Computer Networks

Course code: CSE3151

IEEE 802.3 and Ethernet

- Ethernet is a set of technologies and protocols that are used primarily **in LANs**.

- It was first standardized in 1980s by IEEE 802.3 standard.

- IEEE 802.3 defines the physical layer and the medium access control (MAC) sub-layer of the data link layer for wired Ethernet networks.

- Ethernet is classified into two categories: classic Ethernet and switched Ethernet.

- 802.3 also defines LAN access method using **CSMA/CD**.

- 802.3 is a technology that supports the IEEE 802.1 network architecture.

IEEE 802.3 and Ethernet

Classic Ethernet :

- **Classic Ethernet** is the original form of Ethernet that provides **data rates between 3 to 10 Mbps**.

- The varieties are commonly referred as 10BASE-X.

- Here, 10 is the maximum throughput, i.e. 10 Mbps, BASE denoted use of baseband transmission, and X is the type of medium used.

- Most varieties of classic Ethernet have become obsolete in present communication scenario.

IEEE 802.3 and Ethernet

Switched Ethernet :

- A **switched Ethernet** uses switches to connect to the stations in the LAN.

- It **replaces the repeaters** used in classic Ethernet and **allows full bandwidth utilization**.

Versions of IEEE 802.3 protocol

- There are a number of versions of IEEE 802.3 protocol. The most popular ones are -
- **IEEE 802.3**: This was the original standard given for 10BASE-5. It used a thick single coaxial cable into which a connection can be tapped by drilling into the cable to the core. Here, 10 is the maximum throughput, i.e. 10 Mbps, BASE denoted use of baseband transmission, and 5 refers to the maximum segment length of 500m.
- **IEEE 802.3a**: This gave the standard for thin coax (10BASE-2), which is a thinner variety where the segments of **coaxial cables** are connected by BNC connectors. The 2 refers to the maximum segment length of about 200m (185m to be precise).
- **IEEE 802.3i**: This gave the standard for twisted pair (10BASE-T) that uses unshielded **twisted pair** (UTP) copper wires as physical layer medium. The further variations were given by IEEE 802.3u for 100BASE-TX, 100BASE-T4 and 100BASE-FX.
- **IEEE 802.3i**: This gave the standard for Ethernet over Fiber (10BASE-F) that uses fiber optic cables as medium of transmission.

Frame Format of Classic Ethernet and IEEE 802.3

The main fields of a frame of classic Ethernet are -

- **Preamble**: It is the starting field that provides alert and timing pulse for transmission. In case of classic Ethernet it is an 8 byte field and in case of IEEE 802.3 it is of 7 bytes.

- **Start of Frame Delimiter**: It is a 1 byte field in a IEEE 802.3 frame that contains an alternating pattern of ones and zeros ending with two ones.

- **Destination Address**: It is a 6 byte field containing physical address of destination stations.

- **Source Address**: It is a 6 byte field containing the physical address of the sending station.

- **Length**: It a 7 bytes field that stores the number of bytes in the data field.

Frame Format of Classic Ethernet and IEEE 802.3

- **Data**: This is a variable sized field carries the data from the upper layers. The maximum size of data field is **1500 bytes**.

- **Padding**: This is added to the data **to bring its length to the minimum requirement of 46 bytes**.

- **CRC**: CRC stands for **cyclic redundancy check**. It contains the error detection information.

Classic Ethernet Frame Format

Preamble	Destination Address	Source Address	Data + Padding	CRC
8 bytes	6 bytes	6 bytes	Minimum : 46 bytes / Maximum 1500 bytes	4 bytes

IEEE 802.3 Frame Format

Preamble	SOF	Destination Address	Source Address	Data + Padding	CRC
7 bytes	1 byte	6 bytes	6 bytes	Minimum : 46 bytes / Maximum 1500 bytes	4 bytes