SYSTEMS& NETWORK ADMINISTRATION USING MIKROTIK AND LINUX

By

Md. Abdulla Al Mamun

ID.153-15-6680

This Report Presented in Partial Fulfillment of the Requirements of the Degree of Bachelor of Computer Science and Engineering

Supervised By

Shaon Bhatta Shuvo
Senior Lecturer
Department of CSE
Daffodil International University

Co-Supervised By

Masud Rabbani
Lecturer
Department of CSE
Daffodil International University

DAFFODIL INTERNATIONAL UNIVERSITY

Dhaka-1207, Bangladesh

December 2018

APPROVAL

This Internship titled **"Systems & Network Administration Using Mikrotik and Linux"** Submitted by Md. Abdulla Al Mamun ID: 153-15-6680 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.S.C in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on December 10, 2018.

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Department of Computer Science & Engineering
Jahangirnagor University

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DECLARATION

I prepared the internship report, Md. Abdulla Al Mamun to the department of Computer Science and Engineering, Daffodil International University. Under the Supervision of **Shaon Bhatta Shuvo, Senior Lecturer, Department of CSE,** Daffodil International University.

I also declare that, I collect Information from Daffodil Online Limited (DOL), Data center and Internet Service Provider (ISP) based Company Books and Internet.

Supervised by:

Shaon Bhatta Shuvo
Senior Lecturer
Department of CSE
Daffodil International University

Co-Supervised by:

Masud Rabbani
Lecturer
Department of CSE
Daffodil International University

Submitted by:

Md. Abdulla Al Mamun
ID. 153-15-6680
Department of CSE
Daffodil International University

ACKNOWLEDGEMENT

I thanks to Allah who give me the opportunity to complete my internship and give me change to prepare my internship report.

I firstly thank Daffodil Online Limited and Daffodil Online Limited for all the staff that could finish the internship, so well without their help and thank them so much that they have provided such a beautiful internship.

I really proud for my course supervision **Shaon Bhatta Shuvo, Senior Lecturer,** Department of CSE**,** Daffodil International University, Dhaka. Deep Knowledge & keen interest of my supervisor in the field of **"System & Network Administration Using Mikrotik and Linux"** to carry out this internship. I could not finish the internship report properly without my supervisor's help, and he gave me beautiful direction so I am very grateful to him.

I would like to express our heartiest gratitude to **Dr. Syed Akther Hossain, Professor and Head, Department of CSE,** for his kind help to finish my internship and also to other faculty member and the staff of CSE department of Daffodil International University. My course teacher and my friends cooperated me in many ways to make an internship report.

Finally, I must acknowledge with due to respect the constant support and patients of our parents.

I would like to thank our entire course mate in Daffodil International University, Who took part in this discuss while completing the course work.

ABSTRACT

My internship title is **"System & Network Administration Using Mikrotik and Linux"** work with Mikrotik Router, Switch and Linux. Internet is very important to communicate with each other. Network engineering a respected job is mainly employed on IP address and server and operating system is working on Linux. Its job field is available in different telecommunication companies Grameenphone Banglalink Etc.So in the future I show a lot of opportunity to improve the networking side. I think one upon a time many company is coming in the market to help and secure our data. So we need a lot of network Engineer. So the market we show many opportunities to start a job. That is why I chose my internship topic as **"System & Newark Administration Using Mikrotik and Linux"**

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CHAPTER 1
Introduction

1.1 Introduction

The current time is called the internet and ICT period. It's probably going to be improving on every other day, but we are not able to understand it and it's going to change. We need to find from the internet. Now people are becoming addicted to the internet because of any kind of work done on the internet. It is easy to find all the necessary things by searching Google. We are now presently working with the Office-Court Bank small to large Companies everywhere, through the software we do not have the attendees, and we do not have many more software to connect to internet connectivity. Bank services also include SMS Banking Online Banking Debit Card Service Credit Card Services. The software we use in the office in the bank is connected to the internet and internet connects with the server. Server plays an important role in this regard, and with one server to other server communicate, it conveys information to the receiver.

1.2 Motivation

I am currently a student of the last semester of CSE Department of Daffodil International University; I understand the importance of acquiring real knowledge that I have chosen the internship. While doing internship I learned very well about my work with the Mikrotik and Linux server configuration. As a result, I got to know where these are used in the work and I have developed myself as an expert. I have increased my own self-confidence, I know how much work I know, and I know myself how much I can realize that I will be able to do something good in the future. Hope to say that.

1.3 Internship Objectives

The main objective of education is to acquire knowledge. I choose an internship because I wanted to benefit from the experience. I wanted a new challenge and to learn, improve and develop new sets of skills. A networking engineer's duties and responsibilities are

what he needs to do and how to solve them in the future, to solve them in the past and to do practical work we do on the internship.

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- ➢ IP Address and Sub netting
- ➢ Details of Switch
- ➢ Mikrotik Router
- ➢ To gain details knowledge about Linux Centos 7.

1.4 Introduction to the Company

Daffodil Online Ltd [1]is the networking base company. This company is among the oldest ICT companies in Bangladesh. Daffodil Online is an organization of Daffodil University. Daffodil Online Limited offers a variety of services, one of which is Internet service broadband and one is Domain and hosting, and other services are Networking Solution, Training Center service, co-location service and other services. Daffodil Online important cells include networking, CCNA, Mikrotik, Linux server configuration. Besides, they provide high speed network services in some districts and there are different people in each district to look after them if there are any problems in them. Daffodil Online Limited has always used the tools of the new technology and learns the work of the student after the completion of the problem and if any problem is solved in the freely.

1.5 Report Layout

In the chapter 2 I have described this section about Daffodil Online Limited and they have described the services they provide and have give them an idea of what future jobs can be done after networking internship..

In the chapter 3 I have described about daily task and activities, and Mikrotik router and Linux.

In the chapter 4 I have described is competencies Earned, Smart Plan, Reflections.

In the chapter 5 I have discussed the future of conclusions and networking.

CHAPTER 2
Organization

2.1 Introduction

Daffodil Online Ltd, (DOL)[1]is the networking base company. This company is among the oldest ICT companies in Bangladesh. Daffodil Online is an organization of Daffodil University. Daffodil Online Limited offers a variety of services, one of which is Internet service broadband and one is Domain and hosting, and other services are Networking Solution, Training Center service, co-location service and other services. Daffodil Online Limited offers high speed internet service in six districts is Dhaka, Rajshahi, Bhola, Kishoreganj Chandpur and Kustia. Among the training courses, in networking CCNA Mikrotik, Linux and Server configuration courses. Their main goal is to provide 24-hour service to customers.

2.2 Product and Market Situation

Daffodil Online Ltd prides itself as one of the leading nationwide Internet Service Provider (ISP) in Bangladesh. They are the most experienced and oldest company in the ICT field where they are basic business ethics is long term relationship with the are customers. As they look at the growth over the decade since our inception, they are extremely proud of what we have achieved, and even more excited about our outlook for an equally promising future. Daffodil Online Ltd also provides different IT Services and Professional Training services. These are given below.

IT Services

- ➢ Corporate internet Solution.
- ➢ Security Solution.
- ➢ Domain registration and Web hosting.
- ➢ Proxy & DNS Server solution.
- ➢ Mail server solution.

- ➢ All Computer Network accessories.
- ➢ Professional course and trainings.

Professional Training Services

- ➢ ISP Setup and administration using Linux.
- ➢ Training Course on Certified Ethical Hacking (CEH).
- ➢ ISP Setup and Administration using Mikrotik.
- ➢ Web site Development with Joomla.
- ➢ PHP and MYSQL for Website Development.
- ➢ E-commerce & Open source Joomla Virtue Mart.
- ➢ Red Hat Certified Security Specialist (RHCSS).
- ➢ Red Hat Certified Engineer (RHCE).

2.3 Target Group

The company's customer base includes all consumers and all small-to medium- sized businesses, including start-ups. The company plans to concentrate on soho clients, as these are perfect targets for our new high-speed offerings, and hold the greatest growth potential for the company. Web Solutions feels that these market segments have special pricing and service needs, and make more dedicated, reliable customers.

2.4 SWOT Analysis

SWOT Analysis is a useful technique for understanding your Strengths and Weaknesses, and for identifying both the Opportunities open to you and the Threats you face.

Strengths:

- Strong capital position
- Low debt
- Communication between people separated by distance
- Setting up an online business
- Best salespeople
- Gathering information

Weakness:

- Branding could be better
- Recent scandal from product
- Competition for small resellers
- Large sums of money required to set up businesses

Opportunities:

- Use strong financial position to market acquisition
- Acquire market share through banding
- Age structure of the population changing
- Introduction of simpler tariffs

Threats:

- Competitors could leverage brand strength
- May loss talent
- Lack of differentiation lead to price war

2.5 Organizational Structure

Organizational Structure of Daffodil Online Limited show in figure:

Figure 2.1: Show organizational structure of Daffodil Online

CHAPTER 3
Tasks, Projects and activities

3.1 Daily task and activities

Month-1: In the first month I learned the tasks of Daffodil Online Limited in the internship:

- ➢ Learning and understanding about IP addressing and Sub-netting
- ➢ Learning and understanding about Network Components.
- ➢ Learning and understanding Basic of Mikrotik

Month-2: In the second month I learned the tasks of Daffodil Online Limited in the internship:

- ➢ Learning and understanding basic of Mikrotik Router.
- ➢ Mikrotik Installation.
- ➢ Winbox introduction
- ➢ Connection Static, DHCP
- ➢ Bridge
- ➢ Bandwidth Manage
- ➢ Data backup
- ➢ Firewall Nat

Month-3: In the third month I learned the tasks of Daffodil Online Limited in the internship:

- ➢ Learning basic of Linux.
- ➢ Learning Linux HDD Partitions.
- ➢ Learning Linux Installation
- ➢ Basic Linux commands.
- ➢ Linux Kernel and Password Management.
- ➢ About logger in users.

3.2 Events And Activities

- ➢ Monitoring and Maintained System Computers and Networks.
- ➢ To set up user accounts, passwords &permissions.
- ➢ Troubleshooting the router & server.
- ➢ Local area networks and switches Troubleshooting.
- ➢ To find network faults & solve it.
- ➢ Technical support for people using the network.
- ➢ Everyday checkup admin and monitoring of network users.
- ➢ IT solution Suggest to business problems for solutions.

3.3 Projects, Task and Activities

3.3.1 IP Address and Sub-netting

- ❖ **Types of network address**
  - ➢ Physical address is Mac address (48 bits).
  - ➢ Logical address is IP address

- ❖ **IP address 2 Types**
  - ➢ IPv4 (32 bits)
  - ➢ Ipv6 (128 bits)

- ❖ **Ipv4:**Ipv4 is 32 bits address and 4 portion every portion 8 bits separate by single dot (.)
- ❖ **There are two main parts of IP address**
  - ➢ Network part
  - ➢ Host part

❖ **Classification of IP**

➤ Class A 1-127   **00000000**.00000000.00000000.00000000 bold is
   Network part and others part is host.
➤ Class B 128-191   **00000000.00000000**.00000000.00000000
➤ Class C 192-223   **00000000.00000000.00000000**.00000000
➤ Class D 224-239
➤ Class E 240-255

❖ **Types of IP**

➤ Private
➤ Public

❖ **Private address space**

➤ Class A 10.0.0.0   to   255.255.255.255
➤ Class B 172.16.0.0   to   172.31.255.255
➤ Class C 192.168.0.0   to   192.168.255.255

❖ **Default subnet mask**

➤ Class A 255.0.0.0
➤ Class B 255.255.0.0
➤ Class C 255.255.255.0

3.3.2 Mikrotik Router

Mikrotik [3] is a Latvian company which was founded in 1996 develops router and
wireless (ISP) systems. Mikrotik is a Latvian manufacturer computer networking
equipment. Its sells wireless products and routers. The company's products are known for
being low-priced alternatives to expensive routers and Ethernet radio relay lines.

3.3.3 Mikrotik OS

Mikrotik Router OS [4] is the operating system of Mikrotik Router board hardware. It can also be installed on a pc and will turn it into a router with all the necessary features-firewall, routing, wireless access point, bandwidth management, hotspot gateway, VPN server and more.

3.3.4 Features

Router OS supports many applications used by Internet   service providers. For example

It can be used as a router

- ➢ It provides OSPF, Multiprotocol Level Switching.
- ➢ It provides PPPoE Client- Server
- ➢ VPN-Virtual Private Network
- ➢ Providers firewall rules
- ➢ Providers DHCP Server Service.
- ➢ Easy GUI interface
- ➢ Bandwidth manage is very easy
- ➢ Easy Administration

The Mikrotik router support all of the above Ipv4 and Ipv6, Linux Kernel, Firewall, DHCP, VPN, and others server etc.

3.3.5 Release History

Mikrotik release [5] different version routerOS at different time. Some of them given bellow.

- ➢ Router OS version 6: May 2013
- ➢ Router OS version 5: March 2010
- ➢ Router OS version 4: Oct 2009
- ➢ Router OS version 3: Jan 2008

3.3.6 Router Board

The company manufacturers a series of integrated circuit boards marketed under the name Router board, which implement a complete hardware platform for router OS. The router board line, combine with router OS, in the market small to medium size Mikrotik router is available. This router is very popular from others router, and the router use indoor and outdoor. Internet Service Provider (ISP) use Mikrotik router and small to large company use Mikrotik router maintain their network systems. Mikrotik router easily manage bandwidth and DHCP server configuration and web site block and others system.

Figure 3.1: Screen Printto Mikrotik Router

3.3.7 Cloud Core Router

In November 2012 Mikrotik release the cloud core router[7] 3.2 figure integrated unit which is based on the Tillers CPU supporting 16 to 36 CPU cores, 121000Base-T Ethernet interfaces, and up to four SFP interfaces, as well as "fast-path" packet forwarding between interface (with claimed 24 million packets per second forwarding rate). These units target the medium-sized network providers as well as try to be a well – priced alternative to the other more well-known brands.

Figure 3.2: Mikrotik Cloud Core Router 1036 Series

3.3.8 Propose Network diagram Mikrotik Configuration

Figure 3.3: Shows Mikrotik router network diagram

3.3.9 Initial setup

Mikrotik router connection and setup

At first plug in a UTP cable in Mikrotik LAN port and the other port to the PC.

Second plug in a UTP cable in Mikrotik WAN port that given from ISP.

Browse with Winbox

Click the Winbox, show the IP address and Mac address, Click the Mac address, not need to give Password. After login router need to reset for first use.

Figure 3.4: Mikrotik router first login

Step 1: Add address interface

Process: Router is now Manage by Winbox. Now we need to add WAN address on ether I that given from ISP Provider and add a LAN address to the other ether interface for WAN connectivity. To add a Network address provide an IP address in address filed which will consider gateway for that interface and network address in network field. Now in figure 3.5 shows adding a new network. For this reason we need to go

To add IP an address need to go IP>address >then click on '+'>then click ok then an address can add. Here we use192.168.50.210/24 for WAN and 172.16.1.1/16 for LAN

Figure 3.5: Add IP address in Winbox

Step 2: Setting up Gateway

Process: We need to go IP >Route > '+' > click gateway insert gateway address here we use 192.168.50.1

Figure 3.6: Gateway setup in Winbox

Step 3: DNS Server Setting

Process: Setup DNS server, open Winbox and click DNS setting and setup default DNS.

Figure 3.7 Shows the DNS setup

Figure 3.7: DNS Setup

Step 4: DHCP Configuration

Process: To configure DHCP go to DHCP Server .Then click DHCP setup and select

LAN address and next …next then finished. Shows this configuration figure 3.8 is below.

Figure 3.8: DHCP Setup

Step 5: Bridge Configuration

Bridge allows creating an interface two or more ports under a one Network address. It is called bridge .One router one or more bridge interface. Figure 3.9 Shows how to create a bridge.

Figure 3.9: Bridge Configuration

Now we need to add interfaces under this bridge. First click on "port" and add port under this bridge, and save the bridge default name. Here we can add many interfaces we want to add under the bridge interface.

Ether 4 to Ether 6 under the Bridge-2 LAN

Figure 3.10: Bridge port add

Now an IP address is need to add to the bridge interface. To the process we have go to IP> Address> click on '+' sign and add the IP address and finally finish.

Figure 3.11 shows the way we can configure bridge interface.

Figure 3.11: Add IP address in bridge interface

Step 6: PC Queue

Process: To setup PC queue we need to create queue first for go to Queue> click on '+'> given queues name > target address > select upload download> ok.

Figure 3.12: PC Queue

For set upload and download we need go to Queues> queue type> and create name > set Speed> select source address> for upload and Des address>for download> click ok

Figure 3.13: PC Queue upload and download

In PC queue system we need to configure filter rule and mangle rule then we go to IP->Firewall> click on '+' > then general> select chain forward and given a Source address> then click ok

Then we go to IP>Firewall> mangle rule> Action> Action mark packet> Ok which show in figure 3.14 and 3.15

Figure 3.14: Filter Rule

Figure: 3.15: Mangle rule

Step 7: PPPoE Server Configuration

Process: To Create IP pool PPPoE server need go to IP> Pool> then click '+' > type name and address> ok.

Figure 3.16: PPPoE Server Configuration

For profile create go to profile >then click '+' > General> type name and local address> then go limit> given rate limit then ok.

Figure 3.17: PPP Profile

For secret then need go to secret> click '+'> then insert name password service> ok.

Figure 3.18: PPPoE Securer

For service need to go PPPoE service > insert service name interface> then click OK

Figure 3.19: PPPoE Service

Step 8: How to block website using layer 7 protocol on Mikrotik router

Process: To block a web site then go IP>firewall> layer 7 protocol<click '+' > insert site name>query> ok. Then select the query and go to filter Rule>then click '+'>general > chain forward> Source address> advance select layer 7 protocol select site name>action drop>ok

Back to IP> address> select LAN address and subnet mask> block all IP address

Figure 3.20: Layer 7 Protocol

Then we go to firewall and click '+'> go to action>select accept>ok.

Figure 3.21: Firewall action

Figure 3.22: Nat rule drop site

Step 9: Data backup and export import files

Process: First need go to files>backup> insert name> backup

Figure 3.23: Data file backup system

3.3.10 Centos 7

Centos installation on VMware Workstation

Step 1: Process: First open VMware then go to file option> new virtual machine > select typical>next> next>

Figure 3.24: Linux Installation in VMware

Step 2 Process: Then> insert root password> next>> select custom layout>Next

Figure 3.25: Linux Installation insert password

Step 3 Process: Now create Swap partition> select SWAP>Size> OK

Figure 3.26: Linux Installation create partition

Step 4 Process: Now create root/Partition>Select/>File system ext4> given size> select fixed size>Ok

Figure 3.27: Linux Installation create / root partition

Step 5 Process: Now create /boot partition>select/boot>file system ex4> given size> select fixed size > Ok

Figure 3.28: Linux installation create/ boot partition

Step 6 Process: Now create / home partition> select/> file system ex4> given size> select fixed size> ok then click next> next>

Figure 3.29: Linux installation create/home partition

Step 7 Process: Now select Desktop> Next > Click reboot

Figure 3.30: Linux installation select desktop

Step 8 Process: Then local host login > Start

Figure 3.31: Linux installation root login

3.3.11 Partition

In Linux operating system is a very important part create partition [9]. Linux partition is mainly divide two part, (1) Installation part and (2) Disk part

In installation part create at least major three partitions

❖ **Root Partition: /**

A root partition is defined where see "/". The root directory is located all files on the root partition. Minimum 128 MB RAM and 2 GB HDD Space need. Use as my workstation 2048 MB and RAM 100 GB HDD

❖ **Boot Partition: / boot**

The boot partition 500MB, the mounted point is /boot contain the operating system creating a native ext3 partition to hold these files are need. For the most users, a 200MB boot partition is perfect.

❖ **Swap Partition: swap**

The swap partition is used to help virtual memory, but cannot less than 32 MB. A swap partition of 2 GB to 4 GB and root partition need minimum 10 GB.

3.3.12 The Basic Command of Linux Centos

- ➢ PWD present working directory know where we have
- ➢ LS know the data of a file or folder
- ➢ Uname show operating system
- ➢ Df-h drive show
- ➢ Free-m show swap
- ➢ Display or change data or time=date
- ➢ Change working Directory= cd /root/Desktop
- ➢ Cd change drive
- ➢ Cd. One step back
- ➢ Touch mamun create a blank file (file name).
- ➢ Mkdir mamun create a directory

Figure3.32: Linux Basics Command

Figure : 3.33 Linux Basic command

3.3.13 Server Configuration

In internet service provider server configure is very important. Server selection is very important for each server services. Many servers use in many operating system. Some server configure by ISP, DNS server, FTP server WEB server, Mail server, DHCP server and many others server.

Domain Name System (DNS)

Host specified by the IP address of the computer that is convenient for them, but it's not always easy for people working with the name. Therefore the IP address of the host name does not need to convert to a translation table. Every day millions of new machines popping up on the internet, it would be impossible to keep everyone on the table this sort of date. Where it comes in will DNS[10]. DNS is Domain Name System. DNS-IP address of the machine on the net for all machines that have changed the name. This translates to address the name and address, and some other factors.

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Mail Server

Often as the "Mail Server"[11]according to an e-mail server that acts as your virtual post office, a computer in your network. E-mail to a mail server for local users is stored in a storage area where the mail server, you must decide how to respond to a specific message destination. This consists of a set of rules specified by the user, the user's account on the mail server recogninizes a database locally and with the will be dealt, and the other to handle the transfer of messages from the mail server and e-mail client, which is the element of communication module.

Postmaster is usually referred to as the person responsible for the maintenance of the e-mail server. Most mail servers during normal operation to work without any manual intervention.

Mail Server Configuration

MUA= Mail user agent. Ex: Outlook, Ms Outlook, Pine.

MTA = Mail Transfer Agent. Ex: Gmail, Send mail, Post mail.

MDA = Mail Delivery Agent. Ex: Mail drop.

SMTP = Simple Mail Transfer Protocol. Ex: Used for sending, default port 25.

POP3 = Post Office Protocol 3. Ex: Used for receiving, default port 110.

IMAP = Internet Message Access Protocol. Ex: Used for receiving, default port 143.

Here I have used their popular package which is configuring very easy.

3.4 Challenges

- The First Day Reactions
- Unbalanced Introductions
- An excessive number of Information Absorptions
- Self-ice-breaking sessions
- No-Work!
- How to take the necessary steps?
- Would it be a good idea for me to inquire? Whom would it be a good idea for me to inquire? What will I say when inquiring?
- The recognition that you don't have any acquaintance with/you know
- Understanding the workplace culture
- Would it be advisable for me to be neighborly? Or then again somewhat saved?
- Would it be advisable for me to go for lunch now? Would i be able to clear out?
- How to request a leave?
- Understanding collaboration
- Understanding the organ gram

CHAPTER 4

Competencies and Smart Plan

4.1 Competencies Earned

The IT industry now expanding rapidly. We understand that the big change in the field of IT is happening, we cannot imagine the quantity of the buttons being changed, and we can plan on using the software apps that we will do in the future, but these are the first ones where the software is being built. The idea we do not have. In this short time intern we learn deeply about network component and administrator skill. This is very helpful for us we can make our carrier in network Engineer.

4.2 Smart Plan

I know about network administrator work and responsibility. My future plane completely learn full networks manage, and implementation then it real world. In future I want learn and implement a good network, which system are used small and big organization with low cost. In the future I want to do an ISP business, and I want to be with an IT company where all types of networking and software work will be done.

4.3 Reflections

The internship student gets the practical knowledge in the job sector. Its help to increase job experience and get idea for job sector their working purpose, if you spend three to four month in a company, many things can be learned about how to learn the conduct of the company, learn the rules of the office, and what kind of work in the job sector should do in the future, and what kind of work to do in the sector available, and good preparation for the future. My internship company used very advanced technology and upgrading the services.

CHAPTER 5

Conclusion and Future Career

5.1 Discussion and Conclusion

I have had a lot of experience in the 4 months internship at the last semester. I am very optimistic that I can do something good in the networking sector in the future. In the future, I will be able to use myself in the networking sector with the opportunity. Now I also feel that through this internship it can be more challenging and confident. Now I understand how to use the time when I first started the intern, I had to work seven days an eight hours a week, and it was a lot of trouble first to those who have intern but through this I have learned that to work in the future, I have to work this way. It was a wonderful experience, I hope, I learned a lot from my company and I try to do these things in the future by using these experiences.

5.2 Scope for Further Career

This internship network infrastructure provides a clean idea about the real work of the system and can use it with the help of the knowledge, so it is very important for us, so everyone has internship. I will be able to apply these experiences in the future and network related jobs.

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Appendices

Appendix A: Internship Reflection

Real knowledge is not available from textbooks. Internship plays an important role in achieving real knowledge. As a result of internship in a company, there is a concept about job sector, and there are ideas about what to do for networking jobs. The company's views on the company's future were discussed about how the company was formed in the company's employees, knowing these information and preparing for future jobs, what jobs are to be done in jobs, what kind of work to get to networking jobs, for some organizations, the internship has played an important role in getting all the concepts to work.

Appendix B: Company Detail

Head Office

Name	Daffodil Online Limited.
Type of Organization	Nation Wide Internet Service Provider (ISP)
Address	102, Shukrabad (3rdfloor), Mirpur Road,
	Dhanmondi, Dhaka-1207, Bangladesh
Telephone	02-9143258-60
Fax	880-2-8116103
E-mail	info@daffodilnet.com
Website	www.daffodilnet.com

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