CCNA ROUTING AND SWITCHING

BY

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

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DHAKA, BANGLADESH.

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APPROVAL

This Internship titled "**CCNA Routing & Switching**", submitted by Md. Ziaul Haque, ID No: 183-15-11829 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial and fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 06/01/2022.

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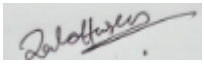

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DECLARATION

I hereby notify that, this internship report is prepared by me, **Md. Ziaul Haque, ID: 183-15-11829** to the department of Computer Science and Engineering, Daffodil International University. Under the supervision of **Mr. Gazi Zahirul Islam, Assistant Professor, Department of CSE**, Daffodil International University. I also Declare that neither this internship report nor any part of this internship report has been submitted elsewhere for award of any degree or Bachelor of Science and Engineering.

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I extremely appreciative and wish significant obligation to **Mr. Gazi Zahirul Islam, Assistant Professor**, Department of CSE Daffodil International University, Dhaka. He was always guiding me to successfully complete the internship periods. Profound Knowledge and unmistakable fascination of administrator in the field of "*CCNA Routing & Switching*" to do this entry level position. His unending tolerance, insightful direction, persistent consolation, consistent and lively investigation, productive feedback, significant guidance, perusing numerous second-rate drafts and revising them at all stage have made it conceivable to finish this Internship.

Heartiest thanks to **Professor Dr. Touhid Bhuiyan**, 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.

I want also like to thank my friends who helped me a lot in finishing this training within the limited time.

Finally, must acknowledge with due respect the constant support and patients of my parents.

ABSTRACT

I am Md. Ziaul Haque. I am a proud Daffodil International University student. CSL Training Center provided me with a final year internship that I recently finished. This internship, called "CCNA Routing and Switching," is in the computer networking industry that examines the design of a network system.

Nowadays our daily life has become impossible to think without internet. I was always more interested in computer networks than anything else. That’s why I chose the topic "CCNA Routing and Switching" for my report. This report consists of total five chapters. The First chapter summarizes Introduction. Chapter Two provides the Organization's background. Chapter Three describes the daily tasks and activities. The fourth and fifth chapters discuss about competencies and conclusions, respectively. The report discusses internships, CCNA and practical work in detail. The report addresses particular Routing, Switching, Addressing, RIP, EIGRP, OSPF, and VLAN are discussed in this internship report.

Network types, routing and switching fundamentals, the TCP/IP and OSI models, IP addressing, WAN technologies, network security, extending switched networks with VLANs, determining IP routes, managing IP traffic with access lists, and establishing point-to-point internet connections are all covered in this context.

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CHAPTER 1
INTRODUCTION

1.1 Introduction:

The most basic function of computer networking is to link individuals for communication. A Statics shows that until January 2021 4.66 billion, 59.5 percent global population use internet worldwide. Network engineers are needed to connect the rest of the world to the Internet. Internet businesses hire network engineers to connect or maintain their networks. CCNA (Cisco Certified Network Associate) is a basic computer network engineering certification. It is also the most secure and popular system in the networking market. Almost every office, bank use CISCO. CCNA Routing and switching is use to connect to and maintain Internet connection. Computer networking is a constantly growing and complex field that can provide an excellent career opportunity for learner.

1.2 Motivation

As a CSE student at DIU, I have always been interested in the networking sector. Interning at a company allows us to gain experience in a professional context while learning new skills. Internships help us learn more about the careers we want to continue. Most networking businesses around the world are looking for CCNA-certified experts. In Bangladesh, there is a huge job opportunity in computer Networking sector. If I know CCNA, I can work as: Network Professional, IT help desk, Technicians, Networking related job. Networking sector is a framework where CCNA improve and enlarge my solidarity in order to have better my future. That’s what motivates me to do internship on CCNA Routing and Switching.

1.3 Internship Objectives

Internships provide me with the opportunity to experience real-world offices, meetings, and events. During my internship, I was introduced to a number of professional and talented individuals. The internship's purpose is to get job experience that I may apply in my future profession. however, the internship's main objective is to meet the requirements of the BSC program.

Other objectives include:

1. Getting to know about networking.
2. Understanding routers and switches.
3. Understanding protocols for routers and switches.
4. Learn to configure the organization's complete network.
5. I comprehended the scenario of practical field networking.
6. Above all, Learn about the working environment and the official environment.

1.4 Introduction to the Company

I need to do a 4-month internship in a workplace to finish my BSc in CSE at Daffodil International University. As a result, I decided to complete my internship at CSL Training Center. It is one of Bangladesh's fastest-growing IT training institutes. It is Dhaka's top networking training facility. In Bangladesh, the firm currently has two locations. The first is in Kuril, while the second is in Lalmatia. They have 15 years of expertise in the field of training. They have over a hundred companies linked with them. They provide high-quality training, including Cisco, Linux, Juniper, Microsoft, and MikroTik certifications. They also provide job placement, vendor exams, and other services. Most importantly, they teach first, then offer us internships at their company.

1.5 Report Layout

There are five chapters in this internship report. These five chapters are simplified in the report layout. I attempted to summarize each chapter. The chapters are summarized below:

- The first chapter summarizes the goals, motivations and objectives of the internship and introduces the company.
- The second chapter provides the background of the organization.
- The third chapter describes the daily tasks, challenges and activities during the internship period.
- The fourth chapter discusses competencies, smart plan and reflections.
- The fifth chapter discusses, conclusion and discusses future career opportunities.

CHAPTER 2
INTERNSHIP ORGANIZATION

2.1 Company Introduction

CSL Training Center is among the fastest-growing IT training centers in the country. It is the best networking training center in Dhaka. Currently the company has 2 branches in Bangladesh. One in Kuril and the other one is in Lalmatia. They have 15 years of training experience. 100+ company associated with them. They partnered with BASIS, BTEB, BITM, e-Cab, RedHat, Person VUE. There corporate clients are: SSF, BTRC, Bangladesh Hi-Tech Park Authority, Global Brand, Tiger IT, THAKRAL information systems private Ltd, NovaCom, BAPEX, AKIJ GROUP. Bangladesh open university, ADN Telecom and more. They offer top quality training that including Cisco Course, Linux Course, Juniper Course, Microsoft Course and MikroTik Course Certification. In addition to regular training, they also offer 100% job guarantee trading, vendor exam, Exam Preparation, etc.

2.2 Product and Market Situation

CSL Training Center is among Dhaka's top networking institutes. CSL training center offer several professional trainings. Such as:

1. CLOUD and VIRTUALIZATION:
    a) AWS solution Architecture -Associate
    b) Microsoft Azure Administrator
    c) DevOps Engineering
    d) Docker and Kubernetes
    e) VMware VSphere 7.0: ICM
2. Routing and Switching:
    a) CCNA
    b) CCNP ENCORE
    c) CCNP ENARSI
    d) Juniper JNCIA & JNCIS
    e) F5 Load Balancer
    f) HCIA Routing and Switching
    g) MikroTik with ISP setup.

h) FTTx and OLT (V-SOL/BDCOM/C-DATA)

3. Network Security:
    a) Cisco CCNP Score
    b) Ethical Hacking
    c) Cisco CyberOps
    d) Cisco VPN
    e) PaloAlto Firewall Administration
    f) Fortinet FortiGate Firewall
    g) Presentation Testing with Kali Linux
4. System Administration:
    a) Red Hat system Administration
    b) Red Hat server Administration
    c) Ubuntu Linux Server
    d) Windows Server 2019
    e) MS Exchange Server 2019
    f) Office 365 Administration
    g) Zimbra Mail Server Administration
    h) Network Management and Monitoring
5. Hardware and Networking:
    a) IT Essentials
    b) Networking 101
6. Automation Tools:
    a) Automation with Ansible
    b) Python for Network Engineer
7. IT security Auditing & MGT:
    a) CISA
    b) CISSP
8. Others:
    a) MS SQL Server Administration
    b) Oracle DBA Admin
    c) Asterisk IPTSP Setup

2.3 Target Group

The organization focuses on students who desire to enhance their networking abilities. The institute's major goal is to assist engineering students and professionals. My internship organization conducts a survey, conducts research on their competitors, and then uses social media ads to reach their consumers.

2.4 SWOT Analysis

Strength:

- Excellent communication abilities
- Possess a positive reputation in the marketplace
- Skilled professional instructor.

Weakness:

- Insufficient financial resources
- Insufficient marketing experience

Opportunities:

- There are training arrangements for all types of people.
- Opportunity to become an instructor at their institute.
- Job placement offer.

Threats:

- They are doing quite well right now. I don’t see any threat. I believe they will keep growing in future.

2.5 Organizational Structure

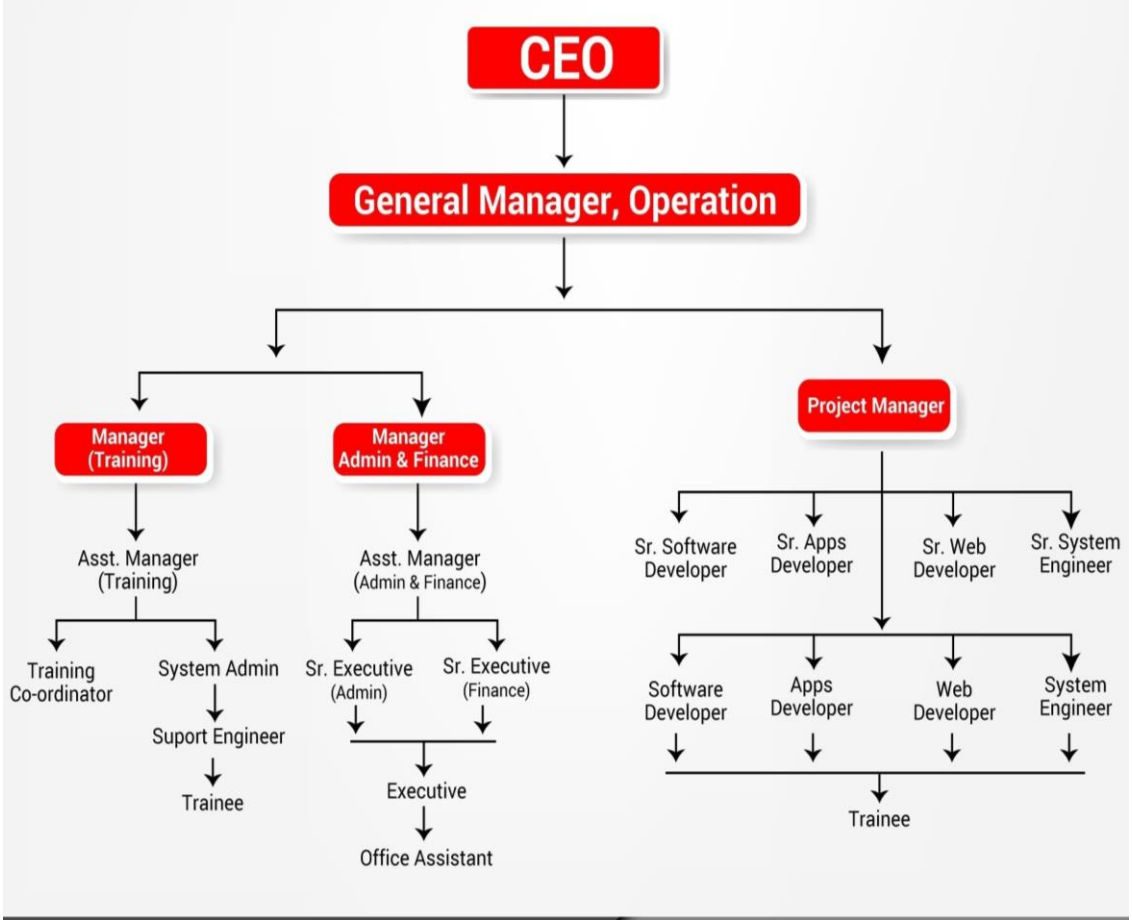

Figure 2.1: Organization Structure

CHAPTER 3
TASKS, EVENTS AND ACTIVITIES

3.1 Daily Task and Activities

In the 1st month at internship:

In the first month of my internship at CSL Training Center, I learned and practiced the following basic tasks:

- Network.
- OSI and TCP/IP.
- IPv4 Addressing and Sub-netting.
- Routing protocol Information.

In the 2nd month at internship:

I learned and conducted the following tasks during the second month of my internship at CSL Training Center:

- Static & Default Routing
- RIP
- EIGRP
- OSPF

In the 3rd month at internship:

I mastered the basics during the first and second months of the internship, and I learnt and did the following duties throughout the third month:

- NAT ant PAT
- Switching Introduction
- VLAN
- Wireless Technology

3.2 Network

Computer Network

When two or more computer are interconnected in order to share file, program or resources is known as computer network. Easy access to information and to increase productivity, computer network is required. Computer network consist of five key elements.

Those five key elements are:

1. End Devices
2. Medium
3. Network Device
4. Messages
5. Rules

To improve network functionality a network, need to fulfill at least three criteria. The most important are Performance, Reliability and Security.

Necessity of Computer Network:

As we know that computer network helps us to share several things such as file, program or resources. The following are the reasons why a computer network is required:

i. Documents or File sharing
ii. Program sharing
iii. Hardware sharing
iv. User communications

Network Types:

1. **LAN:** LAN or local area network connects a small geographical region, such as a 10-meter house floor or a 100-meter building or campus.
2. **MAN:** MAN or Metropolitan area networks link users to a large area network, such as a city. It links LANs throughout a geographical area. It covers a bigger geographical region than LAN but a lesser area than WAN.
3. **WAN:** To connect LANs, Wide Area Networks is needed. When the LANs that need to be linked and separated by a long distance, WANs are frequently used. It is larger than a metropolitan area network, that links a whole nation.

3.3 OSI & TCP/IP Model

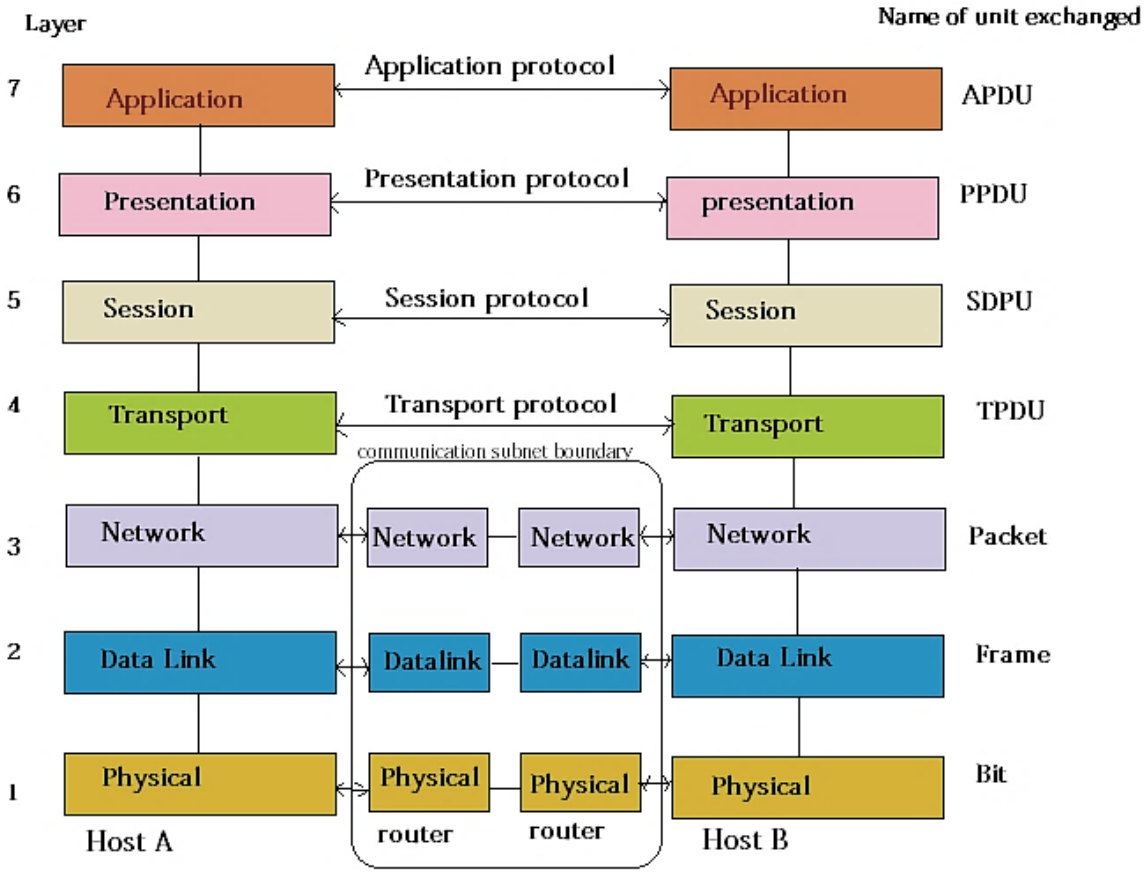

Figure 3.1: OSI model communication between two devices

The OSI model

The International Organization for Standardization (ISO) established and manufactured the open Systems Interconnection (OSI) model. It provides the first structure for managing how data should be distributed across a system. OSI model consist of total 7 layers. and those are:

1. **Physical Layer:** Separate bit can be sent from one node to another through physical layers.
2. **Data Link layer:** Data frames are transported one node to the next across physical layers.
3. **Network Layer:** Network layers work to transmit and coordinate separate data packets from one host to another.

4. **Transport Layer:** The transport layer is in charge of transmitting or receiving the complete message from the source to the destination.
5. **Session Layer:** The Session Layer is accountable for maintaining connections, as well as ensuring authentication and security.
6. **Presentation Layer:** Through translation, compression, and encryption, the presentation layer retains the data syntax and semantics transmitted.
7. **Application Layer:** It offers users with high-level APIs

TCP/IP

Transmission Control Protocol and Internet Protocol (TCP/IP) consist of four different layers. Those are:

1. Application
2. Transport
3. Internet
4. Network Access

These four layers contain several protocols. Such as:

- Application: SMTP, FTP, TELNET, DNS, SNTP, TFTP, etc.
- Transport: TCP, UDP.
- Internet: ICMP, IGMP, ARP, RARP, IP.
- Network Access: ARP, PPP, Ethernet, Interface drive.

Protocols are the set of rules that control how devices communicate and share data across a network. To ease end-to-end network communication, several protocols are frequently used.

TCP/IP and OSI Model:

The OSI model is a general model based on each layer's operation. On the other hand, TCP/IP is protocol-oriented system. TCP/IP protocols define the standards that the Internet is based on. The OSI model provides rules for how communication should be done. TCP/IP, on the other hand, is a more realistic approach.

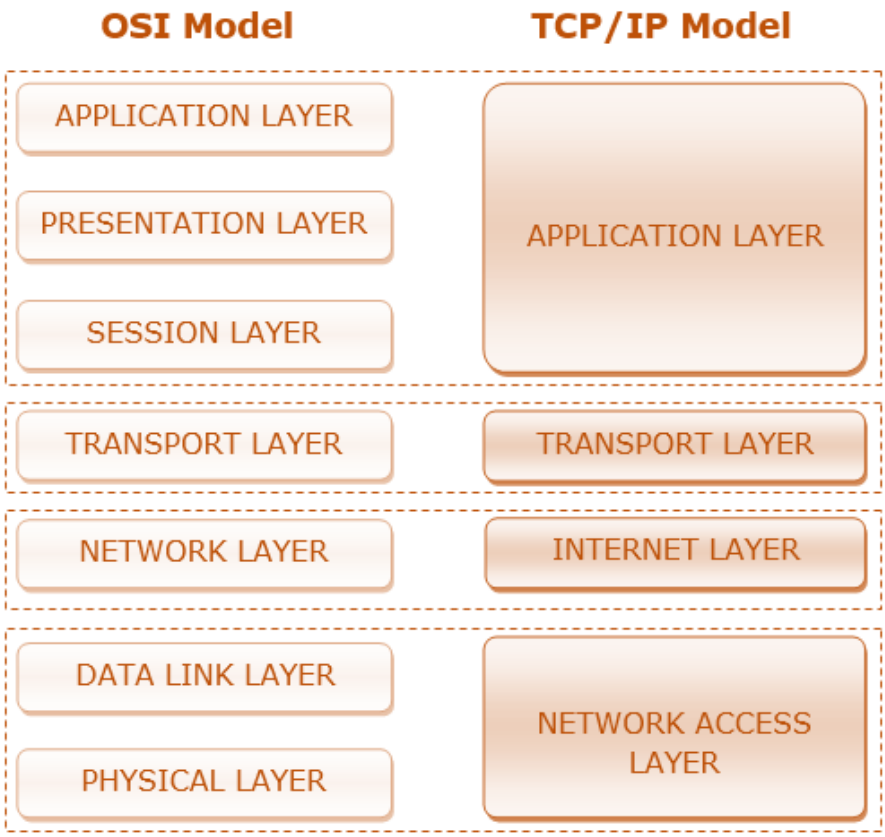

Figure 3.2: TCP/IP Reference Model

3.4 IP Addressing and Sub-netting

The IP address of a network device is a unique identifier. Which is assigned when it is linked to a network.

IP addresses are divided into two type based on the number of bits.

- IP version 4 (IPv4) which is commonly used and contains 32 bits.
- IP version 6 (IPv6) contains 128 bits. It is relatively new and is being used in many countries.

IP addressing

An IP address is used to create hierarchical networks. IPv4 is a highly frequent and simple protocol. The octets of an IP address are four. Each octet is 8 bits in length and contains 32 bits in total. There's a dot between each octet.

Example: **192.168.10.10** is an IP address. And if we see:

First Octets	Second Octets	Third Octets	Fourth Octets
192	168	10	10

We know that computers understand and work by binary. When we convert the IP address to binary, we get:

First Octets	Second Octets	Third Octets	Fourth Octets
11000000	10101000	00001010	00001010

IPv4 address Class

The Internet Protocol hierarchy has different types of IP Addresses that may be utilized effectively in a variety of scenarios based on the needs of the network's hosts. The IPv4 Addressing System is split into five IP Address Classes based on first octet of an IP address.

Address Class	1st octet range (decimal)	Network (N) & Host (H) bit	Default subnet mask	Address Range
A	1-127	N.H.H.H	255.0.0.0	0.0.0.0 - 127.255.255.255
B	128-191	N.N.H.H	255.255.0.0	128.0.0.0 - 191.255.255.255
C	192-223	N.N.N.H	255.255.255.0	192.0.0.0 - 223.255.255.255
D	224-239	NA (multicast)		224.0.0.0 – 239.255.255.255
E	240-255	NA (experiment)		240.0.0.0 – 247.255.255.255

Figure: 3.3: IP Class

The private address blocks are:

10.0.0.0 to 10.255.255.255 (10.0.0.0 /8)

172.16.0.0 to 172.31.255.255 (172.16.0.0 /12)

192.168.0.0 to 192.168.255.255 (192.168.0.0 /16)

IP Sub-netting

A subnetwork, often known as a subnet, is a logical subdivision of an IP network. The process of dividing a network into two or more networks is known as subnetting. The network and the host parts make up an IP address. The network part of an IP address is represented as the initial address of a network by a slash character (/), and ends with the bit-length in Classless Inter-Domain Routing (CIDR) notation.

For example, 100.100.10.10/16 represents first 16 bit for network address and remaining 16 bits for host address. The subnet mask of the IP address is 255.255.0.0

Formula:

Number of subnets = 2^s

Number of hosts per subnet = 2^h - 2

Subnet mask = sum of n bit value

Subnet Size = 256 – n bit value

3.5 Router & Switching Introduction

Router:

A Cisco router is a device that links many networks. It sends traffic from one router to another in the form of "data packets." It operates at the network layer and finds the shortest path from source to destination.

Figure 3.4: Cisco Router

Repeater:

A repeater is an electrical device that receives a signal and retransmits it while also recovering the data. Data transmit rate is measured by frequency and baud rate. There are many types of repeater that comes in a variety of sizes and shapes. In a phone line,

a telephone repeater acts as an amplifier. An optical repeater is an optoelectronic circuit that magnifies a light beam in a fiber optic connection. Both radio and dis antenna is radio receiver and transmitter that constantly retransmits the radio signal.

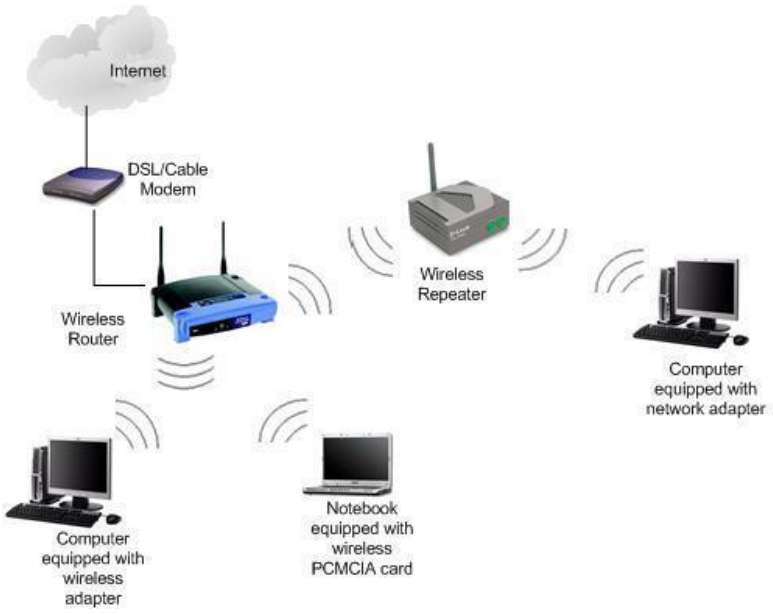

Figure 3.5: Wireless Repeater.

Hub

Hub is a half-duplex layer 1 device. It connects numerous computers and allows data to flow freely from one port to all of the other ports. Less secure, with issues with traffic control. Devices share a collision domain and serve as a network segment.

Figure 3.6: Network Hub

Bridge

The 'bridge' is a data link level device. It also acts as a repeater. By reading MAC addresses, the bridge provides additional data filtering features. It can also connect two LANs using the same protocol. It is a two-port device with one input port and one output port.

Figure 3.7: Network Bridge

Switch

A switch is a type of multiport bridge that contains a buffer to enhance efficiency and performance. The switch operates at the data link layer. By using a table of MAC addresses to select which segments data should be routed to and thereby reducing network traffic. The switch may do error checking before transferring data, it checks for error and only sends legitimate packets to the right port. The switch divides the collision domain of hosts while keeping the broadcast domain intact. Switches runs at far faster rates than bridges and provide more extensive capabilities.

Figure 3.8: Cisco Switch

3.6 Virtual Local Area Network (VLAN)

A VLAN enables many networks to function as though they are part of the same LAN. VLAN separates a network into logical segments. One of the most advantages of VLAN is that it decreases network latency, which saves resources and enhances network efficiency. Furthermore, VLANs are designed to enable segmentation and to aid with concerns such as security, network administration, and scalability. VLANs can also be used to simply regulate traffic flows.

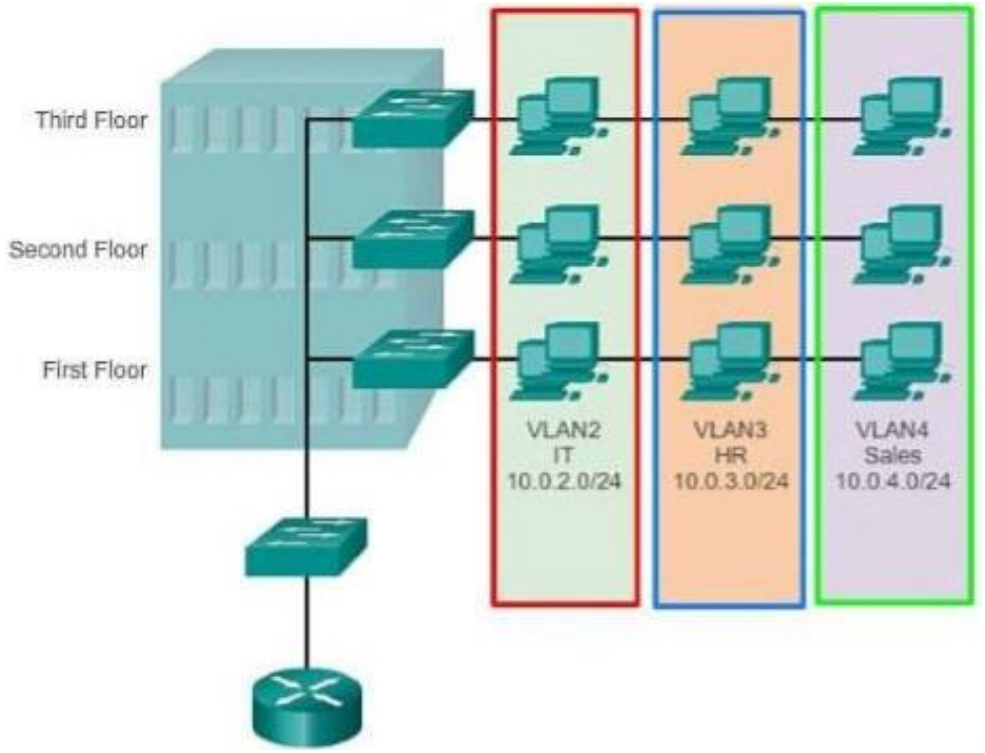

Figure 3.9: VLAN

The syntax of VLAN is:

Syntax
Switch#
Switch#configure terminal
Switch(config)#vlan 2
Switch(config-vlan)#name {*VLAN name*} **[Type the name IT_department]**
Switch(config-vlan)#exit
Switch(config)#vlan 3
Switch(config-vlan)#name{*VLAN name*} **[Type the name HR_department]**
Switch(config-vlan)#exit
Switch(config)#vlan 4
Switch(config-vlan)#name{*VLAN name*} **[Type the name Software_department]**
Switch(config-vlan)#exit

Figure: 3.10: VLAN Syntax

The syntax of adding interface:

Syntax
Switch(config)#int range f0/1-5
Switch(config-if-range)#switchport access vlan 2
Switch(config-if-range)#exit
Switch(config)#int range f0/6-10
Switch(config-if-range)#switchport access vlan 3
Switch(config-if-range)#exit
Switch(config)#int range f0/11-15
Switch(config-if-range)#switchport access vlan 4
Switch(config-if-range)#exit

Figure: 3.11: Interface adding in VLAN.

Syntax of Trunk Port:

Syntax
Switch>enable Switch#configure terminal Switch(config)#interface fastethernet 0/14 Switch(config-if)#switchport mode trunk Switch(config-if)#exit

Figure: 3.12: Syntax of Trunk Port:

Syntax of Inter VLAN Routing:

Syntax
Router#configure terminal Router(config)#interface fastethernet 0/0.1 Router(config-if)#encryption dot1Q 2 Router(config-if)#ip address {*IP address*}{*Subnet mask*} **[VLAN 10 gateway address and mask]** Router(config-if)#exit Router#configure terminal Router(config)#interface fastethernet 0/0.1 Router(config-if)#encryption dot1Q 3 Router(config-if)#ip address {*IP address*}{*Subnet mask*} **[VLAN 20 gateway address and mask]** Router(config-if)#exit

Figure: 3.13: Syntax of Inter VLAN Routing.

3.7 Routing Protocol Introduction

The Routing Protocol aids in the discovery of possible routes inside a network and the determination of the best cost-effective way to the destination router. The routing discovery data is used to generate routing tables for the linked routers, which are then used to make routing decisions by each router.

Router's routing decisions may be controlled in three ways. Those are:

- Static Routing
- Default Routing
- Dynamic Routing

Static Routing

When a router's routing path is manually configured, is known as static routing.

Here is some key feature of static routing:

- In static routing, route path is set manually.
- Each and every change is made by administrator.
- Uses less resources and Extremely secure. And best for small business/network.
- As the network grows, configuration and maintenance become more complex.

Default Routing

The default routing configures the router to deliver all packets on a single route (to the next router).

Dynamic Routing

Routing paths are automatically adjusted by dynamic routing based on their current condition in the routing table. Protocols are used to find the network destination and the optimal route to that destination. Key features of dynamic routing:

- The router exchanges routing information in real time, and it learns and responds to changes in real time.
- Perform in any network (large/small).
- Less secure. It can work well in large network infrastructure.
- Uses more resources than static routing.

Dynamic IP routing protocols:

- RIPv1
- RIPv2
- EIGRP
- OSPFv2
- IS-IS
- BGPv1

3.8 Static and Default Routing

Introduction

Manually inputting routes into a routing database is known as static routing. When a new router joins a network, static routing is used to establish a path through which packets can be delivered from the router to the intended recipient. The router cannot alter the path we specify; It always follows the path we have set.

Static Routing Configuration: Here is some static routing configuration:

- Default Route
- Static Null Route
- Preferred Routes
- Backup Routes
- Static Load Balancing.

The syntax of static routing is:

Syntax
Router (config)# ip route *{destination network}* *{Subnet mask}* *{Next-hop}*

Figure 3.14: Syntax of Static routing

Configuring Static Router:

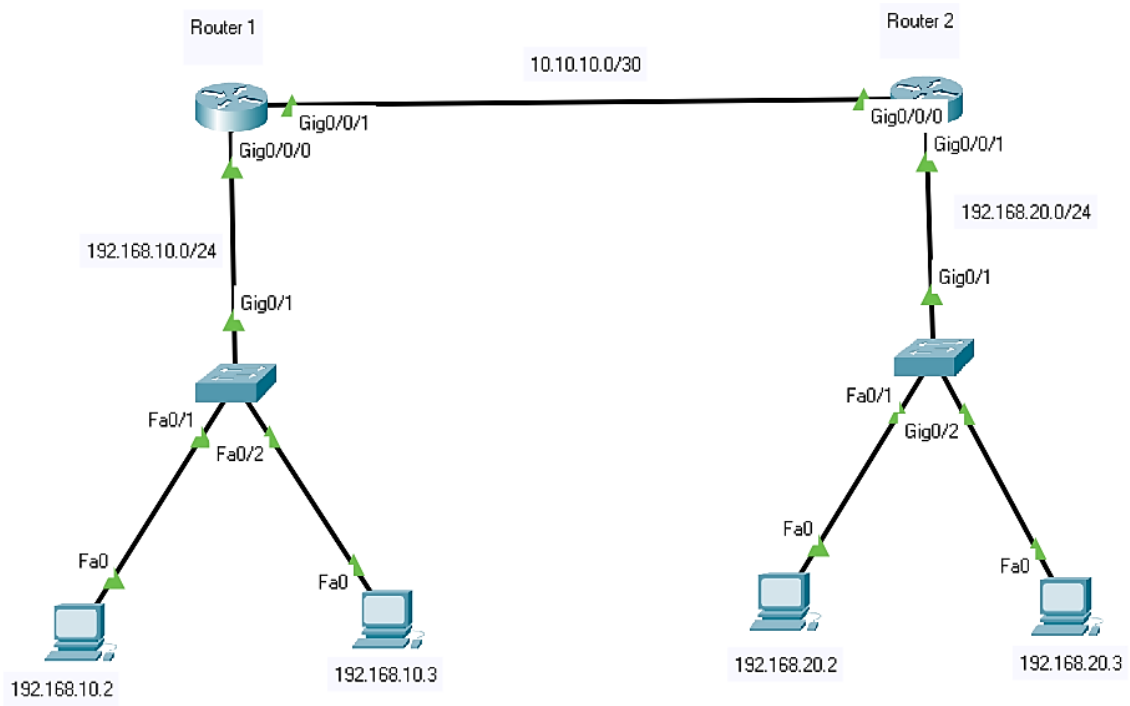

Figure 3.15: Static Routing Topology

Command for Router1:

```
Router>enable
Router#configure terminal
Router(config)#hostname Router1
Router1(config)#interface g0/0/0
Router1(config-if)#ip address 192.168.10.1 255.255.255.0
Router1(config-if)#no shut down
Router1(config-if)#exit
Router1(config)#interface g0/0/1
Router1(config-if)#ip address 10.10.10.1 255.255.255.252
Router1(config-if)#no shut down
Router1(config-if)#exit
Router1(config)#do write
Router1(config)#ip route 192.168.20.0 255.255.255.0 10.10.10.2
Router1(config)#do write
Router1(config)#
```

Command for Router2:

```
Router>enable
Router#configure terminal
Router(config)#hostname Router2
Router2(config)#interface g0/0/1
Router2(config-if)#ip address 192.168.20.1 255.255.255.0
Router2(config-if)#no shut down
Router2(config-if)#exit
```

Router2(config)#interface g0/0/0

Router2(config-if)#ip address 10.10.10.2 255.255.255.252

Router2(config-if)#no shut down

Router2(config-if)#exit

Router2(config)#ip route 192.168.10.0 255.255.255.0 10.10.10.1

Router2(config)#do write

Router2(config)#

Default Routing configuration:

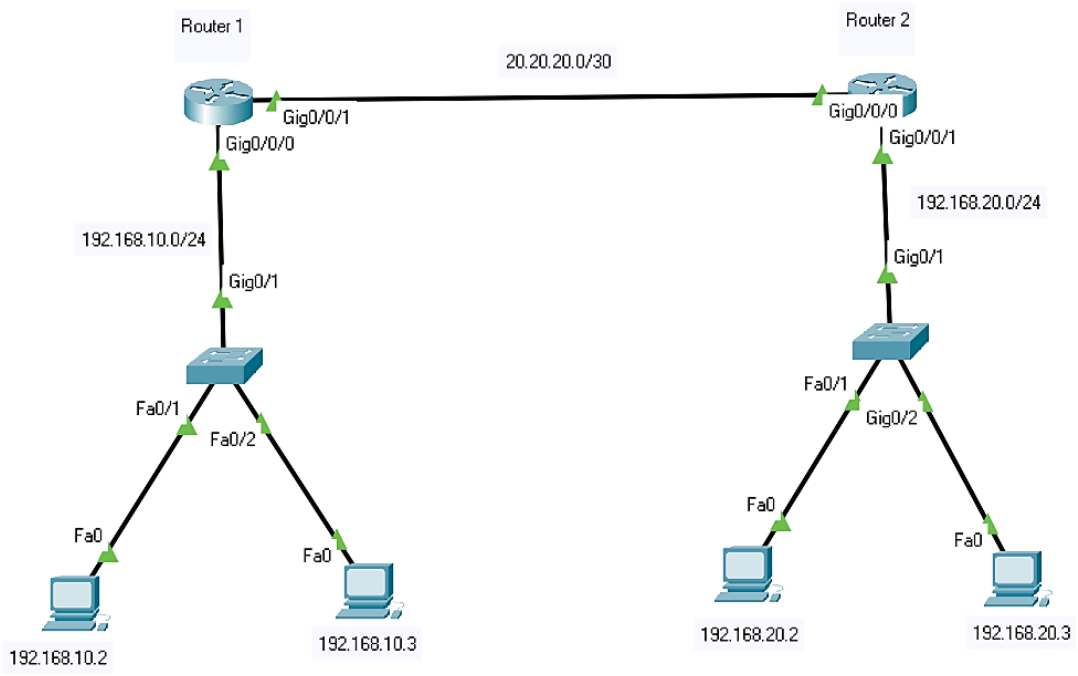

Figure 3.16: Default Routing Topology

Command for Router1:

Router>enable

Router#configure terminal

Router(config)#hostname Router1

```
Router1(config)#interface g0/0/0
Router1(config-if)#ip address 192.168.10.1 255.255.255.0
Router1(config-if)#no shut down
Router1(config-if)#exit
Router1(config)#interface g0/0/1
Router1(config-if)#ip address 20.20.20.1 255.255.255.252
Router1(config-if)#no shut down
Router1(config-if)#exit
Router1(config)#do write
Router1(config)#ip route 0.0.0.0 0.0.0.0 20.20.20.2
Router1(config)#do write
Router1(config)#
```

Command for Router2:

```
Router>enable
Router#configure terminal
Router(config)#hostname Router2
Router2(config)#interface g0/0/1
Router2(config-if)#ip address 192.168.20.1 255.255.255.0
Router2(config-if)#no shut down
Router2(config-if)#exit
Router2(config)#interface g0/0/0
Router2(config-if)#ip address 20.20.20.2 255.255.255.252
```

```
Router2(config-if)#no shut down

Router2(config-if)#exit

Router2(config)#do write

Router2(config)#ip route 0.0.0.0 0.0.0.0 20.20.20.1

Router2(config)#do write

Router2(config)#
```

3.9 Routing Information Protocol (RIP)

The Routing Information Technology (RIP) is a distance vector routing protocol that uses hop count as a routing parameter. Routers in a vector routing system exchange data by forming associations with their immediate neighbors. A maximum of 15 hops can be used in this protocol. This routing protocol is used when we make a small network infrastructure or route autonomously.

In IPv4, there are two types of rip. Those are:

1. RIP version 1
2. RIP version 2

And in IPv6, (RIP ng) is used.

The syntax of RIP is:

Syntax
Router>enable Router#configure terminal Router(config)#router rip Router(config-router)#version 2 Router(config-router)#network {IP address} Router(config-router)#network {IP address} Router(config-router)# no auto summary

Figure 3.17: Syntax of RIP

RIP Configuration:

```
Router>enable

Router#configure terminal

Router (config)#int s0/0

Router (config-if)#no shutdown

Router (config-if)#ip address 192.168.10.3 255.255.255.252

Router (config-if)#int s0/1

Router (config-if)#no shutdown

Router (config-if)#ip address 192.168.10.23 255.255.255.252

Router (config-if)#int f0/0

Router (config-if)#no shutdown

Router (config-if)#exit

Router (config)#router rip

Router (config-router)#version 2

Router (config-router)#network 192.168.10.0

Router (config-router)# network 192.168.23.0

Router (config-router)# network 192.17.0.0

Router (config-router)# exit
```

3.10. Enhanced Interior Gateway Routing Protocol (EIGRP)

EIGRP

EIGRP is a classless advanced distance-vector protocol that gives us significant competitive advantage over other Cisco proprietary protocols.

The Enhanced Interior Gateway Routing Protocol (EIGRP) is the enhanced version of Interior Gateway Routing Protocol (IGRP). The protocol was established to solve the issues with the Routing Information Protocol (RIP). When the EIGRP router is running, it saves all the surrounding routing information and searches for other routes if

necessary. If the router is unable to locate a suitable path, EIGRP assists its neighbors in locating one.

It's a Hybrid Routing Protocol with No Classes. When modifications are made, it sends partial route updates. It employs the default bandwidth and latency composite metrics.

The syntax of EIGRIP is:

Syntax
Router>enable
Router#configure terminal
Router(config)#router eigrp {autonomous number}
Router(config-router)#network {IP address}
Router(config-router)#network {IP address}
Router(config-router)# no auto summary

Figure 3.18: Syntax of EIGRIP

3.11 Open Shortest Path First (OSPF)

The open shortest path first protocol, often known as OSPF, is part of the Interior Gateway Protocol and uses the Link State Routing protocol. The shortest path to the destination is calculated using OSPF. OSPF can calculate the routes of big, complicated local area networks (LANs). It supports VLSM and CIDR.

The syntax of OSPF is:

Syntax
Router>enable
Router#configure terminal
Router(config)#router eigrp {autonomous number}
Router(config-router)#network {IP address}
Router(config-router)#network {IP address}
Router(config-router)# no auto summary

Figure 3.19: Syntax of OSPF

3.12 NAT and PAT

NAT

Network Address Translation (NAT) was created to address issues that arose as a result of the Internet's explosive growth. A single network device can act as an intermediary between a private local area network and a public network by using NAT. NAT is a method of converting a private IP address or a local address into a public IP address.

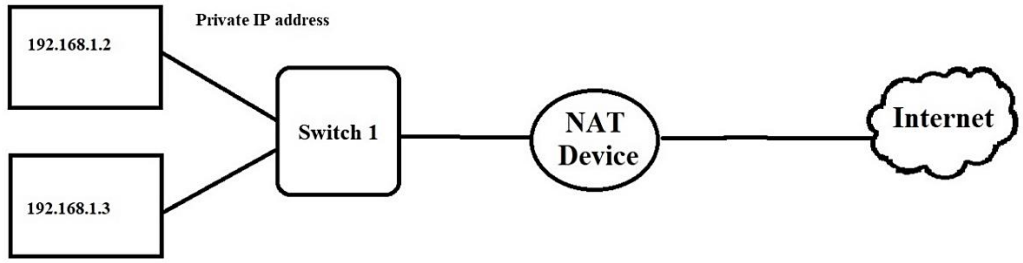

Fig 3.20: NAT

Three types of NAT are:

1. Static NAT
2. Dynamic NAT
3. Overloaded NAT

The syntax of NAT is:

Syntax
Router#configuration terminal
Router(config)#interface {*Choose interface*}
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#interface {*Choose interface*}
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#ip nat inside source static {*privet IP*} {*public IP*}
Router(config)#exit

Figure 3.21: Syntax of Static NAT.

PAT:

PAT converts private IP addresses to public IP addresses by employing port numbers. IPv4 addresses with port numbers are used by PAT. NAT and PAT are nearly identical.

The syntax of PAT is:

Syntax
Router#configuration terminal
Router(config)#interface {*Choose interface number*}
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#interface {*Choose interface number*}
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#access-list {*list number*} permit {*network IP address*} {*wildcard mask*}
Router(config)#ip nat inside source-list {*list number*} interface {*inside interface*} overload
Router(config)#ip nat pool {*pool name*} {*public IP*} net mask {*subnet mask*}
Router(config)#ip nat inside source-list {*list number*} pool {*pool name*} overload
Router(config)#exit

Figure 3.22: Syntax of Static PAT.

3.13 Challenges

This internship has taught me that every workplace is hard. I was presented with an intriguing task early on in my internship. I arrived at the workplace around 8 a.m. It was difficult for me. When I first started as an intern, I assumed networking was simple: just plug in a wire and you're done. Once I begin studying networking, I become aware of my misunderstandings. It was quite difficult for me. But, with the support of my instructor, I eventually discovered that nothing is impossible if I put my mind to it. Everything in the internship session there has been difficult for me, but I have successfully conquered it.

Since it was my first time in an office, I had to adapt and learn a lot of workplace regulations in a short period of time. Every day, I had to communicate with a large number of individuals. I learned how to work with and cope with them.

I am attempting to improve my lifestyle after graduating from Daffodil International University, and I will shortly begin my new employment. As an alumnus, I will use my knowledge and hard work to uphold the reputation of our university.

CHAPTER 4
COMPETENCIES AND SMART PLAN

4.1 Competencies Earned

Every job, business center, or other source of employment requires trained personnel. I chose to complete an internship to obtain real-world experience. During the internship, I was treated as if I were an employee. I have academic knowledge of networking but no actual experience. I learned how to configure a router and a switch, VLAN, OSPF, EIGRP, and RIP. I've been able to monitor the network and troubleshoot issues that have arisen. After completing the internship, I got a lot of confidence. I've improved my personal, interpersonal, and business competencies. Working with my coworkers helped me to improve my level of creativity, determination, honesty, communication, representation, management skills, negotiating skills, leadership, and, most significantly, emotional balance.

4.2 Smart Plan

After completing internship at CSL Training Center, I am now focused and concerned of my career. I have a well-defined aim and mindset. During the internship, I gain real-world experience that will aid me in my future job in the networking area. It is a demanding and competitive industry. Now I'm going to do everything I can to expand my knowledge and practice more. My goal is to master advanced network engineering and establish a career.

4.3 Reflection

"CSL Training Center" provided me with a lot of practical knowledge and fresh experiences throughout my internship. In general, I only work with Cisco properties when I need to. I learnt about Cisco, how it functions, and what a Cisco router's protocol is. In practice, I set up a Cisco router and set up a network that can communicate with one another and is also connected to the internet. It will also assist me in advancing my profession in the field of networking.

CHAPTER 5
CONCLUSION AND FUTURE PLAN

5.1 Discussion and Conclusion

My internship at CSL Training Center ended on November 30, 2021, after four months of hard effort. I learn about many of the things covered in the previous chapter. Cisco network equipment are now used in practically every network industry. This internship allows me to get specific profession knowledge on "CISCO Routing and Switching" before committing to a long-term commitment. This internship program will be beneficial to my future employment. I'm delighted to have completed my internship at CSL Training Center.

5.2 Scope for Further Career

Today, networking is a highly demanding job and there is also a high demand for network engineers. It is a fast-growing industry and the demand for skilled personnel is quickly expanding in this field. In Bangladesh's networking business, there are several career opportunities. A statistics of US Bureau of Labor shows that by 2024, certified IT networking specialist like CCNA is expected to expand by 8%. This is owing to the increased usage of cloud-based and networking technology. So, fantastic news for network engineers in the future.

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