



# ***CLOUD COMPUTING***

## ***Unit-2***

### ***Introduction to IaaS, Public Cloud and Private Cloud Environment***



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## ***IaaS: Intro and Benefits***

***Infrastructure-as-a-Service provides access to fundamental resources such as physical machines, virtual machines, virtual storage, etc. Apart from these resources, the IaaS also offers:***

- ❖ Virtual machine disk storage***
- ❖ Virtual local area network (VLANs)***
- ❖ Load balancers***
- ❖ IP addresses***
- ❖ Software bundles***

***All of the above resources are made available to end user via server virtualization. Moreover, these resources are accessed by the customers as if they own them.***



# **IaaS: Intro and Benefits**

## **Benefits**

**IaaS allows the cloud provider to freely locate the infrastructure over the Internet in a cost-effective manner. Some of the key benefits of IaaS are listed below:**

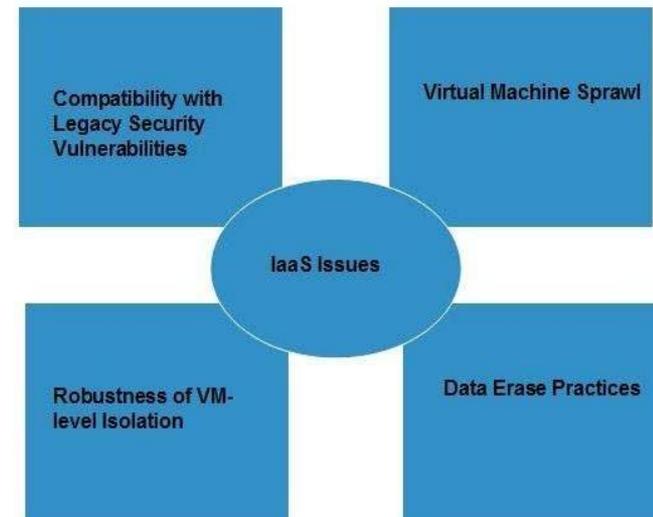
- **Full control of the computing resources through administrative access to VMs.**
- **Flexible and efficient renting of computer hardware.**
- **Portability, interoperability with legacy applications.**
- **Full control over computing resources through administrative access to VMs**
- **IaaS allows the customer to access computing resources through administrative access to virtual machines in the following manner:**
  - **Customer issues administrative command to cloud provider to run the virtual machine or to save data on cloud server.**
  - **Customer issues administrative command to virtual machines they owned to start web server or to install new applications.**

# IaaS: Introduction

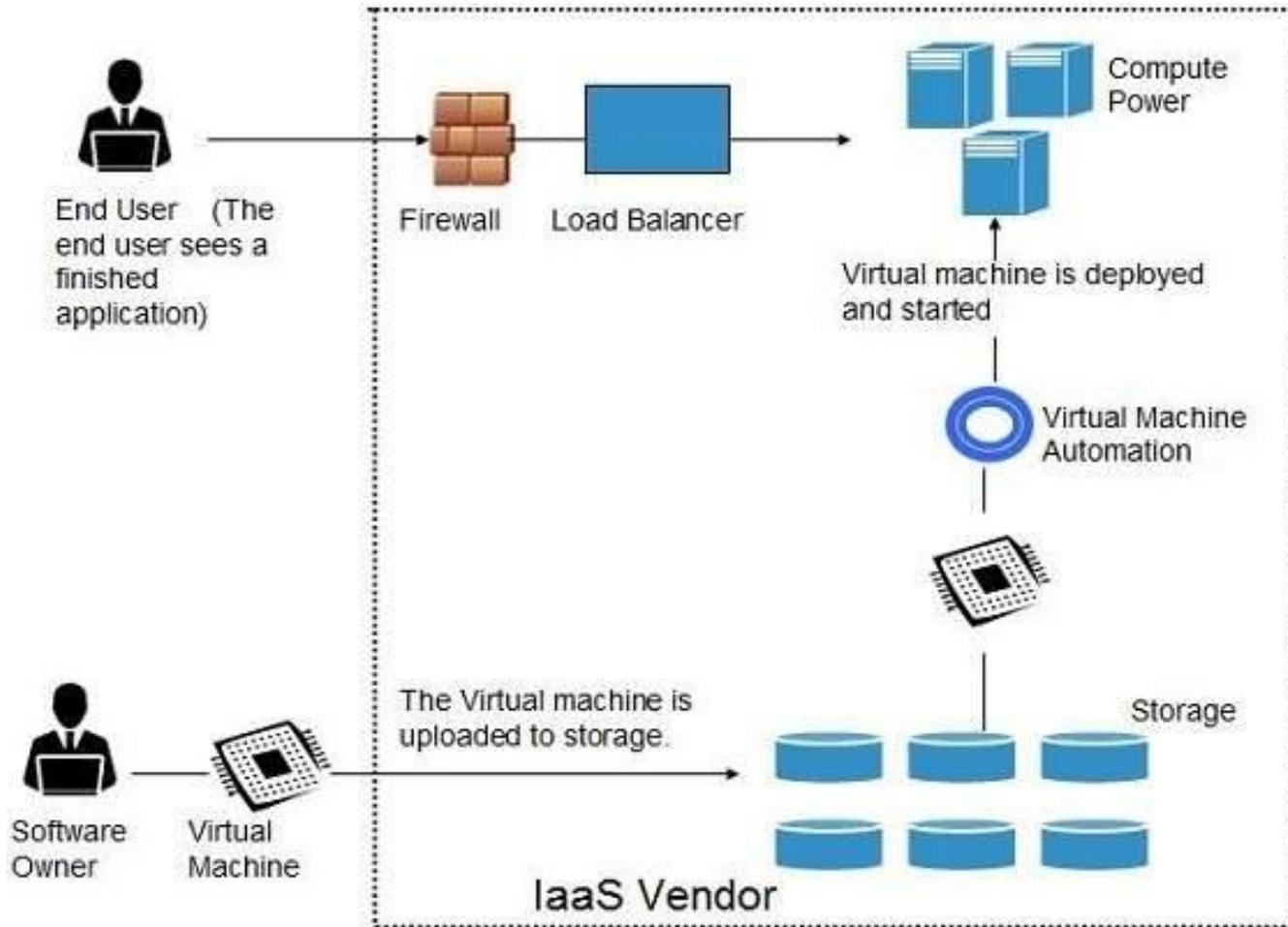
- **Flexible and efficient renting of computer hardware**
- **IaaS resources such as virtual machines, storage devices, bandwidth, IP addresses, monitoring services, firewalls, etc. are made available to the customers on rent. The payment is based upon the amount of time the customer retains a resource. Also with administrative access to virtual machines, the customer can run any software, even a custom operating system.**
- **Portability, interoperability with legacy applications**
- **It is possible to maintain legacy between applications and workloads between IaaS clouds. For example, network applications such as web server or e-mail server that normally runs on customer-owned server hardware can also run from VMs in IaaS cloud.**

## Issues

**IaaS shares issues with PaaS and SaaS, such as Network dependence and browser based risks. It also has some specific issues, which are mentioned in the following diagram:**



# IaaS: Diagram





## **IaaS: Issues**

- **Compatibility with legacy security vulnerabilities**
- **Because IaaS offers the customer to run legacy software in provider's infrastructure, it exposes customers to all of the security vulnerabilities of such legacy software.**
  
- **Virtual Machine sprawl**
- **The VM can become out-of-date with respect to security updates because IaaS allows the customer to operate the virtual machines in running, suspended and off state. However, the provider can automatically update such VMs, but this mechanism is hard and complex.**
  
- **Robustness of VM-level isolation**
- **IaaS offers an isolated environment to individual customers through hypervisor. Hypervisor is a software layer that includes hardware support for virtualization to split a physical computer into multiple virtual machines.**
  
- **Data erase practices**
- **The customer uses virtual machines that in turn use the common disk resources provided by the cloud provider. When the customer releases the resource, the cloud provider must ensure that next customer to rent the resource does not observe data residue from previous customer.**



# **IaaS: Characteristics**

## **Characteristics**

**Here are the characteristics of IaaS service model:**

**Virtual machines with pre-installed software.**

**Virtual machines with pre-installed operating systems such as Windows, Linux, and Solaris.**

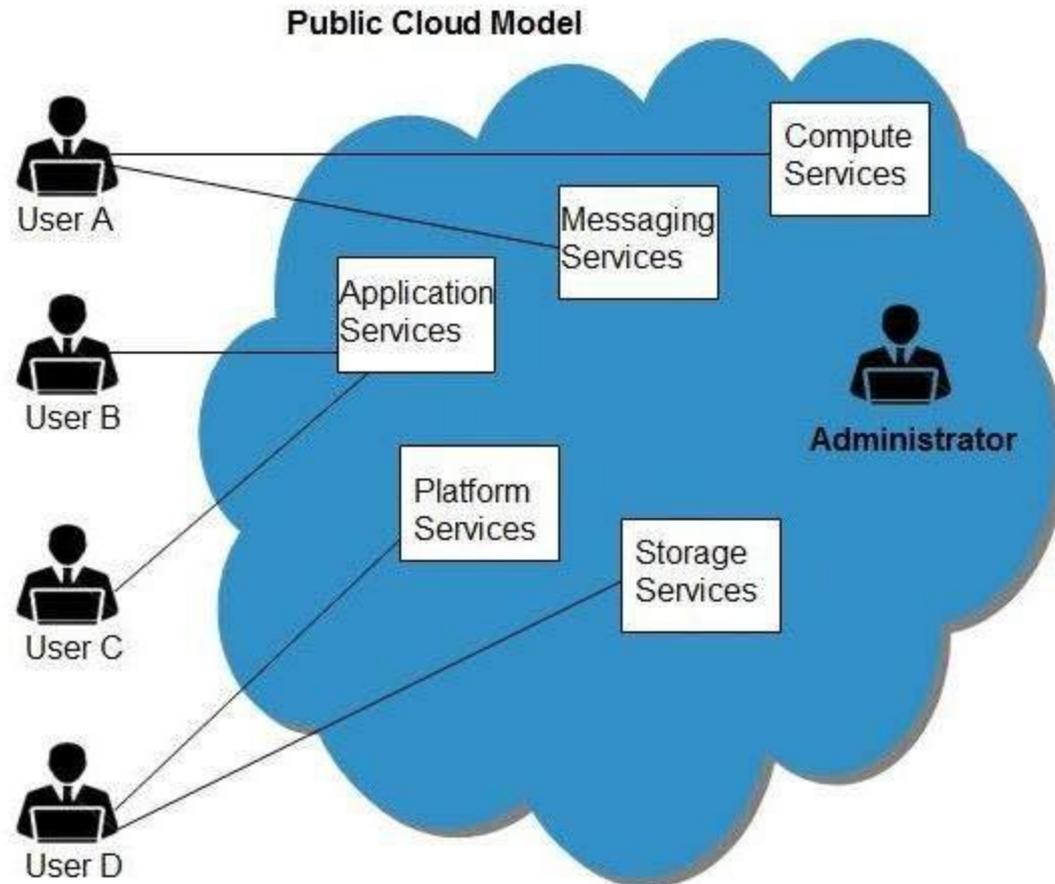
**On-demand availability of resources.**

**Allows to store copies of particular data at different locations.**

**The computing resources can be easily scaled up and down.**

# Public Cloud Model

**Public Cloud allows systems and services to be easily accessible to general public. The IT giants such as Google, Amazon and Microsoft offer cloud services via Internet. The Public Cloud Model is shown in the diagram below.**





# **Public Cloud Model: Benefits**

## **➤ Cost Effective**

**Since public cloud shares same resources with large number of customers it turns out inexpensive.**

## **➤ Reliability**

**The public cloud employs large number of resources from different locations. If any of the resources fails, public cloud can employ another one.**

## **➤ Flexibility**

**The public cloud can smoothly integrate with private cloud, which gives customers a flexible approach.**

## **➤ Location Independence**

**Public cloud services are delivered through Internet, ensuring location independence.**

## **➤ Utility Style Costing**

**Public cloud is also based on pay-per-use model and resources are accessible whenever customer needs them.**

## **➤ High Scalability**

**Cloud resources are made available on demand from a pool of resources, i.e., they can be scaled up or down according the requirement.**



# **Public Cloud Model: Disadvantages**

## **➤ Low Security**

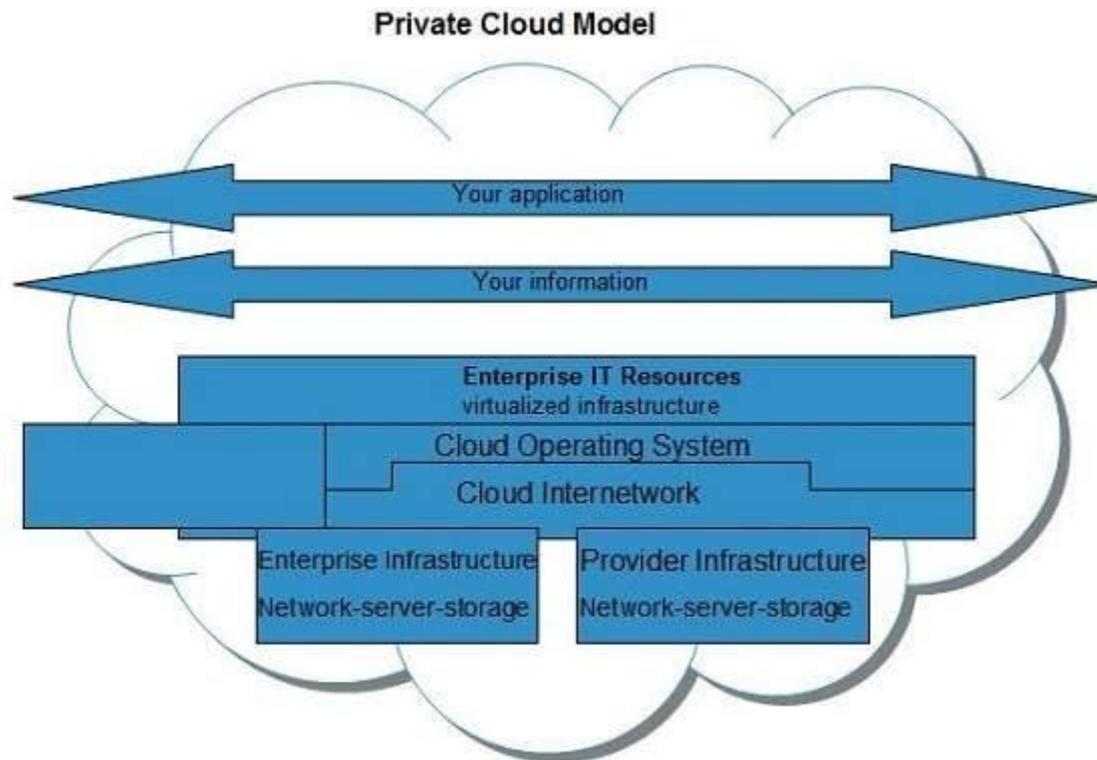
**➤ In public cloud model, data is hosted off-site and resources are shared publicly, therefore does not ensure higher level of security.**

## **➤ Less Customizable**

**➤ It is comparatively less customizable than private cloud.**

# **Private Cloud Model : Introduction**

**Private Cloud allows systems and services to be accessible within an organization. The Private Cloud is operated only within a single organization. However, it may be managed internally by the organization itself or by third-party. The private cloud model is shown in the diagram below.**





## **Private Cloud Model : Benefits**

**Private Cloud allows systems and services to be accessible within an organization. The Private Cloud is operated only within a single organization. However, it may be managed internally by the organization itself or by third-party. The private cloud model is shown in the diagram below:**

### **➤ High Security and Privacy**

**Private cloud operations are not available to general public and resources are shared from distinct pool of resources. Therefore, it ensures high security and privacy.**

### **➤ More Control**

**The private cloud has more control on its resources and hardware than public cloud because it is accessed only within an organization.**

### **➤ Cost and Energy Efficiency**

**The private cloud resources are not as cost effective as resources in public clouds but they offer more efficiency than public cloud resources.**



# **Private Cloud Model : Disadvantages**

## **➤ Restricted Area of Operation**

***The private cloud is only accessible locally and is very difficult to deploy globally.***

## **➤ High Priced**

***Purchasing new hardware in order to fulfill the demand is a costly transaction.***

## **➤ Limited Scalability**

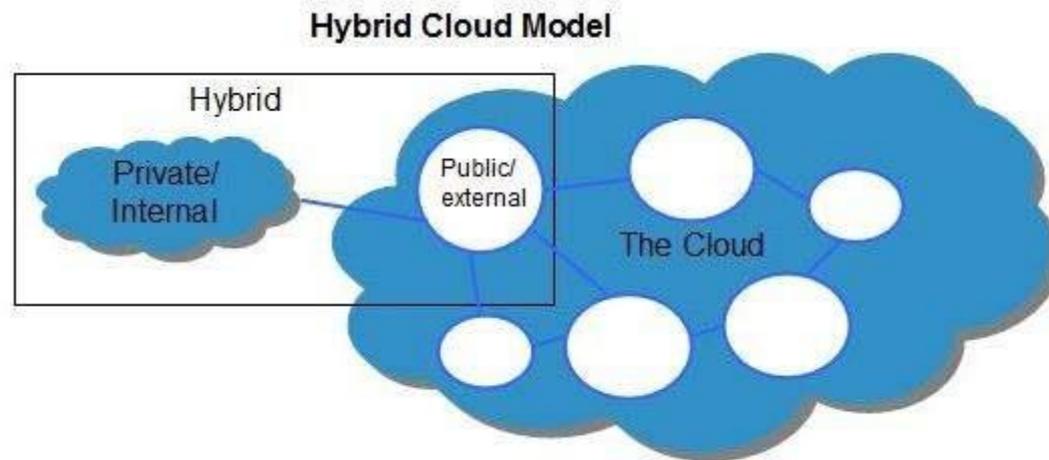
***The private cloud can be scaled only within capacity of internal hosted resources.***

## **➤ Additional Skills**

***In order to maintain cloud deployment, organization requires skilled expertise.***

# Hybrid Cloud Model

**Hybrid Cloud is a mixture of public and private cloud. Non-critical activities are performed using public cloud while the critical activities are performed using private cloud. The Hybrid Cloud Model is shown in the diagram below.**





# **Hybrid Cloud Model : Benefits and Issues**

## **Scalability**

**It offers features of both, the public cloud scalability and the private cloud scalability.**

## **Flexibility**

**It offers secure resources and scalable public resources.**

## **Cost Efficiency**

**Public clouds are more cost effective than private ones. Therefore, hybrid clouds can be cost saving.**

## **Security**

**The private cloud in hybrid cloud ensures higher degree of security.**

## **Disadvantages**

### **Networking Issues**

**Networking becomes complex due to presence of private and public cloud.**

### **Security Compliance**

**It is necessary to ensure that cloud services are compliant with security policies of the organization.**

### **Infrastructure Dependency**

**The hybrid cloud model is dependent on internal IT infrastructure, therefore it is necessary to ensure redundancy across data centers.**