IBM zEnterprise System – What’s New

Bringing Hybrid Computing to Organizations of all Sizes with the IBM zEnterprise 114 (z114)

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IBM System z Family
IBM System z10 family

IBM System z10 EC (2097)
- Announce 2/08 – Server w/ up to 77 PU cores
- 5 models – Up to 64-way
- Granular Offerings for up to 12 CPs
- PU (Engine) Characterization
  - CP, SAP, IFL, ICF, zAAP, zIIP
- On Demand Capabilities
  - CoD, CIU, CBU, On/Off CoD, CPE
- Memory – up to 1.5 TB for Server and up to 1 TB per LPAR
  - 16 GB Fixed HSA
- Channels
  - Four LCSSs
  - 2 Subchannel Sets
  - MIDAW facility
  - 63.75 subchannels
  - Up to 1024 ESCON® channels
  - Up to 336 FICON® channels
  - FICON Express2, 4 and 8
  - zHPF
  - OSA 10 GbE, GbE, 1000BASE-T
  - InfiniBand® Coupling Links
- Configurable Crypto Express3
- Parallel Sysplex clustering
- HiperSockets™ – up to 16
- Up to 60 logical partitions
- Enhanced Availability
- Operating Systems
  - z/OS, z/VM, z/VSE™, TPF, z/TPF, Linux on System z

IBM System z10 BC (2098)
- Announced 10/08 – Server w/ 12 cores
- Single model – Up to 5-way CPs
- High levels of Granularity available
  - 130 Capacity Indicators
- PU (Engine) Characterization
  - CP, SAP, IFL, ICF, zAAP, zIIP
- On Demand Capabilities
  - CoD, CIU, CBU, On/Off CoD, CPE
- Memory – up to 256 GB for Server
  - 8 GB Fixed HSA
- Channels
  - Two LCSSs
  - 2 Subchannel Sets
  - MIDAW facility
  - 63.75 subchannels
  - Up to 480 ESCON channels
  - Up to 128 FICON channels
  - FICON Express2, 4 and 8
  - zHPF
  - OSA 10 GbE, GbE, 1000BASE-T
  - InfiniBand Coupling Links
- Configurable Crypto Express3
- Parallel Sysplex clustering
- HiperSockets – up to 16
- Up to 30 logical partitions
- Enhanced Availability
- Operating Systems
  - z/OS, z/OS e, z/VM, z/VSE, TPF, z/TPF, Linux on System z
Hardware Withdrawals:
IBM System z10 EC and IBM System z10 BC

- Effective June 30, 2012, IBM is withdrawing the following selected products from marketing worldwide
  - All models of the IBM System z10 Enterprise Class (z10 EC) and all upgrades to the z10 EC from the IBM eServer zSeries 990 (z990), IBM System z9 EC (z9 EC), or IBM System z10 BC (z10 BC).
  - All models of the IBM System z10 Business Class (z10 BC) and all upgrades to the z10 BC from the IBM eServer zSeries 890 (z890) or IBM System z9 BC (z9 BC).
  - Model conversions and hardware MES features applied to an existing z10 EC or z10 BC server.

- Field installed features and conversions that are delivered solely through a modification to the machine's Licensed Internal Code (LIC) will continue to be available until June 30, 2013. After June 30, 2013, features and conversions that are delivered solely through a modification to the LIC will be withdrawn.

- The Capacity on Demand offerings that are configured prior to withdrawal are usable until the offering expiration date or termination date, as applicable

IBM zEnterprise 196 Feature

- Effective December 31, 2011 IBM System z will withdraw from marketing the following feature on IBM zEnterprise 196 (z196):
  - HCA2-O LR fanout for 1x IFB (#0168)
  - On or after the effective dates for the withdrawal of these offerings, you can no longer order these products directly from IBM.
IBM zEnterprise family

**IBM zEnterprise 196 (2817)**
- Announced 7/10 – Server w/ up to 96 PU cores
- 5 models – Up to 80-way
- Granular Offerings for up to 15 CPs
- PU (Engine) Characterization
  - CP, SAP, IFL, ICF, zAAP, zIIP
- On Demand Capabilities
  - CoD, CIU, CBU, On/Off CoD, CPE
- Memory – up to 3 TB for Server and up to 1 TB per LPAR
  - 16 GB Fixed HSA
- Channels
  - Four LCSSs
  - 3 Subchannel Sets
  - MIDAW facility
  - Up to 240 ESCON channels
  - Up to 288 FICON channels
  - FICON Express8 and 8S
  - zHPF
  - OSA 10 GbE, GbE, 1000BASE-T
  - InfiniBand Coupling Links
- Configurable Crypto Express3
- Parallel Sysplex clustering
- HiperSockets – up to 32
- Up to 60 logical partitions
- Enhanced Availability
- Unified Resource Manager
- Operating Systems
  - z/OS, z/VM, z/VSE, z/TPF, Linux on System z

**IBM zEnterprise Blade Extension (2458)**
- Announced 7/10
- Model 002 for z196 or z114
- zBX Racks with:
  - BladeCenter Chassis
  - N + 1 components
  - Blades
  - Top of Rack Switches
  - 8 Gb FC Switches
  - Power Units
  - Advance Management Modules
- Up to 112 Blades
  - IBM Smart Analytics Optimizer Solution
  - POWER7 Blades
  - IBM System x Blades
  - IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise (M/T 2462-4BX)
- Operating Systems
  - AIX 5.3 and higher
  - Linux for x Blades
  - Microsoft Windows for x Blades*
- Hypervisors
  - PowerVM Enterprise Edition
  - Integrated Hypervisor for System x

**IBM zEnterprise 114 (2818)**
- Announced 07/11
- 2 models – M05 and M10
  - Up to 5 CPs
- High levels of Granularity available
  - 130 Capacity Indicators
- PU (Engine) Characterization
  - CP, SAP, IFL, ICF, zAAP, zIIP
- On Demand Capabilities
  - CoD, CIU, CBU, On/Off CoD, CPE
- Memory – up to 256 GB for Server
  - 8 GB Fixed HSA
- Channels
  - Two LCSSs
  - 2 Subchannel Sets
  - MIDAW facility
  - Up to 240 ESCON channels
  - Up to 128 FICON channels
  - FICON Express8 and 8S
  - zHPF
  - OSA 10 GbE, GbE, 1000BASE-T
  - InfiniBand Coupling Links
- Configurable Crypto Express3
- Parallel Sysplex clustering
- HiperSockets – up to 32
- Up to 30 logical partitions
- Unified Resource Manager
- Operating Systems
  - z/OS, z/VM, z/VSE, TPF, z/TPF, Linux on System z

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Key Dates
IBM zEnterprise 114 (z114) and z196 GA2 Key Dates

- **IBM zEnterprise 114 (z114) and z196 GA2 Announce – July 12, 2011**
  - First Day Orders for z114 and z196 GA2
  - Resource Link™ support available
  - Capacity Planning Tools Updated
    - zPCR, zCP3000, zTPM, zPSG,
    - BWA Tool, CP3KEXTR, CP3KVMXT
    - VM Planner
  - SAPR Guide and SA Confirmation Checklist available
    - New, SAPR Guide for z114, SA11-002
    - Updated, SAPR Guide for z196, SA10-010
    - Updated, SAPR Guide for zBX Model 002, SA10-006

- **ITSO Redbooks® (Draft versions) – July 12, 2011**
  - New - z114 Technical Guide, SG24-7954-00 - draft available
  - Updated - zEnterprise Technical Introduction, SG24-7832-01, draft available
  - Updated - z196 Technical Guide, SG24-7833-01, draft available
  - Updated - IBM System z Connectivity Handbook, SG24-5444-12 - draft available
  - zEnterprise Unified Resource Management, SG24-7921
IBM zEnterprise 114 (z114) and z196 GA2 Key Dates for Hardware

- **Planned Availability Dates:**
  - **September 09, 2011 – Driver 93**
    - IBM zEnterprise 114 Models M05 and M10 new builds
    - Field installed features and conversions that are delivered solely through a modification to the machine's Licensed Internal Code (LIC):
      - LIC only upgrades for any PU type and memory
      - LIC for CBU and On/Off Capacity upgrade for installed z114s
      - z114 Capacity Setting downgrades
    - IBM System z9® Business Class (z9® BC) upgrades to z114
    - IBM System z10™ Business Class (z10 BC™) upgrades to z114
    - NEW z196s at GA2 level
      - MES for new function/features for installed z196s
    - TKE Support for LIC 7.1
  - **September 26, 2011**
    - Unified Resource manager functions:
      - Manage suite (#0019) enhancements
      - Automate/Advanced Management Firmware Suite (#0020) enhancements
      - Manage Firmware System x Blade (#0042)
      - Advanced Management Firmware System x Blade (#0046)
      - Selected HX5 Blades for zBX
      - Linux on x Blades
  - **October 21, 2011**
    - Add a zBX as an MES to the installed z114
  - **December 31, 2011**
    - z114 Model M05 to M10 upgrades
    - Feature adds (memory, I/O, RPQs and zBX features)
  - **Future**
    - Microsoft Windows (64-bit only) for select IBM System x Blades in a zBX

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Basics of z114 and zBX
Introducing the IBM zEnterprise 114
Extending hybrid computing to a broader set of businesses

IBM zEnterprise 114 (z114)
The next generation midrange mainframe delivering extensive growth options, flexibility, efficiency and improved price performance.

zEnterprise Unified Resource Manager
Centralized management of heterogeneous resources for simplification and resiliency

zEnterprise BladeCenter Extension (zBX)
Integrated IBM POWER7 blades, IBM System x blades, and High-performance optimizers and appliances
Looks like a rack with BladeCenters but much more...

- **zBX is assembled and built at the IBM plant**
  - All parts and microcode - tested and shipped as a completed package

- **zBX hardware redundancy provides improved availability**
  - Redundant switches provide guaranteed connection between z196/z114 and zBX
  - Redundant Power Distribution Units improve availability
  - Extra blowers manage heat dispersion/removal

- **zBX provides an isolated and secure network**
  - Four top-of-rack switches for connection to the controlling z196
  - Traffic on user networks not affected
  - Provides the foundation for the Unified Resource Manager
New Blades Provide Added Flexibility for Workload Deployment and Integration

- **Introducing System x Blades in the zBX**
  - IBM BladeCenter HX5 7873 dual-socket 16-core blades
  - Complements existing portfolio of POWER7, DataPower XI50z and IBM Smart Analytic Optimizer blades.
  - Ordered and fulfilled through System x providers
  - Blades assume System x warranty and maintenance when installed in the zBX

- **Unified Resource Manager will install an integrated hypervisor on blades in the zBX**
  - KVM-based with IBM service and support

- **Up to 112 Blades supported on zBX**
  - Ability to mix and match DataPower XI50z, POWER7 and System x blades in the same chassis for better zBX utilization
  - IBM Smart Analytics Optimizer can mix with others in same rack
  - Number of blades supported varies by type

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Extending support to New Operating System Environments

- **Support for Linux and in the future Windows environments on select System x blades**
  - 64-bit version support only
  - Linux: RHEL 5.5, SLES 11 SP1
  - Additional versions to follow
  - In the future we are planning to support Microsoft® Windows® Server 2008 - Datacenter Edition

- **Certifications inherited from System x**
- **Operating Systems are customer acquired and installed**

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Putting zEnterprise System to the Task

Use the smarter solution to improve your application design

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IBM zEnterprise 114
z114 Overview

- **Machine Type**
  - 2818

- **2 Models**
  - M05 and M10
  - Single frame, air cooled
  - Non-raised floor option available
  - Overhead Cabling and DC Power Options

- **Processor Units (PUs)**
  - 7 PU cores per processor drawer (One for M05 and two for M10)
  - Up to 2 SAPs per system, standard
  - 2 spares designated for Model M10
  - Dependent on the H/W model - up to 5 or 10 PU cores available for characterization
    - Central Processors (CPs), Integrated Facility for Linux (IFLs), Internal Coupling Facility (ICFs), System z Application Assist Processors (zAAPs), System z Integrated Information Processor (zIIP), optional - additional System Assist Processors (SAPs)
  - 130 capacity settings

- **Memory**
  - Up to 256 GB for System including HSA
    - System minimum = 8 GB (Model M05), 16 GB (Model M10)
    - 8 GB HSA separately managed
    - RAIM standard
    - Maximum for customer use 248 GB (Model M10)
    - Increments of 8 or 32 GB

- **I/O**
  - Support for non-PCIe Channel Cards
  - Introduction of PCIe channel subsystem
    - Up to 64 PCIe Channel Cards
    - Up to 2 Logical Channel Subsystems (LCSSs)

- **STP - optional** (No ETR)
**zEnterprise 114 Functions and Features**

**Two hardware models**
- Up to 10 processors configurable as CPs, zAAPs, zIIPs, IFLs, ICFs, or optional SAPs
- Up to 26 subcapacity settings across a maximum of 5 CPs
- Up to 256 GB of Redundant Array of Independent Memory (RAIM) for System
- Dedicated Spares on the Model M10
- Increased capacity processors
- Out of order instruction execution
- Improved processor cache design
- New and additional instructions
- On Demand enhancements
- CFCC Level 17 enhancements

**Cryptographic enhancements**
- 6 and 8 GBps interconnects
- STP enhancements

**Blue items denote common features between z114 and z196**

- Doubled HiperSockets™ to 32
- Doubled Coupling CHPIDs to 128
- New 32 slot PCIe Based I/O Drawer
- Increased granularity of I/O adapters
- New form factor I/O adapters i.e. FICON® Express8S and OSA-Express4S
- Improved PSIFB Coupling Link
- Physical Coupling Links increased to 72
- Optional High Voltage DC power
- Optional overhead I/O cable exit
- NRF Support with either top exit or bottom exit I/O and power
- Reclassification from “general business” environment to “data center”
- Additional CHPIDs – OSM for INMN and OSX for IEDN
- zBX Model 002 with ISAOPT, POWER7, DataPower and IBM System x Blades
- Platform Management from HMC

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z114 – Under the covers

- Internal Batteries (optional)
- Power Supplies
- 2 x Processor Drawers, Memory & HCAs
- I/O Drawer
- PCIe I/O drawers
- 2 x Support Elements

Ethernet cables for internal System LAN connecting Flexible Service Processor (FSP) cage controller cards (not shown)
z114 Processor and Memory Structure
Processor / Memory Subsystem Drawers (Model M05 and M10)

- System resources split between 2 drawers (Model M10)
- Second processor drawer (Model 10) for:
  - Increased specialty engine capability
  - Increased memory capability
  - Increased I/O capability
    - More coupling links than z10 BC
    - More I/O features than z10 BC

Note: Unlike the z196 Books, add/remove/repair of the processor drawer is disruptive
z114 Model Structure and Upgrades

- Model structure based on number of drawers
- M05 sparing based on prior Business Class (BC) offerings – no dedicated spares
- M10 sparing based on Enterprise Class (EC) offerings – dedicated spares
- **Disruptive** upgrade from M05 to M10
  - No model downgrades
- Upgrades from z9 BC and z10 BC into either model M05 or M10
- Only the M10 will upgrade to z196 Model M15 (Air cooled only)

<table>
<thead>
<tr>
<th>Model</th>
<th>CPs</th>
<th>IFLs</th>
<th>zAAPs</th>
<th>zIIPs</th>
<th>ICFs</th>
<th>Std. SAPs</th>
<th>Add’l SAPs</th>
<th>Spares</th>
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<tr>
<td>M10</td>
<td>0-5</td>
<td>0-10</td>
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<td>0-10</td>
<td>2</td>
<td>0-2</td>
<td>2</td>
</tr>
</tbody>
</table>
z114 RAIM Memory

- Memory technology introduced on the z196 is used on the z114
  - Redundant Array of Memory (RAIM) which in the Disk industry is known as RAID
  - Protection from Unscheduled Incident Repair Actions (UIRAs) caused by a DIMM failure
    - DIMM failures include all components on the DIMM
    - Portions of the memory controller or card failure isolated to one memory channel

- Flexible memory option not available on z114
zEnterprise Capacity and Performance Planning
z114 continues the CMOS Mainframe heritage

- Multiprise 2000 – 1st full-custom Mid-range CMOS S/390
- Multiprise 3000 – Internal disk, IFL introduced on midrange
- z800 - Full 64-bit z/Architecture®
- z890 - Superscalar CISC pipeline
- z9 BC - System level scaling
- z10 BC - Architectural extensions
- Higher frequency CPU
- z114 – Additional Architectural extensions and new cache structure

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z114 Sub-capacity Processor Granularity

- The z114 has 26 CP capacity levels (26 x 5 = 130)
  - Up to 5 CPs at any capacity level
    - All CPs must be the same capacity level
- The one for one entitlement to purchase one zAAP and/or one zIIP for each CP purchased is the same for CPs of any speed.
  - All specialty engines run at full speed
  - Processor Unit Value for IFL = 100

<table>
<thead>
<tr>
<th>Number of z114 CPs</th>
<th>Base Ratio</th>
<th>Ratio z10 BC to z114</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 CP</td>
<td>z10 BC Z01</td>
<td>1.18</td>
</tr>
<tr>
<td>2 CPs</td>
<td>z10 BC Z02</td>
<td>1.16</td>
</tr>
<tr>
<td>3 CPs</td>
<td>z10 BC Z03</td>
<td>1.14</td>
</tr>
<tr>
<td>4 CPs</td>
<td>z10 BC Z04</td>
<td>1.13</td>
</tr>
<tr>
<td>5 CPs</td>
<td>z10 BC Z05</td>
<td>1.12</td>
</tr>
</tbody>
</table>
System z Capacity Planning in a nutshell

Don’t use “one number” capacity comparisons!
Work with IBM technical support for capacity planning!
Customers can now use zPCR

The IBM Processor Capacity Reference (zPCR) is a free tool available for download that can be used to size your System z processors.
http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS1381
z114 Upgrades
Upgrade paths

- Upgrade paths from z9 BC and z10 BC
- Upgrade path to z196 Model M15 (Air cooled only)
- Disruptive upgrade M05 to M10 and from M10 to z196 M15
z114 Internal I/O Infrastructure Overview
I/O Subsystem Internal Bus Interconnect Speeds (GBps)

PCIe
- z196 GA2
- z114

8 GBps

InfiniBand
- z10/z196 GA1

6 GBps

STI
- z9

2.7 GBps

STI
- z990/z890

2 GBps

STI
- z900/z800

1 GBps

PCIe: Peripheral Component Interface (PCI) Express
STI: Self-Timed Interconnect
z114 & z196 EC GA2 I/O Drawers and Cages

**z114 & z196 EC**
- 4 I/O domains
- 32 I/O slots (PCIe I/O cards only)
- At least two PCIe fanouts (4 ports per drawer)
- 7 EIA Units

**z114, z196 EC, & System z10 BC**
- 2 I/O domains
- 8 I/O slots (legacy I/O cards only)
- At least 2 HCA2-C fanouts (2 ports per drawer)
- Up to two drawers on a pair of fanouts
- 5 EIA Units

**z196 EC & earlier (except z10 BC)**
- 7 I/O domains
- 28 I/O slots (legacy I/O cards only)
- Up to 4 fanouts for all 7 domains
- 14 EIA Units
An I/O frame slot is a physical location in the A or Z frame for an I/O cage, I/O drawer or PCIe I/O drawer to be inserted = 7u

- **I/O cage** uses 2 I/O frame slots = 14u
  - 28 four port I/O slots = 112 ports
  - 2 cages maximum (3 with RPQ)

- **PCle I/O drawer** uses 1 I/O frame slot = 7u
  - 32 two port I/O slots = 64 ports
  - 5 drawers maximum

- **Old I/O drawer** uses 0.7 frame slot = 5u
  - 8 four port I/O slots = 32 ports
  - Requires 2u of free space for future upgrade to the PCIe I/O drawer
  - 6 drawers maximum

  - **GA2**: Up to 2 on new build
  - **GA1**: Up to 4 on new build

* Locations differ if water cooled; but the number of I/O frame slots is identical.
**z114 Frame Layout for I/O**

- **An I/O frame slot** is a physical location in the frame for an old I/O drawer or PCIe I/O drawer

- **I/O Frame slot 2 and 3 = 7u**
  - Supports I/O drawer or PCIe I/O drawer
  - I/O Frame slot 1 and 4* = 5u
  - M10 – Frame slot 4* NOT available
  - Support I/O drawers ONLY

- **PCIe I/O drawer**
  - Frame slot 3 & 4 uses 1 I/O frame slot = 7u
  - 32 two port I/O slots = 64 ports
  - 2 maximum (1 maximum on M05)

- **Old I/O drawer**
  - Frame slot 1 & 4 uses 1.0 I/O frame slot
  - Frame slot 2 & 3 uses 0.7 I/O frame slot
  - 8 four port I/O slots = 32 ports
  - 2 maximum (3 with RPQ on M05 or M10, 4 with RPQ on M05 only*)

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

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

- **Features – I/O cage and I/O drawer**
  - *Crypto Express3*
  - *ESCON (240 or fewer)*
  - FICON Express8 (*Carry forward or RPQ 8P2534 to fill empty slots*)
  - FICON Express4 (*Carry forward only*)
  - *ISC-3*
  - *OSA-Express3 1000BASE-T*
  - OSA-Express3 (*Carry forward or RPQ 8P2534 to fill empty slots*)
    - 10 GbE, GbE
  - OSA-Express2 (*Carry forward only*)
    - GbE, 1000BASE-T
  - *PSC (Carry forward or new build, no MES add)*
z114 I/O Features supported

**Supported features**

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

- **Features - I/O drawer**
  - *Crypto Express3*, *Crypto Express3 1P*
  - *ESCON (240 or fewer)*
  - *FICON Express8* (Carry forward or RPQ 8P2534 to fill empty slots)
  - *FICON Express4* (Carry forward only for 4 port cards)
  - *FICON Express4-2C* (Carry forward or RPQ 8P2534 to fill empty slots)
  - *ISC-3*
  - *OSA-Express3 1000BASE-T (Includes -2P)*
  - *OSA-Express3* (Carry forward or RPQ 8P2534 to fill empty slots)
    - 10 GbE, GbE
  - *OSA-Express2* (Carry forward only)
    - GbE, 1000BASE-T
  - *PSC (Carry forward or new build, no MES add)*
FICON Express8S – PCIe I/O drawer

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

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

# 0409 – 10KM LX, # 0410 – SX
zEnterprise zHPF supports data transfers larger than 64 k bytes

- zHPF multi-track data transfers are no longer limited to 64 k bytes
  - Up to 256 tracks can be transferred a single operation
  - Eliminating the 64 k byte limit is designed to allow a FICON Express8 channel to fully exploit its available bandwidth
  - This enhancement is exclusive to z196 and z114

- Designed to help provide
  - Higher throughput for zHPF multi-track operations
  - With lower response time

- Requires:
  - FICON Express8S, FICON Express8 or FICON Express4 channel
  - CHPID TYPE=FC definition
  - Control unit support for zHPF

- z/OS operating system support

White Paper: “High Performance FICON (zHPF) for System z Analysis”

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

I/O driver benchmark
I/Os per second
4k block size
Channel 100% utilized

- ESCON: 1200
- FICON Express4 and FICON Express2: 14000 (z10) 31000 (z10)
- FICON Express8: 20000 (z196 z10) 52000 (z196 z10)
- FICON Express8S: 23000 (z196 z114) 92000 (z196 z114)

77% increase

Full-duplex, large sequential read/write mix

- FICON Express4 4 Gbps: 350 (z10 z9)
- FICON Express8 8 Gbps: 520 (z10), 620 (z196 z10), 770 (z196 z10)
- FICON Express8S 8 Gbps: 620 (z196 z114), 620 (z196 z114), 1600 (z196 z114)

108% increase
FCP performance on System z

I/Os per second
Read/writes/mix
4k block size, channel 100% utilized

MegaBytes per second (full-duplex)
Large sequential
Read/write mix
z196 three subchannel sets per logical channel subsystem (LCSS)

- A third subchannel set of 64 K devices is added to each LCSS
- The first subchannel set (SS 0) allows definitions of any type of device allowed today, (i.e. bases, aliases, secondaries, and those other than disk that do not implement the concept of associated aliases or secondaries)
- Second and third subchannel sets (SS1 and SS2) are available to use for disk alias devices (of both primary and secondary devices) and/or Metro Mirror secondary devices only
- CHPID support
  - FICON TYPE=FC on FICON Express8S, FICON Express8 or FICON Express4
  - ESCON TYPE=CNC
- Value
  - Enables extending the amount of storage that can be defined while maintaining performance
  - Provides a means to help simplify device addressing by providing consistent device address definitions for congruous devices
  - Allows use of the same device number in different subchannel sets
- Requires z/OS operating system support
- This enhancement is exclusive to zEnterprise 196
OSA-Express4S fiber optic – PCIe I/O drawer

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

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

- **Small form factor optics – LC Duplex**
OSA-Express4S 10 GbE performance (laboratory)

**Inbound Streams** – 1492 Byte MTUs

- **Mixed Streams** – 1492 Byte MTUs

- **Inbound Streams** – 8000 Byte MTUs

- **Mixed Streams** – 8000 Byte MTUs

**Notes:**
- AWM on z/OS
- z/OS is doing checksum
- 1 megabyte per second (MBps) is 1,048,576 bytes per second
- MBps represents payload throughput (does not count packet and frame headers)
z114 and z196 GA2 InfiniBand HCA3 Fanouts

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

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

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

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

Note: The InfiniBand link data rates do not represent the performance of the link. The actual performance is dependent upon many factors including latency through the adapters, cable lengths, and the type of workload.
Supported CFCC Levels for z114 and z196 (GA2)

**Coupling between z10 and z114**
- The minimal code level for z10 coupling to z196 is Driver 79.
- CFCC Product Release 16 Service Level 2.25.
- MCLs recommended for coupling: Highest available level

**Coupling between z9 and z114**
- The minimal code level for z9 coupling to z196 is Driver 67.
- CFCC Product Release 15 Service Level 2.11.
- MCLs recommended for coupling: Highest available level

**Coupling between z196 and z114**
- The minimal code level for z196 coupling to z196 is Driver 86E.
- MCLs recommended for coupling: Highest available level
- Latest information: z114 or z196 GA2 Driver Exception Letter on Resource Link


Refer to the latest Exception Letter (RESLINK)
z114 and z196 GA2 Parallel Sysplex Coupling Connectivity

z9 EC and z9 BC S07
IFB 12x SDR, ISC-3
z9 to z9 IFB is NOT supported

z9 to z800, z900, z890 and z990
Not supported!

z10 EC and z10 BC
IFB 12x and 1x, ISC-3,

Note: ICB-4 and ETR are NOT supported on z196 or z114

Note: The InfiniBand link data rates do not represent the performance of the link. The actual performance is dependent upon many factors including latency through the adapters, cable lengths, and the type of workload.
z196/z114 Server Time Protocol without Sysplex Timer and additional Enhancements
No Support for the 9037 Sysplex Timer

- It is possible to have a z114 server as a Stratum 2 or Stratum 3 server in a Mixed CTN linked to z10s or z9s (STP configured) 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 z114 can not be in the same Mixed CTN as a z990 or z890 (n-2).

What if failure occurs or server is taken down for maintenance?
Recovery Enhancements – Going away signal

- Going away signal is a reliable unambiguous signal to indicate that the CPC is about to enter a check stopped state

- In an STP-only Coordinated Timing Network, when a going away signal from the CTS is received by the BTS,
  - BTS safely takes over as CTS
  - Going away signal has priority over OLS in a 2 server CTN
  - BTS can also use going away signal to take over as CTS for CTNs with 3 or more servers without communicating with Arbiter

- Dependencies on OLS and CAR removed in a 2 server CTN

- Dependency on BTS>Arbiter communication removed in CTNs with 3 or more servers

- Prerequisites:
  - InfiniBand (IFB) links using
    - HCA3-O to HCA3-O
      - 12x IFB or 12x IFB3
    - HCA3-O LR to HCA3-O LR
      - 1x IFB

- Current recovery design still used when going away signal not received by BTS and for other failure types
Improved time coordination for zBX components

- Network Time Protocol (NTP) clients, running on blades in zBX, can synchronize their time to the NTP server provided by the Support Element (SE) every hour.
  - It is important for the SE's clock to maintain time accuracy.

- An enhancement has been made to improve the time accuracy of the SE's Battery Operated Clock (BOC) by synchronizing the SE's BOC to the server's Time-of-Day (TOD) clock every hour, instead of the previous synchronization which took place every 24 hours.
  - This enhancement allows the SE’s clock to maintain a time accuracy of 100 milliseconds to an NTP server configured as the External Time Source in an STP-only CTN.
  - This enhancement provides the capability for the components in zBX to maintain an approximate time accuracy of 100 milliseconds to an NTP server if they synchronize to the SE's NTP server at least once an hour.

- This enhancement is exclusive to z196 and z114.
z196/z114 Cryptography
Elliptic Curve Cryptography Digital Signature Algorithm (ECC), an emerging public key algorithm expected eventually to replace RSA cryptography in many applications. ECC is capable of providing digital signature functions and key agreement functions. The new CCA functions provide ECC key generation and key management and provide digital signature generation and verification functions compliance with the ECDSA method described in ANSI X9.62 "Public Key Cryptography for the Financial Services Industry: The Elliptic Curve Digital Signature Algorithm (ECDSA)". ECC uses keys that are shorter than RSA keys for equivalent strength-per-key-bit; RSA is impractical at key lengths with strength-per-key-bit equivalent to AES-192 and AES-256. So the strength-per-key-bit is substantially greater in an algorithm that uses elliptic curves.

ANSI X9.8 PIN security which facilitates compliance with the processing requirements defined in the new version of the ANSI X9.8 and ISO 9564 PIN Security Standards and provides added security for transactions that require Personal Identification Numbers (PIN).

Enhanced Common Cryptographic Architecture (CCA), a Common Cryptographic Architecture (CCA) key token wrapping method using Cipher Block Chaining (CBC) mode in combination with other techniques to satisfy the key bundle compliance requirements in standards including ANSI X9.24-1 and the recently published Payment Card Industry Hardware Security Module (PCI HSM) standard.

Secure Keyed-Hash Message Authentication Code (HMAC), a method for computing a message authentication code using a secret key and a secure hash function. It is defined in the standard FIPS 198, "The Keyed-Hash Message Authentication Code". The new CCA functions support HMAC using SHA-1, SHA-224, SHA-256, SHA-384, and SHA-512 hash algorithms. The HMAC keys are variable-length and are securely encrypted so that their values are protected.

Modulus Exponent (ME) and Chinese Remainder Theorem (CRT), RSA encryption and decryption with key lengths greater than 2048-bits and up to 4096-bits.
Summary of Cryptographic Enhancements (2011)

- Crypto Express3 and Crypto Express3 -1P (z114 only)
- AES Key Encrypting Keys (AES KEKs) and AES typed keys, in general
- TR-31 key wrapping method for interoperable secure key exchange
- Elliptic Curve Cryptography (EC-DH key agreement protocol)
- PIN Decimalization table protection
- (Rivest-Shamir-Adleman) RSA-Optimal Asymmetric Encryption Padding (OAEP) with SHA-256
Evolving Role of the HMC and Support Element/HMC Enhancements

Additional material in the z196 TLLB and Techdocs - PRS4582
zEnterprise HMC’s

New HMC
- New HMC feature Code 0091, New Switch feature code 0070
- Additional HMC’s required for Unified Resource Manager and zEnterprise zBX (if installed). Both HMCs must be the same machine type/feature code
- Alternate HMC used for Unified Resource Manager 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).

No ensemble management

Unified Resource Manager

FC 0091, FC 0090, FC 0084

Primary

FC 0091 or FC 0090 (with ECA)

Alternate

FC 0091 or FC 0090 (with ECA)

IBM Hardware Management Console Feature Codes 0084, 0090, and 0091 can all be used on the zEnterprise

See next slide for requirements
Traditional HMCs and SEs

- HMC have an active-active peer relationship with all other HMC
  - May fully control any CPC on any site.
- SE have an active-backup relationship between a pair of SE
  - Dedicated control of one CPC
zEnterprise – Unified Resource Manager HMCs Active-Backup relationship in detail

Traditional HMC can control the ensemble using Web browser via Primary HMC

Primary HMC can directly control any CPC including Ensemble specific functions

Alternate HMC can directly control nothing

Primary and Alternate must be on the same subnet...therefore the ensemble managing HMC is a one site solution. Automation is needed for a two site solution

Ensemble is boxed in yellow

Traditional HMC can directly control any non-Ensemble functions
HMC/SE Secure FTP support

- **New support was added to allow a secure FTP connection from a HMC/SE FTP client to a customer FTP server location**
  - Implemented using the SSH File Transfer Protocol which is an extension of the Secure Shell protocol (SSH)
  - A new Manage SSH Keys console action allows the customer import public keys associated with a host address – added to both HMC and SE.
  - Secure FTP infrastructure allows HMC/SE applications to query if a public key is associated with a host address as well as to utilize the Secure FTP interface with the appropriate public key for a given host.
  - Tasks utilizing FTP now provide a selection for the Secure Host connection.
    - When selected they verify that a public key is associated with the specified host name, and if none is provided they put up a message box to point them to the Manage SSH Keys task to input one. Tasks that provide this support include:
      - Import/Export IOCDS
      - Advanced Facilities FTP ICC Load
      - Audit and Log Management (Scheduled Op Only)
      - Retrieve Internal Code Changes (PE requirement)
Load (IPL) for Alternate Subchannel Set

- Today Load (IPL) devices must be in subchannel set 0 – this restriction is being removed
- The ability to Load (IPL) from an alternate subchannel set is now supported
- Enables customers to utilize the additional device addressability we have provided with less complexity involved
- The Load Address value was expanded to 5 hex digits – the highorder (left most digit) represents the subchannel set and is restricted to 0, 1 or 2
- Impacted tasks included: Load, Customize/Delete Activation Profiles (Image and Load profiles), and HMC APIs (SNMP and CIM)
Advanced Facilities Enhancements for Crypto Express3

- A new interface was added between the SE and the Crypto Express3 to retrieve two types of log data.
  - System Log - a 4 MB data area on the card
  - Pseudo Log - contains several informational logs, combined into one group of data

- The System Log uses the existing “Read log buffer” function. The amount of data varies based on the amount of data stored in the log (4 MB maximum)

- The Pseudo Log request sends a new SE command via the SFCB which causes the crypto card to post a log entry into the Console Log.
  - This request is non-disruptive.
  - Invoked via a new “Get crypto information log” selection
z114 Planning

Always Refer to the Installation Manual for Physical Planning for details:

M/T 2818 – GC28-6907
M/T 2458 – GC28-2611
z114 Floor and Cabling Configurations options

1. I/O and Power Under The Floor
   - RF Tailgate

2. Top Exit I/O and Power Under The Floor
   - RF Tailgate

3. Top Exit Power and I/O Under The Floor
   - RF Tailgate

4. Power and I/O Bottom, but Above The Floor
   - NRF Tailgate

5. Top Exit I/O And Top Exit Power
   - Floor Type Independent
   - Bottom cover

Preferred in Non-Raised Floor environments

Overhead Cable Tray System

Floor Independent (Raised or Non-Raised)

Raised Floor

Non-Raised Floor

Power Cords
I/O Cables
Operating System Support for zEnterprise

- Currency is key to operating system support and exploitation of future servers
- The following releases of operating systems are supported on zEnterprise (refer to PSP buckets for any required maintenance):

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Minimum Supported levels</th>
</tr>
</thead>
</table>
| z/OS             | • V1.11, 1.12, 1.13 or higher  
                  | • V1.8, 1.9, 1.10\(^1\) with the Lifecycle Extension  
                  | • Ensemble support: z/OS V1.10 or higher |
| Linux            | • Red Hat RHEL 5  
                  | • Novell SUSE SLES 11 |
| z/VM             | • V5.4 or higher  
                  | • Ensemble support: V6.1 |
| z/VSE            | • V4.2 or higher  
                  | • Ensemble support: V4.3 |
| z/TPF            | • V1.1 or higher |

- **Support for p Blades**
  - AIX 5.3 and subsequent releases with PowerVM™ Enterprise Edition
- **Support for Linux and Windows* environments on select System x blades**
  - 64 bit version support only
  - Linux: RHEL 5.5, SLES 11 SP1
  - Microsoft Windows Server 2008 R1 - Datacenter Edition*
  - Additional versions to follow*

\(^1\)z/OS 1.10 EOS is September 29, 2011. Requires Lifecycle Extension after this date.

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

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.
zEnterprise – Statements of Direction (SODs)

- The IBM zEnterprise 196 and the zEnterprise 114 are the last System z servers to support the Power Sequence Controller (PSC) feature.
  - IBM intends to not offer support for the PSC (feature #6501) on future System z servers after the z196 (2817) and z114 (2818). PSC features cannot be ordered and cannot be carried forward on upgrade to such a follow-on server.

- The IBM zEnterprise 196 and the zEnterprise 114 are the last System z servers to offer ordering of ISC-3
  - Enterprises should begin migrating from ISC-3 features (#0217, #0218, #0219) to 12x InfiniBand (#0163 - HCA2-O or #0171 - HCA3-O fanout) or 1x InfiniBand (#0168 - HCA2-O LR or #0170 - HCA3-O LR fanout) coupling links.

- The IBM zEnterprise 196 and the zEnterprise 114 are the last System z servers to support ESCON channels
  - IBM plans not to offer ESCON channels as an orderable feature on System z servers that follow the z196 (machine type 2817) and z114 (machine type 2818). In addition, ESCON channels cannot be carried forward on an upgrade to such follow-on servers. This plan applies to channel path identifier (CHPID) types CNC, CTC, CVC, and CBY and to features #2323 and #2324.
  - System z customers should continue migrating from ESCON to FICON. Alternate solutions are available for connectivity to ESCON devices.
The IBM zEnterprise 196 and the zEnterprise 114 are the last System z servers to support FICON Express4 channels:
- Enterprises should begin migrating from FICON Express4 channel features (#3321, #3322, #3324) to FICON Express8/FICON Express8S channels.

The IBM zEnterprise 196 and the zEnterprise 114 are the last System z servers to support OSA-Express2 features:
- Enterprises should begin migrating from OSA-Express2 features (#3364, #3365, #3366) to OSA-Express3/OSA Express4S features.

The IBM zEnterprise 196 and the zEnterprise 114 are the last System z servers 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.
Application Program Interfaces (APIs) to Unified Resource Manager:
- IBM intends to offer APIs for IBM zEnterprise Unified Resource Manager. These APIs are designed to provide access to the same underlying functions that support the Unified Resource Manager user interface and can be exploited to enable discovery, monitoring, and provisioning use cases.
- IBM intends to enhance the Tivoli Integrated Service Management for System z portfolio to take advantage of the additional zEnterprise ensemble monitoring and management information provided by the Unified Resource Manager APIs.

Dynamic discovery of storage resources by Unified Resource Manager
- IBM intends to offer dynamic discovery of storage resources by Unified Resource Manager. A server administrator will be able to trigger discovery of additional storage resources through the User Interface of Unified Resource Manager.
zEnterprise – Statements of Direction (SODs) - continued

- **HiperSockets Completion Queue:**
  - IBM plans to support transferring HiperSockets messages asynchronously, in addition to the current synchronous manner on z196 and z114. This could be especially helpful in burst situations. The Completion Queue function is designed to allow HiperSockets to transfer data synchronously if possible and asynchronously if necessary, thus combining ultra-low latency with more tolerance for traffic peaks. HiperSockets Completion Queue is planned to be supported in the z/VM and z/VSE environments in a future deliverable.

- **HiperSockets integration with the IEDN:**
  - Within a zEnterprise environment, it is planned for HiperSockets to be integrated with the intraensemble data network (IEDN), extending the reach of the HiperSockets network outside of the central processor complex (CPC) to the entire ensemble, appearing as a single Layer 2 network. HiperSockets integration with the IEDN is planned to be supported in z/OS V1.13 and z/VM in a future deliverable.
Summary
A zEnterprise for Everyone

Freedom to choose the “right sized” mainframe to fit your needs.

If you …
…want the flexibility to manage across a heterogeneous platform
…are looking for an entry level mainframe with options for traditional capacity settings
…need a smaller mix of special engines (*zAAP on zIIP great option here!)
…have smaller Coupling and/or I/O attachment requirements
…need the lowest cost application development environment.

The z114 M05 may be the perfect option.

If you …
…want the flexibility to manage across a heterogeneous platform
…want to replace your server with one that has the same number of engines – but would like more IFLs, zAAPs or zIIPs
…want to replace your standalone coupling facility or Linux only server with a machine that provides engine, memory and I/O scale out capabilities
…have future growth needs, but prefer grow in smaller increments and want to avoid disruptive outage during upgrade

The z114 M10 is just what you need.

If you …
…want the flexibility to manage across a heterogeneous platform
…have a large mainframe capacity requirement or desire for massive consolidation – scale to over 52,000 MIPS in one footprint
…have a large disk installment so in turn have large I/O requirements
…need new ways to address your ‘green’ requirements – like water cooling and static power save mode
…have a large CBU requirement – and like the control of having your disaster recovery site right in your own shop.

The enhanced z196 is right for you.
End of Presentation