Token Ring

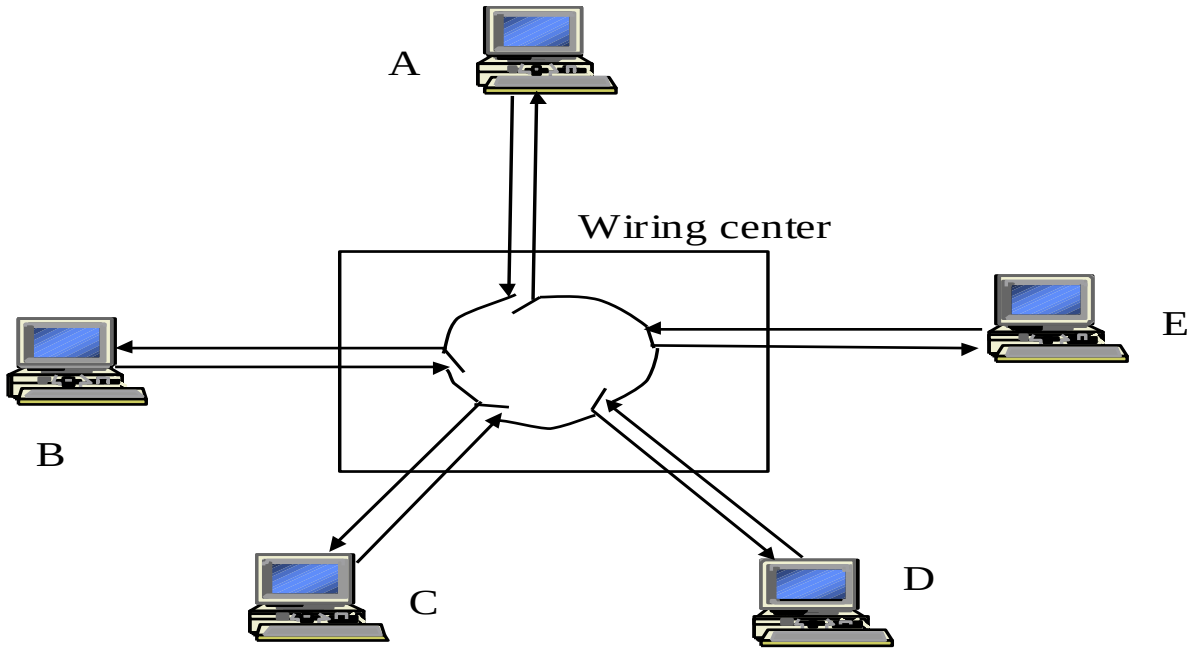
IEEE 802.5 and Token Ring

Token ring :: a number of stations connected by transmission links in a ring topology. Information flows *in one direction along the ring* from source to destination and back to source.

Medium access control is provided by a small frame, **the token**, that circulates around the ring when all stations are idle. ***Only*** *the station possessing the token is allowed to transmit at any given time.*

- When a station wishes to transmit, it must wait for token to pass by and *seize (Catch/ Hold)the token.*
- Frame circles the ring and is removed by the transmitting station.
- Each station interrogates (ask)passing frame, if destined (put-up)for station, it copies the frame into local buffer. *{Normally, there is a one bit delay as the frame passes through a station.}*

Token Ring Network with star topology:-



Re-inserting token on the ring

Choices:

1. After station has completed transmission of the frame.
2. After leading edge of transmitted frame has returned to the sending station

IEEE 802.5 Token Ring

- Maximum number of stations is 250.
- Waits for last byte of frame to arrive before reinserting token on ring *{new token after received}*.

Token Ring

- Under light load – delay is added due to waiting for the token.
- Under heavy load – ring is *“round-robin” (token is pass around to all workstations and return to first workstation to begin another cycle.)*
- The ring must be long enough to hold the complete token.
- Advantages – fair access

Token Maintenance Issues

What can go wrong?

- Loss of token (no token circulating)
- Duplication of token (mistakes)

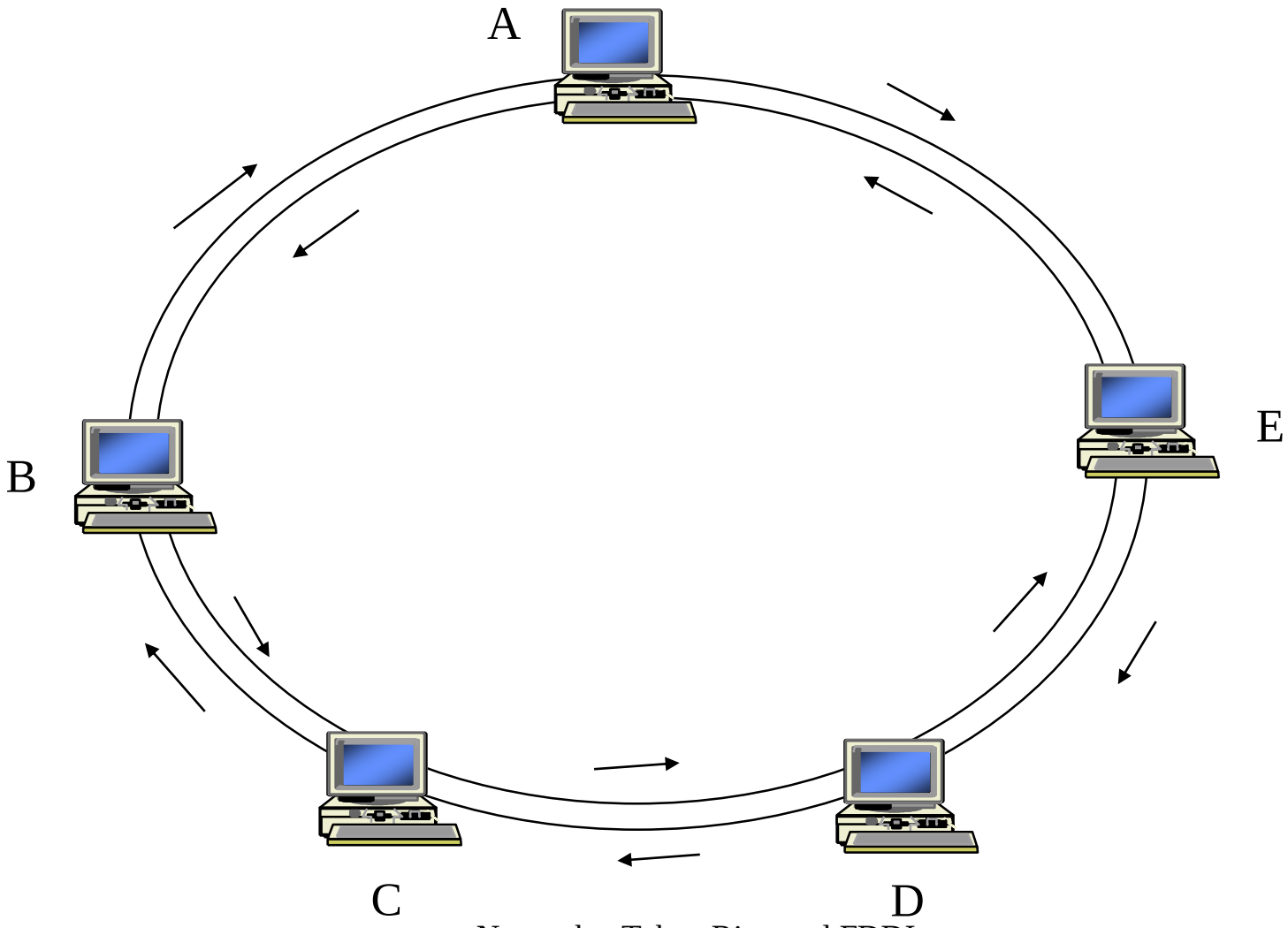
➔The need to designate one station as the *active ring monitor*.

- Persistently (acutely) circulating frame

Fiber Distributed Data Interface (FDDI)

- FDDI uses a ring topology of multimode or single mode optical fiber transmission links operating at 100 Mbps to span (limit) up to 200 kms and permits up to 500 stations.
- *Employs dual counter-rotating rings.*
- In FDDI, token is absorbed (busy) by station and released as soon as it completes the frame transmission *{release after transmission}.*

FDDI Token Ring



FDDI Repair:-

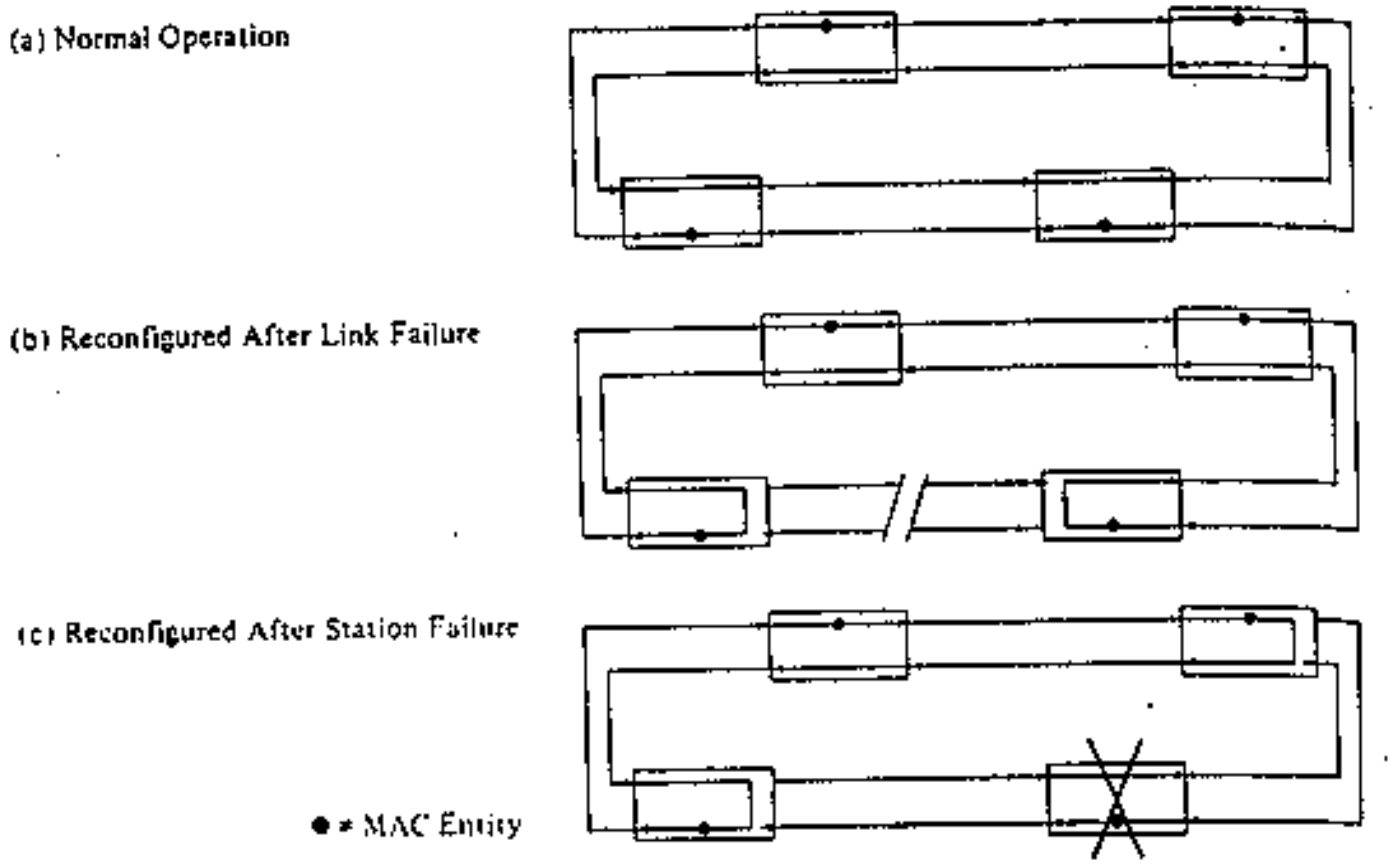


FIGURE 6.7 FDDI Dual-Ring Operation

FDDI

- To accommodate a mixture of stream and burst(describe something sudden) traffic, FDDI is designed to handle two types of traffic:
  - Synchronous frames that typically have tighter (hard) delay requirements (e.g., voice and video)
  - Asynchronous frames have greater delay tolerances (sufferance) (e.g., data traffic)

- FDDI uses TTRT (Target Token Rotation Time) to ensure that token rotation time is less than some value.

- Instead each ring interface has its own local clock.
  - Outgoing data is transmitted using this clock.
  - Incoming data is received using a clock that is frequency to the transitions in the incoming bit stream.

FDDI Data Encoding:-

- Data is encoded using a **4B/5B encoder.**
  - For each four bits of data transmitted, a corresponding 5-bit **codeword** is generated by the encoder.

- The symbols are then shifted out through a NRZI (non-return-to-zero-inverted) encoder which produces a signal transition whenever a 1 bit is being transmitted and no transition when a 0 bit is transmitted ➔ *guarantees a signal transition at least every two bits.*

Differences between 802.5 and FDDI

Token Ring

- Shielded twisted pair
- 4, 16 Mbps
- No reliability specified

- Centralized clock
- Priority and Reservation bits
- New token *after receive*

FDDI

- Optical Fiber
- 100 Mbps
- Reliability specified (dual ring)
- Distributed clocking
- Timed Token Rotation Time
- New token *after transmit*