

NETWORKING & SECURITY FOR CISCO PROPERTIES

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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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DAFFODIL INTERNATIONAL UNIVERSITY

DHAKA, BANGLADESH

AUGUST 2020

APPROVAL

This Project/internship titled NETWORKING & SECURITY FOR CISCO PROPERTIES submitted by MD SHAKIL AHMED, ID No: 173-15-10278 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.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 07-10-2020.

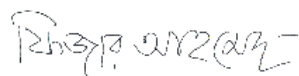
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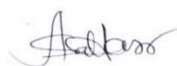
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We hereby declare that, this project has been done by me under the supervision of **Mr. Narayan Ranjan Chakraborty, Assistant Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ACKNOWLEDGEMENT

First we express our heartiest thanks and gratefulness to almighty God for His divine blessing makes us possible to complete the final year project/internship successfully.

We really grateful and wish our profound our indebtedness to **Mr. Narayan Ranjan Chakraborty, Assistant Professor**, Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of networking to carry out this project. His endless patience ,scholarly guidance ,continual encouragement , constant and energetic supervision, constructive criticism , valuable advice ,reading many inferior draft and correcting them at all stage have made it possible to complete this project.

We would like to express our heartiest gratitude to Mr. Narayan Ranjan Chakraborty, Assistant Professor and Head, Department of CSE, for his kind help to finish our project and also to other faculty member and the staff of CSE department of Daffodil International University.

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

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

ABSTRACT

This internship represents Network Security and Network protocol. The main objective of the report is gaining knowledge about Computer Networking, Networking Device, Router, Switch, Server connection by practical experience at New Horizons for applying in different organization.

At New Horizons technologies working with MICROTIK, ARUBA, CISCO, NETGEAR etc. Working with New Horizons I can gather a lot of knowledge about how the configure a network, how the troubleshoot a problem with a big network.

In my four-month internship session at New Horizons CLC I gain a lot of knowledge about working environment.

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CHAPTER 1

Introduction of Networking

1.1 Introduction: Internship is one kind of opportunity to express one's true talent. We need to gather some useful information for our every if the education is not over yet. The internship is for those students who are self-sufficient and successful with the opportunity to be validated by teachers and supervisors for the better future. In each case, they have achieved it despite obstacles that we cannot imagine. It is also important to choose one firm for Internship, which is better than the other. So you can learn a lot from organization. As a student of Computer Science and Engineering I joined the “New Horizons CLC” to finish my BSc and nurtured her desire to learn as much as I could. The point to which you read the book is not very different but it is very difficult to understand from the book how the ISP organization and network is run. The languages of books are not really easy, but the language of internal composition. Basically it is taught about network, configuration. It's also learning how people work and work overnight to support the network & also support network security. Helps to learn things after being involved. This experience helps you do things after being involved in a task. Global experience and achievement. I found networking, communication, problem solving, site research, server management and configuration and others that I could not learn through the textbook. Ideal for my future work in network services with a network administrator.

1.2 Motivation: A computer network is a combination of computer systems and other computer hardware. A communication network that allows a computer to transfer data one device to another. Its established connection two or many more device. It's can connect via wire or wireless. If we connect our device physically, that doesn't mean we are done yet. For establishing a network which transfer dada, we need to set the protocol to, how data can be transmit. Now a day's internet is the most popular computer. Internet

connect globally in one network. Internet easily can connect one country to another country. Internet as like easy but it's too risky if u have no idea how to secure your network. The biggest problem with the internet is Hacker. Hacker can hack your computer or any device via internet. Hacker also can hack your entire network, but you haven't any idea of this. All the Hacker are not good, they can hack your system and blackmail you or published your private data in public. There are a lot of multinational companies or big organization they paid millions of dollar for secure their network. Computer security is the heart of computer network. If our computer is not secure.

1.3 Internship Objectives:

The goal of the internship is achieving work experience and use for it in my future career. But the main goal of the internship is fulfilling of the requirement of BSc program.

Other goal is-

- Achieving knowledge about Networking
- Achieving knowledge about Router & switch
- Router & switch protocol
- Establishing connection of entire network of organization
- Configuring network of entire network of organization.

1.4 Introduction to The company:

If I want to complete my BSc, I need to fulfill its requirement. And internship of an organization is the requirement for completing my BSc. So I choose New Horizon CLC, for completing my internship. Because it's the world's largest independent IT training company. This company have 300 brunch over 72 countries. And the most important thing is they teach first then they give the opportunity to internship in their organization.

1.5 Report layout:

In first chapter of the report its discuss about introduction of internship and briefly discuss about my motivation. In second chapter its briefly discuss about my internship 's organization. Its told about role of my organization, product and market place, target group, swot analysis, organization structure. In chapter three its briefly discussed about my daily task and what I learn from my internship session. In chapter four discussed about competencies and smart plan to solving problem. In last chapter is about conclusion and about my future career.

CHAPTER 2

ORGANIZATION

2.1 Introduction:

As an intern I want to join an Internet Service Provider (ISP) company they provide internet and they support the network of organizations. I thought it good for me to learn from work with them. When I resource about ISP provider company, I found they doesn't teach me to the root. After I find out they won't teach me from the start, then I'm start finding which organization will teach me from the root. A few days later one of my friend suggest me to join New Horizon CLC. Then I resource about New Horizon CLC and I found it's the world's largest independent IT training company. This company have 300 brunch over 72 countries. Its headquarter is in West Conshohocken, Pennsylvania, US. Its parent organization name is New Horizons Worldwide, Inc.

2.2 Product and Market Situation:

In internship period I work with Cisco, Microtik, Netgear, TP-LINK, Netis, Tenda etc. But especially I learned about Cisco properties. Its use for Commercial & Industrial Security Corporation. Product of cisco range are switch, router, WAN acceleration hardware, unified fabric, wireless system, storage networking and cloud computing service.

In networking sector's market situation is too big. In every sector of any kind of organization need their own network. In this marketplace I have some good opportunities to make my career.

2.3 Target Group:

In my internship organizations target was those organizations which need to network support. My internship organization target them by survey organization, research about their competitor then find their customer, Ads through social media.

No organization can't target their customer without surveying customer. If I want to ran a business or organization first I need to research about my competitors and their customer. How the provide the service and how customer treat them. Then I will target my customer my own way.

2.4 SWOT Analysis:

When we got any organizations project first we identify its strength, weakness, opportunities and threats. After we figure it out we analysis about its weakness, until we found the solution of its problem.

2.5 Organizational Structure:

When I join as an intern I have no idea about New Horizons CLC's organizational structure. After a few days I understand they maintain a chain to connected each other. They come together and work step by step, they achieve their goal. Working with them, I also learn their rules. They were all very sociable, I was able to mix with them in a short time. Working with our leader was too enjoyable.

CHAPTER 3

TASK, PROJECT AND ACTIVITIES

3.1 Daily Task and Activities:

As an intern I have a lot of task and activities. I have gathered knowledge from my organization. Every day I discourse a lot of thing with my team, they teach me all the term.

3.1.1 First few days they teach me about,

1. Node, End device
2. Network topology
3. Categories of network
4. Transmission type
5. Ethernet Cabling

Node, End device: Computer, Mobile, Printer, Scanner or any device which capable to send and/or received data.

Network Topology: Network topology is element of the communication network.

Types of topology is

-Mesh topology

-Star topology

-Bus topology

-Ring topology

-Hybrid topology

Mesh Topology: Dedicated point to point link to each several nodes. In this network with n nodes has $n(n-1)/2$ ports.

Advantage: No Traffic Problem, robust, security fault identification & isolation

Disadvantage: Difficult installation, space, cost.

Star topology: Dedicated point to point link & it has only one significant controller, Called a HUB.

Advantage: Robust, Less expensive

Disadvantage: every nodes depends on the one single point.

Bus Topology: All nodes are connected by one long cable.

Advantage: Easy installation, cheap.

Disadvantage: No fault isolation, difficult re configuration.

Ring topology: Its connected point to point link with each sides only two nodes.

Advantage: Simple configuration, Error isolation.

Disadvantage: if disconnect any device in the ring cable damage all network.

Hybrid Network: Combination of multiple topology. Share the advantage of various topology.

3.1.2 Categories of Network: There are three(3) types of network.

- Local Area Network (LAN)
- Metropolitan Area Network (MAN)
- Wide Area Network (WAN)

Local Area Network (LAN):

- Generally, privately owned
- This structure use for a single campus, home, residence. <= within a several mile
- Usage topologies: Ring, Bus, Star.

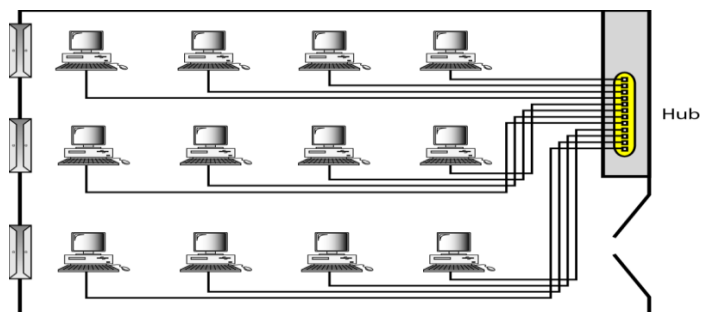


Figure 1: Local Area Network

Metropolitan Area network(MAN):

- Design for expand to a whole city.
- TV network provider, ISP provider
- It's can be owned by a private or a public.

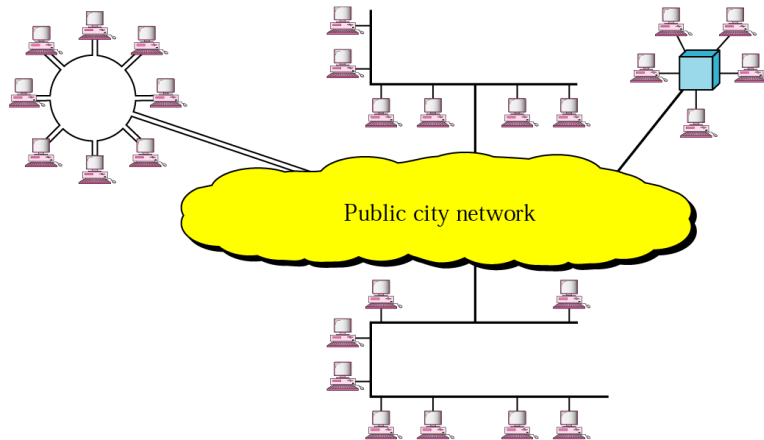
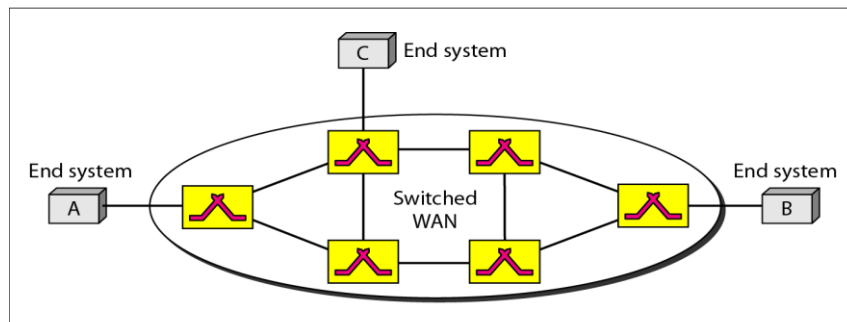


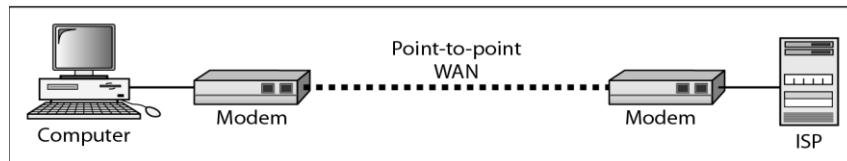
Figure 2: Metropolitan Area Network

Wide Area Network(WAN):

- Use for long distance transmission.
- Its owned and used by one company.



a. Switched WAN



b. Point-to-point WAN

Figure 3: Wide Area Network

3.1.3 Transmission Type:

- Unicast
- Multicast
- Broadcast

Unicast: its communication between one sender and one receiver over full network.

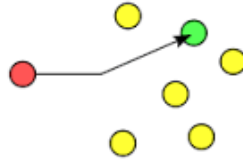


Figure 4: Unicast

Multicast: Multicast is communication one sender to some specific receiver over full network.

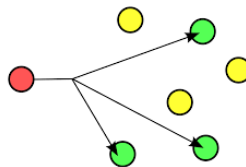


Figure 5: multicast

Broadcast: Broadcast is commonly used for one sender to all receiver over entire network.

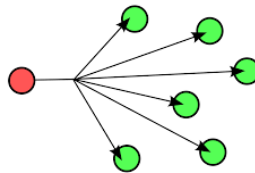


Figure 6: broadcast

3.1.4 Connector: For Ethernet cabling we need to use RJ-45 connector.

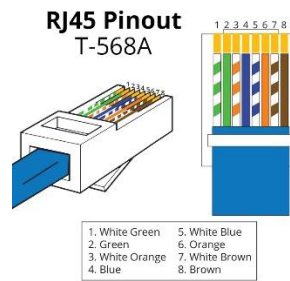


Fig 7: RJ-45 connector

3.1.5 Ethernet Cabling:

1. Straight Through Cable
2. Crossover Cable
3. Rolled Cable

If we want to build a network with Ethernet cabling, then we need to take a look at the most famous Ethernet cable that used today, the “Cat 5 Enhanced UTP”.

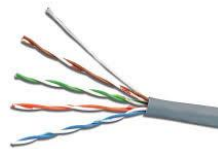


Fig 8: Category 5 Enhanced UTP

Straight-Through Cable: This type of cabling is used to connect for **host to switch or hub**.

- Host to hub/switch
- Router to switch/hub

There are eight wire in this UTP cable, & we need four wire for straight through Ethernet cable. Its comparatively easy to build this type. Pin 1, 2, 3, 6 are used for straight-through. Just need to connect 1 to 1, 2 to 2, 3 to 3 & 6 to 6.

3.1.6 IP Addressing: One of the most important topic in any discussion of TCP/IP is IP addressing. It's written in dotted decimal form. Four section/octet are divided by dots (10.0.0.1). Every octet carries a number between 0 to 225. Why every octet a number between 0-255?

- Computers understand binary language; human understand decimal language.
- Computers behave IP address as a single large 32-digit binary number, but it's not so easy to remember.
- So, we divide them up into four similar section/octet so we can keep in mind and work with them better.

Basic Addressing:

* Each device/node on a network is assigned an IP address. Every IP address has two primary parts:

- Network partition
- & Host partition

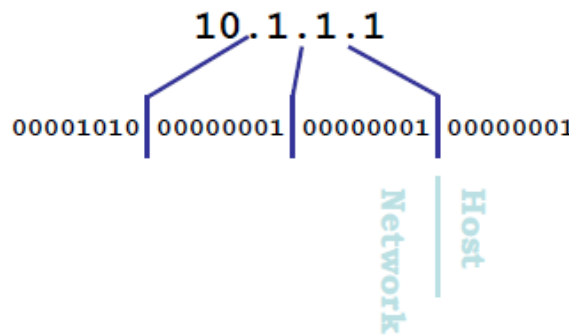


Fig 9: Host & Network

The network partition which express the physical wire the device is connected to.

The host partition, which express the host on that wire.

* Network mask shows us where to divided the host and network part.

- * Every place there is a 1 in the prefix/network mask, its represent network address.
- * Every place there is a 0 in the prefix/network mask its represent host portion of the address.

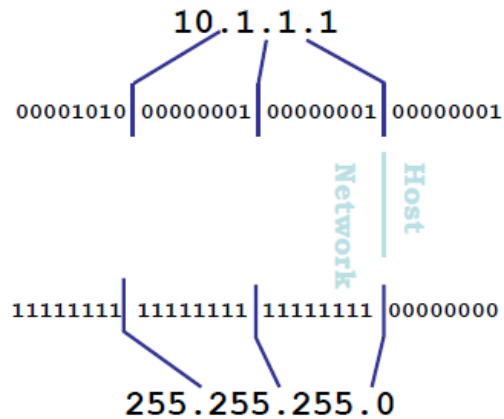


Fig 10: Network mask

- * An alternate set of terminology is:
 - The network part of the address is called prefix.
 - The host part of the address is called host.
 - The network mask is described as a length of prefix, which is a count of the number of 1's in the subnet mask.

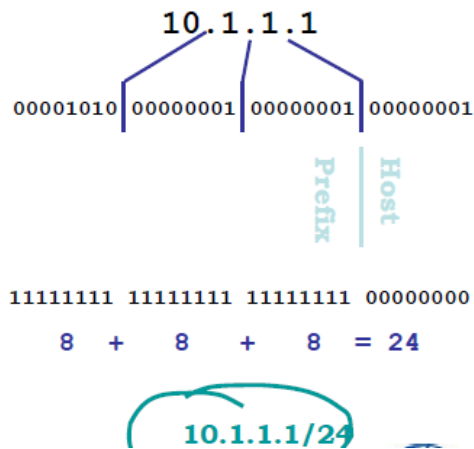


Fig 11: Network address / Prefix

* $32/4 = 8$

* $(2)^8 = 256$

*But computer number beginning 0, so to make a space of 256 number, we number from 0-255.

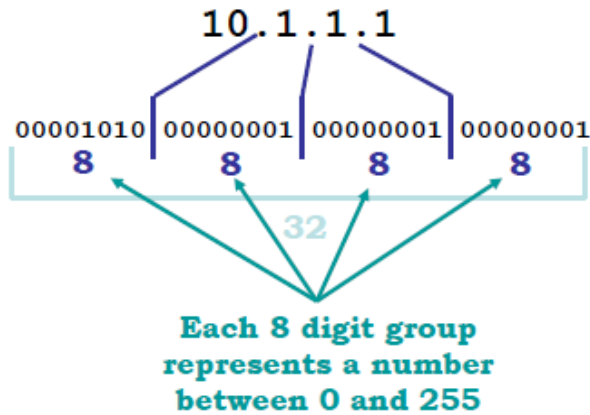


Fig 12: Bit value of each octet

Summary of the three class of network:

Table 1: Summary of the three class of network.

| <i>Class</i> | <i>8-Bits</i> | <i>8-Bits</i> | <i>8-Bits</i> | <i>8-Bits</i> |
|--------------|---------------|---------------|---------------|---------------|
| <i>A</i> | Network | Host | Host | Host |
| <i>B</i> | Network | Network | Host | Host |
| <i>C</i> | Network | Network | Network | Host |
| <i>D</i> | Multicast | | | |
| <i>E</i> | Research | | | |

Bit value:

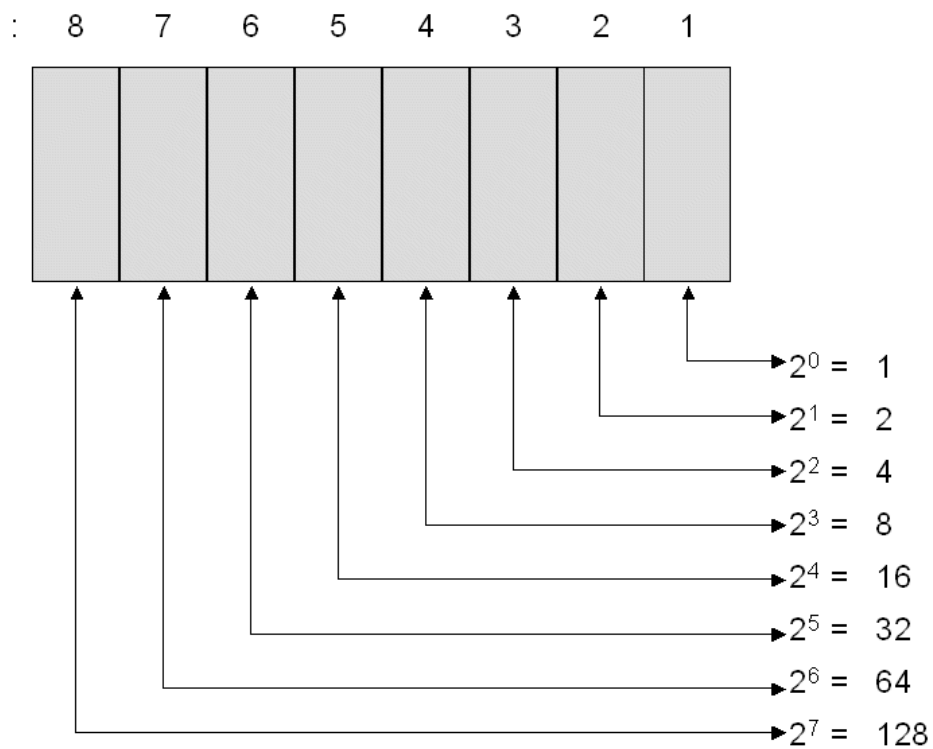


Fig 13: Represent of Bit value

Network Address Range:

Table 2: Network Address Range

| Rules | Minimums & Maximums | Decimal Range |
|---|-------------------------|----------------------|
| Class A | (00000000) = 0 | 1-126 |
| First bit is always 0 | (01111111) = 127 | 0 & 127 are reserved |
| Class B: | (10000000) = 128 | 128-191 |
| First two bits is always 10 | 10111111 = 191 | |
| Class C: | 11000000 = 192 | 192-223 |
| First three bits are always 110. | 11011111 = 223 | |
| Class D: | 11100000 = 224 | 224-239 |
| First four bits are always 1110. | 11101111 = 239 | |

Classful IP Address:

Table 3: Classful IP Address

| Network Class | Starting digits in binary | Natural length | prefix Range of addresses | Example of network |
|----------------|---------------------------|----------------|---------------------------|--------------------|
| Class A | 0 XXXXXXX | 8 | 1.0.0.0/8 through | 11.0.0.0/8 |
| | | | 126.0.0.0/8 | 100.0.0.0/8 |
| Class B | 10 XXXXXX | 16 | 128.0.0.0/26 through | 130.1.0.0/16 |
| | | | 191.0.0.0/26 | 190.1.0.0/16 |
| Class C | 110 XXXXX | 24 | 192.0.0.0/24 through | 193.1.3.0/24 |

Subnet:

- Subnet is a part of another network.
- A single prefix (network address) represent a set of host attached to wire.
- A prefix defines a set of reachable addresses.
- Actually, we've short the part of the prefix, and expand the host part. Originally, expressing more host in a one single address.

Those are subnets of 10.1.1.0/26 network

10.1.1.2/32

10.1.1.2/32

10.1.1.2/32

10.1.1.2/32

VLSM: Variable Length Subnet Masking

- It just denotes that the total IP address position is processed as one flat address position.
- Any prefix is accepting at any point in the network.

10.1.1.0/24

10.1.1.0/25

10.1.1.128/26

10.1.1.192/27

All of those are valid in the same network.

3.2 Event and Activities:

After I gather enough knowledge about basic knowledge of networking (node, categories of network, transmission type, Ethernet cabling, IP addressing) they told me it's not enough to establishing a network connection. For establishing a network connection, we must need some protocol. Every weekly they through an event and they teach a routing protocol. And those protocols are,

- 3.2.1 Interface Configuration:
- 3.2.2 Interface Password
- 3.2.3 Interface Password Recovery
- 3.2.4 Static IP Configuration
- 3.2.5 RIP
- 3.2.6 EIGRP
- 3.2.7 OSPF

3.2.1 Interface Configuration:

Step 1: Type number of interface

Step 2: IP Address – IP Address mask

Step 3: No shutdown

Step 4: Exit

Example of command

```
R0uter22 (config)# int fa0/0 (interface port name & number)
```

```
R0uter22 (config-int)# ip address 192.173.12.10 255.255.255.0
```

```
R0uter22 (config-int)# no shut
```

R0uter22 (config-int)# exit

3.2.2 Interface Password

Step 1: Interface type number (line console, line aux, line vty)

Step 2: password ##### (anything you want)

Step 3: set when the password ask.

Step 4: Exit

Example of command

R0ut23(config)# interface con 0 / line aux 0 / line vty 0 4

R0ut23(config-int)# password *****(anything)****

R0ut23(config-int)# login

R0ut23(config-int)# exit

For Remove Interface Password

Step 1: Interface type number (line console, line aux, line vty)

Step 2: no password

Step 3: no login

Step 4: Exit

Example of command

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```
R0ut3r(config)# interface con 0 / line aux 0 / line vty 0 4
```

```
R0ut3r(config-int)# no password
```

```
R0ut3r(config-int)# no login
```

```
R0ut3r(config-int)# exit
```

3.2.3 Interface Password Recovery

Step 1: first turn off-on the router and press (Ctrl + Break) it will take you to the ROM monitor

Step 2: type confreg 0x2142

Step 3: type reset

Step 4: type **no**

Step 5: type **enable**

Step 6: type **configure terminal**

Step 7: type the interface name which is password protected

Step 8: delete the password

Step 9: config-register 0x2102

Step 10: exit

Step 11: save the changes

Step 12: reload.

Example of command

First off-on the router and press ctrl+break

```
Rommon> confreg 0x2142

Rommon> reset

no

R0ut3r > enable

R0ut3r # configure t

R0ut3r (config)# no service password-encrypted

R0ut3r (config)# no enable password

R0ut3r (config)# no enable secret

R0ut3r (config)# line vty / line aux / line con

R0ut3r (config-line)# no password

R0ut3r (config-line)# no login

R0ut3r (config-line)#exit

R0ut3r (config)# config-register 0x2102

R0ut3r (config)# exit

R0ut3r (config)# write

R0ut3r (config)# reload
```

3.2.4 Static IP Configuration: Static route identify the IP packets.

Step 1: ip route unknown network | subnet mask | next hop ip address

Step 2: end

Example of command:

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```
R0ut3r (config)# (configuration mood)
```

```
R0ut3r (config)# ip route 192.173.13.1 255.255.255.0 223.182.12.2
```

```
R0ut3r (config)# end
```

3.2.5 RIP (Routing Information Protocols):

Characteristics of RIP:

| Characteristic | RIPv2 | RIPv1 |
|-----------------------|-----------------|-----------------|
| Types of protocol | Distance vector | Distance vector |
| Classless support | yes | no |
| VLSM Support | yes | no |
| Auto-Summarization | yes | yes |
| Manual summarization | yes | no |
| Path metric | hops | hops |
| Hop count limit | 15 | 15 |
| Convergence | slow | slow |
| Router Computation | bellman-ford | bellman-ford |

RIP Configuration:

Step 1: Enter configuration mood, and enable RIP

Step 2: Specifies use of RIP version 2.

Step 3: Select a list of network on which RIP is to be Applied, Use those network address of the network which is directly connected.

Step 4: Disable automatic summarization.

Example of command:

R0ut3r (config)# (configuration mood)

R0ut3r (config)# Router rip

R0ut3r (config)# version 2

R0ut3r (config)# network 192.168.10.0 (which is directly connected into the router)

R0ut3r (config)# no auto-summary

R0ut3r (config)# end

3.2.6 EIGRP (Enhanced interior gateway routing protocol):

Characteristics of EIGRP:

| | |
|----------------------|-------------------------|
| Metric value | 5K value(10100-default) |
| Information shearing | multicast (224.0.0.10) |
| Convergence | very fast |
| Administrative value | LAN-90, WAN-170 |
| Maximum hop | 100 Default |
| Standard | Open Standard |
| Hello timer | LAN-5sec, WAN- 40 sec |
| Hello timer | LAN-15sec, WAN-120sec |

EIGRP Configuration:

Step 1: Enter router configuration mood, and enable router eigrp 10 (it's can be 1-65535)

Step 2: eigrp router id (optional).

Step 3: Select a list of network on which EIGRP is to be Applied, Using the address of the network of physically connected and wild card mask.

Step 4: Disable automatic summarization.

Example of command:

```
R0ut3r (config)# (configuration mood)
```

```
R0ut3r (config)# Router eigrp 10
```

```
R0ut3r (config)# eigrp router-id 6.6.6.7 (optional)
```

```
R0ut3r (config)# network 192.173.13.0 0.0.0.255 (which is physically connected into the router)
```

```
R0ut3r (config)# no auto-summary
```

```
R0ut3r (config)# end
```

3.2.7 OSPF (Open Shortest Path Fast):

Characteristics of OSPF:

| | |
|----------------------|----------------------------------|
| Metric value | Bandwidth |
| Information shearing | multicast (224.0.0.5, 255.0.0.5) |
| Convergence | fast |

| | |
|----------------------|-------------------------|
| Administrative value | 110 |
| Maximum hop | Unlimited |
| Standard | Open Standard |
| Hello timer | LAN-10sec, WAN- 300 sec |
| Hello timer | LAN-40sec, WAN- 120 sec |

OSPF Configuration:

Step 1: Enter router configuration mood, and enable router ospf 10 (it's can be 1- 65535)

Step 2: router id 1.1.1.1 (optional).

Step 3: Specifies a list of network on which OSPF is to be Applied, Using the address of the network of physically connected networks and wild card mask. Ex; network-address wild-card-mask area 0

Example of command:

```
R0ut3r (config)# (configuration mood)
```

```
R0ut3r (config)# Router ospf 1
```

```
R0ut3r (config)# router-id 1.1.1.1 (optional)
```

```
R0ut3r (config)# network 192.173.13.0 0.0.0.255 area 5 (which network is physically connected into the router)
```

```
R0ut3r (config)# no auto-summary
```

```
R0ut3r (config)# end
```

3.3 Project Task and Activity:

90% of our office project comes with routing protocol or setting up routing protocol. In this case firstly we solved the problem via simulator (Cisco Packet Tracer). Its (simulator) make work faster and easier. Firstly, we design they're network via cisco packet tracer. Then we count how many network and host they have need. After confirming their network design, we apply the routing protocol to the router. Then we assign IP address of every node (pc, laptop, printer). When the simulator successfully run the entire model of network, we design the same network in their organization and apply the same routing protocol and assign the same IP address in every node.

3.4 Challenges

Firstly, when I join as an intern, I was thinking networking is easy, just connect the cable and that's all. When I study about networking, everything was going over my head. it's being very challenging to me. But slowly slowly I realized with the help of my instructor that nothing is difficult if I want to. In the session of internship there everything is challenging to me but successfully I can overcome it.

CHAPTER 4

Competencies and Smart Plan

4.1 Competencies earned

When I was as an intern I was like an employee, and I have achieved all competencies that an employee should have. I achieved personal, interpersonal and business competencies. Working with my co-worker I develop my creativity level, determination, integrity, communication, delegation, management skill, negotiating skill, leadership and most important for me was emotional balance.

4.2 Smart Plan

I'm so glad to have a good instructor in my internship. He teaches me, how to solve a problem with smartly. When we face a problem, first we research the problem until we got the root of the problem. If we got the main problem firstly we try to solve it with our simulator software. After solved it in simulator, we apply it to the real life router. If we need to built a new network or if we get any project from any organization, we also do the same procedure to solve or built the entire network. Because its save our time and also its gives 100% accuracy.

4.3 Reflection

During internship period I learn a lot of things from "New Horizons CLC". I achieve a lot of knowledge of practical work. Basically I work with them only with cisco properties. I learn about cisco, how its work & what is the protocol of cisco router. In practically I configure a cisco router and build a network connection, which can communicate each other & also connected to the internet. And it will help me for better future in networking field.

CHAPTER 5

Conclusion and Future Career

5.1 Discussion and Conclusion

The internship at New Horizons CLC give me the test of professional career before my permanent commitment are made. They give me those opportunities to involved with them and teach me as an internal person like there co-worker. New Horizon CLC is very known as a computer learning center, but they also provide one of the best networking service in our city. Setting routing protocol is a regular thing for this organization, that's why I choose this New Horizon CLC. This internship session experience will help me to my future career. This was teach me how to work with team members, and how to treat each other.

At last I can say that this internship journey will help me to my future career.

5.2 Scope for Future Career

In the internship period, I achieve a lot of knowledge about networking and it will be very helpful for my future career. It will help me for my professional career. After I complete my internship I will be able for apply any kind of network sector. Now a day without network, we can't imagine any organization. Network is requiring in every sector and every sector needs network administrative. For career in networking I can go all over the world because its carries an international standard.

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