CSE 405: Computer Networks
Section: 03, Summer-2021

A Project Report
on

Design a full-fledged network for an organization with multiple subnets.

Submitted By:

Name: Md. Saifur Rahman
ID: 2018-1-60-048

Submitted to:
Dr. Anisur Rahman
Associate Professor, Dept. of CSE

Date of Submission: 20-09-2021

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

EAST WEST UNIVERSITY

Title:

Designing a Full-fledged Network for an Organization with Multiple Subnets.

Introduction:

To establish a connection where two computers are at two different place of the world, computer network is the only way to establish this connection[1]. Computer Network has also increased the computing ability of a computer[2] by supplying necessary information to a computer. In the past data-pack generated by computer wasn't big and complicated so network speed and advanced protocol was not that much mandatory. In this era, data flow from electronic device has been increased many fold, which is why we have to incorporate many advanced protocol and advanced connection[3] system to increase the data flow and fast connectivity. Side-by-side, advanced network topology[4] including wireless transmission[5] facility has also become more and more popular to keep the scope of future expansion[2] and easy connectivity

Network Topology:

Before designing a network, defining the functionality, connectivity and purpose the network should have to be defined clearly. And, the connectivity and functionality are basically defined in the network topology[6]. There are different kind of network-Bus[7], Mesh[8], Star[9] and Ring[10]- where every network has its own use. Recently, Hybrid topology[11] is very popular. Hybrid topology mainly combination of two or multiple topologies.

Project Statement:

This is a mini project on INTERNATIONAL Apollo University is an enterprise that owns a large number of computers, with a complex network infrastructure. Apart from wired internet access to all the classrooms, labs, employee PCs, library and other administrative and academic wings, the university also provides wireless internet access for everyone This complex network infrastructure is sub-netted and switching/routing mechanisms are in practice.

The task is to create a complete model of a complex network by discovering the interconnectivity of the systems and subnetworks, which will reflect the INTERNATIONAL Apollo University's structure and facilities, features within the network.

Design Details:

In my design, used some important components to establish a network. These are:

1. DHCP Server
2. DNS Server
3. WEB Server
4. PC

5. Switches [2960]
6. PT Routers
7. Wireless Routers (access point-PT)
8. Wire
9. Laptop

DHCP server is to help the system to assign a unique IP address to a computer or host according to the IP-class which we used. This automatically IP assigning will help the university ISC. In my design, there is one DHCP which is connected to a switch that is connected to six campuses. All IP address of pc of six campuses are come from DHCP server.

DNS and Web server are provided a website where students and faculties can visit the site of university. All pcs are connected to the web server so that they can visit the important site like admissions, advising, results, e-Tender, library management, accounts and so on. We have also used wireless router which help the university students and faculties to browsing internet through their mobile or laptops

The whole university are connected like mesh. So, each campus can communicate with each other. So, there are present both wired and wireless network. Thus, students and faculties can access the network in various locations around campus. Switches are using to create subnet. Total design is to create in cisco packet tracer which is network software.

IPv4 Structure:

IPv4 address is a 32-bit address. For example, 16.16.32.254 IP address is composed of two types of addresses:

1. Network address,
2. Host address and
3. IP address

Mainly IP component that determines which bits refer to the network and which bits refer to the host is called subnet mask.

HTTP Server:

HTTP server is used to host the webpages. Here we have imported our university webpages to the HTTP server.

DNS Server:

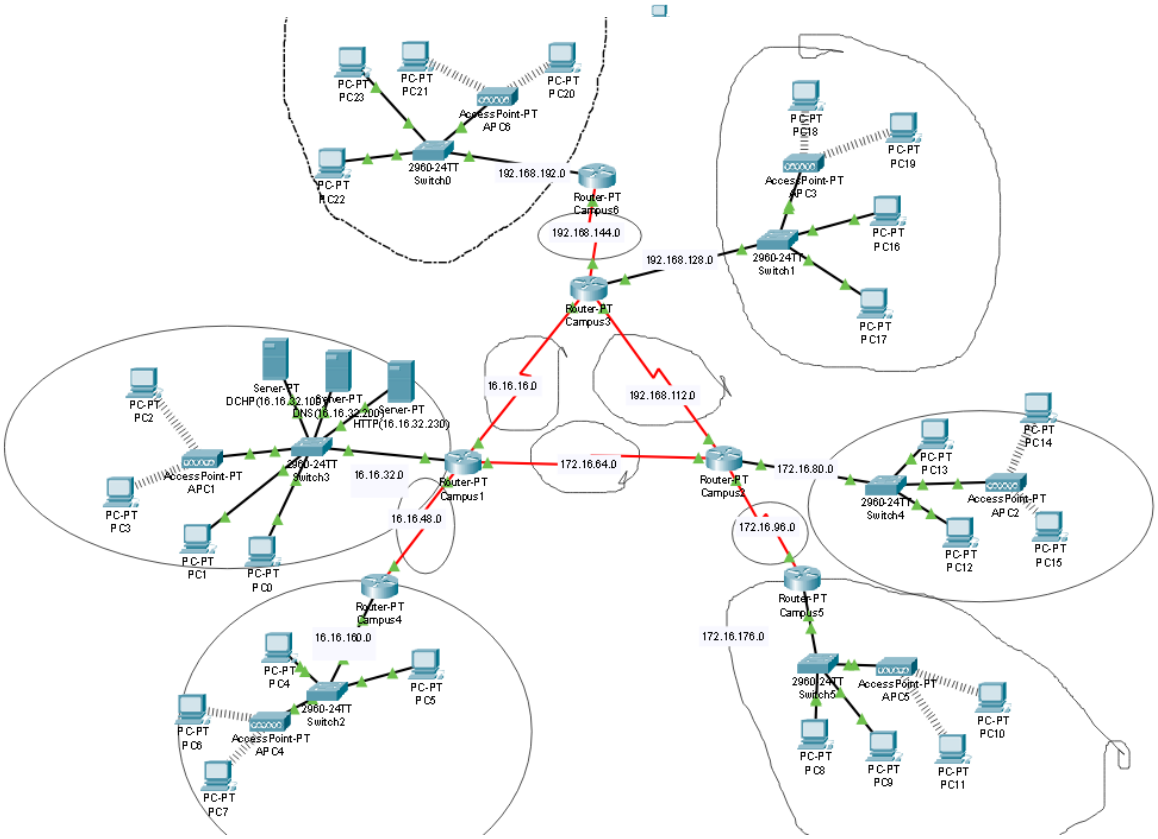
DNS server is used convert the domain name to equivalent IP address. For example: Url is www.apollointernational.edu for this URL we use an Ip address which is a HTTP server. Web page Ip: 16.16.32.230. Mainly when we search then URL or domain name then DNS convert it to a Ip address.

DHCP Server:

This server mainly helps use to give Ip address to connected computers or devices Automatically. We don't need to insert Ip address one by one. It is very time consuming for build a design.

Design and implementation:

This is a University Area Network and it consists of router, switches and end devices. Here we use wireless connection to connect some end devices. Here all networks Ip address, Gateway Ip, DHCP server address, Web Server address, DNS Server address and all end device's address are given.



Network Connection:

As configuring the routers are same. So here I shall give some sample codes I only give router 1's network connection because all router's codes are quite same. Here, Router 1's code:

```
enable
config t
interface fa0/0
ip address 16.16.32.254 255.255.255.0
no shut
do wr
exit

interface se2/0
ip address 15.16.16.1 255.255.255.0
clock rate 64000
no shut
do wr
exit

interface se3/0
ip address 172.16.64.1 255.255.255.0
clock rate 64000
no shut
do wr
exit

interface se4/0
ip address 14.16.48.1 255.255.255.0
clock rate 64000
no shut
do wr
exit
```

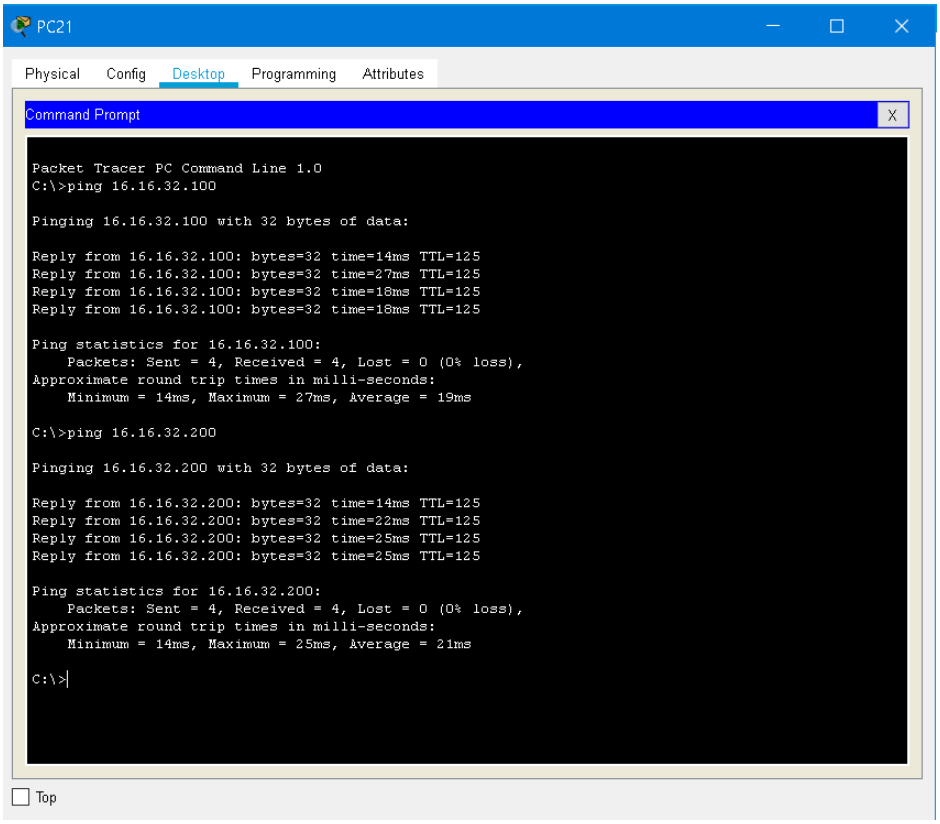
Routing Table:

As configuring all the routers are quite the same Here, I only give router 1's routing table because all routing table code are quite same. Here, routing table's code:

```
enable
config t
router ospf 1
network 16.16.32.0 0.0.0.255 are 1
network 15.16.16.0 0.0.0.255 are 1
network 14.16.48.0 0.0.0.255 are 1
network 172.16.64.0 0.0.0.255 are 1
exit
```

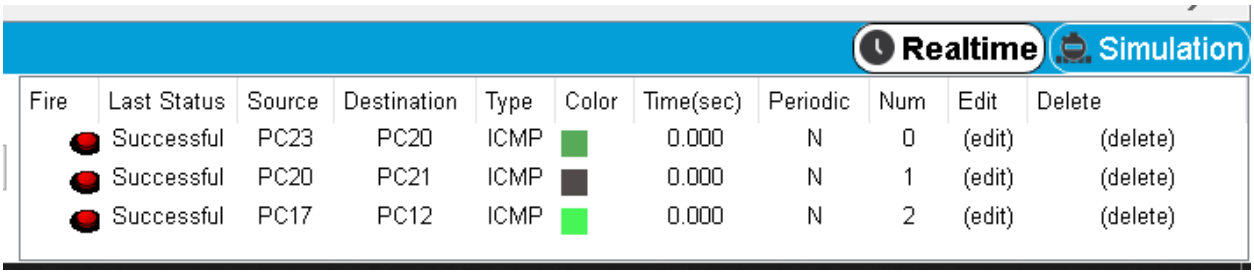
Ping Test:

Use this Ping command for check the Network connectivity and communication.



PDU:

We can also add sample PDU to understand whether a networks pc is communicating with other networks pc:



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC23	PC20	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC20	PC21	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC17	PC12	ICMP		0.000	N	2	(edit)	(delete)

Limitations:

- Incorporation of subnets.

Future plan:

I will incorporate subnet facility so that department wise subnet network can be created. There are some extra ports which can be used to further extension of the university.

Conclusion:

All though I have faced some problem but at the end I was able to implement my plan according to project description. I have implemented DNS, DHCP, WEB server in Cisco Packet Tracer, where the configuration of DHCP is automatically assign IPv4 address to the hosts.

References:

[1] L. L. Peterson and B. S. Davie, *Computer Networks: A Systems Approach*, 5th ed. Elsevier, 2011.

[2] A. Simmonds, P. Sandilands, and L. Van Ekert, “Applied Computing,” *Netw. Secur.*, vol. 3285, pp. 317–323, 2004, Accessed: Sep. 19, 2021. [Online]. Available: http://www.springerlink.com/index/1LQ24LD9UDHX9G8Q.pdf.

[3] “IEEE P802.3ba 40Gb/s and 100Gb/s Ethernet Task Force,” *IEEE 802.3 ETHERNET Work. Gr.*, Accessed: Sep. 19, 2021. [Online]. Available: http://www.ieee802.org/3/ba/.

[4] “История о том, как пионер кибернетики оказался не нужен СССР,” *ria.ru*, Aug. 2010, Accessed: Sep. 19, 2021. [Online]. Available: http://ria.ru/technology/20100809/263341026.html.

[5] “IEEE 802.20 Mission and Project Scope,” *IEEE 802.20 — Mob. Broadband Wirel. Access*, Accessed: Sep. 19, 2021. [Online]. Available: http://grouper.ieee.org/groups/802/20/.

[6] “Network topology - Wikipedia.” https://en.wikipedia.org/wiki/Network_topology

(accessed Sep. 19, 2021).
[7] W. Isaacson, *The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution*. Simon and Schuster, 2014.
[8] A. committee PRQC, “mesh topology,” *ATIS Telecom Gloss. 2007*, Accessed: Sep. 19, 2021. [Online]. Available: http://www.atis.org/glossary/definition.aspx?id=3516.
[9] “Star network - Wikipedia.” https://en.wikipedia.org/wiki/Star_network (accessed Sep. 19, 2021).
[10] “Ring network - Wikipedia.” https://en.wikipedia.org/wiki/Ring_network (accessed Sep. 19, 2021).
[11] “What is Hybrid Topology ? Advantages and Disadvantages,” *OROSK.COM*, Accessed: Sep. 19, 2021. [Online]. Available: http://www.orosk.com/hybrid-topology/.