

Module 1 : Assignment.

i) Illustrate TCP/IP reference model with a neat diagram

The TCP/IP reference model was developed prior to OSI model.

The major goals of this model were

- i) To connect multiple networks together so that they appear as a single network.
- ii) To survive after partial subnet hardware failures.
- iii) To provide a flexible architecture.

Unlike OSI reference model,

TCP/IP reference model has only 4 layers. They are:

- i) Host to network Layer , ii) Internet Layer,
- iii) Transport Layer iv) Application Layer.

OSI model

- 1 Application
- 2 Presentation
- 3 Session
- 4 Transport
- 5 Network
- 6 Data-link
- 7 Physical

TCP/IP model

Application

Transport
Internet

Host to network

Not present in
this model.

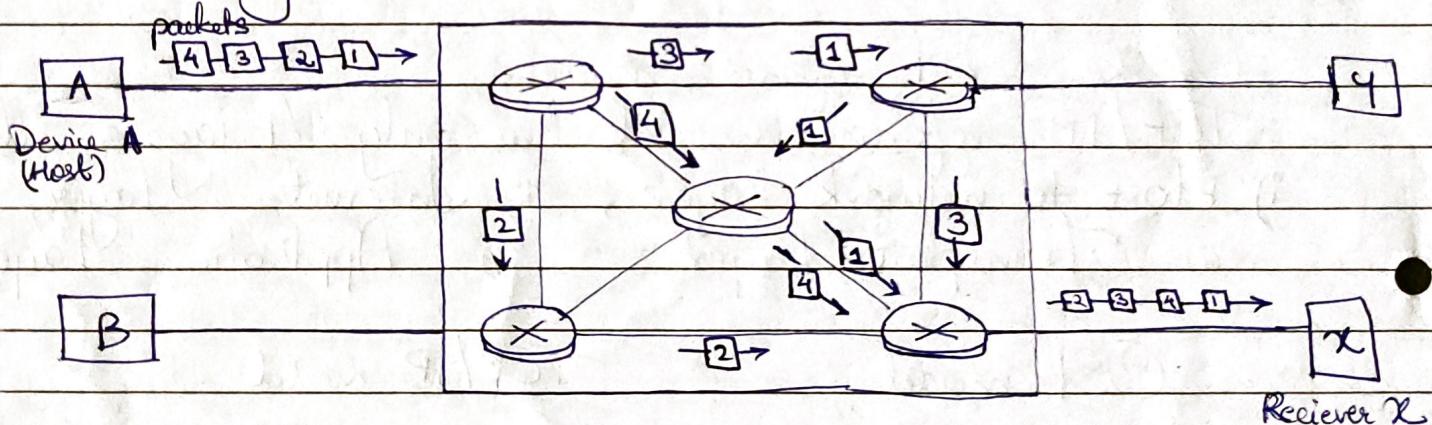
2. Discuss in detail about the packet switched networks.



- Messages need to be divided into packets.
- The size of a packet is determined by the network and the governing protocol.
- No resource reservation, but allocated on demand.
- The allocation is done on 'first come, first serve' basis.
- When a switch receives 4 packets, the packet must wait if there are other packets being processed, this lack of reservation may create delay.

Packet switched networks are of two types:-

1) Datagram network



- Each packet (called as datagram in this approach) is treated independently of all others.
- All packets (or datagrams) belong to the same message may travel different paths to reach their destination.
- Datagram switching is done at the network layer.
- This approach can cause the datagrams of a transaction to arrive at their destination out of order with different delays between the packets.

- Packets may also be lost or dropped because of a lack of resources.
- In most protocols, it is the responsibility of an upper layer protocol to reorder the datagrams or ask for lost datagrams before passing them to the application.
- The datagram networks are referred to connectionless networks. There are no setup or teardown phases.
- Each packet switch has a routing table which is based on the destination address.

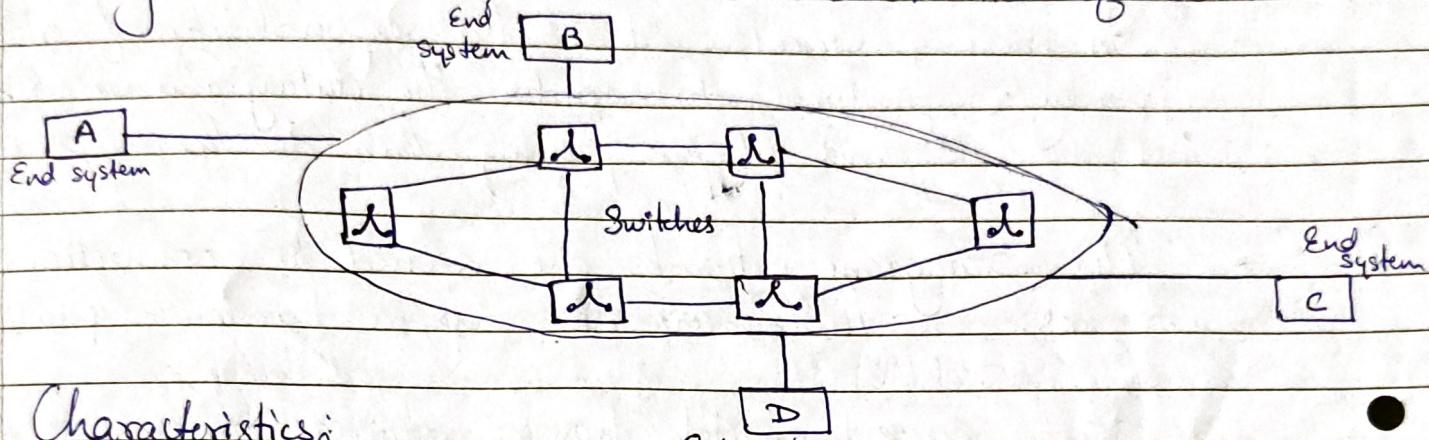
Routing table in a datagram network →

Destination address	Output port
1232	1
4369	2
:	:
7812	4

- The routing tables are dynamic and updated periodically.
- The destination addresses and the corresponding forward output ports are recorded in the table.
- The destination address in the header of a packet in a datagram network remains the same during the entire journey of the packet.
- Efficiency is better than that of a circuit-switched network.
- Switching in the Internet is done by using the datagram approach to packet switching at the network layer.

2) Virtual Circuit Networks

It's a cross between circuit switched network and datagram network, and has characteristics of both.



Characteristics:

- Packets from a single message travel along the same path.
- Three phases to transfer data (setup, data transfer and tear down)
- Resources can be allocated during setup phase.
- Data are packetized and each packet carries an address in the header.
- Implemented in data link layer.

Virtual circuit network addressing.

* Global addressing → Source and destination needs unique address (used by switches only to create a virtual-circuit identifier) during the set up phase.

* Local addressing → actually used for data transfer.
generates VCI - (Virtual circuit identifier)

- a small address is used by a frame between 2 switches.

In virtual circuit network, there is a one time delay for setup and a one time delay for teardown. If resources are allocated during setup, there is no wait time for individual packets.

3) What do you mean by computer network? Classify computer network and Explain them in brief.

→ Computer networks consists of two or more computers that are linked in order to share resources, exchange data files or to allow electronic communication. The computers on a network may be linked through cables, telephone lines, radio waves, satellites or infrared light beams.

There are two aspects of computer networks

Hardware and Software.

Hardware includes physical connection between two machines by using adaptors, cables, routers, bridges, etc.

Software includes a set of protocols. Protocols define a formal language among various components. It makes hardware usable by application.

Computer Networks can be classified into:

- 1) LAN 2) MAN 3) WAN. 4) PAN

1) LAN - Local Area Network

LANs are privately owned networks within a single building or campus of up to a few kilometers in size.

Distinguished based on - their size, transmission technology, topology.

- Lines are restricted in size.
- They use a transmission technology consisting of a single cable to which all machines are attached.

2) MAN - Metropolitan Area Network.

- network which covers a large geographic area by interconnecting different LAN to form a larger network.
- Various LAN's are connected to each other through a telephone exchange line.
- Higher range than LAN (upto 10 KM)

3) WAN - Wide Area Network.

- network that extends over a large geographical area such as states / countries.
- Range upto 1000 Km.
- widely used in the field of business, government and education.

4) PAN - Personal Area Network.

- A network arranged within an individual's area (range of upto 10m)
- used for connecting computer devices of personal use.

- 5) How does UDP differ from TCP?
List applications of TCP.

TCP

- 1. Connection oriented protocol Datagram oriented protocol.
- 2. Reliable as it guarantees Delivery of data to destination delivery of data to destination. cannot be guaranteed.
- 3. Provides extensive error checking mechanism Only has basic error checking mechanism.
- 4. Acknowledgement segment is present No acknowledgement segment.
- 5. Packets arrive in the order that they were sent No sequencing, and managed by Application layer if required.
- 6. Comparatively slower Comparatively faster.
- 7. Comparatively complex More simple
- 8. Less efficient More efficient
- 9. Heavy weight Light weight.
- 10. Does not support broadcasting Supports broadcasting

Applications of UDP:

- 1) Domain name services.
- 2) Simple network management protocol
- 3) Trivial file transfer protocol.
- 4) Routing information protocol.
- 5) Multicasting.

6) Define and discuss in brief about FTP.

→ FTP stands for File Transfer Protocol which is standard network protocol used to transfer computer files from one host to another host over a TCP based network (Internet)

- It is built on a client-server architecture and uses separate control and data connections between client and server.
- It provides the sharing of files.
- Used to encourage the use of remote computers.
- Transfers data more reliably and efficiently.
- FTP protocol establishes two connections between hosts, one connection is used for data transfer another is used for control connection.

Advantages:

- 1) Fastest way to transfer files.
- 2) More efficient
- 3) Secured.

7) Explain in brief about DNS.

→ Domain Name System is a hierarchical distributed naming system for computers or any resource connected to internet or private network.

It distributes the responsibility of assigning domain names and mapping those names to IP addresses by designating authoritative name servers for each domain. This mechanism provides distributed and fault-tolerant service.

8) Significance of layered architecture.

Explain the OSI layered architecture with neat sketch.

Differentiate between LAN, MAN and WAN.

The main aim of layered architecture is to divide the design into small pieces which reduces the complexity of design.

- Layered architecture is modular, provides independence of layers which becomes easy to implement and understand.
- Easy to modify and test.

OSI architecture

1. Physical layer.

- converts bits into electronic signals for outgoing messages and vice versa.

- it is the bottom layer of OSI model which transmits raw bits over a communication channel.

2. Data link layer.

- Main task is to transfer a raw-transmission facility into a line that appears free of errors.

- Has special bit patterns in the beginning & ending of the frame.

- If service is reliable, receiver confirms correct receipt of each frame by sending back acknowledgement frame.

7 Application
6 Presentation
5 Session

4 Transport
3 Network
2 Data link

1 Physical

3. Network layer.

- controls the operation of subnet.
- responsible for delivery of individual packets from source to destination host.
- controls the congestion, when too many packets are present in subnet.

4. Transport layer.

- manages the transmission of data across a network.
- manages flow of data between parties.
- provides acknowledgement of successful transmission and requests retransmits for packets.
- It is an end-to-end layer.

5. Session layer.

- allows users of different machines to establish sessions between them.
- various services such as sit dialog control, token management and synchronization are offered.

6. Presentation layer.

- concerned with syntax and semantics of the information transmitted.
- allows higher level data structures to be defined and exchanged.

7. Application layer.

- responsible for providing services to user.
- contains a variety of protocols such as HTTP.

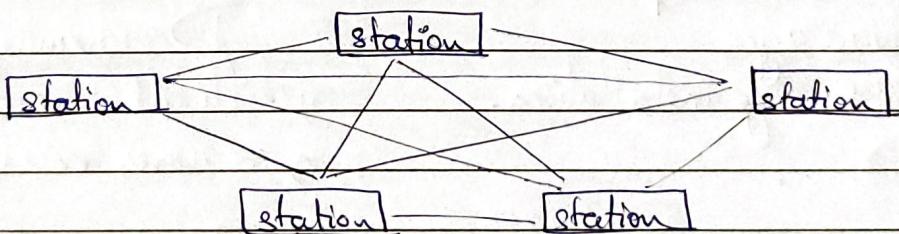
Comparison	LAN	MAN	WAN
i) expands to	Local Area Network	Metropolitan Area	Wide Area
ii) Speed	High	Moderate	Low
iii) Ownership	Private	Private/Public	Public
iv) Design	Easy	Difficult	Difficult.
v) Delay	Short	Moderate	Long
vi) Fault Tolerance	More tolerant	Less tolerant	Least tolerant
vii) Congestion	Low	More	Much More

q. Define Topology. Discuss in brief about computer network topologies. What is the function of SMTP.

→ Topology refers to the way in which a network is laid out physically. Two or more links form a topology.

Mesh top

- Every device has a dedicated point-to-point link to every other device.



- Link carries traffic only between two devices it connects.

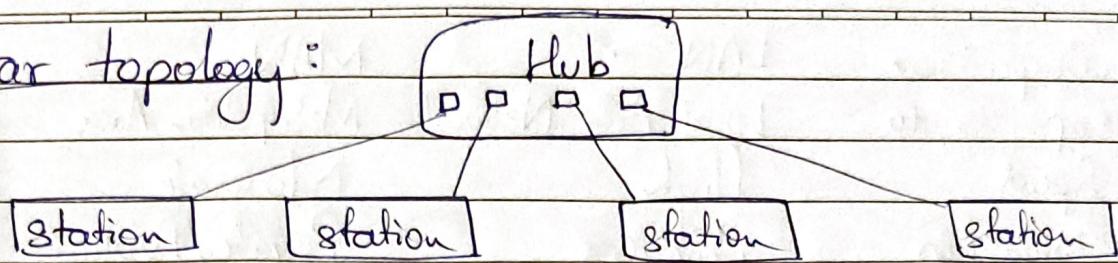
Advantages:

- 1) Privacy & Security.
- 2) Fault identification is easy.
- 3) Eliminates problem of traffic.

Disadvantages:

- 1) Expensive.

Star topology:



- Each device has a dedicated point-to-point link only to central controller called hub.

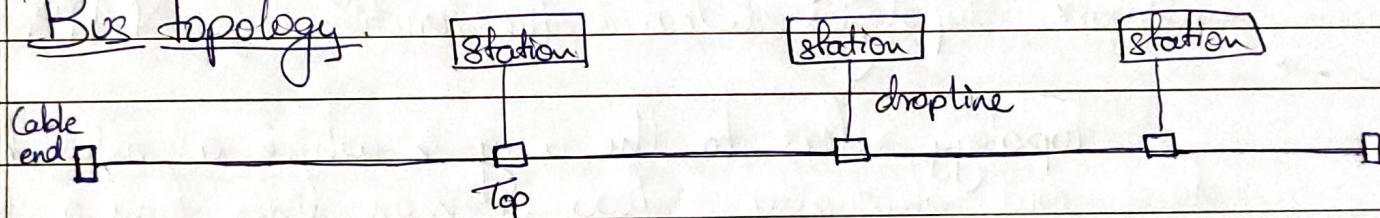
Advantages:

- 1) Less expensive
- 2) Robustness

Disadvantages:

- 1) dependency on one single point
- 2) more cabling is required.

Bus topology.



- it is multipoint
- one long cable acts as a backbone to link all devices
- Nodes are connected by bus cable by drop line and taps.

Advantages

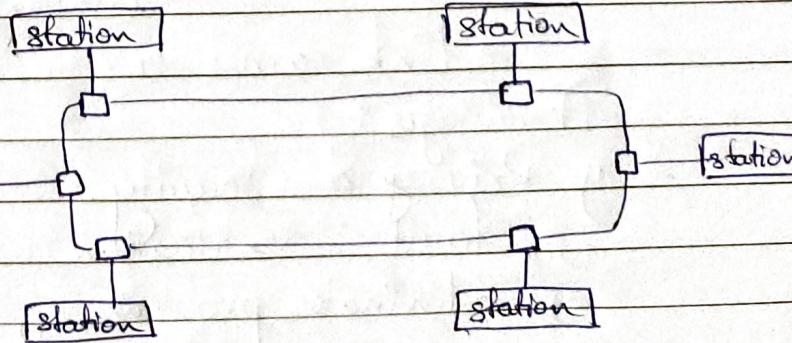
- 1) ease of installation.

Disadvantages

- 1) difficult reconnection
- 2) requires modification of backbone

Ring topology

- Signal is passed in one direction.
- Each device has a point-to-point connection with only 2 devices.



Advantages:

- easy to install & configure
- Unidirectional
- 2) break in a ring can disable ^{entire network}

Disadvantages:SMTP functions

- 1) It verifies the configuration of computer from where email is being sent and grants permission for process.
- 2) It sends out the message and follows successful delivery of email.

(o) What are the distinct characteristics of Local area networks?

- It is a private network, so an outside regulatory body never controls it.
- Operates at relatively higher speed.
- Various kinds of media access control methods like token ring and ethernet.
- Restricted in size.
- LANs run at speeds of 10-100 MBPS, have low delay and very few errors.

(ii) Describe briefly about the circuit-switched network.

-
- consists of a set of switches connected by physical links.
 - A connection between 2 stations is a dedicated path made of one or more links.
 - Each link is divided into n channels using FDM or TDM.

The 3 phases needed for communication:

i) Setup phase: Means creating dedicated channels between the switches.

ii) Data transfer phase: After the establishment of dedicated circuit, the two parties can transfer data.

iii) Teardown phase: When one of the parties needs to disconnect, a signal is sent to each switch to release the resources.

- Circuit switching takes place at physical layer.
- Data transferred between two stations are not packetized.
- No addressing involved during data transfer
- Not so efficient.
- There is delay in transfer of data.

Q] Explain i) ARPANET ii) Internet.

→ ARPANET stands for Advanced Research Projects Agency Network which was one of the world's first operational packet switching networks, first network to implement TCP/IP.

The network was initially funded by ARPA.

The packet switching of ARPANET, together with TCP/IP, would form the backbone of how internet works.

Internet is two or more networks that can communicate with each other.

13) Explain different type of devices used in computer network

→ Repeaters

- It is a device that extends the distance of a particular network run.
- It boosts the signal and sends it to next node.
- Used to connect the same type of media.
- Operate to physical layer of OSI model.

Hub:

- interconnects two or more workstations into LAN.
- It is also called as concentrators.
- Prevents collision between packets transmission from one node to other.
- Has automatically partitioning property.
- Physical layer device.

Bridges

- Intelligent version of repeaters.
- Examines media access control (MAC) address of each packet and forms table.
- used only on small networks.
- operates at data link layer.

Router

- More intelligent version of Bridges.
- They have processor and memory
- Operate at network layer.
- Determines the shortest route to destination.
- Have their own network address.

Switches:

- Like bridges, but they have many ports.
- forms one-to-one connections between any 2 ports.
- Multiple workstations connected to switch use dedicated segments.
- Efficient way to isolate ~~to~~ heavy users from the network.