



# **zEnterprise – An Ideal Basis For Smarter Computing**

Improving Service Delivery With  
Private Cloud Computing

# What Do Data Center Managers Want?

- Standardization to simplify 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 computing resources
- Elastic capability
  - ▶ Resource can be provisioned to quickly scale out and rapidly released to quickly scale in
- 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
- ✓ Low cost pay as you go



User

# Businesses Have Concerns About Public Clouds

## ■ Lack of Reliability

- ▶ Examples of public cloud outages
  - September 2011, Amazon, 2 days
  - August 2011, Amazon, 1 hour
  - 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

### *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!

# zEnterprise Is An Ideal Platform For Private Clouds

## Virtualization Platform

zEnterprise and DS8000 Storage

BladeCenter Extension (zBX)

Unified Resource Manager (zManager)

Enterprise Linux Server Solution Edition for Enterprise Linux

Multi-architecture virtual environment

Elasticity

## Entry Cloud

zEnterprise Cloud Starter Edition

Adds

Automated provisioning

Resource monitoring

## Advanced Cloud

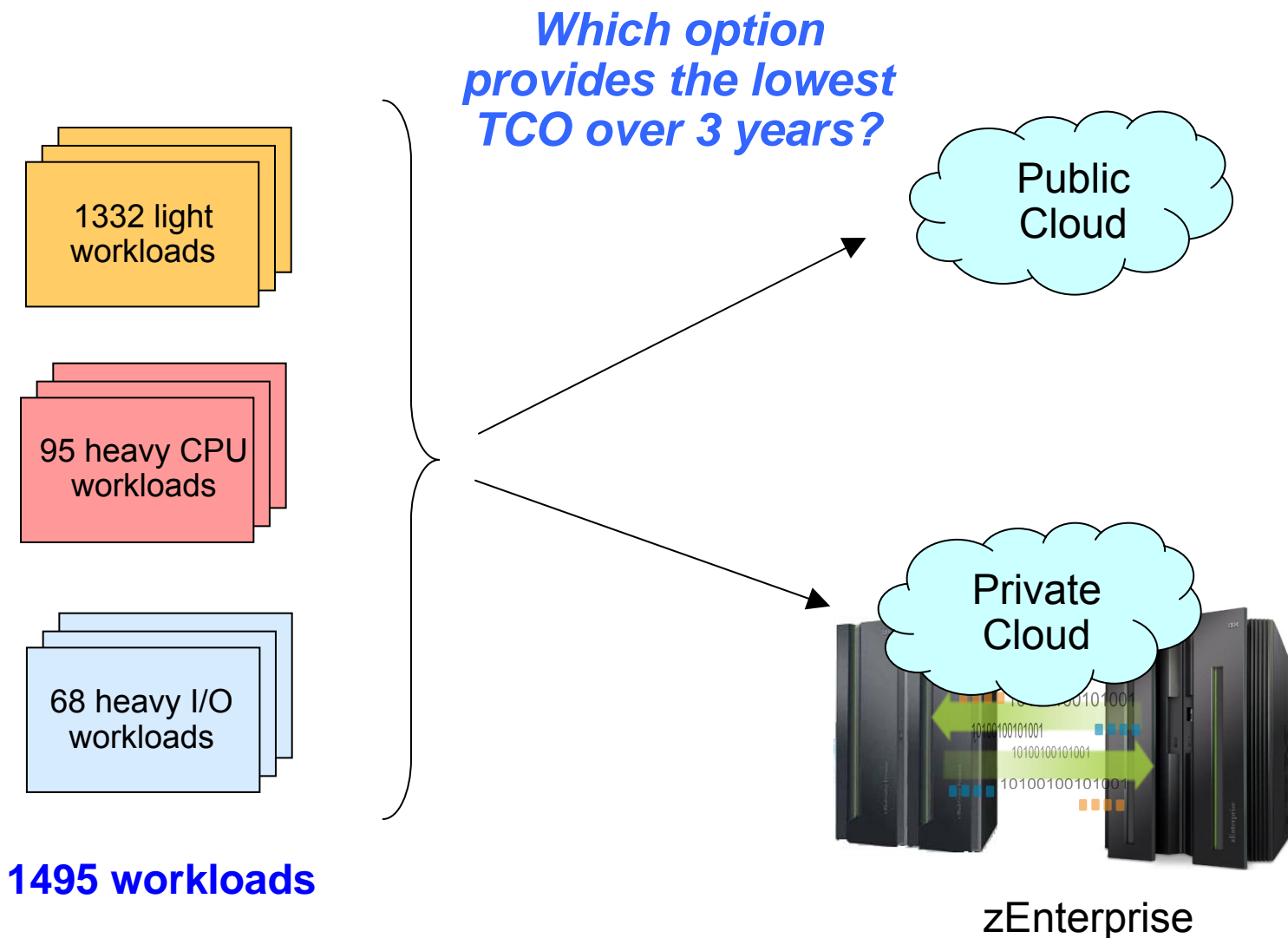
System z Solution Edition for Cloud Computing

Adds

Self-service

Metering and billing

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

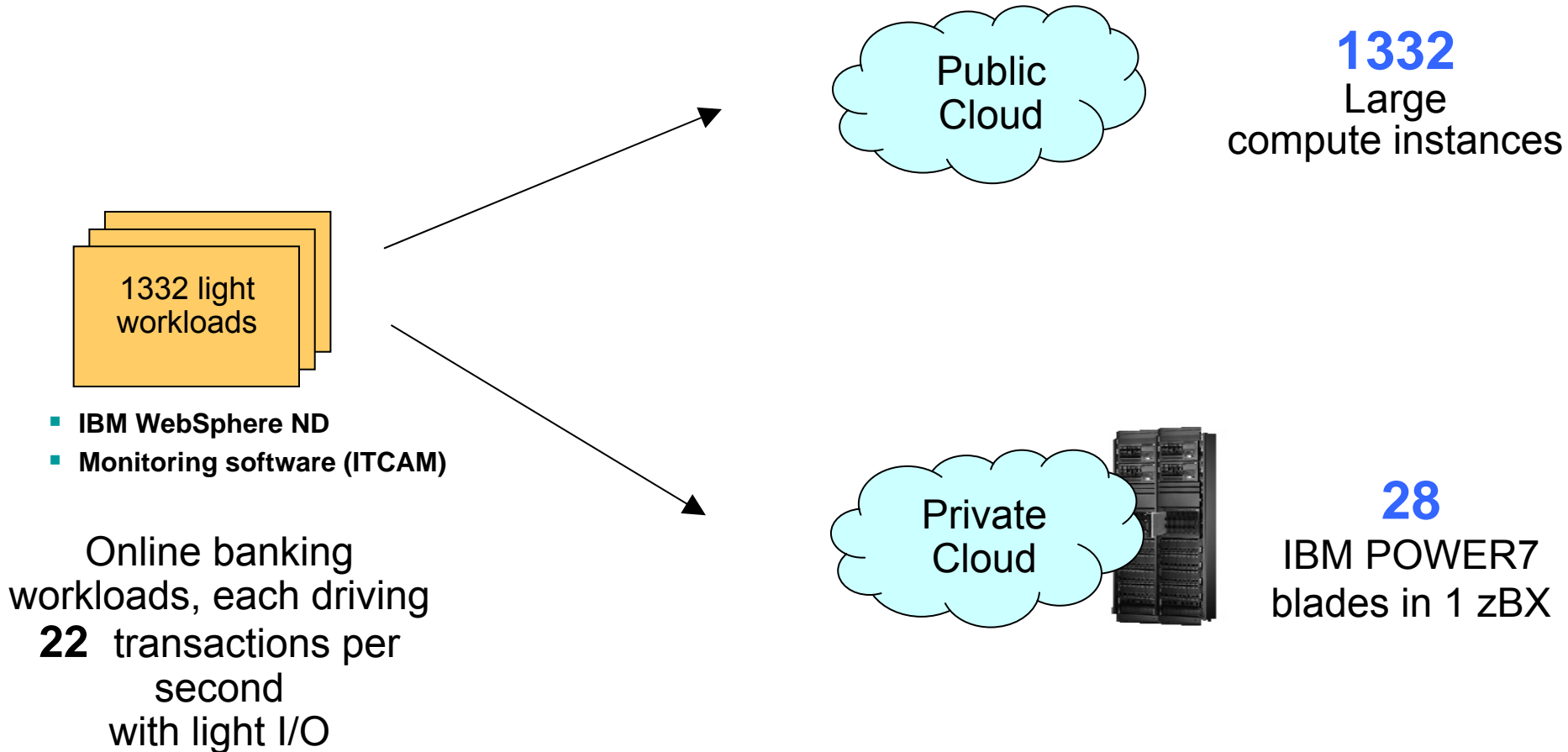




# Variability In Image Usage Allows For Reduction In The Number Of Servers Required

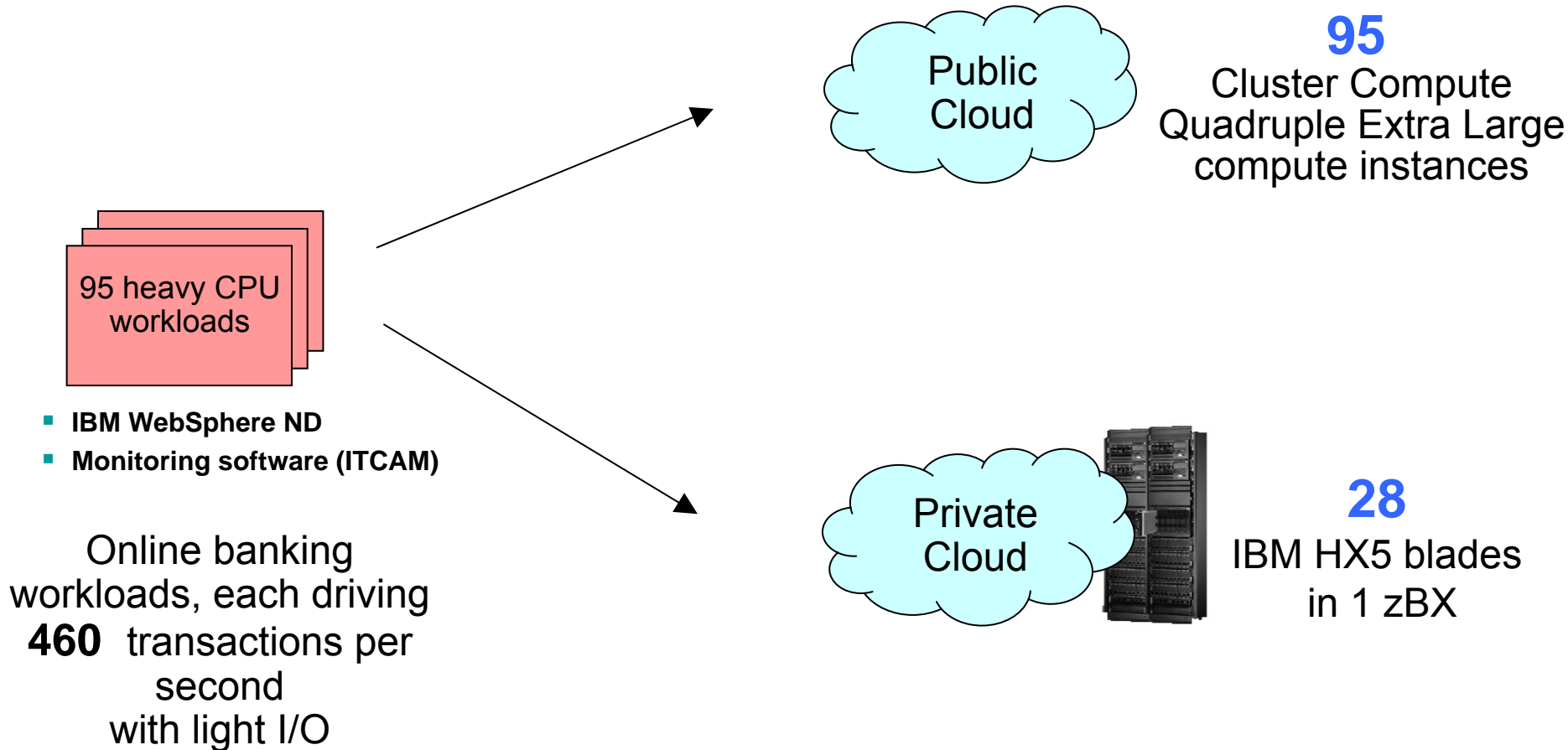
- Consolidation ratios based on comparison data assume “always on” operation
- On average, not all workloads are active all the time
- Some public cloud providers recognize this by running with an “oversold” factor of 1.7
  - ▶ Assumes each server can support 1.7 times the indicated capacity of virtual machines
- This means we don't need as many servers as the comparisons indicate for our private cloud

# Deploying Light Workloads



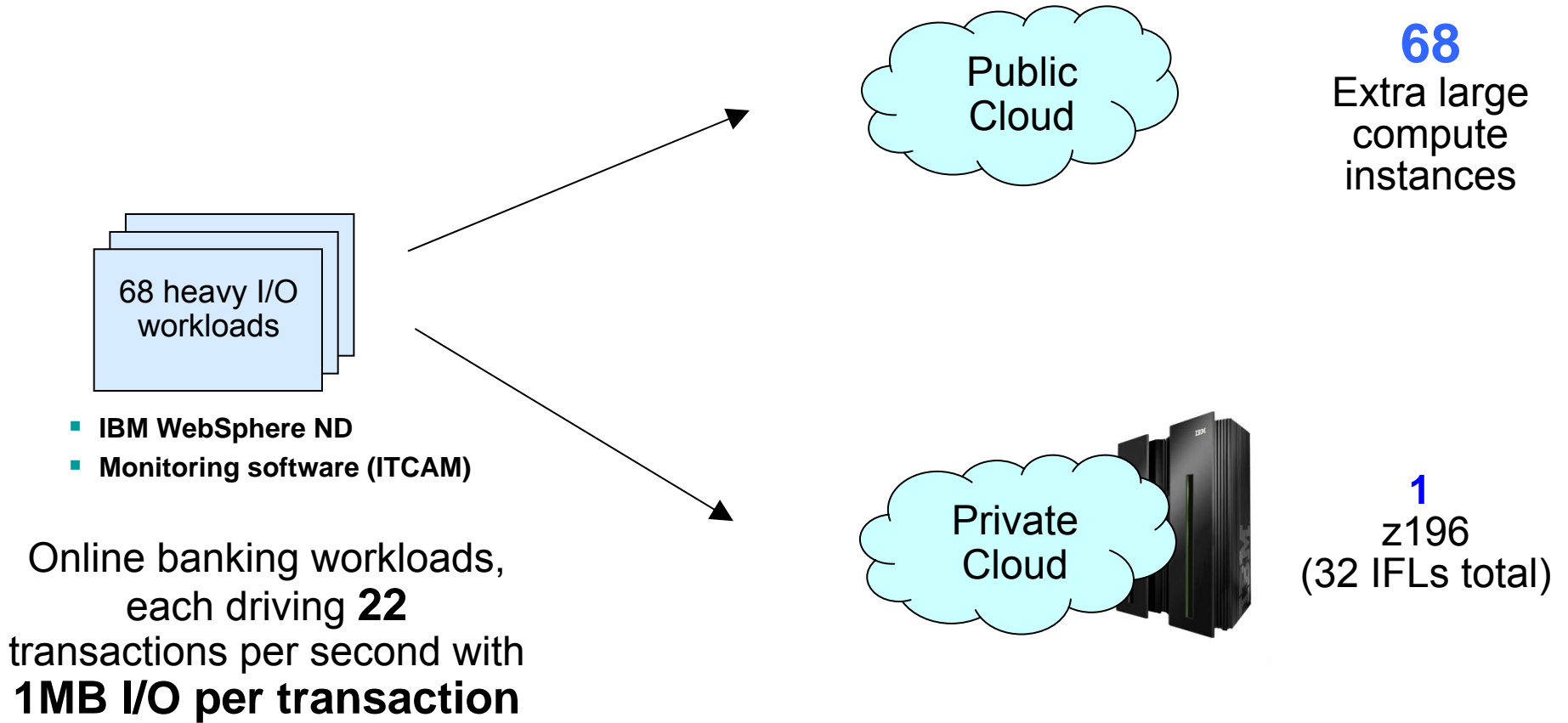
Based on IBM internal on-line banking comparison with applied 1.7 oversold factor

# Deploying Heavy CPU Workloads With Light I/O



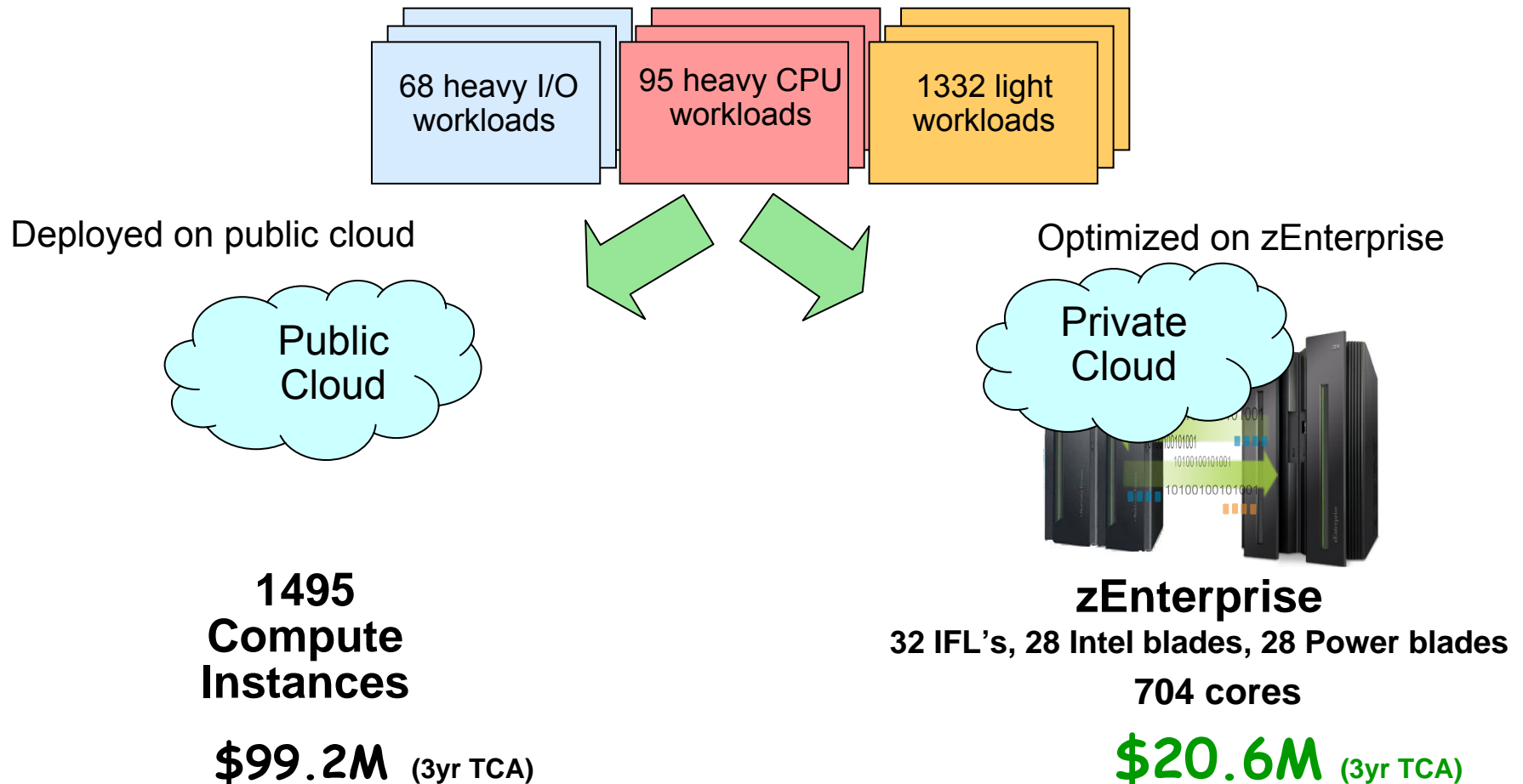
Based on IBM internal on-line banking comparison with applied 1.7 oversold factor

# Deploying Light Workloads With Heavy I/O



Based on IBM internal on-line banking comparison with applied 1.7 oversold factor

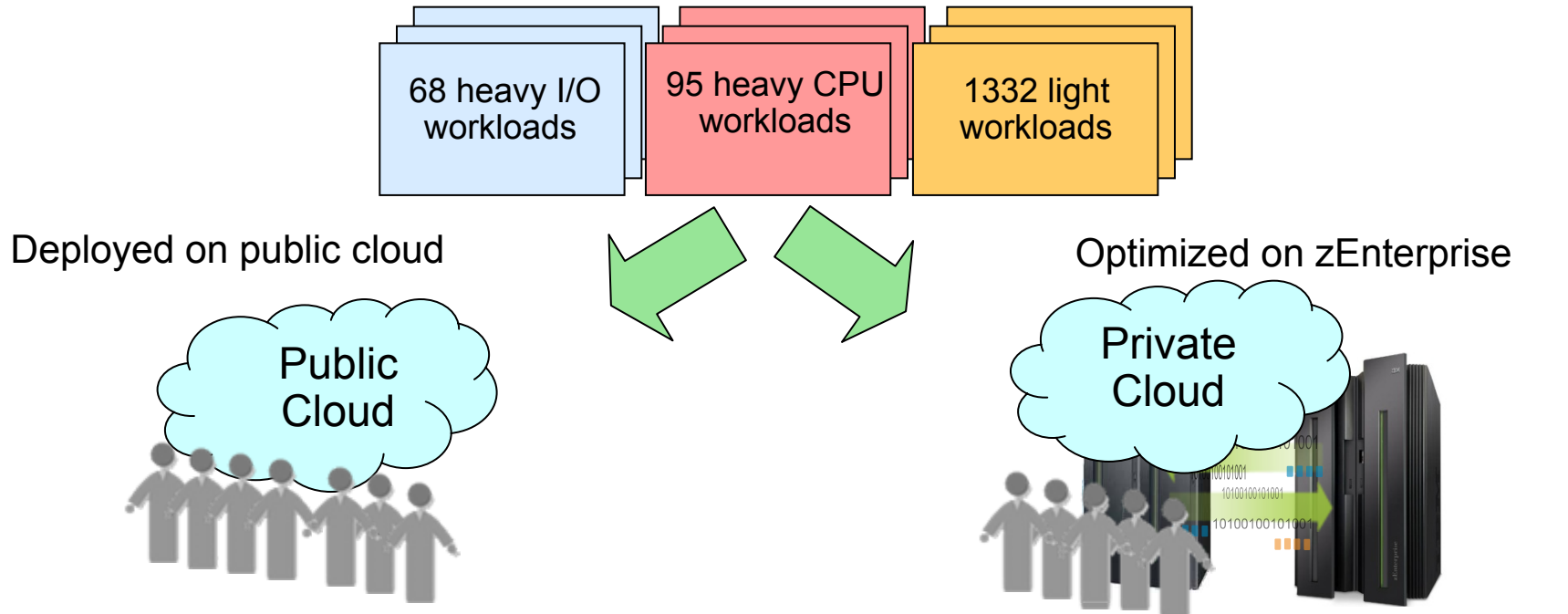
# Compare Cost Of Acquisition For 3 Years



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

**79% less**

# Compare Labor Costs For 3 Years



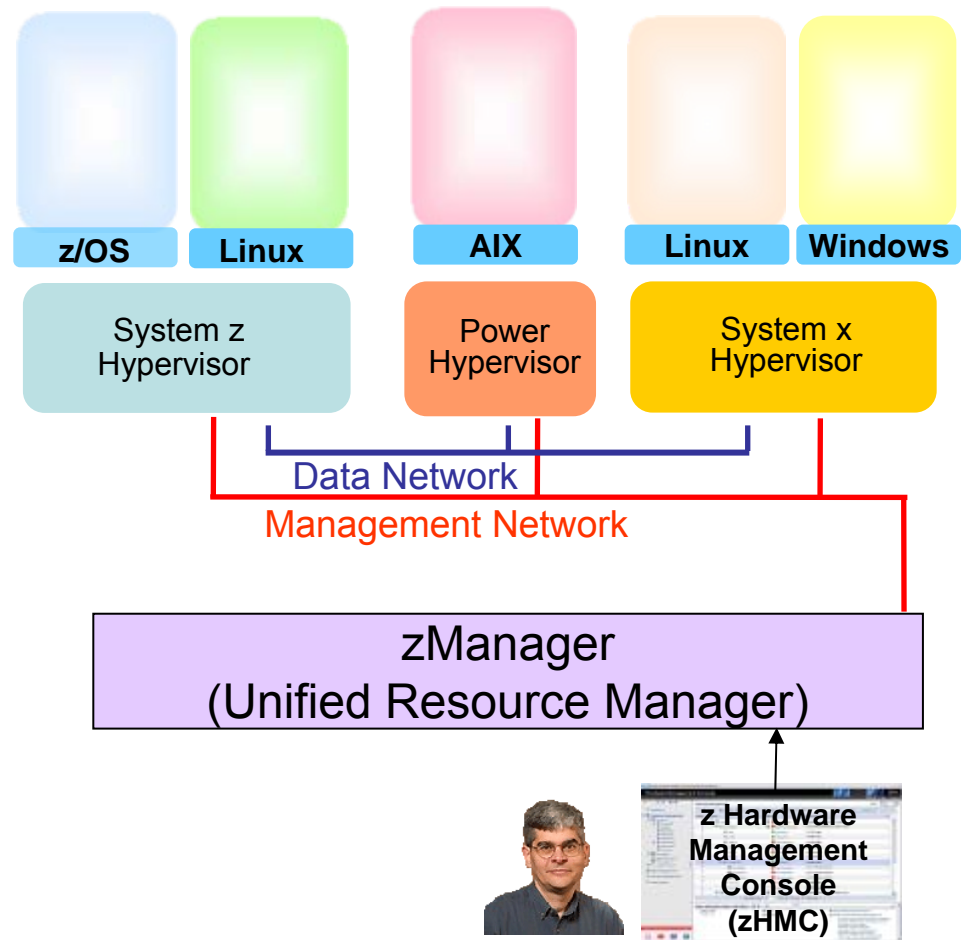
Public cloud eliminates work to provision hardware and virtual machines, but still requires work to provision software, and to manage virtual images

**zManager** reduces work required to provision hardware, virtual machines and software, and to manage virtual images

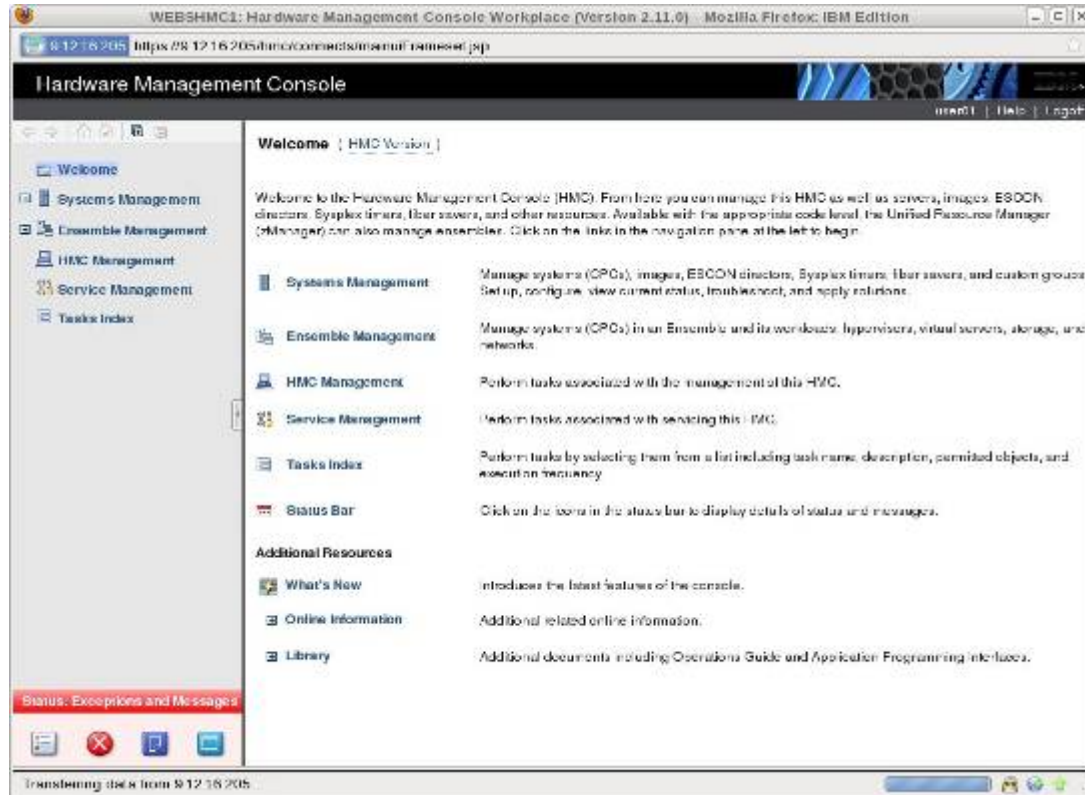
***Which option provides the lowest labor costs?***

# zManager Provides Consistent Structured Management For All Virtual Environments

- **Manage machine resources from single focal point**
  - ▶ Add processors to z114 / z196 while running
  - ▶ Add and configure a blade to zBX while running
  - ▶ Create virtual machines and networks quickly
  - ▶ Runs in service element
- **Virtual machine lifecycle management**
  - ▶ Create, monitor, optimize, destroy
- **Automated functions reduce time and labor**



# DEMO: An Introduction To zManager



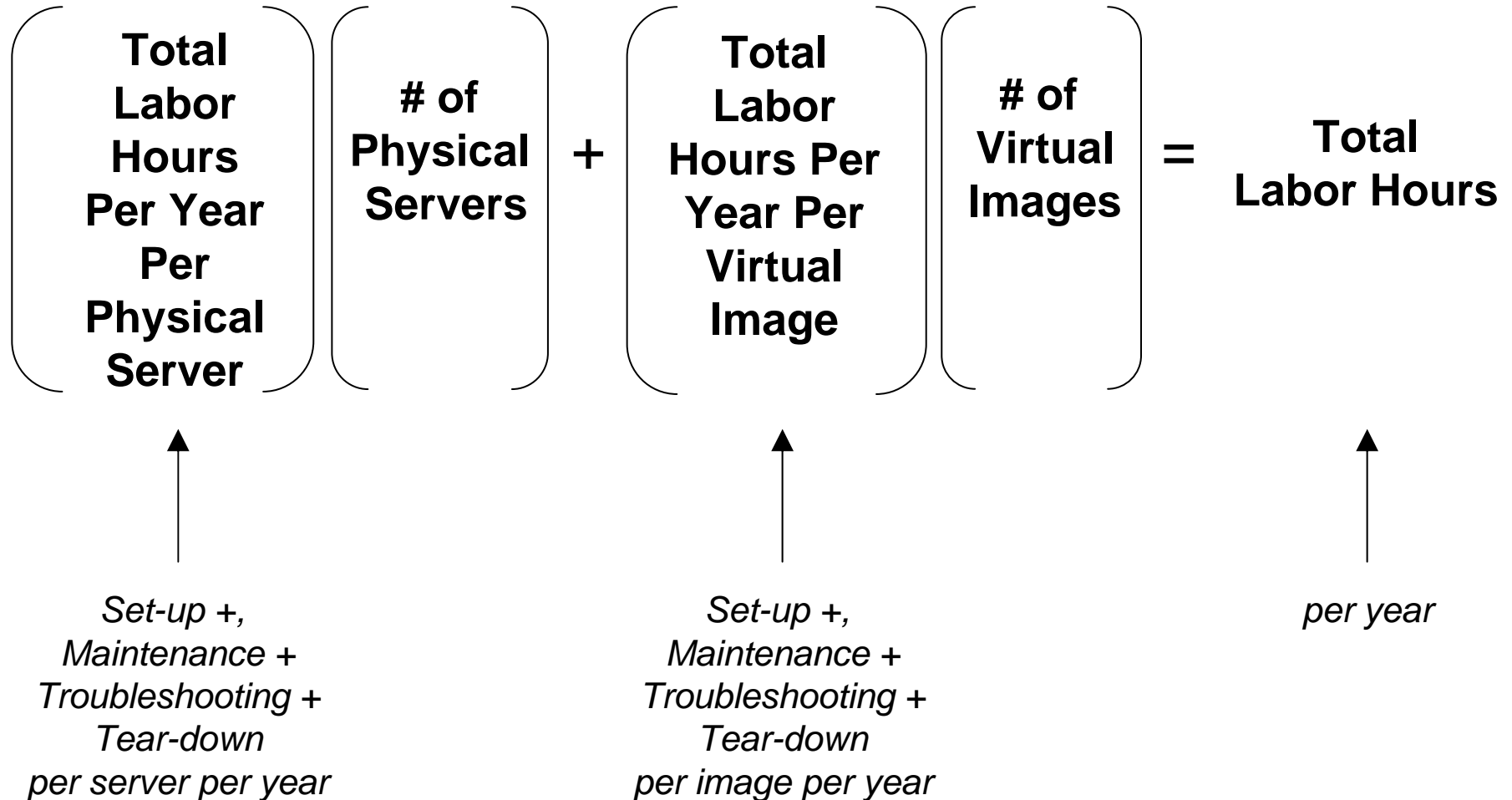
- zManager uses familiar HMC interface
- View and manage all zEnterprise platforms



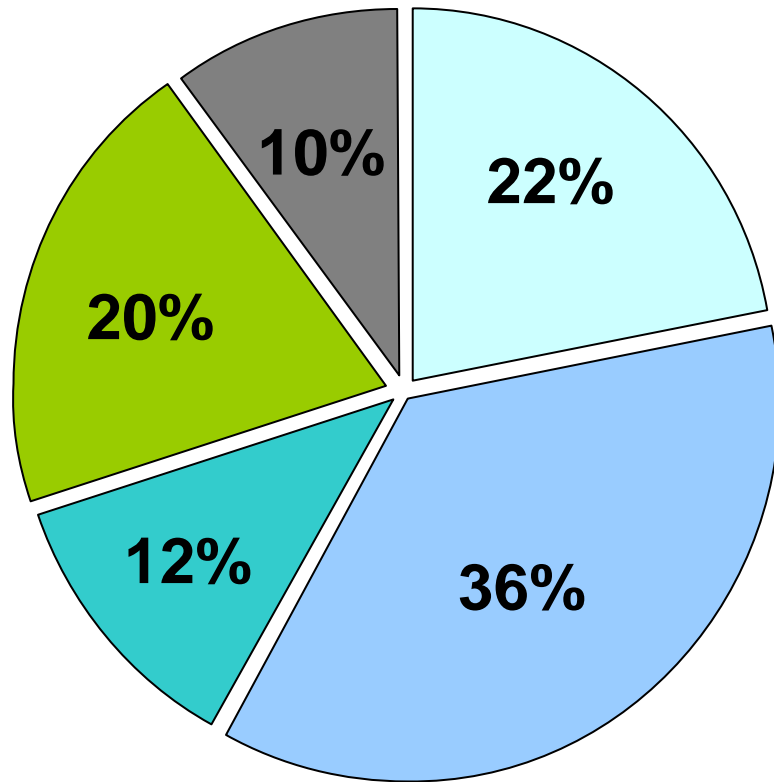
# A Labor Cost Model Is Needed To Assess zManager Benefits

- Field data metrics typically stated in “servers per full-time-equivalent person”
- Allocate hours to
  - ▶ Tasks for each physical server
  - ▶ Tasks for each software image
- Further allocate hardware and software hours to key ITIL processes
- Labor model is a best fit to data from customers, analyst surveys, lab studies, and Alinean tool
- Use model to assess how zManager (Unified Resource Manager) or public cloud will reduce task hours required

# A High-Level View Of The Labor Model



# Labor Model Includes Five Key IT Processes For Infrastructure Administration



Proportional allocation of labor

# zManager Capabilities Reduce Labor Required

Process	Typical Distributed Management Practices	zManager
<b>Deployment Management</b>	<ul style="list-style-type: none"> <li>Manually configure hypervisor and physically set up and configure networks</li> </ul>	<ul style="list-style-type: none"> <li>Automated deployment of hypervisor and out-of-the box physically isolated networks</li> </ul>
<b>Incident And Capacity Management</b>	<ul style="list-style-type: none"> <li>Passive monitoring</li> <li>No end-to-end transaction monitoring</li> <li>Manually monitor virtual machine performance and adjust resources to meet performance goals</li> </ul>	<ul style="list-style-type: none"> <li>Active and continuous monitoring to fix problems quickly</li> <li>End-to-end transaction monitoring to isolate and fix issues</li> <li>Automatic resource adjustments for workloads to meet performance goals</li> </ul>
<b>Asset Management</b>	<ul style="list-style-type: none"> <li>Discover assets with ad hoc manual methods</li> <li>Manual entitlement management</li> </ul>	<ul style="list-style-type: none"> <li>Automated discovery and management of entitlement of assets</li> </ul>
<b>Security Management</b>	<ul style="list-style-type: none"> <li>Multiple, disparate user access management</li> </ul>	<ul style="list-style-type: none"> <li>Centralized, fine-grain user access management</li> </ul>
<b>Change Management</b>	<ul style="list-style-type: none"> <li>No visibility into impact of changes. No standardized procedure to retrieve and apply firmware changes</li> </ul>	<ul style="list-style-type: none"> <li>Visibility into impact of changes. Retrieve and apply firmware changes in a standardized fashion</li> </ul>

# zManager Minimizes Time And Labor For Hardware Setup (Hypervisor And Network)

- 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

Manage zBX Blade Entitlement - P00ETM02

Set up your zBX Blade Entitlements using the table below.

zBX Blades

Select	Location	MTMS	New Entitlement	Current Entitlement	Valid Entitlements
<input type="checkbox"/>	B01BBS04	7870-PEL/YK105000B504	Not entitled	Not entitled	ISAO
<input type="checkbox"/>	B01BBS03	7870-PEL/YK105000B503	Not entitled	Not entitled	ISAO
<input type="checkbox"/>	B01BBS02	7778-23X/YK105003B502	Not entitled	Not entitled	PASB
<input type="checkbox"/>	B01BBS01	7778-23X/YK105003B501	Not entitled	Not entitled	PASB
<input type="checkbox"/>	B10BBS04	7778-23X/YK105003B504	PASB	Not entitled	PASB
<input type="checkbox"/>	B10BBS03	7778-23X/YK105003B503	Not entitled	Not entitled	PASB
<input type="checkbox"/>	B10BBS02	7872-ACI/YK105002B502	Not entitled	Not entitled	XASB
<input type="checkbox"/>	B10BBS01	7872-ACI/YK105002B501	Not entitled	Not entitled	XASB
<input type="checkbox"/>	C01BBS04	7778-23X/YK105003B504	Not entitled	Not entitled	PASB
<input type="checkbox"/>	C01BBS03	7778-23X/YK105003B503	XASB	Not entitled	PASB
<input type="checkbox"/>	C01BBS02	7778-23X/YK105003B502	Not entitled	Not entitled	PASB

Total: 16 Filtered: 16 Selected: 0

zBX Blade entitlement counts

Entitlement Type	Current	Maximum	Spares
ISAO	0	10	6
WDPXI50B	0	10	0
PASB	0	10	8
XASB	0	10	2

OK Cancel Help

# 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
<b>TOTAL TIME</b>	<b>1 hr 48 min 52 sec</b>	<b>46 min 10 sec</b>

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

**97%** reduction  
in labor time

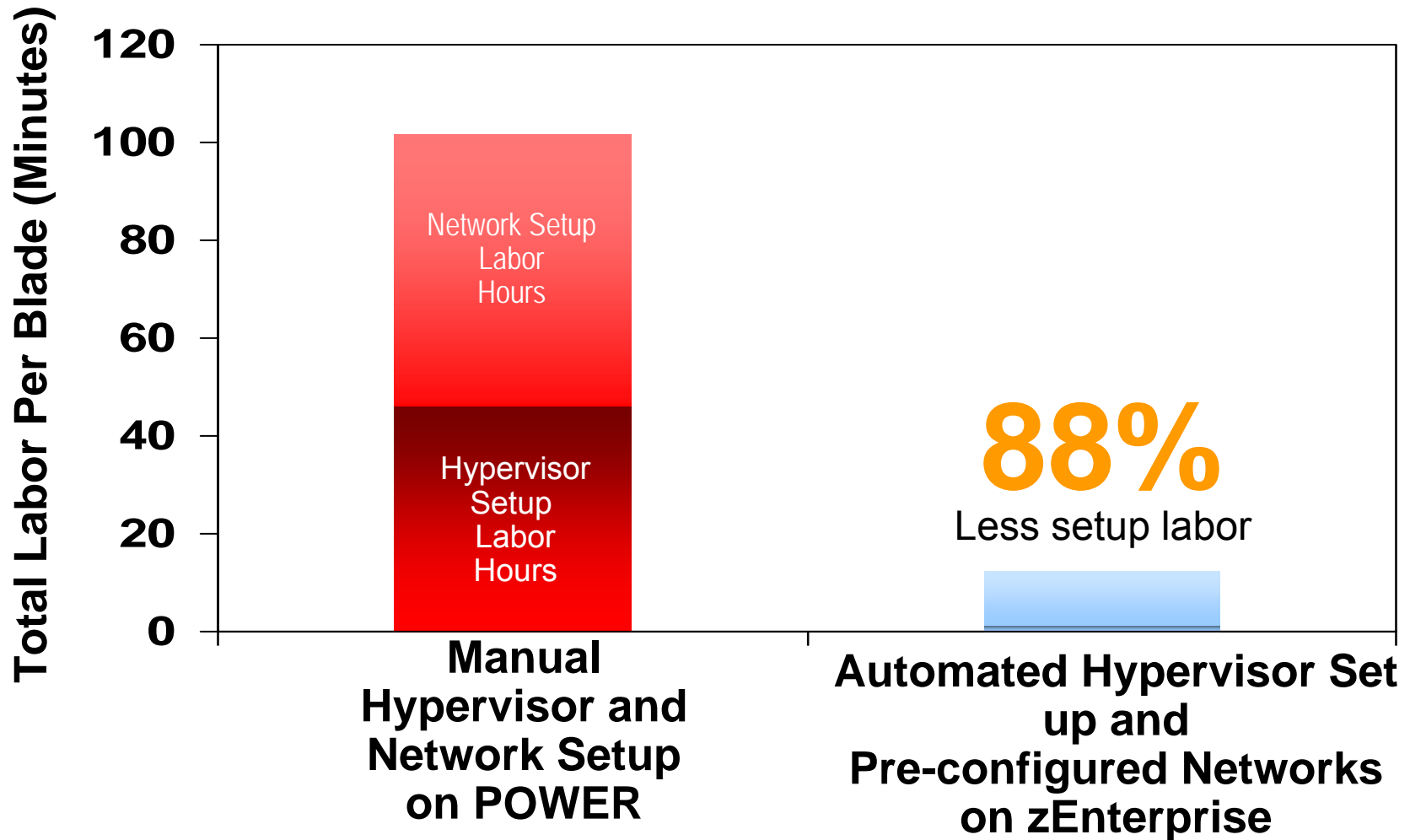
# Network Setup And Configuration Lab Test – Do-It-Yourself vs. zManager

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
<b>TOTAL TIME</b>	<b>26 hrs</b>

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
<b>TOTAL TIME</b>	<b>5 hrs</b>

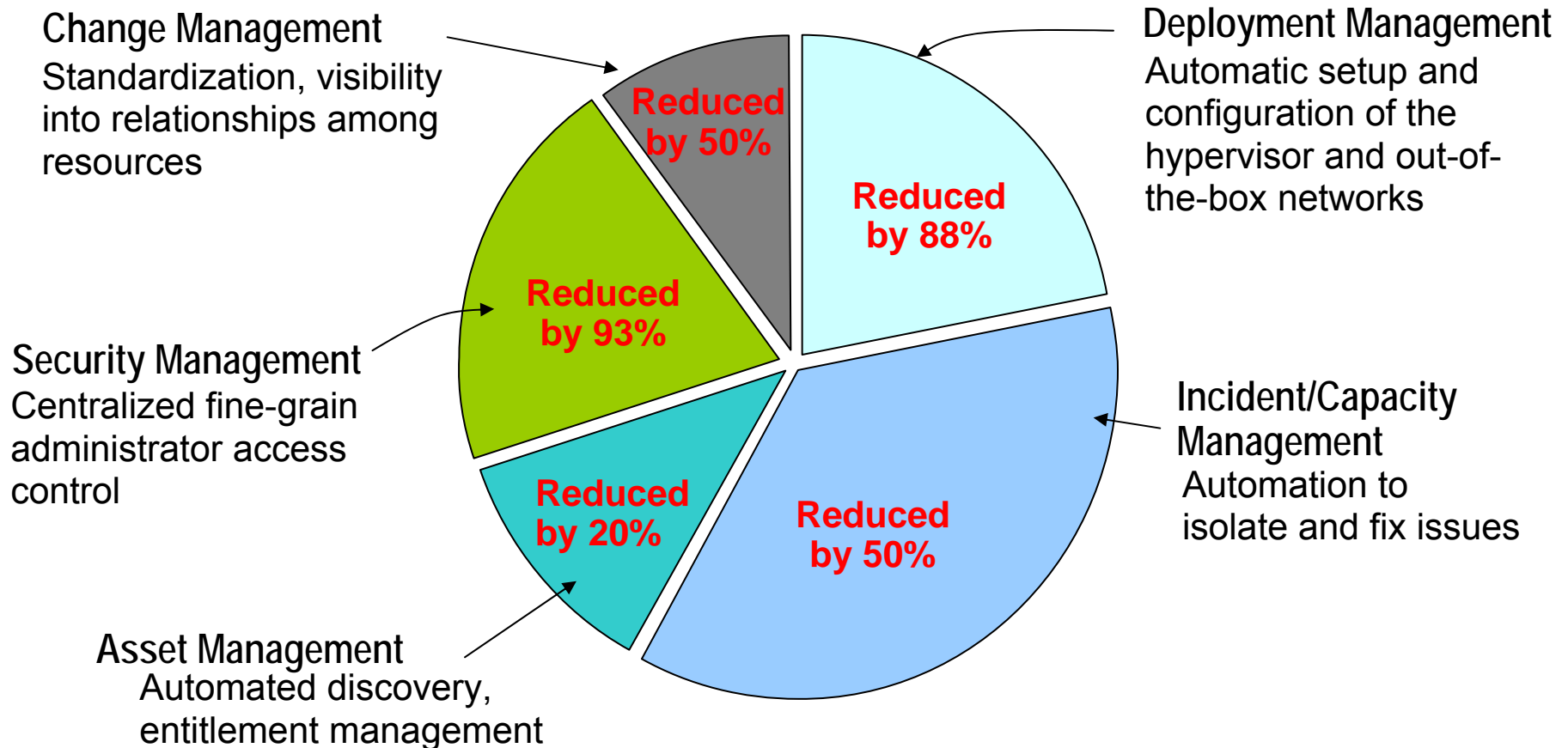
**81%** reduction  
in labor time

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

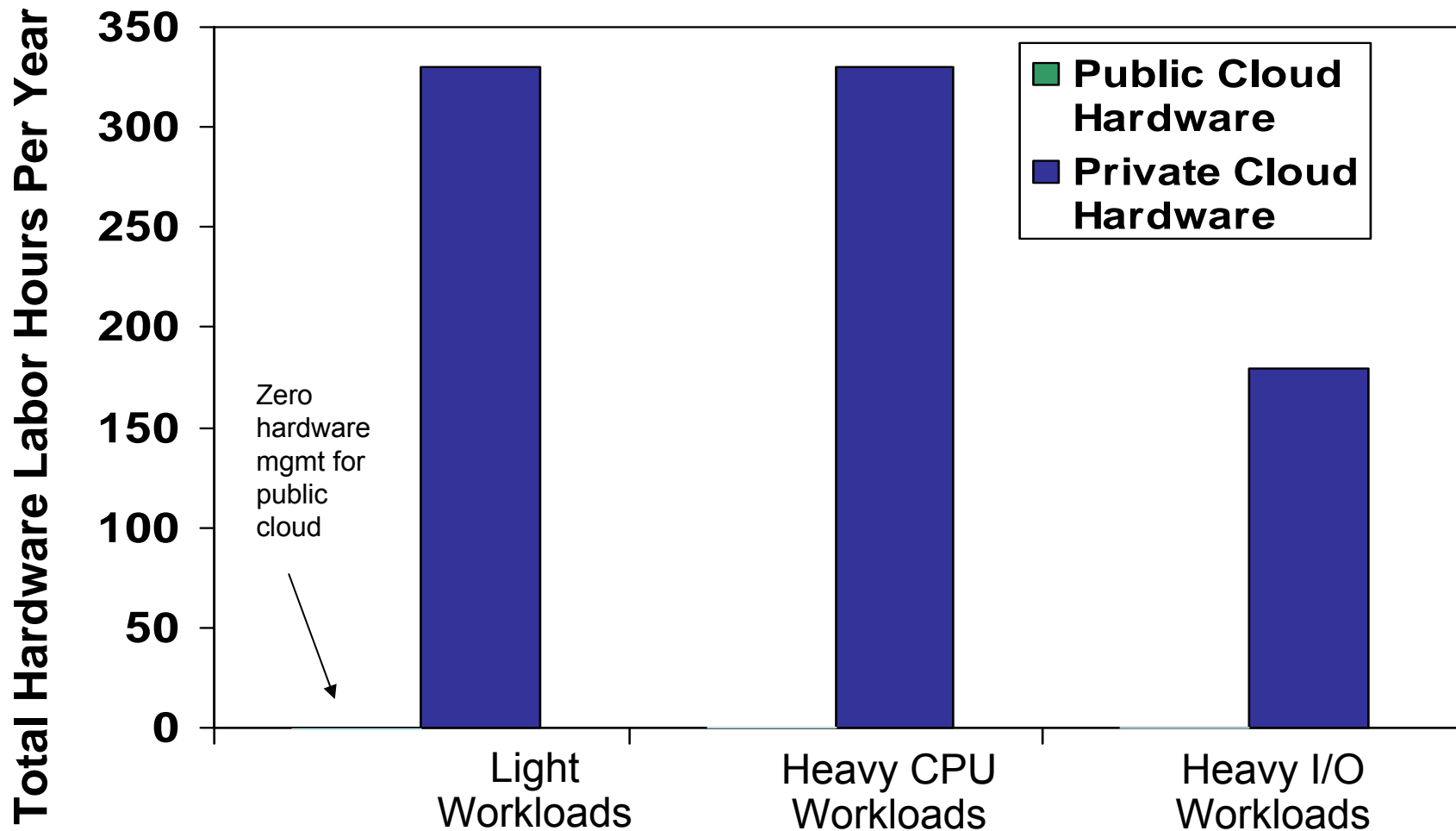




# Model Predicts Hardware Labor Hours Reduction With zManager

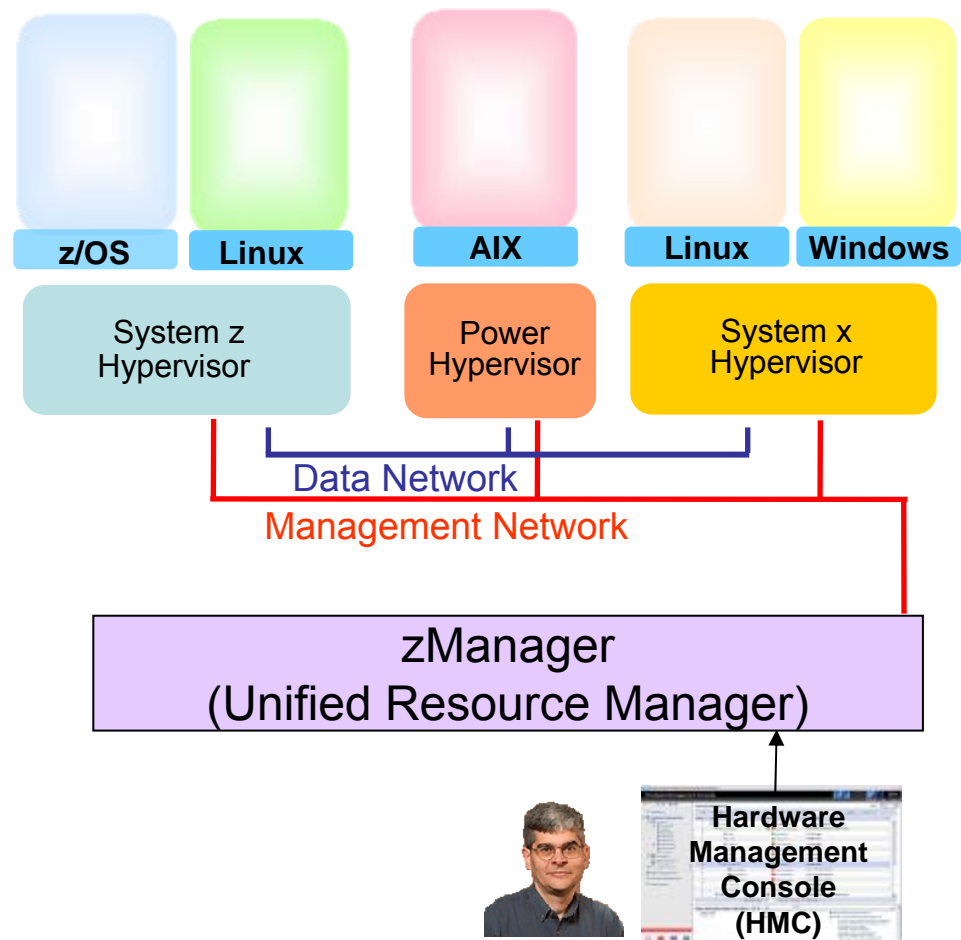


# Comparison of Hardware Labor Hours – Public vs Private Cloud with zEnterprise



# 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

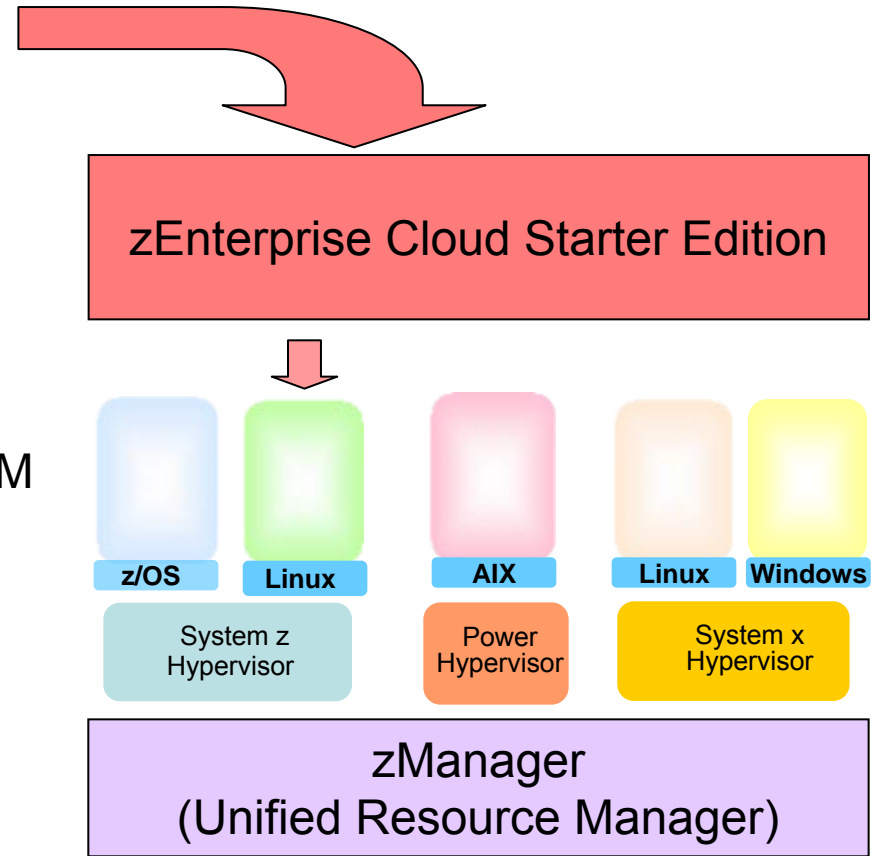
- ▶ Enter name for virtual server
- ▶ Assign number of virtual processors
- ▶ Specify memory
- ▶ Add network device
- ▶ Add storage device
- ▶ Specify boot option
- ▶ Select workload

The screenshot shows a web browser window with the URL `https://9.12.16.205/hmc/content?taskId=281&refresh=726`. The page title is "New Virtual Server - B.1.07". On the left, a navigation menu lists steps: Welcome, Enter Name (highlighted), Assign Processors, Specify Memory, Add Network, Add Storage, Specify Boot Options, Select Workloads, Performance Management, and Summary. The main content area is titled "Enter Name" and contains the instruction "Enter in a name and description for the virtual server." Below this, the "Hypervisor name" is set to "B.1.07" and the "Hypervisor type" is "POWER Blade". The "Name" field contains "AIX6-B07" and is highlighted in yellow. The "Description" field is an empty text box. At the bottom, there are navigation buttons: "< Back", "Next >", "Finish", "Cancel", and "Help". The status bar at the very bottom shows "Done".

# 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



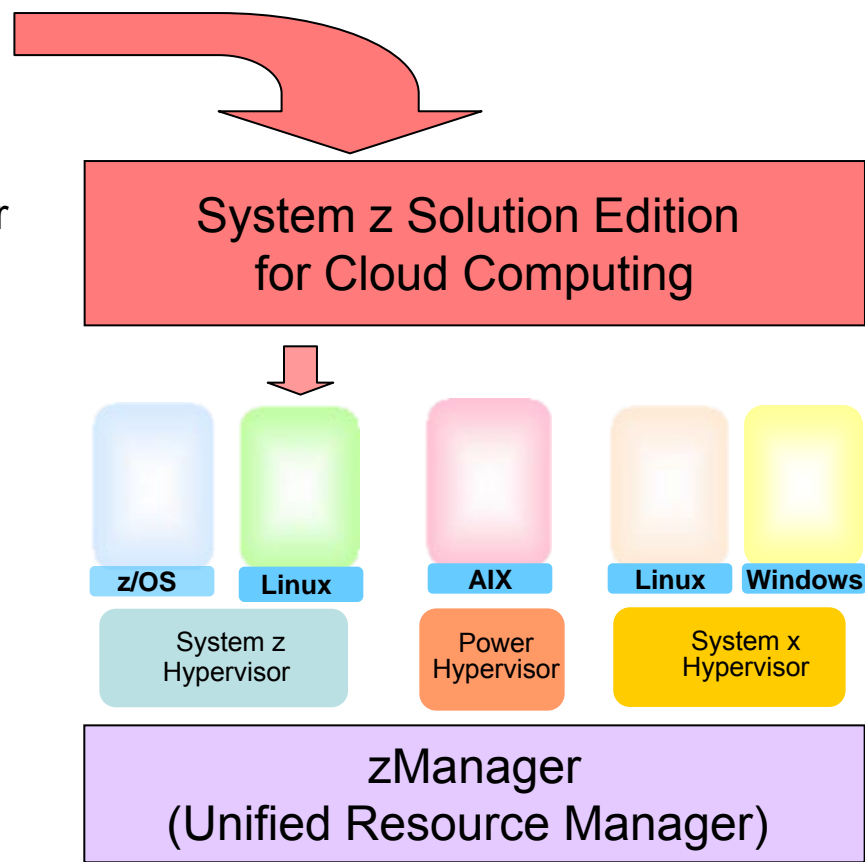
# Automated Provisioning With Tivoli Provisioning Manager (TPM)

- Automates provisioning of virtual software images via cloning from standard images or installing and configuring software
- Workflows define and automate provisioning tasks
  - ▶ 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

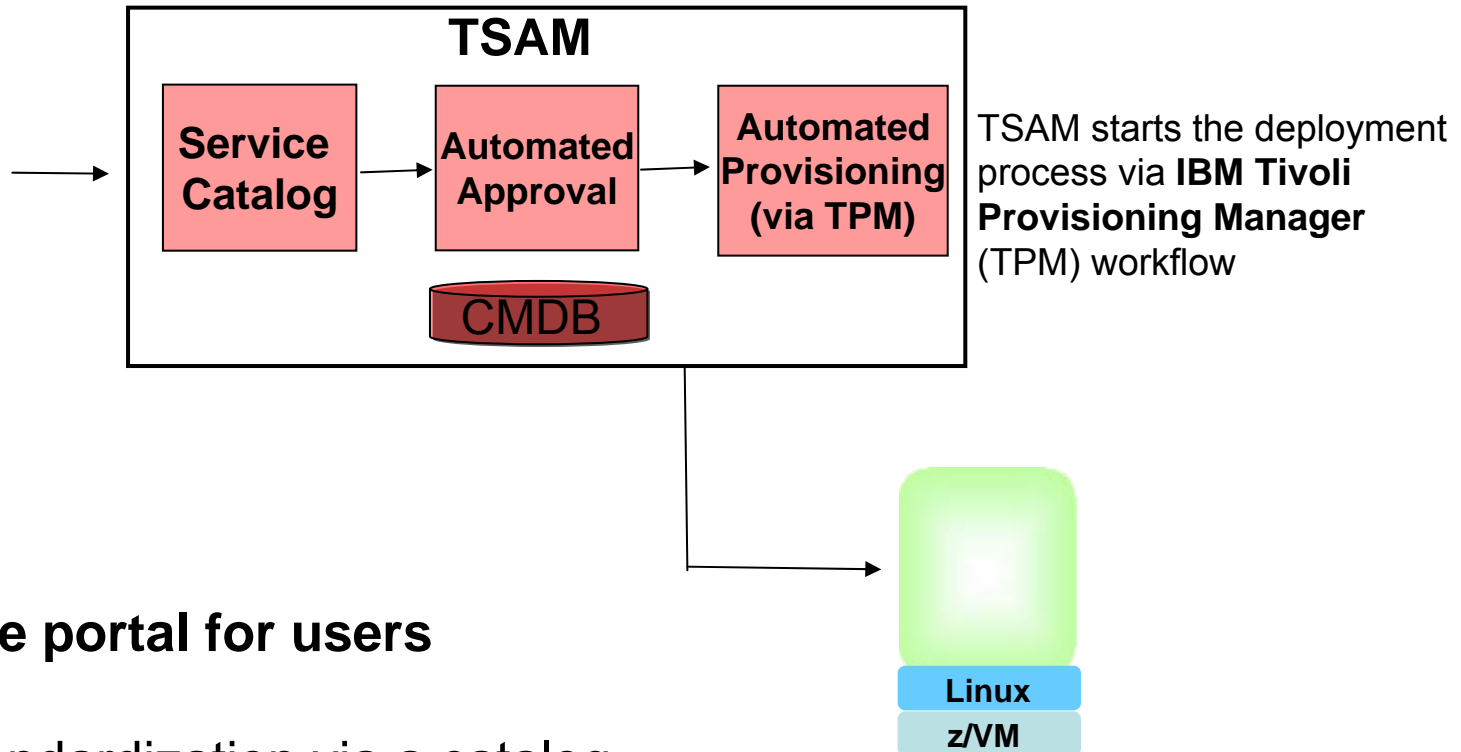
- IBM Tivoli software (runs on Linux on System z)
  - ▶ Self-service provisioning
    - Tivoli Service Automation Manager (TSAM)
  - ▶ Metering and billing
    - Tivoli Usage and Accounting Manager (TUAM)
  - ▶ Monitoring
    - Tivoli OMEGAMON XE on z/VM and Linux
- IBM Lab Services
  - ▶ Planning, installation, configuring, testing services
  - ▶ Significant package discounts



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



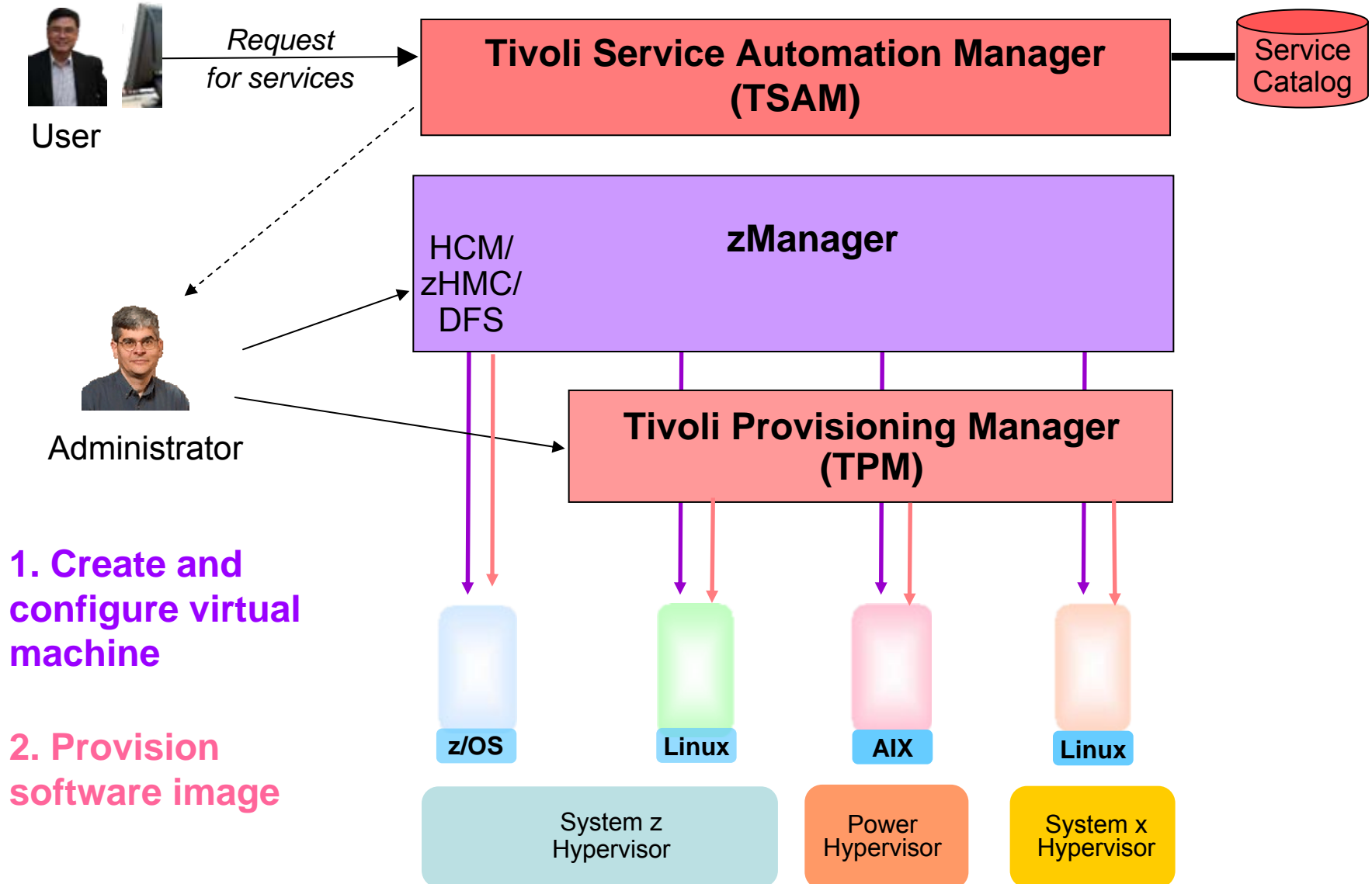
User browses service catalog  
Adds service to shopping cart  
Submits request



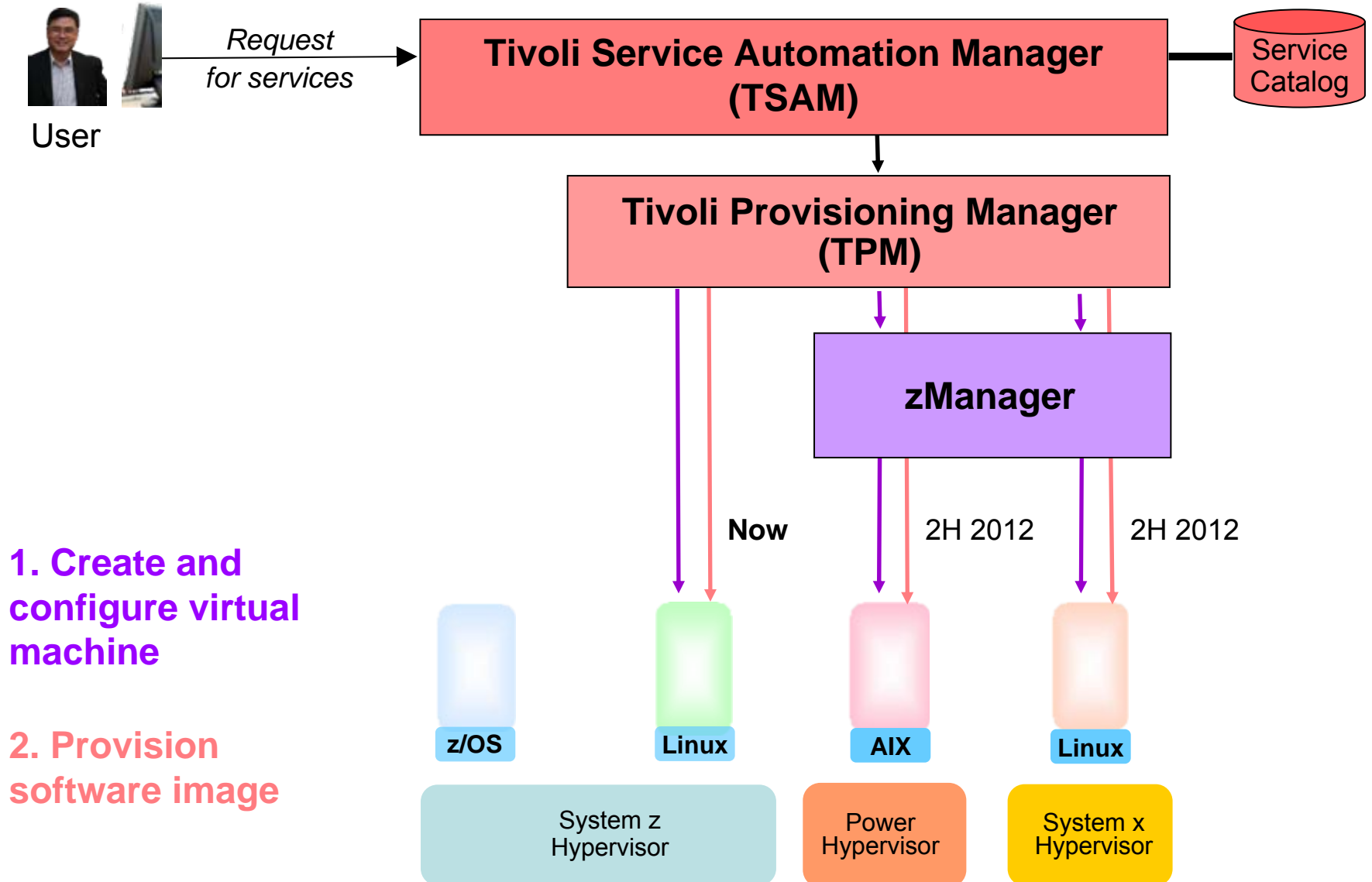
- **Self-service portal for users**
- Enables standardization via a catalog of service offerings
- Automates request processing with pre-defined workflows
- Fast provisioning of virtual servers



# Self-Service Provisioning For zEnterprise (Administrator Driven Workflow)



# Self-Service Provisioning For zEnterprise (Automated Workflow)



# 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

**Create Project with z/VM Linux Servers**

Provision one or more z/VM Linux virtual servers containing a software image.

**General**

\*Project Name: [Text Field] \*Team to Grant Access: [Dropdown]

Project Description: [Text Field]

\*Start Date: 4/15/2010 \*End Date: Until this date [Dropdown] 4/29/2010

**Requested Image**

Resource Group Used to Reserve Resources: System z pool  Monitoring Agent to be Installed

\*Image to be Deployed: [Dropdown]

Select	Name	Hypervisor	CPUs	Memory	Storage
<input checked="" type="radio"/>	SLES 10 with WAS 6	zVM	1	2 GB	7 GB
<input type="radio"/>	RHEL 5 with DB2 9	zVM	1	1 GB	1 GB
<input type="radio"/>	SLES 10 with DB2 9	zVM	1	1 GB	1 GB
<input type="radio"/>	RHEL 5 with WAS 7	zVM	1	1 GB	1 GB
<input type="radio"/>	SLES 10 with WAS 7 and D	zVM	1	1 GB	1 GB

**Resources**

To adjust the settings of the requested resources, press the setting button. After making the necessary adjustment, press the setting button to save the configuration.

**Servers**

\*Number of Servers to be Provisioned: 1  
7 available at above configuration and schedule

**CPU**

Virtual 1  
Physical 1.0

**Memory**

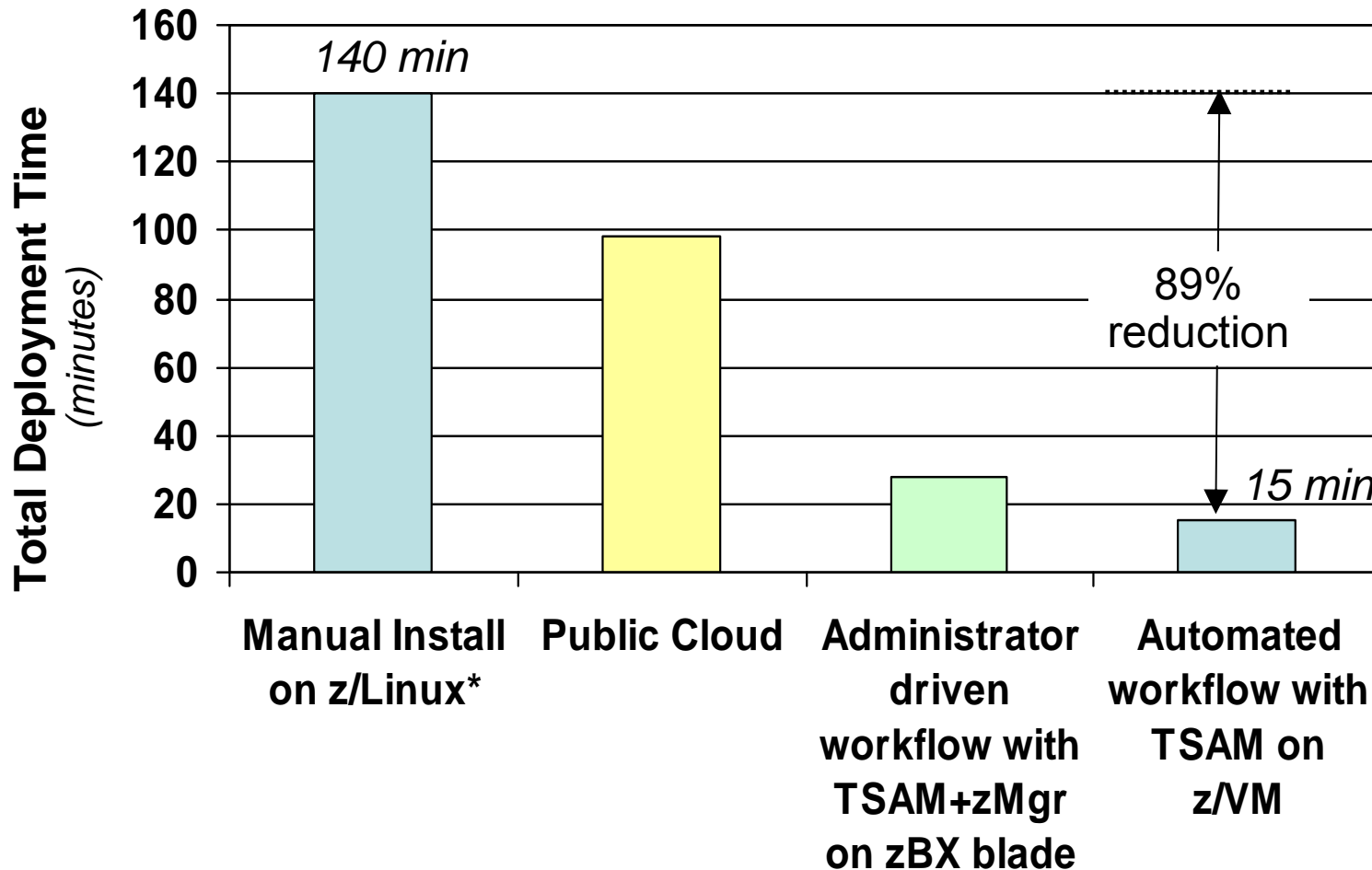
Main 2.000 GB  
Swap 0.000 GB

**Disk**

Local 7 GB

OK Cancel

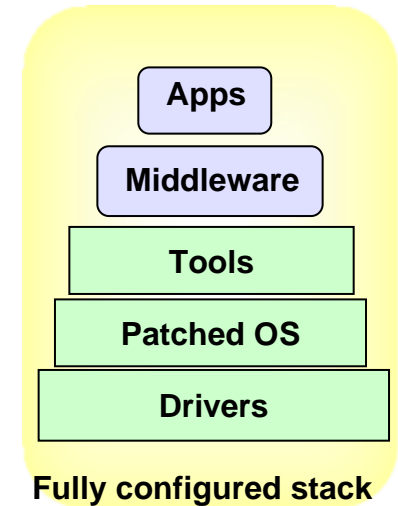
# TSAM Automated Provisioning Is Fast



\*Measured with hands-on work

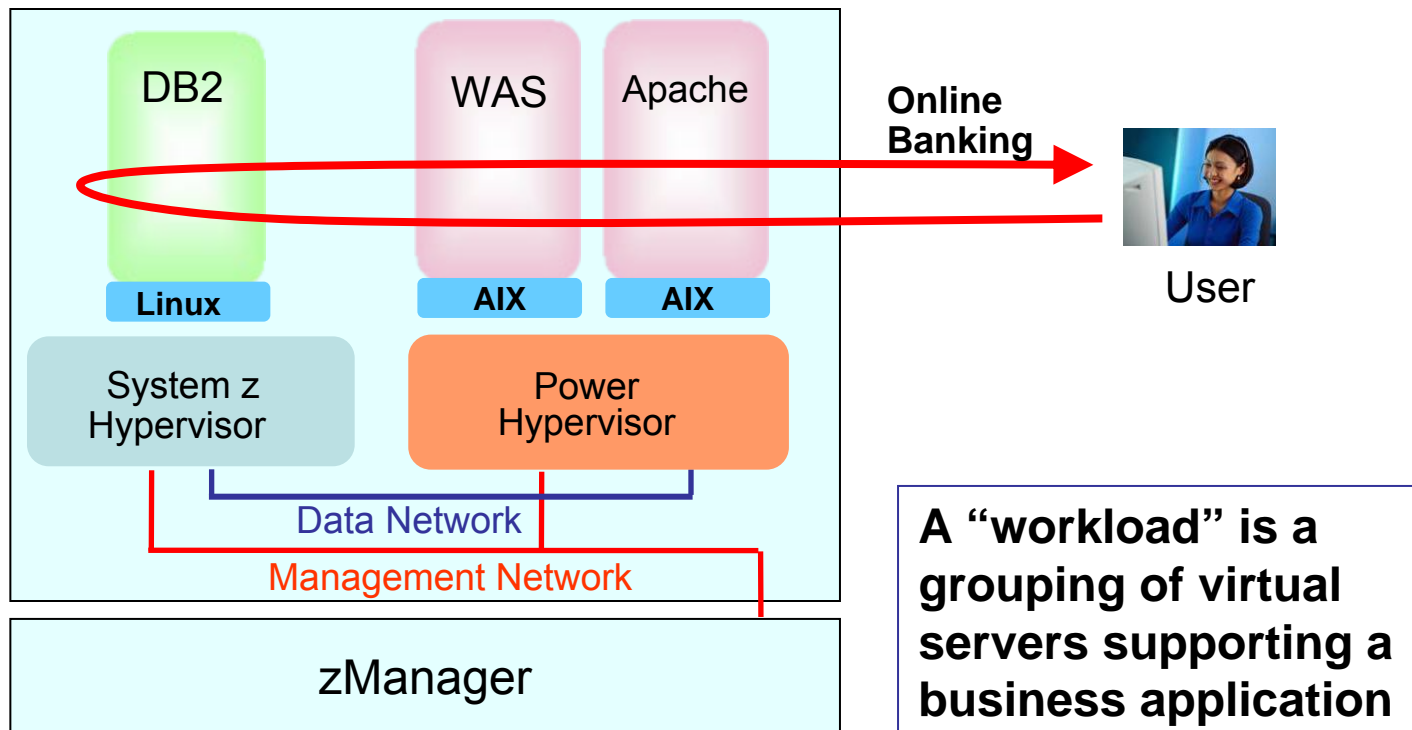
# TSAM Service Catalog Encourages Standardization

- Servers use a full set of software
  - ▶ Operating System, Middleware, Applications
  - ▶ Patches, configuration specifications
- Combination is called a “software stack”
- Without controls, varieties of stacks proliferate
  - ▶ Different levels, patches, product selections, etc
  - ▶ Higher labor costs
- Stack standardization reduces labor costs
  - ▶ Uniformity reduces the number of unique virtual images to manage
- Re-using a standard software image is called “cloning”

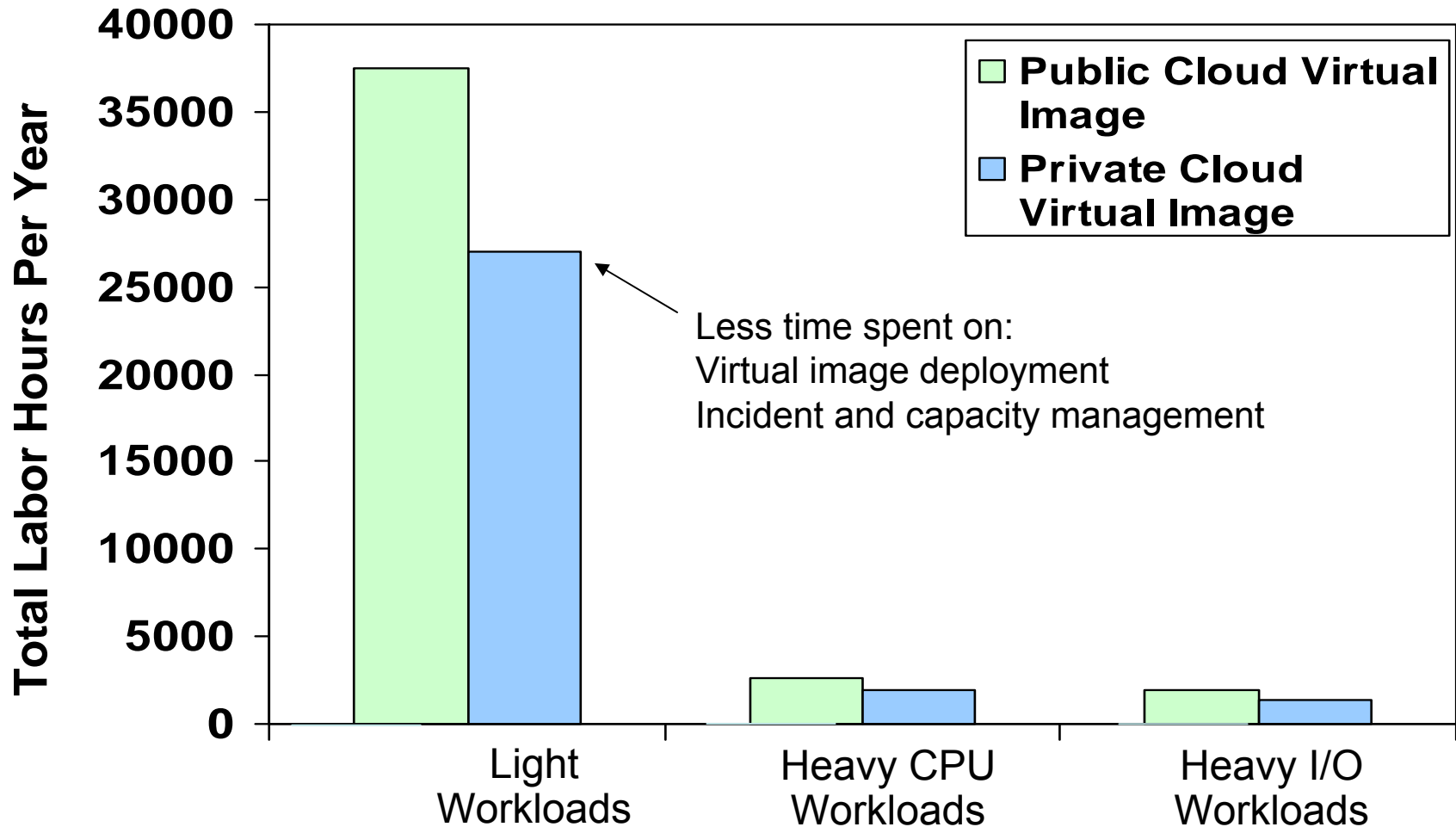


# zManager Incident And Capacity Management

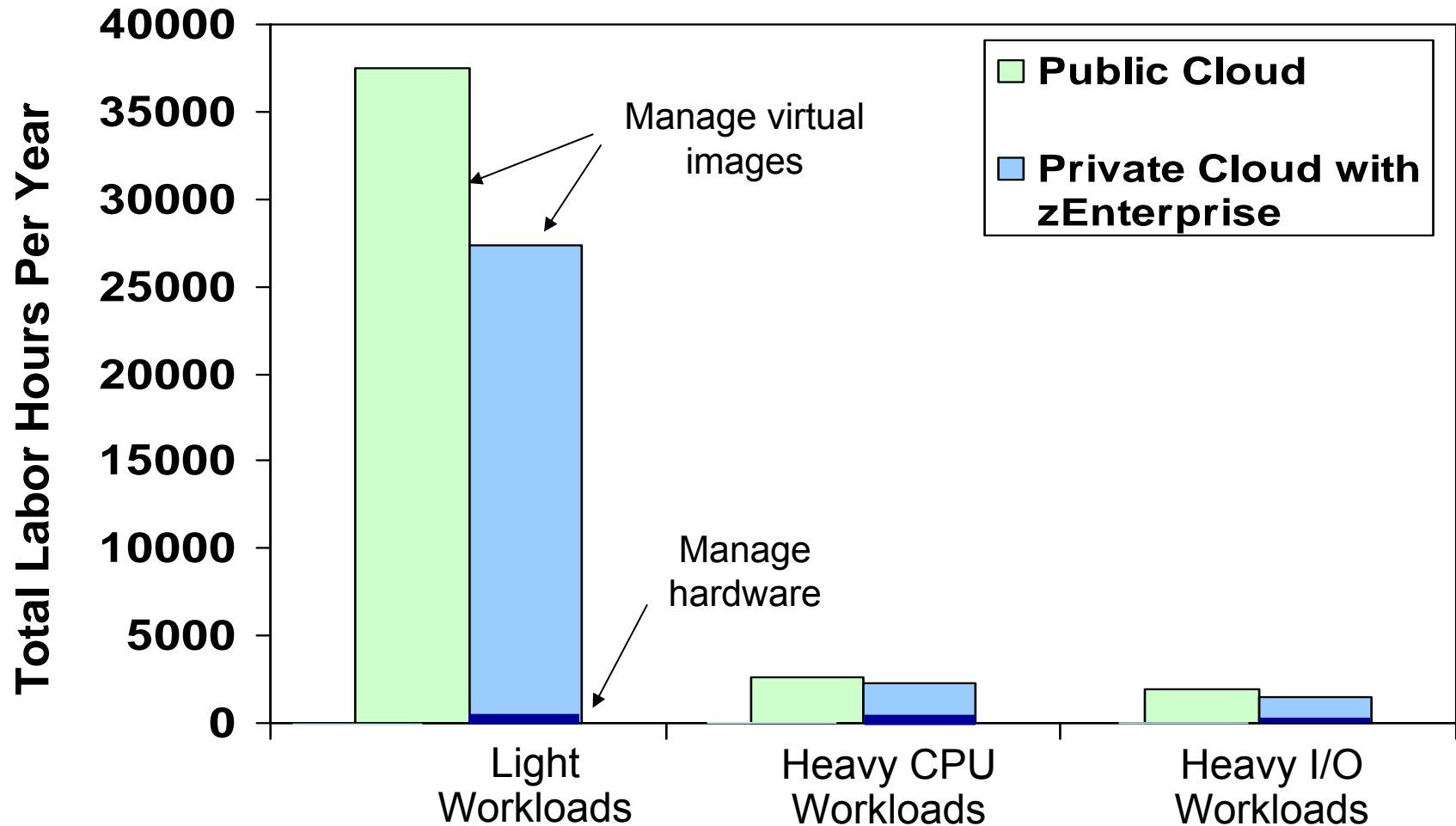
- Active and continuous monitoring to fix problems quickly
- Track transaction performance end to end to isolate bottlenecks
- Automatically adjust processor resource allocations on a particular hypervisor to achieve performance goals



# Comparison Of Virtual Image Labor Hours – Public vs Private Cloud With zEnterprise

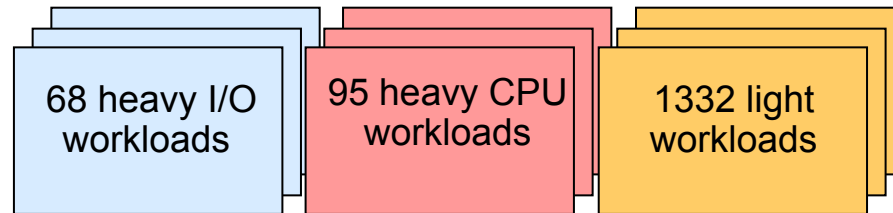


# Comparison Of Total Labor Hours – Public vs Private Cloud With zEnterprise





# 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

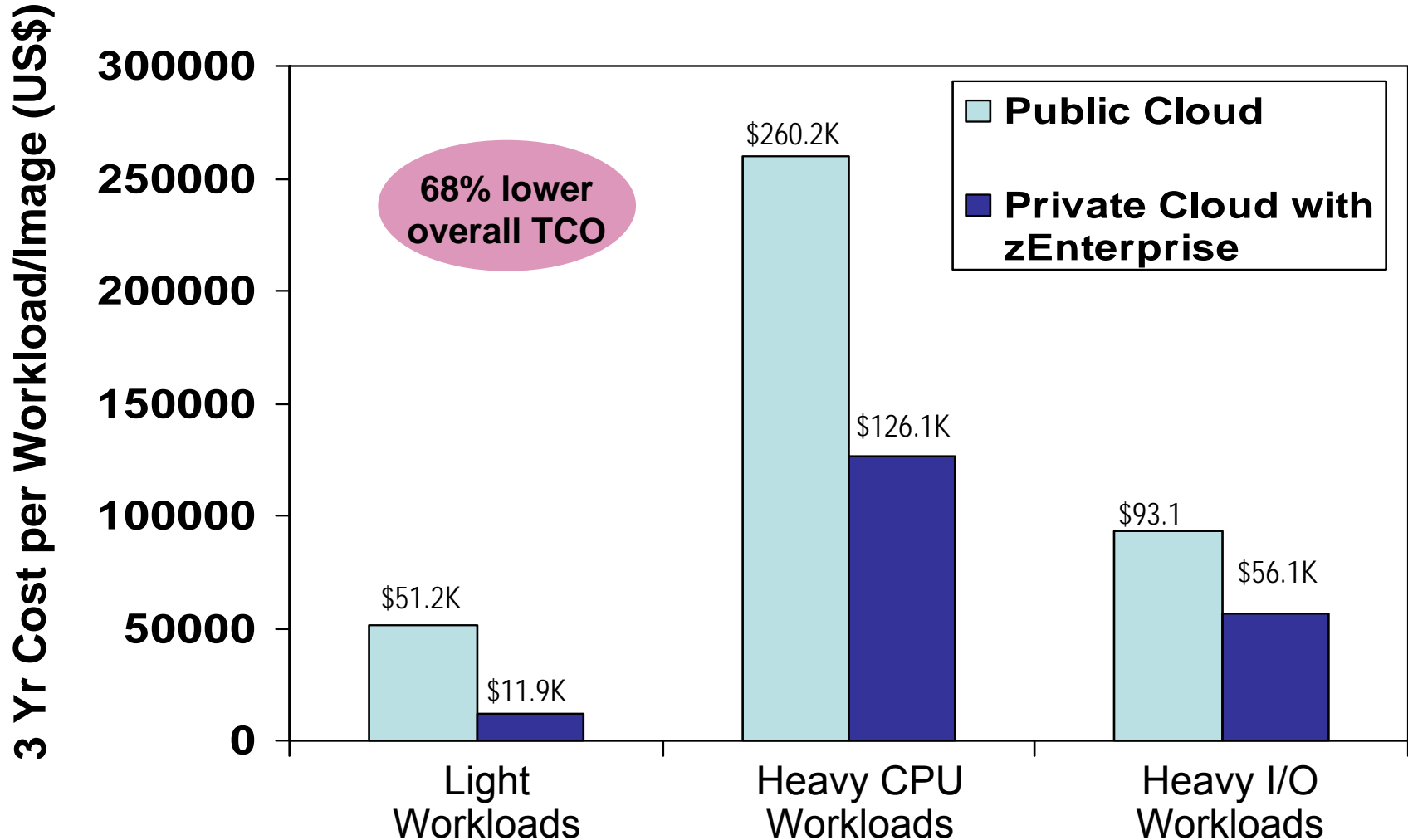
**\$7.2M**

3 years @ \$159,600/yr

**26% less**

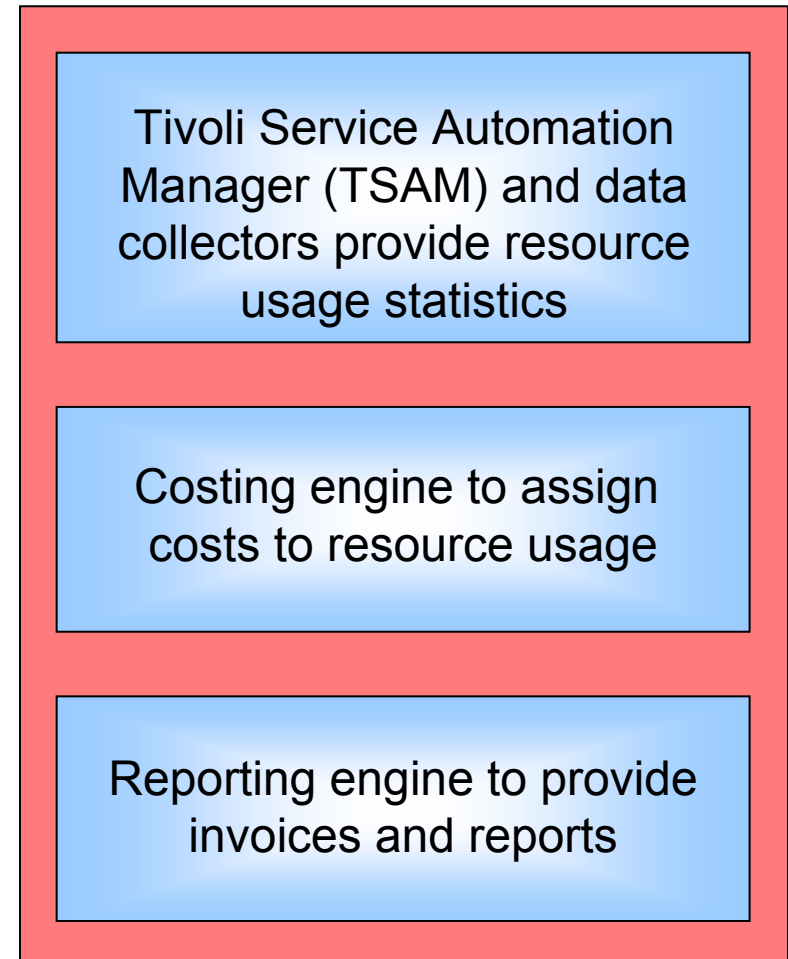
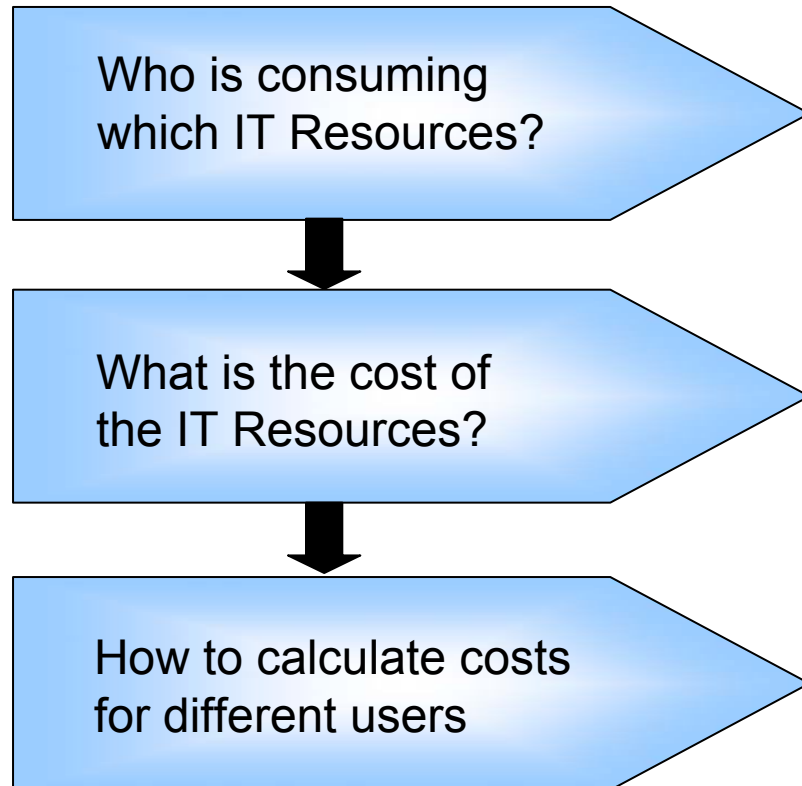
Server configurations are based on consolidation ratios derived from IBM internal studies. Prices are in US currency and will vary by country

# Comparison Of Total Acquisition And Labor Costs – Public vs Private Cloud With zEnterprise



Source: IBM internal study. zEnterprise configurations needed to support the three workload types were derived from IBM comparisons. 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.

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



**Provided by Tivoli Usage and Accounting Manager\***

# 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



*“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.”* —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
- ✓ Low cost pay as you go



User