Networked Wireless Systems Assignment 1

Know your Wifi and Cellular Radio signals

Akilesh B, CS13B1042

Objective:

This assignment helps us better understand the characteristics of Wi-Fi and Cellular Radios in gadgets like smartphones/tablets and Laptops, their transmit and receiver signal strengths.

Part A: Observations using tablet:

I used Nexus 7 tablet with support for GSM, HSPA, LTE. Qualcomm Snapdragon S4 Pro chipset is present in it.

Location	Time	Radio (WiFi/Cellular)	Wi-Fi ESSID/ Cellular Operator Name	Network Type	Rx Signal Strength (dBm)	SNR (dB)	Remarks
Room no 311	18:45	Wi-Fi	IITH	802.11n	-59dBm (2412 MHz, CH 1) -66dBm (2437 MHz, CH 6) -74dBm (5180 MHz, CH 36)	-12	Latency 40 ms Download 3.1 Mbps Upload 1.7 Mbps
Room no 410	13:09	Wi-Fi	IITH	802.11n	-66	-10	Latency 32 ms

					dBm(2412 MHz, CH 1) -80dBm (2462 MHz, CH 11) -68 dBm (5180 MHz, CH 36)		Download 1.8 Mbps Upload 2.6 Mbps

Acad Block A Room 119	14:02	Wi-Fi	IITH	802.11n	-47 dBm (2462 MHz CH11)	-14	Latency 22 ms Download 3.9 Mbps Upload 2.1 Mbps
Room number 311	20:32	Wi-Fi	IITH	802.11n	-62dBm (2412 MHz, CH 1)	-13	Latency 18 ms Download 2.9 Mbps Upload 3.4 Mbps
Room number 410	14:45	Wi-Fi	IITH	802.11n	-74dBm (5180 Mhz, CH 36)	-11	Latency 46 ms Download 1.9 Mbps Upload 4.3 Mbps
Acad Block A room 119	15:15	Wi-Fi	IITH	802.11n	-50 dBm (2462 MHz CH11)	-9	Latency 19 ms Download 4.1 Mbps Upload 2.6 Mbps
Room number 311	07:43	Wi-Fi	IITH	802.11n	-59dBm (2412 MHz, CH 1)	-8	Latency 31 ms Download 3.4 Mbps Upload 4.6 Mbps
Room 410	07:57	Wi-Fi	IITH	802.11n	-66 dBm (5180 MHz)	-11	Latency 34 ms Download 2.7 Mbps Upload 1.1 Mbps

Acad room 119	09:15	Wi-Fi	IITH	802.11n	-57 dBm (2462 MHz)	-7	Latency 32 ms Download 3.2 Mbps Upload 2.7 Mbps
Room 311	21:10	Cellular	Airtel	3G	-92 dBm	None	Latency 98 ms Download 104 Kbps Upload 97 Kbps
Room 311	07:30	Cellular	Airtel	3G	-89 dBm	None	Latency 102 ms Download 91 Kbps Upload 94 Kbps
Near Cafeteria	07:31	Cellular	Airtel	3G	-91 dBm	None	Latency 84 ms Download 102 Kbps Upload 140 Kbps

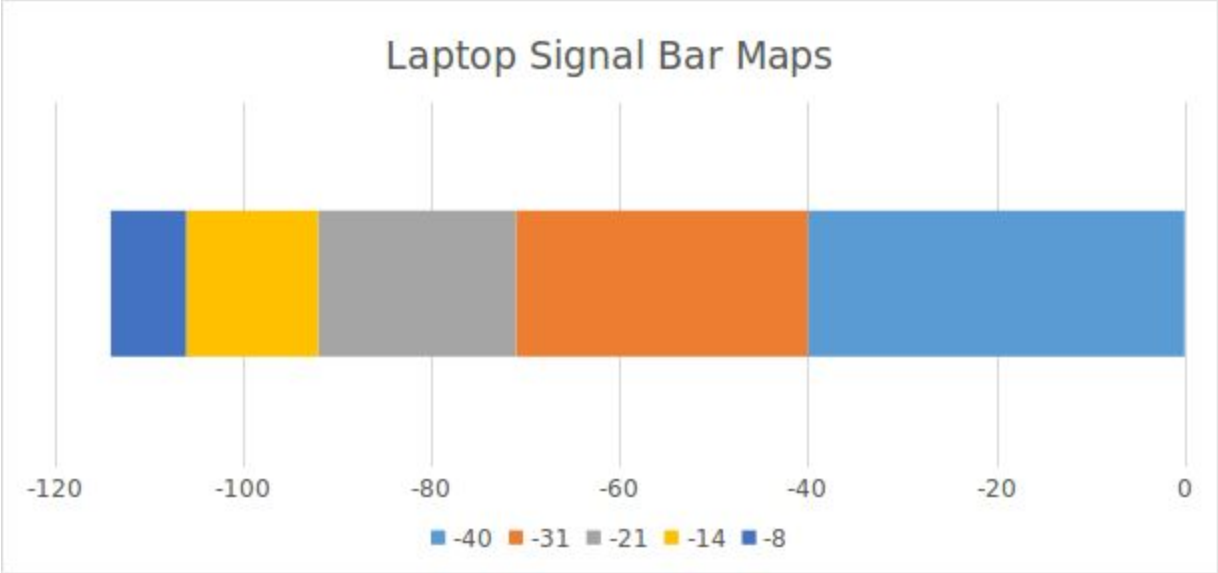
Part B: Observations using Laptop

I used a Samsung laptop with Intel Mobile hm65 express chipset.

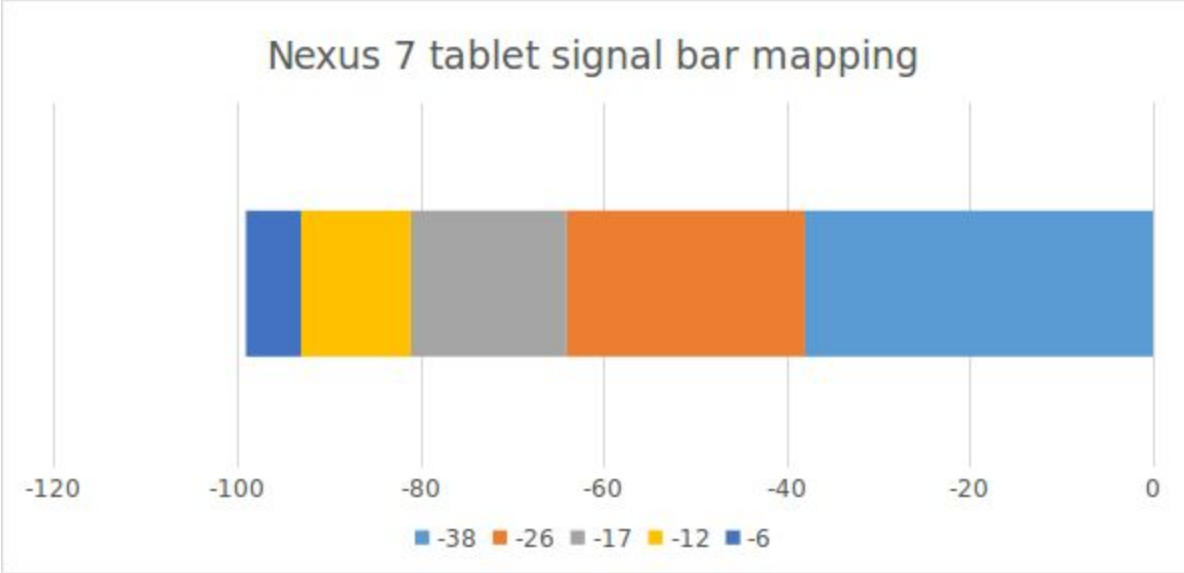
Location	Time	Radio	SSID	Network type	Rx strength (dBm)	Tx power	Remarks
Room 410	13:19	Wi-Fi	IITH	802.11 n	-83 dBm (2.462 GHz)	20 dBm	Download 1.17 Mbps Upload 0.98 Mbps
Room 311	18:51	Wi-Fi	IITH	802.11 n	-62 dBm (2.412 GHz)	20 dBm	Download 2.8 Mbps Upload 1.9 Mbps
Acad 119	10:15	Wi-Fi	IITH	802.11n	-41 dBm (2.462 GHz)	20 dBm	Download 3.5 Mbps Upload 2.87 Mbps

Part C: Signal Bar mappings:

Signal to bar mapping for laptop:



Signal to bar mapping for tablet



From left to right color change indicates increase in bar, that is dark blue to the left is 1 bar, yellow is 2 bar, grey is 3 bar, orange is 4 bar and light blue to the right is 5 bar.

Plot 1 indicates for laptop and plot 2 indicated for tablet.

Part D:

1. 4 Wi-Fi APs - IIT H, Smart-X, DIRECT-, Connectify-me 7 were visible from my measurement location. Channels 1-13 were used by all APs, though the channels used by different APs kept changing over time. Channel 14 were relatively less used by APs and free.

2. This was varying with time. On an average 15 towers were located nearby from the ODF Hostel 300 series. My device was getting connected to nearest tower.

Insights (3 and 4)

3. When tests were performed, the received signal strength varied with time because of difference in user distribution around the AP and their bandwidth requirements. The signal strength increases as we move towards the AP. A subtle difference in strength can be observed indoors and outdoors, on account of walls, the signal experiences some loss and is less indoors. The signal strength in acad building 119 is considerably better than that in ODF hostel. The SNR was found using SNR Analyzer app. The path loss model is also different for different scenarios. An increase or decrease of 1 dBm means the quality is 10 times better or inferior respectively.The cellular signal strength increased as we moved towards the cellular tower. The SNR could not be found in case of cellular. The Tx power observed in laptops was 20 dBm. It is a constant which depends on the configuration of laptop.