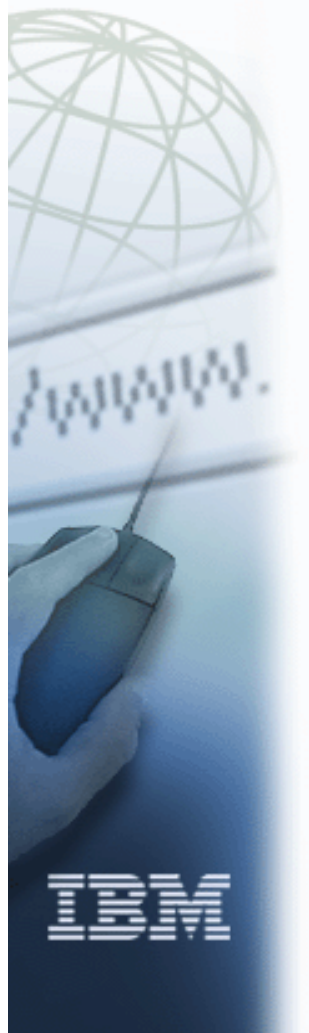


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# zSeries Technical Update



## Redbooks

International Technical Support Organization

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# IBM zSeries Technical Update Agenda

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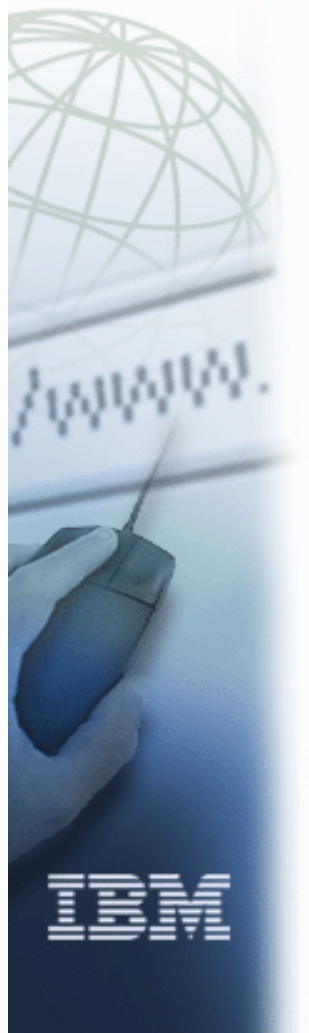


- ☐ Hardware Review
- ☐ Channel Subsystem
- ☐ Connectivity Update
- ☐ OSA ICC
- ☐ Cryptography
- ☐ Availability
- ☐ Parallel Sysplex
- ☐ Extended Distance
- ☐ zAAP
- ☐ Software Support
- ☐ Statements of Direction
- ☐ Summary

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# IBM zSeries z890 and z990 Hardware Review



## Redbooks

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# z890 - Single Hardware Model

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## ❑ Machine Type

- ▶ 2086

## ❑ Model A04 with a Single Book

- ▶ 28 sw models - capacity settings

## ❑ One MCM with:

- ▶ 5 PUs
- ▶ 4 PUs available for characterization as CPs, IFLs, ICFs, and zAAPs
- ▶ 1 standard SAP
- ▶ No standard spares

## ❑ Memory - System Level:

- ▶ Up to 32 GB
- ▶ Single card (8, 16 or 32 GB)
- ▶ System minimum of 8 GB
- ▶ 8 GB increments (8, 16, 24, 32 GB)
- ▶ One concurrent memory upgrade path (24 to 32 GB)

## ❑ I/O:

- ▶ 8 eSTIs @ 2.0 GB/s each
- ▶ Up to 512 CHPIDs and up to 420 Channels ports in one I/O Cage (dependent on Channel types)
- ▶ Max 2 LCSS



# z990 - Four Hardware Models

---



## ❑ Machine Type

- ▶ 2084

## ❑ 4 Models:

- ▶ A08, B16, C24 & D32
- ▶ 1 to 4 books

## ❑ Each Book has:

- ▶ 12 PUs
- ▶ 8 PUs available for characterization as CPs, IFLs, ICFs, zAAPs or additional SAPs
- ▶ 2 PUs standard as SAPs
- ▶ 2 PUs standard as Spares

## ❑ Memory:

- ▶ Up to 64 GB per Book
- ▶ System minimum of 16 GB
- ▶ 8 GB increments
- ▶ Up to 256 GB with 4 Books

## ❑ I/O:

- ▶ Each Book has 12 eSTIs @ 2 GB/s
- ▶ Up to 96 GB System bandwidth with 4 Books
- ▶ 4 Logical Channel Subsystems
- ▶ Up to 1024 channels ports/CEC - dependent on Channel types

# z890/z990 PU Characterization

---



## ■ The type of Processing Units (PUs) that can be ordered (enabled / assigned) on a z890/z990 server include:

- ▶ Central Processors (CPs)
  - Provides processing capacity for z/Architecture™ and ESA/390 instruction sets
  - Runs z/OS, z/VM, VSE/ESA™, TPF, Linux and Linux under z/VM
- ▶ Integrated Facility for Linux (IFL)
  - Provides additional processing capacity for Linux workloads
  - Runs Linux or Linux under z/VM Version 4 and Version 5
- ▶ Internal Coupling Facility (ICF)
  - Provides processing capacity for the execution of the Coupling Facility Control Code (CFCC) in a CF LPAR
- ▶ System Assisted Processors (SAPs) (additional for z990 only)
  - SAPs manages the start and ending of I/O operations for all logical partitions and all attached I/O
- ▶ IBM @server zSeries Application Assist Processor (zAAP)
  - Under z/OS, the Java™ Virtual Machine (JVM) assists with Java processing to a zAAP
  - Requires z/OS 1.6 or z/OS.e 1.6 (z/OS.e for z890)

# New z890 and z990 Functions and Features



zAAP  
Exploitation  
with  
z/OS 1.6

CFCC  
Level 14

FCP LUN  
Access Control  
PREVIEW

FICON  
Purge  
Path  
Extended

Crypto  
Express2

EAL5  
Certification  
for z990  
LPARs

Add/Delete  
Partition  
Names  
with  
z/OS 1.6

Additional  
Upgrade  
Paths to  
z890



Crypto  
for 19-digit  
PANs on  
PCIxCC &  
Crypto  
Express2

TKE 4.2  
Code with  
Smart Reader

Nondisruptive  
Capacity  
Change for  
Sub-Capacity  
z890s

24-Hour  
OOCUoD  
Test  
Period

OSA-Express2  
with  
Concurrent  
LIC Updates

OSA- Express2  
10 Gigabit  
Ethernet  
Long Reach

New HMC  
with  
LCD

GDPS  
Supports  
z/VM 5.1  
HyperSwap

Large Send  
for TCP/IP  
traffic

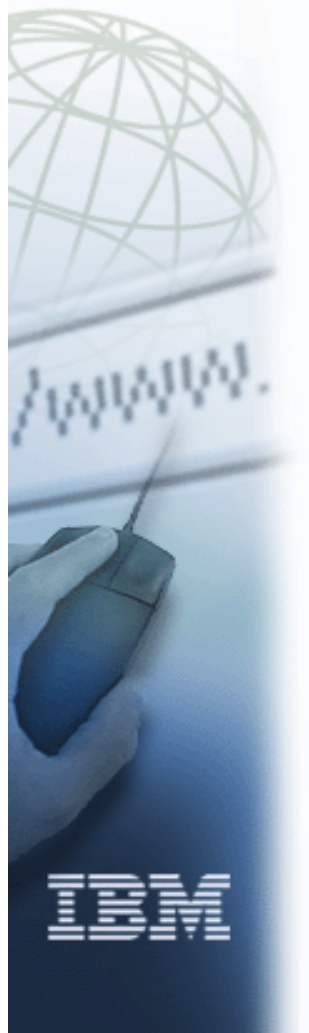
OSA-Express2  
640  
TCP/IP  
Stacks

OSA-Express  
and  
OSA-Expresss2  
Layer 2  
Support  
z/VM 5.1

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# zSeries z890/z990 Channel Subsystem



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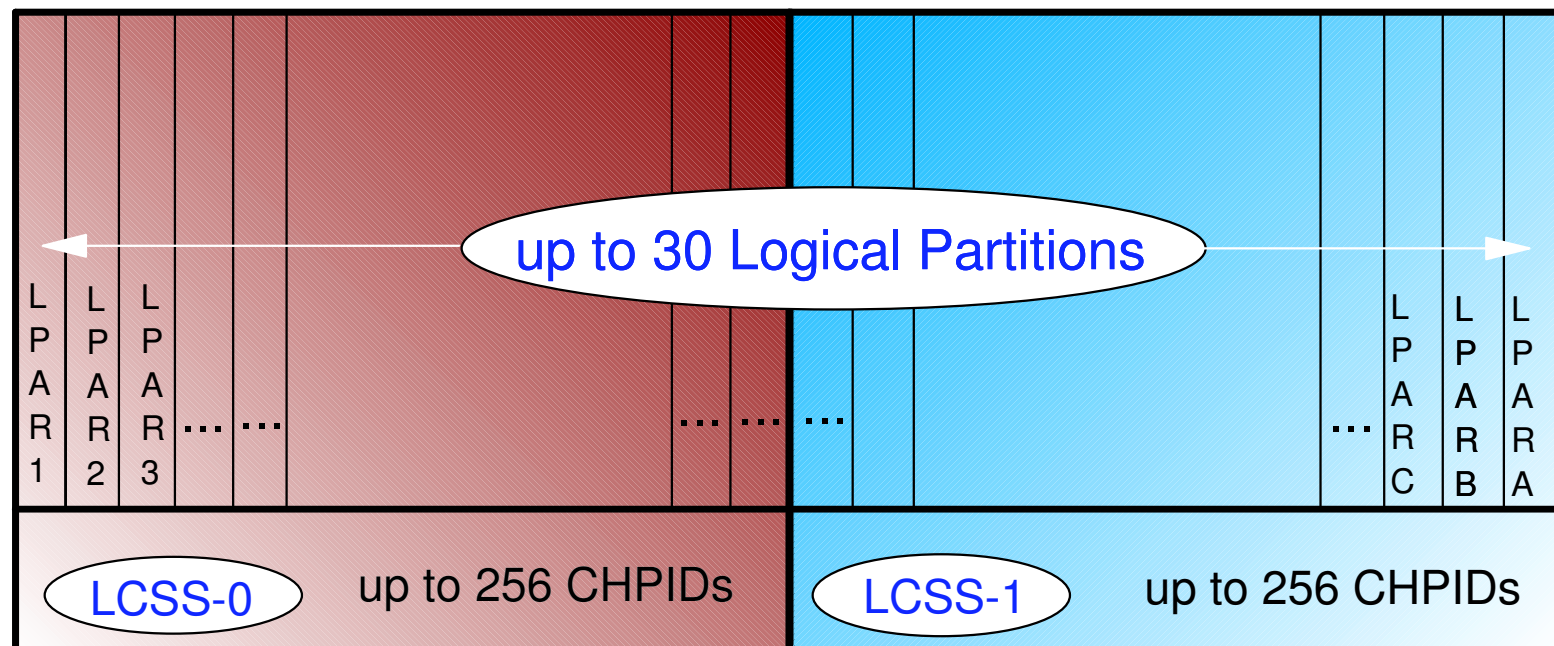
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# z890 Logical Channel SubSystems

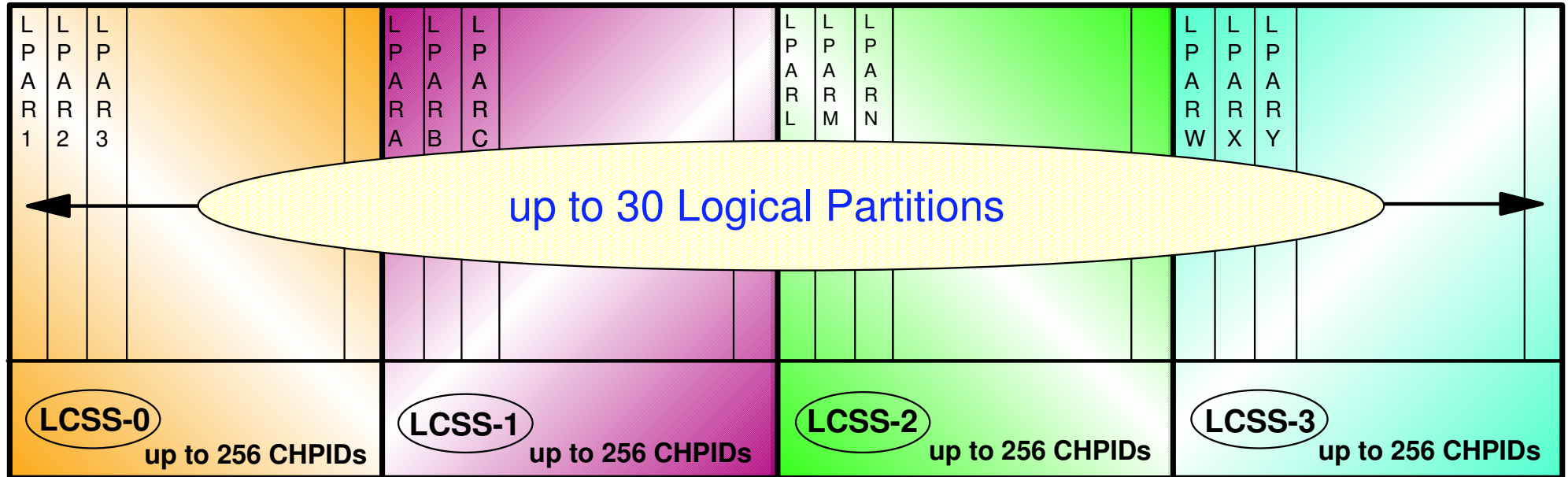


- ❑ 1 or 2 Logical Channel SubSystems (LCSS)
- ❑ Up to 15 Logical Partitions per Logical Channel SubSystem / 30 per machine
- ❑ Up to 512 CHPIDs total / 256 per LCSS
- ❑ A Logical Partition uses I/O from a single LCSS
- ❑ Channel 'spanning' across 2 LCSS - except for ESCON
- ❑ Dynamic CHPID Management & CSS I/O Priority Queuing



***256 Channel limitation per OS image remains unchanged!***

# z990 Logical Channel Subsystems



- ❑ Up to 4 Logical Channel Subsystems (LCSS)
- ❑ Up to 15 Logical Partitions per Logical Channel Subsystem / 30 per machine
- ❑ Up to 1024 CHPIDs total / 256 per LCSS
- ❑ A Logical Partition uses I/O from a single LCSS
- ❑ Channel 'spanning' across multiple LCSS - except for ESCON
- ❑ DCM & I/O Priority Queuing within single LCSS for ESCON

***256 Channel limitation per OS image remains unchanged!***

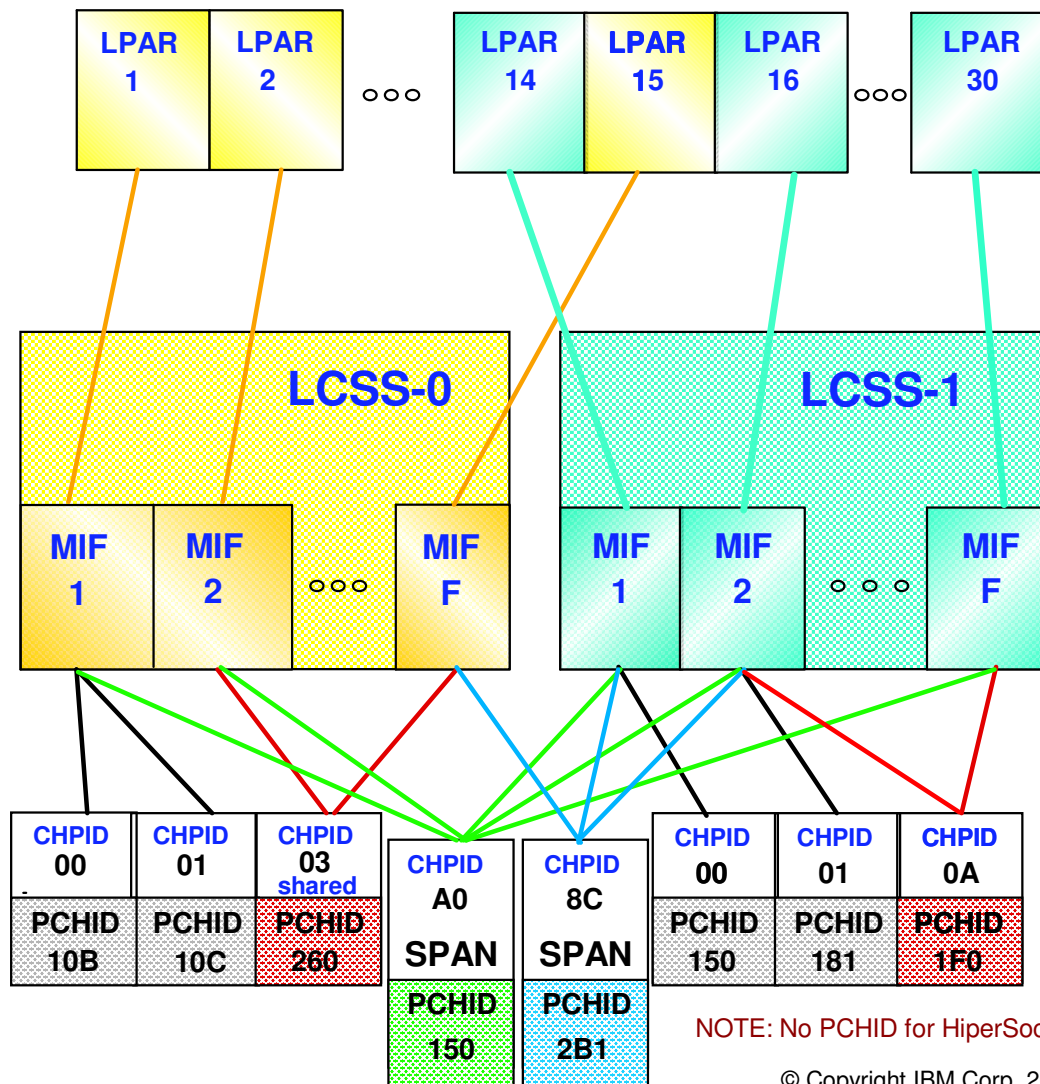
# z890/z990 LCSS

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- ❑ **Created to expand the I/O subsystem architecture**
- ❑ **Increase in customer desired configurations**
- ❑ **Additional LCSS comes into play when:**
  - ▶ More than 256 CHPIDs are needed to satisfy connectivity needs
  - ▶ More than 15 Partitions are needed in a processor
- ❑ **CHPID Sharing**
  - ▶ When a CHPID is shared between Logical Partitions in the same LCSS
- ❑ **CHPID Spanning**
  - ▶ When a CHPID needs to be shared between Logical Partitions residing in a separate LCSS

# z890/z990 CHPID Spanning



- ❑ Shared between partitions across multiple LCSSs
- ❑ Spanning for:
  - ▶ Internal spanned channels
    - HiperSockets and Internal Coupling links
  - ▶ External spanned channels \*
    - FICON Express
    - FCP
    - OSA-Express
    - OSA-Express2
    - ISC-3, ICB-3 and ICB-4
- \* ESCON and FICON Bridge will not support spanning
- ❑ CHPID numbers can be reused in different LCSSs
- ❑ CHPID numbers used for spanned channel can be reused in other non spanned LCSSs
- ❑ Spanning reduces the number of channels that can be defined per CEC
  - ▶ Worst case - 256 if all channels are spanned between all CSSs

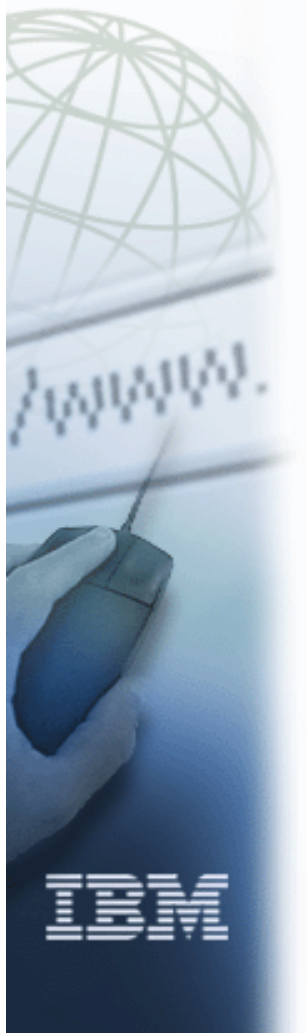
NOTE: No PCHID for HiperSockets and Internal Coupling links. It is required for FICON/OSA/External Coupling Links



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# zSeries Connectivity



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# z890 Connectivity Overview



## ❑ ESCON

## ❑ FICON/FCP

- ▶ FICON Express

## ❑ Networking

- ▶ OSA-Express2 
  - Gigabit Ethernet
  - 10 Gigabit Ethernet
- ▶ OSA-Express
  - Gigabit Ethernet
  - 1000BASE-T Ethernet
  - Token-Ring
- ▶ HiperSockets

## ❑ Coupling Links

- ▶ ISC-3
- ▶ ICB-3, ICB-4
- ▶ IC

## ❑ Crypto

- ▶ Crypto Express2 
- ▶ PCICA
- ▶ PCIXCC

## ❑ Not Supported

(previously supported by G5, G6 or Mprise 3000)

- ▶ Parallel Channels
- ▶ OSA-E ATM and OSA-2
- ▶ FICON (pre-FICON Express)
- ▶ PCICC
- ▶ ICB-2
- ▶ Internal Disk
- ▶ Emulated I/O



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

# z990 Connectivity Overview



## ❑ ESCON

## ❑ FICON/FCP

- ▶ FICON Express

## ❑ Networking

- ▶ OSA-Express2
  - Gigabit Ethernet 
  - 10 Gigabit Ethernet
- ▶ OSA-Express
  - Gigabit Ethernet
  - 1000BASE-T Ethernet
  - Token-Ring
- ▶ HiperSockets

## ❑ Coupling Links

- ▶ ISC-3
- ▶ ICB-2, ICB-3, ICB-4
- ▶ IC

## ❑ Crypto

- ▶ Crypto Express2
- ▶ PCICA
- ▶ PCIXCC



## ❑ Not Supported

(previously supported by z900)

- ▶ Parallel Channels
- ▶ OSA-2
- ▶ FICON (pre-FICON Express)
- ▶ PCICC

Note: OSA-E ATM is supported in z990 as an RPQ.



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

# z890/z990 OSA-Express2

## ❑ **Newest member - 10 Gigabit Ethernet LR (long reach)**

- ▶ One port per feature
- ▶ 9 micron single mode fiber, **SC Duplex connector**

## ❑ **New - Gigabit Ethernet features**

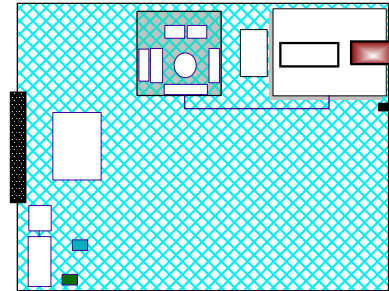
- ▶ Gigabit Ethernet LX (Long wavelength)
  - 9 micron single mode fiber, LC Duplex connector
- ▶ Gigabit Ethernet SX (Short wavelength)
  - 50 or 62.5 micron multimode fiber, LC Duplex connector

## ❑ **Support offered by both 10 GbE and GbE:**

- ▶ Queued Direct Input/Output (QDIO) for TCP/IP traffic only
  - Use TN3270E or Enterprise Extender for SNA traffic
- ▶ Layer 2 support for flexible and efficient data transfer
- ▶ 640 TCP/IP stacks for improved virtualization
- ▶ Large send for CPU efficiency
- ▶ Concurrent LIC update to minimize network traffic disruption
  - increased card memory to facilitate concurrent applications

## ❑ **CHPID type for all features and functions listed is OSD**

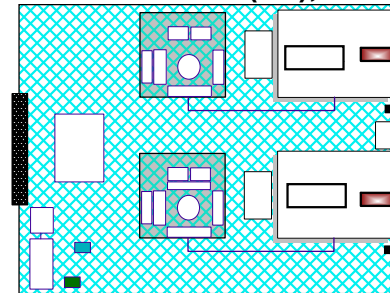
10 Gigabit Ethernet  
Feature 3368



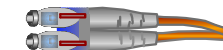
SC Duplex SM



Gigabit Ethernet  
Features 3364 (LX), 3365 (SX)



LC Duplex SM



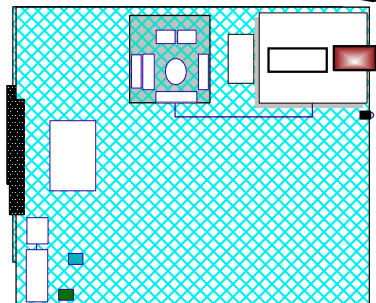
LC Duplex MM

# z890/z990 OSA-Express2/OSA-Express new build offerings

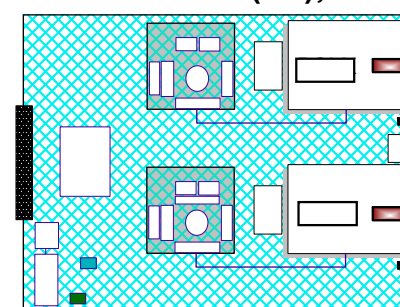


- ❑ Up to 48 network connections - z990
- ❑ Up to 40 network connections - z890
  - ▶ 24 on z890 capacity setting 110
- ❑ Choose from **5** features
- ❑ **OSA-Express2** (shown on previous slide)
- ❑ **OSA-Express**
  - ▶ 1000BASE-T Ethernet (10/100/1000 Mbps)
    - Same Category 5 **copper** as Fast Ethernet
  - ▶ Token Ring (4/16/100 Mbps)
    - Category 5 **copper**
    - z890 and z990 will be the last family of Servers to offer TR
- ❑ **Modes of Operation for 1000BASE-T Ethernet, Token-Ring**
  - ▶ QDIO = TCP/IP traffic only
    - TN3270 or Enterprise Extender for SNA traffic
  - ▶ Non-QDIO = TCP/IP and/or SNA/APPN/HPR

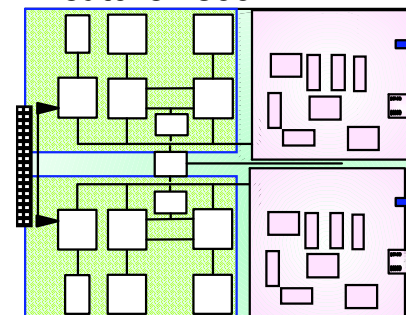
10 Gigabit Ethernet  
Feature 3368



Gigabit Ethernet  
Features 3364 (LX), 3365 (SX)



Ethernet (1000BASE-T)  
Feature 1366



Token Ring  
Feature 2367



# z890/z990 OSA-Express upgrade offerings



❑ Each feature has two identical ports \*

## ❑ Gigabit Ethernet LX

- ▶ 9 micron single mode **fiber**
- ▶ # 1364 uses LC Duplex connector
- ▶ # 2364\*\* uses SC Duplex connector

## ❑ Gigabit Ethernet SX

- ▶ 50 or 62.5 micron multimode **fiber**
- ▶ # 1365 uses LC Duplex connector
- ▶ # 2365\*\* uses SC Duplex connector

## ❑ 1000BASE-T Ethernet (10/100/1000 Mbps)

- ▶ Category 5 **copper**

## ❑ Fast Ethernet\*\* (10/100 Mbps)

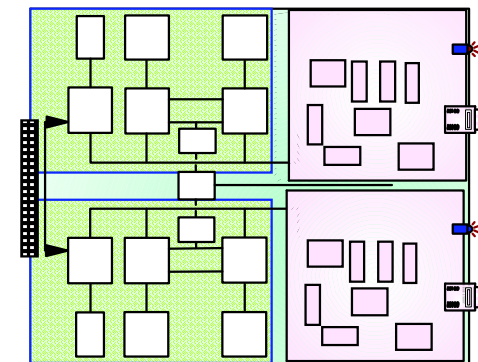
- ▶ Category 5 **copper**

## ❑ Token Ring (4/16/100 Mbps)

- ▶ Category 5 **copper**

## ❑ Modes of Operation

- ▶ QDIO for all = TCP/IP traffic only
  - TN3270 or Enterprise Extender for SNA traffic
- ▶ Non-QDIO = TCP/IP and/or SNA/APPN/HPR
  - 1000BASE-T Ethernet (also see following slide)
  - Token-Ring



Gigabit Ethernet LX  
Features 2364, 1364

Gigabit Ethernet SX  
Features 2365, 1365

1000BASE-T Ethernet  
Feature 1366

Fast Ethernet  
Feature 2366

Token Ring  
Feature 2367

\* Actual throughput is dependent upon customer environment

\*\* Only available when carried forward with an upgrade

# z890/z990 OSA-Express 1000BASE-T Ethernet



❑ Supports auto-negotiation: 10, 100, 1000 Mbps

❑ Capable of achieving line speed \*

## ❑ Modes of operation

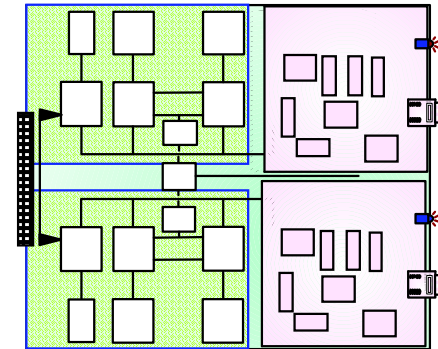
Mode	CHPID Type	Description
QDIO	OSD	TCP/IP traffic
Non-QDIO	OSE	TCP/IP and/or SNA/APPN/HPR traffic
OSA-ICC	OSC	3270 data streams

## ❑ OSA - ICC:

- ▶ Supports TN3270E (RFC 2355) and non-SNA DFT 3270 emulation
- ▶ 120 sessions per port

## ❑ When configured at 1 Gbps

- ▶ Operates in full duplex mode only
- ▶ Operates in QDIO mode or non-QDIO mode
- ▶ Can carry SNA/APPN/HPR traffic (non-QDIO mode)
- ▶ Can carry TCP/IP packets (QDIO or non-QDIO mode)
- ▶ Supports jumbo frames in QDIO mode (8992 byte frame size)



Ethernet  
(1000BASE-T)  
Feature 1366

\* Actual throughput is dependent upon customer environment



## OSA-Express2 / OSA-Express - Layer 2 Support z/VM 5.1

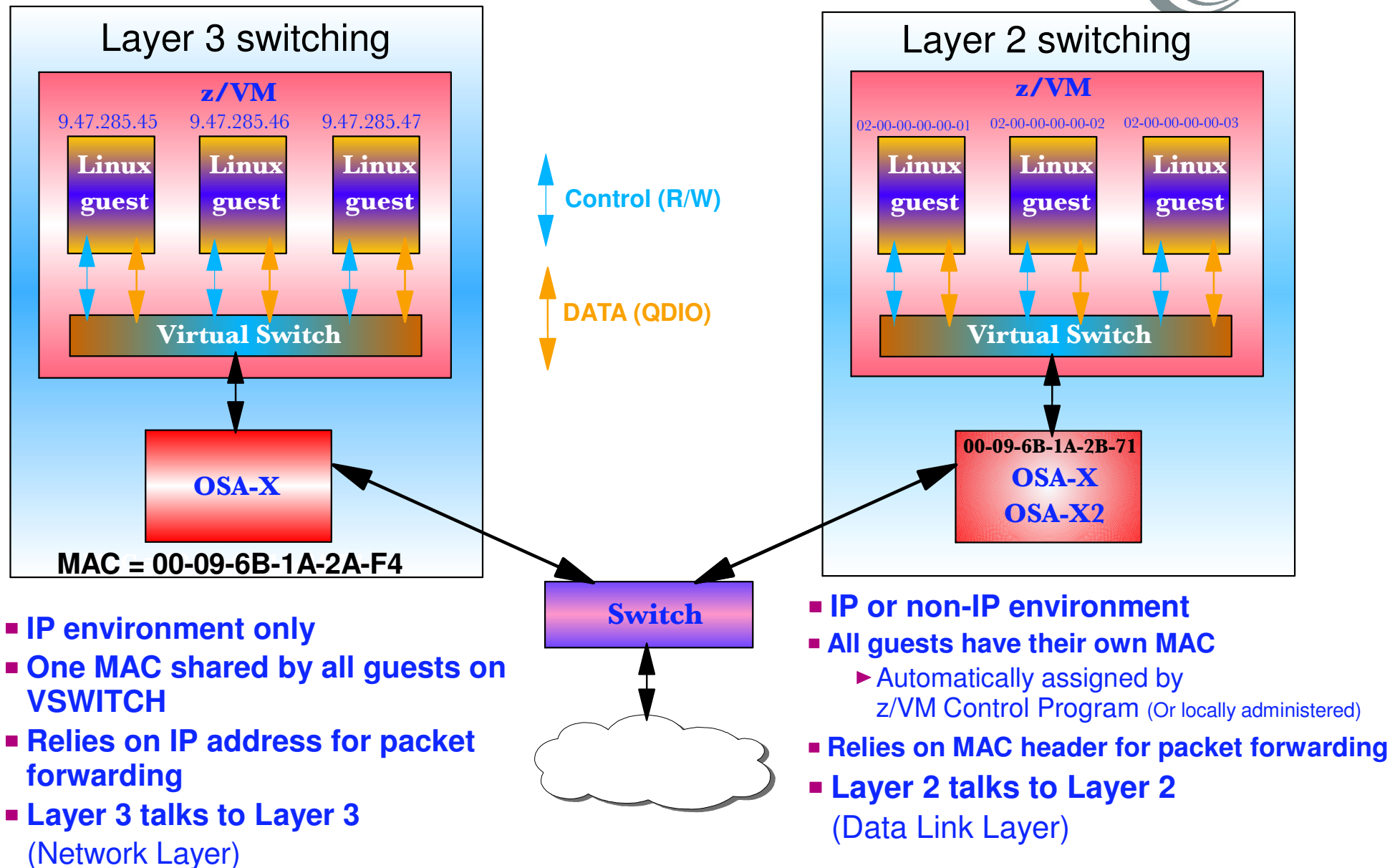


- ❑ **OSA-Express2, OSA-Express, and z/VM VSWITCH**  
now support **Link Layer** (Layer 2) transport mode
- ❑ **Now protocol-independent and Layer-3-independent**
  - ▶ Each guest has a virtual hardware connection
    - Each has a unique Media Access Control (MAC) address
  - ▶ Can support IP and non-IP based protocols
    - IP (IPv4 or IPv6)
    - Non-IP (such as AppleTalk, DECnet, IPX, NetBIOS, SNA)
- ❑ **z/VM VSWITCH**
  - ▶ Performs protocol-independent Ethernet switching
  - ▶ Authorizes and manages guest connections and IEEE 802.1q VI assignments
  - ▶ Provides flexible and automatic MAC address generation and assignment ensuring uniqueness within and across z/VM images, LPARs, server
- ❑ **Supported by z/VM V5.1 (available 12/03/04) on Linux for zSeries**





# Before (Layer 3) and after (Layer 2)

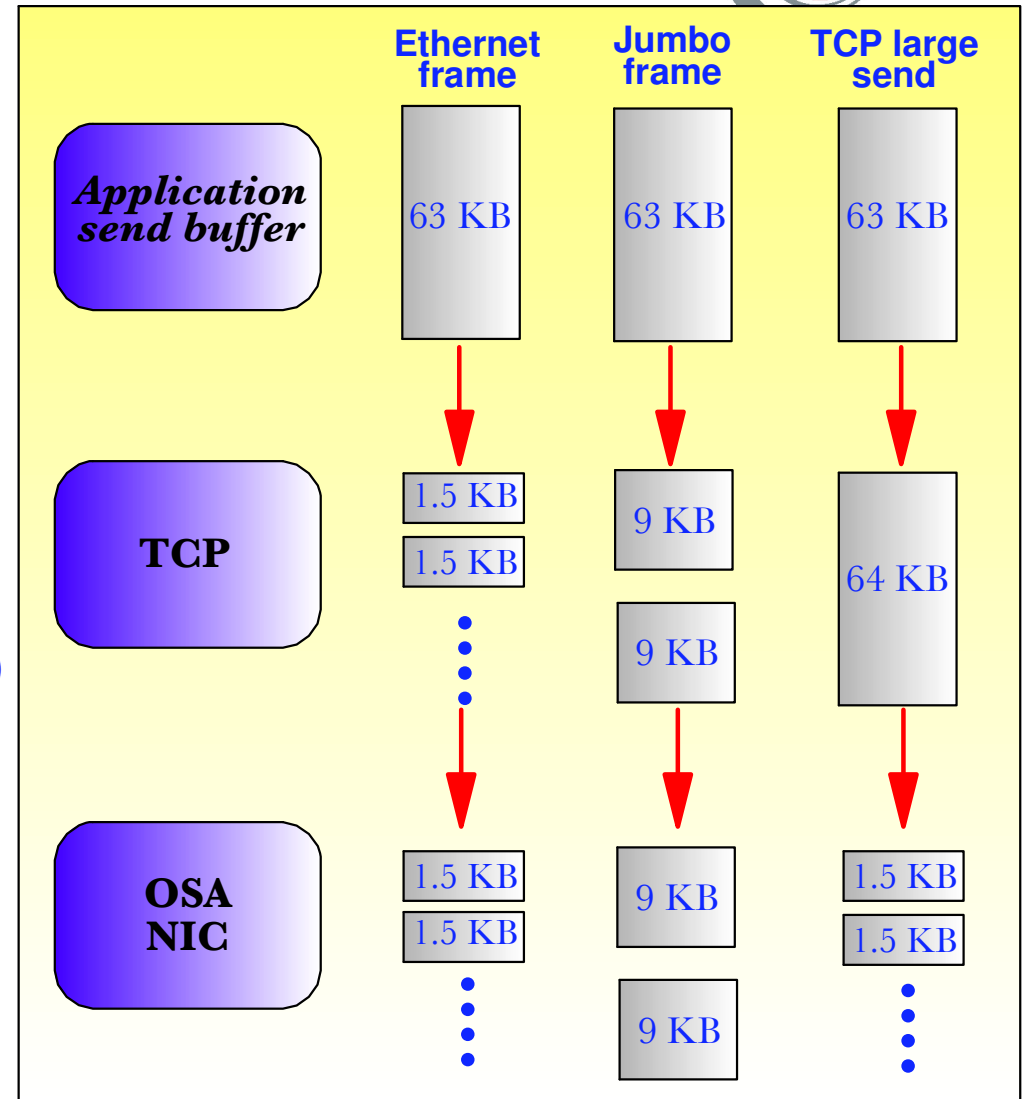


# Large Send for TCP/IP traffic

## (TCP segmentation offload) for CPU efficiency



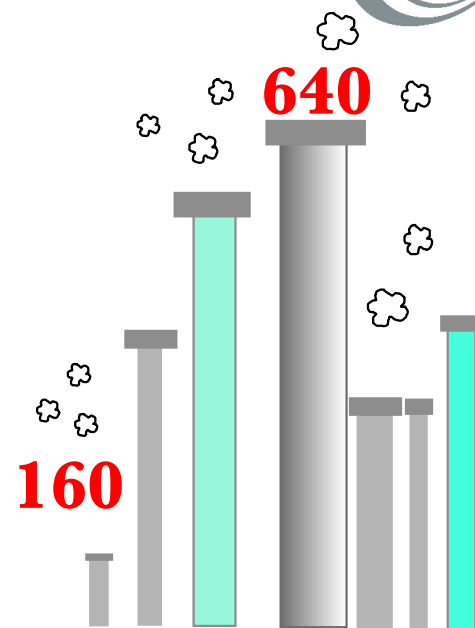
- ❑ OSA-Express2 (GbE and 10 GbE)
- ❑ Segmentation of IP packets done by OSA NIC, not IP stack
- ❑ Offloads the TCP segmentation processing from host TCP/IP stack
- ❑ Host code path length reduced
- ❑ **Sends 64 kilobyte (KB) blocks to OSA**
- ❑ Processing performed by OSA NIC
  - IP/TCP checksum processing
  - TCP packet processing
  - Sends out 1.5 KB packets (1492 byte)
- ❑ For outbound traffic only
- ❑ For IPv4, IPv6
- ❑ For unicast datagrams
- ❑ QDIO mode only (CHPID type OSD)
- ❑ Supported only by Linux on zSeries



# 640 TCP/IP stacks for improved virtualization



- ❑ **Exclusive to OSA-Express2**
  - 640 TCP/IP stacks per OSA-Express2 port/CHPID
- ❑ **For hosting more images on zSeries**
- ❑ **Reduces the number of OSA features required to host multiple images**
- ❑ **Exclusive to OSA-Express2 (GbE, 10 GbE)**
  - QDIO mode only (CHPID type OSD)
- ❑ **Supported by**
  - z/OS and z/OS.e V1.6 with PTF
  - z/VM V5.1
  - Linux on zSeries



	S/390 G5/G6	z900 Dec 00	z900 Oct 01	zSeries May 02	z990 June 03	z990,z890 Oct 04 OSA-Express	z990,z890 Jan 05 OSA-Express2
<b>OSD</b>							
Subchannels per stack	3	3	3	3	3	3	3
IP Stacks per port/CHPID on server	15	80	80	80	160	160	640 *
Subchannels per port	240	240	240	240	480	480	1920 *
IP stacks per LPAR	15	80	80	80	84	160	640 *
Devices per LPAR	240	240	240	240	254	480	1920 *
Maximum Control Units Supported	1	1	1	1	1	16	16

\* If multiple priorities for queues is enabled (one to four QDDIO priorities) the maximum remains at 160 stacks/480 devices

# OSA Express2 / OSA Express Limits



	S/390 G5/G6	z900 Dec 00	z900 Oct 01	zSeries May 02	z990 June 03	z990,z890 Oct 04 OSA-Express	z990,z890 Jan 05 OSA-Express2
Ports per feature (on G5/G6 #5201 had 2 ports)	1	2	2	2	2	2	GbE = 2 10 GbE = 1
Features per system	12	12	12	12	24	24	24
CHPIDs port	1	1	1	1	1	1	1
<b>IP</b>							
Home IP Addresses (IPv4+IPv6+DVIPA) per port	512	512	2048	2048	2048	2048	4096
Max Multicast addresses (IPv4+ IPv6)	64	64	64	1024	1024	1024	2048
ARP table Size *	512	2048	8192	8192	8192	8192	16384
<b>SNA</b>							
PUs per port	2,048	4096	4096	4096	4096	4096	4096
<b>OSE</b>							
Subchannels per stack	2	2	2	2	2	2	2
Devices	240	240	240	240	240	240	240
IP Stacks per port/CHPID on system	120	120	120	120	120	120	120
<b>OSD</b>							
Subchannels per stack	3	3	3	3	3	3	3
IP Stacks per port/CHPID on server	15	80	80	80	160	160	640 (1)
Subchannels per port	240	240	240	240	480	480	1920 (1)
IP stacks per LPAR	15	80	80	80	84	160	640 (1)
Devices per LPAR	240	240	240	240	254	480	1920 (1)
Maximum Control Units Supported	1	1	1	1	1	16	16

\* Note: The ARP table's capacity limits equals the sum of the IPv4 Home Addresses, plus the IPv6 Home Addresses, plus the IPv4 Multicast Addresses, plus the IPv6 Multicast Addresses, and plus the IPv4 Remote Addresses stored in the table.

\*\* OSA-Express2 10 Gigabit Ethernet has one port per feature.

(1) If multiple priorities for queues is enabled (one to four QDDIO priorities) the maximum remains at 160 stacks/480 devices

# zSeries OSA connectors and cables



Feature Code	Feature Name	Connector Type	Cable Type	Comments
2362	OSA-Express 155 ATM SM	SC Duplex	9 micron SM	z900, z800, z990 RPQ
2363	OSA-Expresss 155 ATM MM	SC Duplex	50, 62.5 micron MM	z900, z800, z990 RPQ
2364	OSA-Express GbE LX	SC Duplex	9 micron SM	z900, z800 z990, z890 upgrade only
2365	OSA-Express GbE SX	SC Duplex	50, 62.5 micron MM	z900, z800 z990, z890 upgrade only
2366	OSA-Express Fast Ethernet	RJ-45	Category 5 UTP	z900, z800 z990, z890 upgrade only
2367	OSA-Express Token Ring	RJ-45	STP or UTP	zSeries
1364	OSA-Express GbE LX	LC Duplex	9 micron SM	z990, z890
1365	OSA-Express GbE SX	LC Duplex	50, 62.5 micron MM	z990, z890
1366	OSA-Express 1000BASE-T Ethernet	RJ-45	Category 5 UTP	z990, z890
3364	OSA-Express2 GbE LX	LC Duplex	9 micron SM	z990, z890
3365	OSA-Express2 GbE SX	LC Duplex	50, 62.5 micron MM	z990, z890
3368	OSA-Express2 10 GbE LR	SC Duplex	9 micron SM	z990, z890

MM = Multimode fiber      SM = Single mode fiber

2364, 2365, 2366 can be brought forward on an upgrade from z900, z800. They have been replaced by 1364, 1365, 1366 for new builds. When 3364 and 3365 become available they replace 1364 and 1365.

# Minimum Software Requirements



Feature/Function	z/OS	z/VM	VSE/ESA	TPF	Linux on zSeries
OSA-Express2 GbE	V1.3	V3.1, 4.3	V2.6	4.1	Current dist.
OSA-Express2 10 GbE LR	V1.3	V3.1, 4.3	V2.6	4.1	Early 05 drop
Stack utilization improvement (OSA-Express)	V1.6 *	V3.1, 4.3 *	--	--	--
Checksum offload for IPv4 (OSA-Express, OSA-Express2)	V1.5	--	--	--	SLES8&9, TLES8, CLEE
Layer 2 (OSA-X, OSA-X2)	--	V5.1	--	--	Oct 04 drop (2.4) Early 05 drop (2.6)
640 TCP/IP stacks (OSA-X2)	V1.6 *	V5.1 *			Early 05 drop
Large send (OSA-X2)	--	--	--	--	Early 05 drop

Always check PSP buckets. PTFs may be required. Refer to announcement letters for applicable APARs.

Refer to the online sales manual for a complete list of software prerequisites at <http://www-3.ibm.com/common/ssi/OIX.wss>

z/OS implies z/OS.e (offered on z800,z890 only). z/OS.e began with V1.3

Linux on zSeries current distributions = SUSE SLES 8, Red Hat RHEL 3.0, Turbolinux TLES 8, and Conectiva CLEE

\* PTFs required

# OSA Express evolution...



	G5/G6 Jun 99	G5/G6 Jan 00	z900 Mar 01 GA1	z900 Oct 01 GA2	zSeries May 02 z900GA3	z990 Jun 03 GA2	z890 z990 May 04 GA3	z890 z990 Jan 05 GA4
<b>OSA-Express features</b>								
Gigabit Ethernet LX and SX	X	>	>	>	>	>	>	>
Fast Ethernet (10/100 Mbps)		X	>	>	>	>	>	>
Token Ring (4/16/100 Mbps)				X	>	>	>	>
1000BASE-T Ethernet (10/100/1000 Mbps)						X	>	>
<b>Functions</b>								
OSA/SF Java GUI						X	>	>
48 network connections z990, 40 on z890						z990	z890	>
Spanned channels							X	>
<b>OSA-Express2 features</b>								
10 Gigabit Ethernet LR								X
Gigabit Ethernet LX and SX								X

# OSA Express evolution...



	G5/G6 Jan 2000	z900 March 2001 GA1	z900 October 2001 GA2	zSeries May 2002 z900GA3	z990 June 2003 GA2	z890 z990 May 04 GA3
<b>OSE (non-QDIO, SNA and / or TCP/IP)</b>						
IPv4, Broadcast, Multicast, VIPA (manual)	X	>	>	>	>	>
SNMP (via OSA/SF), SNA (LSA), TCP/IP (LCS)	X	>	>	>	>	>
SNA at 1 Gbps over copper (1000BASE-T Ethernet)					X	>
Direct SNMP for LCS (z/OS V1.6)						X
<b>OSD (QDIO, TCP/IP Only)</b>						
IPv4, Multicast, VIPA (Dynamic)	X	>	>	>	>	>
SNMP (via OSA/SF) QDIO and non-QDIO	X	>	>	>	>	>
Primary/Secondary Routers	X	>	>	>	>	>
VLAN (Priority Tagging); 10/100/1000 Ethernet		X	>	>	>	>
ARP Query		X	>	>	>	>
IPv6 for 10/100/1000 Ethernet				X	>	>
VLAN for 10/100/1000 Ethernet (IEEE 802.1q)				Linux	>	>
ARP Query and ARP Purge entire cache for IPv4				X	>	>
Broadcast support for RIP V1, Direct SNMP subagent				X	>	>
Direct SNMP subagent + Get,GetNext, z/OS				z/OS V1.4	>	>
Multiple Secondary Routers for 10/100/1000 Ethernet				Aug 02	>	>
Adapter interruptions, zVM and Linux					X	>
Performance assist for V=V guests, z/VM					X	>
Checksum offload for IPv4 packets					X	>



# OSA Express2 / OSA Express



	zSeries May 2002	z990 June 2003	Oct. 2003 GA2	z890 z990 May 04 GA3	z890 z990 Oct 04 GA4	z890 z990 Jan 05
<b>OSD (QDIO, TCP/IP Only)</b>						
160 TCP/IP stacks per port		<b>X</b>	>	>	>	>
VLAN support (IEEE 802.1q), z890 z990		z/OS V1.5 z/VM V4.4	>	Linux	>	>
Intrusion Detection Services enhancements		z/OS V1.5	>	>	>	>
SNMP dot3StatsTable, 10/100/1000 Ethernet		<b>X</b>	>	>	>	>
Port name relief, zSeries			<b>X</b>	>	>	>
Full VLAN (IEEE 802.1q) for z/OS on z800, z900			<b>X</b>	>	>	>
SNMP, performance data. 10/100/1000 Ethernet		z990	z800 z900	>	>	>
Direct SNMP subagent support for Traps, Set				<b>X</b>	>	>
Stack utilization improvement (OSA-Express)					<b>X</b>	>
Layer 2 (OSA-Express, OSA-Express2)					OSA-X	OSA-X2
640 TCP/IP stacks (OSA-Express2)						<b>X</b>
Large send (OSA-Express2)						<b>X</b>
Concurrent LIC update (OSA-Express2)						<b>X</b>
<b>OSC (Integrated Console Controller, OSA-ICC)</b>						
TN3270E, Non-SNA DFT 3270 emulation 1000BASE-T Ethernet feature only				<b>X</b>	>	>
120 console sessions per port				<b>X</b>	>	>

# **zSeries – ESCON Director Model 005**

---



## **❑ ESCON Director 9032-005 - end of marketing**

- ▶ December 31, 2004
- ▶ Withdraws the 9032-005 and ALL features. (No IBM replacement)

## **❑ Statement of Direction - Hardware Management Console (HMC)**

- ▶ Beginning with the next zSeries server, after the IBM zSeries 890 and 990, all new HMCs on all currently marketed zSeries servers are intended to become closed platforms. They will support only the HMC application and not the installation of other applications, such as the IBM ESCON Director and the IBM Sysplex Timer console applications.
- ▶ When available, the next-generation HMC is expected to communicate only with G5 Servers and above (Multiprise 3000, G5/G6, z800, z900, z890, z990).
- ▶ TCP/IP is intended to be the only communications protocol supported.

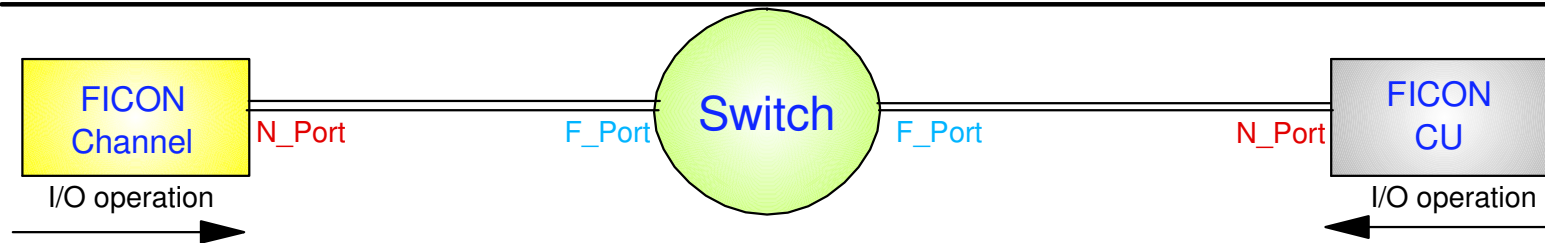
## **❑ Action required if using HMC as Console for ESCON Director**

- ▶ To support the ESCON Director console application, it is recommended that each ESCON Director has a console, other than an HMC
- ▶ Order any console features (FC 5900) needed before the end of marketing
- ▶ Last date for ordering - December 30, 2004

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

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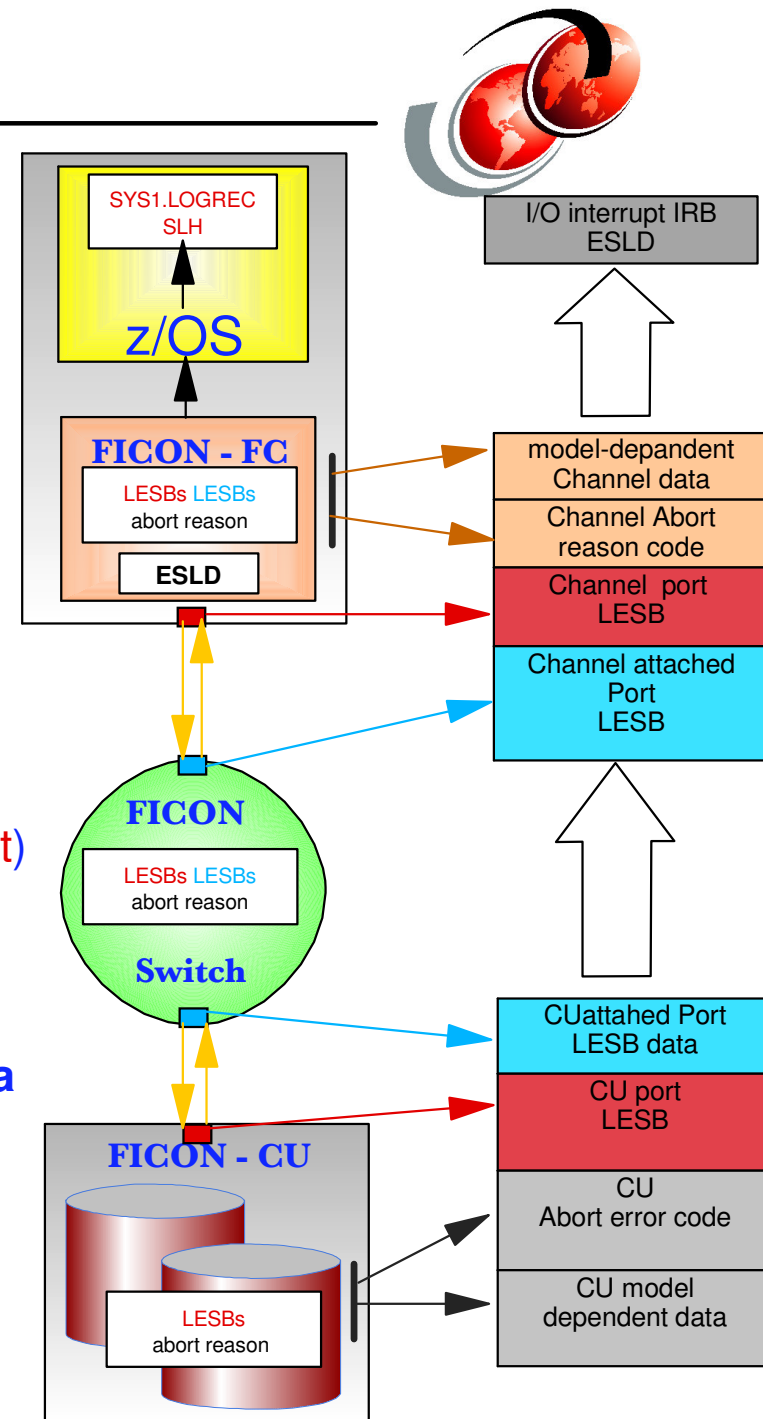
# z890/z990 FICON Enhancements




- ❑ Typical FICON topology is switched point-to-point
- ❑ Twin fiber optical connection between FICON channel **N\_Port** FICON switch **F\_Port**
- ❑ Twin fiber optical connection between FICON switch **F\_Port** and CU **N\_Port**
- ❑ Serial frame is checked at each of the ports for error conditions
- ❑ Most fibre channel errors are indicated at the z/OS host as IFCCs
  - When an IFCC is detected, the FICON I/O operation is aborted by the channel or CU, by sending an abort sequence
  - FICON channel purge path sequence eliminates any outstanding IUs in the CU that are part of the failing operation
- ❑ **PROBLEM:**
  - **No centric point for link error data collection**

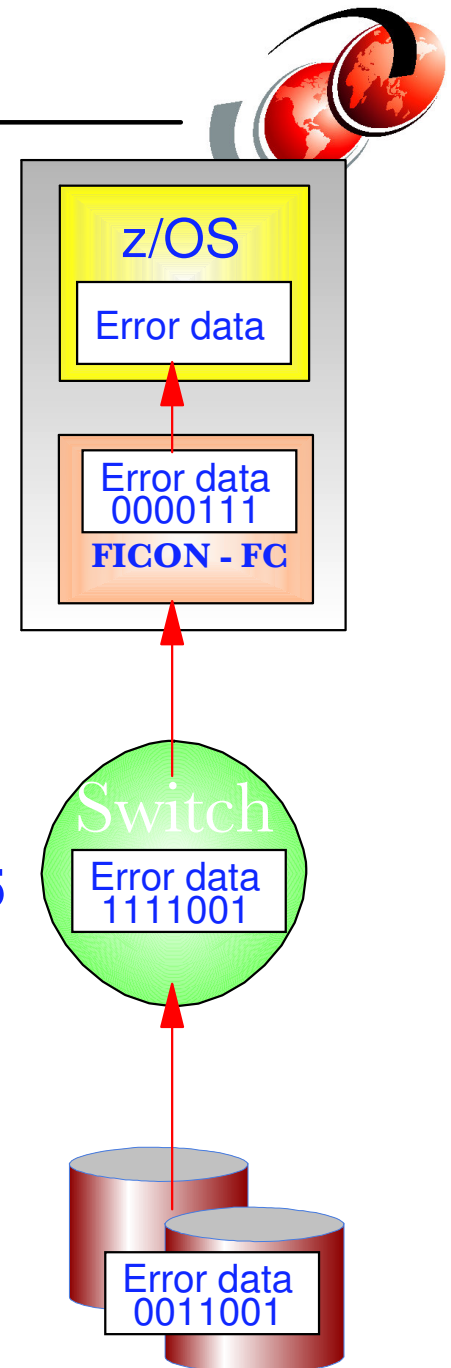
# FICON purge path extended

- ❑ **The FICON channel purge path extended**
  - Initiates when an FICON I/O operation is aborted
  - at the end of the abort sequence
- ❑ **Control Unit aborts I/O operation**
  - LESBs - Link Error Statistical Buffer
  - FICON channel requests LESBs / abort reason from CU N\_Port
  - requests CU neighbor LESBs (the switch F\_Port)
  - requests CU abort reason
  - the channel will have all 4 port LESBs
- ❑ **FICON channel aborts I/O operation**
  - FICON channel request its own LESBs (the channel N\_Port)
  - requests its neighbor LESBs (the switch F\_Port)
  - builds its own abort reason code
  - the channel will have all 4 port LESBs
- ❑ **Subchannel informs z/OS about the additional logout data**
  - uses the new Extended Subchannel Logout Data (ESLD)
  - includes a logout token at I/O interrupt time
  - z/OS gets ESLD from channel subsystem using token
  - ESLD stored as an SLH record in SYS1.LOGREC



# FICON purge path extended

- ❑ Enhanced FICON problem determination 
- ❑ Error-recovery function is extended
  - ▶ Reported in EREP (SYS1.LOGREC)
- ❑ Exclusive to z990 and z890
- ❑ Supported by z/OS and z/OS.e V1.4, and later, with PTFs for APAR 0A06846 and EREP APAR IR51695
- ❑ Available on selected control units / FICON directors
  - ▶ Contact CU / director vendor for specifics on this feature



# FCP LUN Access Control

Preview



## ❑ FCP Channel sharing

- When multiple Linux images share an FCP channel, all images have connectivity to all devices that are connected to the FCP fabric. Because the Linux images all share the same FCP channel, each image uses the same WWPN to enter the fabric (and thus becomes indistinguishable from the other Linux images that share the channel).

## ❑ Zoning and LUN masking

- cannot effectively create appropriate access controls among the Linux images.

## ❑ One FCP channel per Linux Image

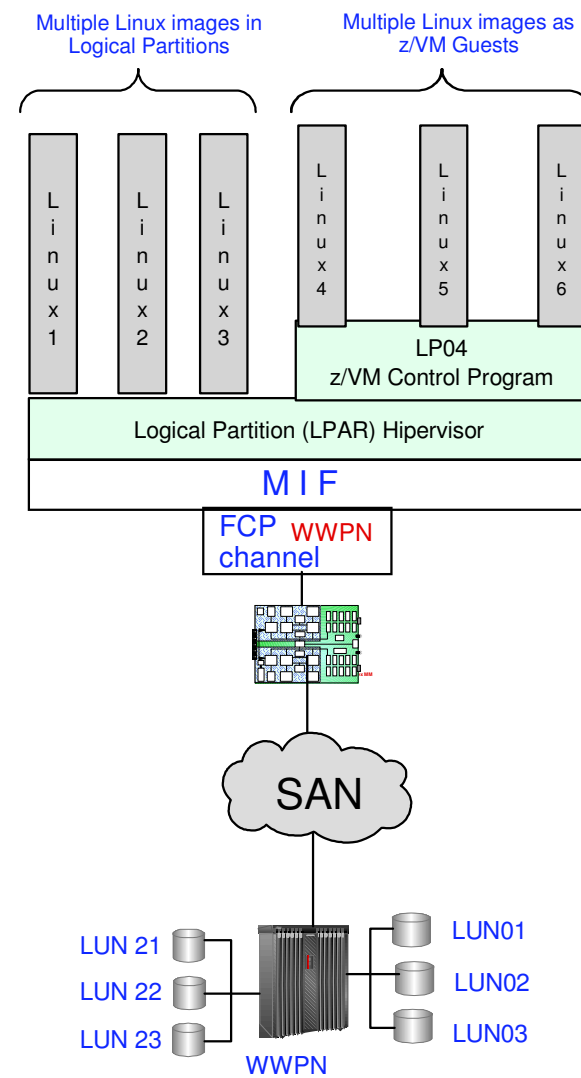
- avoid data share exposures  
also needs appropriate switch zoning, LUN masking, or both

## ❑ Device sharing among logical partitions

- Need a separate channel for each logical partition.  
In order for two or more operating system to share concurrent access to a single device LUN, each of these operating systems will have to access this device through a different zSeries FCP channel.

## ❑ Using a shared channel

- Although multiple operating systems can concurrently access the same remote Fibre Channel port via a single FCP channel, Fibre Channel devices (identified by their LUNs) can only be serially reused.



# FCP LUN Access Control

---



- ❑ Provides host-based improved LUN Access control where multiple operating systems run on the same system and share access to the server I/O paths.
- ❑ Enables Server I/O Virtualization by helping to reduce the number of FCP adapters required.
- ❑ Permits FCP channel sharing plus explicit definitions to individual LPARs
  - Uses a Configuration Utility
    - Access Control Table
      - ✓ describes access rights to devices by individual operating systems
      - ✓ XML format
      - ✓ Package containing: documentation, samples and XML skeletons
    - Download from Resource Link
      - ✓ <http://www.ibm.com/servers/resourcelink/>
      - ✓ <http://www10.software.ibm.com/developerworks/opensource/linux390>
- ❑ Exclusive to z990, z890 - CHPID type FCP only
  - When available will be supported by:
    - ✓ z/VM V4.4, and later, with PTF for APAR VM63328
    - ✓ Linux on zSeries

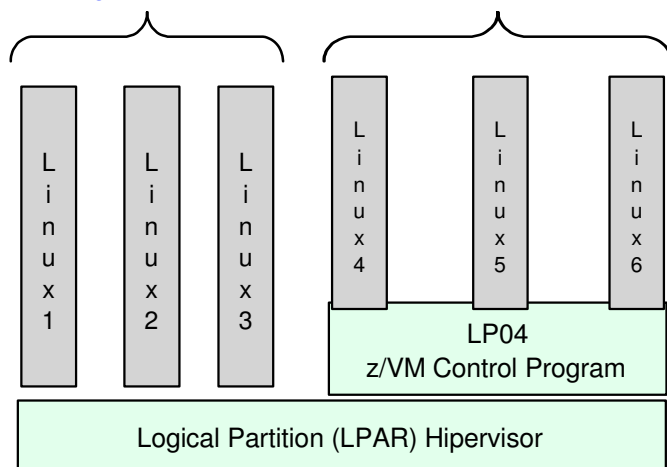
# z890/z990 FCP LUN access control

Preview



Multiple Linux images in  
Logical Partitions

Multiple Linux images as  
z/VM Guests



## → Without FCP LUN access control

- Any Linux guest can communicate with any LUN on a first-come, first-serve basis.

## → With FCP LUN access control

- Can specify separate permissions for z/VM and each Linux guest.
- Allows LUNs on disk controllers to be shared in read-only mode as well as read/write access.
- Provides improved security and access protection.

### With FCP LUN Access Control

Channel "policies" accesses  
for OSs sharing an FCP

LP04 Linux4  
- WWPN3 LUN01 read/write access  
LP04 Linux5  
- WWPN3 LUN02 read/write access

### LUN masking and zoning

Access to controller ports and  
devices (LUNs) is controlled by  
zoning (in switches) and  
LUN masking (in controllers),  
based on identity of host  
adapter (WWPN).



# FICON feature and function introduction



<b><i>Feature / Function - first introduction</i></b>	<b><i>Availability Date</i></b>
<a href="#">24 FICON LX Bridge (FCV), G5</a>	March 31, 1999
MIF (Multiple Image Facility)	Standard (Limited for FCP)
FICON LX Native (FC), G5/G6	August 31, 1999
<a href="#">36 FICON channels</a> on G6	June 30, 2000
FICON LX, z900, <a href="#">96 channels</a> , 2 ports	December 18, 2000
FICON SX, G5/G6, z900	March 30, 2001
FICON Express LX, SX, CTC, z900	October 31, 2001
FICON Express, 2 Gbps, z900, z800	August 13, 2002
Cascaded Directors	January 31, 2003
FCP, z900 and z800	February 20, 2003
FICON/FCP Intermix	March 31, 2003
FICON Express - 2 Gbps, <a href="#">120 channels</a> , z990 CHPID types FCV, FC	June 16, 2003
Availability of FCP on z990	October 31, 2003
FCP SAN management - supports HBA APIs	October 31, 2003
FCP - IPL of OS from SCSI disk #9904 on z990	October 31, 2003
FICON Express, 2 Gbps, z890	May 28, 2004
FICON Express spanned channels	May 28, 2004
FICON performance improvement - 15% increase in 4k SIOs (8300)	May 28, 2004
FCP concurrent patch	May 28, 2004
FICON purge path extended	October 29, 2004
FCP LUN Access Control (PREVIEW)	October 29, 2004

# z890 Connectivity Summary



Maximum of 512 CHPIDs, 28 I/O slots in a single I/O cage (16 I/O slots on Capacity Setting 110)

z890 Feature	Per Server Minimum Features	Per Server Maximum I/O Slots used by Features	Per Server Maximum Connections	Ports/channels/ Increments per Feature	Purchase Increments
16-port ESCON	0 <sup>(1)</sup>	28 <sup>(2)</sup>	420 channels	16 channels <sup>(3)</sup>	4 channels
FICON Express	0 <sup>(1)</sup>	20 <sup>(2) (4)</sup>	40 channels	2 channels	1 feature
STI-3 (5) ICB-3 link	0 0 <sup>(1)</sup>	8 N/A	N/A 16 links <sup>(6)</sup>	2 outputs N/A	N/A 1 link
ICB-4 link	0 <sup>(1)</sup>	N/A <sup>(7)</sup>	8 links <sup>(6)</sup>	N/A	1 link
ISC-3	0 <sup>(1)</sup>	12 <sup>(2)</sup>	48 links <sup>(6) (8)</sup>	4 links	1 link
OSA-Express2	0	20 <sup>(2) (4)</sup>	40 ports	<b>2 or 1 (10 GbE has 1)</b>	1 feature
OSA-Express *	0	20 <sup>(2) (4)</sup>	40 ports	2 ports	1 feature
Crypto Express2	0	8 <sup>(4) (10)</sup>	16 coprocessors	2 coprocessors	1 feature <sup>(9)</sup>
PCICA **	0	2 <sup>(4) (10)</sup>	4 accelerator cards	2 accelerator cards	1 feature
PCIXCC **	0	4 <sup>(4) (10)</sup>	4 coprocessors	1 coprocessor	1 feature <sup>(9)</sup>

1. A minimum of one I/O feature (ESCON, FICON Express) or one Coupling Link (ICB, ISC-3) is required.
2. The capacity setting 110 has the following maximums: ESCON - 16 features (240 channels), FICON Express - 16 features, ISC-3 = 6 features (24 links), OSA-Express2/OSA-Express - 12 features (all features combined cannot exceed 16 features)
3. Each ESCON feature has 16 channels of which 15 channels may be activated. One channel is always reserved as a spare.
4. The maximum quantity of FICON Express, OSA-Express2, OSA-Express, Crypto Express2, PCICA, and PCIXCC features in combination cannot exceed 20 features per server (16 features for capacity setting 110).
5. Each STI-3 distribution card, which supports the ICB-3s, resides in the I/O cage, occupying one I/O slot.
6. The maximum number of Coupling Links combined (ICs, ICB-3s, ICB-4s, and active ISC-3 links) cannot exceed 64 per server.
7. ICB-4s do not require connectivity to a card in the I/O cage. ICB-4s are not included in the maximum feature count for I/O slots.
8. A maximum of 32 ISC-3s can be defined in compatibility mode (operating at 1 Gbps, instead of 2 Gbps).
9. Crypto Express2 and/or PCIXCC feature minimum is 0 or 2.
10. The maximum quantity of Crypto Express2, PCICA, and PCIXCC features cannot exceed eight features per server.

\* When OSA-Express2 GbE becomes available the OSA-Express GbE features are no longer orderable.

\*\* No longer orderable when new features become available © Copyright IBM Corp. 2004. All rights reserved.

# z990 GA4 Connectivity Summary



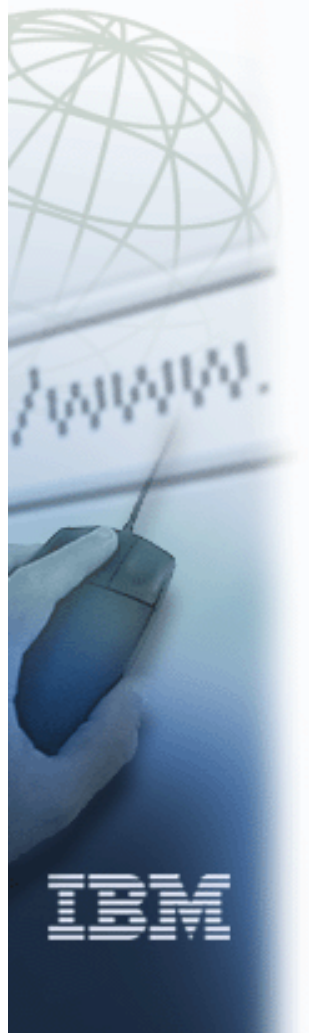
z990 Feature	Per Server Minimum Features	Per Server Maximum I/O Slots used by Features	Per Server Maximum Connections	Ports/channels/ Increments per Feature	Purchase Increments
16-port ESCON	0 <sup>(1)</sup>	69 <sup>(2)</sup>	1024 channels <sup>(2)</sup>	16 channels <sup>(3)</sup>	4 channels
FICON Express	0 <sup>(1)</sup>	60 <sup>(2) (4)</sup>	120 channels	2 channels	1 feature
STI-2 (5) ICB-2 link	0 0 <sup>(1)</sup>	4 N/A	N/A 8 links <sup>(6)</sup>	2 outputs N/A	N/A 1 link
STI-3 (5) ICB-3 link	0 0 <sup>(1)</sup>	8 N/A	N/A 16 links <sup>(6)</sup>	2 outputs N/A	N/A 1 link
ICB-4 link	0 <sup>(1)</sup>	N/A <sup>(7)</sup>	16 links <sup>(6)</sup>	N/A	1 link
ISC-3	0 <sup>(1)</sup>	12	48 links <sup>(6) (8)</sup>	4 links	1 link
OSA-Express2 GbE, 10 GbE	0	24 <sup>(4) (9)</sup>	48 ports	2 or 1 (10 GbE has 1)	1 feature
OSA-Express *	0	24 <sup>(4) (9)</sup>	48 ports	2 ports	1 feature
Crypto Express2	0	8 <sup>(4) (10)</sup>	16 coprocessors	2 coprocessors	1 feature <sup>(12)</sup>
PCICA **	0	6 <sup>(4) (10) (11)</sup>	12 accelerator cards	2 accelerators	1 feature
PCIXCC **	0	4 <sup>(4) (10)</sup>	4 coprocessors	1 coprocessor	1 feature <sup>(12)</sup>

1. A minimum of one I/O feature (ESCON, FICON Express) or one Coupling Link (ICB, ISC-3) is required.
2. Maximum of 48 ESCON features (720 active channels) on Model A08, 48 FICON Express features on A08
3. Each ESCON feature has 16 channels of which 15 channels may be activated. One channel is always reserved as a spare.
4. The maximum quantity of FICON Express, OSA-Express2, OSA-Express, Crypto Express2, PCICA, and PCIXCC features in combination cannot exceed 20 features per I/O cage and 60 features per server.
5. The STI distribution cards, which support ICB-2 and ICB-3, reside in the I/O cage. Each STI distribution card occupies one I/O slot.
6. The maximum number of Coupling Links combined (ICs, ICB-2s, ICB-3s, ICB-4s, and active ISC-3 links) cannot exceed 64 per server.
7. ICB-4s do not require connectivity to a card in the I/O cage. ICB-4s are not included in the maximum feature count for I/O slots.
8. A maximum of 32 ISC-3s can be defined in compatibility mode (operating at 1 Gbps, instead of 2 Gbps).
9. The maximum quantity of OSA-Express2 and OSA-Express features cannot exceed 24 features per server.
10. The maximum quantity of Crypto Express2, PCICA, and PCIXCC features cannot exceed eight features per server.
11. The maximum quantity of PCICA features cannot exceed two features per I/O cage.
12. Crypto Express2 and/or PCIXCC feature minimum is 0 or 2.

\* When OSA-Express2 GbE becomes available the OSA-Express GbE features are no longer orderable.

\*\* No longer orderable when new features become available. © Copyright IBM Corp. 2004. All rights reserved.

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# OSA ICC Integrated Console Controller



## Redbooks

International Technical Support Organization

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# z890/z990 OSA Integrated Console Controller



## ❑ Console Controller for z890 and z990

- System Console (IPL) and operations support for multiple LPARs

## ❑ Supports Ethernet- attached TN3270E emulated sessions

## ❑ Exclusive to new or installed OSA-Express 1000BASE-T Ethernet (FC 1366)

- RJ45 Ethernet LAN attachment
- New CHPID type OSC required
- One or Both ports can be configured for ICC
- OSA-ICC delivered with May, 2004, server LIC
- Up to 120 console sessions per port
- CHPID type OSC can be defined as a spanned
  - Shared among LPARs across LCSSs

## ❑ LAN Connectivity

- LAN-attached consoles running TN3270E clients
  - non-SNA DFT data streams to TN3270E
  - Capable of operating at 10, 100, or 1000 Mbps (1 Gbps)
- Uses RJ-45 connection to category 5 Unshielded Twisted Pair (UTP) copper cabling

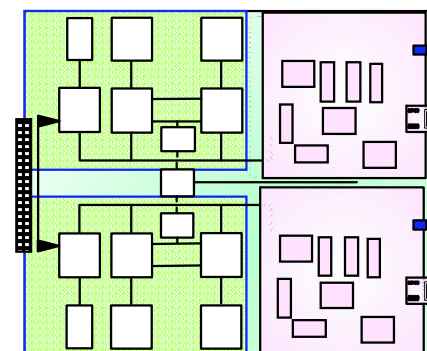
## ❑ Configuration support via Support Element (SE) and Hardware Management Console (HMC)

## ❑ Minimum software:

- z/OS V1.3 or z/OS.e V1.3 (z890) with PTF for APAR OA05738
  - HCD with PTF for APAR OA03689
- z/VM V4.4 with PTF for APAR VM63405
- VSE/ESA V2.6, TPF 4.1
- No Linux support

## ❑ Can coexist in configurations using prior IBM 2074 models and older 3174 controllers

Ethernet  
(1000BASE-T)  
Feature 1366



# OSA-ICC Configuration steps

---



## 1. Operating system

- z/OS NIP console - HCD
- z/OS MCS console - CONSOLExx member
- z/OS VTAM local non-SNA DFT 3270 - VTAM majnode
- z/VM IPL console - system config

## 2. zSeries I/O subsystem - HCD / IOCP

- RESOURCE PARTITION: LCSS ID, logical partition name, MIF ID, MAXDEV
- CHPID: LCSS ID, Path, SHARED, Access/Candidate list, PCHID, OSC
- CNTLUNIT: CU number, LCSS ID, Path, OSC, 254 devices
- IODEVICE: Address range 120 devices, CU Number, 3270-X

## 3. OSA-Express feature

- OSA-ICC Server: Name, Host IP, TCP port, gateway, mask, N/W type, MTU
- OSA-ICC Sessions: LCSS, MIFID, Device, LU name, IP addr, DHD/RM/RTO
- LAN speed/mode: 10/100/1000 Mbps, full/half duplex

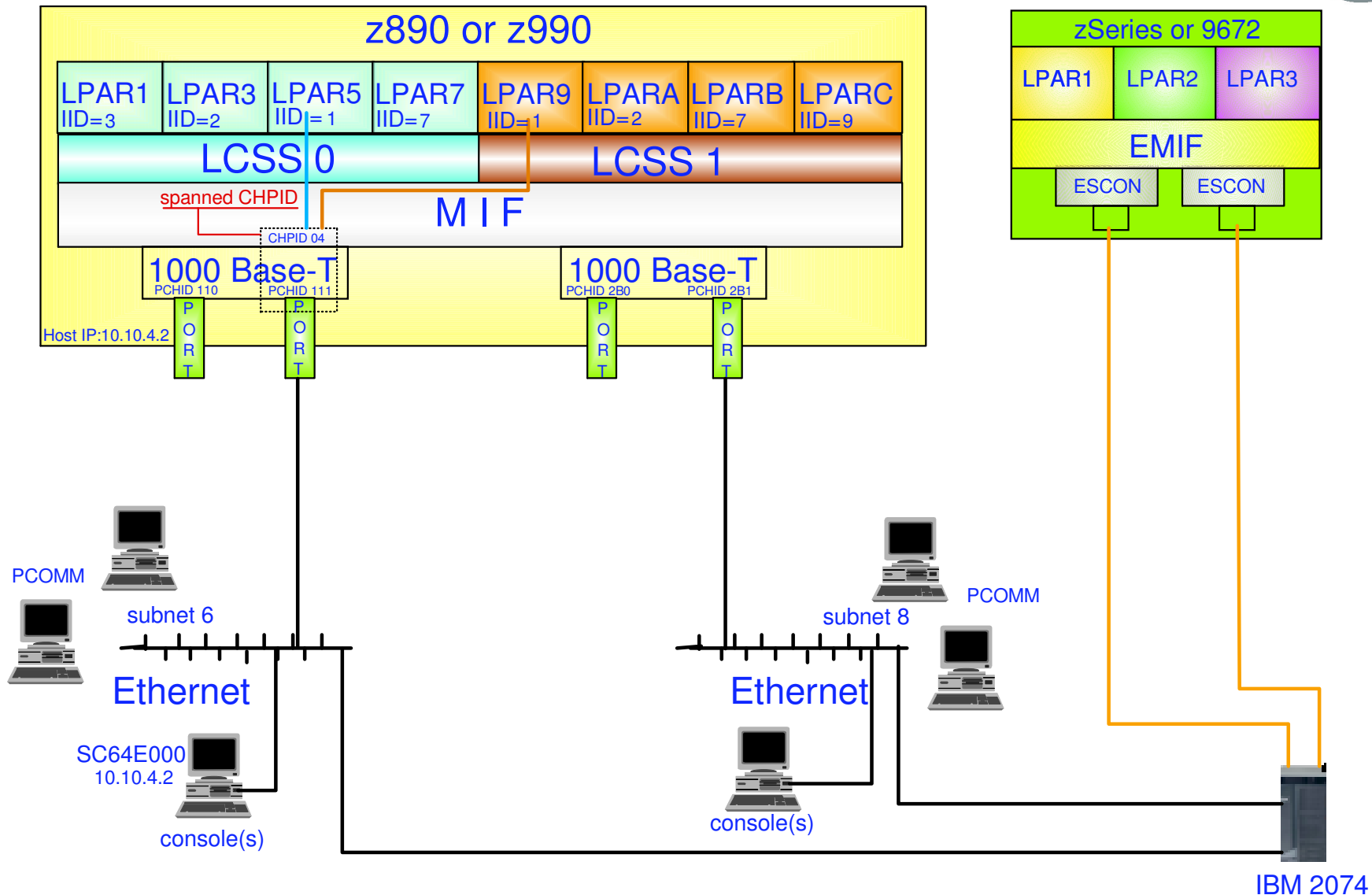
## 4. Ethernet LAN

- N/W type, MTU size, IP addresses, switches, routers, VLANs, VPNs

## 5. Client TN3270E

- Client Workstation: IP address, gateway, mask, speed/mode
- Client TN3270E: Host IP, TCP port, LU name, session type, auto-reconnect

# OSA-ICC Integrated Console Controller





# IOCP Statements

---



## RESOURCE

```
PARTITION=((CSS(0),(LPAR1,3),(LPAR3,2),(LPAR5,1),(LPAR7,7)),  
CSS(1)(LPAR9,1),(LPARA,3),(LPARB,7),(LPARC,9))),  
MAXDEV=((CSS(0),64512),(CSS(1),64512))
```

```
CHPID PATH=(CSS(0,1),04),SHARED,  
PARTITION=((CSS(0),(LPAR5),(=)),(CSS(1),(LPAR9),(=))  
PCHID=111,TYPE=OSC
```

```
CNTLUNIT CUNUMBR=E000,PATH=((CSS(0),04)),UNIT=OSC
```

```
IODEVICE ADDRESS=(E000,120),MODEL=X,CUNUMBR=(E000),UNIT=3270
```



# OSA ICC Port Setup using HMC/SE



**SCZHM5: Hardware Management Console Workplace (Version 1.8.2)**

**Views**

Groups Exceptions Active Tasks Console Actions Task List Books

**Defined CPCs Work Area**

SCZP702 SCZP801 **SCZP901** (1)

**CPC Operational Customization**

Hardware Messages Configure Channel Path On/Off

Operating System Messages Reassign Channel Path

Customize/Delete Activation Profiles (2) OSA Advanced Facilities

Customize Activity Profiles Enable I/O Priority Queuing

Change LPAR I/O

**OSA Advanced Facilities**

Please select a channel ID and press OK.

Channel ID	Channel Type
0110	OSC
0111	OSC
0120	OSD
0121	OSD
0180	OSD
0181	OSD
0190	OSD
0191	OSE

(3)

**Standard Channel Advanced Facilities**

Channel ID: 0111 Channel Type: OSC Description: Fast Ethernet PCI-X

Select an action.

☒ Card specific advanced facilities... (4)

☐ View code level

☐ Card Trace/Log/Dump facilities...

☐ Reset to defaults...

OK Cancel

- 1 using HMC/SE select the Processor
- 2 dbl click on OSA Advanced Facilities in CPC Operational Customization
- 3 select the OSA ICC (OSC) PCHID then click OK
- 4 select the:  
Card specific advanced facilities as shown, then OK

# Entering Server Configuration ...



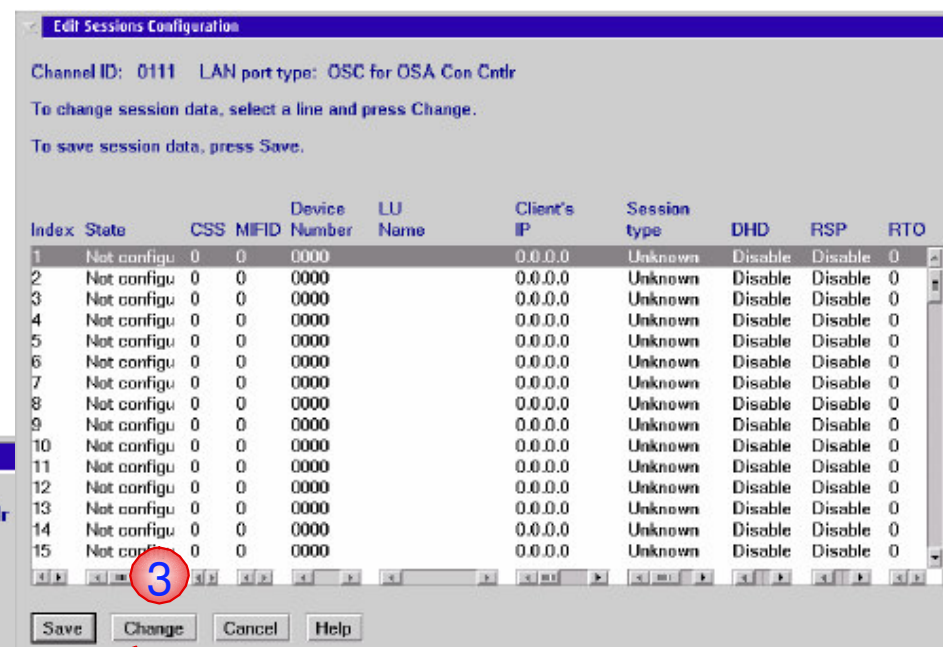
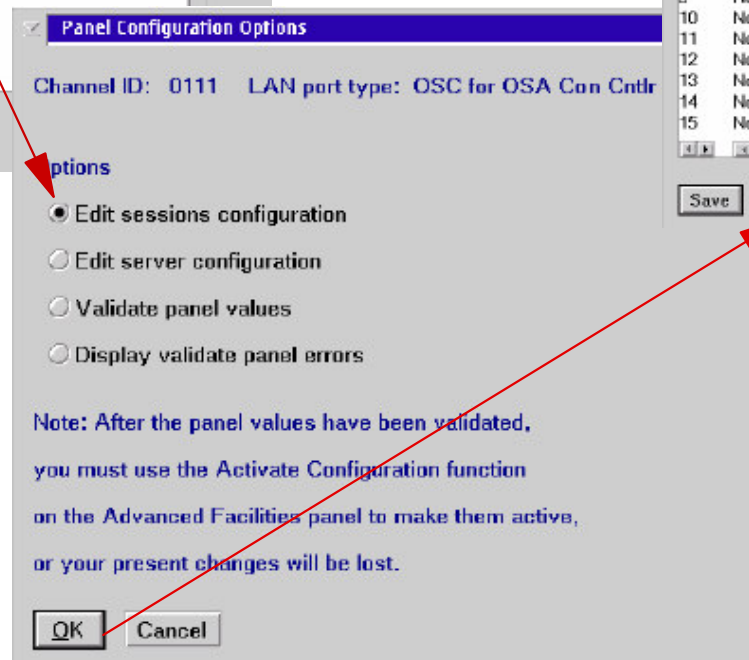
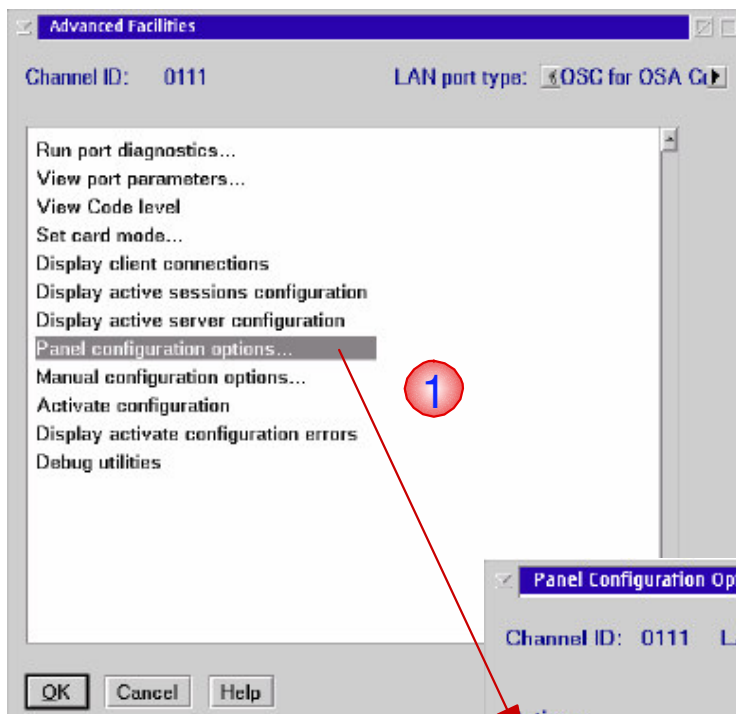
The image shows two overlapping windows from an IBM software interface. The 'Advanced Facilities' window on the left has a menu with 'Panel configuration options...' highlighted. A red arrow points from this menu item to the 'Panel Configuration Options' window. In this second window, the 'Edit server configuration' radio button is selected. A red arrow points from this button to the 'Edit Server Configuration' window on the right. This third window contains fields for Channel ID (0111), LAN port type (OSC for OSA Con Cntr), Server Name (OSCE000), Host IP Address (10.10.4.2), TCP Port (1024), Default Gateway (10.10.4.1), Subnet Mask (255.255.255.0), and Frame type (DIX). Red circles with numbers 1, 2, and 3 are placed near the respective steps in the instructions.

1 in the Adv Facilities panel, select: "Panel configuration options"

2 Select "Edit Server Configuration" then OK

3 Enter the Server (port) information in this panel, then select OK

# Sessions Configuration (1 of 2)



- 1 Again, select "Panel configuration options"
- 2 In the "Panel Configuration Options", select "Edit sessions configuration"
- 3 Select the session to be changed then press "Change"

# Sessions Configuration (2 of 2)



- 1 "Change" option will take you to the "Edit session configuration" data entry panel
- 2 Enter the information required and press "OK"
- 3 Select the next session to be changed then press "Change"
- 4 When all definitions are made, you can "Save", then validate and export your configuration

The screenshot shows the 'Edit Sessions Configuration' window. The top panel displays a list of sessions with columns: Index, State, CSS, MIFID, Device Number, LU Name, Client's IP, Session type, DHD, RSP, and RTO. The bottom panel shows the configuration details for session 1.

**Session List:**

Index	State	CSS	MIFID	Device Number	LU Name	Client's IP	Session type	DHD	RSP	RTO
1	Available	1	1	E000	SC64E000	10.10.10.2	Op Console	Enable	Enable	10
2	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
3	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
4	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
5	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
6	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
7	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
8	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
9	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
10	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
11	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
12	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
13	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
14	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10
15	Not configu	0	0	0000		0.0.0.0	TN3270	Disable	Disable	10

**Session Configuration Details:**

Channel ID: 0111 LAN port type: OSC

Session Index: 1

Session State: Not configured

CSS Value: 1

MIFID: 1

Device Number: E000

LU Name: SC64E000

Client's IP Address: 10 . 10 . 10 . 2

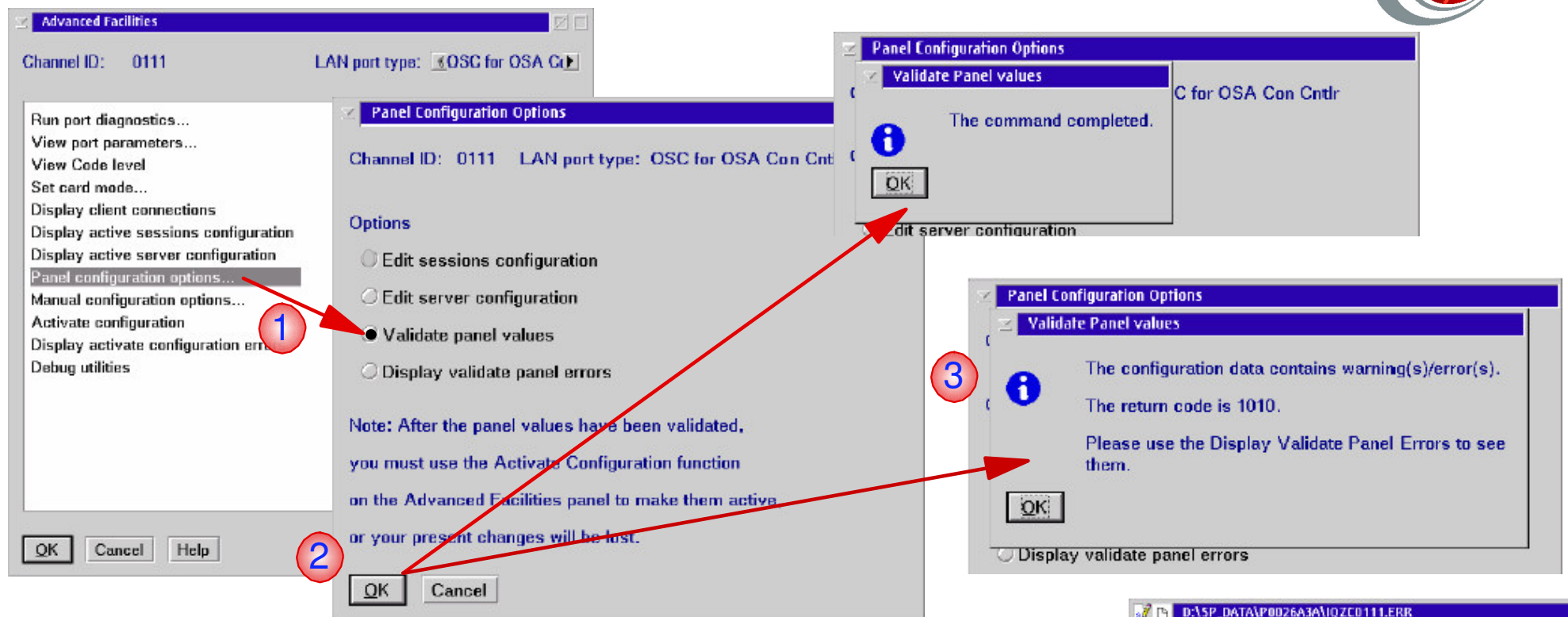
Session Type: ☐ TN3270 ☒ Operator console ☐ printer

Defer Host Disconnect: ☐ disable ☐ enable with defaulted deferment of 60 seconds ☐ enable with no timeout for deferment ☒ enable with user specified defaulted deferment of:

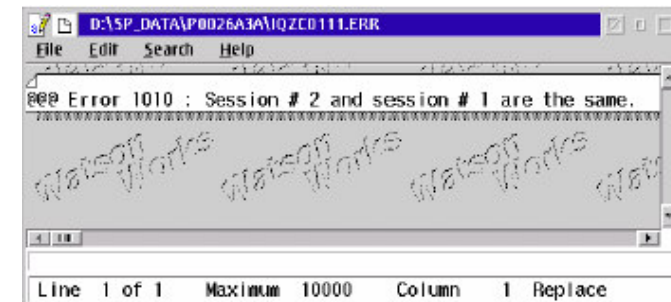
Buttons: Save, Change, Cancel, Help, OK, Delete Session



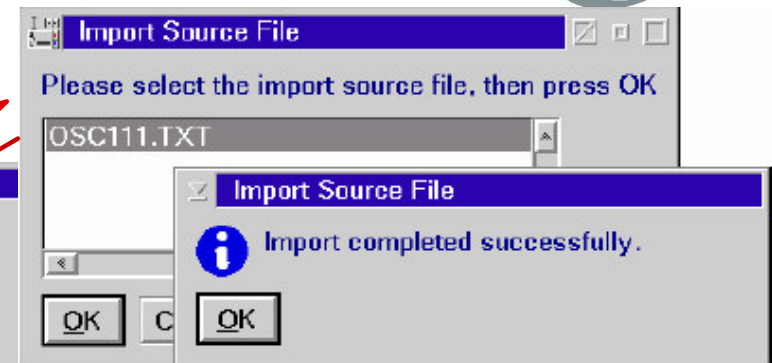
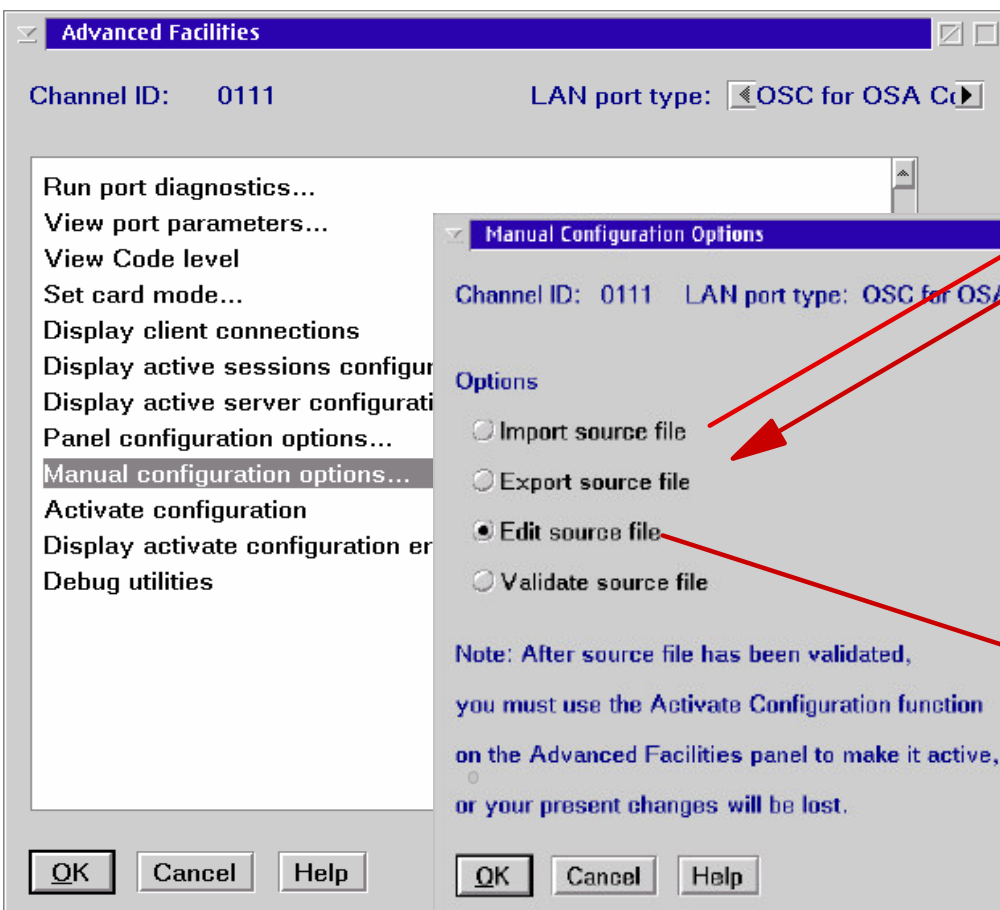
# Validating your configuration



- 1 Select "Validate panel values" to verify your configuration
- 2 Select "OK"
- 3 The configuration entered is checked and the results are displayed as shown



# Import/Export Configuration files



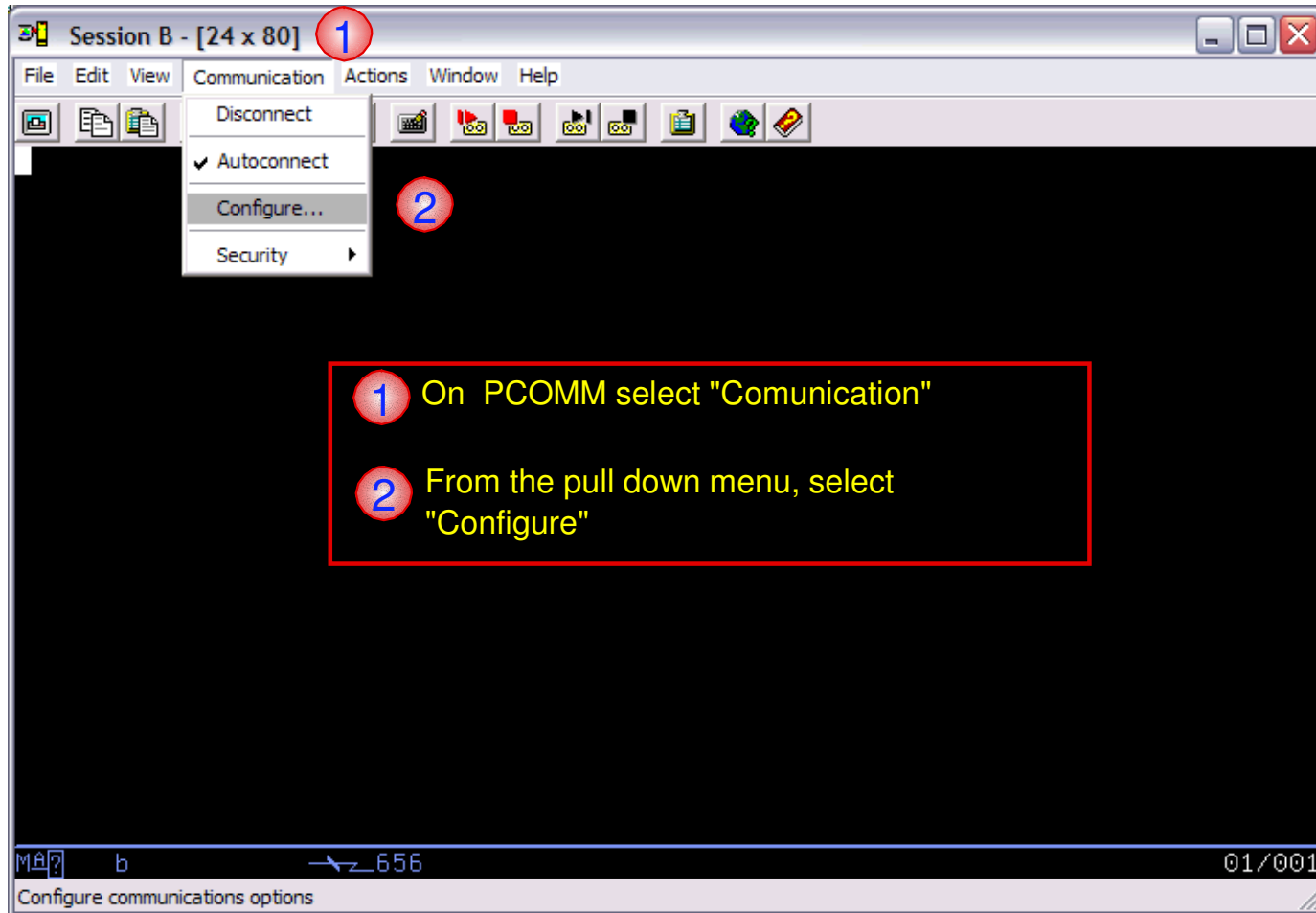
```
// This file has been generated from the binary file D:\POKCODE\IQZC0111.HUL

<OSC_SERVER>
HOST_IP= 10.10.4.2
DEFAULT_GATEWAY= 10.10.4.1
SUBNET_MASK= 255.255.255.0
PORT= 1024
ETHERNET_FRAME= DIX
MTU= 1492
NAME= OSCE000
</OSC_SERVER>

<CONFIG_SESSION>
<SESSION1>
CSS= 01 IID= 01 DEVICE= E000
GROUP= "SC64E000"
CONSOLE_TYPE= 2 RESPONSE= ON READ_TIMEOUT= 10
DEFER_HOST_DISCONNECT= 600
CLIENT_IP= 10.10.10.2
</SESSION1>
</CONFIG_SESSION>
```

- 1 After the configuration is saved, it can be Imported and exported (to/from a diskette)
- 2 In the "Panel Configuration Options", select "Edit sessions configuration"
- 3 Select the session to be changed then press "Change"

# PCOMM workstation configuration (1 of 3)



# PCOMM workstation configuration (2 of 3)



**Customize Communication**

Select Connection to Host

Type of Host: S/390

Interface: LAN

Attachment: Telnet3270

1

Link Parameters... Session Parameters...

Connection Overview

Interface Attachment Type of Host

LAN TCP/IP S/390

Telnet3270

- This connection provides access to an IBM System/390 host over a TCP/IP network, using TN3270 or TN3270E interface. Support for Service Location Protocol, SSL V3 secure layer encryption, load balancing and backup host is also provided.

- This selection is used in networks that typically run TCP/IP protocols.

- This connectivity can also be used to connect to a host network through a firewall which supports NVT

OK Cancel Help

1 click on "Link Parameters"



# PCOMM workstation configuration (3 of 3)



Telnet3270

Host Definition | Automatic Host Location | Advanced Security Setup

	1 Host Name or IP Address	2 LU or Pool Name	3 Port Number
Primary	10.10.4.2	SC64E000	1024
Backup 1			23
Backup 2			23

Printer Association (only valid for TN3270E Display sessions)

Associated Printer Session

Browse...

☒ Start Associated Printer Minimized

☒ Automatically close the associated printer session with this session

☒ Auto-reconnect

☐ Enable Security

4

OK Cancel Apply Help

- 1 Enter the host name or Host IP address. This field must match the Host IP address configured in the OSA-ICC server configuration
- 2 This is the LU Name for this session. The field must match the LU name defined in the corresponding OSA-ICC PCHID session configuration
- 3 This is the TCP port number used by the OSA-ICC PCHID, and workstation TN3270E session, to initially establish session communications. This port number must match the port number defined in the corresponding OSA-ICC PCHID server configuration
- 4 Press "OK" when complete

# OSC PCOMM emulation screen



- This screen will come up as a result of your configuration

The screenshot shows a window titled "Session B - [24 x 80]" with a menu bar (File, Edit, View, Communication, Actions, Window, Help) and a toolbar. The main area displays green text on a black background:

```
** OSC Index 01 connectec to OSCE000 via IP Addr 10.10.4.2:1024 **
** LT Index=00 CSSID=01 LPAR=01 CU=0 UA=00 LUName=SC54E000 **
** Type=2084-A08 Mfg=IBM SN=000000026A3A CHPID=04 Status=Active **
```

At the bottom left, there is a status bar with "MA?" and "b". At the bottom right, it shows "24/001" and "Lexmark Optra Lx plus on LPT1:".

# Getting all together



**Edit Session Configuration**

Channel ID: 0111 LAN port type: OSC for OSA Con Cntrl

Session Index: 1

Session State: Not configured

CSS Value: 1

MIFID: 1

Device Number: E000

LU Name: SC64E000

Client's IP Address: 10.10.10.2

**Edit Server Configuration**

Channel ID: 0111 LAN port type: OSC for OSA Con Cntrl

Server Name: OSCE000

Host IP Address: 10.10.4.2

TCP Port: 1024

Default Gateway: 10.10.4.1

Subnet Mask: 255.255.255.0

Frame type: ☒ DIX ☐ SNAP

**OSC Index 01 connected to OSCE000 via IP Add: 10.10.4.2:1024**

LT Index=00 CSSID=01 LPAR=01 CU=0 UA=00 LU Name=SC64E000

Type=2084-A08 Mfg=IBM SN=000000026A3A CHPID=04 Status=Active

**10.10.10.2:3861**

**Display Client Connections**

Channel ID: 0111 LAN port type: OSC for OSA Con Cntrl

Session Index	Status	MAC	Client's IP	Port	Socket Number	LT Index
1	Connected	00:04:AC:1D:4D:	10.10.10.2	3861	15	0

**telnet3270**

Host Definition | Automatic Host Location | Advanced Security Setup

Host Name or IP Address: 10.10.4.2

LU or Pool Name: SC64E000

Port Number: 1024

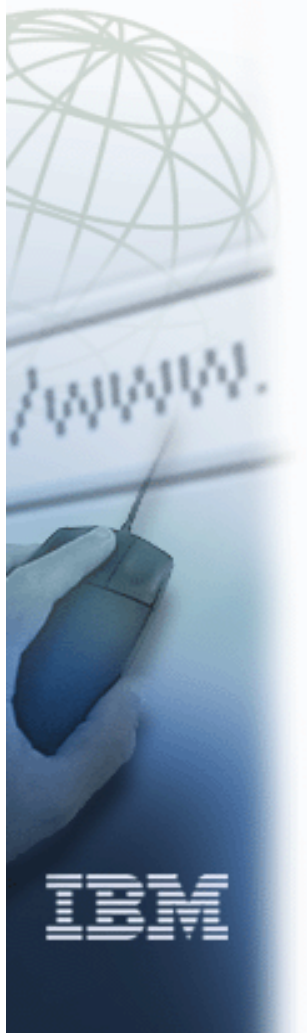
**Reference:** [OSA-Express Integrated Console Controller Implementation Guide - Redbook - SG24-6364](#)

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# zSeries Cryptography



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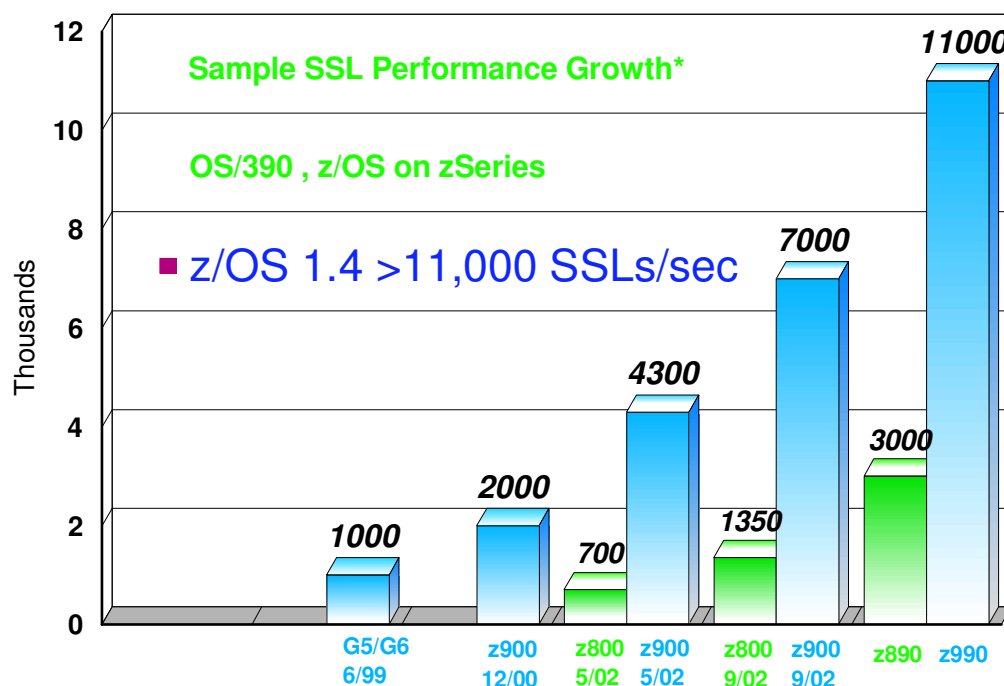
# zSeries Cryptographic Technology



- Focus on Secure Sockets Layer (SSL) encryption
- Continue to provide competitive secure symmetric performance
- Provide seamless integration of Crypto features via ICSF
- Focus on required certifications and open standards



■ Linux 13,000  
SSLs/sec\*



**z990/z890** - Planned for 1Q05  
Crypto Express2

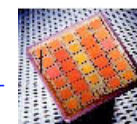
**z890** - May 2004  
PCIXCC, PCICA

**z990** - September 2003  
PCIXCC

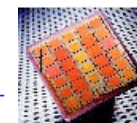
**z990** - June 2003  
CPACF, PCICA

**z900/z800** - Dec. 2000 / May 2002  
2 Chips on CEC Board - CMOS7s +  
PCICC, PCICA (10/2001)

**G6** - June, 1999  
2 Chips on  
Processor  
MCM - CMOS5x +  
PCICC (6/99)



**G5** - Sept., 1998  
2 Chips on  
Processor  
MCM - CMOS5x +  
PCICC (6/99)



**G4** - Sept., 1997  
SCMs on Planar  
Board - CMOS5x



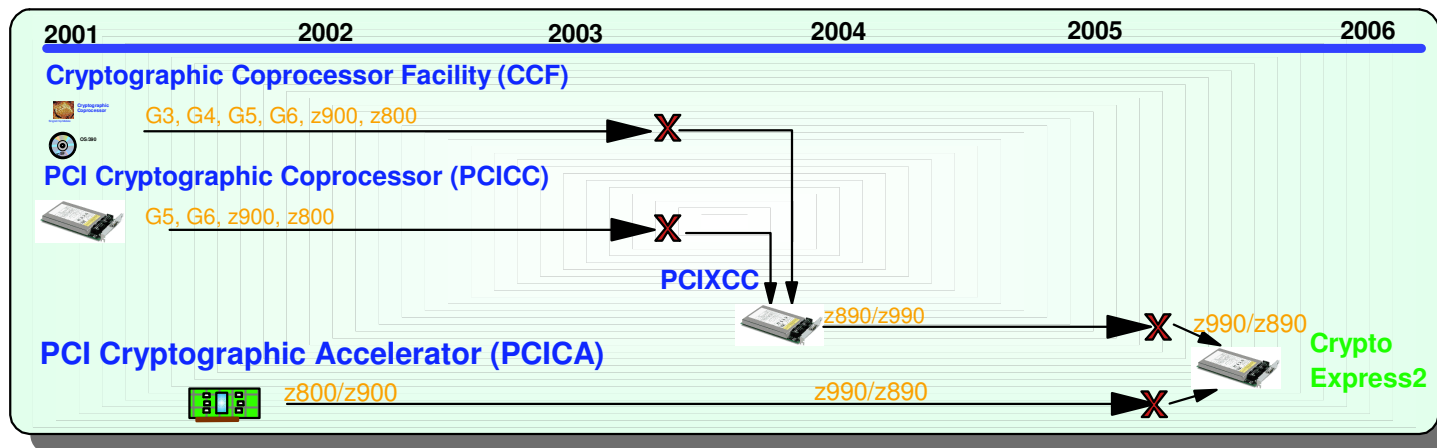
**G3** - June, 1997  
SCMs on Planar  
Board - CMOS5x



\*These measurements are examples of the maximum transactions/second achieved in a lab environment with no other processing occurring and do not represent actual field measurements. Details available upon request.



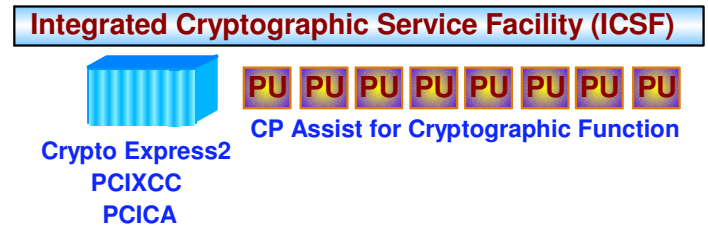
# z890/z990 Crypto Roadmap



Hardware / z/OS Crypto Support	z900/z800 9/2002	z990 9/2003	z990/z890 5/2004	z990/z890 Planned for 1Q05
Hardware	CCF PCICC PCICA	PCIXCC PCICA CPACF	PCIXCC PCICA CPACF	Crypto Express2 CPACF
z/OS (z900/z800)	z/OS V1.2 and later z.OS.e V1.3 and later			
z/OS (z990/z890)		z/OS V1.2 and later	z/OS V1.2 and later z/OS.e V1.3	z/OS V1.3 and later z/OS.e V1.3
Crypto Function	Clear key and secure key crypto	Clear key and secure key crypto	Clear key and secure key crypto	Clear key and secure key crypto

# z890/z990 CPACF

---



## ❑ CP Assist for Cryptographic Function (CPACF)

- ▶ Available on every CP
- ▶ High performance clear key symmetric encryption expected
- ▶ DES and TDES encryption/decryption, SHA-1 hashing
  - DES / TDES require no charge enablement feature
- ▶ Called via ICSF API or 5 new Problem State Instructions
- ▶ 2x or more the performance of the predecessor CMOS Cryptographic Coprocessor Facility (CCF)\*

## ❑ Prerequisite for all PCI crypto cards (FC 3863)

# z890/z990 Crypto Express2

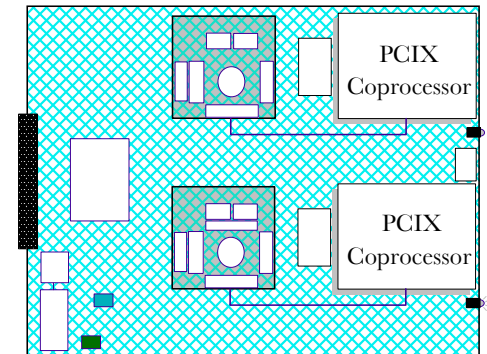
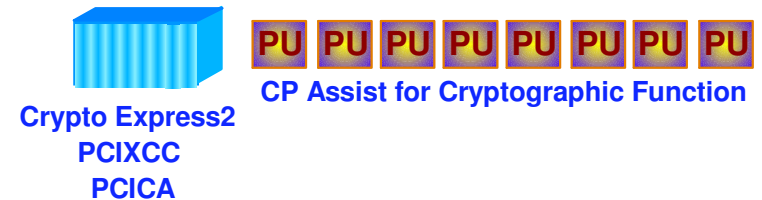


## Crypto Express2



- ❑ **Dual integrated cryptographic coprocessors**
  - Provides PCIXCC and PCICA functionality
- ❑ **Improved throughput over the PCIXCC**
  - Realized with multitasking applications
    - A performance benefit may not be realized with single-threaded applications
- ❑ **Scalable (no CP affinity) - 0 to 8 features (16 coprocessors)**
  - The total number of Crypto Express2, PCICA and PCIXCC features cannot exceed 8 features per server
  - All 8 Crypto Express2 features can plug in a single I/O cage without restrictions
  - Minimum purchase increment is two (Crypto Express2 and/or PCIXCC)
- ❑ **Current applications expected to run without change**
- ❑ **Connection to STI interface; no external cables**
  - does not require a CHPID
- ❑ **Fully programmable, User Defined Extensions (UDX) support**
- ❑ **Designed for FIPS\* 140-2 Level 4 Certification**
- ❑ **Trusted Key Entry (TKE) 4.X support**
  - Secure operational and master key loading
  - Smart Card Reader support (TKE 4.2 only)

### Integrated Cryptographic Service Facility (ICSF)



All z990/z890 cryptographic features are seamlessly managed by ICSF for optimum performance!



# TKE

## and HMC new hardware

---



### □ TKE

- Optional Feature that provides a secure key management system
- Key management system provides authorized persons a method of:
  - ✓ Key identification, separation, update and management

### □ Two new Trusted Key Entry workstations:

- FC 0849 includes a DVD-RAM drive and Token-Ring capabilities.
- FC 0846 includes a DVD-RAM drive and Ethernet capabilities.

### □ TKE 4.2 workstation with smart card reader support - FC 0887

- ▶ Optional feature providing support for generating and storing key parts and key pairs
- ▶ Trusted Key Entry (TKE) 4.2 workstation is used by: CCF, PCICC, PCIXCC, and Crypto Express2
- ▶ TKE 4.2 support does not have a server hardware dependency.
- ▶ Available on S/390 G6 servers and all zSeries servers
- ▶ Available October 29, 2004



### □ HMC

- ▶ HMC (FC 0079) includes a DVD-RAM drive and DUAL Ethernet capabilities. It is now possible to order up to 10 HMCs.
- ▶ HMC (FC 0080) includes a DVD-RAM drive and both Token-Ring and Ethernet capabilities. It is now possible to order up to 10 HMCs.
- ▶ MAUs (FC 0088). Now orderable. Can order up to 10 MAUs. Required for TR
- ▶ Ethernet Switches (FC 0089) EN Switches (former HUB) - Can order up to 10.
- ▶ Two new Flat Panel offerings - Can order up to 10 LCD Monitors.
- ▶ 17" LCD Monitor (FC 6094)
- ▶ 20" LCD Monitor (FC 6095)

# Cryptographic offerings



<b>Announced October 7, 2004</b>	<b>Available PCICC z900, z800</b>	<b>Available PCIXCC z990, z890</b>	<b>Available Crypto Express2 z990, z890</b>	<b>Description</b>
Crypto Express2	---	---	Jan. 28, 2005	Combines functions of PCICA and PCIXCC in one feature
19-digit PANs	Not applicable	Oct. 29, 2004	Jan. 28, 2005	Instead of 13 or 16-digit Personal Account Numbers (PANs) Card Validation Value (CVV) generation and verification services
Less than 512-bit clear key RSA operations	Currently available	Oct. 29, 2004	Jan. 28, 2005	Before only supported applications <u>above</u> 511 bits
2048-bit key (clear and secure) RSA operations	Oct. 29, 2004	Currently available	Jan. 28, 2005	New feature #0867 on PCICC. Integrated in PCIXCC and Crypto Express2 at introduction.

# zSeries Security Certification

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## ☐ **z890/z990 PCIXCC and Crypto Express2**

- ▶ Designed for FIPS\* 140-2 level 4 certification

## ☐ **Logical Partitions**

- ▶ z990, z900 and z800 servers are first and currently\* only to receive Common Criteria certification at Evaluation Assurance Level 5 (EAL5)

## ☐ **Operating Systems Common Criteria Certification**

- ▶ SUSE LINUX on zSeries
  - SUSE SLES 8 has been certified at Controlled Access Protection Profile (CAPP) EAL3+

## ☐ **z/OS 1.6**

- ▶ z/OS 1.6 is under evaluation for Controlled Access Protection Profile (CAPP) EAL3+ and Labeled Security Protection Profile (LSPP) EAL3+

## ☐ **z/VM**

- ▶ IBM has applied for Common Criteria Controlled (ISO/IEC 15408) certification of z/VM V5.1 with the RACF for z/VM optional feature against the Controlled Access Protection Profile (CAPP) and the Labeled Security Protection Profile (LSPP), both at the EAL3+ assurance level

\* As of August, 2004

\* FIPS - Federal Information Processing Standard

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# zSeries Availability



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# zSeries Availability Overview



## □ Parallel Sysplex

- ▶ Availability
- ▶ Capacity
- ▶ Scalability
- ▶ High level of performance
- ▶ Standalone coupling facility



## □ Single System

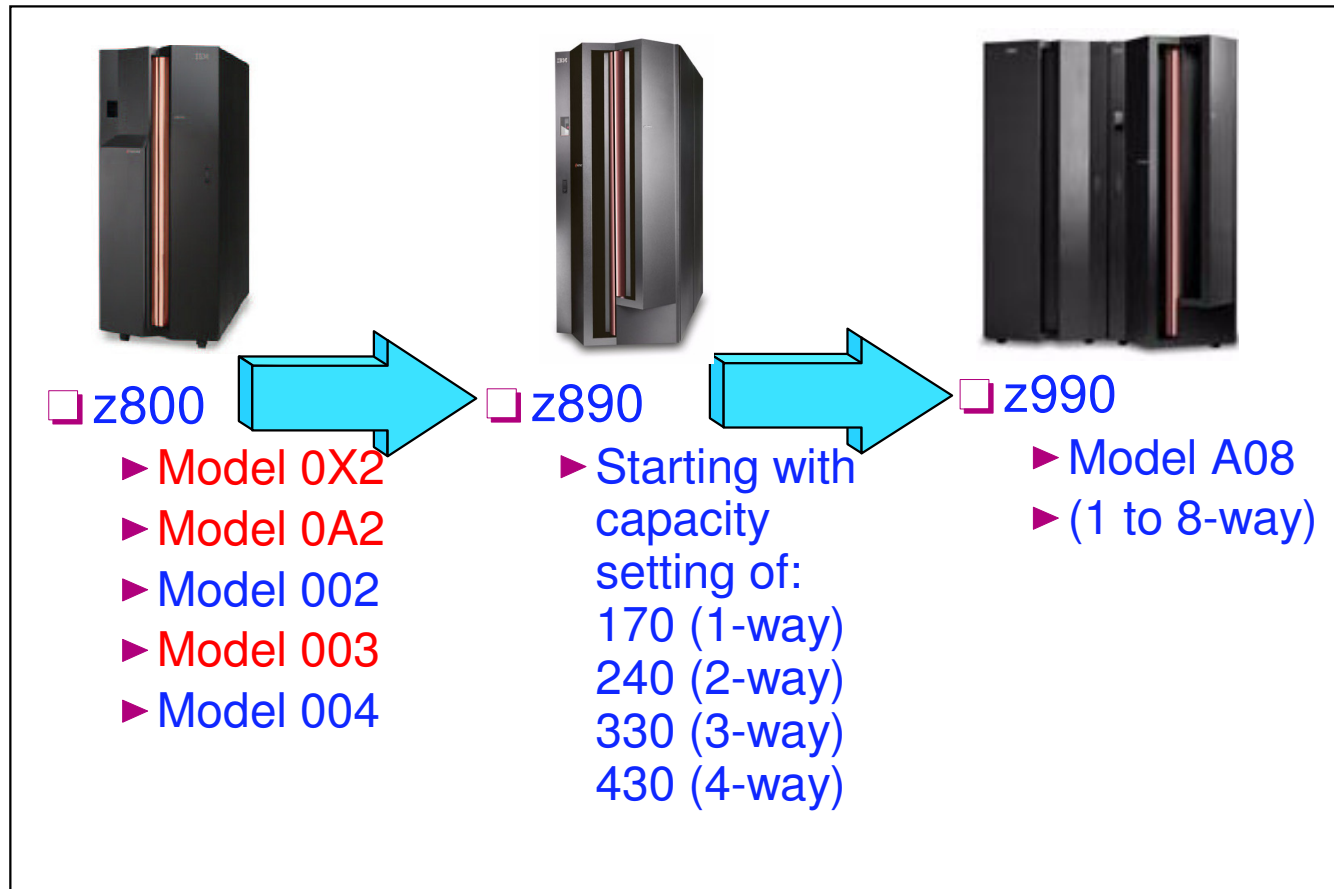
- ▶ Capacity Upgrade on Demand\*
- ▶ Capacity BackUp\*
- ▶ Hot Pluggable I/O
- ▶ Built in Redundancy
- ▶ Advanced Problem Determination
  - FICON purge path extended
- ▶ Concurrent LIC Updates
  - OSA-Express2



zSeries continues to meet the requirements for advanced availability and clustering

\*Terms and conditions may apply

# z800 to z890 and z890 Model Upgrades



- z800 Models 0X2/0A2/002/003/004 to any z890 capacity setting
- Any z890 >243 MIPS to z990 Model A08
- No upgrade from any IBM S/390® 9672 or IBM @server zSeries 900 (z900)

# **z890/z990 - New Availability Functions**

---



## **□ On/Off Capacity on Demand no-charge test capability**

- ▶ Test can be used to validate OOCUoD process or staff training
- ▶ One test per Server lasting up to 24 hours
- ▶ No associated charges for IBM Hardware/Software/Maintenance during the 24 hours test period

## **□ Non-disruptive capacity change of z890s CPs to different speeds**

- ▶ Will no longer require to IPL sub-capacity System after upgrade/downgrades
- ▶ May eliminate up to 2 planned outages
- ▶ No Hardware pre-reqs
- ▶ Operating System Requirements:
  - z/OS and z/OS.e
    - z/OS and z/OS.e 1.4 with PTF for APAR OA07510
  - z/VM
    - z/VM 5.1 (as well as Linux and z/OS guests)

# z890/z990 Concurrent Upgrade - CUoD

---



## □ CUoD\* – Capacity Upgrade on Demand - Standard machine function

- ▶ Nondisruptive addition of CPs (software model upgrade), ICFs, IFLs, zAAPs, and memory
- ▶ LIC enable additional 8 GB memory increments
- ▶ Concurrent model upgrade (capacity setting) to add active PUs, memory, and STI busses
- ▶ Downgrades are disruptive (**Permanent Upgrade**)
- ▶ Note: I/O feature adds and removes are also nondisruptive but not really "CUoD"

\* CUoD may need IPL for z890 "sub" model upgrades with older levels of OS. Additional terms and conditions apply



# z890/z990 Concurrent Upgrade Customer Controlled

---



- ❑ **On/Off Capacity on Demand - Temporary upgrade**
  - ▶ Nondisruptive\* temporary addition of CPs, IFLs, ICFs and zAAPs
  - ▶ Upgrades requiring parts (e.g. for a z990 Model A08 to B16 upgrade) not supported
  - ▶ "Right to use" feature - Orderable as MES or with new build 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
- ❑ **CIU – Customer Initiated Upgrade - Express - Permanent upgrade**
  - ▶ Customer capability to order and install permanent upgrade
  - ▶ Not included:
    - Upgrades requiring parts (e.g. for a z990 Model A08 to B16 upgrade)
    - Channel upgrades by LIC enable of existing ports
  - ▶ CIU feature - MES ordered to initiate contract and administrative setup
  - ▶ Customer orders and installs upgrade via Resource Link and IBM RSF
- ❑ **CBU – Capacity Backup - Temporary emergency capacity upgrade\*\***
  - ▶ Nondisruptive temporary addition of CPs ONLY in an emergency situation
  - ▶ CBU contract required to order CBU features and CBU LIC CC
  - ▶ Customer activates upgrade for test or temporary emergency
  - ▶ Nondisruptive downgrade after test or recovery completed

\* For z890 CPs only for horizontal upgrade. Some older levels of OS may require IPL for vertical or diagonal upgrades.

\*\* For z890 - To FULL size engines only

# zSeries Capacity on Demand Summary



Capacity Upgrade on Demand (CUoD) <sup>***</sup>	Capacity Backup Upgrade (CBU) <sup>***</sup>	Customer Initiated Upgrade (CIU) <sup>***</sup>	On/Off Capacity on Demand (On/Off CoD) <sup>***</sup>
Permanent capacity upgrade; a standard zSeries feature that allows you to order extra capacity resources such as processors, memory*, and I/O	Reserve backup PU capacity for specified duration; original configuration must be restored after test or disaster recovery	Facility for ordering, configuring, pricing and installing capacity upgrades. It is a Web-based solution available through Resource Link	Temporary capacity upgrade (CP, ICF, IFL, AAP) of unlimited duration; orderable through CIU; customer activates and deactivates.
Available on LIC enabled G5/G6, z800, z890, z900 and z990	Available on G5/G6, z800, z890, z900 and z990	Available on LIC enabled z800, z890, z900 and z990	Available only on z890/z990; orderable feature
Inherent capability of 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 or zAAP 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 G5/G6, z800, z890, z900 and z990	Ordering facility available with the z800, z890, z900 and z990	Nondisruptive temporary CP, ICF, IFL or zAAP upgrade; customer deactivates; mutually exclusive with CBU enablement

\* Memory cannot be upgraded on z800 with CUoD. Limited option for z890

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

\*\*\* Additional terms and conditions apply

# Capacity Resource Availability by Server



Capacity on demand	Server
Capacity Backup Upgrade	S/390 G5, G6, z800, z890, z900, z990
Capacity Upgrade on Demand	S/390 G5, G6, z800, z890, z900, z990
Customer Initiated Upgrade	z800, z890, z900, z990
On/Off Capacity on Demand	z890, z990

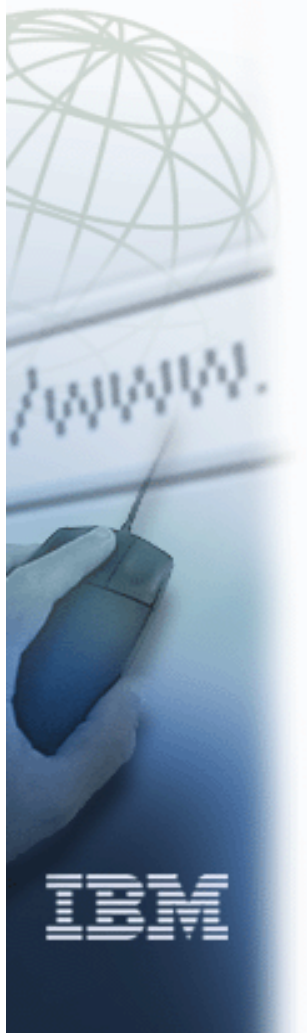
	Capacity Backup Upgrade	Capacity Upgrade on Demand	Customer Initiated Upgrade	On/Off Capacity on Demand (Temp. Cap.)
S/390 G5, G6	Yes	Yes	No	No
z900	Yes, CP only	Yes (CP, I/O, ICF, IFL, Memory )	Yes (CP, IFL, ICF, Memory)	No
z800	Yes, CP only	Yes (CP, I/O, ICF, IFL)	Yes (CP, IFL, ICF)	No
z890/z990	Yes, CP only	Yes (CP, I/O, ICF, IFL, zAAP, Memory*)	Yes (CP, IFL, ICF, zAAP, Memory*)	Yes, CP, ICF, IFL, zAAP

\* For z890 – Applies only when upgrade is from 24 to 32 GB

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# IBM zSeries Parallel Sysplex



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# zSeries Coupling Facility 'Option'

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- ❑ **z890 or z990 can be ordered as a separate standalone, external Coupling Facility model (No CPs/ IFLs/zAAPs)**
- ❑ **z890 as a CF - Single Frame Machine**
  - ▶ Less Space
  - ▶ Better layout when using ICBs
- ❑ **CFCC Level 13 and 14**
- ❑ **Alternatives to standalone CF (workload dependent):**
  - ▶ Install standard z990 model with ICF(s) and CF Links only
    - 2 Frames regardless of number of ICFs or links
    - Has implications for ICB link distances
  - ▶ Implement z890/z990 ICFs on servers with Coupling Facility Duplexing
  - ▶ Continue using existing z800 or z900 CFs (2066-0CF 2064-100)
  - ▶ Upgrade G5 CF (9672-R06) to z900 CF
  - ▶ Using G5 CFs in a Parallel Sysplex cluster with z890/ z990 not recommended
    - Use only as a temporary migration step
- ❑ **NOTES:**
  1. ICB-2 not supported on z890
  2. z890 and z990 will be the last family of Servers to couple with G5/G6 Servers

# zSeries Coupling Facility CC Level 13 and 14

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## ❑ CFCC 13

- ▶ z890 and z990 Driver Level 55 (May 2004)
- ▶ Availability enhancement
  - “Disruptive” CFCC MCL no longer requires a POR to apply or remove.
  - Disruptive to CF LPAR only, not other LPARs on the z890 or z990.
- ▶ Performance enhancement
  - DB2 data sharing
  - Cast out process

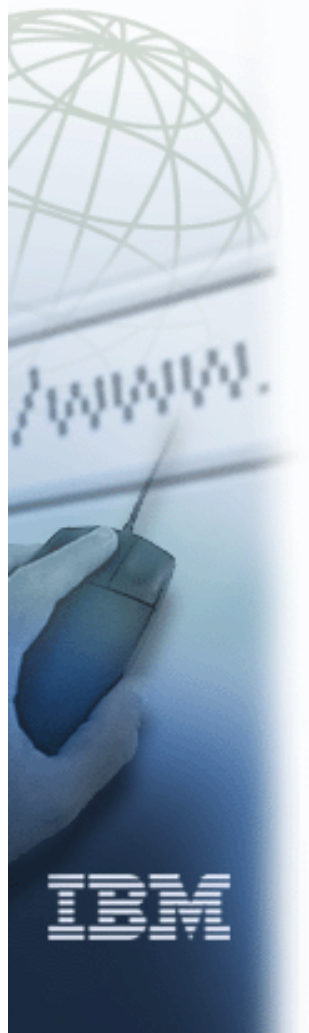
## ❑ CFCC 14

- ▶ z890 and z990 Driver Level 55 (Planned for October 2004)
- ▶ Dispatcher Modifications Supporting CF Duplexing
  - CFCC dispatcher and internal serialization mechanisms have been modified in order to better manage coupled workloads from all environments

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# IBM zSeries Software Support



## Redbooks

International Technical Support Organization

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# z890/z990 Software Support Summary



Operating System	ESA/390 (31-bit)	z/Arch (64-bit)	Notes
z/OS Version 1 Release 2, 3, 4, 5, 6	No**	Yes	1.2: 10/04 End of Service 1.3: OSA-ICC 1.4: 30 LPAR, 4 LCSSs 1.6: zAAP, 24-way
OS/390® Version 2 Release 10	Yes	Yes	9/04 End of Service
Linux, 64-bit distribution	No	Yes	
Linux, 31-bit distribution	Yes	No	
z/VM Version 5	No	Yes	ALS3
z/VM Version 4 Release 3, 4	Yes	Yes	4.4; exploit
z/VM Version 3 Release 1	Yes	Yes	
VSE/ESA Version 2 Release 6, 7	Yes	No	
z/VSE* Version 3 Release 1	Yes	No	Preview
TPF Version 4 Release 1 (ESA mode only)	Yes	No	

\* z/VSE can execute in 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 z/Series hardware.

\*\* IBM Bimodal Accommodation Offering is available for z/OS 1.2, 1.3, and 1.4. This offering will not be provided for z/OS 1.5



# z/OS Support Summary



		G3-G4	G5/G6 Multiprise 3000	z800	z890	z900	z990	End of Service	Coexists with z/OS...	Planned Ship Date
OS/390	2.10	x	x	x	x <sup>c</sup>	x	x <sup>c</sup>	09/04	1.4	
z/OS	1.1		x	x		x		3/04	1.4	
	1.2		x	x	x <sup>c</sup>	x	x <sup>c</sup>	10/04	1.5	
	1.3		x	x	x <sup>c</sup>	x	x <sup>c</sup>	3/05	1.6	
	1.4		x	x	x	x	x	3/07	1.7	
	1.5		x	x	x	x	x	3/07	1.8	
	1.6			x	x	x	x	9/07	1.8	9/04
	1.7			x	x	x	x	9/08	1.9	9/05

x<sup>c</sup> - Compatibility support only

IBM Bimodal Accommodation Offering is available for z/OS 1.2, 1.3, and 1.4. It will not be provided for z/OS 1.5

> 1.1 was withdrawn from service in March 2004

> 1.4 was orderable through September 9, 2004

> 1.6 became orderable September 10, 2004

> 1.5 was also orderable through September 9, 2004

> z/OS.e V1R3/R4/R5/R6/R7 will only run on a z800 and z890 server

# z/VM & VSE/ESA Support Summary Dates



		G3-G4	G5/G6 MP3000	z800	z890	z900	z990	End of Mkt	End of Service
VSE/ESA	2.5	X	X	X		X	X <sup>c</sup>	12/01	12/03
	2.6	X	X	X	X <sup>c</sup>	X	X <sup>c</sup>	3/03	
	2.7*		X	X	X	X	X		
z/VSE***	3.1*		X	X	X	X	X		
z/VM	3.1	x	x	x	X <sup>c</sup>	x	X <sup>c</sup>	8/04	12/05
	4.1		x	x	X <sup>c</sup>	x	X <sup>c</sup>	10/01	06/03
	4.2		x	x	X <sup>c</sup>	x	X <sup>c</sup>	5/02	12/03
	4.3		x	x	X <sup>c</sup>	x	X <sup>c</sup>	8/03	05/05
	4.4*		x	x	x	x	x	tbd	09/06
	5.1*			x	x	x	x	tbd	09/07

<sup>x<sup>c</sup></sup> - Compatibility support






\*Releases currently orderable

\*\*Planned

\*\*\*z/VSE can execute in 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 zSeries hardware.

# zSeries: z/VM and LINUX Support



	G5/G6 MP3000 	z900 	z800 	z890 	z990 
z/VM 3.1					
z/VM 4.3					
z/VM 4.4					
z/VM 5.1					

All current Linux Kernal 2.4 based distributions of SUSE, Red Hat, Turbolinux, Conectiva					
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# zSeries Architectural Level Set with z/OS 1.6 and z/VM 5.1

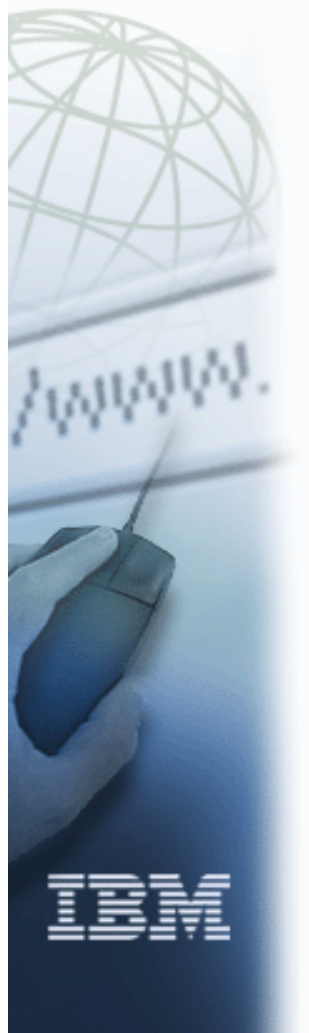


- ❑ z/OS V1.6 requires z/Architecture
- ❑ z/VM V5.1 requires z/Architecture
- ❑ Only zSeries Servers (or comparable) are planned to be supported:
  - ▶ z990 or comparable server
  - ▶ z900 or comparable server
  - ▶ z890 or comparable server
  - ▶ z800 or comparable server
- ❑ The following servers do not support z/Architecture and are not planned to be able to run z/OS V1.6 or z/VM V5.1
  - ▶ **S/390 Parallel Enterprise Server**
    - **Generation 5 (G5) and Generation 6 (G6) models or comparable server**
    - **All models of the Multiprise 3000 Enterprise Server or comparable server**
- ❑ z/VM V4.4 is the last release that is planned to run on G5/G6/MP3000 Servers
  - ▶ **End of Service for z/VM V4.4 is planned for September 2006**
- ❑ z/OS V1.5 is the last release that is planned to run on G5/G6/MP3000 Servers
  - ▶ **End of Service for z/OS V1.5 is planned for March 2007**

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# Extended Distance Solutions



## Redbooks

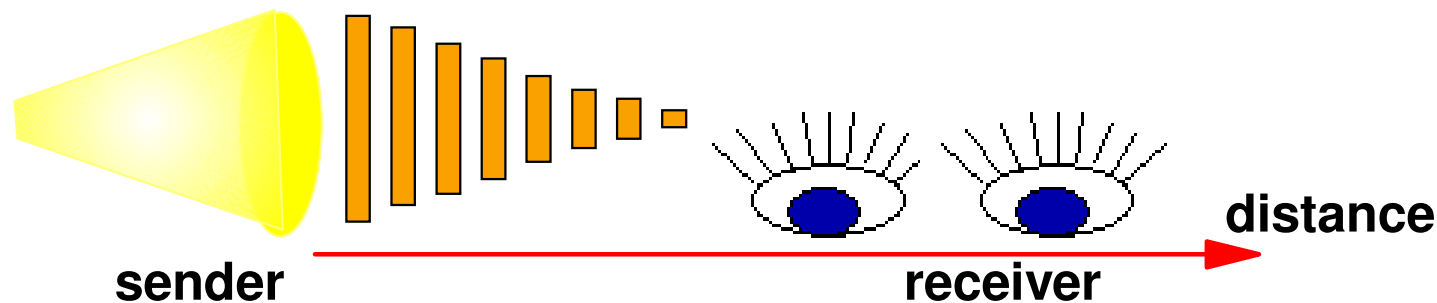
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# Link Loss Budget - what is it ?



- ❑ As a light signal travels through a fiber optic cable, the light signal loses strength



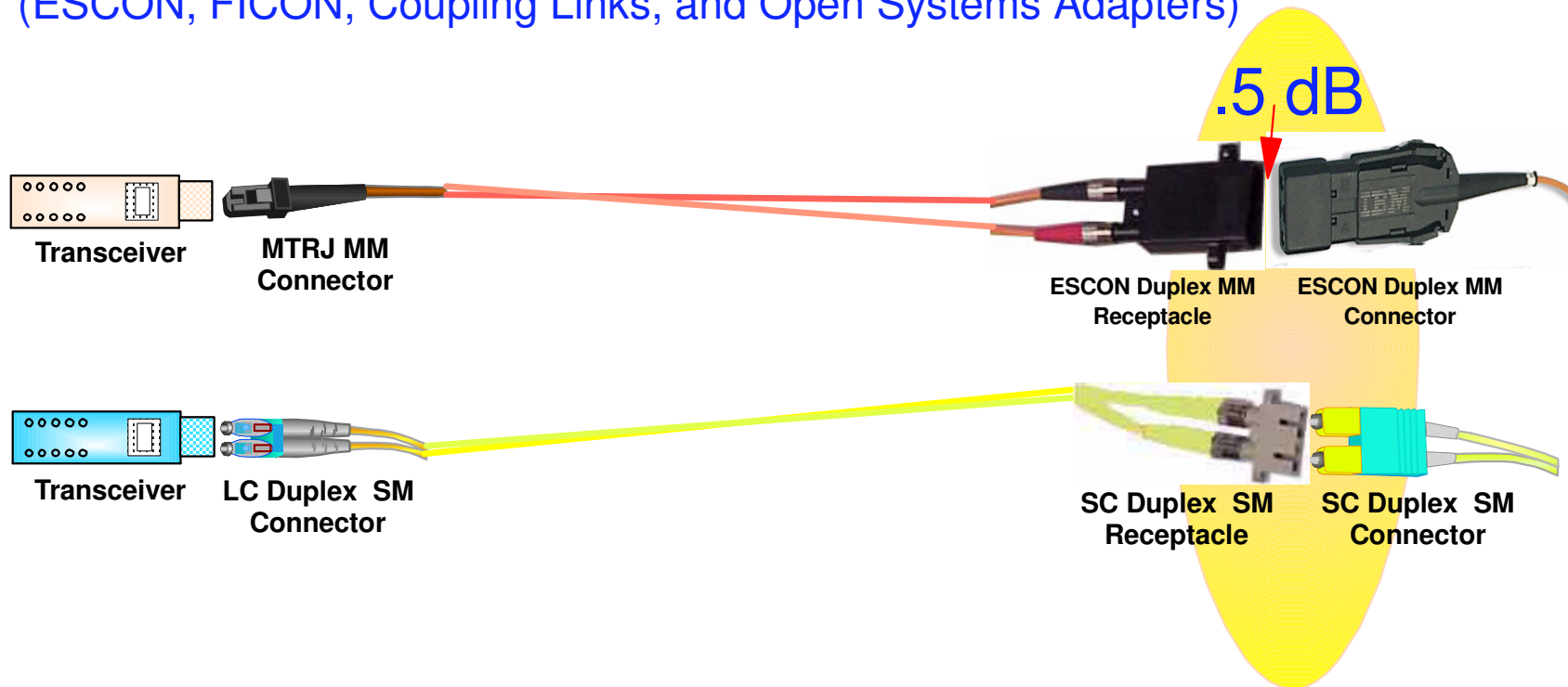
- ❑ dB (deciBel) is the metric used to measure the signal strength (loss or gain)
  - Result: A link loss budget
    - The maximum amount of link attenuation (loss), expressed in decibels (dB), that can exist without causing a possible failure condition (bit errors).
- ❑ Factors that contribute to the loss of signal strength
  - Number of connections (Conversion kits, MCP cables, jumpers, trunks, patch panels)
  - Length of the fiber optic cable

# Calculating link loss budget



## □ Fibre channel standard

- no more than four fiber-to-fiber connections per link
- IBM position - if do not exceed link loss budget - OK
  - Refer to: GA23-0367-07b Planning for Fiber Optic Links (ESCON, FICON, Coupling Links, and Open Systems Adapters)





# Light Delay in Fiber over Distance



- ❑ **The limitation of the speed of light within a fiber optic cable will increase the delay in the response time by 100 microseconds (us) for 10 kilometers (km)**
  - Propagation delay is
    - ✓ 5 us per km one way
    - ✓ 10 us per km round trip
      - $5 \text{ us / km (one way)} \times 10 \text{ km} \times 2 \text{ (round trip)} = 100 \text{ us (0.1 milliseconds - ms)}$
- ❑ **There is an increased response time for every 10 km of distance and every interlocked handshake or round-trip per channel program**

Channel Type	Interlocked Handshakes Required <sup>2</sup>	Total "up to" delay per 10 km
ESCON	6	0.6 ms
FCV - Bridge	2	0.2 ms
FC - Native	1	0.1 ms

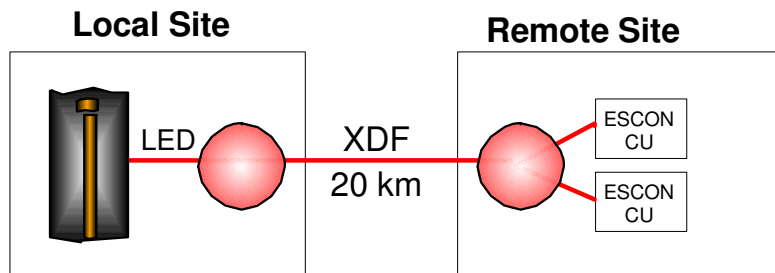
## ❑ Notes:

1. The numbers in the matrix reflect a simple channel program (4 KB read hit)
2. For channel programs that have more interlocked handshakes built into it, distance delays could be larger

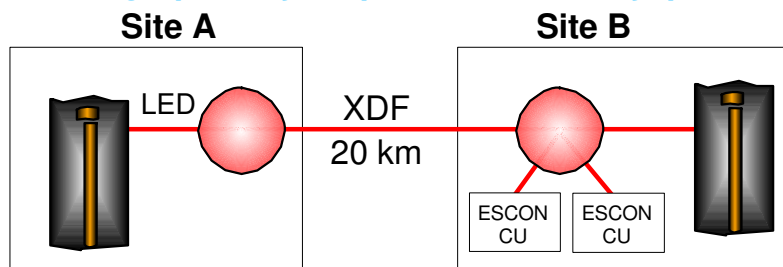
# ESCON versus FICON distance



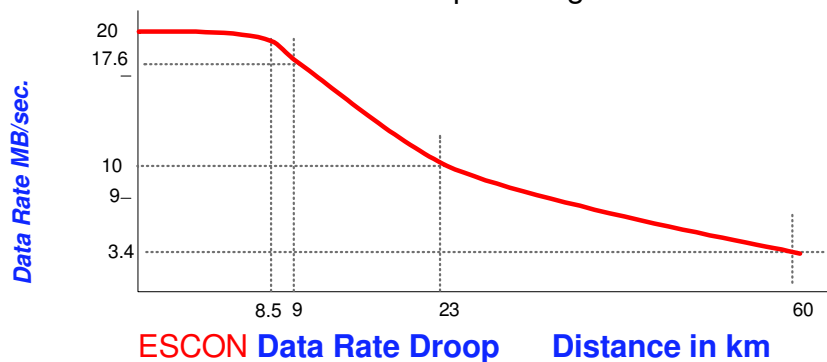
## ESCON Tape Vaulting



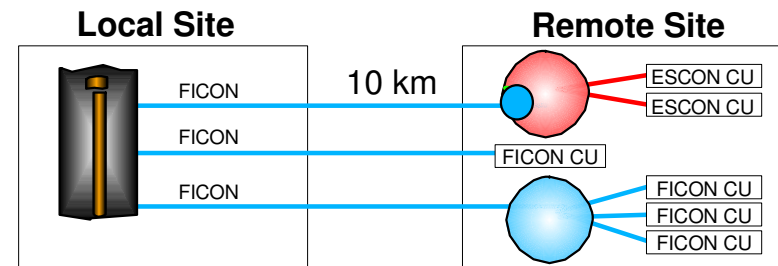
*Geographically Dispersed Parallel Sysplex*



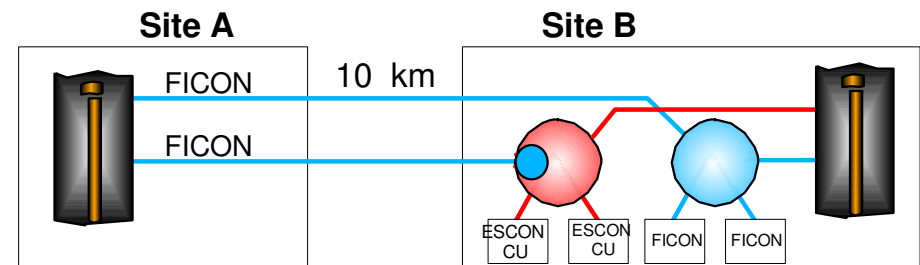
- **ESCON** Director required at both sites
- One fiber per **ESCON** channel
- Data Rate Droop starting at **9 km**



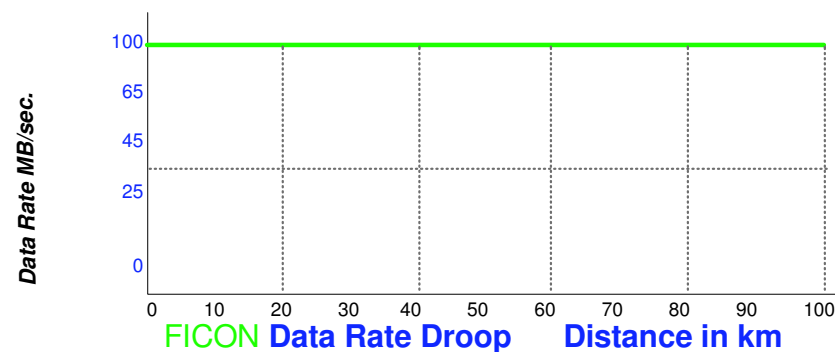
## FICON Tape Vaulting



*Geographically Dispersed Parallel Sysplex*



- **FICON** Director at only one site - -Saves cost of one director
- 8:1 TDM via bridge card - - saves 7 fibers
- Data rate droop negligible up to 100 km with repeaters



# I/O and Storage: FICON / FCP Cabling Options



LX = Long wavelength 1300 nm transceiver

SX - Short wavelength 850 nm transceiver

**9 micron SM fiber**

ESCON \* or  
FICON DIRECTOR

\* ESCON Director requires FICON Bridge Card

- LX transceiver/feature on each end
- Requires 9 micron single mode (SM) fiber

1 Gbps	7.8 dB	10 km (6.2 miles)
2 Gbps	7.8 dB	10 km (6.2 miles)

**Unrepeated distance of 20 km (12.4 miles) with RPQ for 1 Gbps links**

**Unrepeated distance of 12 km (7.4 miles) with RPQ for 2 Gbps links**

**50 or 62.5 micron MM fiber**

ESCON \* or  
FICON DIRECTOR

- LX transceiver/feature on each end combined with a pair of MCP cables
- Uses current 50 or 62.5 micron multimode (MM) fiber infrastructure
- **Reduced distance** and link budget

1 Gbps	5 dB	550 meters (1804 feet)
2 Gbps	N / A	Not supported

**50 micron MM fiber**

FICON  
DIRECTOR

- SX transceiver/feature on each end
- Requires 50 micron multimode fiber
- **Reduced distance** and link budget

1 Gbps	3.9 dB	500 meters (1640 feet)
2 Gbps	2.8 dB	300 meters (984 feet)

**62.5 micron MM fiber**

FICON  
DIRECTOR

- SX transceiver/feature on each end
- Requires 62.5 micron multimode fiber
- **Reduced distance** and link budget

1 Gbps	2.8 dB	250 meters (820 feet)
2 Gbps	2.2 dB	120 meters (394 feet)

**Link Rate      Link Budget      Unrepeated Distance**

# Droop: Key Ingredients

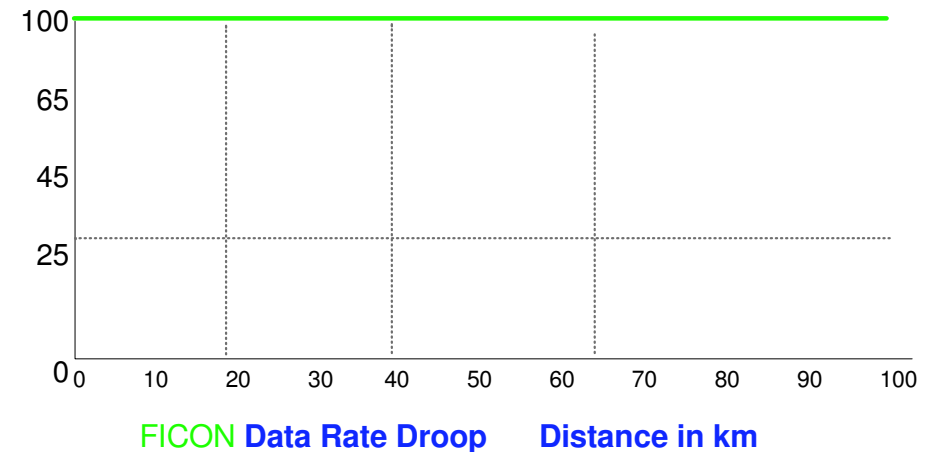
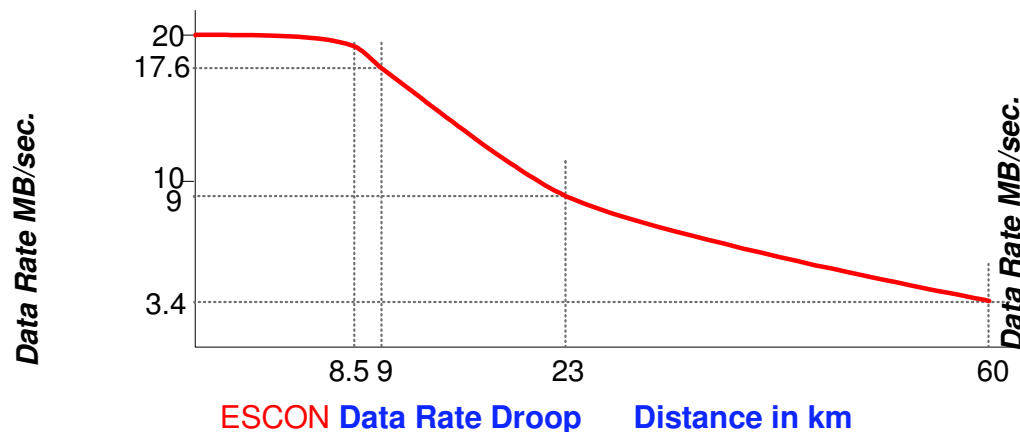


## □ Droop begins when:

The link distance reaches the point where the time light takes to make one round trip on the link is equal to the time it takes to transmit the number of bytes that will fit in the receiver's buffer

## □ Key factors

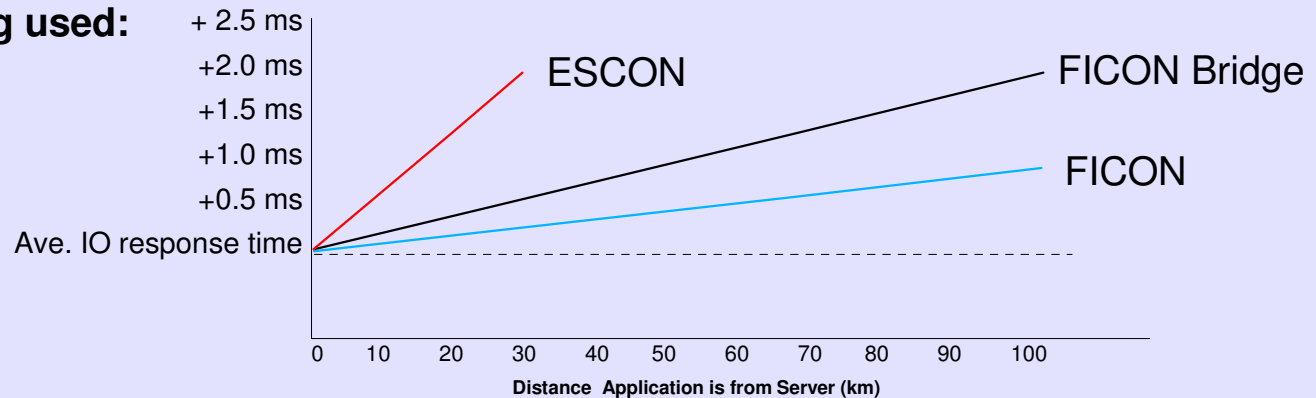
- Speed of light through fiber
- Link data rate
- Buffer capacity
- Packet size



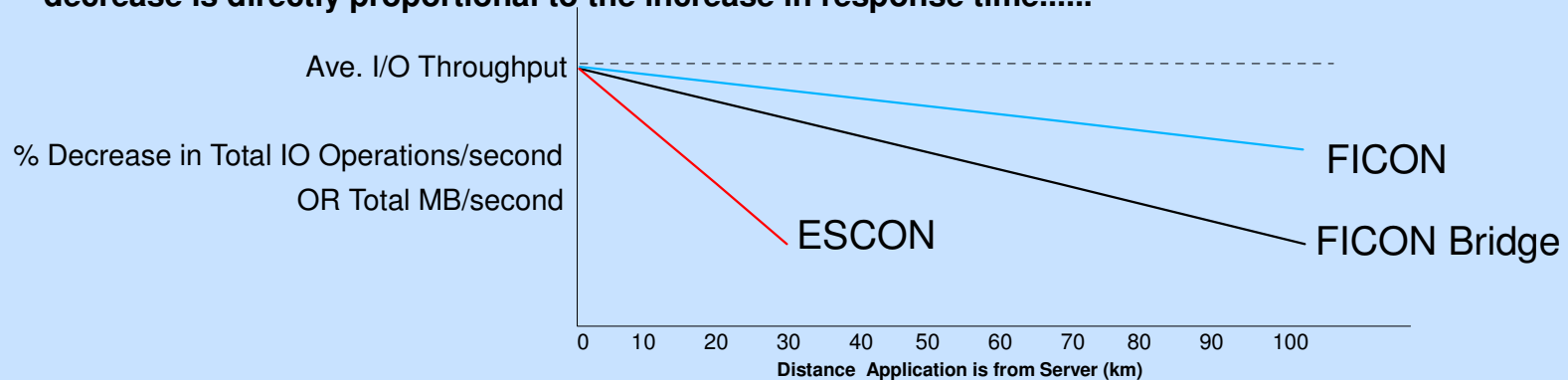
# The longer the distance the greater the application response time



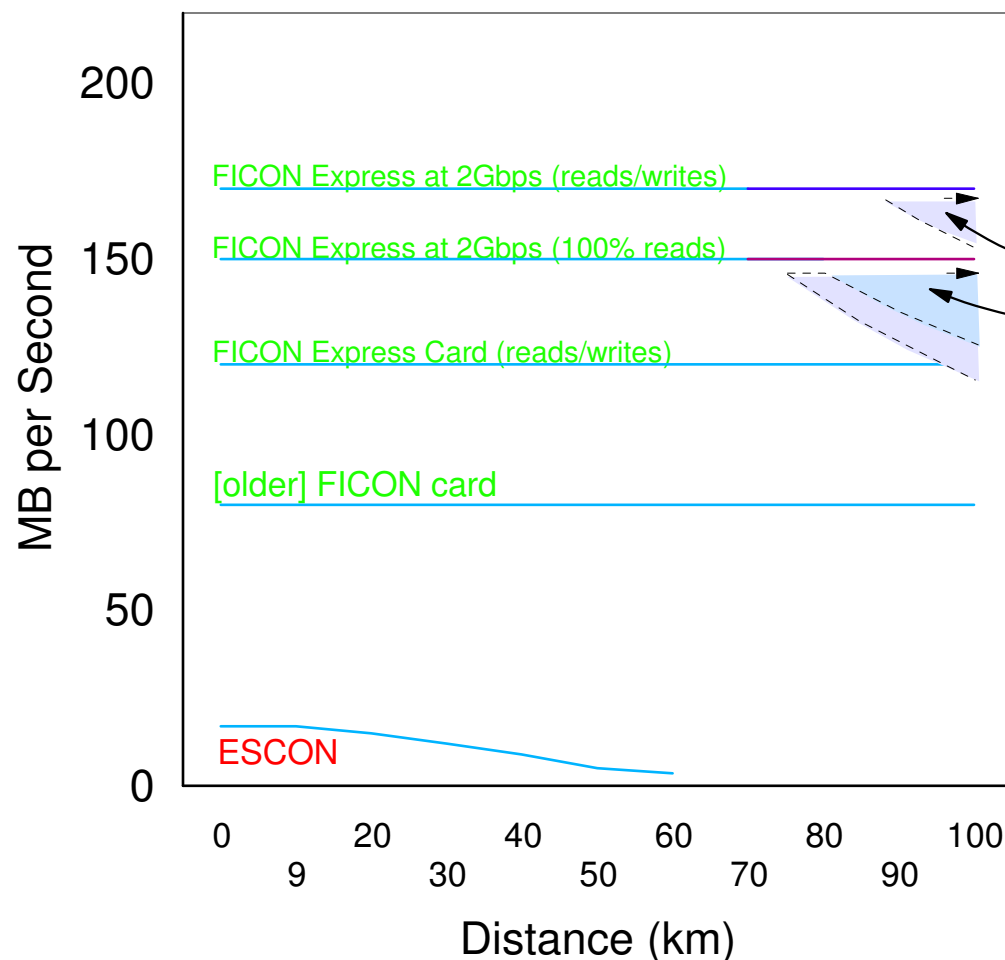
**A reminder, application I/O response time increases over distance and depends on channel being used:**



**... in addition, individual application I/O throughput decreases over distance too - decrease is directly proportional to the increase in response time.....**



# Data Droop at long distances



- ❑ FICON is superior to ESCON
- ❑ Some data droop **may** occur at highest FICON speeds
- ❑ Data droop, **if any at all**, will depend on the FICON director model as well as % reads and writes
- ❑ Consult your switch vendor

## Fibre channel distances



As the Link Data Rate  
*INCREASES*

The Distance and Link Budget

*DECREASES*

When using Multimode Fiber

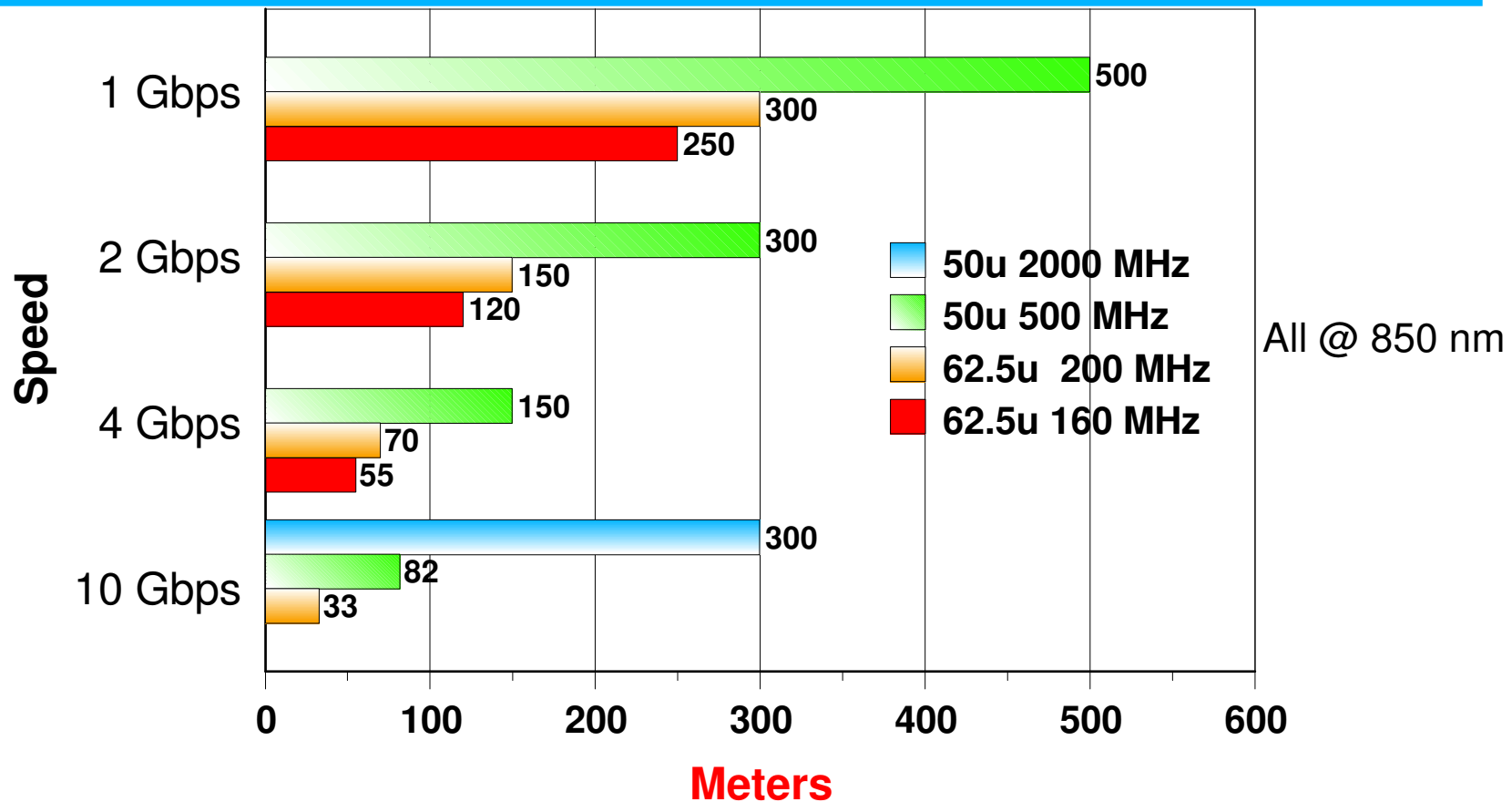


# Fibre channel distances using Multimode fiber optic cable



1, 2, 4 and 10 Gbps = 9u @1310 nm - - 10,000 meters (10 km)

***Compare using 9u single mode fiber = 10,000*** →



# IBM zSeries Qualification testing



- ☐ Vendor Solutions Connectivity Lab  
Poughkeepsie, New York
- ☐ Working with IBM TotalStorage Proven
- ☐ GDPS Qualification testing for vendor products:
  - ✓ Wavelength Division Multiplexing (WDM)
- ☐ FICON/FCP Directors and switches

# IBM zSeries Qualification testing

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## ☐ Testing includes:

- ✓ z/OS Architecture functionality
- ✓ z/OS Architecture recovery
- ✓ In some cases performance measurements

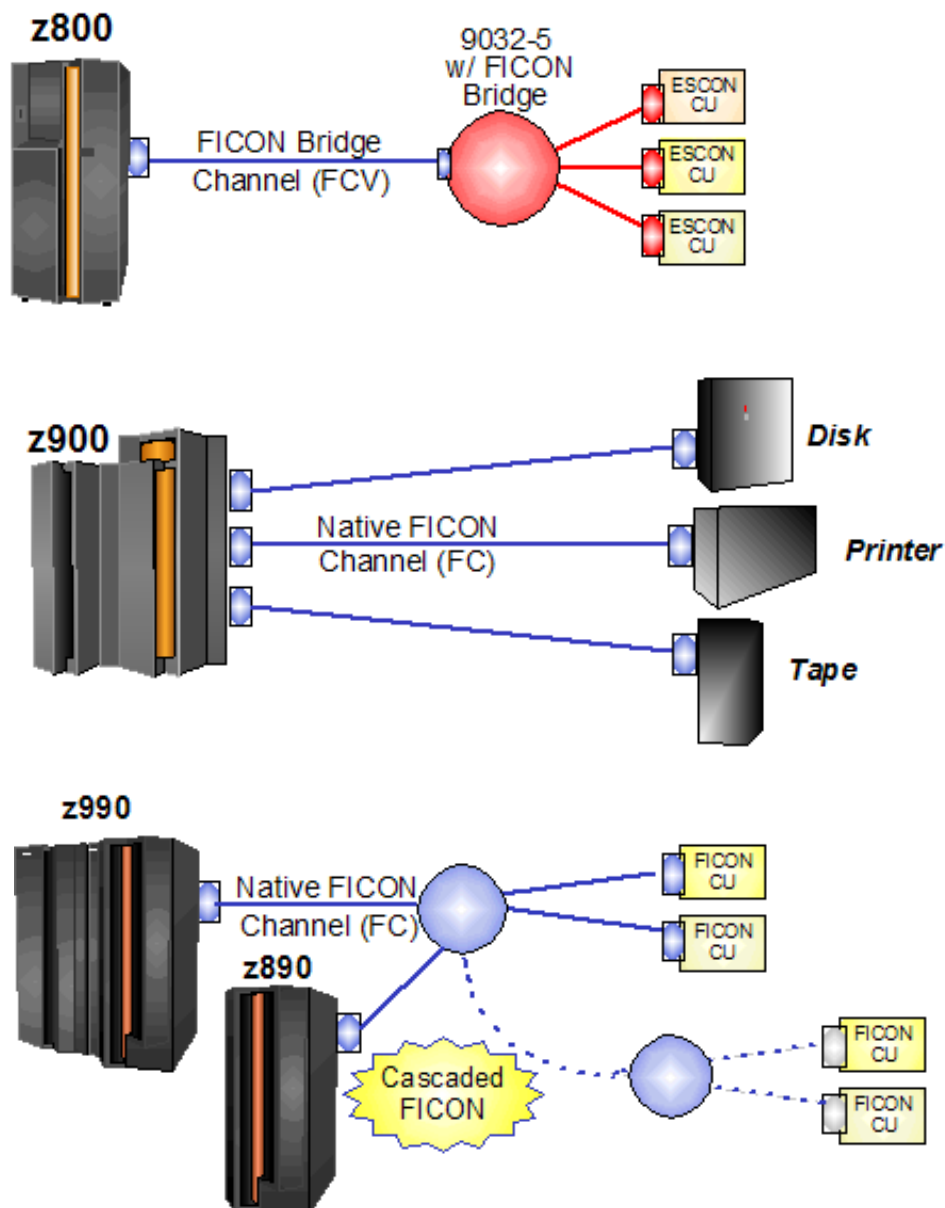
# IBM zSeries FICON Qualification testing



## **zSeries Qualified Director vendors:**

- ✓ Cisco MDS 9000 Mainframe Package
- ✓ CNT FC/9000 Directors
- ✓ IBM TotalStorage SAN Switch M12
- ✓ McData Intrepid 6000 series Directors

# FICON Tested product List



## FICON Bridge

- ▶ IBM ESCON Director Model 5 (IBM 9032-005)
  - Exploits FICON LX channel with existing ESCON control units

## Direct Attachment

- ▶ IBM TotalStorage Enterprise Storage Server
  - IBM 2105-F10, F20, 750, 800
- ▶ IBM TotalStorage Enterprise Tape Controller
  - IBM 3590-A60, IBM
- ▶ IBM TotalStorage Virtual Tape Server
  - IBM 3494-B10, B20
- ▶ IBM Infoprint Color 130 Plus (IBM 3170-005)
- ▶ IBM Infoprint 4100
  - IBM 4100-HD1, PD1, HS1, PS1, PD2, HD2
- ▶ IBM Infoprint 2000 (IBM 2710-AF1)

## FICON/Fibre Channel Switched Connectivity

- ▶ Cisco MDS 9000 - 9216, 9506, 9509
  - (IBM 2062 - D01, D04, D07)
- ▶ CNT FC/9000 Directors (IBM 2042-001, 128, 256)
- ▶ IBM TotalStorage SAN Switch M12 (IBM 2109-M12)
- ▶ McDATA Sphereon 3232 Fabric Switch
- ▶ McDATA Intrepid 6000 Series Directors
  - IBM 2032-064, 140
- ▶ McDATA ED-5000 (IBM 2032-001)

## FICON Cascaded Directors

- ▶ McDATA Intrepid 6000 Series Directors
- ▶ CNT FC/9000 Directors
- ▶ IBM TotalStorage SAN Switch M12

# FICON/FCP products tested at 2 Gbps link data rate



## ■ Devices

- ▶ IBM TotalStorage Enterprise Storage Server
  - Models 750, 800 (IBM 2105-, 750, 800) (FICON, FCP)
- ▶ IBM TotalStorage Enterprise Tape Controller
  - IBM 3590 A60 and (FICON, FCP)

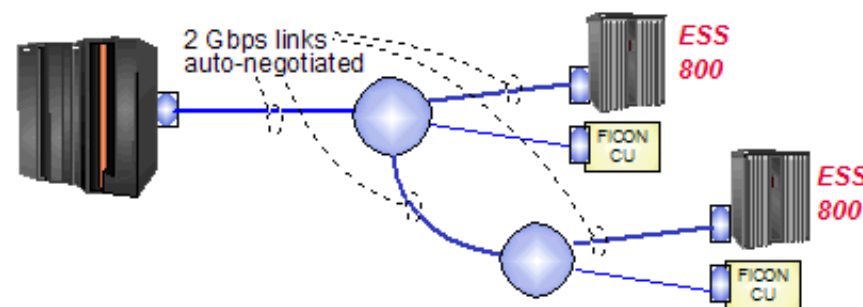
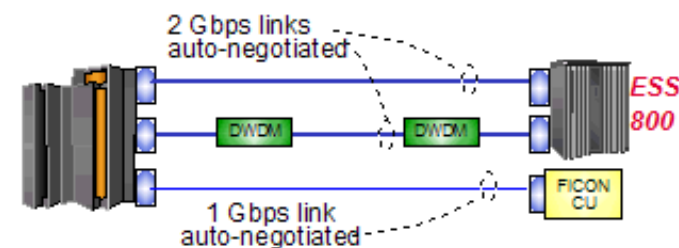
## ■ Switches

- ▶ Cisco MDS 9000 - 9216, 9506, 9509
  - (IBM 2062 - D01, D04, D07)
- ▶ CNT FC/9000 Directors
  - IBM 2042-001, 128, 256 (FICON, FCP)
- ▶ IBM TotalStorage SAN Switch 2109
  - IBM 2109-F16 (FCP)
- ▶ IBM TotalStorage SAN Switch M12 (IBM 2109-M12) (FICON, FCP)
- ▶ McDATA Sphereon 3232 Fabric Switch
  - IBM 2031-232
- ▶ McDATA Intrepid 6000 Series Directors
  - IBM 2032-064, 140 (FICON, FCP)

## ■ Optical

- ▶ Cisco Systems
  - ONS 15530 and 15540 ESPx \* (FICON)
- ▶ Nortel Networks
  - Optera Metro 5200, 5300E (FICON) \*
- ▶ ADVA Fiber Service Platform (FSP) 2000 system \*

\* Contact vendor for details



## ■ 2 Gbps link speed capability is:

- ▶ FICON Express features 2319, 2320
- ▶ Native FICON, FICON CTC, FICON Cascaded Directors, FCP
  - FCV is not supported at 2 Gbps
- ▶ Auto-negotiated point-to-point
  - Between server, switch, and device
  - Transparent to user and application

# FCP product support list



## ❑ **Supported IBM Devices (via Switch):**

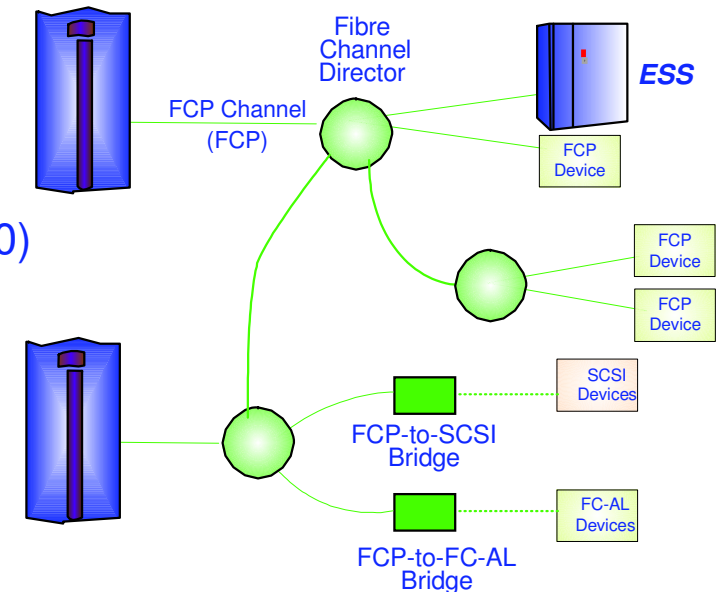
- ▶ IBM TotalStorage Enterprise Storage Server (ESS)  
(IBM 2105-F10, F20, 750, 800)
- ▶ IBM TotalStorage Enterprise Tape Controller  
(IBM 3590-A60, 3592-J70)
- ▶ IBM TotalStorage Virtual Tape Server (IBM 3494-B10, B20)
- ▶ IBM UltraScalable Tape Library  
with Ultrium 2 Fibre Channel Tape Drives feature #1476  
– (IBM 3584-D32, L32)

## ❑ **Supported Directors and Switches:**

- ▶ Cisco MDS 9000 - 9216, 9506, 9509  
– (IBM 2062 - D01, D04, D07)
- ▶ CNT FC/9000 Directors (IBM 2042)
- ▶ IBM TotalStorage SAN Switches (IBM 2109-S08, S16, F16, M12)
- ▶ McDATA Sphereon 3232 Fabric Switch
- ▶ McDATA Intrepid 6000 Series Directors (IBM 2032)
- ▶ McDATA ED-5000 Fibre Channel Director (IBM 2032)
- ▶ McDATA Sphereon 4500 Fibre Channel Switch (IBM 2031-224)

## ❑ **Supported Bridges (via Switch)**

- ▶ IBM Storage Area Network Data Gateway (IBM 2108-G07)  
(FC-to-parallel SCSI connectivity for non-IBM storage)
- ▶ McDATA Model L00 ES-1000 Loop Switch (IBM 2031-L00) (FC-to-FC-AL)



**No direct attachment to controllers, devices, or bridges**



# FICON and FCP Intermix



- ❑ **FICON (FC CHPID type) and Fibre Channel (FCP CHPID type) can now be intermixed in the same director**

- ❑ **Supported by**

- ▶ Cisco MDS 9000 - 9216, 9506, 9509
- ▶ CNT FC/9000 Directors
- ▶ IBM TotalStorage SAN Switch M12
- ▶ McDATA Sphereon 3232 Fabric Switch
- ▶ McDATA Intrepid 6000 Series Directors

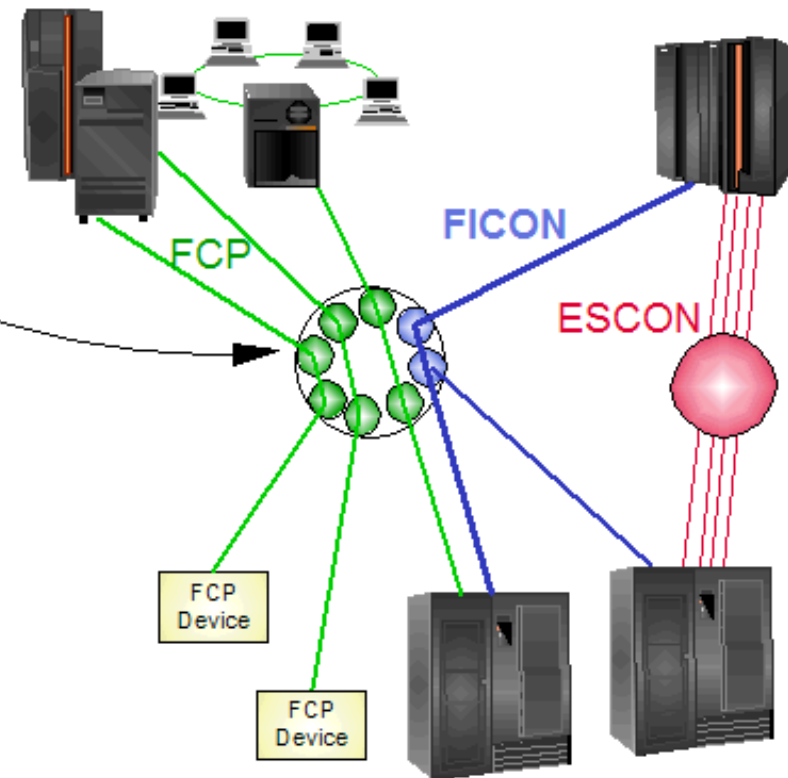
- ❑ **Shared on a port-by-port basis**

- ❑ **Refer to FICON/FCP Intermix White Papers**

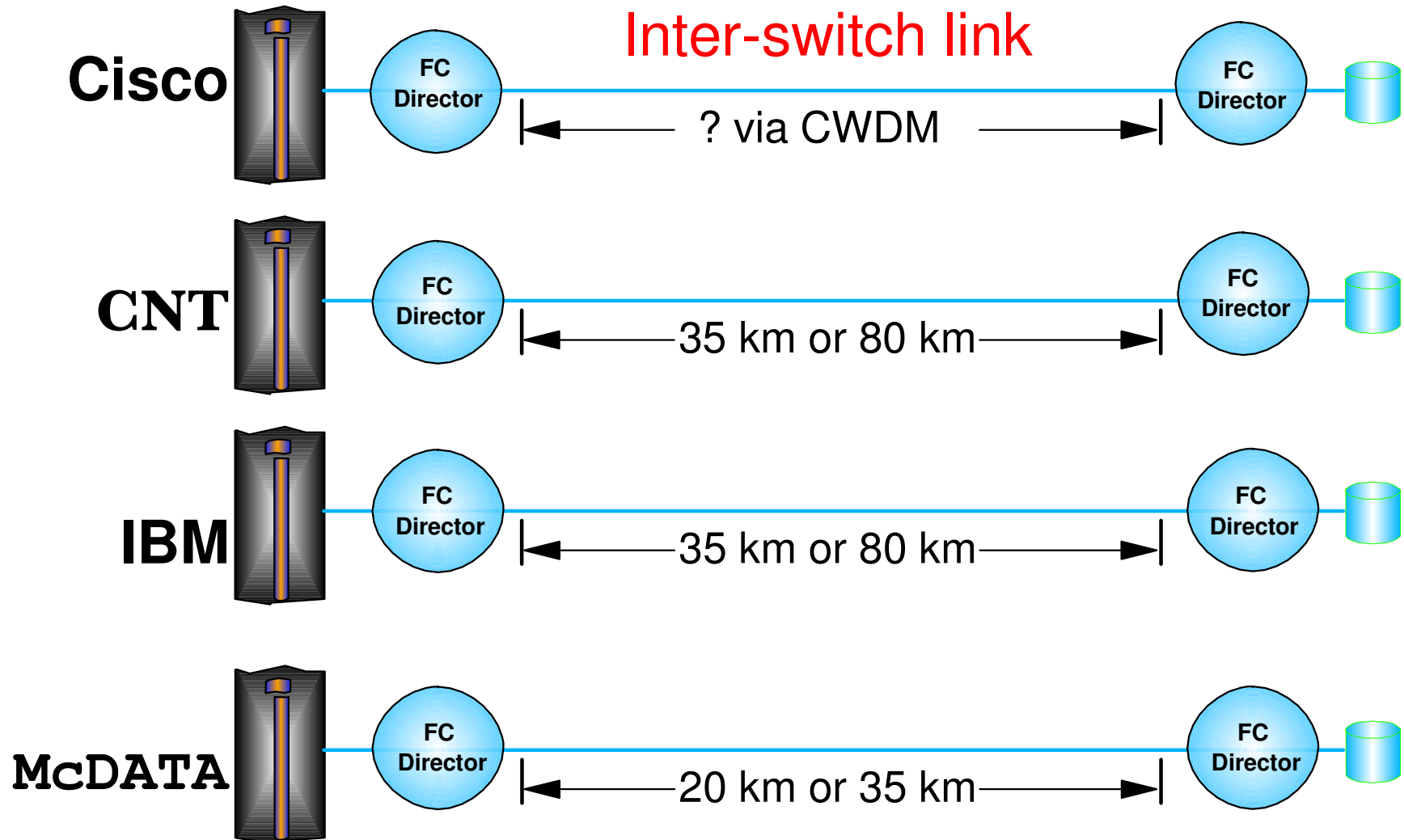
- ▶ <http://www.cnt.com/literature/documents/PL673.pdf>
- ▶ [http://www.mcdata.com/downloads/mkt/wpaper/ficon\\_intermix.pdf](http://www.mcdata.com/downloads/mkt/wpaper/ficon_intermix.pdf)

- ❑ **For Linux on zSeries support of FCP**

- ▶ <http://www10.software.ibm.com/developerworks/opensource/linux390/index.shtml>



# Extended distances using FC Directors



# DWDM product support



## ❑ Dense Wavelength Division Multiplexers (DWDMs)

## ❑ The following vendors are supported for attachment to G5/G6 servers, z800, z900, z890, z990

- ▶ Cisco Systems - ONS 15530 and 15540 ESPx
- ▶ Lucent - Metro EON
- ▶ Nortel Networks - Optera Metro 5100, 5200, 5300E
- ▶ ADVA Fiber Service Platform (FSP) 2000 system

## ❑ The DWDM qualification applies to:

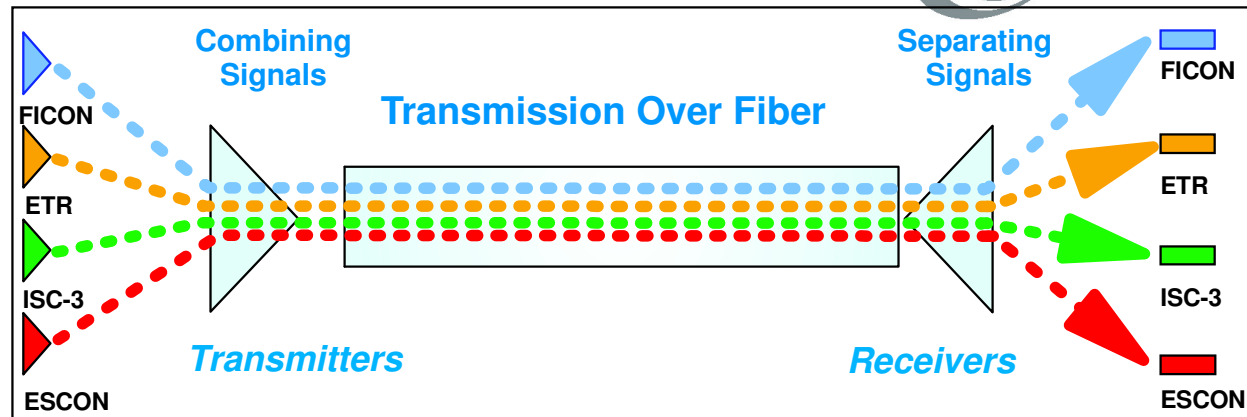
- ▶ GDPS/PPRC up to 40 km
- ▶ GDPS/XRC up to 100 km
- ▶ GDPS/PPRC up to 100 km
  - For Sysplex Timer and ISC-3 via RPQ

## ❑ The DWDM qualification applies to the following protocols:

- ▶ ESCON, FICON/Fibre Channel, ISC-3, OSA-Express GbE, Sysplex Timer (ETR and CLO)

## ❑ Refer to the following web site for a services brochure and further information:

- ▶ <http://www-1.ibm.com/services/files/gss1860f.pdf>



# IBM zSeries GDPS Qualification testing

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## □ zSeries Qualified WDM vendors:

- ▶ Adva Fiber Service Platform 2000 (FSP 2000)
- ▶ Cisco ONS 15530 and ONS 15540 ESPx
- ▶ IBM 2029 Fiber Saver DWDM (withdrawn from marketing)
- ▶ Lucent Metropolis Enhanced Optical Network (EON) System
- ▶ Nortel Networks OPTera Metro 5000 Multiservice Platform

# Fiber link distances using WDM



- The table below lists the data transfer rates and maximum distances for GDPS qualified protocols. For some extended distances, the use of optical amplifiers may be required.

Protocol	Data Transfer Rate	Max repeated distance
ESCON	200 Mbps	100 km <sup>a b c</sup>
CLO	8 Mbps	40 km <sup>a</sup>
ETR	8 Mbps	100 km <sup>a</sup>
FICON (1Gbps) <sup>d</sup>	1062 Gbps	100 km
FICON (2Gbps)	2125 Gbps	100 km
Fiber Channel FC100	1062 Gbps	100 km
Fiber Channel FC200	2125 Gbps	100 km
ISC / ISC-2	1062 Gbps	40 km
ISC-3 Compatibility mode	1062 Gbps	40 km
ISC-3 Peer Mode	2125 Gbps	40 km / 100 km <sup>a</sup>
ISC-3 Peer Mode (1Gbps) <sup>e</sup>	1062 Gbps	40 km / 100 km <sup>a</sup>

a. Requires RPQ 8P2263 zSeries Extended Distance (8P2262 for S/390)

b. Effective channel data rate of an ESCON channel is affected by distance

c. PPRC ESCON is qualified to 103 km

d. Including FICON Bridge card

e. Requires RPQ 8P2197. This RPQ provides an ISC-3 Daughter Card which clocks at 1.062 Gbps in both Peer and Compatibility modes

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# IBM zSeries zAAP



## Redbooks

International Technical Support Organization

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# z890/z990 - IBM eServer zSeries Application Assist Processor (zAAP)

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- Orderable by feature code (FC 6520 for z890 and FC 0520 for z990), up to one for each CP or unassigned CP (for z990) configured on the processor
- The zAAP assist can run all Java code
- zAAPs are designed so that users can manage the use of CPs such that Java code runs only on a CP, only on a zAAP, or on both
- Subsystems that exploit (or will exploit) zAAPs include:
  - ▶ WAS 5.1
  - ▶ CICS®/TS 2.3
  - ▶ DB2 V7 w/PTF UQ81669 (APAR PQ76769)
  - ▶ DB2 V8
  - ▶ IMS™ V7 with PTF UQ80879, UQ82427
  - ▶ IMS™ V8
  - ▶ IMS™ V9
  - ▶ WebSphere WBI Brokers V5 for z/OS
- Other Software
  - ▶ z/OS 1.6 or z/OS.e 1.6 (z890)
  - ▶ IBM SDK 1.4 for z/OS, Java 2 Technology Edition, with PTF (or later) for APAR PQ86689
  - ▶ IBM, Vendor and Customer Java applications are expected to run without modification



# **z890/z990 - Sources for zAAP Information**

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## ■ Sources for zAAP information

- ▶ The main page for the zAAP can be found at:
  - <http://www-1.ibm.com/servers/eserver/zseries/zaap/gettingstarted/>
- ▶ The white paper can be reached at:
  - <http://www-1.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP100417>
- ▶ The tools supporting the announcement can be downloaded from:
  - <http://www6.software.ibm.com/dl/zosjava2/zosjava2-p>
    - (registration will be required)

# The zSeries Application Assist Processor (zAAP)

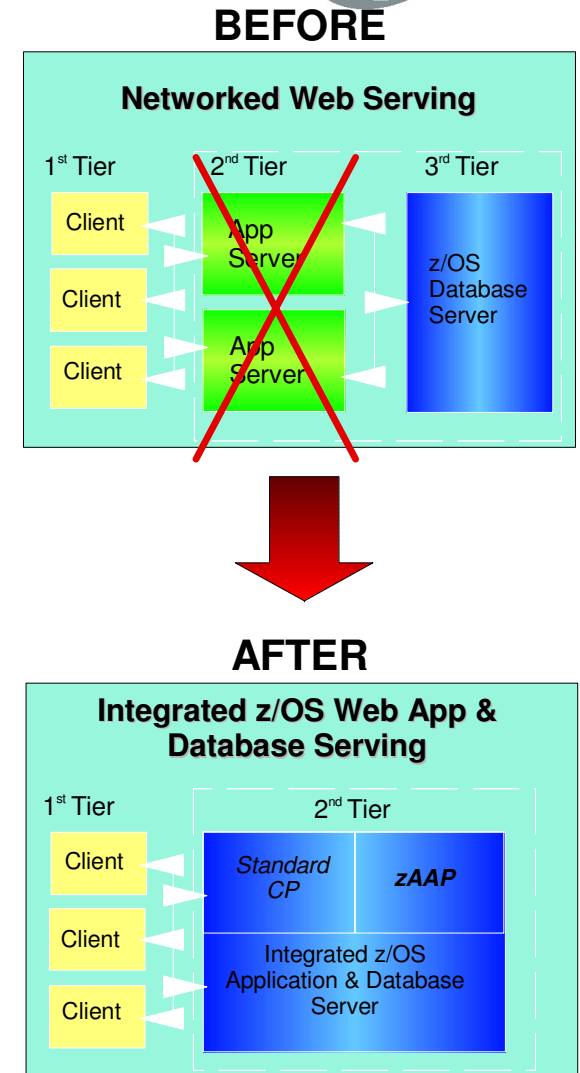


- ❑ Available on the zSeries 990 and zSeries 890 servers
- ❑ *An attractively priced specialized processor unit that provides an economical Java execution environment*
- ❑ zAAPs are configured with general-purpose processors within logical partitions running z/OS
  - *zAAPs are designed to operate asynchronously with the general purpose processor to execute Java programming under control of the IBM Java Virtual Machine (JVM)*
  - *zAAPs only run Java code under control of the IBM JVM*
  - *On z890, the zAAP is a full speed engine*
- ❑ IBM does not impose software charges on zAAP capacity
  - *zAAPs brings additional processing power exclusively for Java application execution without affecting the total MSU rating or machine model designation*

# Integration and Infrastructure Simplification



- ❑ zAAPs can help consolidate, simplify and reduce server infrastructure
  - Improve operational efficiencies.
  - Enables strategic integration of e-business applications with mission-critical database workloads
  - Potential operational advantages over distributed multi-tier solutions
- ❑ Eliminates separate tier to handle application server workload
  - Remove one hardware tier
  - Remove one TCP/IP link
- ❑ Leverage core zSeries strengths and manage Java Workloads automatically with z/OS
  - zSeries Security, Workload Manager (WLM)
  - zSeries Availability, Scalability, Flexibility



# The new zSeries Application Assist Processor (zAAP)

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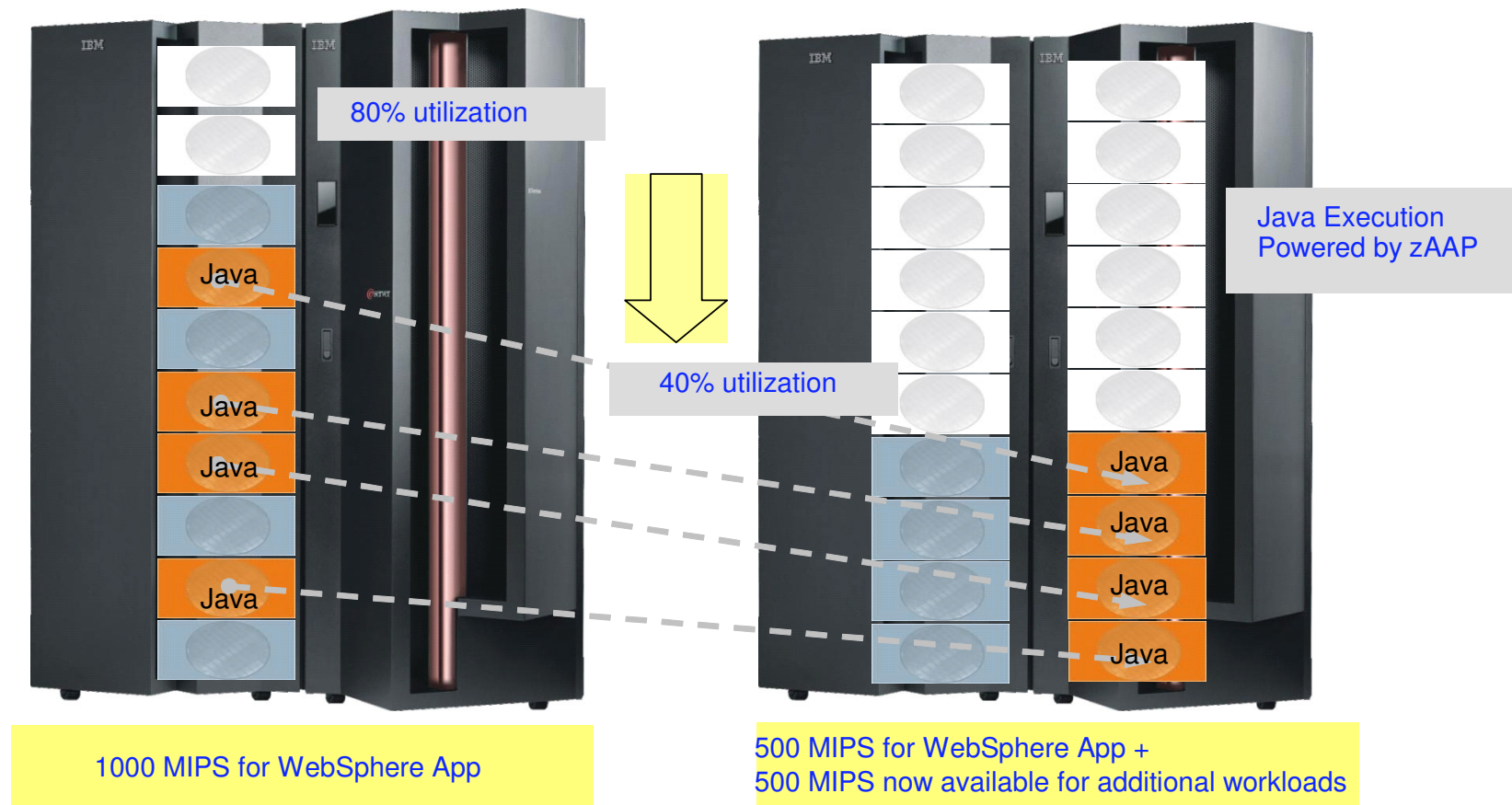
- ❑ Execution of Java processing cycles on a zAAP is a function of :
  - The Software Developer's Kit (SDK) for z/OS, Java 2 Technology Edition, V1.4 with PTF for APAR PQ86689
  - z/OS V1.6 or z/OS.e V1.6
  - Processor Resource/Systems Manager (PR/SM)
- ❑ No anticipated modifications to the Java applications

Objective: Enable integration of Java based Web applications with core z/OS backend database environment for high performance, reliability, availability, security, and lower total cost of ownership

# zAAP Concept Overview: A Simplified Example...



Consider a WebSphere Application that is transactional in nature and requires 1000 MIPS today on zSeries.



**In this example, with zAAP, we can reduce the standard CP capacity requirement for the Application to 500 MIPS or a 50% reduction.**

*\* For illustrative purposes only*





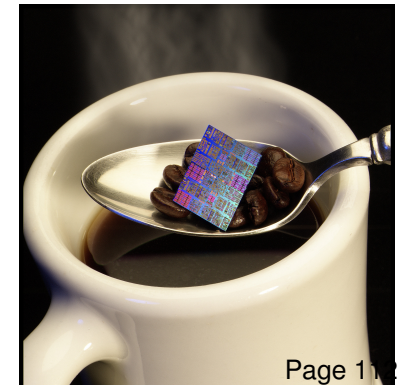
# Technical Overview

# zAAP Operational controls

---



- ❑ IBM z990 or z890 server LPAR Configuration
  - Logical Partition Image profile - Processors
  - LPAR Controls – Processing Weights
- ❑ z/OS 1.6 Dispatcher options
  - PARMLIB member IEAOPTxx
  - IFAHONOR\_PRIORITY = Yes/No
  - IFACrossover = Yes/No
- ❑ JVM runtime options
  - -Xifa: on, off, force, projectn





# The zSeries Application Assist Processor (zAAP)

---



- ❑ zAAPs are configured in the logical partition image profile
- ❑ zAAPs and standard CPs may be defined as either shared or dedicated processors
  - *Shared CPs and zAAPs belong to different processor pools*
  - *Capping option and Processing Weights defined to the logical partition apply to CPs and zAAPs*
- ❑ The logical partition processing weights
  - *(INITIAL, MIN, MAX)*
  - *Are applied independently to the shared CPs and to the shared zAAPs configured to the logical partition*
- ❑ z/OS WLM does NOT manage shared zAAPs

# Partition image profile



Customize Activation Profiles : SCZP901

Logical processor assignment

☐ Dedicated central processors

☐ Dedicated central processors and integrated facility for application

☐ Not dedicated central processors

☒ Not dedicated central processors and integrated facility for application

Not dedicated processor details

Initial processing weight  1 to 999 ☐ Initial capping

☐ Enable WorkLoad Manager

Minimum processing weight

Maximum processing weight

Number of processors - Initial  Reserved

Number of integrated facility for application - Initial  Reserved

Initial / Reserved

- CPs
- IFAs

Note

IFA = zAAP

SCZP901:A07

SCZP901:A08

SCZP901:A09

SCZP901:A11

SCZP901:A12

SCZP901:A13

SCZP901:A14

SCZP901:A17

SCZP901:A18

SCZP901:A19

SCZP901:A1A

SCZP901:A1B

SCZP901:A1D

General Processor Security Storage Options Load PCI Crypto

# zAAP characteristics

---



## □ zAAPs

- *Cannot be IPLed*
- *Only executes z/Architecture™ mode instructions*
- *Do not support manual operator controls*
  - *No PSW Restart, LOAD or LOAD derivatives*
- *Do not respond to SIGP requests unless enabled by a z/OS that supports zAAPs*
- *No I/O interrupts nor Clock Comparator interrupts*
- *Additional architecture differences are anticipated in future implementations*

## □ The z/OS design accommodates zAAP differences

# HMC – CPC Details



**SCZP901 Details**

Instance information

CP Status:	Operating	Activation profile:	SCZP901
CHPID Status:	Exceptions	Last used profile:	not set
Group:	CPC	Service state:	Disabled
IOCDs identifier:	A1	Maximum CPs:	10
IOCDs name:	I00F49	Maximum ICFs/IFLs/IFAs:	6

Lockout disruptive tasks: ☐ Yes ☒ No

System mode: Logically partitioned      Dual AC power maintenance: Fully Redundant  
Alternate SE Status: Operating      CP Assist for Cryptographic Functions: Installed

Acceptable CP/CHPID status

<input checked="" type="checkbox"/> Operating -	<input type="checkbox"/> Power save -	<input type="checkbox"/> No power -
<input type="checkbox"/> Not Operating -	<input type="checkbox"/> Exceptions -	<input type="checkbox"/> Status check -
<input checked="" type="checkbox"/> Acceptable -	<input type="checkbox"/> Service Required -	<input type="checkbox"/> Degraded -

Product information

Machine type / model:	002004 / B16-310	Manufacturer:	IBM
Machine serial:	02 - 0026A3A	CPC serial:	000020026A3A
Machine sequence:	000000026A3A	CPC location:	A19B
Plant of manufacture:	02	CPC identifier:	00

Save    Change Options...    Diagnose reasons...    Cancel    Help

Max CPs  
Max  
ICFs/IFLs/zAAPs

Note  
IFA = zAAP

# SE CPC Work Area



SCZP901: Primary Support Element Workplace (Version 1.8.2)

Views

- Groups
- Exceptions
- Active Tasks
- Console Actions
- Task List

Right click on CPC,  
Select CPs to reach  
CPs Work Area

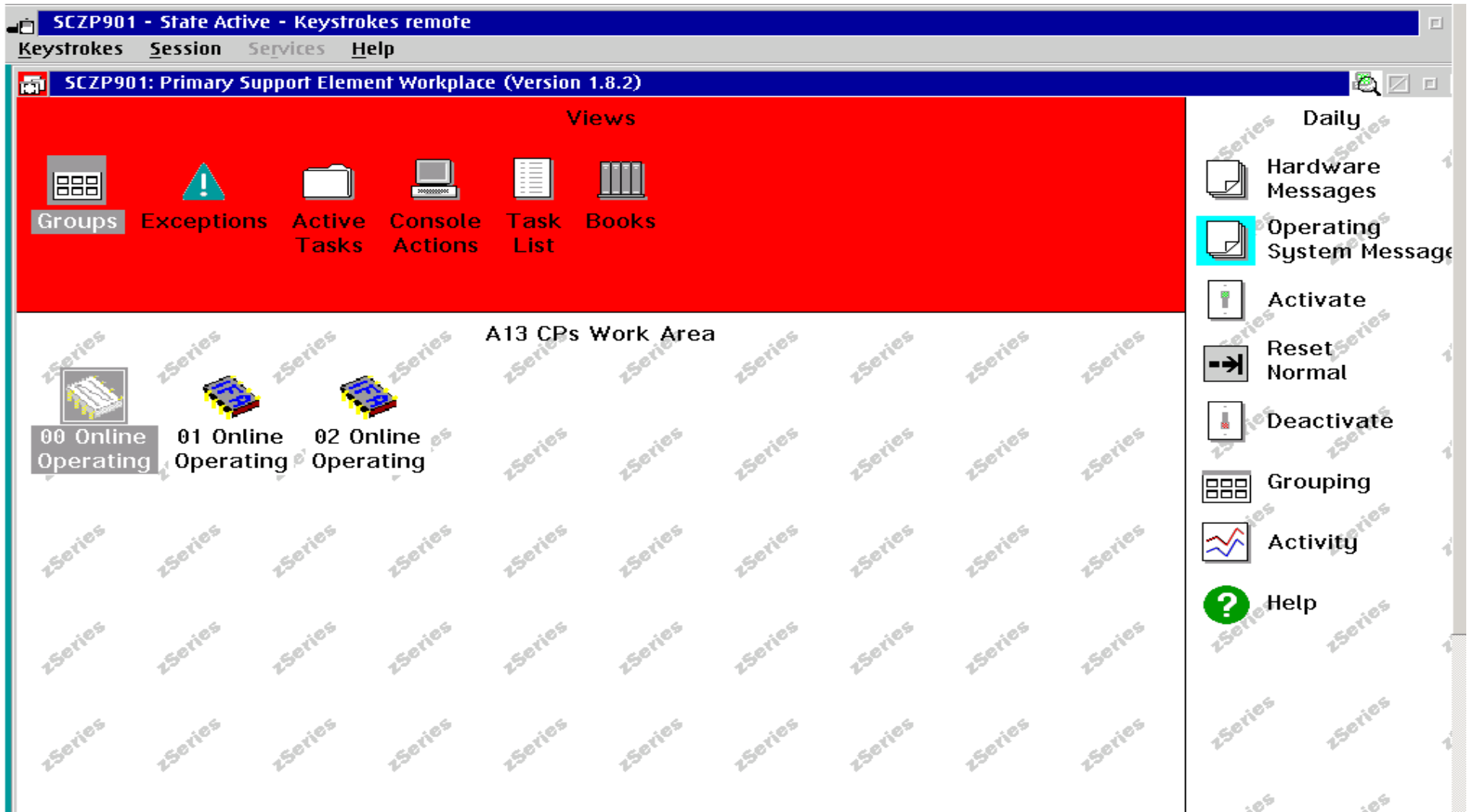
SCZP901

SCZP901 CPs Work Area

00 Online Operating	02 Online Operating	05 Online Operating	07 Online Operating	08 Online Operating	0A Online Operating	0C Online Operating	0E Online Operating
10 Online Operating	12 Online Operating	15 Online Operating	17 Online Operating	18 Online Operating	1A Online Operating	1C Online Operating	1E Online Operating

10 CPs plus 6 [ICFs, IFLs and IFAs (zAAPs)]

# Image CPs Work Area



# Z990 HMC – LPAR Controls



Only two *NON-DEDICATED* Pools

- CPs
- ICFs Pool contains ICFs, IFLs and IFAs (zAAPs)

A3 IODF47

ent	WLM	Initial	Minimum	Maximum	Initial	Current	Non-	Non-dedicated	Integrated	Logical
ht	Managed	Processing	Processing	Processing	Capping	Capping	dedicated	Central	Coupling	Partition
		Weight	Weight	Weight			Processors	Processors	Facility	
<input type="checkbox"/>		50	0	0	<input type="checkbox"/>	No	3	0		A0A
<input type="checkbox"/>		10	0	0	<input type="checkbox"/>	No	2	0		A0B
<input type="checkbox"/>		20	0	0	<input type="checkbox"/>	No	2	0		A0C
<input type="checkbox"/>		10	0	0	<input type="checkbox"/>	No	0	1		A0D
<input type="checkbox"/>		10	0	0	<input type="checkbox"/>	No	0	1		A0E
<input type="checkbox"/>		10	0	0	<input type="checkbox"/>	No	0	1		A0F
<input type="checkbox"/>		20	0	0	<input type="checkbox"/>	No	1	0		A01
<input type="checkbox"/>		20	0	0	<input type="checkbox"/>	No	2	0		A02
<input type="checkbox"/>		50	0	0	<input type="checkbox"/>	No				
<input type="checkbox"/>		40	0	0	<input type="checkbox"/>	No				

Processing Weight  
applies to both pools

# z/OS Configuration Execution Options



- ☐ Options in z/OS Parmlib member IEAOPTxx
- ☐ The selected execution option can be dynamically changed
  - SET OPT command
- ☐ Java Crossover - IFACrossover = Yes
  - Java by Priority IFA - HONOR\_PRIORITY = Yes
  - Java Discretionary Crossover - IFAHONOR\_PRIORITY = No
- ☐ No Java Crossover - IFACrossover = No



# z/OS dispatcher options

---



## Java Crossover - IFACrossover = Yes

- ☐ Java by Priority - IFAHONORPRIORITY = Yes
  - *Standard CPs execute both Java and non-Java work in priority order*
  - *zAAPs execute Java work only, in priority order*

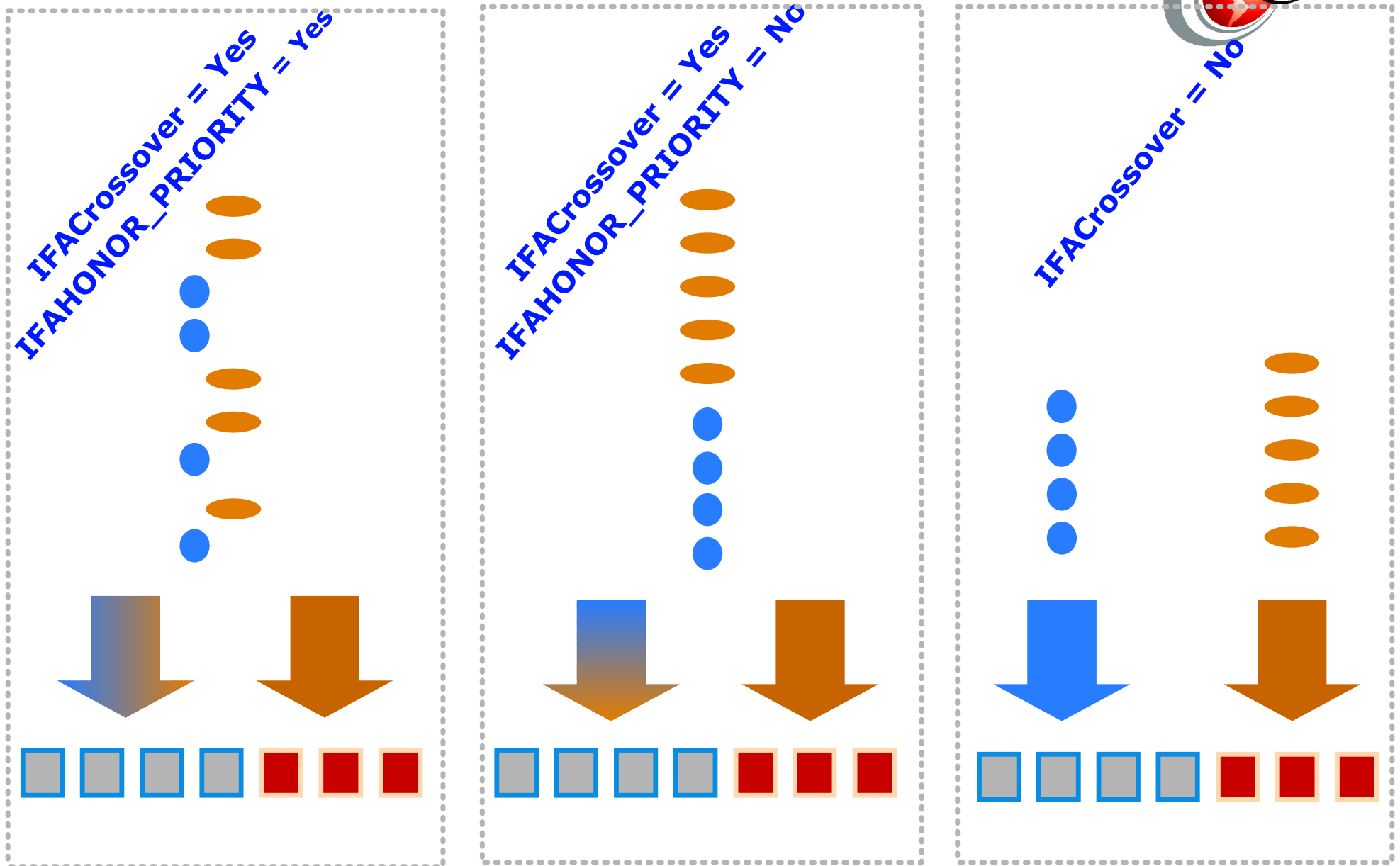
## ☐ Java Discretionary Crossover - IFAHONORPRIORITY = No

- *Standard CPs execute non-Java work in priority order and Java work in priority order only when there is no non-Java work to execute*
- *zAAPs execute Java work only, in priority order*

## No Java Crossover - IFACrossover = No

- ☐ *Standard CPs execute non-Java work only, in priority order*
- ☐ *zAAPs execute Java work only, in priority order*

# z/OS dispatcher options



# JVM options

---



## ❑ **-Xifa:on**

- Enables Java work to be run on the zAAP if the zAAPs are available. This setting is assumed by default.

## ❑ **-Xifa:off**

- Disables use of the zAAP

## ❑ **-Xifa:projectn**

- Designed to estimate projected zAAP usage and write this information to STDOUT at intervals of **n** minutes. The option is primarily intended for assessing potential zAAP use on versions before z/OS 1.6

## ❑ **-Xifa:force**

- Designed to force Java to continue attempting to use zAAP, even if none are available. This option is honored only with the zAAP support delivered with z/OS 1.6. This would typically be specified for the purpose of collecting RMF/SMF data to assess potential zAAP use.

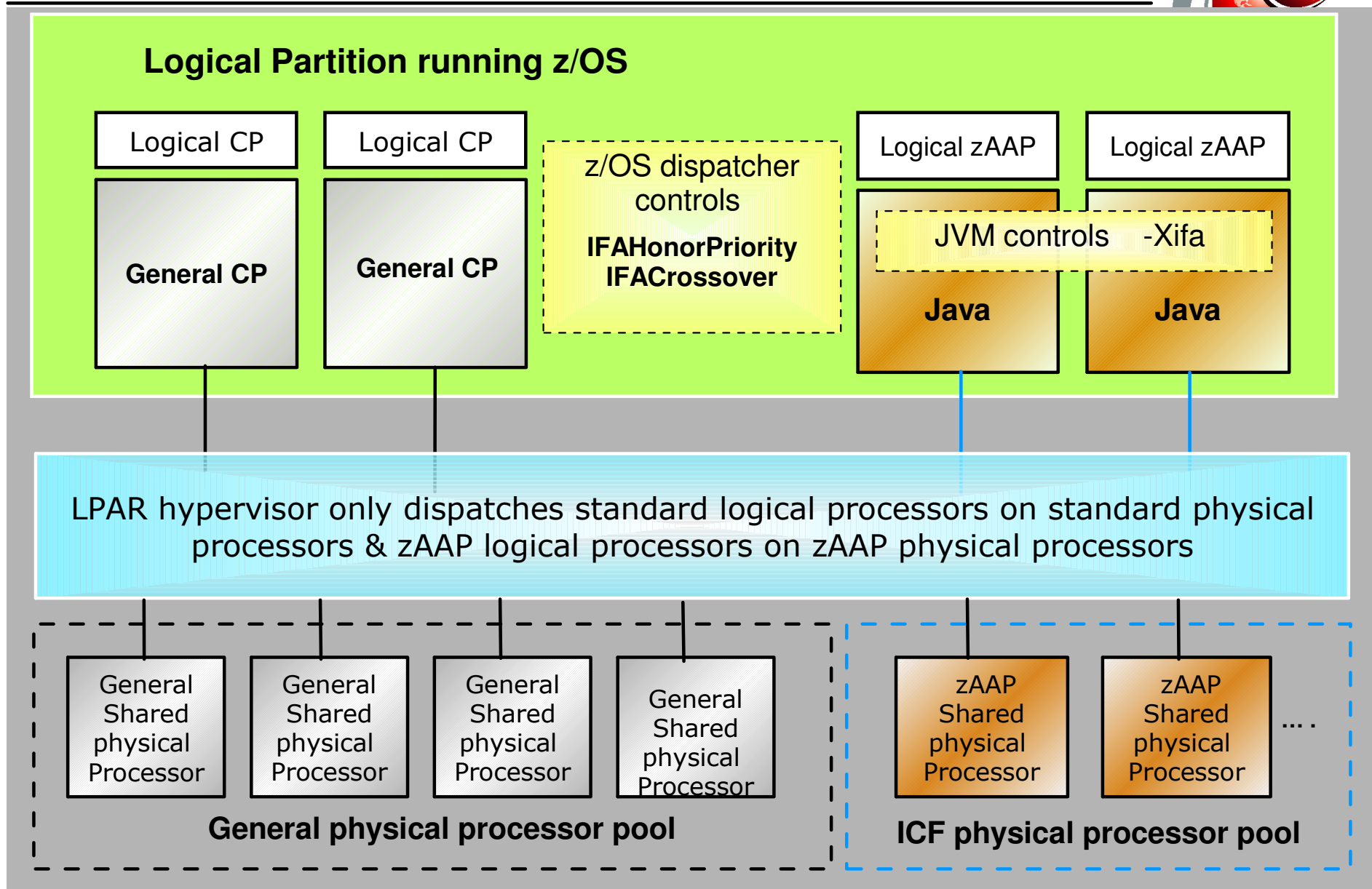
# IBM SDK for z/OS, Java 2 Technology Edition, SDK V1.4

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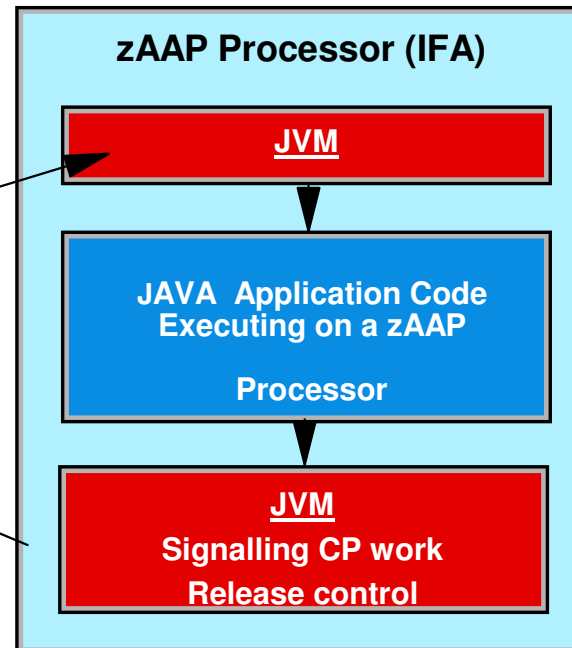
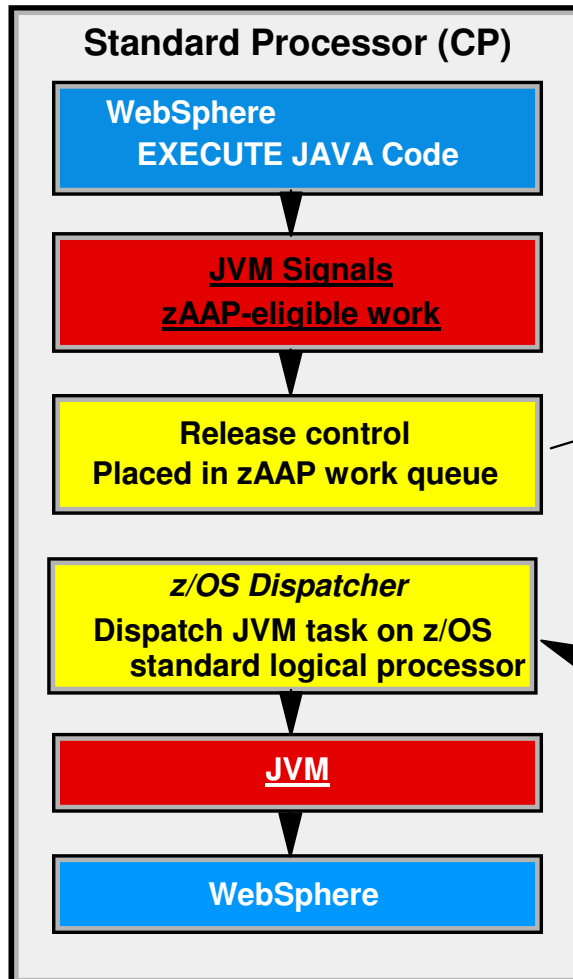


<i>Subsystem</i>	<i>IBM SDK for z/OS, Java 2 Technology Edition, SDK V1.4</i>
WebSphere Application Server V5.02	
WebSphere Application Server V5.1	Yes
IMS V7.1	Yes
IMS V8.1	Yes
IMS V9.1	Yes
CICS TS V2.2	
CICS TS V2.3	Yes
DB2 V7.1	Yes
DB2 V8.1	Yes

# Logical Partition – Shared CPs and zAAPs



# Executing Java under *IBM JVM* control



IBM JVM communicates to z/OS dispatcher when zAAP-eligible code is to be executed

When Java work is to be executed, the work unit is set *zAAP-eligible*

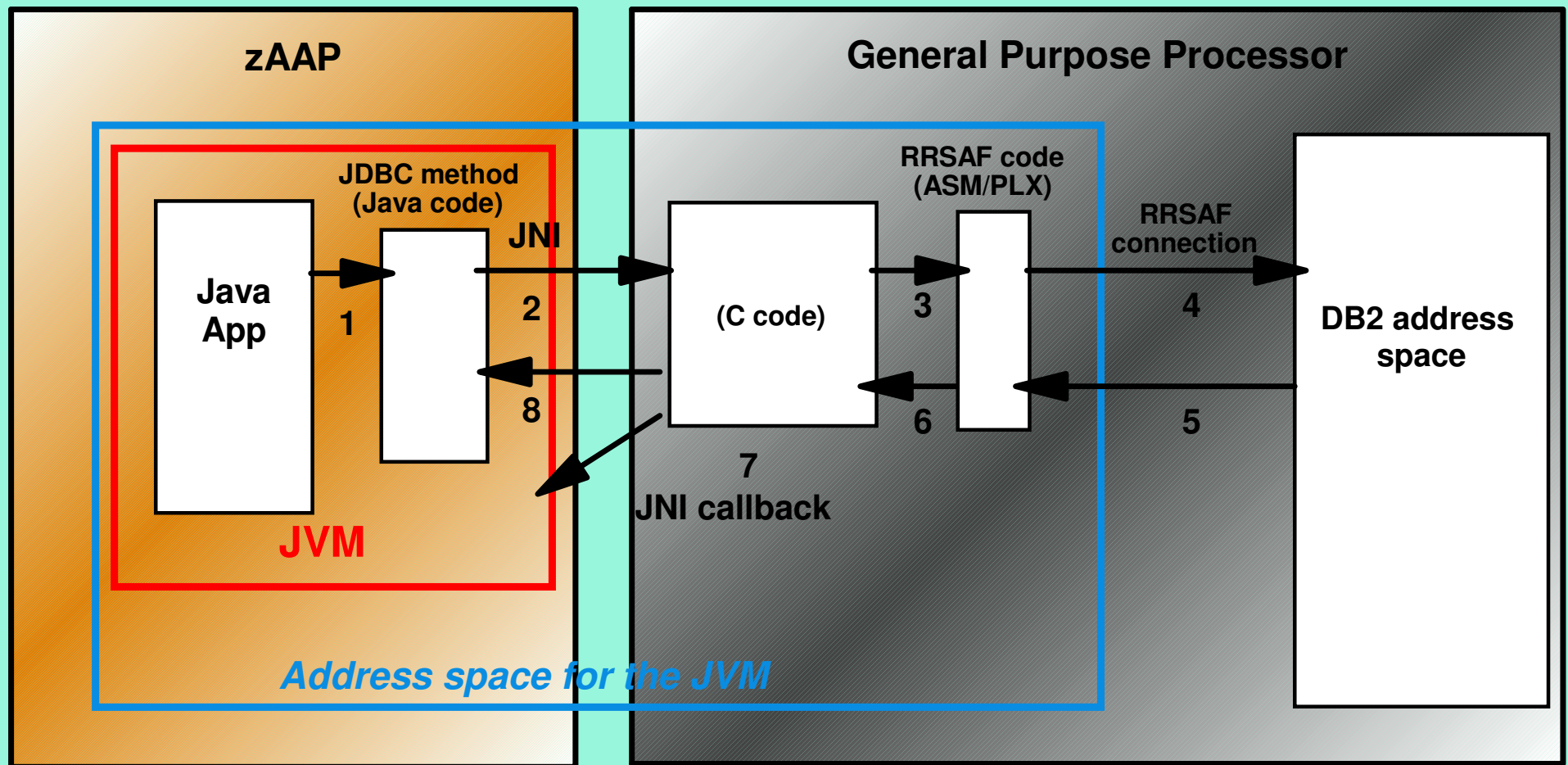
Non zAAP-eligible work only dispatched on standard CPs

zAAP-eligible work dispatched according to runtime options set in JVM and IEAOPTxx

# Java App calling DB2



## *z/OS Logical Partition*





# Installation Planning



# HW/SW Requirements

---



- ❑ IBM z990 or z890 PR/SM
  - zAAPs configured with general purpose CPs within z/OS logical partitions
    - *DED or SHARED*
- ❑ z/OS 1.6 (or z/OSe 1.6)
  - *zAAPs not recognized by z/OS release prior to 1.6*
    - SMF, RMF
- ❑ IBM SDK for z/OS, Java 2 Technology Edition V1.4
  - *with PTF for APAR PQ86689*
  - Subsystems and Applications using SDK 1.4
    - WebSphere V5.1 for z/OS
    - CICS TS 2.3, IMS V8, DB2 V8
    - Other ...

# zSeries configuration rules



- ❑ The number of zAAPs cannot exceed the number of CPs plus unassigned CPs in the server.
  - *One CP must be installed with or prior to any zAAP being installed*
- ❑ On z990, up to four zAAPs can be characterized per book.
  - *You need an IBM 2084 model D32 with a total of 16 assigned and unassigned CPs to assign 16 zAAPs.*
- ❑ On z890, the zAAP is a full speed engine
- ❑ IBM does not impose software charges on zAAP capacity
  - *Additional IBM software charges will apply when additional CP capacity is used*

# Concurrent Upgrade

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- ❑ zAAPs can be concurrently added to a configuration via
  - Capacity Upgrade on Demand (CUoD)
  - Customer Initiated Upgrade (CIU)
  - On/Off Capacity on Demand (On/Off CoD)
- ❑ With On/Off CoD
  - The number of On/Off CoD active zAAPs (#9893) may not exceed the current number of zAAPs (#0520) that are permanently purchased
  - The total number of On/Off CoD active zAPPs (#9893) plus zAAPs (#0520) may not exceed
    - *The number of On/Off CoD Active CPs (#9897)*
    - *Plus the number of CPs (#0716)*
    - *Plus the number of unassigned CPs (#1716).*
- ❑ *Usual Initial/Reserved rule apply for non-disruptive addition of zAAPs*
- ❑ *zAAPs cannot be assigned via Capacity Backup Upgrade*

# z990 and z/OS scalability

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- ❑ In conjunction with z/OS V1.6, the maximum number of *combined zAAPs and CPs* supported on the z990 server in a single LPAR is 24
  - *When using the new IBM zSeries Application Assist Processor (zAAP) the total number of processors defined in a z/OS V1.6 logical partition is the sum of general purpose processors (CPs) and zSeries Application Assist Processors (zAAPs).*
- ❑ In 2005, IBM plans to provide support for z/OS V1.6 to run up to 32 processors in a single logical partition on a z990
- ❑ You can scale up in a single logical partition, and scale out in a parallel sysplex for higher availability.

# zAAP configurations



<i>Z990</i>	<i>Max #zAAPs</i>	<i>Max LPAR CP+zAAP</i>
A08	4	4+4
B16	8	8+8
C24	12	12+12
D32	16	Any combination from 8+16 to 16+8

<i>Z890</i>	<i>Max #zAAPs</i>	<i>Max LPAR CP+zAAP</i>
1xx	1	1+1
2xx	2	2+2
3xx	1	3+1
4xx	0	4+0

On z890, the zAAP is  
a full speed engine

# z/OS 1.6 RMF / SMF Support

---



- ❑ RMF supports zAAP processors
  - *Postprocessor CPU activity report and Workload report*
  - *Monitor III Enclave report*
- ❑ Support is shipped as SPE (APAR OA05731)
  - *PTFs available for z/OS V1.5 RMF*
- ❑ RMF distinguishes between standard CP and zAAP processors
  - *Collects and reports about zAAP service times*
  - *Collects and reports about zAAP delay states for service and report class periods*
  - *For z890, zAAP CPU time is normalized to CP speed*
- ❑ SMF record types
  - *SMF type 30 and type 72 records have been enhanced to provide zAAP usage information*

# z/OS V1.5 on z990 - D M=CPU



RESPONSE=SC49

IEE174I 16.00.24 DISPLAY M 771

PROCESSOR STATUS

ID	CPU	SERIAL
0	+	036A3A2084
1	+	036A3A2084
2	-	

2 x CPs

1 x zAAP offline  
(not supported)

CPC ND = 002084.B16.IBM.02.000000026A3A

CPC SI = 2084.310.IBM.02.0000000000026A3A

CPC ID = 00

CPC NAME = SCZP901

LP NAME = A03 LP ID = 3

CSS ID = 0

MIF ID = 3

+ ONLINE  
- OFFLINE  
. DOES NOT EXIST  
W WLM-MANAGED  
N NOT AVAILABLE

CPC ND CENTRAL PROCESSING COMPLEX NODE  
DESCRIPTOR

CPC SI SYSTEM INFORMATION FROM STSI  
INSTRUCTION

CPC ID CENTRAL PROCESSING COMPLEX IDENTIFIER

CPC NAME CENTRAL PROCESSING COMPLEX NAME

LP NAME LOGICAL PARTITION NAME

LP ID LOGICAL PARTITION IDENTIFIER

CSS ID CHANNEL SUBSYSTEM IDENTIFIER

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# z/OS V1.6 on z990 - D M=CPU



IEE174I 16.11.12 DISPLAY M 703

## PROCESSOR STATUS

ID	CPU	SERIAL
00	+	136A3A2084
01	+A	136A3A2084
02	-A	
03	-A	
04	-A	
05	-A	
06	-A	
07	NA	

CPC ND = 002084.B16.IBM.02.000000026A3A

CPC SI = 2084.310.IBM.02.0000000000026A3A

CPC ID = 00

CPC NAME = SCZP901

LP NAME = A13 LP ID = 13

CSS ID = 1

MIF ID = 3

1 x CP online  
1 x zAAP online  
5 x zAAPs offline  
1 x zAAP Not Available

A =Assist processor = zAAP

**+ ONLINE**  
**- OFFLINE**  
**. DOES NOT EXIST**  
**W WLM-MANAGED**  
**N NOT AVAILABLE**  
**A ASSIST PROCESSOR**



## Page 137

# CPU Activity & Partition Data Report



C P U A C T I V I T Y															
MVS PARTITION NAME							A13		NUMBER OF PHYSICAL PROCESSORS				16		
IMAGE CAPACITY							538		CP				10		
NUMBER OF CONFIGURED PARTITIONS							30		ICF				6		
WAIT COMPLETION							NO								
INTERVAL							DYNAMIC								
----- PARTITION DATA -----							-- LOGICAL PARTITION PROCESSOR DATA --				-- AVERAGE PROCESSOR UTILIZATION PERCENTAGES --				
-----MSU-----							--CAPPING--				---				
PROCESSOR-							DISPATCH TIME DATA----				LOGICAL PROCESSORS --- PHYSICAL PROCESSORS ---				
NAME S WGT DEF ACT DEF WLM%							NUM TYPE		EFFECTIVE TOTAL		EFFECTIVE TOTAL		LPAR MGMT EFFECTIVE TOTA		
A13 A 10 0 7 NO 0.0							1 CP		00.01.13.115 00.01.15.052		12.19 12.51		0.03 1.22 1.25		
A0A A 50 0 4 NO 0.0							2 CP		00.00.39.218 00.00.42.670		3.27 3.56		0.06 0.65 0.71		
A0B A 10 0 2 NO 0.0							2 CP		00.00.24.107 00.00.25.155		2.01 2.10		0.02 0.40 0.42		
A0C A 20 0 6 NO 0.0							2 CP		00.01.05.904 00.01.09.106		5.49 5.76		0.05 1.10 1.15		
A01 A 20 0 5 NO 0.0							2 CP		00.00.47.127 00.00.50.650		3.93 4.22		0.06 0.79 0.84		
A02 A 20 0 8 NO 0.0							2 CP		00.01.23.688 00.01.27.442		6.97 7.29		0.06 1.39 1.46		
A03 A 50 0 4 NO 0.0							2 CP		00.00.46.381 00.00.50.146		3.87 4.18		0.06 0.77 0.84		
A04 A 40 0 3 NO 0.0							1 CP		00.00.28.834 00.00.31.901		4.81 5.32		0.05 0.48 0.53		
A05 A 40 0 3 NO 0.0							1 CP		00.00.31.428 00.00.34.805		5.24 5.80		0.06 0.52 0.58		
A06 A 40 0 3 NO 0.0							1 CP		00.00.28.925 00.00.31.950		4.82 5.33		0.05 0.48 0.53		
A07 A 20 0 6 NO 0.0							2 CP		00.01.00.813 00.01.04.382		5.07 5.37		0.06 1.01 1.07		
A08 A 20 0 11 NO 0.0							2 CP		00.01.58.746 00.02.02.376		9.90 10.20		0.06 1.98 2.04		
A09 A 50 0 5 NO 0.0							2 CP		00.00.50.375 00.00.53.840		4.20 4.49		0.06 0.84 0.90		
A1A A 20 0 1 NO 0.0							2 CP		00.00.06.978 00.00.07.281		0.58 0.61		0.01 0.12 0.12		
A1B A 20 0 3 NO 0.0							2 CP		00.00.29.719 00.00.31.647		2.48 2.64		0.03 0.50 0.53		
A11 A 20 0 5 NO 0.0							2 CP		00.00.47.579 00.00.50.893		3.97 4.24		0.06 0.79 0.85		
A12 A 20 0 6 NO 0.0							2 CP		00.01.02.018 00.01.05.440		5.17 5.45		0.06 1.03 1.09		
A14 A 20 0 2 NO 0.0							2 CP		00.00.18.758 00.00.19.750		1.56 1.65		0.02 0.31 0.33		
A17 A 40 0 0 NO 0.0							1 CP		00.00.00.875 00.00.00.879		0.15 0.15		0.00 0.01 0.01		
A18 A 40 0 0 NO 0.0							1 CP		00.00.00.241 00.00.00.242		0.04 0.04		0.00 0.00 0.00		
A19 A 20 10 0 NO 0.0							2 CP		00.00.00.885 00.00.00.896		0.07 0.07		0.00 0.01 0.01		
*PHYSICAL*									00.06.53.268				6.89 6.89		
									-----		-----				
TOTAL									00.14.25.725 00.22.09.784				7.74 14.43 22.17		
A13 A 10							2 ICF		00.09.56.489 00.09.56.571		49.71 49.72		0.00 16.57 16.57		
A0D A 10							1 ICF		00.09.57.867 00.09.57.902		99.66 99.66		0.00 16.61 16.61		
A0E A 10							1 ICF		00.09.55.805 00.09.55.864		99.31 99.32		0.00 16.55 16.55		
A0F A 10							1 ICF		00.09.32.715 00.09.33.044		95.46 95.52		0.01 15.91 15.92		
A1E A 10							1 ICF		00.09.57.573 00.09.57.639		99.61 99.62		0.00 16.60 16.60		
A1F A 10							1 ICF		00.09.57.899 00.09.57.934		99.66 99.67		0.00 16.61 16.61		
*PHYSICAL*									00.00.29.599				0.82 0.82		

# Workload Report



```

TRANSACTIONS    TRANS.-TIME  HHH.MM.SS.TTT  --DASD I/O--  ---SERVICE---  --SERVICE TIMES--  PAGE-IN RATES  ----STORAGE----
AVG      4.76  ACTUAL          92  SSCHRT   0.0  IOC       0  TCB      1405.2  SINGLE   0.0  AVG      0.00
MPL      4.76  EXECUTION        92  RESP    0.0  CPU     30714K  SRB       0.0  BLOCK   0.0  TOTAL   0.00
31029  QUEUED          0  CONN    0.0  MSO       0  RCT       0.0  SHARED  0.0  CENTRAL 0.00
END/S    51.73  R/S AFFINITY      0  DISC    0.0  SRB       0  IIT       0.0  HSP     0.0  EXPAND  0.00
#SWAPS    0  INELIGIBLE        0  Q+PEND  0.0  TOT     30714K  HST       0.0  HSP MISS 0.0
EXCTD    0  CONVERSION        0  IOSQ    0.0  /SEC    51208  IFA      1109.2  EXP SNGL 0.0  SHARED  0.00
AVG ENC   4.76  STD DEV          0  ABSRPTN   11K  APPL% CP   49.3  EXP BLK  0.0
REM ENC   0.00  TRX SERV   11K  APPL% IFACP 33.9  EXP SHR  0.0
MS ENC   0.00  WORKLOAD ACTIVITY

```

z/OS V1R5

SYSPLEX SANDBOX  
CONVERTED TO z/OS V1R5 RMF

DATE 07/28/2004  
TIME 15.00.00

INTERVAL 09.59.979 MODE = GOAL

PAGE 3

POLICY ACTIVATION DATE/TIME 07/27/2004 17.19.40

Note  
IFA = zAAP

# SMF Records

---



- ❑ The following SMF record types are extended in support of zAAPs.
  - SMF record 30
  - SMF record 70 subtype 1 (CPU activity)
  - SMF record 72 subtype 3 (Workload activity)
  - SMF record 79 subtype 1 and 2 (Address Space State and Resource data)

# SMF record 30



72	48	SMF30ENC	4	binary	CPU time used by the independent enclave, but only when in the WLM enclave. Note that independent enclave time on an IFA is not included. See field SMF30_ENCLAVE_TIME_ON_IFA for that value. SMF30ENC is also part of the value in SMF30CPT.														
76	4C	SMF30DET	4	binary	CPU time used by the dependent enclave, but only when in the WLM enclave. Note that dependent enclave time on an IFA is not included - see field SMF30_DEP_ENCLAVE_TIME_ON_IFA for that value. SMF30DET is also part of the value in SMF30CPT.														
80	50	SMF30CEP	4	binary	CPU time consumed for an address space or job while enqueue promoted (in 1.024 millisecond units).														
82	52	SMF30TF2	2	binary	Additional timer flags  <table><tr><th>Bit</th><th>Meaning When Set</th></tr><tr><td>0</td><td>SMF30_TIME_ON_IFA has an invalid value due to a timer value calculation error.</td></tr><tr><td>1</td><td>SMF30_ENCLAVE_TIME_ON_IFA has an invalid value due to a timer value calculation error.</td></tr><tr><td>2</td><td>SMF30_DEP_ENCLAVE_TIME_ON_IFA has an invalid value due to a timer value calculation error.</td></tr><tr><td>3</td><td>SMF30_TIME_IFA_ON_CP has an invalid value due to a timer value calculation error.</td></tr><tr><td>4</td><td>SMF30_ENCLAVE_TIME_IFA_ON_CP has an invalid value due to a timer value calculation error.</td></tr><tr><td>5</td><td>SMF30_DEP_ENCLAVE_TIME_IFA_ON_CP has an invalid value due to a timer value calculation error.</td></tr></table>	Bit	Meaning When Set	0	SMF30_TIME_ON_IFA has an invalid value due to a timer value calculation error.	1	SMF30_ENCLAVE_TIME_ON_IFA has an invalid value due to a timer value calculation error.	2	SMF30_DEP_ENCLAVE_TIME_ON_IFA has an invalid value due to a timer value calculation error.	3	SMF30_TIME_IFA_ON_CP has an invalid value due to a timer value calculation error.	4	SMF30_ENCLAVE_TIME_IFA_ON_CP has an invalid value due to a timer value calculation error.	5	SMF30_DEP_ENCLAVE_TIME_IFA_ON_CP has an invalid value due to a timer value calculation error.
Bit	Meaning When Set																		
0	SMF30_TIME_ON_IFA has an invalid value due to a timer value calculation error.																		
1	SMF30_ENCLAVE_TIME_ON_IFA has an invalid value due to a timer value calculation error.																		
2	SMF30_DEP_ENCLAVE_TIME_ON_IFA has an invalid value due to a timer value calculation error.																		
3	SMF30_TIME_IFA_ON_CP has an invalid value due to a timer value calculation error.																		
4	SMF30_ENCLAVE_TIME_IFA_ON_CP has an invalid value due to a timer value calculation error.																		
5	SMF30_DEP_ENCLAVE_TIME_IFA_ON_CP has an invalid value due to a timer value calculation error.																		
84	54	SMF30_TIME_ON_IFA	4	binary	CPU time spent on IFA in hundredths of a second (including enclave time).														
88	58	SMF30_ENCLAVE_TIME_ON_IFA	4	binary	Enclave time spent on IFA in hundredths of a second.														
92	5C	SMF30_DEP_ENCLAVE_TIME_ON_IFA	4	binary	Dependent enclave time spent on IFA in hundredths of a second.														
96	60	SMF30_TIME_IFA_ON_CP	4	binary	CPU time spent running IFA eligible work on a standard CP in hundredths of a second (including enclave time).														
100	64	SMF30_ENCLAVE_TIME_IFA_ON_CP	4	binary	IFA Enclave time spent on a standard CP in hundredths of a second.														
104	68	SMF30_DEP_ENCLAVE_TIME_IFA_ON_CP	4	binary	IFA Dependent enclave time spent on a standard CP in hundredths of a second.														

# SMF record 70 subtype 1 (CPU activity)



SMF record 70.1 CPU control section				
Offset	Name	Length	Format	Description
26 1A	SMF70IFA	2	Binary	IFA processors online at the end of the interval

SMF record 70.1 CPU data section				
Offset	Name	Length	Format	Description - CPU type
15 0F	SMF70ITYP	1	Binary	0 Regular CP processor
				1 IFA (zAAP) processor

# SMF record 72 subtype 3 (Workload activity)



SMF record 72.3 workload manager control section					
Offset	Name	Length	Format	Description	
1 1	R723MFLG	1	Binary	Bit	Meaning when set
				0	Indicator for IFA cross-over
				1	Indicator for IFA honor priority
				2-7	Reserved
2 2		2		Reserved	

SMF record 72.3 workload manager control section				
540 F0	R723NFFI	4	Binary	Normalization factor for IFA time. Used to convert between real IFA times and the equivalent time on regular CP. Multiply normalized IFA times with 256 and divide it this value to calculate real IFA time

# SMF record 72 subtype 3 (Workload activity)....

---



SMF record 72.3 period data section				
Offset	Name	Length	Format	Description
504 1F8	R723IFAU	4	Binary	IFA using samples
504 1FC	R723IFCU	4	Binary	IFA on CP using samples. If IFA honor-priority is set, these are included in R723CCUS. If not, these are included in R723IFAU.
512 200	R723IFAD	8	Binary	IFA delay samples
516 204	R723IFAT	8	Floating	Normalized IFA service time (microsecond) long floating point format. Multiply with 256 and divide by R723NFFI to calculate the real IFA service time.
524 20C	R723IFCT	8	Floating	IFA service time spent on CPs (microseconds)



# SMF record 79

---



## SMF record 79.1 ASD and ASDJ data section

Offset	Name	Length	Format	Description
192 C0	R791TIFA	4	Binary	IFA service time (milliseconds) assb_time_on_ifa
196 C4	R791TCP	4	Binary	Service time spent on CPs (milliseconds) assb_time_on_cp
200 C8	R791TIFC	4	Binary	IFA service time spent on CPs (milliseconds) assb_time_ifa_on_cp



# Capacity Planning

# Are zAAPs right for my workloads?

---



## ❑ zAAP Projection Tool for Java 2 Technology Edition

- *Instrumented SDK 1.3.1, available through the Web*
- *Instrumentation included in SDK 1.4*

## ❑ Capacity Planning Considerations for zAAP

- *White Paper - describes the zAAP Projection Tool, prototype measurements and Capacity Planning methodology*

## ❑ Size 390

- *Updated tool available*
- *Special assistance for the sizing methodology described in the white paper. Support also provided with sizing consolidation of distributed Java workloads onto zSeries and zAAP(s)*

# Projection Tool for Java 2 Technology Edition

---



## ❑ SDK 1.3.1 – as is

- The zAAP Projection Tool for Java 2 Technology Edition, SDK1.3.1 users, is an instrumented version of Java for OS/390, Java 2 Technology Edition PTF UQ84703 (SR 22)
- Excel worksheet

## ❑ SDK 1.4

- The added function in the Projection tool is an officially supported part of the z/OS SDK1.4 product, IBM SDK for z/OS, Java 2 Technology Edition, product 5655-I56, with service PTF UQ88783 or later
- The EXCEL worksheet can be used, as-is, in conjunction with the SDK1.4

## ❑ z/OS 1.6 and SDK 1.4

- RMF reports, spreadsheets
- SMF and reduction programs

# zAAP Projection Tool for Java 2



<i><b>Subsystem</b></i>	<i>zAAP Projection Tool for Java 2 Technology Edition, SDK V1.3.1</i>	<i>IBM SDK for z/OS, Java 2 Technology Edition, SDK V1.4</i>
<b>WebSphere Application Server V5.02</b>	<b>Yes</b>	
<b>WebSphere Application Server V5.1</b>		<b>Yes</b>
<b>IMS V7.1</b>	<b>Yes</b>	<b>Yes</b>
<b>IMS V8.1</b>	<b>Yes</b>	<b>Yes</b>
<b>IMS V9.1</b>		<b>Yes</b>
<b>CICS TS V2.2</b>	<b>Yes</b>	
<b>CICS TS V2.3</b>		<b>Yes</b>
<b>DB2 V7.1</b>	<b>Yes</b>	<b>Yes</b>
<b>DB2 V8.1</b>	<b>Yes</b>	<b>Yes</b>

# Projection Tool for Java 2 Technology Edition



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## zSeries Application Assist Processor (zAAP)

Delivering a specialized z/OS Java execution environment

Get started | Prerequisites | Ordering | Configuration

The zAAP Projection Tool for Java 2 Technology Edition, SDK 1.3.1, along with an accompanying Excel Workbook tool for reading, organizing and analyzing data, will allow customers who are considering zAAPs to learn the potential for Java execution on zAAPs inherent in their existing applications. This tool will gather usage information about how much CPU time is spent executing Java code which could potentially execute on zAAPs. By running a Java workload that is representative of the production system operations, it will report, via the Java log, how much of that workload could be eligible for execution on zAAPs. This information will also be useful in predicting the number of zAAPs that might be necessary in order to provide an optimum zAAP configuration.

Learn more

→ [zAAP Home](#)

→ [Getting started](#)

→ [Pricing](#)

→ [Support](#)

→ [FAQ](#)

In conjunction with the tools mentioned above, an IBM White Paper is also available describing the work that was done in preparation for the introduction of the zAAP Projection Tool and describes the workloads tested as well as the results attained. In addition, the paper defines the methodology customers should follow to do the proper capacity planning. For example, it describes running the IBM SDK tool and how to use the results to determine the number of zAAPs required in a particular environment.

To download White Paper, visit:  
[ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP100417](http://ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP100417)

To download the Tools, visit:  
<http://www6.software.ibm.com/dl/zosjava2/zosjava2-p>

Getting Started  
Pricing  
Support  
FAQ

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Make way for the newest  
zSeries server, the z890

### Software

40 years of mainframe innovation  
Read news on zSeries Software

Download Whitepaper  
Download Tool

### Resources

→ What they're saying  
about zAAP

**zAAP Home Page** [ibm.com/servers/eserver/zseries/zaap](http://ibm.com/servers/eserver/zseries/zaap)

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# Projection Tool Download



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Download now

**z/OS Java 2 Technology Edition Projection Tool for z/OS & OS/390, z/OS.e**

Read me: sdk131projectiontoolreadme.txt 6K	<div>Download now</div>
Projection tool: sdk131projectiontool.PAX.Z 46MB	<div>Download now</div>
Projection tool workbook: zAAP_projection_tool_workbook.xls 1384K	<div>Download now</div>

Languages Included: English US

**Installation and Usage Information**

Before using the tool, please be sure to obtain the white paper from <http://www.ibm.com/support/techdocs/atmastr.nsf/WebIndex/WP100417>

ReadMe file, 5K  
PAX.Z file, 46MB  
Excel workbook, 1.3MB

# Projection Tool for Java 2 Technology Edition, SDK 1.3.1

---



- You must apply the fixes for the following APARs

- PQ40047
- PQ40048
- OW45508
- OW45580
- OW48160
- PQ37095

■ PQ39287

Check the Readme.txt file for the latest maintenance information

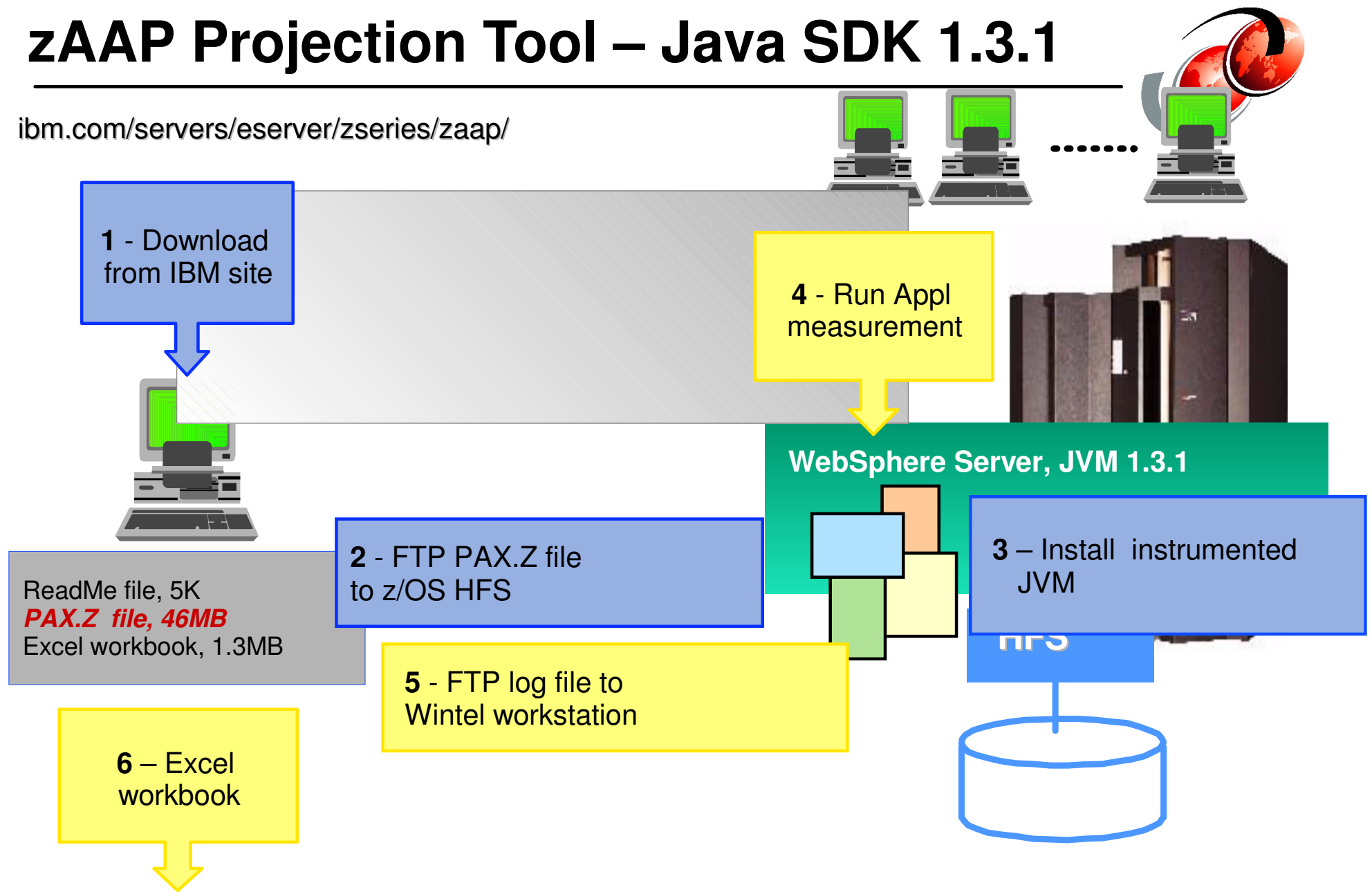
- Check the following APARs

- PQ26125
- PQ26525
- PQ36944
- PQ39622
- PQ39940
- PQ40027
- OW47432
- OW54362 or OW55013
- PQ60748



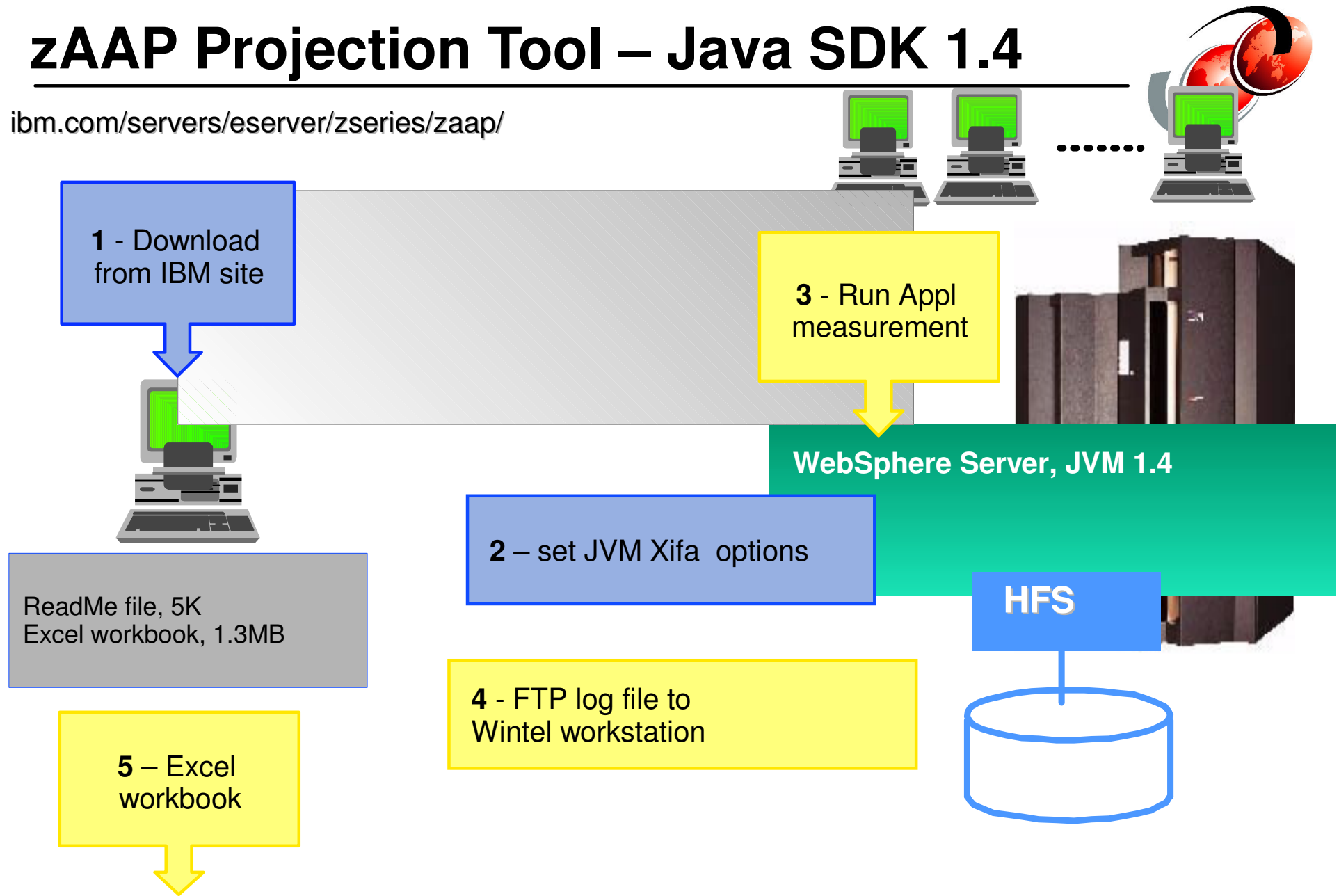
# zAAP Projection Tool – Java SDK 1.3.1

[ibm.com/servers/eserver/zseries/zaap/](http://ibm.com/servers/eserver/zseries/zaap/)



# zAAP Projection Tool – Java SDK 1.4

[ibm.com/servers/eserver/zseries/zaap/](http://ibm.com/servers/eserver/zseries/zaap/)



# Excel Workbook



Microsoft Excel - zAAP\_projection\_tool\_workbook(Aug20).xls

File Edit View Insert Format Tools Data Window Help Acrobat

Window

B15 Instance

zAAP java projection tool workbook - requires macros enabled at

Analysis ToolPak installed

Enter a name to be associated with the address space for which you have also optionally enter the instance or group which will allow you to view the synchronization value (if applicable). These values may be changed on the character in the names you choose. Push the "Obtain projection data" button

Data collected	Webshpere instance	Address Space Name	Service Class
		FMI	(optional)
Obtain projection data from file			
Address spaces processed		Service Class	LO

Load data from file

Analysis ToolPak - Provides functions and interfaces for financial and scientific data analysis

OK Cancel Browse... Automation...

Required Addin: Select **Tools** then **Add-Ins**  
Check **Analysis Toolpak** and **Analysis Toolpak - VBA**  
and then click Ok.

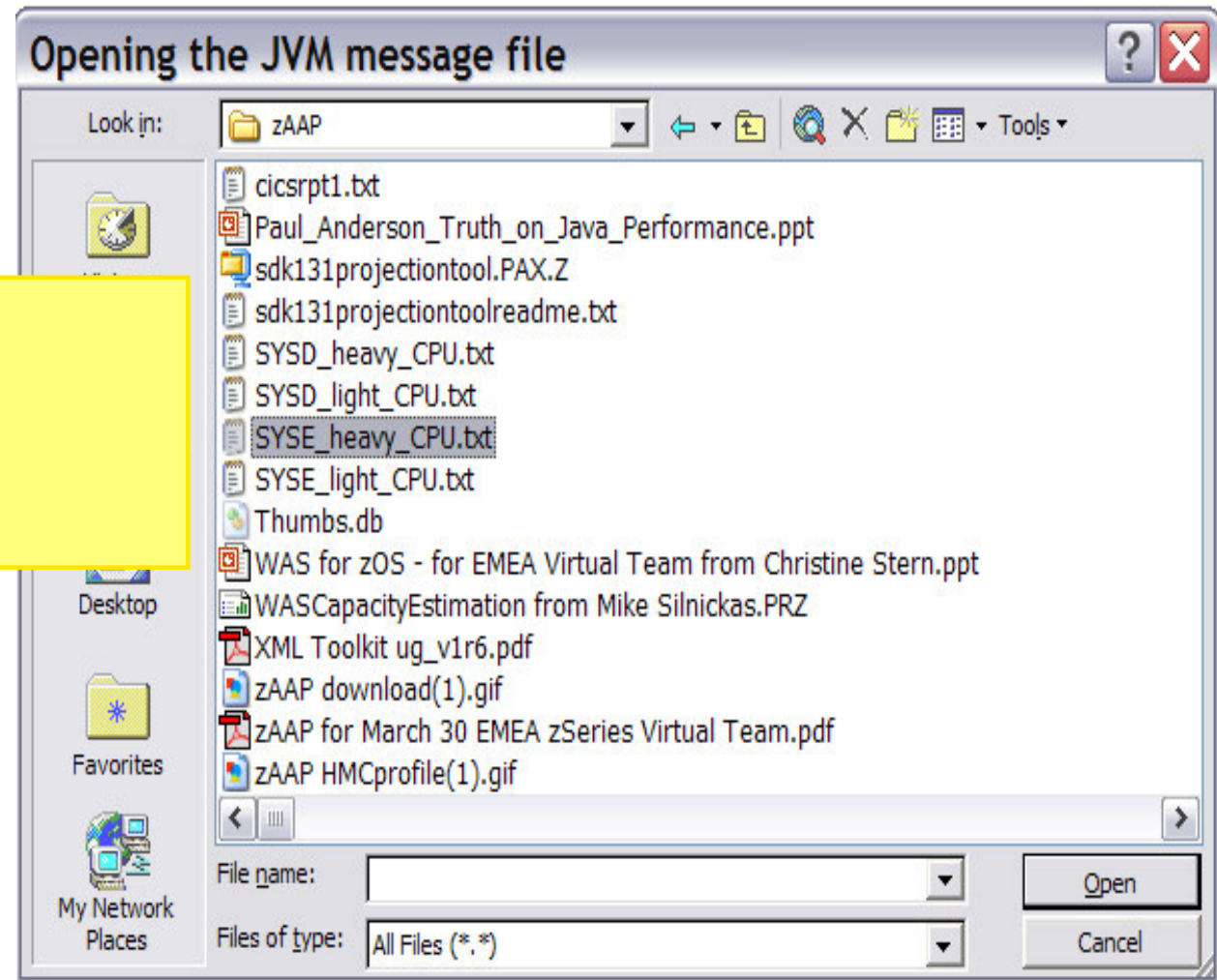
# Obtain projection data from file



select

Obtain projection data from file

Select JVM  
Message File  
(FTPed from z/OS)





# Excel Summary report



	AA	AB	AC	AD	AE	AF	AH	AI	AJ	AK	AL	AM
1	smf_name	Instance or Group	Interval start	zAAP eligible seconds	Java not eligible seconds	Space CPU seconds	%Time zAAP eligible	zAAP% engine eligible	Other Java% engine	Appl% engine	zAAP% w/capt ratio	Uplift for expected util
		<a href="#">Go to Inventory</a>										
2	z900	Service Class		ALL_SC		Group in Service Class		90%		80%		
3	SYSE		23:29:00	51	52	134	38%	6%	6%	15%	6%	8%
4	SYSE		23:44:00	48	50	128	38%	5%	6%	14%	6%	7%
5	SYSE		23:59:00	49	51	130	38%	5%	6%	14%	6%	8%
6	SYSE		00:14:00	50	51	132	38%	6%	6%	15%	6%	8%
7	SYSE		00:29:00	51	52	135	38%	6%	6%	15%	6%	8%
8	SYSE		00:44:00	49	51	131	38%	5%	6%	15%	6%	8%
9	SYSE		00:59:00	51	53	135	38%	6%	6%	15%	6%	8%
10	SYSE		01:14:00	53	55	141	38%	6%	6%	16%	7%	8%
11	SYSE		01:29:00	50	52	132	38%	6%	6%	15%	6%	8%
12	SYSE		01:44:00	52	53	137	38%	6%	6%	15%	6%	8%
13	SYSE		01:59:00	54	56	143	38%	6%	6%	16%	7%	8%
14	SYSE		02:14:00	52	53	136	38%	6%	6%	15%	6%	8%
15	SYSE		02:29:00	52	54	139	38%	6%	6%	15%	6%	8%
16	SYSE		02:44:00	53	55	141	38%	6%	6%	16%	7%	8%
17	SYSE		02:59:00	54	56	143	38%	6%	6%	16%	7%	8%
18	SYSE		03:14:00	53	54	139	38%	6%	6%	15%	6%	8%
19	SYSE		03:29:00	54	56	144	38%	6%	6%	16%	7%	8%
20	SYSE		03:44:00	57	59	150	38%	6%	7%	17%	7%	9%
21	SYSE		03:59:00	53	55	141	38%	6%	6%	16%	7%	8%
22	SYSE		04:14:00	17	18	46	38%	6%	6%	15%	6%	8%
Summary-z900_ALL_SC / Inventory / SYSE-z900_FMI /												
Ready												

# Hints (*ROT*s)

---

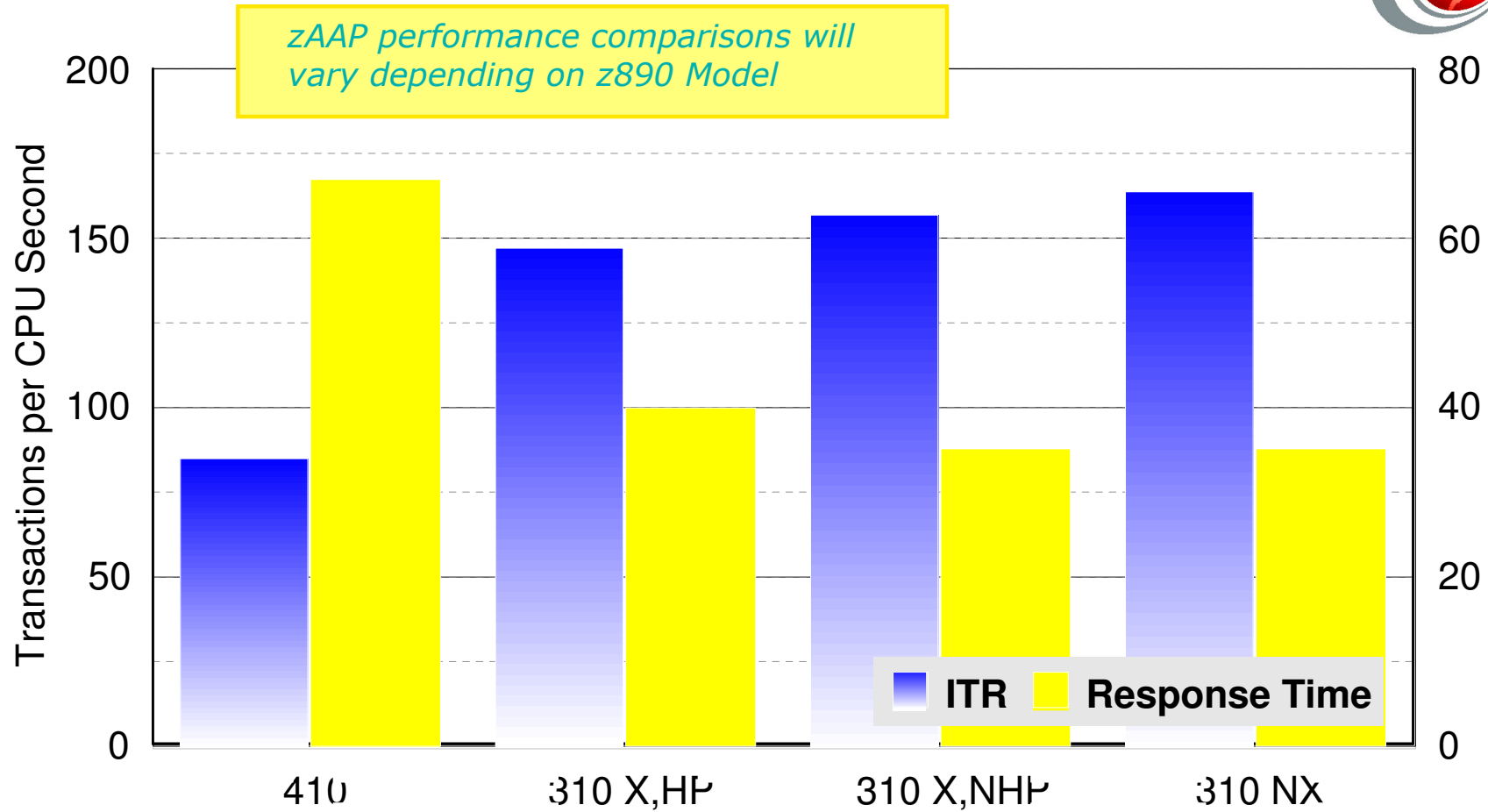


Workload	Notes	zAAP %
XML parser	Parsing of XML documents, using either SAX or DOM parsing APIs with and without validity checking.	98%+
Trade2	JSP, servlets, stateless EJB. Light SQL with a small data base component.	40%
Trade3 ++	Evolved from Trade 2 - J2EE 1.3 with EJB 2.0 component architecture, MDB with Pub/Sub and point-to-point asynchronous messaging. Light SQL with a small data base component.	60%
Web enabled CICS or IMS (ERWW)	Web-Enabled access to traditional CICS, IMS systems and DB2 data bases. J2EE application using servlets, JSPs, stateless session EJBs and access to legacy CICS/IMS. All the business logic is in the legacy transaction	40%
Legacy CICS/IMS	All the business logic in the legacy transaction, no Java	0%



# Performance Considerations

# z890 – Model 410 vs Model 310+zAAP



- Engine speed ratio = 13.8x
- zAAP 15 - 20% CPU busy
- Standard CPs running approx. 90% CPU busy

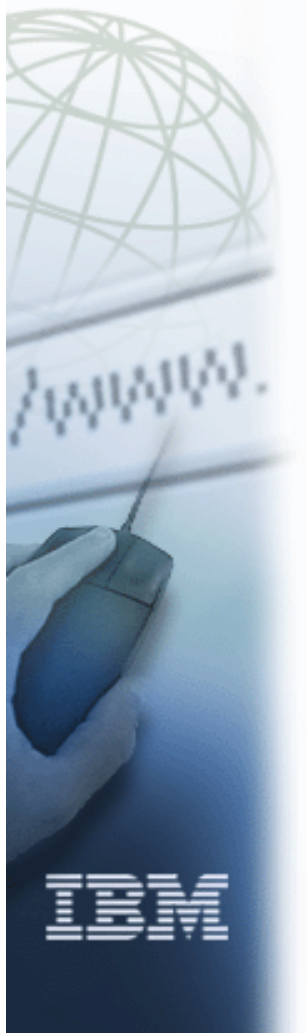
zAAP runs at  
Model 170 engine speed



ibm.com



e-business



# zAAP Summary



## Redbooks

International Technical Support Organization

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# zAAP Summary

---

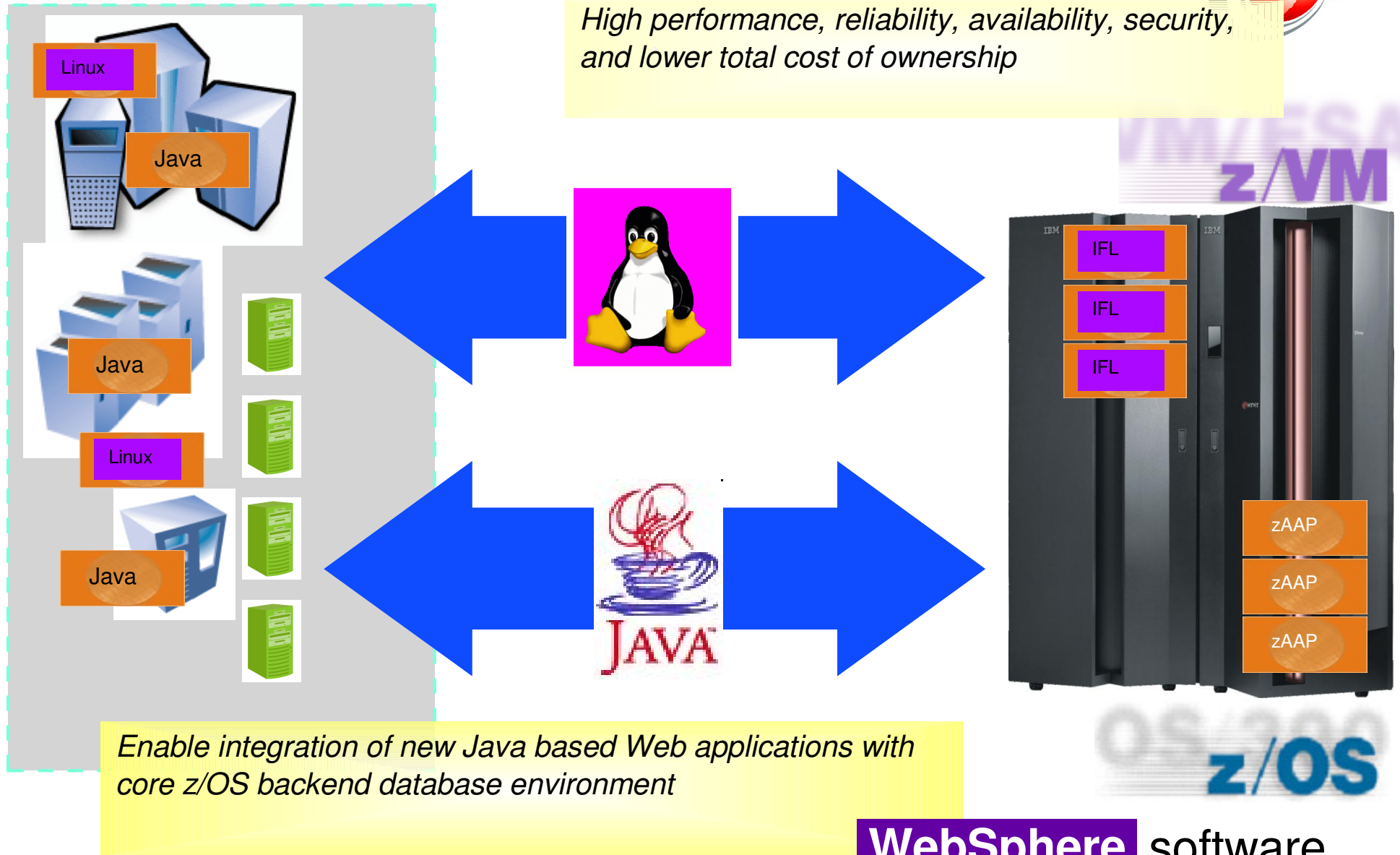


- ❑ **Business Integration model**
  - New strategic Java technology-based applications
  - Require additional CPU resources
- ❑ **zAAPs for business integration and infrastructure Simplification**
  - Integrate new applications with mission-critical data
  - Help reduce infrastructure complexity for multi-tier applications
- ❑ **zAAP ...an industry first**
  - Only specialized processing units for Java Code today
  - Supported by IBM Middleware such as WebSphere, DB2...
- ❑ **zAAPs Provide Investment Flexibility**
  - Extend the value of existing zSeries investments
  - Reduced Total Cost of Ownership through software and maintenance savings

# From n-tier to physical 2-tier



*High performance, reliability, availability, security,  
and lower total cost of ownership*



# The next steps

---



- ❑ Establish z/OS 1.6 migration plan
  - *Subsystems – WebSphere, CICS TS, DB2, etc.*
- ❑ IBM SDK for z/OS, Java 2 Technology Edition V1.4
  - *WebSphere Server, or Server Foundation V5.1 migration plan*
- ❑ Capacity Planning
  - *Review LSPR document, zAAP Capacity Planning White Paper*
  - *Run zAAP projection tool or use ROTs*
- ❑ IBM z990 or z890 server zAAP upgrade
  - *Configuration planning, Partition definition*
- ❑ Leverage zSeries Web-enablement Workshops
  - *WebSphere on z/OS infrastructure skills*



# For more information...

---

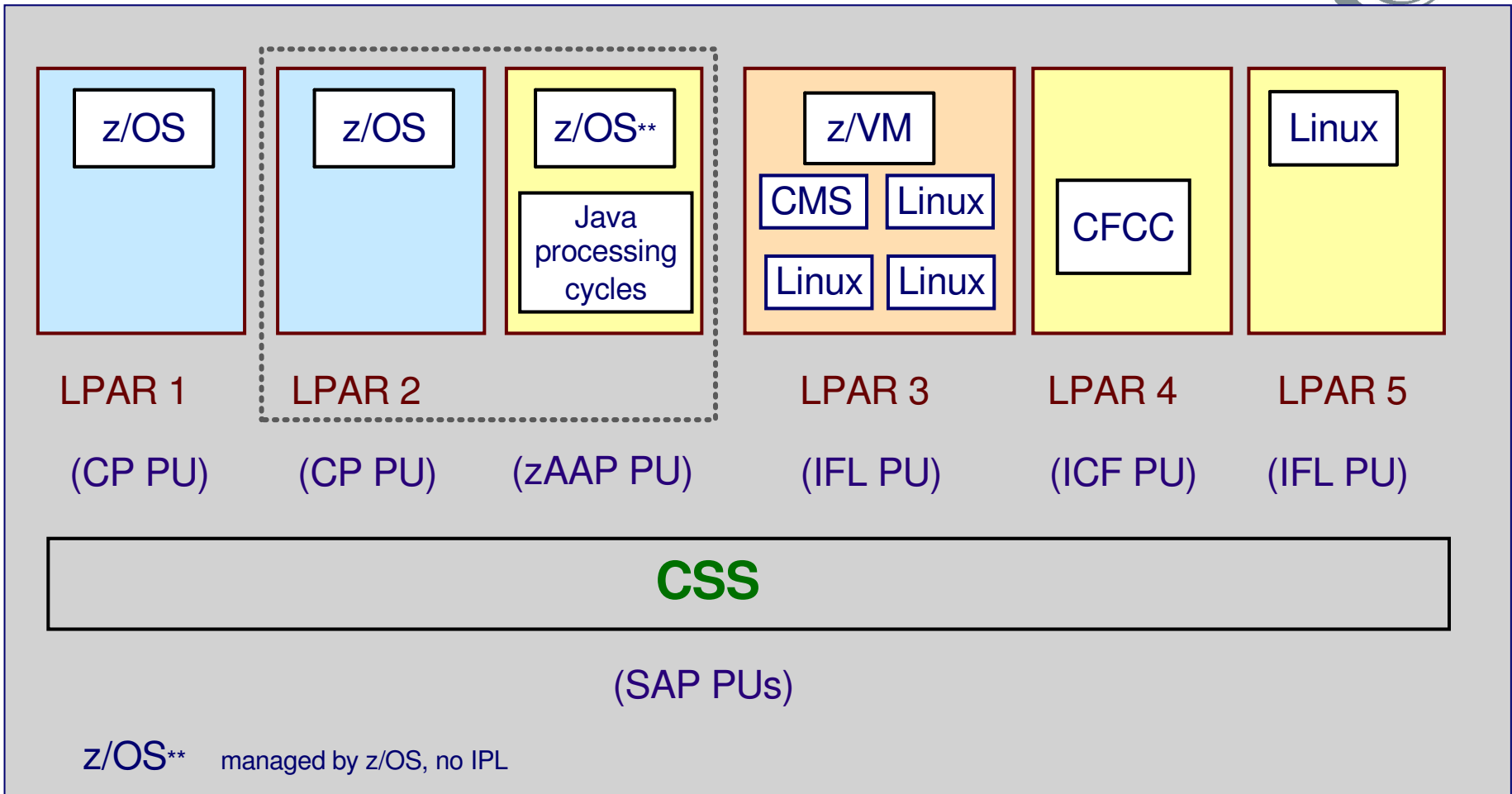


- ❑ zSeries Web site
  - [\*ibm.com/zSeries\*](http://ibm.com/zSeries)
- ❑ zAAP Web site
  - [\*ibm.com/zseries/zaap\*](http://ibm.com/zseries/zaap)
- ❑ z/OS Migration site
  - [\*ibm.com/zseries/zos\*](http://ibm.com/zseries/zos)



# BackUp Foils

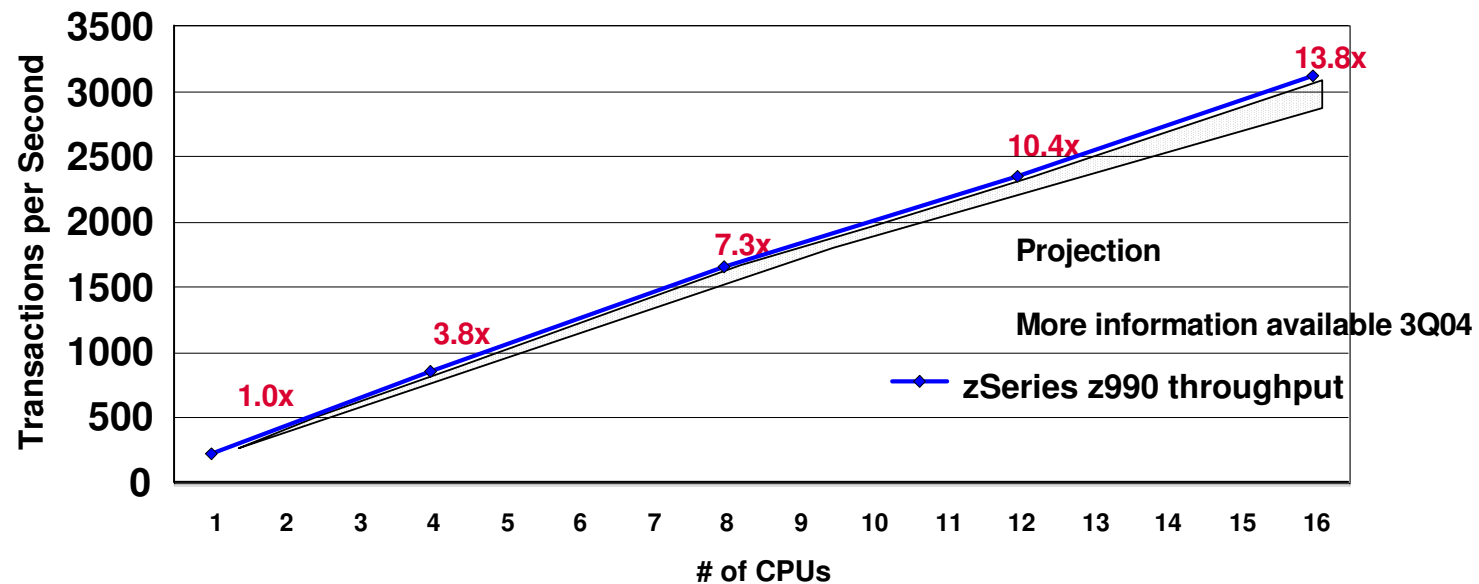
# z990



# zAAP Performance Impacts (SMP scaling effect)



Theoretical example: 100% WebSphere workload with greater than 50% Java content, zAAP full utilization. All have same WLM goal



Possible  
Combinations  
CPs + zAAPs

1+1	2+1	3+1 2+2	4+1 3+2	5+1 4+2 3+3	6+1 5+2 4+3	7+1 6+2 5+3 4+4	8+1 7+2 6+3 5+4	9+1 8+2 7+3 6+4 5+5	10+1 9+2 8+3 7+4 6+5	11+1 10+2 9+3 8+4 7+5 6+6	12+1 11+2 10+3 9+4 8+5 7+6	13+1 12+2 11+3 10+4 9+5 8+6 7+7	14+1 13+2 12+3 11+4 10+5 9+6 8+7	15+1 14+2 13+3 12+4 11+5 10+6 9+7 8+8
-----	-----	------------	------------	-------------------	-------------------	--------------------------	--------------------------	---------------------------------	----------------------------------	--	---	---	--	--

Note:

- Numbers in Red depict estimated SMP scaling ratios
- Assume greater than 50% JVM content that could be handled by zAAP



# XML Toolkit performance Web page



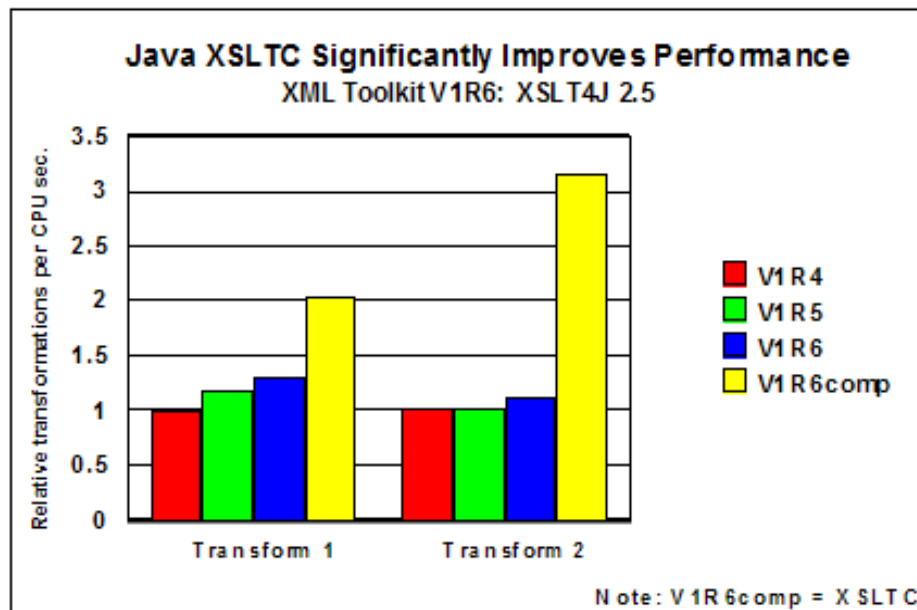
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## XML Toolkit for z/OS and OS/390 Performance Page

### Performance Highlights


The new Java XSLT compiled transformer, XSLTC, available in the V1.6 Toolkit, provides substantial improvement in transformation performance. The chart below compares the performance of the V1.4, V1.5 and V1.6 interpretive transformation processors to that of the V1.6 compiled transformer.




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# Java for z/OS Web page



Address  <http://www-1.ibm.com/servers/eserver/zseries/software/java/>


[ibm.com/servers/eserver/zseries/software/java](http://ibm.com/servers/eserver/zseries/software/java)

  
→ **Select a country**

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## Java™ 2 on the OS/390 and z/OS Platforms



The Java products for the OS/390 and z/OS platforms are full function, have passed the Java compatible test suites and carry the Java compatible logo.  
[more](#)

**Latest news**

- **IBM SDK for z/OS™ Java™, 2 Technology Edition, Version 1.4 PTF available**  
A PTF for SDK 1.4 is available that upgrades the product to the latest service levels and provides a full function SDK compliant with the SDK1.4.2 APIs.(July 12, 2004).
- **Java™ 2 Technology Edition SDK 1.3.1 PTF available**  
A PTF for SDK 1.3.1 is available that upgrades the product to the latest service levels. (May 10, 2004)
- **64-Bit SDK for z/OS**  
IBM has announced a 64-Bit SDK for z/OS at the SDK 1.4 level. More information is contained in the announcement. (August 10, 2004)

**New users**

- [Basics](#)

**Java 2 Technology Edition, SDK 1.3.1**

- [About the product](#)
- [Product content](#)
- [Getting the product](#)
- [Product history](#)

**IBM SDK for z/OS, Java 2 Technology Edition, Version 1.4**

- [About the product](#)
- [Product content](#)

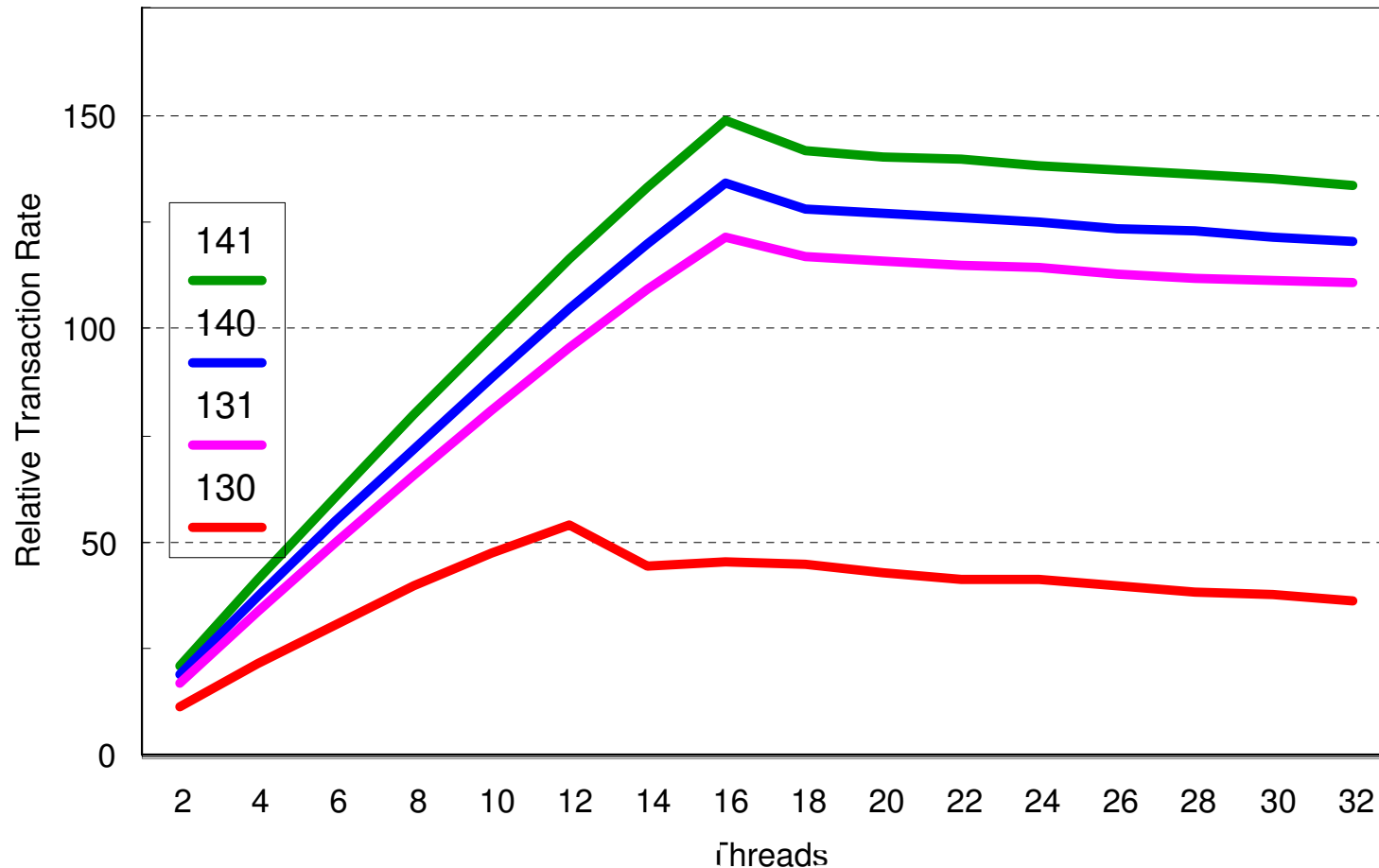
# Extended Translation Facility

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- The Extended Translation Facility adds 10 new instructions to the zSeries instruction set.
  - *These new instructions may enhance performance for data conversion operations done supporting data encoded in Unicode, improving the ability to efficiently support applications enabled for Unicode and/or Globalization.*
  - *The instructions add hardware support for conversions to and from the various Universal Character Set (UCS) Transformation Formats (UTF) encodings used to support Unicode.*
  - *These formats for encoding data are used in a number of important technologies emerging in the Web Services, Grid, and on demand environments, such as XML and SOAP as well as being supported in DB2 for data storage.*

# Multi-threaded Java Performance (z900T)



JDK 1.3.1 - improved JIT and garbage collection

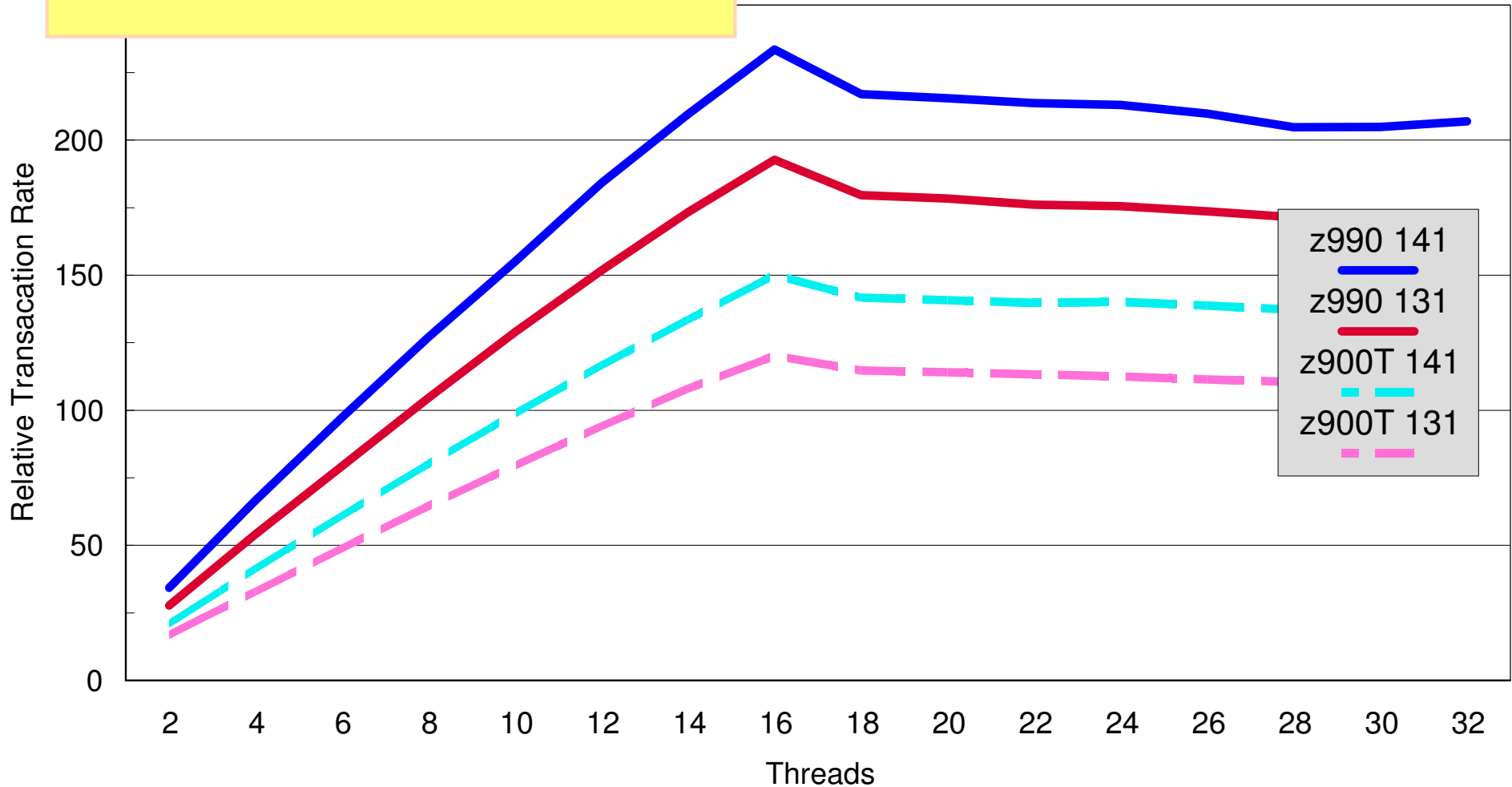
JDK 1.4.0 - high performance linkage and more JIT improvements

JDK 1.4.1 - improved allocation and more JIT improvements

# Multi-Threaded Java Performance z900T/z990



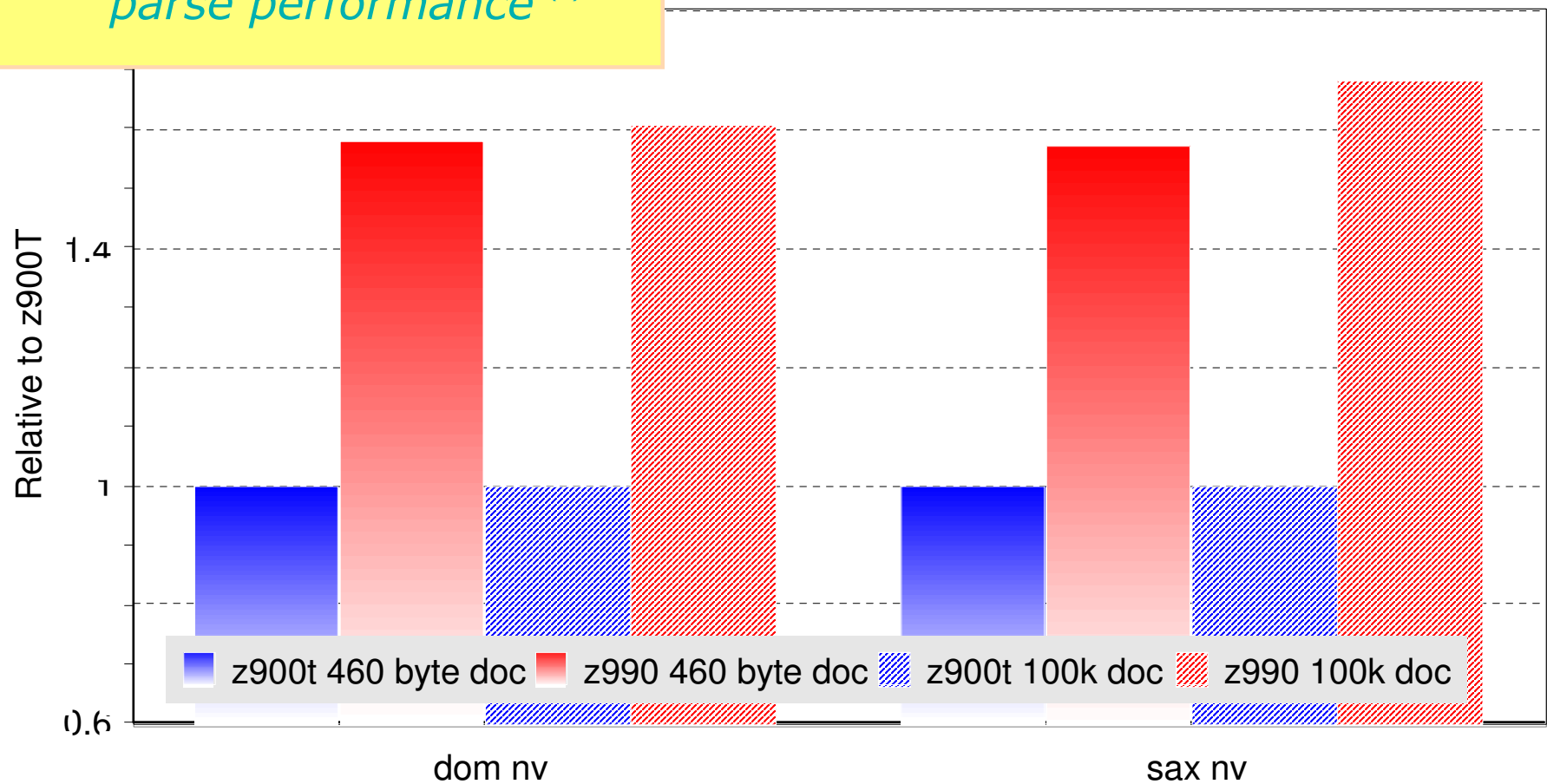
Total 85% increase in Java  
throughput from hardware and  
software enhancements



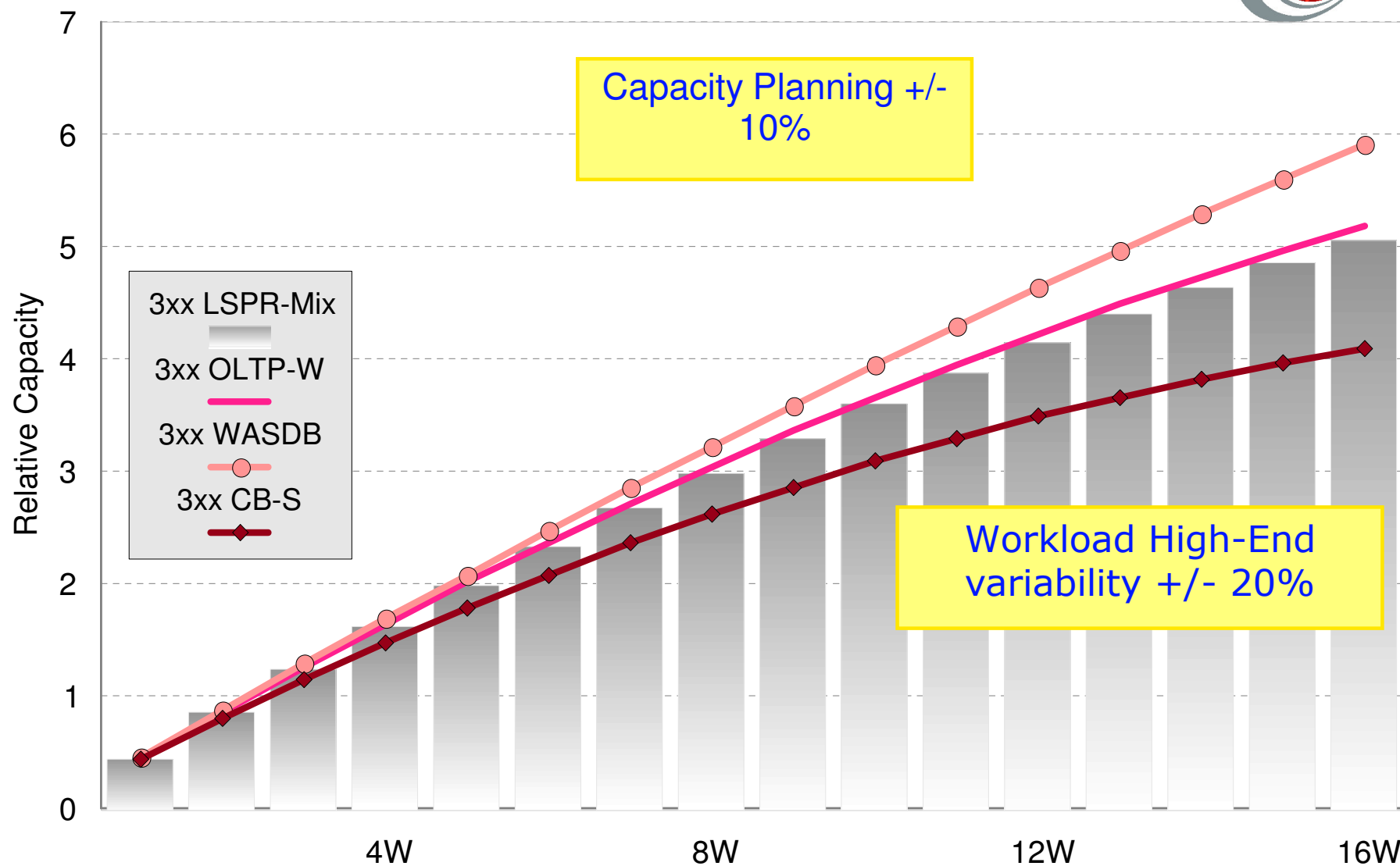
# Parse of XML Document



*Z990 vs z900T*  
*57-68% improved XML*  
*parse performance (\*)*



# 990 LSPR (HW + SW effects)





# XML for z/OS Web page



Address <http://www-1.ibm.com/servers/eserver/zseries/software/xml/>

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**XML Toolkit for z/OS**

**IBM XML Toolkit for z/OS, V1.6**

**NEW!** The **V1.6** XML Toolkit for z/OS [download](#) is now available.

The XML Toolkit for z/OS, V1.6 provides the following enhancements to the previous releases :

- C++ Parser :
  - C++ Namespace support
  - XML 1.1 Candidate Recommendation support
  - Net Accessor support for accessing files on a remote host
- Java Parser :
  - SAX 2.0.1 support
  - XML 1.1 Candidate Recommendation support
- C++ XSLT Processor :
  - reintroduced in V1.6
  - uses new non-XPLINK Standard C++ Library
  - C++ Namespace support
- Java XSLT Processor :
  - new support for compiled sty

**XML**

- Components
- Download
- Usage
- Performance
- Service
- FAQS
- Education
- Library
- Tools
- Feedback

**Related links:**

- Business partners
- Developers

**integrated. PL/I**

**integrated. COBOL**

**Redbook**  
Using XML on z/OS and OS/390  
for Application Integration

**Enter the World of z/OS.e**  
A z/OS.e Overview

[ibm.com/servers/eserver/zseries/software/xml](http://ibm.com/servers/eserver/zseries/software/xml)



# z/OS V1.6

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- ❑ Extending z/OS scale
  - Support for up to 24 engines in a single z/OS image
  - Improved scalability of WebSphere
- ❑ Application flexibility
  - *Support for zSeries Application Assist Processor (zAAP)*
  - 64-bit application development with 64-bit C/C++ and 64-bit Java
- ❑ Security
  - Multilevel security
  - Enhanced Intrusion Detection Services
- ❑ Self-optimizing
  - Simplified Workload Manager control for WebSphere
- ❑ Simplification
  - Easier setup of z/OS functions
  - Enhanced Internet access to z/OS library
  - Easier management new InfoPrint® front end

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# Statements of Direction



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# Statements of Direction

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- ❑ **Greater than 30 LPAR Support:** IBM now intends to support greater than 30 LPARs on a future zSeries server. This represents a modification to IBM's previously expressed direction to support up to 60 LPARs on z990, which no longer represents IBM's intent. When support for greater than 30 LPARs is made available on a future zSeries server, it is IBM's intention to have support included on z/OS 1.6 and later, and z/VM 4.4 and later.
- ❑ **Greater than 24 CP Support:** IBM intends to support greater than 24 CPs or combined CPs and zAAPs, in a single image on appropriate releases of z/OS and z/VM in combination with designated zSeries servers in the future.
- ❑ **Token-Ring Support:** IBM intends the z890 and z990 to be the last high-end zSeries servers to offer Token-Ring adapter features. This includes the zSeries server, the HMC, SE, and TKE workstation features. IBM intends to withdraw Token-Ring adapter features from the IBM 2074 Console Controller
- ❑ **HMC Support:** IBM intends that starting with the next high-end zSeries server, all HMCs on all currently marketed zSeries servers will become closed platforms. They will support only the HMC application and not the installation of other applications, such as the IBM ESCON Director and the IBM Sysplex Timer console applications. When available, the next generation HMC may communicate only with G5 servers and above. Closed HMC cannot act as ESCON Director or Sysplex Timer Console.
- ❑ **ISC-3 to ISC-2 Support:** IBM intends z890 and z990 to be the last family of zSeries servers to support attachment of ISC-3 links to ISC-2 links on G5/G6 servers.

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# Summary



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# Summary of Announcement and Planned Availability Dates



Line Item	Ann Date 2004	Aval Date 2004	Planned Date for Express2	Description
EAL5	Oct 7	N / A	- - -	Certified in May 2004, security of LPARs on z990s
GDPS z/VM HyperSwap	Oct 7	Dec 04	- - -	z/VM V5.1 Coordinated continuous availability and DR sol
CIU & On/Off CoD for LA	Oct 7	Oct 29	- - -	CIU and On/Off CoD now for LA, available via ResoureLink
Capacity change, z890 CPs	Oct 7	Now	- - -	OS only, z/OS 1.4 w/APAR, z/VM 5.1
Dispatcher rewrite (CFCC level 14)	Oct 7	Oct 29	- - -	CF duplexing, better management of coupled workloads
TKE 4.2 w/smart card reader	Oct 7	Oct 29	- - -	Generating and storing secure "stuff"
TKE 4.2 code	Oct 7	Oct 29	- - -	Trusted key entry code supporting smart card reader
2048-bit key mgmt #0867	Oct 7	Oct 29	- - -	for z800, z900 part of base function of PCIXCC/Express2
Crypto Express2	Oct 7	- - -	1Q05	PCICA and PCIXCC in one feature, 2 coprocessors
19-digit PANs PCIXCC/Express2	Oct 7	Oct 29	1Q05	Instead of 13 or 16-digit Pers Account Numbers Card Validation Value (CVV) generation,verify services
< 512-bit keys PCIXCC/Express2	Oct 7	Oct 29	1Q05	Before supported apps only above 511-bit keys
FCP LUN access control PREVIEW	Oct 7	Oct 29	- - -	FICON Express Host-based control of access to storage
FICON purge path extended	Oct 7	Oct 29	- - -	z/OS 1.6 records error data/stats between channel, switch, control unit for FICON Express
OSA-Express2 GbE	Oct 7	- - -	1Q05	Gigabit Ethernet, plus new functions. <a href="#">See below</a>
OSA-Express2 10 GbE LR	Oct 7	- - -	1Q05	<a href="#">10 Gigabit Ethernet Long Reach (single mode fiber)</a>
Layer 2, OSA Express/Express2	Oct 7	Oct 29	1Q05	<a href="#">Any protocol IP or non-IP, simplies network configuration</a>
640 stacks. OSA-Express2	Oct 7	- - -	1Q05	<a href="#">TCP/IP stacks, hosting more Linux images</a>
Large send, OSA-Express2	Oct 7	- - -	1Q05	<a href="#">Send 64 Kilobyte blocks to OSA, saves CPU cycles</a>
Concurrent LIC. OSA-Express2	Oct 7	- - -	1Q05	<a href="#">LIC updates w/o configuration off/on</a>
Stack improvement, OSA-Express	Oct 7	Oct 29	- - -	Now 160 stacks per LPAR instead of 84 per LPAR

# zSeries and POWER based Servers

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## POWER based Servers and zSeries remain separate

We do not plan to converge the microprocessors for Power and zSeries to the point that we will have a common chip. This is due to inherent differences in the architecture of the microprocessors. For example, the zSeries software stack includes customer-written and ISV applications built with the assumption that memory accesses from multiple microprocessors are sequenced by the microprocessor hardware. In the Power architecture, the software handles this explicitly. As a result, convergence at the microprocessor architecture level could result in reduced performance for Power or rewriting all the software that has been written for S/390.

As a result of this, most of the current firmware for zSeries is expected to remain unique. This includes the microprocessor microcode, I/O microcode, and the service subsystem code that provides the error recovery and fault-tolerant capabilities.

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# THE END



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