5.8 MEDIA ACCESS CONTROL (MAC)

- When two or more nodes transmit data at the same time, their frames will collide and the link bandwidth is wasted during collision.
- To coordinate the access of multiple sending/receiving nodes to the shared link, we need a protocol to coordinate the transmission.
- These protocols are called Medium or Multiple Access Control (MAC) Protocols. MAC belongs to the data link layer of OSI model
- MAC defines rules for orderly access to the shared medium. It tries to ensure that no two nodes are interfering with each other's transmissions, and deals with the situation when they do.

Goals of MAC

1. Fairness in sharing
2. Efficient sharing of bandwidth
3. Need to avoid packet collisions at the receiver due to interference

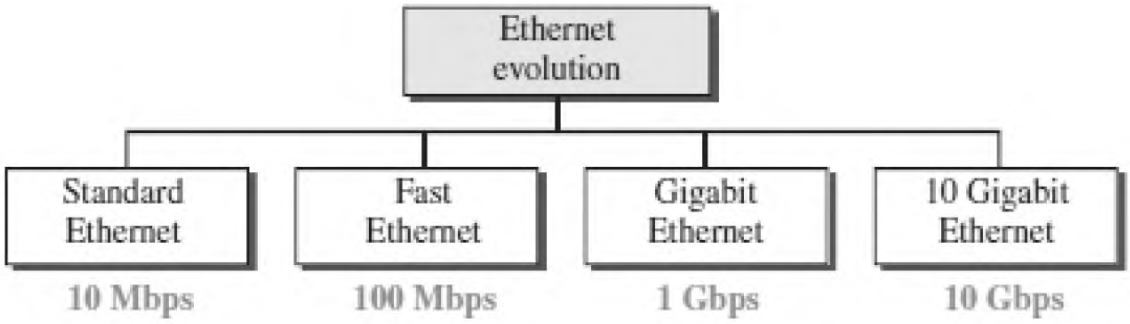
MAC Management

1. Medium allocation (collision avoidance)
2. Contention resolution (collision handling)

5.9 ETHERNET (IEEE 802.3)

- Ethernet was developed in the mid-1970's at the Xerox Palo Alto Research Center (PARC),
- IEEE controls the Ethernet standards.
- The Ethernet is the most successful local area networking technology, that uses bus topology.
- The Ethernet is **multiple-access networks** that is set of nodes send and receive frames over a shared link.
- Ethernet uses the **CSMA / CD (C**arrier **S**ense **M**ultiple **A**ccess with **C**ollision **D**etection) mechanism.

EVOLUTION OF ETHERNET



ACCESS METHOD/ PROTOCOL OF ETHERNET

The access method of Ethernet is CSMA/CD.

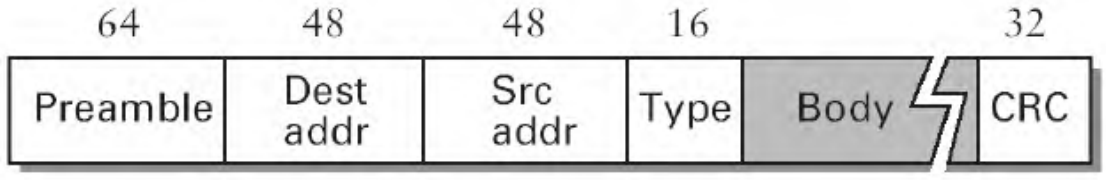
Note : Refer CSMA/CD from MAC

COLLISION DETECTION IN ETHERNET

- As the Ethernet supports collision detection, senders are able to determine a collision.
- At the moment an adaptor detects that its frame is colliding with another, it first makes sure to transmit a **32-bit jamming sequence** along with the **64-bit preamble** (totally 96 bits) and then stops the transmission.
- These **96 bits** are sometimes called **Runt Frame.**

FRAME FORMAT OF ETHERNET

The Ethernet frame is defined by the format given in the Fig.



- The 64-bit ***preamble*** allows the receiver to synchronize with the signal; it is a sequence of alternating 0's and 1's.
- Both the ***source and destination*** hosts are identified with a 48-bit ***address.***
- The packet ***type*** field serves as the demultiplexing key.
- Each frame contains up to 1500 bytes of ***data(Body).***
- ***CRC*** is used for Error detection

Ethernet Addresses

- Every Ethernet host has a unique Ethernet address (48 bits – 6 bytes).
- Ethernet address is represented by sequence of six numbers separated by colons.
- Each number corresponds to 1 byte of the 6 byte address and is given by pair of hexadecimal digits.
- **Eg: 8:0:2b:e4:b1:2** is the representation of 00001000 00000000 00101011 11100100 10110001 00000010
- Each frame transmitted on an Ethernet is received by every adaptor connected to the Ethernet.
- In addition to ***unicast*** addresses an Ethernet address consisting of ***all 1s*** is treated as ***broadcast*** address.
- Similarly the address that has the ***first bit set to 1*** but it is not the broadcast address is called ***multicast*** address.

5.10 CARRIER SENSE MULTIPLE ACCESS / COLLISION DETECTION (CSMA / CD)

- **Carrier Sense** in CSMA/CD means that all the nodes sense the medium to check whether it is idle or busy.
  - If the carrier sensed is idle, then the node transmits the entire frame.
  - If the carrier sensed is busy, the transmission is postponed.
- **Collision Detect** means that a node listens as it transmits and can therefore detect when a frame it is transmitting has collided with a frame transmitted by another node.

Flowchart of CSMA/CD Operation