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Study of Wi-Fi Signal Strength Measurement and it's Optimization

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ABSTRACT:
Very often slow speed of network leads to limited connectivity and delay in processing hours, so we all tend to use wireless technology either at home or at coffee shop or at airport.We deal with the different ways of wireless networking. Wi-Fi is the most accepted technology and is the wireless way to handle networking. This networking might be interrupted either by server failure or by lost in range.
We found that Wi-Fi networking issues occurs mainly due to the range of particular network. The range of the particular WLAN router is restricted to certain limit. We cannot access Wi-Fi at these dead zones which are present beyond that limit.
The main aimof our paper is to measure signal strength of the particular Wi-Fi network at different places and optimize Wi-Fi network such that it can be accessible at dead zones.
The ultimate result is to identify all the access points before installing WLAN routers and then install WLAN routers such that Wi-Fi network will cover dead zones and provide ease in accessing particular network.

Keywords: Wi-Fi, Measurement, Optimization, Routers, Access Points, Dead Zones, Frequency Band, Device.

I. INTRODUCTION

Wi-Fi is the technology for local area networking on devices based on IEEE 802.11 standards. Wi-Fi are having very wide range of applications nowadays and their deployment in near future is expected to increase since it provides a low cost service regarding both installation and maintenance.

Wi-Fi uses the 2.4 GHz (12 cm) UHF and 5 GHz (6 cm) SHF ISM radio bands. Various frequency bands (2.4GHz, 3.6 GHz, 4.9 GHz, 5 GHz, and 5.9 GHz) have their own range of channels. Usually routers uses the 2.4GHz band with a total of 14 channels.

For the network to operate it requires a transmitter and a receiver at both ends to provide connection. Sometimes this technology is used for direct point to point links but more usually there is an access point with an omni-directional antenna allowing 360^{o} access. To transmit and receive the 2.4 GHz signals, an antenna is required at each end [3].

Table 1. Overview of the 802.11 a/b/g/n standards

Standard Name	**802.11 a**	**802.11b**	**802.11 c**	**802.11 n**
Standardization Time	January 2000	December 1999	June 2003	June 2009
Maximum Bandwidth	54 Mbps	11 Mbps	54 Mbps	600 Mbps
Channel Bandwidth	20 MHz	20 MHz	20 MHz	20 or40 MHz

Over the past 20 years, wireless LANs based on 802.11 have become common in office, at home and campus environments. Recent survey suggest over 10 billion Wi-Fi devices have been sold in total. Among those over 4.5 billion devices are in use today. These devices use the same underlying frequency bands and standards defined in the mid-1990s, which results in an increasingly crowded wireless environment [7].

The major problem in this technology is improper installation of WLAN routers which cannot cover the area that need to be covered. This may leads to slow data rate, poor signal strength and poor signal quality.

The problem associated with Wi-Fi technology cannot be solved because of illiteracy in this field. People are not aware of different technical work, technical issues related to Wi-Fi technology. We have to find proper solution to solve the problem.

We have found that the related problem can be solved by making awareness among people about Wi-Fi technology. Adding to it; proper installation of WLAN router in office, at home or at the campus can solve the problem.

The result of the paper is organized as follows: We have presented a literature review in chapter II. The detailed carried experiment, its result and analysis in chapter III and chapter IV respectively.

II. Related Work

Many researches and lots of work done in this domain. The critical task is to identify a proper tool to measure Wi-Fi network signal strength. We have collected various Wi-Fi signal measurement tools, also their suitability with our task. We have selected one tool from following tools for our task:

Table 2.Overview of the different measurement tools

Sr. No	Name of the tool	Windows based or Android	URL
1.	Network Master Speed Test	Android	Android Play Store
2.	Speed Test and Wi-Fi Maps	Android	Android Play Store
3.	Simple Speedcheck	Android	Android Play Store
4.	Internet Speed Meter Lite	Android	Android Play Store
5.	My Wi-Fi Free Speed Test	Android	Android Play Store
6.	4G Speed Test and Meter	Android	Android Play Store
7.	WPA-WPS Tester	Android	Android Play Store
8.	Speed Test-Internet Speed Meter	Android	Android Play Store
9.	Wi-Fi Mobile Network Speed	Android	Android Play Store
10.	Fast Speed Test	Android	Android Play Store
11.	Wi-Fi Analyzer	Android	Android Play Store
12.	My Speed (TRAI}	Windows	Windows Store
13.	Top Wi-Fi Booster	Windows	Windows Store
14.	NETGEAR Wi-Fi Analytics	Windows	Windows Store
15.	Speed Tester	Windows	Windows Store
16.	Speed Smart Speed Test	Windows	Windows Store
17.	WiFive-Free Wi-Fi Tools	Windows	Windows Store
18.	FasTest Speed Test	Windows	Windows Store
19.	CM Data Manager - Speed Test	Windows	Windows Store
20.	Top Wi-Fi Booster	Windows	Windows Store

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	Store		

The mentioned tools are available on Android play store as well as on Windows Store. We have selected **WPA-WPSTester** tool for our task.The app shows following information:

- Channel: This tool helps user to the select proper channel. This tool gives appropriate range of the different Wi-Fi network at different point. It also scan the wireless access pointwith least complicationsand traffic.
- List: It contains basic information for all detected Wi-Fi network: Name of the network, Mac address, Vender name, Channel.

III. EXPERIMENTATION

We have carried out the experiment of Wi-Fistrengthmeasurementat the campus of Vishwakarma Institute of technology, Pune. We selected 'VIT_CAMPUS' (Wi-Fi network available at campus) as our signal measuring network. The device which we used for the measurement is Asus Zenfone 5 (due to availability of the device) with the help of an application "WPA-WPS Tester". We observed following things:

- Wi-Fi network strength
- Range of the Wi-Fi network
- Dead zones
- Network configuration
- Channel

We also mapped signal strength at different locations in our campus. Some important locations where signal strength is good and some locations where Wi-Fi signal is required.

Table 3.Overview of the measurements taken in the campus

Abbreviation used in the table - **No:** Number, **Sr.No:** serial number, **dBm:** decibel meter, **NR:** No Range

Sr. No	Places (Room No.)	Range (dBm)
1.	Dean's Office	-90
2.	Boat club	-65
3.	Student section	NR
4.	Internet Lab	-62
5.	1410	-80
6.	1401	-85
7.	1321	-65
8.	1308	-85
9.	1201	-70
10.	1215	-68
11.	1224	-84
12.	1101	NR
13.	1110	-60
14.	1124	-62
15.	Workshop	-69
16.	Nescafe	NR
17.	Auditorium	-66
18.	Library	NR
19.	Poona Bakery	NR
20.	Canteen	NR
21.	Minus 2	NR

IV. RESULT

We have successfully carried out the experiment. Firstly we have identify the coverage area of the Wi-Fi network. This helps us to locate preliminary wireless access point locations.

We found that there are some locations where Wi-Fi network cannot be accessible. We summarize all the obtained detail of accessible and inaccessible locations and mapped it.

Then we download the map of our campus and

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mapped these three zones onto it. It gives pictorial representation of our data.

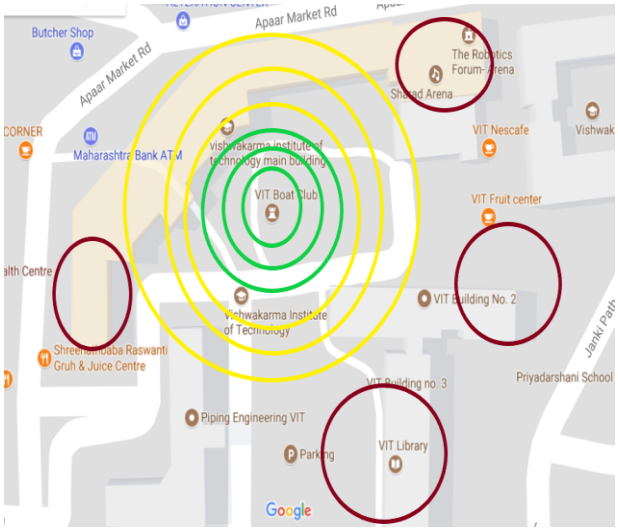

Figure 1: Overview of the signal strength

The above map contain summarized form of all locations:

- Green zone: It shows the locations where Wi-Fi network signal strength and its quality is strong.
- Yellow zone: The zone shows the locations where signal strength and its quality is good enough.
- Red zone: It shows the inaccessible locations which are beyond the Wi-Fi network range.
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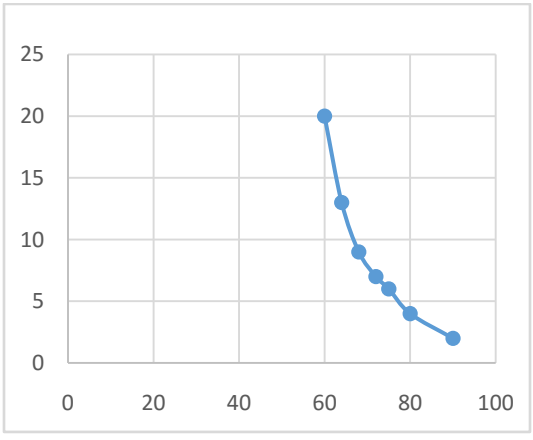

Figure 2: Distance versus signal strength

Figure 3: Distance versus signal strength

The Above graph shows the signal strength of the network with respect to distance. We observed that as we move away from network the signal strength goes on decreasing. We calculated the signal strength which is required to access network and to enjoy high speed connectivity easily, we found that the signal strength should be less than -60dB.

V. CONCLUSION

Increasing the distance from Wi-Fi network leads to a drop in Wi-Fi signal strength. Identify the coverage area and preliminary access locations before installation WLAN router so that it can be optimize to most of the part of office or home or campus. Verifying the access locations can increase signal strength, signal quality and data rate of download/upload. Wi-Fi strength can be increase by proper placement of WLAN routers, changing channels of WLAN signal of the WLAN router, replacement of WLAN router's antenna and switch to IEEE 802.11 standard devices and so on. Study can be made further to show influence of different object and factors on signal strength of wireless network.

VI. REFERENCES

[1] IEEE Standard 802.11-2012. Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications.

[2] Throughput Improvement of High Density Wireless Personal Area Networks, Rambabu A. Vatti, 2014.

[3] J.N.Davies, V.Grout and R.Picking, Prediction of Wireless Network Signal Strength within a Building.

[4] Wi-Fi Parameter Measurements and Analysis I. Soldo, K. Malarić, 2013.

[5] ANALYSIS AND MEASUREMENT OF WI-FI SIGNALS IN INDOOR ENVIRONMENT 1Ahsan Sohail, 2Zeeshan Ahmad, and 3 Iftikhar Ali, 2013.

[6] Measuring Round Trip Times to Determine the Distance between WLAN Nodes Andr´e G¨unther and Christian Hoene, 2005.

[7] Large-scale Measurements of Wireless Network Behavior Sanjit Biswas, John Bicket, Edmund Worng, Raluca Musaloiu, Apurv Bhartia and Dan Aguayo.

[8] Basavarai P. et all. IP in Wireless Networks. Prentice Hall, 2003.

[9] Radovan M. Računalne mreže. Digital Point tiskara, 2010.

[10] IEEE Standard 802.11b-1999 (Supplement to IEEE Std 802.11-1999).