Unit-1: Fundamentals of Cloud Computing

Cloud Deployment Models

What is a Cloud Deployment Model?

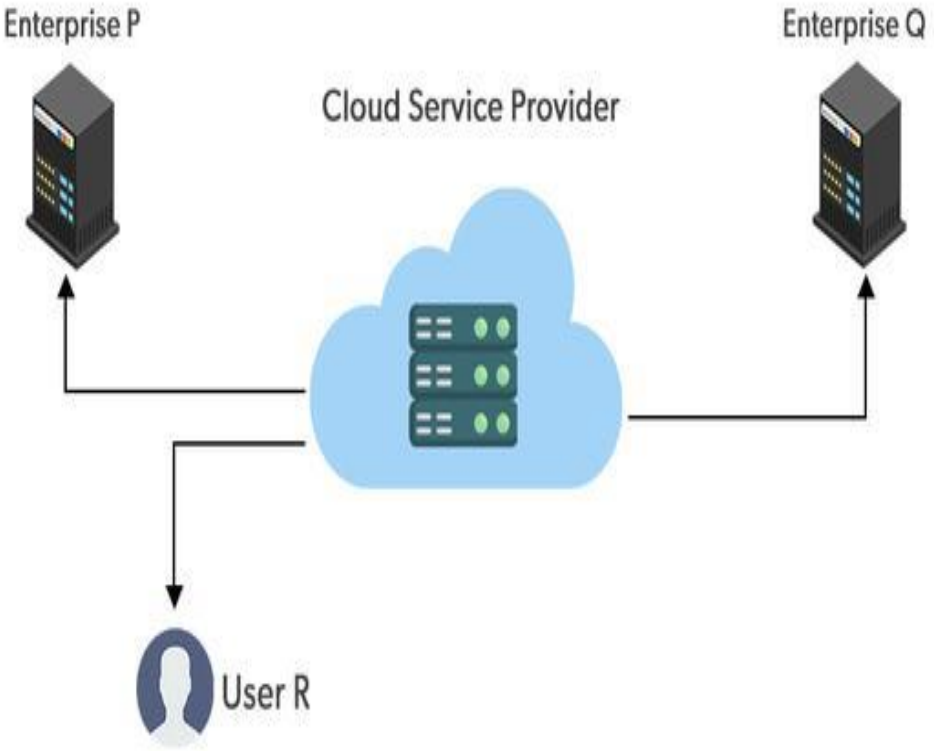
A cloud deployment model defines the specific type of cloud environment based on ownership, size, and access. It determines how and where the cloud infrastructure is located and managed, as well as who has access to it. The choice of a deployment model is crucial as it impacts the scalability, performance, cost, and security of the cloud services.

Different types of cloud computing deployment models are there:

- **Public Cloud**
- **Private Cloud**
- **Hybrid Cloud**
- **Community Cloud**

Public Cloud

- The public cloud makes it possible for anybody to access systems and services. The public cloud may be less secure as it is open to everyone.
- The public cloud is one in which cloud infrastructure services are provided over the internet to the general people or major industry groups.
- The infrastructure in this cloud model is owned by the entity that delivers the cloud services, not by the consumer. It is a type of cloud hosting that allows customers and users to easily access systems and services.
- This form of cloud computing is an excellent example of cloud hosting, in which service providers supply services to a variety of customers.
- In this arrangement, storage backup and retrieval services are given for free, as a subscription, or on a per-user basis. For example, Google App Engine etc.



Public Cloud

Advantages of the Public Cloud Model

- **Minimal Investment:** Because it is a pay-per-use service, there is no substantial upfront fee, making it excellent for enterprises that require immediate access to resources.
- **No setup cost:** The entire infrastructure is fully subsidized by the cloud service providers, thus there is no need to set up any hardware.
- **Infrastructure Management is not required:** Using the public cloud does not necessitate infrastructure management.
- **No maintenance:** The maintenance work is done by the service provider (not users).
- **Dynamic Scalability:** To fulfill your company's needs, on-demand resources are accessible.

Disadvantages of the Public Cloud Model

- **Less secure:** Public cloud is less secure as resources are public so there is no guarantee of high-level security.

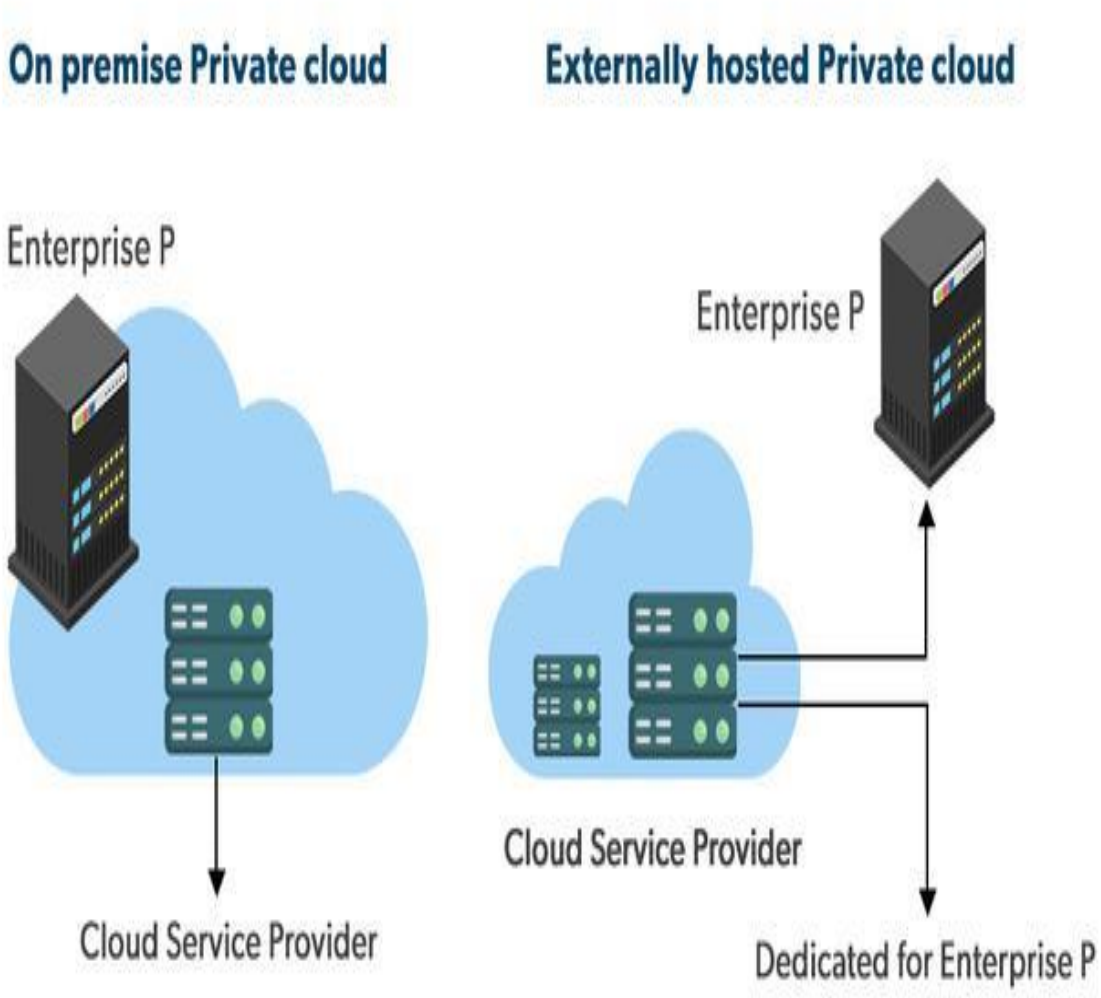
- **Low customization:** It is accessed by many public so it can't be customized according to personal requirements.

Private Cloud

- The private cloud deployment model is the exact opposite of the public cloud deployment model. It's a one-on-one environment for a single user (customer).

- There is no need to share your hardware with anyone else. The distinction between private and public clouds is in how you handle all of the hardware. It is also called the "internal cloud" & it refers to the ability to access systems and services within a given border or organization.

- The cloud platform is implemented in a cloud-based secure environment that is protected by powerful firewalls and under the supervision of an organization's IT department. The private cloud gives greater flexibility of control over cloud resources.



Private Cloud

Advantages of the Private Cloud Model

- **Better Control:** You are the sole owner of the property. You gain complete command over service integration, IT operations, policies, and user behavior.
- **Data Security and Privacy:** It's suitable for storing corporate information to which only authorized staff have access. By segmenting resources within the same infrastructure, improved access and security can be achieved.
- **Supports Legacy Systems:** This approach is designed to work with legacy systems that are unable to access the public cloud.
- **Customization:** Unlike a public cloud deployment, a private cloud allows a company to tailor its solution to meet its specific needs.

Disadvantages of the Private Cloud Model

- **Less scalable:** Private clouds are scaled within a certain range as there is less number of clients.
- **Costly:** Private clouds are more costly as they provide personalized facilities.

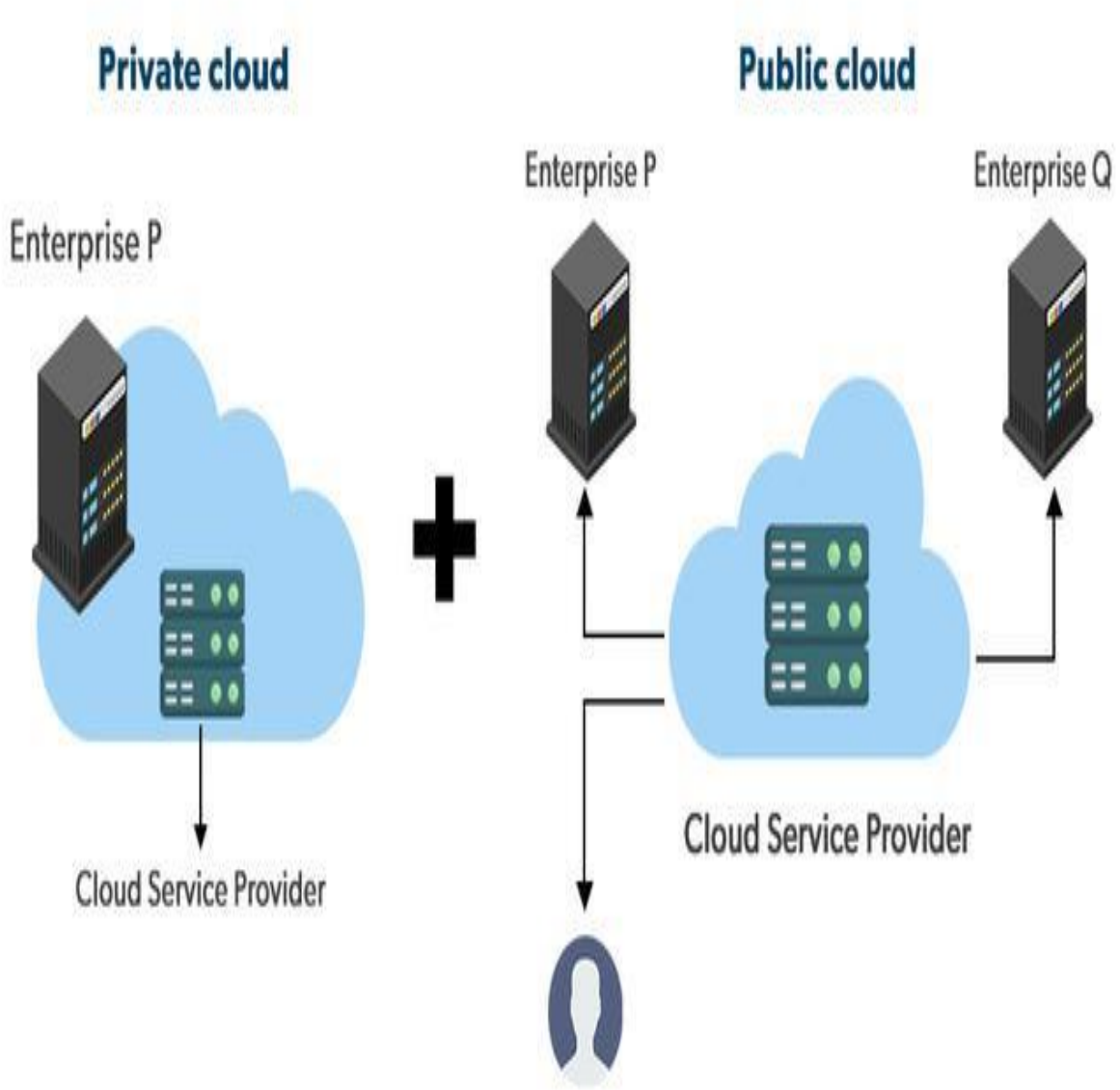
Differences between Public Cloud and Private Cloud

Public Cloud	Private Cloud
Cloud Computing infrastructure is shared with the public by service providers over the internet. It supports multiple customers i.e, enterprises.	Cloud Computing infrastructure is shared with private organizations by service providers over the internet. It supports one enterprise.
Multi-Tenancy i.e, Data of many enterprises are stored in a shared environment but are isolated. Data is shared as per rule, permission, and security.	Single Tenancy i.e, Data of a single enterprise is stored.

Public Cloud	Private Cloud
Cloud service provider provides all the possible services and hardware as the user-base is the world. Different people and organizations may need different services and hardware. Services provided must be versatile.	Specific services and hardware as per the need of the enterprise are available in a private cloud.
It is hosted at the Service Provider site.	It is hosted at the Service Provider site or enterprise.
It is connected to the public internet.	It only supports connectivity over the private network.
Scalability is very high, and reliability is moderate.	Scalability is limited, and reliability is very high.
Cloud service provider manages the cloud and customers use them.	Managed and used by a single enterprise.
It is cheaper than the private cloud.	It is costlier than the public cloud.
Security matters and dependent on the service provider.	It gives a high class of security.
Performance is low to medium.	Performance is high.
It has shared servers.	It has dedicated servers.
Example: Amazon web service (AWS) and Google AppEngine etc.	Example: Microsoft KVM, HP, Red Hat & VMWare etc.

Hybrid Cloud

- By bridging the public and private worlds with a layer of proprietary software, hybrid cloud computing gives the best of both worlds.
- With a hybrid solution, you may host the app in a safe environment while taking advantage of the public cloud's cost savings.
- Organizations can move data and applications between different clouds using a combination of two or more cloud deployment methods, depending on their needs.



Hybrid Cloud

Advantages of the Hybrid Cloud Model

- **Flexibility and control:** Businesses with more flexibility can design personalized solutions that meet their particular needs.

- **Cost**: Because public clouds provide scalability, you'll only be responsible for paying for the extra capacity if you require it.

- **Security:** Because data is properly separated, the chances of data theft by attackers are considerably reduced.

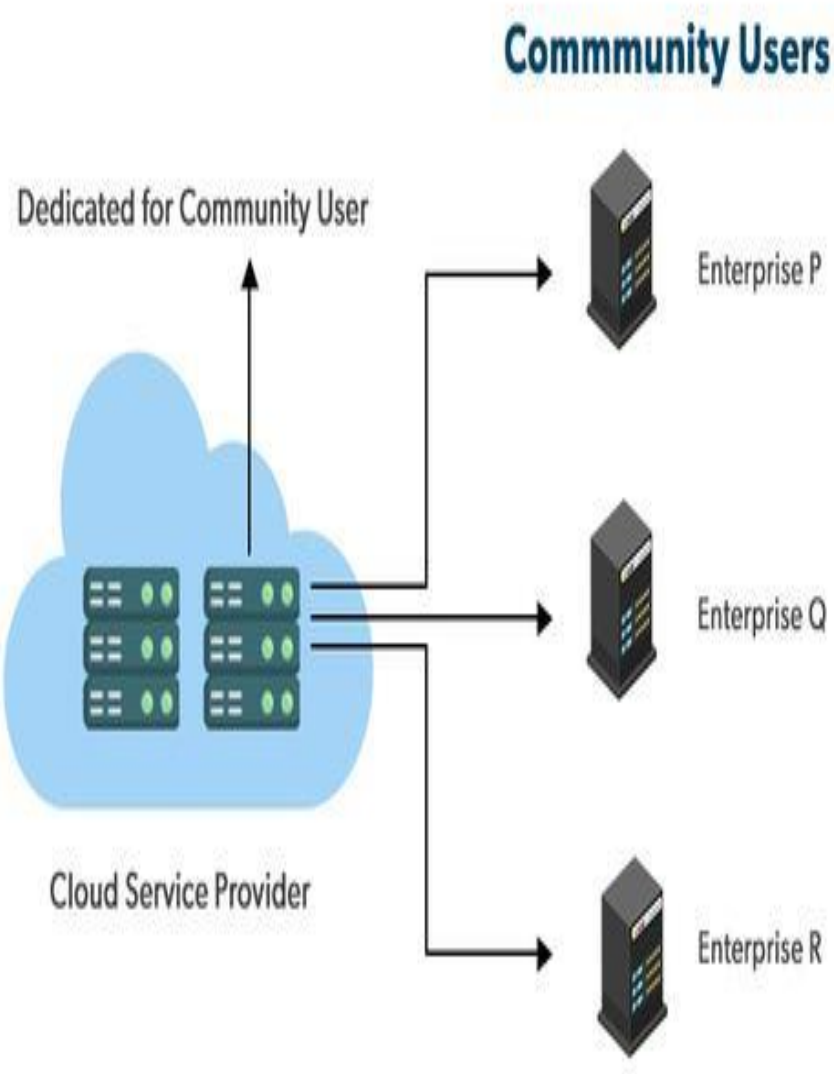
Disadvantages of the Hybrid Cloud Model

- **Difficult to manage:** Hybrid clouds are difficult to manage as it is a combination of both public and private cloud. So, it is complex.
- **Slow data transmission:** Data transmission in the hybrid cloud takes place through the public cloud so latency occurs.

Community Cloud

- It allows systems and services to be accessible by a group of organizations. It is a distributed system that is created by integrating the services of different clouds to address the specific needs of a community, industry, or business.

- The infrastructure of the community could be shared between the organization which has shared concerns or tasks. It is generally managed by a third party or by the combination of one or more organizations in the community.



Community Cloud

Advantages of the Community Cloud Model

- **Cost Effective:** It is cost-effective because the cloud is shared by multiple organizations or communities.
- **Security:** Community cloud provides better security.
- **Shared resources:** It allows you to share resources, infrastructure, etc. with multiple organizations.
- **Collaboration and data sharing:** It is suitable for both collaboration and data sharing.

Disadvantages of the Community Cloud Model

- **Limited Scalability:** Community cloud is relatively less scalable as many organizations share the same resources according to their collaborative interests.
- **Rigid in customization:** As the data and resources are shared among different organizations according to their mutual interests if an organization wants some changes according to their needs they cannot do so because it will have an impact on other organizations.

Advantages of Cloud Computing

Cost Efficiency

- Reduces upfront capital expenditure on hardware and software.
- Offers pay-as-you-go pricing models, minimizing costs for unused resources.

Scalability and Flexibility

- Allows businesses to scale resources up or down based on demand.
- Supports dynamic workloads and growing data storage needs.

Accessibility

- Enables access to data and applications from anywhere with an internet connection.
- Supports remote work and global collaboration.

Disaster Recovery and Backup

- Provides automated backups and faster disaster recovery solutions.
- Reduces the need for complex and expensive recovery plans.

Automatic Updates

- Ensures that software, security patches, and system upgrades are handled automatically by the service provider.

Enhanced Collaboration

- Facilitates real-time collaboration and sharing of resources among teams.
- Supports tools like shared workspaces and cloud-based project management.

Improved Security

- Offers advanced security measures, such as data encryption and intrusion detection.
- Providers adhere to strict compliance and regulatory standards.

Environmentally Friendly

- Optimizes resource use, reducing energy consumption compared to traditional IT setups.
- Promotes green computing by sharing resources.

Rapid Deployment

- Accelerates the implementation of IT solutions without delays associated with hardware procurement.
- Reduces the time to market for new products and services.

Innovation Support

- Provides access to cutting-edge tools like AI, machine learning, and big data analytics.
- Encourages experimentation with minimal risk and cost.

Challenges of Cloud Computing

Data Security and Privacy

- Involves risks of data breaches, unauthorized access, and loss of sensitive information.
- Requires strict adherence to data protection regulations.

Downtime and Dependence on Internet

- Relies heavily on a stable internet connection; outages can disrupt services.
- Downtime due to server failures can affect productivity.

Limited Control

- Users have less control over infrastructure and underlying technologies managed by providers.

Compliance and Legal Issues

- Ensuring compliance with various laws and regulations, especially for cross-border data storage, can be challenging.

Cost Management

- Mismanagement of resources or unexpected spikes in usage can lead to higher-than-expected bills.

Vendor Lock-In

- Switching providers can be complex due to dependency on specific platforms, APIs, and tools.

Performance Variability

- Shared resources may lead to performance issues during peak usage times.

Integration Challenges

- Integrating cloud services with existing on-premises systems can be technically complex.

Knowledge and Expertise

- Requires trained personnel to manage and optimize cloud resources effectively.

Data Transfer Costs and Latency

High costs and delays associated with moving large amounts of data to and from the cloud can be a concern.