

CISCO CERTIFIED NETWORK ASSOCIATE (CCNA)

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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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APPROVAL


This internship titled "CISCO CERTIFIED NETWORK ASSOCIATE (CCNA)", submitted by Md. Sozol Hossain, ID No: 161-15-7208 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 12/12/2018.

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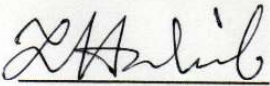
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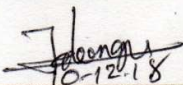
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I hereby declare that, this project has been done by us under the supervision of **Mohammad Jahangir Alam, Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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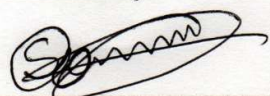


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ABSTRACT

Networking is sharing data and resources between one more computers. To create a network we need some devices and technologies and need them to configure to communicate each other. This report shows how to create a reliable network and how uses and configure the networking devices. Also have some knowledge about networking standard and how they works, IP addressing and subnetting, about cable. This report also shows how to configure various types of protocol in a Cisco router or switch. The first part of this report shows an overview of “Unix Lab Bangladesh” and the second part shows the performed tasks and responsibility during internship period. This report can be a guide to all, about networking using Cisco devices and networking standard. In this report I tried to describe about Cisco Certified Network Associate (CCNA) which is a standard to configure various types of networking devices which supports Cisco standard.

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Chapter 1

Introduction

1.1 Introduction

In this era of the modern world telecommunication is most significant thing. Our life has become more easy for computer and computer networking. As a part of my B.Sc in computer science I have completed my internee on Cisco Certified Network Associate (CCNA). In this training session I have learned about topology, how to implement them, the protocol standards, different types of network design, configuring router and switch with various routing protocols etc. To develop a country, should have to develop a secure and reliable communication system. For this reason I have done my internship on CCNA.

1.2 Motivation

As a student of computer science engineering we gathered so many theoretical knowledge but we are not expertise in practical. But in the real life field all the companies and organizations expect some expertise in individual sector. I think we don't have sufficient expertise of practical knowledge in the real life field of individual sector. In addition I am interested in networking sector and I also want to build my career as a network engineer. Nowadays I think it is very demandable. Because Bangladesh is going forward to vision of "Digital Bangladesh". So we need many expertise people of networking.

1.3 Internship Objectives

In this competitive job market it is so hard to get a good job without proper and sufficient skill. The main objective of my internship program is to prepare myself as a skilled person. I also wanted to gather some experience and wanted to see the application of theoretical knowledge and how to implement them.

1.4 Introduction to the Company

"Unix Lab Bangladesh" is one of the leading institute for training programs. They provide various types of training program. Cisco Certified Network Associate (CISCO), Red Hat Certified Engineer (RHCE), VMware, Python Programming, Java Programming, C# and .Net, Webpage design and development are their main courses. They have well trained and vendor certified trainer to train the trainee. They always take care of the trainee.

1.5 Report Layout

In the Chapter (1): I have described introduction, motivation, objective of my internship and about company.

In the Chapter (2): I have described about the company.

In the Chapter (3-8): I have described my daily activities and task. What I have done in my internship period.

In the Chapter (9): I have described discussion and conclusion and scope for future career.

Chapter 2

Organization

2.1 Introduction

“Unix Lab Bangladesh” is one of the leading learning services and professional development solutions provider in Bangladesh. It has been established to provide the necessary learning solution supply to improve professional knowledge and skills in the field of technical job sector. Their learning programs, whether designed for a global organization or an individual professional, help businesses close skills gaps and foster an environment of continuous talent development. With thousands of courses spanning from foundational training to specialized certifications, the core IT training is focused on technology partners such as Amazon Web Services, Cisco, Microsoft, Red Hat and VMware.

2.2 Product and Market Situation

➤ **Professional Training Services**

- Red Hat Certified Engineering (RHCE)
- Cisco Certified Network Associate (CCNA)
- Java Programming
- C# and .Net
- Python Programming
- High School Programming with C/C++
- PHP & MySQL
- Introduction to networking for beginners
- Webpage design and Development
- VMware

2.3 Target Group

The institute is target those people whose are unskilled and want to improve their skill. The institute also works for engineering students and professionals.

2.4 SWOT Analysis

Strength:

- Good communication skill
- Good reputation in marketplace
- Good trainer

Weakness:

- Lack of experience
- Lack of Capital
- Lack of marketing

Opportunities:

- Training for all kind of people
- Become an instructor

Threats:

- Economic problem to increase their area of training and area of the institute.

Chapter 3

Introduction to CCNA

3.1 Introduction to CCNA

Cisco Certified Network Associate (CCNA) is an information technology certified by Cisco. Cisco Provide an associate-level Cisco Career Certification which is CCNA certification. The Cisco exam has changed several times. Cisco announced an update in 2013 to its certification program with evolving job roles of industry. Cisco Certified Network Associate can be categorized in different types. Cisco offers different types of learning method. Cisco has published a book by Cisco press. We can also learn from online classroom. CCNA certification certifies a technician's skill to install, configure, troubleshoot and operate a medium sized routed and switched network. If we want to get CCNA certification no degree is required. Anyone can be CISCO certified if he/she has a good concept of networking and CISCO device configuration [6].

Chapter 4

Introduction to OSI and TCP/IP reference model

4.1 Introduction to OSI reference model

OSI stands for open system interconnection it is a conceptual model that standardizes the functions of communication of a telecommunication or computing system. OSI model is like a universal language for computer networking. The modern telecommunication system doesn't strictly follow the OSI model but it is still very useful for network troubleshooting. OSI reference model has 7 different layers. Each layer handles some specific task and communicates each other below and above itself [2] [3].

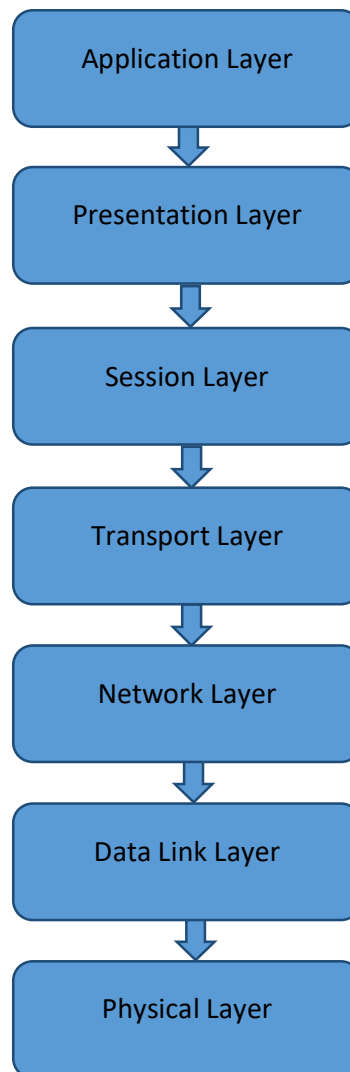


Fig 4.1 : Layers of OSI reference Model

Application Layer: This is the only layer that interacts with data from the user directly. To initiate communication, application software like web browser rely on application layer. Application layer is responsible for protocol and data manipulation. Application layer typically identifies communication partners, determines resource availability and synchronizes communication.

Presentation Layer: This layer makes the data presentable so that the data can be used by application layer. The presentation layer is responsible for data encryption, translation and compression.

Session Layer: This layer establishes, terminates and manages connections between computer/applications. This layer provides the transmission mode as simplex, half-duplex or full-duplex operation.

Transport Layer: This layer provides data transfer between host or end systems transparently. This layer is responsible for data flow control and end to end error recovery. In this layer all data split into some smaller units if need, then pass these to the network layer and it ensure that all the units/packets arrived or not. This layer carries data all the way source to destination so we can say that this layer is a true end to end layer.

Network Layer: This layer controls the subnet operation. Basically this layer maintains how the data packets routed from source to destination. This layer provides routing and switching technologies and creates logical path which known as virtual circuits to transfer data from node to node. Main function of this layer is routing and switching as well as addressing, error handling, congestion control, packet sequencing and internetworking.

Data Link Layer: This layer encodes and decodes packets into bits. This layer works on TCP (Transmission Control Protocol) and handles error, flow control and frame synchronization in the physical layer. This layer is divided into two layers one is the MAC (Media Access Control) layer another is LLC (Logical Link Layer).

Physical Layer: This layer is work with transmission and reception of bits over any communication channel. This layer converts the digital bits into electrical impulse, light or radio signal through a network. This layer may define the transmission mode as simplex, half-duplex and full-duplex.

4.2 Introduction to TCP/IP reference model

TCP/IP stands for Transmission Control Protocol/Internet Protocol it is also a conceptual model like OSI reference model that standardizes the functions of communication of a telecommunication or computing system. TCP/IP reference model is like a universal language for computer networking. The modern telecommunication system follows the TCP/IP model. TCP/IP reference model has 4 different layers but in OSI reference model there was 7 layer. Three layer presentation, session and physical are minimized in TCP/IP model. Each layer handles some specific task and communicates each other below and above itself.

The TCP/IP reference model is used in wide area networks, the ARPANET, the worldwide Internet. A research network was sponsored by DoD (Department of Defense) is The ARPANET. Finally it is connected hundreds of government installations and universities, using leased telephone lines. In this situation the existing protocols had trouble interworking with them, so new reference architecture was needed. Then a model was made, this architecture is known as the TCP/IP Reference Model [4] [5].

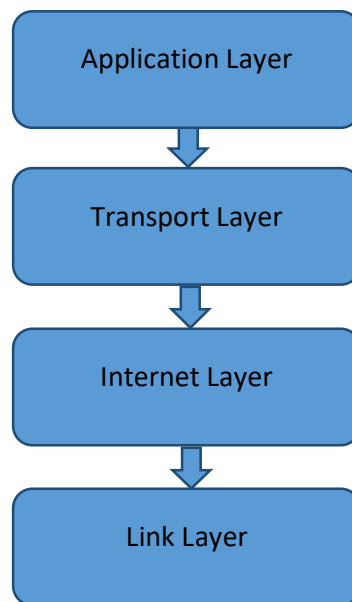


Fig 4.2: TCP/IP Reference Model

Chapter 5

About Physical and Logical Address

5.1 About IP Address

An Internet Protocol Address (IP) is an identifying number of every Routers connected to a network. This address is a unique address for every Router connected a network. Without an IP address no Router can communicate with other Router over an IP based network as the interne. IP address look like 192.168.10.12 in IPv4 and 2006:db9:0:1234:0:557:5:3 in IPv6. Internet Protocol Address (IP) has two versions IPv4 and IPv6. IPv4 (Internet Protocol Version 4) is a address of 32-bit number. For the fast growth of the internet in 1995 IPv6(Internet Protocol Version 6) was developed and it is a 128-bit number. An IP address serves two functions Host and Network. The IP address space is globally managed by the Internet Assigned Number Authority (IANA) [7].

5.2 Classes of IP

Table 1: There are five classes of IPv4 [7]

Class	Decimal Range of 1 st Octet	Network/Host ID (N=Network H=Host)	Default Subnet Mask	Number of Useable Host per Network
A	1-126	N.H.H.H	255.0.0.0	16,777,214 ($2^{24}-2$)
B	128-191	N.N.H.H	255.255.0.0	65,534 ($2^{16}-2$)
C	192-223	N.N.N.H	255.255.255.0	254 (2^8-2)
D	224-239	Reserved for Multicasting		
E	240-254	Used for experimental Research		

Note: Here 127.0.0.0 this IP is not shown in the table because we can't use this. This IP is used for loopback purposes.

5.3 Private and Public IP

Private IP

Private IP is an IP address that is reserved for internal use apart from the public IP. A private IP can be referred to as a local IP address. The Internet Assigned Number Authority (IANA) reserves the following IP as private IP addresses [7].

Table 2: Private IP address

Class	Private IP	Subnet Mask	Address Range
A	10.0.0.0	255.0.0.0	10.0.0.0-10.255.255.255
B	172.16.0.0-172.31.0.0	255.240.0.0	172.16.0.0-172.31. 255. 255
C	192.168.0.0	255.255.0.0	192.168.0.0 - 192.168.255.255

Public IP

Public IP is an IP address that can be accessible from various servers or Routers through the internet. This IP address is globally unique. Routers which are residing Our local network can't communicate directly to the internet via private IP so the Routers uses the public IP to communicate with other Routers. A web server, email server any server Router is accessible which has a public IP [7].

5.4 IP Subnetting

A subnetwork/subnet is a logical subdivision of an IP network. And the way of dividing an IP network into two or more networks is called IP subnetting[7].

Table 3: Class A subnet

Network Bits	Subnet Mask	Bit Borrowed	Subnets	Host per Subnet
8	255.0.0.0	0	1	16777214
9	257.128.0.0	1	2	8388606
10	257.192.0.0	2	4	4194302
11	255.224.0.0	3	8	2097150
12	255.240.0.0	4	16	1048574
13	255.248.0.0	5	32	524286
14	255.252.0.0	6	64	262142
15	255.254.0.0	7	128	131070
16	255.255.0.0	8	256	65534
17	255. 257.128.0	9	512	32766
18	255. 257.192.0	10	1024	16382
19	255. 255.224.0	11	2048	8190
20	255. 255.240.0	12	4096	4094
21	255. 255.248.0	13	8192	2046

22	255.255.252.0	14	16384	1022
23	255.255.254.0	15	32768	510
24	255.255.255.0	16	65536	254
25	255.255.257.128	17	131072	126
26	255.255.257.192	18	262144	62
27	255.255.255.224	19	524288	30
28	255.255.255.240	20	1048576	14
29	255.255.255.248	21	2097152	6
30	255.255.255.252	22	4194304	2

Table 4: Class B subnet

Network Bits	Subnet Mask	Bit Borrowed	Subnets	Host per Subnet
16	255.255.0.0	0	1	65534
17	255.257.128.0	1	2	32766
18	255.257.192.0	2	4	16382
19	255.255.224.0	3	8	8190
20	255.255.240.0	4	16	4094
21	255.255.248.0	5	32	2046
22	255.255.252.0	6	64	1022
23	255.255.254.0	7	128	510
24	255.255.255.0	8	256	254
25	255.255.257.128	9	512	126
26	255.255.257.192	10	1024	62
27	255.255.255.224	11	2048	30
28	255.255.255.240	12	4096	14
29	255.255.255.248	13	8192	6
30	255.255.255.252	14	16384	2

Table 5: Class C subnet

Network Bits	Subnet Mask	Bit Borrowed	Subnets	Host per Subnet
24	255.255.255.0	0	1	254
25	255.255.257.128	1	2	126
26	255.255.257.192	2	4	62
27	255.255.255.224	3	8	30
28	255.255.255.240	4	16	14
29	255.255.255.248	5	32	6
30	255.255.255.252	6	64	2

Chapter 6

Networking Tools

6.1 Router

A **router** is a specialized networking Router which forward data packets from one computer network to another. Typically a data packet is forwarded from one router to another router through the network by creating a internetwork until it reaches its destination. A router connects two or more data lines to communicate each other.



Fig 6.1: Router

Technically router is a layer 3 (OSI reference model) network gateway Router. A router contains a CPU (Central Processing Unit), many kind of digital memory and I/O (Input/output) interfaces. An operating system (OS) is stored in the storage of the router. There are many companies that make router: Cisco, Linksys, Juniper, Net gear, Nortel, Red back, Dlink these companies are manufactures router.

When a router turned on first of all it loads OS (Operating System) from the storage. Then its load the configuration file last saved to NVRAM and setup the network interfaces and protocols. The router put network address and subnet for each interface to its routing table along with the name of the interface itself. When the router get a data packet first of all its checks the destination address by its routing table. Then the router forward the data packet to the correct interface to the next router and this process is continue until the data packet reaches to its destination [6].

6.2 Switch

Switch is network connectivity Router which connects one more Router in a computer network by using packet switching to receive, process and forward data to the destination address. A switch is a multiport network bridge that uses physical address (MAC address) to process/forward data packets at the layer 2 (Data Link Layer) of the OSI reference model. Some switches can process/forward data at the layer 3 (Network Layer).

Switches manage the data flow of a network by transmitting and receiving data. A switch is more intelligent than an Ethernet hub. Different models of network switch support different number of ports to connect Routers. Consumer grade network switch provide eight or four connection for Ethernet Routers, while corporate switch supports 32 to 128 connections. Network switch can be additionally connected to each other by a daisy chaining method. By this method we can connect large number of Router in one network [6].



Fig 6.2: Switch

There are many types of switches exist some types are mention below...

- LAN Switch or Active Hub
Used in Local Area Network (LAN) to connect internal Routers. This kind of switch is known as Ethernet switch or data switch.
- Unmanaged Switch
Unmanaged switch generally used in small companies and home network.
- Managed Switch
There are two types of manageable switch smart switch and enterprise manages switch. Smart switch have limited number of management features. Enterprise managed switch also known as fully managed switch has large ranging of management features [6].

6.3 Fiber Optic Cable

Fiber Optic Cable is known as Optical Fiber Cable is cable that contains one or more optical fiber that are used to carry light. Two types of materials mainly used for optical fiber plastic and glass. Generally plastic fiber used in short range communication and glass fiber used in medium and large range telecommunication. There are two types optical fiber multi-mode and single-mode. NTT Japan demonstrated a single fiber cable that can able to transfer 1 petabit per second (10^{15} bits/s) within a distance of 50 kilometers [9].

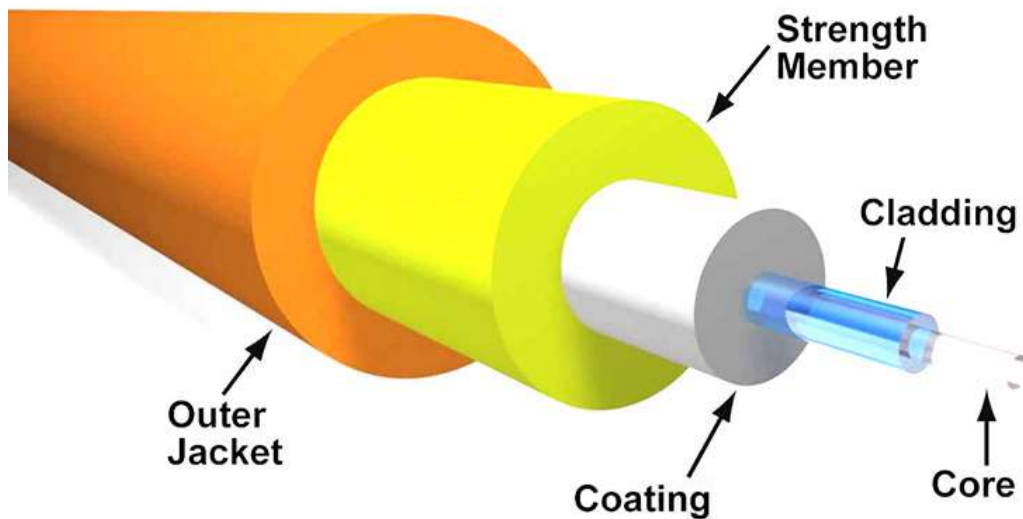


Fig 6.3: Optical Fiber Cable

Advantages of Optical Fiber Cable

1. Optical fiber cable support extremely high bandwidth and speed.
2. Optical fiber is thinner and light weighted than copper cable.
3. The loss of a signal in optical fiber is less than copper cable.
4. Optical fiber is last longer than copper wire.
5. Long distance communication

6.4 Twisted Pair Cable

Twisted pair cable is a type of cable which is made by putting two separate insulated wires together in a twisted pattern and running them parallel to each other. This type of cable is largely used in different types of data and voice transmission. There two different types of twisted pair cable Unshielded Twisted Pair (UTP) and Shielded Twisted Pair (STP). Generally UTP is used in Ethernet installation and STP used in different types of networks to prevent crosstalk and electromagnetic interference [9].

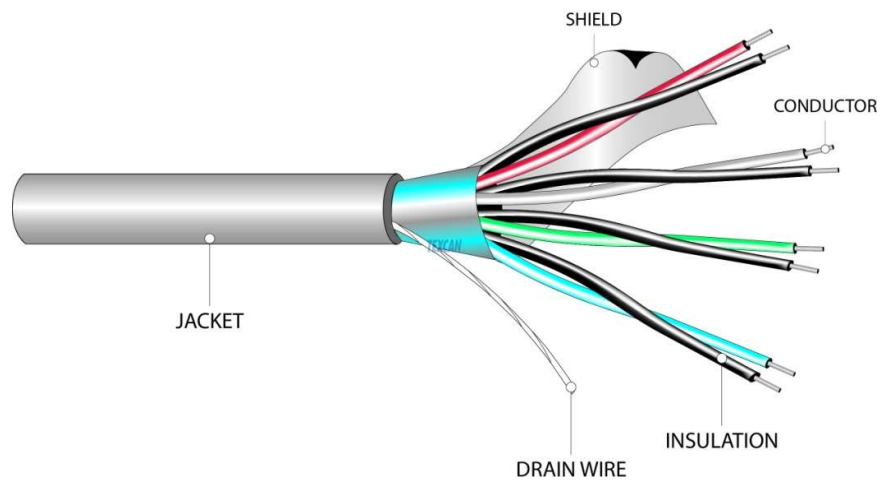


Fig 6.4:Twisted Pair Cable

Advantages of Twisted Pair Cable

1. It's easy to install and handle.
2. Crosstalk problem is minimized.
3. It's cheaper than the other cable.
4. Electrical noise can be prevented.

Chapter 7

Router Configuration

7.1 Platform

Cisco Packet Tracer is simulation software developed by Cisco is software that anyone can implements network topologies by using the tools that provides the Packet Tracer software. This software has many kind of networking tools that used in networking and users/trainee can check the implemented network by simulate the communication process that Cisco Packet Tracer provided. The software provides a drag and drop user interface, user can drag any tool from the Router options and drop them to the interface and user can also remove any tool if need. After completing the network design we can configure the Routers by Command Line Interface (CLI) which is integrated with the Packet Tracer software [8].

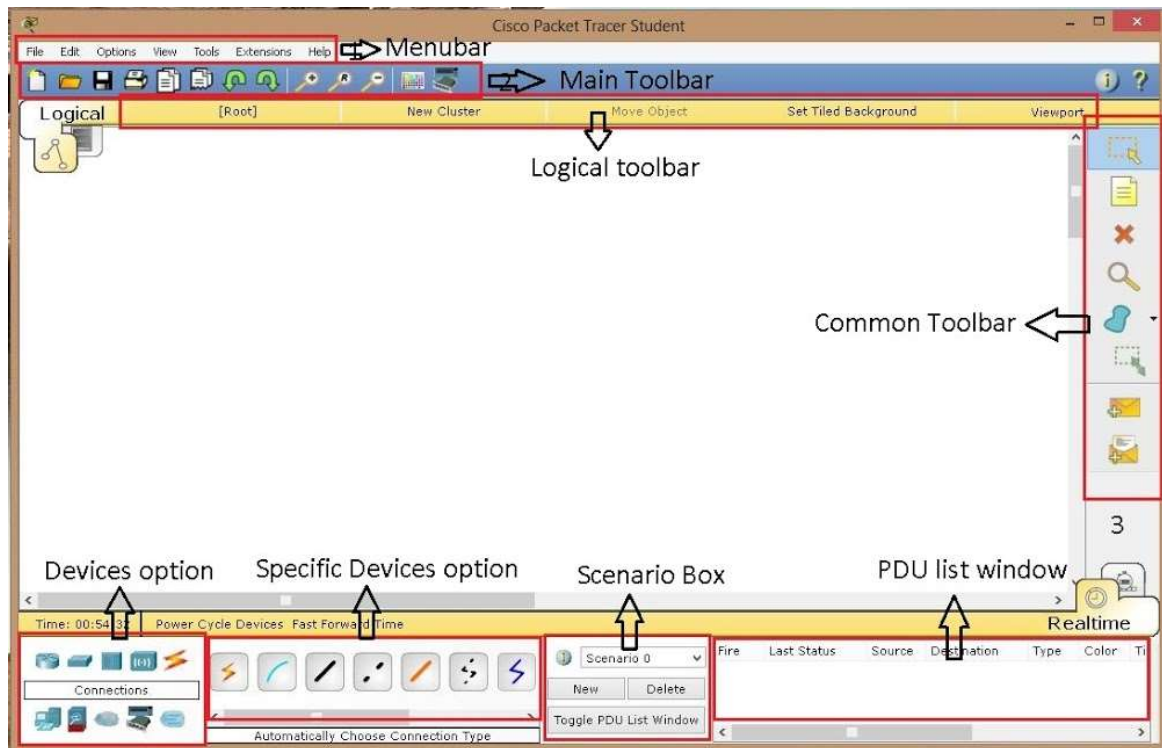


Fig 7.1: Cisco Packet Tracer user interface

7.2 Router Interfaces Configuration

The router/switch interfaces maintain connectivity to the router/switch. There are console and auxiliary port in router/switch to manage router. Usually LAN interfaces include Ethernet, Fast Ethernet and fiber distributed data interface. To change the state of an interface from down to up we need to place IP address to that interface. We have to write **#no shutdown** to change the state to up. To select an interface we must have to write the interface number and after selecting the interface number we can place our IP address. To go to the configure interface mode we need to write **#interface Ethernetnumber** (example: **interface fa0/1**) [8].

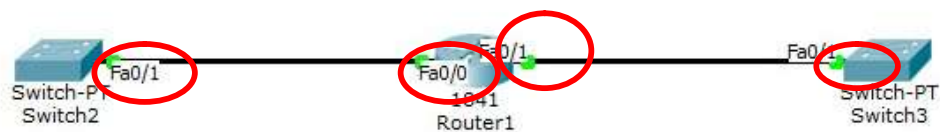


Fig 7.2: Interfaces of router

7.3 Static Routing

When one more router connected to a network all routers don't know the entire network so that we have to signify all the networks to the routers. In static routing we have to define the path that the packets from the router can be forwarded to the destination. In static routing router can't change the path that we provided it always maintain the provided route that's why it's a problem also because router can't find the best path by itself [8].

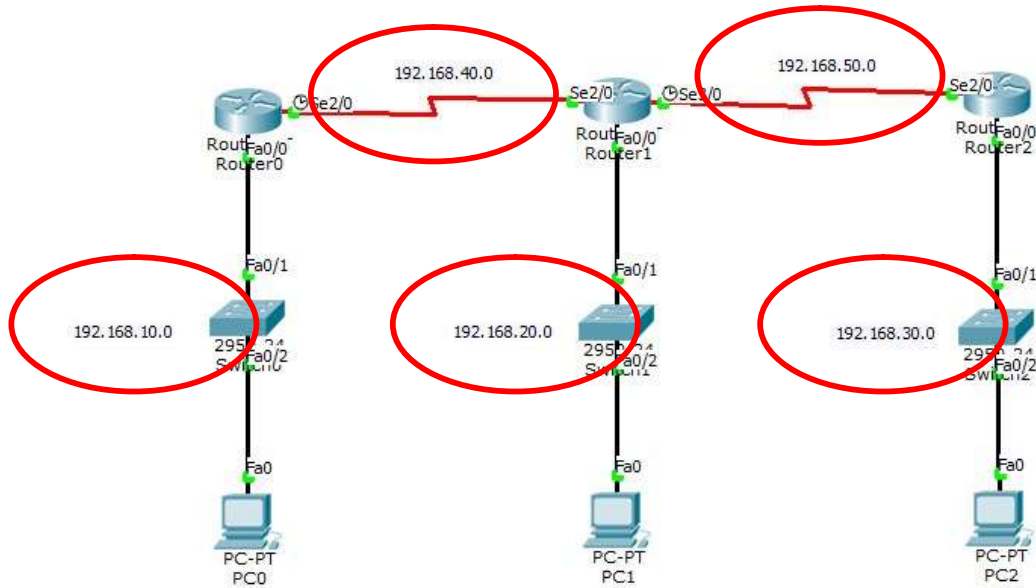


Fig 7.3: Static Routing

7.4 RIP Configuration

RIP stands for Routing Information Protocol. This protocol is used in small to medium TCP/IP networks. This protocol uses a distance vector algorithm to calculate rout. The RIP uses UDP data packets to exchange routing information. Router that running RIP updates routing information in every 30 seconds, if the receiving Router does not receive an update from another Router for 180 seconds or more, the receiving Routers marks the rout as unusable. If the receiving Router does not get any update after 240 seconds it removes all the routing table information for the non-updating Router. The Routers that running RIP collect routing information from its neighbor and its neighbor router get the routing information from its neighbor all the Routers share the routing information in this way and they connected each other [8].

To configure RIP in a router we need to write the commands below.

Table 6: Command to configure RIP

	Command	Purpose
Step-1	Router1> enable	To active privilege mode
Step-2	Router1# configure terminal	To enter global configuration mode
Step-3	Router1(config)# router rip	To set rip protocol
Step-4	Router1(config-rip)# network ip-address	To set the network to do rip
Step-5	Router1(config-rip)# neighbor ip-address	To set the neighbor network
Step-6	Router1(config-rip)# offset-list[access-list-number access-list-name]{in out}offset [interface-typeinterface number]	To set a offset list
Step-7	Router1(config-rip)# end	To end the configuration

7.5 EIGRP Configuration

EIGRP stands for Enhanced Interior Gateway Routing Protocol this is a proprietary protocol of Cisco and this protocol works only in Cisco Routers. This protocol does not send periodic route update like RIP. A router which running EIGRP stores all the routing information of its neighbor to find out the alternate routes when needed. If the router don't get appropriate route, EIGRP queries its neighbors to discover an alternate route. These queries continue until an alternate route is found. EIGRP does not update information periodically. Instead of periodical updates it sends partial updates when needed. All the routers don't get the partial updates, only those routers which need information get the partial updates. This protocol uses four key algorithm technologies these are neighbor discovery, neighbor recovery, Reliable Transport Protocol (RTP) and DUAL. DUAL stores all the destination routes in the topology table [8].

To configure EIGRP we need to write the commands below

Table 7: Command to configure EIGRP

	Command	Purpose
Step-1	Router1(config)# router eigrp <i>autonomous-system</i>	Enables an EIGRP routing protocol in global configuration mode.
Step-2	Router1(config-router)# network <i>network-number</i>	Associates networks with an EIGRP routing protocol in router configuration mode.

Table 8: EIGRP Route Authentication

	Command	Purpose
Step-1	Router1(config)# interface <i>type number</i>	To enter interface configuration mode
Step-2	Router1(config-if)# ip authentication mode eigrp <i>autonomous-system md5</i>	To enables MD5 authentication in EIGRP packets.
Step-3	Router1(config-if)# ip authentication key-chain eigrp <i>autonomous-system key-chain</i>	To enables authentication of EIGRP packets.
Step-4	Router1(config-if)# exit	To exits to global configuration mode.
Step-5	Router1(config)# key chain <i>name-of-chain</i>	To identifies a key chain. (Match the name configured in Step 1.)
Step-6	Router1(config-keychain)# key <i>number</i>	In keychain configuration mode, identifies the key number.
Step-7	Router1(config-keychain-key)# key-string <i>text</i>	In keychain key configuration mode, identifies the key string.
Step-8	Router1(config-keychain-key)# accept-lifetime <i>start-time {infinite end-time duration seconds}</i>	Optionally specifies the time period during which the key can be received.
Step-9	Router1(config-keychain-key)# send-lifetime <i>start-time {infinite end-time duration seconds}</i>	Optionally specifies the time period during which the key can be sent.

7.6 DHCP Configuration

DHCP is Dynamic Host Configuration Protocol it a network management protocol. This protocol is used to assign an IP address dynamically to each Router on a network. If we add a new Router to a switch the Router will get an IP address automatically if we configure DHCP. This protocol reduces the need for a network administrator. When we connect a Router to a network we need to provide IP address to the Router but for a big network it is difficult to remember all the IP address which are used. So there has a chance that IP can be conflict when we provide an IP in a new Router. That is why DHCP is used [8].

The syntax to configuring DHCP is given below

Table 9: Command to configure DHCP

	Command	Purpose
Step-1	Router1# configure terminal	To enter global configuration mode
Step-2	Router1(config)# interface fastEthernet 1/0	To select the interface in which we want provide IP
Step-3	Router1(config-if)# ip address 192.168.20.1 255.255.255.0	Provide IP address with subnet mask
Step-4	Router1(config-if)# no shut	To change the state of interface to up
Step-5	Router1(config-if)# exit	To exit from the interface
Step-6	Router1(config)# ip dhcp pool 1	To create the DHCP pool name
Step-7	Router1(dhcp-config)# network 192.168.20.0 255.255.255.0	Which network we want to apply DHCP
Step-8	Router1(dhcp-config)# default-Router1 192.168.10.1	To set the default gateway
Step-9	Router1A(dhcp-config)# exit	To exit from the DHCP configure mode
Step-10	Router1(config)# ip dhcp excluded-address 192.168.20.1 192.168.20.10	To limit the number of host

7.7 OSPF Configuration

OSPF stands for Open Shortest Path First it is routing protocol for IP network. This protocol uses Link State Routing (LSR) algorithm and its belongs to Interior Gateway Protocols (IGPs), operating with a single Autonomous System (AS). OSPF version 2 is used in IPv4 and OSPF version 3 is used in IPv6. OSPF also support Classless Inter-Domain Routing (CIDR). This protocol calculates the shortest paths/routes from source to destination through the based on an algorithm. The first widely implemented protocol was Routing Information Protocol (RIP), it was calculated the shortest path based on hop, that is how many number of path that a data packet have to traverse to reach the destination. RIP protocol is a dynamic routing protocol, it can change routing table if the topology is changed. But it can't changes routing table if the network condition is change. On the contrary OSPF can calculate the shortest path based on cost of the rout, taking into account bandwidth, delay and load. OSPF is reliable to calculate routes through large and complex Local Area Network (LAN) [8].

An OSPF network can be structured or subdivided. It chooses to simplify administration and optimize traffic and resource utilization. Areas of a network are identified by 32-bit numbers and expressed either simply in decimal or in the same dot-decimal notation that is used for IPv4 addresses. By convention, area 0 represents the backbone area of an OSPF network. While the identifications of other areas may be chosen administrators often select the IP address of a main router in an area as the area identifier. Each additional area has a connection to the OSPF backbone area. These types of connections are maintained by an interconnecting router, this router is known as an Area Border Router (ABR). An ABR maintains separate link-state databases for each area it serves and maintains summarized routes for all areas in the network [8].

To enable OSPF we need to write commands below

Table 10: Command of configure OSPF

	Command	Purpose
Step-1	Router1> enable	To enables privileged mode.
Step-2	Router1# configure terminal	To enters global configuration mode.
Step-3	Router1(config)# router ospf 100	To enables OSPF routing and enters router configuration mode.
Step-4	Router1(config-router)# network 192.168.129.16 0.0.0.3 area 1	Defines an interface on which OSPF runs and defines the area ID for that interface.
Step-5	Router1(config-router)# end	To exit router configuration mode and returns to privileged mode.

To configure OSPF interface parameters we need to write commands below

Table 11: Command to configure OSPF interface parameter [8]

	Command	Purpose
Step-1	Router1> enable	To enables privileged mode.
Step-2	Router1# configure terminal	To enters global configuration mode.
Step-3	Router1(config)# interface Gigabitethernet 0/0	To configures an interface type and enters interface configuration mode.
Step-4	Router1(config-if)# ip ospf cost 65	To explicitly specifies the cost of sending a packet on an OSPF interface.
Step-5	Router1(config-if)# ip ospf retransmit-interval 1	To specifies the number of seconds between link-state advertisement (LSA) retransmissions for adjacencies belonging to an OSPF interface.
Step-6	Router1(config-if)# ip ospf transmit-delay	To set the estimated number of seconds required to send a link-state update packet on an OSPF interface.
Step-7	Router1(config-if)# ip ospf priority 1	To set priority to help determine the OSPF designated router for a network.
Step-8	Router1(config-if)# ip ospf hello-interval 1	To specifies the length of time between the hello packets that the Cisco IOS software sends on an OSPF interface.
Step-9	Router1(config-if)# ip ospf dead-interval 1	To set the number of seconds that a device must wait before it declares a neighbor OSPF router down because it has not received a hello packet.
Step-10	Router1(config-if)# ip ospf authentication-key 1	To assign a password to be used by neighboring OSPF routers on a network segment that is using the OSPF simple password authentication.
Step-11	Router1(config-if)# ip ospf message-digest-key 1 md5 23456789	To enable OSPF MD5 authentication. The values for the <i>key-id</i> and <i>key</i> arguments must match values specified for other neighbors on a network segment.
Step-12	Router1(config-if)# ip ospf authentication message-digest	To specifies the authentication type for an interface.
Step-13	Router1(config-if)# end	To exit interface configuration mode and returns to privileged mode.

To configure OSPF area parameters we need to write commands below

Table 12: Command to configure OSPF area parameter [8]

	Command	Purpose
Step-1	Device> enable	To enables privileged mode.
Step-2	Device# configure terminal	To enters global configuration mode.
Step-3	Device(config)# router ospf 10	To enable OSPF routing and enters router configuration mode.
Step-4	Device(config-router)# area 10.0.0.0 authentication	To enables authentication for an OSPF area.
Step-5	Device(config-router)# area 10.0.0.0 stub no-summary	To define an area to be a stub area.
Step-6	Device(config-router)# area 10.0.0.0 default-cost 1	To specifies a cost for the default summary route that is sent into a stub area or not-so-stubby area (NSSA)
Step-7	Device(config-router)# end	To exit router configuration mode and returns to privileged mode.

To configure OSPF for non-broadcast networks we need to write commands below

Table 13: Command to configure OSPF for non-broadcast networks [8]

	Command	Purpose
Step-1	Device# configure terminal	To enter global configuration mode.
Step-2	Device(config)# interface gigabitethernet 0/0/0	To specifies an interface type and number, and enters interface configuration mode.
Step-3	Device#(config-if) ip ospf network point-to-multipoint non-broadcast	To configure an interface as point-to-multipoint for non-broadcast media.
Step-4	Device#(config-if) exit	To enter global configuration mode.
Step-5	Device#(config) router ospf 109	To configure an OSPF routing process and enters router configuration mode.
Step-6	Device#(config-router) neighbor 192.168.3.4 cost 180	To specifies a neighbor and assigns a cost to the neighbor.

7.8 Telnet Configuration and Accessing

Telnet is a protocol to access a device remotely. Through telnet a administrator can access or configure a router remotely. If we configure telnet in a router then that router can be access from anywhere or another device if that device connected physically with this router. To configure telnet protocol we need to set a password for the router which router we want to activate telnet. To access a router through telnet we must need to know the IP of the interface of the router which router we want to access [8].

To configure telnet protocol to router we need to write commands below

Table 14: Command to configure telnet protocol

	Command	Purpose
Step-1	Router1> enable	To enter privileged mode
Step-2	Router1# Configure terminal	To enter global configuration mode
Step-3	Router1(config)# line VTY 0 15	To select number of VTY line
Step-4	Router1(config-line)# password 1234	To set a password for telnet
Step-5	Router1(config-line)# login	To set when password required
Step-6	Router1(config-line)# end	To exit router configuration mode and return to privileged mode

To access a router through telnet from a pc we need to write command below

Table 15: Command to access a router through PC by telnet

	Command	Purpose
Step-1	PC4> telnet 192.168.10.5	To activate telnet mode
Step-2	Password : 1234	To activate telnet a password must be given which password is provided when router was configured. But password will be remain hidden
Step-3	Router1>	The device reached to the telnet mode

Chapter 8

Switching and VLANs

8.1 Configuring Switch with VLAN's

VLAN is Virtual LAN this can be considered as broadcast domain. VLAN divide a network into separate logical area. It is not mandatory that all the VLAN should belong to one LAN it can be implemented in different LAN. By creating VLAN we can improve the efficiency and security of a network. Generally when we send a packet to a network the packets traverse all the node which is connected to the network but the is sends for a specific node this is decrease the security of network moreover for a big network it is more problematic because in big network there have huge number of node so if data packets move through all the nodes then the data transmission system could be failed. This is why VLAN is important for a network. By creating VLAN a network can be divided into separate area. In this case the data packets can be send to a targeted area. So network efficiency can be increase.

VLAN basically connected with IP sub-network. To communicate between VLANs we must have to route the traffic. The Cisco Nexus 5000 Series switch supports VLAN numbers 1 to 4094 in accordance with the IEEE 802.1Q standard [8].

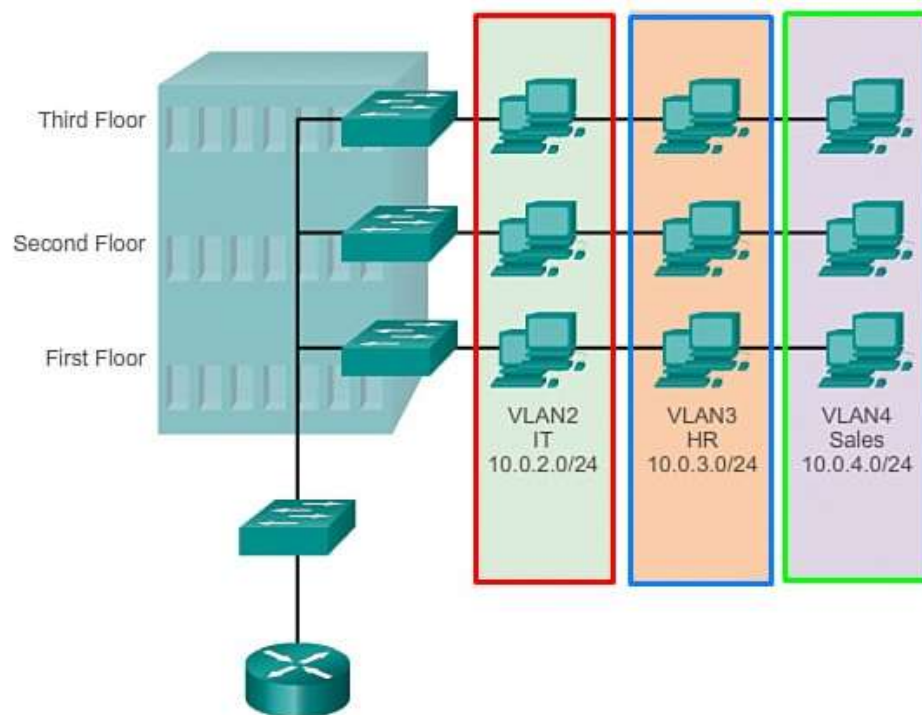


Fig 8.1: VLAN

To configure VLAN in a switch we need to write commands below

Table 16: Command to configure VLAN [8]

	Command	Purpose
Step-1	Switch1> enable	To enter privileged mode
Step-2	Switch1# configure terminal	To enter global configuration mode
Step-3	Switch1(config)# vlan 2	To create new VLAN and give a number of VLAN we can create each port of switch as a VLAN and by default VLAN 1 is always created to a switch and all the ports are the member of VLAN 1
Step-4	Switch1(config-vlan)# name accounts	To give a name of the VLAN 2
Step-5	Switch1(config-vlan)# vlan 3	To create another VLAN to this switch
Step-6	Switch1(config-vlan)# name marketing	To give a name of the VLAN 3
Step-7	Switch1(config)# interface fa0/1	To select a interface
Step-8	Switch1(config-if)# switchport access vlan2	To give access which VLAN can access the interface fa0/1. Here the interface fa0/1 can access the VLAN2
Step-9	Switch1(config-if)# interface fa0/2	To select a interface
Step-10	Switch1(config-if)# switchport access vlan2	To give access which VLAN can access the interface fa0/2. Here the interface fa0/1 can access the VLAN 2
Step-11	Switch1(config-if)# interface fa0/3	To select a interface
Step-12	Switch1(config-if)# switchport access vlan 3	To give access which VLAN can access the interface fa0/3. Here the interface fa0/3 can access the VLAN 3
Step-13	Switch1(config-if)# interface fa0/4	To select a interface
Step-14	Switch1(config-if)# switchport access vlan 3	To give access which VLAN can access the interface fa0/4. Here the interface fa0/3 can access the VLAN 3
Step-15	Switch1(config-if)# exit	To exit from the configure terminal mode

If we have one more switch and both have the same VLAN then we have to configure trunk for communicate with another switch. To configure trunk we have to write commands below.

Table 17: Command to set trunk port [8]

	Command	Purpose
Step-1	Switch1> enable	To enter privileged mode
Step-2	Switch1# configure terminal	To enter global configuration mode
Step-3	Switch1(config)# interface fa0/5	To select interface which will the trunk port
Step-4	Switch1(config-if)# switchport mode trunk	To activate trunking
Step-5	Switch1(config-if)# exit	

Now we need to change the mode of interfaces to access mode which ports are connected with a user otherwise the users can't access the link. To change the mode of interfaces we need to write the commands below

Table 18: Command to change access mode of user connected port [8]

	Command	Purpose
Step-1	Switch1> enable	To enter privileged mode
Step-2	Switch1# configure terminal	To enter global configuration mode
Step-3	Switch1(config)# interface range fa0/1-4	To select the range of interfaces which port can be access the VLAN
Step-4	Switch1(config-if)# switchport mode access	To change the interfaces mode to access.
Step-5	Switch1(config-if)# exit	

Chapter 9

Conclusion and future career

9.1 Limitation and Conclusion

In this session of internship I have got so much experience that will help me in my future life. We got outstanding trainer who gives us so many instruction and direction that can helps our professional and personal life. The institute was so much friendly. Their cooperation made our work easier. When we faced any problem they solved these problems instantly. They gave us all kind of necessary opportunity to teach us. I am thankful to the institute for everything.

9.2 Scope for Future Career

As I mentioned that I have gather lots of practical knowledge about computers and computer networking so I can now make a network and maintain them. I can now make a Campus Network which is very popular to all kind of companies and organization. In this modern world every company and organization needs IT support. So they need expertise people of Information Technology (IT). So I can be part of them.

Appendices

Appendix A: Internship Reflection

My internship period was 3 months. In this period I have gather many more practical knowledge. I think it will help in my future to build up my career in IT sector. I have practiced many things to improve my skill. After completing the internship period I found the difference between theoretical and practical knowledge. In this internship period I have got many unanswered questions. I am happy that I have got a chance to do my internee such a organization.

Appendix B: Company Details



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Phone	: +8801912744877
E-mail	: admin@unixlab.com.bd
Website	: https://unixlab.com.bd

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