Smarter systems for a smarter planet:

System z® Forum

Secure and resilient cloud computing for the modern enterprise

Visibility, Control and Automation

requirements for zCloud's

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Visibility, Control and Automation are IT decisions that can translate to business value metrics

VISIBILITY

See your business services

Understand health and performance of services across your enterprise infrastructure

CONTROL

Manage service risk and compliance

Govern and secure complex infrastructure and ensure regulatory compliance

AUTOMATION

Optimize business service delivery

Drive down cost, minimize human error and increase productivity

Clouds on a Roll!

IT is drawn to cloud's cost, efficiency and control….while **business** users are drawn to cloud's simplified, self-service experience and new service capabilities.

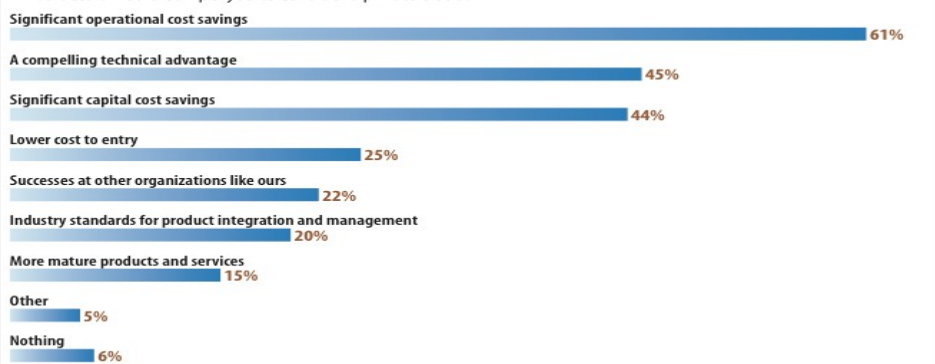"Virtualization has just allowed us to **get ourselves into trouble faster**"

North American Financial Institution

Reasons to Consider a Private Cloud
What factors would compel you to consider a private cloud?

Factor	%
Significant operational cost savings	61%
A compelling technical advantage	45%
Significant capital cost savings	44%
Lower cost to entry	25%
Successes at other organizations like ours	22%
Industry standards for product integration and management	20%
More mature products and services	15%
Other	5%
Nothing	6%

Note: Three responses allowed
Base: 204 respondents at organizations without a private cloud strategy
Data: *InformationWeek* 2012 Private Cloud Survey of 414 business technology professionals, April 2012

R4840512/4

" … at the end of the day, it doesn't matter if what you have is called a private cloud, a well run data center or a unicorn ranch. What matters is that **if your private cloud is basically lots of virtualization and little or no automation and orchestration, then you aren't gaining the benefits you could**. Only when **automation** and **orchestration** hit their stride will you begin to enjoy **full operational efficiencies**."[1]
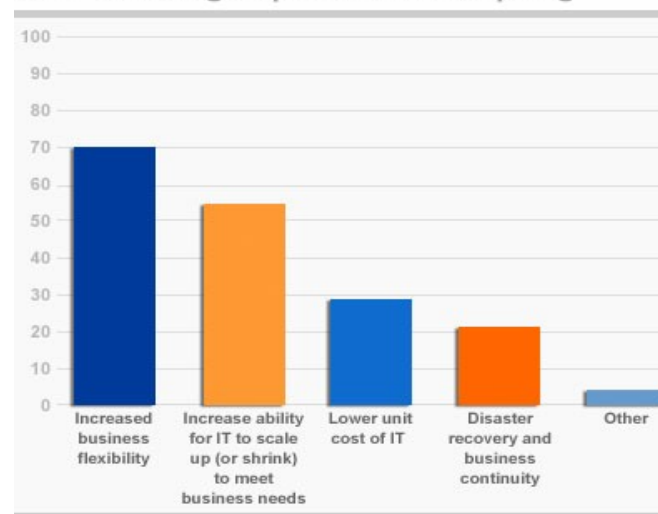
81%
of CIOs are moving to

"The time available to capture, interpret and act on information is getting shorter and shorter."

CEO, Chemicals and Petroleum, United States [2]

55%
of business executives believe cloud enables business transformation and leaner, faster, more agile processes.
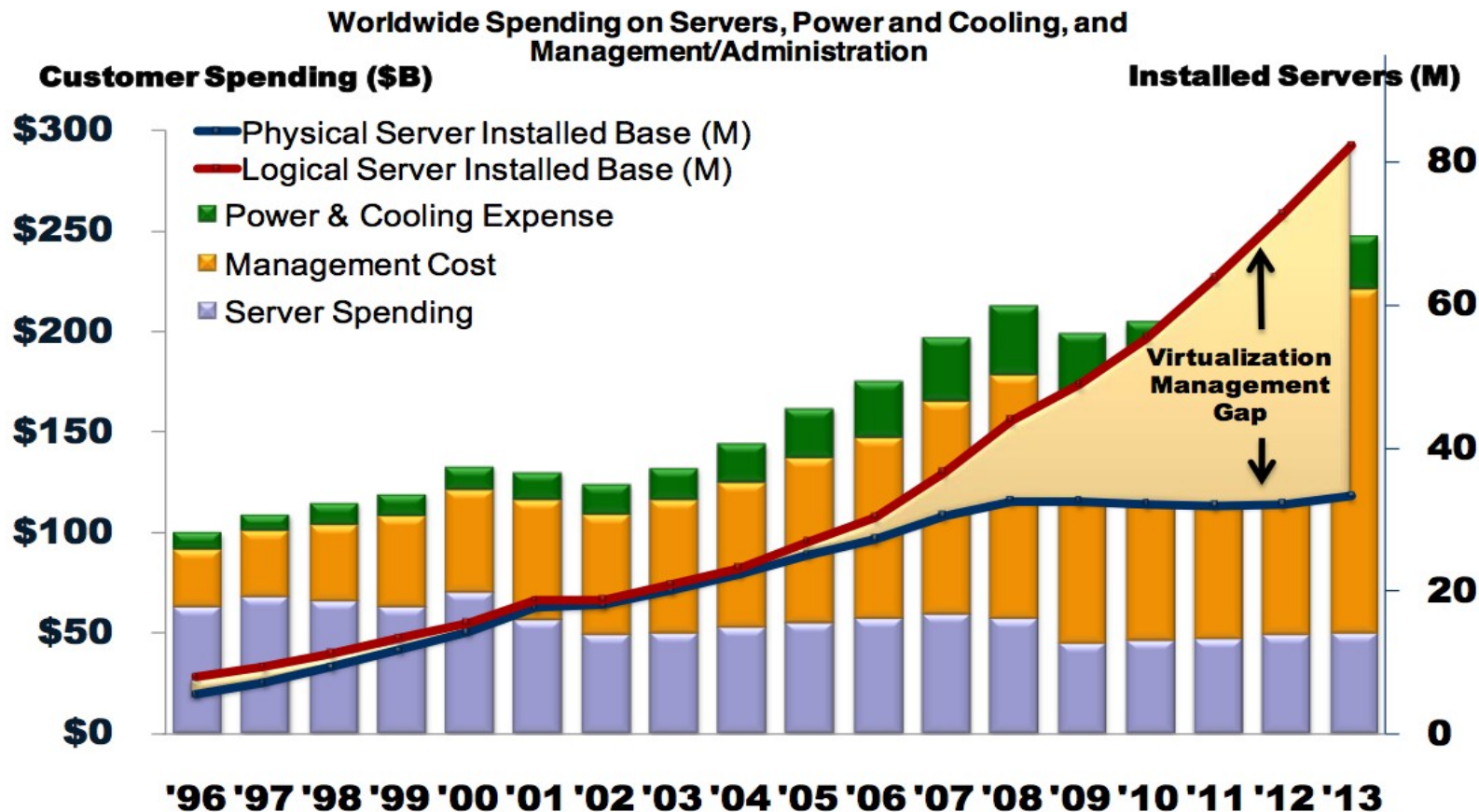
Pressures Driving Adoption of Cloud Computing

Increased business flexibility	70
Increase ability for IT to scale up (or shrink) to meet business needs	55
Lower unit cost of IT	29
Disaster recovery and business continuity	21
Other	4

McKinsey on Business Technology, Spring 2011

1 – *InformationWeek Report Private Cloud Vision v.s Reality*
2- *2012 IBM CEO Study*

Worldwide IT Spending on Servers, Energy and Management

The Virtualization Management Gap continues to demonstrate the opportunity for VMControl


New Economic Model for the Datacenter

Worldwide Spending on Servers, Power and Cooling, and Management/Administration

Customer Spending ($B)

Installed Servers (M)

— Physical Server Installed Base (M)
— Logical Server Installed Base (M)
■ Power & Cooling Expense
■ Management Cost
■ Server Spending

Virtualization Management Gap

'96 '97 '98 '99 '00 '01 '02 '03 '04 '05 '06 '07 '08 '09 '10 '11 '12 '13

Source: IDC, 2011

Gartner's View Multi-System Resource Pools

Server Virtualization: Where Is It Taking Us?

Before Virtualization …
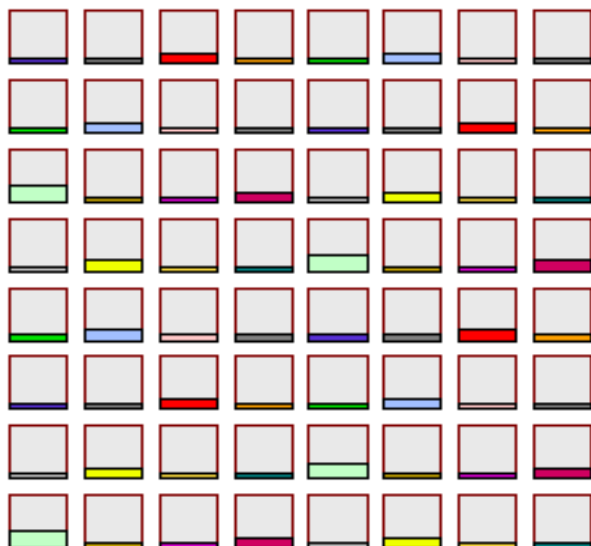
- Server Sprawl
- Low Utilization
- Synchronous Deployment
- Capacity Planning by Server
- Resource Management by Server
- Disaster Recovery by Duplication
- Management Downtime

… After Virtualization

Asynchronous Deployment

Holistic Capacity Planning

High Availability

Live Migration

Centralized Resource Management and Automation

Disaster Recovery Without Duplication

Gartner.
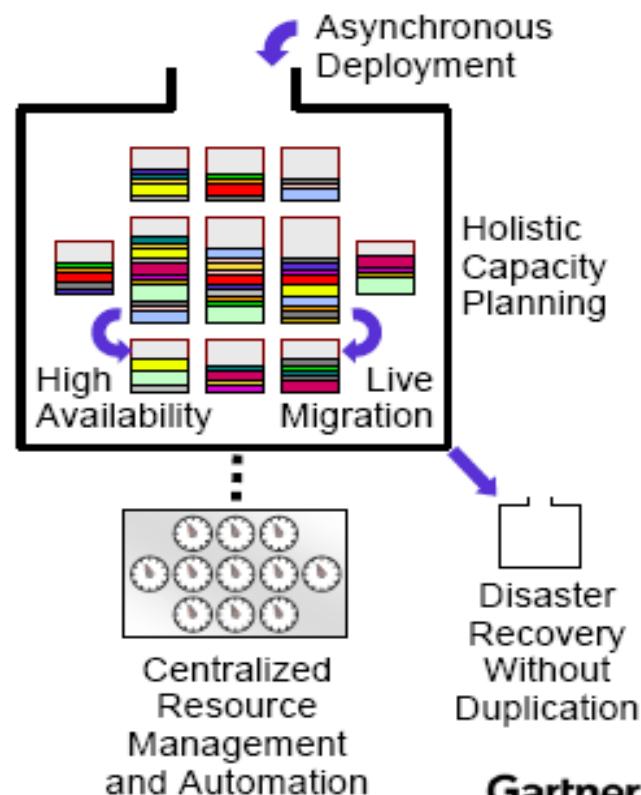
IBM z Cloud Strategy starts small and allows seamless growth as business requirements change over time

- Long term vision
  - SmartCloud support for zLinux and zOS evolving to hybrid cloud solution
  - Aligns with other IBM IaaS and PaaS solutions
    - Applicable to both IT admins and Appl Developers

- Positioning zLinux as System of Engagement and zOS as System of Record
  - Level of integration that leverages strengths of both platforms when combined

  - Selective exploitation of Qualities of Service that System z delivers today
    - HA/DR, isolation/encryption, workload management
    - Heterogeneous workloads running across architectures based on Fit-for-Purpose
    - Near term focus on zVM/zLinux, mid-term focus on zOS, longer term focus on hybrid with zManager (consistent with open cloud services model)
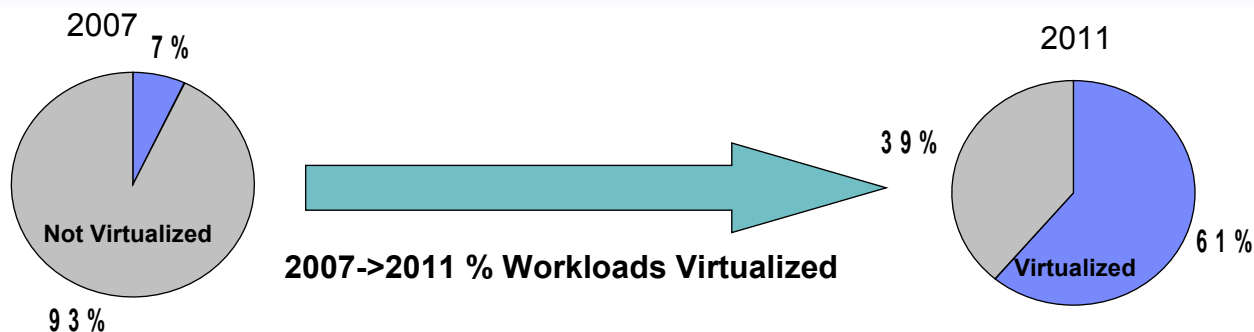
Who drives the Strategic choices on hypervisor ?

Roles
- Consolidations
- Dynamic provisioning/hosting
- Workload management
- Workload isolation
- Software release migration
- Mixed production and test
- Mixed OS types/releases
- Reconfigurable clusters
- Low-cost backup servers

Virtual Servers

Virtualization

Physical Server

Possible benefits
- High resource utilization
- Greater usage flexibility
- Enhanced workload QoS
- High availability and security
- Low cost of availability
- Low management costs
- Enhanced interoperability
- Legacy compatibility
- Investment protection

Hypervisor	
VMware (ESX, VI)	
IBM pHype (AIX, Linux)	
IBM PR/SM & zVM	
SUN Solaris (Zones/LDOMs)	
Open Source (Xen & KVM)	
MS	Hyper-V
	VS
Citrix	
HP VPar	

Virtualization can increase costs if not it's not optimized

Virtualization environments are running in 90% of businesses, but virtualization isn't cheap, and it's definitely not free.

- Hypervisor promises of cutting infrastructure expense by **60%** have given way to **300%** increases in license costs

While costs rise, so does image volume… and now they're in as many as four hypervisors.

- More than **50%** of virtualization environments today have more than one brand of hypervisor.
- Number of virtual machines in use in data centers has increased **10x** in 10 years
- Average number of images "destroyed?" **No one knows…**

Bringing these environments to optimum performance – without dismantling existing infrastructure – is a key challenge

- You can't see always see them patch them or back them up.
- You only know they exist when **you get the bill.**

Visibility - heterogeneous management
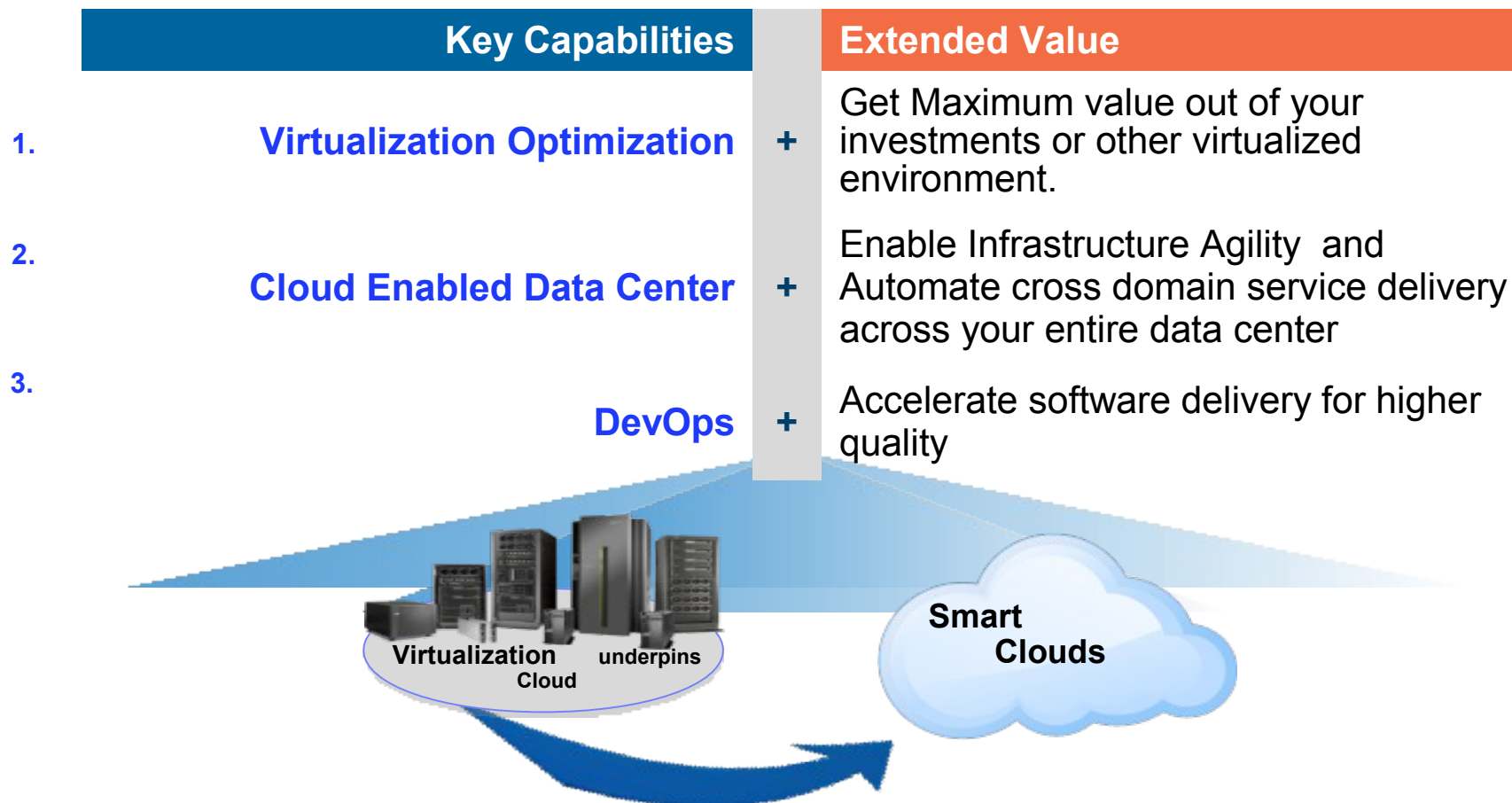### *different persona's need different visibility*

Consolidating Views of Virtual Servers

- Collect key performance and availability metrics

- Proactive & predictive alerts

- Side-by-side real-time and historical data
  assists in separating intermittent problems
  from reoccurring problems from peak
  workloads

- Warehouse data and report on current and future
  trends to identify resource bottlenecks
  and plan for future capacity
  needs

- **Broad Hypervisor support for z/VM, Power Systems, Hyper-V, Solaris, Citrix and VMware virtual environments**
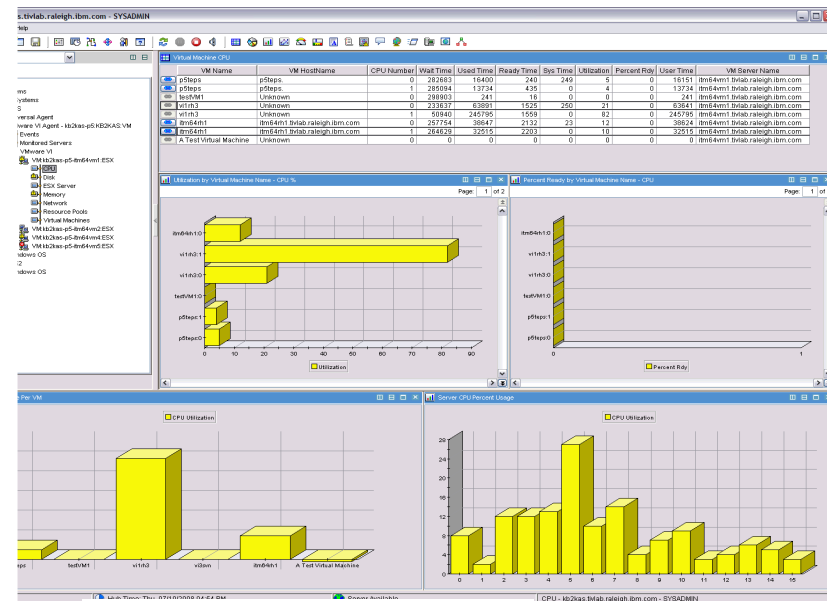
As enterprises move beyond **virtualization** to higher value stages of Cloud, having Cloud Management is critical to their success.

*Organizations need progressive capabilities as they manage their Clouds*

Key Capabilities	Extended Value
1. **Virtualization Optimization** +	Get Maximum value out of your investments or other virtualized environment.
2. **Cloud Enabled Data Center** +	Enable Infrastructure Agility and Automate cross domain service delivery across your entire data center
3. **DevOps** +	Accelerate software delivery for higher quality

Virtualization **underpins**
Cloud

Smart Clouds

Accelerate time to market with repeatable, composite application deployment across private and public clouds

- **Rapid application deployment**: Deploy business applications in minutes

- **Dynamic, policy-based management** of elastic and scalable workloads

- Enables **third-party software deployments** to "build once" and deploy across private and public clouds

**Elastic and Scalable Workloads**
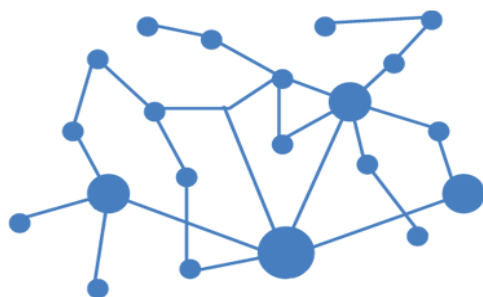
Deploy applications faster
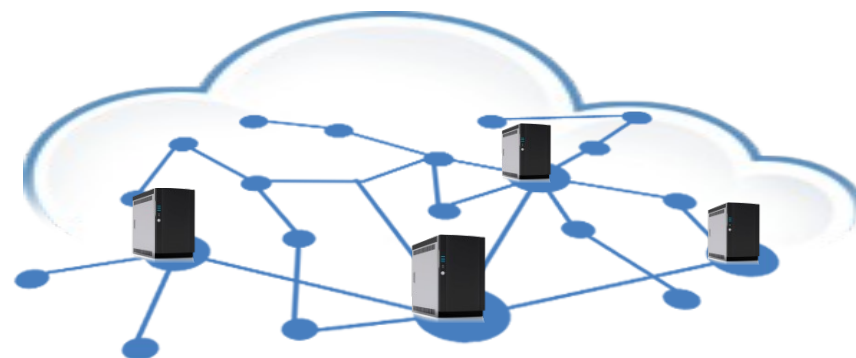
Cloud provides both opportunity and risks

IT driving Value

- **Elastic scalability**
- **Rapid provisioning**
- **Advanced virtualization**
- **Image management**
- **Multi-tenancy & Isolation**
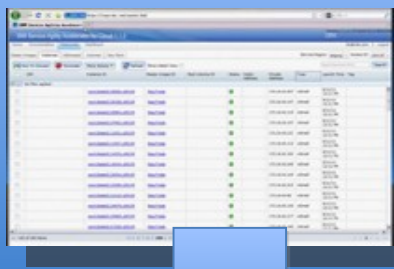- **Flexible pricing**
- **A better user experience**

But need to Control

- **Compliance/Audit**
- **Software licenses**
- **Availability**
- **Data Protection/Integrity**
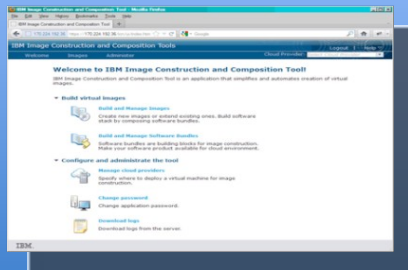- **Analytics/capacity planning**
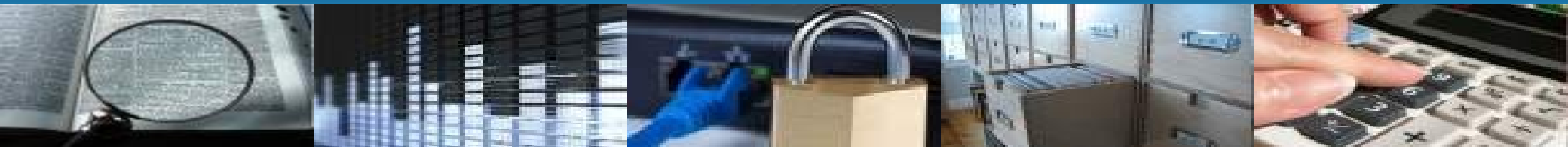
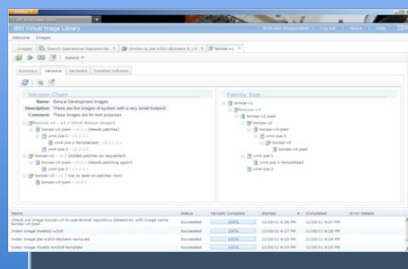# Control - IBM SmartCloud Provisioning - High-scale low-touch component

High-scale low-touch

ICON Image Construction

Virtual Image Library

SmartCloud Provisioning core

- ➢ **Distributed architecture**: Provides solution resilience
- ➢ **Rapid scalable deployment:** Delivers near-instant deployment of hundreds of virtual machines in seconds instead of minutes or hours
- ➢ **Continuous operations:** Performs upgrades and maintenance resulting in no outages or downtime
- ➢ **Reliable, nonstop cloud**: Tolerates and recovers from software and hardware failures automatically
- ➢ **Reduced IT labor resources at scale**: Enables self-service request and automated operations
- ➢ **Hypervisor and hardware:** Is independent of specific platforms
- ➢ **Open source**: Has commodity skills and small footprint

Increase business agility by building the workload-optimized cloud

IBM SmartCloud Provisioning *combines infrastructure and platform capabilities to deliver elastic workload aware management, image lifecycle management and resilient, high-scale provisioning across heterogeneous platforms*

Differentiating capabilities of the business-ready cloud:

- Accelerate application deployment with workload aware management

Reduced standardized topology deployment from over 2 months to 18 minutes

- Manage virtual environment with rich image management and analytics

40% - 80% labor cost reduction by increasing image/admin ratio efficiency
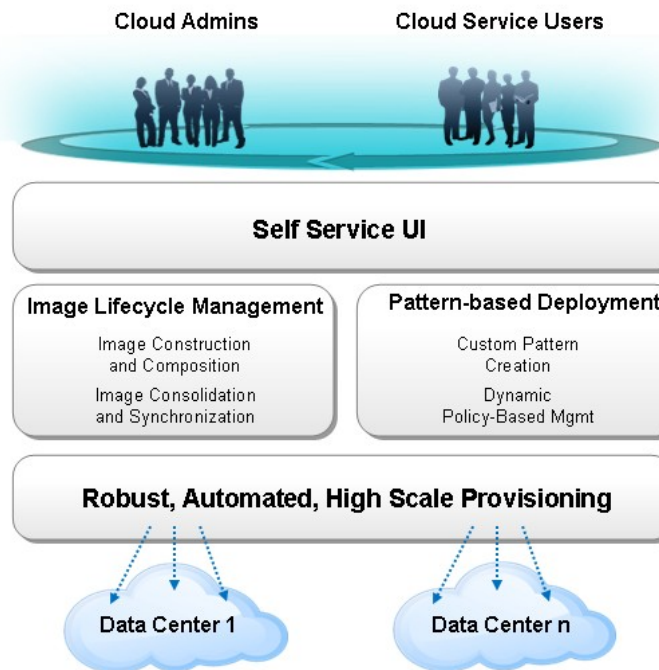
- Avoid vendor lock-in with choice of Hypervisor and Hardware

KVM is 24% cheaper in up front server & software costs compared to competition

- Improve agility with robust, automated, high-scale provisioning

Deploy 100s of new VMs in less than 5 minutes

IBM SmartCloud Provisioning

Cloud Admins   Cloud Service Users

Self Service UI

Image Lifecycle Management	**Pattern-based Deployment**
Image Construction and Composition	Custom Pattern Creation
Image Consolidation and Synchronization	Dynamic Policy-Based Mgmt

Robust, Automated, High Scale Provisioning

Data Center 1   Data Center n

Extending the cloud capabilities beyond SmartCloud Provisioning
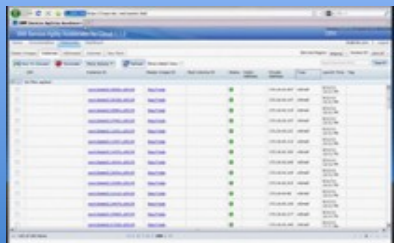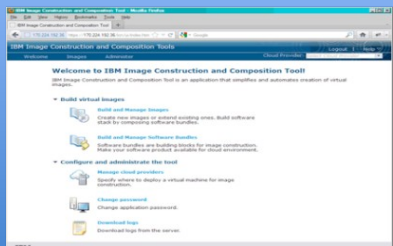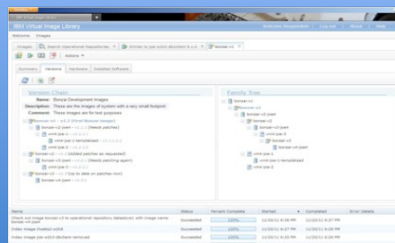
High-scale low-touch
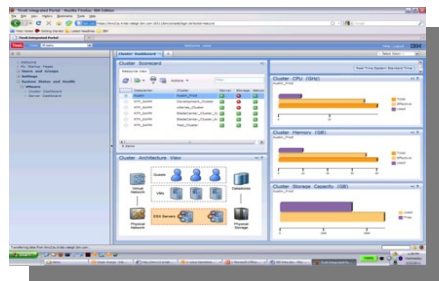
Image Construction

Virtual Image Library

SmartCloud Provisioning core
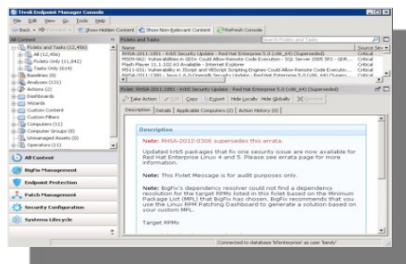
Health analytics
Host and VM monitoring
Event response and management
Capacity planning
What-if scenarios

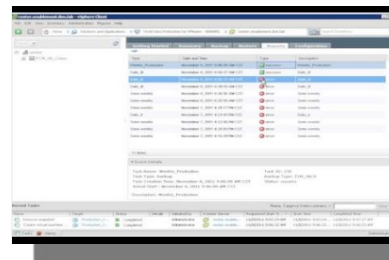Patch management
Compliance reporting
Policy enforcement

Centralized backup
Policy-driven
Data restore
Image snapshots

Usage reporting
Cognos reporting
Accounting and rating
Invoice creation

SmartCloud Monitoring

SmartCloud Patch Management

Tivoli Storage Manager for Virtual Environments

SmartCloud Cost Management
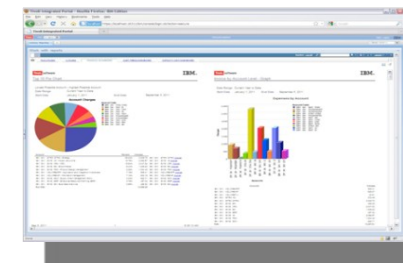
Performance management in the Cloud requires visibility from different perspectives

With cloud computing:

- Workloads move at the click of a mouse
- Capacity can change dynamically
- Some Resources can be accessed via a public or private cloud

The Cloud Administrator

Needs to support changes in demand and understand workload trends, to optimize the infrastructure that the workloads rely on.
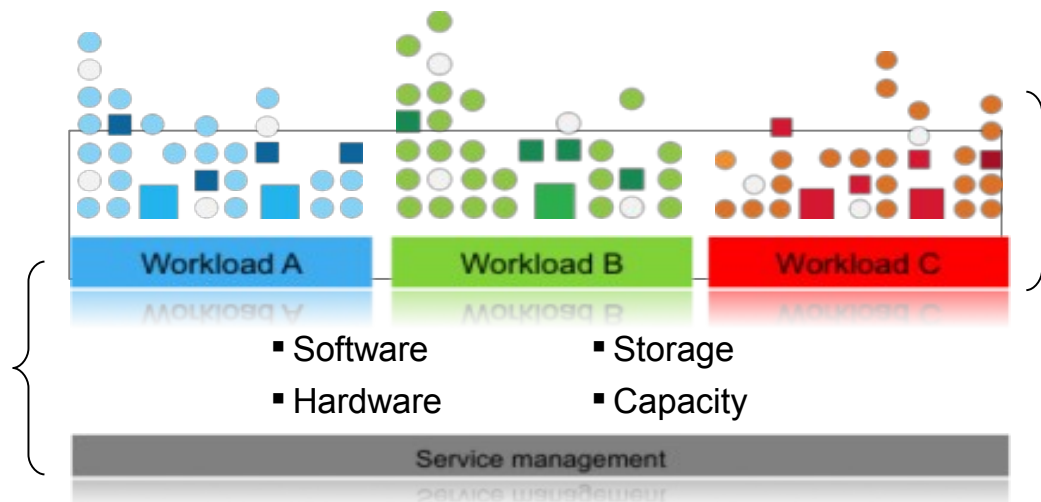
Cloud Tenants

Need to understand and optimize performance of the services being delivered.

The **Cloud Tenant** has responsibility for business service health.

Workload A   Workload B   Workload C

- Software
- Hardware
- Storage
- Capacity

Service management

Understanding the Cloud performance for the Cloud Tenant

Quickly isolate the failing component via Application Performance Management strategies

- Follow path of user transactions across application infrastructure domains, including the mainframe and making it easier to evaluate a transaction in its entirety
  - Agentless: Track flows through network traffic
  - Agent Based: Detailed, Instance-level Transaction Tracking
- Visibility into how IT infrastructure delivers business critical applications
- End-to-End view of response times across multiple domains helps quickly isolate problems and hand problem off to appropriate specialist

0.97sec

0.21sec

1.31sec

0.01sec

3.71sec

Domino or Exchange

Tivoli Directory Server (LDAP)

WebSphere / J2EE

Databases

0.89sec

0.32sec

Web Servers

WebSphere Portal

WebSphere MQ /
WebSphere Message Broker /
WebSphere Process Server /
WebSphere ESB

Siebel
mySAP
environments
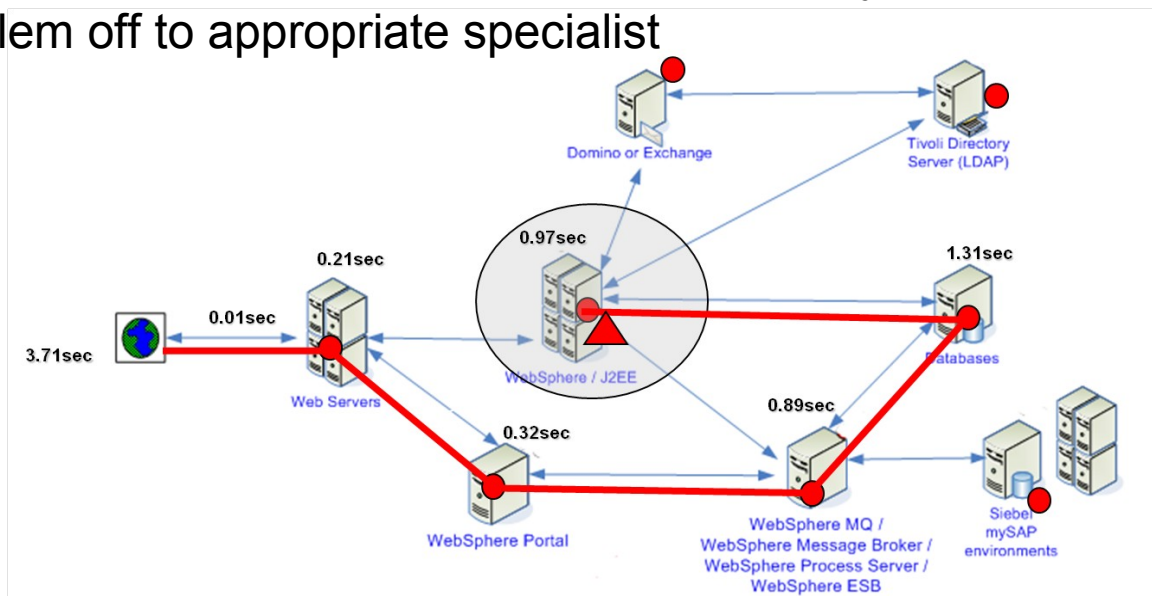
Customers continue to exploit System z as platform for business critical applications
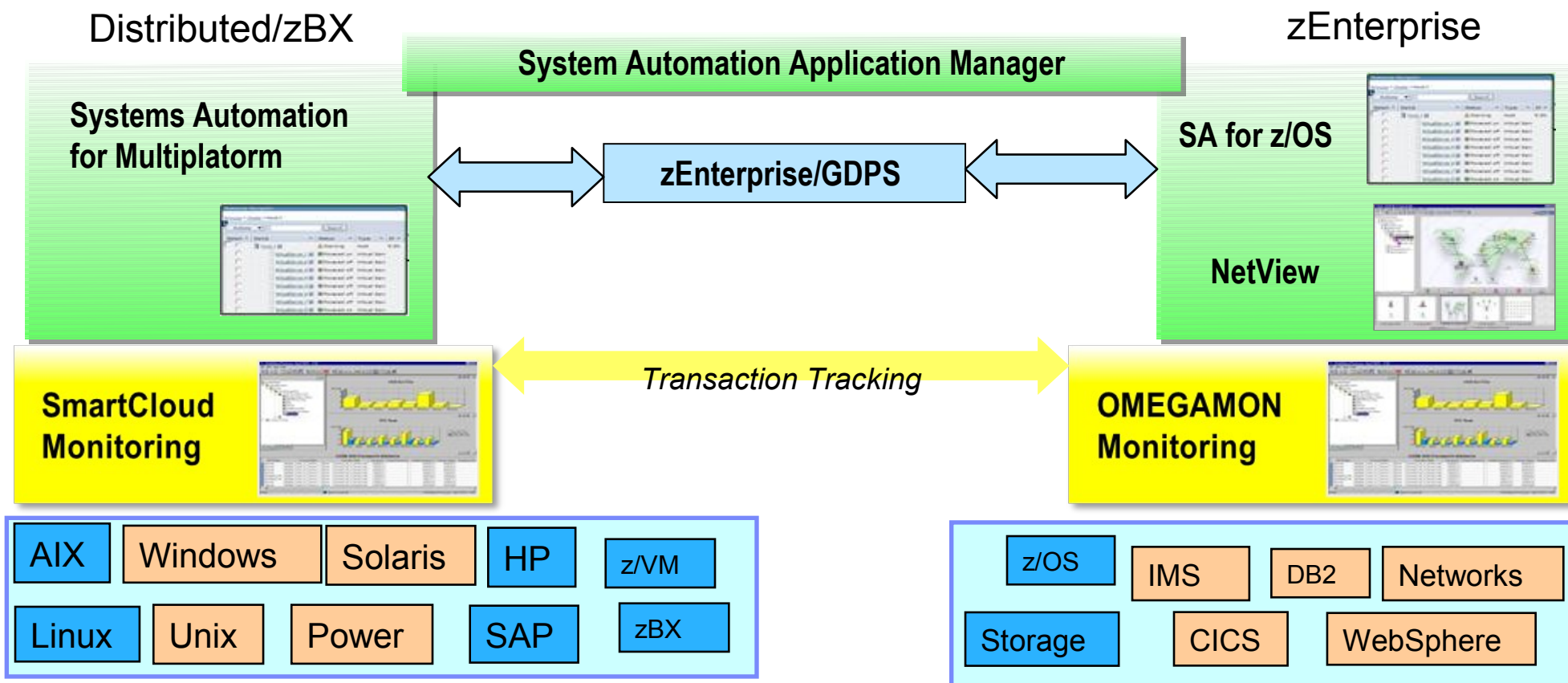
- 90% of Fortune 500 companies rely on mainframes
- 70% of Enterprise Customers indicate z will play part in **cloud initiatives**
- 90% of top insurance companies use z to process high volume transactions

Software (as a service)	OLTP, SOA, on demand	Performance and Availability Managed by OMEGAMON
Platform (as a service)	IMS, CICS, DB2, Storage Messaging, WebSphere	
Infrastructure (as a service)	zEnterprise, 196, 114, zBX, zAware zHelix, Apollo,	

Achieving high availability requires visibility, control and automation with
Application Performance Management
inclusive of the z platform systems and subsystems

Monitoring and System Automation work together across entire enterprise,   including Private Coud

IBM provides end-to-end support including High Availability

Distributed/zBX

zEnterprise

System Automation Application Manager

Systems Automation for Multiplatorm

SA for z/OS

zEnterprise/GDPS

NetView

SmartCloud Monitoring

Transaction Tracking

OMEGAMON Monitoring

| AIX | Windows | Solaris | HP | z/VM |
| Linux | Unix | Power | SAP | zBX |

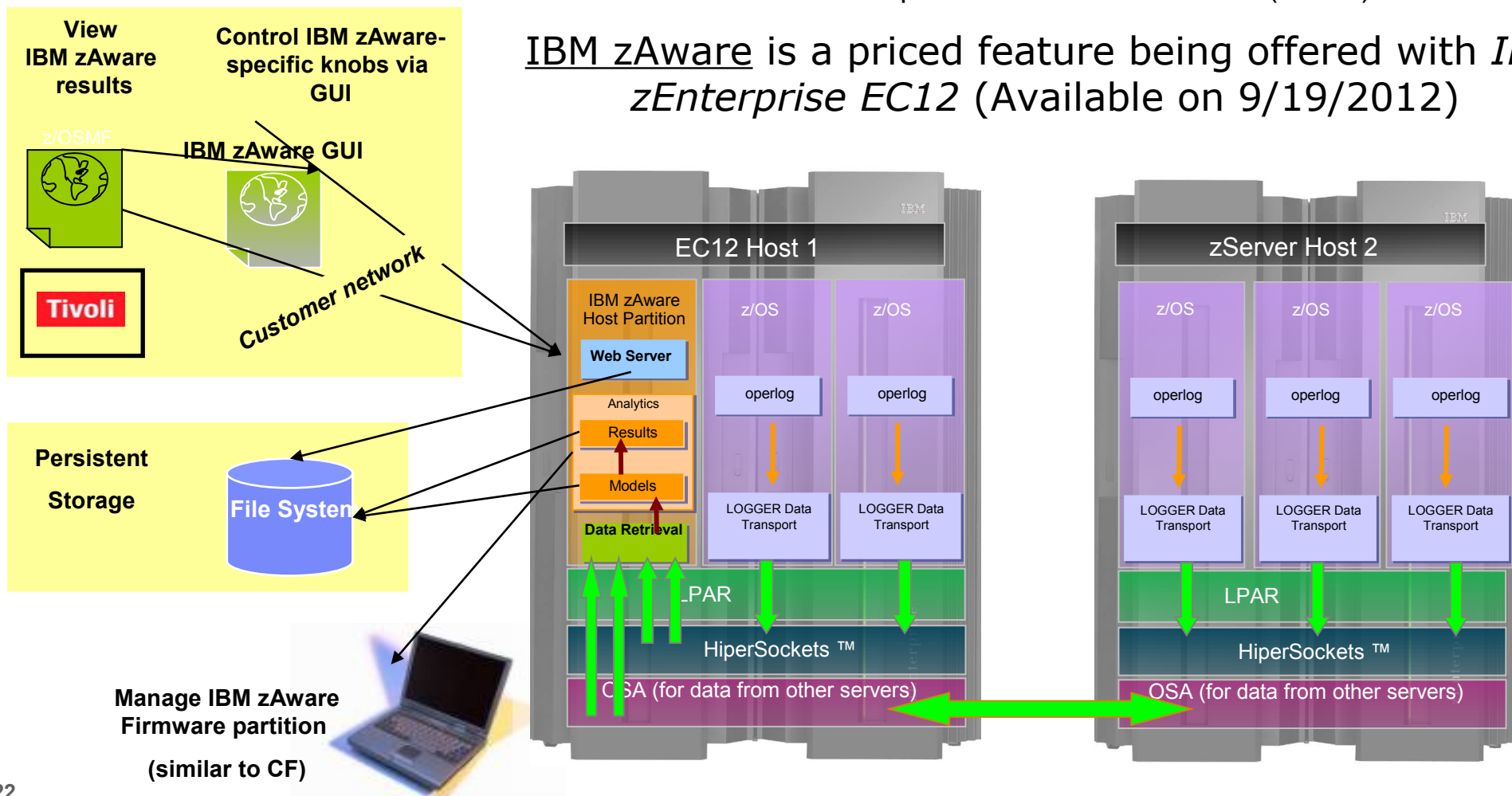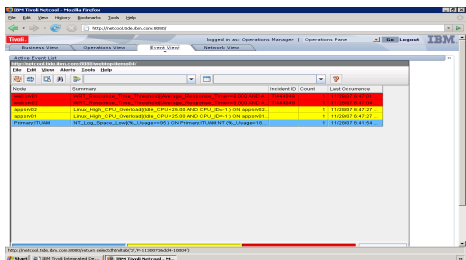| z/OS | IMS | DB2 | Networks |
| Storage | CICS | WebSphere |

Adding Analytics

IBM zAware provides:

- z/OS Log Analytics - Analysis of z/OS operlog
- Firmware appliance that runs 'out of band' (not on z/OS)
- Training period determines 'normal' message flow, volumes, etc.
- Surfaces anomalies to help detect Sick But Not Dead (SBND) scenarios

IBM zAware is a priced feature being offered with *IBM zEnterprise EC12* (Available on 9/19/2012)

View IBM zAware results

Control IBM zAware-specific knobs via GUI

z/OSMF

IBM zAware GUI

Tivoli

Customer network

Persistent Storage

File System

Manage IBM zAware Firmware partition (similar to CF)

EC12 Host 1

IBM zAware Host Partition

Web Server

Analytics
Results
Models

Data Retrieval

z/OS
operlog
LOGGER Data Transport

z/OS
operlog
LOGGER Data Transport

LPAR

HiperSockets ™

OSA (for data from other servers)

zServer Host 2

z/OS
operlog
LOGGER Data Transport

z/OS
operlog
LOGGER Data Transport

z/OS
operlog
LOGGER Data Transport

LPAR

HiperSockets ™

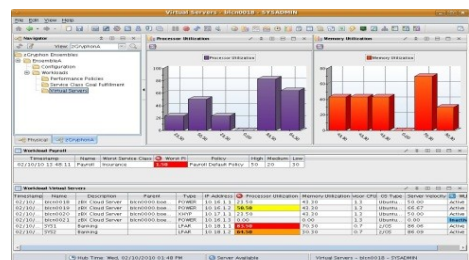OSA (for data from other servers)

IBM zAware, Event Management and Performance Monitoring

View event in Active Event List
Generate trouble ticket

Operator, SME

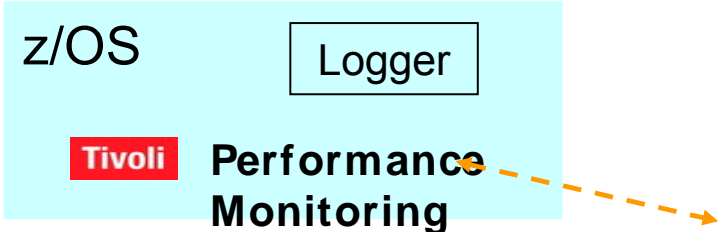Perform PD for anomaly using association with traditional monitoring KPIs

z/OS

Logger

Tivoli Performance Monitoring

Proposed Future Capability

Processing …
- Query zAware (10 minute interval)
- If anomaly detected
  - Trigger situation to Generate Event when anomaly is surfaced
  - Include zAware insights in performance monitoring views

EC12

zAware | IC | F/O | z/O | z/O | zLinux | zLinux | zLinux

z/VM®

PR/SM

z CPU, Memory and IO

SE

z/O | ICS | z/O | z/O | z/O | zLinux | zLinux | zLinux

z/VM

PR/SM™

z CPU, Memory and IO

SE

- Performance monitoring scenarios currently being developed per Tivoli's statement of direction
- Customer input welcome
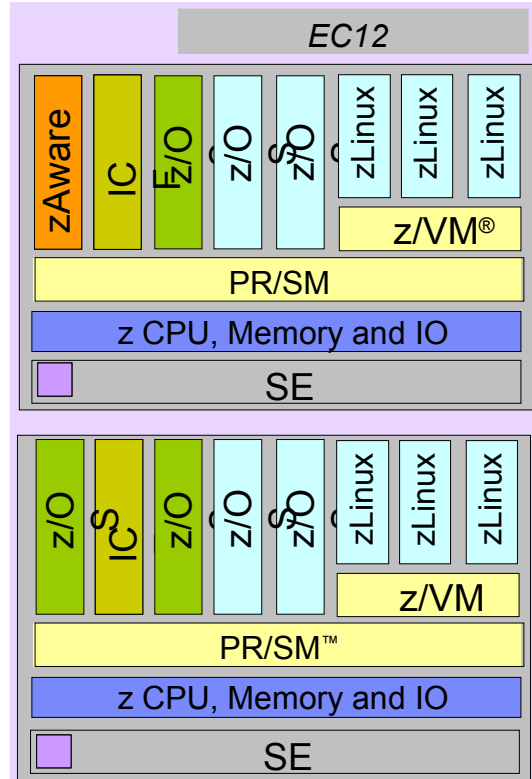
Moving Forward;
IBM drives client-focused open standards and interoperability

IBM solutions are built on a comprehensive, open reference model providing the flexibility and vendor choice to grow your business at your own pace

openstack™
CLOUD SOFTWARE

IBM is a Platinum Member in OpenStack Foundation

The Cloud Standards Customer Council's activities include:

Establishing the criteria for open, standards-based cloud computing, driven by customer use cases.	Providing guidance to the multiple cloud standards-defining bodies.	Defining best-practices and producing case studies, use cases, requirements, gap analysis and recommendations for cloud standards.

320+ participating companies

50% operate outside the IT realm

Interoperable | Flexible | Customer-driven

DMTF   CIMI & OVF   OASIS STANDARD   TOSCA   ISO International Organization for Standardization   THE Open GROUP Making standards work   CCRA   OSLC   Cloud Standards Customer Council

Customers already achieving cost savings from implementing IBM SmartCloud on System z

Taking advantage of z and IFL running Linux, Honolulu provided data in real time creating custom cloud for employees and citizens, and reduced database licensing costs by 68 percent and reduced time to deploy apps from 1 week to hours	**"Ability to develop new offerings faster and at a lower cost means that we can bring valuable new services to market ahead of our competitors."** *Jim Tussing, Chief Technology Officer for Infrastructure and Operations, Nationwide*	**Leveraging the cloud, Marist delivers a wealth of services to its students, faculty, and administrators — as well as to the local business community, vendors, and the open source community.**	**Transzap boosts SaaS uptime with IBM System z.** **"We intend to deliver a 99.9% application uptime guarantee to our customer base, thanks to the availability characteristics of System z."** *Peter Flanagan, CEO, Transzap, Inc.*	**Consolidating 20+ multi-product, departmental BI deployments to Cognos® 8 BI on System z.** **Deploying private cloud self service to support 200k+ users across global workforce 56% cost savings per user (grows with volume).**