Bringing You Up To Date with System z Hardware: 2007

What's new!

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IBM
System z9

VSE-VM-Linux
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IBM Systems

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- **Abstract:** This session highlights IBM System z9 and related hardware from a midrange perspective. This session will briefly cover the z9 EC and will focus primarily on the z9 BC environment. I will point out area of support for z/VSE.

- **Agenda:**
  - **New Announcements Since We Last Met**
  - **Introduction**
  - **z9 EC Recap**
  - **z9 BC Overview**
  - **Operating System Support**
  - **Under the Covers and I/O**
  - **IBM System Storage**
  - **Reference Material**

Announcements Since We Last Met

- **April 2006**
  - IBM System z Business Class (z9 BC) and Enterprise Class (z9 EC)
  - Non-Raised Floor option for z9 BC (October 2006)

- **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 1.9 preview

- **April 2007**
  - z9 BC and z9 EC enhancements
  - Total Storage TS3400 SOD for System z operating systems

Introduction

IBM System z9

The server designed to help protect, grow with, and meet the demands of enterprises 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

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.*

* Excerpted from the Mainframe Charter – August 2003

IBM System z Family

IBM eServer zSeries 900 – z900 (2064)

- Announced 10/00 – first 64-bit zSeries
- 42 models – Up to 16-way
- Specialty Engines
  - CP, IFL, ICF
- On Demand Capabilities
  - CUoD, CIU, CBU
- Memory – up to 64 GB
- Channels
  - 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
  - z/OS, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on zSeries

IBM eServer zSeries 800 – z800 (2066)

- Announced 2/02 – first 64-bit zSeries for mid market
- 10 models – Up to 4-way
- Specialty Engines
  - CP, IFL, ICF
- On Demand Capabilities
  - CUoD, CIU, CBU
- Memory – up to 32GB
- Channel
  - 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
  - z/OS, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on zSeries

IBM eServer zSeries 990 – z990 (2084)

- Announced 5/03 – first zSeries Superscalar Server
- 4 models – Up to 32-way
- Specialty Engines
  - CP, IFL, ICF, zAAP
- On Demand Capabilities
  - CUoD, CIU, CBU, On/Off CoD
- Memory – up to 256 GB
- Channels
  - 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
  - z/OS, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on zSeries

IBM eServer zSeries 890 – z890 (2086)

- Announced 4/04 – zSeries Superscalar Server for mid market
- 1 model – Up to 4-way
  - 28 capacity settings
- Specialty Engines
  - CP, IFL, ICF, zAAP
- On Demand Capabilities
  - CUoD, CIU, CBU, On/Off CoD
- Memory – up to 32 GB
- Channel
  - 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
  - z/OS, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on zSeries

IBM System z9 (z9-109) (2094)

- Announced 7/05
- Superscalar Server
- 5 models – Up to 54-way
- Specialty Engines
  - CP, IFL, ICF, zAAP
- On Demand Capabilities
  - CUoD, CIU, CBU, On/Off CoD
- Memory – up to 512 GB
- Channels
  - 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
  - z/OS, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on System z

IBM System z *family (cont.)*

IBM System z9
(z9 EC) (2094)

- 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
  - CP, IFL, ICF, zAAP, zIIP
- On Demand Capabilities
  - CUoD, CIU, CBU, On/Off CoD
- Memory – up to 512 GB
- Channels
  - 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
  - z/OS, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on System z

IBM System z9
(z9 BC) (2096)

- Announced 4/06 - Superscalar Server with 8 PUs
- 2 models – Up to 4-way
- High levels of Granularity available
  - 73 Capacity Indicators
- Specialty Engines
  - CP, IFL, ICF, zAAP, zIIP
- On Demand Capabilities
  - CUoD, CIU, CBU, On/Off CoD
- Memory – up to 64 GB
- Channels
  - 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
  - z/OS, z/OS.e, z/VM, VSE/ESA, z/VSE, TPF, z/TPF, Linux on System z

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:
    - CPs, IFLs, ICFs, zAAPs, zIIPs, optional 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

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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

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)

Granularity, bringing the System z9 to a new set of customers

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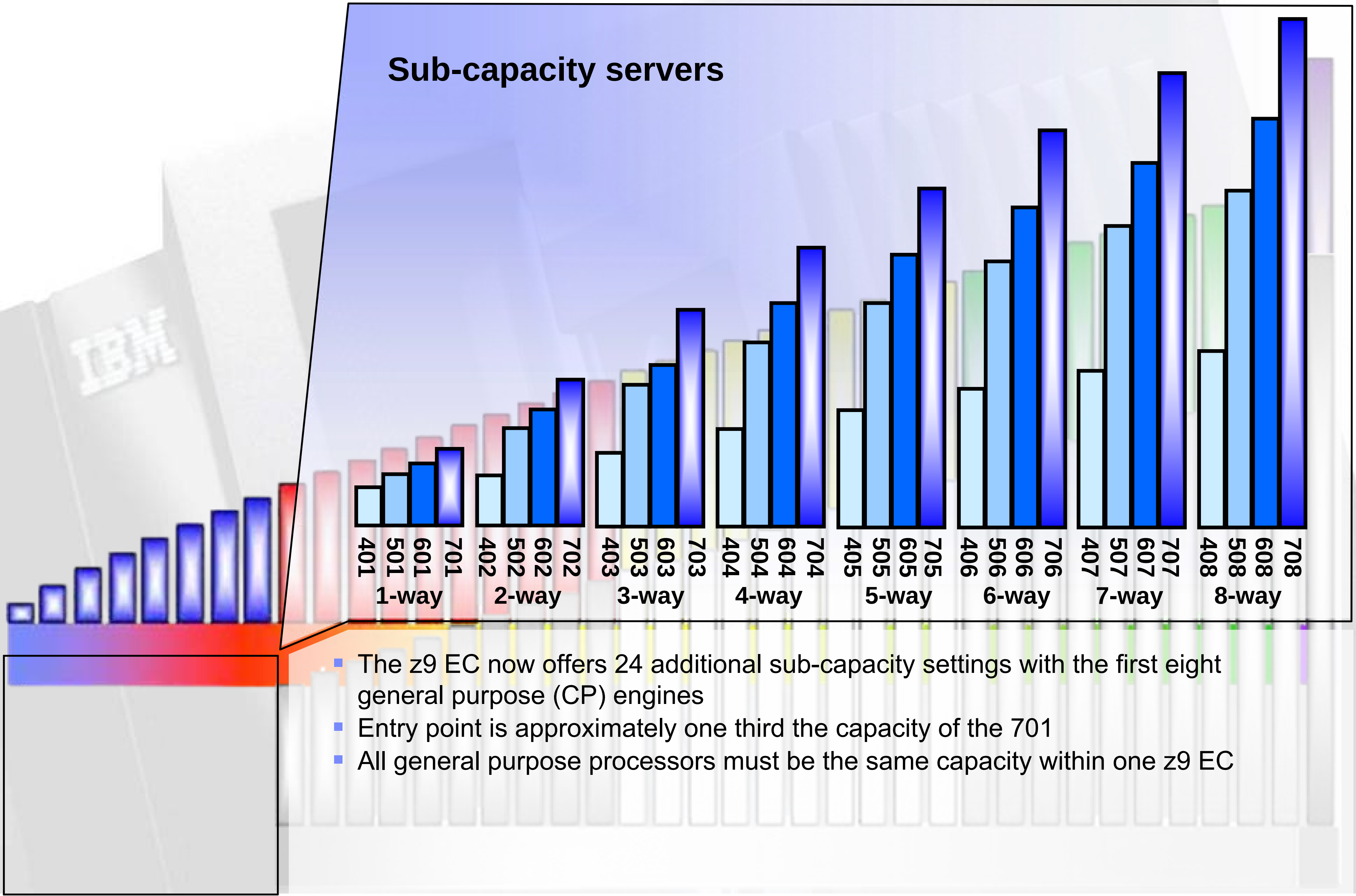
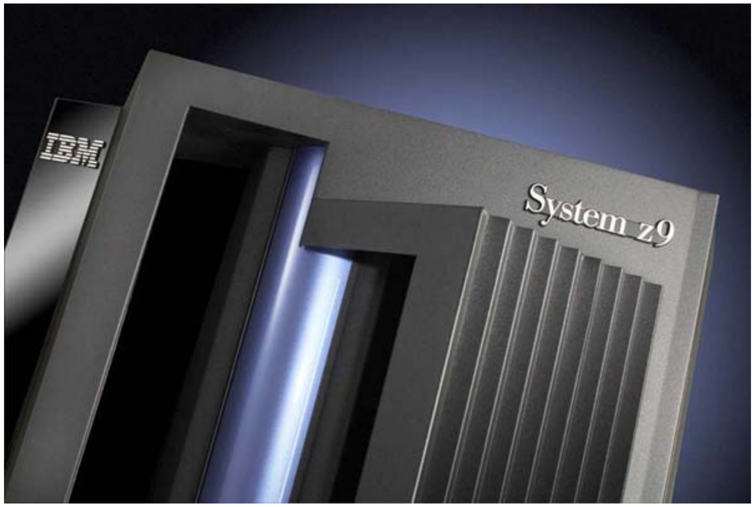
* Only 8 general purpose processors can be sub-capacity

Finding the server to help meet your business needs



- 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

IBM System z9 Business Class



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Processor and Memory

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 price 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, MWLC and EWLC 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 choices

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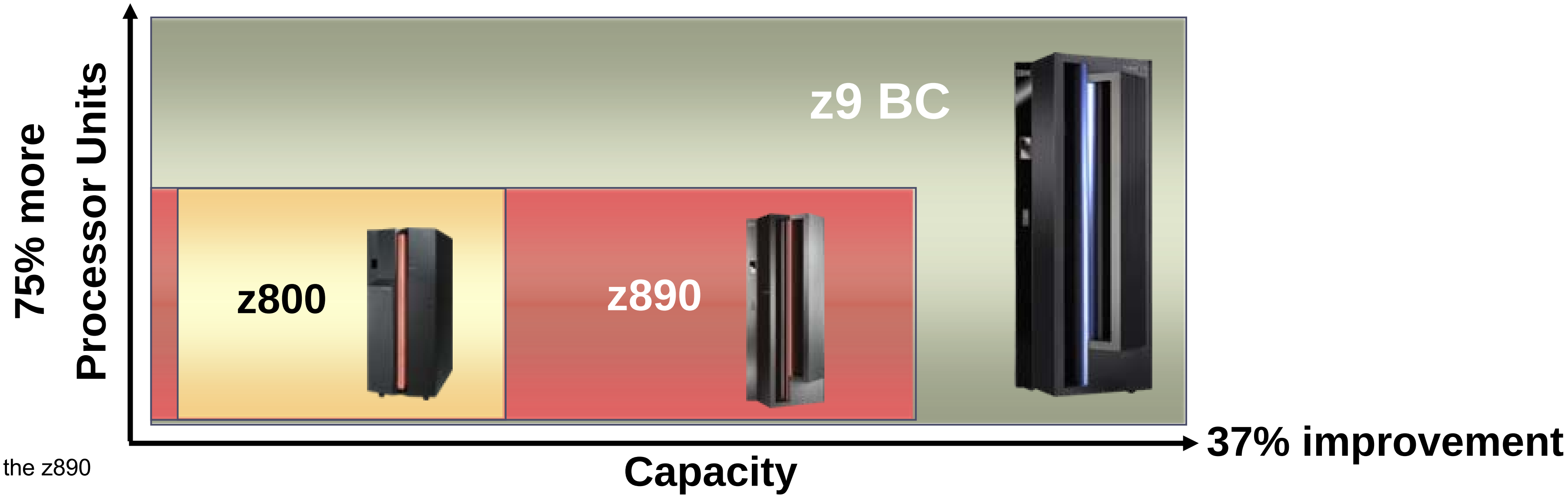
z9 BC – Delivering increased capacity and performance*

Flexibility for growth

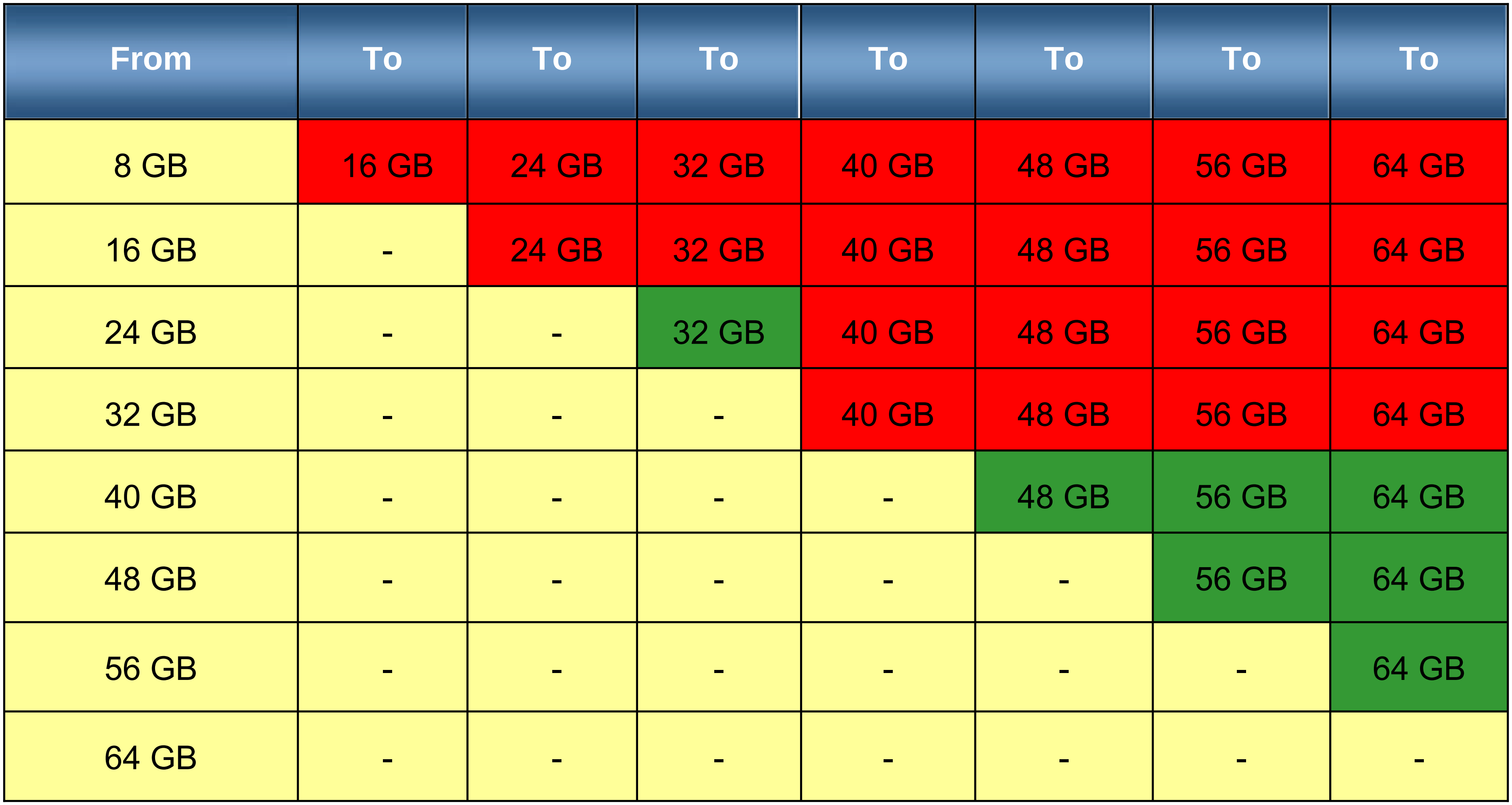
- **Greater granularity and scalability**
  - Two models with one machine type (2096)
  - 73 capacity settings for a 2.6 times increase in flexibility over IBM eServer™ zSeries® 890 (z890)
  - Delivers over 37% more capacity with the same low entry point as the z890
  - Up to 37% hardware performance improvement for Linux® (IFLs), Java™ (zAAPs), data serving workloads (System z9 Integrated Information Processors, or zIIPs) and coupling (ICFs)
  - 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



* Compared to the z890

z9 BC Memory Upgrade Options



From	To	To	To	To	To	To	To
8 GB	16 GB	24 GB	32 GB	40 GB	48 GB	56 GB	64 GB
16 GB	-	24 GB	32 GB	40 GB	48 GB	56 GB	64 GB
24 GB	-	-	32 GB	40 GB	48 GB	56 GB	64 GB
32 GB	-	-	-	40 GB	48 GB	56 GB	64 GB
40 GB	-	-	-	-	48 GB	56 GB	64 GB
48 GB	-	-	-	-	-	56 GB	64 GB
56 GB	-	-	-	-	-	-	64 GB
64 GB	-	-	-	-	-	-	-

Red - Disruptive upgrade

Green - Concurrent upgrade

IBM System z9 BC model comparison

Model R07

- **Processor Units (PUs)**
  - 7 PUs + 1 SAP
  - 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

Model S07

- **Processor Units (PUs)**
  - 7 PUs + 1 SAP
  - 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

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

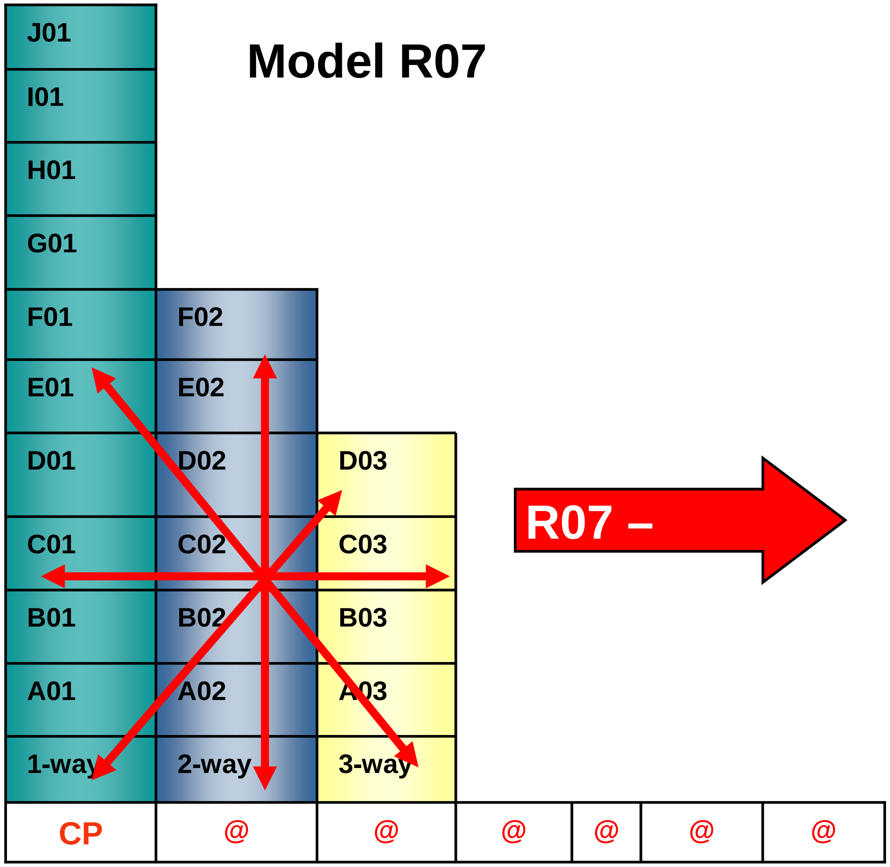
  - Total 73 Capacity Indicators for software models
    - 20 for Model R07 and 53 for Model S07

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

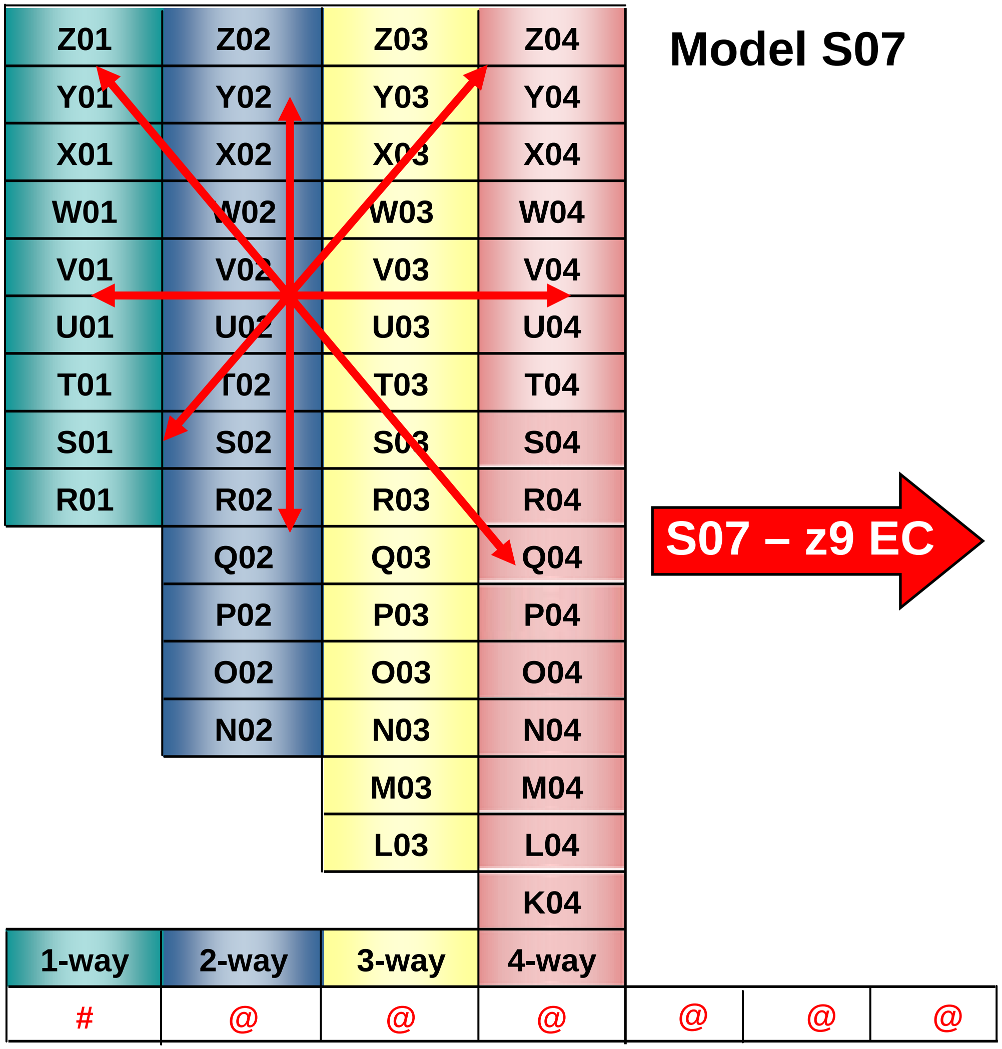
A choice that is just right



Model R07

J01		
I01		
H01		
G01		
F01	F02	
E01	E02	
D01	D02	D03
C01	C02	C03
B01	B02	B03
A01	A02	A03
1-way	2-way	3-way

CP	@	@	@	@	@	@



Model S07

Z01	Z02	Z03	Z04
Y01	Y02	Y03	Y04
X01	X02	X03	X04
W01	W02	W03	W04
V01	V02	V03	V04
U01	U02	U03	U04
T01	T02	T03	T04
S01	S02	S03	S04
R01	R02	R03	R04
	Q02	Q03	Q04
	P02	P03	P04
	O02	O03	O04
	N02	N03	N04
		M03	M04
		L03	L04
			K04
1-way	2-way	3-way	4-way

#	@	@	@	@	@	@

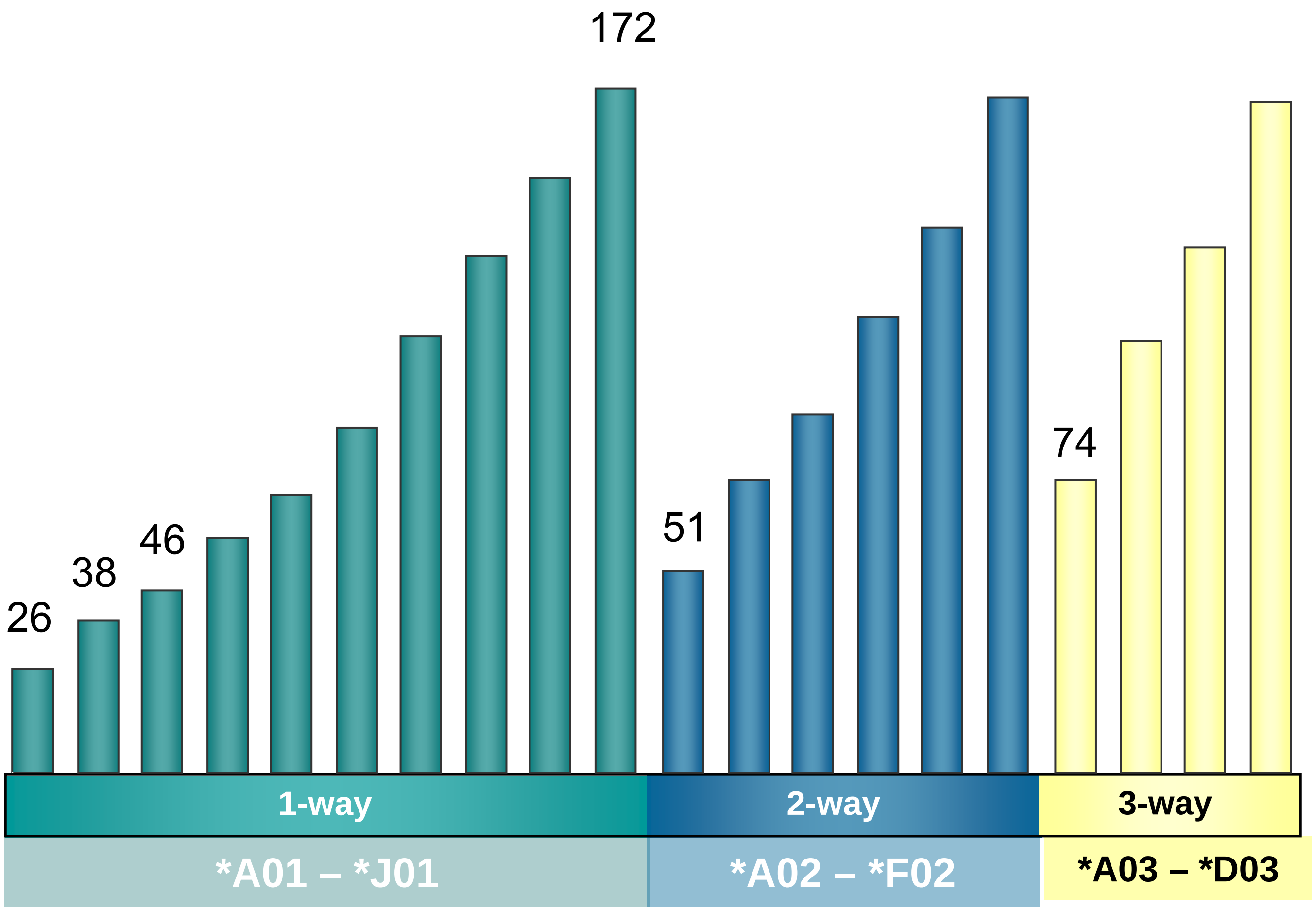
Full on demand upgradeability in the family

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

# = CP or IFL or ICF

@ = Any Specialty Engines. zAAPs and zIIPs have T & Cs

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/zSerieszOS.html

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

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**	4 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	2 PCI-X adapters 5) 1 PCI-X adapter

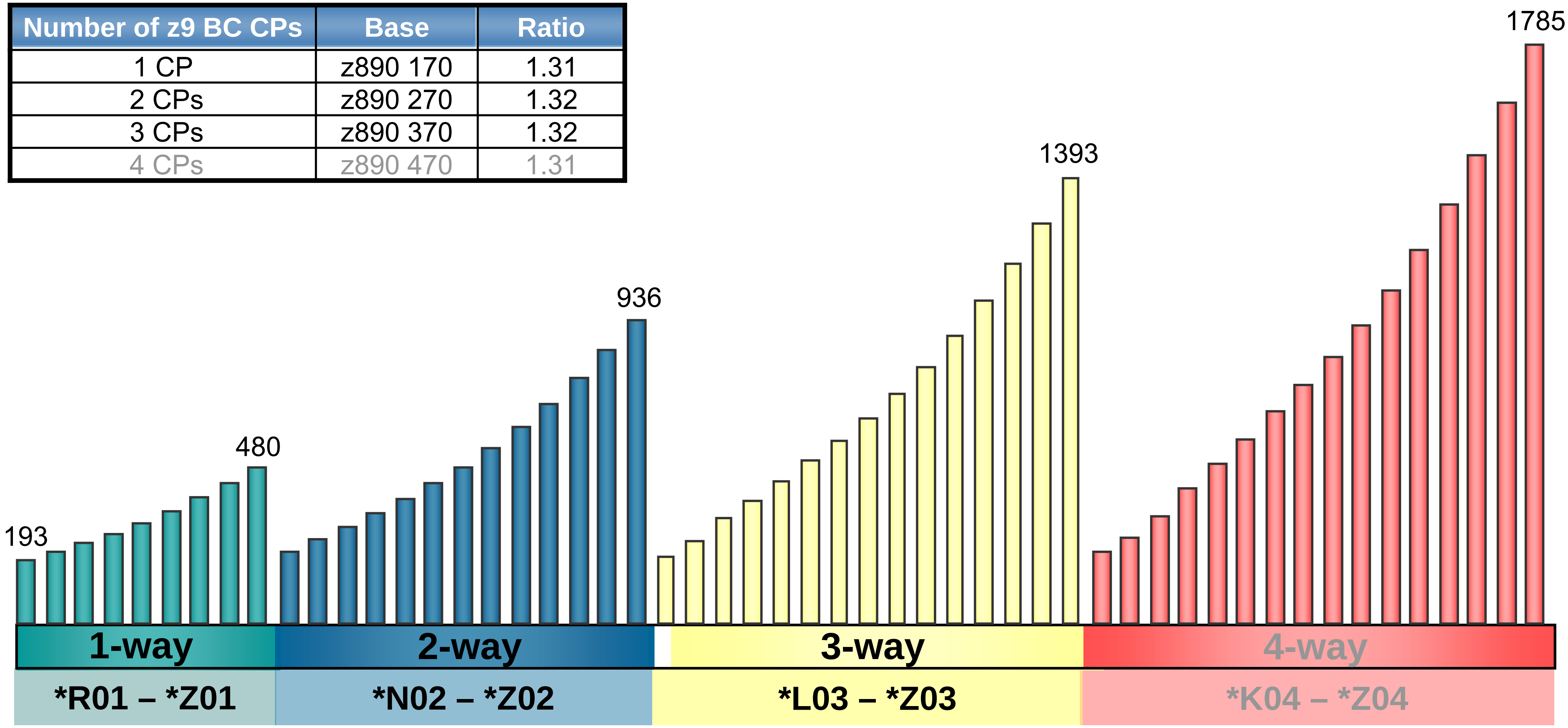
1. Minimum of one I/O feature (ESCON, FICON) or one Coupling Link (ICB, ISC-3) required.
2. Each STI-3 distribution card occupies one I/O slot (supports ICB-3s).
3. Maximum number of Coupling Links combined (ICs, ICB-3s, ICB-4s, and active ISC-3 links) cannot exceed 64 per server.
4. ICB-4s are not included in the maximum feature count for I/O slots but are included in the CHPID count.
5. Initial order of Crypto Express2 is 4 PCI-X adapters (two features). Each PCI-X adapter can be configured as either a coprocessor or an accelerator.
6. A01 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

Number of z9 BC CPs	Base	Ratio
1 CP	z890 170	1.31
2 CPs	z890 270	1.32
3 CPs	z890 370	1.32
4 CPs	z890 470	1.31



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/zSerieszOS.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.

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**	4 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	2 PCI-X adapters (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 4 PCI-X adapters (two features). Each PCI-X adapter can be configured as either a coprocessor or an accelerator.

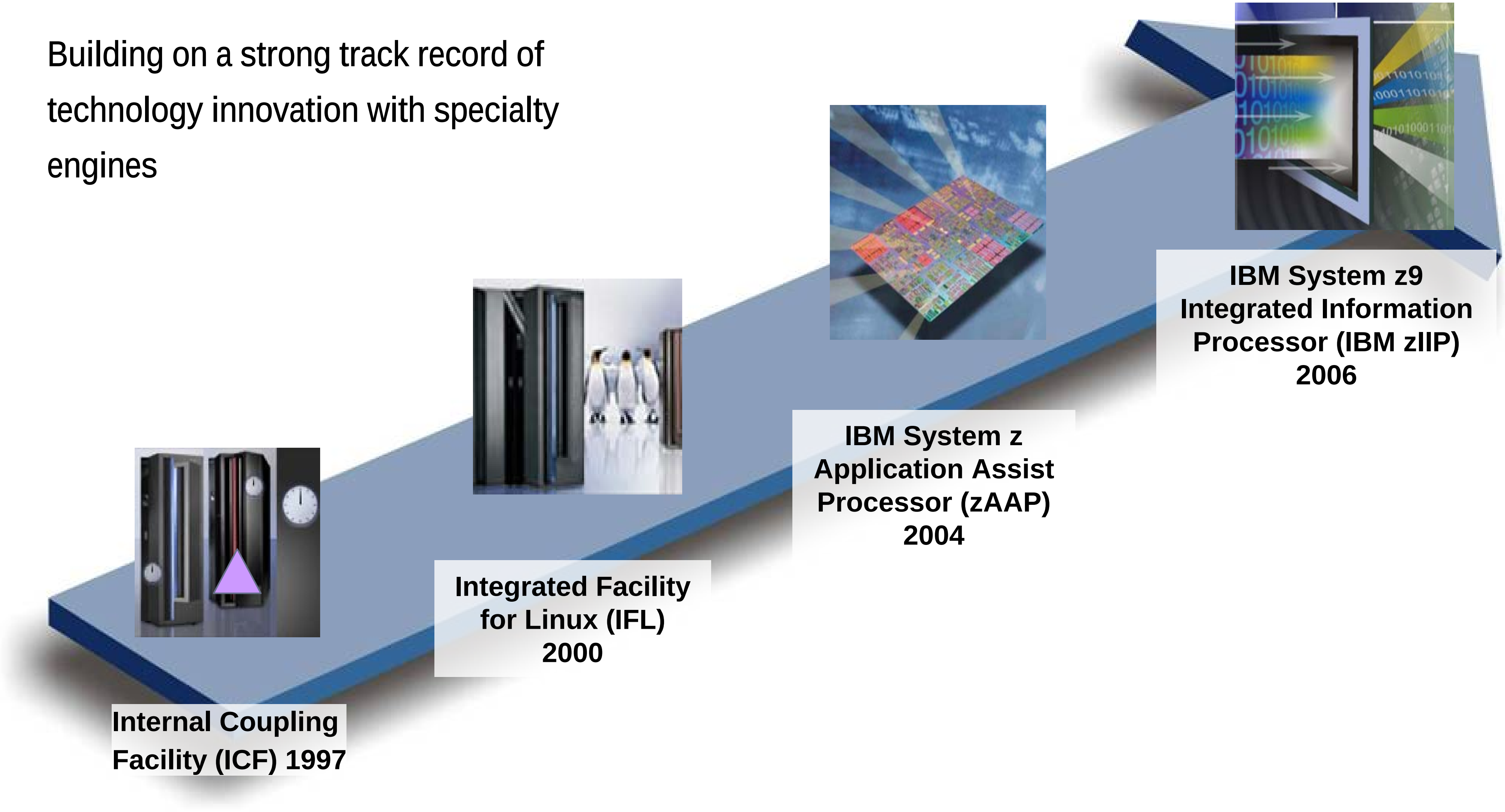
* Carry forward on an upgrade only.

** FICON Express4-2C 4KM LX and SX have two channels per feature

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

IBM System z Application Assist Processor (zAAP) 2004

IBM System z9 Integrated Information Processor (IBM zIIP) 2006

* All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represents goals and objectives only.

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/OS, z/VM, VSE/ESA, z/VSE, TPF4, z/TPF, Linux for System z, **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

System z Capacity on Demand Summary

Capacity Upgrade on Demand (CUoD)***	Capacity BackUp (CBU)***	Customer Initiated Upgrade (CIU)***	On/Off Capacity on Demand (On/Off CoD)***
Permanent capacity upgrade; a standard System z9 and zSeries feature that allows you to order extra capacity resources such as processors, memory*, and I/O	Temporary reserve backup PU capacity (CP, ICF#, IFL#, zAAP# or zIIP#) for specified duration; original configuration must be restored after test or disaster recovery	Facility for ordering, configuring, pricing and installing permanent capacity upgrades. It is a Web-based solution available through Resource Link	Temporary capacity upgrade (CP, ICF, IFL, zAAP, zIIP) of unlimited duration; orderable through CIU; customer activates and deactivates.
Available on LIC enabled System z9, z990, z890, z900, z800 and G5/G6	Available on System z9, z990, z890, z900, z800 and G5/G6	Available on LIC enabled System z9, z990, z890, z900 and z800	Available only on System z9, z990 and z890; orderable feature
Inherent capability of System z9 and zSeries servers; spare processors, memory and/or I/O slots must be available	A CBU contract must be in place prior to implementation and reserve PUs available for test or disaster recovery	A CIU contract must be in place prior to implementation	A CIU contract with special On/ Off CoD terms and conditions and right-to-use feature must be in place prior to implementation
Capacity upgrade Installed by customer or IBM Service representative	Capacity reserve installed by customer or IBM Service representative for predetermined period of use	CIU contract and registration required to use CIU application to order capacity	Feature ordered through IBM Sales; once enacted, customer orders temporary CP, ICF, IFL, zAAP or zIIP upgrade through CIU
Customer or IBM planning required	Customer or IBM planning required	Customer planning required	Customer planning required
Nondisruptive** capacity activation (may require deactivation or activation of LPAR partition)	Nondisruptive** capacity activation System z9, z990, z890, z900 and z800 and G5, G6	Ordering facility available with the System z9, z990, z890, z900 and z800	Nondisruptive temporary CP, ICF, IFL, zAAP or zIIP upgrade; customer deactivates; mutually exclusive with CBU enablement

* Memory cannot be upgraded on z800 with CUoD. Limited option for z890 and z9 BC

** CUoD and CBU may need IPL for z800/z890 "sub" model upgrades with older levels of OS

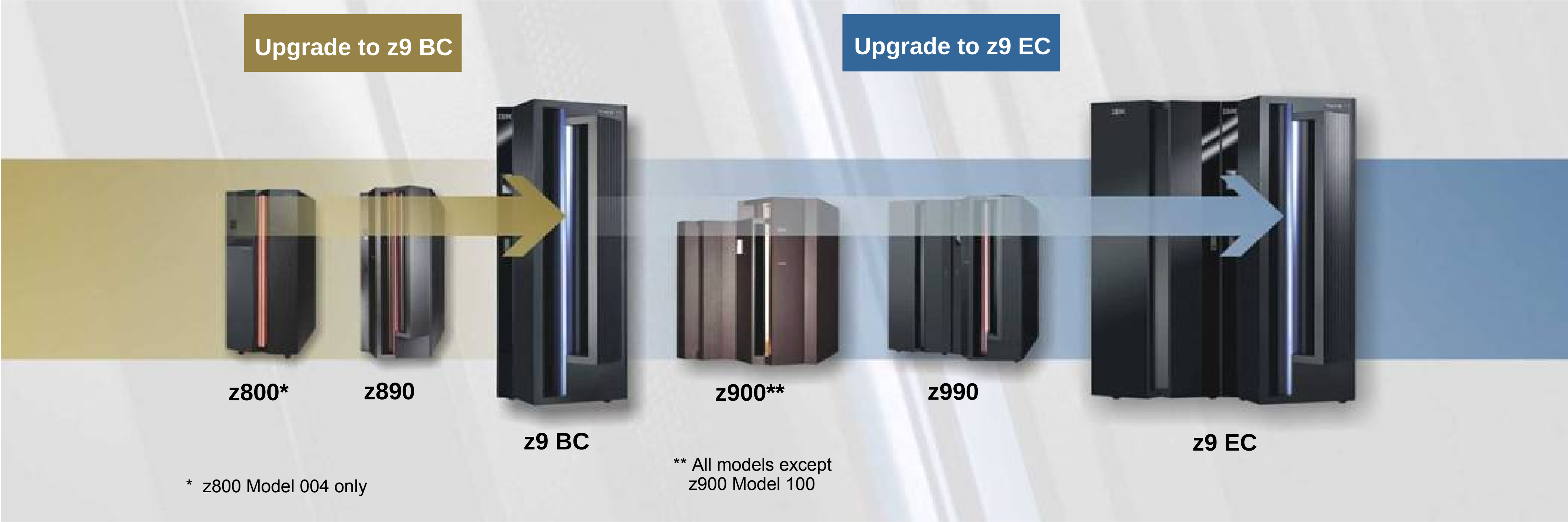
*** Additional terms and conditions apply

# System z9 ONLY

Note: Upgrades are nondisruptive only where there is sufficient hardware resource available and provided pre-planning has been done

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
- On/Off Capacity on Demand upgrades can now be tested by your staff
- New options for reconfiguring specialty engines if business demands it
- Typically no charge MES upgrades on IFLs and zAAPs


Upgrade to z9 BC
Upgrade to z9 EC
z800*
z890
z9 BC
z900**
z990
z9 EC

* z800 Model 004 only

** All models except z900 Model 100

z9 BC Operating System Support

System z9 Supported Operating Systems

Operating System	ESA/390 (31-bit)	z/Architecture® (64-bit)
z/VSE™ Version 3 Release 1(4)	Yes	No
z/VSE Version 4 Release 1(5)	No	Yes
z/VM® Version 5 Release 1(2), 2 and 3(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* (Planned)	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/VM 5.3 is planned to GA in June, 2007
4. 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.
5. 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.

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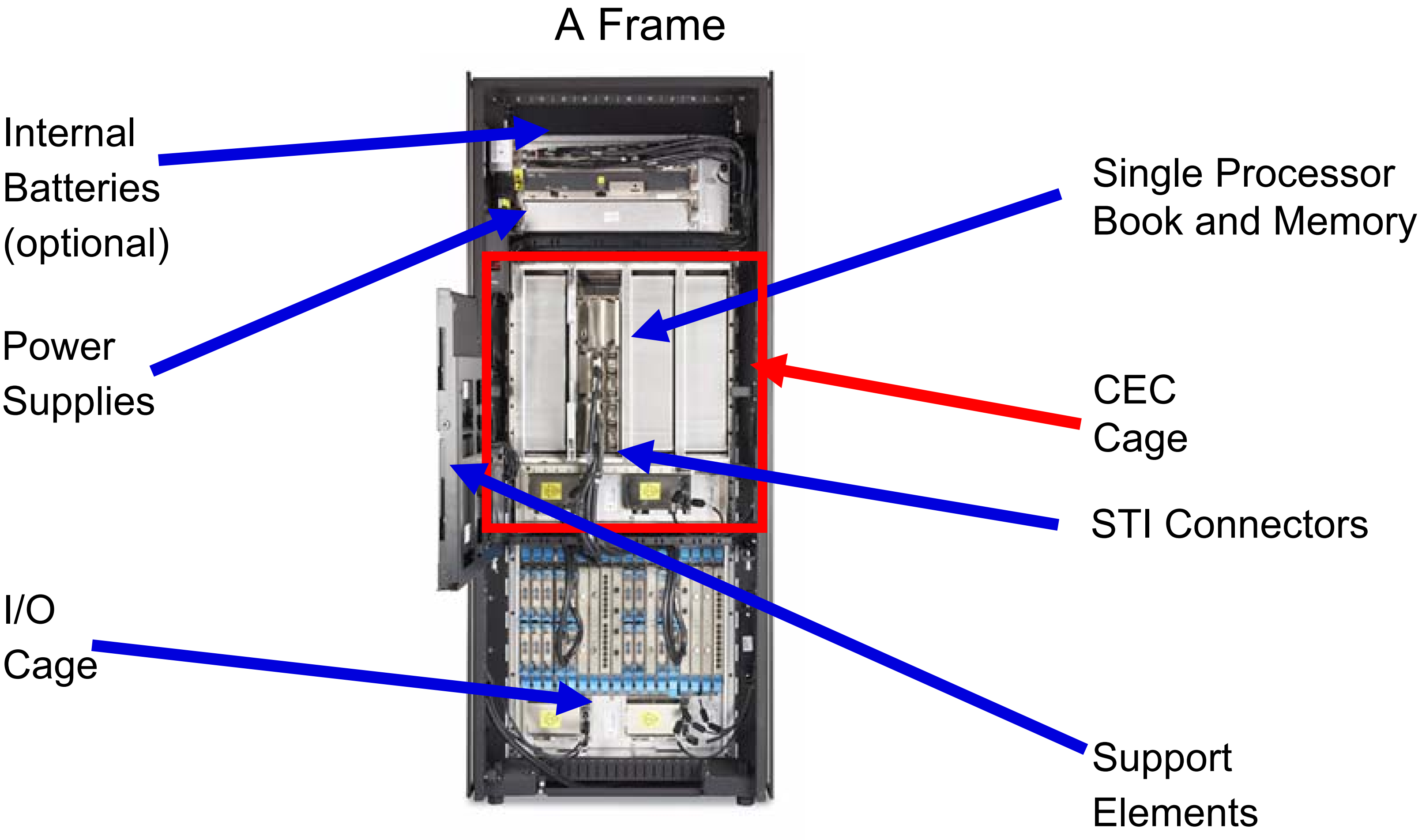
Midrange Workload License Charge (MWLC) for z/VSE

- **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

- **Structured to help address new System z9 opportunities**

z9 BC – Under the covers


A Frame
Internal Batteries (optional)
Power Supplies
I/O Cage
Single Processor Book and Memory
CEC Cage
STI Connectors
Support Elements

Front View

Fiber Quick Connect Feature (optional)

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)

IBM
System z9
CEC
I/O Cage

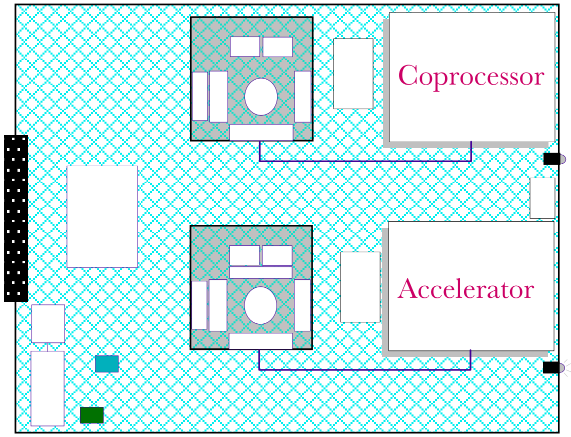
z9 BC Cryptography and Security

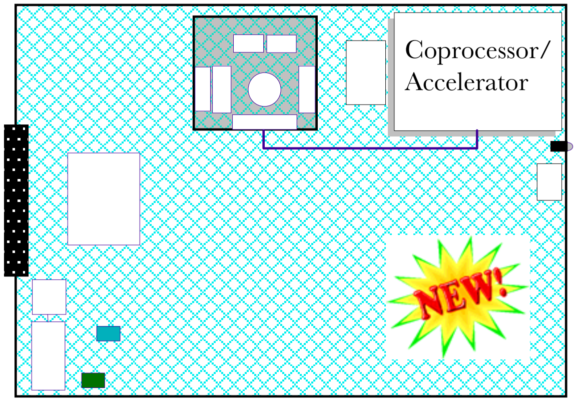
System z9 CPACF

- **CP Assist for Cryptographic Function (CPACF)**
  - Available on every CP & IFL
  - High performance clear key symmetric encryption/decryption
    - Advanced Encryption Standard (AES) – 128-bit
    - Triple DES / DES
    - Requires no charge enablement feature
  - High performance clear key hashing (Shipped enabled on all systems)
    - Secure Hash Algorithm (SHA)-256
    - SHA-1
  - High performance Pseudo Random Number Generator (PRNG)
    - Requires no charge enablement feature
  - Called via ICSF API or Problem State Instructions
- **CPACF Enabler Feature**
  - No additional charge export control feature
  - Required to enable AES, DES/TES, and PRNG (as well as to order Crypto Express2)

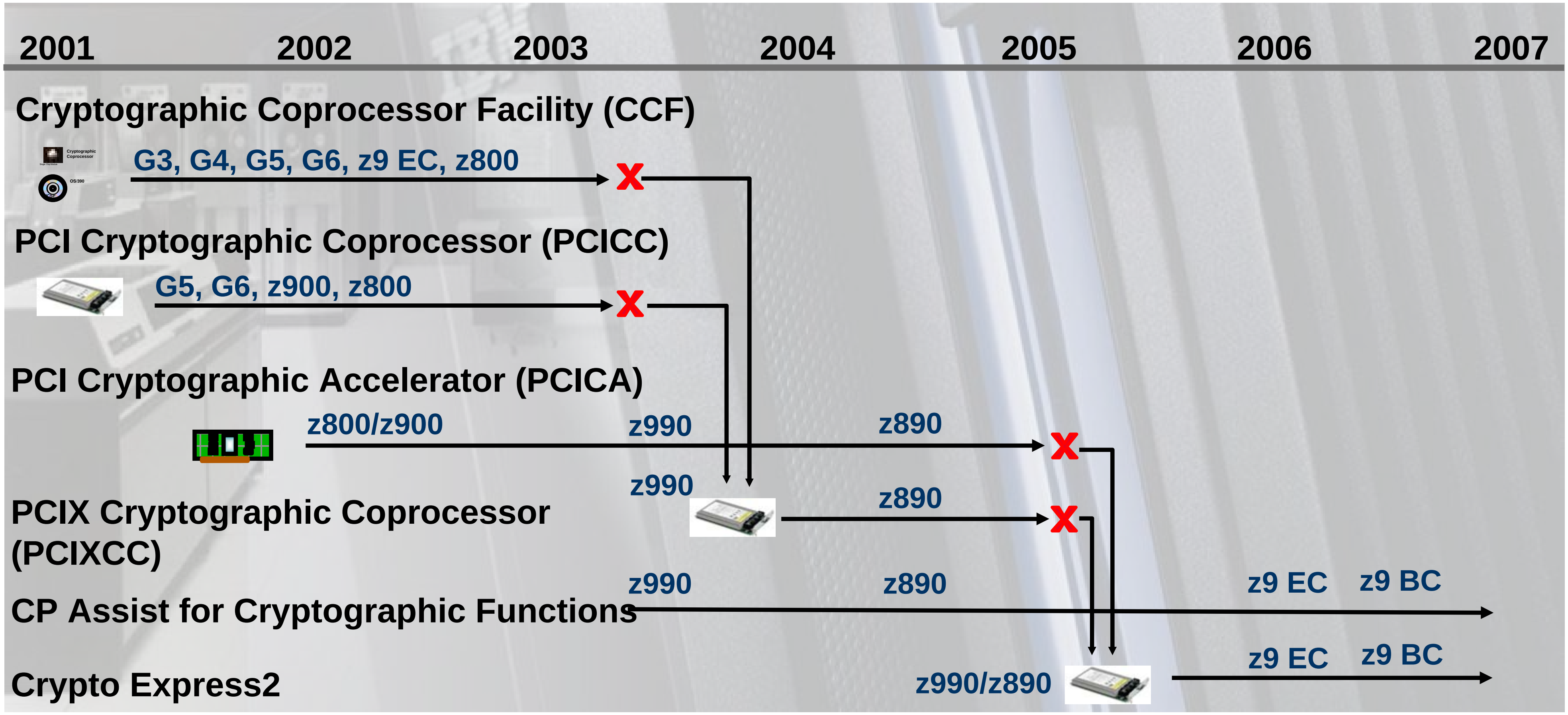
System z9 Cryptographic Support Summary

- **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)
    - Secure Hash Algorithm – 256 (SHA-256)
    - Pseudo Random Number Generation (PRNG)
- **Crypto Express2**
  - Two configuration modes
    - Coprocessor provides “Secure key” and “Public key” function
      - Federal Information Processing Standard (FIPS) 140-2 Level 4 certified
    - Accelerator, designed to provide only “Public key” (SSL) function with enhanced performance
  - Three configuration options
    - Default set to Coprocessor
  - Two feature minimum can be one of each or two of either
- **z9 BC Crypto Express2-1P**
  - Model S07 supports 0, 2, 3, 4, 5, 6, 7, or 8 features
    Model R07 supports no more than 4 features
  - 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





System z9 and zSeries Crypto Roadmap



2001 2002 2003 2004 2005 2006 2007

Cryptographic Coprocessor Facility (CCF)

G3, G4, G5, G6, z9 EC, z800

PCI Cryptographic Coprocessor (PCICC)

G5, G6, z900, z800

PCI Cryptographic Accelerator (PCICA)

z800/z900 z990 z890

PCIX Cryptographic Coprocessor (PCIXCC)

z990 z890

CP Assist for Cryptographic Functions

z990 z890 z9 EC z9 BC

Crypto Express2

z990/z890 z9 EC z9 BC

- 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

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)
  - 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)
  - Parallel (use ESCON Converter)

IBM
System z9

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

FICON to ESCON Converter

OPTICA™
Technologies Incorporated

Enterprise Connectivity and Infrastructure Solutions

PRIZM™

http://www.opticatech.com/products_premier_prizm.html

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 transfers[1]
  - Up to 65% improvement in FICON channel throughput when processing all read or all write data transfers[1]
- **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 and small enterprises with additional price granularity with 2 channel or 4 channel cards for z9 BC**

---

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

System z9 BC FICON Express4

- **FICON Express4 supports:**
  - 4 Gbps with Auto-negotiate capability (1, 2, or 4 Gbps)
  - Can be shared among LPARs
  - Small Form Factor Pluggable (SFP) optics for Service / Repair
    - Concurrent repair/replace action for each SFP
- **Ordering**
  - Two port or four depending on feature
  - Intermix is not supported on a single card
  - All ports must be of the same type, LX or SX

FC 3318 FICON Express4-2C SX (2 ports)

FC 3323 FICON Express4-2C 4km LX (2 ports)

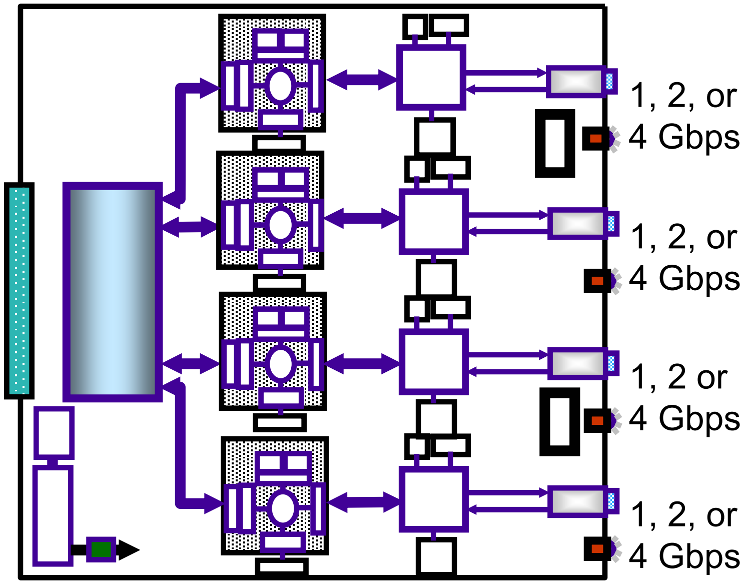
- FC 3318, 3323 NOT supported on z9 EC

FC 3321 FICON Express4 10 km LX

FC 3322 FICON Express4 SX

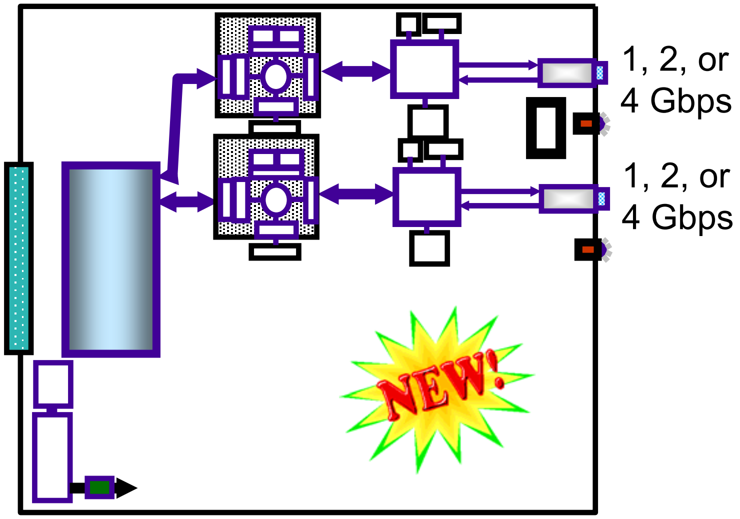
FC 3324 FICON Express4 4km LX

4 Port card shown



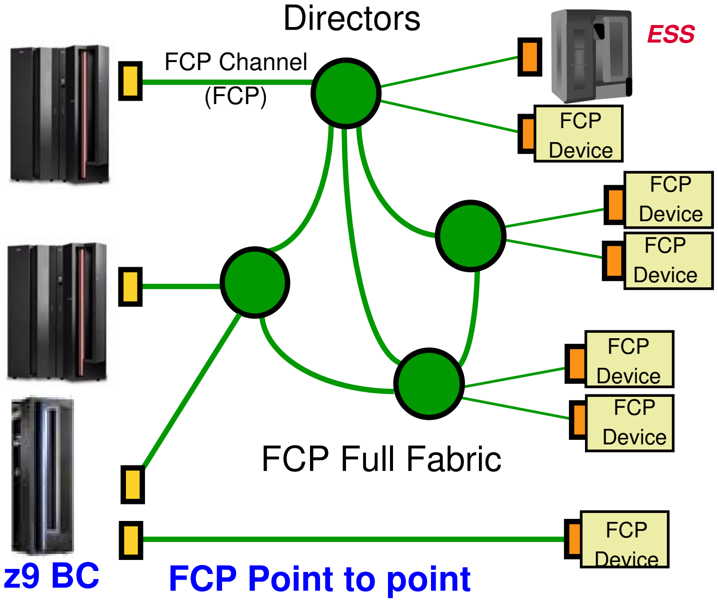
1, 2, or 4 Gbps
1, 2, or 4 Gbps
1, 2 or 4 Gbps
1, 2, or 4 Gbps

2 Port card shown

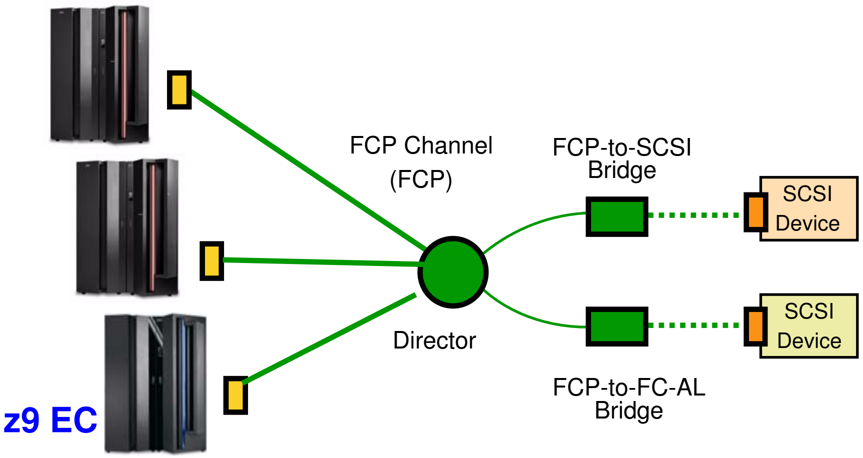


1, 2, or 4 Gbps
1, 2, or 4 Gbps
NEW!

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


Directors
FCP Channel
(FCP)
ESS
FCP Device
FCP Device
FCP Device
FCP Device
FCP Device
FCP Full Fabric
FCP Device
z9 BC
FCP Point to point

- **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 Channel
(FCP)
FCP-to-SCSI
Bridge
SCSI Device
SCSI Device
Director
FCP-to-FC-AL
Bridge
z9 EC

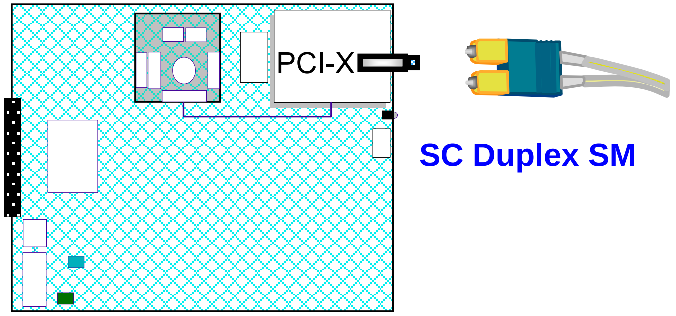
- **FCP switched to SCSI Bridge**
  - FCP-to-SCSI Bridges
  - FCP-to-FC-AL bridge

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

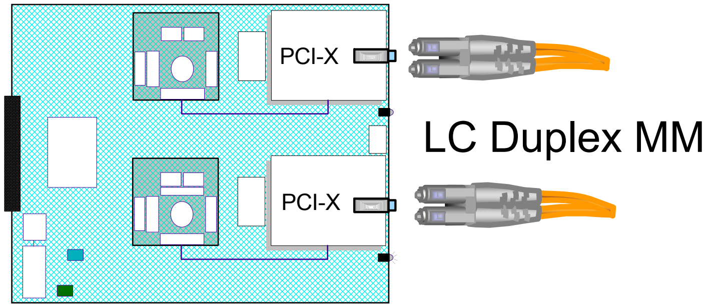
OSA-Express2 10 GbE and GbE

- **10 Gigabit Ethernet LR (long reach)**
  - One port per feature
  - CHPID type OSD (QDIO)
  - 9 micron single mode fiber
  - 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)
  - Exclusive to z9 EC, z9 BC
  - Gigabit Ethernet LX (Long wavelength)
    - –9 micron single mode fiber
  - Gigabit Ethernet SX (Short wavelength)
    - –50 or 62.5 micron multimode fiber
- **Supports**
  - Layer 2 - protocol-independent packet forwarding
  - Large send - offloading TCP segmentation
  - 640 TCP/IP stacks - improved virtualization
  - Concurrent LIC update - minimize traffic disruption

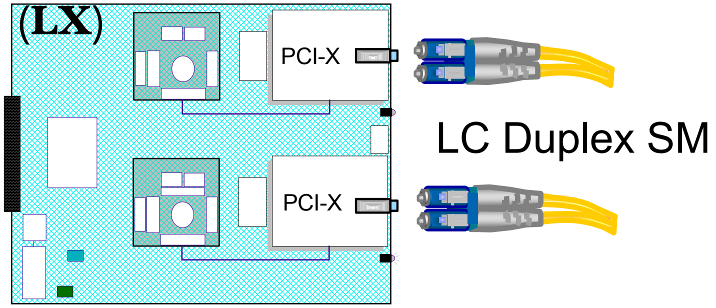
10 GbE - feature # 3368



GbE - feature # 3365 (SX)



GbE - feature # 3364 (LX)

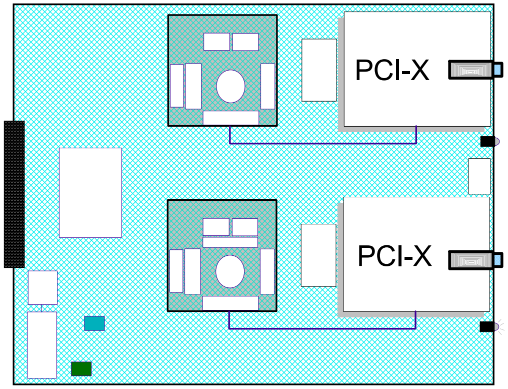


OSA-Express2 1000BASE-T Ethernet

Since 26 May 2006

- **Auto-negotiation to 10, 100, 1000 Mbps over** Category 5 copper
- **Supports:**
  - ▶Layer 2 for protocol-independent packet forwarding
  - ▶Large send for offloading TCP segmentation processing
  - ▶640 TCP/IP stacks for improved virtualization
  - ▶Concurrent LIC update to minimize network traffic disruption
- **Offered on z9 EC, z9 BC, z990, z890**

Feature # 3366



Mode	CHPID	Description
OSA-ICC	OSC	3270 data streams
QDIO	OSD	TCP/IP traffic when Layer 3 Protocol-independent when Layer 2
Non-QDIO	OSE	TCP/IP and/or SNA/APPN/HPR traffic
OSA for NCP	OSN	NCPs running under IBM Communication Controller for Linux

OSA – available on new build and what you can carry forward

Feature	Feature Name	Ports	z800	z890	z9 BC	CHPIDs	Connectors
5201	OSA-2 Token Ring	2	X	N / A	N / A	OSA	RJ-45
5202	OSA-2 FDDI	1	X	N / A	N / A	OSA	SC Duplex
2362	OSA-E 155 ATM SM	2	X	RPQ	N / A	OSD, OSE	SC Duplex
2363	OSA-E 155 ATM MM	2	X	RPQ	N / A	OSD, OSE	SC Duplex
2364	OSA-E GbE LX	2	X	C	C	OSD, L2/L3 **	SC Duplex
2365	OSA-E GbE SX	2	X	C	C	OSD, L2/L3 **	SC Duplex
2366	OSA-E Fast Ethernet	2	X	C	C	OSD, OSE	RJ-45
2367	OSA-E Token Ring	2	X	X	N / A	OSD, OSE	RJ-45
1364	OSA-E GbE LX	2	09/04	X	C	OSD, L2/L3 **	LC Duplex
1365	OSA-E GbE SX	2	09/04	X	C	OSD, L2/L3 **	LC Duplex
1366	OSA-E 1000BASE-T Ethernet	2	N / A	X	C	OSC, OSD L2,L3, OSE	RJ-45
3364	OSA-E2 GbE LX	2	N / A	01/05	X	OSD L2/L3, OSN *	LC Duplex
3365	OSA-E2 GbE SX	2	N / A	01/05	X	OSD L2/L3, OSN *	LC Duplex
3366	OSA-E2 1000BASE-T Ethernet	2	N / A	05/06	X	OSC, OSD L2/L3, OSE, OSN *	RJ-45
3368	OSA-E2 10 GbE LR	1	N / A	01/05	X	OSD L2/L3 **	SC Duplex

LX = Long wavelength transceiver, SX = Short wavelength transceiver, LR - Long Reach transceiver
X = Available for ordering C = Carry forward on an upgrade from z900 or z990
* OSN is exclusive to z9 EC and z9 BC   ** L2/L3 = Layer 2/Layer 3 which is applicable to z9 EC, z9 BC, z990, z890

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

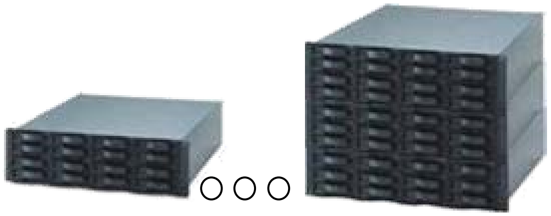
Disk	DS8000 – 4 Gbps FICON/FCP DS6000 – 2 Gbps FICON/FCP
SAN	IBM SAN256B, SAN64B-2*, SAN32B-2, SAN18B-R, SAN256M, SAN140M, SAN32M-2; and Cisco MDS 9513, 9509, 9506, 9216A and 9216i all 4 Gbps FCP/FICON (*planned GA May, 2007)
Virtualization	IBM SVC 4 Gbps FCP for Linux on System z VTS 2 Gbps FICON/FCP TS7510 Virtualization Engine™ – 2 Gbps FCP for Linux on System z Planned 2Q06*
Tape Monday Session	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

*Statements regarding IBM's future direction and plans are subject to change or withdrawal without notice

IBM System Storage Disk: Supports FICON Express4

Enterprise Disk Continuum

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

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

Complements mainframe scalability, performance, and cost effectiveness

z/VSE support for IBM System Storage

New Standard in Pricing and Packaging

IBM TotalStorage DS6000

ESS 750 / 800

New Standard in Functionality, Performance, TCO

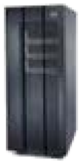
IBM TotalStorage DS8000

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

Enterprise Tape Continuum

TS1120



3494

TS3400

TS3500

TS7700

Tape Drives

- **TS1120 tape drive/controller**
  - ▶Tape drive data encryption
  - ▶Second generation tape drive
  - ▶Controller supports ESCON & FICON
  - ▶100, 500, 700 GB cartridge capacity[2]
- **3592 tape drive**

Tape Libraries

- **TS3400 tape library[1]**
  - ▶Small footprint, TS1120 drive support
  - ▶SOD for other System z operating systems
- **TS3500 tape library**
  - ▶TS1120 tape drive with advanced management function
- **3494 tape library**
  - ▶Investment protection
  - ▶TS1120 and 3590 drive support

Virtualization

- **TS7700 Virtualization Engine**
  - ▶Standalone or Grid deployment
    - ●Third site support in plan[3]
  - ▶Advanced function
  - ▶Higher Performance
  - ▶Robust Roadmap

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[1]Linux on System z support only; [2]Uncompressed Capacity, [3]Statement of Direction included in Aug 29. 2006 announcement

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

Data Center

Secondary Site

Business Partners

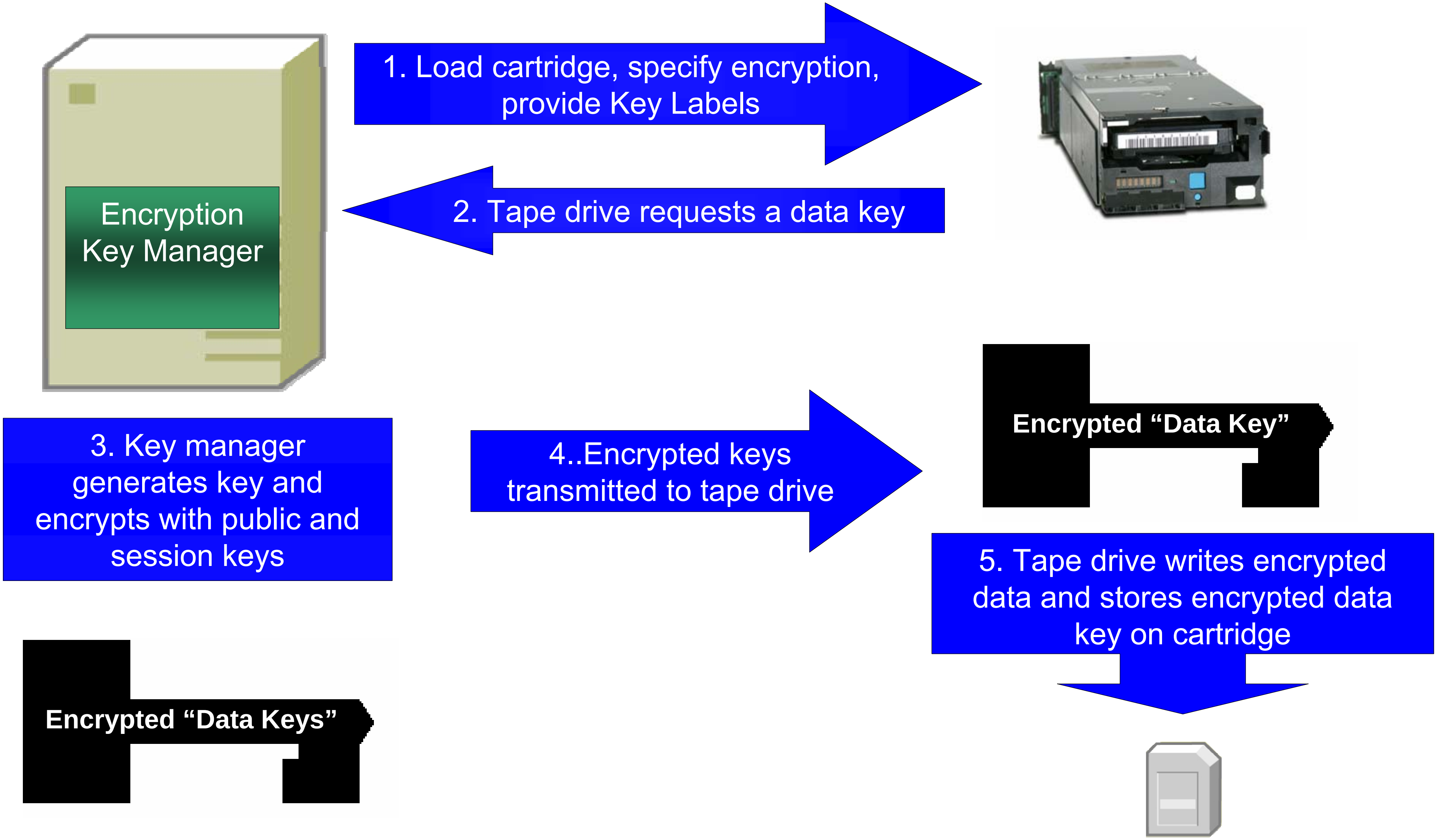
z/VSE support for TS1120 Tape Drive Encryption

- **IBM System Storage TS1120 - first encrypting tape drive**
  - Standard feature on new TS1120 tape drives
  - Supports data encryption using 256 bit AES encryption
  - Microcode enhancements for encryption policy and key communications
  - Encryption performed with minimal (< 1% data rate performance impact)
  - Data is compressed *and* encrypted – no change in media utilization
  - Supports “traditional” and “encrypted” modes of operation
  - Encryption “disabled” unless otherwise specified
  - Chargeable upgrade feature for existing TS1120 Drives
- **z/VSE V4.1 designed for Systems Managed Encryption**
  - Support may be available via PTF after z/VSE V4.1 GA
  - SOD for z/VSE V3.1
- **Innovative IBM Encryption Key Manager (EKM) component for Java platform™ supported on a wide range of systems including:**
  - z/OS, AIX, Linux (incl System z), i5/OS, HP, Sun, and Windows
- **Integration with IBM tape systems, libraries**

TS1120
500 GB
100 MB/sec

Encryption Key Manager

Overview of Encryption Key Manager for Tape Encryption
- key generation, communication and key storage


Encryption Key Manager

1. Load cartridge, specify encryption, provide Key Labels

2. Tape drive requests a data key

3. Key manager generates key and encrypts with public and session keys

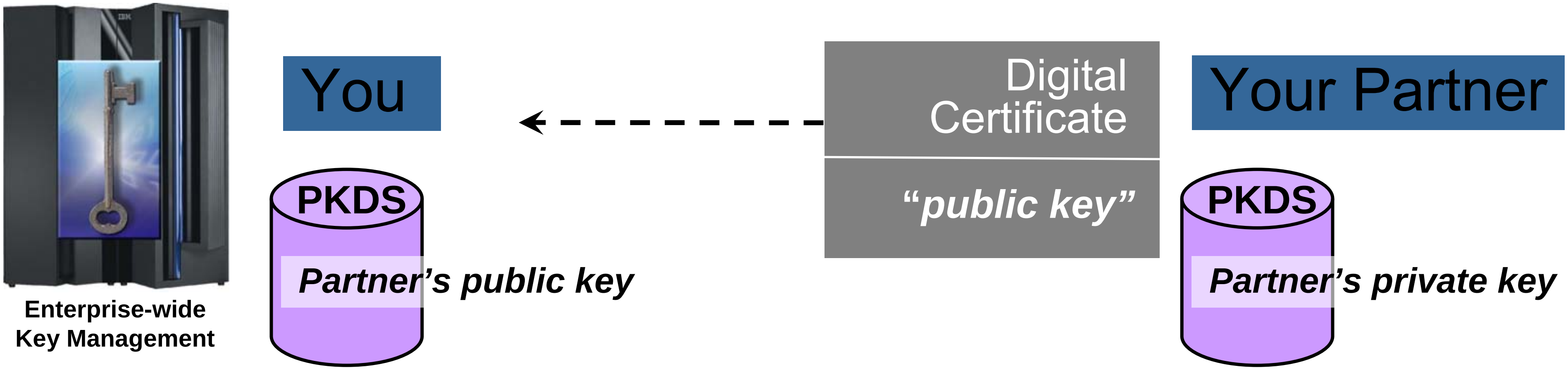
4..Encrypted keys transmitted to tape drive

5. Tape drive writes encrypted data and stores encrypted data key on cartridge

Encrypted "Data Key"
Encrypted "Data Keys"

Establishing a Trusted Exchange with Partners

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



Enterprise-wide
Key Management

You

PKDS

Partner's public key

Digital
Certificate

"public key"

Your Partner

PKDS

Partner's private key

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

Wrap Up

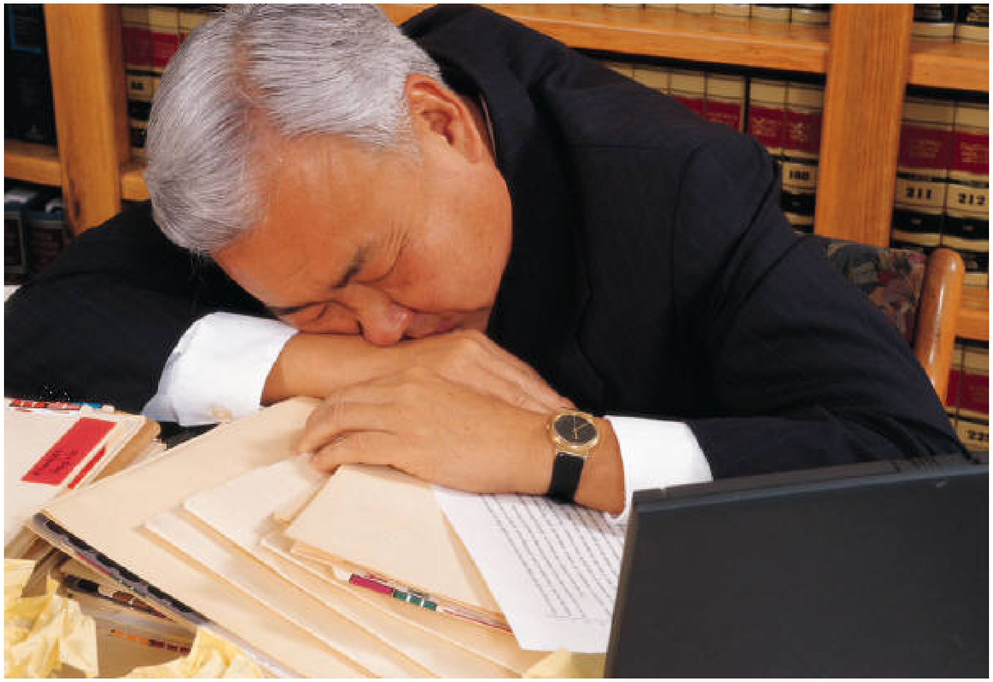
Leadership in systems innovation

- z9 EC and z9 BC offer new capacity settings to give you a choice in selecting the right size mainframe for your business
- Leadership in data and transaction serving with continued IBM platform focus to enable on demand business across the enterprise
- Helping to improve capacity and performance in accessing data with the next generation of 4 Gbps FICON/FCP
- Building on a 40-year heritage to deliver new capabilities for a security-rich corporate data server

Today's ENHANCED Mainframe:

POWERFUL servers for SIMPLIFIED infrastructures

Reference Material



Key References for IBM System z9 BC

- **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**
  (Search Redbook™ Keyword = z9 BC)

Resource Link – the essential site for z9 BC migration!

- **Hardware**
  - Purpose and Description documents, HIPER Alerts, installation planning, education, and libraries for System z9, IBM eServer zSeries, IBM TotalStorage, 2029 Fibre Saver, 2074 Control Unit, 9032 Model 5 Director, 9037 Model 2 Sysplex Timer®
- **Operating Systems and Software**
  - Links to z/OS, z/OS.e, z/VM, z/VSE, VSE/ESA 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 BC 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

- **z9 BC Web site:** www.ibm.com/systems/z/hardware
  - Many links to System z9 specific OS information

End of Presentation

IBM
System z9

Questions ?!?
MICHEL

VSE-VM-Linux
Splash
WAVV-World Alliance

BUSINESS INTERNATIONAL MACHINES

The History of IBM

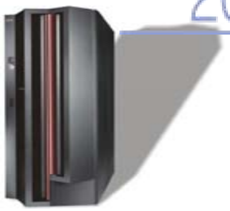
Thank you for your time and for doing business with IBM

1964

1972

1982

1999


2004

2007