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Department of Cyber Security
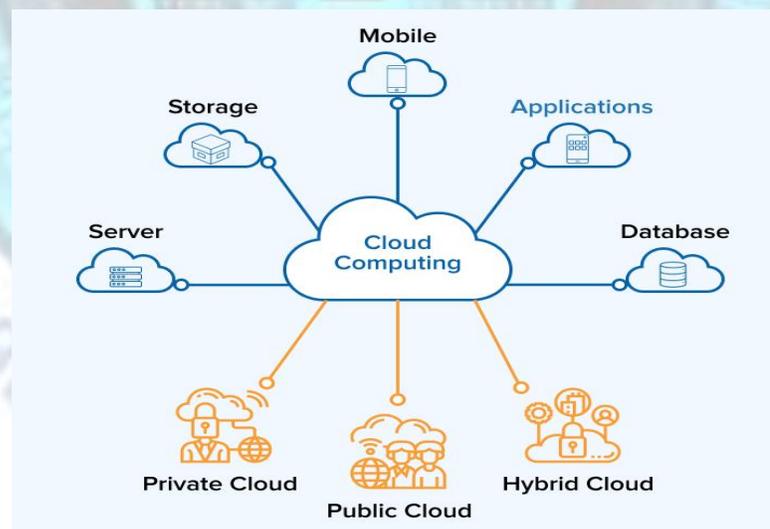
Subject: Cloud computing

Class: Third stage

Lecture: (1)

Lecturer: Msc :Najwan thaeer ali

Cloud computing refers to the delivery of computing services over the Internet. These services enable individuals and organizations to access software, storage, and computing resources that are hosted and managed by third-party providers at remote data centers, rather than on local machines.

The term *"cloud computing"* is used because the underlying infrastructure and processing are abstracted from the user and are often represented as a "cloud" in network diagrams, indicating that the computing takes place remotely.

Common examples of cloud services include online file storage systems, social networking platforms, web-based email services, and online business applications.

The cloud computing model enables users to access information and computing resources from anywhere, provided that a network connection is available.

Cloud computing offers a shared pool of resources, including data storage, networks, processing power, and specialized applications for both corporate and individual users.

One of the key advantages of cloud computing is that users do not need to install or maintain software on their local devices. Applications run entirely on cloud platforms, making them independent of the user's device type or operating system.

As a result, cloud computing supports mobility and flexibility, allowing applications to be accessed efficiently from desktops, laptops, tablets, and mobile devices, thereby enhancing the effectiveness of mobile applications.
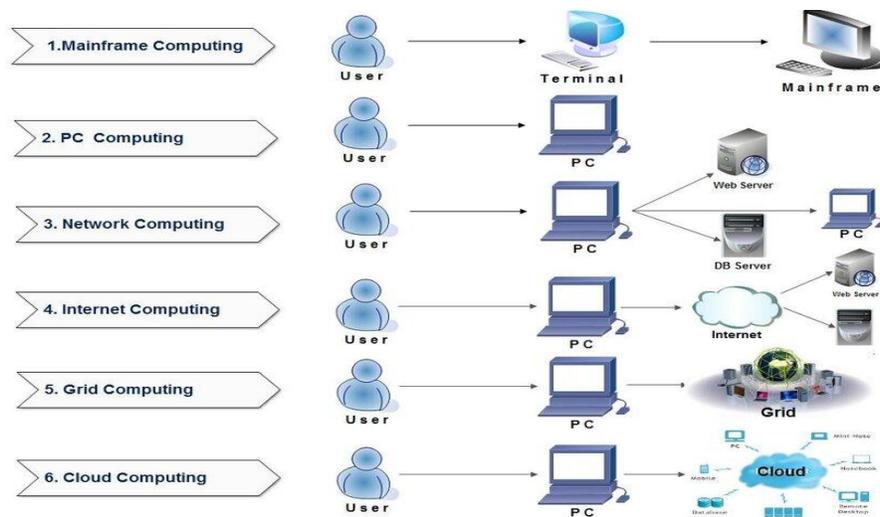
Phase 1:

In this phase, multiple users shared powerful mainframe computers through simple terminals. Computing resources were centralized and accessed remotely.

Phase 2:

Stand-alone personal computers (PCs) became sufficiently powerful to meet the majority of individual users' computing needs, reducing dependence on centralized systems.

Phase 3:

Personal computers, laptops, and servers were interconnected through local area networks (LANs) to share resources and improve performance.

Phase 4:

Local networks were interconnected to form wide-area networks and ultimately a global network, such as the

Internet, enabling access to remote applications and resources.

Phase 5:

Grid computing emerged, providing shared computing and storage resources distributed across multiple administrative domains. Grid computing represents the foundation and starting point for cloud computing.

Phase 6:

Cloud computing extends the concepts of grid computing by delivering scalable shared resources over the Internet in a simplified manner. Users can access all or part of these resources based on a Pay-As-You-Go pricing model.
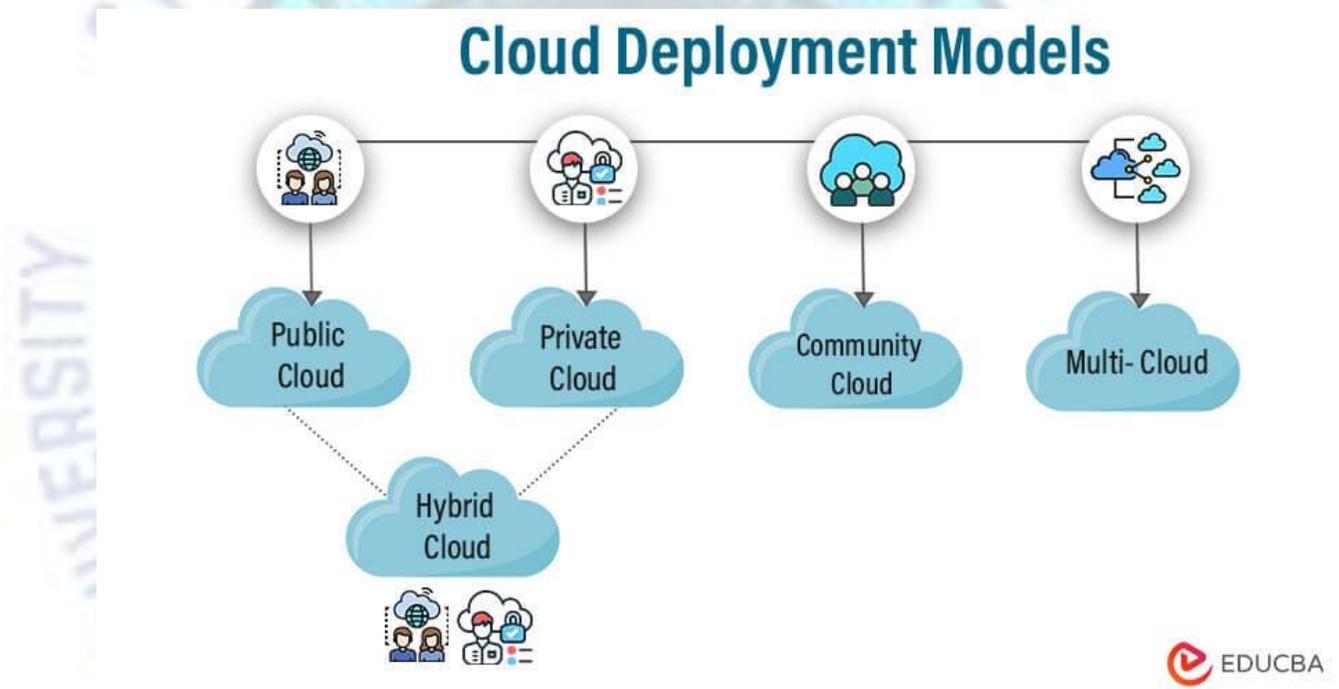
Cloud Computing Definition

Cloud computing can be defined based on five fundamental attributes: multitenancy (shared resources), massive scalability, elasticity, pay-as-you-go pricing, and self-provisioning of resources.

Multitenancy (Shared Resources)

Unlike traditional computing models, which rely on dedicated resources assigned to a single user or organization, cloud computing adopts a multitenant architecture. In this model, computing resources are shared among multiple users.

- **Network level, where communication infrastructure is shared**

- **Host level, where physical servers are shared through virtualization**

- **Application level, where multiple users access the same application instance**

Cloud Deployment Models

Public Cloud · Private Cloud · Community Cloud · Multi-Cloud · Hybrid Cloud

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Layers of Cloud Computing

Cloud computing architecture is composed of multiple layers, each responsible for specific functions and services. These layers work together to deliver scalable and efficient cloud solutions.

1. Physical Layer

This is the foundational layer of cloud computing and includes:

- **Physical servers**
- **Storage devices**
- **Networking equipment**
- **Data centers**

2. Virtualization Layer

This layer abstracts physical hardware using virtualization technologies such as hypervisors. It enables:

- **Creation of virtual machines (VMs)**
- **Efficient resource sharing**
- **Isolation between users**

3. Infrastructure Layer

The infrastructure layer provides virtualized computing resources, including:

- **Virtual servers**
- **Virtual storage**
- **Virtual networks**

4. Platform Layer

The platform layer offers environments and tools for application development and deployment, such as:

- **Operating systems**

- **Databases**

- **Middleware**

- **Development frameworks**

5. Application Layer

The topmost layer consists of cloud-based applications that users access through web browsers or APIs. Examples include:

- **Webmail services**

- **Online collaboration tools**

- **Business applications**