International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 04 Issue: 11 | Nov -2017 www.irjet.net p-ISSN: 2395-0072

Automatic Detection of Stronger Wi-Fi Networks

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Abstract - *In the present day, millions of homes worldwide are equipped with an internet connection. They might either be a wired connection which equips personal computers (PCs) with an internet connection, or a wireless connection that aims to connect devices such as handheld computers and mobile devices to the internet. This paper focuses on a problem that wireless connections face and aims to solve that problem.*

There are multiple Wi-Fi connections that are available in the vicinity of our devices. The available Wi-Fi connections differ in their speeds and strengths relative to the position of our device and the Wi-Fi router. Naturally, anybody would want to connect to the strongest connection. Many a times, we can determine the strength of the connection, but that's not possible all the time. Our devices do not have the capability to automatically switch between the networks as their strengths relative to them vary, and this poses a problem as we cannot always keep checking whether any other Wi-Fi networks are available. The solution we're aiming to find is to provide the capability of automatically detecting and switching to strong Wi-Fi connections, to our devices with almost no user intervention.

Key Words: **Wi-Fi router, Network Interface Card, IEEE 802.11, Signal Strength, RSSI, dBm, Internet Service Provider.**

1. INTRODUCTION

In this day and age, internet is more of a necessity than a luxury. Hundreds of thousands of people are subscribing to the internet services provided by various service providers every day. As new methods to connect to the internet are being devised every single day, there are two main approaches by which a device maybe connected to the internet. A device can be connected to the internet by using a wired connection. Normally, personal computers which are desktops are connected to the internet by the means of a LAN cable, which connects the desktop to the internet by a twisted copper-pair or coaxial-based transport system [7]. This wire is drawn from the Internet Service Provider's office to each subscriber's houses. Also called an Ethernet connection, this is normally faster than wireless connections and also provides better security. However, it comes with its own set of disadvantages. They cannot provide connectivity to the devices that use the 802.11 protocol to connect to the internet and the device needs to be fixed at a point to use the Ethernet means of connecting to the internet.

The second method of connecting to the internet is by the 802.11 protocol, commonly known as the Wi-Fi. Wi-Fi is a great means of connecting to the internet for all the handheld computers and mobile devices that are equipped with a Network Interface card (NIC). This method involves the Internet Service Provider providing an internet connection by the means of an Ethernet cable which connects to a router. The router acts as an Access Point to which devices equipped with a Network Interface Card may connect as a Station (STA) to the Access Point. This method of connecting to the internet has gained a lot of popularity in the last decade as this is a cheaper method of accessing the internet from mobile devices, which otherwise would have to depend on their sim card providers for internet, which is really expensive. Different speeds are charged accordingly, which maybe LTE, 4G, 3G or 2G. Apart from being expensive, the internet provided by them is limited in both speed and capacity. Desktop computers do not have the capability to connect to Access Points, i.e. they cannot connect to Wi-Fi networks as they do not have a Wi-Fi chip built in them. However this problem is solved by the recent developments of USB Wi-Fi adapters and PCI-E Wi-Fi cards, or replacing the motherboard with advanced ones that have built-in Wi-Fi capabilities. [6]

2. EXISTING SYSTEM

With the rapid increase of the use handheld computers and mobile devices in the past decade, the need to provide Ethernet quality internet to these devices has surged. These days, a device without an internet connection is as good as nothing. Many public amenities have begun to take advantage of this fact and have started to provide free Wi-Fi to everyone to attract more customers. Free Wi-Fi may now be found in many public places such as restaurants, colleges, libraries, bus stops, buses and local trains. But the speed and strength of these connections is quite questionable. Naturally, everyone would want a good Wi-Fi connection for a low price, or better yet free. However, choosing the best connection amongst a list of available networks is a tedious task. One would have to individually connect to each network and then check its speed and reliability and then choose the best one. More often than not, we end up using a sub-par connection.

Wi-Fi signal strength is measured and expressed decibel-milliwatts (dBm) or Received Signal Strength Indicator (RSSI) [5]. RSSI is a relative index, whereas dBm is an absolute index. According to the IEEE 802.11 standards, RSSI maybe a value between 0 and 255. The maximum value of the RSSI (RSSI_Max) is defined by the respective chipset manufacturer. Hence, a more absolute measure is used, which is dBm, calculated using logarithms. dBm is a negative value and the closer the value is to zero, the stronger the signal strength is. A dBm value of '-30' is the maximum achievable strength and

is a strong connection, whereas a dBm value of below '-70' is considered weak.

The Wi-Fi speed however, is measured in terms of Mega-Bits per Second (Mbps). The Wi-Fi speeds offered currently by the service providers usually range from 1 Mbps to 100 Gbps, which is a staggering speed, even by the current LTE standards. Any speeds of above 2-3 Mbps are considered good, but this again comes to personal preferences and the types of applications being used.

For a Wi-Fi connection to be reliable, both the strength and the speed have to be commendable. In the existing systems, the Wi-Fi enabled device normally connects to the strongest signal available. But even if we move away from the router, or if the strength of the reduces, the device remains connected to the same Access Point till the signal dies completely and then looks for a new connection. This is definitely a problem if we don't check our devices frequently.

SIGNAL STRENGTH	DESCRIPTION	COMMENTS
-30 dBm	Amazing	Achievable only if few feet away from the AP.
-67 dBm	Very Good	Minimum strength for streaming videos.
-70 dBm	Okay	Minimum strength for web/E-Mail.
-80 dBm	Not Good	Minimum strength for basic connectivity.
-90 dBm	Unusable	Any functionality is unlikely with this strength.

Table 1: Common Signal Strengths

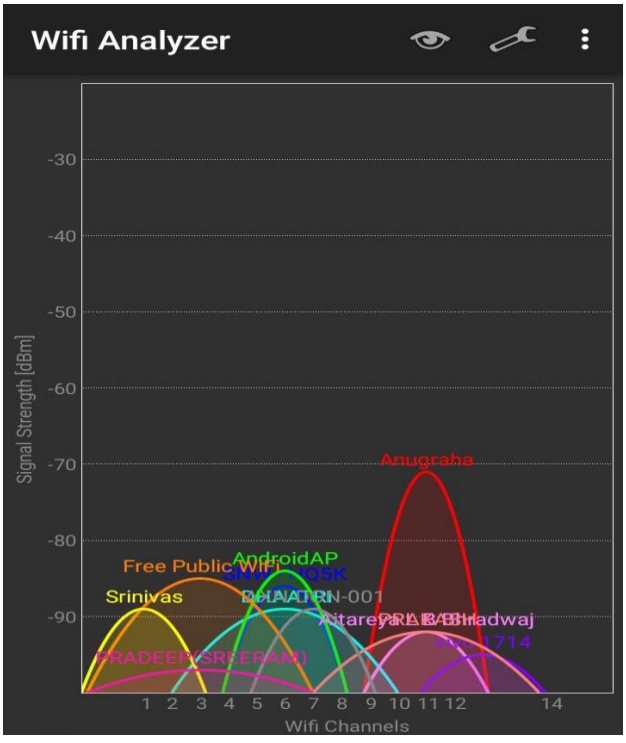


Fig 1: Weak Wi-Fi signal strengths

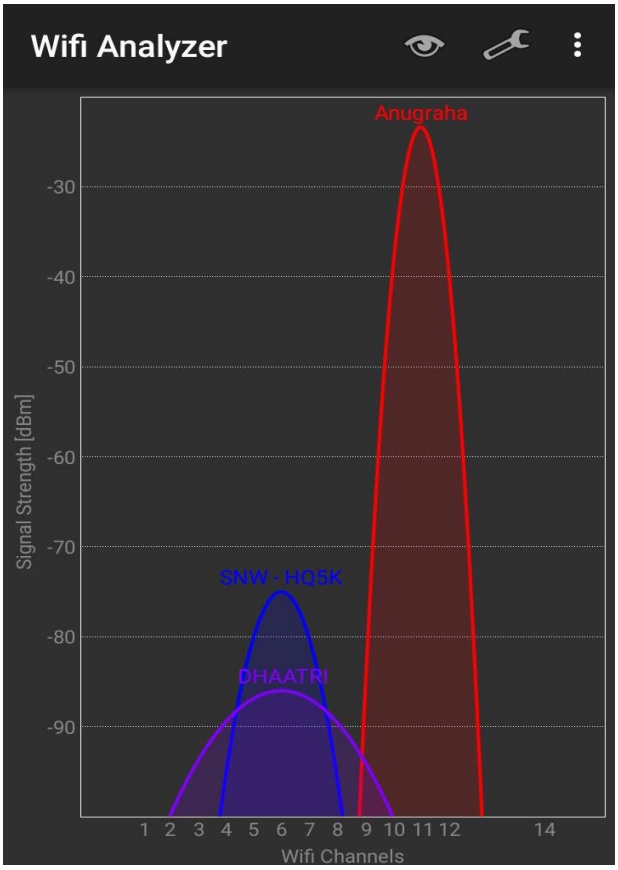


Fig 2: Strong Wi-Fi signal strengths

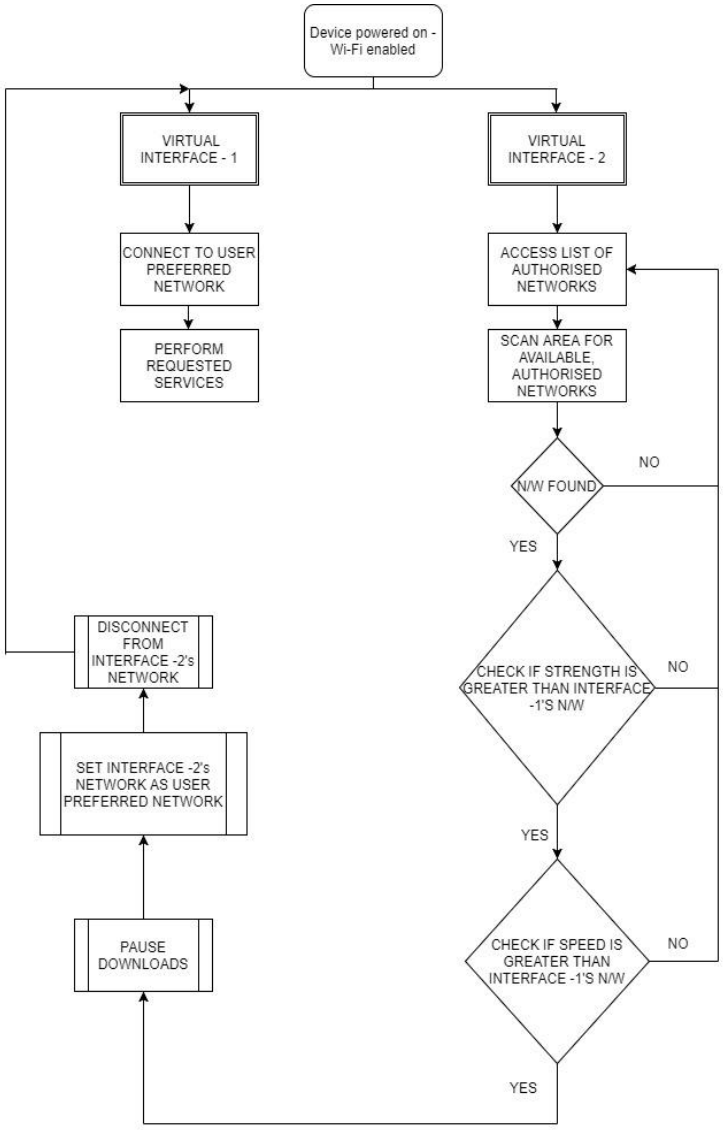
3. PROPOSED SYSTEM

The only method as of now to connect to the strongest and fastest Wi-Fi network is to individually check the speed and strength of all the available networks and select one amongst those. The proposal is to automate the entire process so that the user interference with the system is minimum. At any single instance, a Network Interface Card would be able to connect to a single Wi-Fi network. Hence, there is no means of the device being able to measure the strength of the available signals without being disconnected from the current network. This is infeasible as any ongoing processes depending on the Wi-Fi would get affected. Therefore, we need to devise a method of doing the same without disconnecting from the current network.

As we need to simultaneously connect to two Wi-Fi networks, one for the current usage and another to check for a better network, we need two Network Interface cards. The Wi-Fi capable devices currently have only one Interface Card built within them. One method of implementing two NICs in a single device is that the manufacturers themselves must incorporate two NIC's into the devices which isn't in our hands. The second method is to virtualize the existing NIC into two different NIC's, such that there are two interfaces. This maybe done using an open source solution such as Open vSwitch[2][3] and VDE (Virtual Distributed Ethernet).[4]

After virtualization of the network card, the first network card would be connected to the Wi-Fi network of the user's choice. The devices normally store a list of the previously connected Wi-Fi network names and their passwords, so that when a user tries to reconnect to the network, no authentication is required. The second Network Interface card must constantly be in an iteration of scanning the available networks, connecting to them, checking their signal strength and speed and comparing it with the connection of the first NIC. First, the strength of the signal of the second NIC is compared to the first NIC's signal. If the strength is greater, then the speed of the second NIC's Wi-Fi signal is checked with the first NIC's signal. If the speed is also greater, then any current downloads and Wi-Fi dependent processes are paused, the Wi-Fi connection is switched and the paused processes and downloads are resumed. If the second NIC's Wi-Fi signal and strength are lesser than the first NIC's Wi-Fi, then the second NIC disconnects from the Wi-Fi and connects to any other networks, if available and the process repeats.

4. FLOWCHART



5. CONCLUSION

Handheld computers and mobile devices are always on the move as they are not restricted to a fixed place. This leads to the frequent drop and increase in the Wi-Fi signal that the device may be connected to. If multiple Wi-Fi networks are available, then it is in the best interests of the user to connect to the best available network of the highest bandwidth. The primary motive behind the proposed system is to reduce human interaction with the system and automate the process of choosing a better Wi-Fi network. As the proposed system succeeds in the task of choosing a better Wi-Fi network all by itself, it is definitely a win-win situation. Also, the proposed system continuously scans the surrounding area for better networks and connects to them if it finds the strength and speed of the new network better than the currently corrected network. Using two NICs or virtualizing two Network Interface Cards may lead to more power consumption in a device.[1] But with the advancements in the recent battery technologies such as dash charging, it is definitely possible to overcome any such limitations.

6. REFERENCES

[1] Ranveer Chandra, Paramvir Bahl, Pradeep Bahl, "MultiNet: Connecting to Multiple IEEE 802.11 Networks Using a Single Wireless Card" published in IEEE Infocom 2004. M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.

[2] Ghannam Aljabari, Prof. Dr.-Ing. Evren Eren, "Virtualization of Wireless LAN Infrastructures" presented in the 6th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems K. Elissa,

[3] http://openvswitch.org

[4] http://wiki.virtualsquare.org

[5] https://support.metageek.com/hc/en-us/articles/201955754-Understanding-WiFi-Signal-Strength

[6] https://lifehacker.com/how-can-i-add-wi-fi-to-a-desktop-pc-1569231692

[7] https://computer.howstuffworks.com/home-network2.html