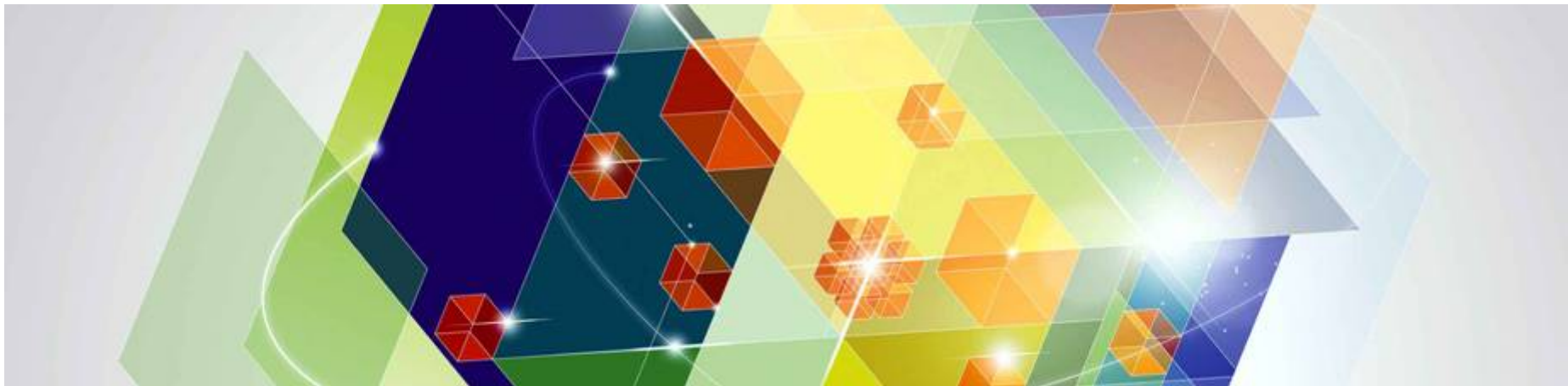


GS05 - IBM zEnterprise Hardware News

October 24th, 2011
Mike Storzer, TMCC R&D Client Centers, Boeblingen Lab





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GDPS*	POWER*	System z9*	zEnterprise	
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Notes:

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

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IBM zEnterprise System – What's New?

Embracing multi-platform, multi-operating environments with more management capability



IBM zEnterprise™ 196 (z196) zEnterprise 114 (z114)

- PCIe Channel Subsystem
- Performance improvements for High Performance FICON for zEnterprise (zHPF)
- Updated GDPS® disaster recovery support for zEnterprise environment
- And much more

zEnterprise Unified Resource Manager

- Operational Controls enhanced with auto-discovery and configuration support for storage resources
- Extending management functions with programmatic access (APIs)

zEnterprise BladeCenter® Extension (zBX)

- Now supporting AIX® 7.1 and Microsoft® Windows® 2008 R2 plus more releases of Linux® on IBM System x®
- New optional 1 Gbps dedicated network to server
- New to DataPower® XI50z firmware support

zEnterprise z114

zEnterprise Technology Designed for Small and Mid-sized Businesses

The Value Begins At the Heart with the z114 ...

zEnterprise 114 (z114)

Machine Type: 2818

2 Models: M05 & M10

- **New technology in a new package**
 - ▶ Modular 2 drawer design for lower cost of entry
 - ▶ Granularity for right-sizing your system
 - ▶ Additional Scale for consolidation and growth
 - ▶ Improved data center efficiency
 - ▶ Same Qualities of Service as the z196
 - ▶ Hybrid enabled to drive workload integration and management
- **Improved Platform Economics**
 - ▶ New Software Curve
 - ▶ Lower Hardware Maintenance
 - ▶ Lower specialty engine and memory prices
 - ▶ Upgradeability for investment protection

Up to **18%** Improvement for traditional z/OS workloads ¹

Up to an **ADDITIONAL 25%** Improvement in CPU intensive workloads via compiler enhancements²

Up to **12%** Total capacity improvement ¹

Scales From **26 - 3100 MIPS**

Up to **130** available capacity settings

From **1-10** configurable cores for client use includes CPs, IFL, zIIP, zAAP, and ICFs

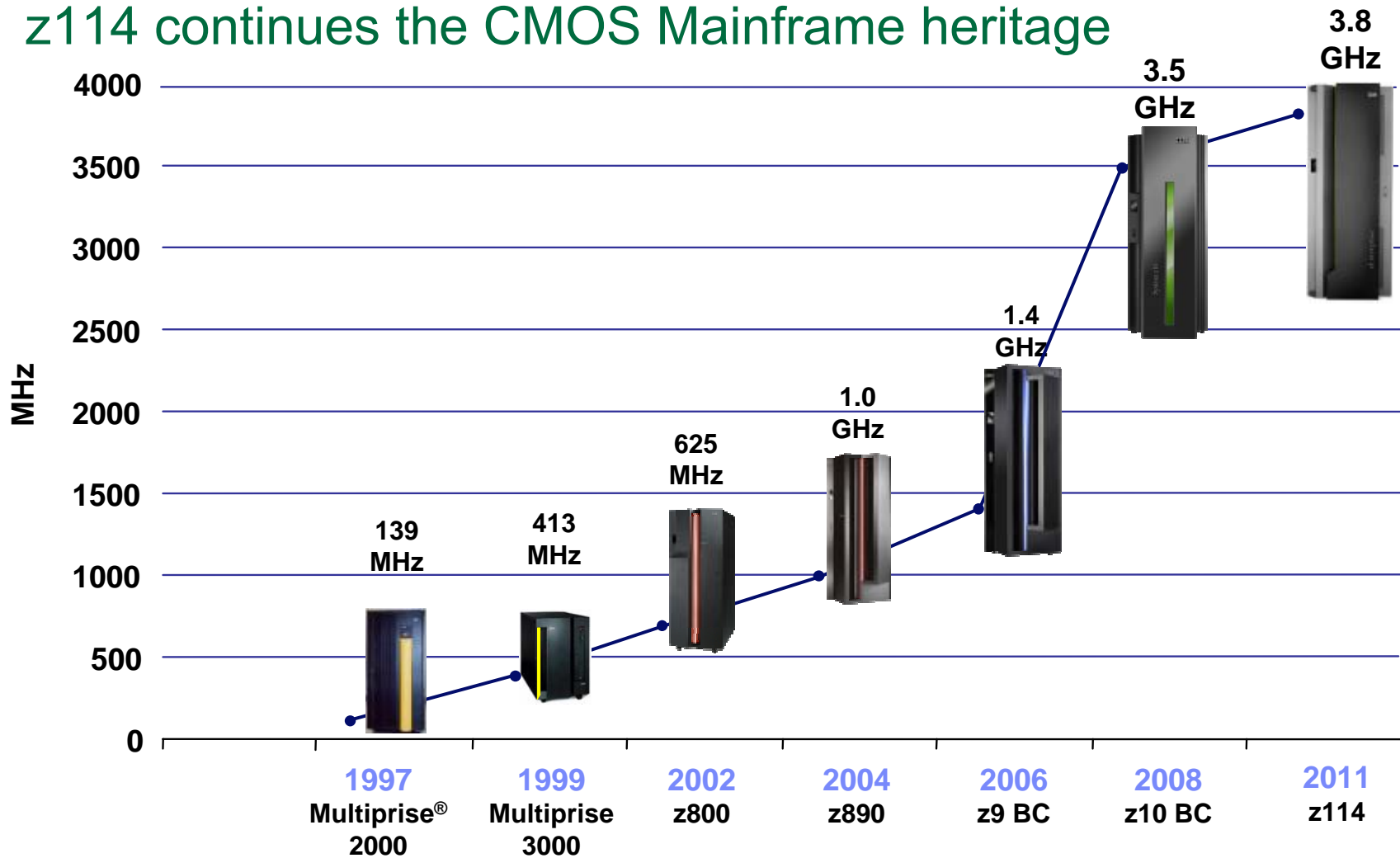
From **0-2** IBM provided spare cores

Up to **256** GB RAIM fault tolerant memory

Fully Upgradeable from the IBM System z10 Business Class™ (z10 BC) & IBM System z9® Business Class (z9 BC); and to the z196 M15

¹Relative capacity and performance compares at equal software levels as measured by IBM Large System Performance Reference (LSPR) workloads using z/OS® 1.11. Results may vary
²The z114 will exhibit up to 25% increase for CPU intensive workload as provided by multiple C/C++ compiler level improvements when going from z/OS 1.09 to z/OS 1.12 © 2011 IBM Corporation

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

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
 - Dependant 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 Models M05 and M10

▪ M/T 2818 – Model M05

- Air cooled
- Single Frame
- Non-raised floor option available
- 30 LPARs

▪ Processor Units (PUs)

- New processor drawer design (1 processor drawer)
- 7 per system
 - 2 SAPs standard
 - Up to 5 CPs
 - Up to 5 specialty engines
 - Up to 2 zIIPs/zAAPs
 - 0 spares when fully configured

▪ M/T 2818 – Model M10

- Air cooled
- Single Frame
- Non-raised floor option available
- 30 LPARs

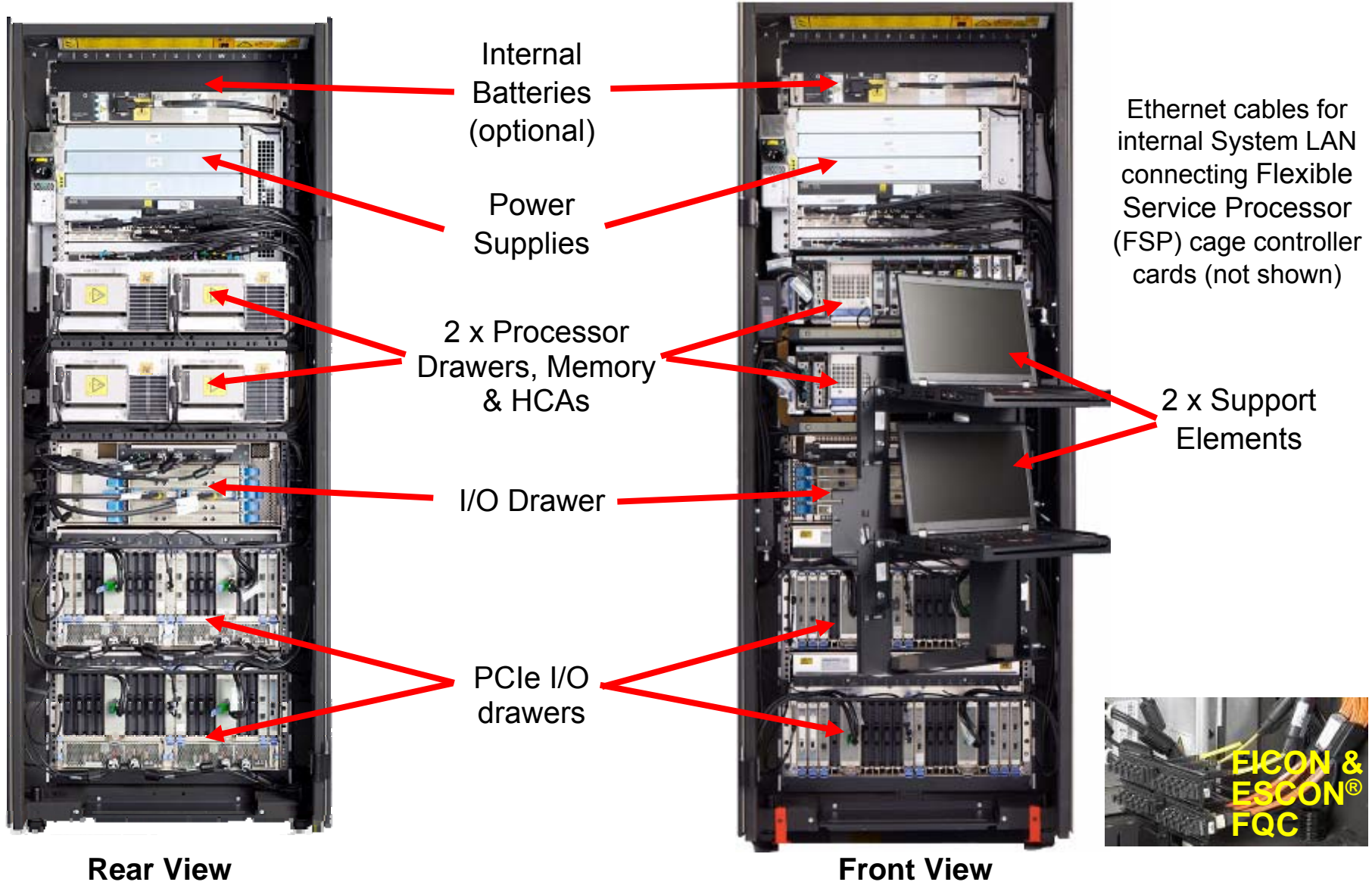
▪ Processor Units (PUs)

- New processor drawer design (2 processor drawers)
- 14 per system
 - 2 SAPs standard
 - Up to 5 CPs
 - Up to 10 specialty engines
 - Up to 5 zIIPs/zAAPs
 - 2 dedicated spares

▪ When Model M10 (requires the 2nd processor drawer)?

- > 5 Customer PUs
- > 120 GB memory
- > 4 Fanouts for additional I/O connectivity – especially PSIFB links
 - Depends - numbers vary for drawers, I/O features and PSIFB links

z114 Model M10 – Under the covers



Processor / Memory Subsystem Drawers (Model M05 and M10)

One z10 BC Drawer



Two z114 Drawers (Model 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

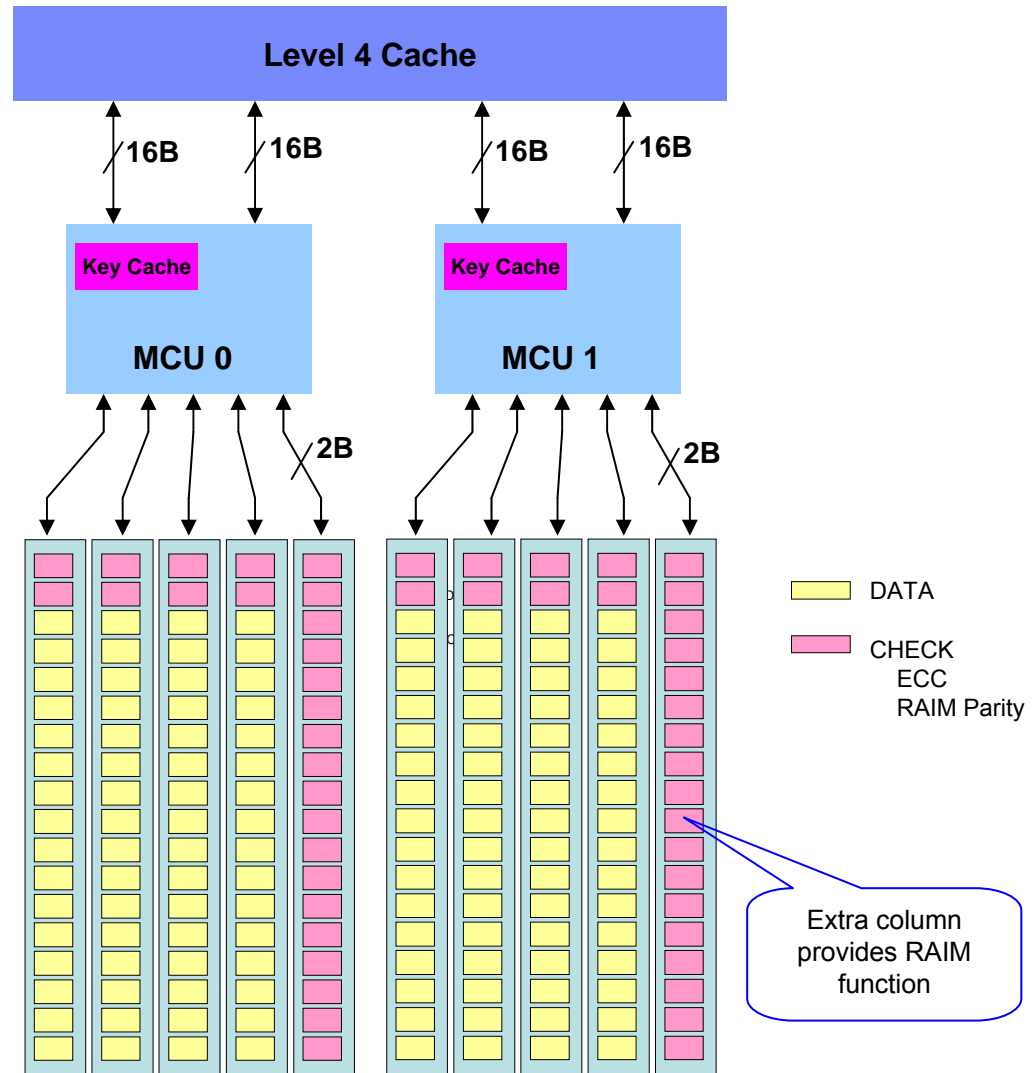
Model	CPs	IFLs Unassigned IFLs	zAAPs	zIIPs	ICFs	Std. SAPs	Add'l SAPs	Spares
M05	0-5	0-5	0-2	0-2	0-5	2	0-2	0
M10	0-5	0-10	0-5	0-5	0-10	2	0-2	2

- **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**
 - SAP and PU Allocation/Sparing in the M10
 - Default assignment is one SAP per drawer; one Spare per drawer. Spill and fill CP low to high; spill and fill specialty engines high to low
 - Two defective PUs may cause the default assignment to spill and fill into the second processor drawer. LPAR has the capability to request PU of a specified type to be grouped together in a book/drawer (i.e. LPAR may change the default assignment)
- **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)**

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



System z I/O Interface Evolution



z9

z10
z196

z196
z114
Sep 2011

Extended Link
(processor to IO Cage)

eSTI
(IBM)



InfiniBand
(Industry
Standard)



PCI Express
(Ind. Std.)

**IO Cage
Backplane**

mSTI
(IBM)



mSTI
(IBM)



PCI Express
(Ind. Std.)

Coupling Link

ISC
(IBM)

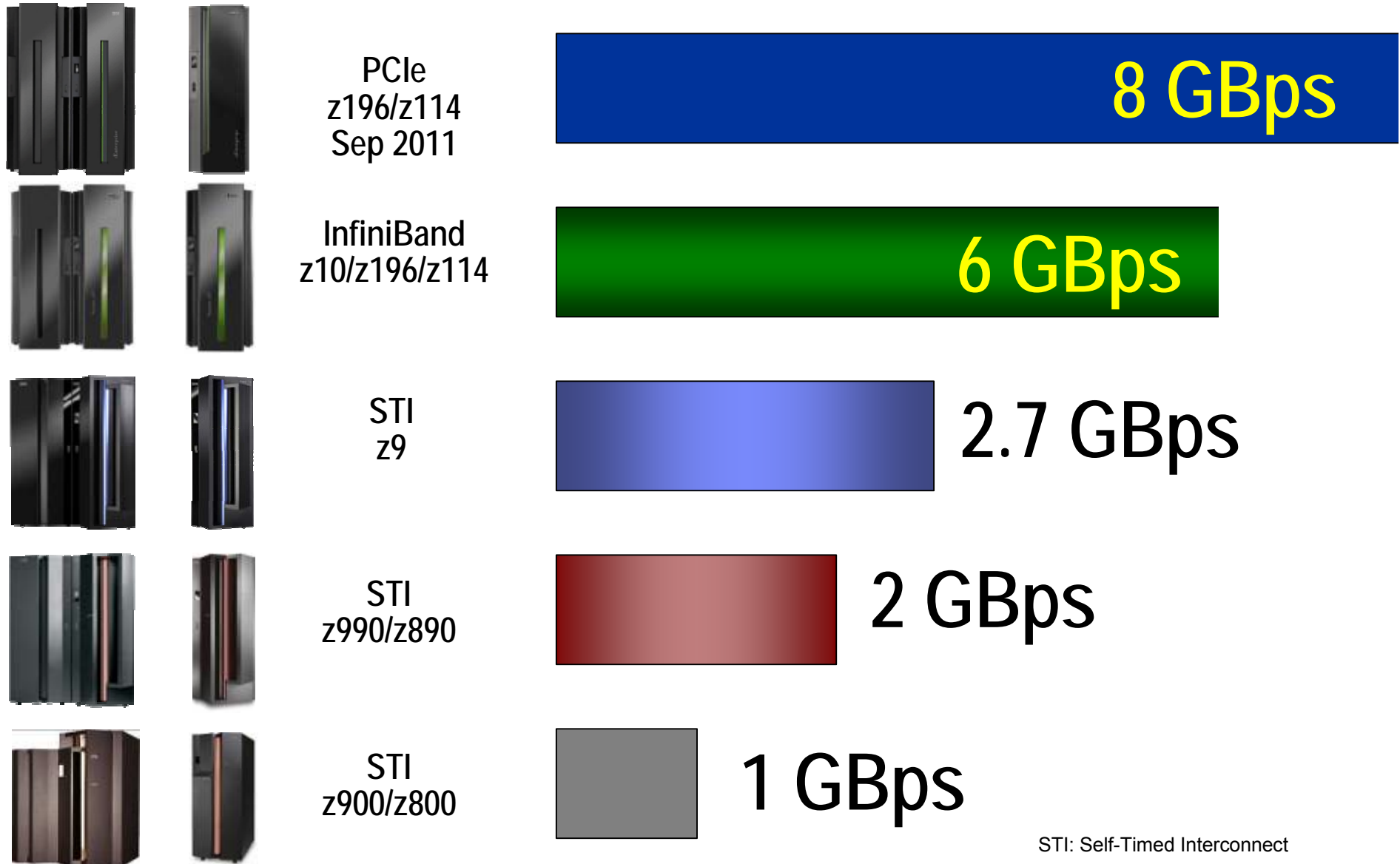


InfiniBand
(Industry
Standard)



InfiniBand
(Ind. Std.)

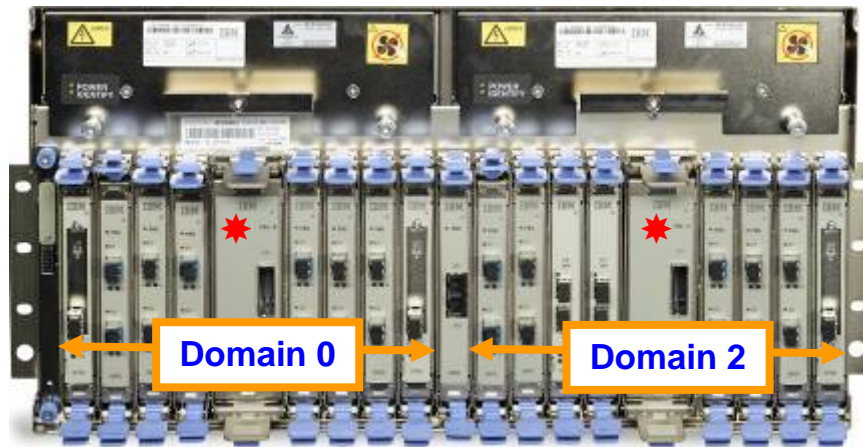
System z I/O Subsystem Internal Bus Interconnect Speeds (GBps)



STI: Self-Timed Interconnect

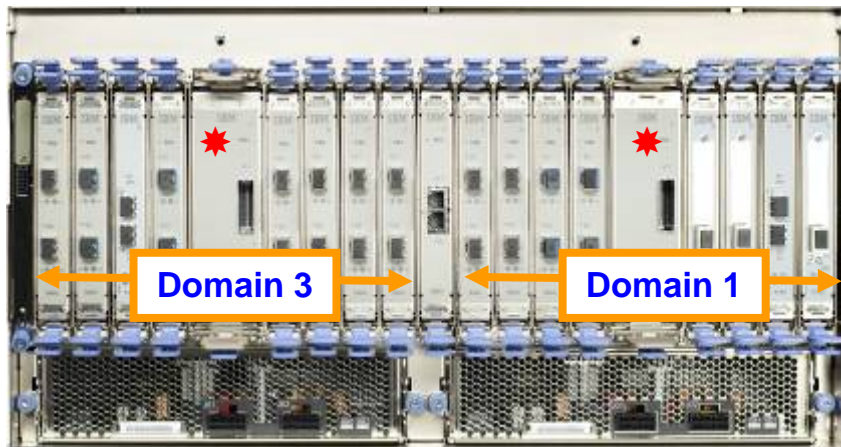
New 32 slot PCIe I/O drawer for z114 and z196

Front



- Supports only the new PCIe I/O cards introduced with z114 and z196 GA2.
- Supports 32 PCIe I/O cards, 16 front and 16 rear, vertical orientation, in four 8-card domains (shown as 0 to 3).
- Requires four PCIe interconnect cards (*), each connected to an 8 GBps PCIe I/O interconnect for all four domains.

Rear



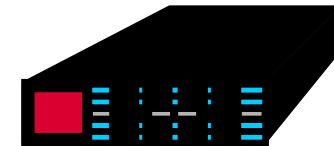
- To support **Redundant I/O Interconnect (RII)** between front to back domain pairs 0-1 and 2-3 the two interconnects to each pair must be from 2 different PCIe fanouts. (All four domains in one of these drawers can be activated with two fanouts.)
- **Concurrent** field install and repair.
- Requires 7 EIA Units of space (12.25 inches ≈ 311 mm)

z114 I/O Features supported

Supported features

I/O cage and I/O drawer

- Crypto Express3 (1P for z114 only)
- ESCON (240 or fewer)
- FICON Express8 (Carry forward or RPQ)
- FICON Express4 (Carry forward only for 4 port cards)
- FICON Express4-2C (Carry forward or RPQ – z114)
- ISC-3
- OSA-Express3 1000BASE-T (Includes 2P for z114)
- OSA-Express3 (Carry forward or RPQ)
 - 10 GbE LR and SR, GbE LX and SX (2P for z114 only)
- OSA-Express2 (Carry forward only)
 - GbE LX and SX, 1000BASE-T
- PSC (Carry forward or new build, no MES add)



8 slot I/O drawer

PCIe I/O drawer

- FICON Express8S
 - SX and 10 km LX
- OSA-Express4S
 - 10 GbE LR and SR
 - GbE SX and LX

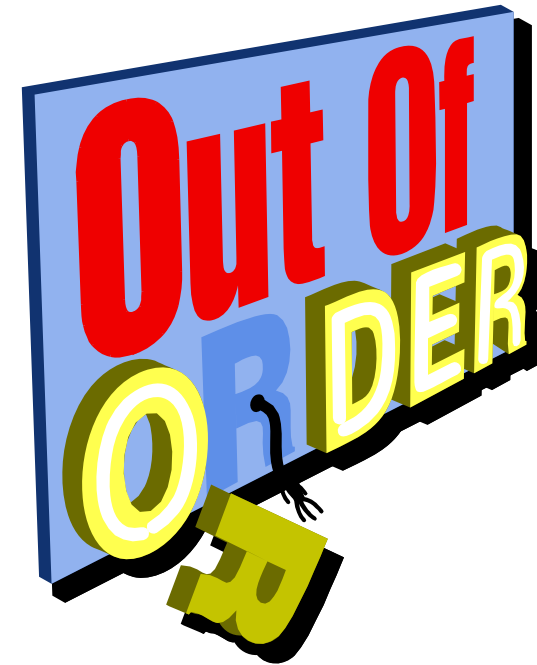


32 slot PCIe I/O drawer

Note: PSIFB links are direct from the HCAs and not from the I/O cage or drawers

z114 Non-Supported Features

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



zEnterprise BladeCenter Extension (zBX) What's new ?

zBX – A Uniquely Configured Extension of the zEnterprise

Looks like a rack with BladeCenters in it ... but so much more

- **Creating an integrated solution experience ... blades are easier to deploy and manage**
 - Infrastructure built and tested at the factory
 - zBX hardware redundancy provides improved availability
 - IBM System z engineer for installation, service and upgrade process
- **Improving the connectivity between blades and IBM System z**
 - Isolated, secure, redundant network dynamically configured
 - High speed 10Gb/EN dedicated network for data
 - NEW – New IEDN TOR 1 GbE optics for the customer network
 - Lower latency due to fewer devices
- **Preserving the customer application architecture**
 - No modifications required for operating systems or applications
 - No System z software running in IBM zEnterprise BladeCenter Extension (zBX)
 - Customer network and storage architectures unchanged



*... managed by the
zEnterprise Unified Resource Manager*

IBM Blades and Optimizers Integrated within the zBX

- **IBM Smart Analytics Optimizer**

- ▶ An appliance-like, add-on, that enables the integration of business insights into operational processes
- ▶ Accelerates select queries, with unprecedented response times
- ▶ Capitalizing on breakthrough technologies to accelerate business analytics

- **IBM WebSphere® DataPower Integration Appliance XI50 for zEnterprise**

- ▶ Purpose-built hardware for simplified deployment and hardened security helps businesses quickly react to change and reduce time to market
- ▶ DataPower XI50z can provide connectivity, gateway functions, data transformation, protocol bridging, and intelligent load distribution.
- ▶ New DataPower XI50z enhancements can provide a secure connection for public cloud applications



- **Select IBM POWER7 and IBM System x blades**

- ▶ Brings a larger application portfolio to zEnterprise
 - Front end applications to centralized data serving ... e.g. SAP
 - Front end to core CICS® or IMS™ transaction processing ... e.g. WebSphere
- ▶ Applications certified to run on zBX supported POWER7 and System x blades will run on them when installed in the zBX



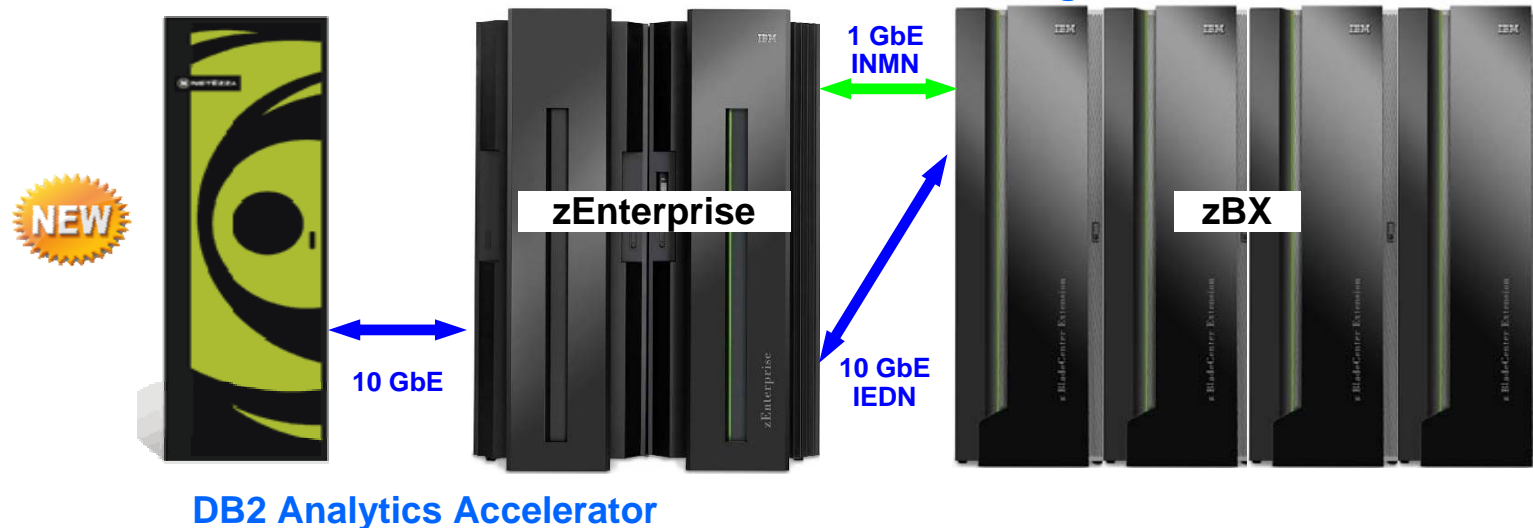
IBM BladeCenter PS701



IBM BladeCenter HX5 (7873)

IBM DB2 Analytics Accelerator -

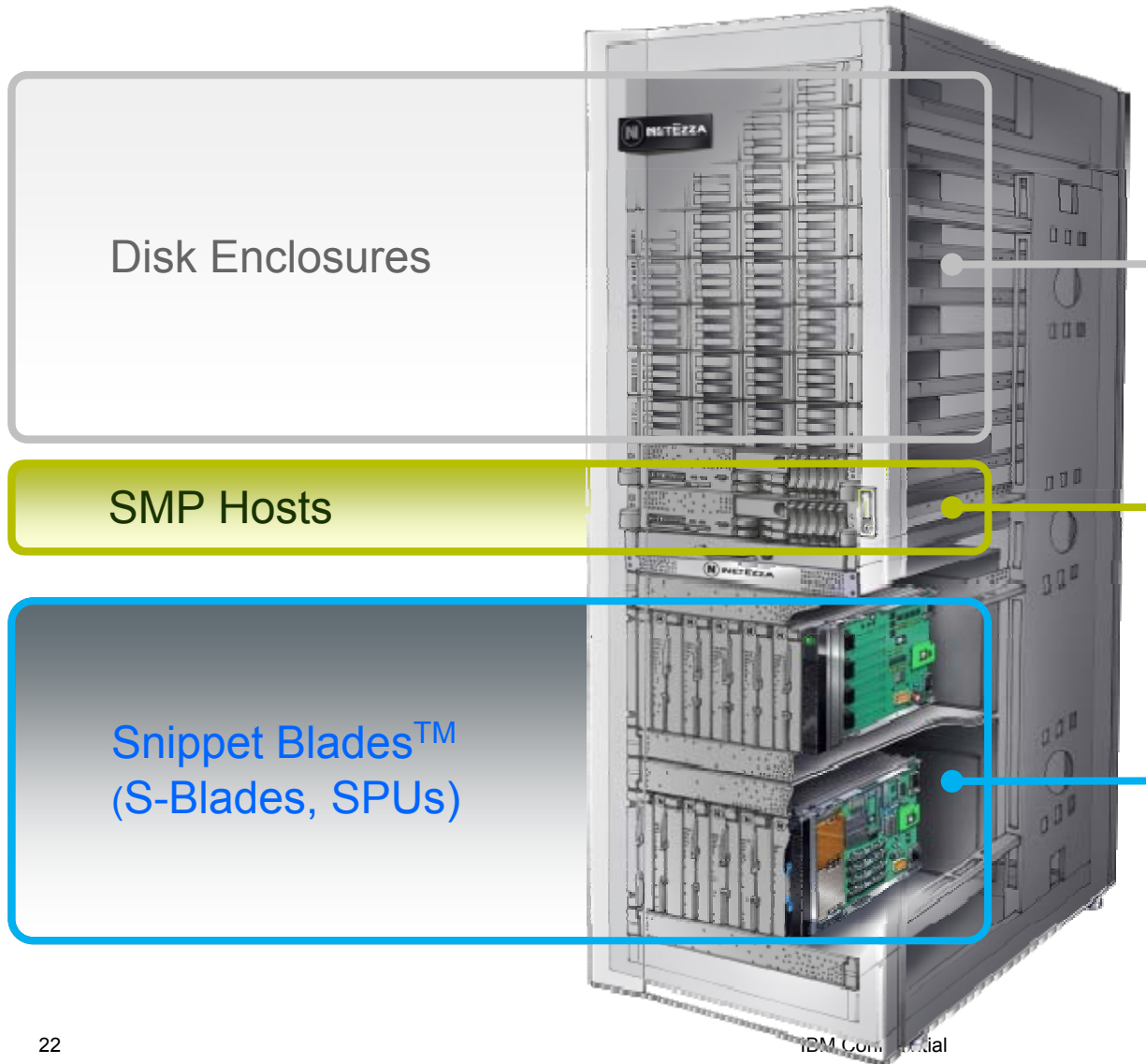
“The evolution of IBM Smart Analytics Optimizer V1”
Unified Resource Manager



- **Managed by System z as an integrated analytics accelerator solution that requires Version 9 or Version 10 of DB2 for z/OS running on a zEnterprise server. DB2 for z/OS “owns the data” and does updates, “single record” lookups, backup, and recovery.**
- **Based on the IBM Netezza analytics platform, a workload-optimized, LAN-attached appliance that incorporates IBM blade servers, storage, and data filtering technology.**
 - ▶ This appliances is **not** integrated into a zEnterprise BladeCenter Extension and is **not** managed by the Unified Resource Manager. It does **not** require or exploit zEnterprise Ensemble capabilities.
- **Designed to plug seamlessly into the System z hardware and software stack without requiring any change to existing application software.**

DB2 Analytics Accelerator V2

Powered by Netezza 1000 Appliance



Disk Enclosures

SMP Hosts

Snippet Blades™
(S-Blades, SPUs)

Slice of User Data
Swap and Mirror partitions
High speed data streaming
High compression rate

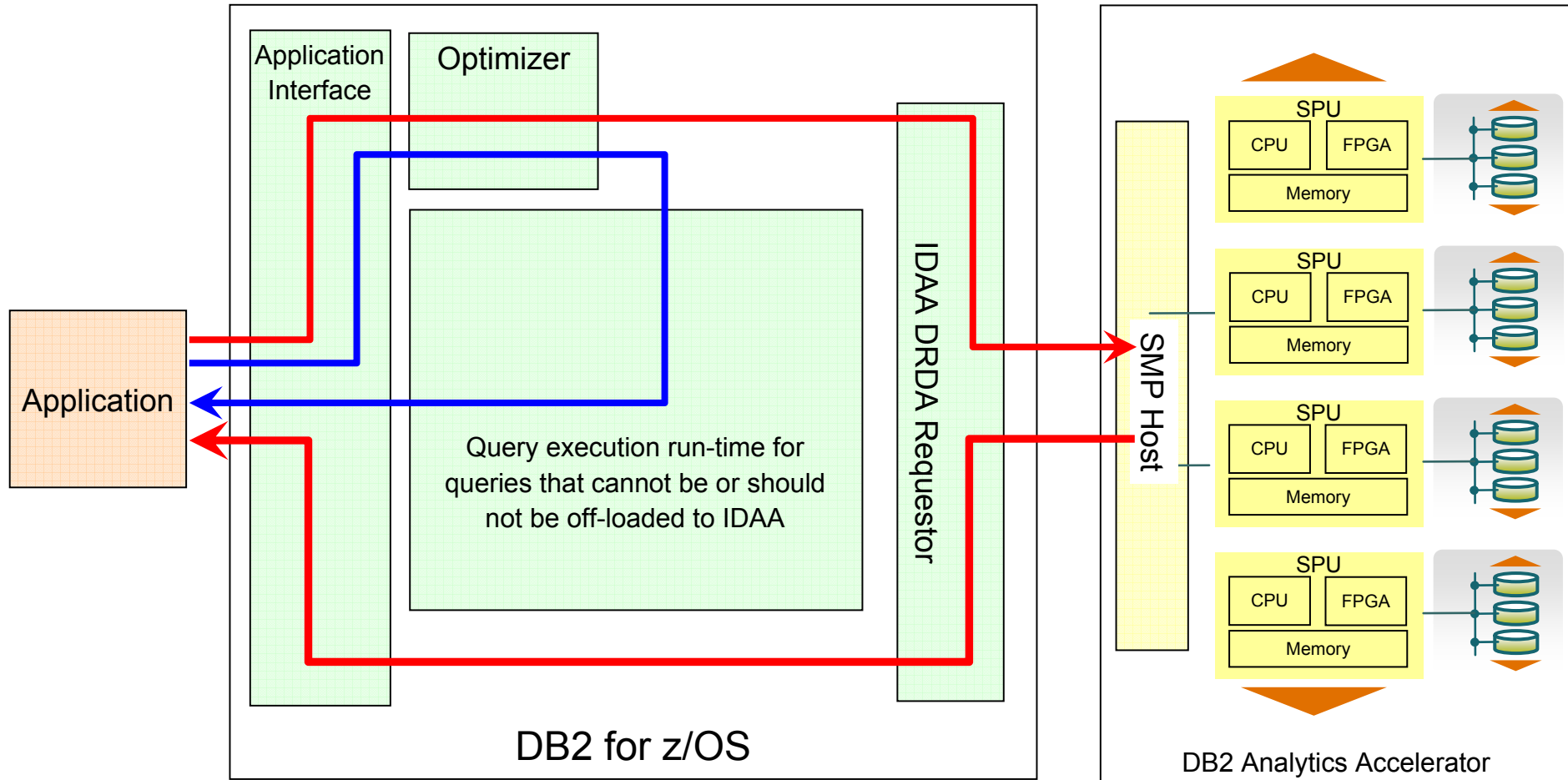
EXP3000 JBOD Enclosures
12 x 3.5" 1TB, 7200RPM, SAS (3Gb/s)
max 116MB/s (200-500MB/s compressed data)
e.g. TF12:
8 enclosures → 96 HDDs
32TB uncompressed user data (→ 128TB)

IDAA Server
SQL Compiler, Query Plan, Optimize
Administration

2 front/end hosts, IBM 3650M3
clustered active-passive
2 Nehalem-EP Quad-core 2.4GHz per host

Processor &
streaming DB logic
High-performance database
engine streaming joins,
aggregations, sorts, etc.
e.g. TF12: 12 back/end SPUs
(more details on following charts)

Query Execution Process Flow



Queries executed without DB2 Analytics Accelerator
 Queries executed with DB2 Analytics Accelerator

IBM BladeCenter PS701 (8406-71Y) Configurations for zBX

- **IBM BladeCenter PS701 (8406-71Y)**
 - ▶ POWER7 8 Core Processor
 - ▶ 8 Processor Cores activated
 - ▶ 1 Processor socket
 - ▶ Single wide Blade only
 - ▶ 3.0GHz
 - ▶ 16 dimm slots (4 or 8 GB DIMMs)
 - ▶ 300GB HDD Internal Disk
- **3 Configurations shown are supported**
- **POWER7 Blades may be acquired by the customer through existing channels or through IBM**
- **PowerVM Enterprise Edition licence and Software Maintenance Agreement is required for all 8 Cores, and must be maintained for the duration of use.**
- **PowerVM Enterprise Edition is controlled as zEnterprise Licensed Internal Code (LIC)**
 - ▶ pHyp 2.1, VIOS 2.1.3
 - ▶ Extensions for configuration and systems management: Hardware setup, FFDC, Heartbeat, PPM daemon

Blade	FC#	Config 1	Config 2	Config 3
Processor 3.0GHz@150W		1	1	1
Processor Activations	8411 8412	4 4	4 4	4 4
Memory kits		32 GB	64 GB	128 GB
8 GB (2 x 4 GB)	8208	4	8	0
16 GB (2 x 8 GB)	8209	0	0	8
HDD 300GB	8274	1	1	1
8406-8275 QLogic 2-port 10Gb Converged Network Adapter (CFE)	8275	1	1	1
8406-8242 QLogic 8Gb Fibre Channel Expansion Card	8242	1	1	1
PowerVM EE	5228	8	8	8
Required SW	PID			
PowerVM EE SW License PID	5765-PVE	8	8	8
PowerVM EE 1 YR SWMA PID	(0001) 5771-PVE	Choose Qty 8 of 1 YR or 3 YR		
PowerVM EE 3 YR SWMA PID	(4991) 5773-PVE	Choose Qty 8 of 1 YR or 3 YR		

(0999)

Warranty and Maintenance

Separate blade warranty is NOT required if in a zBX under IBM maintenance.

zBX maintenance includes 24x7 on-site support for parts (including blades) and service during the 1 year System z warranty and subsequent post warranty maintenance terms

Reference – ITSO Redpaper REDP-4655

IBM BladeCenter PS700, PS701, and PS702 Technical Overview and Introduction

New Blades Provide Added Flexibility for Workload Deployment/Integration

- **Introducing System x Blades in the zBX**
 - Select IBM BladeCenter HX5 7873 dual-socket 16-core blades
 - Ordered and fulfilled through System x providers and installed into the zBX by the customer
 - The zBX web page will host current blade ordering information: http://www.ibm.com/common/ssi/cgi-bin/ssialias?infotype=SA&subtype=WH&appname=STGE_ZS_ZS_USEN&tmlfid=ZSL03128USEN&attachment=ZSL03128USEN.PDF
 - Blades assume System z 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

IBM zEnterprise BladeCenter Extension (zBX) Machine Type: 2458 Mod 002

Optimizers

- IBM Smart Analytics Optimizer
- IBM WebSphere DataPower Integration Appliance XI50z for zEnterprise

Select IBM Blades

- IBM BladeCenter PS701 Express
- IBM BladeCenter HX5 7873

One to four – 42u racks –
capacity for up to 112 blades

- Up to 112 PS701 Power blades
- Up to 28 HX5 System x blades
- Up to 28 DataPower XI50z blades (double-wide)
- Up to 56 IBM Smart Analytics Optimizer blades



*... managed by the
zEnterprise Unified Resource Manager*

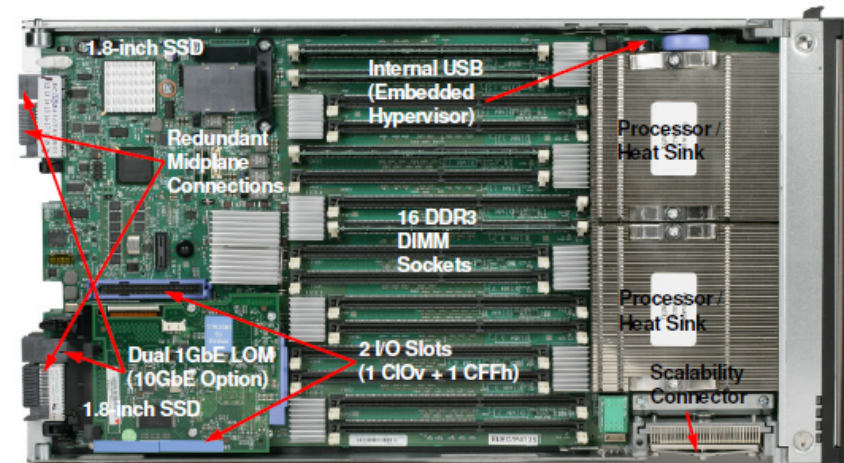
x86 Blade Support



- **HX5 w/ Westmere processor**
 - ▶ Intel 8 core Processor
 - ▶ 2 Processor sockets
 - ▶ 2.13 GHz 105W
 - ▶ Memory 1066 Mhz with 6.4 GTs
 - ▶ 16 DIMM slots
 - ▶ Different memory configurations up to 256GB
 - ▶ Two internal 50GB SSD Disk
 - ▶ 8Gb Fibre Channel
 - ▶ 10 GbE Ethernet

- **Blades will be acquired by the customer through existing channels or through IBM**

Interior View



Extending Support to New Operating System Environments

- **Support for Linux and Windows environments on select System x blades**

- 64-bit version support only



- Linux: RHEL 5.5, 5.6, 6.0, Novell SLES 10 (SP4) and SLES 11 SP1



- Microsoft Windows Server 2008 R2 (recommended: Datacenter Edition)

- The zBX web page will host the most current blade ordering information:

http://www.ibm.com/common/ssi/cgi-bin/ssialias?infotype=SA&subtype=WH&appname=STGE_ZS_ZSUSEN&htmlfid=ZSL03128USEN&attachment=ZSL03128USEN.PDF

- **Certifications inherited from System x**

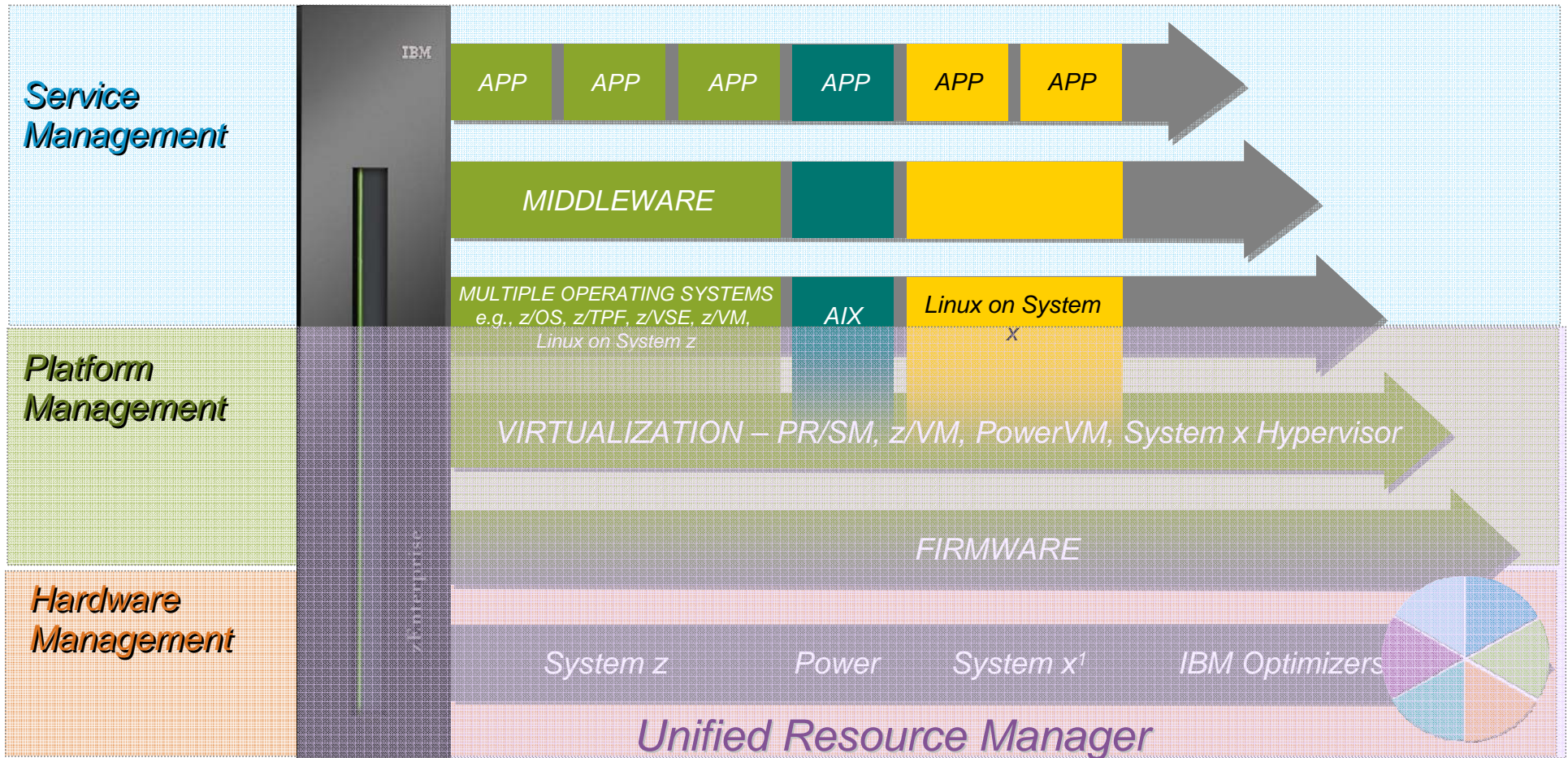
- **Operating Systems are customer acquired and installed**



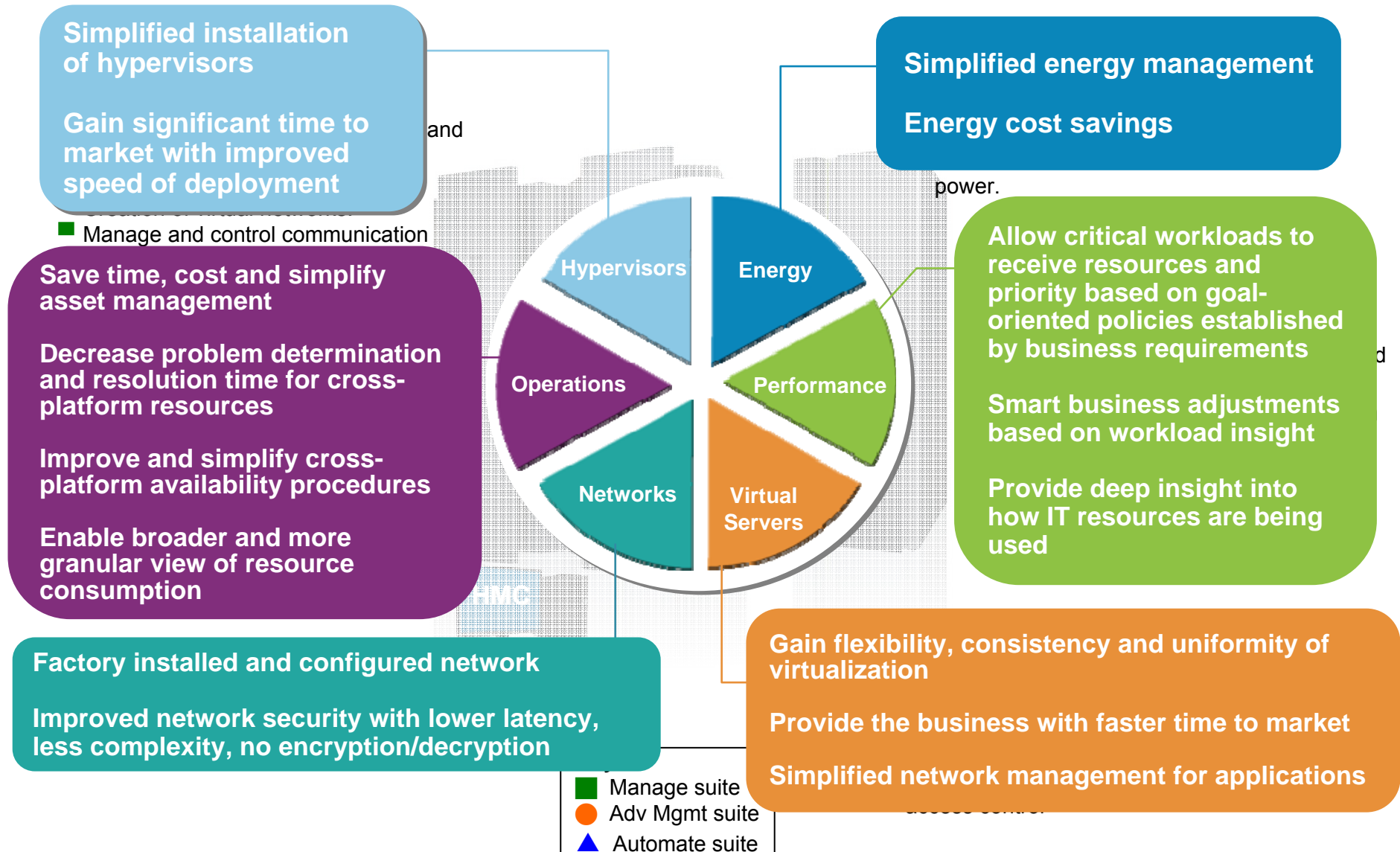
***Manage your
mainframe and
distributed
environment with the
same tools, same
techniques, same
practices***

zEnterprise Unified Resource Manager What's new ?

Heterogeneous Virtual Infrastructure Management



... Value Made Possible By the Unified Resource Manager



Extending zEnterprise Unified Resource Manager

Continuing to add function and management

- **Operational Controls enhanced with auto-discovery and configuration support for new resources**
 - ▶ Dynamic discovery and configuration of storage resources by Unified Resource Manager
- **Extending management functions of Unified Resource Manager with programmatic access**
 - ▶ New Unified Resource Manager APIs enable discovery, monitoring and management of ensemble resources using external tools
 - Open documented interface available for clients
 - Access using common scripting languages like Perl and Python
 - IBM Tivoli® will be taking advantage of the APIs:
 - CA Technologies, Dovetailed Technologies, CSL International and other ISVs are interested in taking advantage of the APIs

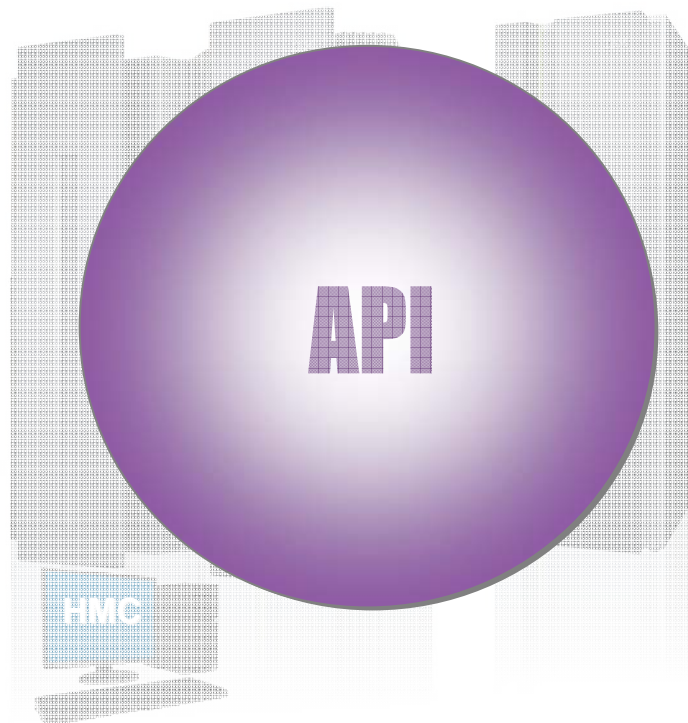


zEnterprise Unified Resource Manager

Service Management – API allows management of zEnterprise from external tools

Application Programming Interface (API) is a new implementation in the HMC

- Build on existing SNMP/CIM function plus new Unified Resource manager capabilities
- TCP/IP Sockets/HTTP is underlying network support with SSL for connection security
- Supports modern scripting languages (e.g., Perl, Python) that have HTTP supporting libraries
- Fully documented and supported for customer and third-party use
- HMC UI remains in place, supported and will continue to be extended as Unified Resource Manager evolves
- APIs are governed by the functions they involve such as 'Manage' or 'Automate'



API allows programmatic access to the same functions exploited by the HMC UI. Corresponding to views and tasks in the UI such as:

- List and get properties for core (traditional) entities, ensemble, workloads, virtual networks, virtual hosts, virtual servers, storage, zBX infrastructure (as well as provide start/stop/restart for many of these also)
- Can provide service oriented functions like metrics retrieval and inventory
- Manage energy management modes
- Help on recover actions of virtual actions
- And more ...

Operating System Support for zEnterprise System

- **Currency is key to operating system support and exploitation of future servers**
- **The following are the minimum operating systems planned to run on z196 or z114:**
 - ▶ z/OS¹
 - z/OS V1.11, 1.12, 1.13 or higher
 - z/OS V1.10, V1.9 and V1.8 in Lifecycle Extension
 - zBX Ensemble support: z/OS V1.10 or higher
 - ▶ Linux on System z distributions:
 - Novell SUSE SLES 10 or higher
 - Red Hat RHEL 5 or higher
 - ▶ z/VM
 - z/VM V5.4 or higher
 - z/VM V6.1 or higher for Enterprise Unified Resource Manager ensemble support
 - ▶ z/VSE V4.2 or higher
 - IEDN support: z/VSE 5.1 (GA November 25, 2011)
 - z/VSE 4.2, 4.3: IEDN access through z/VM VSWITCH (z/VM V6.1)V4.3 (for ensemble support)
 - ▶ z/TPF V1.1 or higher
- **Using the general purpose blades:**
 - ▶ AIX - AIX 5.3 Technology Level 12 or higher, AIX 6.1 Technology Level 5 or higher, AIX 7.1²
 - ▶ Linux on System x – Red Hat RHEL 5.5, 5.6 and 6.0 and Novell SUSE SLES 10 (SP4) and SLES 11 (SP1) – all must be 64-bit only
 - ▶ Microsoft Windows – Microsoft Windows Server 2008 R2 – 64 bit version only^{2,3}

¹ z/OS V1.10 or higher is required to support an ensemble

² Available December 16, 2011

³ Our recommendation is to use Datacenter Edition as it supports unlimited guests

IBM zEnterprise 114 and 196 (z114 and z196) – October 12, 2011 All require: Driver 93 with the most current LIC fixes available on the dates indicated

▪ Planned Availability Dates

- **November 18, 2011**
 - System z High Performance FICON enhancements
 - GDPS support for the zEnterprise System
 - New IBM Implementation Services for System z
- **December 2, 2011**
 - Support for z/VM 6.2 on zEnterprise and z10
- **December 16, 2011**
 - 1000BASE-SX and 1000BASE-LX optics for the zBX 10 GbE Top of Rack (customer network)
 - Additional zBX 8 Gbps FCS optics for POWER7 and System x blade connections to the customer SAN
 - Support for Windows on select System x Blades
 - Support for updated DataPower XI50z firmware
 - Support for AIX 7.1 on POWER7 blades
 - Unified Resource Manager Enhancements
 - Unified Resource Manager API support
 - Unified Resource Manager dynamic discovery of storage resources
 - Unified Resource Manager support for z/VM 6.2



z196

z114



zBX

A zEnterprise for Everyone

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

If you ...

- ...want the flexibility to manage across heterogeneous platform – including z/OS, z/VSE, Linux on System z, AIX, Linux on System x, Windows on System x¹
- ...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

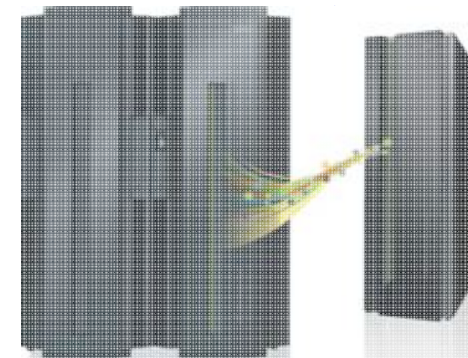
The z114 M10 is just what you need.



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.





Backup

Connectivity Enhancements on z196 and z114

New features with big performance boost

HMC

- Location to run Unified Resource Manager – including monitoring CPU, energy, workload performance
- Host of the ensemble – controlling all functions of the ensemble
- Primary with Alternate needed for DR

Within z1964/z114 and to zBX

- PCIe I/O Infrastructure
- I/O Drawer and I/O Cage¹
- Intraensemble data network (IEDN)
 - Updated options for 1 Gbps connection
- Intranode management network (INMN)



For Clustering

- HCA-3 InfiniBand® Coupling Links
 - 12x InfiniBand (improved performance – 12x IFB3protocol)
 - 1x InfiniBand (4 ports)
- ISC-3 (peer mode only)
- IC (define only)
- STP
 - Improved time coordination for zBX components



To the Network

- OSA-Express4S (PCIe-based)
 - 10 Gigabit Ethernet LR and SR
 - 1 Gigabit Ethernet SX and LX
- OSA-Express3
 - 1000BASE-T Ethernet

To the Data



- FICON® Express8S (PCIe-based)
- zHPF Performance Enhancements
- ESCON®
 - Up to 240 maximum

Enhancing System z world-class Security and Business Resiliency

▪ Cryptographic enhancements on zEnterprise

- Cryptography is in the “DNA” of System z hardware with Processor and Coprocessor based encryption capabilities
 - Processor Clear Key for bulk encryption – key material visible in storage
 - System z exclusive Protected Key CPACF helps to protect sensitive keys from inadvertent disclosure – not visible to application or OS
- Crypto Express3 enhanced to support key ANSI and ISO standards for the banking, finance and payment card industry.
- Enhanced display of cryptographic cards and simplified card configuration and management capabilities via the Trusted Key Entry workstation (TKE).
- Simplified master key management with ICSF enhancements providing a single point of administration within a z/OS Sysplex.
- Continued support for the next generation of public key technologies, ECC support is ideal for constrained environments such as mobile devices.
- Crypto Express3 Coprocessor FIPS 140-2 Level 4 hardware evaluation.

▪ PR/SM™ designed for EAL5 certification.

NEW z196 has received EAL5+

▪ Policy driven flexibility to add capacity to real or virtual processors.

▪ High Availability, Backup and Disaster Recovery solutions

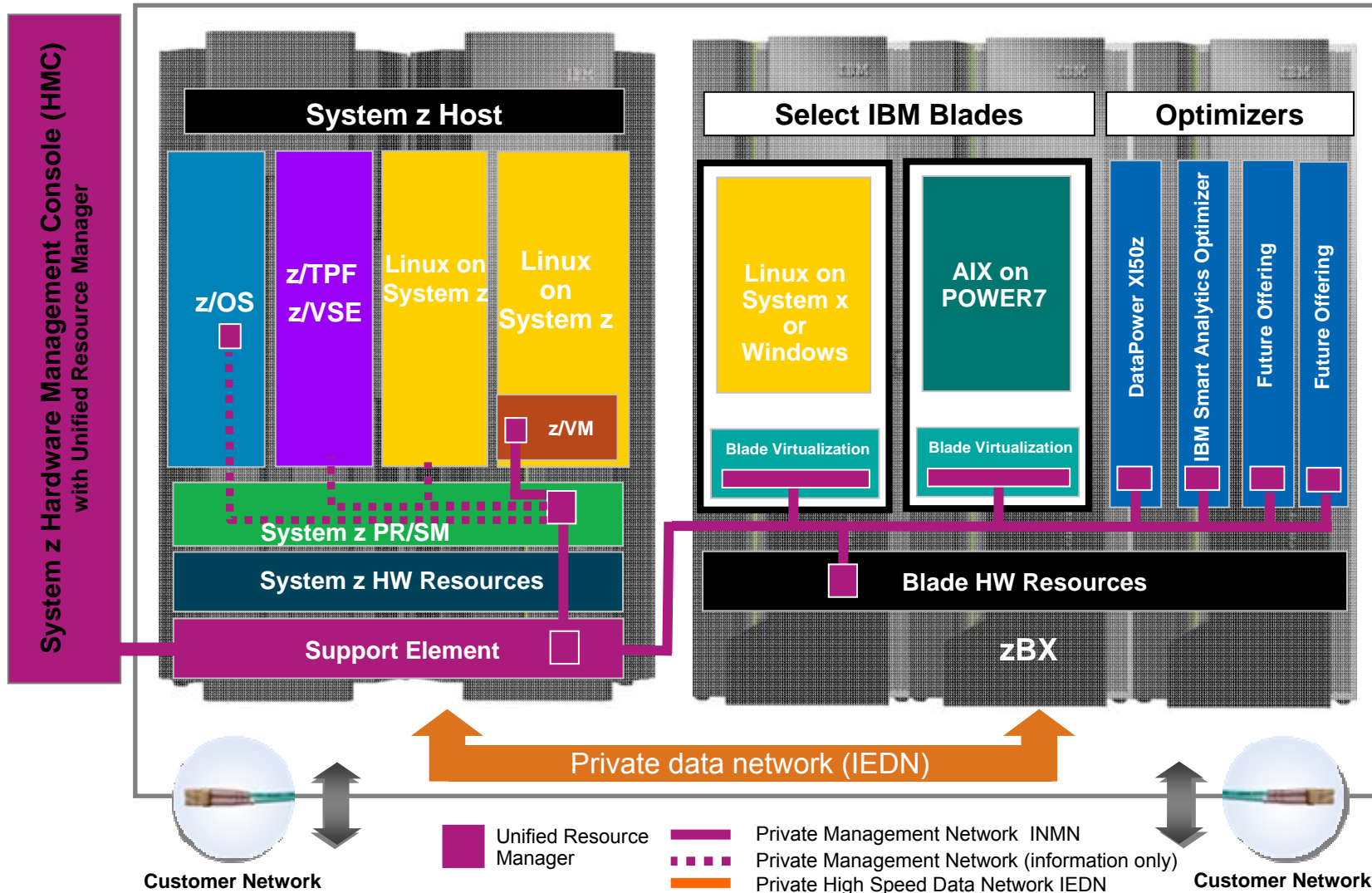
NEW Updated GDPS support for zEnterprise System

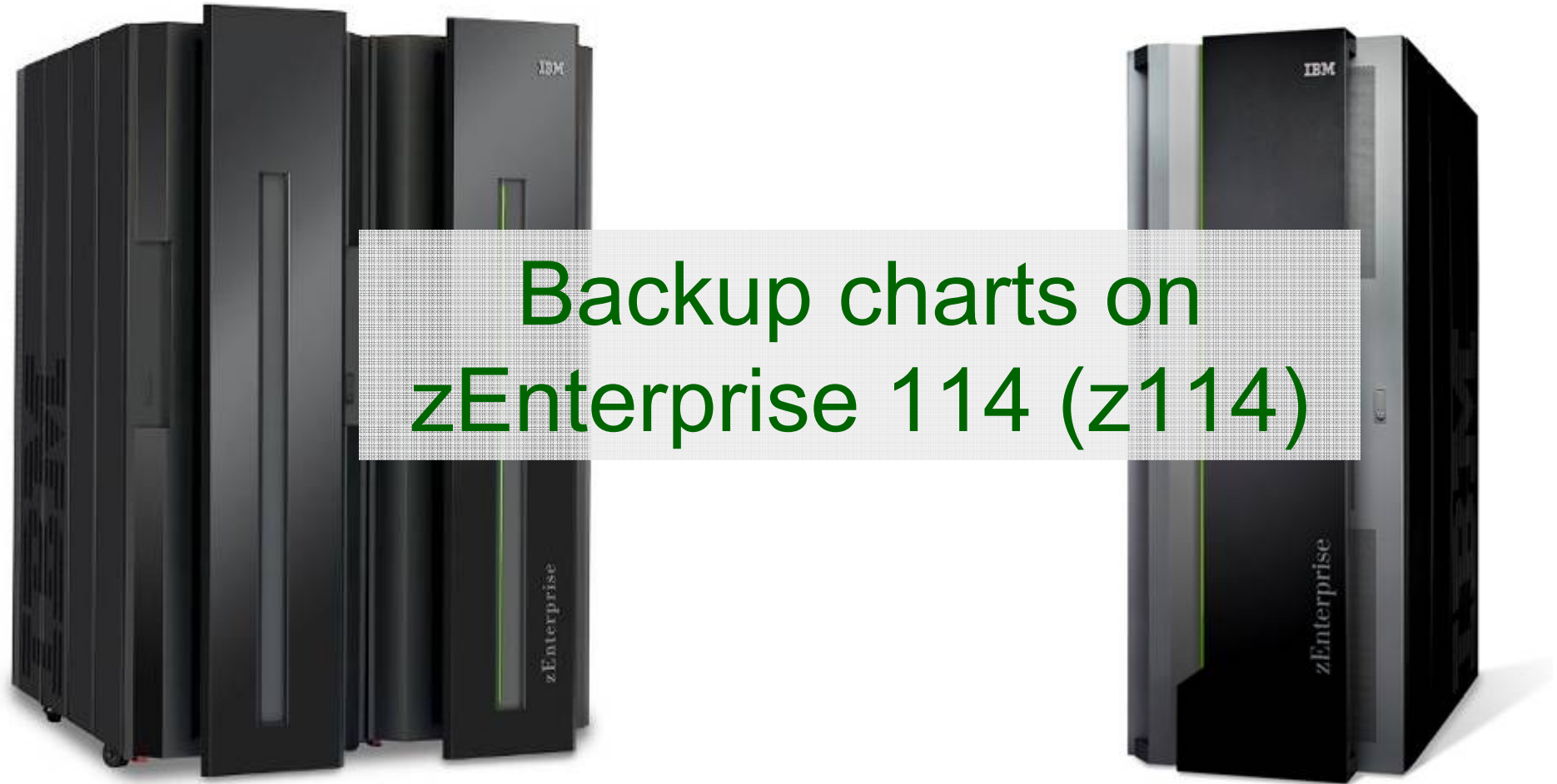
NEW xDR extension to support z/VSE



Putting zEnterprise System to the Task

Use the smarter solution to improve your application design





Deploy Multi-tier workloads on a single integrated system with the z114 *Create an integrated infrastructure that aligns to end-to-end business processes across technology boundaries*

- Unify and optimize multiple architectures to work as a single system
- Scale without adding complexity to meet the growing demands on the infrastructure
- Fit for purpose application deployment
- Improve performance with co-location of data and applications
- Reduce cost through centralized data center management and automation
- Improve resiliency through a private network
- Enable innovation through flexibility and breaking down silos



Extending the reach and strategic role of the mainframe across the enterprise; simplify and reduce the range of skills necessary for managing the datacenter.

Designed and Right-Sized for Existing and Future Applications Requirements

	CP	IFL	zIIP	zAAP	ICF	Add'l SAP	Std SAP	Spare
M05	0-5	0-5	0-2	0-2	0-5	0-2	2	0
M10	0-5	0-10	0-5	0-5	0-10	0-2	2	2

Larger ↑

Z01	Z02	Z03	Z04	Z05
Y01	Y02	Y03	Y04	Y05
X01	X02	X03	X04	X05
W01	W02	W03	W04	W05
V01	V02	V03	V04	V05
U01	U02	U03	U04	U05
T01	T02	T03	T04	T05
S01	S02	S03	S04	S05
R01	R02	R03	R04	R05
Q01	Q02	Q03	Q04	Q05
P01	P02	P03	P04	P05
O01	O02	O03	O04	O05
N01	N02	N03	N04	N05
M01	M02	M03	M04	M05
L01	L02	L03	L04	L05
K01	K02	K03	K04	K05
J01	J02	J03	J04	J05
I01	I02	I03	I04	I05
H01	H02	H03	H04	H05
G01	G02	G03	G04	G05
F01	F02	F03	F04	F05
E01	E02	E03	E04	E05
D01	D02	D03	D04	D05
C01	C02	C03	C04	C05
B01	B02	B03	B04	B05
A01	A02	A03	A04	A05
1-way	2-way	3-way	4-way	5-way

↓ Smaller

- Complete capacity matrix available on both models.
- Granularity levels similar to z10 BC to facilitate upgrades and incremental growth
- Model M10 provides specialty engine scale out capabilities
- Any to any capacity upgrade/downgrade capability within the Model
- CBU capability from smallest to largest capacities within the Model
- On/Off CoD within the Model
- Linux only and ICF only servers

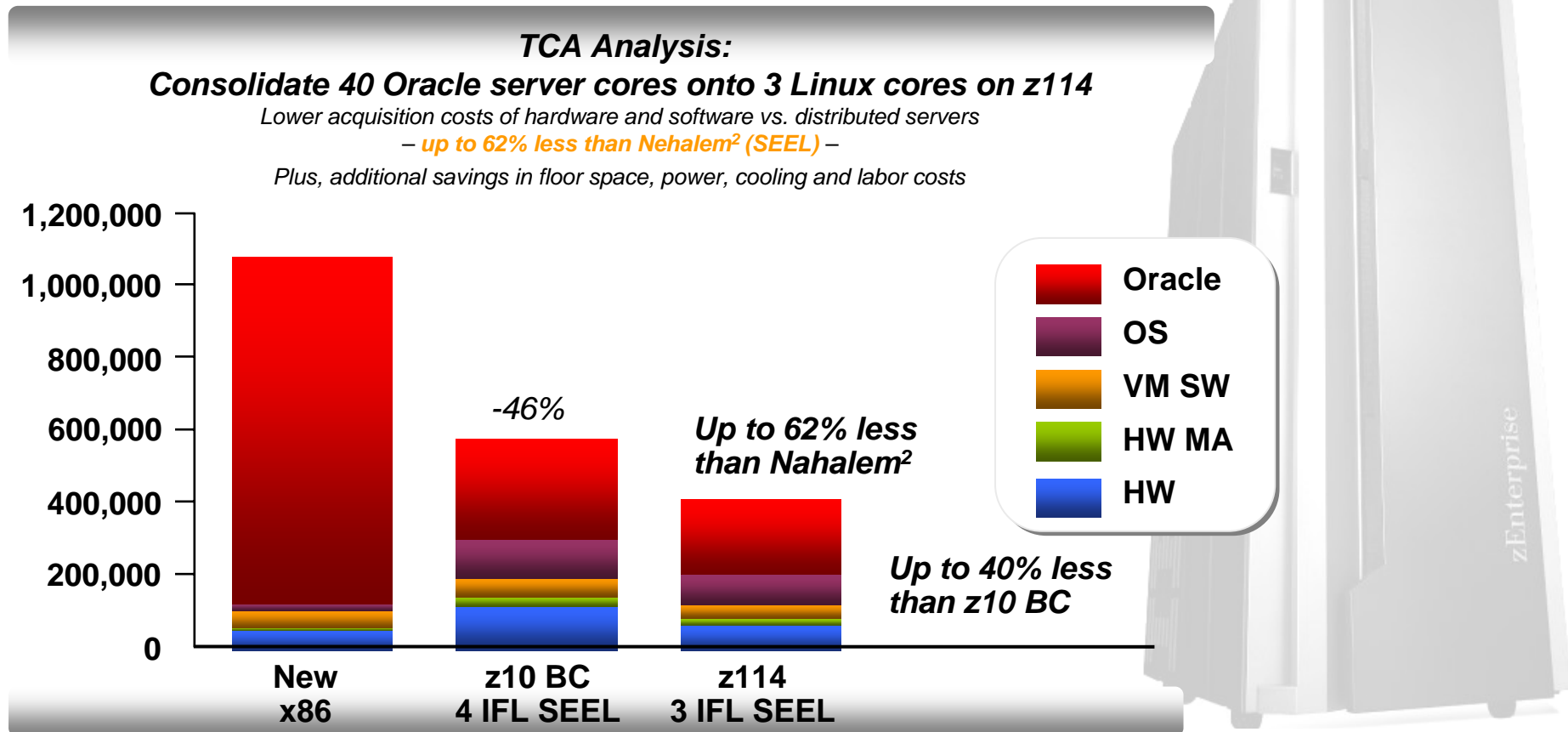
Built to Support Future Data Center Design, Modernization and Efficiencies

- More performance and capacity within the same energy envelope as the IBM System z10 Business Class™ (z10 BC)
- Supports raised floor and non-raised floor configurations
- Improved installation flexibility with overhead cabling option
- Reduced footprint depth by 9" (22.8 cm) compared to z10 BC
- Optional high-voltage DC power input



The Economics of Linux on z114 for Consolidation and Cost Reduction

- Consolidate an average of **30 distributed servers** or more on a single core, or **hundreds** in a single footprint.
- Deliver a virtual Linux server for approximately **\$500 per year** or as little as a **\$1.45 per day per virtual server** (TCA)¹




¹ Based on US Enterprise Linux Server pricing. Pricing may vary by country. Model configuration included 10 IFL cores running a mixed workload averaging 31 virtual machines per core with varying degrees of activity. Includes zEnterprise hardware and z/VM virtualization software. Does not include Linux OS or middleware software.

45 ² Distributed server comparison is based on IBM cost modeling of Linux on zEnterprise vs. alternative distributed servers. Given there are multiple factors in this analysis such as utilization rates, application type, local pricing, etc., savings may vary by user.

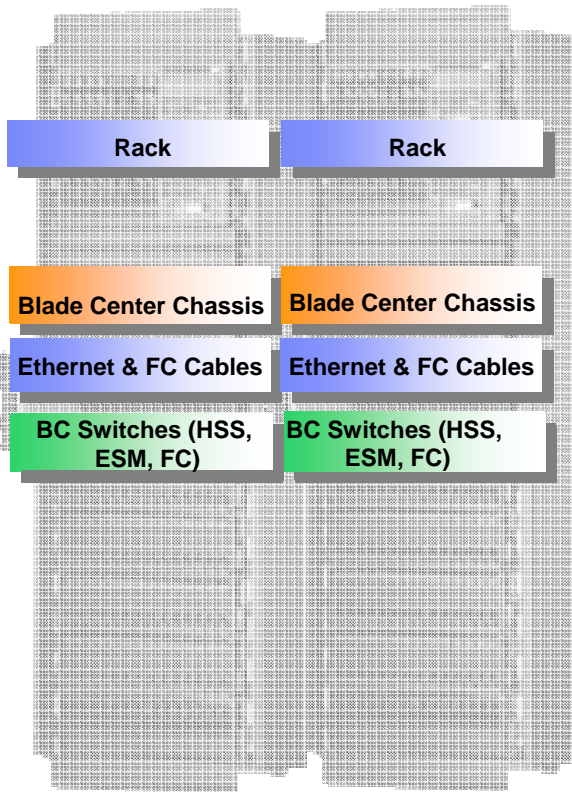
z114 Functional Comparison to z10 BC

Processor / Memory	<ul style="list-style-type: none"> ▪ Uniprocessor Perf. ▪ System Capacity ▪ Processor Design ▪ Models ▪ Processing Units (PUs) ▪ Granular Capacity ▪ Memory ▪ Fixed HSA 	<ul style="list-style-type: none"> ▪ Up to 1.18 performance improvement over z10 BC uniprocessor* ▪ Up to 1.12 times system capacity performance improvement over z10 BC ▪ 3.8 GHz processor chip for z114 vs. 3.5 GHz for z10 BC ▪ z114 has 2 and z10 BC has 1 model ▪ z114 has the same number of PUs as z10 BC i.e. 10. M10 has 2 dedicated spares ▪ z114 has the same number of capacity settings as z10 BC i.e. 130 ▪ z114 has the same number of System memory as z10 BC i.e. 256 GB ▪ z114 has the same fixed 8 GB HSA as the z10 BC
Virtualization and Alternative Processors	<ul style="list-style-type: none"> ▪ Virtualization ▪ zEnterprise BladeCenter Extension (zBX) 	<ul style="list-style-type: none"> ▪ zEnterprise Unified Resource Manager has “workload awareness” where workloads consist of virtual images across the hybrid. ▪ zEnterprise System is a truly integrated hardware platform that is able to span and intelligently manage workloads across mainframe and distributed technologies – including POWER7 and IBM System x Blades² ▪ Optimizers that are supported are IBM Smart Analytics Optimizer and IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise
Connectivity	<ul style="list-style-type: none"> ▪ HiperSockets ▪ FICON for SANs ▪ Total channels ▪ Internal I/O Bandwidth ▪ Enhanced I/O structure ▪ Coupling ▪ Cryptography ▪ LAN Connectivity 	<ul style="list-style-type: none"> ▪ Doubled the number of Hipersockets to 32 ▪ High Performance FICON for z (zHPF) performance enhancements ▪ New and improved family of FICON Express8S features for z114 – Up to 160 channels ▪ z114 can support up to 368 channels (2 x I/O Drawers and 2 x PCIe Drawer) ▪ z114 has industry standard 8 GBps PCIe interconnect Vs. z10 BC using 6 GBps InfiniBand interconnects ▪ PCIe I/O Drawer ▪ Improved coupling with host channel adapters using the 8 GBps interconnects ▪ Improved AES 192 and 256 and stronger hash algorithm with Secure Hash Algorithm (SHA-512) ▪ New family of OSA-Express4S features for z114
On Demand / RAS	<ul style="list-style-type: none"> ▪ Capacity Provisioning Mgr ▪ RAS Focus ▪ Just in Time deployment of Capacity ▪ Enhanced I/O structure 	<ul style="list-style-type: none"> ▪ z114 & z/OS (1.9) for policy based advice and automation ▪ z114 can help eliminate preplanning required to avoid scheduled outages ▪ Capacity on Demand offerings CBU and On/Off CoD plus new Capacity for Planned Events are resident on z114 ▪ z114 has ‘hot-pluggable’ I/O drawers
Environmentals	<ul style="list-style-type: none"> ▪ Monitoring 	<ul style="list-style-type: none"> ▪ z114 displays energy efficiency on SAD screens ▪ Utilizes IBM Systems Director Active Energy Manager for Linux on System z for trend calculations and management of other servers that participate



Backup charts on zBX and Unified Resource Manager (hybrid capabilities and functions)

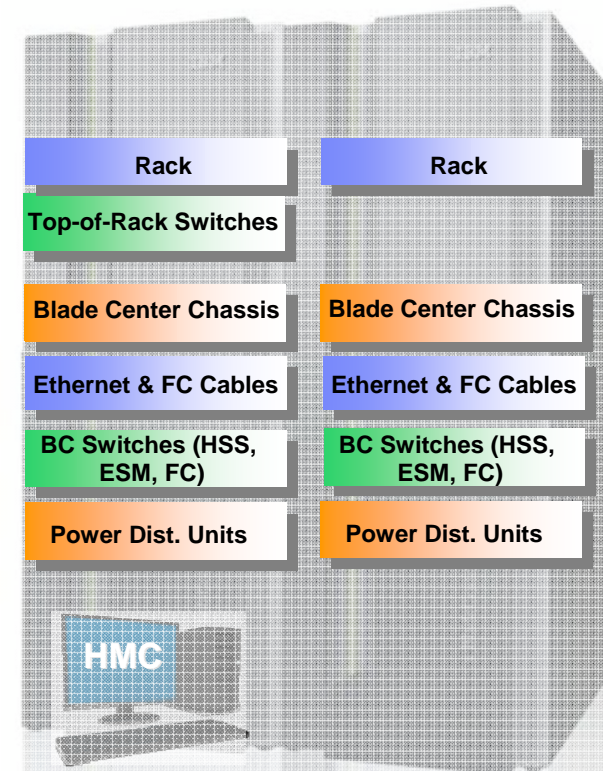
zBX – A Uniquely Configured Extension of the zEnterprise



Rack infrastructure hosting IBM BladeCenters

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 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



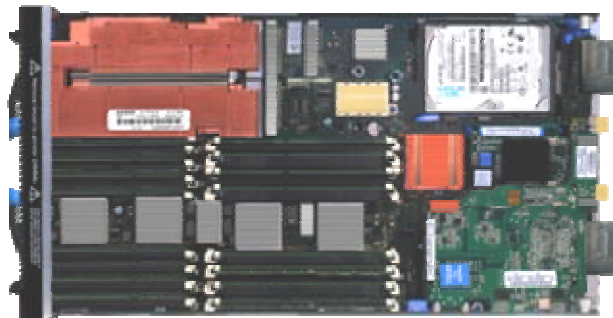
IBM zEnterprise BladeCenter Extension (zBX) 2458 - Model 002

IBM POWER7 and System x Blades

General purpose processors under one management umbrella

What is it?

The zBX infrastructure can host select IBM POWER7 and IBM System x blades. Each blade comes with an installed hypervisor that offers the possibility of running an application that spans z/OS, Linux on System z, AIX on POWER®, Linux or Microsoft® Windows® on System x but have it under a single management umbrella.



How is it different?

- **Complete management:** Advanced management brings operational control and cost benefits, improved security, workload management based on goals and policies.
- **Virtualized and Optimized:** Virtualization means fewer resources are required to meet peak demands with optimized interconnection. Multiple resources (both blade types and optimizers) can reside in a single zBX.
- **Integrated:** Integration with System z brings heterogeneous resources together that can be managed as one.
- **Transparency:** Applications certified to run on AIX 5.3 or 6.1 on POWER7 blades and those certified to run on supported releases of Linux on System x or Windows on the System x blades will run on those blades in a zBX. No changes to deployed guest images.
- **More applications:** Brings larger application portfolio to System z.

IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise Helps Extend the Value of zEnterprise

Purpose-built hardware for simplified deployment and hardened security helps businesses quickly react to change and reduce time to market

What is it?

The IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise can help simplify, govern, secure and integrate XML and IT services by providing connectivity, gateway functions, data transformation, protocol bridging, and intelligent load distribution.



How is it different?

- **Security:** VLAN support provides enforced isolation of network traffic with secure private networks.
- **Improved support:** Monitoring of hardware with “call home” for current/expected problems and support by System z Service Support Representative.
- **System z packaging:** Increased quality with pre-testing of blade and zBX. Upgrade history available to ease growth.
- **Operational controls:** Monitoring rolled into System z environment from single console. Consistent change management with Unified Resource Manager.
- **Cloud:** WebSphere DataPower enhancements can provide a secure, managed connection from the enterprise applications or enterprise users to public cloud applications.

zEnterprise Unified Resource Manager

Hardware Management

Hypervisor Management

- Integrated deployment and configuration of hypervisors
- Hypervisors (except z/VM) shipped and serviced as firmware.
- Management of ISO images.
- Creation of virtual networks.

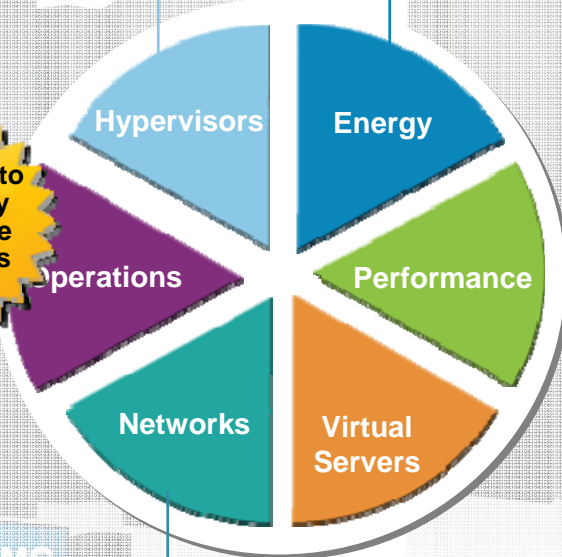
Energy Management

- Monitoring and trend reporting of CPU energy efficiency.

Operational Controls

- Auto-discovery and configuration support for new resources.
 - *Auto discover storage resources*
- Cross platform hardware problem detection, reporting and call home.
- Physical hardware configuration, backup and restore.
- Delivery of system activity using new user.

NEW! Auto discovery of storage resources



Network Management

- Management of virtual networks including access control

Key

- Manage Suite
- Advanced Manage Suite
- ▲ Automate Suite

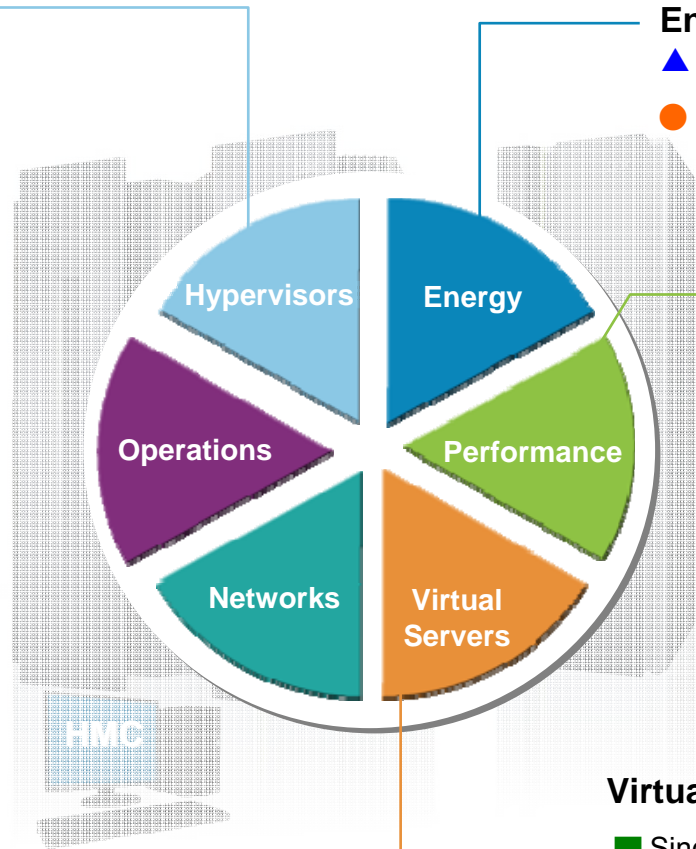
zEnterprise Unified Resource Manager Platform Management

Hypervisor Management

- Manage and control communication between virtual server operating systems and the hypervisor.

Energy Management

- ▲ Static power savings¹
- ▲ Ability to query maximum potential power.



Workload Awareness and Platform Performance Management

- HMC provides a single consolidated and consistent view of resources
- ▲ Wizard-driven set up of resources in accordance with specified business process
- ▲ Ability to monitor and report performance
- ▲ Manage to a performance policy

Virtual Server Lifecycle Management

- Single view of virtualization across platforms.
- Ability to deploy multiple, cross-platform virtual servers within minutes
- Management of virtual networks including access control

Key

- Manage Suite
- Advanced Manage Suite
- ▲ Automate Suite

¹ Select POWER7 blades

zEnterprise Unified Resource Manager Pricing Strategy

Priced to Value: Tiered functionality that scales

Manage, Advanced Management and Automate are ordered as features of the z196 or z114
 When placing an order for a z196 or z114, the default is 'Manage' FC#0019. If you want "Advanced Management / Automate" you will need to order FC#0020. The additional feature codes for these functions for the blades/optimizers will automatically be generated for you based on the number of blades/optimizers that you order. To get ensemble management and cables make sure that you also order FC#0025 on the z196 or z114.

Manage	Delivers Unified Resource Manager's function for core operational controls, installation and configuration, and energy monitoring
Advanced Management	Delivers workload definition and performance policy monitoring and reporting
Automate	Delivers workload definition and performance policy monitoring and reporting. Delivers goal oriented monitoring and goal oriented management of resources and energy management.

	Manage – per connection	Advanced Management - per connection	Automate – per connection
z196 or z114 base hardware configuration	FC#0019 - N/C	N/A	FC#0020 - N/C
IFL	N/C	N/A	FC#0052 – Yes
IBM Smart Analytics Optimizer (zBX FC#0610)	FC#0039 – Yes	N/A	FC#0043 – N/C
POWER7 Blade (zBX FC#0612)	FC#0041 – Yes	N/A	FC#0045 – Yes
DataPower Blade (zBX FC#0611)	FC#0040 – Yes	N/A	FC#0044 – N/C
System x Blade (zBX FC#0613)	FC#0042 – Yes	FC#0046 - Yes	N/A

Unified Resource Manager Flow Charts

- **Note .. The Unified Resource Manager ‘flow’ charts on the next pages are not blank ... they need to be shown in Screen Show!**

Putting zEnterprise System to the Task

Operational Controls – POWER7

Putting zEnterprise System to the Task

Operational Controls – System x

IBM zEnterprise - Freedom by Design



Putting zEnterprise System to the Task

Performance Management

IBM zEnterprise - Freedom by Design



Putting zEnterprise System to the Task

Network Management

Putting zEnterprise System to the Task

Hypervisor Management and Virtual Server Management – POWER7

Putting zEnterprise System to the Task

Hypervisor Management and Virtual Server Management – System x

IBM zEnterprise - Freedom by Design



Putting zEnterprise System to the Task

Energy Management