

■ ECE/CS 4984: Wireless and Networking Mobile Systems ■

At-home Exercise 6 (E6)

Part I – Objectives and Lab Materials

Objective:

The objectives of this exercise are to:

- Analyze the effect of interference created by a Bluetooth piconet on the performance of 802.11b.

After completing the assignment, you should be able to:

- Suggest some techniques to mitigate the interference of Bluetooth on 802.11b

Part II – At-home lab assignment

You are expected to perform the following tasks:

- Take the average of the three throughput readings for the ad-hoc link in the absence of any Bluetooth device and in the presence of Bluetooth interference for each data rate (1Mbps, 2Mbps and *auto*).
- On the same bar graph, plot: (a) the average throughput for the ad-hoc link established in the absence of any Bluetooth device for each data rate (1Mbps, 2Mbps and *auto*) and (b) the average of the measured throughput for the ad-hoc link established in the presence of a Bluetooth Piconet for the three different IEEE 802.11b data rates.
- Calculate the theoretical throughput at the MAC layer expected for 11Mbps PHY layer data rate. Assume the following: data is transferred in the form of UDP data packets on a segment with an MTU of 1500 bytes. DIFS time: 50 μ sec, SIFS time: 10 μ sec, min Contention window length: 31, TPLCP Preamble: 144 μ sec, TPLCP Header: 48 μ sec. In the 802.11b protocol, the data rate for ACKs is 2Mbps. Use the formula given in the paper in your reading assignment for calculating the throughput.

Part III – Report

This report will include both in-class and take-home aspects of this lab assignment.

Provide a report that answers each of the following questions in order:

Part I – In-class experiments

1. Experiments with the *Bluetooth Piconet set-up*
 - (a) What is the MAC address of the Bluetooth adapter used in the experiment?
 - (b) What are the other application profiles available for Bluetooth?
2. Experiments with *interference of Bluetooth and 802.11b*
 - (a) Include the bar graph containing the throughput curves and conclude your results about the interference between Bluetooth with 802.11b. Include the screen shots taken during the class.
 - (b) Is there a significant interference between Bluetooth and 802.11b?
 - (c) Why is the theoretical throughput less than PHY data rate of 11Mbps? Explain what you mean by SIFS and DIFS?
 - (d) Is the measured throughput at data rate *auto* less than the theoretical throughput that you calculated above? If yes, why?
 - (e) How can we reduce the effect of interference of Bluetooth on 802.11b? Suggest some techniques.

Part II – General Conclusions

This is the free-form portion of your report. Provide a summary of lessons learned in this lab, general observations on how each of the tools illustrated by the experiments can be used to configure and assess performance of the network, any unexpected results obtained, etc. Feel free to suggest improvements to the experiments performed in this lab.