KFUPM - COMPUTER ENGINEERING DEPARTMENT

COE-543 – Mobile Computing and Wireless Networks

Student Name:
Student Number:

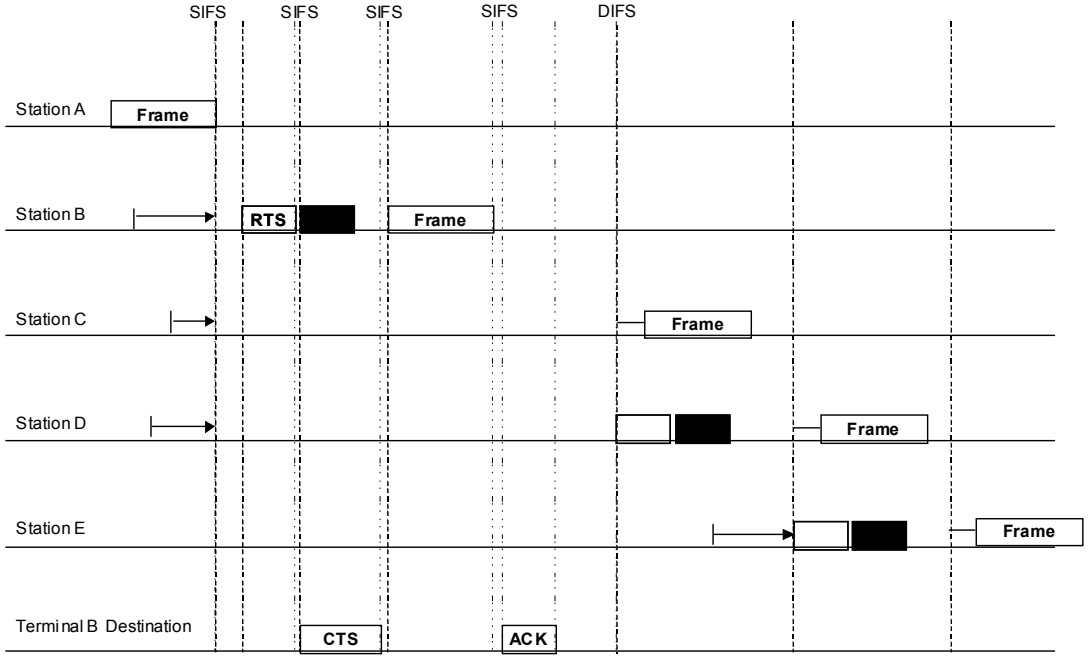
1) (20 points) On the subject of IEEE802.11 MAC.

a) (8 points) Consider the example solved in textbook and class notes Example 4.19. Redo the example assuming station B will use the RTS/CTS mechanism. Assume the node receiving station's B traffic, denoted by "Station B Destination" does not send any traffic of its own. Use a diagram similar to that of Figure 4.15 and show all transmissions from the stations and corresponding interframe spacing (IFS) intervals.

b) (12 point) Define the hidden terminal problem and the exposed terminal problems. How does the mechanism RTS/CTS provide a solution for these two problems.

Solution:

a) Redoing Example 4.19.



b) Hidden terminal problem: consider the following scenario:

←---------- A ---------→ B ←---------- C ---------→

Nodes A and B are within range of each other.

Nodes B and C are also within range of each other. However, C is not in the range of A.

If A sends to B, its transmission could collide with a transmission from C to B, since C is hidden from A.

Solution by RTS/CTS:

1) A sends RTS to B – all nodes within range of A receive this RTS and defer their transmissions.

2) B responds with a CTS – all nodes within range of B (including node C) hear this CTS signal and set the NAV signal accordingly. ➔ Node C is no longer hidden from node A.

Exposed terminal problem: consider the following scenario:

A ←---------- B C ----------→ D

Nodes A and C are within range of B.

Nodes B and D are within range of C.

B wants to send to node A, and C wants to send to node D.

But since C is exposed to B, it will refrain from transmission till B completes its transmission to A.

Solution by RTS/CTS:

1) B sends an RTS to node A – all nodes within range of B set defer their transmissions (including node C).

2) C will not hear the CTS response of A since it is out of range from A.

3) C can start transmission to D by sending an RTS to D ➔ C is no longer exposed to data transmissions from B.

2) (bonus 10 points) On the subject of OFDM/OFDMA

Explain the transmitter/receiver structure for a single carrier OFDM system highlighting the role of the cyclic prefix, the IDFT block, the DFT block, and the on-tap equalizer.

Hint: *watch the last 20 minutes of the following video lecture on OFDM found at: http://www.youtube.com/watch?v=Hajn8fAyeZ0*

Solution: