Introduction to Cloud Computing

- What is Cloud Computing
- Cloud Characteristics
- Cloud Computing Service Model
- Deployment Models in Cloud Computing
- Benefits and Limitations of Cloud Computing

What is Cloud Computing

- Cloud is a metaphor for the Internet. When we say cloud, we are actually referring to internet (since a network has no fixed size or shape).
- Cloud computing is the on-demand delivery of computing power, database storage, applications and other IT resources through a cloud services platform via the internet with pay-as-you-go pricing model rather than burst. In simple terms, cloud computing implies deploying of applications, storing and accessing data over the Internet instead of our local computer / network.
- The phrase **cloud computing** means "**Internet-based computing**" where different services - such as servers, storage and applications are delivered to an organization through the Internet.
  - Cloud Computing refer to a variety of services available over the Internet that deliver computing functionality on the **cloud service provider's infrastructure**.
  - A cloud computing infrastructure consists of highly **optimized data centers** (actually these are third party data centers from the end user point of view), that provide various hardware, software and resources. A Cloud services platform such as Amazon Web Services (AWS) own and maintain the network-connected hardware required for these such services and their customers provision to use what they need. All the management activities are performed usually over a console available over the web. Command line option for management is also provided by many service providers.
  - Cloud platform **hide the complexity** and details of the underlying infrastructure from users and applications by providing very simple graphical interface or API (Applications Programming Interface).
  - The Cloud platform provides on demand services that are **always on, anywhere, anytime and anyplace**.

Why are organizations shifting to Cloud computing technologies?

It is vital to understand that cloud computing is changing the face of Information Technology in corporates and thereby changing the workplace for the IT professionals who manage the network and develop & deploy the applications in the cloud.

Organizations no longer need to own and maintain expensive network equipment which results in reducing the resources (time as well as money) involved in maintaining and updating their hardware servers and software. Cloud service providers deliver the software which results in software that would be latest.

Organizations become agile because they are able to grow as well as shrink computing resources as per the demand, paying only for the resources they actually use. This prevents excess payments which may have been there for bigger infrastructure in order to handle the occasional demand on the servers.

Applications can be managed from Remote places through the Internet from any geographical location.

Cloud Characteristics

Characteristics of Cloud computing that distinguish it from **traditional hosting**.

- **Remotely hosted**: Services or data are hosted on remote infrastructure but available globally.
- **Ubiquitous**: Services or data are available from anywhere through standard internet protocols like HTTP.
- **Resilient**: Cloud providers generally mirrors solutions to multiple data centers to minimize downtime in the event of a disaster like flood or earthquake.
- **On-demand self-service**: A customer can provision computing capabilities, such as server CPU speed and storage as needed without requiring human interaction from service provider. Such capabilities are sold on demand, mostly per second / minute / hour. (this is Pay as you go model)
- **Rapid elasticity** – A user can utilize as much or as little of the cloud capability as required by them. For example, resources (ex: webserver of a site on the cloud) can be scaled to meet high traffic in peak times or scaled down in times of less traffic.
- **Broad network access**. Cloud infrastructure capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, laptops, and PDAs).
- **Fully managed by the provider** - The user is abstracted from the details of how the service is managed in the cloud. For example, the user need not worry about aspects such as hardware used, software updates/patches, plug-ins, firewall security. There is optimum utilization of resources and as well as sharing of resources. Everything is taken care of by the provider.

Cloud Computing Service Models

When we discuss cloud computing, we talk about one of three possible choices for application code: Infrastructure as a Service (**IaaS**), Platform as a Service (**PaaS**) or Software as a Service (**SaaS**). Which one is right for our project depends on our specific needs. Let us examine each one of these cloud choices.

1) **Infrastructure as a Service (IaaS)**
2) **Platform as a Service (PaaS)**
3) **Software as a Service (SaaS)**

1) IaaS (Infrastructure as a Service): is a cloud computing offering where the cloud vendor provides access to computing resources such as servers, storage and networking. Cloud customers will use their own operating systems/platforms and deploy applications in the service provider's infrastructure.

Features:

a) Instead of purchasing hardware outright, the customers pay per usage.

b) Infrastructure is scalable depending on processing and storage needs.

c) Saves enterprises the costs of buying and maintaining their own hardware.

d) Since the data is on the cloud, there can be no single point of failure.

e.g.: Amazon Web Services (AWS), Microsoft Azure, Rackspace Cloud

2) PaaS (Platform as a Service): is a cloud computing offering that provides users with a cloud environment that has hardware and operating system for which they can develop, deploy and manage applications. In addition to storage and other computing resources, cloud customers are provided with APIs and tools for developing and testing their own applications.

Features:

a) Helps in improving efficiency as they do not have to worry about resource procurement, software maintenance and patching.

b) Provides the **developers** with the necessary tools to create, test, host and maintain applications. Enables organizations to focus on development without having to worry about underlying infrastructure. Facilitates collaborative work even if teams work remotely.

c) Service providers manage operating systems, server, security software and backups.

d) Cloud providers offer a readily available Internet-based platform for developers to create applications for such platform.

e.g.: Amazon Web Services (AWS), Microsoft Azure, Rackspace Cloud, Google cloud

3) **SaaS** (Software as a Service): is a cloud computing offering that provides users with access to a cloud-based software. The applications reside on a remote cloud network accessed through the web

Features:

a) SaaS vendors provide users with software and applications via a subscription model.

b) Users do not have to manage, install or upgrade software; SaaS providers manage this.

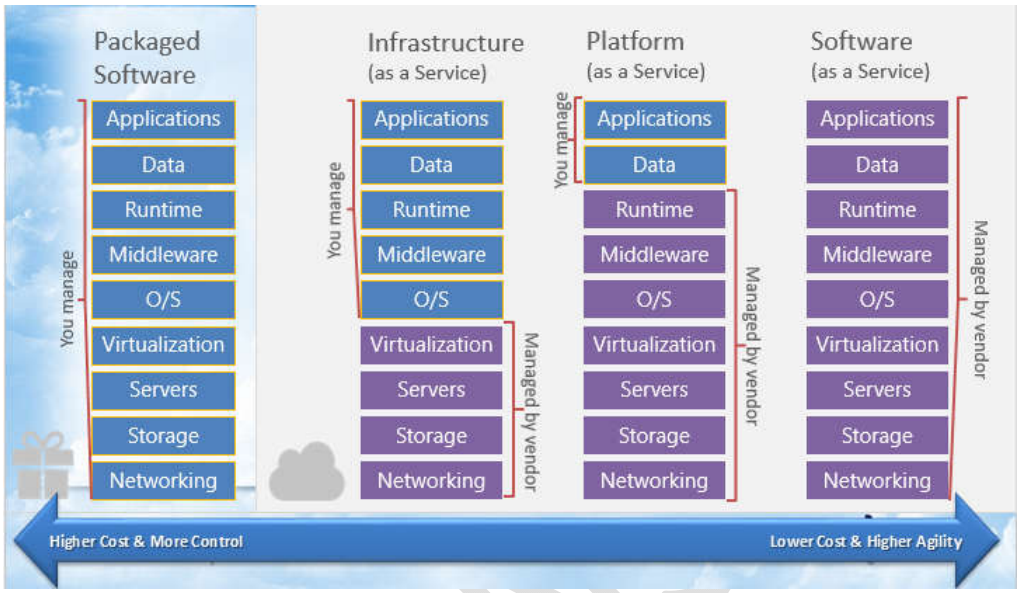
c) Data is secure in the cloud; equipment failure does not result in loss of data.

d) Use of resources can be scaled depending on service needs.

e) Applications are accessible from almost any internet-connected device, from virtually anywhere in the world.

e.g.: Google Apps, Office 365, Sales Force are the common SaaS examples

The following figure summarizes the functionality of the three service models of the cloud.



Benefits and Limitations of Cloud Computing

Benefits of Cloud Computing:

1. Lower Computer Cost
2. Improved Performance
3. Reduced Software Cost and Instant Software Updates
4. Unlimited Storage Capacity
5. Universal Document Access
6. Increased data reliability
7. Device Independence

Limitations of Cloud Computing:

1. Requires a constant and good Internet connection.
2. Does not work well with low-speed connections.
3. Features might be limited based on provider you choose.
4. Can be slow.
5. Stored data might not be secure.
6. **If our data is stored abroad, whose policy do we adhere to?**