

Computer Networks (CS 453): Spring 2011

Homework 6 (Extra credit)

Instructor: V. Arun

Assigned: 4/27/11, Due: 5/04/11

Note: This homework will likely require you to read additional material from Chapter 6 the textbook that we will not have time to fully cover in class. Of course, topics that have not been covered in class will not appear on the final (unless they have been explicitly skipped over and assigned as homework reading in class).

Problem 1 (Quickies, 24 points):

1. What is the difference between *attenuation* and *interference* in wireless networks?
2. What is the difference between collision detection and collision avoidance as in CSMA/CD and CSMA/CA respectively?
3. How many MAC and IP addresses are there in an 802.3 frame? In an 802.11 frame?
4. Which ones of ALOHA, Ethernet, WiFi, and CDMA perform carrier sense?
5. Consider a TCP connection going over MobileIP. The TCP connection setup phase between the correspondent and the mobile host goes through the mobile's home network, but the data transfer phase is directly between the correspondent and the mobile host, bypassing the home network. True or false?
6. Section 6.3.4 discusses 802.11 mobility, in which a wireless station moves from one BSS to another within the same subnet. When the APs are interconnected with a switch, an AP may need to send a frame with a spoofed MAC address to get the switch to forward the frame properly. Why?

Problem 2 (CDMA, 18 points): Suppose a sender X wants to send the data bit 1 with key 100101 and a sender Y wants to send the data bit 0 with key 010110. Assume we code a binary 0 as -1, a binary 1 as +1. Both signals are transmitted at the same time to a receiver Z.

- A. What is the signal received by a receiver?
- B. Show how the receiver recovers the individual bits sent by A and B?
- C. What is the received signal assuming that a noise of (0, +1, -1, 0, 0, -1) is also present in the air and gets added to the transmitted signal? Can the receiver still decode the transmitted bits correctly?

Problem 3 (802.11, 20 points):

1. RTS/CTS is conservative in allowing transmissions in order to prevent collisions. Give an example where the RTS/CTS mechanism would prevent two transmissions from occurring even though they could have both been transmitted simultaneously and successfully.
2. In step 4 of the CSMA/CA protocol, a station that successfully transmits a frame begins the CSMA/CA protocol for a second frame at step 2, rather than at step 1. What rationale

might the designers of CSMA/CA have had in mind by having such a station not transmit the second frame immediately (if the channel is sensed idle)?

Problem 4 (Mobility, 12 points): Consider Figure 6.23 in the text, and suppose now that the correspondent (shown as being stationary in its home network in the figure) and the mobile host shown in the figure are both mobile. Draw the corresponding diagram for this case, showing the steps taken when the correspondent sends a datagram to the remote host and the remote host replies back to the correspondent.

Problem 5 (Wireless, 20 points): Problem P8 from Chapter 6 in the textbook (5th edition).