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

Overview

The IBM System z9™ Business Class (z9 BC) continues the generation of IBM z9 servers introduced with the IBM System z9 EC (z9 109 GA2) that are designed to help optimize your On Demand Business. This new generation of IBM mainframes provides an advanced combination of reliability, availability, security, scalability and virtualization features, together with the ability to reallocate processing power. The z9 BC is designed to match changing business priorities on demand.

The z9 BC is designed specifically as a midrange mainframe and offers extensive growth options and excellent price/performance for those customers requiring a lower-capacity entry point and more granular growth options than offered with the z9 EC.

The IBM z9 BC is designed to help enable your businesses to be resilient in the unpredictable on demand world. With two models and a wide range of capacity settings, the newest member of the IBM System z9 family delivers significantly improved granularity and enriched functions over its predecessor, the IBM @server zSeries® z890. The Model S07 can provide up to twice the memory and more specialty engines as compared with the z890. Also introduced is the new System z9 Integrated Information Processor (zIIP).

The IBM zIIP is the latest customer-inspired specialty engine for the IBM System z9 family. Following on the success of the widely accepted Integrated Facility for Linux (IFL) and System z9 Application Assist Processor (zAAP), the zIIP is designed to help improve resource optimization and lower the cost of eligible workloads, enhancing the role of the mainframe as the data hub of the enterprise.

The z9 BC offers four new FICON™ Express4 features that support autonegotiated speeds of 1, 2 and 4 Gbps. One of the FICON Express4 features is a 2-port card that provides attractive entry pricing to FICON technology adoption and is offered exclusively on the z9 BC.

All FICON Express4 and FICON Express2 features support the Modified Indirect Data Address Word (MIDAW) facility. MIDAW is a new system architecture with software exploitation that is designed to help improve channel utilization and throughput, and potentially reduce I/O response times. The number of FICON Express4 and FICON Express2 concurrent I/O operations that may be active simultaneously has been increased from 32 to 64 per channel as compared to the z890.

IBM has a broad range of disk, tape and SAN products that are ready to support FICON Express4. IBM TotalStorage® DS8000 series and IBM TotalStorage DS6000 series disk systems, part of IBM's System Storage™ portfolio, support the MIDAW facility to help enable the potential throughput and response time benefits that the MIDAW facility can bring.

New integrated clear key encryption security features on the z9 BC include support for Advanced Encryption Standard, Secure Hash Algorithm-256 and Integrated Pseudo Random Number Generation. Performing these functions in hardware can contribute to improved performance.

Application of the z9 BC advanced virtualization technologies creates a solid foundation for flexible integration of business and information management.

New innovations on the z9 BC can help to ensure you have a security-rich platform, can help maximize your resources and their utilization and can help provide you the ability to integrate applications and data across the infrastructure.

At a glance

The IBM System z9 BC is designed to provide:

- Total of 8 PUs vs. 5 PUs on z890
- Same low entry point and 37% improvement in uniprocessor capacity as compared to z890
- Improved granularity: 73 capacity settings as compared with 28 on z890
- IBM System z9 Integrated Information Processor (IBM zIIP)
- On demand: On/Off CoD for CPs, IFLs, ICFs, zAAPs and zIIPs
- Capacity BackUp (CBU) for zAAP, IFL, ICF, zIIP and CP
- Increased availability capabilities as compared to z890
- Improved security with configurable Crypto Express2 and CPACF enhancements as compared to z890
- Connectivity improvements:
  - FICON Express4 supporting 1, 2 or 4 Gbps with 2-port or 4-port card
  - Modified Indirect Data Address Word (MIDAW) facility
  - N Port ID Virtualization (NPv)
  - HiperSockets support of IPv6
  - OSA-Express2 1000BASE-T Ethernet
  - OSA-Express2 OSN (OSA for NCP)

The z9 BC is designed to be a flagship component of your data serving environment.

This announcement is provided for your information only. For additional information, contact your IBM representative.
IBM System z9 BC (z9 BC) — The next step in the transformation: The z9 BC continues the transformation of the mainframe, building upon the structure introduced on z9 EC in support of z/Architecture™, reliability, availability, scalability and virtualization. The z9 BC expands upon key attributes of the platform — reliability, availability, scalability and virtualization — to help ensure you have a resilient infrastructure designed to satisfy the requirements of on demand business. With a low entry point, more engines, and increased performance and total system capacity on the z9 BC as compared to a z890, you have an opportunity to continue to consolidate diverse applications on a single platform at the right capacity.

The z9 BC is designed to provide:

- Reduction in the impact of planned and unplanned server outages:
  - Enhanced driver maintenance
  - Dynamic oscillator switchover
  - Concurrent MBA fanout card hot-plug
  - Redundant I/O Interconnect
  - Program directed re-IPL

- Uniprocessor performance improvement up to 37% (based on LSPR mixed workload average) as compared to the z890

- System z9 Integrated Information Processor (zIIP)

- Up to 3 CPs, 6 specialty engines (IFL, ICF, zAAP and zIIP), 1 standard SAP and 3 optional SAPs on Model R07

- Up to 4 CPs, 7 specialty engines (IFL, ICF, zAAP and zIIP), 1 standard SAP and 3 optional SAPs on Model S07

- Largest number of capacity settings (73) of any IBM midrange to date

- Available memory from 8 GB up to 64 GB offered in 8 GB increments

- Increased host bus bandwidth between memory and I/O
  - Up to 16 Self-Timed Interconnects (STIs), 2.7 GB each for I/O, a 35% increase in STI speed compared to z890’s 2.0 GB STI bus

- Multiple Subchannel Sets (MSS), which is designed to allow improved device connectivity for Parallel Access Volumes (PAVs)

- FICON Express4 supporting 4 Gbps link data rate with:
  - Connectivity to existing and future 1, 2 and 4 Gbps servers, switches, directors and devices
  - Improved performance
  - Enhanced availability with Small Form Factor Pluggable (SFP) optics

- Increased number of concurrent I/O operations that may be active simultaneously for FICON Express4 and FICON Express2, from 32 to 64 per channel, as compared to z890.

- Up to 112 FICON Express4 channels on Model S07; a 40% increase compared to z890

- When using the Modified Indirect Address Word (MIDAW) facility, improved performance over native FICON channels for programs that process data sets exploiting striping and compression (such as DB2®, VSAM, PDSE, HFS and zFS) by reducing channel, director and control unit overhead

- Availability enhancements for FICON

- Increased connectivity for Crypto, FICON and OSA in one I/O cage

- Additional LAN connectivity option with introduction of OSA-Express2 1000BASE-T Ethernet

- OSA-Express2 OSN (OSA for NCP), providing Channel Data Link Control (CDLC) protocol support on the z9 BC for the IBM Communication Controller for Linux™ on System z™ (CCL) allowing system administrators to configure, manage and operate their CCL Network Control Programs (NCPs) in the same manner as their ESCON®-attached 374x NCPs

- Remote Keyload for ATMs

- Configurable Crypto Express2

- Capacity BackUp for zAAP, IFL, ICF, zIIP and CP sub-capacity settings

Facilitating server consolidation

With the expanded capacity of the z9 BC and enhancements to the I/O infrastructure, IBM continues to facilitate the consolidation of multiple servers into one z9 BC. With up to double the memory and up to eight additional STIs, compared to z890, you may be able to reduce the number of servers while hosting additional applications.

<table>
<thead>
<tr>
<th>Models</th>
<th>CPs</th>
<th>Memory</th>
<th>STIs</th>
<th>Max I/O Max (1) FICON Ch ESCON Ch</th>
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<td>1</td>
<td>3</td>
<td>8</td>
<td>64</td>
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<tr>
<td>S07</td>
<td>0</td>
<td>4</td>
<td>8</td>
<td>64</td>
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(1) Note: Maximums are for FICON Express4; for carry forwards from previous machines, only 20 FICON Express2 or FICON Express cards were allowed.

The performance advantage

Performance estimates with z/OS® V1.6 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 z9 BC, z/Architecture processor capacity identifier is defined...
with a (a0x) notation, where “x” is the number of active CPUs and “a” represents the capacity setting.

The performance of the z9 BC Model S07 Z01 is 1.37 times greater than the z890 Model A04 170 based on the Large Systems Performance Reference mixed workload.

The LSPR contains the Internal Throughput Rate Ratios (ITRRs) for the new z9 BC and the previous generation zSeries server 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 stated. For more detailed performance information, consult the LSPR available at http://www-1.ibm.com/servers/eserver/zseries/lspr/

Enhancing availability

Redundant I/O interconnect to help maintain critical connections to devices: The z9 BC is designed such that in the event of a failure of an MBA fanout card or STI cable and subsequent repair, you do not lose access to any I/O. Redundant I/O interconnect is exclusive to the z9 EC and z9 BC.

Enhanced driver maintenance: One of the greatest contributors to downtime during planned outages is Licensed Internal Code (LIC) updates performed in support of new features and functions. When properly configured, the z9 BC is designed to support activating a selected new LIC level concurrently. Concurrent activation of the selected new LIC level is supported only 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. Enhanced driver maintenance, exclusive to the z9 EC and z9 BC, is another step IBM is taking to help reduce the duration of a planned outage.

Dynamic oscillator switchover: The z9 BC has two oscillator cards, a primary and a backup. In the event of a failure of the primary oscillator card, the backup is designed to detect the failure, switch over and provide the clock signal to the server transparently. Prior to the introduction of the z9 BC, a server outage would occur, the subsequent Power On Reset would select the backup and the server would resume operation. Dynamic oscillator switchover is exclusive to the z9 EC and z9 BC.

MBA fanout card hot-plug: A Memory Bus Adapter (MBA) fanout card is designed to provide the path for data between memory and I/O using Self-Timed Interconnect (STI) cables. On z9 BC, an MBA fanout card is available that supports both concurrent maintenance and concurrent install. Up to 8 MBA fanout cards may be installed per system. In the event of an outage, an MBA fanout card, used for I/O, may be concurrently repaired using redundant I/O interconnect. This assures that you don’t lose access to any of the I/O cards.

STI granularity: The MBA fanout card is designed to support Enhanced Self-Timed Interconnect (eSTI) granularity — two STI ports per MBA fanout card (up to 8 MBA fanout cards). Each eSTI operates at 2.7 gigabytes per second (GBps) for I/O and 2.0 GBps for ICBs.

The MBA fanout card supports concurrent maintenance and can be replaced while the machine is running.

Program-directed re-IPL, designed to allow Linux on System z9 to re-IPL without operator intervention: Linux on System z9 is designed to identify how it was IPL’d from the load device. Program-directed re-IPL may request (by calling a Licensed Internal Code function) that it be re-IPL’d from the same load device, using the same load parameters. In this way, program-directed re-IPL allows Linux on System z9 running natively in an LPAR to trigger a re-IPL. This re-IPL is supported for both SSCI and ECKD™ devices.

This program-directed re-IPL function is exclusive to the z9 EC, z9 BC, and Linux on System z9. Refer to the Software requirements section. z/VM® currently provides an alternate method for Linux guest re-IPL.

System z9 Integrated Information Processor

The System z9 Integrated Information Processor (zIIP) is the latest customer-inspired specialty engine planned for the IBM System z9. Following on the success of the widely accepted Integrated Facility for Linux (IFL) and System z9 Application Assist Processors (zAAP), the zIIP is designed to help improve resource optimization and lower the cost of eligible workloads, enhancing the role of the mainframe as the data hub of the enterprise.

The zIIP’s execution environment will accept eligible work from z/OS and z/OS.e. The operating system is designed to manage the work between the general purpose processor (CP) and the zIIP. IBM DB2 UDB for z/OS V8 will exploit the zIIP capability for eligible workloads.

The zIIP will be available on the System z9 EC and System z9 BC. Its introduction can help increase the value that customers may derive from the System z9 over previous generations of the IBM mainframe. With the introduction of the zIIP with the general purpose processor (CP) and optionally including an IFL or a zAAP, customers will be able to take advantage of System z9’s advanced management of multiple workloads and high resource utilization to configure a system that can be optimized to their business objectives.

The zIIP is designed so that programs can work with z/OS and z/OS.e to have eligible portions of its enclave Service Request Block (SRB) work directed to the zIIP. The z/OS and z/OS.e, acting on the direction of programs running in SRB mode, control the distribution of the work between general purpose processors (CPs) and the zIIPs. Using zIIPs can help free up capacity on the general purpose processors. When the zIIPs are available, IBM DB2 UDB for z/OS V8 will exploit them by sending eligible work to z/OS and z/OS.e that can be directed to zIIPs.

- Types of DB2 work executing in SRB mode that will be sent to the zIIP:
  - Network Connected Applications — An application (running on UNIX®, Linux including Linux on System z, Intel® or z/OS) may access an IBM DB2 UDB for z/OS V8 database that is hosted on a z9 BC. Eligible work that can be directed to the zIIP are portions of those requests made from the application server, to the host, through SQL calls over a DRDA using TCP/IP connection.
of workloads that may be running on the server connected over DRDA® over TCP/IP to the z9 BC may include Bl, ERP, or CRM application serving.

- Data Warehousing Applications Requests that utilize IBM DB2 UDB for z/OS V8 star schema parallel queries may have portions of these SQL requests directed to the zIIP. Examples of these applications may include BI applications.

- Index Maintenance Utilities — A portion of DB2 utility functions that are used to maintain index maintenance structures (LOAD, REORG and REBUILD INDEX) can be redirected to zIIP.

- zIIPs are designed to help improve resource optimization and help lower the cost of ownership of the System z9 for eligible workloads by:
  - Leveraging existing multi-tiered DB2 applications that use TCP/IP to access the DB2 database server from the application
  - Offering new opportunities to deploy data warehousing and BI solutions that leverage star schema queries on the System z9
  - Providing no known changes to DB2 applications in order to take advantage of the zIIP
  - Providing no IBM software charges for zIIP capacity

- zIIPs are designed to help free up capacity on the general purpose processor (CP) which may make it available for use by other System z9 workloads

- zIIP requires a System z9 server and software support. The software support is provided by: a Web deliverable with PTFs for z/OS V1.6 and V1.7 which enables the redirecting of eligible workloads to the zIIP and IBM DB2 UDB for z/OS V8 with enabling PTFs. The software support is planned to be available on June 30, 2006. The zIIP is planned to be available on May 26, 2006.

This is an exclusive offering to the IBM System z9 and is supported by z/OS and IBM DB2 UDB for z/OS V8. Refer to the Software requirements section.

**Conversions from and to System z9 Application Assist Processor**

To provide further optimization and flexibility, the z9 BC is now designed to provide conversions for the System z9 Application Assist Processor (zAAP) from and to the Integrated Facility for Linux (IFL), the System z9 Integrated Information Processor (zIIP), the Integrated Coupling Facility (ICF), and all general purpose processor (CP) features. These feature conversions are chargeable.

**Capacity planning and management**

Separate PU management — New flexibility for managing Processor Units (PUs): PUs defined as Internal Coupling Facility (ICFs), Integrated Facility for Linux (IFL), System z9 Integrated Information Processors (zIIPs), or System z9 Application Assist Processors (zAAPs) are now managed separately. In the past, ICFs, IFLs, and zAAPs were grouped together for allocation within and across the LPARs.

The separate management of PU types enhances and simplifies capacity planning and management of the configured LPARs and their associated processor resources.

Separate PU management is exclusive to the z9 EC and z9 BC. PUs characterized as ICFs, IFLs, zAAPs and zIIPs are now recorded and reported separately by z/OS and z/OS.e SMF and RMF™. In the past, they were grouped together. Refer to the Software requirements section.

**Enhancements to On/Off Capacity on Demand**

**On/Off CoD change in temporary capacity:** Currently designed to remove temporary capacity when ordering a different capacity setting, the z9 BC will now support ordering a different capacity setting and switch to the different setting by downloading the second configuration while a previous setting is active.

**API to activate On/Off CoD:** The z9 BC is now designed to permit activation of On/Off CoD given the input parameter of an order number using an HMC SNMP API for activation.

**Administrative On/Off Capacity on Demand Test:** IBM Resource Link will accept orders for zero-capacity increases for all processor unit types for use in testing the ordering, staging, activation and deactivation steps of an On/Off CoD order. A new test panel has been created to supplement the existing CIU and On/Off CoD panels to accept test orders. The resulting LICCC record will be identical to actual On/Off CoD LICCC records; there is no change to actual hardware implementation. No additional feature codes are required.

**Improved LPAR weight management**

For LPARs that have CPs, zIIPs and/or zAAPs configured, a new zAAP/zIIP weight specification is provided to allow a new unique LPAR weight specification for shared zAAPs to be defined. The existing LPAR shared processor weight specification is now applied only to the CPs configured to the LPAR. In the past, the existing shared processor weight specification was applied to both the shared CPs and to shared zAAPs and zIIPs configured to the LPAR. The ability to specify a separate LPAR weight for shared zIIPs and zAAPs helps to enhance and simplify capacity planning and management of the configured LPARs and their associated processor resources.

Improved weight management of CPs, zIIPs and zAAPs is exclusive to the z9 EC and z9 BC and transparent to the operating systems.

**Up to 30 Logical Partitions**

The z9 BC supports 30 Logical Partitions (LPARs) for the Model S07, and 15 LPARs for the Model R07. The z9 BC provides the ability to define up to 256 CHPID definitions and 15 Logical Partitions. With Processor Resource/System Manager™ (PR/SM™) and Multiple Image Facility (MIF), you can share ESCON and FICON channels, ISC-3s and OSA ports across LPARs. ESCON channels cannot span to LPARs defined on different Logical Channel Subsystems.

Support of up to 30 LPARs on the Model S07 z9 BC and up to 15 LPARs on the Model R07 z9 BC is supported by z/OS and z/OS.e, z/VSE®, VSE/ESA®, z/TPF, and Linux on System z9. Refer to the Hardware requirements and Software requirements sections of this announcement.
Enhancements to CP Assist for Cryptographic Function (CPACF): CPACF, supporting clear-key encryption, is activated using a no-charge enablement feature (#3863) and offers the following on every Processor Unit (PU) identified as a Central Processor (CP) or Integrated Facility for Linux (IFL):

- Data Encryption Standard (DES)
- Triple Data Encryption Standard (TDES)
- Secure Hash Algorithm (SHA-1)

CPACF has been enhanced to include support of the following on CPs and IFLs:

- Advanced Encryption Standard (AES) for 128-bit keys
- Pseudo Random Number Generation (PRNG)
- SHA-256

CPACF performance is designed to scale with PU performance improvements. SHA-1 and SHA-256 are shipped enabled on all servers and do not require the enablement feature.

Support for CPACF is also available using the Integrated Cryptographic Service Facility (ICSF). ICSF is a component of z/OS and is designed to transparently use the available cryptographic functions, whether CPACF or Crypto Express2, to balance the workload and help address the bandwidth requirements of your applications.

The enhancements to CPACF are exclusive to the z9 EC and z9 BC and are supported by z/OS and z/OS.e, z/VM and Linux on System z9. Refer to the Software requirements section.

Key management enhancements for remote loading of ATM and POS keys and key exchange with non-CCA systems: Remote Key Loading refers to the process of loading Data Encryption Standard (DES) keys to Automated Teller Machines (ATMs) and Point of Sale (POS) devices from a central administrative site without the need for personnel to visit each machine to manually load DES keys. These enhancements provide two important new features:

- The ability to load initial keys to an ATM or a POS device from a remote location
- Enhanced capabilities for exchanging keys with non-CCA cryptographic systems

Remote loading of initial ATM and POS keys: The process encompasses two phases of key distribution:

1. Distribution of initial key encrypting keys (KEKs) to a newly installed ATM or POS
2. Distribution of operational keys or replacement KEKs, enciphered under a KEK currently installed in the ATM or POS device

Typically, a new ATM or POS device has none of the financial institution’s keys installed. Until now, this has been done by manually loading each of the two clear text key parts individually and separately.

Loading initial cryptographic keys into ATMs is a fact of life for financial institutions and for most machines, that means having two technical personnel visit each ATM to load the key. Manual entry of keys is one of the most error-prone and labor-intensive activities that occur during an installation, making it expensive for the banks and financial institutions.

Remote Key Loading benefits

- Provides a mechanism to load initial keys without the need to send technical staff to ATMs or POS devices
- Reduces downtime due to key entry errors
- Reduces service call and key management costs
- Improves the ability to manage ATM and POS conversions

Improved key exchange with non-CCA cryptographic systems: IBM Common Cryptographic Architecture (CCA) employs Control Vectors to control usage of cryptographic keys. Non-CCA systems use other mechanisms or may use keys that have no associated control information.

The new features added to CCA enhance the ability to exchange keys between CCA systems and systems that do not use Control Vectors, by allowing the CCA system owner to define permitted types of key import and export while preventing uncontrolled key exchange that can open the system to an increased threat of attack.

These enhancements are exclusive to System z9 and supported by z/OS and z/OS.e and by z/VM for z/OS and z/OS.e guests. Refer to the Software requirements section.

ISO 16609 CBC Mode T-DES MAC enhancement

Supports the requirements for Message Authentication using T-DES symmetric encryption: The Integrated Service Facility (ICSF) is designed to use the following callable services to access the ISO 16609 CBC Mode T-DES MAC enhancement in the Cryptographic coprocessor:

- MAC Generate (CSNBMGN)
- MAC Verify (CSNBMVR)

A new Rule Array keyword, TDES-MAC, will be added to these ICSF callable services. The padding used by TDES-MAC will be to pad x00 to the next 8-byte multiple before passing the data to the cryptographic coprocessor.

ISO 16609 CBC mode T-DES MAC is accessible through ICSF function calls made in the Cryptographic Adapter Segment 3 Common Cryptographic Architecture (CCA) code.

This enhancement is exclusive to System z9 and supported by z/OS and z/OS.e and by z/VM for z/OS and z/OS.e guest operating systems. Refer to the Software requirements section.

New and modified ICSF callable services

ICSF, together with Crypto Express 2, supports the basic mechanisms in Remote Key Loading: The implementation offers a security-rich bridge between the CCA environment and the various formats and encryption schemes offered by the ATM vendors.

The following are new ICSF services are offered for Remote Key Loading:

- Trusted Block Create (CSNDTBC): This callable service is used to create a trusted block containing a public key and some processing rules. The rules define the ways and formats in which keys are generated and exported.
- Remote Key Export (CSNDRXK): This callable service uses the trusted block to generate or export DES keys for local use and for distribution to an ATM or other remote device.
Modified ICSF Callable Services for Remote Key Loading:
• PKA Key Import (CSNDPKI)
• PKA Key Token Change (CSNDKTC)

Modified ICSF Callable Services for ISO 16609 CBC mode T-DES MAC:
• Digital Signature Verify (CSNDDSV)
• MAC Generate (CSNBMGN)
• MAC Verify (CSNBMVR)

Refer to the ICSF Application Programmers Guide (SA22-7522) for additional details.

Configurable Crypto Express2: The Crypto Express2 feature has two PCI-X adapters. Each of the PCI-X adapters can be defined as either a Coprocessor or an Accelerator.
• 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)
  - Designed for 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 feature, configured with both PCI adapters as accelerators, is designed to perform up to 6000 SSL handshakes per second. This represents, approximately, a three-fold performance improvement compared to an IBM @server zSeries z890 (z890) when using either a PCI Cryptographic Accelerator (PCICA) feature, with two PCI adapters per feature, or the current Crypto Express2 feature, with two PCI-X coprocessors per feature. The SSL performance was achieved on an IBM System z9 EC, using Enhancements to Cryptographic Support for z/OS and z/OS.e V1R6/R7 Web deliverable (ICSF FMID HCR7731).

Since the performance enhancements are implemented in Licensed Internal Code, current Crypto Express2 features carried forward from z890 to the new z9 BC may take advantage of increased SSL performance and the new configuration capability when the GA level of the LIC is installed.

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 feature is exclusive to the z9 BC and z9 EC and is supported by z/OS and z/OS.e, z/VM, z/VSE and Linux on System z9. z/VSE, VSE/ESA and Linux on System z9 offer support for clear-key SSL transactions only. z/VM V5.1 and later, support 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.

http://w3-3.ibm.com/sales/ssi/OIAccess.wss

TKE 5.0 workstation to enhance security and convenience: The Trusted Key Entry (TKE) workstation feature (#0839) and the TKE 5.0 level of Licensed Internal Code (#0855) are optional features on the z9 BC. The TKE 5.0 LIC is loaded on the TKE workstation prior to shipment. The TKE workstation offers security-rich local and remote key management, providing authorized persons a method of operational and master key entry, identification, exchange, separation and update. The TKE workstation supports connectivity to an Ethernet Local Area Network (LAN) operating at 10, 100 or 1000 Mbps. Up to three TKE workstations can be ordered.

The TKE Workstation, feature #0839, is available on the z9 EC, z9 BC, z990, z890 and z900. Refer also to the Special features section of the Sales manual on the Web for further information.

http://w3-3.ibm.com/sales/ssi/OIAccess.wss

Smart Card Reader: Support for an optional Smart Card Reader attached to the TKE 5.0 workstation allows for the use of smart cards that contain an embedded microprocessor and associated memory for data storage. Access to and the use of confidential data on the smart cards is protected by a user-defined Personal Identification Number (PIN).

The TKE 5.0 LIC continues to support the ability to store key parts on diskettes or paper or optionally on smart cards, or to use a TKE authority key stored on a diskette, or optionally on a smart card, and to log on to the Cryptographic Coprocessors using a passphrase or optionally a logon key pair.

The optional TKE features are:
• TKE 5.0 LIC (#0855) and TKE workstation (#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 5.0 level of LIC, is available on the z9 EC, z9 BC, z990, z890, z900 and z800.

z9 BC cryptographic migration
• The Crypto Express2 feature is supported on z890 and can be carried forward on an upgrade to the z9 BC.
• Customers may use TKE 3.x workstations to control z900, z800, and prior servers.
• Customers may use TKE 4.x workstations to control z990, z890, and prior servers.
• Customers must use TKE 5.0 workstations to control the z9 BC. TKE 5.0 workstations (#0839) may also be used to control z9 EC, z990, z890 and z900 servers.

The PCICC (#0861), PCICA (#0862) and PCIXCC (#0868) features are not supported on the z9 BC.

Enhanced performance assists for z/VM Linux guests

For HiperSockets, FCP and OSA: The z990 and z890 servers introduced an important virtualization technology designed to improve the performance of z/VM guest operating systems (such as Linux on System z) when Queued Direct Input/Output (QDIO) is used. This virtualization technology is designed to allow QDIO interruptions to be passed directly to guests for HiperSockets, Fibre Channel Protocol (FCP) and OSA on the z9 BC, z9 EC, z990 and z890 servers.

A complementary virtualization technology is being introduced for z9 BC, as well as z9 EC, z990, and z890:
• QDIO Enhanced Buffer-State Management (QEBSM) — two new hardware instructions designed to help eliminate the overhead of hypervisor interception

• Host Page-Management Assist (HPMA) — an interface to the z/VM central storage management function designed to allow the hardware to assign, lock, and unlock page frames without z/VM hypervisor assistance

These new hardware assists can allow a cooperating guest operating system to initiate QDIO operations directly to the applicable channel, without interception by z/VM, thereby helping to provide additional performance improvements. Your z990 and z890 servers will require MCL updates. Support is integrated in the z9 EC and z9 BC LIC. The performance assists are provided on the z9 EC, z9 BC, z990 and z890, as follows: HiperSockets (CHPID type IQD), all FICON features (CHPID type FCP) and all OSA features (CHPID type OSD). Refer to the Software requirements section. Refer to z/VM V5.2 Software Announcement A05-0971, dated July 27, 2005.

Enhanced application performance with FICON

Modified Indirect Data Address Word facility: The System z9 I/O architecture supports a new facility for indirect addressing, Modified Indirect Data Address Word (MIDAW) facility, for both ESCON and FICON channels. The use of the MIDAW facility, by applications that currently use data chaining, may result in improved FICON performance by reducing channel, director, and control unit overhead.

Applications that use the following may benefit: DB2, VSAM, Partitioned Data Set Extended (PDSE), Hierarchical File System (HFS), zSeries File System (zFS) and other datasets exploiting striping and compression.

MIDAW facility performance improvement — z9 BC, MIDAW facility, FICON Express4, DB2, DS8000: Results of internal DB2 table scan tests with Extended Format datasets on the z9 BC with the Modified Indirect Data Address Word (MIDAW) facility and the IBM TotalStorage DS8000 yielded the following results when using FICON Express4 operating at 4 Gbps on a z9 BC compared to FICON Express2 operating at 2 Gbps on a z9 BC:

• A 46% improvement in throughput for all reads (270 MBps vs. 185 MBps)

• A 35% reduction in response times

Use of the MIDAW facility with FICON Express4, operating at 4 Gbps, compared to use of Indirect Data Address Words (IDAWs) with FICON Express2, operating at 2 Gbps, showed an improvement in throughput of greater than 220% for all reads (270 MBps vs. 84 MBps) on DB2 table scan tests with Extended Format datasets.

These measurements are examples of what has been achieved in a laboratory environment using one FICON Express4 channel operating at 4 Gbps (CHPID type FC) on a z9 EC with z/OS V1.7 and DB2 UDB for z/OS V8.

Performance is based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput or performance 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, the storage configuration and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput or performance improvements equivalent to the numbers stated here.

The MIDAW facility is exclusive to the z9 EC and z9 BC and is supported by ESCON (CHPID type CNC), and by the FICON features (CHPID type FC). The MIDAW facility is exploited by z/OS. Refer to the Software requirements section.

Increased I/O addressing capability

63.75K subchannels: The z9 BC addresses a maximum of 64K-1 subchannels in subchannel set 0 (zero) with 1024 (1K) of these previously reserved for system use. IBM is making 768 of these 1K reserved subchannels available for customer use. The increased addressable storage this represents may be significant. For example, if you are using 3390 volume sizes and have 768 volumes of 54 GB/volume, this represents 41 terabytes (TB) of increased storage addressability (54 GB/volume * 768 volumes = 41 TB). In addition, the IBM TotalStorage DS8000 Series can be defined to attach 63.75K unit addresses. Now with 63.75K in the host, there is symmetry between the server and storage subsystem.

63.75K subchannels is exclusive to the z9 EC and z9 BC and is supported by all channel types, and by z/OS and z/OS.e, z/VM and Linux on System z9. Refer to the Software requirements section.

Multiple Subchannel Sets: Multiple Subchannel Sets (MSS) is designed to provide an increased number of subchannels. Two subchannel sets are now available per LCSS and are designed to enable a total of 63.75K subchannels in set-0 and the addition of 64K-1 subchannels in set-1.

With the multiple subchannel set facility, one or two sets of subchannels may be configured to each LCSS where subchannel set 0 (zero) may have from 1 to 63.75K subchannels defined and subchannel set 1 (one) may have from 0 to (64K-1) subchannels defined. z/OS v1.7 will allow Parallel Access Volume Alias (PAV-alias) devices in the subchannel set 1 (one). MSS is designed to provide greater I/O device configuration capabilities for large enterprises.

MSS is exclusive to the z9 EC and z9 BC and is supported by ESCON (CHPID type CNC), by all of the FICON features supported on the z9 BC (CHPID type FC) and by z/OS and z/OS.e V1.7 on System z9. Refer to the Software requirements section.

Increased number of FICON open exchanges: The number of open exchanges is being increased from 32 to 64 on FICON Express4 and FICON Express2 channels on the z9 BC to allow workloads with low to moderate control unit cache hit ratios to achieve higher levels of activity rates per channel.

An updated FICON performance white paper is planned to be available later in 2006. Refer to the Web site http://www.ibm.com/servers/eserver/zseries/connectivity/

Increased connectivity in an I/O cage

You may populate the 28 I/O slots in an I/O cage on the S07 model with any mix of the following:

• Up to 8 Crypto Express2
• Up to 28 FICON Express4
• Up to 20 FICON Express2 or FICON Express (available only on an upgrade from z890)
• Up to 24 OSA-Express2
• Up to 20 OSA-Express (OSA-Express available only on an upgrade from z890)
• Continued support of these maximums:
  - Up to 28 ESCON
  - Up to 12 ISC-3 features, providing up to 48 ISC-3 links

On z890 the maximum quantity of Crypto, FICON and OSA features in combination in one I/O cage was limited to 20 features.

This I/O connectivity enhancement on the z9 BC has no unique hardware or software requirements.

**FICON and FCP enhancements**

**FICON Express4 — 1, 2 or 4 Gbps:** A new generation of FICON features, FICON Express4, are now being offered. FICON Express4 continues the tradition of offering more capabilities with each new generation.

FICON Express4:

• Is designed to deliver increased performance compared to the FICON Express2 features on z890
• Offers two unrepeated distance options (4 kilometre and 10 kilometre) when using single mode fibre optic cabling
• Supports a 4 Gbps link data rate with autonegotiation to 1 or 2 Gbps for synergy with existing switches, directors and storage devices
• Offers an entry-level 4 kilometre (km) LX feature supporting two channels per feature for data centres with limited requirements for single mode fibre optic cabling connectivity

The FICON Express4 features have two modes of operation designed for connectivity to servers, switches, directors, disks, tapes and printers:

1. Native FICON and FICON Channel-to-Channel (CTC) traffic (CHPID type FC) in the z/OS and z/OS.e, z/VMM, z/VSE, VSE/ESA, z/TPF, TPF and Linux on System z9 environments.
2. Fibre Channel Protocol traffic (CHPID type FCP) in the z/VMM, z/VSE and Linux on System z9 environments.

The FICON Express4 features are exclusive to System z9. Refer to the Software requirements section for ordering system support for CHPID types FC and FCP.

There are four FICON Express4 features on z9 BC from which to choose:

1. FICON Express4 10KM LX (#3321), with four channels per feature, is designed to support unrepeated distances up to 10 kilometres (6.2 miles) over single mode fibre optic cabling. Use this feature when the unrepeated distance between devices is greater than 4 kilometres or your link loss budget requirements exceed 2 dB end-to-end between devices.
2. FICON Express4 SX (#3322), with four channels per feature, is designed to carry traffic over multimode fibre optic cabling. Refer to the Standards section for the supported unrepeated distances.
3. FICON Express4-2C 4KM LX (#3323), with two channels per feature, is designed to support unrepeated distances up to 4 km (2.5 miles) over single mode fibre optic cabling. This feature is designed to offer a cost-effective solution to satisfy the majority of your FICON/FCP single mode fibre optic cabling distance requirements and offers lower granularity for small configurations. This feature is exclusive to the z9 BC.
4. FICON Express4 4KM LX (#3324), with four channels per feature, is designed to support unrepeated distances up to 4 km (2.5 miles) over single mode fibre optic cabling. This feature is designed to offer a cost-effective solution to help satisfy the majority of your FICON/FCP single mode fibre optic cabling distance requirements.

**Note:** The ANSI Fibre Channel Physical Interface (FC-PI-2) standard defines 10 kilometre (km) transceivers and 4 km transceivers when using 9 micron single mode fibre optic cabling. IBM supports these FC-PI-2 variants.

IBM supports interoperability of 10 km transceivers with 4 km transceivers provided the unrepeated distance between a 10 km transceiver and a 4 km transceiver does not exceed 4 km (2.5 miles).

All channels on a single FICON Express4 feature are of the same type — 4KM LX, 10KM LX or SX. You may carry forward, from z890 or z800, your current FICON Express2 and FICON Express features (#3319, #3320, #2319, #2320).

**FICON Express4-2C 4KM LX — 2 channels per feature option:** On z9 BC, IBM Systems is offering an option of two channels per feature, in addition to the four channels per feature.

If you have a requirement for:

• Two FICON channels, select this feature #3323
• A maximum of four FICON channels, you may choose to order two FICON Express4-2C 4KM LX 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 4KM LX feature
• A mix of SX (multimode) and LX (single mode) fibre optic cabling, you may choose to order the FICON Express4-2C feature to satisfy your single mode fibre optic cabling requirements and order the FICON Express4 SX four-channel feature for your multimode fibre optic cabling requirements
• Eight or more channels, only order the FICON Express4-2C 4KM LX 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 do not have I/O slot limitations in the I/O cage

**FICON Express4 — change in unrepeated distances at 4 Gbps:** As the link data rate increases, the distance decreases when using multimode fibre optic cabling. Care should be taken when migrating from a 2 Gbps infrastructure to a 4 Gbps infrastructure.

Refer to the Standards section for the maximum unrepeated distances when using 50 or 62.5 micron multimode fibre optic cabling. Refer also to Planning for Fiber Optic Links (GA23-0367) for link loss budget changes at 4 Gbps link data rates.

**FICON Express4 availability enhancement:** The FICON Express4 features have Small Form Factor Pluggable (SFP) optics to permit each channel to be individually serviced in the event of a fibre optic module failure. The traffic on the other channels on the same feature can continue to flow if a channel requires servicing.
**FICON Express4 performance improvement for native FICON:** A FICON Express4 channel, when operating at 4 Gbps, is designed to achieve a maximum throughput of up to 330 MBps when processing all read or all write (half-duplex data transfers) large sequential data transfer I/O operations. This represents approximately a 65% increase compared to a FICON Express2 channel operating at 2 Gbps on z890.

These large sequential data transfer measurements for native FICON (CHPID type FC) are examples of the maximum throughput that can be achieved in a laboratory environment using one FICON Express4 channel on a z9 BC with z/OS V1.7 with no other processing occurring and do not represent actual field measurements. Details are available upon request.

**FICON Express4 performance improvement for FCP:** A FICON Express4 FCP channel, when operating at 4 Gbps, is designed to achieve a maximum throughput of up to 400 MBps when processing all read and up to 392 MBps when processing all write (half-duplex data transfers) large sequential data transfer I/O operations. This represents greater than a 100% increase compared to a FICON Express2 channel operating at 2 Gbps on z890.

A FICON Express4 FCP channel, when operating at 4 Gbps, is designed to achieve up to 525 MBps when processing a mix of read and write large sequential data transfer I/O operations. This represents approximately a 50% increase compared to a FICON Express2 channel operating at 2 Gbps on z890.

These large sequential data transfer measurements for FCP (CHPID type FCP to communicate with SCSI devices) are examples of the maximum throughput that can be achieved in a laboratory environment using one FICON Express4 channel on a z9 BC with Linux on System z9, SUSE Linux SLES 9 SP3, with no other processing occurring and do not represent actual field measurements. Details are available upon request.

**Improved FICON error recovery:** System z9 and z/OS and z/OS.e V1.7 I/O recovery processing improvements are designed to allow for the system to detect switch/director fabric problems that may cause FICON links to fail and recover multiple times in a short period of time.

This enhancement is designed to allow the system to detect these conditions and keep an affected path offline until an operator action is taken. This is expected to help limit the performance impacts of switch/director fabric problems. The improved FICON error recovery function is expected to be available in the first half of 2006 and available on z/OS V1.4 with PTFs.

2000 MHz-km multimode fibre optic jumper cables: IBM has qualified the 50 micron multimode 2000 MHz-km ISO/IEC OM3, TIA 850 nanometer laser-optimized 50/125 micrometer fibre optic cable for use when attaching System z to servers, switches, directors, disks, tapes and printers. As of the date of this announcement, support of the OM3 cable is designed to help facilitate use of the latest industry-standard fibre optic cabling when the unrepeated distances offered by 50 micron 500 MHz-km multimode fibre optic cabling are insufficient for your data centre cabling requirements.

Fiber optic jumper cables continue to be provided by IBM Networking Services and are not available as features on System z9.

**N_Port ID Virtualization (NPIV):** N_Port Identifier Virtualization for Fibre Channel Protocol (FCP) channels (CHPID type FCP) is designed to allow the sharing of a single physical FCP channel among operating system images, whether in Logical Partitions (LPARs) or as z/VM guests in virtual machines.

NPIV utilizes a recent extension to the InterNational Committee for Information Technology Standardization (INCITS) Fibre Channel standard. This extension allows a Fibre Channel host bus adapter (HBA) to perform multiple “logins” to a Fibre Channel fabric using a single physical port (N_Port). The previous implementation of the standard required a single physical FCP channel for each login. Each login uses a different unique port name and the switch fabric assigns a unique Fibre Channel N_Port identifier (FC N_Port ID) for each login. These virtualized FC N_Port IDs allow a physical Fibre Channel port to appear as multiple, distinct ports, providing separate port identification and security zoning within the fabric for each operating system image. The I/O transactions of each operating system image are separately identified, managed and transmitted and are processed the same as if each operating system image had its own unique physical N_Port.

NPIV exploits the capability to define multiple virtual FCP channels, each with its own unique Fibre Channel port name and FC N_Port ID. By assigning different virtual port names to different operating system images (running in Logical Partitions or as z/VM guests in virtual machines), operating systems can use the virtual FCP channels as if they were using dedicated physical FCP channels. In particular, access controls based on the virtual port names may be applied in the Fibre Channel fabric using standard mechanisms such as zoning in the switches and Logical Unit Number (LUN) masking in the storage controllers.

NPIV offers improved FCP channel utilization and sharing among operating system images, joining ESCON and native FICON in offering channel sharing through virtualization. This may help reduce your hardware requirements and may help to facilitate infrastructure simplification.

NPIV is the industry-standard solution which supersedes the previewed FCP LUN Access Control. Refer to Hardware Announcement A04-1295, dated October 7, 2004.

NPIV, allowing improved sharing and channel utilization of FCP channels among operating system images in LPARs or virtual machines, is exclusive to the z9 EC and z9 BC and is applicable to all of the FICON features supported on the z9 BC (CHPID type FCP). Refer to the Software requirements section.

**Note:** To utilize NPIV, the Fibre Channel switch to which the FCP channel directly attaches is required to support NPIV. Support of NPIV is not required by cascaded switches (end nodes) or by the storage controllers and devices accessed through the switch.

**FCP point-to-point attachments:** When a FICON feature is configured as CHPID type FCP, IBM now supports the direct attachment of devices (point-to-point connection), without the need for an intermediate Fibre Channel switch or director. Point-to-point connections may be used to access data stored on these devices and also to IPL an operating system or other stand-alone program from such a device, using the SCSI IPL feature. The no-charge SCSI IPL feature (#9904) is required to use the SCSI IPL function.

**Note:** N_Port ID Virtualization is not supported for point-to-point attachments.

FCP point-to-point attachments are supported on the z9 BC, z990 and z890, by the FICON Express4, FICON Express2 and FICON Express features (CHPID type FCP).
and by z/VM for guest usage and Linux on System z. Refer to the Software requirements section.

**FICON availability enhancements**

Request Node Identification Data (RNID) — designed to assist with the isolation of FICON cabling-detected errors: In a fibre optic environment, with extended distances, resolution of fibre optic cabling problems can be a challenge. To help facilitate resolution, the operating system can now request the RNID data for each device or control unit attached to native FICON channels and display the RNID data using an operator command.

RNID is exclusive to the z9 EC and z9 BC and is supported by the FICON Express4, FICON Express2 and FICON Express features (CHPID type FC) and by z/OS and z/OS.e. Refer to the Software requirements section.

FICON link incident reporting is designed to allow an operating system image (without operator intervention) to register for link incident reports improving the ability to capture data for link error analysis. z/OS and z/OS.e will display this information on consoles and will also save it in the system log and in LOGREC.

FICON link incident reporting is exclusive to the z9 EC and z9 BC and is supported by the FICON Express4, FICON Express2 and FICON Express features (CHPID type FC) and by z/OS and z/OS.e. Refer to the Software requirements section.

**New for HiperSockets — IPv6**

HiperSockets supports IP version 6: Internet Protocol Version 6 (IPv6) support is now being offered for HiperSockets (CHPID type IQD). IPv6 is the protocol designed by the Internet Engineering Task Force (IETF) to replace Internet Protocol Version 4 (IPv4) to help satisfy the demand for additional IP addresses.

IPv6 was introduced to expand the IP address space from 32 bits to 128 bits to enable a greater number of unique IP addresses in support of the proliferation of devices now connecting to the Internet, such as cell phones and PDAs.

The support of IPv6 on HiperSockets (CHPID type IQD) is exclusive to the z9 EC and z9 BC and is supported by the FICON Express4, FICON Express2 and FICON Express features (CHPID type FC) and by z/OS and z/OS.e. Refer to the Software requirements section. IPv6 support is currently available on the OSA-Express2 and OSA-Express features in the z/OS and z/OS.e, z/VM, and Linux on System z environments.

**LAN connectivity — OSA enhancements**

OSA-Express2 1000BASE-T Ethernet: IBM has expanded the family of OSA-Express2 features to include 1000BASE-T Ethernet, supporting a link data rate of 10, 100 or 1000 Mbps over a copper infrastructure.

The 1000BASE-T Ethernet feature provides support for:

- Checksum Offload (exclusive to QDIO mode, CHPID type OSD).
- Spanned channels and sharing among LPARs.
- Jumbo frames in QDIO mode (when operating at 1 Gbps).
- Autonegotiation (the target device must also be set to autonegotiate).
- Category 5 Unshielded Twisted Pair (UTP) cabling with RJ-45 connector.
- 640 TCP/IP stacks per port, for hosting more images.
- Large send for IPv4 packets — The host sends 64 KB blocks to OSA for packet processing returning CPU cycles for application use.
- Concurrent LIC update capability — When properly configured, this capability is designed to avoid a configuration off or on which can help to minimize the disruption of network traffic during an update (applicable to CHPID types OSD and OSN).

The 1000BASE-T Ethernet feature supports four modes of operation:

1. OSA-Integrated Console Controller (OSA-ICC) — TN3270E and non-SNA DFT 3270 emulation, CHPID type OSC
2. Queued Direct Input/Output (QDIO), for TCP/IP traffic when using Layer 3 and protocol-independent packet forwarding when using Layer 2 (z/VM and Linux on System z), CHPID type OSE
3. Non-QDIO for SNA/APPN®/HPR and/or TCP/IP traffic, CHPID type OSN
4. OSA-Express2 OSN (OSA for NCP), CHPID type OSN

OSA-Express2 OSN — Open Systems Adapter for NCP: The OSA-Express2 Gigabit Ethernet and 1000BASE-T Ethernet features (#3364, #3365, #3366) now have the capability to provide channel connectivity from System z9 operating systems to IBM Communication Controller for Linux on System z (CCL) with the introduction of the Open Systems Adapter for the Network Control Program (OSA for NCP) supporting the Channel Data Link Control (CDLC) protocol.

OSA-Express2 OSN can help to eliminate the requirement to have any form of external medium (and all related hardware) for communications between the host operating system and the CCL image. Traffic between the two images (operating system and CCL) is no longer required to flow on an external Local Area Network (LAN) or ESCON channel; traffic can flow LPAR-to-LPAR.

If you continue to require SNA solutions that require NCP functions, you can now consider CCL as a migration strategy to replace your IBM Communications Controllers (374x). The CDLC connectivity option enables TPF environments to now exploit CCL.

The OSA-Express2 Gigabit Ethernet and 1000BASE-T Ethernet features provide connectivity with a new CHPID type OSN (Open Systems Adapter for NCP). Each host operating system that currently supports CDLC is expected to be able to utilize CDLC to CCL without changes to the operating system. OSA-Express2 OSN supports both SNA PU Type 5 and PU Type 2.1 channel connectivity.

Utilizing existing SNA support (multiple transmission groups), OSA-Express2 OSN support permits multiple connections between the same CCL image and the same host operating system (such as z/OS or TPF) image.
operating systems must reside within the same physical server (CPC) as the CCL image.

OSA-Express2 OSN:
- Is designed to appear to the operating systems as an ESCON channel connected to a 374x device type which exploits existing CDLC protocols
- Allows system administrators of the various operating systems to configure, manage and operate their CCL NCPs as if they were running in an ESCON-attached 374x Communications Controller
- Enables NCP channel-related functions such as loading and dumping of the NCP
- Does not require external hardware (cables or switches), however the CCL image requires an OSA channel to connect to the network
- Allows multiple CCL images to communicate with multiple operating system images, supporting up to 180 connections (374x subchannels) per CHPID type OSN
- Can span Logical Channel Subsystems

The CCL image connects to OSA-Express2 OSN using extensions to the QDIO architecture. Linux support is in the QETH module.

OSA-Express2 OSN support is exclusive to the z9 EC and z9 BC, and to the OSA-Express2 Gigabit Ethernet SX, Gigabit Ethernet LX and 1000BASE-T Ethernet features (#3364, #3365, #3366), and requires the port to be configured as CHPID type OSN, which can be configured on a port-by-port basis. OSA-Express2 OSN is exclusively for internal communication, LPAR-to-LPAR. Concurrent LIC update is supported. OSA-Express2 OSN is supported by z/OS and z/OS.e, z/VSE, VSE/ESA, z/TPF, TPF, and Linux on System z9. Refer to the Software requirements section.

**VLAN management enhancement — Support of GVRP for ease of use and simplified management:** The OSA-Express2 features now support VLAN prioritization (a component of the IEEE 802.1 standard) to extend support of VLANs to help simplify networking administration and management of VLANs. You may no longer be required to manually enter VLAN IDs at the switch.

Generic Attribute Registration Protocol (GARP) Virtual Local Area Network (VLAN) Registration Protocol, also referred to as GARP VLAN Registration Protocol (GVRP), is an application defined in the IEEE 802.1 standard that allows for the control of IEEE 802.1Q VLANs.

OSA communicates with GVRP-capable (IEEE 802.1Q) switches, registering its VLANs and dynamically updating its table as the VLANs change. VLANs are designed to ease the administration of logical groups of users — they can communicate as if they were on the same LAN. Traffic can be organized by traffic patterns (such as TELNET, FTP, banking transactions) rather than by physical location.

Support of GVRP is exclusive to the z9 EC and z9 BC, and is applicable to all of the OSA-Express2 features when in QDIO mode (CHPID type OSD), and is supported by z/OS, z/OS.e and z/VM. Refer to the Software requirements section.

**OSA-Express2 Ethernet on the z9 BC — Choose any combination:** The Open Systems Adapter-Express2 (OSA-Express2) features provide you with functions and scalability to help satisfy the demands of your global business. With data rates of 10 or 100 Megabits per second (Mbps), 1 Gigabit per second (Gbps) and 10 Gbps, you can select the features that best suit your current and future application requirements:
- OSA-Express2 Gigabit Ethernet LX (long wavelength) (#3364)
- OSA-Express2 Gigabit Ethernet SX (short wavelength) (#3365)
- OSA-Express2 1000BASE-T Ethernet (#3366)
- OSA-Express2 10 Gigabit Ethernet LR (long reach) (#3368)

You may also carry forward to the z9 BC your current OSA-Express2 features as well as your OSA-Express features (#2364, #2365, #2366, #1364, #1365, #1366).

With multiple Ethernet options, you have the flexibility to deploy where applicable:
- 1000BASE-T Ethernet and a copper cabling infrastructure
- Gigabit Ethernet and a multimode or single mode fibre optic cabling infrastructure
- 10 Gigabit Ethernet LR and a single mode fibre optic cabling infrastructure

You have LAN connectivity solutions that can help to satisfy your departmental, data centre, enterprise, LAN backbone, building-to-building and business continuity requirements.

The OSA-Express2 Ethernet features support the following CHPID types:

<table>
<thead>
<tr>
<th>CHPID Type</th>
<th>OSA-Express2 Features</th>
<th>Purpose/Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSO 1000BASE-T</td>
<td>OSA-Express2 Ethernet SX</td>
<td>SNA/APPN/HPR and/or TCP/IP</td>
</tr>
<tr>
<td>OSO 1000BASE-T</td>
<td>OSA-Express2 Ethernet LX</td>
<td>TCP/IP traffic when Layer 3, 10 GbE Protocol-independent when Layer 2</td>
</tr>
<tr>
<td>OSA 1000BASE-T</td>
<td>OSA-Express2 Ethernet SX</td>
<td>Non-QDIO, SNA/APPN/HPR and/or TCP/IP</td>
</tr>
<tr>
<td>OSN 1000BASE-T</td>
<td>OSA-Express2 Ethernet SX</td>
<td>OSA-Express2 OSN (OSA for NCP)</td>
</tr>
</tbody>
</table>

In addition to the above list of functions identified by CHPID type, over time the family of Open Systems Adapters has added additional connectivity and functions. Here are some of the capabilities and functions currently supported:
- Layer 2 for protocol-independent packet forwarding
- Spanned channels for sharing of OSA features among Logical Channel Subsystems (LCSSs)
- 48 connections to the LAN, up to 24 features per server
- Open Systems Adapter/Support Facility (OSA/SF) Java™ GUI
- VLANs (802.1q)
- Simple Network Management Protocol (SNMP) Get, GetNext, dot3StatsTable, performance data, trap, set
- IPv4 and IPv6
- Checksum offload for IPv4 packets
The following functions are exclusive to the OSA-Express2 features:

- OSA-Express2 OSN (OSA for NCP) (1000BASE-T, GbE) (new).
- 640 TCP/IP stacks per port, for hosting more images on the z9 BC.
- Large send for IPv4 packets — The host sends 64 KB blocks to OSA for packet processing returning CPU cycles for application use.
- Concurrent LIC update capability — When properly configured, this capability is designed to avoid a configuration off/on, minimizing the disruption of network traffic during an update (applicable to CHPID types OSD and OSN).

Refer to the publication OSA-Express Customer’s Guide and Reference (SA22-7935). Refer to the Standards section and to the Hardware requirements and Software requirements sections. Refer also to the Sales manual on the Web


**OSA Layer 2/Layer 3 transport enhancement**

Hosts and virtual switches sharing the same OSA-Express2 or OSA-Express feature on System z9 can now communicate directly through an OSA port, whether configured as Layer 2 or Layer 3 transport mode. Prior to this support, Layer 2 and Layer 3 connections on the same OSA (CHPID) were unable to communicate directly requiring that all traffic between these sharing connections be sent out on the physical LAN and routed back into an OSA port.

This virtualization enhancement is designed to facilitate the deployment of Layer 2 virtual switches and hosts. It also allows the LAN administrator to configure and manage their mainframe network topology using the same techniques as their non-mainframe topology.

The Layer2/Layer 3 transport sharing enhancement is applicable to CHPID type OSD (QDIO traffic) and to all of the OSA features supported on System z9. This enhancement is transparent to operating systems.

**OSA/SF enhancements — for IP and MAC addressing**

The Open Systems Adapter/Support Facility (OSA/SF), is an integrated component of the z/OS and z/OS.e, z/VM, z/VSE and VSE/ESA operating systems. The following enhancements are being offered:

- **Layer 3 OSA Address Table (OAT):** The Layer 3 OAT is now designed to display all IPv addresses registered to an OSA port. There is an indicator that can be used to determine the registration status of each IP address (IP addresses in use as well as IP addresses not in use).

This support is applicable to CHPID type OSD (QDIO traffic), to IPv4 addresses and to all of the OSA features supported on System z9. Refer to the Software requirements section.

- **OSA/SF Virtual MAC and VLAN ID display capability:** OSA/SF now has the capability to support virtual Medium Access Control (MAC) and Virtual Local Area Network (VLAN) identifications (IDs) associated with OSA-Express2 and OSA-Express features configured as a Layer 2 interface. This information will now be displayed as a part of an OAT entry and is independent of IPv4 and IPv6 formats. There can be multiple Layer 2 VLAN IDs associated to a single unit address and one group MAC can be associated to multiple unit addresses.

OSA/SF enhancements are applicable to CHPID type OSD (QDIO traffic) and to all of the OSA features supported on System z9. Refer to the Software requirements section.

- **Multicast information in OAT entry:** Group MAC addressing information is being moved from the port section and is now integrated into the Layer 3 OAT entry.

This support is applicable to CHPID type OSD (QDIO traffic) and to all of the OSA features supported on System z9. Refer to the Software requirements section.

**Extended Capacity Backup**

Capacity Backup (CBU) is the temporary activation of CPs, IFLs, ICFs, zIIIPs and/or zAAPs for robust disaster recovery. The CBU features provide the ability to concurrently increment the CP or specialty engine capacity of your System z9 server, using Licensed Internal Code Configuration Control (LIC-CC), in the event of an unforeseen loss of substantial System z9, zSeries or S/390® computing capacity at one or more of your eligible sites. The CBU features contain additional resources and alter related LICCC of the target machine to an agreed upon configuration for up to a 90-day period of time. A single CBU record containing a combination of CP CBUs A-Z (#7870-7895), CBU IFL (#7896), CBU ICF (#7897), CBU zIIP (#7898) and CBU zAAP (#7899) can be added to the z9 BC models with no system power down and no associated re-IML or IPL.

CBU CP, IFL, ICF, zIIP and zAAP activations are mutually exclusive with On/Off CoD activation. Both CBU (any type) and On/Off CoD can reside on the server, but only one can be activated at a time.

CBU test upgrades for the sole purpose of checking your ability in the event of an emergency are permitted. The CBU offering allows for up to five, 10-day tests over five years.

Contact your IBM representative for additional CBU information.

**Customer Initiated Upgrade capacity — Technology on demand**

**Customer Initiated Upgrade facility:** When your business needs additional capacity quickly, Customer Initiated Upgrade (CIU) is designed to deliver it. CIU is designed to allow you to respond to sudden increased capacity requirements by requesting a System z9 Processor Unit (PU) and/or memory upgrade via the Web, using IBM Resource Link™ and downloading and applying it to your System z9 server using your system’s Remote Support connection. Further, with the Express option on CIU, an upgrade may be made available for installation as fast as within a few hours after order submission.

**Permanent upgrades:** Orders (MESs) of all Processor Unit (PU) types and memory for System z9 servers that can be delivered by Licensed Internal Code, Control Code (LIC CC) are eligible for CIU delivery. CIU upgrades may be performed up to the maximum available processor and memory resources on the installed server, as configured.

While capacity upgrades to the server itself are concurrent, your software may not be able to take
advantage of the increased capacity without performing an Initial Programming Load (IPL).

Temporary capacity

On/Off Capacity on Demand: When your business needs short-term additional capacity, On/Off Capacity on Demand (On/Off CoD) is designed to deliver it. On/Off CoD is designed to temporarily turn on Central Processors (CPs), Internal Coupling Facilities (ICFs), Integrated Facilities for Linux (IFLs), Integrated Information Processors (zIIPs), and/or System z9 Application Assist Processors (zAAPs). On/Off CoD utilizes previously uncharacterized Processor Units (that is, those not purchased and assigned as a CP, ICF, zIPP, IFL or zAAP), and purchased but unassigned CP capacity and/or purchased but unassigned IFLs that are available within the server’s current model configuration. On/Off CoD is delivered through the function of Customer Initiated Upgrade (CIU). To participate in this offering, you must have installed CIU Enablement (#9898) and On/Off CoD Enablement (#9896). Activation of this capability is mutually exclusive with CBU activation.

Both On/Off CoD and CBU can reside on the server, but only one can be activated at a time.

You may request and concurrently install temporary capacity through the CIU application on Resource Link and use that additional capacity for as long as needed.

Using this facility, you may add temporary capacity of the various PUs up to the maximum of available PUs that are purchased but unassigned or unpurchased (uncharacterized). If unassigned or uncharacterized PUs are available, then within the physical PU constraints and normal model definitions you may:

- Add a quantity of temporary CPs up to the quantity of permanently active CP plus unassigned CP capacity, as long as the sum of the temporary and permanent CPs is less than or equal to 3 for a Model R07 on the same server or 4 for a Model S07 on the same server; and

- Add a quantity of temporary IFLs up to the quantity of permanently active IFLs plus unassigned IFLs, as long as the sum of the temporary and permanent IFLs is less than or equal to 6 for a Model R07 on the same server or 7 for a Model S07 on the same server; and

- Add a quantity of temporary ICFs up to the quantity of permanently active ICFs as long as the sum of the temporary and permanent ICFs is less than or equal to 6 for a Model R07 on the same server or 7 for a Model S07 on the same server.

You may similarly request and concurrently install a quantity of temporary zIIPs and zAAPs up to the quantity of permanent zIIPs and zAAPs, with the following two limitations:

- The combined quantity of temporary zAAPs plus permanent zAAPs may not exceed the combined quantity of temporarily active CPs plus permanently active CPs plus unassigned CP capacity on the same server. Additionally,

- The combined quantity of temporary zIIPs plus permanent zIIPs may not exceed the combined quantity of temporarily active CPs plus permanently active CPs plus unassigned CP capacity on the same server.

You will be billed for associated usage through one or more of the following features: On/Off CoD Active CP-Day (#9897), On/Off CoD Active IFL-Day (#9888), On/Off CoD Active ICF-Day (#9889), On/Off CoD Active zIIP-Day (#9908), or On/Off CoD Active zAAP-Day (#9893).

Pricing for unassigned CP capacity and unassigned IFLs

On/Off CoD pricing has been enhanced to provide reduced pricing when a temporary upgrade includes activation of previously purchased but unassigned CP capacity and/or previously purchased but unassigned IFLs. Now you may activate any amount of purchased but unassigned CP capacity or purchased but unassigned IFLs on a temporary basis for a flat daily fee per engine type. There is one flat daily fee for temporary usage of purchased but unassigned CP capacity and a second, separate flat daily fee for temporary usage of purchased but unassigned IFLs. The offering is designed such that when you activate purchased but unassigned capacity you’ll be charged the lesser of the flat daily fee or your standard On/Off CoD rate. Contact your IBM representative for additional pricing information.

On/Off CoD test

On/Off CoD allows for a no-charge test. No IBM charges are assessed for the test, including IBM charges associated with temporary hardware capacity, IBM software or IBM maintenance. This test can be used to validate the processes to download, activate and deactivate On/Off CoD capacity nondisruptively. Each On/Off CoD-enabled server is entitled to one no-charge test per contract. This test may last up to a maximum duration of 24 hours commencing with the download and activation of an On/Off CoD order. On/Off CoD tests which exceed 24 hours in duration will be treated in their entirety as billable On/Off CoD upgrades. In addition to validating the On/Off CoD function within your environment, you may choose to use this test as a training session for your personnel who are authorized to activate On/Off CoD.

An additional test offering is introduced on z9 BC. The Administrative On/Off Capacity on Demand (On/Off CoD) Test enables customers to order zero temporary PU features via Resource Link. This test allows a customer to thoroughly rehearse the entire On/Off CoD process without incurring any cost. There is an unlimited number of tests for Administrative On/Off CoD Test and no time-period restrictions.

On/Off CoD no-charge test can be requested from the Web at Resource Link. Refer to http://www.ibm.com/servers/resourcelink

Extended staging of CIU-Express and On/Off CoD orders:

All CIU-Express and On/Off CoD orders may be staged for greater than 30 days. The orders may be staged for an extended period of time, unless one of the following conditions occurs:

- Order is canceled by customer
- Server is no longer under warranty or IBM Maintenance Service Agreement
- Permanent PU and (or) memory configurations are changed

Refer to http://www.ibm.com/servers/resourcelink
On demand support from IBM Global Financing

Let IBM Global Financing, a leading provider of IT financing, assist in your acquisition of IBM leading-edge technology.

Through Total Solution Financing we provide a single source that allows you to consolidate your solution, including hardware, software and services. This helps make acquiring your System z9 fast, easy and affordable.

Through our Total Solution Financing offerings we can provide financing for your on demand needs. Match your investment to your usage with competitive financing for your fixed and variable costs for on demand.

Preview — Server Time Protocol

In July 2005 we announced that IBM plans to make available a new time synchronization feature, Server Time Protocol (STP), which is designed to provide the capability for multiple System z9 and zSeries servers to maintain time synchronization with each other. STP is planned to be the follow-on to the Sysplex Timer® (9037-002). The Sysplex Timer and STP are designed to allow events occurring in different System z9, zSeries and S/390 servers to be properly sequenced in time.

STP is designed for servers that have been configured to be in a Parallel Sysplex® or a sysplex (without a Coupling Facility) as well as servers that are not in a sysplex, but need to be time synchronized. STP is designed to allow timing information to be sent between servers and Coupling Facilities (CFs) over InterSystem Channel-3 (ISC-3) links configured in peer mode, Integrated Cluster Bus-3 (ICB-3) links or Integrated Cluster Bus-4 (ICB-4) links.

STP is designed to:

- Allow clock synchronization between z9 EC, z9 BC, z990, and z890 servers and CFs without requiring the Sysplex Timer.
- Support a multisite timing network of up to 100 km (62 miles) over fibre optic cabling, allowing a Parallel Sysplex to span these distances.
- Potentially reduce the cross-site connectivity required for a multisite Parallel Sysplex.
- Coexist with an ETR network.
- Allow use of dial-out time services to set the time to an international time standard (such as Coordinated Universal Time [UTC]) as well as adjust to the time standard on a periodic basis.
- Allow setting of local time parameters, such as time zone and Daylight Saving Time.
- Allow automatic updates of Daylight Saving Time.

STP is planned to be available as a feature on the z9 BC, z9 EC, z990 and z890, and to be supported by z/OS V1.7 (PTFs will be required to enable STP support).

Implementation Assistance Program (IAP): IBM has made available an Implementation Assistance Program to allow you to accelerate the adoption of STP with IBM’s assistance. The assistance includes consultation, the review of your migration plans, and technical support. The IAP is planned to be made available through 2006.

Coupling connectivity for Parallel Sysplex

IC, ICB and ISC-3 on the z9 BC: The z9 BC supports Internal Coupling channels (ICs), Integrated Cluster Bus-3 (ICB-3), ICB-4 and InterSystem Channel-3 (ISC-3) (peer mode) links for communication in a Parallel Sysplex environment.

- ICS are used for internal communication between Coupling Facilities defined in LPARs and z/OS images on the same server. Up to a maximum of 32 can be defined per server.
- ICBs are used for server-to-server communication over short distances, using 10 metre (33 feet) copper cables, of which 3 metres (10 feet) is used for internal routing and strain relief.
  - Integrated Cluster Bus-3 (ICB-3) (#0993) supports a link data rate of 1 gigabyte per second and is used to connect z9 BCs to z900s, z990s and z880s up to a maximum of 16 links.
  - ICB-4 (#3993) supports a link data rate of 2 gigabytes per second and is used to connect z9 BCs to z9 BCs, z9 ECs, z990s and z880s up to a maximum of 16 links.
- InterSystem Channel-3s (ISC-3s) (#0217, #0218, #0219) support a link data rate of 2 gigabits per second and is used for server-to-server communication at distances up to 10 km (6.2 miles) using 9 micron single mode fibre optic cables. Up to a maximum of 48 ISC-3 links are supported. ISC-3s are supported exclusively in peer mode (CHPID type CFP).

The maximum number of coupling links combined (ICs, ICB-3s, ICB-4s and ISC-3 links) cannot exceed 64 per server.

ICB-2 links are not supported: ICB-2 links were used to support Parallel Sysplex connectivity between 9672 G5 and G6 servers and z990, z900 and z800 servers. ICB-2 links are not supported. Withdrawal of support of ICB-2 links on the z9 BC satisfies the Statement of General Direction in Hardware Announcement A03-0620, dated May 13, 2003.

ISC-3 links in compatibility mode no longer supported: Attachment of ISC-3 links on the z9 BC to HiPerLinks (ISC-2) on G5 and G6 servers is not supported. ISC-3 compatibility mode is not supported on the z9 BC (CHPID types CFs and CFR).

Withdrawal of support of ISC-3 links in compatibility mode on the z9 BC satisfies the Statement of General Direction in Hardware Announcement A04-0405, dated April 7, 2004.

GDPS™ V3.3 enhancements

IBM Global Services continues to enhance GDPS with:

- Extended HyperSwap™ functionality with IOS timing trigger.
- Improved availability with enhanced recovery support in a CF structure duplexing environment.
- Performance improvements for System Logger in a z/OS Global Mirror (previously known as XRC) environment.
- Scalability improvements for XRC.
- Unlimited distance solution for z/OS and open data with the new GDPS/Global Mirror offering.

Unplanned HyperSwap IOS timing trigger: If a disk subsystem experiences a “hard failure” such as a boxed device, rank array failure or disk subsystem failure, current versions of GDPS/PPRC and GDPS/PPRC...
HyperSwap Manager (GDPS/PPRC HM) are designed to detect this and automatically invoke HyperSwap to transparently switch all primary PPRC disks with the secondary disks within seconds.

The HyperSwap IOS timing trigger is designed to allow HyperSwap to be invoked automatically when user-defined I/O timing thresholds are exceeded. In a matter of seconds, transactions can now resume processing on the secondary disk, providing availability benefits and avoiding operator intervention.

**GDPS enhanced recovery support:** In the event of a primary site failure, the current GDPS/PPRC cannot ensure that all CF structures at the secondary site when restarting workloads. This results in loss of “changed” data in CF structures. Users must execute potentially long-running and highly variable data recovery procedures to restore the lost CF data.

GDPS enhanced recovery is designed to help ensure that the secondary PPRC volumes and the CF structures are time consistent, thereby helping to provide consistent application restart times without any special recovery procedures. This is especially significant for customers using DB2 data sharing, IMS™ with shared DEDB/VS0 or WebSphere® MQ shared queues.

**Improving performance:** System logger provides new support for XRC+, by allowing you to choose asynchronous writes to staging data sets for logstreams. Previously, all writes had to be synchronous. This limited the throughput for high-volume logging applications such as WebSphere, CICS®, and IMS. The ability to do asynchronous writes can allow the use of z/OS Global Mirror (XRC) for some applications for which it was not previously practical. XRC+ is available on z/OS and z/OS.e V1.7.

Refer to Preview: IBM z/OS V1.7 and z/OS.e V1.7: World-class computing for On Demand Business, Software Announcement A05-0242, dated February 15, 2005.

GDPS/XRC has extended its automation to support XRC+. It is designed to provide the ability to configure and manage the staging data set remote copy pairs.

**Scalability:** GDPS/XRC support is being extended to help improve XRC scalability for large systems by:

- Write Pacing support for XRC to self tune high-intensity update applications
- Parallel execution of XRC commands across all SDMs for improved responsiveness, improved usability and reduced recovery time
- Support for more than 14 SDMs, allowing GDPS/XRC to handle larger configurations and higher throughputs while maintaining the client’s service level

GDPS/Global Mirror is the latest member of the GDPS suite of offerings. It offers a multisite, end-to-end disaster recovery solution for your IBM z/OS systems and open systems data.

IBM GDPS/Global Mirror automation technology can help simplify data replication across any number of System z systems and/or open system servers to a remote site that can be at virtually any distance from the primary site. This can help ensure rapid recovery and restart capability for your open systems environment for testing and disaster recovery. Being able to test and practice recovery allows you to build skills in order to be ready when a disaster occurs.

GDPS/Global Mirror automation technology is designed to manage the IBM TotalStorage Global Mirror copy services and the disk configuration, monitor the mirroring environment and automate management and recovery tasks. It can perform failure recovery from a central point of control. This can provide the ability to synchronize System z and open systems data at virtually any distance from your primary site.

The point-in-time copy functionality offered by the IBM TotalStorage Global Mirror technology allows you to initiate a restart of your database managers on any supported platform, to help reduce complexity and avoid having to create and maintain different recovery procedures for each of your database managers.

All this helps provide a comprehensive disaster recovery solution.

**IBM Implementation Services for GDPS:** Through comprehensive GDPS services, IBM specialists can help customers reduce costs, speed delivery and ensure a successful disaster recovery implementation. This is done by working with the customers from upfront project planning, to developing detailed implementation and testing plans to help meet their availability requirements, to implementation and verification of their solution.

GDPS V3.3 was available as of January 25, 2006. GDPS is designed to work in conjunction with the z9 EC, z9 BC, z990, z890, z900, and z800 servers. For a complete list of other supported hardware platforms and software prerequisites, refer to the GDPS Web site http://www.ibm.com/systems/z/gdps/

GDPS/Global Mirror has been available as of October 2005. Contact your IBM representative or send an e-mail to gdps@us.ibm.com for information regarding ordering GDPS.

More information on GDPS can be found in IBM GDPS V3.3: Improving disaster recovery capabilities to help ensure a highly available, resilient business environment, Marketing Announcement A06-0273, dated February 14, 2006.

**Token Ring not offered as a feature**

**Token Ring not offered as a feature on the HMC:** Token Ring is not available as a feature on the z9 BC Hardware Management Console (HMC). Current HMCs with Token Ring may be carried forward to the z9 BC on an upgrade from z800 or z890.

Withdrawal of Token Ring support on the z9 BC HMC satisfies the Statement of General Direction in Hardware Announcement A04-0405, dated April 7, 2004.

**Token Ring not offered as a feature on the SE and TKE workstation:** Token Ring is not available as a feature on the z9 BC Support Element (SE) or Trusted Key Entry (TKE) workstation. Token Ring is not offered as a feature on the z9 BC and cannot be carried forward to the z9 BC on a upgrade from z800 or z890.

Withdrawal of Token Ring support on the z9 BC SE and TKE workstation satisfies the Statement of General Direction in Hardware Announcement A04-0405, dated April 7, 2004.

**OSA-Express Token Ring not offered as a feature on the z9 BC:** The OSA-Express Token Ring feature is not supported on the z9 BC. Token Ring is not offered as a...
feature on the z9 BC and cannot be carried forward to the z9 BC on an upgrade from z800 or z890.


Accessibility by people with disabilities

A U.S. Section 508 Voluntary Product Accessibility Template (VPAT) containing details on the Lenovo™ ThinkPads and ThinkCentres accessibility compliance can be requested via IBM’s Web site at http://www-3.ibm.com/able/product_accessibility/index.html

Product positioning

The System z9 BC (z9 BC) represents a continuing evolution of the mainframe and is designed specifically with midrange requirements in mind. z9 BC offers two models, affordable entry and scalability, and provides up to a 37% improvement in uniprocessor capacity compared to the z890 while maintaining the same low entry point. It provides a 40% increase in the number of FICON channels, twice the available memory (up to 64 GB), one third more internal I/O paths, and an increased number of open exchanges (concurrent I/O operations) that may be active simultaneously, from 32 to 64 per FICON Express2 and FICON Express4 channel. This provides a well-balanced systems approach to your ever-changing business needs.

The z9 BC is intended to be the hub of an integrated IT infrastructure supporting mission-critical requirements for on demand business transaction processing and data management. IBM provides more flexibility to respond to changing business demands by allowing it to grow in 73 granular increments, run multiple applications — with multiple operating systems if needed and provide all current System z9 functionality — all on a single server. It is a lower-entry-price platform for midrange customers who want System z9 benefits while running traditional workloads. Offering more and new specialty engines than the z890 or z800 to provide a lower cost for new workloads with Linux or z/OS.e, it is ideal for z/VSE customers who have growing traditional workloads along with growing Linux applications and for Linux and z/VM customers consolidating workloads onto a single zSeries server.

Advanced technology and balanced hardware and operating system interoperability continues with Multiple Subchannel Sets (MSS) and the Modified Indirect Data Address Word (MIDAW) facility. The MIDAW facility may benefit applications that use the following: DB2, VSAM, PDSE, HFS, zFS and other datasets exploiting striping and compression. A new 2-port FICON option provides a cost-effective entry to this technology.

The z9 BC will provide a cost-effective and flexible mainframe with the ability to improve application performance, increase the number of users and supported transactions, increase scalability and consolidate workloads beyond what is available on a z890.

Statement of general direction

Non-raised-floor support

IBM intends to offer the z9 BC for use in a non-raised-floor environment at a future date.

Connectivity using ICB-3 links

System z9 EC and System z9 BC are the last servers to support ICB-3 links. IBM is making this statement to allow enterprises sufficient opportunity to prepare for a migration to ICB-4 links.

IBM System Storage encryption

To address customers’ growing concern with data security, IBM is planning for the development, enhancement and support of encryption capabilities within storage environments such that the capability does not require the use of host server resources (so called “outboard” encryption capabilities). This includes the intent to offer, among other things, capabilities for products within the IBM System Storage portfolio to support outboard encryption and to leverage the key management functions provided by the Integrated Cryptographic Service Facility (ICSF).

Our first implementation of outboard encryption is planned for the IBM System Storage TS1120 Tape Drive in the second half of 2006. The plan includes providing an optional, chargeable microcode and hardware upgrade for TS1120 Tape Drives shipped before encryption availability. Also planned is a new software program for management of encryption keys for tape drives across the enterprise. This new software program would utilize standard key repositories, including ICSF on z/OS and z/OS.e.

These statements represent IBM’s current intentions. All statements regarding IBM’s plans, directions and intent are subject to change or withdrawal without notice. Any reliance on these Statements of Direction is at the relying party’s sole risk and will not create liability or obligation for IBM.

Reference information

Trade-marks

System z9, FICON, System Storage, z/Architecture, System z, ECKD, RMF, PR/SM, Processor Resource/Systems Manager, VSE/ESA, Resource Link, GDPS, HyperSwap, and IMS are trade-marks of International Business Machines Corporation used under license by IBM Canada Ltd. The e-business logo, zSeries, TotalStorage, DB2, ESCON, z/OS, z/VM, DRDA, z/VSE, APPN, S/390, Sysplex Timer, Parallel Sysplex, WebSphere, and CICS are registered trade-marks of International Business Machines Corporation used under license by IBM Canada Ltd. Intel is a registered trade-mark of Intel Corporation. Java is a trade-mark of Sun Microsystems, Inc. UNIX is a registered trade-mark of the Open Company in the United States and other countries. Linux is a trade-mark of Linus Torvalds in the United States, other countries or both. Lenovo is a trade-mark of Lenovo in the United States, other countries or both. Other company, product and service names may be trade-marks or service marks of others.