



Agenda

Introduction

Characteristics of Cloud Computing

Advantages of Cloud Computing

Cloud Service Models

Cloud Implementation Types

Containers, Docker and Kubernetes (with demo)

About IBM Cloud and IKS(PaaS product) (with demo)

Hands on IBM IKS with examples/sample code where students can try (Hands on)

What is Cloud Computing?

Gartner

“Cloud computing is a style of computing where massively scalable IT-related capabilities are provided as a service across the Internet to multiple external customers”

FORRESTER®

“Cloud computing: A pool of abstracted, highly scalable, and managed infrastructure capable of hosting end-customer applications and billed by consumption”



WIKIPEDIA
The Free Encyclopedia

“Cloud computing is Web-based processing, whereby shared resources, software, and information are provided to computers and other devices (such as smartphones) on demand over the Internet.”

What is Cloud Computing?

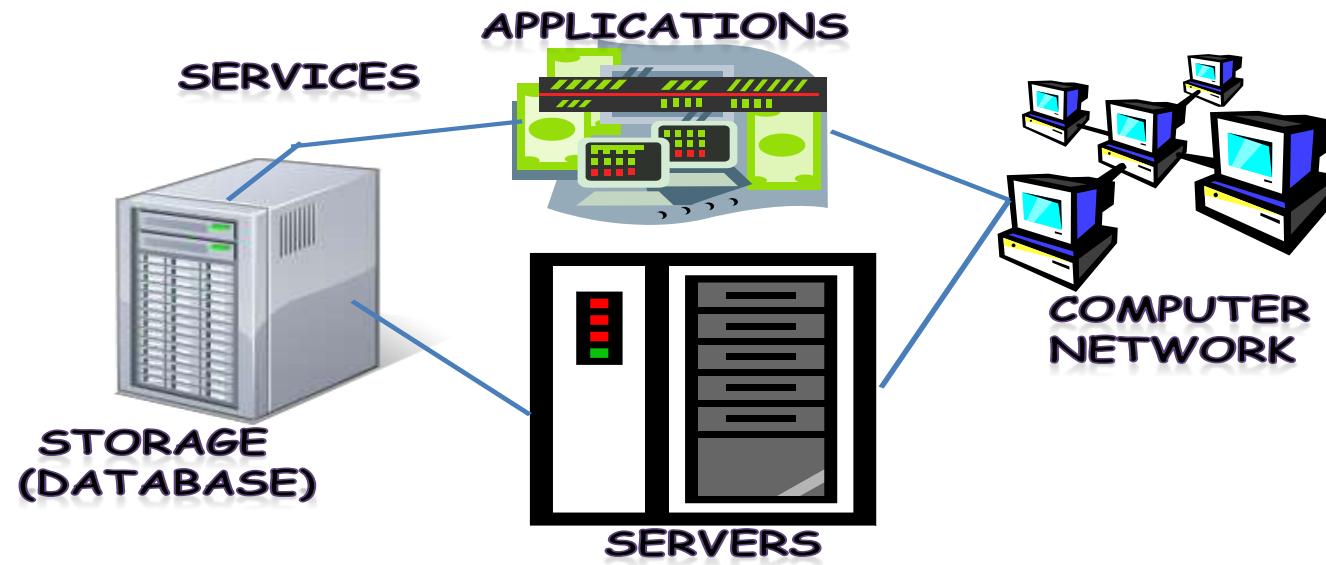
Cloud Computing



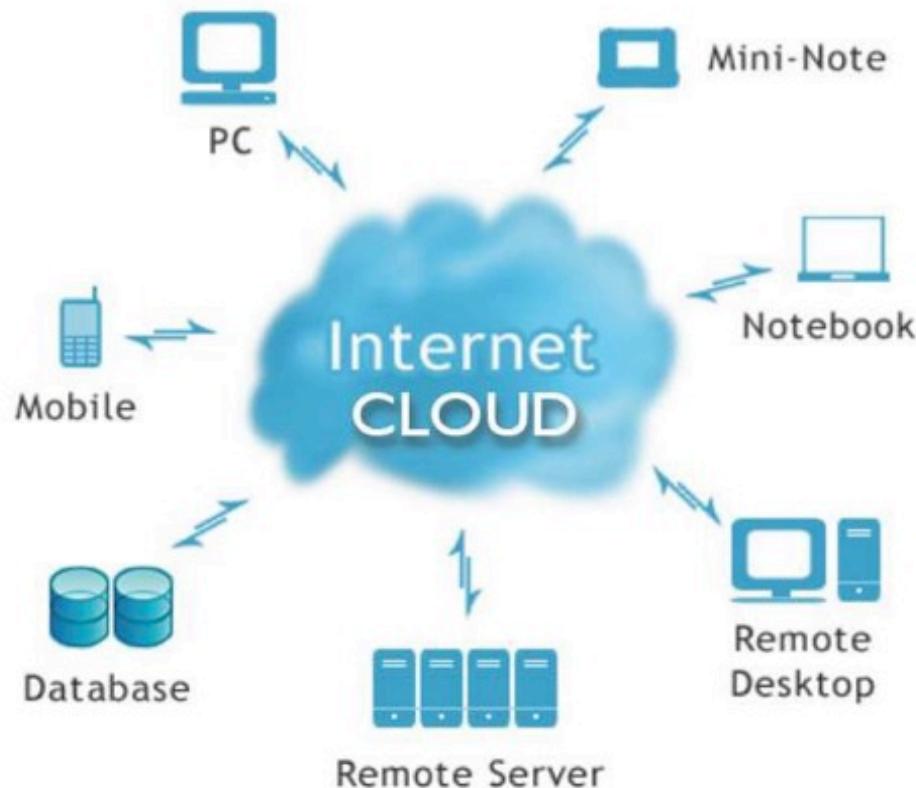
**Computing and software resources that
are delivered on demand, as service..**

*In the simplest terms, **cloud computing** means storing, accessing data and programs over the Internet instead of your computer's hard drive*

What is Cloud Computing?



Everything on the Clouds



Why CLOUD ?

Private Car



VS

Rental or Public Vehicle

Cheap Price



Easy-to-use



Pay-as-you-go



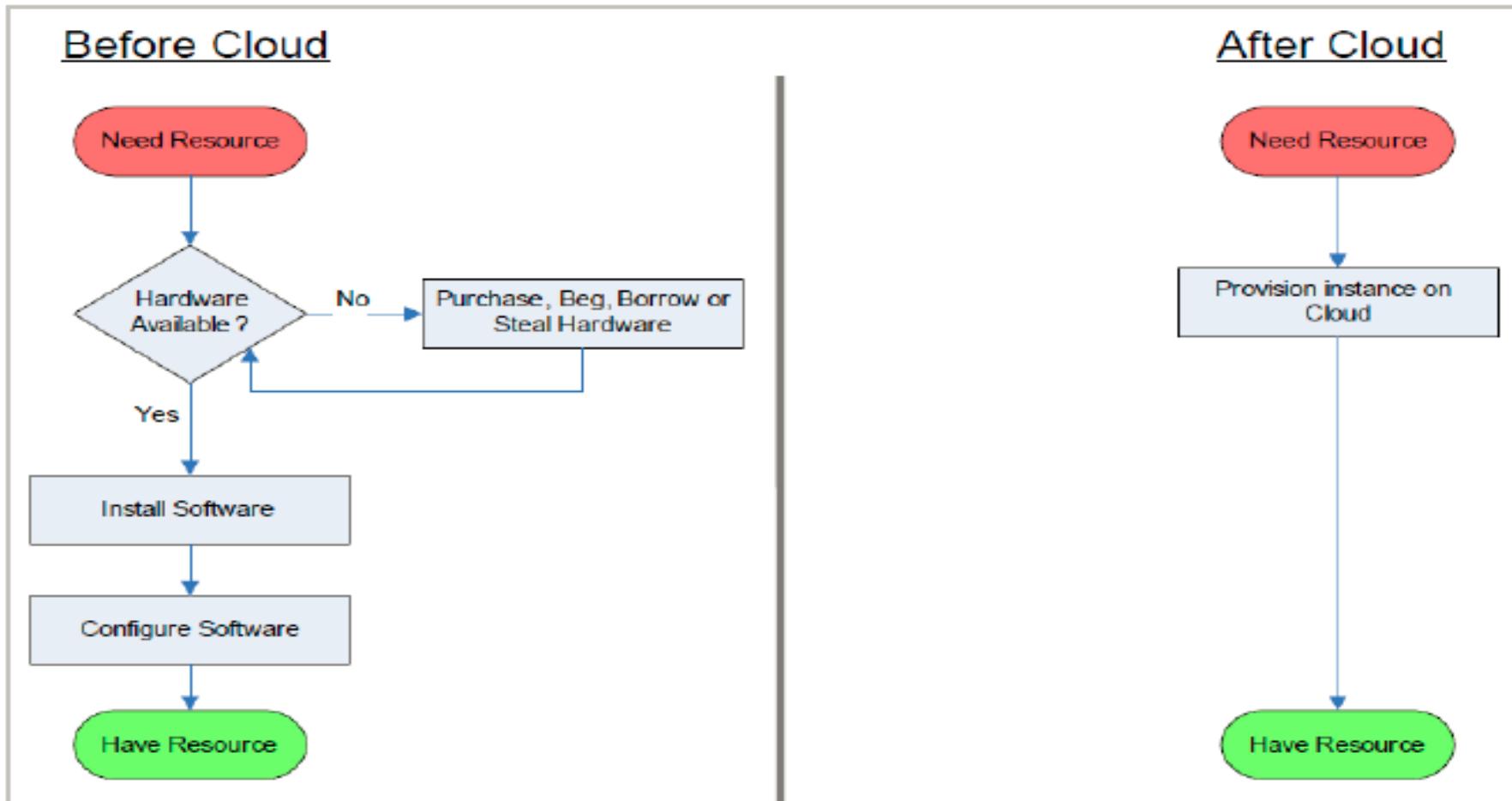
Whatever-you-want



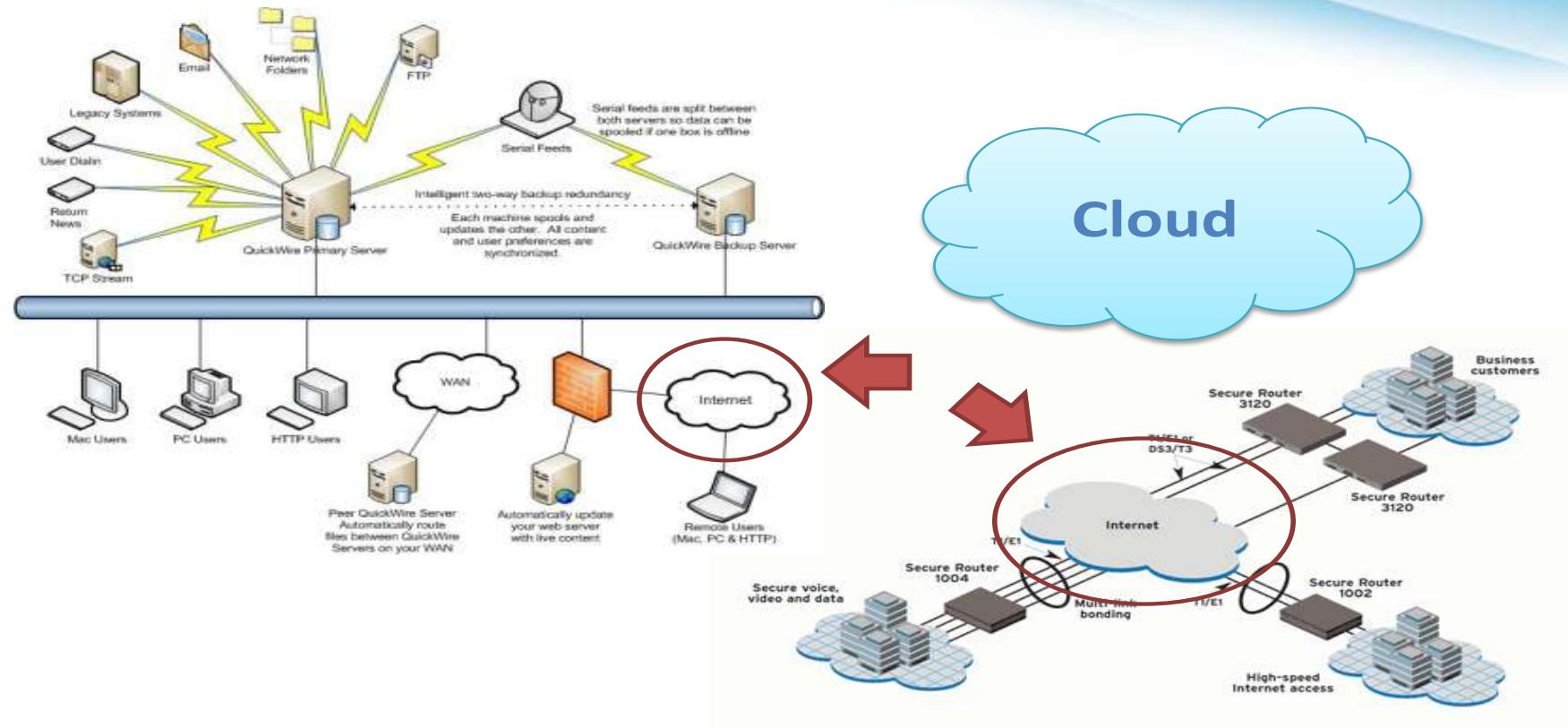
Buying it with expensive price

Just Rental with cheap price

Cloud – example for developer/tester

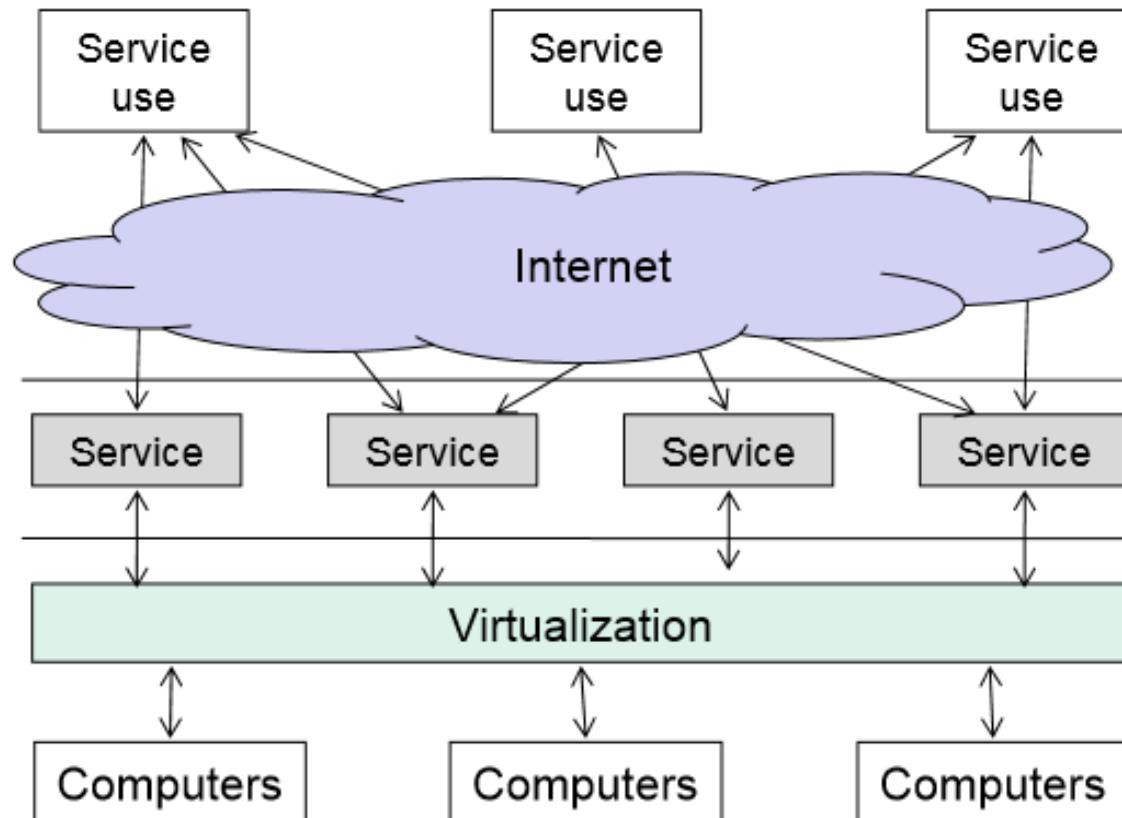


Why is it called “Cloud computing”



Conceptual Level Model for Cloud Computing

Layers



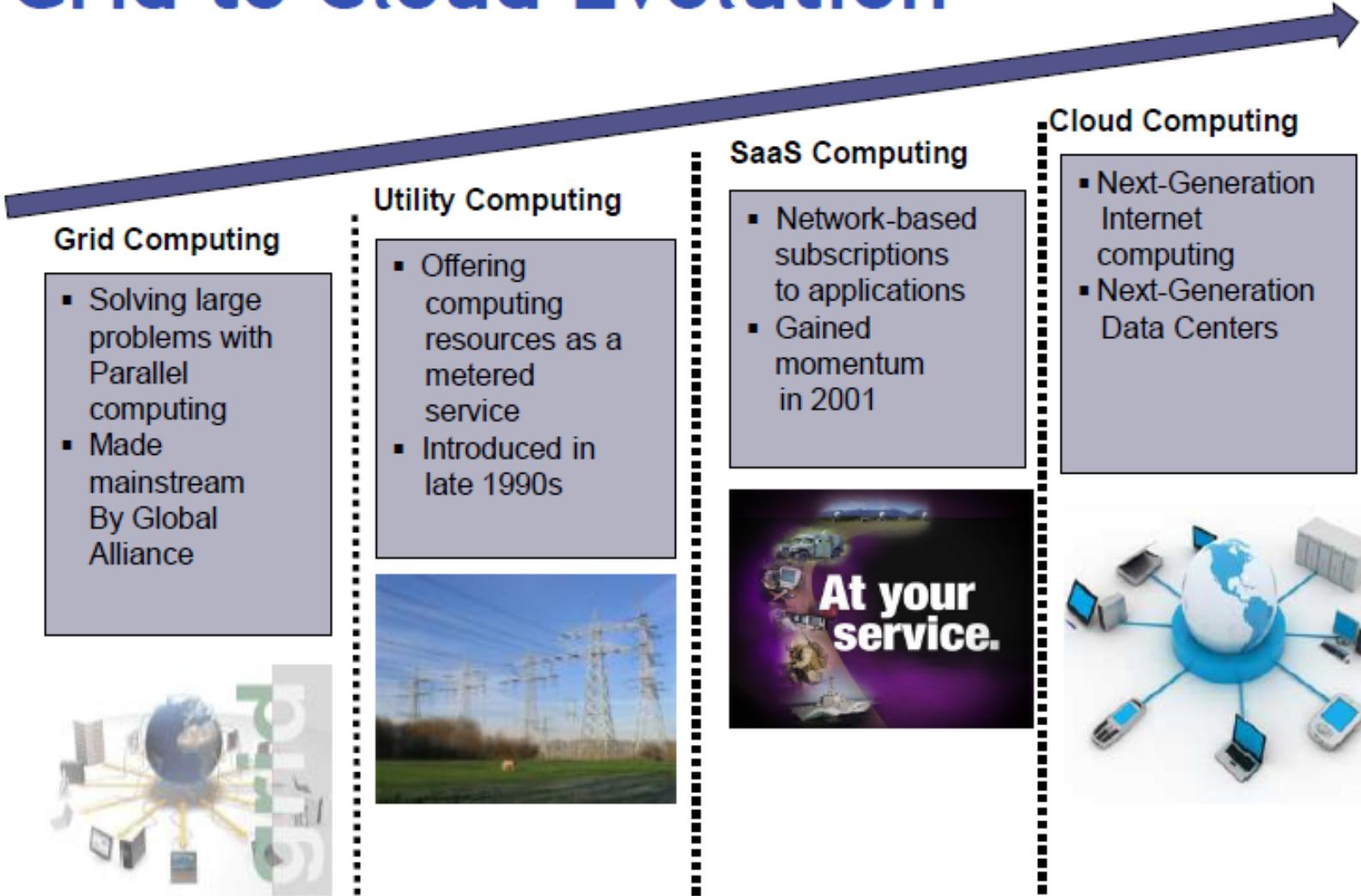
Stakeholders

Cloud service user

Cloud service provider

Infrastructure provider

Grid to Cloud Evolution



Supporting Factors for Cloud Computing

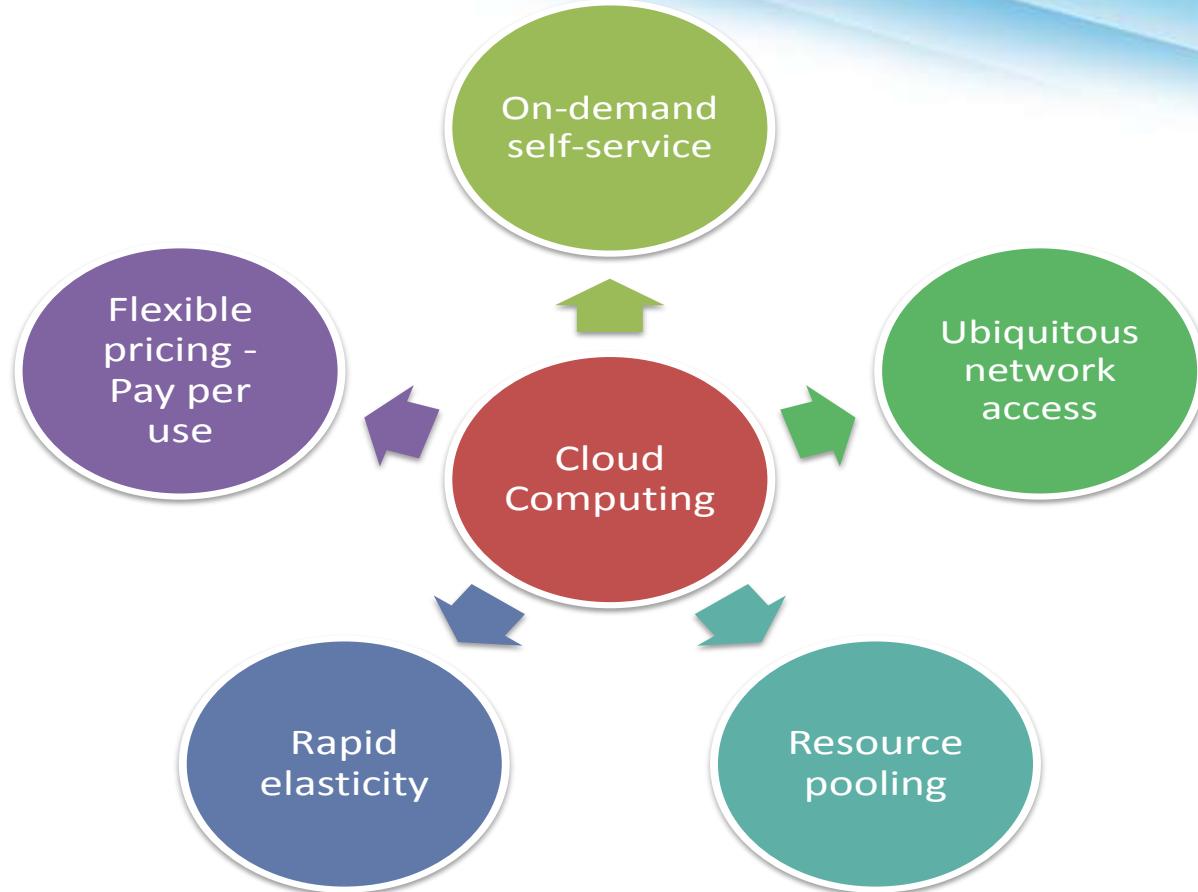
- Combined affect of following factors have made Cloud Computing a compelling Paradigm
 - Advancement in processors
 - Virtualization technology
 - Distributed Storage
 - Automated Management
 - Broadband internet Access
 - Fast and Inexpensive Servers





Essentials of Cloud Computing

Essential characteristics of Cloud Computing



Common characteristics of Cloud Computing

- **On-demand self-service**
 - Ubiquitous network access
 - Resource pooling (advanced virtualization)
 - Rapid elasticity
 - Flexible pricing - Pay per use



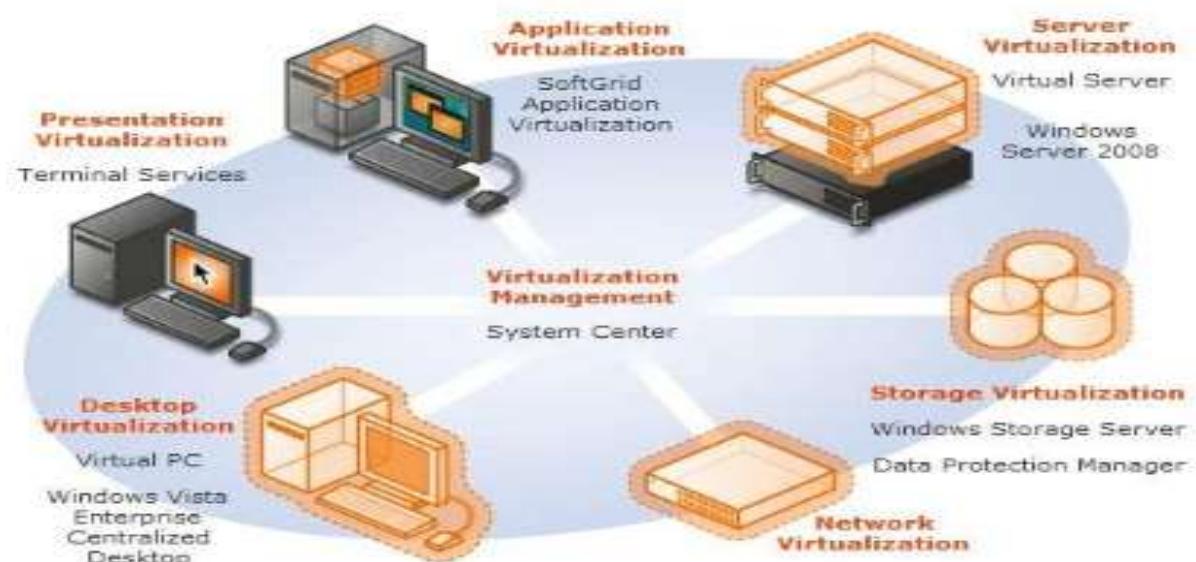
Common characteristics of Cloud Computing

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Common characteristics of Cloud Computing

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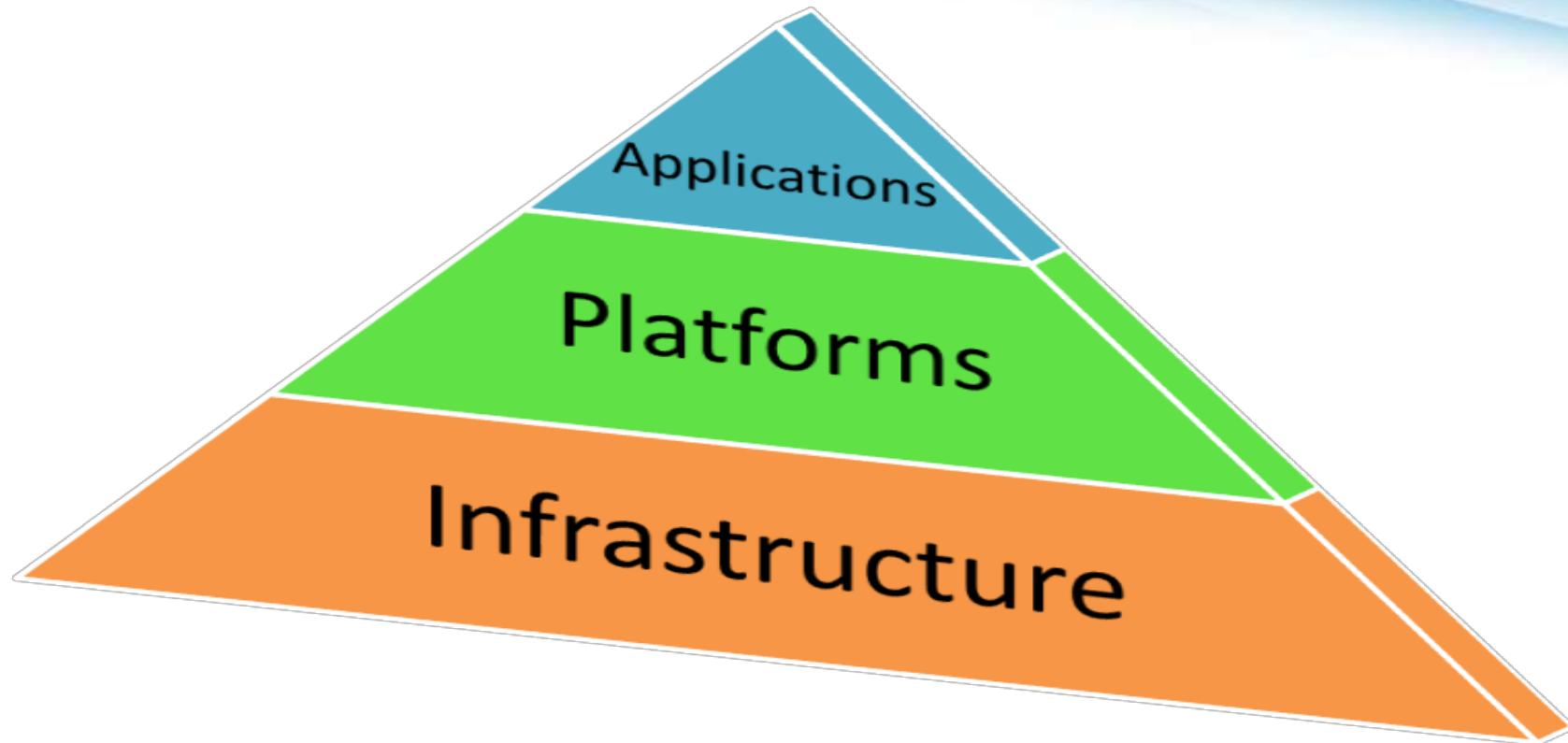
Advantages of Cloud Computing

- Lower Computing Cost
- Improved Performance
- Reduced Software Cost
- Instant Software Updates
- Unlimited Storage Capacity
- Increased Data Reliability
- Device Independence and the “always on!, anywhere and any place”
- Free From Maintenance and the “no-need-to-know”



Cloud Service Models

Cloud Service Layers



Cloud Service models - Characteristics

Software as a Service (SaaS)

- Scalable; Multi-tenant; Metadata driven configurability
- Sometimes free; easy to use; good consumer adoption; proven business models

Platform as a Service (PaaS)

- Highly scalable; multi-tier architecture; Multi tenant environments
- Developers can upload a configured applications and it “runs” within the platform’s framework

Infrastructure as a Service (IaaS)

- Offers full control of a company’s infrastructure; not confined to applications or restrictive instances
- Sometimes comes with a price premium; can be complex to build, manage and maintain

Cloud Service models - Containing

Software as a Service (SaaS)

Email

Business Processes

Industry Applications

CRM/ERP/HR

Platform as a Service (PaaS)

Middleware

Web 2.0 Application Runtime

Development Tooling

Database

Java Runtime

Infrastructure as a Service (IaaS)

Servers

Networking

Storage

Data Center Fabric

Firewalls, load balancers

Cloud Service models - Examples

Software as a Service (SaaS)

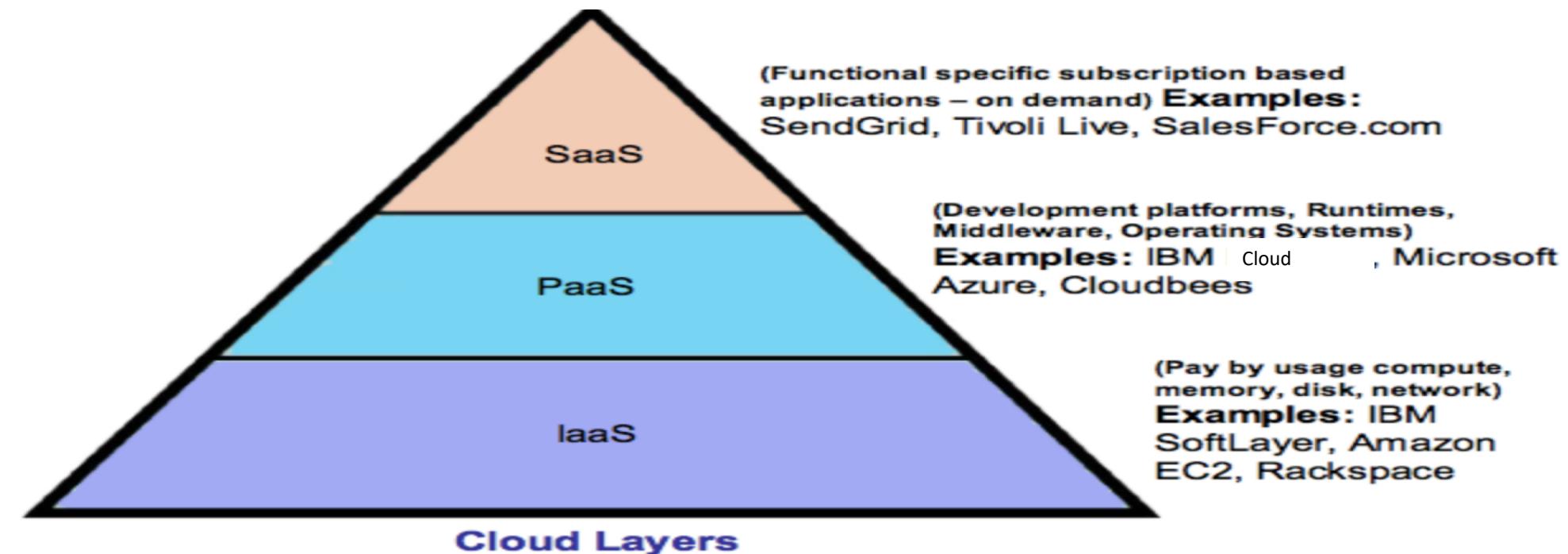


Platform as a Service (PaaS)

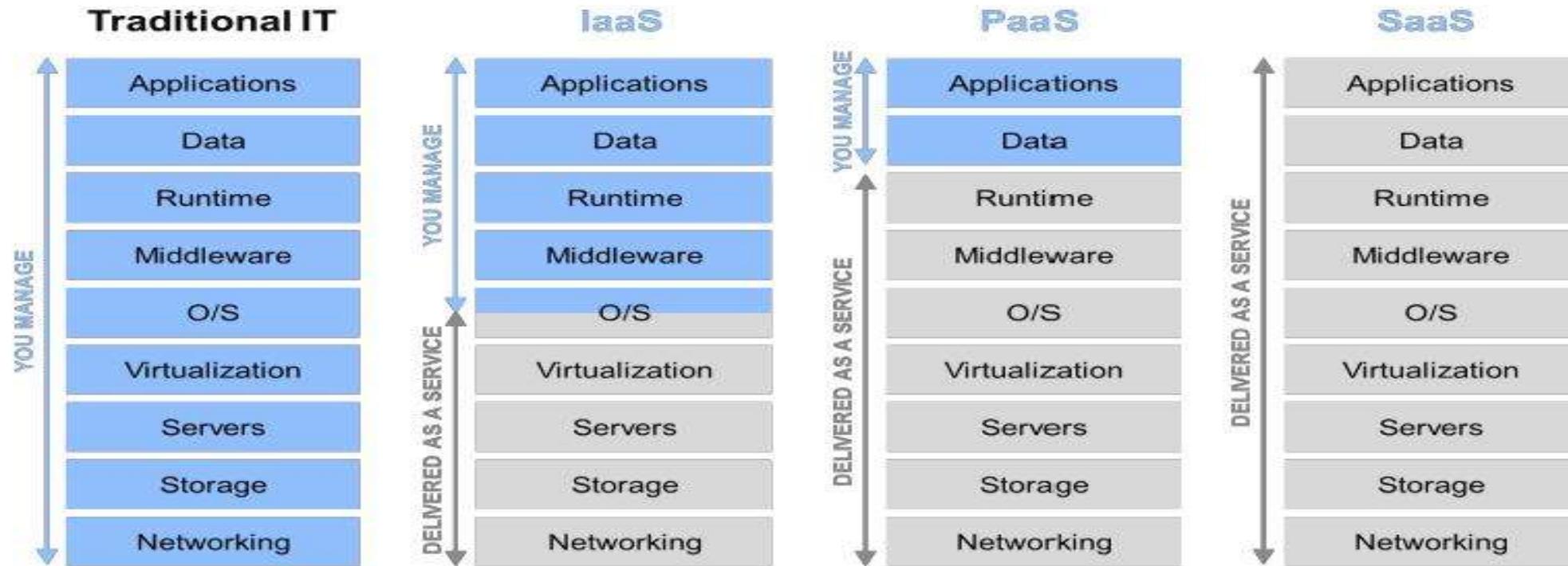


Infrastructure as a Service (IaaS)

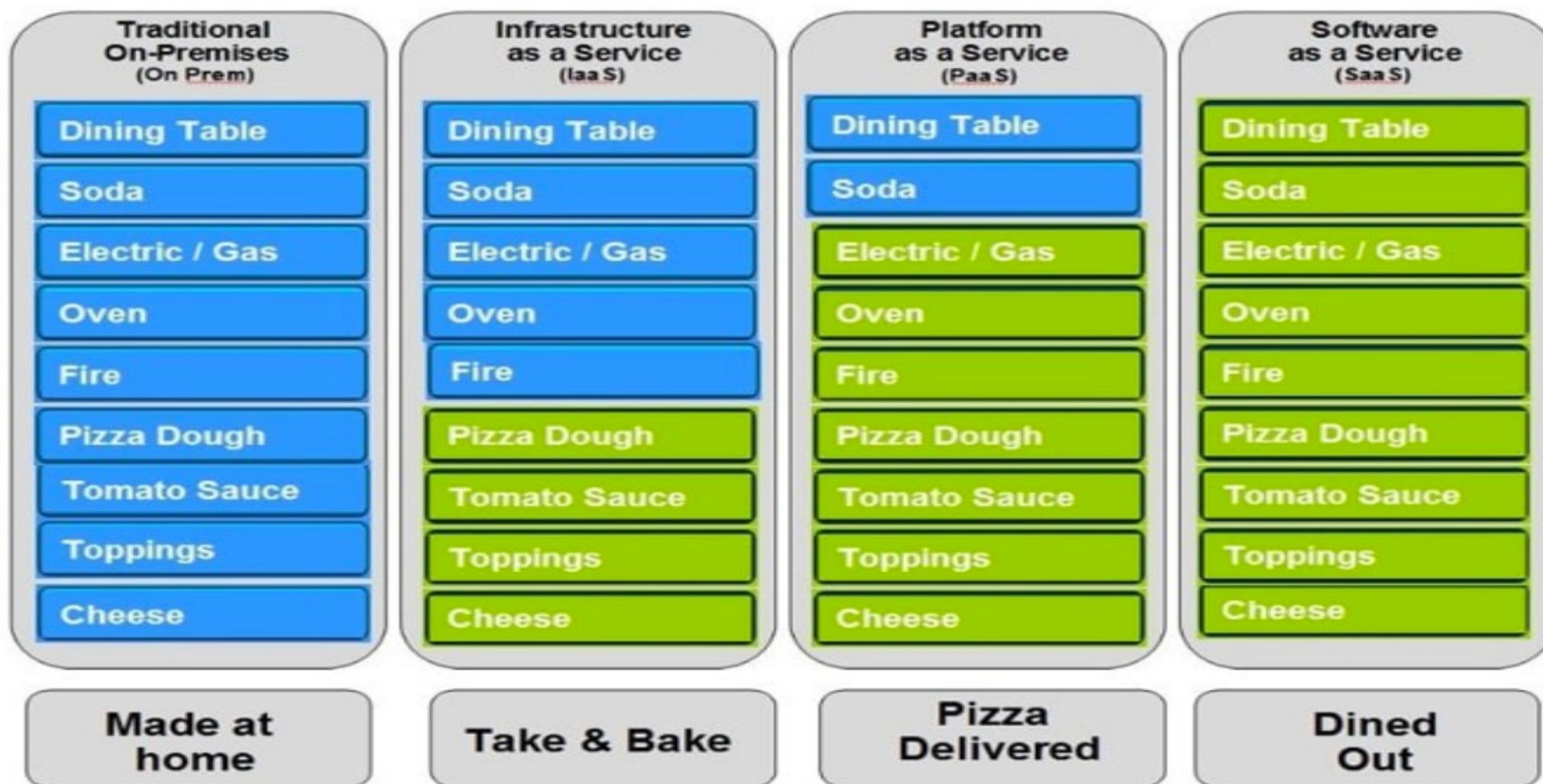




Cloud Service models - Comparison



Pizza as a Service



■ You Manage ■ Vendor Manages

Cloud Computing User Perspective

PAAS
Framework
Operating System
Programming Language
Execution Environment
Database
Web server

Benefits
Use a secure cloud platform to develop and run your software solutions without the cost and complexity of buying and managing hardware and software layers.

IAAS
Hardware
Virtual Machines
Server Storage Network

Benefits
Use a secure infrastructure for a flat monthly fee
No maintenance cost
Scale up and down the amount of data storage.



SAAS
Applications
Application Software

Benefits
Use a specific software solution without incurring in server maintenance and software development costs.

Infrastructure as a Service



IBM Cloud



Ready-to-Rent

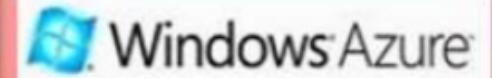
Compute

Storage

Network

Platform as a Service

IBM Cloud



Ready-to-Use

Tools to Create and Deploy Applications

Software as a Service

Ready-to-Wear

Applications Available Over a Network

salesforce.com

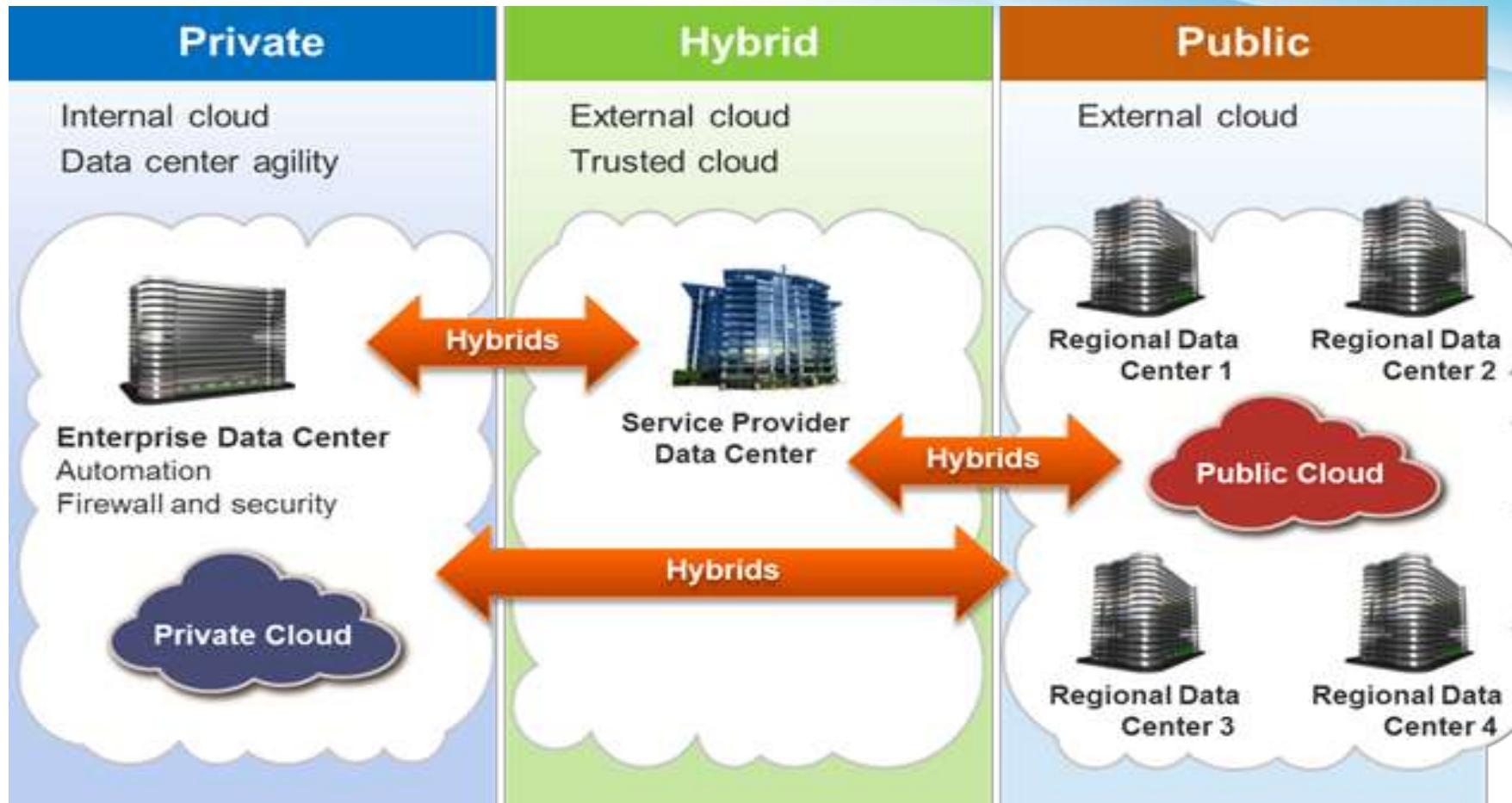
SAP



MASON

Cloud Implementation Types

Cloud implementation types



Public Cloud

- Owned and managed by service provider
- Made available to the general public or a large industry group



Private Cloud

- Operated solely for an organization
- May be managed by the organization or a third party
- Limits access to enterprise and partner network
- Retains high degree of control, privacy and security



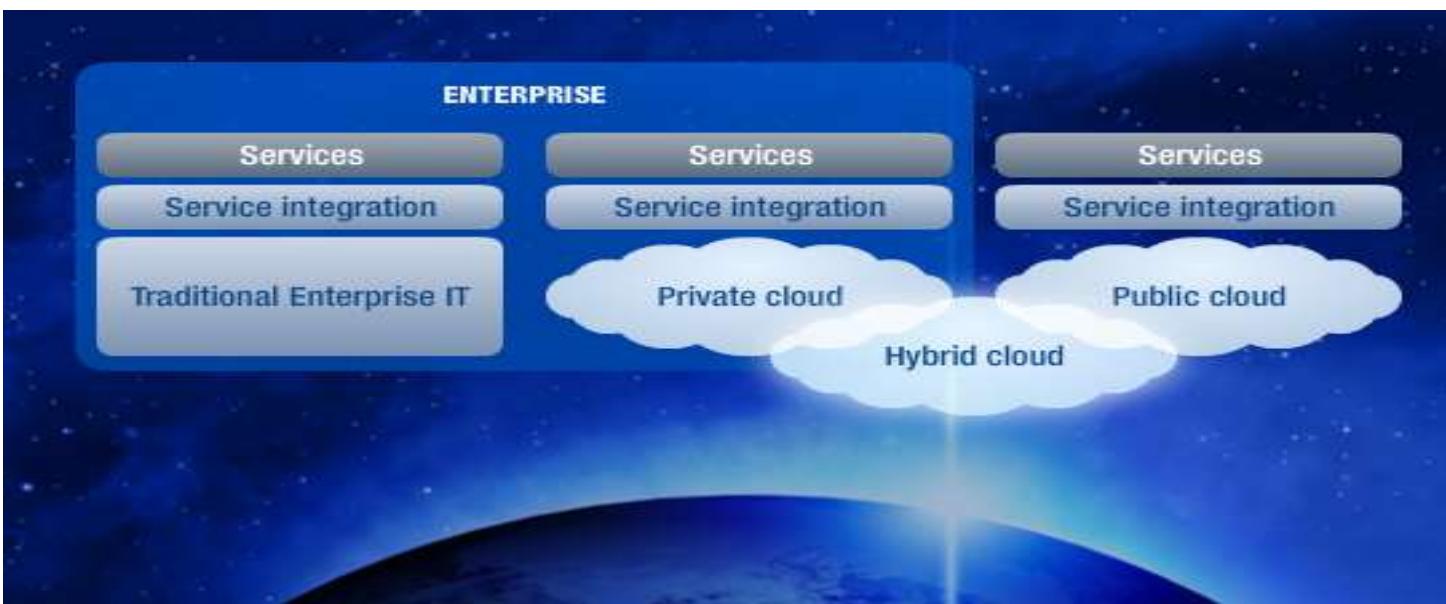
Community Cloud

- shared infrastructure by several organizations which have shared concerns
- May be managed by the organizations or a third party
- Costs are spread over fewer users than a public cloud but more than a single tenant



Hybrid Cloud

- Composition of two or more clouds (private, community, or public) bound together by standardized or proprietary technology that enables data and application portability

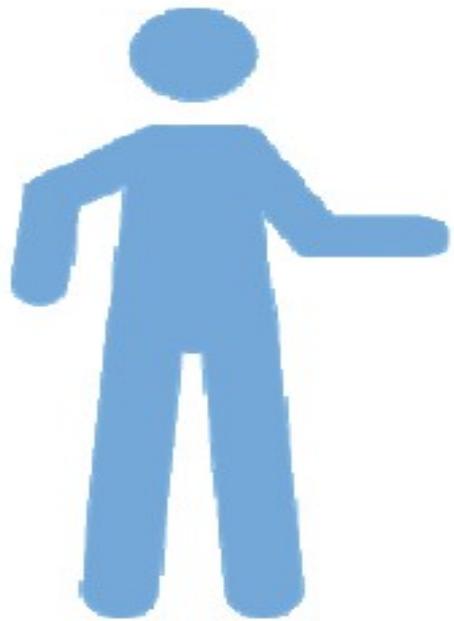


Cloud Deployment Models - Summary

Deployment model	Description	Best suited for	offers	challenges
Public cloud	<ul style="list-style-type: none"> Provisioned of general public use Externally hosted by a service provider 	<ul style="list-style-type: none"> Variable workloads Test & Dev 	<ul style="list-style-type: none"> The Lowest TCO Rabid elasticity & flexibility Faster deployments 	<ul style="list-style-type: none"> Data security & privacy Service availability (e.g. cut in connectivity)
Private cloud	<ul style="list-style-type: none"> Use for a single organization Can be internally or externally deployed 	<ul style="list-style-type: none"> Sensitive data Legal compliance 	<ul style="list-style-type: none"> Security & control Higher customizability performance 	<ul style="list-style-type: none"> High Cost of ownership Required skill set
Community cloud	<ul style="list-style-type: none"> Shared by several organizations typically externally hosted Can be hosted internally by one of the organizations or could be distributed. 	<ul style="list-style-type: none"> Collaboration between universities Multiple business enterprises apply Shared services model (e.g. group of hospitals & clinics) 	<ul style="list-style-type: none"> Lower TCO than private cloud elasticity 	<ul style="list-style-type: none"> Complex IT governance Required skill set
Hybrid cloud	<ul style="list-style-type: none"> Composition of 2 or more clouds that remains unique entities but are bound together. Make use of the scalability and cost-effectiveness of public cloud offers without exposing mission-critical applications and data to third-party vulnerabilities 	<ul style="list-style-type: none"> Cloud bursting On-demand access Sensitive data Storage as a service for non-sensitive data 	<ul style="list-style-type: none"> Lower TCO High elasticity Security & control Performance customizability 	<ul style="list-style-type: none"> Portability interoperability Integration migration

Finally...

Cloud is a shift in the consumption and delivery of IT with the goal of simplifying to manage complexity more effectively.



- **Cloud is:**
 - A new consumption and delivery model
- **Cloud addresses:**
 - Cost reduction
 - Scale
 - Utilization
 - Self-service
 - IT agility, flexibility and delivery of value
- **Cloud represents:**
 - The industrialization of delivery for IT supported services
- **Cloud includes:**
 - Deployment models: public, private, hybrid
 - Delivery models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS) and Business Process as a Service

Cloud Computing Benefits - Summary

- **Business Benefits**

- Almost zero upfront infrastructure investment
- Just-in-time Infrastructure
- More efficient resource utilization
- Usage-based costing
- Reduced time to market



- **Technical Benefits**

- Automation – “Scriptable infrastructure”
- Proactive Scaling
- More Efficient Development lifecycle
- Disaster Recovery and Business Continuity
- Easier Management



Security Risks & Challenges

- Conflicts with international privacy laws
- Data ownership
- Service guarantees
- Securing virtual machines
- Massive outages
- Encryption needs & Standards
- Storing sensitive & personal information in clouds
- Contingency planning / disaster recovery for clouds