Cloud Computing

Cloud computing means storing, retrieving and accessing data and programs over the Internet from a remote location or computer instead of our computer's hard drive.

According to National Institute of Standards and Technology (NIST): "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.

Principles of Cloud Computing:

(a) The five essential characteristic features that promote cloud computing,

(b) The four deployment models that are used to narrate the cloud computing opportunities for customers while looking at architectural models,

(c) The three important and basic services offering models of cloud computing.

5 Essential Characteristic Features :

1. **On-demand self-service:** The Cloud computing services do not require any human administrators, users themselves are able to provision, monitor and manage computing resources as needed.
2. **Broad network access:** 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 personal digital assistants [PDAs]).so, The Computing services are generally provided over standard networks and heterogeneous devices.
3. **Elastic resource pooling:** The provider's computing resources are pooled to serve multiple consumers using a multi tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify the location at a higher level of abstraction (e.g.,

country, state, or data center). Examples of resources include storage, processing, memory, and network bandwidth.

4. **Rapid elasticity:** The Computing services should have IT resources that are able to scale out and in quickly and on as needed basis. Whenever the user requires services it is provided to him and it is scaled out as soon as its requirement gets over.

5. **Measured service:** The resource utilization is tracked for each application and occupant, it will provide both the user and the resource provider with an account of what has been used. This is done for various reasons like monitoring billing and effective use of resources.

4 Deployment Models:

1. Private cloud:

- The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units).
- It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.

2. Public cloud:

- The cloud infrastructure is provisioned for open use by the general public.
- It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them.
- It exists on the premises of the cloud provider.

3. Community cloud:

● The cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations).
●It may be managed by the organizations or a third party and may exist on premise or off premise.

4. Hybrid cloud:

- The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).

3 Service Offering Models :

1.IaaS:

The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources on a pay-per-use basis where he or she is able to deploy and run arbitrary software, which can include operating systems and applications.

2. PaaS:

The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider.

3. SaaS:

The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure, including network, servers, operating systems, storage, and even individual application capabilities, with the possible exception of limited user-specific application configuration settings.

Advantages of Cloud Computing:

1) Back-up and restore data

Once the data is stored in the cloud, it is easier to get back-up and restore that data using the cloud.

2) Improved collaboration

Cloud applications improve collaboration by allowing groups of people to quickly and easily share information in the cloud via shared storage.

3) **Excellent accessibility**

Cloud allows us to quickly and easily access store information anywhere, anytime in the whole world, using an internet connection. An internet cloud infrastructure increases organization productivity and efficiency by ensuring that our data is always accessible.

4) Low maintenance cost

Cloud computing reduces both hardware and software maintenance costs for organizations.

5) Mobility

Cloud computing allows us to easily access all cloud data via mobile.

6) Services in the pay-per-use model

Cloud computing offers Application Programming Interfaces (APIs) to the users for access services on the cloud and pays the charges as per the usage of service.

7) Unlimited storage capacity

Cloud offers us a huge amount of storage capacity for storing our important data such as documents, images, audio, video, etc. in one place.

8) Data security

Data security is one of the biggest advantages of cloud computing. Cloud offers many advanced features related to security and ensures that data is securely stored and handled.

Disadvantages of Cloud Computing:

1) **Internet Connectivity**: In cloud computing, every data (image, audio, video, etc.) is stored on the cloud, and we access these data through the cloud by using the internet connection. If you do not have good internet connectivity, you cannot access this data. However, we have no other way to access data from the cloud.

2) **Vendor lock-in**: Vendor lock-in is the biggest disadvantage of cloud computing. Organizations may face problems when transferring their services from one vendor to another. As different vendors provide different platforms, that can cause difficulty moving from one cloud to another.
3) **Limited Control**: As we know, cloud infrastructure is completely owned, managed, and monitored by the service provider, so the cloud users have less control over the function and execution of services within a cloud infrastructure.

4) Security: Although cloud service providers implement the best security standards to store important information. But, before adopting cloud technology, you should be aware that you will be sending all your organization's sensitive information to a third party, i.e., a cloud computing service provider. While sending the data on the cloud, there may be a chance that your organization's information is hacked by Hackers.

Applications of Cloud Computing in real-world :

1. Online Data Storage
2. Backup and Recovery
3. Big Data Analysis
4. Testing and development
5. Cloud computing in education
6. Anti-Virus Applications
7. E-Governance Application