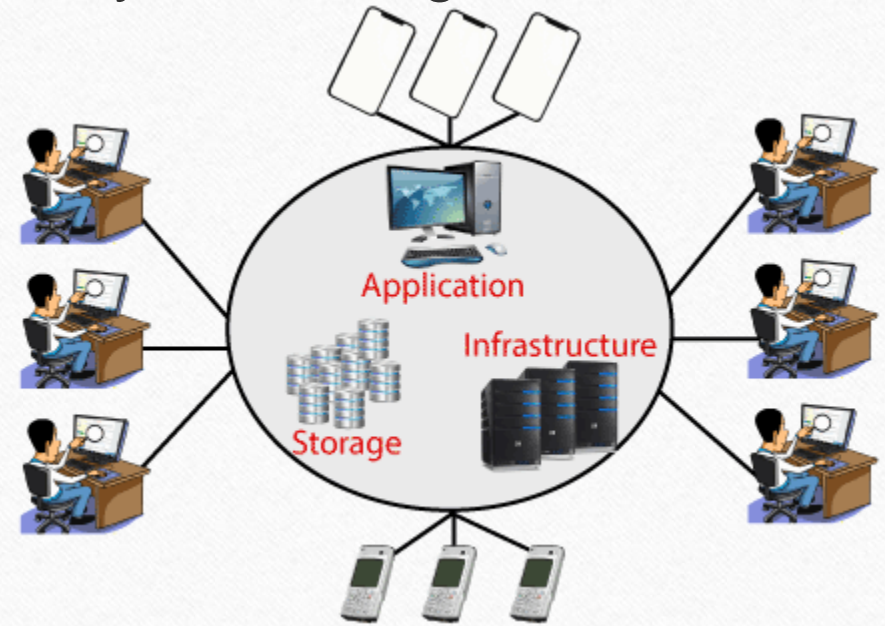# CLOUD COMPUTING

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What is Cloud?

- The term **Cloud** refers to a **Network** or **Internet.** In other words, we can say that Cloud is something, which is present at remote location.

- Cloud can provide services over public and private networks, i.e., WAN, LAN or VPN.

- Applications such as e-mail, web conferencing, customer relationship management (CRM) execute on cloud.
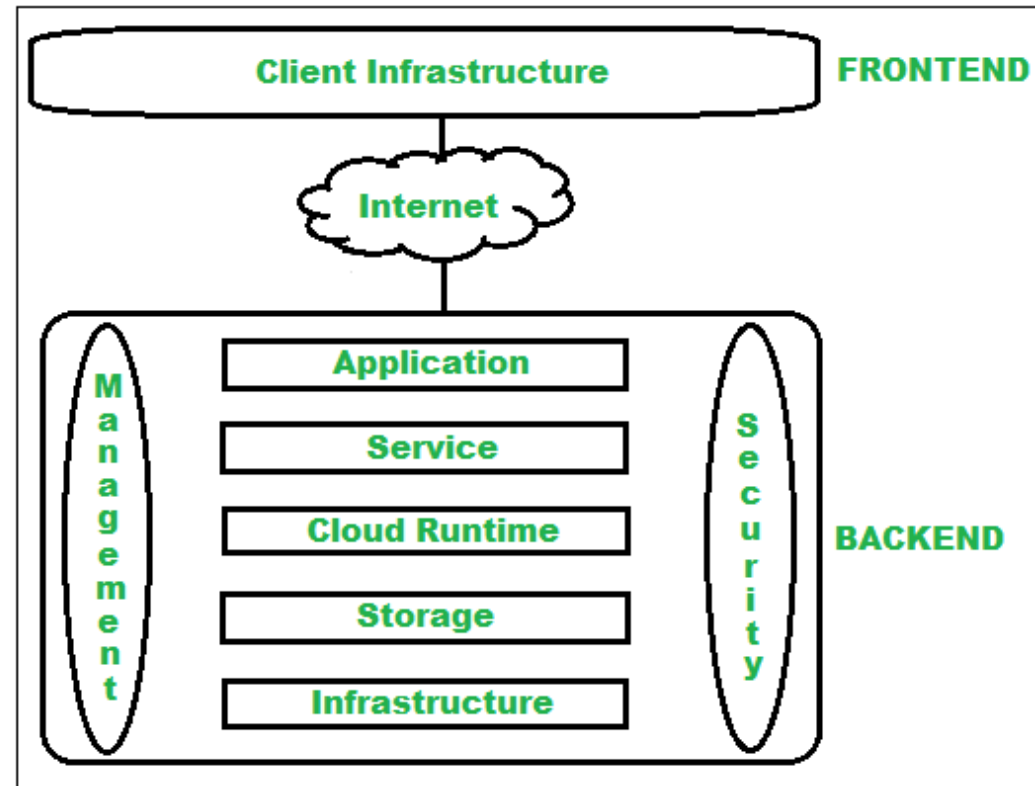
What is cloud computing

- 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 refers to **manipulating, configuring,** and **accessing** the hardware and software resources remotely.

- It offers online data storage, infrastructure, and application.

Cloud Computing Architecture

- The cloud architecture is divided into 2 parts i.e.
  1. Frontend
  2. Backend

Architecture (…)

1. **Frontend :**

   - Frontend of the cloud architecture refers to the client side of cloud computing system.

   - Means it contains all the user interfaces and applications which are used by the client to access the cloud computing services/resources.

   - For example use of a web browser to access the cloud plat form.

   - **Client Infrastructure –** Client Infrastructure refers to the frontend components. It contains the applications and user interfaces which are required to access the cloud platform.

Architecture (…)

2. Backend :
Backend refers to the cloud itself which is used by the service provider. It contains the resources as well as manages the resources and provides security mechanisms. Along with this it includes huge storage, virtual applications, virtual machines, traffic control mechanisms, deployment models etc.
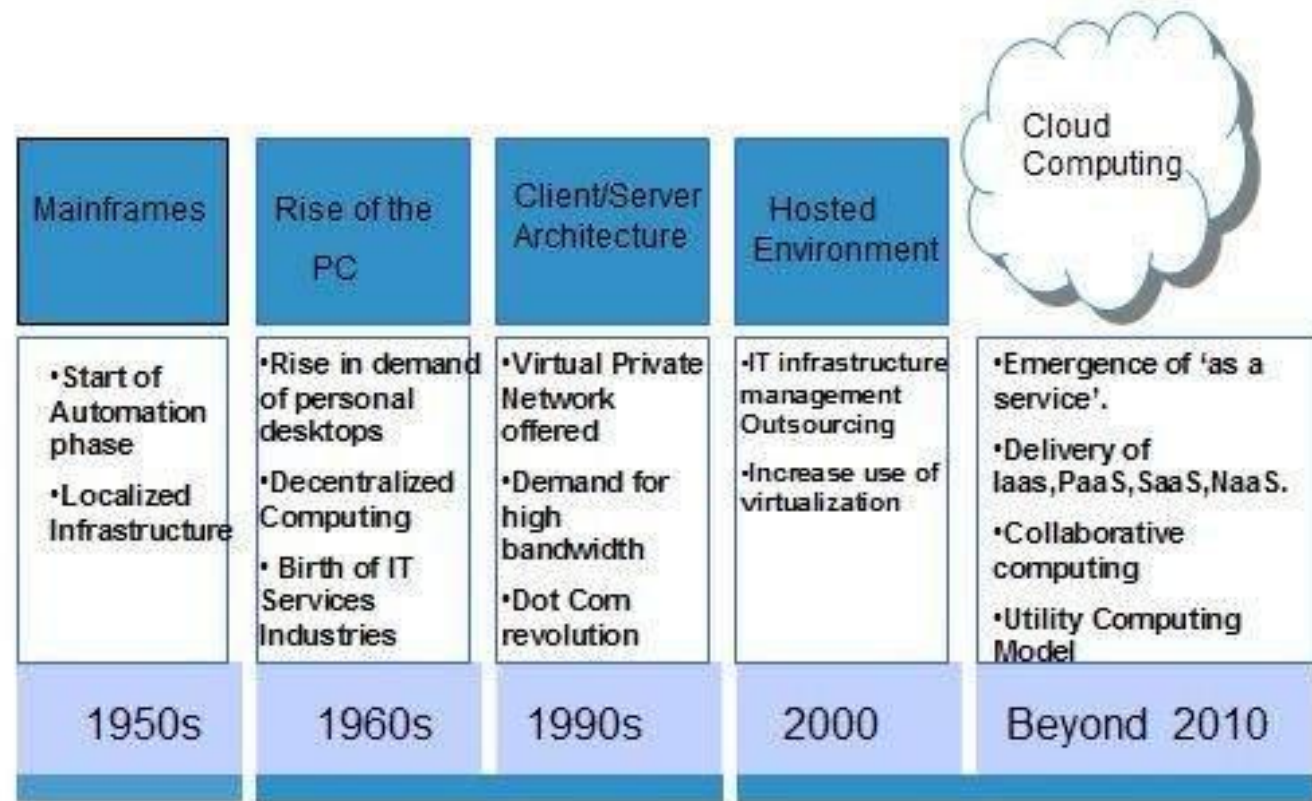
- **Application –**
  Application in backend refers to a software or platform to which client accesses. Means it provides the service in backend as per the client requirement.

- **Service –**
  Service in backend refers to the major three types of cloud based services like SaaS, PaaS and IaaS. Also manages which type of service the user accesses.

- **Cloud Runtime –**
  Runtime cloud in backend refers to provide of execution and runtime platform/environment to the virtual machine.

Architecture (...)

- **Storage –** Storage in backend refers to provide flexible and scalable storage service and management of stored data.

- **Infrastructure –** Cloud Infrastructure in backend refers to hardware and software components of cloud like it includes servers, storage, network devices, virtualization software etc.

- **Management –** Management in backend refers to management of backend components like application, service, runtime cloud, storage, infrastructure, and other security mechanisms etc.

- **Security –** Security in backend refers to implementation of different security mechanisms in the backend for secure cloud resources, systems, files, and infrastructure to end-users.

- **Internet –** Internet connection acts as the medium or a bridge between frontend and backend and establishes the interaction and communication between frontend and backend.
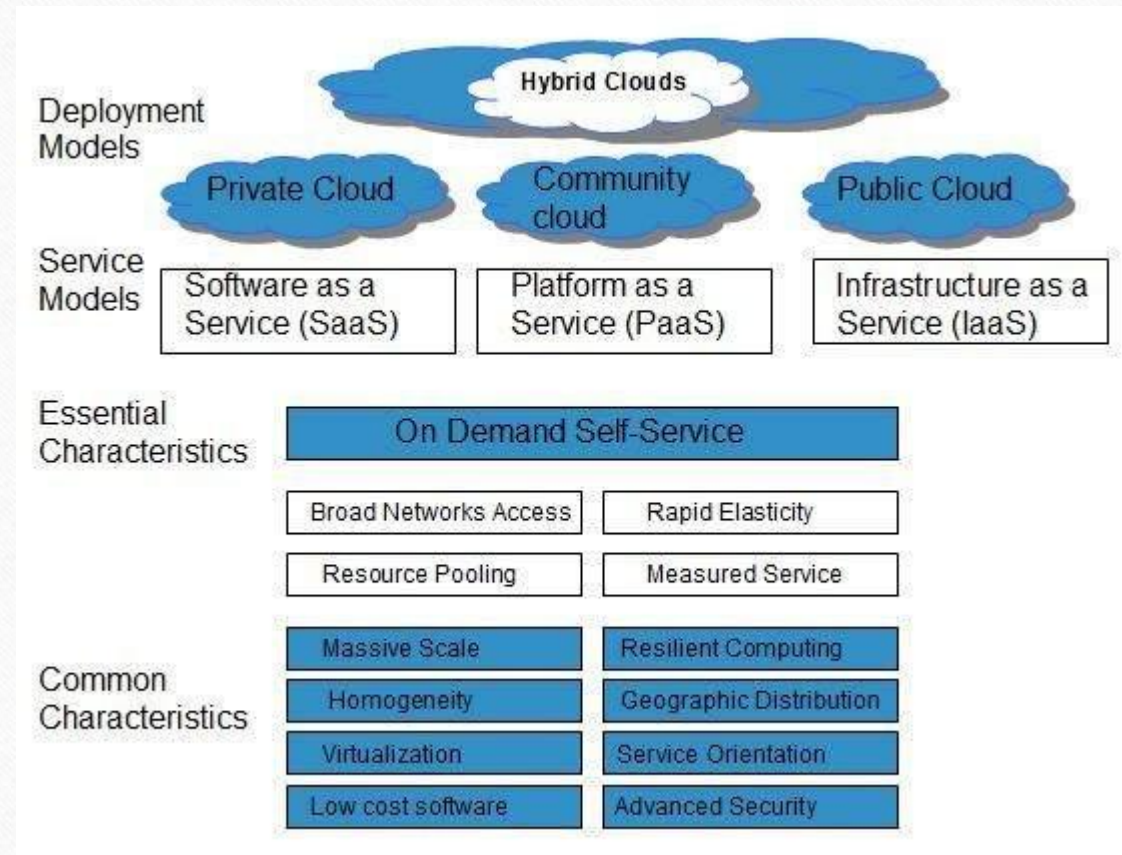
History of Cloud Computing

- The concept of **Cloud Computing** came into existence in the year 1950 with implementation of mainframe computers, accessible via **thin/static clients.**
- Since then, cloud computing has been evolved from static clients to dynamic ones and from software to services.
- The following diagram explains the evolution of cloud computing:

Mainframes	Rise of the PC	Client/Server Architecture	Hosted Environment	Cloud Computing
•Start of Automation phase •Localized Infrastructure	•Rise in demand of personal desktops •Decentralized Computing • Birth of IT Services Industries	•Virtual Private Network offered •Demand for high bandwidth •Dot Com revolution	•IT infrastructure management Outsourcing •Increase use of virtualization	•Emergence of 'as a service'. •Delivery of IaaS,PaaS,SaaS,NaaS. •Collaborative computing •Utility Computing Model
1950s	1960s	1990s	2000	Beyond 2010

Characteristics of Cloud Computing

- Four Key Characteristics

Characteristics of Cloud Computing

- **On Demand Self Service**: Cloud Computing allows the users to use web services and resources on demand. One can logon to a website at any time and use them.

- **Broad Network Access**: Since cloud computing is completely web based, it can be accessed from anywhere and at any time.

- **Resource Pooling**: Cloud computing allows multiple tenants to share a pool of resources. One can share single physical instance of hardware, database and basic infrastructure.

- **Rapid Elasticity:** It is very easy to scale the resources vertically or horizontally at any time. Scaling of resources means the ability of resources to deal with increasing or decreasing demand. The resources being used by customers at any given point of time are automatically monitored.

- **Measured Service:** In this service cloud provider controls and monitors all the aspects of cloud service. Resource optimization, billing, and capacity planning etc. depend on it.

Cloud Computing Models

- There are certain services and models working behind the scene making the cloud computing feasible and accessible to end users.

- Following are the working models for cloud computing:

  - Deployment Models

  - Service Models

1. Deployment Models

- Deployment models define the type of access to the cloud, i.e., how the cloud is located?

- Cloud can have any of the four types of access:

  - Public,

 - Private,

  - Hybrid, and

  - Community.
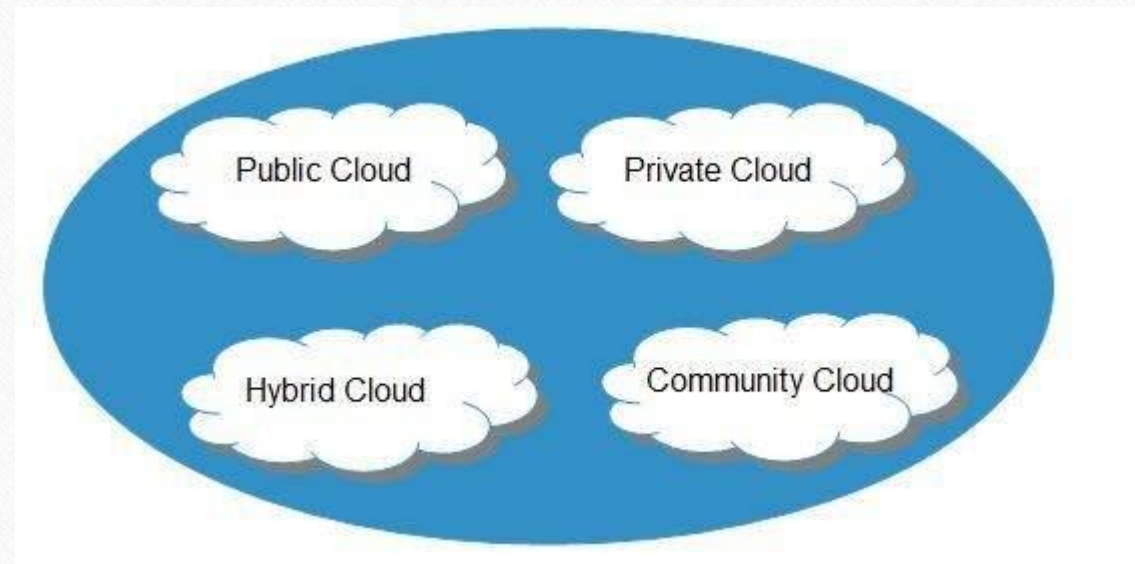
1. Deployment Models

- **Public Cloud** :The **public cloud** allows systems and services to be easily accessible to the general public. Public cloud may be less secure because of its openness.

- **Private Cloud:** The **private cloud** allows systems and services to be accessible within an organization. It is more secured because of its private nature.

- **Community Cloud:** The **community cloud** allows systems and services to be accessible by a group of organizations.

- **Hybrid Cloud:** The **hybrid cloud** is a mixture of public and private cloud, in which the critical activities are performed using private cloud while the non-critical activities are performed using public cloud.
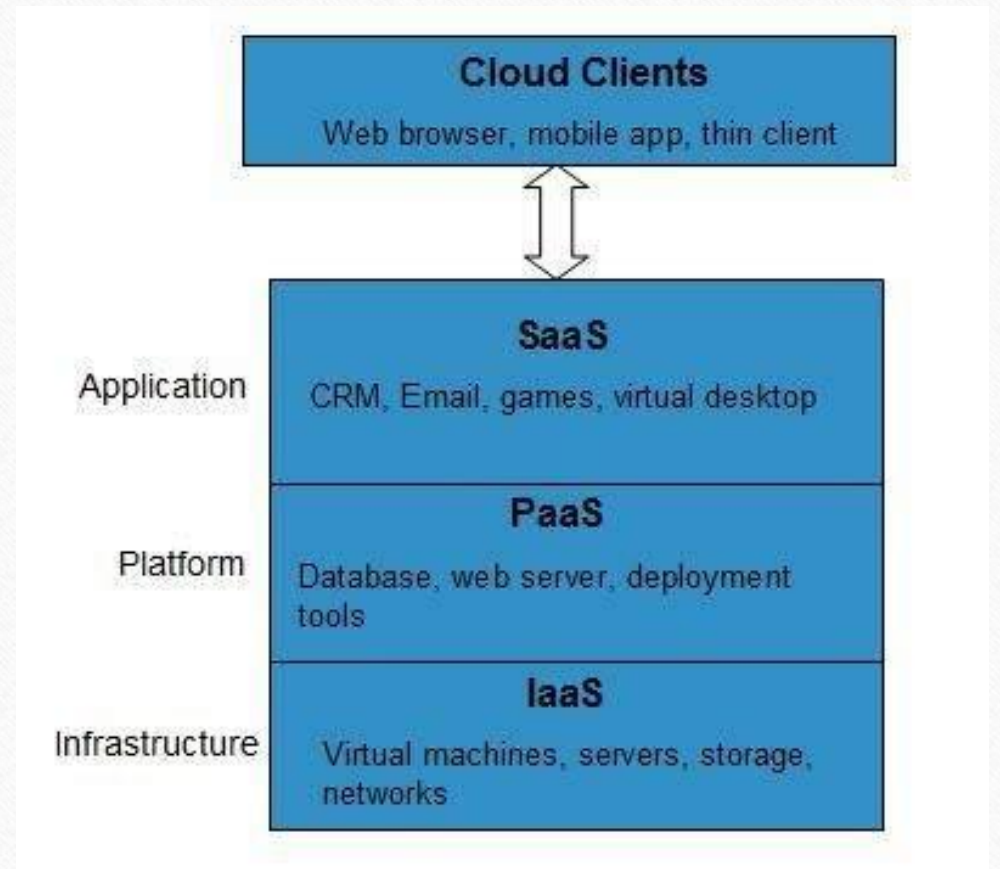
2. Service Models

- These are categorized into three basic service models which are -
    - Infrastructure-as–a-Service (IaaS)
    - Platform-as-a-Service (PaaS)
   - Software-as-a-Service (SaaS)
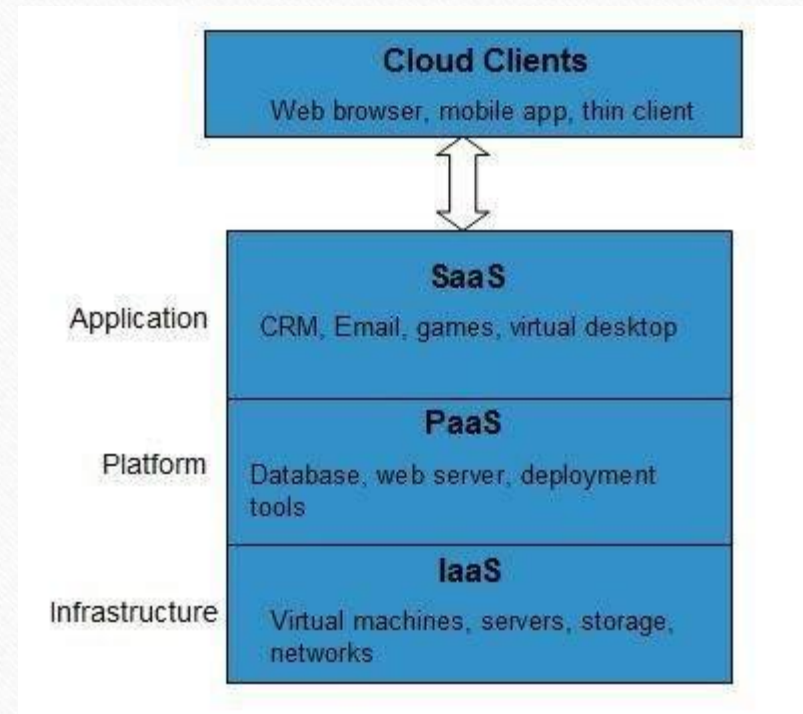
2. Service Models (…)

- **Infrastructure-as-a-Service (IaaS)** is the most basic level of service. Each of the service models inherit the security and management mechanism from the underlying model, as shown in the following diagram:

2. Service Models (…)

- Infrastructure-as-a-Service (IaaS): **IaaS** provides access to fundamental resources such as physical machines, virtual machines, virtual storage, etc.

- Platform-as-a-Service (PaaS): **PaaS** provides the runtime environment for applications, development and deployment tools, etc.

- Software-as-a-Service (SaaS): **SaaS** model allows to use software applications as a service to end-users.

Benefits of Cloud Computing
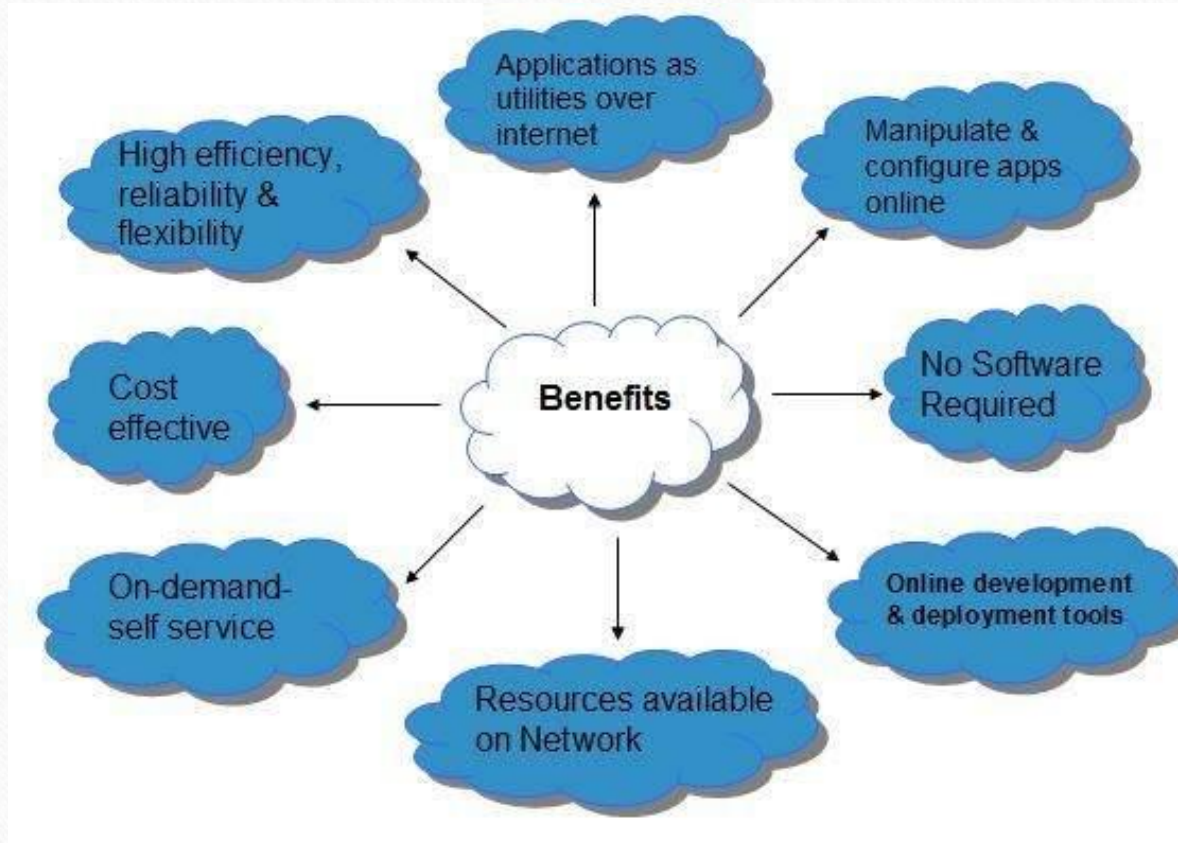
Benefits of Cloud Computing

- One can access applications as utilities, over the Internet.

- One can manipulate and configure the applications online at any time.

- It does not require to install a software to access or manipulate cloud application.

- Cloud Computing offers online development and deployment tools, programming runtime environment through **PaaS model.**

- Cloud resources are available over the network in a manner that provide platform independent access to any type of clients.

- Cloud Computing offers **on-demand self-service.** The resources can be used without interaction with cloud service provider.

- Cloud Computing is highly cost effective because it operates at high efficiency with optimum utilization. It just requires an Internet connection

- Cloud Computing offers load balancing that makes it more reliable.