

ASSIGNMENT 1

COMPUTER NETWORKS

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Q1. Discuss the concept of Networking, advantages, disadvantages and applications.

Ans: A collection of linked autonomous systems that enable dispersed information processing makes up a computer network. It improves performance by processing information quickly.

Advantages of Network:

1. Central Storage of Data –

Files can be stored on a central node (the file server) that can be shared and made available to each and every user in an organization.

2. Faster Problem-solving –

Since an extensive procedure is disintegrated into a few littler procedures and each is taken care of by all the associated gadgets, an explicit issue can be settled in lesser time.

3. It is highly flexible –

This innovation is known to be truly adaptable, as it offers clients the chance to investigate everything about fundamental things, for example, programming without influencing their usefulness.

Disadvantages of Network:

1. Virus and Malware –

On the off chance that even one PC on a system gets contaminated with an infection, there is a possibility for alternate frameworks to get tainted as well. Infections can spread on a system effectively, in view of the availability of different gadgets.

2 .Cost of the network –

The expense of executing the system including cabling and equipment can be expensive.

3. It lacks independence –

PC organizing includes a procedure that is worked utilizing PCs, so individuals will depend on a greater

amount of PC work, rather than applying an exertion for their jobs that needs to be done. Besides this, they will be subject to the primary document server, which implies that, in the event that it separates, the framework would end up futile, making clients inactive.

Q2. Discuss the peer-to-peer connections and multipoint connection.

Ans: **A peer-to-peer connection** is a type of network connection in which each device has the same capabilities and functions as the other devices on the network, rather than having a central server that all the other devices connect to. In a peer-to-peer network, each device acts as both a client and a server, allowing it to communicate directly with other devices on the network without the need for a central server. Peer-to-peer networks are often used for file sharing, online gaming, and other applications that require a high degree of interactivity between devices.

A multipoint connection also known as a conference call, is a type of telephone call that involves more than two parties. With a multipoint connection, multiple people can participate in the same call at the same time, regardless of their physical location. This is often used in business and other settings where it is necessary for a group of people to communicate with each other simultaneously. In a multipoint connection, each participant has the ability to speak and listen, just as they would in a normal telephone call. However, since there are multiple people on the call, it is important for participants to take turns speaking and to be mindful of the time they take up so that everyone has an opportunity to participate.

Q3. Discuss the components required to make a computer network.

Ans: Computer network components are the *major parts* which are needed to *install the software*. Some important network components are **NIC, switch, cable, hub, router, and modem**. Depending on the type of network that we need to install, some network components can also be removed. For example, the wireless network does not require a cable.

NIC

- NIC stands for network interface card.
- NIC is a hardware component used to connect a computer with another computer onto a network
- It can support a transfer rate of 10,100 to 1000 Mb/s.

Hub

A Hub is a hardware device that divides the network connection among multiple devices. When computer requests for some information from a network, it first sends the request to the Hub through cable. Hub will broadcast this request to the entire network. All the devices will check whether the request belongs to them or not. If not, the request will be dropped.

Switch

A switch is a hardware device that connects multiple devices on a computer network. A Switch contains more advanced features than Hub. The Switch contains the updated table that decides where the data is transmitted or not. Switch

delivers the message to the correct destination based on the physical address present in the incoming message. A Switch does not broadcast the message to the entire network like the Hub. It determines the device to whom the message is to be transmitted. Therefore, we can say that switch provides a direct connection between the source and destination. It increases the speed of the network.

Router

- A router is a hardware device which is used to connect a LAN with an internet connection. It is used to receive, analyze and forward the incoming packets to another network.
- A router works in a **Layer 3 (Network layer)** of the OSI Reference model.

Modem

- A modem is a hardware device that allows the computer to connect to the internet over the existing telephone line.
- A modem is not integrated with the motherboard rather than it is installed on the PCI slot found on the motherboard.

Cables and Connectors

Cable is a transmission media used for transmitting a signal.

There are three types of cables used in transmission:

- Twisted pair cable
- Coaxial cable
- Fibre-optic cable

Q4. Discuss the types of networks as LAN, WAN and MAN.

Ans: **Local Area Network (LAN)** –

LAN or Local Area Network connects network devices in such a way that personal computers and workstations can share data, tools, and programs. The group of computers and devices are connected together by a switch, or stack of switches, using a private addressing scheme as defined by the TCP/IP protocol. Private addresses are unique in relation to other computers on the local network. Routers are found at the boundary of a LAN, connecting them to the larger WAN.

Data transmits at a very fast rate as the number of computers linked is limited. By definition, the connections must be high-speed and relatively inexpensive hardware (Such as hubs, network adapters, and Ethernet cables). LANs cover a smaller geographical area (Size is limited to a few kilometers) and are privately owned. One can use it for an office building, home, hospital, school, etc. LAN is easy to design and maintain. A Communication medium used for LAN has twisted-pair cables and coaxial cables. It covers a short distance, and so the error and noise are minimized.

Metropolitan Area Network (MAN) –

MAN or Metropolitan area Network covers a larger area than that of a LAN and smaller area as compared to WAN. It connects two or more computers that are apart but reside in the same or different cities. It covers a large geographical area and may serve as an ISP (Internet Service Provider). MAN is designed for customers who need high-speed connectivity. Speeds of MAN range in terms of Mbps. It's hard to design and maintain a Metropolitan Area Network.

The fault tolerance of a MAN is less and also there is more congestion in the network. It is costly and may or may not be owned by a single organization. The data transfer rate and the propagation delay of MAN are moderate. Devices used for transmission of data through MAN are Modem and Wire/Cable. Examples of a MAN are the part of the telephone company network that can provide a high-speed DSL line to the customer or the cable TV network in a city.

Wide Area Network (WAN) –

WAN or Wide Area Network is a computer network that extends over a large geographical area, although it might be confined within the bounds of a state or country. A WAN could be a connection of LAN connecting to other LANs via telephone lines and radio waves and may be limited to an enterprise (a corporation or an organization) or accessible to the public. The technology is high speed and relatively expensive.

There are two types of WAN: Switched WAN and Point-to-Point WAN. WAN is difficult to design and maintain. Similar to a MAN, the fault tolerance of a WAN is less and there is more congestion in the network. A Communication medium used for WAN is PSTN or Satellite Link. Due to long-distance transmission, the noise and error tend to be more in WAN.

WAN's data rate is slow about a 10th LAN's speed since it involves increased distance and increased number of servers and terminals etc. Speeds of WAN ranges from a few kilobits per second (Kbps) to megabits per second (Mbps). Propagation delay is one of the biggest problems faced here. Devices used for the transmission of data through WAN are Optic wires, Microwaves, and Satellites. An example of a Switched WAN is the asynchronous transfer mode (ATM) network and Point-to-Point WAN is a dial-up line that connects a home computer to the Internet.

Q5. Differentiate between physical and logical topologies.

Ans:

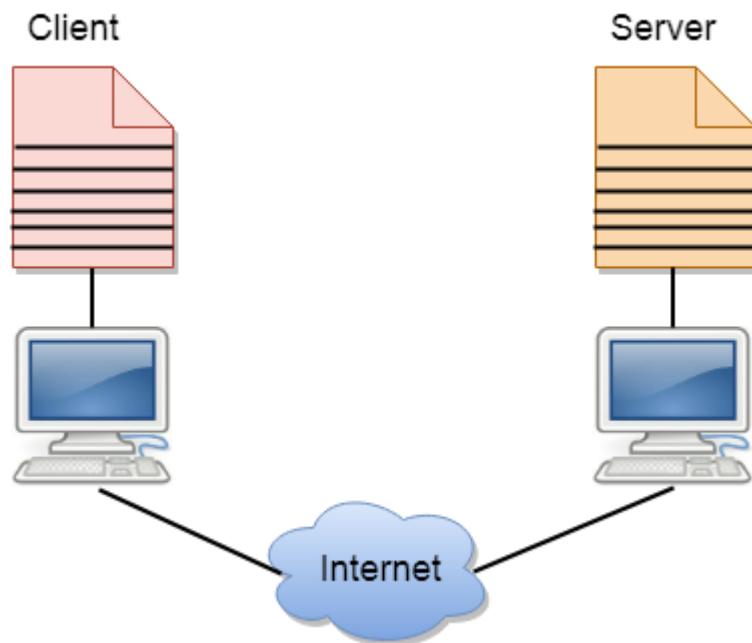
Physical Topology	Logical Topology
Physical Topology means the physical layout of the network.	Logical topology means how the network device layout will be shown and how the data will be transferred.
For example – Ring, Bus, Star, and Mesh.	For example – Ring and Bus.
In this topology, we are concerned with how data will be transferred from the actual path.	This topology is concerned with the high-level representation of the data transfer.
As per the requirement, we can modify the layout of the network.	There is no change accepted.
It can affect cost, bandwidth, scalability etc.	It can affect data delivery.

Physical Topology	Logical Topology
Types of physical topologies are star, mesh, bus, and ring.	Types of logical topologies are logical bus, and logical ring.
It is an actual route concerned with transmission.	It is a high level representation of data flow.
Physical connection of the network.	Data path followed on the network.

Q6. List the different types of networks from surroundings as client-server network, distributed networks, peer-to-peer networks and cloud based networks.

Ans: Client and Server model

- A client and server networking model is a model in which computers such as servers provide the network services to the other computers such as clients to perform a user based tasks. This model is known as client-server networking model.
- The application programs using the client-server model should follow the given below strategies:



Distributed Operating System

A distributed operating system (**DOS**) is an essential type of operating system. Distributed systems use many central processors to serve multiple real-time applications and users. As a result, data processing jobs are distributed between the processors.

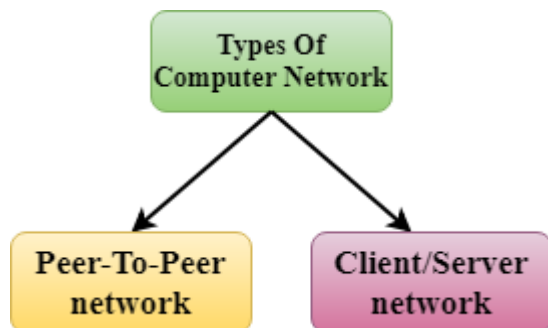
It connects multiple computers via a single communication channel. Furthermore, each of these systems has its own processor and memory. Additionally, these **CPUs** communicate via high-speed buses or telephone lines. Individual systems that communicate via a single channel are regarded as a single entity. They're also known as **loosely coupled systems**.



Computer Network Architecture

Computer Network Architecture is defined as the physical and logical design of the software, hardware, protocols, and media of the transmission of data. Simply we can say that how computers are organized and how tasks are allocated to the computer.

The two types of network architectures are used:



- Peer-To-Peer network
- Client/Server network

Q7. Discuss the concept of Network Topologies.

Ans7: Network topologies refer to the physical and logical arrangement of devices on a computer network. The most common types of network topologies include:

- Star: In a star topology, all devices are connected to a central hub or switch. This central hub acts as a traffic cop, forwarding data to the correct device.
- Bus: In a bus topology, all devices are connected to a single cable or backbone. Data is transmitted along the backbone and all devices listen for the data they need.
- Ring: In a ring topology, all devices are connected in a closed loop. Data is passed from device to device along the ring until it reaches its destination.
- Mesh: In a mesh topology, each device is connected to every other device on the network. This allows for multiple paths for data to travel, making the network more resilient.
- Tree: In a tree topology, the network is organized in a hierarchical structure, with the backbone connecting to multiple branches or sub-networks.

Each topology has its own advantages and disadvantages. For example, a star topology is easy to set up and manage, but if the central hub fails, the entire network goes down. A mesh topology is highly resilient, but can be more complex to set up and manage.

Q8. Protocols and their usage e.g. TCP/IP, http, https, ftp.

1. **Transmission Control Protocol (TCP):** TCP is a popular communication protocol which is used for communicating over a network. It divides any message into series of packets that are sent from source to destination and there it gets reassembled at the destination.
2. **Internet Protocol (IP):** IP is designed explicitly as addressing protocol. It is mostly used with TCP. The IP addresses in packets help in routing them through different nodes in a network until it reaches the destination system. TCP/IP is the most popular protocol connecting the networks.
3. **Hyper Text Transfer Protocol (HTTP):** HTTP is designed for transferring a hypertext among two or more systems. HTML tags are used for creating links. These links may be in any form like text or images. HTTP is designed on Client-server principles which allow a client system for establishing a connection with the server machine for making a request. The server acknowledges the request initiated by the client and responds accordingly

4. **Hyper Text Transfer Protocol Secure (HTTPS):** HTTPS is abbreviated as Hyper Text Transfer Protocol Secure is a standard protocol to secure the communication among two computers one using the browser and other fetching data from web server. HTTP is used for transferring data between the client browser (request) and the web server (response) in the hypertext format, same in case of HTTPS except that the transferring of data is done in an encrypted format
5. **File Transfer Protocol (FTP):** FTP allows users to transfer files from one machine to another. Types of files may include program files, multimedia files, text files, and documents, etc.