UNIVERSITY OF CALIFORNIA, LOS ANGELES

CS M117

Homework #1

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1A	1B	1C	1D	1E	1F
					X

Data Transmission over 802.11b Wireless LAN

Maximum total points [20]

1. **[2]** Are RTS and CTS used with short packets, even if there is a hidden terminal situation?

Using RTS and CTS isn't something that we want to do because the overhead we receive is worse. If we have a packet that's shorter than the RTS we should send the packet and expect collision even if we have a hidden terminal situation

2. [2] Should we still use the Contention Window and Binary Backoff with short packets? Explain?

Short packets don't fully get rid of collisions, therefore, using the Binary Backoff with the Contention Window to retransmit the data with respect to the traffic. So we should still use both together.

3. [2] Why can a new packet that senses the medium idle go off without using the Contention Window (see class slide: "direct access if medium is free")?

If the medium is idle then it is free for communication and therefore we will be able to gain direct access to the new packs without needing the Contention Window. We can therefore avoid unnecessary delay by the Contention Window

4. [2] To deal with this problem 802.11, when many users are located in the same area, and use the same wireless LAN at the same time, what access methods are defined to supports two modes of operations?

First 2KB is first sent, after 1 RTT 4KB sent after another RTT 8KB so on and so on until 32KB is sent on the 4th RTT

5. [2] Consider the effect of using slow start on a line with a 10-msec round-trip time and no congestion. The receive window is 24 KB and the maximum segment size is 2 KB. How long does it take before the first full window can be sent?

With a slow start, sending 2KB. We continue this with round trip times and 2 4KB, 4 segs. with 8KB until we reach 16 segments with 32KB. THis means we would have encountered 4 round trip times and can send the first full window.

6. [2] Given a channel with an intended capacity of 20 Mbps. The bandwidth of the channel is 3 MHz. What signal-to-noise ratio is required in order to achieve this capacity?

Shannon's capacity theorem: C = B * log2(1+S/N)
20 = 3 * log2(1 + S/N)
2^(20/3) -1 = S/N = 100.6
So the signal to noise ratio is 100.6

7. [2] What is the channel capacity for a tele-printer channel with a 300-Hz bandwidth and a signal-to-noise ratio of 3dB?

C = 300*log2(1+1.995)
C = 474.77

8. [1] What really means an idle state?

a. CSMA is 0
b. waiting for DIFS
c. available for communication

9. [1] Five channels, each with a 100-KHz bandwidth, are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 10 KHz between the channels to prevent interference?

The minimum bandwidth is 5 band * 100kHz bandwidth + 4 * 10 = 540 kHz

10) (a) [0.5] List the three different modes of multipath signal propagation (besides direct signal) and the cause for each of these modes.

(b) [1] What kind of signal reception problems these different modes cause?

a) 1. Diffraction, when the waves are obstructed by sharp edges

2. Reflection, surfaces larger than wavelength

3. Scattering, objects smaller than the wavelength

b) 1. Diffraction, small scale fading

2. Reflection, large scale fading

3. Scattering, small scale fading

4. The rest is a result of weakening of a signal

11) [0.5] What is frequency range of 802.11b Wireless Channel?

2.4 to 2.4835 GHz

12). [2] Multipath fading is maximized when the two beams arrive 180 degrees out of phase. How much of a path difference is required to maximize the fading for a 50-km-long 1-GHz microwave link?

lambda = c/f = (3*10^8)/(10^9) = .3m = 30cm

So the path difference is defined as half the wavelength if we want 180 deg so we'd end a .5 * 30cm or 15cm.