

CSMA/CD

Standard Ethernet makes use of CSMA/CD

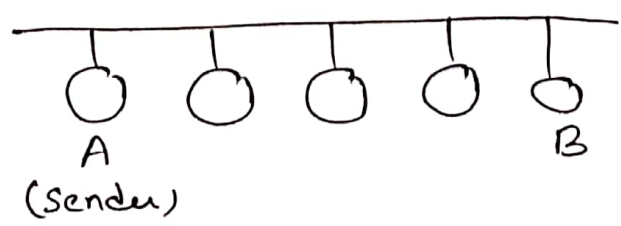
CSMA/CD = Carrier Sense Multiple Access / Collision Detection

Carrier Sense Multiple Access/collision Detection is a media access control method that was widely used in Early Ethernet Technology/LANs. It was implemented on Coaxial cable and Twisted Pair (Early version).

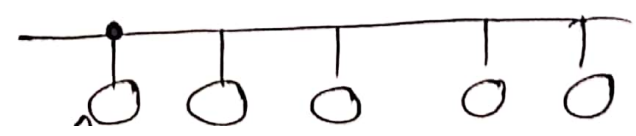
Consider a scenario where there are 'n' stations on a link and all are waiting to transfer data through that channel. In this case all 'n' stations would want to access the link/channel to transfer their own data. Problem arises when more than one station transmits the data at the moment. In this case, there will be collisions in the data from different states.

Working:

Step 1: check if the Sender is ready for transmitting data packets



Step 2: check if the transmission link is idle.

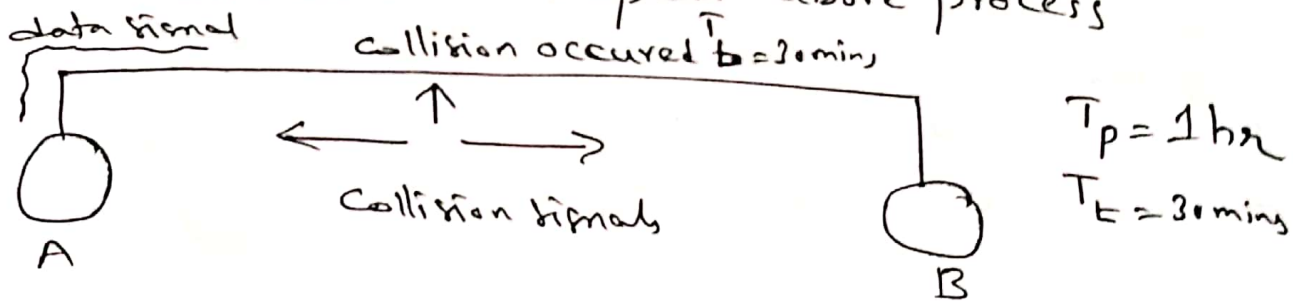


(i.e., Carrier Sense)

Sender has to keep on checking if the transmission link/medium is idle. Sender sends dummy data on the link. If it doesn't receive any collision signal, this means the link is idle at the moment. If it senses that the carrier is free and there are no collisions, it sends the data.

Step 3: Transmit the data and check for collisions.

Sender transmits its data on the link. CSMA/CD doesn't use acknowledgement system. During transmission, if collision signal is received by the node, the transmission is stopped. The station then transmits a jam signal onto the link and waits for random time interval before it again attempts to transfer the data and repeats above process



Step 4: If no collision was detected in propagation, the sender completes its frame transmission and sends the counters.

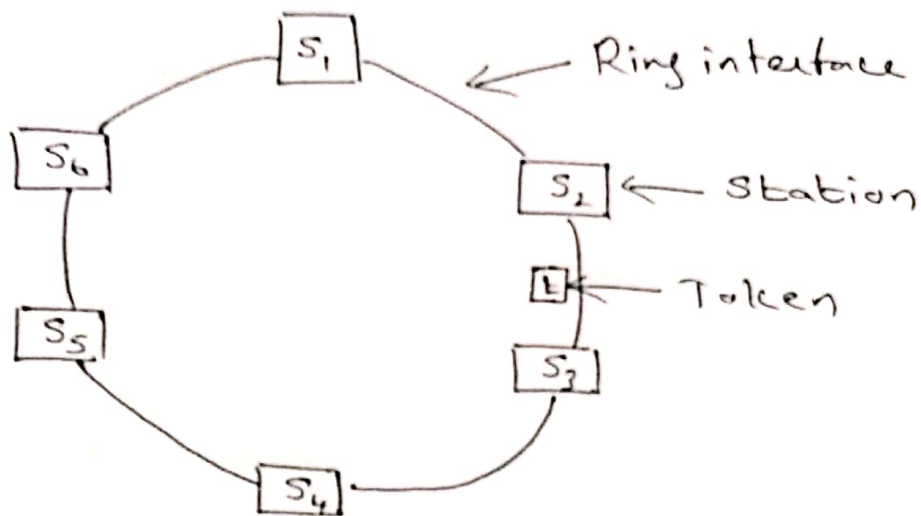
T_p = Propagation Time

T_t = Transmission time

Note: CSMA/CD always uses Half-Duplex transmission mode. Present systems supports Full-Duplex also

Token Ring

The concept of Token Ring network was originally developed by IBM. Later it was modeled by IEEE and given the name IEEE 802.5 - Token Ring. The method used in Token Ring is Token passing.



A ring consist of a collection of ring interfaces connected by point-to-point lines i.e, ring interface of one station is connected to the ring interfaces of its left station as well as right station (on the above diagram). The points can be connected with Twisted Pair, Coaxial cable or Fiber optics.

A special protocol data unit called a token circulates from station to station around the ring.

The mechanism that coordinates passing token from one station to another is called Token Passing. i.e, A station may send data only when it has possession of the token.

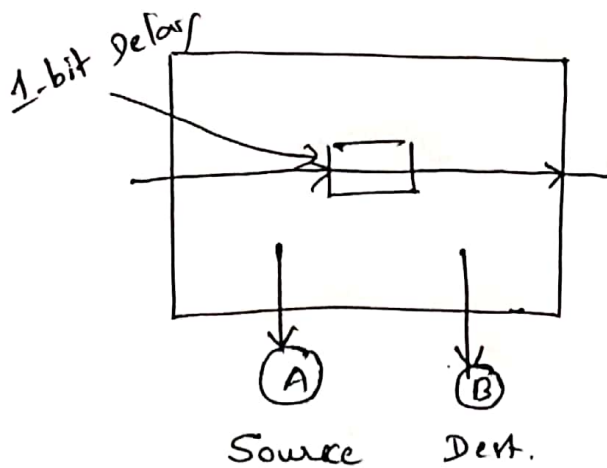
On completion, it forwards ^{the} token to the next station.

Implementation with Token Passing:

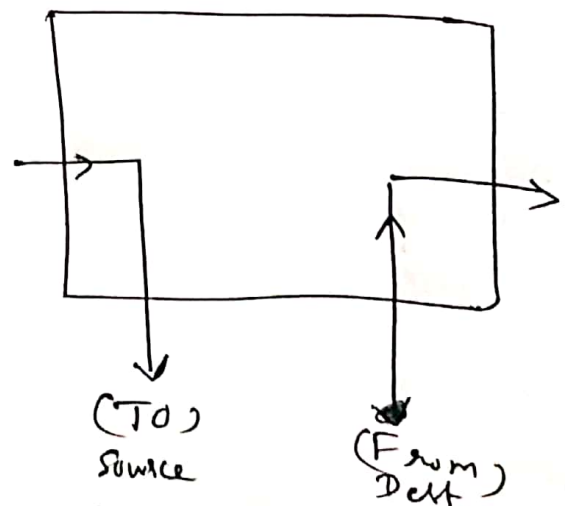
Token-passing networks move a small frame called "Token" around the network. Possession of the token grants the right to transmit. If a node receiving the token in order to transmit data, it seizes the token, alters 1 bit of the token, appends the information that it was to transmit and sends this information to the next station on the ring. Since only one station can possess the token and transmit data at any given time, there are no collisions.

There are two operating modes of ring interface

- (i) Listen Mode: The input bits are simply copied to output with a delay of 1-bit time.
- (iii) Transmit Mode: In transmit mode, the connection between input and output is broken by the interface so that it can insert its own data.



(a) Listen Mode



(b) Transmit mode