IBM

The Gold Standard for Enterprise Computing

Advantages of a Private Cloud on zEnterprise

Businesses are choosing a variety of cloud deployment models

Off-premise (Public)

Hybrid Cloud

On-premise (Private)

**Differences in
Security, Availability, Performance**

- Application/data publicly exposed

- Minimal visibility

- Minimal customization

- Application/data "inside firewall"

- Good visibility

- More customization

50% of enterprises will have full blown hybrid clouds by 2017*

*Gartner: Jan 2014

IBM®

# Applicability of the cloud is broadening to include more enterprise workloads

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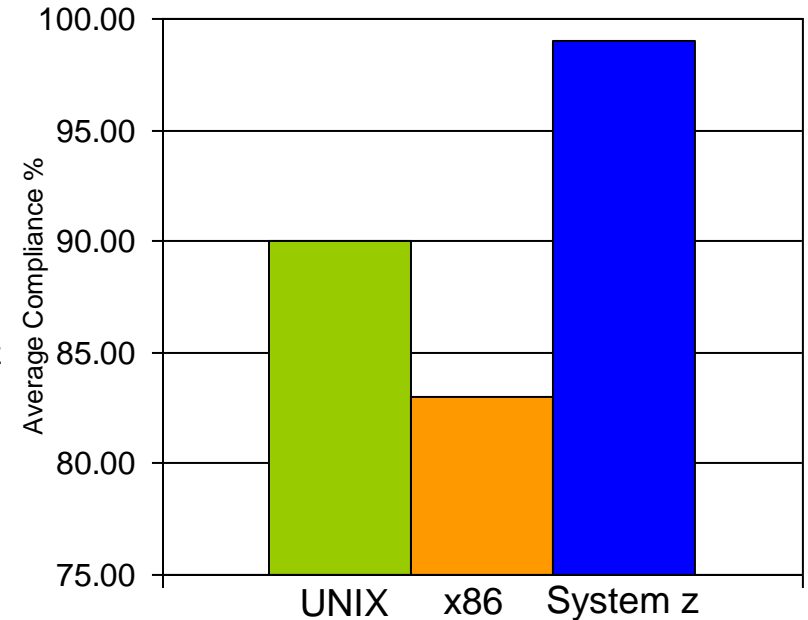

Base: 200 North American and European hardware and infrastructure decision-makers
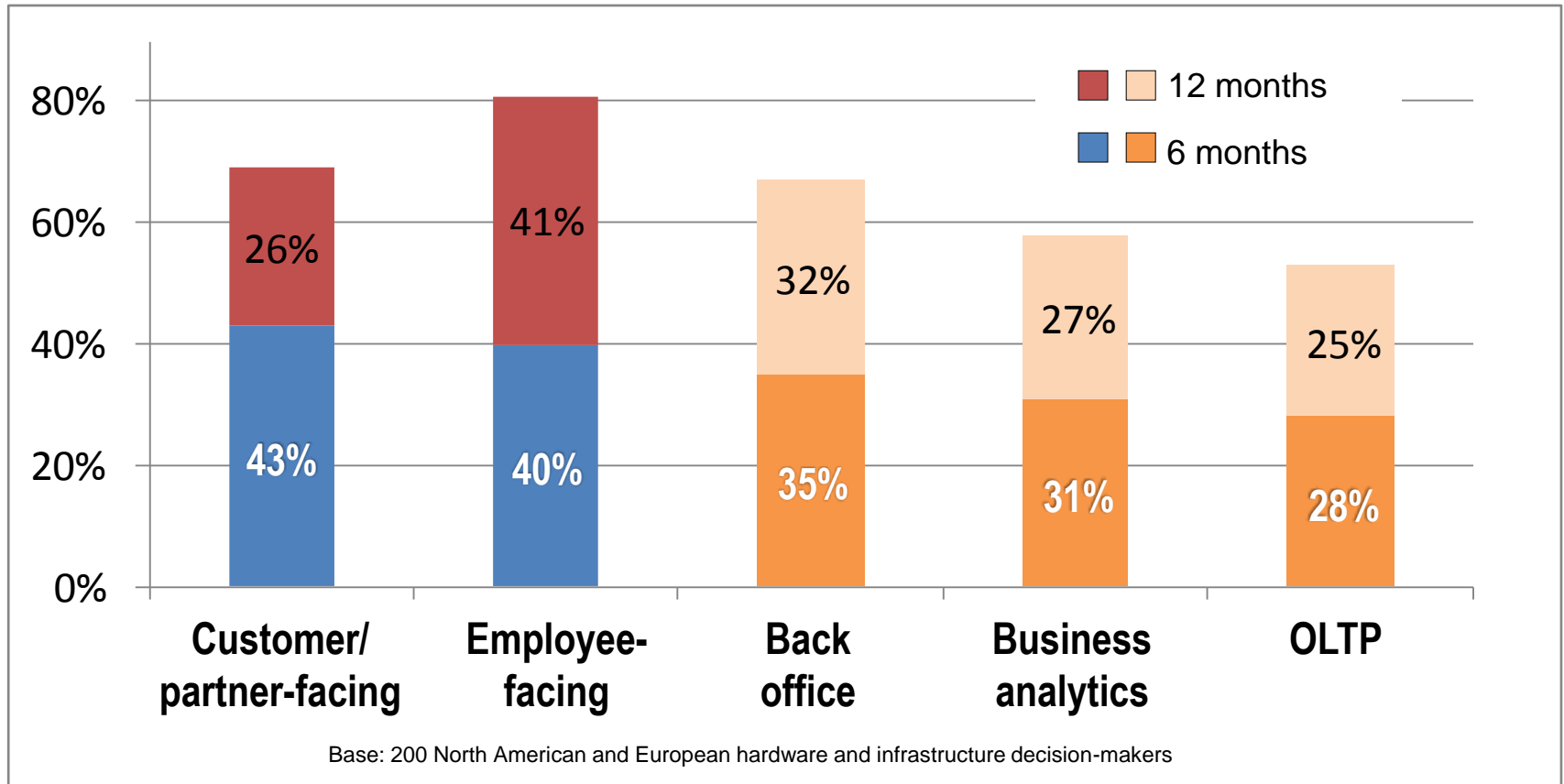
Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, October, 2012

Advantages of a private cloud on zEnterprise

System z excels at supporting enterprise workloads

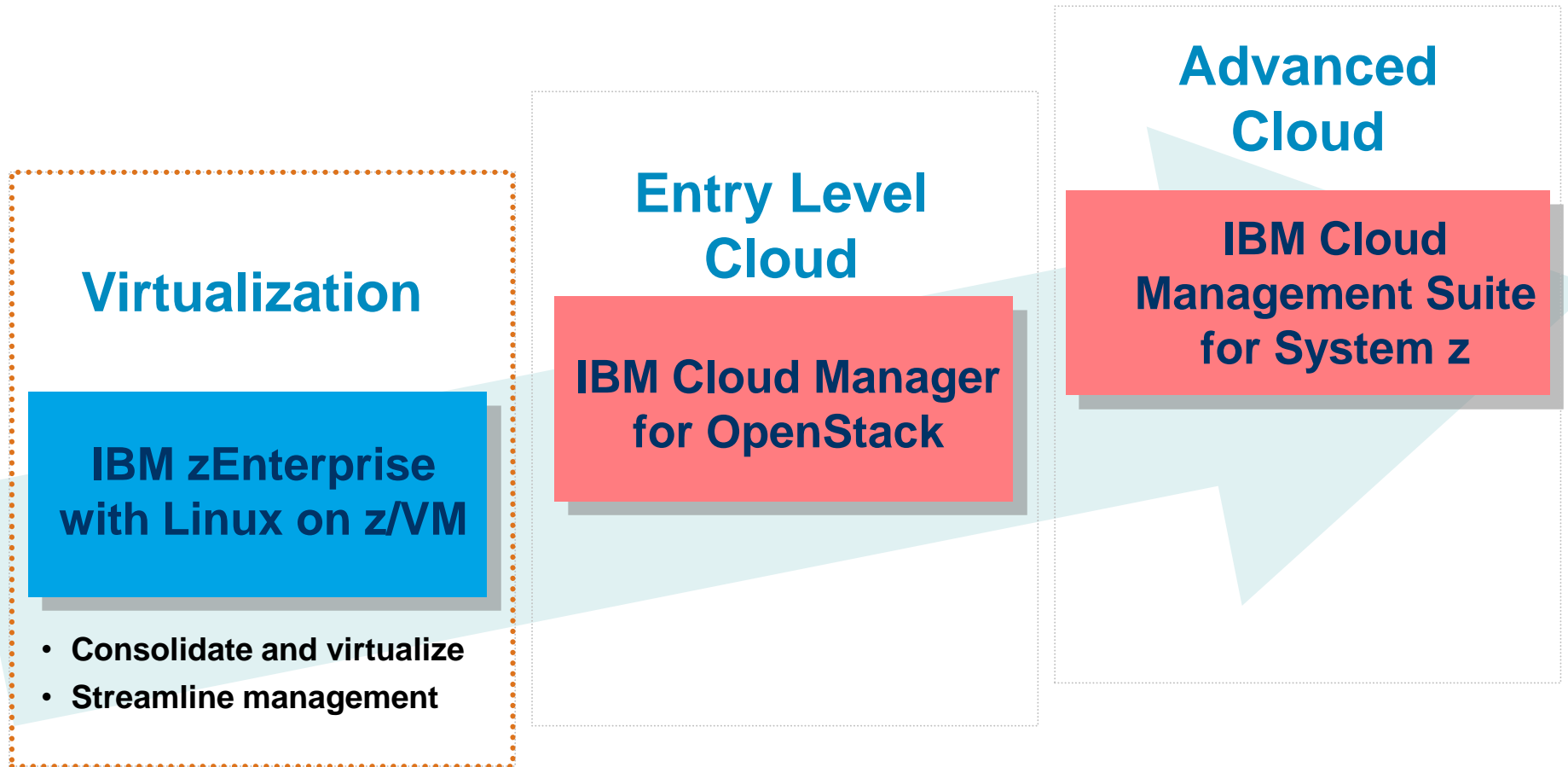**Unauthorized Access Counts**
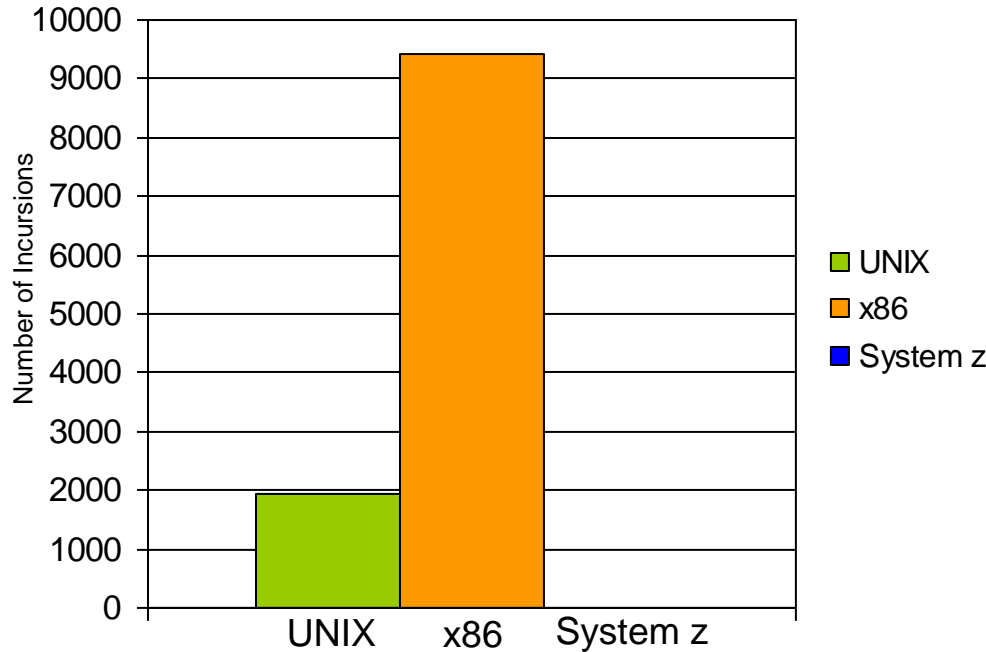
SLA Compliance Summary

- Most secure
- Access to systems of record (z/OS) resident data

- High performance delivering quality service consistently
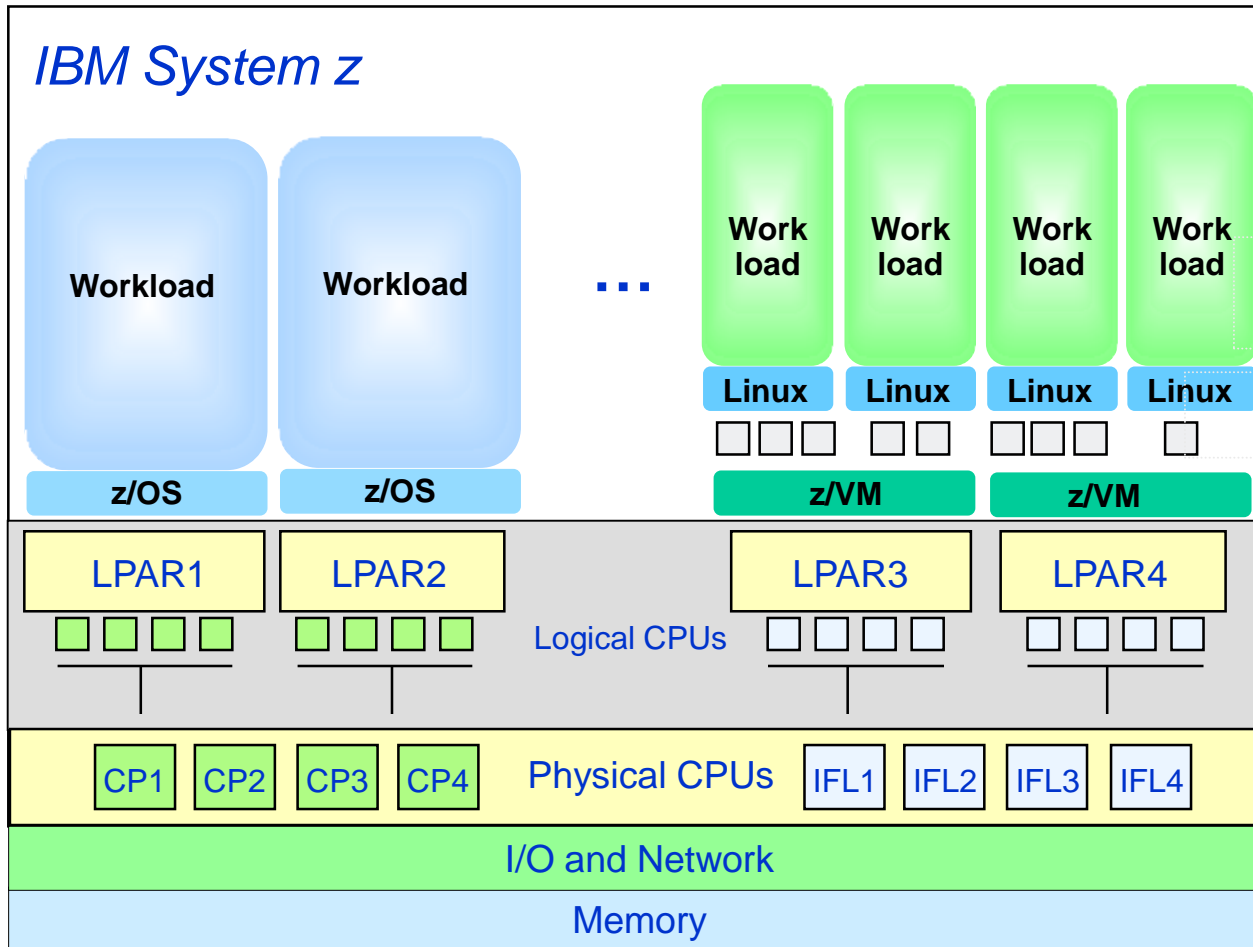- Highly available
- Cost-effective

Source: "System z and Managed Service Providers," white paper by Solitaire Interglobal, 2013

03. Advantages of a private cloud on zEnterprise

Key steps to deliver a robust private cloud on System z

Virtualization

IBM zEnterprise with Linux on z/VM

- **Consolidate and virtualize**
- **Streamline management**

Entry Level Cloud

IBM Cloud Manager for OpenStack

Advanced Cloud

IBM Cloud Management Suite for System z

Reduce costs and improve agility

Advantages of a private cloud on zEnterprise

IBM ®

IBM System z virtualization is built-in, not added-on, to give the best workload isolation

IBM System z

| Workload | Workload | ... | Work load | Work load | Work load | Work load |

Linux | Linux | Linux | Linux

z/OS | z/OS | z/VM | z/VM

LPAR1 | LPAR2 | LPAR3 | LPAR4

Logical CPUs

CP1 | CP2 | CP3 | CP4   Physical CPUs   IFL1 | IFL2 | IFL3 | IFL4

I/O and Network

Memory

Live guest mobility

Multi-system clustering

z/VM supports 1,000s of Linux guests

Linux on z/VM can run on up to 32 IFL processors per LPAR

Workloads in LPAR completely Isolated

Capacity on demand

Shared-everything architecture

Advantages of a private cloud on zEnterprise

# z/VM has multi-system clustering and virtual server mobility
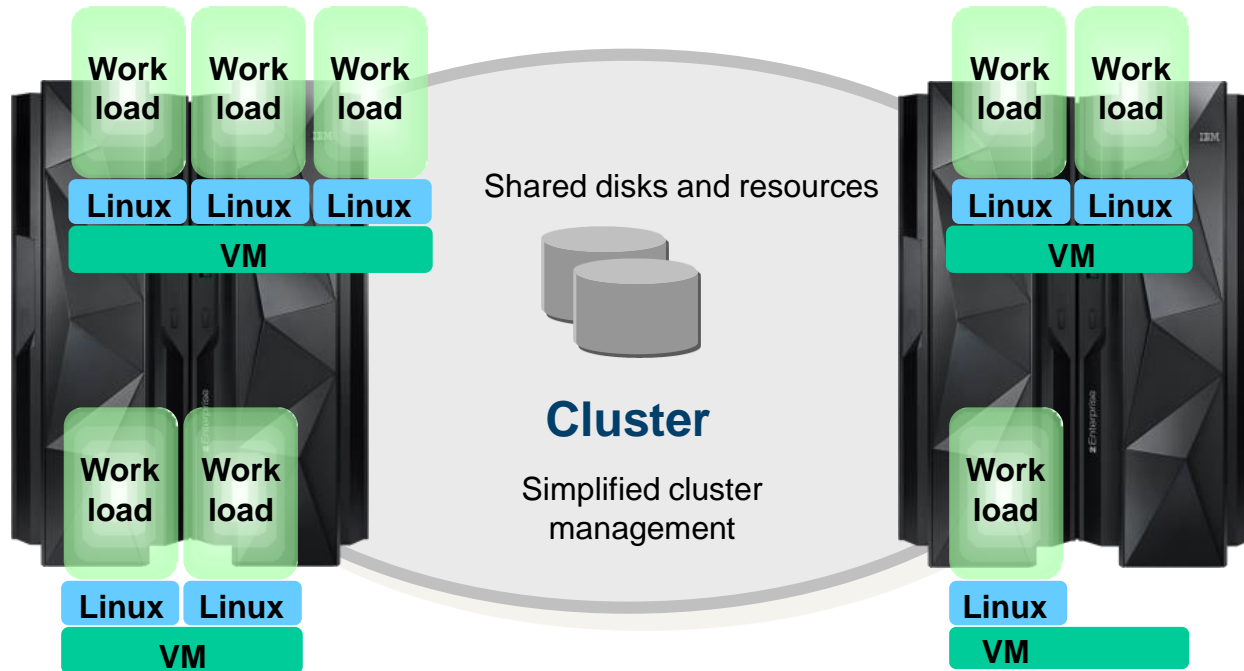
Clustering – Up to 4 VM instances can be clustered as a single system image; cluster members can be on the same or different physical servers

Live Guest Mobility – Move Linux virtual servers non-disruptively to another VM instance on the same or another physical server in the single system image

02. The Right Solution.pptx

Simplified management of the z/VM virtualization layer

IBM Wave virtualization management software for z/VM and Linux on zEnterprise environments

- Intuitive graphical workspace with powerful drag-and-drop capability

- Automatically detects all resources in the environment
  - Spans partitions, servers, sites, geographies
  - Supports SSI clustering and Live Guest Mobility

- Simplify and automate management
  - Monitor, provision, manage user accounts

- ***Significantly reduces administration requirements and costs***
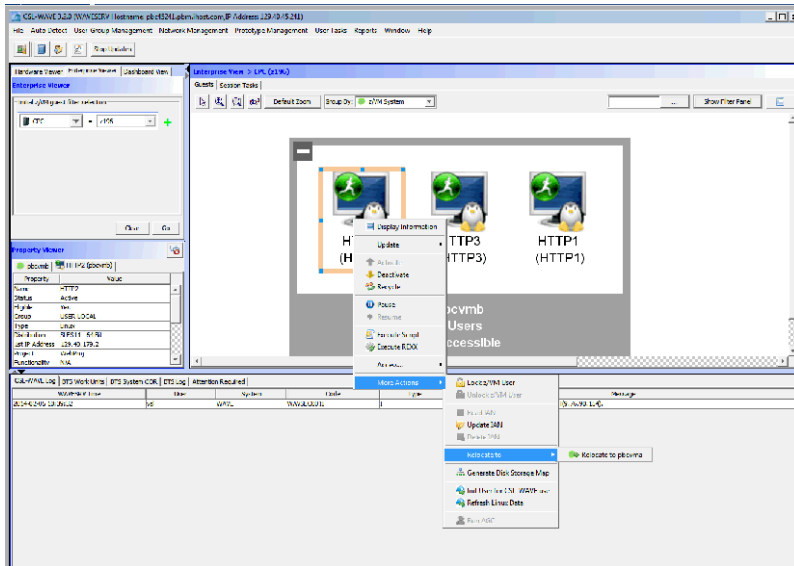
Advantages of a private cloud on zEnterprise
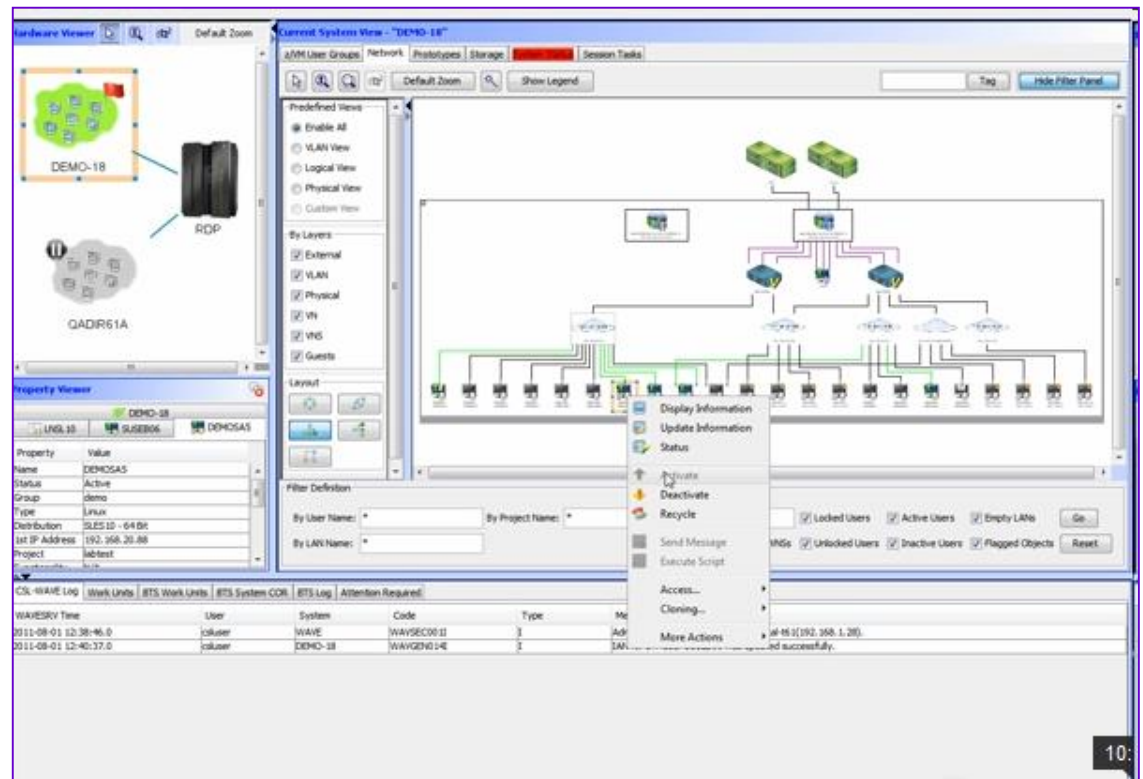
IBM Wave greatly simplifies management of Linux and z/VM

Operation management example: Live Guest Migration

With IBM Wave:

- Graphical user interface
- Execute via menu selection

Using manual control program commands:

Task	Task Steps
Log into both VM instances	Login PBCVMA Login PBCVMB
Find out which instance has the running guest	q HTTP2 in PBCVMA q HTTP2 in PBCVMB
Verify the guest can be moved	vmrelo test HTTP2 to PBCVMB
Move the guest	vmrelo move HTTP2 to PBCVMB
Log out of both instances	Logoff PBCVMA Logoff PBCVMB

Improve productivity with IBM Wave

Common Administrative Tasks	Manual (seconds)	With IBM WAVE (seconds)	Reduction in Labor time
Monitor z/VM	30	13	58%
Add virtual switch	88	20	77%
Activate/deactivate guest	65	10	85%
Execute scripts for guest	96	18	81%
Create clone from guest	576	29	95%
Live guest migration	95	13	87%

Average reduction in labor: **80%**

Measurements taken using CSL-WAVE 3.2.0

Source: IBM CPO Internal Study

Advantages of a private cloud on zEnterprise

DEMO: IBM Wave and Live Guest Mobility

Advantages of a private cloud on zEnterprise

Enterprise Linux Server solution provides a cost-effective way to get started

- Solution includes:
  - Standalone zEnterprise server (either zBC12 or zEC12) with IFLs, memory, I/O connectivity … plus z/VM
  - Hardware and software maintenance for 3 or 5 years
  - Linux available from distribution partners
    - SUSE and Red Hat

- For new Linux workload deployment and consolidation

- Designed from the ground up for enterprise-class workloads

- Extremely attractive pricing

A perfect entry point for businesses
with growing IT needs who are ready to make a commitment to Linux

IBM provides free services support to ISVs when moving Linux applications from x86 to zEnterprise

Chiphopper services offering:

▪ Designed for IBM Business Partners (PartnerWorld members)

▪ Helps them port their existing Linux applications from competitive platforms onto IBM Power Systems or System z running Linux
  – Enablement and guidance services, plus Linux support
  – Access to IBM hardware and middleware, proof of concept environments and platforms for testing
  – Technical assistance during the port
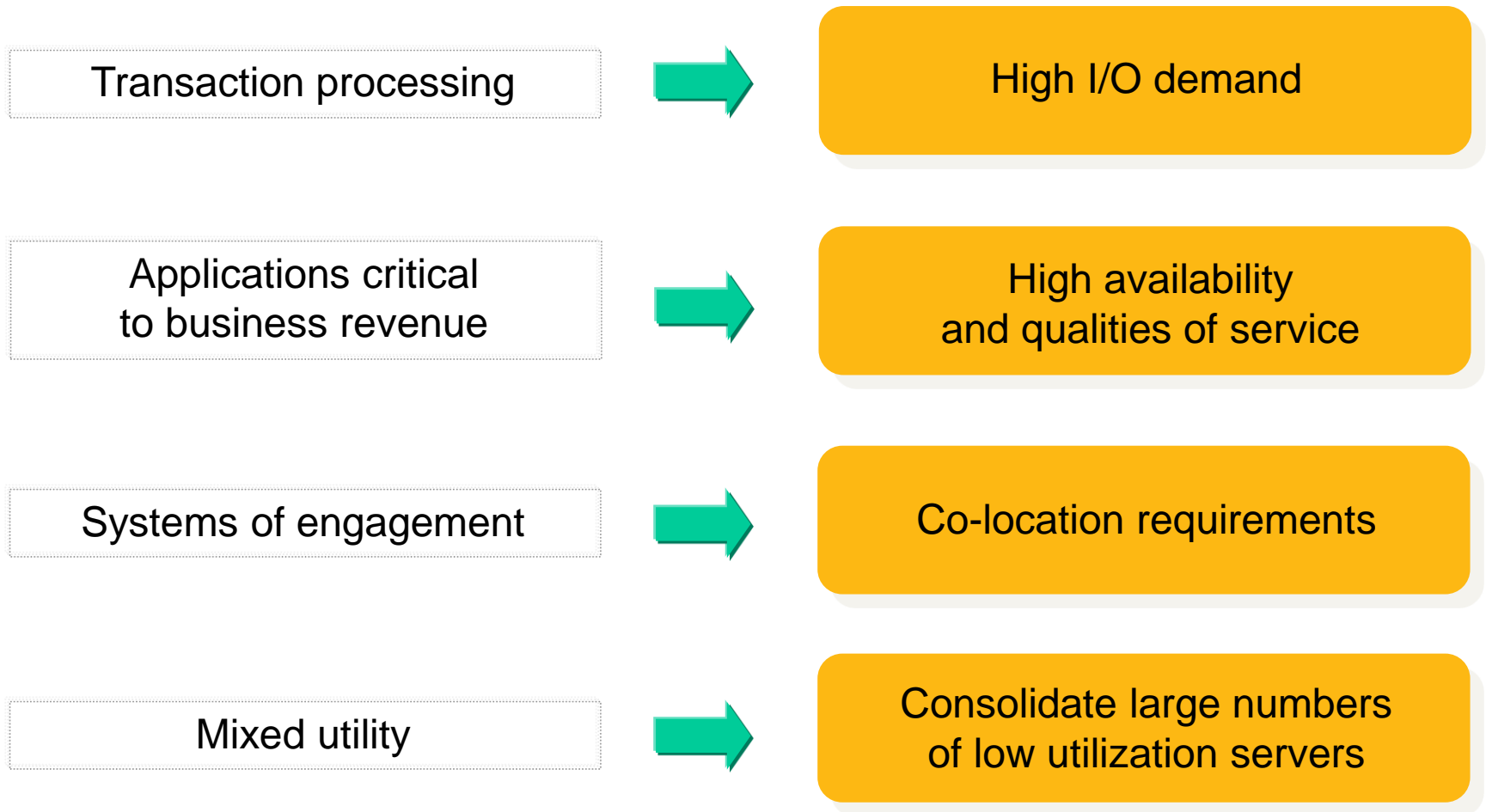 – Post-porting issue support

▪ Free of charge service
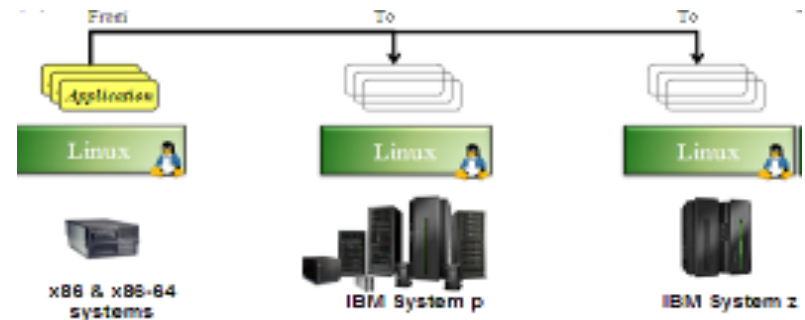
> *"OpenPro and IBM Chiphopper team are working together to provide a flexible, scalable and fully featured business management ERP solution. This system uses the power of open source technologies with many advanced features that have saved clients millions of dollars in operating efficiencies. OpenPro works with the new IBM DB2 version on the powerful IBM System z or i."*
>
> **- Jim Clark, CEO of OpenPro**

For more information, contact Chiphopper web page: www.ibm.com/isv/go/chiphopper, or send an email to chiphop@us.ibm.com

Examples of workloads best suited to consolidate on a private cloud on Linux on z/VM

Transaction processing ➡ High I/O demand

Applications critical to business revenue ➡ High availability and qualities of service

Systems of engagement ➡ Co-location requirements

Mixed utility ➡ Consolidate large numbers of low utilization servers

Advantages of a private cloud on zEnterprise

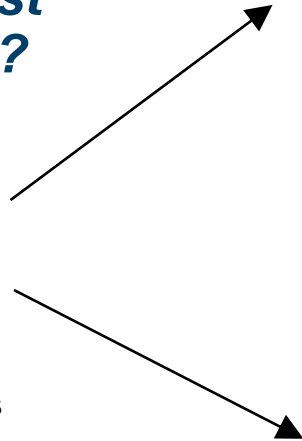# Workloads with higher I/O bandwidth requirements benefit from zEnterprise architecture

Which platform provides the lowest TCA over 3 years?
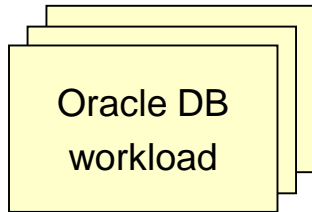
Oracle DB workload

Customer Database Workloads each supporting 4K TPS

Oracle Enterprise Edition
Oracle Real Application Cluster

T5-8 server
(128 cores)

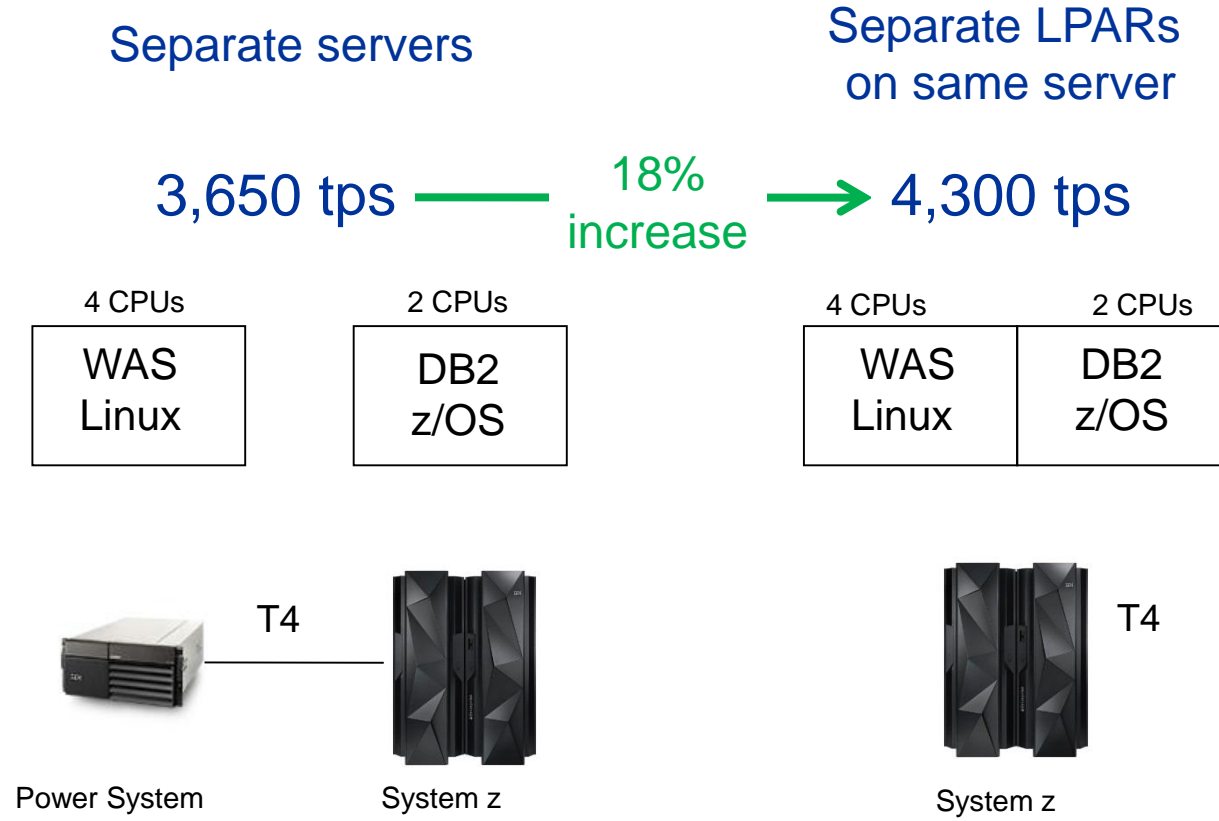3 x 4-node Oracle RAC DB

$8.9M (3 yr. TCA)

zEC12 with 16 IFLs

3 x 4-node Oracle RAC DB

$3.6M (3 yr. TCA)

60% less cost!

TCA includes hardware, software, maintenance, support and subscription. Workload Equivalence derived from a proof-of-concept study conducted at a large Cooperative Bank and projecting to T5-8 servers using published TPC-C Results normalizing them to Performance Units

Co-location benefits from zEnterprise architecture

Separate servers

Separate LPARs
on same server

3,650 tps ———— 18%
increase → 4,300 tps

4 CPUs	2 CPUs	4 CPUs	2 CPUs
WAS Linux	DB2 z/OS	WAS Linux	DB2 z/OS

T4

Power System   System z   System z

Source: IBM CPO.
Type-4 driver used on both platforms to equalize database connectivity

Advantages of a private cloud on zEnterprise

Consolidation onto System z also yields co-location benefits for SAP applications

Business challenge:

- After acquiring a competitor, inherited 200+ standalone servers
- Faced untenable increases in IT costs from system complexity and incompatibility, maintenance and licensing issues
- Customer service was suffering as a result

Solution:

Consolidated distributed servers *and* migrated its mission-critical SAP and DB2-based applications to an IBM System z running Linux, z/OS and z/VM operating systems

Benefits:

- Reduced IT costs as proportion of sales by **50%**
- Consolidation cuts power by **40%** and reduces data center floor space from 6,000 to 1,000 sq. ft.
- Cut system administration and maintenance costs

BALDOR

SAP	DB2
Linux	z/OS

SAP applications
co-located on System z

Advantages of a private cloud on zEnterprise

Key steps to deliver a robust private cloud on System z

Virtualization

IBM zEnterprise with Linux on z/VM

Entry Level Cloud

IBM Cloud Manager for OpenStack

- Deliver self-service
- Standardize and automate provisioning
- Integrated monitoring

## Advanced Cloud

IBM Cloud Management Suite for System z

- Deliver self-service
- Standardize and automate provisioning with patterns
- Integrated monitoring, backup/recovery
- Business process automation

Reduce costs and improve agility

Advantages of a private cloud on zEnterprise

IBM is building cloud management software on open technology OpenStack

Why is this good news for our clients?

#1 – Open, Modular Design
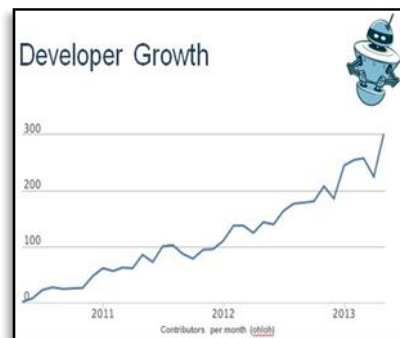*Flexible architecture with open components enables options*
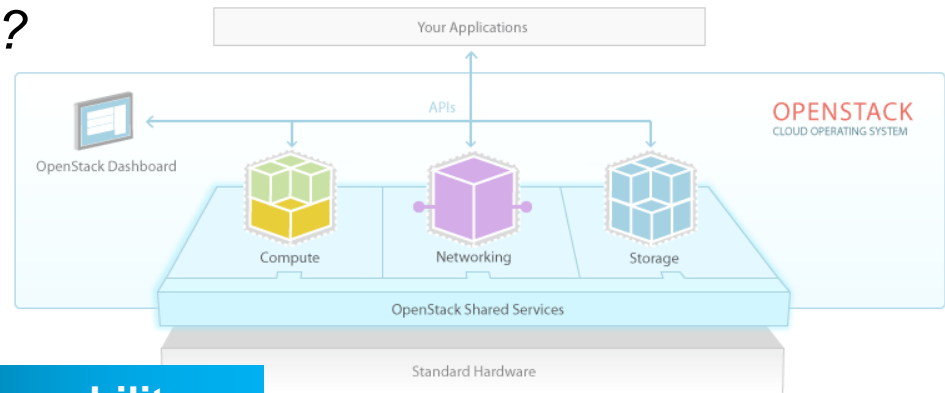
#2 – Vendor Interoperability
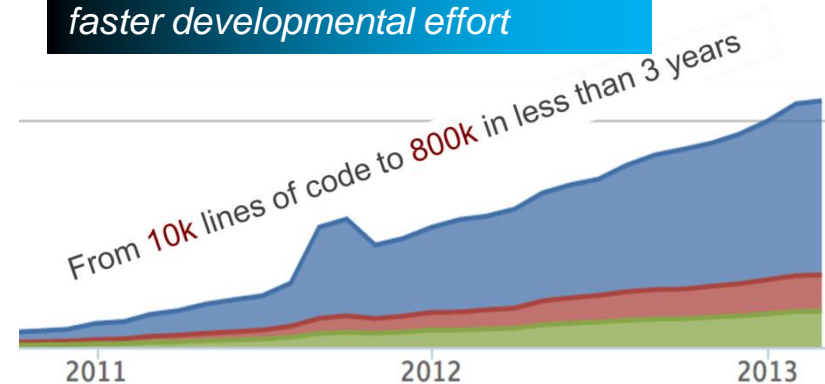*High quality, multi-vendor & user community = freedom from lock-in*

Platinum Sponsors

nebula
rackspace
redhat
suse
IBM
hp
at&t
ubuntu

Gold Sponsors

NetApp
CISCO
YAHOO!
DreamHost
Cloud Computing Association in Taiwan
intel
DELL
JUNIPER NETWORKS
MIRANTIS
MORPH LABS
vmware
cloudscaling
ERICSSON
NEC
Piston CLOUD COMPUTING
eNovance Cloud & Managed Services Provider

Developer Growth

300
200
100

2011   2012   2013
Contributors per month (ohloh)

#3 – Rapid Innovation
Large community effort enables faster developmental effort

From 10k lines of code to 800k in less than 3 years

2011   2012   2013

IBM Cloud Manager with OpenStack

- Easy to deploy and use cloud management software based on OpenStack

- Self-service portal

- Automated workload provisioning and virtual image management

- Monitoring & metering, resource expiration and project approval policies

- Support for major hypervisors such as z/VM, PowerVM, VMware, Hyper-V, KVM

NEW IBM Cloud Management Suite for System z

- Fully automate deployment and lifecycle management of cloud services

- Simplify cloud operations and increase productivity with monitoring of services

- Increase availability of cloud data with easy to implement storage backup/recovery

Provision workloads
SmartCloud Orchestrator

Monitor Workloads
OMEGAMON for z/VM and Linux

Backup/Recover Workloads
Tivoli Storage Manager

Cloud Management Suite for System z

Advantages of a private cloud on zEnterprise

Automate deployment of cloud services with IBM SmartCloud Orchestrator

- Cloud offering based on open standard OpenStack

- Self-service automated provisioning of virtual machine images…
  - Images can include OS, middleware and applications
  - Deploy multiple virtual machines in a single operation with patterns

- …into pools/clouds on virtualized hardware
  - Supports z/VM, PowerVM, VMware, KVM, Amazon (AWS)

IBM SmartCloud Orchestrator

VM
VM
VM

z/VM

VM
VM
VM

PureSystems

VM
VM
VM

VMware ESX

VM
VM
VM

PowerVM

Advantages of a private cloud on zEnterprise
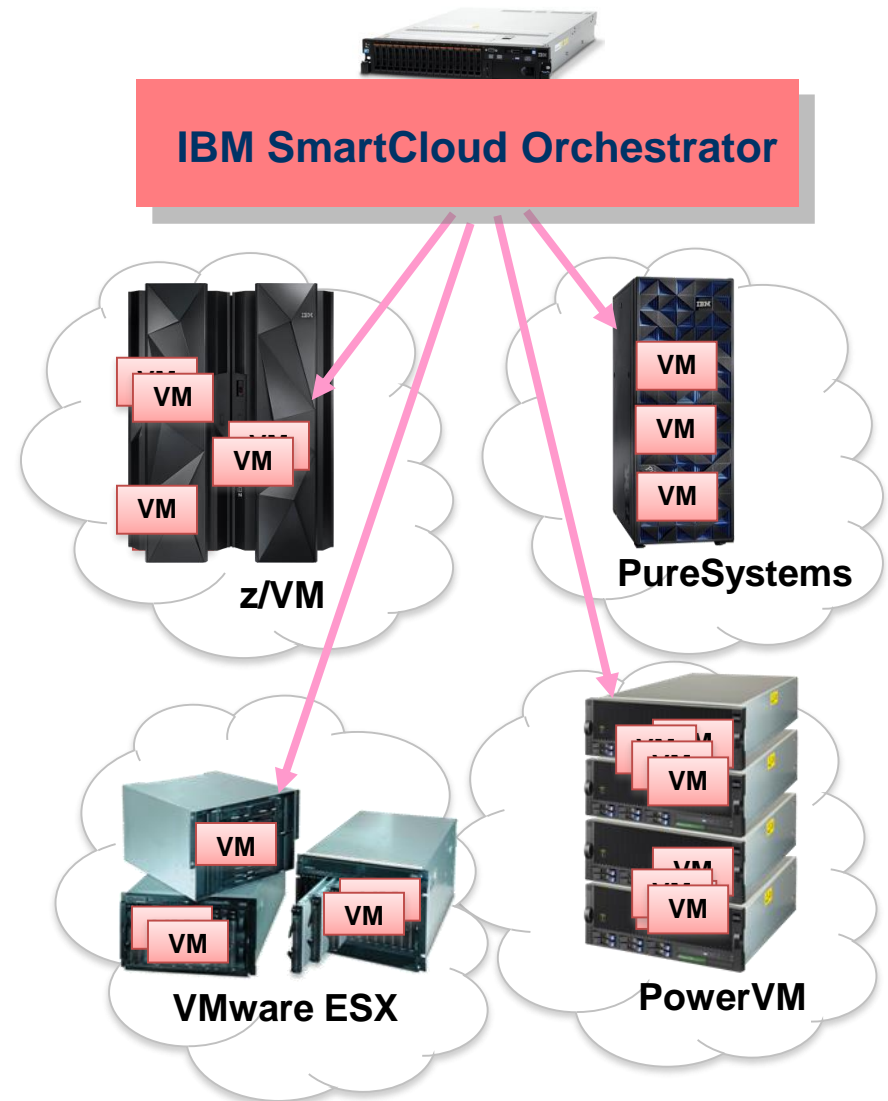
Automation with IBM SmartCloud Orchestrator

User selects and deploys a pattern

IBM SmartCloud Orchestrator

Self Service UI and offerings

Pattern Services	Orchestration Services

Catalog
(Virtual Image Parts, Patterns, Scripts)
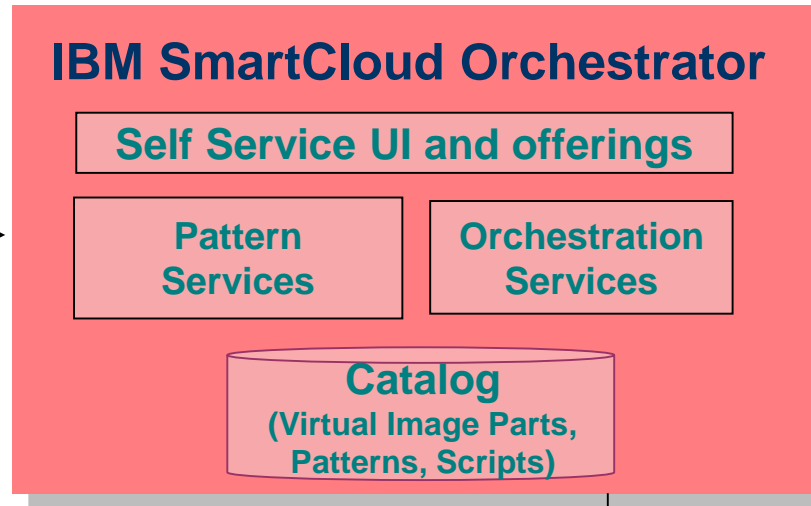
- Self-service console and offerings

- Catalog can have virtual images, scripts and pattern

- Drag and drop tooling for creating and deploying cloud services using catalog

- Integrated monitoring and storage management of cloud services via scripts

- Integrated Business Process Manager for orchestration via content packs

Linux   **Linux**

z/VM

z/VM
Cloud group

Advantages of a private cloud on zEnterprise
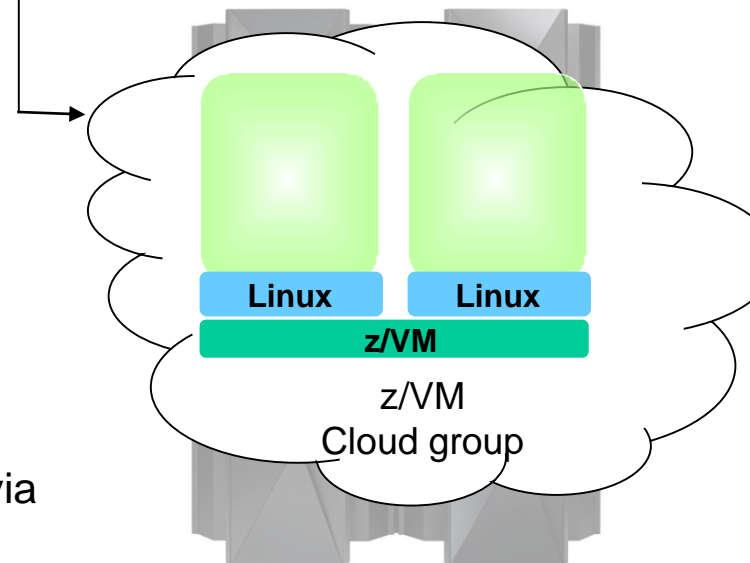
DEMO: IBM SmartCloud Orchestrator

- Administrator sets up pool of resources and makes images, scripts and patterns available to cloud users

- Self-service offerings for cloud users

- Cloud users drag and drop parts to create patterns with multiple VMs

- Automated provisioning of cloud service

Advantages of a private cloud on zEnterprise
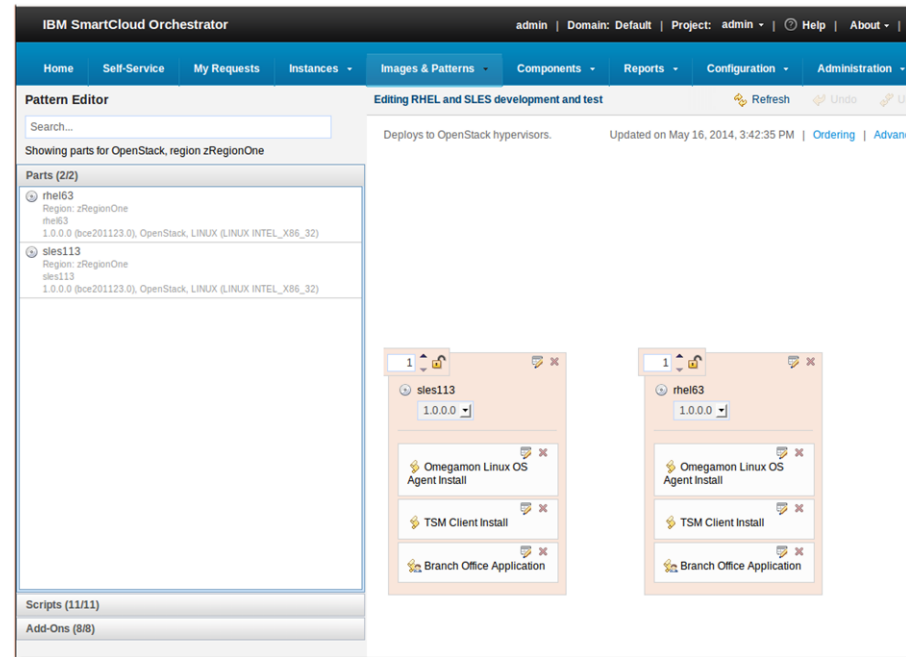
Automate monitoring of cloud services with OMEGAMON XE on z/VM and Linux

- Provides performance monitoring for z/VM and Linux guests

  - Linux agent gather detailed performance data from Linux guests

  - z/VM agent gathers performance data from z/VM and Linux

- Executes automated actions in response to defined events or situations

Advantages of a private cloud on zEnterprise

© 2014 IBM Corporation
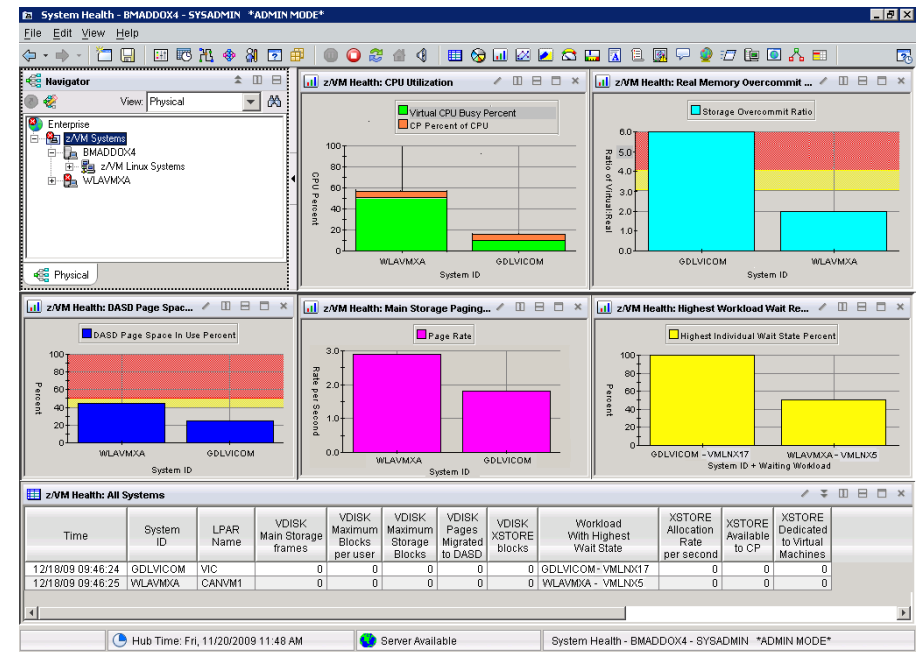
Automate backup and recovery with Tivoli Storage Manager

- High-performance, scalable backups and restores that minimize network traffic

- Performs automated, scheduled asynchronous replication of backup data and metadata

- Data protection and disaster recovery for more than 500 different disk, tape and virtual tape storage

- Management of up to four billion data objects on single server architecture built on IBM DB2

Cloud Backup/Recovery

Advantages of a private cloud on zEnterprise

IBM

NEW IBM Enterprise Cloud System

Standard Linux Environment
- *Red Hat/SUSE*
- *3000+ Applications*

openstack™

Fully Automated Cloud Orchestration & Monitoring

Hypervisor and Virtualization Management

IBM Storage

Utility Pricing and MSP Flexible Financing

Trusted, 24/7 IBM Support

CRN TECHINNOVATOR AWARDS 2013

Award Winning Hardware Design

LINUX JOURNAL 2013 Readers' Choice

- **Factory Integrated**
- **Delivered in 45 Days**
- **Production Ready in Hours**

- **Scale up to 6000 VMs**
- **99.99% Availability**
- **Proven Security**

Advantages of a private cloud on zEnterprise

Enterprise Cloud System Components

Server Options
IBM zEnterprise BC12: 2 - 13 IFLs
IBM zEnterprise EC12: 6 - 101 IFLs

Memory
32 GB memory per core on zEC12/z196
24 - 32 GB memory per core on zBC12/z114
Except where configuration increment rules don't support

I/O
24 FICON® ports with zEC12/z196,
8 FICON ports with zBC12/z114
8 OSA ports

Storage Options
IBM DS8000 System Storage
IBM Storwize v7000

Maintenance
3-5 years for all hardware components (1 yr. warranty and additional years pre-paid)

+

Cloud Management Software
– **IBM Cloud Management Suite**
  • SmartCloud Orchestrator
  • OMEGAMON XE for System z
  • Tivoli Storage Manager
– **Operations Manager for z/VM**
– **Backup & Restore Manager for z/VM**

Virtualization Software
– **IBM z/VM® Version 6.3 with features**
  • z/VM Directory Maintenance Facility
  • z/VM Resource Access Control Facility
  • z/VM Performance Toolkit for VM™
  • z/VM Single System Image
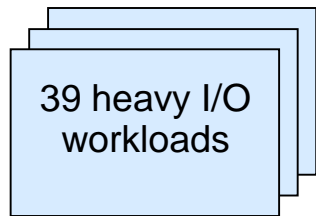– **IBM Wave for z/VM**

Maintenance
– 3-5 years Subscription and Support (S&S)

Services
Pre-integration and pre-configuration services (based on IBM best practices) to load software prior to shipment

On-site personalization services

Public vs. private cloud:
Which option costs less for delivering mixed workloads?

272 very light workloads

87 medium workloads

39 heavy I/O workloads

Public Cloud

Private Cloud (x86)

Private Cloud (zEC12)
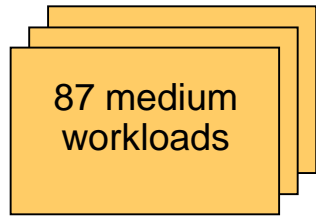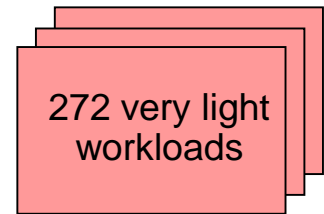
Which option provides the lowest TCO over 3 years?

398 workloads

Platform requirements for deploying workloads with heavy I/O

39 heavy I/O workloads
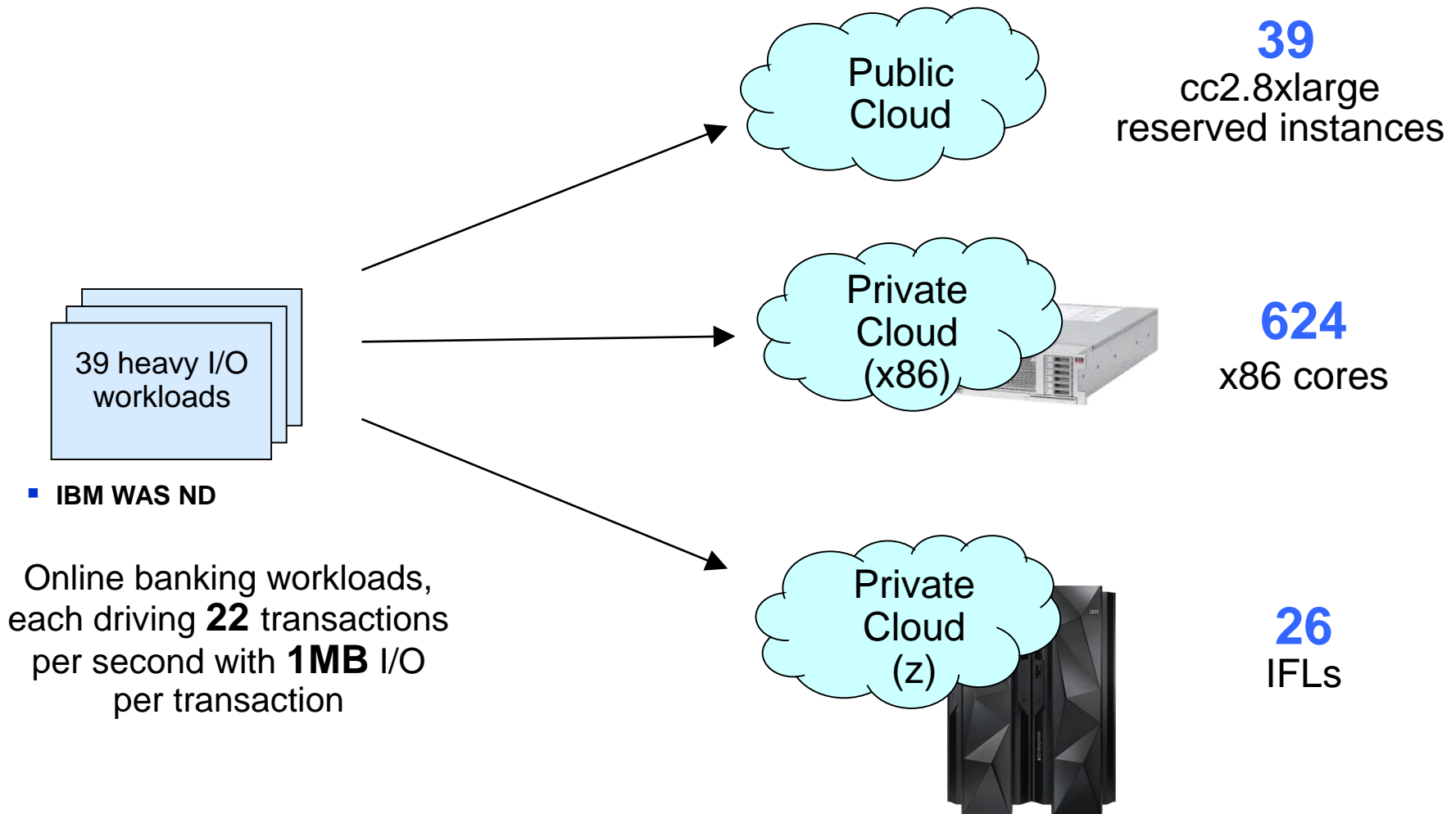
- **IBM WAS ND**

Online banking workloads, each driving **22** transactions per second with **1MB** I/O per transaction

Public Cloud

39
cc2.8xlarge
reserved instances

Private Cloud (x86)

624
x86 cores

Private Cloud (z)

26
IFLs

Server configurations are based on equivalence ratios derived from IBM internal studies.

03 Advantages of a private cloud on zEnterprise

IBM ⚙

Platform requirements for deploying medium workloads
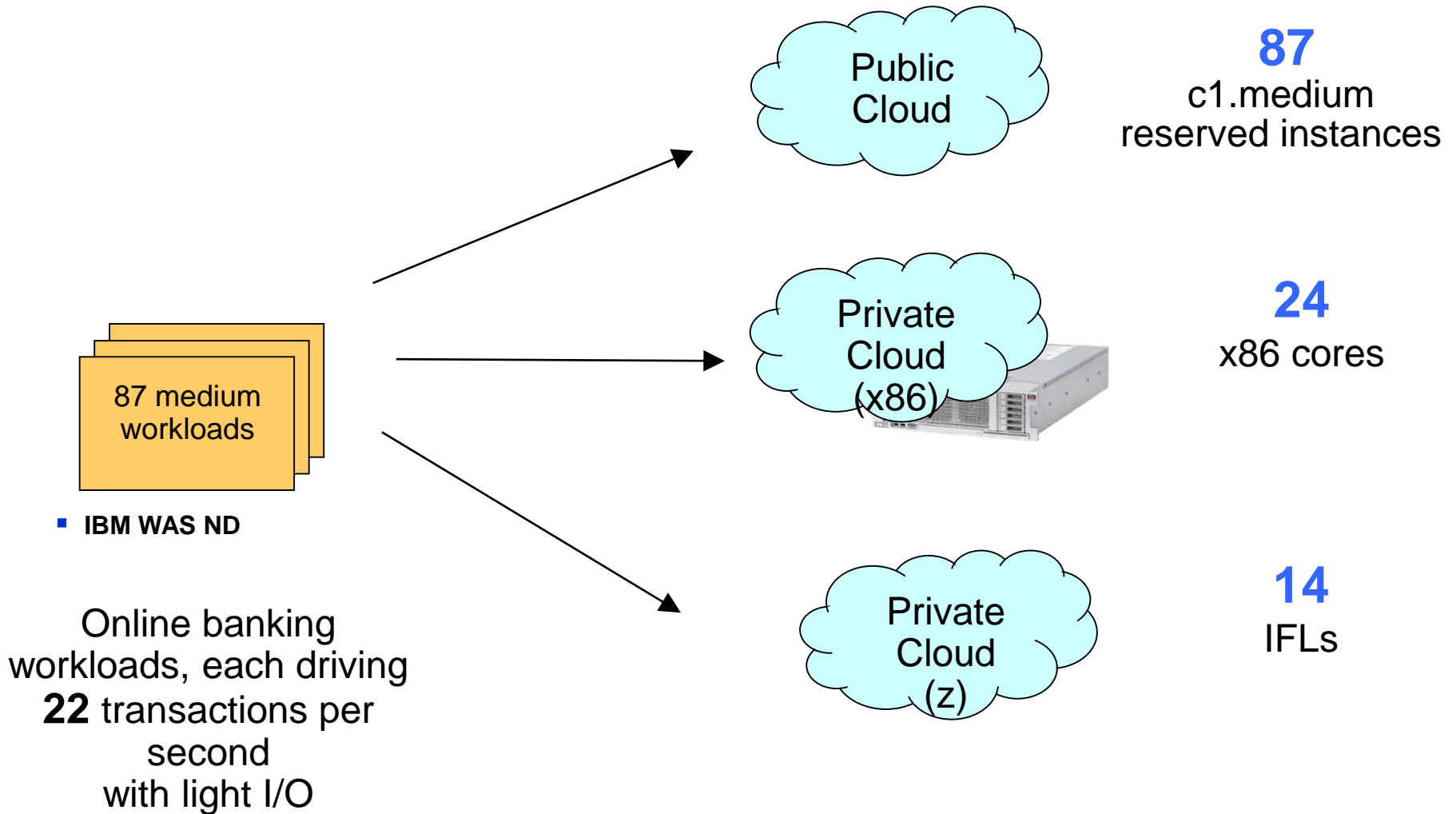
87 medium workloads

- **IBM WAS ND**

Online banking workloads, each driving **22** transactions per second with light I/O

Public Cloud

Private Cloud (x86)

Private Cloud (z)

87
c1.medium reserved instances

24
x86 cores

14
IFLs

Server configurations are based on equivalence ratios derived from IBM internal studies.

Advantages of a private cloud on zEnterprise © 2014 IBM Corporation

Platform requirements for deploying very light workloads
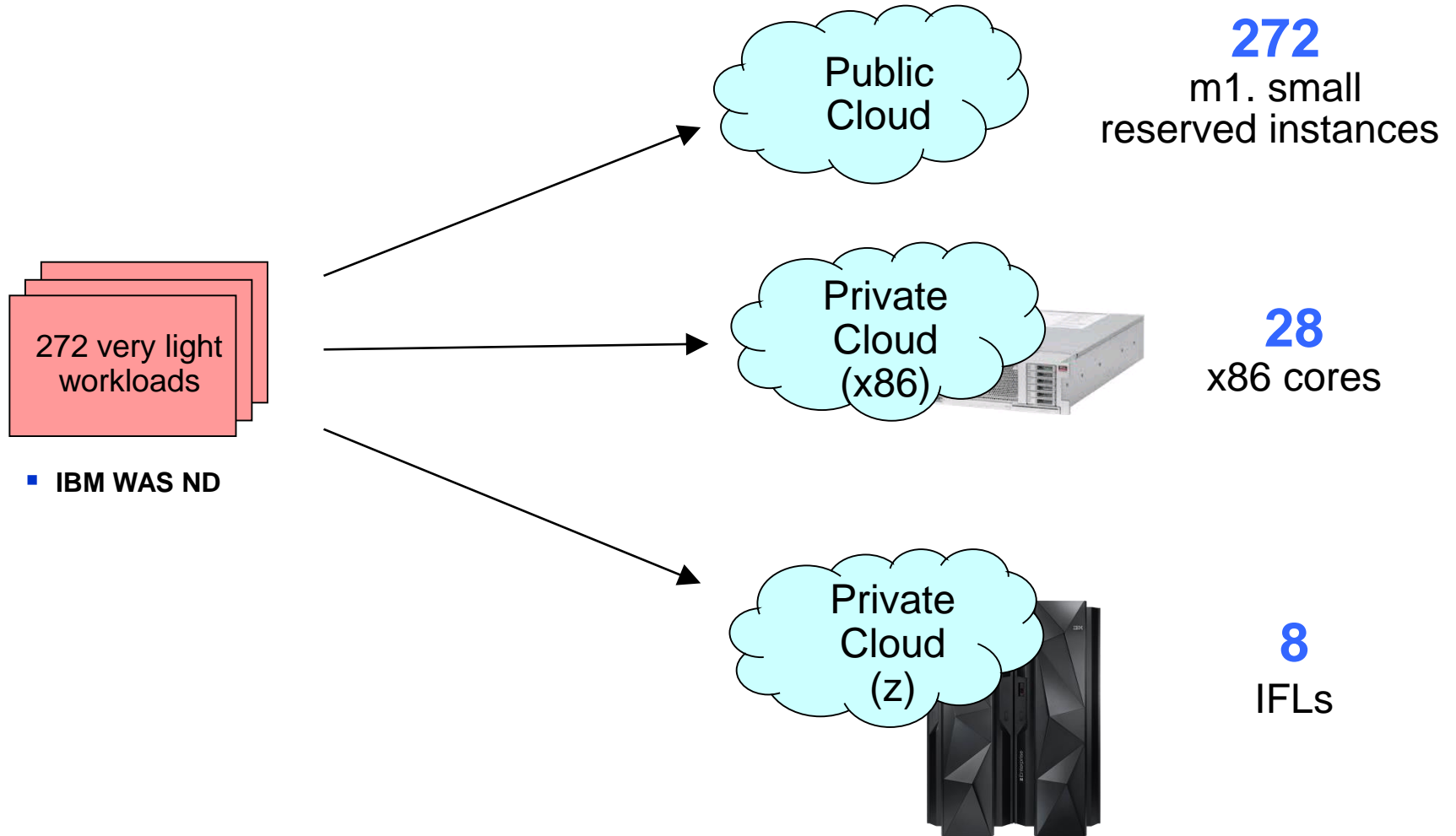
272 very light workloads

- **IBM WAS ND**

Public Cloud

272
m1. small
reserved instances

Private Cloud (x86)

28
x86 cores

Private Cloud (z)

8
IFLs

Server configurations are based on equivalence ratios derived from IBM internal studies.

A private cloud on System z yields the lowest costs
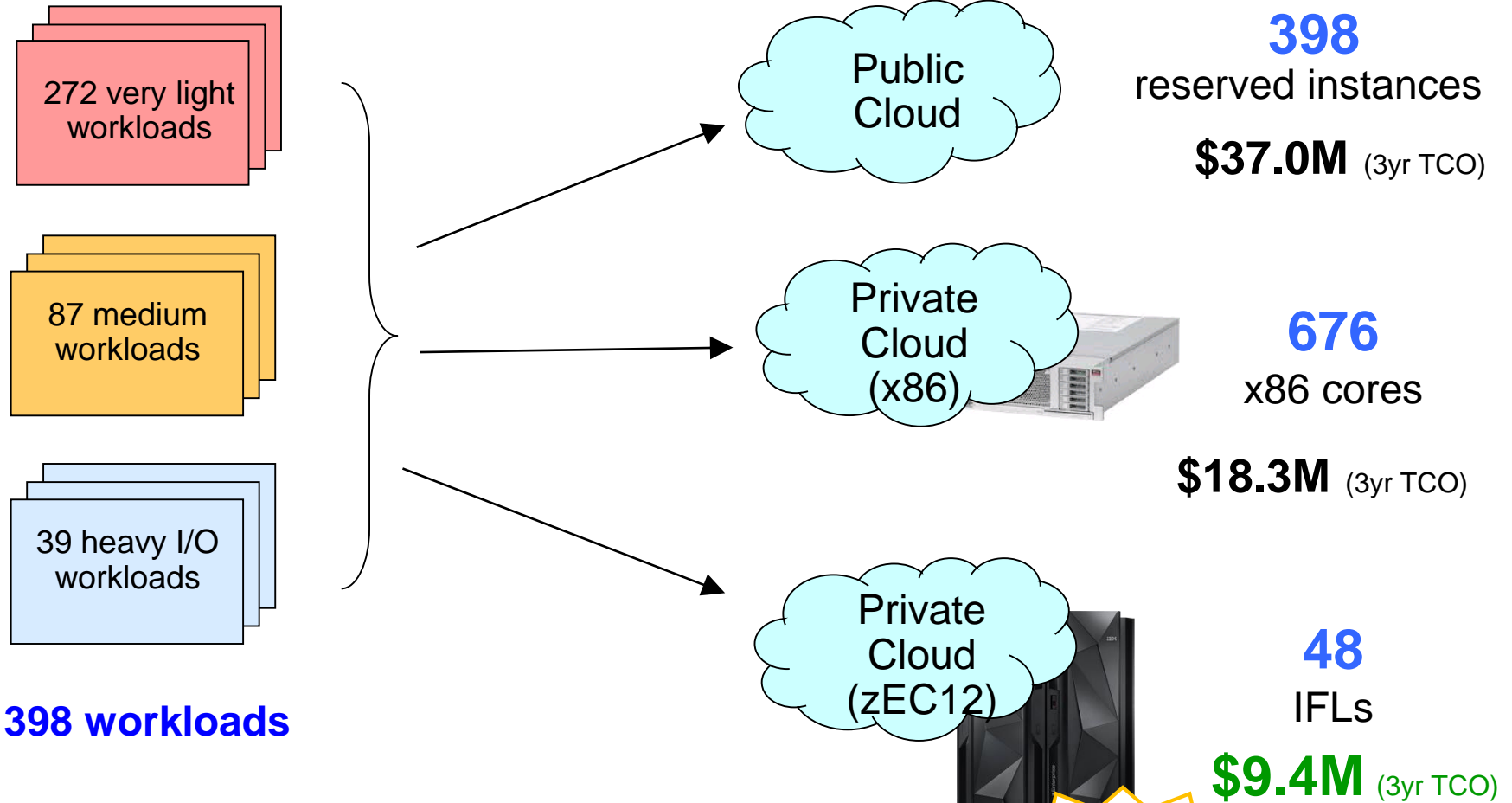
272 very light workloads

87 medium workloads

39 heavy I/O workloads

398 workloads

Public Cloud

398
reserved instances

$37.0M (3yr TCO)

Private Cloud (x86)

676
x86 cores

$18.3M (3yr TCO)

Private Cloud (zEC12)

48
IFLs

$9.4M (3yr TCO)

49 and 75% less cost

Server configurations are based on equivalence ratios derived from IBM internal studies. Prices are in US currency and will vary by country. Public cloud case includes costs of hardware (instances, data in/out, storage, support, free tier/reserved tier discounts), software (middleware) and labor. zEnterprise and x86 cases include costs of hardware (system, storage, virtualization, OS), software (cloud mgmt, middleware), power, floor space and labor.

System z private cloud delivers lowest TCO

Case Study: 398 Workloads
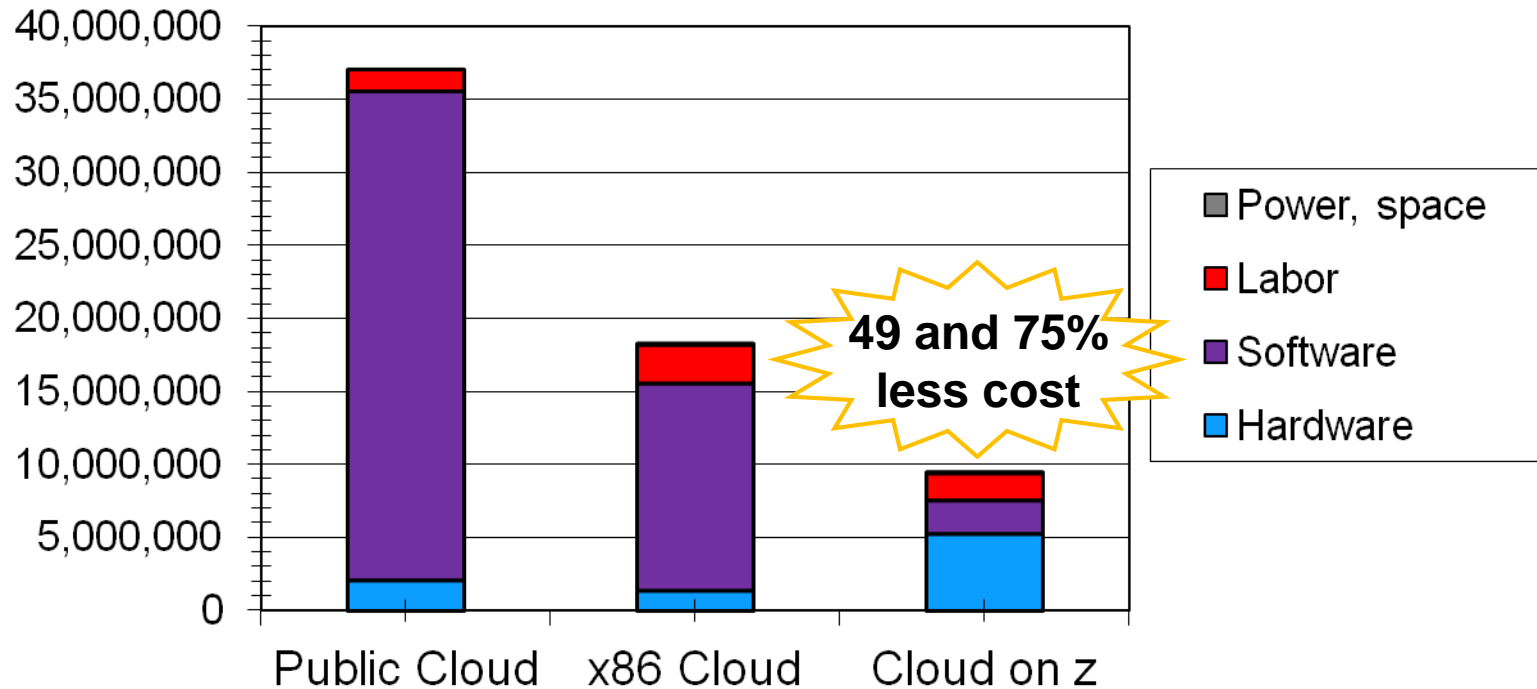
49 and 75% less cost

Legend:
- Power, space
- Labor
- Software
- Hardware

Categories: Public Cloud, x86 Cloud, Cloud on z

Server configurations are based on equivalence ratios derived from IBM internal studies. Prices are in US currency and will vary by country. Public cloud case includes costs of hardware (instances, data in/out, storage, enterprise support, free tier/reserved tier discounts), software (middleware) and labor. zEnterprise and x86 cases include costs of hardware (system, storage, virtualization, OS), software (cloud mgmt, middleware), power, floor space and labor.

Advantages of a private cloud on zEnterprise

NEW

IBM MSP Utility Pricing for System z

- **Available with proven System z virtualization with Open Standards:**

  - New MSPs and First in Enterprise

  - BC12/EC12, System Software, and 3 year S&S

- **Pay-for-Use – Low or no capital expense required**

  - **Fixed Lease Payment:** Discounted initial price which can be as low as 35% of a typically discounted price, available for financing on a lease with fixed monthly or quarterly payments

  - **Variable Usage Payment:** Additional payments made each quarter which varies based on actual usage – costs scale up or down as usage changes

- **Utility pricing made simple**

  - Contracted Core Use Rate based on your configuration

- **Designed for operating expense accounting treatment[1]**

  - Title remains with IBM[2]

  - Choice at contract end – return, buy, replace[2]

- **Low risk – right to return equipment after only 1 year[2]**

  - 36 month fixed lease and 36 month usage contract provide cancellation options with no charge or a pre-stated fee depending on system and usage levels[2]

| Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 |

(1) Accounting treatment is determined by the client
(2) Assumes IBM Global Financing provides leasing contract and is subject to credit approval and other conditions

Advantages of a private cloud on zEnterprise

Businesses around the world are already building enterprise grade mainframe clouds

On Your Side®

Looking for a way to increase IT innovation, Nationwide sought out a cloud infrastructure that could provide dynamic virtualization, cost savings, and the ability to scale to meet future needs.

$15M saved in capital and operational expenditures over just first three years

NY Municipal Shared Services Cloud

Shared services cloud on the mainframe will deliver services to local government.

Cloud model is predicted to eliminate 25% of government's IT budget by streamlining applications and connecting siloed municipalities

Growing MSP uptake with new partnerships around the world

Efficiently delivering high quality services to clients

Advantages of a private cloud on zEnterprise

How to get started

- ***Think it***
  - No one-size-fits all
  - System z is ideal for enterprise workloads requiring high level of security, reliability, scalability, performance

- ***Build it***
  - zEnterprise and IBM Cloud Manager with OpenStack
  - zEnterprise and IBM Cloud Management Suite for System z
  - Enterprise Cloud System

- ***Tap into it***
  - Strategically mix clouds to deliver business outcome
  - Open standards critical for dynamic hybrid cloud strategy
  - IBM cloud solutions built on open standards

Advantages of a private cloud on zEnterprise