

LE 517 Data Communications and Networks

Week 10:- Local Area Network

By

Dr. Piya Techateerawat

Network Topology

- Bus Topology
- Ring Topology
- Star Topology
- Fully Connected Topology

(Please refer to the 1st lecture)

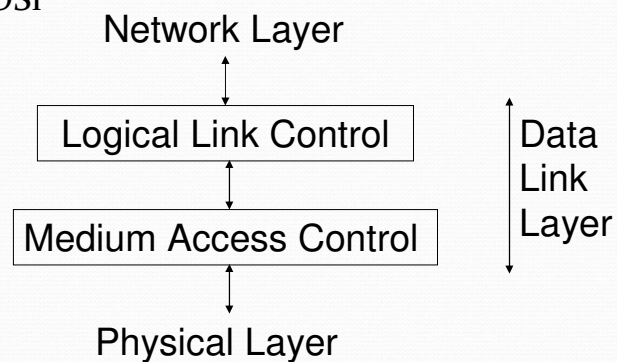
- Combined Topology

Local Area Network

- **IEEE 802.3:- Ethernet**
 - Ethernet Components
 - Cable Specifications
 - Frame Format
- **IEEE 802.5:- Token Ring**
 - Token and Frame Format
 - Reserving and Claiming Tokens
 - Fiber Distributed Data Interface (FDDI)

IEEE 802.3:- Ethernet

- Relation to OSI



Local Area Network

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 - **Ethernet Components**
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IEEE 802.3:- Ethernet

- Transceiver Cable
 - 5 Twisted Pairs
 - 2 Pairs:- Send Data/Control
 - 2 Pairs:- Receive Data/Control
 - 1 Pair:- Power & Ground
- Support Multiple Devices (Multiplexers)

IEEE 802.3:- Ethernet

Sequence of Activities:-

1. PC sends packet information to interface card
2. Interface creates frame and wait signal from transceiver
3. Transceiver detects quiet, Frame is passing to the medium.
(Operate with protocol:- CD, backoff, ...)
4. At receiver, transceiver detects frame and pass to interface
5. Interface has CRC check and pass to PC.
6. PC validate data and pass to higher layer.

Local Area Network

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IEEE 802.3:- Ethernet

Cable Specifications

Type	Detail	Max Dist	Max Rate
• 10 Base 5	50 ohm 10 mm diameter	500 m	10 Mbps
• 10 Base 2	50 ohm 5 mm diameter	185	10 Mbps
• 10 Broad 36	75 ohm coax cable	3600	10 Mbps
• 1 Base 5	unshielded twisted pair	250	1 Mbps
• 10 Base-T	unshielded twisted pair	100	10 Mbps

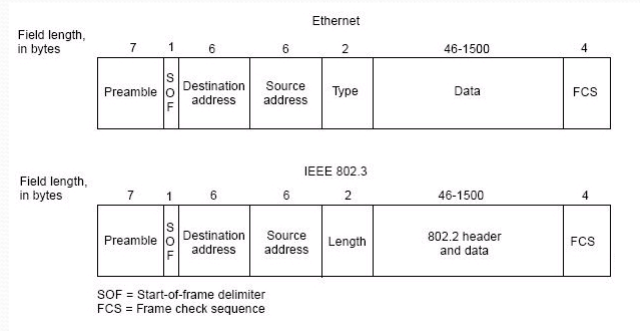
Repeater

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IEEE 802.3:- Ethernet

- Frame Format



IEEE 802.3:- Ethernet

- Utilization

- $U = 100 * (F/R) / (F/R + T * C)$
- U= Percent Utilization
- R = Transmission Rate
- F = Number of bits in a frame
- T = Slot Time
- C = Number of Contention Intervals = $(1-1/N)^{1-N} - 1$
- N = Number stations

IEEE 802.3:- Ethernet

- 802.3 LAN (10 Base 5) with 500 Stations connected to five 500-meter segments. The data rate is 10 Mbps, and the slot time is 51.2 μ sec (standard). If all stations transmit with equal probability, what is the channel utilization using a frame size of 512 bytes ?
- Ans: 82 % how to do this ?

IEEE 802.3:- Ethernet

- $F = 512 * 8 = 4096$ bits
- $F/R = 4096 \text{ bits}/10\text{Mbps} = 410 \mu\text{sec}$
- $C = (1-1/N)^{1-N} - 1 = 1.716$ where $N = 500$
- $U = 100 * 410 / (410 + 51.2 * 1.716) = 82\%$

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IEEE 802.5:- Token Ring

Connected as Ring Topology

Interface pass data to Ring Contention.

Ring Contention is handled through a token.

When token arrives:-

If have nothing to send, pass the token.

If have something, claim token remove from ring and then send data frame.

Each station will check destination data until arrive receiver.

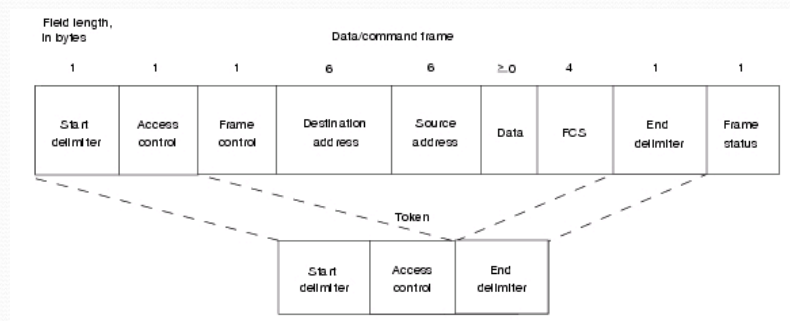
Receiver pick data frame, generate new token and placing in the ring.

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IEEE 802.5:- Token Ring

- Token and Frame Format



Local Area Network

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IEEE 802.5:- Token Ring

- Reserving and Claiming Tokens
 - What if Priority Data ? QoS ?
 - Using Priority bits in AC (Access Control)
 - If lower priority cannot claim the token.
 - Who define token's priority ?
 - Reservation system.

IEEE 802.5:- Token Ring

- Reserving and Claiming Tokens

Only stations with a priority equal to or higher than the priority value contained in a token can seize that token. After the token is seized and changed to an information frame, only stations with a priority value higher than that of the transmitting station can reserve the token for the next pass around the network. When the next token is generated, it includes the higher priority of the reserving station. Stations that raise a token's priority level must reinstate the previous priority after their transmission is complete.

IEEE 802.5:- Token Ring

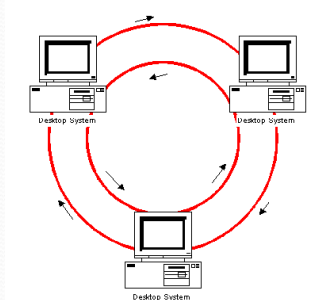
- What if system is crashed/noise ?
 - Note: Unable drain frame called orphan frame
 - Discussion 15-20 design the solution.

Local Area Network

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 - **Fiber Distributed Data Interface (FDDI)**

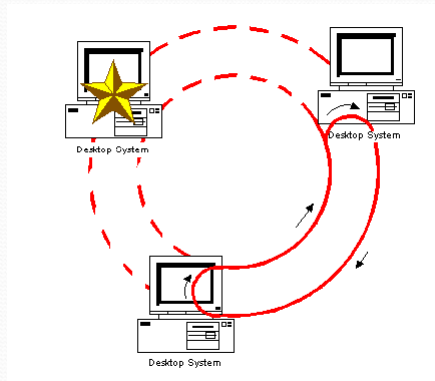
IEEE 802.5:- Token Ring

- Fiber Distributed Data Interface (FDDI)
 - Informal name:- Token Ring over Fiber
- Using 2 rings instead of 1.



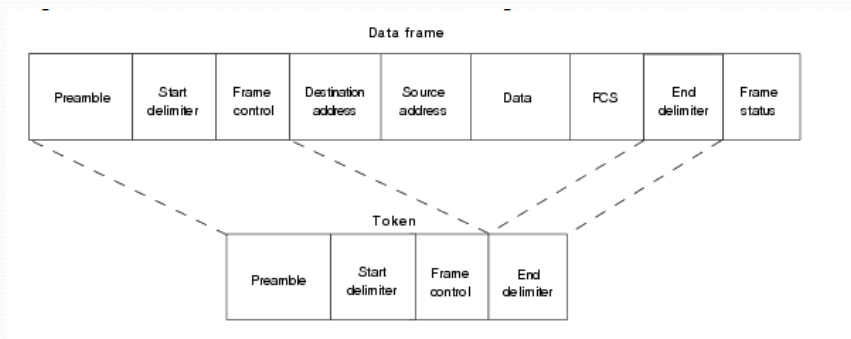
IEEE 802.5:- Token Ring

- Fiber Distributed Data Interface (FDDI)
 - In case that one station is down



IEEE 802.5:- Token Ring

- FDDI Frame

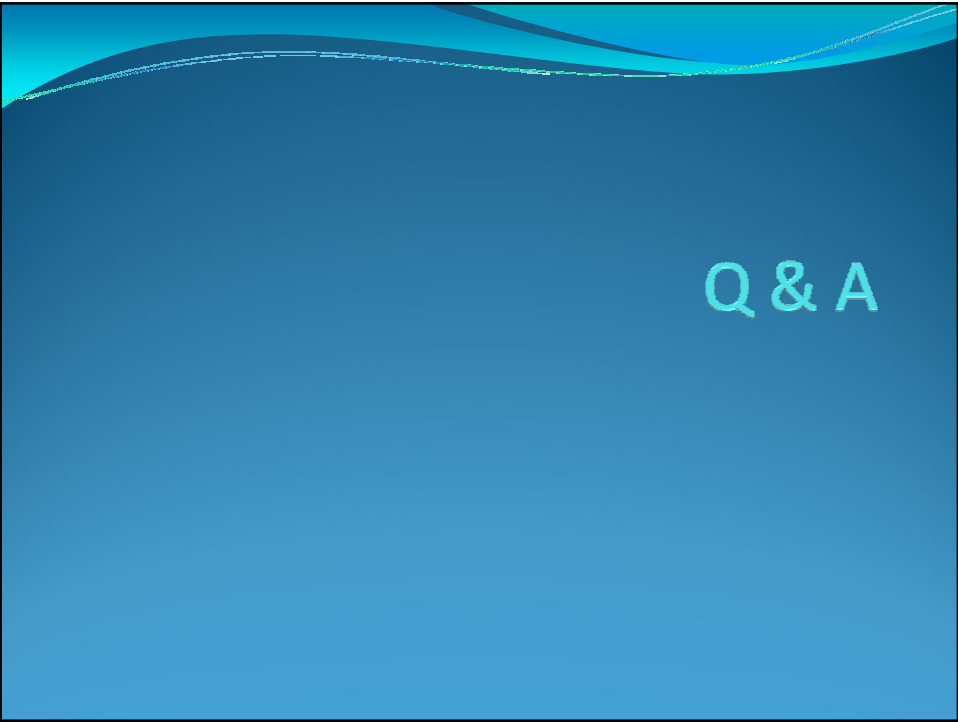


IEEE 802.5:- Token Ring

- Slotted Ring
 - It uses slot similar to token but act as an empty frame
 - There are more than one slot in the ring.
 - If slot arrive and empty the station filling data in slot
 - Station cannot use the same slot to avoid monopolizing.
- Efficiency
 - $U = 100 * \frac{\text{(time to send a frame)}}{\text{(time to send a frame + time to send a token)}}$

Reference

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Q & A