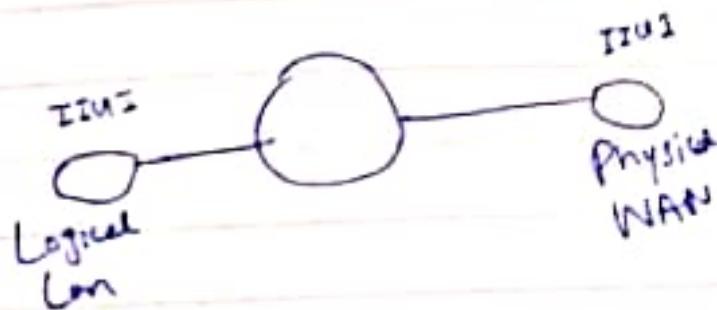
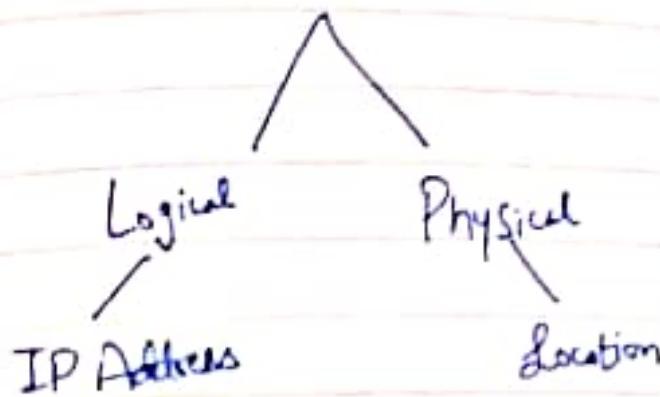


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Computer Networks:-

Combination of two or more PC's but shared the resources.



- ⇒ Combination of public networks are called internet.
- ⇒ Combination of private networks are called intranet.
- ⇒ Combination allows two remote side via internet and internet communication.

with the least and dedicated /fixed path are called extranet / VPN.

⇒ Layout of Network is Topology.

⇒ Mesh → Wastage of cable.

If one will down, other will work.

To find No. of meshes :-

$$K = \frac{K(K-1)}{2}$$

K = No. of nodes

$$\frac{4(4-1)}{2} = \frac{12}{2} = 6$$

Mesh:- (Point-to-Point)

Advantages:-

- ⇒ Use of dedicated links guarantees each connection can carry its own data load.
- ⇒ Eliminate traffic problems that can occur when link must be shared by multiple devices.
- ⇒ If one link become unusable, it does not incapacitate whole system (robust).
- ⇒ If every message travels along dedicated line, only intended recipient sees it. (Privacy, security)
- ⇒ Easy fault identification due to point to point connection.

Dis-Advantages:-

- ⇒ The amount of cabling and no. of I/O ports required.
- ⇒ Because every device is connected to every other device, installation and reconnection is difficult.
- ⇒ Sheer bulk of wiring can be greater than available space can accommodate.
- ⇒ Hardware requirement to connect each link (I/O, cable) can be expensive.

Example:- Connection of telephone regional offices in which every office is connected with other office.

Star:- (Point - to - Point)

Advantages:-

- ⇒ Less expensive than mesh-topology.
- ⇒ Each device needs only one link and one I/O port to connect it to any number of others.
- ⇒ Easy to install and reconfigure.
- ⇒ Less cabling is required.
- ⇒ Robustness
- ⇒ Easy fault identification due to point to point connection.
- ⇒ As long as hub is working, it can be used to monitor link problems.

Dis-Advantage:-

- ⇒ Dependency of whole topology on one single point (hub).
- ⇒ If hub goes down, whole system will dead.

Example:-

Used in LAN's

Bus:- (Multi Point)

Dropline → Connection b/w devices and main cable.

Tap → Connector that either splices into main cable

⇒ As signal travel, along backbone, some of its energy transformed into heat. Therefore it becomes weaker and weaker as it travel farther.

For this reason there is a limit on no. of taps. A bus can support and distance b/w tap.

Advantages:-

⇒ Ease of Installation.

⇒ Less cabling than mesh and star. (B/c backbone cable can be laid along most efficient paths, then connected to nodes by droplines of various lengths).

⇒ Only backbone cable stretches through whole facility.

Dis-Advantages:-

⇒ Difficult reconnection and fault isolation.

⇒ Difficult to add new device.

⇒ Signal reflection at taps can cause degradation in quality.

⇒ Fault in bus cable stops all transmission, even b/w devices on same side of problem.

Example:-

- ⇒ Used in design of early LAN's.
- ⇒ Ethernet LAN's.

Ring:- (Point - to - Point)

- ⇒ Signal reaches from one device to device until its destination. Direct signal from one to last can't be send.
- ⇒ Each device has repeater, when device receives a signal intended for other device, its repeater regenerates the bits and passes them along.

Advantages:-

- ⇒ Easy to install and reconfigure.
- ⇒ To add or delete, devices requires changing only two connections.
- ⇒ Fault isolation is simplified.
- ⇒ If one device does not receive a signal within specified period, it can issue an alarm.

Dis-Advantage:-

- ⇒ Uni-Directional traffic is a problem.

Example:-

Ring Topology was prevalent when IBM introduced its LAN Token Ring, the need for higher speed LAN's made this less popular.

OSI Model:-

E All People seems to need Data Processing

① Application (User Interface) (Not familiar with Backend)

= ② Presentation

③ Session

④ Transport (Acknowledgement that data is received)

⑤ Network (Path Selection)

⑥ Data Layer

⑦ Physical - Link

f
→ f

⇒ SMTP (connection oriented) → Email

Logical → 32 bit Physical → 48 bit (IP-Address)

SAP

=

MAC → 48 bit

T

⇒ Collision of Domain Hub = 1

≡

IP Address parts → Node / Network

≡

OSI Model (Open Systems Interconnection):

Layers:-

It means decomposing of problem of building a network into more manageable components (layers).

- Benefits:-
- ① More Modular design
 - ② Easy to Troubleshoot

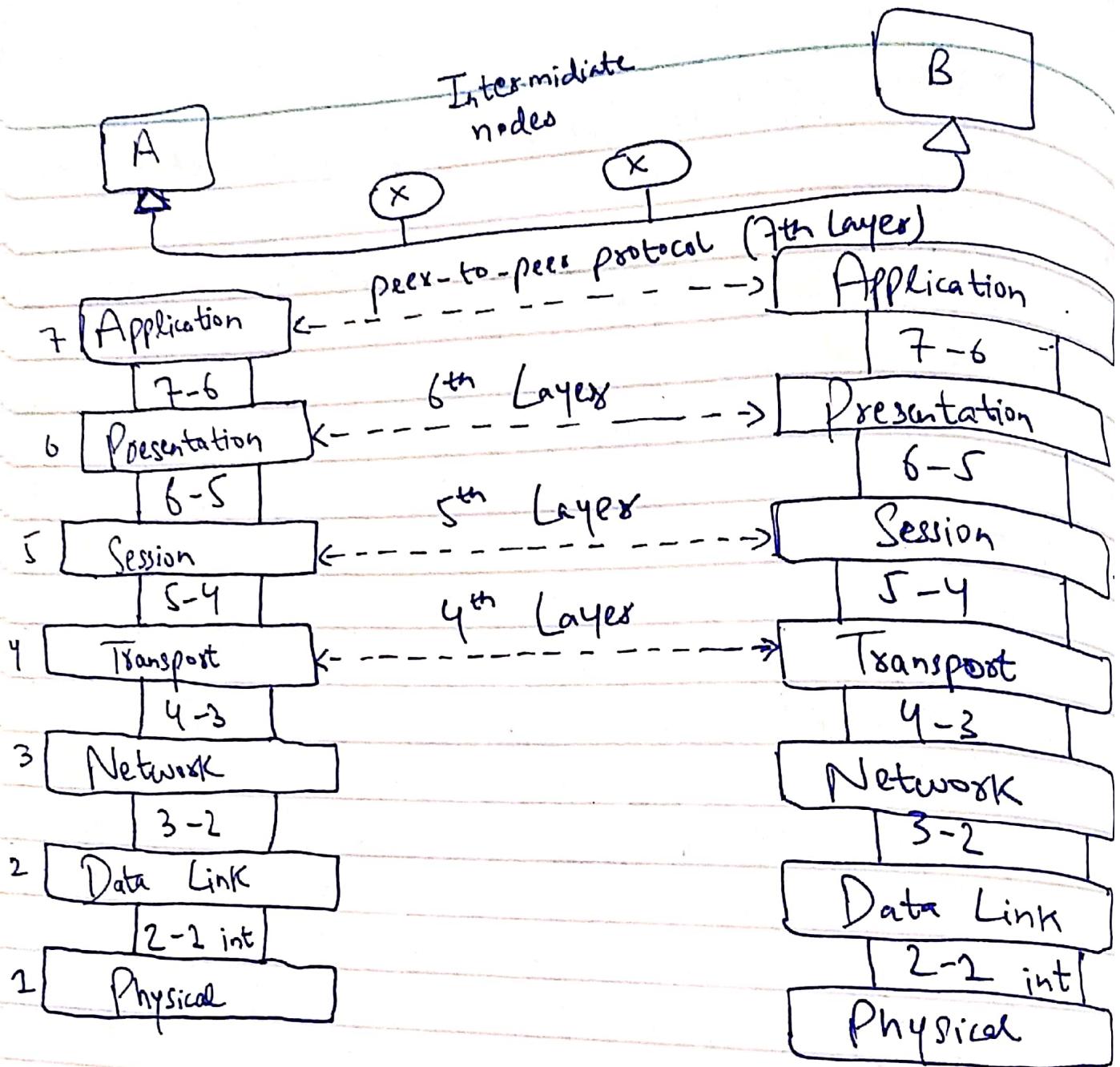
Purpose:-

The purpose of OSI model is to facilitate communication b/w different systems without requiring changes to logic of the underlying hardware and software.

⇒ As message travels from A to B, it may pass through many intermediate nodes. These nodes usually involve only first 3 layers of OSI model i.e.: Physical, Data Link, Network. If someone wants to access application data to be accessed by the routers, he is an attacker or a bad guy.

⇒ The data generated by device or source computer will be from layer seven to layer one. Upon reception of data, the data will be processed from layer one to layer seven.

⇒ There will be interaction b/w adjacent layers i.e. presentation layer is going to interact with application layer



→ If two systems want to communicate with each other, the user at system A is going to generate the data. Data is going to be generated through application layer by open a data generated by application must reach destination computer's (pass through all seven layers of system A and then pass through layers of system B from bottom to top).

Application Layer:-

Resources:-

Services:-

- ① File Transfer and Access Management (FTAM)
- ② Mail Services
- ③ Directory Services.

↓
access of data globally

Presentation Layer:-

It is concerned with syntax and semantics of the information exchanged b/w two systems.
⇒ User Interface

Services:-

- ① Translation (format must be same) (sender or receiver)
- ② Encryption
- ③ Compression (reduced no. of 0's and 1's when sending multimedia)

Session Layer:-

It establishes, maintains and synchronizes the interaction among communication devices.

Services:-

- ① Dialog control
- ② Synchronization

Transport Layer:-

delivery of
is received.

It is responsible for process to process delivery of entire message. Acknowledgement that data

* Whatever data is received from upper layers, it adds source port no. and destination port no. is added in Transport Layer.

Services:-

- ① Point / Port addressing
- ② Segmentation and reassembly
- ③ Connection Control

Connection oriented → Before sending data, connection will be established.

Connection less → Connection will be established and data will be sent.

- ④ End-to-End flow control

⇒ If sender is fast, and receiver is slow, so receiver cannot handle that speed. So, we are in a need to speed matching mechanism. (where will be common speed matching mechanism). So whatever sender sends, receiver is able to receive without any loss.

- ⑤ Error Control

Network Layer:-

It is responsible for delivery of data from original source to the destination network.

Services:-

- ① Logical Addressing

⇒ It means IP addressing. It helps the routers to take decisions, so when a packet is received by this router, it will have source and destination IP address.

⇒ Source IP address and destination IP address is added in network layer.

② Routing

⇒ Finding best route for the packet to be transmitted. Use IP address for finding best route.

Data Link Layer:-

It is responsible for moving data (frames) from one node to another.

Services:-

① Framing

⇒ The data link layer of system A groups the bits of zeros and ones and we call this grouping as a frame.

② Physical Addressing

Every computer is identified with IP, MAC address, and process is identified with help of port numbers. IP address related services are handled by network layer. Port no. → Transport Layer, MAC/physical addressing are done by data link layer.

③ Flow Control } → also in Transport Layer

④ Error Control

⑤ Access Control

→ If two or more devices are connected, it determines which device has control over link at any given time.

⇒ Source MAC address and destination MAC address are added in Data link layer.

Frames are also made in Data link layer.

⇒ Adds header and trailer for MAC address and error.

Physical Layer:-

It is responsible for transmitting bits over a medium. It also provides electrical and mechanical specifications.

⇒ After creation of frames, it is responsibility of this layer to place that frames on channel or medium.

Services:- ① Physical characteristics of medium

⇒ which type of media is used i.e wireless/wire

② Representation of bits

⇒ How zeros and ones converted into signals.

③ Data Rate:

⇒ No. of bits sent each second.

④ Synchronization of bits.

⇒ The clock b/w sender and receiver must synchronize

⑤ Line configuration

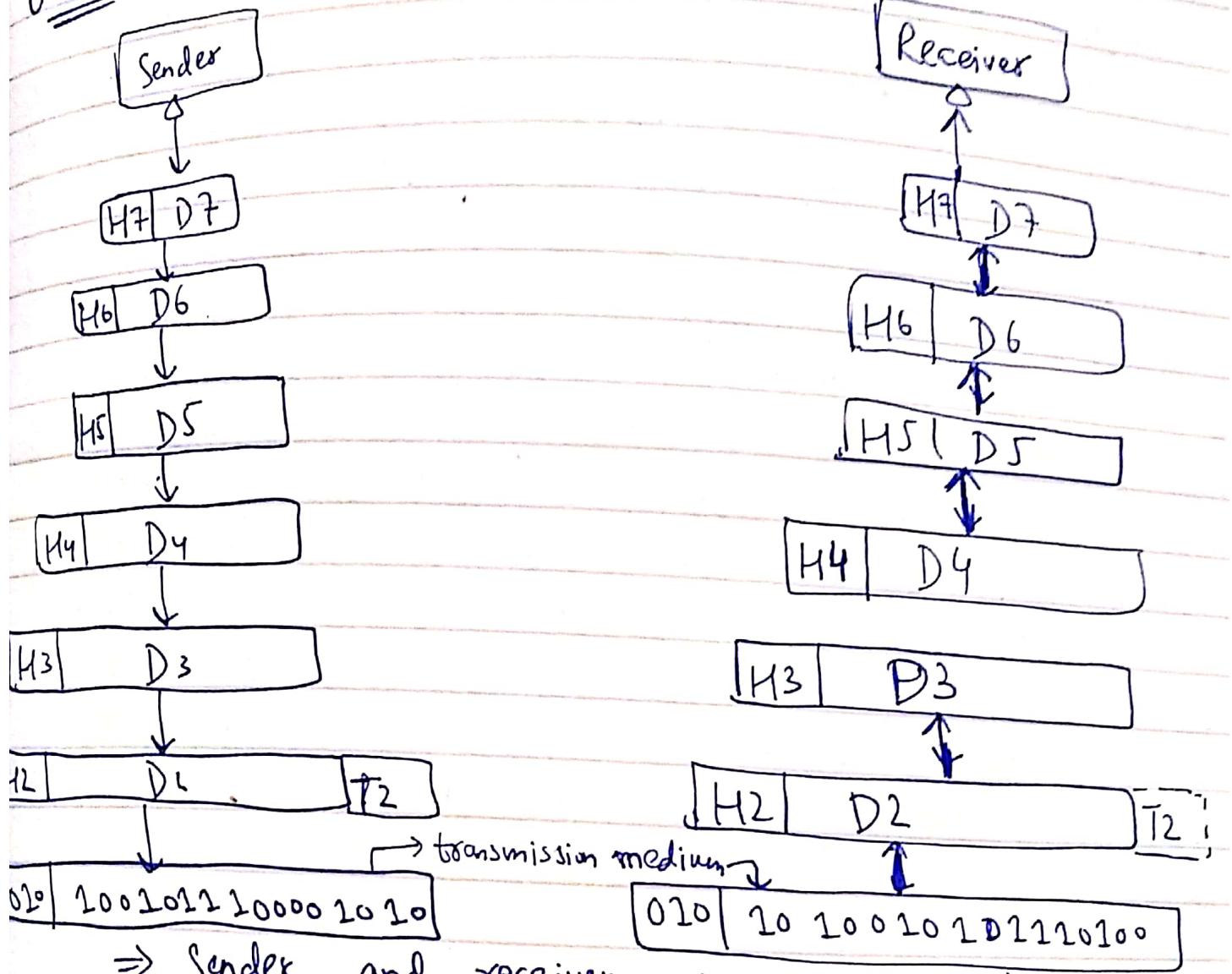
⇒ Determines whether point-to-point or multipoint communication.

⑥ Physical Topology

⇒ How devices are connected to make a network.

⇒ Place the frames on a medium.

Working of OSI:-



⇒ Sender and receiver are connected through a network (Transmission Medium). Data Generated by Application Layer is D7. Some activity is carried out in Application Layer that is H7. Then data is given to presentation Layer, where data is encrypted, compressed or translated and header is added in presentation Layer. → Session Layer (where it establish, synchronizes interaction b/w sender and receiver (Dialog Control)) → Transport Layer (where source port no.

and destination port no. is added) in H4 → network layer (where source IP address and destination IP address is added) in H3 → Data Link layer (where source MAC address and destination MAC address is added) in H2 and error control is also added in trailer part (T2).

Then all data is converted into 0's and 1's in physical layer. It is responsibility of physical layer to take frames which are generated by data link layer and place frames on the transmission medium. And upon the reception, all the data received in form of bits only in receiver side. So physical layer of receiver side receives the data and handed it over to application layers through all various layers.