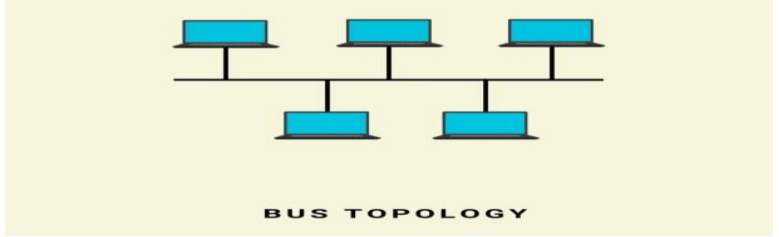
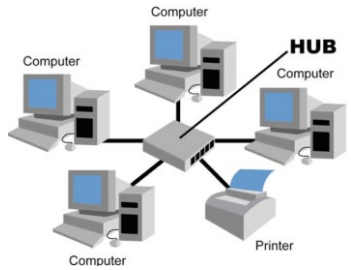
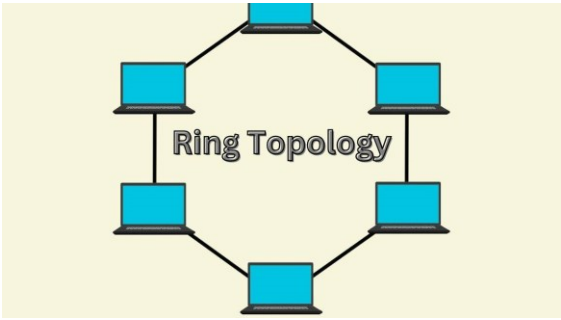
Local Area Network

- **Local Area Networks**
  - Small geographical areas (5 KM)
  - High Reliability
  - High data rate (10 Mbps – 10 Gbps)
  - Privately owned
- **Parameters that characterizes a LAN**
  - Topology
  - Transmission Media
  - Medium access Control Technique

- Topology defines how nodes/stations are connected
- Typical LAN topologies
- **Bus/Tree (Shared Media)**
  - All nodes are connected to a **common medium**
- **Star**
  - All nodes are connected to a **central node (Hub/switch)**
- **Ring**
  - Nodes form a ring by point-to-point links to adjacent neighbours.



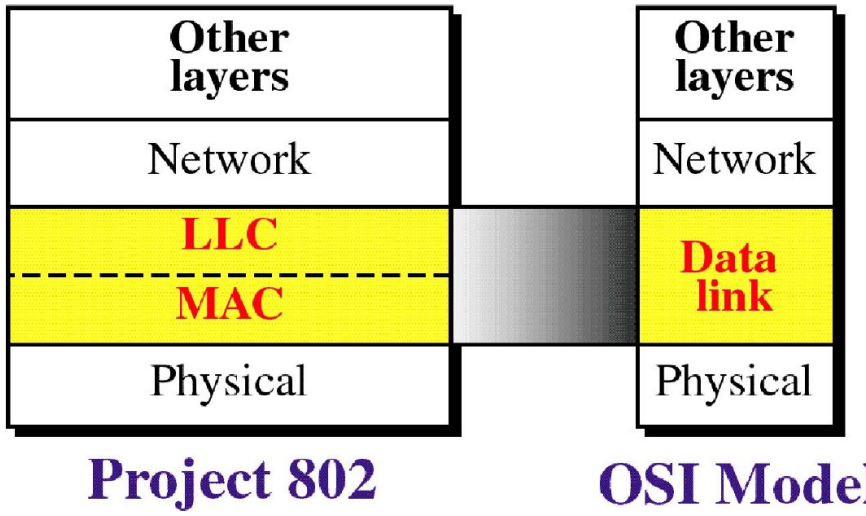




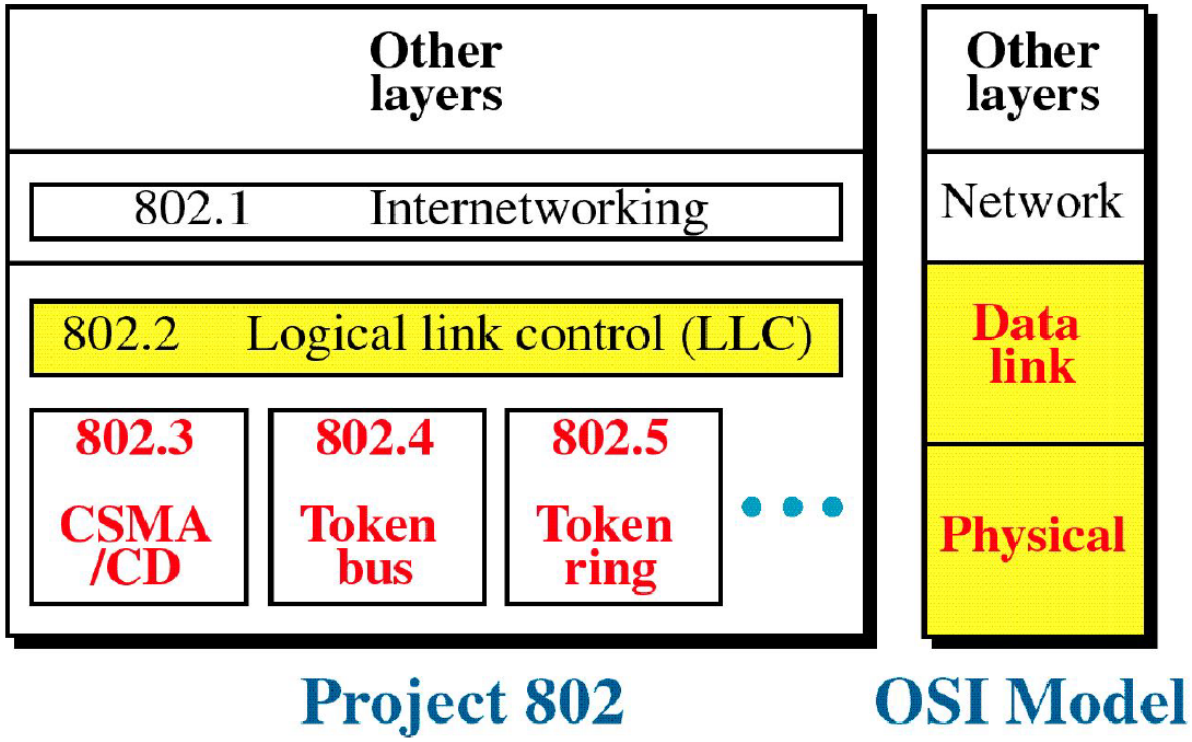
- **Transmission Media**
  - Twisted pair, Coaxial Cable, Optical Fiber, Wireless
- **Medium Access Control**
  - CSMA/CD
  - Token passing
  - CSMA/CA
  - FDMA, TDMA, CDMA

Topology	Transmission Media
(1) BUS	Coaxial
(2) Ring	Twisted Pair, Optical Fiber (Coaxial cable if necessary)
(3) Star	Twisted Pair, Optical Fiber

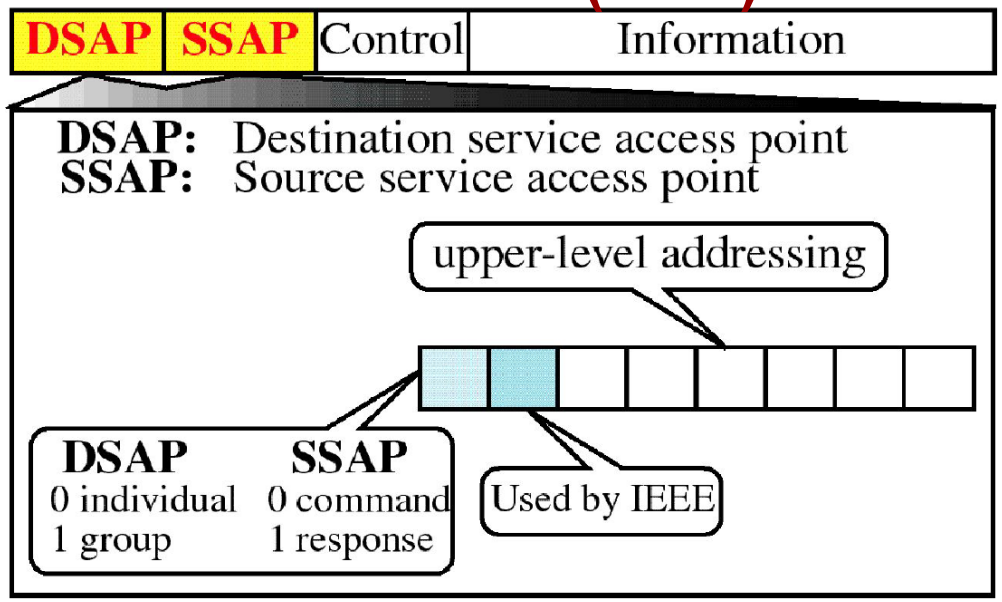
OSI Model and Project 802

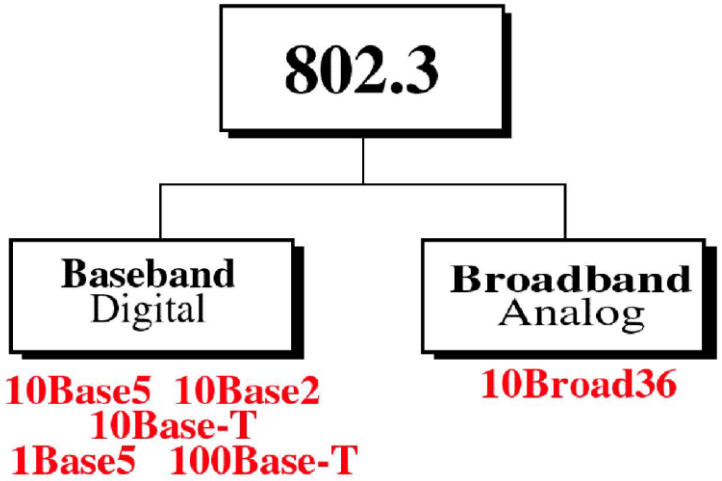


OSI Model and Project 802

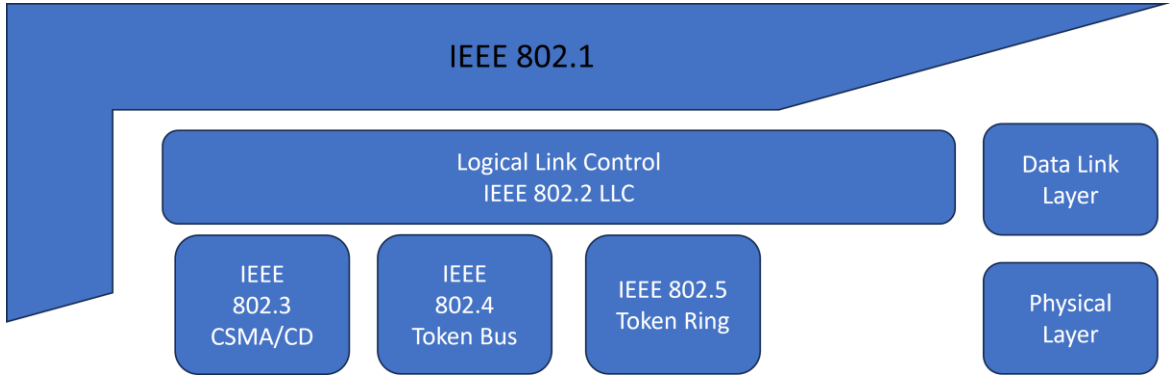


Protocol Data Unit (PDU) Format





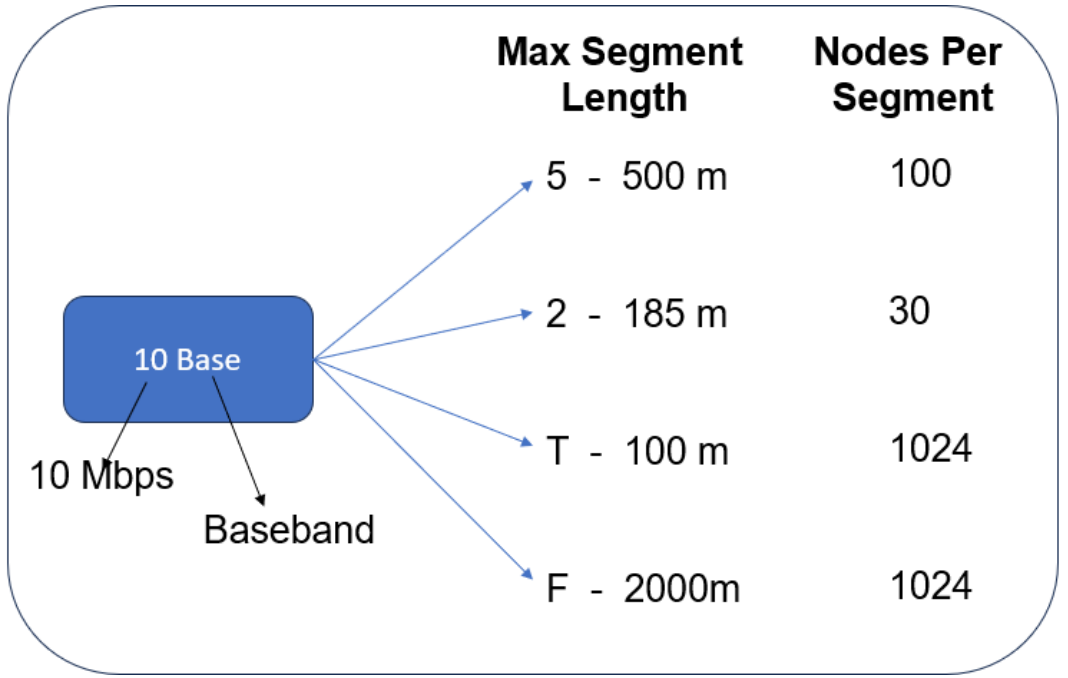
Basic Concepts



- **Physical Layer**
  - Encoding and decoding
  - Collision detection
  - Carrier sensing
  - Transmission and Receipt
- **Data Link Layer**
  - Station interface
  - Data Encapsulation/Decapsulation
  - Link Management
  - Collision Management

- **Signalling:**
  - Manchester in Baseband
  - Differential PSK in broadband

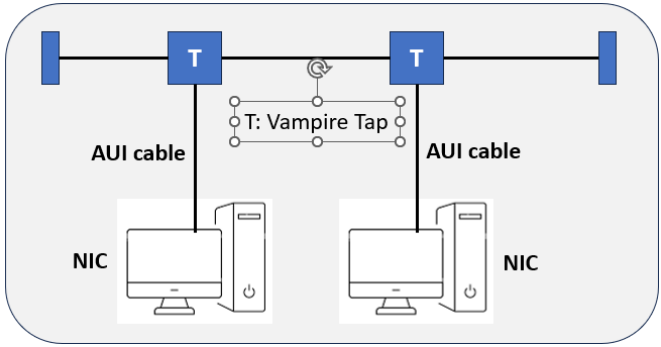
- Physical Layer
  - 10Base5 → Thickwire coaxial
  - 10Base2 → Thinwire coaxial (cheapernet)
  - 10BaseT → Twisted Pair
  - 10BaseF → Fiber Optic
  - 10Broad36 → Coaxial

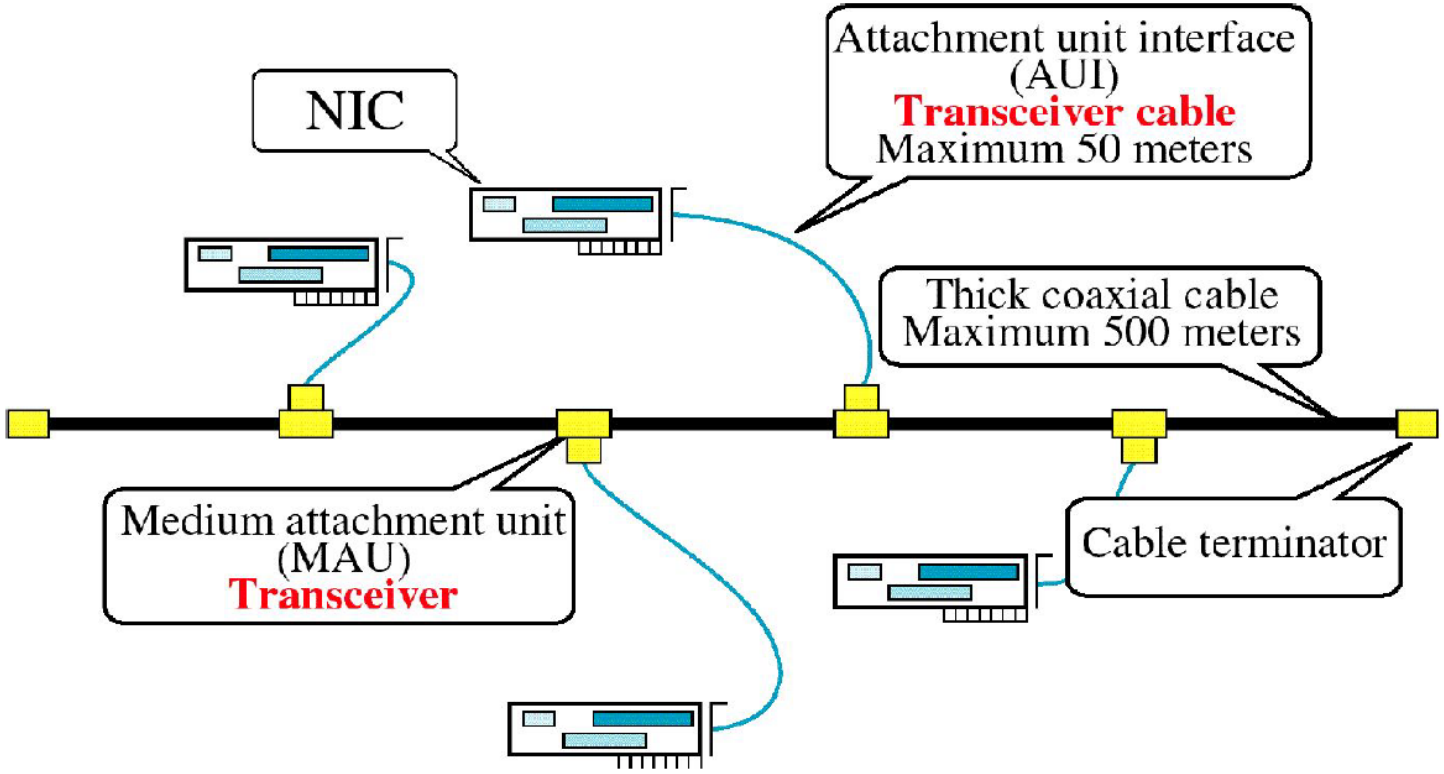


10Base5

- Supports 10 Mbps baseband transmission
- The standard specifies 0.5 inch coaxial cable, known as yellow cable or thick Ethernet
- Each cable segment can be maximum 500 meters long
- Up to a maximum of 5 cable segments can be connected using repeaters, with maximum length 2500 meters
- At most 1024 stations per Ethernet network is allowed

- **Some Characteristics:**
  - Used for backbone networks
  - Tap: Cable need not be cut
  - Transceiver: send/receive, collision detection, electronic isolation
  - AUI: Attachment Unit Interface

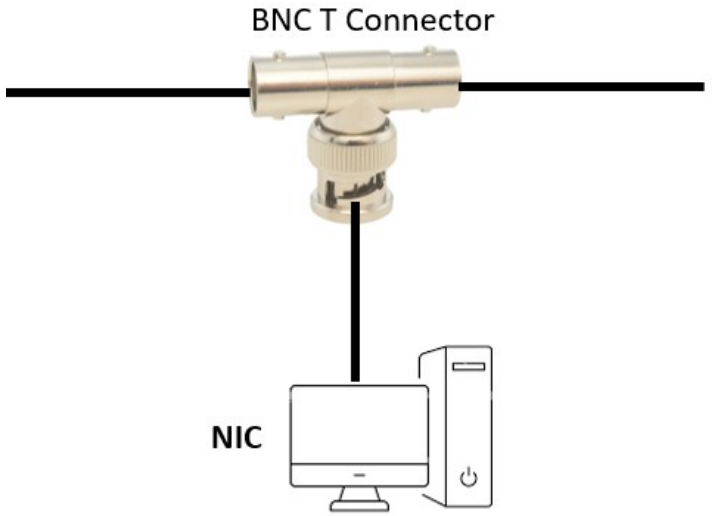


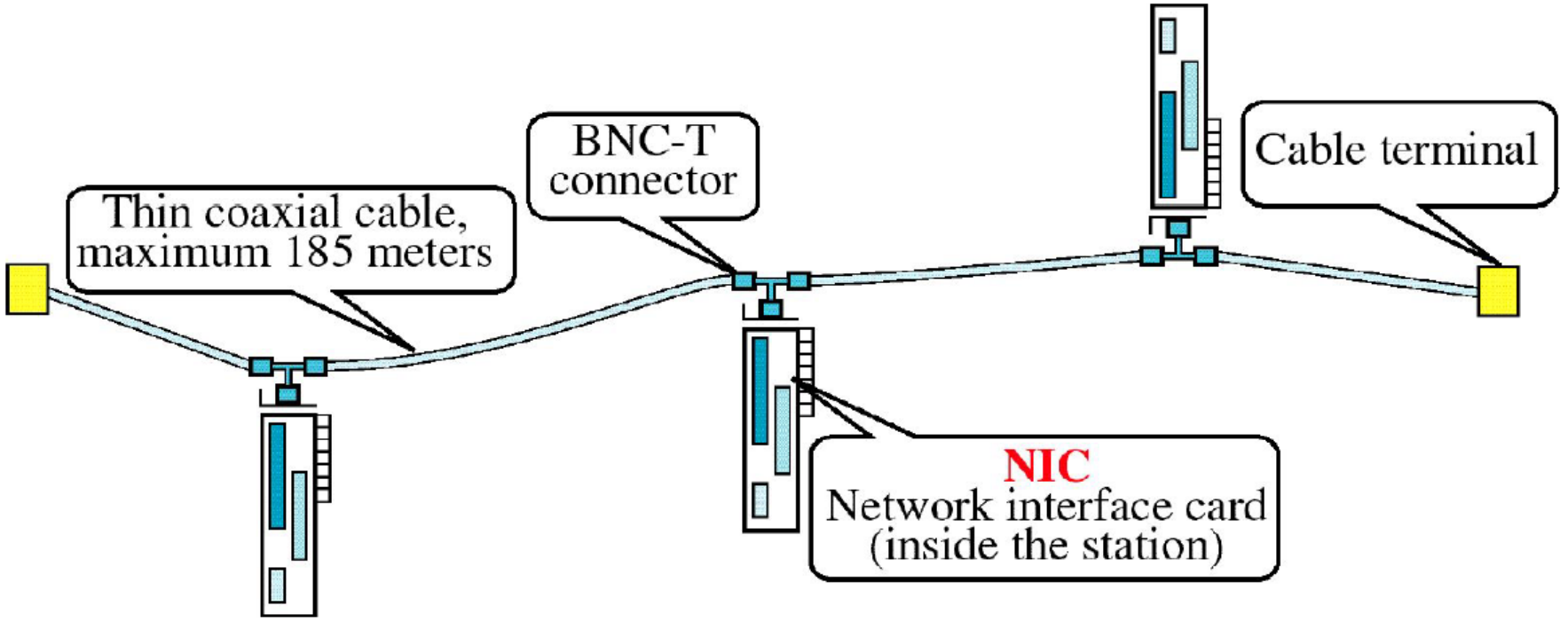


10Base2

- Also supports 10 Mbps baseband transmission
- The standard specifies 0.25 inch coaxial cable known as cheapernet or thin Ethernet
- Each cable segment can be maximum 185 m long
- Up to a maximum of 5 cable segments can be connected using repeaters, with maximum length of 925 meters.

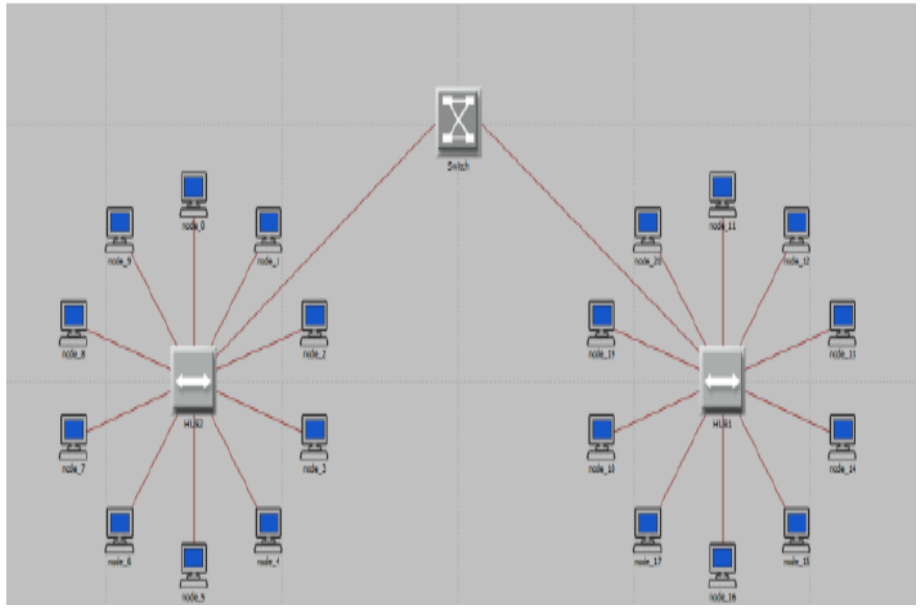
- **Some Characteristics:**
  - Use for office LAN / departmental LAN
  - BNC connector
  - No drop cable

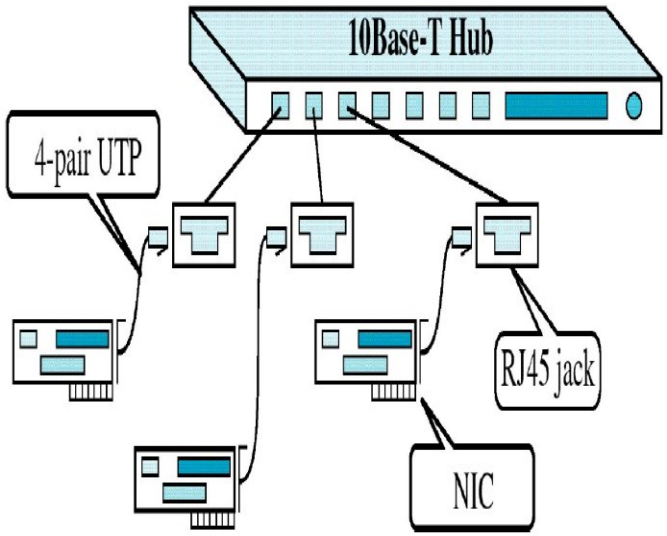




10BaseT

- Supports 10 Mbps baseband transmission
- The standard specifies the 24AWG Unshielded Twisted Pair (UTP)
- Both Cat-3 and Cat-5 cables may be used
- A HUB functions as a repeater
- Stations connect to the hub with RJ45 connector
- Maximum segment length is 100 meters
- Easy to maintain and diagnose





10BaseF

- Allows long distance connections using optical fiber
- 10BaseFP → A passive-star topology, up to 1 km link
- 10BaseFL → An asynchronous point-to-point link up to 2 Km
- 10BaseFB → A synchronous point-to-point link, up to 2 km with 15 cascaded repeaters

10BaseF

Ethernet Frame Format

7	1	6	6	6	46-1500	4	
PA	SFD	DA	SA	LEN	LLC PDU	PAD	FCS

IEEE 802.3

8	6	6	2	46-1500	4	
PA	DA	SA	Type	DATA	PAD	FCS

Ethernet

PA: Preamble ---- 10101010s for synchronization

SFD: Start of frame delimeter --- 10101011 to start frame

DA: Destination MAC address

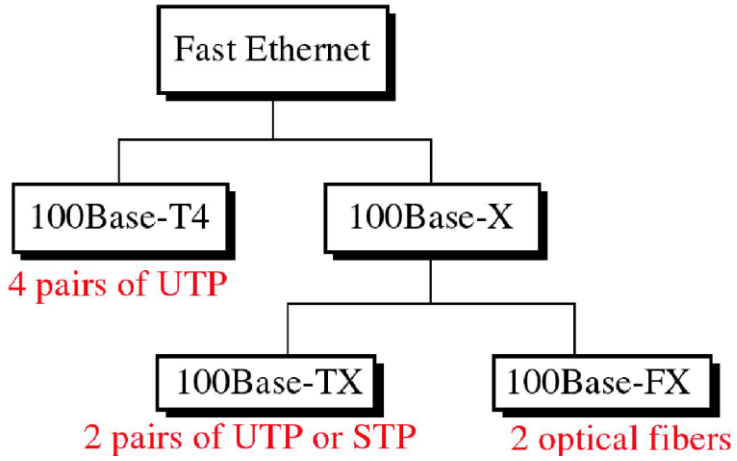
SA: Source MAC Address

LEN: Length => Number of data bytes

Type: Identify the higher-level protocol

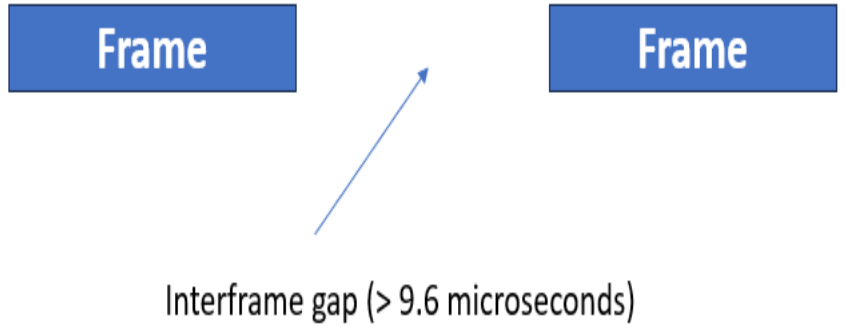
LLC PDU + Pad: minimum 46 bytes, maximum 1500 bytes

FCS: Frame Check Sequence => CRC-32



Inter-frame Gap

- Mandatory 9.6 microsecond interval between two frames
- That is, 96 bit-time delays provided between frame transmissions
- To enable other stations wishing to transmit to take over at this time.



Ethernet Segments