OSI reference model.

OSI stands for open System interConnection. It is a seven layer reference model. We have n number of users connected to computer network. In other to make the system compatible to communicate with each other, international standard organization (ISO) has develop a standard reference model called OSI which is a seven layer architecture. The design principle of OSI reference model are as follows:

1) where different abstractions are needed, a layer has to be created
2) Each layer should perform a well define Function
3) Function of layer should be of international standard
4) The model should be chosen to minimize the information flow across the interface
5) The no. of layer should not be large or too small

Key element of protocols.

1) syntax (2) semantics (3) timing

1) syntax < structure or format of data
indicate how to read the bits.

2) Semantics: The rules they pass thing protocol < interprets meanings of the bits
knows which fields define what actions.

3) Timing: < when data should be sent and what data to be sent.
speed

Stadards -

Standard provide guidelines for manufacturers, vendors, or government agencies and other service providers to ensure the kind of interconnectivity necessary in today's market - DTake and IO International communicat

Standard is n
rules.

Categonas
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2) De jure
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Features of OSI

1) Big pictures of communicatn over network is understandable through this OSI model
2) How hardware and software work together
3) To understand new technologies
4) Trouble shooting is easier
5) It can be used to compare basic functnl relationships on different network

OSI model / layer structure

→ → → <<< >>>

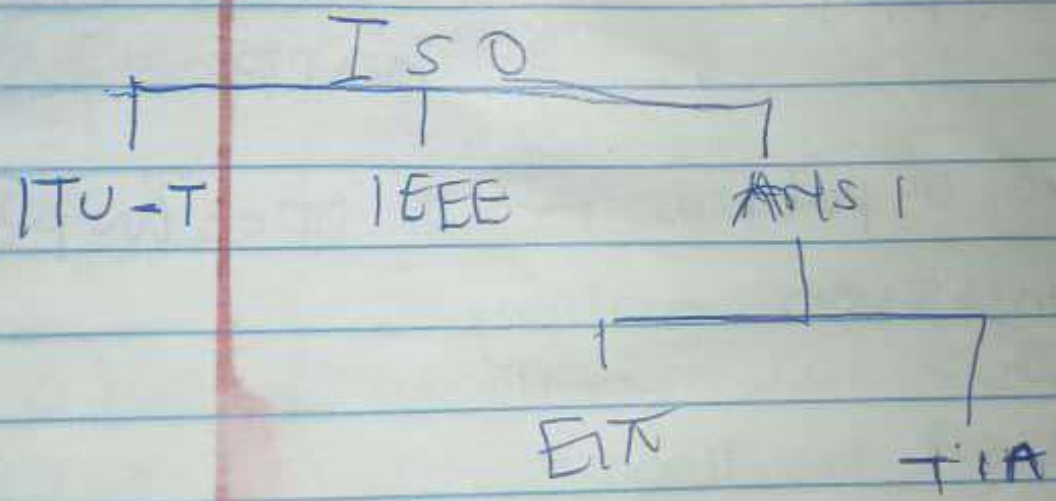
Protocols and standards

A protocol consist of set of rules that govern data communicatn. It determines: (1) what is communicated
2) How it is communicated
3) When it is communicated

Standard is nothing but agreed upon rules.

Categories of standard

1) De facto - By convention or by fact
2) De Jure - By law or By government.



Congestion control Algorithm.

Congestion in a network may occur if the load on a Network is greater than capacity of the network. Congestion control refer to the mechanism and techniques that can either Prevent

Congestion before it happens or re
move congestion after it happens

categories of congestion control mechanisms

open loop

* prevent congestion before it happens

closed loop

* Remove congestion after it happens

What are the policies for the open loop?

1) Retransmission policy
2) Window "
3) Admission "
4) Acknowledgement "
5) Discarding "

What are the techniques to use to remove the congestion are as follows:

1) Back
2) Choke
3) Implic
4) explic

Open

1) ret
packet
bit of
data

2) Wi
Jeat
Conn
3) Ack
Send
4) du
send
Elect
hap

1) Back prossure
2) choke packet
3) Implicat Signally
4) explicat Signally

Open loop (Prevent congeston before it happen)

1) retransmission policy: Here packet can be transmitted to the sorce if lost

↓ lot of data

2) window policy use selective reject window method for congeston control

3) Acknowledgement poky: Here receiver Send acknowledgmt to the sender

4) discard : Here, the router discard less sensitive packet when congesion is likely to happen

Transfer control protocol.

Tcp is a collection oriented protocol

12/01/2022.

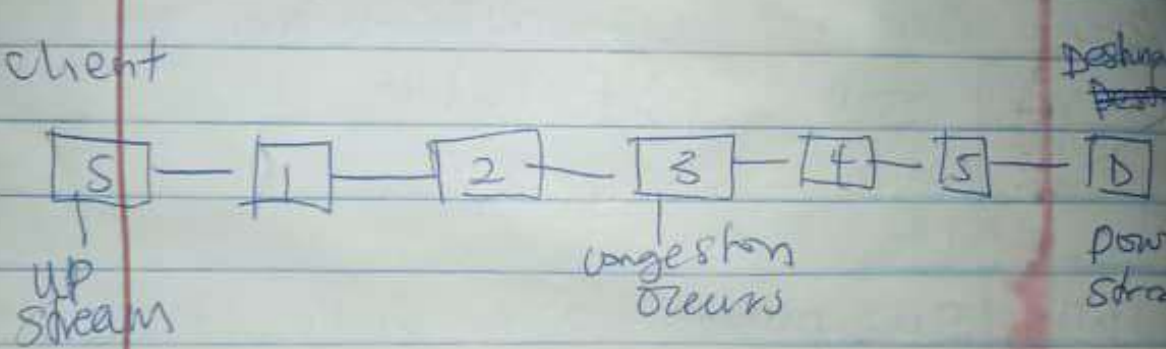
Introduction to data transmission modes

Transmission mode or communication mode is referred as transmission of data between two devices using a communication channel that include an optical fibre, copper wire, wireless channels, and various storage media. The data that get transmitted is in the form of electromagnetic waves. There are various ways of data transmission where the message that is passed is in the sequence of pulses using digital modulation (modulation is converting from analog to digital or digital model). The transmission mode of data was first introduced in a computer networking system during the 1940

5) Admission policy : This is ref to as quality of service mechanism. with this mechanism congestion can be prevented before it happens.

close loop (TM) to remove congest... after it happened)

i) back pressure:



packets send from sender to receiver

Advantages

1) The main advantage is that the capacity of the communication channel can be fully utilize when transmission is btw two devices.

2) In a simplex mode of transmission, the radio station can utilize the entire bandwidth of the communicating channel so that all the data can be transmitted in one shot without any data loss

Disadvantages

1) Since the communication between devices in unidirectional, ~~there is no~~ there is no intercommunication between two devices.

2) The simplex mode of transmission is mainly used in business field where the quick reply is not required as communication mainly perform two way exchange of data.

2) Half duplex transmission mode

In this kind of transmission mode, communication takes place in both direction. the connected devices can transmit or receive the data but not simultaneously. A walky-talky is a perfect example of half duplex transmission mode. When one person speaks from one end, another person listen from the other end. After a brief, the other person speaks and the first person on the other end listen.

Simultaneous speaking is not possible since will be create a distortion of sound and both the receiver and transmitter (sender) will not be able to comprehend information

Adv

1) Half duplex transmission is mainly used for low speed transmission involving wire and circuit

2) With the help of half duplex transmission error detector is perform in a simplex

In modem thus in LANs, WANs, repit. and other networking system.

Types Of Transmission modes

1) Simplex transmission mode

In this type of transmission mode, there is a single flow of information or one direction flow of information from the sender to the receiver. The device is connected in such a way that it is either send only or receive only. There is no other mechanism for the data to be transmitted to the sender and this mode of transmission generally include circuit that are used in securities and fire alarms.

examples: STM

1) communication between the computer and key board where keyboard is input device output is

2) The speaker system where microphone act as input and speacker act as output.

Adv

1) It's the fastest mode of transmission
2) The radio station can contain two separate channel, one channel is used for sending the data in one direction and the other channel for the receiver or the other end in opposite direction.

Disadv

If there's absent of any dedicated paths b/w the communicating devices, then the channel devices of the communicating channel is divided into parts and the proper utilization of bandwidth of the channel will not be maintained

concept of multiplexing
(powerpoint slide page 36).

2) Since both way communication occur the Transmission
this mode of ~~communication~~, the entire bandwidth
of communicating channel is utilize during transmis
and in one direction at a time.

DU

In this mode of transmission, when one party is sending the data, the other party must wait for the respond which lead to a delay in sending and receiving data at the right time.

3) Full duplex transmission mode

In this mode of transmission, communication takes place in both direction over a communication link. The bi-directional communication connect the devices receiving and transmitting at the same time and the communication link control ~~several~~ separate parts for sending and receiving.

Properties of circuit switching

i) Inefficiency

ii) Delay: This can occur in two ways

i) Long initial delay

ii) Low data delay.

(Diagram)

2) develop for voice traffic but can also apply to data traffic

Packet Switching

Here, messages are divided into packets and it is delivered to destination. Two approaches are followed to deliver packet to destination. This approaches are

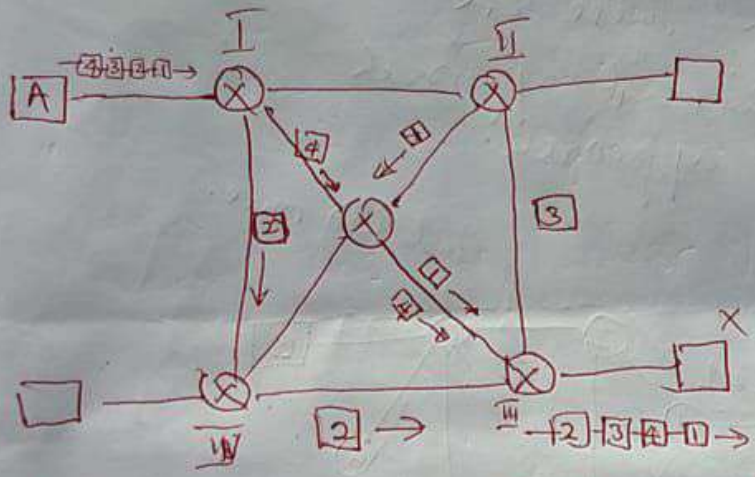
1) Virtual circuit approach
2) Datagram network approach

} ppts slide no 58

In virtual circuit all packets follows the same path.

Datagram Network

Each packet is treated independently. The packets are called datagrams.



I, II, III, IV are switches

Fig: 4 end systems with 5 sockets

1. All packets are treated independently.
2. Each packet may take any route.
3. Packets may arrive out of order.
4. Some packets may get lost or delayed.
5. It is up to the receiver to re-order the packets and recover the missing ones.

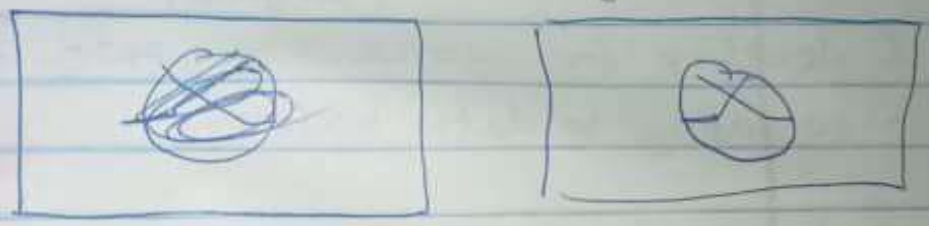
Approaches to datagram network

13/01/2023.

Circuit switching

* Switch is a device which connect multiple communication lines together

get to diagram



Switching is done by connecting to systems to make them a one to one communication

Circuit switching and packet switching

Circuit switching. This is use in public telephone network to form voice communication as well as Data communication, but it is majorly use for voice communication. Communication via a circuit switch has 3 phases

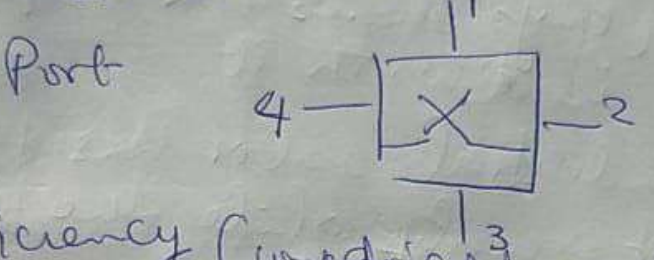
1) circuit establishment
2) data transfer.
3) Circuit disconnection.

3. Routing table of datagram approach

Every switch will maintain the routing table. This table contains 2 info

(1) Destination address

(2) Port



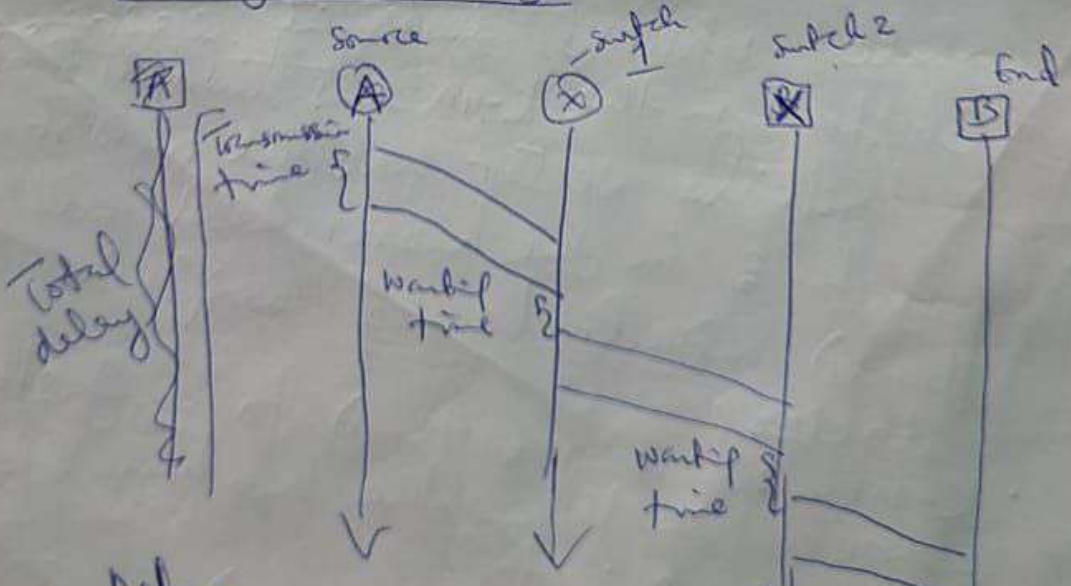
Dest Add	Port
B	2
C	1
.	.

Efficiency (compared to ~~virtual~~ circuit switching network)

Datagram network

(1) Better resources are allocated only when there are packets to be transferred. Hence the efficiency is higher when compared to circuit switching network.

(2) Delay in Datagram



Delay (Total delay in terms of our datagram approach) = 3(Transmission time) + 3(Propagation time) + waiting time1 + waiting time2.

(3) developed for voice traffic but can also apply to data traffic.

Packet switching

Messages is divided into packets and it is delivered to destination.

circuit switching
Packet "
message "

Two approaches are followed to deliver packets to destination. There are

(1) virtual circuit approach
(2) Datagram approach.

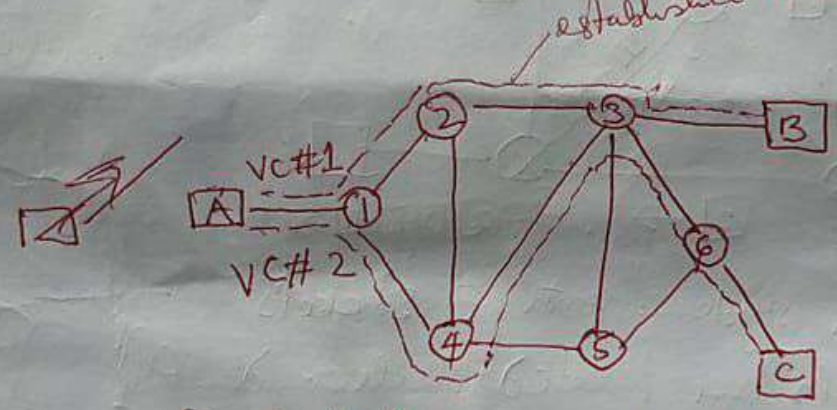


Fig: Virtual Circuit 1,2,3,4,5,6 — Switches

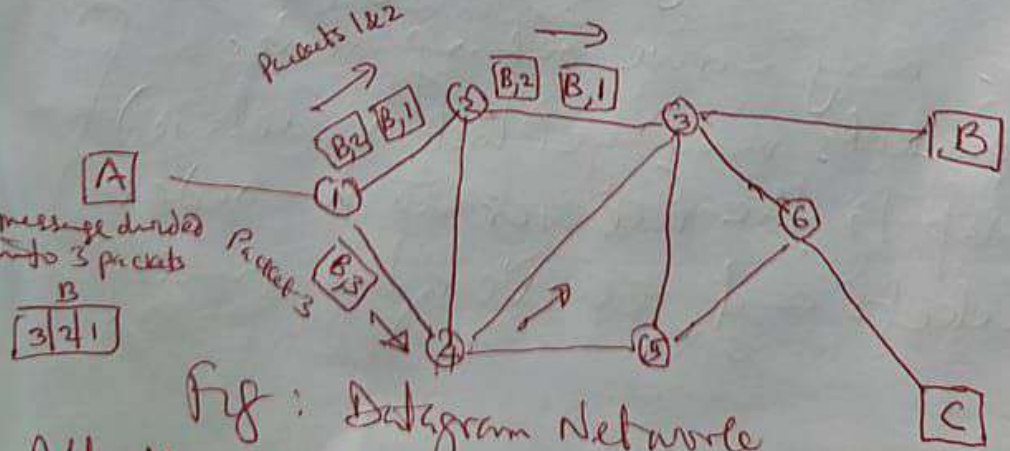


Fig: Datagram Network

All the packets will not follow the same path. Each packet follows its own path

light pulses to the receiver

(2) Multimode graded index fiber

Acts to refract the light towards the center of the fiber by variation in density.

(3) Single Mode fiber

The light is guided down the center of extremely narrow core.

Advantages of Fiber Optics

- greater capacity (bandwidth upto 2Gbps)
- Smaller size and lighter weight
- lower attenuation
- Immunity to environment
- highly secure

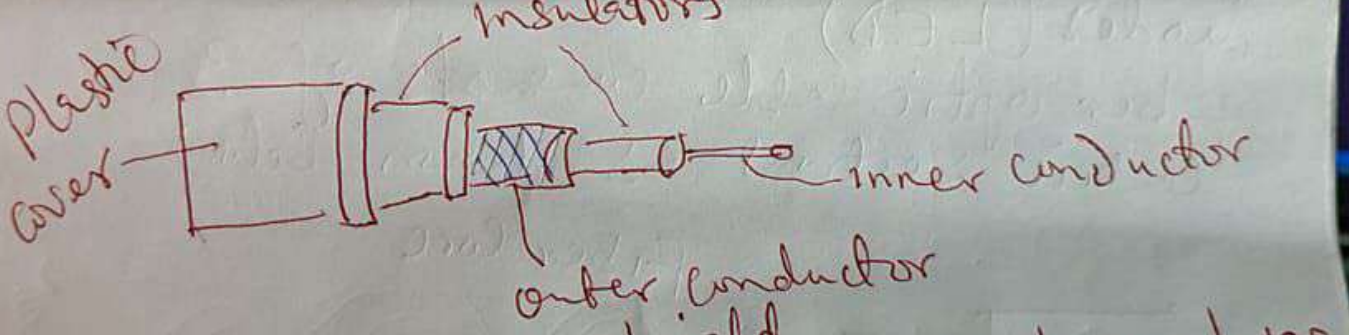
Disadvantages

(1) Expensive over short distance
(2) Requires highly skilled installers
(3) Adding additional nodes is difficult

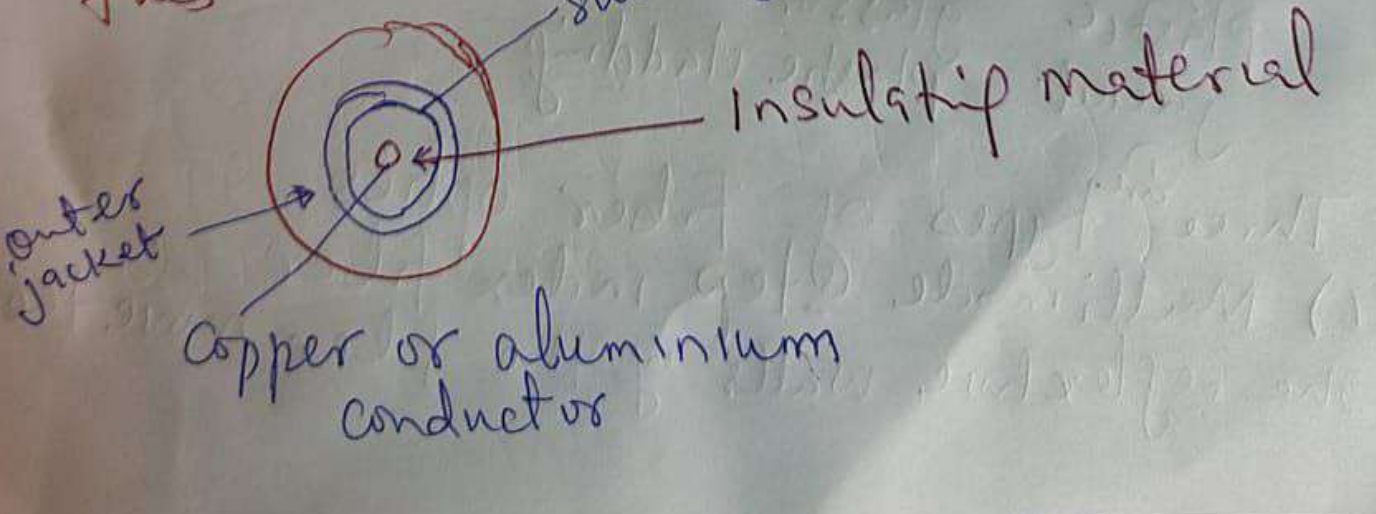
⇒ More expensive
⇒ Better performance.

2. Coaxial Cable

Used for cable television, LANs and telephones.
⇒ Has an inner conductor surrounded by braided mesh.
Both conductors share a common axial hence the term "co-axial"



If u cut this coaxial cable it looks like



Fiber optic Cable

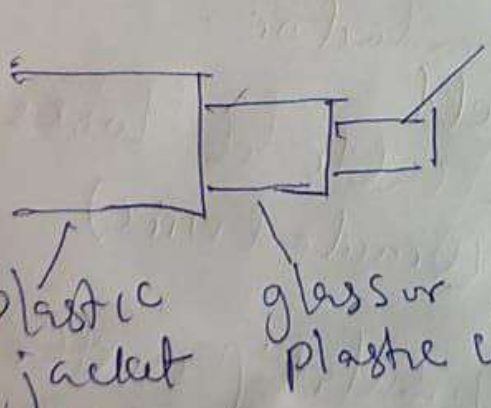
It is a new transmission media medium when compared with the 1st two.

Used by telephone companies in place of long distance lines

Used by private companies in implementing local data communication network

It requires a light source with Injection laser Diode (ILD) or light Emitting diodes (LED)

Fiber optic cable consists of 3 centric sections as shown below



Three types of Fiber optics

(1) Multimode Step index fiber

the reflective walls of the fiber move the

the frequency ranges between 3 KHz & 1 GHz.

(2) Microwaves
used for unicast communications such as telephones, satellite networks and wireless LANs.
Higher frequency ranges can not penetrate walls.
It uses only directional antenas
↘ means point to point communication. so the transmitter and receiver must be aligned.

(3) Infrared
these signals can be used for only short range communication in a closed area using line of sight propagation.
e.g TV remote, Wireless speakers, automatic doors, etc.
Due to short range, it is considered to be one of the most secured transmission media.

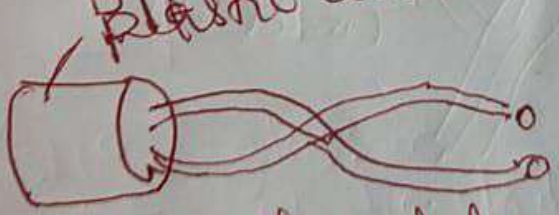
(1) STP

The pair is wrapped with metallic foil to insulate the pair from electromagnetic interference.

It is more expensive and harder to work.

(2) Unshield Twisted Pair (UTP)

Each wire is insulated with plastic wrap, but the pair is encased in an outer covering.



No presence of metalic shield here.

we have 3UTP, 5UTP

3UTP

Data rates upto 16mbps are ~~available~~ achievable

5UTP

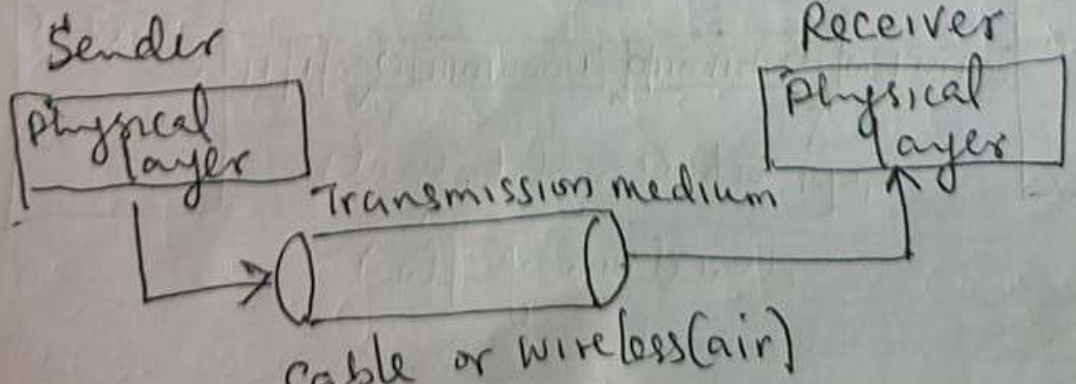
10 mbps (Data rate upto)

Asynchronous here means "asynchronous at the byte level", but the bits are still synchronized; their durations are the same.

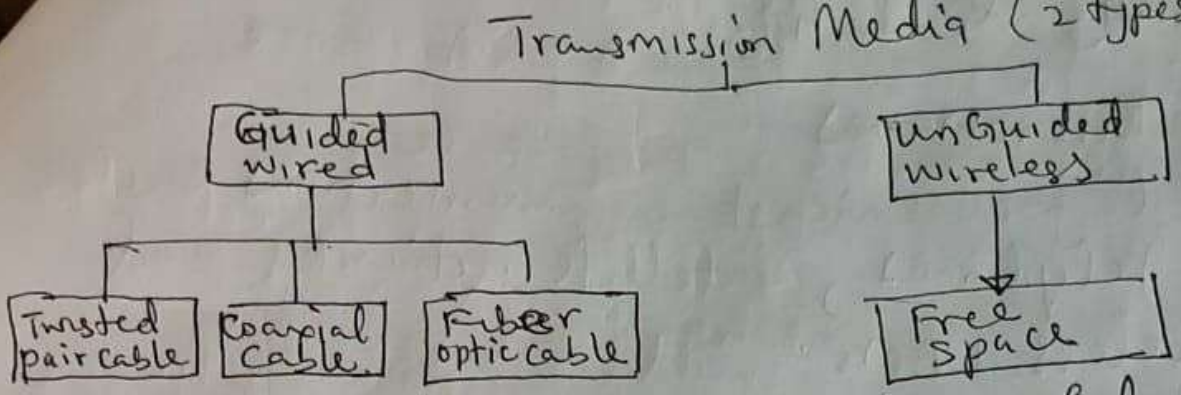
Transmission Media

To send our data from one place to another the first layer (physical layer) of communication network OSI seven layer model is dedicated to transmission media.

- It is a physical path b/w transmitter and receiver.
- * Repeaters or amplifiers may be used to extend the length of medium.



Classes of transmission Media



The factors to be considered while selecting transmission media

(1) Transmission rate
(2) Cost and ease of installation
(3) Resistance of environment condition
(4) Distance

Types of Unguided transmission media (Radio, micro & Infrared waves)

(1) Radio waves
used for multicast communications. Such as radio and television.
Can penetrate through walls.
It is highly regulated. Uses omni directional antenna meaning the signals spread out in all directions and can be received by many antenas.

Guided transmission Media (wired)

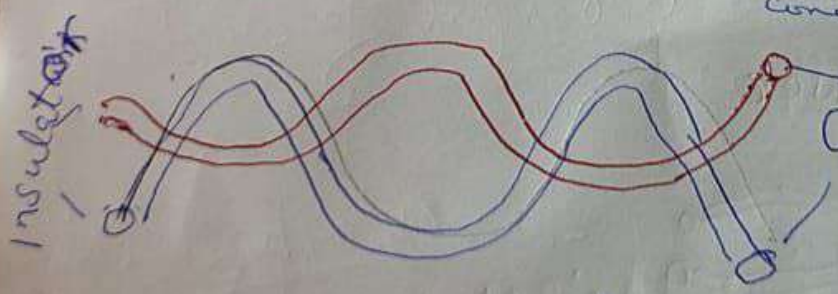
- Twisted Pair cable
- Coaxial cable
- Fiber Optics

1. Twisted Pair cable

It consists of two insulated copper wires arranged in spiral pattern to minimize the electromagnetic interference between adjacent pairs

It is used for customer facilities and over distance and data communication

It is used for low frequency transmission medium.



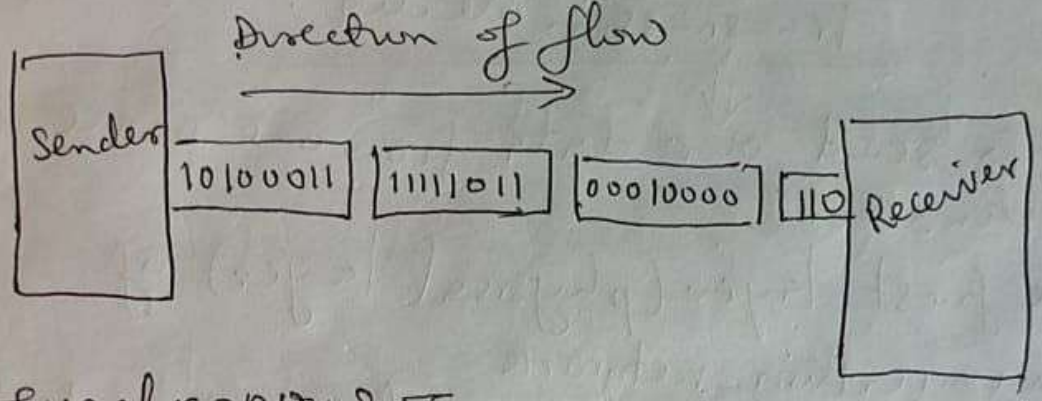
2 Types of twisted pairs

(1) STP (Shielded Twisted Pair)

(2) UTP (Unshielded twisted Pair)

group the bits.

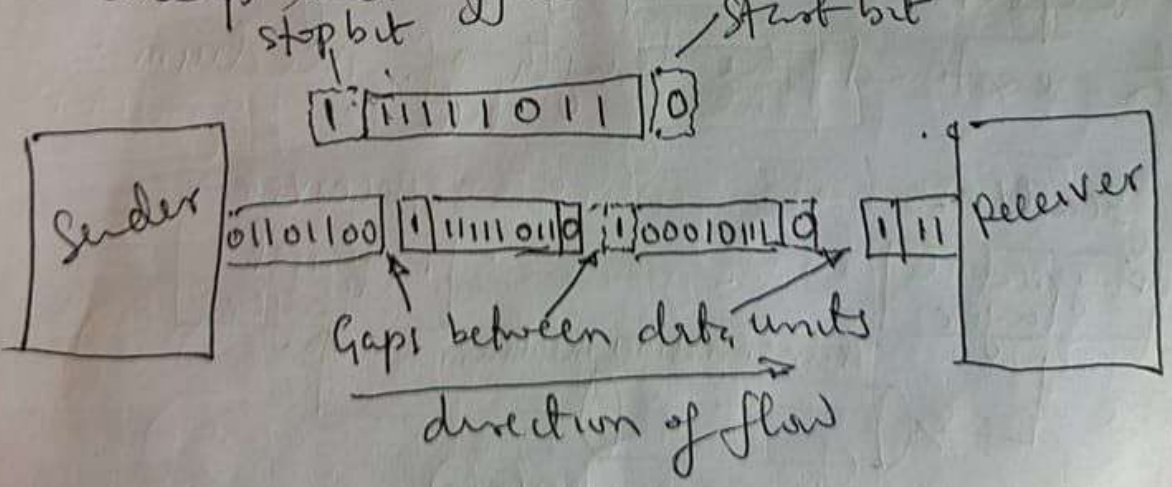
- The receiver counts the bits as they arrive and groups them in eight bit units



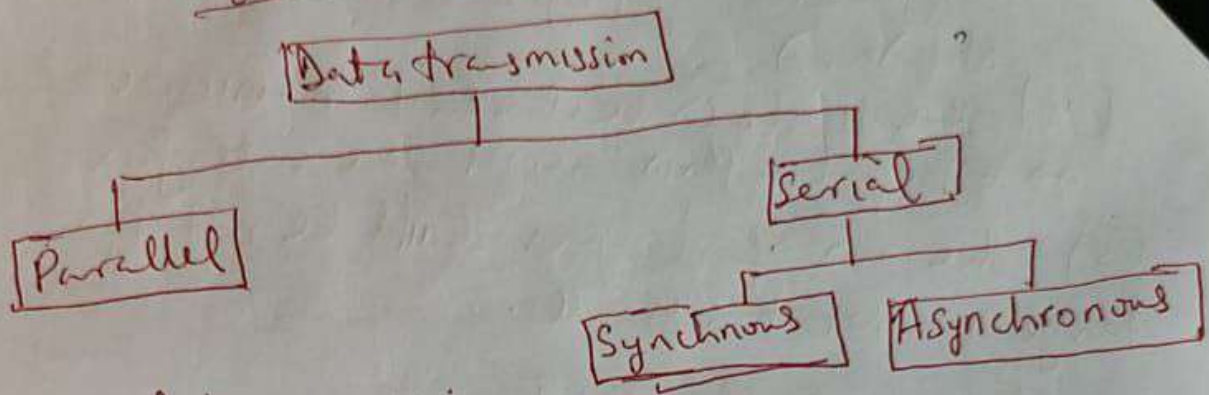
Asynchronous Transmission

Send one start bit(0) at the beginning and one or more stop bits (1) at end of each byte

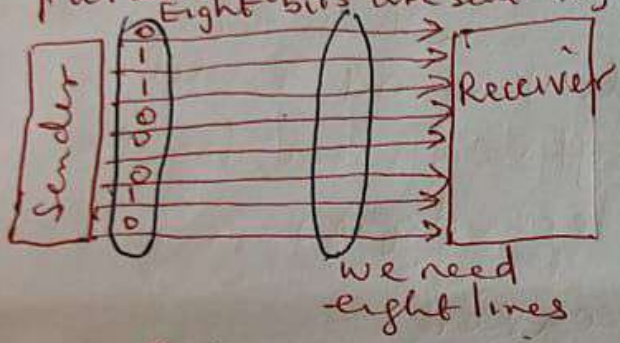
⇔ cheap and effective.



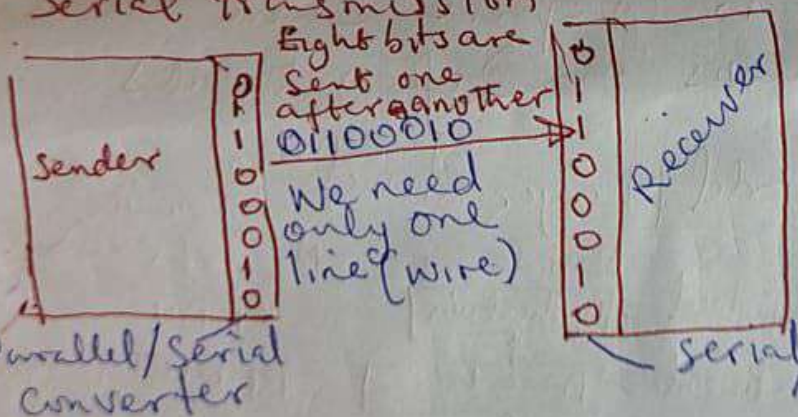
Digital Data Transmission



Parallel transmission
Eight bits are sent together



Serial transmission
Eight bits are sent one after another
01100010



~~Synchrons~~
Synchronous transmission

- Sending bits are after another without start/stop bits or gap.
It is the responsibility of the receiver to

(2) How hardware & software work together
(3) To understand new technologies
(4) Trouble shooting is easier
(5) Can be used to compare basic functional relationships on diff networks

OSI model | Layer structure

another name is desktop layer.