

UNIT- 1 (NETWORKING AND OPEN STANDARDS)

CHAPTER- 1: COMPUTER NETWORKING

MIND MAP –COMPUTER NETWORKING



CHAPTER- 1: COMPUTER NETWORKING

Network: A computer network is a collection of interconnected computers. Two computers are said to be interconnected if they are capable of sharing hardware, software and exchanging information.

Need or advantages for Networking:

1. Resource sharing
2. Reliability
3. Cost factor
4. Communication medium.
5. Central Storage of data

Application of Network:

1. Sharing
2. Access to remote database
3. Communication facilities

Terminology of Network:

Nodes: Nodes refer to the computers that are attached to a network that can share resources of the network.

Server: A computer that facilitates the sharing of data, hardware and software on the network is known as server. Each server has unique name on the network. A server can be of two types:

- (i) Dedicated server
- (ii) Non dedicated server

Domain Name Vs URL: Domain name is unique name assigned to a web site. The URL is the complete address of web page on the website. e. g. URL: [http:// www.cbse.nic.in/index.html](http://www.cbse.nic.in/index.html) Here http is protocol and www.cbse.nic.in is domain name.

Domain Name Resolution: Domain Name resolution is the process of getting corresponding IP address from a domain name.

Network Interface Unit (NIU): A network interface unit is an interpreter that helps to establish a communication between the server and the client.

MAC Address: It refers to the physical address assigned by the NIC manufacturer. A MAC address is a 6 byte address with each byte separated by a colon. For Example: **20:B5:03:63:2E: FC** (The first three bytes refer to manufacturer ID and last three card no.)

IP address: Every machine on a TCP/IP network has a unique identifying number, called IP address: For Example: **202.27.94.137** (also known as Internet Protocol address)

Transmission/ Communication Media

The communication channels which are used for actual physical transmission of data are known as transmission media. The transmission media is of two types: wired and wireless.

Wired Media (Guided Media):

It consists of physical wired medium to carry signals.

- **Twisted pair cable:** A twisted pair cable consists of minimum two insulated copper wires of about 1 mm thickness which are twisted together in a helical form. e.g. Telephone wire. LAN Cable.

Advantages:

1. It is easy to install and maintain
2. It is very cheap (Inexpensive)

Disadvantages:

1. It is not efficient in transmitting data for very long distance without a repeater.
2. Low bandwidth.

- **Co-Axial Cable:** It is a stiff copper wire, surrounded by insulating material. E.g. cable TV wire

Advantages: 1. High band width (data transmission is better than twisted pair cable)

2. Can be used for transmitting data over long distance.

Disadvantages:

1. Expensive than twisted pair cable
2. It is not compatible with Twister pair cable.

- **Optical Fiber:** Optical fiber cables are made up of a glass core through which data is transmitted in the form of light signals.

Advantages:

1. Transmit data over long distance with security and high bandwidth.
2. Immune to noise/external interference.

Disadvantages:

1. Very expensive and quite fragile (breakable).
2. Connecting two optical fibers is a difficult process.

Wireless Media (Unguided Media)

It consists of electromagnetic waves which carry signals

- a) **Blue Tooth:** Bluetooth is a wireless technology for creating personal networks operating within a range of 10 meters.

- b) **Infrared:** The type of transmission that uses infrared light to send the data is known as infrared transmission. e.g.: Remote control of TV and AC.

Advantages:

1. It is a secure medium of transmitting data.
2. It is a cheap mode of transmission.

Disadvantages:

1. It can work for short distance.
2. It cannot go through walls and affected by distance, noise and heat.

- c) **Microwave:** Microwaves are high energy radio waves that are used for line of sight communication.

Advantages:

1. Suitable for high speed, long distance and overseas communication.
2. No need for laying cable.

Disadvantages:

1. Micro wave communication is an insecure communication.
2. Microwave propagation of waves is susceptible to weather effects like Rain, thunder etc.
3. Only straight line transmission is possible.

- d) **Radio wave/Radio Link**

The transmission making use of radio frequencies is termed as radio wave transmission.

Advantages:

1. It is suitable for long distance and can be used for indoors and outdoors.
2. Radio waves can travel in any direction (omnidirectional).

Disadvantages:

1. Radio waves communication is insecure communication.
2. Radio waves propagation is susceptible to weather effects like rain, thunderstorm.

e) **Satellite Link:** The satellite transmission is also a kind of line of sight transmission that is used to transmit signals throughout the world. Services like DTH cable TV, VSAT, GPS and Satellite phones etc. are offered by the satellite.

Advantages:

1. It can cover large area of earth.
2. Satellite proves best alternate where the laying out of cable is difficult and expensive.

Disadvantages:

1. High cost (very expensive) and complex Installation.
2. Signals sent to the earth can be tampered by external interference.

Network devices

Modem: MODulator-DEModulator is a device that connects telephone line to computer. It converts digital signal to analog signal and vice versa.

Hub: Hub is a hardware device used to connect several computers together to form a Local Area Network. Hub broadcasts the message to the entire network.

Switch: Switch is an intelligent Hub, which is used to segment networks into different sub network called subnets. Switch is faster and efficient over Hub due to good traffic management capability.

Repeater: A repeater is a device that amplifies signals transmitted on the network. It is used to extend a network beyond the segment length of the wire used.

Router: The device which connects two similar networks and can handle different protocols.

Gateway: It is a device that connects dissimilar networks.

Bridge: A device that connects two similar networks.

Types of Network

There are mainly four types of network:

Local area Network (LAN): Small computer network that is confined to a local area, office or within a building are known as LAN. E.g. network within school campus.

Metropolitan Area Network (MAN): Metropolitan area network is the network spread over a city or nearby corporate offices. For example, a cable TV network.

Wide Area Network (WAN): This type of network spreads over large geographical area across countries and continents. WANs are generally used to interconnect several other types of networks such as LANs, MANs etc.

Personal Area Network (PAN): The PANs are small network, used to establish communication between computer and other hand-held devices in small proximity up to 10 meters using wired USB connectivity or wireless system like Bluetooth or Infrared.

Difference between LAN and WAN

LAN	WAN
1. Diameter is in a few kilometers	1. Span across countries
2. Very low error rate.	2. High error rate as compare to LAN, MAN, PAN
3. Complete ownership by a single organization	3. Run by multiple organization
4. Speed in MBPS (10-100 Mbps)	4. Normal speed 1-2 Mbps

Network Topologies

Network topologies refer to the way in which the nodes are interconnected in a network.

Star Topology: In star topology each node is directly connected to the central node (server/hub) by a single path.

Advantages:

1. Easy to install and Low cost.
2. A single node failure does not affect the entire network.
3. Problem diagnosis is easy due to central control.

Disadvantages:

1. Central node dependency, i.e. in case central node fails, the entire network fails.
2. Long cable is required because each node is directly attached to the server/central node.

BUS or Linear Topology: In this topology, a single length of the transmission medium is used on which various nodes are attached. It can transmit data in both directions.

Advantages:

1. Short cable length required
2. Easy to extend the network

Disadvantages:

1. Nodes must be intelligent.
2. Fault diagnosis is very difficult

Tree Topology: It is a variation of bus topology and has the shape of an inverted tree.

Advantages:

1. It is most suitable in networking multiple departments of a university where each unit works separately.
2. Fault identification is easy.

Disadvantages

1. As multiple segments are connected to a central hub, if central hub fails, it affects the entire network
2. Maintenance cost is high

Network Protocol

1. **Hypertext Transfer Protocol (HTTP):** HTTP is a communication protocol that is used to transfer information on the internet and WWW. HTTP is a request/response standard between a client and a server. A client is the end user and the server is the web site.
2. **Transmission Control Protocol (TCP):** TCP is responsible for verifying the correct delivery of data from client to server. Data can be lost in intermediate network. TCP adds support to detect errors or loss of data.
3. **Internet Protocol (IP):** IP is responsible for assigning 4 byte IP address to each packet.
4. **Point to Point Protocol (PPP):** It is a protocol used to establish a direct connection between two computers using Telephone lines.

Remote Access Software:

Today there are some softwares that provide you facility of accessing the computer remotely. Remote desktop software lets you access your computer and all its application over the Internet. Example: Team Viewer, Window Remote Desktop, Ammyy Admin etc.

Team Viewer: TeamViewer is a popular piece of software used for Internet-based remote access and support. Team Viewer Software can connect to any PC or server, so you can remotely control your partner's PC as if you were sitting right in front of it.

Network Security Concept:

Cyber Law: Cyber law is a generic terms which refers to all the legal and regulatory aspects of internet and World Wide Web.

Firewall: It prevents unauthorized access to or from a private network. A firewall is used to control the traffic between computer networks.

Cookies: Cookies are the text messages sent by a web server to the web browser so that web server can keep track of the user's activity on a specific web site.

Hackers: Gaining knowledge about someone's private and sensitive information by getting accessibility of his computer system illegally. Hackers are more interested in gaining knowledge about computer system and possibly using this knowledge for playful planks.

Crackers: Crackers are the malicious programs who break into the secure system for some illegal or destructive purpose.

Network security threats:

Denial of Services (DoS): DoS attacks are those attacks that prevent the legitimate users from accessing or using the resources and information. These types of attacks may eat up all the resources of the system and computer become to a halt state.

Intrusion problem:

Snooping: It refers to unauthorized access of someone else data, e-mail, computer activity or data communication. It may comprise monitoring of Keystrokes pressed, Capturing of passwords and login information and interception of e-mails and other private information.

Eavesdropping: It the act of secretly listening / interpreting someone else's private communication or information while data is on its way on the network.

Spyware: Spy ware is a program designed to spy on your activities and reports this data to people willing to pay it either for legal or illegal purposes. It is getting installed in your system without your consent as a file or gets downloaded from websites on Internet.

Spamming: Spamming refers to the sending of bulk-mail (junk-mail) by identified or unidentified sources.

Phishing: Phishing is a process of attempting to acquire sensitive information such as user name, passwords, credit card number, bank account details etc. using a trap-mail in which user himself discloses their private details.

Malicious Programs

Virus: Computer viruses are malicious and self-replicating codes/programs that cause damage to data and files on the computer system.

Worm: It is also a self-replicating program which eats entire disk space or memory. It copies itself until all the disk space or memory is filled.

Trojan Horse: It is a program that appears harmless (like utility program) but actually performs malicious functions such as deleting or damaging files.

Internet application:

SMS (Short Message Services): SMS is the transmission of short text message from one mobile to other mobile phone.

Voice Mail: Transfer of recorded message is known as voice mail.

E-Mail: E-mail allows a user to send or receive message electronically across the world on the computer.

Chat: Online textual talk in real time is called chatting.

Video Conferencing: A two way videophone conversation among multiple participants is called video conferencing

Wireless/Mobile Communication:

GSM: It is a wireless communication medium that provides the user with roaming facility, good voice quality, SMS etc. through digital signals.

CDMA: It is a digital cellular technology that uses spread spectrum technique where the entire bandwidth is divided among several users for transmission of data. This allows multiple people on multiple cell phones over the same channel to share a bandwidth of frequencies.

WLL: Wireless local loop (WLL) technology simply means that the subscriber is connected to the nearest telephone exchange through a radio link instead of copper wires.

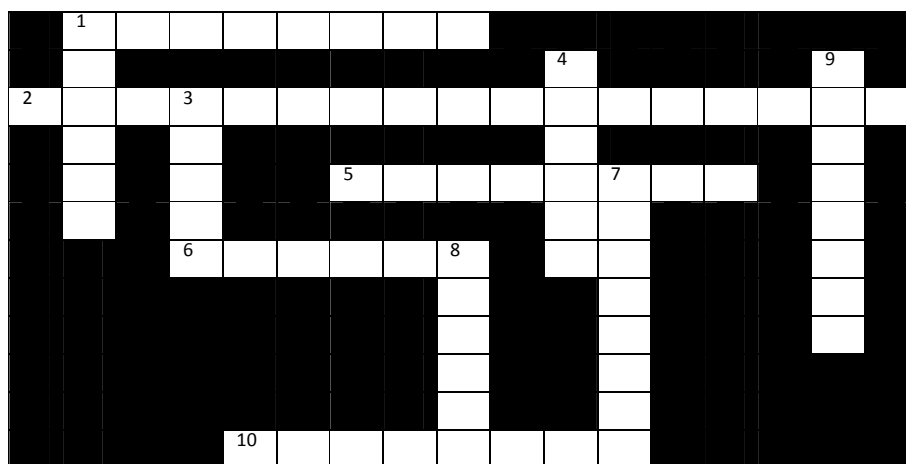
3G: It is the third generation of Wireless & Mobile technology. It is high-speed transmission with advanced multimedia access and global roaming. 3G is mostly used with mobile phones and handsets as a means to connect the phone to the Internet.

4G: It is fourth-generation of wireless service, which refers to the next wave of high-speed mobile technologies that will be used to replace current 3G networks.

Cloud Computing: The practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.

Characteristics: (i) On demand Self-service, (ii) Broad network access. (iii) Resource Pooling (iv) Measured service.

REVISION: Complete the following cross word puzzle using Network concept and terminology



1. (Across) Unauthorized access of someone else's data, email, computer activity etc.
1. (Down) A computer that facilitates sharing of data, software & hardware resources on network.
2. (Across) Term used for 'connecting cables' or 'connecting media' across network.
3. (Down) Name given to the computers on a network.
4. (Down) Unique name assigned to a web site.
5. (Across) A device that amplifies and restores signals for long distance transmission.

6. (Across)An intelligent device that is used to connect several computers in a network.
7. (Down)The pattern of interconnection of nodes in a network.
8. (Down)A person gaining knowledge about someone's private and sensitive information by getting accessibility of his computer system illegally.
9. (Down)A system prevents unauthorized access to or from private network.
10. (Across)Measures taken to protect the networking infrastructure from unauthorized access & misuse.

Very Short Answer Type Question:

1. What is networking?
2. Arrange the following communication channels in the ascending order of their data transfer rate.
(i) Optical Fiber (ii) Coaxial cable (iii) UTP cable
3. Write two advantage and two disadvantages of Coaxial Cables, Twisted Pair Cables, Fiber Optics.
4. What is meant by transmission media? Give two examples of guided media and two examples of unguided media.
5. Which of the following is not a transmission media?
i. Telephone Lines ii. Coaxial Cable iii. Modem iv. Microwave Systems
6. Why switch is called intelligent hub?
7. PACK N PICK is a food supply company with kitchen and market unit 110 meters away from each other. The company recently connected their networks using UTP cable to share the stock related information. But after joining their networks, they are not able to share the information due to loss of signal in between. Which device is to be installed for a smooth communication?
8. Two engineers in the same room have connected their Palm-tops using Bluetooth for working on a Group presentation. Out of the following, what kind of Network have they formed? LAN, MAN, PAN, WAN.
9. What do you mean by topology?
Identify the type of Topology from the following:
(i) If each node is connected with the help of independent cable with the help of a central switching (communication controller).
(ii) If each node is connected with the help of a single co-axial cable.
10. A University would like to go in for networking of all the computers. Which topology would you recommend and why?
11. Lalit is transferring songs from his mobile to his friend's mobile via Bluetooth connection. Name the network used by Lalit.
12. Which protocol is used for transfer of hypertext documents on the internet?
13. Ram wants to transfer hypertext documents on the Internet. Which protocol must be used for the same?
14. Samhita says that the following numbers indicate an address:
i. 208.77.188.166
What is the above address called? To which object/device is it assigned
15. Rohit is confused between the terms Domain Name and URL. Explain the difference with the help of appropriate examples of each.
16. When is a repeater used in a network?

17. What is domain Name?
18. Define any two threats to Network Security.
19. Define the following terms:
Cookies, firewall, snooping, PC Intrusion, spamming, Trojan horse.
20. Define Authorization and Authentication in context of active protection.
21. Define Email.

Short Answer Type Question:

1. **What** is computer network? What are its advantages?
2. Differentiate between guided media and unguided media?
3. Differentiate between LAN and WAN?
4. Define Bluetooth, satellite link.
5. Define the following: Repeater, Gateway, Modem, Switch
6. Write any two advantages and disadvantages of star, tree and Bus topology.
7. What is IP address? Explain with example.
8. What is MAC address? Explain with example.