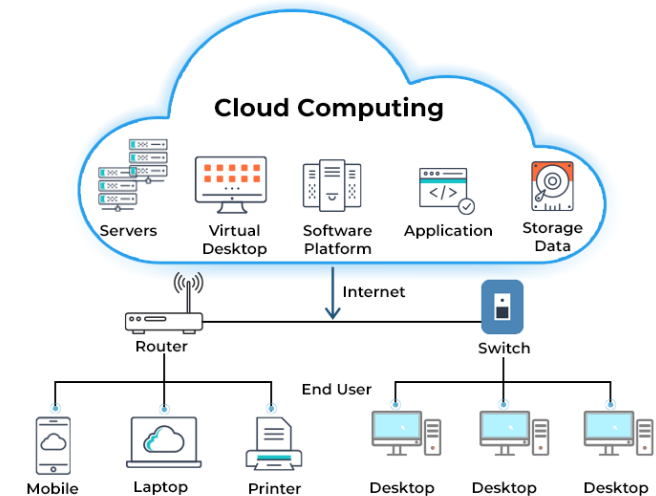# Cloud Computing

Introduction

What is Cloud Computing?

- The term Cloud refers to a network or the internet.
- It is a technology that uses remote servers on the internet to store, manage, and access the data online rather than local services.
- The data can be anything such as files, images, documents, audio, video and more.
- Following operation that can be done using cloud computing:
  - Developing new application and services
  - Storage, backup and recovery of data
  - Hosting blogs and websites
  - Delivery of software on demand
  - Analysis of data
  - Streaming videos and audios

Why Cloud Computing?

- Every small, mid, large scale IT organization must have a server room.

- To establish such IT infrastructure, we need to spend a lot of money, a dedicated space for the server and a person to maintain the server

- To overcome all these problems and to reduce the IT infrastructure cost, Cloud Computing comes into existence.

Features of Cloud Computing

- Agility
- High Availability & reliability
- High Scalability
- Multi Sharing
- Device and Location Independence
- Maintenance
- Low Cost
- Services in the pay-per-use mode

# Advantages & Disadvantages of Cloud Computing

Advantages

- Back-up & Restore Data
- Improved Collaboration
- Excellent Accessibility
- Low Maintenance Cost
- Mobility
- Services in the pay-per-use model
- Unlimited Storage Capacity
- Data Security

Disadvantages

- Internet Connectivity
- Vendor lock-in
- Limited Control
- Security

Cloud Computing Architecture

- Cloud computing architecture is a combination of service-oriented architecture and event driven architecture.

- Cloud computing architecture is divided into two parts:
  - Front End
  - Back End

- fs

Architecture of Cloud Computing
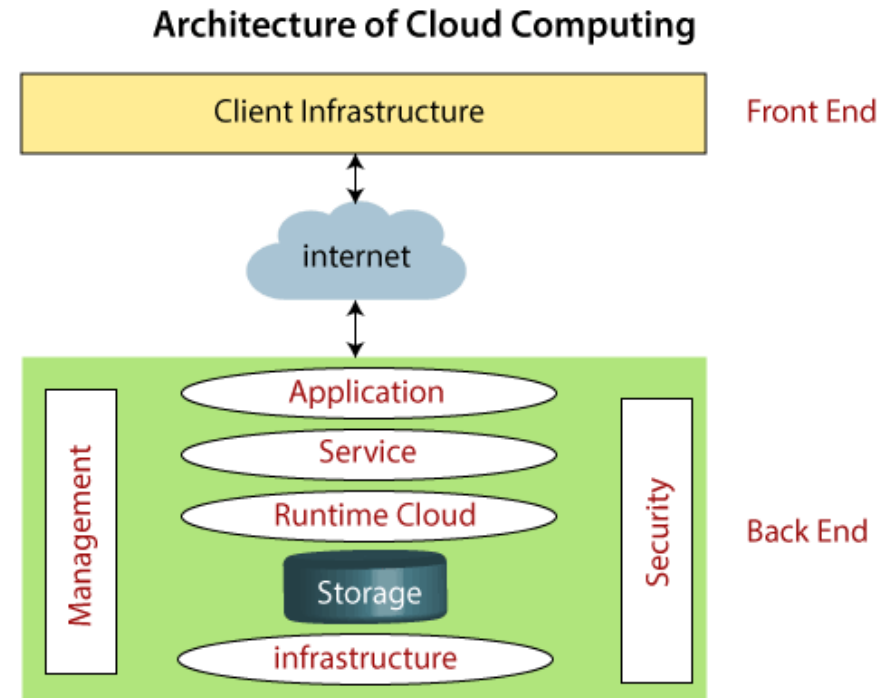
Cloud Computing Architecture – Front End

- Front end is used by the client.
- It contains client-side interfaces and application that are requires to access the cloud computing platforms.
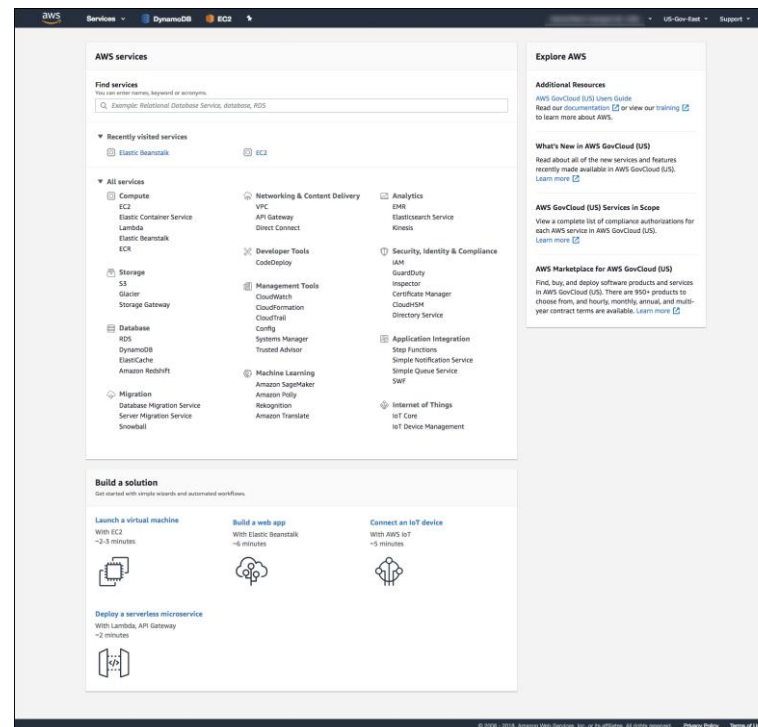
Cloud Computing Architecture – Back End

- Back End is used by the service provider.

- It manages all the resources that are required to provide cloud computing services.

- It includes huge amount of data storage, security mechanism, virtual machines, deployment models, servers, traffic control mechanism.

Component 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 a platform that a client want to access.

- Service
  - A cloud services manages that which type of service you access to the client's requirement

Component of Cloud Computing

- Service
  - Cloud computing offers 3 types of services:
    - **Software as a Service (SaaS)** – It is also known as cloud application services. Mostly, SaaS application run directly through the web browser which means you do not require to download and install these application. Eg: Google Apps, Salesforce Dropbox, Slack Hubstop, Cisco WebEx, etc.
    - **Platform as a Service (PaaS)** – It is also known as Cloud Platform Services. It is quite similar to SaaS, but the difference is that PaaS provides a platform for software creation, but using SaaS, we can access software over the internet without any platform. Eg: Windows Azure, Force.com, Magento Commerce Cloud, OpenShift, etc.
    - **Infrastructure as a Service (IaaS)** – It is also known as cloud infrastructure services. It is responsible for managing application, data, middleware, and runtime environments. Eg: Amazon Web Services(AWS) EC2, Google Compute Engine, Cisco Metapod, etc.

Component of Cloud Computing

- Runtime cloud
  - Runtime cloud provides the execution and runtime environment to the virtual machines

- Storage
  - Storage is one of the most important components of a 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.

Component of Cloud Computing

- Management
  - Management is used to manage components such as applications, service, runtime cloud, storage, infrastructure, etc. in the backend and establish coordination between them.

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

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

Cloud Computing Technologies

- Virtualization
  - Hardware Virtualization
  - Server Virtualization
  - Storage Virtualization
  - Operating System Virtualization
  - Data Virtualization
- Service-Oriented Architecture (SOA)
- Grid Computing
- Utility Computing

Types of Cloud

- 4 types of clouds:
  - Public Cloud
  - Private Cloud
  - Hybrid Cloud
  - Community Cloud

Types of Cloud – Public Cloud

- Public cloud is open to all to store and access information via internet using the pay-per-usage method.

- In public cloud, computing resources are managed and opersted by the Cloud Service Provider(CSP).

- EG: Amazon Elastic Compute Cloud (EC2), IBM SmartCloud Enterprise, Microsoft, Google App Engine, Windows Azure Services Platform.

- In public cloud, same storage is being used by multiple users.

- Public cloud is owned, managed, and operated by businesses, universities, government organizations, or combination of them.

Types of Cloud – Public Cloud

Advantages

- Low Cost
- Location Independent
- Save time
- Quickly and easy to set up
- Business Agility
- Scalability & Reliability

Disadvantages

- Low Security
- Performance
- Less customizable

Types of Cloud – Private Cloud

- Private cloud is also known as internal cloud or corporate cloud.
- Private cloud provides computing services to a private internal network(within the organization) and selected user in general public.
- Private cloud provides a high level of security and privacy to data through firewalls and internal hosting. It also ensures that operational and sensitive data are not accessible to third-party providers.
- EG: HP Data Centers, Microsoft, Elastra-private cloud, Ubuntu, etc.

Types of Cloud – Private Cloud

Advantages

- More Control

- Security and Privacy

- Improved Performance

Disadvantages

- High Cost

- Restricted area of operation

- Limited Scalability

- Skilled People

Types of Cloud – Hybrid Cloud

- Hybrid cloud is a combination of public and private cloud.

  Hybrid Cloud = Private Cloud + Public Cloud

- The main aim to combine these clouds is to create a unified, automated, and well managed computing environment.

- In Hybrid cloud, non-critical activities are performed by the public cloud and critical activities are performed by private cloud.

- Mainly, a hybrid cloud is used in finance, healthcare and universities.

- EG: Amazon, Microsoft, Google, Cisco, etc.

Types of Cloud – Hybrid Cloud
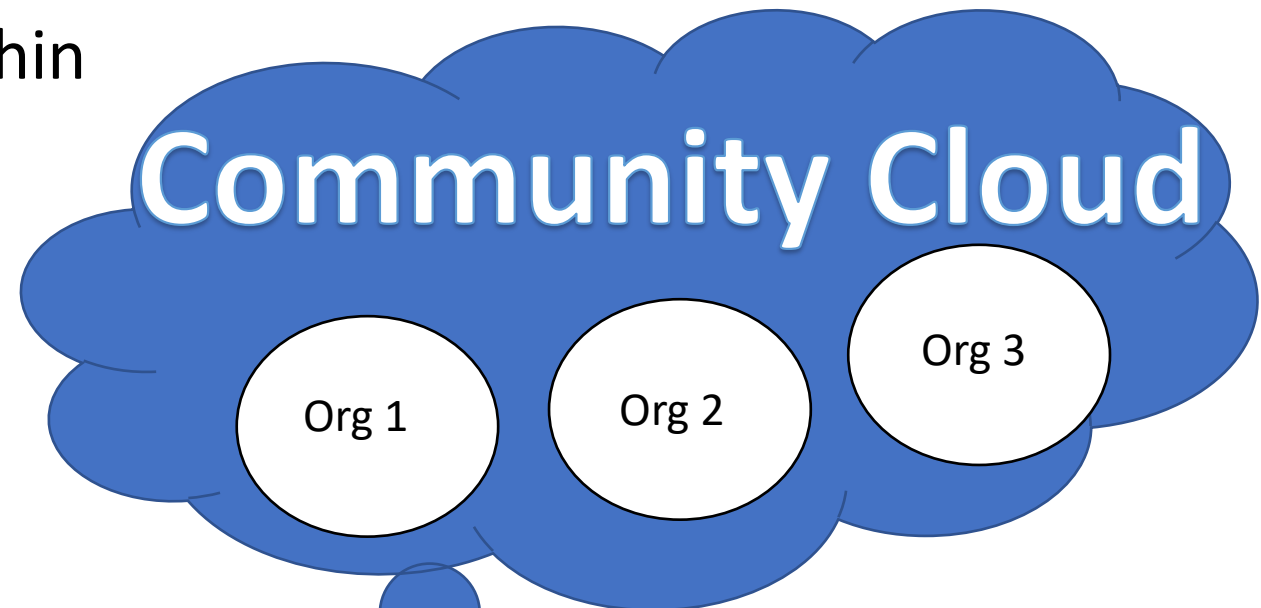
Advantages

- Flexible and Secure

- Cost Effective

- Security

- Risk Management

Disadvantages

- Networking Issues

- Infrastructure Compatibility

- Reliability

Types of Cloud – Community Cloud

- Community cloud is a cloud infrastructure that allows systems and services to be accessible by a group of several organizations to share the information.

- It is owned, managed and operated by one or more organizations in the community, a third party, or a combining of them

- EG: Government organization within India may share computing infrastructure in the cloud to manage data.

Community Cloud

Org 1

Org 2

Org 3

Types of Cloud – Community Cloud

Advantages

- Cost Effective
- Flexible and Scalable
- Security
- Sharing Infrastructure

Disadvantages

- Its not suitable for all organization
- Slow Adoption of Data
- Fixed amount of data storage
- Costly then public cloud
- Sharing responsibility is difficult

Cloud Services Model

- There are 3 types of cloud service model:
  - Infrastructure as a Service (IaaS)
  - Platform as a Service (PaaS)
  - Software as a Service (SaaS)

Cloud Services Model – IaaS

- IaaS is also known as Hardware as a Service (HaaS).
- It's one of the layer of cloud computing platform, which allows customers to outsource their IT infrastructure such as servers, networking, processing, storage, VM, etc.
- Customers access these resources on the internet using pay-per-use model
- IaaS offers in 3 models : private, public and hybrid clouds.
- IaaS provides following services:
  - Compute
  - Storage
  - Network
  - Load Balancers

Cloud Services Model – IaaS

Advantages

- Shared Infrastructure
- Web Access to the resources
- Pay-as-per use model
- Focus on the core business
- On-demand Scalability

Disadvantages

- Security
- Maintenance & Upgrade
- Interoperability Issues

Cloud Services Model – PaaS

- PaaS provides a runtime environment. It allows programmer to easily create, test, run and deploy web applications.

- You can access these application from the cloud service provider on per-per-use basis and access them over the internet.

- PaaS includes infrastructures such as servers, storage, networking, middleware, development tools, database management, business intelligence, etc)

- PaaS provides:
  - Programming Language
  - Application frameworks
  - Databases
  - Other Tools

Cloud Services Model – PaaS

Advantages

- Simplified Development
- Lower Risk
- Prebuilt business functionality
- Instant Community
- Sociability

Disadvantages

- Vendor Lock-In
- Data Privacy
- Integration with the rest of the system application

Cloud Services Model – SaaS

- SaaS is also known as On-Demand Software, which is a software distributed model in which services are hosted by a cloud service provider.

- These services are available to end users , so that they do not need to install any software on their devices to access the service

- Services provided by SaaS:
  - Business Services – ERP, CRM, Billing, Sales, etc.
  - Document Management – Zoho forms, Slack, Samepage, etc
  - Social Networks –
  - Mail Services –

Cloud Services Model – SaaS

Advantages

- SaaS is easy to buy
- One to Many (**O** App – **M** Users)
- Less hardware required
- Low Maintenance
- No special software or hardware version required
- Multidevice Support
- API Integration
- No Client-side installation

Disadvantages

- Security
- Latency Issue
- Total Dependency on Internet
- Switching between SaaS vendors is difficult