Network Design & Implementation for a Large Group of Company

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Submitted in partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science and Engineering



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SONARGAON UNIVERSITY (SU)

October 2020

APPROVAL

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DECLARATION

We, hereby, declare that the work presented in this report is the outcome of the investigation performed by us under the supervision of **Md Rafiqul Islam (Rafiq), Lecturer,** Department of Computer Science and Engineering, Sonargaon University, Dhaka, Bangladesh. We reaffirm that no part of this Project and thereof has been or is being submitted elsewhere for the award of any degree or diploma.

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ABSTRACT

The modern world almost wholly depends on Network technology. Consequently, our life is fully influenced by modern technology-based devices like mobile phones, laptops, tablets, and computers and so on. However, we cannot think a single day without the magical world of network. Computer Networks have become an essential tool in many aspects: human communication, gathering, exchange and sharing of information, distributed work environments, access to remote resources (data and computing power) and many more. Starting from an historical overview, this project will give an introduction to the underlying ideas and technologies of a network design for a large group of company. The second half will concentrate on the most commonly used network routing protocol and securities.

ACKNOWLEDGMENT

At the very beginning, we would like to express my deepest gratitude to the Almighty Allah for giving us the ability and the strength to finish the task successfully within the schedule time.

We are auspicious that we had the kind association as well as supervision of **Md. Rafiqul Islam (Rafiq)**, Lecturer, Department of Computer Science and Engineering, Sonargaon University whose hearted and valuable support with best concern and direction acted as necessary recourse to carry out our project.

We are also thankful to all our teachers during our whole education, for exposing us to the beauty of learning.

Finally, our deepest gratitude and love to my parents for their support, encouragement, and endless love.

LIST OF ABBREVIATIONS

ACL	Access Control List
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Naming System
OSPF	Open shortest Path First
RIP	Routing Information Protocol

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CHAPTER 1
INTRODUCTION TO NETWORK DEVICES

1.1 Introduction

In this chapter we will discuss our whole project. What we want to convey at the outset is that our entire project is on top of the network setup. The key is to use the network tools to make the network more easily accessible and usable.

In this introductory session we will learn what we can use to set up this network very easily. Since we will cover the whole issue with our Cisco Packet Tracer Simulator, you still need to have a clear idea of what kind of device is used to put it into real world.

1.2 Internetworking Device

An internetworking device is a widely-used term for any hardware within networks that connect different network resources. Key devices that comprise a network are routers, bridges, repeaters and gateways.

1.3 Cable:

Cable has been used since the beginning to establish the network, although initially coaxial was used, but now the UTP cut-6 cable and fiber optical cable are the most notable. Such cables have higher security, lower risk of data loss and higher speed.



Figure 1.1: Cat-6 & Fiber optic cable

1.4 Connector:

A device that terminates a segment of cabling or provides a point of entry for **networking** devices such as computers, hubs, and routers. Ethernet **connectors**, such as RJ-45 and BNC **connectors**. Fiber-optic cabling **connectors**, such as SC and ST **connectors**.

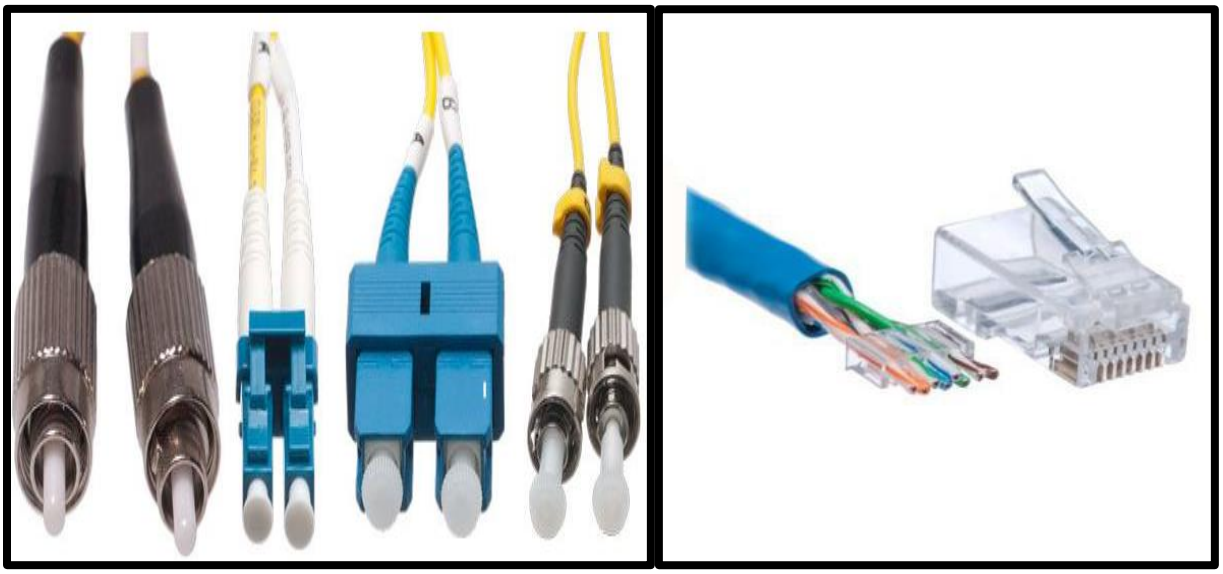


Figure 1.2: Various type of connector

1.5 Network Switch:

A **network switch** (also called **switching hub**, **bridging hub**, and by the IEEE **MAC bridge**[1]) is networking hardware that connects devices on a computer network by using packet switching to receive and forward data to the destination device.

Switches create a **network** while routers connect **networks**. In other words, **network switches** allow different devices on a **network** to communicate, but routers allow different **networks** to communicate. In a nutshell, a **network switch** is typically a Layer-2 device of the OSI model while a router is a Layer-3 device.



Figure 1.3: Switch

1.6 Router& routing devices:

A **router** receives and sends data on computer **networks**. **Routers** are sometimes confused with **network** hubs, modems, or **network** switches. However, **routers** can combine the functions of these components, and connect with these devices, to improve Internet access or help create business **networks**



Figure 1.3: Router

A common tool for modern network computing, routers connect employees to networks, both local and the Internet, where just about every essential business activity takes place. Without routers,

we wouldn't be able to use the Internet to collaborate, communicate, or gather information and learn.

1.7 Server:

A **server** is a computer or system that provides resources, data, services, or programs to other computers, known as clients, over a **network**. In theory, whenever computers share resources with client machines they are considered **servers**. In our topic we use different kind of server for build strong network, such as: FTP, DHCP, RADIUS, MAIL etc.

Before the next chapter, we have shown the diagram of our entire network.

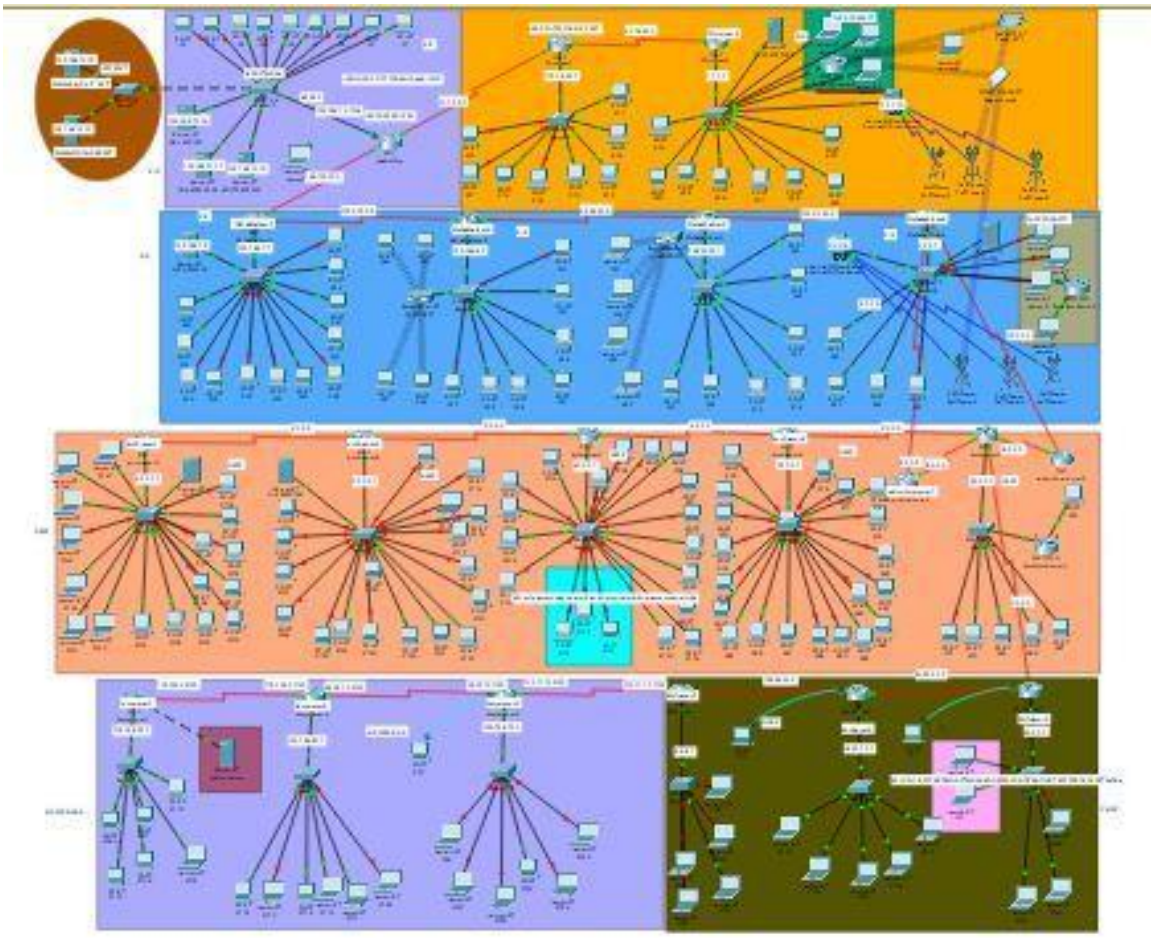


Figure 1.4: Our Network diagram

CHAPTER 2

NETWORK SWITCH

2.1 Network Switch

We already know how a switch works. There is various type works done using switch where needed. Such as: Inter-vlan with switch, port security, switch-to-switch trunking and many more features done by switch. Layer 3 switch also control band width and also many other things. This work has been applied only to the first connection that we have from our ASP to our network. Besides, we didn't do much other than connect the user device to the switch end. Since all other work including bandwidth management is done on the router end. In this way, we have connected only uninterrupted clients using 15 switches in our network. I have tried to create the network using the switch.

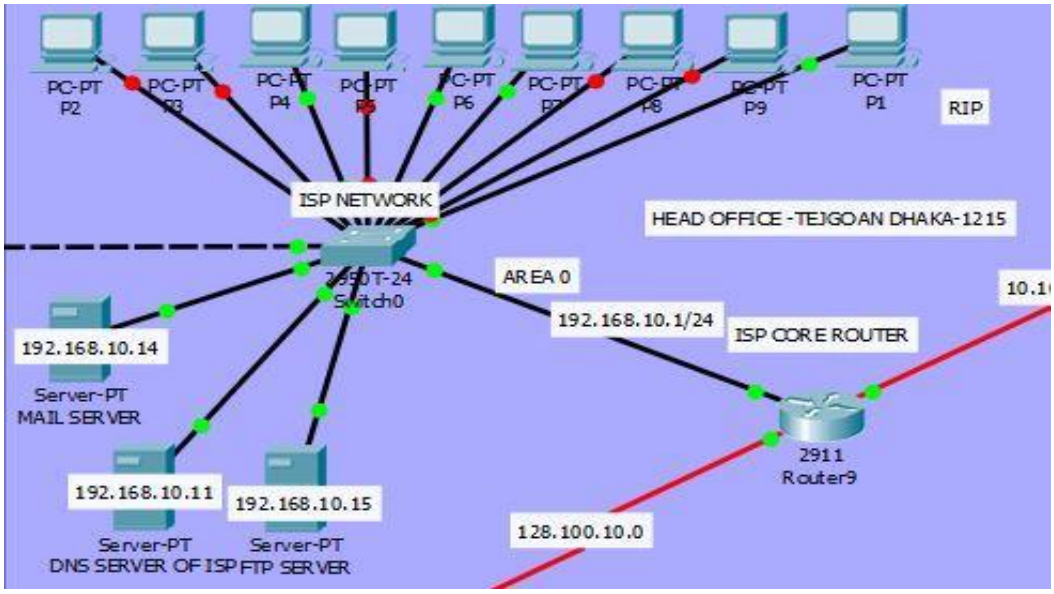


Figure 2.1: Connection of Every switch

CHAPTER 3

ROUTER: HOW WE USE OUR ROUTER IN OUR NETWORK

Before we can understand how routing work protocols, we need to know what routing is. What kind of device is used for this, what kind of protocol does it take and how does it work?

3.1 What is a network route?

Network route is the way to send data packets from one network to another. The path between two nodes is the route of this network. The job of the router is to find the best way to go from network to network.

There are usually three types of routers on the network, such as:

1. Static Route
2. Default Route
3. Dynamic Route

3.2 Static Routing:

Manual routing is done on static routers. In case of small networks where route change is rare, it is better to do this route. If you want to make a change, you have to change the route manually.

Advantage:

- Static routing causes very little load on the CPU of the router, and produce no traffic to other routers.
- Static routing leaves the network administrator with full control over the routing behavior of the network.
- Static Routing is very easy to configure on small networks.

Disadvantage:

- **Human error:** In many cases, static routes are manually configured. This increases the potential for input mistakes. Administrators can make mistakes and mistype in network information, or configure incorrect routing paths by mistake.

- **Fault tolerance:** Static routing is not fault tolerant. This means that when there is a change in the network or a failure occurs between two statically defined devices, traffic will not be re-routed. As a result, the network is unusable until the failure is repaired or the static route is manually reconfigured by an administrator.
- **Administrative distance:** Static routes typically take precedence over routes configured with a dynamic routing protocol. This means that static routes may prevent routing protocols from working as intended. A solution is to manually modify the administrative distance.
- **Administrative overhead:** Static routes must be configured on each router in the network(s). This configuration can take a long time if there are many routers. It also means that reconfiguration can be slow and inefficient. Dynamic routing on the other hand automatically propagates routing changes, reducing the need for manual reconfiguration.

Note: Our network is changeable, and huge. This may change at any time. For this reason, we have not used this routing in our network.

3.3 Dynamic routing:

Dynamic routes are routes that change automatically over time, and the routing protocol creates and manages such routes.

Reasons for Route Change-

1. Network topology changes

2. Network traffic changes

3. The amount of bandwidth

4. The status of the link

Advantage:

The chief **advantages** of **dynamic routing** over static **routing** are scalability and adaptability. A dynamically routed network can grow more quickly and larger, and is able to adapt to changes in

the network topology brought about by this growth or by the failure of one or more network components

Disadvantage:

There are **disadvantages** to **dynamic routing**. **Dynamic routing** requires knowledge of additional commands. It is also less secure than static **routing** because the interfaces identified by the **routing** protocol send **routing** updates out. Routes taken may differ between packets.

3.4 Routing Protocol:

Routing protocols communicate route and metric information between routers so that the router can decide on the best route.

There are several routing protocols, there are many routers that support multiple protocols simultaneously.

The following are some of the most commonly used protocols:

1. Routing Information Protocol (RIP).

2. Enhanced Interior Gateway Routing Protocol (EIGRP)

3. Open Shortest Path First (OSPF)

We have used these three types of protocols in our network.

So later we will see in detail how these protocols work and which routers on our network we have used this protocol in detail. These protocols have different hop counts or administrative distances. Based on these protocols are determined in the routers.

Metrics of the protocol

1. **Hop count:** Hop count is the number of routers that a data packet has to go through to get to a network. Routing protocols prefers low hop count routers. Rip decides based on hop count, Rip always prioritizes low hop count.

2.**Bandwidth:** The amount of data that can flow through a network router at one time is the router's bandwidth. Routing protocols prioritize high-speed bandwidth paths. Because it is possible to reach the destination quickly. EIGRP uses this as a metric. Routing protocol (With our practical example):

3.5 R.I.P:

Routing Information Protocol (RIP) is a dynamic routing protocol which uses hop count as a routing metric to find the best path between the source and the destination network. It is a distance vector routing protocol which has AD value 120 and works on the application layer of OSI model. RIP uses port number 520.

Hop-Count:

Hop count is the number of routers occurring in between the source and destination network. The path with the lowest hop count is considered as the best route to reach a network and therefore placed in the routing table. RIP prevents routing loops by limiting the number of hopes allowed in a path from source and destination. The maximum hop count allowed for RIP is 15 and hop count of 16 is considered as network unreachable.

3.6 Features of RIP:

1. Updates of the network are exchanged periodically.
2. Updates (routing information) are always broadcast.
3. Full routing tables are sent in updates.
4. Routers always trust on routing information received from neighbor routers. This is also known as routing on rumors.

RIP versions:

There are two versions of routing information protocol – **RIP Version-1**, **RIP Version-2**.

RIP version 2 configuration code:

R(config)# router rip

R(config-router)# network 192.168.10.0

R(config-router)# network 172.16.10.0

R(config-router)# version 2

R(config-router)# no auto-summary

Now we will see how we have applied RIP to some of the routers in our network.

Now I want to show what type of configuration doing in our router:

Router 1(Head office main router):

In head office main router we are used RIP version 1,to connect with the other router of the network. Now we want to show the running configuration of the router and Describes all of the part of this.

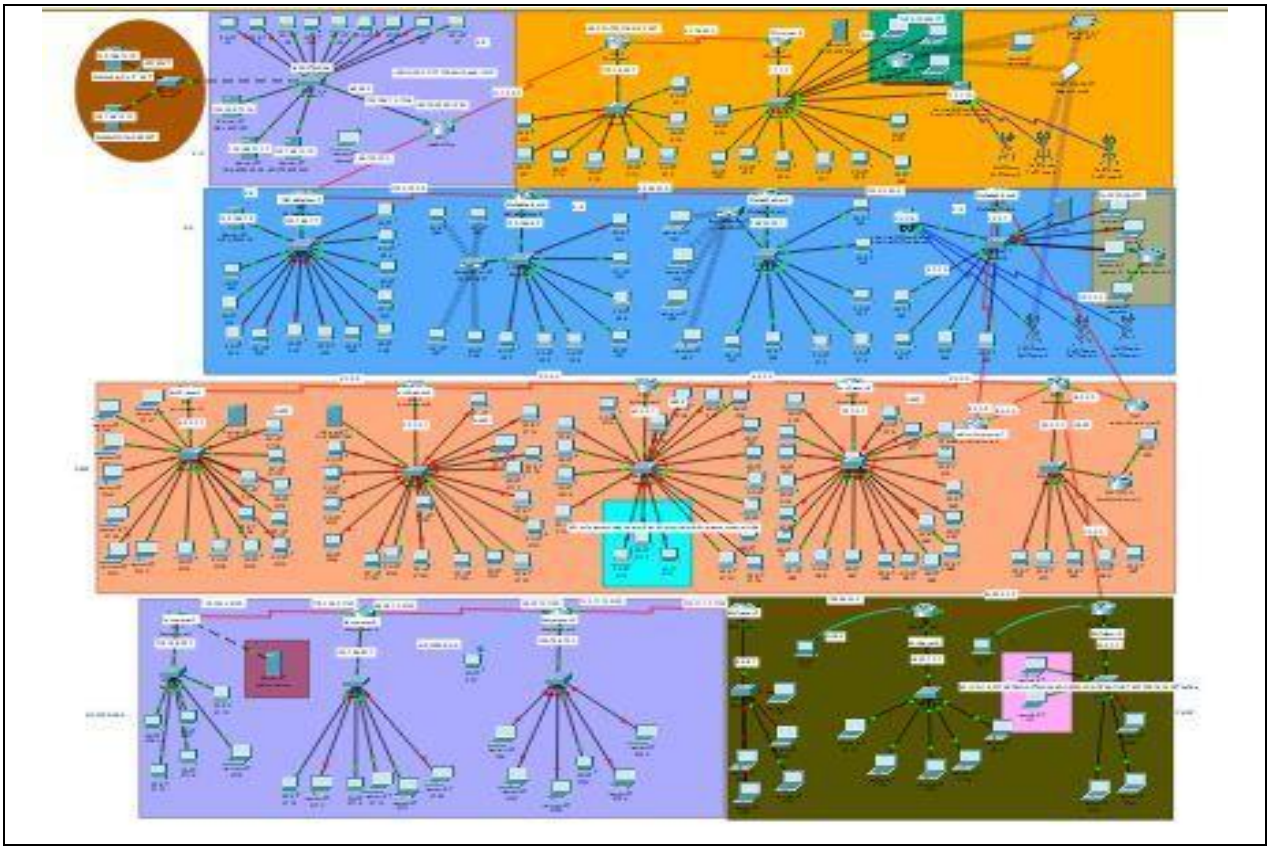


Figure 3.1: Total ISP network

3.7 Head Office POP:

Head office

hostname Head Office

aaa new-model

aaa authentication login default local

username admin secret 5 1mERr$vTbHul1N28cEp8lkLqr0f/

interface GigabitEthernet0/0

ip address 192.168.10.1 255.255.255.0

duplex auto

speed auto

interface Serial0/3/0

ip address 10.10.5.2 255.0.0.0

clock rate 64000

interface Serial0/3/1

ip address 128.100.10.1 255.255.0.0

router rip

network 10.0.0.0

network 128.100.0.0

network 192.168.10.0

line con 0

password admin

line aux 0

linevty 0 4

end

In this configuration we have used rip version 1.

And through this router we have connected 3 networks around us. By installing a serial interface card, we have extended a network through a serial interface.

In gigabit port 1 we are assigned ip address 192.168.10.1 255.255.255.0. Through this we are connected to the network from ISP and from the serial port 0/3/0 we are assigned ip address 10.10.5.2 255.0.0.0 and connect with the mirpur pop-1.

And finally serial interface 0/3/1 assigned ip address 128.100.10.1 255.255.0.0 and connected with mohakhali pop-1. We run the RIP protocol here to connect one network to another.

RIP:

router rip

network 10.0.0.0

network 128.100.0.0

network 192.168.10.0

We have configured line console password and user name and vty telnet password for the entire network.

And this is how we configured Router 1, now we are going to mirpurpop-1 router

3.8 Mirpur Pop-1:

Now we let's see, what we are doing in Mirpur pop-1 router. Let's describe the overall running configuration.

mirpurpop1

hostname Mirpurpop1

a new-model

aaa authentication login default local

username admin secret 5 1mERr$vTbHul1N28cEp8lkLqr0f/

interface GigabitEthernet0/1

ip address 172.16.20.1 255.255.0.0

duplex auto

speed auto

interface Serial0/1/0

ip address 10.10.5.1 255.0.0.0

interface Serial0/1/1

ip address 45.16.20.1 255.0.0.0

clock rate 64000

router rip

network 10.0.0.0

network 45.0.0.0

network 172.16.0.0

line con 0

!

line aux 0

!

linevty 0 4

end

This router has been used one interface gigabit port 1, assigned ip address 172.16.20.1 255.255.0.0 and two serial interface port assigned ip address in order interface Serial0/1/0 ip address 10.10.5.1 255.0.0.0 and interface Serial0/1/1 ip address 45.16.20.1 255.0.0.0.

We are also used rip version 1 here,

router rip

network 10.0.0.0

network 45.0.0.0

network 172.16.0.0

network 45.16.20.1 connected to the point of Mirpur pop-2 and network 10.0.0.0 connected with head office and the gigabit port-1 connected with the entire local office of mirpur-2 branch

Router 2 has been configured in the same way as before.

3.9 Mirpur pop-2:

In the end, Mirpurp pop-2 routers are connected to two networks, one through a serial interface and the other through a gigabit port. This is the last router of Mirpur End. Now we are look at the configured of Mirpur pop-2 router.

```
mirpurpop2
hostname Mirpurpop2
aaa new-model
aaa authentication login default local

username admin secret 5 $1$mERr$vTbHul1N28cEp8lkLqr0f/
! panning-tree mode pvst

interface GigabitEthernet0/0
ip address 1.1.1.1 255.0.0.0
duplex auto
speed auto
interface Serial0/1/0
ip address 45.16.20.2 255.0.0.0
router rip
network 1.0.0.0
network 45.0.0.0
line con 0
!
line aux 0
line vty 0 4
end
```

we have assigned ip address 45.16.20.2 255.0.0.0 interface serial port 0/1/0 connected with mirpur-1 pop and ip address interface GigabitEthernet0/0 ip address 1.1.1.1 255.0.0.0 connected the office network of Mirpur pop 2.

And this router also has used RIP and connected with Mirpur pop-1(full network) and the office network of Mirpur pop02.

That's how Mirpur branch office router work, now we are going to the router of Mohakhali branch. Mohakhali has 4 offices with 4 routers.

3.10 Mohakahli pop-1:

In graphically diagram we see that this router connected with head office router and Mohakhali pop-2 router.

Now we try to look the configuration of this router configuration.

```
mohakhalipop1
hostname Mohakhalipop1
!
aaa new-model
!
aaa authentication login default local

username admin secret 5 $1$mERr$vTbHul1N28cEp8lkLqr0f/

interface GigabitEthernet0/1
ip address 192.168.7.1 255.255.255.0
duplex auto
speed auto
```

interface Serial0/0/0

ip address 128.100.10.2 255.255.0.0

clock rate 64000

interface Serial0/0/1

ip address 103.230.5.1 255.0.0.0

clock rate 64000

router rip

network 103.0.0.0

network 128.100.0.0

network 192.168.7.0

line con 0

!

line aux 0

!

line vty 0 4

end

This router connected with three networks. Assigned ip address in interface GigabitEthernet0/1ip address 192.168.7.1 255.255.255.0 connected with office network, interface Serial0/0/0 ip address 128.100.10.2 255.255.0.0 connected with the main network of head office and finally interface Serial0/0/1 ip address 103.230.5.1 255.0.0.0 connected Mohakhali pop-2 branch router. As same as Mohakhali pop 2,3 connected with their beside router and also use rip as the protocol of the router.

3.11 Mohakhali pop-2:

Configuration of pop-2

mohakhalipop2

```
hostname Mohakahlipop2
aaa new-model
aaa authentication login default local
! !
username admin secret 5 $1$mERr$vTbHul1N28cEp8lkLqr0f/
 !
interface GigabitEthernet0/2
ip address 192.168.8.1 255.255.255.0
ip access-group 10 out
duplex auto
speed auto
rate 2000000
shutdown

interface Serial0/3/0
ip address 103.230.5.2 255.0.0.0
ip access-group 10 out

interface Serial0/3/1
ip address 45.28.20.1 255.0.0.0

router rip
network 45.0.0.0
network 103.0.0.0
network 192.168.8.0
line con 0
!
```

line aux 0

!

line vty 0 4

end

In this router we have connected with Mohakhali pop-1 by the network 102.0.0.0, connected with Mohakahli pop-3 by the network 45.0.0.0 and lastly network 192.168.8.0 connect the office of Mohakhali pop-2. we are used rip protocol here.

router rip

network 45.0.0.0

network 103.0.0.0

network 192.168.8.0

Assigned ip address in interface GigabitEthernet0/2 ip adder 192.168.8.1255.255.255.0 for office. interface Serial0/3/0 assigned ip address 103.230.5.2 255.0.0.0 for connected with Mohakhai pop-1 lastly interface Serial0/3/1 ip address 45.28.20.1 255.0.0.0 for Mohakhali pop-3 that's how the router connected with each other.

3.12 Mohakhali pop-3:

Since the configuration is almost the same, we go straight to the configuration

mohakahlipop3

hostname Mohakahlipop3

aaa new-model

!

aaa authentication login default local

```
username admin secret 5 $1$mERr$vTbHul1N28cEp8lkLqr0f/
interface GigabitEthernet0/1
ip address 128.23.25.1 255.255.0.0
duplex auto
speed auto

interface Serial0/0/0
ip address 45.28.20.2 255.0.0.0
clock rate 64000
!
interface Serial0/0/1
ip address 100.50.20.1 255.0.0.0
clock rate 64000

!
router rip
network 45.0.0.0
network 100.0.0.0
network 128.23.0.0
line con 0
!
line aux 0
!
linevty 0 4
!
!
!
```

End

If you looked the running configure as same as the previous router has same configuration. There three network, once connected with Mohakhali pop-2, once pop-4 and last connected with office network. Now we have configured the last router of Mohakhali branch.

3.13 Mohakhali Pop-4:

```
mohakahlipop4
!
hostname Mohakahlipop4

aaa new-model
!
aaa authentication login default local

username admin secret 5 $1$mERr$vTbHul1N28cEp8lkLqr0f/

interface GigabitEthernet0/1
ip address 5.5.5.1 255.0.0.0
duplex auto
speed auto
!
interface Serial0/0/0
ip address 15.0.0.1 255.0.0.0
!
interface Serial0/0/1
ip address 100.50.20.2 255.0.0.0
!
```

```
interface Serial0/1/0
ip address 7.0.0.2 255.0.0.0
clock rate 64000
!
interface Serial0/1/1
ip address 9.0.0.2 255.0.0.0

routerospf 10
log-adjacency-changes
redistribute rip subnets
!
router rip
redistributeospf 10 metric 10
network 5.0.0.0
network 9.0.0.0
network 15.0.0.0
network 100.0.0.0

line con 0
!
line aux 0
!
linevty 0 4
!
!
!
end
```

This router is very important for redistribute rip routing from OSPF routing protocol. So at first we are assaying ip address every interface and no shutdown this entire interface. After then configure rip routing and OSPF routing.

Finally redistribute rip routing protocol to OSPF.

use this command

router rip

redistributeospf 10 metric

network 5.0.0.0

network 9.0.0.0

network 15.0.0.0

network 100.0.0.0

routerOSPF 10

redistribute rip subnet

In a word this is essential for redistribute different routing protocol any other routing protocol.

3.14 Kustia pop-1:

In this router we have connected many network and used another protocol OSPF.OSPF open shortest path first is a link state protocol. now we see the running status of configuration.

kushtiapop1

hostname Kushtiapop1

aaa new-model

aaa authentication login default local

interface GigabitEthernet0/0

ip address 20.0.0.1 255.0.0.0

duplex auto

```
speed auto

interface Serial0/3/0
ip address 1.0.0.2 255.0.0.0
clock rate 64000
!
interface Serial0/3/1
ip address 2.0.0.1 255.0.0.0
clock rate 64000

routerospf 10
log-adjacency-changes
network 1.0.0.0 0.255.255.255 area 1
network 2.0.0.0 0.255.255.255 area 1
network 20.0.0.0 0.255.255.255 area 1

line con 0
!
line aux 0
!
line vty 0 4
!
!
!
end
```

In this router we connect three networks, created OSPF 10 and created area1. Assign three network ip in area 1 of OSPF. At first we assigned interface GigabitEthernet0/0 ip address 20.0.0.1

255.0.0.0, Interface Serial0/3/0 ip address 1.0.0.2 255.0.0.0 and interface Serial0/3/1 ip address 2.0.0.1 255.0.0.0 and connected with Kushtia pop-2, that's how entire network work.

3.15 Kustia Pop-2:

Running Config:

kushtiapop2

hostname Kushtiapop2

!

aaa new-model

!

aaa authentication login default local

username admin secret 5 1mERr$vTbHul1N28cEp8lkLqr0f/

interface GigabitEthernet0/0

ip address 30.0.0.1 255.0.0.0

duplex auto

speed auto

interface Serial0/3/0

ip address 2.0.0.2 255.0.0.0

!

interface Serial0/3/1

ip address 3.0.0.1 255.0.0.0

clock rate 64000

!

interface Vlan1

noip address

shutdown

```
!
routerospf 10
log-adjacency-changes
network 2.0.0.0 0.255.255.255 area 1
network 30.0.0.0 0.255.255.255 area 1
network 3.0.0.0 0.255.255.255 area 1

line con 0
!
line aux 0
!
linevty 0 4
!
!
!
End
```

As like as previous network Kushtia pop-2 also used OSPF protocol, three network connect on this, one of this network connect with the previous network, connect with office network and one connected next pop 3. Using OSPF is easy to established a big site of area network. This is the good example of OSPF.

3.16 Kushtia pop-3:

Running configures:

```
hostname kushtiapop3
aaa new-model
aaa authentication login default local
username admin secret 5 $1$mERr$vTbHul1N28cEp8lkLqr0f/
```

```
interface GigabitEthernet0/0
ip address 40.0.0.1 255.0.0.0

interface Serial0/3/0
ip address 3.0.0.2 255.0.0.0

interface Serial0/3/1
ip address 4.0.0.1 255.0.0.0
ip access-group 30 out
clock rate 64000

routerospf 10
log-adjacency-changes
network 3.0.0.0 0.255.255.255 area 1
network 40.0.0.0 0.255.255.255 area 1
network 4.0.0.0 0.255.255.255 area 1

access-list 30 deny host 40.0.0.6
access-list 30 deny host 40.0.0.7
access-list 30 deny host 40.0.0.8
access-list 30 permit any

line con 0
!
line aux 0
!
```

linevty 0 4

!

!

!

end

Kushtia pop-3 also contain ospf protocol on it, three networks also connect with this and connect three network and total entire network.

3.17 Kustia pop-4:

Running Config:

kushtiapop4

hostname kushtiapop4

aaa new-model

aaa authentication login default local

username admin secret 5 1mERr$vTbHul1N28cEp8lkLqr0f/

interface GigabitEthernet0/0

ip address 50.0.0.1 255.0.0.0

duplex auto

speed auto

interface Serial0/2/0

ip address 8.0.0.1 255.0.0.0

clock rate 64000

```
interface Serial0/3/0
ip address 4.0.0.2 255.0.0.0
!
interface Serial0/3/1
ip address 5.0.0.1 255.0.0.0
clock rate 64000

routerospf 10
log-adjacency-changes
network 4.0.0.0 0.255.255.255 area 1
network 50.0.0.0 0.255.255.255 area 1
network 5.0.0.0 0.255.255.255 area 1
network 8.0.0.0 0.255.255.255 area 1

line con 0
!
line aux 0
!
linevty 0 4

end
```

This network is configuring by OSPF. It is the also easiest protocol, we have created OSPF 10 and put network under area 1.In this router 4 network connect using ospf. This router connect with next and previous router and also connect own branch network. We create Standard ACL to this network and Show how acl work.

3.18 Kushtia pop-5:

Running config:

```
kushtiapop5
hostname kushtiapop5
aaa new-model
aaa authentication login default local

username admin secret 5 $1$mERr$vTbHul1N28cEp8lkLqr0f/
interface GigabitEthernet0/0
ip address 60.0.0.1 255.0.0.0
duplex auto
speed auto

interface Serial0/2/0
ip address 8.0.0.1 255.0.0.0
!
interface Serial0/2/1
ip address 16.0.0.1 255.0.0.0
!
interface Serial0/3/0
ip address 5.0.0.2 255.0.0.0
!
interface Serial0/3/1
ip address 3.0.0.2 255.0.0.0

routerospf 10
log-adjacency-changes
```

redistribute rip subnets

network 5.0.0.0 0.255.255.255 area 1

network 60.0.0.0 0.255.255.255 area 1

network 8.0.0.0 0.255.255.255 area 1

network 16.0.0.0 0.255.255.255 area 1

network 3.0.0.0 0.255.255.255 area 1

!

router rip

redistributeospf 10 metric 10

network 7.0.0.0

line con 0

password admin

!

line aux 0

password admin

!

line vty 0 4

end

Here two protocol use in same router, OSPF redistribute rip subnets. Redistribution is the important subject. Because of this we change the protocol.

3.19 Jossore Pop-1:

Running Config:

jessorepop1

hostname Jessorepop1

```
aaa new-model
aaa authentication login default group radius local

interface GigabitEthernet0/0
ip address 192.168.90.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/1
ip address 3.5.6.1 255.0.0.0
duplex auto
speed auto
!
interface Serial0/0/0
ip address 172.122.3.2 255.255.255.240
clock rate 64000

router rip
version 2
network 172.122.0.0
network 192.168.90.0
no auto-summary

radius-server host 3.5.6.2 auth-port 1645 key abc123

line con 0
!
```

line aux 0

!

linevty 0 3

login authentication default

linevty 4

password admin

login authentication default

linevty 5 15

login authentication default

end

Firstly, assigning ip address all of the interfaces. Then we have used routing protocol rip version 2 with complete routing.

Lastly configure radius server. Radius server is very important for server based security system that's include router logging username and password

So that we are access the router easily with included username and password.

3.20 Jossore pop-2

Running cpnfig:

hostname jessorepop2

aaa new-model

aaa authentication login default group radius local

interface GigabitEthernet0/0

ip address 192.168.80.1 255.255.255.0

duplex auto

```
speed auto
interface Serial0/0/0
ip address 172.122.3.1 255.255.255.240
!
interface Serial0/0/1
ip address 22.30.10.2 255.255.255.240

router rip
version 2
network 22.0.0.0
network 172.122.0.0
network 192.168.80.0

radius-server host 3.5.6.2 auth-port 1645 key abc123
line con 0
!
line aux 0
!
linevty 0 3
login authentication default
linevty 4
password admin
login authentication default
linevty 5 15
login authentication default

End
```

Firstly, assign ip address uses all interface then its use routing protocol rip version 2 with complete routing.

lastly configure radius server. Radius server is very important for server based security system that's include router logging username and password so that we are access the router easily with included username and password.

3.21 Khulna Pop-1:

Running config:

hostname khulnapop1

enable password admin

interface GigabitEthernet0/0

ip address 6.6.6.1 255.0.0.0

duplex auto

speed auto

interface Serial0/0/0

ip address 110.11.10.1 255.255.255.252

interface Serial0/1/0

ip address 128.64.20.2 255.255.0.0

clock rate 64000

!

interface Serial0/1/1

ip address 100.99.1.1 255.0.0.0

clock rate 64000

router eigrp 10

redistribute rip metric 1544 0 255 1 100

network 128.64.0.0

network 6.0.0.0

network 100.0.0.0

!

router rip

version 2

redistributeeigrp 10 metric 5

network 6.0.0.0

network 110.0.0.0

line con 0

!

line aux 0

!

linevty 0 3

login

linevty 4

password admin

login

End

This router redistributes protocol from rip to eigrp. Eigrp also important protocol to create a network. At the end, we know that from our router description our router used various protocol such as RIP, OSPF, EIGRP etc. This how we build our total network and run smoothly. Every router of this network assigned secret password and highly protected.

CHAPTER 4

ACL: ACCESS CONTROL LIST

4.1 Definition of an Access control List

Access control lists (ACLs) perform packet filtering to control the movement of packets through a network. Packet filtering provides security by limiting the access of traffic into a network, restricting user and device access to a network, and preventing traffic from leaving a network. IP access lists reduce the chance of spoofing and denial-of-service attacks, and allow dynamic, temporary user-access through a firewall.

IP access lists can also be used for purposes other than security, such as to control bandwidth, restrict the content of routing updates, redistribute routes, trigger dial-on-demand (DDR) calls, limit debug output, and identify or classify traffic for quality of service (QoS) features.

An access list is a sequential list that consists of at least one permit statement and possibly one or more deny statements. In the case of IP access lists, these statements can apply to IP addresses, upper-layer IP protocols, or other fields in IP packets.

Access lists are identified and referenced by a name or a number. Access lists act as packet filters, filtering packets based on the criteria defined in each access list.

After you configure an access list, for the access list to take effect, you must either apply the access list to an interface (by using the ip access-group command), a vty (by using the access-class command), or reference the access list by any command that accepts an access list. Multiple commands can reference the same access list.

In the following configuration, an IP access list named branch offices is configured on Fast Ethernet interface 0/1/0 and applied to incoming packets. Networks other than the ones specified by the source address and mask pair cannot access Fast Ethernet interface 0/1/0. The destinations for packets coming from sources on network 172.16.7.0 are unrestricted. The destination for packets coming from sources on network 172.16.2.0 must be 172.31.5.4.

ip access-list extended branch offices

10 permit 172.16.7.0 0.0.0.3 any

20 permit 172.16.2.0 0.0.0.255 host 172.31.5.4

!

Interface fastethernet 0/1/0

ip access-group branch offices in

4.2 Types of ACL:

For those of you who are familiar with access control lists, you're probably aware that there are many different types of access control lists. We have access control lists for IP version 4, for IP version 6, for IPX, for DECnet, for AppleTalk and the list goes on and on and on. What are you responsible for? We are responsible for IP version 4 at this point, and that's where our focus is, IP version 4. And we can break out IP version 4 access control lists into two different types, standard and extended. What's the difference here?

Standard ACL

- Checks ACL source address
- Permits or denies entire protocol suite

Extended ACL

- Checks source and destination address
- Generally, permits or denies specific protocols and applications
- Source and destination TCP and UDP ports
- Protocol type (IP, ICMP, UDP, TCP or protocol number)

We have applied ACL to Kushtia Pop-3 in our network. Here we have controlled some traffic using standard ACL. Kushtia pop-3 pc no 109,110,107 only access own network they do not have the permission to access server. Those is the work of acl.

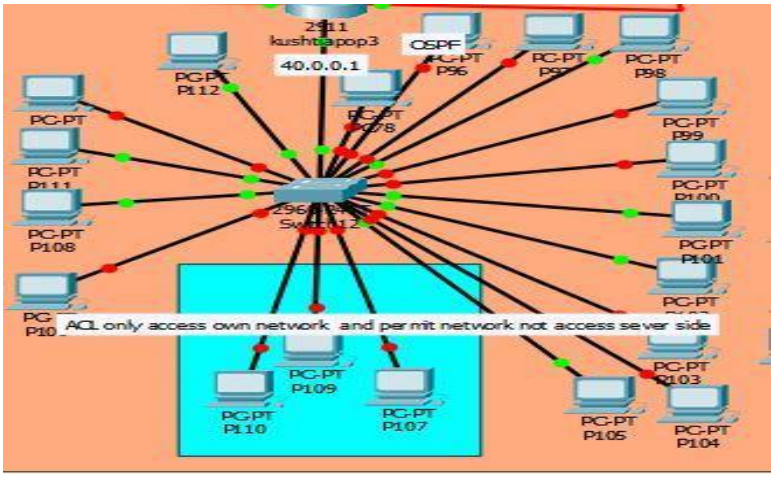


Figure 4.1: Marking pc are applied acl

4.3 Standard acl: we are applying standard acl this network. Main rules of standard acl: standard acl only access own network and permit any other network or host but no access others deny network or host. Now let see example:

1) First image gets a ping from own network.

2) Second image get a ping from others permit network.

3) Third image get no ping from deny network...reply from this massage destination host unreachable.

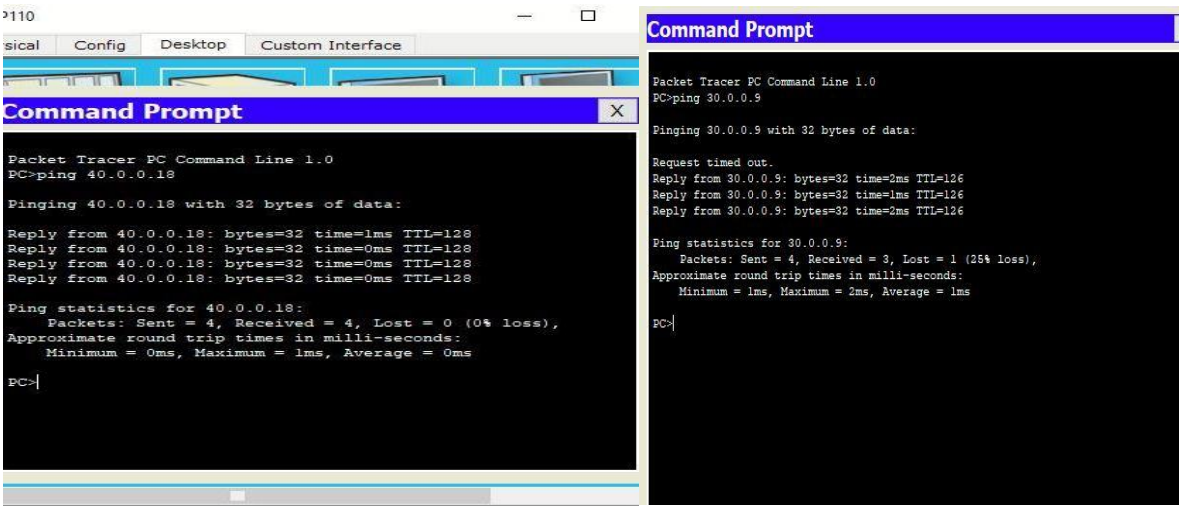


Figure 4.2: Get ping from own and others network

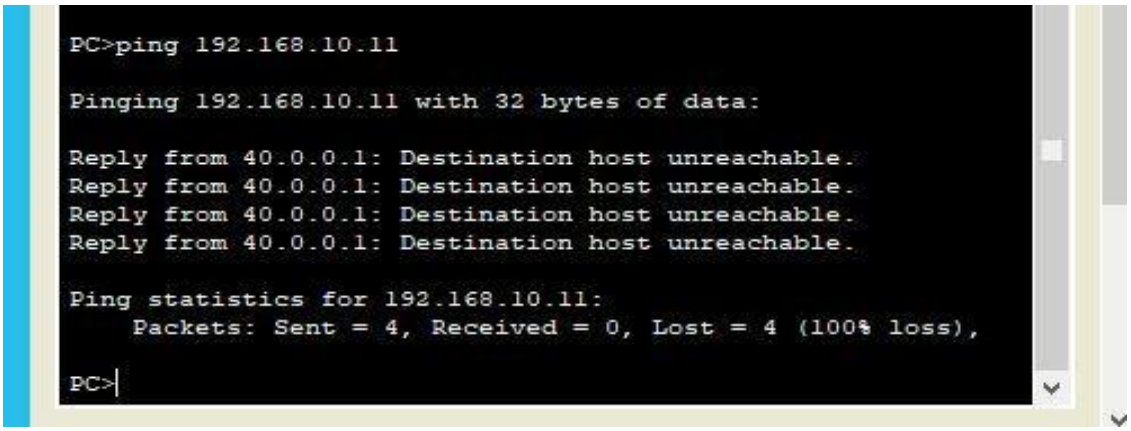


Figure4.3: No ping from deny network

CHAPTER 5

SERVER (MAIL, FTP, RADIUS, DHCP, DNS)

5.1 Definition of SERVER:

A **server** is a computer or system that provides resources, data, services, or programs to other computers, known as clients, over a **network**. In theory, whenever computers share resources with client machines they are considered **servers**.

5.2 What is mail server? How its work?

A **mail server** (or email **server**) is a computer system that sends and receives email. **Mail servers** send and receive email using standard email protocols. For example, the SMTP protocol sends messages and handles outgoing **mail** requests. The IMAP and POP3 protocols receive messages and are used to process incoming **mail**.

5.3 What Is FTP server? How its work?

The File Transfer Protocol (**FTP**) is a standard network protocol used for the transfer of computer files between a client and **server** on a computer network. **FTP** is built on a client-**server** model architecture using separate control and data connections between the client and the **server**.

5.4 What Is RADIOUS server? How its work?

RADIUS is a protocol that was originally designed to authenticate remote users to a dial-in access **server**. ... The device reads the user name and password. The device creates a message called an Access-Request message and sends it to the **RADIUS server**. The device uses the **RADIUS** shared secret in the message.

5.5 What is DHCP server and how its work?

A **DHCP Server** is a network **server** that automatically provides and assigns IP addresses, default gateways and other network parameters to client devices. It relies on the standard protocol known as Dynamic Host Configuration Protocol or **DHCP** to respond to broadcast queries by clients.

5.6 What is DNS server and how its work?

The Domain Name System (DNS) is a central part of the internet, providing a way to match names (a website you're seeking) to numbers (the address for the website). Anything connected to the internet - laptops, tablets, mobile phones, websites - has an Internet Protocol (IP) address made up of numbers.

Now we are trying to see you, how this type of server work in our network:

5.7 Web Server:

Every pc can browse from any network and get a result from every web server. Now let see. Now we are browsing from pc138....and web address is it www.mojaloss.net.so result is here.

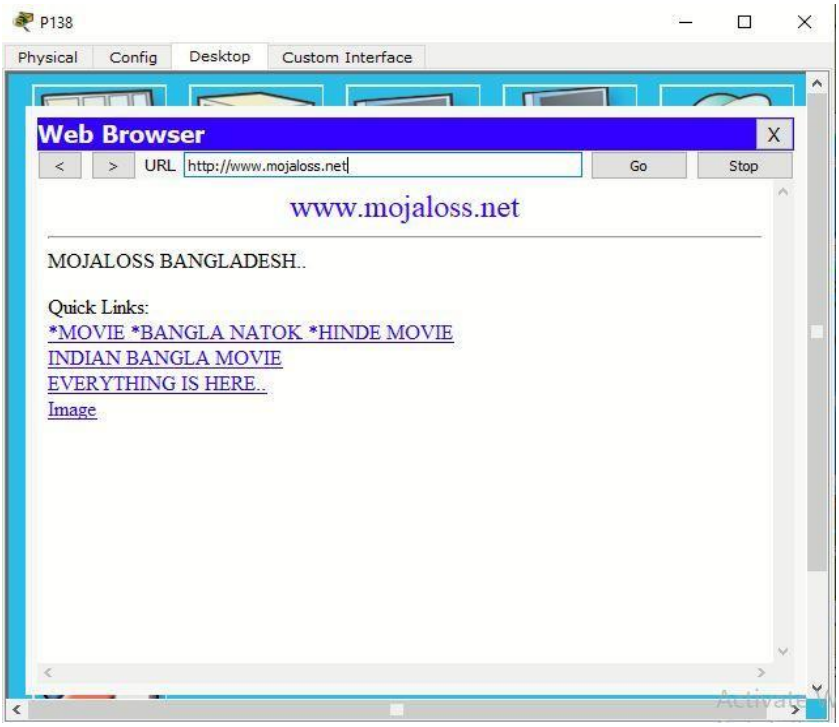


Figure 5.1: Web Server

5.8 DNS Server:

Every pc or client can browse from DNS server...that means DNS server store all domain address and ip. That can access or browse all web side all client or pc. Now let see an example..

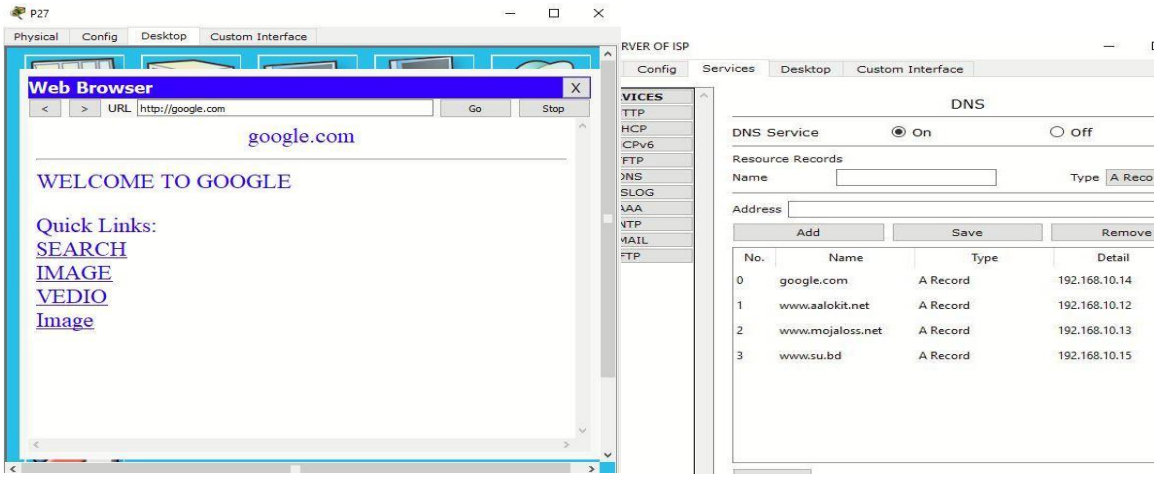


Figure 5.2: DNS Server

5.9 FTP Server:

FTP server can access only all authorize pc or client because of ftp server set a username and Password. Only authorize pc can access it then download and upload any file or documents. Now let see example.

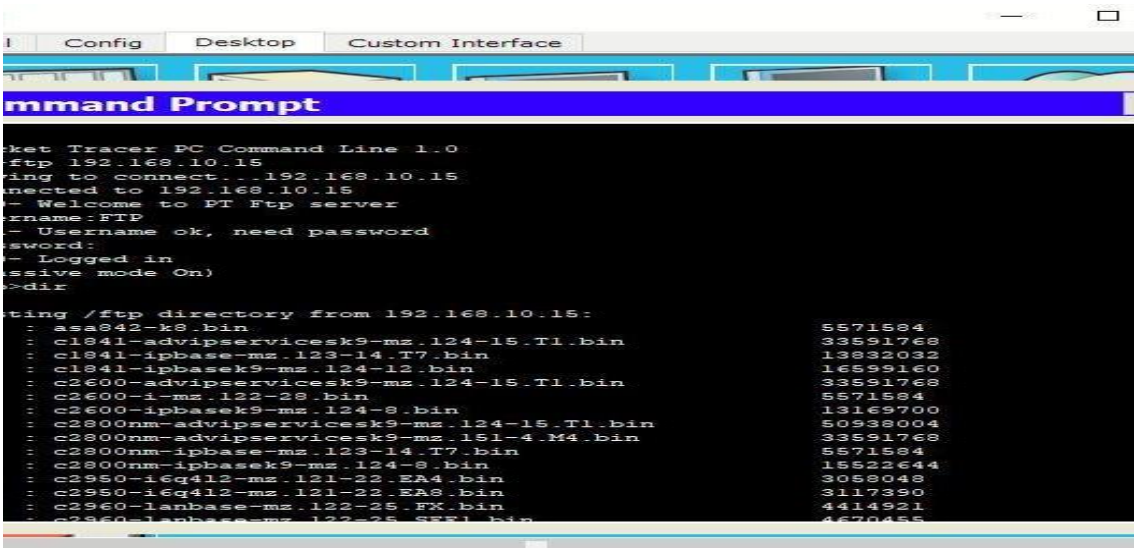


Figure 5.3: FTP Server

5.10 MAIL Server:

Mail server is very important for every network. Every pc sent a mail any other network pc with a mail server. Now let see it.

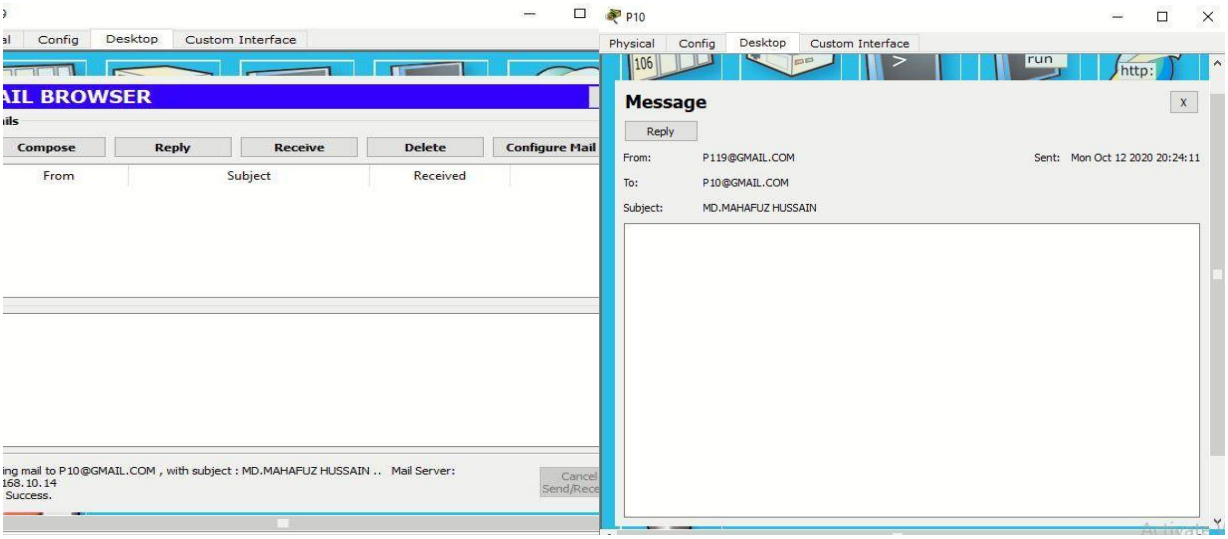


Figure5.4: Mail Server

5.11 DHCP Server:

DHCP server are used for this network because all of pc under the DHCP server get ip address automatically. Every DHCP server has an ip range so that every pc can ip address from ip range of DHCP server. Now let see the example.



Figure 5.5: DHCP Server

4.12 Radius Server:

Radius server is server based security system of a network. It has included username and password all of router under the radius server so that every pc can access the router with radius server's username and password. now let see the Example.

1) First image is radius server that has username and password of router.

2) Second image access the router with radius sever username and password.

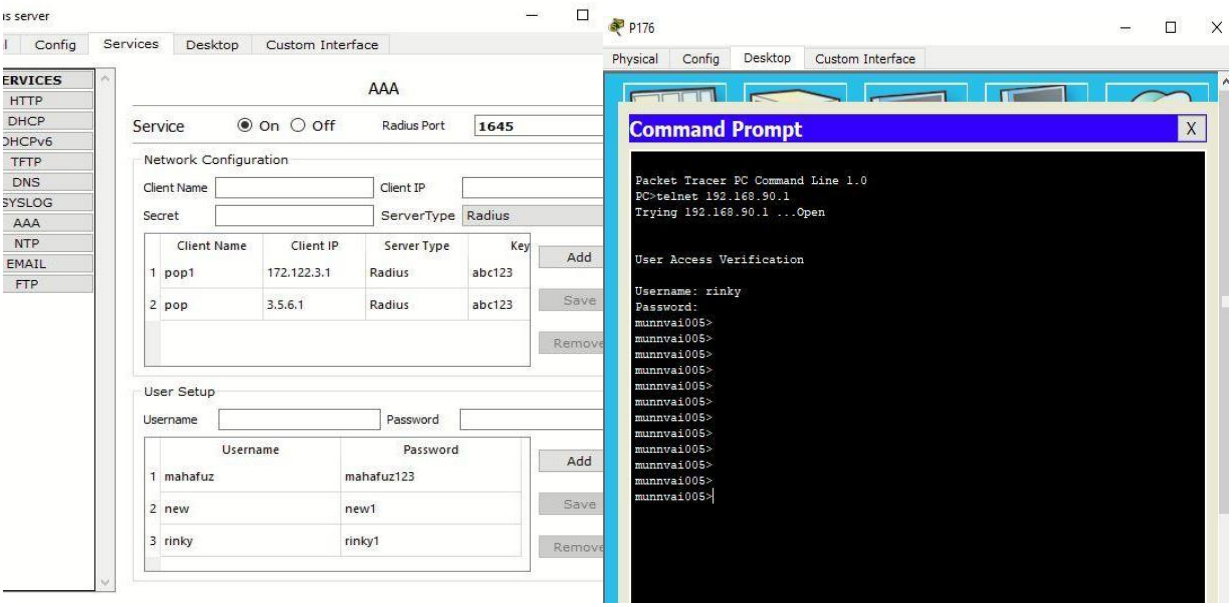


Figure 5.6 Radius Server

CHAPTER 6

CONCLUSION

We presented several approaches for increased availability for network designs by using different types of routing with ACL and the projects in this section understand different types of computer networking topologies. Different types of sectors like home, office, campus etc. are included to share recourses from different areas for a large group of companies. The necessary equipment's which are required to setup the network, the details related to the IP address design, required applications and services along with a detailed network design diagram is provided.

REFERENCES

[1] https://link.springer.com/chapter/10.1007/978-1-4020-8752-3_10

[2] https://www.netacad.com/courses/networking

[3] https://www.netacad.com/courses/networking/ccna-switching-routing-wireless-essential

[4] https://www.pluralsight.com/blog/it-ops/access-control-list-concepts

[5] https://www.instructables.com/How-to-Configure-DHCP-in-Cisco-Packet-Trac

[6] https://computernetworking747640215.wordpress.com/2019/11/22/how-to-configure-an-ftp-server-in-packet-tracer/

[7] https://computernetworking747640215.wordpress.com/2018/07/05/dns-server-configuration-in-packet-tracer/