System z Premier Executive Event

Enabling Business Innovation with Cloud Computing on System z

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Notes:

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

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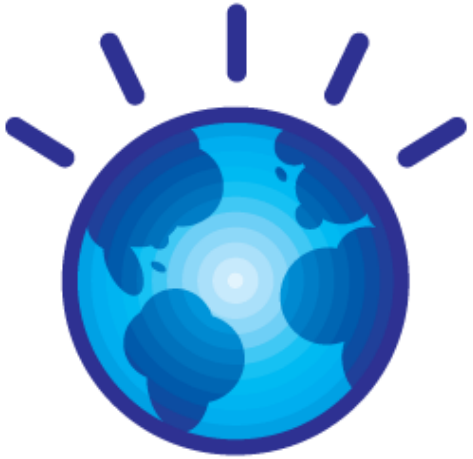
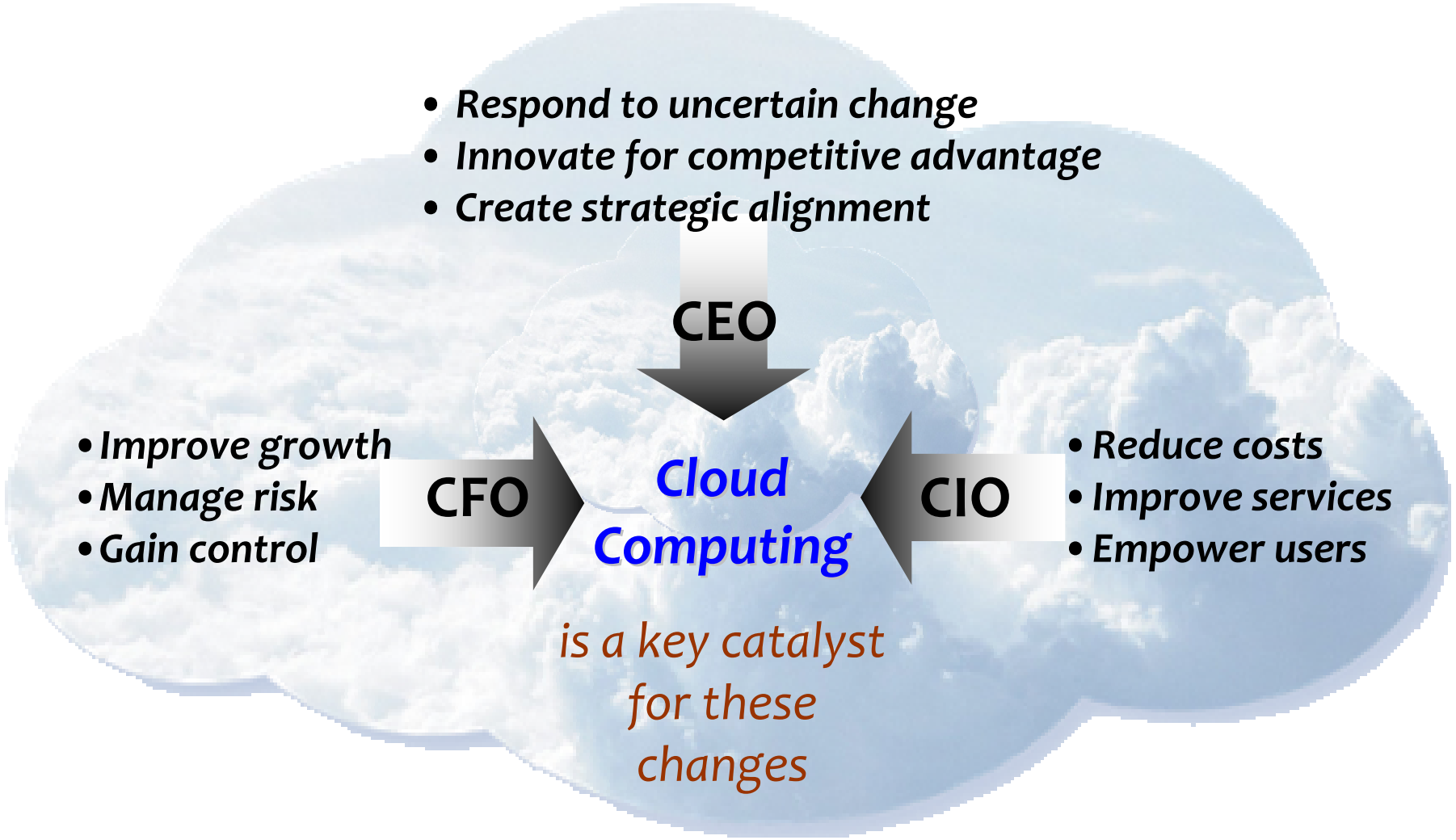
Discussion Topics

- **Cloud computing basics and business value proposition**
- **Linux on System z and z196 – the ideal cloud infrastructure**
- **System z cloud offerings**
- **Customer success stories**
- **A closer look at zEnterprise and cloud computing**



C-level executives are seeking alternatives such as Cloud Computing to reduce costs, improve service, and manage risks



What is Cloud Computing?
U.S. National Institute of Standards and Technology:

"Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction."

Characteristics

- Resource pooling
- Broad network access
- Rapid elasticity
- Measured service
- On-demand self service

Service Models

- Software as a Service
- Platform as a Service
- Infrastructure as a Service

Deployment Models

- Private cloud
- Public cloud
- Hybrid cloud
- Community cloud

Read more at: http://csrc.nist.gov/groups/SNS/cloud-computing/index.html

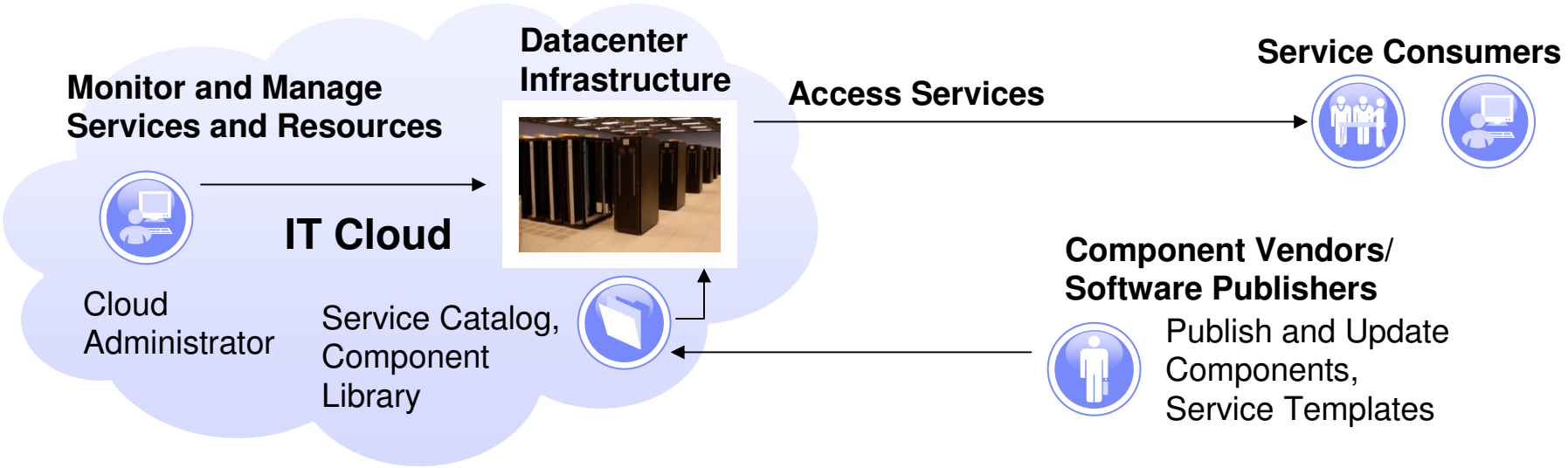
Cloud Computing…

…is a user experience and a business model

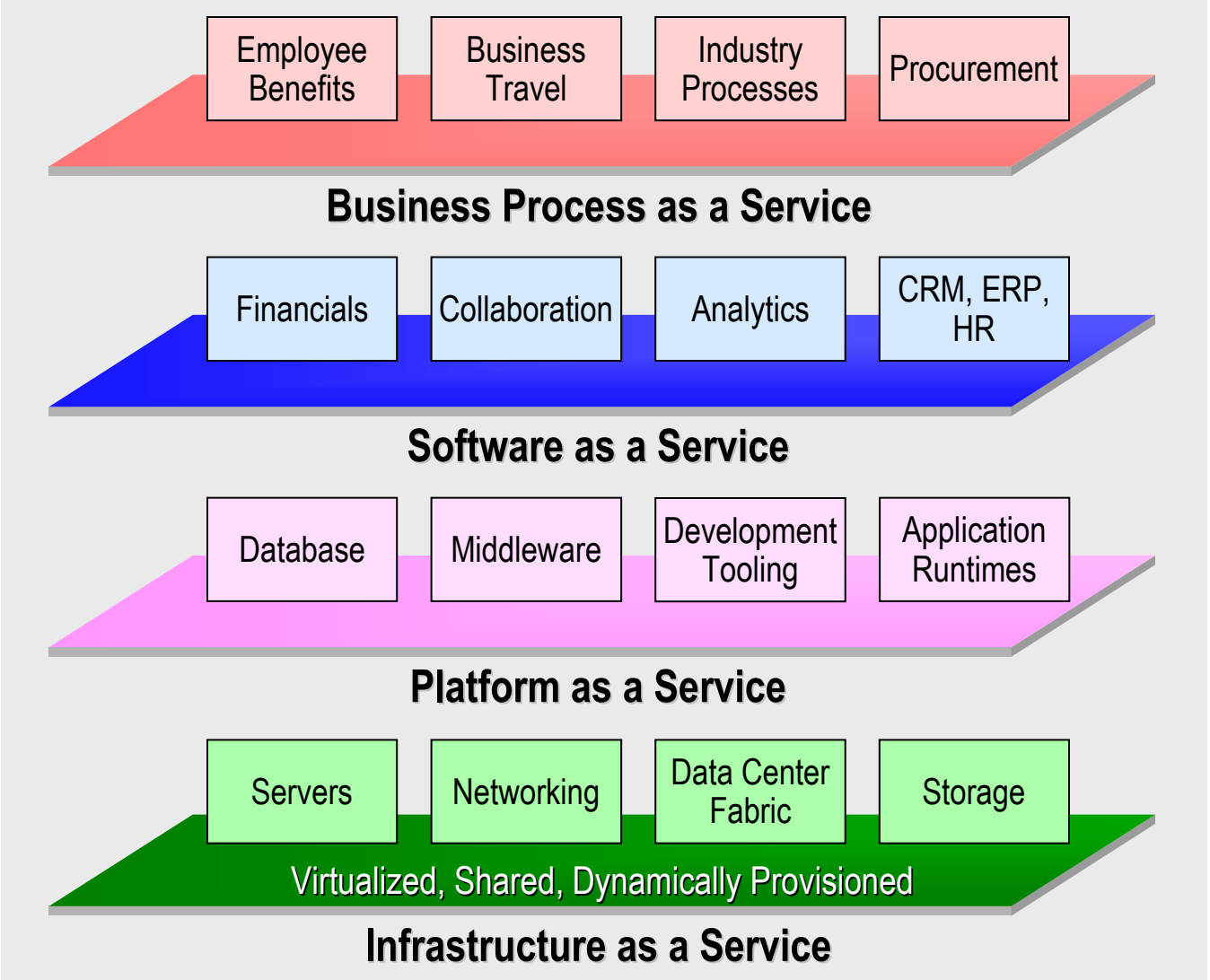
Cloud computing is an emerging style of computing in which applications, data, and IT resources are provided as services to users over the network.

…is an infrastructure management methodology

Cloud computing is a way of managing large numbers of highly virtualized resources such that, from a management perspective, they can be automatically aggregated to deliver services.



Cloud Service Models



EXAMPLES:

IBM Smart Analytics Cloud for System z

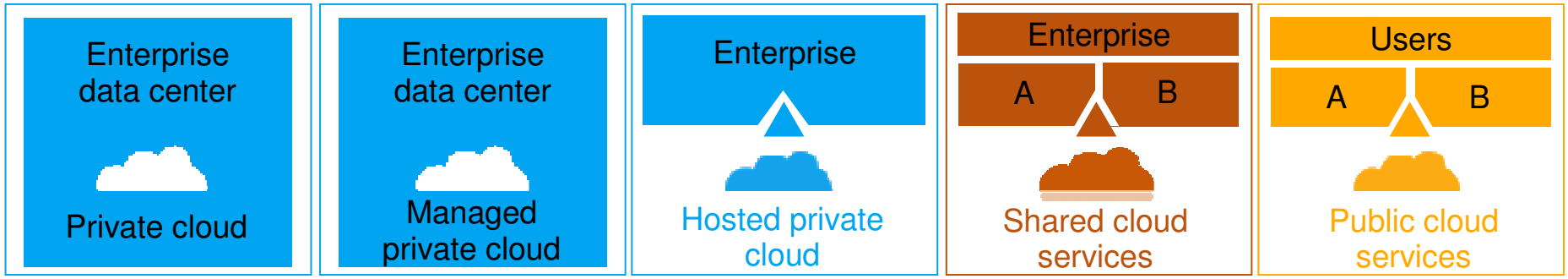
IBM WebSphere CloudBurst Appliance

IBM System z Solution Edition for Cloud Computing

There is a spectrum of deployment options for cloud computing

Private
IT capabilities are provided "as a service," over an intranet, within the enterprise and behind the firewall

Public
IT activities / functions are provided "as a service," over the Internet



Hybrid Internal and external service delivery methods are integrated

Integrate a cloud computing deployment as part of the existing IT optimization strategy and roadmap

Consolidate

- Reduce infrastructure complexity
- Reduce staffing requirements
- Manage fewer things better
- Lower operational costs

Virtualize

- Remove physical resource boundaries
- Increase hardware utilization
- Reduce hardware costs
- Simplify deployments

Standardize and automate

- Standardize services
- Reduce deployment cycles
- Enable scalability
- Flexible delivery

Cloud Economics

Cloud Computing on System z builds on the industry's leading virtualization technology

…leverages virtualization, standardization, and automation to free up operational budget for new investments

…allowing you to optimize new investments for direct business benefits

Cloud computing services from IBM are delivering measurable results and addressing IT infrastructure challenges

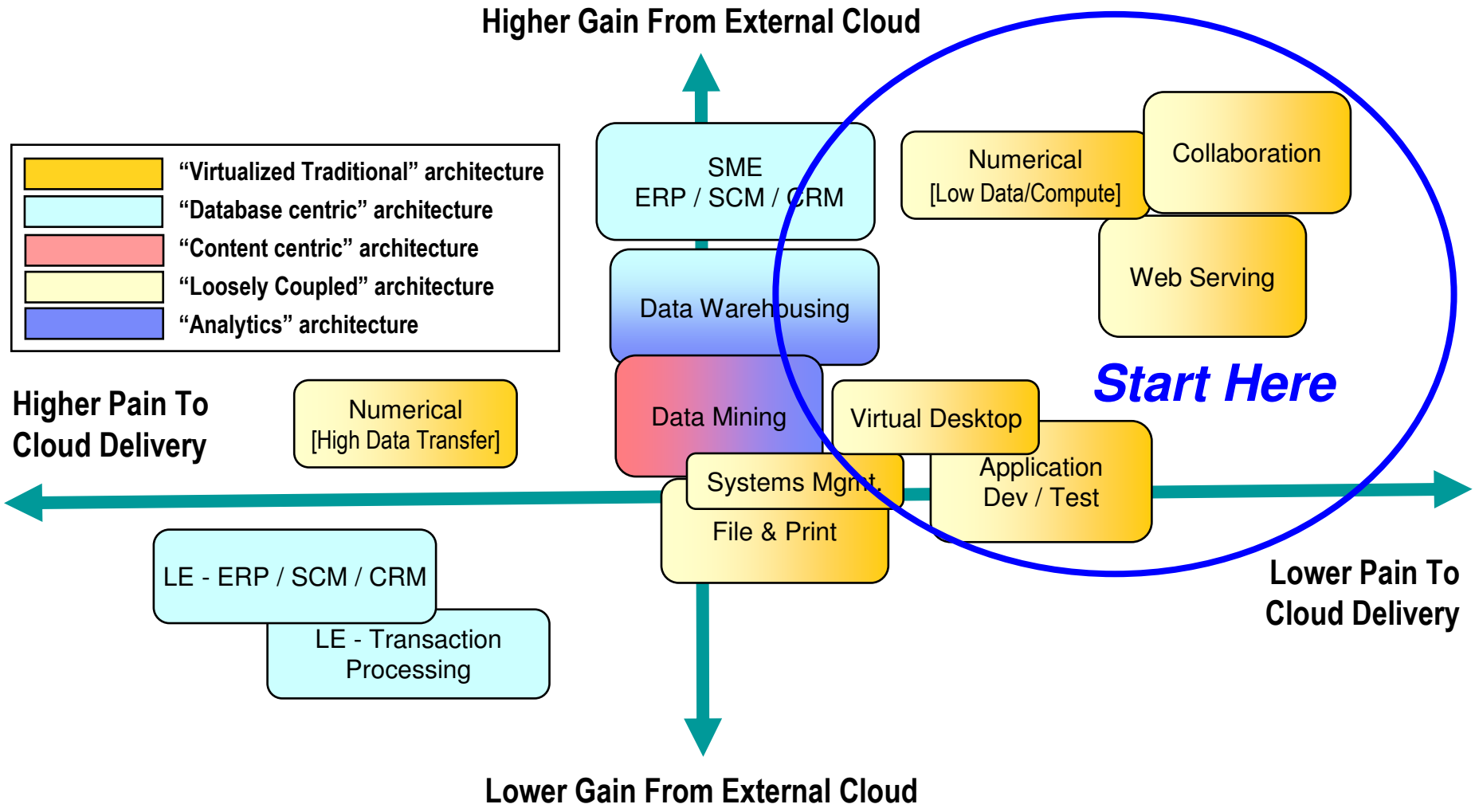
Automation Standardization Virtualization

IT attributes	From	To
Server/storage utilization	10-20%	70-90%
Test provisioning	Weeks	Minutes
Change management	Months	Days/hours
Release management	Weeks	Minutes
Metering and billing	Fixed cost	Variable cost
Service catalog ordering	Months	Days/hours
Service access	Administered	Self service
Payback period for new services	Years	Months

Journey to cloud

SOURCE: Based on IBM and client experience.

Clients Will Adopt Cloud Computing Based on Workload Affinity



Why deploy clouds on larger, scale-up servers like System z?

Higher Utilization

- Shared everything architecture
- Superior workload management
- Host large *and* small workloads

More Efficient Data Center

- Less power and cooling
- Less floor space
- Fewer parts to monitor

Increased Productivity

- Efficient, rapid provisioning
- Superior life-cycle management
- Fast, easy technology refresh

Greater Reliability, Availability

- Hardware / hypervisor redundancy
- Decades of RAS innovation
- Capacity and Backup on Demand

The IBM zEnterprise System:
A New Dimension in Cloud Computing

zEnterprise offers a major leap in virtualization and scale, providing opportunities to gain the benefits of cloud computing **today**. Unlike competitors who offer restrictive cloud solutions, IBM stands alone in offering cloud solutions than span architectures with a proven management solution for visibility, control, and automation.

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

Virtualization
1000s of virtualized systems across a heterogeneous resource pool

Availability
Resiliency management and fewer points of failure

Efficiency
¼ network, 1/25th floor space, 1/20 energy, 1/5 administration

Scalability
A new dimension of scale
Infrastructure capable of a Trillion Instructions per second

IBM zEnterprise System – Best-in-class Systems & 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 tens of thousands of AIX and Linux applications
- High-performance optimizers and appliances to accelerate time to insight and reduce cost
- Dedicated high-performance private network

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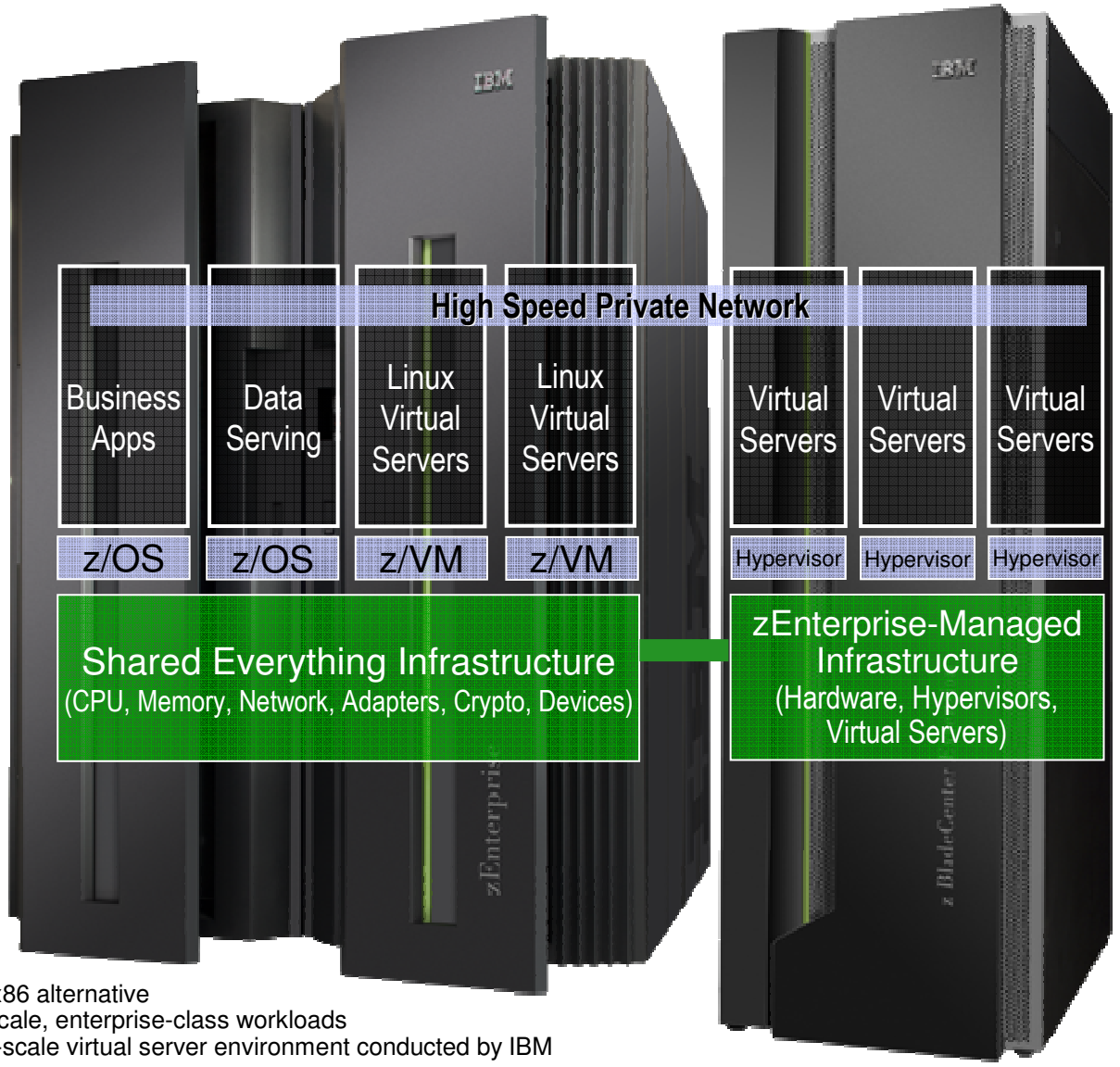
IBM zEnterprise for IT Optimization, Consolidation, Cloud Computing

Even Greater Savings, Operational Simplification, and System Reliability

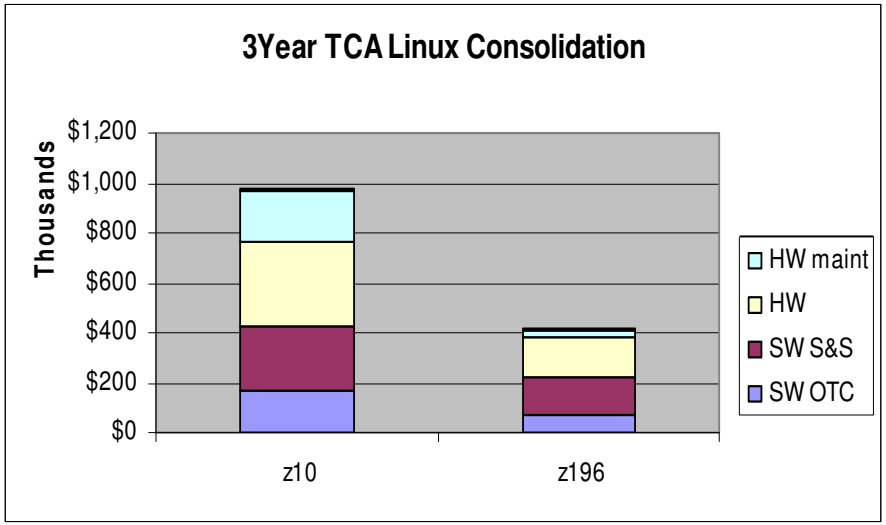
- Consolidate even more with zEnterprise IFLs: up to 60% faster at 33% lower price
- Increase energy savings as you scale, up to 75% (1)
- Spend up to 70% less on acquisition costs (2) and boost staff productivity by up to 70% (3) compared to virtualized x86 alternatives
- Incorporate IBM Power and System z technologies for unparalleled levels of workload optimization
- Manage and govern the integrated environment to deliver superior business results at a lower cost

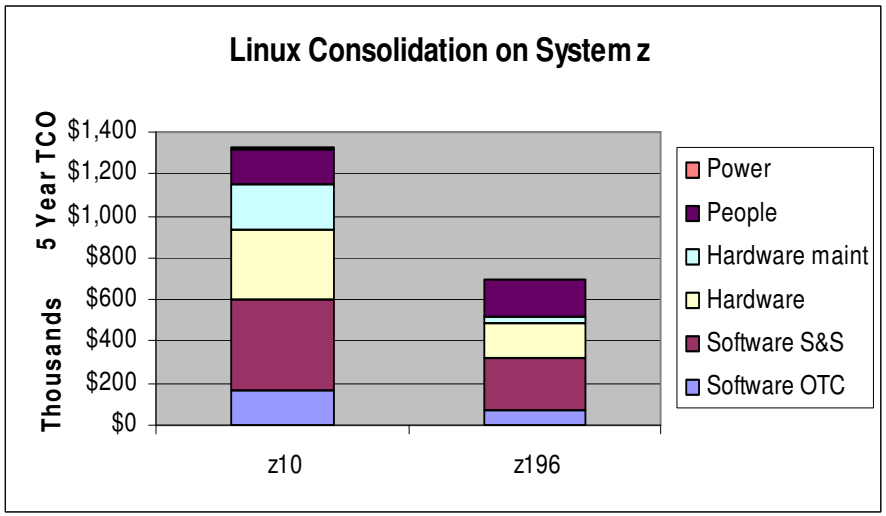


(1) Based on zEnterprise comparison to virtualized x86 alternative
(2) Based on three-year acquisition costs for large-scale, enterprise-class workloads
(3) Based on life-cycle management testing of large-scale virtual server environment conducted by IBM

Driving Down the Cost of Linux and Increasing Customer Value

- Three-year TCA for z196 is less than half of a z10 for equivalent capacity
- Superior Virtualization
- Larger z196 processors can lead to fewer IFLs which:
  - Reduces software fees
  - Simplifies management
  - Reduces hardware costs
    - IFL and memory over 50%
    - Maintenance over 80%
- Able to scale while adding resources non-disruptively
  - Add more engines within book package
  - Better performance per watt



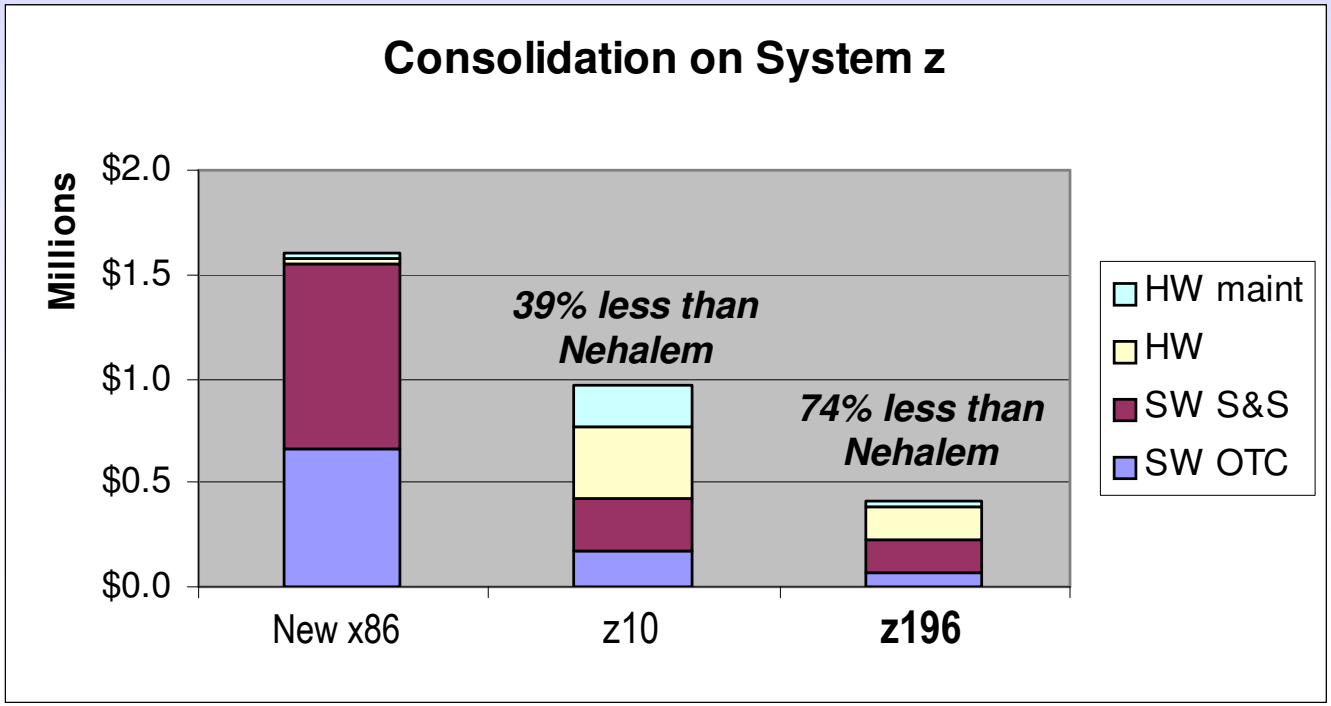


The Most Efficient Platform for Large Scale Consolidation

Linux on z196

- ***Lower acquisition costs of hardware and software vs distributed servers****
- ***Less than $1.00 per day per virtual server (TCA)****
- ***Reduce floor space by up to 90% compared to distributed servers****
- ***Reduce energy consumption by up to 80% compared to distributed servers****

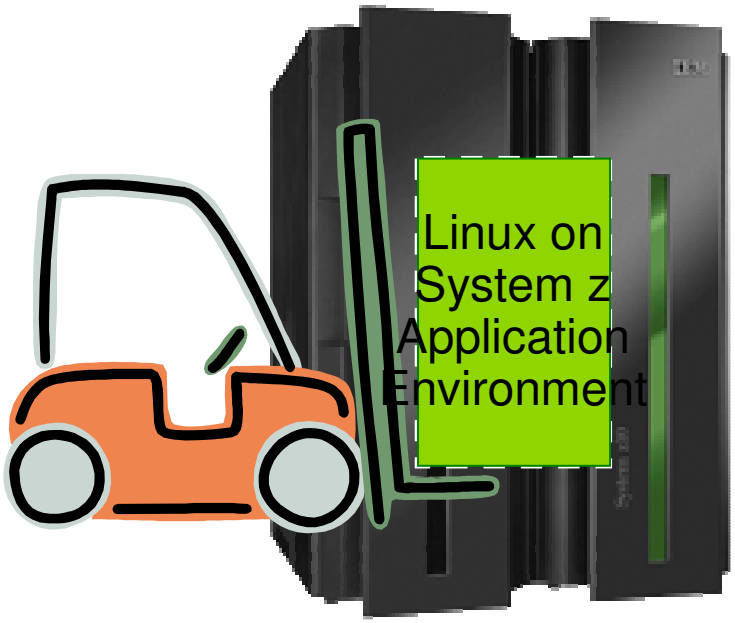
Consolidate 40 Oracle server cores onto 2 Linux cores on zEnterprise



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

Linux on System z Technology Refreshes

Forklift Upgrades: Fast, Easy, Upwardly Compatible



IBM System z10

IBM zEnterprise System

"One of the key advantages we see of running Linux on System z is as new generations of hardware technology are introduced, we're able to basically do a forklift upgrade – we don't have to re-certify applications as we have had to do on other platforms in the past."

– IT Manager, Delivery Industry Company

Linux on System z Advantages

As Seen by a Large Financial Services Company

- Test servers tend to multiply (one application can require 16 or more servers)
  - Unit testing
  - QA testing
  - Enterprise testing
  - Regression testing
  - Cluster testing
  - Middleware and Operating System version testing
- Reliable common driver code for all virtual servers
- HW platform changes / upgrades are all possible without major disruption to Linux
- Every virtual server benefits from hardware upgrades, technology refreshes, and hardware currency – no waiting for the 3-to-4-year upgrade cycle
- No cables!
- No flaky memory cards, no NIC mismatches, no CPU failures
- Real hardware multi-pathing
- Significant power / floor space / cooling savings
- Decommissioned virtual server resources are returned to the shared pool of system resources and reused (vs. spending about $800 to dispose of an old physical server)

Automobile Services Company Selects IBM System z, Linux and WebSphere as New Strategic Direction for Enterprise Middleware

Business challenge:

Client relied on a Microsoft .net infrastructure running on HP blades to connect its various systems. Ad-hoc functionality and non-standard interfaces created support and scalability challenges that made the company less agile in responding to business requirements and new opportunities.

Solution:

A new project offering in-car communication services prompted the company to pursue an IBM WebSphere SOA-based enterprise standard for middleware running on Linux on System z. The System z solution significantly outperformed a Microsoft / HP alternative.

Benefits:

- IBM solution gives the client a more flexible middleware infrastructure to support innovative new solutions
- Increased responsiveness allows client to bring new offerings to the marketplace sooner rather than later
- Client is in a better position to differentiate itself from competitors

The client cited value, performance, and robustness as the primary reasons for selecting the IBM solution.

Solution components:

- IBM System z
- Linux on System z
- IBM Tivoli Composite Application Manager
- IBM Tivoli OMEGAMON
- IBM WebSphere Process Server
- IBM WebSphere Service Registry and Repository
- IBM WebSphere Modeler

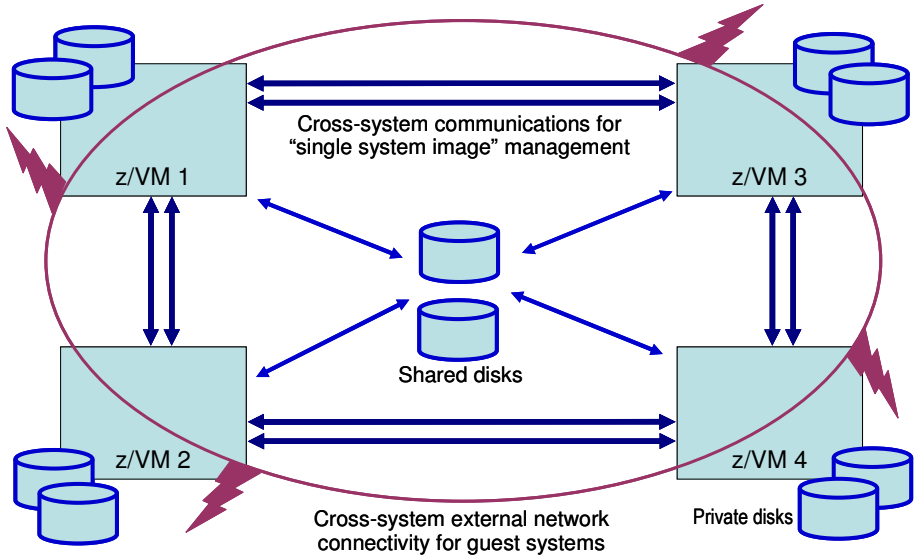
Smarter Virtualization with IBM System z and z/VM

- Do more with less
  - Consolidate more servers, more networks, more applications, and more data in a single machine with Linux and z/VM
  - Achieve nearly 100% utilization of system resources nearly 100% of the time
  - Enjoy the highest levels of resource sharing, I/O bandwidth, system availability, and staff productivity
- Reduce costs on a bigger scale
  - Consume less power and floor space
  - Save on software license fees
  - Minimize hardware needed for business continuance and disaster recovery
- Manage growth and complexity
  - Exploit extensive z/VM facilities for life cycle management: *provisioning, monitoring, workload mgmt, capacity planning, security, charge back, patching, backup, recovery, more...*
  - Add hardware resources to an already-running system without disruption – the epitome of Dynamic Infrastructure
  - Consolidation on a **scale up** machine like System z means fewer cables and fewer components to impede growth

z/VM Statements of Direction

Clustered Hypervisor Support and Guest Mobility
Overview of Planned New Function

- Clients can cluster up to four z/VM systems in a **Single System Image** (SSI)
- Provides a set of shared resources that can be used by both z/VM and hosted virtual machines, with full awareness of sharing by the clustered z/VM systems – be they on the same and/or different z10 servers
  - Directory, minidisks, spool files, Virtual Switch MAC addresses
- Helps simplify systems management for a multi-z/VM environment
  - Single user directory
  - Cluster management from any system
    - Apply maintenance to all systems in the cluster from one location
    - Issue commands from one system to operate on another
  - Built-in cross-system capabilities
  - Service consolidation: run one copy of service virtual machines for the cluster
  - Resource coordination and protection: network and disks



- Dynamically move Linux guests from one z/VM system to another in the cluster via **Live Guest Relocation**
  - Helps reduce planned outages; enhances workload management
  - With z/VM: dynamically move work to available resources **and** dynamically move resources to work

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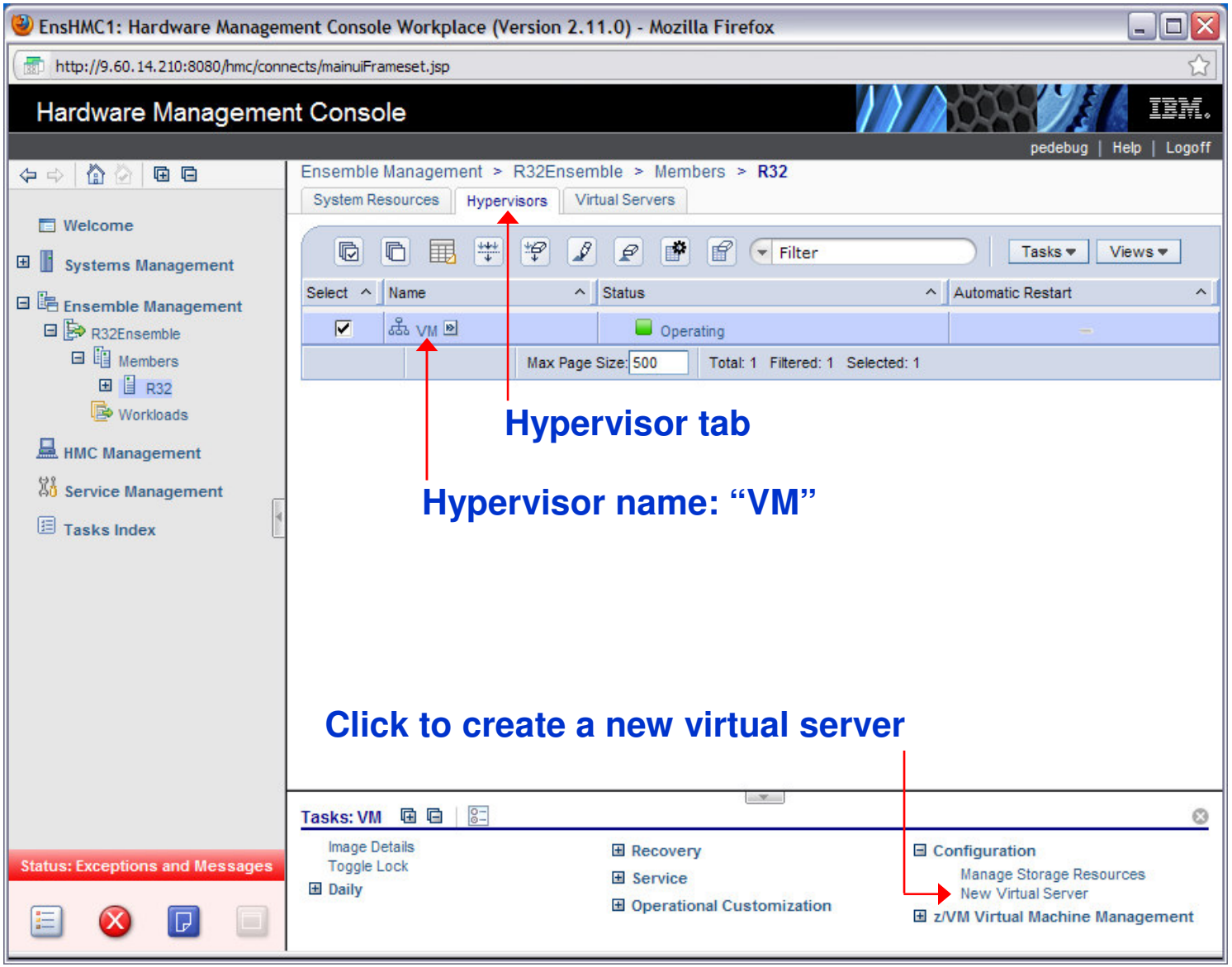
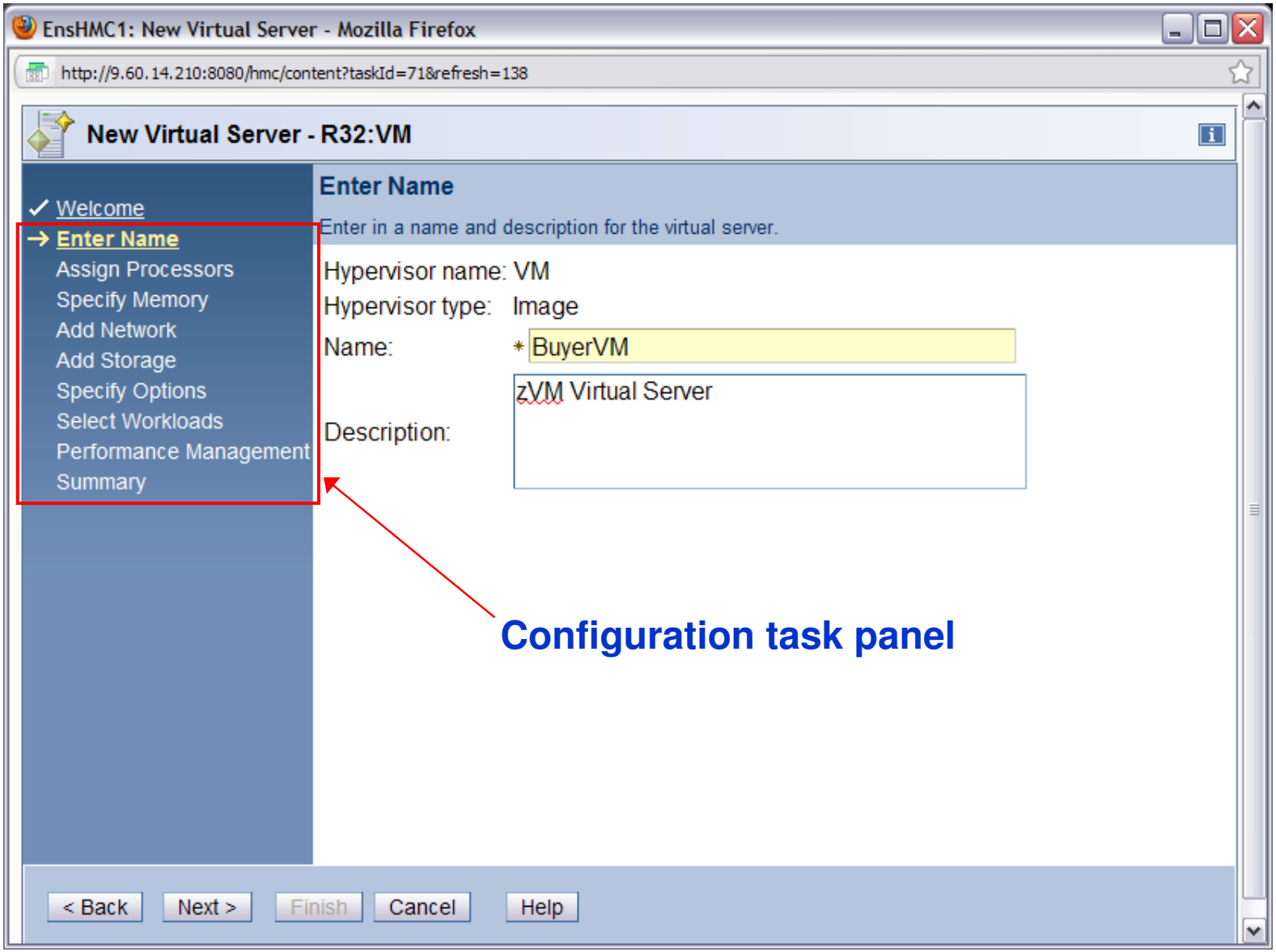
Creating z/VM virtual servers using the zEnterprise Unified Resource Manager



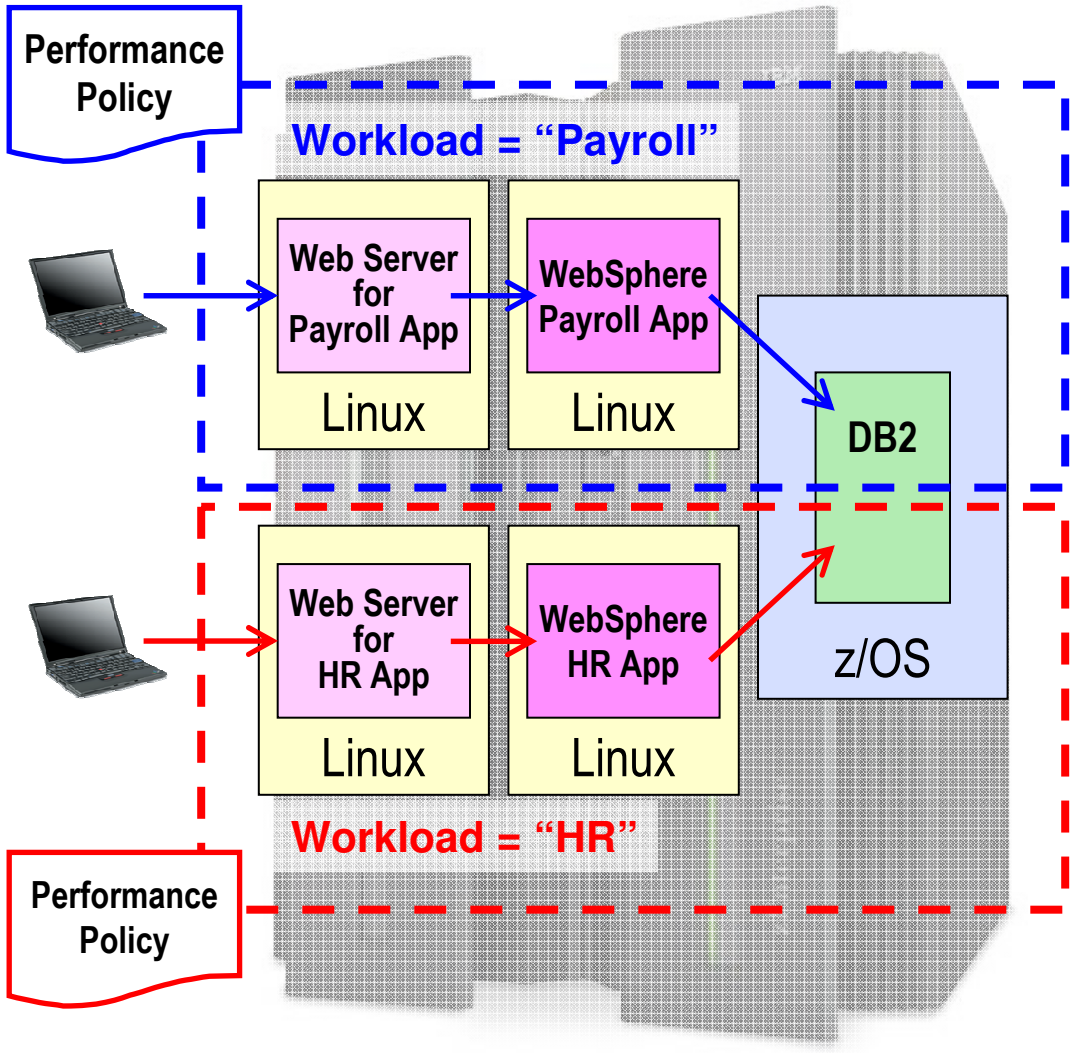
Creating z/VM virtual servers using the zEnterprise Unified Resource Manager



Workload Management with Unified Resource Manager

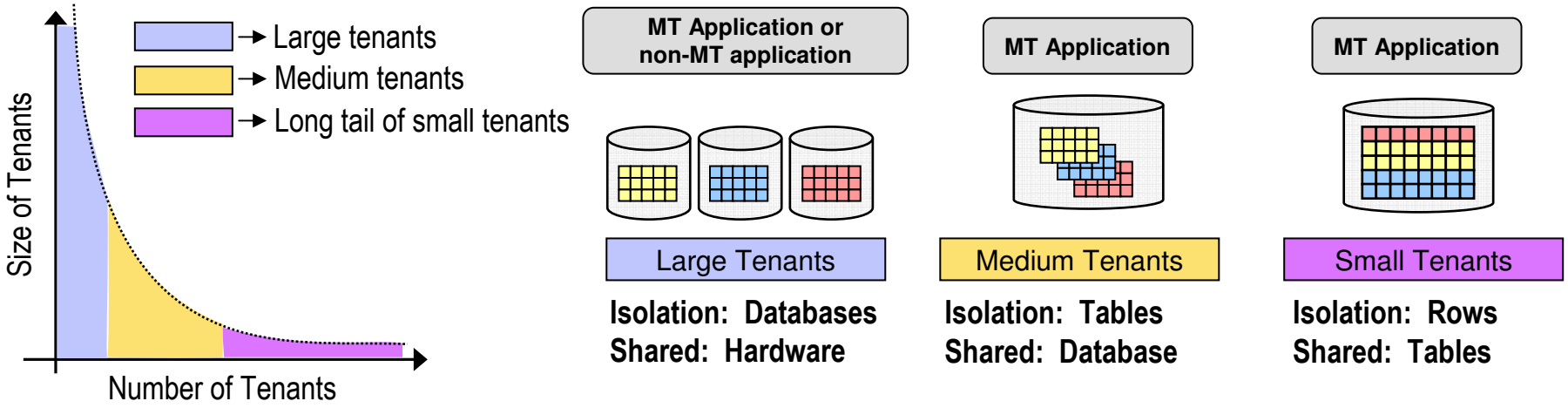
Policy-based Resource Sharing that Aligns IT Assets with Business Priorities

- A **Workload** is a grouping mechanism and management view of virtual servers supporting a business application
- It provides the context within which associated platform resources are *presented*, *monitored*, *reported*, and *managed*
- A **Performance Policy** is associated with a Workload
- Unified Resource Manager will dynamically adjust CPU settings to achieve performance policy compliance
- Workloads can span LPARs, blades, and even zEnterprise systems (up to eight)



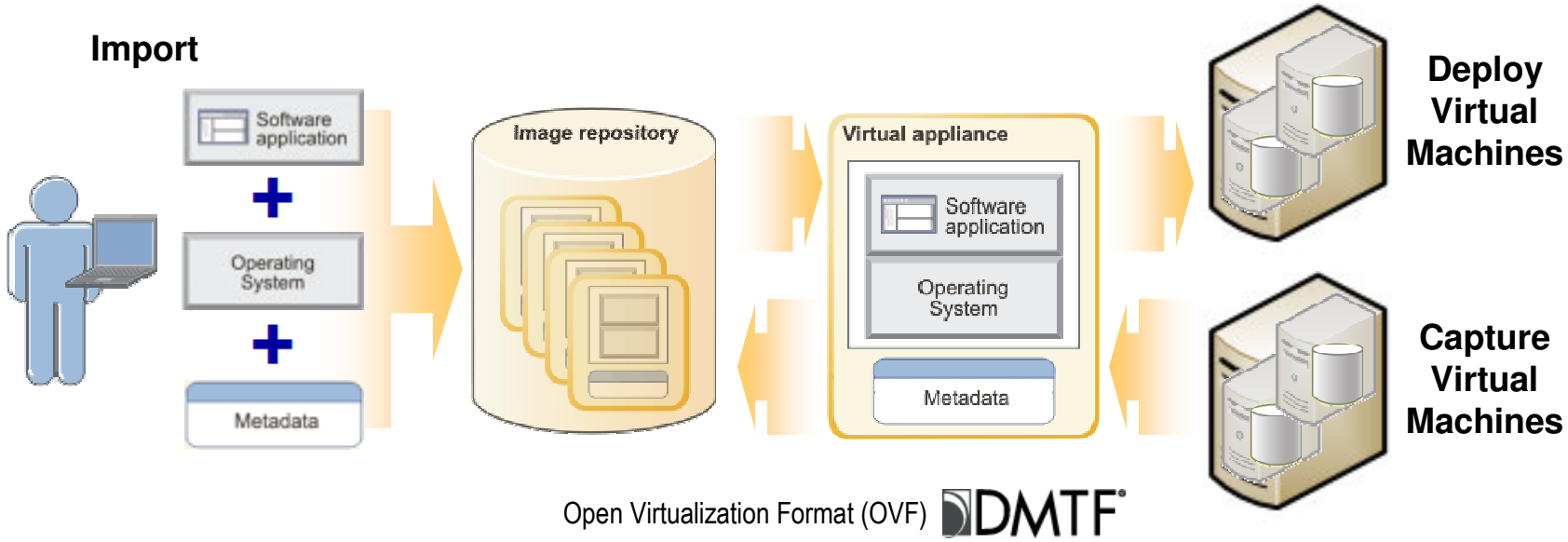
Database-as-a-Service and Multi-tenancy with DB2 on z/OS

- **Multi-tenancy: multiple companies or users using the same software with a level of isolation**
  - Tenants are companies or users that would have historically installed and used a single instance of software solely for their own use
  - Multi-tenancy allows companies/users to use the same software with a level of isolation
- **Multi-tenancy can further reduce hardware and maintenance costs of DBaaS**
- **Analogous to users running various applications on the same operating system**
  - The point is to share management and hardware costs among a number of tenants
  - Tenants, like the distinct users on an operating system require a level isolation



IBM Systems Director VMControl

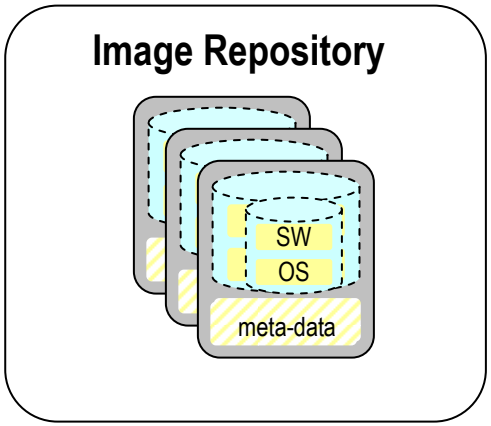
Proactively Manage the Virtual Environment

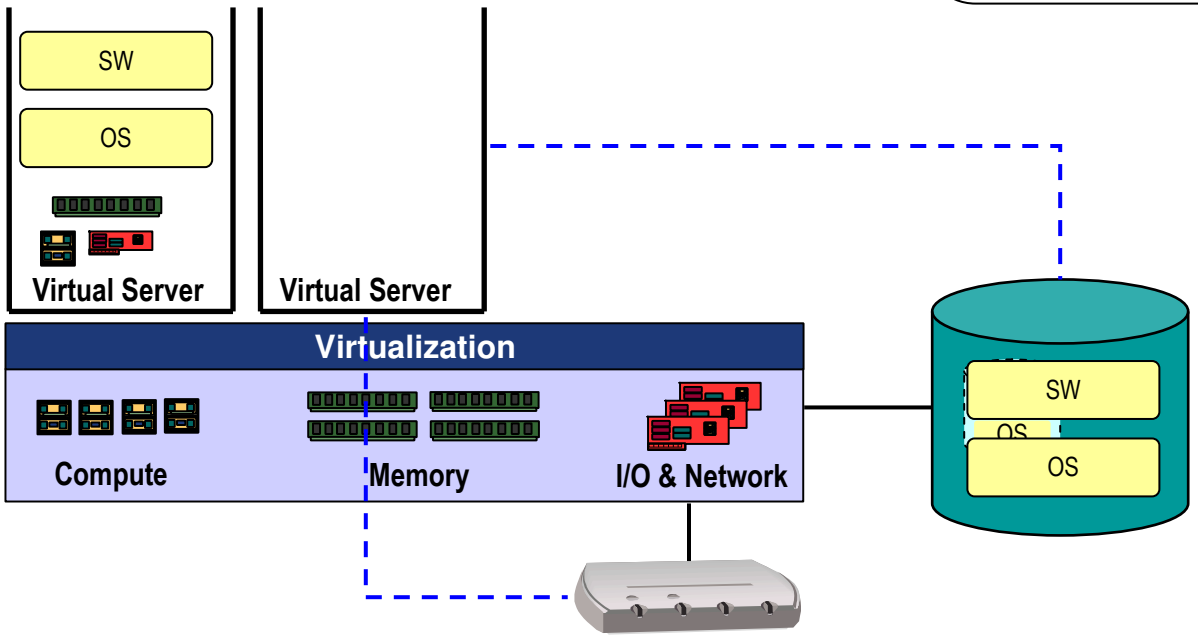


- Discover and manage heterogeneous image repositories
- Import, capture and catalog new images from existing systems
- Simplified virtual image deployment and customization
- Dynamically provision virtual server, storage and network resource
- Leveraging OVF open standard packaging for interoperability

Deploying a Virtual Server Image with VMControl

- The server image meta-data is used to create a virtual container, allocating the required platform resources
- Storage is dynamically allocated and attached to the virtual server – other data disks are attached
- The virtual server is dynamically attached to the appropriate networks and VLANs
- The virtual server is started from the bootable disk image and customized as part of its initial boot





- **Improved time to value**
- **Fewer tools and fewer tasks**
- **Workload (business) context**

View In Animation Mode

IBM System z Cloud Computing Solutions

System z Solution Edition for Cloud Computing

… a cloud computing foundation solution that can be customized by the client for a wide range of cloud workloads

IBM Smart Analytics Cloud for System z

… a cloud computing solution for the delivery of business intelligence & analytics optimized for the large enterprise client

IBM System z Offerings for Large Scale Consolidation

The Enterprise Linux Server

A dedicated IBM zEnterprise or System z10 server for large-scale Linux workloads

System z Solution Edition for Enterprise Linux

Additional capacity on an installed IBM zEnterprise or System z10 server for large Linux workloads

- **Offerings include**
  - System z IFL specialty processors, memory, and I/O connectivity
  - Hardware maintenance for three to five years
  - z/VM virtualization software package with three to five years of subscription and support
- **Supported with promotions from Linux Development partners Novell and Red Hat**
- **Very competitive pricing**
  - Competitive TCA with scalable Linux and UNIX alternatives
  - Total Cost of Ownership and Qualities of Service that blow away the competition
  - Price / performance improves as you grow your environment
  - Able to host thousands of servers in a single system
  - Pricing starting at under $1,000 per virtual server for 3 years for very large consolidations(1)

More Solution Editions include: SAP, Business Resiliency, Security, WebSphere, Application Development, Chordiant, ACI, Data Warehousing, **and Cloud**

(1) Calculations based on specific solution offering components using IBM and client experiences. Results can vary.

TCA: hardware, virtualization software, memory, maintenance

IBM System z Solution Edition for Cloud Computing

	Creates…	That delivers …
Solution Edition for Cloud Computing	An infrastructure solution for cloud computing built on Tivoli & System z	The framework to migrate workloads for rapid adoption of cloud computing benefits

The solution components…

IBM Software

Tivoli. software

Visibility

Control

Automation

IBM Hardware

Centralize, Virtualize, Simplify

IBM Services

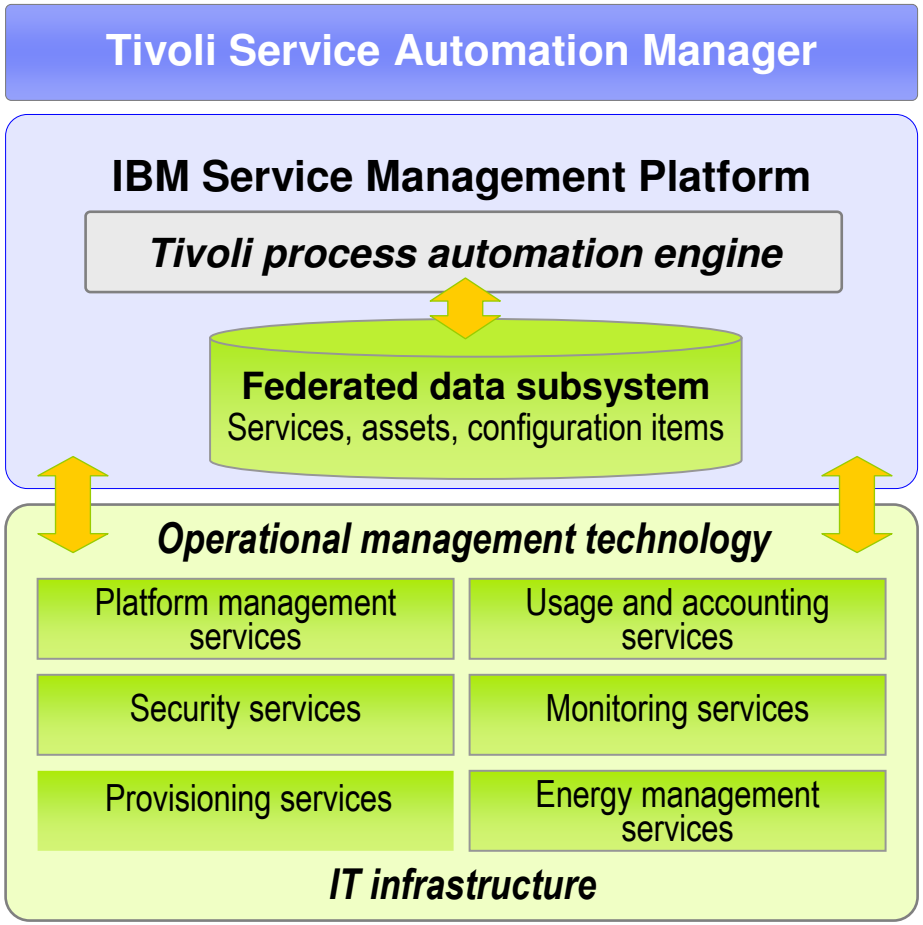
- Phase 1: Create cloud computing use cases within the enterprise
- Phase 2: Implement the service automation and management tooling to support cloud workloads
- Phase 3: Educate the client on cloud computing for on-going success and provide a sample workload

Learn more at: http://www.ibm.com/systems/z/solutions/editions/cloud/index.html

IBM Tivoli Service Automation Manager

Aggregated capabilities for managing your cloud environment

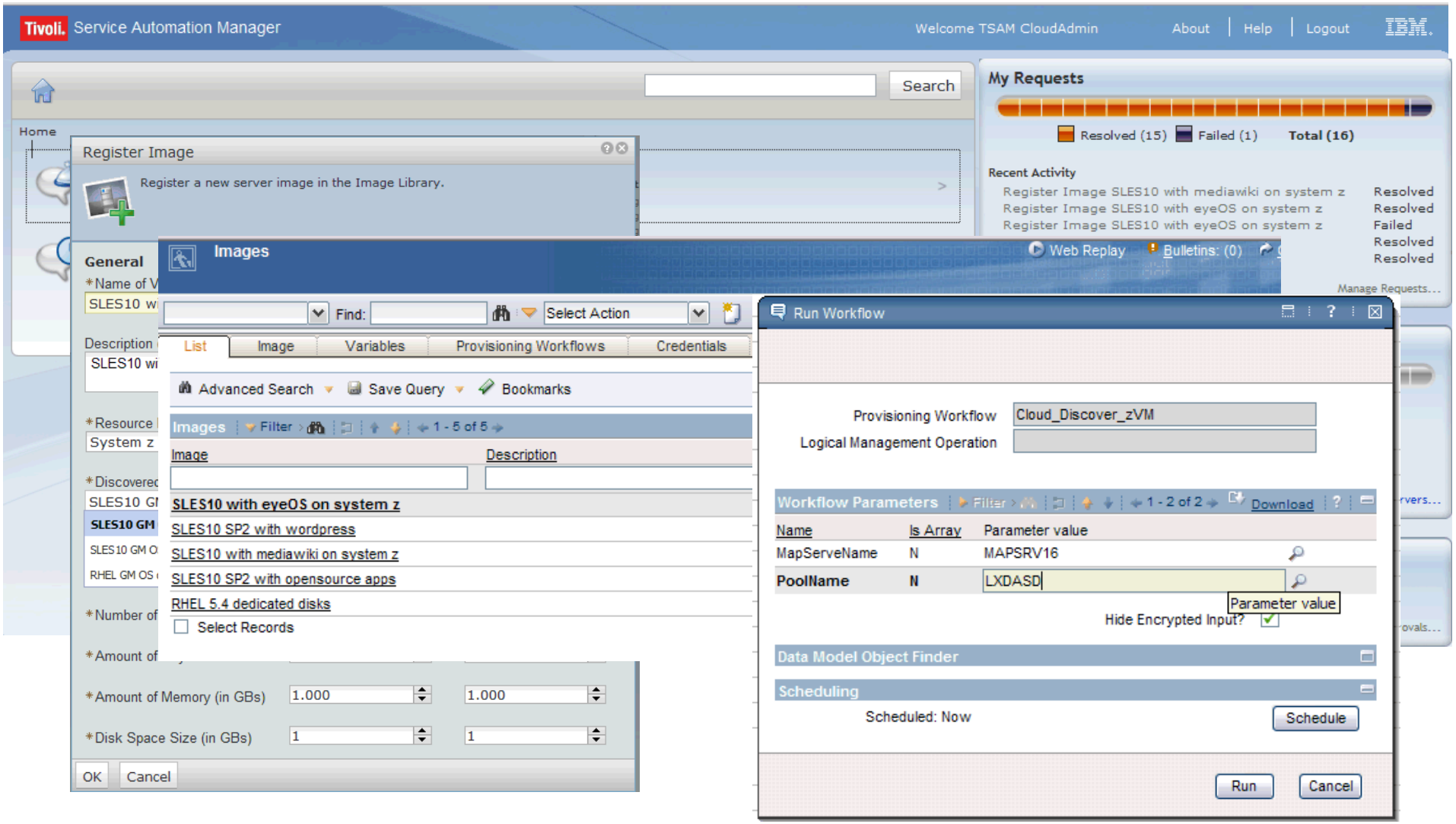
- Built on the IBM Service Management Platform to manage the life cycle of virtual images
- Reduces complexity by orchestrating technology, processes, people and data to provide cloud computing services and service management of cloud computing
- Provides rapid provisioning of physical and virtual resources into a highly secured environment



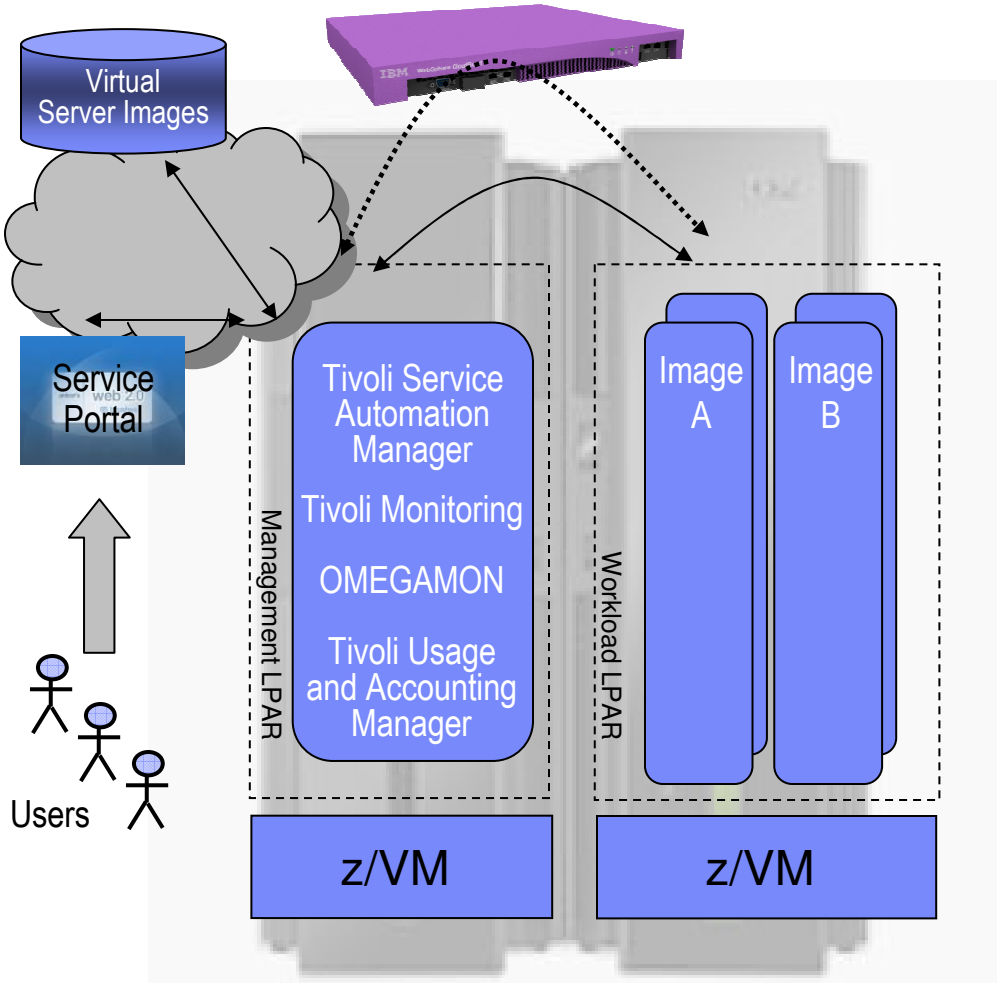
No other vendor provides one solution for consistent provisioning, security, or monitoring across mainframe, UNIX, and x86 platforms

IBM Tivoli Service Automation Manager

Giving Clients Visibility, Control, and Automation of Linux on System z



Architecture Overview of Solution Edition for Cloud Computing



- Management LPAR provides rapid provisioning / de-provisioning and services lifecycle management
- Workload LPAR supports the customer-defined cloud images
  - Linux and z/OS running on z/VM
  - A sample workload is provided by eyeOS (web-based desktop)

Available now!

- WebSphere Cloudburst appliance can be used for rapid provisioning of best practice WebSphere workloads onto System z
- IBM Director with VMControl provides a consistent cross-platform approach to cloud

The System z Solution Edition for Cloud Computing can be used to build test and compute clouds, and also provide a foundation for software services in the cloud

National Business Center Slashes Costs by Creating Strategic Enterprise Cloud Platform on IBM System z

Efficient Data Centers Prove to be a Competitive Advantage

Business challenge:

Despite being part of the Department of the Interior, the National Business Center (NBC) does not receive governmental funding, and relies on competitive bids to operate. It needed to be able to offer the best service while keeping a sharp eye on costs to succeed.

Solution:

Implemented IBM System z mainframes running Linux and IBM WebSphere SOA. A range of IBM Tivoli products help manage mainframe virtualization, provisioning, and balancing workload.

Benefits:

- NBC can experience greater efficiency thanks to higher utilization, better integration, and simplified management than it could realize if using a distributed computing architecture
- System z maximizes ROI by operating at 80-to-100% utilization compared to the 10-to-20% average of distributed servers
- Offers customers solid and secure service, ensuring maximum satisfaction
- Takes advantage of System z virtualization capabilities to optimize resource provisioning and workload balancing

"System z is our enterprise server of choice due to clear advantages in cost-of-acquisition and operation – these savings are vitally important to us as they ensure NBC remains competitive in bidding situations."

— Doug Bourgeois, Director, National Business Center

Solution components:

- IBM System z and z/VM, WebSphere SOA, Linux, and IBM Tivoli management products

The National Business Center
Government Shared Service Provider

Source: Clabby Analytics, August 2009

Universita di Bari

Innovative Cloud Solutions

Wine Market

Support for 60 wineries to determine demand and get best market price

Fish Market

Electronic fish auction for fishermen while on boats

MoniCA

Logistics solution tracks and collects data real time

Solution Edition for Cloud Computing

Solve community challenges

BENEFITS to Clients

Cloud computing allows multiple organizations to tap into heavy-duty computing power at minimal cost.

It lowers the barrier for local businesses to benefit from this technology.

UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

Universita di Bari, established in 1924, is developing cloud-based solutions for a consortium of companies and universities from five regions of southern Italy.

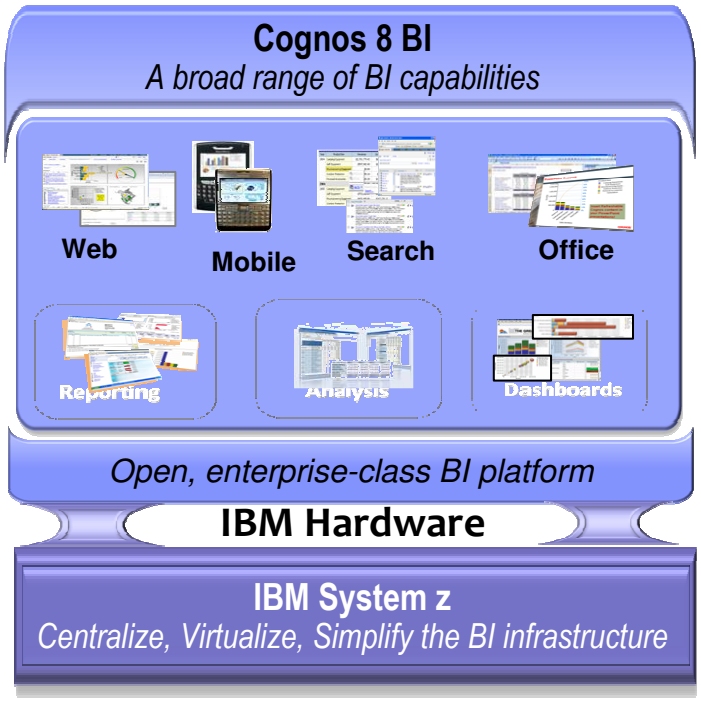
 Press release: http://www-03.ibm.com/press/us/en/pressrelease/32051.wss

IBM Smart Analytics Cloud for System z

	Creates…	That delivers …
Smart Analytics Cloud	A private cloud within the enterprise	A solution for delivering business intelligence to the entire organization

The solution components…

IBM Software

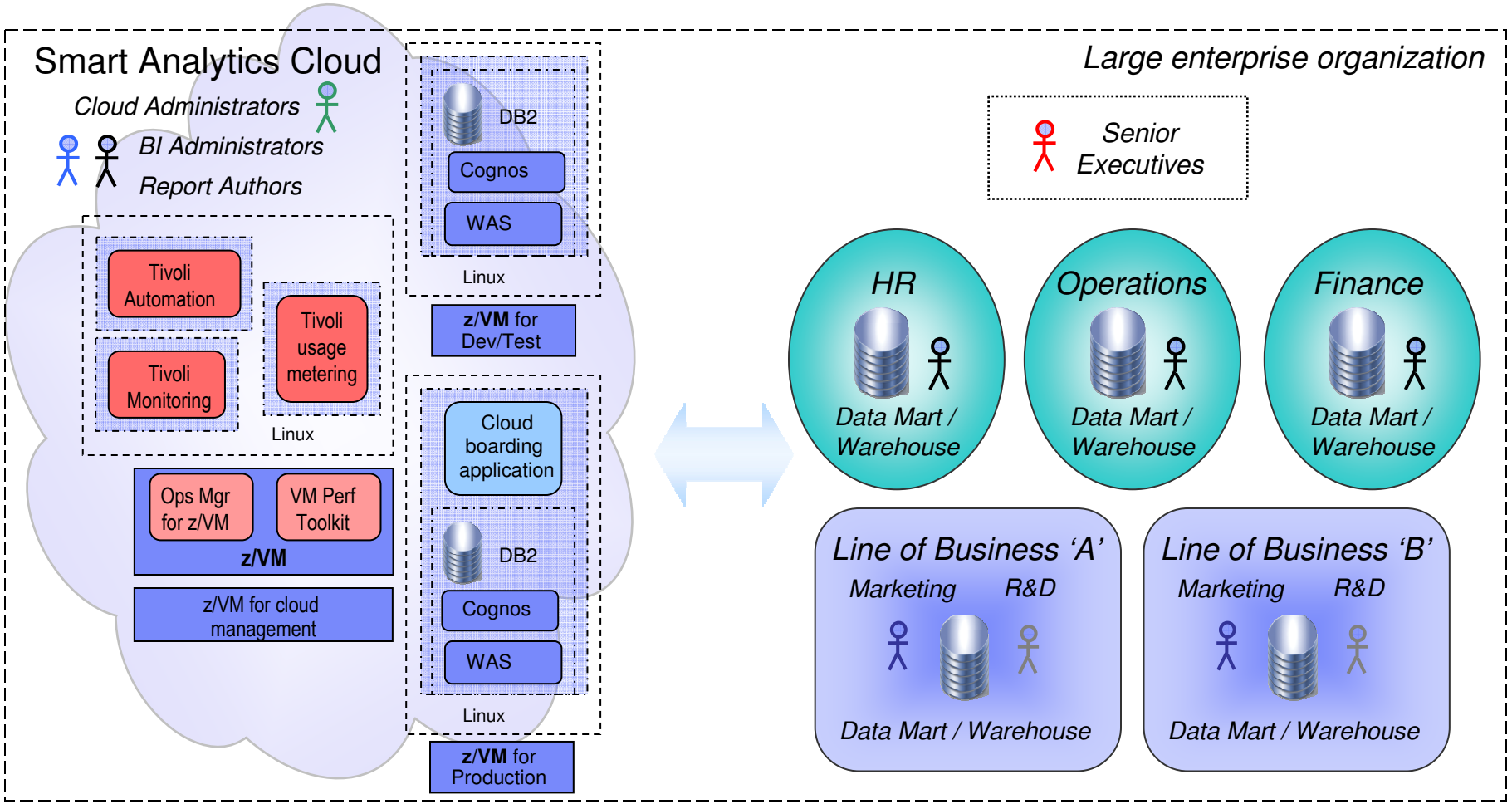


IBM Services

- Phase 1: Create awareness of, a strategy for, and a governance foundation for BI across the organization
- Phase 2: Preparation for the Smart Analytics Cloud
- Phase 3: Install the base cloud, integrate into the corporate enterprise, and test the cloud use cases
- Phase 4: Educate the enterprise for on-going success with the Smart Analytics Cloud

Learn more at: http://www.ibm.com/systems/z/solutions/cloud/smart.html

Smart Analytics Cloud for Large Enterprises



This offering transforms the delivery of business intelligence into a service that is readily available and affordable to corporate users across and beyond the enterprise

Smart Analytics Cloud in the IBM Corporation

Our commitment to informed decision making led us to consider private cloud delivery of Cognos via System z, which is the enabling foundation that makes possible ***more than $20M savings over 5 years****.*

– IBM CIO Office

"What IBM has done is come up with a perfect application for a private cloud."

– John Webster, CNET, Nov. 18, 2009

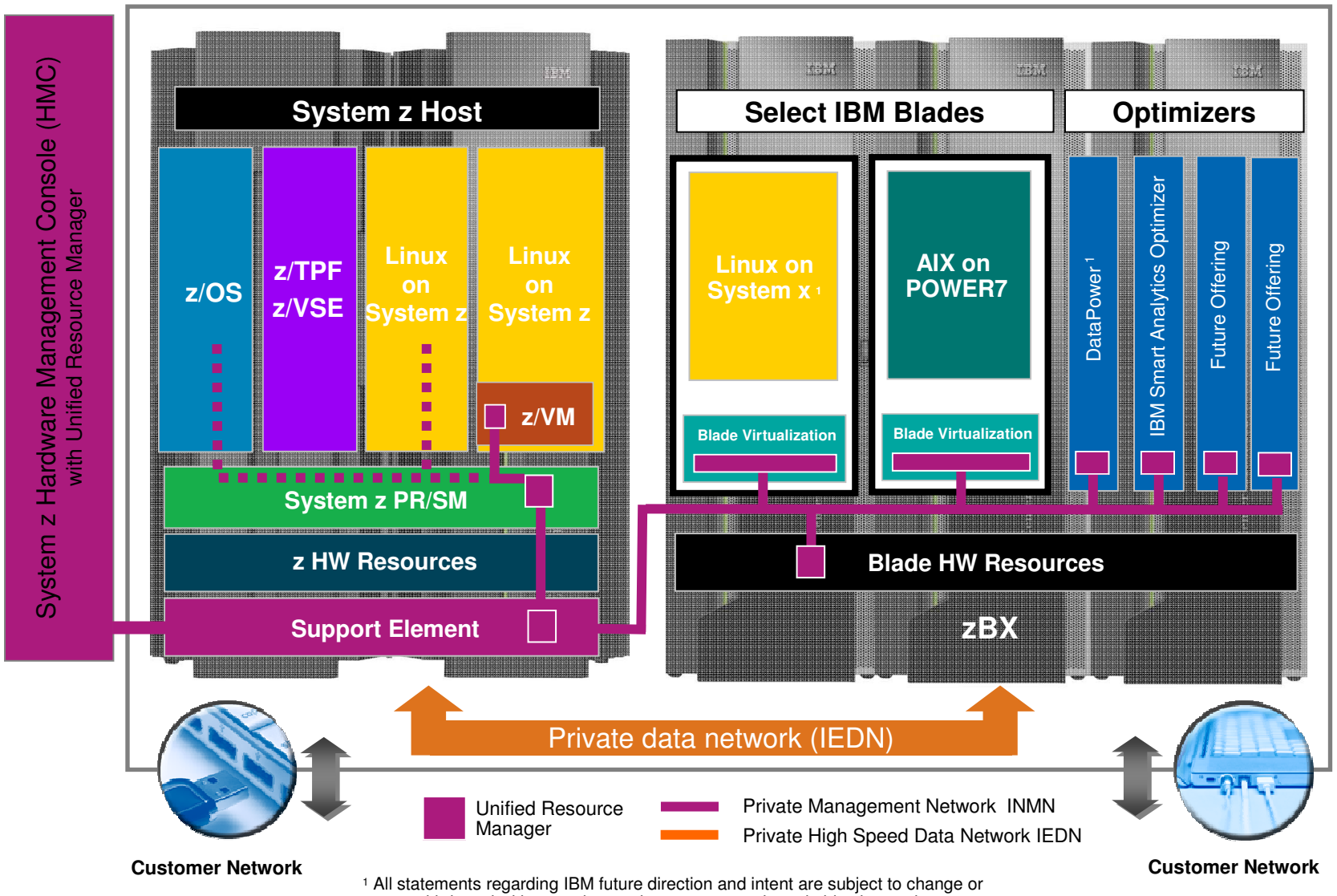
- **Blue Insight:** IBM's deployment is the world's largest private cloud computing environment for business intelligence and analytics that will empower IBMers from around the world with information and business insight to make smarter decisions – no matter where the data resides
- **IBM Smart Analytics Cloud:** a services based solution offering to enable large enterprise clients to build their own private cloud environment with easily consumable business intelligence services, system and software

IBM Blue Insight results:

- Consolidating 20+ multi-product, departmental BI deployments to Cognos 8 BI on System z
- Realizing value from 60+ data sources across IBM representing more than 1 PB of data
- Deploying private cloud self service to support 200,000+ named users across our global workforce (120K by mid-year 2010, expanding to 200K by 2011)
- 56% cost savings per user (grows with volume)
  - $7,775,767 – Infrastructure cost savings realized with z10 technology
  - $2,558,525 – Business Intelligence Competency Center (BICC) cost savings
- Elasticity in a shared server model supporting SLAs for diverse tenants; speed to value and reduced capital spend (26 weeks to 2 weeks)

Putting zEnterprise System to the task

Use the smarter solution to improve your application design

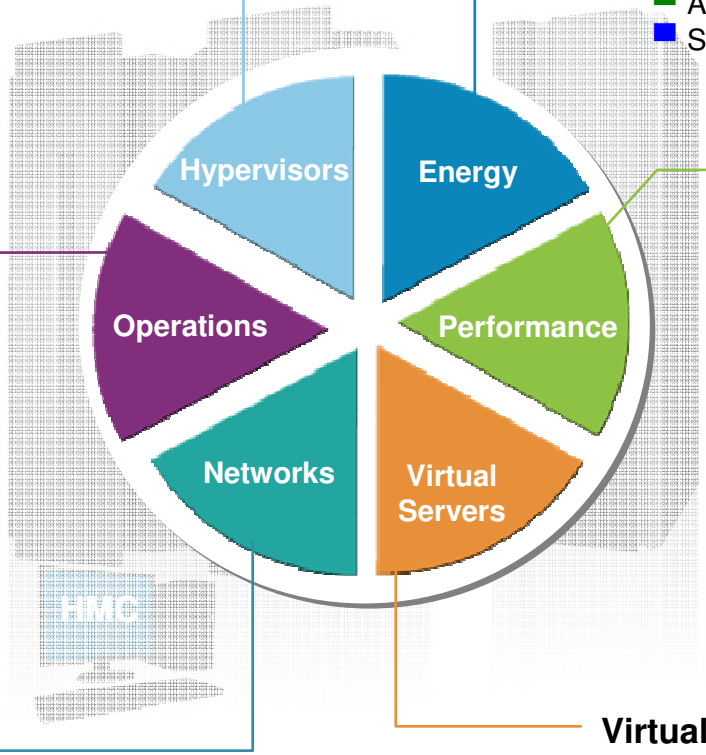


[1] All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represents goals and objectives only.

zEnterprise hardware management and platform management …

Hypervisor Management
- Integrated deployment and configuration of hypervisors
- Hypervisors (except z/VM) shipped and serviced as firmware.
- Management of ISO images.
- Creation of virtual networks.
- Manage and control communication between virtual server operating systems and the hypervisor.

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



Network Management
- Management of virtual networks including access control

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

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

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

Key
- Manage suite
- Automate suite

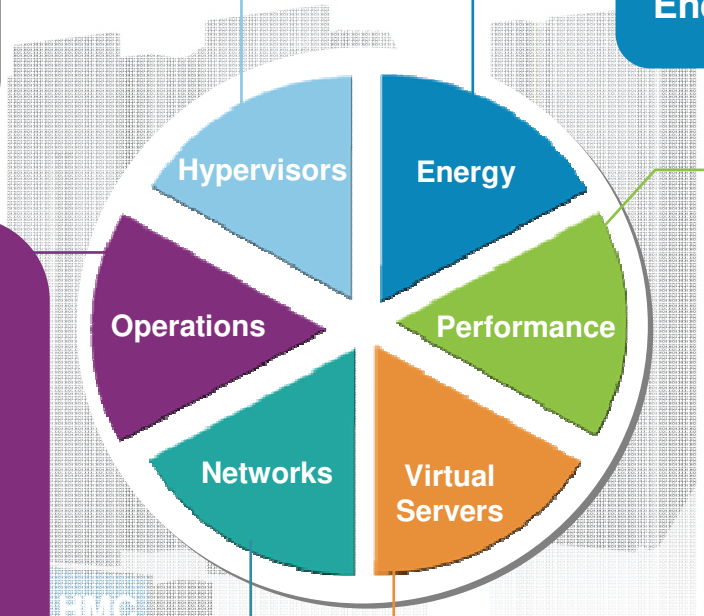
… value made possible by the Unified Resource Manager

Simplified installation of hypervisors

Gain significant time to market with improved speed of deployment

Simplified energy management

Energy cost savings



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

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

Factory installed and configured network

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

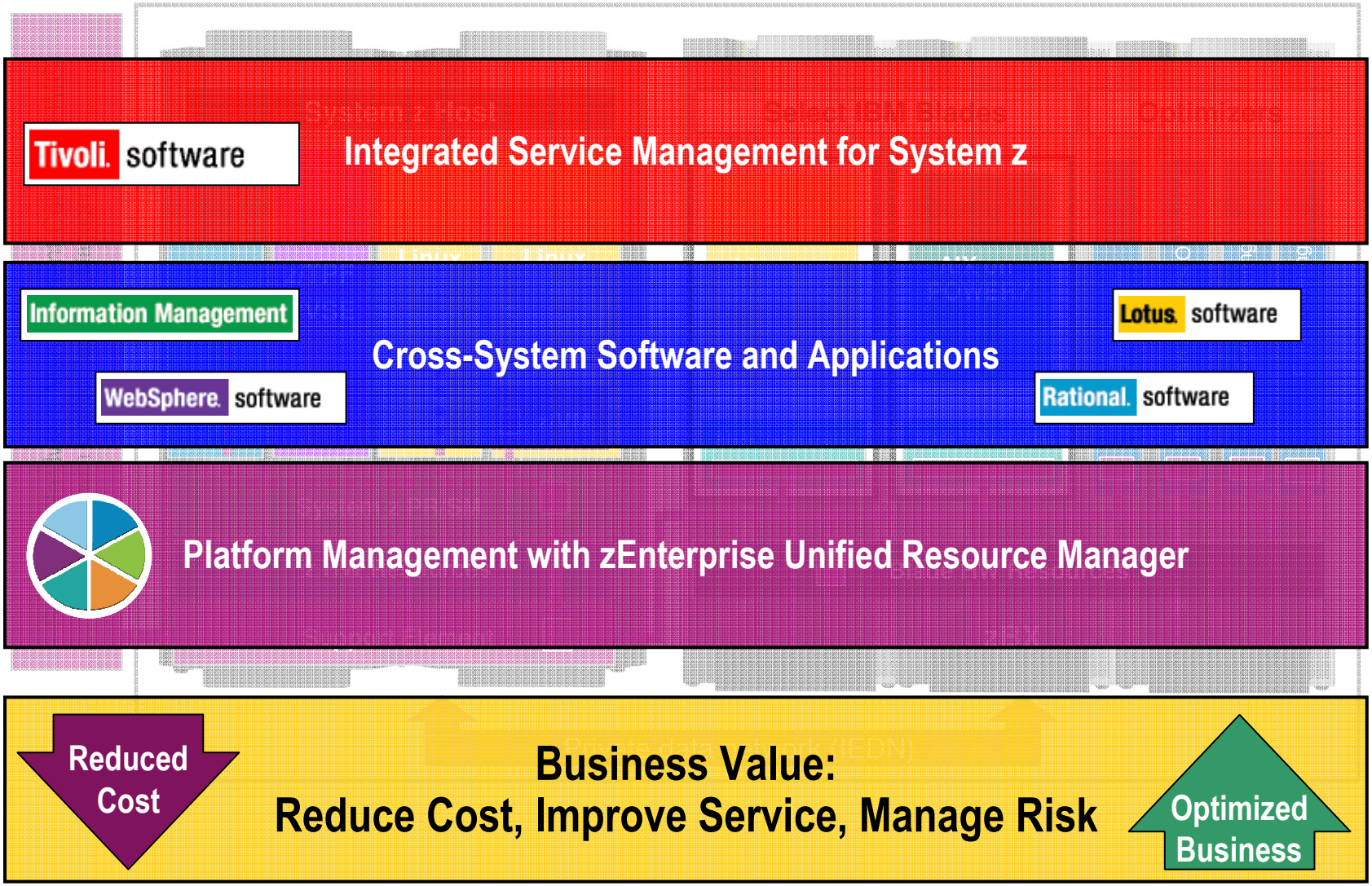
Gain flexibility, consistency and uniformity of virtualization

Provide the business with faster time to market

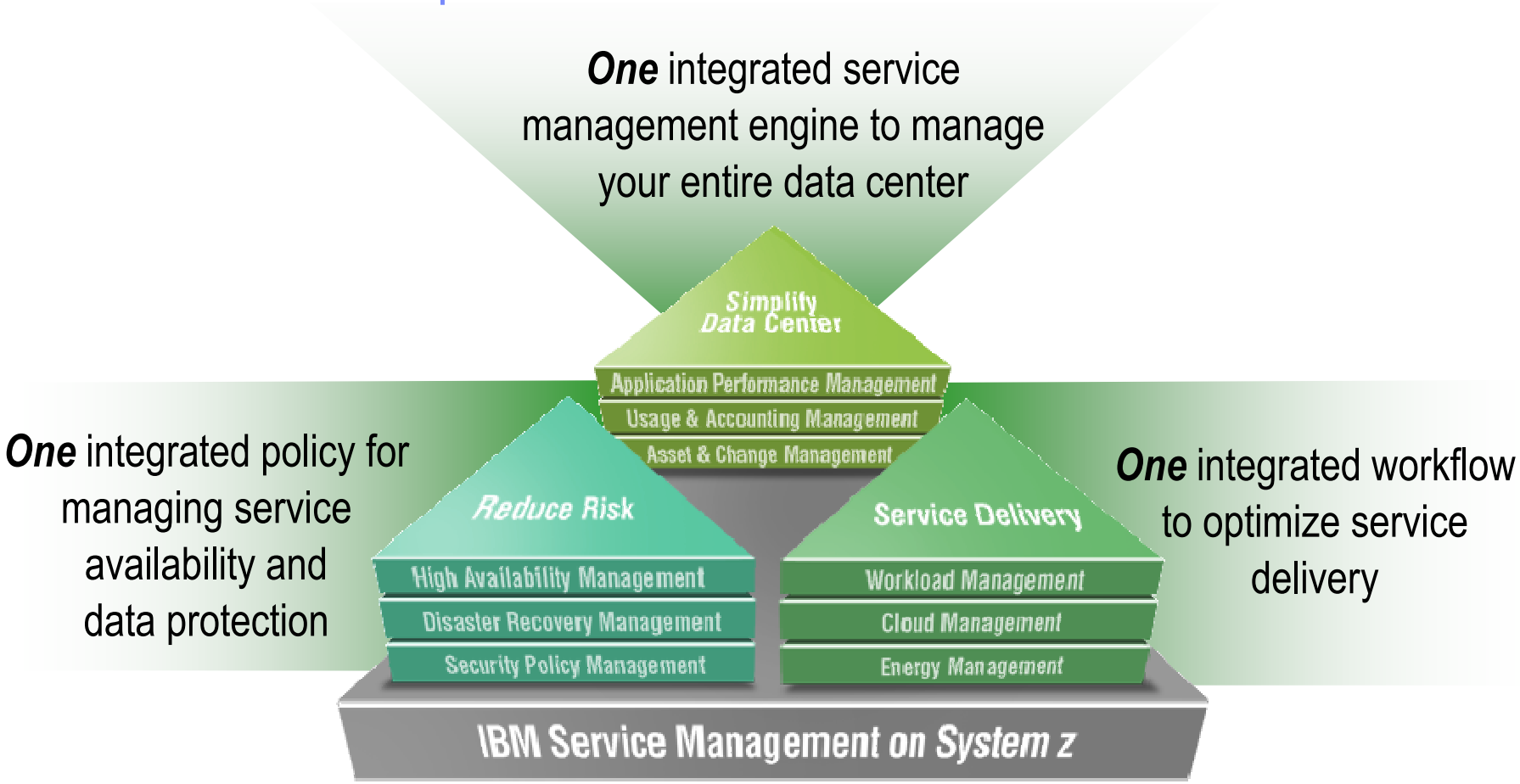
Simplified network management for applications

Workload Optimization with Operational Certainty and Efficiency

Using zEnterprise for "Best Fit" Cloud Computing



IBM Service Management on System z Delivers Value on the Innovation of zEnterprise



IBM Advantage

- Visibility, Control, Automation™ with a single point of control on a common infrastructure
- Consolidated view of the IT infrastructure
- Lower training and maintenance costs
- Integrated, consolidated reporting
- Asset optimization

Security Remains Top Concern for Cloud Adoption

80%

Of enterprises consider security the #1 inhibitor to cloud adoptions

*"**How can we be assured that our data will not be leaked** and that the vendors have the technology and the governance to **control its employees from stealing** data?"*

48%

Of enterprises are concerned about the reliability of clouds

much about the other "-ities" – reliability, availability, etc."

33%

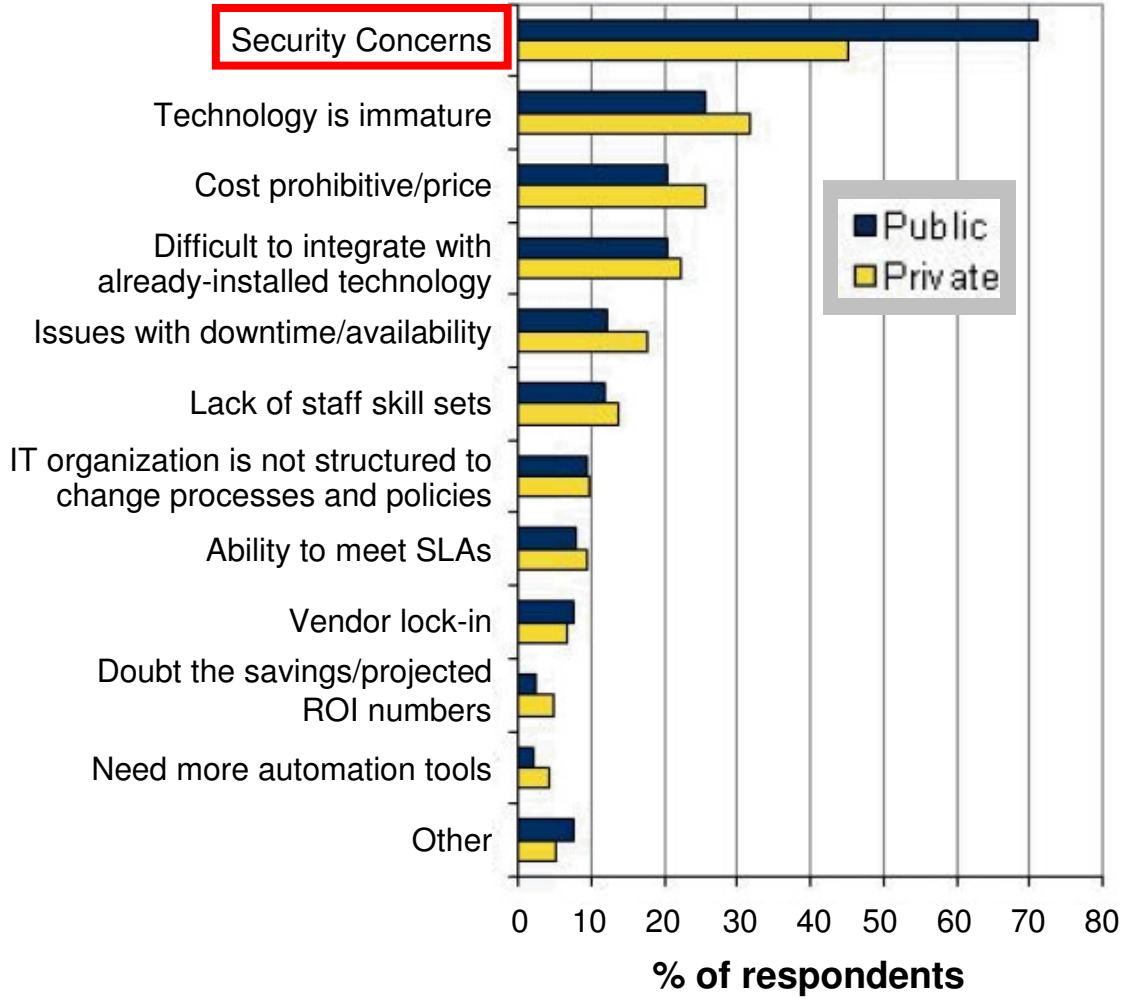
Of respondents are concerned with cloud interfering with their ability to comply with regulations

*"**I prefer internal cloud to IaaS. When the service is kept internally**, I am more comfortable with the security that it offers."*

Source: "Driving Profitable Growth Through Cloud Computing", IBM Study conducted by Oliver Wyman

Top Challenges in Moving to a Public or Private Cloud

Q: What do you see as the top 2 challenges in moving to a public/private cloud?



- Security support, maturity of virtual server hosting, and workload management on System z are proven strengths of the platform
- With zEnterprise and IBM Service Management on System z, these strengths are extended to integrate Power and System x technologies for optimal workload placement and Cloud Computing

Source: IDC's "Data Center and Cloud Computing Survey", January 2010

Securing Your Cloud with **IBM Tivoli Security for zEnterprise**

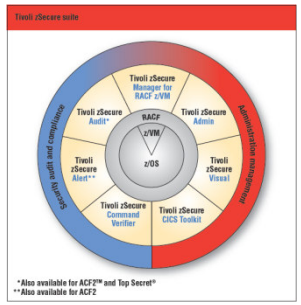
- ✓ **Enforce security policy compliance and reduce security vulnerabilities**
- ✓ **Centrally manage and protect access to applications, business services, infrastructure, and data**
- ✓ **Leverage the mainframe as your Enterprise Security Hub for cross-platform security**

Tivoli zSecure suite and Tivoli Security Management for z/OS

- Cost-effective security administration, security policy enforcement, automated auditing and compliance to detect threats and reduce risk

NEW! Tivoli zSecure Manager for RACF z/VM

- Mainframe audit solution for the enterprise security hub for analysis and reporting
- Mainframe administration enables efficient and effective RACF administration



Tivoli Federated Identity Manager

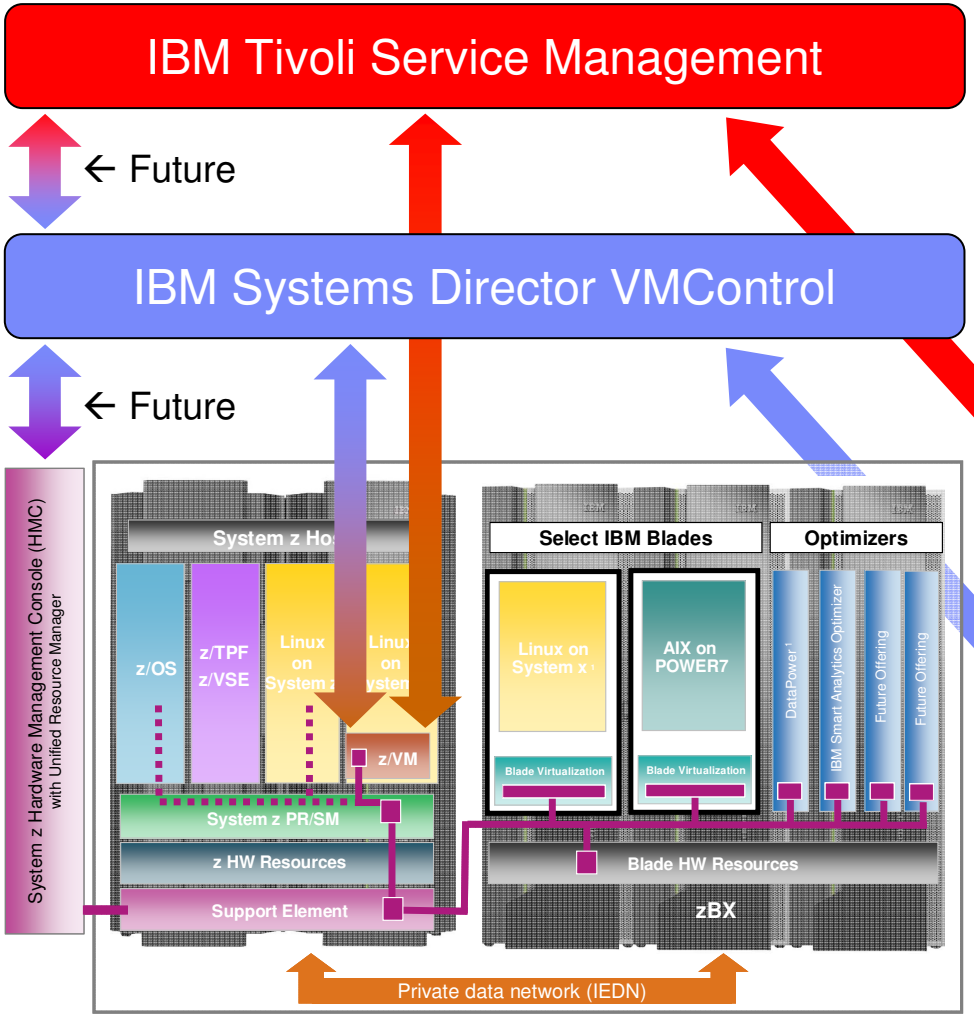
- Secure information sharing with federated SSO and a security token service
- New-user self enrollment capabilities

NEW! Tivoli Access Manager Family

- Data-level entitlement management and enforcement
- B2C enrollment and proxy standards
- Federation standards for on- and off-premise

Multi-System Cloud Management on IBM zEnterprise

The Big Picture Going Forward



- Enables optimal workload placement in a multi-system cloud infrastructure: spend less *and* deliver higher qualities of service
- Allows clients to manage all the hypervisors in a zEnterprise system with consistency
- Extends same management capabilities to Power and System x servers elsewhere in the enterprise

The IBM zEnterprise System:

Now extending System z cost savings and value to a new dimension

- **Designed to meet the need of today's heterogeneous data centers**
- **Enables a mixed set of workloads to be deployed on best fit technologies**
- **Delivers lower acquisition and operating costs than a one size fits all approach**
- **Reduces risk by extending the reach of System z qualities of service**
- **Improves service through tighter integration for multi-tier workloads**