



Cloud Computing

## Lesson Objectives



At the end of this module you will be able to:

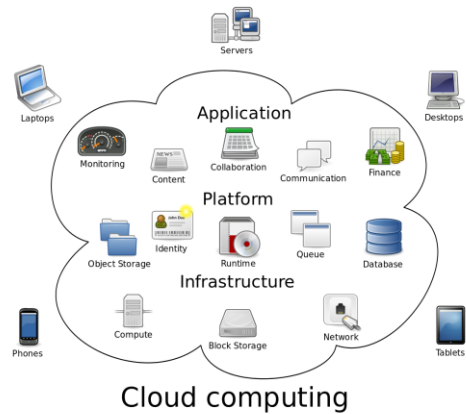
- ✓ Understand the fundamentals Cloud Computing
- ✓ Get an overview of cloud applications, cloud platform and private cloud
- ✓ Understand the difference between SaaS, PaaS and IaaS
- ✓ List out the benefits and limitations of SaaS, PaaS and IaaS



# Introduction to Cloud Computing



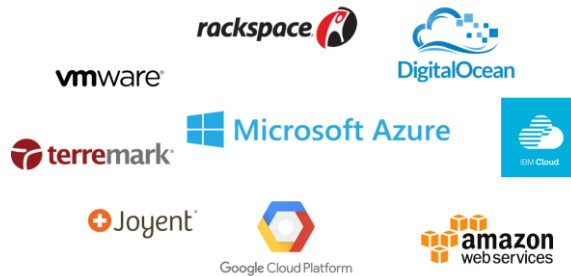
- Cloud computing is a virtualized computing platform that provides infinite resources for running our applications.
- It leverages economies of scale to save our money by only requiring us to pay for what we use.



## Cloud Providers



- A cloud provider is a company that offers some component of cloud computing services like servers, storage, databases, networking analytics and more over the internet.
- Cloud providers are sometimes referred to as cloud service providers or CSPs



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4

Amazon was the first company to move in cloud platforms

## Cloud Computing Benefits



- We move towards an operational expenditure model(OpEx) instead of capital expenditure (CapEx)
  - No need to worry about upfront cost for provisioning space, adequate environment with redundant power and air conditioning, the server racks. Cloud provider takes care of that for you
- Stay on the cutting edge with latest technology.
  - No need to worry about hardware infrastructure to support it
- Ensures redundancy i.e. up-time and availability.
- Can be scaled geographically to lower the latency.

# Elements of the Cloud Computing



## Elasticity

- Dynamically adjusting your infrastructure to service demand

## Scalability

- Scale your virtual machine instances up or down dynamically, and horizontal scaling, where you can spawn multiple instances of a server for load balancing.

## Pooling

- Virtually unlimited compute storage and network power, which can be made available on demand and pay only for what you use.

## Provisioning

- Supports self-service provisioning, no need to be a full administrator to provision resources

# Cloud Computing Categories



Cloud  
Applications

Running applications in data centers owned by third parties and accessed via the internet

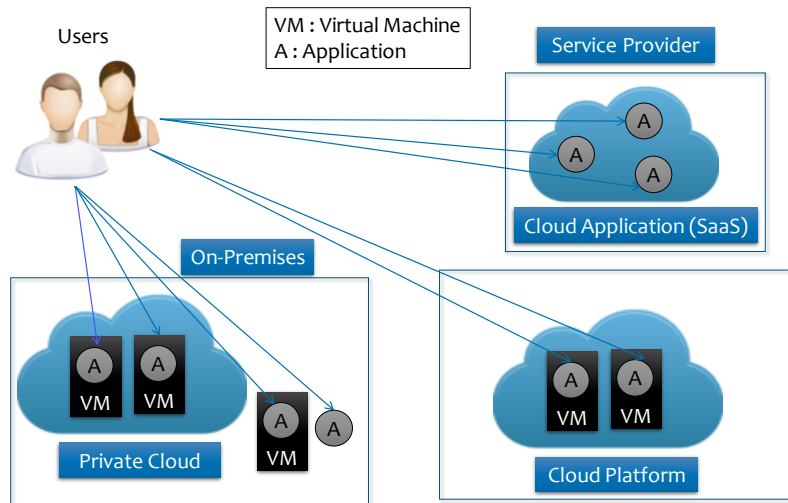
Cloud  
Platforms

Computing resources at data centers across the internet.

Private  
Clouds

Cloud platforms used by a single organization inside their own on-premise data center

# Cloud Computing Categories

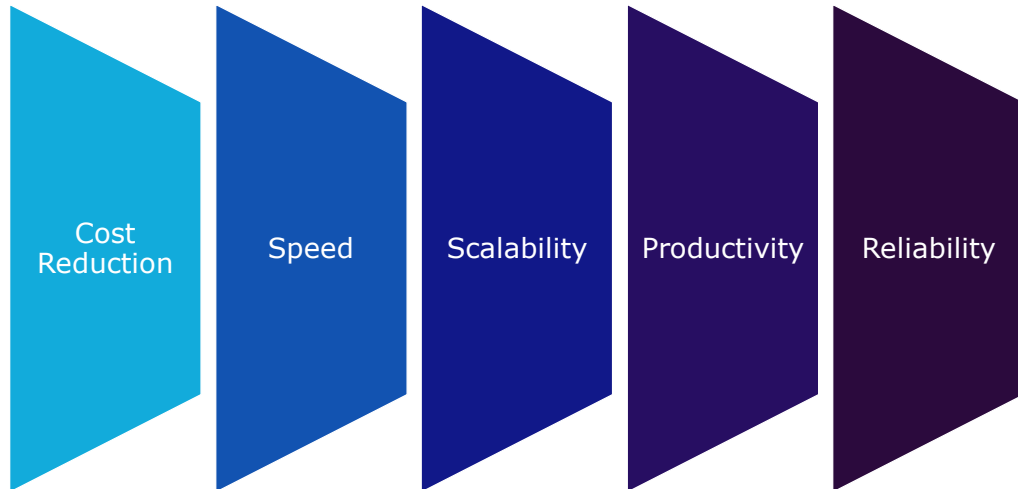


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8



## Benefits of cloud computing



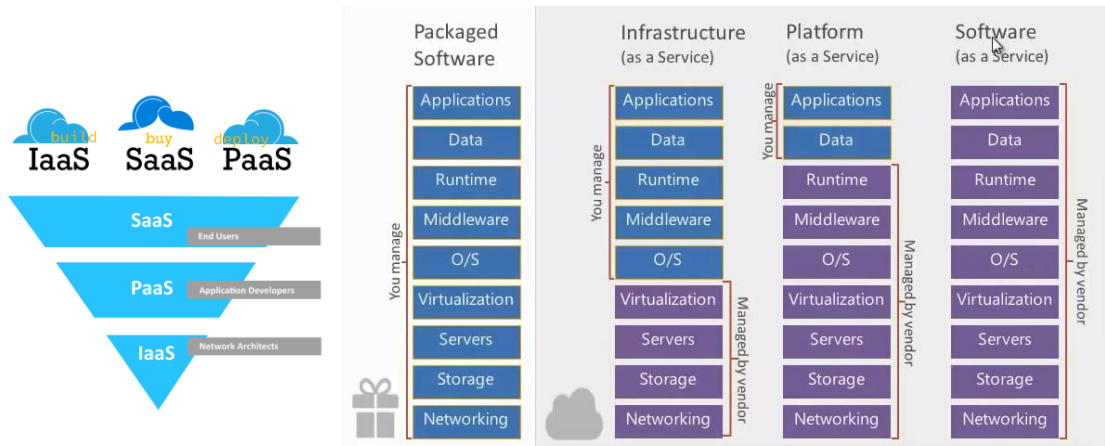
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9

Benefits of cloud computing:

- **Cost** : Hugely reduced capital cost of buying hardware and software's
- **Speed** : Computing resources can be provisioned in minutes typically with in few minutes
- **Scalability** : Computing resources can be scaled up and down quickly according to the business requirements
- **Productivity** : Cloud Computing takes out hardware setup, patching etc. so that IT team can focus on achieving business goals
- **Reliability** : Cloud computing makes data backup, data recovery and business continuity less expensive and faster recovery

# Cloud Services



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10

## Types of cloud services:

### Infrastructure as a Service (IaaS)

Rent IT infrastructure servers and virtual machines (VMs), storage, networks, operating systems from a cloud provider on a pay-as-you-go basis

### Platform as a Service (PaaS)

Cloud computing services that supply an on-demand environment for developing, testing, delivering and managing software applications

### Software as a Service (SaaS)

Delivering software applications over the Internet, on demand and typically on a subscription basis.

## Cloud Applications (SaaS)



- Running applications on the public cloud is commonly referred as Software as a Service(SaaS)
- Cloud applications is nothing but an application which offers CRM(Customer Relationship Management), Email, ERP, collaboration, productivity etc.
- Microsoft, Google, Salesforce, SAP, IBM, Oracle, NetSuite & Zoho were some of the important service providers to offer cloud applications.

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11

### **Microsoft : Office 365**

Microsoft offers Dynamics CRM Online (CRM), Exchange Online(Email), SharePoint online(Collaboration), Office Web Apps(Productivity)

### **Google : Google Apps**

Gmail(Email), Google Sites(Collaboration), Google Docs(Productivity)

**SAP:** Business By Design(ERP)

**IBM:** Lotus Live(Collaboration)

### **Oracle:**

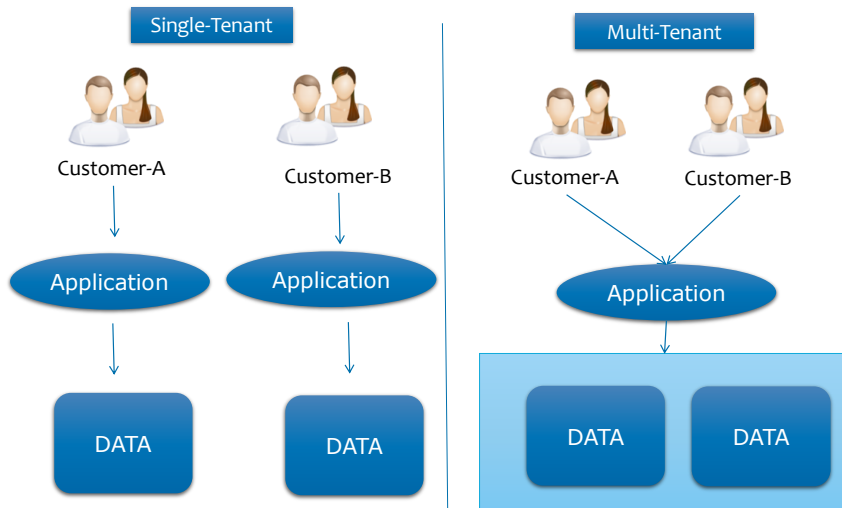
Fusion CRM (CRM)

**NetSuite:** CRM+ (CRM)

**Zoho:** CRM, Mail(Email), Docs(Collaboration), Writer(Productivity)

**Salesforce:** CRM (Salesforce was first vendor to experience real success with SaaS)

# Single-Tenant vs. Multi-Tenant Applications



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12

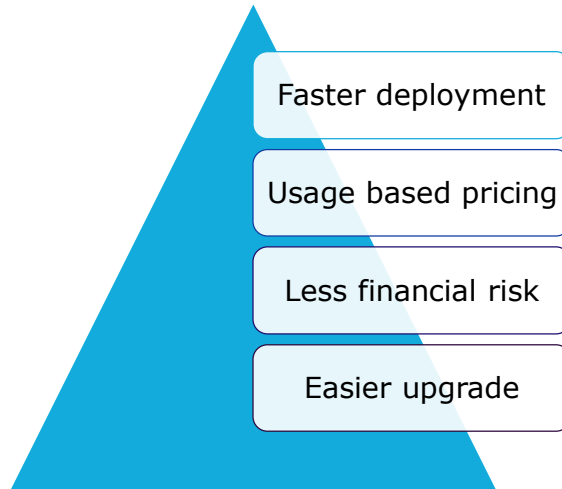
## Single-Tenant Application

Multiple users or Multiple customer organizations, are assigned with their own copy of the application. It requires one instance for each customer, there's no cost advantage

## Multi-Tenant Application

Multiple users or Multiple customer organizations, shares a single copy of the application with their data. It is easy to update, to maintain, to work with, and thus provides cost saving to customers

## SaaS Advantages



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13

### SaaS Benefits:

- Faster deployment because no local installation required
- Usage based pricing i.e. letting us to pay only for what we use
- Less financial risk by lowering up-front cost, in-fact we have free trail option so that we can try it before we buy
- Easier upgrade, no need to worry about updates application will be up to date

## SaaS Limitations



Requires trusted SaaS Provider



Legal concerns



Limited App customization



Integration issues with on-premises applications



Requires good internet connectivity



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14

### **SaaS Limitations:**

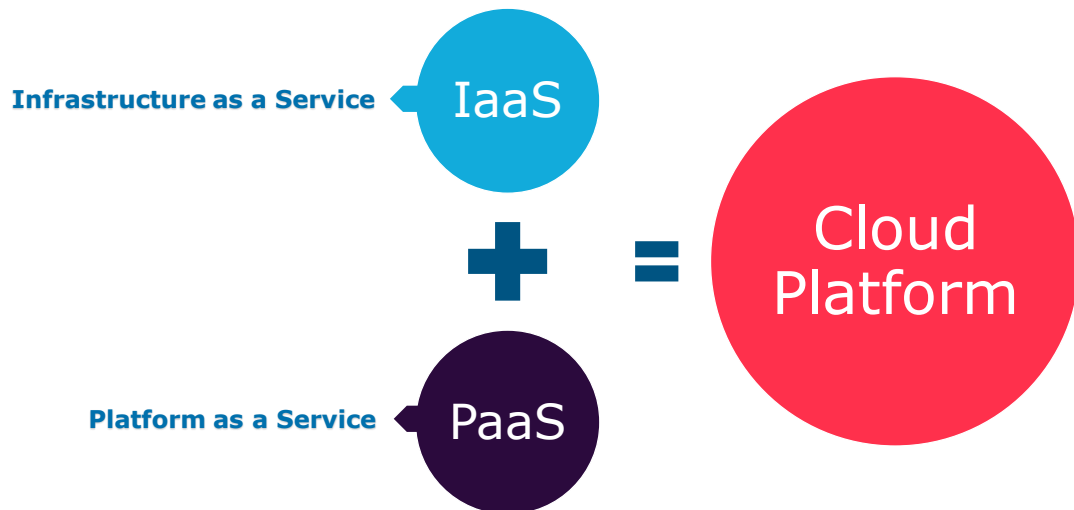
- Requires trusted SaaS Provider for availability and data security
- Legal / regulatory concerns can arise due to the data getting stored outside the customer premises.
- App Customization is limited when using a multi-tenant application.
- Harder to integrate with on-premises applications
- Lower performance can arise if customer has low band internet connectivity

## Cloud Platform



- Cloud platform provides an environment with that developers can build applications on that and users can then use it.
- Cloud platform is a platform not an application. It allows developers to create application, run applications, store data and more
- Cloud platform provides self service access to resources such as a virtual machine , storage , service through a browser interface.
- Cloud platform allows us charging only for the resources an application uses. i.e. we can use a VM for an hour or Giga bytes of storage for a day.

## Cloud Platform categories



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16



## IaaS vs PaaS



IaaS	PaaS
Higher degree of control	Higher agility
Higher support for legacy apps	Higher ease of management
Lower ease of management	Lower degree of control
Lower agility	Lower support for legacy apps

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17

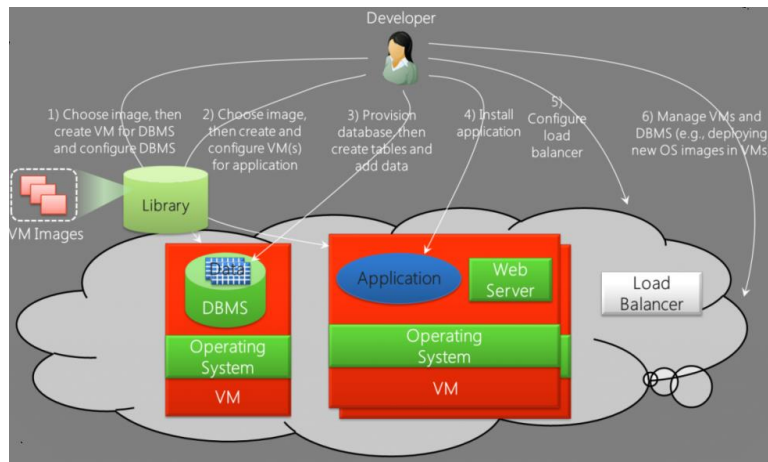
### IaaS

- Network architects or developers can create virtual machines on demand from a library of preexisting VM images
- Network architects or developers need to manage VM's and DBMS and configure the load balancers

### PaaS

- Developers don't create VMs directly rather they provide an application to platform with the platform then runs
- It's like a pre-existing application platform so that developers just need to create database, add data and deploy the application, no need to manage VM's

# Setting-up an Application on IaaS Environment



Source : [channel9.msdn.com](http://channel9.msdn.com)

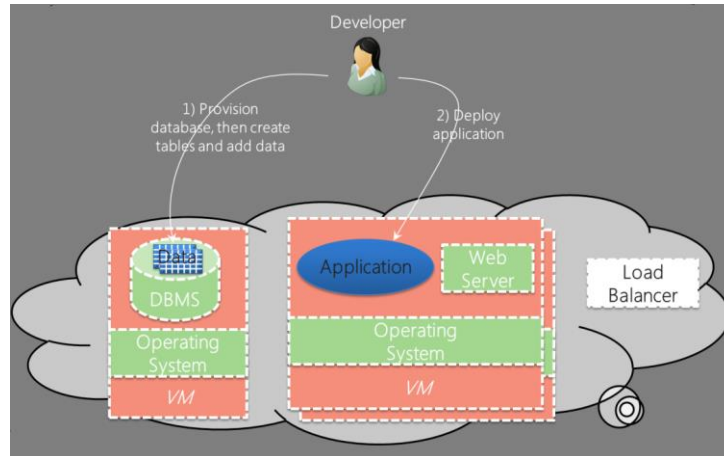
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18

## Developer needs to do the following in IaaS:

1. Choose an image, then create VM for DBMS and configure DBMS
2. Choose an image, then create and configure VM(s) for application
3. Choose database, then create tables and add Data.
4. Install application on the VM created for application
5. Configure the load Balancer
6. Manage VMs and DBMS (developers needs to administering this environment)

## Setting-up an Application on PaaS Environment



Source : [channel9.msdn.com](http://channel9.msdn.com)

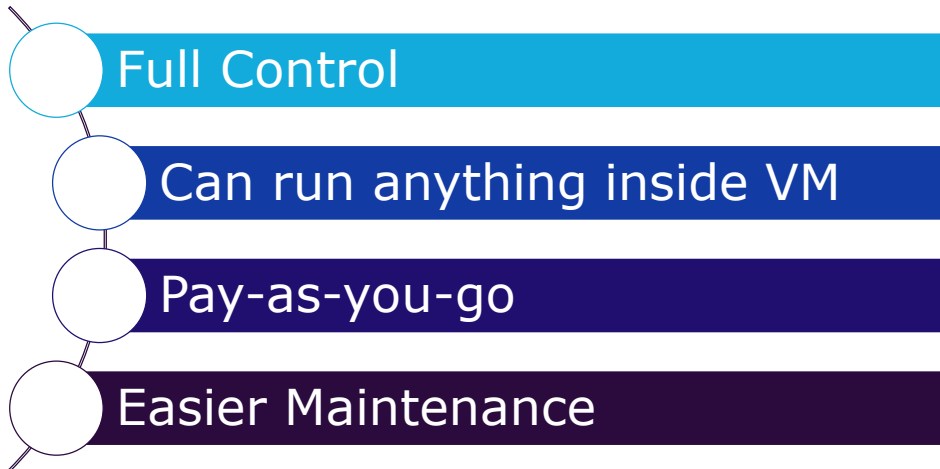
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19

### Developer needs to do the following in PaaS:

1. Create a database, then tables and add data
2. Deploy application on VM created for application and run

## IaaS Advantages



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20

### IaaS Benefits:

- Customers have full control over their VM and everything inside it; customers can choose to automate the provisioning or build their own VM
- Customer can run anything they want inside their VM also get full control of processing inside VM
- Customer can pay what they actually utilize, they can shut down the resources, if it is not in use and save money.
- The customer can run and control its own virtual infrastructure without the overheads of cost and maintenance from running its own hardware.

## IaaS Limitations



Most expensive



More responsibility



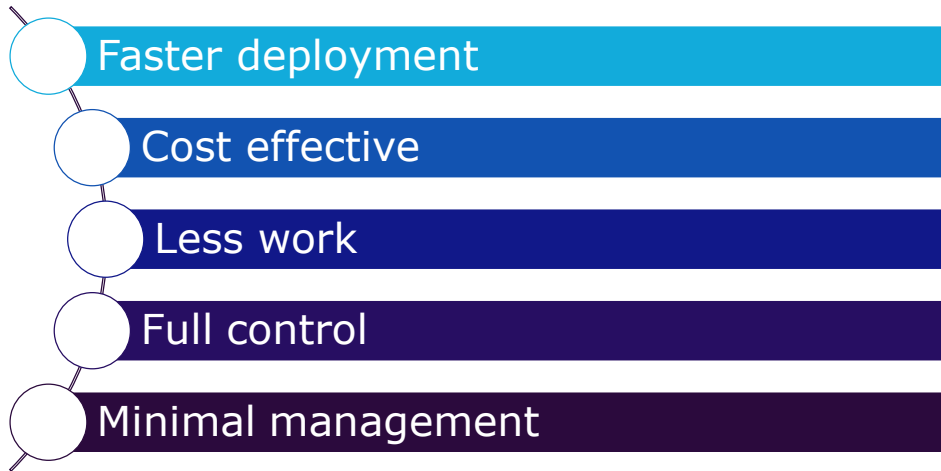
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21

### IaaS limitations:

- Most expensive, since the customer is now leasing the resource, provider can charge for every Cycle, bit of RAM or disk space used.
- Customer is responsible for backups and patch updates.
- The performance of the network depends on the speed of the internet connectivity

## PaaS Advantages



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22

### PaaS Benefits:

- Faster deployment because no local installation required
- Cost effective in comparison to IaaS, because we are essentially leasing the software platform not a resource.
- Developers need to do less work so that applications can be created quickly
- No need to administer the application, organizations can spend less on supporting their applications

## PaaS Limitations



Less familiarity



Need to work with constraints



Vendor lock-in



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23

### **PaaS Limitations:**

- PaaS is less familiar to developers, they need to learn the PaaS platform
- PaaS gives developers less control, they must work with the constraints of PaaS technology.
- PaaS platforms can be quite different from one another and from the on-premises world, so that there is a chance of locking with vendor.

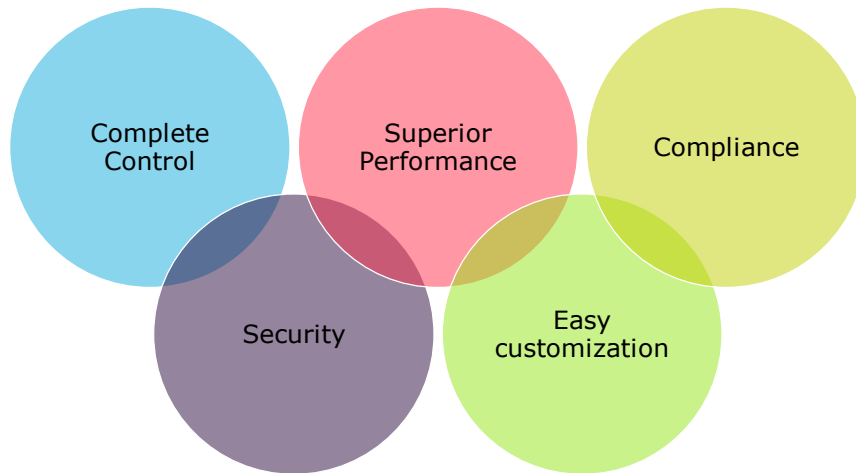
## Introduction to Private Cloud



- Private cloud infrastructure is a dedicated infrastructure provided to one single organization or client.
- Deployed inside firewalls and offer robust IT security for the organization
- Companies also pay third-party service providers to host their private cloud.
- Using Private clouds VM admin in an organization can create a predefined services with predefined users, access rights, and quotas so that it will be immediately available to IT user as soon as they make the request.



## Benefits of Private Cloud



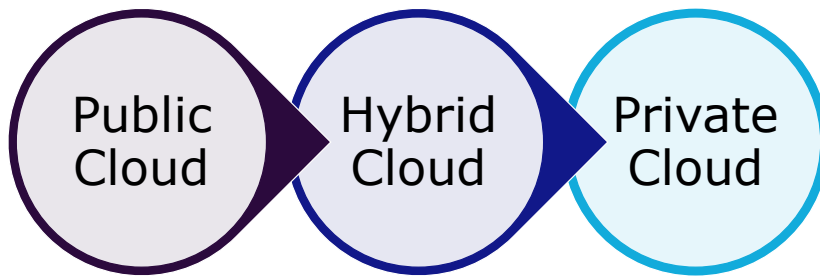
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25

### Benefits of Private cloud:

- Better controls for data, users and information assets.
- The cloud belongs to a single client. Hence, the infrastructure and systems can be configured to provide high levels of security.
- The cloud belongs to a single client. Hence, the infrastructure and systems can be configured to provide high levels of security.
- The hardware and other resources can be customized easily by the company.
- Compliance is achieved easily in private clouds.

## Cloud Deployment Models



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26

### Public cloud

Public clouds are owned and operated by a third-party cloud service provider, which delivers computing resources such as servers and storage over the Internet. All services exist in the internet. This is multi-tenancy. A good example would be the Azure Cloud and Azure-related services, like Office 365. All you need to access those services is an internet connection, a web browser, and a subscription to the service

### Private cloud

A private cloud refers to cloud computing resources used exclusively by a single business or organization. All your services exist in the private network. A private cloud can be physically located on the company's on-site datacenter. Some companies also pay third-party service providers to host their private cloud

### Hybrid cloud

Hybrid clouds combine public and private clouds, bound together by technology that allows data and applications to be shared between them. A secure, private connection between Azure and your on-premises environment, and this is a very flexible way to do Cloud infrastructure. Set up a site-to-site VPN, or you can have a dedicated connection that bypasses the internet. In Azure, this is called ExpressRoute. Hybrid cloud gives businesses greater flexibility and more deployment options. Microsoft is the leading cloud platform companies which has the strongest focus on hybrid cloud

## Summary



- A cloud environment can be accessed from anywhere in the world as long as the user has access to the internet
- Cloud computing leverages economies of scale to save our money by only requiring us to pay for what we use
- Single tenant application, requires one instance for each customer, so there's no cost advantage for SaaS application provider
- Multi tenant applications is easy to update, to maintain, to work with, and also provides cost saving to customers



## Summary



- PaaS doesn't support VMs for On-Demand Use, where as IaaS supports it.
- PaaS gives developers less control, they must work with the constraints of PaaS technology
- Private clouds have value, only if users have customized and unique requests
- Private cloud is allowing automated VM on demand requests, organizations cannot claim their data centers as private cloud without this facility





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