IBM System & Technology Group

System z Update

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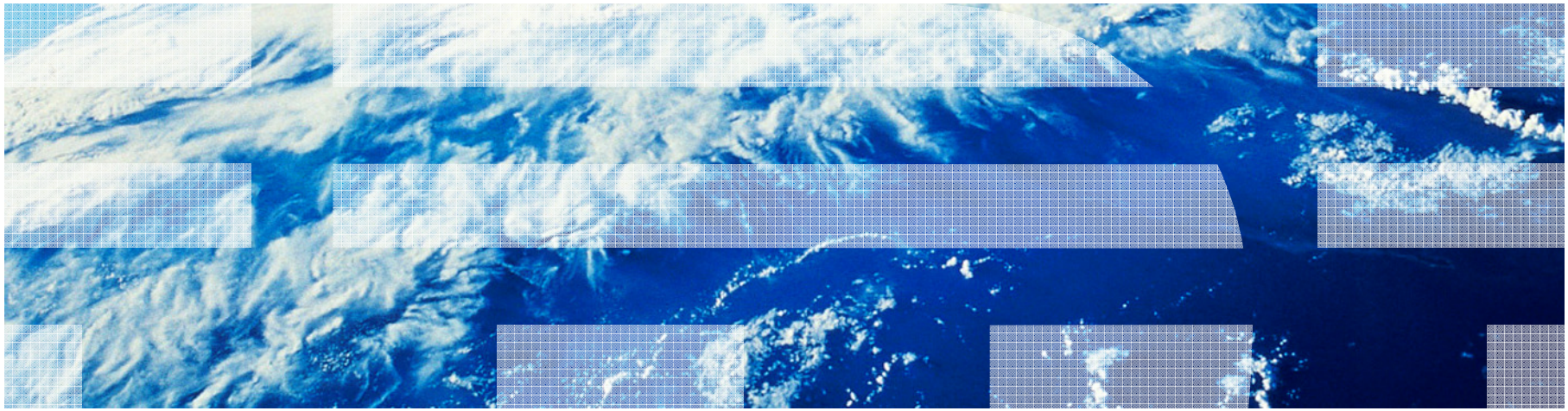
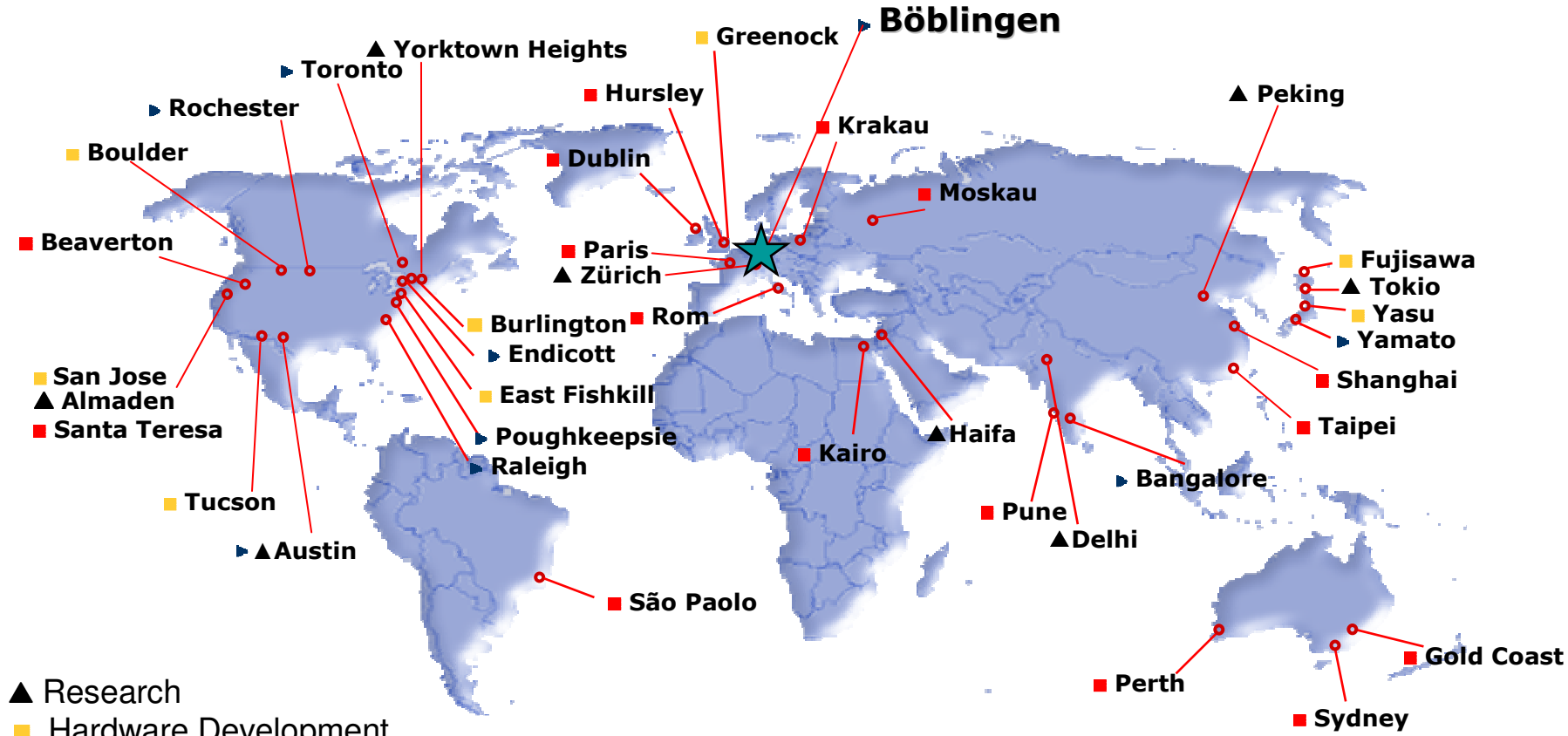


IBM Global Research & Development



Smarter Computing is realized through an IT infrastructure that is designed for data, tuned to the task, and managed in the cloud

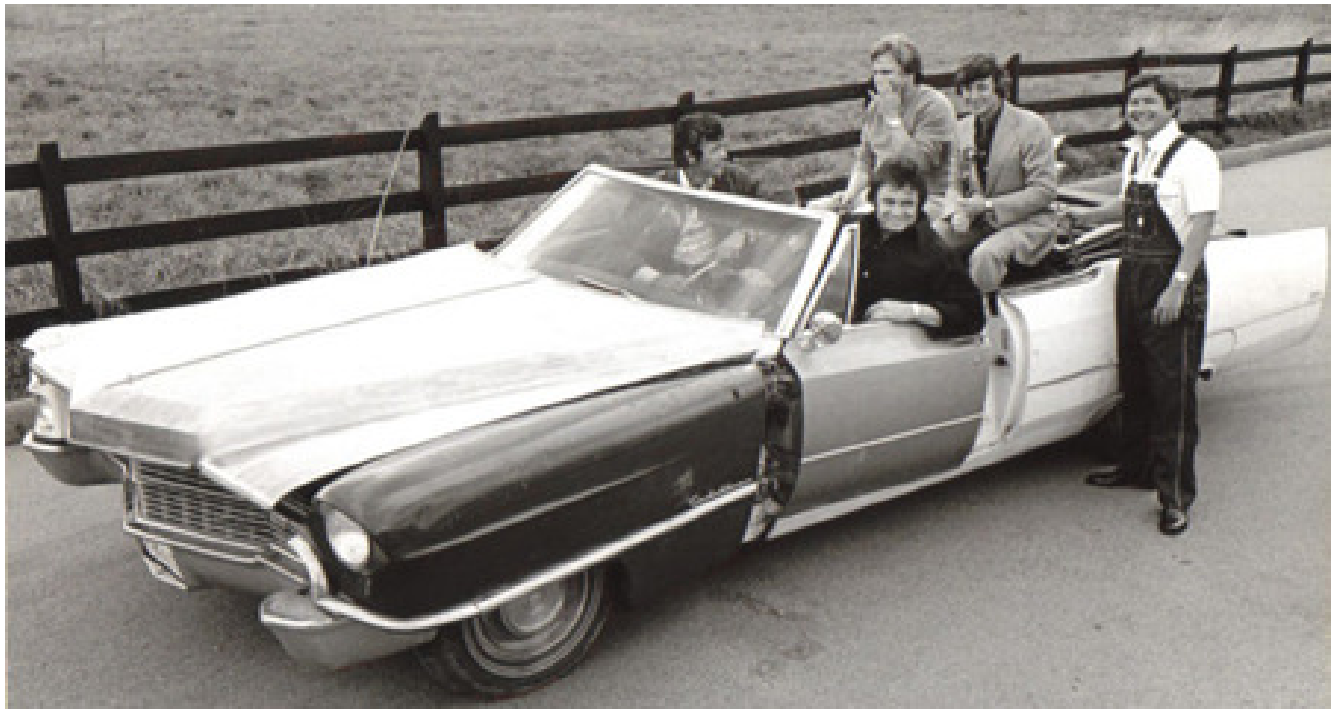
Smarter Computing
The IT Infrastructure that Enables a Smarter Planet

Designed for data
Harness all available information - **89% of CEOs** want better insight via Business Intelligence and analytics

Managed in the Cloud
Reinvent IT - **60% of CIOs plan to use cloud technologies** and **55% of business executives** believe cloud enables business transformation

Tuned to the task
Drive greater performance and improve IT economics - **total cost per workload can be reduce up to 55%** with optimized systems

A word of caution….

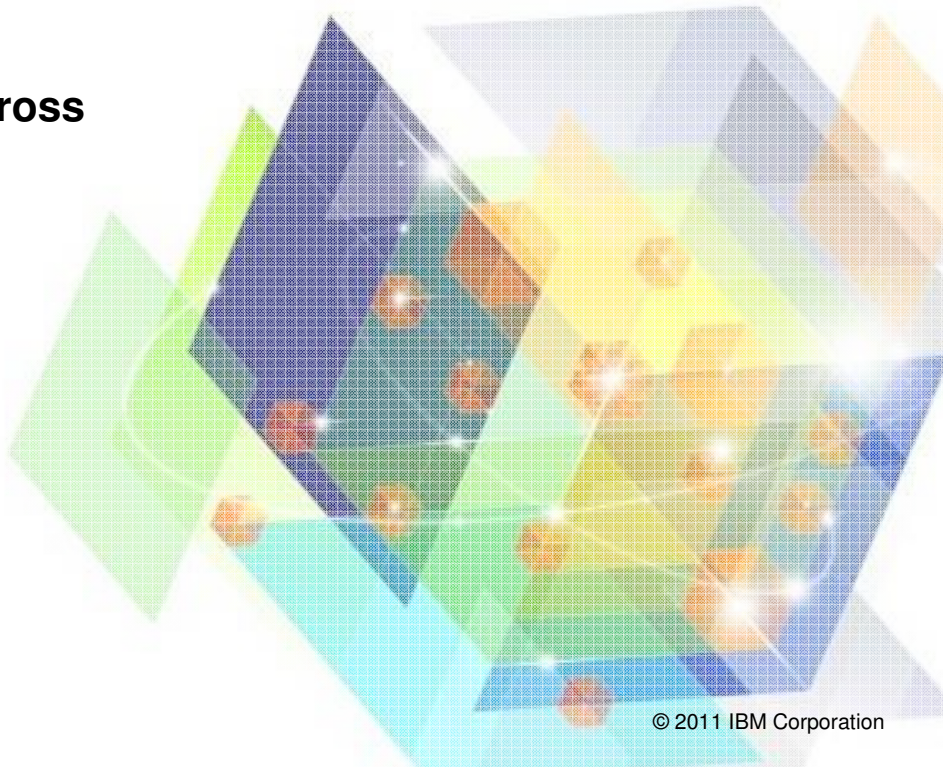


Balanced System Design

Hybrid Computing with the zEnterprise

Freedom to innovate your business with a multi-platform that's both mainframe and distributed

- **Redefining IT frameworks to bring change to operational silos and extend IBM System z® governance to POWER7® and IBM System x blades**
- **Fast and flexible application integration including Microsoft Windows support**
- **Improving agility to compete with consolidation and simplification**
- **Delivering consistent business controls across applications and platforms**
- **Focused on integration and collaboration to fuel business growth**
- **zEnterprise is the industry's only heterogeneous cloud platform**



One Size Does Not Fit All

System z Portfolio: HW pieces for zEnterprise related solutions

IBM zEnterprise System (z196/z114 + zBX + Unified Resource Mgr.)

IBM zEnterprise Starter Edition for Cloud
IBM Enterprise Linux Server

IBM DB2 Analytics Accelerator

IBM Netezza

z196

z114

zBX BladeCenter Extension

IBM Smart Analytics
System 9700 / 9710

DS8000 family

z196 vs. predecessors (z10 EC, z9 EC), capacity comparison

- **z9 EC up to 54-way: 193 – 18505 PCIs**
- **z10 EC up to 64-way: 214 – 31826 PCIs**
- **z196 up to 80-way: 240 – 52286 PCIs**

Note: z/OS V1.11 LSPR numbers quoted

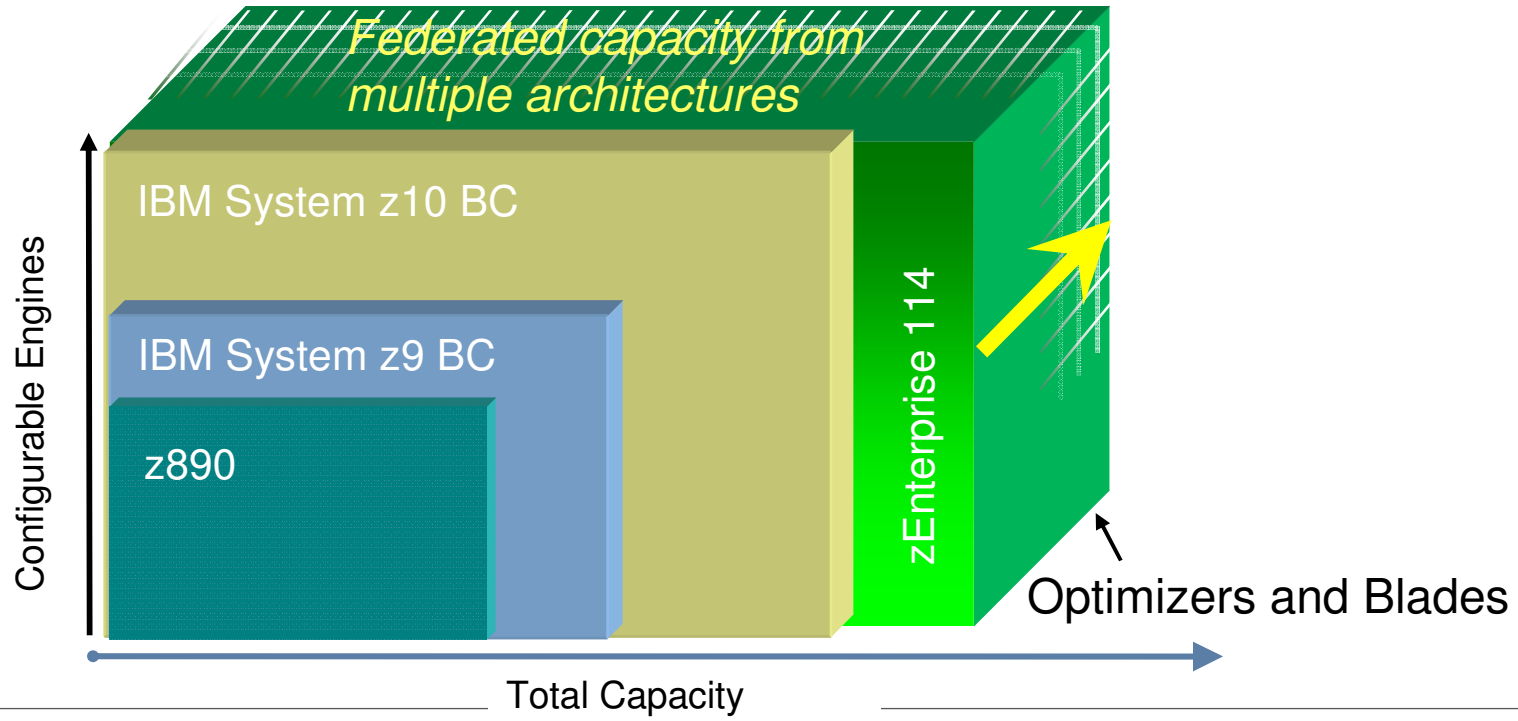
zEnterprise 114 performance and scalability

Think both Inside and Outside the box!

- Faster Processors
  - 18% Improvement in Uniprocessor speed
  - 12% Improvement in overall System capacity
- Architectural equivalence to the z196
- More economic delivery of equivalent capacity

Think System z Qualities of Service!

- zEnterprise 114 Multiple Architecture Ensembles
  - Tightly integrated heterogeneous systems
  - Robust, n+1 configurations
  - Highly virtualized
  - Managed end-to-end
  - Improved economies of scale, efficiency, and price performance

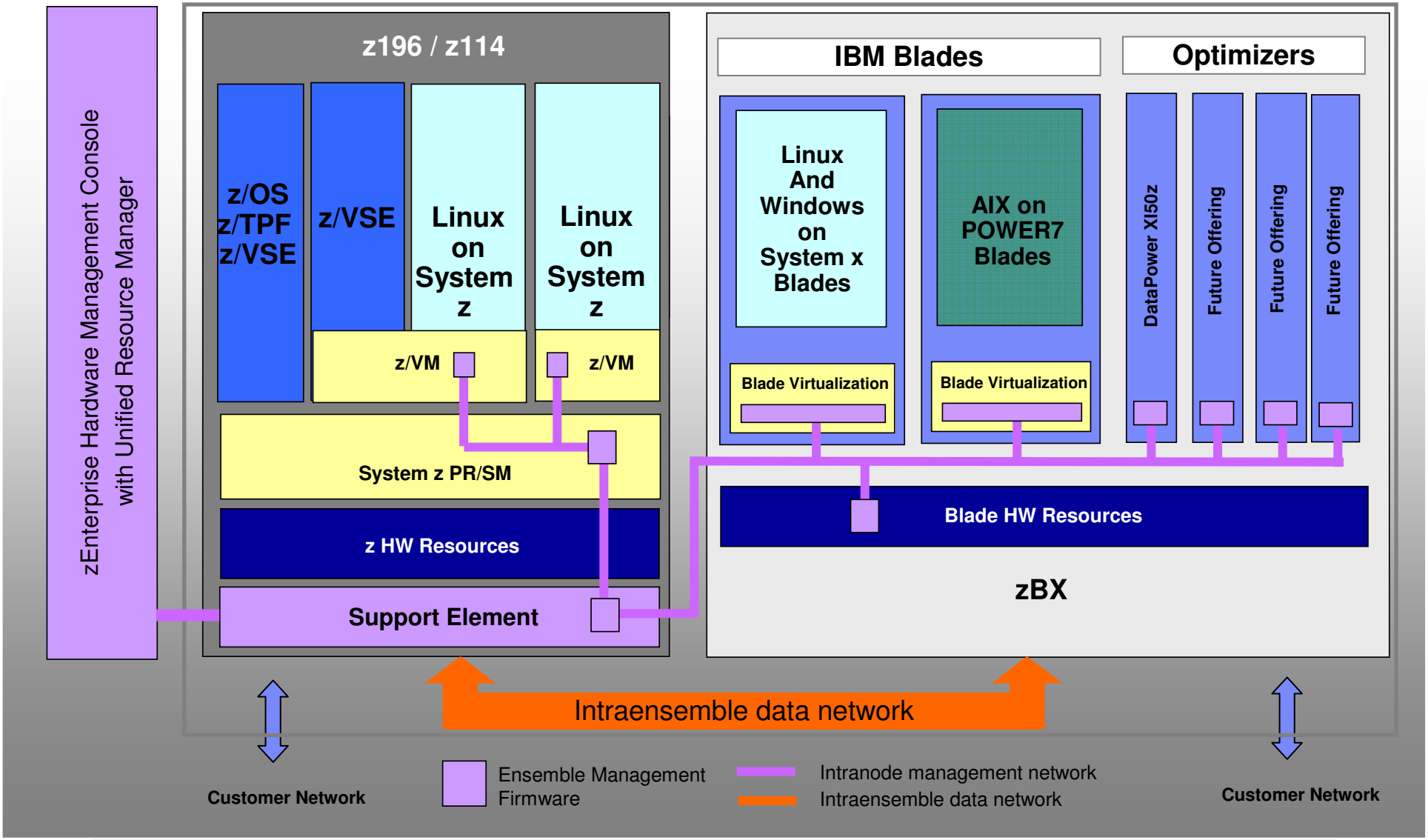


IBM zEnterprise System – Scalable Systems and software technologies

A "System of Systems" that unifies IT for predictable service delivery

IBM zEnterprise 196 / 114	*zEnterprise Unified Resource Manager*	*zEnterprise BladeCenter Extension (zBX)*
▪ Optimized to host large-scale database, transaction, and mission-critical applications ▪ The most efficient platform for large-scale Linux® consolidation ▪ Capable of massive scale-up ▪ New easy-to-use management	▪ Unifies management of resources, extending IBM System z® qualities of service end-to-end across workloads ▪ Provides platform, hardware and workload management	▪ Selected IBM POWER7® blades and IBM System x® blades for deploying applications in a multi-tier architecture ▪ High-performance optimizers and appliances to accelerate time to insight and reduce cost ▪ Dedicated high-performance private network

zEnterprise System - z196/z114 + zBX + Unified Resource Manager



Continuing Value using the Unified Resource Manager

Simplified installation of hypervisors

Gain significant time to market with improved speed of deployment

Simplified energy management

Energy cost savings

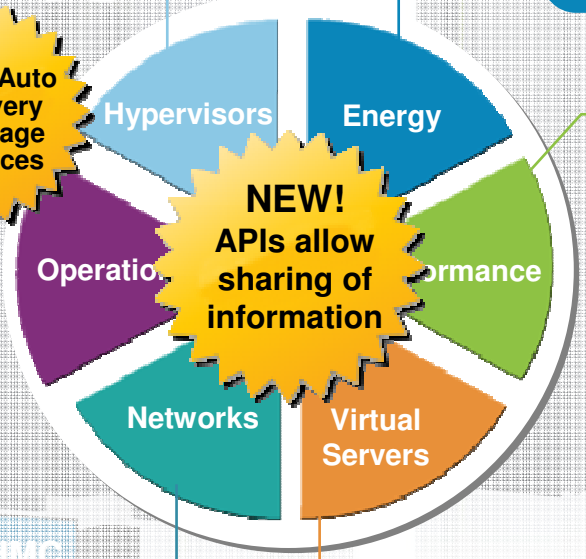
NEW! Auto discovery of storage resources

Save time, cost and simplify asset management

Decrease problem determination and resolution time for cross-platform resources

Improve and simplify cross-platform availability procedures

Enable broader and more granular view of resource consumption



Allow critical workloads to receive resources and priority based on goal-oriented policies established by business requirements

Smart business adjustments based on workload insight

Provide deep insight into how IT resources are being used

Factory installed and configured network

Improved network security with lower latency, less complexity, no encryption/decryption

Gain flexibility, consistency and uniformity of virtualization

Provide the business with faster time to market

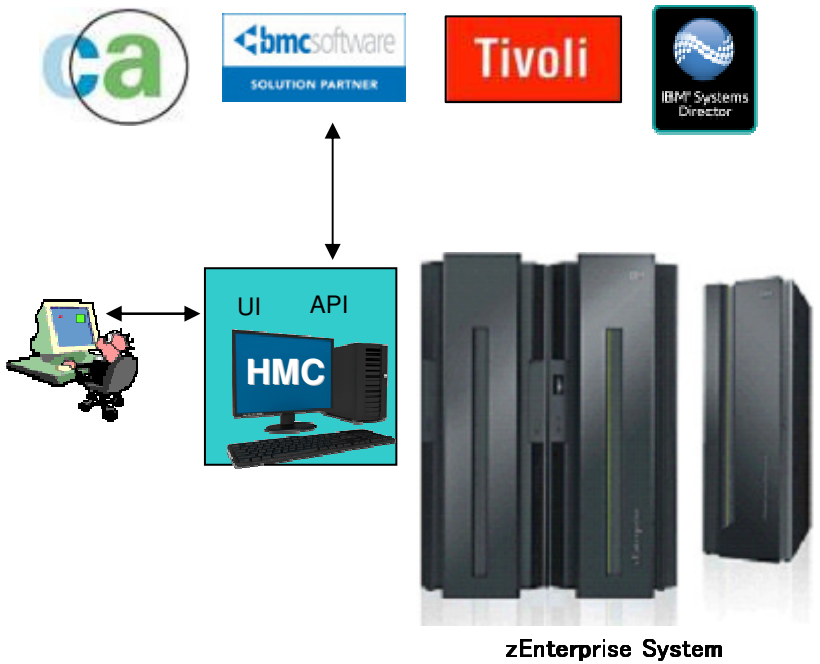
Simplified network management for applications

Unified Resource Manager APIs
Enabling External Management Tools

- **New API support allows programmatic access to the same underlying functions exploited by the HMC user interface (UI)**
  - Same resource types, instances and policies
  - API functions corresponding to views and tasks in the UI
    - Listing resource instances
    - Creating, changing, deleting resource instances
    - Operational control of resource instances

- **Access to functions will enable management of Unified Resource Manager from external (to HMC) tools**

- **Initially the priority scenarios will be the discovery, monitoring, and provisioning use cases**



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

zEnterprise was Introduced with the z196 at its Heart

Up to **40%**	Improvement for traditional z/OS workloads[1]
Up to an additional **30%**	Improvement in CPU intensive workloads via compiler enhancements
Up to **60%**	Total capacity improvement[1]

- 1 to 80 configurable cores for client use
- IFL, zIIP, zAAP, ICFs and optional SAPs
- 45 subcapacity settings
- Up to 3 TB RAIM memory
- Cryptographic enhancements
- Designed for EAL5 certification
- Upgradeable from IBM System z10® Enterprise Class (z10 EC™) and IBM System z9® Enterprise Class (z9® EC)

zEnterprise 196 (z196)

Machine Type: 2817

Models: M15, M32, M49, M66, M80

- **World's fastest 5.2 GHz processor chip**
  - 100 new instructions, new out of order sequence, more on chip cache
- **Focus on the environment and data center**
  - Options to help eliminate hotspots and save on energy
- **Operating System Flexibility**
  - z/OS, z/VM®, z/VSE®, z/TPF and Linux on System z
- **Security and reliability**
  - Elliptic curve cryptography
  - Compliance and security improvements
  - Crypto Express3 enhancements

[1] For average LSPR workloads running z/OS 1.11.

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 workloads** [1]

Up to an ADDITIONAL **25%** **Improvement in CPU intensive workloads via compiler enhancements**[2]

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**

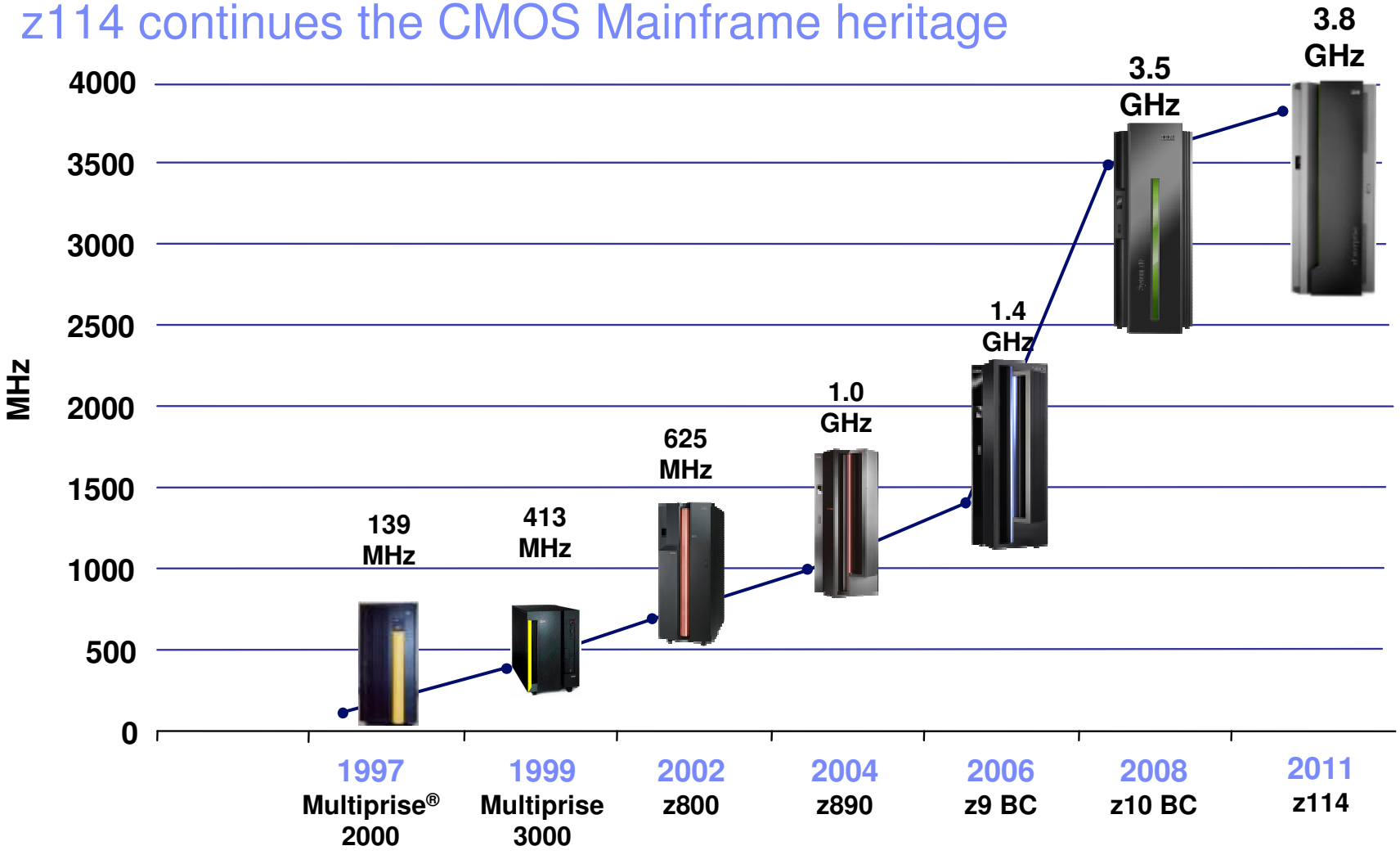
Up to **256** **GB RAIM fault tolerant memory**

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

[1]Relative 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

[2]The 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

z114 continues the CMOS Mainframe heritage



- Multiprise 2000 – 1st full-custom Mid-range CMOS S/390
- Multiprise 3000 – Internal disk, IFL introduced on midrange

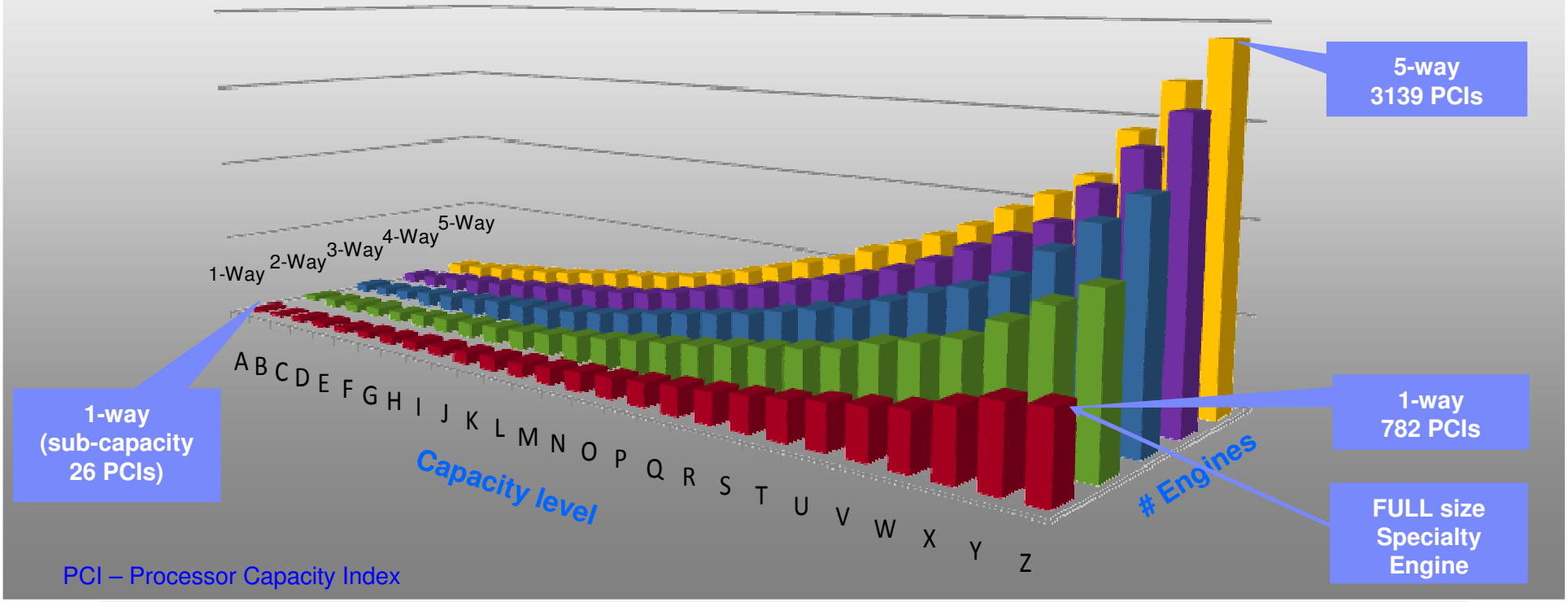
- z800 - Full 64-bit z/Architecture®
- z890 - Superscalar CISC pipeline
- z9 BC - System level scaling

- z10 BC - Architectural extensions
  - Higher frequency CPU
- z114 – Additional Architectural extensions and new cache structure

z114 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

Number of z114 CPs	Base Ratio	Ratio z10 BC to z114
1 CP	z10 BC Z01	1.18
2 CPs	z10 BC Z02	1.16
3 CPs	z10 BC Z03	1.14
4 CPs	z10 BC Z04	1.13
5 CPs	z10 BC Z05	1.12



zEnterprise 114 Functions and Features (September, 2011)

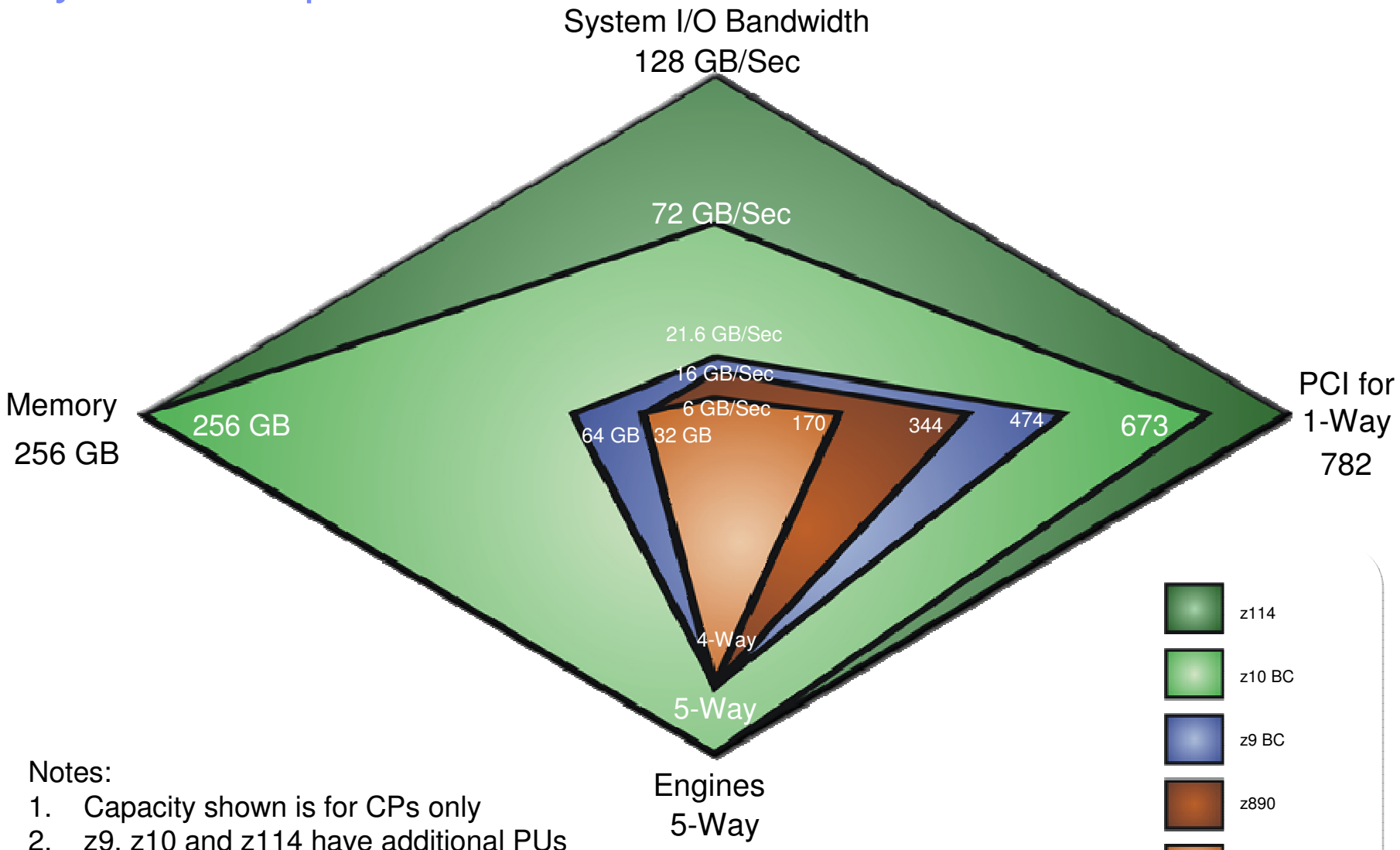
Two hardware models
Up to 10 processors configurable as CPs, zAAPs, zIIPs, IFLs, ICFs, or optional SAPs
Up to 26 subcapacity settings across a maximum of 5 CPs
Up to 256 GB of Redundant Array of Independent Memory (RAIM) for System
Dedicated Spares on the Model M10
Increased capacity processors
Out of 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
2 New OSA CHPIDs – OSX and OSM

Doubled HiperSockets to 32
Additional STP enhancements
Doubled Coupling CHPIDs to 128
Improved PSIFB Coupling Link
Physical Coupling Links increased to 72 (Model M10)
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-Expres4S
Humidity and altimeter smart sensors
Optional High Voltage DC power
Optional overhead I/O cable exit
zBX-002 with ISAOPT, POWER7, DataPower XI50z and IBM System x Blades*
NRF Support with either top exit or bottom exit I/O and power
Reclassification from “general business” environment to “data center”

IBM System z Business Class Configuration Comparisons (1 of 3)

	z9 BC R07	z9 BC S07	z10 BC E10	z114 M05	z114 M10
Uniprocessor Performance	470 MIPS		673 MIPS	782 MIPS	
z/OS Capacity	26-172 MIPS	193-1748 MIPS	26-2760 MIPS	26 - 3139 MIPS	
Total System Memory	64 GB		256 GB	128 GB	256 GB
Configurable Engines	7	7	10	5	10
Dedicated Spares	0	0	0	0	2
Configurable CPs	1-3	0-4	0-5	0-5	
LPARS/LCSS	15/1	30/2	30/2	30/2	
HiperSockets	16		16	32	
I/O Cages/Drawers	1	1	Up to 4	Up to 3(1)	Up to 3(1)
I/O slots per Cage/Drawers	16	28	8	8/32(2)	
FICON® Channels	64	112	128	128(3)	
OSA Ports (10GbE/1GbE)	16/32	24/48	48/96	48/96	
ESCON® Channels	240	420	480	240(4)	
STI (z9), IFB (z10) Bandwidth PCIe (z114 BC) Bandwidth	2.7 GB/sec		6.0 GB/sec	6.0 GB/sec 8.0 GB/sec	
ICB-4/ISC-3/PSIFB	16/48/0		12/48/12	0(5)/48/8 -16(6)	0(5)/48/16 - 32(7)
zIIP/zAAP Maximum Qty	3	3	5	2	5
IFL Maximum Qty	6	7	10	5	10
Capacity Settings	20	53	130	130	130
Upgradeable	Upgrade to z10 and z114		Upgrade to z114	Upgrade From M10 to z196 (M15, Air cooled only)	

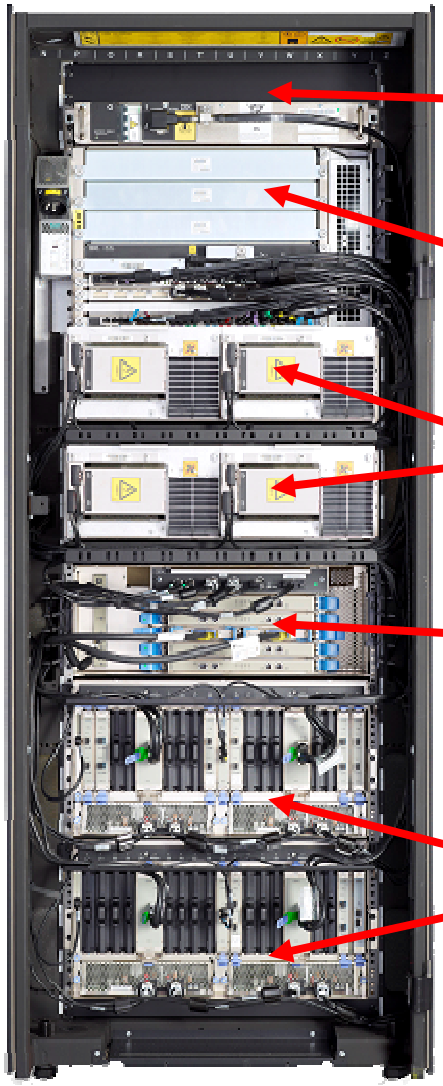
System Comparisons



Notes:

1. Capacity shown is for CPs only
2. z9, z10 and z114 have additional PUs which can be used as Speciality Engines

z114 Model M10 – Under the covers



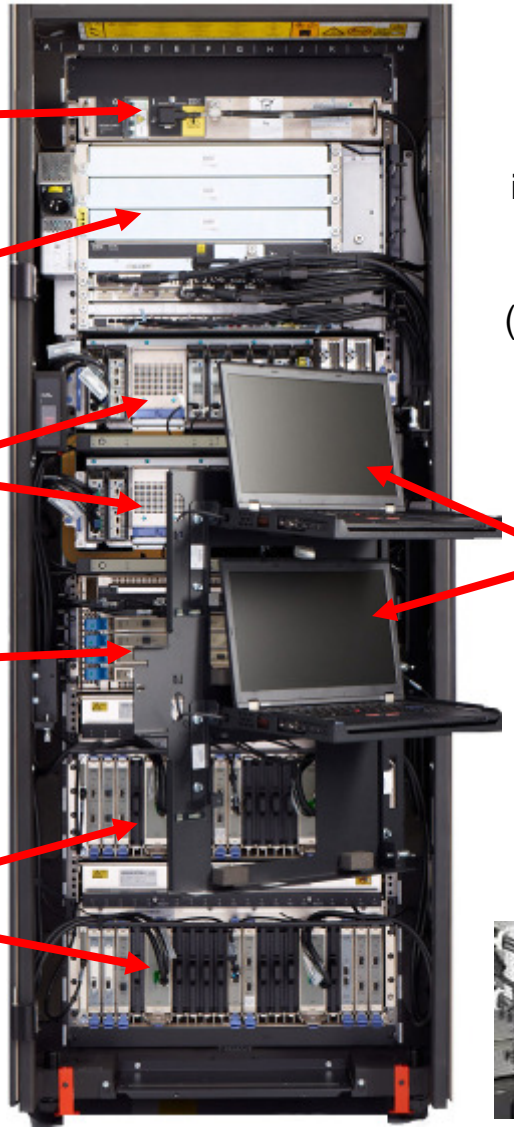
Internal Batteries (optional)

Power Supplies

2 x Processor Drawers, Memory & HCAs

I/O Drawer

PCIe I/O drawers



Ethernet cables for internal System LAN connecting Flexible Service Processor (FSP) cage controller cards (not shown)

2 x Support Elements

z114 Memory Offerings

Memory upgrades within the same color (except white) are concurrent without the need for Memory Plan Ahead.

FC	GB	Increment	M05			M10 (2 CPC drawers)		
			Dial Max	Dimm (GB)	# plugged	Dial Max	Dimm (GB)	# plugged
3609	8	8	24	4	10	N/A	N/A	N/A
3610	16	8		4	10	56	4/4	10/10
3611	24	8		4	10		4/4	10/10
3612	32	8	56	8	10		4/4	10/10
3613	40	8		8	10		4/4	10/10
3614	48	8		8	10		4/4	10/10
3615	56	8		8	10		4/4	10/10
3616	64	8	120	16	10	88	4/8	10/10
3617	72	8		16	10		4/8	10/10
3618	80	8		16	10		4/8	10/10
3619	88	8		16	10		4/8	10/10
3620	96	8		16	10	120	8/8	10/10
3621	104	8		16	10		8/8	10/10
3622	112	8		16	10		8/8	10/10
3623	120	8		16	10		8/8	10/10
3624	152	32	N/A			152	4/16	10/10
3625	184	32				184	8/16	10/10
3626	216	32				248	16/16	10/10
3627	248	32					16/16	10/10

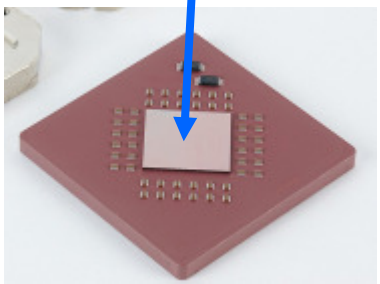
z114 SCM Vs z196 MCM Comparison – Same PU and SC Chip

z114 SCMs

- PU SCM
  - 50mm x 50mm in size – fully assembled
  - Quad core chip with 3 and 4 active cores
  - 2 PU SCMs for M05 and 4 PU SCMS for M10
  - PU Chip size 23.498 mm x 21.797 mm
- SC SCM
  - 61mm x 61mm in size – fully assembled
  - 1 SC SCM for M05, 2 SC SCMs for M10
  - 96 MB L4 cache per chip
  - SC Chip size 24.427 mm x 19.604 mm

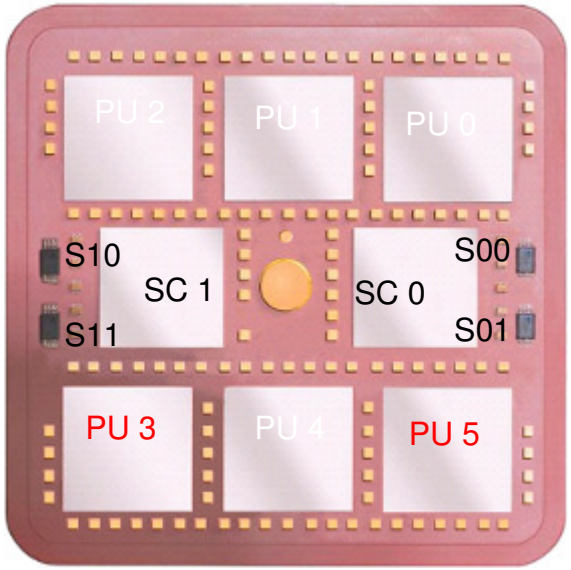
Single PU Chip without heatsink

Single SC Chip without heatsink



z196 Multi Chip Module (MCM)

- MCM
  - 96mm x 96mm in size
  - 6 PU chips per MCM
    - Quad core chips with 3 or 4 active cores
    - PU Chip size 23.498 mm x 21.797 mm
  - 2 SC chips per MCM
    - 96 MB L4 cache per chip
    - SC Chip size 24.427 mm x 19.604 mm
  - Up to 4 MCMs for System



z196 / z114 PU core

Each core is a superscalar out of order processor with these characteristics:

- **Six functional execution units**
  - 2 fixed point (integer), 2 load/store, 1 binary floating point, 1 decimal floating point
- **Up to three instructions decoded per cycle (vs. 2 in z10)**
- **211 complex instructions cracked into multiple internal operations**
  - 246 of the most complex z/Architecture instructions are implemented via millicode
- **Up to five instructions/operations executed per cycle (vs. 2 in z10)**
- **Execution can occur out of (program) order**
  - Memory address generation and memory accesses can occur out of (program) order
  - Special circuitry to make execution and memory accesses appear in order to software
- **Each core has 3 private caches**
  - 64KB 1st level cache for instructions, 128KB 1st level cache of data
  - 1.5MB L2 cache containing both instructions and data

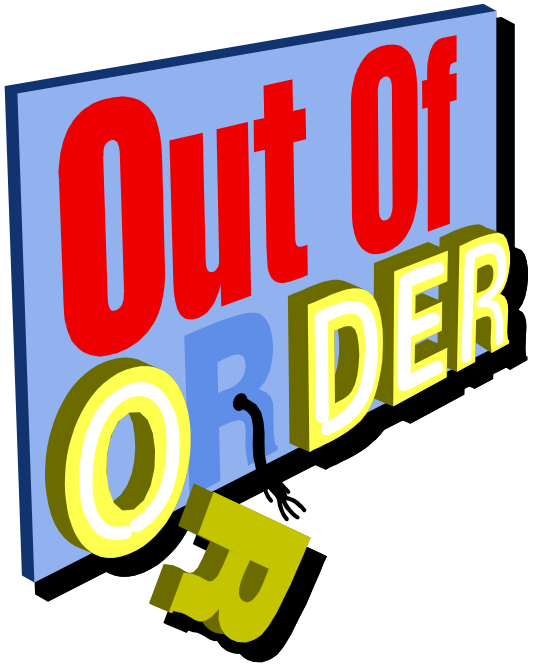
System z I/O Interface Evolution

	z9	z10 z196	z196 z114 Sep 2011
Extended Link (processor to IO Cage)	**eSTI (IBM)**	**InfiniBand DDR (Industry Standard)**	**PCI Express (Ind. Std.)**
IO Cage Backplane	**mSTI (IBM)**	**mSTI (IBM)**	**PCI Express (Ind. Std.)**
Coupling Link	**ISC (IBM)**	**InfiniBand DDR (Industry Standard)**	**InfiniBand DDR (Ind. Std.)**

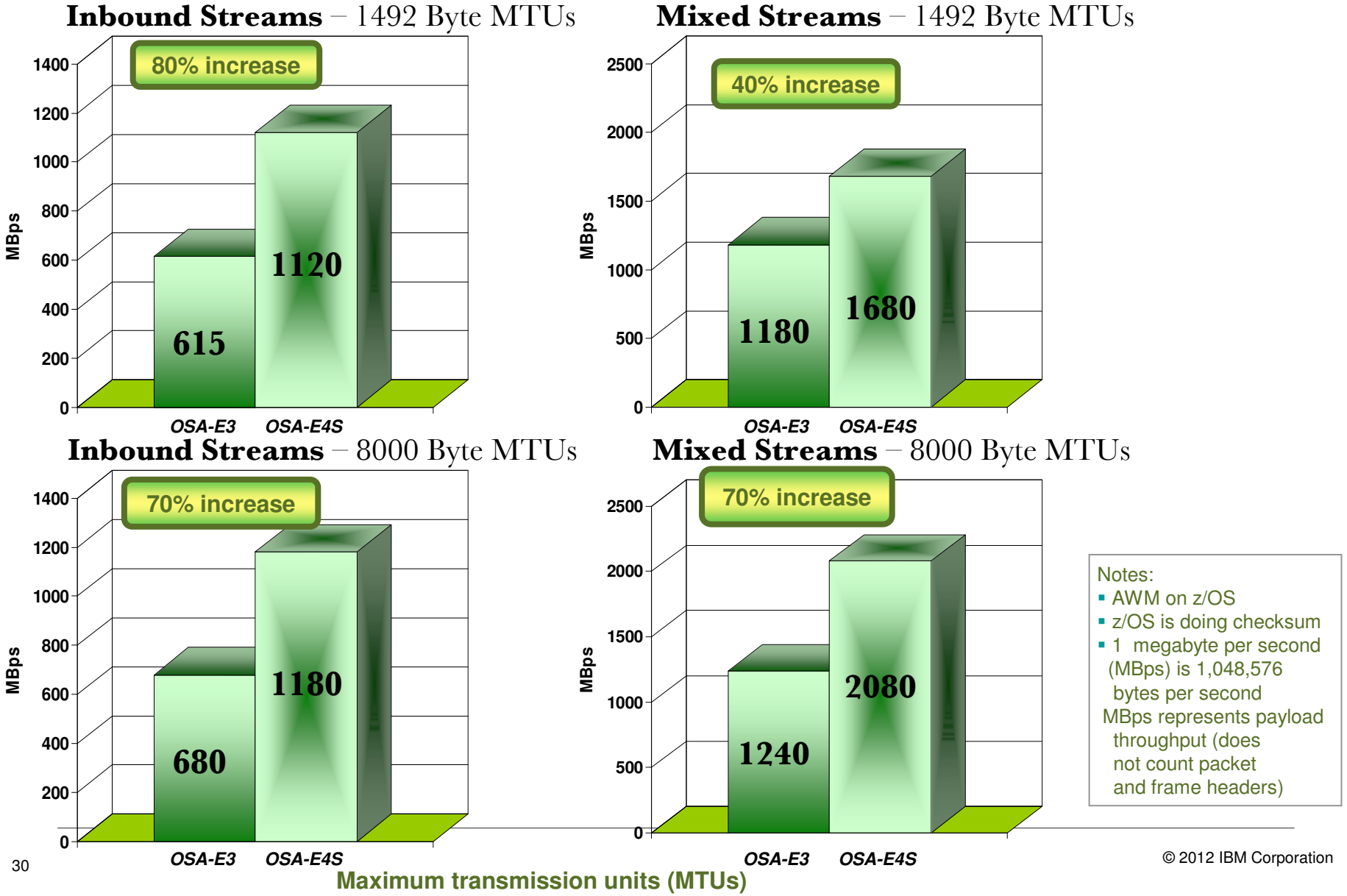
z114 Non-Supported Features

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



OSA-Express4S 10 GbE Performance (Lab measured data)

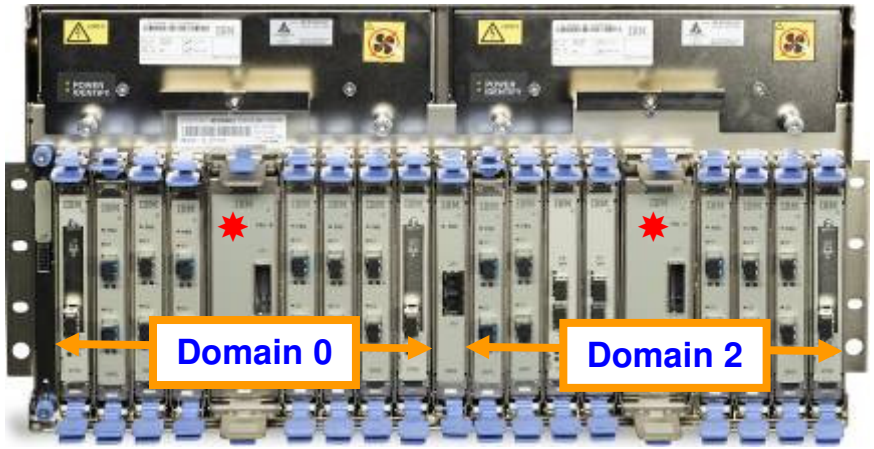


Notes:
- AWM on z/OS
- z/OS is doing checksum
- 1 megabyte per second (MBps) is 1,048,576 bytes per second

MBps represents payload throughput (does not count packet and frame headers)

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

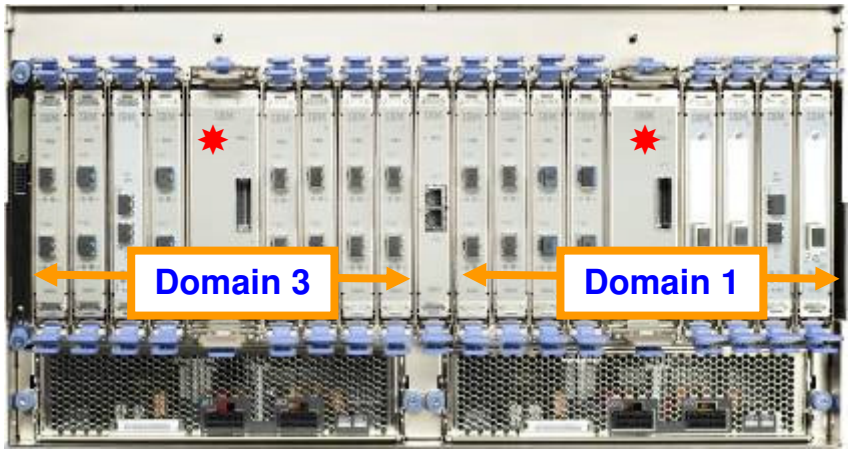
Front



7U

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

Rear



7U

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

I/O Subsystem Internal Bus Interconnect speed (GBps)


PCIe
z196/z114
Sep 2011

8 GBps


InfiniBand
z10/z196/z114

6 GBps


STI
z9

2.7 GBps


STI
z990/z890

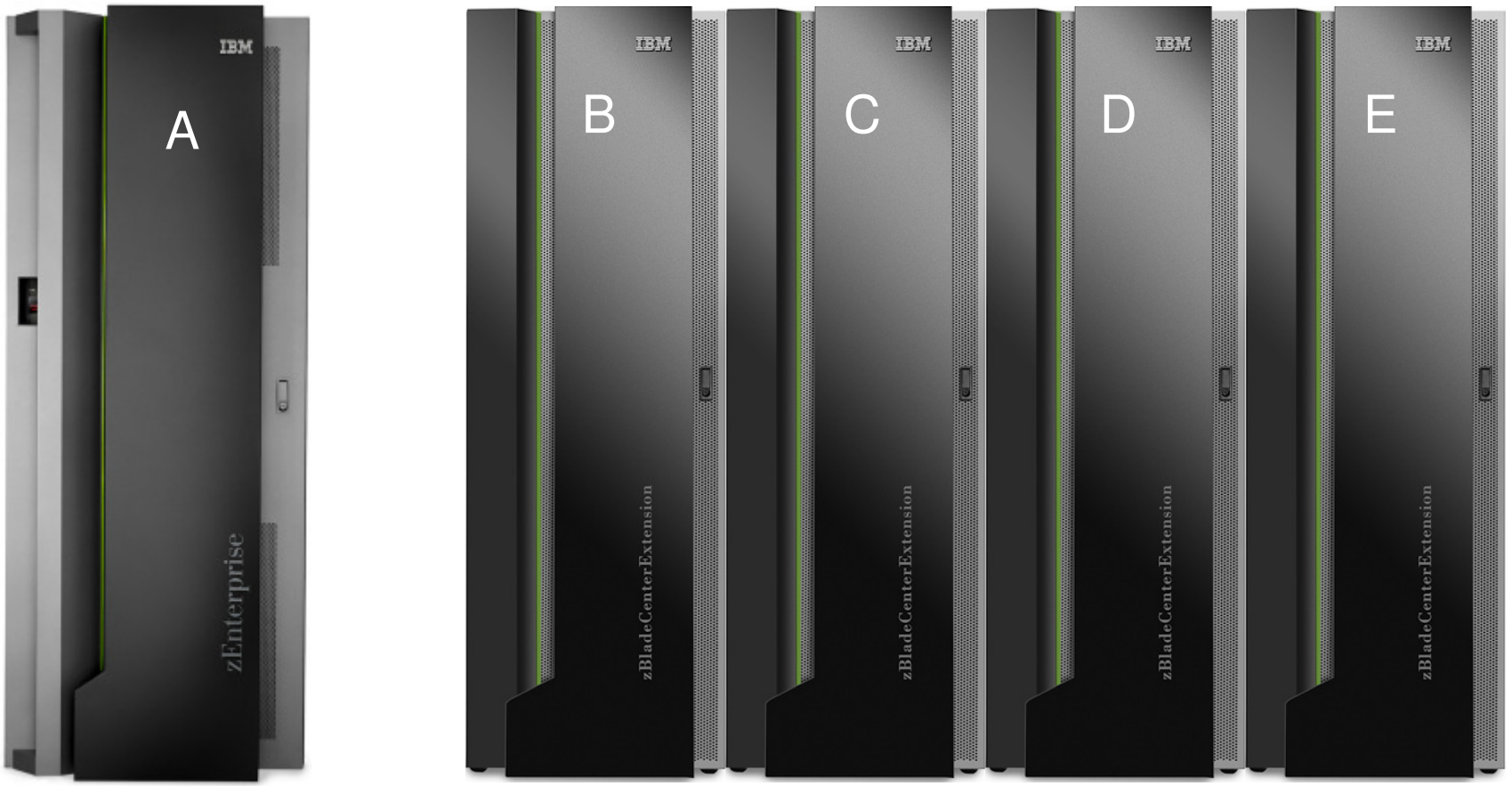
2 GBps


STI
z900/z800

1 GBps

STI: Self-Timed Interconnect

IBM zEnterprise System



IBM zEnterprise 114 (z114)

IBM zEnterprise BladeCenter Extension (zBX)

IBM zEnterprise Unified Resource Manager

zBX Extends the Value To Heterogenous Platforms

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

- Integrated IBM Certified Components driven by System z order
  - Standard parts – TOR switch, BladeCenter Chassis, Power Distribution Units, Optional Rear Acoustic Panels
- System z support
  - Problem reporting, hardware and firmware updates
- Expanding operating system support for z196
  - AIX on IBM p Blades, Microsoft Windows/Linux on IBM System x Blades[1]
  - Optimizer: IBM Smart Analytics Optimizer and IBM WebSphere DataPower
- Simplified management
  - Improved time to install and implement new applications
  - Central point of management for heterogeneous workloads
  - No change to applications

… managed by the zEnterprise Unified Resource Manager

Optimizers
- IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise

Select IBM Blades
- BladeCenter PS701 Express
- IBM System x Blades

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

No System z software running in zBX – Passport Advantage software licensed to blades

No MIPS/MSU rating

Configured for high availability

Optional rear door heat exchanger

zBX Hardware Components Overview

zBX Infrastructure

- Rack
- Top-of-Rack Switch
- Blade Center Chassis
- Ethernet & FC Cables
- Switches (ESM, FC)
- Power Dist. Units
- Opt: Heat Exchanger, Power cord types

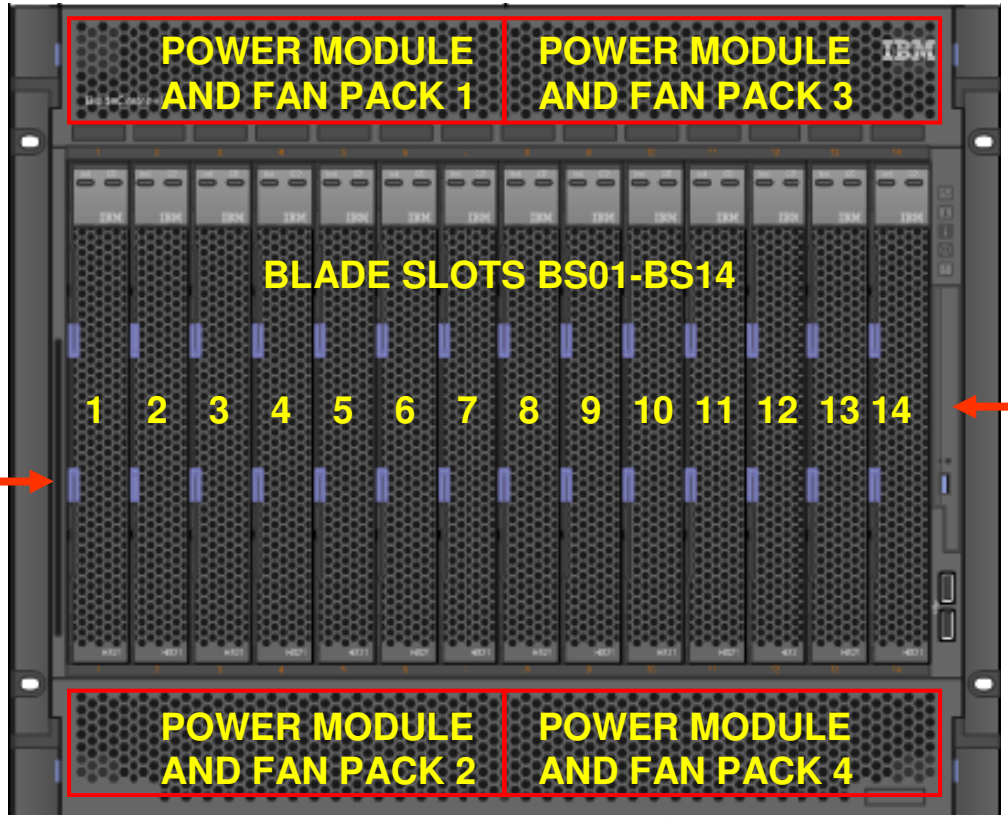
Blades

POWER7 Blades

System x Blades

DataPower XI50z

BladeCenter H Chassis in zBX Front Detail



SERVICE CARD SLOT

MEDIA TRAY SLOT
FRONT SYSTEM LEDS
CD/DVD DRIVE
USB PORTS

FAN PACK

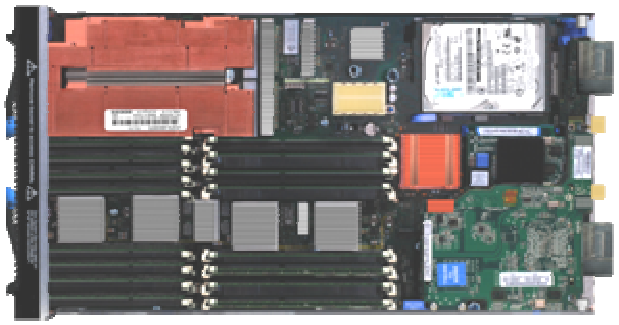
2980 Watt POWER MODULE

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, z/VSE, z/VM, Linux on System z with AIX on POWER®, Linux or Microsoft® Windows® on System x but have it under a single management umbrella.

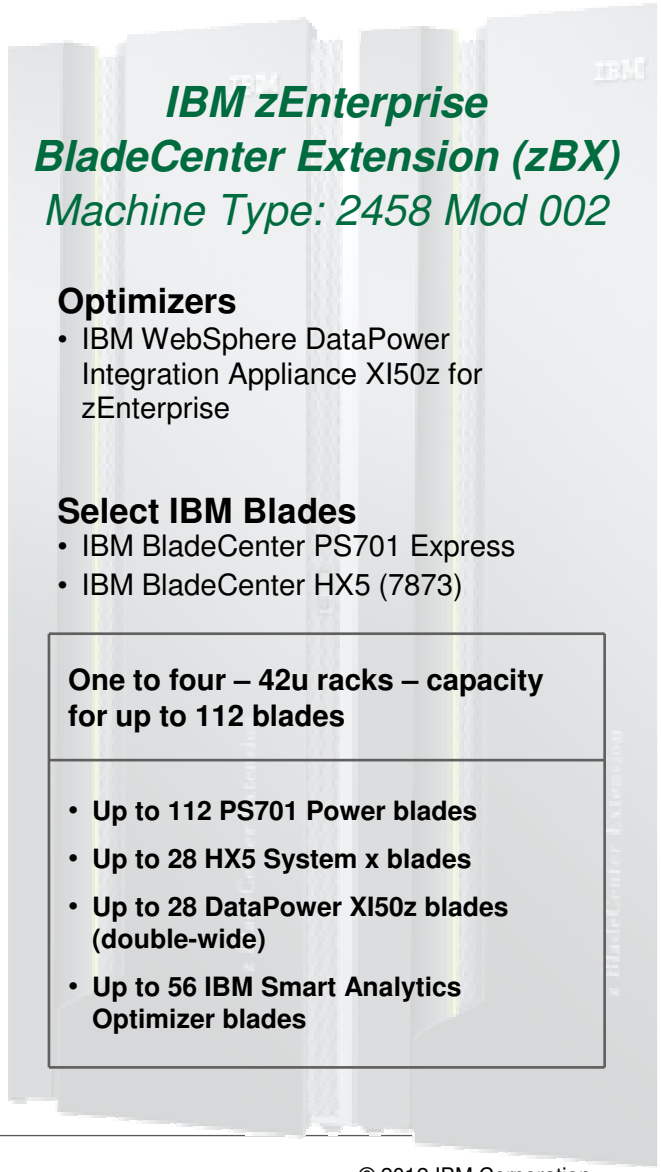


How is it different?

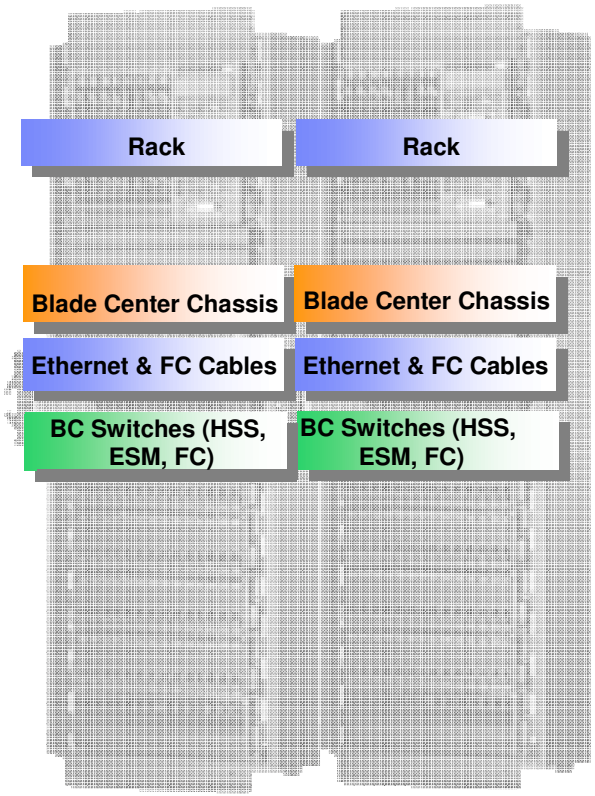
- **Complete management:** Advanced management brings operational control and cost benefits, improved security, workload management based on goals and policies.
- **Virtualized and Optimized:** Virtualization means fewer resources are required to meet peak demands with optimized interconnection. Multiple 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.

New x 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 and DataPower XI50z
  - 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



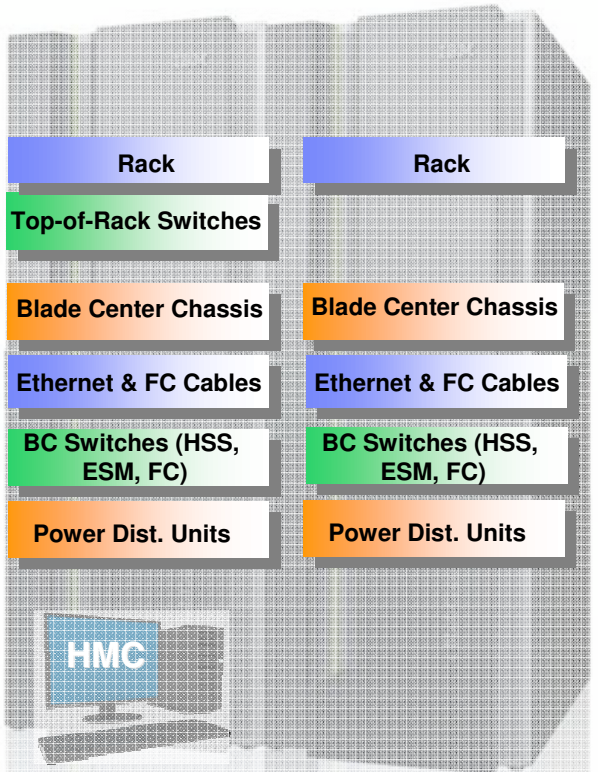
zBX – A Uniquely Configured Extension of the zEnterprise



Rack infrastructure hosting IBM BladeCenters

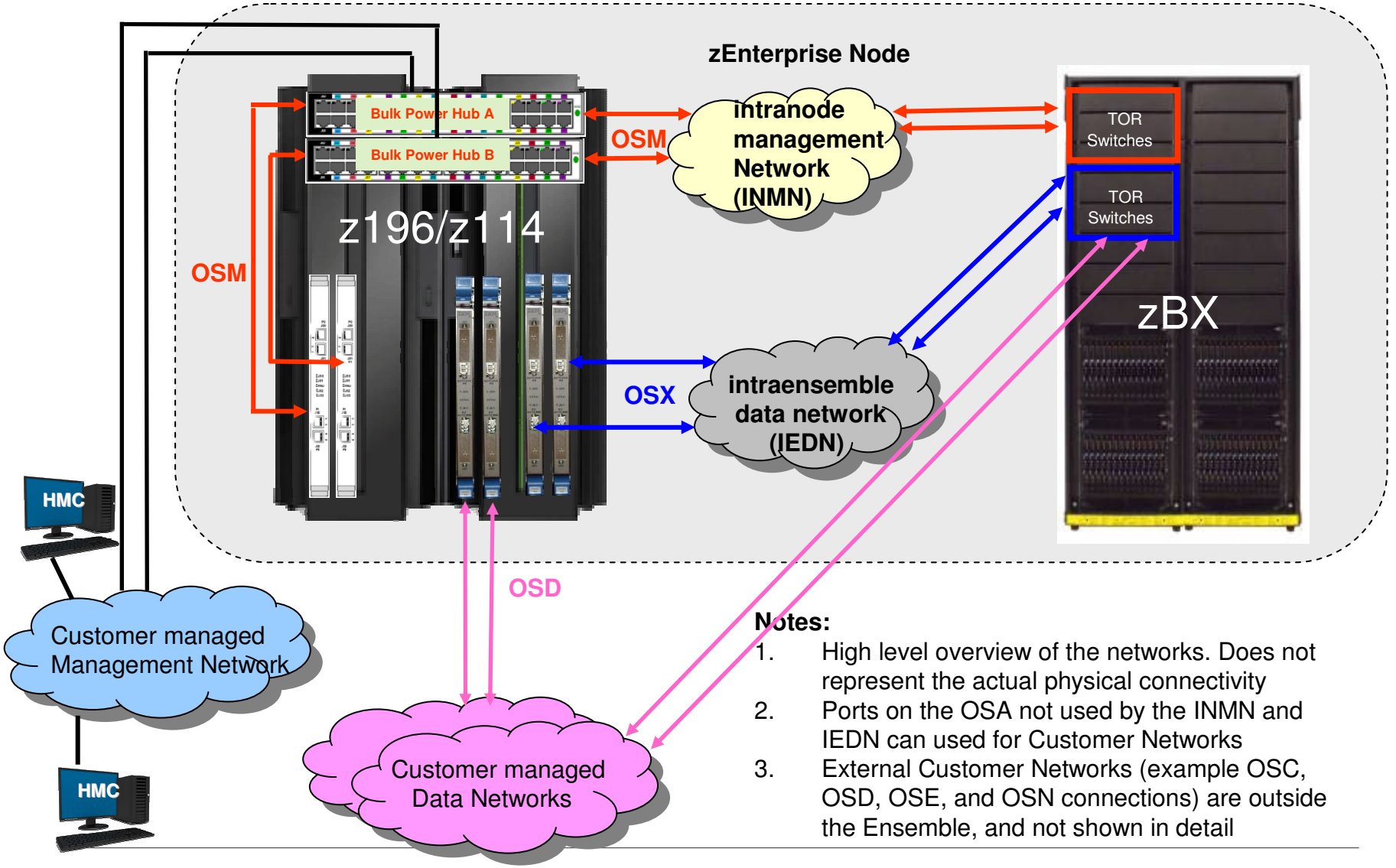
Looks like a rack with BladeCenters but much more...

- 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

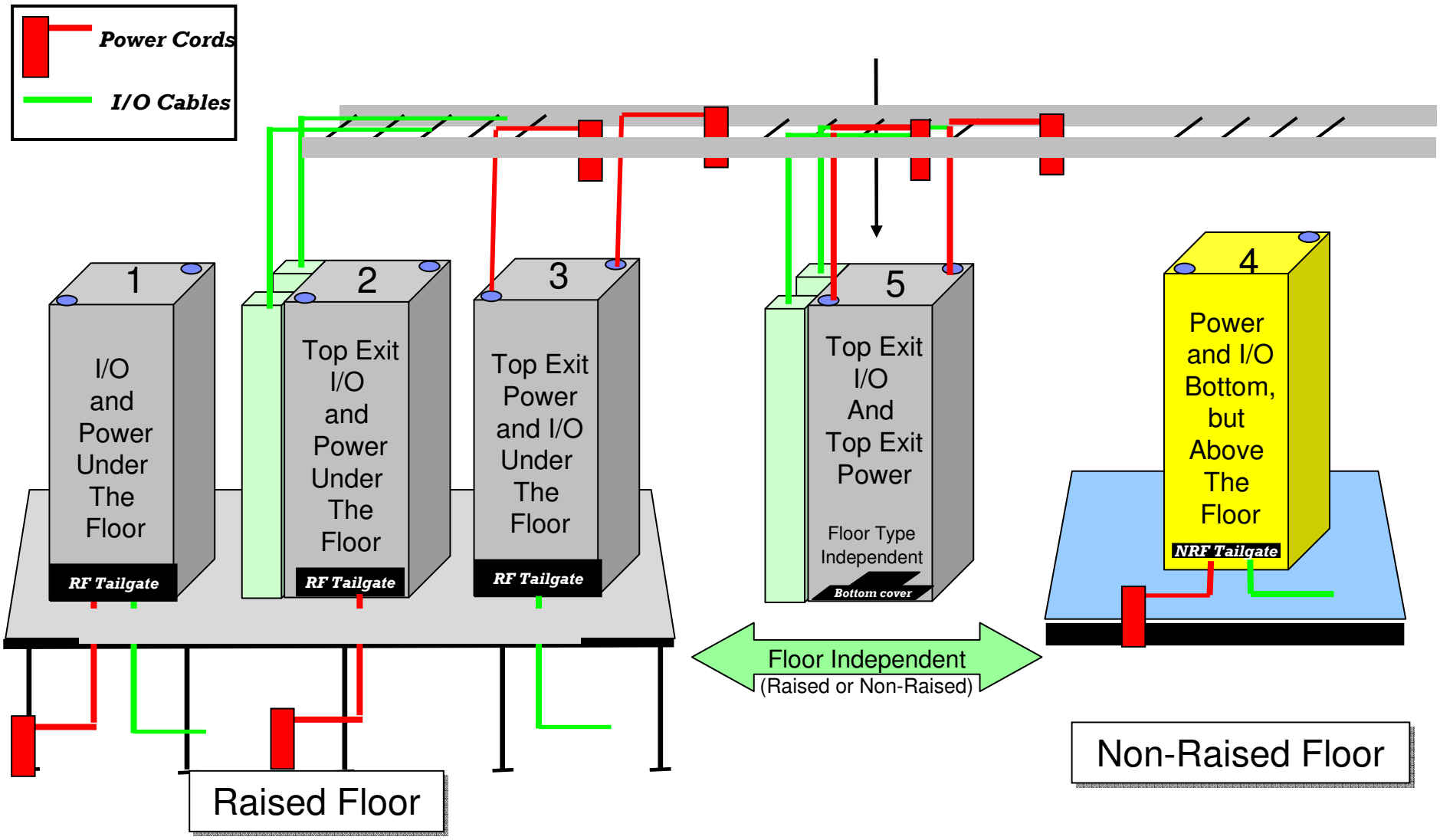
zEnterprise – What are the INMN, IEDN and Customer networks



Notes:

1. High level overview of the networks. Does not represent the actual physical connectivity
2. Ports on the OSA not used by the INMN and IEDN can used for Customer Networks
3. External Customer Networks (example OSC, OSD, OSE, and OSN connections) are outside the Ensemble, and not shown in detail

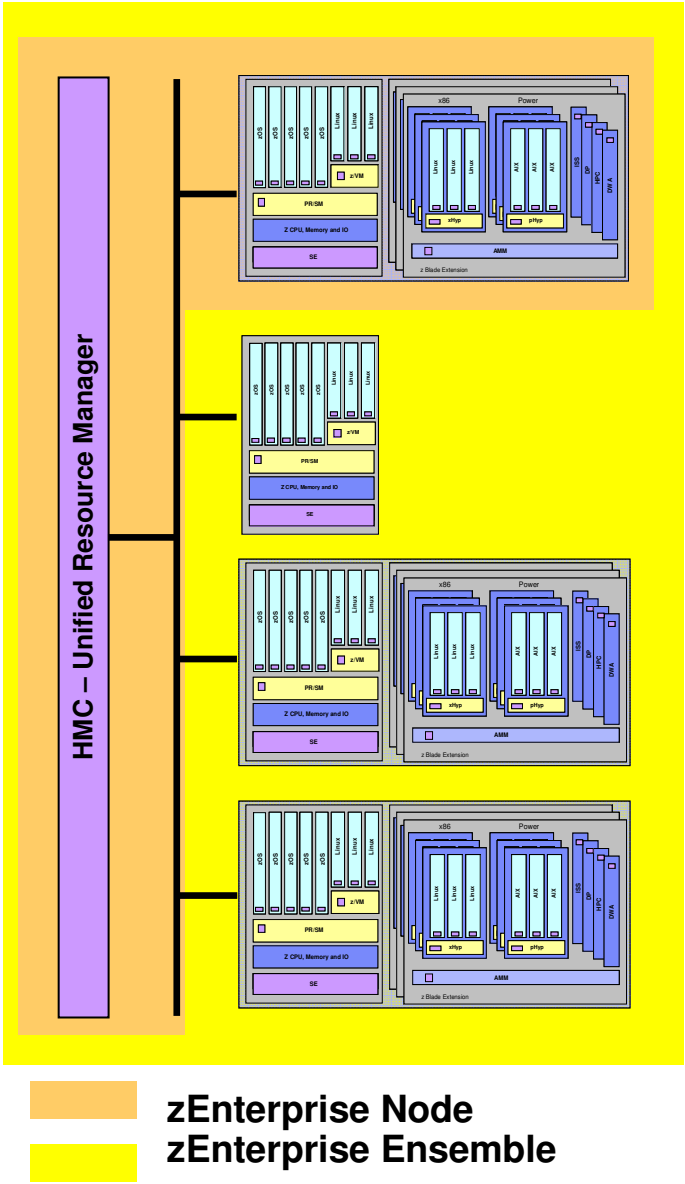
z114 Floor and Cabling Configurations options



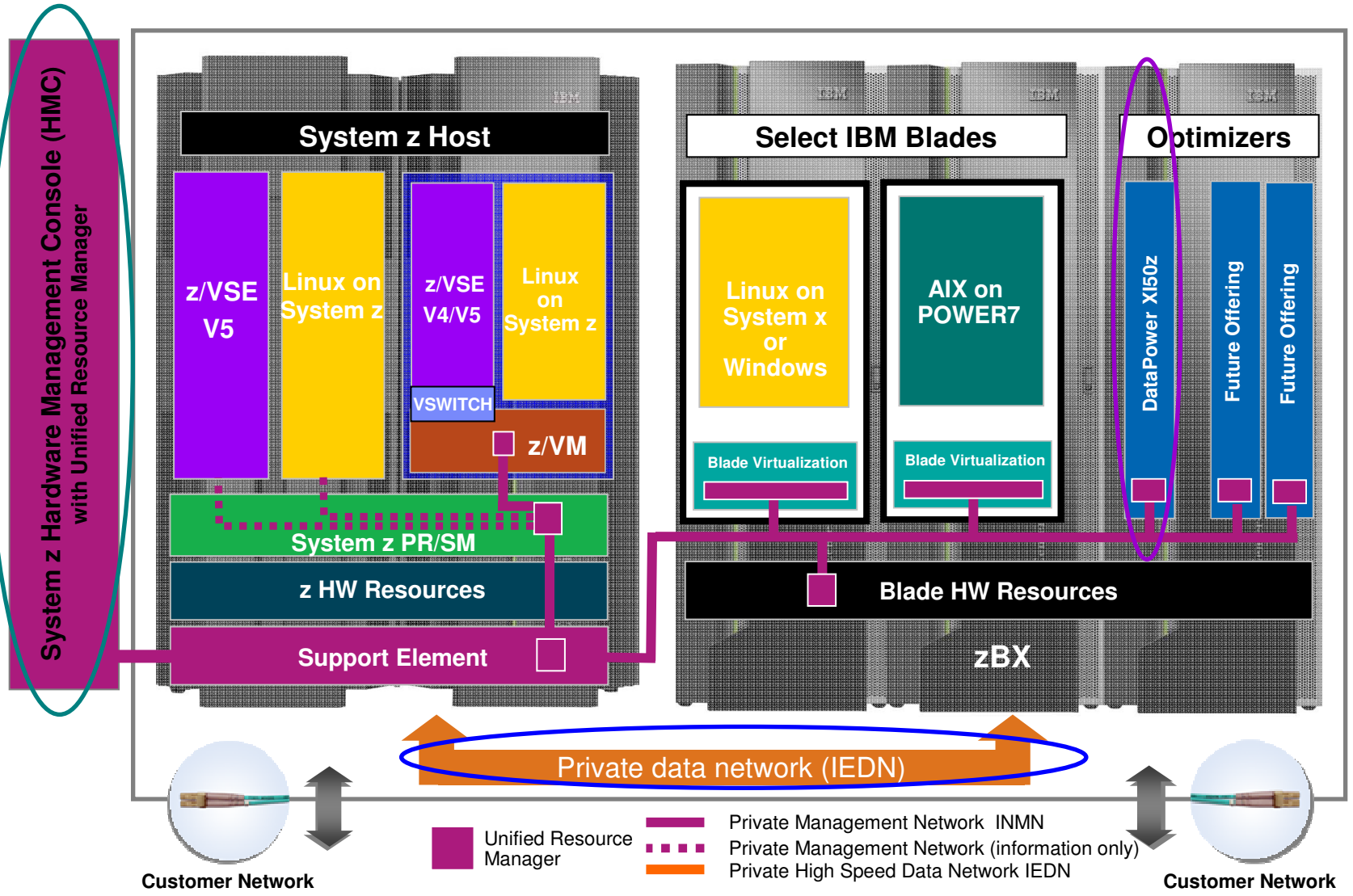
Defining an Ensemble Enables Improved Management and Scale

- **An ensemble is a collection of up to eight zEnterprise nodes that are managed collectively by the Unified Resource Manager as a single logical virtualized system**
- **A zEnterprise node is a z196 with 0 or 1 zBX. The zBX may contain from 1 to 4 racks each containing up to two BladeCenters. At least one node must have a zBX installed**
- **zEnterprise nodes are deployed within a single site**
- **Automated failover to ensemble back up HMC**

An ensemble allows you to have a single pool of resources –integrating system and workload management across the multi-system, multi-tier, multi-architecture environment.



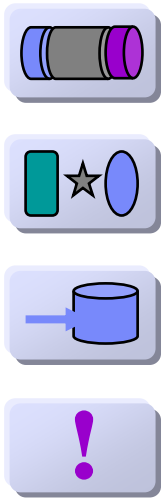
The SOA ESB with Datapower in zEnterprise connecting via IEDN to z/VSE



ESB Integration Appliance XI50

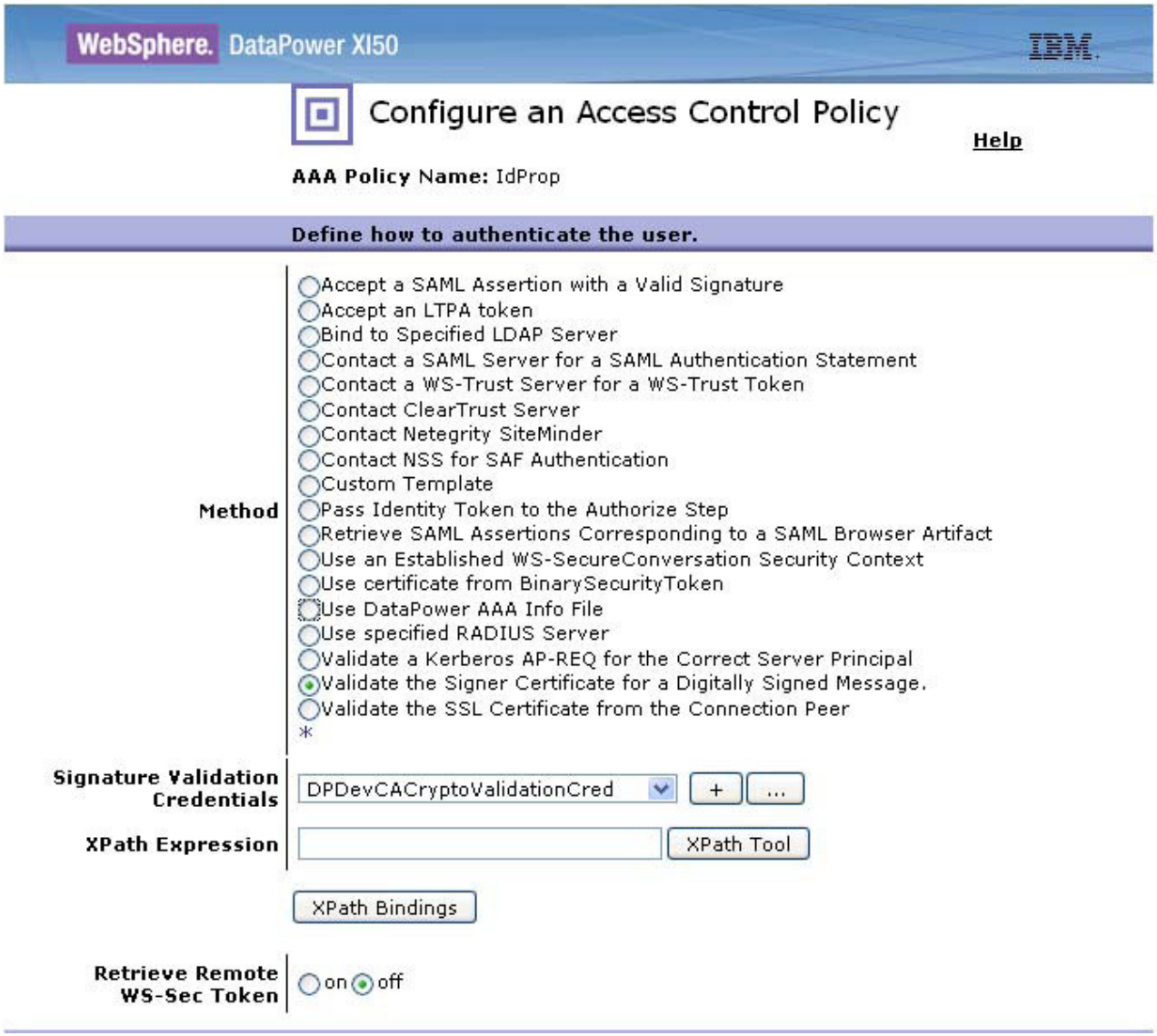
Purpose-built hardware for Enterprise Service Bus functionality

- **SOA Integration / ESB Message Enrichment / Web Service virtualization for legacy applications**
- **Enforce high levels of security independent of protocol or payload format**
- **Integrate with enterprise monitoring systems**
- **Service level management options to shape traffic**



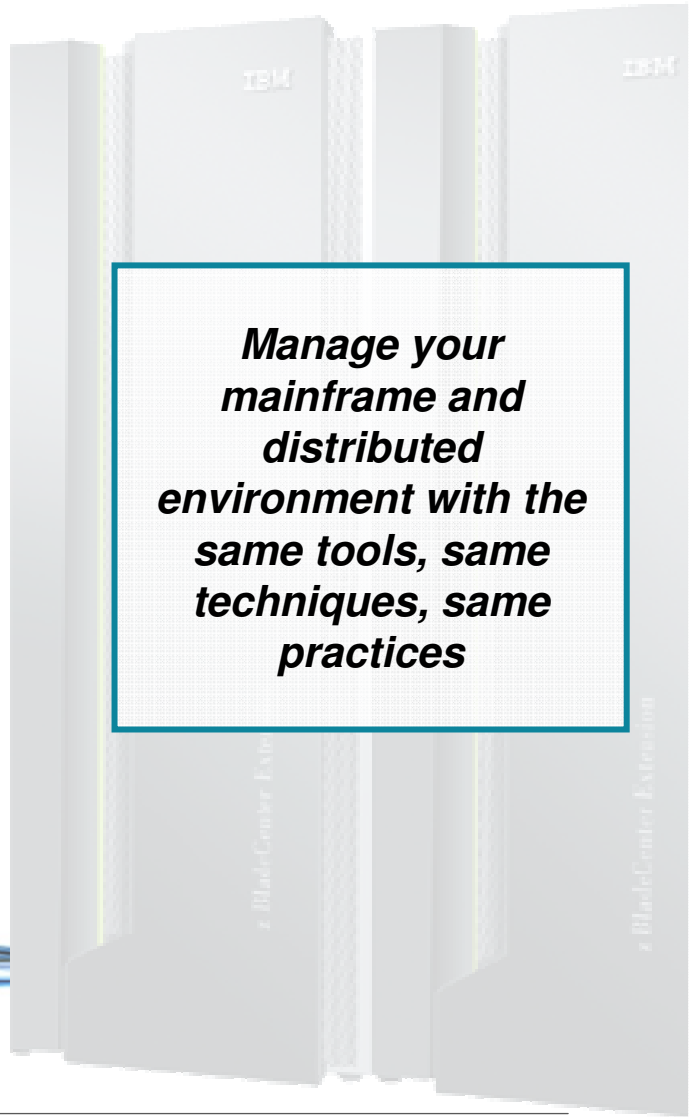
- **Advanced protocol-bridging seamlessly supports a wide array of transports, including HTTP, WebSphere MQ, WebSphere JMS, Tibco EMS, FTP, NFS, et al.**
- **Any-to-any "DataGlue" engine supports XML and Non-XML (Binary) payloads, promoting asset reuse and enabling integration without coding**
- **Direct database access enables message-enrichment and data-as-a-service messaging patterns (DB2, Oracle, MS-SQL, Sybase)**
- **High performance architecture creates low-cost, easily-scalable ESB solution for Smart SOA needs**

IBM WebSphere DataPower Interface



Extending Support to New **Operating System Environments**

- **Support for Linux and Windows environments on select System x blades**
  - 64-bit version support only
  - NEW Linux: RHEL 5.5, 5.6, 6.0, Novell SLES 10 (SP4) and SLES 11 SP1
  - NEW 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

z/VSE Support for IBM Mainframe Servers

IBM Servers	z/VSE V5.1	z/VSE V4.3	z/VSE V4.2	z/VSE V4.1 (out of service)
IBM zEnterprise 196 & 114	✔	✔	✔	✔
IBM System z10 EC & z10 BC	✔	✔	✔	✔
IBM System z9 EC & z9 BC	✔	✔	✔	✔
IBM eServer zSeries 990 & 890	✘	✔	✔	✔
IBM eServer zSeries 900 & 800	✘	✔	✔	✔

On June 14, 2011, IBM announced withdrawal of service for Multiprise 3000 (7030-H30, -H50, -H70), to become effective December 31, 2012.

Please note:

- z/VM V6 requires System z10 technology (or higher)
- Novell SLES 11 requires System z9 technology (or higher)
- Red Hat RHEL 6 requires System z9 technology (or higher)

Leverage the latest Operating Systems to exploit the full value of the z114

z/OS Version 1 Release 13

- z/OS Predictive Failure Analysis and Runtime Diagnostics - help provide early warning of certain system issues before they become obvious
- Updates to shorten batch window, simplify batch programming, and give you more flexibility in deploying batch applications.
- Enhancements to improve I/O performance for z/OS UNIX workloads in a Parallel Sysplex
- Improved backup capability and system responsiveness with less-disruptive backups.
- XML Performance improvements for complex docs
- Continued investment in simplification with z/OS Management Facility
- Support of new encryption and compliance standards and keys

z/VM and Linux on System z

- Server and application consolidation on System z using Linux and z/VM is the industry leader in large-scale, cost-efficient virtual server hosting
- zEnterprise extends the choice of integrated workloads through blades on zBX
- The z114 lowers the entry cost to get started with the Enterprise Linux Server
- Faster cores and a bigger system cache on the z196 let you do even more with less when running Linux on z/VM
- Integrated blades on zBX will offer added dimension for workload optimization including applications on Windows*

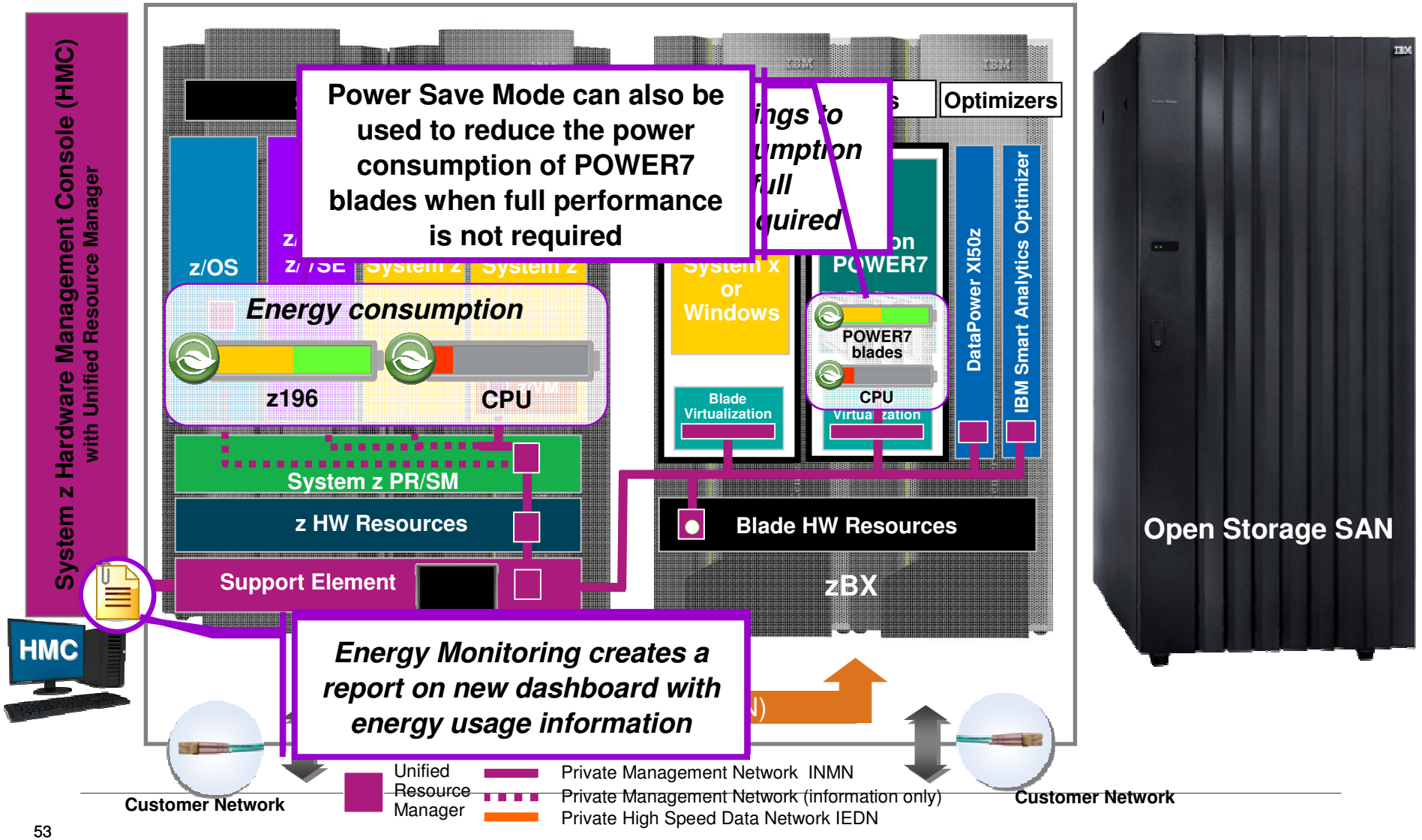
z/VSE Version 5.1

- Introduces 64-bit virtual addressing to z/VSE
  - Reduces memory constraints
  - Allows to exploit more 'data in memory'
- Continues the z/VSE strategy of protect, integrate, and extend (in short "PIE")
  - Protect existing customer investments in applications and data on z/VSE
  - Integrate z/VSE with the rest of IT
  - Extend with Linux on System z to build modern integrated solutions
- Exploitation of selected zEnterprise functions and features as well as IBM System Storage options
- Includes a SoD on CICS Explorer capabilities for CICS TS for VSE/ESA

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

Putting zEnterprise System to the Task

Energy Management



Flexible IT

Accelerating business velocity and decreasing costs

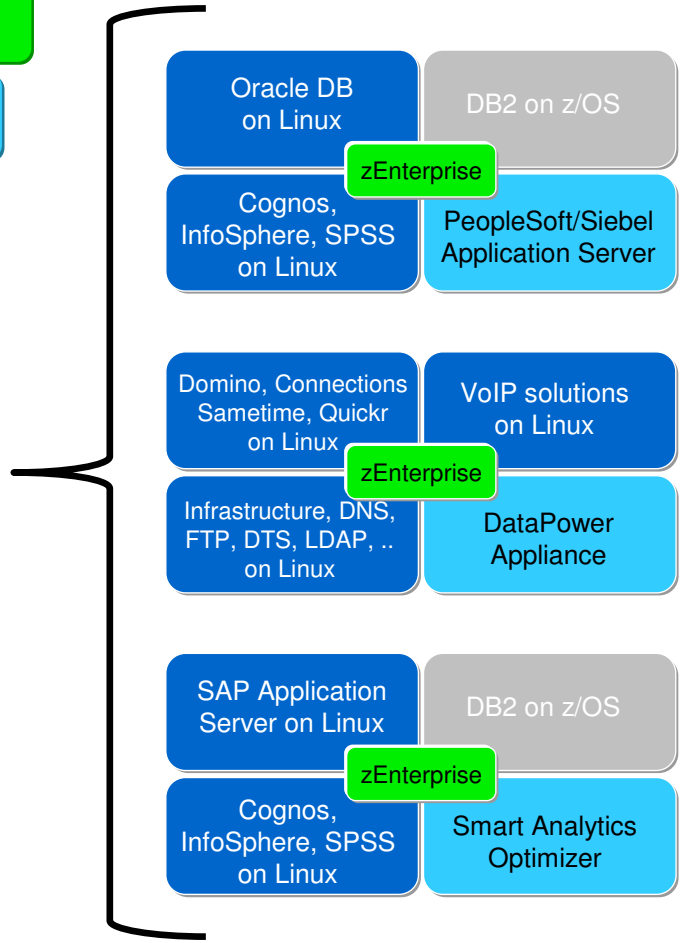
- Flexibility to provision any environment…
- Flexibility to share storage and network capacity across the various environments…
- Flexibility to share certificate authorities, data protection, privacy appliances across the various environments…
- Flexibility to leverage future innovations…

zEnterprise - Smart Solutions

zEnterprise System

z/OS, z/VSE on z196 / z114 | Linux on z196 | zBX, SAO

- Build complete end to end solutions with z196 and zBX
- Leverage centralized control of servers with Unified Resource Manager
- Simplify communications with internal and contained networking
- Leverage zEnterprise strong database capabilities and ability to host multiple diverse database workloads
- Leverage close proximity of BI applications to the hosted databases
- Use Fit for Purpose to put solution components on best architecture to optimize solutions



⇨ Build Solutions to match Business Units requirements

IBM zEnterprise provides large-scale Consolidation and Virtualization to maximize Server Utilization

Do more with less	*Consolidate more servers, networks, applications, and data on a singe Linux and z/VM*	Svenska Handelsbanken: **Consolidated dual site IT infrastructure with 2 IBM System z10 servers – cut Java workloads by 15% per year**
Achieve savings on a greater scale	*Use less power and floor space*	BALDOR: **Cut electricity costs by 60% and floor space requirements by 50%**
Manage Growth and Complexity	*Scale resources to support different types of workloads with Linux IFLs*	SDV Sparda-Datenverarbeitung eG: **Up to 60% more capacity and up to 33% lower prices for Linux IFL Hardware environments**

IBM DB2 Analytics Accelerator *V2.1*

Capitalizing on the best of both worlds – System z and Netezza

What is it?

The IBM Smart Analytics Optimizer is a workload optimized, appliance add-on, that enables the integration of business insights into operational processes to drive winning strategies. It accelerates select queries, with unprecedented response times.

How is it different

- ***Performance:*** Unprecedented response times to enable 'train of thought' analyses frequently blocked by poor query performance.
- ***Integration:*** Connects to DB2 through deep integration providing transparency to all applications.
- ***Self-managed workloads:*** queries are executed in the most efficient way
- ***Transparency:*** applications connected to DB2 are entirely unaware of the Optimizer
- ***Simplified administration:*** appliance hands-free operations, eliminating many database tuning tasks

Breakthrough Technology Enabling New Opportunities

Pricing Enhancement Summary - IBM zEnterprise 114

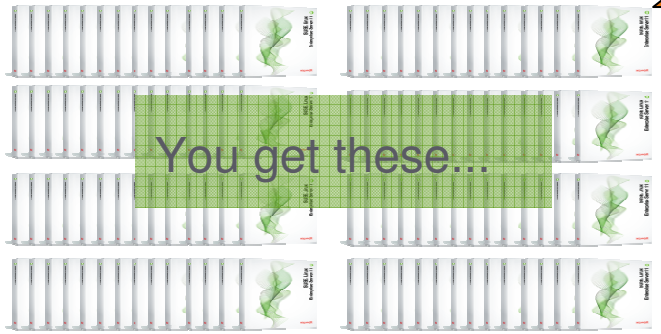
- **New software pricing (AEWLC) for z114** providing up to 18% price reduction, with an average of 5% vs. z10 BC even with no capacity growth:
  - z114 PVU rating for IFL engine decreased from 120 (z10 BC) to 100
  - Separately, announcing 5% EWLC General Price Action on z10 BC, z9 BC, z890 effective January 2012
- Announce 5% maintenance price performance (technology dividend) vs. z10 BC on z114 M05 assuming no capacity growth:
  - Greater benefit with growth
  - 48% price performance on IFLs vs. z10 BC
- Hardware price performance on specialty engines and memory designed to reward growth:
  - 75% memory price reduction, with introduction of upgrade charge
  - 15% to 27% price reduction on specialty engines, with introduction of upgrade charge
  - 25% reduction in hardware entry price

SUSE Linux Enterprise Server for IBM zEnterprise and zBX

New!

If you own this...

You get these...



Honoring 10 years of our customers loyalty to SUSE Linux Enterprise Server for System z, SUSE makes the following offering to all SUSE Linux System z customers:

Free Basic Subscription of SUSE Linux Enterprise Server for x86-64 for unlimited use with all IBM zBX hardware.

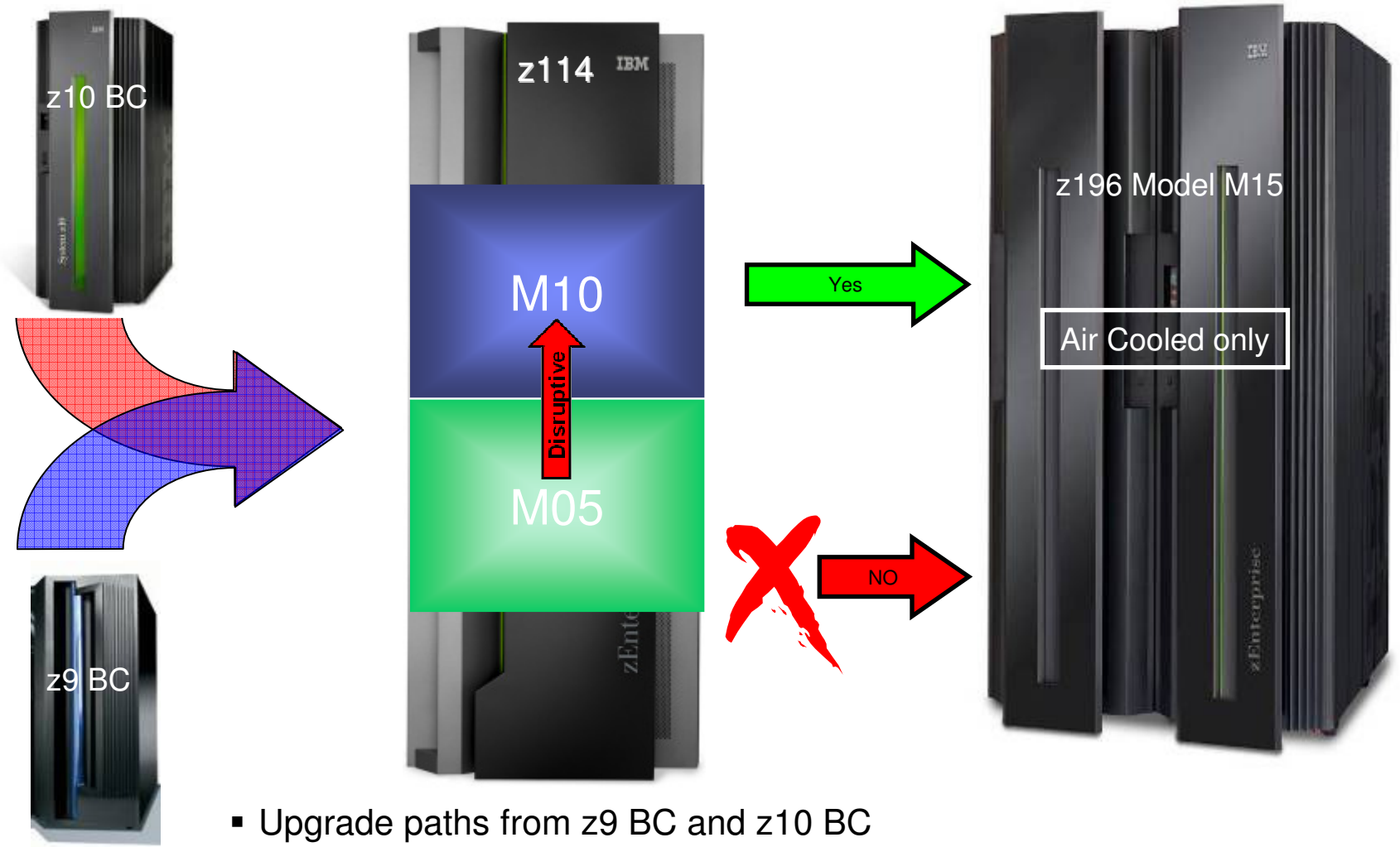
- *Only available to registered SUSE customers with active subscription for SUSE Linux Enterprise Server for System z. This is available for existing subscriptions and new purchases*
- *Additional support services for SUSE Linux Enterprise Server on zBX are also available as special promotion offering from SUSE or, alternatively, can be added via IBM service agreements.*

A Basic Subscription for SUSE Linux Enterprise Server includes Code Maintenance, such as patches, fixes and security updates

A Priority Subscription for SUSE Linux Enterprise Server includes Basic Subscription deliveries plus 24x7 Support services delivered by the Novell Technical Services organization

http://www.novell.com/products/systemz/

z114 Upgrade paths



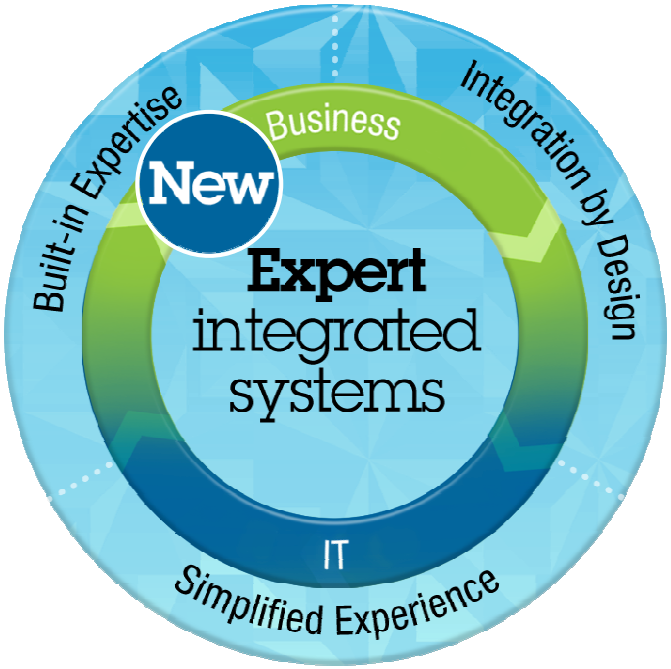
- Upgrade paths from z9 BC and z10 BC
- Upgrade path to z196 Model M15 (Air cooled only)
- Disruptive upgrade M05 to M10 and from M10 to z196 M15

April 11/2012: The time has come for a new breed of systems

Systems with integrated expertise and built for cloud

Built-in Expertise

Capturing and automating what experts do – from the infrastructure to the application



Integration by Design

Deeply integrating and tuning hardware and software – in a ready-to-go workload optimized system

Simplified Experience

Making every part of the IT lifecycle easier

Integrated management of the entire system

A broad open ecosystem of optimized solutions

PureSystems: *A new family of expert integrated systems*

the first two members of the IBM PureSystems family:

New

IBM PureFlex System

Infrastructure System:
Expert at sensing and anticipating resource needs to optimize your infrastructure

New

IBM PureApplication System

Platform System:
Expert at optimally deploying and running applications for rapid time-to-value

- Simplified experience
- Built-in expertise
- Integration by design

zEnterprise
Client Optimized Systems

- Multi-Architecture System for z/OS, AIX, Linux and Windows
- Centrally managed through the Unified Resource Manager
- Best fit when data or applications exist on System z and clients desire z governance

PureSystems
Integrated Expert Systems

- Multi-Architecture system for AIX, i/OS, Linux and Windows
- Centrally managed through Flex System Manager (FSM)
- Best fit when data and applications run on a combination of POWER and System x architecture

Today: Attachment of IBM zEnterprise and IBM PureSystems (via Ethernet) to gain benefits of simplified management and lower IT infrastructure costs for all workloads.

IBM's Tivoli service management platform allows for integration for improving delivery of business services.

In future: Tighter integration of these two systems. Today's investment in either will gain value over time.

Tivoli's Service Management Portfolio, the unifying layer for enterprise wide integration

- **Tivoli Performance Monitoring Family – OMEGAMON, ITM, ITCAM families provides**
  - Visibility, Control and Automation for Applications, Transactions, Databases, all Datacenter Resources
  - End-to End Workload Management and Service Level Objectives Align IT Management with Business Goals
- **Tivoli Financial and Asset Management Family – Usage and Accounting Manager, Asset Discovery provides**
  - Common usage and accounting for business accounting
  - Asset and Change Management for physical and virtual resources
- **Tivoli Workload Automation and Business Service Management family – TWS, TBSM, Netcool/Omnibus provides**
  - Dynamic/Centralized management of Application Workloads based on policies
  - End-to End Workload Management and Service Level Objectives Align IT Management with Business Goals
- **Enterprise Security Portfolio – TAM, Tivoli Security Policy Manager, zSecure provides**
  - End-to-End Enterprise Security
- **Tivoli System Automation Family - Tivoli System Automation for z/OS, Multiplatform and Application Manager, NetView provides**
  - Business Resiliency for Multi-site recovery
  - High availability and disaster recovery for the cloud
- **Tivoli Storage Family – TSM, TPC , Tivoli Advanced storage portfolio and OMEGAMON for Storage provides**
  - Multi-site Storage management and disaster recovery
- **Smart Cloud Family – Smart Cloud Provisioning, Smart Cloud Monitoring provides**
  - Resource provisioning and management for the cloud

Service Management Layer

Delivering to Smarter Computing with zEnterprise

Hybrid computing on System z keeps getting smarter

Initial Focus

- Monitor and management of heterogeneous resources.
- Specialized complex query processing with industry leading performance in a true appliance with IDAA
- DataPower XI50z appliance can help simplify, govern, and enhance the security of XML, Web and IT services – providing fast and flexible application integration
- Support for AIX on POWER7 and Linux on System x.

Delivery of new hybrid function

- Support for Windows Server 2008 on System x
- Extending management functions of Unified Resource Manager with programmatic access
- Expanding internal network communications within the zEnterprise and to the zBX
- Virtual storage management support
- Extend blade support to larger configurations of blades
- Ongoing support for zBX on next generation server

Future Vision

- zEnterprise will continue to invest in improving the virtualization and management capabilities for hybrid computing environments
- zEnterprise will more tightly integrate with PureSystems over time
- zEnterprise and STG will continue to leverage the Tivoli portfolio to deliver enterprise wide management capabilities across all STG systems including PureSystems

Questions?

Wilhelm Mild

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THE Open GROUP
Master
Certified IT Architect

IBM

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