1. Write 10 Laws of Cloudonomics.

1. **Utility services cost less even though they cost more:** This means that cloud services charge more per unit of resource than owning or renting your own servers, but you only pay for what you use, so you save money when your demand is not constant.
2. **On-demand trumps forecasting.**: This means that cloud services let you scale up or down quickly to meet unexpected changes in demand, so you can capture more revenue and avoid wasting money on unused capacity.
3. **The peak of the sum is never greater than the sum of the peaks:** This means that cloud providers can share resources among many customers who have different peak times, so they need less total capacity than if each customer had to provision for their own peak.
4. **Aggregate demand is smoother than individual:** This means that cloud providers can achieve higher utilization of their resources by serving many customers whose demands vary independently, so they can offer lower prices.
5. **Average unit costs are reduced by distributing fixed costs over more units of output:** This means that cloud providers can benefit from economies of scale by spreading their fixed costs (such as infrastructure, software, security, etc.) over a large number of customers and transactions.
6. **Superiority in numbers is the most important factor in the result of a combat (Clausewitz):** This means that cloud providers can better defend against cyberattacks by having more resources and expertise than individual enterprises.
7. **Space-time is a continuum:** This means that cloud services can give you a competitive advantage by enabling faster processing and decision-making for the same cost, or lower cost for the same speed.
8. **Dispersion is the inverse square of latency:** This means that cloud providers can reduce latency (the delay between sending and receiving data) by having more nodes (servers) closer to the customers than individual enterprises can afford to do.
9. **Don't put all your eggs in one basket:** This means that cloud providers can increase reliability by having redundant and geographically dispersed components (such as data centers) that can survive failures or disasters.
10. **An object at rest tends to stay at rest (Newton):** This means that cloud providers can optimize their locations for network, power, cooling, and land costs, while individual

enterprises tend to keep their data centers where they started or where they got a good deal.

2. Seven-step model of migration into a cloud.

The seven-step model of migration into a cloud is a framework for planning and executing the migration of IT infrastructure, applications, and data to a cloud environment.

The steps are:

1. **Conduct cloud migration assessments** to evaluate the current state, goals, benefits, feasibility, risks, and costs of migration.
2. **Isolate** the dependencies of your applications within your existing data center, such as libraries, frameworks, databases, middleware, etc.
3. **Map** the data and application components that will remain in your existing data center and those that will move to the cloud, as well as define the communication and integration mechanisms between them.
4. **Re-architect or refactor** your applications to leverage the cloud-native features and services, such as elasticity, availability, automation, etc.
5. **Augment** your applications with additional functionalities or capabilities that are enabled by the cloud platform, such as analytics, monitoring, backup, etc.
6. **Test** your migrated applications in the cloud environment to ensure that they function correctly and meet your expectations.
7. **Optimize and iterate** your migrated applications for performance, reliability, security, and cost efficiency in the cloud environment, as well as iterate on your migration process based on feedback and learning.

3. What is Cloud computing?

Cloud computing stands for storing and accessing data and programs over the internet, rather than on your computer’s hard drive.

For example, you can use Google Drive to store your files online and access them from any device with an internet connection.

Some advantages of cloud computing are scalability, flexibility, cost-efficiency, and reliability.

Some disadvantages are security risks, dependency on internet connectivity and vendor lock-in.

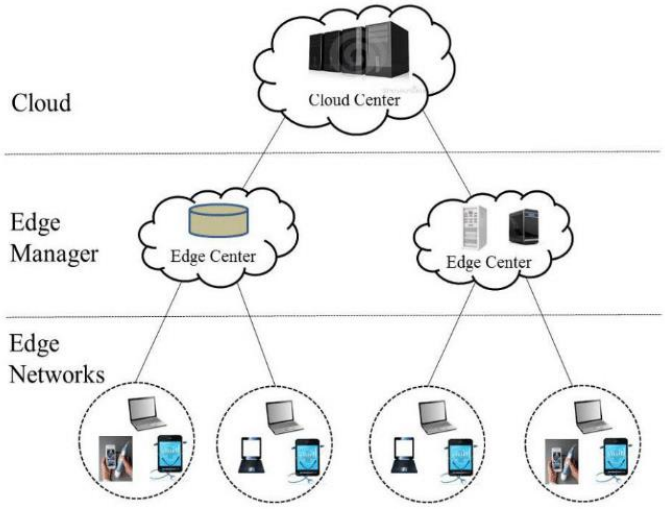
4. What is Edge computing?

Edge computing can be defined as the processing of sensor data away from the centralised nodes and close to the logical edge of the network, toward individual sources of data.

For example, a smart camera can perform face recognition on the device itself without sending the images to the cloud.

Some advantages of edge computing are low latency, reduced bandwidth consumption, enhanced privacy, and security.

Some disadvantages are complexity, maintenance, and interoperability.



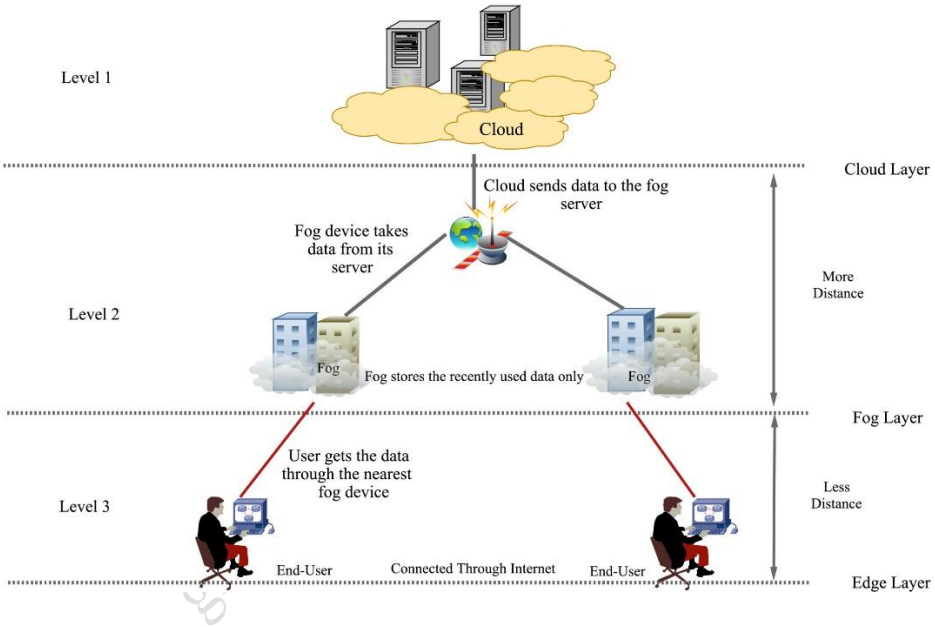
5. What is Fog computing?

Fog computing refers to extending cloud computing to the edge of an enterprise's network. It pushes intelligence down to the local area network (LAN) level of network architecture, processing data in a fog node or IoT gateway.

For example, a smart traffic system can use fog nodes to collect and analyse data from various sensors and cameras on the road and communicate with the cloud for coordination and control.

Some advantages of fog computing are improved performance, reduced network congestion, distributed processing, and storage.

Some disadvantages are scalability issues, security challenges and resource management.



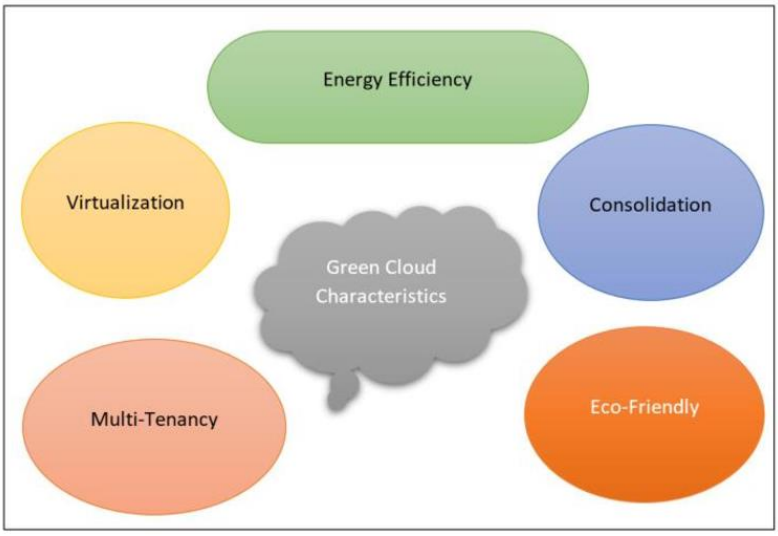
6. What is Green computing?

Green computing is the practice of designing, manufacturing, using, and disposing of computers and related devices in an environmentally friendly way. It aims to reduce the energy consumption, carbon footprint and e-waste of computing systems.

For example, a green data center can use renewable energy sources, efficient cooling systems and virtualization techniques to minimize its environmental impact.

Some advantages of green computing are cost savings, social responsibility, compliance with regulations and enhanced reputation.

Some disadvantages are initial investment, technical limitations, and lack of awareness.



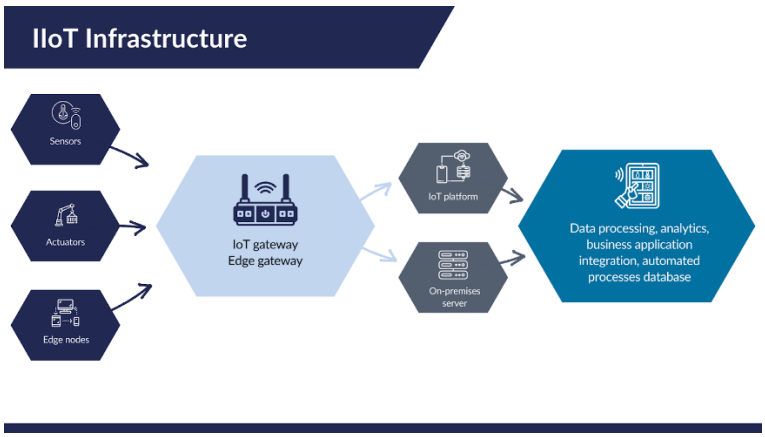
7. IIOT definitions examples, advantages and disadvantages.

IIoT stands for Industrial Internet of Things. It is the use of smart sensors and actuators to enhance manufacturing and industrial processes. It also encompasses traditional physical infrastructure like shipping containers and logistics trucks to gather data, react to events, and make smarter decisions with the help of smart devices.

For example, a smart factory can use IIoT devices to monitor and control the production line, optimize the energy consumption, detect faults, and perform preventive maintenance.

Some advantages of IIoT are improved efficiency, productivity, quality, safety, and profitability.

Some disadvantages are security risks, complexity, interoperability, and scalability issues.



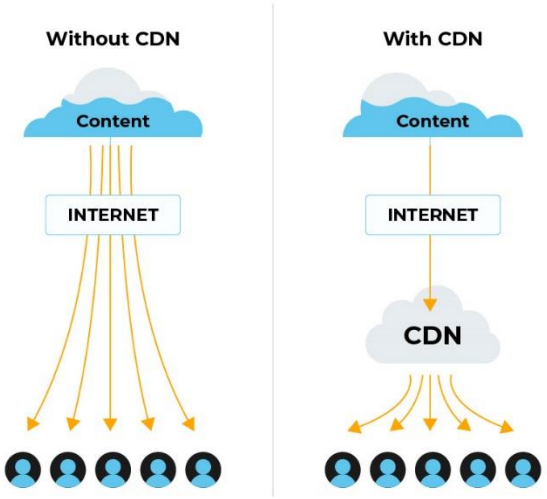
8. What is Cloud Content Delivery Network (CDN) Services?

Cloud Content Delivery Network Services are services that provide a content delivery network (CDN) that accelerates web and video content delivery by using a global network of edge servers to bring content as close to the users as possible.

For example, Google Cloud CDN is a service that offers fast and reliable web and video content delivery with global scale and reach.

Some advantages of cloud CDN services are better performance, scalability, flexibility, and reliability.

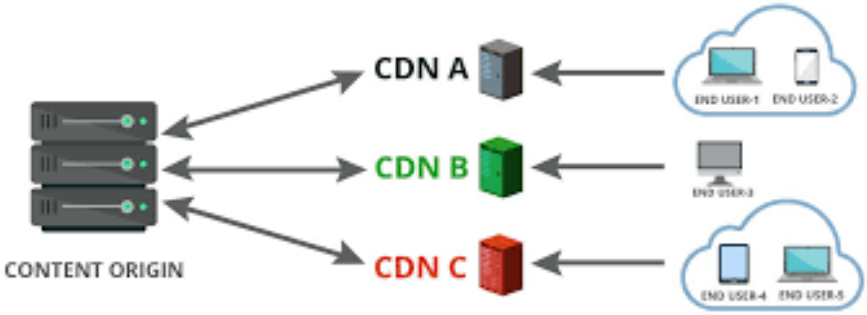
Some disadvantages are security risks, dependency on internet connectivity and vendor lock-in.



9.What is Multi-CDN?

Multi-CDN is a strategy that uses multiple CDN providers to deliver content to users based on various criteria such as performance, availability, cost, and location. For example, Netflix uses multi-CDN to stream its videos to millions of users around the world by dynamically switching between different CDN providers based on the quality of service. Some advantages of multi-CDN are improved user experience, reduced latency, increased

redundancy, and optimized cost. Some disadvantages are complexity, management, and interoperability.

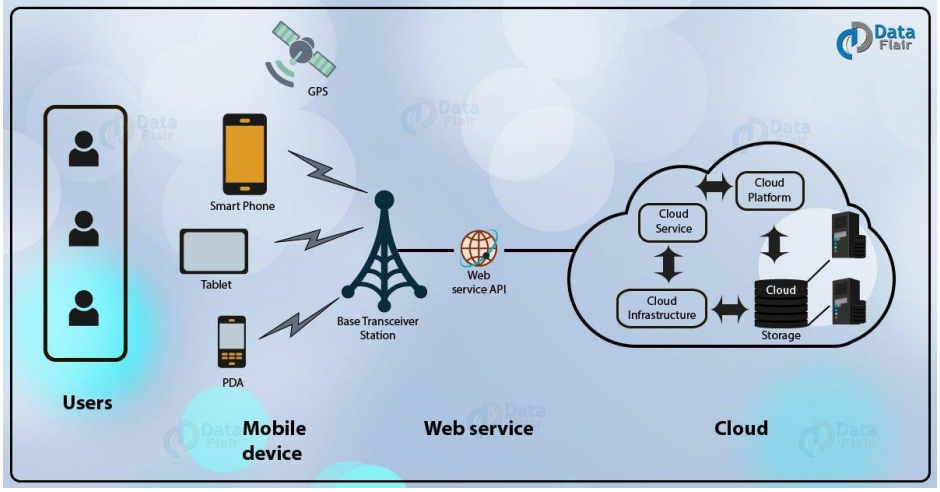


10. What is MetaCDN?

Meta CDN is a type of multi-CDN that uses a cloud-based layer to orchestrate the delivery of content across multiple CDN providers. For example, MetaCDN is a service that offers meta CDN solutions for web acceleration, video streaming and live streaming. Some features of meta CDN are automatic CDN selection, real-time performance monitoring, load balancing and failover.

11. What is Mobile Cloud Computing?

Mobile Cloud Computing is a paradigm that combines mobile computing and cloud computing to enable the delivery of cloud services to mobile devices over wireless networks. For example, Google Docs is a service that allows users to create and edit documents on their mobile devices by accessing the cloud-based application and storage. Some advantages of mobile cloud computing are enhanced functionality, scalability, availability, and security. Some disadvantages are network dependency, bandwidth limitations and privacy concerns.

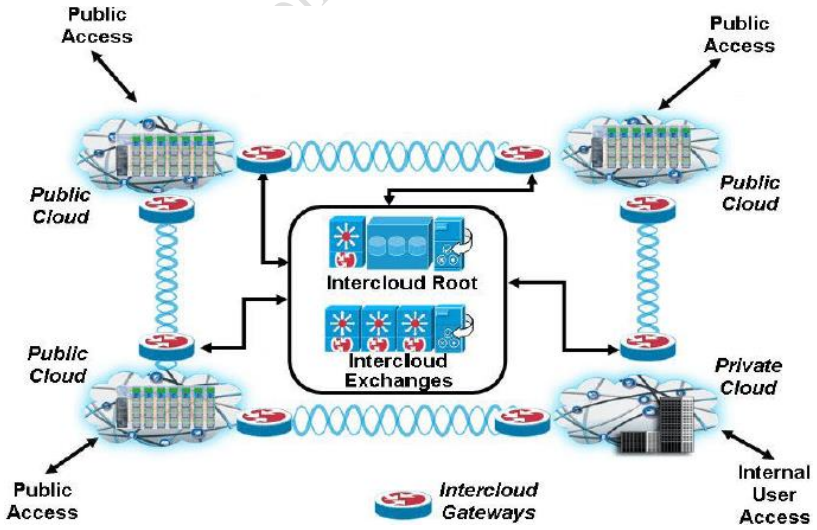


12. What is InterCloud?

InterCloud is a concept that envisions the interconnection of multiple cloud providers to form a global cloud of clouds.

For example, InterCloud Testbed is a project that aims to develop an open framework for intercloud interoperability and federation.

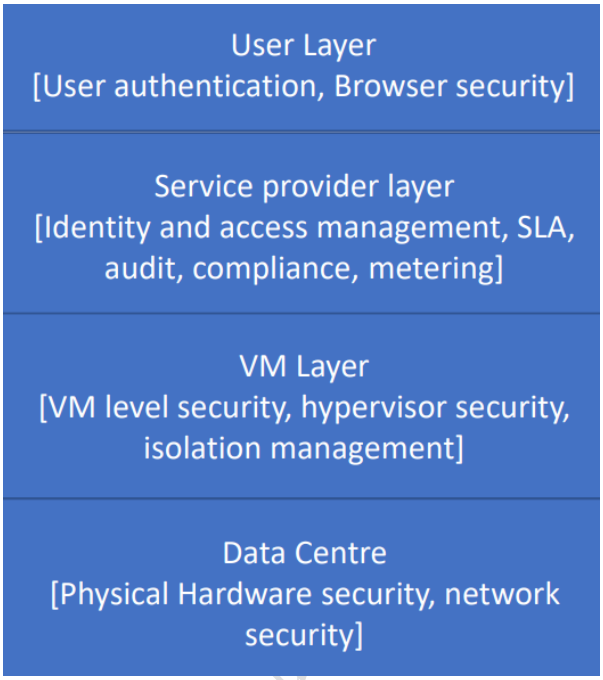
Some issues of intercloud are standardization, governance, security, and trust.



13. Explain Cloud Computing Security Architecture.

Architecture view of the security issues to be addressed in a cloud computing environment for providing security to the customer. This architecture defined four layers on the basis of cloud computing services categorization.

Four Layers of security Architecture:



1. Data Centre Layer: This layer is related to traditional infrastructure security concerns. It consists of physical hardware security, theft protection, network security and all physical assets security.
2. VM Layer: This layer involves VM level security issues, VM monitoring, hypervisor-related security issues and VM isolation management issues.
3. Service provider layer: This layer is responsible for identity and access management, service level agreement (SLA), metering, compliance, and audit- related issues.
4. User layer: This is the first layer of user interaction. It is responsible for user authentication and authorization and all browser- related security issues

14. Explain Types of Cloud Database.

A cloud database is a database that is built, deployed, and accessed in a cloud environment, such as a private, public, or hybrid cloud.

There are two main types of cloud databases:

1. Relational cloud databases consist of one or more tables of columns and rows and allow you to organize data in predefined relationships to understand how data is logically related. Some examples of relational cloud databases are Microsoft SQL Server, Oracle, MySQL, PostgreSQL, and IBM Dbon Cloud.
2. Non-relational cloud databases do not use tables or relationships to store data, but rather use other data models such as key-value, document, graph, or columnar. Some examples of non-relational cloud databases are MongoDB Atlas, OpenStack, DataStax Astra, Rackspace, Redis Enterprise Cloud, EDB Postgres Advanced Server, and SAP HANA Cloud.

Cloud databases offer many benefits compared to on-premises databases, such as fast deployment, accessibility, scalability, disaster recovery, lower hardware costs, value for money, latest tech, and security. However, they also have some challenges such as data privacy, compliance, vendor lock-in, network dependency, and performance variability.

15. Explain Distributed File System.

A distributed file system (DFS) is a file system that is distributed on multiple file servers or multiple locations. It allows programs to access or store isolated files as they do with the local ones, allowing programmers to access files from any network or computer. The main purpose of a DFS is to allow users of physically distributed systems to share their data and resources by using a common file system.

DFS has two components:

1. **Location transparency –** Location transparency achieves through the namespace component. It means that the users do not need to know the physical location of the files or the file servers. The files are accessed by logical names that are mapped to physical locations by the DFS.
2. **Redundancy –** Redundancy is done through a file replication component. It means that the files are copied on multiple nodes for fault tolerance and load balancing. The DFS ensures that the copies are consistent and synchronized.

16. Explain GFS and HDFS.

Cloud GFS and HDFS are both distributed file systems that store large amounts of data across multiple machines. They are similar in many ways, but they also have some differences.

1. **GFS stands for Google File System.** It is a proprietary file system developed by Google to handle its massive data processing needs. GFS splits files into 64 MB chunks and replicates them across different chunk servers for fault tolerance and availability. GFS has a single master server that manages the metadata, such as namespace, access control, and chunk locations. GFS allows multiple appends and concurrent writes to the same file by using a leasing mechanism that grants write permission to a chunk server for a limited time.

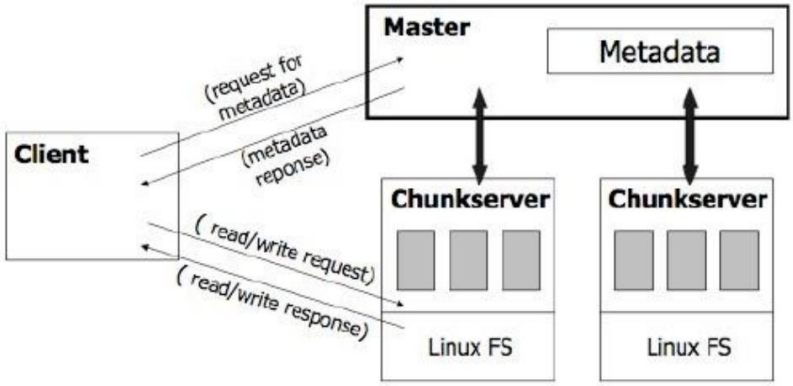
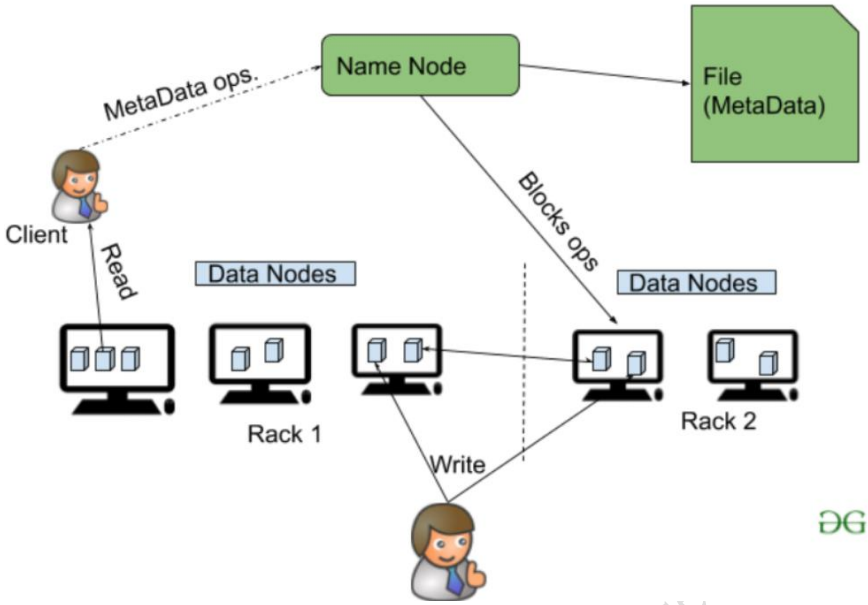


Figure 1

2. **HDFS stands for Hadoop Distributed File System.** It is an open-source file system that is part of the Apache Hadoop project. HDFS is inspired by GFS, but it has some differences and improvements. HDFS also splits files into 64 MB chunks and replicates them across different data nodes for fault tolerance and availability. HDFS has a single name node that manages the metadata, such as namespace, access control, and block locations. HDFS only allows one open and one append operation per file at a time. HDFS also supports snapshots, quotas, encryption, erasure coding, and federation.



Some of the advantages of using cloud storage over HDFS are:

Cloud storage can scale elastically without requiring manual intervention or provisioning.

Cloud storage can offer lower costs and higher durability than HDFS by using different storage classes and lifecycle policies.

Cloud storage can decouple storage from compute, allowing users to run different types of workloads on the same data without affecting performance or availability.

Cloud storage can integrate with other cloud services and tools, such as BigQuery, Dataflow, Dataproc, and Cloud AI Platform.

Some of the disadvantages of using cloud storage over HDFS are:

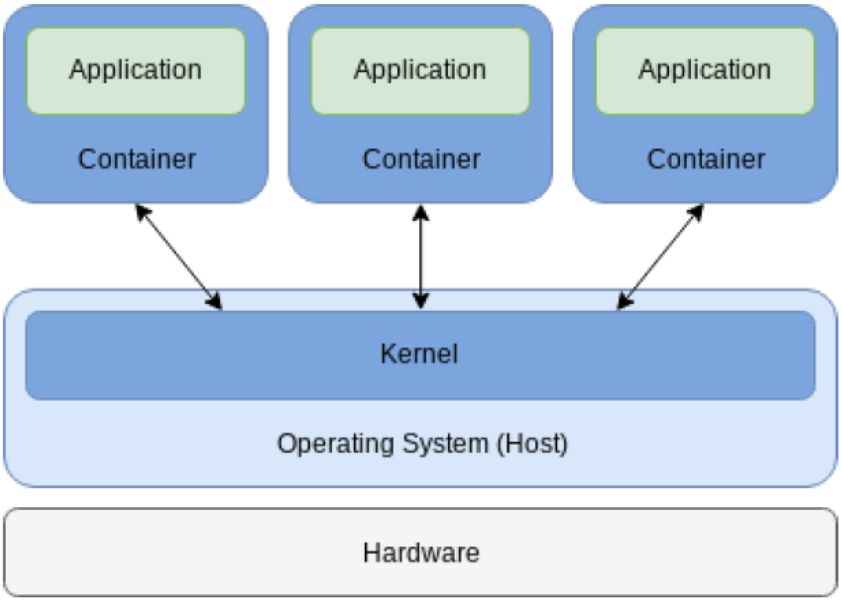
Cloud storage may have higher I/O variance than HDFS, which can affect applications that require consistent I/O performance, such as HBase or other NoSQL databases.

Cloud storage may have higher latency than HDFS, especially for small files or random reads.

Cloud storage may have different semantics than HDFS, such as eventual consistency or lack of atomic renames, which can cause compatibility issues with some applications or frameworks.

17. Explain Container architectures?

A container architecture is a way of designing and deploying software applications using containers. Containers are executable units of software that package up code and all its dependencies, so the application runs quickly and reliably from one computing environment to another. Containers are lightweight and portable because they do not need to include a full operating system in every instance and can instead share the features and resources of the host operating system.



Some features of container architectures are:

Isolation: Containers provide a level of isolation from the host and other containers, which improves security and performance.

Scalability: Containers can be easily scaled up or down to meet the demand of the application, without affecting other containers or the host.

Portability: Containers can run on any platform that supports the container runtime, such as Linux, Windows, or cloud providers, without requiring any changes to the code or configuration.

Consistency: Containers ensure that the application runs the same way in any environment, regardless of the differences in hardware, software, or network.

18. Explain Docker containers.

Docker is an open-source platform that enables you to build, run, and share containers. Docker containers are based on Docker images, which are lightweight, standalone packages of software that include everything needed to run an application: code, runtime, system tools, system libraries and settings. Docker images become containers when they run on Docker Engine, which is a software that manages the lifecycle of containers.

Some features of Docker containers are:

- **Standardization:** Docker created the industry standard for containers, so they can be portable and interoperable across different platforms and tools.
- **Efficiency:** Docker containers are small and fast, as they share the machine's OS kernel and do not require a full OS per application. This reduces the overhead and improves the resource utilization.
- **Security:** Docker containers are safer than traditional applications, as they have the strongest default isolation capabilities in the industry. Docker also provides mechanisms to secure the container images and network communications.

19. What is Kubernetes?

Kubernetes is a system that helps you automate the deployment, scaling, and management of containerized applications. **It also provides features such as automation, management, security, workload, or load balancing.**

Kubernetes lets you run your applications on a cluster of machines (nodes) without worrying about how to distribute them, how to make them communicate, how to manage failures, how to scale them up or down, etc. Kubernetes takes care of all these tasks for you by using a set of rules and configurations that you provide.

Kubernetes is also known as K8s. It is an open-source project that was originally developed by Google and is now maintained by the Cloud Native Computing Foundation (CNCF).