

BCA – Part III
Computer Network

Data link layer is divided into two sublayer. The upper sublayer is responsible for data link control and the lower sublayer is responsible for resolving access to the shared media. If channel is dedicated , we need not the lower media but if channel is shared we need 2nd sub layer of data link layer. . when the common link is available for multiple station, is called multipoint or broadcast link.

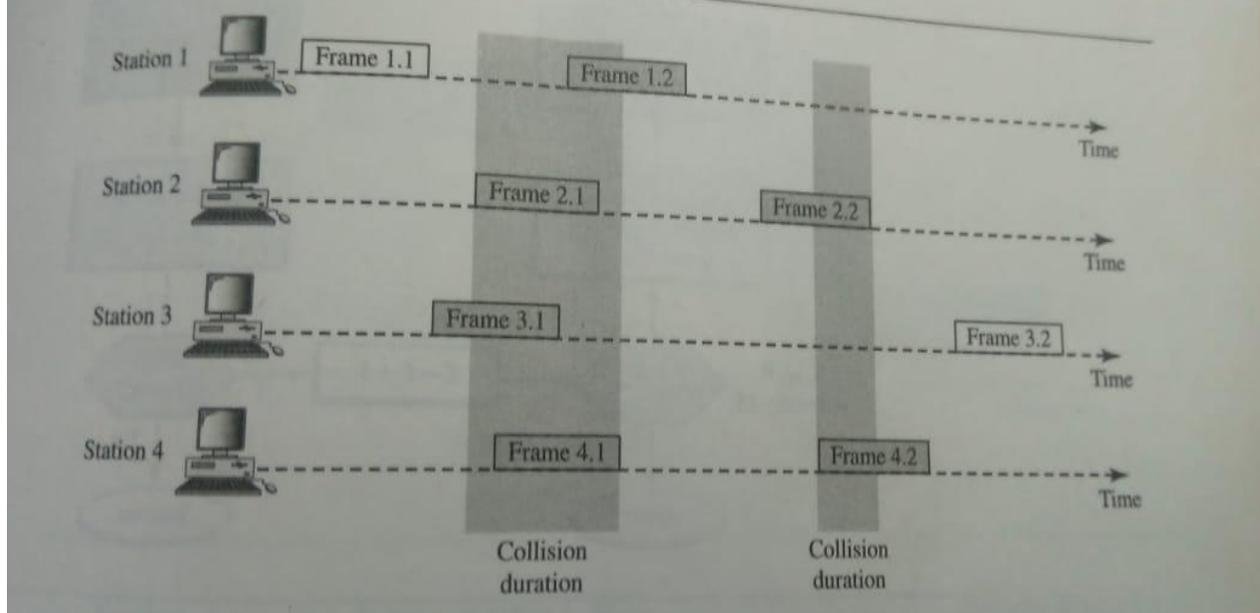
Here , we need multiple access protocol to coordinate access to the link. The protocol guaranteed that the right communication without interrupt. In the multiple point connect the main problem is collision of signal which is solved by the protocol

ALOHA Protocol

CSMA/CD

1. Pure aloha Protocol :- ALOHA Protocol is developed by University of Hawaii in 1970 for wireless LAN but it can be used on any shared medium.
Original ALOHA protocol is called Pure ALOHA that idea is each station sends frame and only on channel to share . so,there is possibility of collision of frame in pure aloha .the transmission may be shown as

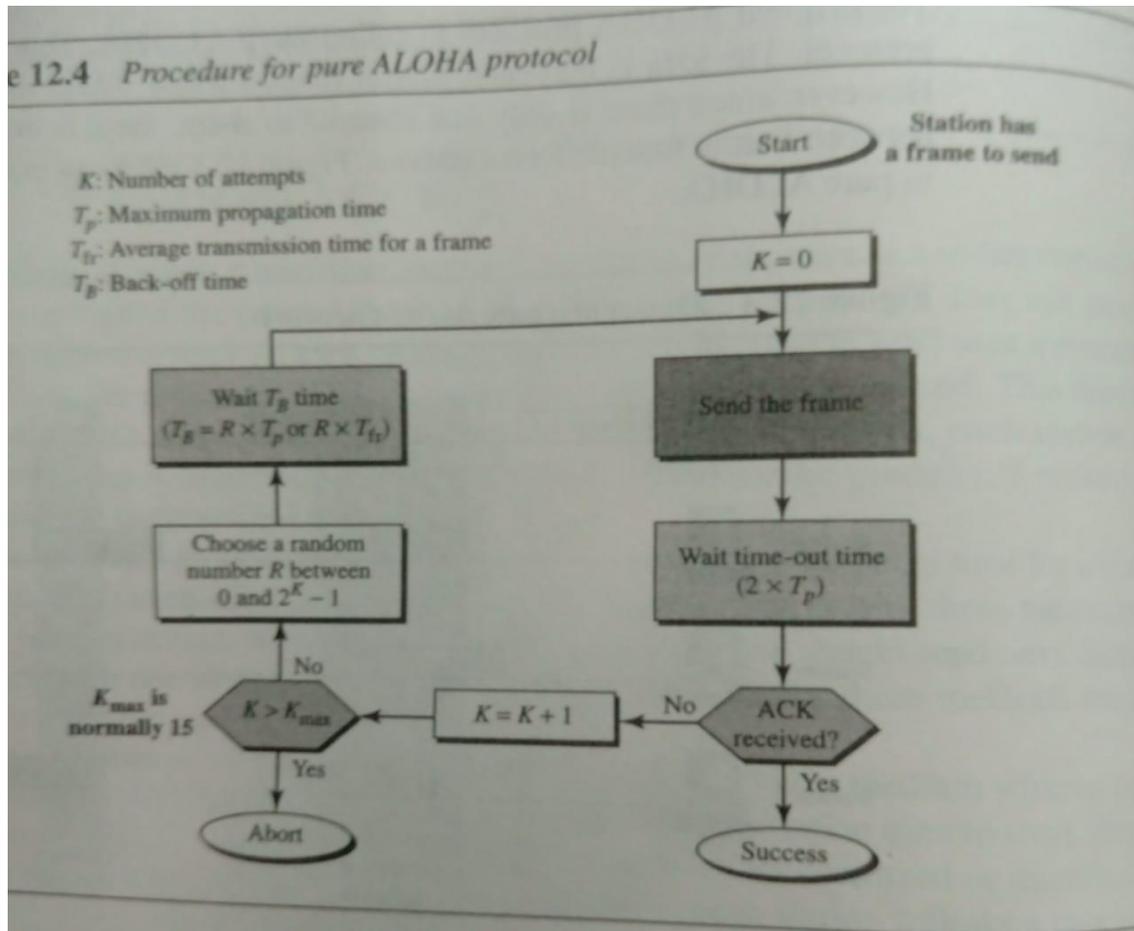
Figure 12.3 Frames in a pure ALOHA network



the above figure , there are four station having two frame each to send and during transmission of eight frame , there may be collision possibility . here, collision involves in two or more stations. If all these station try to resend their frames after the time out, the frame is collide again. Pure ALOHA dictates that when the time out period passes, each station waits a random amount of time before resending the frame. The randomness avoid more collision. Here , we call this time the back off time T_p .

Pure ALOHA has second algorithm to prevent congesting the channel with transmitted frames. After maximum number of retransmission attempts K_{max} , a station give up and try later. Here time out period is equal to maximum round trip propagation delay, which is twice the amount of time required to send a frame between two station. The Back off times T_b depends on the implementation . the vulnerable time in Pure

ALOHA is equal to $2 \times T_b$. the algorithm may be shown as:



Slotted ALOHA Protocol :-

Pure ALOHA has a vulnerable time of $2 \times T_b$ and there is no rule to minimum time time .

In Slotted ALOHA , we divide the time into slots of T_{tr} and force the station to send only at the beginning of the time slot. Here time is synchronous time. If the station misses the moment, they must wait until the beginning of the

next time. . this means that the station which started at the beginning of this slot has already finished sending the frame. .

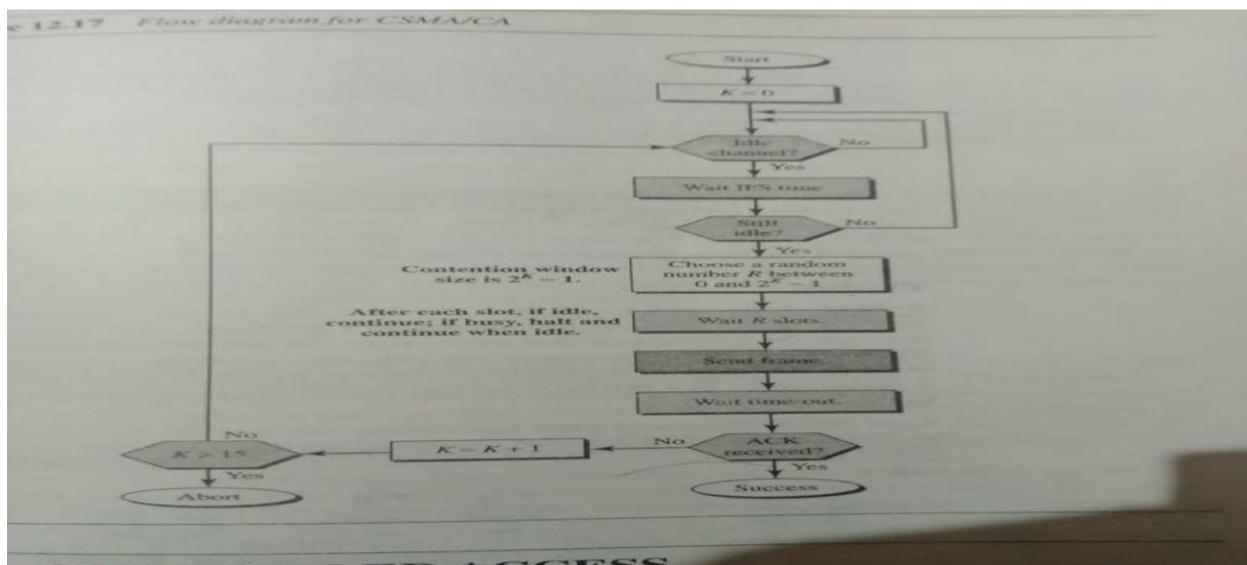
It can be proved that the average number of successful transmission for slotted ALOHA is

$$S = G \times e^{-G} \quad \text{where } G \text{ is the Time Slot. } t$$

The Maximum throughput $S_{max} = 0.368$ when $G = 1$.

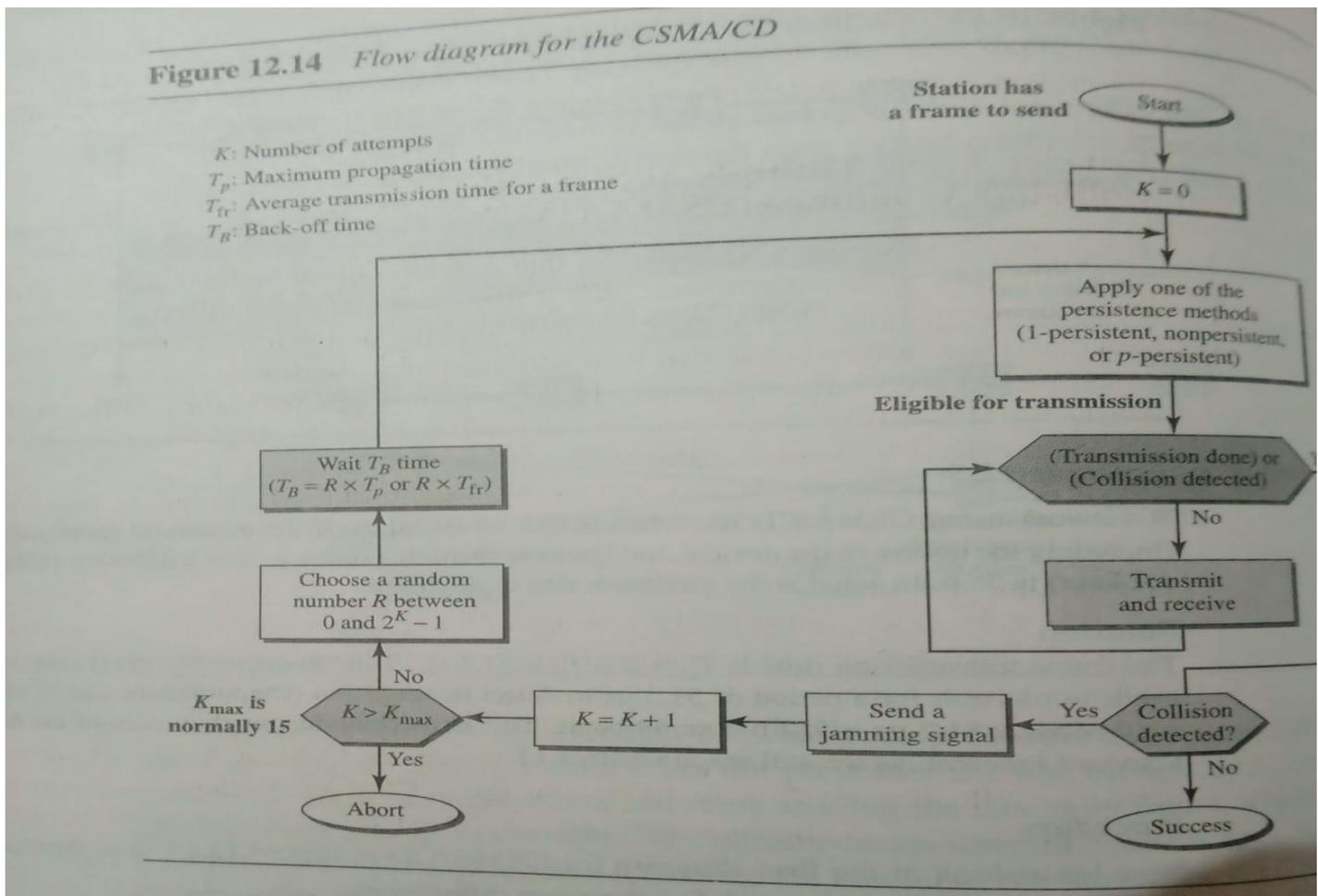
CSMA (Carrier Sense Multiple Access) :

To Minimize the degree of chance of collision another method is used , named as CSMA. This method is based on the principle of “sense before transmit “ or “listen before talk” i.e each station first listen the medium(status of medium) before sending the data. CSMA can reduce the possibility of collision but cannot eliminate it. The possibility of collision still exist because of propagation delay. The protocol algorithm may be shown as :



CSMD (carrier sense Multiple Access with Collision detection.) :-

In this method , a station monitors the medium after it sends a frame to see if the transmission successful then finish otherwise the frame is sent again. For CSMD to work ,we need a restriction on the frame size . before sending the last bit of the frame, the sending station must detect a collision, if any abort the transmission and resend it. The method may be shown as :



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