Technology Update
zEnterprise Hybrid Architecture Overview and Storage Alignment

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Agenda

- zEnterprise Server Overview
- The Hybrid Architecture Business Value
- zManager *Planned Extensions*
- Workloads
- Smarter Computing *Alignment*

THE z196 SERVER

IBM zEnterprise System – Best-in-class systems and software technologies
A "System of Systems" that unifies IT for predictable service delivery

IBM zEnterprise 196 (z196)	**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 z/OS® V1.12	• 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

The heart of a zEnterprise: The z196

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

Up to **40%** Improvement for traditional z/OS workloads

Up to an ADDITIONAL **30%** Improvement in CPU intensive workloads via compiler enhancements

Up to **60%** Total capacity improvement

1 to 80 configurable for client use

IFL, zIIP, zAAP, ICFs and optional SAPs

Up to 3 TB RAIM memory

45 subcapacity settings

Cryptographic enhancements

Optional water cooling and/or HV DC Power

Upgradeable from z10 EC and z9 EC

- Processor Units, Memory, I/O
  - One to four books
  - Hot pluggable I/O drawer
  - 1.5MB L2 Cache per core, 24MB L3 Cache per processor chip
- Focus on the environment
  - Options to help eliminate hotspots and save on energy
  - Static power savings
  - Query maximum potential power
  - Leadership technology for cooling and power distribution
- 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
  - InfiniBand Coupling links

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**
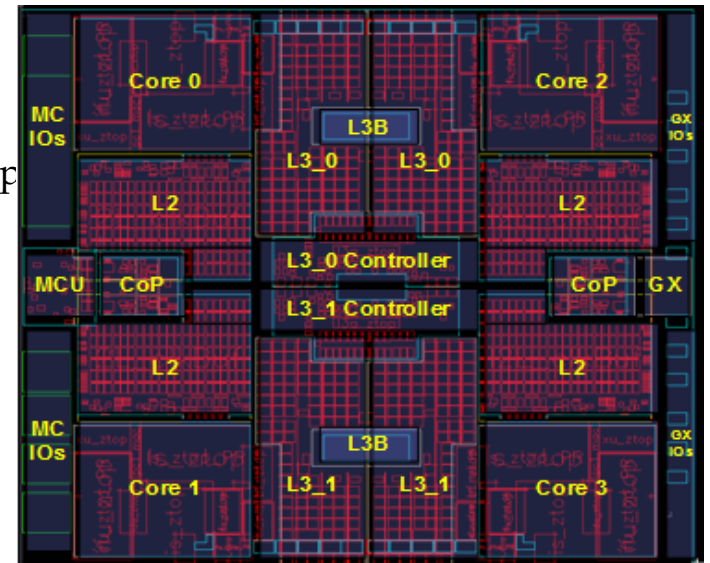
High End Server
Clock Speed Positioning
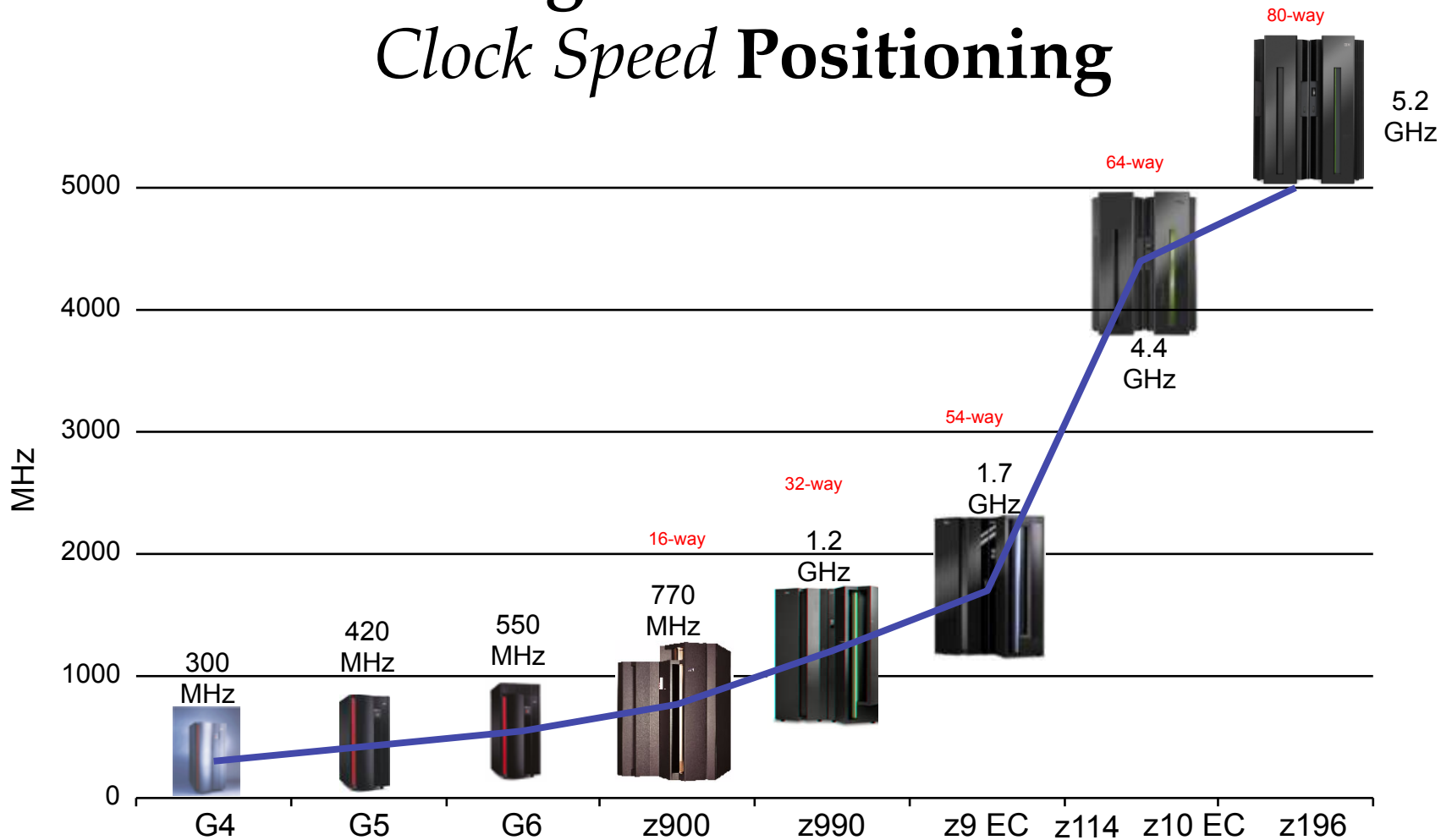
z196 System upgrades

z9 EC

z10 EC

M80
M66
M49
M32
M15

Concurrent Upgrade
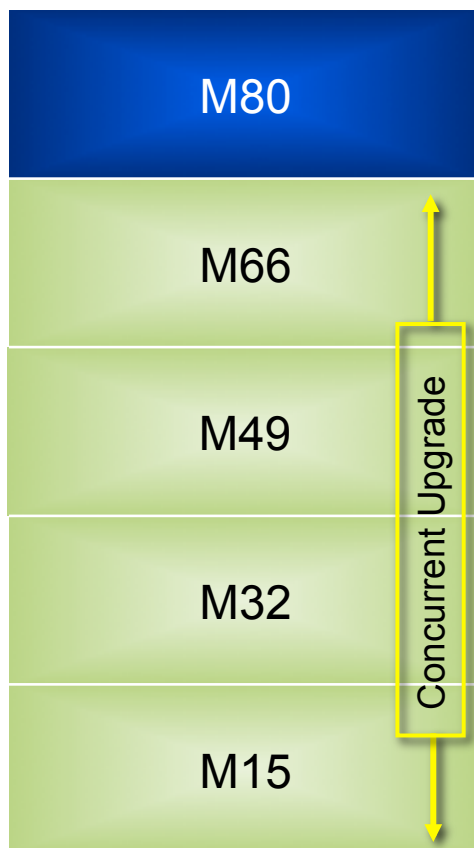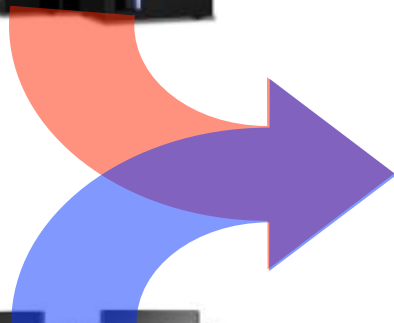
- z196 to higher hardware z196 model
  - Upgrade of z196 Models M15, M32, M49 and M66 to M80 is disruptive
  - When upgrading to z196 all the Books are replaced
  - Upgrade from Air to Water cooled not available
- Upgrade Approaches
  - MES Upgrade (upgrade in place)
  - Push-Pull
  - Side-by-Side

z196 Features

Five hardware models
Quad core PU chip
Up to 80 processors configurable as CPs, zAAPs, **zIIPs**, IFLs, ICFs, or optional SAPs
Increased capacity processors
Out of order instruction execution
Over 100 new and enhanced instructions
Improved processor cache design
Numerous sub-capacity CPs at capacity settings 4, 5, or 6
Up to 3 TB of Redundant Array of Independent Memory (RAIM)
Unified Resource Manager suites
Cryptographic enhancements
On Demand enhancements
Energy efficiencies

z196

2 New OSA CHPIDs – OSX and OSM
Three subchannel sets per LCSS
8 slot, 2 domain I/O drawer
Concurrent I/O drawer add, remove, replace
FICON discovery and autoconfiguration
Doubled HiperSockets to 32
Physical Coupling Links increased to 80
Doubled Coupling CHPIDs to 128
CFCC Level 17
Optional water cooling
Optional High Voltage DC power
Static Power Save Mode
Optional Top Exist I/O cable exit
STP enhancements
zBX-002 with IBM Smart Analytics Optimizer, IBM Blades

THE Z114 SERVER

Introducing the IBM zEnterprise 114

Bringing hybrid computing to a broader set of businesses

New!

IBM zEnterprise 114 (z114)

- *New I/O subsystem for improved system connectivity*
- *Security enhancements*
- *Clustering improvements*
- *New IBM zEnterprise 114 for mid-sized businesses*

zEnterprise Unified Resource Manager

- *Delivering APIs to enable management of Unified Resource Manager from external tools[1]*

zEnterprise BladeCenter Extension (zBX)

- *Introduction of select System x blades into zBX*
- *Support for Linux & in the futureWindows[1] to broaden application support and integration.*

Technology designed for the SMB Space

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 expansion and integration

- ■ **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 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

Providing investment protection

- Continuing to protect your investment with two generation upgrades

- Full upgradeability within each server family

- Temporary or permanent growth when you need it

- z114 offers two models:
  - ► M05 and M10.
  - ► M05 is upgradeable to M10

- z114 (M10) is upgradeable to the z196 (M15 Air cooled only)

z9® BC

z9 EC

z10 BC™

z10 EC™

NEW

z114

z196

Highly Granular Server Capability

	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 ↑ / Smaller ↓

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

- Complete capacity matrix available <u>on both models.</u>

- 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 <u>within the Model</u>

- CBU capability from smallest to largest capacities <u>within the Model</u>

- On/Off CoD <u>within the Model</u>

- Linux only and ICF only servers

Leverage the latest operating systems to exploit the full value of the z114, z196

z/OS Version 1 Release 13

- The new face of z/OS - the z/OS Management Facility adds new software deployment and disk management tasks and many enhancements that help create a more productive and integrated z/OS experience.
- Foundation for modern batch and 'real time' batch applications - updates to shorten batch window, simplify batch programming, and give you more flexibility in deploying batch applications.
- Autonomics for improved, early error detection - helps provide early warning of certain system issues before they can impact your business
- Performance for new and traditional workloads
- 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 and the z114 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™

z/OS   z/VM   z/VSE   z/TPF   Linux

DS8800 Business Class configuration meets the needs of new System z114 model

- **Single-frame DS8800 Business Class system**
  - Streamlined, lower cost configuration to meet the needs of System z114 deployments
  - Dual 2-way processor complex
  - New configuration options reduce costs and provide more capacity in single frame
    - Supports minimum of 8 drives and up to 240 drives
    - Cache options of 16, 32, or 64GB

- **Same great features and capabilities**
  - Same enterprise performance
  - Same system resiliency
  - Same business continuity solutions
  - Same System z optimization capabilities
  - Same optimization features such as Easy Tier, I/O Priority Manager, Thin Provisioning, etc.
  - Same advanced security

Configured with more drives per device adapter to reduce configuration cost and increasing adapter utilization

Business Class Server
Clock Speed Positioning
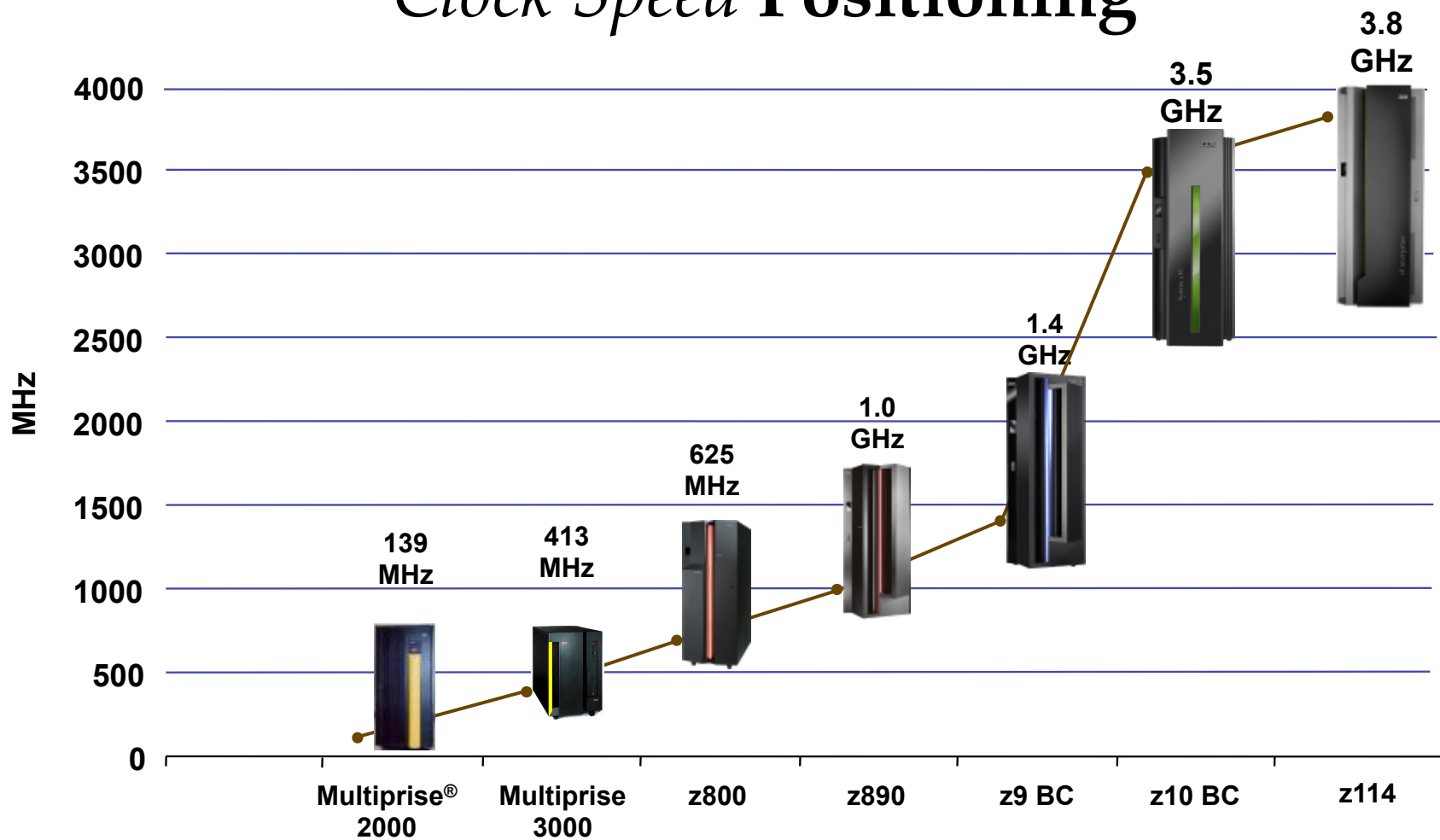
z114 Features

z114

Two hardware models
Up to 10 processors configurable as CPs, zAAPs, **zIIPs**, IFLs, ICFs, or optional SAPs
Up to 26 sub-capacity settings across a maximum of 5 General Purpose 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
Additional STP enhancements

zEnterprise
IBM

Doubled HiperSockets to 32
Doubled Coupling CHPIDs to 128
New 32 slot PCIe Based I/O Drawer
Increased granularity of I/O adapters
New form factor I/O adapters i.e FICON Express8S and OSA-Expres4S
Improved PSIFB Coupling Link
Physical Coupling Links increased to 72
Optional High Voltage DC power
Optional overhead I/O cable exit
NRF Support with either top exit or bottom exit I/O and power
2 New OSA CHPIDs – OSX and OSM
zBX-002 with ISAOPT, POWER7, DataPower XI50z and IBM System x Blades
Platform Management from HMC
Reclassification from "general business" environment to "data center"

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

THE ZENTERPRISE BLADECENTER EXTENSION (ZBX)

Hardware Components Overview

zBX Infrastructure

Blades

zBX

Model 002

Rack

Top-of-Rack Switch

Blade Center Chassis

Ethernet & FC Cables

Switches (ESM, FC)

Power Dist. Units

Opt: Heat Exchanger, Power cord types

IBM
Smart Analytics Optimizer

POWER7 Blades

IBM x86 Blades*

WebSphere DataPower Appliance*

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zBX Rack

- **42U of rack space**
- **Fits easily through standard 2.03m (80") high doorways**
  - External dimensions (HxWxD): 202x65x110cm (79.5"x25.6"x43.3")
  - Supports the optional IBM Rear Door Heat Exchanger or IBM Acoustic Door

BladeCenter

- **Form factor/height rack-mount chassis/9U Blade bays**

- **Power supply module**
  - Up to 4 hot-swap and redundant 2900W AC with load-balancing and failover capabilities.
  - Operating at 200-240V

- **Cooling modules**
  - Two hot-swap and redundant blowers standard, additional fan packs on power supplies

- **Systems Management for hardware**
  - Advanced Management Module standard;
  - Additional Management Module for redundancy required

Standard BladeCenter Chassis

The BladeCenter is a type H chassis.
It is configured for redundancy to provide the capability to concurrently repair its components.

BladeCenter Detail

POWER MODULE AND FAN PACK 1

POWER MODULE AND FAN PACK 3

BLADE SERVER SLOTS BS01-BS14

1 2 3 4 5 6 7 8 9 10 11 12 13 14

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

SERVICE CARD SLOT

POWER MODULE AND FAN PACK 2

POWER MODULE AND FAN PACK 4

POWER MODULE

POWER MODULE WITH FAN PACK

FAN PACK
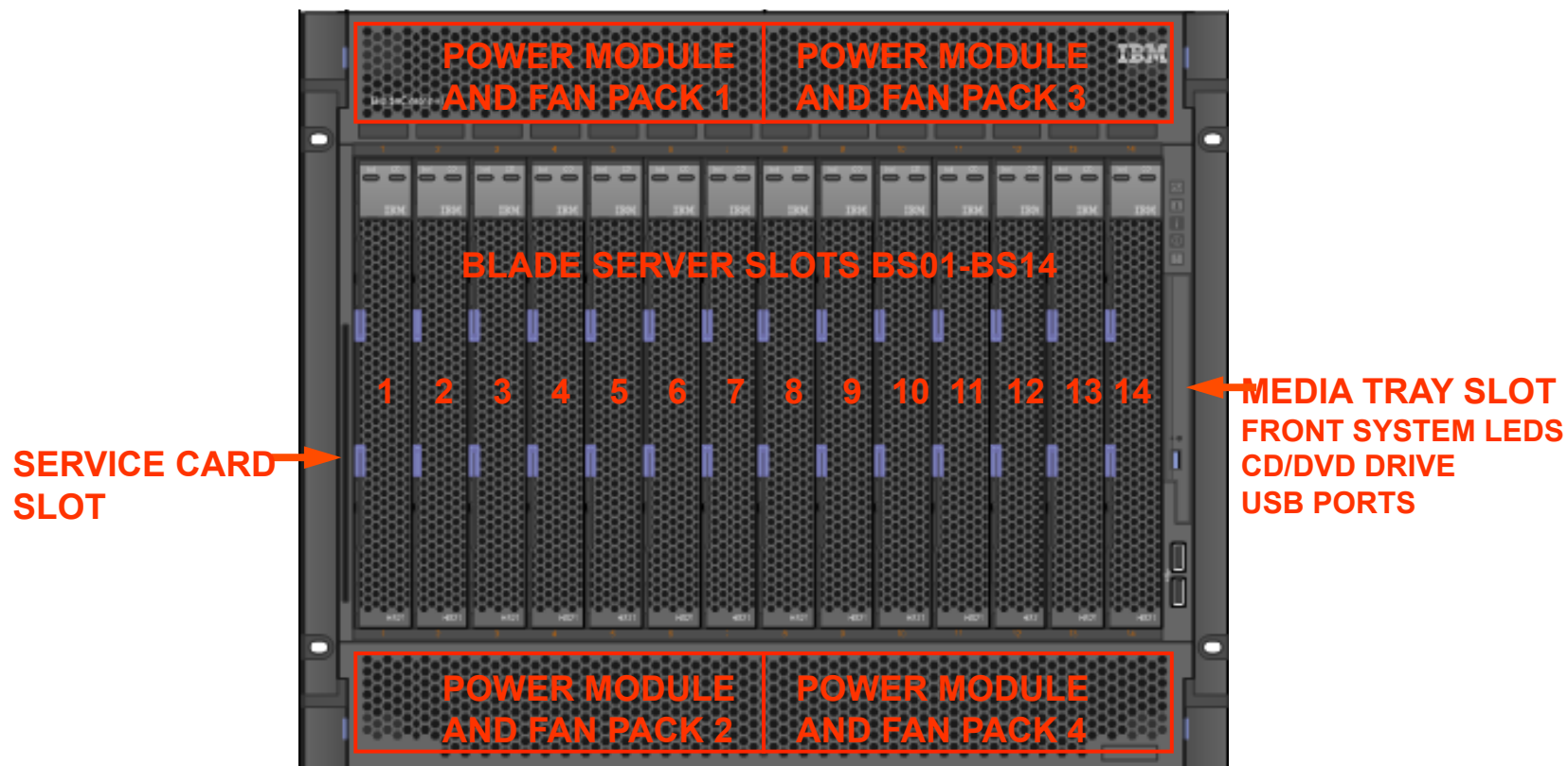
zBX – Interfaces to BladeCenter

- **High Speed Switches Modules**

  - The HSS with Short Range optics is used to connect to System z OSA-Express3 10 GbE adaptors

- **Fibre Channel Switch Modules**

  - QLOGIC 20 port 8 Gbps FC Switch

  - Fibre Channel attachment for customer supplied disk storage

- **Top of Rack (TOR) Switches for INMN and IEDN**

  - The INMN provides connectivity to the Management Module in the BladeCenter Chassis and the BladeCenter Chassis Ethernet switch network.

  - The IEDN is a High-Speed, Physically and Logically Secure, Flat Layer-2 Network for Transaction and Data Flows.

High speed Switch Module

Fibre Channel Switch Module

Top of Rack Switch

Bits and Pieces

- Internal connections pre built and wired in IBM manufacturing

- External connections performed by IBM during installation
  - Cables and labels provided by the customer
  - Disk provided by an alternate means
  - IBM POWER7 Blades provided by an alternate means

- Redundant network components and paths

- Redundant disk connections and paths

- Redundant Top of Rack (TOR) switches

  - INMN (Management Network)
  - IEDN (Data Network)

Firmware Support of zBX
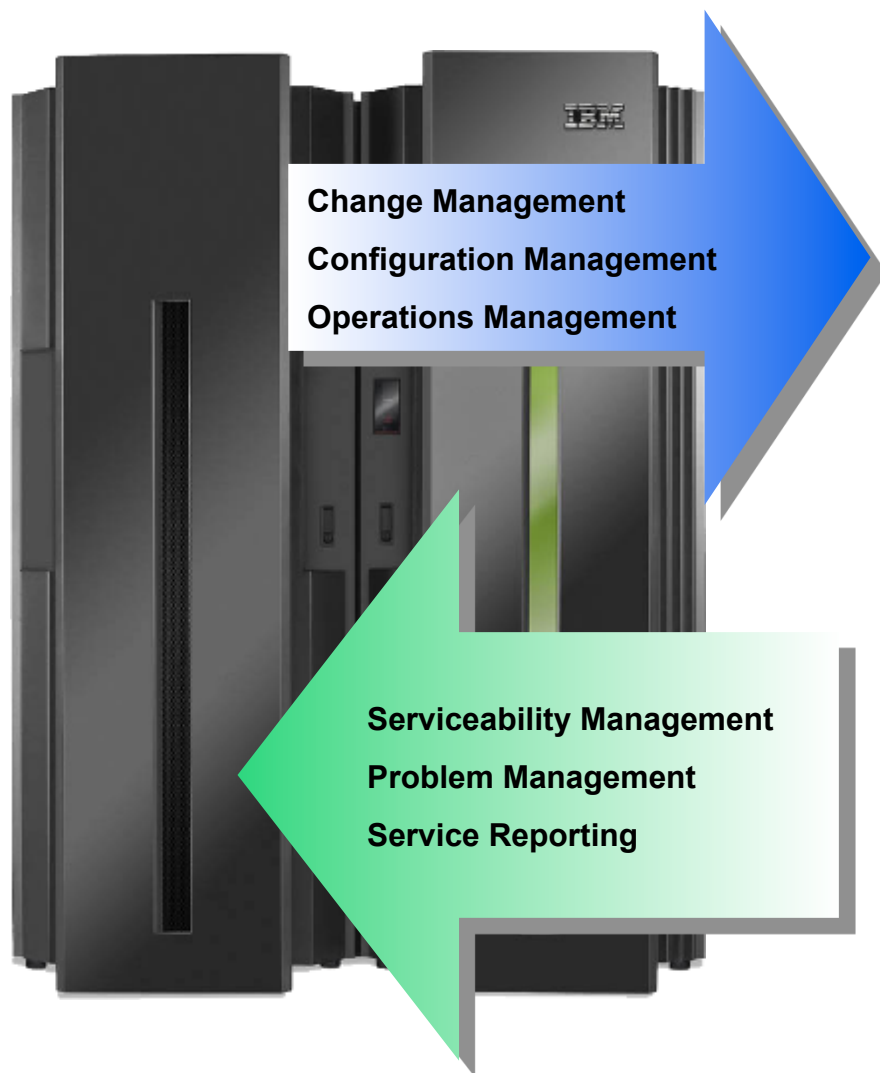
10 GbE Switch (2X)
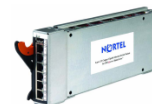
1000BASE-T Switch (2X)

8 Gbps FC Switch (2X)

Change Management

Configuration Management

Operations Management

Advanced Management Module (2X)

Top-of-Rack Switch (2X)

Serviceability Management

Problem Management

Service Reporting

BladeCenter **HS22 Blade**

zEnterprise zBX functions and features

zBX

One hardware model
zBX is controlled by one specific z196
Up to 4 Racks (B, C, D and E)
2 BladeCenters Chassis per rack
Non-acoustics doors standard
Optional Rear Door Heat Exchanger
Optional acoustic doors
Redundant Power, Cooling and Management Modules
10 GbE and 1000BASE-T Network modules
8 Gb SR FC modules

Advance Management Module
1000BASE-T and 10 GbE TORs
Up to 112 Blades
IBM Smart Analytics Optimizer
POWER7 Blades
IBM x86 Blades
WebSphere DataPower Appliances
HMCs required for Unified Resource Manager
Additional zBX owned HMC required if System maintained by Third Party

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GENERAL PURPOSE BLADES
(ALWAYS VIRTUALIZED)

What are *Specialty Engines* ?

Price-Performance

Optimizers

[HPA]

ISAOPT

[FW]

DP

GPB

General Purpose Blades
(x86 and Power)

IFL

Partitioned z
Engines for Linux

ZAAP

ZIIP

Z

Shared Memory

z Frames

zBX
(zEnterprise Blade Center Extension)

Application Inventory
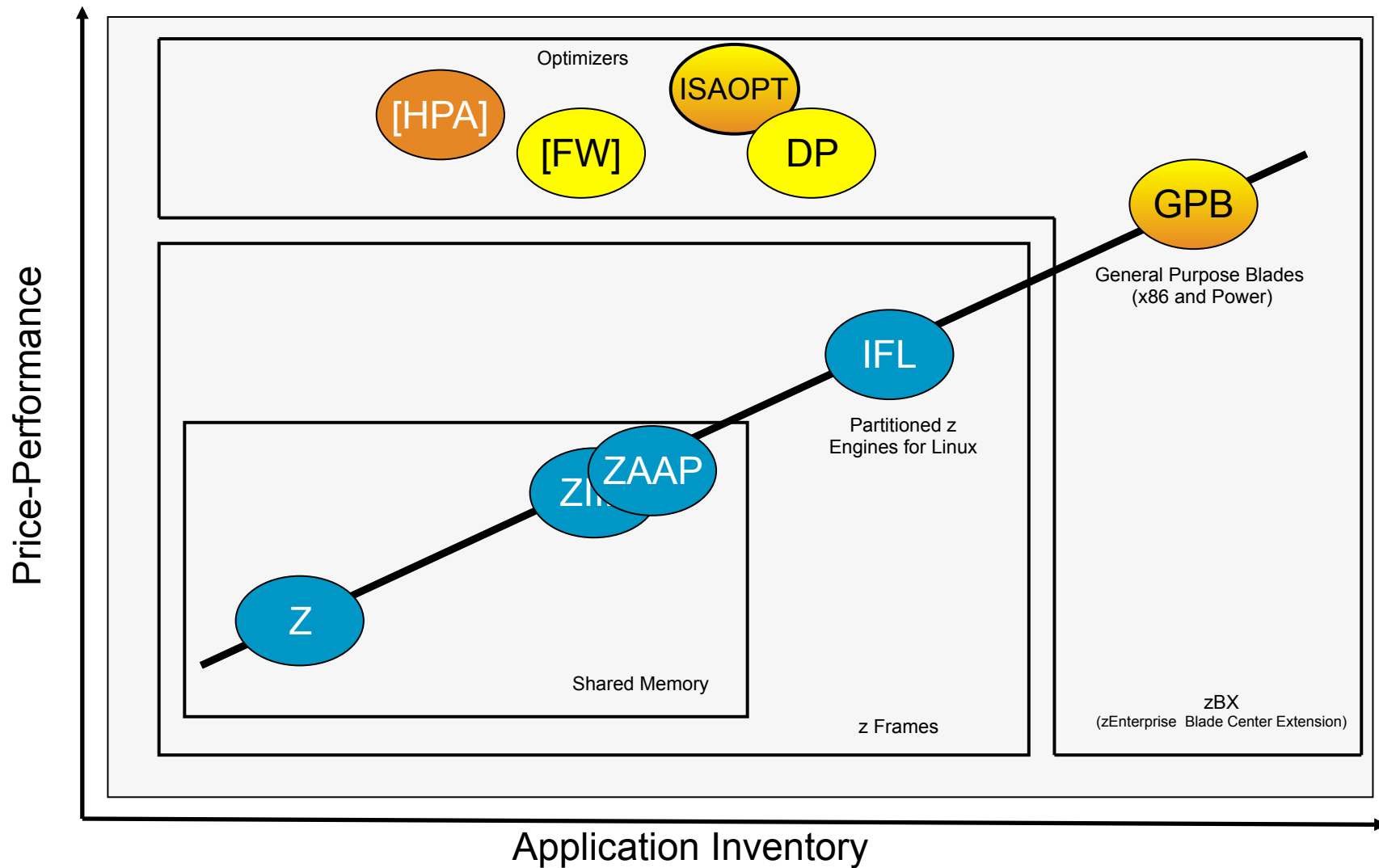
IBM zEnterprise™ BladeCenter ® Extension
IBM POWER7® Blades

- MT 8406 (PS701 Express)

  Customer Configuration:

  - POWER7 8 core Processor
  - 1 Processor socket
  - 3.00 GHz 150W
  - Max 14 per BC-H
  - 16 DIMM slots
  - 300GB HDD Internal Disk

- Blades acquired by customer

- Hypervisor: PowerVM EE

- OS Support (64 bit only):

  - AIX 5.3 TL12+.
  - AIX 6.1 TL5+.
  - AIX 7.1 currently not supported, but being considered.

PS701 Express Blade	FEATURE CODE	CONFIG 0	CONFIG 1	CONFIG 2
Initial Processor 3.00 GHz 150W		1	1	1
Processor Activations	8411 8412	4 4	4 4	4 4
# POWER7 Processors (Sockets)		1	1	1
Blade Width		Single	Single	Single
Total Cores		8	8	8
Memory kits 8 GB (2X4 GB) 16 GB (2x8 GB)	8208 8209	32 GB 4 0	64 GB 8 0	128 GB 0 8
GB/Core		4	8	16
HDD 300GB	8274	1	1	1
8406-8275 Qlogic 2-port 10Gb Converged Network Adapter (CFFh)	8275	1	1	1
8406-8242 Qlogic 8 Gb Fibre Converged Expansion Card (CIOv)	8242	1	1	1
PowerVM Enterprise Edition	5228	8	8	8

IBM zEnterprise™ BladeCenter ® Extension
IBM System x® Blades *(2011)*

- MT 7873 (Hammerhead Westmere)

  Customer Configuration:

  – Intel 8 core Processor
  – 2 Processor sockets
  – 2.13 GHz 105W
  – Max 14 A16M's per BC-H
  – Memory 1066 Mhz with 6.4 GTs
  – 16 DIMM slots
  – 100GB SSD Internal Disk   .

- Blades acquired by customer
- OS Support (64 bit only):

  – Rhel 5.5 and up.
  – SLES 11 (SP 1 and up)
  – Windows Server 2008 Datacenter Edition (SOD)

BLADE	PART NUMBER	OPTIONAL PART NUMBER (i.e. MES)	FEATURE CODE	CONFIG 0	CONFIG 1
Blade Base	69Y3056	69Y3056	A16M	1	1
Initial Processor 2.13 GHz 105W (E7-2830 8C)	69Y3071	69Y3071	A16S	1	1
Additional Processor 2.13 GHz 105W (E7-2830 8C)	69Y3072	69Y3074	A179	1	1
# Intel Processors (Sockets)				2	2
Blade Width				Single	Single
Total Cores				16	16
Memory kits 8 GB 1333 Mhz	46C0558	46C0570	A17Q	8	16
GB/Core				4	8
Speed Burst Card	46M6843	59Y5889	1741	1	1
SSD Exp Card	46M6906	46M6908	5765	1	1
50GB MLC SSD	43W7727	43W7726	5428	2	2
No Internal Raid			9012	1	1
CFFh 10GbE	46M6170	46M6168	0099	1	1
CIOv 8Gb FC	44X1946	44X1945	1462	1	1

NOTE this information is a *Statement of Direction* only.

Windows

IBM's intent is to support

Microsoft Windows Server 2008 – Datacenter Edition on the HX5 7873 blades installed in the zBX. 64 bit version only.

OPTIMIZERS

(CLOSED SOLUTIONS)

WebSphere DataPower Appliances

Innovation

DGXT
Optimal
Software
Interpreter

1999

2000

XSLJIT
Optimized
Software
Compiler

2001

XG3
Optimized
Hardware
Acceleration

2002

XA35

XS40

2003

XI50

XG4
Gigabit/Sec
OEM HW
Solution

2004

The XS40 is a Superset of the XA35.

The XI50 is a Superset of the XS40.

2005

WebSphere
Transformation
Extender

2006

XB60

XM70

IBM
Acquisition

Model
7993
(aka 9003)

2007

2008

ITCAM
for
SOA

Model
9235
(aka 9004)

2009

Secure
Cloud
Connector

2010

The Functionality of the XI50z is a Superset
of the XI50, XI50B and XS40.

Application
Optimization

2011

XI50B

XI50z

The WebSphere DataPower XI50z

- The XI50z includes all the base capability found in the existing XI50, XI50B, and XS40 offerings.

- The XI50z is packaged as a Blade Form-Factor for installation in the **IBM zEnterprise BladeCenter Extension (zBX)** .

- The XI50z supports all ESB, Security, and Integration capabilities of **DataPower XI50** v3.8.1

- The XI50z is the Highest capacity DataPower appliance for SOA workloads, is optimized for zEnterprise environments.

- The XI50z tightly integrates with zEnterprise Unified Resource Manager
  - Unified hardware and firmware management.
  - Monitoring of the DataPower Blade and Energy Consumption.
  - Consolidated Error Logging across the Ensemble.
  - Serviceability, monitoring, and reporting capabilities of zEnterprise

XI50B MES Upgrades to the XI50z are not possible.
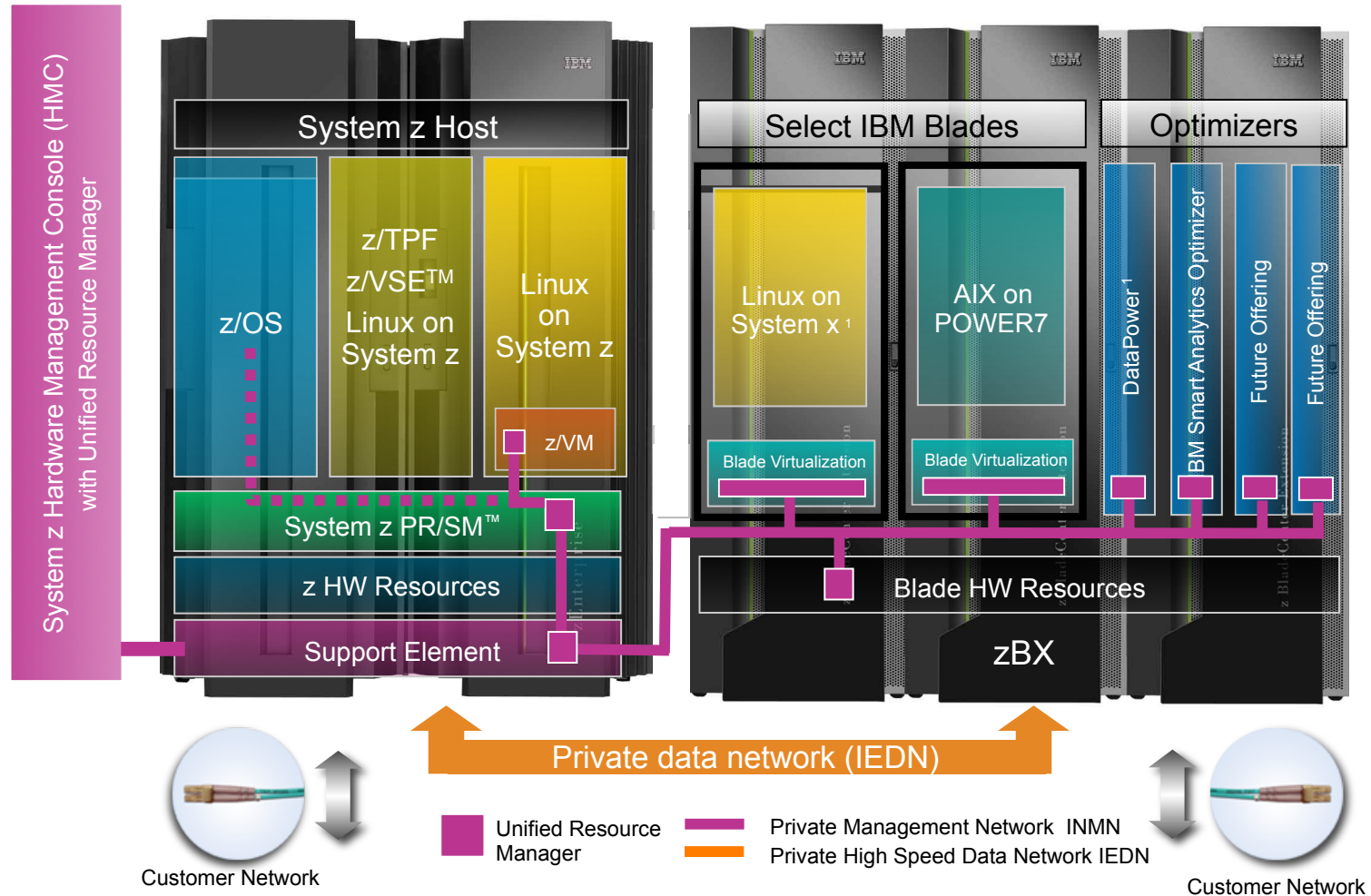
What is the IBM Smart Analytics Optimizer?

- Hardware and software solution to run complex business queries.

- Integrates IBM DB2 V9 for z/OS into a data warehouse environment.

- Significantly reduces the response time for the complex queries.

  - ✓ By running the queries in parallel across multiple blades.

  - ✓ By keeping the data in the blade memory to eliminate I/O.

- Optimizer is transparent to the application.

  - ✓ DB2 selects the queries run on the optimizer.

  - ✓ If optimizer is not available, query will run in DB2 on z/OS.

Preview - IBM Smart Analytics Optimizer V2 (Neteeza) offers unprecedented performance for complex queries, and upcoming versions will further expand those capabilities.

The zEnterprise *Hybrid* System

System z Hardware Management Console (HMC) with Unified Resource Manager

| System z Host | Select IBM Blades | Optimizers |

z/OS

z/TPF z/VSE™ Linux on System z

Linux on System z

z/VM

Linux on System x [1]

AIX on POWER7

DataPower[1]

IBM Smart Analytics Optimizer

Future Offering

Future Offering

Blade Virtualization

Blade Virtualization

System z PR/SM™

z HW Resources

Support Element

Blade HW Resources

zBX

Private data network (IEDN)

Customer Network

Customer Network

■ Unified Resource Manager
— Private Management Network INMN
— Private High Speed Data Network IEDN
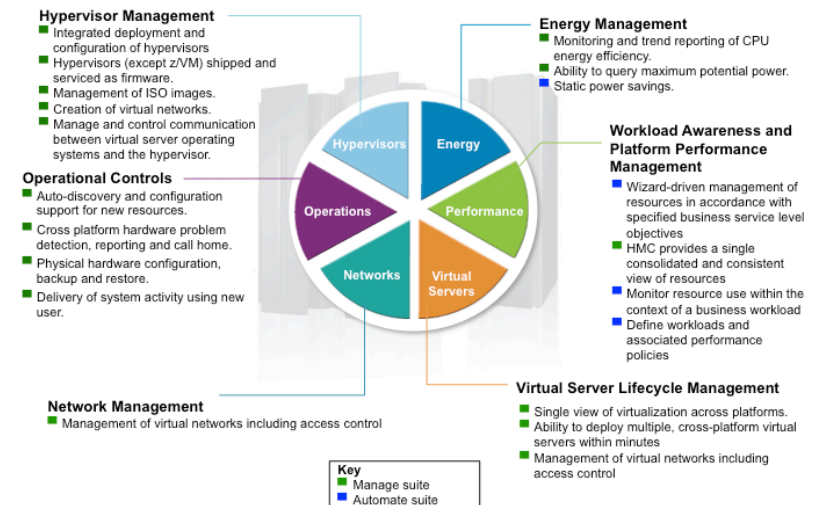
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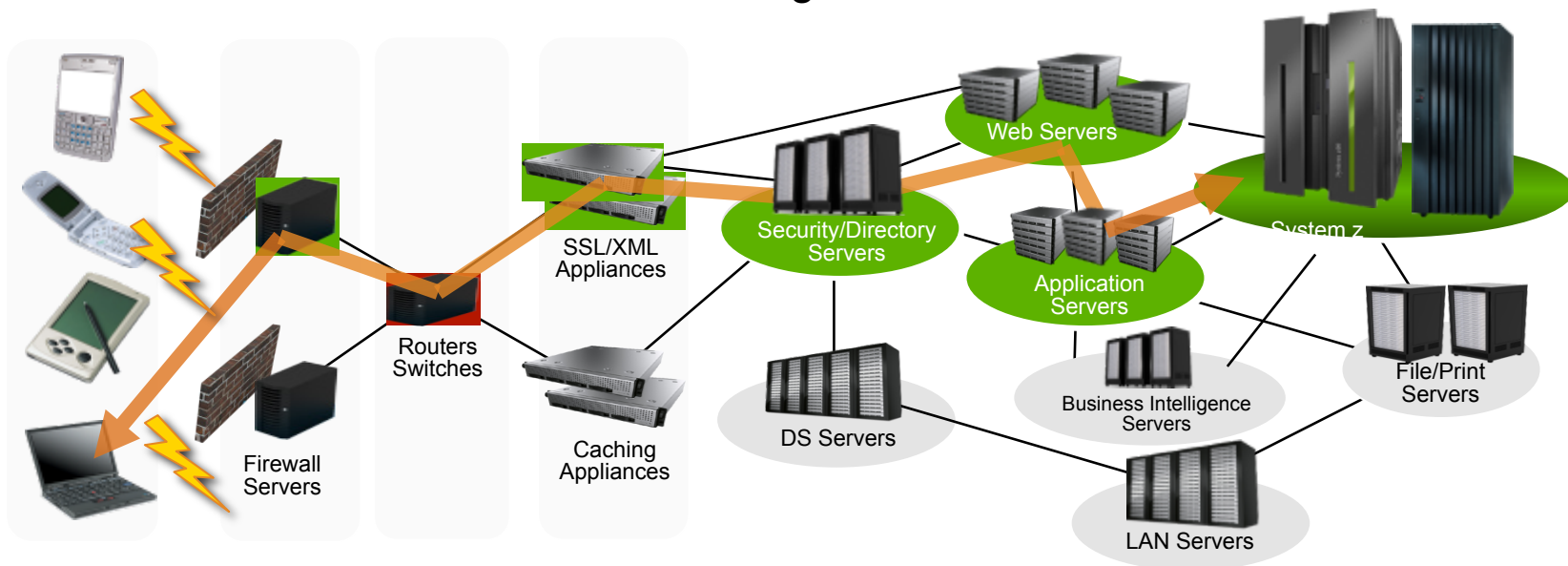
IBM zEnterprise Unified Resource Manager

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

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.

Energy Management
- Monitoring and trend reporting of CPU energy efficiency.
- Ability to query maximum potential power.
- 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

Network Management
- Management of virtual networks including access control

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

Hypervisors · Energy · Performance · Virtual Servers · Networks · Operations

Key
- Manage suite
- Automate suite

The Hybrid Architecture Business Value

# Information technology today: *Limitations*

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

☑ Connected
☒ Integrated
☒ Flexible, Dynamic, and Responsive
☒ Aligned with Business Service Objectives

A Better Approach is needed.
zEnterprise provides the ability to manage the IT infrastructure and Business Application as an integrated whole.
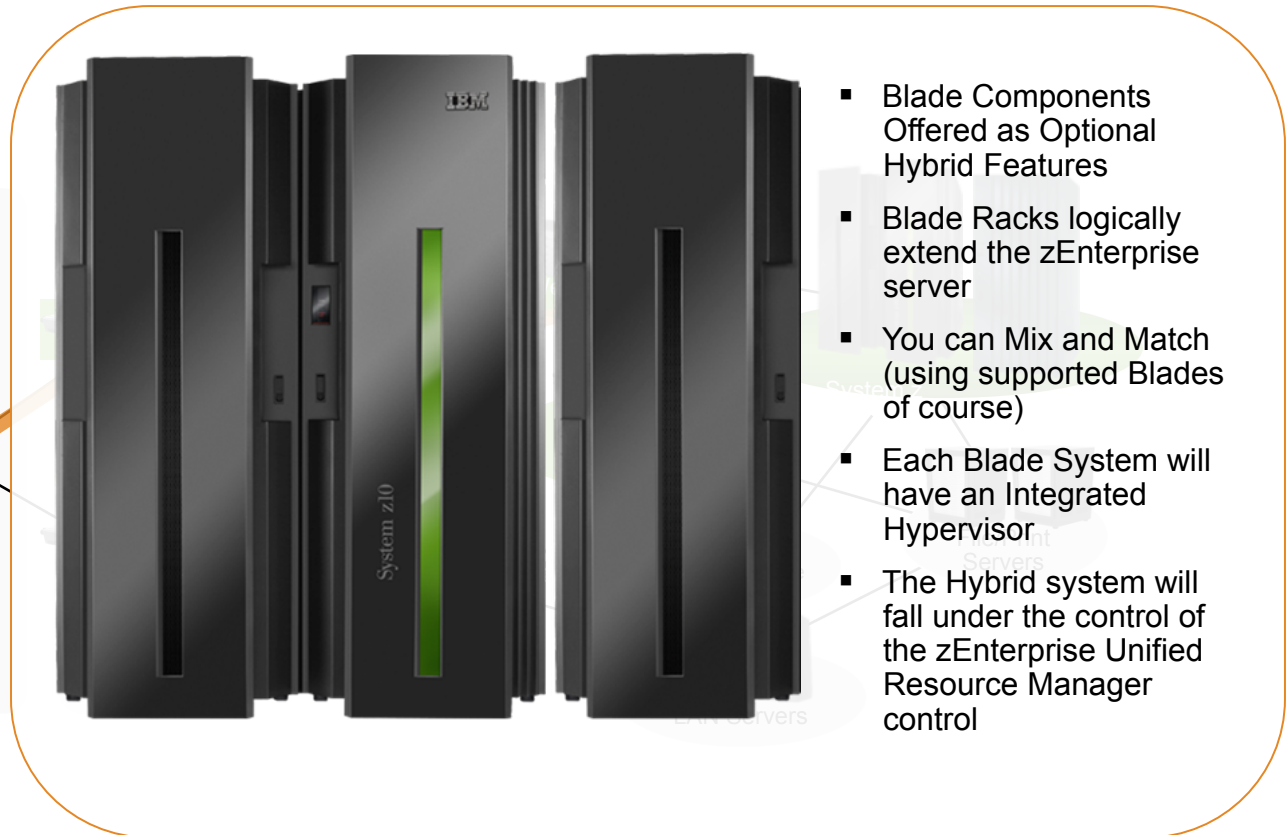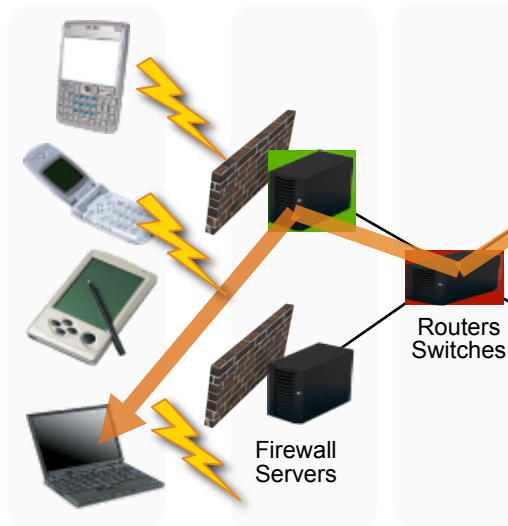
Islands of computing,
have the potential to move from *this*...

Web
Servers

Firewall

Router

Database
Server

Storage

Application
Servers

Router
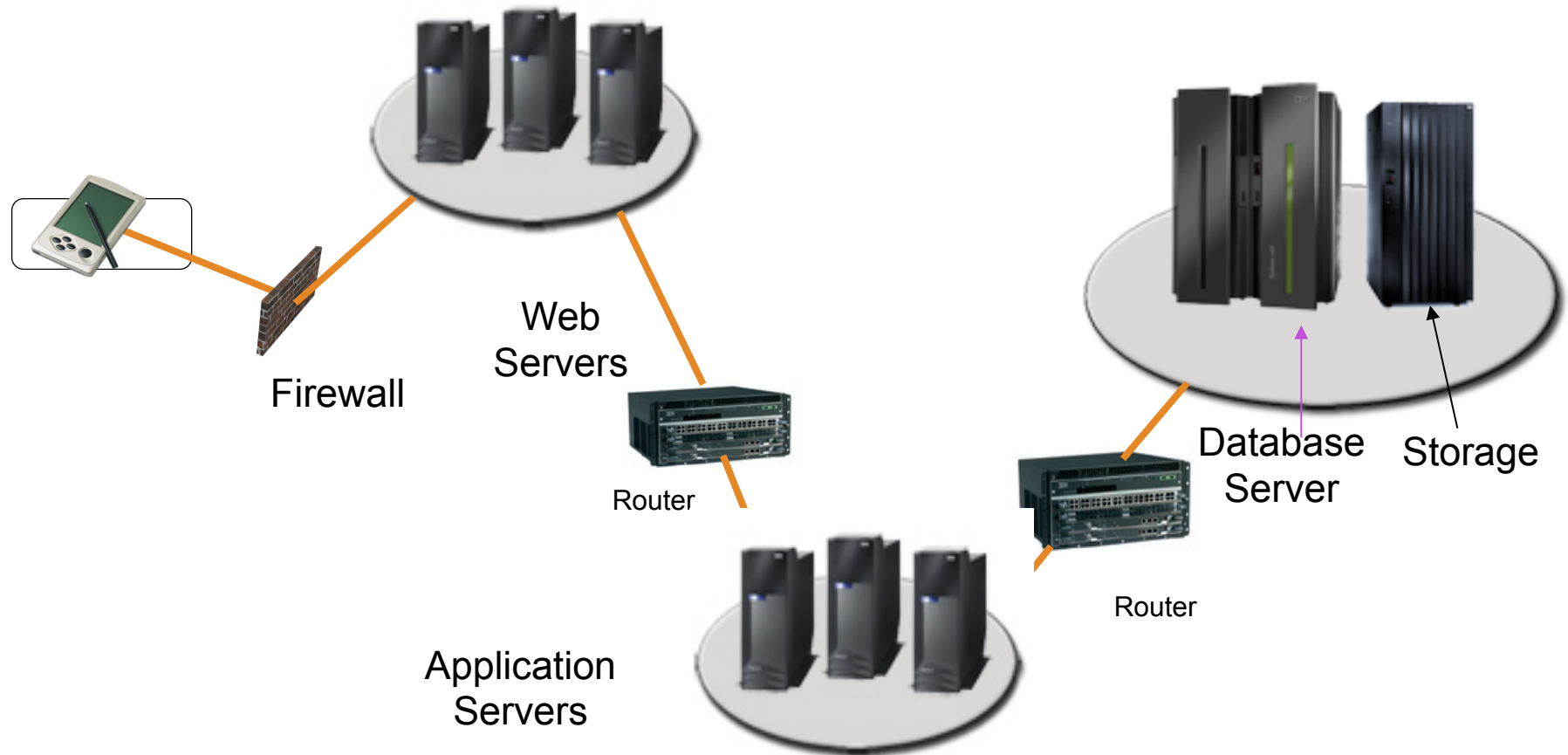
It is possible to understand the Physical & Logical components that make up
an existing or proposed zEnterprise Workload.

To this...

- Blade Components Offered as Optional Hybrid Features
- Blade Racks logically extend the zEnterprise server
- You can Mix and Match (using supported Blades of course)
- Each Blade System will have an Integrated Hypervisor
- The Hybrid system will fall under the control of the zEnterprise Unified Resource Manager control

Routers
Switches

Firewall
Servers

☑ Connected
☑ Integrated
☑ Flexible, Dynamic, and Responsive
☑ Aligned with Business Service Objectives

zManager Value – *End to End Systems Management*

- Multi-System Provisioning/Management: Physical Resources
  - ✓ A single Hardware Management Console, SPoC
  - ✓ Automatic Resource Discovery and Configuration
  - ✓ Automatic System-Resource/Device Inventory Management
  - ✓ Automatic Firmware Deployment and Change Management
  - ✓ Automatic Physical Network Provisioning and Management

- Multi-System Provisioning/Management: Virtual Resources
  - ✓ Automatic Virtual Network Provisioning and Management

- Multi-System Monitoring, Control, and Serviceability Management
  - ✓ Basic Operations Controls
  - ✓ Automated Problem Management, Diagnostics, Field Guided Repairs

- Multi-System Energy Monitoring, Control, and Management
  - ✓ Energy Monitoring and Extended Controls

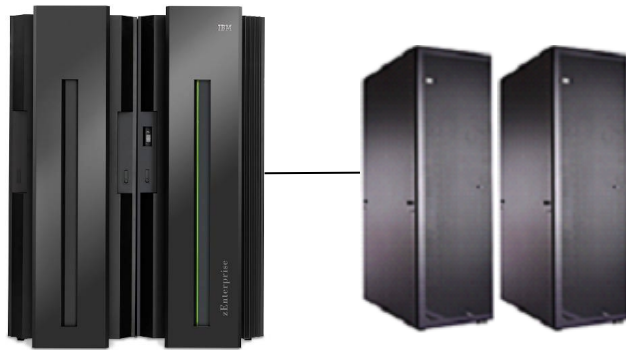# zManager Value – *End to End Systems Management …*

- Multi-Architecture Virtual Server Management
  - ✓ Automatic Hypervisor provisioning and Lifecycle Management
  - ✓ Automatic Virtual Server provisioning and Lifecycle Management

- Multi-Architecture Workload-Based Monitoring and Reporting
  - ✓ Workload Definition and Monitoring as a Whole
- Multi-Architecture Performance Management
  - ✓ Goal-Oriented Workload Performance Policies
  - ✓ Multi-Architecture System Resource Allocation Actions

- Integrated Support for Optimizers

zManager Value – *The Abstracted Interface*

A do-it-yourself solution ...

zEnterprise

- Islands of consolidation

- Distributed management practices can be inconsistent and ad hoc

- Cultural divides within the organization persist

- New-found optimizations via Fit for Purpose

- Consistent and structured management with zManager

- Unified culture around zEnterprise strategy

Abstracted Interface First Example
Hypervisor Setup and Configuration Timings

Current FTE Tasks (per Blade)	Elapsed Time	Labor Time
Initial communication setup & education	6 min 26 sec	6 min 26 sec
Boot VIOS disc & install (creates LPAR for VIOS automatically)	37 min 59 sec	36 min
Configure VIOS networking	2 min 49 sec	2 min 49 sec
Create new storage pool for LPARs	35 sec	35 sec
Install VIOS service fix packs	61 min 5 sec	20 sec
TOTAL TIME	**1 hr 48 min 52 sec**	**46 min 10 sec**

zManager Tasks (per Blade)	Elapsed Time	Labor Time
Add entitlement for a blade	90 min	92 sec
TOTAL TIME	**1 hr 30 min**	**1 min 32 sec**

zEnterprise Economics
IBM SWG CPO
Feb. 2011

97% reduction in labor time

Abstracted Interface Second Example
Network Setup and Configuration Timings

Current FTE Tasks (for two BladeCenters)	Elapsed/Labor Time
Planning (includes time to go over docs, etc)	5 hrs
Cabling	2 hrs
AMM Configuration	2 hrs
Logical Configuration (L2)	8 hrs
Blades network configuration	4 hrs
Testing	2 hrs
Documenting the configuration	3 hrs
TOTAL TIME	**26 hrs**

zManager Tasks (for two BladeCenters)	Elapsed/Labor Time
Planning	3 hrs
Cabling (pre-cabled in zBX)	0 hrs
AMM Configuration (done in zBX)	0 hrs
Logical configuration (L2)	30 mins
Blades network configuration	1 hr 30 mins
Testing (pre-tested)	0 hrs
Documenting the configuration (all part of zManager)	0 hrs
TOTAL TIME	**5 hrs**

81% reduction in labor time

The Unified Resource Manager (Firmware)
A new architectural component introduced with zEnterprise

Key
- **Manage suite** (standard)
- **Automate suite** (optional)
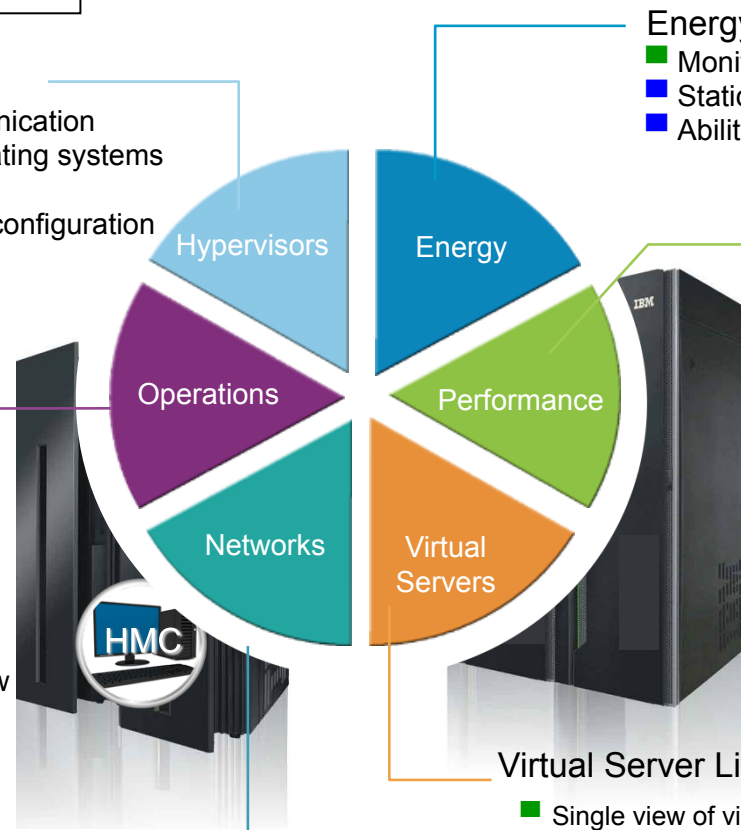
Hypervisor Management
- Manage and control communication between virtual server operating systems and the hypervisor
- Integrated deployment and configuration of hypervisors
- Creation of Virtual Links

Energy Management
- Monitor & trend report CPU power
- Static power saving
- Ability to query maximum potential power

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
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- Define workloads and associated performance policies

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 interface

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

Network Management
- Private, secure and physically isolated data and service networks

Pie chart segments: Hypervisors, Energy, Performance, Virtual Servers, Networks, Operations — HMC

zMANAGER PLANNED EXTENSIONS

Hybrid Development Strategy
## *Dynamic, integrated, and workload optimized*

- **First – Continue to Focus on New Capabilities, Performance and Efficiency**

  ✓ Continued Advancements in System z Technology and Performance

  ✓ Special-purpose compute acceleration for greater levels of workload performance and scalability

- **Second – Focus on Management**

  ✓ Horizontal IT Infrastructure Integration

    ▫ Business service workloads are inherently heterogeneous;

    ▫ They are deployed on heterogeneous system structures

    ▫ A hybrid system is a heterogeneous virtualized platform, providing "One Infrastructure" Integration

    ▫ Integration provides investment protection, reduction of complexity, improved resiliency, and lower cost of ownership

  ✓ Dynamic IT Infrastructure Management

    ▫ Continue to look for ways to drag-down OS-Resident Capability into the base hardware.

    ▫ This is not as foreign as it sounds, Hypervisors are much like an OS anyway

Hybrid Development Strategy
Guiding principals

- **Primary Focus on Dynamic, Workload Optimized, Infrastructure Management**
  - ✓ To integrate, monitor, and manage the heterogeneous infrastructure resources as a single, logical, virtualized system.
  - ✓ To provide:
    - ▫ Dynamic deployment and management of virtual server images and virtualized appliances in a service optimized infrastructure
    - ▫ Built-in capability for upward integration with Data Center Management Tools
- **Look for ways to leverage *Workload Accelerators* and *Optimizers***
- **Enable Hybrid Computing through exploitation of General Purpose Blades**
  - ✓ To incorporate additional "specialty engines" to host applications on their native processor architectures.
  - ✓ To consolidate and manage a multiple-tier, heterogeneous infrastructure with reduced complexity and lower cost.
  - ✓ To enable better integration with System z transaction processing, messaging, and data serving capabilities.

zEnterprise zManager features GA1
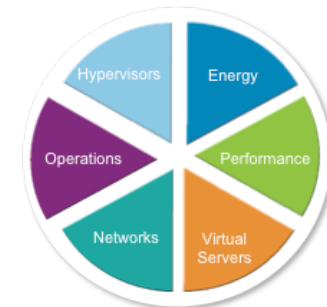
- Integrated and Automated Hardware Management

- Abstracted and Simplified Platform Virtualization Management

- Cross-Platform Workload Awareness and Resource Management

- Cross-Platform Performance, Availability, and Energy Management

- Private High-Speed Data and Management Networks

- Integrated Hypervisors and Hardware Modules

- Transparent Application Accelerator Appliances for

- DB2 Queries, XML Processing, SOA Protocol Conversions & Security

Looking ahead: zManager roadmap

2010

- Blade Attach (SAO)
- Power Application Server Blades
- HW & Firmware Inventory and Configuration
- Blade Firmware Update
- HMC Operational Control for Blades
- Private System Control Network to zBX
- Management Network
- Hypervisor Management
- Ensemble Membership Services
- Virtual Server Provisioning (LPAR, z/VM, PHyp)
- Private Data Network (IEDN)
- Virtual Network Provisioning
- Performance Management
- Energy Monitoring and Controls

2011

- Data Power Integration
- x86 Application Server Blades Resource Monitoring
- Windows
- Virtual Server Provisioning (x86)
- GDPS Extensions
- External Management APIs
- Extensive Instrumentation
- IBM Director VMControl Integration

Enhancements

- x86 Application Server Blades CPU Management
- Availability Management
- Enterprise Management Tooling Integration
- Energy Management
- High Performance Business Analytics
- SVC Integration
- RDMA Capable Connectivity
- Integrated Firewall
- Directed Virtual Server Relocation
- zHYP

- Placement Advisors
- Autonomic Virtual Server Relocation
- Security Isolation and Compliance Reporting
- Virtual Storage Management
- CUoD for zBX
- WAS Acceleration

WORKLOAD CANDIDATES

Workload Characteristics for Deployment

Description	Enablement Category	Benefit Category			
		CAPEX	OPEX	Agility	Regulatory Compliance
Look for workloads with a Large Systems Dependency – Data is a "classic" example.	Application Enablement	X	X		
An IFL-only z196 Server is available. This configuration will support a Linux on zEnterprise Database Server and zBX application hosting.		X	X		
"Do you provide Near-Real Time Fraud Detection today"? Would you like to move to a Real-Time Model?		X	X	X	
Are you looking for ways to integrate existing SOA Business Logic with emerging, strategic Web technologies? While ensuring zero program changes, low latency, and reduced operational expenses?		X	X		
Is Big Data on your radar? Are you exploring options for deploying Hadoop on your infrastructure to gain competitive advantage?		X	X	X	X
Timing is everything.		X	X		
Are you conducting Off-Platform Data Feeds today?	Infrastructure Enablement		X		
Are regulatory requirements driving the need for a secure, Private, E2E Data Network?					X
Are you hosting cross-platform queue managers?			X		
Are you already running zHybrid enabled workloads (DB2, WebSphere)?		X	X	X	
Did you know that XML and SOAP messages can bypass your Firewall security? Are your web services secure from intrusion via SQL Injection and other XML or SOAP Threats?			X		X
Does your current infrastructure provide the range of architecture options required to optimize each applications performance?		X	X		
Are you currently evaluating the benefits of a Private Cloud? Are you aware that one of the prerequisites required for any As-A-Service Offering is an Infrastructure that is both Highly Automated and Highly Virtualized?		X	X	X	
What is your Corporate Backbone network speed? 10Gbits?		X	X		

zEnterprise Workload Architecture Assessment
Workshop Goals

1. For a specific Workload, determine if the zEnterprise/zBX/zManager Framework is a "*good fit*".

2. Contrast various Target Platforms based on the Functional and Non-Functional Requirements of this workload.

3. Provide a structured set of deliverables that share the Logical and Physical Design of the source Workload mapped to the zEnterprise System.

Workshop Delivery schedule

- A Large Team is not required, just those that know the Workload well (1-3 Architects).
- A Client-Designated Technical Lead will be necessary.
- The workshop takes just over 2 days.
- Workshop Results are communicated to the appropriate Client Sponsor.

| Day of Week	Description	Duration (hours)	Target Audience
Day 1 AM	Understanding the zEnterprise Architecture - *Technical Foundation Session* **Objective:** *Educate EAD, ADM, SD, and Senior Networking and Security resources on the zEnterprise Architecture. This sets the foundation for the Assessment Activities.*	2	EAD, ADM, S&D, Senior Network and Security Resources
Day 1 PM	**Application Discovery:** Data and Network Flows/Application Discussion (Led by Senior Client Architects knowledgable of the application). **Objective:** Educate IBM on the Off-Platform Data and Network Flows unique to this workload.	2	IBM Workload Assessment Team
Day 1 PM	**Solution Design:** Interim zBX Logical Design (IMT West WSS Specialist). **Objective:** Initial High-Level Sketches based on Day 1 discussions.	2	IBM Workload Assessment Team
[Day 1 PM]	**Solution Design:** zEnterprise Open Discussion/Futures **Objective:** Demonstrate to the client that the zManager roadmap is sound,High Level Strategic Design Session.	2	CTO, CIO, CFO, Senior Enterprise Architects, ADM, & Service Delivery
Day 2 AM	**Application Discovery:** Functional-Non Functional Requirements Gathering. (WSS Specialist). **Objective:** Gather requirements for	4	IBM Workload Assessment Team
Day 2 PM	**Application Discovery:** Workload Classification and Capacity Needs. (Client Led). **Objective:** Educate IBM on the Business Flows, Groupings, and required Capacity needs..	2	IBM Workload Assessment Team
Day 2 PM	**Solution Design:** zBX Logical Design(IMT West WSS Specialist Led) **Objective:** Perform the Source Workload to Target zBX Frame Mapping, document proposed Ensemble Topology, and run eConfig for proposal inclusion.	2	Client Lead Architects
Day 3 AM	**Solution Discovery:** Workshop Results (IBM Development or IMT West WSS Specialist Led) **Objective:** Share results of study.	2	CTO, CIO, CFO, Senior Enterprise Architects, ADM, & Service Delivery
	Total Time	18	

IBM SMARTER COMPUTING *ALIGNMENT*

IBM Smarter Computing Alignment

Big data

Cloud

Optimized systems

SMARTER COMPUTING

Strategies to Transform IT to Deliver Breakthrough Economics and Value
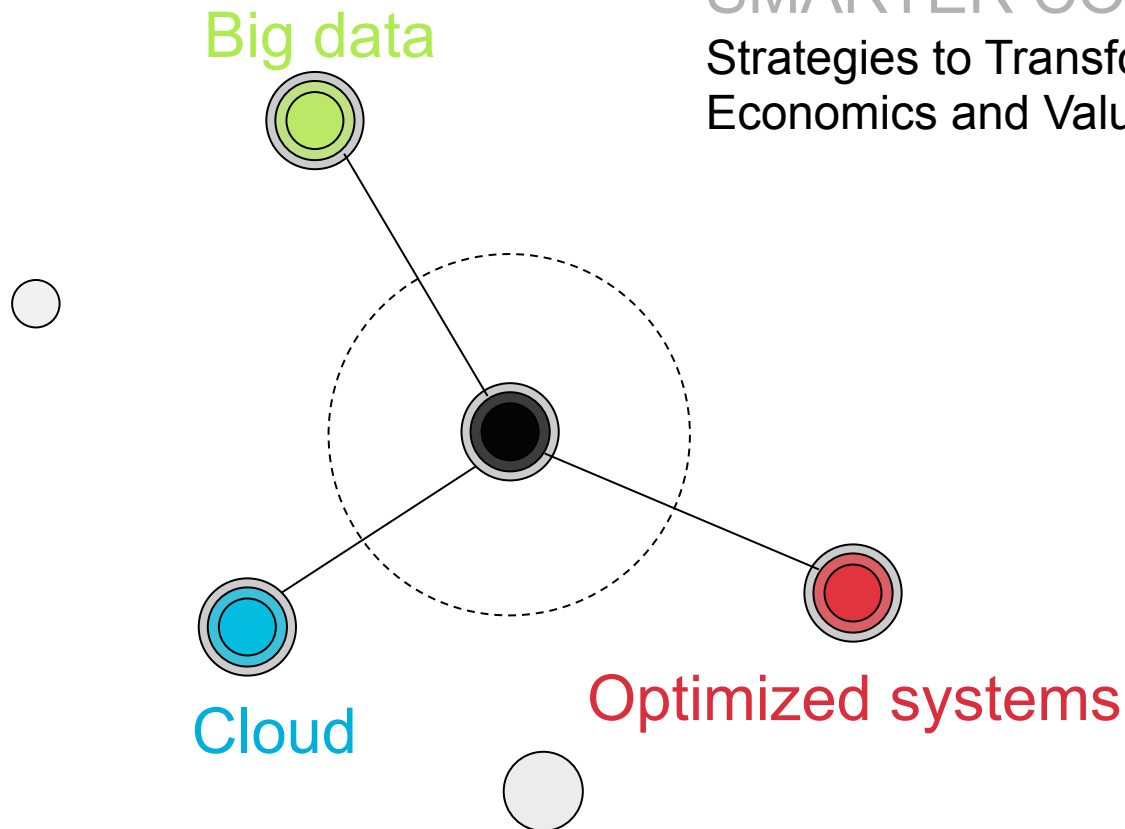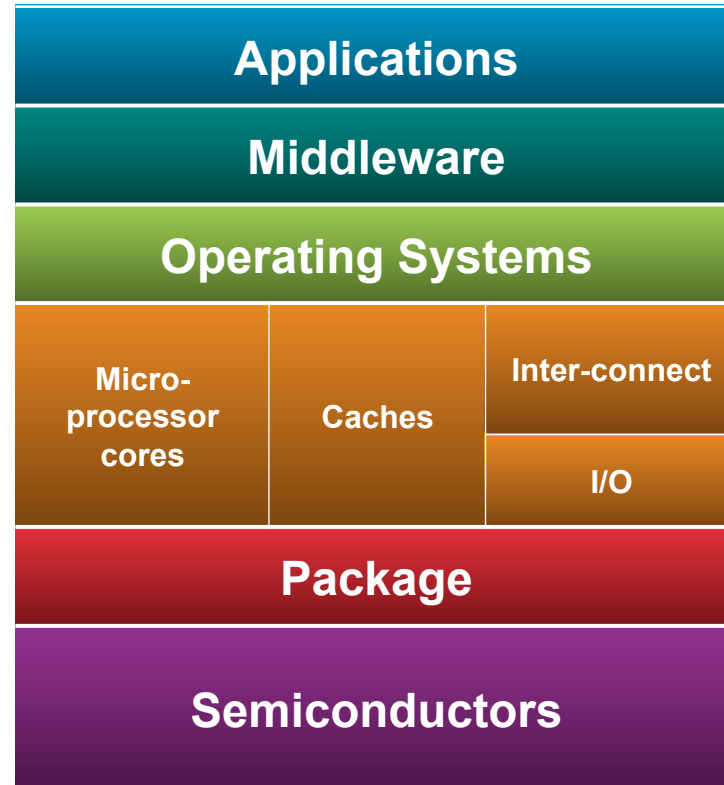
Cloud Computing is a Delivery Model

Optimized Systems aligned to Fit for Purpose

Customers are looking for ways to exploit Big Data to gain a strategic competitive advantage

Optimized Systems

Domain Knowledge

- Workload characteristics
- Interdependencies
- Architecture options

Applications
Middleware
Operating Systems

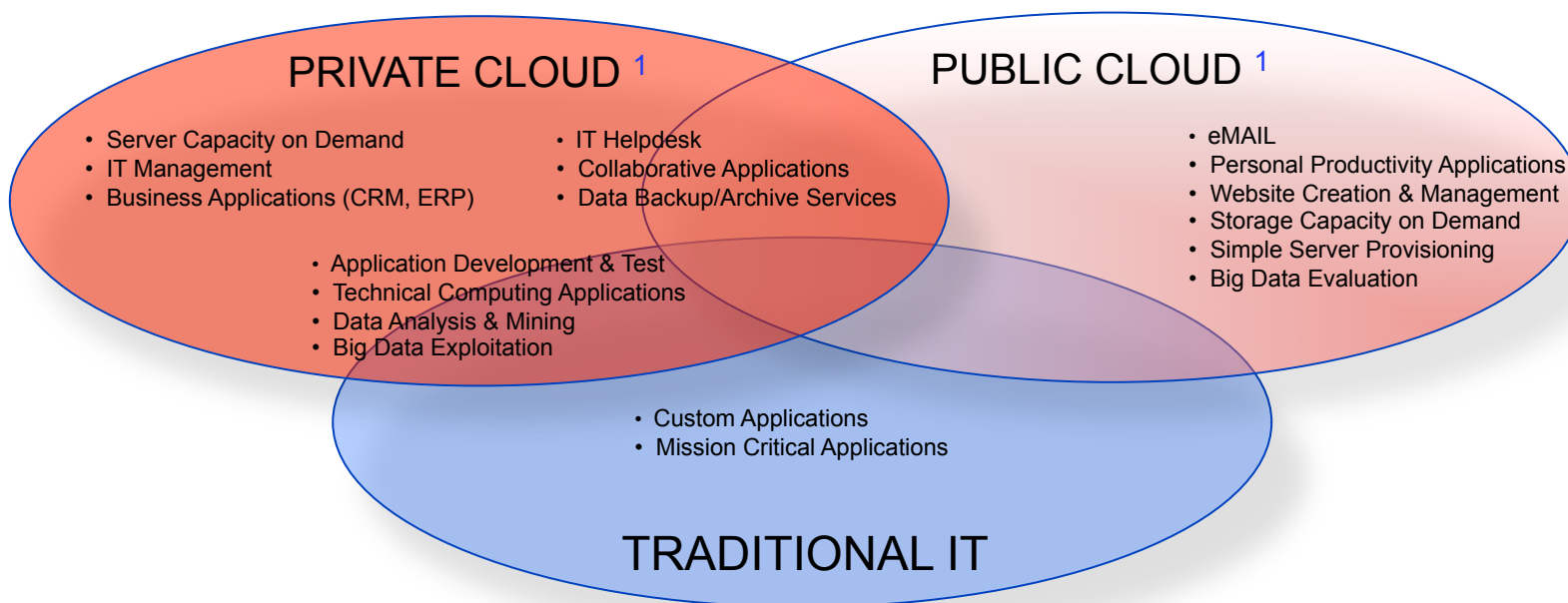| Micro-processor cores	Caches	Inter-connect
		I/O

Package
Semiconductors

Hardware

- Multi-core architectures
- Advanced threading
- Low latency

Software

- Stack integration
- Middleware tuned for hardware
- Integrated management across architectures

Cloud Computing

PRIVATE CLOUD [1]

- Server Capacity on Demand
- IT Management
- Business Applications (CRM, ERP)

- IT Helpdesk
- Collaborative Applications
- Data Backup/Archive Services

- Application Development & Test
- Technical Computing Applications
- Data Analysis & Mining
- Big Data Exploitation

PUBLIC CLOUD [1]

- eMAIL
- Personal Productivity Applications
- Website Creation & Management
- Storage Capacity on Demand
- Simple Server Provisioning
- Big Data Evaluation

- Custom Applications
- Mission Critical Applications

TRADITIONAL IT

Each company has unique needs that must be assessed to determine the correct destination for each workload, but in all cases – IT must manage across this emerging Hybrid Environment.

zEnterprise is uniquely positioned to support your Hybrid Cloud Environment

[1] "Based on the percent of customers that indicated they would adapt Cloud for a given workload in their organization, rated 4 or 5 on a 1-5 Scale IDC May 2010. Source IDC EB Strategy Analysis

What is Big Data?

- **Big Data -** *A term used to describe the processing of datasets that grow so large they become awkward to work with using traditional Database Management Systems and Tools.* This type of data is typically <u>Un-Structured</u>.

- **InfoSphere BigInsights and InfoSphere Streams** - *This is IBM's portfolio of software and services for the analysis and visualization of Big Data (V³).*

One Consultant's View ...

Industry analysts see the importance of being an early adopter of Big Data Analytics ...

Consider the following Gartner perspective.

Publication Date: 14 January 2011
Gartner Burton IT1 Research Note G00208798

Gartner:

Big data analytics and the Apache Hadoop open source project are rapidly emerging as the preferred solution to address business and technology trends that are disrupting traditional data management and processing. Enterprises can gain a competitive advantage by being early adopters of big data analytics. ...

Within this paper, Gartner points out that there are differentiated RAS, CPU and I/O characteristics for servers deployed as core nodes, data nodes and edge nodes. Gartner shares that server selection should focus on the differing requirements of core nodes (JobTracker, namenodes), data nodes (datanodes, TaskTracker) and edge nodes (data movement in/out of the cluster). Also per Gartner, core and edge nodes will require increased reliability, redundancy, and support. A medium-size Hadoop Cluster is between 40-80 Nodes.
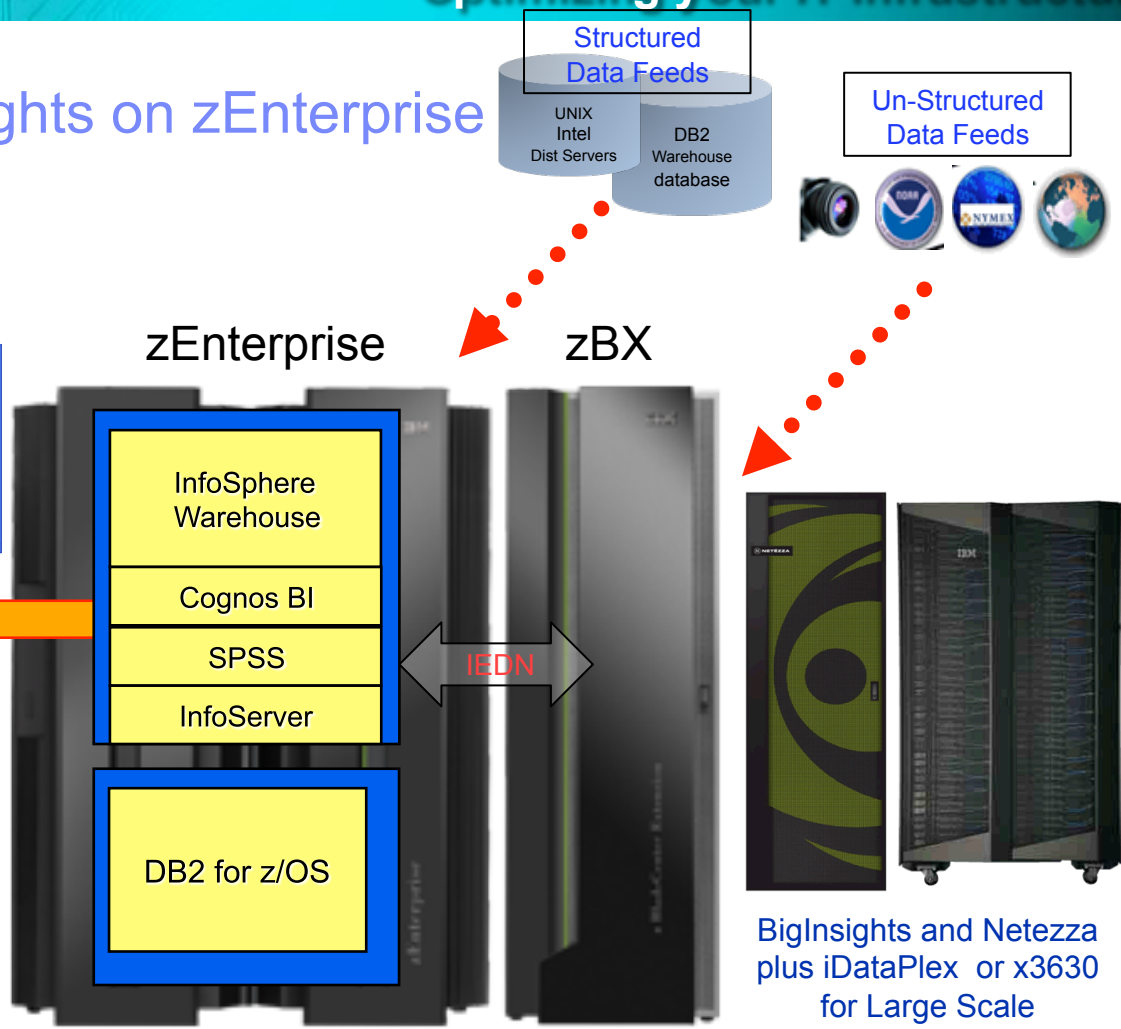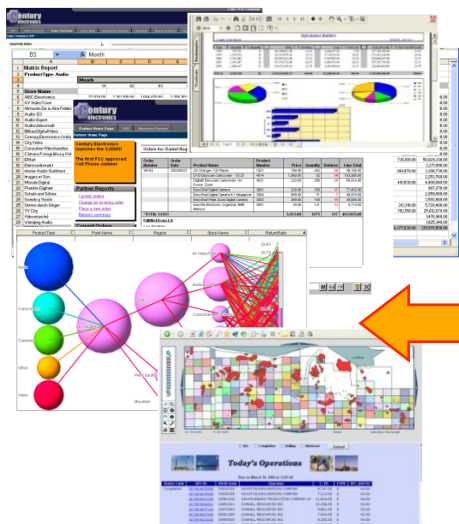
There is a the strong alignment between the processing, networking and storage capabilities of a properly configured zBX frame and the corresponding typical requirements for data nodes in a Hadoop Cluster. A medium-sized Hadoop Cluster (40-80 nodes) can easily fit within a zBX Frame to provide an extremely valuable secondary application during off-peak hours. Larger Clusters can be accommodated via either larger zEnterprise ensembles with multiple zBXes or by deploying additional nodes outside the ensemble.

Big Data InfoSphere BigInsights on zEnterprise
(Future based on x-Blades)

Structured Data Feeds

UNIX Intel Dist Servers

DB2 Warehouse database

Un-Structured Data Feeds

FOUNDATION

Building an end-to-end BI environment on zEnterprise

zEnterprise

zBX

InfoSphere Warehouse

Cognos BI

SPSS

InfoServer

IEDN

DB2 for z/OS

BigInsights and Netezza plus iDataPlex or x3630 for Large Scale

IBM Smart Analytics System for z
- Reduce complexity
- Improved Security
- Highly available,
- Single View of the Business
- Centralized data management
- Query/workload prioritization
- Strong InfoSphere BigInsights alignment

BigInsights on zBX for
Small to Medium Scale
(<500 Data Nodes)
per zEnterprise Ensemble Node

Thank You!