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## Unit : 4 Medium Access Control Sub Layer.

\* Explain Channel Allocation Problem.

⇒ In Channel Allocation, One channel ~~is~~  $W$  is divided into the multiple parts.

One single channel can be divided in multiple part and allocate to the multiple users.

One single channel can be allocate for different user for different tasks.

There are two types of Channel Allocation Problem.

- ci) Static Channel Allocation
- cii) Dynamic Channel Allocation

ci) Static Channel Allocation:

In this Method, we have to use Frequency Division Multiplexing

For Channel Allocation.

Static Channel Allocation is use to Allocate the channel in fixed and equal size.

In this allocation, every channel size is fixed and equal.

Static Channel Allocation is divide channel into fixed number of chunks.

Static Channel Allocation can not change according to real-time network condition.

(ii) Dynamic Channel Allocation :

Dynamic Channel Allocation is more adaptive compare to static channel Allocation.

Dynamic Channel Allocation can be change according to real-time network condition.

In Dynamic Channel Allocation, All the stations are equivalent and every stations can send and receive on the stations.

Time can be divided into the slotted or continuous interval.

When Frame is transmitted in channel then station is block until Frame transmission is done.

\* Explain CSMA (Carrier Sense Multiple Access).

=> Carrier Sense Multiple Access is one of the type of Multiple Access Protocol.

This Protocol is used to check Traffic on channel for the transmission.

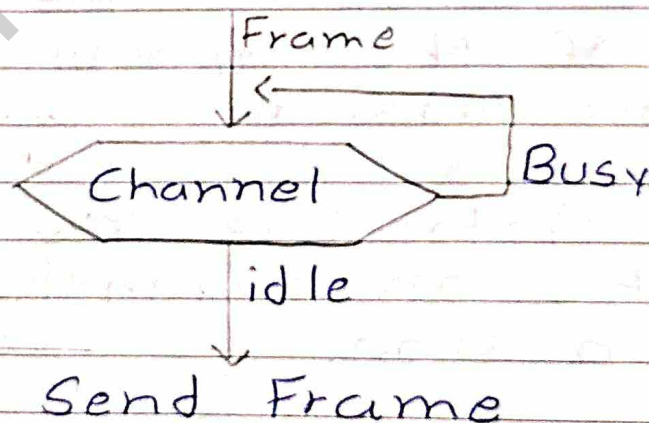
This Protocol is also used to check channel is idle or busy or not.

This Protocol can identify the all the channel information before the transmission of the data.

There are three Persistence Method in CSMA.

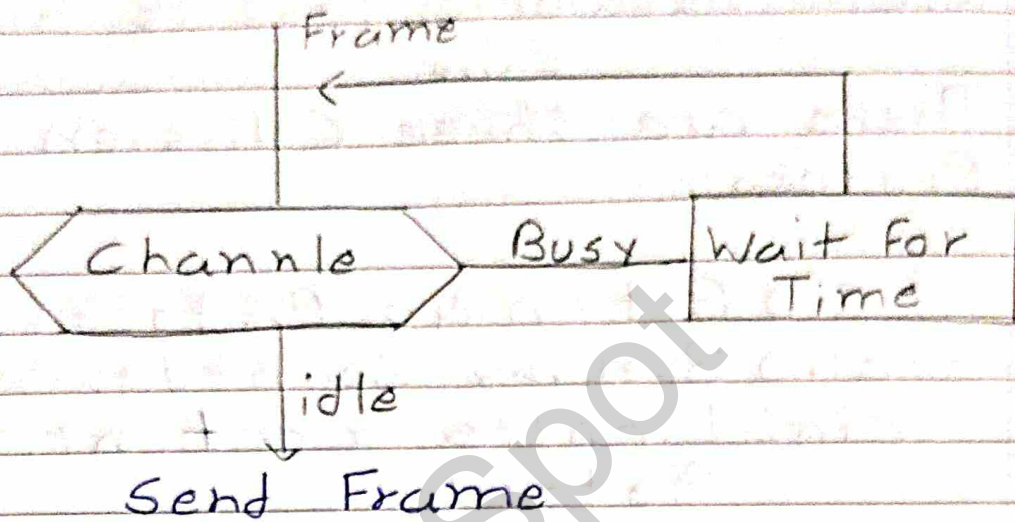
- ci) 1- Persistence Method
- cii) Non- Persistence Method
- ciii) P- Persistence

ci) 1- Persistence Method : IF the station finds the line idle, then it sends frame immediately with Probability 1.

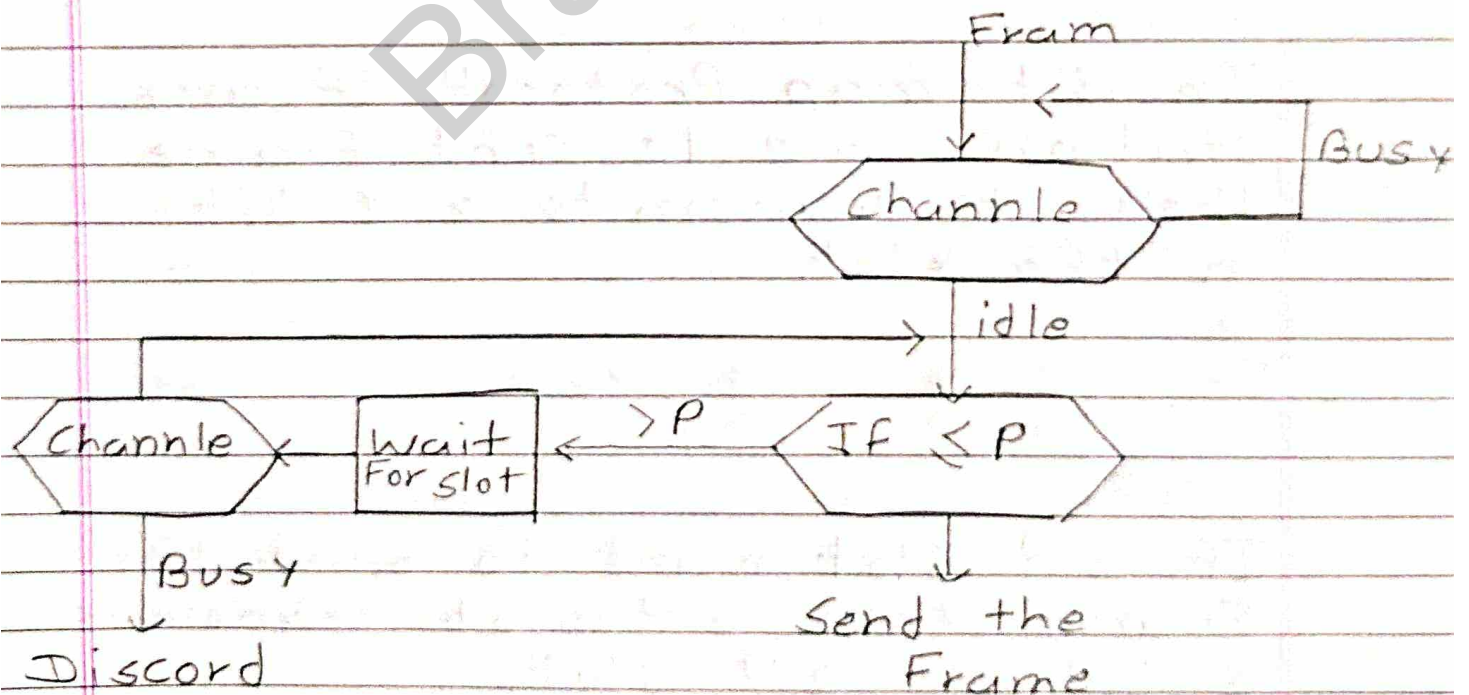


cii) Non- Persistence Method : IF the station finds the line idle, then it sends frame immediately

else waits for random amount of time and then again try to send the Frame.



ii) P- Persistent Method: This method combine the 1-Persistent and Non-Persistent Method.



\* Explain Collision Free Protocols.

=> Collision Free Protocols is use when network load is high.

Four

There are ~~three~~ Collision Free Protocols.

- ci) Bit-map Protocol
- cii) Binary Countdown
- ciii) Limited Contention Protocol
- civ) The Adaptive Tree Walk Protocol.

ci) Bit-map Protocol:

In Bit-map Protocol, If any station have to send frame then it transmits a 1 bit in the slot.

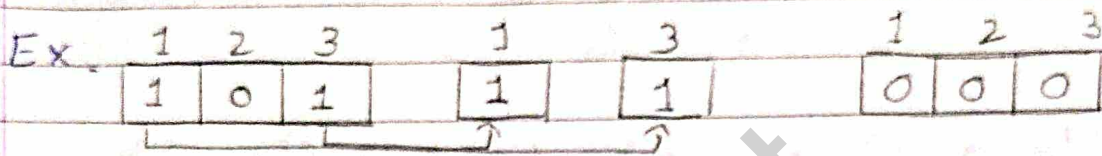
Ex. 

0	1	2	3	4
0	0	1	0	0

IF 2<sup>nd</sup> slot want to send the frame then 2<sup>nd</sup> slot transmits 1 bit in 2<sup>nd</sup> slot.

## - Bit map - Reservation.

In this Method, Every slot can be Reserve For the transmission transmission.



Here, Slot 1 and 2 is Reserve.  
So, Slot 1 and 2 is transmits data First.

## (ii) Binary Countdown:

If Any station want to transmit the data then station have to broadcast its address.

After this every station have to broadcast its Most Significant Bit and after this we have to Perform OR Operation.

After this According to its Priority we have to transmit the data.

Ex.

	Bit Time			
	0	1	2	3
1 - 0 0 0 1	0	-	-	-
2 - 0 0 1 0	0	-	-	-
3 - 1 0 0 1	1	0	0	-
4 - 1 0 1 0	1	0	1	0
	1	0	1	0

Here, we get 1010 Result.  
So, we have to transfer  
4 Station data.

ciii) Limited Contention Protocol:

When Network load is light then Network have to performe ALOHA Protocol.

When Network load is high then Network have to follow Bit-Map Protocol.

civ) Adaptive Tree Walk Protocol.

Steps :

- Every Stations as the Leaf of a Binary tree.



- After this first slot, all the stations can try to get the slot.

- If no conflict then fine, else only nodes under a subtree get to try for next one.

\* Explain Ethernet with Types of Ethernet.

=> Ethernet is used in LAN (Local Area Network) Technology.

Ethernet structure is easy to understand and implement at the Local Area Network.

Ethernet can be operates in two layer is OSI Model: (i) Physical Layer (ii) Data Link Layer.

There are many Types in Ethernet.

(i) Fast Ethernet

(ii) Gigabit Ethernet

(iii) 10-Gigabit Ethernet

(iv) Switch Ethernet

ci) Fast Ethernet :

Fast Ethernet is use Ethernet standard 100BASE-TX.

Fast Ethernet is widely used for improving network speed.

This Ethernet can offers a data rate of 100 Mbps.

cii) Gigabit Ethernet :

Gigabit Ethernet is use Ethernet standard 1000BASE-T.

Gigabit Ethernet is suitable for high performance enterprise networks.

This Ethernet can offers a 10 Gbps over Twisted-Pair cabling.

ciii) 10-Gigabit Ethernet :

10-Gigabit Ethernet is use Ethernet standard 10GBASE-T.

It is suitable for high-performance data transfer in enterprise network.

10-Gigabit Ethernet is used to provide 10 Gbps data rate.

(iv) Switch Ethernet:

In this type of network, we have to use switch to improve the network performance.

Switch Ethernet supports 1000 Mbps upto the 10 Gbps.

\* Explain Ethernet IEEE 802.2.

=> IEEE 802.2 is extended version of IEEE 802 standards.

IEEE 802.2 is used for local Area Network and Metropolitan Area Network.

It defines the rules and protocol for managing data.

link layer Functions.

IEEE 802.2 Focuses on the Logical Link Control sublayer.

It handles tasks related to data link layer management which include Flow control, Error Detection.

IEEE 802.2 defines the format and structure of Media Access Control.

This is designed to support multiple network layer protocols.

IEEE 802.2 allows devices to communicate over the same data link layer.

This standard provide the mechanisms for flow control.

Flow control mechanism prevent data overload and congestion in the network.

\* Explain Logical Link Control Protocol.

=> The Logical Link Control Protocol is a sublayer within the Data Link Layer.

This Protocol plays a crucial role in managing communication between devices on LAN.

The LLC sublayer uses Media Access Control addresses to uniquely identify devices on a LAN.

Using LLC, we can identify the devices with its unique addresses.

The LLC sublayer is responsible for creating and parsing data frames.

The Frames include the packet of the data which includes the destination and source of MAC addresses.

The LLC sublayer can implement flow control mechanisms.

The LLC sublayers includes error detection mechanisms to identify error.

The LLC Protocol is closely associated with IEEE 802 standards.

Ethernet LANs use the LLC sublayer to provide addressing and framing for data frames.

The LLC Protocol allowing devices to communicate effectively on the same LAN.

The LLC Protocol is used to manage the data transmission in network.

This Protocol is also provide the Logic for the data link.

The LLC Protocol also allows to provides multipoint communication in computer network.

\* Explain CSMA/CD.

⇒ CSMA/CD stands for Carrier Sense Multiple Access with Collision Detection.

CSMA/CD is network protocol used in Ethernet networks to manage how devices share the communication medium.

Using this protocol, we can manage the Ethernet devices communication.

This Protocol is mostly used in Thick Ethernet and Thin Ethernet implementations.

Multiple Devices can be connected to the same communication medium.

Steps:

- Collision Detection:

IF two devices detect that the medium is idle and start

transmitting at the same time.

After that they both stop transmitting and send a Jam signal to inform all devices on the network that collision is detected.

This Protocol gives result in the form of successful and unsuccessful transmission.

If collision is detected then transmission is unsuccessful.

Collision detection mechanism is ensure that for the collision

- Exponential Backoff:

After a collision, the colliding devices wait for a random amount of time.

After the timeout, transmit again the Frames.



To minimize the chance of collisions, we have to use a persistence algorithm.

\* Explain Token Ring.

=> Mainly token ring, used in Local Area Network Topology.

Using Token Ring, we have to define the order in which we have to send station.

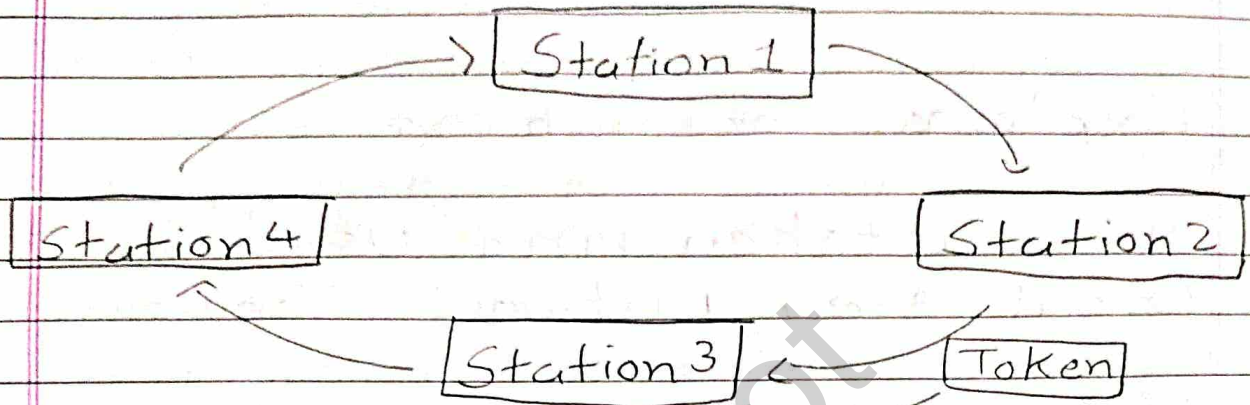
In Token Ring, devices are connected in a physical ring or loop.

Each device is connected to the network by a cable in the ring.

To avoid data collisions, Token Ring uses a Token Passing Protocol.

In this system, a special data packet called the "token"

which circulates around the ring.



Only the devices that possess the token is allowed to transmit data.

Only this device transmits the data which has a token.

For transmitting the data, every device has to wait for the token.

When a device has the token, it can transmit data on the network.

The data travels around the ring until it reaches its destination.

Token Ring minimizes the possibility of data collisions because only one device can transmit at a time.

Drawback:

- 1 Complexity: Token Ring networks require more complex set up for the data transmission.
- 2 Slower Speeds: Token Ring provide the slower speeds for the data transmission.
- 3 Cost: Token Ring setup is more expensive than ethernet.
- 4 Limited Scalability: Token Ring networks is less than ethernet network.

\* Explain DQDB (IEEE 802.6).

=> DQDB stands for Distributed Queue Dual Bus.

Mainly DQDB Used in Metropolitan Area Network Topology.

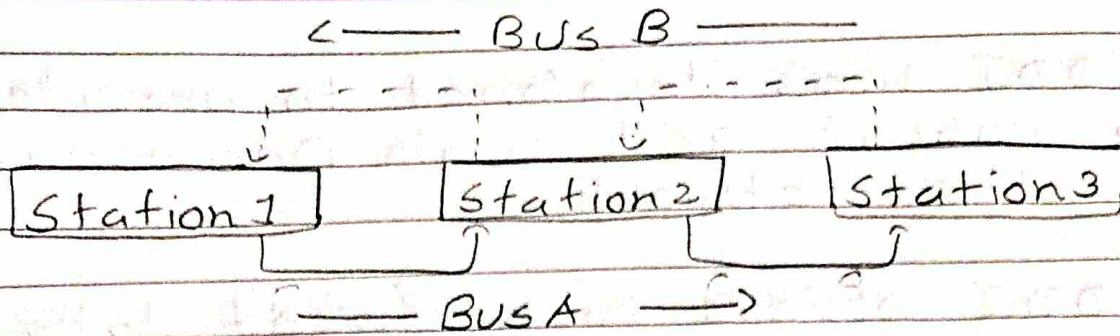
DQDB is designed to support data transmission over a Dual Bus Topology.

This Protocol is also used in Local Area Network to provide high-speed reliable communication.

DQDB uses a dual Bus topology, consisting of two parallel unidirectional buses.

The dual buses topology creates a logical ring structure.

Devices are connected to both buses at specific intervals and data can be transmitted in either direction on each bus.



DQDB uses a Distributed Access control mechanism to regulate how devices can transmit data onto the buses.

Device must acquire a token before they can transmit data.

DQDB is scalable, making it suitable for the Metropolitan area networks.

\* Explain FDDI in computer network.

=> FDDI stands for Fiber Distributed Data Interface.

Mainly FDDI used in Local Area Network for high-speed data transfer.

FDDI was developed to provide a robust and high performance in the network.

FDDI offers high-speed data transmission with 100 Mbps data rates.

FDDI mainly use for Large-Scale Corporate or Data-Intensive Scientific Research networks.

FDDI networks are based on a Dual Ring Topology which consists of two counter-rotating rings.

FDDI uses a token passing Protocol for media access control which is similar to the Token Ring.

FDDI uses multimode Fiber optic cabling which provides high bandwidth and long-distance connectivity.

## - Advantages of FDDI :

- 1 FDDI networks uses fiber optical cable which provide high speed data transfer.
- 2 FDDI networks are high scalable.
- 3 FDDI provides extensive management and allowing networks monitor performance.

## - Disadvantages of FDDI :

- 1 FDDI networks uses fiber optic cable so, network is increase the cost.
- 2 Structure of FDDI networks is complex.