TRAINING DAY 13 REPORT:

- ## Introduction to Network

  Definition:

  A **network** is a group of **two or more connected devices** (like computers, mobiles, servers) that can **communicate and share resources** such as files, internet, printers, or data.

  Example: Computer Lab

  All the computers are connected to a **central server** for file sharing, printing, and internet — this is a **LAN (Local Area Network)**.

- ## Computer Networking

  Definition:

  Computer Networking is the process of **connecting multiple computers and devices** together to **share data, resources, and services** like internet, printers, files, etc.

  It allows devices to **communicate with each other**, either locally or globally.

  The **internet** itself is the world's largest computer network!

- ## Computer Network Functionalities

  Computer networks are not just about connecting devices — they also **perform key functions** to ensure **data is sent and received correctly and efficiently**.

  ### Mandatory Functions (Must-Have for Communication)

  These are **essential** for the proper working of any computer network:

  1. **Error Control**

     - Ensures data is received **accurately**.
     - Detects and **corrects errors** during transmission.

- Eg: If a file is corrupted in transit, it gets resent.

2. **Flow Control**

   - Controls the **rate of data** transmission.

   - Prevents **fast sender** from overwhelming a **slow receiver**.

   - Eg: Like speaking slowly so the listener understands.

3. **Multiplexing**

   - Combines data from **multiple sources** into one signal for transmission.

   - Eg: Like several people sharing the same road.

4. **Demultiplexing**

   - Separates a combined signal back into **individual data streams** at the receiver end.

   - Eg: Sorting letters from different senders into different mailboxes.

Optional Functions (Helpful but not always required)

These depend on the network type or use case:

1. Encryption – Protects data with coding to ensure privacy

2. **Compression** – Reduces size of data to speed up transmission

3. **Routing** – Finds the best path for data (mainly in large networks)

4. **Scheduling** – Prioritizes certain data (like video calls) over others

- # Advantages & Disadvantages of Computer Networks

  How **computer networks** help us connect and share, but also come with some challenges.

  ## Advantages of Computer Networks

   ### 1. Resource Sharing

   - Share printers, files, and internet across devices.

   ### 2. Communication

   - Enables email, messaging, voice & video calls over the network.

   ### 3. Centralized Data Storage

- Data can be stored on a central server and accessed by all.

4. **Time and Cost Saving**

- Reduces need for physical resources and saves time in data transfer.

5. Remote Access

- Allows users to access systems and files from anywhere.

6. **Collaboration**

- Teams can work together in real-time (e.g., Google Docs, file sharing).

Disadvantages of Computer Networks

1. **Security Issues**

- Data can be hacked or stolen if not protected.

2. **Spread of Malware**

- Viruses can quickly spread across connected systems.

3. **Network Failures**

- If the network goes down, communication and access are blocked.

4. **Setup & Maintenance Cost**

- Requires hardware (routers, switches) and technical staff.

5. **Complexity**

- Managing large networks can be difficult without proper training.

• Important Networking Devices

The main devices that help form and manage a **computer network**. These devices handle **data transfer, routing, communication**, and more.

1. Hub

- A basic device that connects multiple computers in a network.

- Sends data to **all** connected devices (not smart).

Not commonly used today due to low efficiency.

2. Switch

- Smarter than a hub.

- Sends data **only to the intended device** using MAC address.

Used in **LANs** for fast communication.

3. Router

- Connects **different networks together** (like home to internet).

- Assigns **IP addresses** and routes data **between networks**.

Common in homes and offices for Wi-Fi & internet access.

4. Modem

- Short for **Modulator-Demodulator**.

- Converts **digital signals to analog** and vice versa for internet access over telephone/cable lines.

 Needed to connect to your ISP (Internet Service Provider).

5. Access Point (AP)

- Extends wireless coverage.

- Lets wireless devices (phones, laptops) connect to a wired network.

 Used in large buildings to spread Wi-Fi range.

6. Repeater

- Boosts and extends network signals.

- Used when the signal gets **weak over long distances**.

Example: Wi-Fi range extender at home.

7. Firewall (Hardware or Software)

- Monitors and controls incoming/outgoing network traffic.

- Provides **security** by blocking unwanted access.

Bonus: Bridge

- Connects **two LAN segments** and makes them act as one.

- Used in older networks (replaced mostly by switches today).

- ## Types of Computer Networks (CN)

Different **types of computer networks** based on their **size, coverage, and purpose**.

1. LAN – Local Area Network

- Covers a **small area** like a home, school, or office.

- Connects a few computers/devices using cables or Wi-Fi.

- **Fast speed**, low cost.

  Example: Computer lab.

2. MAN – Metropolitan Area Network

- Covers a **city or town**.

- Connects multiple LANs within a city using high-speed links.

- Managed by government or big companies.

  Example: City-wide cable network or government department offices.

3. WAN – Wide Area Network

- Covers a **large area** (countries or continents).

- Connects multiple LANs/MANs through satellites, fiber, etc.

- Slower than LAN but offers **global communication**.

  Example: The Internet is the biggest WAN.

4. PAN – Personal Area Network

- Very **small range** (few meters).

- Used for connecting personal devices like phone, laptop, smartwatch.

  Example: Phone connected to Bluetooth earbuds.

5. WLAN – Wireless LAN

- A **wireless version of LAN** using Wi-Fi.

- No physical cables, used in homes, cafés, offices.

Example: Home Wi-Fi network.

- ## Network Protocols

  Network protocols — the **rules and standards** that define how data is sent, received, and processed across a network.

  ### What is a Network Protocol?

  A **network protocol** is a set of **rules and conventions** that allows devices to **communicate** with each other smoothly and correctly in a network.

They define:

- How data is **packaged and transmitted**
- How it is **received and understood**

Common Network Protocols & Their Functions

Protocol	Full Form	Purpose
HTTP	HyperText Transfer Protocol	Used for loading web pages (unsecured)
HTTPS	HTTP Secure	Secure version of HTTP using encryption
FTP	File Transfer Protocol	Transfer files between computers
SFTP	Secure FTP	Encrypted file transfers
TCP	Transmission Control Protocol	Ensures reliable, ordered delivery of data
UDP	User Datagram Protocol	Faster but **no guarantee** of delivery
IP	Internet Protocol	Assigns addresses, handles data routing
SMTP	Simple Mail Transfer Protocol	Sends emails
IMAP	Internet Message Access Prot.	Accesses email on server
DNS	Domain Name System	Converts domain names to IP addresses

Protocol	Full Form	Purpose
DHCP	Dynamic Host Config. Protocol	Automatically gives IP addresses
ICMP	Internet Control Message Prot.	Used for errors and diagnostics (e.g. `ping`)

Example in Real Life:

When I open a website:

1. **DNS** converts the name (like google.com) to an IP.

2. **HTTP/HTTPS** loads the webpage.

3. **TCP/IP** ensures the data reaches properly.

4. **ICMP** might be used if there's a network error.

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