East West University

Department of Electronics and Communications Engineering

INTERNSHIP REPORT ON

Networking Systems of SIZRAM SOLUTIONS Ltd.

Experience Breakthrough Technologies

Prepared by:

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ID: 2012-1-55-018

Dept. Of ECE

East West University

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Declaration

This is to certify 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.

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ID: 2012-1-55-018

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Acceptance

This internship report is submitted to the **Department of Electronics and Communications Engineering, East West University** as partial fulfillment of the requirements for the degree of **B.Sc** in **Electronics and Telecommunication Engineering** under supervisions of the undersigned.

Mohammad Arifuzzaman
Assistant Professor
Department of Electronics and Communications Engineering

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Hasnain Shahriar Prodhan
CEO &Lead Developer

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 Dr. Mohammad Arifuzzaman (Assistant Professor, Dept. of ECE, EWU) for guiding me with lots of effort and time to perform the internship.

I want to convey my gratefulness to Hasnain Shahriar Prodhan(CEO & Lead Developer, SIZRAM SOLUTIONS) who helped me greatly by providing valuable suggestion whenever required my internship report "Networking Systems of SIZRAM SOLUTIONS."

I would also like give to acknowledge everyone of the System Management Department of SIZRAM SOLUTIONS who helped me in many ways by allowing whatever assistance I needed. Without their supports it was not possible for me to complete my internship successfully.

Abstract

This report is based on the whole networking system of a web design and development organization. The organization endeavor to churn out an integrated solution for its clients which helps to build up their image world wide. In enterprise network infrastructure, it is dedicated to offer client with services like website design and development, android and iOS based application development, javascript framework, ERP, SMS gateway and brand sms, domain hosting to the world. To ensure maximum availability of a designed network, it is difficult when power outage or load shedding occurs. In this period, Network structure designing, Network monitoring and troubleshooting, Network user management are included successfully.

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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 [1,2]. 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 web design and development organization SIZRAM SOLUTIONS. 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 structure designing in SIZRAM SOLUTIONS. 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 SIZRAM SOLUTIONS.

Sizram Solutions sets it's own rivalry by aiming to develop web services that happen to be beyond illusion and with high complexity level. We rely on flawlessness and come with remarkable solutions which often appeal you in many ways. We convey a striking web presence for your business that boosts your market value as well as fosters you for expansion .

Name and Address

Name of the Company:	SIZRAM SOLUTIONS
Office Address :	House #Ka 9/1, BashundharaR/A road,Dhaka-1229 Holding No# 533, Abdul bari road ,Sheuj Gari, Bogra-5800
Phone :	+88 01711865677
Email :	info@sizramsolutions.com
Web Site :	www.sizramsolutions.com

Values:

The Values objects of SIZRAM SOLUTIONS are set out as follows

- Facilitate and promote use of IT in all sectors of the economy.
- Develop an efficient network infrastructure that provides open access to international and national network.
- To facilitate flowless remarkable solutions directly to client's premises over web developing and maintaining.
- To provide online connectivity almost anywhere in the country through its network.
- Create employment opportunity in IT 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:

☐ 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

- IT Consultancy
- Customized Solution
- Training

Chapter 2

Devices

Router:

A **router** [3] 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 fibers 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. Beside 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 [4] is a simple networking device that makes it possible to connect two dissimilar media types such as twisted pair with fiber optic cabling as shown in figure 3. 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

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Power Over Ethernet (PoE):

Power over Ethernet or PoE [5] 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.
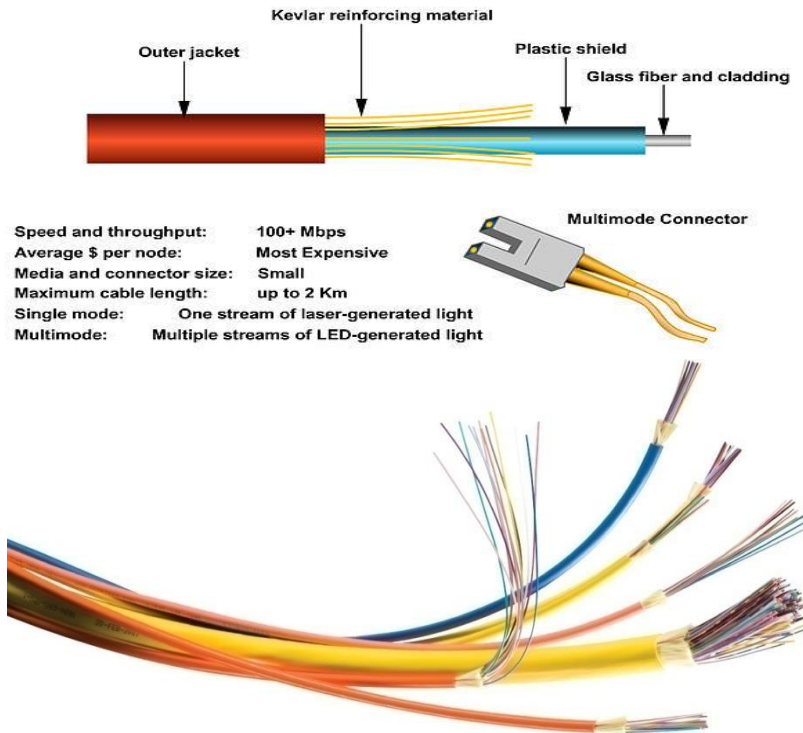
Advantages of Fiber Optic cable:

- 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.

Network Objectives

Collect Design Information

Create Design Proposal

Propose Configuration

No

Have all Designs been Considered?

Yes

Make Selection

Move to Implementation
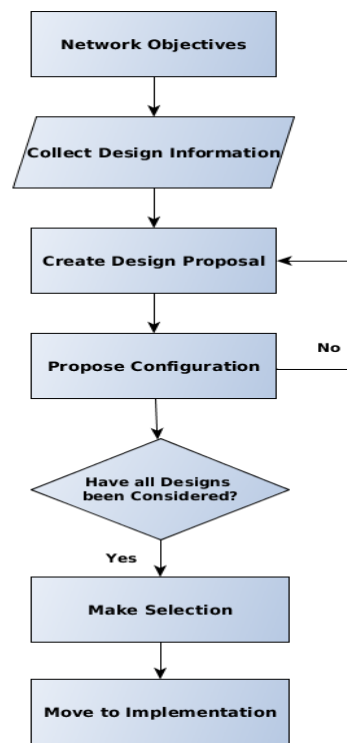
Fig: 6: Design of a Network

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
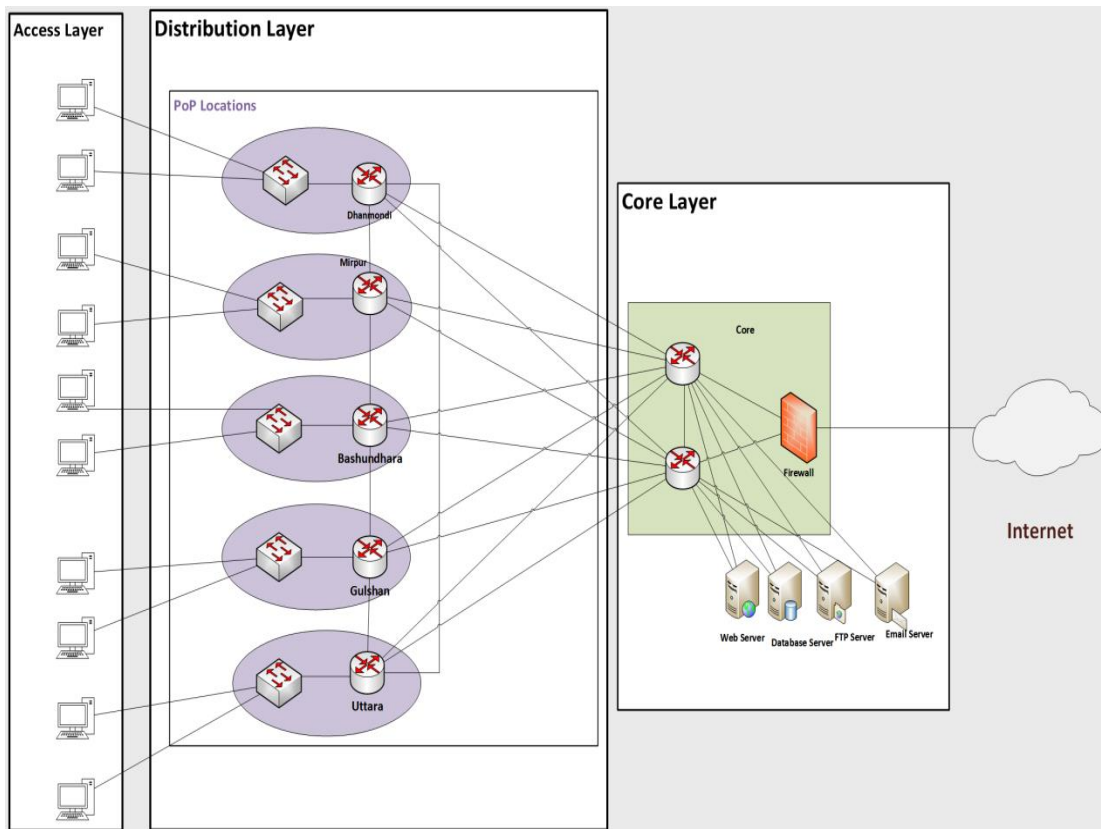
Figure 6.1: Hierarchical Design of a Network.

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
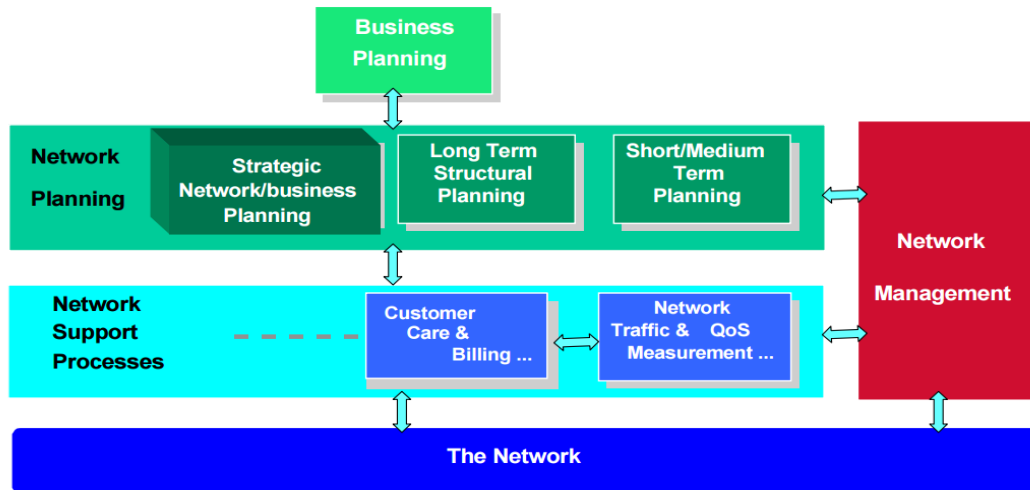
Figure7.2: Network planning processes

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:
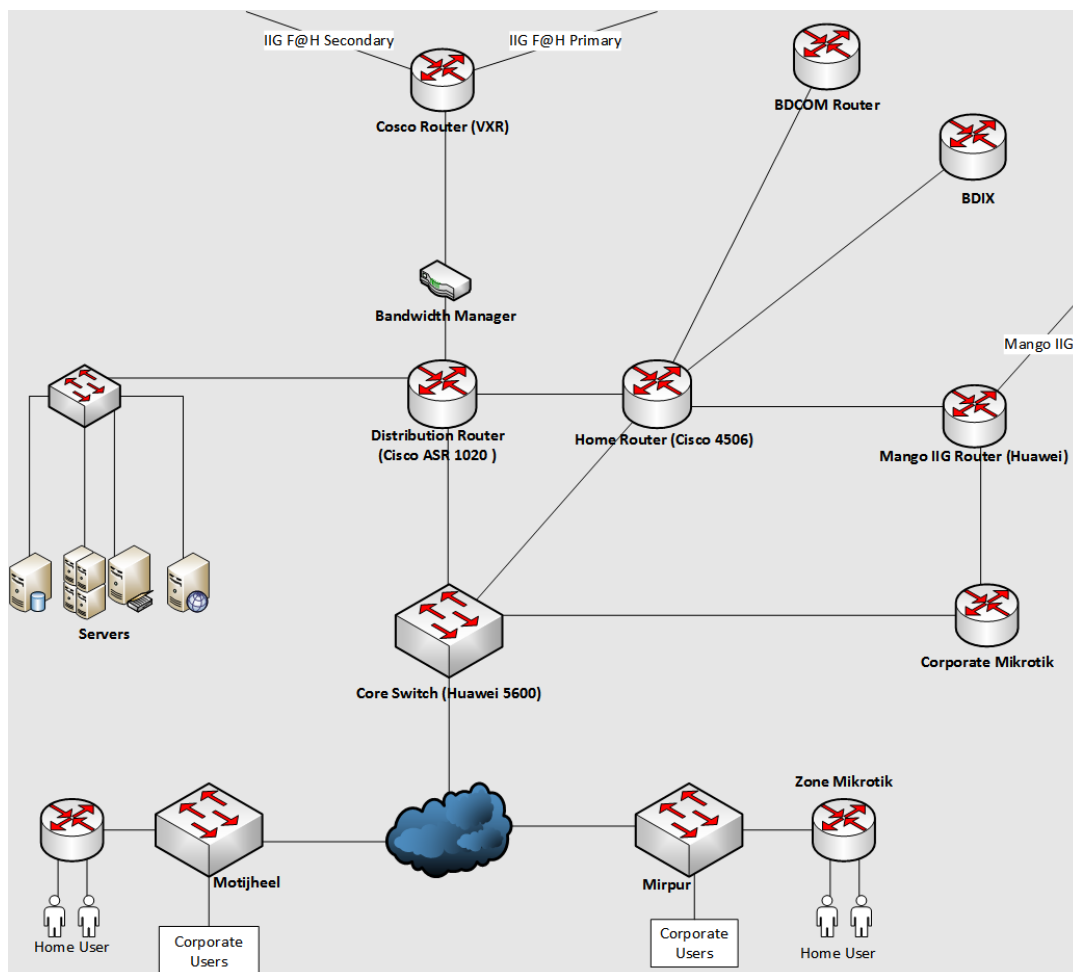
Chapter 4

Internship Activities

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

Network Operating system:
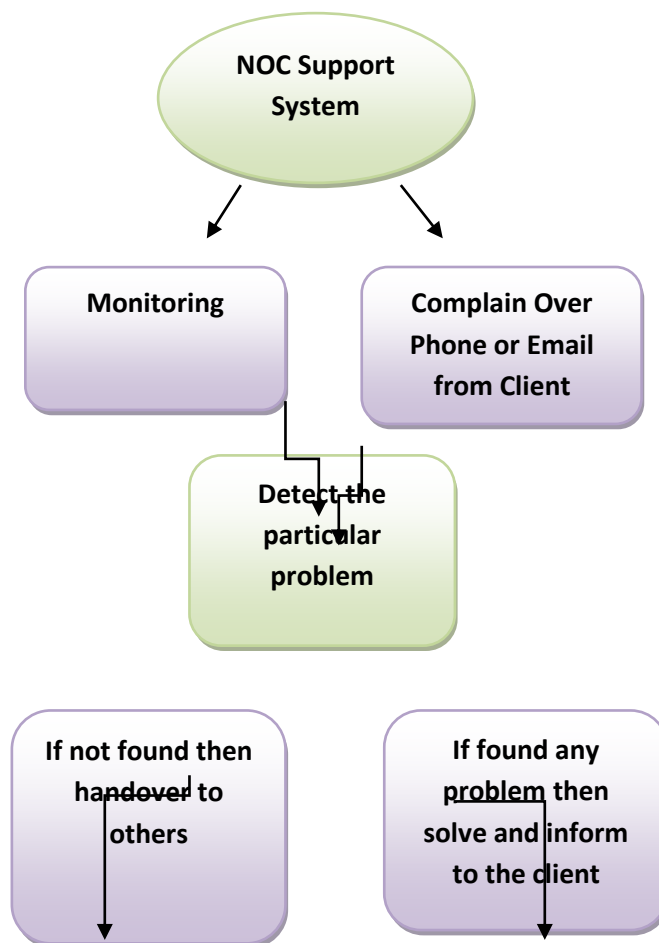
Figure 9: Network operating support system

To achieve these features the main task of Networking operating system is monitoring all of the connections. For monitoring purposes SIZRAM SOLUTIONS uses Network Performance Monitoring tools like Solarwind or Orion, Nagios, Cacti with MRTG.

Orion Solarwind:

Solarwind [6] is a network performance monitoring tool that has used for quickly detects, diagnose, and resolve network performance problems & outages.

- Monitors and analyzes real-time, in-depth network performance metrics for routers, switches, servers, and any other SNMP-enabled devices.
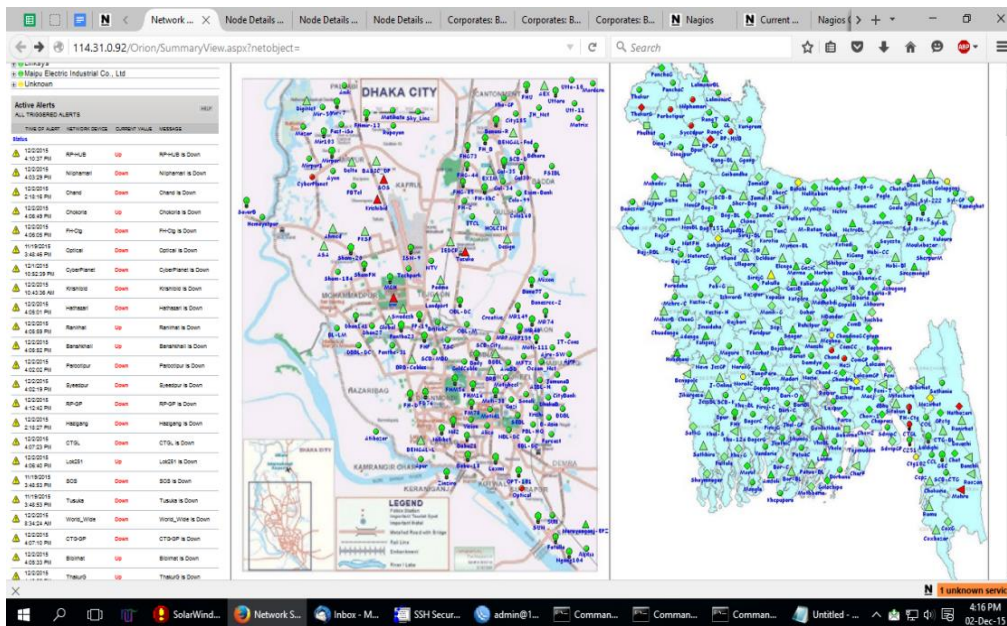
Figure 8: Network Performance Monitoring using
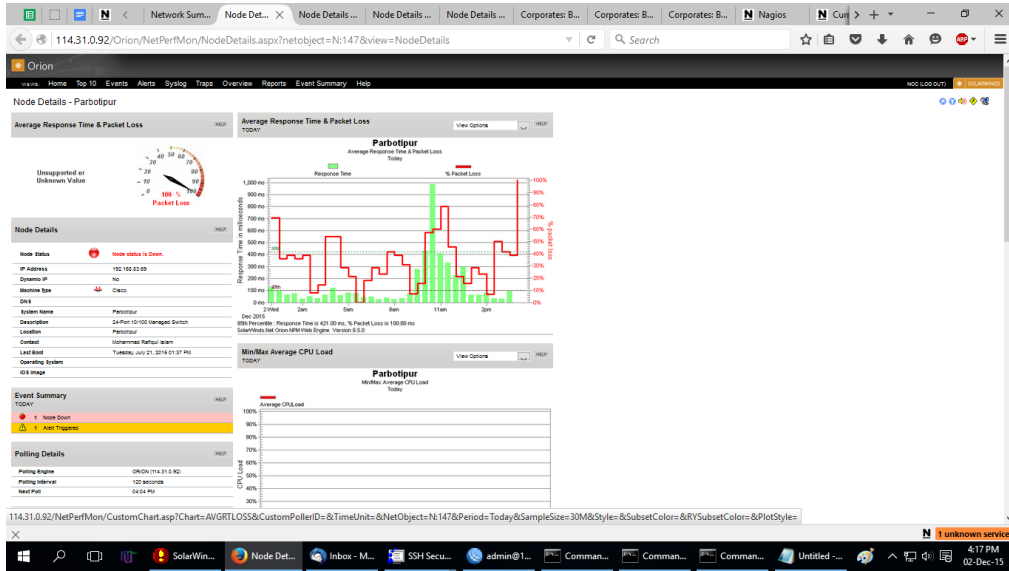
Figure 9: Status report of an interface of Down Time
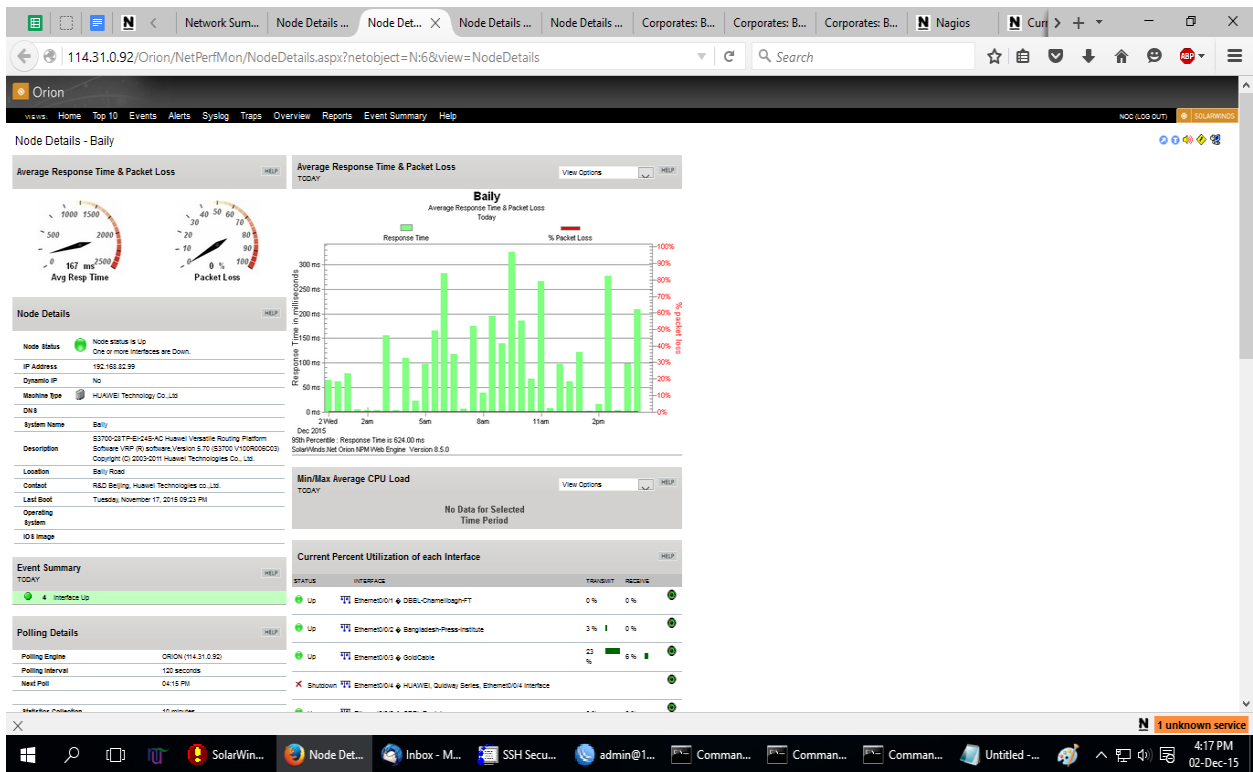
Figure 10: Status report of an interface of Up Time

Figure 11: Status report of Reseller

Nagios:

- Nagios [8,9] 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.
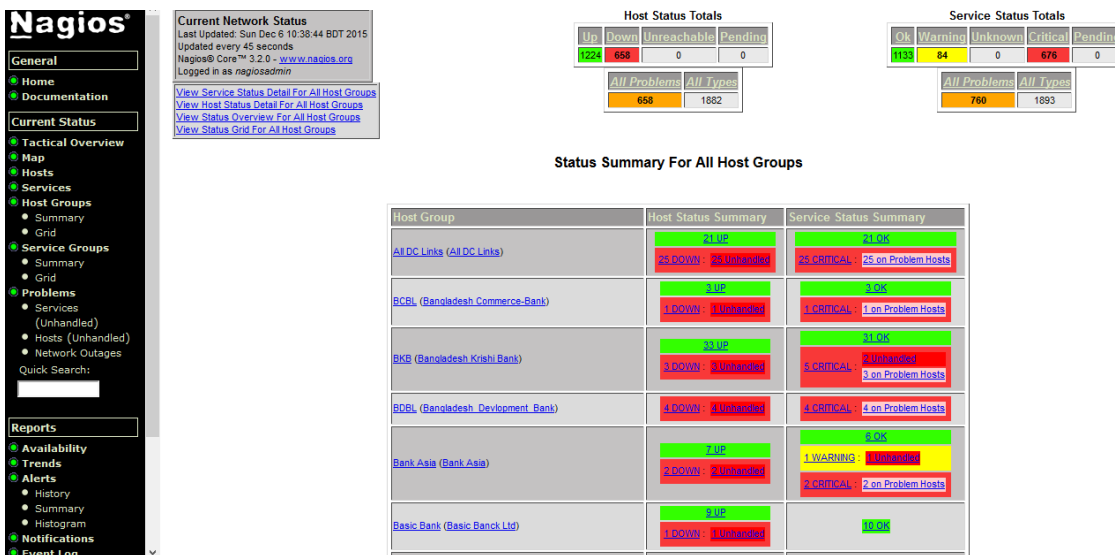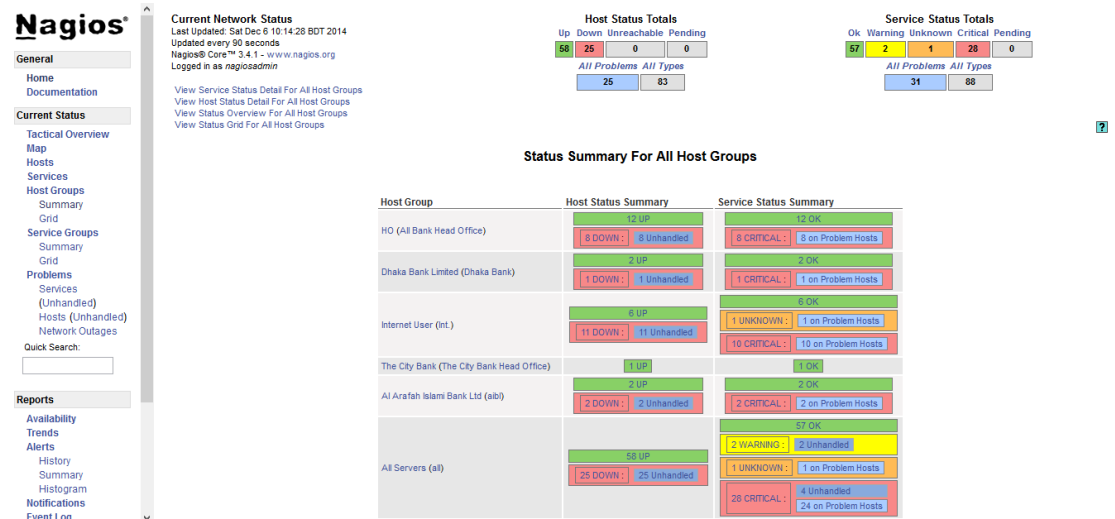

Figure 12: Device Status using Nagios

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 [9, 10]. And we used cacti for monitoring our network bandwidth utilization.
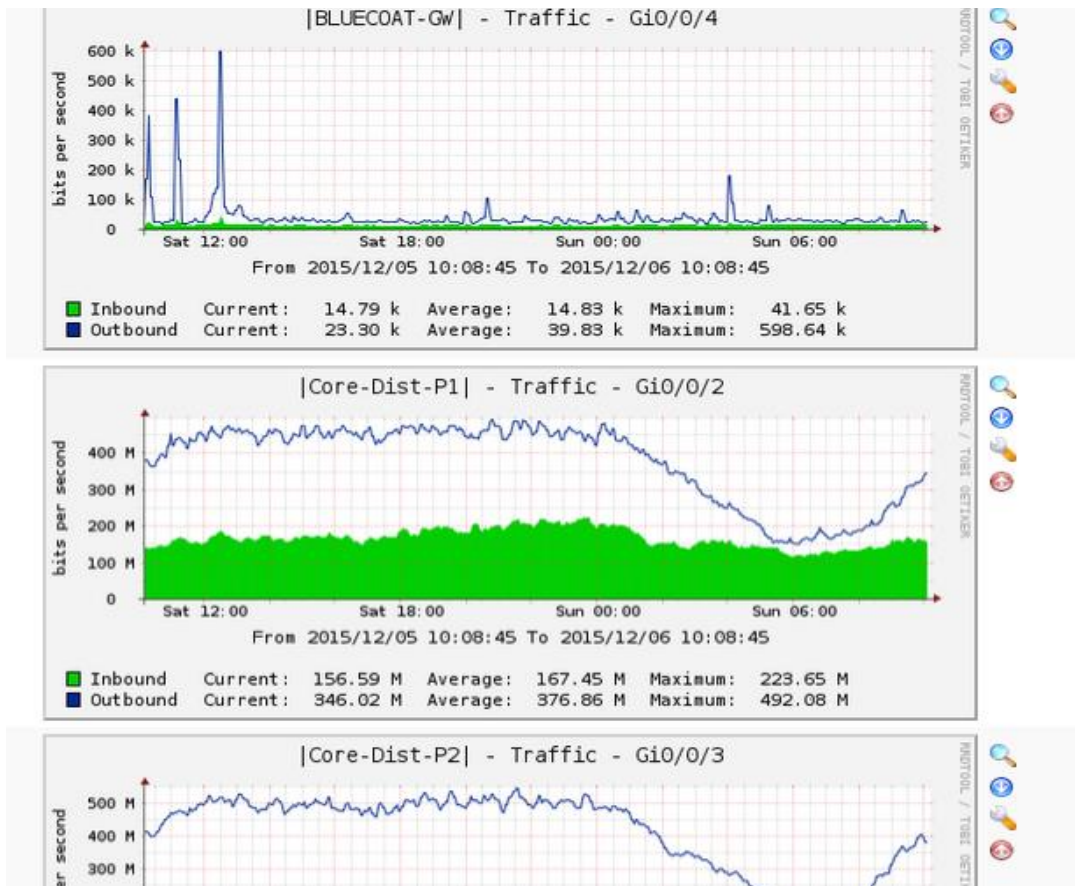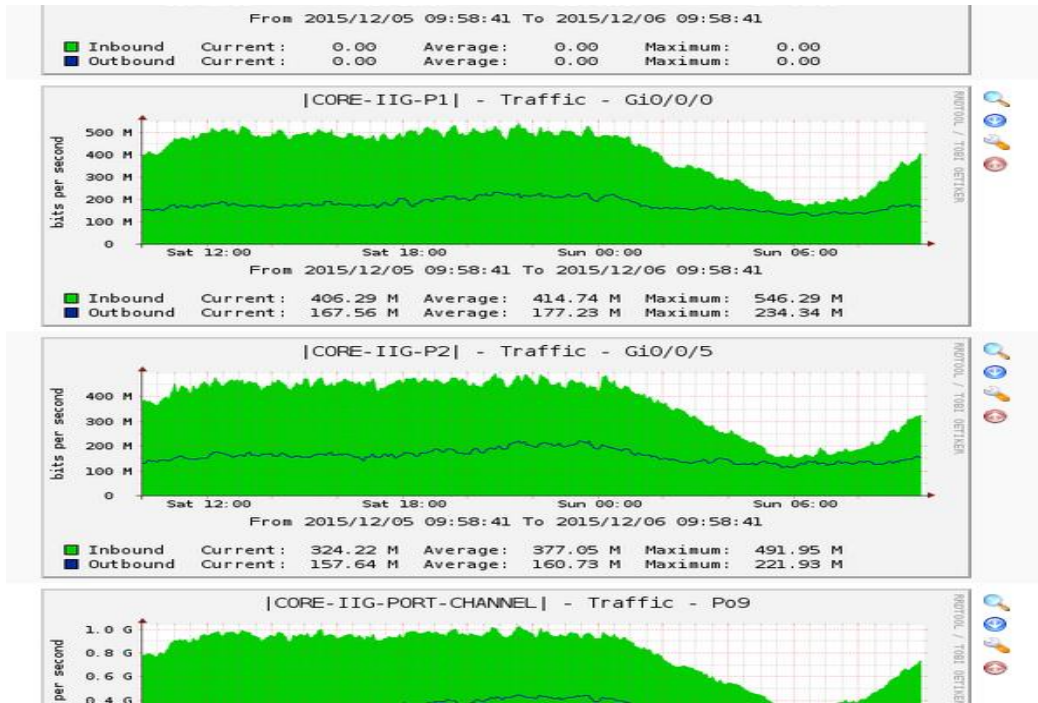
Figure 13: Bandwith usage graph(2)

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.
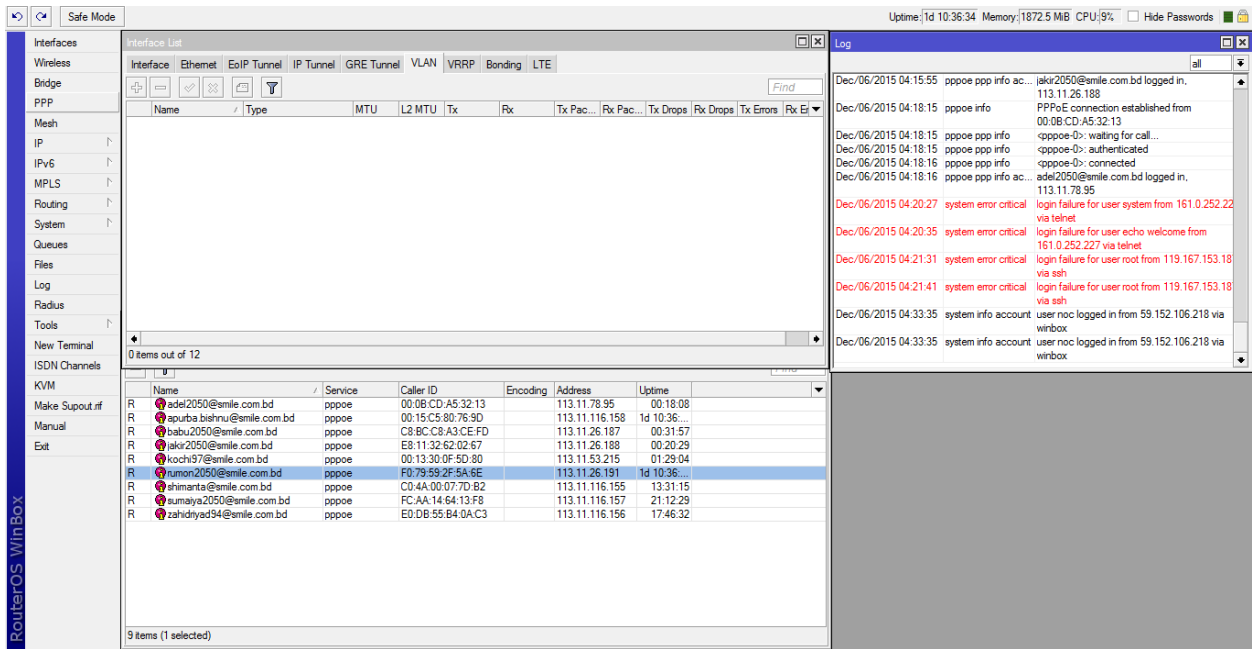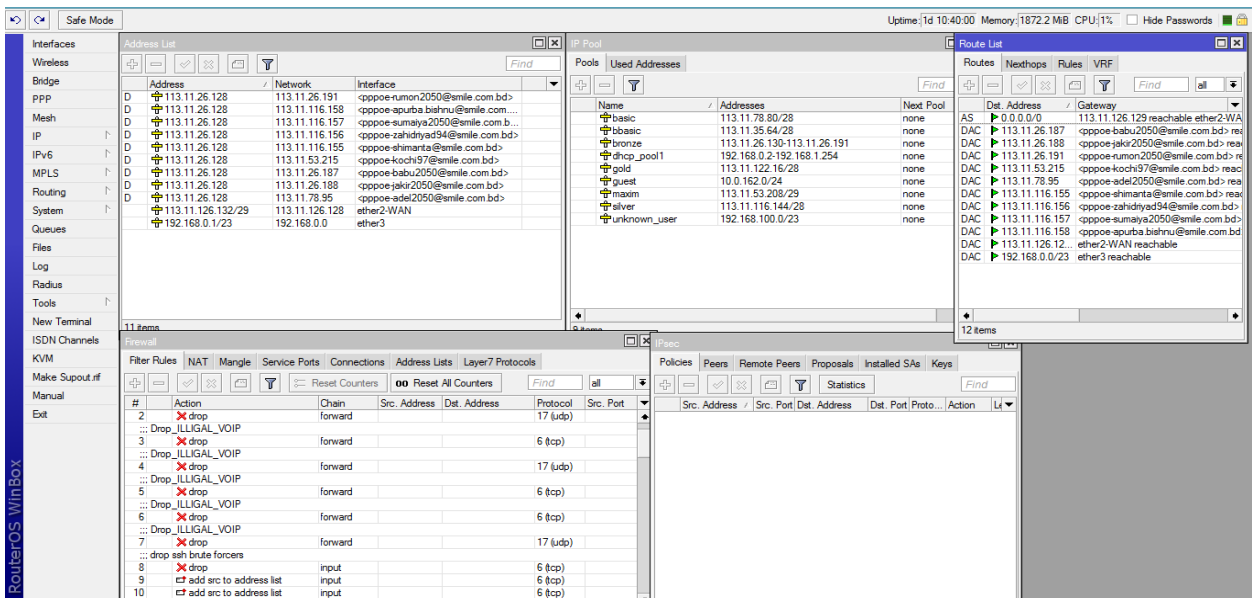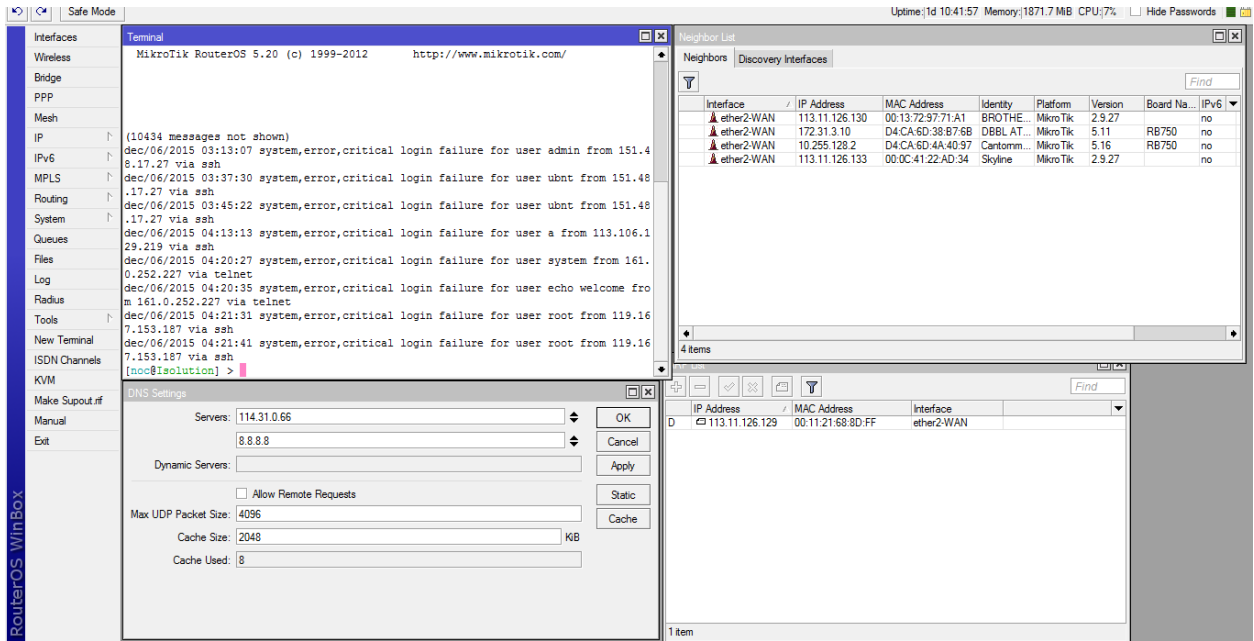
Figure 14: Basic specification of winbox

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

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Chapter 5

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 SIZRAM SOLUTION. 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. . 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.

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