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P. 1. CSMA/CD Protocol

Q(i) DIFS carrier sensing ~~the~~
- A station before transmitting starts sensing the carrier for continuous DIFS duration. If the channel is free ~~become busy~~ during ~~the~~ DIFS for continuous DIFS duration Then The station goes for Back off otherwise keeps on sensing the carrier free for continuous DIFS duration.

Q2.(ii) For back-off following Definitions are required.
-(a) Senders initial window size Wo which is normally = 04.
(b) Senders current window variable Wi

(c) Initially $W_i = W_0 = 4$.

(d)(i) The sender pick up a random num $r \in \{0 \ldots W_i - 1\}$

(d)(ii) If $r = 0$ Then sender immediately sends RTS frame where 0.3.

(e) If $r > 0$ sender starts decreasing r after every slot time, if The channel is free. sensed busy, Then

(f) If The channel is busy, The station starts sensing The carrier again for continues DIFS duration. when it find The channel free for continuous DIFS duration it starts back-off with The value of r, with which it left back off in (f).

(g)(i) After decrementing r as mentioned in steps (e) if value of r becomes 0, Then The sender sends a RTS frame.

(g)(ii) If more Than one sender started DIFS carrier sensings and completed That at The same time and picked up The

The same random no 'r' Then they on decresing r slot by slot as mentioned in (c), will find r = 0 at the same time Then sends RTS frame simultaneously Then There shall be collision of RTS frame.

Here The senders shall detect the collision of RTS frame in a different mechanism as mentioned letter and initiate post collision activity.

(b) If only one station transmits RTS frame as mentioned in 9(ii) Then There will not be collision of RTS frame. Assume A transmit RTS for B.

(i) ~~If only~~ Then all the non-hidden terminals shall be alerted not to transmit for RTS duration. (Duration mentioned in RTS frame)

(ii) Assume, The receiver B ~~shall~~ gets the RTS frame correctly (No hidden terminal transmitting

(K) Then the B shall send the CTS frame to A.

(L) If the CTS frame comes back to A correctly Then the ~~near~~ hidden terminals shall be alerted and (A) shall get the channel with full certainty. But CTS frame can collide also because of the hidden terminal E.

(M) If no collsion of CTS frame Then (A) shall transmit Data frame. Now data frame will not collide, but can be corrupted by transmission here.

(N) If Receiver B receives the frame correctly, Then it will send acknowledgement to A.

(O) After A gets the acknowledgement Then one frame transmission is successfully completed.

(p) If RTS frame collided ~~due~~ ~~to~~ as mentioned in q(i) or RTS frame is corrupted by transmission error, or CTS frame collided or CTS frame was in transmission error Then B shall not send CTS frame. If A does not receive the CTS frame ~~to~~ within a time known as CTSTIMEOUT = DIFS + RCTS frame transmission time Then A will assume that the collision has taken place (Although no collision or, can be transmission error) & A will start the post collision activity.

(q) Also if After sending frame does not come back to A within a time period known as ACKTIME-OUT = DIFS + Acknowledgement frame transmission time Then also A will start the post collision Activity. Because data frame can be corrupted and B does not get the Data frame and does

not send the acknowledgement frame or B sends the Acknowledgement frame receive data frame correctly but ~~acknowledgement~~ acknowledgement is corrupted by error.

(r) 9f both above case (p) & Activity (q) the post collision ~~Activity~~ starts started by any sender here A as example.

(s) Post collision Activity is done by running an Algorithm known as binary back off exponential Algorithm. Here the sender double their Wi variable i.e Wi = 2Wi (Here on first collision Wi becomes 8, 2nd Wi = 16) ...)

Then repeat the some steps from 1(i) of Page(1).

(t) The Above process goes on till 10th collision.

(u) From 11 to 16 collision the Above process goes on

Wi

but the window value is not incremented.

(b)(i) on 17th collision. assuming that something serious has happen (cable break up etc) the network interface card shall detect it and through SNMP protocol the network shall be declared as broken down.

(ii) How Binary exponential Backoff algorithm reduces the probability of collision.

- on the first attempt probability of collision (That two station picking up some random no from 0 to 3 is $\frac{1}{4} \times \frac{1}{4}$ (Same probability) i.e probability of Collision.

$$= \frac{1}{16}$$

- 2nd Attempt probability of collision $= \frac{1}{8} \times \frac{1}{8} = \frac{1}{64}$.

In the 10th to 16th attempt $\frac{1}{1024} \times \frac{1}{1024} \ldots$