

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

Pre-lab and In-class Laboratory Exercise 2 (L2)

Part I – Objectives and Lab Materials

Objective:

The objectives of this lab are to:

- ❑ Introduce you to the infrastructure and ad-hoc mode of wireless LAN operation.
- ❑ Evaluate the network performance by measuring throughput.

After completing the assignment, you should be able to:

- ❑ Set up an infrastructure network consisting of multiple nodes and an access point.
- ❑ Set up an ad hoc network between two or more devices.
- ❑ Measure the throughput and evaluate the range of the wireless devices.

Hardware to be used in this lab exercise:

- ❑ Intel 802.11a cardbus adapter
- ❑ Xircom 802.11b wireless adapter
- ❑ Dell Latitude C640 laptop computer
- ❑ Intel dual access point (Prepared by Graduate Teaching Assistant - GTA)

Software to be used in this lab exercise:

- ❑ *iperf*: traffic generation and network performance measurement tool.

Part II – Pre-lab Assignment

- ❑ Read about the features and operation of *iperf*
(http://dast.nlanr.net/Projects/Iperf/iperfdocs_1.7.0.html).

Note: A copy of the document is saved in C:\WMSD\Labs\Lab_2\doc\index.html. During the lab exercise, you will find *iperf* binary installed in C:\WMSD\Labs\Lab_2.

Part III – In-class Lab Exercise

Each group of two students will be handed out the equipment by the GTA. Please check if you have the following equipment:

1. One Dell latitude C640 laptop computer
2. One Compaq iPAQ with a dual card sleeve.
3. Two 802.11b Xircom wireless Ethernet cards.
4. One 802.11a cardbus adapter.
5. One Xircom CreditCard Bluetooth card.

6. One Intel wireless gateway.

The GTA will first configure the 802.11a access point and demonstrate the configuration steps using a LCD projector. We will evaluate the performance of 802.11a link by measuring the throughput associated with the link. You are expected to perform the following tasks:

- ❑ Teams of two groups (with two students in each group) will perform this experiment together.
The GTA will form the groups.
- ❑ Boot the laptop computers into Windows 2000 system, and then insert the 802.11a cardbus adapter in the PCMCIA card slots.
- ❑ One of the important parameters in the evaluation of network performance is **throughput**. In order to measure throughput for 802.11a, we will connect two notebooks equipped with 802.11a cards in infrastructure mode.
- ❑ The dual access point has the WEP key set and it is necessary for the cardbus adapter to be configured with WEP for it to be associated with the access point. In order to do so, start the 802.11a cardbus utility on the notebook by clicking on the Intel PROSet II icon in Windows Control Panel. If an alert window appears, click 'No' to continue. Switch to the settings tab and edit the *My WLAN places*. Open the default profile, set the SSID to "Intel_dual_1". In the "Security Setting" tab, select the "Enable security" radio button and edit the WEP key to be "ABCDEF4984".
- ❑ Check whether your adapter is associated with the access point by *pinging* the dual access point in the command window. If unsuccessful, ping will return *ping request timed out*. The IP address of the Intel dual access point is 192.0.2.1.
- ❑ If successfully connected, we will use *iperf* to measure the throughput. *Iperf* is a TCP/UDP bandwidth-measuring tool based on the client-server paradigm. In each team one of the groups will act as the transmitter of data (the iperf client). The other group will act as the receiver of data (the iperf server).
- ❑ Open command prompt on both the client and server computers and change the current directory to C:\WMSD\Labs\Lab_2.
- ❑ Configure the server in each team to receive UDP data of length 1470 bytes on port 5001. The UDP server should generate a report of data received every second and the output should be logged in lab2.txt. Use the redirection operator (>>) to save the command output to a log file.
- ❑ Configure the iperf client in each team to transmit UDP datagrams of size 1470 bytes to the server on port 5001 for 10 seconds at a bandwidth of 27 Mbps. Report the throughput and the

UDP packets lost for the experiment. Take a snapshot of the throughput value obtained and include it in the lab report. The two groups that perform the experiment should report the results.

Note: Since the length of datagram is 1470 bytes, each datagram will be one IP packet.

The next experiment deals with setting up of ad-hoc network between two 802.11b devices. All the teams will perform the following steps.

- ❑ To set-up an ad-hoc network between two nodes, stop and remove the 802.11a cards, and then insert the Xircom 802.11b adapter in the notebook. Open the Xircom Client Utility on the desktop. Select the “Network type” to *Ad-Hoc* and enter the ESSID as “ECECS4984” (Same as in Lab 1). In the “Network Security” tab, uncheck the “Use WEP” option. Set the transmission power to 1mW under the “RF network” tab.
- ❑ Auto-configuration is a feature that allows any machine to set its own IP address and defend it against other machines in the same network. It is ideal for settings that completely lack centralized network administration, such as some mobile ad hoc networks. The IP address in Windows can be checked by using the *ipconfig* command. After around 5 minutes, use *ipconfig* command and report the IP address obtained by the card.
- ❑ Test whether your notebook belongs to the network established in class by pinging the group closest to you. Report the ICMP replies returned by ping. You can take a snap shot of the ping output by pressing the Alt and PrntScrn button together. Open Paint program in the “Accessories” program group. Use Ctrl+V to copy the image from clipboard. Save the image as file lab2.bmp and use it later in your report. We will deal with other aspects of ad-hoc networks in Labs 7, 9 and 10.