

## IEEE 802.4-Token Bus

BLM3051  
Data  
Communication

Week 10

- In worst-case scenarios, some computers seem to wait too long to transmit.
  - General Motors
  - 1980s
- Bus and Tree Topology
- Each computer recognizes the computers on its right and left.
- After the logical ring is established, the computer with the highest number will transmit.
- Gives the control frame (Token) to its neighbor
- Collision is impossible
- New computers can be added or removed.
- IEEE 802.4 MAC protocol is quite complex
  - Each computer included in the system must keep up to 10 different time information and
  - Evaluate approximately 24 status information.
- 75Ω Coaxial Cable
- 3 Different Modulation Techniques are used
  - Phase continuous frequency shift keying
  - Phase coherent frequency shift keying
  - Multilevel duobinary amplitude modulated shift keying
- Max speeds: 1,5 ve 10 Mbps

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## IEEE 802.4-Token Bus - Framing

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- SD: Starting Delimiter
- FC: Frame Control
- ED: Ending Delimiter
- Frame size is almost 5 times bigger than 802.3.
- Priority mechanism:
  - 4 levels priority: 0, 2, 4, 6

|          |       |       |           |           |            |        |       |
|----------|-------|-------|-----------|-----------|------------|--------|-------|
| 1 byte   | 1byte | 1byte | 2-6 byte  | 2-6 byte  | 0-8182     | 4byte. | 1byte |
| Preamble | SD    | FC    | Dest.Addr | Src.Addr. | Data. Unit | CRC    | ED    |

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## IEEE 802.5-Token Ring

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- It uses a technique based on the principle that the computers to be transmitted send their data sequentially.
- Token size: 3 bytes (even if the line is empty)
- Token Re-Sizing
- Physical Length of a Bit
- Example:
  - Transmission speed: R Mbps
  - Bit extraction rate:  $1/R \mu\text{sec}$
  - Signal propagation rate: SP m/ $\mu\text{sec}$
  - Every bit occupies on ring: SP/R m
- What is the number of bits (b) that can be simultaneously on an L-meter ring?

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## IEEE 802.5-Token Ring

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- Example: SP: 200m/ $\mu\text{sec}$
- R: 1 Mbps
- L: 1000m
- b: ?
- $b = L * R / SP$

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IEEE 802.5-Token Ring - Priority and Reservation

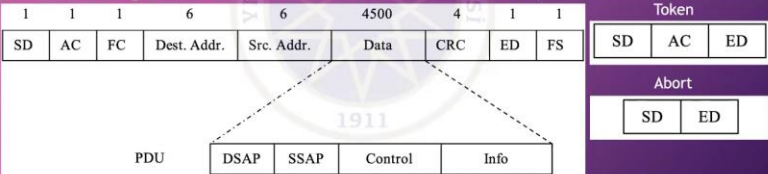
- For reservation: AC (Access Control) is used.
- Time Limitation
- Monitor Station
  - No Token Frame
  - Orphan Frame



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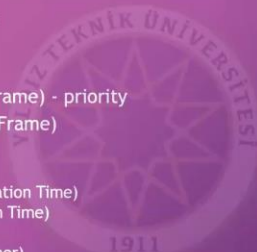
IEEE 802.5-Token Ring - Framing

- NIC (Network Interface Card) Addresses (6-byte)
- Differential Manchester Coding
- Max speeds are 4 and 16 Mbps (IEEE 802.5t: 100 Mbps, IEEE 802.5v: 1 Gbps)
- First sending bit is MSB (different from 802.3 and 802.4)



FDDI (Fiber Distributed Data Interface)

- ANSI and ITU-U standart
- Fiber optics: 100 Mbps
- Token
- S-Frame (Synchronous Frame) - priority
- A-Frame (Asynchronous Frame)
- Timing Register
  - SA (Synch. Allocation)
  - TTRT (Target Token Rotation Time)
  - AMT (Absolute Maximum Time)
- TRT (Token Rotation Timer)
- THT (Token Holding Time)

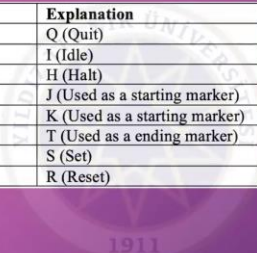


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FDDI (Fiber Distributed Data Interface) - Con't

- 4B/5B Coding
  - Using NRZ-I

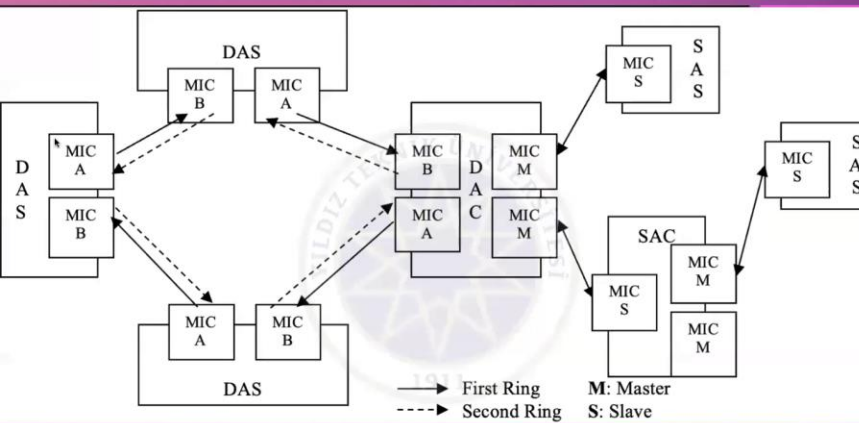
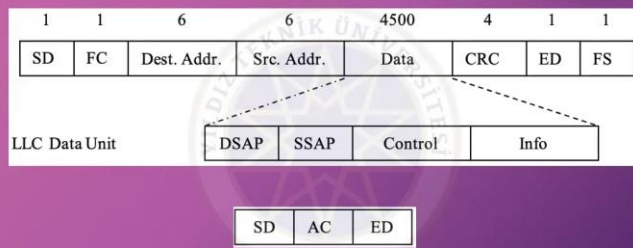
| 5 Bit | Explanation                   | 4 Bit | 5 Bit | 4 Bit | 5 Bit |
|-------|-------------------------------|-------|-------|-------|-------|
| 00000 | Q (Quit)                      | 0000  | 11110 | 1000  | 10010 |
| 11111 | I (Idle)                      | 0001  | 01001 | 1001  | 10011 |
| 00100 | H (Halt)                      | 0010  | 10100 | 1010  | 10110 |
| 11000 | J (Used as a starting marker) | 0011  | 10101 | 1011  | 10111 |
| 10001 | K (Used as a starting marker) | 0100  | 01010 | 1100  | 11010 |
| 01101 | T (Used as a ending marker)   | 0101  | 01011 | 1101  | 11011 |
| 11001 | S (Set)                       | 0110  | 01110 | 1110  | 11100 |
| 00111 | R (Reset)                     | 0111  | 01111 | 1111  | 11101 |



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