UNIT-3

Explain different models for deployment in cloud computing?

Cloud Deployment Models

- Public Cloud
- Hybrid Cloud
- Multi-Cloud

Explain the difference between cloud and traditional datacentres?

What is Cloud Computing?

Cloud Computing, as the name suggests, is a collective combination of configurable system resources and advanced services that can be delivered quickly using the internet. It simply provides lower power expenses, no capital costs, no redundancy, lower employee costs, increased collaboration, etc. It makes us more efficient, and more secure, and provides greater flexibility.

Advantages of Cloud Computing

The following are the Advantages of Cloud Computing:

- **Scalability:** Cloud computing allows organizations to easily scale their computing resources up or down as their needs change, without having to purchase and manage additional hardware.
- **Cost Savings:** Using cloud computing can be more cost-effective than maintaining on-premises IT infrastructure, as it eliminates the need for costly hardware, software, and maintenance expenses.
- **Accessibility:** Cloud computing enables remote access to applications and data, allowing users to work from anywhere with an internet connection.
- **Reliability:** Cloud providers offer high levels of uptime and redundancy, ensuring that applications and data are available even in the event of hardware failure.
- **Flexibility:** Cloud computing offers a wide range of deployment options, including public, private, and hybrid clouds, which can be tailored to meet the unique needs of an organization.

Disadvantages of Cloud Computing

The following are the disadvantages of Cloud Computing:

- **Security*:*** Cloud computing involves sharing sensitive data with a third-party provider, which raises concerns about data security and privacy.

- **Dependence:** Organizations that rely on cloud providers for their computing infrastructure are vulnerable to service disruptions or data loss in the event of provider outages or other issues.
- **Internet Dependency:** Cloud computing requires a reliable and fast internet connection to access applications and data, which can be a challenge in some areas.
- **Technical Issues:** Technical issues with cloud services, such as compatibility problems or software bugs, can sometimes be difficult to resolve and can result in downtime or lost productivity.
- **Lack of Control:** With cloud computing, organizations have limited control over the infrastructure and services they use, which can make it difficult to customize or optimize the environment for their specific needs.

What is Traditional Computing?

Traditional Computing, as name suggests, is a possess 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 relate to. In this computing, user can have access to data only on system in which data is stored.

Advantages of Traditional Computing

Following are the advantages of Traditional Computing:

- **Control:** With traditional computing, an organization has full control over the hardware and software it uses, allowing for customization and optimization of the computing environment.
- **Security:** Traditional computing offers a high level of data security, as sensitive data can be stored on-premises and protected by firewalls, encryption, and other security measures.
- **Reliability:** Traditional computing is not dependent on internet connectivity, making it less vulnerable to service disruptions or data loss.
- **Compatibility:** Traditional computing environments can be tailored to meet the specific needs of an organization, ensuring compatibility with existing software and systems.
- **Data Ownership:** With traditional computing, an organization owns and controls all of its data, reducing concerns about data privacy and regulatory compliance.

Disadvantages of Traditional Computing

Following are the disadvantages of Traditional Computing:

- **Cost:** Traditional computing can be more expensive than cloud computing, as it requires significant capital expenditures for hardware and software, as well as ongoing maintenance and support expenses.
- **Scalability:** Traditional computing can be difficult to scale up or down to meet changing needs, as it requires additional hardware or software to be added to the environment.
- **Accessibility**: Traditional computing may not allow for remote access to applications and data, limiting the ability of users to work from anywhere.
- **Maintenance:** Traditional computing environments require ongoing maintenance and upgrades to ensure security and performance, which can be time-consuming and expensive.
- **Limited Storage Capacity:** Traditional computing environments may have limited storage capacity, requiring organizations to periodically purchase additional hardware to accommodate growing data volumes.

Aspect	**Cloud Computing**	**Traditional Computing**
Definition	Cloud Computing refers to delivery of different services such as data and programs through internet on different servers.	Traditional Computing refers to delivery of different services on local server.
Infrastructure Location	Cloud Computing takes place on third-party servers that is hosted by third-party hosting companies.	Traditional Computing takes place on physical hard drives and website servers.
Data Accessibility	Cloud Computing is ability to access data anywhere at any time by user.	User can access data only on system in which data is stored.
Cost Effectiveness	Cloud Computing is more cost effective as compared to tradition computing as operation and maintenance of server is shared among several parties that in turn reduce cost of public services.	Traditional Computing is less cost effective as compared to cloud computing because one has to buy expensive equipment's to operate and maintain server.
User-Friendliness	Cloud Computing is more user-friendly as compared to traditional computing because	Traditional Computing is less user-friendly as compared to cloud computing because data cannot be accessed anywhere and if user must access data in another system, then he

Aspect	Cloud Computing	Traditional Computing
	user can have access to data anytime anywhere using internet.	need to save it in external storage medium.
Internet Dependency	Cloud Computing requires fast, reliable and stable internet connection to access information anywhere at any time.	Traditional Computing does not require any internet connection to access data or information.
Storage and Computing Power	Cloud Computing provides more storage space and servers as well as more computing power so that applications and software run must faster and effectively.	Traditional Computing provides less storage as compared to cloud computing.
Scalability and Elasticity	Cloud Computing also provides scalability and elasticity i.e., one can increase or decrease storage capacity, server resources, etc., according to business needs.	Traditional Computing does not provide any scalability and elasticity.
Maintenance and Support	Cloud service is served by provider's support team.	Traditional Computing requires own team to maintain and monitor system that will need a lot of time and efforts.
Software Delivery Model	Software is offered as an on-demand service (SaaS) that can be accessed through subscription service.	Software in purchased individually for every user and requires to be updated periodically.

Discuss Cloud Capabilities and Platform Features?

Cloud Capabilities:

- **On-Demand Self-Service:**

Users can access and manage computing resources (storage, servers, etc.) independently without needing to interact with a service provider's IT staff.

- **Broad Network Access:**

Cloud services are accessible from various devices (laptops, tablets, smartphones) via the internet, facilitating remote work and collaboration.

- **Resource Pooling:**

Cloud providers pool resources (physical and virtual) to serve multiple customers, leading to economies of scale and efficient resource utilization.

- **Rapid Elasticity:**

Resources can be scaled up or down quickly based on demand, eliminating the need for upfront investment in peak capacity infrastructure.

- **Measured Service:**

Cloud providers offer pay-per-use pricing models, ensuring users only pay for the resources they consume, promoting cost transparency and avoiding overspending.

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Cloud Platform Features:

- **Scalability:**

Cloud platforms allow for dynamic scaling of resources to meet fluctuating business demands, avoiding performance bottlenecks and enabling efficient resource allocation.

Cost Efficiency:

Cloud services operate on a pay-as-you-go model, eliminating the need for expensive hardware and infrastructure investments, leading to significant cost savings.

Flexibility and Accessibility:

Cloud platforms enable access to services from anywhere with an internet connection, supporting remote work and global collaboration.

Security:

Cloud providers implement robust security measures like encryption, firewalls, and regular updates to protect user data and applications.

Reliability:

Cloud services offer high availability and redundancy, minimizing downtime and ensuring business continuity.

Collaboration:

Cloud platforms facilitate real-time collaboration on documents and projects, regardless of location, enhancing teamwork and productivity.

Disaster Recovery:

Cloud services often include automated backups and recovery options, minimizing data loss risks in case of unforeseen events.

Innovation:

Cloud platforms offer access to cutting-edge technologies and tools, fostering innovation and enabling businesses to stay ahead of the curve.

Sustainability:

Cloud computing reduces energy consumption compared to traditional on-premises infrastructure, contributing to environmental responsibility.

Explain Parallel and Distributed Programming Paradigms

Parallel Programming Paradigms:

Parallel programming focuses on executing multiple tasks or sub-tasks simultaneously within a single computing system, typically utilizing multiple processors or cores. The key characteristic is that these processors often share access to common memory.

- **Shared Memory Paradigm:**

In this model, multiple threads or processes run on different cores of a single machine and communicate by reading from and writing to shared memory locations. Synchronization mechanisms (e.g., locks, mutexes) are crucial to prevent data corruption. OpenMP is a common API for shared-memory parallel programming.

- **Data Parallelism:**

This paradigm involves performing the same operation on different subsets of a large dataset concurrently. Each processor works on a distinct portion of the data, often in a "single program, multiple data" (SPMD) style.

- **Task Parallelism:**

This involves dividing a problem into independent tasks that can be executed concurrently by different processors. Each task might perform a different operation.

Distributed Programming Paradigms:

Distributed programming involves coordinating and executing tasks across multiple independent computers connected by a network. These machines typically have their own private memory and communicate by passing messages.

- **Message Passing Paradigm:**

Processes on different machines communicate explicitly by sending and receiving messages. This is a fundamental paradigm for distributed systems, with Message Passing Interface (MPI) being a widely used standard.

- **Client-Server Paradigm:**

A central server provides services to multiple clients over a network. Clients send requests to the server, which processes them and sends back responses.

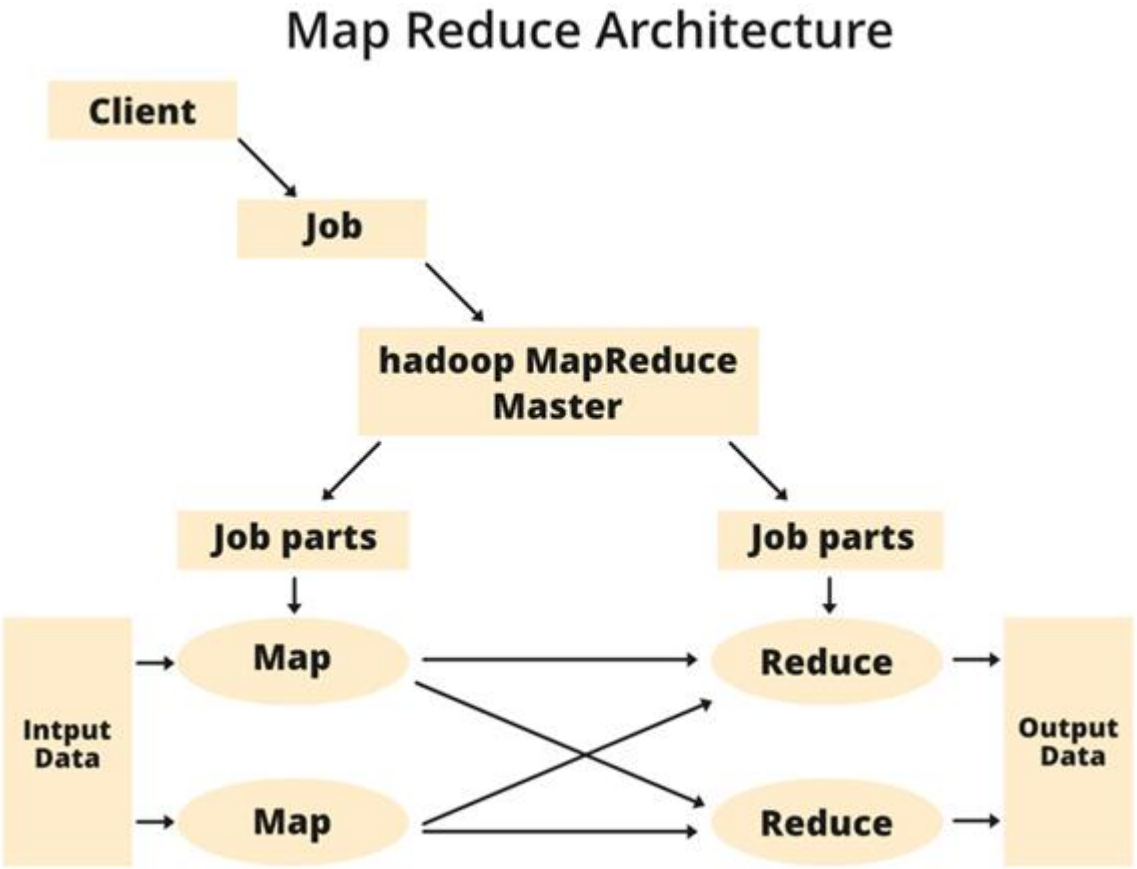
- **Peer-to-Peer (P2P) Paradigm:**

All nodes in the system are considered equal and can act as both clients and servers, sharing resources and communicating directly with each other without a central authority.

- **Remote Procedure Call (RPC) / Remote Method Invocation (RMI):**

These paradigms allow a program on one machine to execute a procedure or method on a remote machine as if it were a local call, abstracting away the network communication details.

Explain Map Reduce Framework?



Write about Infrastructure Cloud Features?

Cloud infrastructure components:

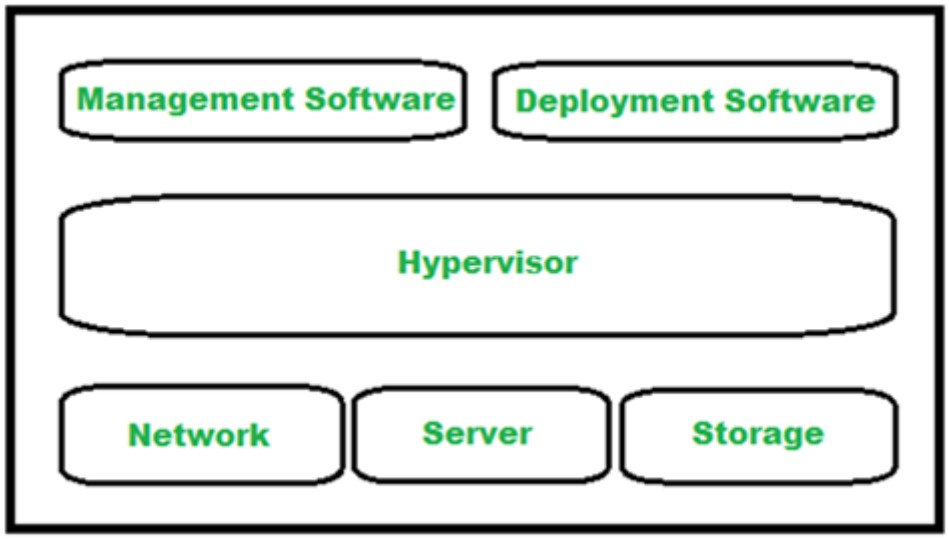
Different components of cloud infrastructure support the computing requirements of a cloud computing model. Cloud infrastructure has number of key components but not limited to only server, software, network and storage devices. Still cloud infrastructure is categorized into three parts in general i.e.

1. **Computing**

2. **Networking**
3. **Storage**

The most important point is that cloud infrastructure should have some basic infrastructural constraints like transparency, scalability, security and intelligent monitoring etc.

The below figure **represents components of cloud infrastructure**



1. Hypervisor:

Hypervisor is a firmware or a low-level program which is a key to enable virtualization. It is used to divide and allocate cloud resources between several customers. As it monitors and manages cloud services/resources that's why hypervisor is called as VMM (Virtual Machine Monitor) or (Virtual Machine Manager).

2. Management Software:

Management software helps in maintaining and configuring the infrastructure. Cloud management software monitors and optimizes resources, data, applications and services.

3. Deployment Software:

Deployment software helps in deploying and integrating the application on the cloud. So, typically it helps in building a virtual computing environment.

4. Network:

It is one of the key components of cloud infrastructure which is responsible for connecting cloud services over the internet. For the transmission of data and resources externally and internally network is must require.

5. Server :

Server which represents the computing portion of the cloud infrastructure is responsible for managing and delivering cloud services for various services and partners, maintaining security etc.

6. Storage :

Storage represents the storage facility which is provided to different organizations for storing and managing data. It provides a facility of extracting another resource if one of the resource fails as it keeps many copies of storage.

Discuss Platform features supported by Clouds?

Core Characteristics:

- **On-demand Self-Service:**

Users can provision and manage computing resources (like servers or storage) themselves without needing to interact with a human administrator.

Broad Network Access:

Services are accessible over standard networks and various devices like laptops, tablets, and smartphones.

Resource Pooling:

Cloud providers pool resources (compute, storage, networking) to serve multiple customers, optimizing utilization and cost.

Rapid Elasticity:

Resources can be scaled up or down quickly and automatically based on demand, ensuring optimal performance and cost efficiency.

Measured Service:

Usage is monitored and metered, allowing users to pay only for the resources they consume

Demonstrate Record Reader in Hadoop?

The RecordReader is a key class in Hadoop's MapReduce compute engine. It **converts the byte-oriented view of input data into record-oriented view for the mapper to process**. In essence, it interprets the raw data into a consumable form - an essential function in the context of data pipelines in MapReduce.