The Gold Standard for Enterprise Computing

Dynamic Cloud with 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
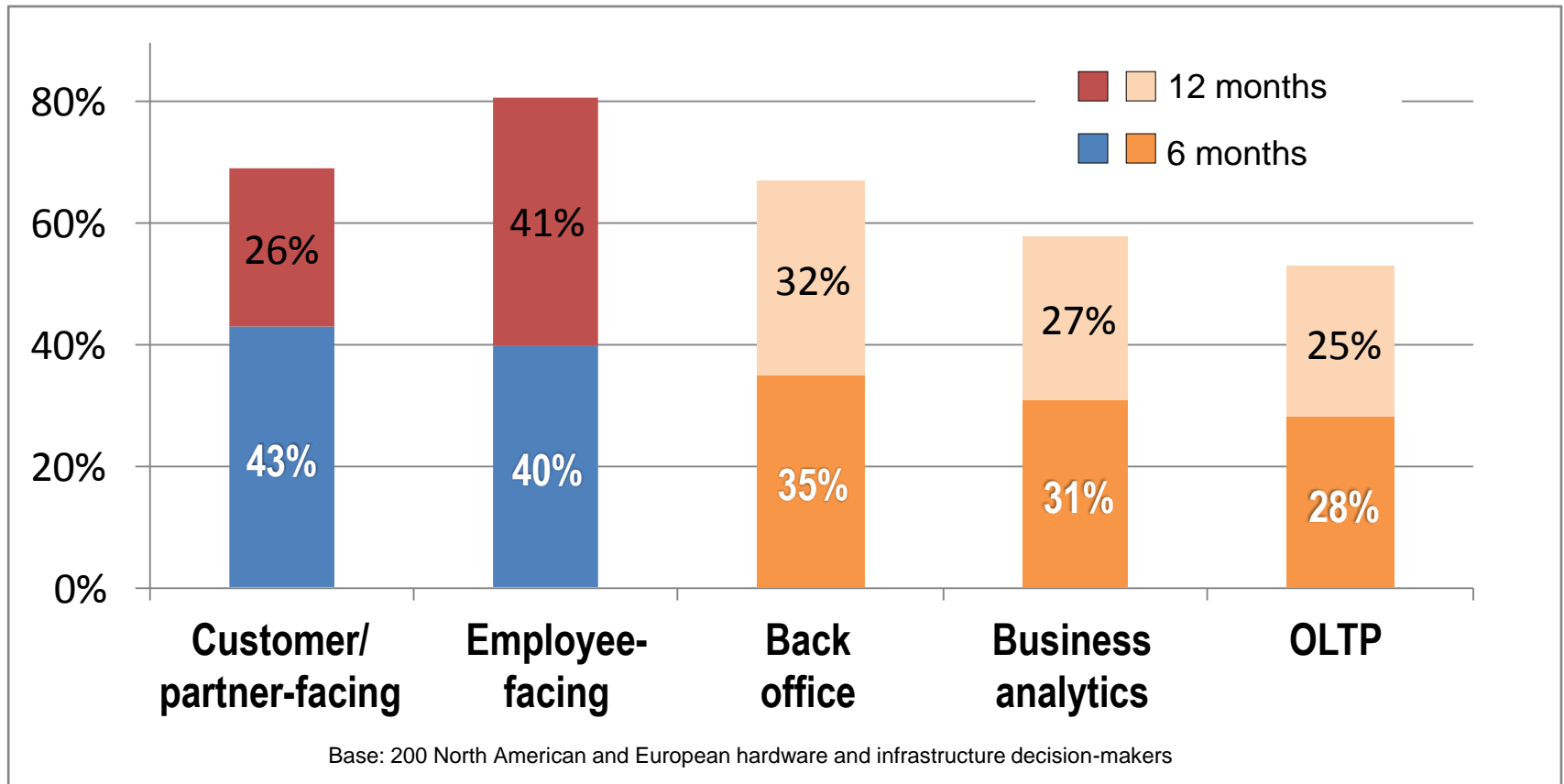- Minimal visibility
- Minimal customization

- Application/data "inside firewall"
- Good visibility
- More customization

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

*Gartner: Jan 2014

03. Dynamic cloud with zEnterprise

Applicability of the cloud is broadening to include more enterprise workloads

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

Legend:
- 12 months
- 6 months

| Application	6 months	12 months
Customer/partner-facing	43%	26%
Employee-facing	40%	41%
Back office	35%	32%
Business analytics	31%	27%
OLTP	28%	25%

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

03. Dynamic cloud with zEnterprise

System z excels at supporting enterprise workloads

Unauthorized Access Counts
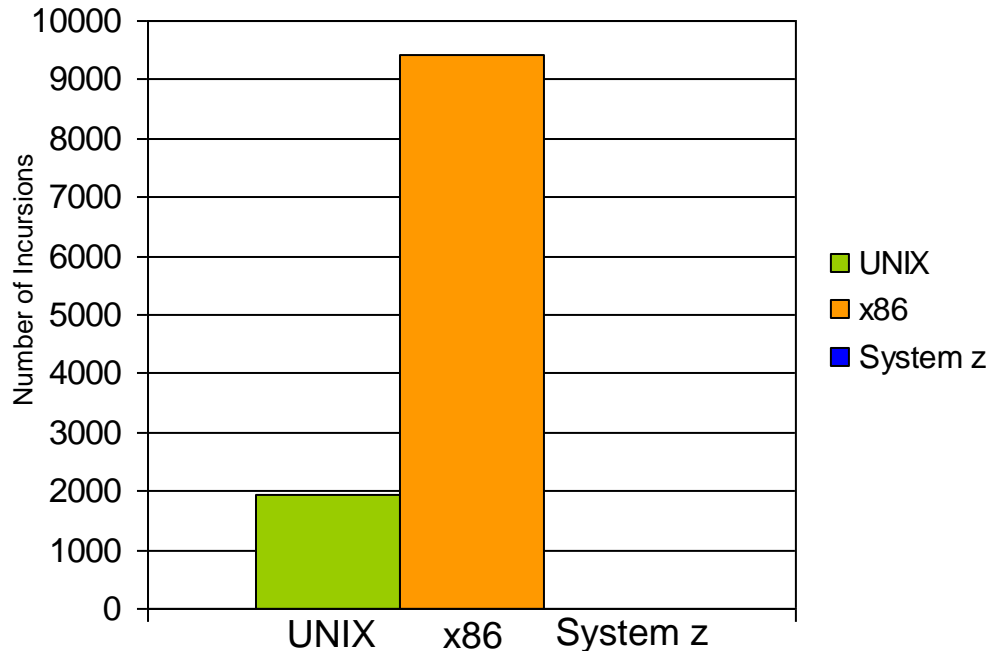
SLA Compliance Summary

- UNIX
- x86
- System z
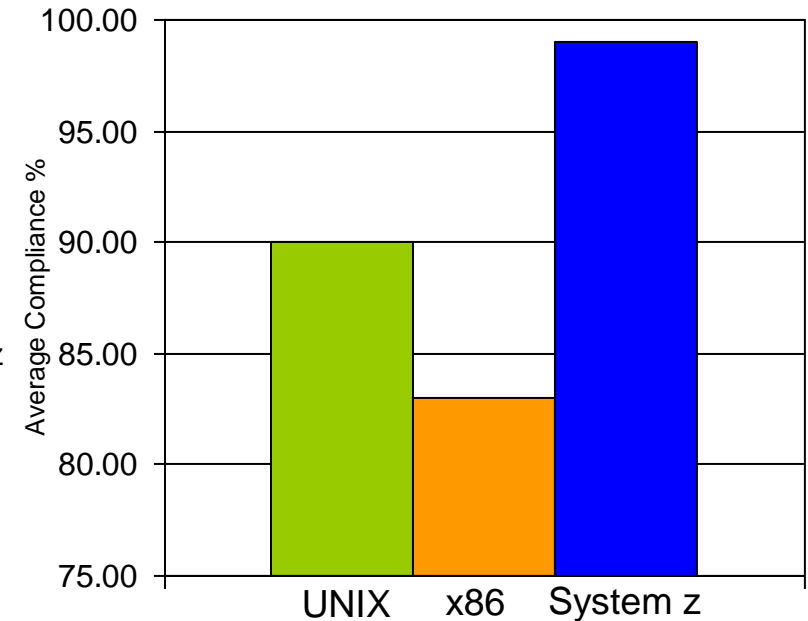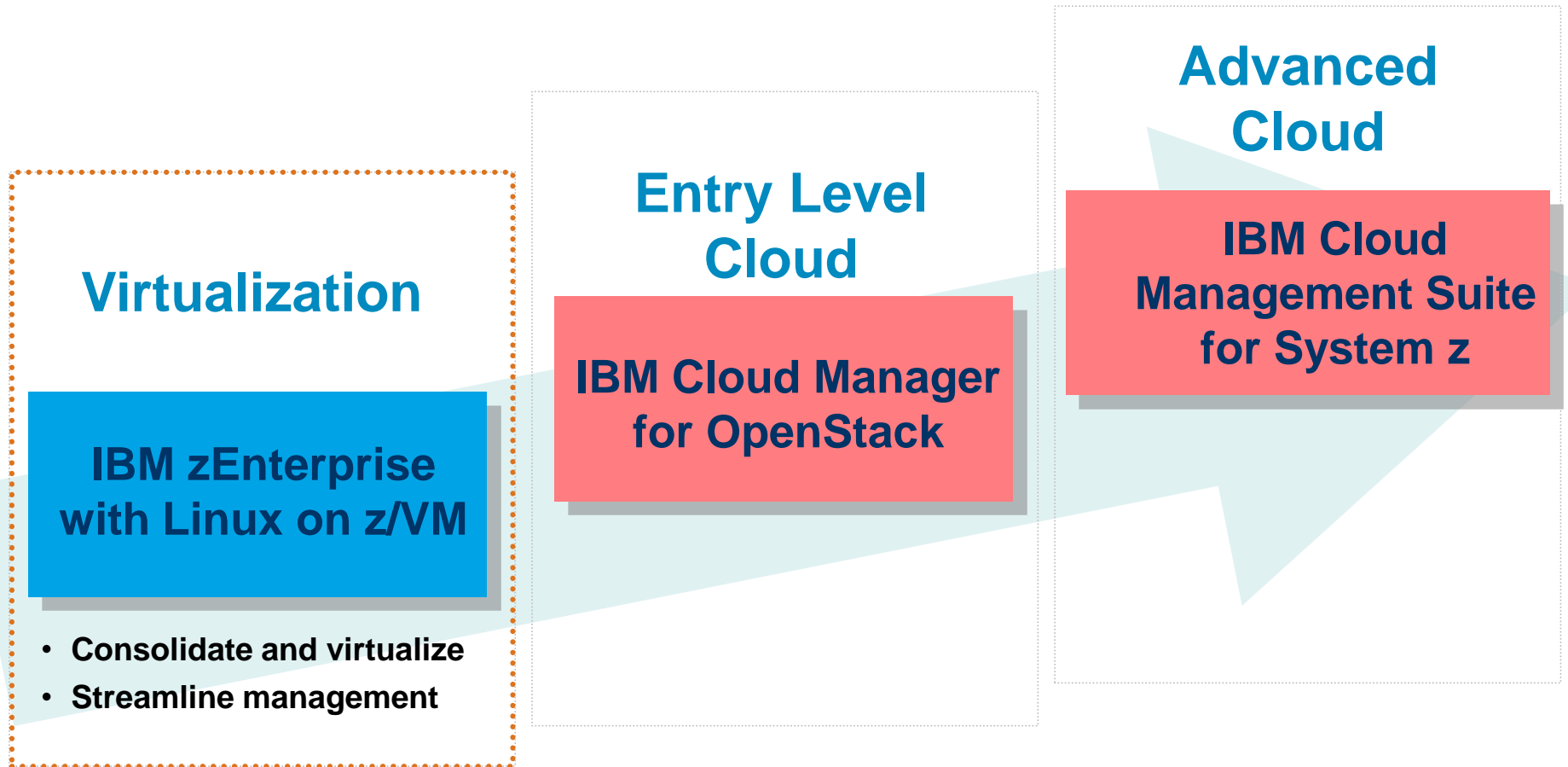
- Most secure
- Access to systems of record (z/OS) resident data

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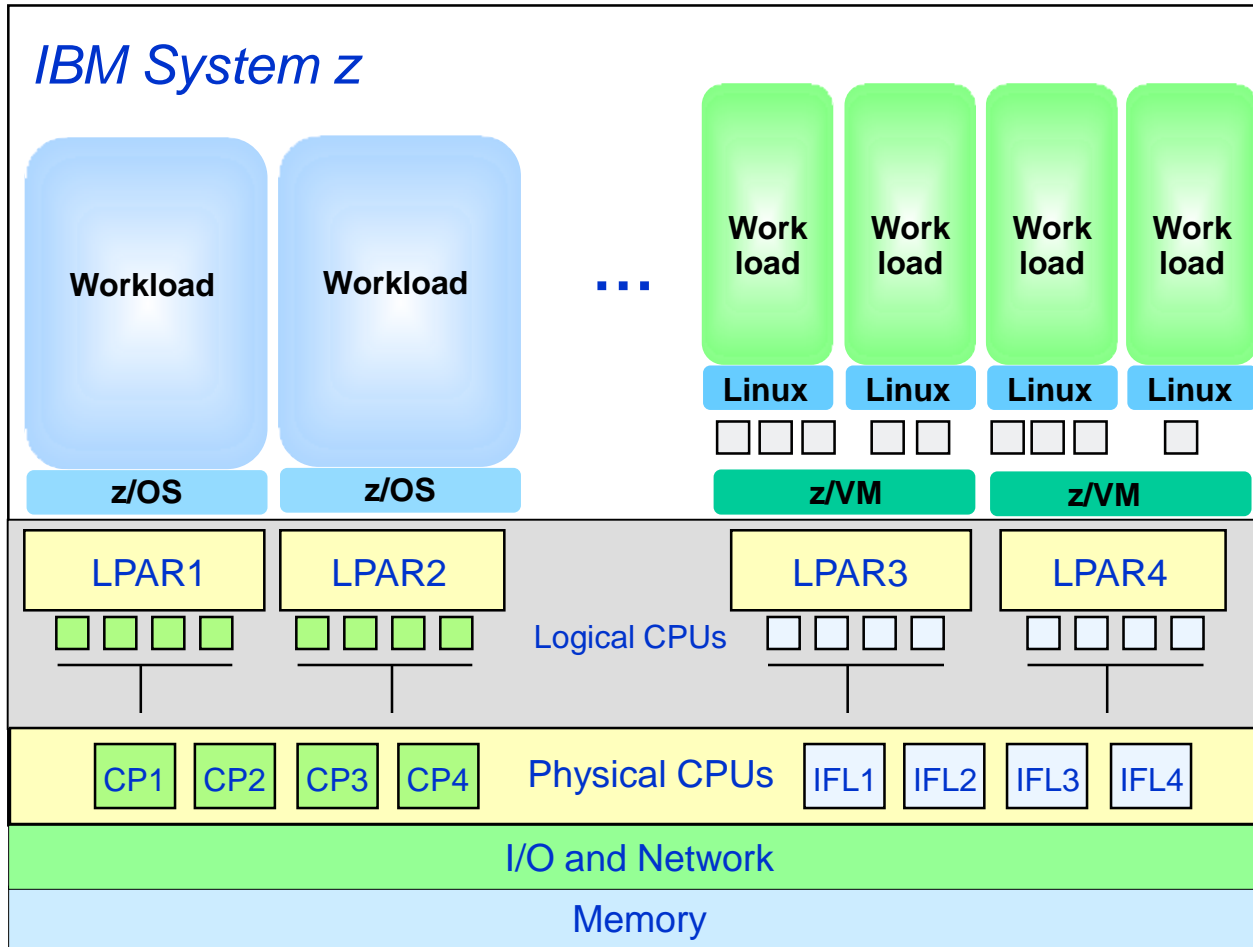- Highly available
- Cost-effective

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

# Key steps to deliver a robust private cloud on System z

Advanced Cloud

IBM Cloud Management Suite for System z

Entry Level Cloud

IBM Cloud Manager for OpenStack

Virtualization

IBM zEnterprise with Linux on z/VM

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

Reduce costs and improve agility

03. Dynamic cloud with zEnterprise

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 |

| 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

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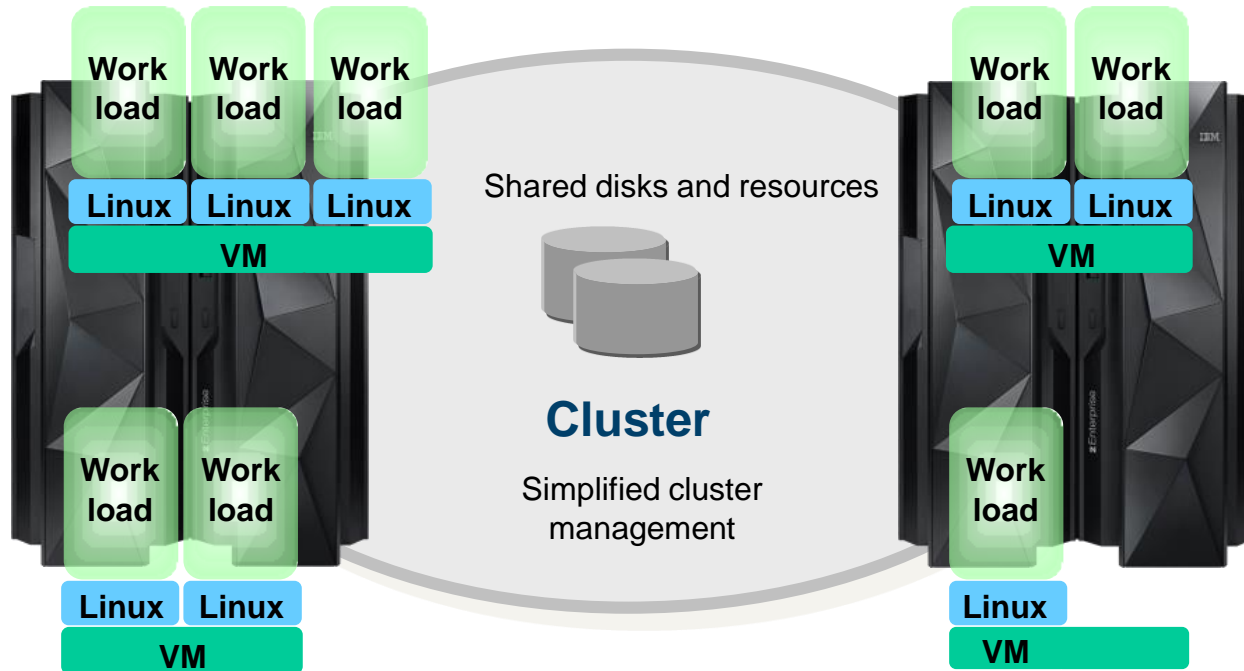
Clustering – Up to 4 VM instances can be clustered as a single system image; cluster members can be on the same or different physical servers

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

03. Dynamic cloud with zEnterprise

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*
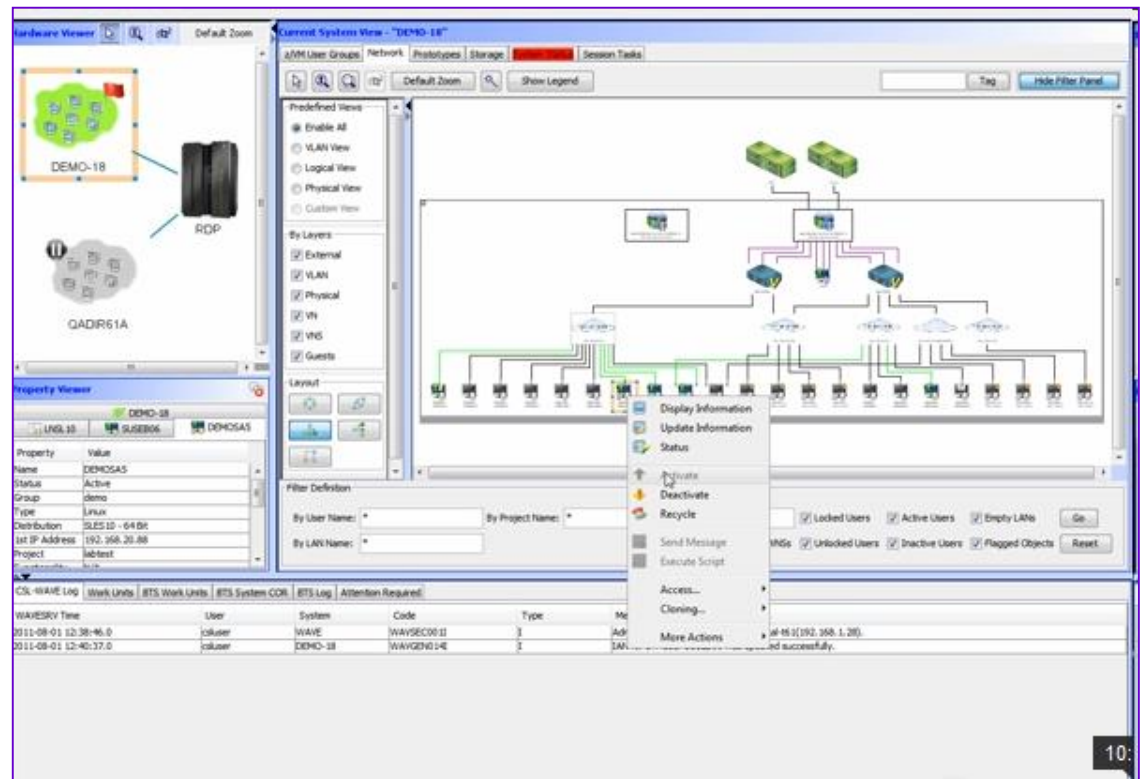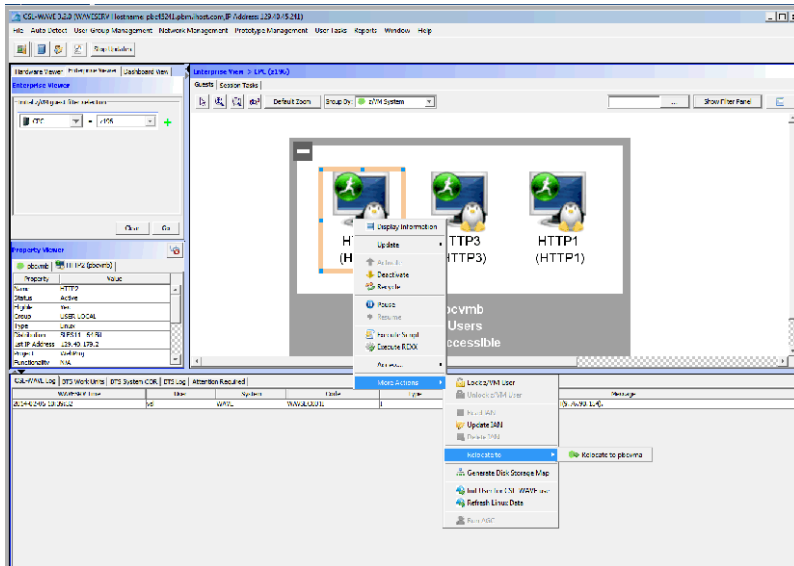
IBM Wave greatly simplifies management of Linux and z/VM

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

IBM ☀

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

03. Dynamic cloud with zEnterprise

DEMO: IBM Wave and Live Guest Mobility

03. Dynamic cloud with 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
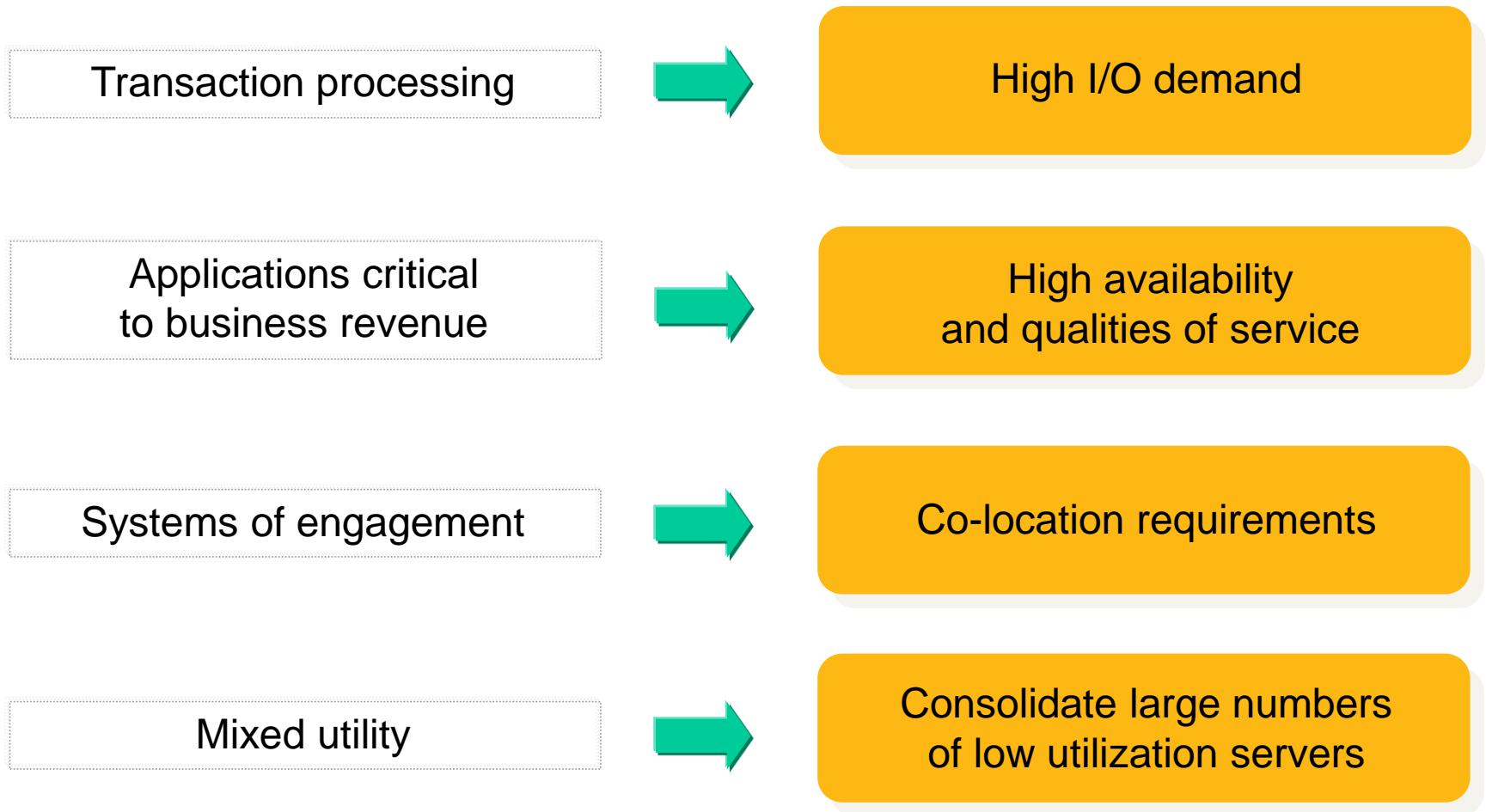 - Post-porting issue support

- Free of charge service
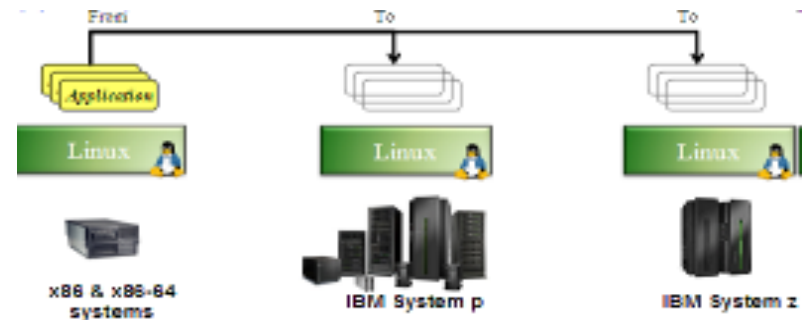
> *"OpenPro and IBM Chiphopper team are working together to provide a flexible, scalable and fully featured business management ERP solution. This system uses the power of open source technologies with many advanced features that have saved clients millions of dollars in operating efficiencies. OpenPro 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

03. Dynamic cloud with zEnterprise   © 2014 IBM Corporation

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

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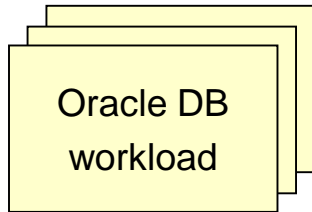
Oracle DB workload

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
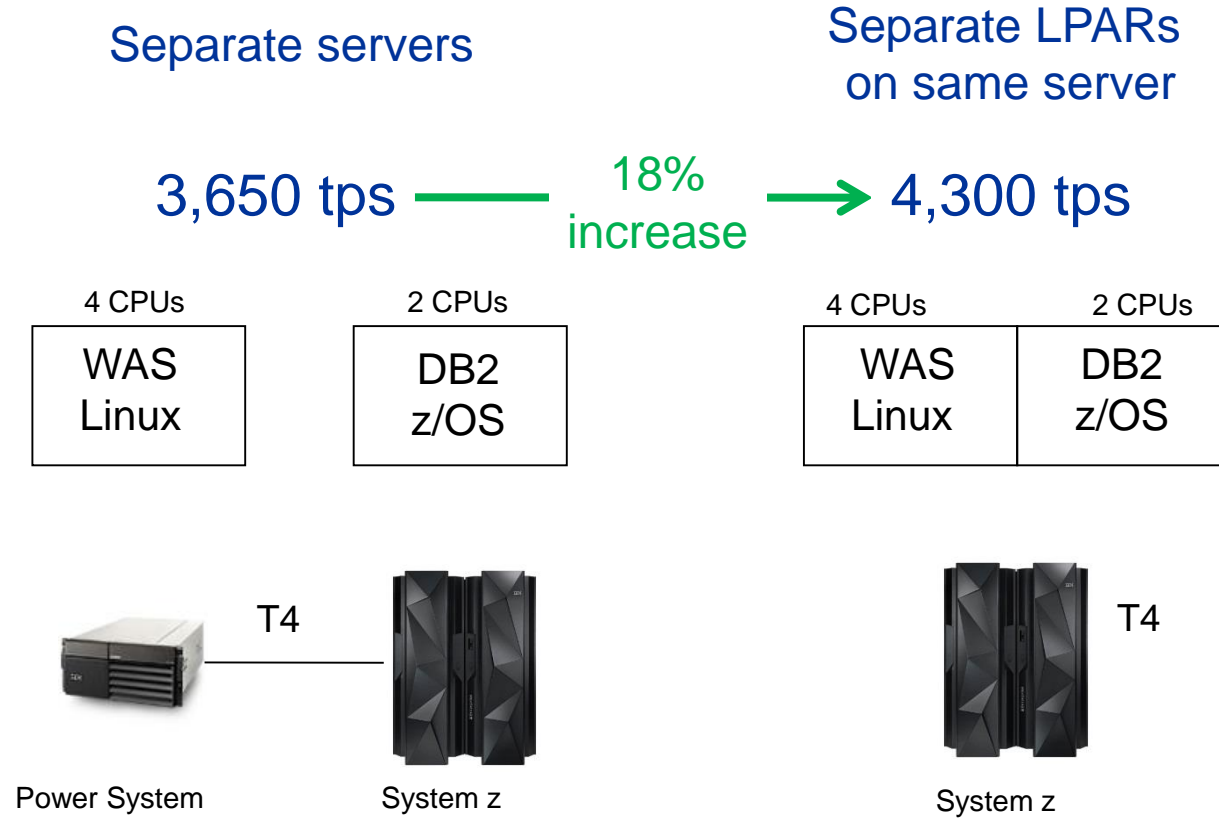
$8.9M (3 yr. TCA)

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
WAS Linux	DB2 z/OS

4 CPUs	2 CPUs
WAS Linux	DB2 z/OS

T4

Power System   System z

T4

System z

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

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
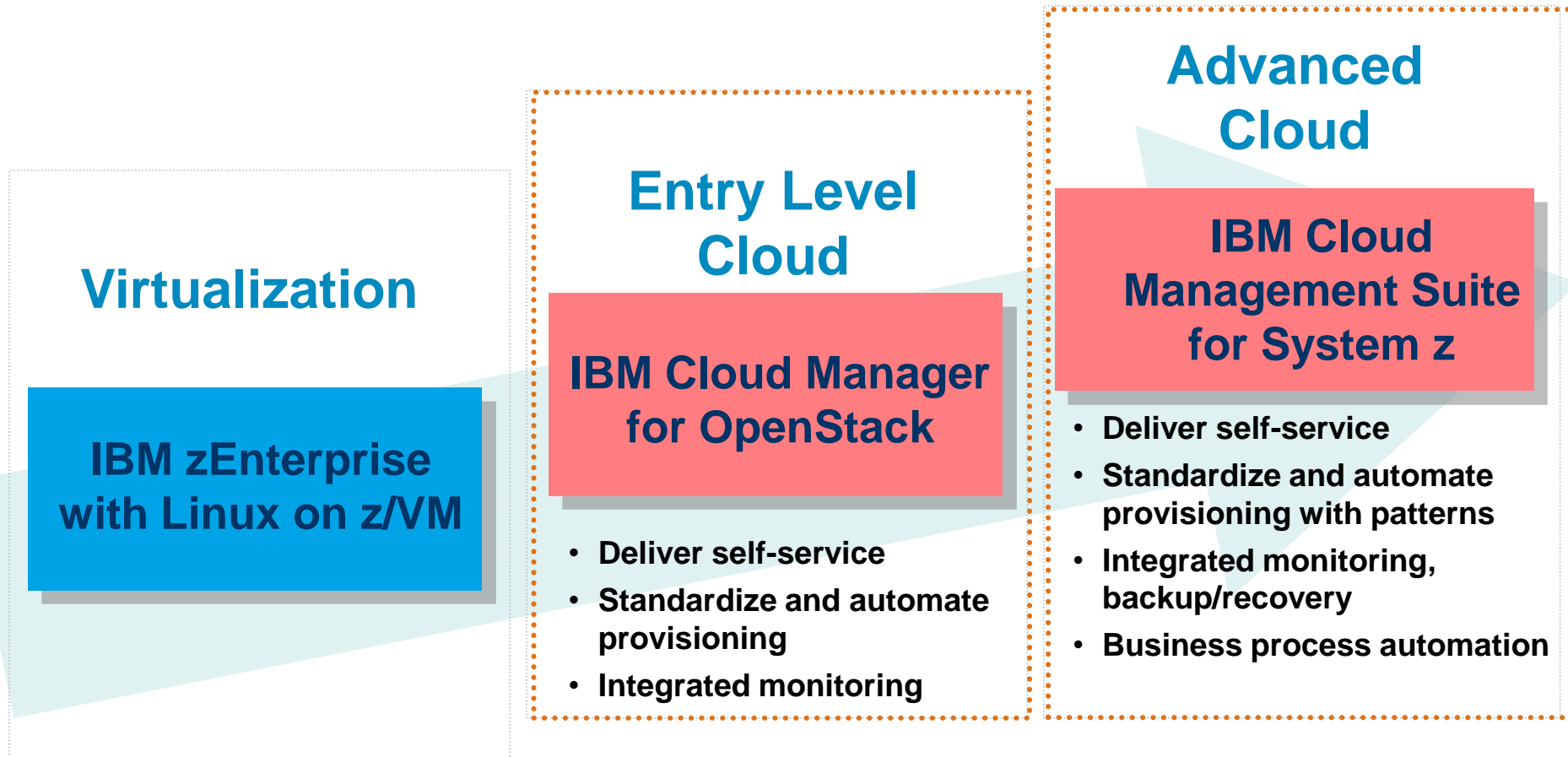
Benefits:

- 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

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

03. Dynamic cloud with zEnterprise

IBM is building cloud management software on open technology OpenStack

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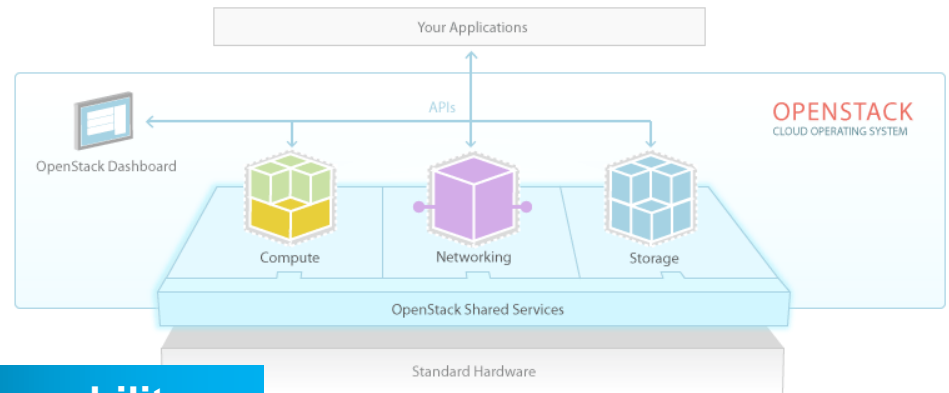
#2 – Vendor Interoperability
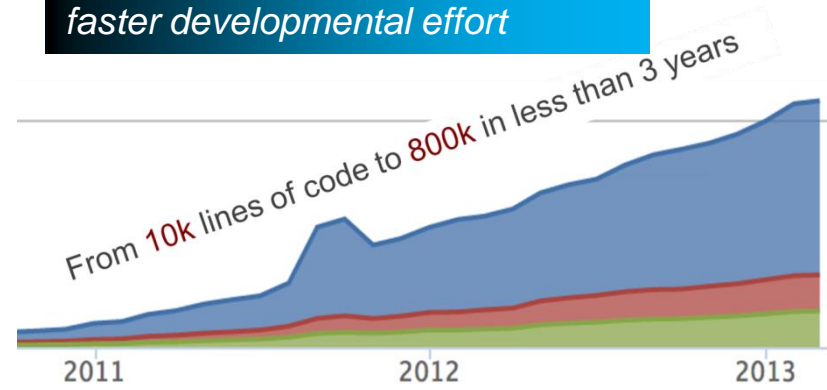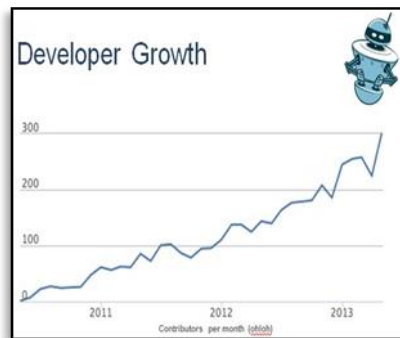*High quality, multi-vendor & user community = freedom from lock-in*

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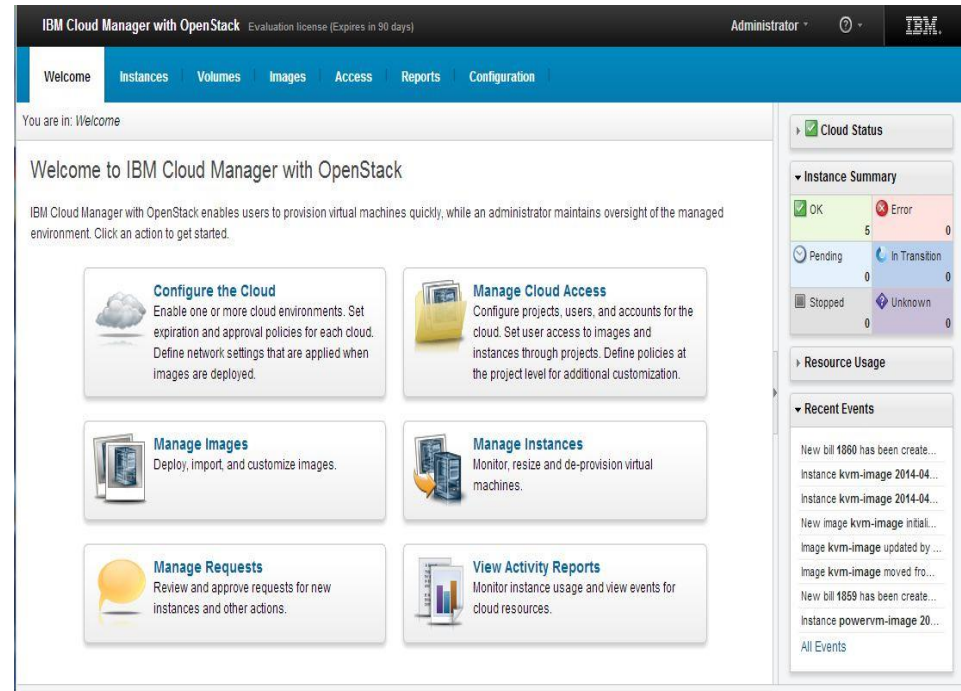*Large community effort enables faster developmental effort*

Platinum Sponsors

Gold Sponsors

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

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

03. Dynamic cloud with zEnterprise   © 2014 IBM Corporation

IBM Cloud Management Suite for System z

NEW

- 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

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

z/VM

PureSystems

VMware ESX

PowerVM
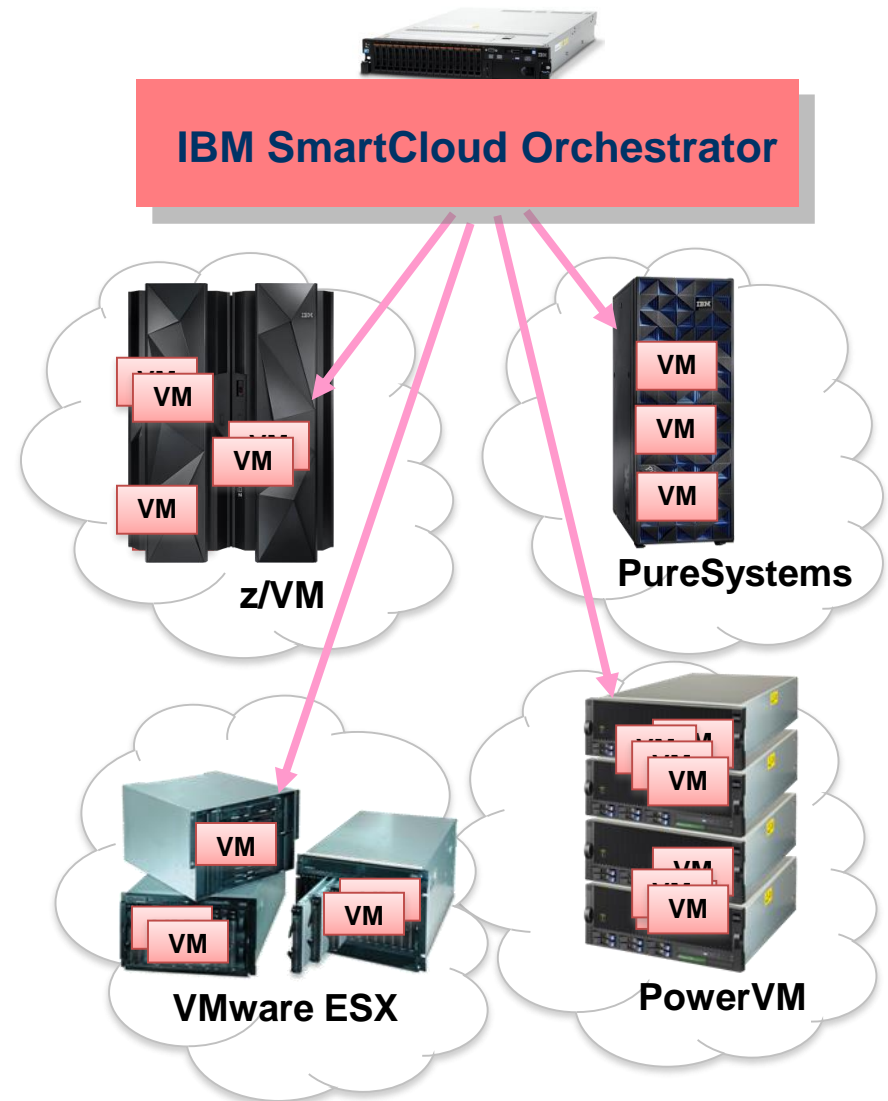
Automation with IBM SmartCloud Orchestrator

IBM SmartCloud Orchestrator

Self Service UI and offerings

Pattern Services

Orchestration Services

Catalog
(Virtual Image Parts, Patterns, Scripts)

User selects and deploys a pattern

- Self-service console and offerings

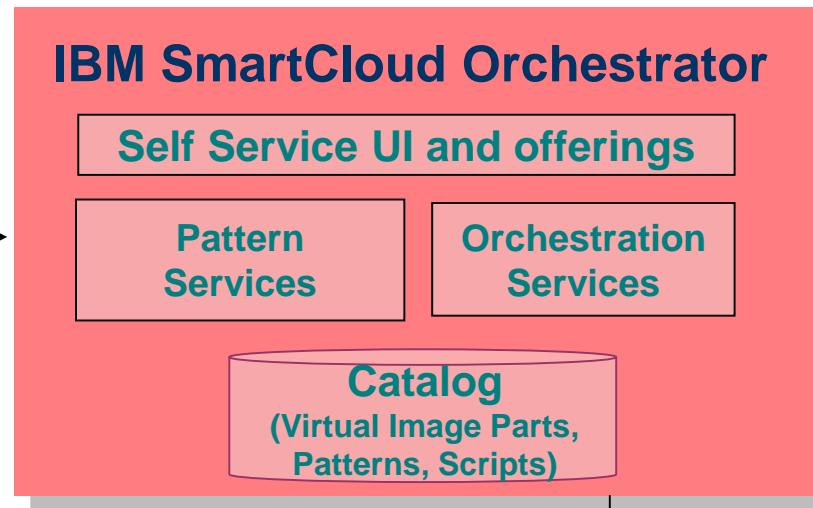- Catalog can have virtual images, scripts and pattern

- 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
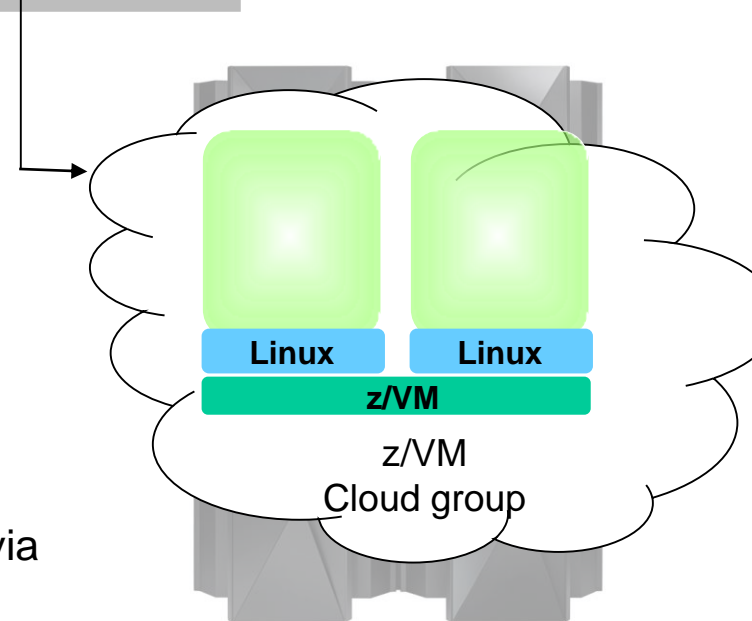
DEMO: IBM SmartCloud Orchestrator

- 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

03. Dynamic cloud with zEnterprise
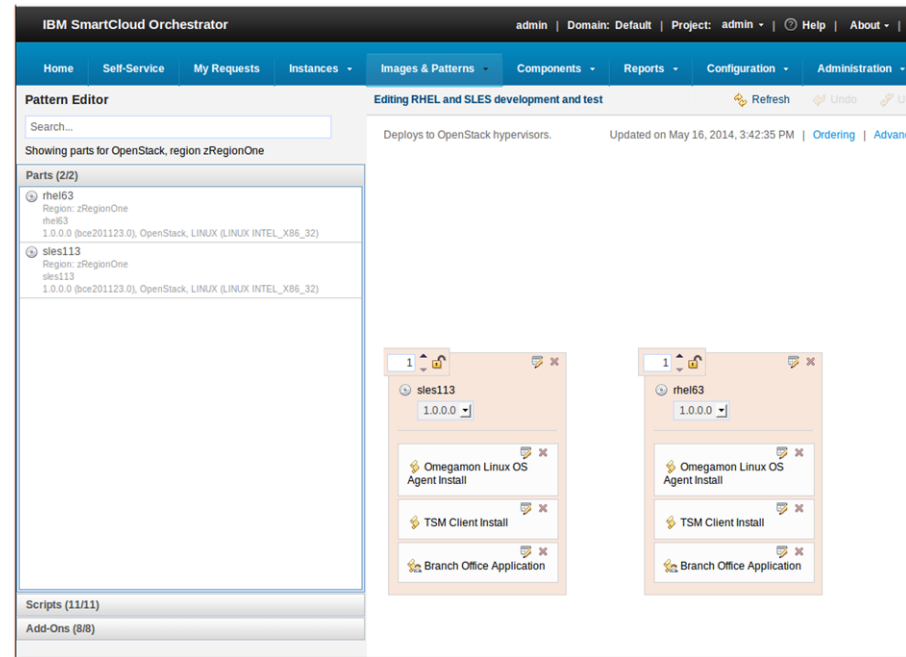
Automate monitoring of cloud services with OMEGAMON XE on z/VM and Linux

- **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**

03. Dynamic cloud with zEnterprise   © 2014 IBM Corporation
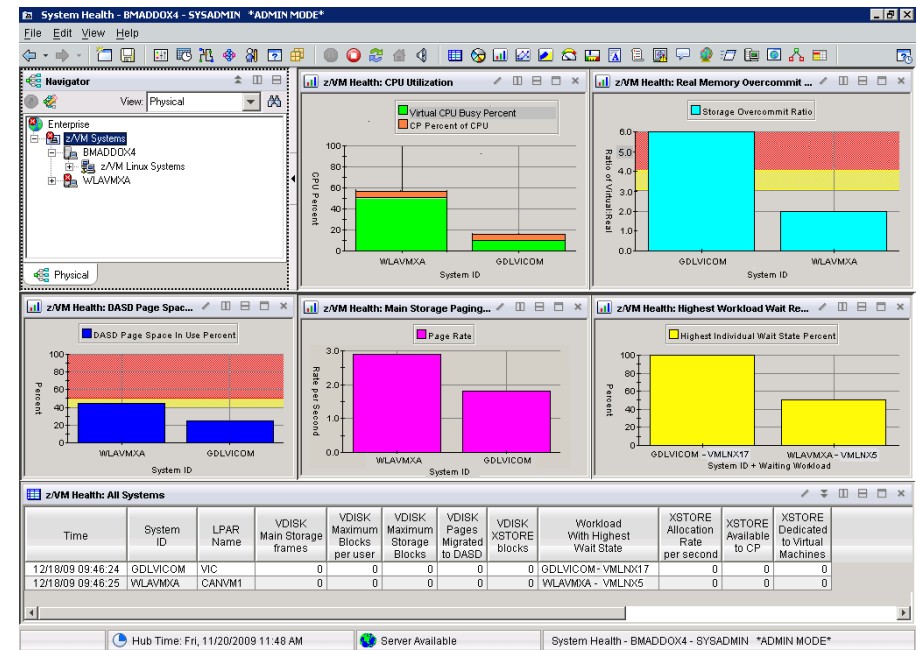
Automate backup and recovery with Tivoli Storage Manager

- 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

03. Dynamic cloud with zEnterprise

IBM®

NEW

IBM Enterprise Cloud System

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

Utility Pricing and MSP Flexible Financing

Fully Automated Cloud Orchestration & Monitoring

openstack™

Trusted, 24/7 IBM Support

Hypervisor and Virtualization Management

IBM Storage

zEnterprise

Award Winning Hardware Design

CRN TECH INNOVATOR AWARDS 2013

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**

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)

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

On-site personalization services

+

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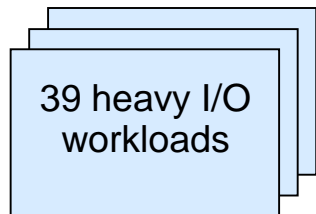– **IBM z/VM® Version 6.3 with features**
  • z/VM Directory Maintenance Facility
  • z/VM Resource Access Control Facility
  • z/VM Performance Toolkit for VM™
  • z/VM Single System Image
– **IBM Wave for z/VM**

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

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)
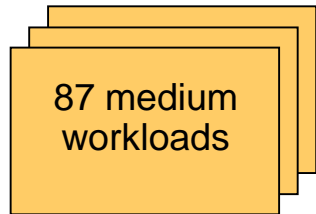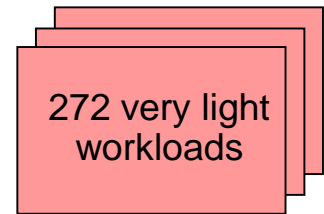
Which option provides the lowest TCO over 3 years?

398 workloads

03. Dynamic cloud with zEnterprise

© 2014 IBM Corporation

Platform requirements for deploying workloads with heavy I/O
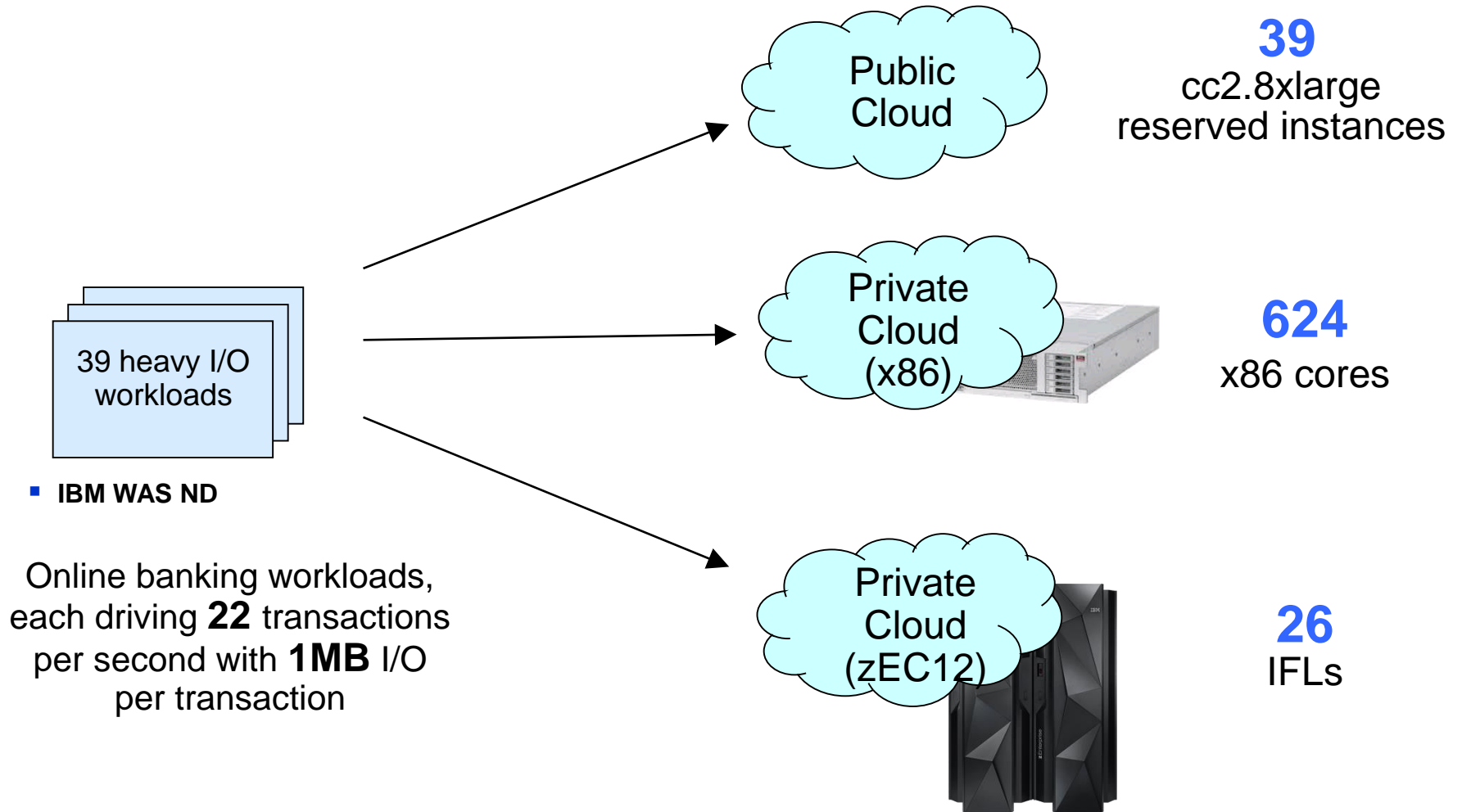
Public Cloud

39
cc2.8xlarge
reserved instances

39 heavy I/O workloads

Private Cloud (x86)

624
x86 cores

- **IBM WAS ND**

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

Private Cloud (zEC12)

26
IFLs

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

Platform requirements for deploying medium workloads
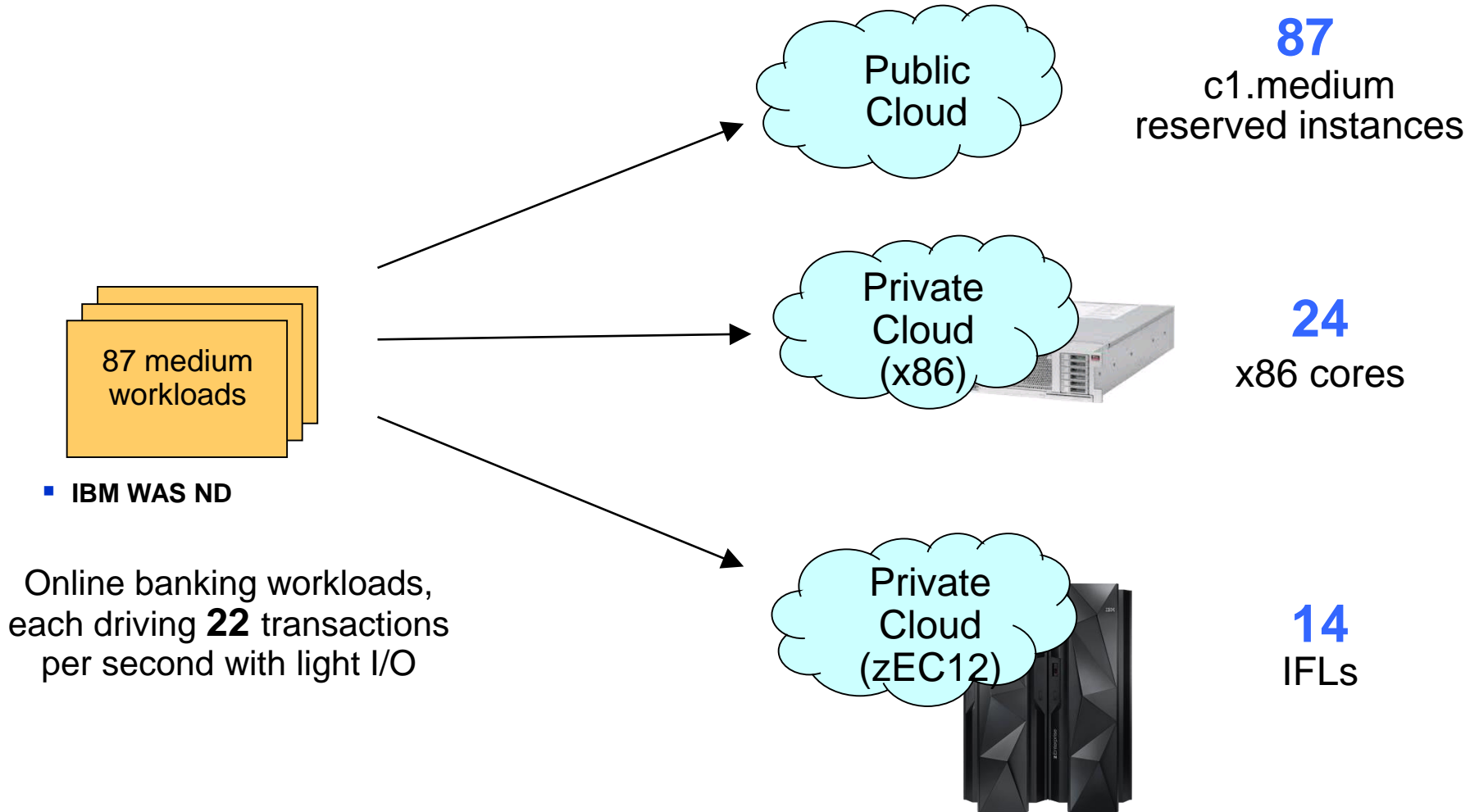
Public Cloud

87
c1.medium
reserved instances

87 medium workloads

▪ **IBM WAS ND**

Private Cloud (x86)

24
x86 cores

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

Private Cloud (zEC12)

14
IFLs

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

Platform requirements for deploying very light workloads
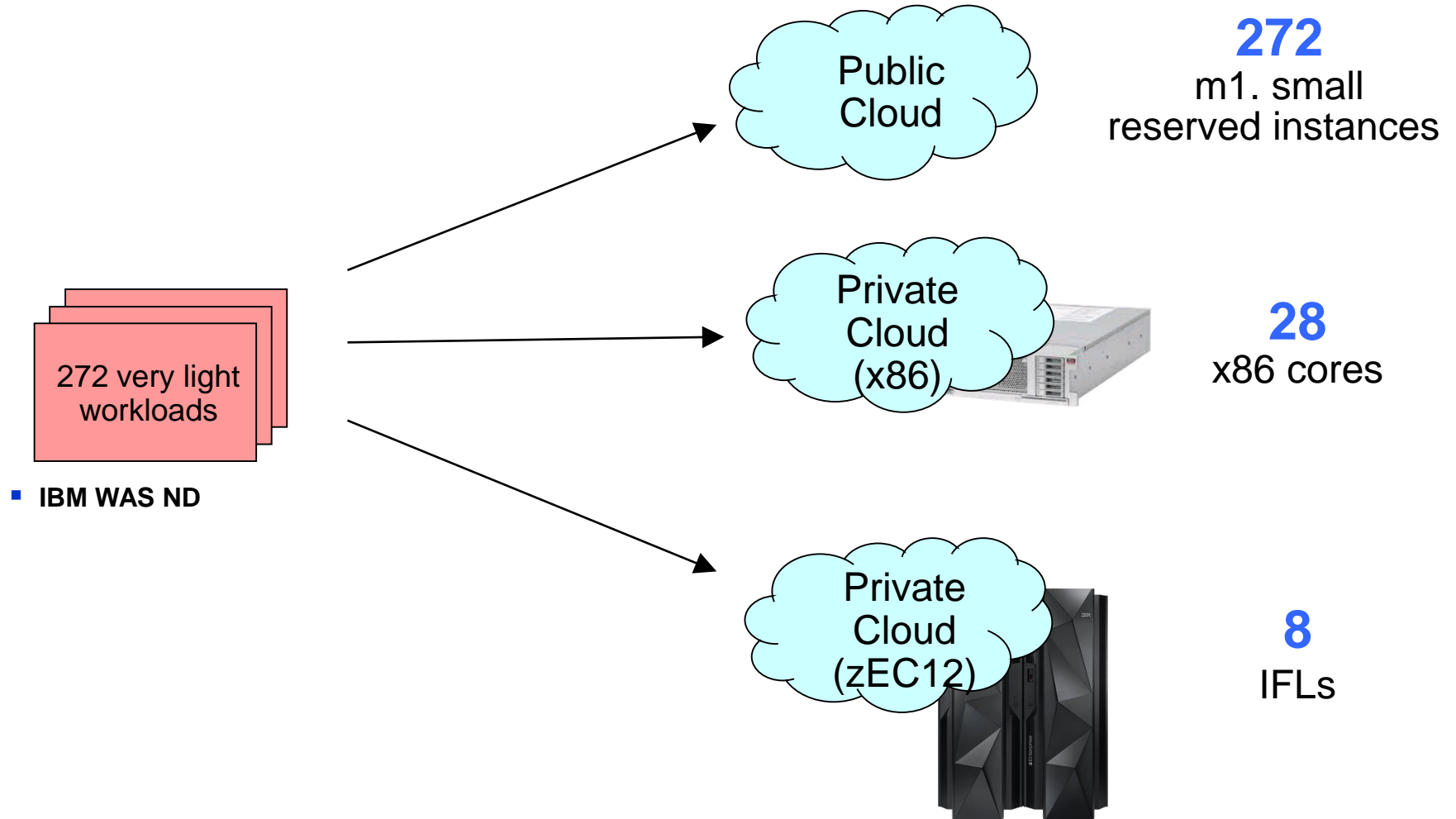
272 very light workloads

- **IBM WAS ND**

Public Cloud → **272** m1. small reserved instances

Private Cloud (x86) → **28** x86 cores

Private Cloud (zEC12) → **8** IFLs

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

03. Dynamic cloud with zEnterprise

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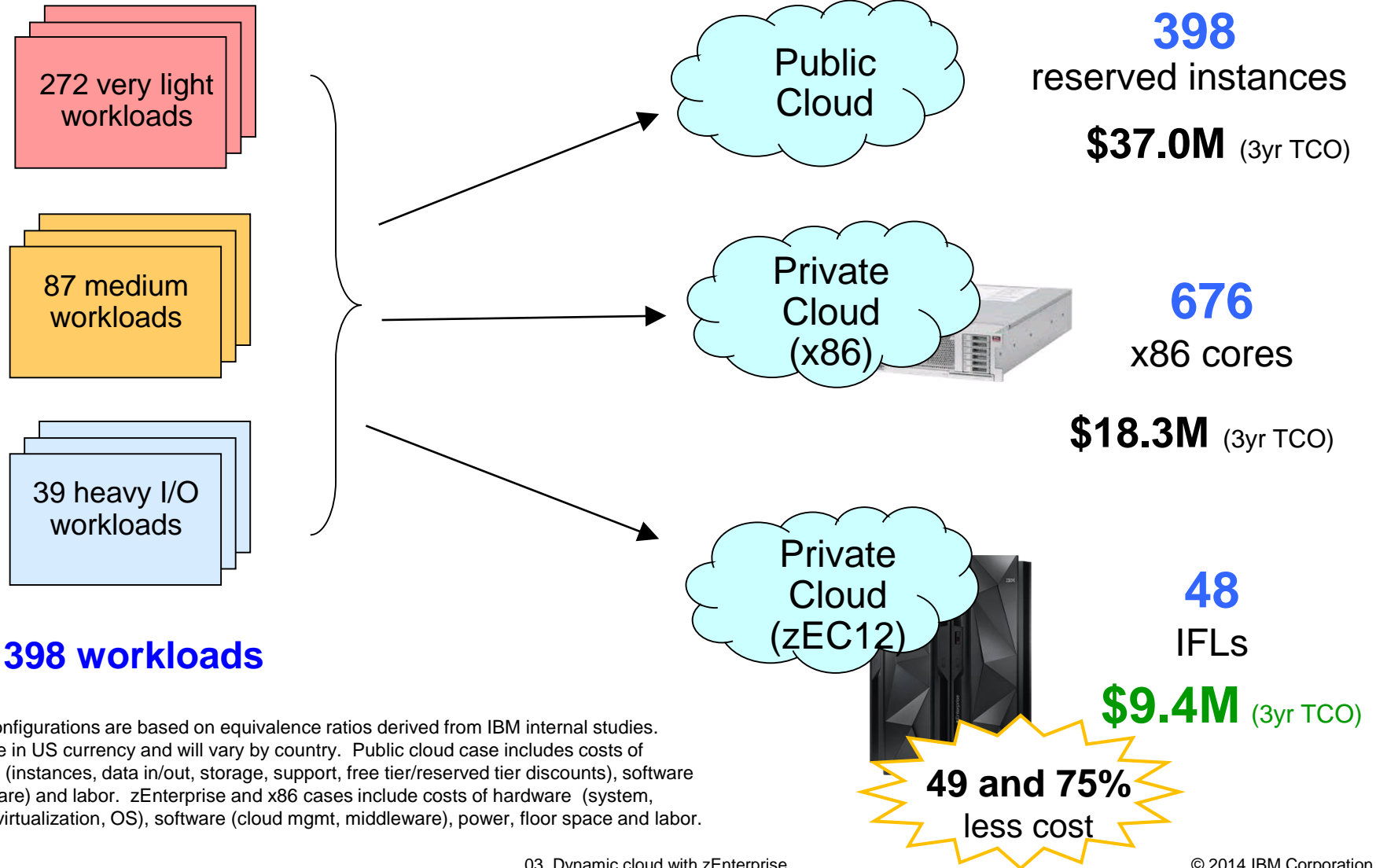
272 very light workloads

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.

03. Dynamic cloud with zEnterprise

System z private cloud delivers lowest TCO

Case Study: 398 Workloads
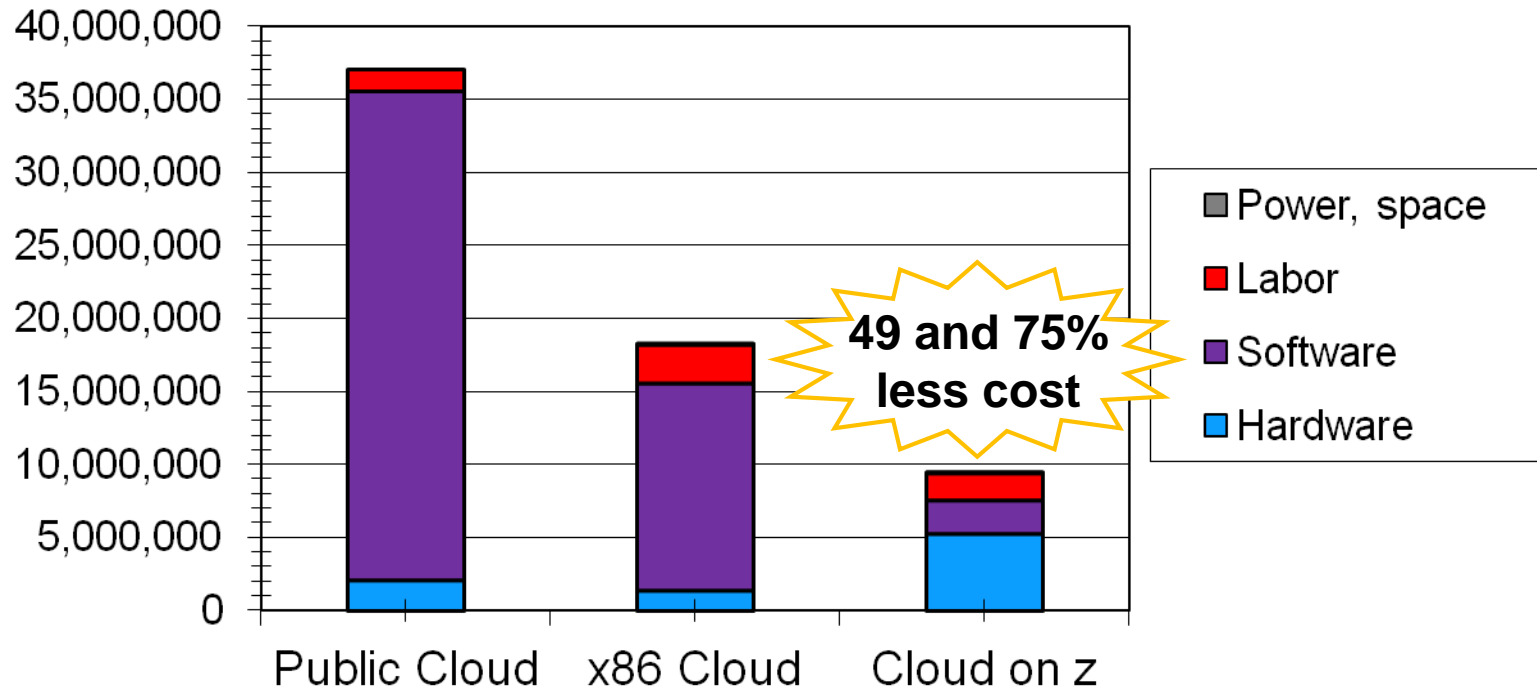
49 and 75% less cost

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

X-axis: 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.

New York Municipal Shared Services Cloud

Connecting cities to fuel growth and prosperity via the cloud

Inefficacy and government waste are enormous problems that affect all 1,600 local governments in New York State.

IBM Research and Software Consulting Associates are partnering to create a shared service cloud for the municipalities of New York. This cloud model is predicted to eliminate 25% of government's IT budget by streamlining applications and connecting silo'ed municipalities.

> "*Change starts by asking the difficult questions and finding innovative solutions. Cloud isn't just for IT anymore; it's for the business.*"
>
> Wil LaBossier, President, Software Consulting Associates

The IBM mainframe is the only platform New York trusts to host that cloud.

In addition to its time-tested scalability, reliability and security, it offers the lowest total cost of ownership — supporting the state as it strives for reduced spending and a smarter, future-ready IT infrastructure.

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

Increasingly, MSPs are building mainframe-based cloud platforms to efficiently deliver high quality services to clients

In late 2013, Oceanet Technology invested in an Enterprise Linux Server, making it the first MSP to provide a mainframe solution in the cloud.

"The availability, reliability and economics of Linux on System Z was crucial. We will cater primarily to companies that use Oracle database, which requires 2-4 times more processor. At a minimum, you make 30% savings to your customer, and applications are about 30% faster than on x86 architecture."

- Cyril Pauty, associate director

Because of System z's exceptional qualities of service, L3C enables its IaaS cloud customers to use mainframe computing transparently. Customers get the cost-effective performance and qualities of service of mainframe technologies without investing in the underlying technology.

"System z is the most cost-effective platform for large Oracle workloads. Whether our customers need to consolidate or isolate processes, our Oracle services would be impossible without it." - Lubo Cheytanov, founder and co-owner, L3C LLP

Using the IBM Enterprise Cloud System, Vissensa can support any aspect of a client's software and service deployment regardless of size, complexity, security, performance and flexibility.

"The zEnterprise platform offers better scalability with the most powerful processors of any server, the highest levels of availability you can get, and with better price/performance than legacy x86 hardware," said Steve Groom, CEO of Vissensa. *"It means we can offer a new level of service, with even better security and lower the total cost of ownership for our clients."*

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