



UNIT – II

Cloud Deployment Models, Service Models and Technological Drivers

1. Cloud Deployment Models

Meaning

Cloud deployment models explain **how cloud services are deployed, who owns the infrastructure, and how users access the cloud environment**. It defines the location of cloud resources and the level of control and security provided to users.

Cloud deployment is a very important concept because different organizations require different levels of security, cost, and control. For example, a bank needs high security, while a startup needs low cost and scalability.

1.1 Public Cloud

A public cloud is a computing model where cloud services are provided over the internet by third-party providers. In this model, the infrastructure is shared among multiple users (called multi-tenancy). The cloud provider manages all hardware, software, and maintenance, while users only use the services.

Public clouds are widely used because they are cost-effective and scalable. Users do not need to buy or maintain physical servers. Instead, they simply rent computing resources.

Example

- Amazon Web Services (AWS)
- Microsoft Azure
- Google Cloud Platform (GCP)

Real-Life Example

When you upload files to Google Drive or use Gmail, you are using a public cloud service.

Advantages

Public cloud is highly cost-effective because users pay only for what they use. It also provides high scalability, meaning resources can be increased or decreased based on demand. Maintenance is handled by the provider, so users do not worry about system updates.

Disadvantages

The main disadvantage is reduced control over infrastructure. Since resources are shared, security and privacy concerns may arise. Also, performance may vary depending on network usage.

1.2 Private Cloud

A private cloud is a cloud environment dedicated to a single organization. It can be hosted either within the organization's data center or by a third-party provider. Unlike public cloud, resources are not shared with others.

Private cloud is mainly used by organizations that require high security and strict control over their data.

Example

- A bank using its own internal cloud system
- Government organizations storing sensitive data

Real-Life Example

A defense organization using a secure internal cloud to store confidential data.

Advantages

Private cloud offers high security and privacy since only one organization has access. It also provides better control over resources and customization according to business needs.

Disadvantages

It is expensive because the organization must maintain infrastructure. Scalability is limited compared to public cloud.

1.3 Hybrid Cloud

Hybrid cloud is a combination of public and private cloud models. In this model, sensitive data is stored in a private cloud, while less sensitive operations are handled by a public cloud.

Hybrid cloud is widely used because it provides both security and flexibility.

Example

- A company storing customer financial data in private cloud and hosting its website on AWS public cloud

Real-Life Example

During peak sales, an e-commerce company uses public cloud for extra traffic while keeping payment data in private cloud.

Advantages

Hybrid cloud is flexible and cost-efficient. It allows organizations to balance security and performance. It also supports scalability during high demand.

Disadvantages

It is complex to manage because it involves integration of two different environments. Security management is also more challenging.

1.4 Community Cloud

A community cloud is shared by multiple organizations that have similar requirements such as security policies, compliance rules, or business goals. It is managed by one or more organizations or a third party.

Example

- Government departments sharing cloud infrastructure
- Hospitals sharing medical data systems

Real-Life Example

Multiple universities sharing a cloud platform for research collaboration.

Advantages

Community cloud reduces cost by sharing infrastructure. It improves collaboration between organizations and provides better security than public cloud.

Disadvantages

Scalability is limited. Managing shared responsibilities can be difficult.

2. Cloud Service Models

Meaning

Cloud service models define **what type of services are provided to users and how much control users have over the system**. These models are the foundation of cloud computing.

There are three main service models: IaaS, PaaS, and SaaS.

2.1 Infrastructure as a Service (IaaS)

IaaS provides basic computing infrastructure such as virtual machines, storage, and networks over the internet. Users are responsible for managing operating systems, applications, and data, while the provider manages hardware.

IaaS is the most flexible cloud service model because users have full control over software environments.

Example

- Amazon EC2
- Google Compute Engine
- Microsoft Azure Virtual Machines

Real-Life Example

A company hosting its website on virtual servers rented from AWS.

Advantages

IaaS provides flexibility and scalability. Users can install any operating system or software. It also reduces hardware costs.

Disadvantages

Users must manage operating systems and security updates, which increases responsibility.

2.2 Platform as a Service (PaaS)

PaaS provides a complete development platform where developers can build, test, and deploy applications without worrying about infrastructure management.

In this model, the provider manages hardware, operating systems, and runtime environment, while users focus only on application development.

Example

- Google App Engine
- Microsoft Azure App Services
- Heroku

Real-Life Example

A developer building a web application and deploying it directly on Google App Engine without managing servers.

Advantages

PaaS simplifies application development and reduces complexity. It improves development speed and reduces maintenance efforts.

Disadvantages

Limited control over infrastructure and dependency on platform provider.

2.3 Software as a Service (SaaS)

SaaS provides fully functional software applications over the internet. Users do not need to install or maintain software. Everything is managed by the provider.

Example

- Gmail
- Google Docs
- Microsoft Office 365
- Zoom

Real-Life Example

Using Gmail in a browser without installing any software.

Advantages

SaaS is easy to use and requires no installation. It is accessible from anywhere and automatically updated.

Disadvantages

Users have no control over software customization. Internet connection is required.

3. Technological Drivers for Cloud Computing

Meaning

Technological drivers are the key technologies that enabled the growth and success of cloud computing. Without these technologies, cloud computing would not be possible.

3.1 SOA (Service-Oriented Architecture) and Cloud Computing

Service-Oriented Architecture (SOA) is a design approach where software applications are built as independent services that communicate with each other through networks.

Each service performs a specific function and can be reused in different applications. This makes systems modular, flexible, and scalable.

In cloud computing, SOA plays a very important role because cloud applications are built using independent services delivered over the internet.

Example

An online shopping system includes:

- Payment service

- Order management service
- Inventory service

Each service works independently but communicates through APIs.

Importance in Cloud

SOA improves reusability, scalability, and flexibility in cloud systems. It allows easy integration of services from different providers.

3.2 Multicore Technology

Multicore technology refers to processors that contain multiple processing cores in a single chip. Each core can execute tasks independently, allowing parallel execution of processes.

Example

Modern Intel and AMD processors with 4-core, 8-core, or 16-core CPUs.

Role in Cloud Computing

Cloud servers run multiple applications simultaneously. Multicore processors help handle large workloads efficiently. They improve performance and reduce energy consumption.

Advantages

- Faster processing
- Better multitasking
- Energy efficient

3.3 Web 2.0 and Web 3.0

Web 2.0

Web 2.0 is the second generation of the internet where users can interact, create, and share content. It focuses on user participation and social networking.

Example

- Facebook
- YouTube

- Wikipedia

Features

- User-generated content
- Social networking
- Interactive applications

Web 3.0

Web 3.0 is the next generation of the internet that focuses on intelligence, decentralization, and machine understanding. It uses AI and block chain technologies.

Example

- Block chain applications
- Decentralized apps (DApps)

Features

- AI-based personalization
- Semantic web
- Decentralized systems
- Better data ownership

Importance in Cloud

Web 3.0 enables smarter cloud applications and improves automation and security.

3.4 Pervasive Computing

Pervasive computing means computing is available everywhere and at all times. Devices are embedded in everyday objects and are connected through networks.

Example

- Smart homes (smart lights, smart AC)
- Wearable devices (smart watches)
- IoT devices like sensors

Features

- Ubiquitous access

- Context-aware systems
- Continuous connectivity

Importance in Cloud

Pervasive computing generates large amounts of data that is processed using cloud computing systems.

3.5 Operating System in Cloud Computing

An operating system manages hardware and software resources. In cloud computing, OS plays a key role in virtualization and resource management.

Most cloud servers use Linux-based operating systems because they are stable and efficient.

Functions

- Process management
- Memory management
- File system management
- Security management

Example

Linux OS used in AWS and Google Cloud servers.

Importance

OS supports virtualization and allows multiple virtual machines to run efficiently.

3.6 Application Environment

Application environment refers to the complete setup required to develop, deploy, and run applications in the cloud.

It includes programming languages, frameworks, runtime environments, and databases.

Examples

- Java, Python, Node.js runtime
- Django, Spring frameworks
- MySQL, MongoDB databases

Types

Traditional Environment

Applications run on local servers.

Cloud Environment

Applications run on cloud platforms and can scale automatically.

Example

Google App Engine provides a complete application environment for developers.



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