



zEnterprise.

A New Dimension in Computing

IBM zEnterprise – Hardware Migration Considerations and Installation Planning



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Statements of Direction WDfM News



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zEnterprise GA1 – Statements of Direction (SODs)

- The 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® (#0163 - HCA2-O fanout) or 1x InfiniBand (#0168 - HCA2-O LR fanout) coupling links.
- The z196 will be last high-end server to offer ordering of the PSC feature. IBM intends to not offer the Power Sequence Controller (PSC feature #6501) on future servers. The PSC feature is used to turn on/off specific control units from the central processor complex (CPC).
- The z196 will be the last high-end server to offer ordering of ESCON channels. This applies to channel path identifier (CHPID) types CNC, CTC, CVC, and CBY. Enterprises should begin migrating from ESCON to FICON. Alternate solutions are available for connectivity to ESCON devices. IBM Global Technology Services, through IBM Facilities Cabling Services, offers ESCON to FICON Migration (Offering ID #6948-97D), to help facilitate migration to FICON to simplify and manage a single physical and operational environment while maximizing green-related savings.
- The z196 will be the last high-end server to support FICON Express4 channels: Enterprises should begin migrating from FICON Express4 channel features (#3321, #3322, #3324) to FICON Express8 channels.
- The z196 will be the last high-end server to support OSA-Express2 features: Enterprises should begin migrating from OSA-Express2 features (#3364, #3365, #3366) to OSA-Express3 features.

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zEnterprise GA1 – Statements of Direction (SODs)

- The zEnterprise is planned to be the last high-end server to support dial-up modems for use with the Remote Support Facility (RSF), and the External Time Source (ETS) option of Server Time Protocol (STP). The currently available Network Time Protocol (NTP) server option for ETS as well as Internet time services available using broadband connections can be used to provide the same degree of accuracy as dial-up time services. Enterprises should begin migrating from dial-up modems to Broadband for RSF connections.
- In the first half of 2011, IBM intends to provide support in the IBM zEnterprise Unified Resource Manager (zManager) for a IBM System x® Blade running Linux on System x.
- By the first half of 2011, IBM intends to offer a WebSphere® DataPower® Appliance for zEnterprise

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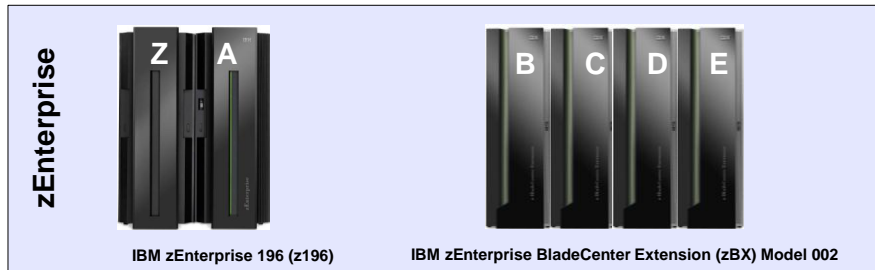
IBM zEnterprise 196 (z196) Overview



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Hardware Detail Introduction



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- Discard after announce! Use the Sales Kit TLLB Deliverable

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Memory Considerations



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z196 Purchase Memory Offerings

Model	Standard Memory GB	Flexible Memory GB
M15	32 - 704	NA
M32	32 - 1520	32 - 704
M49	32 - 2288	32 - 1520
M66	32 - 3056	32 - 2288
M80	32 - 3056	32 - 2288

- **Purchase Memory** – Memory available for assignment to LPARs
- **Hardware System Area** – Standard 16 GB outside customer memory for system use
- **Standard Memory** – Provides minimum physical memory required to hold base purchase memory plus 16 GB HSA
- **Flexible Memory** – Provides additional physical memory needed to support activation base customer memory and HSA on a multiple book z196 with one book out of service.
- **Plan Ahead Memory** – Provides additional physical memory needed for a concurrent upgrade (LIC CC change only) to a preplanned target customer memory

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Infrastructure / IO Considerations



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z196 Channel Options

Supported Channel Types

- **I/O Channels**
 - ✓ FICON Express8
 - ✓ FICON Express4 (Carry forward on upgrade)
 - ✓ ESCON – Migrate Away (240 or fewer)
- **Networking**
 - ✓ OSA-Express3
 - 10 Gigabit Ethernet LR and SR
 - Gigabit Ethernet LX and SX
 - 1000BASE-T Ethernet
 - ✓ OSA-Express2 (Carry forward on upgrade)
 - 1000BASE-T Ethernet
 - Gigabit Ethernet LX and SX
 - ✓ HiperSockets (Define only)
- **Coupling Links**
 - ✓ InfiniBand Coupling Links
 - 12x IB DDR
 - 1x IB DDR
 - ✓ ISC-3 – Migrate Away (Peer mode only)
 - ✓ IC (Define only)
- **Crypto**
 - ✓ Crypto Express3
 - Configurable Coprocessor / Accelerator

Non-Supported Channel Types

- **I/O Channels**
 - ⊗ FICON (before FICON Express4)
 - ⊗ FCV – ESCD Model 5 Bridge Card
- **Networking**
 - ⊗ OSA-Express2 10GbE LR
 - ⊗ OSA-Express (pre OSA-Express2)
- **Coupling Links**
 - ⊗ ICB-4 and earlier ICB
- **Crypto**
 - ⊗ Crypto Express2 and earlier
- **ETR**
 - ⊗ Sysplex Timer (ETR) Attachment

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z196 I/O Discontinuations and Recommendations

Server upgrades and migrations are the best times for cleaning up old I/O connections that are no longer being used and to focus on upgrading to newer I/O features.

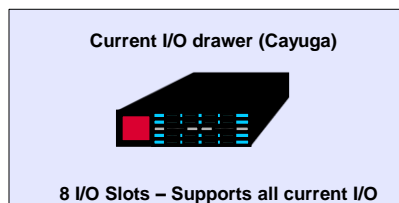
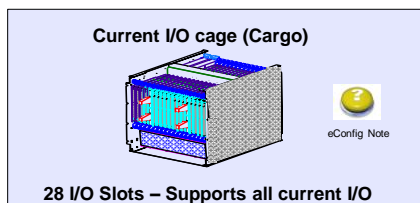
- **More than 240 ESCON channels*, more than 72 I/O cards**
 - Migrate and consolidate to FICON Express8, consider OEM FICON conversion technology if required
 - Eliminate parallel control units or consider OEM FICON conversion technology
 - Contact Poughkeepsie Product Assistance Center (PPAC) for customers that cannot meet this recommendation
- **FICON Channels**
 - FICON Express2 – Migrate and consolidate to FICON Express8
 - FICON Express: Ends support for FICON Conversion with ESCON Director Model 5 Bridge Card, Migrate and consolidate to FICON Express8, consider OEM FICON conversion technology if required
- **OSA Channels and Crypto**
 - OSA-Express2 10 GbE – Migrate to OSA-Express3 10 GbE
 - Crypto Express2 – Migrate to Crypto Express3
- **Parallel Sysplex discontinuations**
 - ICB-4 – Migrate to InfiniBand 12x links
 - Note: ISC-3 is supported but consider consolidation to 12x or migration to 1x InfiniBand

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z196 I/O Cages and Drawers

z196 I/O infrastructure will support I/O cages (z10 EC) and I/O drawers (z10 BC)



I/O cage and Drawer considerations

- Can't order cages or drawers, have to order I/O and/or Crypto features, eConfig will deliver the correct mix of I/O drawers and I/O cages
- There is NO Plan Ahead option available due to the concurrent nature of the I/O drawers
- The I/O drawer can be concurrently added or removed (non-disruptively)
- I/O cage additions and removals are disruptive
- Air cooled models will have a max of 2 x PSC, Water cooled models will have a max of 1 x PSC

Consolidation and Pre-Planning

- For customers with large I/O requirements, focus on consolidating to fewer than 72 slots, reducing to 64 slots or less would be ideal as it would leave room for I/O expansion.

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z196 I/O Cage & Drawer Considerations

No Plan Ahead for I/O

- Determination for the Installation of I/O drawers and I/O cages is determined by eConfig, based upon the number of I/O features installed.
- Upgrades coming from System z9 and System z10 servers can be different from MES upgrades when adding I/O to an existing server.

I/O Cage and I/O Drawer Configuration Examples (next pages)



1. GA New Build and Box MES I/O offerings
2. Loose Piece MES from one I/O cage configuration
3. Loose Piece MES from All I/O Drawer Configuration

ALWAYS use eConfig for planning out I/O Drawer / Cage Configuration Mixes !!!

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z196 – New OSA-Express3 CHPIDs types OSX and OSM

- **Two new OSA-Express3 CHPID types to support new types of z196 networks**
- **A z196 can have up to 6 types of OSA-Express3 CHPID's**
 - External (customer managed) networks
 - Defined as OSC, OSD, OSE, & OSN
 - Existing customer provided and managed OSA ports used for access to the current customer external networks - no changes
 -  – Intranode management network (INMN)
 - Defined as CHPID type OSA Direct-Express Management (OSM)
 - When the PCIe adaptor on 1000BASE-T is defined as CHPID type OSM, the second port cannot be used for anything else
 - OSA-Express3 1000BASE-T configured as CHPID type OSM for z Next Node management of the z196 Ensembles
 - OSA connection via the Bulk Power Hub (BPH) on the z196 to the Top of the Rack (TORs) switches on zBX
 -  – Intraensemble data networks (IEDN)
 - Defined as CHPID type OSA Direct-Express zBX (OSX)
 - OSA Express3 10 GbE configured as CHPID type OSX for data between z196 and zBX
- **Functions Supported:**
 - Dynamic I/O support
 - HCD
 - CP Query capabilities
 - Ensemble Management for these new channel paths and their related subchannels.
- **z/VM 5.4 will provide dynamic I/O support however not allow these CHPID types to be varied online**

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OSA-Express3 Support for zEnterprise

▪ OSA-Express3

- New display command – D OSAINFO
 - Similar to OSA/SF
- Used to monitor and verify current OSA configuration
- Exclusive to CHPID types OSD, OSM and OSX

▪ OSA-Express3 Inbound Workload Queuing (IWQ)

- Communication Server configuration is required to enable Multiple Inbound Data Queues

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Customization / Activation for zBX Network Management

Characteristics of an OSX channel path:

- An OSX channel path is defined like an OSD CHPID, i.e. it may have device priority queuing enabled or disabled.
- It can be attached to an OSX control unit and OSA-X devices. An OSAD device at unit address FE can be defined.
- On an OSX channel path there is a maximum of 480 valid subchannels if device priority queuing is enabled, and a maximum of 1920 valid subchannels if device priority queuing is disabled.

Characteristics of an OSM channel path:

- An OSM channel path is defined like an OSD CHPID, except that device priority queuing must be disabled.
- It can be attached to an OSM control unit and to OSA-M devices. An OSAD device at unit address FE can be defined.
- There is a maximum of 1920 valid subchannels on an OSM channel path.

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z196 Ensemble 'Network' Configuration Rules

- **Each Ensemble requires**
 - Customer managed Management Network
 - A pair of (Primary & Alternate/Backup) Ensemble HMCs.
 - To control and manage the Ensemble.
 - Only one pair of Ensemble HMCs per an Ensemble.
 - For high availability, one is a mirrored backup, and cannot be used as an Ensemble HMC, until fail-over
 - Both are attached to the Customer Managed Management Network.
 - Intranode management network
 - 2 ports from 2 different OSA-Express-3 1000BASE-T Ethernet adapters, for redundancy.
 - To allow the Ensemble HMC, to talk to the System z hypervisors, within the managed Ensemble
- **Depending on the System z applications, each ensemble might require: (these are required if there is a zBX present)**
 - Intranode management network
 - Used for internal node basic hardware management. It is provided and managed by IBM
 - Connects the CPC's BHPs to the management port of the customer procured switch or the TOR switches in the zBX
 - The Orange network is a communications link to the Yellow and Red networks.
 - Intraensemble data network
 - A pair of OSA-Express-3 10 GbE adapters, for redundancy.
 - To allow the System z applications to communicate between OS images to share data
 - To allow the System z application to communicate to the zBX
 - Ensemble zBX to zBX communications. TOR A/B Tree network to each zBX TOR switch from 2 Ensemble Masters
 - Customer managed data network
 - A pair of 10 Gb connections
 - Must provide the MAC address for each device
 - All zBX to zBX connections between ensembles require the Pink Network
- **External customer networks (example OSC, OSD, OSE, and OSN connections) are outside the ensemble, and not included**

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Customization / Activation for zBX Network Management

The support is invoked by:

- Defining new OSA CHPID, control unit and device types within HCD/HCM.
- OSX and OSM channel paths are defined like OSD channel paths.

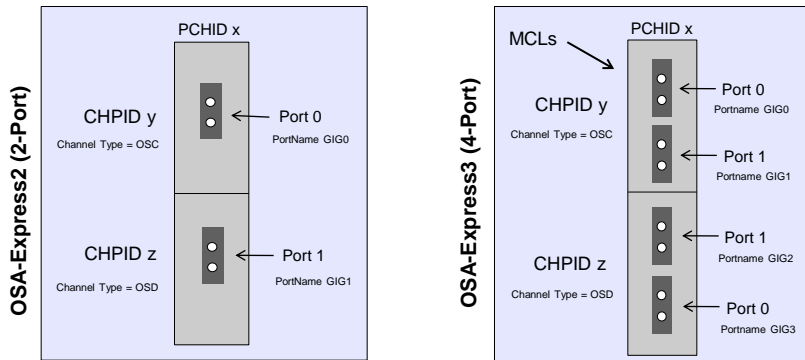
Characteristics:

- OSX/OSM CHPIDs count to the maximum of 48 OSA channel paths of zEnterprise.
- OSX/OSM CHPIDs count to the combined maximum of 336 OSA and FC/FCP channel paths of zEnterprise.

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OSA-Express3 Common Mistakes – Hardware



OSA-Express3 - Common Hardware Problems (Techdoc = PRS3950 / WP101377)

- ➔ 1. Microcode – Failure to stay on top of MCL updates (microcode) or code on card not activated
- ➔ 2. Cable misplugs (4 port cards) – Watch the port numbering, it is reversed on the upper and lower ports
- ➔ 3. Channel Types (4 port cards) – Only one Channel type (OSD, OSE, OSC, OSN) can be defined per CHPID, this means that cards both ports on that CHPID assume the same IOCP definition, this could leave you under configured based on the customer channel type requirement

Watch out for connector change, SC to LC, coming from OSA-Express2 10GbE to OSA-Express3 10GbE

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OSA-Express3 Common Mistakes – Software

- **Neglecting to update VTAM and TCP/IP PTF levels**
- **If assigning OSA/SF device, trying to allocate it on Port 1**
 - OSA/SF device must be assigned to Port 0
- **Neglecting to set Missing Interrupt Handler (MIH)**
- **Portname values must be unique on the CHPID**
- **OAT Definitions:**
 - Wrong Port number in OAT if multiport CHPID
- **AUTO-NEGOTIATE**
 - 1000BASE-T normally supports auto-negotiate for LAN Speed and DUPLEX Mode
 - Ethernet switch and OSA can negotiate between themselves, or Ethernet switch may be configured with a specific speed and duplex setting
 - If OSA port is configured with a value that is incompatible with the switch, the OSA will not connect.

Reference Information
Technote = APAR II12320 or Techdoc = PRS3950 / WP101377

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New OSA-Express-3 Channel Types

<p>Intra Ensemble Data Network (IEDN)</p> <ul style="list-style-type: none"> For zBX use only New channel type: OSX OSA-Express3 10GbE (2-port card) Requires 2 OSA cards (availability) Requires 2 CHPIDs (1 port per card) <p style="text-align: right;">NEW</p> <p style="text-align: center;">2 CHPIDs assigned, 2 ports defined</p> <p>OSX IOCDs EXAMPLE: CHP2F</p> <pre> CHPID PCHID=SE1,PATH=(CSS(0,1,2,3),2F),TYPE=OSX,SHARED, CNTLUNIT CUNUMBR=(09F0,2F),PATH=(CSS(0),2F),UNIT=OSX IODEVICE ADDRESS=(09F0,15),CUNUMBR=(09F0),UNIT=OSA,UNITADD=00, MODEL=X,DYNAMIC=YES,LOCANY=YES </pre>	<p>Intra Node Management Network (INMN)</p> <ul style="list-style-type: none"> For zBX use only New channel type: OSM OSA-Express3 1000BASE-T (4 port card) Requires 2 OSA cards (availability) Requires 2 CHPIDs (1 port per card) Port 0 only, port 1 not supported <p style="text-align: right;">NEW</p> <p style="text-align: center;">2 CHPIDs assigned, 4 ports defined</p> <p>OSM IOCDs EXAMPLE: CHP23</p> <pre> CHPID PCHID=191,PATH=(CSS(0,1,2,3),23),TYPE=OSM,CHPARAM=01,SHARED, CNTLUNIT CUNUMBR=(0910,23),PATH=(CSS(0),23),UNIT=OSM IODEVICE ADDRESS=(0910,15),CUNUMBR=(0910),UNIT=OSA,UNITADD=00, MODEL=M,DYNAMIC=YES,LOCANY=YES </pre>
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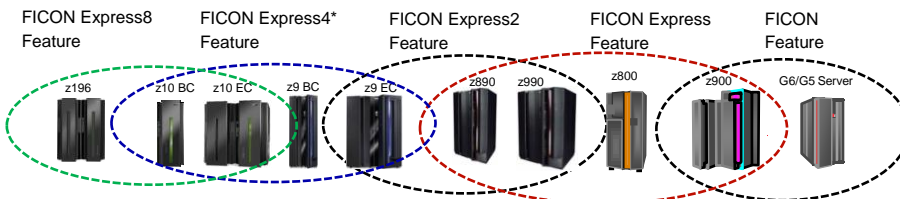
Migration considerations:

- Make sure enough OSA ports are available, especially on 4-port 1000BASE-T cards where a single channel definition (chpid type) will require both ports on the CHPID to be the same channel type.

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System z FICON Server Support History



- FICON Express (2 Gb) available for installs starting on the z900 to the z890 servers (FICON introduced on 9672 G5 servers)
- FICON Express2 (2 Gb) available for installs starting on the z990 to the System z9 EC servers
- FICON Express4 (4Gb) available for installs starting on the System z9 EC to current z10 servers, unavailable for ordering on System z10 after Sept 30, 2009.
- FICON Express8 (8Gb) first available 3rd quarter 2009 on System z10 and now on z196

*FICON Express4 adapters may be carried forward (MES upgrade) on upgrades to a z196

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z196 FICON Channel Support



FICON Express8 channels

- FICON Express4 supported as carry over from MES upgrades
- FICON Express8 is the only FICON cards available for ordering on New Build Configurations
- FICON Express8 will auto negotiate to 2 Gbps or 4 Gbps speeds, 1 Gbps NOT supported. Validate that there are no 1 Gbps connectivity requirements?
- FICON Express8 Buffer Credits reduced to 40 credits. Good for distances up to 10KM, for distances greater than 10KM assure that equipment used for channel extension (DWDM, Director) have sufficient buffer credits to support the workload.
 - Refer to FICON Planning and Implementation Guide (SG24-6497) for more details on buffer credits.
- Review the ability to reduce or consolidate channels. Contact IBM Techline to perform a FICON Aggregation Study?

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ESCON Support

z196 ESCON Support & Recommendations

- Supports up to 240 ESCON channels*, 15 ports per feature, up to 16 features (FC 2323).
- Upgrades and migrations are the perfect time to cleanup unused channels and simplify I/O configurations. ESCON CTC connections, ESCON attached CIPS (to OSA), etc...
- Eliminate parallel control units or consider OEM FICON conversion technology
- Use Statements of Direction to get customers moving forward on ESCON reductions, great leverage item, use them.

NOW IS THE TIME TO START PLANNING MIGRATIONS AWAY FROM ESCON

- **ESCON channels will be phased out (System z10 SOD*)**
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 greater than 240 ESCON channels.
- **The z196 will be the last high-end server to offer ordering of ESCON channels (z196 SOD*)**
This applies to channel path identifier (CHPID) types CNC, CTC, CVC, and CBY. Enterprises should begin migrating from ESCON to FICON. Alternate solutions are available for connectivity to ESCON devices. IBM Global Technology Services, through IBM Facilities Cabling Services, offers ESCON to FICON Migration (Offering ID #6948-97D), to help facilitate migration to FICON to simplify and manage a single physical and operational environment while maximizing green-related savings.

* Customers needing support greater than 240 ESCON channels should contact the Poughkeepsie Product Assistance Center (PPAC).

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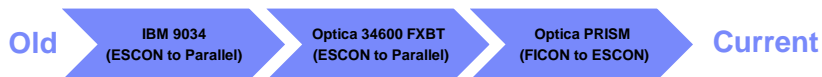


FICON Converter Support



Optica

Partnership



Prizm is available from IBM GTS Site & Facilities as part of the EFM Service (ESCON to FICON Migration - offering # 6948-97D)
http://www-935.ibm.com/services/us/index.wss/itservice/igs/a1026000?cm_re=masthead_-_itservices_-_site
 The order process for Prizm is the same as it is for IBM cabling systems

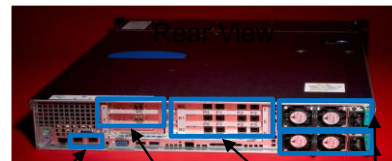
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FICON to ESCON Converter

PRIZM™

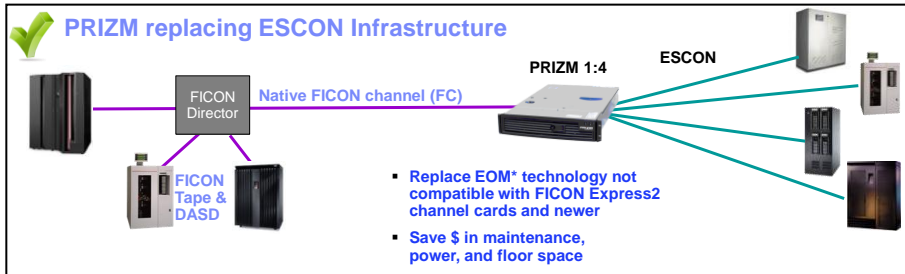
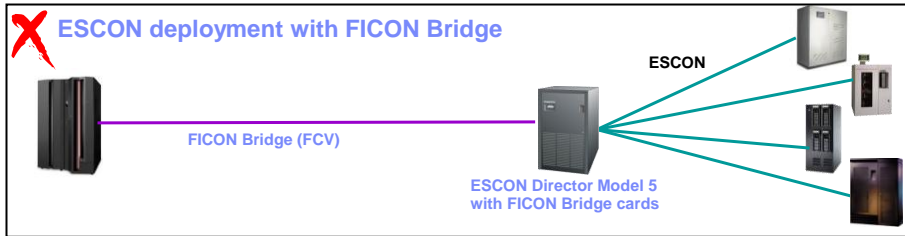


- Native FICON converted to native ESCON
- Optica PRIZM Highlights
 - Intel® server platform, Linux operating system
 - Standard 2U server enclosure, 19 in. rack mountable
 - FICON director support (including cascaded)
 - Redundant/hot swappable components
 - System z Qualified
- IBM Services Offering
 - GTS Solution available in 2H09 under IBM Facilities Cabling Services - ESCON to FICON migration (6948-97D).
 - For updates related to this offering please refer to URL: <http://www-935.ibm.com/services/us/index.wss/itservice/igs/a1026000#>

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Optica FICON Bridge Support

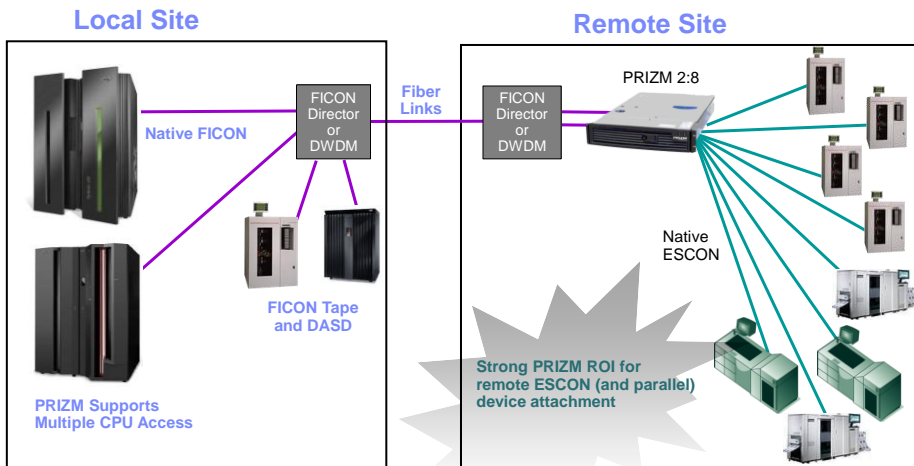


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* EOM = End of Market

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ESCON Device Extension via FICON Infrastructure



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PRIZM - Field Qualified Devices

Brocade ESCON Channel Extenders
USD, USDX

Cisco CIP Router Devices
7500 Series

IBM Communications Devices
3745/3746 Front End Processors
3174, 2074 Terminal Controllers

IBM Magnetic Tape Devices
3480, 3490, 3590

IBM Printer Devices
InfoPrint® 3000, 4000 and 4100

IBM Virtual Tape Devices
3494-B10 and B20 (VTS-VTC)

IBM Disk Storage Devices
2105 F10/F20
DS8000®

Intercom Computer Systems Devices
I-5590 Chameleon (3420/3480/3490)

Memorex Magnetic Tape Devices
5490

NCR Teradata Devices
5400, 4980/5380, 4850

OCE Printer Devices
PS88, PS440, 7450, 9210

Racal/Thales Security Devices
HSM8000

Sun/STK Magnetic Tape Devices
9490 Timberline
T9840-A/B/C Eagle

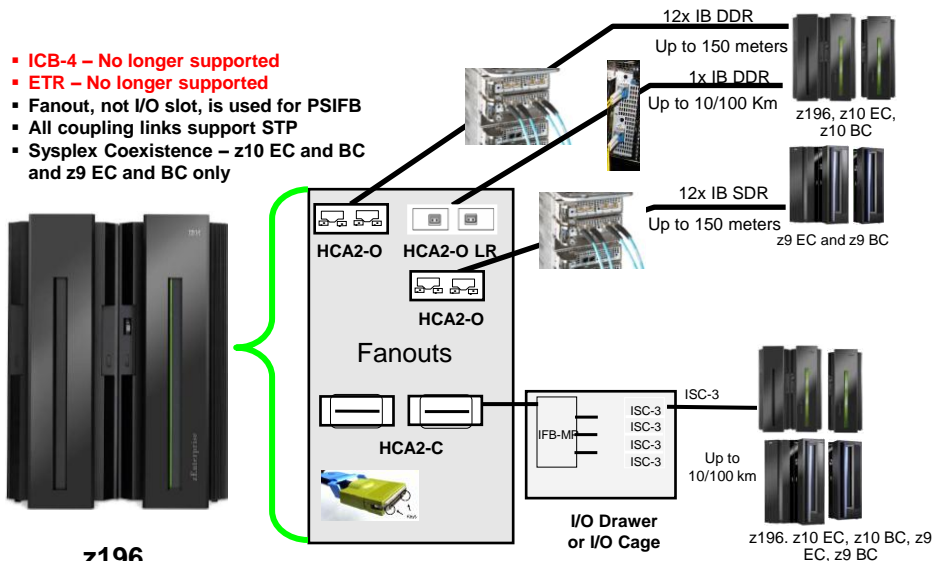
Sun/STK Virtual Tape Devices
VSM4
VSM3

Visara
SCON Console Concentrator

***Other device testing available, as lab or field qualification*

z196 Coupling Links

- ICB-4 – No longer supported
- ETR – No longer supported
- Fanout, not I/O slot, is used for PSIFB
- All coupling links support STP
- Sysplex Coexistence – z10 EC and BC and z9 EC and BC only



PSIFB Coupling Links

PSIFB 12x
(Use to replace ICB and ISC, 150 meters)

AID = xx

Two links per HCA, each requires

- 12x Multi-fiber Push-On (MPO) Duplex connector
- Duplex cable with 12 fibers for transmit and 12 fibers for receive

PSIFB 1x LR (Long Reach)
(Use to replace ISC for extended distance, 10KM)

AID = xx

Two links per HCA, each requires

- LC Duplex connector
- Duplex cable with 1 fiber for transmit and 1 fiber for receive

Considerations:

- Do not exceed 4 CHPID's per link / port (16 CHPID's per HCA)
- Maximum number of coupling CHPID's supported on a z196 is 128 CHPIDs (double z10)
- Order multiple HCA's for availability, 2 links / ports per HCA adapter
- OEM (3rd party) cables, watch out for cable orientation problems, send / receive not labeled

Parallel Sysplex Web Page

<http://www-03.ibm.com/systems/z/advantages/ps/ifb.html>

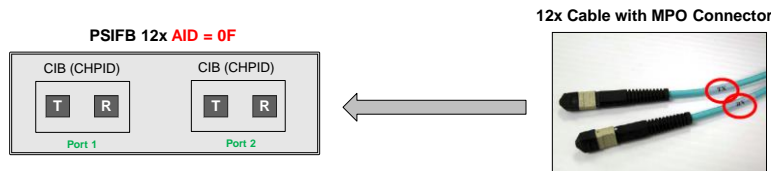
Coupling Facility Configuration Options Whitepaper

<ftp://public.dhe.ibm.com/common/ssi/sa/wh/n/zsw01971usen/ZSW01971USEN.PDF>

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PSIFB Definition



eConfig PCHID Report

```

12739721          PCHID REPORT          May 07, 2010
Machine: 2817-M15 NEW1
-----
Source          Cage Slot F/C   PCHID/Ports or AID          Comment
06/DA          A25B DA06 0163  AID=0F
    
```

IOCP Definitions

To NEWCPC, CSS 0, CHPID C1
 CHPID PATH=(CSS(0),EA),TYPE=CIB,CPATH=C1,AID=0F,PORT=1,SHARED, *
 CSYSTEM=CPCTHERE

* To NEWCPC, CSS 0, CHPID C0
 CHPID PATH=(CSS(0),EB),TYPE=CIB,CPATH=C0,AID=0F,PORT=2,SHARED, *
 CSYSTEM=CPCTHERE

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PSIFB HCA Adapter Options – Summary

- **Host Channel Adapter Optical Fanouts – 2 ports per fanout**
 - z196, up to 16 HCA2-O fanouts
- **PSIFB 12X IB-SDR (3 GBps)**
 - z196 to z9
 - Uses 12 lanes for a total link rate of 3 GBps and is a point-to-point connection, maximum length of 150 meters
 - New 50 micron OM3 (2000 MHz-km) multimode fiber with MPO connectors
- **PSIFB 12X IB-DDR (6 GBps)**
 - z196 to z196
 - z196 to z10
 - Uses 12 lanes for a total link rate of 6 GBps and is a point-to-point connection, maximum length of 150 meters
 - New 50 micron OM3 (2000 MHz-km) multimode fiber with MPO connectors
- **PSIFB 1X IB-DDR LR (5 GBps, Long Reach)**
 - z196 to z196
 - z196 to z10
 - Uses one lane for a total link rate of 5 Gbps and supports an unrepeated distance of 10 km
 - Repeated distances at up to 100 km when attached to a Dense Wavelength Division Multiplexer (DWDM) qualified by z196
 - Speed may be auto-negotiated if the attached DWDM is capable of operating at SDR or DDR
 - Supports SDR at 2.5 Gbps when connected to a DWDM capable of SDR speed
 - Supports DDR at 5 Gbps when connected to a DWDM capable of DDR speed
 - 9 micron single mode fiber optic cables with LC Duplex connectors (same cable as ISC3)

Note: The InfiniBand link data rate of 6 GBps, 3 GBps or 5 GBps does 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. With InfiniBand coupling links, while the link data rate may be higher than that of ICB, the service times of coupling operations are greater, and the actual throughput may be less than with ICB links.

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Coupling Link Analysis



Customers migrating from ISC or ICB links to PSIFB links should contact IBM Techline to perform a PSIFB analysis using zCP3000

- IBM Techline will provide a collection guide that can be delivered to the customer for data collection. All SMF TYPES 70, 71, 72, 73, 74, 75, and 78 are required.
- Information will be used to project impact on subchannel utilization, synchronous / asyn rates and service times.



➤ **Can NOT project accurate service request and service times for PSIFB if you are going to multiple CHPID's per link or if consolidating multiple link types into a single PSIFB link. Not used to project the impact of consolidating links!**

- There is more to consider than just utilization rates. Refer to APAR II14483: for information regarding to link capacity planning.

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zCP3000 – ICB to PSIFB Comparison

CF02LPR1 : SYSG : Edit CF Link Type

Help Analysis

Sysplex Name: MSPLX02 Machine Type
 Sysid: SYSG 2097.720
 CF Name: CF02LPR1 2097.E12/700
 CF Study Interval: 04/09

Link Configuration

Peer mode: Peer Peer
 Distance (km): 0 0
 Link Type: ICB-4 InfiniBand-12x
 CF Links: 2 2
 Subchannels: 14 14
 Shared Channel

Utilization	Current	Estimated
Coupling Facility	35.5%	35.5%
Sysid	39.4%	39.5%
Subchannel	0.7%	0.7%

Requests/sec	Current	Estimated
Sync	3,049.53	2,947.72
Async	196.98	298.79
Total	3,246.51	3,246.51

Service Time (usec)	Current	Estimated
Sync	20.72	24.4
Async	173.5	63.81

Cancel Apply

▪ ICB to PSIFB example, like for like link counts:

1. Fundamentally no impact in CF utilization
2. Processor utilization changes from 39.4% to 39.5% → less than 1% coupling efficiency difference for this workload.
3. Some additional "sync to async" conversion due to slightly higher service times.

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Parallel Sysplex InfiniBand (PSIFB) Assessment Services

IBM Systems Lab Services will assist installations with assessing the potential impacts of introducing the PSIFB coupling link technology in your client's existing datacenter and host environments.

Two z/OS Subject Matter Experts provide the following tasks and services:

- Review of customer's current coupling link configuration
- Assessment of potential impacts to customer host environments by adding InfiniBand
- Determination of possible coupling configuration(s) and migration paths using InfiniBand
- Provide a proposal on possible migration scenarios

Contact Systems Lab Services opportunity manager:

- (WW): Anthony Dilorenzo, dilorenz@us.ibm.com
- (WW): Gerald Koger, jerrykog@us.ibm.com

Additional Reference Information

- Hot Topics Newsletter 23: "Migrate to Parallel Sysplex InfiniBand coupling links":
<http://publibz.boulder.ibm.com/epubs/pdf/e0z2n1a1.pdf>
- Systems Lab Services and Technical Training:
<http://www-03.ibm.com/systems/services/labservices/>

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Three Subchannel Sets Per LCSS



Getting low on UCB's... No problem!

- Addition of a subchannel set of 64K devices to the existing two subchannel sets
- The first subchannel set (SS 0) allow definitions of any type of device as is 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) now be designated for use for disk alias devices (of both primary and secondary devices) and/or Metro Mirror secondary devices only
- CHPID types: ESCON - CNC, FICON - FC (both native FICON and zHPF paths)
- Features: ESCON, FICON Express8, FICON Express4
- z/OS V1.12
- z/OS V1.10 and V1.11 with PTFs

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Customization / Activation for I/O Exploitation

- **Three Subchannel Sets**
 - Extension of Alternate Subchannel Set supports introduced in z/OS 1.7 and 1.10
 - Same restrictions and considerations
 - PPRC-pair secondary's must either all be in subchannel set 1 or all be in subchannel set 2.
 - Reminder: A PPRC-pair are where the primary is in one subchannel set and the secondary is in another subchannel set with the same device number
 - Aliases can appear in the same subchannel set as the PPRC-pair secondary devices.
 - Aliases can appear in all subchannel sets (0, 1, and 2).
 - Only PAV-alias (3390A), PPRC Secondary (3390D) or SAN back-up (3390S) devices
 - After a HyperSwap®, Special PPRC pair of 3390B and 3390D must be added, deleted or changed together during a Dynamic Activate
 - A primary PPRC device found in a different subchannel set than the one being used for system IPL will be box'ed (* no longer box'ing with APAR OA31443*)
- **IODF statement of LOADxx**
 - Allows the installation to select the subchannel set from which to bring primary PPRC devices online
 - SCHSET parameter now allows values '0', '1' or '2'
 - Can also be specified via operator prompt during IPL

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Crypto Express3

Crypto Express2 not supported on z196, cannot be ordered new or carried over on upgrades.

Crypto keys

- Customers should establish a migration plan for reloading master keys.

New Web deliverable HCR7780 (FMID)

- Customers should review their current HCR release and establish a migration plan before installing the new FMID. HCR7780 not available for ESP customers, ESP customers need to install APAR OA29839 on their current version of ICSF.

TKE Workstation (Ethernet only)

- Use TKE Migration Wizard for migrating old TKE settings

UDX (User Defined eXtension)

- UDX interfaces using HW control blocks and ICSF CB, therefore if hw platform changes or ICSF level changes or both, then UDX must be updated for the new control blocks. Customers should contact IBM Global services for assistance if they are using UDX.

PKDS size increased and reduced support for retained private keys (ICSF Web Deliverable HCR7750)

- The size of the PKDS is increased to allow 4096-bit RSA keys to be stored
- Customers using the PKDS for asymmetric keys must copy their PKDS to a larger VSAM dataset before using the new version of ICSF. Even if the customer is not storing RSA keys in their PKDS, the PKDS is a required data set and the format of the data set must change.
- Any pre-HCR7750 system, sharing the PKDS with a post-HCR7750 system must have the toleration APAR installed. That is, starting with HCR7750 the PKDS supports 4096-bit keys. If that PKDS is shared with an earlier version of ICSF, that earlier version of ICSF must have the APAR installed. PTF will allow the PKDS to be larger and prevent any service from accessing 4096-bit keys stored in a HCR7750 PKDS
- Beginning with HCR7751, retained private keys used for key management are no longer supported. These keys can still be stored in the PKDS, however they cannot be stored (or retained) on the Crypto Express card.

Cryptographic Support for z/OS Web deliverables may be obtained at: <http://www.ibm.com/systems/z/os/zos/downloads/>

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Supported z/OS Releases and ICSF Levels

- **z/OS V1.7 Crypto customers can run with:**
 - HCR7720 – Base z/OS V1.7 is not supported
 - HCR7731 – Enhancements to Cryptographic Support for z/OS and z/OS.e V1R6/R7
 - HCR7750 – Cryptographic Support for z/OS V1R7-V1R9 and z/OS.e V1R7-V1R8
 - HCR7751 – Cryptographic Support for z/OS V1.8 through z/OS V1.10 and z/OS.e V1.8
- **z/OS V1.8 Crypto customers can run with:**
 - HCR7731 – Base z/OS V1.8
 - HCR7750 – Cryptographic Support for z/OS V1R7-V1R9 and z/OS.e V1R7-V1R8
 - HCR7751 – Cryptographic Support for z/OS V1.8 through z/OS V1.10 and z/OS.e V1.8
- **z/OS V1.9 Crypto customers can run with:**
 - HCR7740 – Base z/OS V1.9
 - HCR7750 – Cryptographic Support for z/OS V1R7-V1R9 and z/OS.e V1R7-V1R8
 - HCR7751 – Cryptographic Support for z/OS V1.8 through z/OS V1.10 and z/OS.e V1.8
 - HCR7770 – Cryptographic Support for z/OS V1R9-V1R11
- **z/OS V1.10 Crypto customers can run with:**
 - HCR7750 – Base z/OS V1.10
 - HCR7751 – Cryptographic Support for z/OS V1.8 through z/OS V1.10 and z/OS.e V1.8
 - HCR7770 – Cryptographic Support for z/OS V1R9-V1R11
 - HCR7780 – Cryptographic Support for z/OS V1R10-V1R12
- **z/OS V1.11 Crypto customers can run with:**
 - HCR7751 – Base z/OS V1.11
 - HCR7770 – Cryptographic Support for z/OS V1R9-V1R11
 - HCR7780 – Cryptographic Support for z/OS V1R10-V1R12
- **z/OS V1.12 Crypto customers can run with:**
 - HCR7770 – Base z/OS V1.12
 - HCR7780 – Cryptographic Support for z/OS V1R10-V1R12

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z10 Crypto Express3 – UDX

▪ UDX (User Defined eXtension)

- Extends the functionality of IBM's CCA (Common Cryptographic Architecture) application program
 - Customized cryptographic verb controls per customer
- UDX interfaces using HW control blocks and ICSF CB, therefore if HW platform changes or ICSF level changes or both, then UDX must updated for the new control blocks
 - If a customer has UDX, they would already know this

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Customization / Activation for Crypto Exploitation

▪ Crypto Exploitation (software installation)

- New ICSF Web deliverable for Crypto Express3
 - *Cryptographic Support for z/OS V1R10-V1R12* Web deliverable (HCR7780)
 - Available September 10, 2010
 - Only required to exploit function provided
 - **NOT** integrated in ServerPac (even for z/OS V1.12)
 - To exploit keyed HMAC – CKDS must be a variable length VSAM data set
 - All images sharing this CKDS must be at HCR7780
 - ICSF pubs will be updated with HCR7780 function
 - Available online: <http://www.ibm.com/systems/z/os/zos/bkserv>
- z/OS PTFs needed for some z10 GA3 and zEnterprise functions
- New ICSF toleration PTFs needed when sharing keys in a sysplex
 - ECC Master Key (in PKDS)
 - CBC Key Wrap Support (in CKDS)
 - New SMP/E Fix Category will be created for ICSF coexistence
 - IBM.Coexistence.ICSF.z/OS_V1R10-V1R12-HCR7780
- TKE 7.0 is required for X9.8 Pin processing to enable access control points
- For z/OS V1.7 customers, *Enhancements to Cryptographic Support for z/OS and z/OS.e V1R6/R7* Web deliverable is still downloadable from the z/OS download page

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Crypto Express3 on zEnterprise – Other Operating Systems

- **z/VM V5.4 with PTFs for Guest support**
 - VM does not directly use the crypto hardware
- **z/VSE 4.1 and IBM TCP/IP for VSE/ESA™ V1.5.0 with PTFs**
- **z/TPF V1.1 (acceleration mode only)**
- **Linux on System z distributions**
 - Review Novell and Red Hat distribution support statements for a current list of supported hardware

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I/O Summary and Recommendations

- **ICB's not supported, review potential for migrating ICB and ISC3 to PSIFB**
- **If you have more than 240 ESCON channels – Migrate to newer FICON and conversion technology, goal is to eliminate ESCON channels on the server**
 - Consider Optica Prizm for FICON FC -> ESCON CNC conversion
- **FICON Channels**
 - FICON Express2 not supported – Migrate to FICON Express8
 - FICON Express not supported: Ends support for FICON Conversion with ESCON Director Model 5 Bridge Card – Migrate to FICON or consider OEM conversion (e.g Optica Prizm)
- **OSA Channels**
 - To avoid common OSA-Express3 installation problems, read techdoc PRS3950 / WP101377
 - **OSA-Express2 10GbE not Supported** – Migrate to OSA-Express3 10GbE
 - Watch out for a connector change (SC to LC) !
- **Crypto Express2 – Migrate to Crypto Express3**

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z196 Physical Site Planning



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Data Center Comparisons – System z9, z10 & z196

z10 EC to z196

- **Simpler but requires planning**

- Slightly larger footprint (Wider than the z10 and Water option adds ~ 4" depth & Overhead I/O option adds ~12" width)
- Same floor cutouts
- Approximately same power for comparable configs (but for more capacity)
- Approx. same airflow for comparable configurations
- Approx. same weight for comparable configs (Water option adds ~100 lb, Overhead I/O adds ~200 lb)
- Fewer line cords for some systems
- Air temperature, altitude and humidity requirements are the same as z10 (Class 1 ASHRAE/Acoustic Category 1B)

z9 EC to z196

- **More data center issues – like z9 EC to z10 EC transition**

- Larger system footprint (9" deeper front cover to back cover, 3" taller)
 - In addition Water option adds 4" more depth & Overhead I/O option adds 12" width
- Different floor cutouts – floor reinforcement
- Typically more power for comparable configs (but for more capacity)
- Some configs need to add 2 more line cords
- Significantly more airflow for comparable configurations
- Some weight increase for comparable configurations

Raised Floor required for z196 High End Servers

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Power Plugs



New or changed power plug options

- **Eliminated 6 foot Chicago power plugs**
- **World Trade High Voltage (cut) cord types (EMEA)**
- **High Voltage 380V-570v DC Line Cord available**
 - z196 power designed to for universal support of AC and DC power

Line Cord Planning Considerations

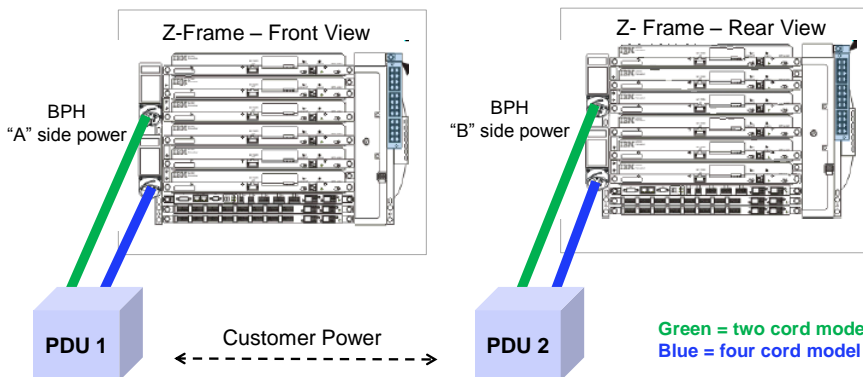
- **z196 requires less power plugs (BPR's) for same configuration as System z10**
 - Two or Four power plugs per server,
 - Number of cords are influenced by the number of supports BPR's. Number of I/O cages and I/O drawers determine the number of BPR's. New server can drive 4 power plugs quicker then MES upgrades.
 - Same number of plugs for AC or DC power options, two or four per server depending upon configuration
- **Line Cord Plan Ahead (FC 3001) option available for the two additional power cords**
- **Balanced Power Plan Ahead (FC 2000) will add two additional power cords**
- **Installation of the two additional power cords as part of an MES are designed to be concurrent**

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Physical Planning Info – Power Connections

- The z196 models are designed with a fully redundant power system. Either two or four line cords are attached to two or four power input ports located in the Z-frame front and rear locations
 - Two cord models will have one cord (A-Side) located in the front and one cord (B-Side) in the rear (Green)
 - Four cord models will have two cords (A-Side) located in the front and two cords (B-Side) in the rear (Blue)



Do not cross these power cords by connecting one "A" and one "B" cord to each power distribution panel. In this example the "A" power cord(s) should connect to one PDU and the "B" power cord(s) should connect to a different PDU (if available). Refer to IMPP GC28-6897 for details.

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IBF Hold Uptime – z10 EC vs z196

z196 IBF Holdup Time

	Number of I/O units						
	0	1	2	3	4	5	6
1 Book	6 min	5 min	12 min	4.0 min	7.0 min	6.8 min	6.8 min
2 Books	7.5 min	7.0 min	5.4 min	6.0 min	7.5 min	6.0 min	6.0 min
3 Books	8 min	7.4 min	4.2 min	7.0 min	5.0 min	4.1 min	4.1 min
4 Books	5 min	4.8 min	2.4 min	4.5 min	3.6 min	3.2 min	3.0 min

Blue = single line cord pair Red = 2 line cord pairs

I/O Units
 • I/O Cage = 2 Units
 • I/O Drawers = 1 Unit

System z10 IBF Holdup Time

IBF hold uptime	One I/O Cage	Two I/O Cages	Three I/O Cages
1 Book	10.8 min	12 min	12 min
2 Books	10.8 min	7.2 min	5.4 min
3 Books	7.2 min	5.4 min	4.2 min
4 Books	5.4 min	4.2 min	2.4 min

Blue = single line cord pair Red = 2 line cord pairs

51 Refer to IMPP GC28-6897 for details

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New Build – Power Comparison

System z10 Power Cords				
	0	1	2	3
	Cargo	Cargo	Cargo	Cargo
1 book	2x60A	2x60A	2x60A	2x60A
2 book	2x60A	2x60A	4x60A	4x60A
3 book	4x60A	4x60A	4x60A	4x60A
4 book	4x60A	4x60A	4x60A	4x60A

1. Line Cord Plan Ahead (FC 3001) option available for the two additional power cords
2. Balanced Power Plan Ahead (FC 2000) will add two additional power cords
3. Installation of the two additional power cords as part of an MES are designed to be concurrent

System z196 Power Cords							
	0	1	2	3	4	5	6
	I/O Unit	I/O Unit	I/O Unit	I/O Unit	I/O Unit	I/O Unit	I/O Unit
1 book	2x60A	2x60A	2x60A	2x60A	2x60A	2x60A	2x60A
2 book	2x60A	2x60A	2x60A	2x60A	2x60A	4x60A	4x60A
3 book	2x60A	2x60A	4x60A	4x60A	4x60A	4x60A	4x60A
4 book	4x60A	4x60A	4x60A	4x60A	4x60A	4x60A	4x60A

I/O Units
 • I/O Cage = 2 Units
 • I/O Drawers = 1 Unit

1. Line Cord Plan Ahead (FC 3001) option available for the two additional power cords
2. Balanced Power Plan Ahead (FC 2000) will add two additional power cords
3. Installation of the two additional power cords as part of an MES are designed to be concurrent

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Loose Piece MES – Power Comparison

System z10 Power Cords				
	0	1	2	3
	Cargo	Cargo	Cargo	Cargo
1 book	2x60A	2x60A	2x60A	2x60A
2 book	2x60A	2x60A	4x60A	4x60A
3 book	4x60A	4x60A	4x60A	4x60A
4 book	4x60A	4x60A	4x60A	4x60A

1. Line Cord Plan Ahead (FC 3001) option available for the two additional power cords
2. Balanced Power Plan Ahead (FC 2000) will add two additional power cords
3. Installation of the two additional power cords as part of an MES are designed to be concurrent

System z196 Power Cords							
	0	1	2	3	4	5	6
	I/O Unit	I/O Unit	I/O Unit	I/O Unit	I/O Unit	I/O Unit	I/O Unit
1 book	2x60A	2x60A	2x60A	2x60A	2x60A	2x60A	2x60A
2 book	2x60A	2x60A	2x60A	2x60A	2x60A	2x60A	2x60A
3 book	2x60A	2x60A	2x60A	2x60A	4x60A	4x60A	4x60A
4 book	4x60A	4x60A	4x60A	4x60A	4x60A	4x60A	4x60A

I/O Units
 • I/O Cage = 2 Units
 • I/O Drawers = 1 Unit

1. Line Cord Plan Ahead (FC 3001) option available for the two additional power cords
2. Balanced Power Plan Ahead (FC 2000) will add two additional power cords
3. Installation of the two additional power cords as part of an MES are designed to be concurrent

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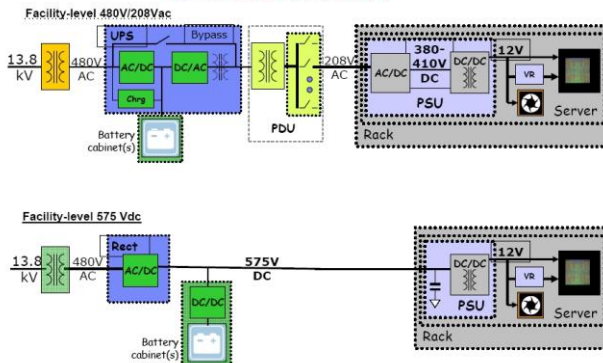
Optional High Voltage DC Power

- A Smarter IT System for a Smarter Planet
- Using high voltage DC power can save, on average, 1 to 3% of power by eliminating DC to AC and AC to DC conversion losses



Infrastructure

AC vs DC Distribution



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HVDC Power Option

SOD for the HV DC power option: FULFILLED

"IBM intends to support the ability to operate from High Voltage DC power on future System z servers. This will be in addition to the wide range of AC power already supported. A direct HV DC datacenter power design can improve data center energy efficiency by removing the need for an additional DC to AC inversion step."

- z196 will retain its universal 2N AC power input capabilities
- Same AC power plugs, cords and service as System z10 EC
- The bulk power in z196 is modified to support HVDC so the only differences in shipped HW to implement the option are the DC line cords:
 - This adds DC line cord feature codes
 - Expect that nominal DC supply voltages supported will include:
 - 570V (500 - 600V)
 - 380V (330- 420V)
- Two or four power cords are required, depending upon the server configuration
- MES conversion of AC to DC Line Cords available, however the MES will be disruptive to install.

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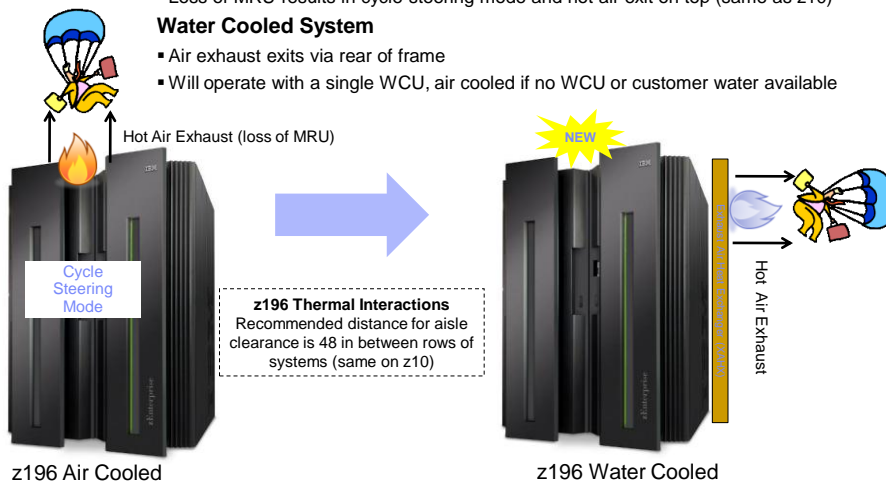
Hot Air Exhaust

Air Cooled System

- Normal Air exhaust front to rear of frame (same as z10)
- Loss of MRU results in cycle steering mode and hot air exit on top (same as z10)

Water Cooled System

- Air exhaust exits via rear of frame
- Will operate with a single WCU, air cooled if no WCU or customer water available



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Water Cooling Option and XAHX

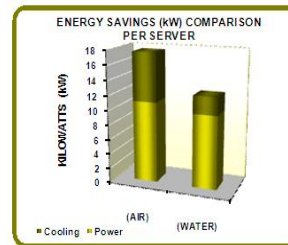


- **Water Cooling Unit (WCU)**
 - Two water cooling units with independent chilled water connections
 - Designed to use using standard building chilled water, temperature range is 6-16 degrees C (43-61 degrees F).
 - Water connection utilizes quick disconnect connectors, one customer supply and return for each WCU
 - Design target is to remove 60 to 65 percent of air heat load
 - MEW Upgrades from air to water and water to air NOT supported

- **Exhaust Air Heat Exchanger (XAHX)**
 - Two Exhaust Air Heat Exchangers (XAHX) units installed on the rear of the A & Z frames
 - Designed to remove heat from the internal system water loop and from internal air exiting the server into the hot air exhaust aisle
 - Different requirements from the zBX Rear Door Heat Exchanger

- **Fill and Drain Kit**
 - Recommend one drain kit per site, FC 3377
 - Consist of FDT Pump, Benzotriazole (BTA) Reservoir Container and associated hoses

- **Quick Energy Estimator**
 - Pre-sales tool to quickly compare energy consumption between air-cooled and water-cooled options
 - Available IBM and IBM BP's only, output can be shared with customers

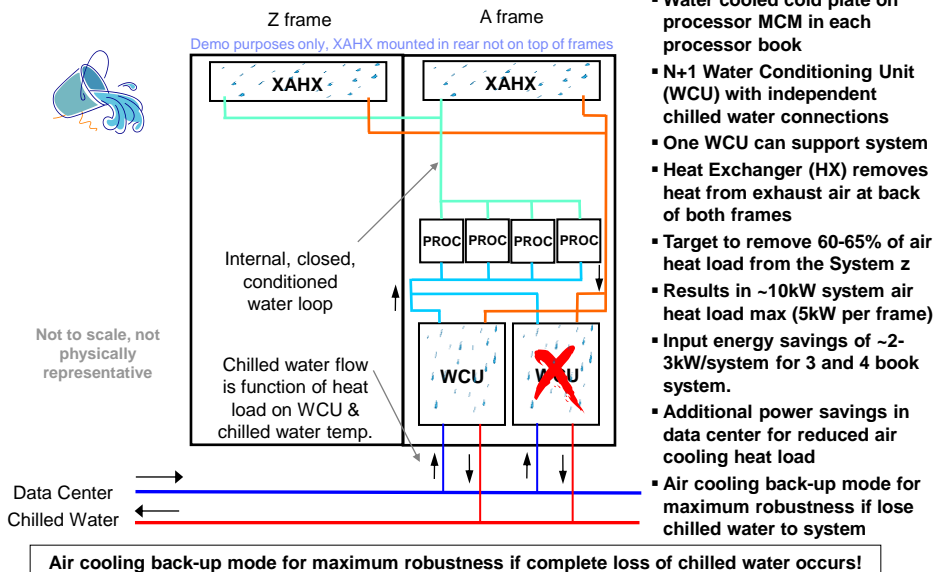


IBM recommends water for the most efficient data center

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Water Cooling Option



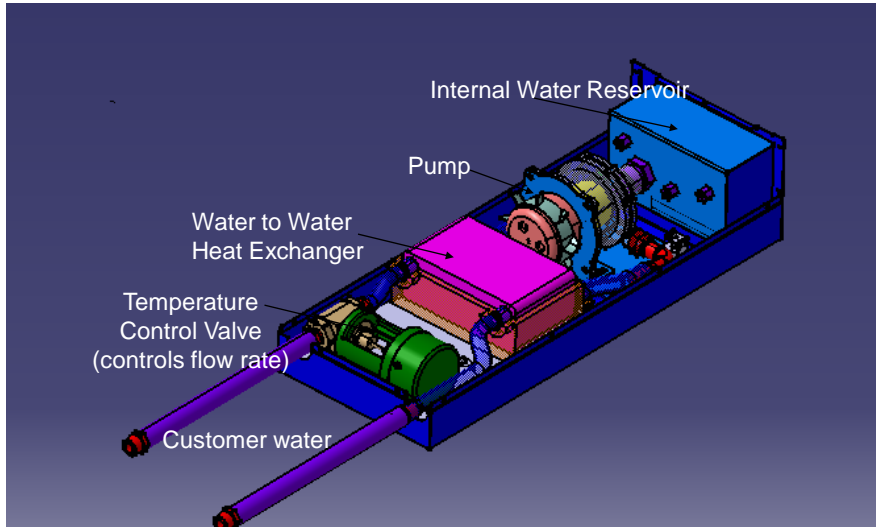
- Water cooled cold plate on processor MCM in each processor book
- N+1 Water Conditioning Unit (WCU) with independent chilled water connections
- One WCU can support system
- Heat Exchanger (HX) removes heat from exhaust air at back of both frames
- Target to remove 60-65% of air heat load from the System z
- Results in ~10kW system air heat load max (5kW per frame)
- Input energy savings of ~2-3kW/system for 3 and 4 book system.
- Additional power savings in data center for reduced air cooling heat load
- Air cooling back-up mode for maximum robustness if lose chilled water to system

Air cooling back-up mode for maximum robustness if complete loss of chilled water occurs!

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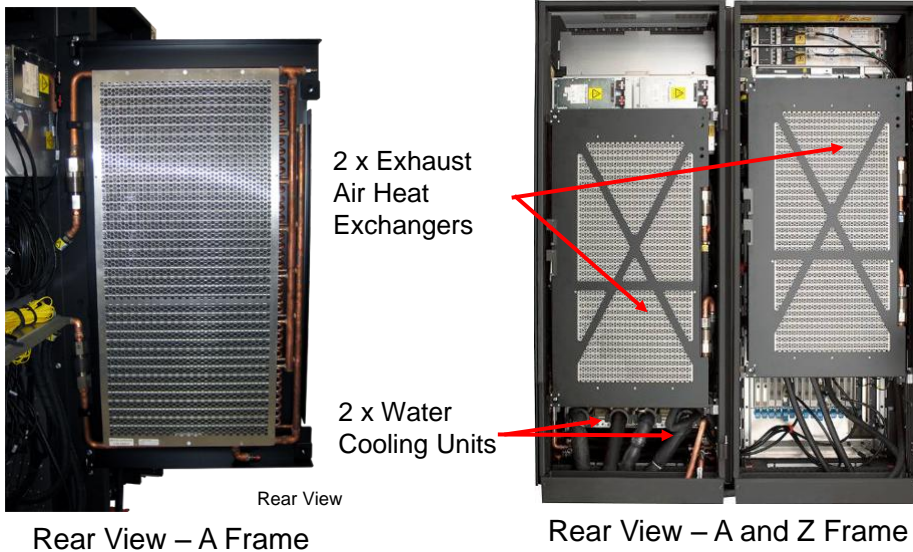
Water Conditioning Unit (WCU)



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Water cooling infrastructure



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Water Cooling Unit Snapshots

z196 Water Cooling Units

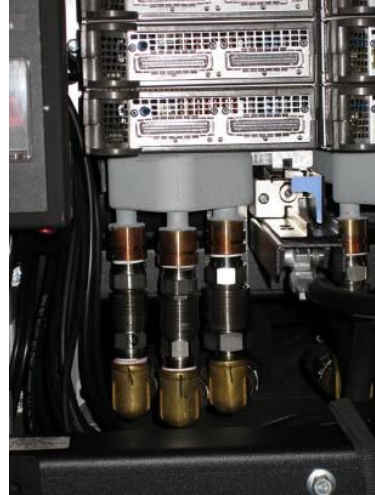


Internal system water closed-loop
Front View



Customer Supplied Water
Rear View

Connections to the Books (Internal system water closed-loop)



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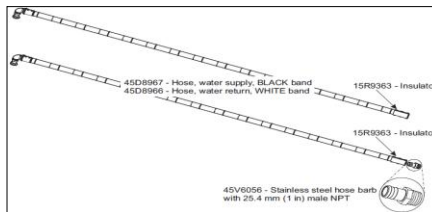
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Customer Supplied Water Loop

The following is used for quick reference only, always use the IMPP for the latest updated information and detailed information!

Customer Water Supply

- Designed to use standard building chilled water
- Allowable system inlet water temperature range is 6-16 OC (43-61 OF)
- Required flow rate to the frame is 3.7 – 79.4 lpm (1 -21 gpm)
- Minimum water pressure required across the IBM hose ends is 0.34 – 2.32BAR (5 – 33.7 psi)



Supply Hoses

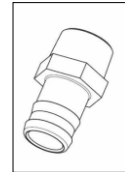
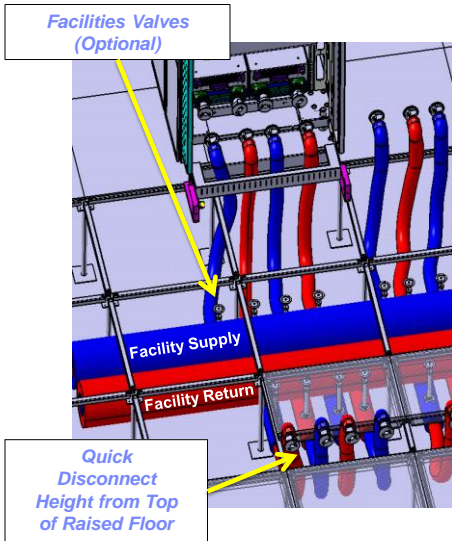
- IBM provides 4.2 m (14 ft) hoses, P/N 45D8967 (supply) and P/N 45D8966 (return) for use with under-floor water supply connections.
 - Customer end of the hoses are left open, allows customer ability to "cut-to-length" to match installation requirements. Insulation clamp P/N 15R9363 is provided to secure the insulation and protective sleeving once the hose has been cut to the desired length and/or installed onto customer facilities plumbing.
- IBM recommends the use of shut-off valves in front of the hoses. Allows for removal of hoses for a service procedure or relocation.
- Stainless steel fitting P/N 45V6056 available for ordering. Fitting is barbed on one side and has a 25.4 mm (1 in) male NPT. Not supplied with original ship group, must be ordered separately.

- **z196 water supply requirements are different from zBX Rear Door Heat Exchanger!**
- **Installation of water cooling connections to data center can result in additional installation time due to scheduling, preparation and installation of hoses, water sensors, etc.**

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Water Cooling Hardware



The hose barb at the customer supply & return is IBM part number 44V6056. The material is stainless steel.

Water Draining Tool





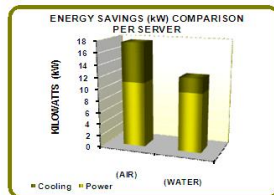
Quick Energy Estimator

IBM and IBM BP Pre-sales tool to quickly compare energy consumption between air-cooled and water-cooled z196's and project potential energy savings.

Sample Run

Power comparisons on two 2817-M32 for 3 years based on 10 cents per KWH.

Power & Cooling (sample chart)



Your Data Center May Realize these Benefits!

There are several benefits that a data center may realize with water-cooled servers. The greater the number of water-cooled servers the greater these benefits are. Important to note is that there may be energy savings realized from the data center's cooling systems after the client re-optimizes their cooling systems after installation of the water-cooled servers.

Based on your selections, the highlighted benefit(s) may be apply to your data center:

- Power Reduction**
Your data center has the potential to utilize power more efficiently. The water-cooled servers allow you to get more computing power to do the same amount of work. There may be less overall load on a generator, time to consider the data acquisition or outsourcing.
- Cooling Capacity Reduction**
Your data center cannot install any other CRACs for cooling. The water-cooled servers have a reduced heat-load expenditure into the data center. You may be able to run more servers without adding more CRACs.
- Reduction in Cooling Requirements**
Your data center has the design that impedes airflow and increases cooling requirements. The water-cooled servers reduce the heat-load from the server to the data center and hence reduce your cooling requirements.
- Hot Spots**
Your data center has hot spots with significant cooling requirements due to heat. A significant amount of the heat from the water-cooled servers is pulled into the clear space, reducing the incidence of hot spots and the cooling required.
- Simple Installation**
Your data center can no longer add any new CRAC units for cooling because of space constraints. The water-cooled servers have a reduced heat-load expended into the center. You may be able to run more servers without adding more CRACs.
- Reduced Inventory**
The new data center inventory systems will be utilized in your data center. This will have reduced power consumption of shared servers.
- Reduced Risk**
It may be beneficial to the client to spend less on power going to their operation.

Tool output can be shared with customers however the tool is for IBM and IBM BP use only, not to be given to customers.

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Water Cooling Considerations

Optional Water Cooling

- MES from Water Cooled (WC) to Air Cooled (AC) – Not allowed
- MES from Air Cooled (AC) to Water Cooled (WC) – Not allowed
- Weight increases 100 lbs including water used for internal cooling loop
- Depth increases 4 Inches, addition of WCU and Heat Exchanger (could be problem with existing aisles)
- Requires customer supplied water, designed to use the same water supply as is currently being used by the Computer Room Air Conditioning (CRAC) units or standard building chilled water.
 - Customer water source from two different chillers are required (recommended)
 - IBM responsible for handling internal water only (filling and draining)
- Fill Drain Kit FC 3377 required, ordered via eConfig
- CPC and zBX water cooling requirements are different

- Water Cooled Servers not available at GA date, target for Water Cooled availability is Sept 10.
- IBM recommends water for most the efficient data center - it removes more heat, per volume, than air.
- Allow for longer lead times when transitioning data center to water, parts, scheduling delays related to computer room activities.

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I/O Cables

No major changes from System z10 except:

- ICB and associated ICB cables no longer supported
- Connector change from OSA-Express2 10GbE (SC) to OSA-Express3 10GbE (LC)

Customer supplies all I/O cables:

- ESCON
- FICON
- OSA
- PSIFB

Cables available from:

- IBM Global Technology Services (GTS)
- Anixter

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InfiniBand Cable Lengths And Part Numbers

- The following cables lengths are available for ordering from IBM GTS or Anixter

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

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System z Connectors and Fiber Optic Cabling

Feature #	Feature name	Connector / Cable	Picture
0219	ISC-3	LC Duplex, 9 u SM	
6155	External Time Reference (ETR)	MT-RJ, 62.5 U MM	
2324	ESCON channel	MT-RJ, 62.5 u MM	
3319/21/23/24/25	FICON Express2, Express4, and Express8 LX	LC Duplex, 9 u SM	
3320/22/26	FICON Express2, Express4, and Express8 SX	LC Duplex, 50, 62.5 u MM	
2319	FICON Express LX	LC Duplex, 9 u SM	
2320	FICON Express SX	LC Duplex, 50, 62.5 u MM	
3362	OSA-Express3 GbE LX	LC Duplex, 9 u SM	
3363	OSA-Express3 GbE SX	LC Duplex, 50, 62.5 u MM	
3370	OSA-Express3 10 GbE LR	LC Duplex, 9 u SM	
3371	OSA-Express3 10 GbE SR	LC Duplex, 50, 62.5 u MM	
3364	OSA-Express2 GbE LX	LC Duplex, 9 u SM	
3365	OSA-Express2 GbE SX	LC Duplex, 50, 62.5 u MM	
3366	OSA-Express2 1000BASE-T Ethernet	RJ-45, CAT 5 UTP	
3368	OSA-Express2 10 GbE LR	SC Duplex, 9 u SM	
2364	OSA-Express GbE LX	SC Duplex, 9 u SM	
2365	OSA-Express GbE SX	SC Duplex, 50, 62.5 u MM	
2366	OSA-Express Fast Ethernet	RJ-45, Cat 5 UTP	
1364	OSA-Express GbE LX	LC Duplex, 9 u SM	
1365	OSA-Express GbE SX	LC Duplex, 50, 62.5 u MM	
1366	OSA-Express 1000BASE-T Ethernet	RJ-45, CAT 5 UTP	

U = micron SM = Single mode fiber, MM = Multimode fiber, LX = Long wavelength transceiver, SX = Short wavelength transceiver, UTP = Unshielded Twisted Pair, STP = Shielded Twisted Pair, LR = Long Reach transceiver
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Overhead Cabling Option (FC 7942)



Overhead cabling is designed to provide increased flexibility and increase air flow in raised-floor environments.

- **Design is side cable “chimneys” or raceways**

 - Fiber I/O and Fiber Trunking
 - 1000BASE-T Ethernet (copper)
 - Supports FQC / FTS options (side mounted brackets)
 - Additional floor cutouts NOT required
- **Physical Planning**

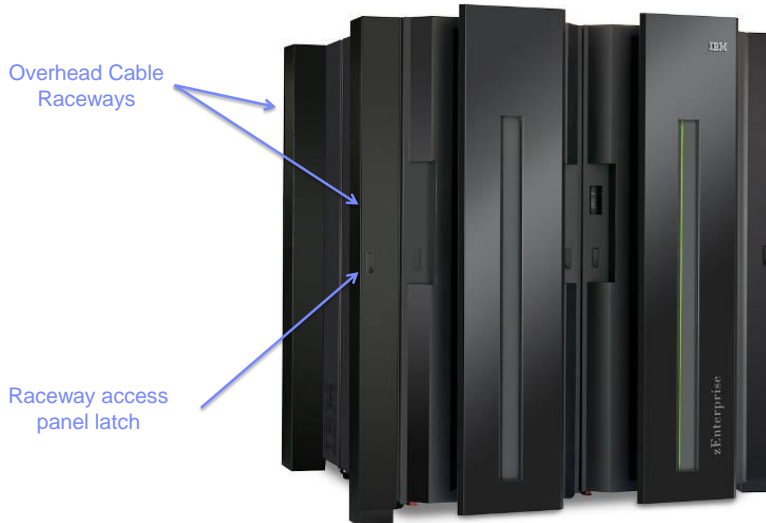
 - Weight add 95 lbs per frame
 - Width add 12 inches
 - Height add 5.5 inches

Top view of frames w/o covers

Side View

Power and optional water use traditional frame bottom entry!

Front View Overhead Cabling Option (FC 7942)



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Site Tools

Site Tool Kit – FC 9968 (z10/z196)



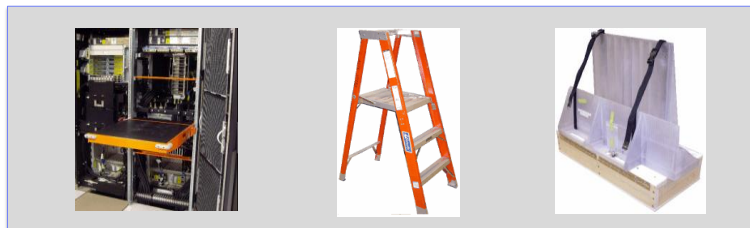
Recommendation is one per site, eConfig always defaults to selected, must visit services tab to deselect



Fill and Drain Kit – FC 3377 (z196)
(Water Cooled Option)



Universal Lift Tool and Ladders – FC 3759 (z10/z196)



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CHPID Mapping



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CHPID Mapping Tool

New version for z196, current level is 5.43, for z196 you will need version 5.50.

- Available from Resource Link only as a download, not as an update. However, any versions after 5.50 will be available as update files.
- Requires Java™ update. This update has given tool windows a new appearance.
- The hard disk space requirement has been increased to 150 MB



Old but important news

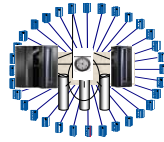
If you plan to use a saved session from version 5.20 or earlier, before upgrading to Version 5.30 or later, export your IOCP file.

CHPID Mapping Tool does not restore an earlier saved session in Version 5.30 or later.

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Sysplex Considerations



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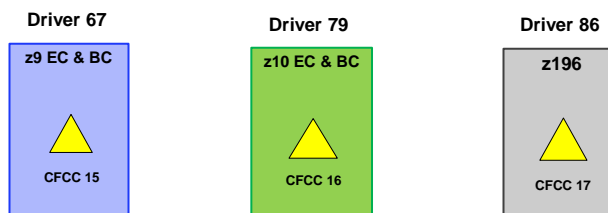
Supported CFCC Levels

Coupling between z10 and z196

- PE recommended minimal code level for z10 coupling to z196 is Driver 79 (Bundle 19). This contains CFCC Product Release 16 Service Level 2.22.
- MCL required on z10 for coupling: N24406.025

Coupling between z9 and z196

- PE recommended code level for z9 is Driver 67
- Minimal code level: CFCC Product Release 15 Service Level x.xx
- MCLs recommended for coupling: Highest available level

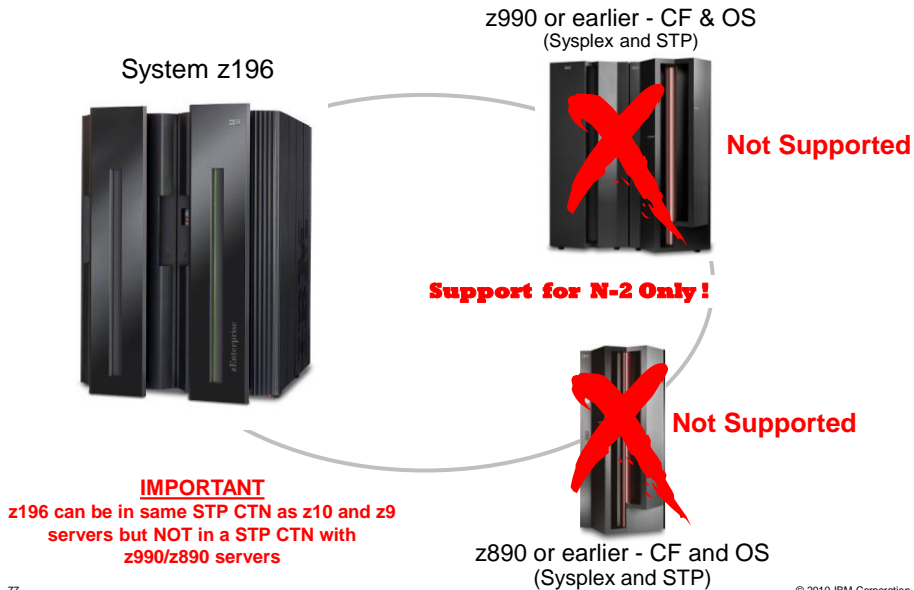


* Always Refer to latest driver exception letter for supported levels ([resource link](#))

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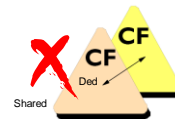
Parallel Sysplex Server Coexistence



Dynamic ICF Expansion Not Supported

Dynamic ICF Expansion Not Supported on z196

- System z10 SoD fulfilled
- Dedicated ICF and Shared CP in the same CF partition not supported on z196
- Dedicated ICF and Shared ICF in the same CF partition not supported on z196



CF Partition Processor Options

- Recommended for production
 - Dedicated ICFs (dedicated CPs can be used, expensive, incurs software cost)
- Not Recommended (exceptions: Backup or function test CFs only)
 - Shared ICFs or Shared CPs
 - To avoid performance problems. Review "PR/SM™ Planning", SB10-7153 for recommendations on weights, Dynamic Dispatch, and capping VERY Carefully!!! Refer to techdoc "Parallel Sysplex Performance: Dynamic ICF Dispatching" TD102670 for additional information.



System z9 and PSIFB Links – Things to Remember

For customers that are wanting to position for PSIFB links on System z9 Servers

- ICB Links are NOT Supported on z196
- Last day for placing PSIFB orders on System z9 is June 30, 2010 (WdFM), order must ship by September 30, 2010.
- Only PSIFB 12x links are supported on System z9, PSIFB 1x LR is NOT supported
- System z9 to z9 connectivity is NOT supported, System z9 PSIFB connectivity supported to System z10 and z196
- Adding the first PSIFB adapter on z9 will be DISRUPTIVE. Once the first PSIFB is installed, additional PSIFB adapters can be added concurrently

Parallel Sysplex Website: <http://www-03.ibm.com/systems/z/advantages/ps0/ifb.html>

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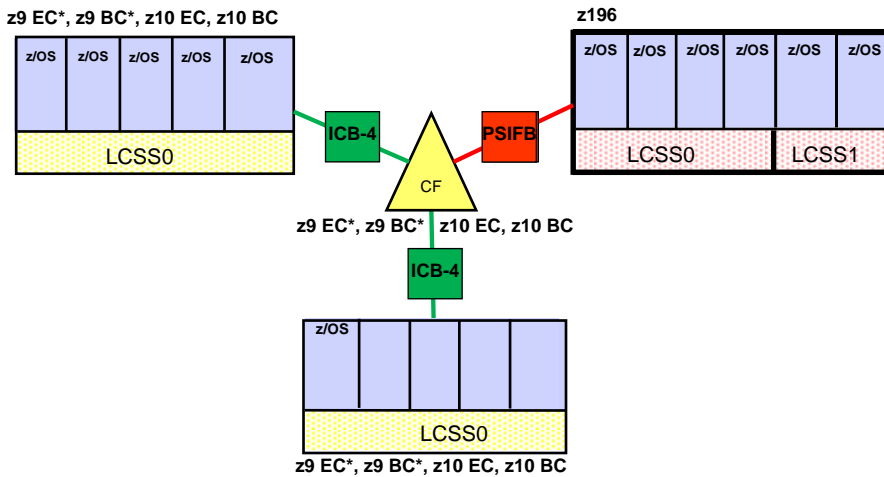
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Parallel Sysplex (No ICB-4 Link Support)

The "intermediate" CFs can provide a 'bridge' to connect to z196

- No ICB-4 Links to z196
- Can intermix existing ICB4 and PSIFB link technology if using z9 or z10 Coupling Facilities

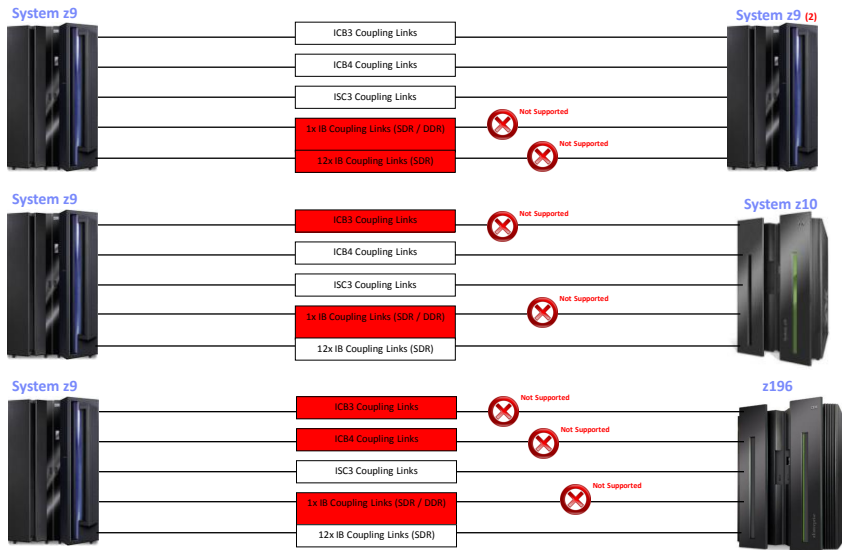


Note: PSIFB links are NOT available for ordering from IBM marketing on System z9 servers after June 30, 2010

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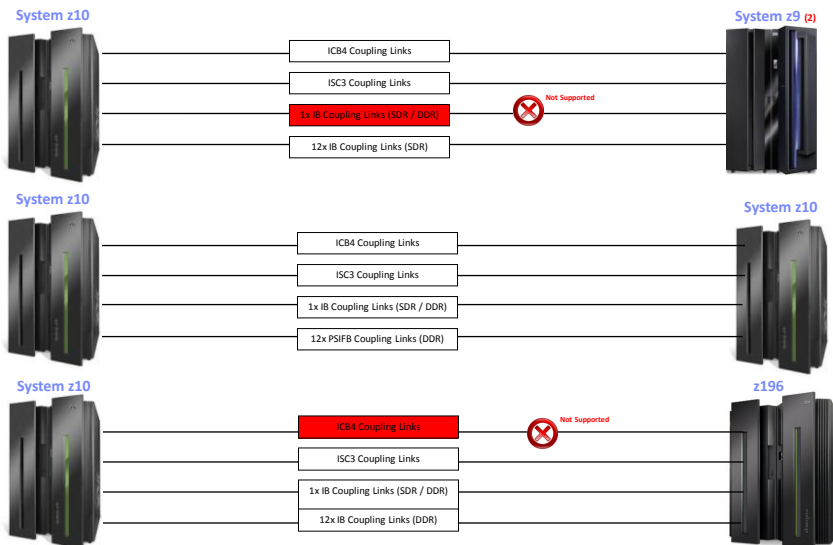
System z9 Link Connectivity to z9, z10, z196



1. System z9 (and higher) connectivity to 9672 servers or older is NOT supported
2. System z9 withdrawal from marketing effective on 06/30/2010, new feature s will no longer be available for ordering after this date © 2010 IBM Corporation

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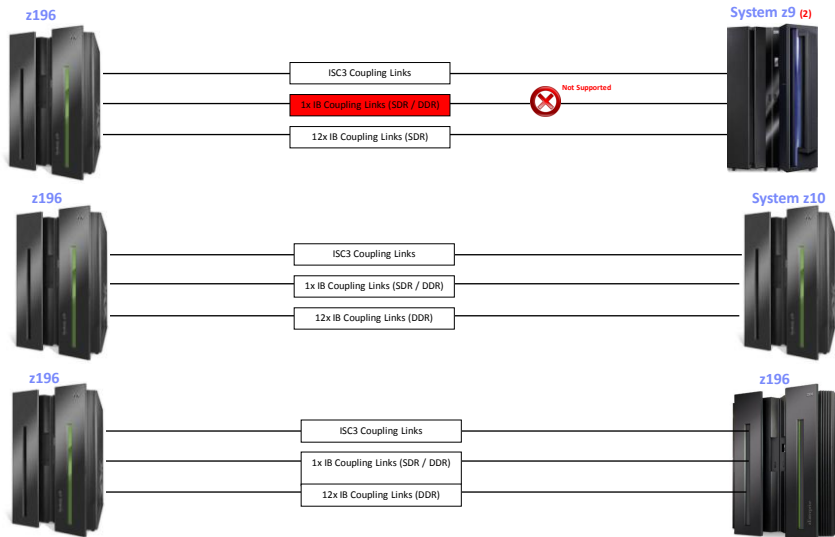
System z10 Link Connectivity to z9, z10, z196



1. System z10 (and higher) connectivity to 206x servers or older is NOT supported
2. System z9 withdrawal from marketing effective on 06/30/2010, new feature s will no longer be available for ordering after this date © 2010 IBM Corporation

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System z196 Link Connectivity to z9, z10, z196



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1. z196 connectivity to 208x servers or older is NOT supported
 2. System z9 withdrawal from marketing effective on 06/30/2010, new features will no longer be available for ordering after this date © 2010 IBM Corporation

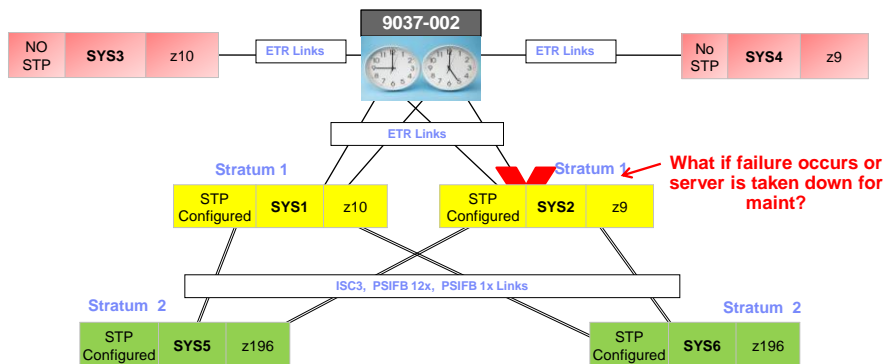
Server Time Protocol (STP)

- **Designed to provide capability for multiple servers to maintain time synchronization with each other and form a Coordinated Timing Network (CTN)**
 - CTN: a collection of servers that are time synchronized to a time value called Coordinated Server Time (CST)
- **Server-wide facility planned to be implemented in System z9, z990, z890 Licensed Internal Code (LIC)**
 - Single view of "time" to Processor Resource/Systems Manager™ (PR/SM)
 - PR/SM can virtualize this view of time to the individual partitions (LPARs)
 - STP not available on z900, z800 or 9672 Gx servers
- **Message-based time synchronization protocol**
 - Similar to Network Time Protocol (NTP) industry standard
 - Timekeeping information transmitted over Coupling Links
 - ISC-3 links (Peer mode), ICB-3 and ICB-4 links
 - NOT standard NTP
- **Supports a multi-site Sysplex of at least 100 km (62 miles) over fiber optic cabling**
 - Allows a Parallel Sysplex cluster to span up to 100 km
- **Designed to coexist with an External Time Reference (ETR) network (9037 based)**
 - Mixed Timing Network

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No Support for ETR with z196



- It is possible to have a z196 server as a Stratum 2 or Stratum 3 server in a Mixed CTN as long as there are at least two z10s or z9s attached to the Sysplex Timer operating as Stratum 1 servers
- Two Stratum 1 servers are highly recommended to provide redundancy and avoid a single point of failure
- Suitable for a customer planning to migrate to an STP-only CTN.
- The z196 can not be in the same Mixed CTN as a z990 or z890 (n-2)

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STP Hardware Considerations

- **Implementation Planning**
 - Review STP Redbooks (planning and implementation), review SAPR site for latest SAPR guide and STP checklist. STP training course available under RESLINK.
- **STP Code FC 1021**
 - Installation of STP is concurrent, also the implementation of STP is designed to be concurrent, however any STP maintenance that has been applied will not be picked up until after the system is IPLed with FC 1021 installed.
- **9037 Requirements**
 - 9037 model 002 supported, requires microcode update to release V03.00.00. Update can be installed concurrent with customer operations
- **HMC Requirements**
 - General STP Use = HMC v2.9.1 or higher
 - NTP Server Use = NTP server requires HMC at level 2.10.1 or higher
 - z196 HMC = HMC 02.11.00
- **Coupling Links**
 - STP will utilize existing coupling links, all link types on current System z servers being marketed are supported. Make sure that there is sufficient connectivity between servers to support STP, multiple links recommended for availability. STP only timing links can be configured by specifying a control unit definition with UNIT=STP.

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STP Operational Considerations

▪ GDPS® Environments

- Update failover process documentation to account for manual STP server role assignments. As of GDPS 3.6, this was not automated by GDPS, must be manually configured at HMC. Watch for improvements in this area.
- Validate DWDM support for STP (check reslink for qualified devices)

▪ Server Power off / on and POR Considerations

- Update operational procedures on how to remove or power down a server assigned as CTS. Cannot deactivate until the CTS server role is reassigned to another server, deactivation will fail

▪ Coupling Link Vary off / on Considerations (last timing link)

- Update operational procedures on how to remove the last coupling link going to a server in STP mode. Removing last link will result in the loss of STP timing signals. Must use FORCE option on the z/OS or CFCC commands or use SE CHPID off/on task (confirmation panel required to vary off last channel path).

▪ Security

- Use of STP/NTP forces increased focus on security due to increased use of HMC. Customer may increase security requirements on HMC USERID and passwords. Use of HMC required to reassign server roles and assign various STP functions and may require a different level of authorization for the users (IE: Sign on with Sysprog verses Operator authority, etc)

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Dense Wavelength Division Multiplexing Support

DWDM (WDM) Support

- If your DWDM device is qualified for ISC links, don't assume that it is also qualified for PSIFB links
- If you are running STP and GDPS, don't assume that because one of these features/functions are qualified that they both are. Each feature/function requires separate qualification
- Don't assume that because one vendor DWDM device is qualified that all devices from that vendor are qualified
- Verify your DWDM code release, not all releases are qualified. For example, a vendor may elect to only certify even or odd releases of their code (meaning you may need to upgrade the DWDM code). Vendors may also charge for code upgrades, always fun topic with customers!
- Refer to TECHDOC FLASH10672 - [Qualified WDMs for Server Time Protocol \(STP\)](#)

PSIFB 1X Long Reach (LR) DWDM Support

- Currently only one vendor and device is qualified to support PSIFB links via DWDM technology
 - IBM System z Qualified WDM: Adva FSP 3000
- Cisco qualification is planned before year end 2010, IBM is not responsible for vendor schedules which are always subject to change
- There is NO support for PSIFB 12x links, use PSIFB 1x LR for extended distance ISC replacements

Check vendor DWDM qualification under IBM Resource Link

> Under Library

> Under System z Qualified Wavelength Division Multiplexer (WDM) products for GDPS solutions

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Parallel Sysplex Summary Page

- 1. z196 does not support active participation in the same Parallel Sysplex with:**
 - IBM eServer zSeries 900 (z900), IBM eServer zSeries 800 (z800),
 - IBM eServer zSeries 990 (z990), IBM eServer zSeries 890 (z890),
 - System/390 Parallel Enterprise Server systems and older
 - This means:
 - Configurations with z/OS on one of these servers can't add a z196 to their sysplex for either a z/OS image or a CF image
 - Configurations with a CF on one of these servers can't add a z196 to their sysplex for either a z/OS image or a CF image
- 2. z196 does not support ICB-4 Coupling Links**
 - Customers should plan their coupling link technology
- 3. z196 does not support connection to an ETR**
 - Customers should migrate to STP *prior* to z196
- 4. z196 does not support Dynamic ICF Expansion**
 - Change production CF to dedicated ICFs (shared ICFs test only)
- 5. z196 can be in same STP CTN as z10 and z9 servers but NOT in a STP CTN with z990/z890 servers**

System z196 & Ensemble HMC



How is the Role of the HMC Changing?

- **Prior to the ensemble management functions in z196, HMC availability was not a critical concern**
 - HMC was not the authoritative holder of any configuration or state information other than configuration info for the HMC itself
 - HMC was not involved in any flows supporting ongoing operation other than call-home, for which redundancy was provided
 - You could turn the HMC off and there would be no effect on operations of the managed systems
- **Addition of ensemble-related function in z196 changes this:**
 - The HMC will now be authoritative holder of some ensemble-scoped configuration not held by any of the Nodes in the ensemble
 - Some configuration actions will be available ONLY from the HMC managing the ensemble, not the SE
 - HMC will have a role in monitoring of Workload performance
- **This change in role drives a need to provide some additional redundancy in the HMC configuration to improve availability**

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Supported HMC's for zEnterprise



HMCs supported for z196

- FC 0084 dual ethernet
- FC 0090 dual ethernet
- FC 0091 dual ethernet

HMCs supported for z196 with ensemble management feature installed, with or without zBX

- FC 0090 dual ethernet
- FC 0091 dual ethernet

Servers enabled for Ensemble Management

- Requires two HMC's, referred to as the Primary HMC and Alternate HMC
- Can be used to control ensembles and traditional system-z servers (z10, z9, etc)
 - One set of HMC's can control an entire ensemble, up to 8 nodes, multiple z196 and zBX's
- Alternate HMC is required and is only used for backup, cannot be used for control unless the Primary HMC is out of service
- Primary and Alternate HMC's to be located in the same data center (not across multiple DC's)
 - Customer can still use remote web access into the Primary HMC for offsite access monitoring and control.

New Ethernet Switch

- Feature code 0070
- IBM recommends two switches for redundancy
- eConfig defaults to zero, validate HMC/SE lan requirements before ordering

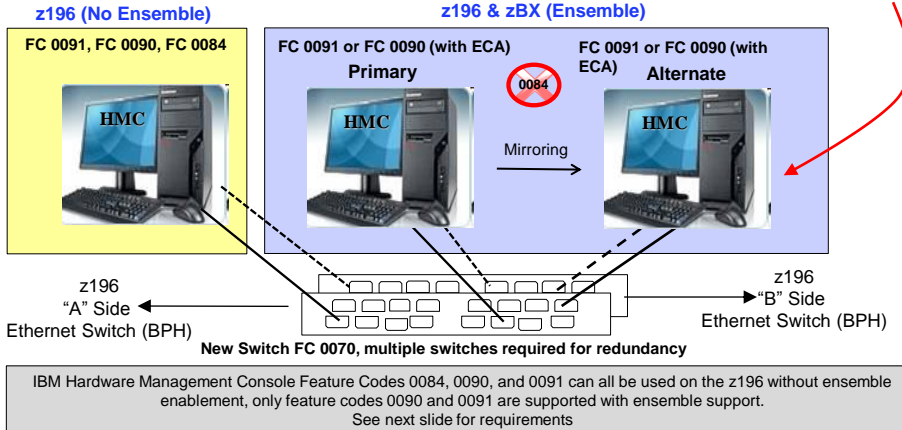
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z196 and HMC's

New HMC

- New HMC feature Code 0091, New Switch feature code 0070
- Additional HMC's required for Ensemble management and z196 zBX (if installed)
- **Alternate HMC used for Ensemble management is allocated for backup purposes only, cannot be used for daily HMC activities. Consider the need for additional HMC's (command center, computer room, etc).**
- Can have a mix of traditional and Ensemble HMC's



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z196 HMC Considerations

- **Ensemble creation**
 - Requires two installed z196 HMCs capable of Ensemble Management
 - One must be designated as the Primary Ensemble Manager
 - The other must be designated Alternate Ensemble Manager
 - Adding z196 Nodes to the Ensemble does NOT increase this requirement
 - **The Ensemble Manager HMC retains all base HMC capabilities and will control & manage both the z196 and zBX**
- **New Build HMC – FC #0091** (Quad-core, 8 GB memory, 250 GB Disk)
 - **FC #0091 is capable of Ensemble Management as shipped**
- **Carry Forward HMC – FC #0090** (Dual-core, 1 GB memory, 250 GB Disk)
 - An ECA is available to upgrade the HMC application and HMC memory to 5 GB
 - ECA ships automatically if FC #0090 is carried forward from z9 or z10
 - ECA is orderable by IBM Service to upgrade FC #0090 still "owned" by a z10
 - **Upgraded FC #0090 is capable of Ensemble Management**
- **Carry Forward HMC – FC #0084** (Dual-core, 1 GB memory, 80 GB Disk)
 - An ECA is available to upgrade the HMC application and HMC memory to 5 GB
 - ECA ships automatically if FC #0084 is carried forward from z9 or z10
 - ECA is orderable by IBM Service to upgrade FC #0084 still "owned" by a z10
 - **Upgraded FC #0084 is NOT capable of Ensemble Management**

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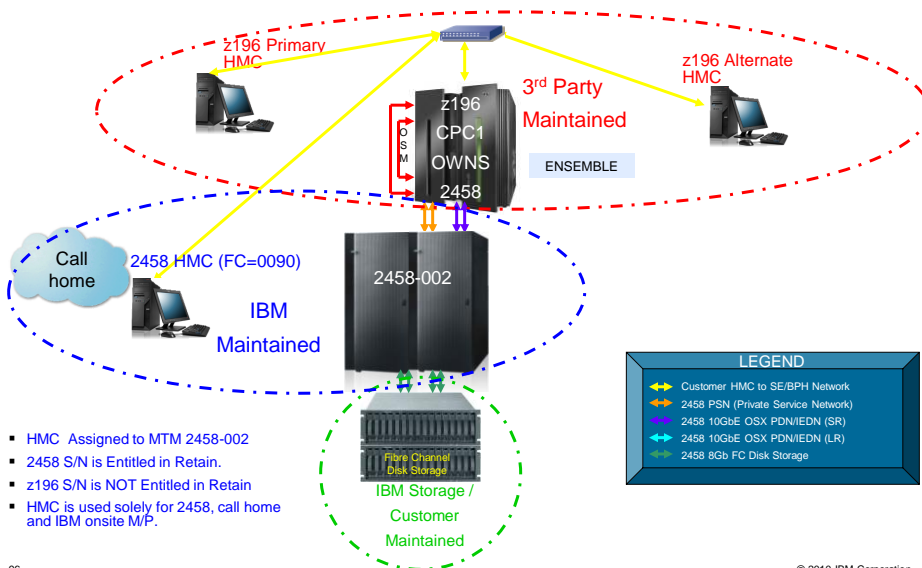
Management Enablement Levels

- **Manage (initial) – FC 0019**
 - Monitoring and trend reporting of CPU energy efficiency
 - New monitor dashboard (augments System Activity Display) enabling a broader view of system resource consumption
- **Manage (enhanced functions – delivered at zBX availability) – FC 0025**
 - Integrated hardware management across all elements of the system
 - Automatic resource discovery and inventory for all elements of the system
 - Private and physically isolated internal service management network connecting all z196 resources
 - Private and secure data network (IEDN) with strict access control across heterogeneous environments
 - PR/SM and PowerVM™ hypervisors for management from a single point of control
 - Virtual server lifecycle management, enabling directed and dynamic virtual server provisioning across all hypervisors and integrated storage, network configuration and ensemble configuration
 - Maximum potential power
- **Automate – FC 0020**
 - Define workloads as representations of physical and virtual resources in the context of a named business process
 - Set performance service level policy and enable performance monitoring, reporting, and resource optimization that can be aligned with customer-defined workload service levels, allowing virtual CPU capacity to be adjusted across a hypervisor
 - Static power savings and energy management

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HMC for Third Party Maintained Systems



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Broadband RSF/Media Only Firmware Component Updates

SOD* - The IBM zEnterprise 196 is planned to be the last high-end server to support dial-up modems for use with the Remote Support Facility (RSF), and the External Time Source (ETS) option of Server Time Protocol (STP). The currently available Network Time Protocol (NTP) server option for ETS as well as Internet time services available using broadband connections can be used to provide the same degree of accuracy as dial-up time services. Enterprises should begin migrating from dial-up modems to Broadband for RSF connections.

- **Firmware Updates on System z can be obtained via**
 - RSF (Remote Support Facility) IBM Support Center using a Broadband connection or a Modem connection
 - Media
- **Firmware for zHybrid (zBX) components has a tendency to be much larger than current System z firmware**
- **z196 will limit some firmware components such they can only be updated via Broadband RSF or Media, not Modem RSF**
 - Even in some of those cases, if the size of the FW update is too large, it may be decided to not even put fixes into RSF (RETAIN) and would only be available via media.
- **Service team has been working with customers to migrate to Broadband RSF**
 - Security concerns of using Broadband versus modem have been addressed.
 - Broadband RSF Tech Note is available in IBM Resource Link to aid customers in understanding the security infrastructure of Broadband RSF.

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Performance



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What's Changing for z196

- **Single set of LSPR data**
 - Primarily based on z/OS 1.11
 - Supports up to 80 CPs in a single image on z196 and IBM System z *
 - Multi-Image table has been updated to z/OS 1.11 supporting up to 80 CPs
 - **New LSPR workloads**
 - **Three hardware-characteristic-based workload categories**
 - **Current workload primitives and Mixes have been replaced**
 - **Reference Processor**
 - **Capacity planning tools affected**
 - zPCR
 - zCP3000
 - BWATOOL
 - zPSG
 - zTPM
- ***Note: When considering a configuration with more than 48 CPs in a single partition please send a note to zpcr@us.ibm.com**

LSPR Tables

- **Multi-image (MI) Processor Capacity Ratio table**
 - Average complex LPAR configuration for each model based on customer profiles
 - Most representative for vast majority of customers
 - Same workload assumed in every partition
 - z/OS only
 - Use for “high level” sizing
 - Used to develop the MSU rating
- **Single-image (SI) Processor Capacity Ratio table ***
 - One z/OS partition equal in size to N-way of model (limit to 80-way)
 - This table ONLY relevant for truly single image z/OS cases
 - Includes z/VM and Linux workloads

***Note: Likely to be dropped in a future release of zPCR**

Single-Image table is used as the basis for IBM capacity planning tools such as zPCR's *LPAR Configuration Capacity Planning* function.

- Multi-Image table is a generalization of relative capacity, and is not useful for capacity planning purposes.

System z10 and z196 processor capacity for z/OS is represented with HiperDispatch turned ON.

LSPR Versions Supported

- **LSPR Data (supporting z196)**
 - z196, and IBM System z (measured in LPAR-mode)
 - [z/OS 1.11](#) (Low, Average, High)*
 - [z/VM](#) (High/LV)
 - [Linux](#) (WASDB/L)
 - **zPCR supplements published workload categories**
 - Low-Avg
 - Avg-High
- **Prior LSPR Data and Tables**
 - Have been removed (z/OS 1.9, z/OS 1.8, z/OS 1.6 and z/OS 1.4)
- **All processor data prior to System z (G6 and before)**
 - Removed from zPCR November 2009
 - Removed from zCP3000 May 2010
- **All capacity planning results will be based on the most recently published data**

***Note: Measured using HiperDispatch; applies to z10 and z196 only**

LPAR Configuration Considerations

- **z/OS 1.11**
 - Supports up to 80 CPs
 - LSPR data for 1 through 80 CPs assumes a single partition
 - Supports zAAP/zIIP Logical CPs
 - [Measured using HiperDispatch*](#)
 - [Minimizes cross book effects](#)
 - [Attempts to keep important Logical CPs on same Real CPs](#)
 - [Improves high speed buffer efficiency](#)
- **Prior z/OS releases may be specified**
 - z/OS 1.4 through z/OS 1.10
 - z/OS 1.11 LSPR capacity data will be used
 - Enforce the SCP rules
- **z/VM 5.4**
 - Supports up to a maximum of 32 CPs
 - LSPR measured up to 32 CPs
- **Linux**
 - zPCR allows up to up to a maximum of 32 CPs
 - LSPR measured up to 16 CPs
- **z/VSE**
 - zPCR allows up to a maximum of 4 CPs
- **CFCC**
 - Supports up to a maximum of 16 CPs

***Note:** "Capacity Planning for z10 Upgrades" document is available TD104738



New LSPR Workload Categories

- **Various combinations of prior workload primitives are measured on which the new workload categories are based**
 - Applications include CICS, DB2, IMS, OSAM, VSAM, WebSphere, COBOL, utilities
- **Low (relative nest intensity)**
 - Workload curve representing light use of the memory hierarchy
 - Similar to past high scaling workload primitives
- **Average (relative nest intensity)**
 - Workload curve expected to represent the majority of customer workloads
 - Similar to the past LoLo-mix curve
- **High (relative nest intensity)**
 - Workload curve representing heavy use of the memory hierarchy
 - Similar to the past DI-mix curve
- **zPCR extends published categories**
 - **Low-Avg**
 - 50% Low and 50% Average
 - **Avg-High**
 - 50% Average and 50% High

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Optionally Capture CPU MF SMF 113 Records on z10s

- **What is CPU MF?**
 - A new z10 and z196 capability to measure cache / memory hierarchy characteristics
- **How can it be used today?**
 - To supplement current performance metrics (e.g. from SMF, RMF™, DB2, CICS)
 - As a secondary data source to understand why performance may have changed
- **What can it be used for in z196 capacity planning?**
 - Capacity Sizing process is the same as today with zPCR
 - Based on DASD I/Os per MSU consumed
 - And optionally use a new Relative Nest Intensity "Hint"
 - SMF 113 data may prove useful in support of an installation of z196
- **What CPU MF is not**
 - It is **Not** a substitute for traditional performance nor capacity metrics
 - It does **Not** indicate the capacity being achieved by the LPAR or processor
- **Encourage Enabling CPU MF COUNTERS on key z10 production partitions**
 - See [CPU MF Overview and WSC Experiences Techdoc TC000041](#)
 - <http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/TC000041>
 - Overview presentation and includes a white paper on how to enable CPU MF COUNTERS
 - Optional - New CPU MF capability will be available to sync SMF 113s with other SMF records
 - SMFINTVAL=SYNC: Synchronize records with the SMF global recording interval
 - Function available via APAR OA30486 for z/OS 1.12 at GA

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IBM Smart Analytics Optimizer – Sizing

- **How do I size the right machine?**
 - Watch this space, things may change
 - Initially, go here
- **For requests outside of North America**
 - dwhz@de.ibm.com
- **For requests in North America**
 - Forward the sizing request to the BI Swat team under Beth Hamel
 - hameleb@us.ibm.com.
- <https://w3.tap.ibm.com/w3ki08/display/isao/Home>
<https://w3.tap.ibm.com/w3ki08/display/isao/Process>
 - Download an off-line version of the questionnaire (ISAO_Assessment_Questionnaire.doc) from <https://w3.tap.ibm.com/w3ki08/display/isao/Process>
 - Complete Questionnaire
 - System Environment and Data Warehouse workload (to make sure that the customer meets the requirements)
- Send the completed Questionnaire to the User ID dwhz@de.ibm.com or to BI Swat team under Beth Hamel in North America hameleb@us.ibm.com.
 - It is not recommended that you approach the customer until you have had feed back on the IBM Smart Analytics Optimizer assessment
 - a quick analysis of real workload should be performed (Quick Workload test)
- Download the [ISAO Assessment Description.zip](#) from the <https://w3.tap.ibm.com/w3ki08/display/isao/Process>

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IBM Smart Analytics Optimizer – Sizing

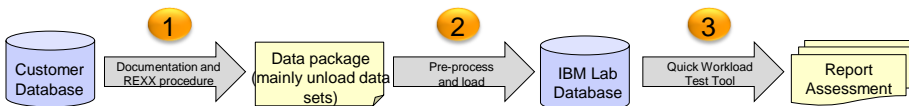
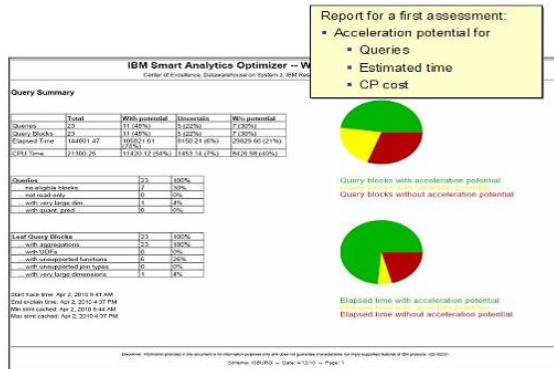
Quick Workload Test

Customer

- Collecting information from dynamic statement cache, supported by step-by-step instruction and REXX™ script (small effort for customer)
- Uploading compressed file (up to some MB) to IBM FTP server

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- Importing data into local database
- Quick analysis based on known Smart Analytics Optimizer capabilities



The result of this analysis will give a first indication how performance and cost may improved with IBM Smart Analytics Optimizer and this particular workload.

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IBM Smart Analytics Optimizer - Sizing

- Additional, more detailed workload analysis may be indicated - either with modeling a customer's data mart or a complete Proof of Concept in the lab or on-site.
- Finally, the proposed solution must undergo a "solution assurance" process to make sure that it is suitable for the customer environment.

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Cross Platform sizing including POWER7 blades

- Size the z196 portion
 - Engage a Techline specialist to help you collect the data and do the sizing via the Deal Hub
 - Use zPCR or zCP3000
 - Use CP2KEXTR and CP2KVMXT to collect the data and create an EDF file for z/OS and z/VM
 - Complete data collection guides located here:
 - <http://w3.ibm.com/techdocs/PRS2664> - for z/OS
 - <http://w3.ibm.com/techdocs/PRS2875> - for z/VM
 - Size the POWER & Blade portion – allow at least one week.
1. Sizing when the customer has an existing set of IBM servers they would like to migrate to POWER7 Blades (go ahead and collect the data now)
 - Identify which machines and which time periods the customer would like to consider in the proposal
 - Collect data from AlX® covering the time frames
 - Work hand in hand with a Power 7 Specialist to collect the data and do the sizing
 - OR
 - Engage a Techline specialist via Deal Hub to help you collect the data and do the sizing
 - sizing questionnaires located here: (5 questions) (will be published soon)
 - <http://w3-03.ibm.com/support/techdocs/atmastr.nsf/WebIndex/PRS4034>
 2. Sizing for new applications running on POWER7 Blades
 - Engage Global Techline Solutions Sizing Support via Deal Hub
 - Software sizing questionnaires located here:
 - http://w3-03.ibm.com/support/techline/sizing/tg_im_sizing.html
 3. Sizing for when migrating from competitive machines to POWER7 Blades
 - Engage a Techline specialist via Deal Hub to help you collect the data and do the sizing
 - Identify which machines and which time periods the customer would like to consider
 - Collect data from the competitive machines covering the time frames
 - Server consolidation data collection guidance located here:
 - <http://w3-03.ibm.com/support/techdocs/atmastr.nsf/WebIndex/PRS1423>

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zBX



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zBX Model 002 Features

zBX Frames / Racks

- Standard 42U (19 inch) IBM Enterprise racks
- Up to 4 racks (B, C, D & E)
- 2 or 4 PDUs per RACK w/ 2-4 line cords (2 PDUs per BladeCenter)

zBX BladeCenters

- BladeCenter size 9U
- Two (1+1) hot-swap and redundant blowers standard
- Additional fan packs on power supplies

Optional Features

- Height Reduction (FC 0570)
 - Used for doorways greater than 80 inches, reduces frame from 79.3 in to 69.5 in (36U)
- Heat Exchanger Rear Door feature (FC 0540)
 - Designed to reduce the heat load to the data center environment and eliminate hot spots within the data center.
- Acoustic Doors (FC 0543)
 - Front and rear doors, adds xx inches
 - Declared sound power level: 7.5 bels.
- Heat Exchanger Rear Door and Acoustic Doors features are mutually exclusive

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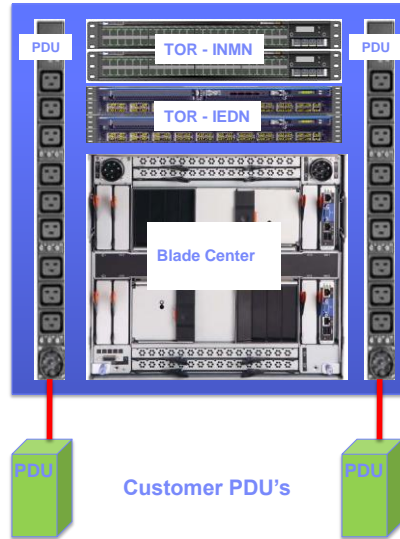
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zBX Power

- **Power not integrated with System z**
 - Requires customer supplied outlets
- **External – Customer Supplied Power**
 - Single or three phase
 - 2 PDUs per BladeCenter (2 line cords per BC)
 - Up to 2 BladeCenters per RACK, 4 line cords
 - Independent line cords 14 feet (4.3m) length.
- **Internal – zBX Power to BC and Switches**
 - Each BladeCenter in the zBX have their own redundant power cords and are plugged into the redundant PDUs in each zBX frame.
 - Each TOR switch in the zBX have their own redundant power cords and are plugged into redundant PDUs in zBX frame B only

For the most reliable availability, the line cords on each side of the racks should be powered from different building power distribution units. Refer to zBX IMPP for planning details!

Single BladeCenter & TORs



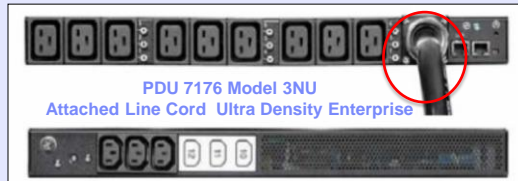
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zBX Customer Power Options – FC 0520 or FC 0521

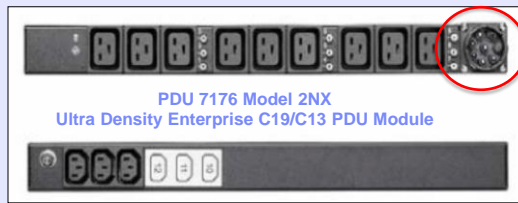
FC 0520 = 3-Phase with Line Cord (US)

- 4.3 m, IEC 309 60A/208V/3PHASE Delta (US) Line cord attached.



FC 0521 = 1-Phase (US) or 3-Phase (Worldwide)

- Attachable line cord, drives selection of additional feature codes below:
 - FC 0531 4.3m, 60A/208V, EPDU to IEC 309 2P+G (US) Line Cord (SINGLE PHASE)
 - FC 0532 4.3m, 63A/230V, EPDU to IEC 309 P+N+G (non-US) Line Cord (SINGLE PHASE)
 - FC 0533 4.3m, 32A/380-415V, EPDU/IEC 309 3P+N+G (non-US) Line Cord, (3PHASE WYE)



Refer to IMPP for information on additional planning specifications relating to specific line cord options

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zBX Configuration ordering

- **zBX is ordered via the zEnterprise eConfig, by specifying the number of IBM Smart Analytics Optimizer and IBM POWER7 Blades**
- **System z e-Config drives out all required infrastructure (BladeCenters, switches, racks, etc.)**
 - System z representative is responsible for getting the connectivity (OSA's and optics) right
- **All IBM POWER7 blades**
 - Ordered through System p representative or other source
- **Only one zBX per controlling CPC**
 - Controlling CPC must be a zEnterprise, not a z10
 - z10 can attach with OSD connections, and can access the solutions/workloads
- **zBX must be adjacent to the controlling CPC**
 - within what a 26 meter (85 feet) cable allows (remember to account for interframe connectivity to BPH and TOR, actual distance between server and zBX will be less)
- **Customer provides**
 - All 10 Gb Ethernet Optical Cables
 - OSA to zBX
 - zBX to zBX
 - zBX to existing customer network
 - IBM Smart Analytics Optimizer
 - Private DASD (DS5020)
 - All Disk Optical Cables
 - IBM POWER7 Blades
 - All blades (from supported list)
 - DASD (from supported list)
 - All Disk Optical Cables

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zBX Rear Door Options

- **Option 1 – Standard Door**
- **Option 2 – Rear Door Heat Exchanger - Feature Code #0540**
 - Requires customer conditioned water.
 - Refer to the Heat Exchanger Rear Door Planning Guide to ensure that the heat is properly dissipated.
 - http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp?topic=/iphad_p5/iphad_exchangeroverview.htm
 - When at that link, just search on 7014-T42
- **There are two circumstances which can be considered for the Rear Door Heat eXchanger (RDHX).**
 1. Order the RDHX as part of the initial order for the zBX.
 2. If not sure if an RDHX is needed, contact IBM Systems & Technology Group (STG) Lab Services.
 - **There is no MES to change to or from a rear door heat exchanger.**
 - **The hoses for the secondary cooling loop are not included with IBM ship group (customer supplied).**
 - **Water cooling units, Coolcentric (formally Vette) URL: <http://www.coolcentric.com/>**

Rear Door Heat eXchanger (option)



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Software Considerations



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zEnterprise General Migration Considerations

- **Software Changes**

- z/OS releases do not require zEnterprise server
- zEnterprise servers ONLY require software identified as 'base' support
 - zEnterprise servers do NOT require any 'functional' software
 - Only required for exploitation

- **Very few new migration issues identified (next chart)**

- z990, z890, z9 EC, z9 BC, z10 EC, and z10 BC migration actions "inherited"
- "Inherited" and new sysplex considerations
- Many functions are enabled/disabled based on the presence or absence of the required hardware and software
 - Some functions have exploitation or migration considerations (subsequent charts)

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zEnterprise Specific Migration Considerations

- **zEnterprise HCD Definitions**
 - CHPID type FCV is no longer supported
 - Fewer ESCON channels
- **New zEnterprise z/Architecture® Machine Instructions**
 - New mnemonics
 - Use of XL C/C++ ARCH(9) and TUNE(9) options
- **Sysplex Considerations**
 - Server participation restriction in a Parallel Sysplex
 - Evaluate Coupling Links requirements
 - zEnterprise does not support ICB-4 Coupling Links
 - Evaluate sysplex timer environment
 - zEnterprise does not support connection to an ETR
 - A mixed CTN configuration is supported
 - z10 and z9 servers using ETR or STP, zEnterprise using STP
 - New CFCC Level
 - Evaluate structure sizes
- **Update SCRT to latest version**
 - There will be one for zEnterprise – release not assigned yet
 - <http://www-03.ibm.com/systems/z/resources/swprice/news.html>

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New zEnterprise z/Architecture Machine Instructions

- **The new mnemonics may collide with (be identical to) the names of Assembler macro instructions you use**
 - If you write programs in Assembler Language, need to compare the list of new instructions to the names of Assembler macro instructions
 - If a conflict is identified, take one of these actions:
 - Change the name of your macro instruction
 - Specify a separate assembler opcode table
 - via PARM= , ASMAOPT, or '*PROCESS OPTABLE....' in source
 - Use a coding technique that permits both use of a new instruction and a macro with the same name in an assembly
- **Use of XL C/C++ ARCH(9) and TUNE(9) options**
 - See later chart

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z/OS XL C/C++ Exploitation of zEnterprise Machine Instructions

▪ C/C++ ARCH(9) and TUNE(9) options:

- The ARCHITECTURE C/C++ compiler option selects the minimum level of machine architecture on which your program will run
 - ARCH(9) exploits instructions available on a zEnterprise server
 - The TUNE compiler option allows you to optimize your application for a specific machine architecture within the constraints imposed by the ARCHITECTURE option
 - The TUNE level has to be at least the ARCH level
 - If the TUNE level is lower than the specified ARCH level, the compiler forces TUNE to match the ARCH level or uses the default TUNE level, whichever is greater
 - For more information on the ARCHITECTURE and TUNE compiler options refer to the z/OS XL C/C++ User's Guide

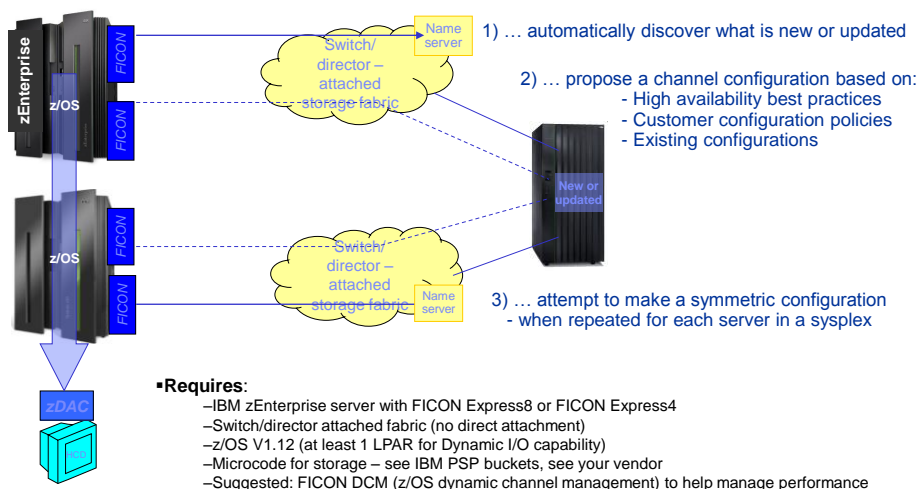
▪ Exploitation Restriction:

- Code compiled with the C/C++ ARCH(9) option can only run on zEnterprise servers, otherwise an operation exception will result
- This is a consideration for programs running on different level servers during development, test, production, and during fallback or Disaster Recovery

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Simplify zEnterprise Configuration Definitions z/OS FICON discovery and auto configuration (zDAC) can ...



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Customization / Activation for I/O Exploitation

▪ z/OS FICON Discovery and Auto-Configuration (zDAC)

- zDAC is invoked through HCD and HCM
- Provides automatic discovery for FICON DASD and TAPE control units
- Reduces level of IT skill and time required to configure new I/O devices
- Ensures system (host) and control unit definitions are compatible with each other

▪ zDAC can

- Display a list of discovered FICON DASD and TAPE controllers
 - Indicates whether the controller is new (ie., no existing devices/control units defined on the controller in the target IODF)
- Discover new devices for existing logical control units on a controller
- Discover new devices and new logical control units on a controller, and propose new paths for each new logical control unit found
- New devices and control units are displayed for either inclusion or exclusion in the target IODF

▪ Through HCD or HCM, the user establishes a policy for the discovery operation

- Can limit the scope of the discovery
- Can limit the proposal information
- Can indicate the desired number of paths to discovered logical control units
- Can indicate the method used for device and control unit numbering

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Customization / Activation for I/O Exploitation

▪ System z FICON Discovery and Auto-Configuration (zDAC)

- zDAC is defined using the HCD Panels
- In order to run zDAC, each TSO userid has to have a HCD Profile set up
- The HCD profile is accessed HCD Profile Options and Policies (Option 0)
 - The Autoconfiguration Policy is Option 0,2 (next chart)
 - To add or edit Autoconfiguration Logical Partition Groups is Option 0,3
 - The LPARs specified in the LP Group can span zEnterprise CECs
 - All members of the group must be running z/OS V1.12 or else the function will not work.
 - To add or edit Autoconfiguration Operating System Groups is Option 0,4
 - Multiple Operating Systems can be targeted for zDAC discovery

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Customization / Activation for I/O Exploitation

- **zDAC**
- **zDAC discovery process is invoked via HCD panel Options 1.6**
- **There are two phases of zDAC discovery:**
 - Fabric Discovery Phase
 - This phase interrogates the switches (McData, Brocade and CISCO) and discovers all of the TAPE and DASD Nodes that are logged in to the fabric.
 - Once this step is executed, a list of nodes is presented for the next phase of discovery.
 - Controller Discovery Phase
 - This phase interrogates the Node, Tape or DASD, when selected for discovery. It determines CU and Device numbering based on the CU configuration, and the paths to be used for access.
 - A proposal will be presented and when accepted, the IODF workfile will contain the entries for the newly discovered node(s).
- **Nodes are discovered during the Fabric Discovery Phase are characterized as either NEW=YES or NEW=NO**
 - NEW=YES means none of the devices on that Node have been defined in the IODF used for Discovery
 - NEW=NO means one or more devices on that Node are currently defined in the IODF used for discovery.

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z/OS Discovery and Auto Configuration

- **Hardware Dependencies**
 - zDAC uses new capabilities in the zEnterprise processor for fabric discovery
 - Explores FICON channels attached to switches
 - FICON Express8 or FICON Express4 (CHPID type: FC)
 - Dynamic I/O Enabled Partitions
 - Up to date controller microcode
 - Tested with IBM 2107 Controller level R12p.9b090910b - Bundle 64.30.87.0
 - Up to date switch microcode
 - Tested with:
 - Brocade Firmware Version: V6.2.0e
 - McData Firmware Version : 09.09.00
- **Software Dependencies**
 - All target systems must be at z/OS R1.12 or higher
 - Mixed level SYSPLEXes are allowed, but only R1.12 can participate in discovery processing
 - Suggested use of Dynamic Channel path Management (DCM) for performance

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Supported zEnterprise Migration Scenarios

1. **Existing System z server to new zEnterprise server**
 - Toleration versus exploitation differs by release
 - ICSF Web deliverable needed for function required
2. **Existing z9 or z10 sysplex replaced by zEnterprise (or zEnterprise added to existing sysplex)**
 - Coupling Link technology (no ICB-4 to zEnterprise)
 - Only STP or Mixed CTN supported (no ETR)
3. **All existing z9 or z10 z/OS images replaced by zEnterprise images**
 - If you want an ensemble
 - z/OS releases must be z/OS V1.10 or higher
 - Configure OSM OSA CHPIDs for Intra-Node Management Network (INMN)
4. **Existing z9 or z10 sysplex replaced by zEnterprise with IBM Blades**
 - z/OS releases must be z/OS V1.10 or higher
 - Configure OSM OSA CHPIDs for Intra-Node Management Network (INMN)
 - Configure OSX OSA CHPIDs for Intra-Ensemble Data Networks (IEDN)
 - User responsible for AIX OS and application provisioning
5. **Existing z10 replaced by zEnterprise with IBM Smart Analytics Optimizer**
 - z/OS releases must be z/OS V1.11 or higher; DB2 releases V9.1 or higher
 - Configure OSM OSA CHPIDs for Intra-Node Management Network (INMN)
 - Configure OSX OSA CHPIDs for Intra-Ensemble Data Networks (IEDN)

Software
z/OS



Operating System Support for z196

- **Currency is key to operating system support and exploitation of future servers**
- **The following are the minimum operating systems planned to run on z196:**
 - z/OS
 - CPC: z/OS V1.9¹ for toleration only; exploitation starts with z/OS V1.10 with full exploitation with z/OS V1.12
 - zBX: z/OS V1.10
 - Linux on System z distributions:
 - Novell SUSE SLES 10 and SLES 11
 - Red Hat RHEL 5
 - z/VM
 - CPC: z/VM V5.4 or higher
 - zBX support: z/VM V6.1
 - z/VSE V4.1 or higher
 - z/TPF V1.1 or higher
- **Using the general purpose application server blades we have:**
 - AIX 5.3, 6.1
 - Linux on System x² (SOD)

¹ z/OS V1.9 support ends on Sept. 30, 2010. Lifecycle Extension for z/OS 1.9 is available Oct. 1, 2010. Note that z/OS 1.8 with the Lifecycle Extension for z/OS 1.8 and z/OS 1.7 with the Lifecycle Extension for z/OS 1.7 are also available with toleration support only.

² 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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z/OS Supported Releases

Toleration Support ONLY

- **z/OS V1.7**
 - with or without zIIP Web Deliverable
 - z/OS Lifecycle Extension required, GTS service contract required after 9/2010
- **z/OS V1.8**
 - z/OS Lifecycle Extension required
- **z/OS V1.9**
 - z/OS Lifecycle Extension available for defect support after 9/30/2010

Exploitation Support

- **z/OS V1.10**
 - selected functions
- **z/OS V1.11**
 - selected functions
- **z/OS V1.12**
 - FULL exploitation

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IBM System zEnterprise Support by z/OS Release

- **IBM System zEnterprise capabilities differ depending on z/OS release**
 - Exploitation support on z/OS V1.10 and higher
 - Toleration support provided on
 - z/OS V1.9
 - Note: z/OS 1.9 support ends Sept. 30, 2010. After that date, IBM Lifecycle Extension for z/OS 1.9 is available for defect support
 - z/OS 1.7 and z/OS 1.8 **with IBM Lifecycle Extension is required**
- **Software requirements differ depending on z/OS release and functions exploited**
 - Support provided via a combination of Web deliverables and PTFs
 - zEnterprise Required PTFs
 - Documented in zEnterprise PSP Bucket: Upgrade = 2817DEVICE, Subset = 2817/ZOS
 - Broken out by z/OS release, identifying required and exploitation
 - Can be identified by SMP/E commands (REPORT MISSINGFIX, LIST, or APPLY)
 - Actual Fix Categories IBM.Device.Server.z196-2817
 - zBX will have a unique category and keyword (D/T2458)
 - Still open whether z/OS V1.7 and z/OS V1.8 PTFs will be able to use FIXCAT Categories
- **zBX Required PTFs**
 - Minimum z/OS 1.10
 - Documented in zEnterprise PSP Bucket: Upgrade = 2458DEVICE, Subset = 2458/ZOS
 - Broken out by z/OS release, identifying required and exploitation
 - Can be identified by SMP/E commands (REPORT MISSINGFIX, LIST, or APPLY)
 - Actual Fix Categories IBM.Device.Server.zBX-2458

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z/OS Support Summary



Release	z900 WdfM	z800 WdfM	z990 WdfM	z890 WdfM	z9 EC WdfM ⁴	z9 BC WdfM ⁴	z10 EC	z10 BC	zEnterprise	End of Service	Coexists with z/OS
z/OS V1.7 [#]	X	X	X	X	X	X	X	X	X	9/08 ^{1,2}	V1.9
z/OS V1.7 w/zIIP [#]	X	X	X	X	X	X	X	X	X	9/08 ^{1,2}	V1.9
z/OS V1.8	X	X	X	X	X	X	X	X	X	9/09 ¹	V1.10
z/OS V1.9	X	X	X	X	X	X	X	X	X	9/10 ^{1,3}	V1.11 [*]
z/OS V1.10	X	X	X	X	X	X	X	X	X	9/11 [*]	V1.12 [*]
z/OS V1.11	X	X	X	X	X	X	X	X	X	9/12 [*]	V1.13 [*]
z/OS V1.12	X	X	X	X	X	X	X	X	X	9/13 [*]	V1.14 [*]

Notes:

- # For HiperDispatch, z/OS 1.7 requires the zIIP Web Deliverable to be installed (but not a zIIP processor)
- 1 The IBM Lifecycle Extension for z/OS provides the ability for customers to purchase extended defect support for that release of z/OS for up to 24 months after the z/OS release's end of service date
- 2 The Lifecycle Extension for z/OS V1.7 is planned to be withdrawn on 10/1/2010
- 3 The IBM Lifecycle Extension for z/OS V1.9 will be required after 9/30/2010 for defect support
- 4 System z9 withdrawal from marketing effective on 06/30/2010
- * Planned. All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice.

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System z, z/VM and z/VSE Support Summary



		z9 EC WdFM	z9 BC WdFM	z10 EC	z10 BC	z196	Ship Date	End of Market	End of Service
z/VSE*	4.1	x	x	x	x	x	3/07	10/08	TBD
	4.2	x	x	x	x	x	10/08	TBD	TBD
	4.3*	x	x	x	x	x	10/08	TBD	TBD
z/VM	5.3	x	x	x	x	x	6/07	9/08	9/10*
	5.4	x	x	x	x	x	09/08	TBD	9/13 ⁽¹⁾
	6.1	No	No	x	x	x	4Q09**	TBD	TBD

Note: z/VSE V4 is designed to exploit 64-bit real memory addressing, but does not support 64-bit virtual addressing. z/VSE V4.3 was previewed July 22, 2010.

* Planned. 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.

⁽¹⁾ End of Service date for z/VM 5.4 extended

Note: z/VM 6.1 Implements a new Architecture Level Set (ALS) available only on IBM System z10 servers or later

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z/VM zEnterprise Compatibility Support

- z/VM support for host / guests on zEnterprise at the z10 functional level with limited exploitation of new functions (transparent)
- Compatibility Support available as PTFs
- Supported releases:
 - z/VM 5.4 [End-of-Service: December 2013]
 - Compatibility only
 - z/VM 6.1 End-of-Service: April 2013, requires a z10 ALS]
 - Compatibility and exploitation items

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Linux is Not An IBM Product

- **Linux on System z does not talk (or write) about its items before the announcement of the corresponding hardware feature**
- **Distributions are products of Novell and Red Hat, not IBM products. IBM does not own distributions**
 - we may have assumptions on content, dates, etc. – but these are assumptions, nothing else
- **IBM cannot talk about future products of its Linux distribution partners (LDPs)**
 - specifically, distribution content cannot be predicted and announced by IBM
 - we can state we are working with our LDPs (on future releases)

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z/VSE – Support Plan for zEnterprise

Compatibility Support:

- **z/VSE V4 will tolerate zEnterprise**
 - z/VSE 4.1, 4.2 (in service), z/VSE 4.3 (Planned availability 4Q2010)
 - Toleration PTFs will be provided at GA, if required
 - CRT (sub-capacity pricing) support for static power saving mode
- **zEnterprise**
 - z/VSE plans to participate in a zEnterprise data network using existing TCP/IP connectivity
 - Transparent when using z/VM VSWITCH

Exploitation:

- **zEnterprise: Data network support (CHPID type OSX) planned with z/VSE 4.3 follow-on**
 - z/VSE 4.3 follow-on: z/VSE 4.3 PTF or follow-on release
- **z/VSE V4 will support new Crypto, OSA-Express, FICON/FCP cards**

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Software z/TPF

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System z, z/TPF Support



		z9 EC (WdfM)	z9 BC (WdfM)	z10 EC	z10 BC	z196	Ship Date	End of Service
TPF	4.1	x ^c	x ^c	x	x	No	2/01	TBD
z/TPF	1.1	x	x	x	x	x	9/05	TBD

- z/TPF Migration Portal
 - <http://www.ibm.com/tpf/ztpfmigration>
- A PRPQ for HLASM running on Linux on z is available
 - z/TPF uses the GNU Cross Compiler (GCC) running under Linux for System z

x^c – Supports up to 30 LPARs with PJ29309

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z/VM z196 Unified Resource Manager Support

▪ If z/VM is running on a z196 that is managed by the Unified Resource Manager:

- The Unified Resource Manager will provide z/VM Systems Management support driven from the ensemble HMC user Interface
- The Unified Resource Manager manages the configuration of ensemble resources for the z/VM. i.e. network and storage, virtual server management
- Each partition or hypervisor must be either in or out of the ensemble; i.e., the hypervisor cannot be partially managed
- z/VM will automatically detect if the LPAR is part of the ensemble during initialization, and later if the ensemble state changes
- New and enhanced SMAPI servers and APIs are provided in support of the Unified Resource Manager
- Pieces of the Unified Resource Manager solution for the z/VM environment are automatically loaded from the SE as part of initializing z/VM in the ensemble

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z/VM z196 Unified Resource Manager Support

- Supports the vision that ensemble resources are owned, managed and under access control of the ensemble.
- Enhancements to provide function required to permit the Unified Resource Manager to perform z/VM system management tasks and Virtual Server management tasks in an Ensemble node.
- z/VM Hypervisor support for the connectivity aspects of the IEDN (intraensemble data network) and the INMN (intranode management network). i.e. vlan, virtual nics, vswitch, etc.
- Provide access control for the management of these resources and control point access of guest (VM) exploitation of the internal networks (who can access, etc.)
- z/VM will not be providing management support for the Unified Resource Manager to manage second level (nested) hypervisors
- z/VM provides the ability for customers to test networking configurations 2nd level from the Unified Resource Manager by:
 - Virtualizing OSX and OSM CHPIDs using z/VM's VSwitch.
 - The ability for system administrator to create an IEDN or INMN VSwitch without connectivity to the physical networks for test purposes.

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z196 Unified Resource Manager SMAPI Support

- **Additional SMAPI support primarily for the Unified Resource Manager environment**
 - Required to utilize ensemble networking resources
 - Required for communication between z/VM and the ensemble HMC
 - Required to start firmware management guests
- **Areas of new/extended SMAPI: Disk, DCSS, Directory Parsing, Networking, System Configuration management**
- **DirMaint™ changes in support of the above**
- **Support associated with diagnose x'2C4' (SCLP FTP) and permission to use.**
- **Miscellaneous**
 - Includes SMAPIs for Hypervisor Performance Management
 - For example, APIs to change a guests relative share or obtain performance data via the INDICATE command

Migration Summary





Specialty Engine – Migration Considerations Part 1



General Migration Considerations

- Always use proper sizing tools like zPCR or CP3000
- Techline/ATS whitepaper and sizing questionnaires available at URL: <http://w3-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS2840>

Common Pools – z890 & z990 servers

- zAAPs, CFs, and Linux partitions all use ICF CPs which are managed out of a single pool of capacity
- Managed independently from the General CP pool
- zAAPs will acquire their characteristics from the z/OS partitions using the zAAPs
- If z/OS uses dedicated CPs, the zAAPs defined to the partition will be dedicated. If z/OS uses shared CPs, the zAAPs defined to the partition will use shared CPs and the weight given to the zAAPs will be equal to the z/OS partitions weight
- The ICF pool's partition weights need to be updated to reflect the introduction of the zAAP

Managed Pools – System z9, System z10, and z196

- zAAP weight can be set independently from z/OS partition
- zIIP weight can be set independently from z/OS partition
- Hard Cap state is done by pool
- GCPs can be capped, while zIIPs and zAAPs are not

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Specialty Engine – Migration Considerations Part 2



Migrations to System z10 & z196 servers

- Considerations for Decimal Floating Point. A C/C++ program compiled with the ARCH() or TUNE() options can only run on the server architecture level set that they were compiled for, or an operation exception will result. This is a consideration for programs that may need to run on different level servers during development, test, production, and during fallback or DR.
- Term IFA (Integrated Facility for Applications) updated to zAAP (System z Application Assist Processors) on all HMC/SE panels

Informational documentation and Web sites

- zIIP / zAAP Software Update – TD103516
<http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/TD103516>
- Web zIIP Information
<http://www-03.ibm.com/systems/z/advantages/ziip/gettingstarted/>
- Web zAAP Information
<http://www-03.ibm.com/systems/z/advantages/zaap/gettingstarted/prereqs.html>

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Memory – Migration Considerations Part 1



Enhanced availability during Book Repairs (System 9, z10 and z196)

- To enhance availability Consider Installing/Using Flex Memory on System 9, 10 EC and System z196 servers, flex memory requires configurations with two books and higher.

Disruptive memory upgrades

- Adding or increasing physical memory can be disruptive depending upon the system configuration. While single book changes will always be disruptive, the impact to changes on machines with multiple books can be reduced by using EDM but can still require temporary loss of memory and processor resources depending on the preplanning of books and flex memory available. Installing additional physical memory in advance can reduce or avoid these situations.
- Plan Ahead Memory should be used for customers that require non-disruptive changes. Logical memory increments can be enabled concurrently at a later date via microcode only upgrades. System z10 and z196 servers only.

HSA Considerations

- System z9 users should refer to the “HSA Estimator” under Resource Link to obtain HSA accurate estimates. Tool not available for System z10 & z196 configurations.
- HSA sizing should be accounted for on System z9 servers. On System z10 & z196 servers, dedicated memory is allocated for HSA usage which eliminates the need to account for the impact of HSA on these machines.

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Memory – Migration Considerations Part 2



Review MVS RSU parameter / reserved memory

- Review reserved memory settings in the Support Element image profiles
- Larger increment sizes may result in too much memory being reserved for reconfiguration after a migration unless proper RSU options are used

Operating System Memory Limitations (System z10 EC)

- The maximum real memory that can be assigned to a partition on a z10 EC & z196 server is 1 TB

Support Element IMAGE Profile – Engine Count

- Validate that the number of engines, CP, zIIP and zAAP (initial + reserved) does not exceed the number of engines supported by the operating System
- For System z10 & z196 partitions running in “z/VM Mode”, validate that the number of engines, CP, zIIP, zAAP, IFL, ICF (initial + reserved) does not exceed the number of engines supported by the operating System

Large Page Support (System z10 only)

- The Large Page support function will not be enabled without the software. Page frames will be allocated at the current 4K size without the large page support
- There is a new LFAREA=xx%|xxxxxxM|xxxxxxG parameter in the IEASYSxx member of SYS1.PARMLIB – Default is zero
- It can NOT be changed dynamically

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I/O Migration Considerations



z9 BC PSIFB (HCA) Considerations

- Up to 6 HCA1-O fanout cards (12 links) can be installed on a z9 BC S07 model
- Up to 6 HCA1-O fanout cards (12 links) can be installed on a z9 BC R07 models except for the model A01 which is limited to only 8 IFB links total

z9 EC PSIFB (HCA) Considerations

- HCA plugging is restricted to 6 HCA1-O fanout cards (12 links) on a z9 EC model S08, up to 8 total HCA1-O fanout cards can be plugged on a z9 EC model S18 or higher (16 links). This is due to a power restriction on the System z9 EC.

z10 EC I/O Card Slot Usage

- All I/O domains (domain six or G) are not used until all other domains are full in all other I/O cages. Only when more than 72 I/O cards are required, will the last domain (domain six or G) be populated which fill all 28 slots.
 - One I/O Cage = 0 –24 slots (cards)
 - Two I/O Cages = 25-48 slots (cards)
 - Three I/O Cages = 49-84 slots (cards)

z10 BC I/O Drawers

- I/O Drawer Power Planning
 - Single phase machine power only supports up to two I/O drawers, Three phase machine power will support up to four I/O drawers (maximum config).
 - Converting single phase power to three phase power is a disruptive change.

z196 I/O Cages and Drawers

- The z196 supports a mix of I/O cages and Drawers
- Cage / Drawer mix is determined by the number of I/O slots that are used, always refer to eConfig for determining the mix of drawers and cages that will be installed
- Drawers add/remove concurrent, Cage add/remove disruptive
- No support for I/O cage planehead
- Greater than 72 slots, call PPAC
- Greater than 240 ESCON, call PPAC

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ESCON – Migration Considerations



MT-RJ/ESCON Conversion Jumpers

- On early zSeries servers (z800 and z900) the ESCON conversion jumper (MT-RJ to Duplex) was available for ordering with the server, as such they are considered to be part of the ship group and should be returned with the original system when it is replaced.
 - Consider eliminating the need for these jumpers by replacing older ESCON duplex cables with cables that have MT-RJ connections or review the "Fiber Quick Connect" (FQC) feature that is available for ordering on System z10 servers.
 - If MT-RJ jumpers are still required then the customer will need to order replacements. The MTRJ jumper is available for ordering from IBM Fiber Cabling Services.
 - ESCON Duplex Receptacle to MT-RJ Connector, 2 meter, 62.5 MM, P/N 05N4804.

MCSS/LCSS Spanning

- MCSS / LCSS functionality was introduced on z890/z990 server and has been carried forward on subsequent servers. Spanning is a process that allows sharing of channel resources between LPARs running on MCSS / LCSS configurations. ESCON does not support spanning. Careful planning is required to assure that there are enough ESCON channel ports available for servers that will be utilizing multiple LPARs configured to run in a multiple MCSS/LCSS configuration.

z890/z990 Complex Migration using HCD and HCM

- Techdoc WP100563, URL: www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP100563

MT-RJ Jumper Tip

- Defective MT-RJ jumper removal tip – Refer to retain tip H18365

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Network – Migration Considerations Part 1



Validate OSA transceiver type (SX vs LX)

- Always review old / new configurations to assure the correct transceiver type was ordered, long wave (LX) vs short wave (SX). Must match the connection that the channel will be connecting to on the switch or Network device.

OSA-Express3 Card

- OSA-Express3 cards are available in 1GBE, 10GBE and 1000BASE-T features and are currently only available on the System z10 servers
- The connector on the OSA-Express3 10GBE cards has changed from SC to LC, feature codes 3370 and 3371
- For the operating system to recognize all four ports on an OSA-Express3 Gigabit Ethernet or 1000BASE-T card running in QDIO mode (OSD), a new release and/or PTF is required. If software updates are not applied, only two of the four ports will be "visible" to the operating system. Refer to operating system function charts for required software levels. For OSA-Express3 1000BASE-T cards running in non-QDIO mode (OSE), no software is required, all 4 ports are usable.
- OSA-Express3-2P Cards, FC 3369 and FC 3373 are only supported on the z10 BC
- Only the 1000BASE-T cards support the auto-negotiation feature
- For more information on defining multiple ports per CHPID, see <http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101377>

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Network – Migration Considerations Part 2



SNA Traffic (Non-QDIO mode, OSA-1000BASE-T)

- For customers that require SNA/APPN/HPR TCP/IP passthru, you must use a card that supports non QDIO operation which is currently only supported on the 1000BASE-T cards
- On machine migrations, assure that a plan is in place to reload the OSA OAT tables (OSA-1000BASE-T cards / non-QDIO mode)

OSA Segmentation

- Review latest exception letters and TIPs regarding the use of OSA Segmentation
- Information on the related code levels for OSA has been updated in TDR H191773, also review Hiper APAR PK46334

Migrations from z800 & z900 servers running in QDIO mode

- Review VTAM® TRLE PORTNAME to device name requirements (SAPR mustread, z890/z990 and higher). The PORTNAME on VTAM's TRLE must match the device name in the DEVICE statement in the TCPIP profile and they must all be the same in every instance of TCPIP/VTAM that share the same OSA adapter.

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FICON – Migration Considerations Part 1



Validate FICON transceiver type (SX vs LX)

- Always review old / new configurations to assure the correct transceiver type was ordered, long wave (LX) vs short wave (SX). Must match the connection that the channel will be connecting to on the director or Storage / I/O device.
- If connecting through a director then you must match the channel to the director input port only, the output port of the director can be a different transceiver type.

FICON Express4 2-Port Card

- The FICON Express4 2-port card is only valid on z9 BC and z10 BC configurations only, these cards cannot be ordered or carried forward to System z10 EC models or on the z196.

Migrations from servers using FICON Bridge (FCV mode)

- FICON Express2 and FICON Express4 features do not support FCV mode. FCV mode is available on System z9 & z10 servers only if FICON Express LX feature 2319 is carried over on upgrades. It is intended that the System z10 servers will be the last to support FICON Express LX feature 2319 and CHPID type FCV (SOD).
- Review OEM options for customers that require FICON to ESCON bridge technology (PRIZM FICON to ESCON Converter).
- FICON converter (FCV) channels do not support spanning (MCSS/LCSSL).

FICON Express8

- FICON Express8 does not support direct attachment to devices running at 1 Gbps. If you have devices that run at 1 Gbps you must connect via a FICON director or use FICON Express4.

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FICON – Migration Considerations Part 2



FCP Connectivity

- NPIV exploitation requires an FC switch that supports the NPIV standard. It is not supported in a point-to-point topology.
- FCP SCSI IPL feature enabler (FC 9904) is standard on System z10, no need to order.

Upgrades – Carry Forward

- FICON and FICON Express2 are supported on z10 EC, z9 EC, and z9 BC servers only if carried forward on an upgrade. These feature cannot be ordered new.

zHPF Support

- Supported on System z10 & z196
- Only supported on FICON Express8, Express4 and FICON Express2
- Only used if all CHPIDs and associated control unit ports support zHPF protocol

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Crypto Migration Considerations



CPACF

- CPACF functionality was introduced on the z890 / z990 servers and above, functionality has changed over the previous use of servers using CCF. Refer to the tecdocs below for details.
 - <http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/TD101704>

Crypto CEX2C / CEX3C Cards

- CEX2C and CEX3C cards do not require CHPID assignments
- When carrying forward CEX2C cards, assure plans are in place to reload any keys that were stored in these devices.

ICSF Considerations

- Customers should review their current HCR release and establish a migration plan before installing the new FMID.

TKE Workstation

- The TKE workstation only supports Ethernet adapters to connect to a Local Area Network operating at 10, 100, or 1000 Mbps

LPAR Migration Considerations Part 1



Migrations from z800 / z900

- **Introduction to LCSS/MCSS**
 - Review LCSS/MCSS. Techdoc WP100563 “z890/z990 Complex Migration Using HCD and HCM”
 - <http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP100563>
- **Partition ID changes**
 - Review changes in Partition Identification. Techdoc WP100418 “zSeries Partition Identification in an MCSS Processor”
 - <http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP100418>

Migrations from z890 / z990

- **Specialty Engines**
 - Specialty engine pooling assignments have changed, review and update LPAR profile weights and capping assignments



LPAR Migration Considerations Part 2



Migrations to System z10 & z196

▪ HiperDispatch

- Review Techdoc WP101229 “z/OS: Planning Considerations for HiperDispatch Mode”
 - <http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101229>
- There is a new **HIPERDISPATCH=YES/NO** parameter in the IEAOPTxx member of SYS1.PARMLIB and with the SET OPT=xx command to control whether HiperDispatch is enabled or disabled for this system
 - Can be changed dynamically
 - HiperDispatch is disabled by default
 - HiperDispatch is supported on z/OS 1.7 with zIIP support, z/OS 1.8 and z/OS 1.9 releases
 - A Health Check will be provided to verify that HiperDispatch is enabled on a z10 EC system

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Cabling Considerations



Migrations to System z9, System z10 & z196

- System z196
 - Cables not supplied with server, customer must acquire all channel cables including PSIFB
- System z9 and z10
 - The only cables available for ordering with the System z9 and System z10 servers are the ICB cables. All other cabling (ESCON, FICON, OSA, ISC, PSIFB) including conversion cables should be ordered through IBM GTS, Anixter or customer cable supplier.
- ICB-4 Cables
 - A change was made to the ICB-4 connector on System z10 machines. New cables are required when connecting to a System z10 server. Two cables are available for ordering, one supports cabling connectivity from a z10 to z9 (or below) server and the other supports connectivity from a z10 to z10 server. Assure that the appropriate cables have been ordered.
- OSA-Express3 Connector Change
 - The OSA-Express3 connectors were changed from SC Duplex to LC Duplex

Migrations to System z10 BC

- I/O Drawers
 - I/O cards are installed horizontally in the I/O drawers. It is very important that cables are routed to the side cable trough else concurrent replacement of I/O cards may not be possible.

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Performance Considerations



Sizing Tools

- IBM sizing tools should always be used when migrating workloads between servers
- Always check to assure that you are running the latest tool release. IBM employees can check the ATS Web site and download the latest releases from URL:
 - <http://w3-03.ibm.com/support/americas/wsc/cpsproducts.html>

System z10 and z196 Servers

- HiperDispatch Considerations
 - LSPR measurement for z/OS is represented with HiperDispatch turned on. To allow for migration and tuning, the z/OS setting for HiperDispatch is OFF.
 - Review Techdoc WP101229 “z/OS: Planning Considerations for HiperDispatch Mode”
 - <http://www-03.ibm.com/support/techdocs/atmastr.nsf/WebIndex/WP101229>

z196 Physical Planning Considerations

- Similar floor loading, cooling and weight considerations as System z10
- Conversions not allowed from Air to Water or Water to Air, new build only
- Customer will need additional time for ordering, installing and positioning data center(s) for optional HVDC power feature
- Customer will need additional time for ordering, installing and positioning data center(s) for optional water cooling feature
- Multiple PDU's recommended for server power cords, up to 2 power plugs per PDU
- Multiple computer room air conditioning (CRAC) water taps required for optional water cooling feature
- Zero clearance install side to side not possible with System z9 or older – doors on older machine will not open
- System z site preparation/ installation support available for European Countries. New machine type (2819) for ordering of for the delivery of site preparation/installation support materials on z196, System z10 EC, and System z10 BC

zBX Planning Considerations



No mixing of customer components in zBX racks (IE: no customer supplied switches, BladeCenters, etc.)

Two fully-redundant power supplies (PDUs) support a single zBX BladeCenter.

- Each PDU has it's own line cord and can support the BladeCenter if one of the PDU's should fail. Each power feed should be able to handle full load of BladeCenter and wired to a separate building power source.
- There can be up to two BladeCenters per rack, or up to 4 power plugs per frame. Up to 16 power plugs for a 4 zBX rack configuration.

Optional Rear Door Heat Exchanger (RDHX), special considerations or conditioning for Primary and Secondary loops, refer to zBX IMPP for recommendations (dew point, water flow rates, materials for loop).

- Contact GTS for data center services
- Water cooling units, Coolcentric (formally Vette) URL: <http://www.coolcentric.com/>

26 meter (85 ft) distance restriction between z196 and zBX

- Account for interframe connectivity distance to TOR and BPH, distance between frames will be closer to 23 meters (75 ft) between the z196 server and the zBX frames

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Reference and Education



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Education and Training – Redbooks

z196 Redbooks:

- IBM System z196 Enterprise Class Technical Introduction, SG24-7832
- IBM System z196 Enterprise Class Technical Guide, SG24-7833
- IBM System z Connectivity Handbook, SG24-5444
- IBM System z196 Enterprise Class Configuration Setup, SG24-7834
- IBM System z196 Platform Management, SG24-7835

RedGuide_1: Advantaging Application Workloads in a z196 Environment "Value Guide"

- This guide will articulate the business value of z196/Hybrid from customer perspective of how workloads can be optimized in this environment

RedGuide_2: Planning for Application Workloads to exploit z196 - "Companion Guide"

- This guide will outline the IT architecture planning tasks to migrate an application/workload from a current environment to z196, optimized environment. It will provide a mapping to reference information (both formal publications, papers, and web information (such as capacity planning tools) that users will need to perform planning tasks.

Red Book: Application workloads

- This book will describe provide a deeper, execution view of the identifying the characteristics of an application that may be advantaged in a workload optimized environment (z196)
- Through the use of specific (anonymous) scenarios and showcases derived from the workload profiling, scenarios will be used to describe workloads showing a current topology and a future, z196 optimized topology. Some of these scenarios may include:
 - SAP applications (financial, and ERM/CRM)
 - Insurance workloads using web services deployed on System z, System p, and Intel blades
 - Banking applications that can be optimized by using data power for web applications
 - Target Completion: December, 2010

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zEnterprise Reference Information

z196 Publications

- *System Overview SA22-1086*
- *Hardware Management Console Operations Guide SC28-6895*
- *Support Element Operations Guide SC28-6896*
- *Installation Manual GC28-6890*
- *Installation Manual for Physical Planning GC28-6897*
- *Maintenance Information for Fiber Optic Links SY27-2597*
- *Parts Catalog GC28-6869*
- *Safety Inspection GC28-6894*
- *Safety Notices G229-9054*
- *Service Guide GC28-6892*
- *ESCON and FICON Channel to Channel Reference SB10-7034*

Ensemble Publications

- *Introduction to Ensembles GC27-2609*
- *Ensemble Planning and Configuring Guide GC27-2608*
- *Ensemble Performance Management Guide GC27-2607*
- *Hardware Management Console and Support Element Operations Guide for Ensembles SC27-2606*

Refer to IBM Resource Link for a complete list of publications

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zBX Reference Information

zBX Publications

- z196 System Overview SA22-1086
- Hardware Management Console Operations Guide SC28-6895
- Support Elements Operations Guide SC28-6896
- zBX Installation Manual (2458-002) - need to fix link when pub avail GC27-2610
- zBX Installation Manual for Physical Planning (2458-002) GC27-2611
- zBX Safety Inspection GC28-6889
- zBX Service Guide GC28-6884
- zBX Parts Catalog - Appendix in zBX Service Guide GC28-6884
- System z Statement of Limited Warranty GC28-6883
- BladeCenter HS22 (Type 7870) Installation and User's Guide 59Y6959
- BladeCenter HS22 (Type 7870) Problem Determination and Service Guide 59Y6960*
- BladeCenter PS701 and PS702 (Type 8406) Installation and User's Guide - fix link 44R5338
- BladeCenter HS22 (Type 7870) Problem Determination and Service Guide 59Y6960*
- 7014 Series Model T00 and Model T42 System Rack SA38-0577
- IBM eServer xSeries Rack Planning Guide 02R2777
- Installation and Maintenance Guide - DPI C13 PDU+, DPI C13 3-phase PDU+, DPI C19 PDU+, and DPI C19 3-phase PDU+ 43V6030
- Installation and Maintenance Guide - Ultra Density Enterprise C19/C13 PDU+ and PDU Modules 46M1388
- BladeCenter Advanced Management Module User's Guide 44R5380
- IBM Safety Information 02R2735
- Complete Hardware Guide for IBM Ethernet Switch J48E GA32-0663
- Safety Notices G229-9054

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STP References and Additional Information

- **Redbooks**
 - Server Time Protocol Planning Guide, SG24-7280
 - <http://www.redbooks.ibm.com/redpieces/abstracts/sq247280.html>
 - Server Time Protocol Implementation Guide, SG24-7281
 - <http://www.redbooks.ibm.com/redpieces/abstracts/sq247281.html>
- **Education**
 - Introduction to Server Time Protocol (STP)
 - Available on Resource Link at General Availability (GA)
 - www.ibm.com/servers/resourcelink/hom03010.nsf?OpenDatabase
- **STP Web site**
 - www.ibm.com/systems/z/ps0/stp.html
- **Systems Assurance**
 - The IBM team is required to complete a Systems Assurance Review (SAPR Guide, SA06-012) and to complete the Systems Assurance Confirmation Form via Resource Link
 - <http://w3-03.ibm.com/support/assure/assur30i.nsf/WebIndex/SA779>
- **For further information on NTP and the NTP Public services project, refer to the Web sites:**
 - <http://www.ntp.org>
 - <http://support.ntp.org>
 - <http://www.faqs.org/rfcs/rfc1305.html>

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End



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Dank u
Dutch

Merci
French

Спасибо
Russian

Gracias
Spanish

شكراً
Arabic

감사합니다
Korean

Tack så mycket
Swedish

धन्यवाद
Hindi

תודה רבה
Hebrew

Obrigado
Brazilian Portuguese

Dankon
Esperanto

Thank You

谢谢
Chinese

ありがとうございます
Japanese

Trugarez
Breton

Danke
German

Tak
Danish

Grazie
Italian

நன்றி
Tamil

děkuji
Czech

ขอบคุณ
Thai

go raibh maith agat
Gaelic

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