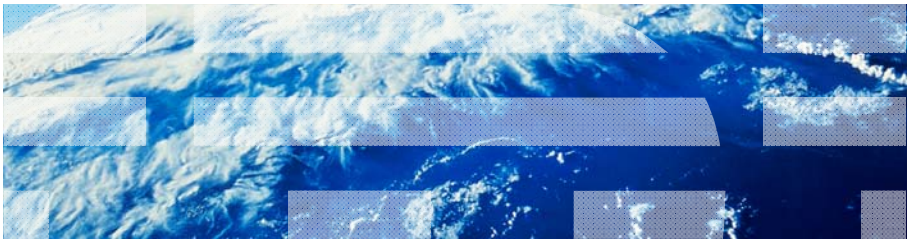
Session 11785

Cloud with zEnterprise: Aligned with Your IT

Glenn Anderson, IBM Technical Training



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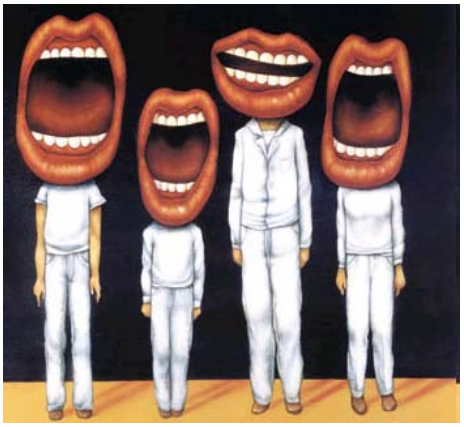
What are we talking about…….

- Aligned with your IT
- Cloud
- zEnterprise



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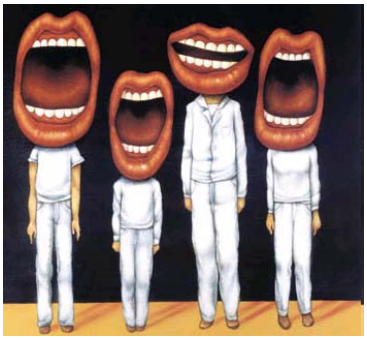

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Today's Challenges

85% idle

In distributed computing environments, up to 85% of computing capacity sits idle.

70¢ per $1

70% on average is spent on maintaining current IT infrastructures versus adding new capabilities.

1.5x

Explosion of information driving 54% growth in storage shipments every year.

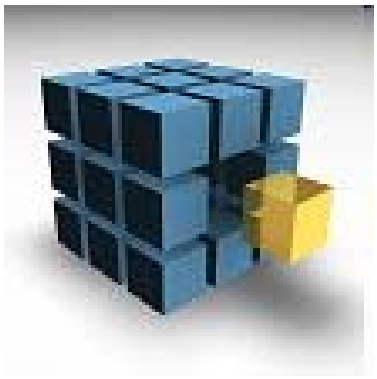
$40 billion

Consumer product and retail industries lose about $40 billion annually, or 3.5 percent of their sales, due to supply chain inefficiencies.

33%

33% of consumers notified of a security breach will terminate their relationship with the company they perceive as responsible.

Businesses need to get back to using IT as part of a corporate strategy, as opposed to an inward-looking operational role.



From The IT Payoff, by Sarv Devaraj and Rajiv Kohli

Reducing Cost and Optimizing Business

….leverages virtualization, standardization and automation to free up operational budget for new investment (inward looking)

… allowing you to optimize new investments for direct business benefits (corporate strategy)

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Cost and Value Milking Stool

- Cost Case (IT Finance)
- Technical Case (Operations)
- Value Case (Together)

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Why the crazy interest in cloud computing today?

- **IT needs to deliver service, to meet the needs of the business you are supporting**
- **IT has not been doing a good job of this. Users are not satisfied**
- **A public cloud is a model for IT to do a better job of delivering services to end users**
- **IT needs to operate as a value center. When IT is a cost center, the only thing they ask you to do is cut costs!**

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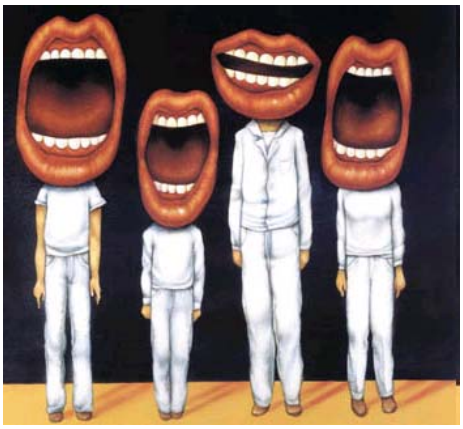
What are we talking about…….

- Aligned with your IT
- **Cloud**
- zEnterprise



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Cloud Computing **is the provision of dynamically scalable and often virtualized resources as a service**

Business Perspective	*IT Perspective*
A user experience & business model • *Transparent infrastructure* • *Massively scalable* • *Dynamically delivered* • *Standardised, self served* • *Utility Pricing Model*	**An infrastructure management and services delivery method** ▪ *Secure & Resilient* ▪ *Automated* ▪ *Public and Private* ▪ *Enterprise class* ▪ *Virtualized* ▪ *Easily managed*

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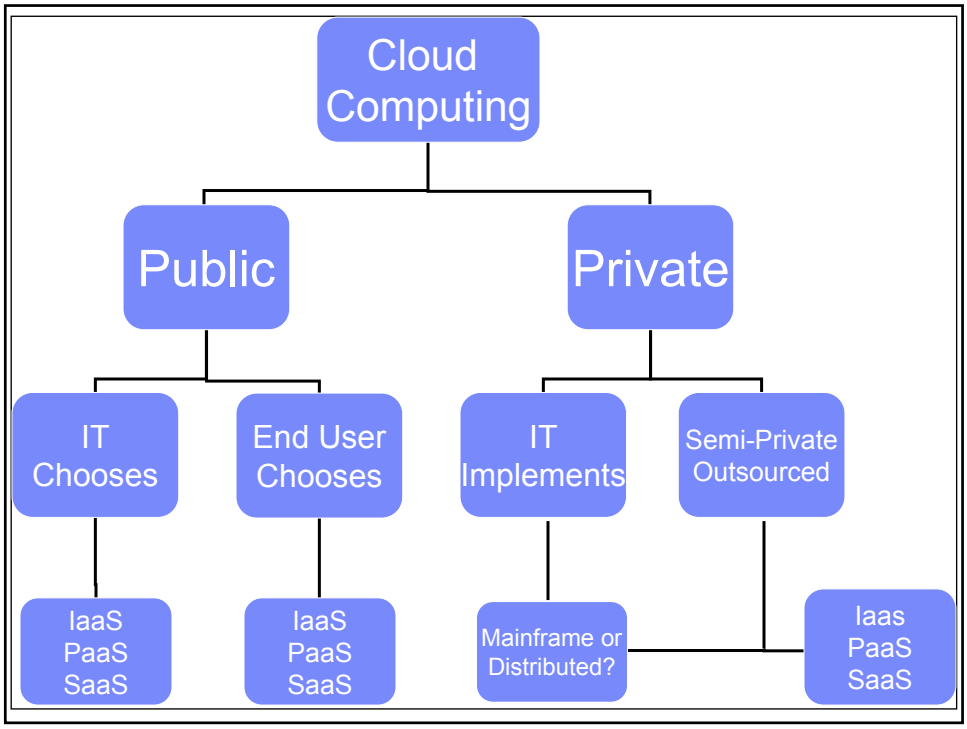

What are the Characteristics of Public Cloud Computing?

- **On-Demand Self Service**
  - Pick services you need, when you need them
- **Broad Network Access**
  - Available over network through thin or thick clients
- **Resource Pooling**
  - Resources are shared, serving multiple consumers
- **Rapid Elasticity**
  - Capabilities provisioned, in some cases automatically
- **Measured Service**
  - Pay only for what you use

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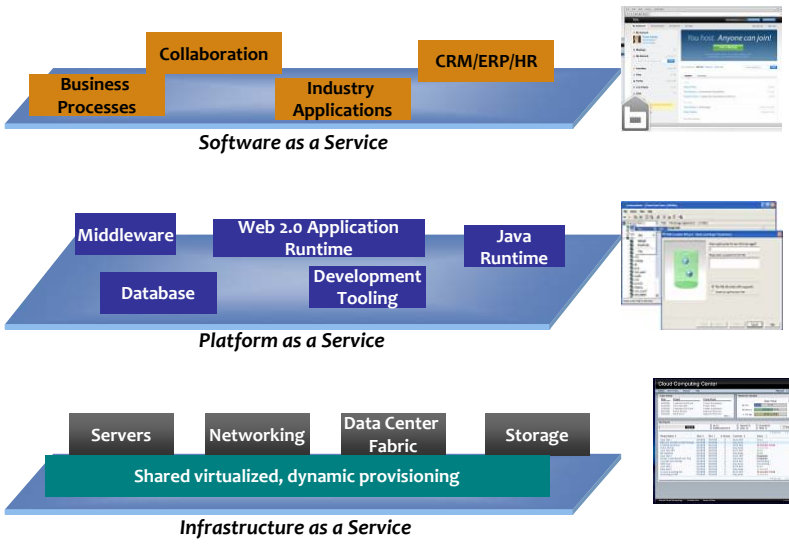
The layers of IT-as-a-Service



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So What Makes a Private Cloud?

- Automation
  - Takes you from a virtualized environment to a more public cloud-like environment
- IT service management
  - Integrating with change, incident and config mgmt processes so that a server and its life cycle can be located and identified
- Self-service from a UI
  - This is not easy. Consider cultural churn and effective resource sharing.
- Are you provisioning VM's or provisioning whole applications?
- A pay-as-you-go model between the IT organization and the line of business?

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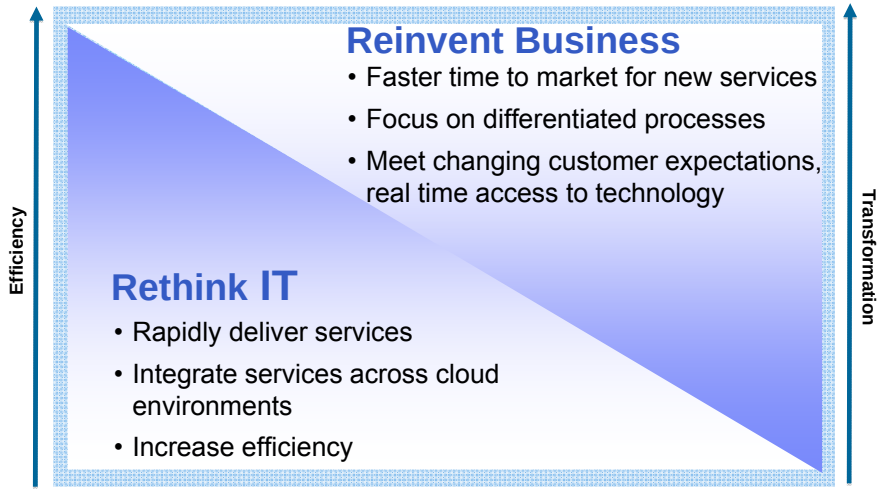
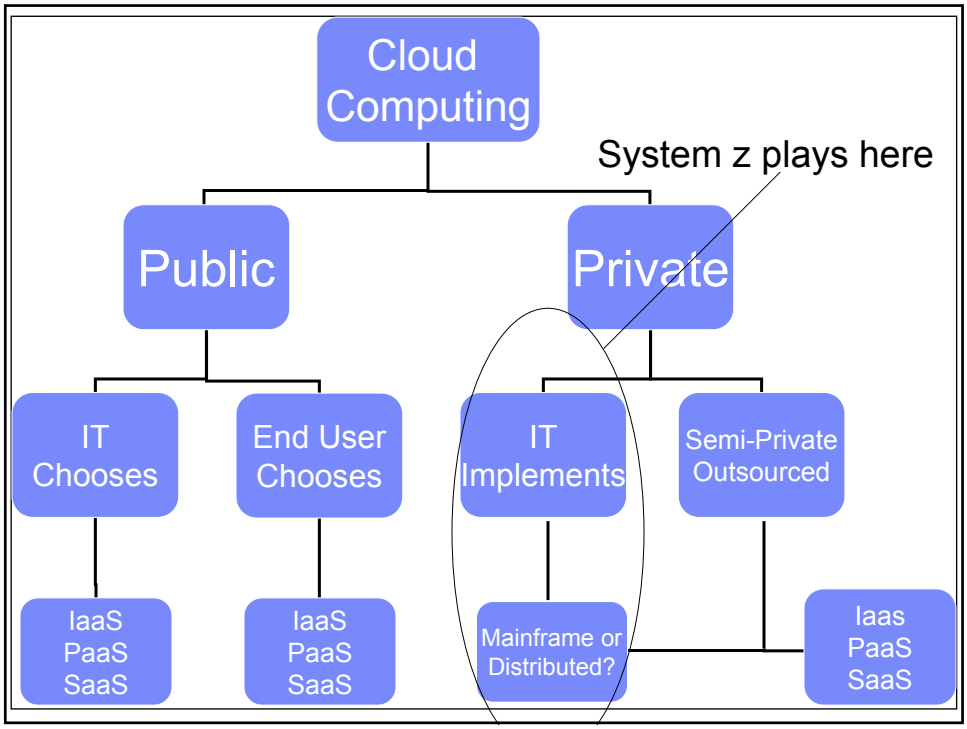
Cloud computing allows companies to rethink IT and reinvent the way they do business



Economics of Computing are Changing



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What are we talking about…….

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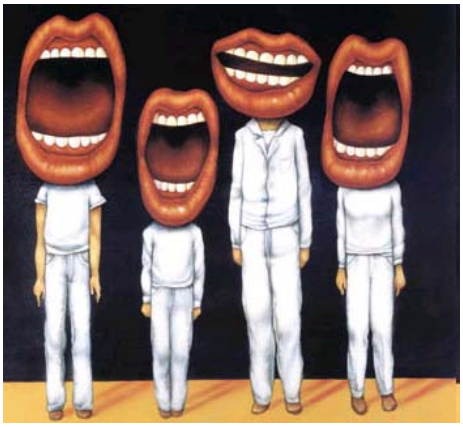

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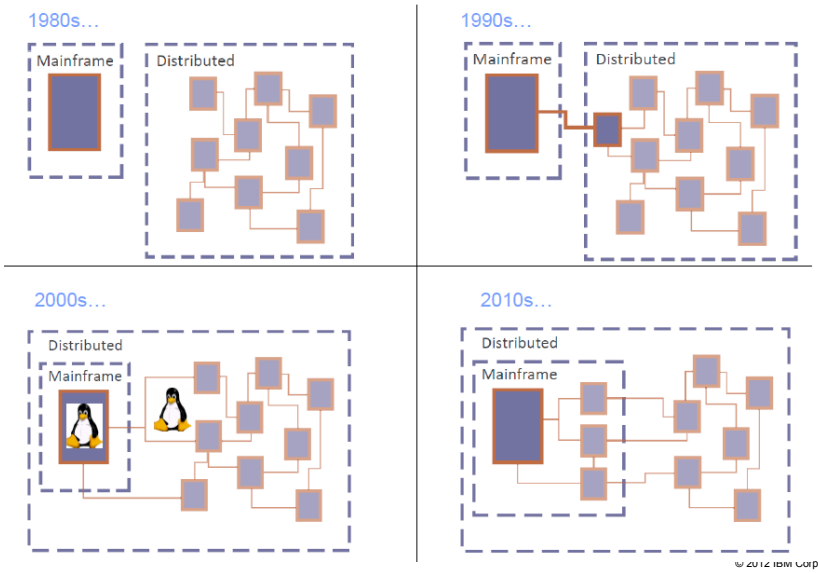
System z and distributed worlds



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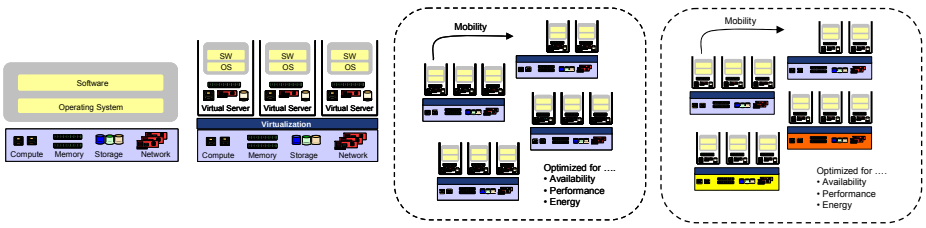
The Evolution of the Platform

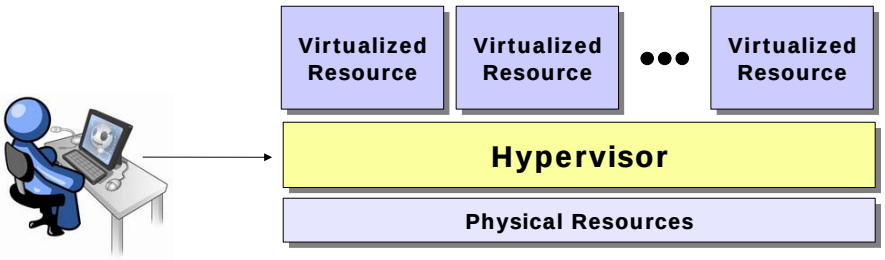


Server | **Virtualized Server** | **Virtualized Cluster** | **Virtualized Heterogeneous Cluster**

Advanced Management of Virtualized IT Infrastructure

Key Role of the Hypervisor in Cloud Computing

In many cloud scenarios there's a hypervisor at the heart of it which provides the ability to spin up virtual resources:



For System z we have two hypervisors:

- **PR/SM** - logically partitions the physical CEC
- **zVM** - provides "virtual machines" on LPAR

In addition:

- **zManager** - controls creation of "virtual servers" on top of the blades in the zBX

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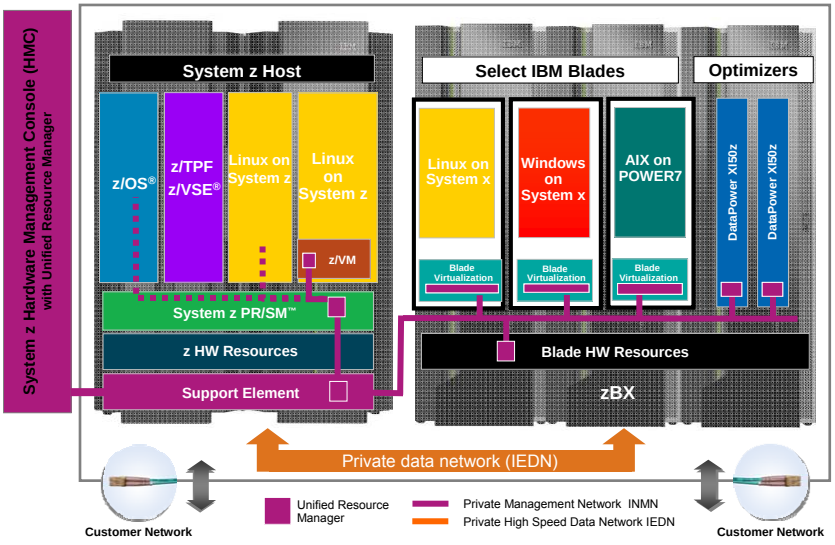
zEnterprise System Hybrid Configuration



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Principles to Apply to Cloud Computing Challenges

- Design for cloud-scale efficiencies
  - zEnterprise demonstrates efficiency through virtualization, consolidation, platform and energy management, etc.
- Support lean service management
  - zEnterprise provides standardized admin, automated provisioning, etc.
- Identify and leverage commonalities
  - zEnterprise provides a high degree of commonalities
- Define and manage generically
  - zEnterprise Unified Resource Manager

Prevalent Issues with Cloud Environments

- Security
- Availability and reliability
- Scalability
- Elasticity
- Monitoring
- Qualities of Service
- Workload Identification
- Seamless Integration
- Chargeback
- Capacity Planning
- Support
- Standardization

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System z: The choice for Enterprise Class Computing

Pain Point	System z	Power	x86
Avoiding downtime	**Best** Unmatched system reliability and redundancy of server hardware assets.	Better	Good
Managing growth	**Best** Dynamically add real hardware; share system resources with multiple hypervisors in a single machine.	Better	Good
Underutilized Resources	**Best** (up to 100%) Extensive hardware sharing as you scale; extremely granular sharing of system resources.	Better (~ 80%) Moderate hardware sharing as you scale	Good (~ 50%) Very little hardware sharing as you scale
Need for flawless system monitoring	**Best** Superior statistics and operational insight.	Better	Good
Workload management	**Extensive** Also able to span architectures with zEnterprise (z/p/x).	Moderate	Minimal
Time to market	**Best** Server cloning can be achieved in seconds; granular and efficient sharing of resources facilitates rapid provisioning.	Better	Good

Role and Value of System z

Function	Cloud Model	z/VM	z/OS
Hardware Configuration	CMDB	HMC	HMC
Hw/SW Relationships	CMDB	System Directory	SYS1.PARMLIB
Monitoring	ITM	Performance toolkit	SMF/RMF/ OMEGAMON
Software configs	DSL	VMSES	SMP
Usage	TUAM	Performance Toolkit	SMF/RMF
Image Repository	Hipervisor / SAN	System Directory + Guest MiniDisks	SYS1.PARMLIB + DASD
Provisioning	TPM + HiperVisor	TPM Support	No TPM Support yet
Automation	TPAE	Netview	MPF - Netview
Service Request Management	TSRM	NA	NA
Pervasive Security	None	RACF/ACF2 etc.	RACF/ACF2 etc.

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Value Using System z for Cloud Computing

BUSINESS VALUES: Unchallenged virtualization leadership
— System utilization rates +80 percent
— Shared everything approach — network, memory, CPU, etc.— enables less components and a more simplistic IT foundation
— 1/4 of the network costs of distributed capacity

BUSINESS VALUES: Created on zero downtime design principles
— Physical redundant parts within the box that support hot fail-over
— System capacity that can be plugged into existing, running systems
— Mean time between failure is measured in decades on System z

BUSINESS VALUES: Secure and trusted platform
— High-performance cryptography
— Improved Secure Sockets Layer (SSL)
— z architecture has less intrusion points
— LPARs are equivalent of separate physical boxes

BUSINESS VALUES: Energy efficient with less footprint
— Consumes 1/12th the electricity as a distributed server farm
— Consumes 1/25th the floorspace as distributed capacity

BUSINESS VALUES: Operationally efficient with less
— 1/5 the administration resources required to support more workload
— Greater ROI for IT projects
— Near-linear scalability with +1M servers supported

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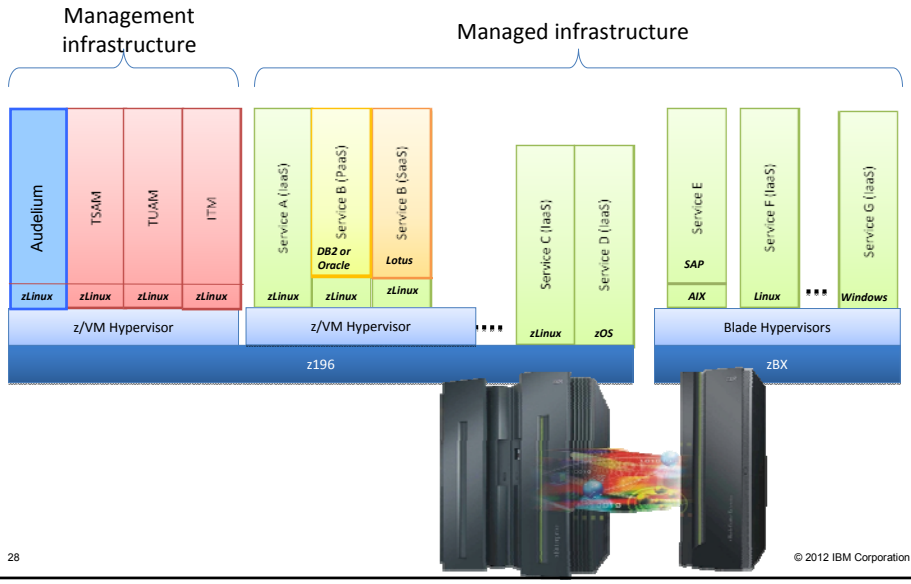
Example of Cloud Architecture on IBM zEnterprise System



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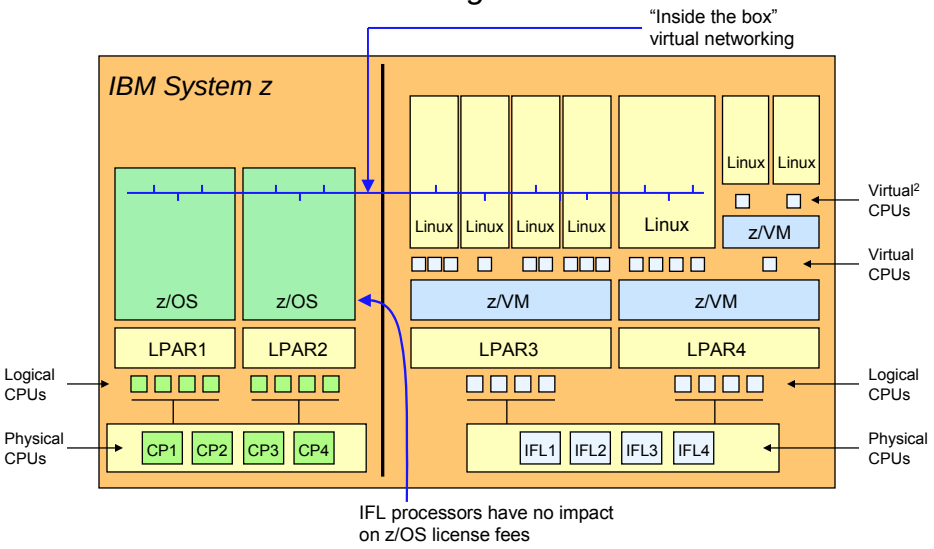
IBM System z Virtualization Leadership

Extreme Levels of CPU Sharing



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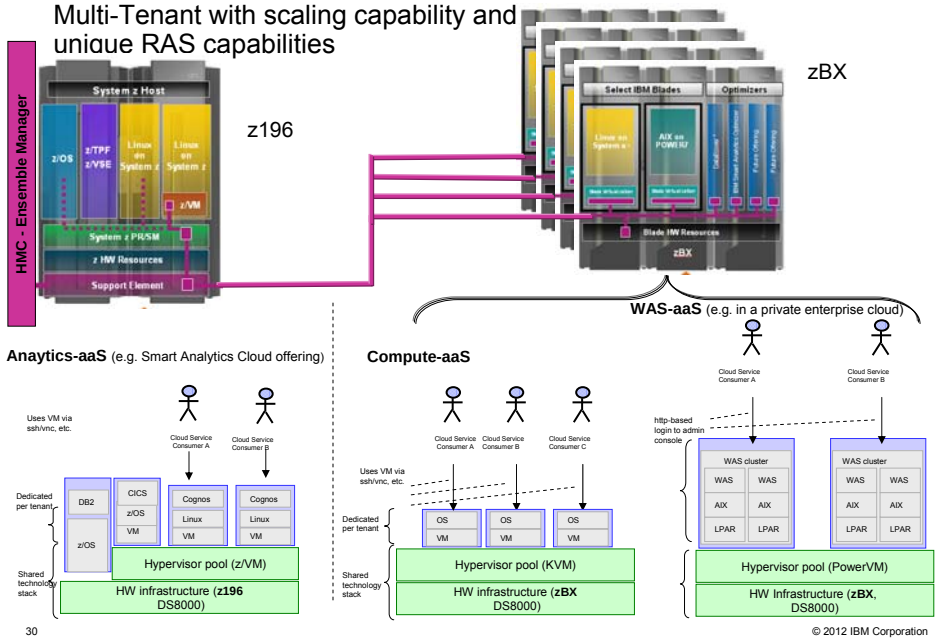
Multi-Tenant with scaling capability and unique RAS capabilities



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zEnterprise Unified Resource Manager
Transforming the way resources are managed and deployed

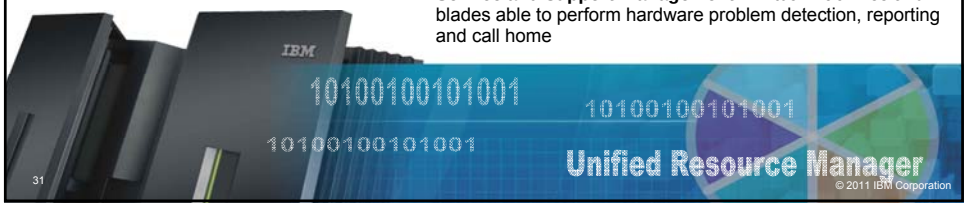
What is it?

Unified Resource Manager provides infrastructure awareness to optimize the system resources in accordance with understanding the policies assigned to that particular workload.

Functions are grouped into suites of tiered functionality that enable different levels of capability – Manage, Advanced Management and Automate.

How is it different?

- **Heterogeneous management:** Total systems management across heterogeneous resources. APIs facilitate enterprise wide management.
- **Integration:** Single point of control, common skills for resources, reduced complexity of day to day operations..
- **Monitoring.** New dashboard for CPU resources and energy management.
- **Simplified installation:** Auto discovery and configuration of resources and workloads with single interface
- **Secure:** Improved network security with lower latency, less hops and less complexity. Improved control of access due to management of hypervisors as firmware.
- **Service and support management:** Virtual machines and blades able to perform hardware problem detection, reporting and call home



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… Value Made Possible By the Unified Resource Manager

Simplified installation of hypervisors

Gain significant time to market with improved speed of deployment

Simplified energy management

Energy cost savings

power.

Save time, cost and simplify asset management

Decrease problem determination and resolution time for cross-platform resources

Improve and simplify cross-platform availability procedures

Enable broader and more granular view of resource consumption

user.

Improve enterprise management

Adherence to current industry design practices

Deliver consistent interface to operations staff

Allow critical workloads to receive resources and priority based on goal-oriented policies established by business requirements

Smart business adjustments based on workload insight

Load balancing to manage traffic flow

Provide deep insight into how IT resources are being used

Factory installed and configured network

Improved network security with lower latency, less complexity, no encryption/decryption

Monitor status and general health of network resources

Gain flexibility, consistency and uniformity of virtualization

Provide the business with faster time to market

Simplified network management for applications

Bridging of internal HiperSockets network to the entire ensemble

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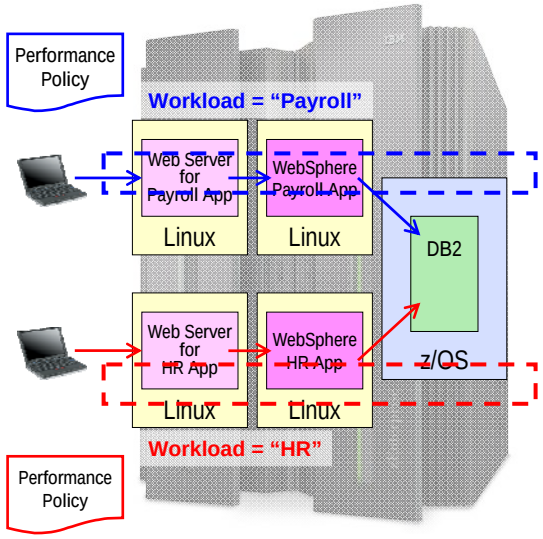
Workload Management with Unified Resource Manager

Policy-based Resource Sharing that Aligns IT Assets with Business Priorities

- A **Workload** is a grouping mechanism and management view of virtual servers supporting a business application
- It provides the context within which associated platform resources are *presented*, *monitored*, *reported*, and *managed*
- A **Performance Policy** is associated with a Workload
- Unified Resource Manager will dynamically adjust CPU settings to achieve performance policy compliance
- Workloads can span LPARs, blades, and even zEnterprise systems (up to eight)



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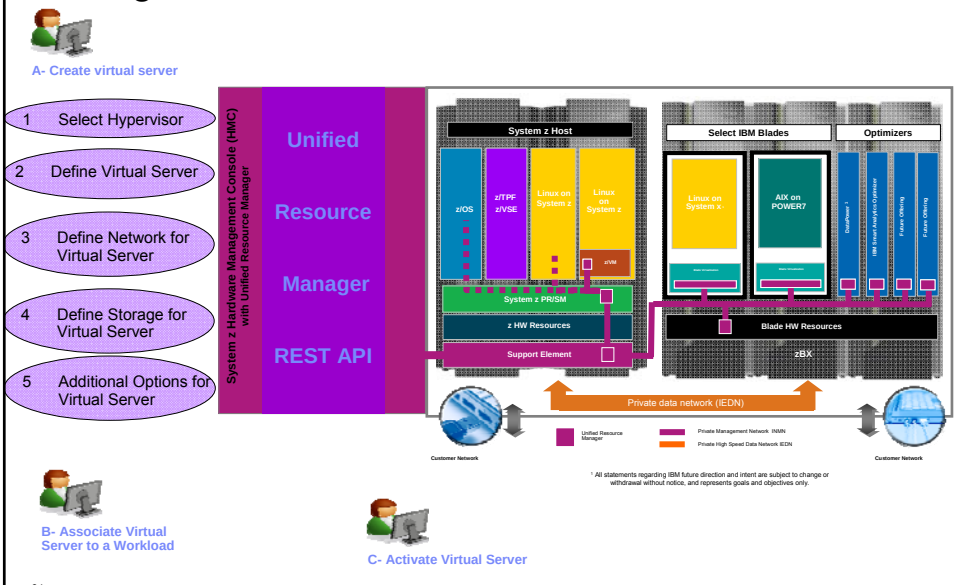
Calling REST API to create a virtual server



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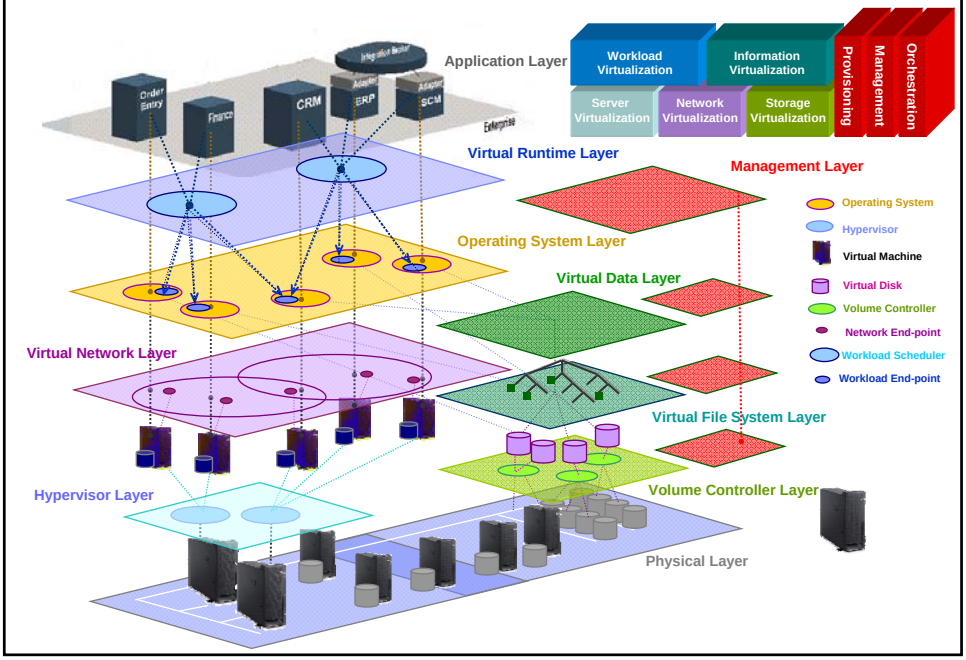
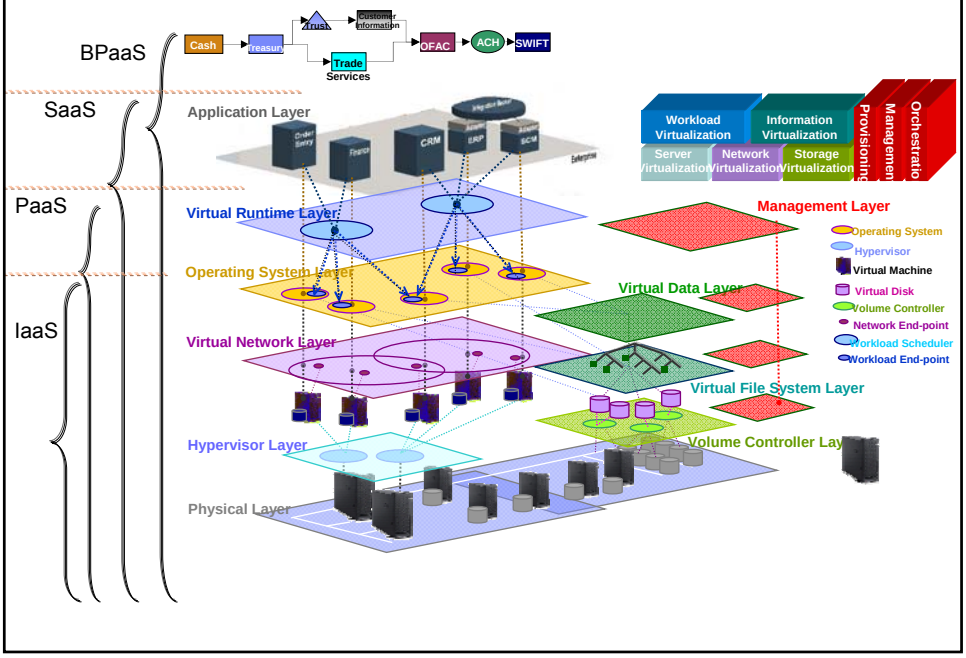
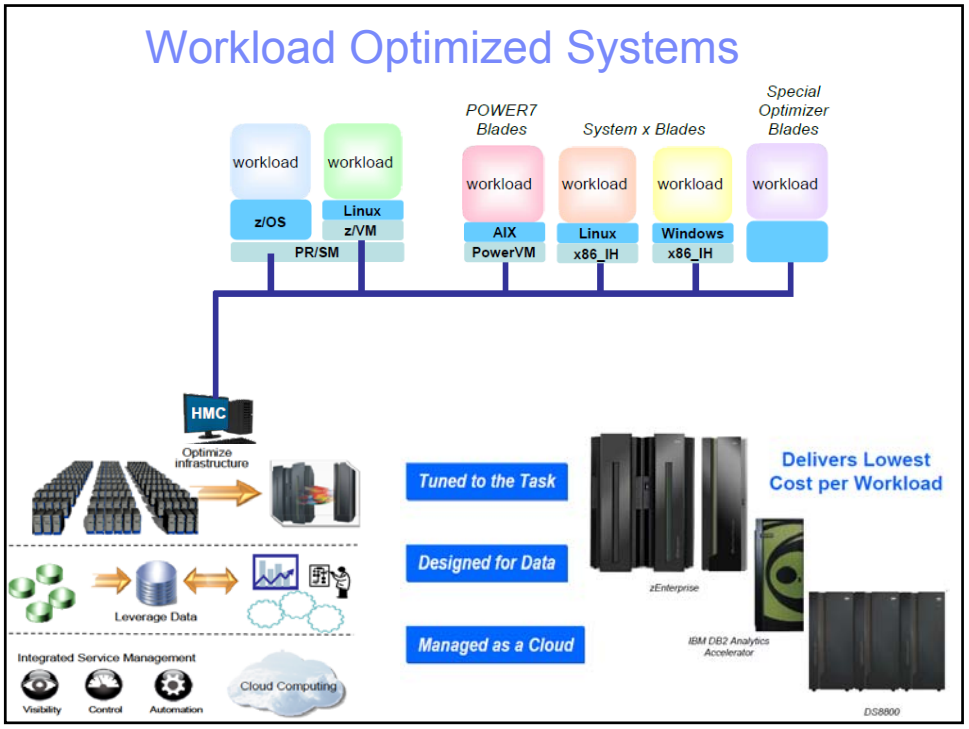
Identify System z Layers in your Cloud Service



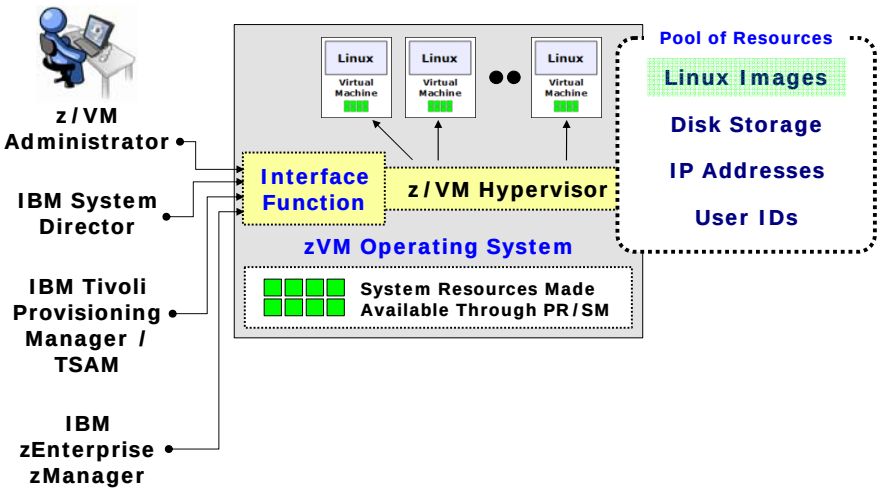
Cloud Services Layers (Infrastructure view)





zVM as a Target Hypervisor for Cloud Computing

It works and it works very well ... because IBM has developed function to take programmatic requests and spin up virtualized environments:



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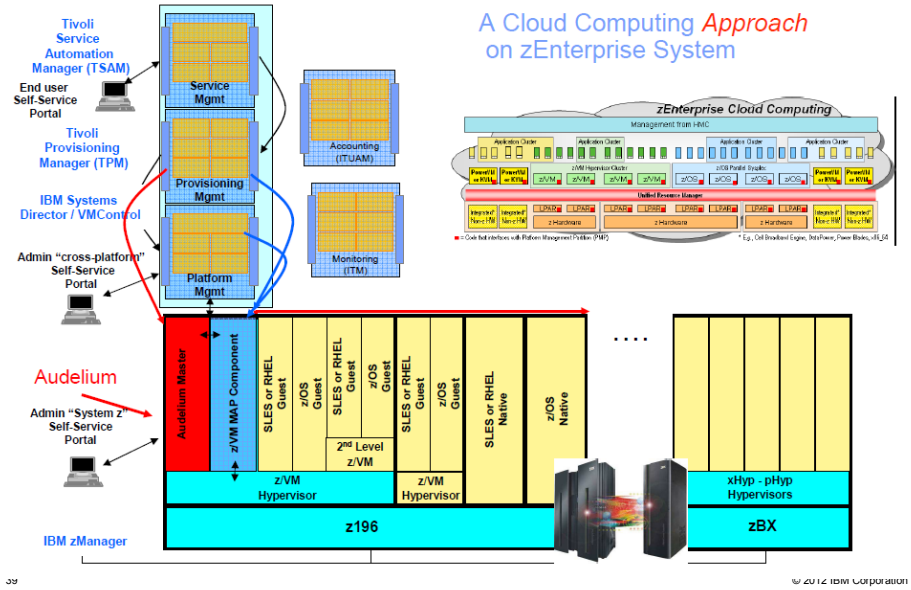
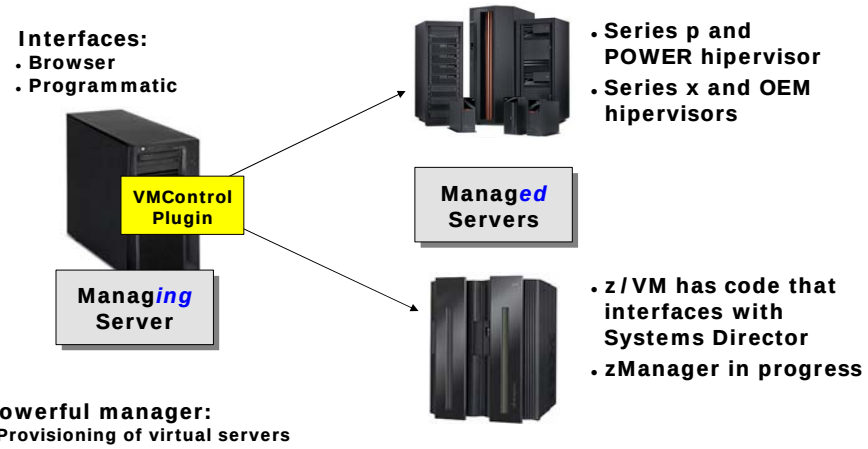
Select Integrated solutions based on requirements



IBM System Director and z/VM

A software function that understand how to communicate with various hypervisors to request the provisioning of virtual servers



Powerful manager:
- Provisioning of virtual servers
- Server driver and microcode
- Power usage, etc.

Tivoli Provisioning Manager / Automation Mgr

Software Solution from Tivoli that performs provisioning and adds additional cloud-related functionality:

Interfaces:
- Browser
- Programmatic

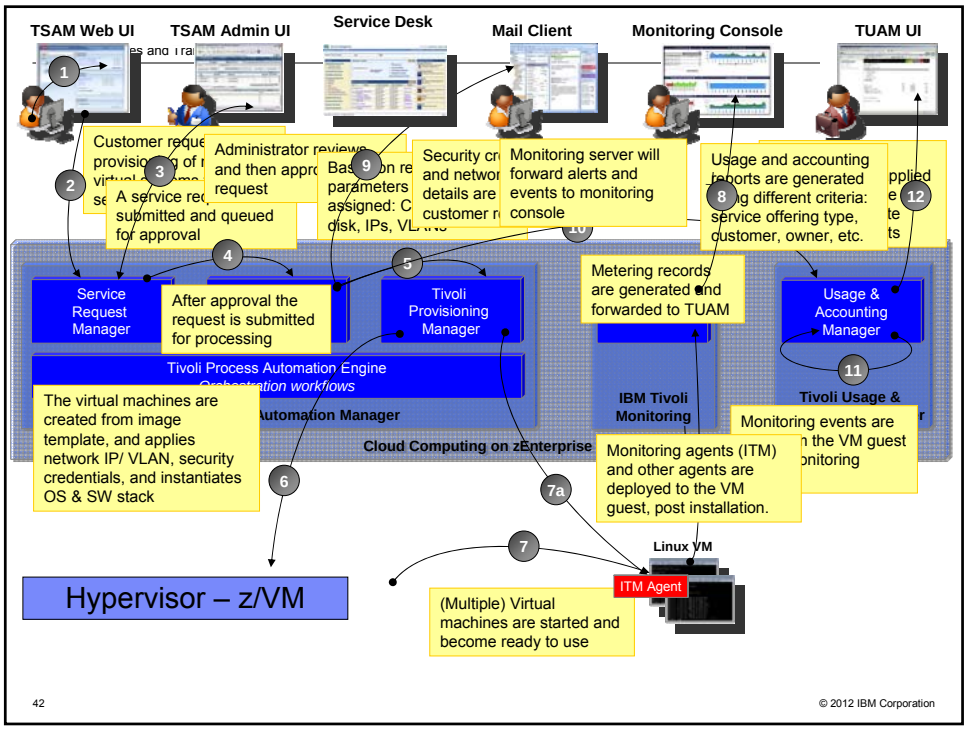
TPM TivSAM

Managed Servers

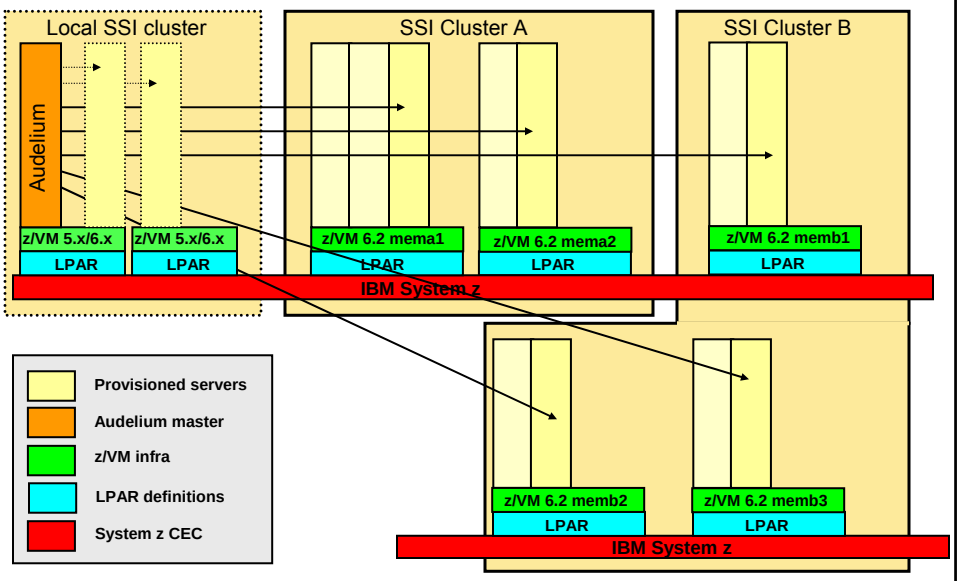
- System p and POWER hypervisor
- System x and OEM hypervisors

- zVM has code that interfaces with TPM/TSAM
- zManager in progress

TPM provisions virtual servers. It has a powerful scripting language and is very flexible. Tivoli Service Automation Manager (TSAM) includes TPM under the covers. It is intended to be a full function "service automation manager" -- request interface, provisioning, usage meters, billing, etc.



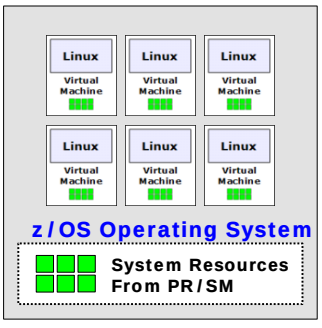
New options with z/VM 6.2 SSI clustering



What About z/OS?

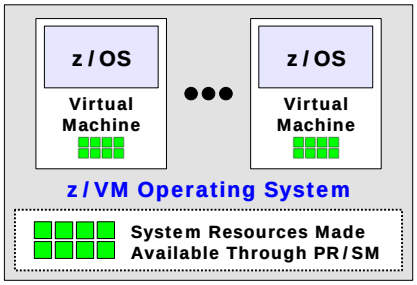
Two questions here ...

Can z/OS serve the same kind of hipervisor role z/VM serves?



Answer: No, not its design

Can z/OS be the operating system running in a z/VM virtualized cloud environment?



Answer: Yes, technically this is possible. We see this mostly in customized test environements.

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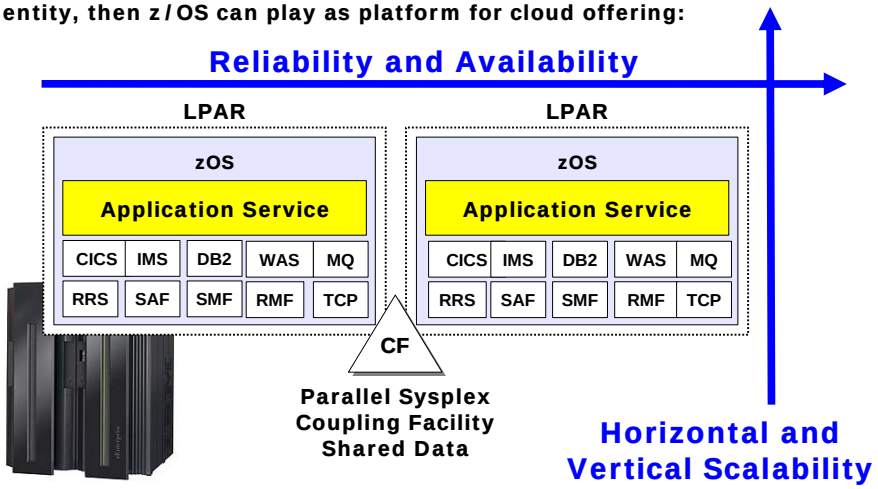
z/OS for Software as a Service (SaaS)

If the cloud resource offered is software functionality partitioned by identity, then z/OS can play as platform for cloud offering:



Standard Parallel Sysplex Story

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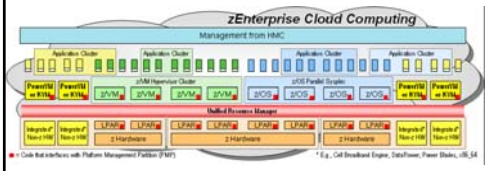
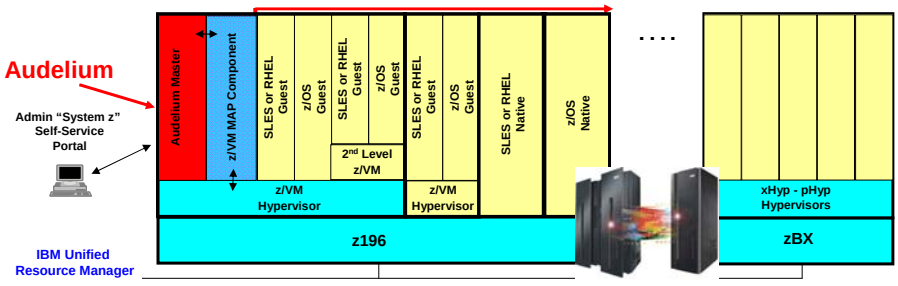
A Cloud Computing *Approach* on zEnterprise System



Audelium STG Lab Service Offering

- Benefits:
  - ✓ Understand considerations to **consolidate and virtualize on System z**
  - ✓ **Ensure success** in deploying an automated solution for provisioning of Linux and z/VM systems
  - ✓ **Deliver customized** planning, design and implementation **services**
  - ✓ **Improve delivery** of IT Infrastructure services and being able to integrate with service management solutions
  - ✓ **Minimize** customer **IT operational costs** by consolidating existing or new workloads on System z



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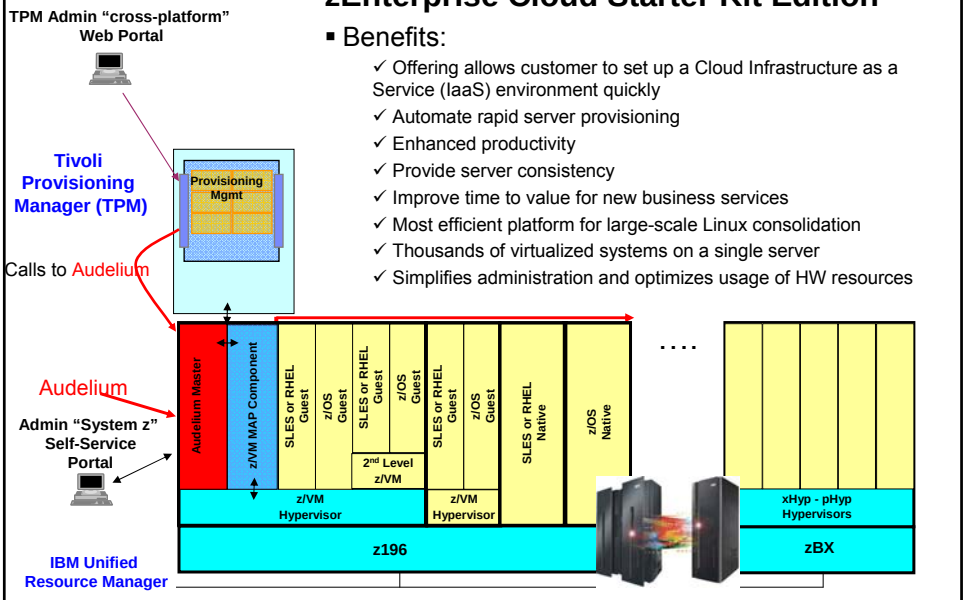
zEnterprise Cloud Starter Kit Edition

- Benefits:
  - ✓ Offering allows customer to set up a Cloud Infrastructure as a Service (IaaS) environment quickly
  - ✓ Automate rapid server provisioning
  - ✓ Enhanced productivity
  - ✓ Provide server consistency
  - ✓ Improve time to value for new business services
  - ✓ Most efficient platform for large-scale Linux consolidation
  - ✓ Thousands of virtualized systems on a single server
  - ✓ Simplifies administration and optimizes usage of HW resources



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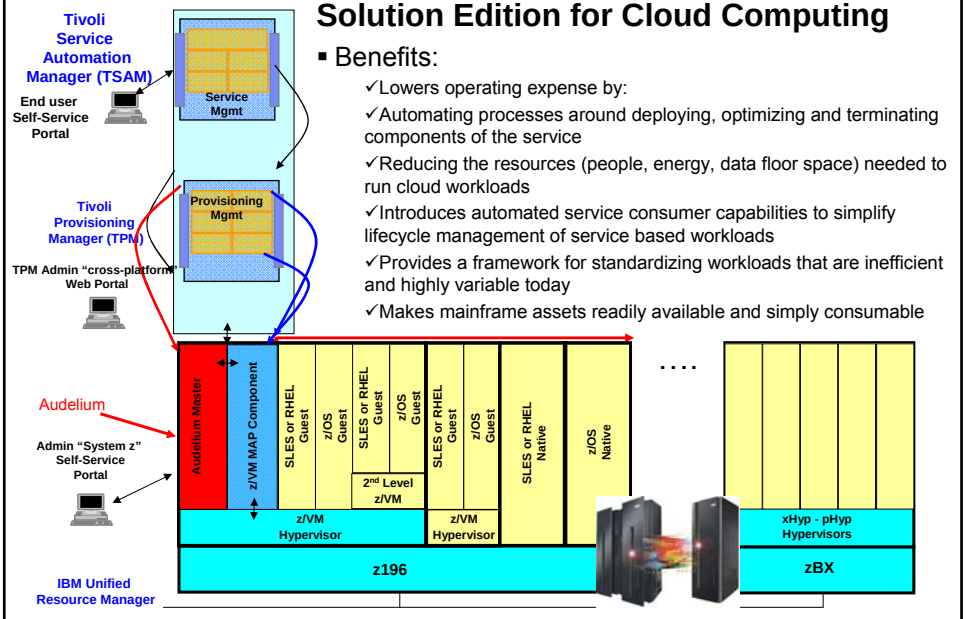
Solution Edition for Cloud Computing

- Benefits:
  - ✓Lowers operating expense by:
  - ✓Automating processes around deploying, optimizing and terminating components of the service
  - ✓Reducing the resources (people, energy, data floor space) needed to run cloud workloads
  - ✓Introduces automated service consumer capabilities to simplify lifecycle management of service based workloads
  - ✓Provides a framework for standardizing workloads that are inefficient and highly variable today
  - ✓Makes mainframe assets readily available and simply consumable



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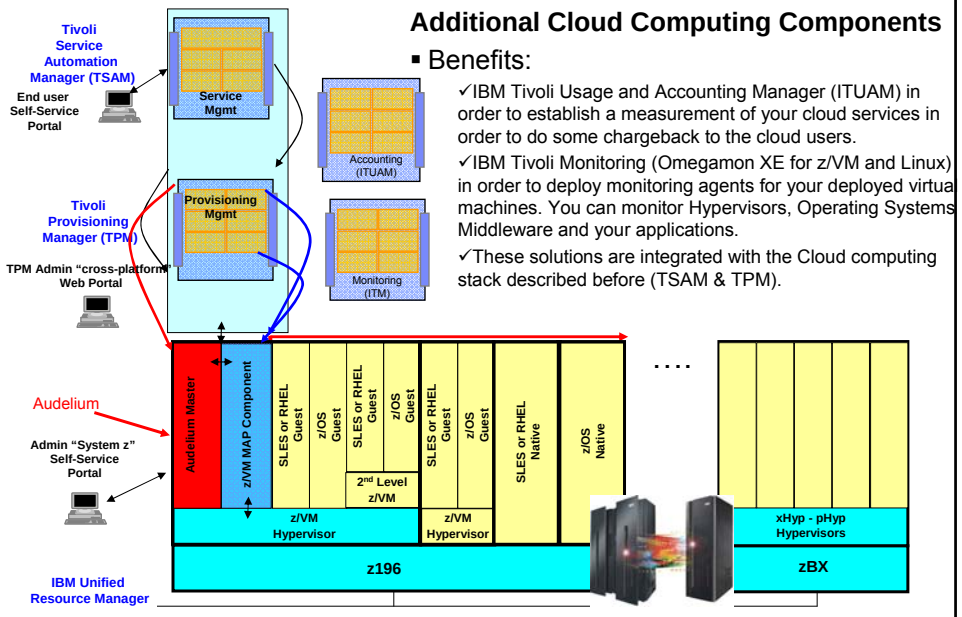
Additional Cloud Computing Components

- Benefits:
  - ✓IBM Tivoli Usage and Accounting Manager (ITUAM) in order to establish a measurement of your cloud services in order to do some chargeback to the cloud users.
  - ✓IBM Tivoli Monitoring (Omegamon XE for z/VM and Linux) in order to deploy monitoring agents for your deployed virtua machines. You can monitor Hypervisors, Operating Systems Middleware and your applications.
  - ✓These solutions are integrated with the Cloud computing stack described before (TSAM & TPM).



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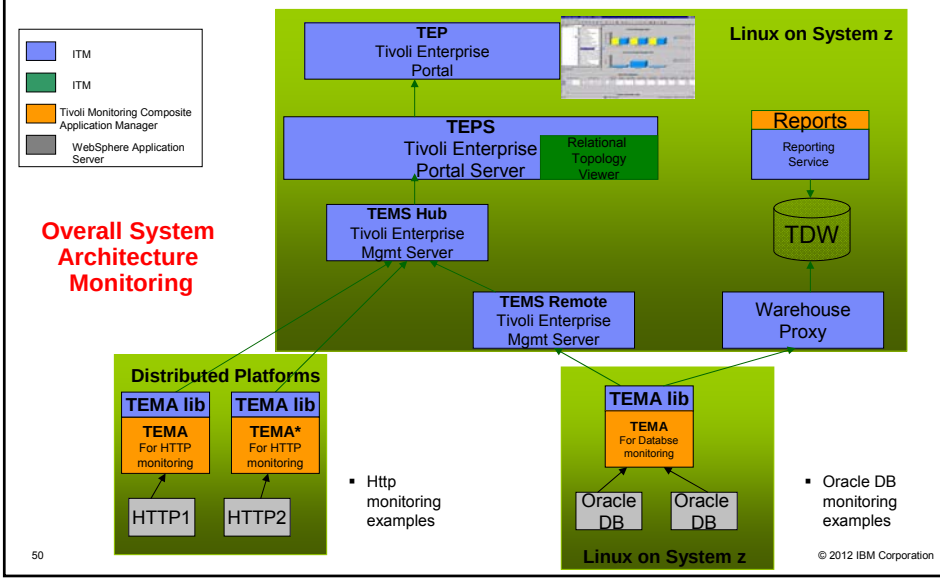
Tivoli Monitoring Architecture Overview



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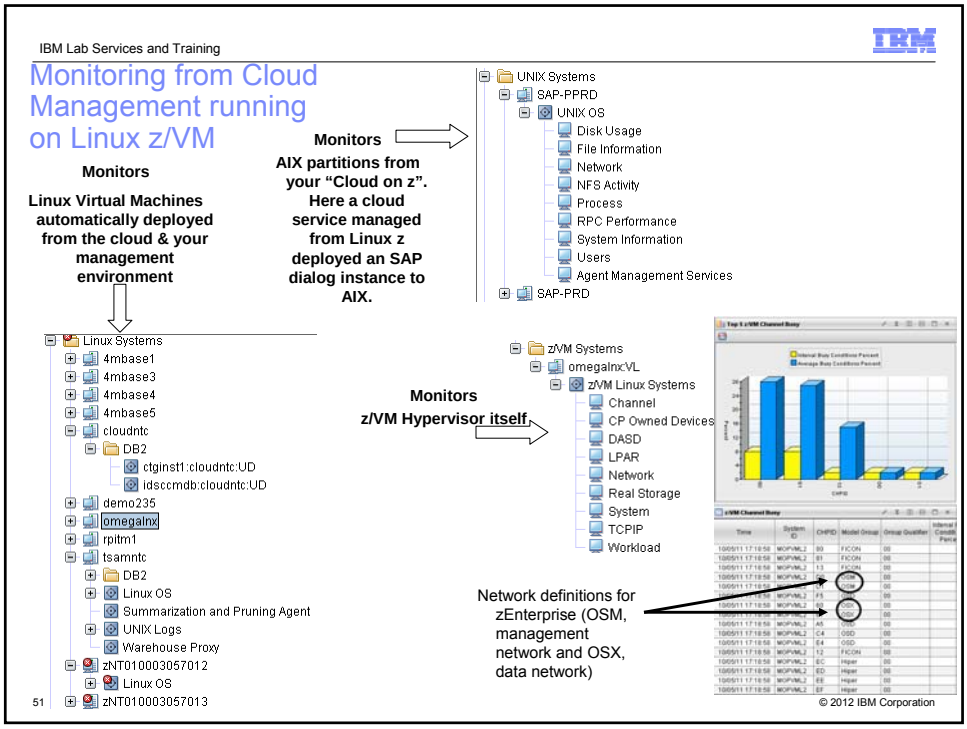
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Monitoring from Cloud Management running on Linux z/VM
Monitors
Linux Virtual Machines automatically deployed from the cloud & your management environment
Monitors
AIX partitions from your "Cloud on z". Here a cloud service managed from Linux z deployed an SAP dialog instance to AIX.
UNIX Systems
SAP-PPRD
UNIX OS
Disk Usage
File Information
Network
NFS Activity
Process
RPC Performance
System Information
Users
Agent Management Services
SAP-PRD
Linux Systems
4mbase1
4mbase3
4mbase4
4mbase5
cloudntc
DB2
ctginst1:cloudntc:UD
idsccmdb:cloudntc:UD
demo235
omegalnx
rpitm1
tsamntc
DB2
Linux OS
Summarization and Pruning Agent
UNIX Logs
Warehouse Proxy
zNT010003057012
Linux OS
zNT010003057013
Monitors
z/VM Hypervisor itself
z/VM Systems
omegalnx:VL
z/VM Linux Systems
Channel
CP Owned Devices
DASD
LPAR
Network
Real Storage
System
TCPIP
Workload
Network definitions for zEnterprise (OSM, management network and OSX, data network)
51
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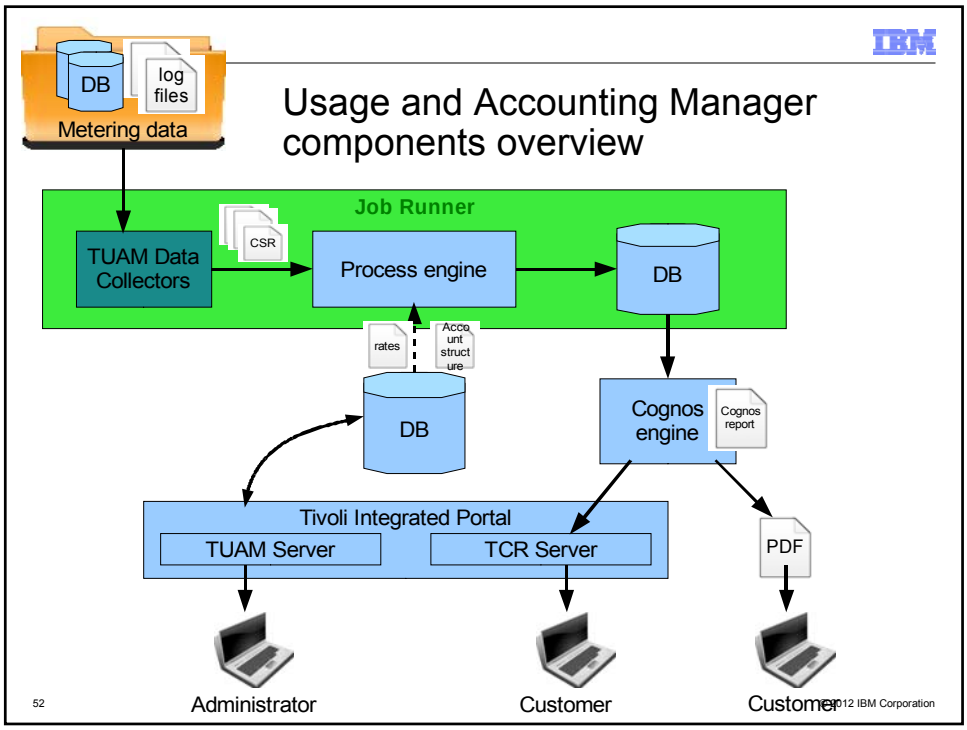
DB
log files
Metering data
Usage and Accounting Manager components overview
Job Runner
TUAM Data Collectors
CSR
Process engine
DB
rates
Acco unt struct ure
DB
Cognos engine
Cognos report
Tivoli Integrated Portal
TUAM Server
TCR Server
PDF
Administrator
Customer
Customer
52
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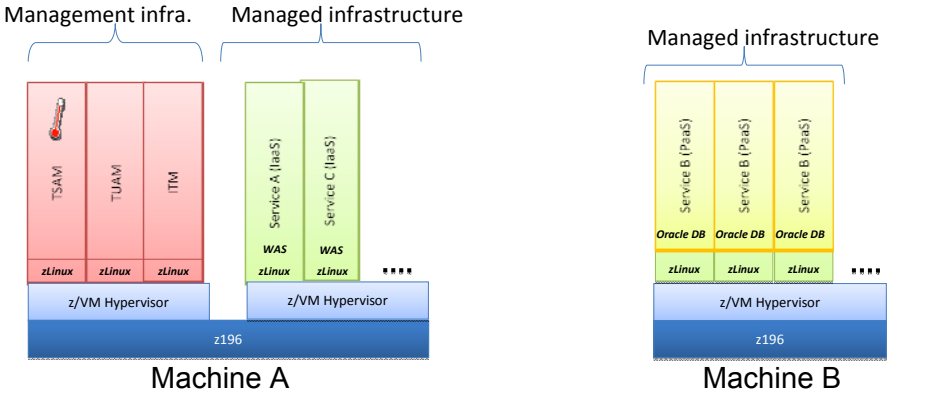
Accounting **Allocation of Resources**

Getting defaults metrics from TSAM

Simple to configure, provide information on service requests.

Metrics : duration and size of machines requested
Identifiers : chargeback department, requester, project name, hostname



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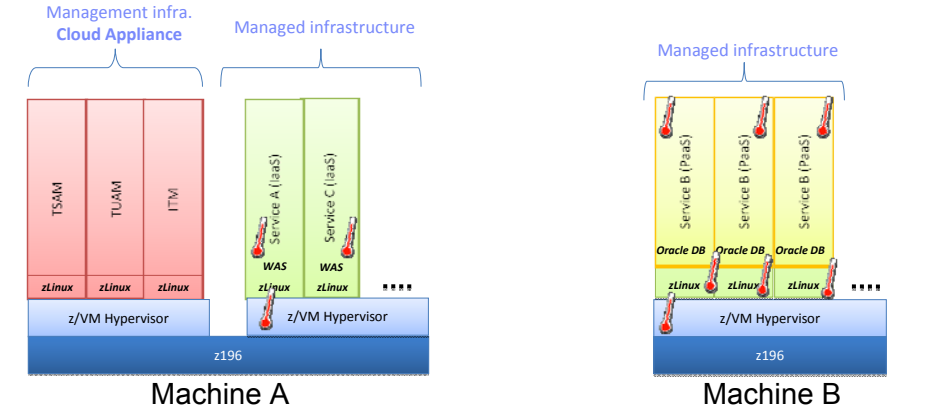
Accounting Real **Utilization of Resources**

Getting real utilization metrics information for each machine

Could be complex to configure : installation of agents in each machine has to be automated
Metrics : - *hypervisor* : percentage CPU, memory, I/O, …
- *OS* : percentage CPU virtuel, # processes, …
- *application* : # of databse transactions, # of http requests, …
Identification : hostname



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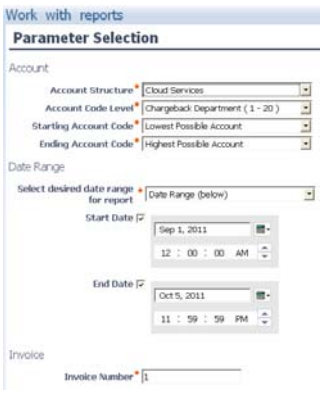
Accounting from Cloud Management running on Linux z/VM

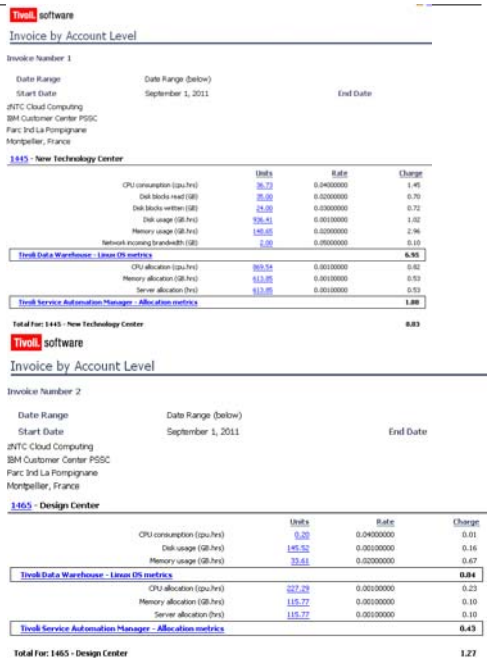
Step 1

Select your report's parameters



Step 2

Generate the invoices for each department



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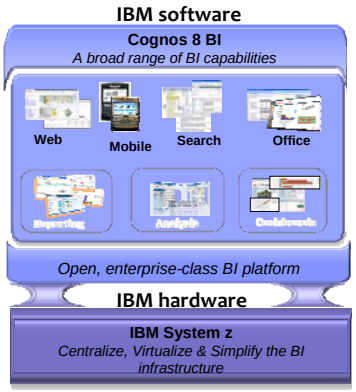
Introducing the Smart Analytics Cloud

A private cloud optimized for analytic services in large enterprises

	Defined as …	To create…	That delivers …
Smart Analytics Cloud	IBM Smart Business - services with industry leading hardware & software	A private cloud computing solution for business intelligence (BI) & analytics	A services solution for delivering business intelligence to the entire organization



IBM Services

- Create awareness of BI and understand the needs for a BI strategy across the organization
- Complete a readiness assessment to define the scope and priorities for the solution
- Deploy Cognos 8 BI for Linux on System z as a private cloud
- Provide the skills for the on going management & expansion of their BI private cloud deployment

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stem z – Cloud Computing Offerings

Cloud Management - Service Automation Manager Technology

- IBM Offering 'IBM System z Solution Edition for Cloud Computing' – covers Tivoli Service Automation Manager (TSAM) as cloud life-cycle instance, including service catalogue, orchestration of requests and based on TPM as deployment component

Infrastructure Management – Director & Provisioning Manager Technology

- IBM Offering 'zEnterprise Starter Edition for Cloud' - Tivoli Provisioning Manager (TPM) as cloud service deployment instance
- IBM Systems Director VMControl – Director GUI initiated virtual server deployment

Infrastructure Virtualization – z/VM & Unified Resource Manager Technology

- Unified Resource Manager (URM) – zEnterprise HMC initiated virtual server deployment (z/VM-Linux, KVM/Intel-Linux/Windows, PowerVM-AIX) on zBX

Audelium – Service Offering - Fast start automated z/VM Linux & z/OS deployment

Closing Thoughts…..

Cloud Computing involves virtualizing compute resources behind an interface. Compute services are provided dynamically

The users of a cloud are *unaware* of infrastructure details

The administrators of a cloud *are* aware and use various solutions to provide the infrastructure

Different kinds of cloud: IaaS, PaaS, SaaS

Quite often there's a hypervisor in the mix …

… and function to interact with the hypervisor to create and manage the virtual server infrastructure

System z does have a role in the cloud:

- **z/VM -- as hipervisor for virtualized Linux**
- **z/OS -- as a platform for Software as a Service**
- **zEnterprise/zManager -- infrastructure and manager of a set of hypervisors in a hybrid environment**

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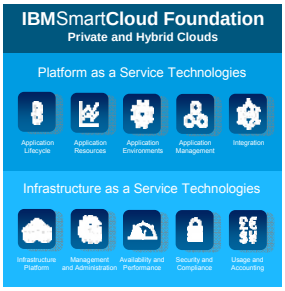
Conclusion

e Cloud Offerings for System z
h from Truth)

x on System z by using:
nux Server
ualization on System z)



Then, initiate your journey to Cloud Computing by using :
=> STG Lab Service offering named "Audelium" (based on DIRMAINT)
=> Unified Resource Manager
=> IBM System Director - VMControl
=> **Cloud Starter Edition** (based on TPM)
=> Cloud Management with the **Solution Edition For Cloud Computing** (based on TSAM)

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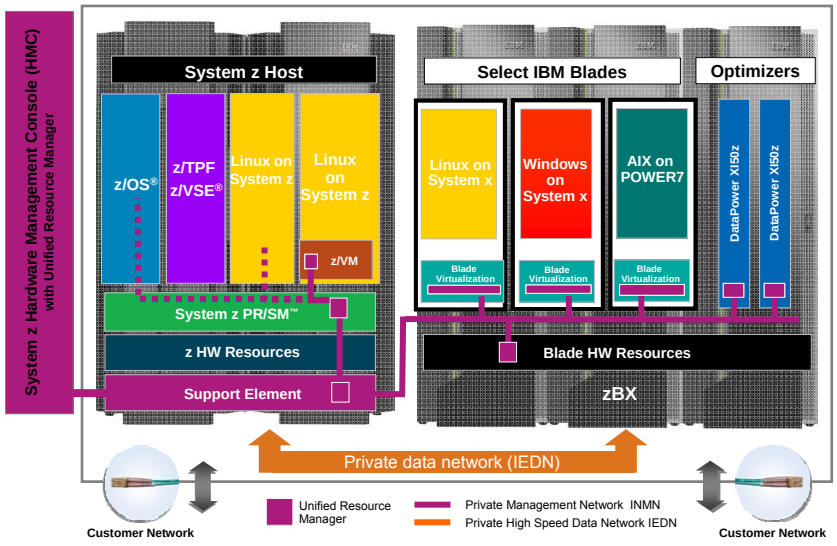
zEnterprise System Hybrid Configuration



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IBM*	PowerVM	zEnterprise	
IBM eServer	PR/SM		

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