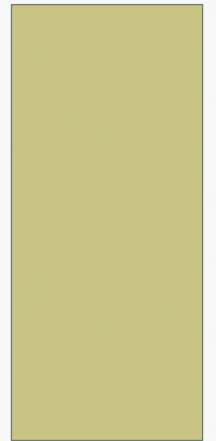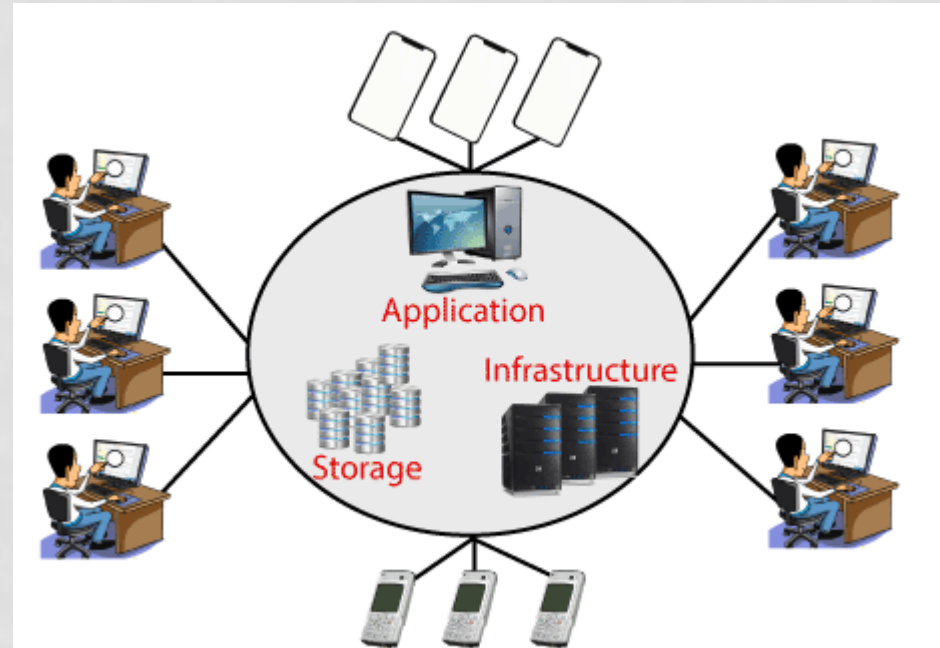# CLOUD COMPUTING

UNIT I (PART 1)

INTRODUCTION TO CLOUD COMPUTING

- Cloud Computing is the delivery of computing services such as servers, storage, databases, networking, software, analytics, intelligence, and more, over the Cloud (Internet).

- Cloud Computing provides an alternative to the on-premises datacenter.

- With an on-premises datacentre, we have to manage everything, such as purchasing and installing hardware, virtualization, installing the operating system, and any other required applications, setting up the network, configuring the firewall, and setting up storage for data.

- After doing all the set-up, we become responsible for maintaining it through its entire lifecycle.

- But if we choose Cloud Computing, a cloud vendor is responsible for the hardware purchase and maintenance.
- They also provide a wide variety of software and platform as a service. We can take any required services on rent.
- The cloud computing services will be charged based on usage.

ADVANTAGES OF CLOUD COMPUTING

- **Cost:** It reduces the huge capital costs of buying hardware and software.
- **Speed:** Resources can be accessed in minutes, typically within a few clicks.
- **Scalability:** We can increase or decrease the requirement of resources according to the business requirements.
- **Productivity:** While using cloud computing, we put less operational effort. We do not need to apply patching, as well as no need to maintain hardware and software. So, in this way, the IT team can be more productive and focus on achieving business goals.
- **Reliability:** Backup and recovery of data are less expensive and very fast for business continuity.
- **Security:** Many cloud vendors offer a broad set of policies, technologies, and controls that strengthen our data security.

TYPES OF CLOUD COMPUTING
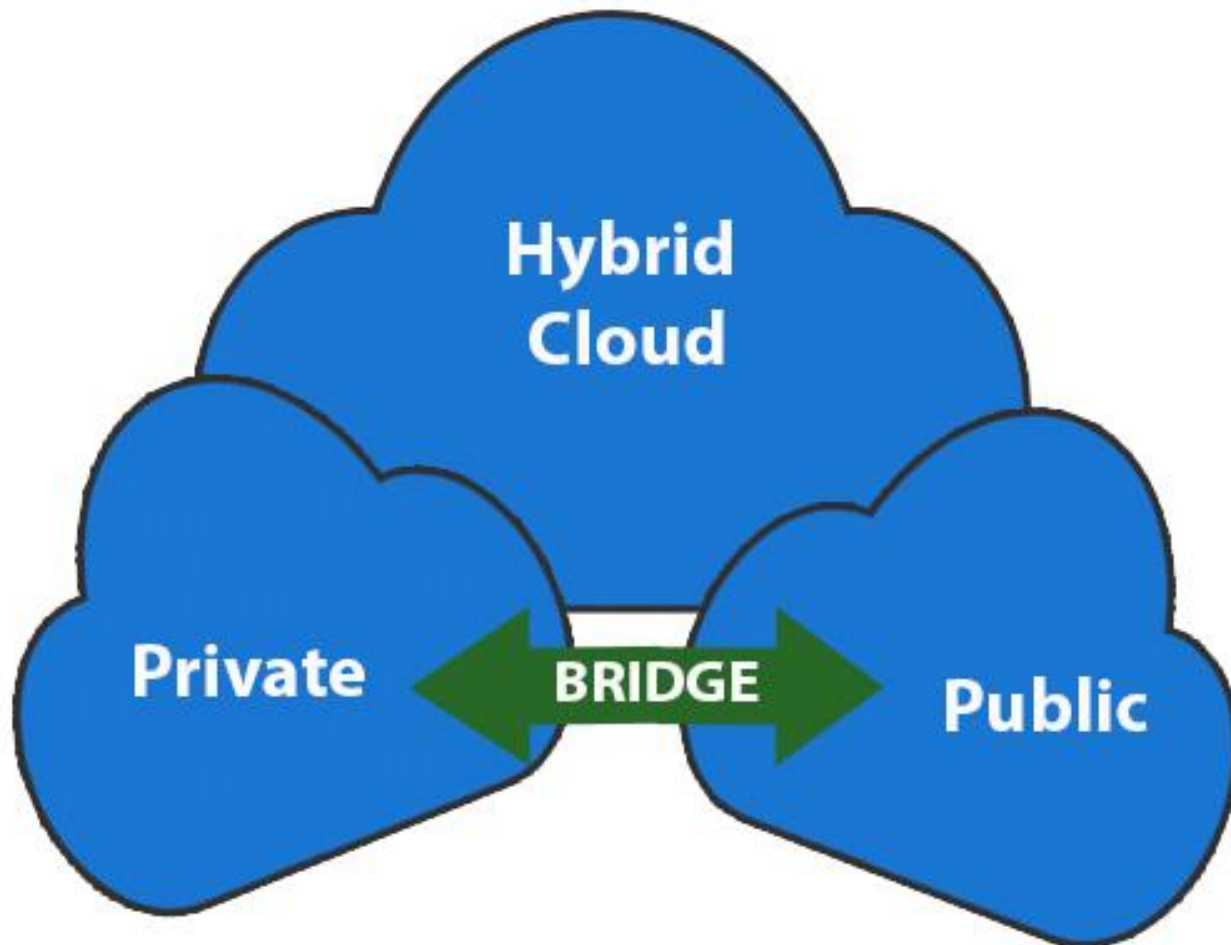
- **Public Cloud:** The cloud resources that are owned and operated by a third-party cloud service provider are termed as public clouds. It delivers computing resources such as servers, software, and storage over the internet

- **Private Cloud:** The cloud computing resources that are exclusively used inside a single business or organization are termed as a private cloud. A private cloud may physically be located on the company's on-site datacenter or hosted by a third-party service provider.

- **Hybrid Cloud:** It is the combination of public and private clouds, which is bounded together by technology that allows data applications to be shared between them. Hybrid cloud provides flexibility and more deployment options to the business.

TYPES OF CLOUD SERVICES
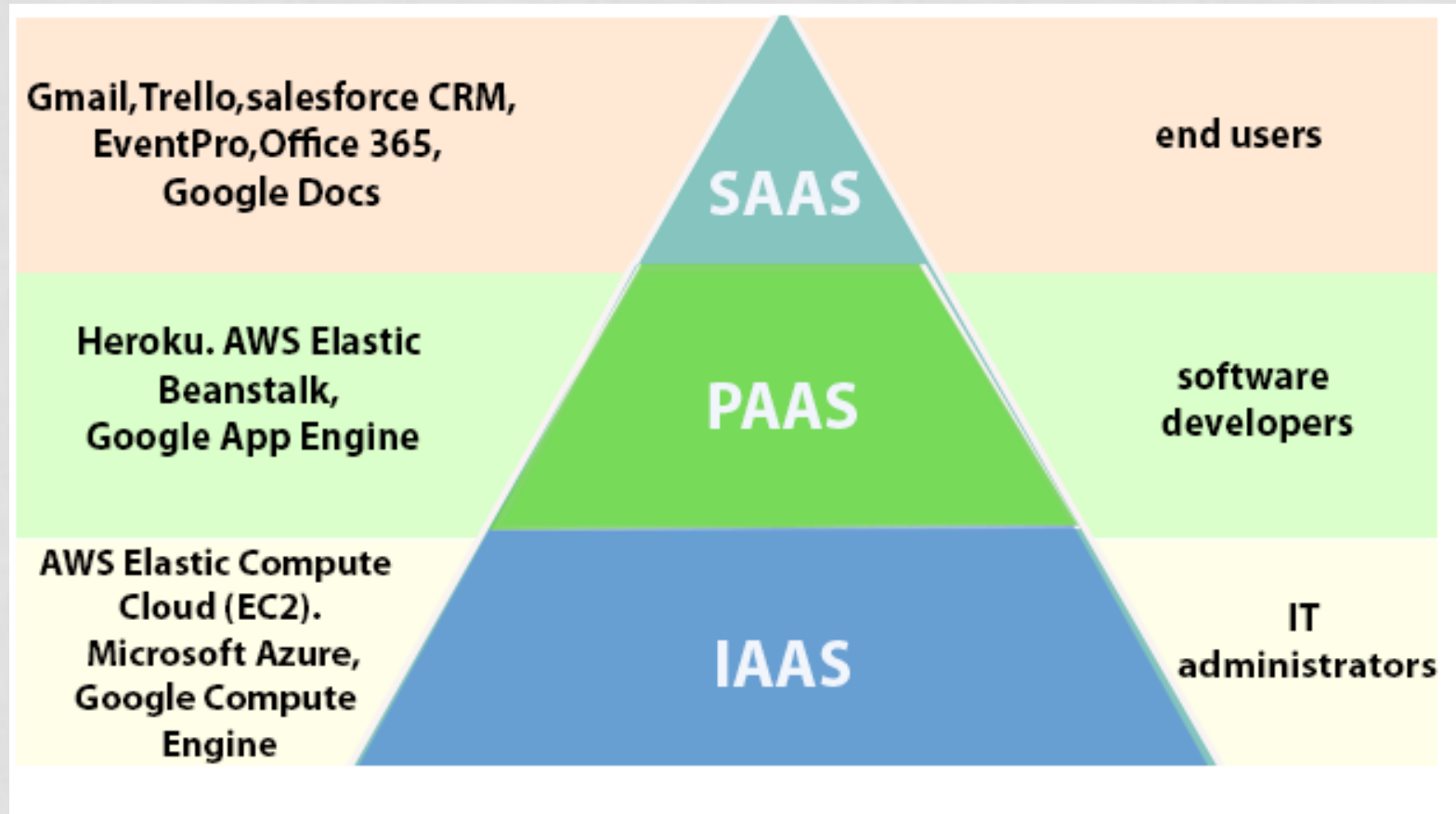
INFRASTRUCTURE AS A SERVICE (IAAS)

- In IaaS, we can rent IT infrastructures like servers and virtual machines (VMs), storage, networks, operating systems from a cloud service vendor.

- We can create VM running Windows or Linux and install anything we want on it.

- Using IaaS, we don't need to care about the hardware or virtualization software, but other than that, we do have to manage everything else.

- Using IaaS, we get maximum flexibility, but still, we need to put more effort into maintenance.

PLATFORM AS A SERVICE (PAAS)

- This service provides an on-demand environment for developing, testing, delivering, and managing software applications.

- The developer is responsible for the application, and the PaaS vendor provides the ability to deploy and run it.

- Using PaaS, the flexibility gets reduce, but the management of the environment is taken care of by the cloud vendors.

SOFTWARE AS A SERVICE (SAAS)

- It provides a centrally hosted and managed software services to the end-users.

- It delivers software over the internet, on-demand, and typically on a subscription basis.

- E.g., Microsoft One Drive, Dropbox, WordPress, Office 365, and Amazon Kindle. SaaS is used to minimize the operational cost to the maximum extent.

VIDEO LINKS

- https://www.youtube.com/watch?v=h6BzHP-oIKs
- https://www.youtube.com/watch?v=36zducUX16w

EVOLUTION OF CLOUD COMPUTING

- Cloud computing is all about renting computing services. This idea first came in the 1950s.

- In making cloud computing what it is today, five technologies played a vital role.

- These are distributed systems and its peripherals, virtualization, web 2.0, service orientation, and utility computing.

Distributed Systems

It is a composition of multiple independent systems but all of them are depicted as a single entity to the users. The purpose of distributed systems is to share resources and also use them effectively and efficiently.

But the main problem with this system was that all the systems were required to be present at the same geographical location.

Mainframe computing

Mainframes which first came into existence in 1951 are highly powerful and reliable computing machines. These are responsible for handling large data such as massive input-output operations. Even today these are used for bulk processing tasks such as online transactions etc.

Cluster computing

In 1980s, cluster computing came as an alternative to mainframe computing. Each machine in the cluster was connected to each other by a network with high bandwidth. These were way cheaper than those mainframe systems. These were equally capable of high computations

Grid computing

In 1990s, the concept of grid computing was introduced. It means that different systems were placed at entirely different geographical locations and these all were connected via the internet.

Virtualization

It was introduced nearly 40 years back. It refers to the process of creating a virtual layer over the hardware which allows the user to run multiple instances simultaneously on the hardware

Service orientation

It acts as a reference model for cloud computing. It supports low-cost, flexible, and evolvable applications. Two important concepts were introduced in this computing model. These were Quality of Service (QoS) which also includes the SLA (Service Level Agreement) and Software as a Service (SaaS).
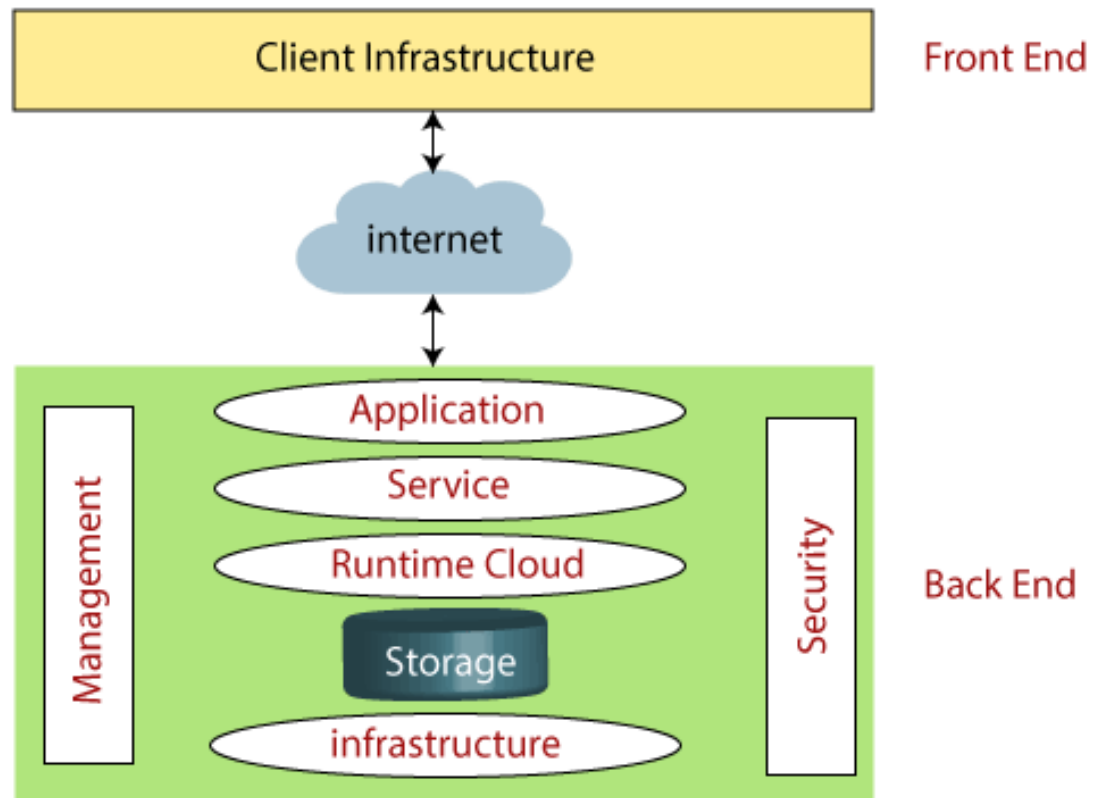
Utility computing

It is a computing model that defines service provisioning techniques for services such as compute services along with other major services such as storage, infrastructure, etc which are provisioned on a pay-per-use basis.

CLOUD COMPUTING ARCHITECTURE

- As we know, cloud computing technology is used by both small and large organizations to store the information in cloud and access it from anywhere at anytime using the internet connection.
- Cloud computing architecture is a combination of service-oriented architecture and event-driven architecture.
- Cloud computing architecture is divided into the following two parts –
    - Front End
    - Back End

Architecture of Cloud Computing

Client Infrastructure — Front End

internet

Application
Service
Runtime Cloud
Storage
infrastructure

Management

Security

Back End

- **Front End**

The front end is used by the client. It contains client-side interfaces and applications that are required to access the cloud computing platforms. The front end includes web servers (including Chrome, Firefox, internet explorer, etc.), thin & fat clients, tablets, and mobile devices.

- **Back End**

The back end is used by the service provider. It manages all the resources that are required to provide cloud computing services. It includes a huge amount of data storage, security mechanism, virtual machines, deploying models, servers, traffic control mechanisms, etc.

COMPONENTS OF CLOUD COMPUTING

Client Infrastructure

Client Infrastructure is a Front end component. It provides GUI (Graphical User Interface) to interact with the cloud.

Application

The application may be any software or platform that a client wants to access.

Service

A Cloud Services manages that which type of service you access according to the client's requirement.

Cloud computing offers the following three type of services:

- o IaaS
- o PaaS
- o SaaS

Runtime Cloud

Runtime Cloud provides the execution and runtime environment to the virtual machines.

Storage

Storage is one of the most important components of cloud computing. It provides a huge amount of storage capacity in the cloud to store and manage data.

Infrastructure

It provides services on the host level, application level, and network level. Cloud infrastructure includes hardware and software components such as servers, storage, network devices, virtualization software, and other storage resources that are needed to support the cloud computing model.

Management

Management is used to manage components such as application, service, runtime cloud, storage, infrastructure, and other security issues in the backend and establish coordination between them.

Security

Security is an in-built back end component of cloud computing. It implements a security mechanism in the back end.

Internet

The Internet is medium through which front end and back end can interact and communicate with each other.