

Signal Strength Analysis in Residential Area

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Abstract—Implementation of a wireless network or what is commonly referred to as WLAN (Wireless Local Area Network) technology that has been regulated by standards IEEE 802.11. WiFi network is used to connect various devices and share data. Analysis of Wireless or wireless networks using the InSSIDer application, call Information on existing networks in the vicinity that have WiFi signal transmission

Index Terms—IEEE 802.11, InSSIDer, Wireless

I. INTRODUCTION

A long with the development of the era of technology, it is unavoidable, we as humans can not avoid the existence of this technology, a lot of technology makes a lot of things change so that makes the technology is part of life. one of these technologies is wireless network technology or can be called wireless network technology, which is widely used in various places, for example on campuses, cafes, coffee shops, and others.

Wireless development is very rapid, because it is flexible without using cables and saves costs, but from the statement Wireless also has many advantages and disadvantages. Previously it was thought that wired networks were faster and more secure than wireless networks. However, continuous improvement in wireless networking technologies such as the Wireless networking standard has made a lot of difference in speed and security between those wired and wireless networks.

- Local Area Network

local area network (LAN) is designed to connect personal computers and other digital devices within a half mile or 500 meter radius. LANs usually connect several computers in a small office, all computers in one building, or all computers in several buildings in close proximity. The most common LAN operating systems are Windows, Linux, etc.

- Wide Area Networks (WAN)

Wide area networks (WAN) span large geographic distances (entire regions, states, continents, or the entire world). The most universal and powerful WAN is the Internet. Computers are connected to a WAN via a public network, such as a telephone system or private cable system, or via leased lines or satellites. A metropolitan area network (MAN) is a network that covers a metropolitan area, usually a city and its main suburbs. Its geographical scope is in between WAN and LAN.

- Metropolitan Area Network (MAN)

MAN or Metropolitan Area Network covers a larger area than a LAN and a smaller area than a WAN. It connects two or more computers that are separate but are in the same or different cities. It covers a large geographical area and can function as an ISP (internet service provider). MAN is designed for customers who need high-speed connectivity. MAN speeds range in terms of Mbps. It is difficult to design and maintain a Metropolitan Area Network. The fault tolerance of MAN is less than LAN and also there is more congestion in the network. The data transfer rate and propagation delay of the MAN is moderate. [1]

II. RELATED WORK

Wi-Fi or better known as WLAN (Wireless Local Area Network) is a wireless network technology that is intended to connect several IP-based terminals (PCs, notebooks or PDAs) in a LAN (Local Area Network) area. WLAN is a application wireless development for data communication. As the name implies, wireless, meaning wireless, WLAN is a local network that does not use cables. WLAN network is very effective to use in an area or building. With performance and security reliable, the development of WLAN networks is a new trend in network development to replace wired networks or full wired networks. Solutions from WLAN development can cover a home area, small office, company to public areas

According to Andi Maslan and Tonny Wangdra, Wi-Fi is a wireless networking standard, only with the appropriate components can be connected to the network (2012: 105). According to him, Wi-Fi technology has standards protocol set by an international institute called the Institute of Electrical and Electronic Engineers (IEEE), which are generally as follows:

- The IEEE 802.11a standard is Wi-Fi with a frequency of 5 GHz which has a speed of 54 Mbps and a network range of 300m.
- The IEEE 802.11b standard is Wi-Fi with a frequency of 2.4 GHz which has a speed of 11 Mbps and a network range of 100m.
- The IEEE 802.11g standard is Wi-Fi with a frequency of 2.4 GHz which has a speed of 54 Mbps and a network range of 300m.

TABLE I
TABLE SPECIFICATION WIFI AND COMPABILITY

Specification	speed	frequency band	Series Compability
802.11b	11Mb/s	2.4GHz	b
802.11a	54Mb/s	5GHz	a
802.11g	54Mb/s	2.4GHz	b,g
802.11n	100Mb/s	2.4GHz	b,g,a

^aWahana Komputer,2010

A. Measurement RSSI (Receive Signal Strength indicator)

RSSI is a technology that is often used to measure an indicator of transmission strength data / signal received by the receiver of a wireless device. RSSI is usually used to map value based on distance, height, barrier, etc.

The power received by the antenna (P_r) is placed at a distance d of a known number of transmitting antennas transmitted power (P_t) and is given by Friis equation in equation:

$$P_r = P_t G_r G_t \left(\frac{\lambda}{4\pi d} \right)^2 \quad (1)$$

where G_t is the Gain of the transmitting antenna, G_r is the Gain of the receiving antenna and the λ is wavelength . [2] the influence of temperature and wind strength greatly affect the quality of RSSI, for the room and in the room there will be a very significant difference, factors that affect signal transmission at a receiver are obstacles such as walls, height, quality of the transmitter, and others. performance on signals that use the 2.4 Ghz band at one time there will be noise if the device used is a fake NIC.

B. Effect of Various Factors on RSSI of Antenna Positioning

The influence of factors on RSSI on the positioning of the antenna on the USB wireless TL-WN722N [3] greatly affects the reception of data on the device / Laptop this allows unstable transmission to occur when using the InSSIDer application and using SpeedTest to test the data transfer speed.

III. SCENARIO

this section we are use tools scenario as follows :

A. Tools and materials

- Access Point: the access point used in this session is the access point with the SSID "Alfatih", using the Huawei HG8245 router vendor with 100% transmission
- Laptop: The laptop used is an HP brand with 8440p series with Windows dual boot Ubuntu operating system, 1st generation i5 processor, with 1 TB of storage, and 6 GB of RAM
- Mobile : Redmi Note 8 with 4 GB RAM and 64 GB internal storage
- USB Wireless : TP-LINK TL-WN722N with a maximum data transfer speed of 150 Mbps
- Meter : to measure the distance from the router to the receiver

B. Software Used

- InSSIDer Application: functions as a WiFi scanner that can be reached by WiFi adapters with very detailed results for each WiFi network. Another advantage of this inSSIDer software is that it can work on regular WiFi adapter brands so it doesn't require a special WiFi adapter / device. [4]
- Speedtest by Ookla : a site that provides internet connection speed testing provided by a company from Kalispel .

C. Data collection technique

- Doing research planning that discusses the data to be taken at the time of the study include the floor plan, height access point, coordinates, distance, RSSI
- Specifies the coordinates of the Access Point position and the position of the receiver in the indoor environment.
- of the inSSIDER Application that has been run will report data against RSSI nilai values received by the receiver, and data collection is complete

Measurements made on this transmission signal are as follows:



Fig. 1. Location Measurements

in the picture above measured using a meter the distance is 8.5 meters with the router position in the house This condition has obstacles because there are several walls that the signal must penetrate. so that what is obtained on the TL-WN722N receiver is not stable.

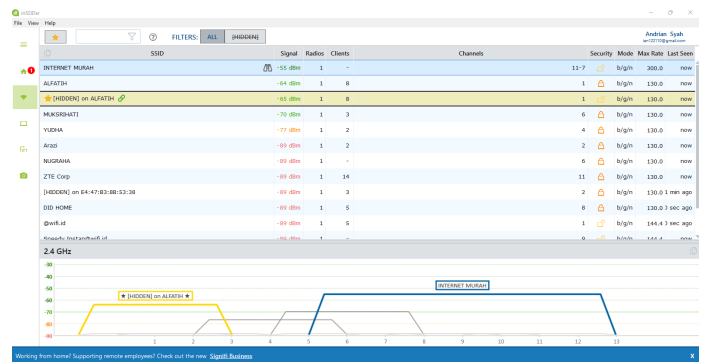


Fig. 2. Analyze InSSIDer

we get a signal called "ALFATH" of -65dBm in the HIDDEN position, if we look at HIDDEN this means that there is an SSID that is enabled for broadcast or broadcast.

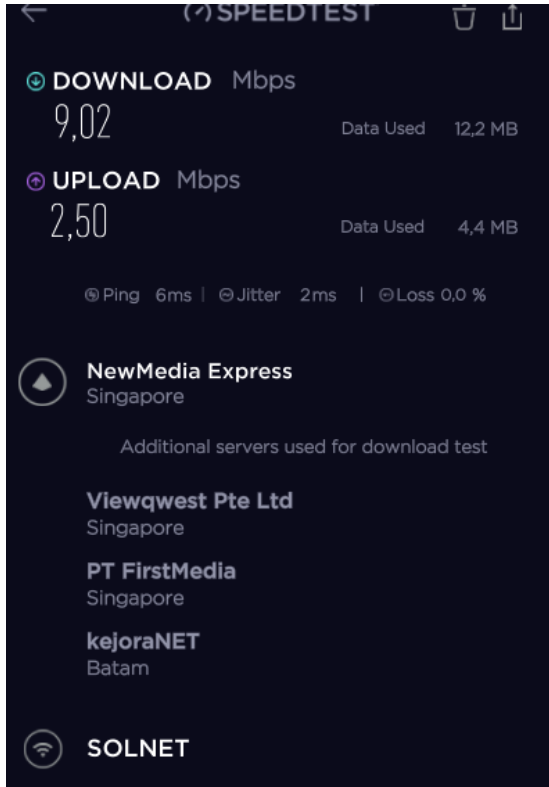


Fig. 3. SpeedTest

In this test, the obstacle that exists between the receiver and the router is a wall that is only in the bulkhead. we can see that the speed we get from the ISP should be 1:2 with a 25 Mbps package.

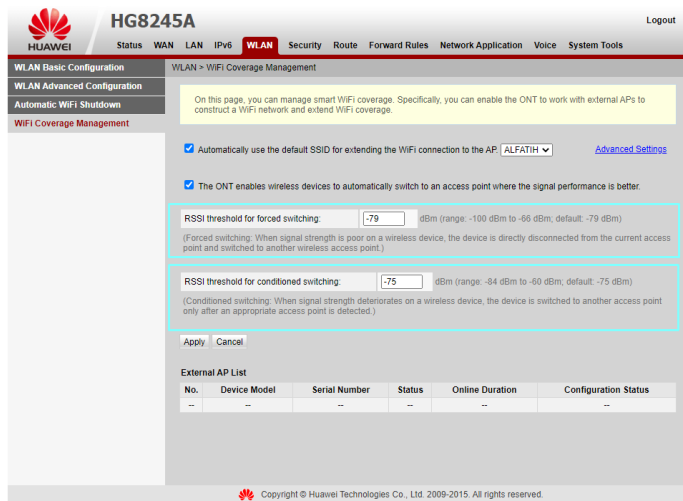


Fig. 4. Admin Page From Router Huawei HG8245

RSSI signal strength received by receiver does not depend on distance between transmitter and receiver, however shows

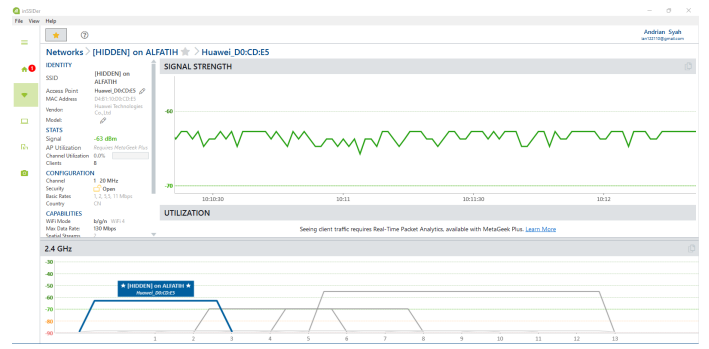


Fig. 5. Signal Strength View

that there are large variations in fading and shadowing at a location. This matter seen at the measurement place that is in good condition The environment has many properties such as in the room there are partitions, walls, tables and other properties, so that signal attenuation, signal deflection and reflection will occur signal resulting in a strong drop the signal emitted by the transmitter to the receiver, even though the distance between the transmitter and receiver close enough, but blocked by there is a property around it, then strength the signal will decrease and possibly the signal strength will be equal to the strength signal at the distance between transmitter and receiver which is far enough away, but does not have barrier around it.

IV. RESULTS AND DISCUSSION

From the results of the wireless network analysis carried out in a residential environment between houses using a wireless usb signal receiver TP-LINK TL-WN722N, that is, when we walk to the 2nd floor in the Iteba campus area, the network will move to the nearest access point with a double SSID thereby reducing transmission on a router, this is because the use of bands on the router is more than 1 SSID so the resulting coverage is low and makes the accessed speed decrease when used in the SpeedTest By Ookla application [5].

$$AverageRSSI = \frac{TotalvaluesRSSI}{TotalCoordinatesreceiver} \quad (2)$$

TABLE II
TABLE ANALIZE MEASUREMENTS RSSI

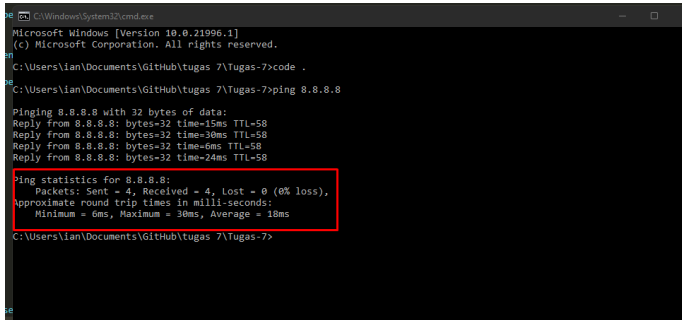
No	Tall	Receiver	Receiver signal average
1	178cm	8 Receiver	-53.87 dbm
2	180cm	7 Receiver	-51.98 dbm

^aProceeds from InSSIDer funds

V. CONCLUSION

A network will be inhibited if there is a wall and a wall that causes results unstable and makes data transmission to the receiver device less and as a result buffering occurs, therefore there must be a repeater at every point to ensure maximum data reception strength and no distortion of a wireless signal.

The use of the 2.4 GHz and 5 GHz bands actually doesn't affect it, but when we tested it when using the SSID Hotspot using the 5 GHz band it wasn't detected on the laptop. old or outdated, but on laptops that already support the 5 GHz feature, you will be able to see the SSID that was created. [6]



```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.21996.1]
(c) Microsoft Corporation. All rights reserved.

C:\Users\ian\Documents\GitHub\tugas 7\tugas-7>code .
C:\Users\ian\Documents\GitHub\tugas 7\tugas-7>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=15ms TTL=58
Reply from 8.8.8.8: bytes=32 time=30ms TTL=58
Reply from 8.8.8.8: bytes=32 time=6ms TTL=58
Reply from 8.8.8.8: bytes=32 time=24ms TTL=58

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 6ms, Maximum = 30ms, Average = 18ms

C:\Users\ian\Documents\GitHub\tugas 7\tugas-7>
```

Fig. 6. Measurements With Commad Promp

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