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MULTIPLE ACCESS PROTOCOL

→ If there is a dedicated link b/w sender & receiver then Data Link control layer is sufficient.

→ If there's no dedicated link then multiple stations can access the channel one-by-one.

→ Hence Multiple Access Control Protocols are req. to avoid the collision & congestion of data.

Classification of MA Protocol :

- Random Access Protocol
  - ALOHA
  - CSMA (Carrier Sense Multiple Access)
  - CSMA/CD (wired) (CSMA collision Detection)
  - CSMA/CA (wireless) (collision Avoidance)
- Controlled Access Protocol
  - Reservation
  - Polling
  - Token Passing
- Channelization Protocols
  - (frequency Division) → FDMA
  - (code Division) → CDMA
  - (Time Division) → TDMA

ALOHA is the part of Random Access Protocol which was initially developed for the wireless LAN network.

Since we're using the shared medium to transmit the data from sender to receiver there are chances of collision, which further leads in garbelled of the data.

ALOHA
- Pure ALOHA
- Slotted ALOHA

Pure ALOHA allows station to transmit at any time and it'll send the next packet when it'll get the acknowledgement from the receiver.

If sender doesn't receive ack from the receiver then it'll wait for random amount of time to transmit the next frame.

Since multiple stations are connected with shared medium & they have to wait for random amount of time, which increases the probability of collision.

SLOTTED ALOHA is used to develop the efficiency of pure alloha by providing the slots in the time scale

The sending of the frames are allowed only at the beginning of every slot

If some station misses out the time slot for sending frame then it will send the frame from the next time slot from the beginning.

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* CSMA (Career Sense Multiple Access) is to min. the chance of collision & therefore increase the efficiency of channel.
- The principal of CSMA is sense before transmit
- It will sense the career, i.e: career is idle or the career is busy.
- Because of the propagation delay there is possibility of collision.

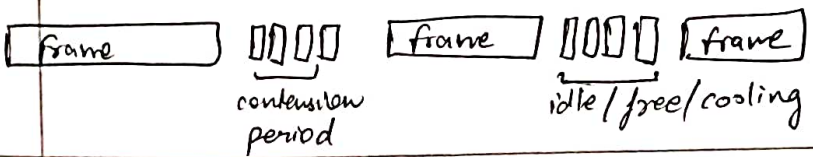
Types of CSMA protocol

① One Persistent CSMA ② P Persistent CSMA ③ Non-Persistent CSMA

① In this type of protocol, before sending the data, station first listens to the channel to see if anyone else is transmitting the data at that moment.
If that moment, the channel is idle then it'll send the frame & if the channel is busy, then it continuously senses until the channel became idle.
Since, the sending of frames probability is 1 thats why it is called one-persistent method.

③ Non-Persistent Method, station senses the channel & if no one else is sending then the sender starts sending the signal.
It doesn't continuously sense the channel inspite of that, it takes randomly sensing of the channel.
Because of this randomness sometimes channel become already idle and not be utilized properly.

② P-Persistent Method, is applied on slotted channels & when the stations become ready to send, it sense the channel.
Unlikely the station act as if there has been a collision, then it will wait for a



random amount of time to retransmit the data.

CSMA - CD (Collision Detection)

① Used in shared channel for collision detection
② If two stations sense the channel to be idle & begin their transmission then immediately there are chances of collision of data packets
③ Quickly transmitting damaged frames saves time & bandwidth of the channel which is done by CSMA-CD protocol
④ It will consist alternating contention & transmitting period with ideal period occuring when all the stations are quiet.

CSMA - CA (Collision Avoidance)

① Used in the wireless network
② Standard - IEEE 802.11
③ Agenda - to avoid collision by comparing the width of the frame from sender and receiver side.

Controlled Access Protocol

* **Reservation**
  - → Every data station will send the data after doing the reservation on the channel.
  - → In reservation protocol the data can be transmitted only in serial manner which results in poor utilisation of channel frequency, propogation delay.
  - → In some extent the collision btw the data pkts. are avoided by compromising the channel efficiency.

* **Polling**

  There will be a master data or node which will be responsible for data pkt transmission into the channel w/o collision.

  - → **Drawbacks:**
    - Failure of master node leading the collapse of data transmission
    - Propagation delay
    - **Congestion problem** - Access amount of data at particular data and incomplete data transmission by the station.

* **Token Passing**

  Every data station will send the complete data then after it will transfer some token to the next data station connected to transfer their data pkts into the channel.

The congestion problem is addressed with following drawbacks:

- Randomness of every data station
- Propagation delay
- Data interruption or collapse if token is not passed to the nearest or the next node or data stn.

Channelisation Protocols

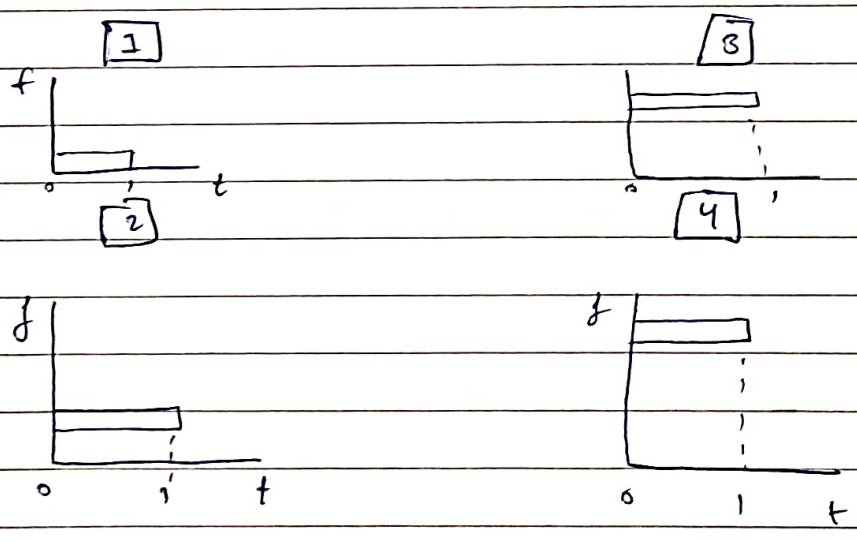
* **TDMA:**

different stations connected to a common medium/channel having the same frequency packets to transmit the data into the channel.

the time access is divided in several mini slots & station has to send the data in given slots with same frequency.

Since each station is continuously sending the data into the channel increases the channel efficiency & utilisation.

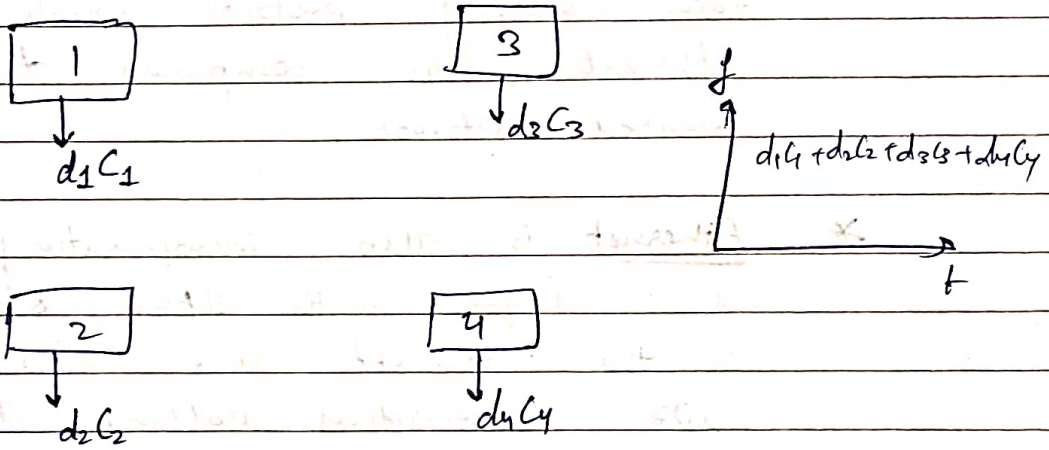
* **FDMA (Frequency div. multiple access)**



→ different frequency at the same time by the connected data stations.

→ different stations have different frequency data pkts. which further leads to interference and noise to avoid this gaurd band is used which is the min. time interval to transmit the another data pkts. by the station.

✱ CDMA



different stations transmit the data pkts. they add the some code with data to avoid the affect of interference & collision.

data stations are free to send the data with different stations in different times.

FDDI (fiber Distributed Data Interface)

→ LAN (200km)

→ IEEE 802.4

→ TCP/IP

→ Physical

→ Data link layer → Network → LLC, MAC → Physical

→ Token Passing (controlled Access protocol)

Fiber optics

→ Total internal reflection

→ Speed fast

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FDDI is used in extended LAN network

It uses the IEEE 802.4 standard with token passing protocol which makes it quite efficient as compared to ethernet or other wired network.

* Ethernet is also incorporating physical and data link layer with IEEE 802.2 to 802.3, most of the ethernet uses standard controlled access protocol like reservation polling and token passing

Ethernet Classification

- Standard Ethernet → 10mbps
- Fast Ethernet → 100mbps
- Gigabit Ethernet → 1 Gbps
- Ten gigabit Ethernet → 10Gbps

* Frame format of Ethernet

7byte	1 byte	6byte	6byte	2byte	Min → 46byte, Max 1500byte
Preamble	SFD 10101011	Destination MAC address	Source MAC Address	length or type	Data + Padding

4byte CRC

- Start frame Delimeter
- Cyclic Redundancy check

← Physical layer → ← data link layer →

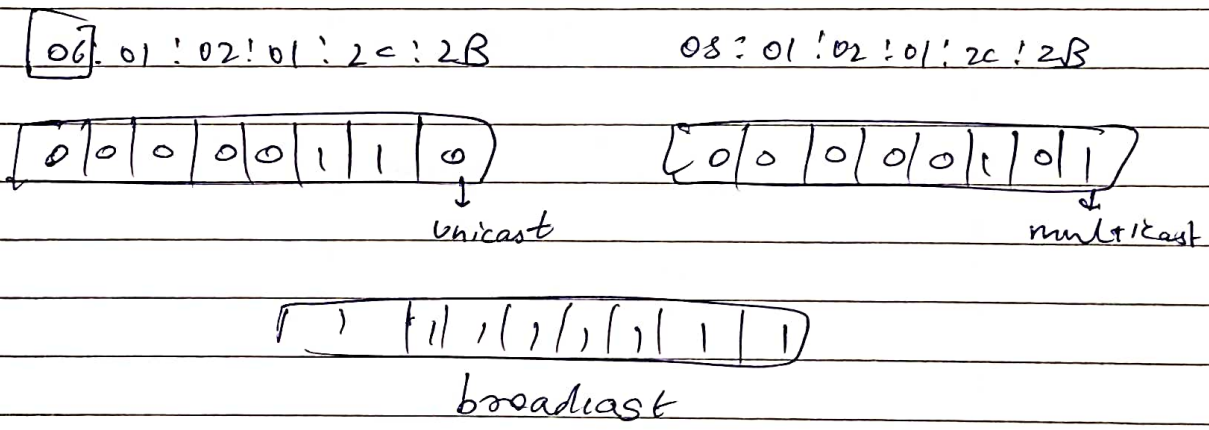
Min → 26 + 46 = 72 byte × 8 bits
= 576 bits

Max → 26 + 1500 = 1526 byte × 8 bits
= 12208 bits

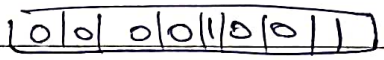
unicast
multicast
broadcast

Eg. Ethernet Address
06:01:02:01:2C:2B identify the type of broadcast in above ethernet address.

The starting of Ethernet address is basically used to identify the type of broadcast i.e. unicast, multicast or broadcast.
If the bit is 0, then the add is unicast otherwise it is multicast.



1. 09:08:26:14:11:01



Wifi (Wireless fidelity)

- It uses the IEEE 802.11 standard
- Like ethernet it's designed to used in a limited geographical area.
- In wifi mostly CSMA - CA protocol is used for proper data transmission
- The primary challenge in wifi is to ~~mitigate~~ mediate access to a shared communication medium.
- It supports the additional features like power management and ~~seq~~ security mechanism.
- 802.11 uses five GHz radio band frequency with almost 23 channels.