Introduction to Cloud Computing

Cloud Computing

- Cloud computing is the delivery of computing services—servers, storage, databases, networking, software—over the internet ("the cloud")

- to offer faster innovation, flexible resources, and economies of scale.

Cloud Computing

- **History and Evolution**:
- 1960s: Mainframe time-sharing
- 2006: AWS launched — true beginning of modern cloud
- Now: Multi-cloud, AI-powered platforms

Cloud Computing

- **Benefits**:
- Cost reduction
- Scalability
- Global access
- High availability
- Maintenance-free (for users)

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➢Cloud Service Models: IaaS, PaaS, SaaS

Cloud computing provides services in **three major layers**:

1. IaaS :Infrastructure (VMs, Storage), Who Uses It (SysAdmins, DevOps)

2. PaaS : Platform (runtime, DBs, tools), Who Uses It (Developers)

3. SaaS: Software , Who Uses It (End Users, Businesses)

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- **Infrastructure as a Service (IaaS)**
- IaaS provides virtualized **hardware resources** over the internet: servers, storage, networks.
- **Components:**
- Virtual Machines (VMs)
- Storage (block, object)
- Firewalls, Load balancers
- Networking (IP, VPN)

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- **Infrastructure as a Service (IaaS)**

Examples:

1. **Amazon EC2 (AWS)**
2. **Google Compute Engine (GCP)**
3. **Microsoft Azure Virtual Machines**

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- **Infrastructure as a Service (IaaS)**

Use Cases:

1. Hosting websites
2. Backup and recovery
3. Building your own cloud platform
4. Scalable testing environments

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- **Platform as a Service (PaaS)**
- PaaS offers **tools and frameworks** for developers to build, test, and deploy applications without managing the underlying infrastructure.

➢ **Services Included:**
  – Operating system
  – Middleware
  – Databases
  – Development tools

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Platform as a Service (PaaS)

Examples:

1. **Google App Engine**

2. **Heroku**

3. **Microsoft Azure App Services**

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Platform as a Service (PaaS)

Use Cases:

1. Rapid application development
2. Web and mobile app deployment
3. Microservices architecture

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Software as a Service (SaaS)

SaaS provides **ready-to-use software** over the internet — no installation required.

Includes:

1. Application
2. Data storage
3. Maintenance
4. Security

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Software as a Service (SaaS)

Examples:

1.   Google Workspace (Docs, Gmail)

2.   Microsoft 365

3.   Dropbox, Salesforce, Zoom

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Software as a Service (SaaS)

Use Cases:

1. Email and communication tools
2. Office productivity

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- IaaS PRACTICE (Infrastructure as a Service)
  - Launch a Virtual Machine (Linux or Windows)
  1. AWS Platform:
     1. Go to EC2
     2. Launch instance (e.g., Ubuntu)
     3. Choose t2.micro (free tier)
     4. Configure SSH key, network
     5. Connect via SSH

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- IaaS PRACTICE (Infrastructure as a Service)
  - Launch a Virtual Machine (Linux or Windows)
  1. Azure Platform:
     1. Go to [Azure Portal](#)
     2. Create a Virtual Machine
     3. Select Ubuntu or Windows
     4. Choose B1s (free tier)

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- IaaS PRACTICE (Infrastructure as a Service)
  - Launch a Virtual Machine (Linux or Windows)
  1. GCP Platform:
     1. Go to Google Cloud Console
     2. Compute Engine > VM instances
     3. Create Instance
     4. Choose OS, region, machine type
     5. SSH via browser

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- PaaS PRACTICE (Platform as a Service)
  - Deploy a simple Python or Node.js web app
  1. AWS Platform:
     1. Go to Elastic Beanstalk
     2. Create new application
     3. Upload a .zip with your app (Flask, Node.js)
     4. Let AWS auto-deploy

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- PaaS PRACTICE (Platform as a Service)
  - Deploy a simple Python or Node.js web app
  1. Azure Platform:

     1. Azure Portal > App Services
     2. Create Web App
     3. Choose Node.js, Python, .NET
     4. Use GitHub Actions or local deployment

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- PaaS PRACTICE (Platform as a Service)
  - Deploy a simple Python or Node.js web app
  1. GCP Platform:
     1. Install Cloud SDK
     2. Create app.yaml file
     3. Deploy with gcloud app deploy
     4. App runs on Google App Engine

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- **SaaS PRACTICE (Software as a Service)**

  Use existing cloud SaaS tools for business

  AWS Platform:

  1. Amazon WorkMail (business email)
  2. AWS Honeycode (no-code apps)
  3. Amazon QuickSight (BI dashboards)

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- **SaaS PRACTICE (Software as a Service)**
  Use existing cloud SaaS tools for business
  Azure Platform:
  1. Microsoft 365 (Excel, Word, Teams)
  2. Power BI
  3. Dynamics 365 (CRM/ERP)

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- **SaaS PRACTICE (Software as a Service)**

  Use existing cloud SaaS tools for business

  GCP Platform:

  1. Google Workspace (Docs, Sheets, Gmail)
  2. Looker Studio (BI tool)

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Deployment Model

- A **deployment model** defines **how and where** the cloud infrastructure is hosted and **who** has access to it.

- There are four common types:
    1. Public Cloud
    2. Private Cloud
    3. Hybrid Cloud
    4. Community Cloud

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Deployment Model

1. Public Cloud

A public cloud is owned and operated by third-party providers like AWS, Azure, or Google Cloud. Resources are shared among multiple customers.

Examples:

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

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Deployment Model

2. Private Cloud

- A **private cloud** is used **exclusively** by one organization. It can be hosted **on-premises** or by a third-party provider.

- **Examples:**
- VMware vCloud
- OpenStack
- Azure Stack (for hybrid)

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Deployment Model

3. Hybrid Cloud

A **hybrid cloud** combines public and private clouds, allowing **data and applications to move between them**.

- **Examples:**
- Azure + Azure Stack
- AWS + On-premises VMware
- Google Anthos

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Deployment Model

4. Community Cloud

A **community cloud** is shared by **organizations with similar goals**, such as security, compliance, or performance..

- **Examples:**
- Cloud for healthcare institutions
- Government agencies sharing infrastructure

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Real-World Scenario Summary

Organization	Best Model	Reason
Startup	Public Cloud	Low cost and fast deployment
Government Agency	Private Cloud	High security, compliance needs
E-commerce Company	Hybrid Cloud	Customer data in private, website public
Medical Research	Community Cloud	Shared tools and data, compliance

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1. **Public Cloud**: Shared, scalable, less secure
2. **Private Cloud**: Secure, expensive, customizable
3. **Hybrid Cloud**: Best of both, complex
4. **Community Cloud**: Shared with similar users