

COMPUTER NETWORKING



Your Aim

to learn about:



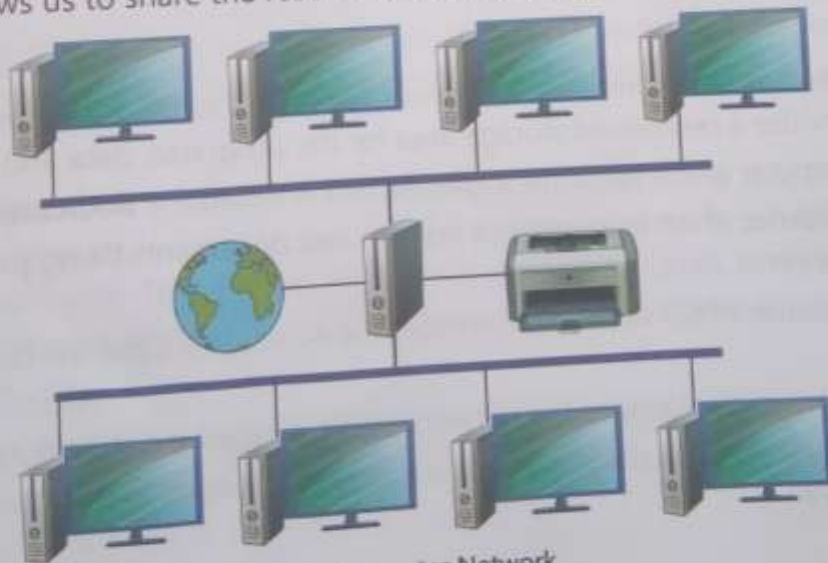
- Computer network
- Advantages of computer network
- Components required for a network
- Topology
- Wireless networking technology
- Need for computer network
- Network terminology
- Types of network
- Network architecture
- Protocol

INTRODUCTION

The process of connecting computers and peripheral devices with each other, so that they can exchange data is called computer networking. To do networking, various types of hardware devices, protocols and software are required.

COMPUTER NETWORK

The computer network is a system of interconnected computers which can communicate with each other. It allows us to share the resources such as computers and peripherals.



Computer Network

The computers on the network can communicate with each other as well as work independently. Each computer in a network is called a node. The computers in the network may be linked through the cable, hub, switch, NIC (Network Interface Card), modem or router.

There are different kinds of computer networks that work in different ways. Networks may be very small and simple as in a room or they may be complex as a global network like the Internet. There may be wired or wireless connection between computers on the network.

NEED FOR COMPUTER NETWORK

Computers and other devices connected on a network help in:

- * **Resource Sharing:** It help the users to share files and hardware devices such as printers, scanners, etc.
- * **Communication:** It helps us to communicate with others through e-mail, video conference, instant messaging, etc.

ADVANTAGES OF COMPUTER NETWORK

The advantages of computer network are:

- * The information can be easily shared by the people.
- * It helps in reducing the cost of hardware.
- * Store information on one centralised location.
- * Reliability implies backing up of information. If a system crashes, then the information is accessible on another workstation for future use.
- * Reduction in installation cost.
- * User authentication process to secure the data.
- * People will have the accessibility to all the information they need to get and share through e-mails and instant messaging which saves time and money in passing information.

NETWORK TERMINOLOGY

Server

A server is also called as host computer. It controls the access to the hardware and software on the network. It provides a centralised storage area for the programs, data and information.

- * The computer which performs a specific task is called the **dedicated server**.
- * The computer which manages the printers and documents being printed is called the **print server**.
- * The computer which stores and provides the access to a database is called a **database server**.
- * The server which manages the network traffic is called a **network server**.
- * The computer which delivers the requested web pages to our computer is called a **web server**.

Client

It is a computer which depends on the server for all the resources. For example, a server might store a network version of Excel program. Every client on the network can access the Excel program from the server.



COMPONENTS REQUIRED FOR A NETWORK

The components needed for a network are:

- * Network Interface Card (NIC)
- * Hub or switch
- * Router
- * Modem
- * Networking Cable (Ethernet cable)



NIC



Ethernet cable



Hub or Switch



Modem



Router

Network Interface Card (NIC)

It is an expansion card which provides the network access to a computer. It allows the computer to connect to a network through a wired or wireless medium.

Hub or Switch

A Hub or Switch is hardware device that has various boxes to which the computers, printers and other networking devices are connected. The main function of a hub is to direct information around the network and facilitate communication between all the connected devices.

Router

It is a networking device used to connect and facilitate transfer of information between two networks. It is located at the gateways where two networks connect.

Modem

It stands for MODULATOR – DEMODULATOR. It is a hardware device that is used to connect a computer to the Internet via a telephone line or a wireless medium. It converts data from digital to analog and vice versa. The process of converting analog signals to digital signals is called modulation. The process of converting digital signals to analog signals is called demodulation.

Networking Cable

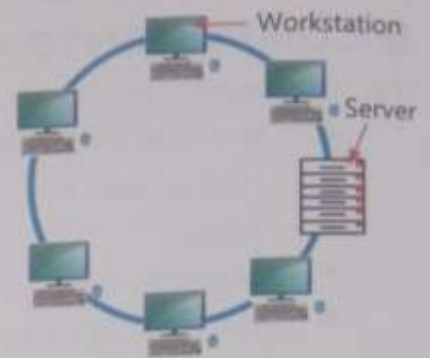
Networking cable, also known as Ethernet cable is a transmission medium that allows to transport information from one place to other place. There are various types of networking cables such as coaxial cable, twisted pair cable, and optical fiber cable.

TYPES OF NETWORK

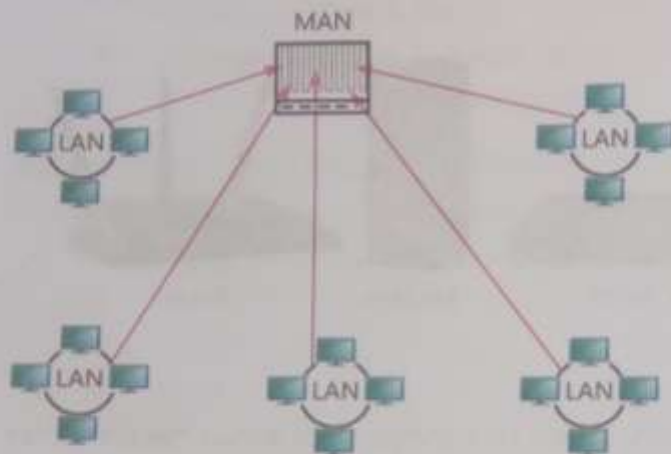
Different types of networks can classified on the basis of geographical areas covered. There are five types of networks as follows:

LAN (Local Area Network)

It is a digital communication system that interconnects a larger number of computers and other peripheral devices within a radius of less than 1 km. This type of network is usually preferred for a smaller area such as a school building, computer lab, etc. The total diameter of LAN is not more than 5 km.



Local Area Network



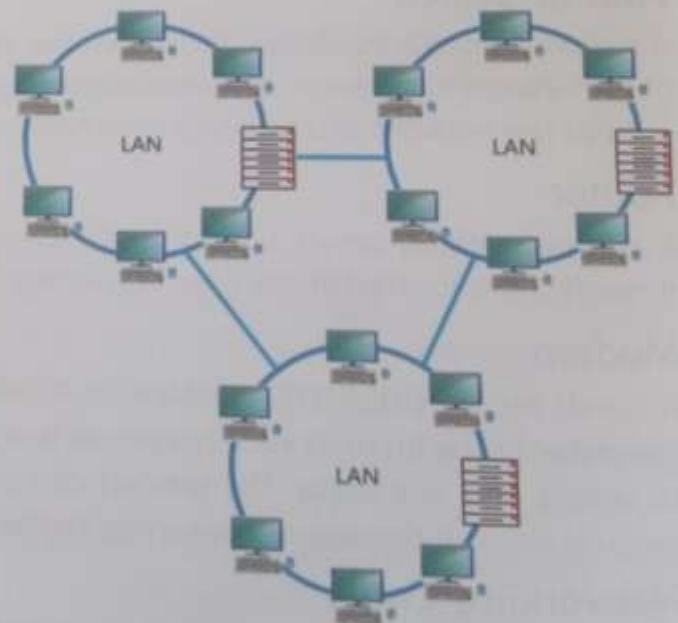
Metropolitan Area Network

MAN (Metropolitan Area Network)

This network consists of two or more local area networks or campus area networks together that usually spans several buildings in the same city or town.

WAN (Wide Area Network)

It is a digital communication system that interconnects a large number of computers in a wide geographical area. This network may operate on a worldwide or nationwide basis. In such type of network, there may not be physical connection between computers. In WAN telephone lines, microwave, satellite links, etc; can be used as transmission medium.



Wide Area Network



Personal Area Network

PAN (Personal Area Network)

These are privately owned networks. PAN is used to establish the communication amongst the computers within the range of 20 to 30 feet. It can be wired or wireless.

CAN (Campus Area Network)

CAN, also known as Cluster Area Network connects two or more LANs that are limited to specific geographical areas, for example, college campus, office building etc. A campus area network is larger than LAN since it may span in multiple buildings within a specified area.



Campus Area Network or Cluster Area Network

TOPOLOGY

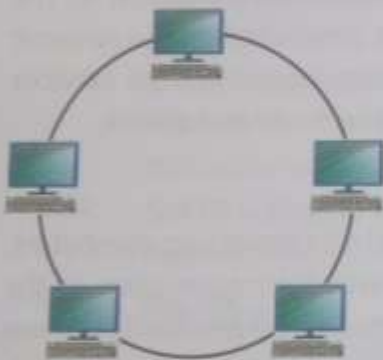
Topology refers to the geometric arrangement of computers or nodes in a network. The factors that determine the type of topology are cost, flexibility and reliability. There are five different types of topologies. Let us learn about these in detail.

Bus Topology

In this topology, all the nodes are connected to a single common path. It is simple and easy to maintain. Additional nodes can be connected at any point along its length. But this topology suffers from a major disadvantage that fault detection in the topology is very difficult.



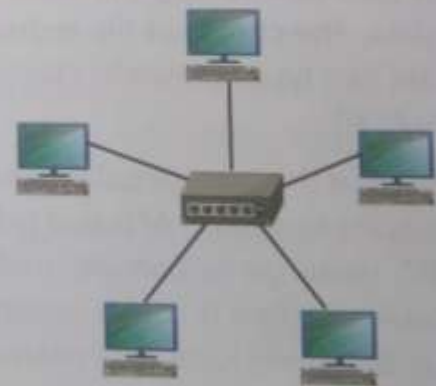
Bus Topology



Ring Topology

Ring Topology

In this topology, all the nodes are connected in a circular path. The messages are travelled in clockwise or anti clockwise direction. Any damage to the cable of any node or device can result in breakdown of the whole network.



Star Topology

Star Topology

In this topology, central node acts as a hub to which all the other nodes are connected. As compared to the bus topology, star topology requires more devices and cables. The addition of a new node to a star topology is difficult as it involves a connection all the way to the central node.



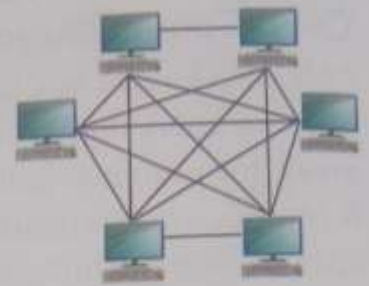
Tree Topology

Tree Topology

In this topology, nodes are connected as branches of a tree where hub acts as a root node. It is very simple in nature as it is easier to add or remove the faulty nodes. But its major disadvantage is that if the root node fails to operate, the entire network is inoperable.

Mesh Topology

In this topology, every single node in a network is connected to all the other nodes or computers in the network. There is minimal chances of breakdown in this topology. This topology is mostly used in LANs.



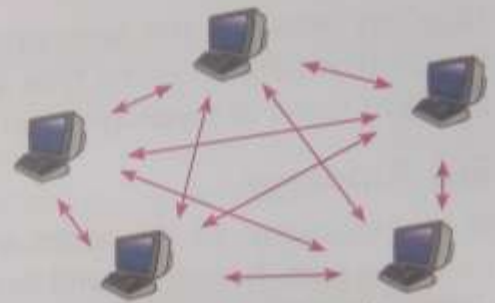
Mesh Topology

NETWORK ARCHITECTURE

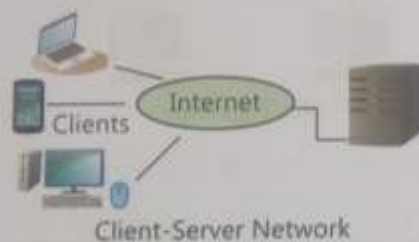
The network architecture defines the overall design of the computer network. There are two types of network architectures.

Peer-to-Peer Network

It is a network of two or more computers that uses the same type of program to share the data. Each computer is considered to have equal responsibilities and acts like a server to the other computers in the network. It works well in small environment.



Peer-to-Peer Network



Client-Server Network

Client-Server Network

It is a network in which one computer is designated as the server and all the other computers connected on the network are called the clients. The clients can request for the services from the server. This is called the client-server network.

WIRELESS NETWORKING TECHNOLOGY

In a wireless networking technology, no wires or physical media is used for connecting computers. It uses electromagnetic waves like infrared, microwave and radio waves for transmission of the data. The choice of the technology depends on the distance and speed of transmission. There are two types of wireless technologies named Wi-Fi and Bluetooth.

Wi-Fi

Wi-Fi is the most popular wireless communication technology used for homes, private business LANs and public hotspots. A Wi-Fi enabled device such as a PC, video game console, mobile phones or MP3 player can connect to the Internet when it comes within the range of a wireless network. Wi-Fi allows us to deploy local area networks without wires thus reduces the cost of the network expansion.



Bluetooth

Bluetooth is a technology that enables wireless communication between a low-power consumption devices within a short range (1 meter, 10 meters, 100 meters). It facilitate for different devices to communicate with each other when they are in a required range. The latest version of bluetooth, Bluetooth 5.0 technology provides data transfer speed up to 2 Mbps.



It provides a way to connect and exchange information between devices such as mobile phones, telephones, laptops, printers, personal computers, GPS receivers (Global Positioning System) through 2.4 GHz short range radio frequency bandwidth.

PROTOCOL

Protocol is a set of rules that governs the communication between the computers on a network. Certain network protocols and standards are to be followed in order to ensure that your computer can communicate with another computer over a network.

Different types of protocols used for different operations on the Internet are:

- * **HTTP – Hyper Text Transfer Protocol:** It is a set of rules that defines how the Web pages transfer data over the Internet.
- * **HTTPS – Hyper Text Transfer Protocol Secure:** It is secure version of HTTP. The information is converted into code to prevent unauthorised access. Nowadays, most of the websites uses the HTTPS protocol instead of HTTP.
- * **FTP – File Transfer Protocol:** It is a set of rules that allows file uploading and downloading from the other computers over the Internet.
- * **TCP/IP – Transmission Control Protocol/Internet Protocol:** It is a network protocol that defines how the information or messages are routed from one end of a network to the other.
- * **POP3 - Post Office Protocol Version 3:** It is an Internet standard protocol that allows e-mail clients to retrieve e-mail messages from an e-mail server.
- * **IMAP – Internet Message Access Protocol:** It is an e-mail protocol that stores e-mail messages on a mail server and allows the user to view, access and manipulate the messages on the mail server from their computer.
- * **SMTP – Simple Mail Transfer Protocol:** It is an e-mail protocol for sending e-mail messages across the Internet.

Reb **t** - - - - -

- * The computer network means the system of interconnected computers.
- * The components needed for a network are Network Interface Card, networking cable, hub or a switch and router.
- * Network Interface Card allows the computer to connect to a network through a wired or wireless medium.
- * Hub is a hardware device that has various boxes to which the computers, printers and other networking devices are connected.
- * Router is a networking device used to connect and facilitate transfer of information between two networks.
- * MODEM stands for MODULATOR – DEMODULATOR. It is a device that is used to connect a computer to the Internet through a telephone line or a wireless medium.
- * The different types of networks are PAN, CAN, LAN, MAN and WAN.

- * Various types of topologies used in a network are bus, star, tree, ring and mesh.
- * There are two types of computer network architectures – peer-to-peer network and client-server network.
- * It is the most popular wireless communication technology used for homes, private business LANs and public hotspots.
- * Bluetooth is a technology that enables wireless communication between low-power consumption devices within a short range.
- * Protocol is a set of rules that governs the communication between the computers over a network.

One Touch Learn

A. Tick (✓) the correct option.

- Which of these terms describe a computer that is connected to a network?

a. <input checked="" type="checkbox"/> Node	<input type="checkbox"/>	c. Unit	<input type="checkbox"/>
b. Device	<input type="checkbox"/>	d. Attachment	<input type="checkbox"/>
- A computer network that spans across a city can be called a

a. LAN	<input type="checkbox"/>	c. <input checked="" type="checkbox"/> MAN	<input type="checkbox"/>
b. WAN	<input type="checkbox"/>	d. CAN	<input type="checkbox"/>
- Which networking device can convert the digital data into analog signal and vice versa?

a. Hub	<input type="checkbox"/>	c. Router	<input type="checkbox"/>
b. <input checked="" type="checkbox"/> Modem	<input type="checkbox"/>	d. LAN Card	<input type="checkbox"/>
- In this topology the central node acts as a hub, switch or router to which all the other nodes are connected.

a. Bus	<input type="checkbox"/>	c. <input checked="" type="checkbox"/> Star	<input type="checkbox"/>
b. Ring	<input type="checkbox"/>	d. Mesh	<input type="checkbox"/>

B. Write 'T' for true and 'F' for false. Correct the false statements.

- Modulation is the process of converting analog signals to digital signal. T
- Bluetooth technology uses radio frequency to transmit data from one system to another. T
- Through computer networking, information can be easily shared amongst the people. T
- In Bus topology, all the nodes are connected to a single common path. T
- A server is also called as host computer. T

C. Fill in the blanks using the words given below.



router, protocol, SMTP, mesh, NIC

1. **Protocol** is a set of rules that governs the communication between computers on a network.
2. **SMTP** is a protocol used to send e-mail messages over the internet.
3. **Router** is a networking device used to connect and facilitate transfer of information between two networks.
4. In **Mesh** topology every node is connected to each other node.
5. **NIC** is an expansion card which is used to provide the network access to a computer.

D. Identify the type of topology.



Ring Topology



Tree Topology



BUS Topology



Star Topology

Let's Do It



A. Short answer type questions.

1. What is a protocol?
2. Name the various components needed for a computer network.
3. Define client and server.
4. What is topology?

B. Long answer type questions.

1. What is a computer network? Write its advantages.
2. Describe LAN and MAN.

A – Short answer type questions –

Qu. 1 What is a protocol?

Answer Protocol is a set of rules that governs the communication between the computers over a network

Qu. 2 Name the various components needed for a computer network.

Answer The components needed for a network are –

- Network Interface Card (NIC)
- Hub or switch
- Router
- Modem
- Networking Cable (Ethernet cable)

Qu. 3 Define client and server.

Answer It is a network in which one computer is designated as the server and all the other computers connected on the network are called the clients.

Qu. 4 What is topology?

Answer Topology refers to the geometric arrangement of computers or nodes in a network. The factors that determine the type of topology are cost, flexibility and reliability.

B – Long answer type questions –

Qu. 1 What is a computer network? Write its advantages.

Answer The computer network is a system of interconnected computers which can communicate with each other. It allows us to share the resources such as computers and peripherals.

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Advantages of Computer Network-

The advantages of computer network are –

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- It helps in reducing the cost of hardware.
- Store information on one centralized location.
- Reliability implies backing up of information. If a system crashes. Then the information is accessible on another workstation for future use.
- Reduction in installation cost.
- User authentication process to secure the data.
- People will have the accessibility to all the information they need to get and share through e-mails and instant messaging which saves time and money in passing information.

Qu. 2 Describe LAN and MAN.

Answer LAN (Local Area Network) –

It is a digital communication system that interconnects a larger number of computers and other peripheral devices within a radius of less than 1 km. this type of network is usually preferred for a smaller area such as a school building, computer lab, etc. The total number of LAN is not more than 5 km.

MAN (Metropolitan Area Network) -

This network consists of two or more local area networks or campus area networks together that usually spans several buildings in the same city or town.