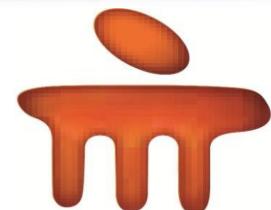


# Introduction to Cloud Computing



Ahmad H Bardolia,  
SME Cloud & Emerging Technology



**manipalexecutive**  
**education**

# Agenda

Introduction to Virtualization

Types of Virtualization & Hypervisor

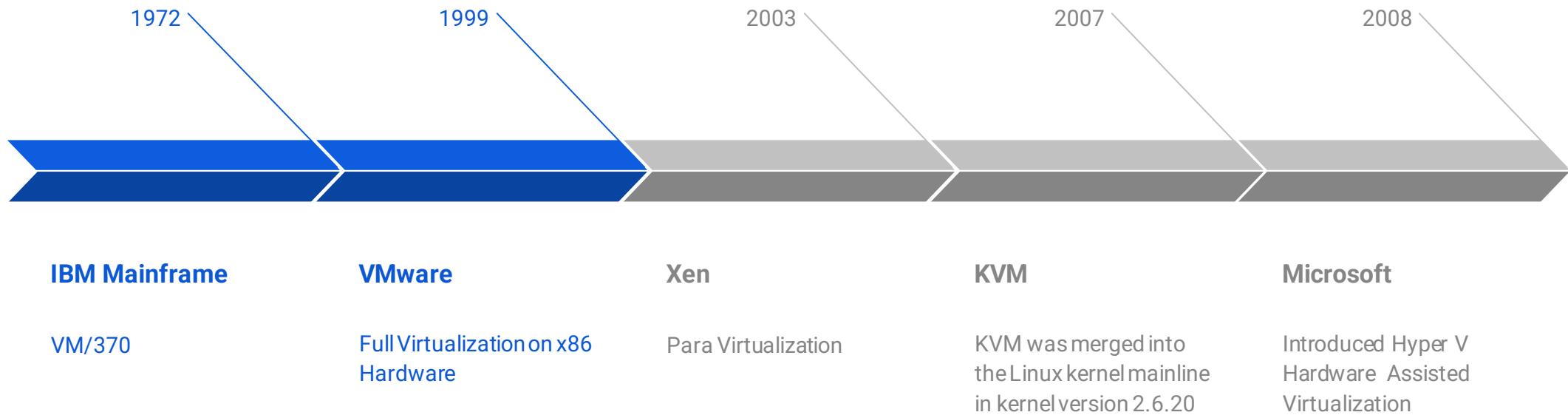
Virtualization Lab

Introduction to Cloud Computing

Cloud Service & Deployment Model



# History of virtualization



# Before Virtualization early 2000

Application



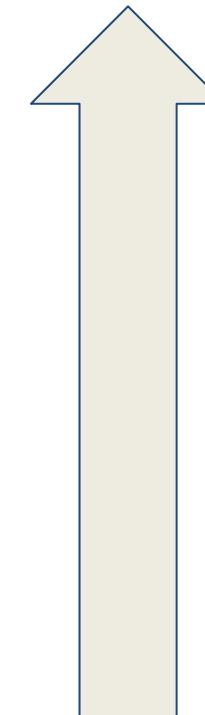
OS ( Win/Linux)



Server



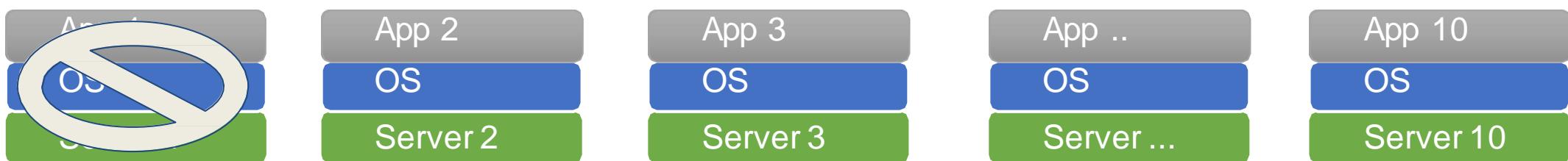
80-90%



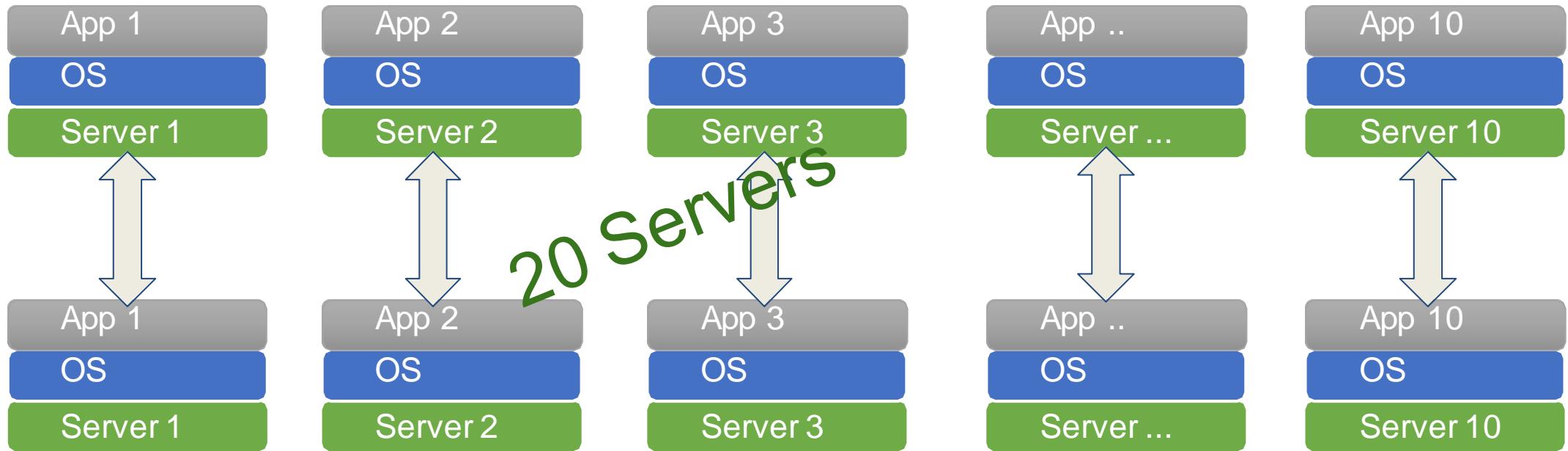
Pentium  
Days  
Single Core,  
256/512 MB  
80 GB DISK

Resource Utilization

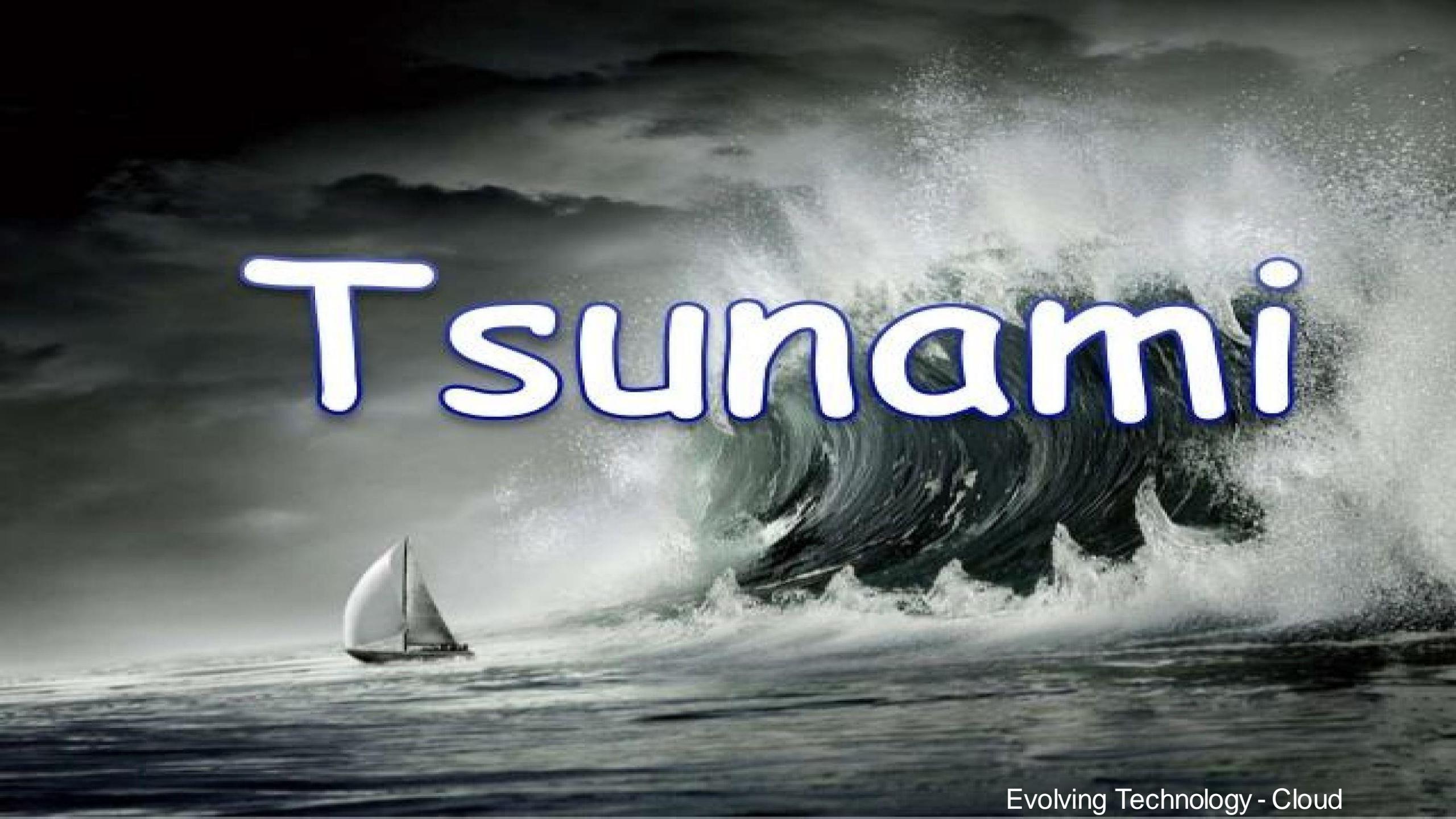
# Infrastructure for 10 application



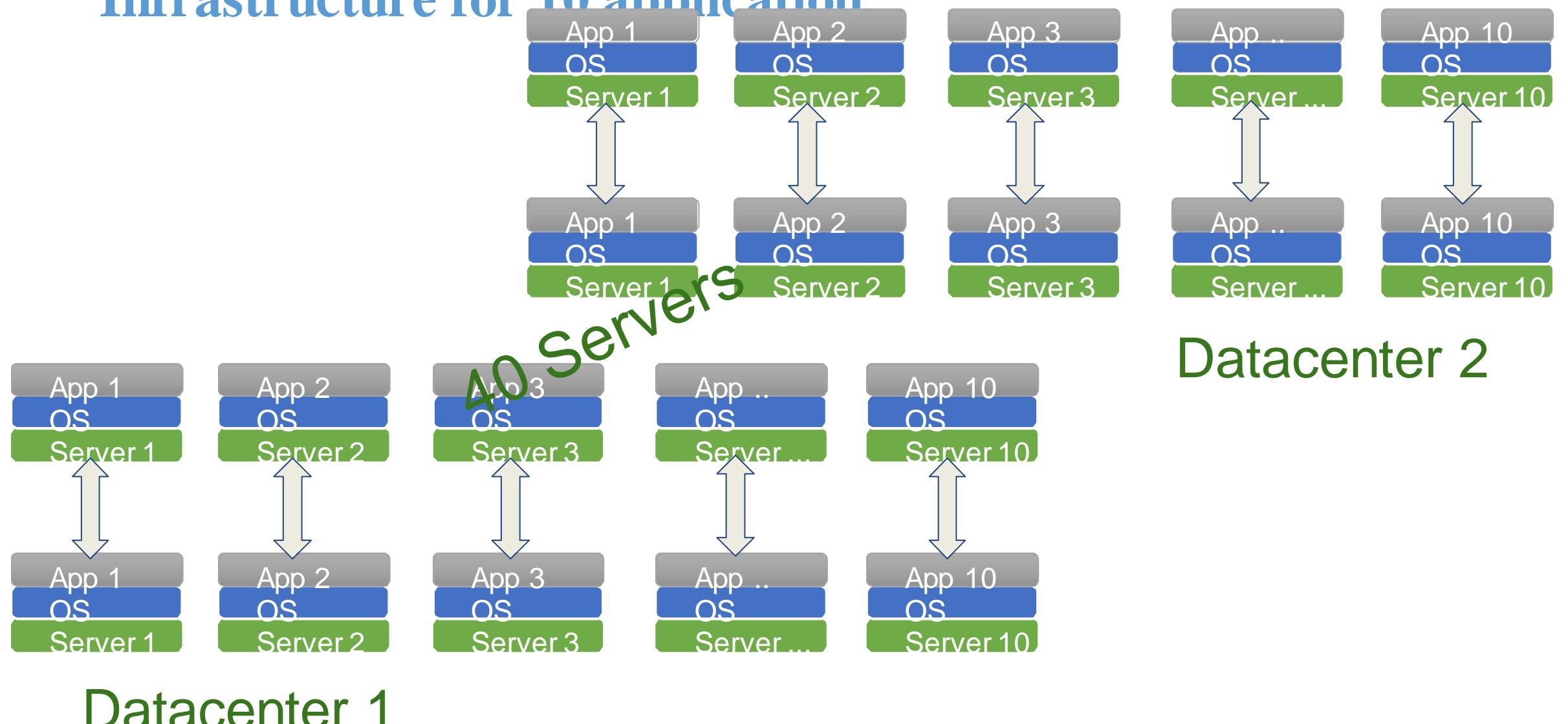
# Infrastructure for 10 application



# Tsunami

A dramatic photograph of a massive ocean wave crashing towards the shore. The wave is dark and turbulent, with white spray at its base. In the lower-left foreground, a small sailboat with a single mast and sail is visible on the calm water. The sky above is filled with heavy, dark clouds.

# Infrastructure for 10 application



# Before Virtualization

Application



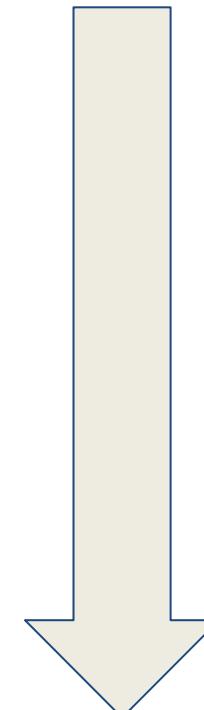
OS ( Win/Linux)



Server



8-10%



256 Core,  
16 TB RAM  
XX TB/PB  
DISK

Resource Utilization

Sales  
Windows

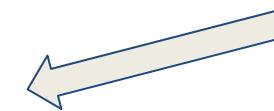
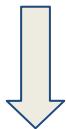
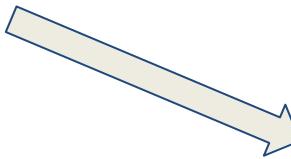
12%

CRM  
Linux

10%

ERP  
Solaris

25%



# Building Virtual Datacentre



Hypervisor



Server



# Summary : Before & After Virtualization

## Before Virtualization

1. Dedicated Physical Server for Each Application
2. Underutilized resources
3. Each Physical Server runs Single Operating System at a time
4. Running multiple applications on same machine often creates conflict
5. For a new application needs a Dedicated Server

## After Virtualization

1. Single physical server can now run multiple Virtual Servers
2. Each Virtual server can run different operating system and applications
3. Each virtual server will have a virtual hardware ( v CPU, vNIC, vRAM, vDisk)
4. Failure of a virtual server will not have any effect of other Virtual servers.

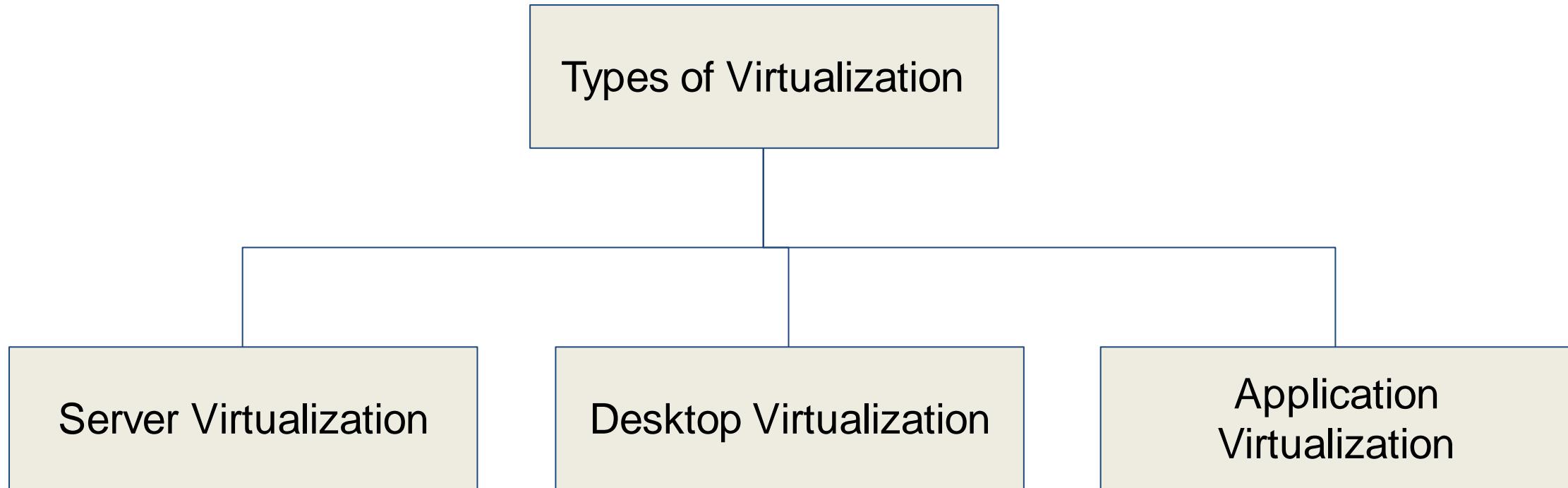
# Benefits of Virtual Machines

1. Virtualization decouples the application and operating system from the server hardware
2. Most servers are under utilized, but since they can do only one thing, they waste space, power and are expensive to cool. Virtualization allows IT to consolidate servers.
3. It also allows a big reduction in cooling costs, one of the bigger expenses for data centres.

**BUT THAT'S NOT ALL**

4. Free from the confines of a single IT controlled server, a virtual machine can be
  1. Replicated
  2. Moved
  3. Suspended
  4. Re-Animated
5. In a word, what you get from virtualization is agility
  1. More things
  2. Faster
  3. Less Money

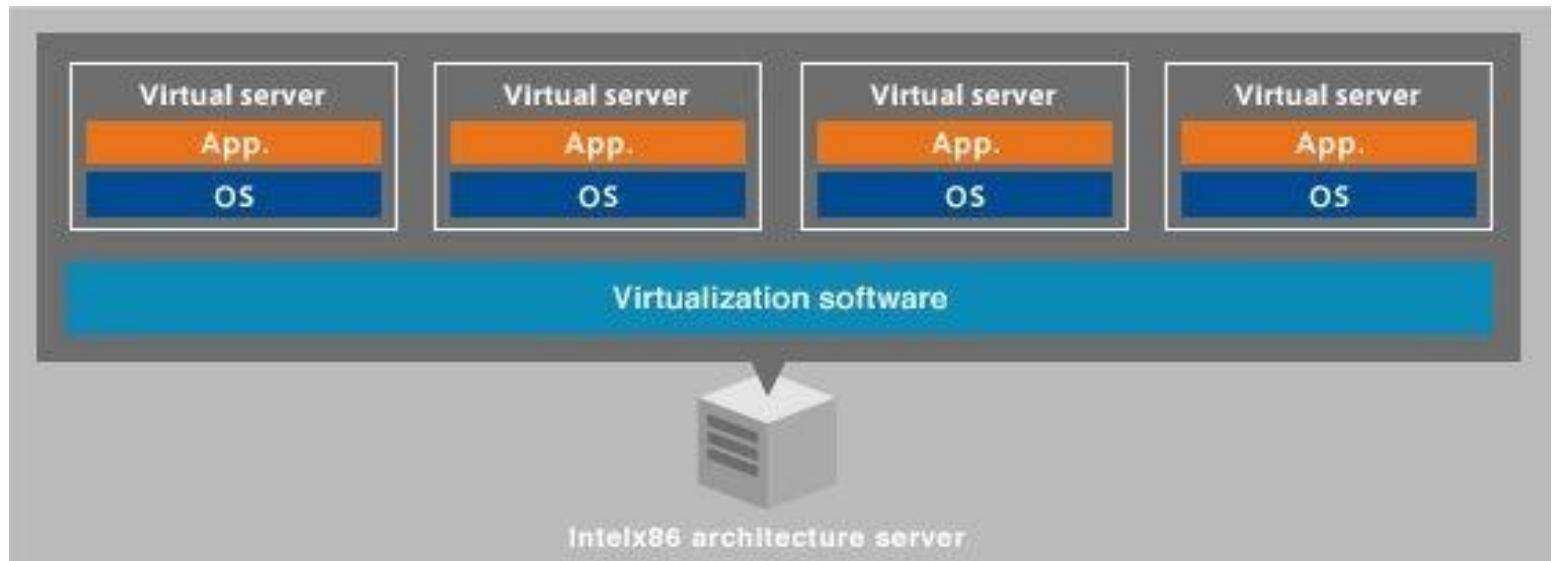
# Types of virtualization



# Types of virtualization

## Server Virtualization

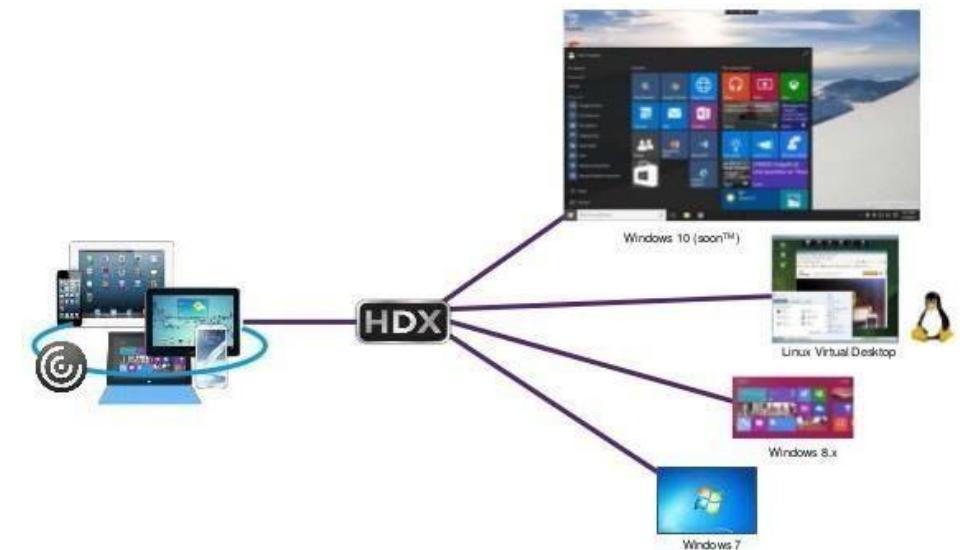
1. Server virtualization is the abstraction of applications and operating systems from physical servers.
2. This allows for the creation of VMs (app and OS pairs) that offer much greater usage efficiency on physical servers and afford enormous flexibility with regard to provisioning of applications.
3. Eg. Vmware ESXi, Citrix Xenserver, Microsoft HyperV, Linux KVM etc



# Types of virtualization

## Desktop Virtualization

1. Desktop virtualization or "virtualizes desktop computers" are virtual desktop environments that are "served" to users on the network.
2. Windows desktops, apps and data as-a-service for every user
3. Any device, anywhere access including user self-service
4. High definition user experience across any network
5. You interact with a virtual desktop in the same way you would use a physical desktop.
6. Eg. Microsoft MED-V, Citrix XenDesktop, etc



**Citrix** Gateway

Please log on

User name

Password

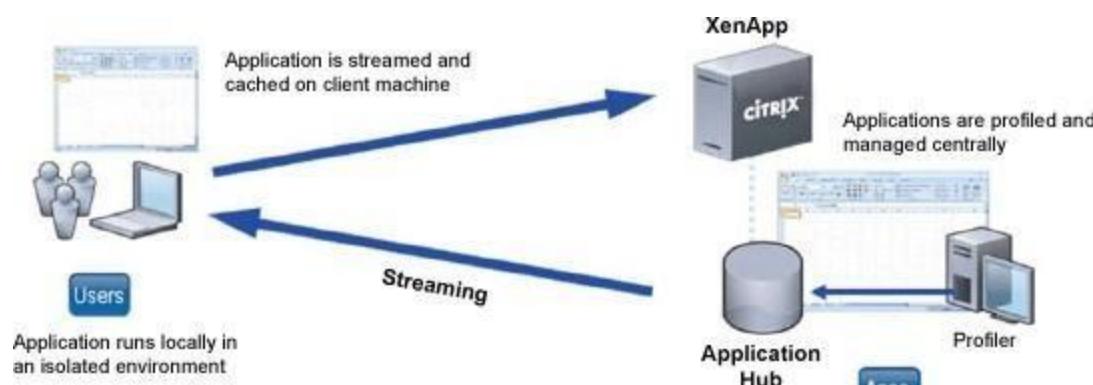
Password 2

Log On

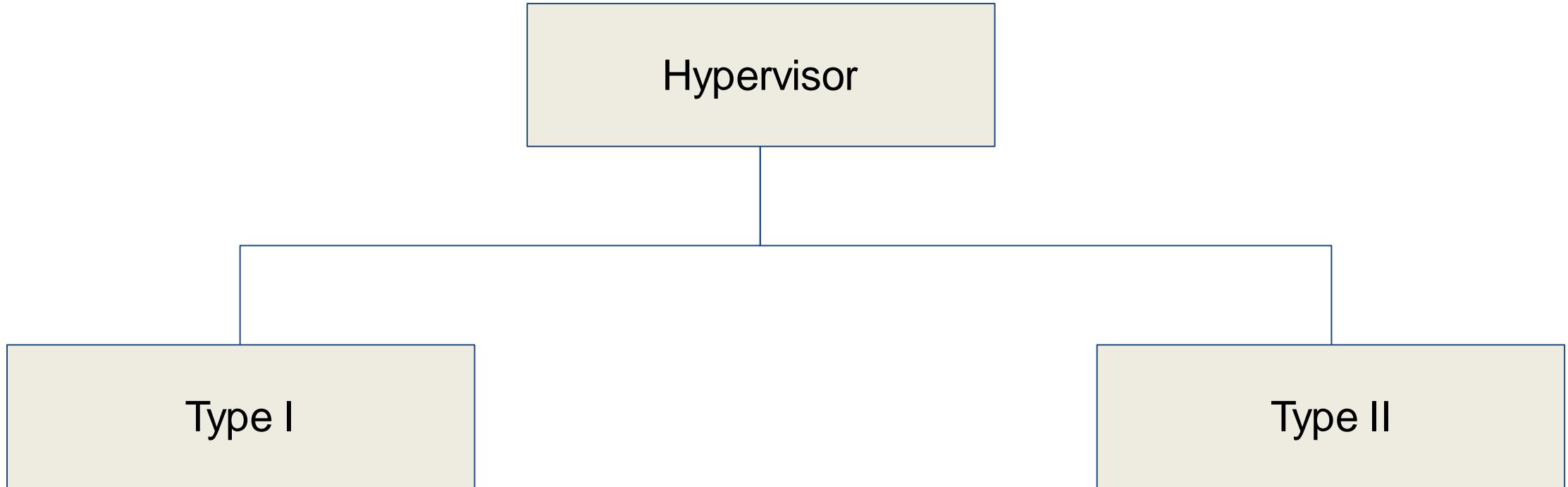
# Types of virtualization

## Application Virtualization

1. Here the Applications are virtual (they are never installed physically on boxes either due to conflicts with it's previous version / other applications or for security reasons).
2. Only thing required for installation on client machine is a client software.
3. It is either streamed or cached locally on demand and then executed
4. Eg. Microsoft App-V, XenApp , VMware ThinApp

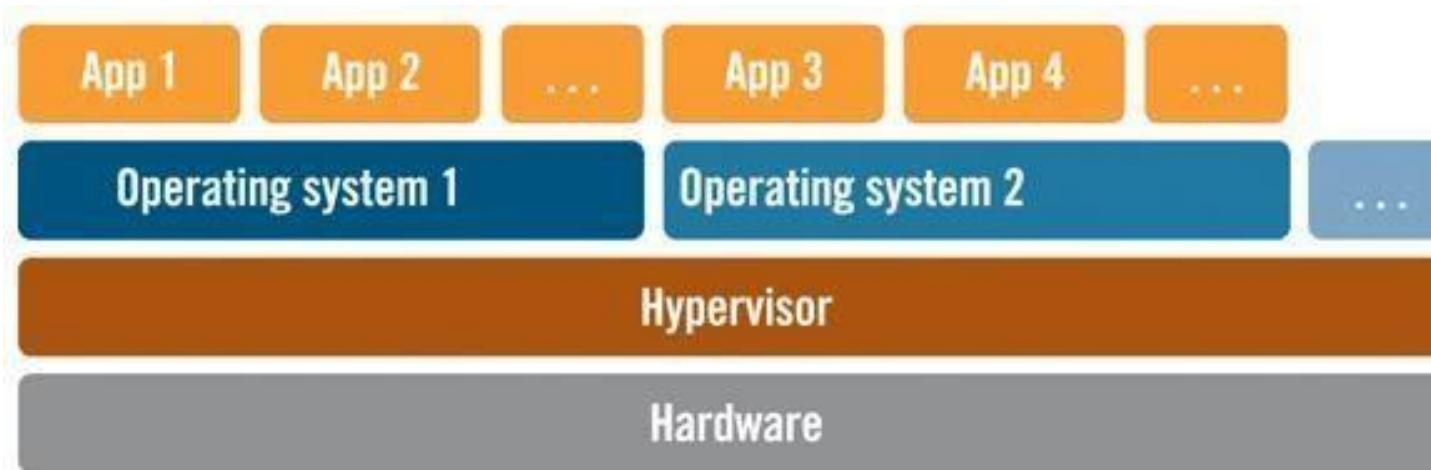


# Types of Hypervisor



## Type I

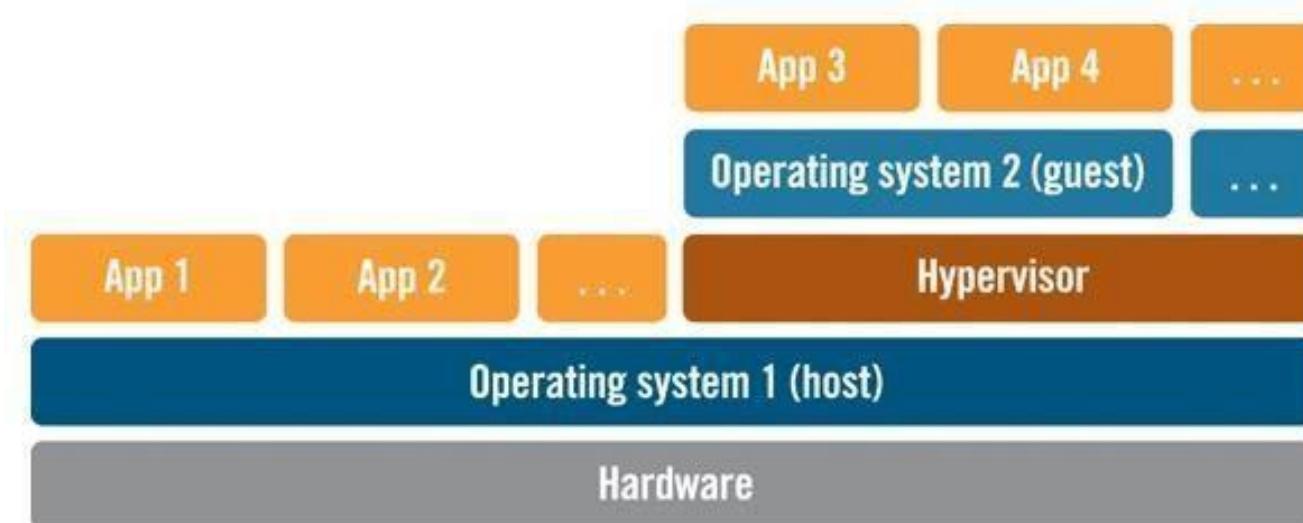
- Type I hypervisor runs on “bare metal”
- In short, a Type I hypervisor is a virtualization platform which is delivered as an integral part of an operating system



Eg: ESXi, HyperV, Xenserver, Xen, KVM

## Type II

- Type I hypervisor runs on a host OS
- Type II hypervisor is a virtualization platform which is delivered as a process that runs within an operating system



Eg: Qemu, Virtual Box, Vmware workstation

## Hypervisor vendor



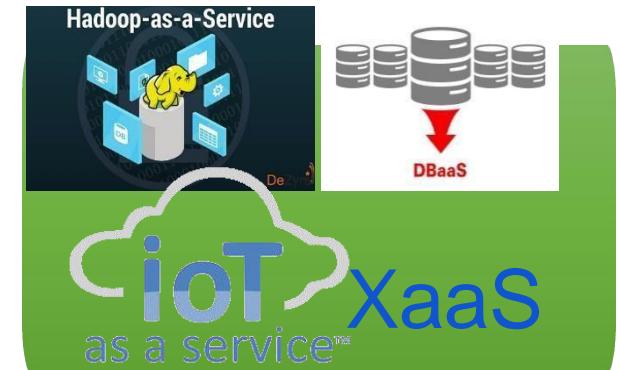
# Virtualization Demo

# Cloud Foundation

# IT Evolution from mainframe to cloud



# Cloud Building Block



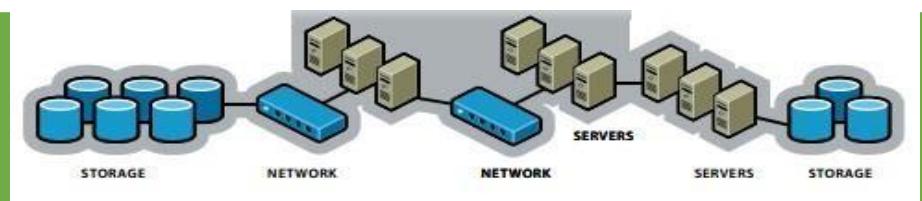
## Cloud Management Stack



## Virtual Infrastructure



## Physical Infrastructure



# What is cloud computing???

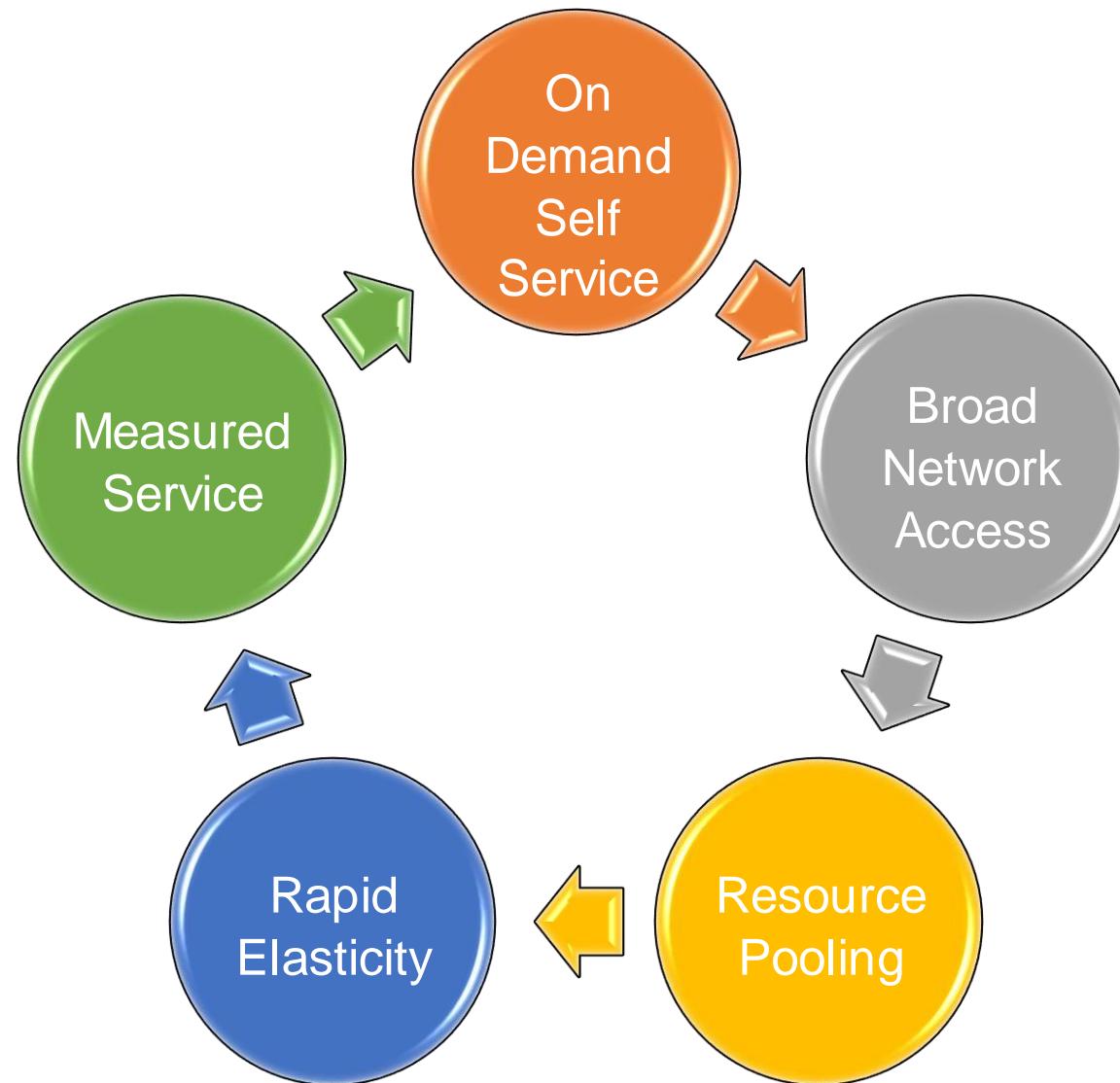
**According to the official NIST definition:**

“Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.“ ( Source NIST )

**In simple words,**

“Cloud computing is providing IT as a Utility service.”

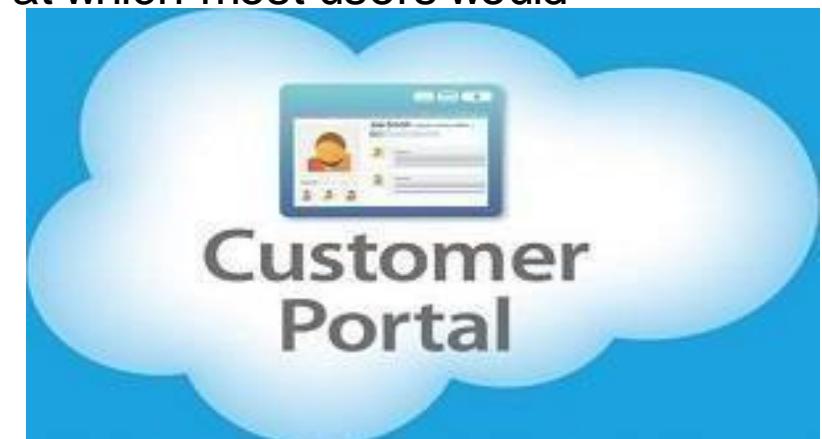
# Characteristic of cloud computing??



# Characteristic of cloud computing

## On-Demand Self-Service

- With on-demand self-service, a client (which can be a person or a company) can provision computing resources from the cloud without having to interact with IT or service provider personnel.
- In other words, you can order it online by clicking buttons (without a salesperson trying to meet you for lunch).
- Now, obviously, this breaks down if a major corporation wants to provision massive amounts of computing power.
- In this case, they would need to understand availability, and would likely negotiate on price, service levels, and uptime with the provider personnel, and there might be a few meals in there as well.
- But the actual service they provision could be on-demand at the scale at which most users would consume it.



## Amazon Web Services

## Compute

- EC2 Virtual Servers in the Cloud
- EC2 Container Service Run and Manage Docker Containers
- Elastic Beanstalk Run and Manage Web Apps
- Lambda Run Code in Response to Events

## Storage &amp; Content Delivery

- S3 Scalable Storage in the Cloud
- CloudFront Global Content Delivery Network
- Elastic File System Fully Managed File System for EC2
- Glacier Archive Storage in the Cloud
- Snowball Large Scale Data Transport
- Storage Gateway Hybrid Storage Integration

## Database

- RDS Managed Relational Database Service
- DynamoDB Managed NoSQL Database
- ElastiCache In-Memory Cache
- Redshift Fast, Simple, Cost-Effective Data Warehousing
- DMS Managed Database Migration Service

## Networking

- VPC Isolated Cloud Resources
- Direct Connect Dedicated Network Connection to AWS
- Route 53 Scalable DNS and Domain Name Registration

## Developer Tools

- CodeCommit Store Code in Private Git Repositories
- CodeDeploy Automate Code Deployments
- CodePipeline Release Software using Continuous Delivery

## Management Tools

- CloudWatch Monitor Resources and Applications
- CloudFormation Create and Manage Resources with Templates
- CloudTrail Track User Activity and API Usage
- Config Track Resource Inventory and Changes
- OpsWorks Automate Operations with Chef
- Service Catalog Create and Use Standardized Products
- Trusted Advisor Optimize Performance and Security

## Security &amp; Identity

- Identity & Access Management Manage User Access and Encryption Keys
- Directory Service Host and Manage Active Directory
- Inspector Analyze Application Security
- WAF Filter Malicious Web Traffic
- Certificate Manager Provision, Manage, and Deploy SSL/TLS Certificates

## Analytics

- EMR Managed Hadoop Framework
- Data Pipeline Orchestration for Data-Driven Workflows
- Elasticsearch Service Run and Scale Elasticsearch Clusters
- Kinesis Work with Real-Time Streaming Data
- Machine Learning Build Smart Applications Quickly and Easily

## Internet of Things

- AWS IoT Connect Devices to the Cloud

## Game Development

- GameLift Deploy and Scale Session-based Multiplayer Games

## Mobile Services

- Mobile Hub Build, Test, and Monitor Mobile Apps
- Cognito User Identity and App Data Synchronization
- Device Farm Test Android, iOS, and Web Apps on Real Devices in the Cloud
- Mobile Analytics Collect, View and Export App Analytics
- SNS Push Notification Service

## Application Services

- API Gateway Build, Deploy and Manage APIs
- AppStream Low Latency Application Streaming
- CloudSearch Managed Search Service
- Elastic Transcoder Easy-to-Use Scalable Media Transcoding
- SES Email Sending and Receiving Service
- SQS Message Queue Service
- SWF Workflow Service for Coordinating Application Components

## Enterprise Applications

- WorkSpaces Desktop in the Cloud
- WorkDocs Secure Enterprise Storage and Sharing Service
- WorkMail Secure Email and Calendaring Service

## Resource Groups

Learn more

A resource group is a collection of resources that share one or more tags. Create a group for each project, application, or environment in your account.

[Create a Group](#)[Tag Editor](#)

## Additional Resources

## Getting Started

Read our documentation or view our training to learn more about AWS.

## AWS Console Mobile App

View your resources on the go with our AWS Console mobile app, available from Amazon Appstore, Google Play, or iTunes.

## AWS Marketplace

Find and buy software, launch with 1-Click and pay by the hour.

## AWS re:Invent Announcements

Explore the next generation of AWS cloud capabilities. See what's new

## Service Health

All services operating normally

Updated: Jun 21 2016 16:39:00 GMT+0530

[Service Health Dashboard](#)

## All services

Filter services

## Overview

## Featured

## Categories

All

General

Compute

Networking

Storage

Web

Mobile

Containers

Databases

Analytics

Blockchain

AI + machine learning

Internet of things

Mixed reality

Integration

Identity

Security

DevOps

Virtual  
machines

App Services

Storage  
accountsSQL  
databasesStatic Web  
AppsAzure  
Cosmos DBAzure  
Cosmos DBKubernetes  
services

Function App

Virtual  
networksAzure Active  
DirectoryResource  
groups

Monitor



Advisor

Security  
Center

All services

Free training from Microsoft [See all](#)Core Cloud Services - Azure  
architecture and service guarantees

9 units • 45 min

Azure provides a global network of secure datacenters you can deploy your services into. Learn about the physical architecture of Azure, how redundancy is provided, and what sort of service guarantees

Microsoft provides[Start](#) Core Cloud Services - Manage services  
with the Azure portal

9 units • 1 hr 13 min

Tour the Azure portal features and services, and customize the portal.

[Start](#) Cloud Concepts - Principles of cloud  
computing

10 units • 1 hr 2 min

Explore the core concepts of cloud computing and how it can help your business.

[Start](#)

## Get to know Azure



- Home >
- Compute Engine >
- App Engine >
- VPC network >
- Hybrid Connectivity >
- Network services >

## PRODUCTS ▾

- Marketplace
- Billing
- APIs & Services >
- Support >
- IAM & Admin >
- Getting started
- Compliance
- Security >

## COMMENDATIONS



Loading... searched up to Jun 2, 2021

HIDE FILTER

## Filters

CLEAR

## User

Filter Name



## Categories

## Activity types

4 types selected



## Resource type

All types selected



## Date/time

LATEST

## Instances

Compute

Overview

Instances

Volumes

Images

Access &amp; Security

Network

Orchestration

Object Store

Admin

Identity

Instance Name =

Filter

Launch Instance

Delete Instances

More Actions ▾

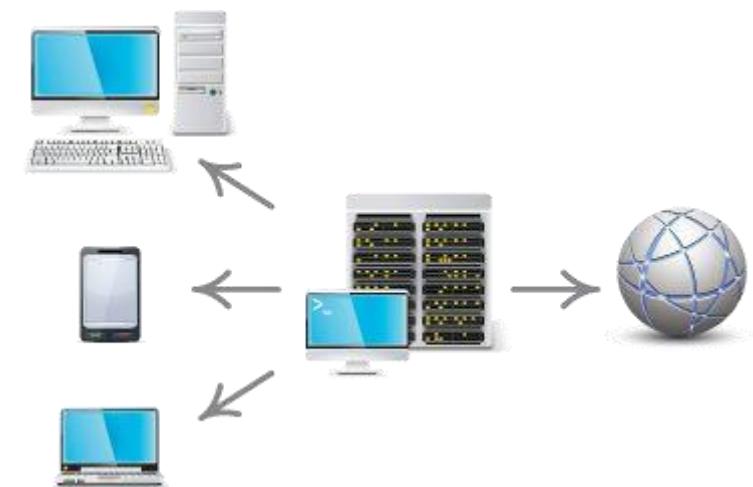
<input type="checkbox"/>	Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
			172.16.2.4								
<input type="checkbox"/>	Server1	cirros	Floating IPs: m1.tiny	-		Active	nova	None	Running	1 day, 1 hour	<button>Create Snapshot</button> ▾
			20.0.0.206								
			172.16.2.3								
<input type="checkbox"/>	Server2	cirros	Floating IPs: m1.tiny	-		Active	nova	None	Running	1 day, 1 hour	<button>Create Snapshot</button> ▾
			20.0.0.205								
			10.0.2.3								
<input type="checkbox"/>	VM02	cirros	Floating IPs: m1.tiny	-		Active	nova	None	Running	1 day, 2 hours	<button>Create Snapshot</button> ▾
			20.0.0.203								
			10.0.1.3								
<input type="checkbox"/>	VM01	cirros	Floating IPs: m1.tiny	-		Active	nova	None	Running	1 day, 2 hours	<button>Create Snapshot</button> ▾
			20.0.0.202								

Displaying 4 items

# Characteristic of cloud computing

## Ubiquitous Network Access

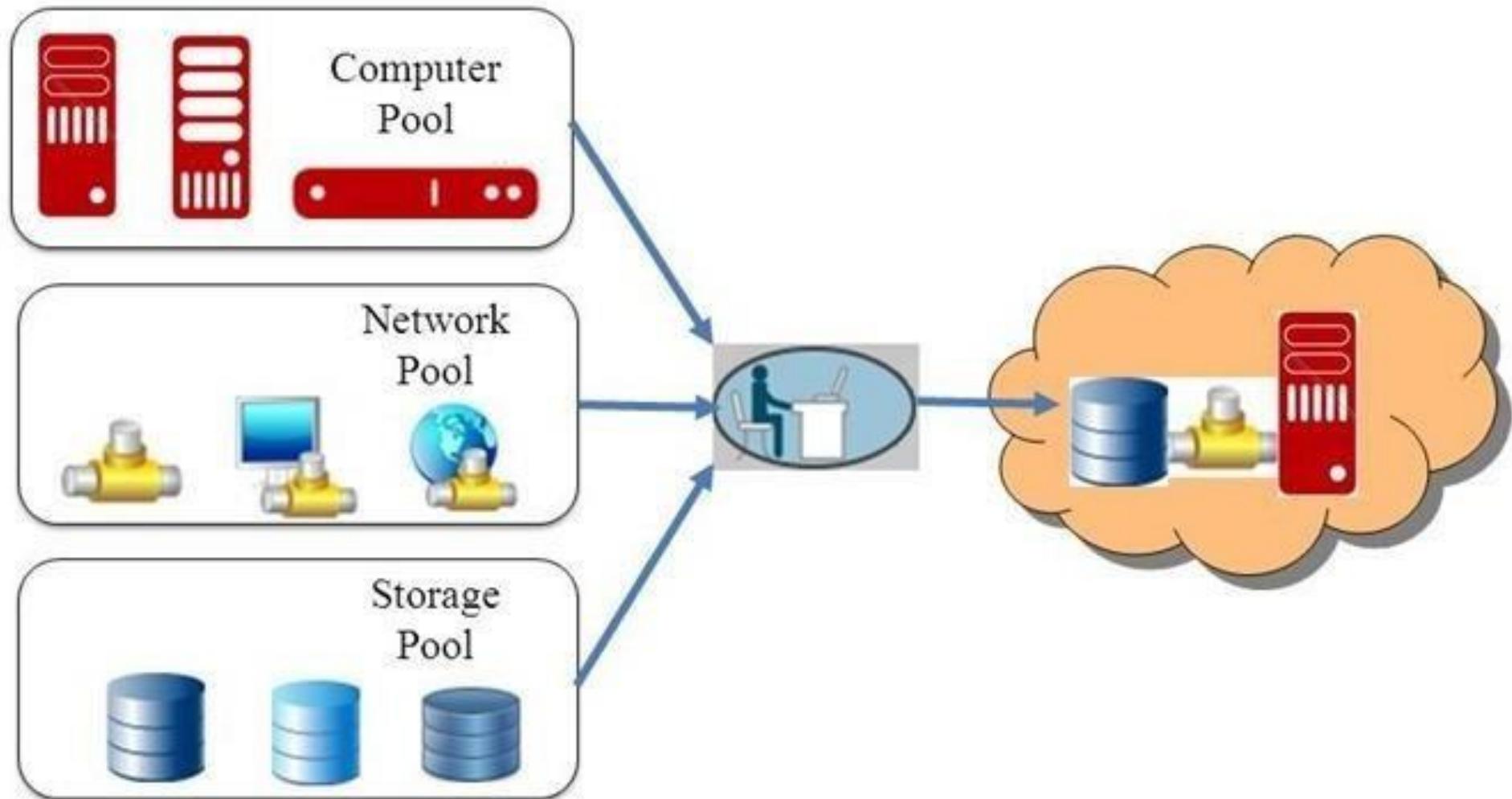
- Simply put, you should be able to connect to the cloud from wherever you are with whatever you have.
- In other words, you should be able to use standard platforms that provide simple connectivity without having to put down dedicated cables or systems and without having to buy custom hardware for access.
- In many cases, network access to the cloud can be done over the Internet, but this is not really a requirement. It simply means that you should not have to build out a separate or specialized network to gain access to a cloud.
- You should be able to access cloud from any gadgets which have browser capabilities



# Characteristic of cloud computing

## Resource Pooling

- Resource pooling is where many of the advantages of cloud networking are derived from. As the name suggests, the cloud provider has different types of grouped resources, including storage, memory, computer processing, and bandwidth (just to name a few), which instead of being dedicated to any one client are allocated to clients as they need them.
- Rather than having a dedicated resource allocated to a user, the cloud model allows clients to draw resources from functional pools as needed.
- This pooling (and allocating) of resources allows what is commonly known as a multitenant model, where the provider is able to maximize the utilization and efficiency of its resources by sharing them among many customers.
- Users no longer have to pay for resources they are not using, and it allows the providers to gain efficiencies by having a common set of tools to draw from rather than replicating them for every customer.
- In some cases, such as a private cloud (described later in this chapter), a client might want their own dedicated resource pool, but even within that model, the resource pool is shared among the individual users from that single client.



# Characteristic of cloud computing

## Rapid Elasticity

- Elasticity is probably the one characteristic that most people refer to when describing a cloud.
- Accomplished via automation and application programming interfaces (APIs), elasticity is the ability to very rapidly (or even instantly) “spin up” computing resources for a short while or to accommodate an event and then spin it all back down (just as easily) when you no longer need it.
- This capability is where most of the efficiencies of the cloud come from.
- For example, this feature could allow a small biomedical firm to perform computationally intensive research analysis on per project basis rivaling what a large public company or university could do, all without any of the massive upfront costs and at a small fraction of the cost per CPU.
- The cloud in a very real way allows small clients to bring enterprise-class computing resources to bear at an affordable rate.
- At the same time, it provides an enormous reduction in operational costs for large enterprises whose businesses require them to maintain large data centers based mostly on the concept of rapid elasticity.



# Characteristic of cloud computing

## Pay Per Use

- The cloud is, generally speaking, a pay per use model.
- This attribute is a bit hard to pin down because some clients may want or need a fully private cloud (as explained later).
- Private clouds require a fixed monthly payment because, by definition, another client could not use the same resources even if they were idle.
- That said, even this model allows the client to outsource ownership of the computing assets, eliminating both the large capital expense and the management expense of maintaining servers and storage devices.



# Cloud Service Models



# Cloud Service Models

Cloud is a pay-as-you-go model, IT resources are offered as a service (that you rent) as opposed to a product (that you purchase), and there are three different ways to carve out services for users in an “as a service” model:

- Software as a service (SaaS): The provider offers an application that clients connect to over the network.
- Infrastructure as a service (IaaS): The provider offers processing, storage, and other computing resources in a manner that has the attributes listed earlier.
- Platform as a service (PaaS): The provider offers the ability to run applications that they have created themselves.



# Cloud Service Models

## Software as a Service (SaaS)

- When people think of cloud computing, it is usually software as a service that comes to mind.
- Most individuals who connect to a cloud infrastructure (and many are doing this without even realizing it) are taking advantage of the SaaS model.
- With SaaS, a user can access an application that is hosted by the provider, rather than installing that application on their own machines.
- The application software is run out of one or more data centers, where the user's data is also stored.
- Typically, access to the application is made via a web browser, installed software, or a “thin client” that connects to the cloud application over the Internet.

# Cloud Service Models

## What Consumer Gets ?

- Consumer can use the software which is developed and deployed and maintained by the SaaS Cloud Provider
- Consumer can use the software application through internet from Any Device like ( ipad, Android Mobile, Desktop or Laptop )

## How is consumer is Charged ?

- Consumer is Charged per User Per month
  - Example A: Salesforce is CRM software which developed, deployed and managed by Salesforce company
  - If 10 employees want to use Salesforce app ,they pay 5 USD per employee per month

## Consumer Role ?

- Consumer is merely a user ,and uses application AS-IS basis ,without ability to change or modify application

# Cloud Service Models

## Advantages of SaaS:

- The ability to connect to the application from anywhere and from multiple devices, as opposed to having a dedicated machine to which you must have physical access.
- Not having to manage stored data, software upgrades, operating systems, or really anything else
- The reduction in management resources and technical personnel for companies

## Disadvantages of SaaS:

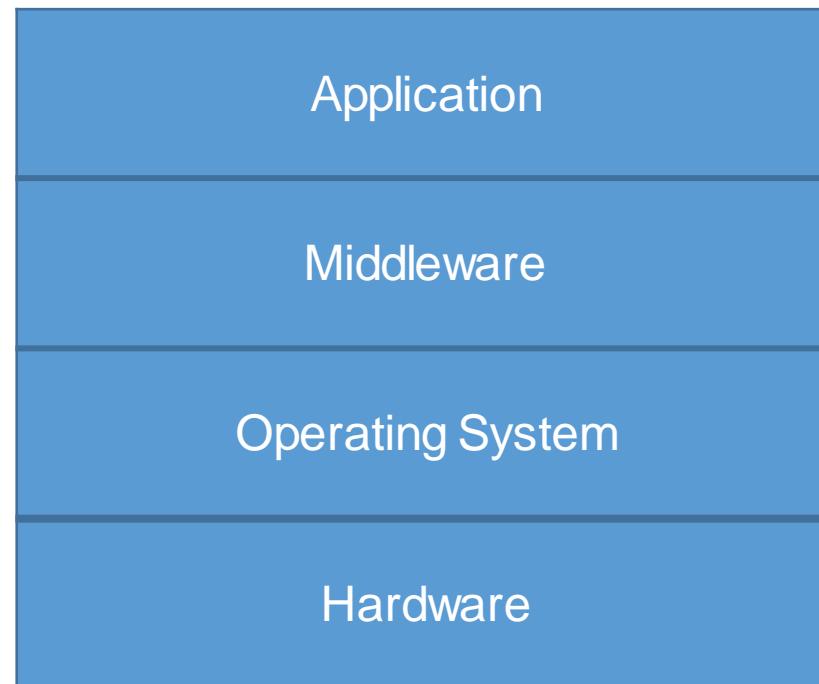
- The requirement to have network connectivity to access an application.
- The loss of 100% control of your data, which might make it difficult to switch from one application provider to another.

# SaaS Models

Service Provider

Admin Control

Full Control



Consumer

Limited Control

No Control

# SaaS Service provider



# Cloud Service Models

## Infrastructure as a Service (SaaS)

- In an infrastructure as a service (IaaS) model, the client rents compute resources that enable them to run their own software programs, including both operating systems and applications.
- With IaaS, the client is renting the infrastructure (which the provider retains control of) but is still able to control the applications and operating system software. The client is also able to control storage of their data and has some control over network functions and security (such as firewalls).
- Basically, the client rents a server (or servers) that they can then install their own programs on.
- This model is most common with enterprise-class clients, who can enjoy significant reductions in IT operational costs, especially if they only need these resources on a part-time basis (or when there is a big disparity between peak use and average use).
- Smaller organizations can also benefit because this model eliminates what was often an overwhelming startup cost for access to enterprise-class computing resources.

# Cloud Service Models

## What Consumer Gets ?

- ❑ Consumers get dedicated Physical Infrastructure or Virtual Infrastructure-As-A-Service
  - ❑ Dedicated Physical Servers ( Single, Dual and Quad Socket servers ) - Charged Per System Per Month
  - ❑ Virtual Servers ( VM's running windows or Linux OS ) - Charged Per VM Per Hour
  - ❑ Dedicated Storage ( SAN or NAS storage ) - Charged Per System Per Month
  - ❑ Virtual Storage ( Block or File Storage ) - Charged Per GB Per Month

## Who Manages Cloud Infrastructure In IaaS Cloud Services ?

- ❑ In Private Cloud internal IT team manages the Cloud Infrastructure
- ❑ In Public Cloud, The Service provider manages the entire Cloud Infrastructure

## Consumer Role in IaaS?

- ❑ Consumer can deploy operating systems and run applications of his choice
- ❑ The consumer does not manage or control the underlying cloud infrastructure

# Cloud Service Models

## Advantages of IaaS:

- A significant reduction (or complete elimination) of startup and ongoing costs for IT infrastructure
- The ability to use multiple operating systems without losing flexibility to switch between them

## Disadvantages of IaaS:

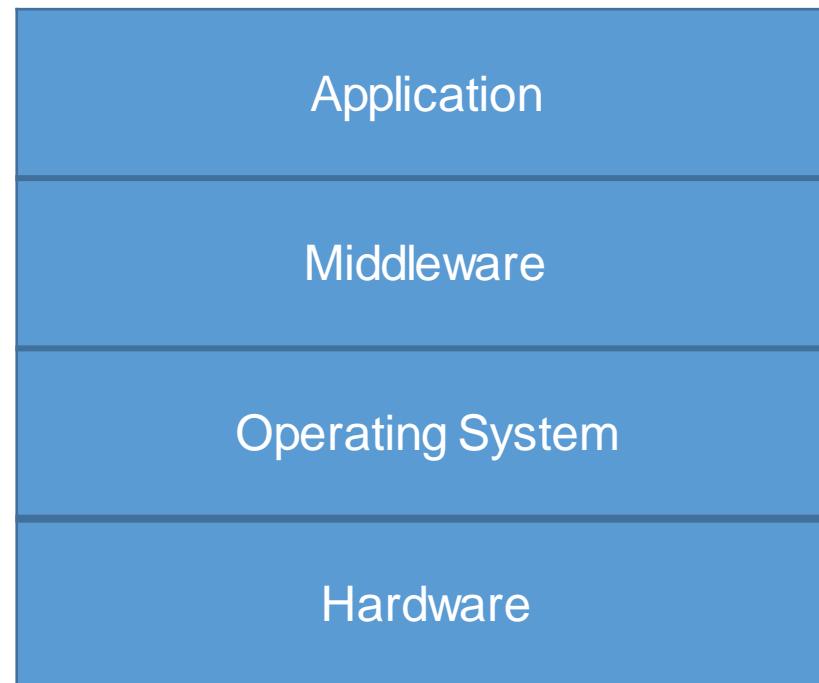
- Some security concerns with outsourcing the infrastructure, especially when using a shared or multi-tenant cloud for sensitive or regulated data.
- Loss of physical control of your data. With the traditional infrastructure, you know exactly where your data is.
- Lack of visibility into cloud network traffic.

# IaaS Models

Service Provider

No Control

Full Control



Consumer

Full Control

No Control

# IAAS Service provider



# Cloud Service Models

## Platform as a Service (SaaS)

- In a platform as a service (PaaS) model, the client is provided a computing platform upon which they can develop and run their own applications or programs.
- In a PaaS model, to ensure that the proper resources are allocated, the client must usually let the service provider know what programming tools they will be using (such as Java or .NET).

# Cloud Service Models

## What you Get ?

- Consumer will get ability to use Development environments like .Net, Java, Ruby, Python, Perl etc...

## How they Charge You ?

- Consumer is charged Per hourly basis

## Who manages Cloud Infrastructure in PaaS ?

- In Private Cloud internal IT team manages the Cloud Infrastructure
- In Public Cloud, The Service provider manages the entire Cloud Infrastructure

## Consumer Role ?

- The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage

# Cloud Service Models

## Advantages of PaaS:

- It eliminates the need to maintain an IT team for the development environment. Usually developers and IT support teams have to exist in parallel, or (and probably more often) coders are forced to spend time building and maintaining their own infrastructures. With PaaS, developers can just code.
- This system makes it very cost-effective to port programs or systems to new platforms.
- If there is a need or desire to port that program to a new platform, much of the expense goes into building out the development and test beds of the new platform.

## Disadvantages of PaaS:

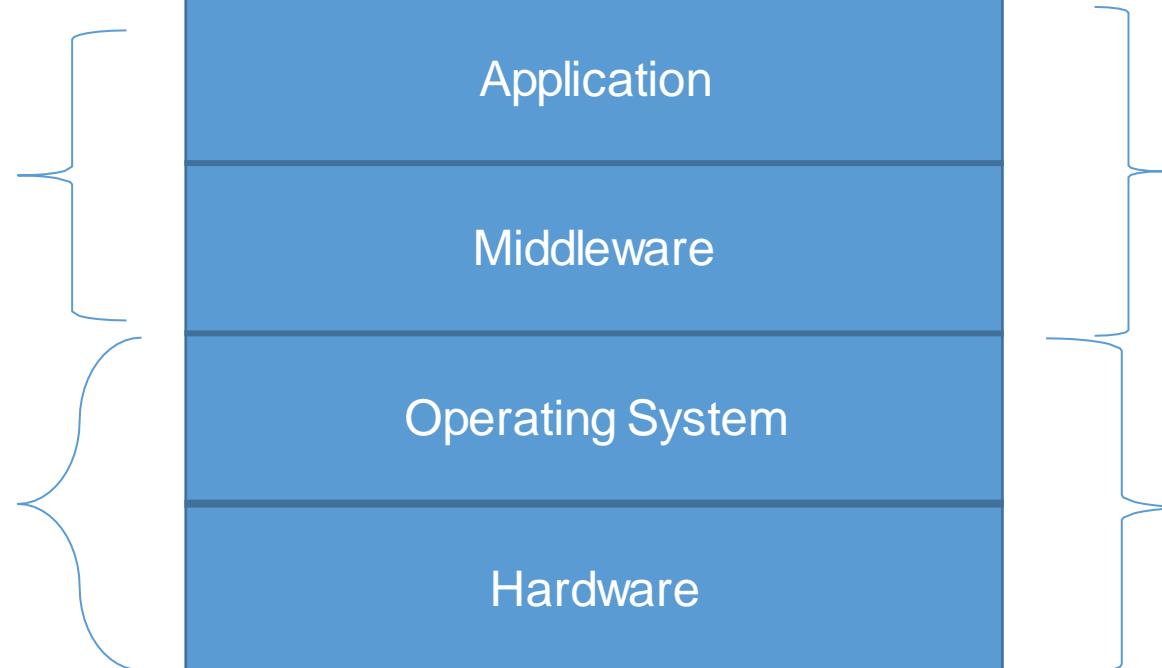
- With a PaaS model, your code is located elsewhere. In many cases (especially for developers), your source code is your biggest and most important asset.
- Another potential issue is security and secrecy.

# PAAS Models

Service Provider

No Control

Full Control



Consumer

Full Control

No Control

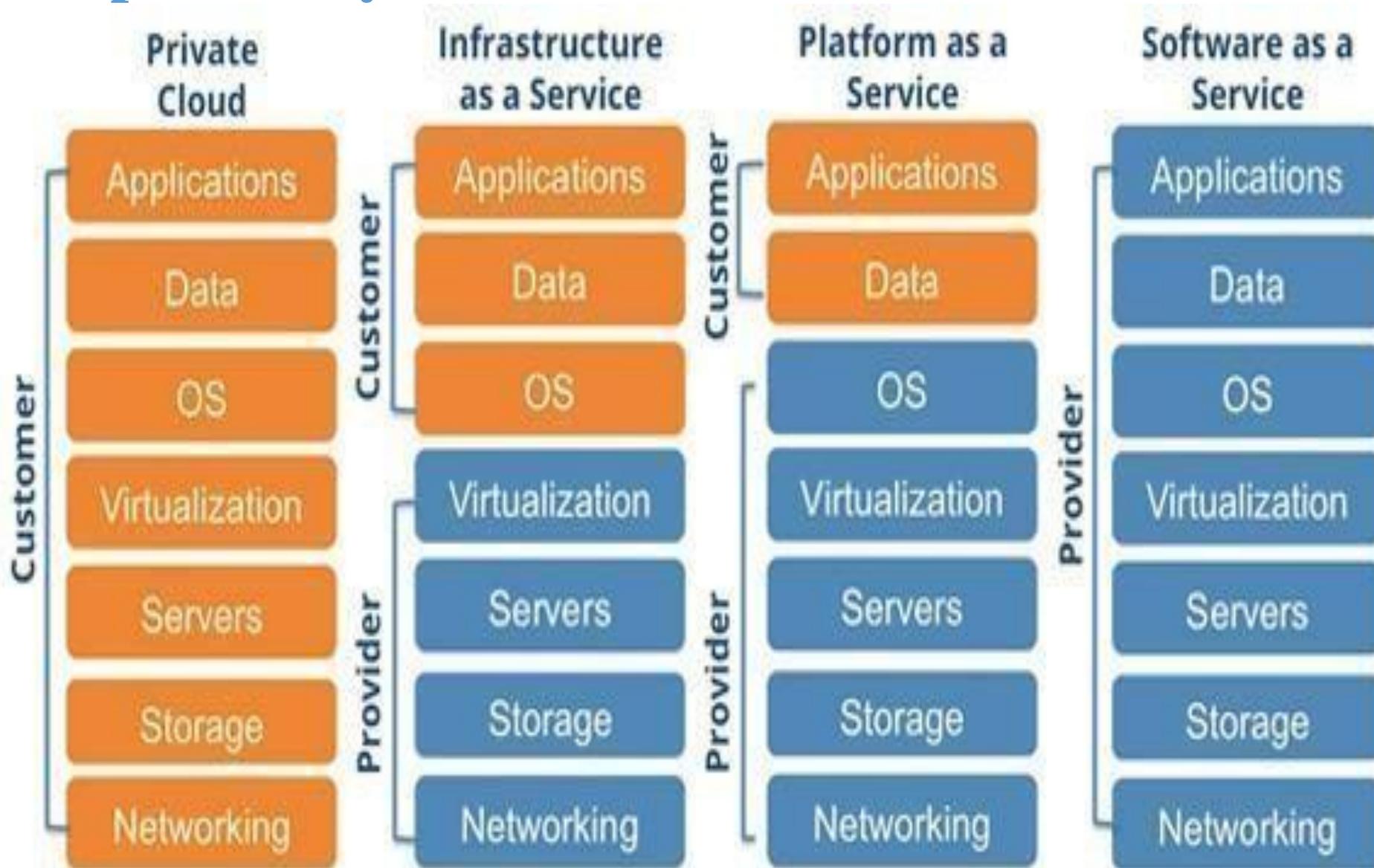
# PAAS Service provider



Google app engine



# Cloud Responsibility Matrix

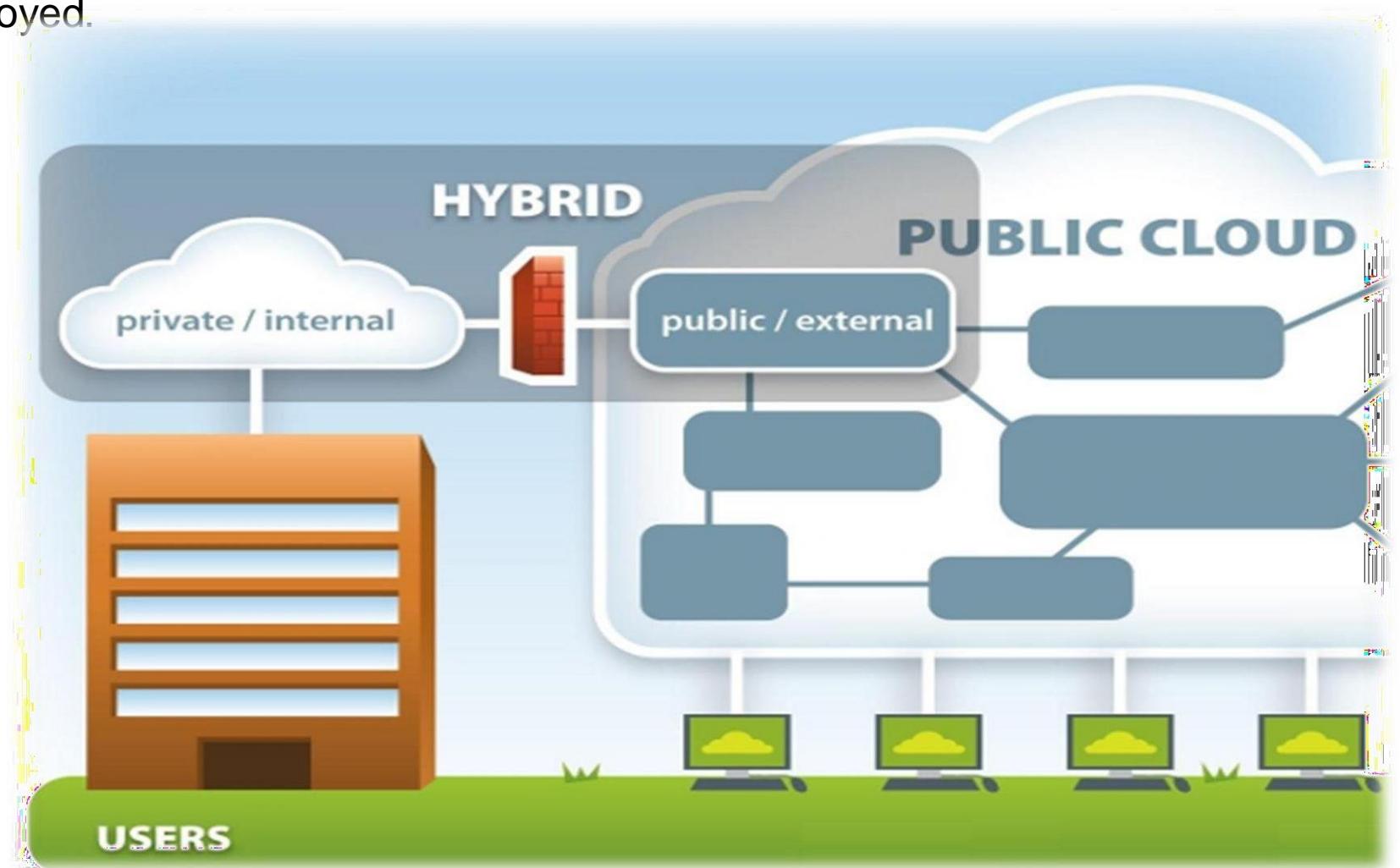


# Cloud Deployment model

With the attributes of a cloud service and the types of services defined, it makes sense to look at how cloud services are deployed.

Clouds deployment models:

- Private Cloud
- Public Cloud
- Community Cloud
- Hybrid Cloud



# Cloud Deployment model

## Private Cloud :

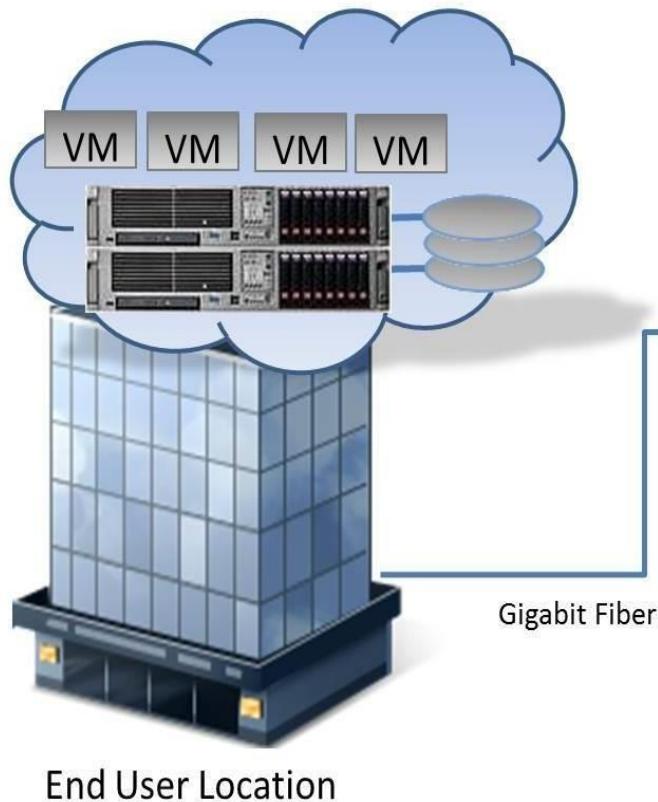
- The cloud infrastructure is operated solely for an organization. It may be managed by the organization or a third party and may exist on premise or off premise.
- The cloud infrastructure is accessed only by the members of the organization and/or by granted third parties.
- The purpose is not to offer cloud services to the general public, but to use it within the organization.
- Private cloud is hosted in the data centre of a company and provides its services only to users inside that company or its partners.
- A private cloud provides more security than public clouds, and cost saving in case it utilizes otherwise un-used capacities in an already existing data centre.
- The only big advantage that private cloud has over public cloud is that of data security and privacy.
- The major drawback of private cloud is its higher cost. When comparisons are made with public cloud; the cost of purchasing equipment, software and staffing often results in higher costs to an organization having their own private cloud.

# Cloud Deployment model

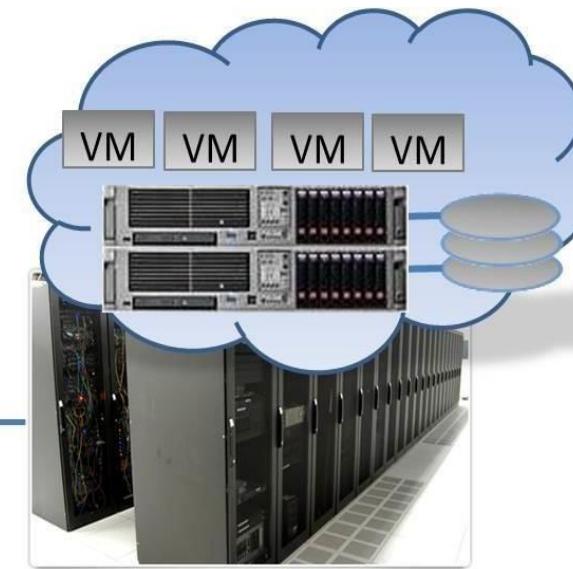
## The characteristics of Private Cloud are:

- Single Tenancy ( Exposed only to organizational users)
- Consumers will be internal Line Of Business ( LOB) or employees within the organization
- Cloud Infrastructure is owned , deployed and managed by the organization's IT team
- Cloud Infrastructure is generally hosted on premises or hosted off premise
- High Security compared to Public Cloud
- The IT team has complete control over the deployed infrastructure and applications
- Service Management is facilitated by organization's IT Team

# Private Cloud Deployment model



**Private Onsite Cloud**



**Private Offsite Cloud**

# Cloud Deployment model

## Public Cloud :

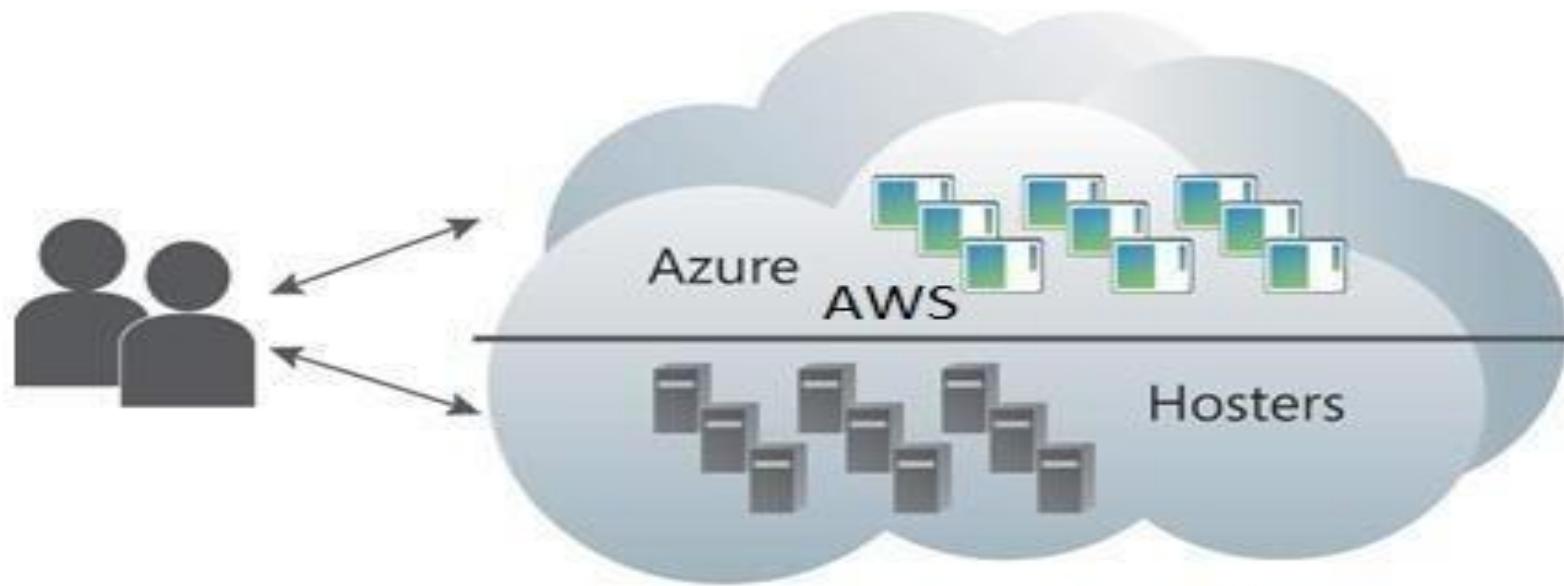
- The cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services.
- In public clouds, resources are offered as a service, usually over an internet connection, for a pay-per-usage fee.
- Users can scale their use on demand and do not need to purchase hardware to use the service.
- Public cloud providers manage the infrastructure and pool resources into the capacity required by its users.
- Public clouds are available to the general public or large organizations, and are owned by a third party organization that offers the cloud service.
- A public cloud is hosted on the internet and designed to be used by any user with an internet connection to provide a similar range of capabilities and services.
- Public cloud users are typically residential users and connect to the public internet through an internet service provider's network

# Cloud Deployment model

The characteristics of Public Cloud are:

- Multi Tenancy
- Consumers will be multiple organization and individuals across the globe who has Valid Credit card holder can consume the services
- Cloud Infrastructure is owned ,deployed and managed by the Service Providers
- Cloud Infrastructure is generally hosted in multiple datacenters in different geographical location
- Consumers have very limited or no control of security practices of service providers
- Service Management ,Service catalogue, chargeback, is facilitated by the Service Providers
- Few of the Service providers might also provide additional services like Managed Hosting for customers to host their private cloud infrastructure and also provide Physical infrastructure under pay-per-use plan ,generally you can rent for specified time period

# Public Cloud Deployment model



**Public cloud by  
service providers**

# Cloud Deployment model

## Community Cloud / Multitenant Cloud :

- A community cloud falls between public and private clouds with respect to the target set of consumers.
- It is somewhat similar to a private cloud, but the infrastructure and computational resources are exclusive to two or more organizations that have common privacy, security, and regulatory considerations, rather than a single organization

### The characteristics of Community Cloud are:

- Multi Tenancy and is a shared private cloud
- Community cloud delivers services through self provisioning portal via internet to specific group of organization who share common goal or purpose
- Consumers can be multiple organizations and individuals from the community
- Infrastructure is owned ,deployed and managed by the one or more participating Community organization
- Infrastructure Management, service Creation, chargeback is facilitated by Community owner or by tenants

# Cloud Deployment model

## Hybrid Cloud:

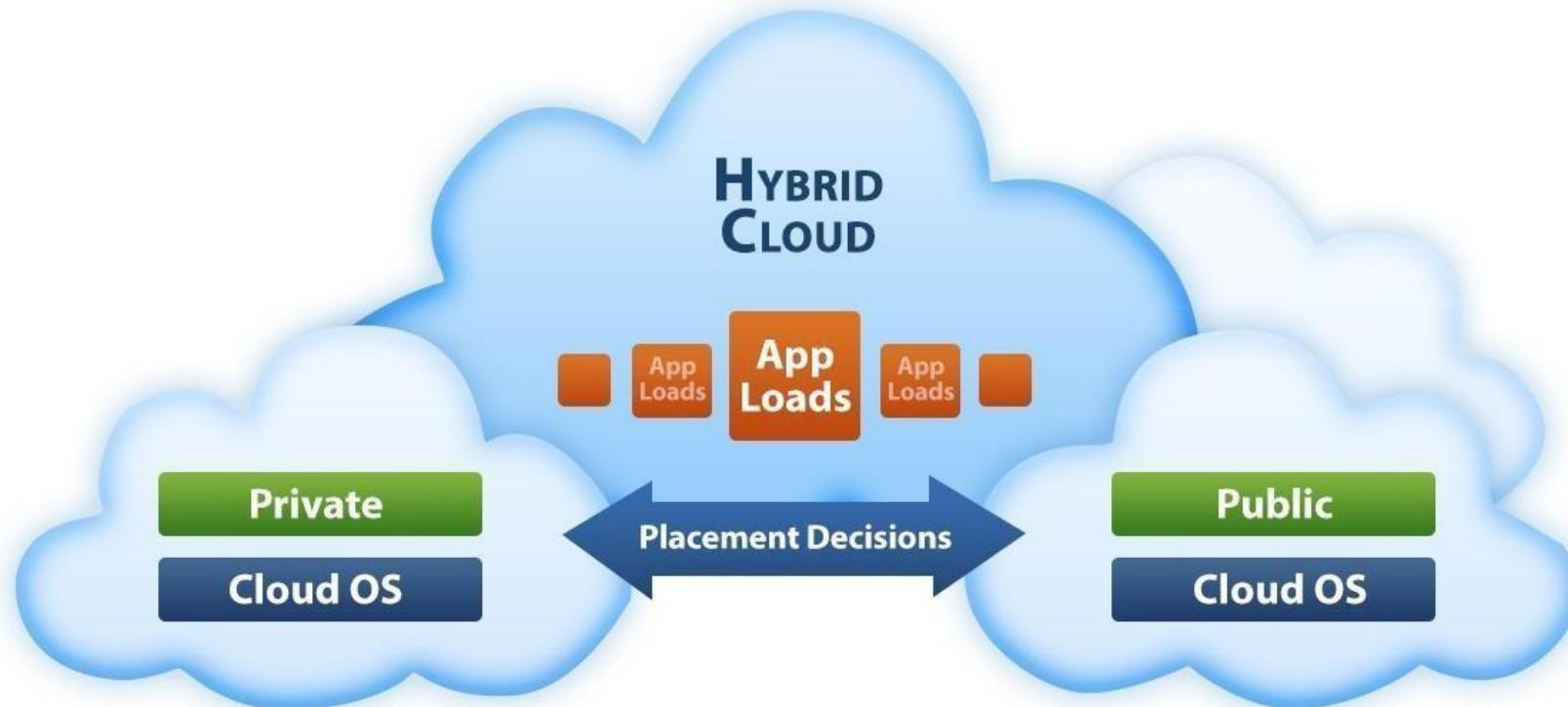
- Hybrid clouds are more complex than the other deployment models, since they involve a composition of two or more clouds (private, community, or public).
- Each member remains a unique entity, but is bound to others through standardized or proprietary technology that enables application and data portability among them
- A hybrid cloud is a composition of at least one private cloud and at least one public cloud.
- A hybrid cloud is typically offered in one of two ways: a vendor has a private cloud and forms a partnership with a public cloud provider, or a public cloud provider forms a partnership with a vendor that provides private cloud platforms.

# Cloud Deployment model

## The characteristics of Hybrid Cloud are:

- A combination /Federation of Private cloud and one or more Public Cloud service providers
- Consumers access services through organization's self provisioning portal and some of the services via internet from public cloud
- Consumers are organizational LOB's and Individuals
- Private Cloud Infrastructure is owned ,deployed and managed by the Organization's internal IT Team
- Public Services infrastructure is owned ,deployed and managed by service provider

# Hybrid Cloud Deployment model



# Cloud Service Provider

Infrastructure as a  
Service IaaS



Platform as a Service  
PaaS

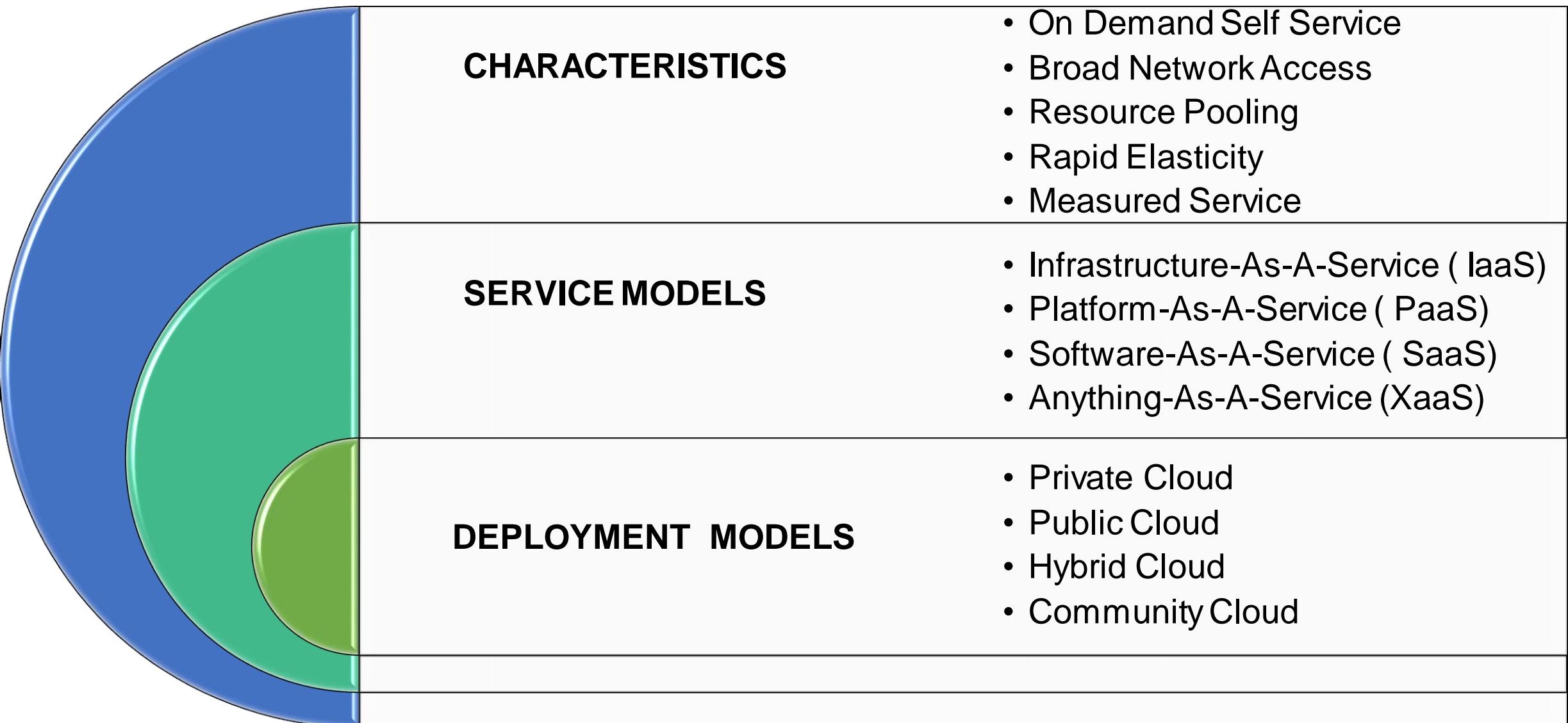


Software as a Service  
SaaS



	<b>Public</b>	<b>Private</b>	<b>Hybrid</b>
Reliability	More reliability as infrastructure spawned across multiple geographical distinct regions	More reliability as infrastructure located within on premise or datacenter or may be spread across 2-3 datacenter.	More reliability than private cloud
Scalability	Provides virtually unlimited scalability	Have to carefully plan resources for scaling	Has a advantage of bursting in public cloud
Security	Generally enterprise class security available but as such varies depending upon service provider	Highest level of security setting possible	Through proper planning relatively high level of security setting possible
interoperability	Least interoperability with vendor lock in	Least interoperability with ability to launch service in same cloud environment	Provides a easy mechanism to launch service in multi cloud environment
Performance	Good Performance	Best Performance	Better than Public
privacy	you may not know where your data is stored or how it is backed up, and whether unauthorized users can get access to it.	You know where exactly your data is stored or how is backed up and how have access to it.	You know where data is in private cloud but not in public cloud

# Cloud Computing Summary



# Questions???