

(1) data transfer b/w nodes = 1 GB/sec

Encryption overhead = 5% \rightarrow ~~2006~~ $\frac{5}{100}$ 0.05

Effective transfer rate $\stackrel{\text{dr}}{=} 1 \text{ Gbps} \rightarrow$ Encryption overhead
 $= 1 - 0.05$
 $= 0.95 \text{ Gbps}$

* Unit-S:-

(2) HDFS Storage Mechanism:-

* blocks:- Large files are divided into blocks, which are distributed across Data Nodes

* Replication:- Each block is replicated (typically three) to ensure fault tolerance.

HDFS Components:-

* Name Node:- Manages metadata (file structure) but does not store actual data.

* Data Node:- stores actual data blocks and handles write operations.

Architecture Comparison:-

* peer-to-peer:- Each node has equal responsibilities
coordination and consistency are chal

* master-slave (HDFS):- Name Node manages metadata; it stores data

simplifies metadata management
tolerance through data replication

* Real-Time Examples:-

* yahoo! Search

* Facebook

② Hadoop Clusters: Analysis:-

(i) Robustness:- Data Replication:- ensures system resilience and availability.

(ii) Data Disk Failures:-

Replication:- data is replicated across multiple data nodes

Automatic Recovery:- lost blocks are re-replicated

(iii) Heartbeats and Re-replication:-

Heartbeats:- monitor DataNode health.

Re-replication:- Replaces lost blocks to maintain replication

(iv) Cluster Rebalancing:-

Purpose:- Distribute data evenly across the cluster to prevent hotspots.

(v) Data Integrity:-

Checksums:- validate and correct data corruption

(vi) Metadata Disk Failure:-

Single point of failure:- Addressed with redundant backup and high availability setups.

(vii) Snapshots:-

Purpose:- Capture filesystem state for backup and recovery.

⑥ Analyze the cloud services used in e-commerce applications.

cloud services play a critical role in the infrastructure of e-commerce applications.

1. Infrastructure as a Service (IaaS)

Examples:- Amazon web services, Microsoft Azure, Google cloud platform.

Uses:- scalability:- easily scale up or down based on demand.

Flexibility:- Customize the infrastructure to meet specific requirements.

Cost management:- pay only for resources used.

2. Platform as a Service (PaaS)

Examples:- Heroku, Google App Engine, AWS, Elastic Beanstalk.

Uses:-

Development Efficiency:- provides a platform to develop, run and manage applications without worrying about the underlying infrastructure.

Integration:- Simplifies integration with other services and applications.

Speed to market:- Accelerates the development process by providing preconfigured environments.

3. Software as a Service (SaaS)

Examples:- Shopify, Magento, Big Commerce.

Uses:- Ease of use:- Ready to use applications for various e-commerce functions.

Maintenance:- The provider manages updates, security, maintenance.

Accessibility:- Accessible from any device with internet connectivity.

⑦ Discover the location services used in Google maps.

⇒ main location services used in Google maps

1. Gps (Google positioning system):-

* Function :- provides precise location data by triangulating signals from multiple satellites.

* Uses :- determining exact geographic coordinates

⇒ enabling turn-by-turn navigation.

2. WiFi positioning system:-

* Function :- uses the proximity of wi-fi networks to determine a device's location.

* Uses :- enhancing location accuracy indoors or in areas where Gps signals are weak.

⇒ providing location data in urban environments with dense wi-fi networks.

3. Cell Tower Triangulation:-

* Function :- estimates a device's location based on its distance from multiple cell towers.

* Uses :- offering location data when Gps and wi-fi signals are unavailable

4. Bluetooth Low Energy Beacons :-

* Function :- uses Bluetooth signals from beacons for positioning

* Uses :- indoor navigation and proximity-based services.

5. Crowdsourced Data :-

* Function :- Aggregates anonymous location data from users to improve map accuracy and traffic predictions.

* Uses :- updating road conditions and maps

⇒ providing real-time traffic updates.

6. Offline maps and Local data storage :-

* Function :- Stores map data locally on the device for use without an internet connection.

* Uses :- providing navigation and location services in ^{area} with poor connectivity.

① Outline about the cloud services used in Google Colab.

Google Colab, short for "Colaboratory", is a free cloud service provided by Google Colab that allows users to write and execute python code in a web-based, interactive notebook environment.

1. Google Compute Engine (GCE):-

- * Function :- provides the virtual machines for running colab notebooks.
- * Uses :- offers scalable and powerful Compute resources for executing code.

2. Google drive Integration:-

- * Function :- Allows seamless access and storage of files.
- * Uses :- Users can save and load notebooks and datasets directly from google drive.

3. Google cloud storage:-

- * Function :- provides durable and scalable Object storage.
- * Uses :- Storing large datasets and files accessible from colab

4. Tensor processing Units:-

- * Function :- It is a specialized hardware for accelerating machine learning computations.
- * Uses :- Running deep learning models with more efficiency in colab.

5. Google cloud AI platform:-

- * Function :- provides tools for building, training and deploying machine learning models.
- * Uses :- Enhances machine learning workflows with colab, integrating with other AI services.

④ Predict the cloud services used in virtual meeting (Onmeet, Zoom, etc)

UNIT - III

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1. Compute and virtual machines :-

Function :- provide scalable computing resources to host meeting applications.

Examples :- Google Compute Engine, Amazon EC2, Azure Virtual machines

2. Real-Time Communication Services :-

Function :- Enable audio and video communication between participants in real-time.

Examples :- web RTC, Amazon Chime SDK, Twilio Programmable Video.

3. Content Delivery Networks (CDNs) :-

Function :- Distribute audio and video streams efficiently to reduce latency.

Examples :- Google Cloud CDN, Amazon Cloud Front, Azure CDN

4. Storage services :-

Function :- store meeting recordings, chat logs and other data.

Examples :- Google cloud storage, Amazon S3, Azure Blob storage

5. Identity and Access Management (IAM) :-

Function :- manage user identities and control access to meeting resources securely.

Examples :- Google Identity, AWS IAM, Azure Active Directory.

(I) Dropbox :-

→ Dropbox is a file hosting service that allows users to store files online, share them with others and synchronize them across multiple devices like laptops, phones and tablets.

→ It was founded in 2007 by MIT students Drew Houston and Arash Ferdowsi.

→ Initially, Dropbox used Amazon web services for its operation but has since developed its own infrastructure.

Features :-

(i) File storage and synchronization :-

→ store files online and sync them across multiple devices.

(ii) File sharing :- easily share files and folders with others via links.

(iii) Collaboration Tools :-

collaborate in real time with shared folders and tools like Dropbox paper.

(iv) Automatic Backup :- Automatically Backup photos, videos and documents from your devices.

(v) File Recovery :- Recover deleted files and access previous versions.

(vi) Offline access :- Access files without an internet connection.

(vii) Integration with other Apps :- works with apps like Microsoft Office, Slack and Zoom.

(viii) Security features :- include encryption, two-factor authentication and remote device wipe.