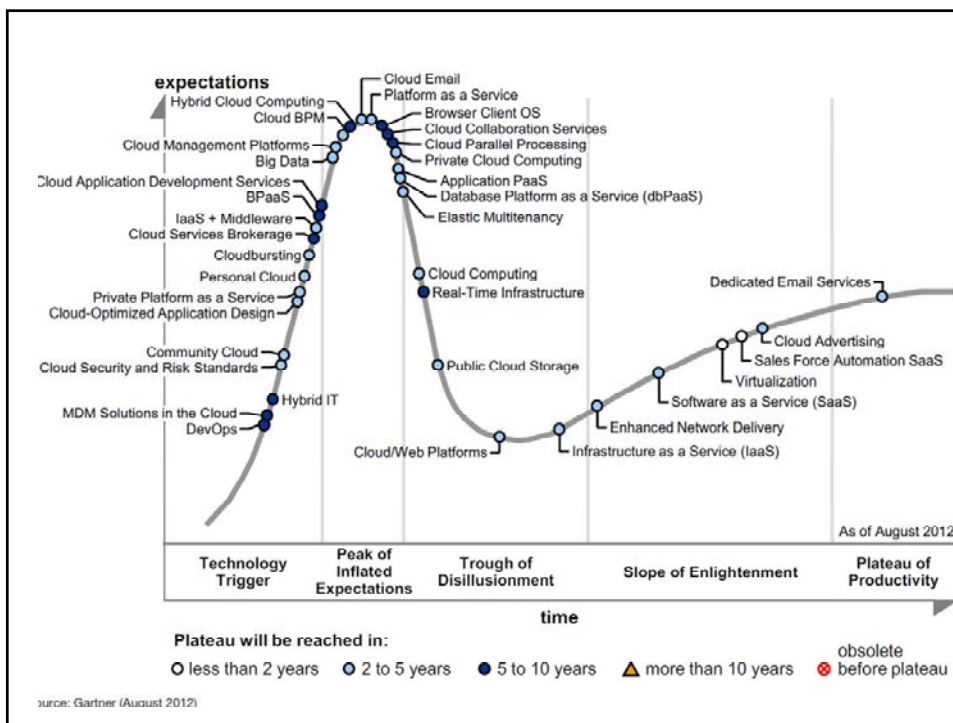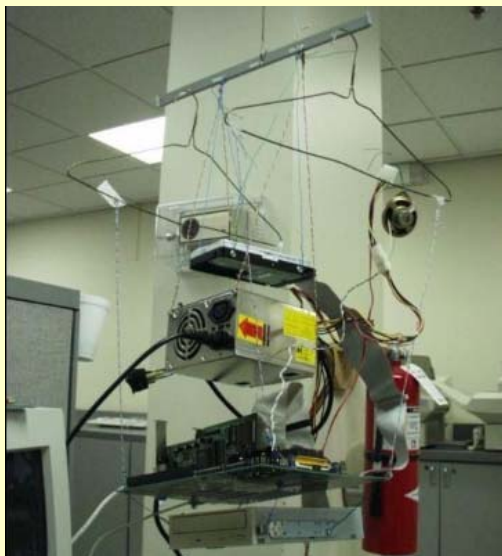# Does Cloud Computing Still Matter?

A Mainframer's Update

Glenn Anderson
IBM Technical Training

Session 13064

What is the Problem They are Trying to Solve?

- **59% - more efficient use of IT resources**

- **53% - workload scalability**

- **Other goals…….**
  - **Reduce costs**
  - **Reduce time to market**
  - **Reliability**

SOLUTION

PROBLEM

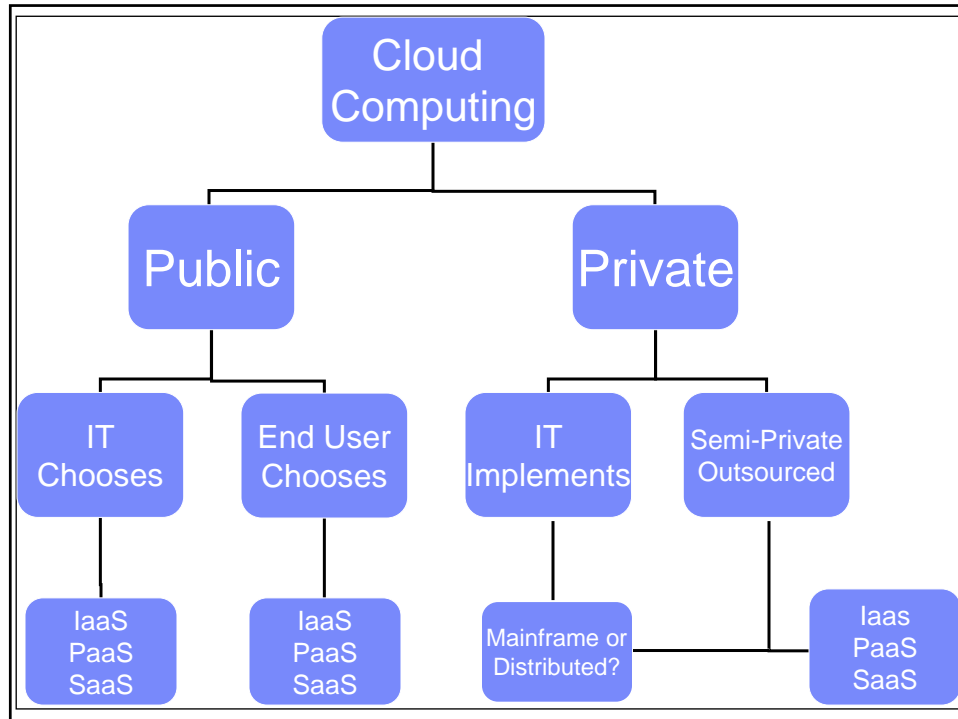3   © 2012 IBM Corporation

The trouble with cloud…….

The term "cloud computing" is used so generally and not specifically as to cause confusion.

What does it mean to "move to the cloud?"

A distinction always needs to be made between public cloud and private cloud.

2/1/2013

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                    ┌──────────────┐
                    │    Cloud     │
                    │  Computing   │
                    └──────────────┘
              ┌────────────┴────────────┐
        ┌──────────┐              ┌──────────┐
        │  Public  │              │ Private  │
        └──────────┘              └──────────┘
        ┌────┴────┐              ┌─────┴─────┐
   ┌────────┐ ┌────────┐   ┌──────────┐ ┌──────────────┐
   │   IT   │ │End User│   │    IT    │ │ Semi-Private │
   │Chooses │ │Chooses │   │Implements│ │  Outsourced  │
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   │  IaaS  │ │  IaaS  │   │Mainframe │ │     Iaas     │
   │  PaaS  │ │  PaaS  │   │    or    │ │     PaaS     │
   │  SaaS  │ │  SaaS  │   │Distributed?│ │   SaaS     │
   └────────┘ └────────┘   └──────────┘ └──────────────┘
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Public Cloud and Private Cloud

- **Cloud is not a place. It is an operational model. A delivery model**
  - **Providing IT resources to end users as <u>services</u>**

- **Public cloud – applications, storage and other resources are made available to the general public over the internet by a service provider**

- **Private cloud – cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party**

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The History of Cloud Computing

- **1961 – John McCarthy at MIT – Computing as a Public Utility**
- **1999 – Salesforce application delivery over the Internet**
- **2002 – Amazon Web Services**
- **2006 – Google Docs**
- **2009 – Browser based enterprise applications – Google Apps, Windows Azure**

- **"Cloud Computing" term first used in 1997 – from diagrams of clouds representing the Internet**

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Public Cloud

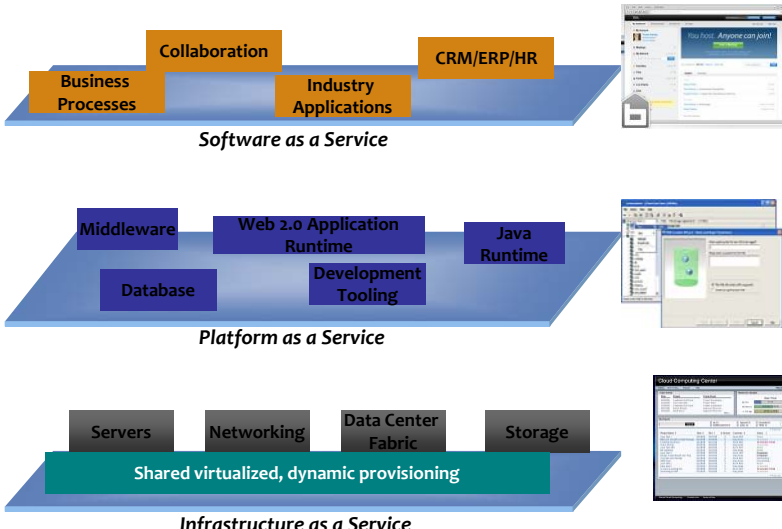**What are the Characteristics of Public Cloud Computing?**

- **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

Collaboration

CRM/ERP/HR

Business Processes

Industry Applications

Software as a Service

Middleware

Web 2.0 Application Runtime

Java Runtime

Database

Development Tooling

Platform as a Service

Servers

Networking

Data Center Fabric

Storage

Shared virtualized, dynamic provisioning

Infrastructure as a Service

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Infrastructure as a Service (IaaS)

- **Delivering cloud computing infrastructure as an on-demand service. Rather than purchasing servers, software, etc., clients buy those resources as an outsourced service on demand.**

- **Dynamic scaling, variable cost, multiple users on a single piece of hardware**

- **When demand is variable – spikes and troughs**
- **When no capital available to invest in hardware**
- **Need to understand regulatory compliance**

- **Amazon Web Services, Rackspace**

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Platform as a Service (PaaS)

- **A platform for the creation of software, delivered over the web, without the complexity of buying and maintaining the software and infrastructure underneath it.**

- **Services to develop, test, deploy, host and maintain applications in the same integrated development environment**
- **Multi-tenant architecture where multiple concurrent users utilize the same development application**

- **Concern if app needs to be highly portable in terms of where it is hosted**
- **Concern with possible vendor lock-in**

- **Google App Engine, Microsoft Azure Services, Force.com**

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Software as a Service (SaaS)

- Software deployed over the internet. A provider licenses an app to customers either as a service on demand, through a subscription, in a pay-as-you-go model, or at no charge

- Web access to commercial software managed from central location
- Software delivered in one to many model
- Users not required to handle upgrades or patches

- Good for vanilla offerings, where solution is largely undifferentiated, such as email
- Software where demand spikes significantly
- Concern if requirement for extremely fast processing of real time data

- Salesforce.com CRM product

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By the way, most "experts" consider SaaS the future of cloud computing……cloud specific apps written to a set of services hosted in the cloud.

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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!**

Reducing Cost and Optimizing Business

| VIRTUALIZATION | + | ENERGY EFFICIENCY | + | STANDARDIZATION | + | AUTOMATION | = | Reduced Cost |

….leverages virtualization, standardization and automation to free up operational budget for new investment (inward looking)
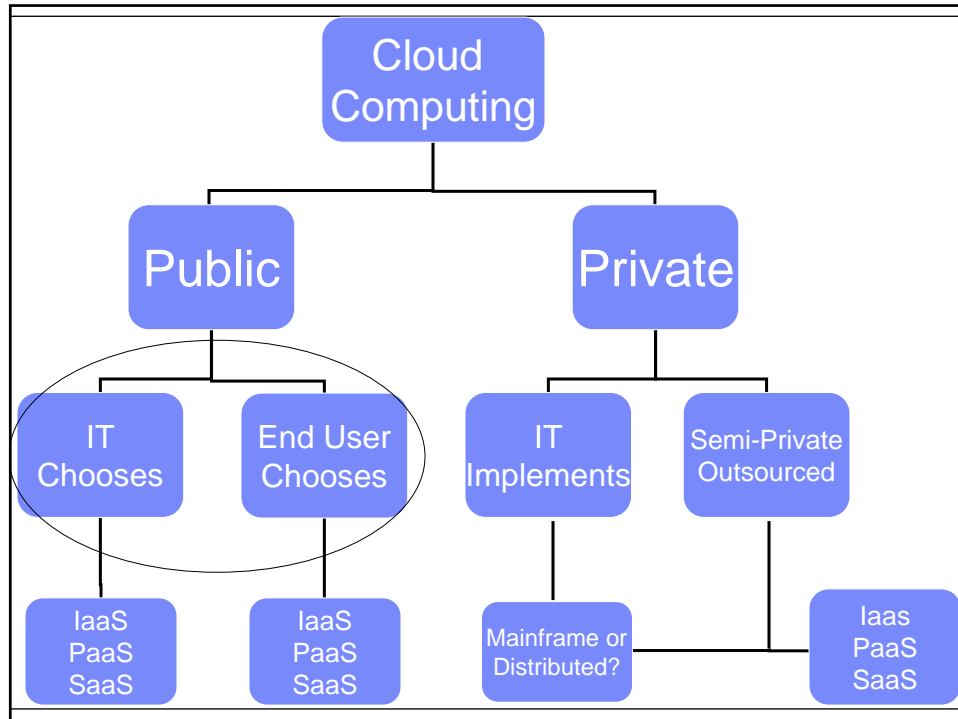
| AGILITY | + | BUSINESS & IT ALIGNMENT | + | SERVICE FLEXIBILITY | + | INDUSTRY STANDARDS | = | OPTIMIZED BUSINESS |

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

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                    ┌──────────────┐
                    │    Cloud     │
                    │  Computing   │
                    └──────────────┘
              ┌────────────┴────────────┐
        ┌──────────┐              ┌──────────┐
        │  Public  │              │ Private  │
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   │  IT    │ │ End User │  │   IT     │ │ Semi-Private │
   │Chooses │ │ Chooses  │  │Implements│ │  Outsourced  │
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   ┌────────┐ ┌──────────┐                        ┌──────────┐
   │  IaaS  │ │  IaaS    │  ┌──────────────┐      │   Iaas   │
   │  PaaS  │ │  PaaS    │  │ Mainframe or │      │   PaaS   │
   │  SaaS  │ │  SaaS    │  │ Distributed? │      │   SaaS   │
   └────────┘ └──────────┘  └──────────────┘      └──────────┘
```

Land of a 1000 CIOs…….

- If users aren't happy, you run the risk of them doing their own thing

- We cannot mandate that people use IT services

- Most dominant users of public cloud computing services don't work for IT

- By circumventing IT, business departments get their job done faster

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The Challenge of Public Cloud Service Sprawl

- Maintaining business relevance

- Mitigating the risk of rogue services

- Obtaining the optimal IT service value

- Providing business with the support it needs

- Aligning service levels with business objectives

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Does a Public Cloud Really Lower IT Expenses?

- IaaS: Analyze Load Profiles
  - Bandwidth-heavy, compute-heavy, or combination
  - More spiky the load, IaaS more cost-efficient

- Cloud Storage: Beware of Hidden Costs
  - Basic cost per gigabyte of cloud storage
  - Extra charge for data transfers, metadata functions, copy/delete of files

- Pay-as-you-use Model Not Best for Resources Needed Constantly
  - Rental car analogy

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What IT Services workloads are we seeing move to Public cloud delivery?

1. Single virtual appliance workloads
2. Test and Pre-production systems
3. Mature packaged offerings, like e-mail and collaboration
4. Software development environments
5. Batch processing jobs with limited security requirements
6. Isolated workloads where latency between components is not an issue
7. Storage Solutions/Storage as a Service
8. Backup Solutions/Backup & Restore as a Service
9. Some data intensive workloads if the provider has a cloud storage offering tied to the cloud compute offering

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End to End Public Cloud Computing Issues

Consider Disaster Recovery

Replication between machines in a room is not DR

Compliance

How will Cloud providers put you at risk

Security

Secure the data.

Multi Tenancy issues

Selecting appropriate workloads

*Cloud **technical** models do not solve all problems.*

Performance and network latency

Huge amounts of data back and forth over the internet

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What IT Service workloads may **not** be appropriate for Public cloud delivery?

1 Workloads which depend on sensitive data normally restricted to the Enterprise
- Employee Information - Most companies are not ready to move their LDAP server into a public cloud because of the sensitivity of the data
- Health Care Records - May not be ready to move until the security of the cloud provider is well established

2 Workloads composed of multiple, co-dependent services
- High throughput online transaction processing

3 Workloads requiring a high level of auditability, accountability
- Workloads subject to Sarbanes-Oxley, for example

4 Workloads based on 3rd party software that do not have a virtualization or cloud aware licensing strategy

5 Workloads requiring detailed chargeback or utilization measurement as required for capacity planning or departmental level billing

6 Workloads requiring customization (e.g. customized SaaS)

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Private Cloud

Is a Private Cloud Really a Cloud at All?

- It's still your data center
- You own the capital assets
- The resources are not infinite
- At the corporate level, there is no pay-as-you-go

Private cloud is really not a "cloud" at all. It means operating your data center to deliver service in a public cloud-like model.

Which of these Characteristics of Public Cloud Computing Interests You as a __System z__ IT Organization?

- **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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Which of these Characteristics of Public Cloud Computing Interests You as a __System z__ IT Organization?

- **On-Demand Self Service (do end user's need this?)**
  - Pick services you need, when you need them
- **Broad Network Access (who needs access to your services?)**
  - Available over network through thin or thick clients
- **Resource Pooling (do you already do this?)**
  - Resources are shared, serving multiple consumers
- **Rapid Elasticity (does production really need this?)**
  - Capabilities provisioned, in some cases automatically
  - **(good for test/dev, requires automation)**
- **Measured Service**
  - Pay only for what you use **(you own it all already)**

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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
    ├── Public
    │     ├── IT Chooses → IaaS PaaS SaaS
    │     └── End User Chooses → IaaS PaaS SaaS
    └── Private   (System z plays here)
          ├── IT Implements → Mainframe or Distributed?
          └── Semi-Private Outsourced → Iaas PaaS SaaS
```

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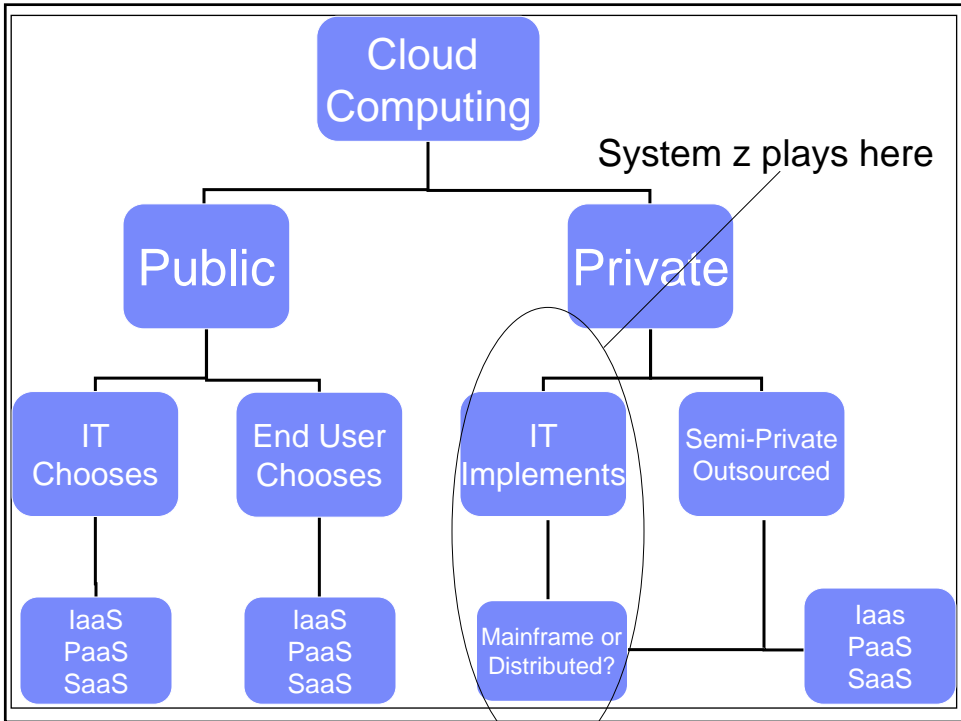
AGAIN - What is the Problem You are Trying to Solve?

- **Probably depends on who you ask……..**

  - **More efficient use of IT resources?**
  - **Workload scalability?**
  - **Reduce costs?**
  - **Reduce time to market?**
  - **Reliability?**

  - **Meet the needs of the business?**
  - **Provide more agile service delivery?**

Typical reasons for cloud

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What Does it Mean – "We Should Be Doing Cloud Computing?"

1. **Build a public cloud and market its services externally**

2. **Purchase services from a public cloud**

3. **Build your own private cloud, using technology that exhibits the characteristics of public cloud computing**

4. **Enhance your service delivery to emulate the public cloud computing model**

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Why Isn't the Mainframe Part of Cloud Discussions?

- **People responsible for cloud implementations focus on distributed**
  - because that is what they have seen in the cloud space
  - that is the technology they know
  - The vast majority of articles, blogs, podcasts on cloud computing are focused on the distributed world

- **Incorrect perception that the mainframe lacks sufficient cloud tools.**

- **Incorrect perception that mainframe is more expensive than distributed**

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:

| Virtualized Resource | Virtualized Resource | ••• | Virtualized Resource |

Hypervisor

Physical Resources
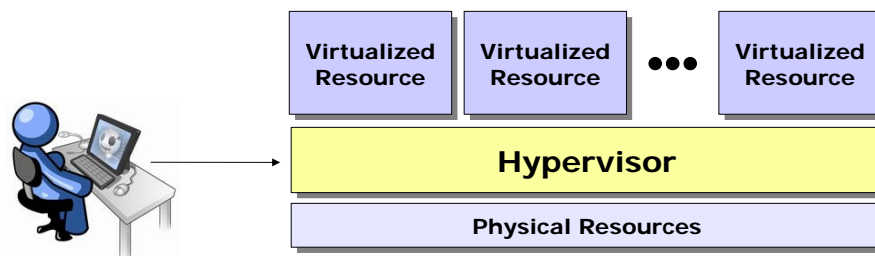
For System z we have two hypervisors:

- **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

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:

z/VM Administrator

IBM System Director

IBM Tivoli Provisioning Manager / TSAM

IBM zEnterprise zManager

Linux	Linux		Linux
Virtual Machine	Virtual Machine	●●	Virtual Machine

Pool of Resources

Linux Images
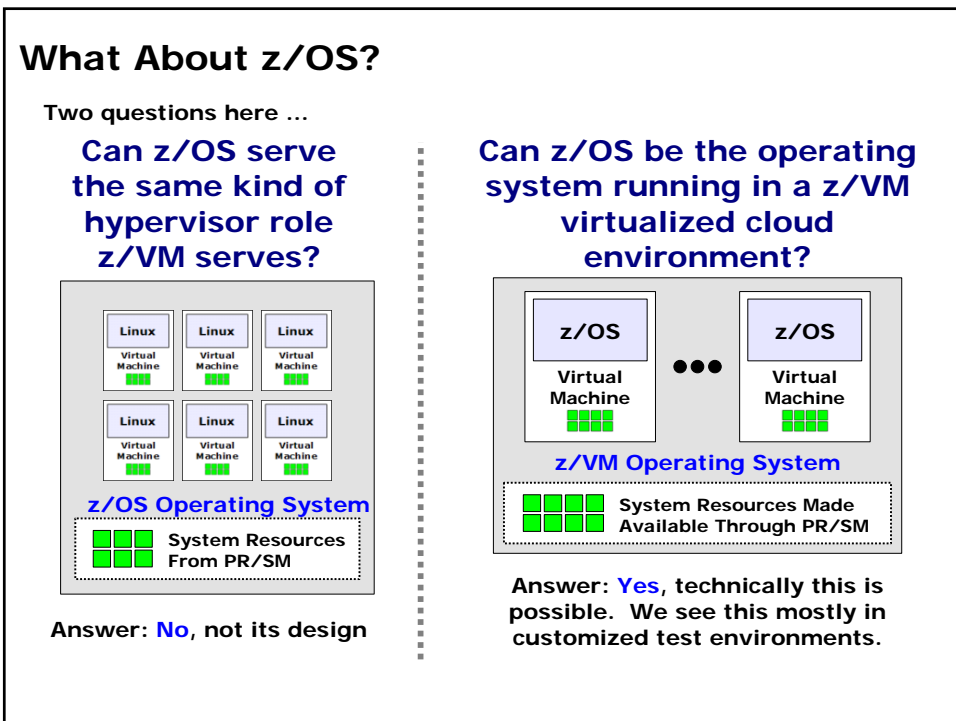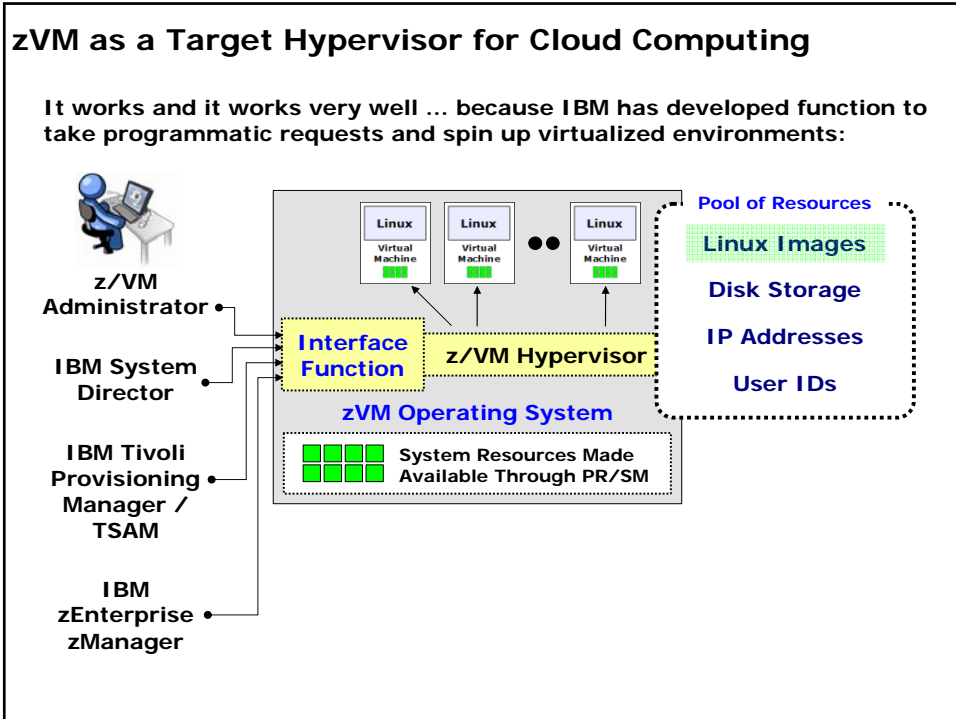
Disk Storage

IP Addresses

User IDs

Interface Function   **z/VM Hypervisor**

zVM Operating System

System Resources Made Available Through PR/SM

What About z/OS?

Two questions here ...

Can z/OS serve the same kind of hypervisor role z/VM serves?	**Can z/OS be the operating system running in a z/VM virtualized cloud environment?**

Linux	Linux	Linux
Virtual Machine	Virtual Machine	Virtual Machine
Linux	Linux	Linux
Virtual Machine	Virtual Machine	Virtual Machine

z/OS Operating System

System Resources From PR/SM

Answer: No, not its design

z/OS		z/OS
Virtual Machine	●●●	Virtual Machine

z/VM Operating System

System Resources Made Available Through PR/SM

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

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:

Reliability and Availability

LPAR	LPAR
zOS	zOS
Application Service	**Application Service**

CICS	IMS	DB2	WAS	MQ
RRS	SAF	SMF	RMF	TCP

CICS	IMS	DB2	WAS	MQ
RRS	SAF	SMF	RMF	TCP

CF

**Parallel Sysplex
Coupling Facility
Shared Data**

**Horizontal and
Vertical Scalability**

Standard Parallel Sysplex Story

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What does all this mean to a mainframe person?

- **A mainframe is what you are trying to get to when you build a cloud**

- **We were doing cloud on the mainframe before "cloud" was defined**

- **Clients are beginning to use z/VM and zLinux to provide IaaS and PaaS**

- **Linux images can be built up quickly**

- **Address spaces on z/OS can be spun up**

- **zEnterprise Hybrid Computing for cloud**

- **We can be the private cloud for the enterprise**

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Develop a cloud strategy and implementation plan

- **Without a strategy, Public Cloud computing can be a threat to the CIO and the IT team**
  - **Reduced control of IT services delivered over the Internet**
  - **Perceived cost gap between a cloud service delivered by providers outside of the IT team and "traditional" services delivered by IT**

- **With a strategy, private cloud computing can be an opportunity for the CIO**
  - **Lower costs, more responsive IT, optimized delivery**
  - **Greater range of services and capabilities**
  - **Greater visibility in billing / chargeback to LOBs**
  - **Better control of the users' systems, desktops, and services access**

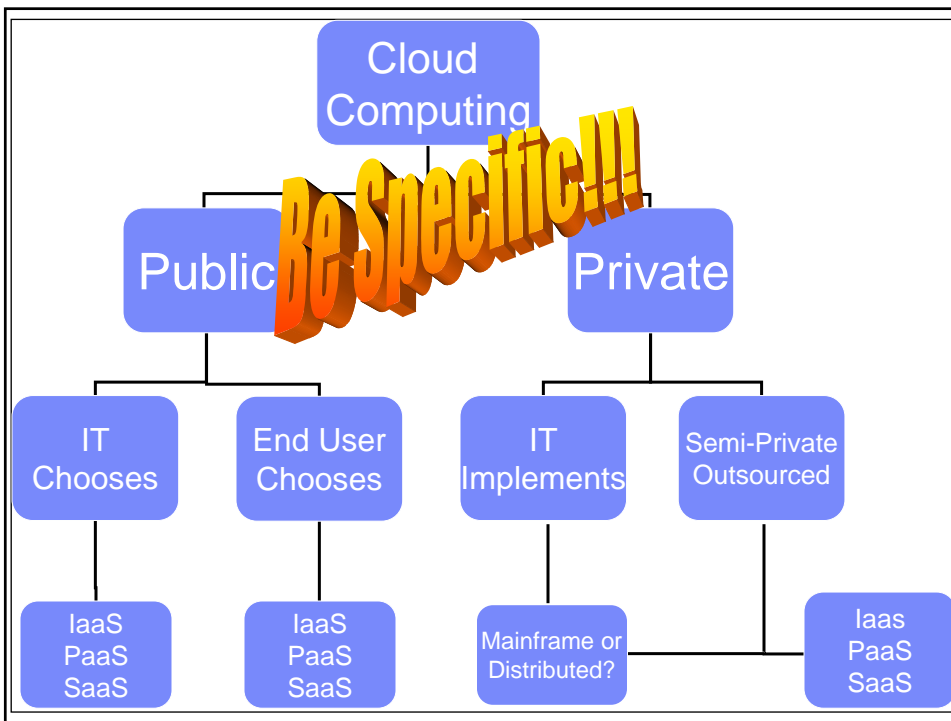- **Ignore the hype. Create a business case. Define your domains. Choose the right cloud technology.**

Don't Let the Cloud Fog Your Vision!

Session 13064