

History of cloud computing

Before computing was come into existence, client server architecture was used where all the data and control of client resides in server side. If a single user want to access some data, firstly user need to connect to the server and after that user will get appropriate access. But it has many disadvantages. After client server computing, distributed computing came into existence, in this type of computing all computers are networked together with the help of this, user can share their resources when needed. It also has certain limitations. So in order to remove limitations faced in distributed system, cloud computing was emerged.

Client-server → Distributed

Distributed

Cloud computing

Disadvantages of cloud computing

- It requires good internet connection
- User have limited control on data

The first company who started calling cloud services was sales force latter in 2002 Amazon started AWS, in 2009 google play also started providing cloud services. Microsoft in 2009 launched its microsoft Azure.

Characteristics of cloud computing

* On-demand self-service:

The cloud computing service does not require any human administrator user. themselves are able to provision, monitor and manage computing resources as needed.

* Broad network access:

The computing services are generally provided over standard networks and heterogeneous devices.

* Rapid elasticity:

The computing services should have IT resources that are able to scale out and in quickly and on as needed basis whenever the user require services it is provided to him and it is scale out as soon as its requirement gets over.

* Resource pooling:

The IT resource (eg: network, servers, storage, application, services) present are shared across multiple applications and occupant in an uncommitted manner.

Multiple clients are provided services from a same physical resource.

* Measured Services:

The resource utilization is tracked for each application and occupant, it will provide both the user and the resource provider with an account of what has been used. This is done for monitoring, billing and effective use of resource.

Advantages of cloud computing.

- Back-up and restore data

once the data is stored in the cloud, it is easier to get back-up and restore that data using the cloud.

- Improved collaboration

Cloud applications improve collaboration by allowing groups of people to quickly and easily share information in the cloud via shared storage.

- Excellent accessibility

Cloud allows us to quickly and easily access stored information anywhere, anytime in the whole world, using an internet connection. An internet cloud infrastructure increases organisation productivity and efficiency by ensuring that our data is always accessible.

- Low maintenance cost

Cloud computing reduces both hardware and software maintenance costs for organisations.

- Mobility

Cloud computing allows us to easily access all cloud data via mobile.

- Services in the pay-per-use model

Cloud computing offers application programming interfaces (APIs) to the users for access services on the cloud and pays the charges as per the usage of service.

UNLIMITED STORAGE CAPACITY

Cloud offers us a huge amount of storage capacity for storing our important data such as documents, images, audio, video, etc. in one place.

Data security

Data security is one of the biggest advantages of cloud computing. Cloud offers many advanced features related to security and ensures that data is securely stored and handled.

Disadvantages of cloud computing

INTERNET CONNECTIVITY

In cloud computing every data (image, audio, video, etc.) is stored on the cloud, and we access these data through the cloud by using the internet connection. If you do not have good Internet connectivity, you cannot access these data. However, we have no any other way to access data from the cloud.

Vendor lock-in

Vendor lock-in is the biggest disadvantage of cloud computing. Organisations may face problems when transferring their services from one vendor to another. As different vendors provide different platforms, that can cause difficulty moving from one cloud to another.

Limited control

Cloud infrastructure is completely owned, managed, and

monitored by the service provider, so the cloud users have less control over the function and execution of services within a cloud infrastructure.

SECURITY

Although cloud service providers implement the best security standards to store important information. But, before adopting cloud technology, you should be aware that you will be sending all your organization's sensitive information to a third party, i.e., a cloud computing service provider. While sending the data on the cloud, there may be a chance that your organization's information is hacked by hackers.

Cloud computing Vs Cluster computing Vs Grid computing.

Cloud computing

- Cloud computing uses a client-server architecture to deliver computing resources such as servers, storage, databases and software over the cloud (internet) with pay-as-you-go-pricing.
- Cloud computing becomes a very popular option for organizations by providing various advantages, including cost-saving, increased productivity, efficiency, performance, data backup, disaster recovery and security.
- Cloud computing follows client-server computing architecture.
- Scalability is high.
- Cloud computing is more flexible than grid computing.

- Cloud operates as a centralized management system.
- In cloud computing cloud servers are owned by infrastructure providers.
- Cloud computing uses services like IaaS, PaaS and SaaS.
- Cloud computing is service-oriented.
- It is accessible through standard web protocols.

GRID COMPUTING

- Grid computing is also called as "distributed computing". It links multiple computing resources (PC's, workstations, servers, storage elements) together and provides a mechanism to access them.
- The main advantage of grid computing is that it increases user productivity by providing transparent access to resources, and work can be completed more quickly.
- Grid computing follows a distributed computing architecture.
- Scalability is normal.
- Grid computing is less flexible than cloud computing.
- Grid operates as a decentralized management system.
- In grid computing, grids are owned and managed by the organization.

- Grid computing uses systems like distributed computing, - distributed information and distributed pervasive.
- Grid computing is application-oriented.
- It is accessible through grid middleware.

CLUSTER COMPUTING

A computer cluster is a local network of two or more homogeneous computers. Computation happens on such a computer network i.e. cluster is called cluster computing.

- Nodes must be homogeneous i.e. they should have same type of hardware and operating system.
- Computers in a cluster are dedicated to the same work and perform no other task.
- Computers are located close to each other.
- Computers are connected by a high speed local area network bus.
- Computers are connected in a centralized network topology.
- Scheduling is controlled by a central server.
- Whole system has a centralized resource manager.
- Whole system functions as a single system.

- Cluster computing is used in areas such as Web logic Application servers, databases etc.
- It has centralized resource management.

OPEN STANDARD IMPORTANCE

UNIT - 2

- Comparison with traditional computing architecture (client/server)

- Cloud computing.

Cloud computing is collective combination of configurable system resources and demand services that can be delivered quickly using internet. It simply provides lower power expenses, no capital costs, no redundancy, lower employee costs, increased collaboration, etc. It makes us more efficient, more secure & provide greater flexibility.

- It refers to delivery of different services such as data and programs through internet on different servers.

- It takes place on third-party servers that is hosted by third-party hosting companies.

- It is ability to access data anywhere at anytime by user.

It is more cost effective as compared to traditional computing as operations and maintenance of server is shared among several parties that in turn reduce cost of public servers.

- It is more user friendly as compared to traditional computing because user can have access to data anywhere using internet.

- It requires fast, reliable and stable internet connections to access information anywhere at any time.

It provides more storage space and servers as well as more computing power so that applications and software run much faster and effectively.

It also provides availability and elasticity i.e. one can increase or decrease storage capacity, server resources, etc., according to business needs.

If cloud service is used by provider's support team.

Software is offered as an on-demand service (SaaS) that can be accessed through subscription service.

TRADITIONAL COMPUTING

Traditional computing is a process of using physical data centers for storing digital assets and running complete networking system for daily operations. In this access to data, or software, or storage by users is limited to device or official network they are connected with, user can have access to data only on system in which data is stored.

- It refers to delivery of different services on local servers.

It takes place on physical hard drives and website servers.

User can access data only on system in which data is stored.

It is less cost effective as compared to cloud computing because one has to buy expensive equipments to operate & maintain server.

- It is less user-friendly as compared to cloud because data cannot be accessed anywhere and if user has to access data in another system, then he needs to save it in an external storage medium.
- It does not require any internet connection to access data or information.
- It provides less storage as compared to cloud access data computing.
- It does not provide any scalability and elasticity.
- It requires own team to maintain and monitor system that will need a lot of time and effort.
- Software is purchased individually for every user and requires to be updated periodically.

Services provided at various levels.

Software as a Service (SaaS)

It is a way of delivering services and applications over the internet. Instead of installing and maintaining software, we simply access it via the internet, freeing ourselves from the complex software and hardware management. It removes the need to install and run applications on our computers or in the data centers eliminating the expenses of hardware as well as software maintenance.

SaaS provider is a complete software solution that you purchase on a pay-as-you-go basis from a cloud service provider.

Most SaaS applications can be run directly from a web browser without any downloads or installations required. The SaaS applications are sometimes called Web-based software, on-demand software, or hosted software.

Advantages of SaaS:

- Cost effective
- Reduced times
- Accessibility
- Automatic updates
- Scalability

Platform As A Service

PaaS is a category of cloud computing that provides a platform and environment to allow developers to build applications and services over the internet. PaaS services are hosted in the cloud and accessed by users simply via a web browser. A PaaS provider hosts the hardware and software on its own infrastructure. As a result, PaaS frees users from having to install in-house hardware and software to develop or run a new application. Thus, the development and deployment of the application take place independent of the hardware. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment. To make it simple, take the example of an annual day function you will have two options either to create a venue or do rent a venue but the function is the same.

Advantages of Paas.

- Simple and convenient for users.
- Cost-effective.
- Efficiently managing the lifecycle. (designed to support the complete web application lifecycle; building, testing, deploying, managing & updating.)

INFRASTRUCTURE AS A SERVICE

Infrastructure as a service (IaaS) is a service model that delivers computer infrastructure on an outsourced basis to support various operations. Typically IaaS is a service where infrastructure is provided as outsourcing to enterprise such as networking equipment, devices, database, and web servers.

It is also known as hardware as a service (HaaS). IaaS customers pay on a per-user basis, typically by the hour, week, or month. Some providers also charge customers based on the amount of virtual machine space they use.

It simply provides the underlying operating systems, security, networking, and servers for developing such applications and services and deploying development tools, databases, etc.

Advantages of IaaS.

- Cost-effective
- Website hosting
- Security
- Maintenance.

Architecture of cloud computing (working).

Cloud computing which is one of the demanding technology of the current time and which is giving a new shape to every

organisation by providing on demand virtualized resources /resources starting from small to medium and medium to large, every organisation uses cloud computing resources for storing information and accessing it from anywhere and anytime only with the help of internet.

Cloud is divided into two parts

- ① Front end
- ② Back end

Architecture of cloud computing is the combination of both SOA (service oriented architecture) and FDA (Event driven-architecture). Client infrastructure, application, service, runtime, cloud, storage, infrastructure, management and security all these are the components of cloud computing architecture.

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 platform.

Client Infrastructure - Client infrastructure is a part of the frontend component. It contains the applications and user interfaces which are required to access the cloud platform. It provides (graphical user interface) GUI to interact with the cloud.

Backend:

Backend refers to the cloud itself which is used by the

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 mechanism, deployment models etc.

① Application

Application in backend refers to a software or platform to which client accesses. Means it provides the services in backend as per the client requirement.

② Service

Service in backend refers to the major three types like SaaS, PaaS, IaaS - Also manages authority of service the user accesses.

③ Runtime cloud

Runtime cloud in backend provides the execution and runtime platform / environment to the Virtual machine.

④ Storage

Storage in backend provides reliable and scalable storage services and management of stored data.

⑤ Infrastructure

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

⑥ Management

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

⑦

Security

Security in backend refers to implementation of different security mechanisms in the backend for secure cloud resources & system files, and infrastructure to end users.

⑧

Internet

Internet connection acts as the medium or a bridge b/w frontend and backend and establishes the interaction and communication between frontend and backend.

Benefits of cloud architecture

- Makes overall computing simpler
- Improves data processing requirements
- Helps in providing high security
- Makes it more modularized
- Results in better disaster recovery
- gives good user accessibility
- Reduces IT operating costs

Web development and User Interface on cloud

- Scalability
- Cost effective
- data security
- Easy accessibility
- Productivity
- Mobility
- Website management
- Service model
- Flexibility

Cloud Deployment Models

It identifies the specific type of cloud environment based on ownership, scale & access, as well as the cloud's nature and purpose. The location of the servers you're utilizing and who controls them are defined by a cloud deployment model. It specifies how your cloud infrastructure will look, what you can change, and whether you will be given services or will have to create everything yourself. Relationships b/w the infrastructure and your users are also defined by cloud deployment types.

- **Public cloud**

The public cloud makes it possible for anybody to access system and services. The public cloud may be less secure as it is open for everyone. The public cloud is one in which cloud infrastructure services are provided over the internet to the general people or major industry groups. The infrastructure in this cloud model is owned by the entity that delivers the cloud services, not by the consumer. It is a type of cloud hosting that allows customers and users to easily access systems and services. This form of cloud computing is an excellent example of cloud hosting, in which service providers supply services to a variety of customers. In this arrangement, storage backup & retrieval services are given for free, as a subscription, or on a per-use basis. Eg: Google App engine.

Advantages of public cloud

- Minimal Investment
- No setup cost
- Infrastructure management is not required
- No maintenance
- Dynamic Scalability

PRIVATE CLOUD

The private cloud deployment model is the exact opposite of the public cloud deployment model. It's a one-on-one environment for a single user (customer). There is no need to share your hardware with anyone else. The distinction between private and public cloud is in how you handle, own the hardware. It is also called "internal cloud" as it refers to the ability to access systems and services within a given border or organization. The cloud platform is implemented in a cloud-based secure environment that is protected by powerful firewalls and under the supervision of an organization's IT department.

The private cloud gives the greater flexibility of control over cloud resources.

Advantages of the private cloud model.

- Better control
- Data security and privacy
- Supports Legacy systems
- Customization

HYBRID CLOUD

By bridging the public and private worlds with a layer of proprietary software, hybrid cloud computing gives the best of both worlds. With a hybrid solution, you may host the app in a safe environment while taking advantage of public-cloud's cost savings. Organizations can move data and applications b/w different clouds using a combination of two or more cloud deployment methods, depending on their needs.

Advantages of the hybrid cloud model

- Flexibility and control

- Cost

- Security

COMMUNITY CLOUD

It allows systems and services to be accessible by a group of organizations. It is a distributed system that is created by integrating the services of different clouds to address the specific need of the community, industry or business. The infrastructure of the community would be shared between the organization which has shared concerns or tasks. It is generally managed by a third party or by the combination of one or more organizations in the community.

Advantages of community cloud

- Cost effective
- Security
- Shared resources
- Collaboration and data sharing

UTILITY COMPUTING

Utility computing is a service-providing paradigm in which a service provider makes computer resources and infrastructure management available to customers as needed, charging them on a per-use basis rather than a set fee.

The user can only pay for what they use using utility computing. It is a plug-in that is administered by an organization that determines what kind of cloud services must be deployed.

The majority of businesses prefer a hybrid strategy.

VIRTUALISATION

Virtualisation is a technique of how to separate a service from the underlying physical delivery of that service. It is the process of creating virtual version of something like - computer hardware.

In other words, one of the main cost effective, hardware reducing, and energy saving techniques used by cloud providers is virtualization. Virtualization allows to share a single physical instance of a resource or an application among multiple customers and organisation at one time.

Benefits of virtualization

- More flexible and efficient allocation of resources
- Enhance development productivity
- It lowers the cost of IT infrastructure.
- Remote access and rapid availability.
- High availability and disaster recovery.
- Pay per use of the IT infrastructure on demand
- Enables running multiple operating systems.