Assignment : Cloud Computing

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**Module 1: Fundamentals**

**1- What is cloud computing?**

### **Definition**

Cloud computing is the **on-demand delivery of computing resources** (such as servers, storage, databases, networking, and software) over the internet. It eliminates the need for **on-premises hardware**, allowing users to access scalable and flexible computing power.

### **Key Characteristics**

✅ **On-Demand Self-Service** – Resources are provisioned as needed  
✅ **Scalability** – Easily scale resources up or down  
✅ **Pay-as-You-Go Pricing** – Only pay for what you use  
✅ **Accessibility** – Access from anywhere via the internet  
✅ **Security & Reliability** – Data redundancy and backups ensure uptime

## **Types of Cloud Computing**

☁️ **Public Cloud** – Services offered by third-party providers (e.g., AWS, Azure, Google Cloud)  
☁️ **Private Cloud** – Dedicated infrastructure for a single organization  
☁️ **Hybrid Cloud** – Combination of public and private cloud for flexibility

## **Cloud Service Models**

🔹 **Infrastructure as a Service (IaaS)** – Virtual machines, storage, and networking (e.g., AWS EC2, Azure VMs)  
🔹 **Platform as a Service (PaaS)** – Managed environments for application development (e.g., Google App Engine)  
🔹 **Software as a Service (SaaS)** – Ready-to-use applications (e.g., Gmail, Microsoft 365)

## **Benefits of Cloud Computing**

✔️ **Cost-Efficiency** – No upfront hardware costs  
✔️ **Flexibility & Scalability** – Quickly adjust resources as needed  
✔️ **Business Continuity** – Automatic backups and disaster recovery  
✔️ **Global Reach** – Access services from anywhere  
✔️ **Security** – Built-in encryption and compliance

**2-Describe cloud computing deploy model.**

## > **Cloud Computing Deployment Models**

Cloud computing deployment models define **how cloud resources are hosted, managed, and accessed** based on an organization's needs. The four main models are:

### **1. Public Cloud** ☁️

**Definition:** Cloud services provided by third-party vendors over the internet, shared among multiple users.

✅ **Characteristics:**

* Hosted by **providers** like AWS, Microsoft Azure, Google Cloud
* **Pay-as-you-go** pricing model
* Highly **scalable and cost-effective**
* No infrastructure management required

**Best for:** Startups, small businesses, and non-sensitive workloads

### **2. Private Cloud** 🏢

**Definition:** A dedicated cloud infrastructure used exclusively by a single organization.

✅ **Characteristics:**

* Hosted **on-premises** or by a third-party provider
* Offers **higher security, control, and customization**
* **More expensive** than public cloud
* Requires in-house **IT management**

**Best for:** Enterprises, government agencies, financial institutions

### **3. Hybrid Cloud** 🔄

**Definition:** A combination of **public and private** clouds for flexibility and workload balancing.

✅ **Characteristics:**

* Mix of **on-premises, private, and public** cloud resources
* Enables **data and application portability**
* Balances **cost, security, and performance**
* Ideal for **disaster recovery & workload distribution**

**Best for:** Businesses needing a mix of security & scalability

### **4. Community Cloud** 🤝

**Definition:** A shared cloud infrastructure for organizations with similar interests or regulatory requirements.

✅ **Characteristics:**

* Used by multiple organizations **within the same industry**
* Ensures **compliance and security** for shared standards
* **Managed by a third party** or collectively by organizations
* Less expensive than a private cloud

**Best for:** Healthcare, banking, government agencies

**3-What are components of cloud computing?**

## > **Components of Cloud Computing**

Cloud computing consists of several **key components** that work together to deliver cloud-based services. These include **infrastructure, platforms, services, and security** to ensure efficient and scalable operations.

### **1. Infrastructure Components** 🏗

These form the **foundation** of cloud computing.

✅ **Computing Power (Servers & Virtual Machines)** – Provides processing capabilities using physical or virtual servers.  
✅ **Storage (Cloud Storage, Databases)** – Stores data securely (e.g., Amazon S3, Google Cloud Storage).  
✅ **Networking (Load Balancers, Firewalls, VPNs)** – Manages data flow and security across cloud environments.

### **2. Cloud Service Models**

These define how cloud resources are delivered.

🔹 **Infrastructure as a Service (IaaS)** – Provides **virtualized computing resources** (e.g., AWS EC2, Azure VMs).  
🔹 **Platform as a Service (PaaS)** – Offers **development environments** for app creation (e.g., Google App Engine).  
🔹 **Software as a Service (SaaS)** – Delivers **ready-to-use software applications** (e.g., Gmail, Microsoft 365).

### **3. Cloud Management & Security**

These ensure cloud services are **secure, efficient, and optimized**.

✅ **Cloud Management** – Tools to monitor and control cloud resources (e.g., AWS CloudWatch, Azure Monitor).  
✅ **Security & Compliance** – Encryption, firewalls, identity management (e.g., IAM, SSL, Multi-factor Authentication).  
✅ **Disaster Recovery & Backup** – Ensures data **redundancy and failover** (e.g., AWS Backup, Azure Site Recovery).

### **4. Deployment Models**

Defines how cloud services are deployed and accessed.

**Public Cloud** – Services shared across multiple organizations (e.g., AWS, Google Cloud).  
 **Private Cloud** – Dedicated cloud for a single organization.  
 **Hybrid Cloud** – Combination of public & private cloud for flexibility.  
 **Community Cloud** – Shared cloud for specific industries (e.g., government, healthcare).

### **5. End-User Access & Interfaces**

Allows users to interact with cloud services.

✅ **Web-based Interfaces** – Cloud portals (e.g., AWS Management Console).  
✅ **APIs (Application Programming Interfaces)** – Enables automation and integration (e.g., RESTful APIs).  
✅ **Command-Line Interfaces (CLI)** – Direct interaction with cloud resources (e.g., AWS CLI, Azure CLI).

**4-cloud computing advantage and disadvantage Advantages of Cloud Computing**

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**Advantages of Cloud Computing**

Cloud computing offers numerous **benefits** for businesses and individuals by providing scalable, cost-effective, and flexible computing resources.

**1. Cost Efficiency**

✅ No need for expensive **hardware and infrastructure**  
✅ Pay-as-you-go pricing – only pay for what you use  
✅ Reduces maintenance and operational costs

**2. Scalability & Flexibility**

✅ Easily scale resources up or down based on demand  
✅ Supports **business growth** without additional hardware investment  
✅ Ideal for **dynamic workloads** and seasonal spikes

**3. Accessibility & Mobility**

✅ Access cloud services **anytime, anywhere** with an internet connection  
✅ Supports **remote work** and collaboration across different locations  
✅ Compatible with **multiple devices** (PCs, tablets, smartphones)

**4. Reliability & Disaster Recovery**

✅ Cloud providers offer **99.9% uptime** with redundant servers  
✅ Automatic **backups and disaster recovery** solutions  
✅ Minimizes data loss risks with geographically distributed data centers

**5. Security & Compliance**

✅ Cloud providers use **advanced security measures** (encryption, firewalls, IAM)  
✅ Regular **security updates** and compliance with industry standards  
✅ **Multi-factor authentication (MFA)** and **data encryption** for enhanced security

**6. Automatic Updates & Maintenance ⚙**

✅ Cloud providers handle **software and security updates**  
✅ No manual intervention required for patches and system upgrades  
✅ Reduces IT workload, allowing businesses to focus on core tasks

**7. Environmental Benefits**

✅ **Optimized energy usage** in large-scale data centers  
✅ Reduces **carbon footprint** compared to on-premises data centers  
✅ Promotes **green computing** with shared resources