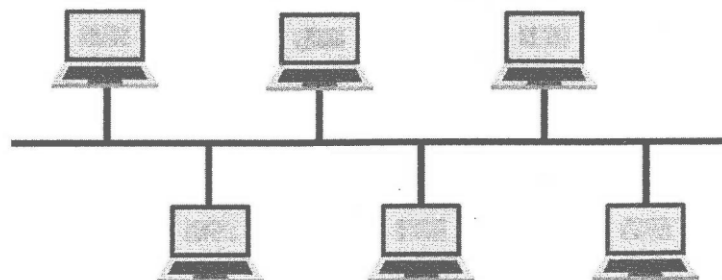


COMPUTER NETWORKS

STUDY NOTES

- **Introduction to Computer Network:** A computer network is a group of devices connected with each other through a transmission medium such as wires, cables, etc. These devices can be computers, printers, scanners, fax machines, etc. The purpose of having computer network is to send and receive data stored in other devices over the network.
- **Evolution of networking:** In 1969, the world's first network was developed and networking was started with the development of ARPANET. The US Department of Defense sponsored a project named ARPANET (Advanced Research Projects Agency Network) whose goal was to connect computers at different universities and US Defence.
- In the mid-1980s another federal agency, the national science foundation created a new high capacity network called NSFnet (National Science Foundation Network) which was more capable than ARPANET. NSFnet allowed only the academic research on its network and not any private business on it.
- **Mac Address and IP Address:** An IP address is a unique address that identifies a device on the internet or a local network. IP stands for "Internet Protocol," which is the set of rules governing the format of data sent via the internet or local network. An IP address is, as such, generally shown as 4 octets of numbers from 0-255 represented in decimal form instead of binary form. For example, 168.212. 226.204
- A MAC address is a hardware identification number that uniquely identifies each device on a network.
- The MAC address is manufactured into every network card, such as an Ethernet card or Wi-Fi card, and therefore cannot be changed.
- MAC address is a 48-bit hexadecimal address. It's usually six sets of two digits or characters, separated by colons.
- **Difference between Internet and web:** The Internet is a global network of networks while the Web, also referred formally as World Wide Web (www) is a collection of information that is accessed via the Internet.
- **The Internet:** It is a global network connecting millions of computers. The internet is decentralized. There are a variety of ways to access the internet.
- **The Web:** It is a system of internet servers that support specially formatted documents. Documents are formatted in a markup language that supports links to other documents. Applications called web browsers make it easy to access the World Wide Web.
- **Topologies:**
 - ❖ **Bus Topology:** Bus topology, also known as line topology, is a type of network topology in which all devices in the network are connected by one central network cable or coaxial cable. The single cable, where all data is transmitted between devices, is referred to as the bus, backbone, or trunk.



■ **Advantages of Bus Topology**

It is cost effective.

Cable required is least compared to other network topology.

Easy to expand joining two cables together.

■ **Disadvantages of Bus Topology**

Cable fails, then whole network fails.

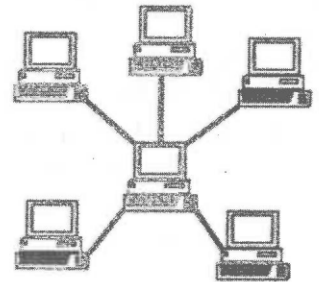
If network traffic is heavy or nodes are more, the performance of the network decreases.

Cable has a limited length.

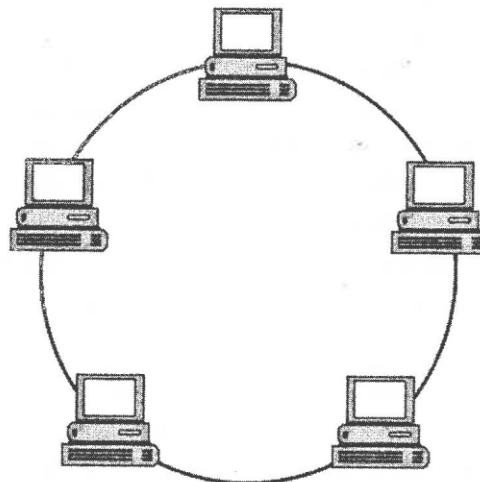
- ❖ **Star Topology:** A star topology, is a network topology in which each device is connected to a central hub.

- **Advantages:** If one node or its connection breaks, it does not affect the other computers nor their connections. Appropriate for a large network.

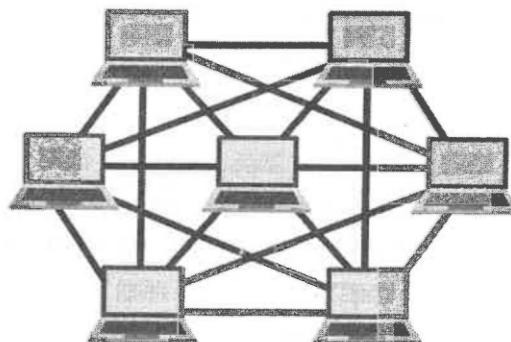
- **Disadvantages:** Expensive due to the number and length of cables needed to wire each host to the central hub. The central hub is a single point of failure for the network.



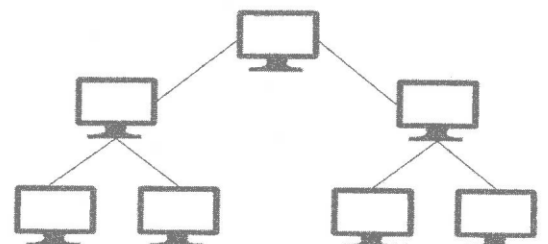
- ❖ **Ring Topology:** A ring network is a network topology in which each node connects to exactly two other nodes, forming a single continuous pathway for signals through each node – a ring.



- ❖ **Mesh Topology:** A mesh topology is a network setup where each computer and network device is interconnected with one another, the connections between devices take place randomly.

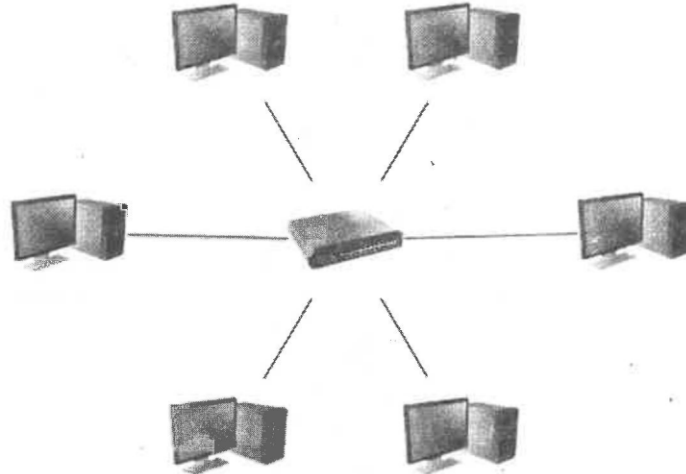


- ❖ **Tree Topology:** A tree topology is a special type of structure where many connected elements are arranged like the branches of a tree. In a tree topology, there can be only one connection between any two connected nodes. Because any two nodes can have only one mutual connection, tree topologies create a natural parent and child hierarchy.

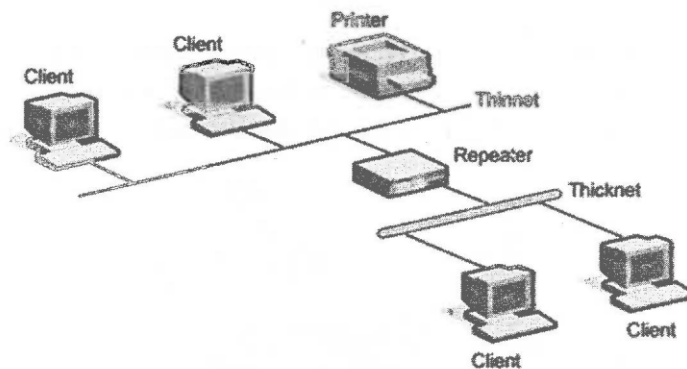
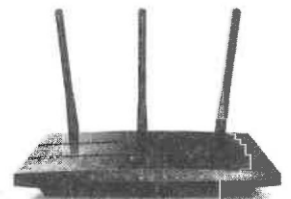


• **Network Devices:**

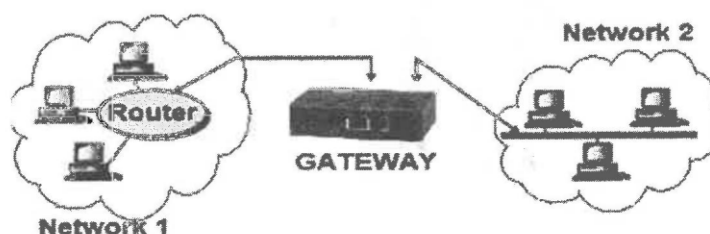
- ❖ **Hub:** A hub is the most basic networking device that connects multiple computers or other network devices together.
- ❖ **Switch:** A network switch connects devices within a network (often a local area network, or LAN). Unlike a router, a switch only sends data to the single device it is intended for (which may be another switch, a router, or a user's computer), not to networks of multiple devices.



- ❖ **Router:** Routers select paths for data packets to cross networks and reach their destinations. Routers do this by connecting with different networks and forwarding data from network to network — including LANs, Wide Area networks (WANs), or autonomous systems, which are the large networks that make up the Internet.
- ❖ **Repeater:** A repeater is an electronic device that receives a signal and retransmits it. Repeaters are used to extend transmissions so that the signal can cover longer distances.

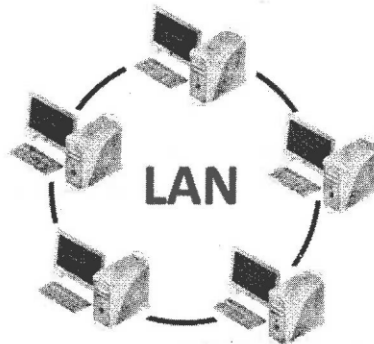


- ❖ **Gateway:** A gateway is a hardware device that goes about as a “gate” between two networks. It very well might be a server, firewall, router, or another device that empowers traffic to stream all through the network.

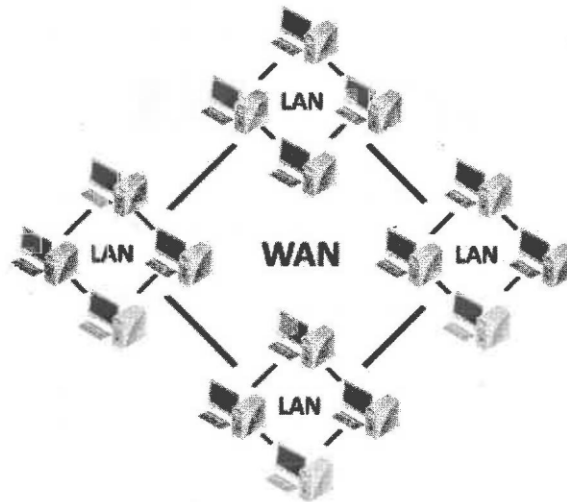


• **Types of Network: LAN,WAN,MAN:**

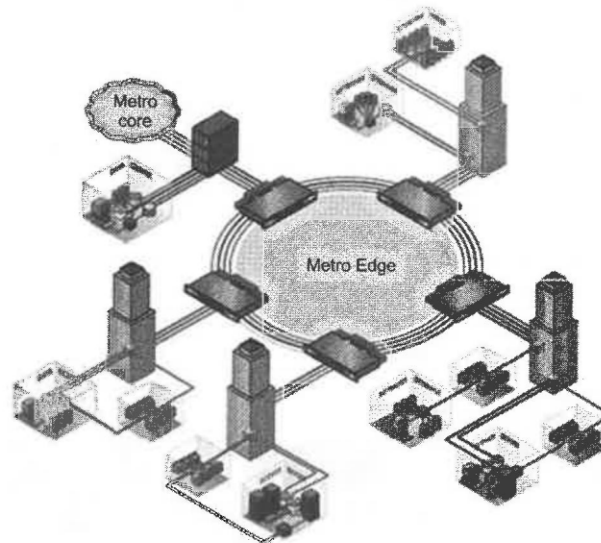
- ❖ **LAN:** A Local Area Network (LAN) is a collection of devices connected together in one physical location, such as a building, office, or home. A LAN can be small or large, ranging from a home network with one user to an enterprise network with thousands of users and devices in an office or school.



- ❖ **WAN:** A Wide Area Network (WAN) is a collection of Local Area Networks (LANs) or other networks that communicate with one another. A WAN is essentially a network of networks, with the Internet the world's largest WAN.



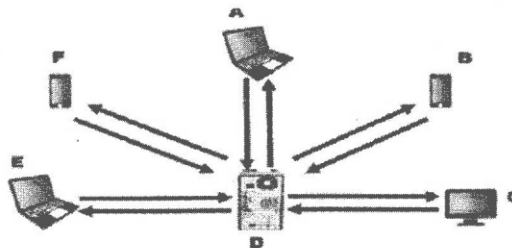
- ❖ **MAN:** A Metropolitan area network (MAN) is a computer network that connects computers within a metropolitan area, which could be a single large city, multiple cities and towns, or any given large area with multiple buildings. A MAN is larger than a Local Area Network (LAN) but smaller than a Wide Area Network (WAN).



QUESTION BANK

MULTIPLE CHOICE QUESTIONS

- Samarth is a hardware engineer of "Happy School". He has been given the task of installing a network in the school lab which has around 40 computers.
 - Suggest the most suitable type of network topology he should use in order to maximise speed and make each computer independent of network breakdowns.
 - Bus Topology
 - Star Topology
 - Ring Topology
 - Mesh Topology
 - In order to allow data transfer from server to only the intended computers which network device is required in the lab to connect the computers?
 - Switch
 - Hub
 - Router
 - Gateway
- Ramanpreet has to work on his science project which deals with electromagnetic waves. A lot of research work is required by him for the same. He uses Google Chrome to search for the relevant matter.
 - Google Chrome is an example of a
 - Website
 - Web browser
 - Web Page
 - Search engine
- Computers connected by a network across different cities is an example of _____
 - LAN
 - MAN
 - WAN
 - PAN
- _____ is a device that forwards data packets along networks.
 - Switch
 - Hub
 - Router
 - Repeater
- _____ network device is known as an intelligent hub.
 - Switch
 - Hub
 - Router
 - Repeater
- A _____ is networking device that connects computers in a network by using packet switching to receive, and forward data to the destination.
 - Switch
 - Hub
 - Router
 - Repeater
- Dr. Theekkar Singh is a very experienced orthopaedician in the Raj Nagar City. He is planning to connect 5 of his clinics of the city with a personalised application for his appointment organization without using mobile/web application.
 - Which out of the following networks would be suitable?
 - PAN
 - LAN
 - MAN
 - WAN
 - Which of the following topologies needs least cable length?
 - Star
 - Tree
 - Bus
 - None of the above
- Which of the following is a web browser?
 - Microsoft Windows
 - Android
 - Microsoft Edge
 - Ubuntu
- What is the type of network for long distance communication?
 - LAN
 - MAN
 - WAN
 - PAN
- Refer to the following diagram and answer the questions given below.



- Which of the following devices act as a server?
 - A
 - B
 - C
 - D

- (ii) The arrow from device D to pointing to A represents?
 (a) HTTP request (b) HTTP response
 (c) HTTP request & response (d) All of these
- (iii) Which of the following device(s) can have IP Addresses?
 (a) A (b) D (c) F (d) All of these
- (iv) Identify the network topology of the given network:
 (a) Ring (b) Star (c) Bus (d) None of the above
11. Which network topologies require a central hub?
 (a) Ring (b) Bus (c) Star (d) Tree
12. Bus, Ring and star topology mostly used in the _____.
 (a) LAN (b) MAN (c) WAN (d) Internetwork
13. The topology with highest reliability is _____.
 (a) Ring (b) Bus (c) Star (d) Mesh
14. Which of the following is not the type of network topology?
 (a) Circle (b) Bus (c) Star (d) Mesh
15. A device that connect network with different protocols _____.
 (a) Switch (b) Hub (c) Gateway (d) Router
16. A device that is used to connect a number of LAN is:
 (a) Router (b) Repeater (c) Switch (d) All of these
17. Which network is able to connect and send data in each computer via central hub or switch without looking where the data is sent?
 (a) Star (b) Router (c) Bus (d) LAN
18. Which topology allow to connect computers including server in ring?
 (a) Star (b) Tree (c) Ring (d) LAN
19. Which network device connect one LAN to other LAN using same protocol?
 (a) Router (b) Switch (c) Modem (d) Bridge
20. The computer Network is _____.
 (a) Network computer with cable (b) Network computer without cable.
 (c) Both of the above (d) None of the above
21. Hardware address is known as _____.
 (a) MAC address (b) IP address
 (c) Network Interface card (d) Address Resolution Protocol
- Clarification:** Along with an IP address there is also a hardware address. Typically it is tied to a key connection device in your computer called the network interface card. Every NIC has a hardware address that is known as MAC, for Media Access Control.
22. MAC stands for _____.
 (a) Media Area Control (b) Memory Access Control
 (c) Media Access Control (d) Memory Area Control
23. MAC address are used as _____.
 (a) Network address (b) IP address (c) Hardware address (d) None of these
24. What is the format of IP address?
 (a) 34 bits (b) 64 bits (c) 16 bits (d) 32 bits
25. IP address stands for _____.
 (a) Internet Protocol address (b) Internet Permission address
 (c) Indian Protocol address (d) International Protocol address

26. ARPANET used the concept of packet switching network consisting of subnet and _____ computers.
 (a) local (b) remote (c) host (d) network
27. ARPANET was developed by the ARPA(Advanced Research Project Agency) in _____ which is the research arm of DOD.
 (a) 1968 (b) 1966 (c) 1969 (d) 1967
28. ARPANET stands for?
 (a) Advanced Research Project Agency Network
 (b) Advanced Research Programmed Auto Network
 (c) Advanced Research Project Automatic Network
 (d) Advanced Research Project Authorized Network
29. A program that is used to view websites is called a:
 (a) Browser (b) Web viewer (c) Spreadsheet (d) Word processor
30. Speed of Internet is measured in:
 (a) GHz (b) GB (c) Gbps (d) Dpi

INPUT TEXT BASED MCQs

Read the following passage and answer the following questions (31 to 35).

The Internet is of central importance in this world. Communication and visibility are two properties that the Internet bestows. Without the email a lot of communication would cripple down to snail's pace. Normal post would have to be relied on which is much much slower than email. Apart from email, instant messaging is very convenient too. You get immediate feedback on information you have to share. By putting up your website, you can make visible your business to the users of the Internet. This makes your business known to the world, and multiplies your efforts put on business maintenance and setup. Often, WWW is taken synonymously as Internet. That is not true. WWW is a subset of the Internet which contains a lot of the resources like text, images, videos, unstructured and structured data. WWW stands for World Wide Web.

31. Which of the following is an example of communication that the Internet helps you make?
 (a) Postal mail (b) Email (c) Courier service (d) Money order
32. In what range is the time taken for email to reach from one sender to a recipient?
 (a) Seconds (b) Minutes (c) Hours (d) Days
33. Which of the following is TRUE?
 (a) Internet is a subset of WWW (b) WWW is a subset of the Internet
 (c) There are no images in the WWW (d) None of these
34. Which of the following URL's is NOT one of a business/company?
 (a) www.google.com (b) www.amazon.com
 (c) sway.office.com (d) microsoft.com
35. Which of the following does NOT have an instant messaging app?
 (a) Google (b) Microsoft
 (c) Whatsapp (d) Amazon

Read the following passage and answer the following questions (36 to 39).

There are various possible topologies for node connections. Most of these are used on a LAN. Mesh topology is the kind of topology, where every node is connected to every other node. There also is the bus topology which consists of a single communication line running through the network, to which the nodes are connected. Like a backbone in humans. Then there is the star network, which has its own advantages, like complete failure of all the nodes is rare, and failure of one does not impact the communication capabilities of the remaining computers. The ring topology is also

used in LAN's, but is prone to failures because of its single medium running in a circular fashion. The most prevalent technology in LAN's with bus topology is the Ethernet and in Pan's is the Mesh topology.

36. Which of the following topologies consists of the maximum interconnections between nodes?
 (a) Bus (b) Ring (c) Mesh (d) Star
37. Which of the following topologies is most prone to failure of the central switch used communications?
 (a) Bus (b) Mesh (c) Star (d) Ring
38. In which of the following topologies does the data flow take place in a circular fashion or ring like fashion?
 (a) Bus (b) Mesh (c) Star (d) Ring
39. Which of the following topologies has the data flowing to the nodes as if in a human using the backbone?
 (a) Star (b) Ring (c) Mesh (d) Bus

ANSWERS

Multiple Choice Questions

- | | | | | | | | | | |
|------------|-------------|----------|-----------|----------|---------|---------|------------|----------|---------|
| 1. (i) (b) | (ii) (a) | 2. (b) | 3. (c) | 4. (c) | 5. (a) | 6. (a) | 7. (i) (c) | (ii) (c) | 8. (c) |
| 9. (c) | 10. (i) (d) | (ii) (b) | (iii) (d) | (iv) (b) | 11. (c) | 12. (a) | 13. (c) | 14. (a) | 15. (c) |
| 16. (a) | 17. (a) | 18. (c) | 19. (d) | 20. (c) | 21. (a) | 22. (c) | 23. (c) | 24. (d) | 25. (a) |
| 26. (c) | 27. (d) | 28. (a) | 29. (a) | 30. (c) | | | | | |

Input Text Based MCQs

- | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 31. (b) | 32. (a) | 33. (b) | 34. (c) | 35. (d) | 36. (c) | 37. (c) | 38. (d) | 39. (d) |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|

HINTS/EXPLANATION

1. (i). (b) Star topology will maximize speed and make the computers mostly immune to network breakdowns.
 (ii). (a) Switch does this. This is the reason the switch is called an "intelligent hub". Sends only to the intended computer.
2. Google Chrome is the web browser by Google.
6. (a) Switch is such a device.
10. (i) D is the central device and so is the server.
 (ii) Since D is the server, it must be sending response to the client computer.
 (iii) All computers connected to the network can have IP addresses.
 (iv) It looks like the Star topology
15. The gateway is such a device.
18. As the devices are connected in a ring, the topology is also ring.
25. IP address stands for Internet Protocol address.
29. Browser is the name used for this.
30. Gbps or earlier Mbps were fine.