High Length Wi-Fi Network System

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Abstract — The present world today is running continuously, looking for something new day after day. Today, the world is standing at the edge of the door, thinking back after a few decades from now on, it was possible only because of science. And the main discovery content of that science is the Internet. Because of this internet, we can easily do any work that was not possible before such as with a distant person, we can now speak very easily, no matter where we are, we can see him and only because of the internet. Telecommunication sector is created to make communication media reach the target. This sector has reached the hands of the media today. People can quickly talk to people far away or close to them. Telecommunication sector has allowed us to run the internet, which is why we can take advantage of this when we need it. Because of science, we are using this internet medium in different ways. For example, broadband line (Ethernet) and router system process. Our job will be to provide the people of the whole Bangladesh with the internet only through the Wi-Fi router system process. That's why anyone can use the internet whenever he/she wishes, no matter how much he/she is out of range of the network? Our system will cover the entire country with a few network towers which will make Wi-Fi systems such as the router now-a-days.

Index Terms — Urban Area, Rural Area, Wi-Fi Network Tower, and Telecommunication Sector.

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1 INTRODUCTION

The Internet is a medium by which it is possible to bring the entire world at once. Today the world has come to our hands due to the internet. What we need to know is because of the internet we know so easily. Not only is this the use of the internet is also used in many activities. This internet is the main vehicle to reach the peak of the current society. There are some innovations on the day and inventive things are being developed day by day. A few years ago, when the Internet came at hand, we used it with the help of a wire, called Broadband Line (Ethernet). This medium is still being used. However, due to Ethernet, only one user can use his/her device. But many people will be able to use this kind of things, when it comes to router devices then many users can use their devices at a time. The main reason for this is that the demand of the people is increasing due to the internet and efforts are being made to bring innovation. Every country has urban and rural area. In Bangladesh we have also urban and rural areas. When we look in our countries urban area, people get lots of opportunities where rural people do not get it. Most of the cases rural people are deprived from using the innovative things. So, every area both of urban and rural area creates provider who provide the internet by cable which is called Broadband Line (Ethernet).

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Most of the people in our country use Broadband Line (Ethernet). Some of the people use prepaid/postpaid system which is provide by company. But recently people are interested to use internet by router system process because they want to use many devices or many devices used by many users at a time. In figure we can see how Ethernet and Router system work.
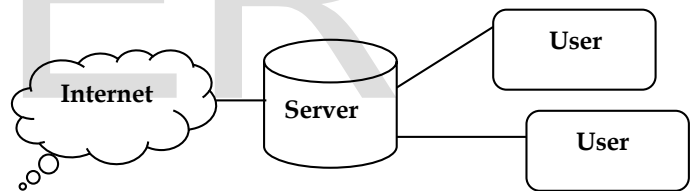

Figure 1: Broadband Line (Ethernet)

Figure 2: Router System Process

To communicate with distant people, we invent phone. Then it is modified now we invented mobile phone. For this reason, telecommunication sector is to create and provide signals so that when people can speak intelligently with distant or near people. To provide this signal to the user, telecommunication sector used Network Tower. In Bangladesh telecommunication sector basically used 3/4 types of network tower.

Table 1: Height of Network Tower

Name	Height
Green Field	34m + Outdoor
Roof Top	32m + Outdoor
Roof Top / Green Field	29m/32m + Outdoor

Roof Top means the network tower which is established on building of the roof and green field means the network tower which is established on open area.

Telecommunication sector is currently operating on the internet. For this, they are using the network towers. The work of mobile network towers and internet provider network is a little bit different, but it is compatible with the work procedure.

Recently in our country telecommunication sector work on 2G and 3G system. For long distance coverage they used this system 2G and 3G system. This system is very helpful for better communication. 2G system can cover long distance. By this process we can easily call other people who are live in far away from him/her. This process is called wireless voice communication process. 3G system is used UMTS (Universal Mobile Telecom System) and EDGE. By this process we can video call. It is also used HSDPA (High Speed DL Packed Access) and HSUPA (High Speed Uplink Packet Access). By this process we can easily download. In here, it is also used LTE (Long Term Evolution) system. This process is created and provides by network tower to the user. It's not very simple process but helpful system for better communication. They used it for providing the internet to the user. Telecommunication sector also think about those people whose do not find any Wi-Fi system to connect their devices they used this system; they buy data packages. For using internet user will buy data and they can easily use it. It is basically made for rural area people but now every user uses this system.

2 WORK ACTIVITIES OF TELECOMMUNICATION SECTOR:

Telecommunication sector basically worked for two systems. One is provided network signal to the mobile users and second one is provide internet by data packages system (2G and 3G) system to the users.

We will describe about the second one. There is a controller who controls the server and this server directly connected to the tower to create internet. When internet is ready for providing then the main process is started. It connects to the tower and provide internet to the user by data packages

system which is control by controller. They [Controller] store the data information from the user.
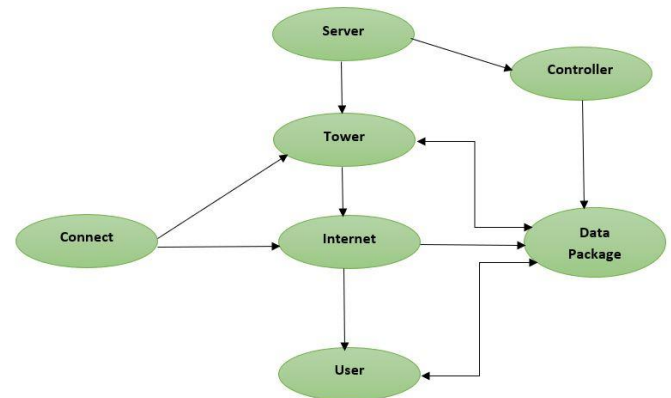
Flow Chart: Activities of Telecommunication Sector (Work Process)

2.1 FOCUS:

We will create Wi-Fi network tower system which is providing internet to the user. The work process is very simple as like router system process. Our system is also following the work process of Telecommunication network tower system. But the difference is our system will create Wi-Fi for users where telecommunication network tower create signal and 2G, 3G system for users. Another difference is we do not need so many towers for providing internet to the user where telecommunication sector use lots of towers to provide internet to the user.

2.2 OUR FOCUS AREA ZONE IS:

- First coverage the limitation area to provide internet.
- Don't be creating much tower.
- Second coverage city and division.
- At the end coverage the whole country (Bangladesh).
- Login system.

2.3 WORK ACTIVITIES OF WI-FI NETWORK TOWER SYSTEM:

In our process we have a controller who controls the server and this server directly connect to the Wi-Fi Network Tower to create internet. When internet is ready for providing then the main process is started. It connects to the tower and provide internet to the user. We will give log in process system for security issues. User will connect their devices to the internet by log in system process. Data will store to the

system and control by the controller.
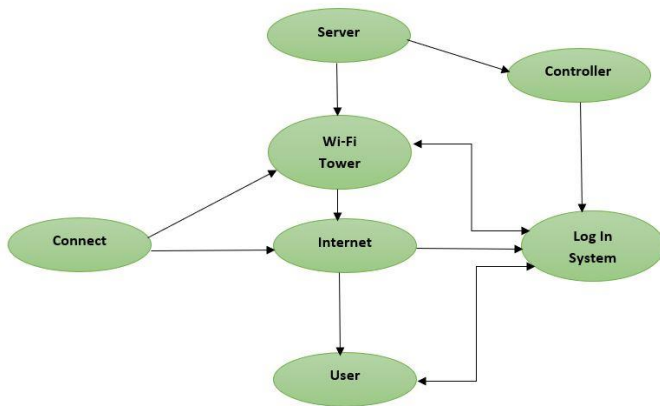
Flow Chart: Activities of Wi-Fi Network Tower System

2.4 PROCESS:

Step 1: Controller controls the server and tower.
Step 2: Internet provide to the user.
Step 3: User will log in and connect their devices.
Step 4: Multi user (vast) connect their devices at a time.

3 TOWER WIRELESS FREQUENCY:

Using Wireless Link Calculator [1] we can assure that the connection link will be stable as theoretical term proves.

Wireless Link Calculator

Parameters	SITE 1		SITE 2	
Wireless cards				
Power	25	dBm	25	dBm
RX Sensitivity	-100	dBm	-100	dBm
Antennas				
Gain	25	dBi	25	dBi
Cables				
Length	0	m	0	m
Type	LMR400		LMR400	
Link				
Distance	75	km		
Frequency	5000	MHz		

Calculate

Link theoretical status	Reliable
Theoretical signal level at site 1	-70/required -100
Theoretical signal level at site 2	-70/required -100

For antenna we are using DynaDish 5 it 802.11a/n/ac supports wireless standards

So we can easily establish internet connection from user devices to our Wireless AP. From test result it also shows the potential to support huge amount of client with providing high speed internet. Like an ISP controls bandwidth same we will do with our system using the MikroTik router board CRS226-24G-2S+RM. Using the RouterOS latest version we can bridge the connection between our captive portal system to the internet via this router board.

3.1 SPECIFICATIONS OF DYNADISH 5 WIRELESS FREQUENCY:

Wireless specifications

5 GHz

	Transmit power (dBm)	Receive Sensitivity	Transmit power (mW)
6MBit/s	31	-96	1259
54MBit/s	28	-81	631
MCS0	30	-96	1000
MCS7	27	-77	501
MCS9	22	-72	158

3.2 SPEED COMPARISON CHART:

Ethernet test results

RBDynaDishG-5HacD		QCA9557 1G all port test					
		1518 byte		512 byte		64 byte	
Mode	Configuration	kpps	Mbps	kpps	Mbps	kpps	Mbps
Bridging	none (fast path)	81.2	986.1	234.9	962.2	477.7	244.6
Bridging	25 bridge filter rules	81.2	986.1	118.4	485.0	119.5	61.2
Routing	none (fast path)	81.2	986.1	234.9	962.2	408.2	209.0
Routing	25 simple queues	81.2	986.1	158.3	648.4	165.8	84.9
Routing	25 ip filter rules	64.8	786.9	70.4	288.4	60.9	31.2

3.3 CABLING:

For establishing cable connections between switches routers or the DynaDish 5 we will use Category 6 (CAT 6).

4 HEIGHT MEASUREMENT:

Ground Towers, which must be implemented on the

grounds, can cover approximately 8.05 to 72.42 km whereas rooftop towers can cover 3.22 km to 40.23 km around their implemented places. In urban areas, rooftop towers are pretty convenient since there are less places to implement ground towers. Moreover, ground towers are more sophisticated than rooftop in maintaining and implementing as well in the urban areas. Rooftop towers' satellites have the coverage length ranging from 3.22 km to 40.23 km *spreadingly* in a single direction which we have mentioned earlier. Meanwhile, satellites of these towers can move 180° from a fixed movable position. However, these satellites have coverage area ranging from 32.53 km2 to 1618.74 km2 radially which is determined by the area of circle $A = \pi r^2$. Therefore, these towers are very convenient for the urban areas to broadcast the wireless network flawlessly and cost effectively as well. Furthermore, we can create wireless field through the satellites to provide internet throughout the small areas, cities, divisions and the country as well. We have to necessarily use ground towers or green field towers to provide nationwide wireless internet. Proper combination of various towers will be more cost effective and will be comparatively easier in maintain either. We are going establish a roadmap to give a light on the feasibility of our idea.

Diagonally, it has the length of 1.54 km.

We are planning to set up ground towers to at the ends of diagonal length of Azimpur to have maximum coverage. Moreover, we will implement two or three rooftop towers to check the coverage capacity and internet service initially. Later on, we will try to decrease the number of towers according to the wireless field and internet service. Ground towers are mainly the connecting path for the cities. The adjacent areas of Azimpur will be connected through these towers and according to this process, we can cover the Dhaka city and the adjacent cities of Dhaka as well. Throughout this process, in fact, we can cover the whole country.

Ground towers are the vital part of this project to create a nationwide wireless system since we have to cover the long distances through these towers. We will use rooftop towers while we are providing internet throughout the cities since cities have more congested places rather than the open places in countryside and have more buildings as well. Among cities, high rise buildings will be used to implement the rooftop towers to avoid the negative effects of the frequencies of the wireless fields.

Figure 3: Tower Implementation in Azimpur Area

5 PROCESS OF TOWER IMPLEMENTATION:

To begin with, we have selected Azimpur located in Dhaka, Bangladesh as our elementary area. Azimpur has the area of 1.18 km2 having height 1.17 km and length 1.08 km.
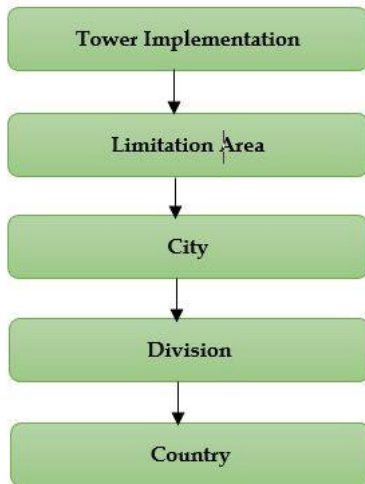
For tower implementation our main focus is to cover the limitation area first. Then it will cover the city area. After that we will focus on to cover the division and lastly, we will cover the whole country.

6 LOG IN SYSTEM PROCESS: INTERNET FOR EVERYONE

Our login system will be working as a captive portal. Benefits of using captive portal are that we can manage each user with unique id as for their login credentials. To access the internet a user has to create a user id via connecting to the portal and filling some necessary forms. Come to the homepage when a user connects to our Wi-Fi system. The process of our system will begin with receive HTTP request message from client device. Our system will identify the request and give access then client device will be successfully connected to our system. After successfully connection our system will show the welcome page to the user and user can easily see the welcome page. In welcome page use will find two options. First option is log in process and second option is register process. Log in process means if our valid user has an account in our system they can easily sign in to our system and can easily use our system. Register process means which user has no account in our system if they want to access in our system they need to an account and this option will help him to create an account in our system. If our client device does not connect to our system, it will take out to the system just because of user has no account. So, user must have an account for accessing the process. After that user can login to portal if

already registered or if user is new to this portal, they can register via register page in upper right side.
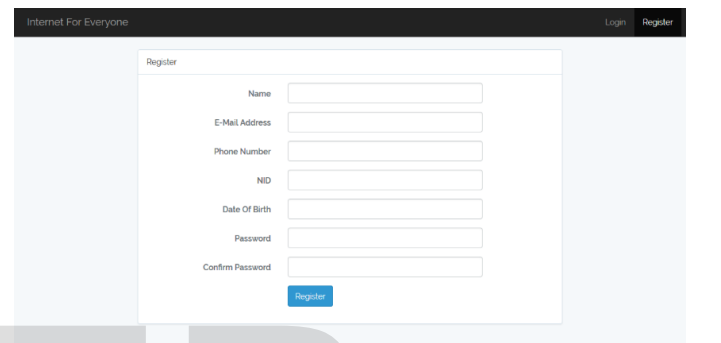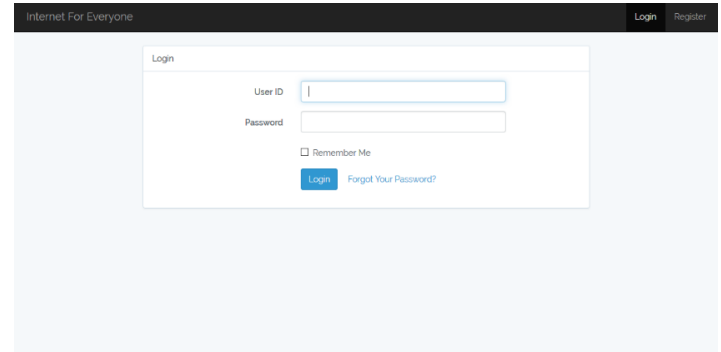
Why using a captive portal?

So, we are using captive portal so that we can track our users and also be able to give them their privacy and security which they are concern about. Open Wi-Fi networks can be easily is targeted for various kinds of cybercrime attack by hackers. To help them from those hackers we are supporting this captive portal system so that our user can safely use the internet without being worried about online hackers.

What are the cons of this system?

As we ensure our users good internet connection with security protection this system will be costing, high monitoring equipment's so budget for building this system goes up for this.

What is the future works we can do of this system or think about evolve of this system?

Primarily this system can provide internet but having a trouble to register and connect each time. In future we can develop more secure way to connect it with social login credentials. There will be more benefit if we can apply it For

example, if someone using the captive portal logs in using their facebook account, we could have permission to collect information such as, age, date of birth, what their interests are etc. With this information we can create more personalized experiences, based on real information.

7 COSTS:

Every year, the telecommunication sector is spending a lot of money in building network towers. About 4 thousand network towers are built every year in Bangladesh. If we took our process the cost limitation is very low from the telecommunication sector process. Our process is also highly effective.

Table 2: Cost of network and Wi-Fi network tower

Telecommunication Sector (Tower)	Our Tower (Wi-Fi)
Built tower (Per Year): 4000 Cost: 4-5 lakh (Per Tower) [Assumption] Total Amount: 1,600,000,000 tk. [Took 4 lakh per tower]	Built Tower: 250-300 [Assumption] Fixed. Cost: 8-9 lakh (Per Tower) [Assumption] Total Amount: 240,000,000 tk. [Took 300 tower]

8 BENEFITS:

[1] Every user can connect their devices to the internet by Wi-Fi network tower.

[2] Don't need to implement high amount of network tower for providing internet.

[3] In our Wi-Fi network tower system overall cost will be more efficient.

So, this system approach is very effective from telecommunication sector work process.

9 MISSIONS:

Our main focus is to provide internet whole of the countries people by Wi-Fi network tower and our system build limitation Wi-Fi network tower for coverage the area.

CONCLUSION:

We have focused most on our papers provide internet whole of the countries by Wi-Fi network tower system and build limitation network tower for coverage the area. This is our main focus.

For our work purpose to fulfill our mission we divide the work mechanism. First, we worked on limitation area. After that we worked on city and then worked on division. But our mission or goal is to provide internet to whole of the countries and increase the number of users.

We also talked about the cost of network tower and Wi-Fi network tower system and seen about which tower is more efficient for using to provide internet.

We must care about our user data. That's why we also create a log in system process for security issues. We need to more research for security issues and also work mechanism.

If this system is creating then the work growth will increase because our world is dependable on internet and people also. For each work people need internet. If it is created people will always touch the internet. For this reason, we also need powerful power plant which is always supply power.

For better communication and work growth this process is very effective but we need more research work on this sight.

REFERENCES:

[1] Bhaskaran Raman and Kameswari Chebrolu, Indian Institute of Technology, Kanpur. Experiences in Using WiFi for Rural Internet in India. IEEE Communications Magazine January 2007.
[2] Kameswari Chebrolu, Bhaskaran Raman, Sayandeep Sen. Long Distance 802.11b Links: Performance Measurements and Experience. Mobi Com'06, September 23-06,2006, Los Angeles, California,USA.
[3] Sanjay Shakkottai and Theodore S. Rappaport, The University of Texas at Austin
Peter C. Karlsson, Telia Sonera Sweden. Cross-Layer Design for Wireless Networks. IEEE Communications Magazine • October 2003.
[4] Haux R, Kulikowski C, editors. Methods Inf Med 2006, Reprinted with permission of the Royal Society of Medicine from: J Telemed Telecare 2004. A study of a rural telemedicine system in the Amazon region of peru. Journal of Telemedicine and Telecare 2004.
[5] Sayandeep Sen, Bhaskaran Raman.Long Distance Wireless Mesh Network Planning:Problem Formulation and Solution. WWW 2007, May 8-12, 2007, Banff, Alberta, Canada
[6] Ellen W. Zeguara, Kenneth L. Calvert, Samrat Bhattacharjee. How to Model an Internetwork.
[7] N. R. Puli, The SRAWAN MAC Protocol to Support Real-Time Services in Long Distance Networks, Master's thesis,IIT-Kanpur, Aug. 2006; with B. Raman.

[8] K. Chebrolu, B. Raman, and S. Sen, "Long-Distance 802.11b Links: Performance Measurements and Experience,"MOBICOM, 2006.

[9] N. Mishra et al., "Wake-on-WLAN," 15th Annual Int'l.World Wide Web Conf., May 2006.

[10] S. Sen, S. Kole, and B. Raman, "Rural Telephony: ASocio-Economic Case Study," Int'l.Conf. Info and Commun. Technologies and Development, May 2006.

[11] J. Simo, A. Martinez, P. Osuna, S. Lafuente, andJ. Seoane. The design of a wireless solar-powered router for rural environments isolated from health facilities. IEEE Wireless Comunication Magazine, 15(3):24–30, June 2008.

[12] J. Simo, P. Osuna, R. Quispe, and D. Espinoza.Application of ieee 802.11 technology for health isolated rural environments. In Proc. of IFIP WCC-WCIT, Santiago de Chile, Chile, 2006.

[13] J. Simo, J. Seoane, and R. Salazar. A qos-aware ad-hoc wireless network for isolated rural

environments. In EUNICE 2005, 2005.

[14] Carlos Rey-Moreno, Ines Bebea-Gonzalez, Ignacio Foche-Perez. A Telemedicine WiFi Network Optimized for Long Distances in the Amazonian Jungle of Peru. Extreme Com '11, September26-30, 2011, Manus, Brazil.

[15] Ermanno Pietrosemoli, Marco Zennaro, Giuseppe Misuri,Mauro Calderini, Renzo Rossi, MarcoBrunozzi,GiorgioChiuppesi, Natale Sardo, Gianni Schinti, Gianluigi Corona,

Paolo Piredda, Mario Mellis and Giampiero Usai. High-Capacity long distance wireless link.

[16] MikrotikWireless Link

Calculator.https://mikrotik.com/test_link.php.

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