

E17

Bringing You Up To Date with System z Hardware for z/VSE

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Announcements Since Last Spring

- **June 2006**
 - ▶ 12/31/2007 end of service 2003, 3006, 9672-G4 and 9674-C05 (US letter 906-132)
- **January 2007**
 - ▶ z/VSE 4.1
 - ▶ z/VSE MWLC Software pricing
 - ▶ z/OS zNALC software pricing
- **February 2007**
 - ▶ z/VM 5.3
 - ▶ z/OS V1.9 Preview
- **April 2007**
 - ▶ z9 BC and z9 EC enhancements
- **June 2007**
 - ▶ 12/31/2007 withdrawal of all models of the z890; 06/30/2008 withdrawal of all model and MES features within z890. (US letter 907-134)
- **July 2007**
 - ▶ System Storage TS1120 Tape Controller supports TS3400 Tape Library attachment for IBM System z
- **September 2007**
 - ▶ z/VM 5.1 End of Service



Introduction



Powerful servers for simplified infrastructures

IBM System z9

The server designed to help protect, grow and meet the demands of enterprise of all sizes

The IBM System z9™ Enterprise Class (z9 EC) – formerly called z9-109 – and the new IBM System z9 Business Class (z9 BC) deliver excellence in enterprise computing and are designed and optimized for on demand business



z9 EC

- **Built on more than 40 years of industry leadership and taking that leadership to new levels**
 - ▶ Scalability
 - ▶ Availability
 - ▶ Security
- **It's time to rethink the role of the mainframe**
 - ▶ A mainframe for everyone
 - ▶ Helping to drive increased value from data and applications
 - ▶ Helping to simplify management and reduce costs of storage subsystems with new connectivity options



z9 BC

Now there is a System z9 for everyone

The Mainframe Charter – Providing a Strategic Framework

It is our intention to...



Innovation

- Provide leadership in innovation to enhance the use of the IBM mainframe to support increasingly integrated and flexible business processes for the on demand business.



Value


- Enhance the value proposition and lower the cost of computing of mainframe solutions in a way that is compelling, clear, and consistent.*



Community

- Support programs designed to foster vitality in the IBM mainframe community, helping to promote a strong application portfolio and world-class support services.*

IBM System z Family



<p>IBM eServer zSeries 900 – z900 (2064)</p>  <ul style="list-style-type: none"> Announced 10/00 – first 64-bit zSeries 42 models – Up to 16-way Specialty Engines <ul style="list-style-type: none"> CP, IFL, ICF On Demand Capabilities <ul style="list-style-type: none"> CUoD, CIU, CBU Memory – up to 64 GB Channels <ul style="list-style-type: none"> Up to 256 ESCON channels FICON Express, Parallel Token-Ring, FDDI, Ethernet, ATM Coupling Links Crypto coprocessors, accelerators Parallel Sysplex clustering HiperSockets – up to 4 Up to 15 logical partitions Operating Systems <ul style="list-style-type: none"> z/OS, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on zSeries 	<p>IBM eServer zSeries 800 – z800 (2066)</p>  <ul style="list-style-type: none"> Announced 2/02 – first 64-bit zSeries for mid market 10 models – Up to 4-way Specialty Engines <ul style="list-style-type: none"> CP, IFL, ICF On Demand Capabilities <ul style="list-style-type: none"> CUoD, CIU, CBU Memory – up to 32GB Channel <ul style="list-style-type: none"> Up to 240 ESCON Channels FICON Express Networking Adapters (OSA) Coupling Links Cryptographic Coprocessors Parallel Sysplex clustering HiperSockets – up to 4 Up to 15 partitions Operating Systems <ul style="list-style-type: none"> z/OS, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on zSeries 	<p>IBM eServer zSeries 990 – z990 (2084)</p>  <ul style="list-style-type: none"> Announced 5/03 – first zSeries Superscalar Server 4 models – Up to 32-way Specialty Engines <ul style="list-style-type: none"> CP, IFL, ICF, zAAP On Demand Capabilities <ul style="list-style-type: none"> CUoD, CIU, CBU, On/Off CoD Memory – up to 256 GB Channels <ul style="list-style-type: none"> Four LCSSs Up to 1024 ESCON channels Up to 240 FICON Express2 channels Token-Ring, GbE, 1000BASE-T Ethernet Coupling Links Crypto Express2 Parallel Sysplex clustering HiperSockets – up to 16 Up to 30 logical partitions Operating Systems <ul style="list-style-type: none"> z/OS, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on zSeries 	<p>IBM eServer zSeries 890 – z890 (2086)</p>  <ul style="list-style-type: none"> Announced 4/04 – zSeries Superscalar Server for mid market 1 model – Up to 4-way <ul style="list-style-type: none"> 28 capacity settings Specialty Engines <ul style="list-style-type: none"> CP, IFL, ICF, zAAP On Demand Capabilities <ul style="list-style-type: none"> CUoD, CIU, CBU, On/Off CoD Memory – up to 32 GB Channel <ul style="list-style-type: none"> Two LCSSs Up to 420 ESCON channels Up to 80 FICON Express2 channels Networking Adapters (OSA) Coupling Links Cryptographic Coprocessors Parallel Sysplex clustering HiperSockets – up to 16 Up to 30 partitions Operating Systems <ul style="list-style-type: none"> z/OS, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on zSeries 	<p>IBM System z9 (z9-109) (2094)</p>  <ul style="list-style-type: none"> Announced 7/05, Superscalar Server 5 models – Up to 54-way Specialty Engines <ul style="list-style-type: none"> CP, IFL, ICF, zAAP On Demand Capabilities <ul style="list-style-type: none"> CUoD, CIU, CBU, On/Off CoD Memory – up to 512 GB Channels <ul style="list-style-type: none"> Four LCSSs Multiple Subchannel Sets MIDAW facility 63.75 subchannels Up to 1024 ESCON channels Up to 336 FICON channels 10 GbE, GbE, 1000BASE-T Coupling Links Configurable Crypto Express2 Parallel Sysplex clustering HiperSockets – up to 16 Up to 60 partitions Enhanced Availability Operating Systems <ul style="list-style-type: none"> z/OS, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on System z
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IBM System z family (cont.)

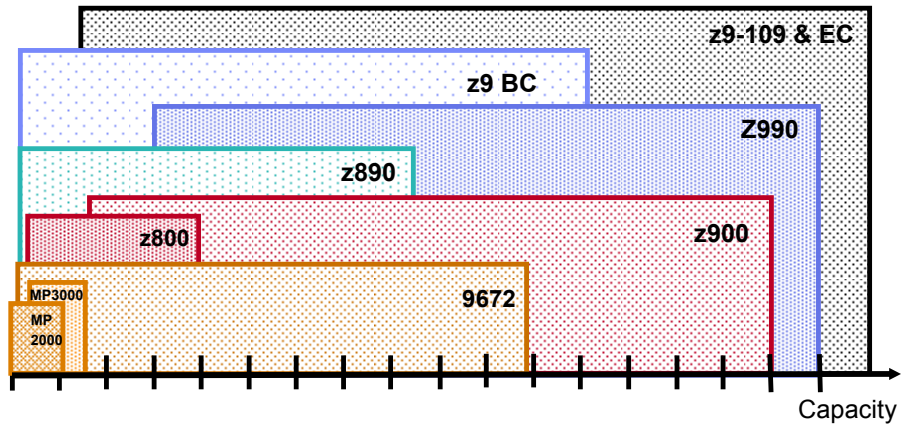
The latest family of mainframe servers

<p>IBM System z9 (z9 EC) (2094)</p>  <ul style="list-style-type: none"> Announced 4/06 - Superscalar Server with up to 64 PUs 5 models – Up to 54-way Granular Offerings for up to 8 CPs Specialty Engines <ul style="list-style-type: none"> CP, IFL, ICF, zAAP, zIIP On Demand Capabilities <ul style="list-style-type: none"> CUoD, CIU, CBU, On/Off CoD Memory – up to 512 GB Channels <ul style="list-style-type: none"> Four LCSSs Multiple Subchannel Sets MIDAW facility 63.75 subchannels Up to 1024 ESCON channels Up to 336 FICON channels Enhanced FICON Express2 and 4 10 GbE, GbE, 1000BASE-T Coupling Links Configurable Crypto Express2 Parallel Sysplex clustering HiperSockets – up to 16 Up to 60 logical partitions Enhanced Availability Operating Systems <ul style="list-style-type: none"> z/OS, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on System z 	<p>IBM System z9 (z9 BC) (2096)</p>  <ul style="list-style-type: none"> Announced 4/06 - Superscalar Server with 8 PUs 2 models – Up to 4-way High levels of Granularity available <ul style="list-style-type: none"> 73 Capacity Indicators Specialty Engines <ul style="list-style-type: none"> CP, IFL, ICF, zAAP, zIIP On Demand Capabilities <ul style="list-style-type: none"> CUoD, CIU, CBU, On/Off CoD Memory – up to 64 GB Channels <ul style="list-style-type: none"> Two LCSSs Multiple Subchannel Sets MIDAW facility 63.75 subchannels Up to 420 ESCON channels Up to 112 FICON channels Enhanced FICON Express2 4 Gbps 10 GbE, GbE, 1000BASE-T Coupling Links Configurable Crypto Express2 Parallel Sysplex clustering HiperSockets – up to 16 Up to 30 logical partitions Enhanced Availability Operating Systems <ul style="list-style-type: none"> z/OS, z/OS.e, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on System z
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System z Positioning



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IBM System z9 Enterprise Class



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IBM System z9 EC overview

- **Machine Type**
 - ▶ 2094
- **5 Models**
 - ▶ S08, S18, S28, S38 and S54
- **Processor Units (PUs)**
 - ▶ 12 PUs (16 for Model S54) per book
 - ▶ 2 SAPs per book, standard
 - ▶ 2 spares per server
 - ▶ 8, 18, 28, 38 or 54 PUs available for characterization:
 - Cental Processors (CPs), Integrated Facility for Linux (IFLs), Internal Coupling Facility (ICFs), System z Application Assist Processors (zAAPs), System z Integrated Information Processor (zIIPs), optional System Assist Processor (SAPs)
- **Memory**
 - ▶ Minimum of 16 GB
 - ▶ Up to 128 GB per book
 - 16 GB increments
 - ▶ Up to 512 GB
- **I/O**
 - ▶ Up to 16 STIs per book
 - 2.7 GB/sec for each
 - ▶ Total system I/O bandwidth capability of 172.8 GB/sec
 - ▶ Up to 4 Logical Channel SubSystems (LCSSs)
 - ▶ New generation of FICON/FCP
- **Other**
 - ▶ 60 LPARs



Note: formerly known as the z9-109)

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z9 EC Model Structure

A flexible model structure that can be optimized for your business

- One machine type – 2094 – five models – S08, S18, S28, S38, and S54
- Model number indicates PUs available for characterization
- 2 System Assist Processors (SAPs) per book
- 2 spares standard per server
- z9 EC software models
 - ▶ 700, 401 to 408, 501 to 508, 601 to 608 and 701 to 754
 - ▶ nxx, where n = the capacity setting of the engine, and xx = the number of PU characterized as CPs in the CEC
 - ▶ Once xx exceeds 08, then all CP engines are full capacity

Models	MCMs	Available PUs	Max Available Sub-capacity CP PUs	Standard SAPs	Standard Spares	CP/IFL/ICF/zAAP/zIIP ****	Max Memory	Max Channels
S08*	1	12	8	2	2	8	128 GB	960 **
S18*	2	24	8	4	2	18	256 GB	1024
S28*	3	36	8	6	2	28	384 GB	1024
S38*	4	48	8	8	2	38	512 GB	1024
S54*	4	64	8	8	2	54	512 GB	1024

Notes:

* Must have a minimum of 1 CP, IFL or ICF

** There is a max of 64 ESCON features/960 active channels and a max of 64 FICON features/256 channels on Model S08.

*** The one for one relationship of zAAP or zIIP to CP still exists, but one CP can satisfy requirement for either or both specialty engines

**** Maximum of 16 ICFs

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Extending sub-capacity to the z9 EC (April 2006) Increased business flexibility with more choices

- Choose a server sized to meet your business objectives
 - ▶ Introducing sub-capacity engines on the z9 EC
 - ▶ Four capacity settings per engine
 - ▶ New lower entry – about 66% smaller than z9 EC current entry
 - ▶ A total of 24 new settings, each with less capacity than the full capacity 8-way
 - ▶ Additional engines can be specialty engines or CBUs
- Availability of all current z9 EC features and functions when running with sub-capacity processors *
 - ▶ Enhanced book availability and advanced driver maintenance functions are available on multi book systems
- Any to any upgradeability available within the new sub-capacity matrix, as well as to current z9 EC capacity settings
- Sub-capacity CBUs now available on z9 EC (and z9 BC)



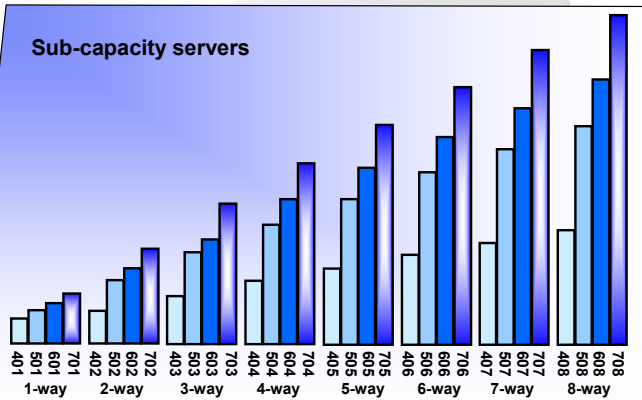
* Only 8 general purpose processors can be sub-capacity

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Finding the server to help meet your business needs

Sub-capacity servers

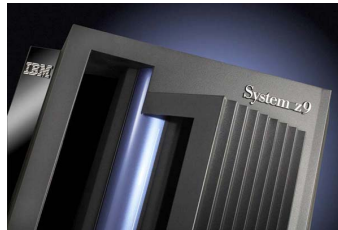


- The z9 EC now offers 24 additional sub-capacity settings with the first eight general purpose (CP) engines
- Entry point is approximately one third the capacity of the 701
- All general purpose processors must be the same capacity within one z9 EC

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IBM System z9 Business Class



z9 BC – The modern mainframe for the small to medium enterprise

- Based on System z9 technology
- Designed for flexibility in 2 new models
- Lower capacity and priced features
- More engines for more workloads
- On demand upgrade capability
- Enhanced networking and connectivity options
- Built with System z9's cryptographic and encryption functions
- Tiered EWLC and MWLC Software Pricing Structure
- Operating system support – similar to z9 EC
- Single frame - available for either raised or non-raised floor

Low entry point and more flexibility



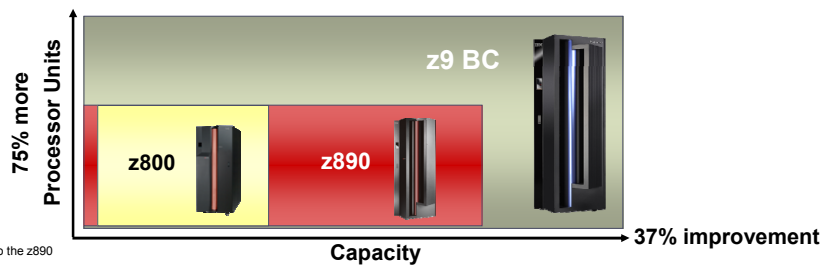
z9 BC – Delivering increased capacity and performance* Flexibility for growth

Greater granularity and scalability

- ▶ Two models with one machine type (2096)
- ▶ 73 capacity settings for a 2.6 times increase in flexibility over IBM eServer™ zSeries® 890 (z890)
- ▶ Delivers over 37% more capacity with the same low entry point as the z890
- ▶ Up to 37% hardware performance improvement for Linux® (IFLs)
- ▶ Double the memory – up to 64 GB per server

Improved I/O Performance

- ▶ 40% more FICON® channels – up to 112
- ▶ Up to 170% more bandwidth than the z890
- ▶ Can improve FICON performance with Modified Indirect Data Address Word (MIDAW) facility
- ▶ Double the FICON concurrent I/O operations from 32 to 64 on FICON channel
- ▶ Multiple Subchannel Sets (MSS) for an increased number of logical volumes



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IBM System z9 BC model comparison

Model R07

- **Processor Units (PUs)**
 - ▶ 7 PUs + 1 SAP per system
 - ▶ 1 - 3 CPs
 - ▶ 0 – 3 zAAPs or zIIPs
 - ▶ 0 – 6 IFLs or ICFs
 - ▶ 20 Capacity Settings
- **Memory**
 - ▶ 8 – 64 GB
- **I/O**
 - ▶ 240 ESCON®
 - ▶ 64 FICON Express4
 - ▶ 32 OSA-Express2 (2-port); with 24 on A01
 - ▶ 8 Crypto Express2
 - ▶ 16 STIs

Machine Type 2096



Model S07

- **Processor Units (PUs)**
 - ▶ 7 PUs + 1 SAP per system
 - ▶ 0 - 4 CPs
 - ▶ 0 – 3 zAAPs or zIIPs
 - ▶ 0 – 7 IFLs or ICFs
 - ▶ 53 Capacity Settings
- **Memory**
 - ▶ 8 – 64GB
- **I/O**
 - ▶ 420 ESCON
 - ▶ 112 FICON Express4
 - ▶ 48 OSA-Express2 (2-port)
 - ▶ 16 Crypto Express2
 - ▶ 16 STIs

Both models have **Sub-capacity CBU CPs** and **Specialty Engine CBU** capabilities which are intended to help provide more robust disaster recovery possibilities

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IBM zSeries 890 to System z9 BC comparison

z890

- **Processor Units (PUs)**
 - ▶ 4 PUs + 1 SAP
 - ▶ 0 - 4 CPs
 - ▶ 0 - 2 zAAPs (*no zIIPs*)
 - ▶ 0 - 4 IFLs or ICFs
 - ▶ 28 Capacity Settings
- **Memory**
 - ▶ 8 - 32GB
- **I/O**
 - ▶ 420 ESCON
 - ▶ 80 FICON Express2
 - ▶ 40 OSA-Express2 (2-port)
 - ▶ 16 Crypto Express2
 - ▶ 8 STIs



Sub-capacity CBU CPs & Specialty Engine CBU

z9 BC

- **Processor Units (PUs)**
 - ▶ 7 PUs + 1 SAP
 - ▶ 0 - 4 CPs
 - ▶ 0 - 3 zAAPs or zIIPs
 - ▶ 0 - 7 IFLs or ICFs
 - ▶ 73 Capacity Settings
- **Memory**
 - ▶ 8 - 64GB
- **I/O**
 - ▶ 420 ESCON
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 - ▶ 48 OSA-Express2 (2-port)
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z9 BC Model Structure

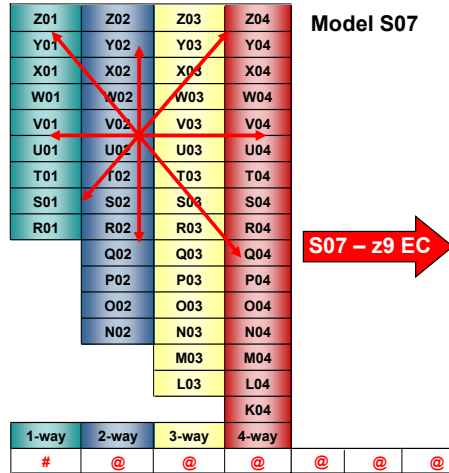
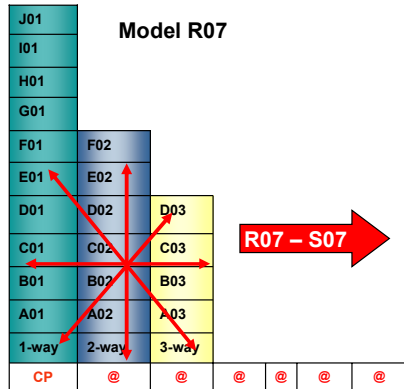
- **One machine type – 2096 – two hardware models, R07 and S07**
- **Model number indicates PUs available for characterization**
- **One System Assist Processors (SAPs) per System**
- **z9 BC software models**
 - ▶ nxx, where n = subcapacity engine size and xx = number of CPs
 - Model R07: n = A up to J and xx = 1 to 3
 - Model S07: n = K up to Z and xx = 1 to 4
 - ▶ Total 73 Capacity Indicators for software models
 - 20 for Model R07 and 53 for Model S07

Models	MCMs	Available PUs	Max Available Subcapacity CPs	Standard SAPs	Standard Spares	CP/IFL/ICF/zAAP/zIIP ****	Max Memory	Max Channels
R07*	1	8	3	1	0	3/6/6/3/3	64 GB	240 ***
S07**	1	8	4	1	0	4/7/7/3/3	64 GB	420 ***

Notes:

- * Must have a minimum of 1 CP
- ** Must have a minimum of 1 CP, IFL or ICF
- *** Max is for ESCON channels
- **** For each zAAP and/or zIIP installed there must be a corresponding CP. The CP may satisfy the requirement for both the zAAP and/or zIIP. The combined number of zAAPs and/or zIIPs can not be more than 2x the number of general purpose processors (CPs).

z9 BC Improved Granularity and Scalability A choice that is just right

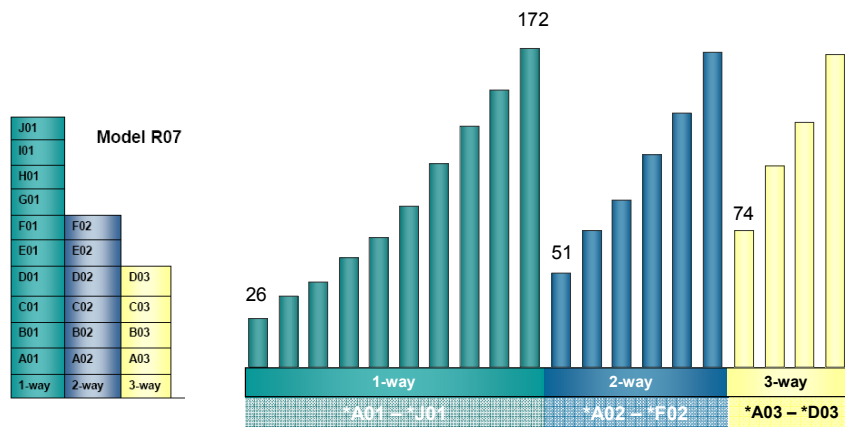


Full on demand upgradeability in the family

- ▶ Model R07 must have minimum 1 CP engine
- ▶ Model S07 may be a full IFL system
- ▶ Model R07 upgradeable to Model S07
- ▶ Model S07 upgradeable to z9 EC Model S08

= CP or Specialty Engine
@ = Any Specialty Engines

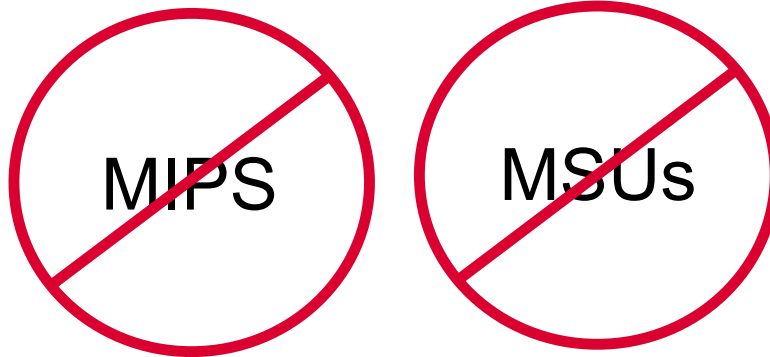
System z9 BC R07 Capacity and Performance



Note: For MSU values, refer to:
www-1.ibm.com/servers/eserver/zseries/library/swpriceinfo/
For ITRs refer to: www-1.ibm.com/servers/eserver/zseries/lspr/zSeriesOS.html

* CI = Capacity Indicator and refers to number of installed CPs and capacity setting as reported by STSI instruction.

z9 Capacity Planning in a nutshell



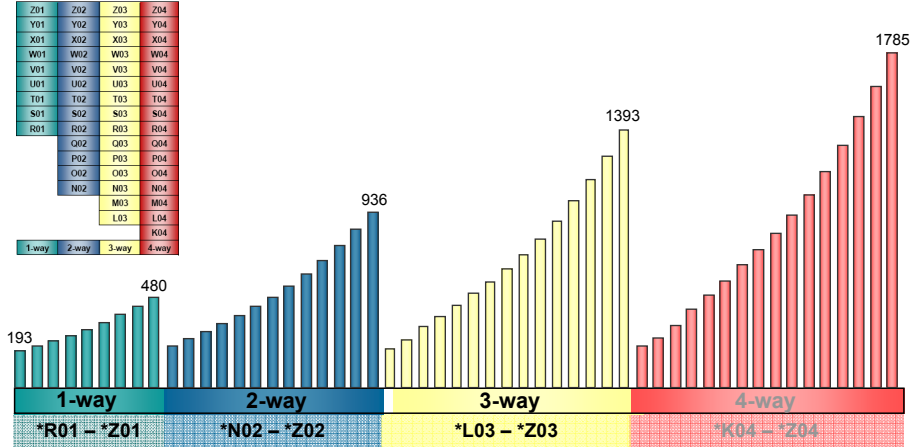
*Don't use "one number" capacity comparisons!
Work with IBM technical support for capacity planning!*

z9 BC Model R07 I/O Features

Features	Minimum # of features	Maximum # of features	Maximum connections	Increments per feature	Purchase increments
16-port ESCON	0 ⁽¹⁾	16	240 channels	16 channels 1 reserved as spare	4 channels
FICON Express4**	0 ⁽¹⁾	16	64 channels**	4 channels** 2 channels**	4 channels** 2 channels**
FICON Express2*	0 ⁽¹⁾	16	64 channels	4 channels	4 channels
FICON Express*	0 ⁽¹⁾	16	32 channels	2 channels	2 channels
OSA-Express2	0	16	32 ports ⁽⁶⁾	2 or 1 (10 GbE has 1)	2 ports/1 port
OSA-Express*	0	16	32 ports ⁽⁶⁾	2 ports	2 ports
Crypto Express2	0	4	8 PCI-X adapters	2 PCI-X adapters 1 PCI-X adapter ⁽⁵⁾	2 PCI-X adapters ⁽⁵⁾ 1 PCI-X adapter ⁽⁵⁾

1. Minimum of one I/O feature (ESCON, FICON) or one Coupling Link (ICB, ISC-3) required.
 2. Each STI-3 distribution card occupies one I/O slot (supports ICB-3s).
 3. Maximum number of Coupling Links combined (ICs, ICB-3s, ICB-4s, and active ISC-3 links) cannot exceed 64 per server.
 4. ICB-4s are not included in the maximum feature count for I/O slots but are included in the CHPID count.
 5. Initial order of Crypto Express2 is two features. Each PCI-X adapter can be configured as either a coprocessor or an accelerator. Crypto Express2-1P has one PCI-X adapter.
 6. AO1 has up to 8 ICB-4 links. Up to 12 OSA-Express2/ OSA-Express features.
- * Carry forward on an upgrade only.
** FICON Express4-2C 4KM LX and SX have two channels per feature

System z9 BC S07 Capacity and Performance



Note: For MSU values, refer to:
www-1.ibm.com/servers/eserver/zseries/library/swpriceinfo/
 For ITRs refer to: www-1.ibm.com/servers/eserver/zseries/lpr/zSeriesOS.html

* CI = Capacity Indicator and refers to number of installed CPs and capacity setting as reported by STSI instruction. Model CI Z00 does not have any CPs.

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z9 BC Model S07 I/O Features

Features	Minimum # of features	Maximum # of features	Maximum connections	Increments per feature	Purchase increments
16-port ESCON	0 ⁽¹⁾	28	420 channels	16 channels 1 reserved as a spare	4 channels
FICON Express4**	0 ⁽¹⁾	28	112 channels**	4 channels** 2 channels**	4 channels** 2 channels**
FICON Express2*	0 ⁽¹⁾	20	80 channels	4 channels	4 channels
FICON Express*	0 ⁽¹⁾	20	40 channels	2 channels	2 channels
OSA-Express2	0	24	48 ports	2 or 1 (10 GbE has 1)	2 ports/1 port
OSA-Express*	0	20	40 ports	2 ports	2 ports
Crypto Express2	0	8	16 PCI-X adapters	2 PCI-X adapters 1 PCI-X adapter	2 PCI-X adapters ⁽⁵⁾ 1 PCI-X adapter ⁽⁵⁾

- Minimum of one I/O feature (ESCON, FICON) or one Coupling Link (ICB, ISC-3) required.
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* Carry forward on an upgrade only.
** FICON Express4-2C 4KM LX and SX have two channels per feature

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More choice for your business *Evolution of specialty engines*

Building on a strong track record of technology innovation with specialty engines



Internal Coupling Facility (ICF) 1997



Integrated Facility for Linux (IFL) 2000

Support for new workloads and open standards



IBM System z Application Assist Processor (zAAP) 2004



IBM System z9 Integrated Information Processor (zIIP) 2006

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System z9 PU Characterization

- The type of Processor Units (PUs) that can be ordered on System z9:
 - ▶ **Central Processor (CP)**
 - Provides processing capacity for z/Architecture™ and ESA/390 instruction sets
 - Runs z/VSE, VSE/ESA, Linux for System z, z/OS, z/VM, TPF4, z/TPF, or Coupling Facility
 - ▶ **Integrated Facility for Linux (IFL)**
 - Provides additional processing capacity for Linux workloads
 - Runs z/VM (with Linux for System z guests) or Linux for System z
 - ▶ **IBM System z Application Assist Processor (zAAP)**
 - Under z/OS, the Java Virtual Machine (JVM) assists with Java processing to a zAAP
 - ▶ **IBM System z9 Integrated Information Processor (zIIP)**
 - Provides processing capacity for selected workloads e.g., DB2 for z/OS V8 workloads executing in SRB mode
 - ▶ **Internal Coupling Facility (ICF)**
 - Provides additional processing capacity for the execution of the Coupling Facility Control Code (CFCC) in a CF LPAR
 - ▶ **Optional System Assist Processors (SAP)**
 - SAP manages the start and ending of I/O operations for all Logical Partitions and all attached I/O

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On Demand Upgrades – Customer Controlled

- CBU – Capacity Backup - Temporary emergency capacity upgrade
 - ▶ Nondisruptive temporary addition of CPs, zAAPs, zIIPs, IFLs and ICFs in an emergency situation
 - ▶ CBU contract required to order CBU features and CBU LIC CC
 - ▶ Customer (or IBM) activates upgrade for test or temporary emergency
 - ▶ Nondisruptive downgrade required after test or recovery completed
- CIU – Customer Initiated Upgrade - Express - Permanent upgrade
 - ▶ Customer capability to order and install permanent upgrade
 - ▶ CIU feature - ordered to initiate contract and administrative setup
 - ▶ Customer orders and installs upgrade via Resource Link and IBM RSF
 - ▶ CUoD capabilities NOT included:
 - Upgrades requiring parts (e.g. I/O feature card add)
 - Channel upgrades by LIC enable of existing ports
- On/Off Capacity on Demand - Temporary upgrade
 - ▶ Nondisruptive temporary addition of CPs, zAAPs, zIIPs, IFLs, and ICFs in any situation
 - ▶ Upgrades requiring parts (e.g. I/O feature card add) not supported
 - ▶ "Right to use" feature - ordered to initiate contract and administrative setup
 - ▶ Customer orders and installs upgrade via Resource Link and IBM RSF
 - ▶ Nondisruptive removal when capacity is no longer wanted

System z9 On/Off Capacity on Demand

- Prerequisite for use:
 - ▶ Customer Initiated Upgrade (FC #9898) and On/Off CoD (FC #9896) "right-to-use feature"
 - ▶ Signed CIU contract with specific Ts & Cs governing temporary capacity
- Order temporary capacity – Resource Link
 - ▶ Can at most add capacity equal to active permanent capacity of the same type
For example – Go from 2 CPs to 4, 1 IFL to 2, or do both in the same order
(Note: CIU upgrades and CBU do NOT have the this restriction)
 - ▶ PUs that have never been characterized can be activated as CPs, zAAPs, zIIPs, IFLs or ICFs
 - ▶ Unassigned IFLs can be activated only as IFLs – [Price advantage on z9 BC](#)
 - ▶ Unassigned CP capacity can be activated only as CPs – [Price advantage on z9 BC](#)

System z9 On/Off Capacity on Demand

- Order is manufactured: An LIC record is established and staged to RETAIN
 - ▶ Multiple orders to meet different customer requirements can be staged
 - ▶ Orders remain on RETAIN for an extended period until:
 - Downloaded and activated (Initiates billing except for the 24-hour test)
 - Customer cancels order
 - Machine is no longer under warranty or IBM Maintenance Service Agreement
 - Change to Permanent PU and/or memory configurations invalidates order
 - ▶ A record, once activated, has no expiration date
- On/Off CoD activation and CBU can coexist
 - ▶ Must deactivate one function to activate the other one
 - ▶ CBU PUs configured do not reduce On/Off CoD temporary capacity orderable

Protecting your investment in IBM System z technology

- Designed to protect your investment by offering upgrades from zSeries servers to System z9 servers and upgradeability within the System z9 family
- Growth can be initiated when you need it – either temporarily or permanently
- New options for reconfiguring specialty engines if business demands it
- Typically no charge MES upgrades on IFLs and zAAPs



z9 Operating System Support

System z9 Supported Operating Systems

Operating System	ESA/390 (31-bit)	z/Architecture® (64-bit)
z/VSE™ Version 3 Release 1 ⁽³⁾	Yes	No
z/VSE Version 4 Release 1 ⁽⁴⁾	No	Yes
z/VM® Version 5 Release 1 ⁽²⁾ , 2 and 3	No	Yes
Linux on System z, 64-bit distribution	No	Yes
Linux on System z, 31-bit distribution	Yes	No
z/OS Version 1 Release 9	No	Yes
z/OS.e ⁽¹⁾ and z/OS Version 1 Releases 6, 7, 8	No	Yes
z/TPF Version 1 Release 1	No	Yes
TPF Version 4 Release 1 (ESA mode only)	Yes	No

1. z/OS.e - z800, z890 and z9 BC only. Release 1.8 will be the last release of z/OS.e.

2. Support for z/VM 5.1 will end September 30, 2007.

3. z/VSE v3, 31-bit mode only. It does not implement z/Architecture, and specifically does not implement 64-bit mode capabilities. z/VSE is designed to exploit select features of IBM System z9 and zSeries hardware.

4. z/VSE V4 is designed to exploit 64 bit real memory addressing, but will not support 64-bit virtual memory addressing.

Note: Please refer to the latest PSP bucket for latest PTFs for new functions/features.

IBM System z9 Exploitation

Functions	z/VSE V4.1	z/VSE V3.1 (Note 1)
z/Architecture mode only	Yes	No
64-bit <i>real</i> addressing (up to 8 GB proc storage)	Yes	No
Fibre Channel Protocol (FCP) for SCSI Disks	Yes	Yes
CP Assist for Cryptographic Function (CPACF)	Yes	Yes
Crypto Express2 (SSL RSA encryption assist)	Yes	Yes
HiperSockets™ (including spanned HiperSockets)	Yes	Yes
FICON Express2™ & FICON Express4™	Yes	Yes
OSA Express2 (incl Gb, 10Gb, 1000 Base-T, OSN)	Yes	Yes
OSA Integrated Console Controller (OSA-ICC)	Yes	Yes
Up to 60 LPARs and 4 LCSSs	Yes	Yes

Note 1: z/VSE V3 can operate in 31-bit mode only. It does not implement z/Architecture and specifically does not implement 64-bit mode capabilities. z/VSE V3 is designed to support selected features of IBM System z9 hardware. Technical Conference
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Midrange Workload License Charge (MWLC) for z/VSE

Requires current hardware (IBM System z9 EC or z9 BC) and z/VSE V4

- ▶ exception: z9 BC Capacity Setting A01 remains zSeries Entry License Charge™ (zELC)

Full-capacity and sub-capacity MWLC options

- ▶ Full-capacity mode offers improved price/performance compared to GOLC, zELC, and TWLC alternatives
- ▶ Additional price/performance possible through sub-capacity mode

VSE Central Functions + 12 IBM middleware products are eligible

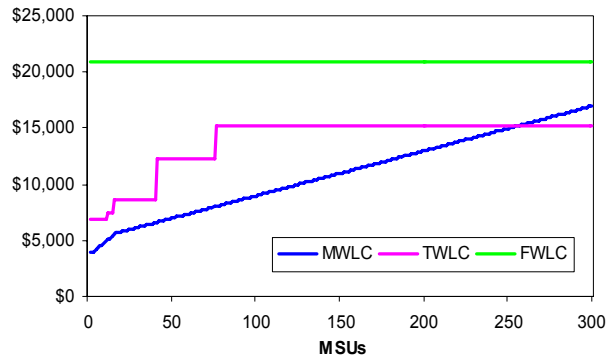
- | | | | |
|------------|------------------------------|------------|-----------------------|
| ▶ 5686 CF8 | VSE Central Functions | ▶ 5686 068 | IBM COBOL for VSE/ESA |
| ▶ 5696 234 | HLASM | ▶ 5686 A01 | IBM C for VSE/ESA |
| ▶ 5648 054 | CICS TS for VSE/ESA V1 | ▶ 5686 069 | IBM PL/1 for VSE/ESA |
| ▶ 5686 065 | ACF/VTAM® for VSE/ESA V4 | ▶ 5746 SM3 | IBM DFSORT/VSE V3 |
| ▶ 5686 A04 | TCP/IP for VSE/ESA V1.5 | ▶ 5746 XX1 | DL/I VSE |
| ▶ 5648 099 | DITTO/ESA® for VSE | ▶ 5686 A06 | MQSeries® for VSE/ESA |
| ▶ 5697 F42 | DB2 Server for VSE & VM | | |



Note: see z/VSE webpage for additional information via LVL replays:

- z/VSE V4.1 User Experiences for a real example of savings
- Midrange Workload License Charge for z/VSE
- z/VSE and MWLC Announcement Overview

MWLC Sample Stack vs. TWLC and FWLC



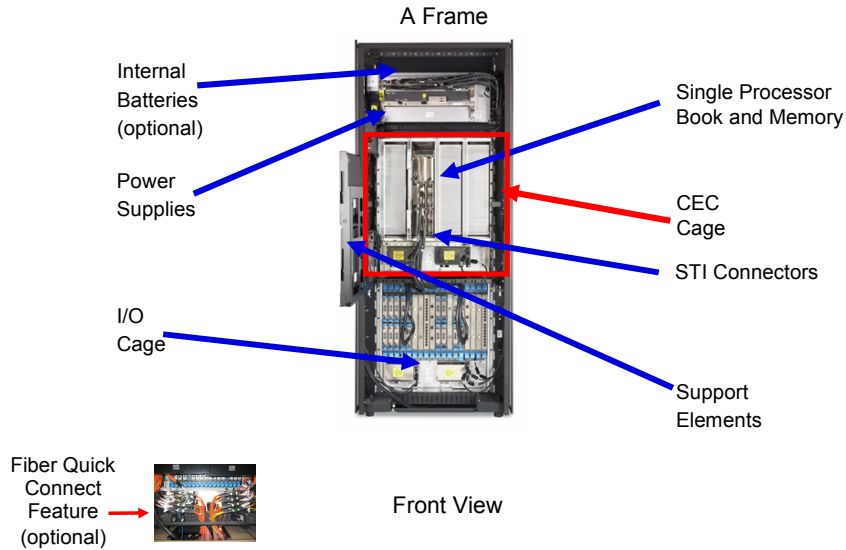
- Customers may choose between MWLC/TWLC or MWLC/FWLC as appropriate to their machine
- Additional price/performance may be possible with sub-capacity mode

*Sample software stack includes: VSE CF V8, HLASM, VTAM, DITTO, COBOL
 *Prices subject to change without notice; all prices shown in USD

Key References for z9 BC Operating Systems

- Primary Operating System Web sites
 - ▶ z/OS: www.ibm.com/servers/eserver/zseries/zos/
 - Downloads: www.ibm.com/servers/eserver/zseries/zos/downloads/
 - Migration: www-03.ibm.com/servers/eserver/zseries/zos/installation/
 - Library: www.ibm.com/servers/eserver/zseries/zos/bkserv/
 - ▶ z/VM: www.vm.ibm.com/
 - ▶ Linux on zSeries: www.ibm.com/servers/eserver/zseries/os/linux/
 - ▶ VSE/ESA: www.ibm.com/servers/eserver/zseries/os/vse/
- OS Preventative Service Planning (PSP) Buckets for z9 BC
 - ▶ z/OS: Upgrade = 2096DEVICE, Subset = 2096/ZOS
 - ▶ z/VM: Upgrade = 2096DEVICE, Subset = 2096/ZVM
 - ▶ z/VSE: Upgrade = 2096DEVICE, Subset = 2096/ZVSE
- z9 BC Web site: www.ibm.com/systems/z/hardware
 - ▶ Many links to System z9 specific OS information

z9 BC – Under the covers



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z9 BC Connectivity Overview

- **HiperSockets, up to 16 (internal LAN)**
- **Crypto Express2**
 - ▶ up to 8
 - ▶ Now configurable from HMC
 - Coprocessor for secure key transactions (default)
 - Accelerator for SSL acceleration
- **FICON Express4, FICON Express2, and FICON Express**
 - ▶ Up to 28 features / 112 channels (FICON Express4 and Express2)
 - ▶ Up to 28 features / 56 channels (FICON Express4 2-port)
- **16-port ESCON**
 - ▶ Up to 420 channels
- **OSA-Express2, OSA-Express**
 - ▶ Up to 24 features
 - ▶ Fast Ethernet, 1000BASE-T Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet
- **Coupling Links, up to 64 in combination**
 - ▶ IC (up to 32), ICB-3 (up to 16), ICB-4 (up to 16), ISC-3 (up to 48 active links)



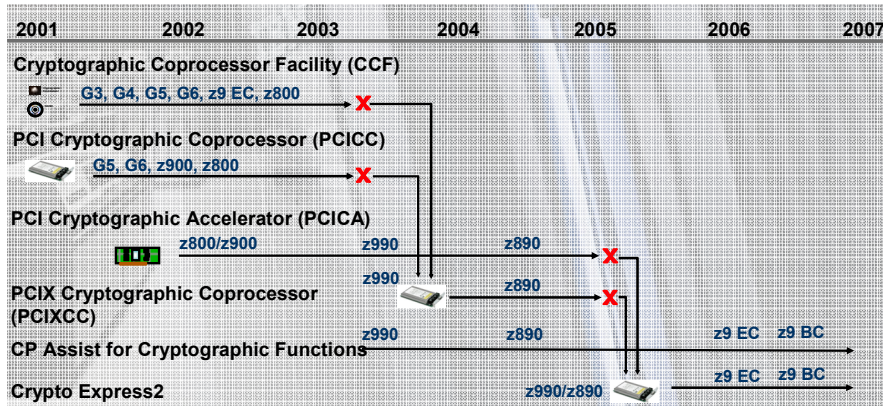
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z9 BC Cryptography and Security



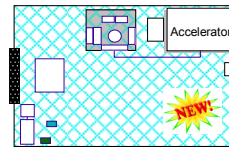
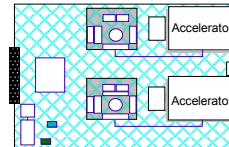
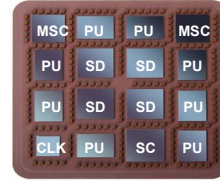
System z9 and zSeries Crypto Roadmap



- Cryptographic Coprocessor Facility – Supports “Secure key” cryptographic processing
- PCICC Feature – Supports “Secure key” cryptographic processing
- PCICA Feature – Supports “Clear key” SSL acceleration
- PCIXCC Feature – Supports “Secure key” cryptographic processing
- CP Assist for Cryptographic Function allows “Clear key” crypto functions from any CP/IFL
- Crypto Express2 – Combines function and performance of PCICA and PCICC

System z9 Cryptographic Accelerator

- **CP Assist for Cryptographic Function (CPACF)**
 - ▶ Standard on every CP and IFL
 - ▶ Supports DES, TDES and SHA-1
 - ▶ New to z9
 - Advanced Encryption Standard (AES) 128-bit
 - Secure Hash Algorithm – 256 (SHA-256)
 - Pseudo Random Number Generation (PRNG)
 - ▶ No charge enabler feature - FC #3863
 - ▶ Required to order Crypto Express2
- **Crypto Express2 Accelerator**
 - ▶ Non-default configuration (default = coprocessor)
 - Configurable from the HMC
 - Provides SSL acceleration functions
 - Minimum purchase increment is two
 - ▶ Hardware acceleration for Secure Sockets Layer (SSL) transactions
 - ▶ Federal Information Processing Standard (FIPS) 140-2 Level 4 certified
- **z9 BC Crypto Express2-1P**
 - ▶ Model R07 supports up to 4 features
 - ▶ Model S07 supports up to 8 features
 - ▶ Designed for FIPS 140-2 Level 4 Certification
 - ▶ Single and dual Crypto Express2 features can be mixed
 - ▶ Can not be carried forward from a z9 BC Model S07 on an upgrade to a z9 EC



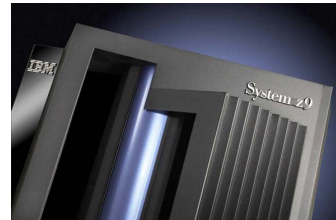
z9 BC Channels



System z9 Connectivity Type

- **FICON/FCP**
 - ▶ FICON Express4
 - ▶ FICON Express2 (carry forward on upgrade)
 - ▶ FICON Express (carry forward on upgrade)
- **ESCON**
- **Networking**
 - ▶ OSA-Express2
 - Gigabit Ethernet LX and SX
 - 10 Gigabit Ethernet LR
 - 1000BASE-T Ethernet
 - ▶ OSA-Express (carry forward on upgrade)
 - Gigabit Ethernet LX and SX
 - 1000BASE-T Ethernet
 - Fast Ethernet
 - ▶ HiperSockets
- **Coupling Links**
 - ▶ ISC-3 (Peer mode only)
 - ▶ ICB-3, ICB-4
 - ▶ IC

- **Channel types not supported:**
 - ▶ FICON (pre-FICON Express)
 - ▶ Parallel (use ESCON Converter)
 - ▶ OSA-Express Token-Ring (SOD Oct 2004)
 - ▶ OSA-Express ATM 155
 - ▶ OSA-2
 - ▶ PCIXCC
 - ▶ PCICA
 - ▶ ICB-2 (SOD 2003)
 - ▶ ISC-3 Links in Compatibility Mode (SOD April 2004)



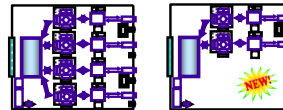
Note: Only ICB cables orderable. All other cables have to be sourced separately.

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Introducing FICON Express4 for System z9

- **Designed to improve capacity and performance with next generation 4 Gbps FICON/FCP**
 - ▶ Up to 25% improvement in FICON channel throughput when processing a mix of read and write data transfers¹
 - ▶ Up to 65% improvement in FICON channel throughput when processing all read or all write data transfers¹
- **Helps to support reduced cost of storage operations and shorter backup windows with faster channel link data rates**
- **Enables migration to higher performance with 1/2/4 Gbps auto-negotiating links**
- **Cost-effective FICON exploitation for midrange enterprises**
 - ▶ Choice of 4 channel or 2 channel cards for z9 BC
 - ▶ 2 channels cards may not be carried forward to z9 EC



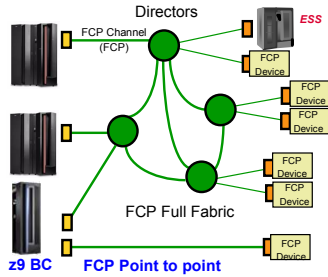
1. Large sequential data transfers on z9 EC with FICON Express4 operating at 4 Gbps (running z/OS V1.7) when compared to FICON Express2 on z9-109 (running z/OS V1.6)

Next generation 4 Gbps FICON/FCP ... helping to improve capacity and performance

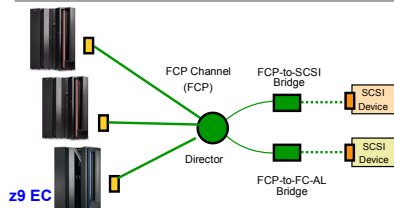
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z9 BC FCP Attachment Options for z/VM, z/VSE and Linux



- **FCP Full Fabric Connectivity**
 - ▶ Homogeneous, single vendor fabric
 - ▶ Fibre channel directors, switches
 - ▶ NPIV support
 - ▶ 64 Open Exchanges
- **FCP point to point – Designed to support all FICON features supported on System z9**
 - ▶ Direct attachment to FCP CU port
 - ▶ NPIV support not applicable



- **FCP switched to SCSI Bridge**
 - ▶ FCP-to-SCSI Bridges
 - ▶ FCP-to-FC-AL bridge

Supported devices: www.ibm.com/servers/eserver/zseries/connectivity/#fcp

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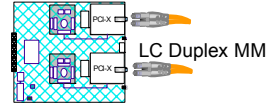
OSA-Express2 10 GbE and GbE

- **10 Gigabit Ethernet LR (long reach)**
 - f One port per feature, CHPID type OSD (QDIO)
 - f 9 micron single mode fiber
 - f SC Duplex connector
- **Gigabit Ethernet features**
 - Two ports of LX or two ports of SX
 - CHPID type OSD (QDIO)
 - CHPID type OSN (OSA for NCP)
- **1000Base-T Ethernet feature**
 - f CHPID type OSC (OSA-ICC 3270 data streams)
 - f CHPID type OSD (QDIO)
 - f CHPID type OSN (OSA for NCP)
 - f Offered on z9 EC, z9 BC, z990, z890

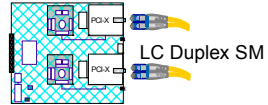
10 GbE - feature # 3368



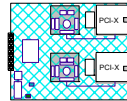
GbE - feature # 3365 (SX)



GbE - feature # 3364 (LX)



1000Base-T Feature # 3366



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IBM System Storage



IBM Storage Ready for System z9 and FICON Express4

IBM System z9 and IBM storage 4 Gbps FICON/FCP connectivity may help to:

- Support faster link speeds and shorter backup windows
- Enable channel and link consolidation to help simplify management and reduce the cost of the storage infrastructure
- Support easier migration to 4 Gbps bandwidth with auto-negotiating links



*IBM has a full range of
Disk, SAN, Tape, Software,
& Services for System z9*

Disk DS8000 – 4 Gbps FICON/FCP
DS6000 – 2 Gbps FICON/FCP

SAN IBM SAN256B, SAN64B-2*, SAN32B-2, SAN18B-R,
SAN256M, SAN140M, SAN32M-2;
and Cisco MDS 9513, 9509, 9506, 9216A and 9216i
all 4 Gbps FCP/FICON (*planned GA May, 2007)

Virtualization IBM SVC 4 Gbps FCP for Linux on System z
VTS 2 Gbps FICON/FCP
TS7510 Virtualization Engine™ – 2 Gbps FCP for Linux
on System z Planned 2Q06*

Tape IBM TS1120 4 Gbps FCP Tape Drive
IBM TS1120 Tape Controller 4 Gbps FICON
IBM LTO Gen 3 - 4 Gbps FCP for Linux on System z
IBM TS3310 Tape Library-4 Gbps FCP for Linux on System z
IBM TS3400 Tape Library FCP for Linux on System z
IBM TS3500 Tape Library

IBM System Storage Disk: Supports FICON Express4



New Standard in Pricing and Packaging

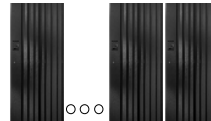


DS6000

- Affordable pricing with the capabilities of traditional enterprise products
- Great performance in a modular package, up to 64TB
- Can start small and grow in physical capacity – a great entry to midrange solution
- Up to 8 2 Gbps auto-sensing FICON/FC host ports

- Supports major types of servers including IBM System z, System i™ Linux, UNIX®, Microsoft® Windows®.
- Industry-leading copy services - compatible between IBM System Storage DS6000, DS8000, IBM TotalStorage Enterprise Storage Server® (ESS) 800, ESS 750

New Standard in Functionality, Performance, TCO



DS8000

- Excellent performance
- First class storage consolidation platform with physical capacity up to 320 TB
- Options for model-to-model field upgrades help protect investment
- Up to 128 4 Gbps auto-sensing FICON/FC ports or 64 ESCON ports

- Common management tools and interfaces
- Designed for enterprise class reliability to help support continuous operations

Complements mainframe scalability, performance, and cost effectiveness

IBM TotalStorage Disk Positioning with System z

Choose IBM TotalStorage DS8000 if need:

Highest Performance / Scalability, ESCON or FICON/FC attach, Storage System LPAR Capability with DS8300

Many customer references

Choose IBM TotalStorage DS6800 if need:

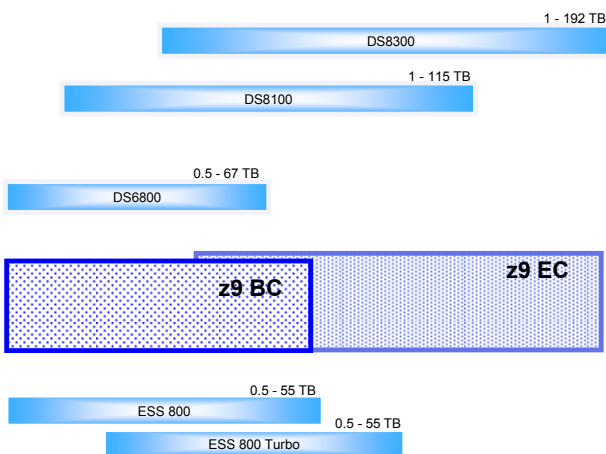
Lowest price, FICON/FC attach, Modular/small footprint, Easy install / serviceability

Many customer references

Previous Generation DASD

IBM TotalStorage ESS Refurbished with Warranty

ESCON or FICON/FC attachment, Many older references showing wide customer acceptance



z/VSE support for IBM System Storage



IBM System Storage	DS6000	ESS 750, 800, 800Turbo	DS8000. DS8000 Turbo
ESCON	Not Avail	Yes	Yes
FICON	Yes	Yes	Yes
FCP/SCSI	Yes	Yes	Yes

IBM System Storage Tape: Supports FICON Express4



TS1120

Tape Drives

- **TS1120 tape drive/controller**
 - ▶ Tape drive data encryption
 - ▶ Second generation tape drive
 - ▶ Controller supports ESCON & FICON
 - ▶ 100, 500, 700 GB cartridge capacity¹
- **3592 tape drive**



3494



TS3400



TS3500

Tape Libraries

- **TS3400 tape library**
 - ▶ Small footprint, TS1120 drive support
 - ▶ Supported on System z
- **TS3500 tape library**
 - ▶ TS1120 tape drive with advanced management function
- **3494 tape library**
 - ▶ Investment protection
 - ▶ TS1120 and 3590 drive support



TS7700

Virtualization

- **TS7700 Virtualization Engine**
 - ▶ Standalone or Grid deployment
 - Third site support in plan
 - ▶ Advanced function
 - ▶ Higher Performance
 - ▶ Robust Roadmap

Data Protection Requirements

- Regulatory requirements driving need for greater data security, integrity, retention/auditability, and privacy
- Severe business impacts caused by loss or theft of data including financial liability, reputation damage, legal/compliance risk
- Need to share data securely with business partners and maintain archive/backups at remote locations
- Respect for customer privacy
- Need to reduce complexity and improve processes around enterprise encryption management
- Need ability to cost effectively encrypt large quantities of tape data



Secondary Site



Business Partners



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IBM TS1120 Tape Drive Encryption

- IBM System Storage TS1120 - first encrypting tape drive
 - ▶ Standard feature on new TS1120 tape drives
 - ▶ Supports "traditional" and "encrypted" modes of operation
 - encryption "disabled" unless otherwise specified
 - ▶ Implements data encryption using AES-256 encryption
 - ▶ Data is automatically compressed *then* encrypted – no change in media utilization
 - ▶ Encryption performed with minimal (< 1% data rate performance impact)
- Systems Managed Encryption with z/VSE V4.1 & V3.1
- IBM Encryption Key Manager (EKM) for Java platform™
 - ▶ EKM stores and manages *labels* and *key encrypting keys*
 - runs on z/OS, AIX, Linux (incl System z), i5/OS, HP, Sun, & Windows
 - ▶ Secure TCP/IP connection between EKM and TS1120
 - ▶ ESM supplies data encrypting keys to TS1120 on request
 - ▶ TS1120 encrypts files using data encrypting key
 - ▶ TS1120 stores *encrypted* data encrypting key on cartridge
 - data encryption key can be encrypted using two different *key* encryption keys



TS1120
500 GB
100 MB/sec

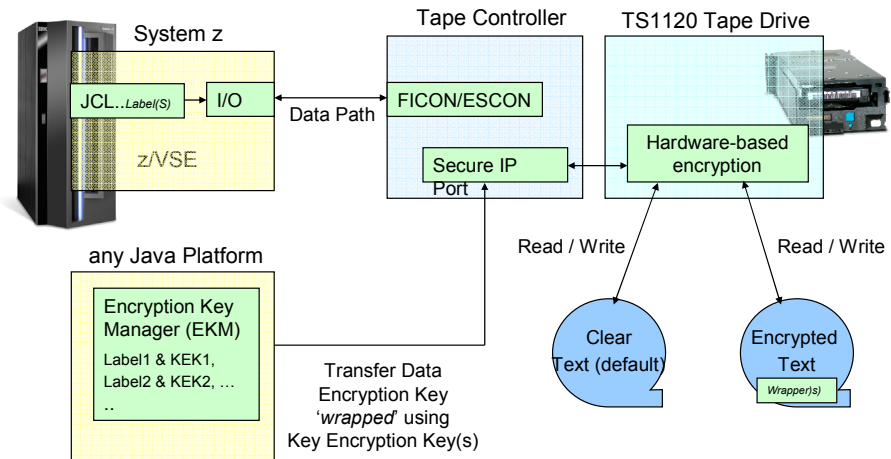
Encryption Key
Manager



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IBM Tape Encryption – TS1120

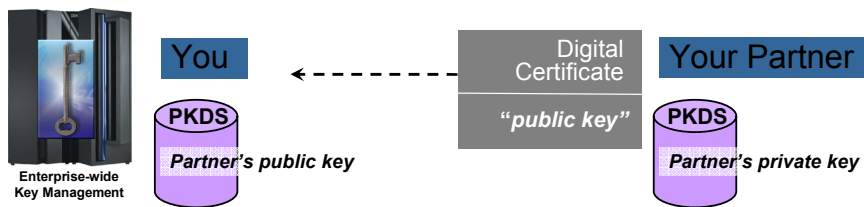


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Establishing a Trusted Exchange with Partners

Key Exchange – Digital Certificates can be used to identify and authenticate



"I know you by your Public Key, so I can create a file that only you can read."

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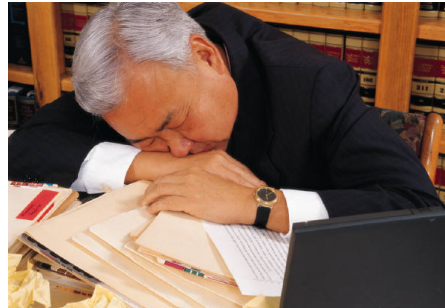
Wrap Up

System z and System Storage: *An exceptional combination*

- Architected, designed and tested to work Better Together
- Delivering powerful new technologies designed to address today's critical business needs
- Granular, High performance, Security-rich and supports a lower Total Cost of Ownership
- Technologies for Optimizing the infrastructure for an Infrastructure designed for 24X7 operations
- Extraordinary support and service



Reference Material



Key References for IBM System z9

- **IBM System z Web site:** www.ibm.com/systems/z/
- **IBM System z Data Sheets (US English):** www.ibm.com/systems/z/hardware
- **IBM System z FAQ:** www.ibm.com/systems/z/faq
- **Resource Link™:** www.ibm.com/servers/resourcelink
 - ▶ zSeries Web site for no-additional-charge hardware support
 - ▶ Access to the zSeries library and other information required for migration
- **IBM Redbooks™:** www.redbooks.ibm.com

Resource Link – the essential site for z9 migration!

- **Hardware**
 - ▶ Purpose and Description documents, HIPER Alerts, installation planning, education, and libraries for System z9, IBM eServer zSeries, IBM System Storage, 2029 Fibre Saver, 2074 Control Unit, 9032 Model 5 Director, 9037 Model 2 Sysplex Timer®
- **Operating Systems and Software**
 - ▶ Links to z/VSE, z/VM, VSE/ESA, z/OS, z/OS.e, z/TPF and TPF
- **Forums**
 - ▶ General discussion forums on supported products
- **Product support**
 - ▶ Support information and services for cross-brand hardware, operating systems, software, and solutions
- **Register for an ID Today!**
www.ibm.com/servers/resourceLink

Key References for z9 Operating Systems

- **Primary Operating System Web sites**
 - ▶ z/VSE: www.ibm.com/servers/eserver/zseries/os/vse/
 - ▶ z/VM: www.vm.ibm.com/
 - ▶ Linux on System z: www.ibm.com/servers/eserver/zseries/os/linux/
 - ▶ z/OS: www.ibm.com/servers/eserver/zseries/zos/
- **OS Preventative Service Planning (PSP) Buckets for z9 BC**
 - ▶ z/OS: Upgrade = 2096DEVICE, Subset = 2096/ZOS
 - ▶ z/VM: Upgrade = 2096DEVICE, Subset = 2096/ZVM
 - ▶ z/VSE: Upgrade = 2096DEVICE, Subset = 2096/ZVSE
- **IBM System z9 Web site:** www.ibm.com/systems/z/hardware
 - ▶ Many links to System z9 specific OS information





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*Thank you for your
time and for doing
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1964



1972



1982



1999



2004



2007

