Course Name: A Level (2<sup>nd</sup> Sem)            Subject: DCN

Topic: Random Access Protocols contd.            Date: 05-05-20
[CSMA/CD]

## Carrier Sense Multiple Access with Collision Detection (CSMA/CD):

- The CSMA method does not specify the procedure following a collision. Carrier sense multiple access with collision detection (CSMA/CD) augments the algorithm to handle the collision.
- The CSMA/CD method is mainly used in **wired** network.
- In this method, a station monitors the medium after it sends a frame to see if the transmission was successful. If so, the station is finished. If, however, there is a collision, the frame is sent again.
- To better understand CSMA/CD, let us look at the first bits transmitted by the two stations involved in the collision. Although each station continues to send bits in the frame until it detects the collision, we show what happens as the first bits collide. In Figure, stations A and C are involved in the collision.
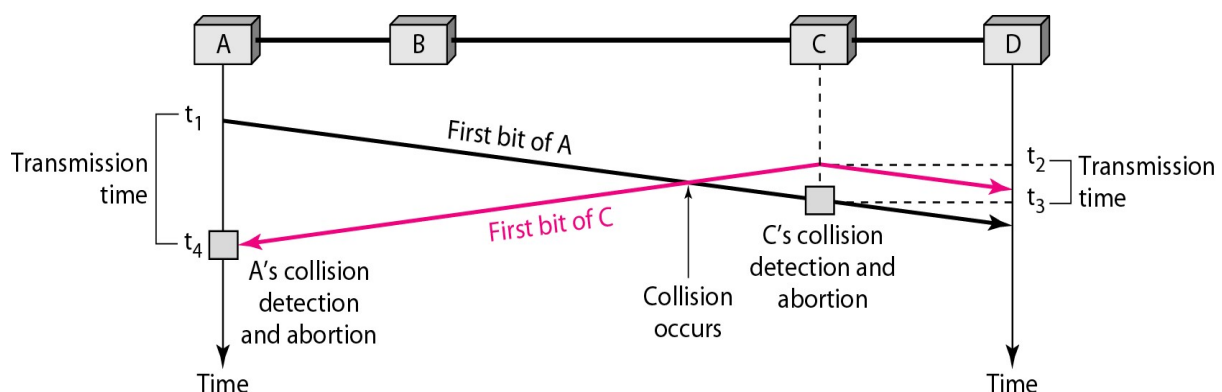


- At time $t1$, station A has executed its persistence procedure and starts sending the bits of its frame.
- At time $t2$, station C has not yet sensed the first bit sent by A. Station C executes its persistence procedure and starts sending the bits in its frame, which propagate both to the left and to the right. The collision occurs sometime after time $t2$.
- Station C detects a collision at time $t3$ when it receives the first bit of A's frame. Station C immediately (or after a short time, but we assume immediately) aborts transmission.
- Station A detects collision at time $t4$ when it receives the first bit of C's frame; it also immediately aborts transmission.
- Looking at the figure, we see that A transmits for the duration $t4 – t1$; C transmits for the duration $t3 - t2$. At time $t4$, the transmission of *A's* frame, though incomplete, is aborted; at time $t3$, the transmission of B's frame, though incomplete, is aborted.

It is similar to the one for the ALOHA protocol, but there are **differences**:

- The **first** difference is the addition of the persistence process. We need to sense the channel before we start sending the frame by using one of the persistence processes (non-persistent, 1-persistent, or p-persistent).
- The **second** difference is the frame transmission. In ALOHA, we first transmit the entire frame and then wait for an acknowledgment. In *CSMA/CD,* transmission and collision detection is a continuous process. We do not send the entire frame and then look for a collision. The station transmits and receives continuously and simultaneously (using two different ports). We constantly monitor in order to detect one of two conditions: either transmission is finished or a collision is detected. Either event stops transmission. If a collision has not been detected, it means that transmission is complete; the entire frame is transmitted. Otherwise, a collision has occurred.
- The **third** difference is the sending of a short jamming signal that enforces the collision in case other stations have not yet sensed the collision.
- **Throughput**: The throughput of CSMA/CD is greater than that of pure or slotted ALOHA. The maximum throughput occurs at a different value of G and is based on the persistence method and the value of p in the p-persistent approach. For 1-persistent method the maximum throughput is around 50 percent when G =1. For non-persistent method, the maximum throughput can go up to 90 percent when G is between 3 and 8.

## Exercises:

A. **What do you understand by CSMA/CD technique? How does it handle the situation, if collision detected in the network.**
B. **Compare CSMA/CD with ALOHA technique.**