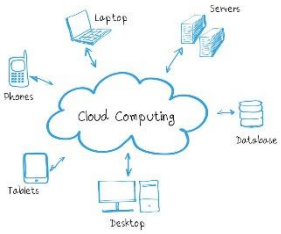
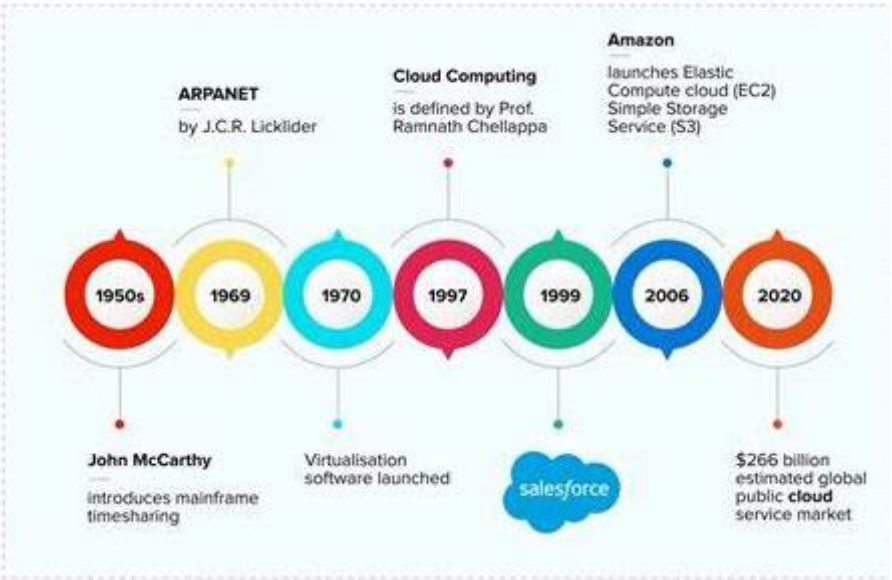
Unit 1: Introduction to Cloud Computing

1.1 Introduction to Cloud Computing



- **Definition**: Cloud computing provides on-demand availability of computer system resources like storage, databases, and computing power without direct user management.
    - *Example*: Platforms like Google Drive or Dropbox.
- **Key Features**:
    1. **On-Demand Self-Service**: Users can provision resources without human intervention.
    2. **Broad Network Access**: Accessible over the internet from any device.
    3. **Resource Pooling**: Multi-tenant model using shared resources.
    4. **Rapid Elasticity**: Scalable resources based on demand.
    5. **Measured Service**: Usage-based pricing.
- **Objective**:
    - Understand the foundational elements of cloud computing.
    - Identify real-world examples and applications.

1.2 History & Evolution of Cloud Computing



- **Early Beginnings**:
    - **1960s**: John McCarthy suggested the idea of computation delivered as a public utility.
    - **1970s**: Development of virtualization (IBM VM/370).
- **Milestones in Cloud Development**:
    1. **1990s**: Emergence of SaaS with Salesforce.

2. **2006**: Amazon introduced EC2.
3. **2010s**: Rise of hybrid clouds.

- **Recent Trends**:
  - Use of **serverless computing** (AWS Lambda).
  - Expansion of **edge computing** to reduce latency.

Activity: **Discussion:** How has cloud technology impacted industries like e-commerce and entertainment?

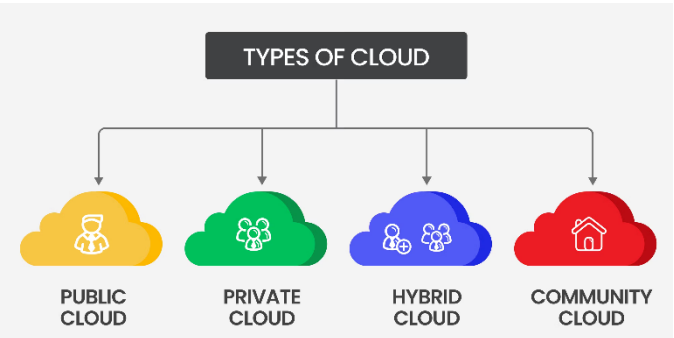
1.3 Types of Cloud Computing

1.3.1 Service Models:

- **Infrastructure as a Service (IaaS)**:
  - Provides virtualized computing resources like VMs and storage.
  - *Examples*: AWS EC2, Microsoft Azure VMs.
- **Platform as a Service (PaaS)**:
  - Enables application development without managing infrastructure.
  - *Examples*: Google App Engine, Heroku.
- **Software as a Service (SaaS)**:
  - Offers software applications over the internet.
  - *Examples*: Microsoft Office 365, Dropbox.

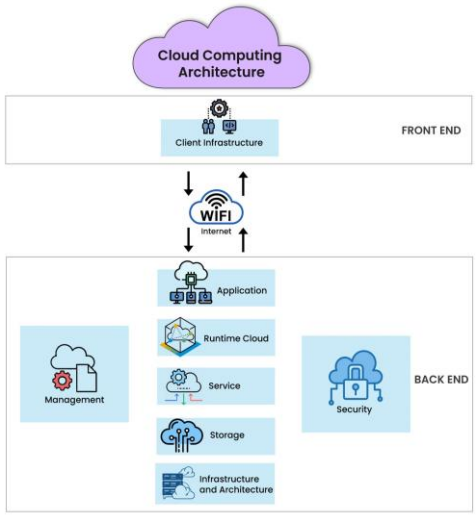
1.3.2 Deployment Models:

- **Public Cloud**:
  - Shared resources managed by third parties.
  - *Example*: AWS, Azure.
- **Private Cloud**:
  - Exclusive to a single organization.
  - *Example*: On-premises VMware deployment.



- **Hybrid Cloud**:
  - Combines public and private clouds.
  - *Example*: Combining on-premises servers with Azure.

1.4 Cloud Computing Architecture



- **Components**:
  - **Front-End Interface**: User-facing applications (browsers, mobile apps).
  - **Back-End Systems**: Servers, storage, and databases.
  - **Middleware**: Facilitates communication between front-end and back-end.
- **Example**:
  - A retail website on AWS uses EC2 for computation, S3 for storage, and DynamoDB for databases.
- **Discussion Activity**: Create a basic architecture diagram for a video-streaming application like Netflix.

1.5 Cloud Vulnerabilities

- **Common Threats**:
  1. **Data Breaches**: Unauthorized access to sensitive data.
  2. **Account Hijacking**: Phishing attacks on cloud credentials.
  3. **Denial of Service (DoS)**: Overloading servers to disrupt operations.
- **Real-World Examples**:
  - Capital One breach (2019): Exposed over 100 million customer records.
- **Mitigation Strategies**:
  - Implement strong authentication protocols.
  - Regular vulnerability assessments.
  - Encrypt data at rest and in transit.