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Optimization of WLAN for Higher Data Rate

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Abstract: ***In the modern world it has become very important that every person has a link to the global world via internet. Keeping this in mind Wi-Fi provides a strong access to the internet. Majority of the people use Wi-Fi to connect to internet. A wireless router allows wired and wireless Ethernet LAN devices to connect to a (usually) single WAN device such as a cable modem or a DSL modem. Wi-Fi routers these days are available at a very low price. Being affordable and reliable they are the customer's first choice. Different routers provide different coverage area.***
The paper describes about analysis of a Wi-Fi signal and its strength for achieving the best available speed at various locations of campus. The motive is to present how the signals are measured, analysed and optimized for a better performance and strong connectivity. Several measurements were conducted to note down Signal strength at different locations in the college campus and hence to provide a solution to an optimized cost efficient network. This project has been carried out by many others. But still there is enough scope available and lots of research can still be done to achieve a higher efficiency. People have carried out the experiment but have not given techniques to optimize the available network for speed as well as strength. If the area in which Wi-Fi network has to be set up is studied in advance keeping in mind the affecting factors, then it is possible to have a well-established and high speed effective network set up in all prime locations. This will ensure better connectivity
Thus it is necessary for us that we have an optimized network which provides a solution to the best available speed, covers maximum area and is cost efficient.
Keywords: ***Xirrus, dB level, data rate, Wi-Fi***

I. INTRODUCTION

Wi-Fi is crucial component in engineering colleges, software companies and other private companies. It is essential to make sure that the router are placed in the area in such a way that the entire required area will be covered so that it can be used by the people. In this project we have identified the position of routers in. We have measured the speed at different locations and identified the dead zones to solve the problem of connectivity.
There are many tools which are available free of cost and provide sufficient information about the available Signal. Amongst all the available tools, five of them are listed below with a brief description.

A. Coverage
1) Android based Tool .Available free of cost on Play Store.
2) The app shows Map of your surrounding with access points
3) However fails to show exact location.

B. Wi-Fi Analyzer
1) Simplest to use.
2) Available across all platforms.

C. InSSIDer 2.0
1) Available on Windows.
2) Shows all the network info as well as Graphical representation.

D. Xirrus
1) Available on Windows.
2) It is available as trial version for 1 month. Can be used to design our own MAP.

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E. Acrylic

1) Available on MAC and Windows.

2) Not available as open source but is very efficient.

II. EXPERIMENTAL PROCEDURE

Amongst the five stated tools, two tools Xirrus and coverage were chosen. This ensured more reliable readings. Both the tools are very efficient in their own ways.

On the experimental part different locations in our campus were surveyed and noted the signal strength as well as speed at these points. The time was also considered keeping in mind the number of users. Using laptop a connection was made to the available SSID. The strength values in dBm and speed values mbps were noted. After successful completion of the experiment, the available data was analysed and subsequent results were concluded. After this a photo of the campus map was obtained from Google Maps and the available data was plotted in a pictorial format showing available strengths including the dead zones.

A. Wi-Fi Information

SSID: VIT_CAMPUS
Bandwidth: 20MHz
Protocol: 802.11
Mac ID: E0-94-67-15-13-91
Network Band: 2.4 GHz

On the optimization part we then found out areas where one more Router can be placed or the existing be relocated so that dead zones are removed. This new network was again plotted on map.

Location	Strength	Signal	Speed
1401	-77 dBm	Moderate	430 kbps
1413	-69 dBm	Moderate	657 kbps
1217	-65 dBm	Moderate	650 kbps
1222	-90 dBm	Weak	83 kbps
HOD office (2nd floor)	-57 dBm	Strong	659 kbps
1202	-83 dBm	Weak	429 kbps
1019	-67 dBm	Moderate	504 kbps
1301	-95 dBm	Very Weak	Nil
1324	-84 dBm	Weak	128 kbps
Student's Section	-89 dBm	Weak	248 kbps
Boat Club	-57 dBm	Strong	648 kbps
Parking	-60 dBm	Strong	650 kbps
Canteen	-73 dBm	Moderate	346 kbps
Library	-54 dBm	Strong	773 kbps
Reading Hall	-53 dBm	Strong	834 kbps
Ground	-85 dBm	Weak	297 kbps
Fruit Centre	-68 dBm	Moderate	423 kbps
NesCafe	-74 dBm	Weak	378 kbps
Auditorium	-70 dBm	Moderate	454 kbps
Chemical Building	-65 dBm	Moderate	500 kbps

Table-1: Wi-Fi Strength and Speed

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It can be seen that there are some points where Wi-Fi signal is very low in the campus these points are indicated by red marks in the map. These points can be categorised as weak signal strength.

It can also be observed that the signal strength at a place directly affects speed at that location. Points where signal strength is high higher data speeds can be experienced. However this observation has upper bound, the speed can only be increased up to a certain limit depending on the router. The data transfer speed increases up to a point as signal strength increases.

To build a cost efficient network we should rearrange the Wi-Fi routers to cover maximum area. A suitable plan is illustrated in the map. Apart from this certain signal extenders should be used in order to get strong signal strength everywhere.



Fig-1: Map showing Access Points and Wi-Fi Strength

III. CONCLUSION

From the experiment conducted, it can be concluded that the speed of the network is directly proportional to the signal strength upto a maximum range after which the strength no longer affects the speed. If the network strength is too low then the data connectivity goes nil (As can be seen in one of the readings). However the speed cannot be optimized by strength after maximum data speed of the service provider is reached.

The speed of the network also varies with number of devices connected. More the number of devices lesser are the speeds. Some routers hence allow only a limited number of connections (Usually 10).

The network routers and access points should be aligned properly keeping in consideration the maximum range and capabilities. Properly arranged Wi-Fi networks perform better and hence better results can be obtained at higher speeds.

IV. FUTURE SCOPE

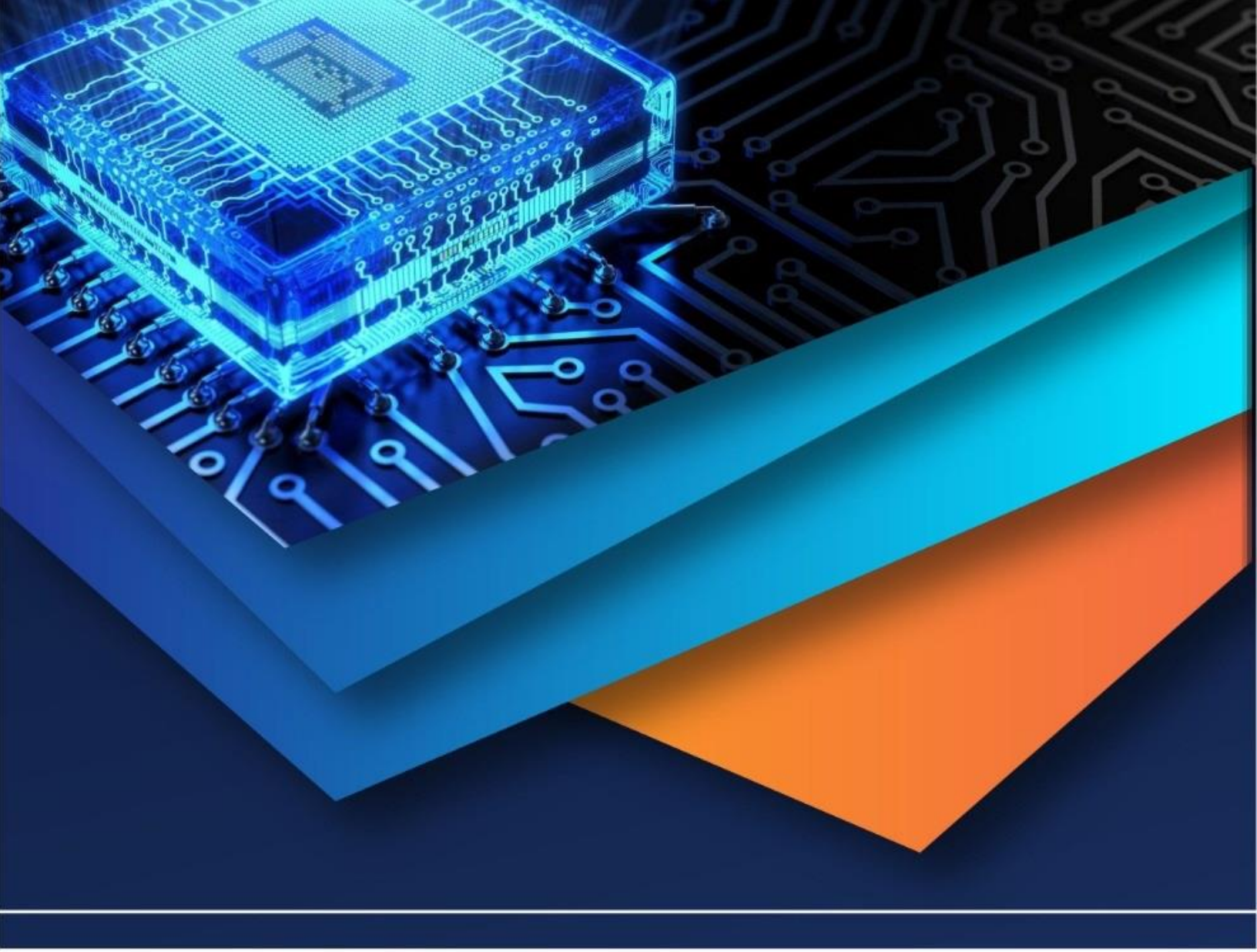
This Project cn be built into a powerful and accurate product to measure all the network optimization parameters like speed, strength, connectivity etc.

As we all know that currently trending technology in market is the Internet of Things. If all the available data is recorded and stored over coud for different research purpose then even stronger network can be built by taking in consideration some other factors.

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