

## UNIT-4

### INFRASTRUCTURE AS A SERVICE (IAAS)

#### I) IaaS Service providers:

a) **Amazon Ec2:** Amazon EC2 (Elastic Compute Cloud) is a web service interface that provides resizable compute capacity in the AWS cloud. It is designed for developers to have complete control over web-scaling and computing resources.

#### EC2 Components:

In AWS EC2, the users must be aware about the EC2 components, their operating systems support, security measures, pricing structures, etc.

- **Operating System Support:** Amazon EC2 supports multiple OS in which we need to pay additional licensing fees like: Red Hat Enterprise, SUSE Enterprise and Oracle Enterprise Linux, UNIX, Windows Server, etc.
- **Security:** Users have complete control over the visibility of their AWS account. In AWS EC2, the security systems allow create groups and place running instances into it as per the requirement.
- **Pricing:** AWS offers a variety of pricing options, depending on the type of resources, types of applications and database. It allows the users to configure their resources and compute the charges accordingly.
- **Fault tolerance:** Amazon EC2 allows the users to access its resources to design fault-tolerant applications. EC2 also comprises geographic regions and isolated locations known as availability zones for fault tolerance and stability. It doesn't share the exact locations of regional data centers for security reasons.

#### Features of EC2

Here is a list of some of the prominent features of EC2 –

- **Reliable** – Amazon EC2 offers a highly reliable environment where replacement of instances is rapidly possible. Service Level Agreement commitment is 99.9% availability for each Amazon EC2 region.
- **Designed for Amazon Web Services** – Amazon EC2 works fine with Amazon services like Amazon S3, Amazon RDS, Amazon DynamoDB, and Amazon SQS. It provides a complete solution for computing, query processing, and storage across a wide range of applications.

- **Secure** – Amazon EC2 works in Amazon Virtual Private Cloud to provide a secure and robust network to resources.
- **Flexible Tools** – Amazon EC2 provides the tools for developers and system administrators to build failure applications and isolate themselves from common failure situations.
- **Inexpensive** – Amazon EC2 wants us to pay only for the resources that we use. It includes multiple purchase plans such as On-Demand Instances, Reserved Instances, Spot Instances, etc. which we can choose as per our requirement.

**II) Go Grid:** GoGrid is a global leader in hybrid infrastructure on-demand cloud. Our infrastructure consists of Infrastructure connected servers, Load balancers, Firewalls, nework and storage. GoGrid was a cloud infrastructure service, hosting Linux and Windows virtual machines managed by a multi-server control panel.

GoGrid becomes one of the first infrastructures as a service provider to offer windows server 2008 in the cloud. The windows server 2008 operating system from Microsoft offers increased server stability, manageability, and security over previous versions of windows server. GoGrid customers can deploy windows server 2008 servers in just a few minutes for as little as 19 cents an hour, with no commitment.

GoGrid enables system administrators to quickly and easily create, deploy, load balance and manage windows, Linux cloud servers within minutes. GoGrid offers web based Graphical user interface that allow for “point and Click” deployment of complex and flexible network infrastructures, which include load balancing and multiple web and database servers, all setup with icons through the GUI.

Initial windows server 2008 offerings on GoGrid include both 32-bit and 64-bit pre configured templates.Pre configured Templates in order to minimize time to deploy. Pre configuration includes:

- Windows server 2008 standard with Internet Information Services.
- Windows Server 2008 standard with IIS and SQL Server 2005 Express edition.
- Windows Server 2008 standard with IIs 7 and SQL server 2005 Express Edition
- ASP.Net

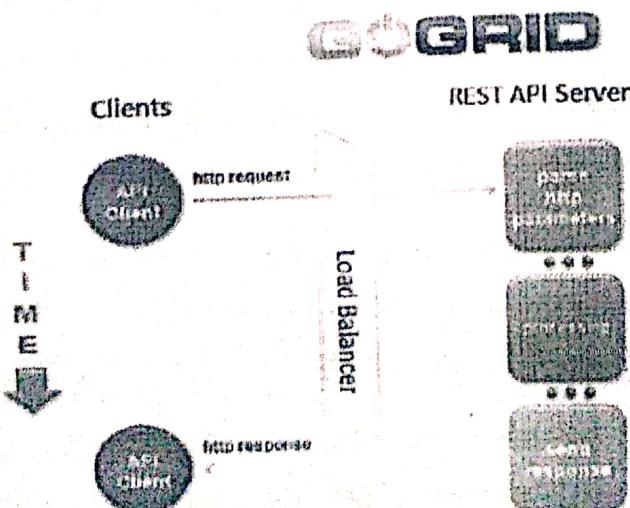
Windows server 2008 Standard includes terminal Services Gateway, Remote DesktopClient for Terminal services, Application Server, Active Directory Domain Services, DHCP server, DNS server, and SMTP.

**GoGrid API:** GoGrid's API is a web service that allows developers to control their interaction with GoGrid's cloud hosting Infrastructure. The GoGrid API provides two-way communication for controlling GoGrid's control panel functionality. Typical uses for the API include:

- Auto scaling network servers.
- Listening assigned public and private IP addresses.
- Deleting Servers.
- Listing billing details.

The GoGrid API is a REST-like Query interface. GoGrid method calls are made over the internet by sending HTTPS GET or POST requests to the GoGrid API REST Server. Nearly any computer language can be used to communicate over HTTPS with the REST server. The GoGrid API supports these languages:

- Java
- PHP
- Python
- Ruby



### **III) Microsoft Windows Azure:**

Microsoft Azure, formerly known as Windows Azure, is Microsoft's public cloud computing platform. The services provided by Microsoft Azure are PaaS and IaaS. Microsoft Azure is a cloud computing platform created by Microsoft which developers and IT professionals use to build, deploy and manage applications through their global network of datacentres.

#### **Components in Microsoft Azure:**

- **Data Management:** Data management can be done by using SQL server Database component or the simple data storage module offered by Windows Azure. SQL server database can be used for relational database. The storage module can store unrelated tables (without foreign key or any relation) and blobs. Blobs include binary data in the form of images, audio, video, and text files.
- **Networking:** Azure traffic manager routes the requests of a user intelligently to an available datacenter. The process involves finding the nearest datacenter to the user who makes the request for web application, and if the nearest datacenter is not available due to various reasons, the traffic manager deviates the request to another datacenter.

The virtual network is another feature that is part of networking in services offered by Windows Azure. The virtual network allows a network between local machines at your premise and virtual machine in Azure Datacenter.

- **Big Data and Big Compute:** The large amount of data can be stored and managed using Windows Azure. Azure offers HDInsight which is Hadoop-based service. Organizations often need to manage large amount of data which is necessarily not relational database management. Hadoop is a prominent technology used these days. Thus, Azure offers Hadoop service on their platform for clients.
- **Messaging:** Windows Azure offers two options for handling the interactions between two apps. One falls under storage component of the service and is called 'Message Queues'. The other one comes under the app service and is called 'Service Bus'.
- **Caching:** Microsoft Azure offers two kinds of caching which are in-memory Caching and Content Delivery Network (CDN) for caching frequently accessed data and improves the application performance.

- **Identity and Access:** This component is about management of users, authentication and authorization. Active directory stores the information of users accessing the application and also the organization's information.
- **Commerce:** Windows Azure offers the opportunity to users to buy or sell applications and data through their platform.
- **Software Development Kit (SDK) :**Azure applications can be produced by the developers in various programming languages. Microsoft currently provides language-specific SDKs for Java, .NET, PHP, Node.js, Ruby, and Python.

#### **Microsoft Azure PROS:**

- **High Availability:** Unlike other vendors, the Microsoft Azure cloud offers high availability and redundancy in data centers on a global scale. Because of this, Azure can offer a service level agreement, or SLA, of 99.95%.
- **Security:** Microsoft Azure has a strong focus on security, following the standard security model of Detect, Assess, Diagnose, Stabilize and Close. Azure provides simple, user-friendly services for increased protection, such as multi-factor authentication and application password requirements.
- **Scalability:** Microsoft Azure makes it easy to scale compute power up or down with nothing more than the click of a button. With this scalability structure, businesses have the flexibility to pay for only what they use.
- **Cost-Effectiveness:** Azure's pay-as-you-go pricing allows you better managing their IT budgets, purchasing only as much as they need.

#### **Microsoft Azure CONS:**

- **Requires Management:** As with most cloud service providers, Azure needs to be expertly managed and maintained, which includes patching and server monitoring.
- **Requires Platform Expertise:** Unlike local servers, Azure requires expertise to ensure all moving parts work together efficiently. While a common mistake, on-premise servers' compute power does not translate equivocally in the cloud, potentially costing businesses thousands of dollars per year.

#### **IV) Recent Developments of Amazon :**

Amazon has a host of new technologies in its pipeline, working their way through various stages of development:

**1. Amazon Dash Button:** Amazon announced its new Dash Button technology in late March 2015. Amazon Dash Button is a Wi-Fi connected device that ensures you never run out of your essential household, drink, grocery, health care, personal care, baby and pet products ever again. When you are running low on your favourite products at home, simply press Dash Button and relax while your order is fulfilled and delivered. You can be notified of your order confirmation through the Amazon App. Dash Button lets you order products immediately without needing to be reminded and allows you to save time by skipping the search process for your exact product.

**2. Amazon Fresh:** is a supplementary of the Amazon.com American e-commerce company. It is a grocery delivery service currently available in some U.S. states, London, Tokyo, Berlin. Items ordered through AmazonFresh are available for home delivery on the same day or the next day, depending on the time of the order and the availability of trucks.

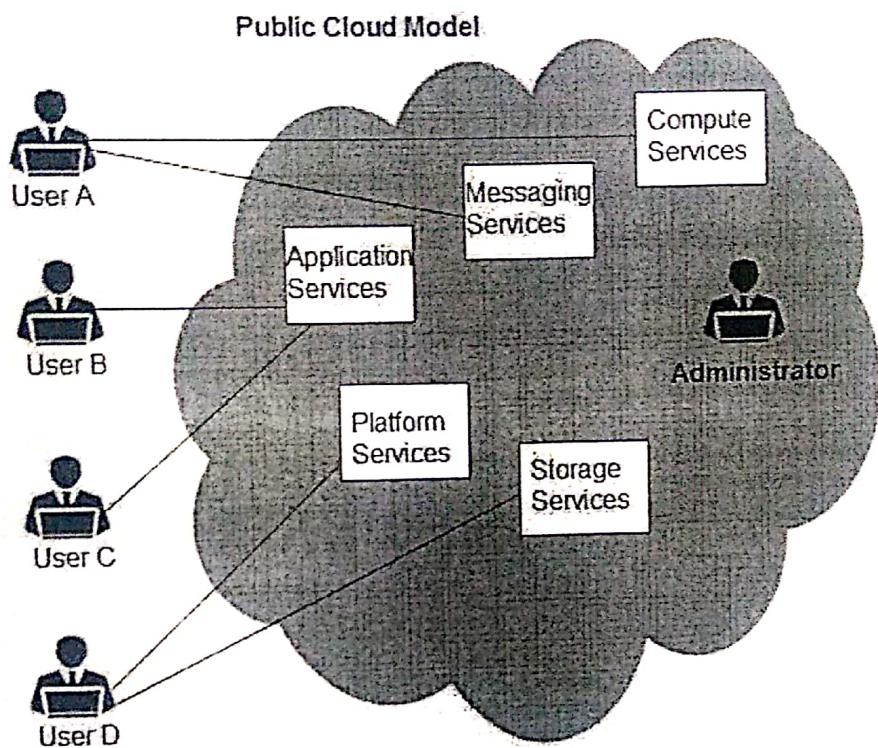
**3. Amazon Prime Air:** Amazon's Prime Air drone is a delivery system in development that will use remote-controlled robotic vehicles to transport goods from the company's order fulfillment centers to the consumer. This uses GPS navigation.

**4. Amazon Fire TV:** Amazon Fire TV is a digital media player and its microconsole remote developed by Amazon. The device is a small network appliance that can deliver digital audio/video content streamed via the internet, to a high-definition television. It also allows users to play video games with the included remote, via a mobile app, or with an optional game controller.

**5. Amazon Fire Phone:** In June 2014, Amazon made its first push into the smartphone market with its launch of the Amazon Fire phone. The device runs the same operating system, Fire OS, as Amazon's popular Kindle Fire e-reader. Fire OS offers users a host of unique and innovative features, such as Dynamic Perspective, which creates the appearance of depth and 3-D.

## Cloud Deployment Models

I) **Public Cloud:** 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.



### Benefits:

There are many benefits of deploying cloud as public cloud model. The following diagram shows some of those benefits:

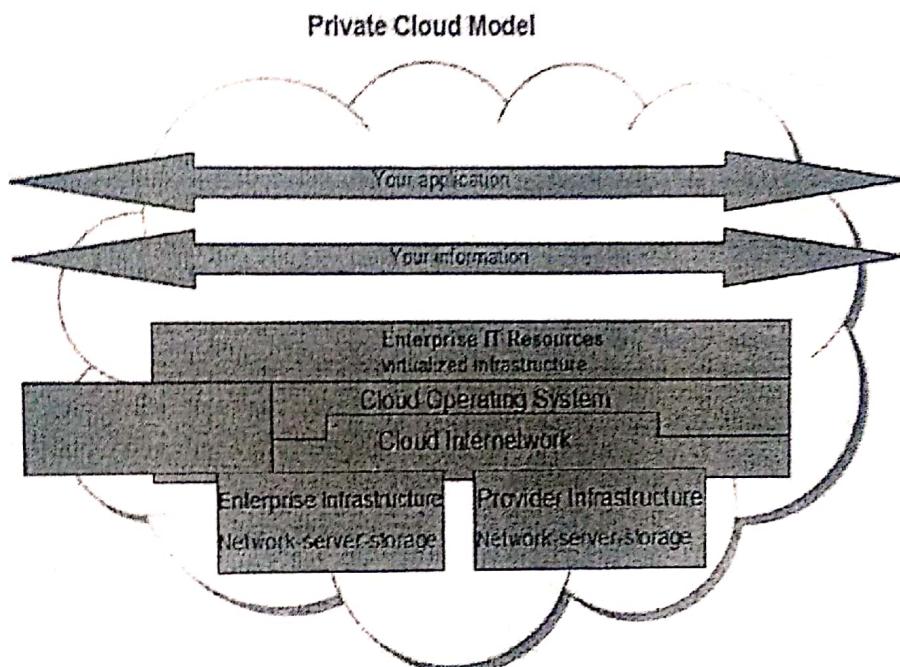
- **Cost Effective:** Since public cloud shares same resources with large number of customers it turns out inexpensive.
- **Reliability:** The public cloud employs large number of resources from different locations. If any of the resources fails, public cloud can employ another one.
- **Flexibility:** 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 to the requirement.

#### **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.

**2) 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.



#### **Advantages:**

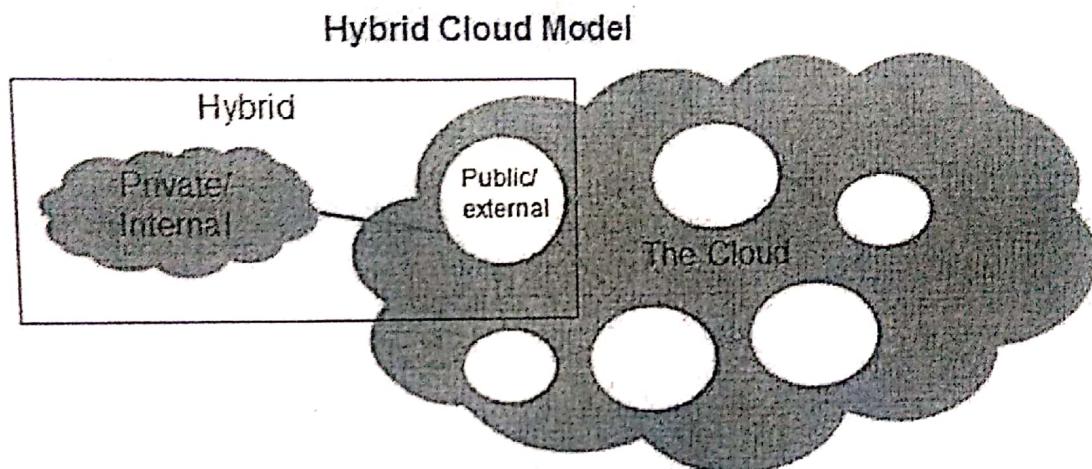
- **High Security and Privacy:** Private cloud operations are not available to general public and resources are shared from distinct pool of resources. Therefore, it ensures high security and privacy.
- **More Control:** The private cloud has more control on its resources and hardware than public cloud 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.

#### **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.

**III) 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.



#### Advantages:

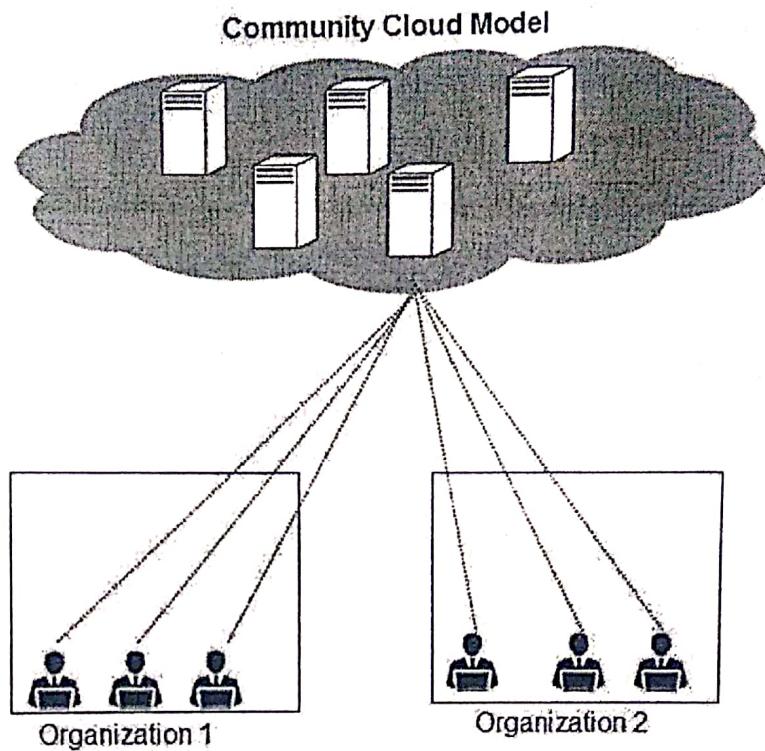
- **Scalability:** It offers features of both, the public cloud scalability and the private cloud scalability.
- **Flexibility:** It offers secure resources and scalable public resources.
- **Cost Efficiency:** Public clouds are more cost effective than private ones. Therefore, hybrid clouds can be cost 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.

#### IV) Community Cloud:

Community Cloud allows system and services to be accessible by group of organizations. It shares the infrastructure between several organizations from a specific community. It may be managed internally by organizations or by the third-party. The Community Cloud Model is shown in the diagram below.



#### Benefits:

**There are many benefits of deploying cloud as community cloud model.**

- **Cost Effective:** Community cloud offers same advantages as that of private cloud at low cost.
- **Sharing Among Organizations:** Community cloud provides an infrastructure to share cloud resources and capabilities among several organizations.
- **Security:** The community cloud is comparatively more secure than the public cloud but less secured than the private cloud.

## v) Advantages of Cloud Computing:

- **Cost efficiency** – The biggest reason behind shifting to cloud computing is that it takes considerably lesser cost than an on-premise technology. Now the companies need not store the data in disks anymore as the Cloud offers enormous storage space, saving money and resources of the companies.
- **High Speed** – Cloud computing deploy the service quickly in fewer clicks. This quick deployment gets the resources required for your system within fewer minutes.
- **Excellent accessibility** – Storing the information in cloud allows you to access it anywhere and anytime regardless of the machine making it highly accessible and flexible technology of present times.
- **Back-up and restore data** – Once the data is stored in Cloud, it is easier to get the back-up and recovery of that, which is quite a time taking process on-premise.
- **Manageability** – Cloud computing eliminates the need for IT infrastructure updates and maintenance since the service provider ensures timely, guaranteed and seamless delivery of your services and also takes care of all the maintenance and management of your IT services according to the service level agreement (SLA).
- **Disaster Recovery:** It is highly recommended that businesses have an emergency backup plan ready in the case of an emergency. Cloud storage can be used as a back-up plan by businesses by providing a second copy of important files. These files are stored at a remote location and can be accessed through an internet connection.
- **Proper Security:** The service vendors select the highest level of security of the data. For which a user can set a proper audit, passwords, and encryption.

## vi. Amazon Compute Service level agreement:-

Amazon compute service ~~agreement~~ level agreement is a policy governing the use of products and services by Entity or organisation under the terms of AWS (Amazon web Service) customers ~~agreement~~ between Amazon web Services. This Services ~~the~~ <sup>level</sup> agreement applies separately to each account using the included products and services. The products and services are:  
a) Amazon Elastic Compute Cloud.  
b) Amazon Elastic container Service.

AWS will use commercially reasonable efforts to make the included products and services each available with a monthly uptime percentage of at least 99.99%. The included products and services do not meet the service commitment, you will be eligible to receive a service credit.