SHARE

SHARE in Orlando
August 7 - 12, 2011

IBM

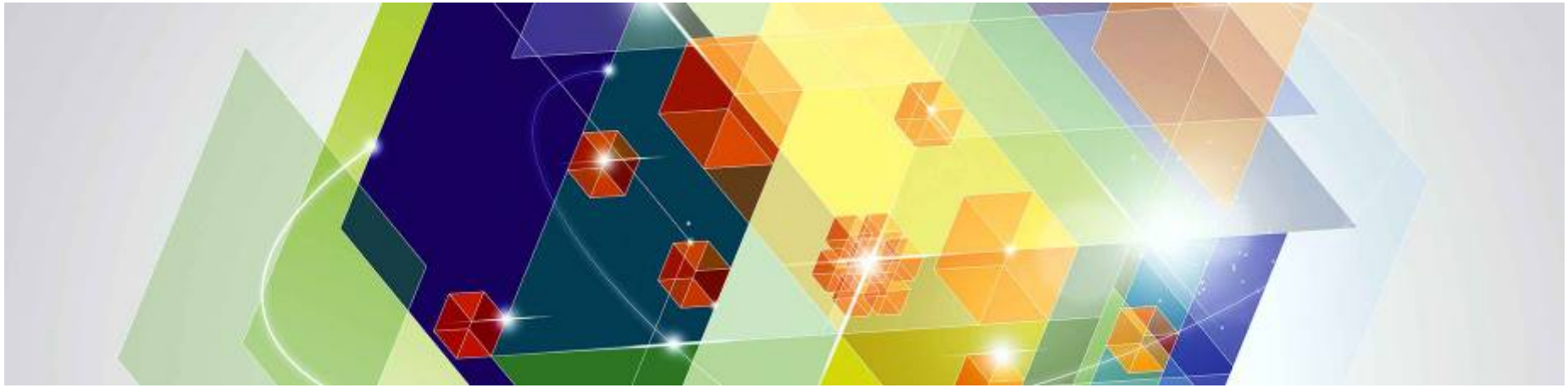
Introducing the new IBM zEnterprise 196 and 114 PCIe I/O and Coupling Infrastructure

Session ID: 9797

Speaker: Harv Emery

Advanced Technical Skills

IBM zEnterprise - Freedom by Design



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zEnterprise 114 and zEnterprise 196 GA2

I/O infrastructure

- ***New*** PCIe-based I/O infrastructure
- ***New*** PCIe I/O drawer
  - Decreased port purchase granularity (fewer ports per I/O card)
  - Increased port density compared to the previous I/O drawer or z196 I/O cage
  - Designed for improved power and bandwidth compared to previous I/O cage or z196 I/O drawer

Storage

- ***New PCIe-based*** FICON Express8S features

Networking

- ***New PCIe-based*** OSA-Express4S features

Coupling

- ***New*** 12x InfiniBand and 1x InfiniBand features (***HCA3-O fanouts)***
  - *12x InfiniBand - decreased service times when using 12x IFB3 protocol*
  - *1x InfiniBand – increased port count*

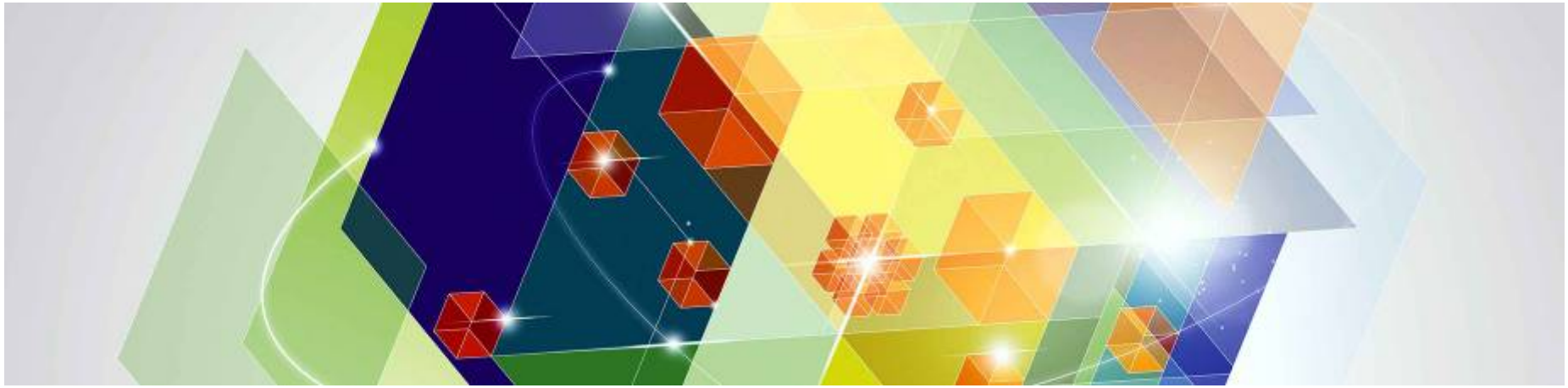
Note: The z114 and z196 at GA2 will ship with a new LIC Driver, Driver 93

I/O subsystem

SHARE Sessions on Migration and Exploitation:

- 9701, 9702: Wed 9:30, 11:00 – Marna Walle, “Migrating to z/OS 1.13 Parts 1 and Part 2”
- 10099: Fri 8:00 – Riaz Ahmad, “Everything a z/OS SysProg Needs to Know to Exploit zEnterprise”

IBM zEnterprise - Freedom by Design



z114 and z196 at GA2 support two different internal I/O infrastructures

- **The *current* InfiniBand I/O infrastructure first made available on z10**
  - InfiniBand fanouts supporting a 6 GBps InfiniBand I/O interconnect
  - InfiniBand I/O card domain multiplexers with Redundant I/O interconnect in:
    - The 14U, 28-slot, 7-domain I/O cage (z196 only)
    - The 5U, 8-slot, 2-domain IO drawer (z114 and z196)
  - Selected legacy I/O feature cards
    - Carry forward and new build
- **And a *new* PCI Express 2 I/O infrastructure**
  - PCIe fanouts supporting a new 8 GBps PCIe I/O interconnect
  - PCIe switches with Redundant I/O interconnect in for I/O domains in a ***new*** 7U, 32-slot, 4-domain I/O drawer (z114 and z196 GA2)
  - ***New*** FICON Express8S and OSA-Express4S I/O feature cards
    - Based on selected industry standard PCIe I/O
    - Designed to:
      - **Improved I/O port purchase granularity (fewer ports per card)**
      - **Improved performance**
      - **Increased I/O port density**
      - **Lower energy consumption**

I/O Subsystem Internal Bus Interconnect Speeds (GBps)

PCIe
z196 GA2
z114

8 GBps

InfiniBand
z10/z196 GA1

6 GBps

STI
z9

2.7 GBps

STI
z990/z890

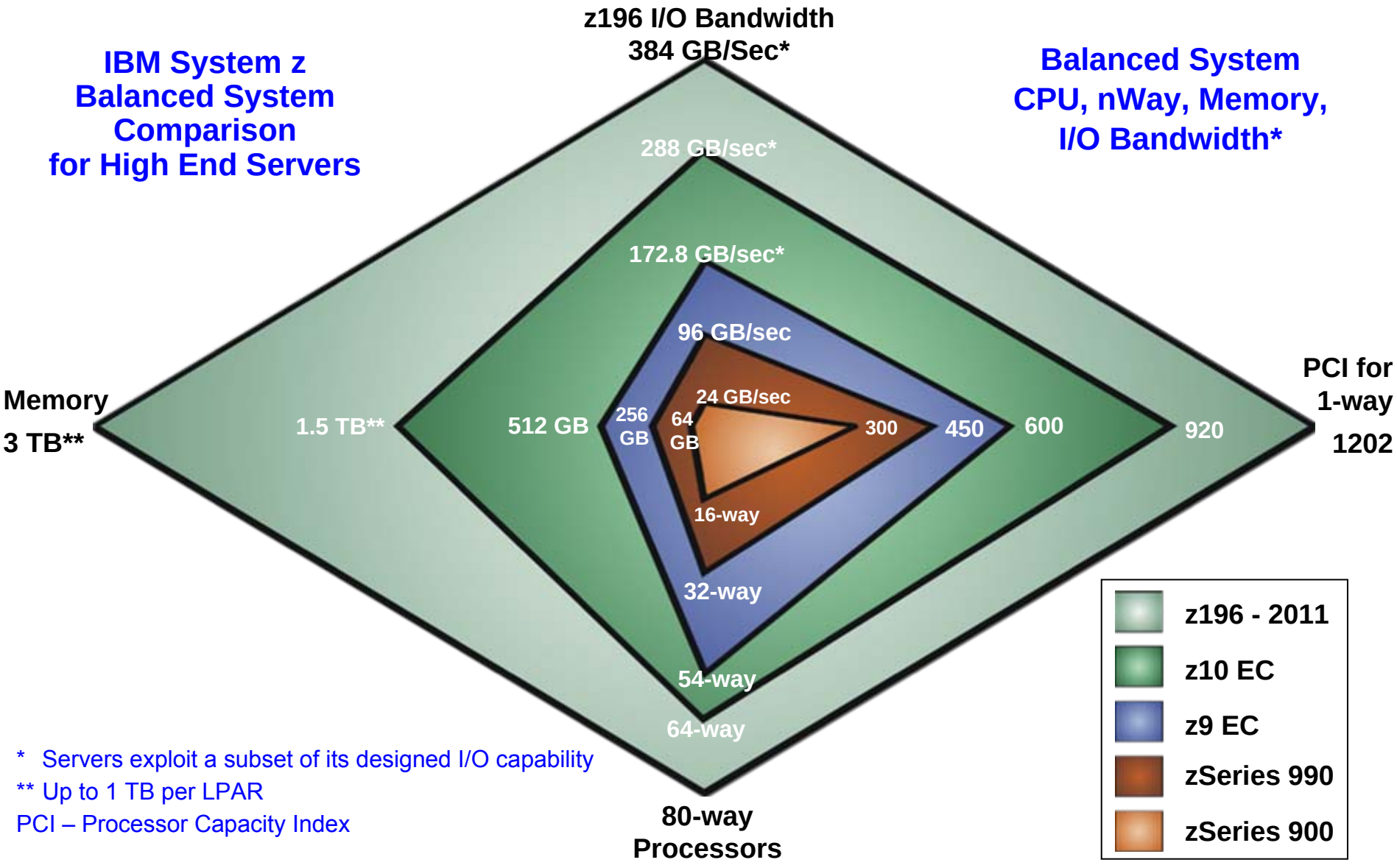
2 GBps

STI
z900/z800

1 GBps

PCIe: Peripheral Component Interface (PCI) Express
STI: Self-Timed Interconnect

IBM System z Balanced System Comparison for High End Servers



* Servers exploit a subset of its designed I/O capability

** Up to 1 TB per LPAR

PCI – Processor Capacity Index

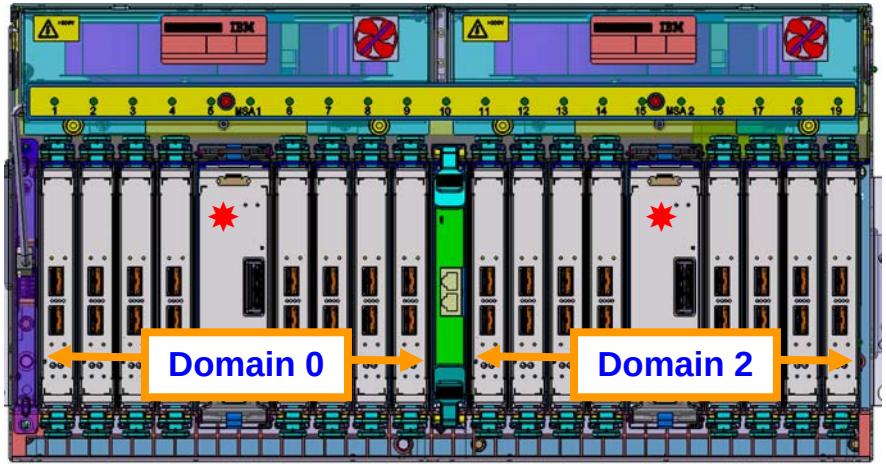
PCIe I/O drawer and PCIe I/O features

- **Increased infrastructure bandwidth**
  - PCI Express 2 x16 - ***8 GBps interconnect***
    (Compared to 6 GBps 12x InfiniBand DDR interconnect)
  - PCI Express 2 x8 - ***4 GBps*** available to PCIe I/O feature cards
    (Compared to 2 GBps or less available to older I/O feature cards)
- **Compact**
  - Two 32-slot PCIe I/O drawers occupy the same space as one 28-slot I/O cage
  - Increases I/O port density 14% (Equivalent to an increase from 28 to 32 slots)
- **Improved I/O port purchase granularity**
  - "Half high" I/O feature cards compared to older I/O feature cards
  - Two ***FICON Express8S*** channels per feature (Four on FICON Express8)
  - One or two ***OSA-Express4S*** ports per feature (Two or four on OSA-Express3)
- **Reduced power consumption**
- **Designed for Improved Reliability, Availability, and Serviceability**
  - Concurrent field MES install and repair
  - Symmetrical, redundant cooling across all cards and power supplies
  - Temperature monitoring of critical ASICs

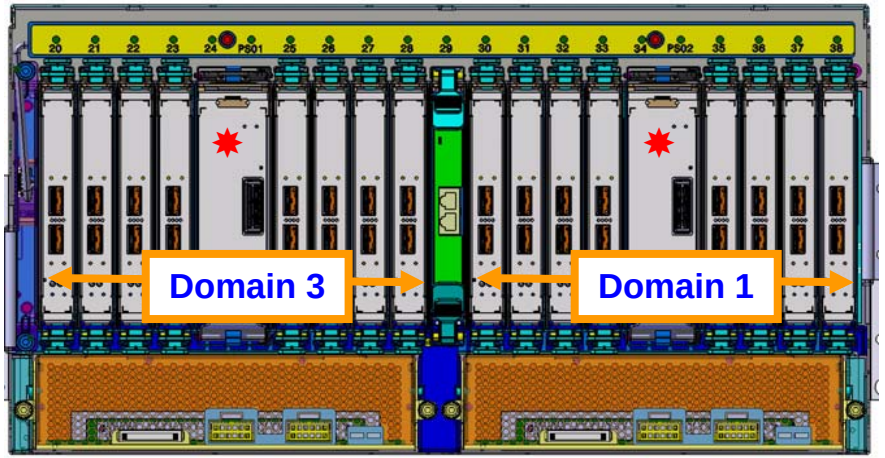
New PCIe 32 I/O slot drawer

NEW

Front

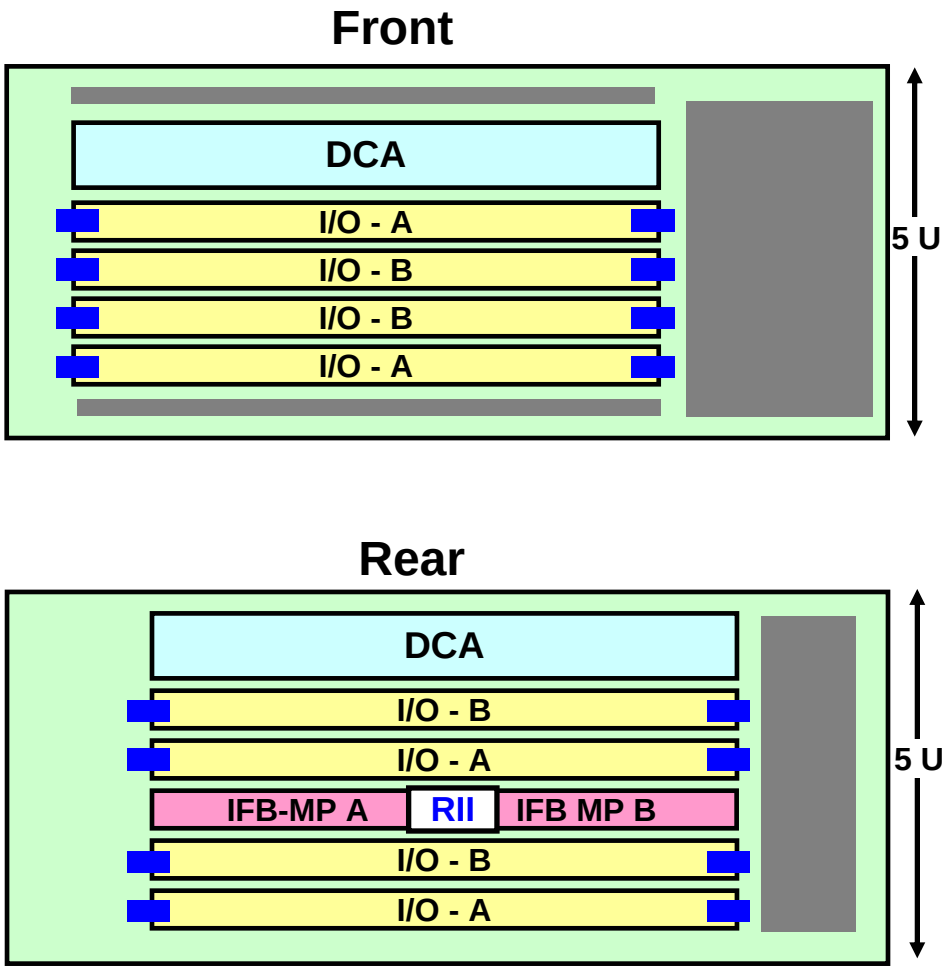


Rear



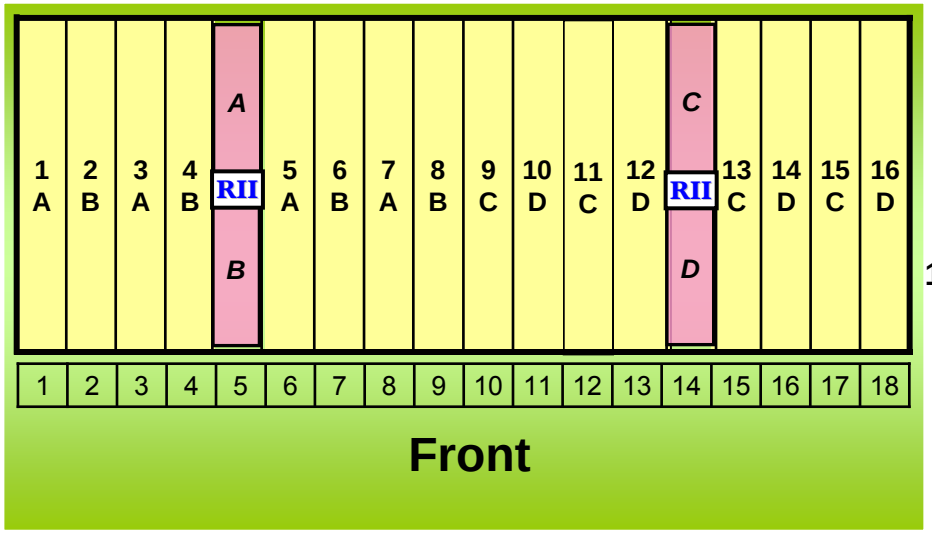
- Supports only the new PCIe I/O cards introduced with z114 and z196 GA2.
- Supports 32 PCIe I/O cards, 16 front and 16 rear, vertical orientation, in four 8-card domains (shown as 0 to 3).
- Requires four PCIe switch cards (✸), each connected to an 8 MBps PCIe I/O interconnect to activate all four domains.
- To support Redundant I/O Interconnect (RII) between front to back domain pairs 0-1 and 2-3 the two interconnects to each pair must be from 2 different PCIe fanouts. (All four domains in one of these cages can be activated with two fanouts.)
- Concurrent field install and repair.
- Requires 7 EIA Units of space (12.25 inches ≈ 311 mm)

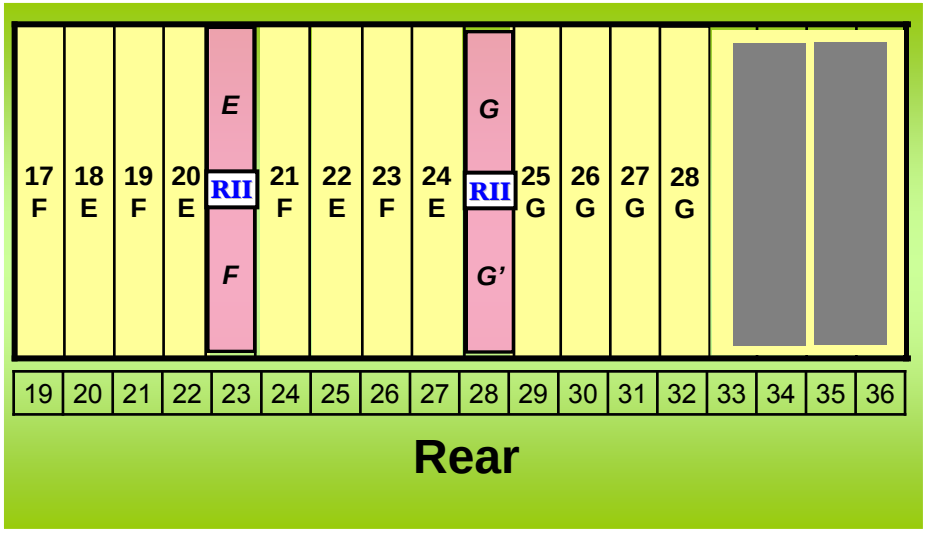
z196 and z114 8-slot I/O Drawer (Introduced with z10 BC)



- Supports all z10 BC and z196 GA1 I/O and Crypto Express3 cards
- Supports 8 I/O cards, 4 front and 4 back, horizontal orientation, in two 4-card domains (shown as A and B)
- Requires two IFB-MP daughter cards, each connected to a 6 MBps InfiniBand interconnect to activate both domains.
- To support Redundant I/O Interconnect (RII) between the two domains, the two interconnects must be from two different InfiniBand fanouts. (Two fanouts can support two of these drawers.)
- Concurrent add, repair.
- Requires 5 EIA Units of space (8.75 inches ≈ 222 mm)

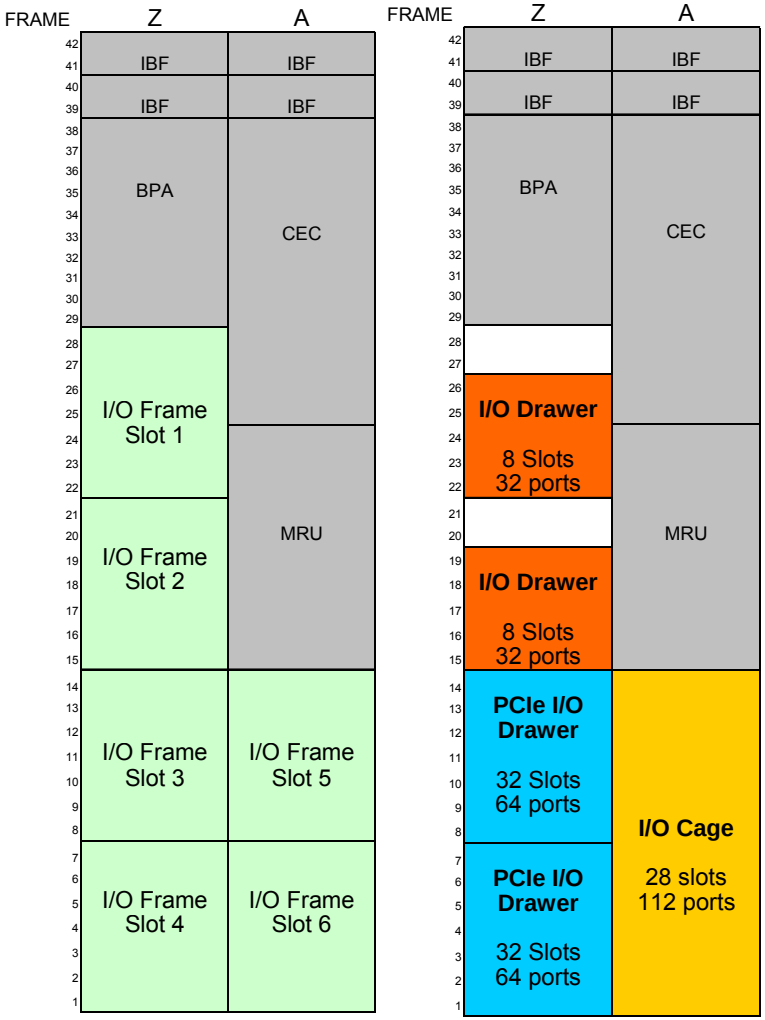
z196 28-slot I/O Cage (Introduced with z900)





- Supports all z10 EC and z196 GA1 I/O and Crypto Express3 cards
- Supports 28 I/O cards, 16 front and 12 rear, vertical orientation, in seven 4-card domains (shown as A to G)
- Requires eight IFB-MP daughter cards (A to G'), each connected to a 6 MBps InfiniBand I/O interconnect to activate all seven domains.
- To support Redundant I/O Interconnect (RII), the two interconnects to each domain pair (A-B, C-D, E-F, and G-G') must come from two different InfiniBand fanouts. (All seven domains in one of these cages can be activated with four fanouts.)
- Disruptive field install or remove
- Requires 14 EIA Units of space (24.5 inches ≈ 622 mm)

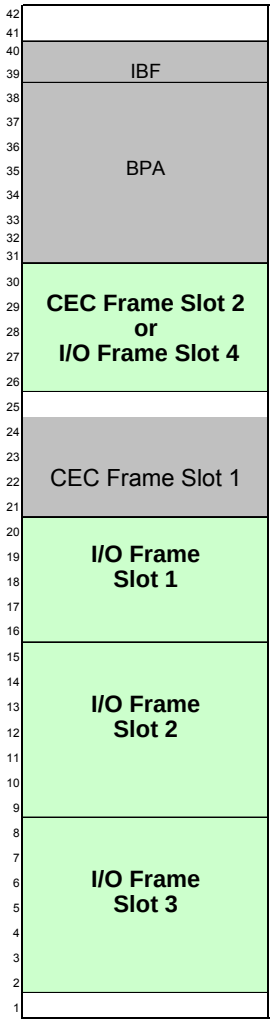
z196 Frame Layout for I/O – Air Cooled*

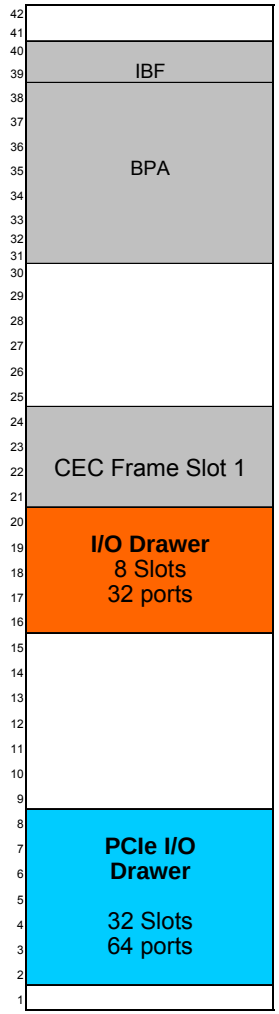


- An **I/O frame slot** is a physical location in the A or Z frame for an I/O cage, I/O drawer or PCIe I/O drawer to be inserted = 7u
- **I/O cage** uses 2 I/O frame slots = 14u
  - 28 four port I/O slots = 112 ports
  - 2 cages maximum (3 with RPQ)
- **PCIe I/O drawer** uses 1 I/O frame slot = 7u
  - 32 two port I/O slots = 64 ports
  - 5 drawers maximum
- **Old I/O drawer** uses 0.7 frame slot = 5u
  - 8 four port I/O slots = 32 ports
  - Requires 2u of free space for future upgrade to the PCIe I/O drawer
  - 6 drawers maximum
    - GA2: Up to 2 on new build
    - GA1: Up to 4 on new build

*** Locations differ if water cooled; but the number of I/O frame slots is identical.**

z114 Frame Layout for I/O

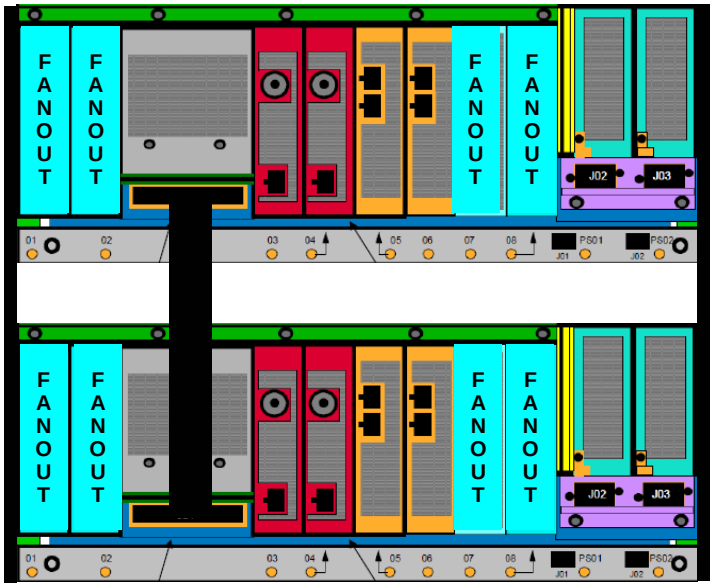




- An **I/O frame slot** is a physical location in the frame for an old I/O drawer or PCIe I/O drawer
- I/O Frame slot 2 and 3 = 7u
  - Supports I/O drawer or PCIe I/O drawer
  - I/O Frame slot 1 and 4* = 5u
    - M10 – Frame slot 4* NOT available
    - Support I/O drawers ONLY
- **PCIe I/O drawer**
  - Frame slot 3 & 4 uses 1 I/O frame slot = 7u
  - 32 two port I/O slots = 64 ports
  - 2 maximum (1 maximum on M05)
- **Old I/O drawer**
  - Frame slot 1 & 4 uses 1.0 I/O frame slot
  - Frame slot 2 & 3 uses 0.7 I/O frame slot
  - 8 four port I/O slots = 32 ports
    - 2 maximum (3 with RPQ on M05 or M10, 4 with RPQ on M05 only*)

*** Note: I/O Frame Slot 4 is used for CEC drawer 2 in the z114 M10**

z114 Connectivity for I/O and Coupling



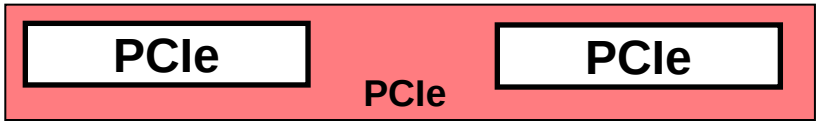
Drawer 2
M10 only

Drawer 1
M05 and M10

- **Up to 4 fanouts per z114 CEC drawer**
  - M05 (one CEC drawer) – up to 4 fanouts
  - M10 (two CEC drawers) – up to 8 fanouts

- **I/O fanouts compete for fanout slots with the InfiniBand HCA fanouts that support coupling:**
  - HCA2-O 12x two InfiniBand DDR links
  - HCA2-O LR two 1x InfiniBand DDR links
  - **HCA3-O two 12x InfiniBand DDR links**
  - **HCA3-O LR four 1x InfiniBand DDR links**

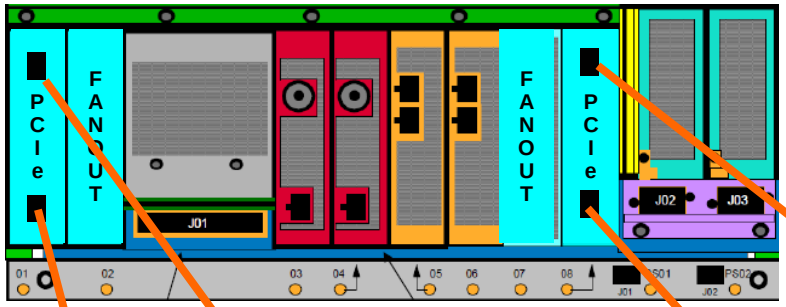
NEW



- **PCIe fanout – PCIe I/O Interconnect links**
  Supports two PCIe 8 GBps interconnects on copper cables to two 8-card PCIe I/O domain switches.
  Always plugged in pairs for redundancy.

- **HCA2-C fanout – InfiniBand I/O Interconnect**
  Supports two 12x InfiniBand DDR 6 GBps interconnects on copper cables to two 4-card I/O domain multiplexers.
  Always plugged in pairs for redundancy.

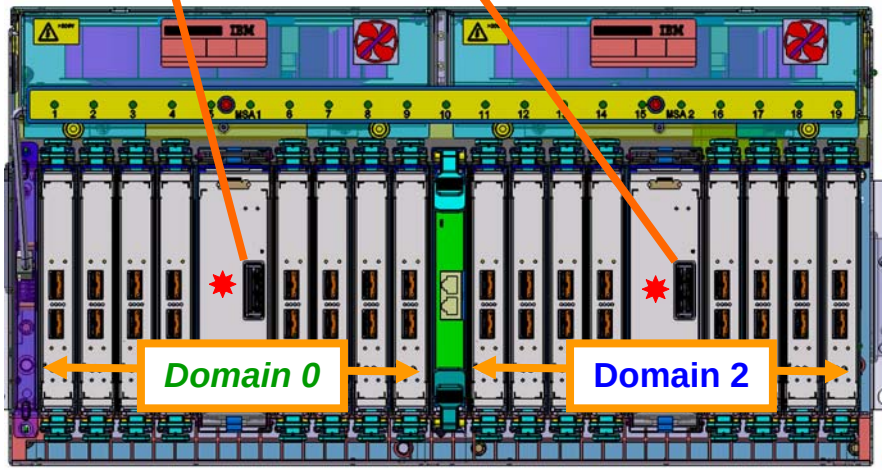
z114 M05 Redundant I/O Interconnect Example – One PCIe Drawer



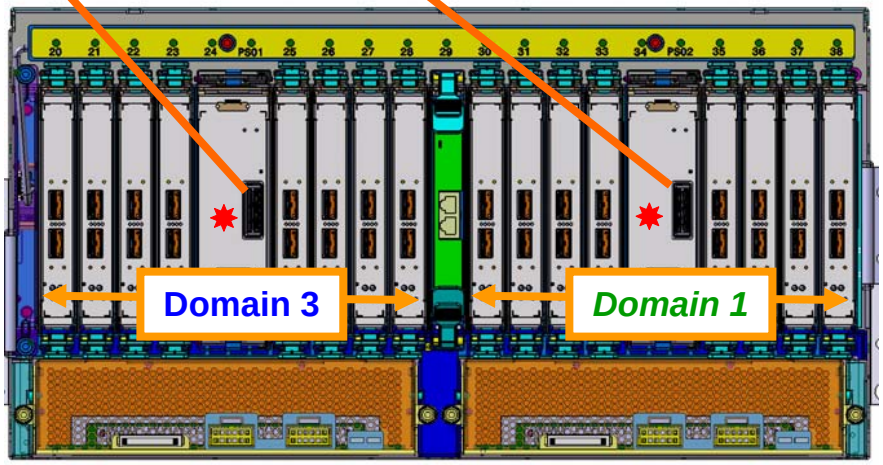
- Different **PCIe** Fanouts Support Domain Pairs:
  - ***0 and 1***
  - **2 and 3**
- Normal operation: Each PCIe interconnect in a pair supports the eight I/O cards in its domain.
- Backup operation: One PCIe interconnect supports all 16 I/O cards in the domain pair.

PCIe switch cards (✸)

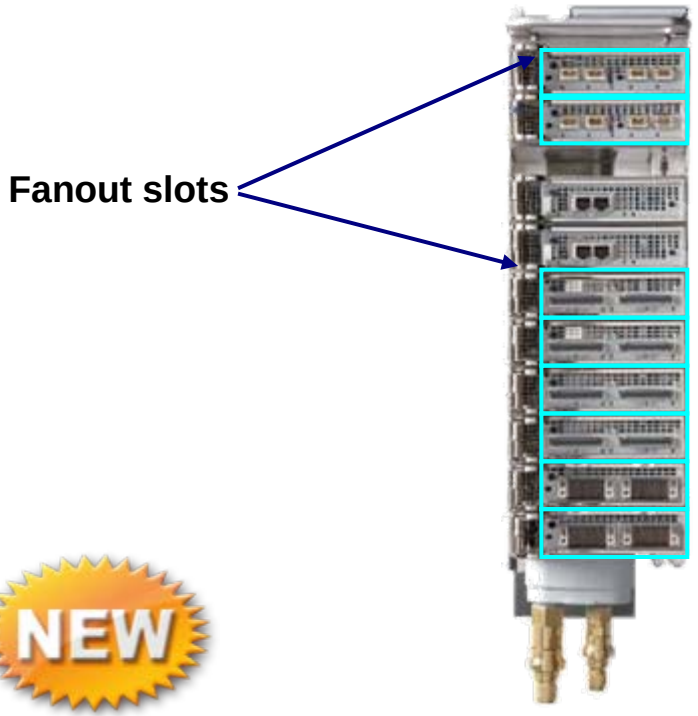
Front



Rear



z196 Connectivity for I/O and Coupling



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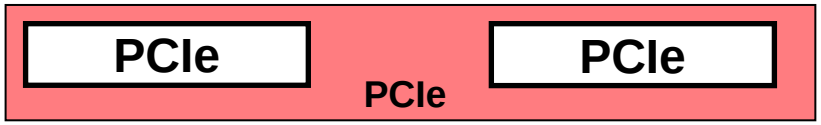


- **Up to 8 fanout cards per z196 book**
  - M15 (1 book) – up to 8
  - M32 (2 books) – up to 16
  - M49 (3 books) – up to 20
  - M66 and M80 (four books) – up to 24

- **I/O fanouts compete for fanout slots with the the InfiniBand HCA fanouts that support coupling:**
  - HCA2-O 12x two InfiniBand DDR links
  - HCA2-O LR two 1x InfiniBand DDR links
  - **HCA3-O two 12x InfiniBand DDR links**
  - **HCA3-O LR four 1x InfiniBand DDR links**

- **PCIe fanout – PCIe I/O Interconnect links**
  Supports two copper cable PCIe 8 GBps interconnects to two 8-card PCIe I/O domain multiplexers.
  Always plugged in pairs for redundancy.

- **HCA2-C fanout – InfiniBand I/O Interconnect**
  Supports two copper cable 12x InfiniBand DDR 6 GBps interconnects to two 4-card I/O domain multiplexers.
  Always plugged in pairs for redundancy.

z196 Book and I/O fanout plugging

M15

ECF	OSC		ECF	OSC
filler	D1	I/O	filler	filler
	D2	I/O		
	D3	FSP		
	D4	FSP		
	D5	I/O		
	D6	I/O		
	D7	I/O		
	D8	I/O		
	D9	I/O		
	DA	I/O		

M32

ECF	OSC		ECF	OSC
filler	D1	I/O	filler	D1	I/O
	D2	I/O		D2	I/O
	D3	FSP		D3	FSP
	D4	FSP		D4	FSP
	D5	I/O		D5	I/O
	D6	I/O		D6	I/O
	D7	I/O		D7	I/O
	D8	I/O		D8	I/O
	D9	I/O		D9	I/O
	DA	I/O		DA	I/O

Front views

M49

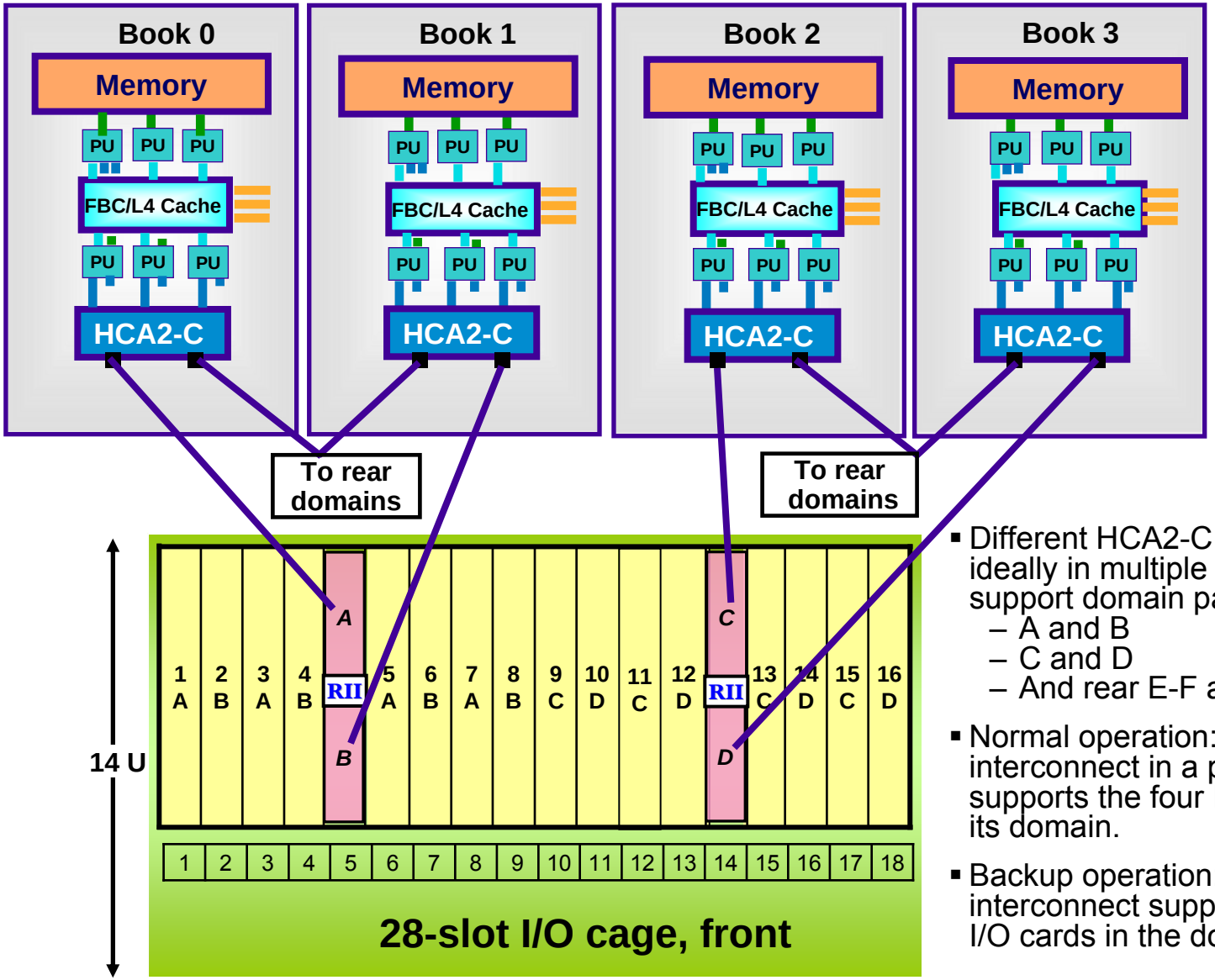
ECF	OSC		ECF	OSC
filler	D1	I/O		
	D2	I/O		
	D3	FSP	D3	FSP	D3	FSP
	D4	FSP	D4	FSP	D4	FSP
	D5	I/O	D5	I/O	D5	I/O
	D6	I/O	D6	I/O	D6	I/O
	D7	I/O	D7	I/O	D7	I/O
	D8	I/O	D8	I/O	D8	I/O
	D9	I/O	D9	I/O	D9	I/O
	DA	I/O	DA	I/O	DA	I/O

M66 or M80

ECF	OSC	ECF	OSC
D3 FSP	D3 FSP	D3 FSP	D3 FSP
D4 FSP	D4 FSP	D4 FSP	D4 FSP
D5 I/O	D5 I/O	D5 I/O	D5 I/O
D6 I/O	D6 I/O	D6 I/O	D6 I/O
D7 I/O	D7 I/O	D7 I/O	D7 I/O
D8 I/O	D8 I/O	D8 I/O	D8 I/O
D9 I/O	D9 I/O	D9 I/O	D9 I/O
DA I/O	DA I/O	DA I/O	DA I/O

- **I/O fanouts**
  - M15 – up to 8
  - M32 – up to 16
  - M49 – up to 20
  - M66 – up to 24
  - M80 – up to 24
- **Cooling Design**
  - Fanout locations D1 and D2 are NOT used in the 2nd and 3rd Book for Model M49
  - Fanout locations D1 and D2 are NOT used in any Book for Models M66 or M80

z196 Redundant I/O Interconnect, 28-slot I/O cage



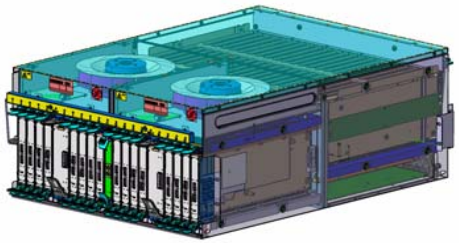
- Different HCA2-C Fanouts, ideally in multiple books, support domain pairs:
  - A and B
  - C and D
  - And rear E-F and G-G'
- Normal operation: Each IFB interconnect in a pair supports the four I/O cards in its domain.
- Backup operation: One IFB interconnect supports all 8 I/O cards in the domain pair.

z196 GA2 I/O Features supported

Supported features

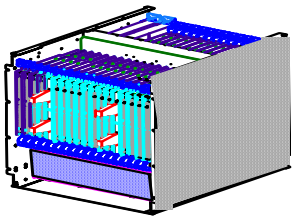
- **Features – PCIe I/O drawer**
  - ***FICON Express8S***
    - SX and LX
  - ***OSA-Express4S***
    - 10 GbE LR and SR
    - GbE SX and LX

PCIe I/O drawer

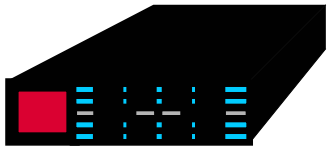


32 I/O slots

- **Features – I/O cage and I/O drawer**
  - **Crypto Express3**
  - **ESCON (240 or fewer)**
  - FICON Express8 ***(Carry forward or RPQ 8P2534 to fill empty slots)***
  - FICON Express4 (**Carry forward only**)
  - **ISC-3**
  - **OSA-Express3 1000BASE-T**
  - OSA-Express3 (***Carry forward or RPQ 8P2534 to fill empty slots***)
    - 10 GbE, GbE
  - OSA-Express2 ***(Carry forward only)***
    - GbE, 1000BASE-T
  - **PSC (Carry forward or new build, no MES add)**



28 slot I/O cage

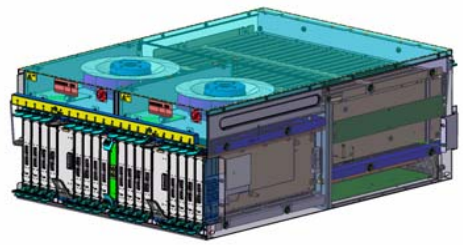


8 slot I/O drawer

z114 I/O Features supported

Supported features

- **Features - PCIe I/O drawer**
  - ***FICON Express8S***
    - SX and 10 km LX
  - ***OSA-Express4S***
    - 10 GbE LR and SR
    - GbE SX and LX



32 slot PCIe I/O drawer

- **Features - I/O drawer**
  - **Crypto Express3, Crypto Express3 1P**
  - **ESCON (240 or fewer)**
  - *FICON Express8 (**Carry forward or RPQ 8P2534 to fill empty slots**)*
  - *FICON Express4 (**Carry forward only for 4 port cards**)*
  - *FICON Express4-2C (**Carry forward or RPQ 8P2534 to fill empty slots**)*
  - **ISC-3**
  - **OSA-Express3 1000BASE-T (Includes -2P)**
  - *OSA-Express3 (**Carry forward or RPQ 8P2534 to fill empty slots**)*
    - *10 GbE, GbE*
  - *OSA-Express2 (**Carry forward only**)*
    - *GbE, 1000BASE-T*
  - **PSC (Carry forward or new build, no MES add)**

8 slot I/O drawer

Current FICON Express4 and OSA-Express2 Statements of Direction* July 12, 2011 Announcements

- **The IBM zEnterprise 196 and the IBM zEnterprise 114 will be the last System z servers to support FICON Express4 features**: IBM plans not to offer FICON Express4 features as an orderable feature on future System z servers. In addition, FICON Express4 features **cannot be carried forward** on an upgrade to such follow-on servers. Enterprises should begin migrating from FICON Express4 to FICON Express8S features.
  - For z196, this new Statement of Direction restates the SOD in Announcement letter 110-170 of July 22, 2010.
- **The IBM zEnterprise 196 and the IBM zEnterprise 114 will be the last System z servers to support OSA-Express2 features**: IBM plans not to offer OSA-Express2 features as an orderable feature on future System z servers. In addition, OSA-Express2 features **cannot be carried forward** on an upgrade to such follow-on servers. Enterprises should begin migrating from OSA-Express2 features to OSA-Express4S 10 GbE and GbE features and OSA-Express3 1000BASET features.
  - For z196, this new Statement of Direction restates the SOD in Announcement letter 110-170 of July 22, 2010.

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

Current Power Sequence Controller Statement of Direction* July 12 , 2011 Announcements

- **The IBM zEnterprise 196 and the zEnterprise z114 are the last System z servers to support the Power Sequence Controller (PSC) feature**. IBM intends to not offer support for the PSC (feature #6501) on future System z servers after the z196 (2817) and z114 (2818). PSC features cannot be ordered and cannot be carried forward on an upgrade to such a follow-on server.

- **Notes:**
  - This is a revision to the PSC statement of general direction published October 20, 2009, IBM System z10 - Delivering Security-Rich Offerings to Protect Your Data, Hardware Announcement 109-678.
  - The PSC optional feature provides the ability to power control units with the required hardware interface on and off from the System z server.

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Current ESCON Statement of Direction* July 12, 2011 Announcements

- **The IBM zEnterprise 196 and the IBM zEnterprise 114 will be the last System z servers to support ESCON channels**: IBM plans not to offer ESCON channels as an orderable feature on future System z servers. In addition, ESCON channels **cannot be carried forward** on an upgrade to such follow-on servers. This plan applies to channel path identifier (CHPID) types CNC, CTC, CVC, and CBY and to featured 2323 and 2324. System z customers should continue migrating from ESCON to FICON. Alternate solutions are available for connectivity to ESCON devices. IBM Global Technology Services offers an ESCON to FICON Migration solution, Offering ID #6948-97D, to help simplify and manage an all FICON environment with continued connectivity to ESCON devices if required.
- Notes:
  - For z196, this new Statement of Direction restates the SOD in Announcement letter 111-112 of February 15, 2011. It also confirms the SOD in Announcement letter 109-230 of April 28, 2009 that “ESCON Channels will be phased out.”

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Previous I/O Statements of Direction

- **The z196 is planned to be the last high end System z server to support FICON Express4 and OSA-Express2.** Clients are advised to begin migration to FICON Express8 and OSA-Express3.
- **The z196 is planned to be the last high end System z server on which ~~ESCON channels,~~ ISC-3 links, ~~and Power Sequence Control~~ features can be ordered. Only when an installed server with those features is field upgraded to the next high System z server will they be carried forward.** Clients are advised to begin migration to FICON Express8, InfiniBand links, and alternate means of powering control units on and off.

- **It is IBM's intent for ESCON channels to be phased out.** System z10 EC and System z10 BC will be the last servers to support more than 240 ESCON channels
- **The System z10 will be the last server to support connections to the Sysplex Timer (9037).** Servers that require time synchronization, such as to support a base or Parallel Sysplex, will require Server Time Protocol (STP). STP has been available since January 2007 and is offered on the System z10, System z9, and zSeries 990 and 890 servers.
- **ICB-4 links to be phased out.** IBM intends to not offer Integrated Cluster Bus-4 (ICB-4) links on future servers. IBM intends for System z10 to be the last server to support ICB-4 links as originally stated in Hardware Announcement 108-154, dated February 26, 2008
- **The System z10 will be the last server to support Dynamic ICF expansion.** This is consistent with the Statement of Direction in Hardware Announcement 107-190, dated April 18, 2007: "IBM intends to remove the Dynamic ICF expansion function from future System z servers."

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

Optica PRIZM FICON Converter

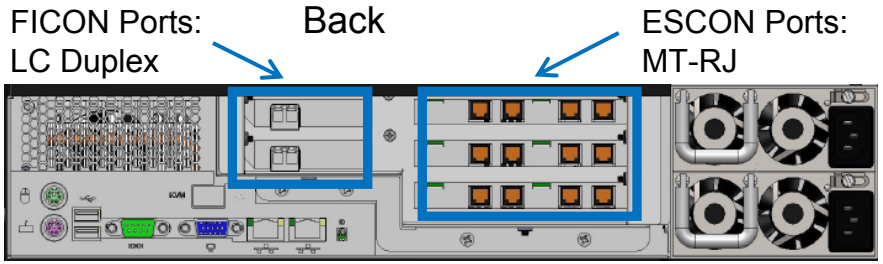
http://www.opticatech.com/

Supports the elimination of ESCON channels on the host while maintaining ESCON and Bus/Tag-based devices and applications

What is PRIZM?

- A purpose-built appliance designed exclusively for IBM System z; enables ESCON devices to be connected to FICON channels or fabrics
- Allows ESCON devices to connect to FICON channels and FICON fabrics/networks
  - Prizm also supports attachment of parallel (bus/tag) devices to FICON channels via ESBT module
- Converts 1 or 2 FICON channels (CHPID type FC) into 4, 8 or 12 ESCON channels
  - Replace aging ESCON Directors with PRIZM (maintenance savings)
  - Achieve streamlined infrastructure and reduced Total Cost of Ownership
- Qualified by the IBM Vendor Solutions Lab in POK for all ESCON devices; qualified for connectivity to Brocade and Cisco FICON switching solutions
  - Refer to: http://www-03.ibm.com/systems/z/hardware/connectivity/index.html
    - Products -- > FICON / FCP Connectivity -- > Other supported devices
- PRIZM is available via IBM Global Technology Services: ESCON to FICON Migration offering (#6948-97D)

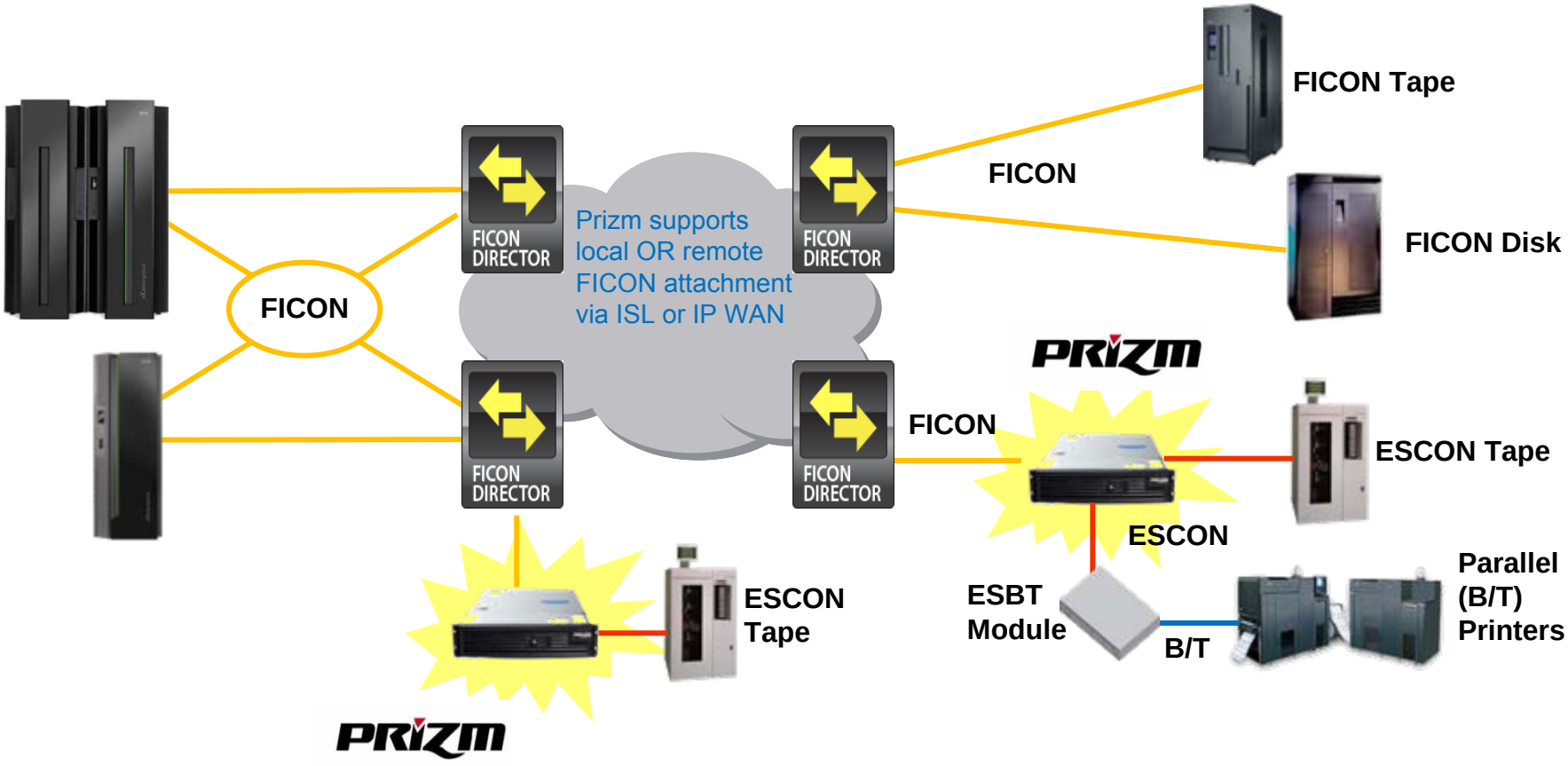
Front



Where Does Prizm Fit in the Data Center?

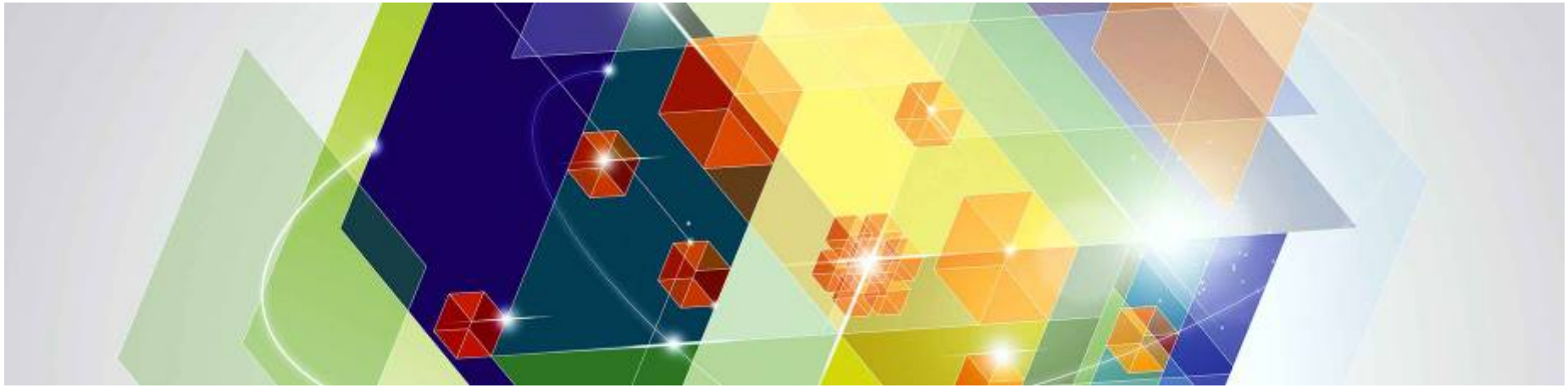
Topologies supported by Prizm

- Local: direct attached or switched
- Remote: ISL (cascaded) or IP channel extended



Channels

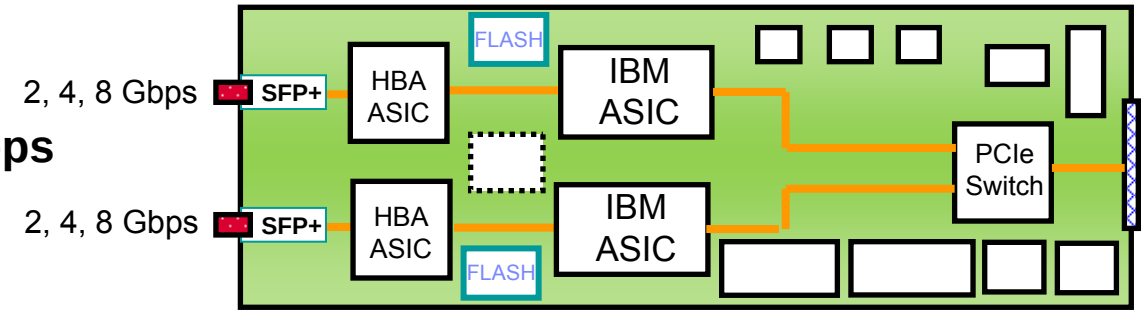
IBM zEnterprise - Freedom by Design



FICON Express8S – PCIe I/O drawer

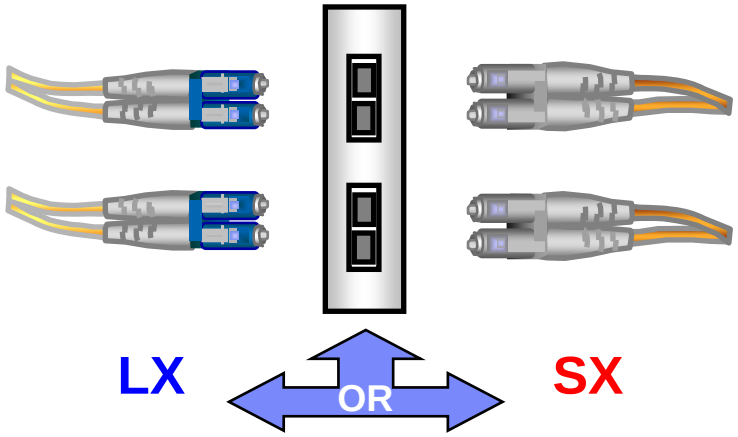
NEW

- **For FICON, zHPF, and FCP environments**
  - CHPID types: FC and FCP
  - 2 PCHIDs/CHPIDs
- **Auto-negotiates to 2, 4, or 8 Gbps**
- **Increased performance compared to FICON Express8**



- **10KM LX - 9 micron single mode fiber**
  - Unrepeated distance - 10 kilometers (6.2 miles)
  - Receiving device must also be LX
- **SX - 50 or 62.5 micron multimode fiber**
  - Distance variable with link data rate and fiber type
  - Receiving device must also be SX
- **2 channels of LX or SX (no mix)**
- **Small form factor pluggable (SFP) optics**
  - Concurrent repair/replace action for each SFP

0409 – 10KM LX, # 0410 – SX



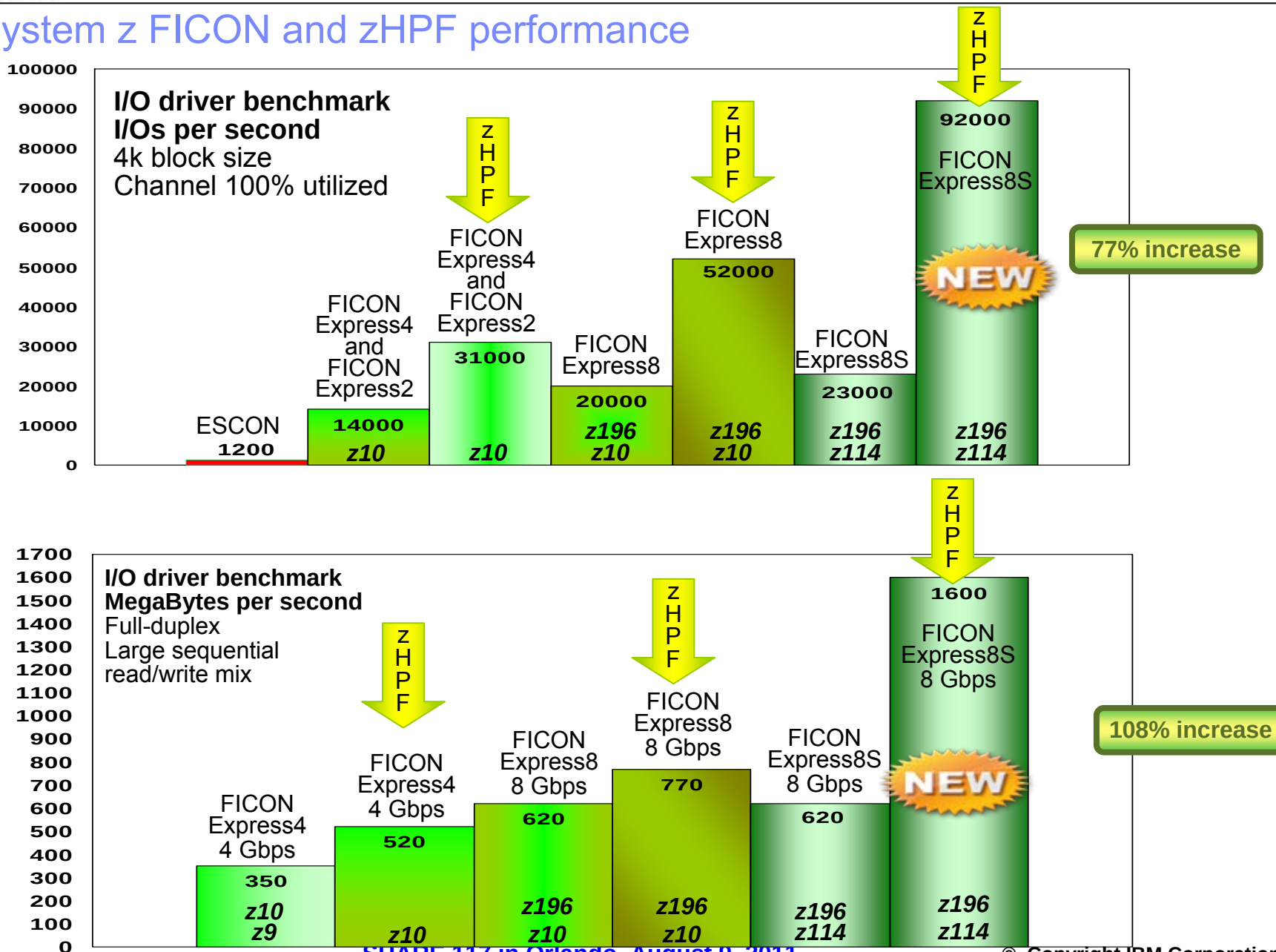
zEnterprise zHPF supports data transfers larger than 64 k bytes

- **zHPF multi-track data transfers are no longer limited to 64 k bytes**
  - Up to 256 tracks can be transferred a single operation
  - Eliminating the 64 k byte limit is designed to allow a FICON Express8 channel to fully exploit its available bandwidth
  - This enhancement is exclusive to z196 and z114
- **Designed to help provide**
  - Higher throughput for zHPF multi-track operations
  - With lower response time
- **Requires:**
  - FICON Express8S, FICON Express8 or FICON Express4 channel
  - CHPID TYPE=FC definition
  - Control unit support for zHPF
- **z/OS operating system support**

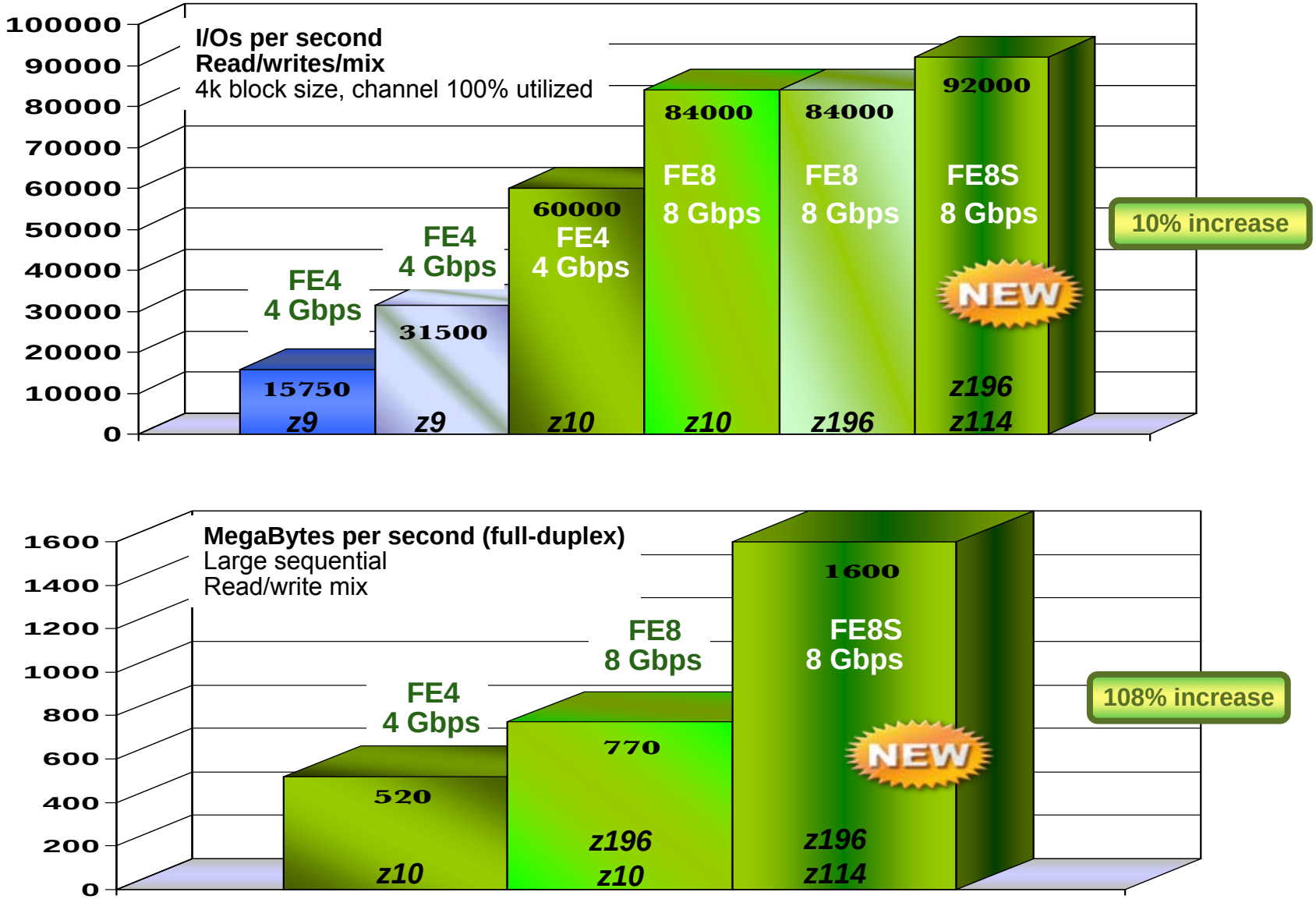
White Paper: "High Performance FICON (zHPF) for System z Analysis"
http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101789

High Performance FICON (zHPF) for DS8000 System z Attached Analysis: AG Storage ATS Offering
http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/FLASH10668

System z FICON and zHPF performance



FCP performance on System z

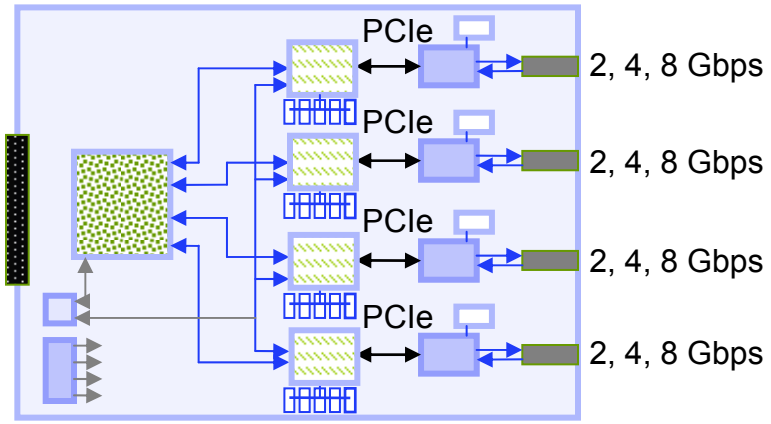


FCP channels to support T10-DIF for enhanced reliability

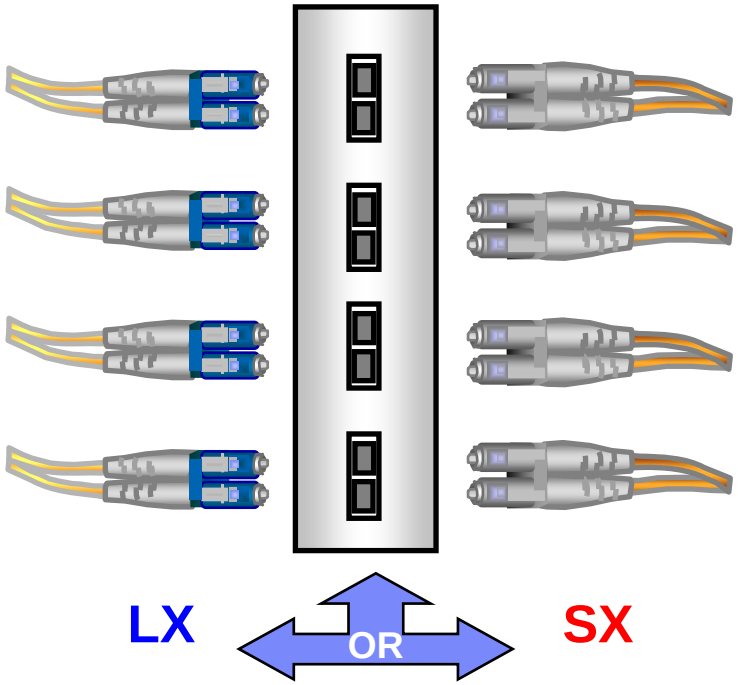
- **System z Fibre Channel Protocol (FCP) has implemented support of the American National Standards Institute's (ANSI) T10 Data Integrity Field (DIF) standard.**
  - Data integrity protection fields are generated by the operating system and propagated through the storage area network (SAN).
  - System z helps to provide added end-to-end data protection between the operating system and the storage device
- **An extension to the standard, Data Integrity Extensions (DIX), provides checksum protection from the application layer through the host bus adapter (HBA), where cyclical redundancy checking (CRC) protection is implemented**
- **T10-DIF support by the FICON Express8S and FICON Express8 features, when defined as CHPID type FCP, is exclusive to z196 and z114.**
- **Exploitation of the T10-DIF standard requires support by the operating system and the storage device**
  - z/VM 5.4 with PTFs for guest exploitation
  - Linux on System z distributions:
    - IBM is working with its Linux distribution partners to include support in future Linux on System z distribution releases. .

z196 FICON Express8

- **Auto-negotiate to 2, 4, or 8 Gbps**
  1 Gbps devices not supported point to point
- **Connector - LC Duplex**
- **Four LX ports (FC #3325)**
  - 9 micron single mode fiber
  - Unrepeated distance - 10 km (6.2 miles)
  - Receiving device must also be LX
- **Four SX ports (FC #3326)**
  - 50 or 62.5 micron multimode fiber
    (50 micron fiber is preferred)
  - Unrepeated distance varies fiber type and link data rate
  - Receiving device must also be SX
- **LX and SX performance is identical**
- **Additional buffer credits supplied by a director or DWDM are required to sustain performance beyond 10 km**



3325 – 10KM LX, # 3326 – SX



Small Form Factor Pluggable (SFP) optics.
Concurrent repair/replace action for each SFP

z196 and z114 FICON discovery and auto-configuration

- **Provides automatic discovery for FICON disk and tape control units**
- **Reduces the level of skill and time required to configure new I/O devices**
- **Ensures system (host) and control unit definitions are compatible with each other**
- **Automatically discovers storage devices accessible to the system but not currently configured and proposes host definition values**
  - For discovered control units, explores for defined logical control units and devices
  - Compares discovered logical control units and devices against those configured previously
  - Adds missing logical control units and devices to the configuration, proposing control unit and device numbers, and proposing paths to reach them
    - Channel paths are chosen using algorithm to minimize single points of failure
- **Integrated with existing System z host configuration tools (HCD & HCM)**
- **Requires**
  - CHPID TYPE=FC on FICON Express8S, FICON Express8 or FICON Express4
  - Channel attached to a FICON Director with Name Server
  - Dynamic I/O enabled systems
  - z/OS support

Three subchannel sets on z196

Note: z114 supports only LCSS 0 and 1, 15 LPARs each, and had only two subchannel sets in each LCSS

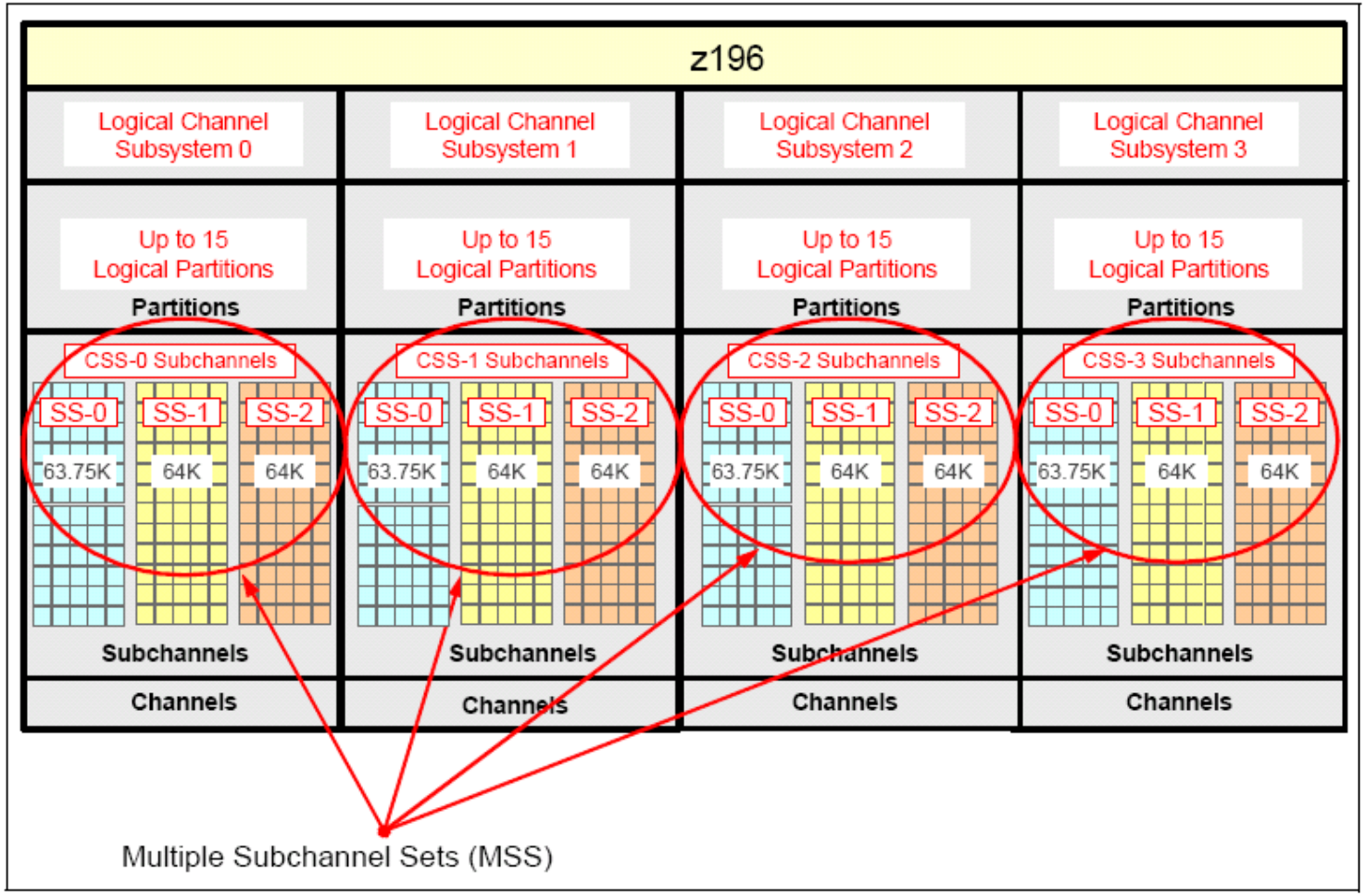


Figure 1-4 Multiple subchannels sets

z196 three subchannel sets per logical channel subsystem (LCSS)

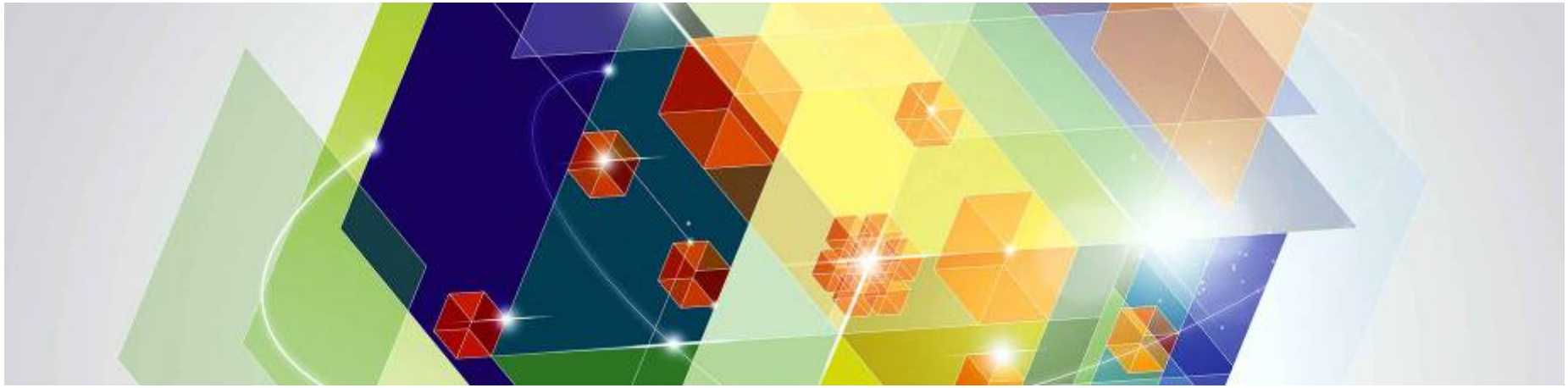
- **A third subchannel set of 64 K devices is added to each LCSS**
- **The first subchannel set (SS 0) allows definitions of any type of device allowed today, (i.e. bases, aliases, secondaries, and those other than disk that do not implement the concept of associated aliases or secondaries)**
- **Second and third subchannel sets (SS1 and SS2) are available to use for disk alias devices (of both primary and secondary devices) and/or Metro Mirror secondary devices only**
- **CHPID support**
  - FICON TYPE=FC on FICON Express8S, FICON Express8 or FICON Express4
  - ESCON TYPE=CNC
- **Value**
  - Enables extending the amount of storage that can be defined while maintaining performance
  - Provides a means to help simplify device addressing by providing consistent device address definitions for congruous devices
    - Allows use of the same device number in different subchannel sets
- **Requires z/OS or Linux on System z operating system support**
- **This enhancement is exclusive to zEnterprise 196**

zEnterprise IPL from an alternate subchannel set

- Enables IPL from subchannel set 1 (z196 and z114) or subchannel set 2 (z196 only), in addition to subchannel set 0.
- Devices used early during IPL processing can now be accessed using subchannel set 1 or subchannel set 2. This is intended to allow the users of Metro Mirror (PPRC) secondary devices defined using the same device number and a new device type in an alternate subchannel set to be used for IPL, IODF, and standalone dump volumes when needed.
- IPL from an alternate subchannel set is supported by z/OS V1.13, as well as V1.12 and V1.11 with PTFs.

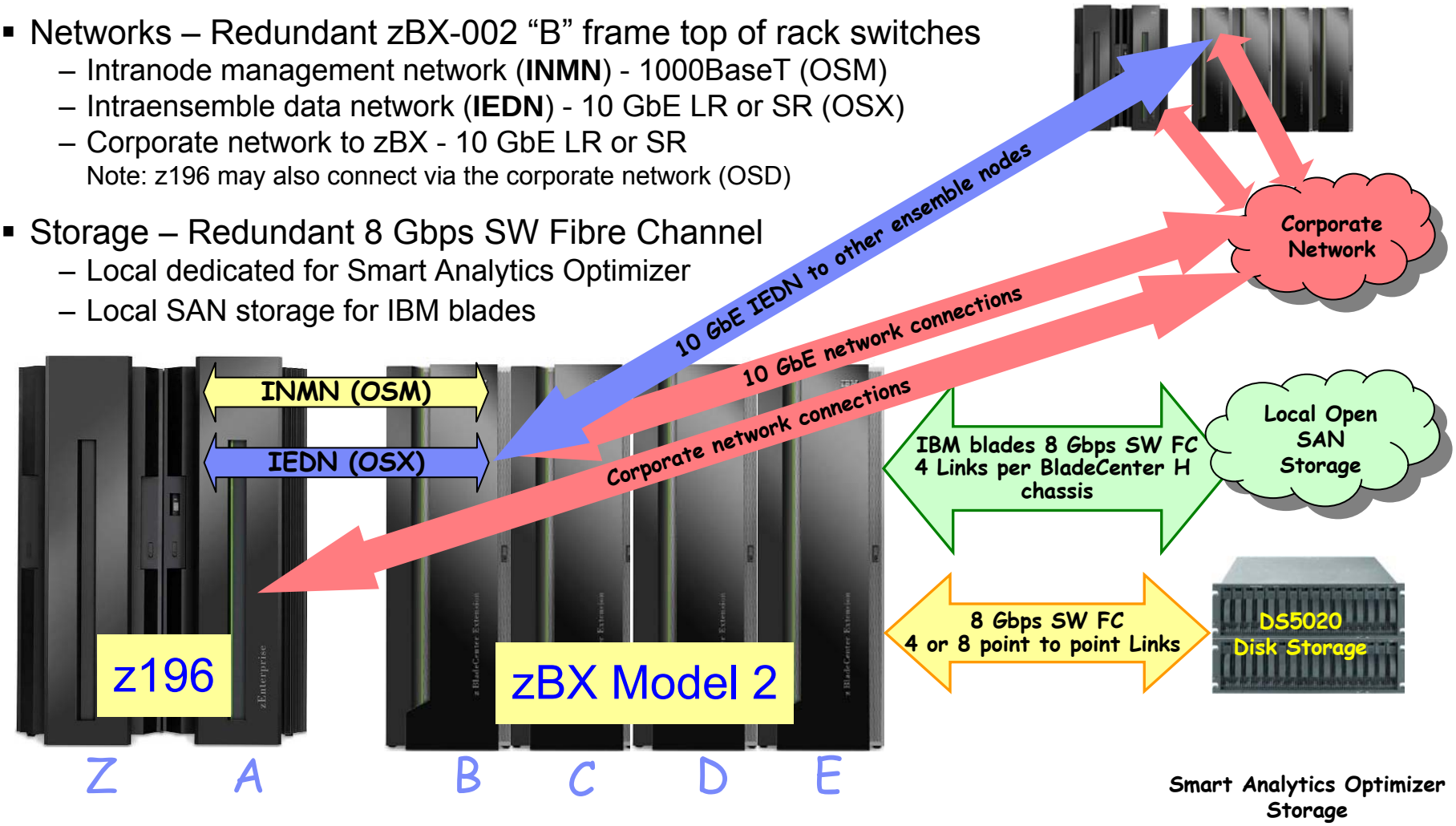
Networking

IBM zEnterprise - Freedom by Design



zEnterprise z196 and zBX Model 2 Ensemble Connectivity

- Networks – Redundant zBX-002 "B" frame top of rack switches
  - Intranode management network (**INMN**) - 1000BaseT (OSM)
  - Intraensemble data network (**IEDN**) - 10 GbE LR or SR (OSX)
  - Corporate network to zBX - 10 GbE LR or SR
    Note: z196 may also connect via the corporate network (OSD)
- Storage – Redundant 8 Gbps SW Fibre Channel
  - Local dedicated for Smart Analytics Optimizer
  - Local SAN storage for IBM blades

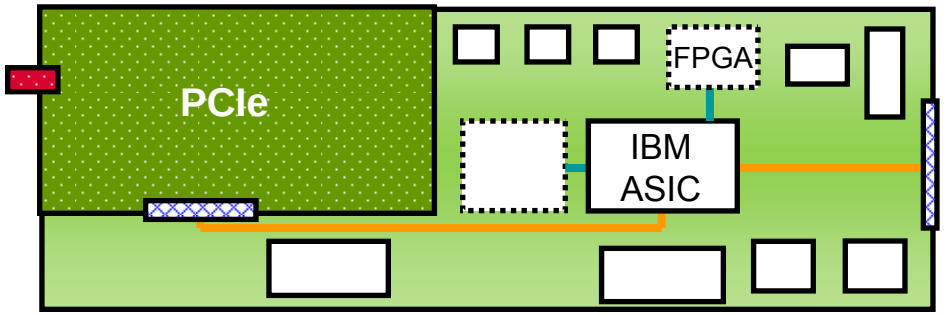


zEnterprise Networking Sessions: 9245, 9246, 9534 – Gus Kassimis and Gwen Dente

OSA-Express4S fiber optic – PCIe I/O drawer

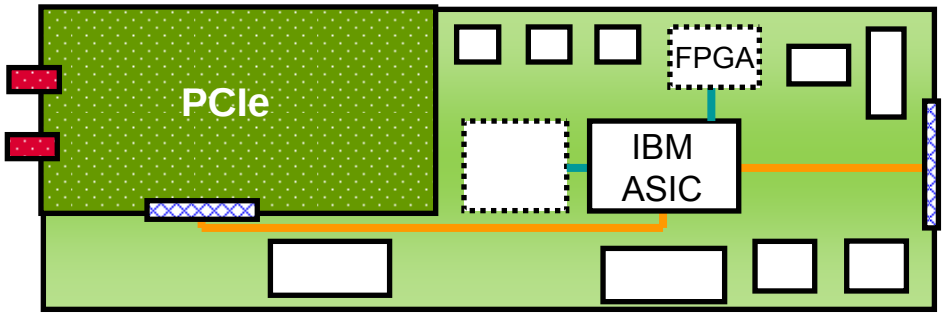
NEW

- **10 Gigabit Ethernet (10 GbE)**
  - CHPID types: OSD, OSX
  - Single mode (LR) or multimode (SR) fiber
  - One port of LR or one port of SR
    - 1 PCHID/CHPID



0406 – 10 GbE LR, # 0407 – 10 GbE SR

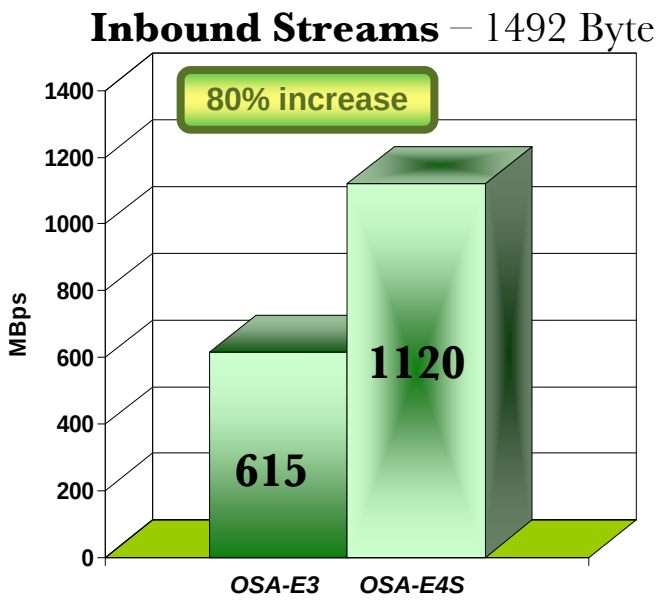
- **Gigabit Ethernet (GbE)**
  - CHPID types: OSD (OSN not supported)
  - Single mode (LX) or multimode (SX) fiber
  - Two ports of LX or two ports of SX
    - 1 PCHID/CHPID

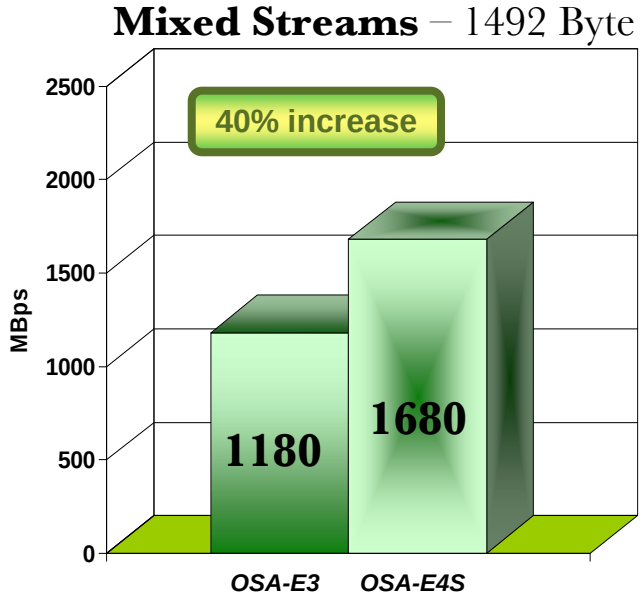


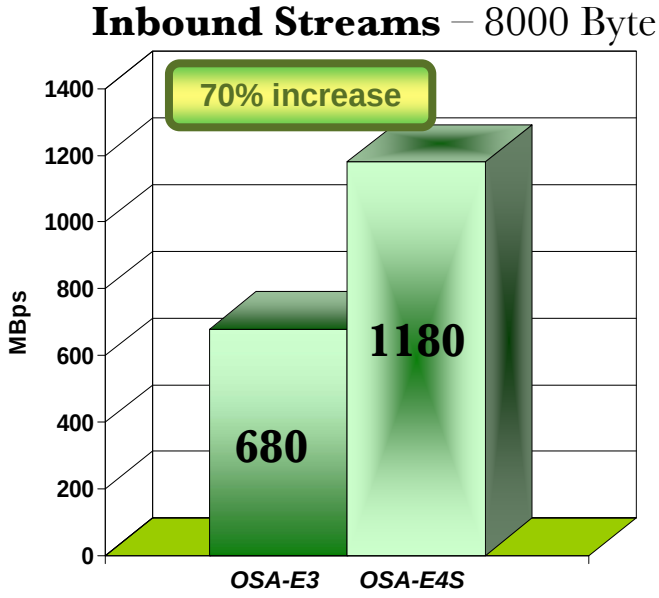
0404 – GbE LX, # 0405 – GbE SX

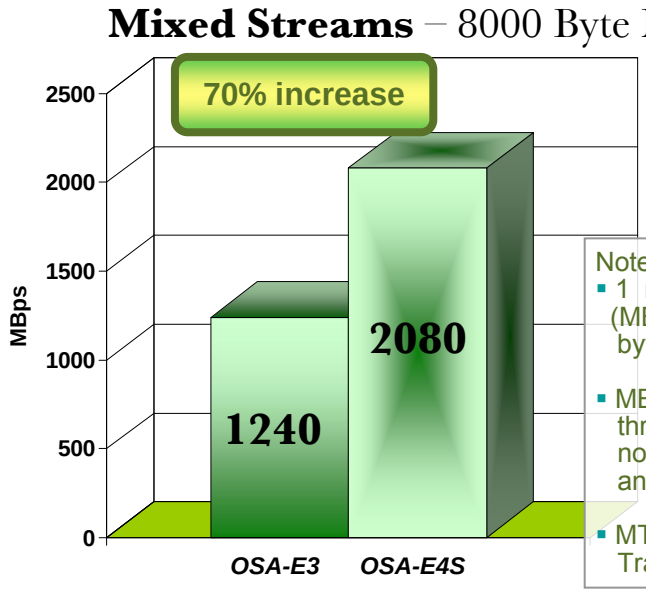
- **Small form factor optics – LC Duplex**

OSA-Express4S 10 GbE performance (laboratory)





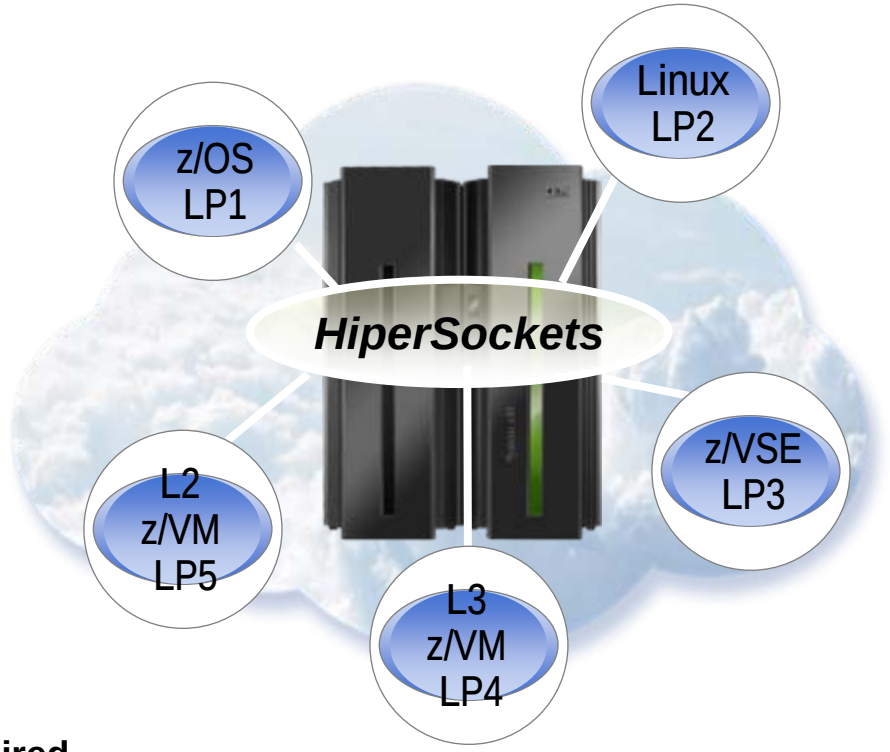




Notes:
- 1 megabyte per second (MBps) is 1,048,576 bytes per second
- MBps represents payload throughput (does not count packet and frame headers)
- MTU = Maximum Transmission Unit

z196 and z114 HiperSockets
Now **double** the number of HiperSockets!

- **High-speed "intraserver" network**
- **Independent, integrated, virtual LANs**
- **Communication path – system memory**
- **Communication across LPARs**
  - Single LPAR - connect up to **32 HiperSockets**
  - 4096 communication queues
- **Spanned support for LPARs in multiple LCSSs**
- **Virtual LAN (IEEE 802.1q) support**
- **HiperSockets Network Concentrator**
- **Broadcast support for IPv4 packets**
- **IPv6**
- **HiperSockets Network Traffic Analyzer (HS NTA)**
- **No physical cabling or external connections required**



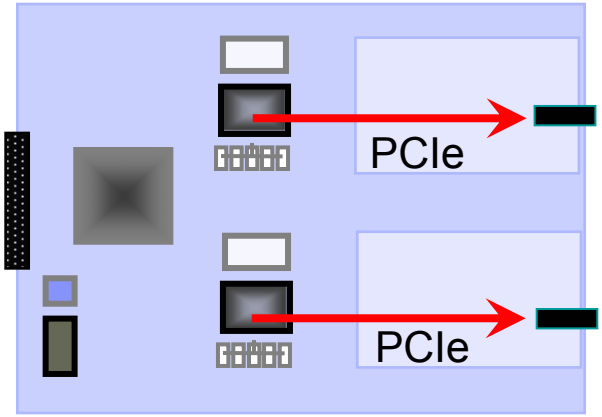
zEnterprise – HiperSockets Statements of Direction July 12, 2011 Announcements*

- **HiperSockets Completion Queue:**
  - IBM plans to support transferring HiperSockets messages asynchronously, in addition to the current synchronous manner on z196 and z114. This could be especially helpful in burst situations. The Completion Queue function is designed to allow HiperSockets to transfer data synchronously if possible and asynchronously if necessary, thus combining ultra-low latency with more tolerance for traffic peaks. HiperSockets Completion Queue is planned to be supported in the z/VM and z/VSE environments in a future deliverable..
- **HiperSockets integration with the IEDN:**
  - Within a zEnterprise environment, it is planned for HiperSockets to be integrated with the intraensemble data network (IEDN), extending the reach of the HiperSockets network outside of the central processor complex (CPC) to the entire ensemble, appearing as a single Layer 2 network. HiperSockets integration with the IEDN is planned to be supported in z/OS V1.13 and z/VM in a future deliverable.

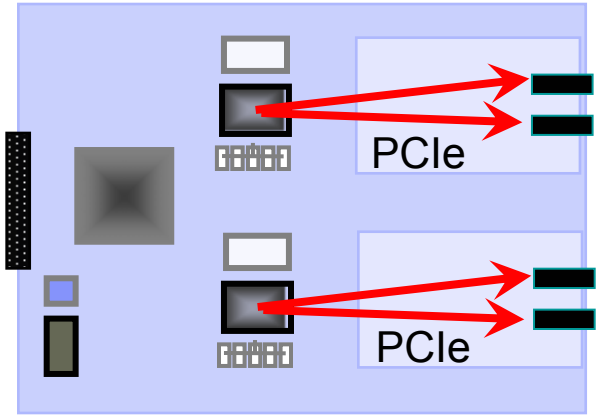
zEnterprise OSA-Express3 (fiber optic)

- **Double the port density of OSA-Express2**
- **Reduced latency & improved throughput**
  - Ethernet hardware data router
- **Improved throughput – standard & jumbo frames**
  - New microprocessor
  - New PCI adapter
- **CHPID types**
  - 10 Gigabit Ethernet – OSD TCP/IP or **OSX for intraensemble data network Ensemble requires two OSX CHPIDs on two separate feature cards of the same type**
  - Ensemble requires two OSX
  - Gigabit Ethernet – OSD TCP/IP or and OSN for the communication controller for Linux
- **Port usage in 2-port Gigabit Ethernet CHPIDs**
  - OSD both with operating system support
  - OSN does not use any ports

	OSA-Express2	OSA-Express3
Microprocessor	500 MHz – 10 GbE 448 MHz – 1 GbE	667 MHz
PCI bus	PCI-X	PCIe G1



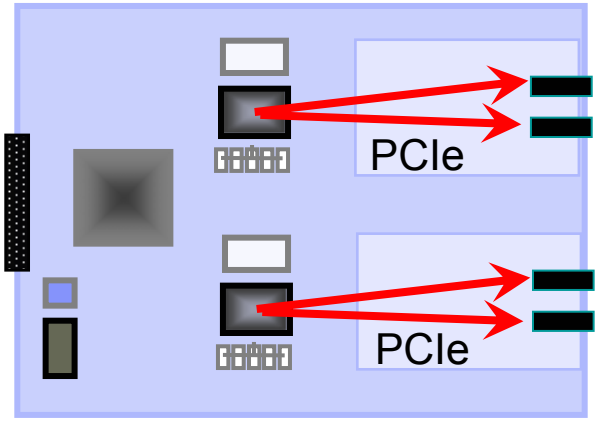
10 GbE LR #3370,
10 GbE SR #3371



CHPID shared by two ports
GbE LX #3362, GbE SX #3363

zEnterprise OSA-Express3 1000BaseT

- Auto-negotiation to 10, 100, 1000 Mbps
- Double the port density of OSA-Express2
- Reduced latency & improved throughput
  - Ethernet hardware data router
- Improved throughput – standard & jumbo frames
  - New microprocessor
  - New PCI adapter
- Port usage in 2-port CHPIDs
  - OSC, OSD, OSE both
  - **OSM port 0 only**
  - OSN does not use ports
- **Ensemble requires two OSM CHPIDs on two different feature cards**



CHPID shared by two ports
1000BaseT # 3367

	OSA-Express2	OSA-Express3
Microprocessor	448 MHz	667 MHz
PCI bus	PCI-X	PCIe G1

Mode	TYPE	Description
OSA-ICC	OSC	TN3270E, non-SNA DFT, OS system console operations
QDIO	OSD	TCP/IP traffic when Layer 3, Protocol-independent when Layer 2
Non-QDIO	OSE	TCP/IP and/or SNA/APPN/HPR traffic
Unified Resource Manager	**OSM**	**Connectivity to intranode management network (INMN)**
OSA for NCP (LP-to-LP)	OSN	NCPs running under IBM Communication Controller for Linux (CCL)

z196 GA2 I/O Connectivity

Features	Offered As	Maximum # of features	Maximum channels	Increments per feature	Purchase increments
ESCON	**NB**	16	240 channels	1 - 15 active	4 channels
FICON					
FICON Express8S	**NB**	160	320 channels	2 channels	2 channels
FICON Express8	CF*	72	288 channels	4 channels	4 channels
FICON Express4	CF	72	288 channels	4 channels	4 channels
ISC-3	**NB**	12	48 links	4 links	1 link
OSA-Express					
OSA-Express4S	**NB**	48	96 ports	1 (10 GbE) / 2 ports	1 feature
OSA-Express3 1000BASE-T	**NB**	24	96 ports	4 ports	1 feature
OSA-Express3 10 GbE, GbE	CF*	24	96 ports	2 (10 GbE) / 4 ports	1 feature
OSA-Express2**	CF*	24	48 ports	2 ports	1 feature
Crypto Express3* **	**NB**	8	16 PCIe adapters	2 PCIe adapters	1 feature ***

* Can be carried forward or ordered on MES with RPQ 8P2534
** OSA-Express2 10 GbE LR is not supported as a carry forward
*** Two features initially, one thereafter

NB = New Build
CF = Carry Forward

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

z114 I/O Connectivity

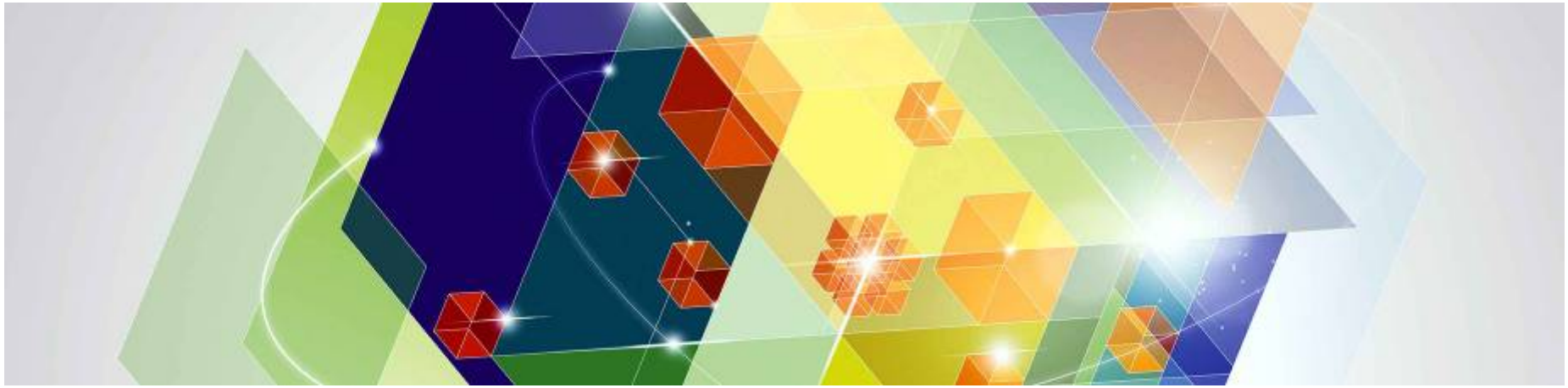
Features	Offered As	Maximum # of features	Maximum channels	Increments per feature	Purchase increments
ESCON	**NB**	16	240 channels	1 - 15 active	4 channels
FICON					
FICON Express8S	**NB**	64	128 channels	2 channels	2 channels
FICON Express8	CF*	16	64 channels	4 channels	4 channels
FICON Express4	CF	16	64 channels	4 channels	4 channels
FICON Express4-2C	CF*	16	32 channels	2 channels	2 channels
ISC-3	**NB**	12	48 links	4 links	1 link
OSA-Express					
OSA-Express4S	**NB**	48	96 ports	1 (10 GbE) / 2 ports	1 feature
OSA-Express3 1000BASE-T	**NB**	16	64 ports	2 (-2P) / 4 ports	1 feature
OSA-Express3 10 GbE, GbE	CF*	16	64 ports	2 (10 GbE) / 4 ports	1 feature
OSA-Express3-2P GbE	CF*	16	32 ports	2 ports	1 feature
OSA-Express2**	CF	16	32 ports	2 ports	1 feature
Crypto***					
Crypto Express3	**NB**	8	16 PCIe adapters	2 PCIe adapters	1 feature***
Crypto Express3-1P	**NB**	8	8 PCIE adapters	1 PCIe adapter	1 feature***

* Can be carried forward or ordered by MES using RPQ 8P2534
** OSA-Express2 10 GbE LR is not supported as a carry forward
*** Two features initially, one thereafter

NB = New Build
CF = Carry Forward

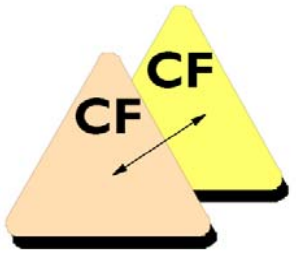
Coupling

IBM zEnterprise - Freedom by Design



System z CFCC Level 17

- **CFCC Level 17 allows:**
  - Up to 2047 structures per Coupling Facility (CF) image, up from the prior limit of 1023. This allows definition of a larger number of data sharing groups, which can help when a large number of structures must be defined, such as to support SAP configurations or to enable large Parallel Sysplex configurations to be merged. Exploitation requires z/OS v1.12 and the PTF for APAR OA32807; PTFs are also available for z/OS v1.10 and z/OS V1.11.
  - More connectors to list and lock structures. XES and CFCC already support 255 connectors to cache structures. With this new support, XES also supports up to 247 connectors to a lock structure, 127 connectors to a serialized list structure, and 255 connectors to an unserialized list structure. This support requires z/OS 1.12 and the PTF for APAR OA32807; PTFs are also available for z/OS V1.10 and z/OS V1.11.
  - Improved CFCC Diagnostics and Link Diagnostics
- **Structure and CF Storage Sizing with CFCC level 17**
  - May increase storage requirements when moving from CFCC Level 16 (or below) to CF Level 17
  - Using the **CFSizer** Tool is recommended
  - http://www.**ibm.com**/systems/z/cfsizer/

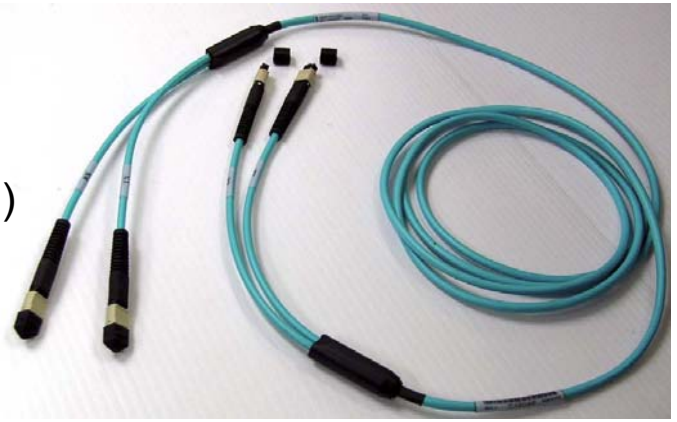


- **Greater than 1024 CF Structures requires a new version of the CFRM CDS**
  - All systems in the sysplex must to be at z/OS V1.12 or have the coexistence/preconditioning PTF installed.
  - Falling back to a previous level (without coexistence PTF installed) is NOT supported without a sysplex-wide IPL

Parallel Sysplex using InfiniBand (PSIFB)

ready for even the most demanding data sharing workloads

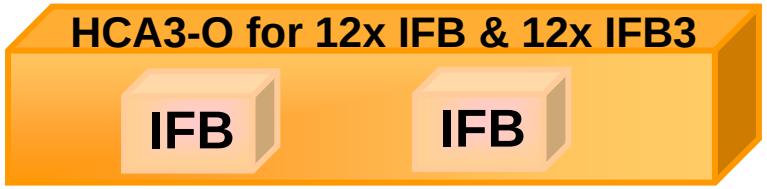
- **Simplify Parallel Sysplex connectivity**
  Do more with less
  - Can **share physical links** by defining multiple logical links (CHPIDs)
  - Can **consolidate** multiple legacy links (ISC and/or ICB)
  - Can more easily address link constraints
    - Define another CHPID to increase available subchannels instead of having to add physical links



- **More flexible placement of systems in a data center**
  - 12x InfiniBand coupling links (FC #0171 HCA3-O and #0163 HCA2-O)
    - Support optical cables **up to 150 meters**. No longer restricted to 7 meters between System z CPCs
  - 1x InfiniBand coupling links (FC #0170 HCA3-O LR and FC #0168 HCA2-O LR)
    - Use the same single mode fiber optic cables as ISC-3 and FICON/FCP for **unrepeated distances of up to 10 km,** and metropolitan distances with qualified DWDM solutions

z114 and z196 GA2 InfiniBand HCA3 Fanouts

- ***New* 12x InfiniBand and 1x InfiniBand fanout cards**
- **Exclusive to zEnterprise 196 and zEnterprise 114**



Up to 16 CHPIDs – across 2 ports*

– **HCA3-O fanout for 12x InfiniBand coupling links**
  - CHPID type – CIB
    - ***Improved service times with 12x IFB3 protocol***
    - Two ports per feature
    - Fiber optic cabling – 150 meters
    - Supports connectivity to HCA2-O
      (No connectivity to System z9 HCA1-O)
    - Link data rate of 6 GBps

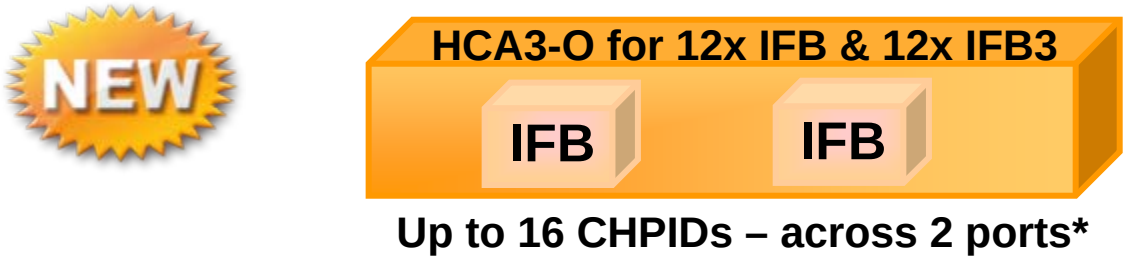
Up to 16 CHPIDs – across 4 ports*

– **HCA3-O LR fanout for 1x InfiniBand coupling links**
  - CHPID type – CIB
    - ***Four ports per feature***
    - Fiber optic cabling
      - 10 km unrepeated, 100 km repeated
    - Supports connectivity to HCA2-O LR
    - Link data rate server-to-server 5 Gbps
    - Link data rate with WDM; 2.5 or 5 Gbps

*** Performance considerations may reduce the number of CHPIDs per port.**

Note: The InfiniBand link data rates do not represent the performance of the link. The actual performance is dependent upon many factors including latency through the adapters, cable lengths, and the type of workload.

12x InfiniBand Coupling IFB3 Protocol (HCA3-O fanout)



Up to 16 CHPIDs – across 2 ports*

- **Two protocols**
  1. 12x IFB – HCA3-O to HCA3-O or HCA2-O
  2. 12x IFB3 - improved service times for HCA3-O to HCA3-O
     - ***12x IFB3 service times are designed to be 40% faster than 12x IFB***

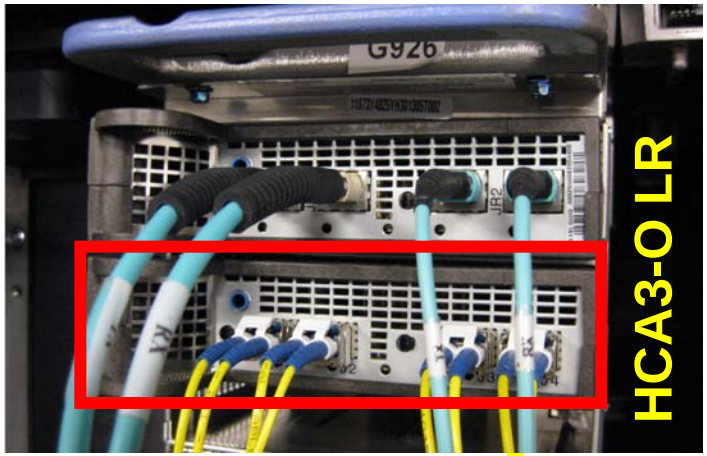
- **12x IFB3 protocol activation requirements**
  - **Four or fewer CHPIDs per HCA3-O port**
    - If more than four CHPIDs are defined per port, CHPIDs will use IFB protocol and run at 12x IFB service times

*** Performance considerations may reduce the number of CHPIDs per port.**

Note: The InfiniBand link data rates do not represent the performance of the link. The actual performance is dependent upon many factors including latency through the adapters, cable lengths, and the type of workload.

z114 and z196 GA2 1x InfiniBand Coupling Links

Multiple CHPIDs per link, 32 or 7 subchannels per CHPID (HCA2-O LR and HCA3-O LR)



- Up to 16 CHPIDs using same physical links
  - More subchannels per physical link
  - Link sharing by different Sysplexes
- **Now** more subchannels per CHPID
  - **32 subchannels per CHPID**
  - **Option to define 32* or 7 subchannels**
  - **z114 or z196 GA2 to z114 or z196 GA2**

NEW

32* subchannels per CHPID (default)

Up to 16 CHPIDs per HCA3-O LR

512 subchannels per HCA3-O LR

For Example:

CHPID FF
32 subchannels

CHPID FE
32 subchannels

One 1x IFB link

64 subchannels

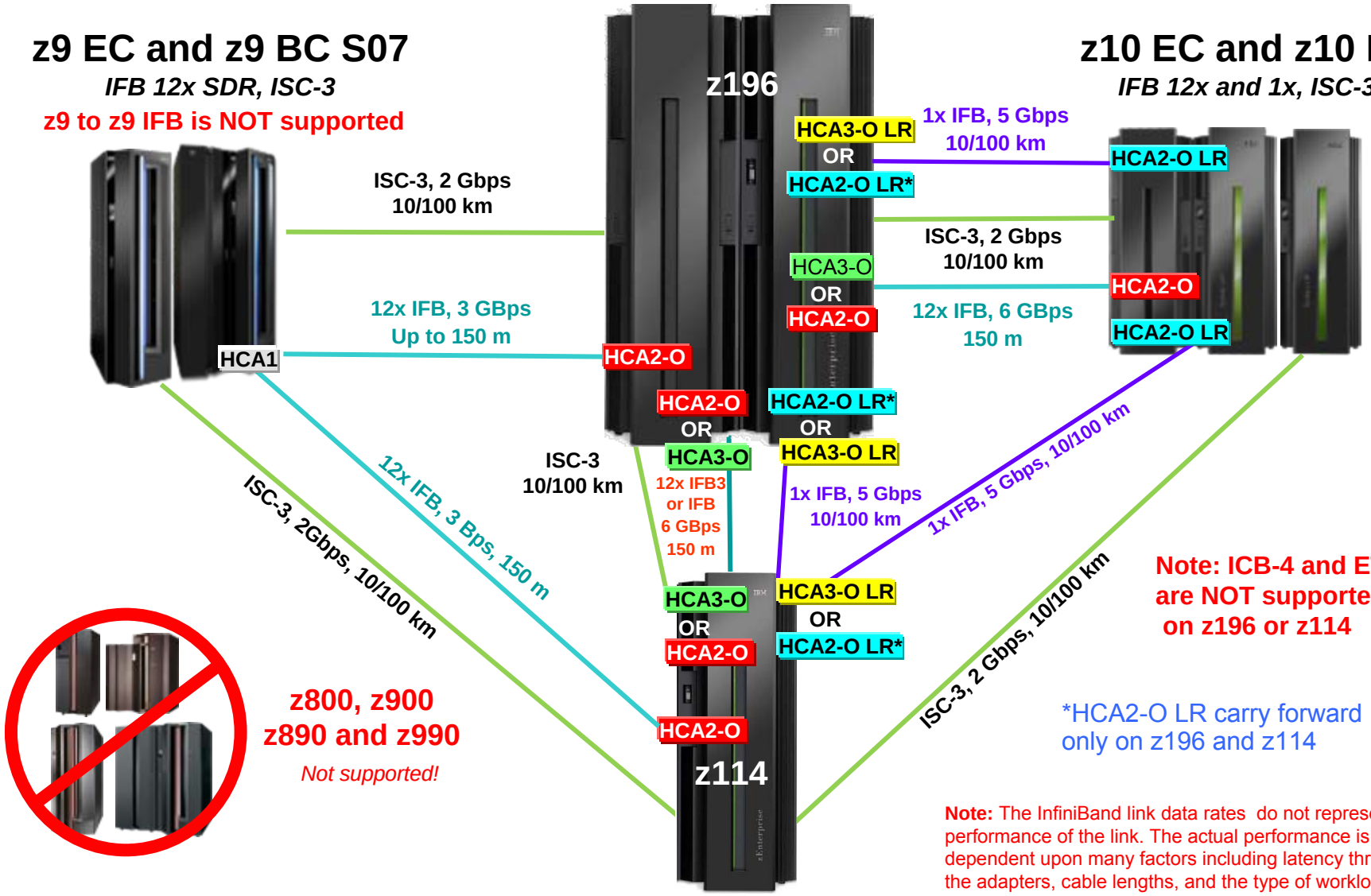
***HCD will default to 32 subchannels. There will be a new option to limit to 7 subchannels, the former limit.**

z114 and z196 GA2 InfiniBand Coupling Fanouts

Description	F/C	Ports	Comments
HCA3-O LR 1x IB DDR NEW	0170	4	PSIFB coupling (10 km unrepeated, 100 km with DWDM) Double port density. More subchannels per CHPID.
HCA3-O 12x IB DDR NEW	0171	2	PSIFB coupling (150 m) Improved responsiveness (HCA3-O to HCA3-O)
HCA2-O 12x IB-DDR	0163	2	Coupling (150 meters) Also available on z10 EC, z10 BC. Required for 12x connection to System z9 HCA1-O.
HCA2-O LR 1x IB-DDR Carry Forward only	0168	2	Coupling (10 km unrepeated, 100 km with DWDM) Also available on z10 EC, z10 BC
Note: Coupling fanouts compete for slots with the HCA2-C and PCIe fanouts for I/O drawers and cages.			

Note: The InfiniBand link data rates do not represent the performance of the link. The actual performance is dependent upon many factors including latency through the adapters, cable lengths, and the type of workload.

z114 and z196 GA2 Parallel Sysplex Coupling Connectivity



Note: The InfiniBand link data rates do not represent the performance of the link. The actual performance is dependent upon many factors including latency through the adapters, cable lengths, and the type of workload.

z196 coupling link GA2 connectivity summary

Features	Minimum # of features	Maximum # of features	Maximum connections	Increments per feature	Purchase increments
HCA3-O LR (1x)	0	12	48 links (M15: 32*)	4 links	4 links
HCA3-O (12x)	0	16	32 links (M15: 16*)	2 links	2 links
ISC-3	0	12	48 links	4 links	1 link
HCA2-O LR (1x) – CF only	0	16 (M15-8*)	32 links (M15:16*)	2 links	2 links
HCA2-O (12x)	0	16 (M15-8*)	32 links (M15:16*)	2 links	2 links

*** Uses all available fanout slots. Allows no other I/O or coupling.**

z114 coupling link GA2 connectivity summary

Features	Minimum # of features	Maximum # of features	Maximum connections	Increments per feature	Purchase increments
HCA3-O LR (1x)	0	8* (M05 – 4*)	32* links (M05: 16*)	4 links	4 links
HCA3-O (12x)	0	8* (M05 – 4*)	16* links (M05: 8*)	2 links	2 links
ISC-3	0	12	48 links	4 links	1 link
HCA2-O LR (1x) – CF only	0	6 (M05 – 4*)	12 links (M05: 8*)	2 links	2 links
HCA2-O (12x)	0	8* (M05 – 4*)	16* links (M05: 8*)	2 links	2 links

*** Uses all available fanout slots. Allows no other I/O or coupling.**

Thank you

Questions?

Backup

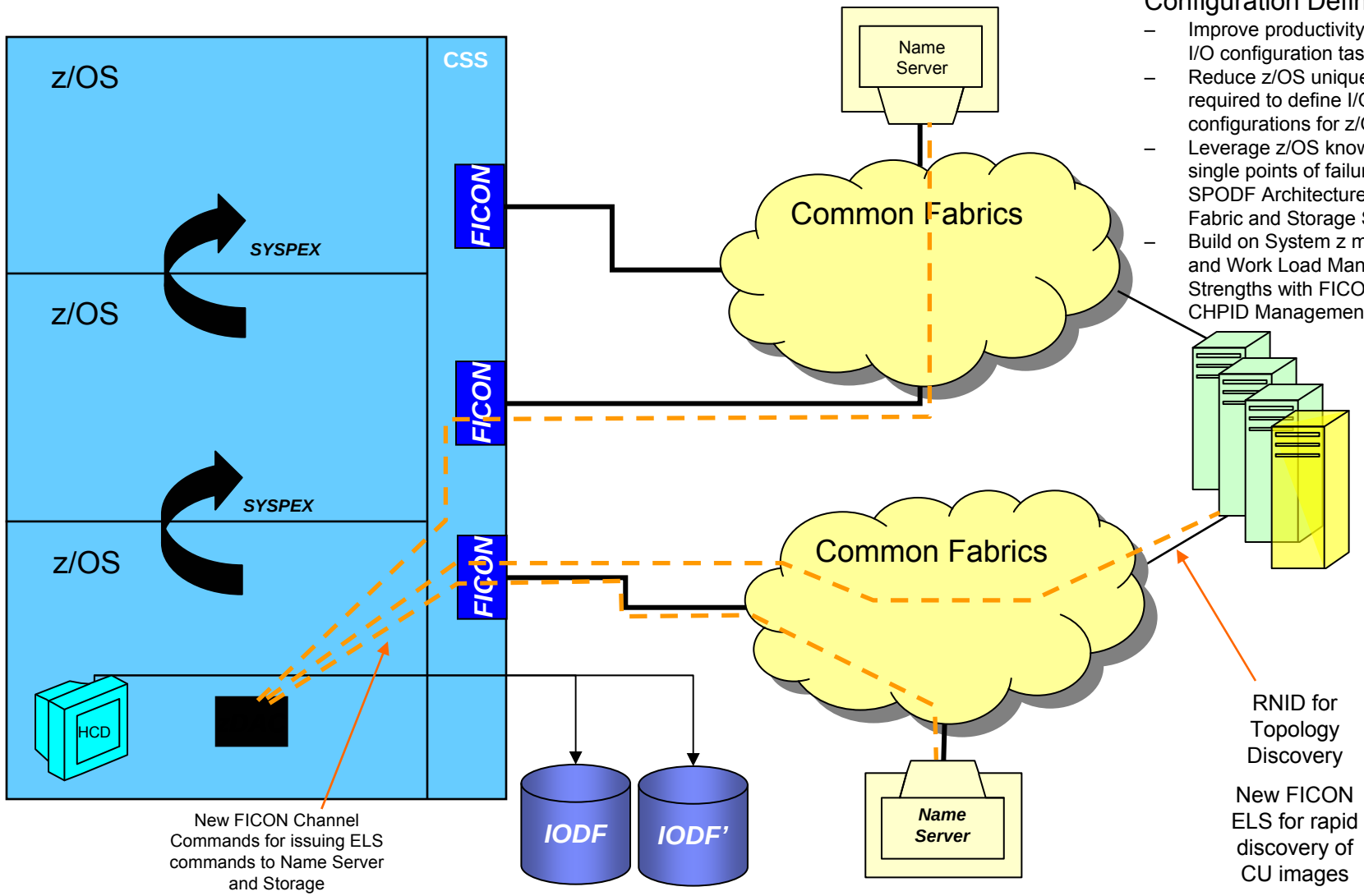
IBM zEnterprise - Freedom by Design

Glossary for System z I/O on zEnterprise

Acronym	Full Name	Description / Comments
N/A	I/O drawer	I/O drawer introduced with z10 BC and also supported on z196 and z114; has 8 I/O card slots
N/A	I/O cage	I/O cage available since z900 (not supported on z10 BC or z114); has 28 I/O card slots
N/A	PCIe switch	Industry standard PCIe switch ASIC used to fanout (or multiplex) the PCI bus to the I/O cards within the PCIe I/O drawer
N/A	PCIe I/O drawer	New I/O drawer that supports PCIe bus I/O infrastructure; has 32 I/O card slots
PCI-IN	PCIe interconnect	Card in the PCIe I/O drawer that contains the PCIe switch ASIC z10 uses IFB-MP; z9 uses STI-MP
N/A	PCIe fanout	Card on front of processor book that supports PCIe Gen2 bus; used exclusively to connect to the PCIe I/O drawer; PCIe fanout supports FICON Express8S and OSA-Express4S Used instead of an HCA2-C fanout for I/O which continues to support the cards in the I/O cage and I/O drawer
HCA3 or HCA3-O LR	HCA3-O LR fanout for 1x IFB	For 1x InfiniBand at unrepeated distances up to 10 km; supports 12x IFB and 12x IFB3 protocols; ***increased service times when using 12x IFB3 protocol*** 5 Gbps link data rate; ***4 ports per fanout***; may operate at 2.5 Gbps or 5 Gbps Based upon capability of DWDM. Exclusive to z196 and z114; can Communicate with an HCA2-O LR fanout; third generation Host Channel Adapter
HCA3 or HCA3-O	HCA3-O fanout for 12x IFB	For 12x InfiniBand at 150 meters; 6 GBps link data rate; two ports per fanout; can communicate with an HCA2-O fanout on z196 or z10; cannot communicate with an HCA1-O fanout on z9; third generation Host Channel Adapter

zEnterprise Discovery and Auto-Configuration (zDAC)

- Simplify System z I/O Configuration Definitions
  - Improve productivity for existing I/O configuration tasks
  - Reduce z/OS unique skills required to define I/O configurations for z/OS
  - Leverage z/OS knowledge of single points of failure with SPODF Architectures in CEC, Fabric and Storage Subsystems
  - Build on System z measurements and Work Load Management Strengths with FICON Dynamic CHPID Management



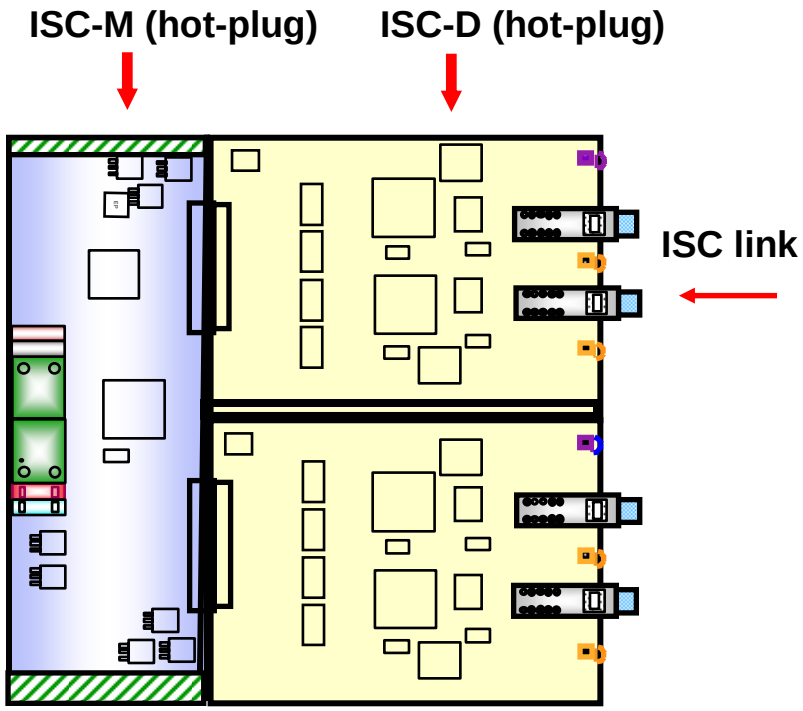
Glossary for System z Coupling

Acronym	Full name	Comments
AID	Adapter identification	HCA fanout has AID instead of a PCHID
CIB	Coupling using InfiniBand	CHPID type z196, z10, System z9
HCA	Host Channel Adapter	Path for communication
MBA	Memory Bus Adapter	Path for communication
PSIFB	Parallel Sysplex using InfiniBand	InfiniBand Coupling Links
12x IFB	12x InfiniBand	12 lanes of fiber in each direction
1x IFB	1x InfiniBand	Long Reach - one pair of fiber
12x IFB3	12x InfiniBand3	Improved service times of 12x IFB on HCA3-O

Type	System z10	zEnterprise
HCA1-O fanout	NA	NA
HCA2-O fanout	Optical - Coupling 12x InfiniBand	Optical - Coupling 12x InfiniBand
HCA2-O LR fanout	Optical - Coupling 1x InfiniBand	Optical - Coupling 1x InfiniBand
HCA3-O fanout	NA	Optical - Coupling 12x InfiniBand
HCA3-O LR fanout	NA	Optical - Coupling 1x InfiniBand
MBA fanout	Copper - Coupling (ICB-4)	N/A

ISC-3 coupling links on zEnterprise

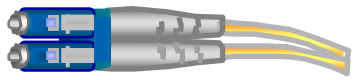
- **InterSystem Channel-3 (ISC-3)**
  - ISC-3 links ordered in increments of one
  - Activated links balanced across features
- **Peer mode only – 2 Gbps**
  - #0217 (ISC-M), #0218 (ISC-D / ISC link)
  - Activate link - #0219
  - Four links per ISC-M
    - Two links per ISC-D
  - Supports 9µ single mode fiber
- **Up to 48 links per machine**



ISC-3

The IBM z196 will be the last high-end server to offer ordering of ISC-3.

Enterprises should begin migrating from ISC-3 features (#0217, #0218,#0219), to 12x InfiniBand (#0171 – HCA3-O fanout) or 1x InfiniBand (#0170 –HCA3-O LR fanout) coupling links.



LC Duplex connector

System z – Maximum Coupling Links and CHPIDs (z196 GA2 and z114)

Server	1x IFB (HCA3-O LR)	12x IFB & 12x IFB3 (HCA3-O)	1x IFB (HCA2-O LR)	12x IFB (HCA2-O)	IC	ICB-4	ICB-3	ISC-3	Max External Links	Max Coupling CHPIDs
z196	48 M15 – 32*	32 M15 – 16* M32 – 32*	32 M15 – 16* M32 – 32*	32 M15 – 16* M32 – 32*	32	N/A	N/A	48	104 (1)	128
z114	M10 – 32* M05 – 16*	M10 – 16* M05 – 8*	M10 – 12 M05 – 8*	M10 – 16* M05 – 8*	32	N/A	N/A	48	M10 (2) M05 (3)	128
z10 EC	N/A	N/A	32 E12 – 16*	32 E12 – 16*	32	16 (32/RPQ)	N/A	48	64	64
z10 BC	N/A	N/A	12	12	32	12	N/A	48	64	64
z9 EC	N/A	N/A	N/A	HCA1-O 16 S08 - 12	32	16	16	48	64	64
z9 BC	N/A	N/A	N/A	HCA1-O 12	32	16	16	48	64	64

1. A z196 M49, M66 or M80 supports a maximum 96 extended distance links (48 1x IFB and 48 ISC-3) plus 8 12x IFB links.
   A z196 M32 supports a maximum 96 extended distance links (48 1x IFB and 48 ISC-3) plus 4 12x IFB links*.
   A z196 M15 supports a maximum 72 extended distance links (24 1x IFB and 48 ISC-3) with no 12x IFB links*.
2. z114 M10 supports a maximum of 72 extended distance links (24 1x IFB and 48 ISC-3) with no 12x IFB links*.
3. z114 M05 supports a maximum of 56 extended distance links (8 1x IFB and 48 ISC-3) with no 12x IFB links*.

* Uses all available fanout slots. Allows no other I/O or coupling.

Supported 12x InfiniBand DDR cable lengths
OM3 50/125 micrometer multimode fiber optic cabling

- **Cables available from:**
  - IBM Global Technology Services (GTS)
  - Anixter www.anixter.com/
  - Computer Crafts Inc. www.computer-crafts.com/
  - Tyco www.tycoelectronics.com/
  - Fujikura www.fujikura.com/
- **Fiber core – 50u multimode**
- **Light source – SX laser**
- **Fiber bandwidth @ wavelength: 2000 MHz-km @ 850 nm**
- **IBM cable part numbers highly recommended**

Item Description	Cable IBM P/N	Cable Length Meters	Cable Length Feet	Connector Type
Duplex 24-fiber cable Assembly	41V2466	10.0 m	32.8 f	MPO - MPO
Duplex 24-fiber cable Assembly	15R8844	13.0 m	42.7 f	MPO - MPO
Duplex 24-fiber cable Assembly	15R8845	15.0 m	49.2 f	MPO - MPO
Duplex 24-fiber cable Assembly	41V2467	20.0 m	65.6 f	MPO - MPO
Duplex 24-fiber cable Assembly	41V2468	40.0 m	131.2 f	MPO - MPO
Duplex 24-fiber cable Assembly	41V2469	80.0 m	262.4 f	MPO - MPO
Duplex 24-fiber cable Assembly	41V2470	120.0 m	393.7 f	MPO - MPO
Duplex 24-fiber cable Assembly	41V2471	150.0 m	492.1 f	MPO - MPO
Duplex 24-fiber cable Assembly	42V2083	Custom	N/A	MPO - MPO

1x InfiniBand
9/125 micrometer single mode fiber optic cabling

- **Cables available from:**
  - IBM Global Technology Services (GTS)
  - Your preferred cable provider
- Fiber core – 9µ single mode
- Light source – LX laser @ wavelength: @ 1310 nm

Note: the fiber optic cabling is the same
as used with ISC-3, FICON LX, 10 GbE LR, and GbE LX

LC Duplex connector

LC Duplex harness

Introducing z196 and z114 PCIe I/O and Coupling Final Slide

Last Slide

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