

15-441 Extra Credit Assignment

Announced: April 20 (Tuesday) in class

Sign-up Due: April 23 (Thursday) end of class

Phone Checkout Time: 10:30am ~ 12:00pm, 1:30pm ~ 3:00pm Friday

Due Date: April 30 (Friday)

Sign-up is required to do this experiment to reserve a phone for you.

Intro/Sign-up

This assignment is purely optional. In this assignment, you will be given a Motorola Droid phone or a HTC G1 android phone. The Droid phones are Verizon phones and they come with a 3G data plan. (So you don't have to pay). G1 phones do not have service included, but you can still use WiFi for free, or you have your SIM card put in to use data or voice plan. (You must either have ATT or T-mobile SIM card preferably with a data plan.) In case you use your own SIM card with the G1 phone, you will be responsible for the data and voice use through the subscription you already have with your provider. Replace the SIM card at your own risk. Make sure you do not end up with a unexpected charge by using the data service. Another option is to use your own android based phones if you have one. The phones will be given in a first-come first-served basis. We will provide an "expected return date" when you are given a phone. Please return promptly or points will be deducted

We have a limited number of phones (~25). To make sure everyone who are interested to get a chance, we ask you to sign-up by the end of class Thursday April 22. To sign-up email dongsuh@cs.cmu.edu with your name and andrew ID. We will make sure everyone who signs up gets a chance. You should not take phones unless you plan to do the assignment.

You are responsible for taking care of the provided hardware and ensuring that it is returned in good condition. You must replace any lost/broken hardware.

This assignment is optional and "extra credit". It is worth 25% of a single HW. However, note that you cannot raise your overall HW grade over 100% using this extra credit. I.e, this is primarily to help students who didn't do well on an earlier HW to make up some lost ground. If you don't need the points, you are still welcome to do the assignment for the fun learning experience :-)

If you have any questions, email dongsuh@cs.cmu.edu

Assignment

The assignment is divided in to the following three steps: 1) installing the app 2) experiment, and 3) a brief write-up.

1) Installing the App.

You will need to first activate the phones. Dongsu will help with the activation. After activation, install the app. The app will either be made available in the google market for free so you can download, or be installed manually by Dongsu at the time of activation.

To pick up the phones, stop by Dongsu's office at GHC 7223 between 10:30am to noon and 1:30pm to 3:00pm on Friday the 23rd.

2) Experiment

You will need to associate and get Internet access from at least two access points outside CMU. Any access point you have access to can be used other than the CMU access points. You will need to connect to the AP every day for at least 5 days. If you use the browser, email or any application that requires data communication, the phone will automatically associate to access points when it detects a remembered AP near by.

- To make sure the WiFi interface is turn on you need to check the following:
From the default home screen press (Menu) → (Settings) → (Wireless controls) and check Wi-Fi. This enables WiFi interface.
- To make the phone remember the AP, you need to first manually connect to the AP.
From the default home screen press (Menu) → (Settings) → (Wireless controls) → (Wi-Fi settings). The screen will display the list of available Wi-Fi networks. Select one to connect.



Figure 1.



Figure 2.

App functionality:

The app, when installed, remembers the locations and the access points you had Internet through and maps it. To see the map, click on the application “WiFi Mapper”. You can find the application when you pull up the bottom tab. (Figure 1).

When you click on (Menu) button, the app displays 4 menu items. “My Location”, “Bandwidth Test”, “Toggle Show BSSID”, “About WiFiMapper”. “My Location” locates your position on the map. “Bandwidth Test” performs the bandwidth measurement using the currently active interface.

What you need to do:

1. Get Internet access from two non-CMUAPs on at least 5 different days for each AP.
2. Use the bandwidth test at least 3 times for WiFi and answer questions.
3. Use “My Location” a few times.

3) Write-up

Turn in a write up that answers the questions below. Some of the questions may not have the right answer and may be dependent on your measurement.

1) Generic Use:

What is the bssid of the two APs you have associated every day for at least 5 days? The application tells you bssid information when you click on the AP (Figure 2). You need to make sure you associate the the AP every day. The server script tells you this information, but currently the client only displays the last accessed time. You cannot report one of CMU's access point. You will not get points for this if you fail to use the the access point on at least 5 different days.

As an example, your activity should look like the following. You don't have to provide the table but you can use one to record for your own purpose.

Example)

BSSID	DATE				
00:11:22:33:44:55	04/21/10	04/22/10	(some date)	(some date)	(some date)
00:11:22:33:44:77	(some date)	(some date)	(some date)	(some date)	(some date)

Your own)

BSSID	DATE				

2) Bandwidth and signal strength measurement:

Perform bandwidth test from an AP on 3 different locations (vary the distance between you and the AP.)

a) What is the bandwidth, signal strength of the AP and link speed of the wireless link?

Location	Bandwidth (Mbps)	Signal Strength (dBm)	Link Speed (Mbps)
A			
B			
C			

b) Do you see any correlation between signal strength and bandwidth? What might be the reason or this correlation or non-correlation?

c) Do you see any correlation between signal strength and link speed?

3) Localization and Coverage of WiFi access points:

a) Dongsu had the WifiMapper place APs where the signal strength was the strongest. Do you think this is reasonable? Explain why or suggest a different method in a paragraph or two.

b) Ideally Dongsu wants to display a coverage region for each AP, but he is not sure how he can calculate the area covered by a single AP. Write a paragraph or two about the following question to help him out. What is the coverage of a single access point? How large is the area that is covered by the access point? Provide a rough estimate in terms of area. (You can get a hint by displaying all the measurement for a single AP you observed.) Describe the shape of the area. Is it circular? Does the coverage of the two AP show the same shape? What do you think is the reason?

4) Localization:

When an Internet connection is detected or “My Location” is pressed, the phone tries to localize it self. Android based phones either uses GPS based or Network based localization. GPS based localization provides accuracy up to a few meters where as Network based localization has much lower accuracy (typically 50~100m for WiFi based, and 1km for GSM/CDMA based localization. The accuracy is displayed as a light shaded area when you use “My Location”. Try it when you are outside and when you are indoor and wait until the location gets more accurate. Where do you observe the most accurate localization result?