Session Title:
IBM zEnterprise Technical Introduction

Session ID: 8920

Advanced Technical Skills

Speaker: Harv Emery

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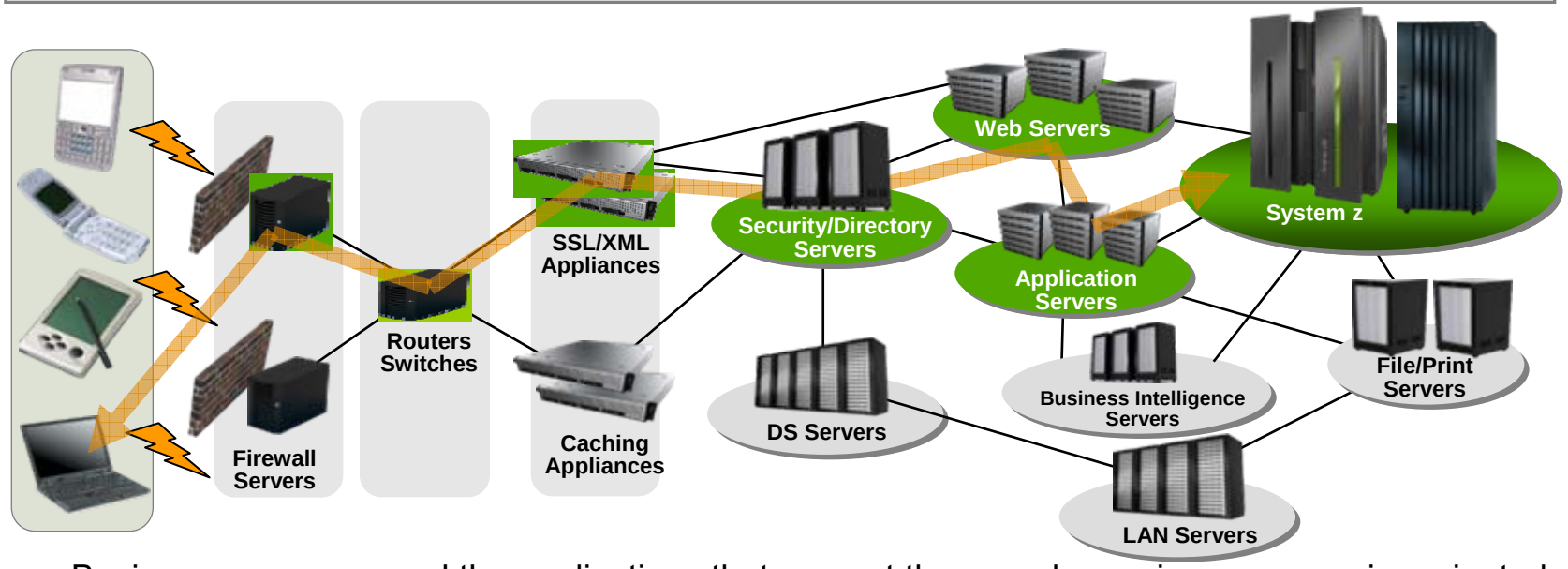
Information Technology Before zEnterprise: Limitations

Information technology today is limited by the technology and architecture configurations available.



- Business processes and the applications that support them are becoming more service oriented, modular in their construction, and integrated.
- The components of these services are implemented on a variety of architectures and hosted on heterogeneous IT infrastructures.
- Approaches to managing these infrastructures along the lines of platform architecture boundaries cannot optimize: alignment of IT with business objectives; responsiveness to change; resource utilization; business resiliency; or overall cost of ownership.
- **Customers need better approach: The ability to manage the IT infrastructure and Business Application as an integrated whole.**

IBM zEnterprise System – Best in Class Systems and Software Technologies

A system of systems that unifies IT for predictable service delivery

Unified management for a smarter system: zEnterprise Unified Resource Manager

- Unifies management of resources, extending IBM System z® qualities of service end-to-end across workloads
- Provides platform, hardware and workload management

The world's fastest and most scalable system: IBM zEnterprise™ 196 (z196)

- Ideal for large scale data and transaction serving and mission critical applications
- Most efficient platform for Large-scale Linux® consolidation
- Leveraging a large portfolio of z/OS® and Linux on System z applications
- Capable of massive scale up, over 50 Billion Instructions per Second (BIPS)

Scale out to a trillion instructions per second: IBM zEnterprise BladeCenter® Extension (zBX)

- Selected IBM POWER7® blades and IBM x86 blades[1] for tens of thousands of AIX® and Linux applications
- High performance optimizers and appliances to accelerate time to insight and reduce cost
- Dedicated high performance private network

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

System z Value Extends To Heterogeneous 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 Acoustic Panels
- **System z support**
  - Problem reporting, hardware and firmware updates
- **Expanding operating system support for zEnterprise**
  - AIX, Linux on System x[1]
- **Simplified management**
  - Improved time to install and implement new applications
  - Central point of management for heterogeneous workloads
  - No change to applications

Optimizers
- **IBM Smart Analytics Optimizer**
- **WebSphere DataPower Integration Appliance XI50 for zEnterprise (DataPower XI50z)**

Select IBM Blades
- **BladeCenter PS701 Express**
- **IBM x86[1]**

One to four – 42u racks – capacity for 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

… managed by the zEnterprise Unified Resource Manager

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zBX … Infrastructure to Support More Resources

- **zBX houses the multiplatform solutions key to the zEnterprise System.**
  - Optimizers that are dedicated to workloads.
    - IBM Smart Analytics Optimizer and DataPower XI50z
    - Closed environments with hardware and software included in solution
    - Individualized tools for sizing and customizing – dependant on the optimizer
  - Select IBM POWER7 and IBM x86[1] blades – running *any* application supported by the operating system installed on the blade – with no change.
  - Mix and match Optimizer and select general purpose POWER7 and IBM x86 blades in the same rack.
  - zBX is a System z machine type for integrated fulfillment, maintenance, and support
- **Secure network connection between zBX and z196 for data and support.**
  - Fast 10 Gb Ethernet connection to the data
  - Less latency – fewer 'hops' to get to the data and no need for encryption / firewall
  - Traffic on user networks not affected.
- **Sharing of resources – up to eight z196 servers can attach to the zBX and have access to solutions**
- **Configuration, support, monitoring, management – all by Unified Resource Manager**

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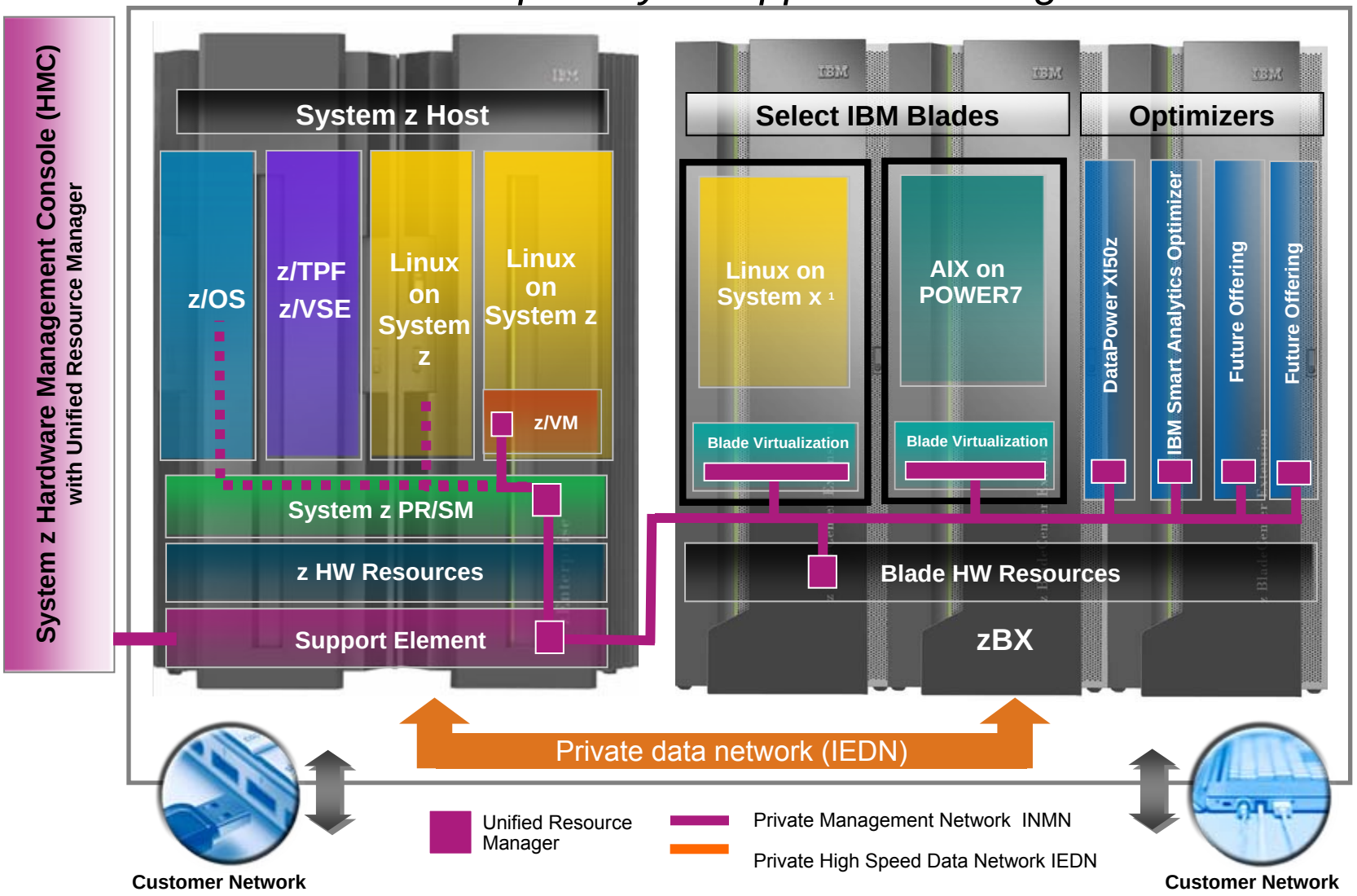
Putting zEnterprise System to the task

Use the smarter solution to improve your application design



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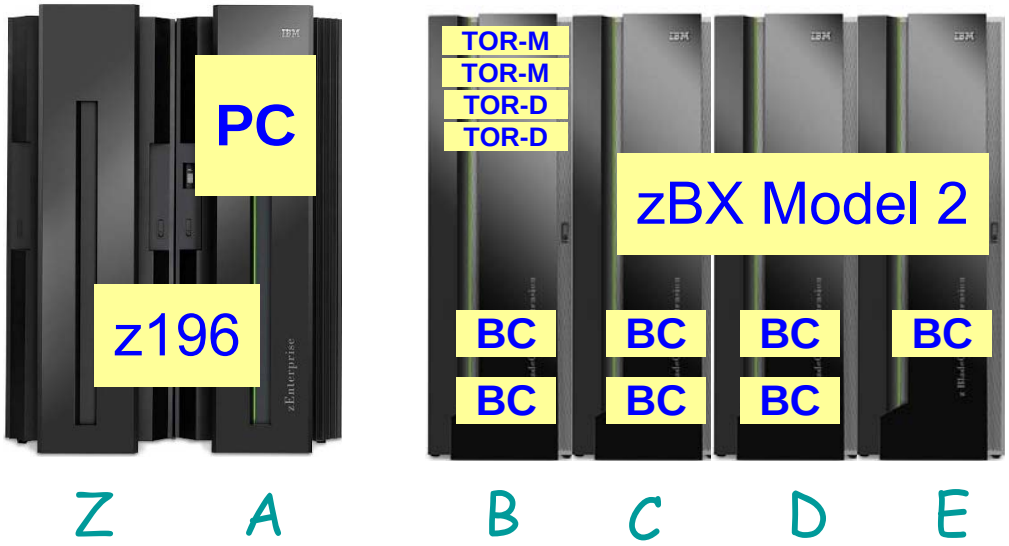
zEnterprise Processors and Connectivity Introduction

- **z196 – Processor Cage (PC)**
  - Placement - “A” frame, top
  - 1 to 4 processor books – Processors, memory, I/O buses
- **zBX Model 2 – IBM BladeCenter H chassis (BC) 1 to 8, 7 shown**
  - Placement - “B” to “E” frames, bottom
  - Bays for up to 14 IBM blades
  - Each IBM blade – processors, memory, and I/O
- **zBX Model 2 – Top of Rack (TOR) Switches**
  - Management (M) – 1 Gbps Ethernet to z196 and zBX BladeCenters
  - Data (D) – 10 Gbps Ethernet to z196, zBX BladeCenters, customer network., and other ensemble nodes

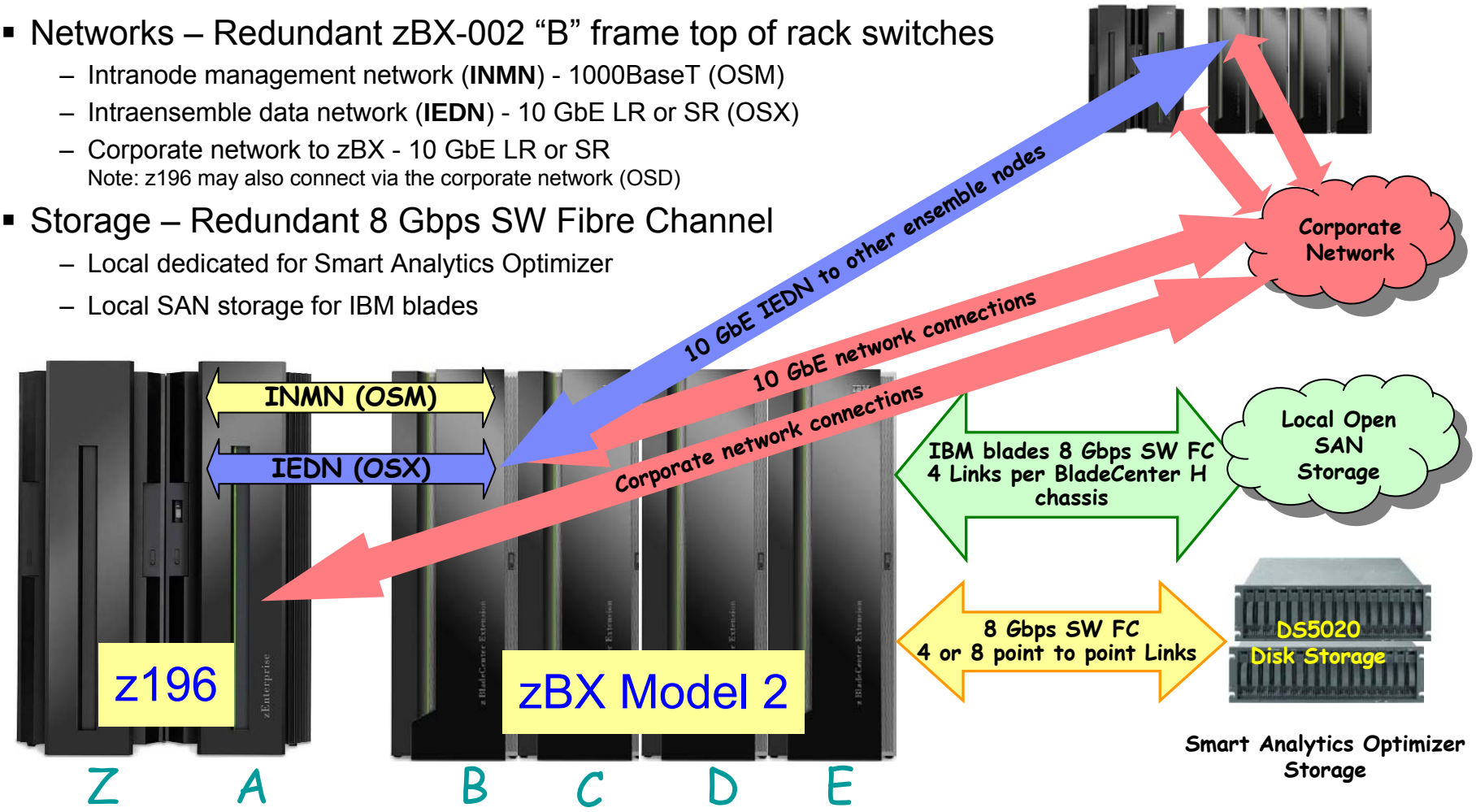
z196 Processor Cage (front)



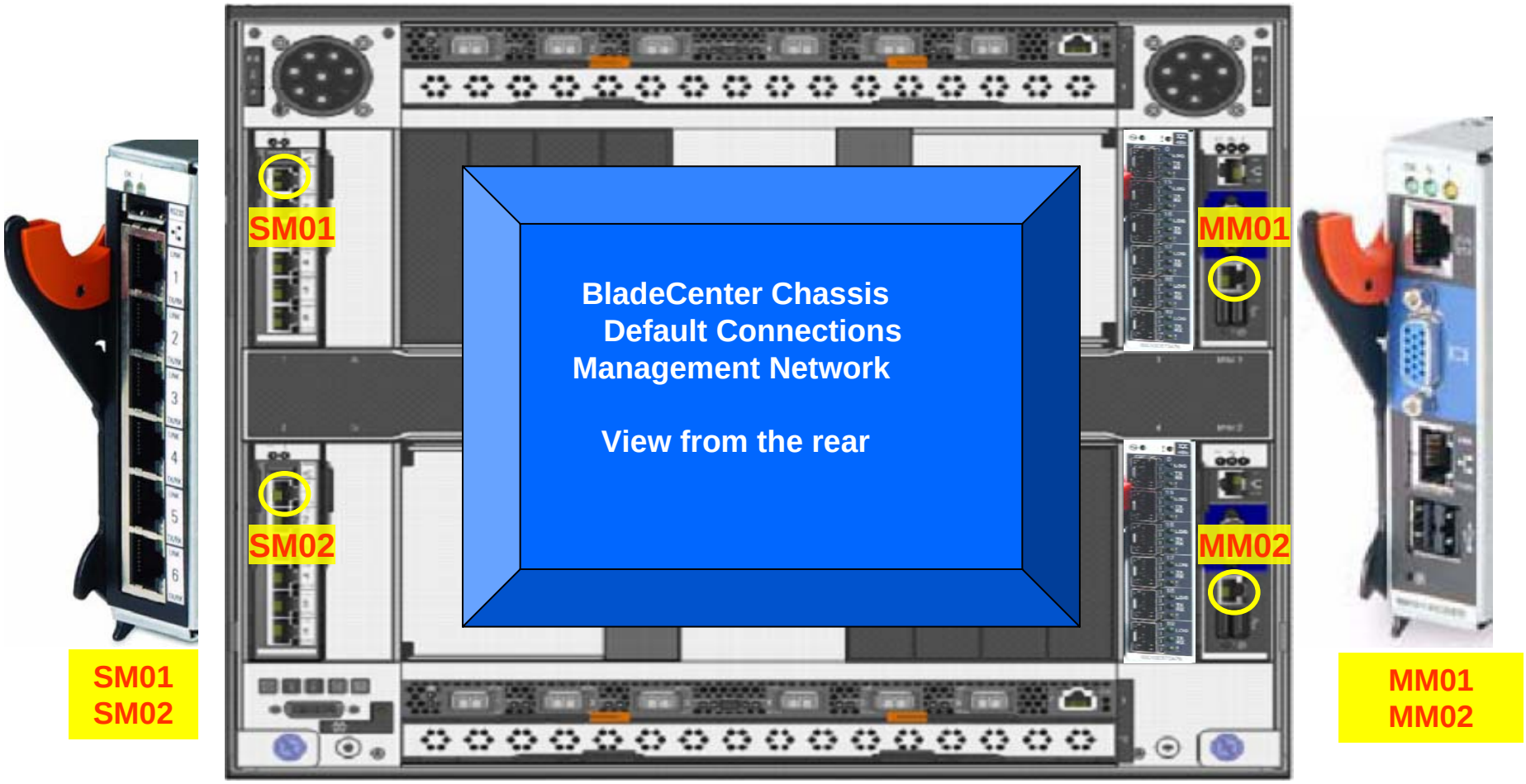
IBM BladeCenter H (front) Up to 14 blades

zEnterprise z196 and zBX Model 2 Ensemble Connectivity

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



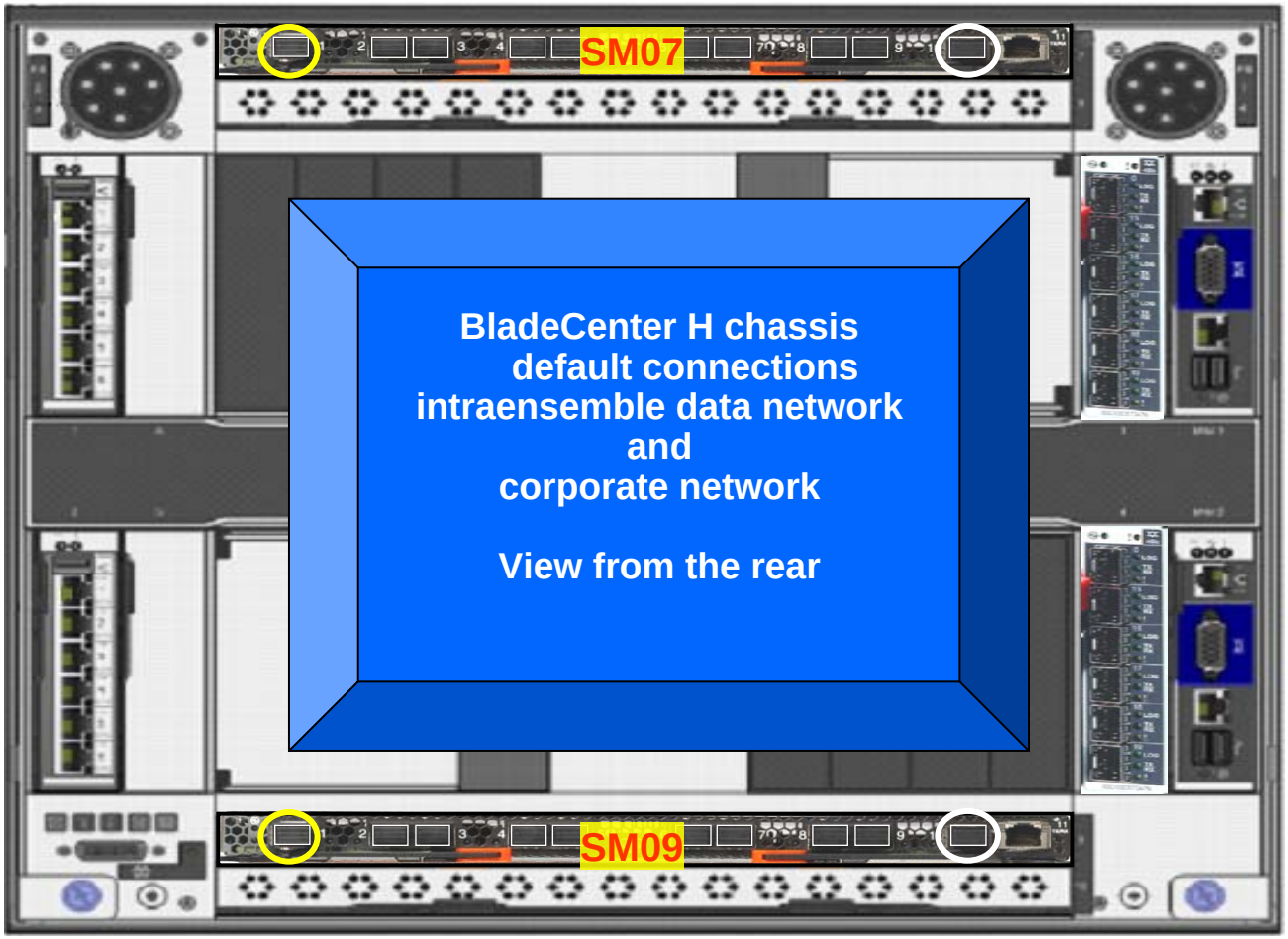
BladeCenter Chassis Connectivity to both TOR INMN Switches



- 1000BaseT Ethernet Switch Modules – **SM01 and SM02**
- Advanced Management Modules – **MM01 and MM02** (1000BaseT ports)

BladeCenter Chassis Connectivity to both TOR IEDN Switches

SM07
SM09



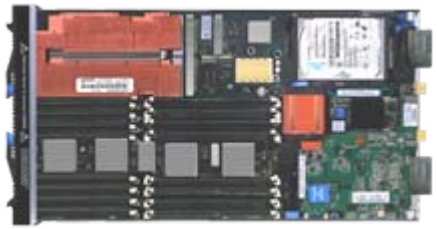
- 10 Gbps Ethernet High Speed Switch Modules – **SM07 and SM09**
- Each connects to **both** of the two TOR 10 Gbps Ethernet IEDN switches in the "B" frame

IBM POWER7 and IBM x86[1] Blades

General purpose processors under one management umbrella

What is it?

The zBX infrastructure can host select IBM POWER7 and IBM x86 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®, or Linux on System x (SOD) [1] 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.
- **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 will also be certified and run on the POWER7 blade. No changes to deployed guest images.
- **More applications:** Brings larger application portfolio to System z.

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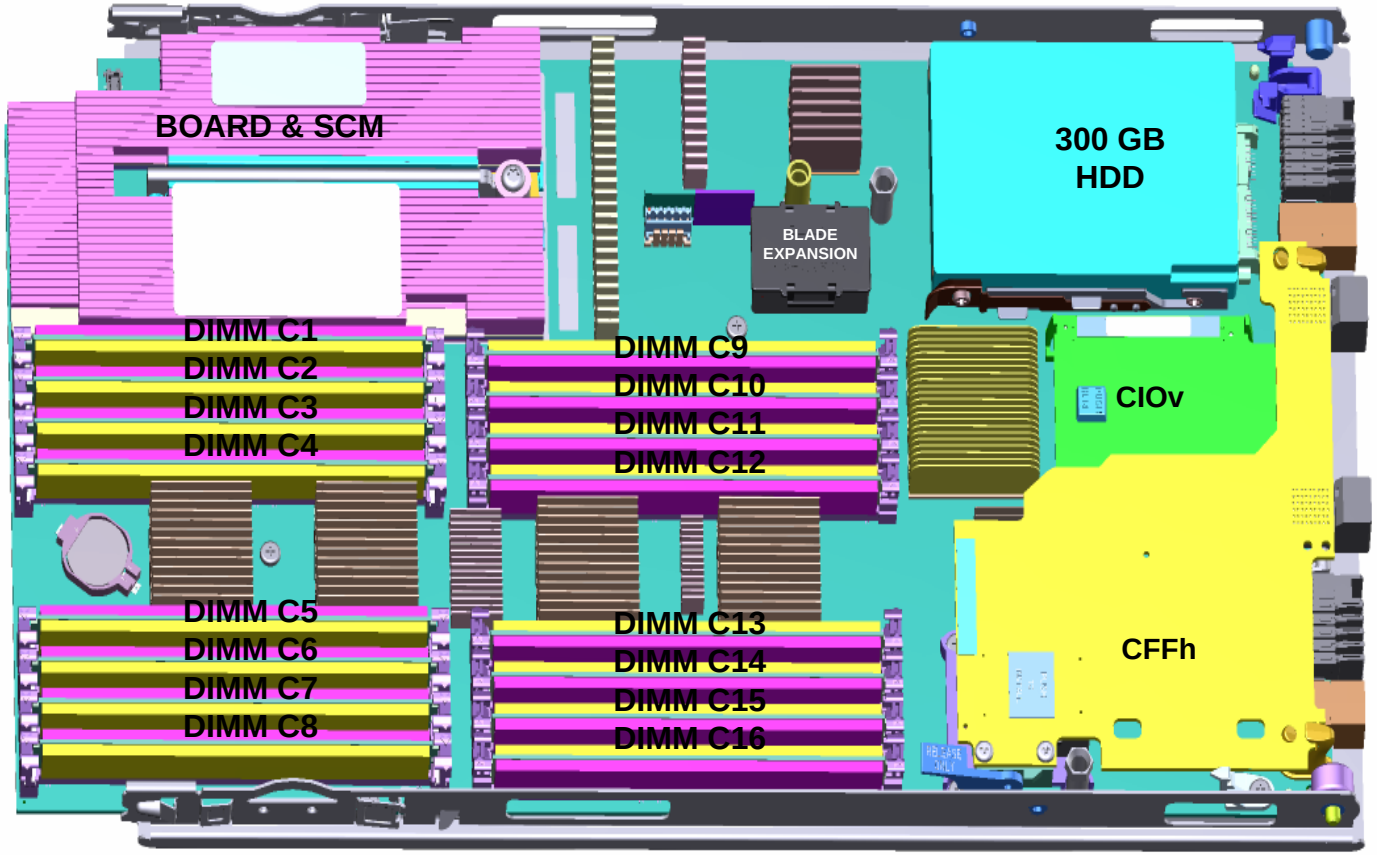
IBM BladeCenter PS701 (8406-71Y) – POWER7 blade



I/O Connections to BladeCenter Modules

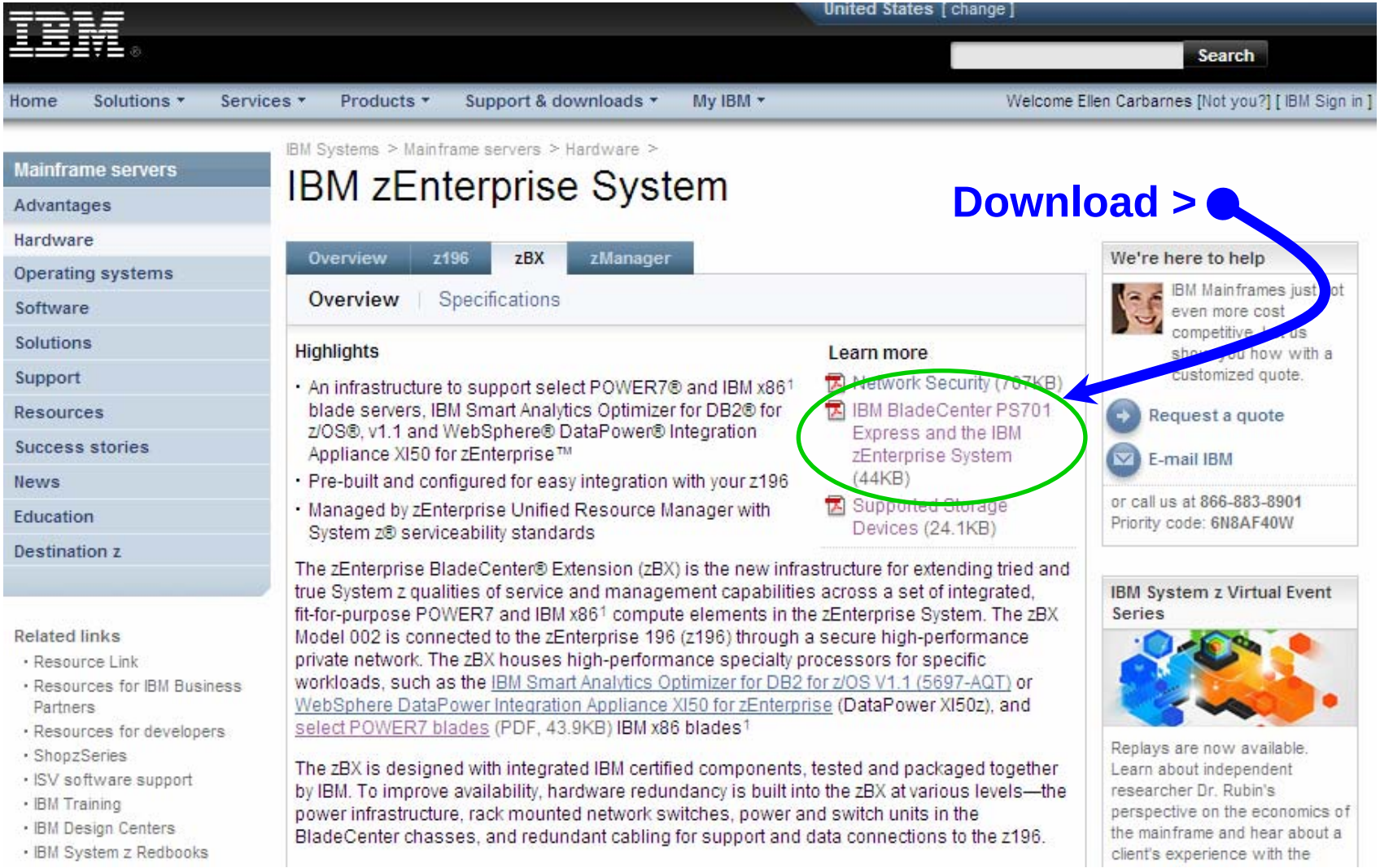
- 2-port 8 Gbs Fibre Channel Expansion Card (CIOv)
- 2-port 10 Gbps Ethernet Expansion Card (CFFh)
- 2-port 1 Gbps Ethernet Internal

IBM BladeCenter PS701 (8406-71Y) – POWER7 Blade Processor and Memory Options

- One 8-core processor; 4 threads per core
- 3.0 GHz @ 150W
- Choice of three supported memory configurations
  - 32 GB, 64 GB, 128 GB

Choices	Config 1 (Small)	Config 2 (Medium)	Config 3 (Large)
Processor	3.0GHz@150W 8 Cores	3.0GHz@150W 8 Cores	3.0GHz@150W 8 Cores
Cache	256 KB L2, 4 MB L3 per core	256 KB L2, 4 MB L3 per core	256 KB L2, 4 MB L3 per core
Threads	4 per core	4 per core	4 per core
DIMMs	8x4GB (32GB)	16x4GB (64GB)	16x8GB (128 GB)

Supported POWER7 blade configurations for zBX are documented: Here: http://www.ibm.com/systems/z/hardware/zenterprise/zbx.html



IBM Smart Analytics Optimizer

Capitalizing on breakthrough technologies to accelerate business analytics

What is it?

The IBM Smart Analytics Optimizer is a workload optimized, appliance-like, 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 IBM Smart Analytics Optimizer.
- **Simplified administration:** Appliance-like hands-free operations, eliminating many database tuning tasks.

Faster insights for enabling new opportunities

IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise (DataPower XI50z)

Purpose-built hardware for simplified deployment and hardened security

What is it?

The IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise can help simplify, govern, and enhance the security of 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. And integration with RACF® security.
- **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. Guided placement of blades to optimize.
- **Operational controls:** Monitoring rolled into System z environment from single console. Time coordination with System z. Consistent change management with Unified Resource Manager.

IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise (DataPower XI50z)

- DataPower XI50z (2462-4BX)
  - Same hardware as DataPower XI50B (4195-4BX)
    - "Double-wide" Blade: 2 BladeCenter slots
    - IBM HS22 Blade + DataPower expansion unit
  - Firmware based on DataPower firmware v3.8.1
  - Same Acceleration, Security, and Integration capabilities
- Can coexist with POWER7 blades in the same zBX BladeCenter
  (Also planned to coexist with future general purpose x86 blades – Statement of Direction*)
- Leverages advanced zBX BladeCenter networking infrastructure
  - 2 x 1 GbE interfaces to zBX 1 GbE top of rack switches (zManager - INMN)
  - 2 x 10 GbE interfaces to zBX 10 GbE top of rack switches (IEDN)
- Ordering, configuration and installation
  - Hardware and firmware are configured and ordered by eConfig as zBX features
  - Ships installed in a new-build zBX or field installed by IBM service as an MES
- Tightly integrated with zEnterprise
  - Unified hardware and firmware management by zManager
  - Inherits zEnterprise Ensemble serviceability, monitoring and reporting capabilities

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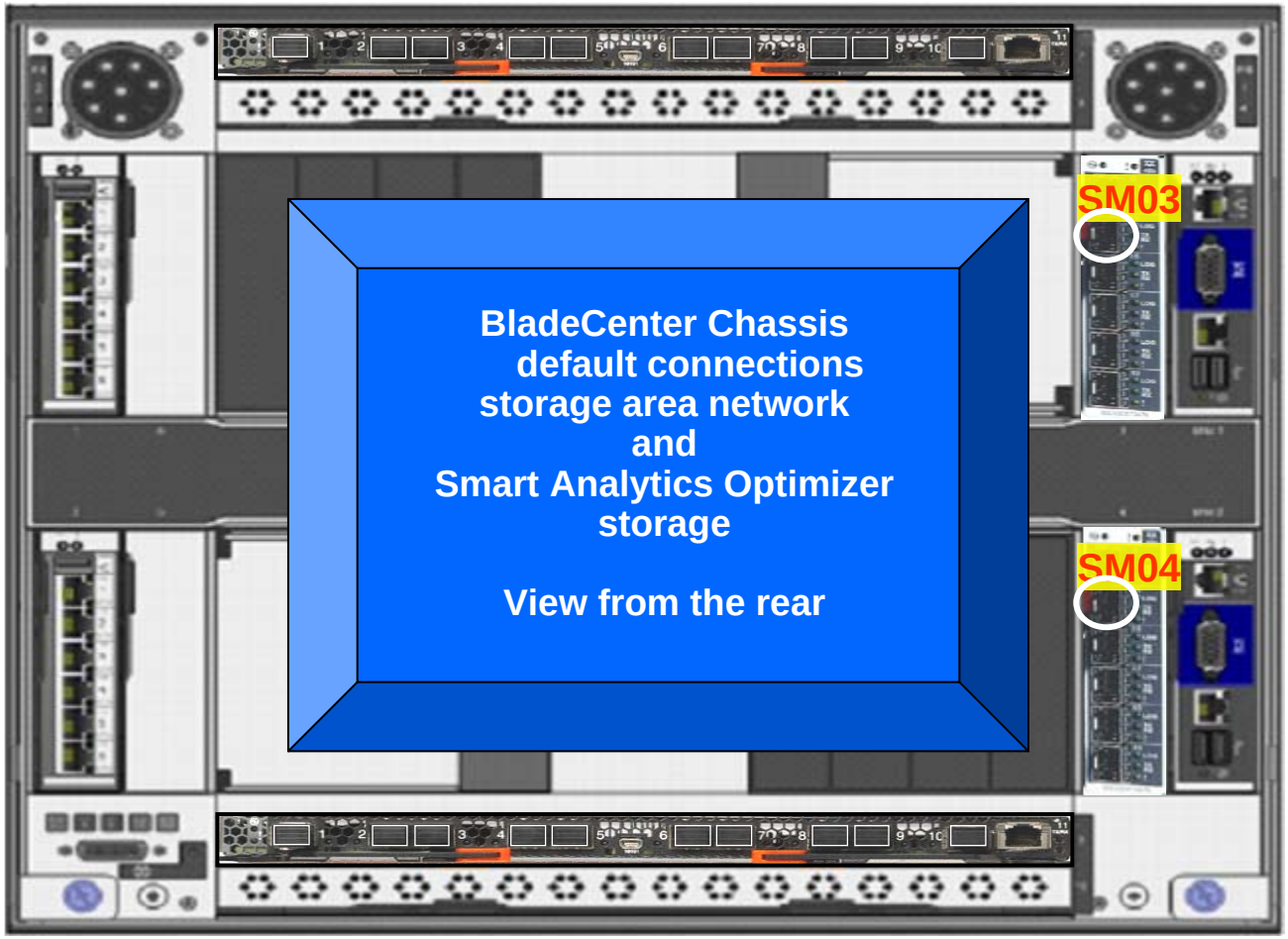
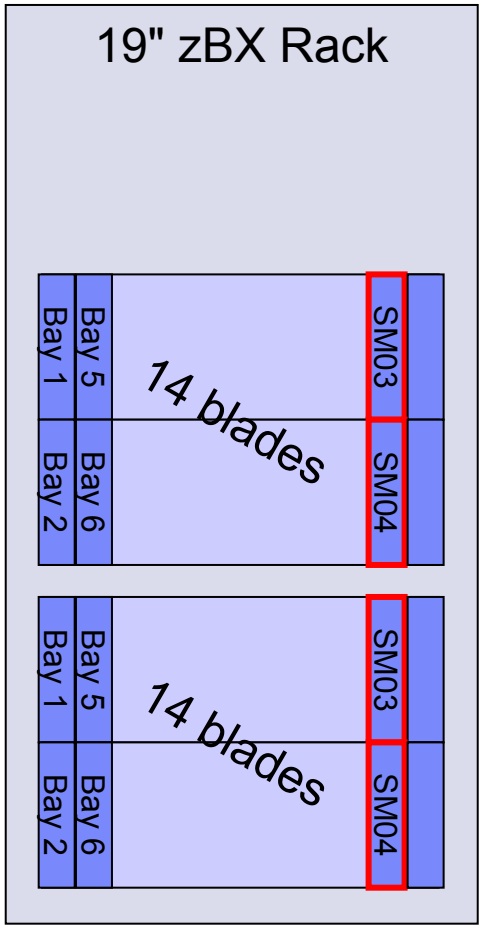
BladeCenter Chassis Connectivity to SAN or Optimizer Storage



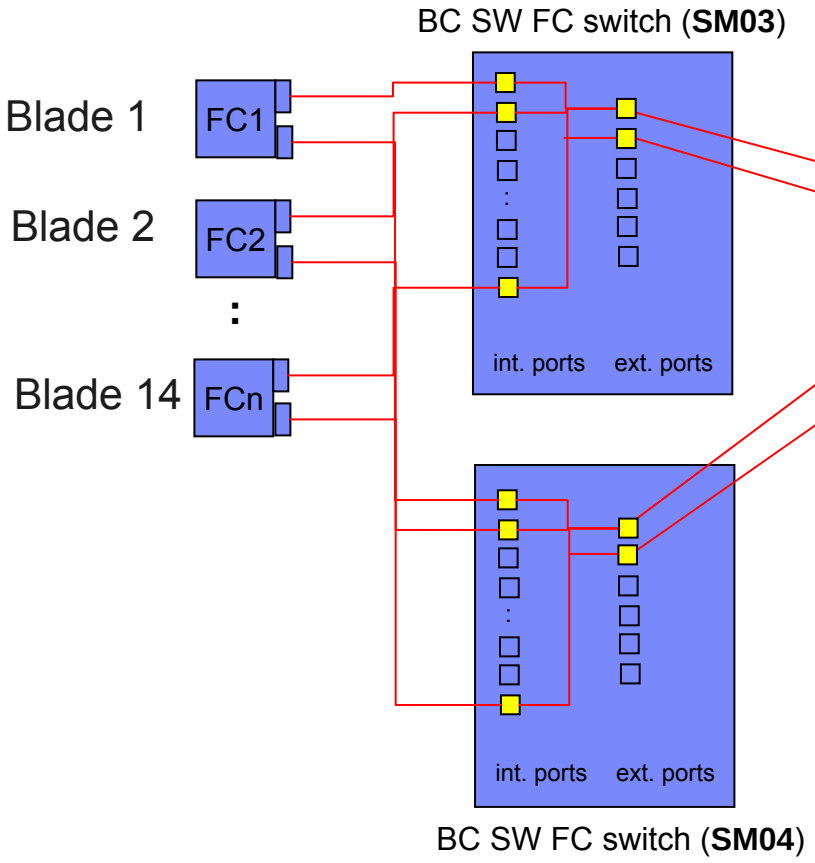
SM03
SM04

- 8 Gbps SW Fibre Channel Switch Modules – **SM03 and SM04**
  - External Customer SAN connection for IBM blades (4 per BladeCenter H chassis)
  - Internal SAN and External to Dedicated Storage for IBM Smart Analytics Optimizer

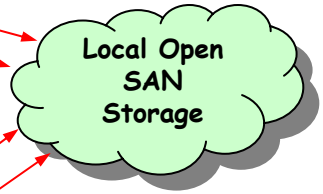
IBM POWER7 Blades BC Switch Module to SAN Connections



zBX rack, 2 BC H



Connectivity per BC chassis



1. **J00 and J15 connections each switch module**
2. **Must connect to an SW (aka SX) 2, 4, or 8 Gbps SAN switch port**
3. **Switch must support N_Port ID Virtualization**
4. **SAN interoperability mode is required**
5. **FCP disk (open SCSI) Access control by**
   - **Zoning in switches**
   - **LUN Masking**

Blade Expansion Cards

- One 2-port card per blade
- 8 Gbps CIOv

Each BC chassis FCS switches

- Two SW 8Gbps QLOGIC fibre channel switches
- Run in pass-thru mode, exploit NPIV
- Two SAN connections each module (Ports J00, J15)

zEnterprise Unified Resource Manager

Transforming the way resources are managed and deployed

What is it?

*Unified Resource Manager provides **workload awareness** to optimize the system resources in accordance with understanding the policies assigned to that particular workload.*

Functions are grouped into two suites of tiered functionality that enable different levels of capability - Manage suite and Automate suite.

How is it different?

- **Heterogeneous management:** Total systems management across heterogeneous resources
- **Integration:** Single point of control, common skills for resources, reduced complexity of day to day operations.
- **Monitoring.** New dashboard for CPU resources and energy management.
- **Simplified installation:** Auto discovery and configuration of resources and workloads with single interface
- **Secure:** Improved network security with lower latency, less hops and less complexity. Improved control of access due to management of hypervisors as firmware.
- **Service and support management:** Virtual machines and blades able to perform hardware problem detection, reporting and call home

Management Stack

Building an architectural construct of hardware, software, services

Service Management

- Visibility, Control and Automation for Applications, Transactions, Databases and Data Center Resources
- End-to End Workload Management and Service Level Objectives that Align IT Management with Business Goals
- Common Usage and Accounting for business accounting
- Dynamic/Centralized Management of Application Workloads based on Policies
- Business Resilience for multi-site recovery
- End-to-end Enterprise Security

Platform Management

- Workload based Resource Allocation and Provisioning for zEnterprise
- Physical and Virtual Resource Management (Server, Storage, Network)
- Goal Oriented Resource Management of zEnterprise (Availability, Performance, Energy, Security)
- Ensemble Network and Storage Management

Extending with

Unified Resource Manager

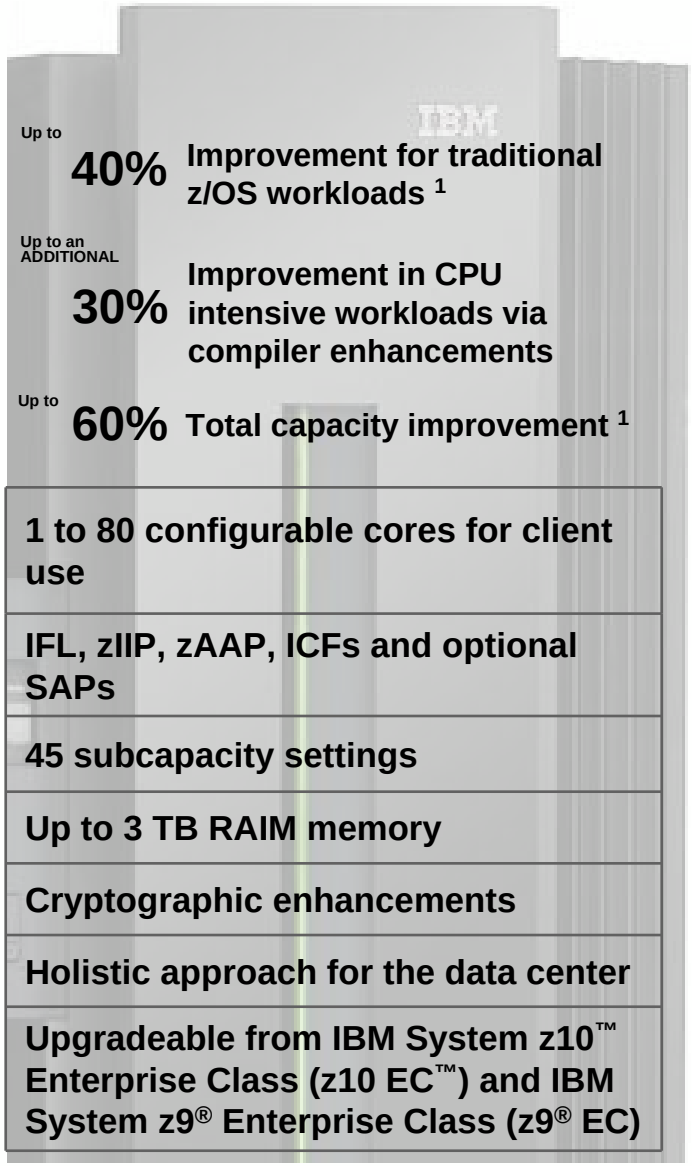
- **Hypervisor management and creation of virtual networks**
- **Operational controls, service and support for hardware / firmware**

Hardware Management

- Configuration management for hardware / firmware
- Operational controls for the hardware / firmware
- Service and Support for the hardware / firmware
- Lifecycle management for the platform's virtual resources

- **Network management of private and secure data and support networks**
- **Energy monitoring and management**
- **Workload awareness and platform performance management**
- **Virtualization management – single view of virtualization across the platform**

zEnterprise Value Begins At the Heart of z196 …



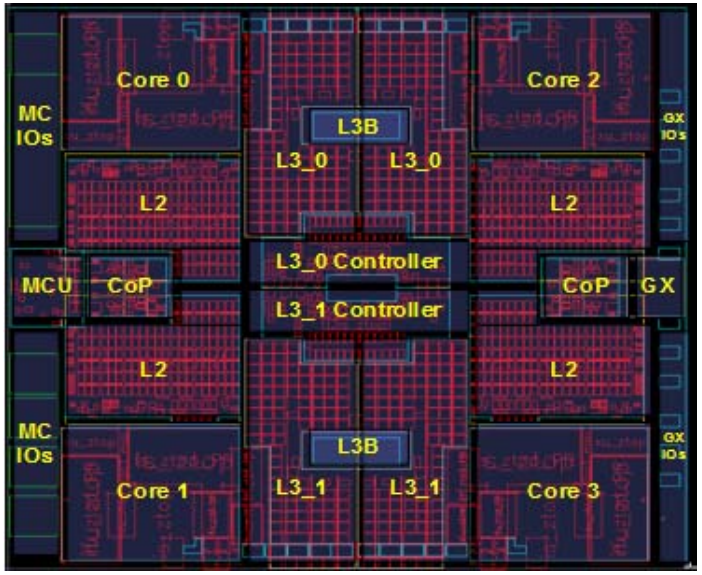
zEnterprise 196 (z196)
Machine Type: 2817
Models: M15, M32, M49, M66, M80

- **Improved connectivity**
  - One to four books
  - Hot pluggable I/O drawer
  - InfiniBand Coupling links
- **Focus on the environment**
  - Options to help eliminate hotspots and save on energy
  - Static power savings
  - Query maximum potential power
- **Operating System Flexibility**
  - z/OS, z/VM®, z/VSE™, z/TPF and Linux on System z
- **Security and reliability**
  - Elliptic curve cryptography
  - Concurrent patch update enhancements

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

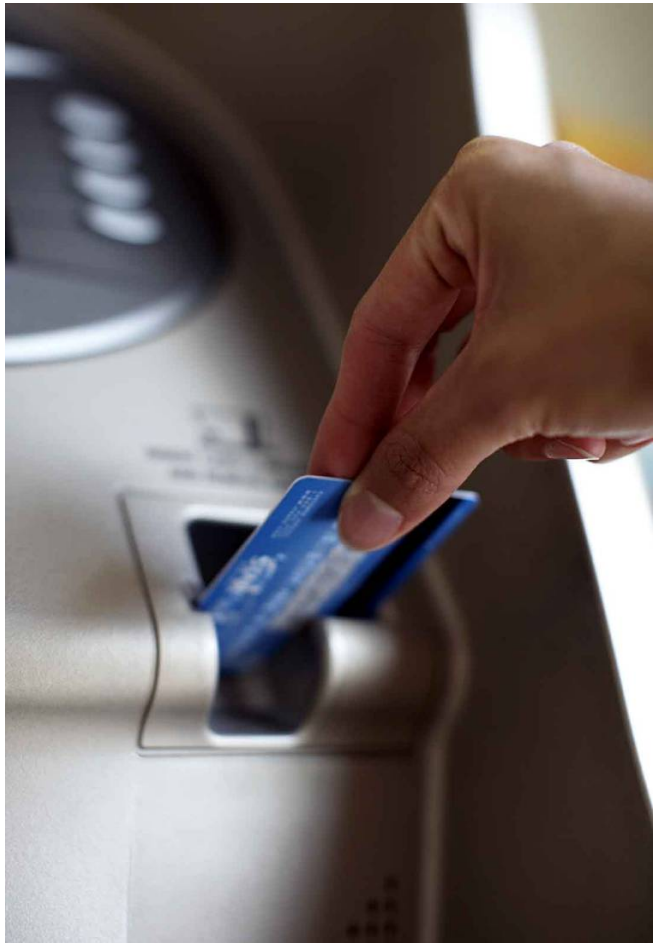
z196 – IBM Leadership Technology At the Core

- **New 5.2 GHz Quad Core Processor Chip boosts hardware price/performance**
  - 100 new instructions – improvements for CPU intensive, Java™, and C++ applications
  - Over twice as much on-chip cache as System z10 to help optimize data serving environment
  - Out-of-order execution sequence gives significant performance boost for compute intensive applications
  - Significant improvement for floating point workloads
- **Performance improvement for systems with large number of cores – improves MP ratio**
- **Data compression and cryptographic processors right on the chip**



Protecting with IBM's World-Class Security and Business Resiliency Solutions

- **Cryptographic enhancements on z196**
  - Support for the next generation of public key technologies with ECC support that is ideal for constrained environments such as mobile devices.
  - Compliance and security improvements for the payment card industry.
  - With today's focus on compliance, the Crypto Express3 is enhanced for the banking and finance industry.
- **PR/SM™ designed for EAL5 certification.**
- **Policy driven flexibility to add capacity to real or virtual processors.**
- **Backup and Disaster Recovery solutions**
  - GDPS® offers:
    - Business continuity for Linux applications running on System z
    - Management and coordination of outages across z196 and distributed servers in zBX using clustering solutions
  - Reduce complexity by consolidating multiple open platform backup processes into a single System z-controlled process.
  - Simplify disaster recovery with TS7680 automated replication to remote site.

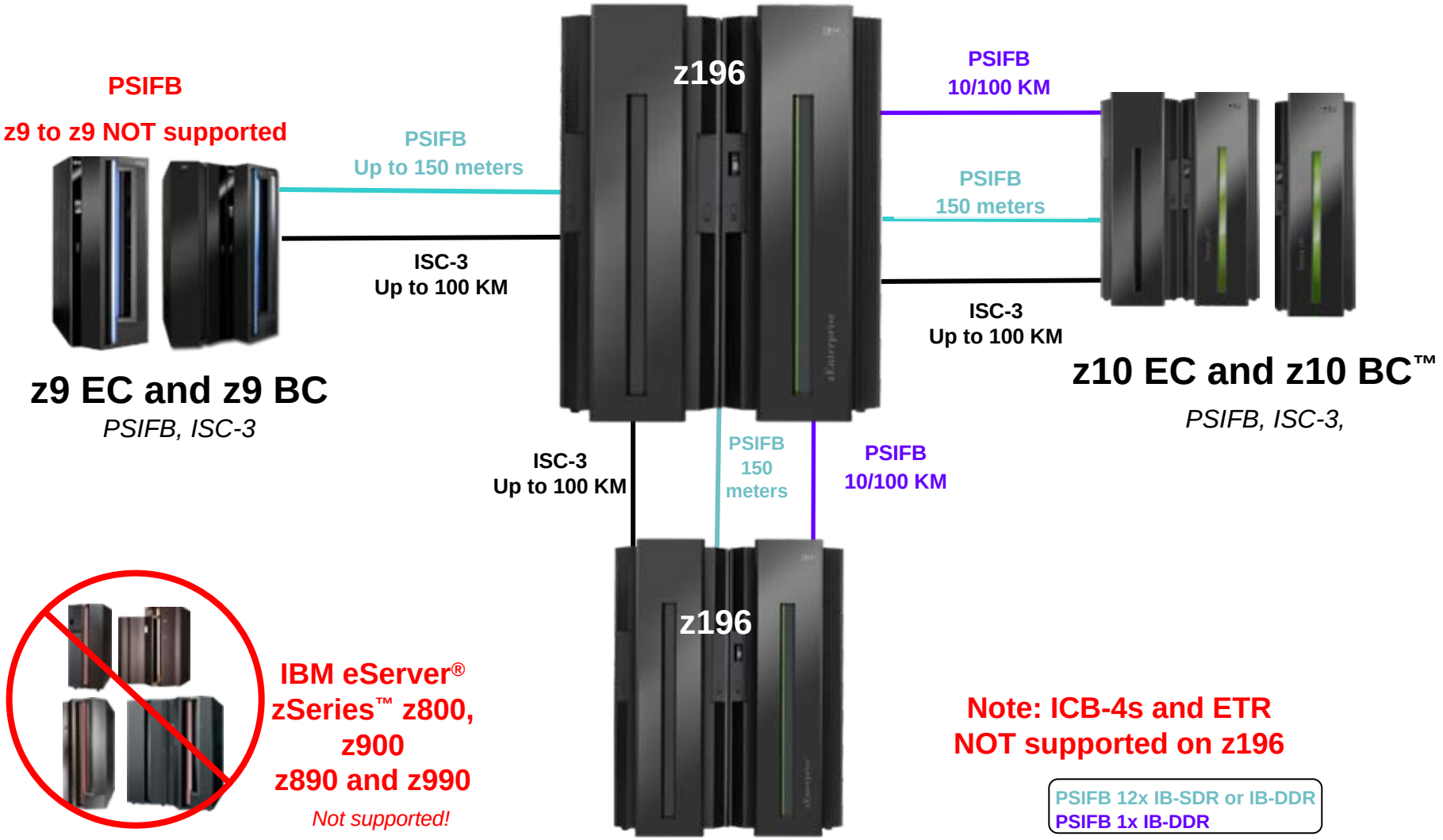


Storage Connectivity Has Gotten Easier and Performance Better

Designed, developed and tested together is key to unlocking value

- Simplified configuration of FICON® disk and tape with z/OS discovery and auto-configuration (zDAC)
- zHPF enhancements allows for increased exploitation transparently to applications and middleware
- Introduction of hot pluggable I/O drawer
- Extending for storage growth with new three subchannel sets per LCSS

z196 Parallel Sysplex coexistence of Servers/CFs and coupling connectivity



z196 – Helping to Control Energy Consumption in the Data Center

- **Better control of energy usage and improved efficiency in your data center**
- **New water cooled option allows for energy savings without compromising performance**
  - Maximum capacity server has improved power efficiency of 60% compared to the System z10 and a 70% improvement with water cooled option
- **Savings achieved on input power with optional High Voltage DC by removing the need for an additional DC to AC inversion step in the data center**
- **Improve flexibility with overhead cabling option while helping to increase air flow in a raised floor environment**
- **z196 is same footprint as the System z10 EC[1]**

[1] With the exception of water cooling and overhead cabling

Operating System Support for zEnterprise System

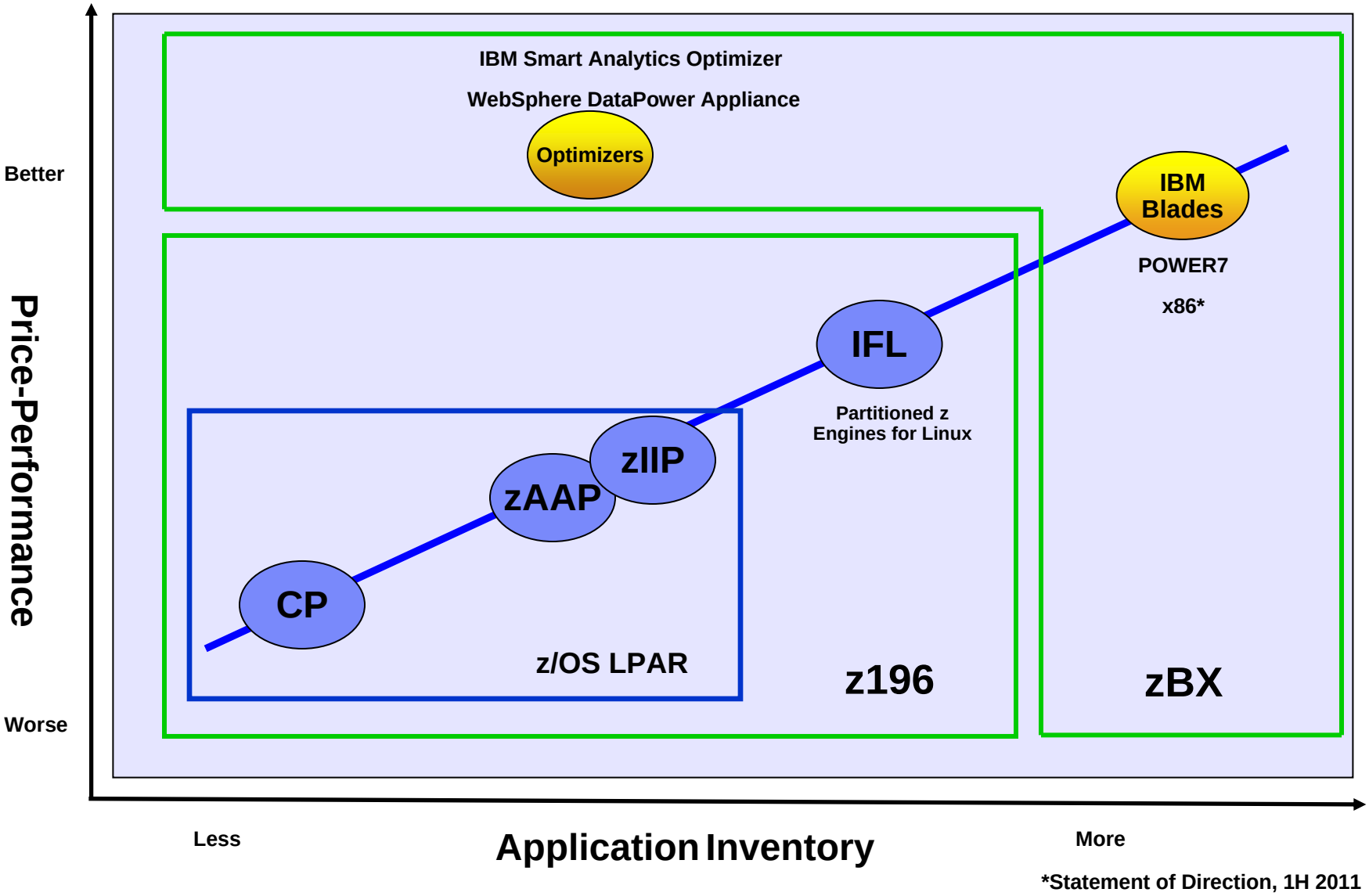
- **Currency is key to operating system support and exploitation of future servers**
- **The following are the minimum operating systems planned to run on z196:**
  - z/OS
    - z196: Exploitation starts with z/OS V1.10[1] with full exploitation with z/OS V1.12
    - Ensemble support: Starts with z/OS V1.10
  - Linux on System z distributions:
    - Novell SUSE SLES 10 and SLES 11
    - Red Hat RHEL 5 and RHEL 6
  - z/VM
    - z196: z/VM V5.4 or higher
    - Ensemble support: z/VM V6.1
  - z/VSE V4.1 or higher
  - z/TPF V1.1 or higher

- **Using the general purpose blades:**
  - AIX 5.3, 6.1
  - Linux on System x [2] (SOD)

[1] z/OS V1.9 support ended on Sept. 30, 2010. Lifecycle Extension for z/OS 1.9 became available Oct. 1, 2010. Note that Lifecycle Extension support for z/OS 1.9 and z/OS 1.8 provides z196 toleration only, not exploitation or Ensemble support. Lifecycle Extension support has been withdrawn for z/OS 1.7.

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

System z "Specialty Engine" Evolution to the zEnterprise Ensemble



*Statement of Direction, 1H 2011

IBM zEnterprise System:

A revolutionary change has come to IT bringing a new dimension in computing

- Redefining IT frameworks to bring change to operational silos and extend System z governance to POWER7 and IBM x86[1] blades
- Driving business decisions based on insight rather than hindsight
- 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

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

Thank you

Questions?

zEnterprise Technical Introduction Backup

z196

zBX Model 2

Unified Resource Manager and zBX Overview

Machine Type: 2817

M80
M66
M49
M32
M15

Machine Type: 2458

Model 002

Standardized Configuration:

- One to four 42u racks – capacity for 112 blades
- Integrated IBM Certified components – driven by System z order
  - Standard parts - TOR Switch, BladeCenter Chassis, Power Distribution Units
  - Configured for high availability
- Select IBM blades
  - POWER7 701 blades
  - IBM x86 blade [1] (SOD)
- Optimizers
  - IBM Smart Analytics Optimizer
  - IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise (DataPower XI50z)
- Managed by zEnterprise Unified Resource Manager
- Concurrent zBX attachment and enablement

Environmentals:

- Optional water cooling with rear door heat exchanger
- Optional acoustic door panels
- Energy monitoring and management

Software:

- No change to application
- No System z software running in zBX
- No MIPS/MSU rating

Simplified Management:

- Operational control via z196
  - Managed via secure internal network
  - Reduces proliferation of individually managed external resources
- System z support
  - Problem reporting
  - Hw and firmware updates
- Improved time to install and implement new applications
- Central point of management for heterogeneous workloads
  - Increase utilization of resources

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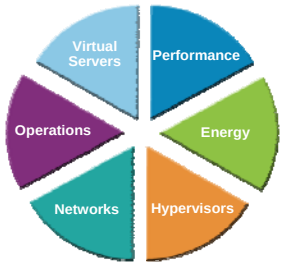
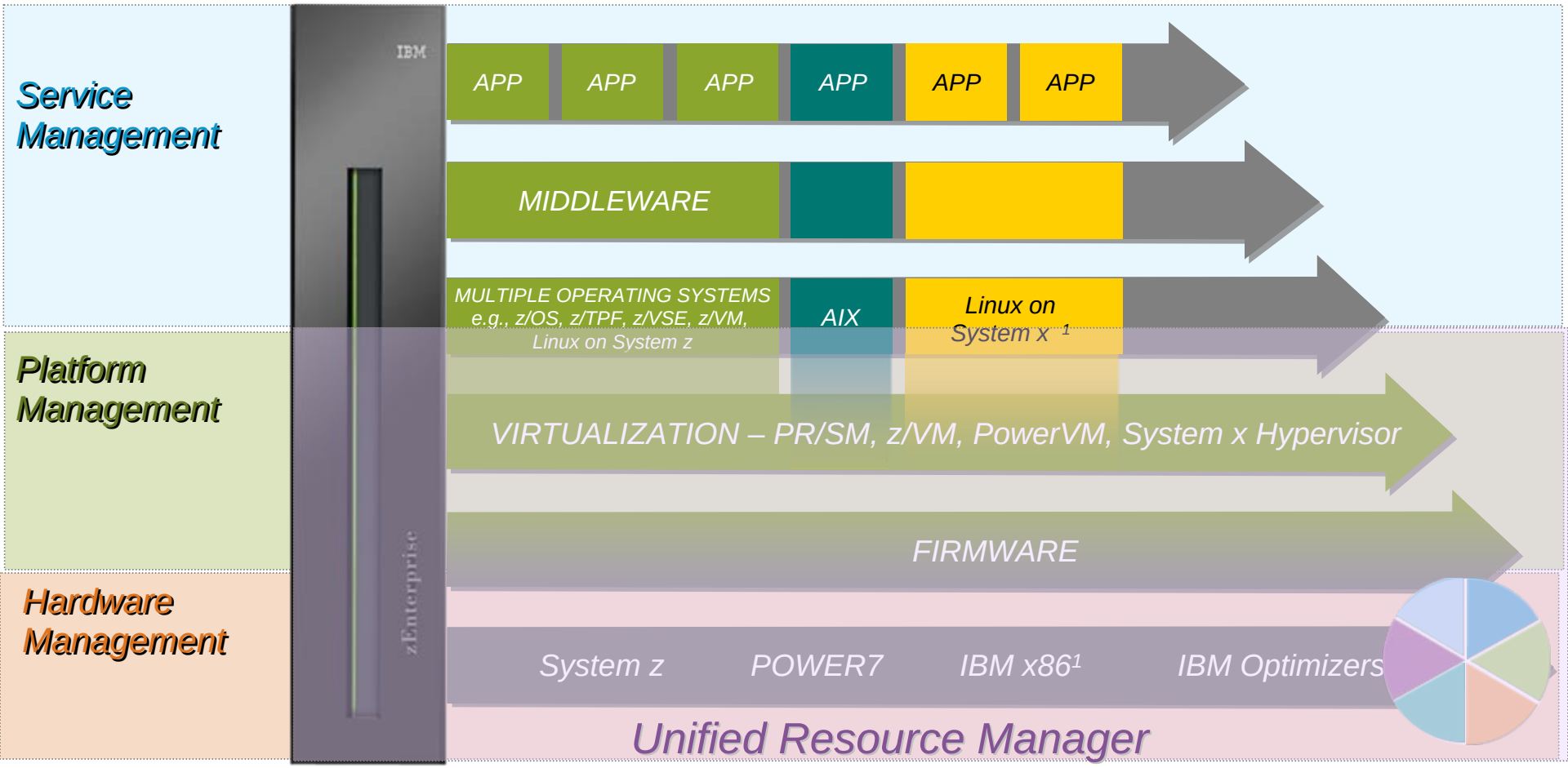
Unified Resource Manager

Two suites of tiered functionality



- ***Manage***
  - Monitor and trend reporting of CPU energy efficiency.
  - New dashboard interface enabling a broader view of system resource consumption.
  - Integrated hardware / asset management across all elements of the system.
  - Private and physically isolated connections for secure support and data sharing.
  - Administrative simplification (wizard) for virtual server provisioning and enablement of integrated storage and network across hypervisors.
- ***Automate***
  - Additional wizard function to set up resources associated with a workload the capability to associate those resources with a named business process.
  - Ability to manage to a user defined performance service level policy and enable performance monitoring, reporting and resource optimization.
  - Static power savings and energy management capabilities.

zEnterprise extends Service Management for improved governance



Focused, collaborative innovation

A "complete systems" approach

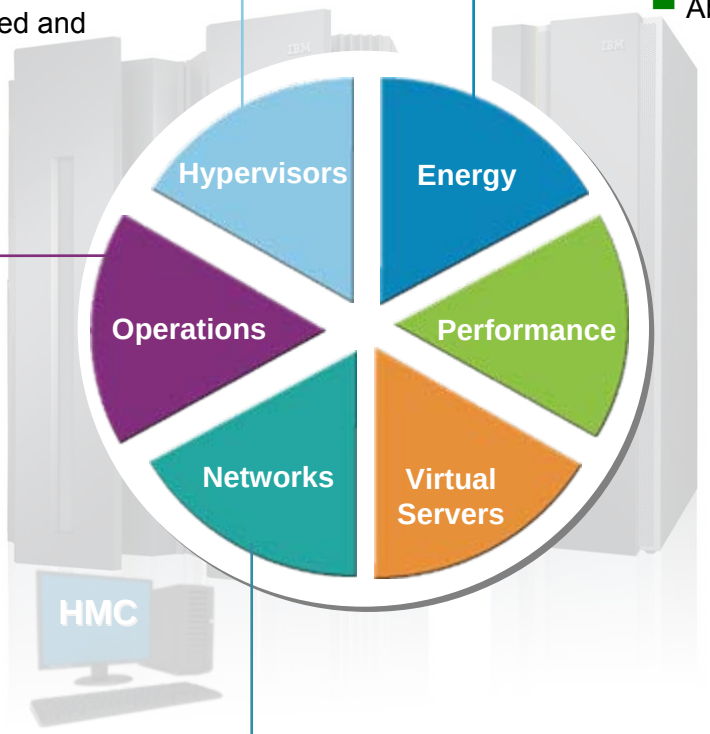
1 All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represents goals and objectives only.

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.
- Ability to query maximum potential power.



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

Network Management
- Management of virtual networks including access control

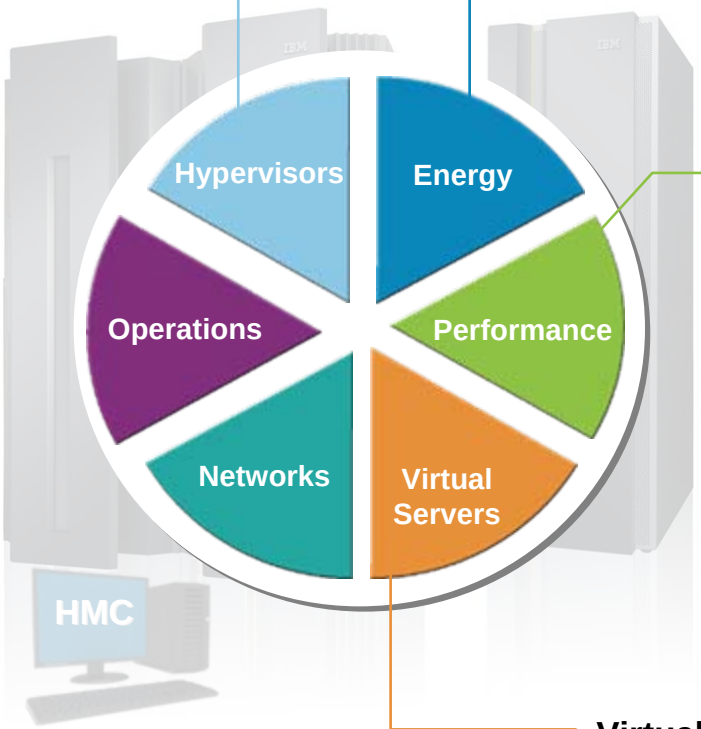
Key
- Manage suite
- Automate suite

zEnterprise Unified Resource Manager

Platform Management

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

Energy Management
- Static power savings



Workload Awareness and Platform Performance Management
- Wizard-driven management of resources in accordance with specified business service level objectives
- HMC provides a single consolidated and consistent view of resources
- Monitor resource use within the context of a business workload
- Define workloads and associated performance policies

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
- Automate suite

… Value Made Possible By the Unified Resource Manager

Simplified installation of hypervisors

Gain significant time to market with improved speed of deployment

Simplified energy management

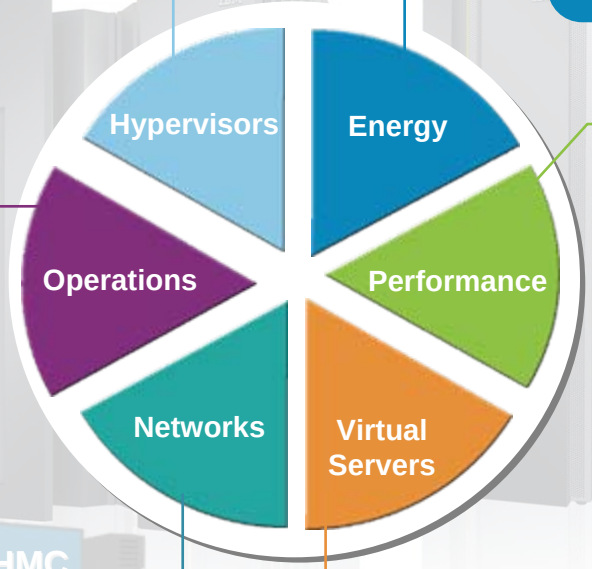
Energy cost savings

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

zEnterprise System Functional Comparison to z10 EC

Processor / Memory	▪ Uniprocessor Performance ▪ System Capacity ▪ Processor Design ▪ Models ▪ Processing cores ▪ Granular Capacity ▪ Memory ▪ Fixed HSA	▪ Up to 40% performance improvement over z10 EC uniprocessor [1] ▪ Up to 60% system capacity performance improvement over z10 EC 64-way [1] ▪ New 5.2GHz processor chip versus 4.4GHz ▪ z196 will have 5 and z10 EC has 5 models, both with up to 4 books ▪ z196 has up to 80 cores to configure, up to 64 on z10 EC ▪ z196 has up to 125 capacity settings versus 100 on the z10 EC ▪ z196 has up to 3 TB with improved RAS vs. up to 1.5 TB on z10 EC ▪ z196 and z10 EC both have fixed 16 GB HSA
Virtualization and Alternative Processors	▪ Virtualization ▪ zEnterprise BladeCenter Extension (zBX)	▪ zEnterprise Unified Resource Manager has “workload awareness” where workloads consist of virtual images across the hybrid. This awareness allows Unified Resource Manager to optimize resources according to business policies established for a workload. ▪ zEnterprise System is a truly integrated hardware platform that is able to span and intelligently manage workloads across mainframe and distributed technologies – including select POWER7 and IBM x86[2] blades ▪ Optimizers that will be supported are IBM Smart Analytics Optimizer and WebSphere DataPower Integration Appliance XI50 for zEnterprise in the zBX..
Connectivity	▪ HiperSockets™ ▪ FICON ▪ I/O subsystem ▪ Internal I/O Bandwidth ▪ Coupling ▪ Cryptography	▪ z196 support of 32 HiperSockets versus z10 EC supporting 16 ▪ High Performance FICON for z (zHPF) enhancements ▪ Both I/O cage and new I/O drawer (with concurrent add/remove/repair) versus only I/O cage on z10 EC ▪ z196 has industry standard 6 GBps InfiniBand® supports high speed connectivity and high bandwidth ▪ Coupling with InfiniBand – improved distance and potential consolidation savings ▪ z196 has programmable functions for Elliptic Curve Cryptography (ECC) not available on z10 EC
On Demand / RAS	▪ On Demand Offerings ▪ RAS Focus	▪ Administrative Test for On/Off Capacity on Demand ▪ z196 offers advanced memory enhancements (RAIM) and advanced power and thermal optimization and management that can help to control heat / improve RAS
Environmentals	▪ Energy ▪ Cooling	▪ z196 offers Power Save modes for processor, I/O and memory – not on z10 EC ▪ z196 offers optional water cooling and DC power – not available on z10 EC

[1] For average LSPR workloads running z/OS 1.11.
[2] All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represents goals and objectives only

IBM z196 Overview

Machine Type: 2817

M80
M66
M49
M32
M15

Machine Type: 2458

Model 002

Technology and Performance:

- One to four books available
- 20 cores per book
  - 60% more total capacity than z10 EC 64-way [1]
- New 5.2 GHz superscalar processor
  - 40% improvement for n-way processors
  - Sub-capacity available
- Configurable cores for CPs, specialty engines, SAPs
- Memory
  - Minimum – 32GB
  - Maximum 3 TB / 960 GB per book
  - Up to 1 TB per LPAR
  - 16 GB HSA separately managed
- Upgradeable from z10 EC and z9 EC
- InfiniBand Coupling Links

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

Environmental:

- Options to help in the elimination of hotspots and save on energy
  - Optional water cooling, high voltage DC power, top exit I/O
- Static Power Savings
- Query Max Potential Power
- Humidity and Altitude Sensors

Software:

- Operating system flexibility with z/OS, z/VM, z/VSE, z/TPF and Linux on System z … plus more with zBX

Security and Reliability

- Elliptic curve cryptography
- Crypto Express 3 performance improvements
- RAIM memory design
- Introduction of hot pluggable I/O drawer
- Concurrent patch update for crypto, OSA data router, and MRU firmware

Synergy with z196 Operating Systems

z/OS

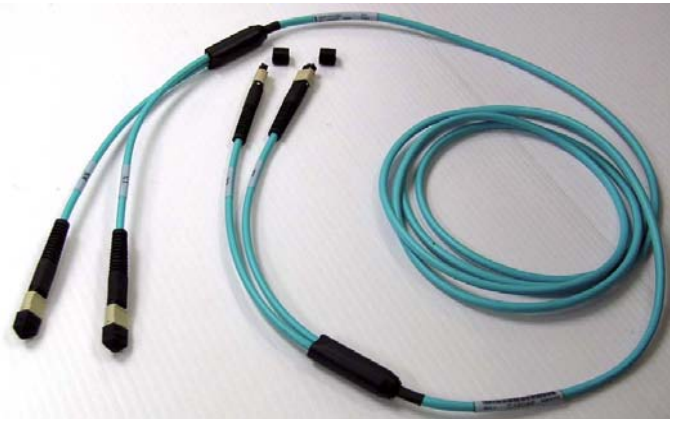
- New automatic discovery and configuration for fabric-attached FICON® disk and tape devices can save you hours on storage configuration time
- New definitions for new management network and data network
- New “off the wire” network traffic separation improves performance for your critical interactive and streaming workloads, as well as sysplex distributor traffic
- Support for the next generation of public key technologies with ECC support that is ideal for constrained environments such as mobile devices.
- Participation with new z196 management capabilities by allowing monitoring of z/OS workloads - a new agent can send high level z/OS WLM data to the Unified Resource Manager

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 introduces virtual server provisioning and management for Linux guests running on z/VM
  - Use the Unified Resource Manager to create z/VM virtual machines
  - Simplify the skill level needed to manager a Linux on z/VM environment
- Faster cores and a bigger system cache on the z196 let you do even more with less when running Linux on z/VM
- Plus integrated blades on zBX offer added dimension for workload optimization

z196 Parallel Sysplex InfiniBand coupling (PSIFB)

ready for even the most demanding data sharing workloads



- **Simplify Parallel Sysplex connectivity**
  Do more with less
  - Can **share physical links** by defining multiple logical links (CHPIDs) up to **128**
  - Can **consolidate** multiple legacy links (ISC and/or ICB)
  - Easily address link constraints (e.g. define another CHPID to increase available subchannels instead of having to add physical links)
  - PSIFB and ISC-3 links allow for a total of **80 physical links** on z196
- **More flexible placement of systems in a data center**
  - InfiniBand coupling links (FC 0163 and 0167) take advantage of optical cables **up to 150m long**. No longer restricted to only 10m between System z CECs when using these high performance links.
  - InfiniBand coupling link Long Reach (LR FC 0168) features use the same 9 micron fibre cables as ISC-3 and FICON/FCP for **unrepeated distances of up to 10km,** and metropolitan distances with qualified DWDM solutions.

zEnterprise System Overview

zEnterprise 196 (z196)

Machine Type: 2817

5 Models:

M80
M66
M49
M32
M15

zEnterprise BladeCenter Extension (zBX) Machine

Type: 2458

Model 002

Technology and Performance:

- **z196**
  - 1.4x performance improvement compared to z10 EC[1]
  - Double the memory for new workloads
  - 60% more total capacity than z10 EC
  - Processor design for data serving, Java
  - Larger cache for even better data serving
  - Upgradeable from z10 EC and z9 EC
- **zBX Model 002**
  - Integrated select IBM blades and optimizers
  - Management of heterogeneous hardware and firmware as one logical system
  - Optimizers – IBM Smart Analytics Optimizer and WebSphere DataPower Integration Appliance XI50 for zEnterprise
  - POWER7 and IBM x86 (SOD)[2] blades
  - Support for many new applications

Unified Resource Manager:

- Central point of management for heterogeneous workloads
- Reduce proliferation of individually managed external resources
- Improved time to install and implement new application
- Increase utilization of resources

Dynamic Energy:

- Optional water cooling on z196 and zBx
- Optional high voltage DC Power
- Energy monitoring across system
- Humidity and altitude sensors

Availability and Serviceability:

- **z196**
  - Improved availability with RAIM
  - Integrated monitoring for health of multi-platform workloads
  - Optional overhead cabling
- **zBX**
  - High availability configuration
  - Unified service support for zBX
  - Concurrent zBX attachment and enablement

[1] On equal n-Way for average LSPR workloads running z/OS® 1.11

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

Service Levels to Match Your Business Needs

Increased flexibility for your multi-architecture strategy when data is on z/OS

zEnterprise System

TCO Focus

TCA Focus

- ✓ Silo managed islands of computing
- ✓ Less dynamic than z virtualization
- ✓ Minimal resource sharing with z resources

Distributed Systems

- ✓ Expanded ISV support for enterprise applications
- ✓ Targeted for applications that interact with mainframe data and transactions
- ✓ Provisioned and managed by System z

Select IBM Blades in zBX

- ✓ Extreme consolidation of servers and networking
- ✓ Superior levels of virtual server provisioning, monitoring and workload management
- ✓ Industry-best virtual I/O bandwidth and reliability
- ✓ Fewer components and reduced complexity
- ✓ System z qualities of dynamic resource management and capacity-on-demand
- ✓ Seamless integration with z/OS backup and disaster recovery solutions

Linux on z/VM

- ✓ Extreme scalability and performance for transaction processing and data serving
- ✓ High availability and cross-system scalability with Parallel Sysplex® and GDPS
- ✓ Leading policy-based capacity provisioning and workload management
- ✓ Pervasive, high-performance security support

z/OS

LOWER

SCALABILITY, SECURITY, DYNAMIC WORKLOAD MANAGEMENT

HIGHER