COMPUTER NETWORK

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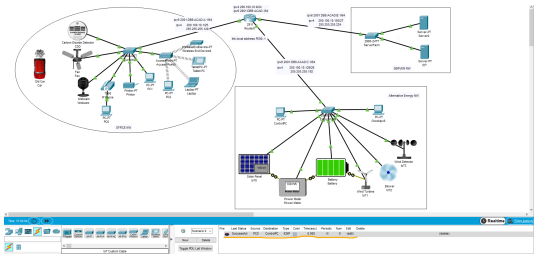
Abstract

In this project, you will learn how the IPv4 address and IPv6 address are divided according to the required IP addresses and the link-local address which is only significant on the local network. That's why we can not ping from one network to another network using a link local address. Moreover, if you try to give the same network IP address to different interfaces, you will encounter an 'overlapping' error. Furthermore, you will see there are two options available to us in order to implement a password. They are 'enable password' and 'enable secret' and you will learn the different between them. You will also see that IoT devices, DNS server, Web server and telnet configuration settings are made and some conditions are added.



NOTE : In line with the possibilities given by latex, the dimensions of the figures have remained small. Please enlarge the size to view the figures.

1 Introduction

In this project, I was required to implement a network system with router. We will learn how to create multIPle networks, divide these networks as much as IP addresses as they need, how to create IPv4 and IPv6 DHCP, what is the difference between a link-local address and a global address, 2 different encryption techniques for enable mode in the router. We will also learn how to configure the configuration for DNS server and Web server, how to access the router's CLI from PC0. Furthermore, We will see both communicate techniques which are IPv6, IPv4 and link-local address. And also, you can see the required things below.

	IP NEED(MAX)	IPv4 NW	IPV4 Prefix	IPv6 NW	IPv6 Prefix
Full		200.100.10.0	/24	2001:DB8:ACAD::	/48
OFFICE NW	100	200.100.10.1	/25	2001:DB8:ACAD:A::1	/64
Alternative Energy NW	50	200.100.10.129	/26	2001:DB8:ACAD:C::1	/64
SERVER NW	20	200.100.10.193	/27	2001:DB8:ACAD:B::1	/64

DEVICE	IPv4 Address)	IPv6 Address
Server	200.100.10.194	2001:DB8:ACAD:B:2D0:D3FF:FEDC:AC70
PC0	200.100.10.12	2001:DB8:ACAD:A:20A:F3FF:FE55:D983
ControlPC	200.100.10.131	2001:DB8:ACAD:C:20A:F3FF:FE75:53E0

2 Assignments

First, I found the given devices in the document and placed them in order as shown in the figure. After that as according to my searching, I tried to link-local address. Because, I was wondering what is the different between global address. Link-local IPv6 address that's been generated from the devices we can say MAC address. So, the link-local addres allows the device to communicate on the local network and any device on an IPv6 netwok needs to have a minimum at least a link-local address. To show you, I have two pc which name are ControlPC and CheckIPv6 and they are connected to a EnergyField Switch. Therefore, they should be able to communicate with each other on the local network using IPv6 address. I copied the link local address from PCControl. Then I open up CheckIPv6 pc and in this pc I went to the IP Configuration window and this pc has a link local address also. Therefore, I went to open up the command prompt and I wrote a ping then, right click to paste the IPv6 address of PCControl. When I press the enter, I was getting replies. This means that I have verified that we can communicate with the link local address on PCControl to CheckIPv6. You can see in figure 1.

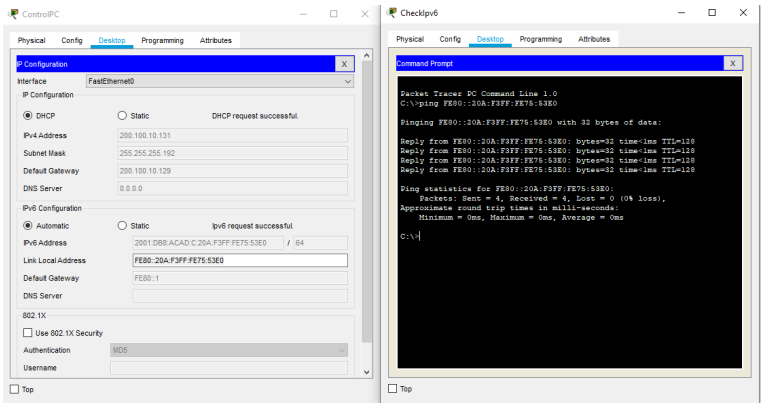


Figure 1

According to my searching; router will not have automatic link local addresses enabled and in fact the router has IPv6 routing disabled by default. Therefore, I had to do some configurations on this router to get router to play along in given IPv6 network. Therefore, I went the CLI. Then I typed 'no' that I can just go straight to router prompt. Then I typed 'enable' to get to privileged user mode and then I typed 'conf t' to get to global configuration mode. Then, the first thing that I need to do is typed 'IPv6 unicast-routing' to enable IPv6 unicast routing on the router so, without it IPv6 is basically disabled by default. Then I need to go interface gigabit g0/0, g0/1 and g0/2. Then I typed 'int g0/0' that puts me into interface configuration mode and I can manually configure my link local address. Link local addresses are only locally significant. After that I typed the given link local address like 'IPv6 address FE80::1' link-local'. This creates a manual link local address on the router. Then I typed 'no shut' so, interface was up. Then I did the same thing the other interfaces. In fact I can use the same link local address on the other interface. They do not need to uniquely identify one network from another network. That's why I used the same link local address. Therefore, all interfaces on the router have a link local address of FE80::1. Then I tested it by open ControlPC's command prompt and typed ping FE80::1. When I did this I saw that I was getting replies so, it worked out. Then I tried to send ping from PC0 to ControlPC. However, it did not work because as my searching, link local addresses are only significant on the local network. They are only using for communicating on the local network so,

they are not routable. I learnt that we can not ping from one network to another network using a link local address. You can see in figure 2.

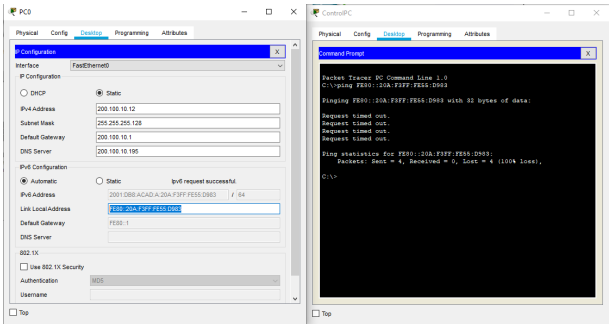


Figure 2

I realized that, I need to set up some global unicast address that are routable so that I can communicate from one network to another network. Therefore, I have to create three IPv6 networks with seperate addresses for each subnet. Fisrtly, I went the router' CLI then, I typed in order 'enable', 'conf t'. Then I need to go each interfaces. I typed 'int g0/0' and 'IPv6 address 2001:DB8:A::1/48' to give IPv6 address. Then I typed 'no shut'. It worked out, but the next interface I was typed 'IPv6 address 2001:DB8:B::1/48' and I was getting error which is 'overlapping'. I researched the error, it took long time to solved. it means that I was trying to give the same network IP address to different interfaces. So, this is the promlem. Also, I was realized that every example on the internet IPv6 address was always like '2001:DB8:A::1/64' and change the IPv6 address as a 2001:DB8:B::/64 it works. Then I remove the old IPv6 from the router and I did all of thing at the beginning. After that, I went ControlPC pc's IP configuration, I changed the static to Automatic from IPv6 configuration. I got the this notification(Figure 3).

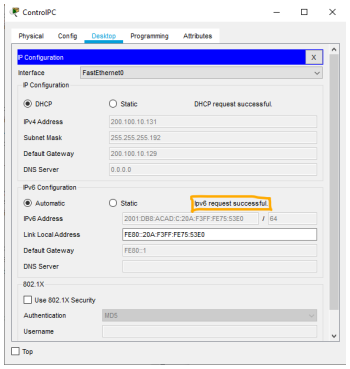


Figure 3

Then I copied link local address from PC0. When I do that step, in CheckIPv6 pc' command prompt, I typed the link local address however, I changed to be global address like FE80::20A:F3FF:FE55:D983 – 2001:DB8:ACAD:A:20A:F3FF:FE55:D983. Then, I was getting the replies. That means it worked and pinging one network to another network.(Figure 4).

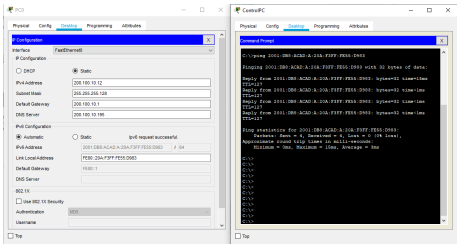


Figure 4

After that, I worked on IPv4 IP address and DHCP. Firstly, I turn on the DHCP from server' service. Then I went to the router's CLI. I typed 'enable' –>'conf t' –>'IP DHCP pool netA', –>'network 200.100.10.0 255.255.255.128' –>'default-router 200.100.10.1' –>'exit'. I did the same thing for netB and netC. Then, I tried to ping from PC0 to Server (Figure 5). And also, you can see on the router.

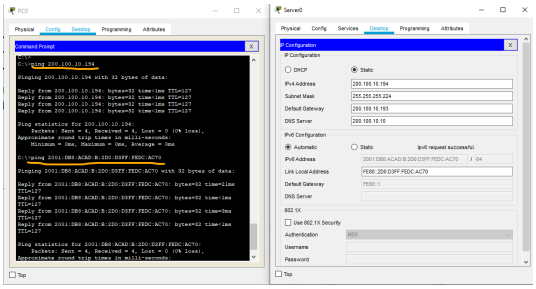
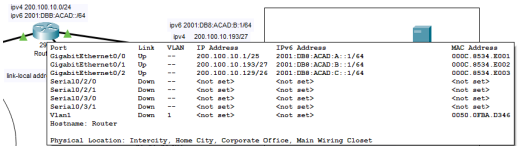


Figure 5: PC0 IPv4 and IPv6 connectivity with the Server



For enable secret password part, enable password for cisco routers and switchers. The enable command is used to access privileged mode also known as enable mode and this mode offers the user a lot more options what they can can do to the switch a router it's a lot more powerful so, it's a advise to limit access by requiring a password. There are two options available to us in order to implement a password. So, first of two methods of implementing an enable password is 'enable password'. So, the parameter we want to enter the primary characteristic of this method is that the password we choose is stored in the configuration file as clear text so, anyone can view that password. It's not terribly secure and it's not the best route to go. The second option is the 'enable secret' password command so the command itself is enable secret and then enter the parameter we want to enter. The password when we use this command the password we enter is going to be automatically hidden or encrypted by the i/os and is done by using a mathematical function and it's known as the md5 hash. So this function produces a value and the password we choose is run through this function and this hash value is created and instead of seeing the actually password we enter, we see this funny-looking string of characters which no one knows

what it is. So, this is a more secure method of storing that. To do that firstly, I tried 'enable password'. Then I went the router' CLI, I typed 'enable','conf t' then 'enable password sultan' to do that I gave a password. Then when I typed this 'sh run', we can the password. So anyone can view the password. After that I tried the same thing but this time I typed 'enable secret netseclab'. So, it shows like figure 6.

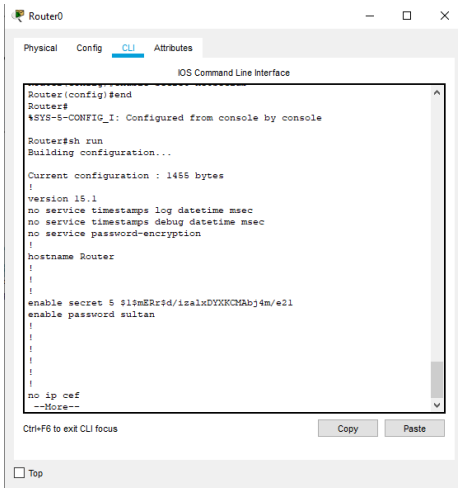


Figure 6

For telnet part, thanks to telnet, the configurations we make on the router can be done on another device. You can see in figure 7.

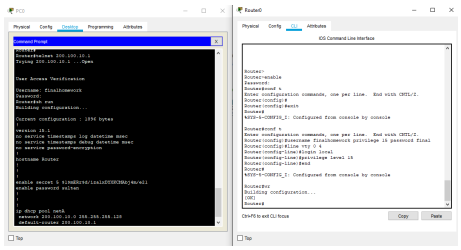


Figure 7

For DNS server and Web server, I added a new server for Iot devices. Then, I did some configuration on server(Figure 8) so that PC0 can reach this web server by writing DNS IP address.

For last step which is IoT devices part, I added it the devices and do some conditional like midterm homework.

3 Conclusion

As a result, I learnt a lot of new things in this assignment. Although I used the Cisco Packet Tracer for many times so, I had experiences lots things. I learnt how the IPv4 address is divided

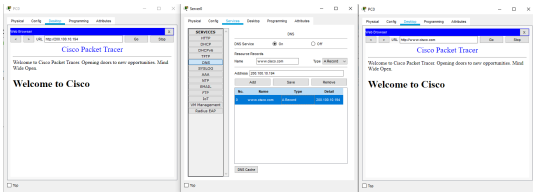


Figure 8

according to the required IP addresses and the link-local address which is only significant on the local network. That's why we can not ping from one network to another network using a link local address. And also, I got lots of error when I was doing this project. The most important error was 'overlapping' error. Because I was trying to gve the same network IP address to different interfaces. Moreover, I was confused divide IPv4 IP address as much as IP addresses as they need. After this project, I learnt that how I can do. Furthermore,I learnt two options available to us in order to implement a password. They are 'enable password' and 'enable secret' and I learnt the different between them which are anyone can view enable password. Also, enable secret ; the password when we use this command the password we enter is going to be automatically hidden or encrypted by the i/os and is done by using a mathematical function and it's known as the md5 hash. Then I learnt DNS server, Web server and telnet configuration settings are made and some conditions are added. Moreover, I learnt the configurations we make on the router can be done on another device thanks to telnet.

References

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