



IBM z9 EC and z9 BC — Delivering greater value for everyone

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At a glance

Today's announcement for the IBM System z9 Enterprise Class (z9 EC) and IBM System z9 Business Class (z9 BC) continues our commitment to deliver improved flexibility, security, and availability, and to help control your costs.

Enhancements to the IBM System z9:

- LPAR group capacity limit is provided for improved management of LPARs.
- An FCP channel is now capable of achieving full data rate, 400 MegaBytes per second (MBps), for all reads or all writes (half-duplex data transfers). An FCP channel is capable of achieving 550 MBps for a mix of reads and writes (full-duplex data transfers). These laboratory measurements apply to large sequential data transfers. Note: An FCP channel is designed to communicate with SCSI devices.
- Lightweight Directory Access Protocol (LDAP) support for Hardware Management Console user authentication has been designed to assist system administrators with the creation of user IDs.
- New opportunities for small and midsized enterprises to more economically migrate to z9 BC are being offered — lower-priced FICON Express4 and Crypto Express2 features and an enhancement to Capacity Backup Upgrade for the z9 BC to assist with business continuity planning.
- z/VM integrated systems management support using the HMC provides out-of-the-box integrated GUI-based basic management of z/VM guests.
- Power monitoring and a zPower estimation tool are designed to assist with the management of your server environment.
- System z9 enhancements to On/Off Capacity on Demand are designed for greater flexibility to more quickly enable temporary capacity.
- Networking enhancements for the OSA-Express family of features are designed to facilitate serviceability, help simplify the infrastructure, facilitate load balancing, reduce latency and improve performance, and allow ports to be combined in a single logical link for increased throughput and nondisruptive failover.
- A new level of Licensed Internal Code for the Trusted Key Entry workstation offers usability enhancements and service mode support, improving access to operations.
- IBM Implementation Services for Parallel Sysplex® are being offered to assist with the assessment, implementation, operation, and maintenance of a System z™ Sysplex environment.
- Kits are being offered for raised-floor and non-raised environments to help physically secure System z frames to the floor.

Previewing z/OS enhancement to help reduce Total Cost of Ownership:

- z/OS Communications Server will allow the IPSec processing to take advantage of System z9 Integrated Information Processors (zIIPs).

For ordering, contact:

Your IBM representative or the Americas Call Centers at

800-IBM-CALL Reference: YE001

Overview

Today's enhancements to the IBM System z9™ Enterprise Class (z9 EC) and Business Class (z9 BC) servers demonstrate our commitment to the continuing evolution of the IBM mainframe by providing leadership in data and transaction serving, continuing the focus on the mainframe strengths — security, virtualization, availability, and scalability.

The LPAR group capacity limit feature is designed to allow you to specify a capacity limit for each LPAR, facilitating management. With changes to the FCP Licensed Internal Code, FCP channels are designed to achieve full data rate for half-duplex data transfers and improved data rates for full-duplex data transfers in the z/VM® and Linux™ on System z9 environments.

With the introduction of OSA-Express Network Traffic Analyzer and QDIO Diagnostic Synchronization, System z9 offers improved serviceability for data capture and analysis by system administrators. The availability of hardware and software traces can help with the resolution of networking problems in the z/OS® and z/OS.e environment.

With the addition of support for Layer 3 Virtual MAC (VMAC) addresses in the z/OS and z/OS.e environment, we have helped to simplify configuration definition and management as well as facilitating load balancing. Each TCP/IP instance can now associate all its IP addresses with their own unique VMAC address.

For small and mid-sized mainframe users, Crypto Express2-1P (with one PCI-X adapter) and FICON™ Express4-2C SX (with two channels per feature) are being offered on the z9 BC as a more economical alternative for the cryptographic and Storage Area Network environments. An enhancement to Capacity Backup (CBU) is offered for z9 BC Model R07 that will allow CBU to all S07 capacity settings.

The System z9 is designed to provide tight coordination between server hardware and operating systems, subsystems, applications, storage, and networking. The System z9 can deliver a balanced system to support your core business applications as well as providing infrastructure you can leverage to exploit the latest technologies and extend your core business applications and processes while maintaining the qualities of service you expect. By using System z9 technologies, such as specialty engines, you can leverage your mainframe to deploy new workloads, helping to satisfy your growing businesses while achieving more value from your existing assets.

Key prerequisites

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

Planned availability dates

- May 11, 2007: Features and functions
- May 15, 2007: HMC Dual Ethernet (#0084)
- June 29, 2007: z/VM integrated systems management for z/VM 5.3
- Third quarter 2007: Dynamic LAN idle for z/OS and z/OS.e V1.8 with PTF

Description

System z9 enhancements

On/Off Capacity on Demand enhancement

System z9 now provides the ability to store up to 100 On/Off CoD LICCC records on the Support Element, at any given time, giving greater flexibility to quickly enable needed temporary capacity. Each record may be easily identified with descriptive names, and users can select from a list of records that may be activated.

LPAR group capacity limit

With the logical partition (LPAR) group capacity limit on z9 EC and z9 BC, you can now specify LPAR group capacity limits allowing you to define each LPAR with its own capacity and one or more groups of LPARs on a server. This is designed to allow z/OS to manage the groups in such a way that the sum of the LPARs' CPU utilization within a group will not exceed the group's defined capacity. Each LPAR in a group can still optionally continue to define an individual LPAR capacity limit.

LPAR group capacity limit requires that all LPARs managed in the group are running at z/OS or z/OS.e V1.8 or later. LPAR group capacity limits may help provision a portion of a System z9 server to a group of LPARs allowing the CPU resources to float more readily between those LPARs, resulting in more productive use of "white space" and higher server utilization. Refer to the Software requirements section.

z/VM integrated systems management

z/VM integrated systems management for the z9 EC and z9 BC Hardware Management Console (HMC) provides out-of-the-box integrated Graphical User Interface-based (GUI-based) basic management of z/VM guests. The HMC will automatically detect z/VM images. The z/VM integrated systems management capability supports the following image management functions: activate, deactivate, and display guest status. Refer to the Software requirements section.

Hardware decimal floating point facilities

IBM is implementing hardware decimal floating point facilities in System z9. The facilities include 4-, 8-, and 16-byte data formats, an encoded decimal (base-10) representation for data, instructions for performing decimal floating point computations, and an instruction which performs data conversions to and from the decimal floating point representation.

Base 10 arithmetic is used for most business and financial computation. To date, floating point computation used for work typically done in decimal arithmetic has involved frequent necessary data conversions and approximation to represent decimal numbers. This has made floating point arithmetic complex and error prone for programmers using it in applications where the data is typically decimal data.

Initial software support for hardware decimal floating point is limited to High Level Assembler support running in z/OS and z/OS.e on System z9. z/OS V1.9 will provide support for hardware decimal floating point instructions and decimal floating point data types in the C and C++ compilers as a programmer-specified option. Support is also provided in the C Run Time Library and the dbx debugger.

This function is also supported by z/VM V5.2 and later for guest operating system use. There is no support available for machines earlier than System z9. Refer to the Software requirements section.

Enhanced driver maintenance utilization

The new features in this announcement are delivered using Enhanced driver maintenance (EDM). When properly configured, the z9 EC and z9 BC are designed to support activating a selected new LIC level concurrently. Concurrent activation of the selected new LIC level is only supported at specific sync points (points in the maintenance process when LIC may be applied concurrently — MCL service level). Sync points may exist throughout the life of the current LIC level. Once a sync point has passed, you will be required to wait until the next sync point supporting concurrent activation of a new LIC level. Certain LIC updates will not be supported by this function. Contact your IBM representative to help you determine the appropriate configuration. With proper planning, you may be able to avoid planned outages when installing driver maintenance and updates. Enhanced driver maintenance is exclusive to the z9 EC and z9 BC, and may help eliminate the need for a planned outage. Refer to the Hardware requirements section.

FCP enhancements

Fibre Channel Protocol (FCP) performance

With changes to the FCP Licensed Internal Code, an FCP channel is designed to help provide increased performance (a FICON channel configured as CHPID type FCP supporting communication with SCSI devices). Laboratory measurements for half-duplex data transfers yielded 31,500 starts per second for reading or writing 4k block sizes (up to twice the number of

start I/Os per second previously measured). Measurements yielded 30,500 starts per second for reading or writing 8k block sizes. These results were achieved in a laboratory environment with an I/O driver program using one channel configured as CHPID type FCP with no other workload on the System z9 and an unconstrained disk device. These results do not represent actual field measurements.

The FCP performance enhancement applies to the FICON Express4 features (CHPID type FCP) on z9 EC and z9 BC and is transparent to operating systems.

FCP throughput improvements for half-duplex and full-duplex data transfers

Changes to the FCP Licensed Internal Code are also designed to improve throughput. An FCP channel is now capable of achieving full data rate, 400 MegaBytes per second (MBps), for all reads or all writes (half-duplex data transfers). An FCP channel is capable of achieving 550 MBps for a mix of reads and writes (full-duplex data transfers). These measurements apply to large sequential data transfers.

The FCP throughput improvements were achieved in a laboratory environment with an I/O driver program using one channel configured as CHPID type FCP with no other workload on the System z9 and an unconstrained disk device. These results do not represent actual field measurements.

The FCP throughput improvements apply to the FICON Express4 features (CHPID type FCP) on z9 EC and z9 BC and are transparent to operating systems.

FCP performance metrics

For an FCP channel, I/O information is being made available using Linux on System z9. This data, relating to FCP performance (latencies) and FCP channel usage, may help with the analysis of FCP channels.

Linux on System z9 can extract the hardware statistics (time spent in the fabric and time spent in the channel) to assist with the preparation of graphics to help analyze the performance and usage of FCP channels.

FCP performance metrics applies to the FICON Express4 and FICON Express2 features (CHPID type FCP) on z9 EC and z9 BC in the Linux on System z9 environment. Refer to the Software requirements section.

Networking enhancements

OSA-Express Network Traffic Analyzer for z/OS and z/OS.e

An enhancement to the Queued Direct Input/Output (QDIO) architecture is designed to allow trace records to be sent to the host operating system to improve the capability to capture data for both the system programmer and the network administrator. This function allows the operating system to control the trace for the LAN and capture the records into host memory and storage (file systems), using existing host operating system tools to format, edit, and process the trace records.

OSA-Express Network Traffic Analyzer is exclusive to z9 EC and z9 BC, applicable to the OSA-Express2 features when configured as CHPID type OSD (QDIO), and supported by z/OS and z/OS.e. Refer to the Software requirements section.

QDIO Diagnostic Synchronization for z/OS and z/OS.e

An additional enhancement to the QDIO architecture is designed to provide system administrators the ability to coordinate and simultaneously capture both operating system and OSA-Express2 traces at the same instance (occurrence of the failure or system event). This function allows the host operating system to signal the OSA-Express2 feature (using a new IP Assist function) to stop traces and capture the current trace records. Using existing tools (traps) and commands, the operator can capture both hardware and software traces at the same time, and then correlate the records during post processing.

QDIO Diagnostic Synchronization is exclusive to z9 EC and z9 BC, applicable to the OSA-Express2 features when configured as CHPID type OSD (QDIO), and supported by z/OS and z/OS.e. Refer to the Software requirements section.

Layer 3 Virtual MAC for z/OS and z/OS.e

To help simplify the infrastructure and to facilitate load balancing when an LPAR is sharing the same OSA Media Access Control (MAC) address with another LPAR, each operating system instance can now have its own unique "logical" or "virtual" MAC (VMAC) address. All IP addresses associated with a TCP/IP stack are accessible using their own VMAC address, instead of sharing the MAC address of an OSA port. This applies to Layer 3 mode and to an

OSA port shared among Logical Channel Subsystems. This support is designed to:

- Improve IP workload balancing
- Dedicate a Layer 3 VMAC to a single TCP/IP stack
- Remove the dependency on Generic Routing Encapsulation (GRE) tunnels
- Improve outbound routing
- Simplify configuration setup
- Allow WebSphere® Application Server content-based routing to work with z/OS in an IPv6 network
- Allow z/OS to use a "standard" interface ID for IPv6 addresses
- Remove the need for PRIROUTER/SECROUTER function in z/OS

VMACs are currently available for Layer 2 mode in the z/VM and Linux on System z9 environments. OSA Layer 3 VMAC is exclusive to z9 EC and z9 BC, applicable to the OSA-Express2 and OSA-Express features (not supported on Fast Ethernet #2366) when configured as CHPID type OSD (QDIO), and supported by z/OS and z/OS.e. Refer to the Software requirements section.

Dynamic LAN idle for z/OS and z/OS.e

Dynamic LAN idle is designed to reduce latency and improve network performance by dynamically adjusting the inbound blocking algorithm. When enabled, the z/OS TCP/IP Stack is designed to adjust the inbound blocking algorithm to best match the application requirements.

For latency sensitive applications, the blocking algorithm is modified to be "latency sensitive." For streaming (throughput sensitive) applications, the blocking algorithm is adjusted to maximize throughput. In all cases, the z/OS TCP/IP stack dynamically detects the application requirements, making the necessary adjustments to the blocking algorithm. The monitoring of the application and the blocking algorithm adjustments are made in real-time, dynamically adjusting the application's LAN performance.

System administrators can authorize the z/OS TCP/IP stack to enable a dynamic setting, which was previously a static setting. The z/OS TCP/IP stack is designed to dynamically determine the best setting for the current running application based on system configuration, inbound workload volume, CPU utilization, and traffic patterns.

Dynamic LAN idle is exclusive to z9 EC and z9 BC, applicable to the OSA-Express2 features (CHPID type OSD), and supported by z/OS and z/OS.e. Refer to the Software requirements section.

Link aggregation for z/VM in Layer 2 mode

z/VM Virtual Switch-controlled (VSWITCH-controlled) link aggregation (IEEE 802.3ad) allows you to dedicate an OSA-Express2 port to the z/VM operating system when the port is participating in an aggregated group and configured in Layer 2 mode. Link aggregation (trunking) is designed to allow you to combine multiple physical OSA-Express2 ports into a single logical link for increased throughput and for nondisruptive failover in the event that a port becomes unavailable.

- Aggregated link viewed as one logical trunk and containing all of the Virtual LANs (VLANs) required by the LAN segment
- Load balance communications across several links in a trunk to prevent a single link from being overrun
- Link aggregation between a VSWITCH and the physical network switch
- Point-to-point connections
- Up to eight OSA-Express2 ports in one aggregated link
- Ability to dynamically add/remove OSA ports for "on demand" bandwidth
- Full-duplex mode (send and receive)
- Target links for aggregation must be of the same type (for example, Gigabit Ethernet to Gigabit Ethernet)

The Open Systems Adapter/Support Facility (OSA/SF) will provide status information on an OSA

port — its "shared" or "exclusive use" state. OSA/SF is an integrated component of z/VM.

Link aggregation is exclusive to z9 EC and z9 BC, applicable to the OSA-Express2 features in Layer 2 mode when configured as CHPID type OSD (QDIO), and supported by z/VM. Refer to the Software requirements section.

Availability enhancements

System-initiated CHPID reconfiguration

System-initiated channel path identifier (CHPID) reconfiguration is designed to reduce the duration of a repair action when an ESCON® or FICON channel, an OSA port, or an ISC-3 link is shared across logical partitions (LPARs). This is designed to minimize operator interaction to configure channels off-line and on-line. This enhancement applies to all CHPID types for all of the I/O features supported on z9 EC and z9 BC — ESCON, FICON, Open System Adapter (OSA), and ISC-3. z/OS and z/OS.e provide support for this enhancement. Refer to the Software requirements section.

Multipath Initial Program Load (IPL)

Multipath IPL is designed to help eliminate manual problem determination when executing an IPL. If an error occurs, an alternate path is selected. Multipath IPL is applicable to ESCON channels (CHPID type CNC) and FICON channels (CHPID type FC). z/OS and z/OS.e provide support for this enhancement. Refer to the Software requirements section.

These availability enhancements are exclusive to z9 EC and z9 BC.

Parallel Sysplex enhancements

Coupling Facility Control Code (CFCC) Level 15 is being made available on System z9 EC and BC

Enhancement includes:

- Increasing the allowable tasks in the Coupling Facility (CF) from 48 to 112.

Note: When migrating CF levels, lock, list, and cache structure sizes may need to be increased to support the new function. This adjustment can impact the system when it allocates structures or copies structures from one coupling facility to another at different CF levels. The coupling facility structure sizer tool is designed to size structures for you, and takes into account the amount of space needed for the current CFCC levels.

IBM Implementation Services for Parallel Sysplex

To assist with the assessment, implementation, operation, and maintenance of a System z Sysplex environment, IBM Global Technology Services is releasing today the IBM Implementation Services for Parallel Sysplex.

IBM Implementation Services for Parallel Sysplex is designed with eight selectable modules to help you with your System z Sysplex environment. Each is a stand-alone module that can be individually acquired. The first module is an infrastructure assessment module, followed by seven modules which address the following System z Sysplex disciplines:

1. Infrastructure planning, design, and implementation
2. Availability and performance assessment
3. Configuration and migration assistance
4. Operator training
5. Maintenance strategy
6. Maintenance environment design and implementation
7. Production cut over and deployment planning

For more information on this offering, visit

<http://www.ibm.com/services/server>

or contact your IBM representative.

Security enhancements

TKE 5.1 workstation LIC

The Trusted Key Entry (TKE) workstation 5.1 level of Licensed Internal Code (LIC) includes service mode support and usability enhancements. The TKE workstation now supports two user categories (auto-logged user and service user). With TKE 5.1, service user has been introduced to help separate the tasks for servicing the console. The auto-logged user now has access only to the basic operations tasks. There is also a new task layout display to help improve the look and usability of the TKE console.

TKE 5.1 LIC continues to support the ability to store key parts on diskettes, paper, or optionally on smart cards. TKE authority keys can continue to be stored on a diskette or optionally on a smart card. The TKE can also continue to be used to log on to the Cryptographic Coprocessors using a passphrase, or optionally a logon key pair.

The optional TKE features are:

- TKE 5.1 LIC (#0856) and TKE workstations (#0859 and #0839)
- TKE Smart Card Reader (#0887)
- TKE additional smart cards (#0888)

The Smart Card Reader, which can be attached to a TKE workstation with the 5.1 level of LIC, is available on the z9 EC, z9 BC, z990, and z890.

LDAP support for HMC user authentication

Lightweight Directory Access Protocol (LDAP) support for Hardware Management Console (HMC) user authentication allows a user to configure their HMCs to use a LDAP server to perform user ID and password authentication at logon time. This function allows the use of the current user ID and password policy for HMC user IDs and passwords, and provides one centralized user ID and password control mechanism to help address this requirement which exists in many users' corporate security guidelines.

The user ID is defined on the HMC along with the roles to be given to the user ID. HMC settings related to the user ID will continue to reside on the HMC, and the LDAP directory will be used to authenticate the user, thus eliminating the need to store the user ID's password locally. SSL and non-SSL connections to the LDAP server are supported.

This function is designed to more easily assist system administrators in the creation of HMC user IDs matching existing company user names. This can help reduce the need to create and distribute passwords by leveraging operations that may already be managed by the corporate control procedures.

HTTPS proxy for network-based RSF connections

The network-based Remote Support Facility (RSF) connection can now optionally pass through a customer-supplied Hypertext Transfer Protocol over Secure Socket Layer (HTTPS) proxy system for even greater security.

The Hardware Management Console (HMC) provides a choice of Secure Sockets Layer (SSL) (https) connections to IBM with a phone (modem) based RSP connection or a network-based (Internet) connection.

HMC enhancement

Optional TCP/IP-based connection for the System z9 HMC Application Programming Interface

The System z9 HMC API, when enabled, allows remote systems management of the System z9 hardware using systems management applications. This API uses the industry-standard Simple Network Management Protocol (SNMP) as the access mechanism. In past releases, only User Datagram Protocol (UDP) has been supported for SNMP API communication. With this release, both UDP and TCP/IP are supported. TCP/IP may be preferred where a firewall must be crossed or where a busy or unreliable network makes TCP/IP guaranteed delivery desirable.

Support Element enhancement

Tree-style user interface for the z9 EC and z9 BC Support Element

The tree-style user interface is currently available on the Hardware Management Console and is now being made available on the Support Element as an alternative to the classic style user interface. The tree-style navigation model provides hierarchical views of system resources and

tasks using drill-down and launch-in-context techniques.

Environmental enhancements

Power monitoring

System z9 now provides the capability to monitor the power consumption and temperature of the system. The System Activity Display on the Hardware Management Console is designed to display the current total power consumption in Kilowatts, Btu/hour, and input temperature.

zPower estimation tool

System z9 now provides a tool on IBM Resource Link™ which provides the user an estimate as to the anticipated power consumption of a particular machine model and its associated configuration. A user will input the machine model, memory, and I/O configuration. The tool will output an estimate of the power requirements needed for this system. Refer to

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

Frame tie-down for raised floor and non-raised floor for System z

Bolt-Down Kits for raised floor and non-raised floor environments are now available for the System z frames. These kits are designed to provide frame stabilization floor tie-down hardware for securing a System z frame to a concrete floor beneath a 9 inch to 13 inch (228.6mm to 330.2mm) or 12 inch to 22 inch (304.8mm to 558.8mm) raised floor, or to a non-raised floor environment. The z9 EC requires two Bolt-Down Kits, one for the A-frame and one for the Z-frame.

These kits are designed to help secure the frames and their contents to help prevent damage when exposed to vibrations and shocks such as those in a seismic event. The frame tie-downs are intended for securing a System z frame weighing less than 3600 lb (1633 kg) per frame. These tie-downs are designed to help secure the frame on a raised floor or non-raised floor installation.

These kits are provided on AN "AS IS" BASIS, WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. We have conducted limited tests and therefore not all situations are tested. Rather, the information has been provided to help to procure the parts needed and either install the design or request IBM to install the design as a service.

z/VM enhancements

Modified Indirect Data Address Words (MIDAWs) for guests: z/VM V5.3 supports guest use of the MIDAW facility allowing operating systems such as z/OS to use this new aspect of z/Architecture™ without regard to whether the operating systems are running in a logical partition or a virtual machine. The support of this function is designed to provide more flexibility and performance.

z/VM V5.3 support for zIIPs and zAAPs: z/VM V5.3 will provide simulation and virtualization support for the System z9 Integrated Information Processor (zIIP), and the System z Application Assist Processor (zAAP) specialty engines for test and production guest support of workloads utilizing these engines. This new support is designed to help clients extend the business value of the mainframe virtualization technology for existing and new workloads.

Exclusive to z9 BC

Enhancement to z9 BC Capacity Backup Upgrade (CBU)

The z9 BC Model R07 will allow CBU to all S07 capacity settings. This can provide greater flexibility for disaster recovery planning on the z9 BC. This change does not apply to On/Off CoD.

FICON Express4-2C SX

An option of two channels per feature in addition to the current four channels per feature is being offered for the z9 BC. If you have a requirement for:

- Two FICON SX channels, select this feature #3318
- A maximum of four FICON channels, you may choose to order two FICON Express4-2C SX features, with each of the features in a separate I/O domain for high availability

- A maximum of six FICON channels, you may choose to order one FICON Express4 four-channel feature and one FICON Express4-2C SX feature
- Eight or more channels, only order the FICON Express4-2C SX feature if connectivity to FICON control units cannot be spread over two I/O domains for high availability using only FICON Express4 four-channel features
- FICON channel increments other than four, or you do not have I/O slot limitations in the I/O cage

The FICON Express4-2C SX feature is exclusive to z9 BC. Refer to the Software requirements section for operating system support for CHPID types FC and FCP. Refer also to the **Special features** section of the Sales Manual on the Web for further information.

Crypto Express2-1P

An option of one PCI-X adapter per feature, in addition to the current two PCI-X adapters per feature, is being offered for the z9 BC to help address small and midrange security requirements while maintaining high performance.

The Crypto Express2-1P feature with one PCI-X adapter can continue to be defined as either a Coprocessor or an Accelerator. A minimum of two features must be ordered.

- Crypto Express2 Coprocessor — for secure-key encrypted transactions (default)
 - Designed to support security-rich cryptographic functions, use of secure-encrypted-key values, and User Defined Extensions (UDX)
 - Federal Information Processing Standard (FIPS) 140-2 Level 4 certification
- Crypto Express2 Accelerator — for Secure Sockets Layer (SSL) acceleration
 - Designed to support clear-key RSA operations
 - Offloads compute-intensive RSA public-key and private-key cryptographic operations employed in the SSL protocol

On the z9 BC, a Crypto Express2-1P feature when configured as an accelerator is designed to perform up to 3000 SSL handshakes per second. The SSL performance was achieved on an IBM System z9 BC using Enhancements to Cryptographic Support for z/OS and z/OS.e V1.6 and V1.7 Web deliverable (ICSF FMID HCR7731).

These measurements are examples of the maximum handshakes per second achieved in a laboratory environment with no other processing occurring and do not represent actual field measurements. Details are available upon request.

The configurable Crypto Express2-1P feature is exclusive to the z9 BC and is supported by z/OS, z/OS.e, z/VM, z/VSE®, and Linux on System z. z/VSE and Linux on System z offer support for clear-key SSL transactions only. Current versions of z/OS, z/OS.e, and z/VM offer support for both clear-key and secure-key operations.

Refer to the Software requirements section. Refer also to the **Special features** section of the Sales Manual on the Web for further information.

Previews

IPSec and zIIPs for z/OS

An enhancement to the z/OS Communications Server is planned to allow IPSec processing to take advantage of IBM System z9 Integrated Information Processors (zIIPs). In effect, the zIIP could be used as a high-speed encryption engine that is designed to provide better price performance for eligible IPSec workload. IPSec is an open networking standard used to create highly secure connections between two points in an enterprise — this may be server-to-server, or server to network device, as long as they support the IPSec standard. End-to-end encryption is deployed to provide a highly secure exchange of network traffic. This capability is planned to be available in August 2007 with z/OS V1.8 and PTFs and native in z/OS V1.9, when available.

Business demands to protect sensitive data on the Internet have increased the requirement for users to implement end-to-end encryption on Virtual Private Networks (VPNs). At the same time that businesses are seeing an increased need for data protection, they are also increasing their use of more open networks such as the Internet. Moving secure business data and transactions from proprietary trusted networks to more open networks creates an ever-increasing need for new technologies to protect this data.

The IPSec support was included in z/OS Communication Server in z/OS V1.7, and is designed

to provide authentication, integrity, and data privacy from z/OS to other network endpoints that support IPSec. In addition to allowing you to run host-based IPSec for security-rich end-to-end network flows, the V1.7 IPSec added IP filtering to help protect your host. Since the IPSec support is implemented in the IP protocol layer, it can be used for a variety of network traffic types to/from any application without any anticipated change to that application.

The new zIIP Assisted IPSec function is designed to move most of the IPSec processing from general-purpose processors to the zIIPs. In addition to performing eligible encryption processing, the zIIP will also handle cryptographic validation of message integrity, and IPSec header processing. This is designed to allow you to take advantage of the cost saving benefits of the zIIP when you implement IPSec to secure your valuable business transactions and bulk data movement and to protect your host. The z/OS Communication Server (z/OS CS) is designed to interact with z/OS Workload Manager to have all of its enclave Service Request Block (SRB) work made eligible to run on the zIIP.

C and C++ compiler support for hardware decimal floating point

z/OS V1.9 will include programmer-directed support in the C and C++ compilers for decimal floating point data types and the hardware decimal floating point instructions. There is also support for the data types and instructions in the C Run Time Library and the dbx debugger. The new instructions are added in support of the Draft Standard for Floating-Point Arithmetic P754, which is intended to supersede the ANSI/IEEE Std 754-1985.

All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice.

Accessibility by people with disabilities

A U.S. Section 508 Voluntary Product Accessibility Template (VPAT) containing details on the product's accessibility compliance can be requested via IBM's Web site at

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

Section 508 of the U.S. Rehabilitation Act

IBM System z9 is capable on delivery, when used in accordance with IBM's associated documentation, of satisfying the applicable requirements of Section 508 of the Rehabilitation Act of 1973, 29 U.S.C. Section 794d, as implemented by 36 C.F.R. Part 1194, provided that any Assistive Technology used with the product properly interoperates with it.

Product positioning

The System z9 environment provides a coordinated design offering server hardware working together with operating systems and subsystems, applications, storage, and networking to deliver a balanced system for traditional environments. This classic environment can be used as the framework for running newer application workloads which extend mainframe qualities of service such as security, availability, virtualization, and scalability to all your applications — new or traditional. By leveraging new technologies, such as specialty engines, potentially greater economic value can be found in the reuse of existing assets, leading to a cost-effective deployment of your new workloads on System z9.

Today's announcements for the z9 EC and z9 BC deliver improved performance and flexibility, and may help users control costs. Enhancements include improvements to On/Off Capacity on Demand to assist in defining new ways to acquire temporary capacity when the business demands are changing. An LPAR group capacity limit may help control software costs while taking advantage of white space available on the server. Hardware decimal floating point facilities support the Draft Standard for Floating-Point Arithmetic P754, which is intended to supersede the ANSI/IEEE Std 754-1985.

Additional management enhancements for the System z9 include improved hardware and software traces for the OSA-Express2 family of network adapters and new capabilities designed to monitor power and temperature consumption of the server.

The z9 BC, specifically designed for small and midsize mainframe users, offers a variety of growth options and excellent price/performance for enterprises requiring a lower-capacity entry point and more granular growth than offered on the z9 EC. New enhancements to the z9 BC include allowing a Model R07 to Capacity Backup Upgrade (CBU) to an S07 to accommodate larger backup configurations, the delivery of a single PCI-X adapter feature — the Crypto Express2-1P allowing for a new lower entry for security, and introduction of a two-channel feature — FICON Express4-2C SX. These features may help ease the cost of entry into the z9

BC.

System z9 open standards support and flexibility can be expanded with Linux on System z9. This environment combines Linux with the advantages of the IBM mainframe and the advanced virtualization features of the z/VM hypervisor designed to extend System z9 capabilities on infrastructure simplification, business integration, and solution availability.

Statement of general direction

Dynamic ICF expansion

IBM intends to remove the Dynamic ICF expansion function from future System z servers.

z/OS XML to be enabled for both zAAP and zIIP specialty engines

In z/OS V1.8, IBM introduced a new element of z/OS, z/OS XML System Services (z/OS XML). z/OS XML is a system-level XML parser integrated with the base z/OS operating system and is designed to deliver an optimized set of services for parsing XML documents (z/OS XML has also been made available on z/OS V1.7). The initial beneficiaries of this system component were middleware and applications requiring high-performance non-validating XML parsing. z/OS XML may currently be accessed by an Assembler programming interface and one of the first exploiters, DB2® 9 for z/OS, uses this Assembler interface for XML native support. IBM plans to add C/C++ support for z/OS XML with z/OS V1.9, satisfying the Statement of Direction in Software Announcement [206-039](#), dated February 28, 2006.

IBM is announcing its intent to enable the z/OS XML component to take advantage of System z Application Assist Processors (zAAPs). This future enhancement means that middleware and applications requesting z/OS XML System Services (for example DB2 processing using local connection) will have the capability for z/OS XML System Services processing to execute on the zAAP. Specifically, z/OS XML System Services parsing executing in TCB mode will be redirected to the zAAP.

In addition, IBM is announcing its intent to enable the z/OS XML component to fully take advantage of IBM System z9 Integrated Information Processors (zIIPs). With respect to DB2, z/OS XML processing may be partially directed to zIIPs when utilized as part of a distributed request (like DB2 DRDA®). The future enhancement is planned to further benefit eligible work by directing the full amount of the z/OS XML System Services processing to zIIPs when it is utilized as part of any zIIP eligible workload (like DRDA). Specifically, z/OS XML System Services parsing that is executed in SRB mode from zIIP-eligible enclaves is planned to be redirected to the zIIP.

zAAPs and zIIPs are designed to help free-up general computing capacity and lower total cost of operation for select new workloads such as Java™, business intelligence (BI), ERP, CRM, and IPsec encryption on the mainframe. IBM does not impose software charges on zAAP and zIIP capacity. Collectively, z/OS XML System Services support of zAAP and zIIP intends to provide the advantages of XML processing on z/OS with Total Cost of Ownership (TCO) benefits of either the zIIP or the zAAP processor regardless of the invocation environment.

As part of future plans, IBM intends to extend and expand on the use of z/OS XML System Services enabled for zAAP specialty processors as the basis for additional future enhancements:

- IBM intends to enhance the XML Toolkit for z/OS so that eligible workloads may exploit the z/OS XML component — this extends zAAP exploitation to the XML Toolkit for z/OS.
- IBM intends to add validating parsing to the z/OS XML component — this extends zAAP exploitation for XML validating parsing as well.

IBM Tivoli® OMEGAMON® XE for Mainframe Networks

To support customers who are moving to secure data transmission across open networks using IPsec, IBM Tivoli intends to deliver the ability to monitor IPsec in OMEGAMON XE for Mainframe Networks V4.1. IBM Tivoli OMEGAMON XE for Mainframe Networks is intended to provide users the ability to monitor the use of IP filters and the performance of IPsec tunnels for the TCP/IP stacks on a z/OS system. Users will be able to identify potential network attacks or configuration problems with IP filters and IPsec security associations (SAs). The information provided may be used to perform problem determination and to identify possible corrective actions.

Support for System Storage™ TS3400 Tape Library

IBM plans to enhance the System Storage TS3400 Tape Library by adding autoloader support for the library with System z (z/OS, z/VM, z/VSE, and TPF). Additionally, IBM plans to support

system-managed encryption in a System z environment with the TS3400.

Server participation in a Parallel Sysplex

The IBM System z9 Enterprise Class (z9 EC) and Business Class (z9 BC) servers will be the last servers to support participation in the same Parallel Sysplex with IBM eServer® zSeries® 900 (z900), IBM eServer zSeries 800 (z800), and older System/390® Parallel Enterprise Server systems.

All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice. Any reliance on these statements of general direction is at the relying party's sole risk and will not create liability or obligation for IBM.

Reference information

Previous announcements for reference:

Refer to Hardware Announcement [106-287](#), dated April 27, 2006.

IBM System z9 Business Class — z9 technology innovation for small and medium enterprises

Refer to Hardware Announcement [106-293](#), dated April 27, 2006.

IBM System z9 Enterprise Class: A security-rich, resilient and scalable mainframe for managing on demand infrastructures

Refer to Hardware Announcement [207-019](#), dated February 6, 2007.

IBM z/VM V5.3 — Improving scalability, security, and virtualization technology

Refer to Hardware Announcement [106-715](#), dated October 10, 2006.

Server Time Protocol for IBM System z9, zSeries 990 and 890; non-raised-floor support for System z9 BC

Business Partner information

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

BP Attachment for Announcement Letter 107-190

<https://www.ibm.com/partnerworld/mem/sla.jsp?num=107-190>

Trademarks

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Education support

Visit the following Web site for additional information

<http://www.ibm.com/training/us>

Call IBM IT Education Services at 800-IBM-TEACH (426-8322) for catalogs, schedules, and enrollments.

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

Title	Order number
z9 BC System Overview	SA22- 1083
z9 BC Installation Manual -- Physical Planning	GC28- 6855
z9 EC Installation Manual -- Physical Planning	GC28- 6844
z9 EC System Overview	SA22- 6833
System z9(TM) PR/SM(TM) Planning Guide	SB10- 7041

The following publications are shipped when a new server is ordered, and are available in the Library section of Resource Link:

Title	Order number
z9 BC Installation Manual	GC28- 6852
z9 BC Service Guide	GC28- 6853
z9 EC Installation Manual	GC28- 6840
z9 EC Service Guide	GC28- 6841
z9 BC Safety Inspection Guide	GC28- 6854
z9 EC Safety Inspection Guide	GC28- 6842
Safety Notices	G229- 9054

The following publications are available at planned availability using the ITSO Redbooks™ Web site

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

Title	Order number
IBM System z(TM) Connectivity Handbook	SG24- 5444
IBM System z9 Enterprise Class Technical Guide	SG24- 7124
System z9 BC Technical Introduction	SG24- 7241

The following publications are available at planned availability in the Library section of Resource Link:

Title	Order number
API for JAVA	API - JAVA
Application Programming Interfaces	SB10- 7030
Capacity on Demand User's Guide	SC28- 6846
CHPID Mapping Tools User's Guide	GC28- 6825
Coupling Facility Channel I/O Interface Physical Layer	SA23- 0395
ESCON(R) and FICON(TM) CTC Reference	SB10- 7034
ESCON I/O Interface Physical Layer	SA23- 0394
FICON I/O Interface Physical Layer	SA24- 7172
Hardware Management Console Operations Guide (Ver 2.9.2)	SC28- 6859
IOCP User's Guide	SB10- 7037
Maintenance Information for Fiber Optic Links	SY27- 2597
Open Systems Adapter-Express Customer's Guide and Reference	SA22- 7935
z9 BC Parts Catalog	GC28- 6856
z9 EC Parts Catalog	GC28- 6843
Planning for Fiber Optic Links	GA23- 0367
SCSI IPL -- Machine Loader Messages	SC28- 6839
Service Guide for Hardware Management Consoles and Support Elements	GC28- 6861
Standalone IOCP User's Guide	SB10- 7152
Support Element Operations Guide (Version 2.9.2)	SC28- 6860
System z9, zSeries(R), and S/390(R) Functional Matrix	GM13- 0623

Publications listed above on Resource Link may be obtained by accessing the following Web site

<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.

Services

Global Technology Services

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

These services help you learn about, plan, install, manage, or optimize your IT infrastructure to be an On Demand Business. They can help you integrate your high-speed networks, storage systems, application servers, wireless protocols, and an array of platforms, middleware, and communications software for IBM and many non-IBM offerings. IBM is your one-stop shop for IT support needs.

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

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

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

<http://www.ibm.com/services/continuity>

For details on education offerings related to specific products, visit

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

Select your country, and then select the product as the category.

Technical information

Specified operating environment

Hardware requirements: The hardware requirements for the features and functions contained in this announcement are identified.

A new driver level is required.

HMC (V2.9.2) plus MCLs and the Support Element (V2.9.2) plus MCLs are available on May 11, 2007.

Enhanced driver maintenance utilization

The new features in this announcement are delivered via EDM. When properly configured, the z9 EC and z9 BC are designed to support activating a selected new LIC level concurrently. Concurrent activation of the selected new LIC level is only supported at specific sync points (points in the maintenance process when LIC may be applied concurrently — MCL service level). Sync points may exist throughout the life of the current LIC level. Once a sync point has passed, you will be required to wait until the next sync point supporting concurrent activation of a new LIC level. Certain LIC updates will not be supported by this function. Contact your IBM representative to help you determine the appropriate configuration. With proper planning, you may be able to avoid planned outages when installing driver maintenance and updates. Enhanced driver maintenance is exclusive to the z9 EC and z9 BC, and may help eliminate the need for a planned outage.

Note: HMC (V2.9.2) is required to utilize Enhanced driver maintenance.

Coupling Facility Control Code (CFCC) Level 15

Note: When migrating CF levels, lock, list, and cache structure sizes may need to be increased to support the new function. This adjustment can impact the system when it allocates structures or copies structures from one coupling facility to another at different CF levels. The coupling facility structure sizer tool is designed to size structures for you, and takes into account the amount of space needed for the current CFCC levels.

Access Resource Link at

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

MCLs are designed to be applied concurrently. Contact IBM service personnel for further information.

Peripheral hardware and device attachments

For the appropriate peripheral hardware and device attachments, contact your IBM representative.

Software requirements: Listed are the operating systems and the minimum versions and releases which support the z9 EC and z9 BC for the features and functions identified in this announcement. Select the releases appropriate to your operating system environments.

Refer to [105-241](#), dated July 27, 2005, for the minimum operating system release and level requirements to operate and/or use the features and functions announced prior to this date.

Notes

- z9 EC and z9 BC support LPAR mode only.
- z/OS@.e is exclusive to z9 BC.
- Refer to the z/OS, z/VM®, and z/VSE® subsets of the 2094DEVICE and 2096DEVICE Preventive Planning (PSP) buckets prior to installing a z9 EC and z9 BC. There may be a minimum MCL level required by operating systems. It is critical that all bucket information is reviewed and adhered to prior to IPLing the operating system.

LPAR group capacity limit for LPAR on z9 EC and z9 BC requires at a minimum:

- z/OS or z/OS.e V1.8.

z/VM integrated systems management on z9 EC and z9 BC requires at a minimum:

- z/VM V5.3 — June 2007.

Hardware decimal floating point facilities on z9 EC and z9 BC require at a minimum:

- z/OS or z/OS.e V1.9 includes C and C++ programming language support.
- z/OS or z/OS.e V1.6 with PTF for High Level Assembler support.
- z/VM V5.2.

FCP performance metrics on z9 EC and z9 BC require at a minimum:

- Linux™ on System z — Novell SUSE SLES 9 SP3. IBM is working with its distribution partners to provide this function in future distribution releases.

OSA-Express Network Traffic Analyzer for the OSA-Express2 features (CHPID type OSD) on z9 EC and z9 BC, requires at a minimum:

- z/OS or z/OS.e V1.8 with PTFs.
- z/VM V5.1 for guest exploitation.

QDIO Diagnostic Synchronization for the OSA-Express2 features (CHPID type OSD) on z9 EC and z9 BC, requires at a minimum:

- z/OS or z/OS.e V1.8 with PTFs.
- z/VM V5.1 for guest exploitation.

Layer 3 Virtual MAC for z/OS and z/OS.e for all of the OSA-Express2 and OSA-Express (not supported on Fast Ethernet #2366) features (CHPID type OSD) supported on z9 EC and z9 BC, requires at a minimum:

- z/OS or z/OS.e V1.8 with PTFs.
- z/VM V5.1 for guest exploitation.

Dynamic LAN idle (performance improvement) for the OSA-Express2 features (CHPID type OSD) on z9 EC and z9 BC requires at a minimum:

- z/OS or z/OS.e V1.8 with PTFs — third quarter 2007.
- z/VM V5.1 for guest exploitation

Link aggregation for z/VM in Layer 2 mode for the OSA-Express2 features (CHPID type OSD) on z9 EC and z9 BC requires at a minimum:

- z/VM V5.3.

System-initiated CHPID reconfiguration for all CHPID types for all of the I/O features supported on z9 EC and z9 BC — ESCON, FICON, Open System Adapter (OSA), and ISC-3 requires at a minimum:

- z/OS and z/OS.e V1.6, V1.7, and V1.8 with PTFs.

Multipath IPL, for ESCON (CHPID type CNC) and for all of the FICON features (CHPID type FC) supported on z9 EC and z9 BC, requires at a minimum:

- z/OS or z/OS.e V1.7.
- z/OS or z/OS.e V1.6 with PTF.

FICON Express4-2C SX (CHPID type FC) including Channel-to-Channel (CTC) on z9 BC requires at a minimum:

- z/OS or z/OS.e V1.7.
- z/OS V1.6 or z/OS.e with PTF.
- z/VM V5.1.
- z/VSE V3.1.
- z/TPF V1.1.
- TPF V4.1 at PUT 16.
- Linux on System z — the currently available distributions: Novell SUSE SLES 9 and SLES 10, Red Hat RHEL 4 and RHEL 5.

FICON Express4-2C SX (CHPID type FCP) for support of SCSI disks on z9 BC requires at a minimum:

- z/VM V5.2 for enhanced performance assist for z/VM guests.
- z/VM V5.1 and V5.2 with PTFs for system usage of N_Port ID Virtualization (NPIV).
- z/VM V5.1 (for z/VM install, IPL, and operation from SCSI disks).
- z/VSE V3.1.
- Linux on System z — the currently available distributions: Novell SUSE SLES 9 and SLES 10, Red Hat RHEL 4 and RHEL 5.

Crypto Express2-1P on z9 BC requires at a minimum:

- z/OS or z/OS.e V1.6 and later, with z990 Cryptographic Support Web deliverable, or z990 and z890 Enhancements to Cryptographic Support Web deliverable.
- z/VM V5.1 for guest exploitation.

- z/VSE V3.1 and IBM TCP/IP for VSE/ESA™ V1.5 with PTFs.
- Linux on System z — the currently available distributions: Novell SUSE SLES 9 and SLES 10, Red Hat RHEL 4 and RHEL 5 for clear-key SSL. IBM is working with its distribution partners to provide support for secure-key transactions in future distribution releases.

Note: The configurable Crypto Express2-1P feature is exclusive to the z9 BC and is supported by z/OS, z/OS.e, z/VM, z/VSE and Linux on System z. z/VSE and Linux on System z offer support for clear-key SSL transactions only. Current versions of z/OS, z/OS.e, and z/VM offer support for both clear-key and secure-key operations.

Limitations

Hardware Management Console (HMC): The HMC is for the exclusive use of the HMC application. Customer applications cannot reside on the HMC. TCP/IP is the only supported communication protocol. HMC version 2.9.2 supports z9 EC, z9 BC, z990, z890, z900, z800, G5, and G6.

Planning information

Customer responsibilities

Customer responsibilities for site preparation: Information on customer responsibilities for site preparation can be found in the following publications, which are available in the Library section of Resource Link at

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

Cable orders: For the two-channel FICON Express4-2C SX feature, the cabling requirements and connectors (LC Duplex) remain unchanged.

Security, auditability, and control

The z9 EC, z9 BC, z990, and z890 use the security and auditability features and functions of host hardware, host software, and application software.

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

IBM Electronic Services

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

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

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

To learn how Electronic Services can work for you, visit

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

Terms and conditions

MES discount applicable: No

Field-installable feature: Yes

Warranty period: One year

Customer setup: No

Machine code: Same license terms and conditions as base machine.

Prices

Prices are available upon request.

Description	Mach type	Mod	Feature number	EW **	MMMC fe i n d i c a	Ini t/ MES
IBM System z9 Enterprise Class	2094		S08 S18 S28 S38 S54			
HMC Dual Ethernet			0084	**	X	Both
HMC Token Ring and Ethernet			0085	**	X	Both
TKE 5.1 LIC			0856	**	X	Both
Bolt-Down Kit, High Raised Flr			7995	**	X	Both
Bolt-Down Kit, Low Raised Flr			7996	**	X	Both
IBM System z9 Business Class	2096	R07				
HMC Dual Ethernet			0084	**	X	Both
HMC Token Ring and Ethernet			0085	**	X	Both
TKE 5.1 LIC			0856	**	X	Both
Crypto Express2-1P			0870	**	X	Both
FICON Express4-2C SX			3318	**	X	Both
Bolt-Down Kit, High Raised Flr			7995	**	X	Both
Bolt-Down Kit, Low Raised Flr			7996	**	X	Both
Bolt-Down Kit, Non-Raised Flr			7997	**	X	Both
CBU CP-K			7880	**	X	Both
CBU CP-L			7881	**	X	Both
CBU CP-M			7882	**	X	Both
CBU CP-N			7883	**	X	Both
CBU CP-O			7884	**	X	Both
CBU CP-P			7885	**	X	Both
CBU CP-Q			7886	**	X	Both
CBU CP-R			7887	**	X	Both
CBU CP-S			7888	**	X	Both
CBU CP-T			7889	**	X	Both
CBU CP-U			7890	**	X	Both
CBU CP-V			7891	**	X	Both
CBU CP-W			7892	**	X	Both
CBU CP-X			7893	**	X	Both
CBU CP-Y			7894	**	X	Both
CBU CP-Z			7895	**	X	Both
IBM System z9 Business Class	2096	S07				
HMC Dual Ethernet			0084	**	X	Both
HMC Token Ring and Ethernet			0085	**	X	Both
TKE 5.1 LIC			0856	**	X	Both
Crypto Express2-1P			0870	**	X	Both
FICON Express4-2C SX			3318	**	X	Both
Bolt-Down Kit, High Raised Flr			7995	**	X	Both

Bolt-Down Kit, Low Raised Flr	7996	**	X	Both
Bolt-Down Kit, Non-Raised Flr	7997	**	X	Both
IBM zSeries	2084			
z990				A08 B16 C24 D32

HMC Dual Ethernet	0084	**	X	Both
HMC Token Ring and Ethernet	0085	**	X	Both
TKE 5.1 LIC	0856	**	X	Both
Bolt-Down Kit, High Raised Flr	7995	**	X	Both
Bolt-Down Kit, Low Raised Flr	7996	**	X	Both

IBM zSeries 2086 A04
z890

HMC Dual Ethernet	0084	**	X	Both
HMC Token Ring and Ethernet	0085	**	X	Both
TKE 5.1 LIC	0856	**	X	Both
Bolt-Down Kit, High Raised Flr	7995	**	X	Both
Bolt-Down Kit, Low Raised Flr	7996	**	X	Both
Bolt-Down Kit, Non-Raised Flr	7997	**	X	Both

** If field installed on a purchased machine, parts removed or replaced become the property of IBM and must be returned.

Feature conversions

Type	From Feature	Type	To Feature	Returned parts	Continuous maintenance
2096	7880	2096	7870	Y	Y
2096	7880	2096	7871	Y	Y
2096	7880	2096	7872	Y	Y
2096	7880	2096	7873	Y	Y
2096	7880	2096	7874	Y	Y
2096	7880	2096	7875	Y	Y
2096	7880	2096	7876	Y	Y
2096	7880	2096	7877	Y	Y
2096	7880	2096	7878	Y	Y
2096	7880	2096	7879	Y	Y
2096	7881	2096	7870	Y	Y
2096	7881	2096	7871	Y	Y
2096	7881	2096	7872	Y	Y
2096	7881	2096	7873	Y	Y
2096	7881	2096	7874	Y	Y
2096	7881	2096	7875	Y	Y
2096	7881	2096	7876	Y	Y
2096	7881	2096	7877	Y	Y
2096	7881	2096	7878	Y	Y
2096	7881	2096	7879	Y	Y
2096	7882	2096	7870	Y	Y
2096	7882	2096	7871	Y	Y
2096	7882	2096	7872	Y	Y
2096	7882	2096	7873	Y	Y
2096	7882	2096	7874	Y	Y
2096	7882	2096	7875	Y	Y
2096	7882	2096	7876	Y	Y
2096	7882	2096	7877	Y	Y
2096	7882	2096	7878	Y	Y
2096	7882	2096	7879	Y	Y
2096	7883	2096	7870	Y	Y
2096	7883	2096	7871	Y	Y
2096	7883	2096	7872	Y	Y
2096	7883	2096	7873	Y	Y
2096	7883	2096	7874	Y	Y
2096	7883	2096	7875	Y	Y
2096	7883	2096	7876	Y	Y
2096	7883	2096	7877	Y	Y
2096	7883	2096	7878	Y	Y
2096	7883	2096	7879	Y	Y

2096	7884	2096	7870	Y	Y
2096	7884	2096	7871	Y	Y
2096	7884	2096	7872	Y	Y
2096	7884	2096	7873	Y	Y
2096	7884	2096	7874	Y	Y
2096	7884	2096	7875	Y	Y
2096	7884	2096	7876	Y	Y
2096	7884	2096	7877	Y	Y
2096	7884	2096	7878	Y	Y
2096	7884	2096	7879	Y	Y
2096	7885	2096	7870	Y	Y
2096	7885	2096	7871	Y	Y
2096	7885	2096	7872	Y	Y
2096	7885	2096	7873	Y	Y
2096	7885	2096	7874	Y	Y
2096	7885	2096	7875	Y	Y
2096	7885	2096	7876	Y	Y
2096	7885	2096	7877	Y	Y
2096	7885	2096	7878	Y	Y
2096	7885	2096	7879	Y	Y
2096	7886	2096	7870	Y	Y
2096	7886	2096	7871	Y	Y
2096	7886	2096	7872	Y	Y
2096	7886	2096	7873	Y	Y
2096	7886	2096	7874	Y	Y
2096	7886	2096	7875	Y	Y
2096	7886	2096	7876	Y	Y
2096	7886	2096	7877	Y	Y
2096	7886	2096	7878	Y	Y
2096	7886	2096	7879	Y	Y
2096	7887	2096	7870	Y	Y
2096	7887	2096	7871	Y	Y
2096	7887	2096	7872	Y	Y
2096	7887	2096	7873	Y	Y
2096	7887	2096	7874	Y	Y
2096	7887	2096	7875	Y	Y
2096	7887	2096	7876	Y	Y
2096	7887	2096	7877	Y	Y
2096	7887	2096	7878	Y	Y
2096	7887	2096	7879	Y	Y
2096	7888	2096	7870	Y	Y
2096	7888	2096	7871	Y	Y
2096	7888	2096	7872	Y	Y
2096	7888	2096	7873	Y	Y
2096	7888	2096	7874	Y	Y
2096	7888	2096	7875	Y	Y
2096	7888	2096	7876	Y	Y
2096	7888	2096	7877	Y	Y
2096	7888	2096	7878	Y	Y
2096	7888	2096	7879	Y	Y
2096	7889	2096	7870	Y	Y
2096	7889	2096	7871	Y	Y
2096	7889	2096	7872	Y	Y
2096	7889	2096	7873	Y	Y
2096	7889	2096	7874	Y	Y
2096	7889	2096	7875	Y	Y
2096	7889	2096	7876	Y	Y
2096	7889	2096	7877	Y	Y
2096	7889	2096	7878	Y	Y
2096	7889	2096	7879	Y	Y
2096	7890	2096	7870	Y	Y
2096	7890	2096	7871	Y	Y
2096	7890	2096	7872	Y	Y
2096	7890	2096	7873	Y	Y
2096	7890	2096	7874	Y	Y
2096	7890	2096	7875	Y	Y
2096	7890	2096	7876	Y	Y
2096	7890	2096	7877	Y	Y
2096	7890	2096	7878	Y	Y
2096	7890	2096	7879	Y	Y
2096	7891	2096	7870	Y	Y
2096	7891	2096	7871	Y	Y
2096	7891	2096	7872	Y	Y
2096	7891	2096	7873	Y	Y

2096	7891	2096	7874	Y	Y
2096	7891	2096	7875	Y	Y
2096	7891	2096	7876	Y	Y
2096	7891	2096	7877	Y	Y
2096	7891	2096	7878	Y	Y
2096	7891	2096	7879	Y	Y
2096	7892	2096	7870	Y	Y
2096	7892	2096	7871	Y	Y
2096	7892	2096	7872	Y	Y
2096	7892	2096	7873	Y	Y
2096	7892	2096	7874	Y	Y
2096	7892	2096	7875	Y	Y
2096	7892	2096	7876	Y	Y
2096	7892	2096	7877	Y	Y
2096	7892	2096	7878	Y	Y
2096	7892	2096	7879	Y	Y
2096	7893	2096	7870	Y	Y
2096	7893	2096	7871	Y	Y
2096	7893	2096	7872	Y	Y
2096	7893	2096	7873	Y	Y
2096	7893	2096	7874	Y	Y
2096	7893	2096	7875	Y	Y
2096	7893	2096	7876	Y	Y
2096	7893	2096	7877	Y	Y
2096	7893	2096	7878	Y	Y
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2096	7894	2096	7873	Y	Y
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2096	7894	2096	7877	Y	Y
2096	7894	2096	7878	Y	Y
2096	7894	2096	7879	Y	Y
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2096	7895	2096	7873	Y	Y
2096	7895	2096	7874	Y	Y
2096	7895	2096	7875	Y	Y
2096	7895	2096	7876	Y	Y
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2096	7895	2096	7878	Y	Y
2096	7895	2096	7879	Y	Y

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