

Evaluation of Signal Strength and Band Analysis of Wireless LAN

Indradhar Paka
Computer Science and Engineering
BML Munjal University
Haryana, India
indradhar.paka.18mec@bmu.edu.in

Abstract— *Wireless LAN analysis using Access Point is a project which analyzes the Wi-Fi connectivity in a home network. This work shows and explains the details of the analysis and the results of the experiment on the Wi-Fi using analyzer tool called InSSIDer.*

Keywords— *WIFI, IEEE 802.11, Inssider tool.*

I. INTRODUCTION

Wi-Fi (Wireless Network LAN) has become one of the most prominent ways to connect all kinds of devices such as personal computers, audio players, tablets, smartphones and many kinds of digital devices. Any wireless local area network that follows IEEE 802.11 standard are considered as Wi-Fi. Wi-Fi has become a common terminology used by everyone but not many know about the intricate performance factors of a Wi-Fi network and how all the devices are able to stay connected using relatively few access points [1].

This report presents the results and analysis which was done on a wireless home router. InSSIDer tool has been used to analyze the Wi-Fi traffic network.

II. RELATED WORK

David Kotz et al [2] have analyzed the Wi-Fi traffic at Dartmouth university for eleven weeks. Mikhail Afanasyev et al [3] performed analysis on mixed usage of urban Wi-Fi network. Balachandran et al. analyzed WLAN usage for some days in a conference setting [4]. Mikhail Afanasyev et al performed analysis on mixed usage of urban Wi-Fi network [5].

III. METHODOLOGY

Before performing analysis of the network, Wi-Fi information makes in better understanding. Network analysis is performed with the help of command prompt commands and gateway information provided by home router.

A. Wi-Fi Information

The basic information about the Wi-Fi such as SSID, IP address, MAC address, Subnet mask, DHCP, DNS.

SSID is broadcast by stations in beacon packets to announce the presence of a network. Unlike basic service set identifiers, SSIDs are usually customizable. These SSIDs can be zero to 32 byte long [6][7].

IP address (Internet Protocol address [8]) is a numerical label assigned to each device connected to a computer network that uses the Internet Protocol for communication.

MAC address (media access control address) is a unique identifier assigned to a network interface controller (NIC) for use as a network address in communications within a network segment [9].

Subnet Mask is the bitmask that when applied by a bitwise AND operation to any IP address in the network, yields the routing prefix. Subnet masks are also expressed in dot-decimal notation like an address [10].

DHCP server dynamically assigns an IP address and other network configuration parameters to each device on the network, so they can communicate with other IP networks. DHCP is a network management protocol used on IP networks [11].

DNS domain name system maintains the domain name hierarchy and provides translation services between it and the address spaces. Internet name servers and a communication protocol implement the Domain Name System [12].

Refer Table (1) for the basic information of a LAN.

Table 1 Information of local area Wi-Fi router

Key	Value	Description
SSID	The Ancient One	The SSID of the wireless network
Channel	6	The channel of the wireless network.
IP Address	192.168.100.1	The LAN IP address of the router.
MAC Address	48:EE:0C:1C:B6:1A	The physical address of the router.
Subnet Mask	255.255.255.0	The LAN subnet mask of the router.
Encryption	WPA/WPA2 Mixed	The encryption method of the wireless network.
DHCP	Enabled	Shows if router's DHCP is enabled or not.
DNS	103.57.132.236 103.57.132.246	IP address of the domain name server

B. Lan Scan

Lan Scan shows the devices connected to the nearby Access point or router. In this case 3 devices are connected to the router. IP address and MAC address of the corresponding device had also been stored. This scan can also be performed by fetching active client table from the gateway information provided by the router.

Table (2) shows the active devices which have been connected on a local network through router.

Table 2 Devices connected to LAN

Name	IP Address	MAC Address
JCruxx	192.168.100.2	ea:1b:fb:33:8f:d8
android-f11319268f0f63de	192.168.100.5	18:59:36:0c:81:c1
LAPTOP-F7U6QIDK	192.168.100.4	70:c9:4e:f1:51:3f

C. Send Ping to the Gateway

Ping is a computer network administration software utility used to test the reachability of a host on an Internet Protocol network.

Figure (1) shows a ping command performed on command prompt from end point to the gateway with 0 packet loss.

```
C:\>ping 192.168.100.1

Pinging 192.168.100.1 with 32 bytes of data:
Reply from 192.168.100.1: bytes=32 time=68ms TTL=30
Reply from 192.168.100.1: bytes=32 time=92ms TTL=30
Reply from 192.168.100.1: bytes=32 time=4ms TTL=30
Reply from 192.168.100.1: bytes=32 time=72ms TTL=30

Ping statistics for 192.168.100.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 4ms, Maximum = 92ms, Average = 59ms
```

Figure 1 Ping sent from end node to the router

D. Signal Scan and Channel Scan

The 2.4GHz band is broken up into 14 channels (1-14), each 20MHz wide. In 2.4GHz, only 3 of them do not overlap or interfere with one other: 1, 6, and 11. In the 5GHz band, we have channels ranging from 36 up to 165 [13].

The 2.4 GHz band provides coverage at a longer range but transmits data at slower speeds. The 5 GHz band provides less coverage but transmits data at faster speeds. However, higher frequencies allow data to be transmitted faster than lower frequencies, so the 5 GHz band allows you to upload and download files faster [14].

The signal strength receiving from the router from a 2.4 GHz channel is shown in fig (2). and available detectable channels and their strength is shown in fig (3). in table 3 “channel” section specifies the bandwidth and physical channel of the router which is been analyzed. And strongest and weakest signal which is detecting by the receiver.

Table (3) AP link data rate specifies the amount of data transmitted during a specific period over a network.

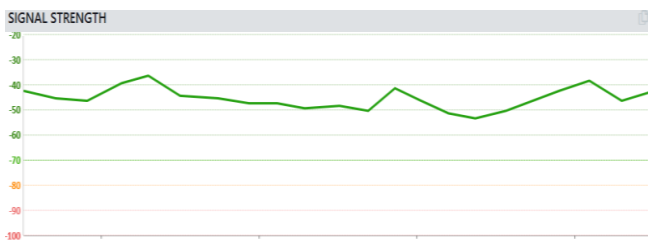


Figure 2 Signal strength receiving from router

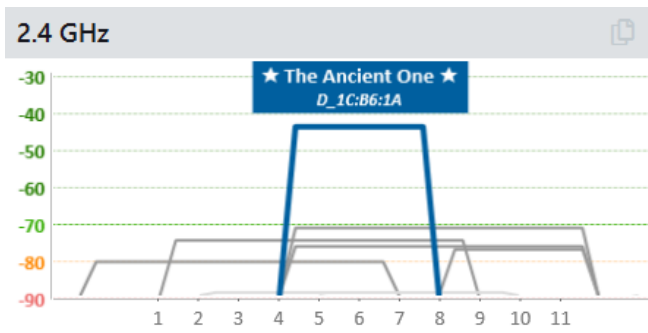


Figure 3 Channel of 2.4 GHz receiving from router

Table 3 Statistics and Configuration of 2.4GHz channel

Protocol	Wi-Fi 4 (802.11n)
Network Band	2.4 GHz
Signal	-48dBm
Channel, Bandwidth	6, 20MHz
AP link data rate (Receive/Transmit)	144/72 (Mbps)
Security	WPA-PSK/WPA2-PSK AES
Max data rate	144.4 Mbps
Wi-Fi Mode	b/g/n Wi-Fi 4

IV. RESULTS AND CONCLUSION

By analyzing a home Wi-Fi network, we can conclude from signal scan that router supports only 2.4GHz, which can also cover wider area but transmits at lower rate. And by using advanced encryption standard the security can be considered as standard. Channel 6 says that signal is not interfaced with one other. Data rate specifies that the transfer of data receiving is 144 Mbps. Encryption standards were maintained by WPA/WPA2 mixed. In order to increase the coverage of signal, access points or Wi-Fi repeaters can be used.

Usage of wireless communication one can achieve freedom from wires. It can establish connection if a device in a network range. To access Wi-Fi a device must need Wi-Fi enabled. These devices can send and receive data wirelessly in any location equipped with Wi-Fi access.

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