

# CLOUD COMPUTING STUDY

## NOTES

Cloud computing is the delivery of computing services—including servers, storage, databases, networking, software, and analytics—over the Internet (“the cloud”). It allows users to access and manage data and applications remotely rather than relying on local servers or personal devices.

### **Characteristics of Cloud Computing**

- **On-Demand Self-Service**: Users can provision computing resources automatically without requiring human interaction.
- **Broad Network Access**: Services are accessible over the network via standard mechanisms from various devices (e.g., smartphones, tablets, laptops).
- **Resource Pooling**: Providers pool computing resources to serve multiple clients, dynamically allocating resources based on demand.

- **Rapid Elasticity**: Resources can be scaled up or down quickly and easily, allowing for flexibility in handling workload changes.
- **Measured Service**: Resource usage is monitored, controlled, and reported, allowing for transparency and billing based on usage.

## **Architecture of Cloud Computing**

Cloud computing architecture consists of two main components: the front-end (client side) and the back-end (server side).

- **Front-End**: The client's interface to access cloud services, which can include:
  - **Web Browsers**: Accessing cloud applications via the Internet.
  - **Mobile Applications**: Dedicated apps for cloud services on mobile devices.
  - **Thin Clients**: Lightweight computers or devices designed to connect to cloud services.

- **Back-End:** The infrastructure that supports cloud services, including:
  - **Servers:** Physical or virtual machines that store data and run applications.
  - **Storage:** Databases and storage systems that handle data management.
  - **Virtualization:** Technology that allows multiple virtual instances to run on a single physical server, optimizing resource use.
  - **Networking:** The connectivity and protocols that enable communication between the front end and back end.
  - **Management Software:** Tools that manage cloud resources, ensure security, and monitor performance.

## **Types of Cloud Computing**

- **Public Cloud:** Services are delivered over the public Internet and shared across multiple organizations. Examples include Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP).

- **Private Cloud**: Services are maintained on a private network, dedicated to a single organization. This allows for greater control and security.
- **Hybrid Cloud**: A combination of public and private clouds, allowing data and applications to be shared between them for flexibility and optimization.
- **Community Cloud**: Shared infrastructure for a specific community with shared concerns (e.g., security, compliance).

## **Cloud Service Models**

- **Infrastructure as a Service (IaaS)**: Provides virtualized computing resources over the Internet. Users can rent infrastructure (e.g., servers, storage) and manage operating systems and applications.

**Examples:** Amazon EC2, Google Compute Engine, Microsoft Azure Virtual Machines.

- **Platform as a Service (PaaS)**: Offers hardware and software tools over the Internet, allowing developers to build and deploy applications without managing underlying infrastructure.

**Examples:** Google App Engine, Microsoft Azure App Service, Heroku.

- **Software as a Service (SaaS):** Delivers software applications over the Internet on a subscription basis, removing the need for installation and maintenance.

**Examples:** Google Workspace, Microsoft 365, Salesforce.

## **Applications of Cloud Computing**

- **Data Storage and Backup:** Cloud services allow users to store large amounts of data remotely and back it up easily, ensuring data redundancy and accessibility.

- **Web Hosting:** Businesses can host websites and applications in the cloud, scaling resources as needed without managing physical servers.

- **Big Data Analytics:** Cloud computing provides tools and services to analyze vast amounts of data quickly and cost-effectively.

- **Software Development and Testing:** Developers can use cloud-based environments to develop, test, and

deploy applications without investing in physical infrastructure.

- **Collaboration Tools**: Cloud applications facilitate teamwork by allowing users to share documents, manage projects, and communicate in real-time (e.g., Slack, Trello).
- **Machine Learning and AI**: Cloud platforms offer tools and services for building and deploying machine learning models and AI applications.
- **Internet of Things (IoT)**: Cloud computing supports the collection, storage, and analysis of data from IoT devices, enabling real-time insights and automation.

## **Benefits of Cloud Computing**

- **Cost Efficiency**: Reduces capital expenses by allowing organizations to pay only for what they use.
- **Scalability**: Easily scales resources up or down based on demand.
- **Flexibility and Accessibility**: Provides remote access to data and applications from anywhere with an Internet connection.

- **Automatic Updates:** Cloud providers manage software updates and security patches, reducing maintenance overhead for users.

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