EECS 489 Discussion 12

Announcements

- Project 4 due soon
- No office hours next week

Q1 CSMA/CA

Suppose an 802.11b station is configured to always reserve the channel with the RTS/CTS sequence. Suppose this station suddenly wants to transmit a 1,000 byte segment of data, and all other stations are idle at this time.

Assume a transmission rate of 11 Mbps. Ignoring propagation delay and assuming no bit errors, calculate the time required to transmit the frame and receive the acknowledgement. Further assume that a frame without data is 32 bytes long.

Q1

RTS + CTS + Frame + ACK

23 + 23 + 751 + 23 = 820 microseconds

32 * 8 / 11 = 23 microseconds

8256 / 11 = 751 microseconds

Q2

Consider the following idealized LTE scenario. The downstream channel is slotted in time. There are four nodes, A, B, C, and D, reachable from the base station at rates of 10 Mbps, 5 Mbps, 2.5 Mbps, and 1 Mbps, respectively, on the downstream channel. These rates assume that the base station fully utilizes the time slot to send to just one station. The base station has an infinite amount of data to send to each of the nodes.

What is the maximum rate at which the base station can send to the nodes, assuming it can send to any node it chooses during each time slot? Is your solution fair?

Q2

Consider the following idealized LTE scenario. The downstream channel is slotted in time. There are four nodes, A, B, C, and D, reachable from the base station at rates of 10 Mbps, 5 Mbps, 2.5 Mbps, and 1 Mbps, respectively, on the downstream channel. These rates assume that the base station fully utilizes the time slot to send to just one station. The base station has an infinite amount of data to send to each of the nodes.

What is the maximum rate at which the base station can send to the nodes, assuming it can send to any node it chooses during each time slot? Is your solution fair? 10 Mbps (only send to A). Not fair

Q2

Consider the following idealized LTE scenario. The downstream channel is slotted in time. There are four nodes, A, B, C, and D, reachable from the base station at rates of 10 Mbps, 5 Mbps, 2.5 Mbps, and 1 Mbps, respectively, on the downstream channel. These rates assume that the base station fully utilizes the time slot to send to just one station. The base station has an infinite amount of data to send to each of the nodes.

If there is a fairness requirement that each node must receive an equal amount of data during each one second interval, what is the average transmission rate by the base station (to all nodes) during the downstream sub-frame?

Q2

Assume n1, n2, n3, n4 rounds for A, B, C, D respectively

Each round is t seconds

Data transmitted to A in one round = 10t => 10t*n1 in n1 rounds

Data transmitted to B in one round = 5t => 5t*n2 in n2 rounds

Data transmitted to C in one round = 2.5t => 10t*n3 in n3 rounds

Data transmitted to D in one round = 1t => 10t*n4 in n4 rounds

Q2

To be fair 10t n1 = 5t n2 = 2.5t n3 = t n4

So, 2*n1 = n2, n3 = 4*n1, n4 = 10*n1

Suppose N = n1 + n2 + n3 + n4

=> n1 = N / 17

Avg transmission = (10t*n1+5t*n2+ 2.5t*n3+t*n4)/t*N

= (10N/17 + 5 * 2N/17 + 2.5 * 4N/17 + 1 * 10N/17)/N = 40 / 17 = 2.35 Mbps