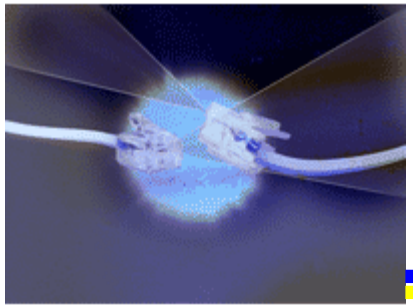
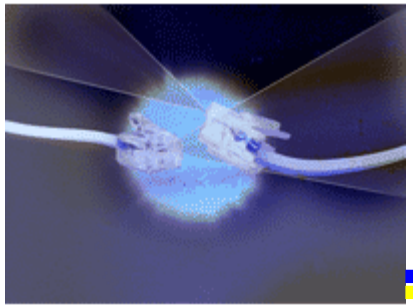


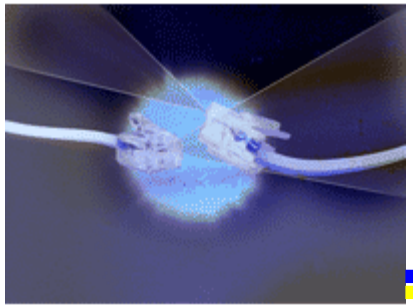
FDDI

- Fiber Distributed Data Interface – newer type of token ring
  - Uses optical fiber instead of copper wire
- Dual rings allow transmission of data in opposite directions
  - Second ring not normally used
  - If primary ring fails, nodes on either side of ring loop back on the secondary fiber (Fig. 2.34)



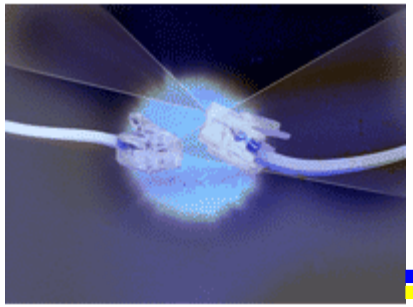
FDDI (cont.)

- Simpler *single-attachment stations* (SAS) allowed – concentrator used to attach them to ring
  - Concentrator includes *optical bypass switches* to isolate failed nodes
- Each station buffers between 9 and 80 bits
  - Stations can have different buffer sizes
  - Station can start sending before buffer is full



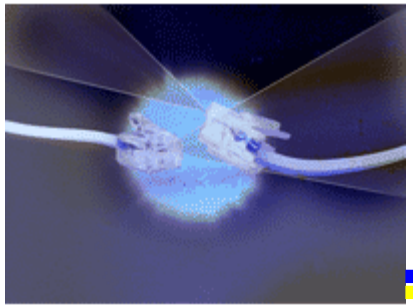
Physical Properties

- Data rate 100 Mbps
- Uses 4B/5B encoding
- Limited to 500 stations per network
- Max. 2 km between stations
- Total limit of 200 km of fiber
  - Limits total distance between stations to 100 km
- Can also run on coax or twisted pair



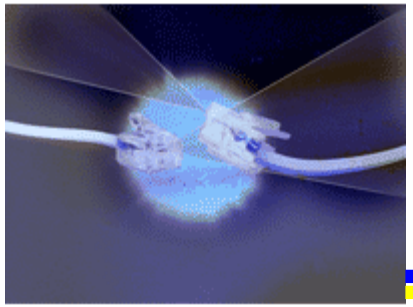
Timed Token Algorithm

- Define *target token rotation time* (TTRT) that all nodes agree to meet
  - Gives upper bound on TRT
  - Each node measures TRT – if token arrival is outside TTRT, node does not transmit data
  - If token arrival is early, node can hold token to delay it
- This can still lead to starvation for some nodes



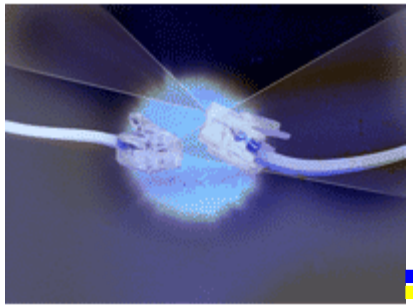
Timed Token Algorithm (cont.)

- To address, give frames one of two priorities, *synchronous* or *asynchronous*
  - Node can send synchronous frames even if token arrives late
  - But … total amount of synchronous data that can be sent in one token rotation is limited. Can only add one additional TTRT's delay



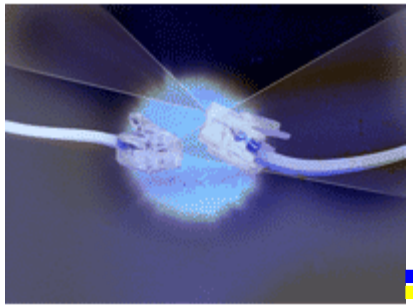
Token Maintenance

- All nodes monitor to make sure token still present on ring
  - If a node hasn't seen a frame or token for too long, it sends a *claim* frame
  - Claim includes a bid for the TTRT the node needs to meet any app. timing constraints
  - If claim makes it back to sender, sender knows bid was lowest, and the node has the token

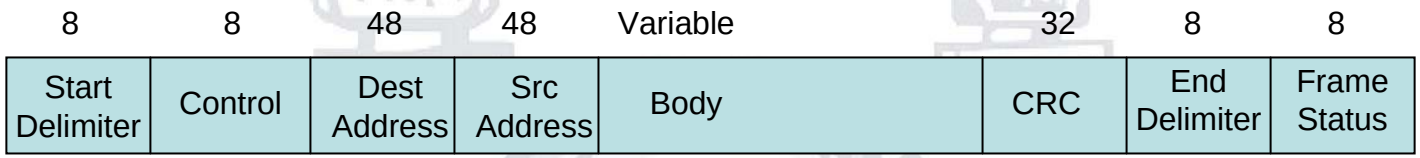


Token Maintenance (cont.)

- If a node receives a claim and has a higher TTRT, updates TTRT to the one in the claim
- If the node has a lower TTRT, node replaces the claim frame with its own
- Ties broken by “highest address wins”
- After a claim finally makes it unmodified back to its sender, that sender has the token, and everyone agrees on TTRT



Frame Format



- Start and end delimiters use invalid 4B/5B codes
- Bit in the header indicates synchronous or asynchronous traffic
- Doesn’t include access control bits of 802.5