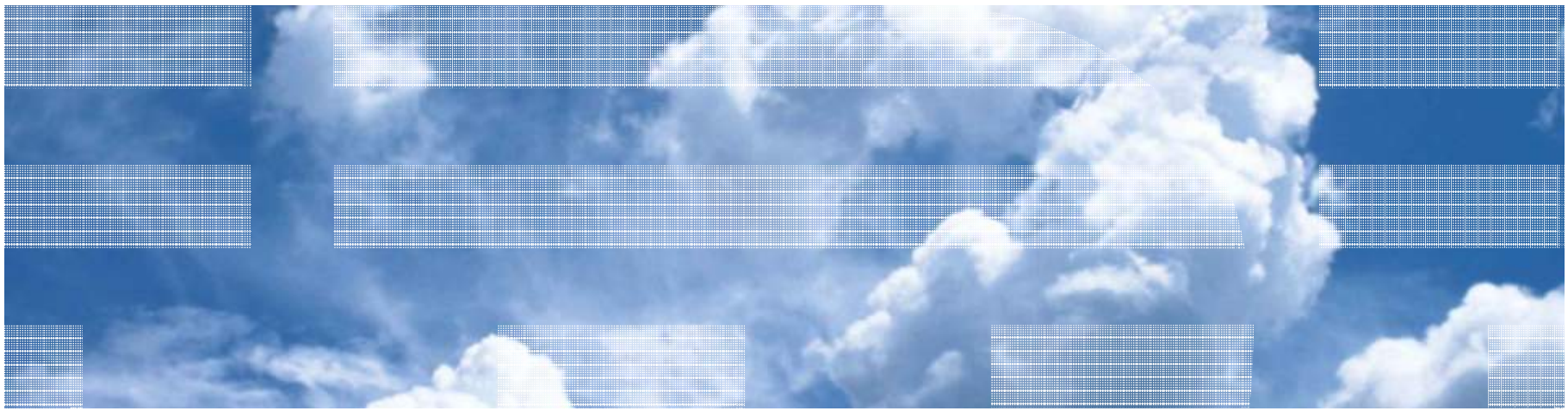
IBM Cloud Computing

Overview of the value of Linux on System z for cloud computing



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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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Topics we will cover in this presentation

- An introduction to cloud computing
- The value of IBM System z® Linux® as a foundation for the cloud
- System z Linux cloud computing offerings
- Conclusion

Cloud computing strategic planning assumptions

Highlights from the Gartner Symposium

- By 2012, 80% of Global 2000 enterprises will be using some level of cloud computing services (private or public).
- By 2012, 80% of Fortune 1000 enterprises will be using some level of cloud computing services, and 30% will use cloud computing system and/or application infrastructure services.
- By year-end 2012, half the world's largest 100 enterprises will have at least one service that they consider to be a private cloud computing service, using virtual machines as a basic building block.
- By 2014, most providers of cloud services will actively pursue both consumer and enterprise application business, thus requiring both tenant-application and tenant-enterprise models of multi-tenancy in their platforms.

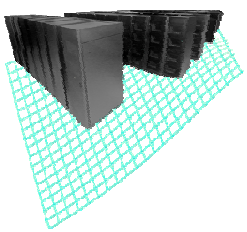
Cloud computing is an evolution not a revolution

"Clouds will transform the information technology (IT) industry... profoundly change the way people work and companies operate."

The Economist

Grid Computing

Solving large problems with parallel computing



Utility Computing

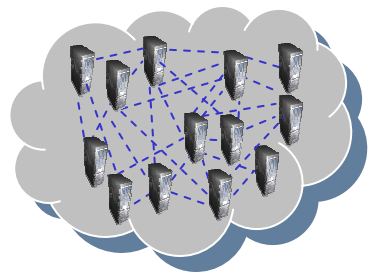
Offering computing resources as a metered service

Software as a Service

Network-based subscriptions to applications

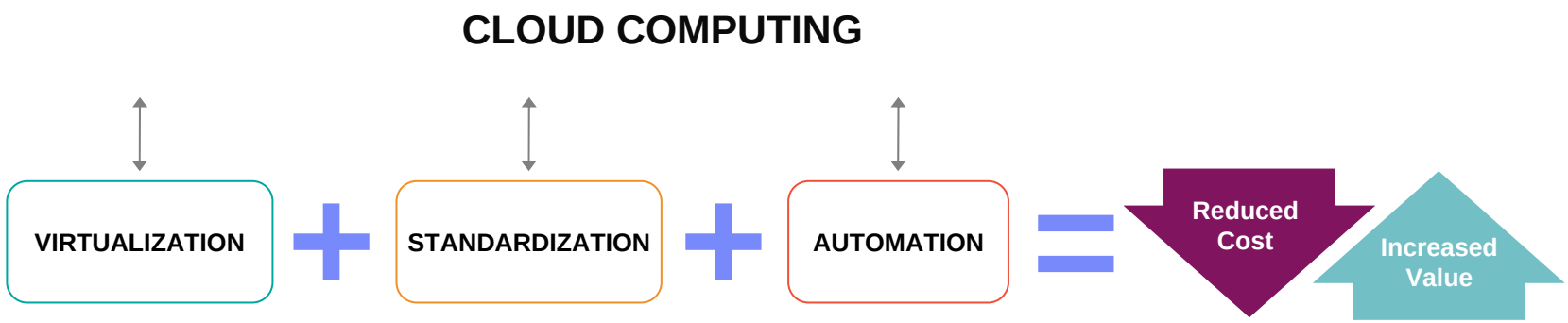
Cloud Computing

Anytime, anywhere access to IT resources delivered dynamically as a service.



Cloud computing is the 21st deployment model for workloads

An effective cloud computing deployment is highly optimized to achieve more with less….



…leveraging virtualization, standardization and automation to free up operational budget for new investment.

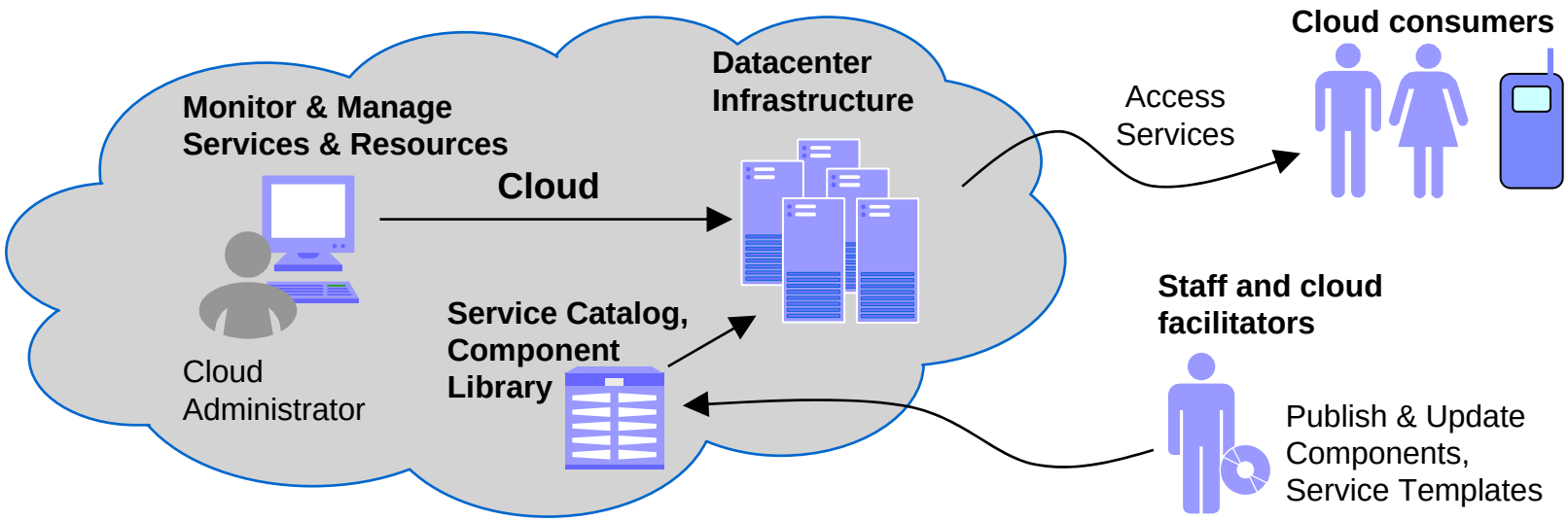
What is cloud computing?

A user experience and a business model

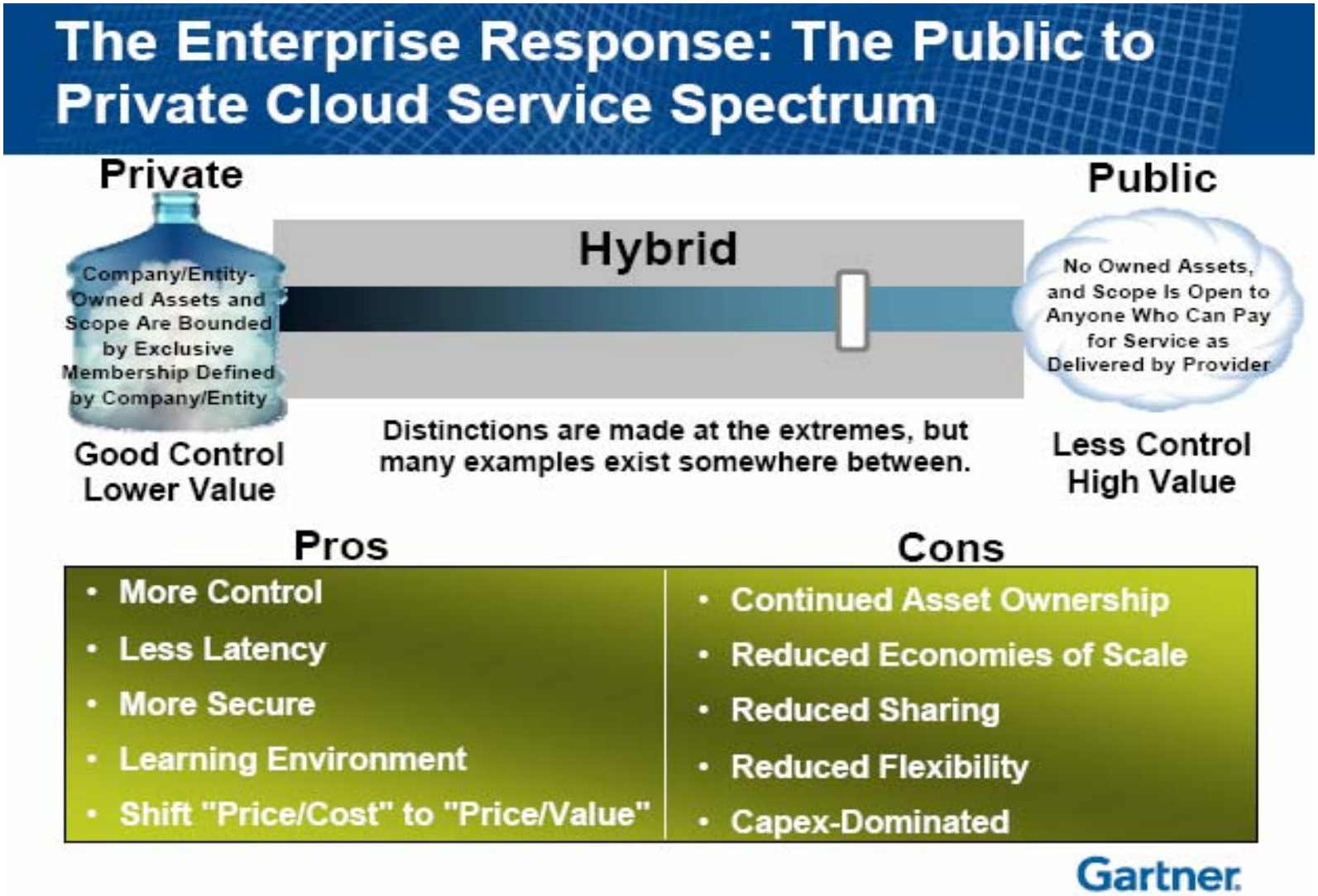
Cloud computing is an emerging style of IT delivery in which applications, data, and IT resources are **rapidly provisioned** and provided as **standardized offerings** to users over the web in a **flexible pricing model**.

An infrastructure management and services delivery methodology

Cloud computing is a way of **managing** large numbers of highly **virtualized resources** such that, from a management perspective, they resemble a single large resource. This can then be used to deliver services with **elastic scaling**.



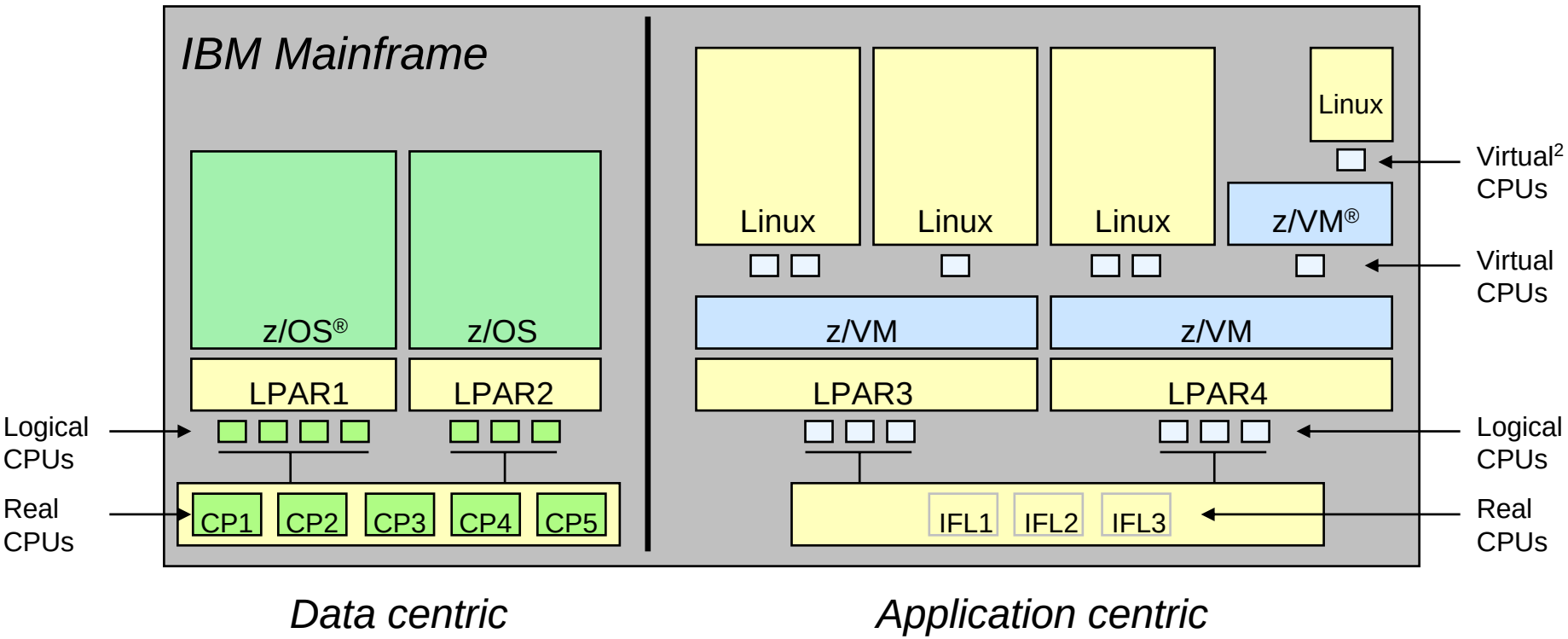
Private or public - what kind of cloud is for you?



System z is virtualized from the silicon to the app

The unique virtualization of System z enables utilization rates of +90% consistently and capable of going beyond that for long periods of time.

By comparison, best in breed cloud computing utilization rates are 38% (Google)



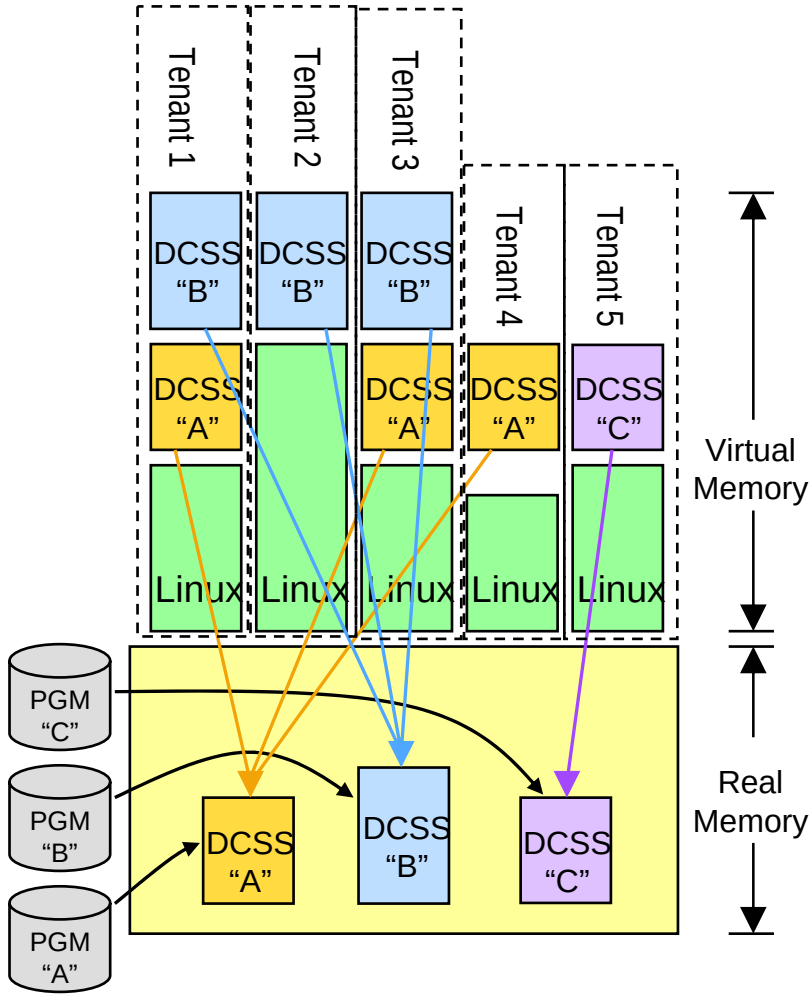
Transparent multi-tenancy of applications with Discontiguous Saved Segments (DCSS)

Data-in-Memory technology

- Share a single, real memory location among multiple virtual machines
- High-performance data access

Shared program executables

- Program executables are stored in an execute-in-place file system, then loaded into a DCSS
- DCSS memory locations can reside outside the defined virtual machine configuration
- Access to file system is at memory speeds; executables are invoked directly out of the file system (no data movement required)
- Avoids duplication of virtual memory and data stored on disks
- Helps enhance overall system performance and scalability



Read the Redbook®: http://www.redbooks.ibm.com/redbooks/pdfs/sg247285.pdf

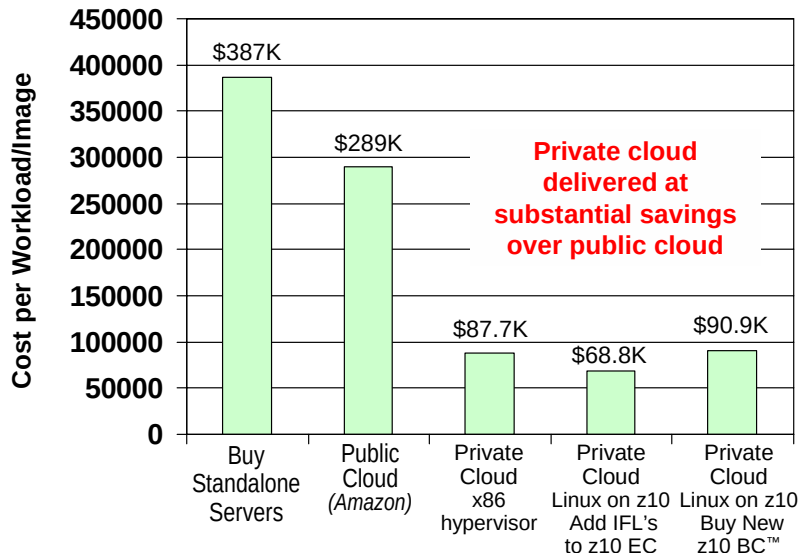
System z clouds achieve operational efficiency through economies of scale

Clouds built on mainframes can deliver economies of scale by using less resources while delivering more workload capability

Dramatic Simplification through Virtualization

Unit	Distributed	System z Linux	% Reduction
Software Licenses	**26,700**	**1,800**	**93%**
Ports	**31,300**	**960**	**97%**
Cables	**19,500**	**700**	**96%**
Physical Network Connections	**15,700**	**7,000**	**55%**

Cost Per Image for Linux Workloads (5 Yr TCO)



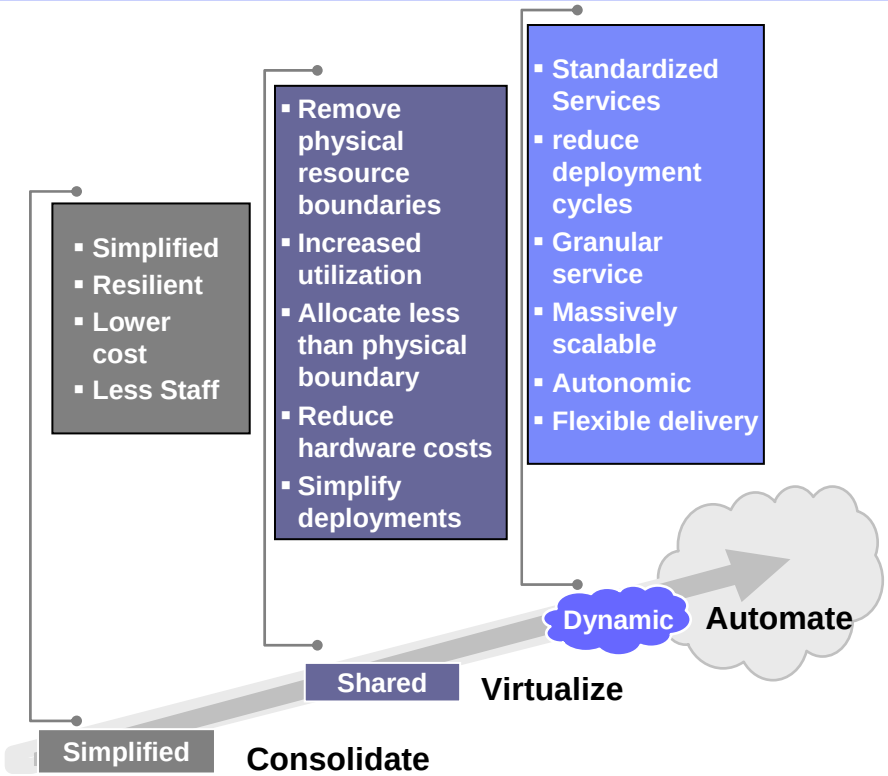
Project Big Green view of TCO results in potential 60-75% gross cost savings over 5 yrs

TCO Comparison of cloud and non-cloud consumption patterns of compute resources (100 Linux IaaS)

Two White Papers exist on the Linux on z library web page:

- Advantages of a Dynamic Infrastructure: A Closer Look at Private Cloud TCO
- A Benchmark Study on Virtualization Platforms for Private Clouds

The IT Transformation Roadmap for the Enterprise to get to Cloud Computing is paved for Linux on System z



Customers provisioning their own virtual servers in a private cloud setting will find it far less expensive with Linux on System z than either conventional stand-alone servers or public cloud alternatives.

Clabby Analytics Case study:

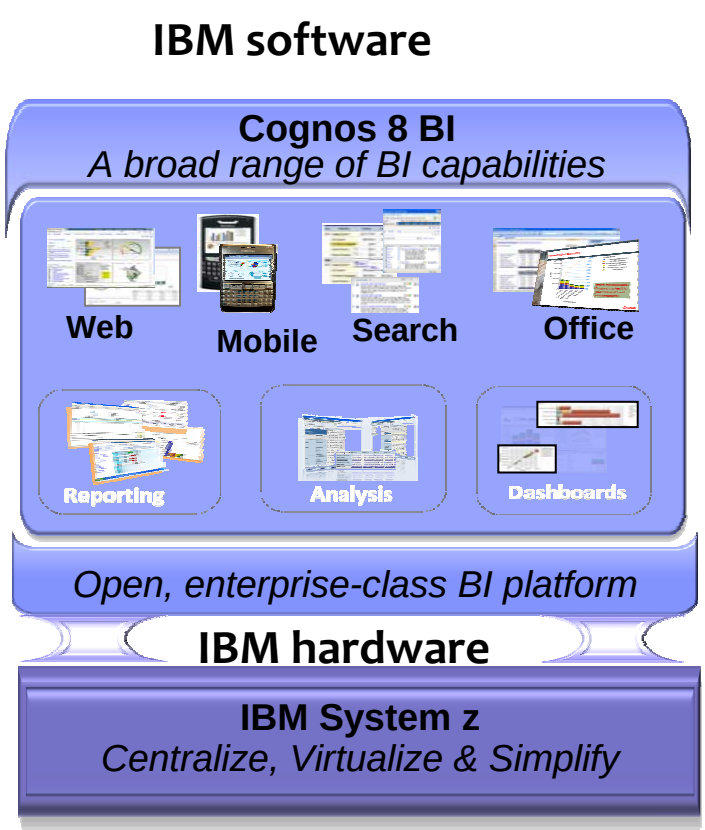
The Department of the Interior's National Business Center - Using System z as a Strategic Enterprise Cloud Platform

- Standardized on IBM's System z environment as its enterprise-server-of-choice due to **clear advantages in cost-of-acquisition and cost-of-operation**.
- Moving all new enterprise-class applications onto IBM System z on Linux because it believes that System z servers are their **most efficient computing platform**.… System z servers **enable to be extremely competitive** when it comes to competitive bidding (especially against distributed computing architectures).
- By taking advantage of the **System z's best-in-the-industry virtualization capabilities** (System z servers are at least a decade ahead of x86-based servers) in terms of **virtualization sophistication**, **resource provisioning**, and **workload balancing** based upon prescribed and agreed-to levels of service.

ibm.com/common/ssi/cgi-bin/ssialias?infotype=PM&subtype=AB&htmlfid=ZSC03060USEN&attachment=ZSC03060USEN.PDF&appname=STG_ZS_USEN_AB

Introducing the Smart Analytics Cloud

A private cloud optimized for analytic services in large enterprises



IBM Services

- Create awareness of and a strategy for BI with a competency center
- Complete a readiness assessment for the Cloud
- Lead the planning process for the Cloud
- Implement Cognos® 8 BI for Linux on System z as a private cloud
- Provide the skills and education required for the on going success of the Cloud

New Voice of the CIO

Business intelligence is critical for enterprise competitiveness

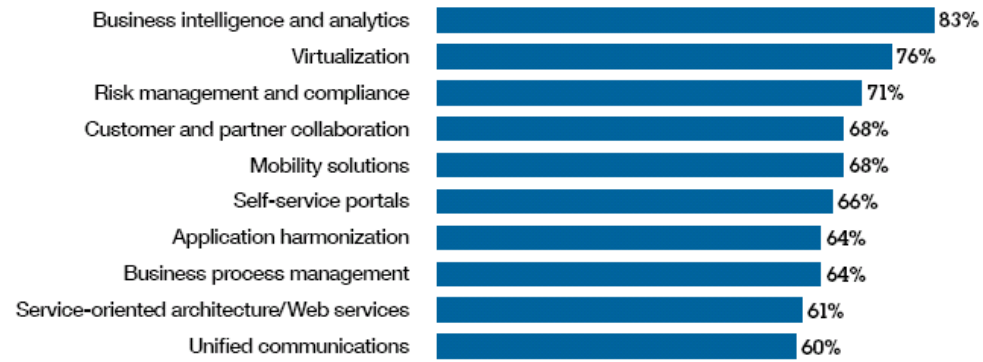
Information-led innovation starts with treating information as an asset.

"Facts drive decisions." - Insurance CIO

"… better business intelligence will bring marketing analysis to a higher level, to improve buying behavior and increase advertising ROI."

- Media and Entertainment CIO

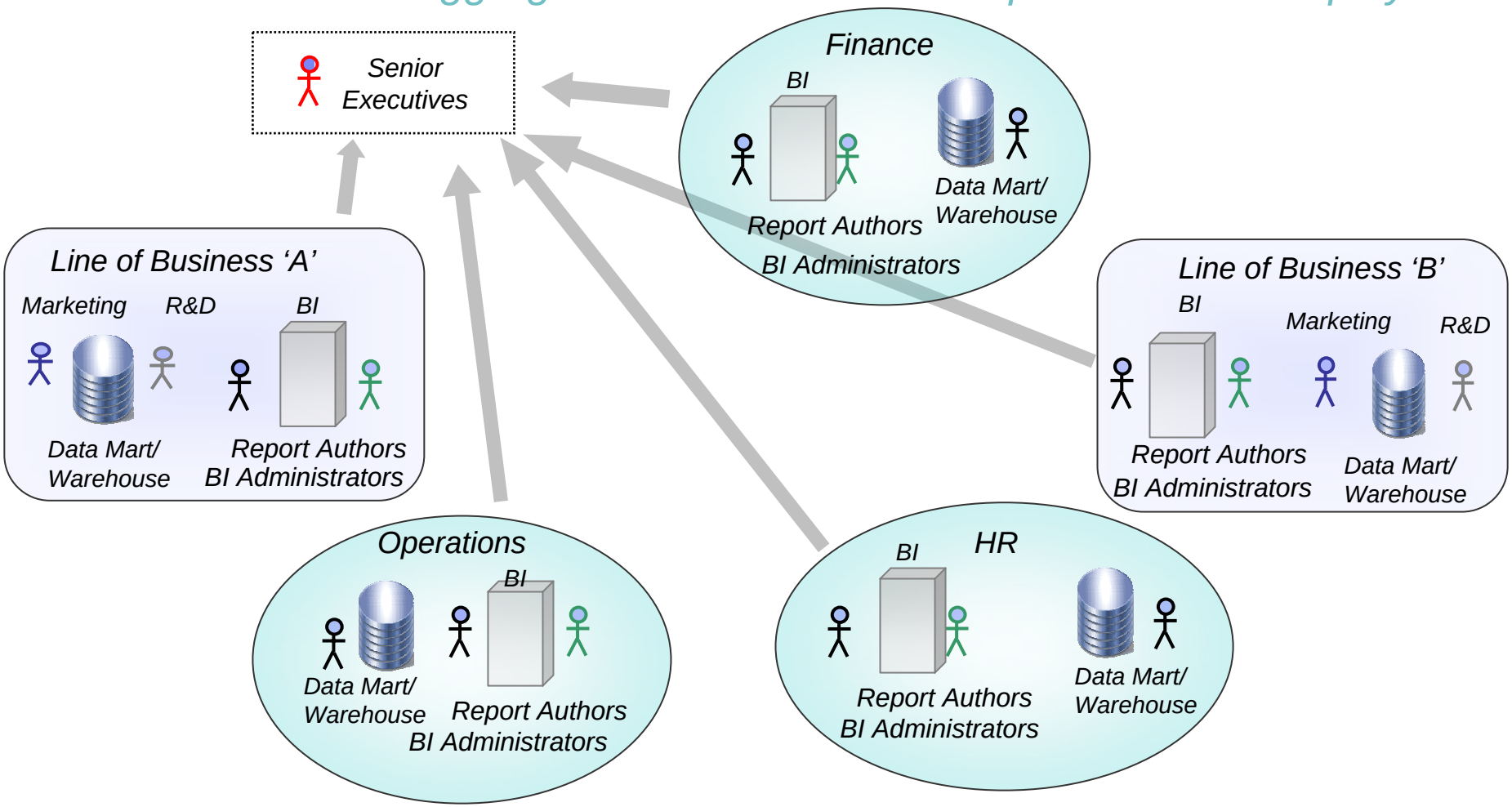
CIO responses to: What kind of visionary plans do you have for enhanced competitiveness?



Read the full report: http://www.**ibm.com**/services/us/cio/ciostudy/

Delivering BI in a large enterprise is a challenge

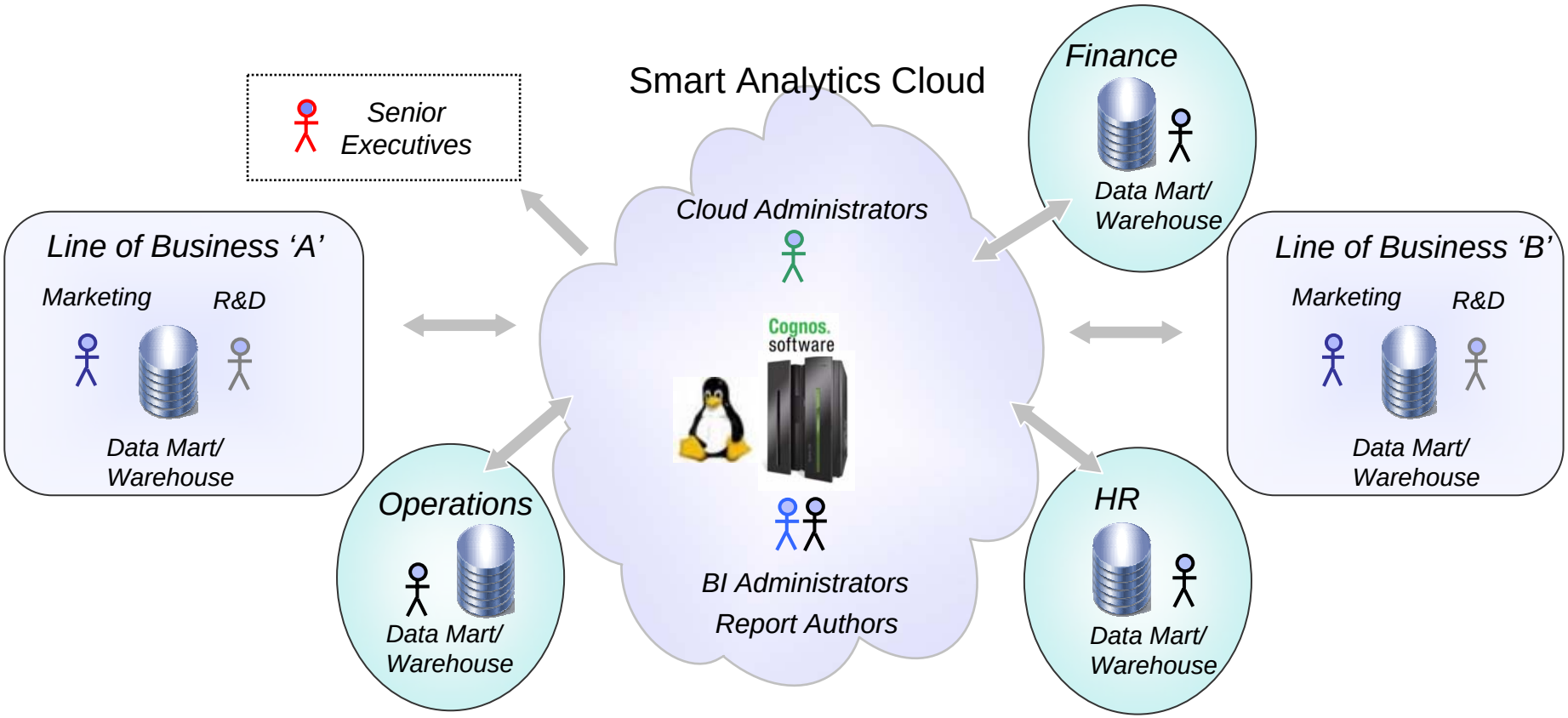
Information must be aggregated from a series of departmental BI deployments



Each BI deployment is a silo and slightly different than every other BI deployment, driving up costs and making regulations and corporate enforcement difficult.

Smart Analytics Cloud - large enterprise private BI cloud

Delivers cloud computing efficiencies for enterprise business intelligence



This offering transforms the delivery of business intelligence and performance management into a service that is readily available and affordable to corporate users.

Smart Analytics (Private) Cloud in the IBM corporation

In the spotlight

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

-IBM CIO Office

The Smart Analytics Cloud enables IBM to deliver business intelligence (BI) with greater efficiency across the enterprise

- **Blue Insight:** the largest private cloud computing environment for business analytics that will provide more than 200,000 IBMers with the ability to extract information from around the world to make smarter decisions through information empowerment – no matter where the data resides
- **IBM Smart Analytics Cloud offering:** based on the same architecture as Blue Insight, this solution will enable large enterprise clients to build their own private cloud environment with easily consumable business intelligence services, system and software

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

IBM Internal results:

- Consolidating +20 multi-product, departmental BI deployments to Cognos 8 BI on System z
- Realizing value from +60 data sources across IBM
- Deploying a private cloud to support +200,000 named users across our global workforce (75K users today, expanding to 120K by mid-year 2010, expanding to 200K by end of 2011)
- Savings: $7,775,767 - Infrastructure cost savings realized with IBM System z10™ technology; $2,558,525 - Business Intelligence Competency Center (BICC) cost savings; 56% - cost savings realized per user (savings grows with volume)
- Elasticity in a shared server model supporting SLAs for diverse tenants; Speed to value and reduced capital spend (26 weeks to 2 weeks)

Introduction to Solution Editions

[August 14, 2009]

System z Solution Edition Series announced by IBM

(Telecomworldwire Via Acquire Media NewsEdge) IBM (NYSE:IBM) announced on Friday the System z Solution Edition Series - seven integrated hardware, software and services packages.

A solution edition is an aggressive pricing / packaging concept for targeted workloads/use cases on System z.

- Delivers tangible savings in hardware, software, and services
- Leverages the strengths of System z to deploy key workloads, including WebSphere®, business intelligence/data warehousing, application development, ACI, SAP, security and **cloud computing**

Learn more about solution editions: http://www.**ibm.com**/systems/z/solutions/editions/

Solution Edition for Cloud Computing

A service automation and management framework for System z

IBM software

Tivoli. software


Visibility


Control

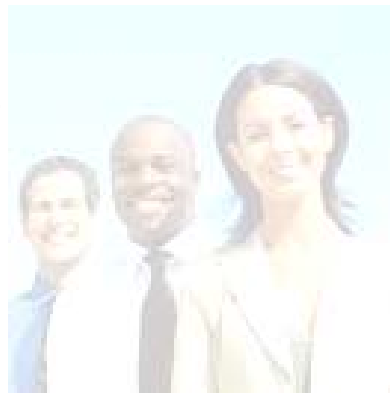

Automation

IBM hardware

Centralize, Virtualize & Simplify

IBM Services

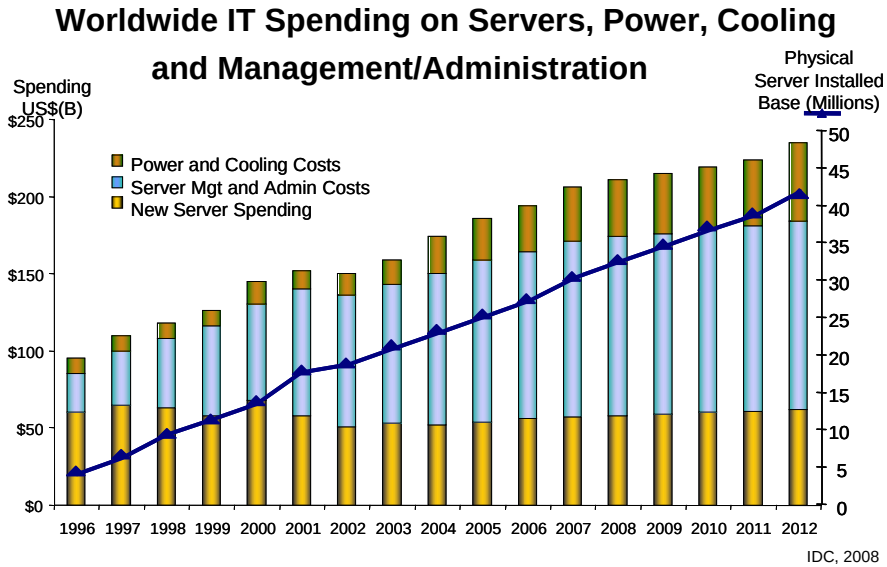
- Create an awareness of cloud computing deployment opportunities within the enterprise
- Educate the corporation on cloud computing use cases and management scenarios



- Implement the service automation and management tooling to support cloud workloads

The Solution Edition for Cloud Computing brings value

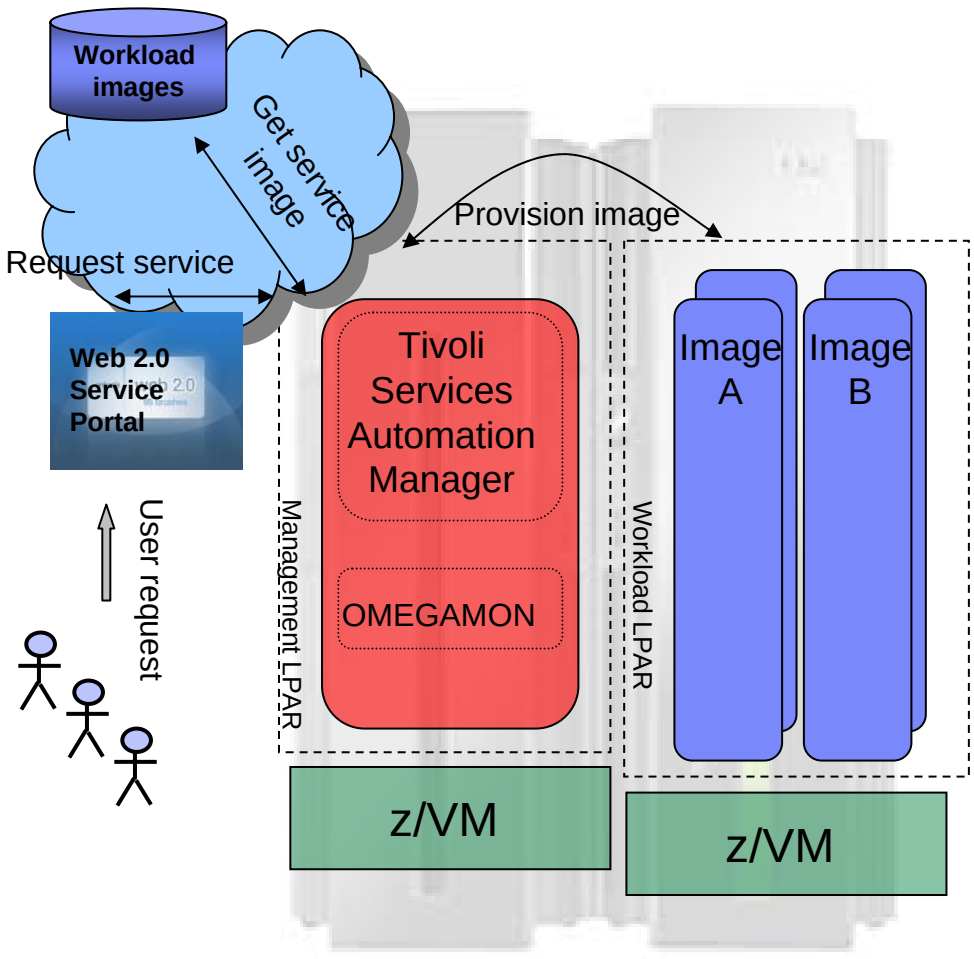
- Lowers operating expense by:
  - Reduces steps and complexity in the provisioning process
  - Reduces the impact of human error in the enterprise
  - Reduces the resources (people, energy, data floor space) needed to run cloud workloads



IDC, 2008

- Introduces automated service consumer capabilities to simplify lifecycle management of service based workloads
  - Speeds reaction to deliver a new IT service
- Provides a framework for standardizing workloads that are inefficient and highly variable today
  - Standardizes the different configurations used in the enterprise
- Makes mainframe assets readily available and simply consumable to leverage QoS for workloads
  - Provides elasticity and scale to meet min, mean, or peak workloads
  - Supports significant up-times quotas supporting SLAs for cloud workloads

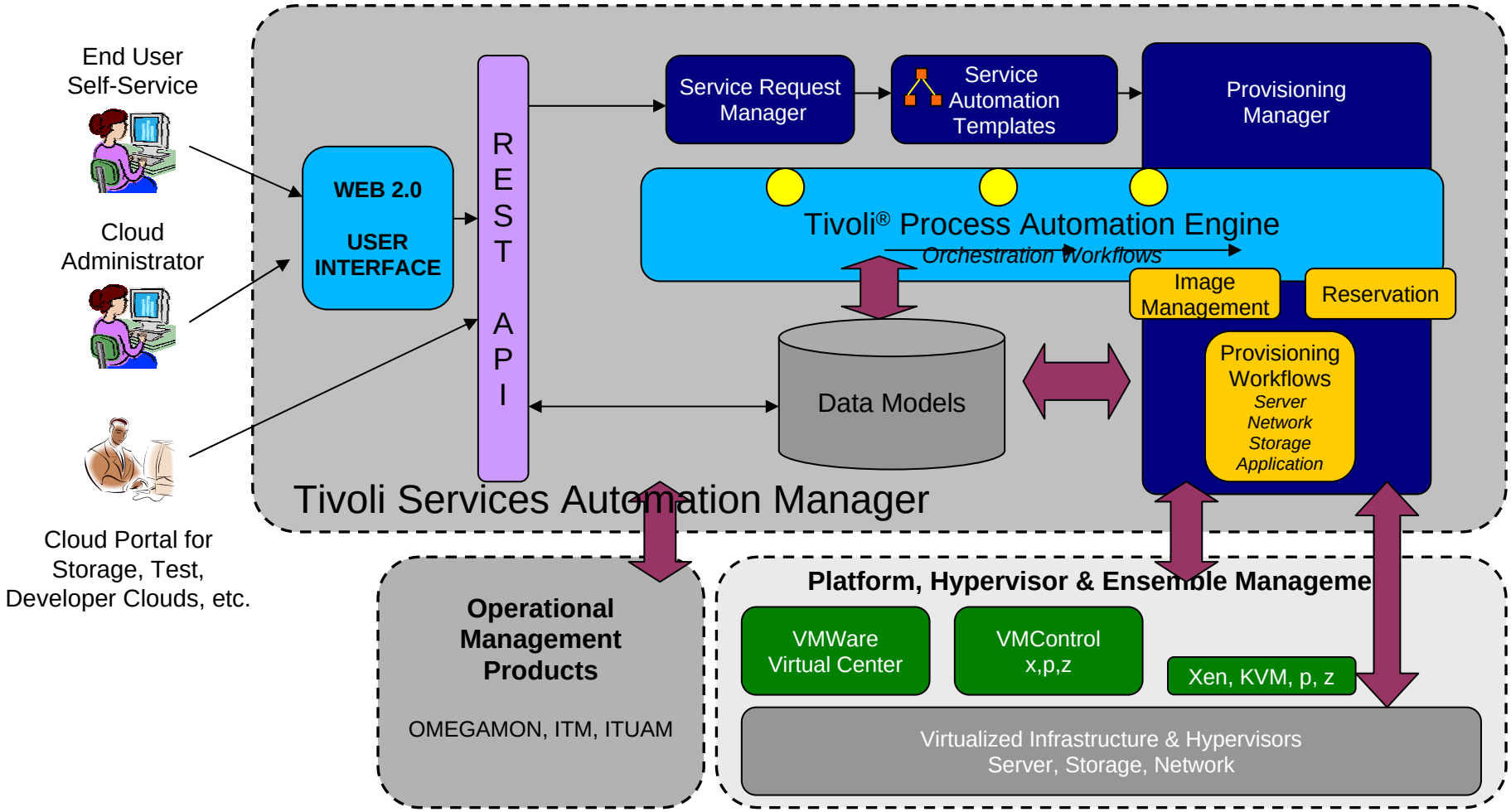
An architecture of the Solution Edition for Cloud Computing



- Management LPAR provides a "managed from" infrastructure, consisting of Linux (SUSE) guests running TSAM and OMEGAMON®
  - Rapid automation and services lifecycle management for z/VM based Linux cloud services
- Workload LPAR provides the "managed to" environment, supporting the customer defined cloud images
  - Supports Linux (SUSE and Redhat) and z/OS workloads support under z/VM
  - A sample workload is provided

Service management from Tivoli

Converged service delivery platform for cloud computing



IBM Solution Edition for Cloud Computing

A framework for delivering cloud computing solutions on System z

Delivers a service automation management infrastructure for cloud computing on System z

- Quicker time to value - IBM services creates the private cloud framework on System z at the customer location and provides user training
- Easier implementation - cloud computing management software from Tivoli for automating and maintaining workloads in a cloud
- Greater efficiency - System z with z/VM and Linux provide the foundation to centralize, standardize and virtualize cloud computing workloads

Customer benefits:

- Faster ROI
- Self service access to mainframe assets
- Reduced operations and labor expenses
- Internet scale
- Rapid provisioning of workloads
- Enterprise qualities of service for cloud workloads

In the spotlight

"We are using System z to deliver cloud computing and hosting services while advancing our innovative business models.
Doug Bourgeois - Director, National Business Center

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

IBM Solution Edition for Enterprise Linux

A framework for delivering cloud computing solutions on System z

Industry-leading virtualization, built with security and availability

- A highly scalable and flexible virtual infrastructure inside a single IBM System z10 server
- The ability to share all system resources with all virtual servers with unmatched levels of efficiency and security
- The ability for a tight integration of consolidated workload with existing applications and data

Customer benefits:

- Single-server simplicity with saving opportunities
- Advanced resource utilization and dynamic allocation through industry leading virtualization and sharing of system resources
- Massive scalability, running up to thousands of virtual Linux servers concurrently
- Rock-solid system security and ensured isolation and protection

A Linux-ready virtualization offering that combines the outstanding z/VM virtualization and the industry-leading IBM System z10 technologies with solution pricing that accelerates return on investment for workload consolidation and new Linux workload deployments. This solution easily scales to meet your consolidation needs though unmatched virtualization and server capabilities.

Learn more: www.**ibm.com**/systems/z/solutions/editions/linux.html

IBM Enterprise Linux Server

Industry-leading virtualization, built with security and availability

- A highly scalable and flexible virtual infrastructure inside a single IBM server - virtual server workload “on demand”
- The ability to share all system resources with all virtual servers with unmatched levels of efficiency and security
- Business continuance and disaster recovery that help minimize your expenses
- A solution that helps you achieve a quick return on investment without sacrificing enterprise-class qualities of service
- The ability to deploy and manage a large scale-out virtual server environment on the industry’s best scale-up, share-everything system architecture

Customer benefits:

- Single-server simplicity with saving opportunities
- Advanced resource utilization and dynamic allocation through industry leading virtualization and sharing of system resources
- Massive scalability, running up to thousands of virtual Linux servers concurrently
- Rock-solid system security and ensured isolation and protection

The IBM Enterprise Linux Server is a proven server consolidation platform that helps you control costs while improving virtual server availability, workload management, and energy efficiency.

Learn more: www.**ibm.com**/systems/z/os/linux/els.html

Where can I go to learn more?

IBM Cloud Computing

- Homepage www.**ibm.com**/ibm/cloud

Linux on IBM System z

- Homepage www.**ibm.com**/systems/z/os/linux

IBM Smart Analytics Cloud

- Homepage www.**ibm.com**/systems/z/solutions/cloud/smart.html

IBM Solution Edition for Cloud Computing

- Homepage www.**ibm.com**/systems/z/solutions/editions/cloud/index.html

IBM Solution Edition for Enterprise Linux

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IBM Enterprise Linux Server

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