

# Linux® and Cloud capabilities on z Systems

**Diego 迪戈 Bessone**

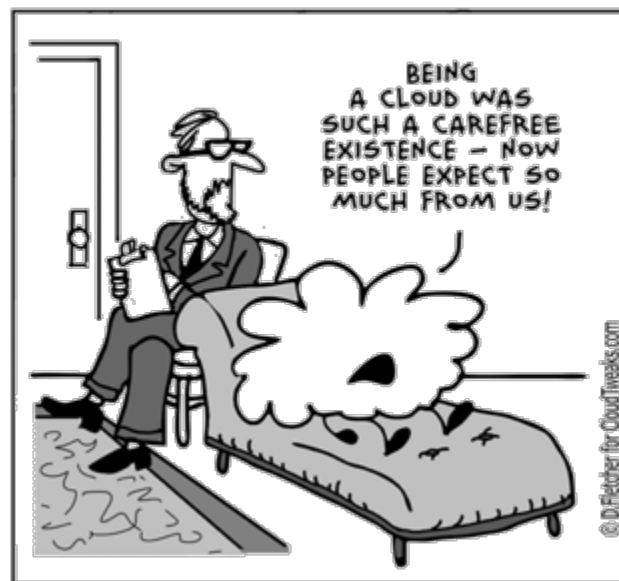
Beijing 北京, China – May 20<sup>th</sup>, 2015



## Linux and Cloud capabilities on z Systems

By the end of this presentation, you should be able to do the following:

- Articulate the value and benefit that deploying a cloud on z Systems offers IBM's customers:
  - Importance of Cloud
  - IBM offerings
  - Linux on z Systems
  - Cloud on z opportunity
  - Cloud on z benefits
  - z Systems differentiators
- Identify the elements of the z Systems cloud strategy
- Describe the value of each component in the Linux on z Systems cloud ecosystem
- Identify the value that a z/OS® cloud solution brings to our customers



## Table of Contents

- Cloud Computing
- Linux on z landscape
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- Discussion Activity
- Common Objections
- Key Learning Points



# The market is moving, forcing businesses to transform



## Explosion in transaction growth

*driven by mobility  
and the Internet of  
Things*



## Analytics is moving to real time

*to capture new  
opportunities at the  
point of impact*



## Hybrid cloud is the new standard

*for delivering service,  
agility, trust and  
efficiency*



## Infrastructure matters because business outcomes matter

1 in 2

business leaders don't  
have access to data they  
need<sup>1</sup>

2/3

of CMOs want better  
tools<sup>2</sup>

80%

Of CIOs are targeting  
analytics for insights<sup>3</sup>

1 trillion

connected objects and  
devices on the planet  
generating data by 2015<sup>4</sup>

2.5 billion

Gigabytes of data generated  
every day<sup>5</sup>

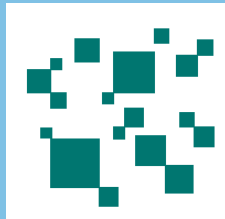
80%

of the world's data is  
unstructured<sup>6</sup>

## But not all organizations are ready... but they will be...



**0%** of companies report that their IT infrastructure is fully prepared to meet the demands of big data...



**62%** of companies plan to increase their infrastructure spend in the next 12-18 months

Why?

#1 reason companies invest in *IT Infrastructure*?

**To achieve competitive differentiation...**

**Infrastructure matters because business outcomes matter**

# Mobile, social, cloud, big data and analytics are changing how we live, work and interact

**63% of people**

expect to be doing more shopping on their mobile devices over the next couple of years



**40% of people**

socialize more online than they do face-to-face



**57% of companies**

using cloud to drive competitive and cost advantages

**300x growth**

of digital content between 2005-2020



**80% of all data**

is unstructured and growing 15x the rate of structured data

## Cloud is becoming pervasive as the engine of new service delivery



57% of companies are using cloud to drive competitive and cost advantage<sup>13</sup>

85% of new SW is being built for the Cloud<sup>14</sup>

Customers with a clearly defined Cloud strategy enjoy **almost 2x the revenue growth and nearly 2.5x higher gross profit** than peers<sup>15</sup>

## Did you know?

Business challenges with implementing the next generation of Cloud Computing

### Trust



61%

Of CIOs site security as their biggest inhibitor to cloud adoption<sup>16</sup>

### Economics



80%

of IT budget is used to maintain current systems with only 20% for new innovation<sup>17</sup>

### Agility



59%

Percentage of respondents who in a recent survey said that enhanced business agility is driving their cloud adoption.<sup>18</sup>

## z Systems are the World's Most Trusted and Efficient Cloud Server

### Trust



Leadership security capabilities such as EAL 5+ certification for protection in highly virtualized environments

### Superior Economics



Enable superior cloud services at 39% lower cost than x86 and 65% lower cost than public cloud†

### Agility



Almost unlimited capacity and automated provisioning of resources across multiple workloads

# Cloud on z13

Transform how businesses use IT resources to drive down costs and fuel innovation for competitive advantage

## Improve economics and performance

UP TO  
**8000** Virtual servers

Or up to 50 per core to dramatically reduce operational costs and administration overheads

### **SMT technology on z Systems**

Improves price / performance and throughput of workloads

## Flexible Options to Deliver New Solutions

### **KVM**

New industry-standard hypervisor (SOD)

**141 cores with 85 LPARs**

High capacity for scale and agility

## Unmatched Security and Availability

### **Crypto Express 5S**

Advanced security for increased throughput of transactions

### **GDPS Virtual Appliance for Linux and zAware**

Provides highest levels of resiliency and disaster recovery for enterprise grade Linux



Private Cloud



Hybrid Cloud

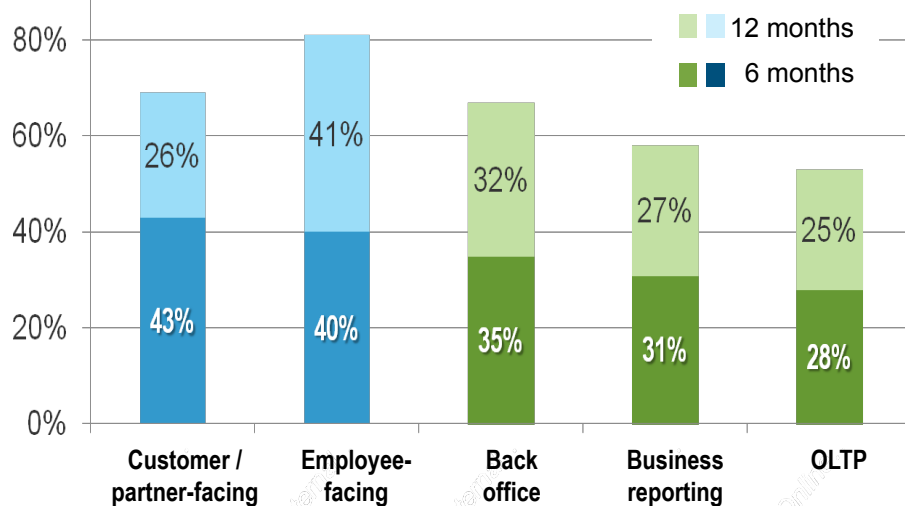


Public Cloud

# 3 of 5 top cloud scenarios are traditional enterprise workloads

## What types of applications do you plan to host on cloud platforms?

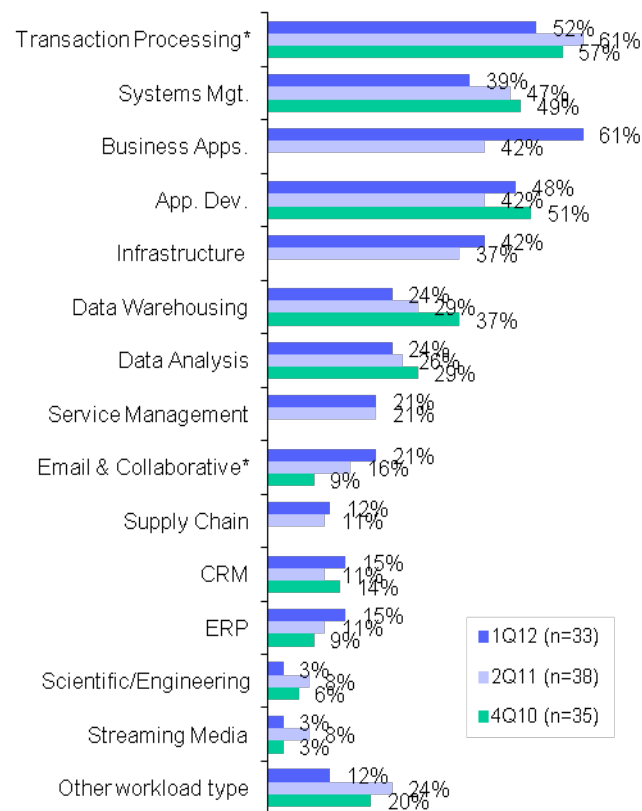
(Base: 200 North American and European hardware and infrastructure decision-makers)



Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, October, 2012

## Linux Workloads on z Systems

(Base: Running/planning to run Linux on the Mainframe)



Source: 2012 Systems Directions



# Linux on IBM z Systems in 2014

Installed Linux MIPS at 49% CAGR\*

- **26.4%** of total installed MIPS run **Linux** as of 4Q13
- Installed IFL **MIPS increased 24%** from 1Q13 to 1Q14
- **39%** of z Systems Customers have **IFLs installed** as of 1Q14
- **80 of the top 100** z Systems customers are running Linux on the mainframe as of 1Q14 \*\*
- **55% of new FIE/FIC** z Systems Accounts run Linux (FY10-FY13)
- **34%** of all mainframes have **IFLs**

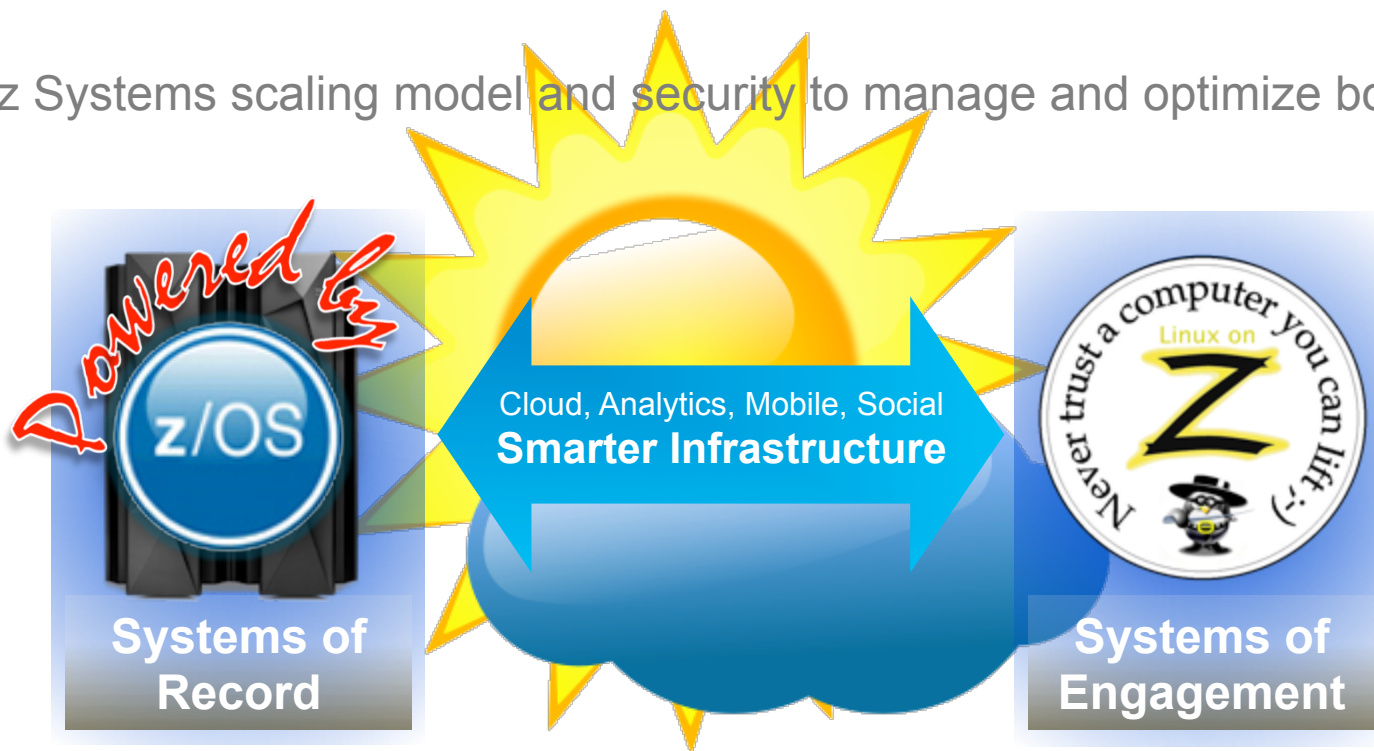


\*Based on YE 2003 to YE 2013

\*\*Top 100 is based on total installed MIPS

## z Systems span **Systems of Record** and **Systems of Engagement**

z Systems scaling model and security to manage and optimize both



Business Transactions  
Quality of Service  
Command & Control  
Facts and Data “source of truth”

Mobile and Social  
Dynamic  
Interactions and Collaboration  
Insight, Trends, Analytics

## Linux on z Systems means an enterprise grade Linux solution

While “Linux is Linux”, z Systems server and virtualization technologies provide an enhanced Linux solution

### Having an enterprise grade Linux solution brings:

- ✓ IT simplicity to run hundreds of workloads on one server
- ✓ Workload integration of new and existing enterprise data and applications
- ✓ Virtualization management for easy and flexible server provisioning
- ✓ High productivity through efficient life cycle management
- ✓ High utilization of shared resources

*Linux on z Systems provides security, availability, and scalability to deploy and consolidate a variety of workloads*





# Differentiation for deploying clouds on z Systems

**90%+**  
utilization  
**Increased  
Productivity**

- Advanced workload management that provisions resources on the fly for 90%+ utilization and maximizes ROI
- Significant software license savings due to z Systems power/scale

**100K**  
virtual servers  
**Higher  
Utilization**

- Maintain service levels with up to 100% CPU utilization
- “Shared everything” architecture
- Manage up to 100,000 diverse virtual servers
- Unmatched scalability with 24X more scale than x86

**80%**  
less energy  
**More  
Efficient  
Data Center**

- Up to 80% less energy than existing distributed servers
- Less floor space
- Fewer parts to manage

Up to  
**32%**  
Lower cost  
**Than x86  
Cloud**

- Superior cloud services
- Real time capacity on demand to manage growth and handle workload spikes
- Up to 60% less TCO than the Public Cloud



## IBM z Systems

# Differentiate your cloud services and drive margins sky high

**A growing company doesn't always mean a growing budget.** IBM z Systems deliver high-performance cloud solutions that are exponentially more cost-efficient, giving you the right tools for your business while helping to keep your profit margins high.

**8,000** on a single system  
virtual servers offer unparalleled scalability

**Cloud infrastructure costs that are 50% less** than competitive platforms

Cloud security that's  
**17x greater** than competitive platforms

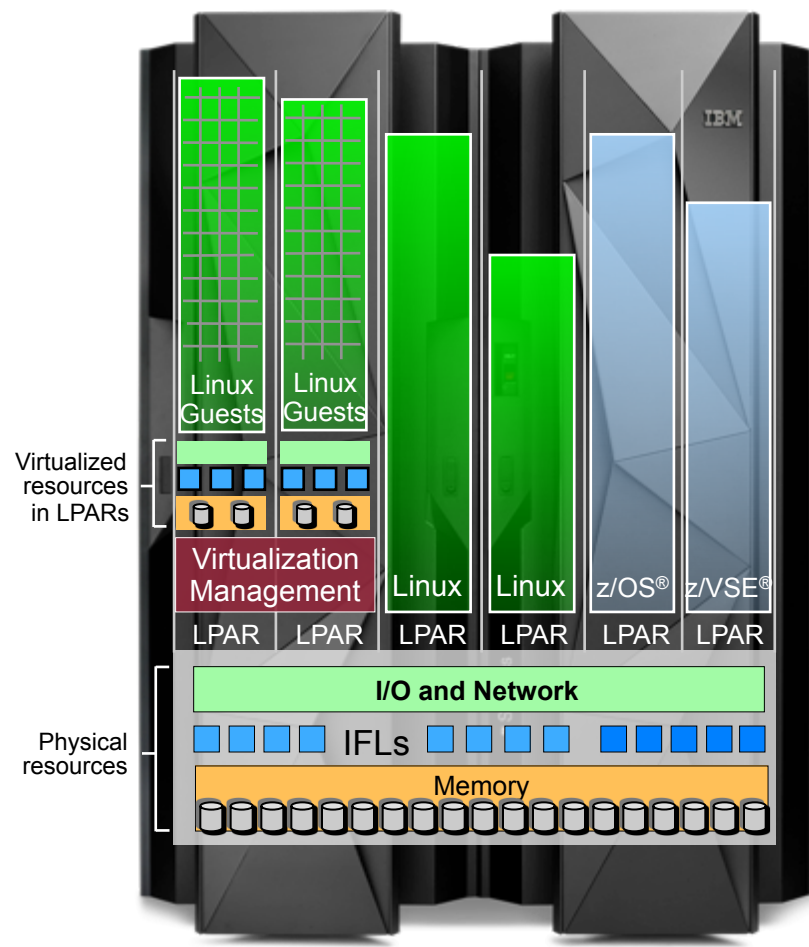
**30% faster** Linux and Java workloads with new Dynamic Multi-Threading capabilities

To learn more about how IBM z Systems can help you differentiate your cloud services at lower costs, visit [ibm.com/systems/z/announcement](http://ibm.com/systems/z/announcement)

# Linux on IBM z13

- Data center simplicity inside one server
- Trusted operations
- Unrivaled economics

<b>LPAR</b>	<b>Logical Partition</b> = subset of hardware resources, virtualized as a separate computer; up to 85 LPARs can be configured
<b>IFL</b>	<b>Integrated Facility for Linux = core</b> ; up to 141 cores (IFLs) on IBM z13™ (z13)
<b>Virtual. Mgmt.</b>	Hypervisor providing efficiency at scale and virtualization management for easy administration, provisioning, automation
<b>Linux Guest</b>	virtual Linux guests running workloads such as mobile, analytics, databases, Java™ apps, etc. – in a cloud; up to thousands Linux guests can be hosted on a single z13



# IBM z Systems world-class Virtualization

## LPAR and IBM z/VM technologies

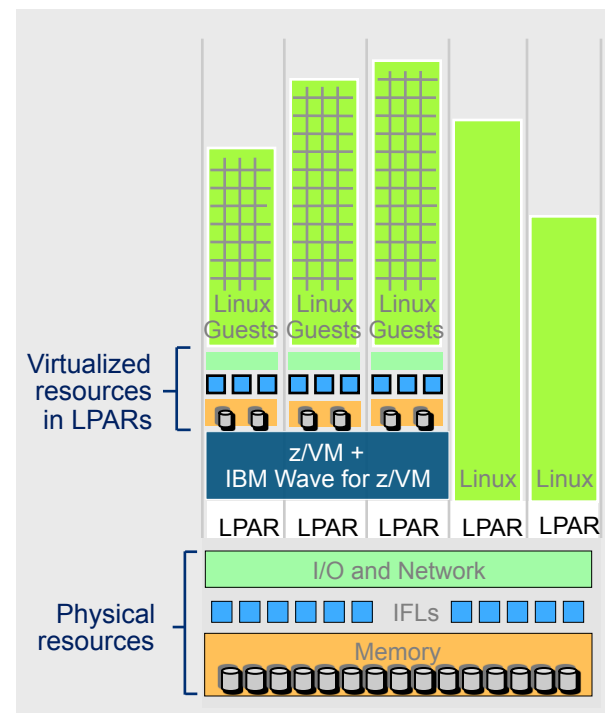
✓ *Virtualization*    ✓ *Consolidation*    ✓ *Workload management*    ✓ *Automation*

### Logical Partitioning (LPAR) and z/VM are complementary

- **LPAR**
  - Host a relatively small number of very high-performance virtual servers
  - Very low overhead, hardware-based virtualization through partitioning
- **z/VM**
  - Host large numbers of high-performance virtual servers
  - Low overhead, hardware-based, true virtualization with extreme levels of software augmentation
- **IBM Wave for z/VM**
  - Drives simplicity into managing highly virtualized environments
  - Take the first critical steps toward cloud

### Together, LPAR and z/VM technology provide:

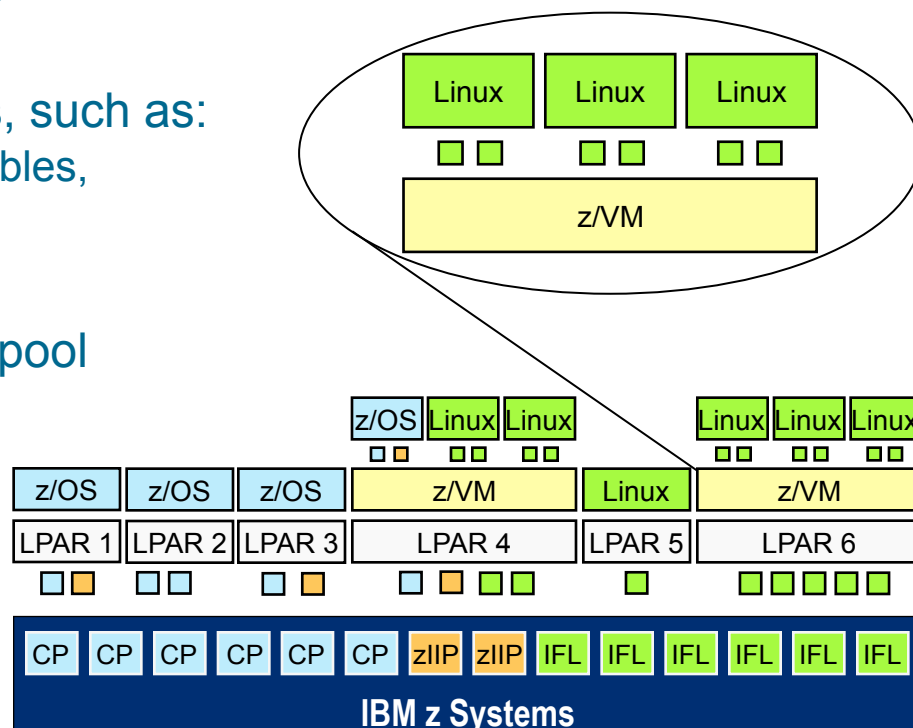
- High performance “on the metal” virtual servers for larger, performance-critical workloads
- The ability to provision up to thousands of virtual Linux servers flexible and on demand



Virtualization is a part of the *basic componentry* of the z Systems platform

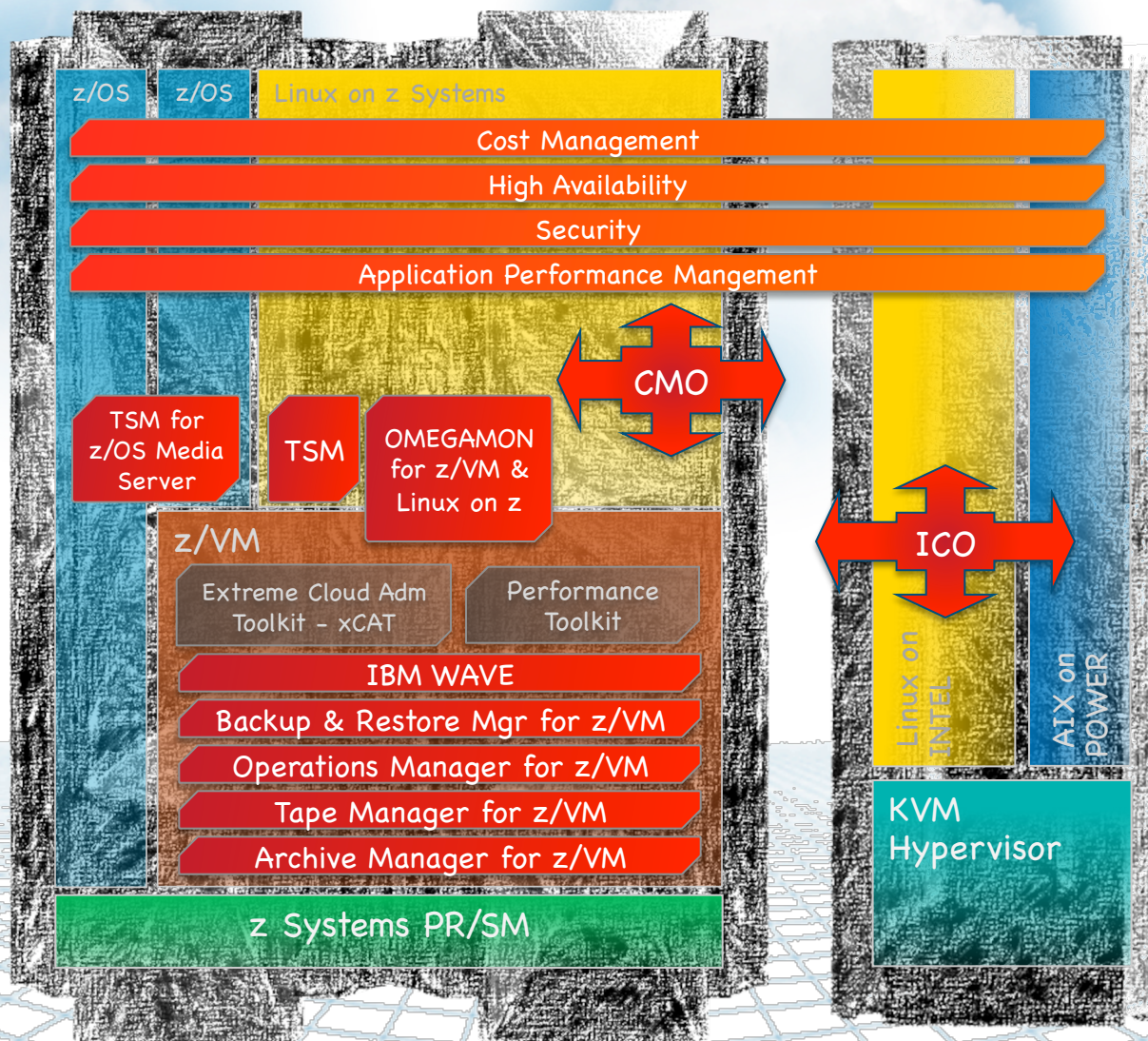
# IBM z/VM – Powerful and Versatile Virtualization

- World class quality, security, reliability
- Extreme scalability creates huge cost savings opportunities
  - Software licensing
  - Hardware maintenance and networking
  - Floor space and Energy
- Exploitation of advanced technologies, such as:
  - Shared memory (Linux kernel, executables, communications)
  - Virtual networking (Switches, LANs)
- Highly granular control over resource pool
- Valuable tool for Disaster Recovery and Resiliency plans and processes





# Complete solution for cloud workloads on z Systems



## IBM Infrastructure Suite for z/VM and Linux on z Systems

Organizations that have expanded their business using virtualization technology with Linux on z Systems now have one solution that provides them with multiple tools to monitor, operate, automate, and backup and recover their entire z/VM and Linux on z Systems environment.

### Product components include:

- OMEGAMON XE for z/VM and Linux on z
- Operations Manager for z/VM
- IBM Wave
- Backup and Restore Manager for z/VM
- IBM Tivoli Storage Manager Extended Edition



### Benefits include:

- ✓ Easy-to-use, content rich interface that is simple and free of operational complexity.
- ✓ Improved productivity with rapid cloning and provisioning of Linux guests on IBM z/VM.
- ✓ Simplified administration with flexible reporting.
- ✓ Easier administration with detailed performance monitoring, including customized views and historical data

## xCAT - Extreme Cloud Administration Toolkit

- Shipped as part of z/VM 6.3
- Allows customers to set up and administer a rudimentary cloud environment on z/VM only, without purchasing any other cloud management software
- Scalable open source toolkit that includes:
  - Provisioning and de-provisioning of virtual guest environments
  - Monitor physical and virtual resources
  - Provide network, storage and image management
- No upgrade path to SmartCloud suite
- xCAT has four different interfaces
  - REST (Representational State Transfer) APIs
  - Browser based Graphical User Interface
  - Command Line Interface (CLI)
  - XML
- If customers want to manage other environments besides z/VM, then open source can be downloaded from: [http://sourceforge.net/apps/mediawiki/xcat/index.php?title=Main\\_Page](http://sourceforge.net/apps/mediawiki/xcat/index.php?title=Main_Page)







# OMEGAMON XE on z/VM and Linux Overview



- Provides performance monitoring for z/VM and Linux guests
- Linux agents gather performance data from Linux guests
- z/VM agent gathers performance data from z/VM
  - Including z/VM view of guests
  - Uses IBM Performance Toolkit for VM as its data source
- Executes automated actions in response to defined events or situations

## z/VM

- ✓ PAGING and SPOOLING Utilization
- ✓ DASD
- ✓ LPAR Utilization
- ✓ NETWORK Utilization (Hiper Socket and Virtual Switch)
- ✓ REAL STORAGE Utilization
- ✓ TCPIP Utilization – Server/Users
- ✓ SYSTEM Utilization
- ✓ Workload (z/VM User ID) Activity
- ✓ Linux Workload Workspace
- ✓ Channel Workspaces (includes FICON)
- ✓ CCW Translations
- ✓ Processor and Processor by LPAR

## Linux on z Systems

- ✓ Linux OS
- ✓ Capacity Usage
- ✓ Disk Usage
- ✓ File Information
- ✓ Network
- ✓ Process
- ✓ System Information
- ✓ Users

## A scenario...

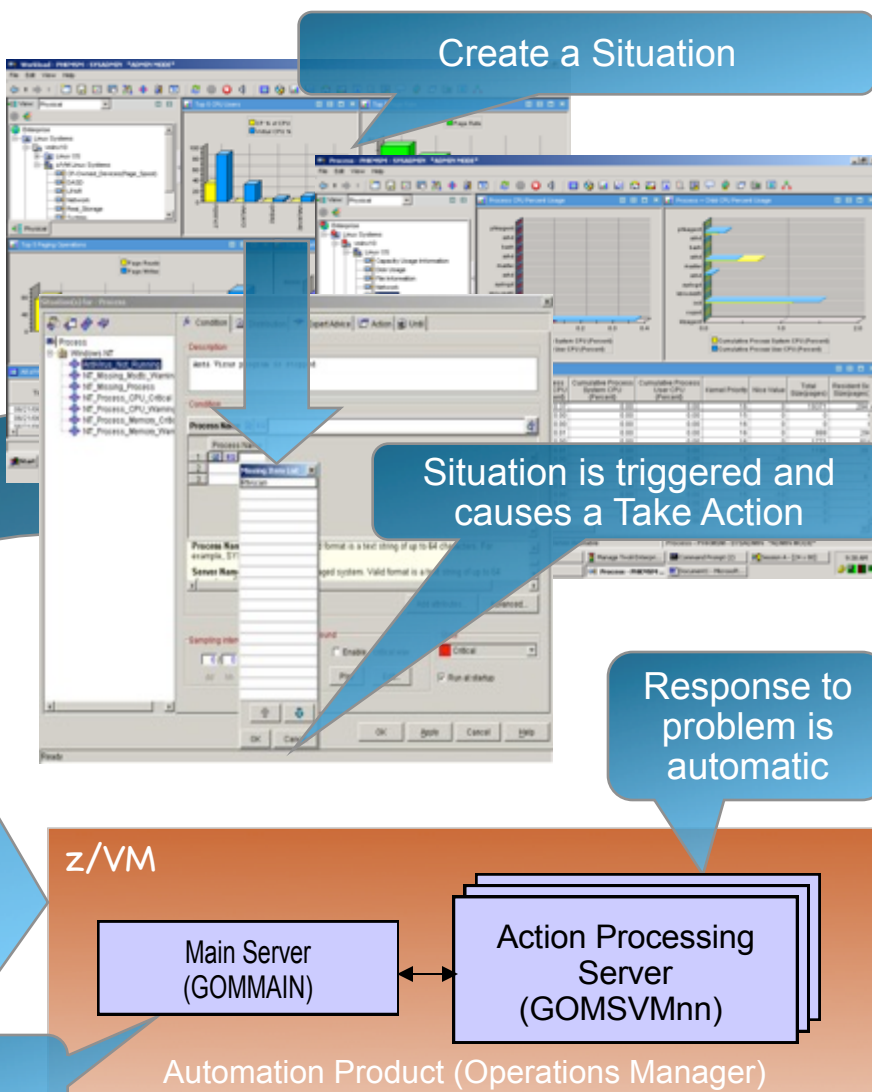
### Problem

- Uneven Linux guest CPU consumption

### Solution

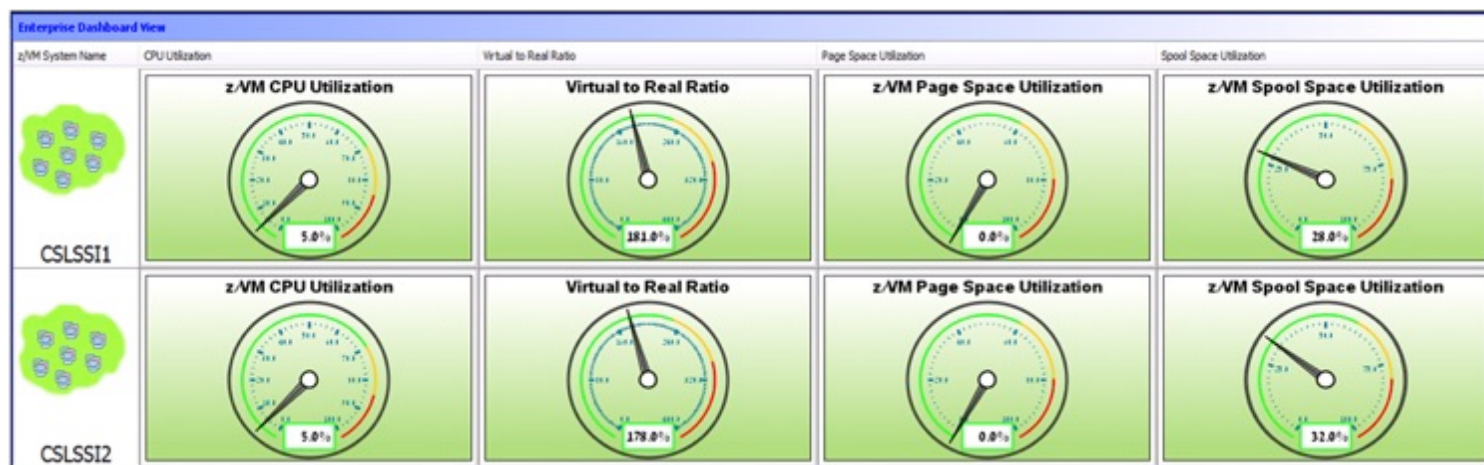
1. Use situation to recognize high swapping with high CPU and working set size
2. Send message to Operations Manager
3. Operations Manager invokes a rule to execute a CP tuning command to allocate more resources to the Linux Guest

Message is sent and triggers z/VM automation



## Comparing Performance Monitoring with **IBM-WAVE** and **OMEGAMON XE for z/VM and Linux on z**

- IBM-WAVE provides real-time monitoring of virtual server resources from a single graphical interface



- With OMEGAMON XE for z/VM and Linux on z, you have not only real-time monitoring of z/VM, but you also have:
  - Monitoring of individual Linux guest environments
  - Historical view of monitoring data
- Both OMEGAMON XE and IBM-WAVE can coexist in customer environments
- Both gather the data from the Performance Toolkit for z/VM

# IBM Cloud Manager with OpenStack

Offers rapid time to value

Chef Server and Client included

**IBM Cloud Manager with OpenStack** is an easy to deploy, simple to use cloud management software offering **based on OpenStack (Icehouse) with open cloud APIs**. Importantly, we include **IBM enhancements** that features a self-service portal for **workload provisioning, virtual image management, and monitoring**. It's an innovative, cost-effective approach that also includes **automation, metering, and security**.

## Supports Heterogeneous Compute, Storage & Network

- Central management across multiple hypervisors & domains
- All **IBM server architectures** & major hypervisors supported

## Additional Features for Increased Efficiency

- **Dashboards** show Cloud admin resource capacity, VM utilization
- **Reporting/Metering/Billing**, Resource expiration & project approval policies, network configuration & mapping

## Multi-Cloud Federation Clouds

- **Federation** of multiple OpenStack instances



**Accelerate Time to Market:** Improvement for new applications

**Integrated Management:** Approvals, metering, billing, users and projects through a single 'pane of glass'

**Flexible, modular design:** Based upon OpenStack IaaS – Access to OpenStack APIs. Extensible via REST API allowing partners to easily customize the UI

**Open  
Simple  
Innovative**



# Quickly build out complex cloud workload instances on z Systems



## *IBM Custom Patterns for Linux on IBM z Systems™*

- Reduce deployment error/fix
- Reduce need for deep product skills
- Improve quality of delivery
- Reduces operating and capital expenses

## More

patterns to be delivered in 2015

**12 patterns**  
for key IBM z  
Systems™ portfolio

WAS Network Deployment  
WAS Liberty  
ODM Decision Server  
ODM Decision Center  
Integration Bus  
DB2

Business Process Server  
Business Process Center  
Business Monitor  
WebSphere® Portal  
WebSphere MQ  
MobileFirst Platform

Up to **80%**  
reduction in  
multi-product  
deployment

# IBM Cloud Orchestrator

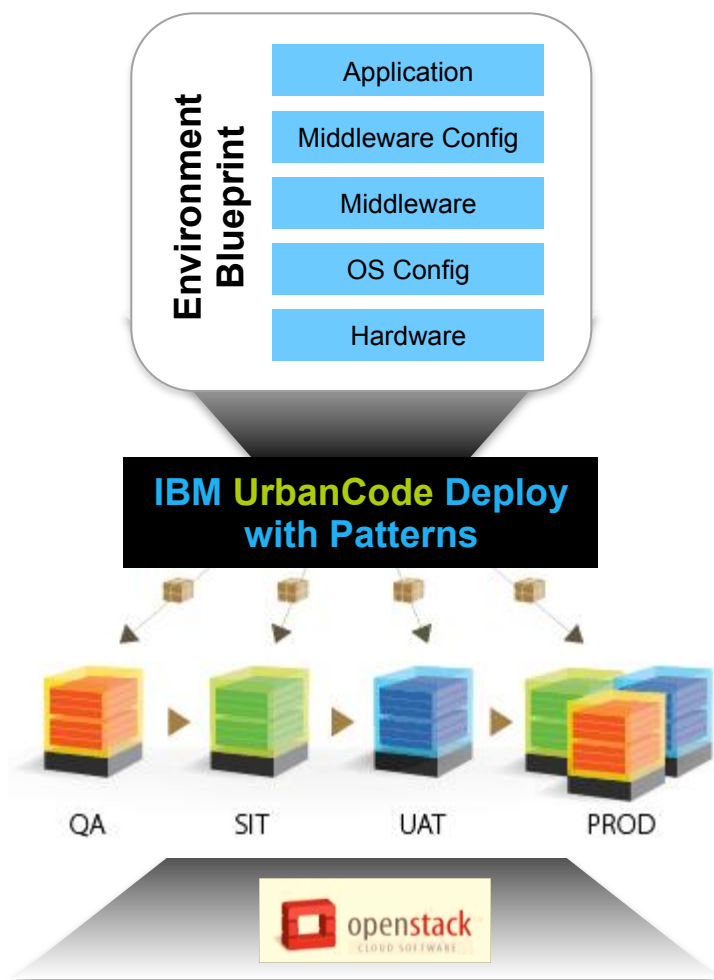
The ability to support user-driven services requests and orchestrated resource deployment is pivotal to an optimized infrastructure and can provide tremendous cost savings

- **IBM Cloud Orchestrator** is a comprehensive open cloud management platform that automates the delivery of cloud services. Its advanced cloud capabilities include:
  - **Automating** the management of virtual environments
  - **Building** dynamic service delivery models.
  - **Integrating** business policies and systems in a customized cloud service through workflow integration
- **IBM Cloud Orchestrator** is a comprehensive service delivery platform that can help:
  - Drive down costs
  - Increase speed to deliver business services



# Introducing IBM UrbanCode Deploy with Patterns

Design and deploy full stack application environments for multiple clouds



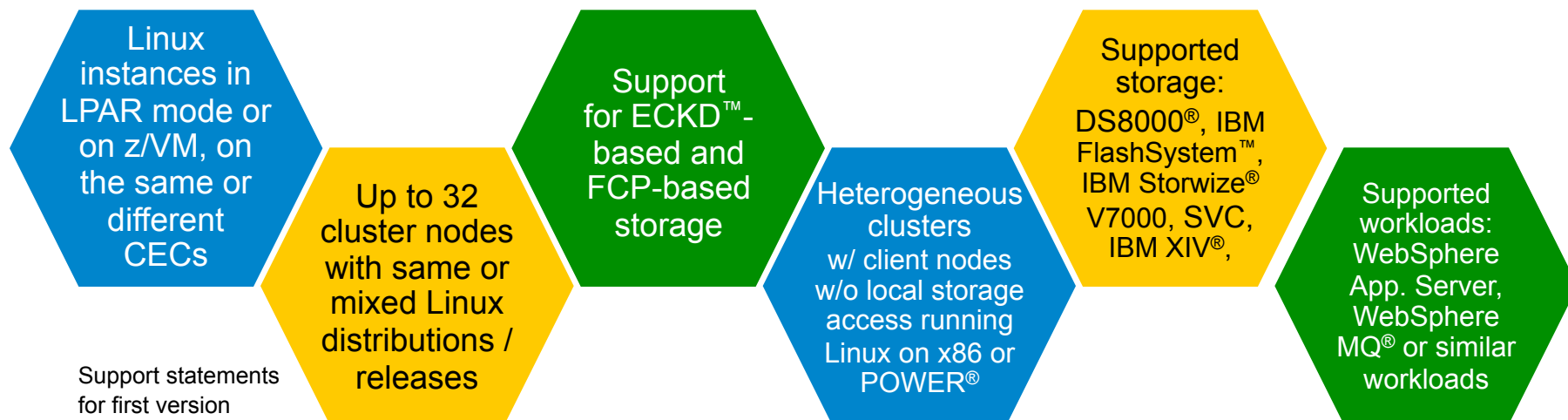
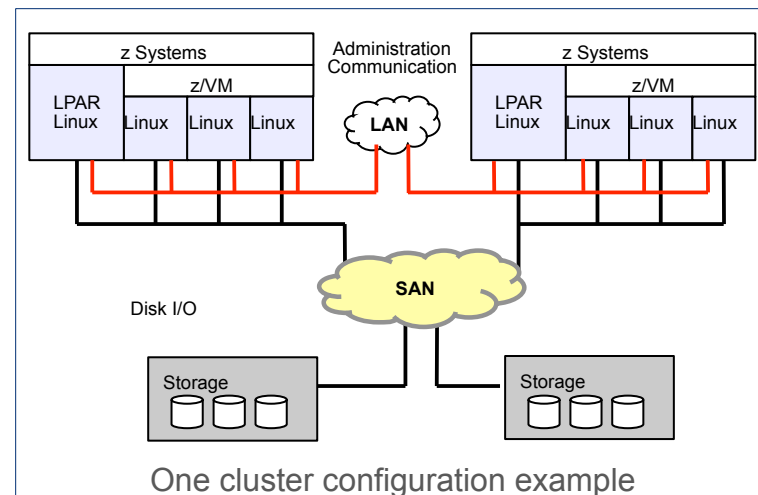
- ✓ Pattern designer
  - Design open, full stack application environments in a diagram or textual editor
- ✓ Design once, deploy anywhere
  - Deploy full stack environments to multiple clouds
- ✓ Environment lifecycle management
  - Manage infrastructure change and easily apply changes to existing environments
- ✓ Delivery process automation
  - Automated delivery process with integrated full stack environments

# IBM Spectrum Scale\* for Linux on z Systems

Based on IBM GPFS technology

## Robust clustered file system

- Concurrent high-speed, reliable data access from multiple nodes
- Extreme scalability and accelerated performance
- Smooth, non disruptive capacity expansion and reduction



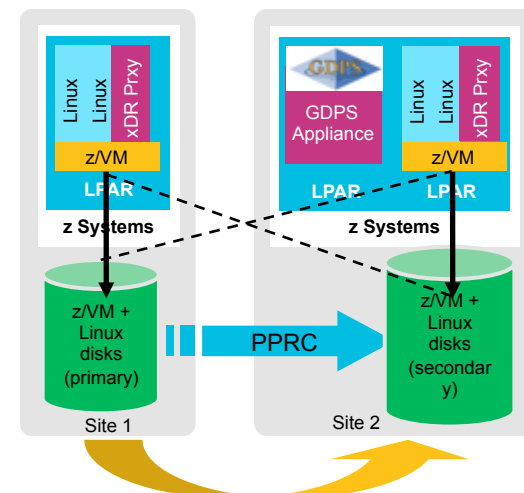
# IBM GDPS Virtual Appliance for Linux on z Systems

Drive high availability and improved disaster recovery in your systems



IBM GDPS Virtual Appliance is designed to facilitate near-continuous availability and disaster-recovery by extending GDPS capabilities for Linux on z Systems and z/VM environments.

- Fully integrated Continuous Availability and Disaster Recovery solution for Linux on z Systems
- GDPS helps customers avoid outages both planned, and unplanned due to single component failures or whole site failures
- Self contained and pre-configured virtual machine image
  - Contains an operating environment (little or no z/OS skills required), GDPS/PPRC, Tivoli® NetView® and Systems Automation\*\*, an appliance management layer, and APIs / UIs for customization, administration, and operation tailored to the appliance function
- Improves both consumability and time-to-value for customers



## GDPS/PPRC is capable of providing

- *Near continuous disk availability*
- *Highly automated D/R solution*
- *Recovery Time Objective less than an hour*
- *Recovery Point Objective of zero*
- *Protection against localized area disasters*

# New software distribution of KVM for z Systems



New software distribution of KVM on z Systems that will co-exist with z/VM's support of Linux on z Systems

In addition to the continued investment in z/VM, IBM intends to support a Kernel-based Virtual Machine (KVM) offering for z Systems that will host Linux on z Systems guest virtual machines.

- The KVM offering will be software that can be installed on z Systems processors like an operating system and can co-exist with z/VM virtualization environments, z/OS, Linux on z Systems, z/VSE and z/TPF.
- The KVM offering will be optimized for z Systems architecture and will provide standard Linux and KVM interfaces for operational control of the environment, as well as supporting OpenStack interfaces for virtualization management, enabling enterprises to easily integrate Linux servers into their existing infrastructure and cloud offerings.



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



## Cloud Computing on z/OS

With z/OS, we need to think about cloud just a bit differently.....

- Today in cloud environments on distributed servers, or even with Linux on z Systems, customers would provision a virtual machine with an instance of an operating system to run a single workload.
  - To deploy another workload would mean another virtual machine with another instance of the operating system.
- However, in the context of z/OS, this methodology goes against everything we have come to know and expect about z/OS.
  - On z/OS, you have the ability to run multiple disparate workloads with different service levels for those hosted workloads with isolation or multitenancy.
- Hence, our **approach for cloud on z/OS** is not focusing on the provisioning of operating system instances, but rather, **the ability to provision multiple workloads in a single z/OS instance.**

# CICS TS v5.1 with cloud enablement



*Moving towards a cloud oriented service delivery platform*

## **3 simple steps to cloud enablement...**

1. Define your platform encapsulating your existing regions
2. Define your applications, entry points, and dependencies from existing assets
3. Deploy your applications onto your platform

## **With cloud enablement you can...**

- Bring the flexibility of cloud deployment to your existing CICS™ assets
- Easily measure resource usage of your CICS business applications
- Dynamically control your CICS applications and infrastructure at runtime



### **Application**

*Create agile services from existing assets*



### **Platform**

*Create agile service delivery platforms*



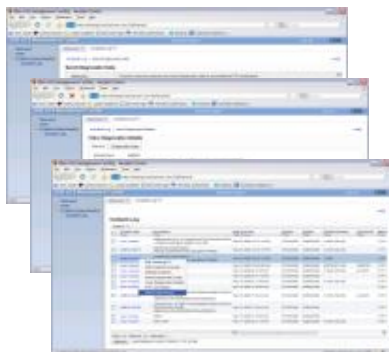
### **Policy**

*Control critical resource thresholds with policies*



# Cloud Computing on z/OS: Provisioning Scenario

## Workload Pattern



A Cloud workload has been defined that includes integration with WebSphere App Server on Linux for z Systems and CICS/DB2 system on z/OS

The Application developer creates a pattern to describe the application topology by pointing to a WAS virtual system pattern (virtual image)

## SmartCloud Orchestration



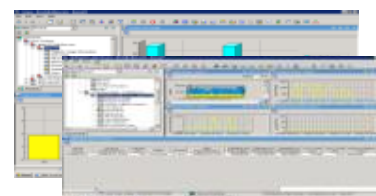
The system programmer then launches into SCO to create workflow which will orchestrate the provisioning on the z/VM and Linux for z Systems system and interface to z/OSMF to cause the CICS and DB2 artifacts to be provisioned/ deployed with appropriate configuration (e.g. network and security settings to satisfy the pattern)

## z/OSMF - Workflow Broker



The administrator customizes the z/OSMF workflows for CICS, DB2, Communication Server and Security server to support the workflow request to drive each platform's REST APIs to accomplish the required configuration requests.

## CICS and DB2 Administration



Verify / Review the CICS & DB2 parameters before deploying

# Linux on IBM z13 is open for all Solutions

Capitalize from transformative technologies

- **Cloud**
- **Mobile applications**
- **Analytics and Data services**
- **Security & Infrastructure services**
- Business applications
- Business Process Management
- Enterprise Content Management
- Development & test
- Industry Solutions
- Social services



## IBM z Systems transforming Cloud



### Private Cloud

z/OS and Linux on z Systems as the foundation of the most secure, scalable private cloud infrastructure



### Hybrid Cloud

Leveraging BlueMix™ and interoperability with SoftLayer, AWS and other public cloud offerings




### Public Cloud

Enabling MSPs/CSPs to deliver differentiated mainframe-based service offerings

*“Smaller enterprises often choose public cloud services, but encounter issues with cost and complexity when they expand. With ... the Enterprise Cloud System – which can accommodate more than 8,000 VMs – we can offer clients the cost effective scalability they need to take their business to the next level.”* - Steve Groom, CEO of Vissensa



z Systems provides the infrastructure to support  
**all dimensions** of cloud service delivery








# Linux on z13

The enterprise grade Linux solution

z13 <sup>1</sup>	
<b>Up to 10 TB</b>	>3X more available memory
<b>Up to 141</b>	Configurable cores
<b>Up to 85</b>	Configurable LPARs
<b>IBM zAware</b>	Maximize service levels 
<b>Larger Cache</b>	More workloads per server
<b>Crypto Express5S</b>	Performance and function 
<b>SMT, SIMD</b>	Enhanced performance



## Enterprise grade Linux solution:

<b>IBM GDPS® Virtual Appliance</b>	<i>Continuous availability &amp; Disaster recovery</i> 
<b>IBM Spectrum Scale (IBM GPFS technology)</b>	<i>Clustered file system</i> 
<b>SOD: KVM for z Systems</b>	<i>Open source virtualization</i>
<b>IBM Infrastructure Suite</b>	<i>Management suite for z/VM and Linux</i>
<b>IBM Wave for z/VM</b>	<i>Intuitive virtualization management</i>
<b>IBM z/VM</b>	<i>Virtualization with efficiency at scale</i>
<b>IBM z13</b>	<i>Unmatched server technology &amp; capacity</i> 

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<sup>1</sup> Total capacity improvement over zEC12 of 40+ percent

# Clients run many workloads on Linux on z Systems



Database deployment

- [Sparda-Datenverarbeitung eG](#) (DB2, Oracle)
- [EVERTEC](#) (Oracle)
- [L3C LLP](#) (Oracle)
- [Dundee City Council](#) (Oracle)
- [Met Office](#) (Oracle)
- [America First Credit Union](#) (DB2)
- [SinfoniaRx](#) (DB2)



Web application and SOA infrastructure

- [BTMU](#)
- [Nationwide](#)
- [Halkbank](#)
- [Renfe](#)
- [Bank New Zealand](#)



Real-time insights

- [Sicoob](#)
- [White Cube](#)
- [Bankia](#)
- [Miami-Dade County](#)
- [IBM](#)



... and much more

- [ABK-Systeme GmbH](#) (MobileFirst)
- [Banca Carige](#) (MobileFirst)
- [German Pension Fund](#) (Content Mgt)
- [BCBS Minnesota](#) (SAP)
- [Baldor](#) (SAP)
- [Porto Alegre](#) (Maximo)
- [City a. County of Honolulu](#) (Maximo)
- [IBM](#) (Connections/Notes)



## Common Objections to Linux on z Systems

### **z Systems servers are too expensive; the total cost of acquisition (TCA) of distributed servers is much cheaper.**

This is a very limited scope on IT costs. An IT solution consists of hardware, maintenance, virtualization and middleware, software, service and support for the software, and the applications. While TCA of a single server might be lower, the TCO of a distributed environment is not. The major cost reduction is achieved on software costs, since Linux software is usually priced on a per-core basis. Consolidation onto z Systems means a few IFLs vs. many, many cores of x86 or UNIX servers.

### **z Systems is in a whole other class - “overkill.” I don’t need this.**

Even small companies or departments in larger enterprises have seen 3-5 year TCO savings over 50%. z Systems superior capabilities are cost-competitive to x86 alternatives for installations as small as half a rack of blade or rack servers. Especially, the Enterprise Linux Server (ELS) based on z13 has extended capabilities and is very attractively priced.

### **Virtualization on x86 is good enough.**

This thought is mostly driven by lack of education and understanding of the “new” z Systems servers and z/VM virtualization capabilities. Did you know that z/VM offers the highest levels of resource sharing for processors, communication, memory, storage, I/O and cryptographic features, including the sharing of Linux program executables, over-commitment capabilities for processors and memory and I/O bandwidth, resulting in nearly 100% utilization of the system resources nearly 100% of the time? Clustering in the form of the Single System Image (SSI) feature and Live Guest Relocation (LGR) are supported as well.

### **The software is not available for Linux on z Systems; it’s proprietary technology.**

Linux is Linux, and Linux on z Systems supports the industry standard Linux distributions (Red Hat, SUSE), applications, programming languages, and interfaces like other Linux platforms. The ecosystem is growing continuously; IBM and ISVs support the environment with their applications - more than 3,000 Linux applications are available. In addition, all applications for Linux on x86 can be made available for Linux on z Systems. IBM has a support program in place, named Chiphopper™, to help ISVs.

## Key learning points

- Business Challenges with implementing Cloud are Trust, Economics and Agility
- 26.4% of total installed MIPS run Linux as of 4Q13 and that number has grown every year since 1999.
- 90% of z customers say Cloud is critical to their plans. Now is the window of opportunity for private clouds with Linux on z Systems.
- z Systems maintain service levels with up to 100% CPU utilization for clouds on z
- z Systems provide unmatched scalability with 24X more scale than x86 on Linux on z
- The key components for building a cloud on z Systems include z/VM 6.3, Linux on z Systems, IBM Infrastructure Suite for z/VMs, and IBM Cloud Manager with OpenStack
- Up to 80% reduction in multi-product deployment when using patterns for cloud
- A different approach is needed for cloud on z/OS to take advantage of the operating system's unique capabilities. The difference is not focusing on the provisioning of operating system instances, but rather, the ability to provision multiple workloads in a single z/OS instance.
- With up to 10TB of memory, larger cache, SMT and SIMD among other features, Linux on z is identified as an enterprise grade Linux solution.
- Common objections to Linux on System z include that the mainframe is too expensive and complex, x86 is good enough, and our software is not available on Linux on z.

Advanced Top Gun: Winning with z Systems™



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