



Information Technology for Management

By
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Unit3

- Introduction and conceptual framework of networking & Telecommunication
- Components of networking,
- LAN/WAN/MAN, network topologies, and
- Various options of networking for business,
- Various medium of communication,
- Physical and cable less (dial up, leased line, satellite, V-SAT, DSL Lines, fiber optics)

Earlier Days

- In the early days, computers were expensive and organizations could afford to buy only one computer which was shared by everyone in the organization.
- For example, at IIT Kanpur a computer called IBM 1620 was installed in 1964.
- It was one of the first computers installed in an IIT and cost Rs. 20 Lakhs when the dollar exchange rate was Rs. 4.75 per dollar in contrast to today's Rs. 66.80 per dollar.
- It was used 24 hours a day.

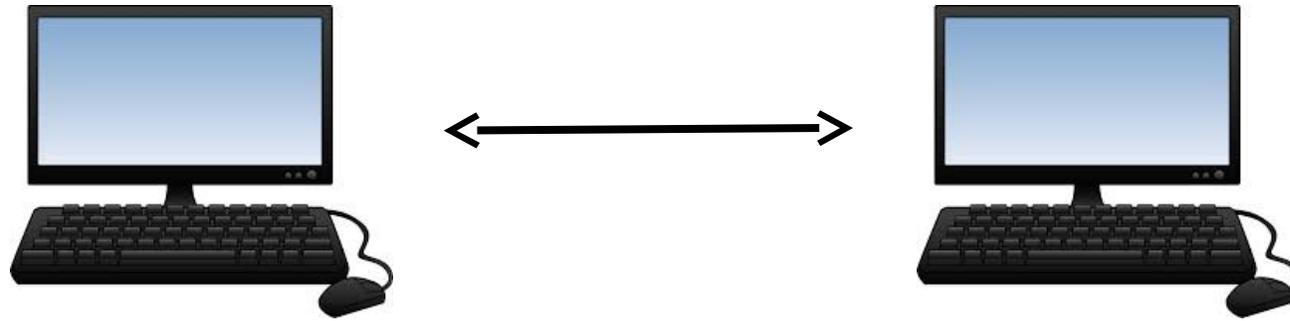


Transformation began.....

- The real transformation in computer technology occurred in 1982 with the introduction of Personal Computers by IBM.
- Computers of more power than IBM 1620 were available for Rs. 1 Lakh.
- Price of computers went down rapidly and their power increased.



What next.....



Thus, we'll have a brief look at computer networks



Types of Networks

Different types of networks are distinguished based on their size (in terms of the number of machines), their data transfer speed, and their reach.

There are usually said to be three categories of networks:

LAN (Local Area Network)

MAN (Metropolitan Area Network)

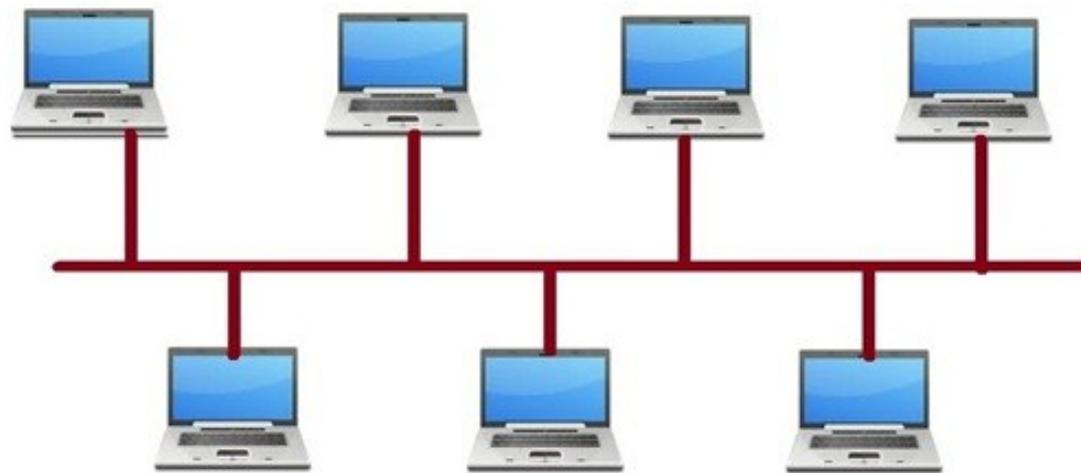
WAN (Wide Area Network)

There are two other types of networks:

TAN (Tiny Area Network) and

CAN (Campus Area Network)

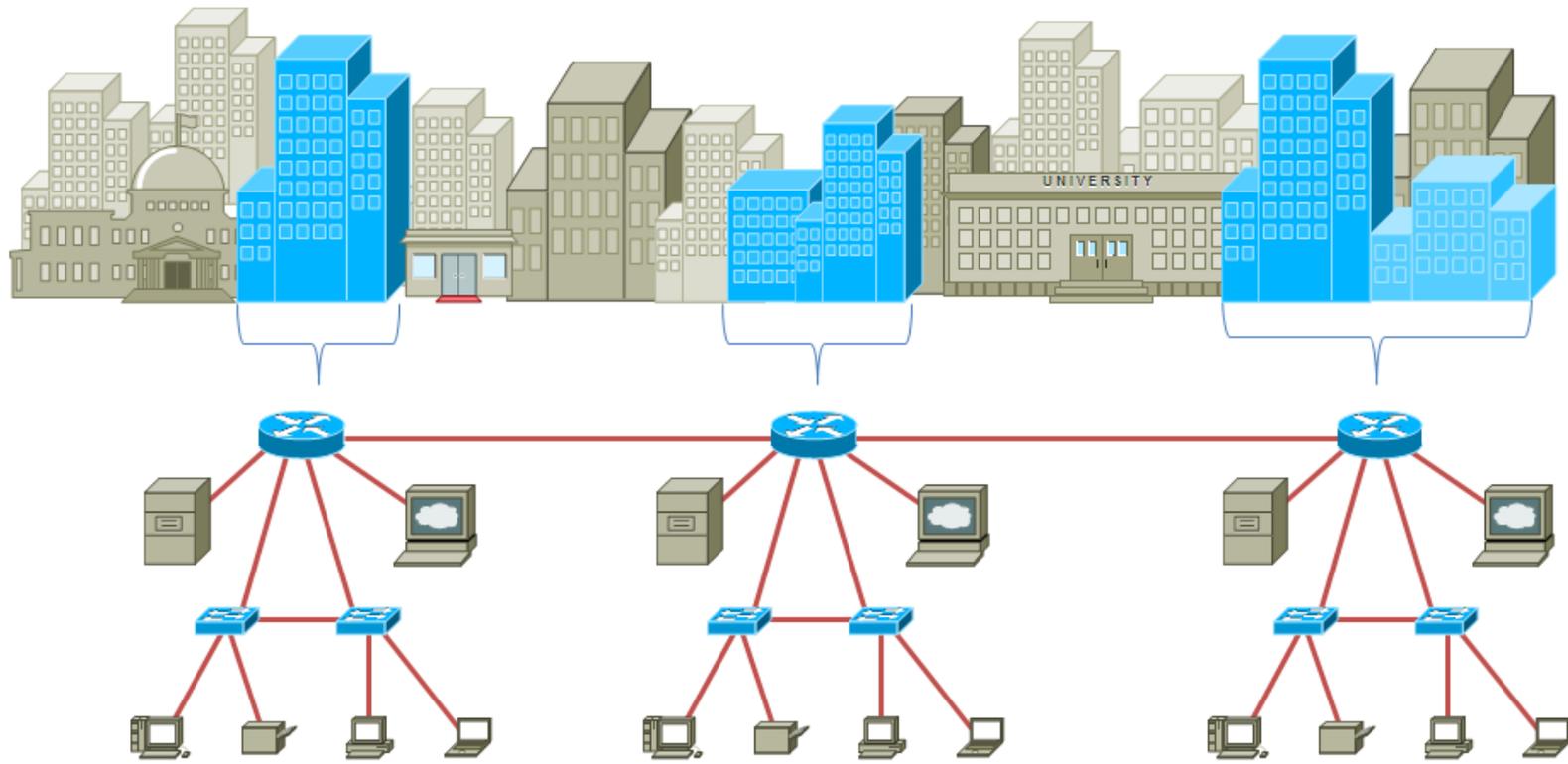
LAN : Local Area Network



LAN : Local Area Network

- It's a group of computers which all belong to the same organization, and which are linked within a small geographic area using a network, and often the same technology (the most widespread being Ethernet).
- A **local area network** is a network in its simplest form.
- Data transfer speeds over a local area network can reach up to 10 Mbps to 1 Gbps.
- A local area network can reach as many as 100, or even 1000, users.
- By expanding the definition of a LAN to the services that it provides, two different operating modes can be defined:
- In a "peer-to-peer" network, in which communication is carried out from one computer to another, without a central computer, and where each computer has the same role.
- In a "client/server" environment, in which a central computer provides network services to users.

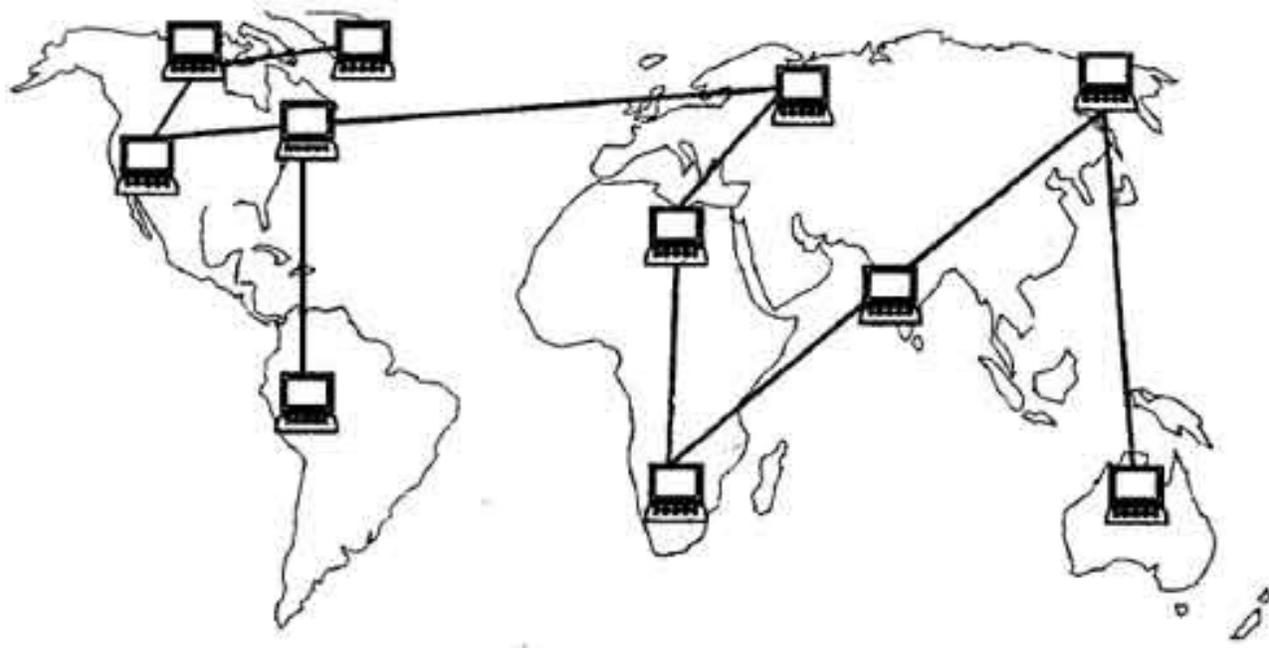
MAN (MetropolitanAreaNetwork)



MAN (Metropolitan Area Network)

- **MANs** (*Metropolitan Area Networks*) connect multiple geographically nearby LANs to one another (over an area of up to a few dozen kilometers) at high speeds.
- Thus, a MAN lets two remote nodes communicate as if they were part of the same local area network.
- A MAN is made from switches or routers connected to one another with high-speed links (usually fibre optic cables).

WAN : Wide Area Network

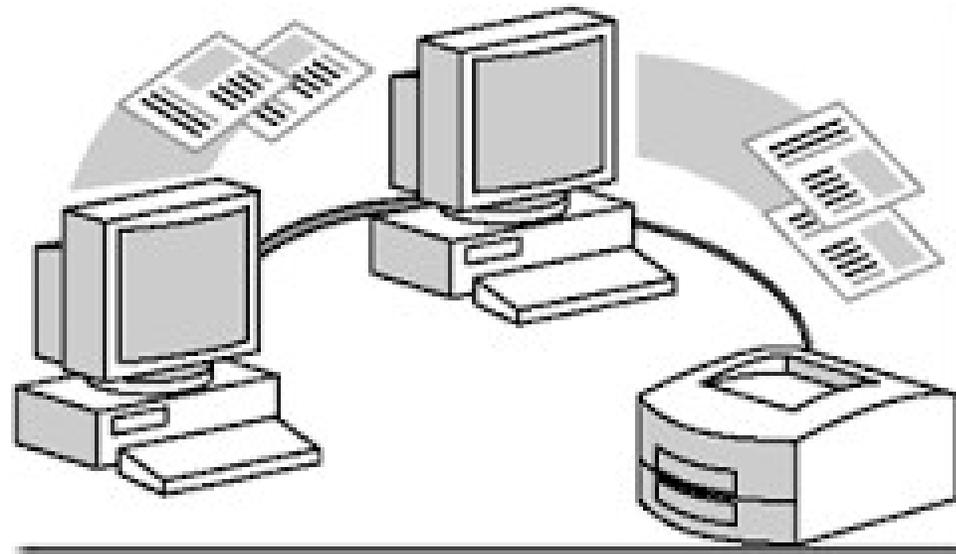


WAN : Wide Area Network

- A **WAN** (Wide Area Network or extended network) connects multiple LANs to one another over great geographic distances.
- The speed available on a WAN varies depending on the cost of the connections (which increases with distance) and may be low.
- WANs operate using routers, which can "choose" the most appropriate path for data to take to reach a network node.
- The most well-known WAN is the Internet.

TAN : Tiny Area Network

TANs (Tiny Area Network), which are the same as LANs but smaller (2 to 3 machines).



CAN : Campus Area Network

- **CANs (Campus Area Networks)**, which are the same as MANs (with bandwidth limited between each of the network's LANs).
- This is a network which is larger than a LAN, but smaller than a MAN.
- This is typical in areas such as a university, large school or small business.
- It is typically spread over a collection of buildings which are reasonably local to each other.
- It may have an internal Ethernet as well as capability of connecting to the internet.

WLAN : Wireless Local Area Network



WLAN : Wireless Local Area Network

- This is a LAN which works using wireless network technology such as Wi-Fi.
- This type of network is becoming more popular as wireless technology is further developed and is used more in the home and by small businesses.
- It means devices do not need to rely on physical cables and wires as much and can organize their spaces more effectively.

Network Topology



Network Topology

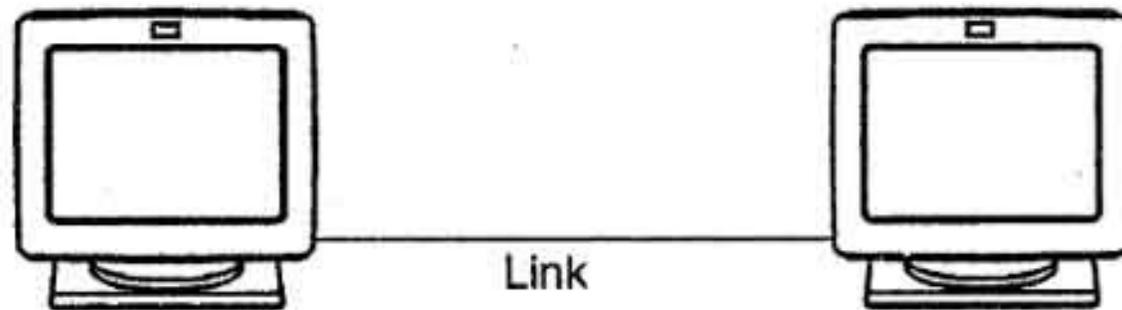
Network topology is the arrangement of the various elements (links, nodes, etc.) of a computer network.

The study of network topology recognizes eight basic topologies:

- Point-to-point
- Bus
- Star
- Ring or circular
- Mesh
- Tree
- Hybrid

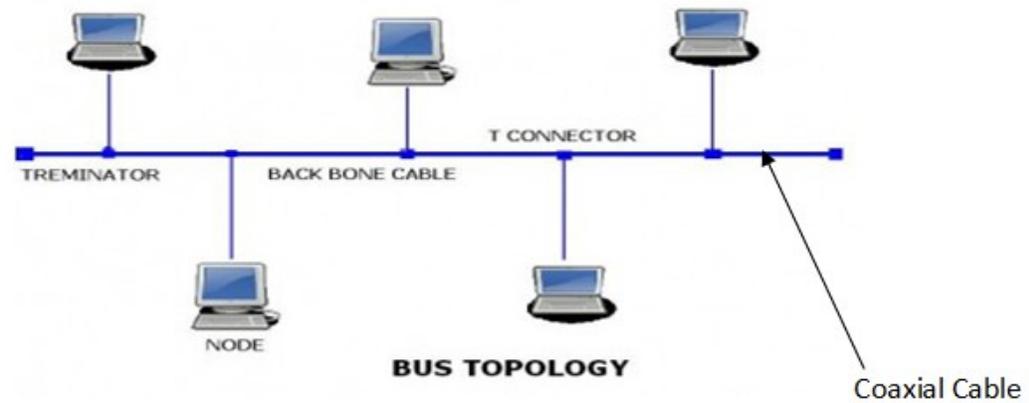
Point-to-Point

- The simplest topology is a permanent link between two endpoints.
- Switched point-to-point topologies are the basic model of conventional telephony.
- The value of a permanent point-to-point network is unimpeded communications between the two endpoints.



BUS

- In local area networks where bus topology is used, each node is connected to a single cable.
- Each computer or server is connected to the single bus cable.
- A signal from the source travels in both directions to all machines connected on the bus cable until it finds the intended recipient.
- If the machine address does not match the intended address for the data, the machine ignores the data.
- Alternatively, if the data matches the machine address, the data is accepted.



BUS

Features of Bus Topology

- It transmits data only in one direction.
- Every device is connected to a single cable.

Advantages of Bus Topology

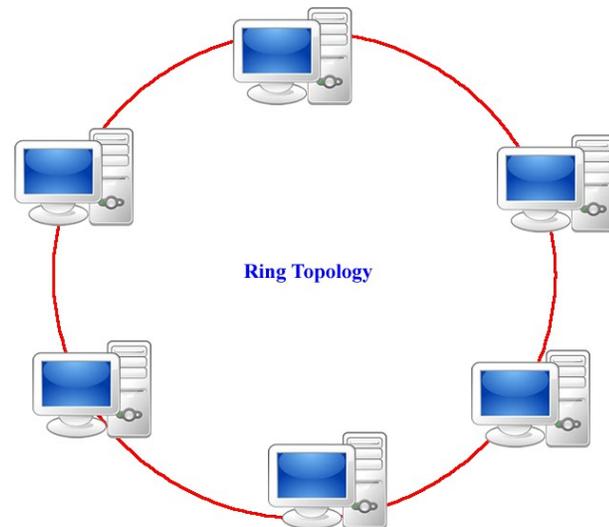
- It is cost effective.
- Cable required is least compared to other network topology.
- Used in small networks.
- It is easy to understand.
- Easy to expand joining two cables together.

Disadvantages of Bus Topology

- Cables fails then whole network fails.
- If network traffic is heavy or nodes are more the performance of the network decreases.
- Cable has a limited length.
- It is slower than the ring topology.

RING

- A network topology that is set up in a circular fashion in which data travels around the ring in one direction.
- Each device incorporates a receiver for the incoming signal and a transmitter to send the data on to the next device in the ring.
- The network is dependent on the ability of the signal to travel around the ring.
- When a device sends data, it must travel through each device on the ring until it reaches its destination.
- Every node is a critical link.



RING

Features of Ring Topology

- The transmission is unidirectional, but it can be made bidirectional by having 2 connections between each Network Node, it is called **Dual Ring Topology**.
- In Dual Ring Topology, two ring networks are formed, and data flow is in opposite direction in them. Also, if one ring fails, the second ring can act as a backup, to keep the network up.
- Data is transferred in a sequential manner that is bit by bit. Data transmitted, has to pass through each node of the network, till the destination node.

Advantages of Ring Topology

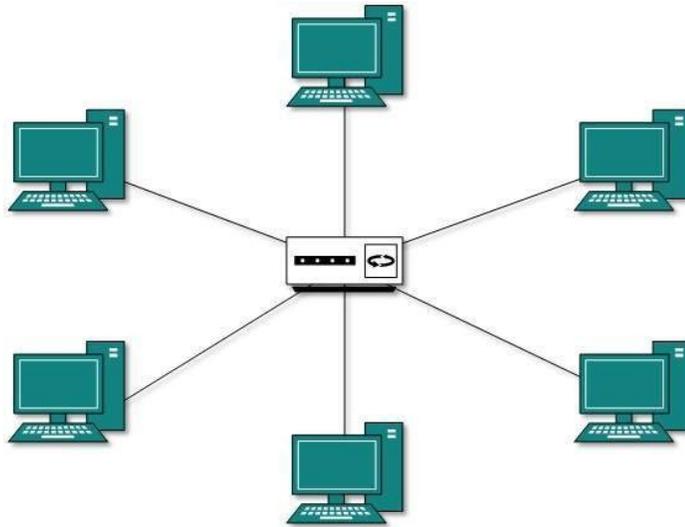
- Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.
- Cheap to install and expand

Disadvantages of Ring Topology

- Troubleshooting is difficult in ring topology.
- Adding or deleting the computers disturbs the network activity.
- Failure of one computer disturbs the whole network.

STAR

- In local area networks with a star topology, each network host is connected to a central hub with a point-to-point connection.
- In Star topology every node (computer workstation or any other peripheral) is connected to central node called hub or switch.
- The switch is the server and the peripherals are the clients.



STAR

Features of Star Topology

- Every node has its own dedicated connection to the hub.
- Hub acts as a repeater for data flow.
- Can be used with twisted pair, Optical Fibre or coaxial cable.

Advantages of Star Topology

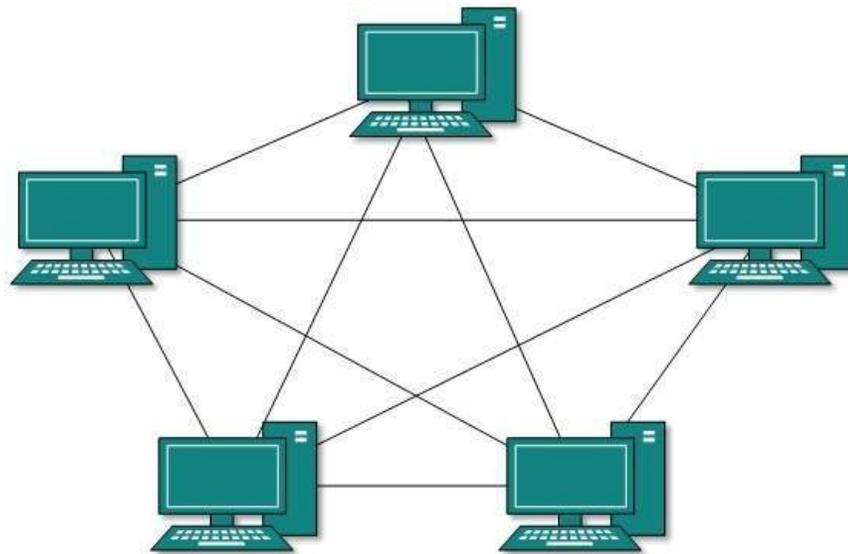
- Fast performance with few nodes and low network traffic.
- Hub can be upgraded easily.
- Easy to troubleshoot.
- Easy to setup and modify.
- Only that node is affected which has failed, rest of the nodes can work smoothly.

Disadvantages of Star Topology

- Cost of installation is high.
- Expensive to use.
- If the hub fails then the whole network is stopped because all the nodes depend on the hub.
- Performance is based on the hub that is it depends on its capacity

MESH

- It is a point-to-point connection to other nodes or devices.
- All the network nodes are connected to each other.
- The value of fully meshed networks is proportional to the exponent of the number of subscribers, assuming that communicating groups of any two endpoints, up to and including all the endpoints.



MESH

Features of Mesh Topology

- Fully connected.
- Robust.
- Not flexible.

Advantages of Mesh Topology

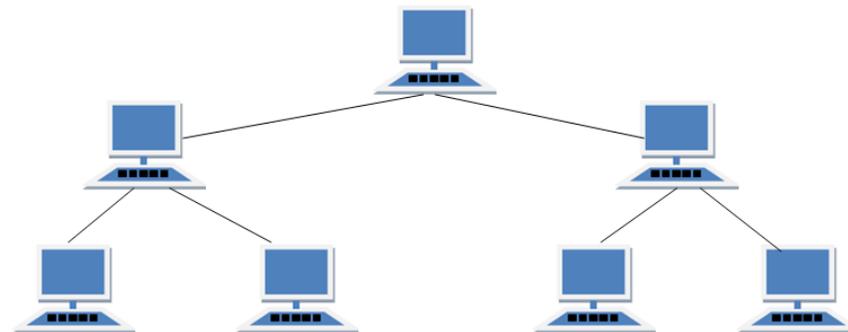
- Each connection can carry its own data load.
- It is robust.
- Fault is diagnosed easily.
- Provides security and privacy.

Disadvantages of Mesh Topology

- Installation and configuration is difficult.
- Cabling cost is more.
- Bulk wiring is required.

TREE

- This particular type of network topology is based on a hierarchy of nodes.
- The highest level of any tree network consists of a single, 'root' node, this node connected either a single (or, more commonly, multiple) node(s) in the level below by (a) point-to-point link(s).
- These lower level nodes are also connected to a single or multiple nodes in the next level down.
- Tree networks are not constrained to any number of levels, but as tree networks are a variant of the bus network topology, they are prone to crippling network failures should a connection in a higher level of nodes fail/suffer damage.
- Each node in the network has a specific, fixed number of nodes connected to it at the next lower level in the hierarchy, this number referred to as the 'branching factor' of the tree.
- This tree has individual peripheral nodes.



TREE

Features of Tree Topology

- Ideal if workstations are located in groups.
- Used in Wide Area Network.

Advantages of Tree Topology

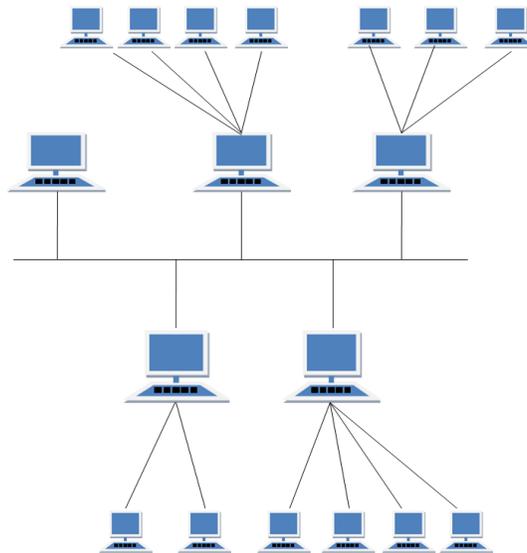
- Extension of bus and star topologies.
- Expansion of nodes is possible and easy.
- Easily managed and maintained.
- Error detection is easily done.

Disadvantages of Tree Topology

- Heavily cabled.
- Costly.
- If more nodes are added maintenance is difficult.
- Central hub fails, network fails.

HYBRID

- Hybrid networks use a combination of any two or more topologies in such a way that the resulting network does not exhibit one of the standard topologies (e.g., bus, star, ring, etc.).
- Forexample a tree network connected to a tree network is still a tree networktopology.
- Twocommon examples for Hybrid network are: *star ring network* and *star busnetwork*.



HYBRID

Features of Hybrid Topology

- It is a combination of two or topologies
- Inherits the advantages and disadvantages of the topologies included.

Advantages of Hybrid Topology

- Reliable as Error detecting and trouble shooting is easy.
- Effective.
- Scalable as size can be increased easily.
- Flexible.

Disadvantages of Hybrid Topology

- Complex in design.
- Costly.

Advantages of Computer Networking

- Easy Communication and Speed
- Ability to Share Files, Data and Information
- Sharing Hardware
- Sharing Software
- Security
- Speed

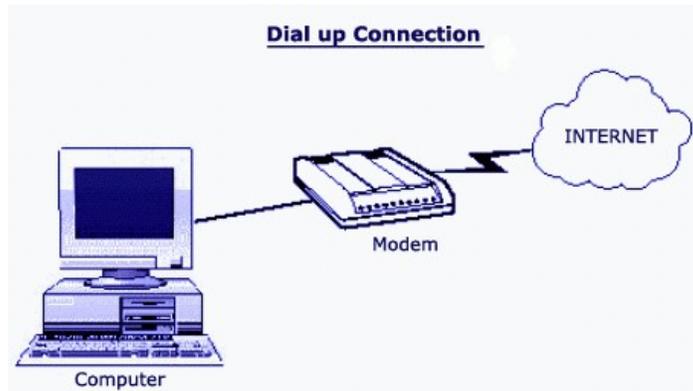
Disadvantages of Computer Networking

- Breakdowns and Possible Loss of Resources
- Expensive to Build
- Security Threats
- Bandwidth Issues

Medium of Communication

Dial-up

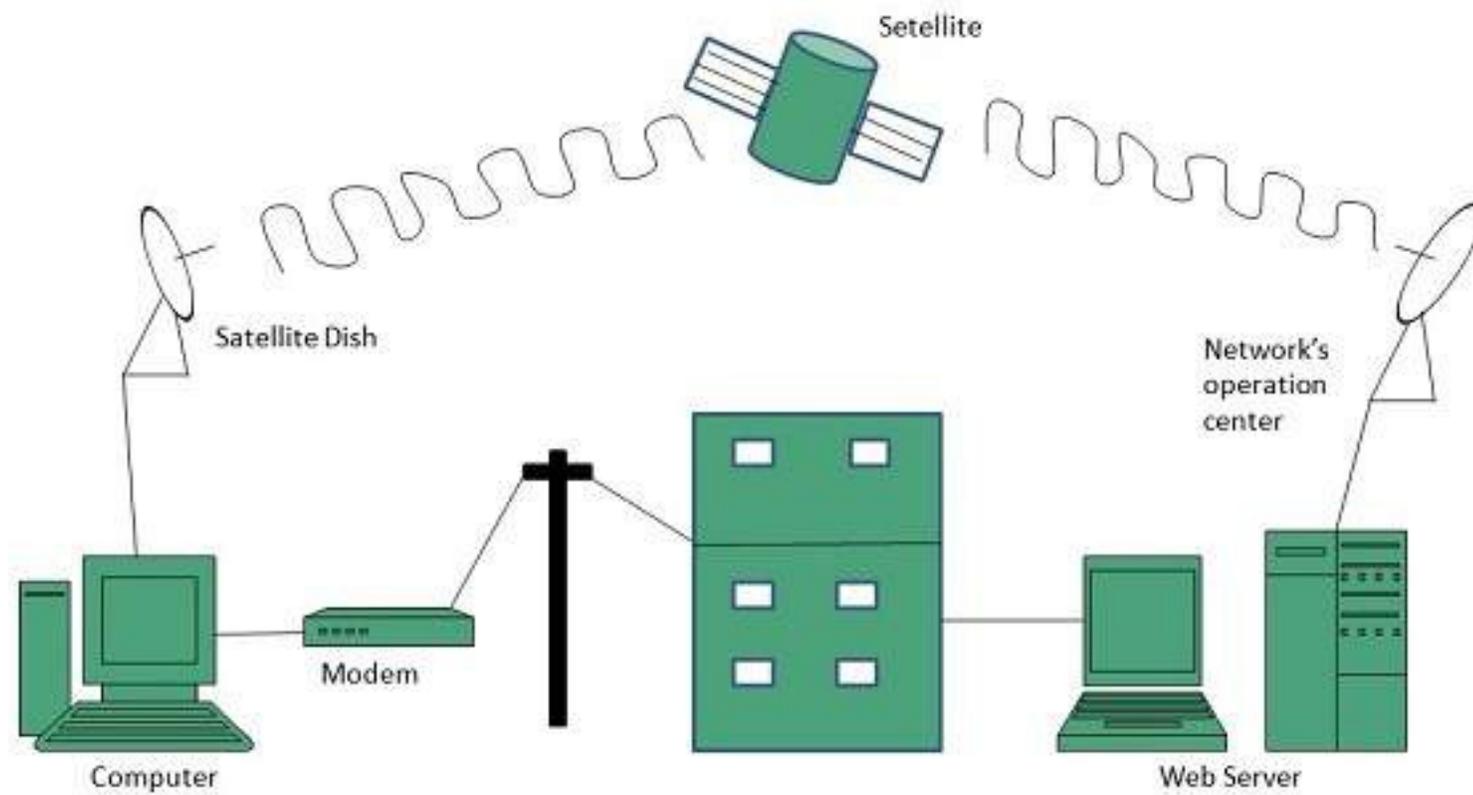
- **Dial-up Internet access** is a form of Internet access that uses the facilities of the public switched telephone network (PSTN) to establish a connection to an Internet service provider (ISP) by dialing a telephone number on a conventional telephonenumber.
- The user's computer or router uses an attached modem to encode and decode information into and from audio frequency signals, respectively.
- Despite losing ground to broadband since the mid-2000s, dial-up may still be used where other forms are not available or the cost is too high, such as in some rural or remote areas.



Lease Line

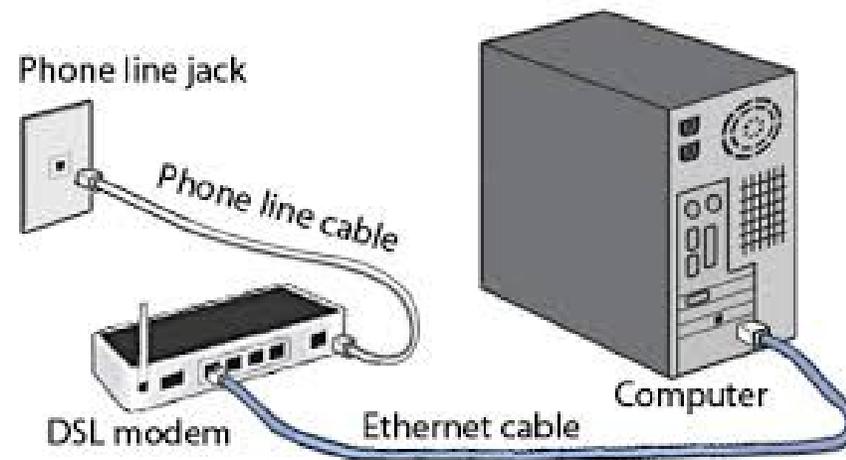
- A **leased line** is a private bidirectional line between two or more locations provided in exchange for a monthly rent.
- Sometimes known as a **private circuit** or **data line** in the UK.
- Leased lines can be used for telephone, data or Internet services.
- Typically, leased lines are used by businesses to connect geographically distant offices.
- Unlike dial-up connections, a leased line is always active.
- The fee for the connection is a fixed monthly rate.
- The primary factors affecting the monthly fee are distance between end points and the speed of the circuit.
- Because the connection does not carry anybody else's communications, the carrier can assure a given level of quality.
- An Internet leased line is a premium internet connectivity product, delivered over fiber normally, which is dedicated and provides uncontended, symmetrical speeds, full-duplex.
- It is also known as an internet leased line, DIA line, data circuit or private circuit.

Satellite



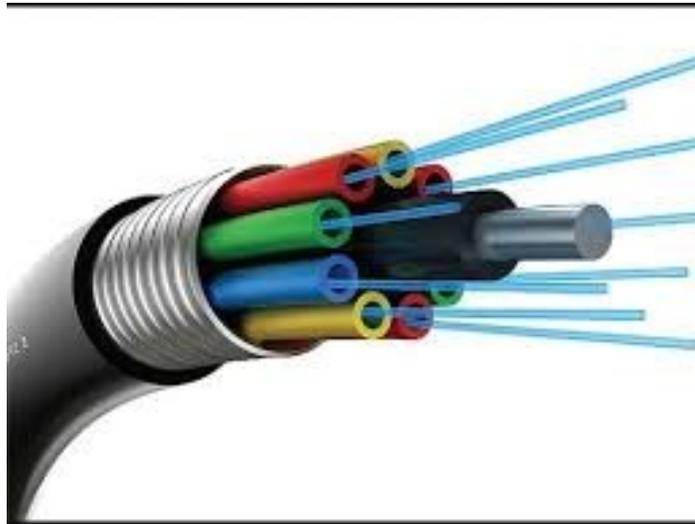
DSL :Digital Subscriber Line

- DSL (Digital Subscriber Line) is a technology for bringing high- bandwidth information to homes and small businesses over ordinary copper telephone lines.



Fiber-optic

- **Fiber-optic communication** is a method of transmitting information from one place to another by sending pulses of light through an optical fiber.



Activity

MTNL/BSNL vs. Local Cable-walavs.Tikonavs. Others

(Airtel,Docomo, Idea, Reliance)

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