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Course Instructor: Dr. Manmohan Sharma	
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Q1. Explain four basic network topologies, and write advantages and disadvantages of each type.

Ans: ① Bus Topology: In "Bus topology" a single cable (wire) connects all the devices in the network. The devices are connected to cable by drop lines and tapes also called T-connector. A drop line is connection between device and main cable.

→ Advantages:-

i) Easy to install
ii) Cost effective
iii) Any computer can be a server.

→ Disadvantages:-

i) A break in the cable stops all the transmission means the network goes down.
ii) Fault detection & isolation is difficult.
iii) Once the network is establish and wire is cut, additional computers are difficult to connect.

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(2) Star Topology: In "Star Topology" each computer (Node) has independent connection from server through hub/switch. The server is located at central location.

→ Advantages:-

i) Fault detection & isolation is easy.
ii) Easy installation
iii) Adding more nodes are easy.

→ Disadvantages:-

i) Extra cost for Hub/Switch.
ii) Failure of central computer (server) will leads to failure of entire network.

(3) Ring Topology: In "Ring Topology" each device has dedicated point to point line configuration in a circular manner. The data travel from one device to another until they reached the destination.

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→ Advantages:-

i) Data transfer rate is high.

ii) Network sever is not needed to control network connectivity.

→ Disadvantages:-

i) If any node is shut down then entire network will be impacketed.

ii) Difficult to add and remove devices once the network has been set up.

④ Mesh Topology: In "Mesh Topology" every device has dedicated point to point connection with every other devices.

→ Advantages:-

i) Traffic load is less

ii) A break in a single link does not affect in transmission.

→ Disadvantages:-

i) It is costly.

ii) Difficult to configure.

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For each of the following four networks, discuss the consequences if a connection fails.

a) Five devices arranged in a mesh topology.

Ans: As we know, every device has connected point-to-point in mesh topology, so if one connection fails, the other connections will still be working fine.

b) Five devices arranged in a star topology (not counting the hub)

Ans: In star topology each device has independent connection from sesrver, so if one connection fails, the other device still be able to send packets (data)

c) Five devices arranged in a bus topology.

Ans: In bus topology a single connection connects all the devices in the network, so if the connection fails all transmission stop and entire network goes docon.

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d) Five devices arranged in a ring topology.

Ans: In ring topology all the devices has connected through a single connection in a circular manner, so if a connection fails then the entire network will be goes down

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Q2. How does information get passed from one layer to the next in the Internet model? What are headers and trailers, and how do they get added and removed? With the help of examples explain the concerns of the physical layer, data link layer, network layer, transport layer and application layers in the internet model?

Sol? The network layer takes the message created by the application layer and breaks it into several messages then the data link layer formats the message to indicate where it starts and ends, decides when to transmit it over the physical media and detects the error and corrects that occur during the time of transmission.

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Headers and trailers are control data included close to the beginning and the completion of each data unit at each layer of the sender and ousted at the relating layers of the beneficiary. They give the source and destination addresses, synchronization points, information for error detection.

When we send data(packets) from source(sender) to the destination (receiver) internet layer transfer the information across the multiple network layers:-

i) Physical layer: The physical layer is responsible for transmitting raw bits over the physical communication channel. Physical layer also determine the direction of transmission between two devices. It also deals with mechanical, electrical & physical transmission medium which lies below the physical layer.

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ii) Data Link Layer: The main task of data link layer is to transforms the raw bits error free. It performs this task by breaking the input data into frames and transmit these frames sequencially. It also control the flow control which is needed when the transmission speed of sender do not match with the receiver's speed.

iii) Network layer: The network layer is responsible for delivery of data packets from source to destination across multiple network link. The network layer select the best path (shortest path) to transmit the data packet on network. The network layer translates the logical address to the physical address.

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iv) Transport Layer: The transport layer is responsible for the delivery of entire message whereas network layer is responsible for delivery of individual packet. It puts the sequence number to each packet so that they can be re-assembled at the destination in proper order. It is also responsible for transmitting the missing packet.

v) Application layer: Application layer is responsible for providing interface to the application user. This layer also provide services like email, database access, remote file access and transfer telnet etc. It also allows application to communicate with application of other computer.

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Q3: Explain working of the following networking medium / devices with the help of supporting diagrams.

a) UTP cable: UTP stands for "Unshielded Twisted Pair". It is the most common type of communication medium in use today. A twisted pair consist of two insulated copper wires twisted together in helical form. This is done to reduce crosstalk and electromagnetic interference. Each signal on a twisted pair requires both wires. UTP cable improves the bandwidth to match the baseband of television signals. Telephone and Ethernet cables are common example of UTP wires. The two wires in each pair carry opposite signals. Each signal is detected

as the opposite end when the signal is detected to be reaches the receiver.

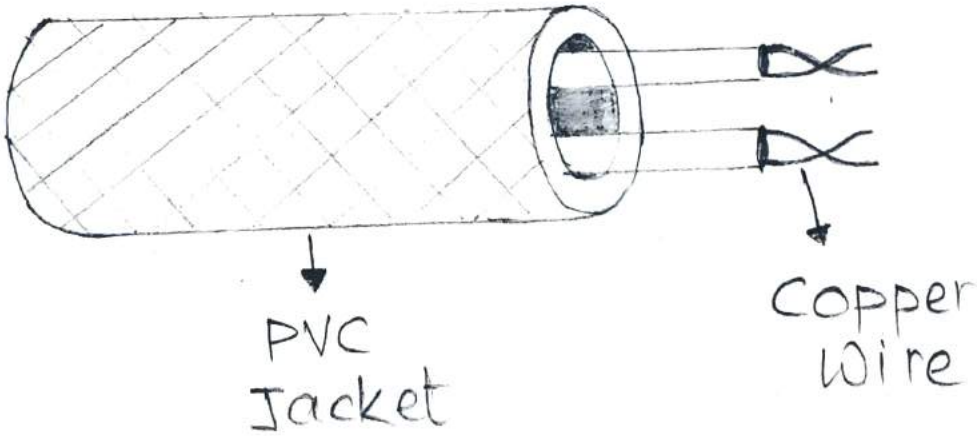

Fig: UTP Cable

b) **Router**: Router is a network hardware device that allows to make communication in between the internet and all devices which are linked to the internet. Router has responsible to receives, analyze, forward all data packets from the modem and transfer it to the destination point.

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End devices such as (PC, laptop or phone) which generate the few sequences of data into Bit form and then IP always ready to send these packets to further processing. All IP packets are transmitted along with their paths across the network, then router has responsible for getting to packet routing to the destination point

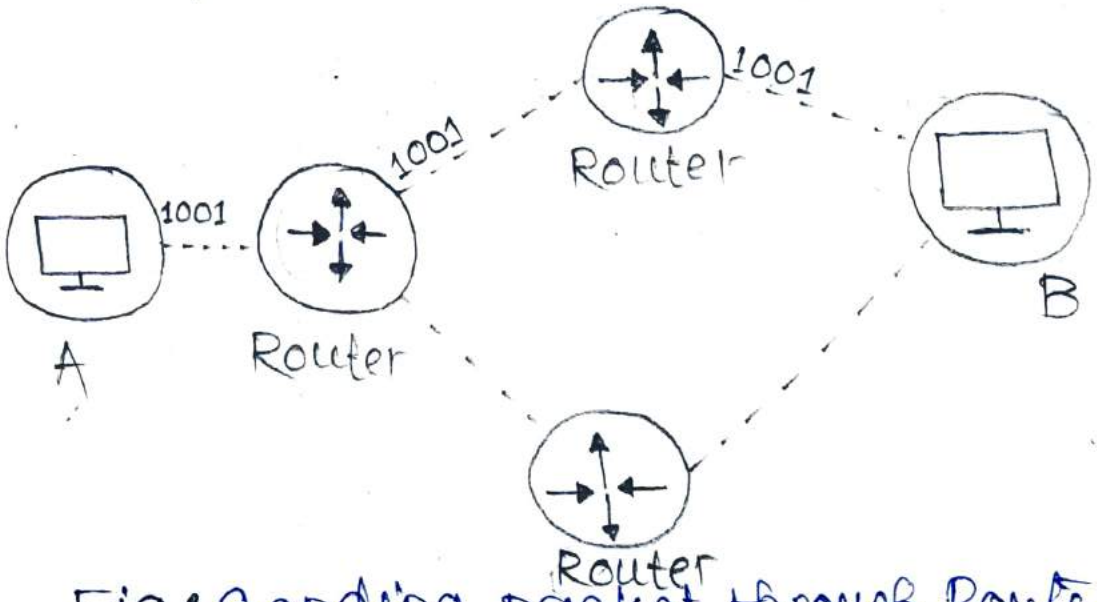

Fig: Sending packet through Router

While sending and receiving all data packets, each device appends the IP address with these packets, IP address means unique address like as your postal house address. The main

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goal of IP address is to identifies the sender and receiver over the network.

So, routes has the all information that which path is better to send packets across the network. The information is stored into routing table, but before sending any packet, it takes the decision that route is OK for forwarding them, and this process is known as Routing Process.