zEnterprise – The Ideal Platform For Smarter Computing

Improving Service Delivery With Private Cloud Computing

What Do Data Center Managers Want?

- Offer standardized services
- Flexibility to schedule workloads
- On-demand, elastic virtual infrastructure
- Security/compliance
- Reduce operational costs including labor

Data Center Manager

What Do Users Want?

- Self-service
  - User request services via a web portal
- Fast provisioning
  - Automated provisioning/de-provisioning of resources
- Elastic capability
  - Resource can be provisioned to quickly scale out and rapidly released to quickly scale in
- Security/compliance
- Low cost pay as you go
  - Users pay for what they use

User

Satisfy Everyone's Requirements With A Private Cloud

- ✓ Standardized services
- ✓ Flexibility
- ✓ Elasticity
- ✓ Security
- ✓ Reduce costs

Data Center Manager

- ✓ Self-service
- ✓ Fast provisioning
- ✓ Elasticity
- ✓ Security
- ✓ Low cost pay as you go

User

Businesses Have Concerns About Public Clouds

- Lack of Reliability
  - Examples of public cloud outages
    - April 2011, Amazon, 2 days,
    - April 2011, Azure, 6 hours
    - Jan 2011, Salesforce, 1 hour
    - May 2010, Amazon, 4 outages in 1 week
    - April 2010, Azure, 40 mins
    - June 2009, Amazon, 5 hours
    - March 2009, Azure, 22 hours
    - July 2008, Amazon, 5 hours 45 mins
    - Aprll 2008, Amazon, 3 hours
    - Feb 2008, Amazon 2 hours; Salesforce.com, 1 day

Amazon's Trouble Raises Cloud Computing Doubts

April 22,2011 Computerworld

As technical problems interrupted computer services provided by Amazon for a second day on Friday, industry analysts said the troubles would prompt many companies to reconsider relying on remote computers beyond their control.

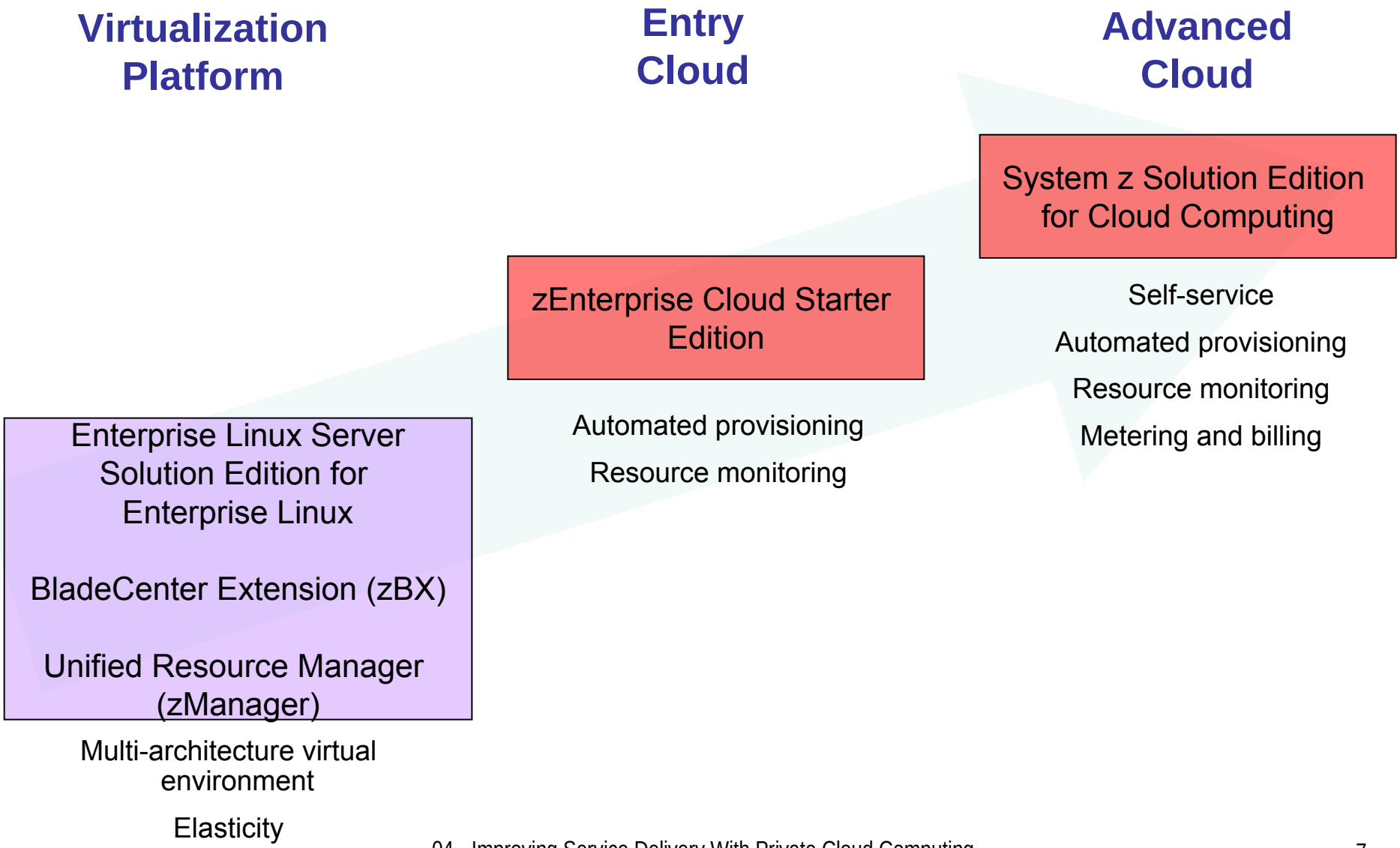
- Lack of Security/Compliance
  - Isolation of applications and data, data encryption/segregation
  - Compliance with laws and regulations
- Limited Archiving
  - Network performance and amount of data involved are limiting factors

Transform And Improve Service Delivery With A Private Cloud Instead

- "**Private**" because it is only used by enterprise employees
- Offers same capabilities as a public cloud
  - Virtualization platform with elastic scalability
  - Support for instant provisioning of service
  - Self-service portal to request service
  - Metering and billing capability to support pay as you go model
- But with advantages over a public cloud
  - Multiple architectures
  - Control of security, data protection, availability, and workload management policies
  - Lower cost!

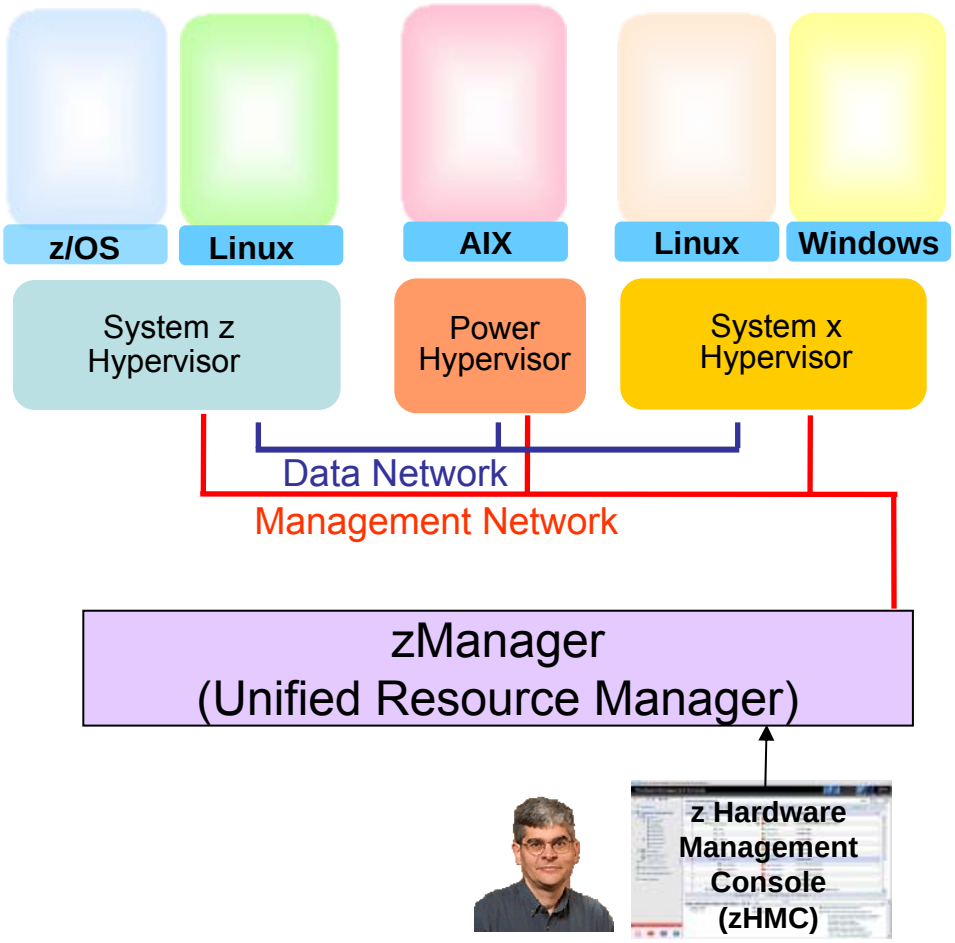
What Technology is Needed for a Private Cloud?

Improve Service Delivery With A Private Cloud on zEnterprise While Reducing Costs



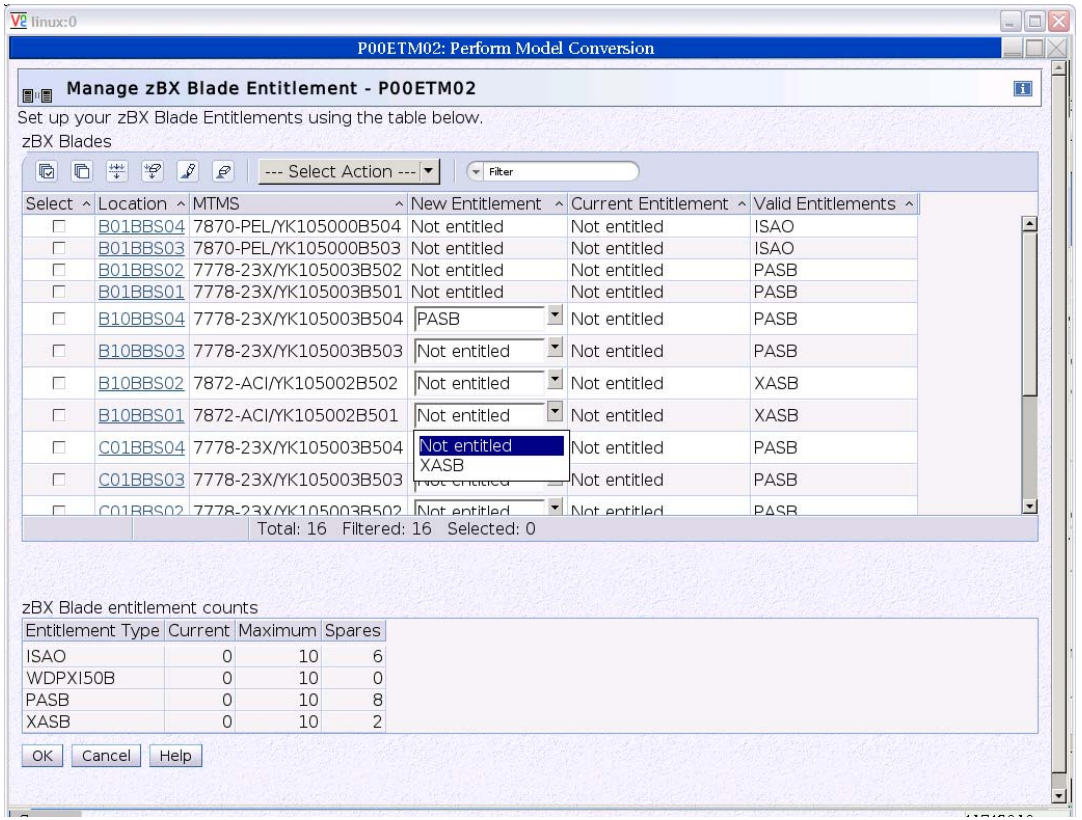
zEnterprise Provides An Optimized Virtualized Platform

- Multi-architecture virtual environments enable a broad range of workloads
- Elastic Scalability
  - Add processors to z114 / z196 while running
  - zManager provides consistent structured management for all virtual environments
    - Add and configure a blade quickly
    - Create virtual machines and networks quickly



zManager Minimizes Time And Labor For Hypervisor And Network Setup

- Read the entitlements for blades
- Auto-discover and inventory for all elements
  - No need to install and configure libraries or sensors
- Automatic setup and configuration of the hypervisor



Hypervisor Setup And Configuration Lab Test – Do-It-Yourself vs. zManager

DIY Tasks (per Blade)	Elapsed Time	Labor Time
Initial communication setup & education	6 min 26 sec	6 min 26 sec
Boot VIOS disc & install (creates LPAR for VIOS automatically)	37 min 59 sec	36 min
Configure VIOS networking	2 min 49 sec	2 min 49 sec
Create new storage pool for LPARs	35 sec	35 sec
Install VIOS service fixpacks	61 min 5 sec	20 sec
TOTAL TIME	**1 hr 48 min 52 sec**	**46 min 10 sec**

zManager Tasks (per Blade)	Elapsed Time	Labor Time
Add entitlement for a blade	90 min	92 sec
TOTAL TIME	**1 hr 30 min**	**1 min 32 sec**

97% reduction in labor time

Source: IBM CPO Internal Study

Network Setup And Configuration Lab Test – Do-It-Yourself vs. zManager

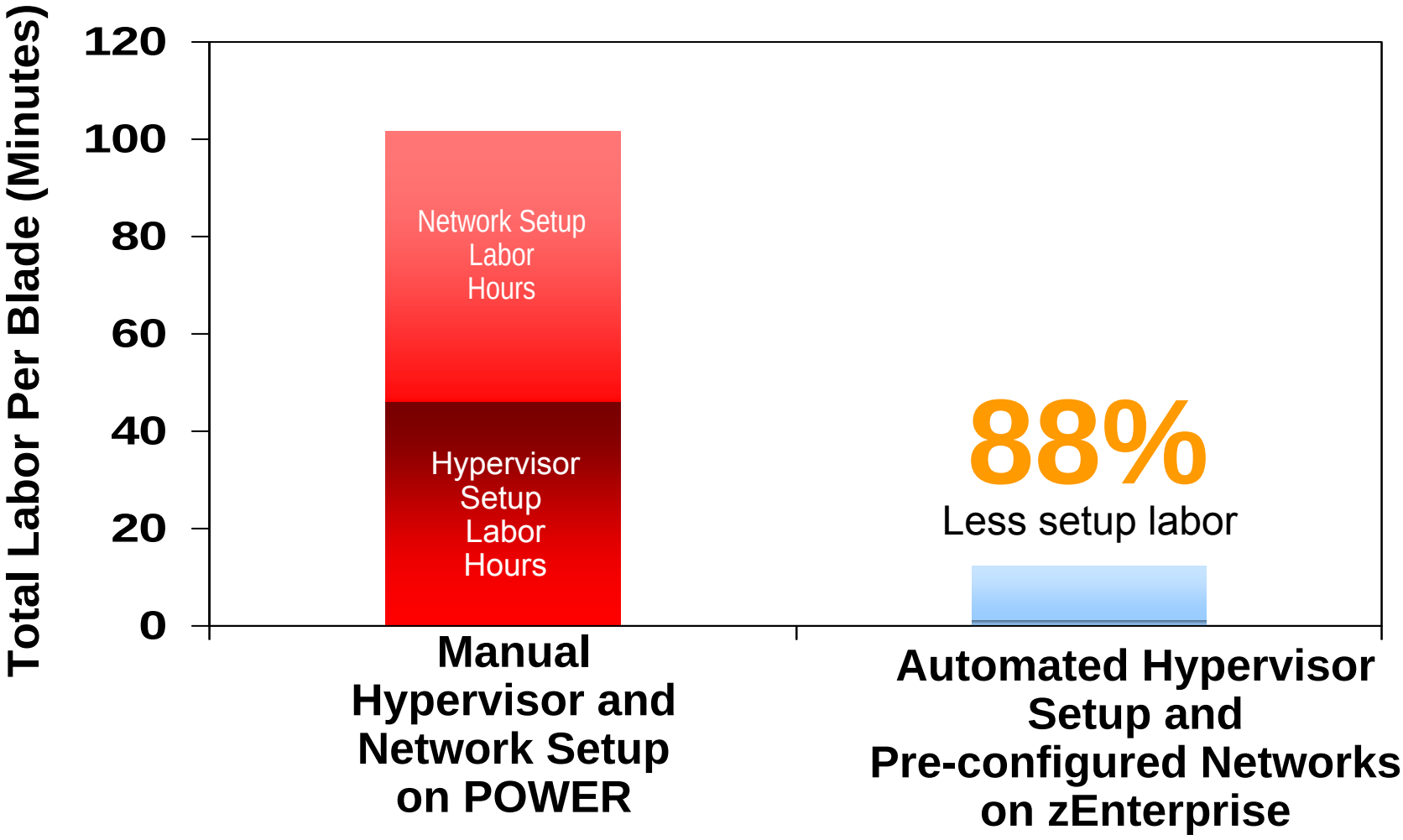
Do-It-Yourself Tasks (for two BladeCenters)	Elapsed/Labor Time
Planning (includes time to go over docs, etc)	5 hrs
Cabling	2 hrs
AMM Configuration	2 hrs
Logical Configuration (L2)	8 hrs
Blades network configuration	4 hrs
Testing	2 hrs
Documenting the configuration	3 hrs
TOTAL TIME	**26 hrs**

zManager Tasks (for two BladeCenters)	Elapsed/Labor Time
Planning	3 hrs
Cabling (pre-cabled in zBX)	0 hrs
AMM Configuration (done in zBX)	0 hrs
Logical configuration (L2)	30 mins
Blades network configuration	1 hr 30 mins
Testing (pre-tested)	0 hrs
Documenting the configuration (all part of zManager)	0 hrs
TOTAL TIME	**5 hrs**

81% reduction in labor time

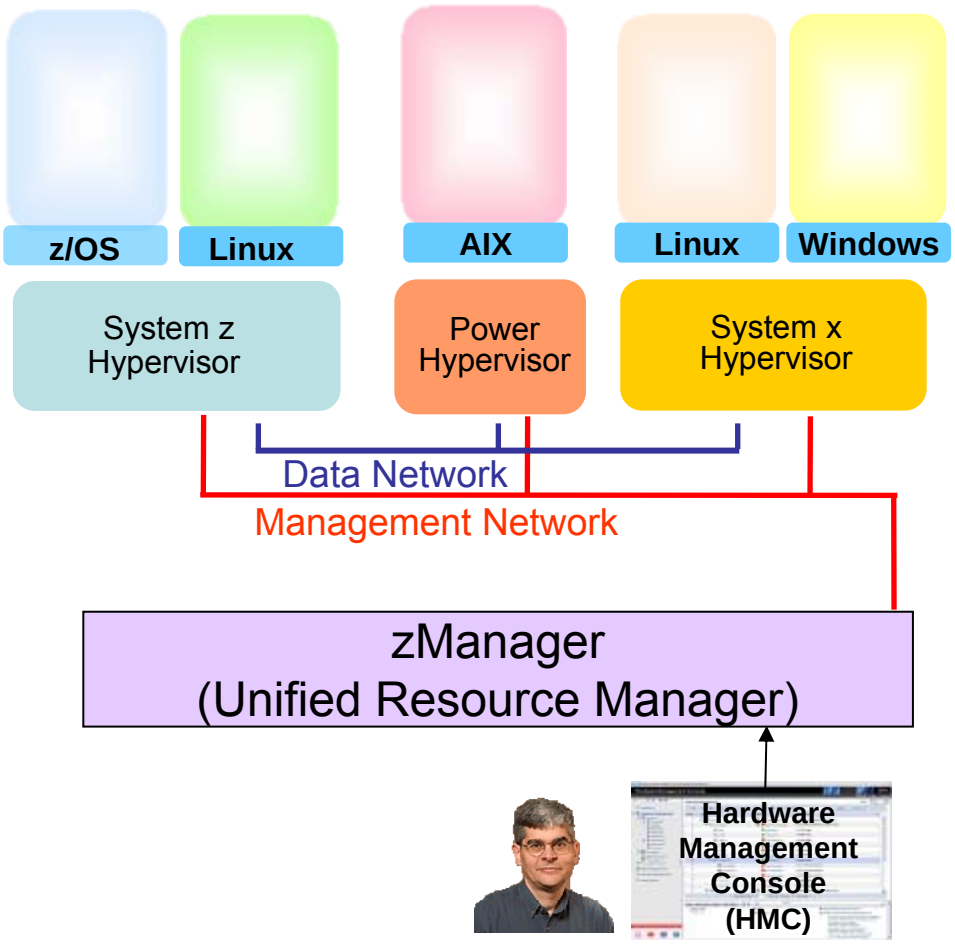
Source: IBM CPO Internal Study

Automated Hypervisor Setup And Pre-configured Network Enable Fast Platform Scale Up



Manage Virtual Servers With zManager

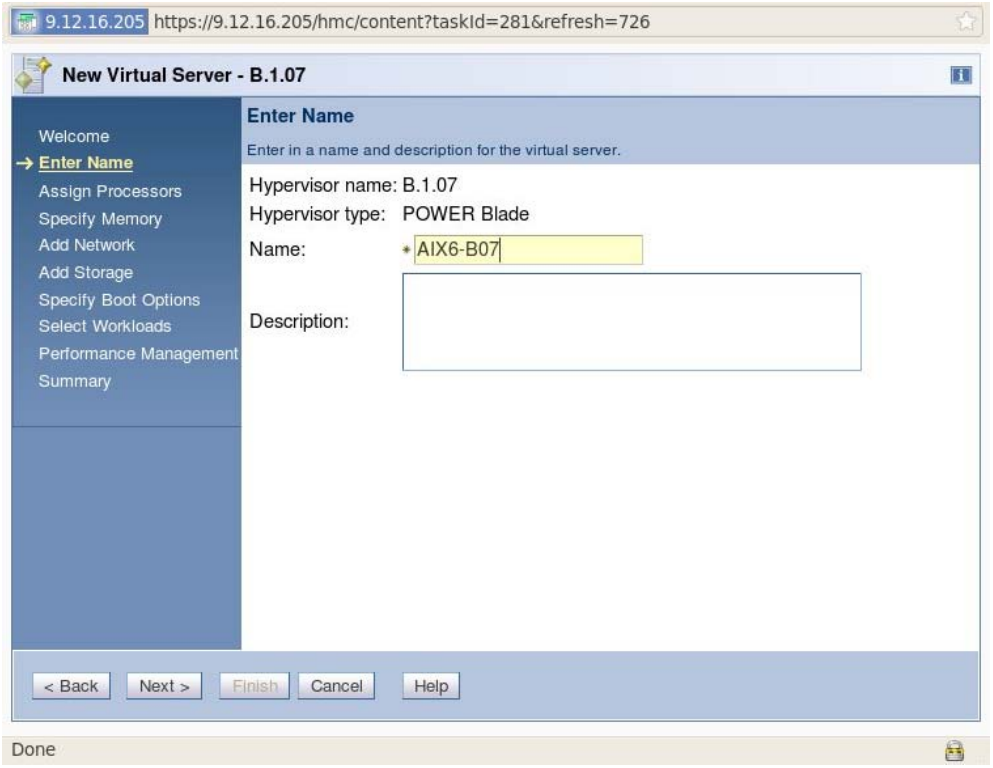
- From one console, create virtual machines in z/VM and in zBX hypervisors
- Start / stop / delete virtual machines under zManager control
- Create virtual networks
- Monitor resource usage
  - CPU, Memory, Power consumption



DEMO: Create Virtual Server With zManager

Create virtual server on a Power blade

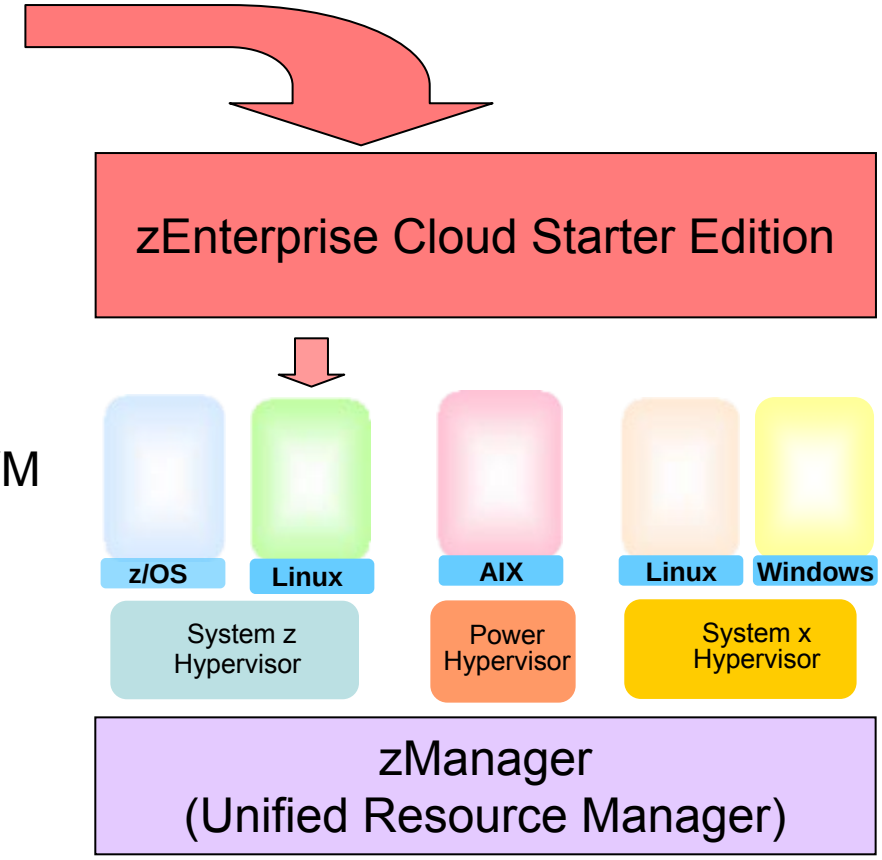
- Enter name for virtual server
- Assign number of virtual processors
- Specify memory
- Add network device
- Add storage device
- Specify boot option
- Select workload



zEnterprise Cloud Starter Edition

Adds package of software and services for automated provisioning and monitoring

- IBM Tivoli software (runs on Linux on System z)
  - Automated provisioning
    - Tivoli Provisioning Manager (TPM)
  - Monitoring
    - Tivoli OMEGAMON XE on z/VM and Linux
- IBM Lab Services
  - Planning, installation, configuring, testing services



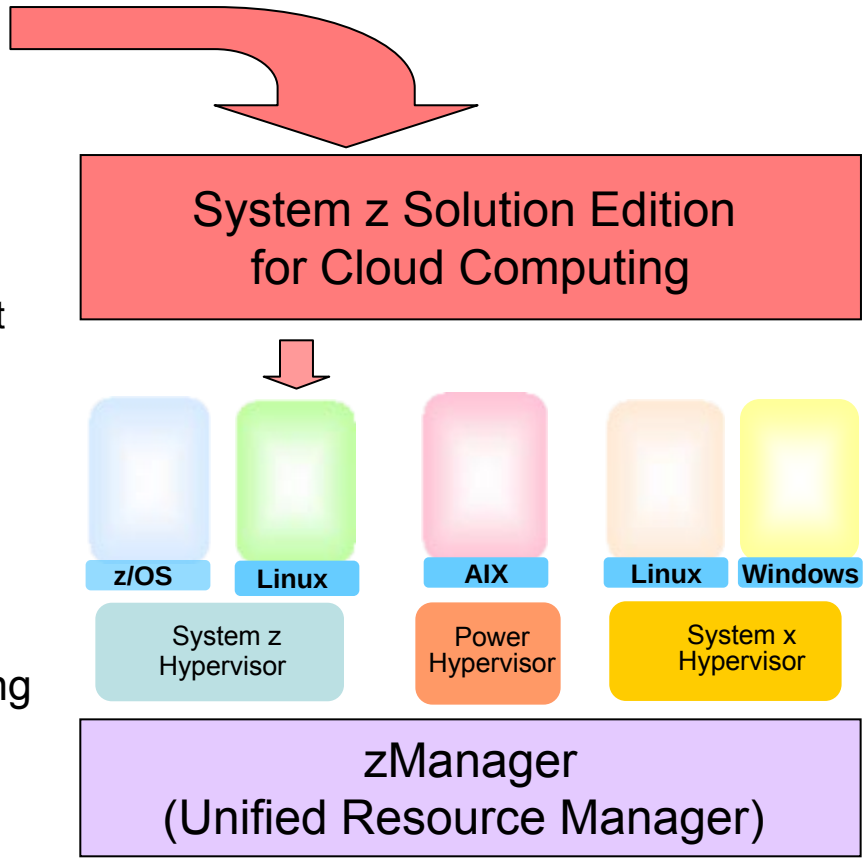
Automated Provisioning With Tivoli Provisioning Manager (TPM)

- Automates provisioning of virtual servers via cloning from images or installing and configuring software
- Tasks automated through automation workflows
  - Pre-built workflows describe provisioning steps
  - Automatic workflow execution with verification at each step
  - Automation Package Developer allows customization for data center best practices and procedures
- Virtual image repository allows customers to centralize and standardize on provisioning materials
  - Images, application packages, configuration properties

IBM System z Solution Edition For Cloud Computing

Adds package of software and services for self-service provisioning, metering, billing and monitoring

- IBM Tivoli software (runs on Linux on System z)
  - Self-service provisioning
    - Tivoli Service Automation Manager (TSAM)
    - TSAM integrates with IBM Workload Deployer appliance to automate provisioning of WebSphere environment
  - Metering and billing
    - Tivoli Usage and Accounting Manager (TUAM)
  - Monitoring
    - Tivoli OMEGAMON XE on z/VM and Linux
- IBM Lab Services
  - Planning, installation, configuring, testing services
  - Significant package discounts

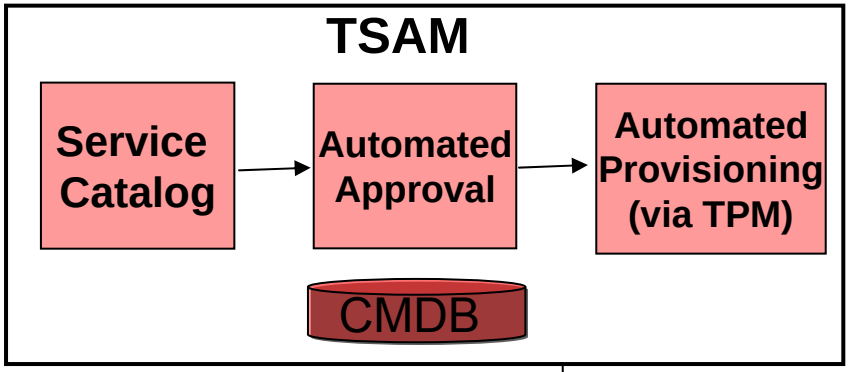


Self-Service Provisioning With Tivoli Service Automation Manager (TSAM)

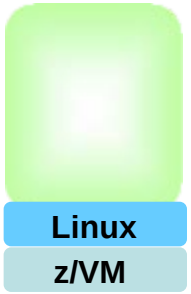
User browses service catalog

Adds service to shopping cart

Submits request



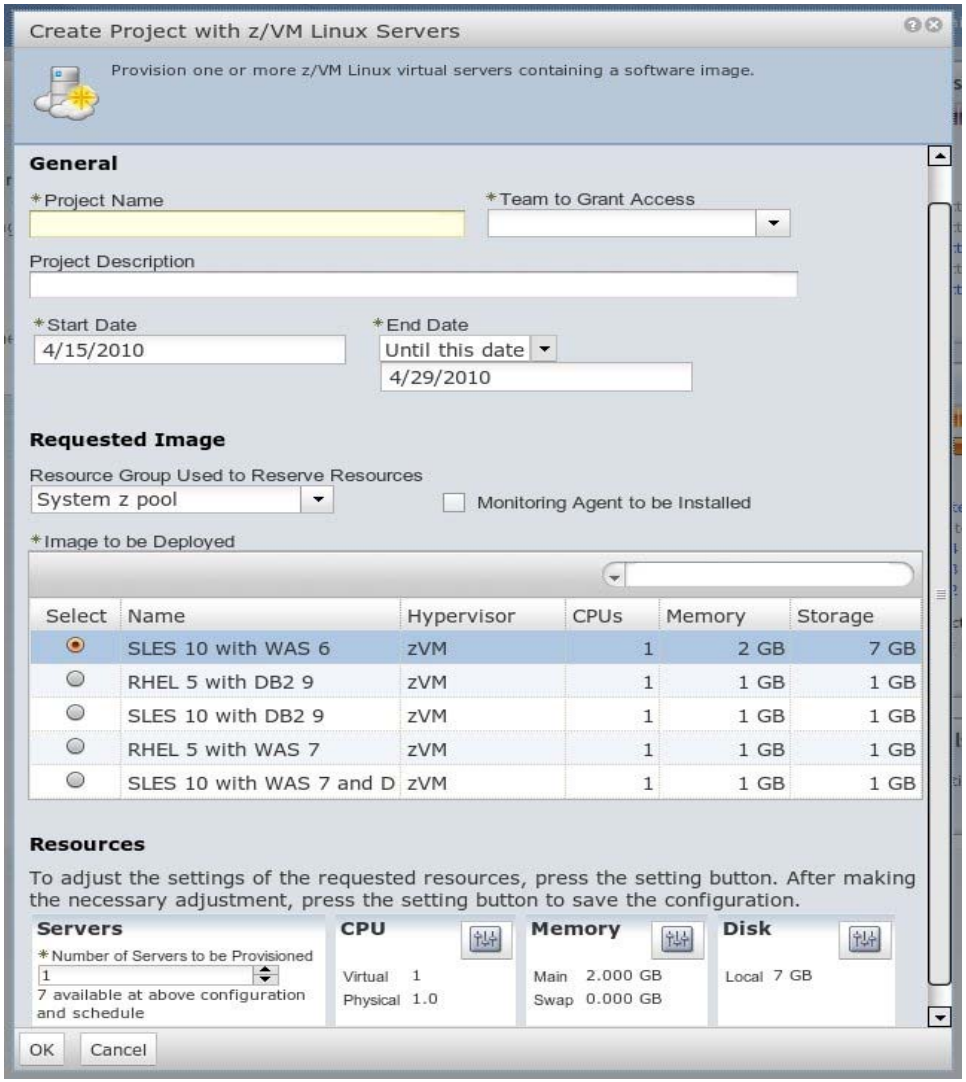
TSAM starts the deployment process via **IBM Tivoli Provisioning Manager** (TPM) workflow



- Self-service portal for users
- Enables standardization via a catalog of service offerings
- Automates request processing with pre-defined workflows
- Fast provisioning of virtual servers

DEMO: Self-Service Provisioning With IBM Tivoli Service Automation Manager (TSAM)

- Submit a request to add a new virtual machine (VM) under z/VM to an existing project
- VM created with a complete software stack (zLinux, WebSphere, customer application and Tivoli Monitoring agent) installed
- Requester is notified via email when the request is completed



Self-Service Provisioning For zEnterprise

User

Request for services

Tivoli Service Automation Manager (TSAM)

Service Catalog

Administrator

Automated Out-of-the-box

HCM/ zHMC/ DFS

Tivoli Provisioning Manager (TPM)

To be delivered in 2H 2012

z/OS

Linux

AIX

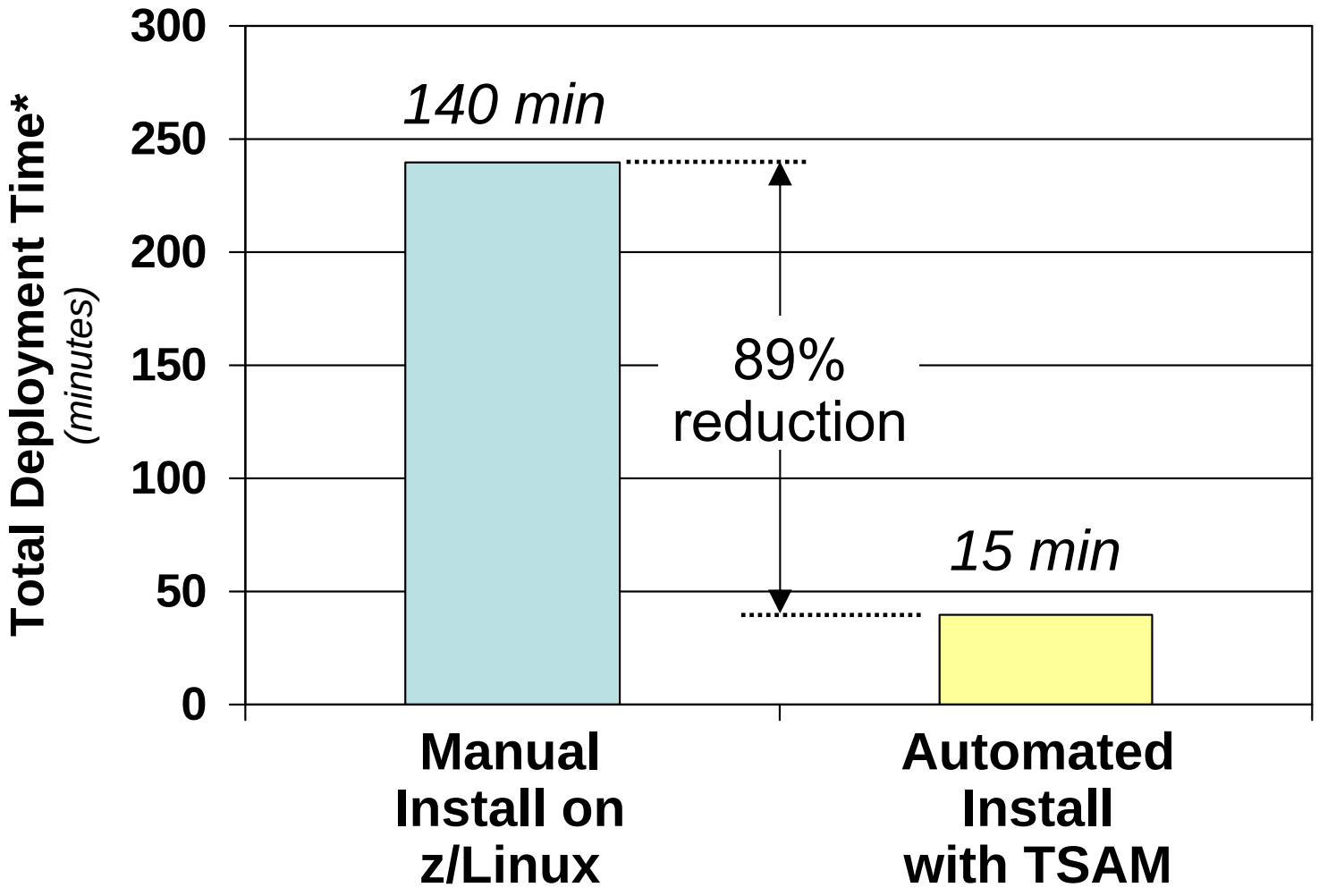
Linux

System z Hypervisor

Power Hypervisor

System x Hypervisor

TSAM Automated Provisioning Is Fast



* Excluding network transmission time

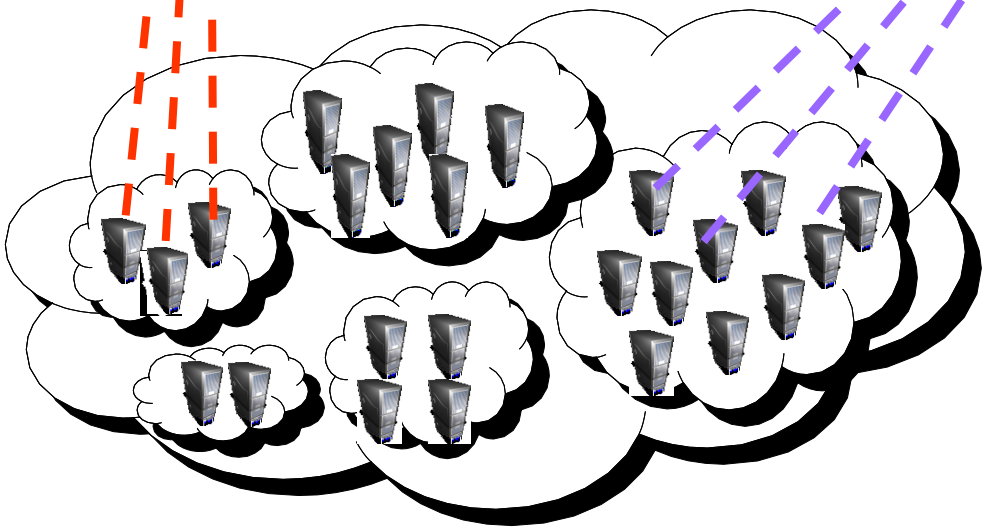
Automated Provisioning For Complete WebSphere Environment With IBM Workload Deployer

Tivoli Service Automation Manager (TSAM)

IBM Workload Deployer (IWD)

General purpose provisioning

Complete WebSphere environment provisioning

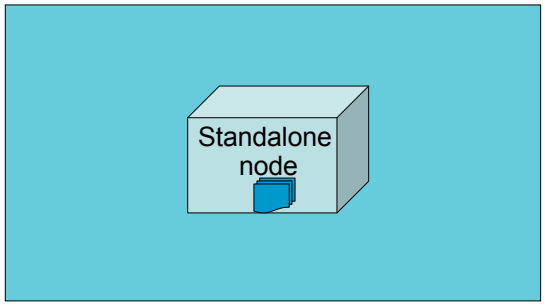


- Appliance pre-loaded with standardized WebSphere Application Server Hypervisor Edition and patterns
- Self-service automated provisioning of WebSphere environment onto z/VM on z196

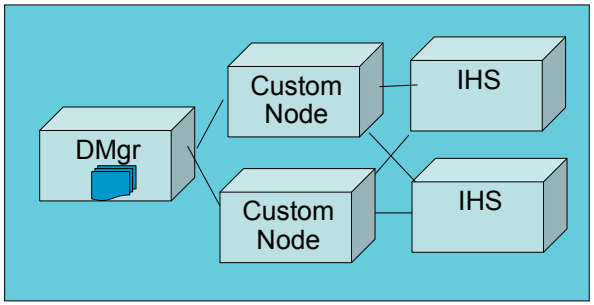
IBM Workload Deployer Deploys Preloaded Virtual System Patterns

A Virtual System Pattern is one or more virtual images and script packages to satisfy a certain deployment topology

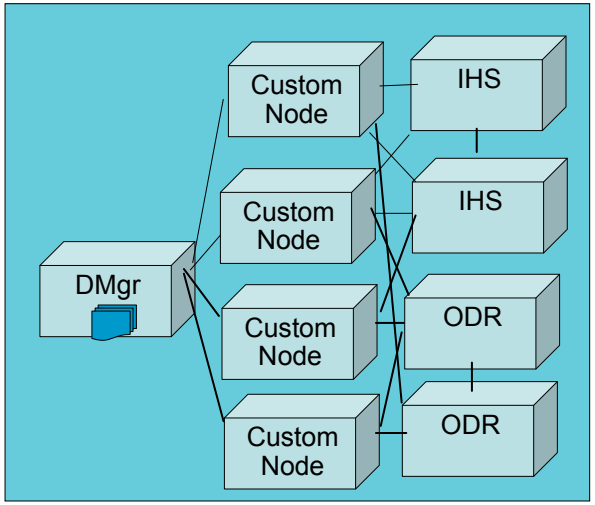
Single Server



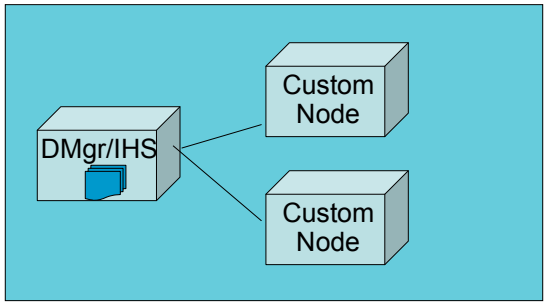
WebSphere cluster



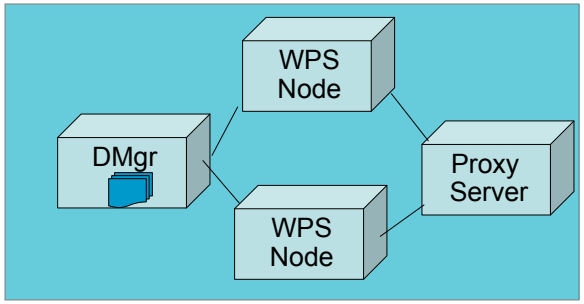
WebSphere Advanced Cluster



WebSphere cluster (dev)



WebSphere Process Server (Scalable)



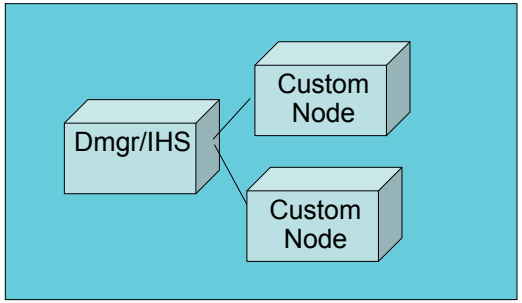
Advanced Options for messaging, session persistence, and global security available

DMgr = Deployment Manager

IHS = IBM http Server

Example: Manual Deployment Steps For WAS Clustered Environment

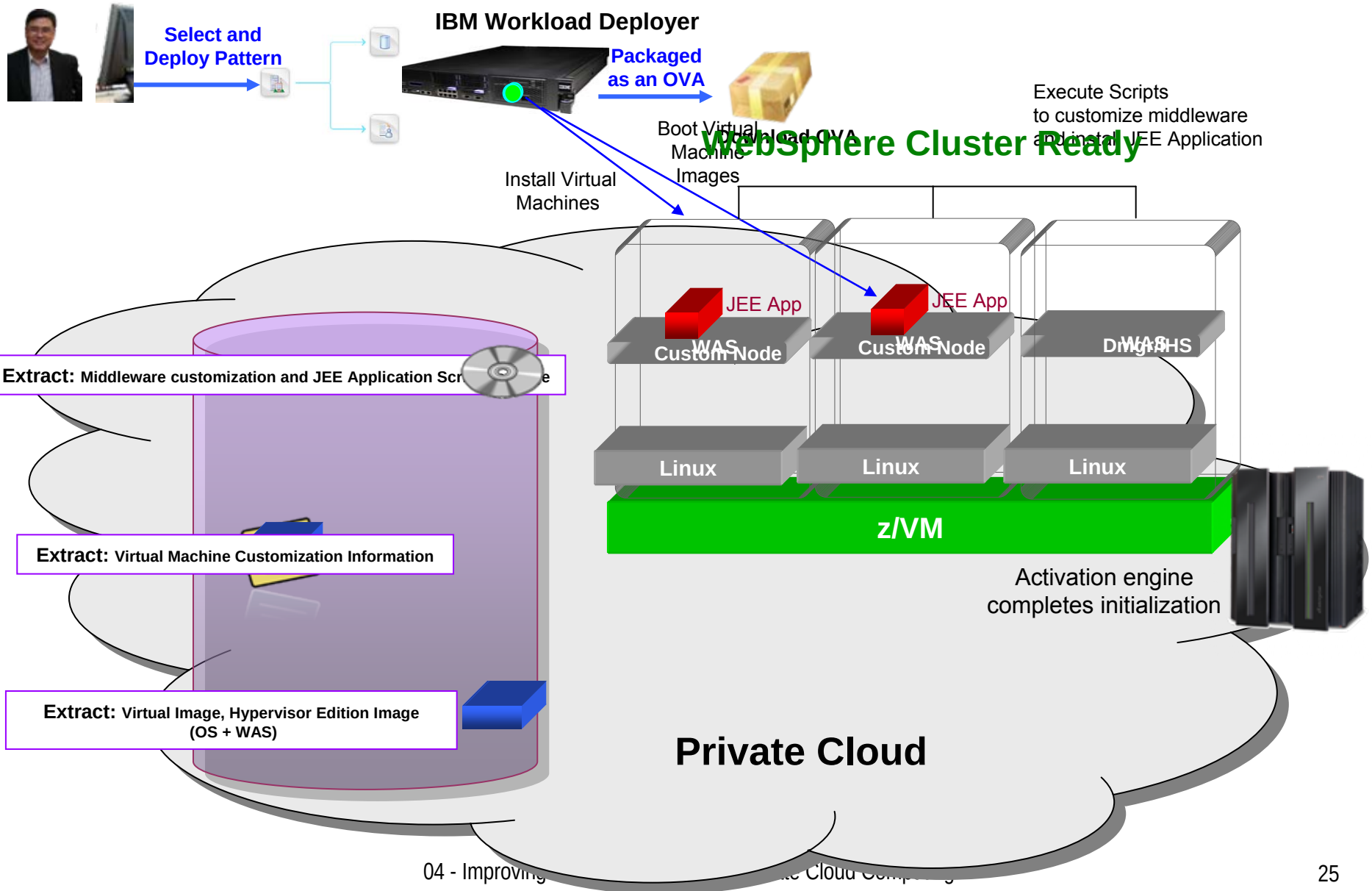
WebSphere cluster



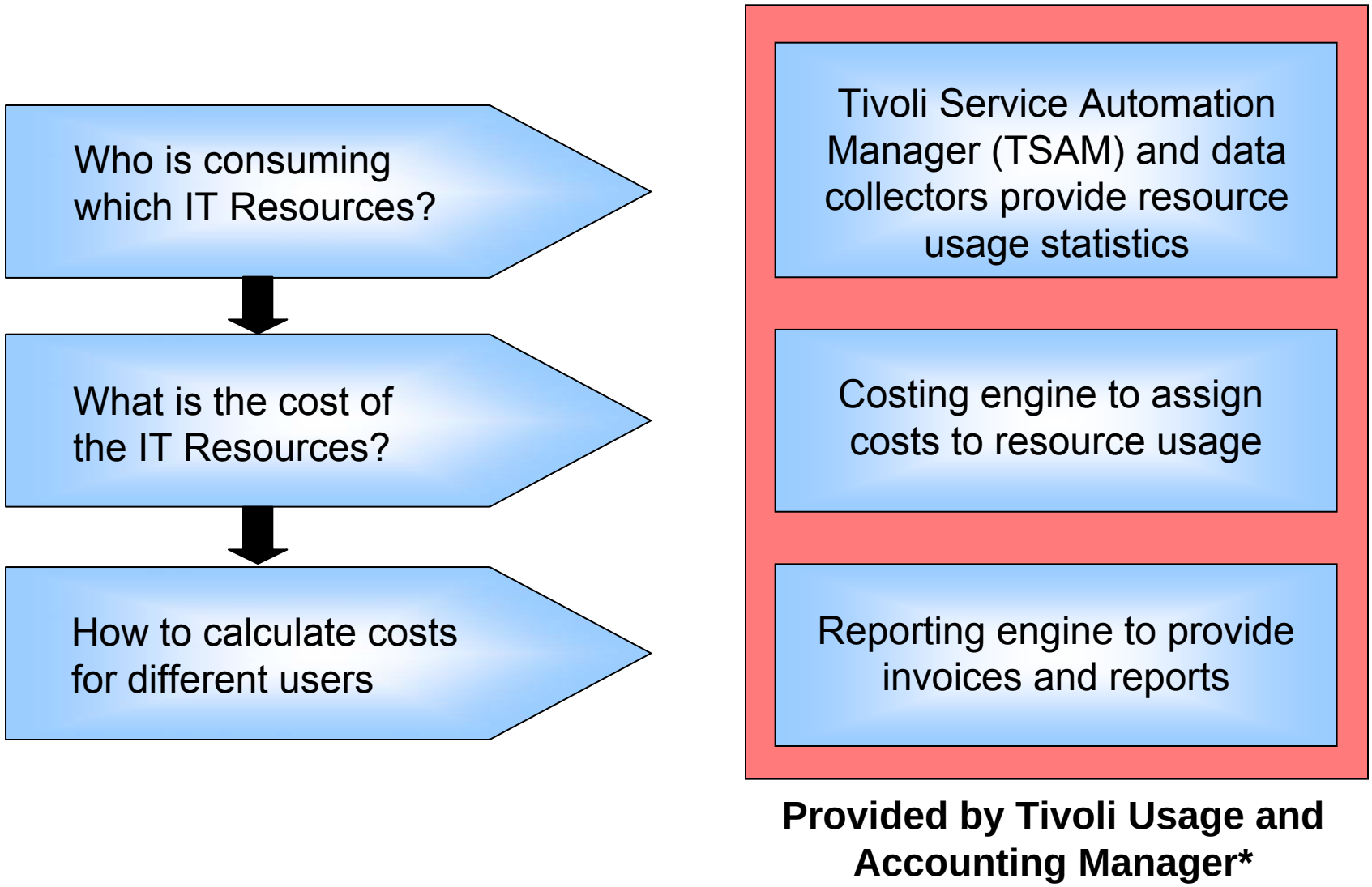
1. Create 3 virtual servers and install OS and middleware
   - 1 WebSphere deployment manager/IBM HTTP Server
   - 2 WebSphere Nodes
2. Configure the Deployment Manager/HTTP Server
3. Configure WebSphere Cluster with 2 members
4. Configure Session replication on servers to support Failover
5. Deploy the Application to the WebSphere Cluster

All of these steps are done automatically with IBM Workload Deployer Pattern

Example: Use Standardized Pattern For Automated Deployment Of WAS Clustered Environment

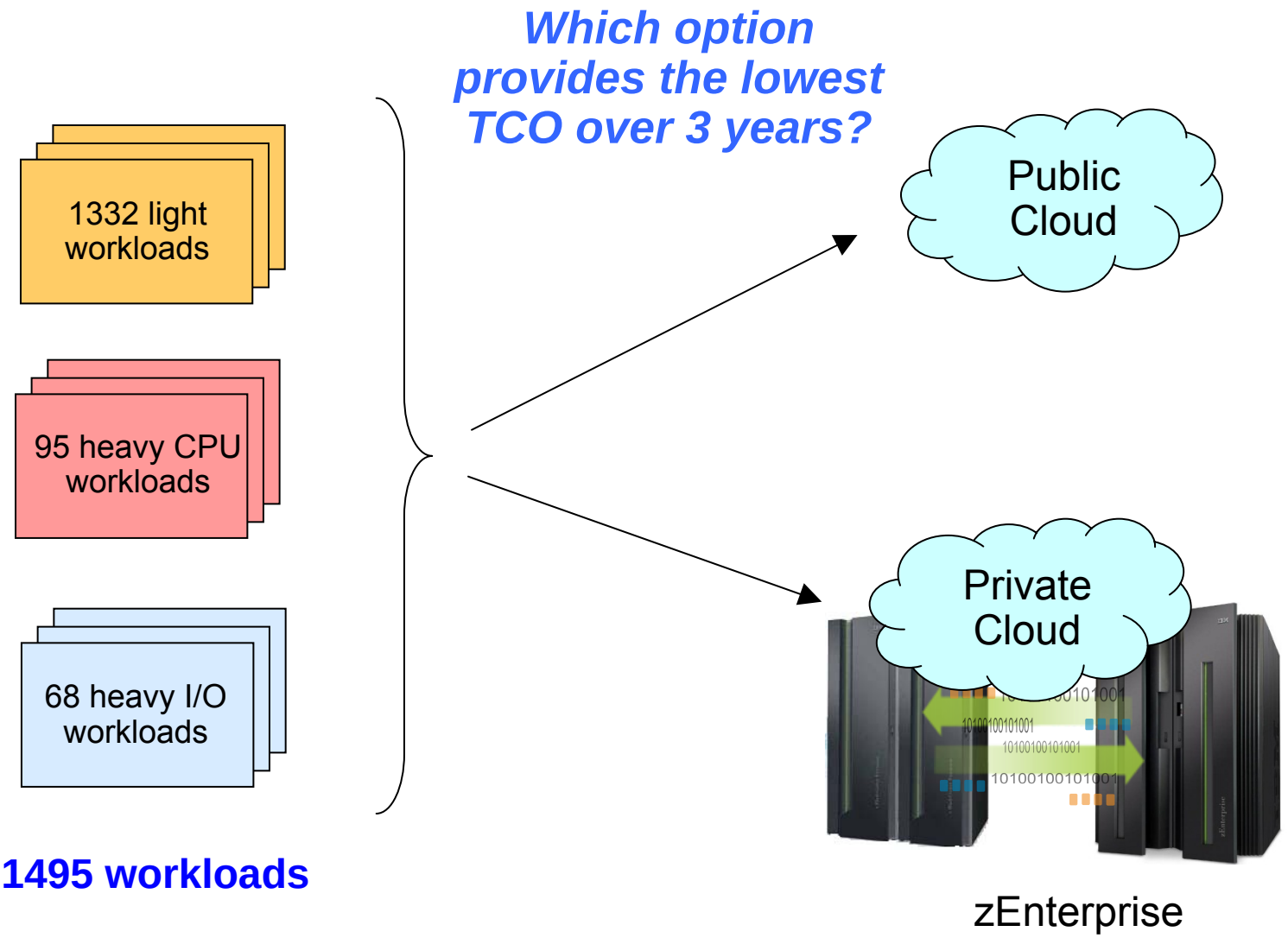


Pay-As-You-Go Chargeback With Tivoli Usage And Accounting Manager (TUAM)



Provided by Tivoli Usage and Accounting Manager*

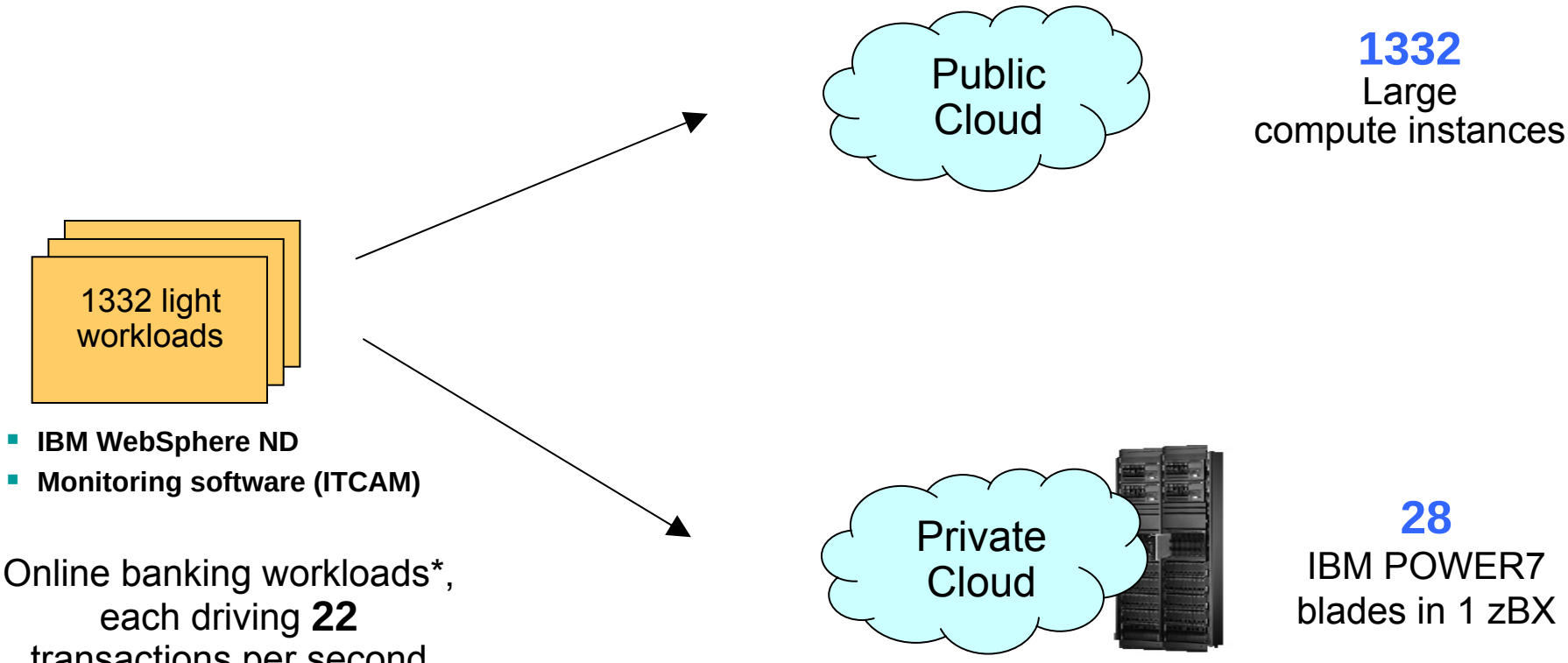
Public vs. Private Cloud: Which Option Costs Less For Delivering Mixed Workloads?



Variability In Image Usage Allows For Reduction In The Number Of Servers Required

- Consolidation ratios based on benchmark data assume “always on” operation
- On average, not all workloads are active all the time
- Amazon EC2 public cloud recognizes this by running with an “oversold” factor of 1.7
  - Assumes each server can support 1.7 times the indicated capacity of virtual machines
- This means we don’t need as many servers as the benchmarks indicate

Deploying Light Workloads



* CPO on-line banking benchmark

Deploying Heavy CPU Workloads With Light I/O

95 heavy CPU workloads

- **IBM WebSphere ND**
- **Monitoring software (ITCAM)**

Online banking workloads*, each driving **460** transactions per second with light I/O

Public Cloud

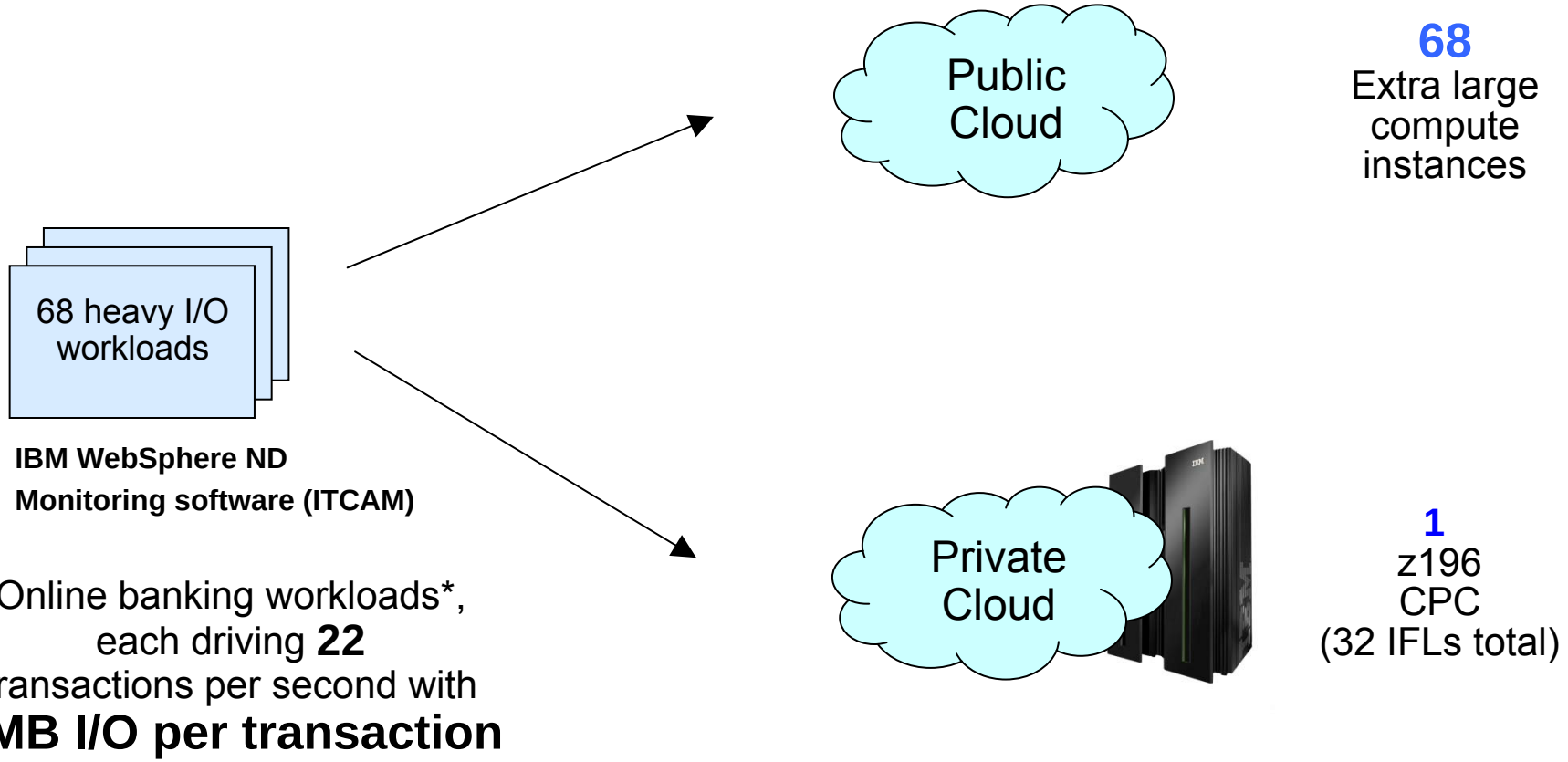
95
Cluster Compute Quadruple Extra Large compute instances

Private Cloud

28
IBM HX5 blades in 1 zBX

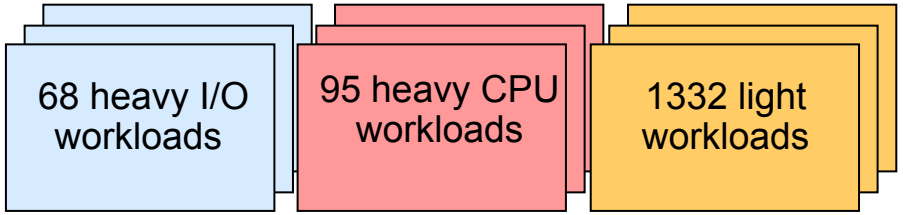
* CPO on-line banking benchmark

Deploying Light Workloads With Heavy I/O



* CPO on-line banking benchmark

Compare Cost Of Acquisition For 3 Years



Deployed on public cloud

Public Cloud

1495 Compute Instances

$99.2M (3yr TCA)

Optimized on zEnterprise

Private Cloud

zEnterprise

32 IFL's, 28 Intel blades, 28 Power blades

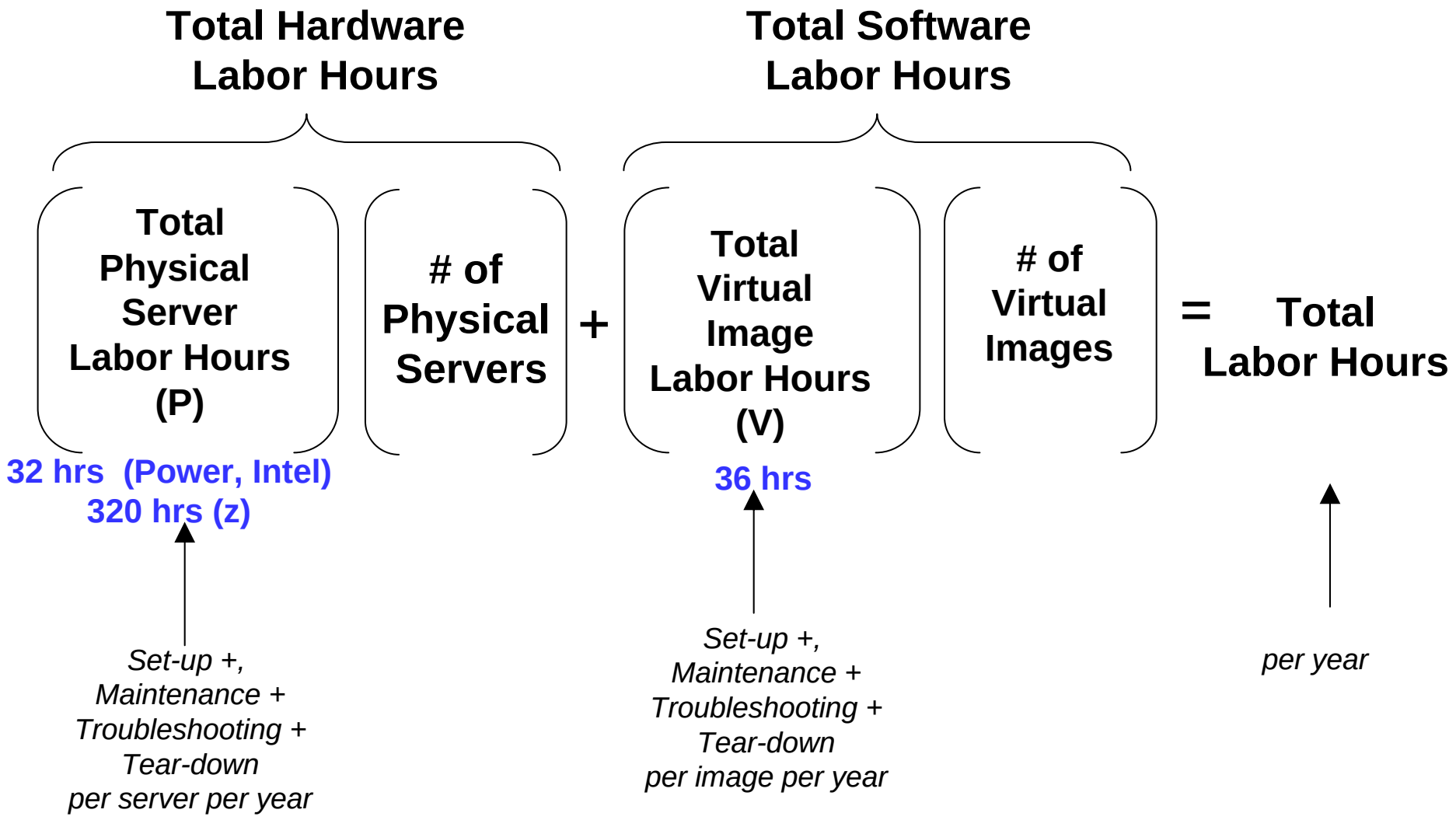
704 cores

$20.6M (3yr TCA)

79% less

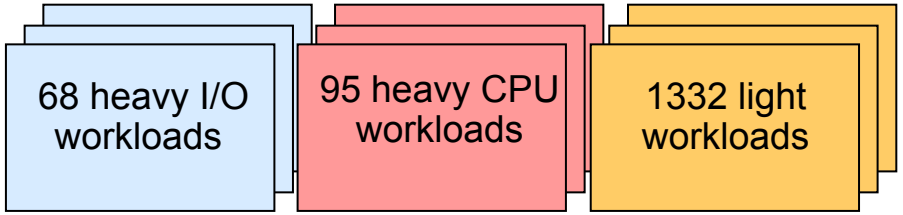
Server configurations are based on consolidation ratios derived from IBM internal studies. Prices are in US currency and will vary by country
Amazon case includes costs of instances and network
zEnterprise case includes costs of hardware, software, network, storage and power

A High-Level View Of The Labor Model – Best Fit To Field Data

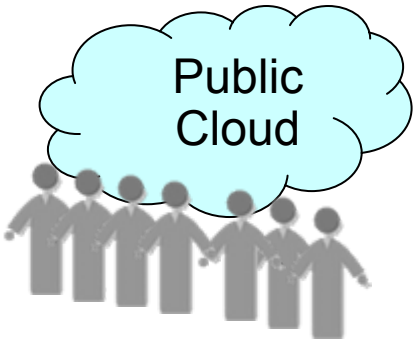


Values best fit to collected field data

Compare Labor Costs For 3 Years



Deployed on public cloud



42,086 labor hours/yr

20.23 administrators

$9.7M

3 years @ $159,600/yr

Optimized on zEnterprise

31,146 labor hours/yr

14.97 administrators

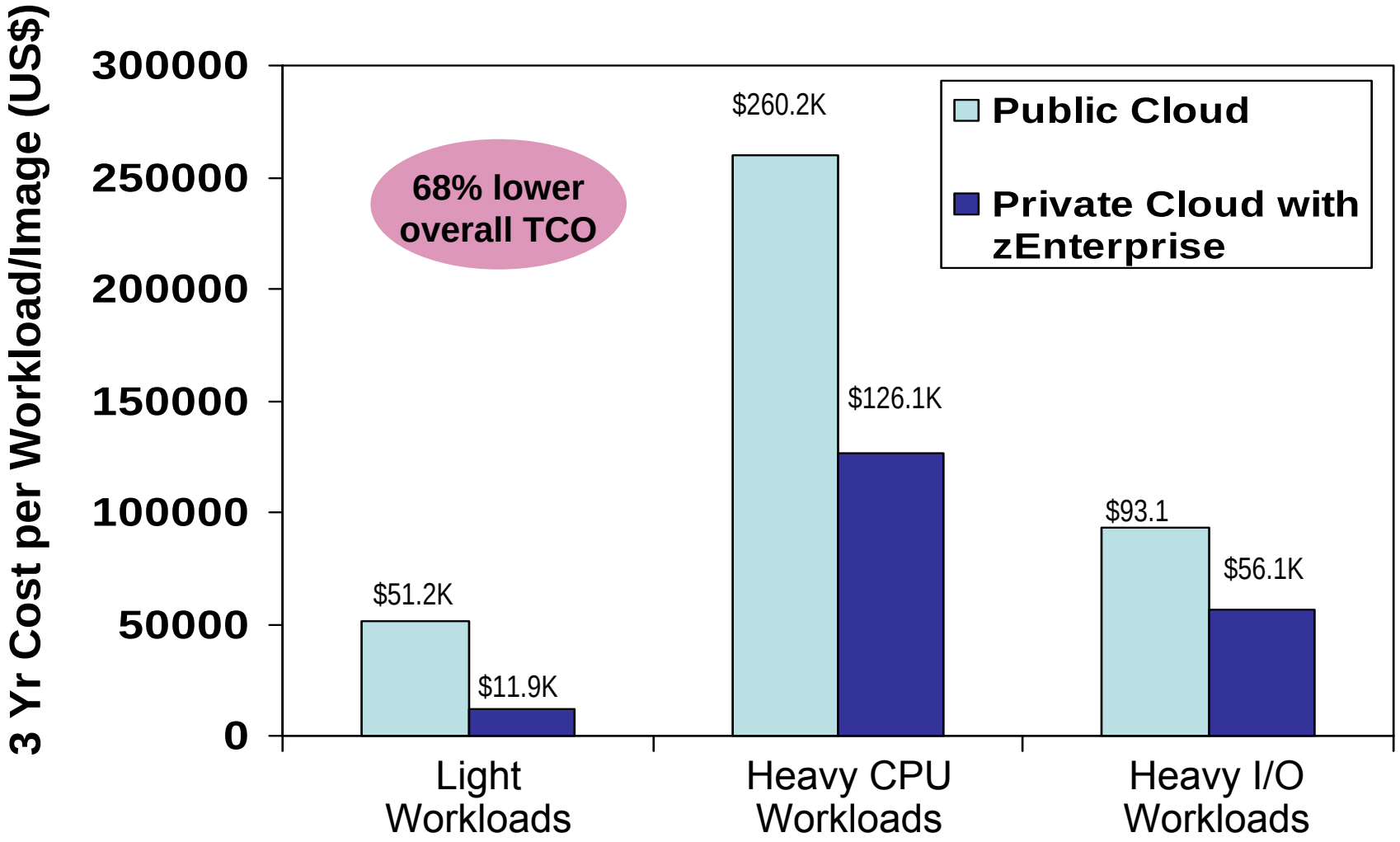
$7.2M

3 years @ $159,600/yr

26% less

Server configurations are based on consolidation ratios derived from IBM internal studies. Prices are in US currency and will vary by country

Private Cloud On zEnterprise Dramatically Reduces Costs For Workload



Source: IBM internal study. zEnterprise configurations needed to support the three workload types were derived from IBM benchmarks. Public cloud sizing needed to support the three workload types was calculated based on compute capacity of public cloud services. 3 yr TCO for public cloud based on pricing info available by the service provider. 3 yr TCO for zEnterprise includes hardware acquisition, maintenance, software acquisition, S&S and labor. US pricing and will vary by country.

University Of Bari Deploys A System z Cloud

Premier educational institution in southern Italy, with nearly 70,000 students and more than 1,800 teaching staff

- **Business need**
  - University needed a platform to facilitate cost-effective, flexible application development
- **Solution**
  - Virtualized infrastructure with IBM System z, IBM System Storage, SUSE Linux Enterprise Server for IBM System z
  - IBM System z Solution Edition for Cloud Computing (IBM Tivoli Service Automation Manager)
- **Benefits**
  - Virtualize the University laboratory for students
  - Provide very rapid provisioning and management of new development, test and production environments, and enable each environment to scale up or down to meet demand
  - System z cloud has enabled the development of innovative applications for the local fishing, wine-making and transportation, as well as the University itself

"The IBM System z Solution Edition for Cloud Computing eliminates the trouble and expense of buying and managing new infrastructure, making the development of small-scale solutions much more viable. Moreover, as demand for a solution increases, the cloud can simply allocate more resources, so there is no problem with scalability."
—Professor Visaggio, full professor of Software Engineering at the University of Bari

Satisfy Everyone While Reducing Costs With A Private Cloud On zEnterprise

- ✓ Standardized services
- ✓ Flexibility
- ✓ Elasticity
- ✓ Security
- ✓ Reduce costs

Data Center Manager

- ✓ Self-service
- ✓ Fast provisioning
- ✓ Elasticity
- ✓ Security
- ✓ Low cost pay as you go

User