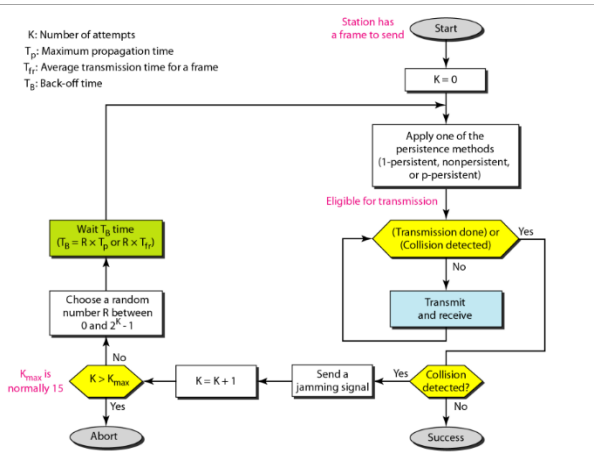
Represent and briefly describe the algorithm of CSMA/CD for MAC sublayer



Explain the difference between slotted aloha csma and aloha.

- CSMA is less collision than slotted aloha.

- Slotted aloha use generate random number to repeat send.

- Aloha protocol does not try to detect whether the channel is free before transmitting.

- CSMA protocol verifies that the channel is free before transmitting data

Explain the difference slotted aloha and pure aloha

pure aloha: immediately transmits its frame completely, If collided it retransmits the frame again with the probability p, Vulnerable time=2*Tfr.

slotted aloha: Frames are of the same size, when node obtains fresh frame, it transmits in next slot, if collision, node retransmits frame in each subsequent slot with prob. p until success, Vulnerable time=Tfr.

Explain the back off in period contention and name CSMA/CA

- Used by all carrier sense variants.

- Provides random access to the channel.

Explain how RTS/CTS solve Hidden terminals problem.

Sender sends a Request to Send (RTS) frame containing the length of the transmission Receiver respond with a Clear to Send (CTS) frame Sender sends data Receiver sends an ACK; now another sender can send data When sender doesn't get a CTS back, it assumes collision

Q 4)

physical data rate is 10 Mbps and RTS is 20 byte CTS is 14 byte ACK is 14 bytes DIFS is 40 Micro S SIFS is 20 Micro S , data is 200 byte (we add 35 before sending)

1. find time to deliver 1 frame (including RTS CTS ACK)

let's calculate the transmission times for each frame:

- RTS transmission time: (20 bytes * 8 bits/byte) / (10 Mbps) = 16 µs
- CTS transmission time: (14 bytes * 8 bits/byte) / (10 Mbps) = 11.2 µs
- ACK transmission time: (14 bytes * 8 bits/byte) / (10 Mbps) = 11.2 µs
- Data transmission time: (235 bytes * 8 bits/byte) / (10 Mbps) = 188 µs

Now, let's consider the interframe spaces:

- DIFS: 40 µs
- SIFS: 20 µs

RTS transmission time + SIFS + CTS transmission time + SIFS + Data transmission time + SIFS + ACK transmission time + DIFS
= 16 µs + 20 µs + 11.2 µs + 20 µs + 188 µs + 20 µs + 11.2 µs + 40 µs
= 326.4 µs.

2. find actual data rate

To find the actual data rate, we need to consider the overhead introduced by the control frames (RTS, CTS, and ACK). The total number of bits transmitted for these frames can be calculated as follows:

= (RTS frame size + CTS frame size + ACK frame size) * 8 bits/byte
= (20 bytes + 14 bytes + 14 bytes) * 8 bits/byte
= 384 bits
The total number of bits transmitted for the data frame (including the additional 35 bytes) is:
= (data frame size + additional bytes) * 8 bits/byte
= (200 bytes + 35 bytes) * 8 bits/byte
= 1880 bits
The actual data rate can be calculated as:
= data frame bits / (data frame bits + control frame bits) * physical data rate
= 1880 bits / (1880 bits + 384 bits) * 10 Mbps
= 83.16%

Explain sifs and difs.

SIFS (Short Inter Frame Spacing) highest priority, for ACK, CTS, polling response.

DIFS (DCF, Distributed Coordination Function IFS) π lowest priority, for asynchronous data service

Q5)

5 Easy MCQ