INFUSION NOTES

WHEN ONLY THE BEST WILL DO

RAJASTHAN

COMPUTER INSTRUCTOR

(RAJASTHAN STAFF SELECTION BOARD (RSSB))

(ENGLISH MEDIUM)

PART – 5

COMPUTER STUDY (PART-3)

Preface

*Dear Readers, The presented notes "**Rajasthan Computer Instructor (English Medium)**" have been prepared by a dedicated team of teachers and colleagues, each proficient in their respective subjects. These notes aim to provide comprehensive support to readers appearing for the "**Rajasthan Computer Instructor Recruitment Examination**" conducted by the Rajasthan Staff Selection Board.*

Despite careful efforts, there may still be some errors or shortcomings in the notes. Therefore, valuable suggestions from you, the respected readers, are warmly welcomed.

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Chapter – 1

communication and network concepts (computer network)

What is a Network?

A network is essentially a collection of physical devices such as computers which are linked in such way that enables the exchange of information to and fro. The act of exchanging information between devices in such a manner is termed as networking. Networking enables two or more physical devices that are separated geographically to be able to communicate and exchange files and services.

What is PAN (Personal Area Network)?

PAN (Personal Area Network) is a computer network formed around a person. It generally consists of a computer, mobile, or personal digital assistant. PAN can be used for establishing communication among these personal devices for connecting to a digital network and the internet.

Characteristics of PAN

Below are the main characteristics of PAN:

- It is mostly personal devices network equipped within a limited area.
- Allows you to handle the interconnection of IT devices at the surrounding of a single user.
- PAN includes mobile devices, tablet, and laptop.
- It can be wirelessly connected to the internet called WPAN.
- Appliances use for PAN: cordless mice, keyboards, and Bluetooth systems.

Advantages of PAN

Here are the important pros/benefits of PAN network:

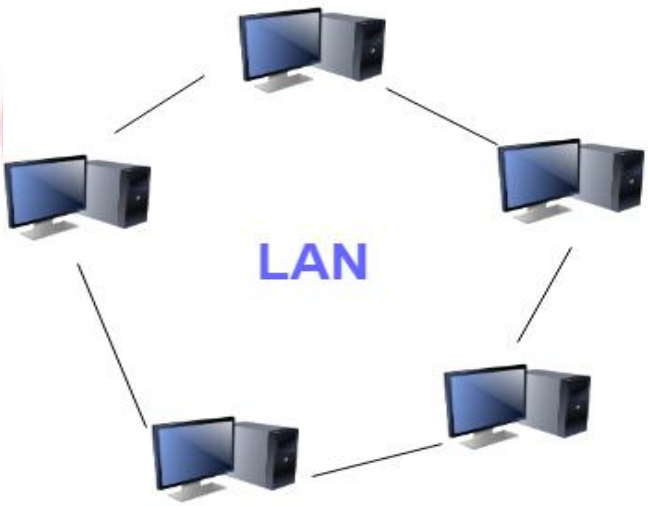
- PAN networks are relatively secure and safe
- It offers only short-range solution up to ten meters
- Strictly restricted to a small area

Disadvantages of PAN

- Here are the cons/drawbacks of using PAN network:
- It may establish a bad connection to other networks at the same radio bands.
- Distance limits.

is a LAN (Local Area Network)?

What A **Local Area Network** (LAN) is a group of computer and peripheral devices which are connected in a limited area such as school, laboratory, home, and office building. It is a widely useful network for sharing resources like files, printers, games, and other application. The simplest type of LAN network is to connect computers and a printer in someone's home or



office. In general, LAN will be used as one type of transmission medium. It is a network which consists of less than 5000 interconnected devices across several buildings

Local Area Network (LAN)

Characteristics of LAN

Here are the important characteristics of a LAN network:

- It is a private network, so an outside regulatory body never controls it.
- LAN operates at a relatively higher speed compared to other WAN systems.
- There are various kinds of media access control

methods like token ring and ethernet.

Advantages of LAN

Here are the pros/benefits of LAN:

- Computer resources like hard-disks, DVD-ROM, and printers can share local area networks. This significantly reduces the cost of hardware purchases.
- You can use the same software over the network instead of purchasing the licensed software for each client in the network.
- Data of all network users can be stored on a single hard disk of the server computer.
- You can easily transfer data and messages over networked computers.
- It will be easy to manage data at only one place, which makes data more secure.
- Local Area Network offers the facility to share a
- single internet connection among all the LAN users.

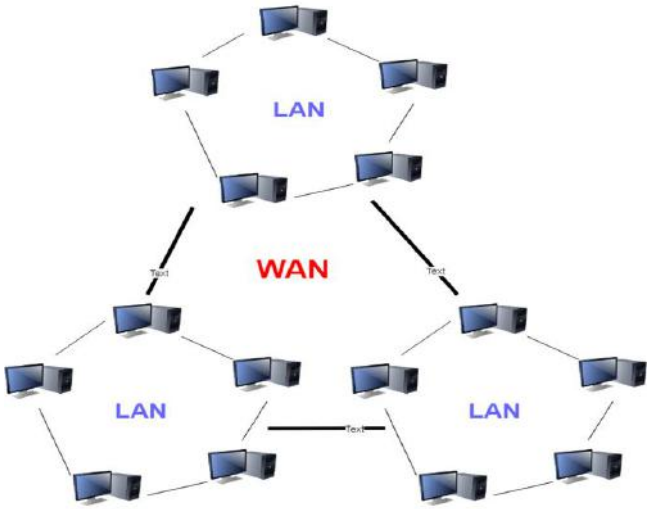
Disadvantages of LAN

Here are the cons/drawbacks of LAN:

- LAN will indeed save cost because of shared computer resources, but the initial cost of installing Local Area Networks is quite high.
- The LAN admin can check personal data files of every LAN user, so it does not offer good privacy.
- Unauthorized users can access critical data of an organization in case LAN admin is not able to secure centralized data repository.
- Local Area Network requires a constant LAN administration as there are issues related to software setup and hardware failures.

What is WAN (Wide Area Network)?

WAN (Wide Area Network) is another important computer network that which is spread across a large geographical area. WAN network system could be a connection of a LAN which connects with other LAN's using telephone lines and radio waves. It is mostly limited to an enterprise or an organization.



Wide Area Network (WAN)

Characteristics of WAN

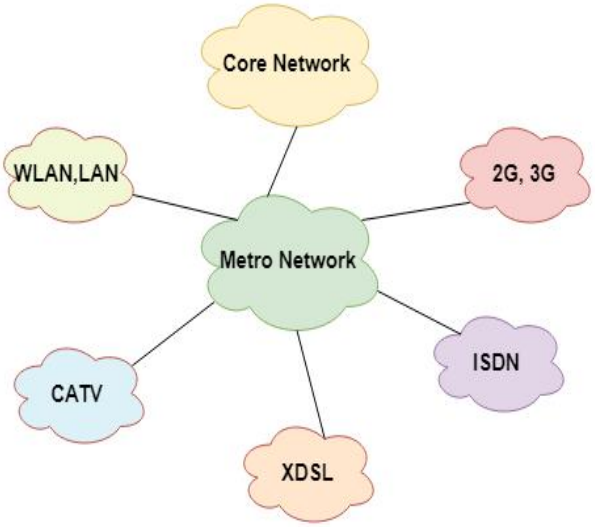
- Below are the characteristics of WAN:
- The software files will be shared among all the users; therefore, all can access to the latest files.
- Any organization can form its global integrated network using WAN.

Advantages of WAN

- Here are the benefits/pros of WAN:
- WAN helps you to cover a larger geographical area. Therefore business offices situated at longer distances can easily communicate.
- Contains devices like mobile phones, laptop, tablet, computers, gaming consoles, etc.
- WLAN connections work using radio transmitters and receivers built into client devices.

Disadvantages of WAN

- Here are the drawbacks/cons of WAN network:
- The initial setup cost of investment is very high.
- It is difficult to maintain the WAN network. You need skilled technicians and network administrators.
- There are more errors and issues because of the wide coverage and the use of different technologies.



- It requires more time to resolve issues because of the involvement of multiple wired and wireless technologies.
- Offers lower security compared to other types of network in computer.

What is MAN (Metropolitan Area Network)?

A **Metropolitan Area Network** or MAN is consisting of a computer network across an entire city, college campus, or a small region. This type of network is large than a LAN, which is mostly limited to a single building or site. Depending upon the type of configuration, this type of network allows you to cover an area from several miles to tens of miles.

Metropolitan Area Network (MAN)

Characteristics of MAN

- Here are important characteristics of the MAN network:
- It mostly covers towns and cities in a maximum 50 km range
- Mostly used medium is optical fibers, cables
- Data rates adequate for distributed computing applications.

Advantages of MAN

- Here are the pros/benefits of MAN network:
- It offers fast communication using high-speed carriers, like fiber optic cables.
- It provides excellent support for an extensive size network and greater access to WANs.
- The dual bus in MAN network provides support to transmit data in both directions concurrently.
- A MAN network mostly includes some areas of a city or an entire city.

Disadvantages of MAN

- Here are drawbacks/cons of using the MAN network:
- You need more cable to establish MAN connection from one place to another.
- In MAN network it is tough to make the system secure from hackers

Other Types of Computer Networks

Apart from above mentioned computer networks, here are some other important types of networks:

1. WLAN (Wireless Local Area Network)
2. Storage Area Network
3. System Area Network
4. Home Area Network
5. POLAN- Passive Optical LAN
6. Enterprise private network
7. Campus Area Network
8. Virtual Area Network

Let's see all these different types of networks in detail:

1) WLAN

WLAN (Wireless Local Area Network) helps you to link single or multiple devices using wireless communication within a limited area like home, school, or office building. It gives users an ability to move around within a local coverage area which may be connected to the network. Today most modern day's WLAN systems are based on IEEE 802.11 standards.

2) Storage-Area Network (SAN)

A Storage Area Network is a type of network which allows consolidated, block-level data

storage. It is mainly used to make storage devices, like disk arrays, optical jukeboxes, and tape libraries.

3) System-Area Network

System Area Network is used for a local network. It offers high-speed connection in server-to-server and processor-to-processor applications. The computers connected on a SAN network operate as a single system at quite high speed.

4) Passive Optical Local Area Network

POLAN is a networking technology which helps you to integrate into structured cabling. It allows you to resolve the issues of supporting Ethernet protocols and network apps.

POLAN allows you to use optical splitter which helps you to separate an optical signal from a single-mode optical fiber. It converts this single signal into multiple signals.

5) Home Area Network (HAN):

A Home Area Network is always built using two or more interconnected computers to form a local area network (LAN) within the home. For example, in the United States, about 15 million homes have more than one computer.

These types of network connections help computer owners to interconnect with multiple computers. This network allows sharing files, programs, printers, and other peripherals.

6) Enterprise Private Network :

Enterprise private network (EPN) networks are build and owned by businesses that want to securely connect numerous locations in order to share various computer resources.

7) Campus Area Network (CAN):

A Campus Area Network is made up of an interconnection of LANs within a specific geographical area. For example, a university campus can be linked with a variety of campus buildings to connect all the academic departments.

8) Virtual Private Network:

A VPN is a private network which uses a public network to connect remote sites or users together. The VPN network uses "virtual" connections routed through the internet from the enterprise's private network or a third-party VPN service to the remote site.

It is a free or paid service that keeps your web browsing secure and private over public WiFi hotspots.

Network topology aligns a network setup so each node is interconnected with network links or connecting lines.

It helps organizations in device monitoring, network visualizations, and network issue diagnosis.

While there are several ways of arranging a network, each method has its own advantages and disadvantages.

Depending on the degree of connectivity and security the organization needs, IT teams may develop a network topology map.

TYPES OF NETWORK TOPOLOGY

Organizations can choose different types of network topologies depending on the suitability of various operations, overall network size, and business objectives.

Bus Topology

Bus topology is sometimes also referred to as line or backbone topology.In this network setup, every device is connected to a single cable running throughout the network.

Teams can connect as many nodes as they need; however, it may affect network performance. One of the connected nodes acts as a server and transmits data in a single direction from one end to the other. Smaller networks using this type of topology often use a coaxial or RJ45 cable to link devices together.

Advantages

- Bus topology works well for smaller networks and keeps the layout extremely simple and easy to understand.
- It's reliable, flexible, and expandable.
- In a bus topology, it's easier to connect and remove devices without affecting the others in the network.
- And, it's cost effective, as it uses a single cable for data transmission.

Disadvantages

- Bus topologies are highly vulnerable to network failures and slowdowns.
- One of the major disadvantages of this topology is it uses a single cable for data transmission, which can lead to various issues.
- If the cable fails to work, the entire network goes down, which is time consuming to fix and expensive to restore.
- During high traffic, the network performance decreases as the data travels through one cable.
- These limitations make this topology suitable for smaller networks.
- Moreover, bus topology is half-duplex, which means data cannot be transmitted in opposite directions simultaneously—a drawback for organizations with an extensive network where high-level data transmission is a regular practice.

- **Ring Topology**
- In ring topology, devices are connected in a loop forming a ring.
- The data packets circulate from one computer to another in a single direction to reach their destination.
- Ring topology is also known as half duplex for this reason.
- Ring topology can be converted into dual ring topology or full duplex, meaning the data can flow both clockwise and anticlockwise with the help of two concentric rings or cables connected to each node.
- Dual ring topology is used as a backup if the primary ring fails.
- Ring topology follows the token passing principal.
- The tokens are passed from one computer to another based on which way the data is transmitted.
- Once the computer receives the token, it transmits data and sends the token back with an acknowledgment signal.
- Within the topology, one node is chosen to configure the network and monitor other devices in the loop.
- This type of network configuration is mostly used in small businesses and schools.

Advantages

- The circular flow of data and the token-based protocols minimize the chance of packet collision.
- The unidirectional nature of ring topology provides high speed.
- Ring topology is capable of handling high volumes of nodes in a network and heavy traffic compared to bus topology.
- Troubleshooting errors like cable faults in the ring network is easier and more convenient.
- It provides excellent communication over a long distance and is cost effective compared to other topologies such as mesh, hybrid, and tree.
- Dual ring topology offers an extra layer of data security as it's more resistant to failures due to its dual network connection.
- If one network fails, the other takes over.

Disadvantages

- The failure of one node can take down the entire network.
- The nodes in ring topology need to be continuously monitored to ensure they're in good health.
- Transmission line failure is another drawback of ring topology.
- This type of network configuration also raises scalability issues.
- The addition or removal of network devices can lead to communication delays.

Star Topology

A star topology is the most commonly used network configuration.

In this type of topology, nodes are connected to a central device like a switch or a hub with the help of coaxial cable, optical fiber, or twisted pair cable. The node layout in star topology is done such that the central device acts as a server and the peripheral devices are treated as clients. The central device is responsible for data transmission across the entire network and performs its job repeatedly.

Advantages

- Star topology has several advantages that make it the most-used network configuration.
- The use of a central server greatly reduces the chances of network failure and data loss.
- If a node stops functioning, it doesn't impact others in the network.
- Unlike ring topology, new computers and devices can be added, removed, and modified in star topology without taking the entire network offline.
- Moreover, this type of topology is simple to set up and manage and requires fewer cables to connect the nodes with the central device.

Disadvantages

- In star topology, if the central device fails to operate, the entire network goes down at once.
- Administrators need to monitor and maintain the central device carefully to avoid errors.
- The performance of the entire network solely depends on the central device's configurations, speed, and performance.

Mesh Topology

Mesh topology is a point-to-point connection in which infrastructure nodes are connected directly, non-hierarchically, and dynamically to as many nodes as possible to transmit data.

The web-like structure of the network configuration offers two methods for data transmission: routing and flooding. Routing refers to the way nodes use a routing logic to find the shortest distance to the destination of the packet.

Flooding refers to the way the data is transmitted to nodes within the network. It doesn't require a routing logic.

Types of Mesh Topology

Partial Mesh Topology

In a fully interconnected mesh network, when some nodes are connected to one or two nodes (peripheral nodes), the setup is known as partial mesh.

If the network or primary nodes fail, the rest of the nodes remain unaffected.

Full Mesh Topology

When every node within a network is interconnected, the set-up is known as full mesh. To calculate the number of connections in the network, the following formula can be used:

$n(n-1)/2$

(n is the number of computers in the network)

Advantages:

- Mesh topologies are extremely reliable.
- They can manage high amounts of traffic as multiple nodes can transmit data simultaneously.
- The strong interconnections make the topology resistant to failures.
- Additional devices don't burden the network or disrupt data transmission.

Disadvantages:

- Mesh topology is time consuming, expensive, and sometimes gives redundant connections.
- The mesh layout is hugely complex and is difficult to set up, manage, and maintain.

Tree Topology

- Tree topology is a network structure in which a root node is connected to other nodes arranged

in a parent-child hierarchy.
- Tree topologies need to have at least three levels of hierarchy in which only one mutual connection exists between two connected nodes.
- The topology is a combination of the star (nodes connected to the central server) and bus (linear) topologies.
- Due to the flexible and scalable nature of this topology, it's often used for a wide area network to sustain spread-out devices.

Advantages
- It's easier to add more nodes in this type of topology as it follows a parent-child hierarchy.
- The hierarchy and the alignment of nodes make it easier for IT teams to find and troubleshoot errors.

Disadvantages
- The only point of concern in tree topology is its root node. If it fails to function, it affects all the nodes connected to its branches.
- Maintaining the network is challenging because when adding nodes, it becomes difficult to manage the entire network and each node in it.
- Moreover, tree topology requires a considerable amount of cables to connect nodes throughout the hierarchy, which makes the layout more complex.

Hybrid Topology
- A hybrid topology is a mix of two or more topologies highlighted above.
- It's most commonly used by large enterprises where individual departments have personalized network topologies to suit their network usage requirements.
- The capabilities and vulnerabilities highly depend on the type of topologies coupled together.
- The combination of star-bus and star-ring network configurations are the most common examples of the hybrid network topology.

Advantages
- Hybrid topologies offer flexibility, reliability, and scalability by combining the strongest aspects of different topologies in a single hybrid setup.
- Hybrid topologies can be modified according to an organization's needs.

Disadvantages
- Hybrid topologies are highly complex. Each type of technology has its own drawbacks.
- Therefore, administrators need to manage each topology involved in a hybrid setup as per its unique requirements.

WHICH TOPOLOGY TO CONSIDER?

Choosing a topology depends on a range of factors such as length of the cable, cable type, cost of setting up, and scalability.

1. If a business's priority is keeping the setup simple, bus topology is the most lightweight and easy-to-install network configuration, in terms of cable needs.
2. All topologies generally use three types of cables: twisted pairs, coaxial cables, and optical fiber cables.
3. The cost of installing the network configuration is also an important consideration.
4. The more complex topology the organization chooses, the more it has to pay for the resources and the time invested in creating their setup.
5. If the organization plans to upscale the network infrastructure later, teams should consider choosing a scalable topology unaffected by adding devices.
6. Star topology is an ideal choice for this requirement as it shows minimal disruption when adding nodes.

What is the OSI Model?

The open systems interconnection (OSI) model is a conceptual model created by the International Organization for Standardization which enables diverse communication systems to communicate using standard protocols. In plain English, the OSI provides a standard for

different computer systems to be able to communicate with each other.

The OSI Model can be seen as a universal language for computer networking. It's based on the concept of splitting up a communication system into seven abstract layers, each one stacked upon the last.

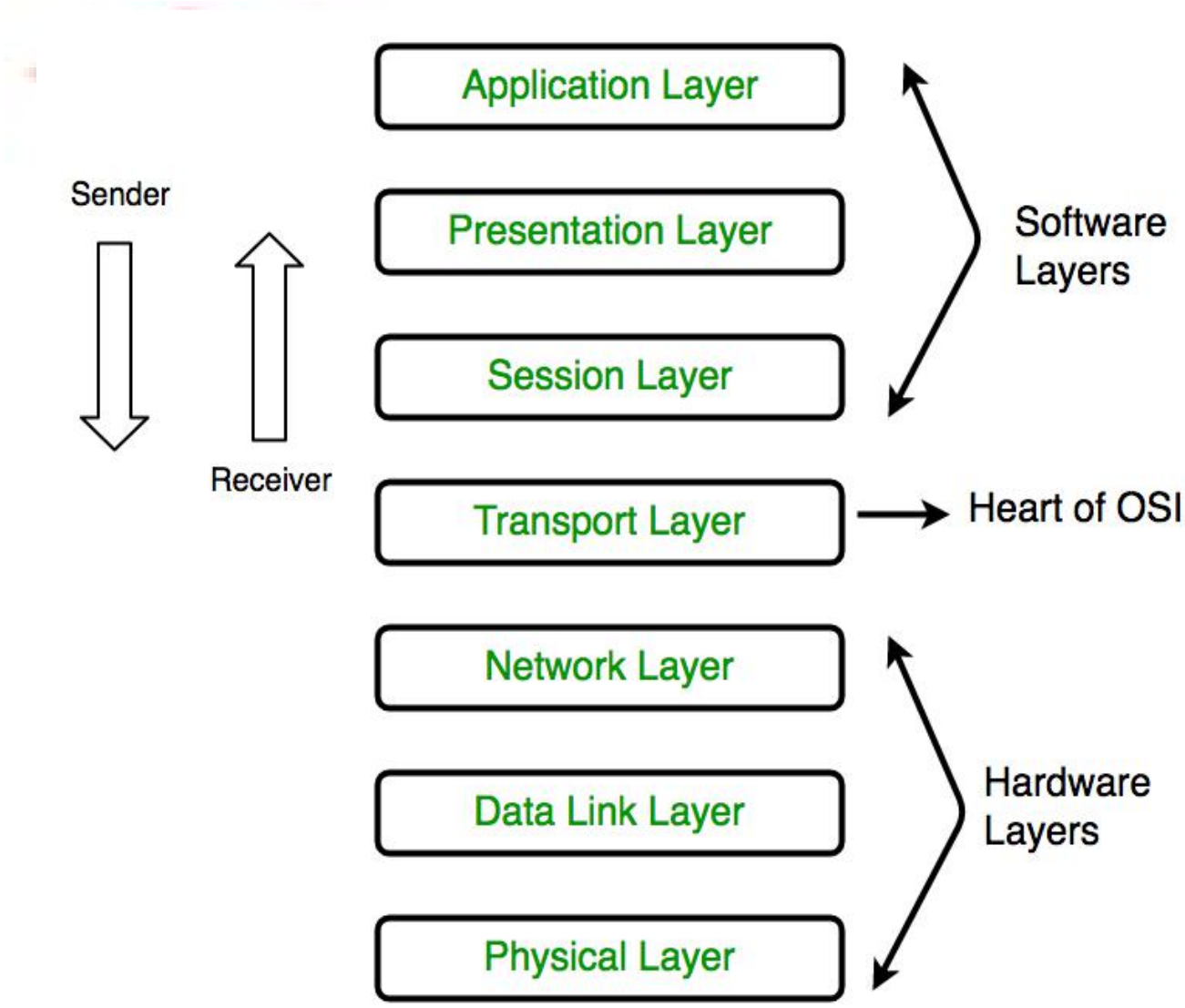
OSI layers -

1. Physical Layer
2. Data-Link Layer
3. Network Layer
4. Transport Layer
5. Session Layer
6. Presentation Layer
7. Application Layer

The OSI (Open Systems Interconnection) model is a conceptual framework used to understand and describe how different network protocols interact in a network system. It divides the network communication process into seven distinct layers, each responsible for specific functions in transmitting data from one system to another. Here's a detailed look at each of the OSI layers, starting from the top:

1. **Application Layer (Layer 7)**

- **Role**: This is the top layer where end-user applications interact with the network. It provides the interface through which users and applications access network services.
- **Responsibilities**:



communication is still reliable. Poor quality triggers a handoff.

3. **Speed of the Mobile Device**: If the mobile device is moving at high speed (e.g., in a car or train), the system will anticipate frequent handoffs as the user moves between different cells.
4. **Cell Load**: If the base station is overloaded with traffic, a handoff may be triggered to move the call or data session to a less congested cell.
5. **Network Load and Available Resources**: The network will prioritize efficient usage of resources. If a new base station has more available resources (e.g., free channels), it may be chosen for handoff.
6. **Time-of-Day and Traffic Patterns**: In some networks, handoff decisions can be based on traffic patterns at different times of the day. If certain base stations experience higher traffic during peak times, users might be handed off to base stations with lower traffic.

Challenges in Handoff Process

1. **Call Drop/Interruption**: In hard handoff scenarios, there is a small possibility of the call being dropped or interrupted during the transfer between cells. This is especially problematic in real-time communication like voice calls.
2. **Handoff Latency**: There may be a slight delay in the handoff process, especially in networks that do not support soft handoffs. This delay can cause temporary degradation in communication quality.
3. **Signal Interference**: The process can be affected by interference from external sources like weather, buildings, or other signals, which can degrade the quality of the handoff.
4. **Overlapping Coverage Areas**: In some cases, neighboring cells may have overlapping coverage areas, which can cause difficulties in determining the right time for handoff.
5. **Seamless Handoff in High-Speed Environments**: For users moving at high speeds (e.g., in vehicles), maintaining seamless handoff without service interruptions becomes more challenging, particularly in older technologies like 3G.

Adjacent Channel Interference (ACI)

Adjacent Channel Interference (ACI) refers to interference that occurs when signals from neighboring frequency channels overlap or interfere with each other. This type of interference typically arises when mobile communication systems are operating in close proximity to each other in frequency space, and the transmission from one channel spills over into the adjacent channel.

ACI can significantly degrade the quality of the communication, causing dropped calls, poor data throughput, and signal distortion. It is a critical issue in mobile communication, especially when the frequency spectrum is crowded, and efficient use of available channels is needed.

Causes of Adjacent Channel Interference (ACI)

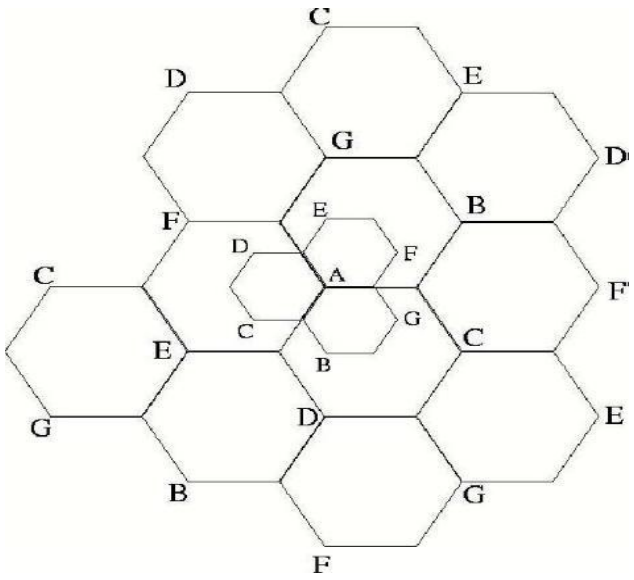
1. **Insufficient Guard Bands**:
   A guard band is a small frequency range that separates adjacent communication channels to prevent overlap. If the guard band between channels is too narrow or not properly maintained, signals from neighboring channels can interfere with each other, causing ACI.
2. **Non-Linearities in Transmitters and Receivers**:
   Non-linear behavior in transmitters (such as amplifiers) or receivers can cause distortion of signals, which might spill over into adjacent channels. These non-linearities are particularly problematic when the system operates at high power levels.
3. **Improper Channel Allocation**:
   In systems where frequency channels are not properly allocated or managed, adjacent channels might be allocated in a way that increases the likelihood of interference. This can occur when

similar frequencies are placed next to each other in densely populated networks.

4. **High Power Transmission**:
   If a mobile device or base station transmits with too high a power, it can cause its signal to spread into adjacent channels, thereby interfering with other communication on nearby frequencies.
5. **Frequency Reuse**:
   In cellular networks, frequency reuse techniques are used to maximize the use of available spectrum. However, if adjacent cells use the same or similar frequencies without proper management of interference, ACI can occur.
6. **Radio Propagation Effects**:
   Environmental factors such as buildings, terrain, and weather can influence how signals propagate. These propagation effects can cause signal spillover from one channel to adjacent ones, leading to ACI.

Cell-Splitting

Cell splitting is the process of subdividing a congested cell into smaller cells, each with its own base station and a corresponding reduction in antenna height and transmitter power. Cell splitting increases the capacity of a cellular system since it increases the number of times that channels are reused.



How Cell-Splitting Works

1. **Large Cell Division:**
   - In a traditional cellular network, a large cell covers a broad geographical area with a single base station. When the number of users increases in this area, the cell may become overloaded, leading to issues like network congestion, poor call quality, and slower data speeds.
   - Cell-splitting involves dividing a large cell into multiple smaller cells, each with its own base station and frequency channels. This division helps distribute the load more efficiently and enhances network capacity.
2. **Deployment of Smaller Base Stations:**
   - Smaller base stations (often referred to as microcells or picocells) are deployed within the existing coverage area to provide more capacity and handle a higher number of users. These smaller cells operate at lower power levels than the original large cell.
   - The cell size is reduced to improve the frequency reuse factor, allowing the network to support more users within a limited geographical area.
3. **Frequency Reuse:**
   By creating smaller cells, frequency reuse becomes more efficient. In a large cell, there may be limited room for reusing the same frequency channels due to interference. With cell-splitting, the smaller cells allow for more frequent reuse of channels, as interference is minimized within each smaller cell.
4. **Traffic Load Distribution:**
   With the smaller cells, the overall network traffic is distributed more evenly. This reduces the load on any single base station, leading to improved service quality in the network.

Sectoring

Sectoring in Mobile Communication

Sectoring is a technique used in mobile communication to improve the capacity, coverage, and efficiency of a cellular network. In

- **Bug Bounty Programs**: Ethical hackers can also participate in bug bounty programs where they are rewarded for finding and reporting vulnerabilities in software or systems.

9. Ethical Hacker Skills:

To become an ethical hacker, individuals need a blend of technical and soft skills:

- **Technical Skills**: Knowledge of operating systems (Linux, Windows), programming languages (Python, C, JavaScript), networking (TCP/IP, firewalls), and security tools.
- **Soft Skills**: Critical thinking, problem-solving, effective communication (for reporting findings), and attention to detail.

10. Benefits of Ethical Hacking:

- **Enhanced Security**: Identifying and fixing vulnerabilities before they can be exploited by malicious hackers.
- **Regulatory Compliance**: Meeting industry standards and regulations (e.g., GDPR, HIPAA) that require regular security audits.
- **Reputation Management**: Ensuring that sensitive data and systems are protected from breaches, which helps maintain customer trust and brand integrity.
- **Cost Saving**: Preventing data breaches, which can result in substantial financial losses due to fines, lost business, and damage to reputation.

Conclusion:

Ethical hacking is a vital part of cybersecurity, helping organizations protect their digital assets by proactively identifying and fixing vulnerabilities. It requires a strong understanding of technology, a sense of responsibility, and a commitment to ethical conduct. With cyber threats becoming more sophisticated, ethical hackers are crucial in defending systems and networks against malicious attacks.

Chapter - 3

DatabaseManagement System (DBMS)

DBMS

A database-management system (DBMS) is a collection of interrelated data and a set of programs to access those data.

This is a collection of related data with an implicit meaning and hence is a database. The collection of data, usually referred to as the database, contains information relevant to an enterprise.

The primary goal of a DBMS is to provide a way to store and retrieve database information that is both convenient and efficient.

Below is an overview of key components and concepts involved in database management:

1. Database Management System (DBMS)

A DBMS is software that enables users to define, create, maintain, and control access to databases. It acts as an interface between users and the database, managing data storage, retrieval, and manipulation. The DBMS ensures data integrity, security, and consistency.

Popular DBMS Examples:

- Relational DBMS (RDBMS): MySQL, PostgreSQL, Oracle
- Non-relational DBMS (NoSQL): MongoDB, Cassandra, Redis
- In-memory DBMS: Redis, Memcached
- NewSQL DBMS: Google Spanner, CockroachDB

2. Types of Databases

- Relational Databases: Store data in tables with rows and columns. Data is accessed using SQL (Structured Query Language). Example: MySQL, Oracle, Microsoft SQL Server.
- NoSQL Databases: Designed for handling unstructured or semi-structured data. They support various data models like document, key-value, graph, and columnar. Example: MongoDB, Couchbase, Cassandra.

- Distributed Databases: Data is distributed across multiple physical locations, enhancing availability and fault tolerance. Example: Apache Cassandra, Google Spanner.
- In-memory Databases: Store data in the system's main memory (RAM) instead of on disk, offering faster data access. Example: Redis.

3. Database Design

- Schema Design: Defines the structure of the database, including tables, fields, relationships, and constraints.
- Normalization: The process of organizing data to minimize redundancy and dependency. It involves dividing a database into tables and defining relationships between them.
- Entity-Relationship (ER) Diagram: A visual representation of the database structure, showing entities (tables) and their relationships.

4. SQL (Structured Query Language)

SQL is the language used for querying and managing relational databases. It includes:

- DML (Data Manipulation Language): SELECT, INSERT, UPDATE, DELETE
- DDL (Data Definition Language): CREATE, ALTER, DROP
- DCL (Data Control Language): GRANT, REVOKE
- TCL (Transaction Control Language): COMMIT, ROLLBACK

5. Transactions and ACID Properties

- Transaction: A sequence of operations performed as a single unit. A transaction can either be completed successfully (commit) or rolled back if an error occurs.
- ACID Properties: Ensure the reliability and consistency of transactions:
  - Atomicity: All operations in a transaction are completed successfully or none are.
  - Consistency: The database transitions from one valid state to another.
  - Isolation: Transactions do not affect each other when executed concurrently.
  - Durability: Once a transaction is committed, its effects are permanent.

6. Data Security and Integrity

- Data Integrity: Ensures that the data is accurate, consistent, and reliable throughout its lifecycle. Includes constraints like primary keys, foreign keys, unique, and check constraints.
- Data Security: Includes mechanisms like encryption, authentication, and authorization to protect sensitive data from unauthorized access.
- Backup and Recovery: Regular backup of the database to ensure data can be restored in case of hardware failure or other issues.

7. Indexing

Indexes are used to speed up query performance by allowing faster search and retrieval of data. Common index types include:

- B-tree Indexes: A balanced tree structure used in most relational DBMS.
- Hash Indexes: Uses a hash function for quick lookups.
- Full-text Indexes: Used for text searches.

8. Database Administration

A Database Administrator (DBA) is responsible for managing the DBMS, including tasks such as:

- Installing, configuring, and upgrading the DBMS.
- Monitoring database performance.
- Ensuring data availability and recovery.
- Managing user access and security.
- Performing regular backups and handling restoration.

9. Backup and Recovery

- Backup: A process of copying data to a secure location to prevent data loss.
- Recovery: Involves restoring the database to its original state after data loss or system failure.
- Techniques include full, incremental, and differential backups.

10. Scalability and Performance Optimization

- Horizontal Scaling: Adding more machines to handle increased load (used in distributed databases).
- Vertical Scaling: Increasing the resources (CPU, memory, etc.) on a single server.
- Sharding: Dividing a database into smaller, more manageable pieces.

- Load Balancing: Distributing queries across multiple servers to optimize performance.

11. Cloud Databases

Cloud databases are hosted on cloud platforms and offer flexibility, scalability, and high availability. Popular cloud DBMS include:

- Amazon RDS, Azure SQL Database, Google Cloud SQL

12. Big Data and Data Warehousing

- Data Warehousing: The process of collecting, storing, and managing large volumes of historical data for analysis and reporting.
- Big Data: Refers to large, complex datasets that cannot be handled by traditional DBMS. Tools like Hadoop and Spark are used to process big data.

Data

By data, we mean known facts that can be recorded and that have implicit meaning. For example, consider the names, telephone numbers, and addresses of the people you know.

You may have recorded this data in an indexed address book, or you may have stored it on a diskette, using a personal computer and software such as DBASEIV or V, Microsoft ACCESS, or EXCEL.

Data Processing Vs. Data Management Systems

Although Data Processing and Data Management Systems both refer to functions that take raw data and transform it into usable information, the usage of the terms is very different.	The term Data Management Systems refers to an expansion of this concept, where the raw data, previously copied manually from paper to punched cards, and later into data entry terminals, is now fed into the system from a variety of sources, including ATMs, EFT, and direct customer entry through the Inter.

File Oriented Approach

- The earliest business computer systems were used to process business records and produce information.
- They were generally faster and more accurate than equivalent manual systems.
- These systems stored groups of records in separate files, and so they were called file processing systems.
- In a typical file processing systems, each department has its own files, designed specifically for those applications.
- The department itself working with the data processing staff, sets policies or standards for the format and maintenance of its files. Programs are dependent on the files and vice-versa; that is, when the physical format of the file is changed, the program has also to be changed.

Although the traditional file oriented approach to information processing is still widely used, it does have some very important disadvantages.

S.NO.	File System	DBMS
1.	File system is a software that manages and organizes the files in a storage medium within a computer.	DBMS is a software for managing the database.
2.	Redundant data can be present in a file system.	In DBMS there is no redundant data.

DBMS provides security to the data stored in it because all users have different rights to access database.

Some of the user can access the whole database while other can access a small part of database. For example, a computer network lecturer can only access files that are related to computer subjects but HOD of the department can access files of all subject that are related to their department.

13. Represents Complex Relationship between Data

Data stored in a database is connected with each other and a relationship is made in between data. DBMS should be able to represent the complex relationship between data to make efficient and accurate use of data.

14. Query Language

Queries are used to retrieve and manipulate data but DBMS is armed by a strong query language that makes it more effective and efficient.

Users have the power to retrieve any kind of data they want from database by applying different set of queries. File-Based system has not this luxury of query language.

Advantages and Disadvantages of a DBMS

Data independence:

Application programs should be as independent as possible from details of data representation and storage.

The DBMS can provide an abstract view of the data to insulate application code from such details.

Efficient data access:

A DBMS utilizes a variety of sophisticated techniques to store and retrieve data efficiently. This feature is especially important if the data is stored on external storage devices.

Data integrity and security:

If data is always accessed through the DBMS, the DBMS can enforce integrity constraints on the data.

For example, before inserting salary information for an employee, the DBMS can check that the department budget is not exceeded. Also, the DBMS can enforce access controls that govern what data is visible to different classes of users.

Data administration:

When several users share the data, centralizing the administration of data can offer significant improvements.

Experienced professionals who understand the nature of the data being managed, and how different groups of users use it, can be responsible for organizing the data representation to minimize redundancy and fine-tuning the storage of the data to make retrieval efficient.

Concurrent access and crash recovery:

A DBMS schedules concurrent accesses to the data in such a manner that users can think of the data as being accessed by only one user at a time. Further, the DBMS protects users from the effects of system failures.

Reduced application development time:

Clearly, the DBMS supports many important functions that are common to many applications accessing data stored in the DBMS. This, in conjunction with the high-level interface to the data, facilitates quick development of applications.

Disadvantages of a DBMS

Danger of a Overkill: For small and simple applications for single users a database system is often not advisable.

Complexity: A database system creates additional complexity and requirements. The supply and operation of a database management system with several users and databases is quite costly and demanding.

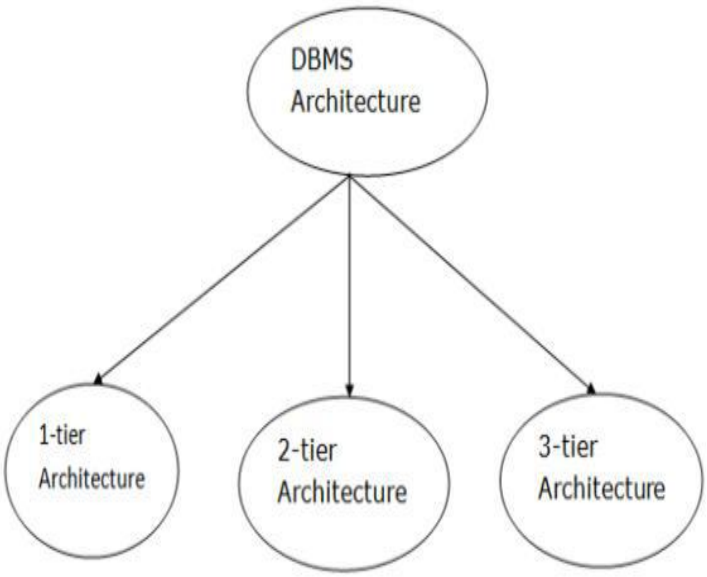
Qualified Personnel: The professional operation of a database system requires appropriately

trained staff. Without a qualified database administrator nothing will work for long.

Costs: Through the use of a database system new costs are generated for the system itselfs but also for additional hardware and the more complex handling of the system.

Lower Efficiency: A database system is a multi-use software which is often less efficient than specialised software which is produced and optimised exactly for one problem

DBMS Architecture



The architecture of DBMS depends on the computer system on which it runs.

For example, in a client-server DBMS architecture, the database systems at server machine can run several requests made by client machine.

We will understand this communication with the help of diagrams.

Types of DBMS Architecture

There are three types of DBMS architecture:

1. Single tier architecture
2. Two tier architecture
3. Three tier architecture

Single tier Architecture (1 tier)

Single-tier architecture, often referred to as "monolithic architecture", is the simplest form of DBMS architecture where all the DBMS components are integrated and run on a single system or machine. In this architecture, the database management system (DBMS) and its database reside on the same server, and the user interacts directly with the DBMS through a local client or interface.

Components of Single-Tier Architecture

1. **Database Management System (DBMS):**
   The DBMS includes all components responsible for managing the database, such as query processors, transaction managers, and storage management. In a single-tier setup, everything (including the database engine and management features) runs on the same machine.
2. Database:
   The actual data is stored locally on the system, meaning both the data storage and data management are in the same place.
3. User Interface:
   The user interacts directly with the DBMS through a local application or tool (e.g., a desktop application). There is no need for a separate middle layer (such as an application server) to process requests.

How Single-Tier Architecture Works:

- Direct Interaction: The user accesses the database directly from the client interface without any intermediary layers, making this architecture relatively simple. The database and application run on the same machine, so users can interact with the system through the DBMS interface (such as a command-line interface, or GUI).
- No Middle Layer: Unlike two-tier or three-tier architectures, the single-tier architecture lacks a business logic layer or an application server. All operations (data processing, management, retrieval, etc.) are handled by the DBMS directly.
- Local Storage and Management: The database and DBMS engine share the same physical

resources (CPU, memory, and storage) of the single machine.

Advantages of Single-Tier Architecture:

1. **Simplicity:**
   The architecture is straightforward and easy to understand, especially for small applications or systems where complex data management is not needed.
2. **Easy Setup:**
   No complex configurations are required since all components are on a single machine. This makes deployment easier, especially for small-scale or local databases.
3. **Performance (For Smaller Systems):**
   For small applications with low data traffic, a single-tier architecture can provide good performance because all operations are done locally, without the need for network communication or data transfer between different tiers.
4. **Lower Cost:**
   Since all components run on a single machine, there is no need for multiple servers or network infrastructure, which can make the solution less expensive for small-scale implementations.

Disadvantages of Single-Tier Architecture:

1. **Limited Scalability:**
   Single-tier systems are not scalable in the same way as multi-tier systems. As the number of users or the size of the database grows, the system can become slow or inefficient since all resources (data, logic, and storage) are confined to a single machine.
2. **Limited Availability:**
   If the single machine fails, the entire DBMS, application, and database are affected. There is no fault tolerance or redundancy in place, so the system's availability is limited to the reliability of that one machine.
3. **Security Risks:**
   Since there is no separation between the database and the application, security risks increase. Any user or application with access to the system could potentially modify or access the entire database, which could pose a risk in larger, more complex environments.
4. **Maintenance Challenges:**
   As the system grows, managing, maintaining, and upgrading the system could become cumbersome, as all components are tightly coupled. Any update to the DBMS might require shutting down the entire system, affecting the database and applications running on it.
5. **Lack of Flexibility:**
   There is little flexibility in terms of adapting the architecture to meet more complex needs. For example, if you want to separate business logic or scale the system, you will have to rework the architecture significantly.

Use Cases for Single-Tier Architecture:
Single-tier architecture is best suited for:

- Small-scale applications with minimal user interaction.
- Desktop applications where the database is local to the system.
- Educational purposes and learning environments where simplicity is important.
- Prototyping or small proof-of-concept applications that don't require scalability.

Example:
Consider a local database application like a personal contact manager or a small inventory system. In such cases, the database is stored on the local machine, and the user interacts with the data directly without needing a network or separate application layers.

2-Tier Architecture

In **2-Tier Architecture** of a Database Management System (DBMS), the system is divided into two layers: the **Client** and the **Server**. This architecture is designed to simplify the interaction between the database and the user, allowing for direct communication between

the client application and the DBMS running on the server.

Components of 2-Tier Architecture

1. **Client Tier (Application Layer):**

- **What it is:** The client tier is responsible for interacting directly with the end-user. It handles the user interface (UI) and application logic, sending queries to the database and presenting results to the user.
- **Components:**
    - User interface (UI)
    - Application logic
    - Query processing (such as SQL queries sent to the DBMS)
- **Function:** The client is where the end-user interacts with the system. The application here will handle the presentation of the data and often includes the business logic required to process data before it is sent to the server or after it is received.
- **Examples:** A desktop application (like a local accounting program) or a web browser (for web-based applications).

2. **Server Tier (Database Server):**

What it is: The server tier hosts the DBMS and stores the database. It is responsible for processing SQL queries, managing data storage, and ensuring data integrity and security.

Components:

- **DBMS Engine**: The core system that handles query processing, transactions, data retrieval, and other database functions.
- **Database**: The actual data is stored here in tables, and the DBMS manages all data operations like storage, retrieval, modification, etc.
- **Function:** The server executes the queries sent from the client and returns the results to the client. It also handles data storage, backup, and recovery processes.
- **Examples:** DBMS like MySQL, Oracle, SQL Server, PostgreSQL.

How 2-Tier Architecture Works

1. **Client Request:** The client application sends a query (like a SQL query) to the server to retrieve, modify, or delete data.
2. **Server Processing:** The DBMS on the server processes the query, interacting with the database (the actual data storage) and performing necessary operations, such as retrieving data from tables or executing stored procedures.
3. **Result Transmission:** After processing the query, the server sends the results back to the client. These results are presented to the user via the client application.

Advantages of 2-Tier Architecture

1. **Simplified Communication:**
Direct communication between the client and the database server, with no intermediary layer. This reduces complexity compared to multi-tier architectures.
2. **Faster Performance (For Smaller Applications):**
Since the client communicates directly with the server, there is less overhead in processing the requests, which can lead to faster performance for small-scale systems.
3. **Cost-Effective for Small-Scale Applications:**
Requires fewer resources in terms of server and infrastructure. There is no need for an application server, reducing hardware and maintenance costs.
4. **Easier to Implement:**
Simple and straightforward to set up, making it a good choice for smaller applications with limited user interactions and data needs.

Disadvantages of 2-Tier Architecture

1. **Limited Scalability:**
As the number of users increases, the server may get overloaded, as it is directly handling all requests from multiple clients. Scaling this system requires upgrading the server, which can be expensive and inefficient.
2. **Security Risks:**

Chapter – 5

Web Technology and Multimedia

Types of Internet Protocols

Internet protocols are essential rules or standards that allow devices to communicate with each other over the internet. They govern how data is transmitted, routed, and received. Here is an overview of some **common types of internet protocols**:

1. **TCP/IP (Transmission Control Protocol/Internet Protocol)**

Description:

TCP/IP is the suite of communication protocols used to connect devices on the internet. It's the backbone of internet communication. It consists of two main components:

- **TCP (Transmission Control Protocol)**: Ensures reliable transmission of data packets. It breaks data into packets, sends them to the destination, and ensures all packets arrive in the correct order.
- **IP (Internet Protocol)**: Responsible for addressing and routing packets of data so that they reach the correct destination.

Function:

- **TCP** ensures data is sent and received in a reliable, error-free manner.
- **IP** handles the addressing of data packets and their routing through the network.

2. **HTTP/HTTPS (Hypertext Transfer Protocol / Hypertext Transfer Protocol Secure)**

Description:

HTTP is the protocol used for transferring hypertext documents (such as HTML pages) over the internet. HTTPS is the secure version of HTTP, where encryption is applied to the data exchanged between the server and client.

- **HTTP**: Unencrypted communication, mainly used for websites.
- **HTTPS**: A secure version that uses encryption (SSL/TLS) to protect data.

Function:

- **HTTP** enables communication between browsers and web servers, allowing users to access websites.
- **HTTPS** ensures that any data exchanged, like passwords or credit card details, remains secure.

3. **FTP (File Transfer Protocol)**

Description:

FTP is used to transfer files between a client and a server over the internet. It allows the user to upload or download files from a server.

- **Active Mode**: The client opens a port for data transfer.
- **Passive Mode**: The server opens the port for data transfer.

Function:

- FTP allows users to transfer large files, manage files on remote servers, or download content from websites.

4. **DNS (Domain Name System)**

Description:

DNS is a protocol used to convert human-readable domain names (like www.example.com) into IP addresses (like 192.168.1.1), which are used to locate and identify devices on the internet.

Function:

- It resolves domain names to IP addresses to ensure that web browsers can locate the correct website server and load the requested page.

5. **SMTP (Simple Mail Transfer Protocol)**

Description:

SMTP is used for sending emails from one server to another. It handles the process of routing email messages to the recipient's mail server.

Function:

- *SMTP allows the sending of emails and ensures the email is delivered to the correct mail server for routing.*

6. IMAP (Internet Message Access Protocol) / POP3 (Post Office Protocol)

Description:

IMAP and POP3 are protocols used for retrieving emails from a mail server.

- **IMAP**: *Keeps emails on the server and allows users to view them from multiple devices. It synchronizes email across all devices.*
- **POP3**: *Downloads emails to the local device and typically removes them from the server.*

Function:

- *IMAP is used for accessing and managing email on the server, allowing better synchronization across multiple devices.*
- *POP3 is used for retrieving email to a local device, with messages typically removed from the server.*

7. ARP (Address Resolution Protocol)

Description:

ARP is used to map an IP address to a MAC (Media Access Control) address in a local network. It helps devices communicate over a local area network (LAN) by resolving IP addresses to hardware addresses.

Function:

- *ARP helps devices find the physical address (MAC) of a device on a local network, ensuring that data packets reach the correct device.*

8. ICMP (Internet Control Message Protocol)

Description:

*ICMP is used for sending error messages and operational information. It is primarily used for diagnostic purposes (e.g., **ping**).*

Function:

- *ICMP is used to send error messages, like when a network destination is unreachable. It also helps with network diagnostics and determining if a device is reachable.*

9. DHCP (Dynamic Host Configuration Protocol)

Description:

DHCP is used to assign IP addresses dynamically to devices on a network. It automatically provides the necessary configuration for devices to communicate over a network.

Function:

- *DHCP allows devices to obtain an IP address, subnet mask, and default gateway automatically from a DHCP server, reducing the need for manual configuration.*

10. BGP (Border Gateway Protocol)

Description:

BGP is the protocol used to exchange routing information between different networks or autonomous systems (ASes) on the internet.

Function:

- *BGP helps in determining the best path for data transfer between networks. It is essential for the routing of data packets across the global internet.*

11. SIP (Session Initiation Protocol)

Description:

SIP is used for initiating, managing, and terminating communication sessions such as voice calls, video calls, and instant messaging over the internet.

Function:

- *SIP helps in managing multimedia communication sessions, including voice over IP (VoIP), video conferencing, and online messaging.*

12. SNMP (Simple Network Management Protocol)

Description:

SNMP is used to manage and monitor network devices like routers, switches, and servers. It allows administrators to view device information and troubleshoot network problems.

Function:

- *SNMP allows network administrators to monitor network health, performance,*

and availability, providing a way to identify and address issues remotely.

13. TLS/SSL (Transport Layer Security / Secure Sockets Layer)

Description:

TLS and SSL are protocols used to encrypt data between a client (e.g., web browser) and a server. SSL is the predecessor of TLS, and while both are still commonly referred to as SSL, TLS is the more modern and secure version.

Function:

- SSL/TLS encrypts communication to protect data from eavesdropping, tampering, and forgery, especially during activities like online banking or shopping.

14. NAT (Network Address Translation)

Description:

NAT is a method used by routers to translate private IP addresses on an internal network to a public IP address before data is sent to the internet.

Function:

- NAT helps manage and conserve IP addresses, allowing multiple devices on a private network to share a single public IP address when accessing the internet.

15. RDP (Remote Desktop Protocol)

Description:

RDP is a protocol developed by Microsoft that allows users to connect to another computer remotely over a network.

Function:

- RDP allows for remote access to a computer's desktop, enabling users to control and interact with the computer as if they were physically present.

16. SIP (Session Initiation Protocol)

Description:

SIP is a signaling protocol used for initiating, maintaining, and terminating real-time communication sessions, such as VoIP (Voice over IP), video conferencing, and instant messaging.

Function:

- SIP is used for creating and managing multimedia communication sessions, enabling video, voice, and other types of real-time communication.

Here is a table with some important **Internet Protocols** and their associated **port numbers**:

Protocol	Port Number	Description
HTTP	80	Hypertext Transfer Protocol; used for browsing websites without encryption.
HTTPS	443	Hypertext Transfer Protocol Secure; used for secure communication on the web (encrypted).
FTP	21	File Transfer Protocol; used for transferring files between a client and server.
SFTP	22	Secure File Transfer Protocol; used for secure file transfers over SSH (Secure Shell).
SSH	22	Secure Shell; used for secure remote login and command execution.
Telnet	23	Telnet Protocol; used for remote login, but insecure compared to SSH.
SMTP	25	Simple Mail Transfer Protocol; used for sending emails between servers.

China. It is a free web browser that is used for both Windows as well as Android. It cooperates with companies like Microsoft, Intel, and Qualcomm. It offers services such as **cloud services**, **social networking**, **maps**, **videos**, **images search**, and many more. The main disadvantage of using Baidu is that it can transmit the user's personal data to the Baidu server without using any encryption algorithm.

6. Yandex

Yandex was started by two Russian developers in **1990**. It is a free browser that is available for Windows, macOS, Android, and iOS. It mainly includes **online advertising**, **App Analytics**, **Data management**, **smart home technology**, **Artificial intelligence**, as well as a voice assistant called Alice.

The advantage of the Yandex search engine is that it is safe because its browser uses built-in protection, which means when we search a harmful site page, then a pop-up comes, and the browser automatically blocks them.

7. **Yahoo!**

It is the most widely used Internet search engine and the largest web portal. It provides a structure to view thousands of websites and millions of web pages. Yahoo email services help us to capture a huge market. It includes various services such as Yahoo answers, Yahoo groups, Yahoo search engine, and Yahoo messengers, etc.

8. Ask

Ask was launched by **Garret Gruener** and **David Warthen** in 1996. The aim to design Ask is to perform the search based on the questions submitted by internet users.

It is similar to search engines like Google, Bing, DuckDuckGo, and Yahoo!.

9. Naver

Naver is also known as **Google of South Korea**. It is one of the most important Chromium-based search engine platforms operated by **Naver Corporation**. It was introduced in 1999 and able to pull out various types of results that match from the entered keywords. It covers almost 75% of searches in the country. Naver also works as a community platform, which creates user generates content where users share their knowledge and discussions. According to research, this search engine handled 74.7% web searches in South Korea, and 42 million users are enrolled in it.

Online and offline messaging_

Online – when we connect with other user or device using internet.

Offline- Connectivity without internet.

Online messaging- a way to send or receive our messages through a network connected with internet. Today days it is growing day by day. We know like Ourkut and after that FB or recently days what sup message app or Gmail , yahoo mail etc. both sender or receiver should online

Ofline messaging- not necessary for be online at the time of communication means like u listen about outlook which is a feature of messaging used over local area network in a small office building or a network. Or some time when communication is going to be held one of the use may be offline. You may left a message for your friend when there is no online connectivity both side .

INTRODUCTION TO INSTANT MESSAGING

Instant messaging (IM) is a form of communication over the Internet that offers an instantaneous transmission of text-based messages from sender to receiver. Most instant messaging software include the option for performing file transfers, audio chat, video calling and conferencing, sharing desktops, etc. apart from standard text chat. Instant messaging software is widely used for personal and commercial use.

- Chat - Create a chat room with friends or co-workers
- Web links - Share links to your favorite Web sites
- Video - Send and view videos, and chat face to face with friends
- Images - Look at an image stored on your friend's computer
- Sounds - Play sounds for your friends
- Files - Share files by sending them directly to your friends
- Talk - Use the Internet instead of a phone to actually talk with friends
- Streaming content - Real-time or near-real-time stock quotes and news
- Mobile capabilities - Send instant messages from your cell phone

1. Online Messaging

Online messaging refers to real-time communication that happens over the internet. In online messaging, users are required to be connected to a network or internet service for sending and receiving messages. This is commonly done through instant messaging (IM), chat applications, or social media platforms.

Characteristics of Online Messaging:

1. **Real-Time Communication**:
   - Messages are delivered instantly or with very little delay.
   - Both sender and receiver must be online at the same time.
2. **Requires Internet Connectivity**:
   - Online messaging requires a stable internet connection, such as Wi-Fi or mobile data.
3. **Supported by Various Platforms**:
   - Examples include platforms like WhatsApp, Facebook Messenger, Telegram, Slack, WeChat, Skype, and email services like Gmail or Outlook.
4. **Multimedia Sharing**:
   - Users can send not just text but also multimedia messages, including images, videos, audio, and even file attachments.
5. **Group Chats**:
   - Most online messaging services support group conversations, allowing multiple users to participate in a discussion at once.
6. **Cloud-Based Storage**:
   - Some online messaging services store messages on cloud servers, enabling users to retrieve past conversations on multiple devices.
7. **Instant Notifications**:
   - Online messaging services typically push notifications when a new message is received, ensuring that users can respond quickly.
8. **Security Features**:
   - Many platforms offer end-to-end encryption (such as WhatsApp or Signal) to protect the privacy of the messages.

Popular Examples of Online Messaging:

- **WhatsApp**: A messaging platform allowing users to send texts, images, videos, and voice messages over the internet.
- **Facebook Messenger**: A chat application integrated with Facebook, used for real-time communication with friends and groups.
- **Slack**: A messaging app designed for team collaboration and communication in the workplace.
- **Skype**: Provides both voice and video calling, in addition to text messaging, allowing real-time communication over the internet.

2. Offline Messaging

Offline messaging refers to the communication method where messages are sent and stored for delivery at a later time when the recipient comes online. These systems do not require both sender and receiver to be online simultaneously. Offline messaging is widely used in environments where internet connectivity is unstable, or where users may not always be available for real-time communication.

Characteristics of Offline Messaging:

1. **Delayed Delivery**:

- The message is stored until the recipient comes online or can be accessed later.
- Often used for sending messages when the recipient isn't currently available or connected to the internet.

2. **No Internet Required for Receiving**:
   - The recipient does not need to be online to receive the message. They can read or listen to it once they reconnect to the internet.
3. **Data Synchronization**:
   - Messages are stored temporarily in the device or application and then synchronized when the device goes online. This makes it suitable for areas with intermittent connectivity.
4. **Asynchronous Communication**:
   - It does not require real-time interaction between sender and receiver, and thus, is considered asynchronous communication.
   - Users can respond at their convenience, unlike online messaging that often requires instant replies.
5. **Suitable for Low Connectivity Areas**:
   - Useful for rural or remote areas where internet access may be inconsistent or unavailable.
6. **Simple Text Communication**:
   - While offline messaging platforms may support rich media messages (images, video), many offline systems primarily support simple text-based communication.

Examples of Offline Messaging:

1. **SMS (Short Message Service)**:
   A form of text messaging that works over mobile networks rather than the internet. It doesn't require an internet connection to send or receive messages. SMS is an example of offline communication since messages are sent and received through mobile network towers.
2. **Email**:
   When sending emails via a mobile device or desktop, users may not be connected to the internet at the time of composing the email. The email is queued and sent once the device reconnects to the internet.
3. **Voicemail**:
   Allows users to leave voice messages for others, who can retrieve them at their convenience. The recipient does not need to be online to receive the message, but they must have access to voicemail systems to listen to it.
4. **Push Notifications**:
   On smartphones, some messaging systems store notifications or messages in a "notification center" and send them when the recipient is online. The messages or alerts might be missed if the user is offline, but they will be stored for later retrieval.

Differences Between Online and Offline Messaging

Feature	Online Messaging	Offline Messaging
Connectivity	Requires active internet connection	No immediate internet connection required
Real-time Communication	Yes, messages are delivered instantly	No, messages are delivered when the recipient is online
Usage Environment	Used in areas with stable internet connectivity	Used in areas with intermittent or no internet
Types of Media	Text, images, videos, voice, and files	Primarily text-based (but can support multimedia in some cases)
User Experience	Instant feedback and interaction	Delayed response time

- **Cross-Platform Compatibility**: XML works across various platforms, and scripts can interact with XML data, making it flexible for web applications.
- **Dynamic Content**: Combining XML with client-side or server-side scripting allows for dynamic, interactive web pages that fetch and display live data.

HTML INTERACTIVITY TOOLS:

HTML Interactivity Tools

HTML interactivity tools are used to enhance the user experience on web pages by adding dynamic and interactive features. These tools are commonly paired with scripting languages like JavaScript to make the content more interactive and responsive. Let's explore the key HTML interactivity tools:

1. Forms and Input Elements

Forms are one of the most common tools used in HTML to capture user data. They allow users to input information and submit it to a server for processing. Forms can be interactive, enabling users to enter details, choose options, and interact with the webpage.

- **Form Elements**:
  - **Text Fields** (<input type="text">): For single-line text input.
  - **Password Field** (<input type="password">): For entering passwords.
  - **Checkboxes** (<input type="checkbox">): For boolean choices.
  - **Radio Buttons** (<input type="radio">): For selecting one option from multiple choices.
  - **Select Dropdown** (<select>): For selecting options from a dropdown list.
  - **Textarea** (<textarea>): For multi-line text input.
  - **Submit Button** (<button type="submit">): For submitting the form.

Example:

html

Copy

```
<form action="/submit_form">
    <label for="name">Name:</label>
    <input type="text" id="name" name="name">
    <label for="email">Email:</label>
    <input type="email" id="email" name="email">
    <input type="submit" value="Submit">
</form>
```

2. Hyperlinks (<a> Tag)

The <a> (anchor) tag is used to create hyperlinks that allow users to navigate between pages or trigger actions when clicked.

- **Navigation Links**: Allows linking to other pages, websites, or resources.
- **Anchor Links**: Allows jumping to specific sections within the same page.
- **Action Links**: Triggering JavaScript functions or events.

Example:

html

Copy

```
<a href="https://www.example.com" target="_blank">Go to Example.com</a>
```

3. Multimedia Integration

HTML allows embedding multimedia content to enhance interactivity. This includes images, videos, audio, and animations.

- **Images**: <img> tag is used to display images on a webpage.
- **Videos**: <video> tag is used to embed video content.
- **Audio**: <audio> tag is used to embed audio content.
- **Animations**: CSS animations and JavaScript can be used to animate elements for interactivity.

Example:

html

Copy

```
<video controls>
    <source src="video.mp4" type="video/mp4">
```

Your browser does not support the video tag.
</video>

4. JavaScript (JS)

JavaScript is the scripting language that adds interactivity and dynamic behavior to an HTML page. It allows you to manipulate the DOM (Document Object Model), handle events, and create interactive effects.

- **Event Handling**: JavaScript can listen for events like clicks, keypresses, or mouse movements and trigger specific actions in response.
- **DOM Manipulation**: JavaScript can add, remove, or change elements on the page dynamically without needing to reload the entire page (e.g., using document.getElementById()).

Example:

html
Copy
<button onclick="alert('Hello, World!')">Click Me</button>

5. CSS (Cascading Style Sheets)

CSS is used to style the HTML elements and can add interactive effects through transitions, animations, and hover states. It's often combined with JavaScript for enhanced interactivity.

- **Hover Effects**: Changing the appearance of elements when the user hovers over them.
- **Transitions**: Smoothly animating changes from one state to another.
- **Animations**: Creating motion effects on elements such as sliding, fading, etc.

Example:

html
Copy
<style>
button:hover {
background-color: blue;
color: white;
transform: scale(1.2);
transition: all 0.3s ease;
}
</style>
<button>Hover over me!</button>

6. Modal Windows

Modal windows are pop-up windows that appear above the main content to grab the user's attention, often used for displaying forms, alerts, or confirmations.

- **JavaScript and CSS**: They are implemented using JavaScript to trigger the modal opening and closing, and CSS to style the modal's appearance.

Example:

html
Copy
<button onclick="document.getElementById('myModal').style.display='block'">Open Modal</button>

×
Some text in the Modal..

7. Drag and Drop

The drag-and-drop functionality allows users to move elements around on the page.

- **HTML5 Drag and Drop API**: This allows elements to be dragged and dropped using the mouse. It involves setting elements as draggable and listening for drag-and-drop events.

Example:

html
Copy
Drag me

```
<script>
function drag(event) {
    event.dataTransfer.setData("text", event.target.id);
}
</script>
```

8. Form Validation

HTML5 introduced built-in form validation, where the browser checks if the entered data is correct before submitting it to the server.

- **Required Fields**: Ensures that certain fields are filled out before submission.
- **Pattern Matching**: Checks if the data matches a specific format (e.g., email or phone number).
- **Min and Max Lengths**: Enforces the minimum and maximum number of characters in a field.

Example:

```
html
Copy
<form>
    <input type="text" required placeholder="Name">
    <input type="email" required placeholder="Email">
    <input type="submit">
</form>
```

9. Dynamic Content Loading (AJAX)

AJAX (Asynchronous JavaScript and XML) allows content to be loaded or updated without refreshing the entire page.

- **AJAX Requests**: Allows JavaScript to send and receive data from the server asynchronously and update parts of the webpage accordingly.

Example:

```
javascript
Copy
var xhttp = new XMLHttpRequest();
xhttp.onreadystatechange = function() {
    if (this.readyState == 4 && this.status == 200) {
      document.getElementById("content").innerHTML = this.responseText;
    }
};
xhttp.open("GET", "example.html", true);
xhttp.send();
```

10. Canvas and SVG

The <canvas> element in HTML5 and **SVG** (Scalable Vector Graphics) allow developers to draw graphics dynamically, create animations, and manipulate images.

- **Canvas**: Used for drawing 2D shapes and images via JavaScript.
- **SVG**: An XML-based format that is used to create vector graphics.

Example:

```
html
Copy
<canvas id="myCanvas" width="200" height="100"></canvas>
<script>
var ctx = document.getElementById('myCanvas').getContext('2d');
ctx.fillStyle = "blue";
ctx.fillRect(10, 10, 150, 50);
</script>
```

Other tool application:-

1. Font Dragr

Font Dragr allows you to preview custom web fonts in the browser with a simple drag-and-drop interface. You can test typefaces, scalable vector graphics, and Web Open Fonts instantly, helping you decide whether the font is appropriate for your website.

2. HTML5 Maker

HTML5 Maker is an online animation tool that lets developers add interactive content using

INFUSION NOTES
WHEN ONLY THE BEST WILL DO

Dear Aspirants, here are the our results in differents exams (Proof Video Link)

RAS PRE. 2021 - https://shorturl.at/qBJ18 (74 प्रश्न , 150 में से)

RAS Pre 2023 - https://shorturl.at/tGHRT (96 प्रश्न , 150 में से)

UP Police Constable 2024 - http://surl.li/rbfyn (98 प्रश्न , 150 में से)

Rajasthan CET Gradu. Level - https://youtu.be/gPqDNlc6URO

Rajasthan CET 12th Level - https://youtu.be/oCa-CoTFu4A

RPSC EO / RO - https://youtu.be/b9PKjl4nSxE

VDO PRE. - https://www.youtube.com/watch?v=gXdAk856W18&t=202s

Patwari - https://www.youtube.com/watch?v=X6mKGdtXyu4&t=2s

PTI 3rd grade - https://www.youtube.com/watch?v=iA_MemKKgEk&t=5s

SSC GD - 2021 - https://youtu.be/2gzzfJyt6vI

EXAM (परीक्षा)	DATE	हमारे नोट्स में से आये हुए प्रश्नों की संख्या
MPPSC Prelims 2023	17 दिसम्बर	63 प्रश्न (100 में से)
RAS PRE. 2021	27 अक्तूबर	74 प्रश्न आये
RAS Mains 2021	October 2021	52% प्रश्न आये

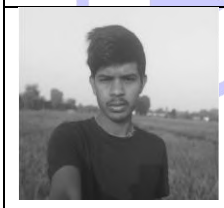
whatsapp https://wa.link/yoh401 1 web.- https://shorturl.at/mhX41

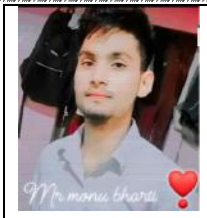
RAS Pre. 2023	01 अक्टूबर 2023	96 प्रश्न (150 मेंसे)
SSC GD 2021	16 नवम्बर	68 (100 में से)
SSC GD 2021	08 दिसम्बर	67 (100 में से)
RPSC EO/RO	14 मई (1st Shift)	95 (120 में से)
राजस्थान S.I. 2021	14 सितम्बर	119 (200 में से)
राजस्थान S.I. 2021	15 सितम्बर	126 (200 में से)
RAJASTHAN PATWARI 2021	23 अक्तूबर (1st शिफ्ट)	79 (150 में से)
RAJASTHAN PATWARI 2021	23 अक्तूबर (2nd शिफ्ट)	103 (150 में से)
RAJASTHAN PATWARI 2021	24 अक्तूबर (2nd शिफ्ट)	91 (150 में से)
RAJASTHAN VDO 2021	27 दिसंबर (1st शिफ्ट)	59 (100 में से)
RAJASTHAN VDO 2021	27 दिसंबर (2nd शिफ्ट)	61 (100 में से)
RAJASTHAN VDO 2021	28 दिसंबर (2nd शिफ्ट)	57 (100 में से)
U.P. SI 2021	14 नवम्बर 2021 1st शिफ्ट	91 (160 में से)
U.P. SI 2021	21नवम्बर2021 (1st शिफ्ट)	89 (160 में से)
Raj. CET Graduation level	07 January 2023 (1st शिफ्ट)	96 (150 में से)
Raj. CET 12th level	04 February 2023 (1st शिफ्ट)	98 (150 में से)
UP Police Constable	17 February 2024 (1st शिफ्ट)	98 (150 में से)

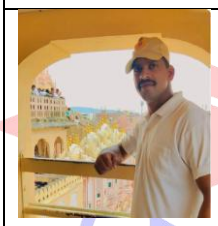
& Many More Exams like UPSC, SSC, Bank Etc.

Our Selected Students

Approx. 563+ students selected in different exams. Some of them are given below -

Photo	Name	Exam	Roll no.	City
	**Mohan Sharma S/O Kallu Ram**	Railway Group - d	114195120370022	PratapNagar Jaipur
	**Mahaveer singh**	Reet Level- 1	1233893	Sardarpura Jodhpur
	**Sonu Kumar Prajapati S/O Hammer shing prajapati**	SSC CHSL tier-1	2006018079	Teh.- Biramganj, Dis.- Raisen, MP
N.A	**Mahender Singh**	EO RO (81 Marks)	N.A.	teh nohar , dist Hanumangarh
	**Lal singh**	EO RO (88 Marks)	13373780	Hanumangarh
N.A	**Mangilal Siyag**	SSC MTS	N.A.	ramsar, bikaner

	**MONU S/O KAMTA PRASAD**	SSC MTS	3009078841	kaushambi (UP)
	**Mukesh ji**	RAS Pre	1562775	newai tonk
	**Govind Singh S/O Sajjan Singh**	RAS	1698443	UDAIPUR
	**Govinda Jangir**	RAS	1231450	Hanumangarh
N.A	**Rohit sharma s/o shree Radhe Shyam sharma**	RAS	N.A.	Churu
	**DEEPAK SINGH**	RAS	N.A.	Sirsi Road , Panchyawala
N.A	**LUCKY SALIWAL s/o GOPALLAL SALIWAL**	RAS	N.A.	AKLERA , JHALAWAR
N.A	**Ramchandra Pediwal**	RAS	N.A.	diegana , Nagaur

	**Monika jangir**	RAS	N.A.	jhunjhunu
	**Mahaveer**	RAS	1616428	village-gudaram singh, teshil-sojat
N.A	**OM PARKSH**	RAS	N.A.	Teshil-mundwa Dis- Nagaur
N.A	**Sikha Yadav**	High court LDC	N.A.	Dis- Bundi
	**Bhanu Pratap Patel s/o bansi lal patel**	Rac batalian	729141135	Dis.- Bhilwara
N.A	**mukesh kumar bairwa s/o ram avtar**	3rd grade reet level 1	1266657	JHUNJHUNU
N.A	**Rinku**	EO/RO (105 Marks)	N.A.	District: Baran
N.A.	**Rupnarayan Gurjar**	EO/RO (103 Marks)	N.A.	sojat road pali
	**Govind**	SSB	4612039613	jhalawad

	**Jagdish Jogi**	EO/RO (84 Marks)	N.A.	tehsil bhinmal, jhalore.
	**Vidhya dadhich**	RAS Pre.	1158256	kota
	**Sanjay**	Haryana PCS	96379 	Jind (Haryana)

And many others.....