

Computer Network -

A computer network is a set of electronic devices sharing resources located in the network. A computer uses common communication protocols over a digital connection to communicate with each other.

History of Computer

① ARPANET - (Advanced Research Project Agency Network)

- Established by the US department of defence (DOD).
- The work started in 1960's.
- 4 nodes at University of California at Los Angeles, University of Utah, University of California at Santa Barbara, Stanford Research Institute.
- On October 1969, the first message was exchanged.

② TELENET -

- Telenet was first commercial adaptation of ARPANET.
- Concept of ISP (Internet service Provider) was developed.
- The main function of ISP was to provide uninterrupted internet connection to the customer and at affordable range.

③ Internet -

Switch **Server**

Routers

Hubs

Firewall

Pc

Database

~~imp~~ Network Topologies

A network topology is an arrangement or a layout of ~~tie~~ links and nodes, under computer network. They are classified as logical and physical topologies.

Types of Topology

① Bus Topology

⑤ Mesh Topology

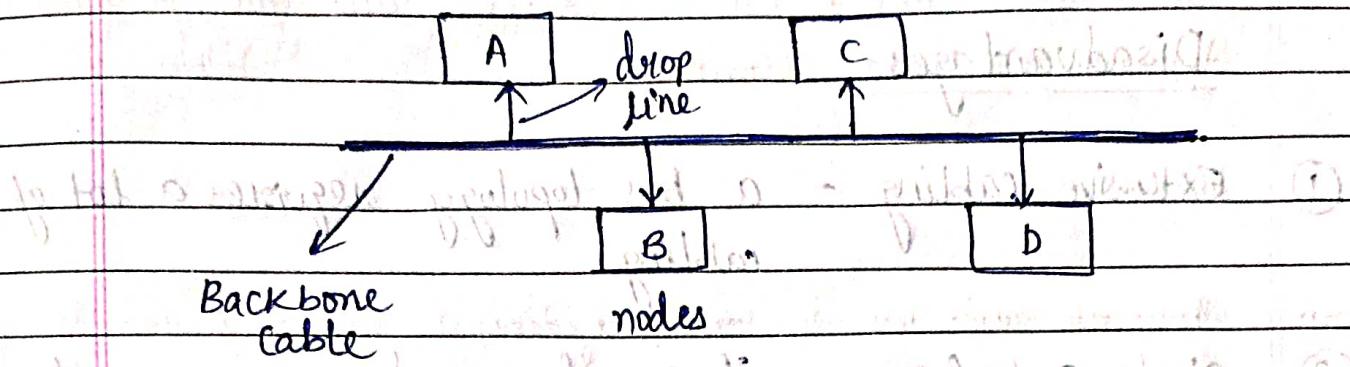
② Ring Topology

⑥ Hybrid Topology

③ Star Topology

④ Tree Topology

① BUS TOPOLOGY



A bus topology is designed in such a way that all the stations are connected to a single cable known as the backbone cable.

The configuration of a bus topology is quite simpler as compared to ~~another~~ topology.

Advantages -

- 1) low cost cable - nodes are directly connected to the backbone cable without passing through a hub. so, initial cost of installation is low.
- 2) Bus topology is a familiar technology as the installation and trouble shooting techniques are well known. Hardware components are easily available.

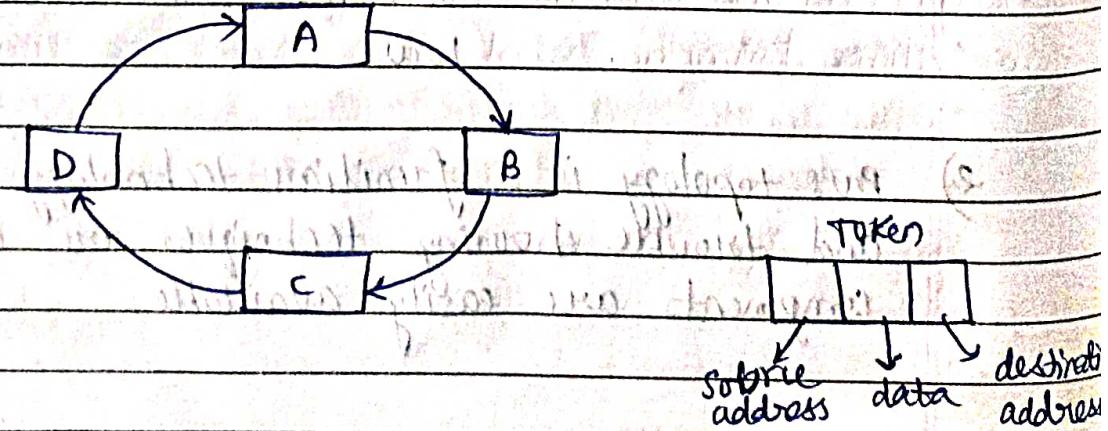
- ③ A failure in one node will not affect other nodes.

Disadvantages -

- ① Extensive cabling - a bus topology requires a lot of cabling.
- ② Single Interface - if 2 nodes send a message at a time then the signals of both the nodes collide with each other.
- ③ Re-configuration is difficult.
- ④ If the backbone cable fails, the entire network fails.

②

Ring Topology



Ring topology is like the bus topology but with the connector end.

The flow of data is only in one direction.

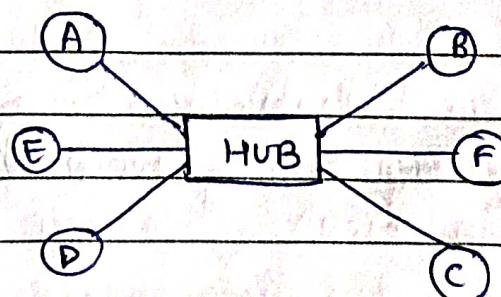
Advantages -

- 1) Since the data flow is only in one direction, the chance of collision is reduced. A network server is not required.
- 2) Devices can be added without affecting the performance.
- 3) Easy to identify the failure point.

Disadvantages -

- 1) If one device fails, the entire network fails.
- 2) Costly than bus topology.

Star Topology -



Star topology is an arrangement of the network in which every node is connected to the central hub. The central hub is called server, and the peripheral devices are called clients.

Advantages -

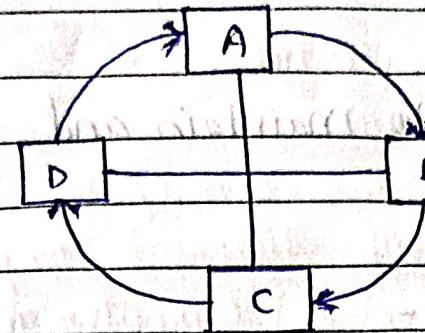
- 1) Troubleshooting is quite efficient as compared to bus topology.
- 2) All the stations are connected to the centralized network.
- 3) As all the stations are connected to the central hub, therefore, failure in one station will not affect the other stations.
- 4) It is easily expandable.

Disadvantages -

- 1) If the central hub goes down, all the connected nodes will not be able to communicate with each other.

④

Mesh topology -



mesh topology is an arrangement of network in which all the computers are interconnected through various connections.

There are multiple paths from one computer to another.

It does not contain any hubs which acts as central point.

It is mainly used for wireless network.

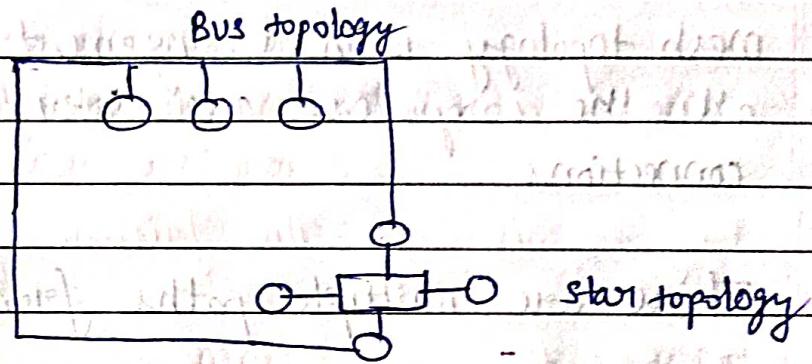
Advantages -

- ① mesh topology is very reliable as any link breakdown will not affect the communication between the connected computers.
- ② Communication is very fast between the nodes.
- ③ Adding new devices will not affect the communication with other devices.

Disadvantages -

- 1) It is expensive.
- 2) It is difficult to maintain and manage.

⑤ Hybrid Topology -



It is a combination of various different types of topologies.

Advantages -

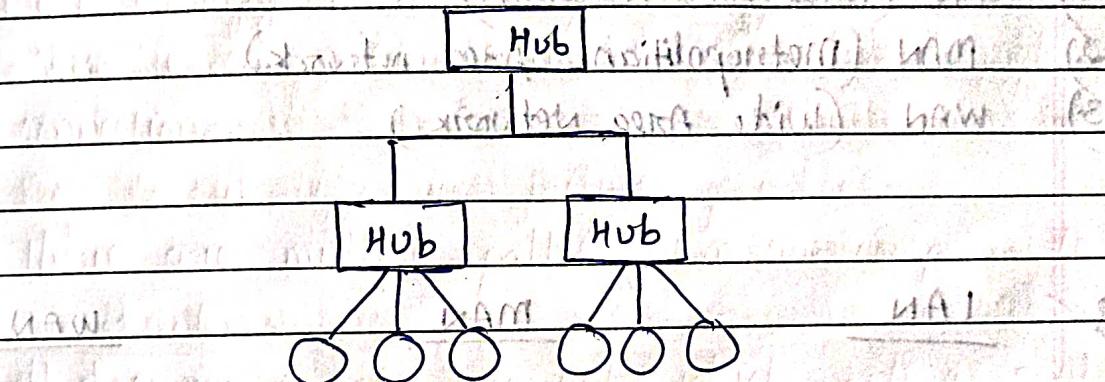
- 1) If a fault occurs in any part of the network, it will not affect the rest of the network.
- 2) The size of the network can be easily expanded without affecting the functionality of existing network.

3) very flexible.

Disadvantages -

- 1) complex design.
- 2) costly.

Tree Topology -



~~imf~~ Types of Computer Network AreaLANMANWAN

The network allows a computer to connect and communicate with different computers. There are basically 3 types of computer networks -

- 1.) LAN (Local Area Network)
- 2.) MAN (Metropolitan Area network)
- 3.) WAN (Wide Area Network)

LANMANWAN

1) A local area network is a network that links a small group of computers in a certain geographical region.

A metropolitan Area network is a network that spans in a area such as towns and cities.

A wide Area network has an ability to link the number of countries and continents.

2.) The speed of LAN is high. The speed of MAN is average. The speed of WAN is low.

3.) The ownership of LAN is private.

The ownership of MAN can be private or public.

The ownership of WAN can be private or public.

- 4) It is used in school, colleges, hospitals etc. It is used for small town. It is used for countries & continents.
- 5) It is easier and less expensive, to design and maintain. It is more difficult to design and maintain than LAN. It is more difficult to design and maintain than LAN and MAN.

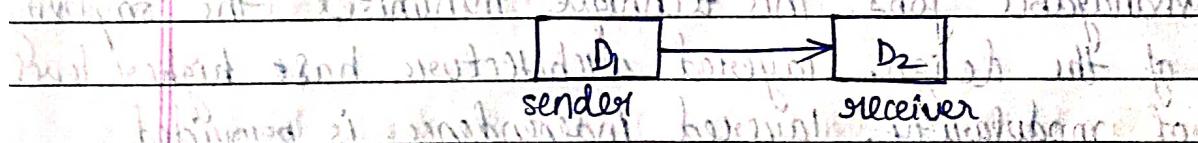
Transmission Mode

(Data flow).

The transmission mode means transferring the data between the devices. There are 3 types of modes -

- 1) simplex
- 2) ~~Half~~ Half Duplex
- 3) Full Duplex

1.) Simplex - at a time one activity is going on side.



In a simplex mode, the communication is in unidirection. In a simplex mode, only one of the two devices can transmit and other can only receive. One fast at once is the example of Television, keyboard.

of Television, keyboard

2) Half Duplex

In a half duplex mode, each station can transmit and receive but not at the same time. When a device is sending, the other can only receive and vice-versa.

e.g. walky-talky.

3) Full-Duplex

Both the stations can transmit and receive at the same time.

e.g. internet

Q. What is the need for layered architecture?

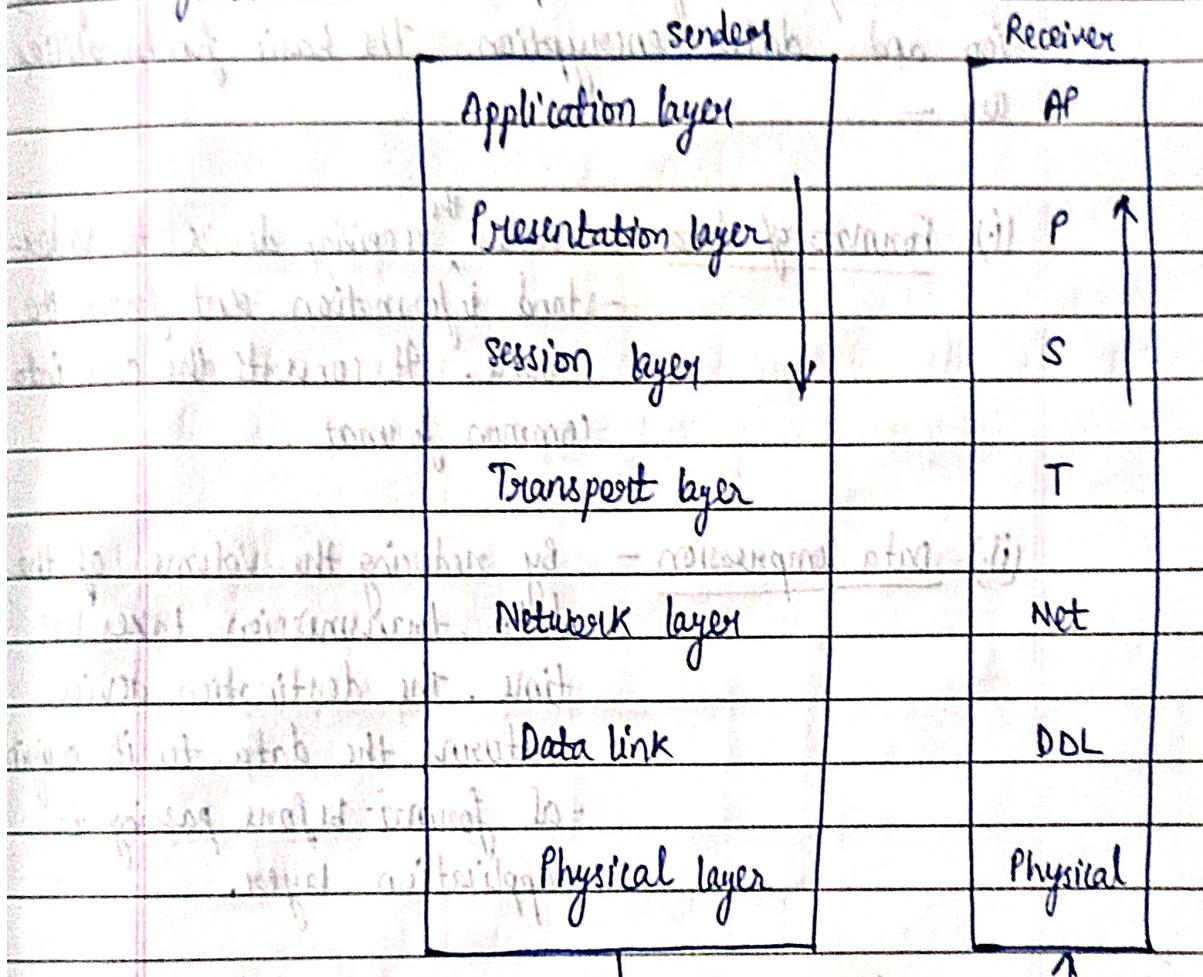
Ans. This technique divides unmanageable task into tiny and manageable jobs. This technique minimises the complexity of the design. Layered architecture have higher level of modularity. Layered independence is provided making it easier to apply allowing changes to one layer implementation have no effect on other level. It is easy to test and study.



Unit 1

OSI Reference Model (Part 1)

open system interconnection - it describes the universal standard of communication over a network. There are basically 7 layers. Each layer provides different functions and services.



Application layer

It is the highest layer of OSI model. It provides services directly to the user. It provides an interface between a user and the network. Basic functionality are -

electronic mail, electronic messaging, browsing the www etc.

2) Presentation layer - It converts the information into understandable form.

It is responsible for data translation, data compression and data encryption. The basic functionalities are -

(i) Format of data - enables the receiving device to understand information sent from the source. It converts the data into common format.

(ii) Data compression - By reducing the volume of the data, transmission takes less time. The destination device returns the data to its original format before passing to application layer.

(iii) Data Encryption - It allows the data to be converted to a form in which it hides its meaning.



3) session layer

The session layer is responsible for establishing, maintaining and terminating a connection. The basic functionalities are —

- (i) Synchronisation of data flow.
- (ii) Dialogue controlling. (Transmission mode)

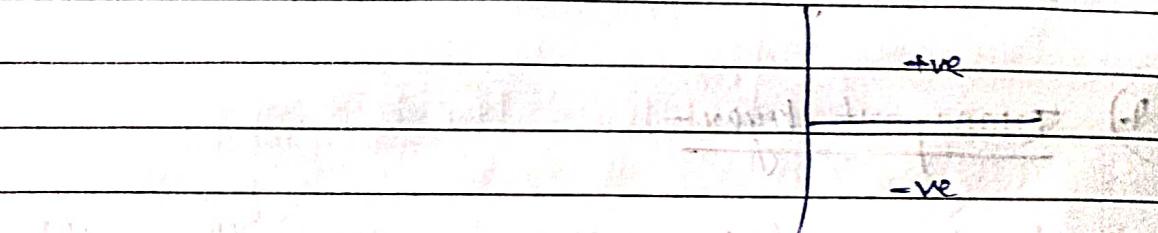
4.) Transport layer-

The transport layer

digital to digital encoding

obtains digital signal 1011 → binary | 1 | 0 | 1 | 1 | → digital signal 1011

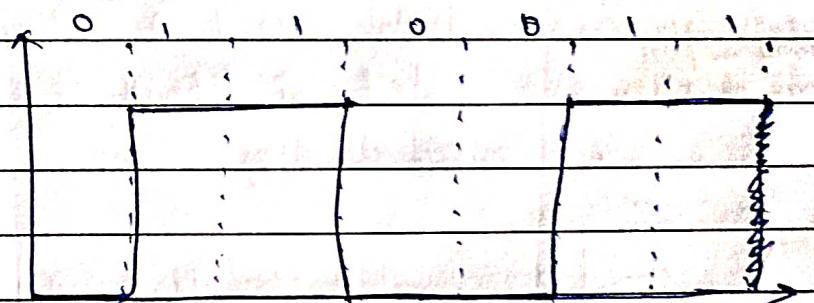
- Unipolar → either only positive or only negative
- Bipolar → both positive, negative
- Eiphase



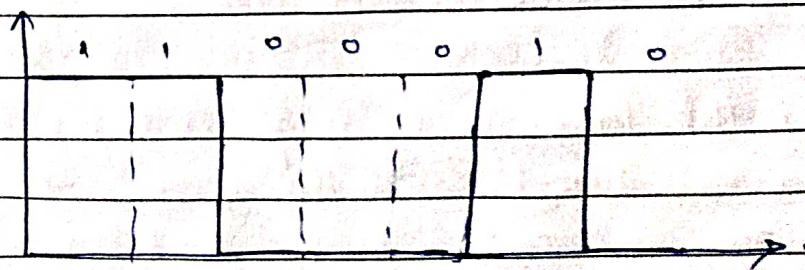
Unipolar -

eg.) 0 1 1 0 0 1 1

0 → low
1 → high



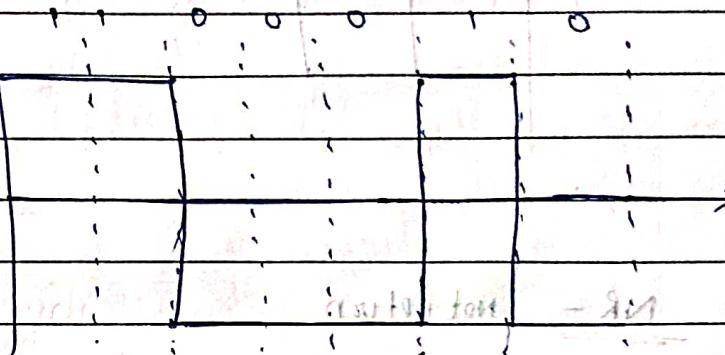
2.) 11 0 0 0 1 0



Bipolar → NRZ-L (non-return zero level)
 → NRZ-I (" - inversion)
 → NR

~~eg~~ 11 000 10 (NRZ-L)

1 → +ve
 0 → -ve

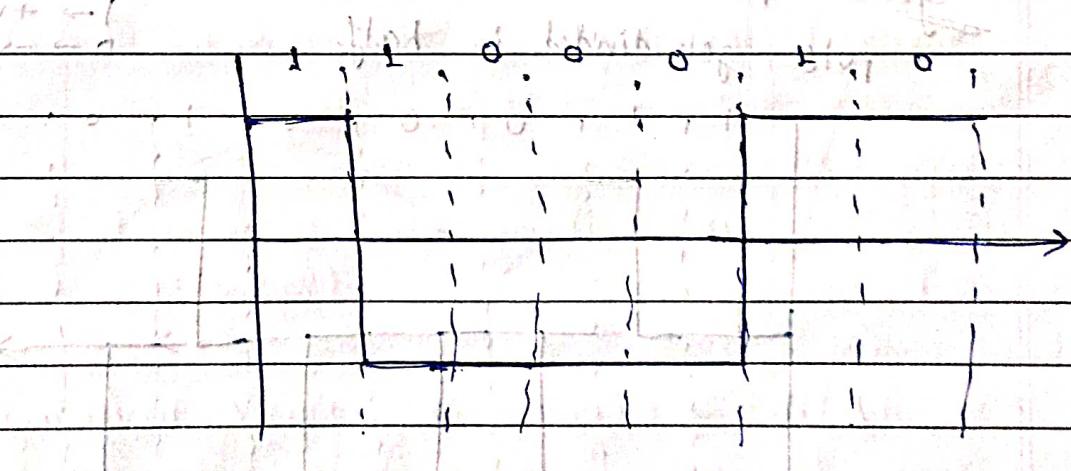


(NRZ-I)

nextbit 0 → no inversion

nextbit 1 → inversion

11 000 10

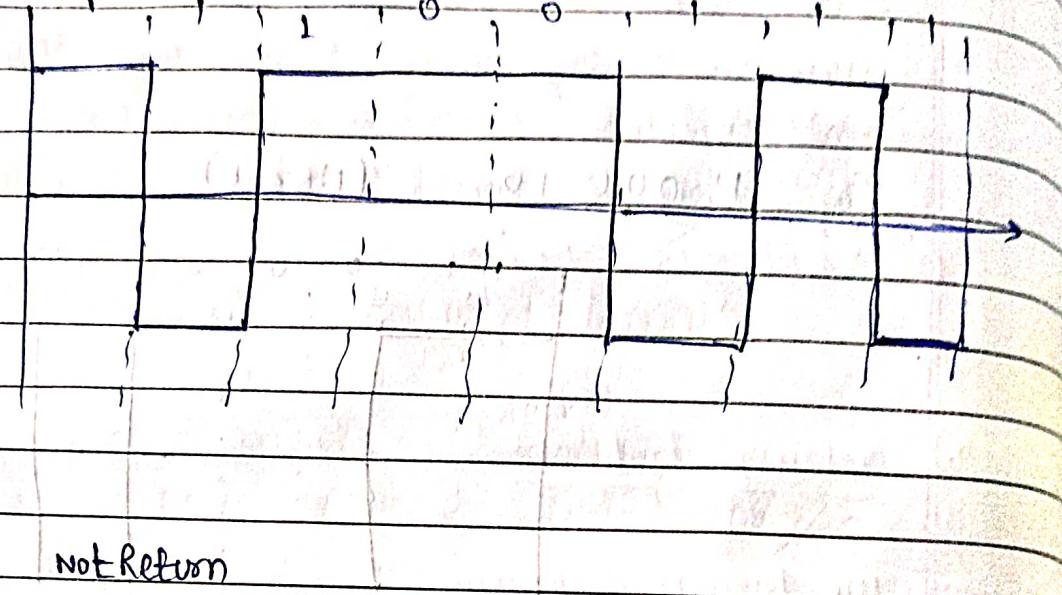


eg. NRZ-T

11100111

1 → +ve

0 → -ve



NR - Not Return

1 → all positive

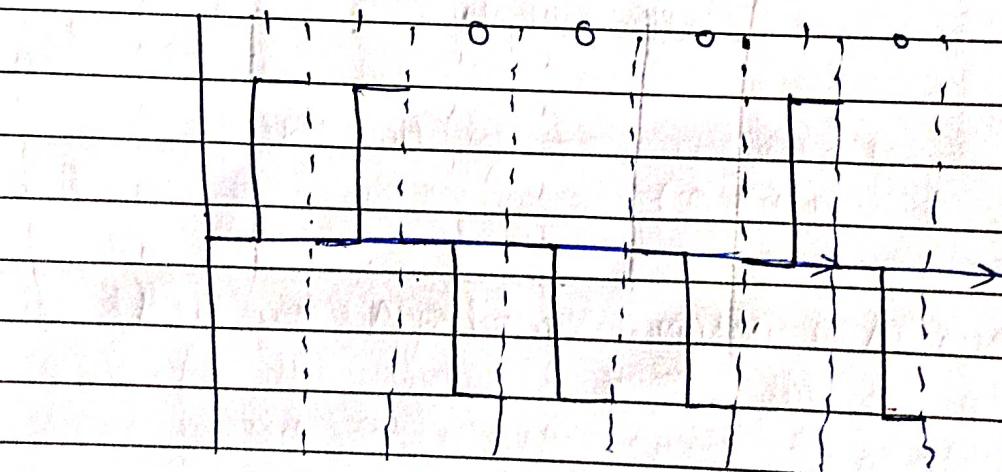
0 → all negative

eg.

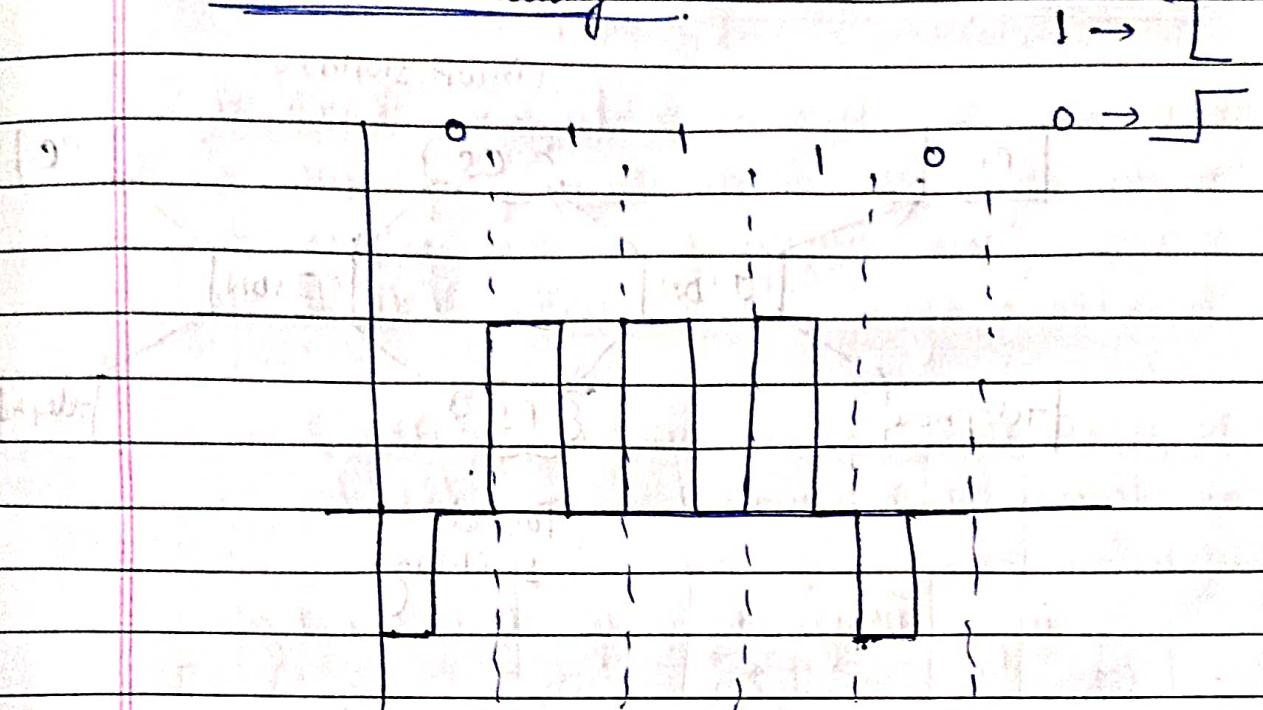
110010

pulse gets divided in half.

1 → +ve
0 → -ve

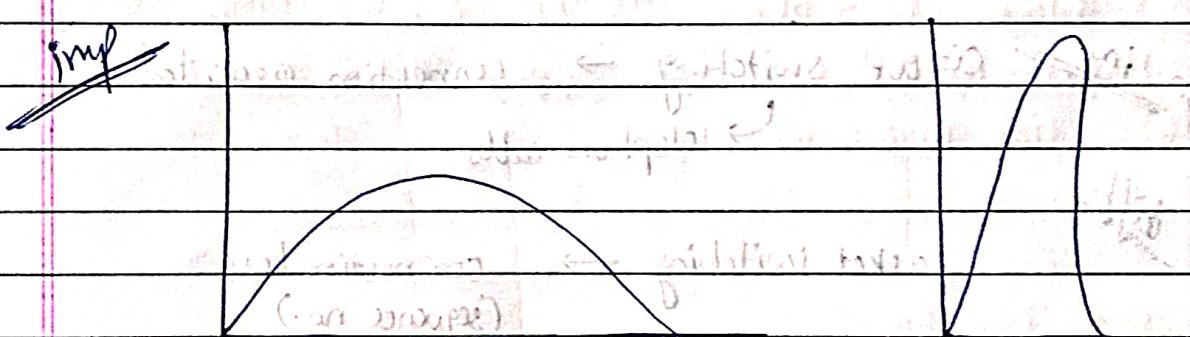


Manchester Encoding



and digital utilization (utilization of bandwidth) after Manchester encoding is 100% (utilization with respect to the bandwidth).

so, Manchester encoding is used in LAN.



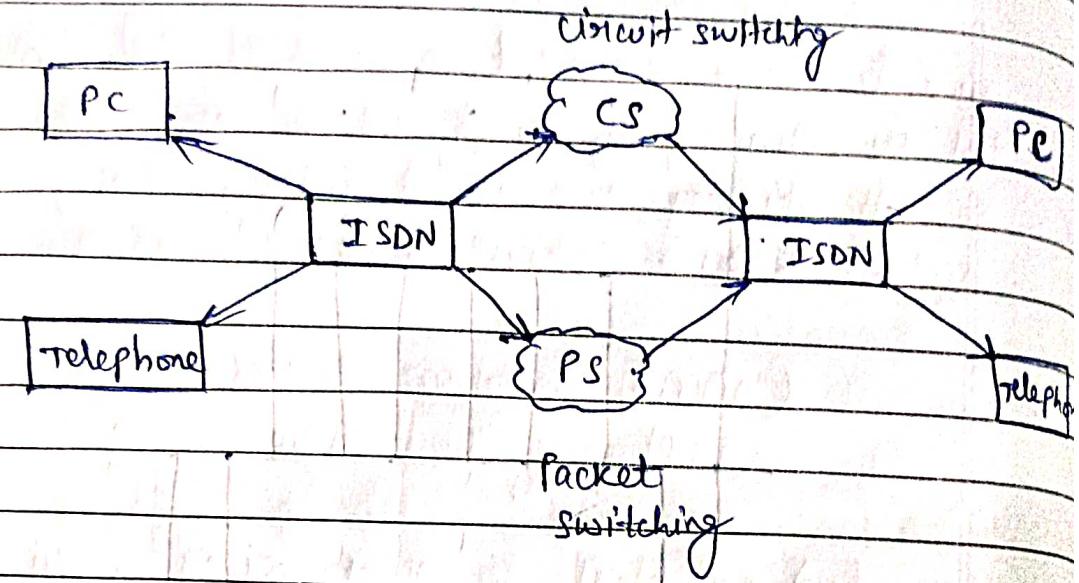
After standardization, narrowband is used in LAN.

Broadband

I SDN → Integrated service Digital Network

Widely used in LAN

T ISDN -



~~diff~~ connection oriented — first establish connection
 connectionless — no connection establishment

~~communication mode~~ ~~imp~~ Circuit switching → connection oriented
 diff. → telephone calls.

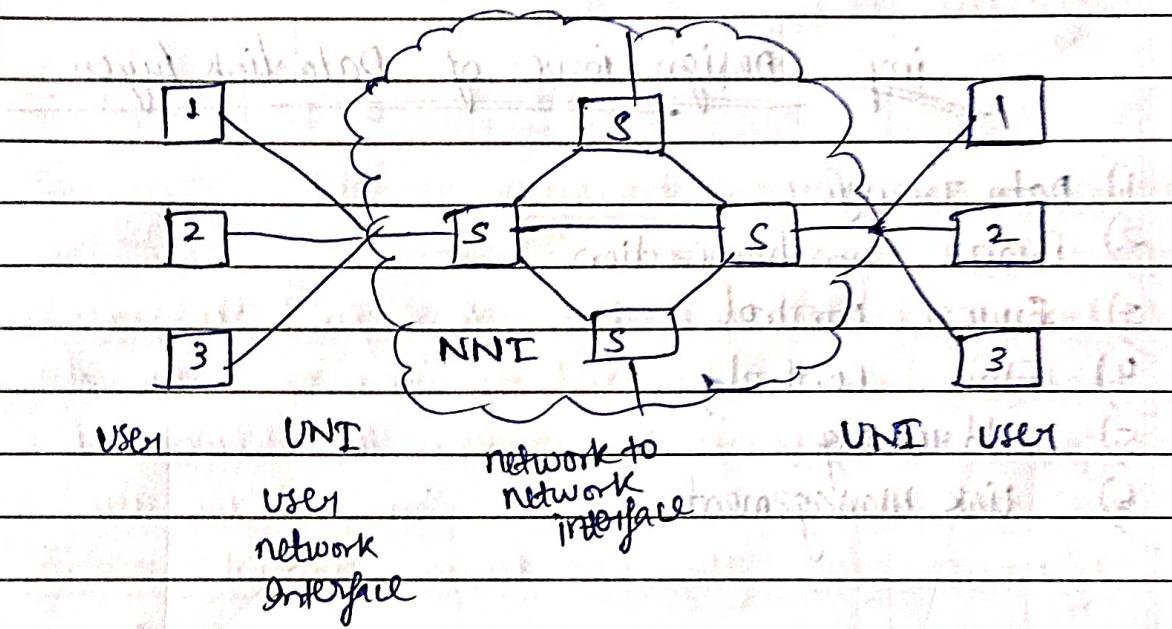
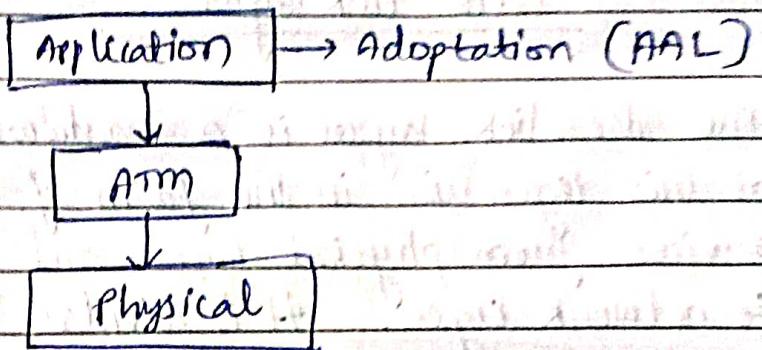
packet switching → connectionless
 (sequence no.)

ATM → Asynchronous transmission/transfer mode

size 53 bytes → ^{header} 5 + 48 → payload.

uses concept of both CS & PS.

→ no. of cells / count of cells vary



functionality of ATM network is much difficult than other
but ATM provides better bandwidth allocation & better performance
and from interconnection with other networks can be done
with more compatibility with other standard protocols like TCP/IP
and IPX/SPX. ATM is also good for real time traffic
and ATM is also good for video conferencing.
but it is very expensive.