

**EAST
WEST
UNIVERSITY**



Department of Electronics and Communications Engineering

INTERNSHIP REPORT ON

Networking System of BDCOM Online Ltd.



Prepared by:

Md. Mahmud Hossain Khan

ID: 2012-1-55-052

Dept. Of ECE

East West University

Supervised by:

Md. Asif Hossain

December 2015

Letter of Transmittal

10 December 2015

To
Md. Asif Hossain
Senior Lecturer
Department of Electronics and Communication Engineering
East West University

Subject : Submission of Project Report as Internship(ETE-498)

Dear Sir,

I am pleased to let you know that I have completed my Internship program at BDCOM Online Ltd, Dhanmondi, Dhaka. The attaché contain of the internship report that has prepared for your evaluation and consideration. The internship has given me a great opportunity to work with the networking system closely and also gave me the opportunity to apply the theoretical knowledge in real life situation which I have acquired since last four years from you and the other faculty of EWU, which would be a great help for me in future.

I am very grateful to you for your guidance throughout the internship period, which helped me a lot to acquire practical knowledge.

Thanking You.

Yours Sincerely

Md. Mahmud Hossain Khan
ID# 2012-1-55-052
Dept. of ECE
East West University

Declaration

This is certified that the internship report is done by me under the course “Research/Internship(ETE-498)”. It has not been submitted elsewhere for the requirement of any degree or any other purpose except for publication.

Md. Mahmud Hossain Khan

ID: 2012-1-55-052

Dept. Of ECE

Acceptance

This internship report is submitted to the **Department of Electronics and Communication Engineering, East West University** is submitted in partial fulfillment of the requirements for the degree of **B.Sc in ETE** under complete supervision of the undersigned.

Md. Asif Hossain
Senior Lecturer
Dept. of ECE

Mohammad Akhter Uz Zaman
Deputy. Manager, NOC
BDCOM Online Ltd.

Acknowledgement

At first I wish to convey my cordial thanks and gratitude to Almighty Allah for everything. I would like to thank my parents and everyone else who has supported me all the way through to complete the Internship program successfully and also to those who rendered their cooperation in making this report.

I would like to thank **Md. Asif Hossain (Senior Lecturer, Dept. of ECE, EWU)** for guided me with lots of effort and time to perform the internship program.

I want to convey my gratefulness to **Mohammad Akhter Uz Zaman (Deputy. Manager, NOC, BDCOM Online Ltd.)** who helped me greatly by providing valuable suggestion whenever required my internship report “**Networking System of BDCOM Online Ltd.**” They also gave the opportunity to hold tht flagship of the topic.

I would also like give to acknowledgments everyone of the System Management Department of **BDCOM Online Ltd.** For providing suggestion on how to work and what is the procedure to work in a practical manner and also how to make the internship report in a better way. They helped me in many ways by allowing whatever assistance I needed. Otherwise it was not possible for me to complete my report.

Abstract

This report focuses on the whole networking system of an ISP company. Internet Service Provider (ISP) can provide various services like data connectivity service, Internet service, Security ensures, Fiber optic networks, Network infrastructure design and maintenances and support. In enterprise network infrastructure, ISPs provide redundant links or backup mechanism that can keep up a network even when unplanned outage occurs. To ensure maximum availability of a designed network it is difficult when power outage or load shedding occurs. There are many kind of services also can provide an ISP like IP telephony services, Vehicle tracking system, restore petrol and cut of engine also.

Table of Contents

Title	pages
Chapter 1. Introduction	
Background of the study -----	1
About BDCOM Online Ltd -----	2-4
Chapter 2. Devices	
Router -----	5
Switch -----	6
Media Converter, PoE device -----	7
Fiber Optic -----	8
Chapter 3. Network Designing	
Design of a network -----	9
Objectives of a network design -----	10
Requirements to design a network -----	10
Backbone Network Design -----	11-12
Network Planning -----	13-14
Overall design of a Network Planning -----	14

Chapter 4. Internship Activities

ISP NOC support system -----	15
Orion Solarwind -----	16-18
Nagios -----	19
Cacti with MRTG -----	20-21
Winbox -----	22-23

Chapter 5. Additional Services

GPS Vehicle Tracking System -----	24-25
IP Telephony Service -----	26

Chapter 6. Conclusion

Conclusion -----	27
References -----	28

Chapter 1

Introduction

In the broadest terms, people like to view the Internet as a cloud, you put your data in one place, it comes out the place you want it to on the other side. In reality the internet is tens of thousands kilometers of fiber optic cable, hundreds of thousands to millions of kilometers of copper wire, and hardware and software connecting them all together in a redundant, fast, and self-sufficient network. But not to worry, it's not that bad: you only have to worry about a very small portion of the network, you can let someone else worry about the rest, and you even get someone to yell at when things go wrong.

I had an opportunity to work with most leading IT and Internet Service Provider (ISP) service provider that is BDCOM Online Limited. I consider myself timely to get a chance to take a deep look to their development methods, working models, deals and industrial behavior. And I was intending to look into the Networking Industry and how it looks like practically, how they interact with their clients, how they design a system and what are their rules in their environmental work.

I got the chance to work in Network Operation Center (NOC) in BDCOM Online Limited. We know computer networking is the principal part of our modern life. I decided to know about computer networking and how does it work, how to design a wide area network and backbone network, what are the important keys to design a beneficial network, how can I design cost effective network and how to mitigate downtime of a network.

About BDCOM Online Ltd.

BDCOM Online Limited was incorporated under the Companies Act. 1994 on 12th February, 1997 as a private limited company with an authorized capital of Tk. 10,000,000.00 consisting of 100,000 ordinary shares of Tk. 100.00 each. On December 12 2001, BDCOM was converted into a public limited company with an authorized capital of Tk. 250,000,000.00 consisting of 25,000,000 ordinary shares of Tk. 10.00 each. At present authorized capital of Tk. 1,000,000,000.00 consisting of 100,000,000 ordinary shares of Tk. 10.00 each increased as on 29th June 2010. At present paid up capital of the Company is Tk. 383,409,450.00 consisting of 38,340,945 ordinary shares of Tk. 10 each.

Name and Address

Name of the Company: BDCOM ONLINE LIMITED

Office Address : RANGS Nilu Square (5th floor), Satmosjid Road, House # 75;
Road # 5/A, Dhanmondi R/A, Dhaka 1209, Bangladesh

Phone : +88 09 666 333 666

Fax : +88 02 8122789

Email : office@bdcom.com

Web Site : www.bdcom.com, www.bdcom.net

Trade License

Registration Number : No. 110084

Registered To : Dhaka City Corporation

Certificate of Incorporation

Number : No. C-32328(1449)/97

Date : 12th February, 1997

Registered To : Register of Joint Stock Companies and Firms Bangladesh, Dhaka,
Bangladesh

ISO Certification

Name : ISO 9001:2008

Certificate Number : 63806/A/0001/UK/En Issue No: 1

Date of Issue : 11 May 2015 Expiry Date: 10 May 2018

Issued By : United Registrar of Systems Ltd.
UK.

Values:

The Values objects of BDCOM Online Limited are set out as follows

- Facilitate and promote use of ICT in all sectors of the economy.
- Develop an efficient ICT infrastructure that provides open access to international and national network.
- To facilitate high speed, dedicated broadband connectivity directly to client's premises over a radio/wireless and Optical Fiber link.
- To provide data connectivity almost anywhere in the country through its network.
- Create employment opportunity in ICT sector.
- To help corporate houses create and maintain their identity in an attractive way through dynamic & innovative web sites.
- To provide enterprise-grade data security solutions to corporate houses in order to protect their sensitive information.

Services:

Internet

- Corporate
- Small Business
- Home user

Data Communication

- Nationwide Secure Connectivity
- Dark Fiber Connectivity
- Clear Channel Connectivity
- Capacity Based Connectivity

Network

- Corporate Network
- Small Business Network
- Personal Area Network

Graphic

- Photoshop
- Illustrator
- InDesign

Solutions:

Enterprise

- Network
- IP-VPN
- Hosting
- Co-location
- E-Mail

System Integration

- ICT Consultancy
- Customized Solution
- Training

IP Phone

- Corporate
- Home
- Call Center
- IPPBX
- Short-code Routing
- Audio-Video Conference

Chapter 2

Devices

Router:

A **router** is a networking device that forwards data packets between computer networks. Routers perform the "traffic directing" functions on the Internet. A data packet is typically forwarded from one router to another through the networks that constitute the internetwork until it reaches its destination node.

A router is connected to two or more data lines from different networks (as opposed to a network switch, which connects data lines from one single network). When a data packet comes in on one of the lines, the router reads the address information in the packet to determine its ultimate destination. Then, using information in its routing table or routing policy, it directs the packet to the next network on its journey. This creates an overlay internetwork.



Figure 1: Router

The most familiar type of routers are home and small office routers that simply pass data, such as web pages, email, IM, and videos between the home computers and the Internet. An example of a router would be the owner's cable or DSL router, which connects to the Internet through an ISP. More sophisticated routers, such as enterprise routers, connect large business or ISP networks up to the powerful core routers that forward data at high speed along the optical fiber lines of the Internet backbone. Though routers are typically dedicated hardware devices, use of software-based routers has grown increasingly common.

Switch:

A network switch (also called switching hub, bridging hub, officially MAC bridge) is a computer networking device that connects devices together on a computer network, by using packet switching to receive, process and forward data to the destination device. Unlike less advanced network hubs, a network switch forwards data only to one or multiple devices that need to receive it, rather than broadcasting the same data out of each of its ports.



Figure 2: Switch

A network switch is a multiport network bridge that uses hardware addresses to process and forward data at the data link layer (layer 2) of the OSI model. Switches can also process data at the network layer (layer 3) by additionally incorporating routing functionality that most commonly uses IP addresses to perform packet forwarding; such switches are commonly known as layer-3 switches or multilayer switches. Besides most commonly used Ethernet switches, they exist for various types of networks, including Fibre Channel, Asynchronous Transfer Mode, and InfiniBand.

Media Converter:

A fiber media converter is a simple networking device that makes it possible to connect two dissimilar media types such as twisted pair with fiber optic cabling. They were introduced to the industry nearly two decades ago, and are important in interconnecting fiber optic cabling-based systems with existing copper-based, structured cabling systems. They are also used in metropolitan area network (MAN) access and data transport services to enterprise customers.



Figure 3: Media Converter

A fiber media converter is a simple networking device that makes it possible to connect two dissimilar media types such as twisted pair with fiber optic cabling. They were introduced to the industry nearly two decades ago, and are important in interconnecting fiber optic cabling-based systems with existing copper-based, structured cabling systems. They are also used in metropolitan area network (MAN) access and data transport services to enterprise customers.

Power Over Ethernet (PoE):

Power over Ethernet or PoE describes any of several standardized or ad-hoc systems which pass electrical power along with data on Ethernet cabling. This allows a single cable to provide both data connection and electrical power to devices such as wireless access points or IP cameras. Unlike standards such as Universal Serial Bus which also power devices over the data cables, PoE allows long cable lengths. Power may be carried on the same conductors as the data, or it may be carried on dedicated conductors in the same cable.



Figure 4: PoE Device

Fiber Optic:

Optical fiber or fiber optic refers to the medium and the technology associated with the transmission of information as light pulses along a glass or plastic strand or fiber.

Fiber Optic Cable

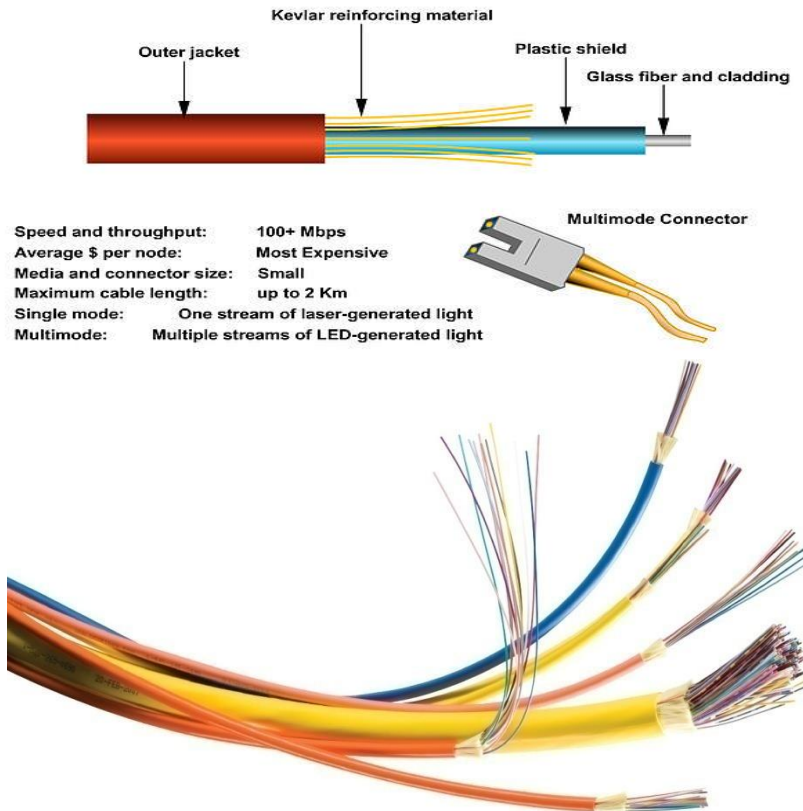


Figure 5: Optical Fiber

Advantages of Fiber Optic cable:

- Greater bandwidth than metal cables. Large carrying capacity.
- Less susceptible than metal cables to interference.
- Much thinner and lighter than metal wires.
- Data can be transmitted digitally rather than analogically.
- Fiber optic cables costs much less to maintain.

Chapter 3

Design of a Network

Below the steps of a business network design. It will fulfill all of the requirements of any organization.

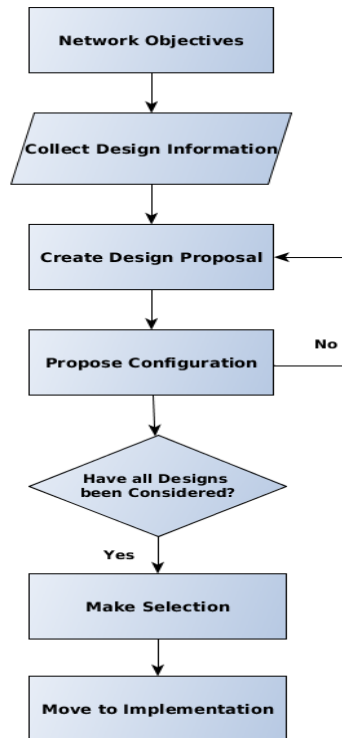


Figure 6: Design steps of a business network

Objectives of a network design:

- a) Who are the users of this network and what are the requirements?
- b) What types of application will be supported?
- c) Does the design replace of existing network?
- d) Overall Responsible for network management
- e) What is the budget?
- f) designed consideration

Requirements to design a network:

- a) Bandwidth Requirements
- b) Performance Requirements
- c) Protocols Required
- d) Quality of Service/Type of Service (QoS/ToS)
- e) Sensitivity to Packet Loss and Delay
- f) Multicast
- g) Scalability
- h) Security

Backbone Network Design:

To design a network, we need to follow some rules or steps that create a network more efficient and give high performance. A designed network has some goals that are discussed earlier.

- I. Scalability
- II. Availability
- III. Security
- IV. Manageability

To fulfill the fundamental goals of a network must be built an architecture that allows for both flexibility and growth.

Hierarchical networks have some advantages over flat network designs. The benefit of hierarchical design is that local traffic remains local. Only traffic goes to other networks and it's moved to a higher layer. A flat network using Layer-2 devices provide to control broadcasts or to filter undesirable traffic. As more devices and applications are added to a flat network then response times degrade until the network becomes unusable.

Keeping all of the above, we can use the hierarchical method to design of our desire network. There are some benefits of hierarchical network that are given below.

Actually hierarchical network is divided into three layers.

- 1) Core layer: Connects distribution layer devices
- 2) Distribution layer: Interconnects the smaller local networks
- 3) Access layer: Provides connectivity for network hosts and end devices

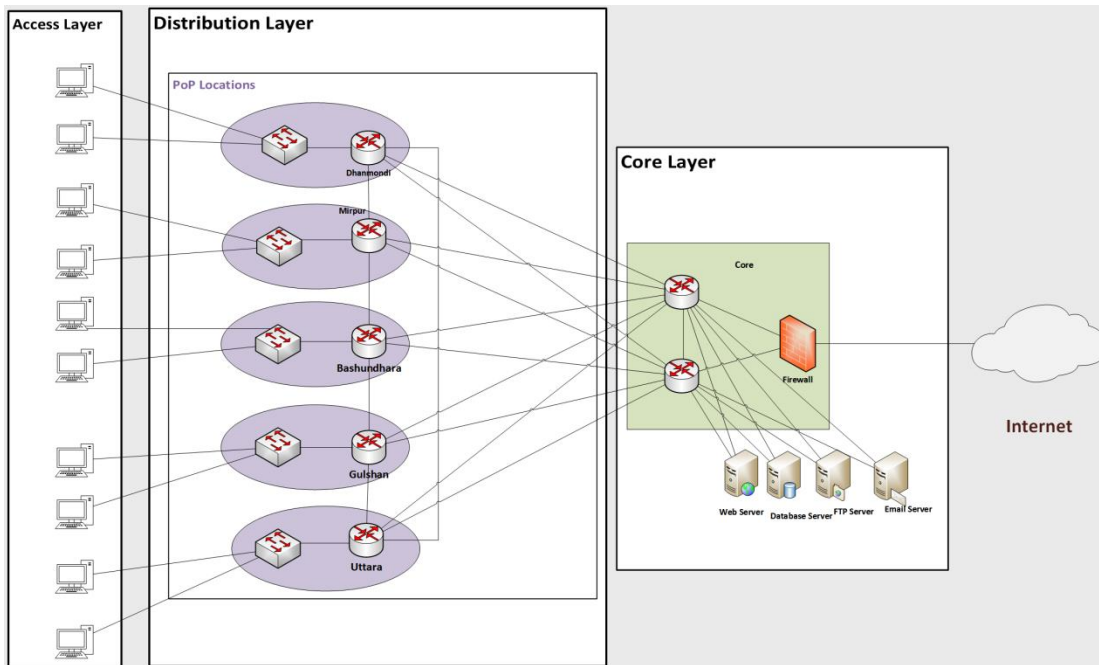


Figure 7: Hierarchical Design of a Network.

For long distance we can use fiber optic cable or radio connectivity for backbone connection. Fiber optic and radio connectivity is more efficient than Ethernet cable. Due to signal degradation we cannot use Ethernet cable long distance. On the other hand, by using optical fiber and radio connectivity we can transfer signal for long distance. Most of the backbone network is connected by fiber optic cable or radio connectivity.

Network Planning:

A typical task has to follow to perform a proper planning of a network that can solve the complexity. A planned network has to perform of the business of an organization. In that case, a perfect network plan is followed to the proper business plan

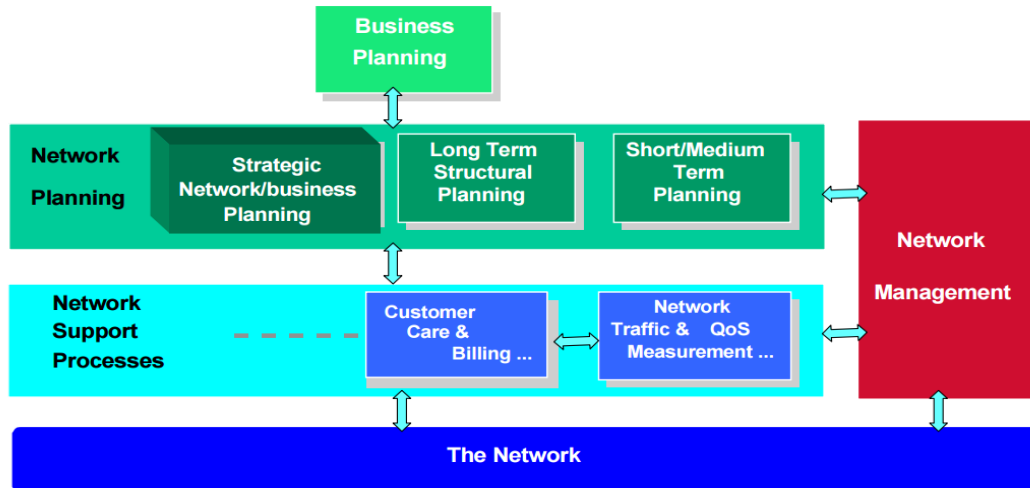


Figure7.2: Network planning processes

Long Term Planning (LTP): Long lifetime and large investments for their deployment.

Strategic Planning:

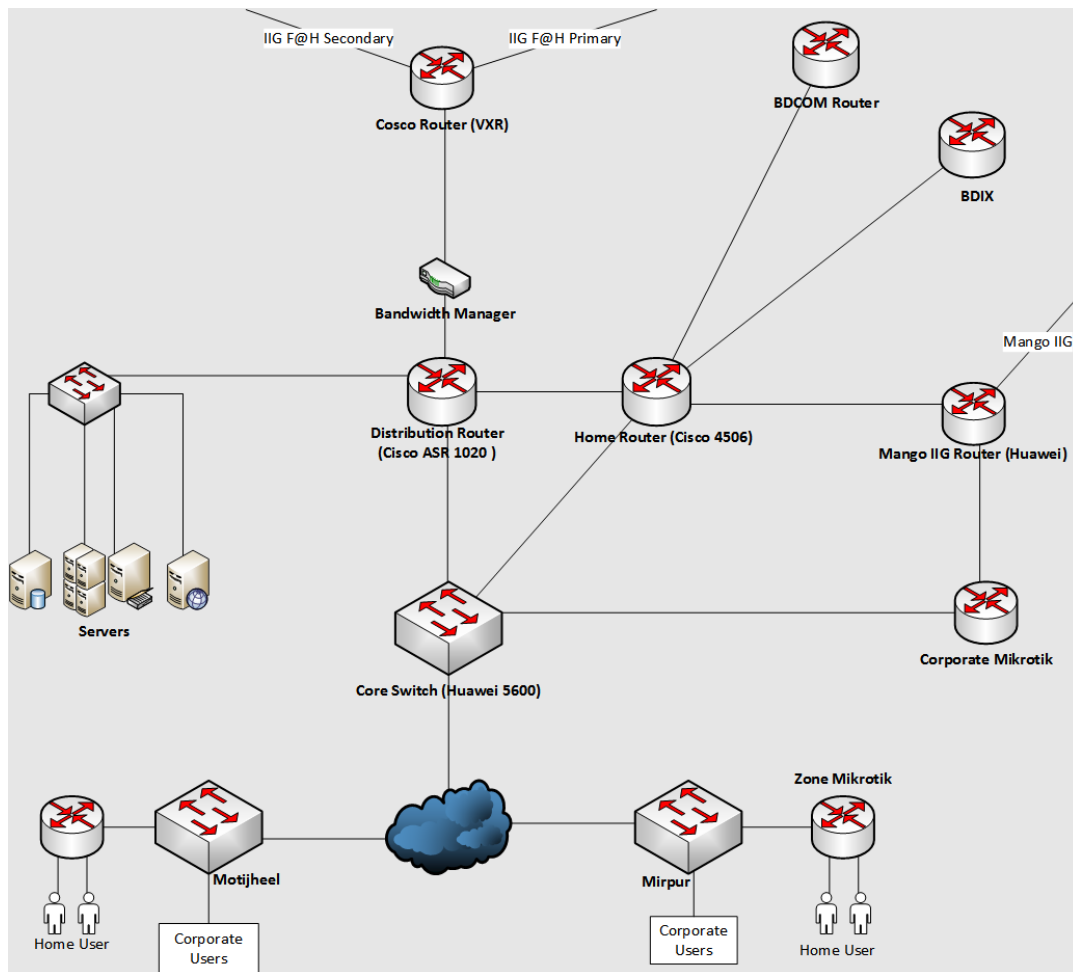
- Technology
- Network mechanism
- Recovery mechanism

Fundamental Planning:

- Topology planning
- Allocation of function in network nodes
- Distribution functions in network nodes.
- Resource optimization

- **Medium Term Planning:** Capacity upgrading of the network nodes and links. This always following the long-term (LT) deployment strategies.
- **Short Term Planning:** The routes and the telecommunications systems that support a demand on this planning

Overall design of a Network Planning:



Chapter 4

Internship Activities

In this paper is about ISP network design and maintenance in Network Operation Center (NOC). The main works of NOC is to ensure high security, proper maintenance service and reliable connection to the clients.

3.1. ISP NOC support system

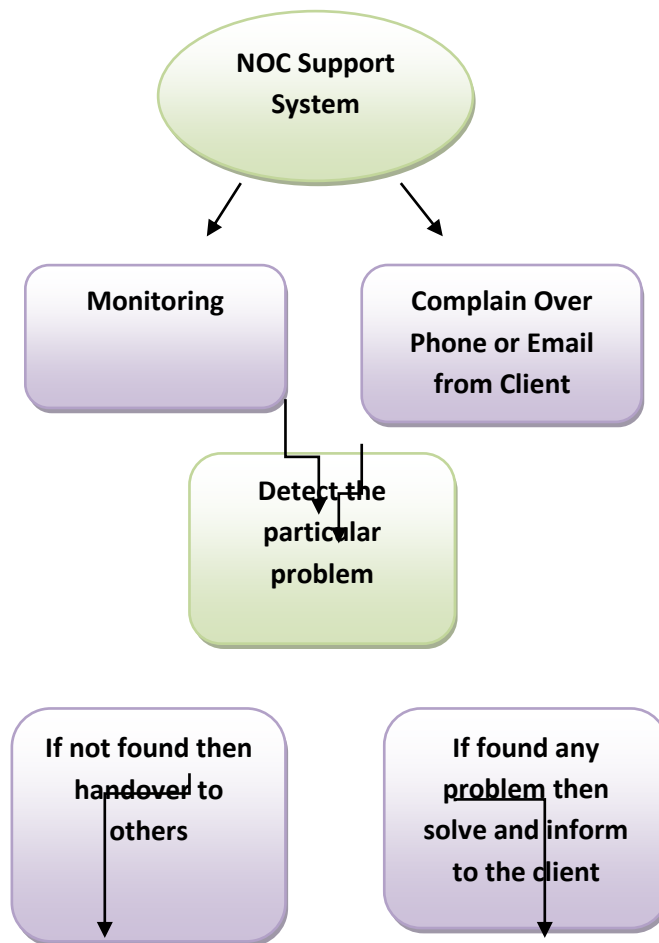


Figure 7: NOC support system of BDCOM

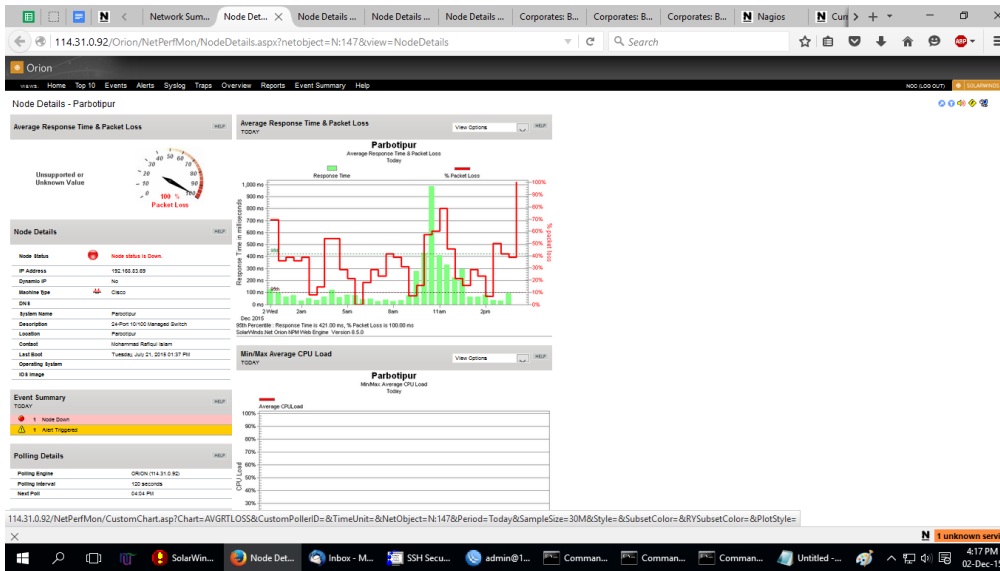


Figure 9: Status report of an interface of Down Time

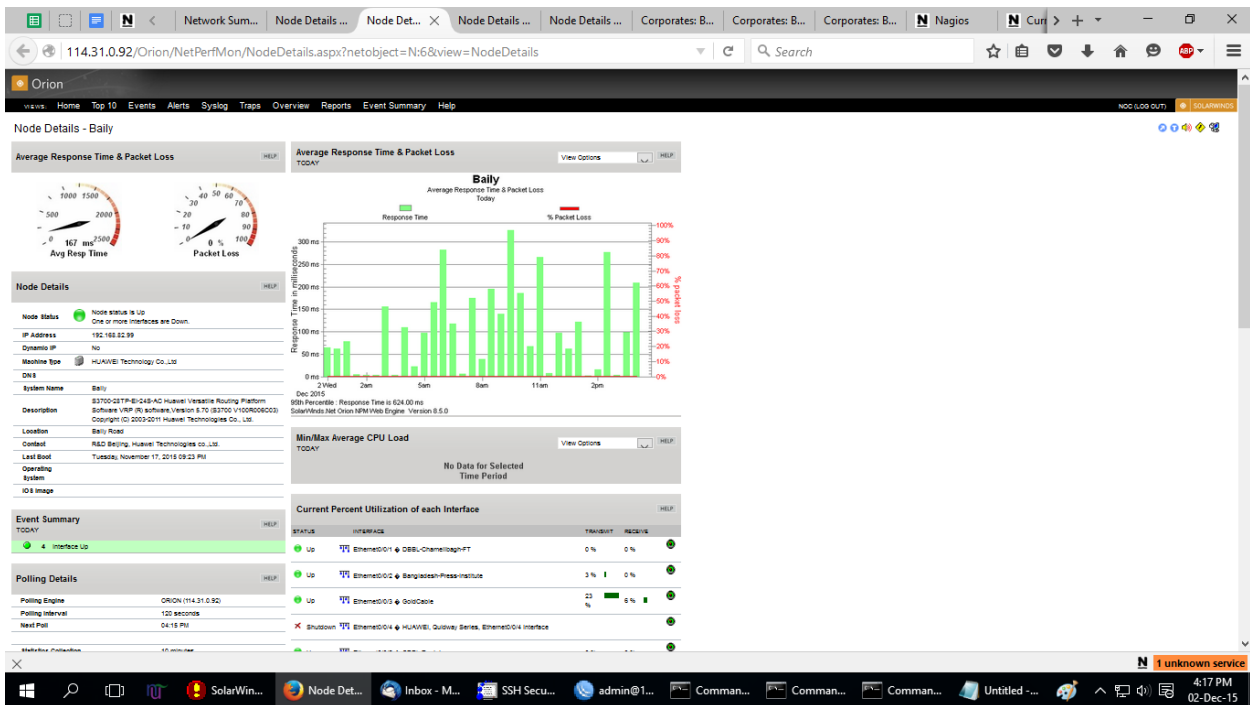


Figure 10: Status report of an interface of Up Time

Node	Response Time	Packet Loss	Status	Since last change
"Cyber Planet 113....	no response	100 %	Request Timed Out	35 minutes
Laldighi 113.11.125.54	5 ms	85 %	Node Up	1 minute
Faridpur_Shoily Networ...	no response	100 %	Request Timed Out	35 minutes
"CTG-GEC 113....	6 ms	96 %	Node Up	
CEPZ 113.11.125.66	7 ms	92 %	Node Up	1 minute
CTG-Agrabad 119....	6 ms	81 %	Node Up	2 minutes
Optical Daudkandi 113....	no response	100 %	Request Timed Out	35 minutes
Fultala 113.11.95.242	no response	100 %	Request Timed Out	35 minutes
Prodesta 113.11.125.238	no response	100 %	Request Timed Out	35 minutes
Baily-Road 113....	2 ms	4 %	Node Up	35 minutes
"Sylhet POP 210....	5 ms	0 %	Node Up	34 minutes
Moulvibazar 113....	7 ms	7 %	Node Up	16 hours, 18 minutes
Banani 113.11.126.66	2 ms	8 %	Node Up	35 minutes
FB-Tel 113.11.126.230	1 ms	4 %	Node Up	11 hours, 50 minutes
Alpha-1 113.11.125.243	1 ms	0 %	Node Up	11 hours, 49 minutes
"West Jatrabari 113....	2 ms	8 %	Node Up	11 hours, 50 minutes
Bbaria 113.11.125.94	3 ms	0 %	Node Up	11 hours, 50 minutes
Sylhet-2 113.11.125.130	7 ms	0 %	Node Up	35 minutes
Ayon 113.11.126.26	1 ms	4 %	Node Up	24 hours, 2 minutes
"Saydabd Jahangir-Cabl...	2 ms	8 %	Node Up	17 hours, 20 minutes
"Motizheel RADIO POP...	3 ms	10 %	Node Up	11 hours, 24 minutes
U-turn Bogra 113....	4 ms	0 %	Node Up	2 hours, 49 minutes
"Ultimate _Solution - Ch...	11 ms	0 %	Node Up	35 minutes
Dhanmondi-5 113....	0 ms	0 %	Node Up	11 hours, 50 minutes
"Optical 4 113.11.125.18"	2 ms	4 %	Node Up	11 hours, 50 minutes
Dhanmondi-4 113....	1 ms	0 %	Node Up	11 hours, 50 minutes
Motizheel 113.11.126.190	1 ms	4 %	Node Up	11 hours, 50 minutes
"Netone _Tangail 113....	3 ms	8 %	Node Up	11 hours, 50 minutes
"Shamoily POP 113....	1 ms	4 %	Node Up	18 hours, 7 minutes
Dhanmondi-1 113....	0 ms	0 %	Node Up	11 hours, 50 minutes
Sunamganj-Reseller 113....	9 ms	0 %	Node Up	35 minutes
Creative 113.11.126.238	2 ms	0 %	Node Up	2 days, 15 hours, 53 minutes

Figure 11: Status report of Reseller

Nagios:

- Nagios is an open source network monitoring application. It is originally designed to run under Linux. It watches hosts and services that you specify, alerting you when things go bad and when they get better.

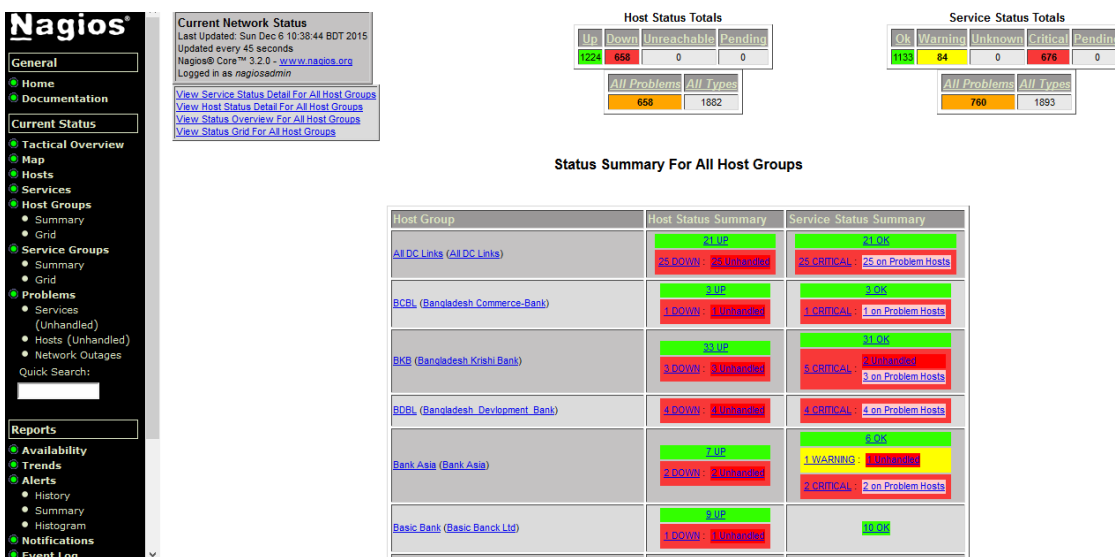
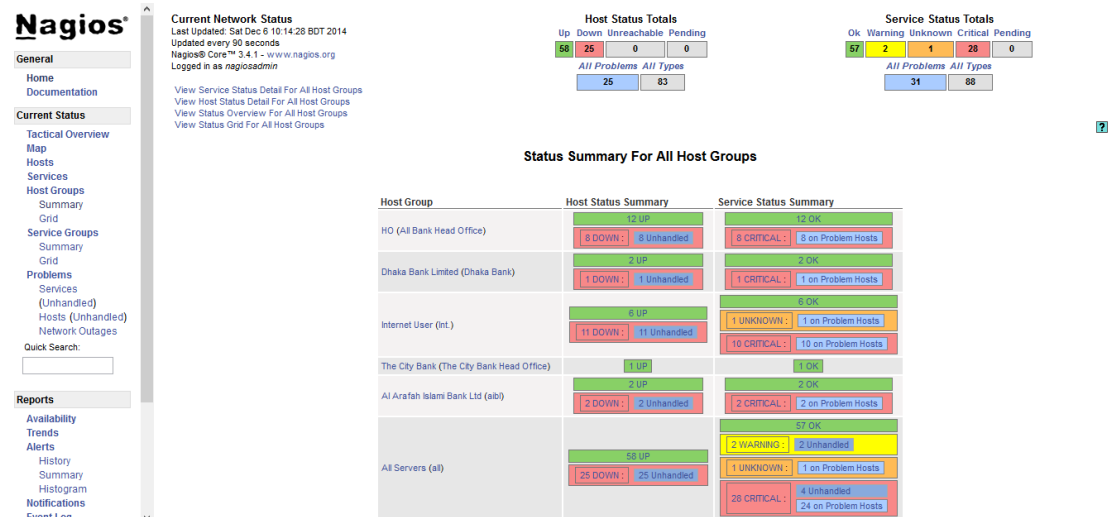


Figure 12: Device Status using Nagios

Cacti with MRTG:

Cacti is an open source network monitoring and graphing tools. Cacti allows a user to provide services at predetermined intervals and graph the resulting data. It is generally used to graph time series data of metrics such as CPU load and network bandwidth utilization. And we used cacti for monitoring our network bandwidth utilization.

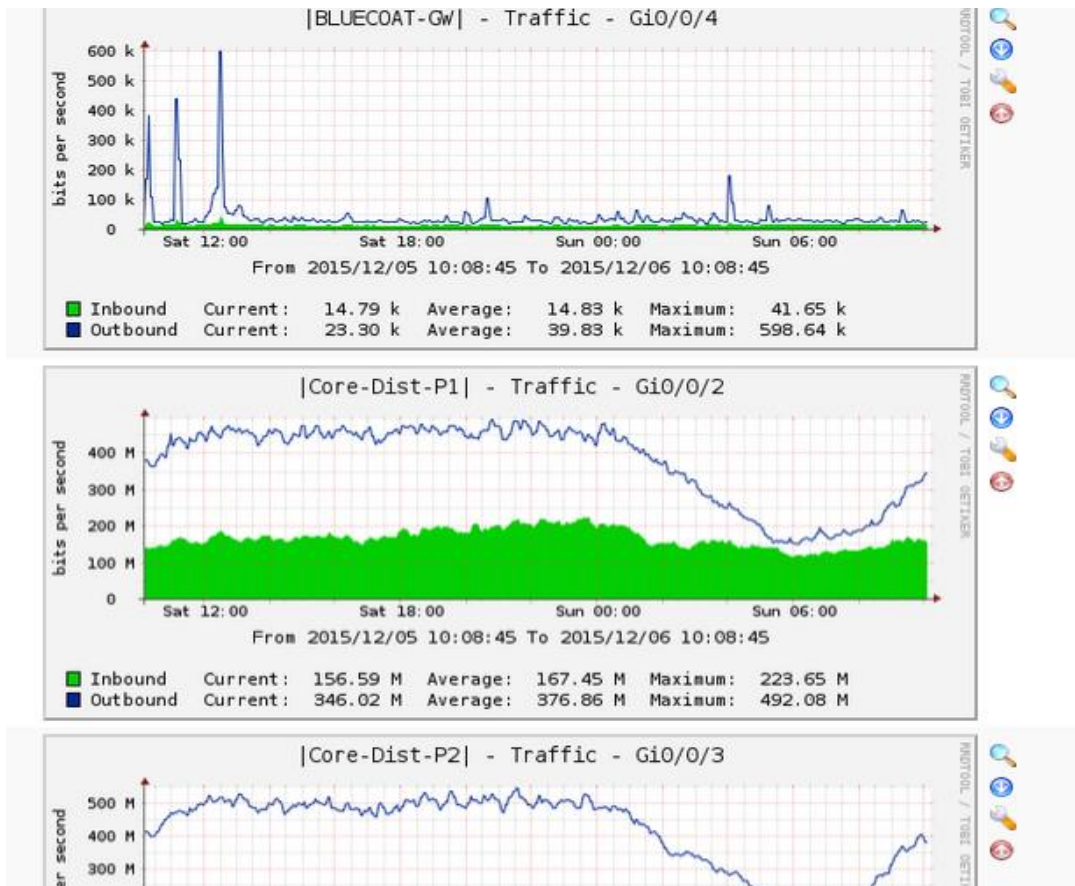


Figure 12: Bandwith Usage graph

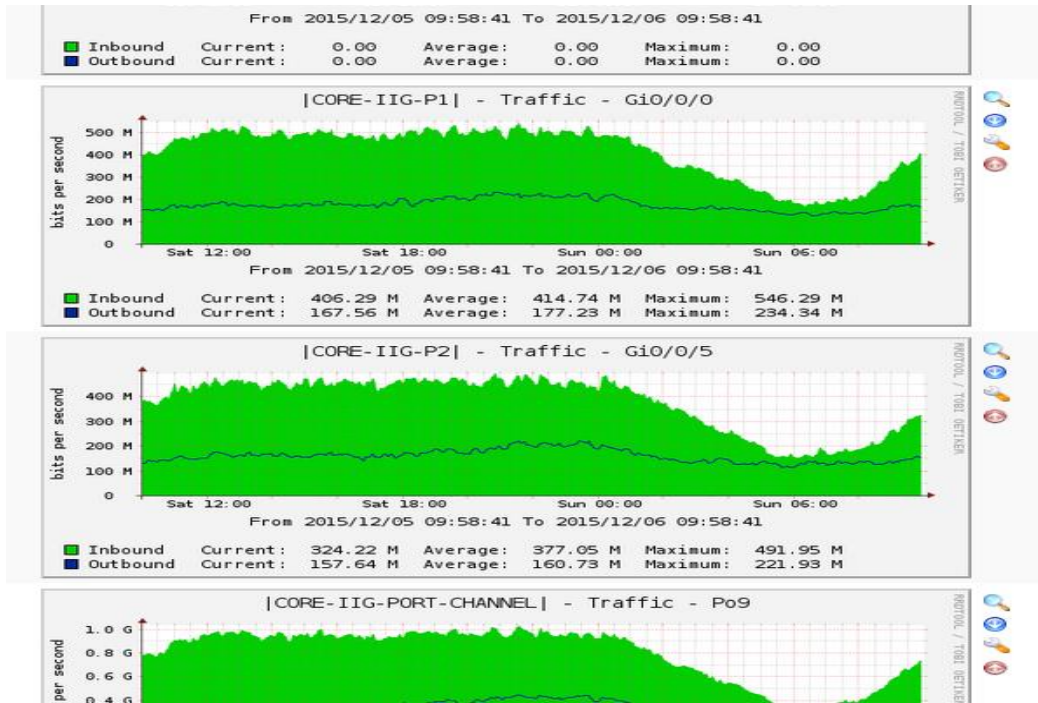


Figure 13: Bandwith usage graph(2)

Winbox:

Connect and configure Mikrotik RouterOS routers via a graphical user interface by using Winbox. It is more helpful for graphical user interface and also has console system. Here are some specification of Mikrotik router using Winbox.

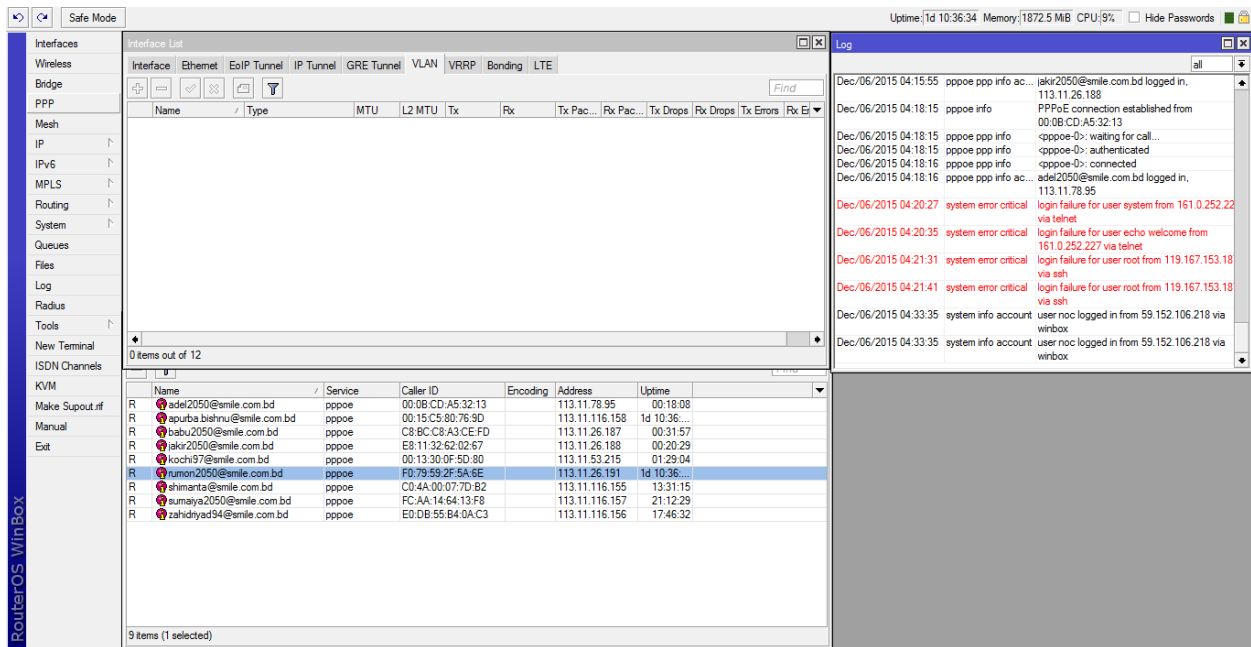


Figure 14: Basic specification of winbox

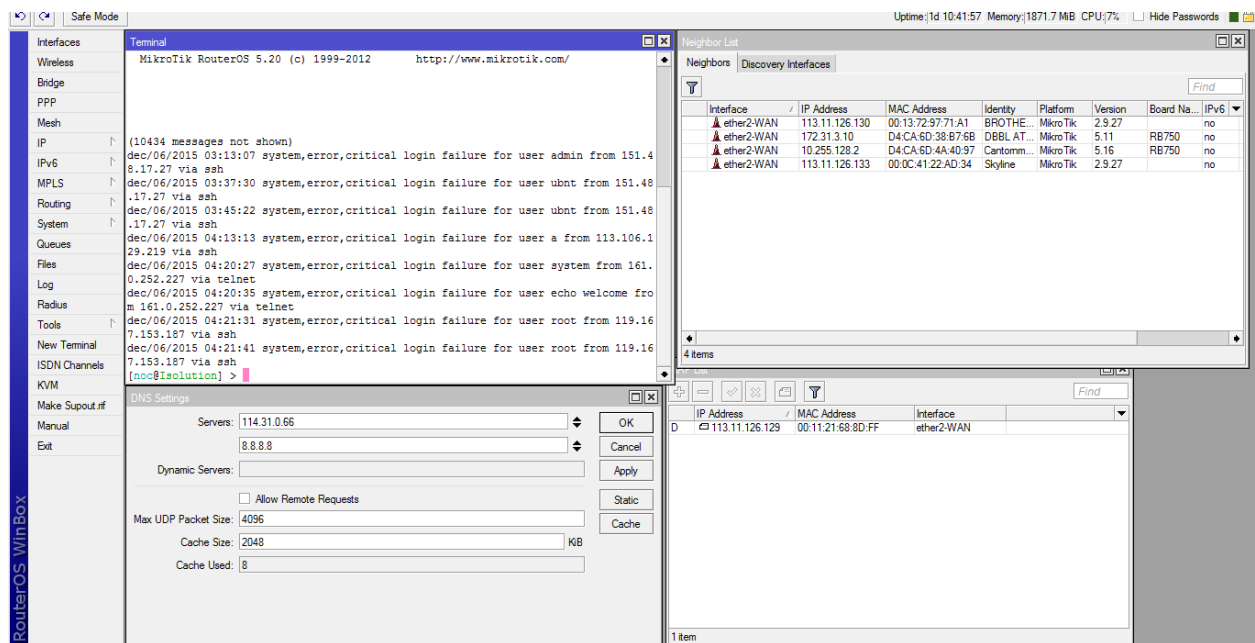
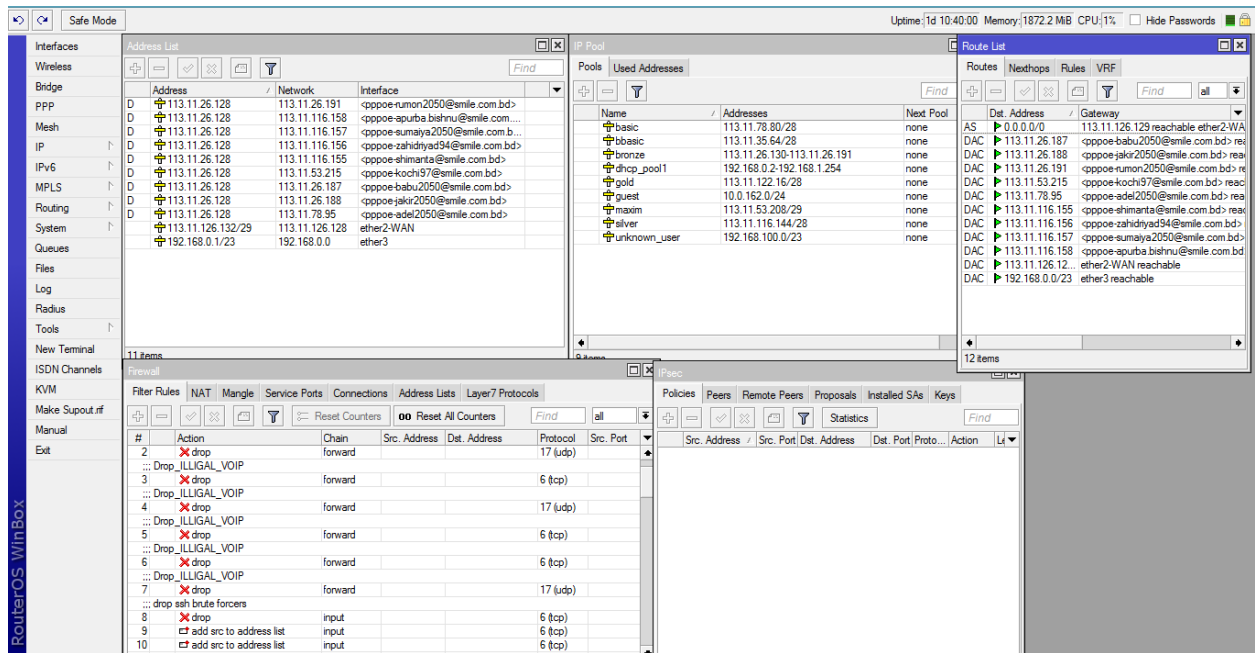


Figure 15: Different types of routing, firewall, terminals, routes list, IPSecs and traffic monitoring.

Chapter 5

GPS Vehicle Tracking System

Global Positioning System (GPS) is a worldwide radio-navigation system formed from the constellation of 24 satellites and their ground stations. The Global Positioning System is mainly funded and controlled by the U.S Department of Defense (DOD). The system was initially designed for the operation of U. S. military. But today, there are also many civil users of GPS across the whole world. The civil users are allowed to use the Standard Positioning Service without any kind of charge or restrictions.

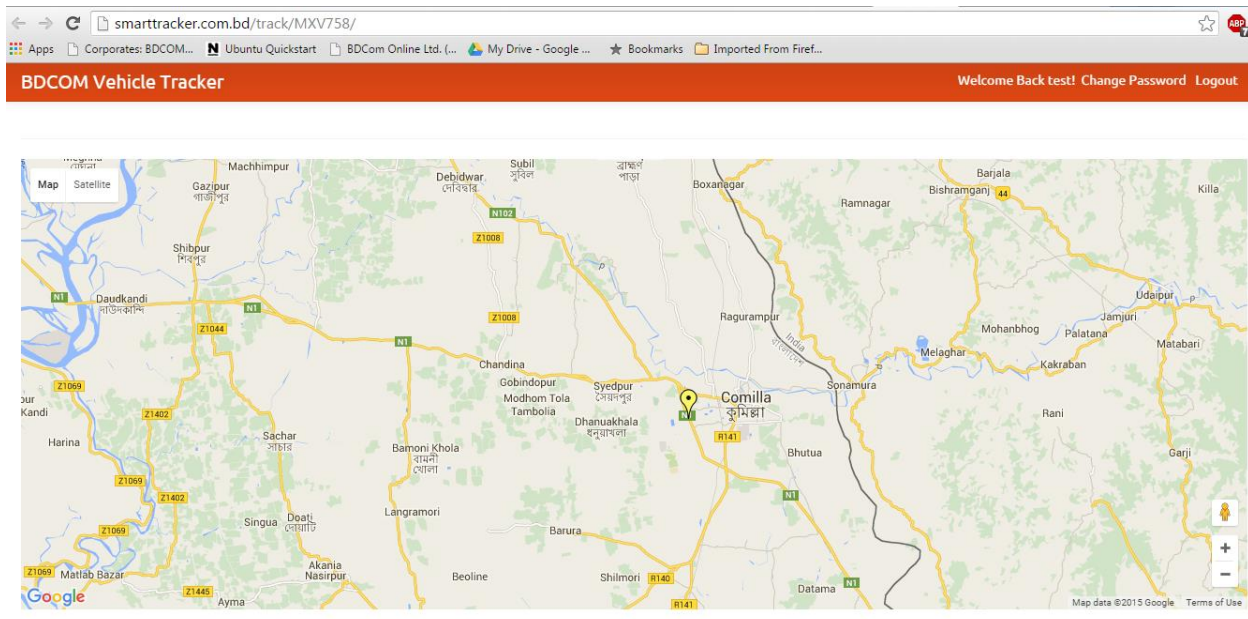


Figure 16: Smarttracker tracking system

Global Positioning System tracking is a method of working out exactly where something is. A GPS tracking system, for example, may be placed in a vehicle, on a cell phone, or on special GPS devices, which can either be a fixed or portable unit. GPS works by providing information on exact location. It can also track the movement of a vehicle or person. So, for example, a GPS tracking system can be used

by a company to monitor the route and progress of a delivery truck, and by parents to check on the location of their child, or even to monitor high-valued assets in transit.

GPS provides special satellite signals, which are processed by a receiver. These GPS receivers not only track the exact location but can also compute velocity and time. The positions can even be computed in three-dimensional views with the help of four GPS satellite signals. The Space Segment of the Global Positioning System consists of 27 Earth-orbiting GPS satellites. There are 24 operational and 3 extra (in case one fails) satellites that move round the Earth each 12 hours and send radio signals from space that are received by the GPS receiver.

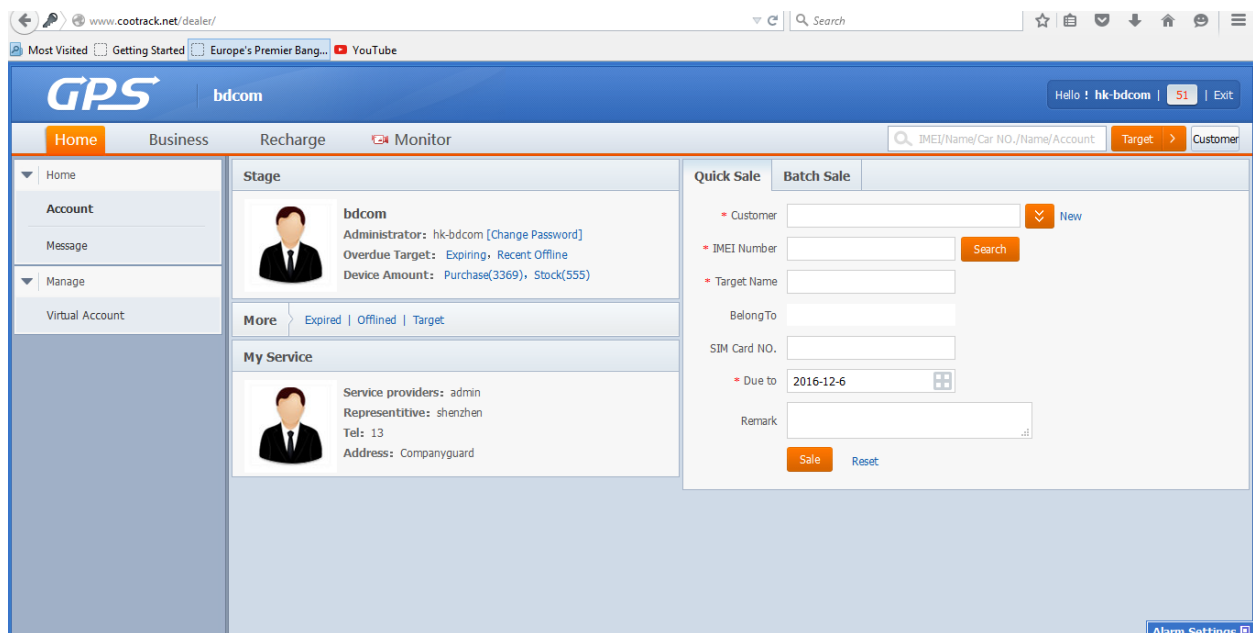


Figure 17: Coo track system.

IP Telephony Service:

Voice over IP (VoIP) is a methodology and group of technologies for the delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the Internet. Other terms commonly associated with VoIP are **IP telephony**, **Internet telephony**, **broadband telephony**, and **broadband phone service**.



[Profile](#) [Services](#) [Products](#) [Solutions](#) [Business](#) [Support](#) [MyBDCOM](#) [Contact](#) [Financial Info](#)



The term *Internet telephony* specifically refers to the provisioning of communications services (voice, fax, SMS, voice-messaging) over the public Internet, rather than via the public switched telephone network (PSTN). The steps and principles involved in originating VoIP telephone calls are similar to traditional digital telephony and involve signaling, channel setup, digitization of the analog voice signals, and encoding. Instead of being transmitted over a circuit-switched network, however, the digital information is packetized, and transmission occurs as IP packets over a packet-switched network. Such transmission entails careful considerations about resource management different from time-division multiplexing (TDM) networks.

Chapter 6

Conclusion

Internship is an opportunity to acquire a real life experience of what I learned in my academic life. Working as an intern in the Network operations center of BDCOM Online Ltd. I have learnt to be dedicated to the job. Dedicative mindset is the most important thing to work in such a sophisticated environment. It is beyond mere official matter. For most of the engineering or technical company, the engineers have to get attached with the working process. 24x7 service monitoring has taught me how to handle technical staffs in an efficient manner. As there was an opportunity to serve BDCOM Online Limited many ways. I have gathered a lot of experience throughout the entire internship period. There was a scope in the field of computer network planning and designing, Data connectivity, ensuring security, different types of application configuration and maintain. In this report I have explained my experiences and about Network Designing and Optimization. I have learned so many significant procedures from my supervisors and colleagues and conducted some tasks on a regular basis throughout my entire Internship period and ultimately earned the confidence to deal with Assignment myself. It is a great opportunity to use the knowledge and skills that I had acquired. I also learned how to handle critical faults and got the new ideas. Doing this kind of work is really helpful for my career and I like to do this kind of work again.

References:

<http://openbookproject.net/courses/intro2ict/networking/intro.html>
https://en.wikipedia.org/wiki/Computer_network
<http://www.pctechauthority.com/learn-pc-networking/intro-to-network-communications.html>
<http://www.bdcom.com/>
<http://www.bdcom.com/profile.html>
<http://www.bdcom.com/factsheet.html>
http://www.eetimes.com/document.asp?doc_id=1278363
http://www.cootrack.net/index_en.shtml
<http://smartracker.com.bd/accounts/signin/?next=/>
<http://cacti.smile.com.bd/>
<http://mailx.bdcom.net/nagios/>
<http://210.4.76.3/nagios3/>
<http://114.31.7.2:81/nagios/>
<http://www.scte.org/documents/pdf/CCNA4%20Sample.pdf>
<http://www.scte.org/documents/pdf/CCNA4%20Sample.pdf>
http://upload.ecvv.com/upload/Product/20098/China_Fiber_Optic_Media_Converter20098281545522.jpg
<http://www.ndm.net/lan/images/stories/cisco/routers/Cisco-2801-Integrated-Services-Router.jpg>
https://en.wikipedia.org/wiki/Router_%28computing%29
https://en.wikipedia.org/wiki/Network_switch
https://en.wikipedia.org/wiki/Fiber_media_converter
https://en.wikipedia.org/wiki/Power_over_Ethernet
<http://www.solarwinds.com/network-performance-monitor.aspx>
<https://en.wikipedia.org/wiki/MikroTik>