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**ENG/20M**

**CSCE 560 Homework 6**

**Chapter 7 – Wireless and Mobile Networks**

**Fall 18**

**Assigned: Monday, 28 Nov**

**Due: Wednesday, 5 Dec, 1400**

You must include these questions in your submitted solution. In other words, your submission must include the question listed followed by your solution with the answer clearly indicated (e.g., put a box or circle around the final answer).

**Problem 1.** Chapter 7, R3.

What are the differences between the following types of wireless channel impairments: path loss, multipath propagation, and interference from other sources?

Path loss – or decreased signal strength – is inevitable because electromagnetic radiation weakens as it disperses in free space and as it passes through matter (e.g. walls and floors).

Multipath propagation occurs when some portions of the electromagnetic radiation bounces off of surfaces that other portions do not [bounce off of]. This means that portions of the wireless signal can travel further than other portions, which in turn blurs the signal received at the destination.

Multiple electronic devices can transmit (and/or produce general noise) in the same frequency band of the electromagnetic spectrum. When this happens, wireless transmitters experience signal interference.

**Problem 2.** Chapter 7, R5.

Describe the role of the beacon frames in 802.11.

Beacon frames contain all of a wireless network’s important information. A wireless host will periodically broadcast beacon frames to announce the existence of its wireless network.

**Problem 3.** Chapter 7, R6.

Explain why the following statement is either true or false: Before an 802.11 station transmits a data frame, it must first send an RTS frame and receive a corresponding CTS frame. [Question has been modified from the text version.]

False. A wireless station has the option of reserving the channel (by sending an RTS frame and receiving a CTS frame), but, again, it’s just an option. In fact, stations typically only send RTS frames for notably long data frames.

**Problem 4.** Chapter 7, R7.

Why are acknowledgements used in 802.11 but not in wired Ethernet?

Compared to Ethernet, 802.11 is relatively lossy. For this reason, a wireless transmitter can’t know if its transmissions are received without error – unless the receiver sends acknowledgements.

**Problem 5.** Chapter 7, R8.

True or False: Ethernet and 802.11 use the same frame structure.

False. For example, the 802.11 frame includes four address fields, but the Ethernet frame only contains two address fields.

**Problem 6.** Chapter 7, R10.

Suppose the IEEE 802.11 RTS and CTS frames were as long as the standard DATA ~~and ACK~~ frames. Would there be any advantage to using the CTS and RTS frames? Why or why not? [Question has been modified from the text version.]

No, there would no longer be an advantage. Long RTS/CTS frames would block the channel for as long as it would be blocked by colliding data frames – which is exactly what RTS/CTS frames seek to avoid. Thus, RTS and CTS frames are only worthwhile if they’re significantly shorter than the standard data frames.

**Problem 7.** Chapter 7, R11.

Section 7.3.4 discusses 802.11 mobility, in which a wireless station moves from one BSS to another within the same subnet. Assume two APs are interconnected with a switch and the wireless station moves from BSS1 to BSS2. An AP may need to send a frame with a spoofed MAC address to get the switch to forward the frame properly. Why? Which AP sends the spoofed frame? [Question has been modified from the text version.]

When the wireless station moves to BSS2, the switch between the two APs still has BSS1 in its forwarding table for the wireless station. To fix this issue, BSS2 broadcasts a frame with a spoofed MAC address (for the wireless station). In doing so, BSS2 forces the switch to update its forwarding table and thus send to BSS2 those packets destined for the wireless station.

**Problem 8.** Chapter 7, P1.

Consider the single-sender CDMA example in Figure 7.5. What would be the sender's output (for the 2 data bits shown) if the sender's CDMA code were (1, -1, 1, -1, 1, -1, 1, -1)? Fill in the blanks:

|  |  |  |
| --- | --- | --- |
| **m** |  |  |
| **1** | -1 | 1 |
| **2** | 1 | -1 |
| **3** | -1 | 1 |
| **4** | 1 | -1 |
| **5** | -1 | 1 |
| **6** | 1 | -1 |
| **7** | -1 | 1 |
| **8** | 1 | -1 |

Thus,

d1 = -1, 1, -1, 1, -1, 1, -1, 1

d0 = 1, -1, 1, -1, 1, -1, 1, -1

**Problem 9.** Chapter 7, P7.

Suppose an 802.11b station is configured to always reserve the channel with the RTS/CTS sequence. Suppose this station suddenly wants to transmit 1,000 bytes of data, and all other stations are idle at this time. As a function of SIFS and DIFS (i.e., your answer will contain the variables “SIFS” and “DIFS”), and ignoring propagation delay and assuming no bit errors, calculate the time required to transmit the frame and receive the acknowledgment. Assume a transmission rate of 11 Mbps.

We know is the total time required. Because the control frames (RTS, CTS, and ACK) are the same size (that is, 32 bytes), this simplifies to . This simplifies to .

Note that the data frame contains the data itself and an additional 32 bytes of header. In plugging in values for , , and , we see that the total time required for the transmission is

.

**Wireshark Lab**

Complete the lab in 06 - Wireshark\_802.11\_v7.0.pdf.

Okay.

**ERRATA:**

[redacted]

Also, there is an inconsistency in the Wireshark capture file. The destination MAC address in the SYN-ACK packet is not as expected. Assume the address 91:2a:b0:49:b6:4f is equivalent to 00:13:02:d1:b6:4f.

The author doesn’t explain this other than to say “Curiously, this [SYN-ACK MAC] is different from the MAC address of the host used in the frame that sends the TCP SYN. The host wireless interface is behaving as if it has two interface addresses - interesting!”

You should know this is not uncommon. We see some rather unique behavior in the wireless world that isn’t always explainable. In this case, we’re not sure where he is running Wireshark. If it is running on a host other than 00:13:02:d1:b6:4f, it could see a corrupt frame while 00:13:02:d1:b6:4f receives a correct frame.

Hope this helps.