Unit 2. Basic organization and Network fundamentals: *Computer Organization*: Functional components ,Input/Output devices, Storage types, Memory hierarchy.

Types of Computers: Micro, Mini, Mainframe, Supercomputers.

Networking Fundamentals: Definition, need for networks, types (LAN, WAN, MAN), topology (Star, Ring, Bus).

Internet Basics: IP Address, Domain Name, Web Browser, Email, WWW.

Computer network:-

A computer network is an interconnection among two or more computers or computing devices. Such interconnection allows computers to share data and resources among each other.

Ex:- internet , school or college computer lab network, mobile networks, wi-fi, Bluetooth, mobile hotspot network.

Feature of Computer Networks:-

Computer Networking has become the backbone of modern communication and information exchange.

A computer network is needed to share data resources, information easily and securely among multiple computers.

1). Resource Sharing:-

Networks allow for efficient sharing of resources such as printers, storage devices and software applications, reducing the need for individual devices for each user. This helps organizations reduce costs while increasing productivity and operational efficiency.

2). Improved communication:-

A network provides various communication tools like email, whatsapp, video conferencing, making it easier for teams to communicate.

3). Internet Access:-

Network provides businesses, organizations and individuals with access to the internet, which is important for accessing online resources, communicating globally. Internet connectivity via networks has become essential for research, marketing, customer service and more.

4). Enhanced Security:-

Computer networks play a critical role in securing sensitive data. Security technologies such as firewalls, encryption and secure connections and valuable data is protected from cyber attacks.

5). Remote Access:-

Users can access data or systems from anywhere using the internet.

Ex:- employees working from home can connect to their office network.

6). Speed and Efficiency:-

Computer networks allow fast transfer of data and information between devices, instead of using USB drives or CD's. networks also reduce manual work and savetime.

Ex:- in a college, when marks are updated on the server, all departments can view the results instantly. No need to send files manually to each system.

Use of computer Networks:-

1). For people, video conferencing person to person communication through computer network.

2). Accessing for remote information.

3). For interactive entertainment like video on demand and playing game.

4). It is used of social issues.

5). Computer networks are used for resources sharing(like data, equipment etc..)

Types of Networks:-

A computer network is a system that connects many independent computers to share information or data and resources.

It is a collection of two or more computers linked together for communication and resource sharing. The connection between computers can be established using wired (cable) or wireless technologies.

1). Personal Area Network (PAN):-

It is a network formed by connecting a few personal devices like computers, laptops, mobile phones, smartphones, printers etc. all these devices connected within an approximate range of 10 meters. A PAN may be wired or wireless.

Ex:-

Bluetooth connection between a phone and wireless earbuds,

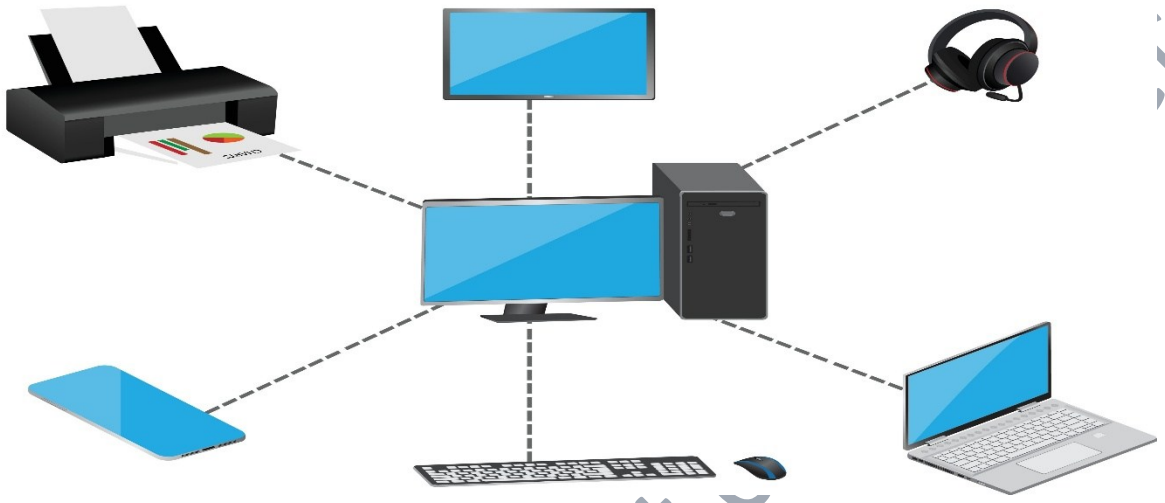
Infrared communication between TV and Remote,

USB connection between laptop and mobile,

Wifi hotspot from mobile to laptop,

Smartwatch connected to smartphone.

PAN: Personal Area Network



2). Local Area Network (LAN):-

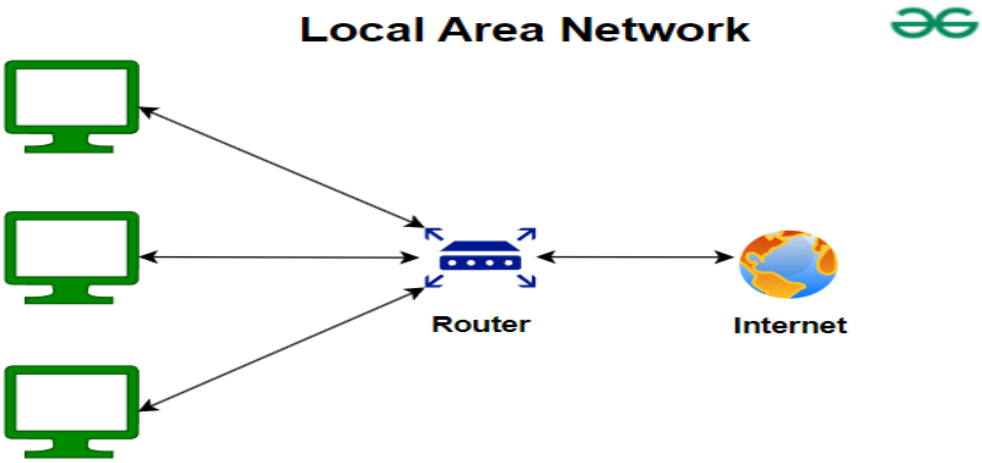
It is a network that connects computers, mobile phones , tablet, mouse, printers etc placed at a limited distance.

The geographical area covered by a LAN can range from a single room, a floor, an office. The range of LAN is 1 KM.

It's designed to cover short distances, allowing all connected devices to share resources such as files, printers, and internet access. In most LANs, speeds range from 10 Mbps to 100 Mbps, though faster speeds are now common.

Examples of LAN

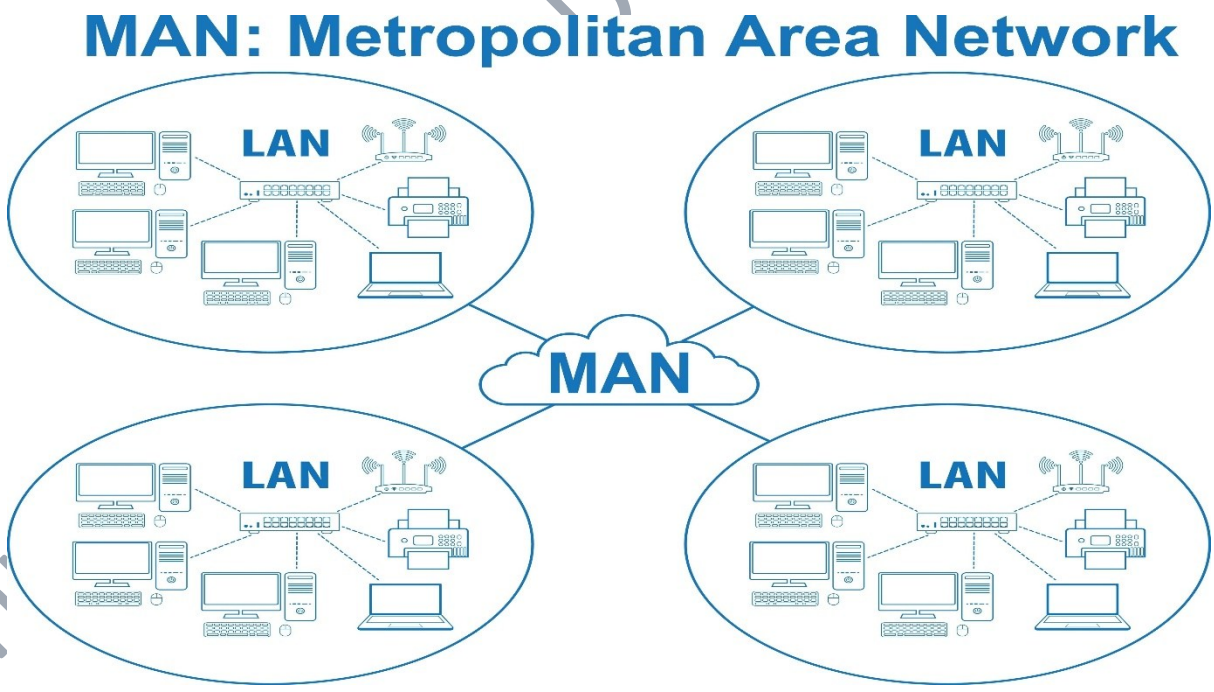
- Computers connected in a **computer lab**.
- Systems in a **college or school building** connected to one server.
- **Office network** where employees share files and printers.



3). Metropolitan Area Network (MAN):-

A MAN is a network that covers a large geographical area like a city or a town.

It connects multiple LANs together within a metropolitan area. A MAN network can be extended up to 10 to 50 KMs.



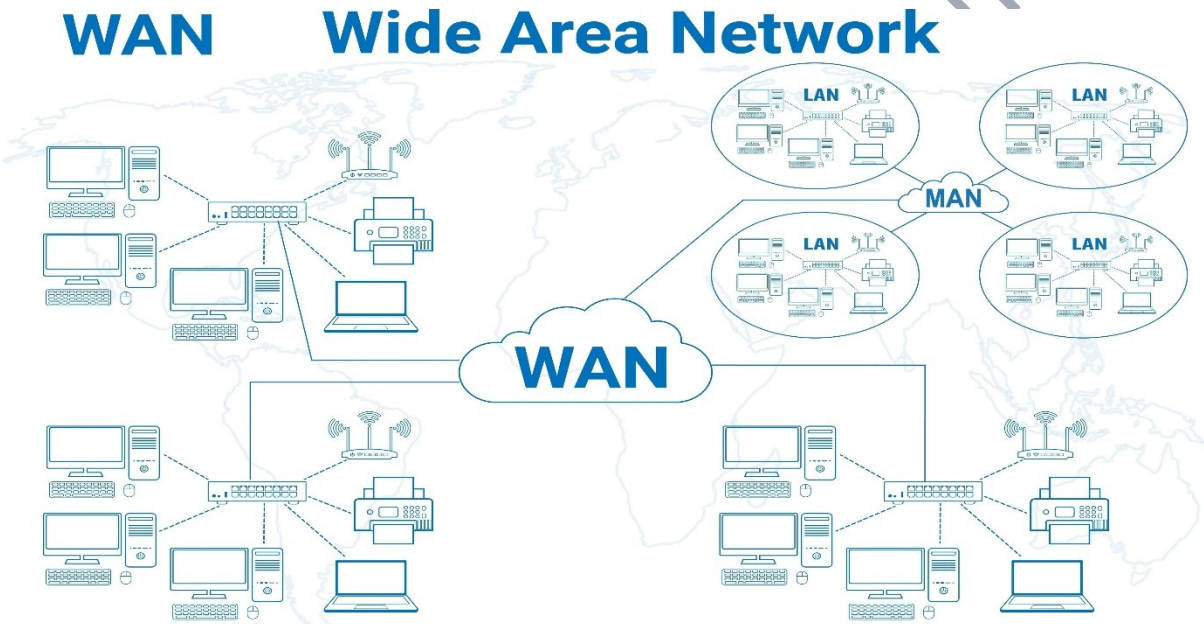
Ex :- TV Cables, Mobile Towers.

4). Wide Area Network (WAN):-

WAN connects computers and other LANs and MANs, which are spread across different geographical locations of country.

Large business, educational and government organisations connect their different branches in different locations across the world through WAN.

The Internet is the largest WAN that connects billions of computers, smartphones and millions of LANs from different continents.



Network Topologies :-

A network topology is the arrangement of devices (nodes) and connections (links) in a computer network. It shows how computers, servers and other devices are connected and how data flow between them.

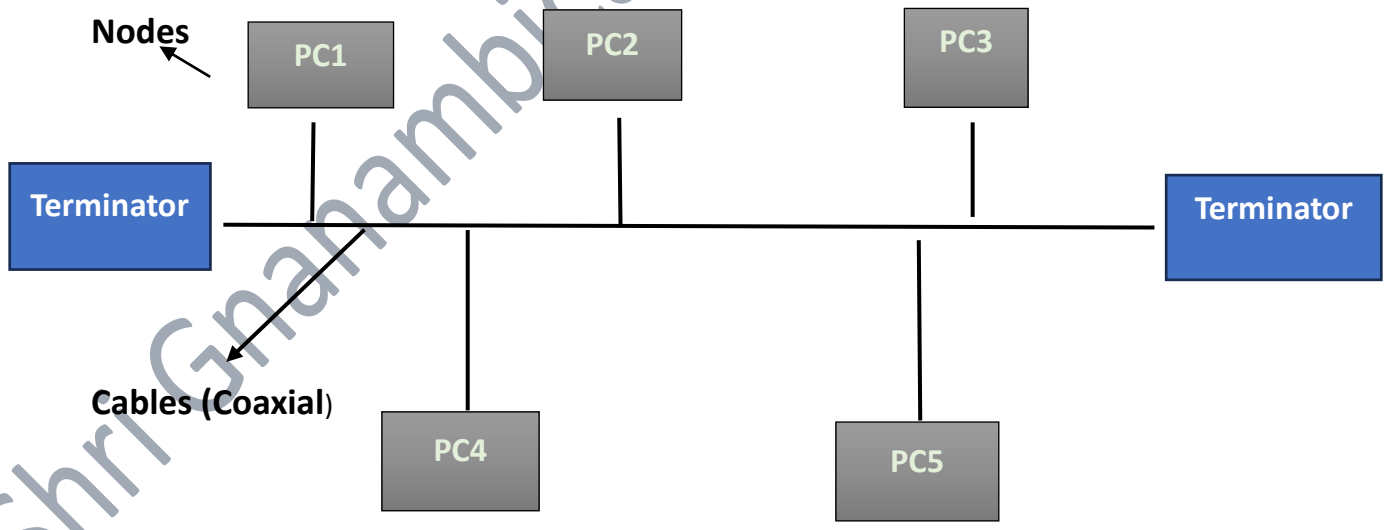
In short topology means arrangement of computers. Topology defines the structure of the network of how all the components are interconnected to each other.

Types :-

1. Bus topology
2. Star topology
3. Ring topology
4. Tree topology
5. Mesh topology
6. Hybrid topology

1. Bus topology:-

In this topology all the computers are connected with single cable. Generally coaxial cables are used for connecting computers. This single cable acts as a shared communication medium.



Advantages :-

1. Easy to install and use for small networks.

2. Requires less cable than star or mesh topology.

3. cost-effective for small setups.

How it works:-

1. when a computer sends data, it travels through the main cable (the bus).

2. Every device connected to the bus receives the data, but only the intended receiver accepts and processes it.

3. the signal continues along the bus until it reaches the end terminators.

4. terminators stop the signal from bouncing back and causing errors.

Example:-

Suppose 5 computers (PC1 , PC2, PC3, PC4, PC5) are connected using a single cable.

* when PC1 sends data to PC5 , the message travels through the main cable.

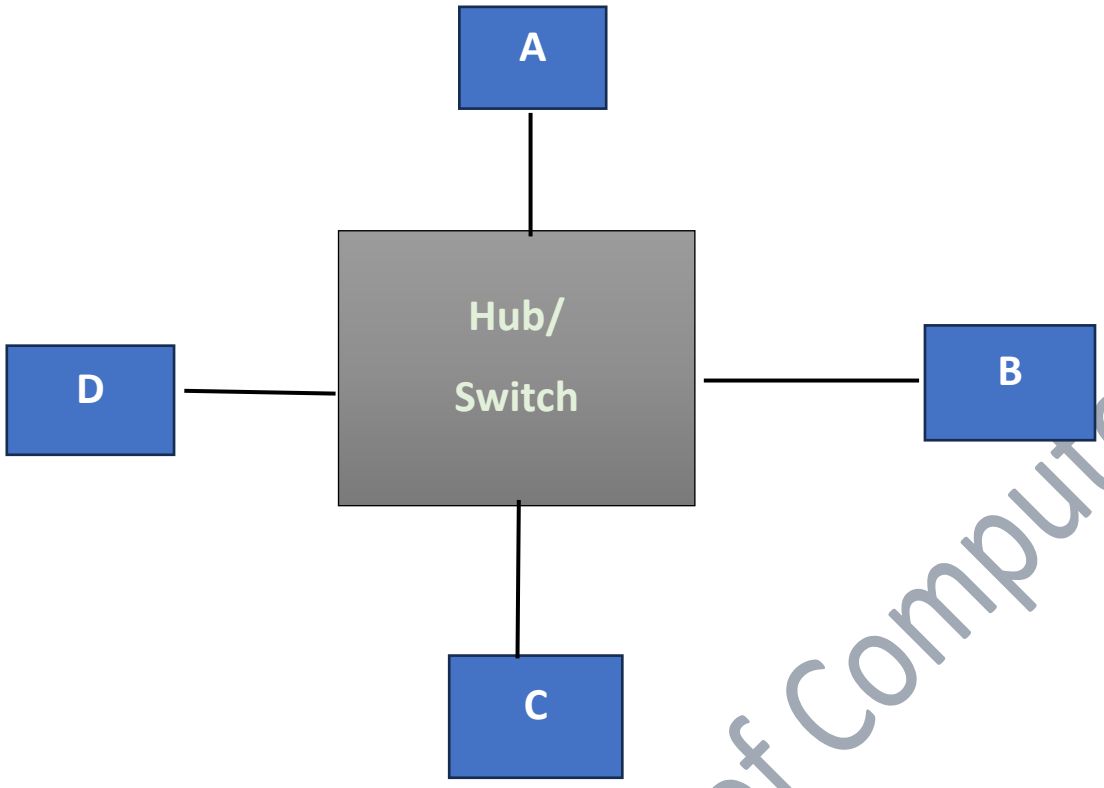
* PC2, PC3, PC4 receive the signal but ignore it since it's not for them.

* PC5 accepts the data.

2. Star Topology:-

In star topology all computers (nodes) are connected to a central device like a switch or hub. They do not connect to each other directly, only to the central device.

Star Topology is considered very effective, efficient and fast as each device is directly connected with the central device.



Hub:-

A hub is a simple network device that connects multiple computers in a LAN. It takes data from one computer and sends it to all other computers connected to it.

How it works (hub):-

1. when a computer sends data
2. the hub receives it.
3. then the hub broadcasts that data to all other parts.
4. only the intended computer uses it, others just ignore it.

Switch:-

A switch is a smarter device then a hub. It connects multiple computers and sends data only to the specific device.

How it works:-

1. when a computer (A) sends data to (D)
2. the switch checks the MAC address of D.
3. it sends the data only to D's port, not to every one.

Ex:-

If A sends a message to D

Hub → sends to all (B,C,D)

Switch → sends only to D.

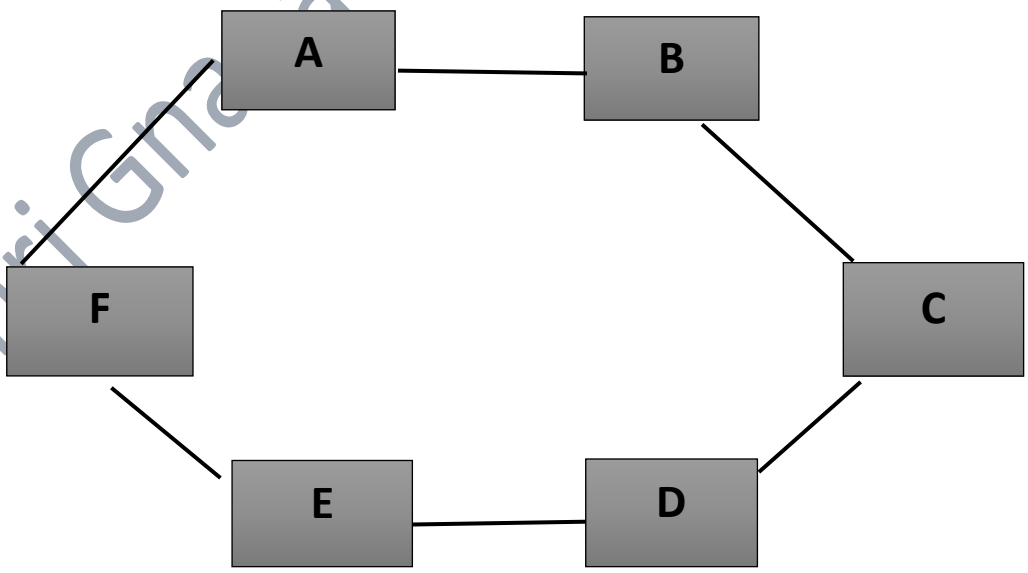
How it works (Star Topology):-

1. suppose computer A wants to send data to computer D.
2. A sends the data to the hub/ switch (center)
3. the Hub/ Switch checks where the data should go.
4. it then sends the data only to D (the destination).

Ring Topology:-

In ring topology, each computer (node) is connected to exactly two other computers forming a closed loop(ring). All computers are connected in a circle.

Data travels in one direction or sometimes in both directions. There is no central hub or switch.



How ring topology works:-

1. suppose computer A wants to send data to computer D.

2. data moves from A → B → C → D.

3. each computer checks the destination address.

-> if it's not the destination, it passes the data to the next node.

-> if it matches, the computer accept the data.

Difference between MAC Address and IP Address:-

MAC Address:-

MAC stands for Media Access Control. The MAC address, also known as the physical or hardware address, is a unique value associated with a network.

IP Address:-

IP address also known as Internet Protocol Address. Is also a unique address that can be used to uniquely identify each node in a network. It is used to identify a device's location on the internet or network.

Internet Basics:-

The internet is a global network of interconnected computers that communicate with each other using standard communication protocols such as TCP/IP(Transmission Control Protocol/ Internet Protocol). It allows users to share information, access websites, sends emails, and transfer data across the world.

The internet connects millions of devices through servers, routers, and communication links, enabling various services

like the world wide web(WWW), email, online banking, e-commerce and social media.

It is often called “network of networks” because it links many smaller networks together, making it possible for anyone, to exchange data.

History of the Internet:-

Long age before the internet computers could not share information. Each computer worked alone- no connection, no data sharing.

1). ARPANET

Stands for advance research project agency network. It is the first internet started in 1969 and it was created by the US defence department.

2). Email

In 1971m a man named Ray Tomlinson created Email. For the first time people could send messages using computers.

3). TCP/IP protocols:-

In 1983, a new rule called TCP/IP started . this rule helped different networks connect together from this time, the name internet started being used.

4). DNS introduced

In 1984, DNS (domain name system) started. Before DNS, people had to remember long numbers (IP address), after DNS, people could type easy names like www.google.com

5). WWW created

In 1989, Tim Berners lee a scientist invented the WWW. He created HTML for writing web pages, HTTP for sending and receiving web pages, URL for websites addresses.

6). Web Browsers and websites :-

In 1993, the first browser called mosaic was made. Later browsers like Netscape, internet explored and google chrome. People started making websites for education, shopping and entertainment.

7). Smart Internet:-

People use internet on mobiles, tablets, smart TVs technologies like cloud AI, IOT, and 5G made internet very fast and smart today the internet connects the whole world.

What is an IP Address ?

An IP Address (Internet Protocol) is a unique numerical label assigned to every device(computer, smartphone, printer etc..) connected to a network that uses the Internet Protocol (IP) for communication.

It acts like a home address for a device on the internet and it helps other devices identify and locate it to send and receive data.

There are two main types of IP addresses used in networking:

1. IPv4(internet protocol version 4)

- old and most commonly used version
- 32- bit address
- written in numbers separated by dots and total 4.3 billion addresses.

Ex:- 192.168.1.1

2. IPv6(internet protocol version 6)

- new version (because IPv4 address are getting finished)
- 128- bit address

- written in hexadecimal numbers separated by colons and IPv6 address count is infinite.

Ex:- 2001:0db8:85a3:0000:0000:8a2e:0370:7334

TCP (transmission control protocol):-

Generally Transmission means sending or transferring some thing from one place to another.

It is one of the main protocols used on the internet to send and receive data safely and correctly between two computers.

TCP is a connection-oriented protocol, which means it establishes a connection between the sender and receiver before data transmission.

It divides large data into small packets, sends them and ensures that all packets reach the destination correctly and in order.

Example:-

Imagine you are sending a photo to your friend on whatsapp.

Step-by-step :-

1. when you press “send” your photo is broken into small pieces called data packets.

2. TCP sends these packets one by one through the internet.

3. if any packet is lost, TCP will send it again

4. TCP makes sure that all packets reach your friend in the correct order.

5. finally, TCP joins all the packets together your friend sees the full photo clearly.

Transmission = sending data

Control = managing or guiding

Protocol = set of rules

So TCP= rules that control how data is sent safely and correctly over the internet.

WWW(world wide web):-

WWW is a collection of websites and webpages that you can access on the internet using a browser like chrome , firefox etc.. it was created to help people share and find information easily, using links that connect different pages together.

The web allows us to browse websites, watch videos, shop online , and connect with others around the world through our computers and phones.

The WWW was created in 1989 by a scientist named Tim Berners-Lee. He worked at a research center. He is called the father of the web. He developed HTML(language for web pages), URL(address of a webpage), HTTP(rules for communication on web).

Meaning of the word:-

World = entire world (global)

Wide = spread anywhere

Web = network of webpages linked together.

So www= a global network of webpages connected using links.

Key parts of the web :-

The web has three main building blocks that make it work.

1). URL (uniform resource locators):-

This is the address of a webpage, like http://www.gnanambicacollege.com . it tells your browser

exactly where to find the page. URL is the complete address used to locate a specific webpage on the internet.

2). HTTP(hypertext transfer protocol):-

This is the set of rules that lets your browser and the server talk to each other to send and receive webpages.

3). HTML (hypertext markup language):-

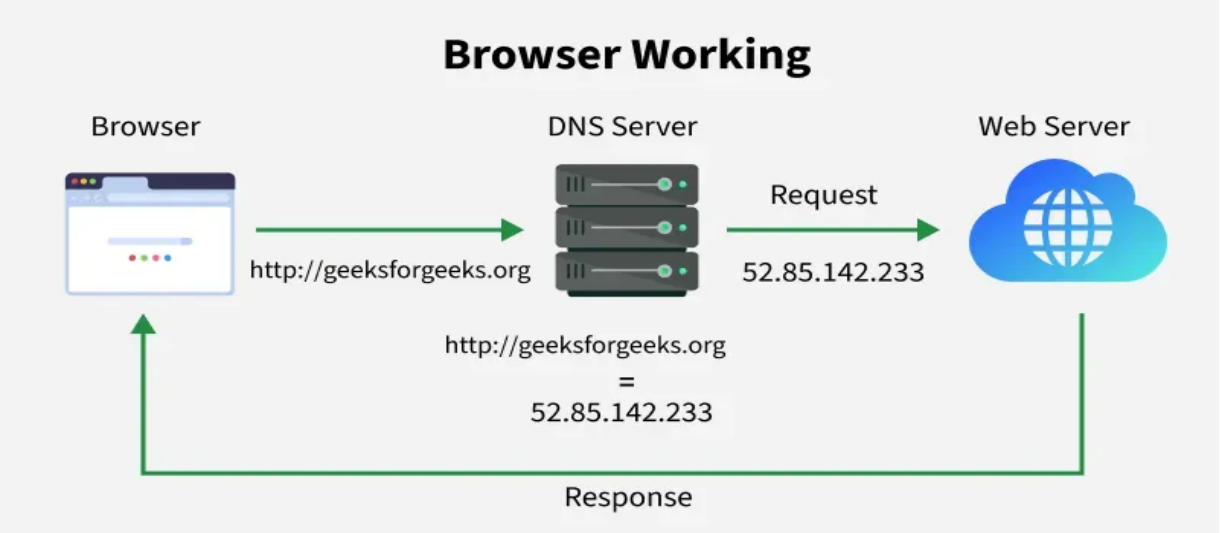
This is the code that tells browsers how to display a webpage, including where to put text, pictures, and links.

Web Browser:-

A web browser is a software application that allows users to open, view, and interact with websites on the world wide web.

When a user enters a URL(uniform resource locator) in the address bar, the browser sends a request to the web server where the website is stored the server then responds by sending the required web page data, which the browser displays on the users screen.

Web browsers are capable of interpreting web languages such as HTML, CSS and javascript and convert then into a user-friendly visual format containing text ,images, audio, video, tables and links.



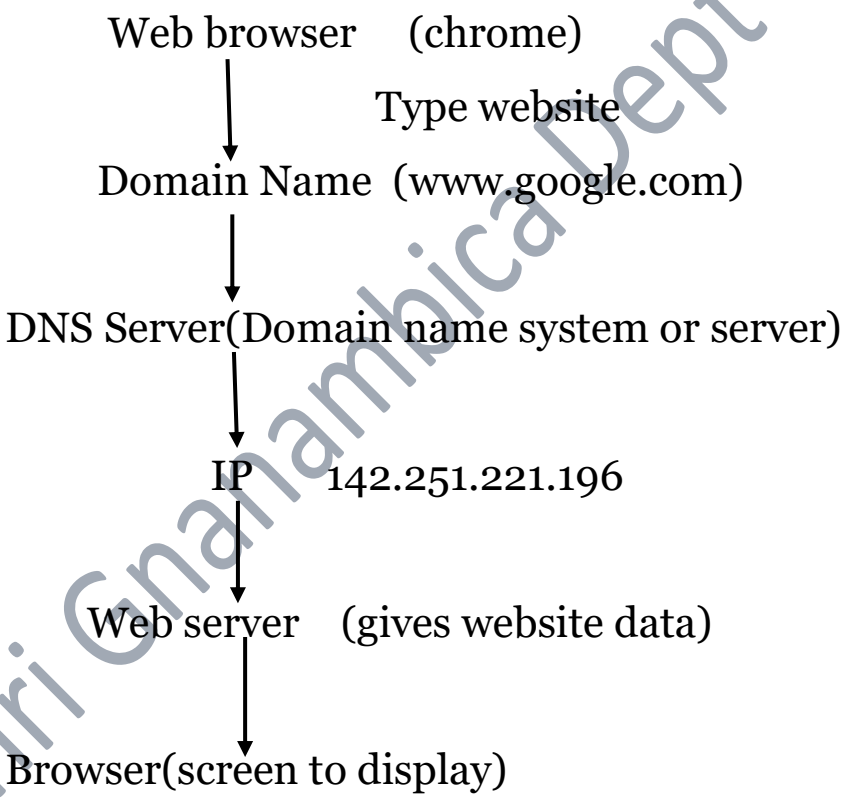
Examples of popular web browsers:-

Google chrome , mozilla firefox, Microsoft edge, safari, opera, yahoo etc...

How a web browser works:-

1. users enter URL Ex:- www.google.com
2. browsers convert URL into the websites IP address.
3. browsers sends request to the web server.
4. server responds with webpage code (HTML, CSS,JS)
5. browsers draws the webpage and displays it to the user.

Step- by-Step Working:-



Domain name:-

A domain name is the human-readable address of a website on the internet. It is used to identify and access websites easily.

Computers communicate with each other using IP addresses, which are numerical since numbers are difficult to remember , domain names were introduced so that users can remember website addresses easily.

Ex:- www.google.com

www = indicates the website is on the world wide web

google= name of the organization/ website.

.com= top level domain, meaning commercial website.

Types of Domain names:-

1). Top level Domains (TLDs)

.com → commercial organizations

.org→ organizations

.edu → educational institutions

.gov → government websites.

2). Country code top level Domains

Used to identify country-based websites.

.in → india

.uk → united kingdom

.us → united states

How Domain Names Work

1. User enters a domain name in the browser.
2. The **DNS (Domain Name System)** converts the domain name into its corresponding **IP address**.
3. The browser then connects to the web server using the IP address.
4. Website content is displayed to the user.

DNS Server:- (Domain name system)

A DNS server is a system that translates human readable domain names into machine- readable IP addresses that means it is an internet service that translates domain names (like www.google.com) into IP address (like 142.250.193.48).

Computers on the internet communicate using IP addresses not names. Since name are easier for humans to remember, DNS acts as a translator between the name we type and the address computers use.

Email :-

Email stands for electronic mail. It is a method to send messages from one computer to another through the internet. It is mostly used in business, education, technical communication and document interaction. It allows communicating with people all over the world.

Email is invented by Ray Tomlinson in 1971. He also used the "@" symbol to separate the username and the domain (like user@domain.com)

Technologies used in Email:-

1). SMTP (simple mail transfer protocol):-

SMTP is the main protocol used to send emails from one computer to another. It transfers the message from your email client(like Gmail, outlook) to the destination mail server.

Ex:- when you click "send", SMTP carries your message from your Gmail account to the receivers mail server.

2). POP3(post office protocol version 3):-

POP3 is used for receiving emails from the mail server to your device. It downloads the email to your computer or phone, and then delete it from the server (by default).

3). IMAP(internet message access protocol):-

IMAP is another protocol for receiving emails, but it keeps messages on the server instead of deleting them. You can read the same emails from multiple devices(mobile, laptop etc.)

4). MIME(multipurpose internet mail extensions):-

MIME allows emails to carry attachments such as images, audio, video and documents.

Ex:-

sgdc@gmail.com to friend@yahoo.com

1. Gmail uses SMTP to send your messages.
2. the messages travels via the internet.
3. yahoo's server receives it and stores it using IMAP/POP3.
4. your friend opens yahoo mail and reads it.

Type of computers :-

A computer is a electronic device that can store , process and display data according to the instructions given by the user.

Computers are available in different sizes, speeds and storage capacities to perform various types of tasks. Based on their processing power, size, purpose and performance computers are divided into different categories.

1. Micro Computer
2. Mini Computer
3. Mainframe Computer
4. Super Computer.

1. Micro Computer:-

A micro computer is also known as a personal computer (PCs). It was first introduced in the 1970s. it is a small, low-cost computer designed for use by one person at a time.

Micro computers contains all the basic components such as an input devices, output devices, storage device, memory and processor.

A Microcomputer gets its name because its **Central Processing Unit (CPU)** is a **microprocessor**, which is a tiny integrated circuit (IC) chip that performs all the processing tasks.

main features of microcomputer:-

1. single-user system(generally).

2. small in size and cost-effective.

3. users a microprocessor as CPU

4. easy to use, requires little technical knowledge.

Ex:-

- Desktop PC, laptop, tablet, smartphone

2. Mini Computer :-

A mini computer is a medium- sized computer that is in the middle of a micro computer and a mainframe computer in terms of speed, size, storage and cost. It was first developed in the mid- 1960s by digital equipment corporation(DEC).

It is more powerful than a micro computer and can handle multiple users working at the same time. A mini computer can support 10 to 100 users has their own terminal connected to one central system. In india , the first minicomputer was wipro series-86.

Ex:- DEC PDP-11 (digital equipment corporation programmed data processor-11).

VAX 11/780 (virtual address extensions)

IBM AS/400 (international business machines application system).

3. Mainframe Computers:-

A mainframe computer is a large, powerful and high-performance computer used by big organizations to process and store huge amounts of data. It can support hundreds or even thousands of users at the some time.

Mainframes are mainly used where large-scale data processing and security are required such as banks, railways, government offices et..

Uses of mainframe computers:-

→ in Banking to store, customer data, process transactions manage ATMs and data security.

→ in Railways for online reservations, passenger records, train schedules and centralized data management .

Functions of mainframe computers :-

1. ***Data Processing*** (handles large amounts of business data like salary, bill and transactions).

2. ***Centralized Database Management*** (stores and manages data from multiple branches or offices).

3. ***Transaction Handling*** (processes thousands of transactions per seconds in banking, railways etc.).

4. ***Backup and Recovery*** (provides reliable backup and ensures no data is lost).

5. ***Security and Encryption*** (protects confidential and financial data from unauthorized access).

Ex:-

→IBM system (it was the first mainframe series developed by IBM).

→ IBM Zseries (modern mainframe series) – including IBM z10, z13, z14, 15, z16 models. Used by SBI, ICICI bank, LIC and IRCTC for handling millions of transactions daily.

→ Hitachi z800 (developed by hitachi led(Japan) used for real time business data processing data processing and telecom billing systems).

4. Super Computer :-

the first supercomputer was developed by Seymour cray in the 1960's. he is called father of supercomputing.

--> Dr. Vijay Bhatkar was developed india's first supercomputer, PARAM 8000.

A super computer is the fastest and most powerful type of computer, designed to perform very large and complex calculations at extremely high speed. t can process **trillions of instructions per second (TIPS)** and is used for scientific, engineering, and research purposes.

Applications of super computer:-

Field	**Uses**
Weather Forecasting	Predicts rainfall, cyclones, storms (e.g., Cyclone Fani prediction by Pratyush & Mihir).
Medical Research	Drug discovery, DNA sequencing, cancer treatment simulations.

Field	Uses
Space Research	Used by ISRO for rocket design, satellite launch simulation.
Defense	Missile testing, defense modeling, and nuclear research.
Banking & Finance	Risk analysis, stock market predictions.
Artificial Intelligence (AI)	Training large AI and machine learning models.
Engineering Design	Aircraft, automobile design testing.

Super computer in India :-

1. PARAM 8000 (India's first super computer -1991- pune)
2. PARAM siddhi-AI (AI & COVID-19 research-pune)
3. Pratyush (weather & climate forecasting-pune)
4. Mihir (weather & climate forecasting- Noida).
5. SahasraT (scientific research- Bangalore)

A **supercomputer** is the **brain of scientific and technological advancement**.
It helps countries like India in **weather forecasting, defense, AI, and space research**.
Supercomputers play a vital role in solving the world's biggest challenges — from predicting cyclones to finding cures for diseases.

Feature	Micro computer	Mini computer	Mainframe computer	Super computer
Definition	Smallest and cheapest computer used by one person.	Medium-sized computer used by small organizations.	Larger computer used by big organizations to handle large data.	Most powerful and fastest computer used for scientific research.
Processor	Single microprocessor	Multiple processors	Hundreds of processors	Thousands of processors working in parallel.
Speed	Low (few million instructions/sec)	Moderate	Very high	Extremely high (trillions of calculations /sec)
Storage capacity	Limited	Moderate	Very large	Extremely large (many petabytes)
Cost	Low	Moderate	very expensive	Very expensive (most costly)
Examples	PC, Laptop	DEC-PDP, IBM AS	IBM Z series, Hitachi	PARAM siddhi AI, Pratyush. Fugaku.
Use	Education, personal use, small business.	Small industries, department servers.	Banks, railways, insurance companies.	Weather forecasting, defense, spce research.

Functional Components of a Computer:-

A **computer system** is an electronic device that performs calculations, stores data, and executes instructions automatically according to a program.
To perform these tasks efficiently, a computer is divided into **functional components**, also known as **functional units**.

There are mainly **five functional components**:

1. Input Unit
2. Storage Unit
3. Processing Unit (CPU)
4. Output Unit
5. Control Unit

(a) Input Unit

- The **input unit** is responsible for **taking data and instructions** from the user and converting them into a form that the computer can understand (binary form — 0s and 1s).
- This data is then sent to the **main memory** or **processor** for processing.

Functions of Input Unit:

1. Accepts data and instructions.
2. Converts them into binary form.
3. Sends them to the memory or CPU.

Examples:

- Keyboard
- Mouse
- Scanner
- Microphone
- Joystick

(b) Central Processing Unit (CPU)

- The CPU is the **brain of the computer**.
- It performs **all processing operations** such as calculations, comparisons, and logical decisions.
- It also **controls** the operation of all other units.

The CPU is divided into **three main parts:**

1 Arithmetic and Logic Unit (ALU)

- Performs **arithmetic operations**: addition, subtraction, multiplication, division.

- Performs **logical operations**: comparisons such as greater than (>), less than (<), equal (=).

2 Control Unit (CU)

- Acts as the **controller or supervisor** of the entire system.
- It **fetches**, **decodes**, and **executes** instructions.
- It sends control signals to other components to perform specific operations.

3 Registers

- Small high-speed storage locations inside the CPU.
- Used to **hold data temporarily** during execution (for example: accumulator, instruction register, program counter).

(c) Storage Unit (Memory Unit)

This unit stores data and instructions **before**, **during**, and **after** processing.

Functions:

1. Stores data and instructions temporarily or permanently.
2. Provides data to CPU when required.
3. Saves processed results for later use.

Types of storage:

- **Primary storage** → RAM, ROM (directly accessible by CPU)
- **Secondary storage** → Hard disk, Pen drive (for long-term storage)

(d) Output Unit

- Converts processed data (machine language) into a **human-readable form**.
- Displays or produces the final results to the user.

Functions:

1. Receives processed data from CPU.
2. Converts it into understandable form.
3. Presents output to the user.

Examples:

- Monitor
- Printer
- Speakers
- Projector

(e) Control Unit (CU)

Although it's part of the CPU, it plays a special role:

- Controls and coordinates the work of all components.
- Ensures correct sequence of data flow.
- Acts like a **traffic police officer** directing data and instructions.

🔁 Overall Working Cycle of Computer:

Input → Process → Output

↓

Storage

For example:

You type numbers using a keyboard → CPU performs addition → Result is displayed on monitor → Stored in memory if required.

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2. Input and Output Devices

Input Devices

These are devices through which the user **enters data and instructions** into the computer system.

Device	Function
Keyboard	Used for typing letters, numbers, and commands.
Mouse	Used for pointing, clicking, and selecting items.
Scanner	Converts printed images/text into digital form.
Microphone	Records sound and voice input.
Webcam	Captures live video.
Light Pen	Used to draw directly on screen.
Barcode Reader	Reads barcodes used in stores.

Output Devices

These devices are used to **display, print, or present** processed data.

Device	Function
Monitor	Displays visual output (text, video, graphics).
Printer	Produces hard copies of documents.
Speaker	Produces audio output.
Projector	Displays output on a large screen.
Plotter	Draws large-scale graphics (used by engineers, architects).

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3. Storage Types

The computer uses various types of storage to hold data. Storage is divided into **three levels:**

(a) Primary Storage

- Also called **main memory** or **internal memory**.
- Directly accessed by CPU.
- Fastest but limited in size.
- Volatile (data is lost when power is off).

Examples:

1. **RAM (Random Access Memory):**
    - Temporary storage.
    - Data is erased when the computer is turned off.
2. **ROM (Read Only Memory):**
    - Permanent memory.
    - Stores important programs like BIOS (used during startup).

3. **Cache Memory:**
    - Very high-speed memory between CPU and RAM.
    - Stores frequently used data for quick access.

(b) Secondary Storage

- Used for **long-term storage** of data and files.
- Not directly accessed by CPU; data is first loaded into main memory.
- Non-volatile (data remains even after power off).

Examples:

- Hard Disk Drive (HDD)
- Solid State Drive (SSD)
- Pen Drive
- CD/DVD
- Memory Card

(c) Tertiary Storage

- Used for **backup, archival, and massive data storage**.
- Slowest and cheapest per bit.

Examples:

- Magnetic tapes (for backups)
- Cloud Storage (Google Drive, OneDrive)
- External backup systems

4. Memory Hierarchy

The **memory hierarchy** is the arrangement of computer memory in a system based on speed, cost, and capacity. It helps the computer to access data efficiently by storing information in different levels according to how frequently it is used. The hierarchy is structured from the fastest and smallest memory at the top to the slowest and largest memory at the bottom.

It includes the following levels:

(1) Registers, which are the fastest and smallest memories located inside the CPU used to hold temporary data and instructions;

(2) Cache Memory, a high-speed memory that stores frequently used data for quick access by the CPU;

(3) Main Memory (RAM), which stores data and programs currently being processed;

(4) Secondary Memory, such as hard disks and SSDs, used for permanent data storage.

(5) Tertiary Storage, like magnetic tapes and cloud storage, used for backup and archival purposes. The higher levels are faster and more expensive but have smaller capacity, while the lower levels are slower, cheaper, and have larger capacity.

The **advantages** of memory hierarchy are:

it increases the overall processing speed of the computer, balances cost and performance, reduces CPU waiting time for data, and ensures efficient data storage and management. Thus, memory hierarchy helps the computer system achieve high performance at a reasonable cost.

Registers (Fastest, Smallest, Costliest)

↓

Cache Memory

↓

Main Memory (RAM)

↓

Secondary Storage (HDD, SSD)

↓

Tertiary Storage (Cloud, Tape)

Important questions :-

5 Marks :-

1). Define Computer Network and explain the need for networking.

2). Network topology ? explain one type .

3). Difference between LAN, MAN, WAN ?

4). Explain input and output devices with examples.

5). Different types of computer storages ?

6). Difference between micro, mainframe and super computer.

7). Define IP address and its types?

8). Explain world wide web (WWW) and its features.

10 Marks questions :-

1). Explain different types of computers with examples and uses.

2). Explain different types of computer networks with suitable diagrams.

3). Explain types of network topologies with neat diagram .

4). Explain computer organization and its functional components.