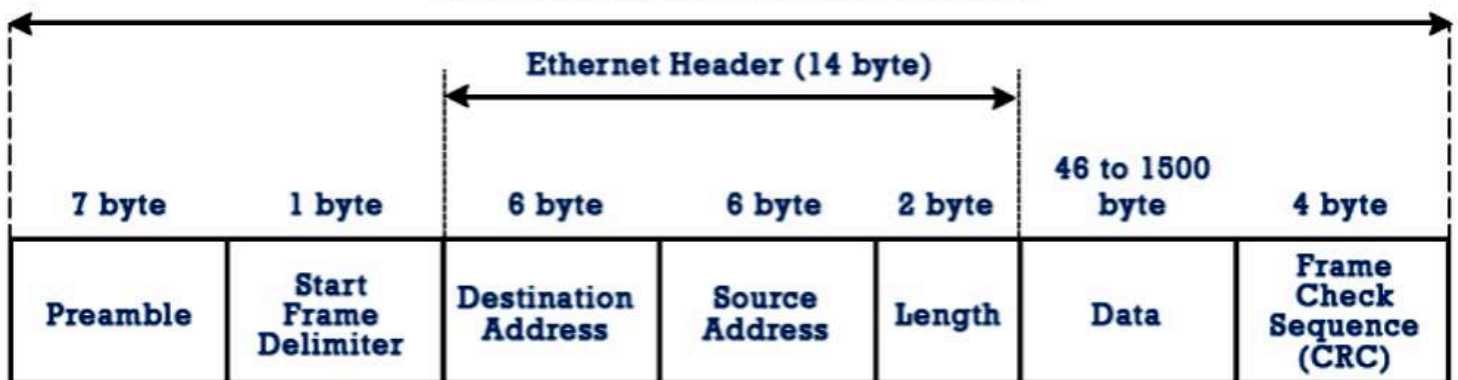


IEEE 802.3 Ethernet Frame Format



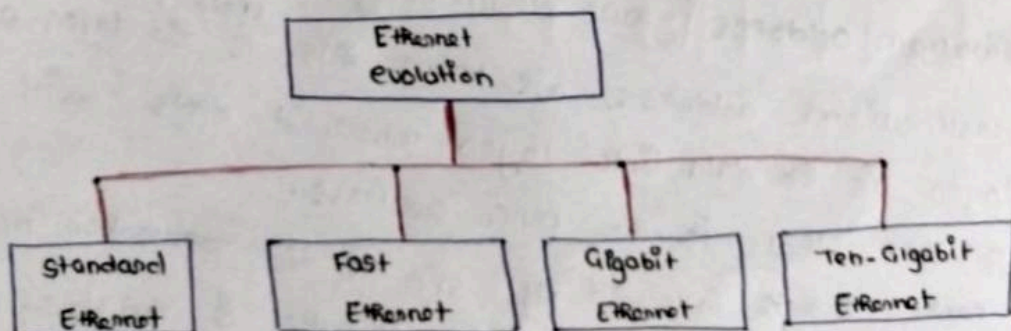
ETHERNET [ETHERNET 802.3 (Ethernet LAN)]

- One of the most widely used wired LAN Technologies.
∴ wired LAN Technologies is wifi, which is also for LAN but wifi is an example of wireless LAN Technology
- in which layer ethernet operates:-
ethernet operates in the data link layer and the physical layer.
it is working on both the layer data link layer and physical link layer.
- Ethernet belongs to the family of networking technologies that are defined in the IEEE 802.2 and 802.3 standards.
- it supports data bandwidths of 10, 100, 1000, 10,000, 40,000 and 100,000 mbps (100Gbps)
- Ethernet was evolved it was in megabits per second now its ranges up to 100 gigabits per second and more.

• Ethernet Standards:

- define layer 2 protocols and layer 1 technologies.
∴ in layer 2 protocols as an Ethernet protocol. and layer 1 it is called as an Ethernet technology
- Two separate sublayers of the data link layer to operate
- logical link control (LLC) and the MAC sublayers.

EVOLUTION OF ETHERNET



• Standard Ethernet Speed = 10mbps

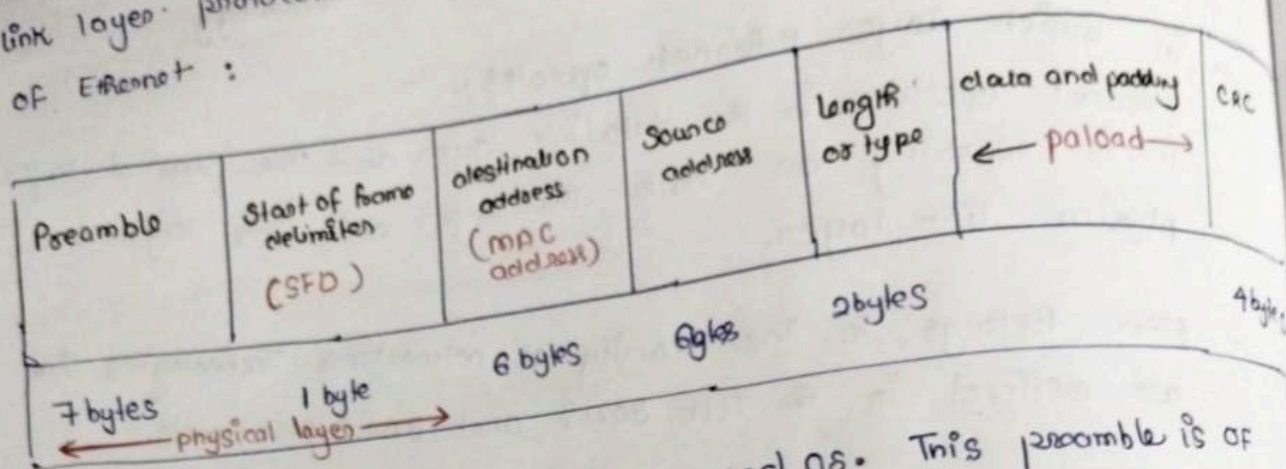
• Fast Speed = 100mbps

• Gigabit Speed = 1Gbps

• Ten-gigabit Speed = 10Gbps

© FRAME FORMAT OF ETHERNET

• Frame Format of Ethernet is somewhat similar to the previous data link layer protocols we address. we will see here frame format of Ethernet:



© Preamble: 56 bits of alternating 1s and 0s. This preamble is of 7 bytes. when we say 7 bytes it is of 56 bits of alternating ones and zeros.
 ∴ So 101010... up to 56 bits.

→ what do we need this preamble?
 ∴ This preamble is just for passing synchronization purpose.

- * 7 byte field (56 bits)
- * 101010... (up to 56 bits)
- * indicates starting of the frame
- * for bit synchronization.

© SFD: [Start frame delimiter] →

∴ This acts as a flag so this is also for synchronization purpose the flag is fixed here. The SFD is 1 byte. we have

* 1 byte field
 * set to 10101011

this 1 byte information that is 8 bits 10101011 and the main feature about this is act as a flag at the same time last two bits that is these two ones indicates the receiver that the ~~next~~ upcoming field is the destination MAC address

© Destination address [MAC destination] → sender and receiver with the same LAN.

∴ destination address we know this is the layer 2 protocol. layer is the data link layer where it deals with the physical address that is the MAC address.

next 6 bytes followed by SFD is the destination MAC address which is 6 bytes. we know 6 bytes is 48 bits. as MAC address

- ① Length or Ethertype fields :-
 which is two bytes. so length then decides the length of the data and the type of the data. means that is upper layer protocol is using so that information is placed in this path and then comes the data and the padding.

Length :- **

* 2 bytes (16 bits) field
 * 0-15 value

- ② data and padding :-
 data means whatever it has receives from the upper layer that is the network layer that information is placed here generally padding is used to make the frames a fixed size frame and finally we trailer part.

* Payload field
 * variable length field

- ③ CRC [Frame check Sequence] :-

CRC stands for cyclic check redundancy check which is used for error detection purpose. The size of the CRC in Ethernet is 4 bytes the ethernet frame has the fields preamble, start frame delimiter, The destination mac address and source address

→ The preamble and SFD is placed in the physical layer that is mention as physical layer header, actually the physical layer only has to deal with the synchronization path

* 4 byte field
 * used to detect the errors

- ④ ETHERNET FRAME Field :- MIN AND MAX LENGTH :-

MAC destination address	MAC Source address	Ethertype length PDU	minimum Payload length: 46 bytes max Payload length: 1500 bytes Data and Padding	CRC
6 bytes	6 bytes	2 bytes		
minimum frame length: 512 bits or 64 bytes				
maximum frame length: 12,144 bit or 1518 bytes				

- Ethernet is a data link layer protocol. It deals with the MAC address and obviously IP address will be in this part because in network layer it will be adding the IP address and it will be placed here and then we have length field which is of 2 bytes.

\therefore minimum payload length is 46 bytes and
 \therefore maximum payload length will be 1500 bytes, this is actually on IP packet

So minimum frame length is $46 + 6 + 6 + 2 + 4$ is 64 bytes or 512 bits,
 maximum frame length is $1500 + 6 + 6 + 2 + 4$
 = 1518 bytes or 12,144 bits.

NOTES :-

Frame Length :-

minimum :- 64 bytes (512 bits)

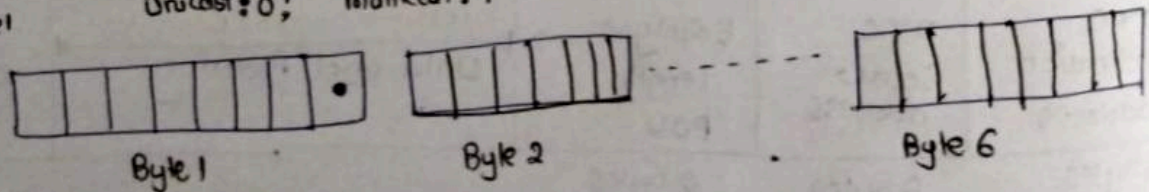
maximum :- 1518 bytes (12,144 bits).

ETHERNET ADDRESS :-

- We know MAC address is the Ethernet address.

Example : 06:01:02:01:2C:4B

Byte 1 Byte 2 Byte 3 Byte 4 Byte 5 Byte 6
 06:01:02:01:2C:4B \Leftrightarrow 6 bytes \Leftrightarrow 12 hex digits \Leftrightarrow 48 bits
 Unicast: 0; Multicast: 1



→ NOTE :

What is MAC address?

- MAC address, when a device is manufactured.
- It is assigned to NIC of the device.
- Unique identifier assigned to every device.

- low cost
- operates at physical & data link layer
- Ethernet is one of the standard LAN technologies used for building wired LANs.
- It is defined under IEEE 802.3

© ADVANTAGES OF USING Ethernet:-

- It is simple to understand and implement
- Its maintenance is easy.
- It is cheap.