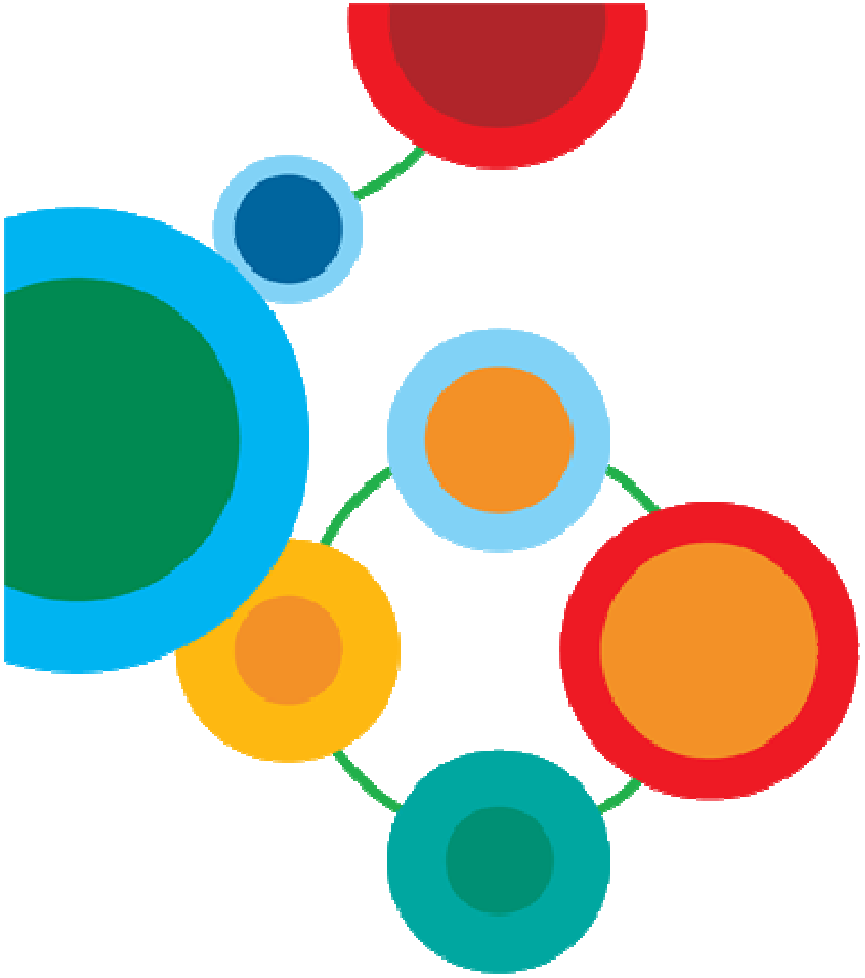


Exploiting the Power of the Mainframe: The Latest News from System z

Session Number 1682

Diane Goff, IBM

IBM Software

Information On Demand 2011

Information On Demand 2011

Please Note:

IBM's statements regarding its plans, directions, and intent are subject to change or withdrawal without notice at IBM's sole discretion.

Information regarding potential future products is intended to outline our general product direction and it should not be relied on in making a purchasing decision.

The information mentioned regarding potential future products is not a commitment, promise, or legal obligation to deliver any material, code or functionality. Information about potential future products may not be incorporated into any contract. The development, release, and timing of any future features or functionality described for our products remains at our sole discretion.

Performance is based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput or performance that any user will experience will vary depending upon many factors, including considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve results similar to those stated here.

Agenda

- Smarter Planet / Smarter Computing and the Role of IBM System z®
- IBM zEnterprise™ System

  A Smarter 'System of Systems' for a Smarter Planet

  - IBM zEnterprise 196 (z196)
  - IBM zEnterprise 114 (z114) - NEW
  - IBM zEnterprise BladeCenter®Extension (zBX)
  - IBM Unified Resource Manager
- IBM zEnterprise Software

Three years ago, IBM started describing the Smarter Planet

fueling innovation across industries.

Neonatal Care

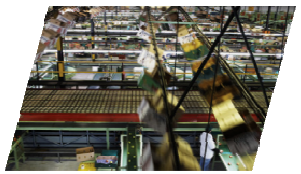
Law Enforcement

Telecom

Fraud Prevention

Resource Management

Traffic Control



Manufacturing

Trading

As our planet becomes smarter

We are seeing dramatic shifts that are changing the way the world works … both business and society

- 3 million new blog posts a day
- 10 billion tweets a year
- 3.5 billion pieces of content per week

Nothing is changing more than IT …

The way it's accessed … Ubiquitously

The way it's applied … for insight

The way it's architected … Integrated & flexible

The demands placed on the data center have never been greater

32.6 million servers worldwide

- **85% idle** computer capacity
- **15%** of servers run 24/7 without being actively used on a daily basis

1.2 Zetabytes (1.2 trillion gigabytes) exist in the "digital universe"

- **50%** YTY growth
- **25%** of data is unique; **75%** is a copy

Between 2000 and 2010

- Servers grew **6x** ('00-'10)
- Storage grew **69x** ('00-'10)
- Virtual machines grew **51% CAGR** ('04-'10)

Data centers have **doubled** their energy use in the past five years

- **18%** increase in data center energy costs projected

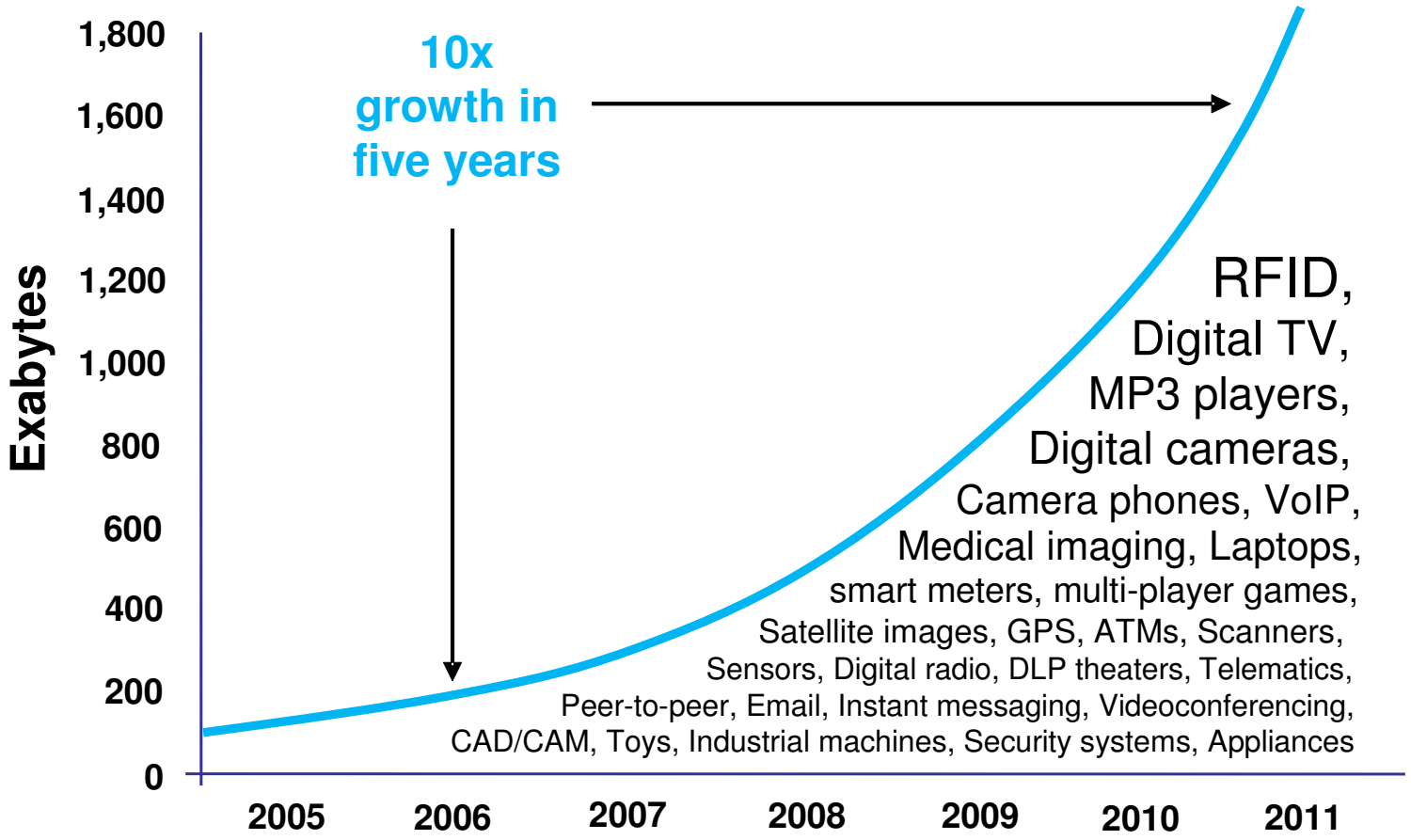
Internet connected devices **growing 42% per year**

Since 2000 security vulnerabilities grew **eightfold**

… while IT budgets are growing less than 1% per year

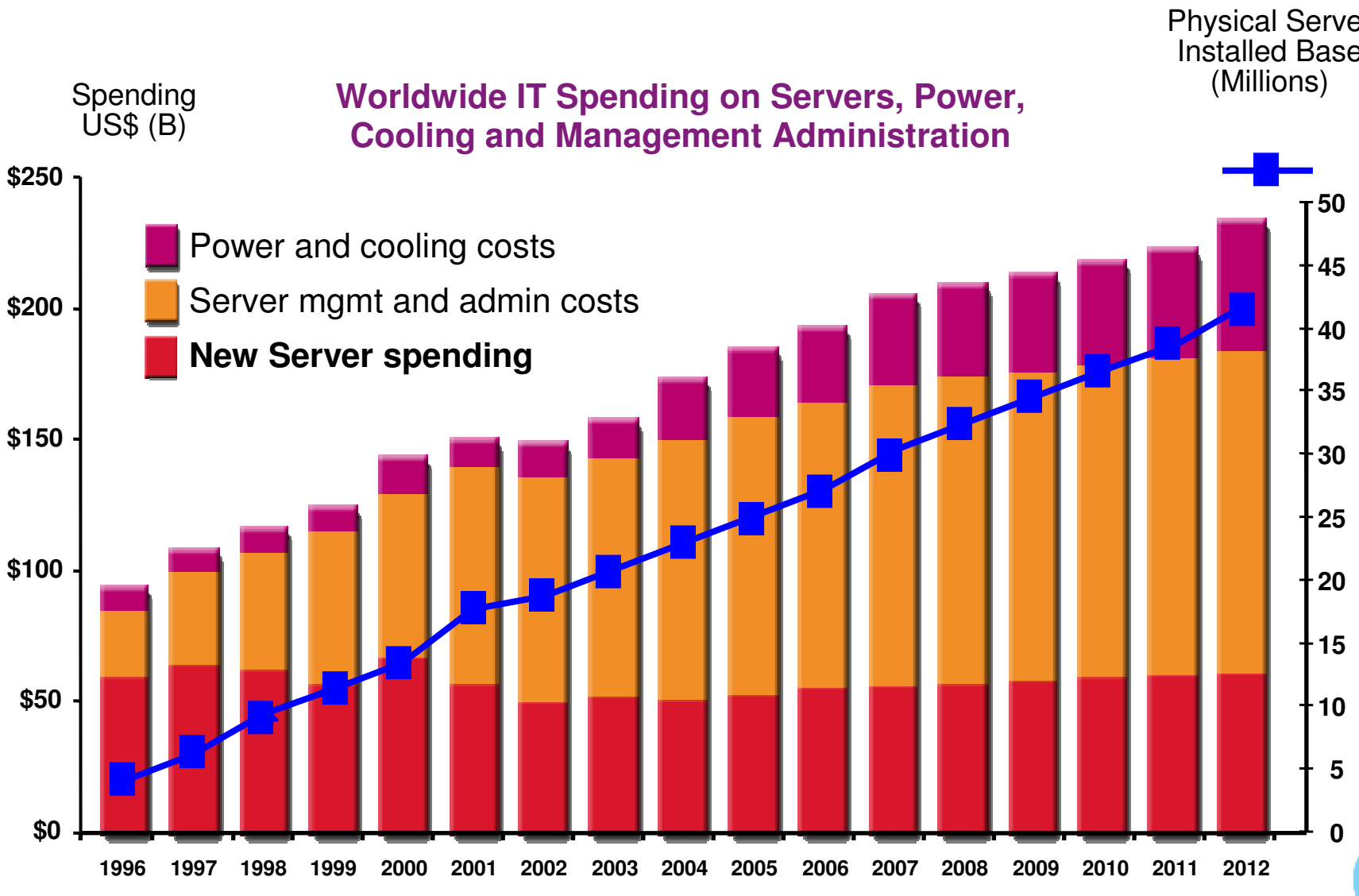
By the end of 2011, the world will be 10 times more instrumented than it was in 2006

Internet connected devices will leap from 500 million to 1 trillion



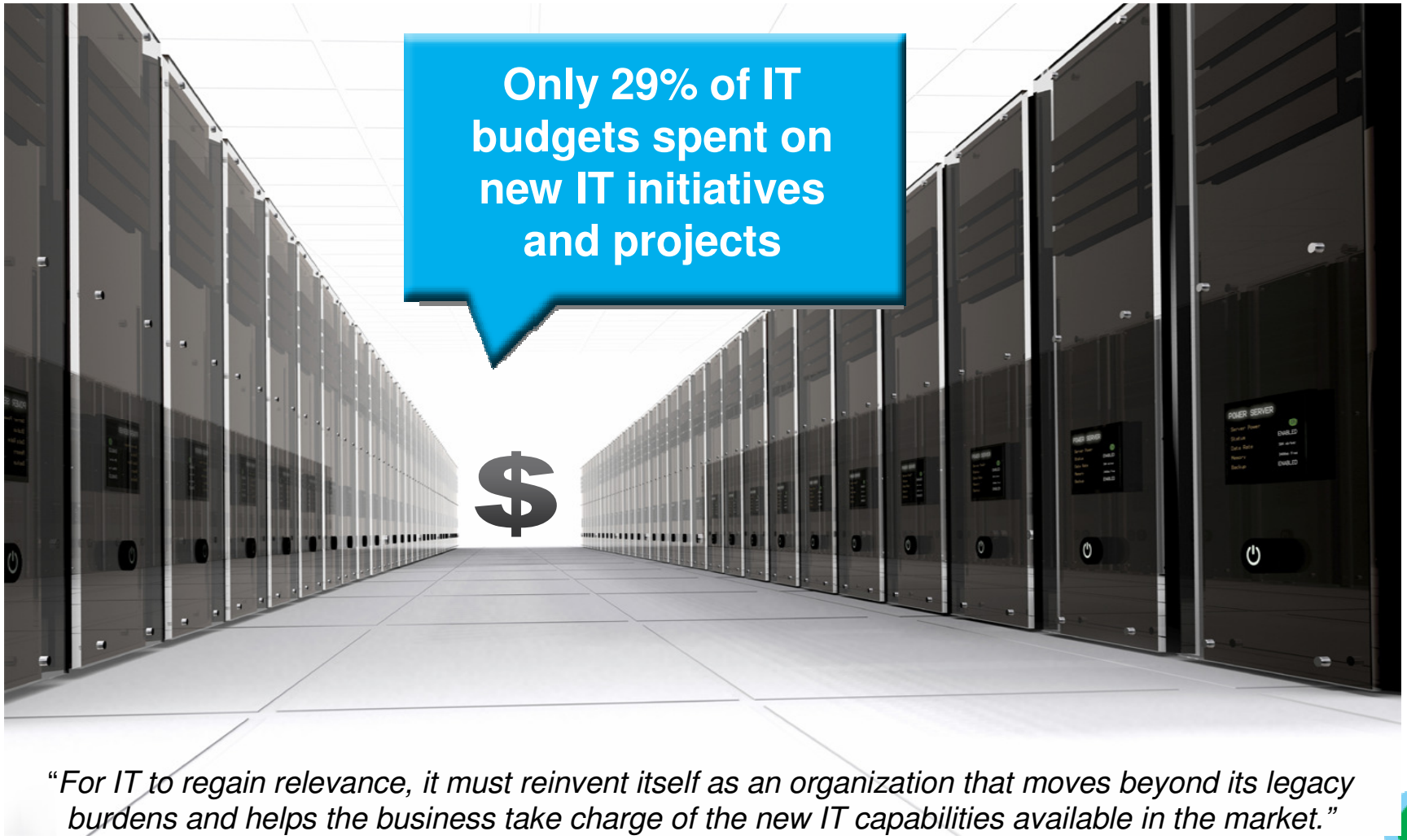
Approximately 70% of the digital universe is created by individuals, but enterprises are responsible for 85% of the security, privacy, reliability, and compliance

IT Operating Costs Are Out of Control



Source: IDC

IT budgets are spent on ongoing operations and maintenance instead of new IT initiatives and projects



"For IT to regain relevance, it must reinvent itself as an organization that moves beyond its legacy burdens and helps the business take charge of the new IT capabilities available in the market."

Forrester Research, Inc., Accelerating At The Intersection Of Business And Technology -- A Sneak Preview Of Forrester's IT Forum 2011, April 2011

By thinking differently about computing, IT leaders can overcome the IT conundrum to meet exploding demands with flat budgets.

IT leaders must address the viscous cycle of sprawling IT, inflexible IT and incomplete data to overcome the IT conundrum.

Incomplete, Untrusted Data:
Decisions are made on incomplete data, big ideas are seen as risky, and small decisions are not optimized

Sprawling IT:
Every IT investment leads to more sprawl which drives up costs

Inflexible IT:
Inflexibility of infrastructure limits responsiveness to customer demands

Through a new approach to IT – Smarter Computing, an enterprise can overcome the IT conundrum to double capacity for IT service on a flat budget.

Designed for Data
Harness all available information and unlock insights to make informed choices

Tuned to the Task
Drive greater efficiency and performance for each workload

Managed as a Cloud
Rapid delivery of new services to reinvent business

Smarter Computing is realized through an IT infrastructure that is designed for data, tuned to the task, and managed as a 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 as a 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 reduced up to 55%** with optimized systems

IBM zEnterprise System: Freedom by design

An Ideal platform for smarter computing:

Clients are using the strengths of IBM System z®; security, availability, resiliency, scalability, virtualization and management as part of their infrastructure transformation

IBM is now enhancing the System z platform to deliver new capabilities that help accelerate the journey to smarter computing

Tuned to the task

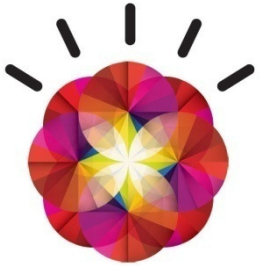
Extending and enhancing the hybrid capabilities of IBM zEnterprise™ with improved management options and support for a broader set of workloads

Managed with cloud technologies

Extending the System z portfolio of cloud offerings with a new entry-level Infrastructure as a Service delivery model

Designed for data

Building on the success of the IBM Smart Analytics Optimizer with increased performance for a broader set of queries



Smarter Computing
is an IT infrastructure that is:

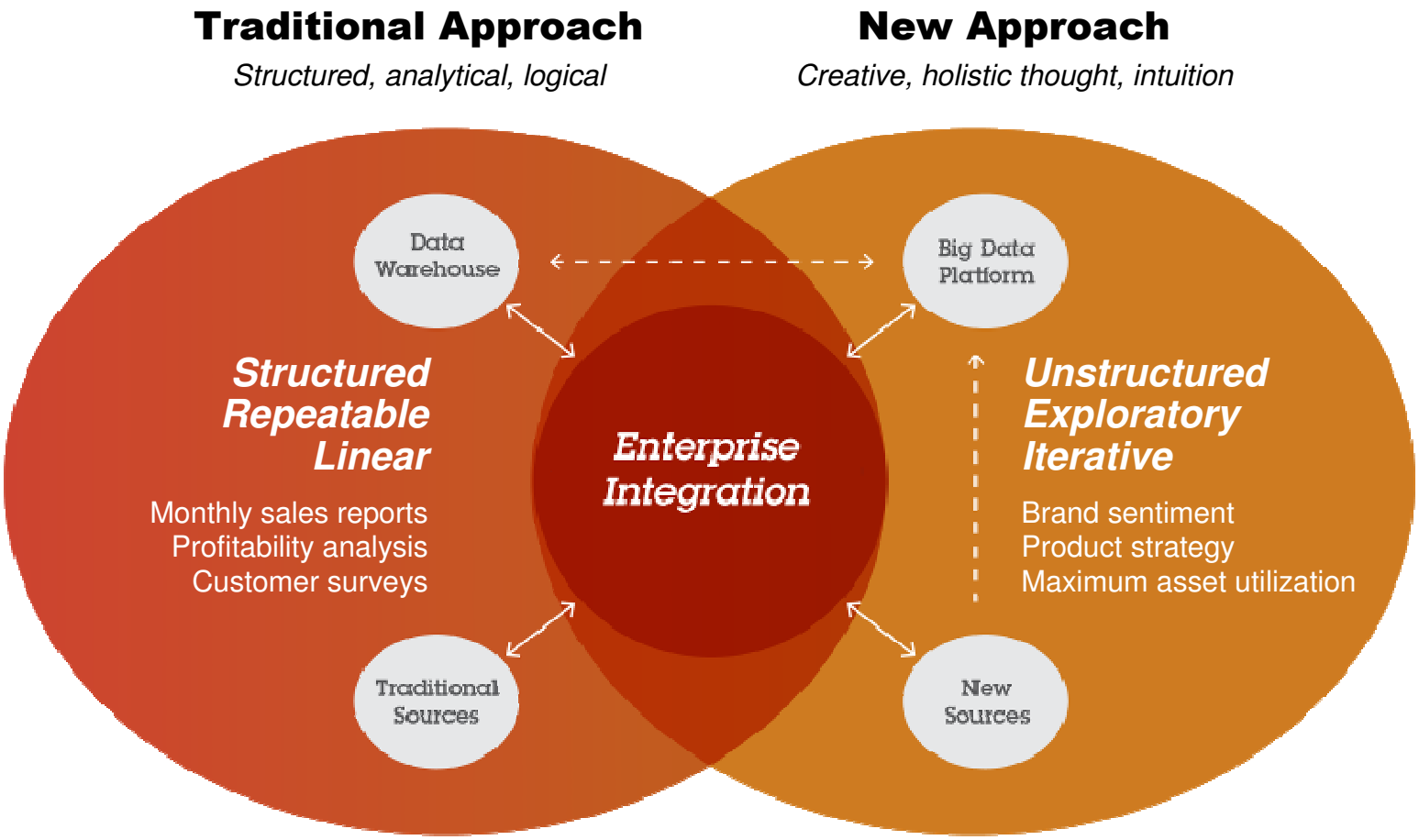
Designed for data / Tuned to the task / Managed in the cloud

Big Data / Optimized Systems / Cloud

IBM zEnterprise delivers data for applications across the enterprise

- A single centralized data base that supports all access methods with real time operational data
- Massive scale allows access from vast numbers of users simultaneously without degradation in service levels
- Unmatched security, availability and transactional integrity enables access 24/7 and protects data on the network or at rest

Integrating new approaches such as Big Data will unlock those insights.



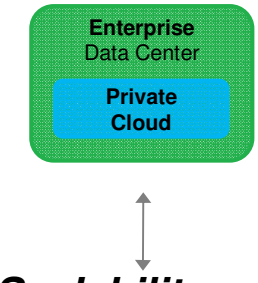
New capabilities to analyze big data

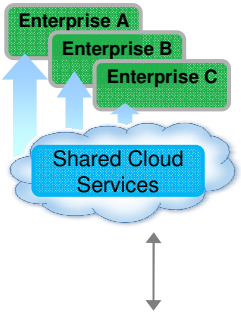
Business insight integration

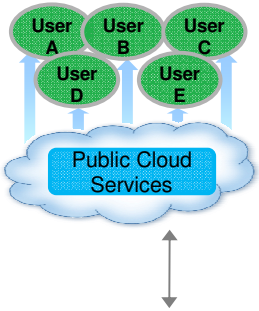
IBM DB2® Analytics Accelerator is a new workload optimized, appliance add-on, that enables the integration of business insights into operational processes [Evolution of IBM Smart Analytics Optimizer]

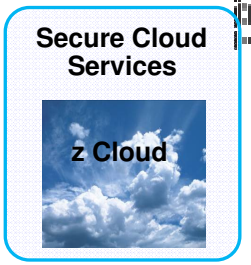
Smart Analytics System – 9700/9710, an End-to-end BI environment that can support a data distribution hub and transactional analytics platform for modernized reporting and predictive analytics

Cloud Computing: More Value with zEnterprise









Scalability

Ability to meet massive demands from users and data

Unmatched scalability with the highest transaction processing capacity

Virtualization

Centralize Management of virtual servers across a heterogeneous pool

Scale out to 100,000 virtual servers in a single zEnterprise System

Security

Industry leading security at the core of an integrated infrastructure

Identifies potential fraud in Real Time

Availability

Resiliency management and fewer points of failure

Centralized workload management aligned to business priorities

Efficiency

Economies of scale for Labor, software and environmental costs

Reduce labor, energy, and development costs, by up to 70%, 90%, and 20% (resp).

IBM zEnterprise provides exceptional capabilities for flexible service delivery

Broad Network Access
Very large number of end user access from multiple sources including mobile devices

Rapid Elasticity
A new dimension of Scale. Most efficient platform for Large-scale Linux consolidation

Resource Pooling
1000s of virtualized systems across a heterogeneous resource pool

Measured Service
Meter, monitor, and track workloads for chargebacks and capacity expectations

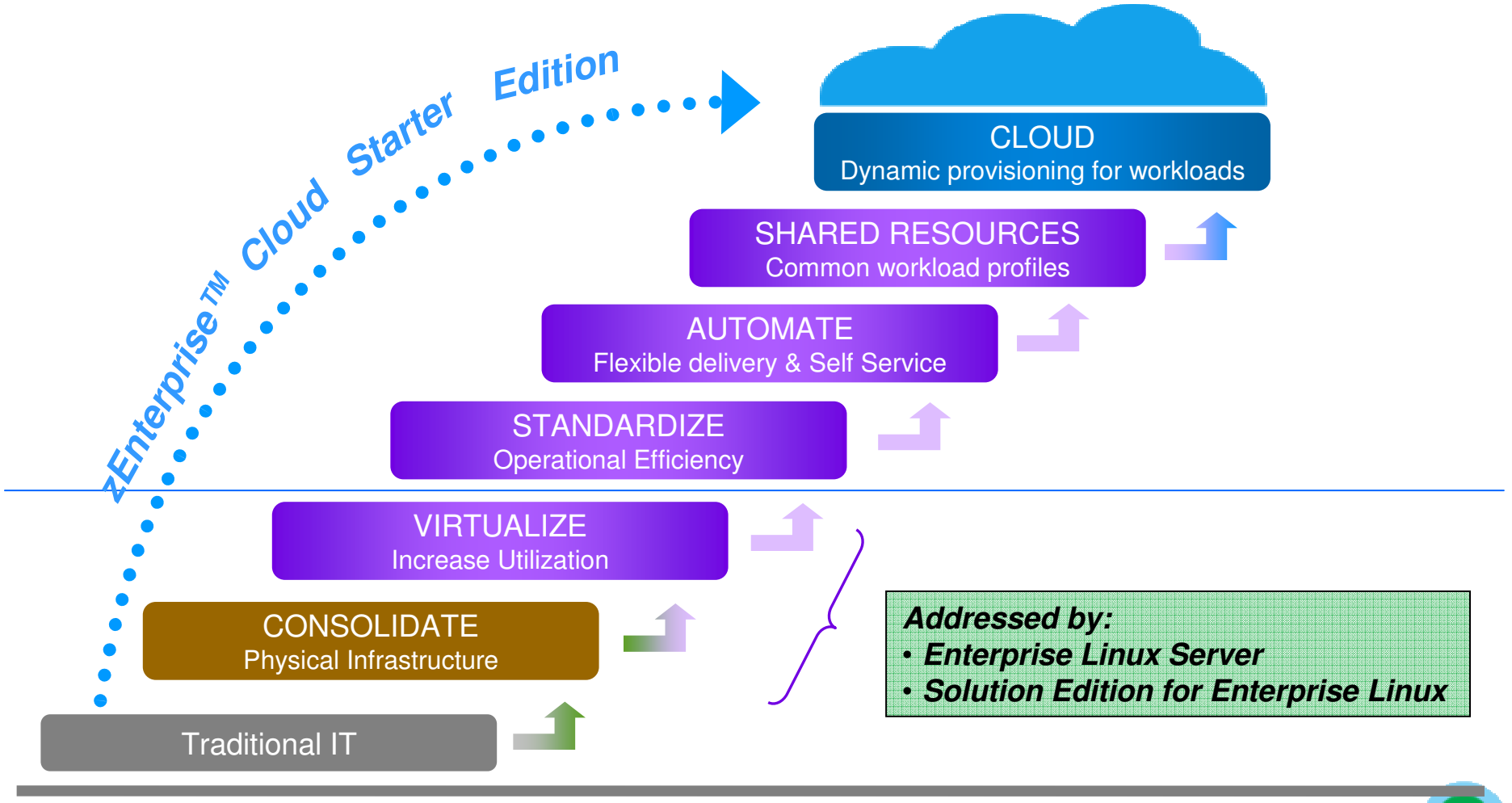
On Demand Self-Service
Automate provisioning and service requests reducing provisioning cycles from weeks to minutes

Helping clients get started with Cloud computing on System z

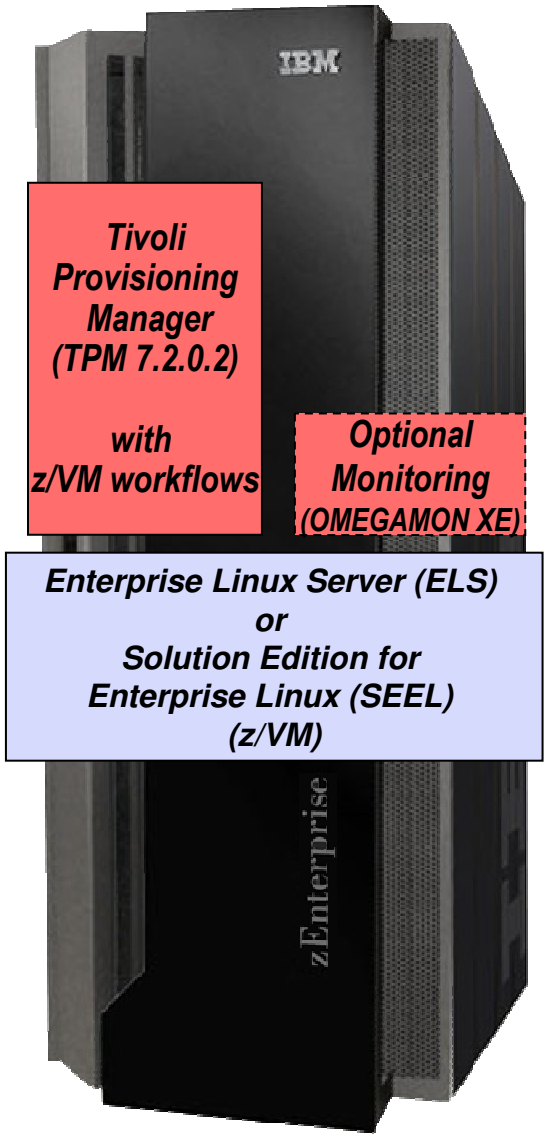
The zEnterprise Starter Edition for Cloud is an entry-level Infrastructure as a Service delivery model for Linux on System z with Tivoli® Provisioning Manager

z/VM® Live Guest Relocation (LGR) moves virtual servers to another LPAR or another mainframe server for increased flexibility, scalability and availability in cloud deployments on System z

How zEnterprise™ Cloud Starter Edition helps in the journey to Cloud



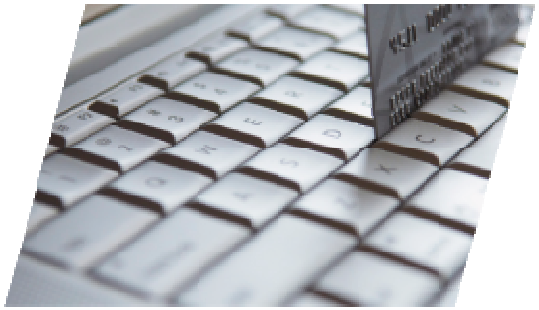
IBM zEnterprise Starter Edition for Cloud
Establishing Infrastructure as a Service (IaaS) delivery model



Built on top of Enterprise Linux Server or Solution Edition for Enterprise Linux

- **Allows customers to create a Cloud IaaS environment**
- **Integrates into customer's self-service UI**
- **Resource monitoring provided by OMEGAMON® XE for z/VM® and Linux® (Optional)**
- **z/VM workflows simplify installation**
- **STG Lab Services can provide rapid provisioning with newly created z/VM workflows (Optional)**

Optimized Systems means:
Matching workloads to systems that are optimized for the workloads' characteristics



Transaction Processing and Database

- Thousands of online users
- Large transactional databases
- 24x7 operation

Business Intelligence and Analytics

- Fewer users
- Complex queries
- Multiple data sources
- Large data warehouse

Business Process Management

- Unite content, people and process flows
- Orchestrate multiple services
- Empower business users

Here is a great example of an optimized system—Watson

How Watson is Optimized:

- Software exploits massive parallelism in Power7 architecture—with 2870 processor cores and 4 threads per core
- 15 Terabytes of RAM to hold the entire data in memory
- Leverages the Apache Hadoop open framework to distribute the workload for loading information into memory

Enabling it to achieve the workload requirement of response time < 3 seconds

Simplify and reduce cost with IBM zEnterprise

- An Integrated system of multiple architectures for optimizing the deployment of multi-tier workloads
- Creating a single point of control for management and administration to reduce operational overheads by up to 80%, including:
  - Power and Facilities
  - Labor
  - Software Licenses

Lower cost of acquisition by up to 56%*

Reduce cost of ownership by up to 55%*

- Based on IBM analysis of a large Financial Services company Datacenter. See details on ibm.com/systems/zenterprise/
- Deployment configurations based on IBM studies and will vary based on workload characteristics. Price calculations based on publicly available US list prices, prices will vary by country.

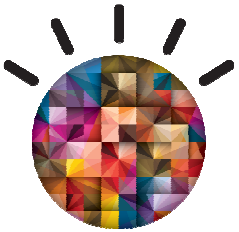
Deploy workloads on best fit architecture for efficiency and innovation.

- Over 7,000 applications supported on z/OS® & Linux for System z
- zBX enables a broader set of applications
  - AIX® on Power Blades
  - Linux on IBM System x® Blades
  - Microsoft® Windows® on System x Blades

Freedom by design:

Utilize the best fit architecture– Mainframe, Power, x86

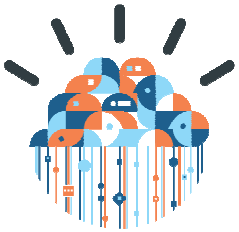
Optimized Systems provide the ideal infrastructure foundation for Big Data and Cloud



Designed for Data

Optimized Systems for Big Data

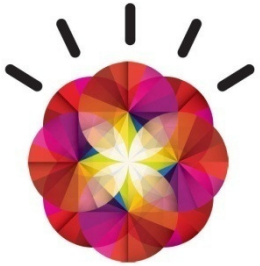
- Workload Optimization for Big Data, Business Analytics and Data Warehousing
- Storage optimization leveraging capabilities such as compression, de-duplication, encryption and archival



Managed in the Cloud:

Optimized Systems for Cloud

- Secure foundation for virtualizing servers, storage and networks
- Automated resource management, provisioning and charge back aligning IT assets with business priorities



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is an IT infrastructure that is:

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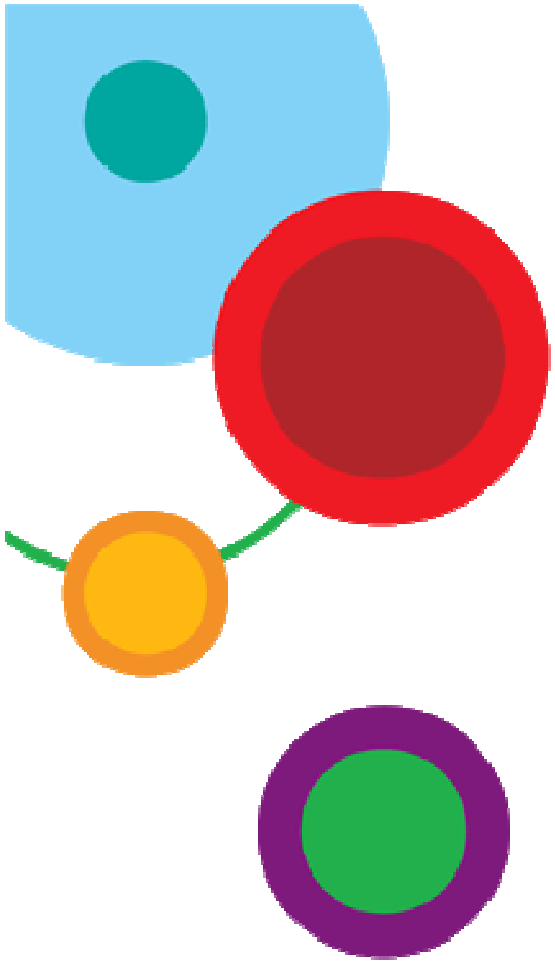


IBM zEnterprise System – What's New

Bringing Hybrid Computing to Organizations of all Sizes

The IBM zEnterprise System: Capabilities for smarter computing

An integrated system of systems that delivers freedom by design.

Designed for Data

Integrates operational data and advanced analytics …

… to deliver actionable insight within a timeframe that matters.

Tuned to the Task

Consolidates workloads and collapses infrastructures…

… to deliver superior economics to the business.

Managed in a Cloud

Flexible delivery of high quality services…

… for the convergence of enterprise computing and cloud computing.

In July 2010, the IBM zEnterprise system introduced the first hybrid computing technology enabling clients to:

- Optimize the deployment of workloads by utilizing the best fit technology and operating environment
- Deploy enterprise private clouds that are ready for mission critical applications
- Establish a common management infrastructure for both mainframe and distributed-systems
- Take actionable insight based upon real time analytics

Central Processing | IBM zEnterprise™ Unified Resource | IBM zEnterprise BladeCenter®

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)

- 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

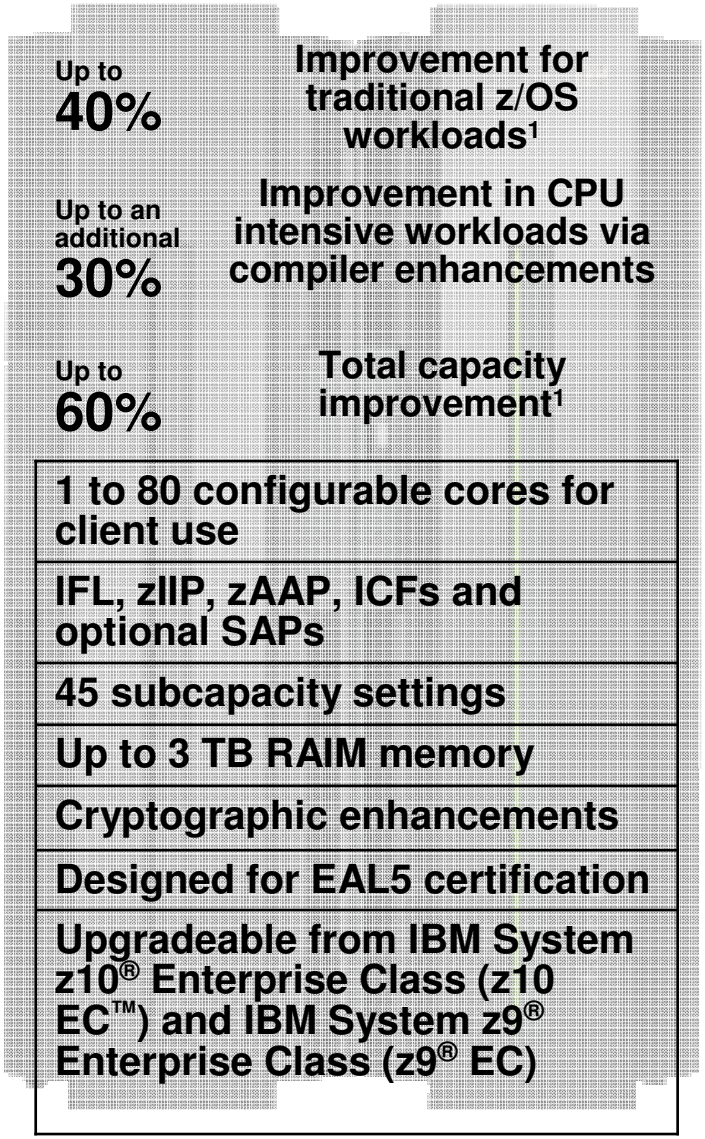
zEnterprise Unified Resource Manager

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

zEnterprise BladeCenter Extension (zBX)

- 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 was Introduced with the z196 at its Heart



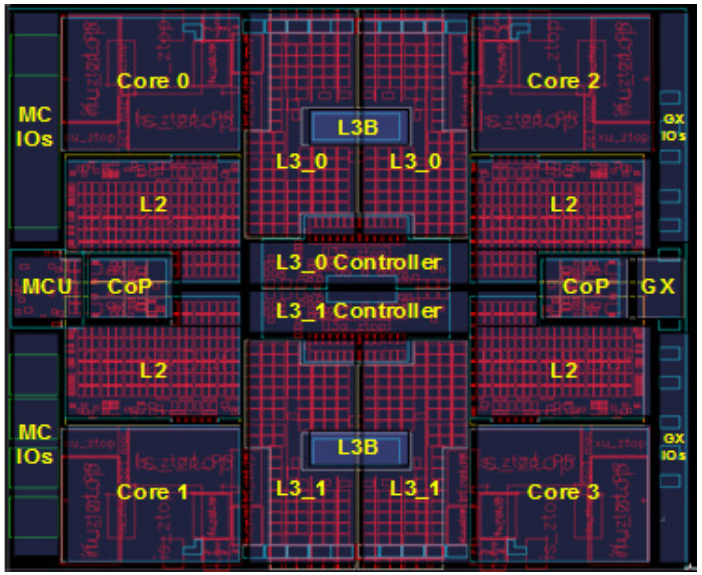
zEnterprise 196 (z196)
Machine Type: 2817
Models: M15, M32, M49, M66, M80

- **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.

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**



zBX – A Uniquely Configured Extension of the zEnterprise
Looks like a rack with BladeCenters in it…. but so much more

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

… managed by the zEnterprise Unified Resource Manager

IBM Blades and Optimizers Integrated within the zBX

- IBM Smart Analytics Optimizer
  - An appliance-like, add-on, that enables the integration of business insights into operational processes
  - Accelerates select queries, with unprecedented response times
  - Capitalizing on breakthrough technologies to accelerate business analytics
- IBM WebSphere® DataPower® Integration Appliance XI50 for zEnterprise
  - Purpose-built hardware for simplified deployment and hardened security helps businesses quickly react to change and reduce time to market
  - DataPower XI50z can provide connectivity, gateway functions, data transformation, protocol bridging, and intelligent load distribution.
- Select IBM POWER7 and IBM System x blades
  - Brings a larger application portfolio to zEnterprise
    - Front end applications to centralized data serving … e.g. SAP
    - Front end to core CICS® or IMS™ transaction processing … e.g. WebSphere
  - Applications certified to run on zBX supported POWER7 and System x blades will run on them when installed in the zBX

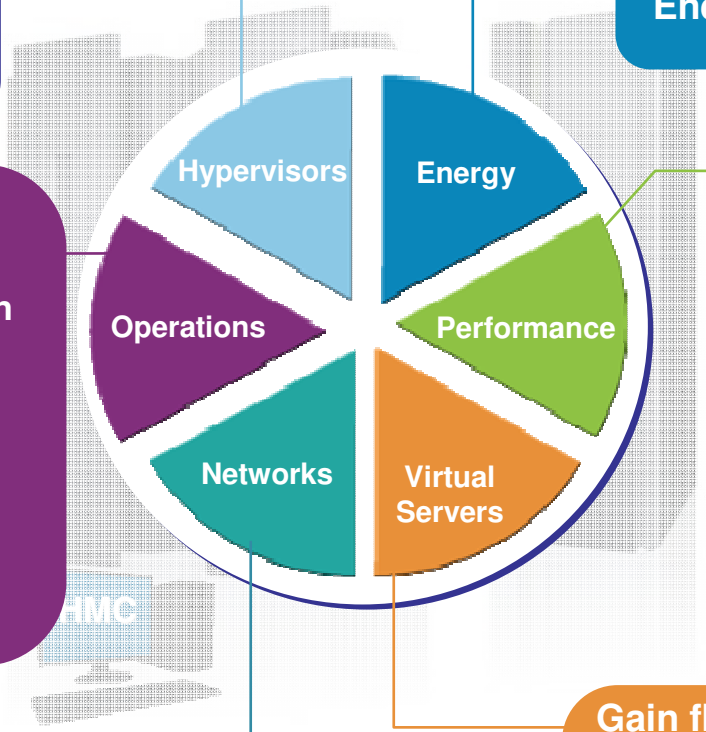
Continuing Value using the Unified Resource Manager

Simplified installation of hypervisors

Gain significant time to market with improved speed of deployment

Simplified energy management

Energy cost savings



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

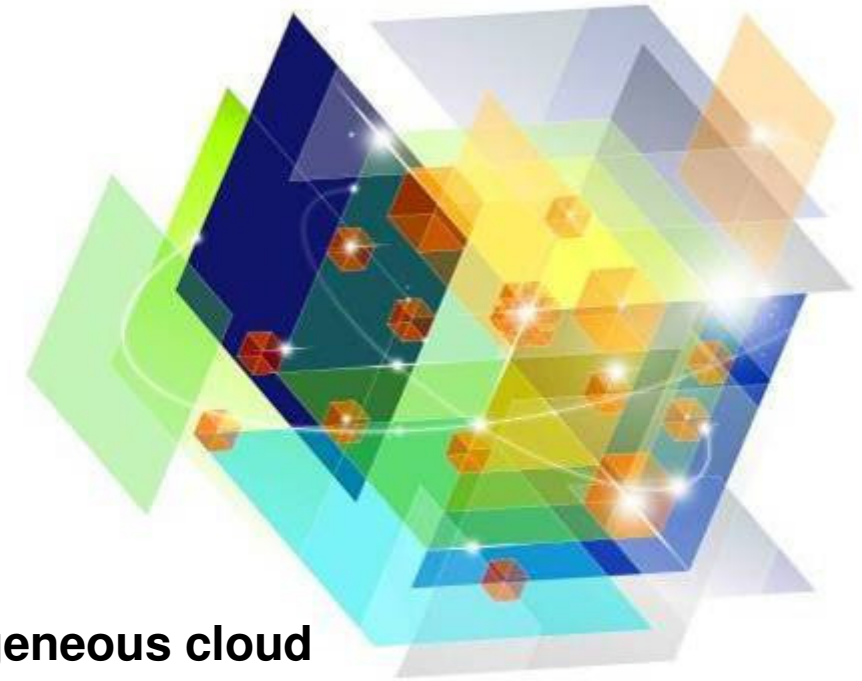
Gain flexibility, consistency and uniformity of virtualization

Provide the business with faster time to market

Simplified network management for applications

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 System z governance to POWER7 and IBM System x blades**
- **Fast and flexible application integration**
- **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**



Introducing the next steps in the evolution of zEnterprise

- New innovations to improve zEnterprise at its core
- Increase flexibility to deploy and manage enterprise clouds
- New zEnterprise designed for mid-sized clients
- Expanding the boundaries of hybrid computing

Introducing the IBM zEnterprise 114
Bringing hybrid computing to a broader set of businesses

Central Processing Complex

- *New I/O subsystem for improved system connectivity*
- *Security enhancements*
- *Clustering improvements*
- *New IBM zEnterprise 114 (z114) for mid-sized businesses*

zEnterprise Unified Resource Manager

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

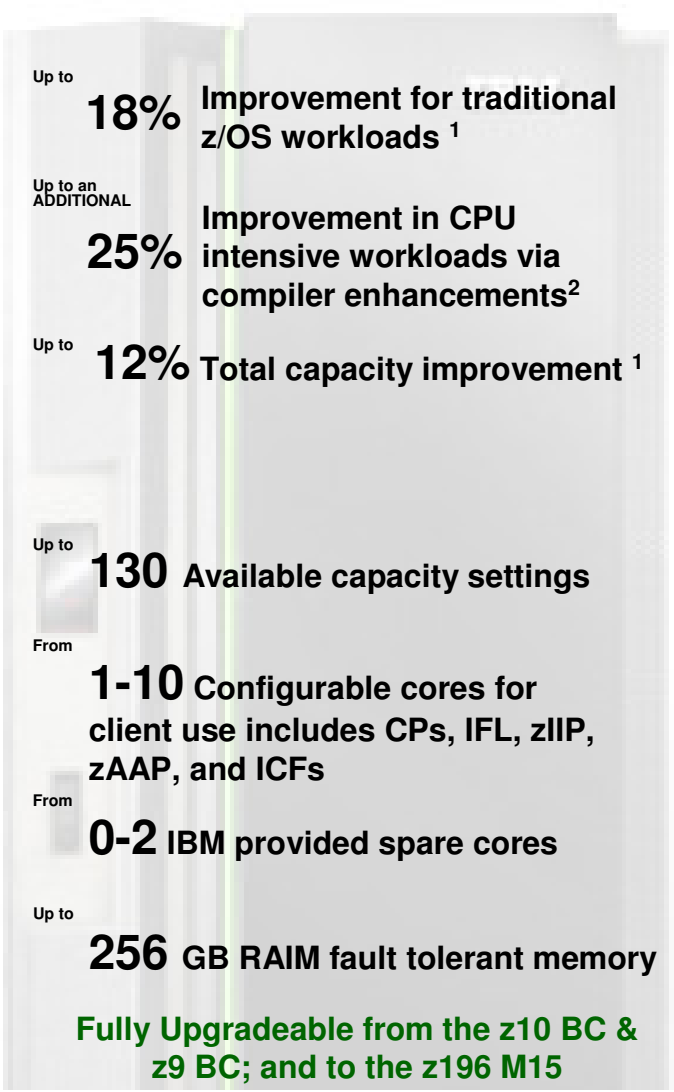
zEnterprise BladeCenter Extension (zBX)

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

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

zEnterprise Technology Designed for Small and Medium Businesses

The value begins with a new size…



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]

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 z10 BC & z9 BC; and to the z196 M15

NEW

zEnterprise 114 (z114)

Machine Type: 2818

2 Models: M05 & M10

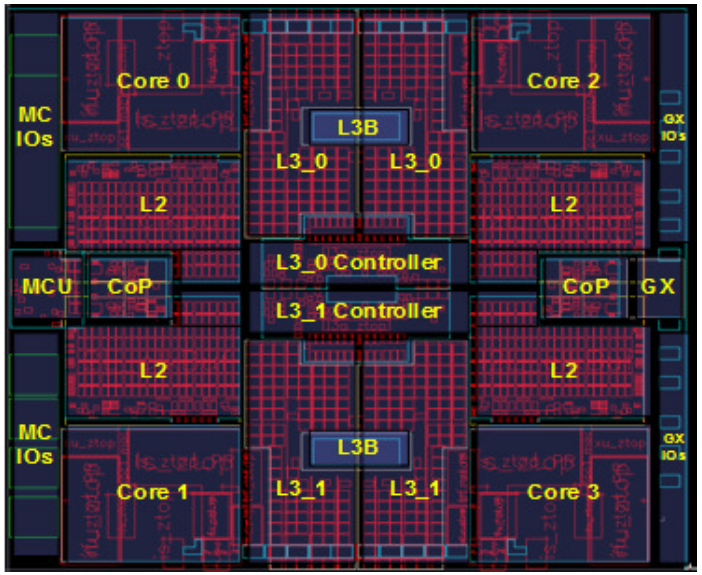
- New technology in a new package
  - Modular 2 drawer design for lower cost of entry
  - Granularity for right-sizing your system
  - Additional Scale for consolidation and growth
  - Improved data center efficiency
  - Same Qualities of Service as the z196
  - Hybrid enabled to drive workload expansion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

[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 – IBM Leadership Technology At the Core

- **3.8 GHz Superscalar Processor Chip boosts hardware price/performance**
  - 100 new instructions – improvements for CPU intensive, Java™, and C++ applications
  - New on-chip cache structure 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
- **Data compression and cryptographic processors right on the chip**
- **Over 18 percent performance improvement per core and 12% improvement in total system scalability over the z10 BC.**
- **Compiler related enhancements help drive gains of up to 25% improvement in throughput for CPU/Numeric intensive workloads.**



z114 Overview

- **Machine Type**
  - 2818
- **2 Models**
  - M05 and M10
  - Single frame, air cooled
  - Non-raised floor option available
  - Overhead Cabling and DC Power Options
- **Processor Units (PUs)**
  - 7 PU cores per processor drawer (One for M05 and two for M10)
  - Up to 2 SAPs per system, standard
  - 2 spares designated for Model M10
  - Dependant on the H/W model - up to 5 or 10 PU cores available for characterization
    - Central Processors (CPs), Integrated Facility for Linux (IFLs), Internal Coupling Facility (ICFs), System z Application Assist Processors (zAAPs), System z Integrated Information Processor (zIIP), optional - additional System Assist Processors (SAPs)
  - 130 capacity settings
- **Memory**
  - Up to 256 GB for System including HSA
    - System minimum = 8 GB (Model M05), 16 GB (Model M10)
    - 8 GB HSA separately managed
    - RAIM standard
    - Maximum for customer use 248 GB (Model M10)
    - Increments of 8 or 32 GB
- **I/O**
  - Support for non-PCIe Channel Cards
  - Introduction of PCIe channel subsystem
    - Up to 64 PCIe Channel Cards
  - Up to 2 Logical Channel Subsystems (LCSSs)
- **STP - optional** (No ETR)

New Blades Provide Added Flexibility for Workload Deployment and Integration

- **Introducing System x Blades in the zBX**
  - Select IBM BladeCenter HX5 7873 dual-socket 16-core blades
  - Ordered and fulfilled through System x providers and installed into the zBX by the customer
  - The zBX web page will host current blade ordering information: http://www.ibm.com/common/ssi/cgi-bin/ssialias?infotype=SA&subtype=WH&appname=STGE_ZS_ZS_USEN&htmlfid=ZSL03128USEN&attachment=ZSL03128USEN.PDF
  - Blades assume System z warranty and maintenance when installed in the zBX
- **Unified Resource Manager will install an integrated hypervisor on blades in the zBX**
  - KVM-based with IBM service and support
- **Up to 112 Blades supported on zBX**
  - Ability to mix and match DataPower XI50z, POWER7 and System x blades in the same chassis for better zBX utilization
  - IBM Smart Analytics Optimizer can mix with others in same rack
  - Number of blades supported varies by type

… managed by the zEnterprise Unified Resource Manager

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

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

Select IBM Blades
- IBM BladeCenter PS701 Express
- IBM BladeCenter HX5 7873

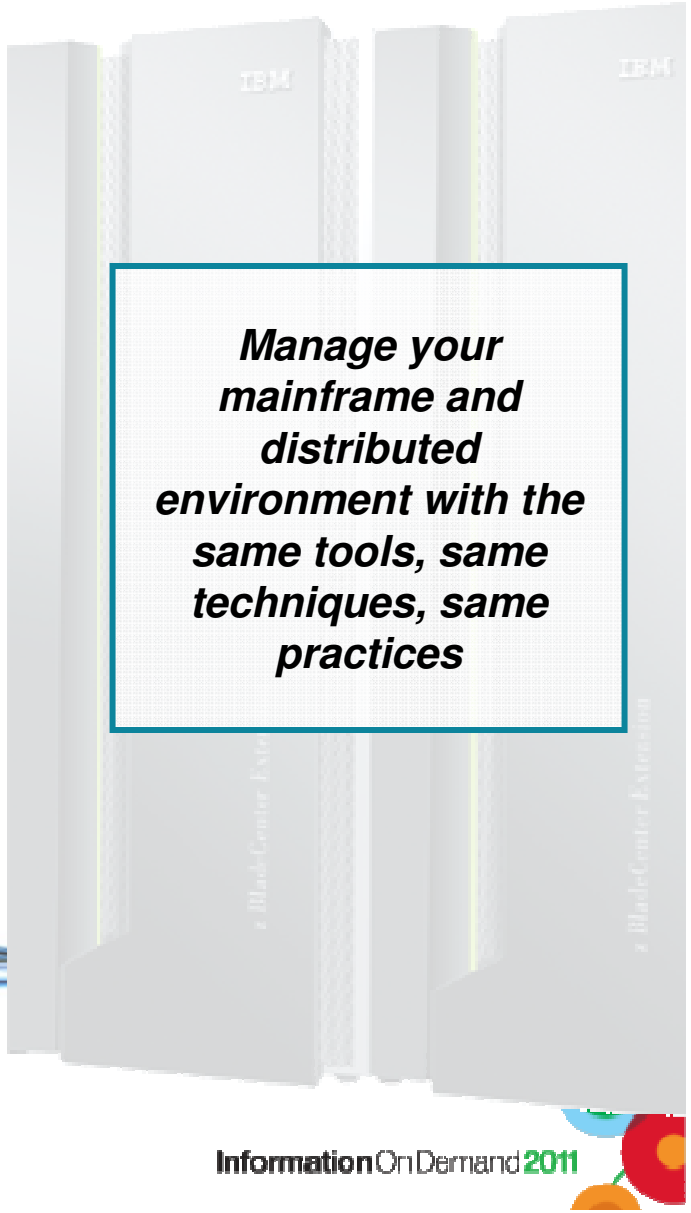
One to four – 42u racks – capacity for up to 112 blades

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

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



zBX Overview

- **Machine Type/Model 2458-002**
  - One Model with 5 configurations for IBM Smart Analytics Optimizer
- **Racks – Up to 4 (B, C, D and E)**
  - 42U Enterprise, (36u height reduction option)
  - 4 maximum, 2 chassis/rack
  - 2-4 power line cords/rack
  - Non-acoustic doors as standard
  - Optional Rear Acoustic Door
  - Optional Rear Door Heat Exchanger (conditioned water required)
- **Chassis – Up to 2 per rack**
  - 9U BladeCenter
  - Redundant Power, cooling and management modules
  - Network Modules
  - I/O Modules
- **Blades (Maximum 112 in 4 racks)**
  - IBM Smart Analytics Optimizer Blades (0 to 7 to 56)
    - Can not mix other Blades in the same Chassis
  - Customer supplied POWER7 Blades (0 to 112)
  - Customer supplied IBM System x Blades* (0 to 28)
  - IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise, M/T 2462-4BX (up to 28 – double width)
  - Non-IBM Smart Analytics Optimizer Blades can be mixed in the same chassis
- **Management Firmware**
  - Unified Resource Manager
- **Top of Rack (TOR) Switches - 4**
  - 1000BASE-T intranode management network (INMN)
  - 10 GbE intraensemble data network (IEDN)
- **I/O**
  - 8 Gb Fibre Channel (FC) connected to customer supplied disks
  - IBM Smart Analytics Optimizer uses DS5020 disks
    - DS5020s not shared with Customer supplied Blades

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

Extending zEnterprise Unified Resource Manager
Continuing to add function and management

- Operational Controls enhanced with auto-discovery and configuration support for new resources
  - Dynamic discovery and configuration of storage resources by Unified Resource Manager

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

Co:Z Co-Processing Toolkit

CSL International

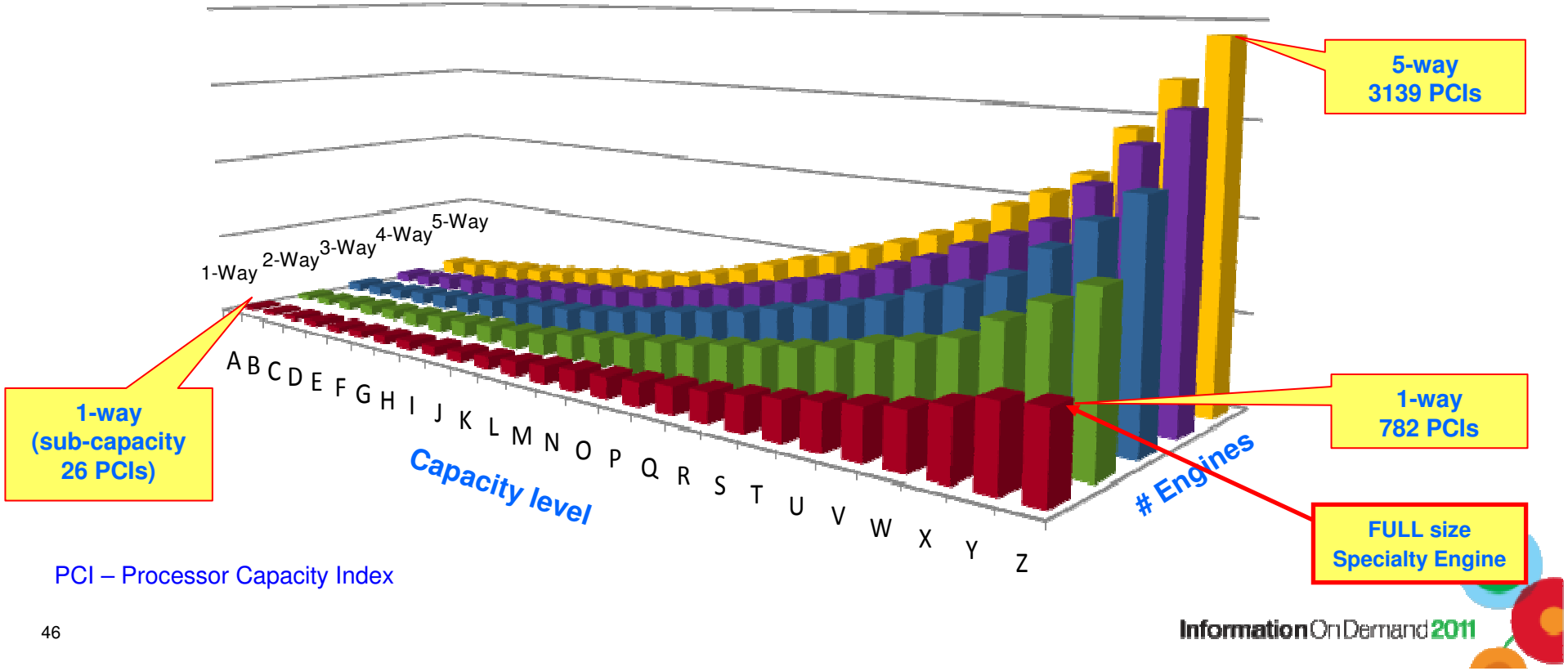
Tivoli

ca technologies

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**



PCI – Processor Capacity Index

Built to support future data center design, modernization and efficiencies

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

Save with z114's lower energy consumption

The average z114 uses less electricity than a clothes dryer **and about the same amount of power as 4 kitchen coffee makers.**[1]

With the z114, get about 12% more work done per unit of energy **over the z10 BC.**

The z114 M05 can help lower energy demands by as much as 15% **compared to the z10 BC.**

49 x4100 Sun servers draw more than 5X the power **of the z114s needed to replace them to run an identical Linux workload.**[2]

A z114 can provide more performance per watt than a Nehalem **x86-blade solution for a mid-sized client.**[2]

… and don't forget about the new High-Voltage DC Power Option

[1] Average z114 3KW. Energy star.gov, manufacture data and ABS Alaskan identify coffee makers as approximately 800 watts.
[2] IBM Eagle customer studies; results may vary.

Enhancing System z world-class security and business resiliency

- **Cryptographic enhancements on zEnterprise**
  - Cryptography is in the “DNA” of System z hardware with Processor and Coprocessor based encryption capabilities
    - Processor Clear Key for bulk encryption – key material visible in storage
    - System z exclusive Protected Key CPACF helps to protect sensitive keys from inadvertent disclosure -- not visible to application or OS
  - NEW Crypto Express3 enhanced to support key ANSI and ISO standards for the banking, finance and payment card industry.
  - NEW Enhanced display of cryptographic cards and simplified card configuration and management capabilities via the Trusted Key Entry workstation (TKE).
  - NEW Simplified master key management with ICSF enhancements providing a single point of administration within an z/OS Sysplex.
  - Continued support for the next generation of public key technologies , ECC support is ideal for constrained environments such as mobile devices.
  - Crypto Express3 Coprocessor FIPS 140-2 Level 4 hardware evaluation.
- **PR/SM™ designed for EAL5 certification.**
- **Policy driven flexibility to add capacity to real or virtual processors.**
- **High Availability, Backup and Disaster Recovery solutions**
  - Leverage z114 and z196 as part of the new GDPS®/ active-active continuous availability solution

Connectivity Enhancements on z196 and z114
New features with big performance boost

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

Within z196/z114 and to zBX
NEW
- *PCIe I/O Infrastructure*
- I/O Drawer and I/O Cage[1]
- Intraensemble data network (IEDN)
- Intranode management network (INMN)

For Clustering
NEW
- *HCA-3 InfiniBand® Coupling Links*
  - *12x InfiniBand (improved performance – 12x IFB3protocol)*
  - *1x InfiniBand (4 ports)*

NEW
- ISC-3 (peer mode only)
- IC (define only)
- STP
  - *Improved time coordination for zBX components*

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

To the Data
NEW
- *FICON Express8S (PCIe-based)*
- ESCON®
  - Up to 240 maximum

[*] I/O cage for z196 only

Extend data and analytics capabilities

- The z114 supports the IBM Smart Analytics Optimizer for query performance **up to 80X faster**
- The IBM Smart Analytics System 9600 for the z114 creates a new entry point for advanced analytics on System z

IBM DB2 Analytics Accelerator for z/OS V2.1

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

What is it?

The IBM DB2 Analytics Accelerator is a workload optimized, appliance add-on to a DB2 z/OS Data Warehouse

- **Breakthrough technology enabling new opportunities**
- **Extreme performance for complex analytics (aka Train of Thought analysis)**
- **Integrated with DB2 for z/OS V9 and V10**
- **Transparent to DB2 applications and users**

GA Date:
DB2 V9 – 11/25/11
DB2 V10 – 1/31/12

IBM Smart Analytics System (ISAS) 9700 and 9710

Integrated and Packaged Solution of HW, SW and Implementation Services

IBM System z Hardware

DS8800 Storage

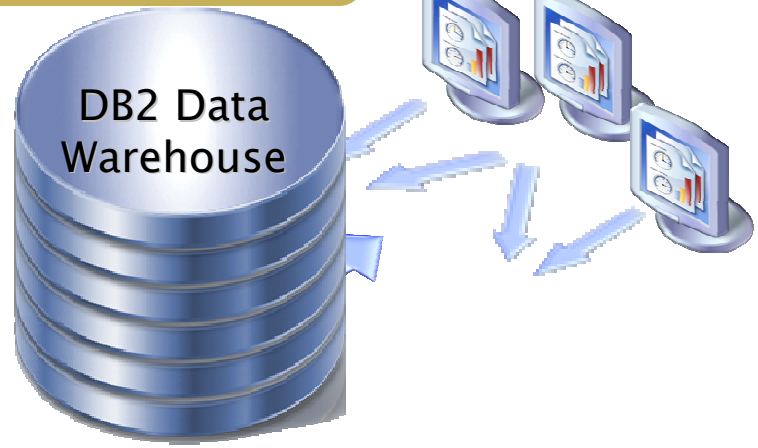
9700 – z196
9710 - z114

DB2 for z/OS VUE V9 or 10, DB2 Utilities Suite V10.1

SPSS Modeler

InfoSphere Warehouse V9.7.3

Cognos 10.1 BI



Implementation Services

Hardware

Can be extended with IDAA

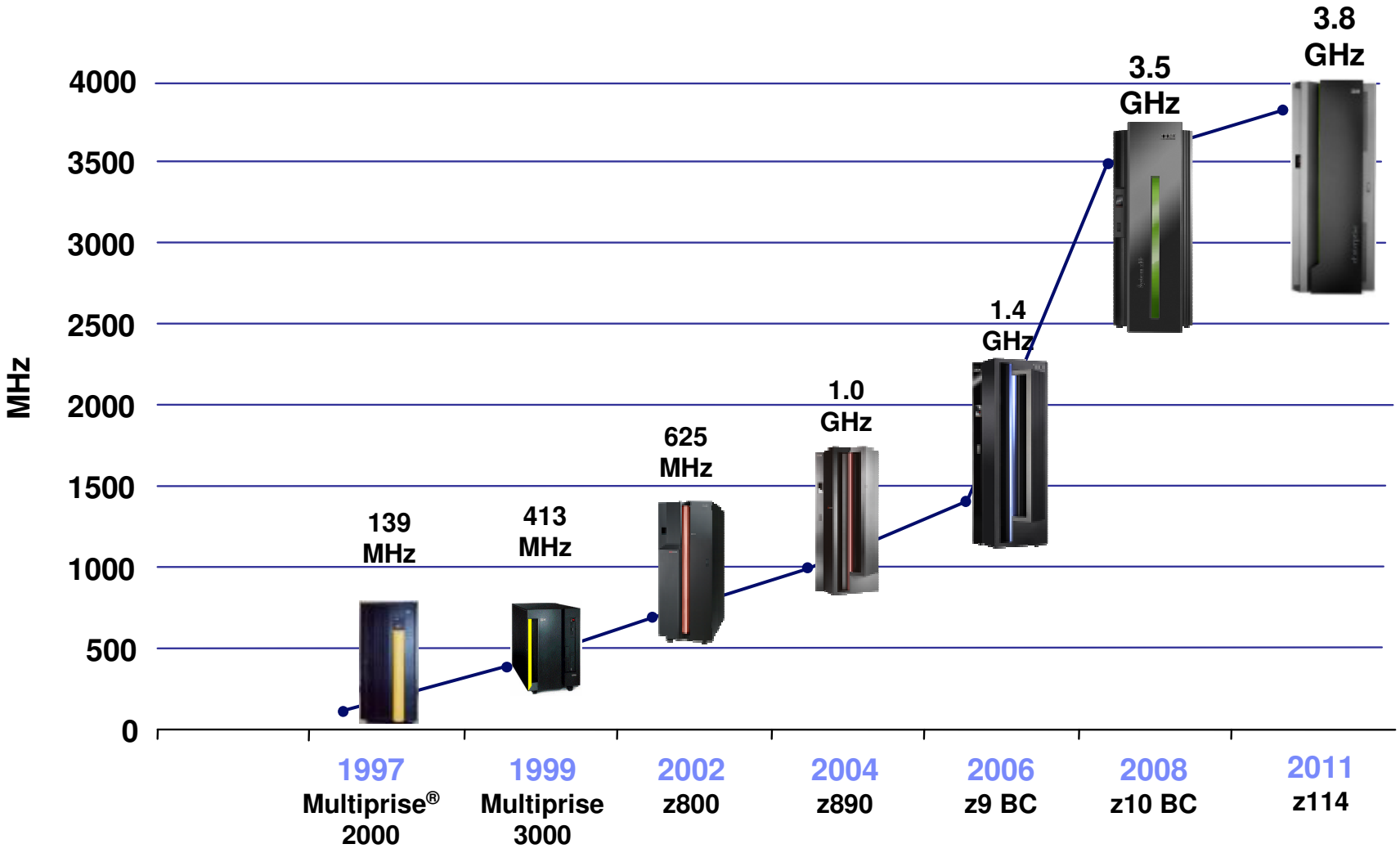
Software

Standard (all SW) or Foundation (DB2 and Utilities only)

Services

Turnkey package - enables customers to rapidly deploy cost effective DWH / BA across their business.

z114 continues the CMOS Mainframe heritage

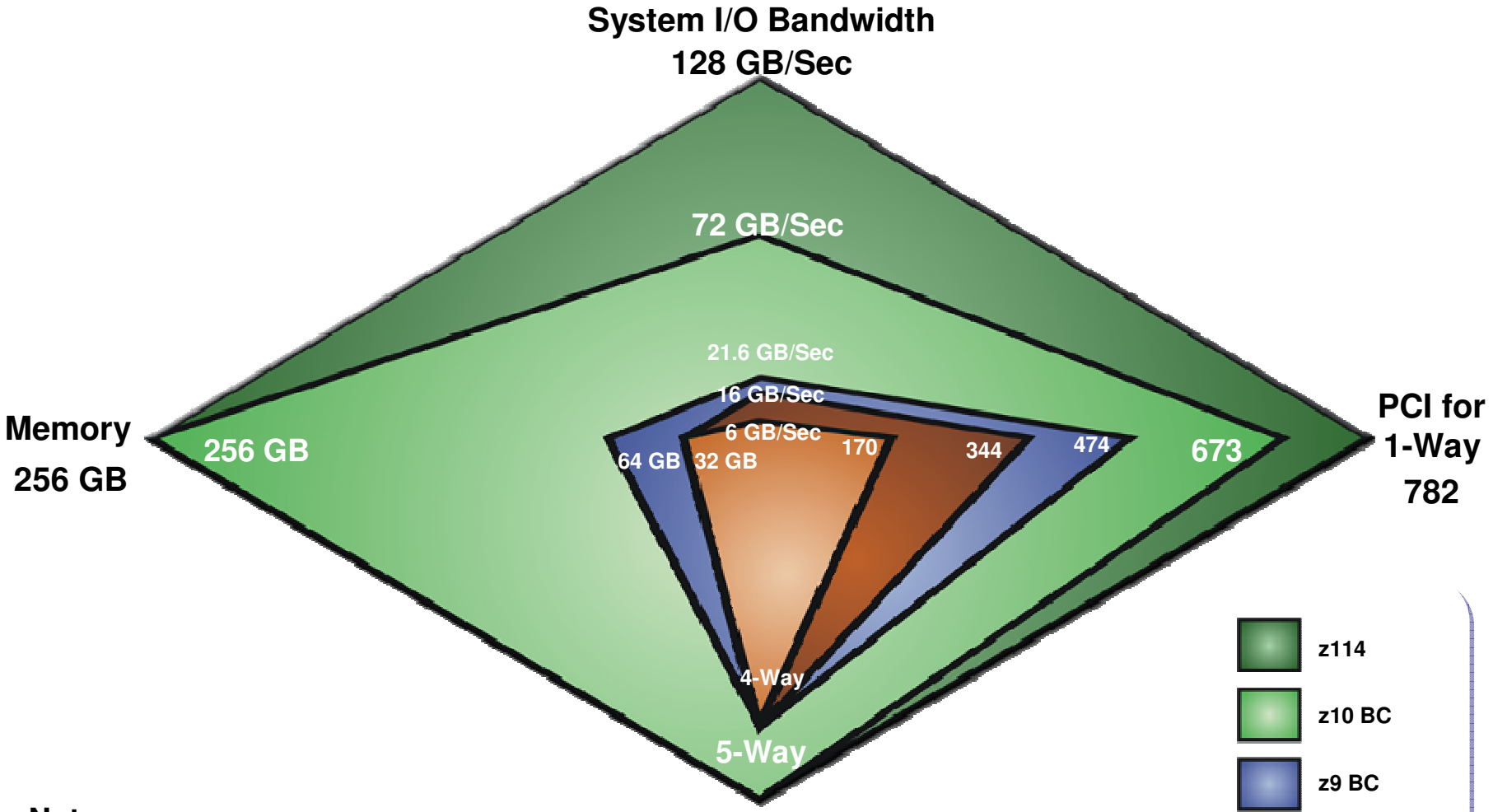


- Multiprise 2000 – 1st full-custom Mid-range CMOS S/390
- Multiprise 3000 – Internal disk, IFL introduced on midrange

- 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

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

IBM zEnterprise Family

IBM zEnterprise 114 (z114)

IBM zEnterprise BladeCenter Extension (zBX)

Unified Resource Manager

IBM zEnterprise 196 (z196)

IBM zEnterprise BladeCenter Extension (zBX)

Unified Resource Manager

IBM zEnterprise family

IBM zEnterprise 196 (2817)

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

IBM zEnterprise Blade Extension (2458)

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

IBM zEnterprise 114 (2818)

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

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zEnterprise 114 Functions and Features (GA Driver 93 – 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
STP enhancements

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
zBX Model 002 with ISAOPT, POWER7, DataPower and IBM System x Blades
Platform Management from HMC

Blue items denote common features between z114 and z196

zEnterprise zBX Functions and Features

One hardware model
zBX is controlled by one specific z196 or z114
Up to 4 Racks (B, C, D and E)
2 BladeCenters Chassis per rack
Non-acoustics doors standard
Optional Rear Door Heat Exchanger
Optional Rear acoustic door
Redundant Power, Cooling and Management Modules
10 GbE and 1000BASE-T Network modules
8 Gb FC modules

Advance Management Module
1000BASE-T and 10 GbE TORs
Up to 112 Blades
IBM Smart Analytics Optimizer
POWER7 Blades
IBM System x Blades*
IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise
HMCs required for Unified Resource Manager
Additional zBX owned HMC required if System maintained by Third Party

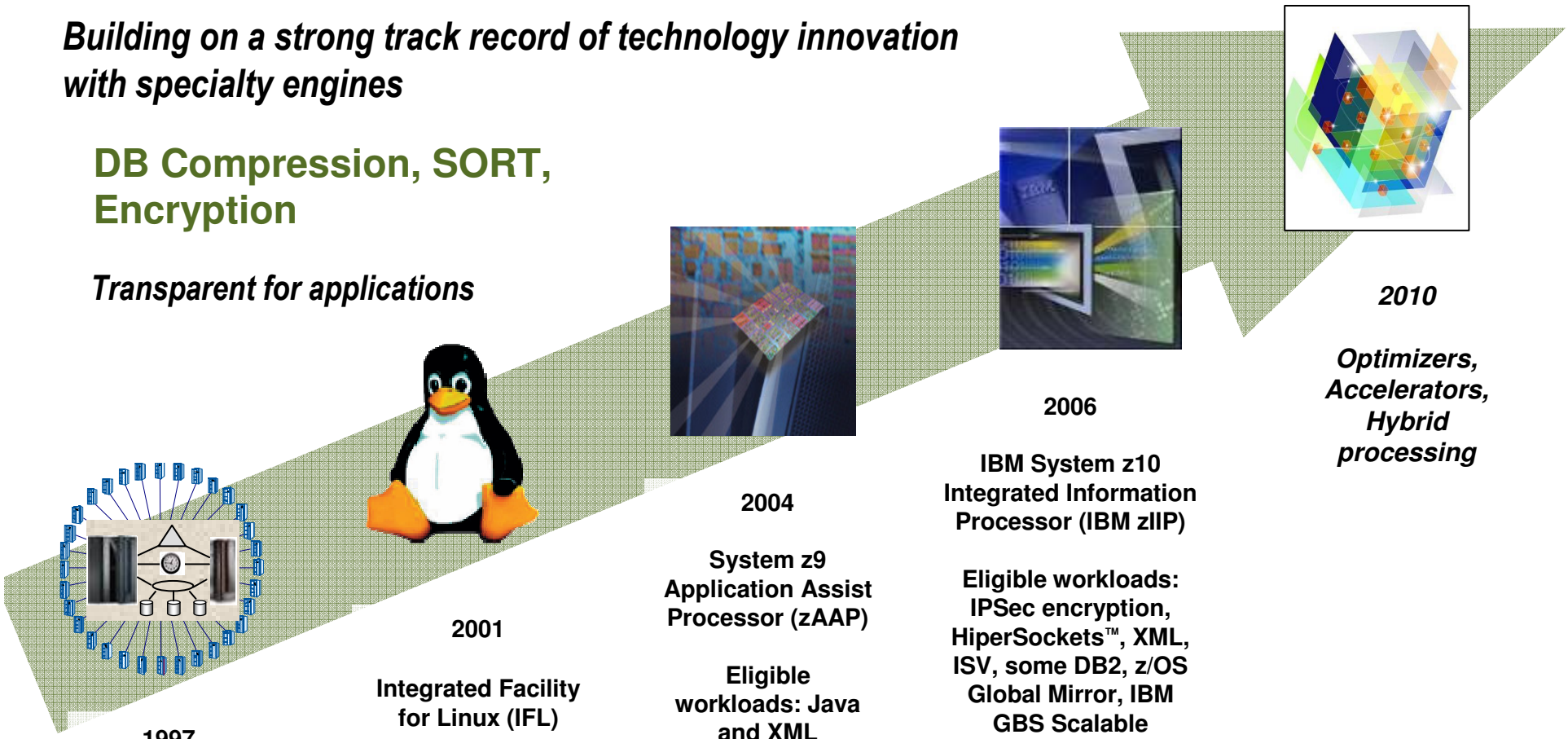
*All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice. Any reliance on these Statements of General Direction is at the relying party's sole risk and will not create liability or obligation for IBM.

The Evolution of System z

Building on a strong track record of technology innovation with specialty engines

DB Compression, SORT, Encryption

Transparent for applications



1997

Internal Coupling Facility (ICF)

2001

Integrated Facility for Linux (IFL)

2004

System z9 Application Assist Processor (zAAP)

Eligible workloads: Java and XML

2006

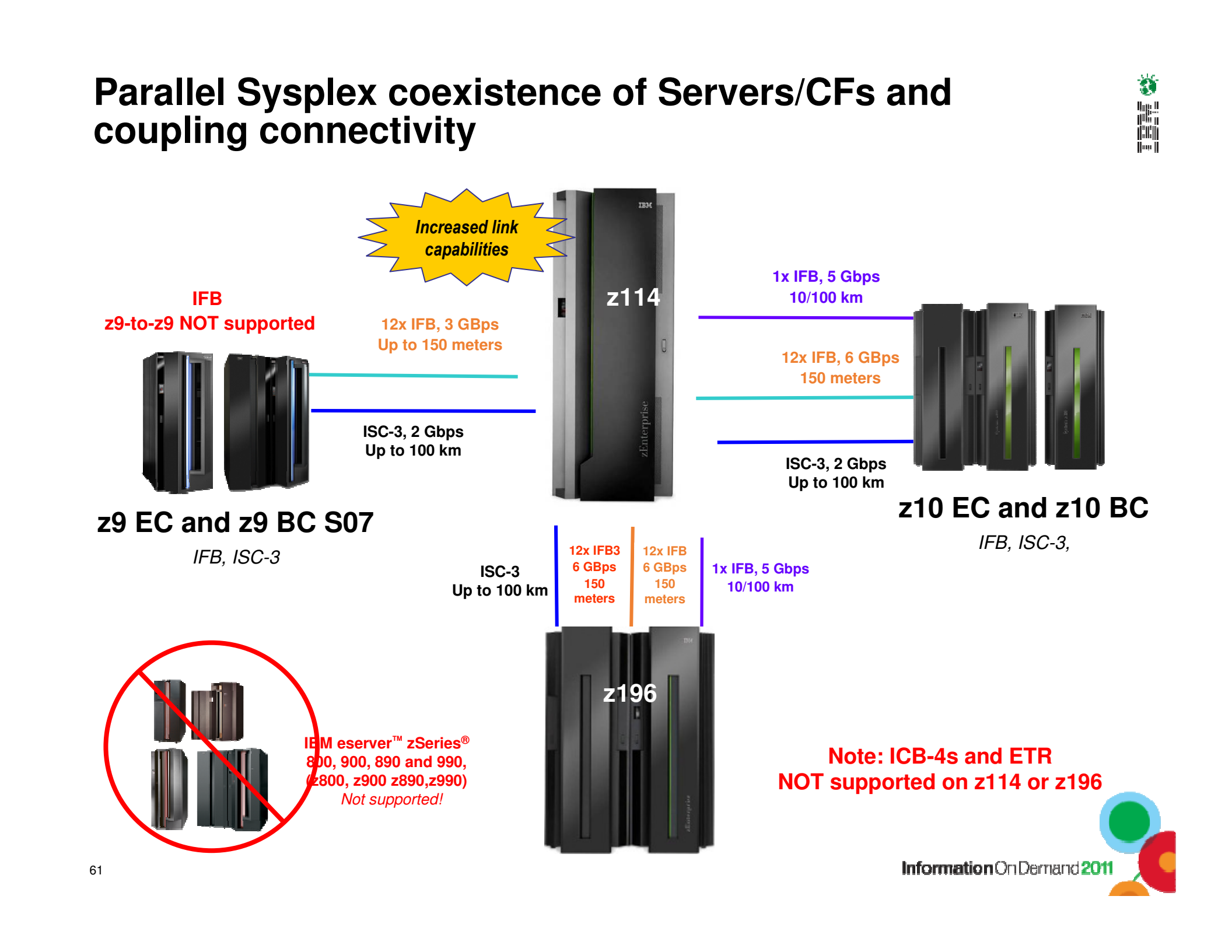
IBM System z10 Integrated Information Processor (IBM zIIP)

Eligible workloads: IPSec encryption, HiperSockets™, XML, ISV, some DB2, z/OS Global Mirror, IBM GBS Scalable Architecture for Financial Reporting

2010

Optimizers, Accelerators, Hybrid processing

Parallel Sysplex coexistence of Servers/CFs and coupling connectivity



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

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 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™**

Operating System Support for z114

- Currency is key to operating system support and exploitation of future servers
- The following are the minimum operating systems planned to run on z114

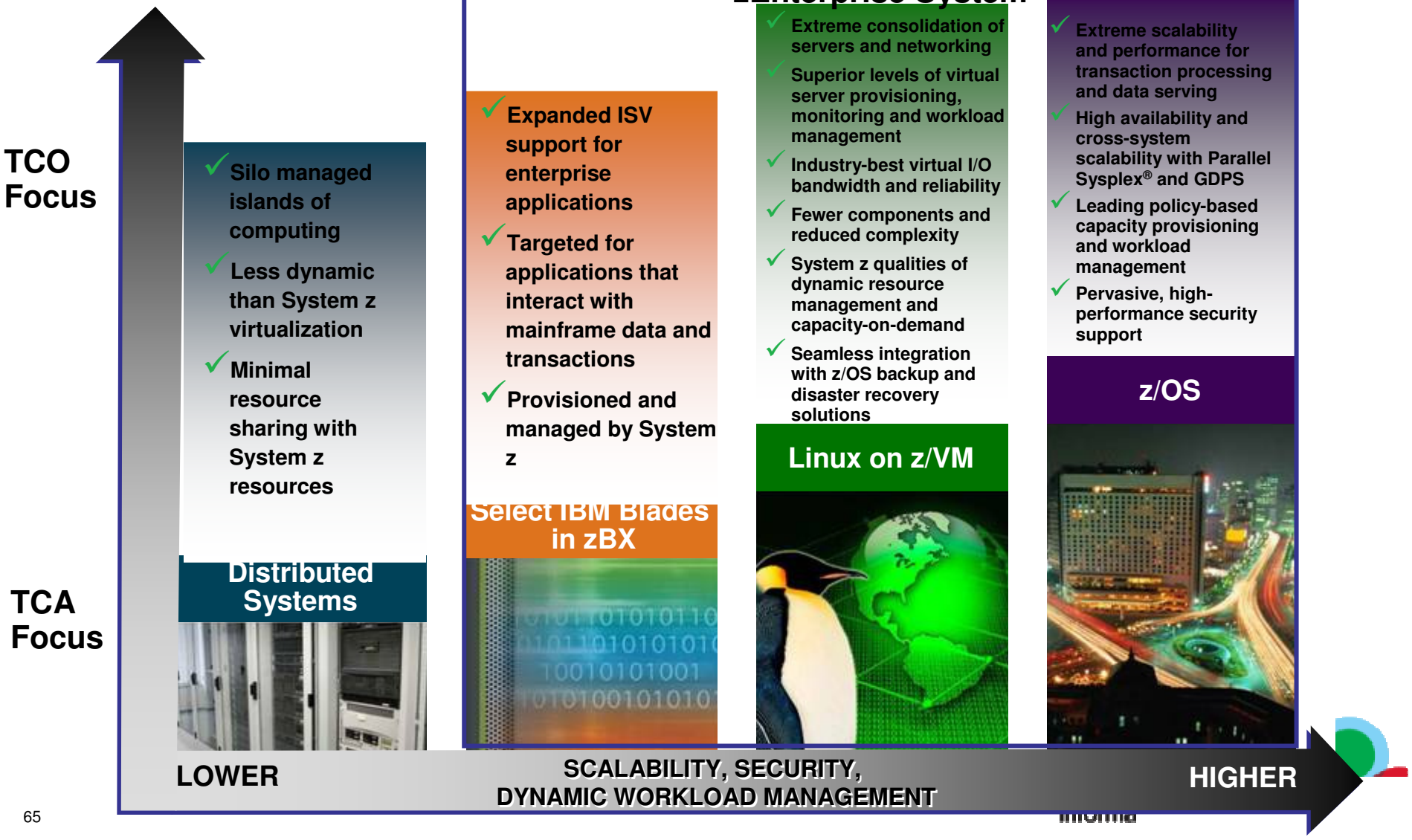
Operating System	*Supported levels*
z/OS	• V1.11, 1.12, 1.13 or higher • V1.10* (requires Lifecycle Extension after September 30, 2011) • V1.8 and 1.9, in Lifecycle Extension • zBX Ensemble support: z/OS V1.10* or higher
Linux	• Red Hat RHEL 5 • Novell SUSE SLES 11
z/VM	• V5.4 • zBX Ensemble support: V6.1
z/VSE	• V4.2 • zBX Ensemble support V4.3 or higher
z/TPF	• V1.1 or higher

* z/OS 1.10 support ends Sept. 30, 2011, and Lifecycle Extension is required after that date.

Providing investment protection while enabling growth

- **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)**

Service Levels to Match Your Business Needs
Increased flexibility for your multi-architecture strategy



A zEnterprise for Everyone
Freedom to choose the "right sized" mainframe to fit your needs.

If you …

…want the flexibility to manage across heterogeneous platform – including z/OS, AIX, Linux on System x, Windows on System x[1]

…are looking for an entry level mainframe with options for traditional capacity settings

… need a smaller mix of special engines (*zAAP on zIIP great option here!)

… have smaller Coupling and/or I/O attachment requirements

… need the lowest cost application development environment.

The z114 M05 may be the perfect option.

If you …

…want the flexibility to manage across a heterogeneous platform

…want to replace your server with one that has the same number of engines – but would like more IFLs, zAAPs or zIIPs

… want to replace your standalone coupling facility or Linux only server with a machine that provides engine, memory and I/O scale out capabilities

… have future growth needs, but prefer grow in smaller increments and want to avoid disruptive outage during upgrade

The z114 M10 is just what you need.

If you …

…want the flexibility to manage across a heterogeneous platform

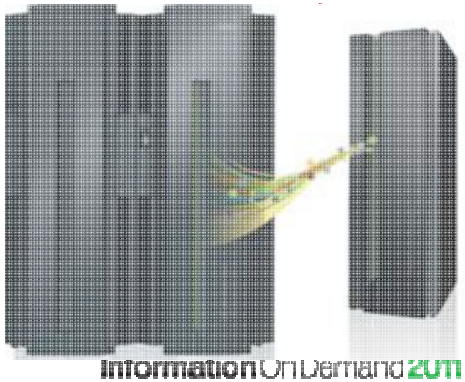
… have a large mainframe capacity requirement or desire for massive consolidation – scale to over 52,000 MIPS in one footprint

… have a large disk installment so in turn have large I/O requirements

… need new ways to address your 'green' requirements – like water cooling and static power save mode

… have a large CBU requirement – and like the control of having your disaster recovery site right in your own shop.

The enhanced z196 is right for you.



Underpinned by a thriving System z ecosystem

Thousands of ISVs invest in System z

7,000+ applications supported on z (**3250+** Linux and **4000+** z/OS)	**1,200** new and upgraded applications on System z in 2010	**120+** new ISV partners added to the platform

"Banks have to be up 24x7x365 in today's market. …System z has a proven track record of high availability both within an implementation and also within an entire enterprise with business continuity and failover capabilities."

– Frank Sanchez, FIS

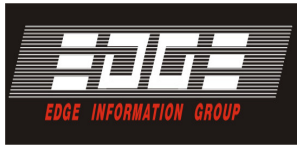
Worldwide adoption of mainframe curriculum

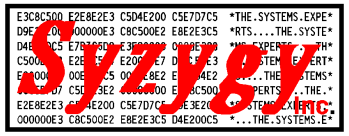
814 schools enrolled with more adding curricula	**32,941 students** from **17 countries** participated in Master the Mainframe contests	**SystemzJobs.com** connects System z clients, partners and businesses with students and professionals seeking z jobs

"The contest allowed us to have a real-world experience with real projects. I feel learning DB2 was one of the reasons I was able to advance to a database-focused job at work."

– Jay Thomas, Pace University

Extensive ISV support for zEnterprise





What is the IBM Academic Initiative?

Membership in the IBM Academic Initiative is free and open to individual faculty members.

A skills initiative – **An IBM program that partners with academic institutions worldwide to build a pipeline of skilled students for the IT jobs of tomorrow and skills for a smarter planet.**

System z Mission **(ibm.com/university/systemz):**

- ✓ **Assist clients world wide with z skills**
- ✓ **Demonstrate IBM's commitment and continued investment in the mainframe**

IBM System z courses

Foundational principles

- **Intro to the Mainframe: z/OS Basics***
- **Intro to the Mainframe: Networking***
- **Intro to the Mainframe: Security***
- **Intro to the Mainframe: Large Scale Commercial Computing**

Operating systems

- **Linux on System z**
- **Introduction to z/VM®**
- **Introduction to z/VSE Basics**
- **UNIX® System Services (Module)**

User interfaces

- **ISPF: z/OS Basic Interfaces**

Storage management

- **VSAM**

Programming languages

- **Assembler**
- **COBOL**
- **JCL**

Other

- **Developing COBOL with Rational Developer for System z V7.6**
- **z/OS Advanced Topics***
- **z/OS Emerging Technologies***
- **z/OS Installation**

Tivoli security, systems, network, and storage management courses

- **IBM Tivoli License Compliance Manager for z/OS 4.2 Implementation**
- **IBM Tivoli System Automation for z/OS 3.1 Introduction and Operations**
- **IBM Tivoli System Automation for z/OS 3.1 Implementation and Administration**
- **IBM Tivoli Workload Scheduler 8.2 for zOS Scheduler's Workshop**

Information, data and transaction management

- **Enterprise Server Data Management**
- **DB2 for z/OS Fundamentals**
- **DB2 Family Fundamentals (Cross product)**
- **DB2 SQL Workshop (Cross product)**
- **DB2 for z/OS Database Admin Workshop, Part 1**
- **DB2 for z/OS Database Admin Workshop, Part 2**
- **DB2 Programming Workshop for z/OS**
- **DB2 for z/OS Application Development**
- **DB2 for z/OS Query Optimization and Performance Tuning**
- **Intro to IMS***
- **IMS Fundamentals**
- **An Introduction to IMS (Textbook reference)**
- **Transaction Management**

***available in audio version**

Application development

- **WebSphere Application Server for z/OS**
- **Intro to IBM WebSphere Developer for z (Web based)**
- **WebSphere MQ for z/OS System Administration**
- **Developing COBOL with IBM Rational Developer for System z**

Diagnosis

- **z/OS RAS and Diagnostics***

eLearning resources

- **Interactive e-Learning Module: *z/OS Basics***
- **Flash Demo: Introduction to Rational Developer for System z**
- **Develop a batch DB2 for z/OS COBOL application using RDz**
- **Developing and debugging a COBOL DB2 application**
- **Editing record-oriented programs with the System z LPEX editor**
- ***Learn about your future in Large Systems***
- ***Careers in Mainframes***

Introducing SystemzJobs.com - *The link to your future career*

The IBM System z Job Board at **SystemzJobs.com** is a new resource that connects students learning IBM Enterprise Systems with companies hiring talent.

Benefits of using SystemzJobs.com

- **Free, secure, and easy to use**
- **Fast access to the best jobs in the IT industry**
- **Global pool of available jobs**

Getting started

Follow these steps at SystemzJobs.com to get started:

1. **Create a secure account (optional)**
2. **Search for jobs with your preferences**
3. **Connect with employers**

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Visit: **ibm.com**/university/systemz

Questions? Contact zSkills@us.ibm.com

Market Reaction to the z114

"Oracle was actually helping IBM revitalize the mainframe market … **Suddenly the IBM System z looks far more attractive than the Oracle/Sun alternatives** … **Rather than create complexity and then create tools to reduce it, why not start out with a less complex solution?** System z has simply turned out to be more elegant**."**

-- Rob Enderle, Enderle Group

"With the z114, IBM can now deliver a more compelling total cost of acquisition (TCA) case, giving midrange enterprises another option as **they consolidate, virtualize, and migrate their sprawling server farms. This will be particularly interesting to shops running HP Itanium or Oracle/Sun servers.**"

-- Alan Radding, Independent Assessment

"In fact, the zEnterprise hybrid computing model may be even more beneficial and impactful to small and mid-sized organizations as **'the dream machine' – providing the ability to integrate and manage classic mainframe with AIX, Linux on System x and, soon, Windows workloads**!"

-- Steve Bartlett, The Clipper Group

"… The business benefits will include rapid deployment of new workloads to meet changing business conditions and faster time to decision based on faster processing of large amounts of data. IT will gain in efficiency by being able to leverage small IT groups to deploy, manage, and maintain more workloads, improving IT staff productivity."

-- Jean Bozman and Tim Grieser, IDC

"The new z114 aggressively attacks the 'mainframes are too expensive' argument with significantly reduced hardware, software, and maintenance pricing – and with bundled Solution Edition pricing … **For these reasons, we believe IT executives considering migrating away from Oracle's SPARC- and Hewlett-Packard (HP) Itanium-based servers should** look very closely at IBM's new z114! … this 26 to 3,100 MIPS box will be just what the doctor ordered for HP and Oracle-Sun server customers**."**

-- Joe Clabby, Clabby Analytics

Market Reaction to the z114 continued…

"The IBM zEnterprise hybrid computing solution, which links the IBM System z mainframe with IBM Power and System x blade servers, **optimizes the performance of multi-tier workloads that have an affinity to mainframe applications and data**. It focuses on analytics, business intelligence, decision support and end-to-end workloads that tap scalable databases running on System z. With the introduction of the **IBM zEnterprise 114, this hybrid computing solution is being brought to much lower price points, enabling mid-sized organizations and departments of large enterprises to improve the deployment and management of these workloads**."

-- Jean S. Bozman, IDC Enterprise Platforms Group

"Enterprises of all sizes need to take a close look at how the z114 might help **lower their total cost of computing while increasing their qualities of service delivery**."

-- Mike Kahn, The Clipper Group

" … A modern mainframe is making inroads **as a consolidation option** for modern Linux workloads, including server consolidation."

-- Phil Murphy, Forrester

"The tech giant hopes the zEnterprise 114, which starts at under $75,000, will be an attractive option for emerging markets like Africa. … the offer marks IBM's lowest ever price for a mainframe server**."**

– Dow Jones

Extending the Hybrid model

A new entry point for hybrid computing

Introducing the IBM zEnterprise 114, specifically designed for mid-sized businesses

Increased flexibility to deploy and manage zEnterprise

New APIs for the Unified Resource Manager[1] enables end-to-end management of services and infrastructure

Extending the boundaries of hybrid computing

Adding support for System x blades for Linux and Windows* along with Linux on z, AIX®, z/OS, z/VSE®, z/VM®, and z/TPF gives new flexibility for workload deployment

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

Deploy Multi-tier workloads on a single integrated system

Create an integrated infrastructure that aligns to end-to-end business processes across technology boundaries

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

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

IBM zEnterprise System – What's New?

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

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

- Performance improvements for High Performance FICON for zEnterprise (zHPF)
- Updated GDPS® disaster recovery support for zEnterprise environment
- xDR extension to support z/VSE®
- And much more ….

zEnterprise Unified Resource Manager

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

zEnterprise BladeCenter® Extension (zBX)

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

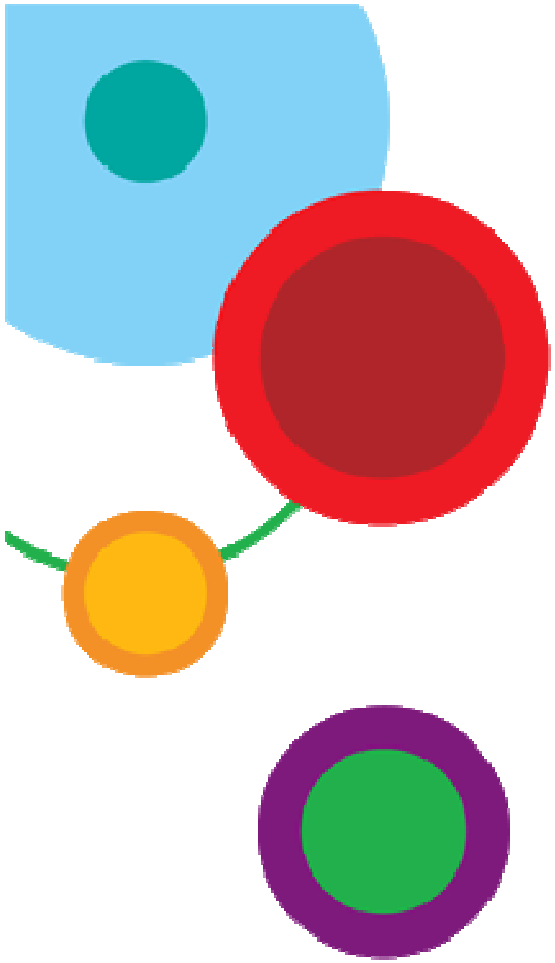
Summary

Introducing the next capabilities in the evolution of zEnterprise

Is your business positioned to leverage the best platform for each workload?

- **NEW! IBM zEnterprise 114 (z114)**
  A new entry point for hybrid computing with a 25% lower entry hardware cost than z10 BC
- **NEW! Delivering APIs to enable management of Unified Resource Manager from external tools[1]**
  Increased flexibility to deploy and manage enterprise clouds
- **NEW! System x blade support for Linux integrated into zEnterprise – and Windows[1] support**
  Enables more choices for optimal deployment of workloads on best fit architecture for efficiency and innovation
- **NEW! IBM Implementation Services for System z – zEnterprise Setup and Migration**
- **NEW! IBM zEnterprise 114 Financing Offer**
  Acquire z114 today – defer payments until 2012

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



What's new with z/OS and z/OS Management Facility Version 1 Release 13

Agenda

- z/OS® and z/OS Management Facility function and value
- Integration with IBM zEnterprise™ System

z/OS Management Facility – the new face of z/OS

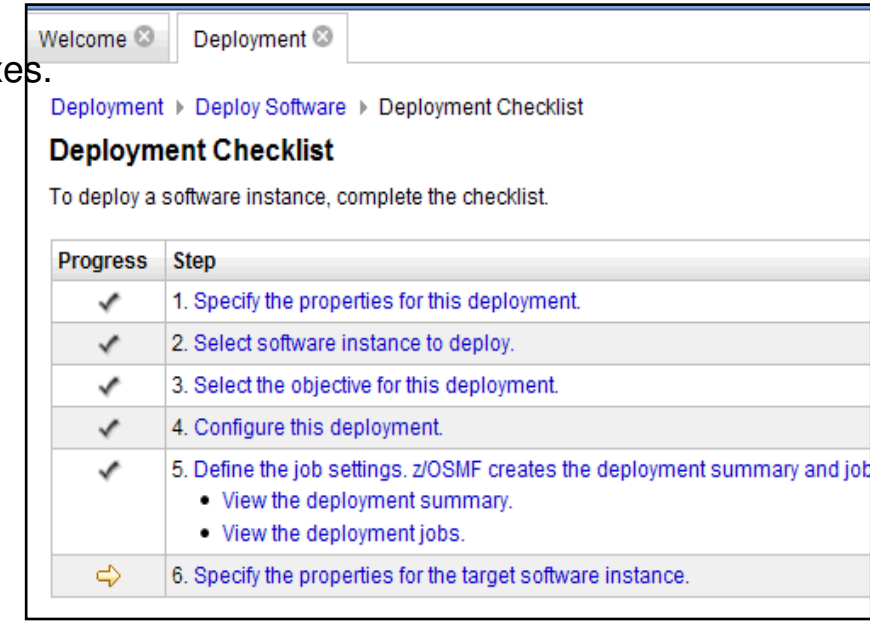
Streamlined processes and built-in guidance address a broad scope of activities and helps create a more integrated z/OS experience.

- **Configuration**
  - Configuration Assistant for z/OS Communication Server (R11) – Simplified configuration and setup of TCP/IP policy-based networking functions
- **Performance**
  - Capacity Provisioning (R13) - simplified monitoring of CP status for domains
  - Resource Monitoring and System Status (R12) – single view of sysplex and Linux® performance status and dynamic real time resource metrics.
  - Workload Management – creation, editing, and activation of WLM policies (R12)
- **Problem Determination**
  - Incident Log (R11) – Simplified capture, packaging, sending of SVC dump diagnostic data
- **Software**
  - Deployment (R13) - Clone z/OS images, deploy software more easily and consistently
- **Storage**
  - DASD Management (R13) - Define new SMS storage volumes quickly and easily*
- **z/OS Classic Interface**
  - ISPF Task integrates existing ISPF into z/OSMF to launch to ISPF functions directly (R13)
- **Base**
  - A new web-based (REST) interface enables you to submit batch jobs and access batch data from non-z/OS systems (R13)
  - Leverage IBM System z® Specialty engines
  - IBM Assistance available to help with pre-planning, early discovery, and readiness review for new z/OSMF environment

* The DASD Management task is planned to be made available in 1Q 2012 with the PTF for APAR PM40869

z/OSMF Software Deployment (R13)
New! - simplified deployment of installed software

- **New task designed to make deployment of installed software simpler and safer.**
  - Easy to follow checklist replaces manual and error prone procedures with a user friendly application
  - Incorporates IBM recommended best practices for software deployment.
- **Software Deployment can clone software**
  - Locally, single system or within a sysplex
  - Remotely, across a network, and multiple sysplexes.
- **Software Deployment can also:**
  - Identify, modify, delete software instances
  - Generate jobs to copy a software instance
  - Verify cross-system and cross-product requisites, verify fixes
  - Copy ALL parts of the software (SMP/E CSI inventory too)
- **Clones all SMP/E installed software!**
  - IBM, ISV, z/OS, stack or individual products
  - Service upgrades for all of the above (via complete replacement)



z/OSMF DASD Management* (R13)

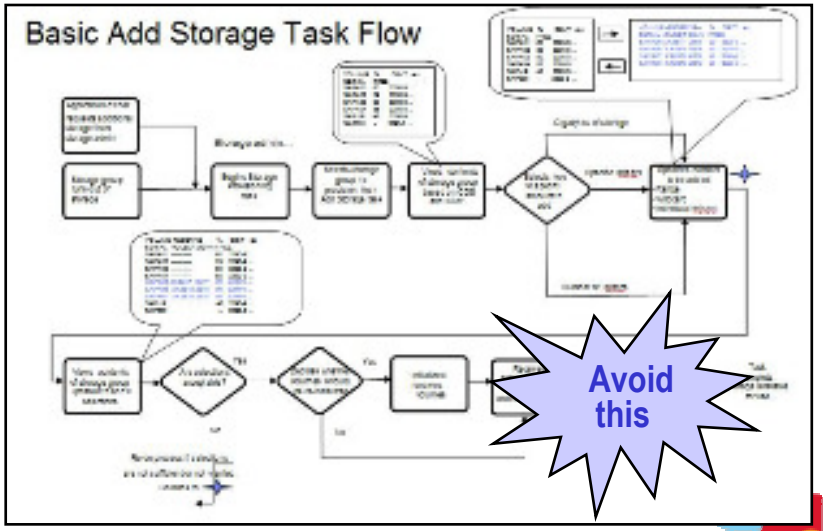
New! - The first phase in simplifying storage management

- **Add storage to an SMS Pool storage group through a single user interface**
  - Easier, with less SMS skill needed

- **Manage containers of pre-defined available volumes with the introduction of the reserve storage pool resource.**

- **Display new pool storage group attributes**
  - View the list of pool storage groups associated with the active configuration
  - View an alert when the Storage Utilization Notification Threshold is exceeded
  - Display storage group level attributes
  - View volumes associated with a storage group
  - Display volume level attributes

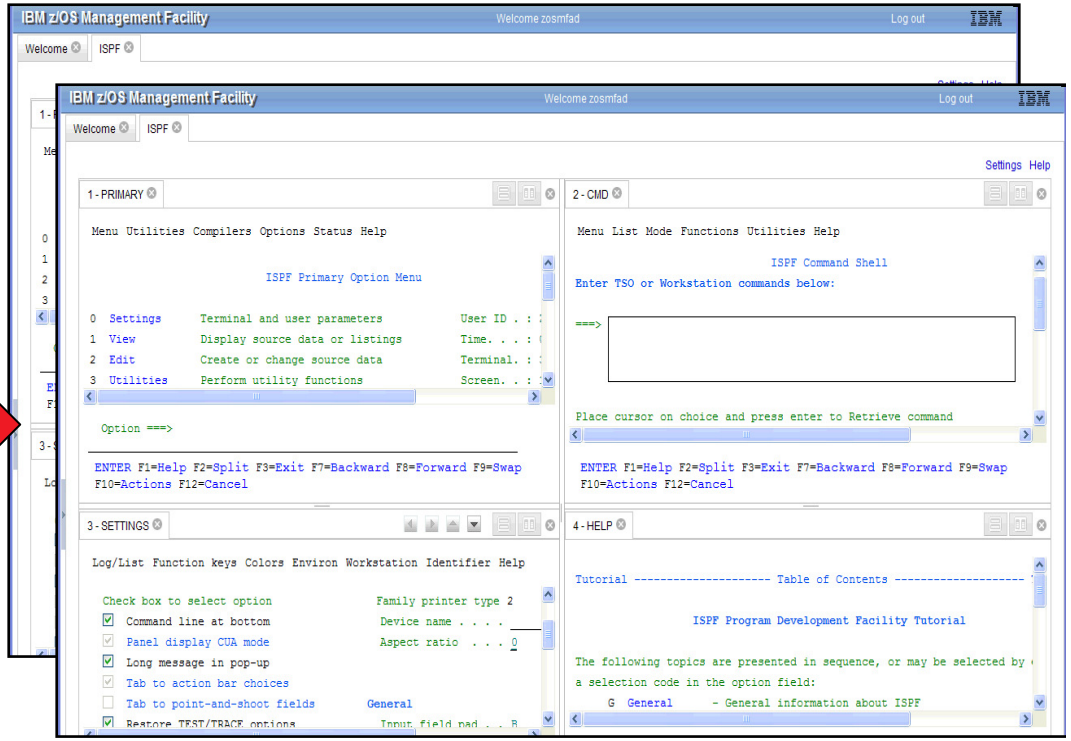
- **Select the AddStorage Wizard to guide you through steps that can simplify the task of adding storage to a storage group**



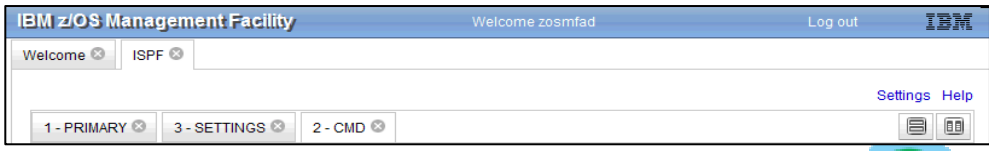
*Planned to be made available in first quarter 2012 with the PTF for APAR PM40869

z/OSMF and ISPF (R13)
New! - Work with existing interfaces

- **Enables system programmer to perform tasks from one interface.**
  - Also makes ISPF applications URL Web-accessible for linking and launching from other applications



- **Up to 4 panes**
  - Panes can be sized. Each pane can have multiple ISPF sessions, tabs can be moved between panes
  - Shows ISPF Menu bar, Command line, Function keys
  - Open and cascade multiple windows



- **Also available in tabbed format**

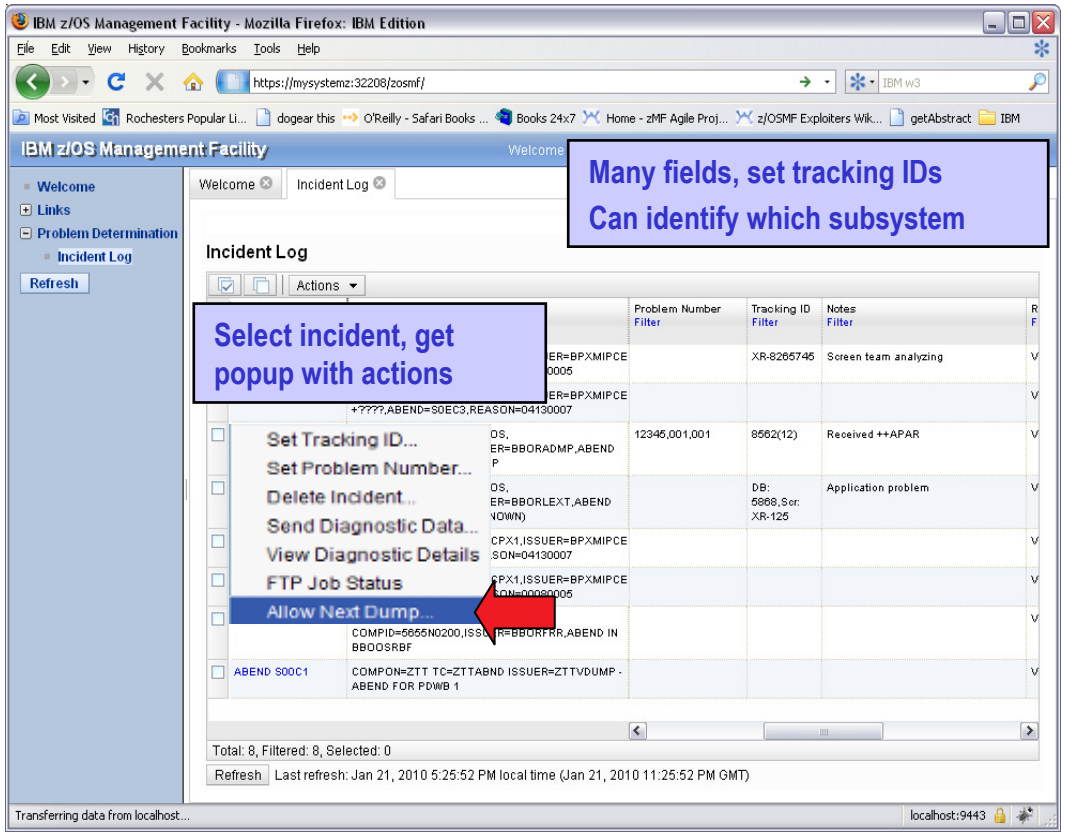
z/OSMF Incident Log (R11)

Save hours of time when diagnosing incidents

- **Respond to and manage incidents quickly and efficiently**
  - View, sort, and act on incidents (identified by subsystem)
  - Package dump data for transmission in minutes

- **For z/OSMF R12**
  - Add additional comments and diagnostic data
  - Encrypted parallel FTP of the incident files, to IBM .
  - Sending additional user-defined data with an incident

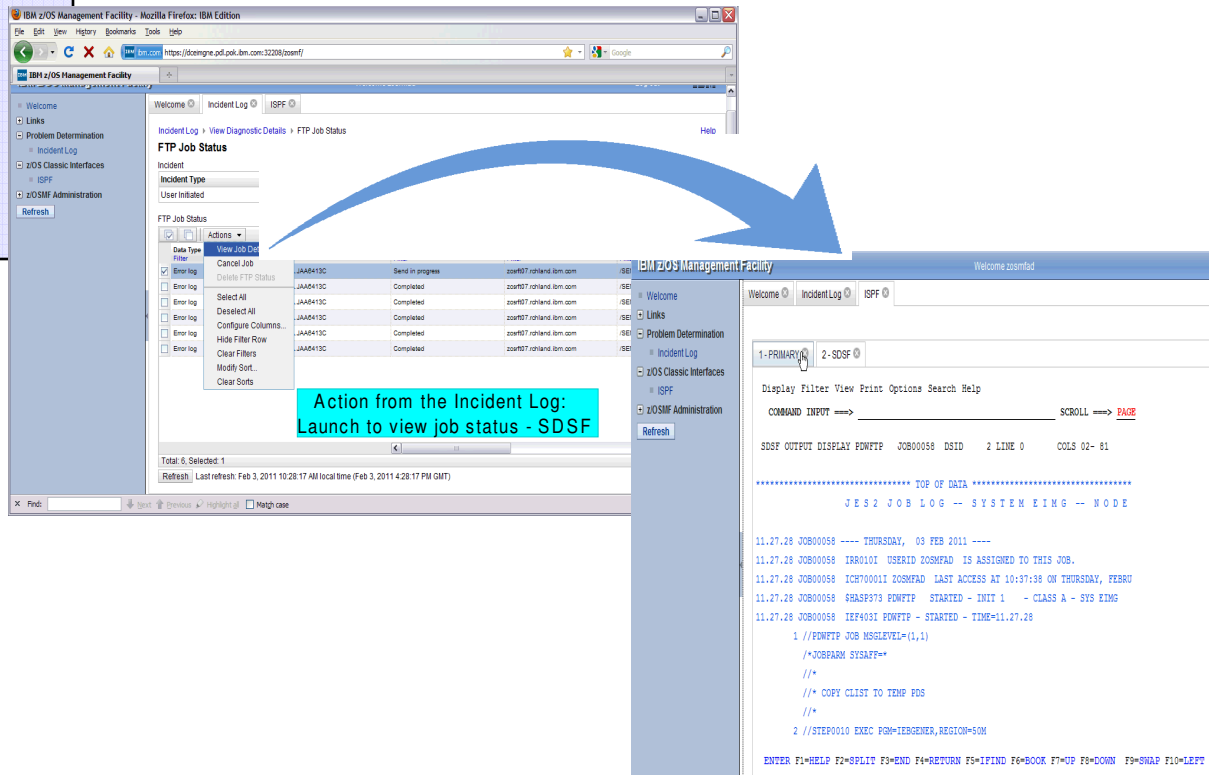
- **For z/OSMF R13**
  - New APAR search
  - View job status via SDSF launch
  - Utilizes new Problem Documentation Upload utility in base of z/OS R13
  - Also available as a download from http://www14.software.ibm.com/webapp/set2/sas/f/zaids/pduf.html



Note, screen capture from z/OSMF R12

Application Linking (R13)
Example, link Incident Log to SDSF in context

- **A more seamless experience when working with z/OS.**
- **Make your own linkages between z/OSMF apps and even to any web-based apps**

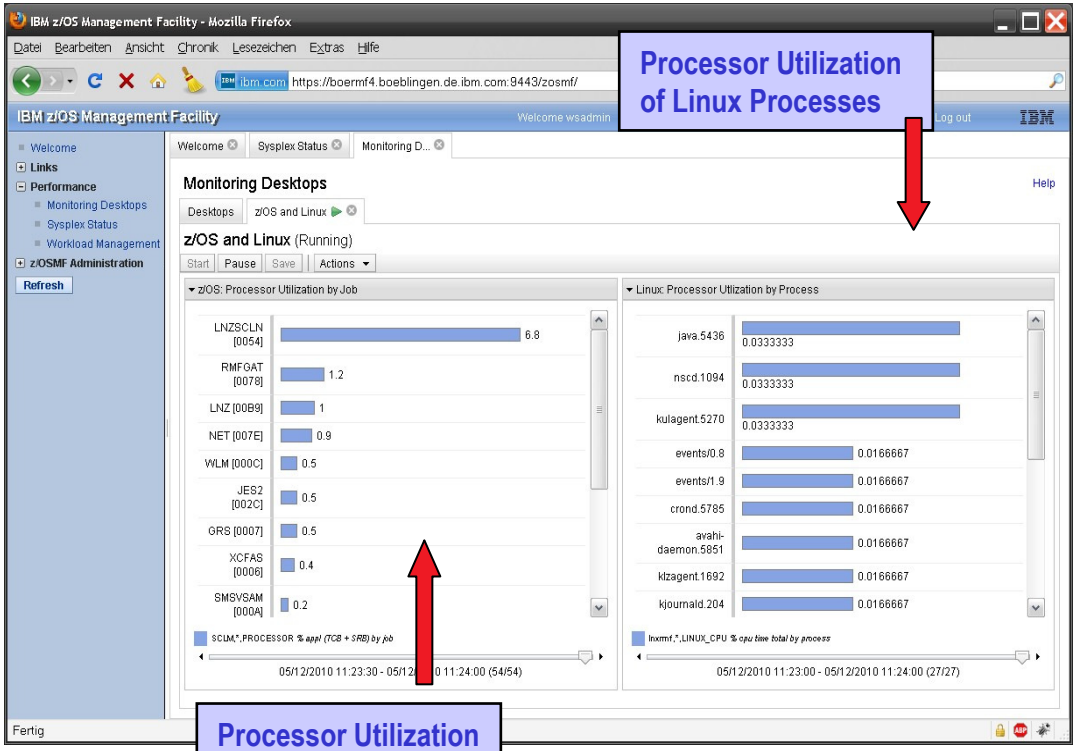


- Define an ‘event’ (such as “View Job Status”)
- Then define the ‘event handler’ action and parameters (such as ‘go to ISPF’ with context of the job)

Integrated z/OS and Linux resource monitoring
A monitoring solution for multi-tier workloads

- **Monitor the resources for z/OS and Linux workloads**
- **Ideal for use with System z Enterprise System**

- **For z/OSMF R12**
  - Use separate as-is, no-charge web-download tool to gather resource information for Linux systems.
- **For z/OSMF R13**
  - New integrated performance data gatherers for Linux on System z, Linux on IBM System x®, and AIX® systems
  - Additional monitoring capabilities for your zEnterprise System



Note, screen capture from z/OSMF R12

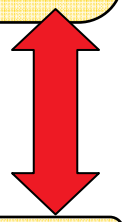
New programmatic interface for z/OS batch
Function delivered with z/OSMF R13

- **A new REST API (HTTP(s)-based) interface to z/OS**
- **Easy programmatic access to the power of z/OS batch capabilities**
  - REST API web services can be used by: web applications (javascript/AJAX, Flex(Flash), etc) and other web service clients, such as Java, PHP, Perl, etc
  - The REST API web service will connect to both JES2 and JES3, as well as select secondary subsystems

Today:
Complex programming
- Allocate and open internal reader
- TSO/ISPF submit,
- FTP "interface-level2"
- Java z/OS submit interface

Security protocol limitations

New option today
- Any web-based, Java, PHP, Perl application, etc. supporting HTTP
- New RESTful HTTPs based API
- Highly secure, firewall friendly,
- Simplified text-like programming



Break the barriers of batch
Submit JCL, get status, retrieve output files, change jobclass, cancel job, purge job

z/OS JES2 and z/OS JES3

z/OS R13 - The foundation for modern batch

- **About 90% of customers consider batch mission critical***
- Challenge: Greater volumes of data and larger batch and on-line processing windows.
- Solution: Need to make batch more efficient.

- **Expand existing COBOL applications with Java!**
  - More choice for application development skills
  - Leverage specialty engines!
- **Simplified programming!**
  - Enhancements in z/OS simplify the development and maintenance of existing batch applications.
  - Enable distributed applications to access the power of z/OS batch
- **Shorter batch windows!**
  - New function in z/OS helps make batch processing more efficient
  - "Pipe" data between two batch jobs to enable these jobs to perform concurrent reads and writes
- **Real time batch!**
  - WebSphere® Compute Grid delivers a batch environment capable of supporting 24x7 batch and OLTP processing, and parallel computing

* IBM Market Research

z/OS R13 - The foundation for modern batch (detail)

- **Expand existing COBOL applications!**
  - The z/OS Batch Runtime environment, provides Java-to-COBOL interoperability, for transactional updates to DB2®, and for sharing database connections between Java and COBOL (R13)*
    Ideal for processing for computationally intensive programs and extensions
  - Use JZOS Batch Toolkit for z/OS for efficient use of z/OS System interfaces for Java batch (IBM Java SDKs for z/OS)
  - Leverage specialty engines!
- **Simplified programming!**
  - JES2 JCL enhancements provide in-stream data in catalogue procedures, more options on setting job return codes, and the ability to stop and hold a job at the end of a step (not just at the end of the job) give much more granularity and control (z/OS R13)
  - An new REST API allows you to submit z/OS batch jobs and retrieve z/OS batch job information from distributed systems as well as z/OS systems; and is intended to make z/OS batch processing much more accessible to distributed systems and web-based processes (z/OS and z/OSMF R13)
- **Shorter batch windows**
  - Allow overlapping processing for multi-volume data sets (FREEVOL=EOV, R13)
  - Avoid recalling migrated datasets, just to delete them (IEFBR14, R11)
  - “Pipe” data between two batch jobs to enable these jobs to perform reads and writes concurrently (BatchPipes®, 5655-D45)
- **Real time batch**
  - WebSphere Compute Grid delivers a resilient, highly available, secure, and scalable runtime with container-managed services for batch applications
  - Capable of supporting 24x7 batch and OLTP processing, and parallel computing

* Prerequisites:
IBM 31-bit SDK for z/OS, Java Technology Edition, Version 6.0.1 (5655-R31)
DB2 V9.1 for z/OS (5635-DB2) or later with PTFs
IBM Enterprise COBOL for z/OS V4.1 (5655-S71) or later

Additional z/OS R13 simplification enhancements

- **Health Checker Framework, updates**
  - Greater ability to schedule health checks
  - Ability for checks to raise message severity as conditions change
- **New health checks:**
  - Two new checks for Allocation – intended to warn about potential Allocation deadlock conditions
  - Detects tape library initialization errors with suggestions on how to resolve.
- **New Migration checks for:**
  - zFS configuration options, new symbolic links, z/OS console mode of operation
- **DFSMSrmm™, updates:**
  - NEW automatic recovery for missing our out-of-sequence tape volumes. For multivolume data sets, DFSMSrmm will attempt to return the corrected list
  - New ability to specify data sets by expiration date or VRS policy management. Help simplify retention policies, avoid batch VRS policy management, and enable you to determine how long a tape data set will be retained
- **DFSMSdfp™ updates:**
  - New includes the explanatory text for Open, Close, and End of Volume error conditions along with the error message.
- **SMF dump improvement for log streams** (SMF dump to log stream introduced with z/OS R9)

z/OS Availability Enhancements

- **Availability enhancements (with R13)**
  - **Avoid JES2 re-starts** with JES2 dynamic spool migration, rapidly discontinue and drain spool volumes quickly
  - **Avoid JES3 re-starts** with JES3 dynamic spool add
  - **Improved channel recovery** - track errors and automatically remove failing paths (on a controller level) faster
  - **zFS internal restart** - automatically recover disabled aggregates in Sysplex aware mode – avoiding lengthy manual system recovery process.
  - **Automatic rerouting and recovery of z/OS system name server resolver**
  - **Concurrent service for DADSM and CVAF and DADSM dynamic exits** – avoid planned outages

z/OS Predictive Failure Analysis and Runtime Diagnostics

- **z/OS PFA checks intelligently analyze the rate and trends of specific z/OS system resources and report on z/OS system anomalies. Potentially helping you to identify and avoid failures. PFA checks analyze:**
  - Common storage usage checking (R10)
  - LOGREC arrival rate detection (R10)
  - Frame and slot usage checking (R11)
  - Message arrival rate detection (with z/OS R11)
  - SMF Message Arrival rate detection (R12)
  - ENQ and SPOOL utilization tracking (R13)
  - **Additional customization** (R12)
    - You can specify atypical jobs and address spaces to be excluded from learning algorithms

- **Runtime Diagnostics helps you to pin point the source of a 'soft failure' by looking at z/OS system resources in real time and reporting on areas of contention. RTD checks for:**
  - Select critical messages in the Operlog (z/OS R12)
  - Address spaces with high CPU usage or which might be in a loop (z/OS R12)
  - Address spaces suspended in local lock contention (z/OS R12)
  - System address spaces that are ENQ "waiters" (z/OS R12)
  - Evaluates GRS latch and z/OS UNIX System Services file system latch contention (z/OS R13)
- **Autonomics (R13)** - RTD is automatically invoked from PFA when PFA detects very low SMF arrival rates, RTD problem notification sent to PFA. (R13)

z/OS Availability Enhancements
Parallel Sysplex updates for R13

- **Fully shared zFS in a sysplex!**
  - **Between 50% (1.5x) and 150% (2.5x)* I/O performance improvement** for any z/OS UNIX workload using shared zFS in a Parallel Sysplex®. Applications that use zFS, such as z/OS UNIX System Services and WebSphere Application Server for z/OS, are expected to benefit
  - Also: Less-disruptive recovery from most internal zFS problems (for both single system and sysplex-aware systems)
  - Also: A new health check for zFS configuration files
- **Simplified software deployment – clone z/OS and software in a sysplex (z/OSMF R13)**
- **Eliminate the need for WebSphere MQ for SDSF Sysplex environments.**
- **Automatic monitoring, takeover, and recovery to prevent CSM-constrained conditions**
- **NEW Easier to use XCF signaling protocol**
- **Updated volume information on all systems in the sysplex when DFSMSdss™ or DFSMShsm™ Fast Replication Backup and Recovery processing complete**
- **More responsive to VIPA changes**
- **Workload balancing of IPsec IKEv2 and IPv4.**

* I/O performance improvements measured for fully shared zFS ranged from very small to 900%, with the majority of workload conditions tested falling between 50% and 150%. The actual amount of improvement will depend on the environment (monoplex or Parallel Sysplex) and the type of file processing being done.

NEW suite of GDPS solutions

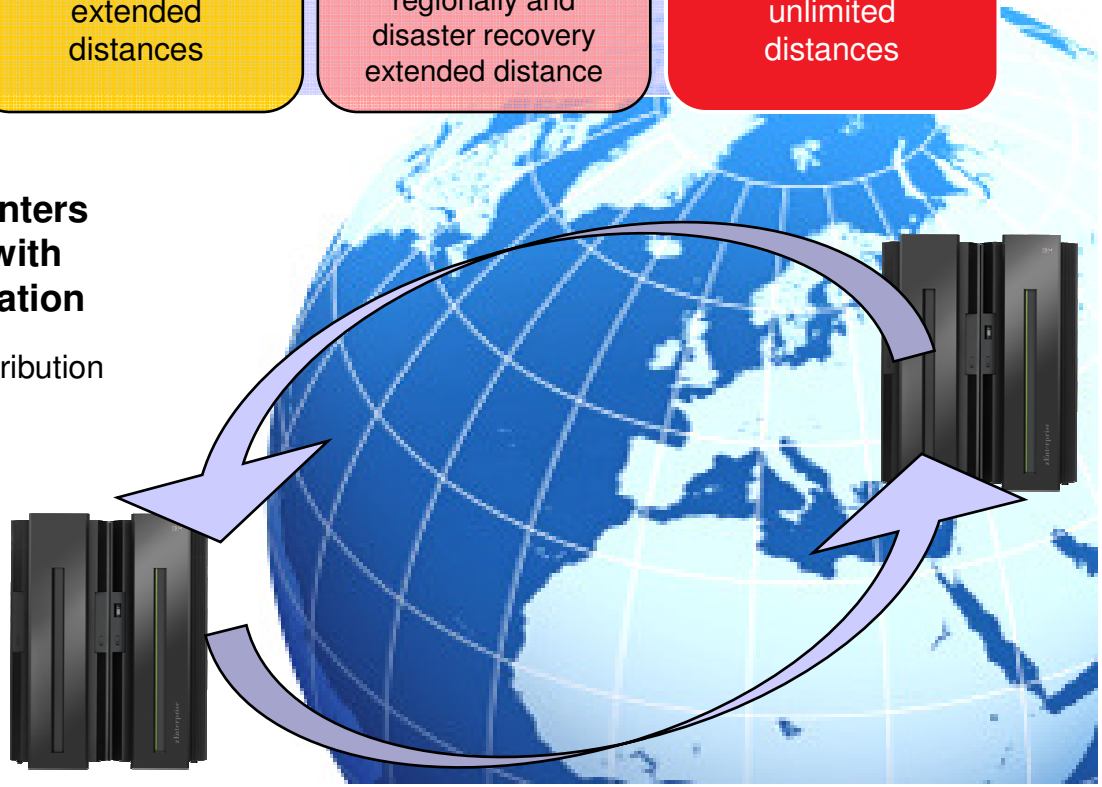
IBM GDPS active/active continuous availability family of solutions is the next generation of GDPS

IBM Geographically Dispersed Parallel Sysplex (GDPS)

GDPS/HyperSwap™ Manager Continuous availability of data within a data center	**GDPS/PPRC** Continuous availability or disaster recovery within a metropolitan region	**GDPS/GM GDPS/XRC** Disaster recovery at extended distances	**GDPS/MGM GDPS/MzGM** Continuous availability regionally and disaster recovery extended distance	**GDPS active/active** Near-continuous availability across unlimited distances

GDPS/ A-A concept: two or more data centers running the same applications and data with cross-site workload balancing and replication

- z/OS workload monitoring, management, and distribution
- z/OS data and transaction replication
- GDPS automation
- First configuration is ‘Active Standby’



IBM GDPS active/active continuous availability family of solutions
The next generation of GDPS.

- Challenge
  - Multi-site, global-distance solutions may take up to an hour to recover full application availability at the remote site.
- What's New
  - GDPS/ Active-Active solution, Active Standby configuration*
  - Designed to provide continuous availability for two or more sites separated by global distances and achieve Recovery Time Objective of 1 minute or less**
  - Statement of Direction for Active Query configuration***
- Value
  - Automated recovery of z/OS applications means recovery can be faster and without human error
  - A complete solution for continuous availability (consulting, design, implementation, and maintenance) means piece of mind for you
  - Continuous availability over global distance sites helps meet more stringent audit and legislative compliance requirements

** Active Standby is the first configuration available under the GDPS/Active-Active family of solutions. Additional IBM software prerequisites required*
*** Recovery Time Objective (RTO) is a definition of the amount of time it takes from the initial disaster declaration to having critical business processes available to users. Less than one hour RTO is based on use of IBM best practices and includes the time it takes to: IPL an LPAR, reconfigure disk, reconfigure coupling facility and CF structure, apply System z Capacity Back Up, as well as switching network connections.*
****All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives o*

z/OS R13 Performance for many key workloads

- **Between 50% and 150%* I/O performance improvement for any z/OS UNIX workload using shared zFS in a Parallel Sysplex**.
  - Applications that use zFS, such as z/OS UNIX System Services and WebSphere Application Server for z/OS, are expected to benefit
- **Between 15% and 55%* IEBCOPY performance improvement for traditional workloads**
  - Workloads copying PDS to PDS, copying PDS to sequential, or compressing a PDS are expected to benefit
- **Potential for shorter batch windows ***
  - New JCL FREEVOL=EOV parameter frees up a tape volume when the batch job is done with it.
- **Network throughput Enterprise Extender** can be improved
  - Using Inbound Workload Queuing (IWQ), available on OSA-Express3 and OSA-Express4S (July 12, 2011)
- **Foundation for extreme data handling and simplified storage management**
  - Potentially improved I/O performance without the need for application changes for QSAM-, BPAM-, and BSAM-based workloads by leveraging High Performance FICON™. Also, existing EAV functionality is enhanced with support for larger, 1 TB Extended Address Volumes (EAVs).** - IBM statements of direction

* Based on IBM Lab results, your results will vary.
I/O performance improvements measured for fully shared zFS ranged from very small to 900%, with the majority of workload conditions tested falling between 50% and 150%. The actual amount of improvement will depend on the environment (monoplex or Parallel Sysplex) and the type of file processing being done.
IEBCOPY improvement will depend on conditions such as: the amount of data being copied, block size, and type of IEBCOPY operation
Batch concurrency for multi volume tape datasets and will depend on the amount of data being processed

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

zOS R13 Enhancements in Security

- **IKEv2**
  - Initial support with z/OS R12 Communications Server. z/OS R13 adds Network Address Translation (NAT) traversal support for IKEv2 over IPv4.
- **System SSL, ECC**
  - z/OS R12 Communications Server added support for Elliptic Curve Cryptography (ECC), ECDSA (Elliptic Curve Digital Signature Algorithm).
  - z/OS R13 to extend System SSL ECC support for :
    - Creating ECC-style certificates in key database files or ICSF PKCS#11 tokens
    - Creating ECC-style certificates through the Certificate Management Services (CMS) API
    - Enabling ECC for TLS V1.0 and TLS V1.1 handshakes (RFC4492)
    - ECC certificate support with Crypto Express3 Coprocessor (on zEnterprise server)
- **ICSF support for additional HMAC algorithms**
  - Support for FIPS-198, support planned for SHA-1, SHA-224, SHA-256, SHA-384, and SHA-512
- **TN3270 and FTP support for password phrases**
- **Ported tools**
  - IBM Ported Tools for z/OS (5655-M23), a no-charge product, provides the sudo (su "do") open source tool that allows system administrators to delegate authority to users or groups while providing the RACF® (or equivalent) audit trail of the user and their commands. Already available on UNIX platforms, now available with z/OS UNIX System Services.

z/OS Security Server – RACF
*Helping to address security and compliance** guidelines*

Enhancements with z/OS R13

- **RACF**
  - RACF Remote Sharing Facility (RRSF) support for TCP/IP (in addition to SNA APPC)
  - Support for generating Elliptic Curve Cryptography (ECC) secure keys (using Crypto Express3 Cryptographic Coprocessors (CEX3C) available with zEnterprise servers)
- **Tivoli Directory Server for z/OS (LDAP)**
  - Support for SHA-2 and salted SHA-2 hashing of user password attributes. Addresses:
    - Need for stronger hashing and cryptographic algorithms
    - Enhanced interoperability with distributed IBM TDS, openLDAP, and other LDAP servers.
    - The National Institute of Standards and Technology (NIST) policy for the use of hash functions.
  - Support for LDAP administrators to delegate LDAP administrative authority
    - Can improve LDAP administration flexibility, help improve auditability, and help improve security
  - Support for DB2 9 for z/OS (5635-DB2) backend for scalability of large LDAP deployments
  - Improved interoperability between z/OS applications and Microsoft Active Directory environments for Kerberos
  - Support for RFC 2696 and RFC 2891 for improved LDAP sorted search performance

** It is the customer's responsibility to identify, interpret, and comply with laws or regulatory requirements that affect its business. IBM does not represent that its products or services will ensure that the customer is in compliance with the law.

z/OS and IPv6

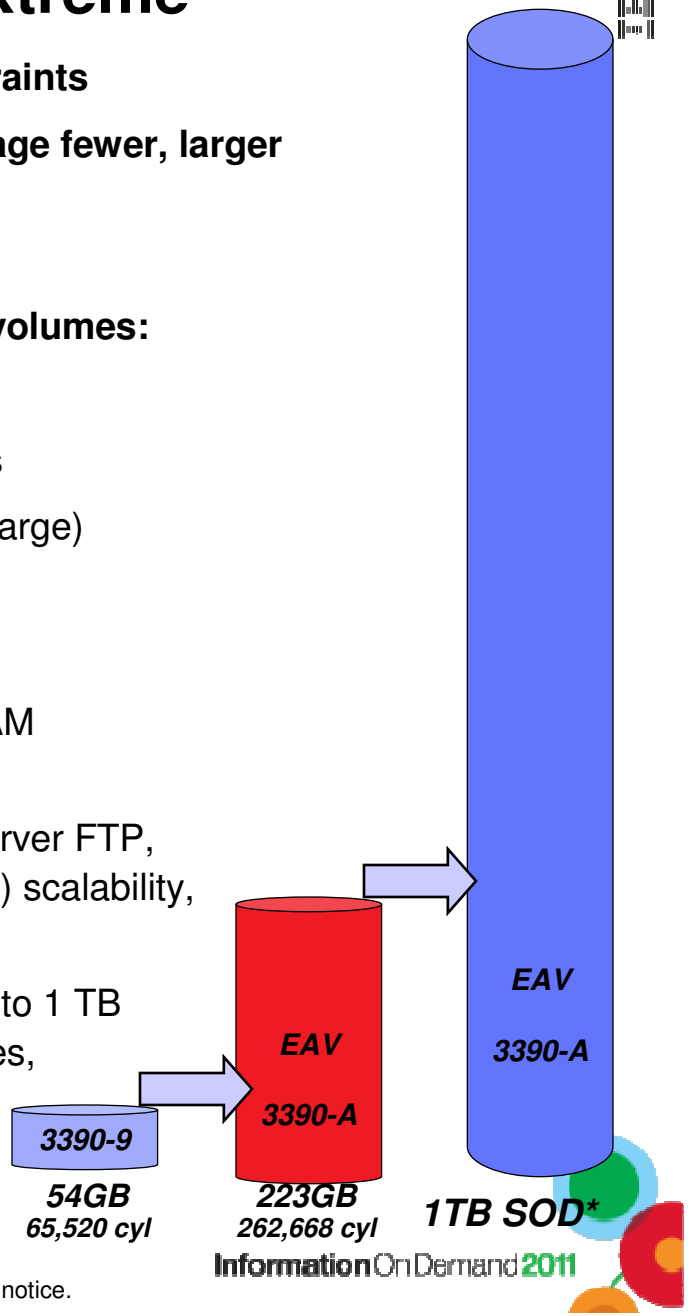
- **IPv4 address pool is exhausted** February 3, 2011
  - http://www.ipv6news.info/2011/02/04/ipv4-address-pool-is-exhausted/
  - Now the IPv4 Internet only has the stock of IPv4 addresses held by the regional registrars and Internet Service Provides (ISPs) to keep it going.

- **z/OS is IPv6 certified!** (http://jitc.fhu.disa.mil/adv_ip/register/certs/ibmzosv110_dec08.pdf)

- **z/OS Communications Server is adding function for IPv6 networks:**
  - **For z/OS R11**
  - Support RFC4941 and RFC5095; and the AES-based AES-XCBC-MAC-96 and AES-XCBC-PRF-128 algorithms - intended to meet new government IPv6 standards
  - **For z/OS R12**
  - Health checks for IPv4 and IPv6 routing
  - Support for DFSMSrmm, IKEv2, ability to Send DNS Queries over IPv6, support for security-related RFC3484 and RFC5014
  - **For z/OS R13**
  - Support for IPv6 intrusion detection security equivalent to that provided for IPv4, integrated with the Configuration Assistant (in z/OSMF)
  - Support for IPv6 checksum and segmentation offload enhancements and for LPAR-to-LPAR checksum offload for both IPv4 and IPv6 packets available with OSA-Express4S QDIO (announced July 12 2011)
    - TCP/IP segmentation and checksum processing on OSA card and not on CP

Taking z/OS Storage Volumes to the Extreme

- **Extended Address Volumes (EAVs) help address storage constraints**
- **Can help simplify storage management by enabling you to manage fewer, larger volumes, as opposed to many small volumes**
- **IDEAL for large datasets, may improve storage utilization!**
- **DS8000® exploitation rolled out over time, starting with 223 GB volumes:**
  - With z/OS R10, support for VSAM
  - With z/OS R11, support for extended format sequential data sets
  - With z/OS R12, support extended to sequential (both basic and large) data sets, partitioned (PDS/PDSE) data sets, catalogs (ICF now larger than 4 GB), BDAM data sets, JES spool and checkpoint data sets, standalone Dump extended format dump data sets, DFSMSrmm data sets, generation data groups (GDGs) and VSAM volume data sets (VVDSs).
  - With z/OS R13 - Support extended to z/OS Communications Server FTP, SDSF extended format print files, VSAM volume data set (VVDS) scalability, ISPF to display data sets eligible for EAV.
  - **SOD** - support for larger extended address volumes (EAVs), up to 1 TB per volume, on IBM System Storage® DS8700 and DS8800 series, with new DS8000 licensed machine code.*



*All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice.

z/OS and server support

	z800/ z900	z890/ z990	z9 EC/BC	z10 EC/ BC	z196	z114	DS8000 DS6000 ®	TS1130	End of service	Lifecycle Extension for z/OS	Coexists with	Ship date
R7	X	X	X	X (1,2)	X(1)	NO	X(1)	X	9/2008	9/2010	R9	9/2005
R8	X	X	X	X	X	X(4)	X	X	9/2009	9/2011	R10	9/2006
R9	X	X	X	X	X	X(4)	X	X	9/2010	9/2012	R11	9/2007
R10	X	X	X	X	X(3)	X(3,4)	X	X	9/2011	9/2013	R12	9/2008
R11	X	X	X	X	X	X	X	X	9/2012*		R13	9/2009
R12	X	X	X	X	X	X	X	X	9/2013*		R14*	9/2010
R13	X	X	X	X	X	X	X	X	9/2014*		R15*	9/2011*
R14*	X	X	X	X	X	X	X	X	9/2015*		R16*	9/2012*

* All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.
(1) IBM Lifecycle Extension for z/OS V1.7 (5637-A01) was required for the z10 BC, z196, and disk storage
(2) IBM Lifecycle Extension for z/OS V1.7 (5637-A01) required for support for some z10 EC features
(3) z/OS V1.10 and later required for zBX and Ensemble management exploitation
(4) IBM Lifecycle Extension for z/OS V1.8 (5638-A01) and for z/OS V1.9 (5646-A01) required for z114. Lifecycle Extension for z/OS V1.10 (5656-A01) required starting October 2011.
(5) See IBM GTS services for additional fee-based extended service options

Out of service (5)
Lifecycle Extension withdrawal 2 years later
General support

z/OS R13 – Smarter operating system for a Smarter Planet and Smarter Computing

More value from your workloads with programming, performance, and operations improvements. Enhancements for release 13:

▪Foundation for modern batch applications

- A new z/OS base component, z/OS Batch Runtime environment, provides the framework for Java-to-COBOL interoperability, for transactional updates to DB2, and for sharing database connections between Java and COBOL. *
- Simplified batch application programming and potentially shortened batch windows, with new JES2 JCL improvements, giving you more control of your batch applications.
- Leverage the strength of z/OS batch, a new web-based (REST) interface enables you to submit batch jobs and access batch data from non-z/OS systems**

▪Improved performance for new and traditional workloads***:

- Between 50% and 150%* I/O performance improvement for workloads using shared zFS in a Parallel Sysplex.
- Up to 15% to 55%* IEBCOPY performance improvement for traditional workloads
- Potentially shorter batch windows using JES2 JCL improvements to free tape volumes more quickly

▪Availability enhancements:

- Improve spool volume management by using new JES2 spool migration function and JES3 dynamic spool add capability
- Improved channel recovery - track errors and automatically remove failing paths (on a controller level) faster
- zFS internal restart - automatically recover disabled aggregates in Sysplex aware mode – avoiding lengthy manual system recovery process.
- Avoid planned outages - Concurrent service for DADSM and CVAF

* Prerequisites: IBM 31-bit SDK for z/OS, Java Technology Edition Version 6.0.1 (5655-R31), DB2 V9.1 for z/OS (5635-DB2) or later with PTFs, IBM Enterprise COBOL for z/OS V4.1 (5655-S71) or later
** Prerequisite: RESTful API included in z/OSMF V1.13.
*** Based on IBM Lab results, your results will vary.
I/O performance improvements measured for fully shared zFS ranged from very small to 900%, with the majority of workload conditions tested falling between 50% and 150%. The actual amount of improvement will depend on the environment (monoplex or Parallel Sysplex) and the type of file processing being done.
IEBCOPY improvement will depend on conditions such as: the amount of data being copied, block size, and type of IEBCOPY operation

z/OS Management Facility – the new face of z/OS

Streamlined processes and built-in guidance address a broad scope of activities and helps create a more integrated z/OS experience.

- **Configuration**
  - Configuration Assistant for z/OS Communication Server (R11) – Simplified configuration and setup of TCP/IP policy-based networking functions
- **Performance**
  - Capacity Provisioning (R13) - simplified monitoring of CP status for domains
  - Resource Monitoring and System Status (R12) – single view of sysplex and Linux® performance status and dynamic real time resource metrics.
  - Workload Management – creation, editing, and activation of WLM policies (R12)
- **Problem Determination**
  - Incident Log (R11) – Simplified capture, packaging, sending of SVC dump diagnostic data
- **Software**
  - Deployment (R13) - Clone z/OS images, deploy software more easily and consistently
- **Storage**
  - DASD Management (R13) - Define new SMS storage volumes quickly and easily
- **z/OS Classic Interface**
  - ISPF Task integrates existing ISPF into z/OSMF to launch to ISPF functions directly (R13)
- **Base**
  - A new web-based (REST) interface enables you to submit batch jobs and access batch data from non-z/OS systems (R13)
  - Leverage System z Specialty engines
  - IBM Assistance available to help with pre-planning, early discovery, and readiness review for new z/OSMF environment(s).

z/OS – Smarter operating system for a Smarter Planet and Smarter Computing

z/OS V1.13 – Performance, programming, and operations improvements help you to gain more value from your workloads.

http://www.ibm.com/systems/z/os/zos/

z/OSMF V1.13 - Streamlined processes and built-in guidance address a broad scope of z/OS activities and helps create a more integrated z/OS experience and improved productivity

http://www-03.ibm.com/systems/z/os/zos/zosmf/

IBM Software for System z announcements for zEnterprise

Delivering on the promise of Smarter Computing through new workloads

Multi-Platform Development and Transaction Processing

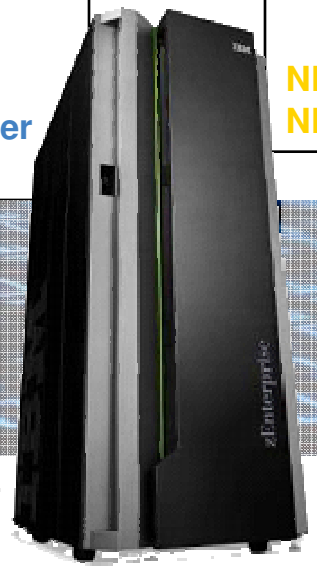
NEW! Collaborative Lifecycle Management (RTC, RQM, RRC)
NEW! Rational® Developer for IBM zEnterprise™
NEW! z/OS XL C/C++ V1.13
NEW! WebSphere® Application Server
NEW! CICS®

Virtualization and Optimization

NEW! SOD-Tivoli® Integrated Service Management for zEnterprise API Support
NEW! IBM Tivoli Workload Automation

Risk Management

NEW! GDPS®/Active-Active
NEW! Tivoli Application Dependency Discovery Manager



Business Process Management

NEW! Business Monitor for z/OS
NEW! Business Process Manager

Data Warehousing and Analytics

NEW! IBM Smart Analytics System 9600 for z114
NEW! InfoSphere™ Classic Federation for z/OS®
NEW! InfoSphere Classic Change Data Capture for z/OS
NEW! InfoSphere IMS™ Replication for z/OS
NEW! OMEGAMON® XE for IMS v4.2 IF3

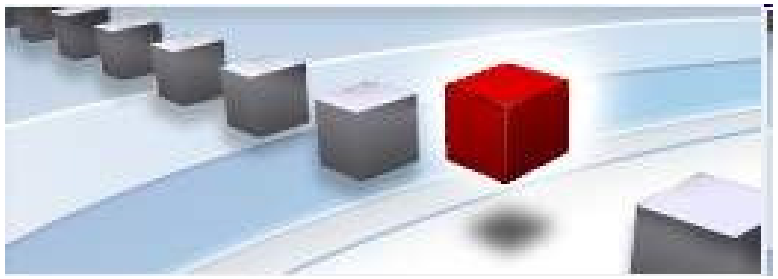
Cloud Computing

NEW! Rational Virtual Developer Desktop
NEW! Cloud and Lifecycle Management for zEnterprise
NEW! Preview - IBM zEnterprise Cloud Starter Edition

Data Warehousing and Analytics
Helps organizations better understand, anticipate and shape business outcomes.

Appliance targeted at accelerating the performance of warehousing workloads for z/OS

- IBM DB2 Analytics Accelerator for z/OS V2.1
  Incorporating Netezza technologies to further expand the number of queries that benefit from this optimizer model.
  - Extending acceleration to significantly larger number of queries
  - Expanded size of the data to be accelerated
  - Improved concurrent query execution
  - Incremental update by partition
  - DB2 9 and DB2 10 for z/OS support
- IBM Smart Analytics System 9600 for z114 **– Building an end-to-end BI environment on System z**
- InfoSphere Classic Federation for z/OS**,** InfoSphere Classic Change Data Capture for z/OS, InfoSphere IMS Replication for z/OS **– IMS tools to integrate and transform data**
- OMEGAMON XE for IMS v4.2 IF3 - **Optimize performance and availability of vital IMS systems**



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

IBM DB2 Analytics Accelerator for z/OS V2.1

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

What is it?

The IBM DB2 Analytics Accelerator is a workload optimized, appliance add-on to a DB2 z/OS Data Warehouse

- **Breakthrough technology enabling new opportunities**
- **Extreme performance for complex analytics (aka Train of Thought analysis)**
- **Integrated with DB2 for z/OS V9 and V10**
- **Transparent to DB2 applications and users**

GA Date:
DB2 V9 – 11/25/11
DB2 V10 – 1/31/12

IBM Smart Analytics System (ISAS) 9700 and 9710

Integrated and Packaged Solution of HW, SW and Implementation Services

IBM System z Hardware

DS8800 Storage

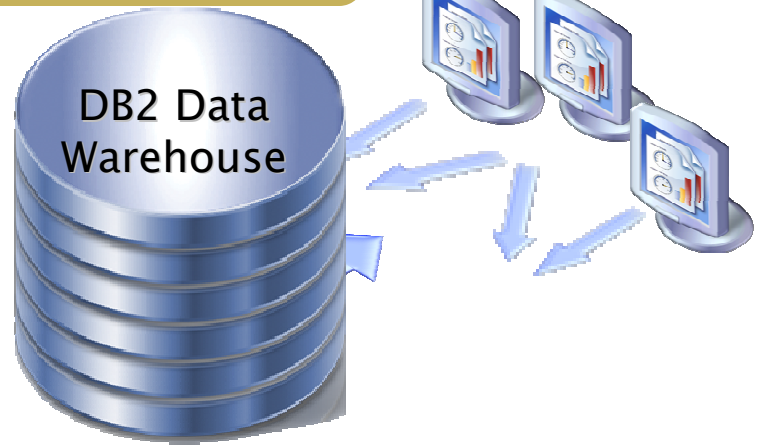
9700 – z196
9710 - z114

DB2 for z/OS VUE V9 or 10, DB2 Utilities Suite V10.1

SPSS Modeler

InfoSphere Warehouse V9.7.3

Cognos 10.1 BI



Implementation Services

Hardware

Can be extended with IDAA

Software

Standard (all SW) or Foundation (DB2 and Utilities only)

Services

Turnkey package - enables customers to rapidly deploy cost effective DWH / BA across their business.

Integrating and transforming data to ensure trusted information is used in critical business initiatives

InfoSphere Classic Federation for z/OS, InfoSphere Classic Change Data Capture for z/OS, InfoSphere IMS Replication for z/OS

- InfoSphere Classic Federation for z/OS **- SQL read/write access to sequential & VSAM files, IMS, IDMS, Datacom and Adabas databases**
  - Superior CA-DATACOM connectivity
  - Tight integration with DataStage® for file access
  - Addition of monitoring and metrics
  - Compliance with Swiss security mandates
  - Simplified deployment – Test to QA to Prod
- InfoSphere Classic Change Data Capture for z/OS **- Replicate IMS data to local or remote RDBMS, message queues, flat files, ETL tools (e.g. DataStage)**
  - Continuous mirroring – Apply data changes at target as generated at the source
  - Scheduled and (periodic mirroring) – Apply net changes on a scheduled basis
  - Refresh – Apply a snapshot version of source
- InfoSphere IMS Replication for z/OS **- Native IMS to IMS replication for high availability**
  - Very high speed and high volume replication with less than two second latency
  - Integrated with IBM's Active/Standby solution

Risk Management
Comprehensive security for a dynamic infrastructure
Minimizing risk for discovery and backup systems

- NEW! GDPS/Active-Active - **Two or more sites, separated by *unlimited* distances, running the same applications and having the same data to provide cross-site workload balancing and Continuous Availability / Disaster Recovery**
  - Customer data at geographically dispersed sites kept in sync via replication
  - Shift from disaster recovery model to nearly continuous availability model
  - Integration of IBM products and GDPS control software through an IBM service engagement which includes project management throughout the implementation cycle
  - Active/Standby configuration released now, IBM plans to make available the Active/Query configuration which will provide the ability to selectively query data in either site.

Keep critical business applications up and running without data loss in case of disaster for System z platform

IBM GDPS/Active-Active continuous availability

Reduces application downtime to help lower costs, improve productivity and boost customer loyalty

- Continuous Availability
  - Provides continuous availability for two or more sites separated by unlimited distances, achieving Recovery Time Objective of 1 minute or less.
  - Shift from disaster recovery model to nearly continuous availability model
- Results
  - Planned workload switch - **20** seconds from active site to standby site
  - Unplanned workload switch - **120** seconds from active site to standby site
  - Planned site switch - (9 * CICS-DB2 and 1 * IMS workloads) **20** seconds
  - Unplanned workload switch - **150** seconds

Continued Investment in System z software for zEnterprise

Information Management

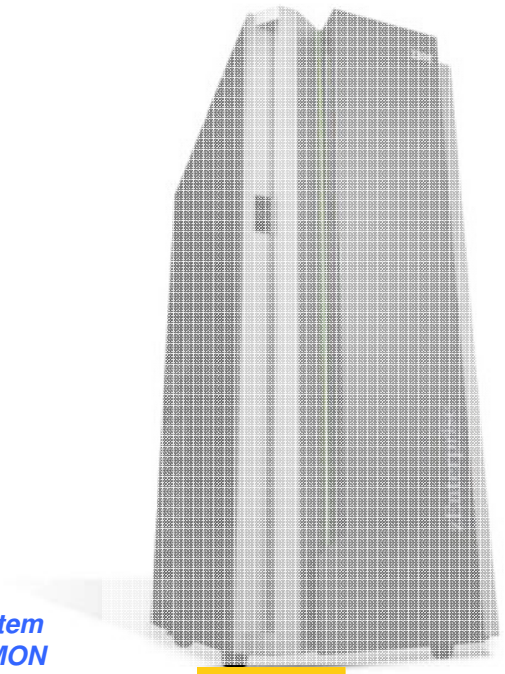
Strong information management platfor
built for business workloads
DB2, IMS, FileNet, InfoSphere Warehouse, InfoS
Server, Cognos, SPSS, Optim™

NEW! Preview- IBM Smart Analytics Optimizer V2
NEW! IBM InfoSphere Guardium Data Encryption fo
IMS Databases, InfoSphere Classic Federation for z
InfoSphere Classic Change Data Capture for z/OS.
IMS Replication for z/OS
NEW! IBM Smart Analytics System 9600 for z1
NEW! DB2 10
NEW! DB2 for z/OS Tools
NEW! IMS 12
NEW! Content Manager OnDemand for z/OS
NEW! FileNet
NEW! Case Manager
NEW! GDPS/Active Active

Tivoli

Visibility, control, security, and automation
from System z across your business
IBM Service Management on System z, TSAM, System
Automation and NetView for z/OS, TWSz, OMEGAMON

NEW! SOD - Tivoli Integrated Service Management for z API Support
NEW! Tivoli Application Dependency Discovery Manager
NEW! Cloud and Lifecycle Management for zEnterprise
NEW! Preview - BM zEnterprise Cloud Starter Edition
NEW! NetView®
NEW! ITCAM for Transactions
NEW! Tivoli Asset Discovery for z/OS
NEW! Tivoli Application Management for zEnterprise
NEW! IBM Security Key Lifecycle Manager for z/OS
NEW! Tivoli Advanced Reporting and Management for DFSMShsm™
NEW! IBM Security zSecure suite
NEW! IBM Tivoli Workload Automation
NEW! IBM Multi-site Workload Lifeline v1.1



Lotus

Productivity and Collaboration
Portal, Connections, Lotus® Notes Domino®, Sametime

NEW! IBM Lotus Connections
NEW! IBM Lotus Quickr™ for Domino
NEW! IBM WebSphere Portal for z/OS and Linux on System z

WebSphere

Application infrastructure, connectivity and dynamic business processes
WAS, CICS, BPM, WMQ, ESB, DataPower®, ILOG, Lombardi

NEW! WebSphere Application Server
NEW! CICS
NEW! WebSphere Extended Deployment Compute Grid
NEW! Business Monitor for z/OS
NEW! Business Process Manager
NEW! IBM WebSphere DataPower Integration Appliance XI50 for zEnterprise
NEW! WebSphere MQ File Transfer Edition for z/OS

Rational

Application Development Tools and Software Delivery Platform
Compilers (C/C++, PL/I, COBOL), RDz, RTC

NEW! Collaborative Lifecycle Management
NEW! Rational Virtual Developer Desktop
NEW! Rational AppScan Source Edition
NEW! Enterprise Modernization for Developers Prescriptive Solution Service Offering
NEW! Rational Automation Framework for WebSphere
NEW! Rational Developer for zEnterprise
NEW! Rational Developer for System z Unit Test Feature
NEW! z/OS XL C/C++ V1.13

IBM zEnterprise System: Freedom by Design
The broadest systems architecture – for integration and management of multi-platform applications and data

IBM zEnterprise z196 (z196)
IBM zEnterprise z114 (z114)
Industry's most robust design for keeping systems and data continuously accessible

Unified Resource Manager
Extending zEnterprise qualities of service and management across the infrastructure

BladeCenter Extension (zBX)
- AIX®, Linux®, and Microsoft® Windows®* applications
- Appliance Blades - Smart analytics, DataPower®

1. Meets the need of today's heterogeneous data centers
2. Enables mixed workload business processes to be deployed and centrally managed
3. Allows optimized integration of data, applications, and web serving
4. Delivers dynamically responsive IT with lower acquisition and operating costs

*(Statement of Direction) on System x blades in 4th quarter 2011

Deploy workloads on best fit architecture for efficiency and innovation

- **Over 7,000 applications supported on z/OS® & Linux for System z**
- **zBX enables a broader set of applications**
  - AIX® on Power® Blades
  - Linux on System x® Blades
  - Windows on System x Blades[1]

Freedom by design:

Utilize the best fit architecture – Mainframe, Power, x86

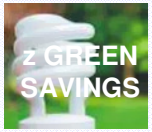
[1] All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represents goals and objectives only.

Maximizing Utilization of Resources

- **Up to 100% server utilization compared to 10-20% distributed server utilization[1]**
- **Shared everything infrastructure allows for maximum utilization of resources**
  - CPU, Memory, Network, Adapters, Cryptography, Devices

High business growth

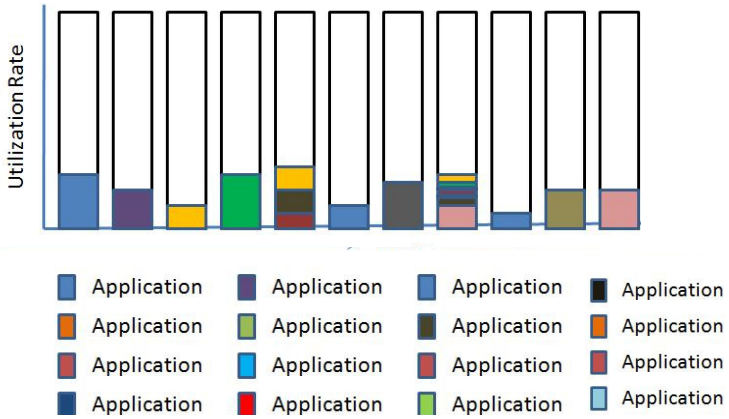
Green strategy Running out of energy & space



Lowers power consumption for each work unit

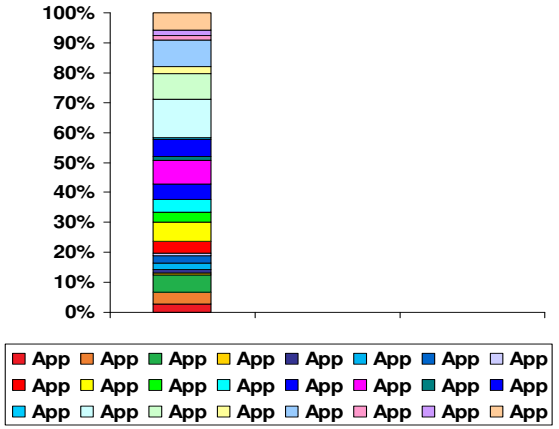
Customer savings

Underutilized distributed servers



Typically single application per server

Up to 100% utilized System z server

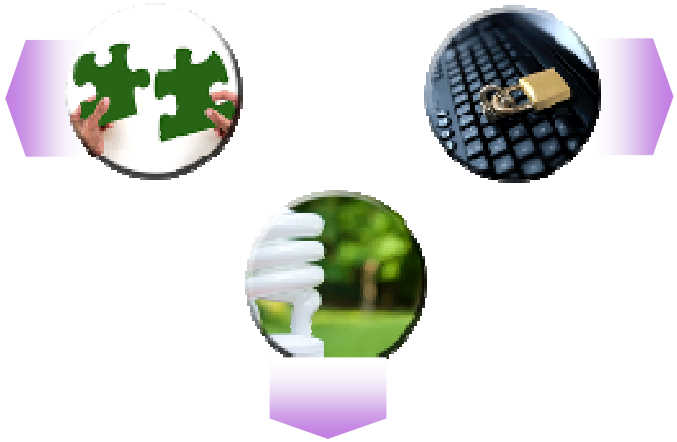


Multiple applications on one System z server

[1] Source: gomainframe.com Joe Clabby

IBM zEnterprise applies unsurpassed Quality of Service for the delivery of business critical services

Security
Extending System z Security to a Private network across heterogeneous resources



Availability
Resiliency management and fewer points of failure

Efficiency
1/4 network, 1/25th floor space, 1/20 energy, 1/5 administration

Up to 70% in security audit savings	***Up to 52% lower security admin costs***	***Fewer points of breach than pure UNIX or x86***

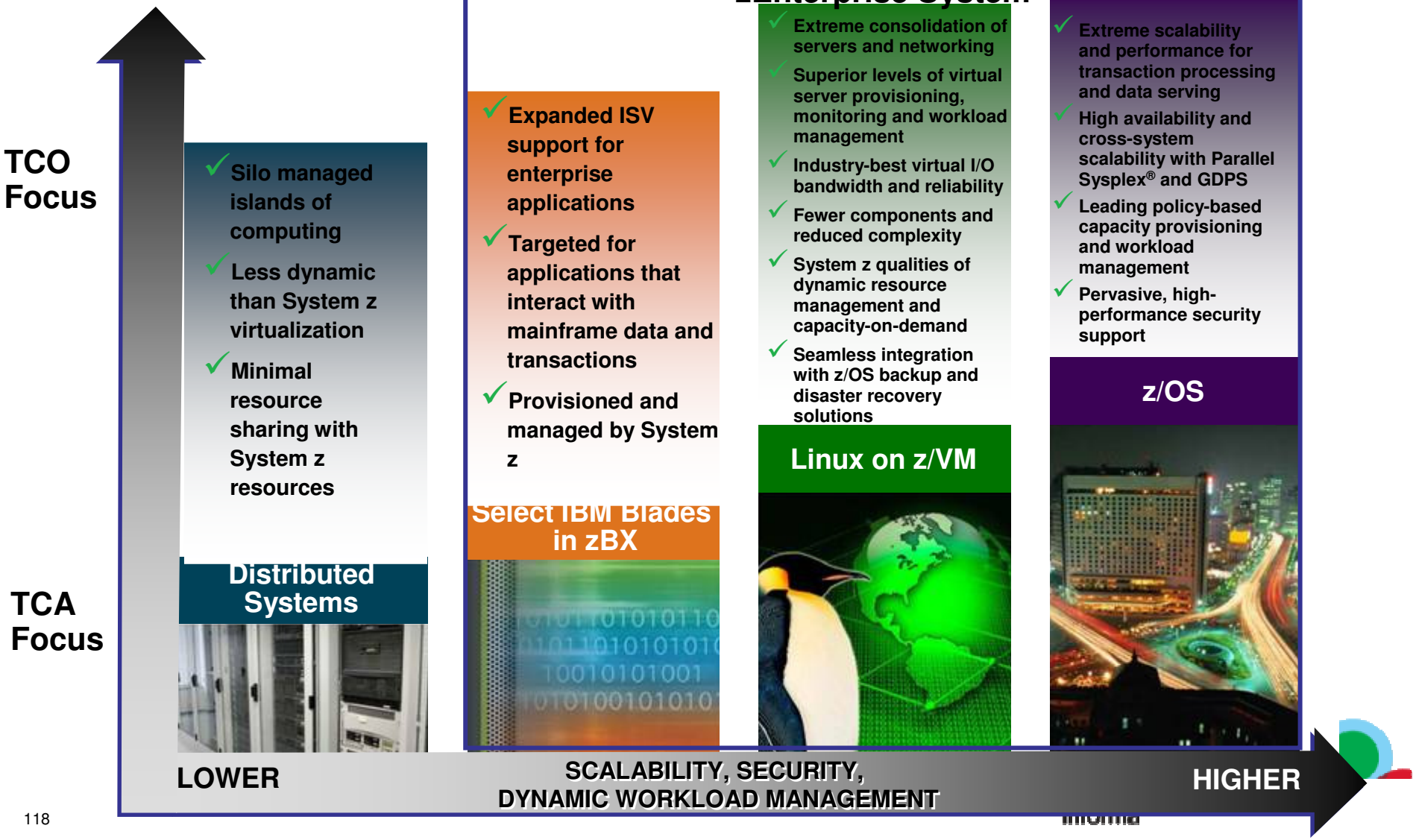
Leverage existing application investments and deliver more value through modernization and transformation

- Transform existing legacy applications with advanced Rational® tools to accelerate deployment of new services and improve developer productivity
- Modernize existing legacy applications to extend ROI, reduce risk and cost of deployment and to deploy more quickly with faster development cycles
- Develop and deploy new services using a common set of tools and skills for all platforms

Modernize without migration to reduce cost and risk

Modernize in place to accelerate service delivery

Service Levels to Match Your Business Needs
Increased flexibility for your multi-architecture strategy



A zEnterprise for Everyone
Freedom to choose the "right sized" mainframe to fit your needs.

If you …

…want the flexibility to manage across heterogeneous platform – including z/OS, AIX, Linux on System x, Windows on System x[1]

…are looking for an entry level mainframe with options for traditional capacity settings

… need a smaller mix of special engines (*zAAP on zIIP great option here!)

… have smaller Coupling and/or I/O attachment requirements

… need the lowest cost application development environment.

The z114 M05 may be the perfect option.

If you …

…want the flexibility to manage across a heterogeneous platform

…want to replace your server with one that has the same number of engines – but would like more IFLs, zAAPs or zIIPs

… want to replace your standalone coupling facility or Linux only server with a machine that provides engine, memory and I/O scale out capabilities

… have future growth needs, but prefer grow in smaller increments and want to avoid disruptive outage during upgrade

The z114 M10 is just what you need.

If you …

…want the flexibility to manage across a heterogeneous platform

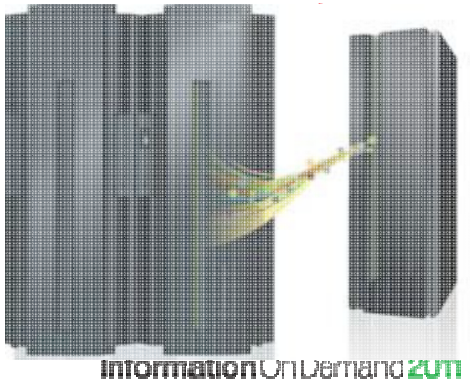
… have a large mainframe capacity requirement or desire for massive consolidation – scale to over 52,000 MIPS in one footprint

… have a large disk installment so in turn have large I/O requirements

… need new ways to address your 'green' requirements – like water cooling and static power save mode

… have a large CBU requirement – and like the control of having your disaster recovery site right in your own shop.

The enhanced z196 is right for you.



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