto Express5S coprocessor. This option is only available when you are creating an Authority Signature key from inside a Crypto Module Notebook of a Crypto Express5S.

Print Capability: TKE 8.0 is planned to have limited print support. The Configure Printers utility allows the administrator to add printers to the TKE. The only printers allowed to be added are printers that have device drivers on the TKE including the GUTENPRINT and HPLIP device driver packages. You will not be able to load your own device drivers.

New Features in the Crypto Node Management (CNM) Utility: The TKE Workstation Setup utility allows you to load and save user roles and profiles. The CNM utility now has stand-alone launch points for these two tasks in the Access Control pull down menu.

ENC-Zero Verification Pattern for 24-byte DES Operational Keys: TKE 8.0 is planned to support an ENC-Zero verification pattern that is computed and displayed with 24-byte DES operational keys.

Usability Enhancements: TKE 8.0 is planned to have many usability enhancements including the ability for users to select a check box that will allow them to change their passphrase on the logon screen for a passphrase profile. Additionally, users can now select multiple items in the Hosts container, Crypto Module Groups container, or Domain Groups container of the main window of the TKE application. If more than one item is selected, you can delete all of the definitions or close all of the hosts or groups at once.

FICON Express16S - a new generation for FICON, zHPF, and FCP

IBM is releasing **a new I/O infrastructure** that will strengthen the synergy between DS8870 and IBM z Systems, delivering improved, predictable, and repeatable performance, and enhanced resiliency for mission-critical environments. IBM plans to announce the support of this new I/O infrastructure for DS8870 Storage Systems in May of 2015.

NOTE: 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.

With the introduction of **FICON Express16S on the IBM z13**, you now have additional growth opportunities for your Storage Area Network (SAN). FICON Express16S supports a link data rate of 16 gigabits per second (Gbps) and auto-negotiation to 4 or 8 Gbps for synergy with existing switches, directors, and storage devices. With support for native FICON, High Performance FICON for z Systems (zHPF), and Fibre Channel Protocol (FCP), the IBM z13 server enables you to position your SAN for even higher performance -- helping you to prepare for an end-

to-end 16 Gbps infrastructure to meet the lower latency and increased bandwidth demands of your applications.

The new FICON Express16S channel will work with your existing fiber optic cabling environment, both single mode and multimode optical cables. The FICON Express16S feature running at end-to-end 16 Gbps link speeds will provide reduced latency for large read/write operations and increased bandwidth compared to the FICON Express8S feature.

Increased performance for the zHPF protocol: In laboratory measurements using FICON Express16S in an IBM z13 with the zHPF protocol and small data transfer I/O operations, FICON Express16S operating at 16 Gbps achieved a maximum of 93,000 IOs/sec. In laboratory measurements, using FICON Express16S in an IBM z13 with the zHPF protocol and a mix of large sequential read and write data transfer I/O operations, FICON Express16S operating at 16 Gbps achieved a maximum throughput of 2600 MB/sec (reads + writes) compared to a maximum of 1600 MB/sec (reads + writes) achieved with FICON Express8S operating at 8 Gbps. This represents an approximately 63% increase. This performance data was measured in a controlled environment running an I/O driver program under z/OS. The actual throughput or performance that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed.

Increased performance for the FCP protocol: A FICON Express16S feature, when defined as CHPID type FCP, conforms to the Fibre Channel Protocol (FCP) standard to support attachment of SCSI devices, to complement the classical storage attachment supported by FICON and zHPF channels.

In laboratory measurements, using FICON Express16S in an IBM z13 with the FCP protocol for small data transfer I/O operations, FICON Express16S operating at 16 Gbps achieved a maximum of 110,000 IOs/sec, compared to the maximum of 92,000 IOs/sec achieved with FICON Express8S operating at 8 Gbps.

In laboratory measurements, using FICON Express16S in an IBM z13 with the FCP protocol and FICON Express16S operating at 16 Gbps, FICON Express16S achieved a maximum throughput of 2560 MB/sec (reads + writes) compared to the maximum of 1600 MB/sec (reads + writes) achieved with FICON Express8S operating at 8 Gbps. This represents approximately a 60% increase. The actual throughput or performance that any user will experience will vary depending upon considerations such as the amount of multi-programming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed.

With the introduction of the FICON Express16S in an IBM z13 operating using the FCP protocol, several recommended and allowable operating characteristic values have increased which will enable additional workload consolidation. Specifically, the recommended maximum number of NPIV hosts defined to any single physical FCP channel has increased from 32 to 64, the allowable maximum number of remote N_Ports a single physical channel can communicate with has increased from 512 to 1024, and the maximum number of LUNs addressable by a single physical channel has increased from 4096 to 8192. In support of these increases, the FCP channels have also been designed to now support 1528 concurrent I/O operations, an increase from the prior generation FCP channel limit of 764.

The FCP protocol is supported by z/VM, z/VSE®, and Linux on IBM z Systems. Refer to the [Software requirements](#) section.

16Gb FICON and FC host adapters on IBM DS8870: Improve SAN performance and resiliency with faster 16Gb Fibre Channel and FICON host adapters on DS8870. For DB2 Log Writes, this new host adapter will help to improve the efficiency of the 16 Gbps zHPF and heritage FICON to reduce large log write latency, resulting in DB2 transactional latency improvements for applications and middleware, including SAP. For managed file transfer with Connect Direct these new host adapters can help to reduce elapsed times. In addition, I/O bound batch jobs will improve lapsed times.

FCP SAN Explorer: A new function is available on the HM through the Problem Determination panels that provides a centralized view of Storage SAN facilities available to an FCP channel. The tool facilitates configuration setting and debug without requiring an operating system to be running. It does require the IBM z13 to have completed an Initial Machine Load (IML) and the partitions of interest to be activated. The tool can also operate concurrently with customer I/O workloads in a nondisruptive manner. It provides an operator with a layered view of the SAN environment. Specifically, device numbers (hosts) assigned to a partition, the fabric zone members available to the host, the remote end port error statistics, the accessible logical unit numbers (LUNs), and basic LUN configuration information can be queried and displayed using this tool. This data can also optionally be exported in CSV format.

Cleaning discipline for FICON Express16S fiber optic cabling

With the introduction of 16 Gbps link data rates, it is even more critical to ensure your fiber optic cabling infrastructure performs as expected. With proper fiber optic cleaning and maintenance, you can be assured that the "data gets through."

With 16 Gbps link data rates over multimode fiber optic cabling, link loss budgets and distances are reduced. Single mode fiber optic cabling is more "reflection sensitive." With high link data rates and single mode fiber optic cabling there is also less margin for error. The cabling is no longer scratch-tolerant and contaminants such as dust and oil can present a problem.

To keep the data flowing, proper handling of fiber trunks and jumper cables is critical as well as thorough cleaning of fiber optic connectors. Work with your data center personnel or IBM personnel to ensure you have fiber optic cleaning procedures in place.

Enabling the Transition to FICON Express16S with Forward Error Correction (FEC)

FICON Express16S channels running at 16 Gbps can take advantage of Forward Error Correction (FEC) capabilities when connected to devices that support FEC. FEC allows FICON Express16S channels to operate at higher speeds, over longer distances, with reduced power and higher throughput, while retaining the same reliability and robustness that FICON channels have traditionally been known for. FEC is a technique used for controlling errors in data transmission over unreliable or noisy communication channels. When running at 16 Gbps link speeds, clients should see fewer I/O errors, thus easing the transition to the new, high-speed link technologies and reducing the potential impact to production workloads by I/O errors.

Forward Error Correction Codes support on 16Gbps adapters on IBM DS8870: For Peer to Peer Remote Copies, FEC helps to preserve data reliability. This enhancement is designed to provide the *equivalent* reliability improvement as doubling the optical signal strength.

FICON Dynamic Routing

With the IBM z13 server, FICON channels are no longer restricted to the use of static Storage Area Network (SAN) routing policies for Inter Switch Links (ISLs) for cascaded FICON directors. The z Systems feature that supports dynamic routing in the Storage Area Network (SAN) is called FICON Dynamic Routing (FIDR). It is designed to support the dynamic routing policies provided by the FICON Director manufacturers, for example, Brocade's Exchange Based Routing (EBR) and Cisco's Open Exchange ID Routing (OxID). Check with the switch provider for their support statement.

FICON Dynamic Routing can help clients reduce costs by having the ability to share SANs between their FICON and FCP traffic, improve performance due to SAN dynamic routing policies better exploiting all the available ISL bandwidth through higher utilization of the ISLs, and simplify management of their SAN fabrics due to

static routing policies assigning different ISL routes with each power-on-reset which makes the SAN fabric performance difficult to predict.

Clients will need to ensure that all devices in their FICON SAN support FICON Dynamic Routing before they implement this feature.

FICON Dynamic Routing on IBM DS8870 enables clients to use SAN dynamic routing policies across cascaded FICON Directors to simplify configuration and capacity planning, and to provide persistent and repeatable performance and higher resiliency. In Peer to Peer Remote Copy configurations sharing of switches is simplified and hardware costs can be reduced by allowing FICON and FCP to share the same switch infrastructure. IBM's Metro Mirror technology uses FCP as the transport. So, now FICON and Metro Mirror can flow over the same Inter Switch Links (ISLs) and be managed with consistent fabric priority, described below.

Storage Area Network (SAN) Fabric I/O Priority

This new function on the IBM z13 provides the ability for z/OS to specify an I/O priority for the SAN fabric to utilize. This capability allows z/OS to extend the z/OS Work Load Manager (WLM) to manage the SAN fabric, completing the management of the entire end-to-end flow of an I/O operation. WLM will assign an I/O priority consistent with the client-specified goals for the workloads within the supported range of I/O priorities in the SAN fabric. SAN fabric I/O priority is especially useful in circumstances that can lead to SAN fabric contention such as workload spikes and hardware failures to provide additional resilience and allow z/OS WLM to deliver the highest I/O priority to the most important work first.

SAN Fabric Priority on IBM DS8870: IBM will be the first platform to exploit this industry feature with a fully integrated workload management solution provided by z/OS and supported by DS8870. Intelligent access to data and greater efficiencies are reached with SAN Fabric I/O Priority enabled by DS8870. The DS8870 will also propagate the fabric priority for write operations to the resulting Metro Mirror traffic to provide a consistent prioritization with FICON when sharing the same SAN infrastructure and Inter Switch Links (ISLs).

Improved High Performance FICON for z Systems (zHPF) I/O Execution at Distance

High Performance FICON for z Systems (zHPF) has been enhanced to allow all large write operations (> 64 KB) at distances up to 100 km to be executed in a single round trip to the control unit thereby not elongating the I/O service time for these write operations at extended distances.

zHPF Extended Distance II on IBM DS8870: zHPF Extended Distance II allows customers to achieve service level agreements after a disaster or when a storage control unit failure causes a HyperSwap® event. This capability is required especially for GDPS® HyperSwap configurations where the secondary DASD subsystem is in another site. For multi-site configurations, the zHPF Extended Distance II feature can help to reduce the impact of distance on I/O response times, increasing remote data transfer with better performance when writing data remotely (remote site recovery).

Improved Channel Subsystem (CSS) Scalability

The IBM z13 server has improved the channel subsystem (CSS) scalability with support for six logical channel subsystems (LCSSs) which are required to support the eighty five LPARs for IBM z13, four subchannel sets (to support more devices per logical channel subsystem), and 32K devices per FICON channel up from 24K channels in the previous generation.

Additionally, a fourth subchannel set for each logical channel subsystem (LCSS) is provided to facilitate elimination of single points of failure for storage after a disk failure by simplifying the exploitation of IBM's DS8870 Multi-target Metro Mirror storage replication with TPC-R HyperSwap.

z/OS Support for the IBM z13 (z13)

Continued tight integration between hardware and software technologies has become increasingly important to meeting the capacity and performance demands of mission-critical workloads. Accordingly, z/OS exploits many of the new functions and features of IBM z13 including:

- z/OS V2.2 (5650-ZOS) is planned to support the operation of zIIP processors in simultaneous multithreading (SMT) mode, with two threads per processor. This new function is designed to help improve throughput for zIIP workloads and provide appropriate performance measurement, capacity planning, and SMF accounting data. This support is also planned to be available for z/OS V2.1 with PTFs at IBM z13 general availability.
- z/OS V2.2 is planned to support up to 141 processors (CPs and zIIPs) per LPAR or up to 128 physical processors (256 logical processors) per LPAR in SMT mode. z/OS V2.2 is also planned to support up to 4 TB of real memory per LPAR. This support is also planned to be available on z/OS V2.1 with PTFs. For more information, see Software Announcement [JP15-0006](#), dated January 14, 2015, z/OS V2.2 - Fueling the new Digital Enterprise.
- z/OS V2.2 is planned to provide support for the new vector extension facility (SIMD) instructions available on IBM z13 servers. This new support, also planned to be available for z/OS V2.1 with PTFs in February 2015, is intended to help enable high-performance analytics processing, and is planned to be exploited by z/OS XML System Services; IBM 31-bit SDK for z/OS, Java Technology Edition, Version 8 (5655-DGG); IBM 64-bit SDK for z/OS, Java Technology Edition, Version 8 (5655-DGH); Enterprise PL/I for z/OS V4.5 (5655-W67); and Enterprise COBOL for z/OS 5.2 (5655-W32) in February 2015. IBM intends to exploit the 64-bit SDK for z/OS, Java Technology Edition, Version 8 in IBM WebSphere® Liberty Profile for z/OS, and in the full profile of WebSphere Application Server for z/OS, which is also expected to benefit from SIMD exploitation. For more information, refer to Software Announcement [JP15-0004](#), dated January 14, 2015, IBM 64-bit SDK for z/OS, Java Technology Edition, Version 8.

Application serving with SSL could see up to 2x improvement in throughput per core with IBM 64-bit SDK for z/OS, Java Technology Edition, Version 8 on IBM z13 with SMT vs. Java 7 on zEC12.

- z/OS V2.2 will be designed to provide prioritization data for the FICON fabric on IBM z13 processors, so the highest priority write operations can be done first when the fabric becomes congested. This support is also planned to be available for z/OS V1.13 (5694-A01) and z/OS V2.1 with PTFs in third quarter 2015, coincident with general availability of z/OS V2.2. This new function is intended to provide end-to-end prioritization according to WLM policy for write operations, in addition to the existing support for channel and control unit prioritization for both read and write operations.
- z/OS V2.2 is planned to support up to four subchannel sets on IBM z13 servers. This helps relieve subchannel constraints, and can allow you to define larger I/O configurations that support multi-target Metro Mirror (PPRC) along with large numbers of PPRC secondaries and Parallel Access Volume (PAV) aliases. As with the prior support for up to three subchannel sets, you can define base devices, aliases, and secondaries in the first subchannel set (set zero), and define only aliases and secondaries in subchannel sets one, two, and three. All four subchannel sets support FICON and zHPF protocols. This support is also planned for z/OS V1.13 and z/OS V2.1 with a PTF at IBM z13 general availability.
- z/OS V2.2 running on IBM z13 processors with IBM System Storage® DS8000® series devices and a minimum MCL is planned to support a new health check for FICON dynamic routing. This health check will be designed to check all components of a dynamic routing fabric, the channel subsystem, and disk control units to make sure that dynamic routing requirements are met if dynamic routing has been enabled for one or more FICON switches. This support, also planned for z/OS V1.13 and z/OS V2.1 with PTFs at functional availability, which remains in third quarter 2015, is intended to help you identify misconfiguration errors that can result in data integrity exposures.

- z/OS V2.2 Communications Server is planned to support the new virtualization capability planned for the 10GbE RoCE Express features on IBM z13 processors. This new support will be designed to allow you to fully utilize the ports in the RoCE feature and to share features across up to 31 z/OS images on an IBM z13 processor. Also, z/OS V2.2 Communications Server is planned to support selecting between TCP/IP and RoCE transport layer protocols automatically based on traffic characteristics, and to support MTU sizes up to 4K for RoCE features. The virtualization support is also available on z/OS V2.1 with a PTF.
- Full support for the new Crypto Express5S (CEX5S) features is planned for z/OS V2.2 and with the Enhanced Cryptographic Support for z/OS V1.13 - z/OS V2.1 web deliverable planned to be available at IBM z13 general availability.
- z/OS V2.2 XL C/C++ is planned to provide support for the new IBM z13 processor, with new ARCH(11) and TUNE(11) parameters designed to take advantage of the new instructions to deliver increased optimizations for your generated code. XL C/C++ will be designed to also support the Single Instruction Multiple Data (SIMD) instructions with the vector programming language extensions, and the IBM MASS (Mathematical Accelerator Subsystem) and ATLAS (Automatically Tuned Linear Algebra Software) libraries. The MASS library may be used for accelerated execution of elementary math functions and serve as a higher performance alternative to the standard math library that is part of the z/OS XL C/C++ Runtime. The ATLAS library provides linear algebra function support for BLAS (Basic Linear Algebra Subprograms) and LAPACK (Linear Algebra PACKage) functions routinely used in Business Analytics and Optimization solutions. Together these two libraries provide a powerful framework for development of new Business Analytics workloads, porting math-intensive workloads from other platforms, and accelerating Business Analytics workloads on IBM z13. This function is also planned to be available in February 2015 for z/OS V2.1 XL C/C++ with a web deliverable from the z/OS download site

<http://www.ibm.com/systems/z/os/zos/tools/downloads/#webdees>

IBM z13 systems are supported by z/OS V1.13 (5694-A01) and z/OS Version 2 (5650-ZOS).

Note: 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.

z/VM Support for the IBM z13 (z13)

With the PTF for APAR VM65577, z/VM provides support that will enable guests to exploit zEC12 function supported by z/VM on the IBM z13 (z13). z/VM support for IBM z13 includes support for:

- New hardware facilities
 - z/VM supports the following new hardware facilities transparently.
 - Load/Store-on-condition Facility 2
 - Load-and-Zero-Rightmost-Byte Facility
 - Decimal-Floating-Point Packed Conversion Facility
 - Delay Facility

New facility bits have been defined that will be passed to a guest and can be tested to determine if a hardware facility is available. A guest can use the STFLE instruction to obtain the facilities list.

TRACE, DISPLAY I, and VMDUMPTL support for interpreting the new instructions associated with these facilities for display purposes is not provided.

- Updates to monitor records for CPU-Measurement Counter Facility: The new Counter Second Version Number value (4) is supported and appropriate counters are collected and stored in the CPU-Measurement Facility Counters monitor record (Domain 5 Record 13).
- CPU-Measurement Counter Facility collection enhancement: Host exploitation is provided for a new instruction to allow collection of multiple counters simultaneously, when the store-CPU-counter-multiple facility is installed. This is expected to reduce the overhead for collecting CPUMF data for z/VM monitor records.
- New I/O related architectures: Support is provided for new I/O related architectures and features of z13 including:
 - PCI function measurement block enhancements for the RDMA over Converged Ethernet (RoCE) adapter
 - Dynamic I/O support for new channel path type CS5 (Coupling over PCIe)
 - Dynamic I/O support for specifying virtual channel IDs (VCHIDs) for HiperSockets™ (IQD) channels
- Crypto Express5S and enhanced domain support for Crypto Express5S

z/VM SMT support

With the PTF for APAR VM65586, z/VM provides host exploitation support for SMT on IBM z13, which will enable z/VM to dispatch work on up to two threads (logical CPUs) of an IFL processor core. z/VM simultaneous multithreading support is enabled only for IFL processors in a Linux only mode or z/VM mode logical partition.

z/VM exploitation of SMT enables z/VM on z13 to dispatch work on an individual thread of a core, allowing a core to be shared by two guest CPUs or z/VM Control Program tasks. This can result in increased throughput per core from more efficient use of shared core resources.

Simultaneous multithreading support is available on a z/VM system only if the facility is installed on the hardware and enabled on the z/VM system with the MULTITHREADING system configuration statement. The MULTITHREADING statement is optional, and multithreading is disabled if the statement is omitted.

z/VM host simultaneous multithreading exploitation support does not virtualize threads for guest exploitation. However, Linux guests may benefit from the host support because the first level z/VM system is able to achieve higher throughput from the multithreaded IFL cores.

z/VM CPU pools provide a mechanism for limiting the CPU resources consumed by a group of virtual machines to a specific capacity. In an environment without SMT, these capacities are enforced in terms of a number of cores. In an SMT environment, these capacities are enforced in terms of a number of threads. Consequently, it might be necessary to increase the capacities of CPU pools, in order to provide adequate resource to CPU pool members.

Increased z/VM CPU scalability

With the PTF for APAR VM65586, z/VM will support up to 64 logical processors on z13:

- 64 cores are supported with multithreading disabled.
- 32 cores (up to 2 threads per core) are supported with multithreading enabled.
- z/VM V6.3 continues to support up to 32 logical processors on prior machines.

z/VM Multi-VSwitch Link Aggregation Support

With the PTFs for APARs VM65583 and PI21053, z/VM V6.3 provides Multi-VSwitch Link Aggregation Support, allowing a port group of OSA-Express features to span

multiple virtual switches within a single z/VM system or between multiple z/VM systems. Sharing a Link Aggregation Port Group (LAG) with multiple virtual switches increases optimization and utilization of the OSA-Express when handling larger traffic loads. Higher adapter utilization protects customer investments, which is increasingly important as 10 gigabit deployments become more prevalent. This enhancement makes it possible to do VSwitch Link Aggregation with OSAs shared with other z/VM logical partitions, lifting the previous restriction of requiring dedicated OSAs.

IBM Wave for z/VM (IBM Wave)

IBM Wave allows IT organizations and service providers to simplify and automate the management of virtualized environments beginning with z/VM. Featuring an intelligent content-rich interface to manage Linux virtual servers, IBM Wave's capabilities have been recently enhanced to further simplify operations, drive productivity, and leverage existing skills to help customers efficiently deploy and manage highly virtualized infrastructures.

IBM Wave can help IT organizations manage any combination of z/VM instances: standalone z/VM instances, SSI clusters, or z/VM instances sharing directories, all using a flexible and highly customizable Wave architecture. With recent enhancements, IBM Wave for z/VM now offers enhanced SCSI-only support for managing EDEVs, new support for cross-system virtual server cloning, and LDAP for authentication purposes.

IBM Wave is a comprehensive management tool designed for administrators, operators, system programmers and more. It is now included in several virtualization solutions on z Systems including Enterprise Linux Server, Solution Edition for Enterprise Linux, Enterprise Cloud Systems, and IBM Infrastructure Suite.

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 z13, zEC12, zBC12, z196, and z114 servers, Coupling Facilities, Server Time Protocol (STP), and coupling links (ICA SR, InfiniBand) 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.

The IBM Integrated Coupling Adapter (ICA SR), introduced on the IBM z13 platform, is a two-port, short distance coupling fanout that utilizes a new coupling channel type: CS5. The ICA SR utilizes PCIe Gen3 technology, with x16 lanes that are bifurcated into x8 lanes for coupling. The ICA SR is designed to drive distances up to 150 m and support a link data rate of 8 GBps. It is also designed to support up to 4 CHPIDs per port and 7 subchannels (devices) per CHPID. The maximum number of ICA SR fanout features is limited to 16 per system.

The ICA SR fanout resides in the PCIe I/O fanout slot on the IBM z13 CPC drawer, which supports 10 PCIe I/O slots. Up to 10 ICA SR fanouts and up to 20 ICA SR ports are supported on an IBM z13 CPC drawer, enabling greater connectivity for short distance coupling on a single processor node compared to prior generations.

The ICA SR can only be used for coupling connectivity between IBM z13 servers, and the ICA SR can only connect to another ICA SR. IBM recommends that you order ICA SR (#0172) on the IBM z13 processors used in a Parallel Sysplex to help ensure coupling connectivity with future processor generations.

The ICA SR fanout requires new cabling. For distances up to 100 m, clients can choose the OM3 fiber type. For distances up to 150 m, clients must choose the OM4 fiber type. Refer to *IBM z Systems Planning for Fiber Optic Links (FICON/FCP, Coupling Links, and Open System Adapters)*, GA23-1407, and to *IBM z Systems*

Maintenance for Fiber Optic Links (FICON/FCP, Coupling Links, and Open System Adapters), SY27-7694, which can be found in the Library section of Resource Link® at

<http://www.ibm.com/servers/resourcelink/svc03100.nsf?OpenDatabase>

Refer to the [Software requirements](#) section.

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.

HCA3-O 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 on zEC12, zBC12, z196, or z114 machines. HCA2-O is not supported on IBM z13.

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 on zEC12, zBC12, z196, or z114 machines, which has two ports/links. HCA2-O LR is not supported on IBM z13.

Two protocols - 12x IFB and 12x IFB3 - for 12x InfiniBand coupling links

- 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 improved latency compared to 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 zEC12, zBC12, z196, or z114 servers, links will run with the 12x IFB protocol.

The maximum number of all HCA3 fanout features is limited to 16 per system. Internal coupling links (ICs) can also be used for internal communication between Coupling Facilities (CFs) and z/OS images on the same server.

ISC-3 links are not supported on IBM z13.

Note: The ICA SR and InfiniBand (PSIFB) 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 ICA SR and 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. zEC12, zBC12, z196, and z114 servers do not support attachment to a Sysplex Timer, but they can participate in a Mixed CTN that has a z10™ synchronized to the Sysplex Timer. This maintains the capability for servers to concurrently migrate from an existing ETR network to a Mixed CTN and from a Mixed CTN to an STP-only CTN.

The IBM z13 can only participate in an STP-only CTN.

STP Enhancements

- Enable STP communications via the IBM Integrated Coupling Adapter (ICA SR)
- Initialized Time Panel enhanced to list time zone and leap second offset as well as indicates if the system time was set; this enables users to quickly check fields during CTN configuration
- Set Date and Time Panel enhanced to encourage use of External Time Source to set CTN time
- Time Zone panel enhanced with confirmation messages when setting STP time zone via adjust Time Zone panel on Current Time Server (CTS); also lists scheduled switch times for leap seconds and time zone/daylight savings time on Timing Network Tab
- Added support for view-only STP panels

Parallel Sysplex Enhancements

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. In the Coupling Facility, we have added an availability enhancement that is a scalability enabler for large cache structures.

- IBM z13 will support up to 256 Coupling CHPIDs, twice the 128 coupling CHPIDs supported on zEC12. This provides enhanced connectivity and scalability for a growing number of coupling channel types and facilitates consolidation of multiple Sysplexes into the same set of physical servers. Note that each CF image will continue to support a maximum of 128 coupling CHPIDs.
- Up to 141 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.
- CFCC Level 20 supports the Coupling Facility use of Large Memory to improve availability for larger CF cache structures and data sharing performance with larger DB2 Group Buffer Pools (GBP). This support removes inhibitors to using large CF cache structures, enabling use of Large Memory to appropriately scale to larger DB2 Local Buffer Pools (LBP) and Group Buffer Pools (GBP) in data sharing environments.

To learn more about the performance benefits of large DB2 structures, reference *IBM zEnterprise System: Performance Report on Exploiting Large Memory for DB2 Buffer Pools with SAP* at

<http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP102461>

CICS Transaction Server for z/OS support for IBM z13 (z13)

All in-service releases of IBM CICS Transaction Server for z/OS (CICS TS) will support the z13 hardware. This gives CICS TS customers, at an appropriate level of z/OS, the potential to benefit from facilities of z13, including:

- Simultaneous multithreading (SMT) can be used on zIIP processors by CICS Java applications.
- Greater data compression and reduced data transfer time are provided by enhanced zEnterprise Data Compression (zEDC), which could be exploited by CICS SMF data when using SMF log streams.
- CICS TS transactions using SSL or TLS could take advantage of cryptographic acceleration with the Crypto Express5S cryptographic adapter.
- Planned availability of Large Memory on z/OS, up to 4 TB per z/OS image, could be useful to customers requiring more real memory to back large amounts of virtual storage, such as large, or large numbers of, CICS Shared Data Tables, CICS main temporary storage above-the-bar, and JVM server heap storage.

IBM z BladeCenter Extension (zBX) Model 004

The onsite upgrade to an **IBM z BladeCenter Extension (zBX) Model 004** continues to support workload optimization and integration for zEnterprise. The zBX Model 004 is available as an upgrade from an existing zBX Model 002 or Model 003. The upgrade will decouple the zBX from its controlling CPC and with the addition of redundant Support Elements, it will become a standalone Node within an ensemble. An ensemble must contain a z114, z196, zBC12, zEC12, and/or z13. Once upgraded, any available slots in an existing chassis can be used with the proper entitlements. Environmental options and Optics will be available to support reconfiguration and relocation.

Hardware Management Console (HMC)

Alternative to USB Flash Memory Drive: With the Hardware Management Console 2.13.0, the USB Flash Memory Drive will continue to be supported. However, the Hardware Management Console 2.13.0 will also provide alternative options for each task that currently has an option to utilize a USB Flash Memory Drive, and this will allow customers to eliminate the requirement for USB Flash Memory Drive. These alternatives such as FTP Servers and Remote Browser from workstation will be documented in IBM Knowledge Center. If you prefer no USB Flash Memory Drive usage, select the Feature Code 0845 "Read-Only Media Option" if presented to you during certain eConfig options. Note that these USB Flash Memory Drive options are only available for managed IBM z13 systems. The legacy managed systems (zEC12 or earlier) still have a requirement for the USB Flash Memory Drive.

Discontinuance of System Activity Display Task: With the Hardware Management Console 2.13.0, the System Activity Display task is no longer supported for IBM z13 systems. The Monitors Dashboard task (available since z196) provides equivalent functionality. The System Activity display functionality is available for legacy systems (zEC12 or earlier) which are managed by the Hardware Management Console 2.13.0.

Hardware Management Console Data Replication Versioning: The Hardware Management Console 2.13.0 Data Replication task has added versioning support, and this requires all Hardware Management Consoles to update to the 2.13.0 level in order for Data Replication to replicate data between the Hardware Management Consoles. Any Hardware Management Console at 2.12.1 level or earlier will not be able to perform the data replication with a Hardware Management Console 2.13.0.

Hardware Management Console Time Source Change: The Hardware Management Console 2.13.0 will no longer define its time source using the Add Object Definition. The time source is now defined on the Customize Console Date/Time task. This will provide a clearer identification of all defined time sources including validation of Server Time Protocol (STP) Coordinated Timing Network IDs (CTN IDs).

Trusted Computing: The Hardware Management Console currently validates all licensed internal code delivery and updates onto itself with a digitally signed firmware process. Version 2.13.0 has been enhanced to remove a default option of

including boot from media for the Hardware Management Console. This will address some security analysis programs which flag this as an issue.

User Management Dashboard: The Hardware Management Console 2.13.0 has re-engineered user related tasks by establishing a User Management Dashboard task which replaces the following tasks: User Profiles, Customer User Controls, Password Profiles, Manage Enterprise Directory Server Definitions, User Templates, and User ID Patterns. This User Management Dashboard task provides additional functionality such as more granular user management controls and inheritance controls for objects added to groups. It is recommended to look at the Hardware Management Console What's New section in the online help or IBM Knowledge Center to view detailed descriptions for this new task including getting started tutorials for different usage scenarios.

Refer to the [Hardware requirements](#) section for a list of HMC system support.

Enhancements to Advanced Workload License Charges

Enhancements to Advanced Workload License Charges and Technology Transition Offerings:

Complementing the announcement of the z13 server IBM is introducing:

- A new Technology Transition Offering (TTO) called Technology Update Pricing for the IBM z13
- New and revised Transition Charges for Sysplexes TTOs for actively coupled Parallel Sysplexes (z/OS) and Loosely Coupled Complexes (z/TPF)

Technology Update Pricing for the IBM z13 extends the software price/performance provided by AWLC for z13 servers. The new and revised Transition Charges for Sysplexes programs provide a transition to Technology Update Pricing for the IBM z13 for sysplex customers who have not yet fully migrated to z13 servers. This ensures that aggregation benefits are maintained and also phases in the benefits of Technology Update Pricing for the IBM z13 pricing as customers migrate.

When a z13 server is in an actively coupled Parallel Sysplex or a Loosely Coupled Complex, you may choose either aggregated AWLC pricing or aggregated Parallel Sysplex License Charges (PSLC) pricing, subject to all applicable terms and conditions.

For additional information about software pricing for the z13 server, refer to Software Announcement [JP15-0001](#), dated January 14, 2015, Technology Transition Offerings for the IBM z13 offer price-performance advantages.

When a z13 server is running z/VSE, you may choose Mid-Range Workload License Charges (MWLC), subject to all applicable terms and conditions.

For more information about AWLC, PSLC, MWLC, or the Technology Update Pricing and Transition Charges for Sysplexes TTO offerings, refer to

<http://ibm.com/systems/z/resources/swprice/>

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

Product positioning

The newest member of the IBM z Systems family, the IBM z13, 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 IBM z13 is designed

enable the digital era for cloud, mobile, and advanced analytics capabilities. Users are able to efficiently store, manage, retrieve, and analyze vast amounts of data for business insight without unnecessary cost or complexity. Additionally, IBM z13 brings trusted security and reliability at every level for critical business processes and applications, and protects data that is the most valuable resource of your business.

Analytics offers the opportunity to anticipate demand and infuse analytics processing into every new solution. A key value is the integration of analytics with business-critical transactions to deliver real-time insights for the next best action, at the most impactful time. Examples are being able to send offers to shoppers based on loyalty status and buying history, or providing up sell or cross sell opportunities, or understanding the potential for fraud when your client's credit card is being used inconsistently with prior purchases or in locations not consistent with the client's physical location. The IBM z13 offers up to 10 TB of RAIM memory, double cache density over zEC12, and double system I/O bandwidth. Both on-chip and feature compression help to serve up more of the right data at the critical point of impact. The IBM z13 is designed for real-time transactional analytics.

Mobile applications are no longer just about consumer applications; they are enabling how we transact business and do our jobs. They are now connected to the Internet of things, gathering data and transacting with not only smartphones, but numerous other devices that sensor and monitor physical conditions, machines, and infrastructure. What used to be a single retail banking transaction that would have involved an account look up and withdrawal, has been transformed into something else, often kicking off ten times or more incremental transactions to improve client experience and offer your business the opportunity to conduct more business. To keep up with the volume and pace of supporting mobile applications, you need a backend infrastructure that is fast, accurate, and secure. IBM z13 has superior scale with up to 141 configurable cores and intelligent I/O with workload management, enhanced error correction capability, and improved recovery. IBM z13 offers next-generation security enhancements including a performance improvement on the Crypto Express5S to support the mobile world. IBM z13 is designed for secure transactional growth.

Everyone is looking for ways to leverage the cloud and to provide greater levels of efficiency through new IT delivery models. City governments can ensure effective administration of citizen services. Universities can provide students virtual desktops with flexible, reliable, and secure access. Insurers can rapidly develop and provide new offerings at lower costs. But challenges exist in scale, speed, and management of cloud deployment. IBM z13 is designed for scaling with up to 30% throughput improvement for Integrated Facility for Linux and up to 40% capacity improvement for IBM z Integrated Information Processor specialty engines using simultaneous multithreading compared to the same processor types on zEC12. IBM z13 delivers the infrastructure with z Systems qualities of service for enterprise-grade Linux on either z/VM or KVM (see [Statements of General Direction](#)). IBM zAware is now available for Linux on z Systems to deliver a creative availability solution to help maximize service levels. IBM z13 is committed to open standards and has enhanced sharing of I/O and networking features. Implementation of the new GDPS Appliance for Linux (see [Statements of General Direction](#)) offers business continuity in support of cloud. IBM z13 enables the rapid and flexible development and delivery of new offerings and is designed for efficiency and trusted cloud services.

IBM z13 continues to provide heterogeneous platform investment protection with the updated IBM z BladeCenter Extension (zBX) Model 004 and IBM z Unified Resource Manager. Enhancements to the zBX include the uncoupling of the zBX from the server and installing redundant Support Elements (SEs) into the zBX. zBX Model 002 and Model 003 can be upgraded to the zBX Model 004.

Statements of General Direction

IBM plans to accept for review **certification requests from cryptography providers** by the end of 2015, and intends to support the use of cryptography algorithms and equipment from providers meeting IBM's certification requirements

in conjunction with z/OS and z Systems processors in specific countries. This is expected to make it easier for customers to meet the cryptography requirements of local governments.

KVM offering for IBM z Systems: In addition to the continued investment in z/VM, IBM intends to support a Kernel-based Virtual Machine (KVM) offering for z Systems that will host Linux on z Systems guest virtual machines. The KVM offering will be software that can be installed on z Systems processors like an operating system and can co-exist with z/VM virtualization environments, z/OS, Linux on z Systems, z/VSE, and z/TPF. The KVM offering will be optimized for z Systems architecture and will provide standard Linux and KVM interfaces for operational control of the environment, as well as providing the required technical enablement for OpenStack for virtualization management, allowing enterprises to easily integrate Linux servers into their existing infrastructure and cloud offerings.

In the first half of 2015, IBM intends to deliver a **GDPS/Peer to Peer Remote Copy (GDPS/PPRC) multiplatform resiliency capability** for customers who do not run the z/OS operating system in their environment. This solution is intended to provide IBM z Systems customers who run z/VM and their associated guests, for instance, Linux on z Systems, with similar high availability and disaster recovery benefits to those who run on z/OS. This solution will be applicable for any IBM z Systems announced after and including the zBC12 and zEC12.

Enhanced RACF® password encryption algorithm for z/VM: In a future deliverable an enhanced RACF/VM password encryption algorithm is planned. This support will be designed to provide improved cryptographic strength using AES-based encryption in RACF/VM password algorithm processing. This planned design is intended to provide better protection for encrypted RACF password data in the event that a copy of RACF database becomes inadvertently accessible.

IBM intends that a future release of IBM CICS Transaction Server for z/OS will support 64-bit SDK for z/OS, Java Technology Edition, Version 8 (Java 8). This support will enable the use of new facilities delivered by IBM z13 which are exploited by Java 8, including Single Instruction Multiple Data (SIMD) instructions for vector operations and simultaneous multithreading (SMT).

z/VM support for Single Instruction Multiple Data (SIMD): In a future deliverable IBM intends to deliver support to enable z/VM guests to exploit the Vector Facility for z/Architecture (SIMD).

IBM intends to provide **support for the Read Diagnostic Parameters Extended Link Service command for fiber channel SANs** as defined in the T11.org FC-LS-3 draft standard. Support for the Read Diagnostic Parameters Extended Link Service command is intended to improve SAN reliability and fault isolation.

Removal of support for Expanded Storage (XSTORE): z/VM V6.3 is the last z/VM release that will support Expanded Storage (XSTORE) for either host or guest usage. The IBM z13 server family will be the last z Systems server to support Expanded Storage (XSTORE).

The IBM z13 will be the last z Systems server to support running an operating system in ESA/390 architecture mode; all future systems will only support operating systems running in z/Architecture mode. This applies to operating systems running native on PR/SM as well as operating systems running as second level guests. IBM operating systems that run in ESA/390 mode are either no longer in service or only currently available with extended service contracts, and they will not be usable on systems beyond IBM z13. However, all 24-bit and 31-bit problem-state application programs originally written to run on the ESA/390 architecture will be unaffected by this change.

Stabilization of z/VM V6.2 support: The IBM z13 server family is planned to be the last z Systems server supported by z/VM V6.2 and the last z systems server that will be supported where z/VM V6.2 is running as a guest (second level). This is in conjunction with the statement of direction that the IBM z13 server family will be the last to support ESA/390 architecture mode, which z/VM V6.2 requires. z/

VM V6.2 will continue to be supported until December 31, 2016, as announced in Withdrawal Announcement [JP14-0022](#), dated February 04, 2014.

Product Delivery of z/VM on DVD/Electronic only: z/VM V6.3 will be the last release of z/VM that will be available on tape. Subsequent releases will be available on DVD or electronically.

Removal of support for Classic Style User Interface on the Hardware Management Console and Support Element: The IBM z13 will be the last z Systems server to support Classic Style User Interface. In the future, user interface enhancements will be focused on the Tree Style User Interface.

Removal of support for the Hardware Management Console Common Infrastructure Model (CIM) Management Interface: IBM z13 will be the last z Systems server to support the Hardware Console Common Infrastructure module (CIM) Management Interface. The Hardware Management Console Simple Network Management Protocol (SNMP), and Web Services Application Programming Interfaces (APIs) will continue to be supported.

The IBM z13 will be the last z Systems server to support FICON Express8 channels: IBM z13 will be the last high-end server to support FICON Express8. Enterprises should begin migrating from FICON Express8 channel features (#3325, #3326) to FICON Express16S channel features (#0418, #0419). FICON Express8 will not be supported on future high-end z Systems servers as carry forward on an upgrade.

The IBM z13 server will be the last z Systems server to offer ordering of FICON Express8S channel features. Enterprises that have 2 Gb device connectivity requirements must carry forward these channels.

Removal of an option for the way shared logical processors are managed under PR/SM LPAR: The IBM z13 will be the last high-end server to support selection of the option to "Do not end the timeslice if a partition enters a wait state" when the option to set a processor run time value has been previously selected in the CPC RESET profile. The CPC RESET profile applies to all shared logical partitions on the machine, and is not selectable by logical partition.

The IBM z13 will be the last generation of z Systems hardware servers to support configuring OSN CHPID types. OSN CHPIDs are used to communicate between an operating system instance running in one logical partition and the IBM Communication Controller for Linux on z Systems (CCL) product in another logical partition on the same CPC. See Withdrawal Announcement [JP14-0626](#), dated December 02, 2014, for details regarding withdrawal from marketing for the CCL product.

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.

Reference information

Refer to Hardware Announcement [JG12-0145](#), dated August 28, 2012.

Product number

Description	Machine Type	Model	Feature
IBM z13	2964	N30 N63 N96 NC9 NE1	
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 w/Dual EN			0092
HMC Rack Mount			0094
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-zIIP			0125
100 CPE Capacity Unit-zIIP			0126
1 CPE Capacity Unit-SAP			0127
100 CPE Capacity Unit-SAP			0128
A Fr Radiator			4027
A Fr Water			4028
I/O Cage Full Card Airflow			0114
Fanout Airflow			0165
HCA3-0 LR fanout for 1x IFB			0170
HCA3-0 fanout for 12x IFB			0171
ICA SR fanout			0172
PCIe fanout Gen3			0173
Fanout airflow PCIe			0174
Manage FW Suite			0019
Automate FW Suite			0020
Ensemble membership			0025
IBM zAware			0011
IBM zAware 10 pack			1010
IBM zAware DR 10 pack			1011
PCIe Interconnect Gen3			0401
Flash Express			0402
Flash Express			0403
FICON Express8S 10Km LX			0409
FICON Express8S SX			0410
10 GbE RoCE Express			0411
OSA-Express5S GbE LX			0413
OSA-Express5S GbE SX			0414
OSA-Express5S 10 GbE LR			0415
OSA-Express5S 10 GbE SR			0416
OSA-Express5S 1000BASE-T			0417
FICON Express16S LX			0418
FICON Express16S SX			0419

zEDC Express	0420
Month Indicator	0660
Day Indicator	0661
Hour Indicator	0662
Minute Indicator	0663
Read-Only Media Option	0845
TKE workstation	0847
4767 TKE Crypto Adapter	0894
32GB USB backup media	0848
TKE 8.0 LIC	0877
Crypto Express5S	0890
TKE Smart Card Reader	0891
TKE addl smart cards	0892
UID Label for DoD	0998
STP Enablement	1021
EMEA Special Operations	1022
16 GB Mem DIMM(5/feat)	1610
32 GB Mem DIMM(5/feat)	1611
64 GB Mem DIMM(5/feat)	1612
128 GB Mem DIMM(5/feat)	1613
LICCC Ship Via Net Ind	1750
32GB FTR Converted memory	1897
32GB Memory Capacity Incr	1898
16GB Memory Capacity Incr	1899
16GB FTR Converted memory	1900
32GB Preplanned memory	1990
16GB Preplanned memory	1996
Line Cord Plan Ahead	2000
64 GB Memory	2427
96 GB Memory	2429
128 GB Memory	2431
160 GB Memory	2433
192 GB Memory	2435
256 GB Memory	2439
320 GB Memory	2441
384 GB Memory	2443
448 GB Memory	2445
544 GB Memory	2484
640 GB Memory	2485
736 GB Memory	2486
832 GB Memory	2487
928 GB Memory	2488
1056 GB Memory	2489
1184 GB Memory	2490
1312 GB Memory	2491
1440 GB Memory	2492
1696 GB Memory	2493
1952 GB Memory	2494
2208 GB Memory	2495
2464 GB Memory	2496
US English	0235
France	0236
German/Austrian	0237
LA Spanish	0238
Spain	0239
Italian	0240
French Canadian	0241
Portuguese	0242
UK English	0243
Norwegian	0244
Sweden Finland	0245
Netherlands	0246
Belgian French	0247
Denmark	0248
Swiss French/German	0249
Flat Panel Display	6096

Balanced Power Plan Ahead	3003
BPD Pair	3010
BPR Pair	3011
Internal Battery IBF	3214
Fill and Drain Kit	3380
Fill and Drain adapter kit	3379
Universal Lift Tool/Ladder	3105
Universal Lift Tool upgr kit	3103
Serv Docs Optional Print	0033
CPACF Enablement	3863
I/O Drawer	4008
PCIe I/O Drawer	4012
14ft Water Hose	7801
FQC Bracket & Mounting Hdw	7929
LC Duplex 6.6ft Harnesses	7930
LC Duplex 8.5ft Harness	7931
LC Duplex 12ft Harness	7936
Top Exit I/O Cabling	7942
Side Covers	7949
Non Raised Floor Support	7998
4-in-1 Bolt Down Kit	8018
3-in-1 Bolt Down Kit-W	8019
Bolt Down Kit NRF	8020
380-570V DC TE cord BPE-1	8947
200V 3Ph TE cord BPE-11	8952
380-570V DC TE cord BPE-2	8953
200V 3Ph TE cord BPE-2	8955
14ft 380-570V DC line cord	8963
14ft 200V 3ph cord	8993
14ft 380-570V DC cut TE cd	8948
14ft Lov 3ph cut TE cord	8949
14ft Hiv 3ph cut TE cord	8951
14ft 380-570V DC cut cord	8965
14ft Lov 3ph cut line cord	8982
14ft Hiv 3ph cut line cord	8988
14ft 200-240V 3ph cut-LSZH	8996
14ft Hiv 3ph cut line-LSZH	8998
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 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 SAP day	9928
100 SAP days	9929
Weight Distribution Kit	9970
Height Reduce Ship	9975
Height Reduce for Return	9976
CP4	1915

CP5	1916
CP6	1917
CP7	1918
IFL	1919
ICF	1920
SAP (optional)	1921
zIIP	1922
Unassigned IFL	1923

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 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	8100
1-Way Processor CP4	8101
2-Way Processor CP4	8102
3-Way Processor CP4	8103
4-Way Processor CP4	8104
5-Way Processor CP4	8105
6-Way Processor CP4	8106
7-Way Processor CP4	8107
8-Way Processor CP4	8108
9-Way Processor CP4	8109
10-Way Processor CP4	8110
11-Way Processor CP4	8111
12-Way Processor CP4	8112
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14-Way Processor CP4	8114
15-Way Processor CP4	8115
16-Way Processor CP4	8116
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18-Way Processor CP4	8118
19-Way Processor CP4	8119
20-Way Processor CP4	8120
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30-Way Processor CP4	8130

1-Way Processor CP5	8131
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30-Way Processor CP7	8220
400 Capacity Marker	9492
401 Capacity Marker	9493
402 Capacity Marker	9494
403 Capacity Marker	9495
404 Capacity Marker	9496
405 Capacity Marker	9497
406 Capacity Marker	9498
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719 Capacity Marker			9601
720 Capacity Marker			9602
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724 Capacity Marker			9606
725 Capacity Marker			9607
726 Capacity Marker			9608
727 Capacity Marker			9609
728 Capacity Marker			9610
729 Capacity Marker			9611
730 Capacity Marker			9612

IBM z13	2964	N30	
Model N30 - Air Cooled			1033
Model N30 - Water Cooled			1038

IBM z13	2964	N63	
Model N63 - Air Cooled			1034
Model N63 - Water Cooled			1039

IBM z13	2964	N96	
Model N96 - Air Cooled			1035
Model N96 - Water Cooled			1040

IBM z13	2964	NC9	
Model NC9 - Air Cooled			1036
Model NC9 - Water Cooled			1041

IBM z13	2964	NE1	
Model NE1 - Air Cooled			1037
Model NE1 - Water Cooled			1042

IBM z13	2964	N63	
		N96	
		NC9	
		NE1	

2720 GB Memory	2497
2976 GB Memory	2498
3232 GB Memory	2499
3488 GB Memory	2500
3744 GB Memory	2501
4000 GB Memory	2502
4256 GB Memory	2503
4512 GB Memory	2504
4768 GB Memory	2505
5024 GB Memory	2506

31-Way Processor CP7	8221
32-Way Processor CP7	8222
33-Way Processor CP7	8223
34-Way Processor CP7	8224
35-Way Processor CP7	8225
36-Way Processor CP7	8226
37-Way Processor CP7	8227
38-Way Processor CP7	8228
39-Way Processor CP7	8229
40-Way Processor CP7	8230
41-Way Processor CP7	8231
42-Way Processor CP7	8232
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44-Way Processor CP7	8234
45-Way Processor CP7	8235
46-Way Processor CP7	8236
47-Way Processor CP7	8237
48-Way Processor CP7	8238
49-Way Processor CP7	8239
50-Way Processor CP7	8240
51-Way Processor CP7	8241
52-Way Processor CP7	8242
53-Way Processor CP7	8243
54-Way Processor CP7	8244
55-Way Processor CP7	8245
56-Way Processor CP7	8246
57-Way Processor CP7	8247
58-Way Processor CP7	8248
59-Way Processor CP7	8249
60-Way Processor CP7	8250
61-Way Processor CP7	8251
62-Way Processor CP7	8252
63-Way Processor CP7	8253

731 Capacity Marker	9613
732 Capacity Marker	9614
733 Capacity Marker	9615
734 Capacity Marker	9616
735 Capacity Marker	9617
736 Capacity Marker	9618
737 Capacity Marker	9619
738 Capacity Marker	9620
739 Capacity Marker	9621
740 Capacity Marker	9622
741 Capacity Marker	9623
742 Capacity Marker	9624
743 Capacity Marker	9625
744 Capacity Marker	9626
745 Capacity Marker	9627
746 Capacity Marker	9628
747 Capacity Marker	9629
748 Capacity Marker	9630
749 Capacity Marker	9631
750 Capacity Marker	9632
751 Capacity Marker	9633
752 Capacity Marker	9634
753 Capacity Marker	9635
754 Capacity Marker	9636
755 Capacity Marker	9637
756 Capacity Marker	9638
757 Capacity Marker	9639
758 Capacity Marker	9640
759 Capacity Marker	9641

760 Capacity Marker	9642
761 Capacity Marker	9643
762 Capacity Marker	9644
763 Capacity Marker	9645

IBM z13	2964	N96 NC9 NE1
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5288 GB Memory	2507
5536 GB Memory	2508
5792 GB Memory	2509
6048 GB Memory	2510
6560 GB Memory	2511
7072 GB Memory	2512
7584 GB Memory	2513
64-way Processor CP7	8254
65-way Processor CP7	8255
66-way Processor CP7	8256
67-way Processor CP7	8257
68-way Processor CP7	8258
69-way Processor CP7	8259
70-way Processor CP7	8260
71-way Processor CP7	8261
72-way Processor CP7	8262
73-way Processor CP7	8263
74-way Processor CP7	8264
75-way Processor CP7	8265
76-way Processor CP7	8266
77-way Processor CP7	8267
78-way Processor CP7	8268
79-way Processor CP7	8269
80-way Processor CP7	8270
81-way Processor CP7	8271
82-way Processor CP7	8272
83-way Processor CP7	8273
84-way Processor CP7	8274
85-way Processor CP7	8275
86-way Processor CP7	8276
87-way Processor CP7	8277
88-way Processor CP7	8278
89-way Processor CP7	8279
90-way Processor CP7	8280
91-way Processor CP7	8281
92-way Processor CP7	8282
93-way Processor CP7	8283
94-way Processor CP7	8284
95-way Processor CP7	8285
96-way Processor CP7	8286

764 Capacity Marker	9646
765 Capacity Marker	9647
766 Capacity Marker	9648
767 Capacity Marker	9649
768 Capacity Marker	9650
769 Capacity Marker	9651
770 Capacity Marker	9652
771 Capacity Marker	9653
772 Capacity Marker	9654
773 Capacity Marker	9655
774 Capacity Marker	9656
775 Capacity Marker	9657
776 Capacity Marker	9658
777 Capacity Marker	9659
778 Capacity Marker	9660
779 Capacity Marker	9661
780 Capacity Marker	9662
781 Capacity Marker	9663
782 Capacity Marker	9664
783 Capacity Marker	9665
784 Capacity Marker	9666
785 Capacity Marker	9667
786 Capacity Marker	9668
787 Capacity Marker	9669
788 Capacity Marker	9670

789 Capacity Marker	9671
790 Capacity Marker	9672
791 Capacity Marker	9673
792 Capacity Marker	9674
793 Capacity Marker	9675
794 Capacity Marker	9676
795 Capacity Marker	9677
796 Capacity Marker	9678

IBM z13	2964	NC9 NE1
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8096 GB Memory	2514
8608 GB Memory	2515
9120 GB Memory	2516
9632 GB Memory	2517
10144 GB Memory	2518
97-way Processor CP7	8287
98-way Processor CP7	8288
99-way Processor CP7	8289
100-way Processor CP7	8290
101-way Processor CP7	8291
102-way Processor CP7	8292
103-way Processor CP7	8293
104-way Processor CP7	8294
105-way Processor CP7	8295
106-way Processor CP7	8296
107-way Processor CP7	8297
108-way Processor CP7	8298
109-way Processor CP7	8299
110-way Processor CP7	8300
111-way Processor CP7	8301
112-way Processor CP7	8302
113-way Processor CP7	8303
114-way Processor CP7	8304
115-way Processor CP7	8305
116-way Processor CP7	8306
117-way Processor CP7	8307
118-way Processor CP7	8308
119-way Processor CP7	8309
120-way Processor CP7	8310
121-way Processor CP7	8311
122-way Processor CP7	8312
123-way Processor CP7	8313
124-way Processor CP7	8314
125-way Processor CP7	8315
126-way Processor CP7	8316
127-way Processor CP7	8317
128-way Processor CP7	8318
129-way Processor CP7	8319

797 Capacity Marker	9679
798 Capacity Marker	9680
799 Capacity Marker	9681
7100 Capacity Marker	9682
7101 Capacity Marker	9683
7102 Capacity Marker	9684
7103 Capacity Marker	9685
7104 Capacity Marker	9686
7105 Capacity Marker	9687
7106 Capacity Marker	9688
7107 Capacity Marker	9689
7108 Capacity Marker	9690
7109 Capacity Marker	9691
7110 Capacity Marker	9692
7111 Capacity Marker	9693
7112 Capacity Marker	9694
7113 Capacity Marker	9695
7114 Capacity Marker	9696
7115 Capacity Marker	9697
7116 Capacity Marker	9698
7117 Capacity Marker	9699
7118 Capacity Marker	9700
7119 Capacity Marker	9701
7120 Capacity Marker	9702

7121 Capacity Marker	9703
7122 Capacity Marker	9704
7123 Capacity Marker	9705
7124 Capacity Marker	9706
7125 Capacity Marker	9707
7126 Capacity Marker	9708
7127 Capacity Marker	9709
7128 Capacity Marker	9710
7129 Capacity Marker	9711

IBM z13	2964	NE1	
130-Way Processor CP7			8320
131-Way Processor CP7			8321
132-Way Processor CP7			8322
133-Way Processor CP7			8323
134-Way Processor CP7			8324
135-Way Processor CP7			8325
136-Way Processor CP7			8326
137-Way Processor CP7			8327
138-Way Processor CP7			8328
139-Way Processor CP7			8329
140-Way Processor CP7			8330
141-Way Processor CP7			8331

7130 Capacity Marker	9712
7131 Capacity Marker	9713
7132 Capacity Marker	9714
7133 Capacity Marker	9715
7134 Capacity Marker	9716
7135 Capacity Marker	9717
7136 Capacity Marker	9718
7137 Capacity Marker	9719
7138 Capacity Marker	9720
7139 Capacity Marker	9721
7140 Capacity Marker	9722
7141 Capacity Marker	9723

Description	Machine Type	Model	Feature
ZBX	2458	004	
ZBX model 004			0512
Service Docs Optional Print			0033
HMC			0092
HMC rack mounted			0094
SE 1U			0600
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 Y Cord			0533
Rear door heat exchanger			0540
Acoustic rear door			0543
Top exit			0545
DataPower blade			0611
Pwr blade enablement			0612
System x blade enablement			0613
Processor Blade Filler			0618
Rack filler panel 1U			0341
3200mm cat6 cable			0625
10GbE 1m SFP cable			0626
10GbE 3m SFP cable			0627
10GbE 7m SFP cable			0628
10GbE LR 10km SFP+			0632
10GbE SR SFP+			0633
1000BASE-LX 1310nm 10km SFP			0634
1000BASE-SX 850nm 550m SFP			0635
Manage FW suite			0019
Automate FW suite			0020
Manage FW Pwr blade			0178
Automate FW Pwr blade			0179

Manage FW System x blade	0182
Automate FW System x blade	0183
Manage FW DP blade	0184
Automate FW DP blade	0185
US English	0235
France	0236
German/Austrian	0237
LA Spanish	0238
Spain	0239
Italian	0240
French Canadian	0241
Portuguese	0242
UK English	0243
Norwegian	0244
Sweden Finland	0245
Netherlands	0246
Belgian French	0247
Denmark	0248
Swiss French/German	0249
Month indicator	0660
Day indicator	0661
Hour indicator	0662
Minute indicator	0663
Read-Only Media Option	0845
32GB backup media	0848
Flat panel display	6096
RPO action flag	9003

Description	Machine		Feature
	Type	Model	
IBM zEnterprise EC12	2827		
		H20	
		H43	
		H66	
		H89	
		HA1	
TKE 8.0 LIC			0877
TKE workstation			0847
TKE Smart Card Reader			0891
TKE addl smart cards			0892
4767 TKE Crypto Adapter			0894
Fill and Drain Kit			3380
Fill and Drain adapter kit			3379
Universal Lift Tool/Ladder			3105
Universal Lift Tool upgr kit			3103

Description	Machine		Feature
	Type	Model	
IBM zEnterprise BC12	2828		
		H06	
		H13	
TKE 8.0 LIC			0877
TKE workstation			0847
TKE Smart Card Reader			0891
TKE addl smart cards			0892
4767 TKE Crypto Adapter			0894
Universal Lift Tool/Ladder			3105
Universal Lift Tool upgr kit			3103

Features that may carry forward on an upgrade:

The following features are not orderable on the IBM z13 models.

If they are installed at the time of an upgrade to the IBM z13 they may be retained.

Description	Mach Type	Mod	Feature Code
IBM z13	2964	N30 N63 N96 NC9 NE1	
HMC			0091
HCA2-C Fanout			0162
IFB-MP Daughter Card			0326
STI-A8 Mother Card			0327
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
TKE workstation			0842
Addl smart cards			0884
TKE Smart Card Reader			0885
FICON Express8 10KM LX			3325
FICON Express8 SX			3326
Fill and Drain Kit			3378
Universal Lift Tool/Ladder			3759

The following features are not orderable on the IBM z BladeCenter Extension model 004. If they are installed at the time of an upgrade to the IBM z BladeCenter Extension model 004 they may be retained.

Description	Mach Type	Mod	Feature Code
IBM z BladeCenter Extension	2458	004	
HMC			0091
Std front door			0541
Chassis counter weight			0544
Primary zBX rack			0601
Expansion zBX rack			0602
zBX configured chassis asm			0603
10 GbE HSS switch			0605
Fibre channel ESM switch			0606
Mgmt TOR switch			0607
IEDN TOR switch			0608
8 Gb SW optical module			0615
Rack filler plate 3U			0619
1000 mm cat6 cable			0620
15 ft cat6 cable			0624

Model conversions

From		To		Description
M/T	Model	M/T	Model	
2817	M15	2964	N30 (*)	M15 air to N30 air
2817	M15	2964	N63 (*)	M15 air to N63 air
2817	M15	2964	N96 (*)	M15 air to N96 air
2817	M15	2964	NC9 (*)	M15 air to NC9 air
2817	M15	2964	NE1 (*)	M15 air to NE1 air
2817	M32	2964	N30 (*)	M32 air to N30 air
2817	M32	2964	N63 (*)	M32 air to N63 air
2817	M32	2964	N96 (*)	M32 air to N96 air
2817	M32	2964	NC9 (*)	M32 air to NC9 air
2817	M32	2964	NE1 (*)	M32 air to NE1 air
2817	M49	2964	N30 (*)	M49 air to N30 air
2817	M49	2964	N63 (*)	M49 air to N63 air
2817	M49	2964	N96 (*)	M49 air to N96 air
2817	M49	2964	NC9 (*)	M49 air to NC9 air

2817	M49	2964	NE1	(*)	M49 air	to NE1 air
2817	M66	2964	N30	(*)	M66 air	to N30 air
2817	M66	2964	N63	(*)	M66 air	to N63 air
2817	M66	2964	N96	(*)	M66 air	to N96 air
2817	M66	2964	NC9	(*)	M66 air	to NC9 air
2817	M66	2964	NE1	(*)	M66 air	to NE1 air
2817	M80	2964	N30	(*)	M80 air	to N30 air
2817	M80	2964	N63	(*)	M80 air	to N63 air
2817	M80	2964	N96	(*)	M80 air	to N96 air
2817	M80	2964	NC9	(*)	M80 air	to NC9 air
2817	M80	2964	NE1	(*)	M80 air	to NE1 air
2817	M15	2964	N30	(*)	M15 air	to N30 water
2817	M15	2964	N63	(*)	M15 air	to N63 water
2817	M15	2964	N96	(*)	M15 air	to N96 water
2817	M15	2964	NC9	(*)	M15 air	to NC9 water
2817	M15	2964	NE1	(*)	M15 air	to NE1 water
2817	M32	2964	N30	(*)	M32 air	to N30 water
2817	M32	2964	N63	(*)	M32 air	to N63 water
2817	M32	2964	N96	(*)	M32 air	to N96 water
2817	M32	2964	NC9	(*)	M32 air	to NC9 water
2817	M32	2964	NE1	(*)	M32 air	to NE1 water
2817	M49	2964	N30	(*)	M49 air	to N30 water
2817	M49	2964	N63	(*)	M49 air	to N63 water
2817	M49	2964	N96	(*)	M49 air	to N96 water
2817	M49	2964	NC9	(*)	M49 air	to NC9 water
2817	M49	2964	NE1	(*)	M49 air	to NE1 water
2817	M66	2964	N30	(*)	M66 air	to N30 water
2817	M66	2964	N63	(*)	M66 air	to N63 water
2817	M66	2964	N96	(*)	M66 air	to N96 water
2817	M66	2964	NC9	(*)	M66 air	to NC9 water
2817	M66	2964	NE1	(*)	M66 air	to NE1 water
2817	M80	2964	N30	(*)	M80 air	to N30 water
2817	M80	2964	N63	(*)	M80 air	to N63 water
2817	M80	2964	N96	(*)	M80 air	to N96 water
2817	M80	2964	NC9	(*)	M80 air	to NC9 water
2817	M80	2964	NE1	(*)	M80 air	to NE1 water
2817	M15	2964	N30	(*)	M15 water	to N30 water
2817	M15	2964	N63	(*)	M15 water	to N63 water
2817	M15	2964	N96	(*)	M15 water	to N96 water
2817	M15	2964	NC9	(*)	M15 water	to NC9 water
2817	M15	2964	NE1	(*)	M15 water	to NE1 water
2817	M32	2964	N30	(*)	M32 water	to N30 water
2817	M32	2964	N63	(*)	M32 water	to N63 water
2817	M32	2964	N96	(*)	M32 water	to N96 water
2817	M32	2964	NC9	(*)	M32 water	to NC9 water
2817	M32	2964	NE1	(*)	M32 water	to NE1 water
2817	M49	2964	N30	(*)	M49 water	to N30 water
2817	M49	2964	N63	(*)	M49 water	to N63 water
2817	M49	2964	N96	(*)	M49 water	to N96 water
2817	M49	2964	NC9	(*)	M49 water	to NC9 water
2817	M49	2964	NE1	(*)	M49 water	to NE1 water
2817	M66	2964	N30	(*)	M66 water	to N30 water
2817	M66	2964	N63	(*)	M66 water	to N63 water
2817	M66	2964	N96	(*)	M66 water	to N96 water
2817	M66	2964	NC9	(*)	M66 water	to NC9 water
2817	M66	2964	NE1	(*)	M66 water	to NE1 water
2817	M80	2964	N30	(*)	M80 water	to N30 water
2817	M80	2964	N63	(*)	M80 water	to N63 water
2817	M80	2964	N96	(*)	M80 water	to N96 water
2817	M80	2964	NC9	(*)	M80 water	to NC9 water
2817	M80	2964	NE1	(*)	M80 water	to NE1 water
2827	H20	2964	N30	(*)	H20 air	to N30 air
2827	H20	2964	N63	(*)	H20 air	to N63 air
2827	H20	2964	N96	(*)	H20 air	to N96 air
2827	H20	2964	NC9	(*)	H20 air	to NC9 air
2827	H20	2964	NE1	(*)	H20 air	to NE1 air
2827	H43	2964	N30	(*)	H43 air	to N30 air
2827	H43	2964	N63	(*)	H43 air	to N63 air
2827	H43	2964	N96	(*)	H43 air	to N96 air
2827	H43	2964	NC9	(*)	H43 air	to NC9 air
2827	H43	2964	NE1	(*)	H43 air	to NE1 air
2827	H66	2964	N30	(*)	H66 air	to N30 air
2827	H66	2964	N63	(*)	H66 air	to N63 air

2827	H66	2964	N96	(*)	H66 air	to N96 air
2827	H66	2964	NC9	(*)	H66 air	to NC9 air
2827	H66	2964	NE1	(*)	H66 air	to NE1 air
2827	H89	2964	N30	(*)	H89 air	to N30 air
2827	H89	2964	N63	(*)	H89 air	to N63 air
2827	H89	2964	N96	(*)	H89 air	to N96 air
2827	H89	2964	NC9	(*)	H89 air	to NC9 air
2827	H89	2964	NE1	(*)	H89 air	to NE1 air
2827	HA1	2964	N30	(*)	HA1 air	to N30 air
2827	HA1	2964	N63	(*)	HA1 air	to N63 air
2827	HA1	2964	N96	(*)	HA1 air	to N96 air
2827	HA1	2964	NC9	(*)	HA1 air	to NC9 air
2827	HA1	2964	NE1	(*)	HA1 air	to NE1 air
2827	H20	2964	N30	(*)	H20 air	to N30 water
2827	H20	2964	N63	(*)	H20 air	to N63 water
2827	H20	2964	N96	(*)	H20 air	to N96 water
2827	H20	2964	NC9	(*)	H20 air	to NC9 water
2827	H20	2964	NE1	(*)	H20 air	to NE1 water
2827	H43	2964	N30	(*)	H43 air	to N30 water
2827	H43	2964	N63	(*)	H43 air	to N63 water
2827	H43	2964	N96	(*)	H43 air	to N96 water
2827	H43	2964	NC9	(*)	H43 air	to NC9 water
2827	H43	2964	NE1	(*)	H43 air	to NE1 water
2827	H66	2964	N30	(*)	H66 air	to N30 water
2827	H66	2964	N63	(*)	H66 air	to N63 water
2827	H66	2964	N96	(*)	H66 air	to N96 water
2827	H66	2964	NC9	(*)	H66 air	to NC9 water
2827	H66	2964	NE1	(*)	H66 air	to NE1 water
2827	H89	2964	N30	(*)	H89 air	to N30 water
2827	H89	2964	N63	(*)	H89 air	to N63 water
2827	H89	2964	N96	(*)	H89 air	to N96 water
2827	H89	2964	NC9	(*)	H89 air	to NC9 water
2827	H89	2964	NE1	(*)	H89 air	to NE1 water
2827	HA1	2964	N30	(*)	HA1 air	to N30 water
2827	HA1	2964	N63	(*)	HA1 air	to N63 water
2827	HA1	2964	N96	(*)	HA1 air	to N96 water
2827	HA1	2964	NC9	(*)	HA1 air	to NC9 water
2827	HA1	2964	NE1	(*)	HA1 air	to NE1 water
2827	H20	2964	N30	(*)	H20 water	to N30 water
2827	H20	2964	N63	(*)	H20 water	to N63 water
2827	H20	2964	N96	(*)	H20 water	to N96 water
2827	H20	2964	NC9	(*)	H20 water	to NC9 water
2827	H20	2964	NE1	(*)	H20 water	to NE1 water
2827	H43	2964	N30	(*)	H43 water	to N30 water
2827	H43	2964	N63	(*)	H43 water	to N63 water
2827	H43	2964	N96	(*)	H43 water	to N96 water
2827	H43	2964	NC9	(*)	H43 water	to NC9 water
2827	H43	2964	NE1	(*)	H43 water	to NE1 water
2827	H66	2964	N30	(*)	H66 water	to N30 water
2827	H66	2964	N63	(*)	H66 water	to N63 water
2827	H66	2964	N96	(*)	H66 water	to N96 water
2827	H66	2964	NC9	(*)	H66 water	to NC9 water
2827	H66	2964	NE1	(*)	H66 water	to NE1 water
2827	H89	2964	N30	(*)	H89 water	to N30 water
2827	H89	2964	N63	(*)	H89 water	to N63 water
2827	H89	2964	N96	(*)	H89 water	to N96 water
2827	H89	2964	NC9	(*)	H89 water	to NC9 water
2827	H89	2964	NE1	(*)	H89 water	to NE1 water
2827	HA1	2964	N30	(*)	HA1 water	to N30 water
2827	HA1	2964	N63	(*)	HA1 water	to N63 water
2827	HA1	2964	N96	(*)	HA1 water	to N96 water
2827	HA1	2964	NC9	(*)	HA1 water	to NC9 water
2827	HA1	2964	NE1	(*)	HA1 water	to NE1 water
2964	N30	2964	N63	(*)	N30 air	to N63 air
2964	N30	2964	N96	(*)	N30 air	to N96 air
2964	N30	2964	NC9	(*)	N30 air	to NC9 air
2964	N30	2964	NE1	(*)	N30 air	to NE1 air
2964	N63	2964	N96	(*)	N63 air	to N96 air
2964	N63	2964	NC9	(*)	N63 air	to NC9 air
2964	N63	2964	NE1	(*)	N63 air	to NE1 air
2964	N96	2964	NC9	(*)	N96 air	to NC9 air
2964	N96	2964	NE1	(*)	N96 air	to NE1 air
2964	NC9	2964	NE1	(*)	NC9 air	to NE1 air

2964	N30	2964	N63	(*)	N30 water	to N63 water
2964	N30	2964	N96	(*)	N30 water	to N96 water
2964	N30	2964	NC9	(*)	N30 water	to NC9 water
2964	N30	2964	NE1	(*)	N30 water	to NE1 water
2964	N63	2964	N96	(*)	N63 water	to N96 water
2964	N63	2964	NC9	(*)	N63 water	to NC9 water
2964	N63	2964	NE1	(*)	N63 water	to NE1 water
2964	N96	2964	NC9	(*)	N96 water	to NC9 water
2964	N96	2964	NE1	(*)	N96 water	to NE1 water
2964	NC9	2964	NE1	(*)	NC9 water	to NE1 water

2458	002	2458	004	(*)	002	to 004
2458	003	2458	004	(*)	003	to 004

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

Feature conversions

The feature conversion list for IBM z13 is available now in the *Library* section of Resource Link.

This list can be obtained at Resource Link by accessing the following website

<http://www.ibm.com/servers/resourcelink/lib03011.nsf/pages/2964FeatureConversions?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.

Publications

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

Title	Order number
IBM z13 Installation Manual for Physical Planning (IMPP)	GC28-6938
PR/SM Planning Guide	SB10-7162
IOCP User's Guide	SB10-7163
ZBX Model 004 Installation Manual for Physical Planning (IMPP)	GC27-2630

The following IBM z13 publications are shipped with the product and will be available at planned availability in the *Library* section of Resource Link:

Title	Order number
IBM z13 Installation Manual	GC28-6936
IBM z13 Service Guide	GC28-6937
Service Guide for TKE Workstations (Version 7.0)	GC28-6942
Systems Safety Notices	G229-9054
IBM z13 Safety Inspection	GC28-6935
Systems Environmental Notices and User Guide	Z125-5823
z Systems Statement of Limited Warranty	GC28-6946
License Agreement for Machine Code	SC28-6872
License Agreement for Machine Code Addendum for Elliptic Curve Cryptography	GC27-2612

The following publications will be available at planned availability in the *Library* section of Resource Link:

Title	Order number
Integrating the HMC's Broadband RSF into your Enterprise	SC28-6951

Application Programming Interfaces	SB10-7164
Capacity on Demand User's Guide	SC28-6943
Common Information Model (CIM) Management Interface	SB10-7165
CHPID Mapping Tool User's Guide	GC28-6947
Hardware Management Console Web Services API (V2.13.0)	SC27-2627
IBM z13 Parts Catalog	GC28-6939
SCSI IPL - Machine Loader Messages	SC28-6948
Service Guide for HMCs and SES	GC28-6944
Stand-Alone IOCP User's Guide	SB10-7166
Ensemble Workload Resource Group Management Guide	GC27-2633
Ensemble Planning Guide	GC27-2631
IBM z Advanced Workload Analysis Reporter (IBM zAware) Guide V2.0	SC27-2632
OSA-Express Customer Guide and Reference	SA22-7935
OSA/SF on the Hardware Management Console	SC14-7580
FICON CTC Reference	SB10-7167
Maintenance Information for Fiber Optic Links	SY27-7694
Planning for Fiber Optic Links	GA23-1407

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

Title	Order number
ZBX Models 004, 003, and 002 Service Guide	GC28-6950
ZBX Model 004 Installation Manual	GC27-2629
Systems Safety Notices	G229-9054
ZBX Models 004, 003, and 002 Safety Inspection	GC28-6949
z Systems Statement of Limited Warranty	GC28-6946
Systems Environmental Notices and User Guide	Z125-5823
ZBX Health Check Guide	00WK626
Readme First Guide for ZBX Move	00WK623

Resource Link

Publications for IBM z Systems 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.

HMC and SE console documentation

At planned availability, the Hardware Management Console (HMC) and Support Element (SE) console documentation (Version 2.13.0) will be available from the IBM Knowledge Center (select z Systems and then select your product from the navigation bar).

<http://www.ibm.com/support/knowledgecenter>

The following Redbooks® publications are available now:

Title	Order number
IBM z13 Technical Guide	SG24-8251
IBM z13 Technical Introduction	SG24-8250
z Systems Functional Matrix	REDP-5157
IBM z13 Configuration Setup	SG24-8260
z Systems Connectivity Handbook	SG24-5444
Extending z/OS System Management Functions with IBM zAware	SG24-8070
Real-time Fraud Detection Analytics on z Systems	SG24-8066

To download these Redbooks publications, go to

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

For other IBM Redbooks publications, refer to

<http://www.redbooks.ibm.com/>

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IBM Publications Center Portal

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Services

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IBM services include business consulting, outsourcing, hosting services, applications, and other technology management.

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For details on available services, contact your IBM representative or visit

<http://www.ibm.com/services/us/en/it-services/gts-it-service-home-page-1.html>

For details on available IBM Business Continuity and Recovery Services, contact your IBM representative or visit

<http://www.ibm.com/services/us/en/it-services/business-continuity/>

For details on education offerings related to specific products, visit

<http://www.ibm.com/services/learning/ites.wss/zz/en?pageType=page&c=a0011023>

Technical information

Specified operating environment

Physical specifications - IBM z13 Air Cooled Machine

Dimensions (rounded to the nearest 0.1" 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

* Note: The height with overhead I/O cable exit differs from the standard height only with the optical cable organizer feature installed.

System with covers and reduction

- Inches	73.5	61.6	70.3
- Centimeter	186.7	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	145.8	82.2	202.6

Each frame with one side cover and with packaging (ARBO crate)

- Inches	63.4	36.5	87.6
- Centimeter	161.0	92.7	222.5

Approximate weight:

	New Build Minimum System Model N30 No I/O Drawer	New Build Maximum System Model NE1 Max # of I/O Drawers
--	--	---

System with IBF feature

- kg	1512	2714
- lb	3333	5983
- kg (O/H IO cable exit)	1566	2768
- lb (O/H IO cable exit)	3453	6103

System without IBF feature

- kg	1309	2410
- lb	2886	5312
- kg (O/H IO cable exit)	1364	2464
- lb (O/H IO cable exit)	3006	5432

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 z13 Water Cooled Machine

Dimensions (rounded to the nearest 0.1" 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

* Note: The height with overhead I/O cable exit differs from the standard height only with the optical cable organizer feature installed.

System with covers and reduction

- Inches	77.5	61.6	70.3
- Centimeter	196.9	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	156.0	82.2	202.6
Each frame with one side cover and with packaging (ARBO crate)			
- Inches	68.0	36.5	87.6
- Centimeter	172.7	92.7	222.5

Approximate weight:

	New Build Minimum System Model N30 No I/O Drawer	New Build Maximum System Model NE1 Max # of I/O Drawers
System with IBF feature		
- kg	1546	2737
- lb	3408	6034
- kg (O/H IO cable exit)	1600	2791
- lb (O/H IO cable exit)	3528	6154
System without IBF feature		
- kg	1343	2433
- lb	2961	5363
- kg (O/H IO cable exit)	1398	2487
- lb (O/H IO cable exit)	3081	5483

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 z 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 004 with 28 blades per rack
- kg	675
- lb	1490

Operating environment - IBM z13 Air Cooled Machine

Temperature:

- 10° to 35°C (50° to 95°F) for all models up to 900 meters above sea level; maximum ambient reduces 1°C per 300 meters above 900 meters

Relative Humidity: 20% to 80%

Wet Bulb (Caloric Value): 25°C (77°F) Operating Mode

Max Dew Point: 21°C (69.8°F) Operating Mode

Electrical Power (maximum)

Utility	N30	N63	N96	NC9	NE1	Power Factor
200-240 VAC	9.9 kVA	18.0 kVA	22.4 kVA	27.1 kVA	27.4 kVA	0.996
380-415 VAC	10.1 kVA	18.5 kVA	23.0 kVA	27.8 kVA	28.1 kVA	0.978
480 VAC	10.5 kVA	19.1 kVA	23.8 kVA	28.8 kVA	29.1 kVA	0.958
400 VDC	9.6 kW	17.6 kW	21.8 kW	26.4 kW	26.7 kW	-

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

Noise level:

- Typical Configuration (Model N63)
 - Declared A-Weighted Sound Power Level, LWAd(B) = 7.8
 - Declared A-Weighted Sound Pressure Level, LpAm(dB) = 59
- Maximum Configuration (Model NE1)
 - 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)

Systems

- Product Category (2011 law): B
- Computer Energy Consumption Efficiency - 2011 law (Watts/GTOPS):1012
- Japan VCCI, Class A

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 z13 Water Cooled Machine

Temperature:

- 10° to 35°C (50° to 95°F) for all models up to 900 meters above sea level; maximum ambient reduces 1°C per 300 meters above 900 meters

Relative Humidity: 20% to 80%

Wet Bulb (Caloric Value): 25°C (77°F) Operating Mode

Max Dew Point: 21°C (69.8°F) Operating Mode

Electrical Power (maximum)

Utility	N30	N63	N96	NC9	NE1	Power Factor
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200-240 VAC	9.5 kVA	17.4 kVA	21.5 kVA	25.5 kVA	25.8 kVA	0.996
380-415 VAC	9.7 kVA	17.8 kVA	22.0 kVA	26.2 kVA	26.4 kVA	0.978
480 VAC	10.1 kVA	18.4 kVA	22.8 kVA	27.1 kVA	27.4 kVA	0.958
400 VDC	9.2 kW	16.9 kW	20.9 kW	24.9 kW	25.1 kW	-

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

Noise level:

- Typical Configuration (Model N63)
 - Declared A-Weighted Sound Power Level, LWAd(B) = 7.9
 - Declared A-Weighted Sound Pressure Level, LpAm(dB) = 60
- Maximum Configuration (Model NE1)
 - 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)

Systems

- Product Category (2011 law): B
- Computer Energy Consumption Efficiency - 2011 law (Watts/GTOPS):1012
- Japan VCCI, Class A

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 z BladeCenter Extension

Temperature:

- 10° to 32°C (50° to 89°F) for all models up to 900 meters above sea level; 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

Max 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

Homologation

This product is not certified for direct connection by any means whatsoever to interfaces of public telecommunications networks. Certification may be required by law prior to making any such connection. Contact an IBM representative or reseller for any questions.

Hardware requirements

The hardware requirements for the IBM z Systems and its features and functions are identified. **A new driver level is required.** HMC (V2.13.0) plus MCLs and the Support Element (V2.13.0) are available on March 9, 2015.

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 2.13.0, as described, apply exclusively to z13 and 2458-004. However, the HMC version 2.13.0 will also support the systems listed in the table below.

Family	Machine Type	Firmware Driver	SE Version
zBC12	2828	15	2.12.1
zEC12	2827	15	2.12.1
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

Peripheral hardware and device attachments

IBM devices previously attached to IBM System z10®, z196, and zSeries servers are supported for attachment to IBM z13 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 z13 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 z Systems FICON and FCP channels can be found in the *Library* section of Resource Link.

<https://www.ibm.com/servers/resourcelink>

Software requirements

IBM z13 requires at a minimum:

- z/OS V2.2.
- z/OS V2.1 with PTFs.
- z/OS V1.13 with PTFs.
- z/OS V1.12 with required maintenance (compatibility support only) and extended support agreement.

Note: z/OS V1.12 supports IBM z13, however, z/OS V1.12 support was withdrawn September 30, 2014. After that date, an IBM Software Support Services - Service extension for z/OS V1.12 is required. Speak with your IBM representative for details. No exploitation of new IBM z13 system function is available with z/OS V1.12. Certain functions and features of the IBM z13 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 Software Support Services for z/OS V1.12, see Services Announcement [AS14-0008](#), dated June 24, 2014.

- z/VM V6.2 with PTFs (Compatibility, CEX5S including enhanced crypto domain support).
- z/VM V6.3 with PTFs (Multi-VSwitch Link Aggregation, SMT, Compatibility, CEX5S including enhanced crypto domain support).
- z/VSE V5.1 with PTFs.
- z/VSE V5.2 with PTFs.
- z/TPF V1.1 with PTFs.
- Linux on z Systems:
 - SUSE Linux Enterprise Server (SLES) for System z: SLES 12 and SLES 11.
 - Red Hat Enterprise Linux (RHEL) for System z: RHEL 7 and RHEL 6.

For recommended distribution levels refer to

<http://www.ibm.com/systems/z/os/linux/resources/testedplatforms.html>

- zBX Model 004 Support Plan:
 - For details on hypervisor levels and supported operating systems on the zBX Model 004, refer to

http://www.ibm.com/systems/z/hardware/zenterprise/zbx_specs.html

Simultaneous multithreading (SMT) requires at a minimum:

- z/OS V2.2.
- z/OS V2.1 with PTFs.
- z/VM V6.3 with PTFs; planned availability March 13, 2015.
- Linux on z Systems:
 - IBM is working with its Linux distribution partners to include support in future distribution releases.
 - Existing distributions of Linux on z can benefit from SMT exploitation in a z/VM host.

z/VM Multi-VSwitch Link Aggregation requires at a minimum:

- z/VM V6.3 with PTFs; planned availability May 30, 2015.

FICON Express8S (CHPID type FC) when utilizing IBM z13 FICON or Channel-To-Channel (CTC), requires at a minimum:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

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

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2 with PTFs for guest exploitation.
- z/TPF V1.1 with PTFs.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

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

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2 with PTFs for guest exploitation.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

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

- z/VM V6.2.
- z/VSE V5.1.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

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

- z/VM V6.3 for guest exploitation.
- Linux on z Systems:
 - SLES 12 and SLES 11 SP3.
 - RHEL 7 and RHEL 6.4.

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

- z/VM V6.2 for guest exploitation.
- Linux on z Systems:
 - SLES 12 (DIF and DIX) and SLES 11 SP2 (DIF and DIX).
 - RHEL 7 (DIF and DIX) and RHEL 6.4 (DIF only).

FICON Express16S (CHPID type FC) when utilizing FICON or Channel-To-Channel (CTC), requires at a minimum:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

FICON Express16S (CHPID type FC) for support of zHPF single-track operations requires at a minimum:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2 with PTFs for guest exploitation.
- Linux on z Systems:
 - SLES 12 and SLES 11 SP1.
 - RHEL 7 and RHEL 6.

FICON Express16S (CHPID type FC) for support of zHPF multitrack operations requires at a minimum:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2 with PTFs for guest exploitation.
- Linux on z Systems:
 - SLES 12 and SLES 11 SP2.
 - RHEL 7 and RHEL 6.1.

FICON Express16S (CHPID type FCP) for support of SCSI devices requires at a minimum:

- z/VM V6.2.
- z/VSE V5.1.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

FICON Express16S (CHPID type FCP) support of hardware data router requires at a minimum:

- z/VM V6.3 for guest exploitation.
- Linux on z Systems:
 - SLES 12 and SLES 11 SP3.
 - RHEL 7 and RHEL 6.4.

T10-DIF support by the FICON Express16S features when defined as CHPID type FCP requires at a minimum:

- z/VM V6.2 for guest exploitation.
- Linux on z Systems:
 - SLES 12 (DIF and DIX) and SLES 11 SP2 (DIF and DIX).
 - RHEL 7 (DIF and DIX) and RHEL 6.4 (DIF only).

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

CHPID type OSD with exploitation of two ports per CHPID:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

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

- z/OS V2.2.

- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1 with PTFs.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

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

CHPID type OSD:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

CHPID type OSX for access control to the intraensemble data network (IEDN) from IBM z13 to Unified Resource Manager functions:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2 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 with PTFs.
- Linux on z Systems:
 - SLES 12 and SLES 11 SP1 (maintenance update).
 - RHEL 7 and RHEL 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 V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.

- z/VSE V5.1.

CHPID type OSD with exploitation of two ports per CHPID:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1 with PTFs.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

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

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

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

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13 with PTFs.
- z/VM V6.2 for guest exploitation.

Checksum offload for IPv6 packets (CHPID type OSD):

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13 with PTFs.
- z/VM V6.2 for guest exploitation.

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

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13 with PTFs.
- z/VM V6.2 for guest exploitation.

Large Send for IPv6 packets (CHPID type OSD):

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13 with PTFs.
- z/VM V6.2 for guest exploitation.

CHPID type OSE supporting 4 or 2 ports per feature:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.

CHPID type OSM for intranode management network (INMN) :

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2 to define, modify, and delete CHPID type OSM when z/VM is the controlling LPAR for dynamic I/O.
- Linux on z Systems:
 - SLES 12 and SLES 11 SP2.
 - RHEL 7 and RHEL 6.

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

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1 with PTFs.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

OSA-Express5S GbE LX (#0413) and GbE SX (#0414) require at minimum:

CHPID type OSD with exploitation of two ports per CHPID:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.

- z/TPF V1.1 with PTFs.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

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

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

OSA-Express5S 10 GbE LR (#0415) and 10 GbE SR (#0416) require at a minimum:

CHPID type OSD:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

CHPID type OSX for access control to the intraensemble data network (IEDN) from IBM z13 to Unified Resource Manager functions:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2 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 with PTFs.
- Linux on z Systems:
 - SLES 12 and SLES 11 SP1 (maintenance update).
 - RHEL 7 and RHEL 6.

OSA-Express5S 1000BASE-T Ethernet (#0417) requires at minimum:

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

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.

CHPID type OSD with exploitation of two ports per CHPID:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1 with PTFs.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

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

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

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

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13 with PTFs.
- z/VM V6.2 with PTFs for guest exploitation.

Checksum offload for IPv6 packets (CHPID type OSD):

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13 with PTFs.
- z/VM V6.2 for guest exploitation.

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

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13 with PTFs.
- z/VM V6.2 for guest exploitation.

Large Send for IPv6 packets (CHPID type OSD):

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13 with PTFs.
- z/VM V6.2 for guest exploitation.

CHPID type OSE supporting 4 or 2 ports per feature:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.

CHPID type OSM for intranode management network (INMN) :

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2 to define, modify, and delete CHPID type OSM when z/VM is the controlling LPAR for dynamic I/O.
- Linux on z Systems:
 - SLES 12 and SLES 11 SP2.
 - RHEL 7 and RHEL 6.

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

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13.
- z/OS V1.12. Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2.
- z/VSE V5.1.
- z/TPF V1.1 with PTFs.
- Linux on z Systems:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

IBM Integrated Coupling Adapter (ICA SR) requires at a minimum:

- z/OS V2.2.
- z/OS V2.1 or V1.13 with PTFs.
- z/VM V6.2 with PTFs to define, modify, and delete CHPID type CS5 when z/VM is the controlling LPAR for dynamic I/O.

Support for 256 Coupling CHPIDs requires at a minimum:

- z/OS V2.2.
- z/OS V2.1 or V1.13 with PTFs.
- z/VM 6.2 with PTFs for guest exploitation.

Crypto Express5S (#0890) Toleration, which treats Crypto Express5S cryptographic coprocessors and accelerators as Crypto Express4 coprocessors and accelerators, requires at a minimum:

- z/OS V2.2.
- z/OS 2.1 with PTFs
- z/OS V1.13 with PTFs.
- z/OS V1.12 with PTFs. (The z/OS Lifecycle Extension for z/OS V1.12 (5658-A01) is required for support.) Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.2 with PTFs for guest exploitation.
- z/VSE V5.1 with PTFs.
- z/VSE V5.2 with PTFs.
- Linux on z Systems: IBM is working with its Linux distribution partners to provide support via maintenance or future distribution releases for:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

Crypto Express5S (#0890) support of Visa Format Preserving Encryption requires at a minimum:

- z/OS V2.2.
- z/OS V2.1 with the Enhanced Cryptographic Support for z/OS V1.13-V2.1 web deliverable installed.
- z/OS V1.13 with the Enhanced Cryptographic Support for z/OS V1.13-V2.1 web deliverable installed.
- z/VM V6.2 with PTFs for guest exploitation.

Crypto Express5S (#0890) support of greater than 16 Domains requires at a minimum:

- z/OS V2.2.
- z/OS V2.1 with the Enhanced Cryptographic Support for z/OS V1.13-V2.1 web deliverable installed.
- z/OS V1.13 with the Enhanced Cryptographic Support for z/OS V1.13-V2.1 web deliverable installed.
- z/VM V6.2 with PTFs for guest exploitation.
- z/VSE V5.1 with PTFs.
- z/VSE V5.2 with PTFs.
- Linux on z Systems: IBM is working with its Linux distribution partners to provide support via maintenance or future distribution releases for:
 - SLES 12 and SLES 11.
 - RHEL 7 and RHEL 6.

10GbE RoCE Express (#0411) for Shared Memory Communications - Remote Direct Memory Access (SMC-R) requires at a minimum:

- z/OS V2.1 with PTFs.
- z/OS V1.13 with PTFs (compatibility support only).
- z/OS V1.12 with PTFs (compatibility support only). Note: See z/OS V1.12 note at the beginning of the Software Requirements.
- z/VM V6.3 with PTFs for guest exploitation.
- Linux on z Systems: IBM is working with its Linux distribution partners to include support in future distribution releases.

10GbE RoCE Express (#0411) for Ethernet communications (which does not require a peer OSA) including Single Root I/O Virtualization (SR-IOV) requires at a minimum:

- z/VM V6.3 with PTFs for guest exploitation.
- Linux on z Systems: Currently limited to experimental support in:
 - SLES 12 and SLES11 SP3 with latest maintenance.
 - RHEL 7.0.

XL C/C++ support of ARCH(11) and TUNE(11) parameters requires at a minimum:

- z/OS V2.2.
- z/OS V2.1 with a web deliverable from the z/OS download site
<http://www.ibm.com/systems/z/os/zos/tools/downloads/#webdees>

Transactional memory requires at a minimum:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13 with PTFs.
- Linux on z Systems:
 - SLES 12 and SLES 11 SP3.
 - RHEL 7 and RHEL 6.4.

IBM zAware requires at a minimum:

- For monitored z/OS servers:
 - z/OS V2.2.
 - z/OS V2.1.
 - 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.
- z/VM V6.2 with PTFs in support of monitoring Linux on z Systems guests.
- The following browsers are supported for the GUI: Firefox 31 and IE 9, 10, 11.

Flash Express requires at a minimum:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13 with PTFs and the z/OS V1.13 RSM Enablement Offering web deliverable installed. The web deliverable is available at
<http://www.ibm.com/systems/z/os/zos/downloads/>
- Linux on z Systems:
 - SLES 12 and SLES 11 SP3.
 - RHEL 7 and RHEL 6.4.

2 GB Large Pages requires at a minimum:

- z/OS V2.2.
- z/OS V2.1.
- z/OS V1.13 with PTFs and the z/OS V1.13 RSM Enablement Offering web deliverable installed. The web deliverable is 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 V2.2.
- z/OS V2.1.
- z/OS V1.13 with PTFs.
- z/OS V1.12 with PTFs. Note: See z/OS V1.12 note at the beginning of the Software Requirements.

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 z13 is approximately 22 installer hours. This does not include planning hours. This assumes 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 z13 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.

Terms and conditions

IBM Global Financing

Yes

Products - terms and conditions

Warranty period

One year

Warranty period - IBM z 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 z BladeCenter Extension

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

- IBM intends to deliver the enhanced IBM z Systems model of service and support for all blade products that are supported for use in the zBX. The enhanced service and support for blade products is intended to be available when the blades are installed in a zBX and activated via a unique IBM z Systems 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 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 a blade for installation in a zBX since IBM z Systems is providing the higher level of service for blades while they are installed in a zBX.
- For all hardware that will be installed in IBM z Systems 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 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

If required, IBM will provide repair service depending on the types of maintenance service specified for the machine. Contact your local representative.

The following service is provided.

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

Warranty service upgrades

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.

General terms and conditions

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.

Contact the local IBM office.

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 which the customer has acquired. You can obtain the agreement at

http://www.ibm.com/systems/support/machine_warranties/machine_code.%20html

or by contacting your IBM representative.

Specific Machine LIC Type Model

2964-N30
2964-N63
2964-N96
2964-NC9
2964-NE1

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 z13 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.%20cryptadd.html

The terms of this ECC Addendum are included with the LMC when a cryptography feature is included in the IBM z13 order, or when a cryptography feature is carried forward as part of an MES order into IBM z13.

Machine Code License Acceptance Requirement

Acceptance-By-Use Machine: Yes, acceptance of the Machine Code license terms is conveyed through the user's initial use of the Machine.

Prices

For all local charges, contact your IBM representative.

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AP distribution

Country/Region	Announce
AP IOT	
ASEAN *	Yes
India/South Asia **	Yes
Australia	Yes
People's Republic of China	Yes
Hong Kong S.A.R of the PRC	Yes
Macao S.A.R of the PRC	Yes
Taiwan	Yes
South Korea	Yes
New Zealand	Yes
Japan IOT	
Japan	Yes

* Brunei Darussalam, Indonesia, Cambodia, Lao People's Democratic Republic, Malaysia, Philippines, Singapore, Thailand, and Vietnam

** Bangladesh, Bhutan, India, Sri Lanka, Maldives, Nepal, and Afghanistan

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Corrections

(Corrected on March 12, 2015)

The "Description" and "Software requirements" sections were revised.

(Corrected on February 27, 2015)

The "Product number," "Description," and "Software requirements" sections were revised.

(Corrected on January 23, 2015)

In the "Publications" section, an order number was revised.