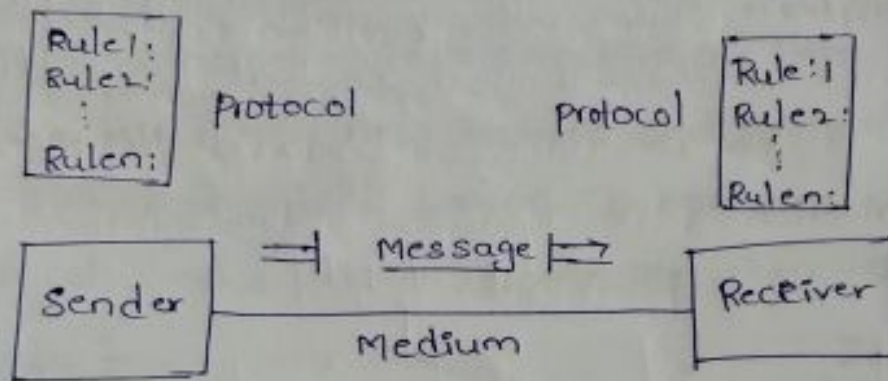


* Computer Network

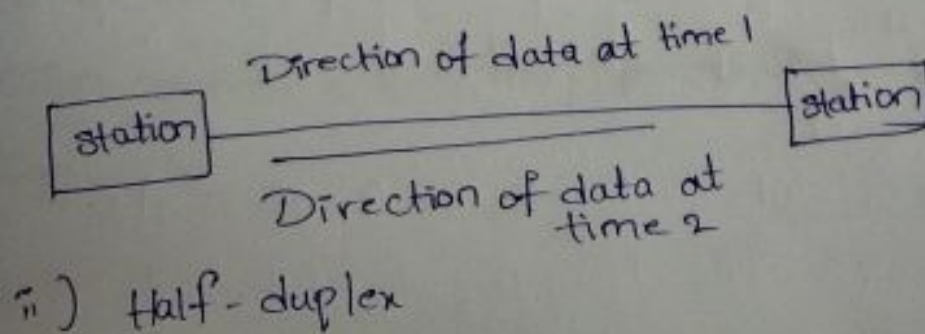
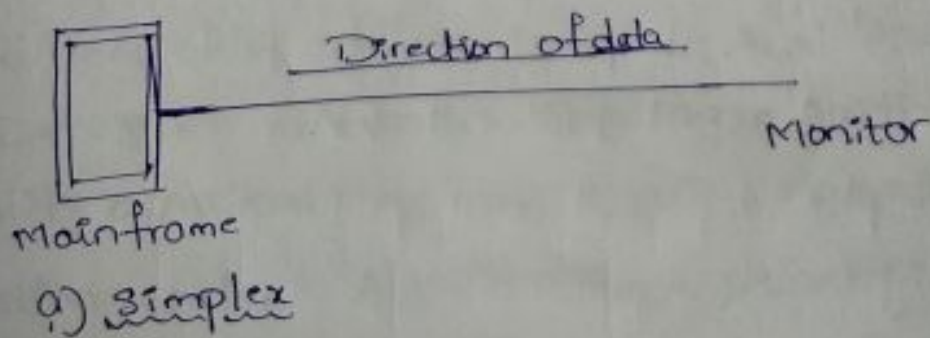
Computer Network is a group of computers that use a set of common communication protocols over digital interconnections for the purpose of sharing resources located on or provided by the network nodes.

* Components :- The data communication system has five components.

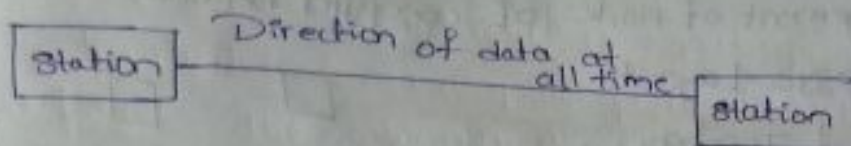


* Data-flow :-

Communication between two devices can be simplex, half duplex, or full-duplex as shown in figure below.



iii) Full-duplex



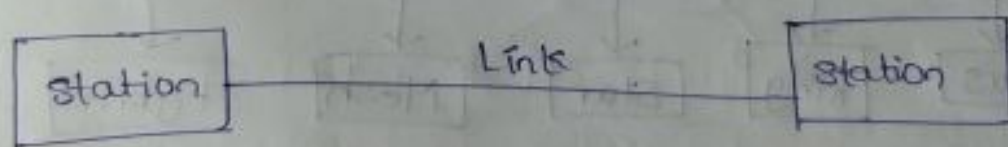
* Network:- A network is a set of devices (often referred to as nodes) connected by communication links.

* A node can be a computer, printer, or any other device capable of sending and/or receiving data generated by other nodes on the network.

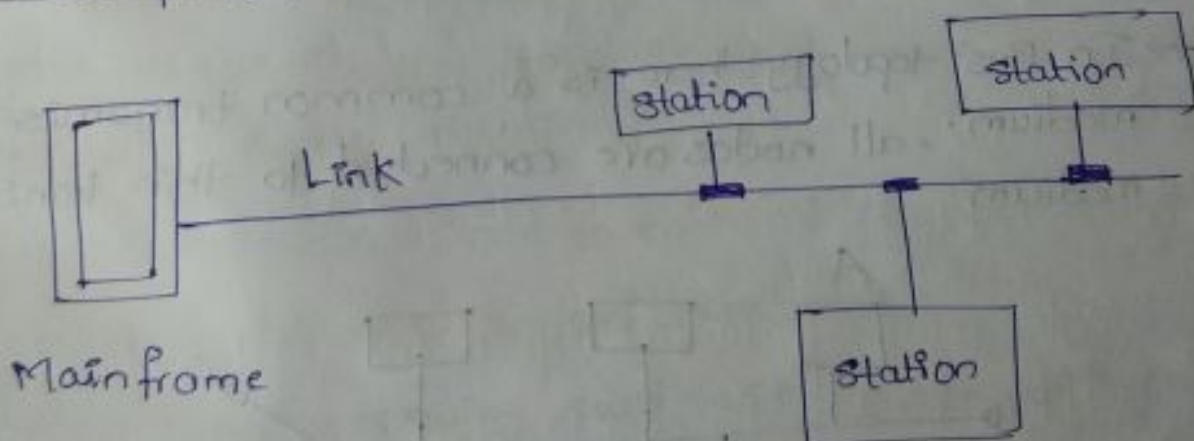
* Types of connections:-

1. point-to-point
2. Multipoint

i) point-to-point



ii) Multipoint:-

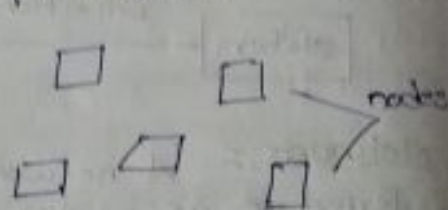


* Topology :-

→ Arrangement of nodes of computer networks.

→ Topology = Layout

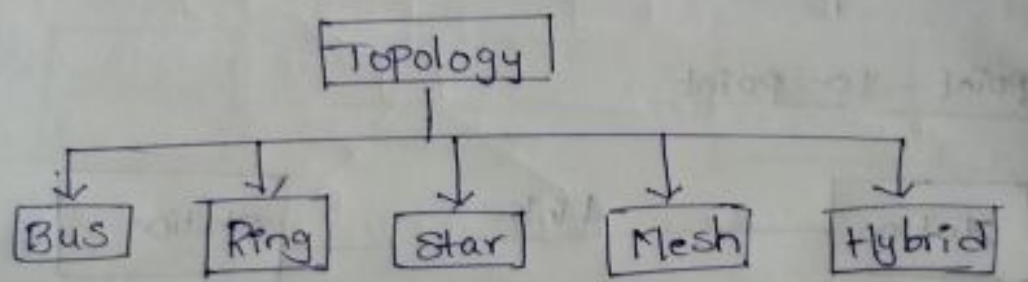
1. physical Topology
2. Logical Topology



* physical topology is defined as the placement of the various nodes.

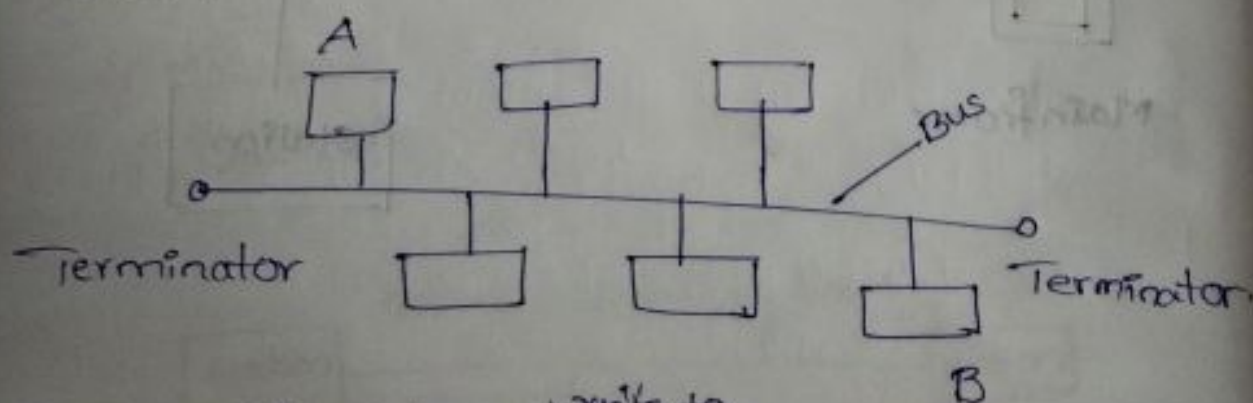
* Logical topology is defined as the . It deals with the data flow in the network.

→ Simply Topology means the arrangement of nodes such away that we have to make communication of among all the nodes.



* Bus Topology :-

→ In Bus topology there is a common transmission medium. all nodes are connected to this transmission medium.



→ Suppose if node A ^{wants to} send a data to B we can send the data to through this transmission

→ All nodes

→ there are

* Advantage

1. Only one
2. Suited
3. Node

* Disadvantage

1. NO fault
2. Limit
3. NO

* Ring

→ A ring

→ peer

are

→ T

→ c

→ s

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* Advantage

1. per
2. c
3. A

→ All nodes in the can receive the signals simultaneously.
→ there data can flow Bidirectional.

* Advantages:-

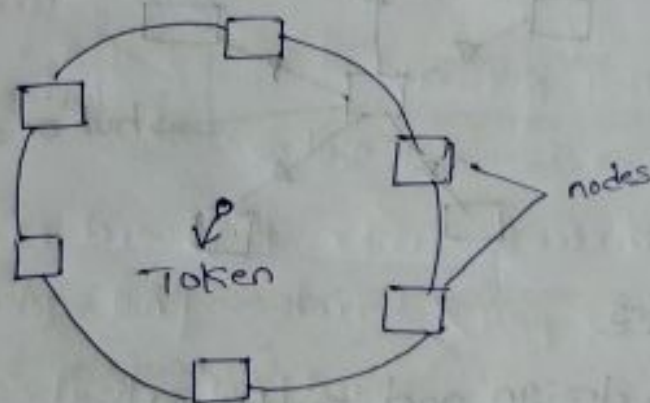
1. Only one wire - Less expensive.
2. Suited for temporary network.
3. Node failure doesn't effect others.

* Disadvantages:-

1. NO fault-tolerant (No redundancy).
2. Limited cable length.
3. NO Security.

* Ring Topology:-

→ A ring topology is a bus topology in a closed loop.



→ peer-to-peer LAN topology that means all nodes are with equal rights.

→ Two connections: one to each of its nearest neighbors.

→ communication is in unidirectional.

→ sending and receiving data takes place with the help of TOKEN.

* Advantages:-

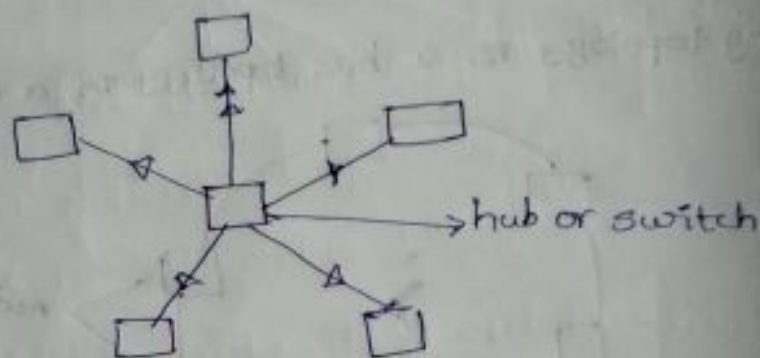
1. performance is better than bus topology.
2. can cause bottleneck due to weak links.
3. All nodes with equal access.

* Disadvantages

1. Unidirectional. single point of failure will affect the whole network.
2. \uparrow in load - \downarrow in performance.
3. No security.

* Star Topology :-

- * Every node is connected to a central node called a hub or switch.
- * Centralized Management.
- * All traffic must pass through the hub or switch.



* Advantages

1. Easy to design and implement.
2. centralized administration.
3. Scalable.

* Disadvantages :-

1. Single point of failure affects the whole network.
2. Bottlenecks due to overloaded switch / hub.
3. Increased cost due to switch / hub.

Extended



* Mesh

* Adv

1. Fault to

2. R

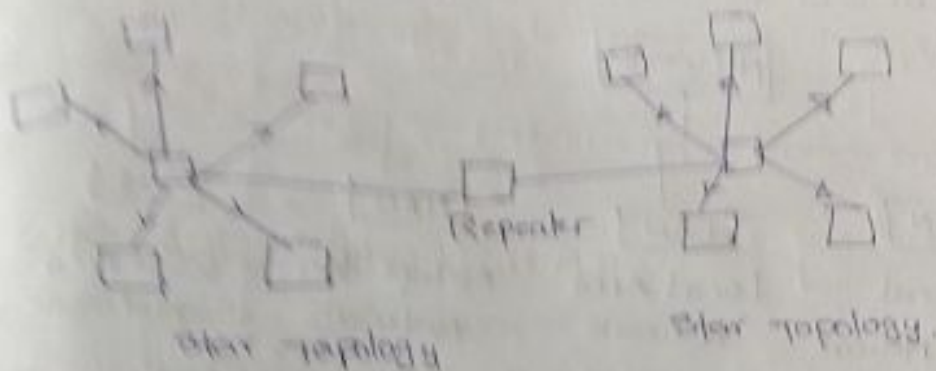
* D

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* Hy

Extended Star Topology



* Mesh Topology:-



* Each node is directly connected to every other nodes in the network.

* Fault tolerant and reliable.

* If one link is fails, it has another ways to reach the destination.

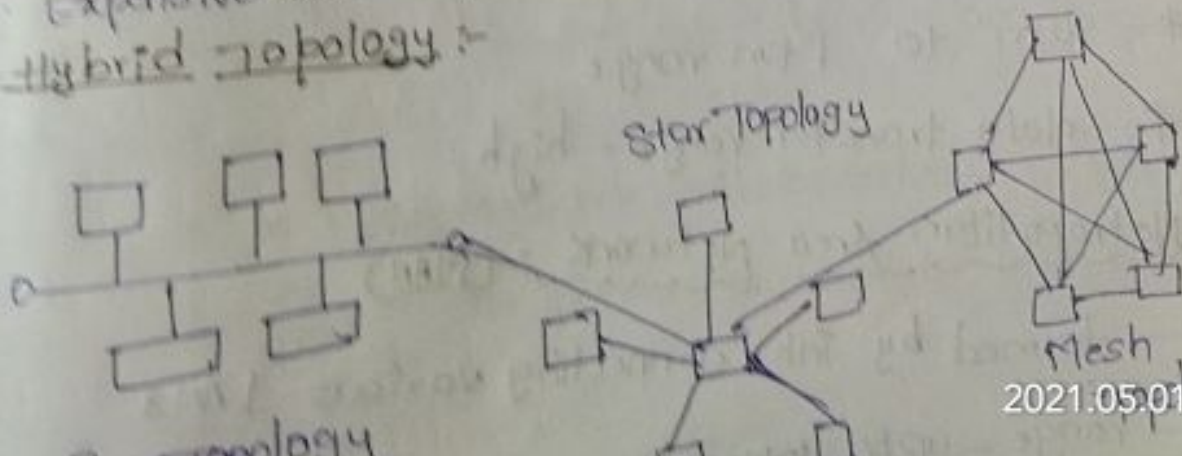
* Advantages:-

1. Fault tolerant (It means a failure is not going to affect the network).
2. Reliable.

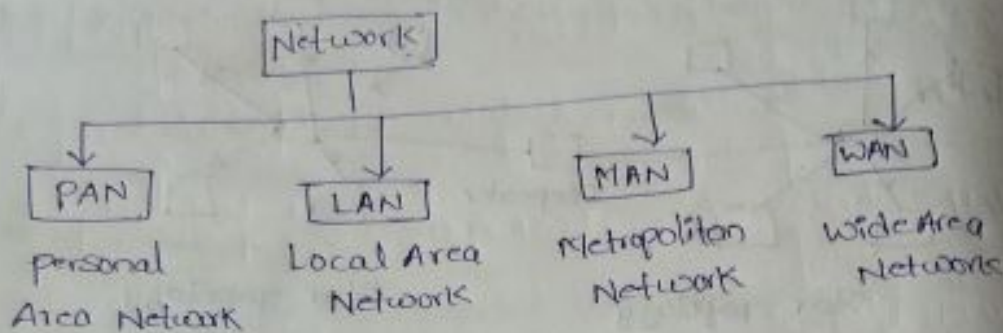
* Disadvantages:-

1. Issues with broadcasting messages.
2. Expensive and impractical for large networks.

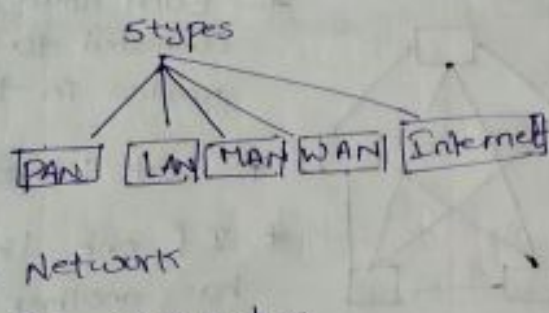
* Hybrid Topology:-



* Types of Network :-



* PAN (personal Area Network) :-



* Smallest Network

* Range is < 10 meters

Eg - Bluetooth, printer, keyboard, mouse.

2 types of PAN $\left\{ \begin{array}{l} \text{wireless PAN - Bluetooth, wifi} \\ \text{wired PAN - keyboard, mouse} \end{array} \right.$

* LAN (Local Area Network)

* Group of computers connected to each other in a small area.

* 10 m to 1 km range.

* data transfer range - high.

* Metropolitan Area Network :- (MAN)

* Formed by interconnecting various LANs

* range - up to 10 km 100 km.

* Wide Area Network

* Huge geographical

* provide connect

* range - upto

* InterNetwork (Internet)

* Networks of

* Largest Net

* can share

* Reference Model

In computer netw

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* Wide Area Network (WAN) :-

- * large geographical area
- * provide connectivity to many LANs
- * range - upto 1000 kms

* InterNetwork (Internet) :-

- * Networks of Networks
- * Largest Network - connects all WANs
- * can share enormous information world wide

* Reference Model :-

In computer networks, reference models give a conceptual framework that standardizes communication between heterogeneous networks.

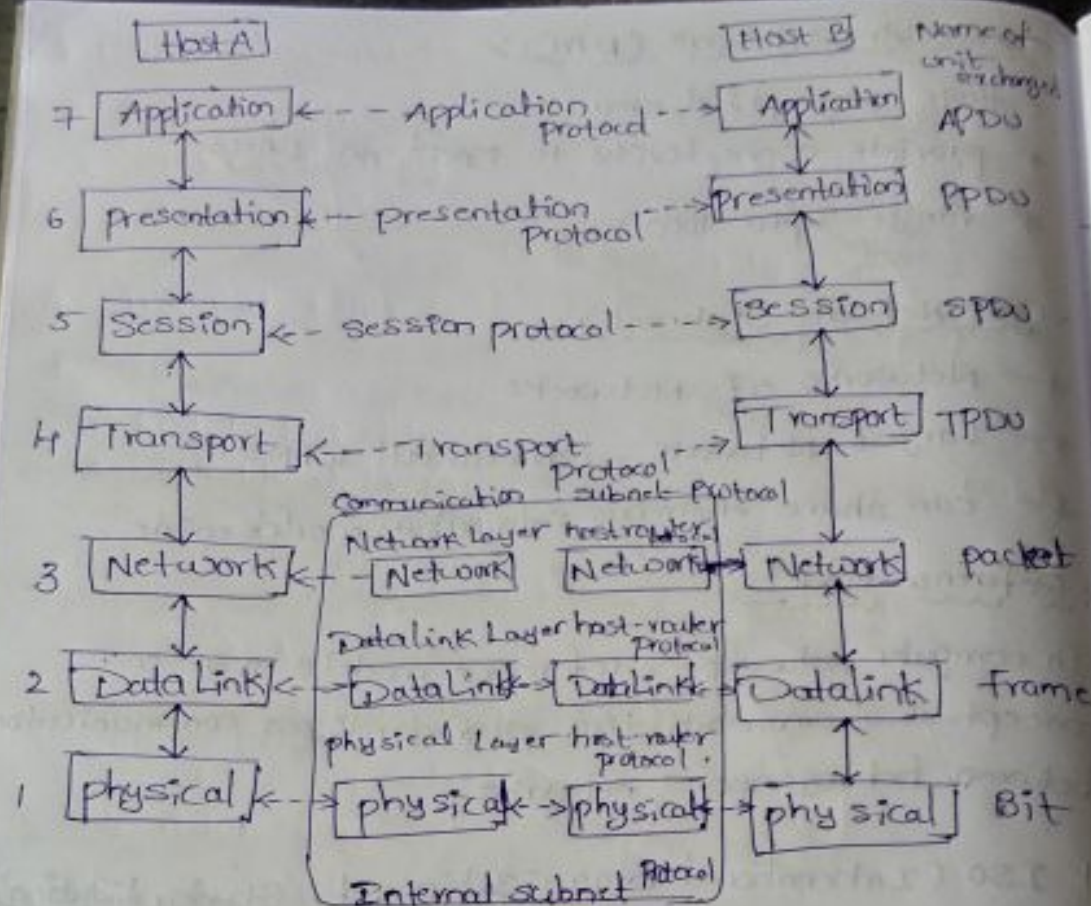
1. ISO (International Organization of Standardization)
2. OSI (Open System Interconnection)

* OSI Reference Model :-

- * OSI stands for open systems interconnection. It has been developed by ISO (International Organization of Standardization).

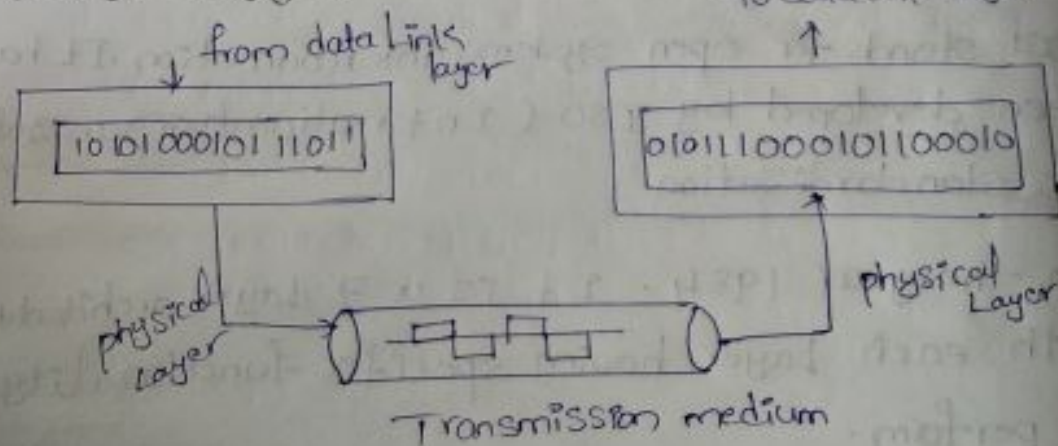
* In the year 1984. It is a 7 Layer architecture with each layer having specific functionality to perform.

* All these 7 layers work collaboratively to transmit the data from one person to another across the globe.



OSI Model

1. Physical Layer :-



* Functions of physical Layer :-

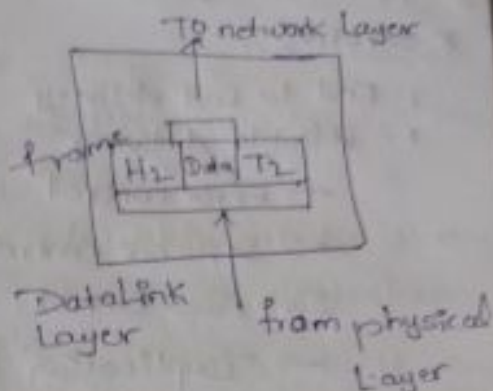
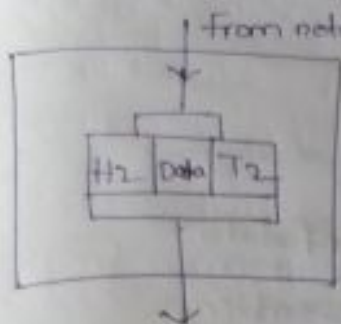
- 1) Bit Synchronization
- 2) Bit rate control
- 3) physical Topology

ii) Transmission mode

→ Responsible for the actual physical connection between devices. (Whether the connection is wire (or) wireless)

Data Link Layer :-

* The data is represented in the form of frames



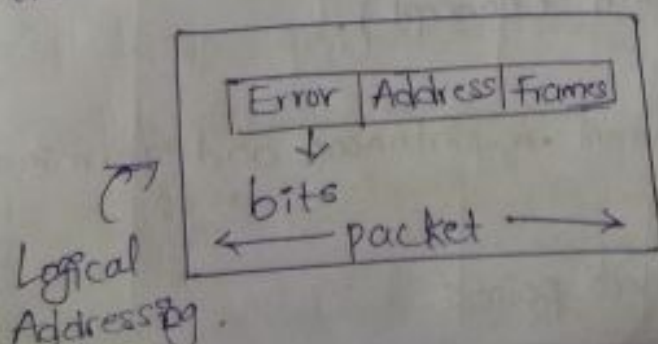
* Functionalities :-

- i) Framing
- ii) physical addressing
- iii) Error control
- iv) Flow control
- v) Access control

* This Layer is used to detect the errors while the data is sending from source to destination.

3) Network Layer :-

* Here the data is in the form of packets.



Logical Addressing.

* Functionalities :-

1. Logical Addressing
2. Inter networking
3. Fragmentation

4. Transport Layer :-

* Services :-

1. End to End delivery
2. Reliable delivery

→ Error control

→ Sequence control

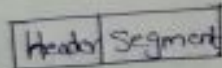
→ Loss control

→ Duplication control

3. Flow of control

4. Addressing

* Here the data is represented as segments.



* We have two types. They are

1. connection oriented

→ connection establishment

→ Data Transfer

→ connection Termination

→ Acknowledgement

2. connection Loss

→ Data Transfer

5. Session Layer :-

→ Based on time limit (Concept).

* Services :-

1. Session establishment, maintenance and Termination

2. Synchronization

* Creating check points

* Services

1. Guaranteed delivery

2. Inorder packets

3. Guaranteed Maths 24hr

4. Security

* E1 :- 100 p

3) Dialog Co

→ All

6. Presentation

* Service :-

i) Trans

ii) Enc

iii) Ser

7. Application

* TCP/IP

* Impleme

* 4 Layer

*

* TCP

1. Host -

* Used

* Da

2. Intr

* IS - 100 pages of data

checkpoint = 20 pages

If error in transmitting 60 pages

61-page

3) Dialog Control

→ Allow two systems to start communicating.

6. Presentation Layer :-

* services :-

i) Translation - ASCII - EBCDIC

ii) Encryption / Decryption → secure

iii) Sender → Data → encrypted - cipher text
Receiver → cipher → Decrypted → plain text

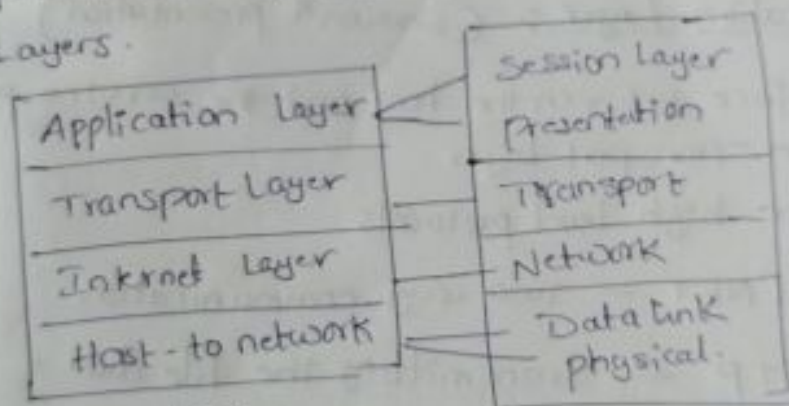
7. Application Layer :-

* TCP/IP Model :- (implementation model)

* Implementation of OSI model

* 4 Layers.

*



TCP/IP

OSI

* TCP - Transmission control protocol.

1. Host-to-control network-layer :-

* Used for physical transmission of data.

* Define a protocol to connect to host.

2. Internet Layer (Network Layer) :-

* Main protocol - IP (Internet protocol)

* Responsible to transmit packets independently.

* packets may not be received in the order they have sent

* Functions :-

- i) packets Delivery
- ii) Routing
- iii) congestion control.

3. Transport Layer :-

- Segmenting, splitting of data.
- Decides to send the data either in single path or multiple/parallel path.
- Break the data into small units which are handled effectively by this layer.
- Header information added.
- Transmission error-free end-to-end delivery of segments.

4. Application Layer :- (Session & presentation)

* Interface between the host and the services provided by the Transport Layer.

* Includes high-level protocols.

→ TELNET — Two way communication

→ FTP — Transmitting the file data.

→ SMTP — Transport Electronic mail

→ DNS — Resolves IP address to Textual

* Protocol stack :-

Application	TELNET	FTP	SMTP	DNS
Transport	TCP		UDP	
Internet	IP			
Host to network	Ethernet	Frame Relay	Token Ring	