

Wi-Fi Network Analysis using Wi-Fi Analyser

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Abstract: The project is about the analysis of the Wi-Fi Network with at our homes. The criteria which is being followed to judge the analyze the Wi-Fi Network includes parameters like- AP link data rate, PHY channel and bandwidth, strongest and weakest signal strength etc. The tool which is being used here is “Network Analyzer” by Jiri Techet. The results of the lowest and strongest signal strength is based on the distance from the access point.

Keywords—Signal, Network, Bandwidth

I. INTRODUCTION

Wi-Fi is the wireless technology which is based over the IEEE 802.11 standard. This technology uses radio waves for data transmission from a client's device to access point and this whole architecture involves a router also which completes the connection to the other device which is being communicated on the network. Wi-Fi works over various frequency bands which can hugely impact the analysis of the network, like 2.4Ghz and 5Ghz. The 2.4Ghz frequency band is used at the time when more range is required and 5Ghz is used when less range and more data transfer speed is required. There are various factors which drive the range of Wi-Fi like the surrounding walls, pillars, home appliances etc. These ranges also depend on the type of access points as it makes the bridge between the router and end point. This wireless system comprises of distributed systems and access points.

Wi-Fi security has also been a major topic of discussion over the years. The most basic way to get secure is to disable the SSID name which would make the network invisible. Technologies like WEP (Wired Equivalent Privacy) were also were easily cracked with tools like aircrack. Further, the new technologies were rolled out like WPA/WPA2 which were based on AES and were found to more secure.

II. ANALYSING THE NETWORK

A. Device and the Application used

The device which is used here for analysing the Wi-Fi network is OnePlus 6t, which operates on Android version 10. Further, the application used for this network test is “Network Analyzer” by Jiri Techet.

B. Parameters of the Network Analyzing

The application used on the device was - “Network Analyzer” by Jiri Techet. The template is used to format your paper and style the text. The whole analyzation process involved of various parameters like:

- **IP Address of the device and gateway:** IP address is the number which is given to a device which is connected to that particular network which is being analysed. Here, the IP address of the device connected and the gateway (the device which forms a link for data transmission between two networks) was used and noted down.

- **MAC address:** The MAC address is the hardcoded number assigned to the device which we connect to the network. This address does not change with network unlike the IP address.
- **Subnet Mask:** Methodology to divide the IP address into two separate parts which is the host and network.
- **AP link data rate:** This is the maximum speed that your device can communicate with the device that it is linked to.
- **Channel and bandwidth:** The channels are basically the medium for data transmission for the wireless networks and the bandwidth is the respective frequency of the particular channel on which the data rate and range depends.
- **Strongest and weakest signal strength:** These are the signal strengths which are observed in the dBm (decibel milliwatts). The value of the signal strength which is in dBm is always negative for a reason which is that strength is not so strong that the value could go in positive numbers.

C. Procedure of Network Analysis Activity

The whole process started with downloading the Network Analyzer application onto the device from the Google Play Store. Then connected the device to the available Wi-Fi and noted down the reading and took the screenshots attached further below in the paper for reference.

D. Functionalities Provided by the Application

The application used provides various functionalities which can help in detecting the problems in the network setup, connectivity etc. It is equipped with a fast wifi device discovery tool, including all the LAN device's addresses, manufacturers and names. Further, Network Analyzer contains standard net diagnostic tools such as ping, traceroute, port scanner, DNS lookup, and whois. Finally, it shows all neighbouring wi-fi networks together with additional details such as signal strength, encryption and router manufacturer to help discovering the best channel for a wireless router. Everything works with both IPv4 and IPv6.

E. Graph Analysis

The graphs which are there in the Wi-Fi signal tab help us to get more graphical information regarding the possible connections around the device. The x-axis of the graph gives us the signal strength value in dBm and the y-axis of the graph provide the channel number range which is allotted to the particular SSID. The graph is also added down below in the result for further information.

III. RESULTS

The various parameters which were taken into account for network analysis from the available parameters/functionalities were:

1. IP Address of the device and gateway
2. MAC Address, subnet mask, DNS Server
3. AP link data rate
4. PHY channel and bandwidth
5. Wi-Fi channel signals
6. Strongest and weakest signal strength

Table I. Analysis Results

S.NO.	Parameters	Values/Results
1.	IP Address of Device	192.168.1.165
2.	IP Address of Gateway	192.168.1.1
3.	MAC Address	16:ae:88: d8:05:50
4.	Subnet Mask	255.255.255.0
5.	DNS Server	192.168.1.1 8.8.8.8
6.	Link Rate	72Mbps
7.	Wi-Fi channel	11
8.	Strongest Signal	-37dBm
9.	Weakest Signal	-103dBm

There were many other observations made while doing the Analysis from the application that the signal strength very much depends on the distance between the access point and device which is using the Wi-Fi.

Information	
ACTIVE CONNECTION	
Connection Type	Wi-Fi (PS) ●
External IP	N/A Reload
External IPv6	N/A Reload
HTTP Proxy	N/A
WI-FI CONNECTION SETTINGS	
IP Address	192.168.1.65
Subnet Mask	255.255.255.0
Default Gateway IP	192.168.1.1
DNS Server IP	192.168.1.1 8.8.8.8
IPv6 Addresses	fe80::14ae:88ff:fed8:550 2405:204:1304:ab91:14ae:88ff:fed8:550 2405:204:1304:ab91:887b:900c:79c2:edbc
Default Gateway IPv6	fe80::e4c4:84ff:feaa:f0a2
DNS Server IPv6	N/A

Fig I. Network Information

The Fig I clearly give us all the information regarding the network to which our device is connected. The various details involve the type of connection which is Wi-Fi in this case with a name of "PS", further as the connection is based over IPv4 thus there is no value in the IPv6 box. Going further down we see that all the Wi-Fi details are mentioned- IP address, subnet mask, IP address of the gateway and DNS server IP address too.

CELL DETAILS SETTINGS	
Data State	Disconnected ●
Data Activity	None ●
Roaming	No ●
SIM State	Ready ●
SIM Operator Name	Jio 4G
SIM MCC/MNC	405/872 (in)
Operator Name	Jio 4G
MCC/MNC	405/872 (in)
Network Type	Unknown
Phone Type	GSM
Signal Strength	-103 dBm ●

Fig II. Cell Details

In this Fig II. we are provided with the cell details which are hardcoded on the device itself. The first 2 rows are having negative values because of the reason that the device is connected to Wi-Fi and not to the mobile data. We can also notice that we get to know about the ISP, type of the device and the signal strength which is measured in dBm. There are furthermore two things MCC/MNC which stands for mobile country codes and mobile network codes respectively.

Wi-Fi Signal SETTINGS	
2.4 GHZ	
11 PS	-36 dBm
6c:59:76:04:d9:68	WPA2/WPA (AES/TKIP)
Shanghai Tricheer Technology Co., Ltd.	40 MHz, WPS
11 Taneja	-67 dBm
a0:41:47:4b:f0:53	WPA2 (AES)
Huawei Device Co., Ltd.	20 MHz
2 Ashok dixit	-68 dBm
0c:41:e9:8d:90:04	WPA2/WPA (AES/TKIP)
HUAWEI TECHNOLOGIES CO., LTD	20 MHz
1 25122013	-78 dBm
14:57:9f:c5:43:f4	WPA2/WPA (AES/TKIP)
HUAWEI TECHNOLOGIES CO., LTD	20 MHz

Fig III. Wi-Fi Signal Details

The Fig III gives us the details of the Wi-Fi's available or detectable by the device and are close to its vicinity. Here we can notice that the connection to which our device is connected is highlighted. There is a lot of information given to us like the address of the other Wi-Fi connections, the protocols which are being used to protect the connection, the signal strength, AP link rate and we are provided with the frequency used like 2.4Ghz or 5Ghz.

WI-FI DETAILS		SETTINGS
Enabled	Yes	●
Connection State	Completed	●
SSID	PS	
BSSID	6c:59:76:04:d9:68	
Vendor	Shanghai Tricheer Technology Co.,Ltd.	
Channel	11	
MAC	16:ae:88:d8:05:50	
Speed	72 Mbps	
Signal Strength	-36 dBm	

Fig IV. Wi-Fi Details

This figure contains all the details regarding the Wi-Fi to which the device is connected. The details involve the enabled or not row, state of the connection (whether the device is properly connected or not), SSID – Server Set Identifier which is a name used to create a difference between the different Wi-Fi's. BSSID- Basic Server Set Identifier is the MAC of the AP. Then furthermore this also contains the AP link rate, channel number, signal strength.

≡QueryStart

QUERY

Domain Name / IP Address

Ping

Route

Ports

Whois

DNS

SETTINGS

Prefer IPv6

Fig V. Query/Command Section

The Network Analyzer application also gives us the option to run various commands and queries over the network to which device is connected. The examples of the commands which are executable are – Ping command, whoislook up type commands, traceroute command, port

commands and also there is a section for queries regarding DNS server.

Ping		Start
192.168.1.1 (12)		
● 12	192.168.1.1 jiofi.local.html	13.9 ms
● 11	192.168.1.1 jiofi.local.html	21.8 ms
● 10	192.168.1.1 jiofi.local.html	20.6 ms
● 9	192.168.1.1 jiofi.local.html	18.1 ms
● 8	192.168.1.1 jiofi.local.html	55.9 ms
● 7	192.168.1.1 jiofi.local.html	18.5 ms
● 6	192.168.1.1 jiofi.local.html	23.7 ms
● 5	192.168.1.1 jiofi.local.html	16.9 ms
● 4	192.168.1.1 jiofi.local.html	53.6 ms
● 3	192.168.1.1 jiofi.local.html	17.8 ms
● 2	192.168.1.1 jiofi.local.html	17.7 ms
● 1	192.168.1.1 jiofi.local.html	19.2 ms

Fig VI Ping Command

The command used above is ping command which is used to check the connectivity. This command is used to test the IP address as well as the name of the computer. The above image very clearly gives us the information of each request being made and send to the gateway for the connection and also gives us the time which is taken to receive back the request set. This command is based on the ICMP packets where the device which sends the request waits for the response.

Below in Fig VII we are given with the graphs which are there for each Wi-Fi. This graph on its x-axis represents the channels and on the y-axis represent the signal strength in dBm. As you can see that there are a lot of detectable Wi-Fi but all of them have different strength, this depends on the distance between the device and the AP.

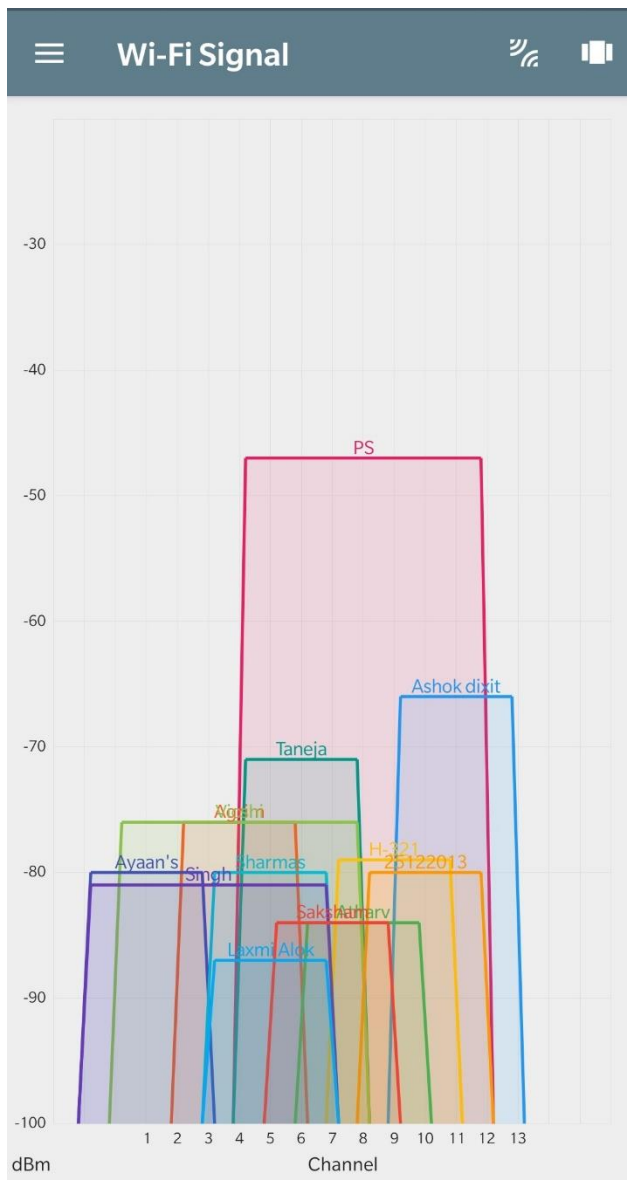


Fig VII Wi-Fi Signal Graph

IV. CONCLUSION

There are a lot of factors and parameters on which the Network analysis is based on or depends on. The parameters on which the network analysis are – IP Address, MAC Address, DNS server information, subnet mask, channel on which is the Wi-Fi is, link rate of the AP, signal strength measured in dBm whose value is quite low.

The application used by us in this project also gives us the option to analyze the Wi-Fi available with the help of graphs and also give us the power to execute network commands like – ping, route, whois etc. which help us to analyze the network in more detail.

The strength of the signals very much depend on the distance between the device and AP which we got to know from the graphs incurred through the application.

Furthermore, in the project we took screenshots and analyzed them to get a better understanding.

V. REFERENCES

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