



**EAST WEST UNIVERSITY**

**Project Report**

**Submitted To**

**Dr. Anisur Rahman**

**Associate Professor**

**Department of Computer Science & Engineering,**

**East West University, Dhaka**

**Submitted By**

Yougshree Saha Urmy

**Student ID:** 2021-1-60-127

**Department of CSE**

**Course code:** CSE 405

**Section:** 02

**Course Title:** Computer Networks

**Submission Date:** 26/12/2023

**Title of the Project:** Design a full-fledged network for an organization with multiple subnets.

**Introduction:** A computer network is a group of devices connected with each other through a transmission medium such as wires, cables etc. Multiple devices can share a file or access a server and communicate with each other, provide remote access and collaborate.

**Implementation Details:** In this project, I have used Cisco Packet Tracer for the implementation. To implement this project, I have used: A DHCP server, DNS server, Web server, six routers. Every router is connected with a switch. Multiple devices-PC, Laptop, mobile have been used here. To connect the PC with the switch, I used copper straight through cable, for laptop and mobile WRT 300N, and then connected the switch to the router through Serial DCE. Here I used different classes in every campus and routers. Then I configured and OSPF six routers in CLI. Fourteen networks are established after connecting them all. I have also configured the DNS server, Web server. Here every device's IP address is different. All the device's DNS server address is connected with the DNS IP address. By doing this I can browse the Apex University from any device into the six campuses.

## **Objectives:**

1. How to configure a router with different classes.
2. How different classes networks are classified in one complex network.
3. How to build a complex network with multiple subnets using Dynamic Routing Algorithms
4. How to create a web page for Apex University and located through the address <http://www.apex.edu.bd> .

**Background:** Apex University, is an enterprise like East West University, owns many 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 every campus. On top of that the university runs complex networked systems to support several of its business processes like admissions, advising, results, eTender, library management, accounts and so on. This complex network infrastructure is subnetted and switching/routing mechanisms are in practice.

**Tasks:** Your task is to create a complete model of a complex network by discovering the interconnectivity of the systems and subnetworks, which will reflect the University's structure and facilities;

features within the network will include the followings:

- The web page of the university will reflect its own information.
- A single DNS server needs to be installed to locate webserver - meaning people will browse University's web site from any campus with the following address:  
<http://www.apex.edu.bd>
- Configure the whole network in such a way that IP for the hosts of different campuses will be automatically assigned by a single DHCP server. If a single DHCP is not doable by you, then use multiple DHCP servers; however, that will be discredited.
- Create at least six LAN, one for each campus; among the hosts in a network make sure some wireless hosts are added in addition to wired hosts.
- University's full network has covered its six campuses with six routers; Connections between the campus routers are given at the end of the handout; you will have to follow the exactly the given topology.
- Connectivity between all the hosts needs to be established.

- For routing protocol, please use dynamic routing algorithm i.e., OSPF
- Network addresses will be from all 3 classes

While designing, keep the issue of future expansion/growth in mind for each of the subnets (if required) and preserve spaces. In physical design, it is a good practice to have a server room where all the servers are located in one LAN segment.

**Design Details:** Equipments that are used to complete the model of Apex University complex network are-

1.Switch (6)

2. PC (14),

3.Laptop (7),

4. Mobile (2),

5.Router-PT (6)

6.WRT300N (6),

7.Cable Straight Through,

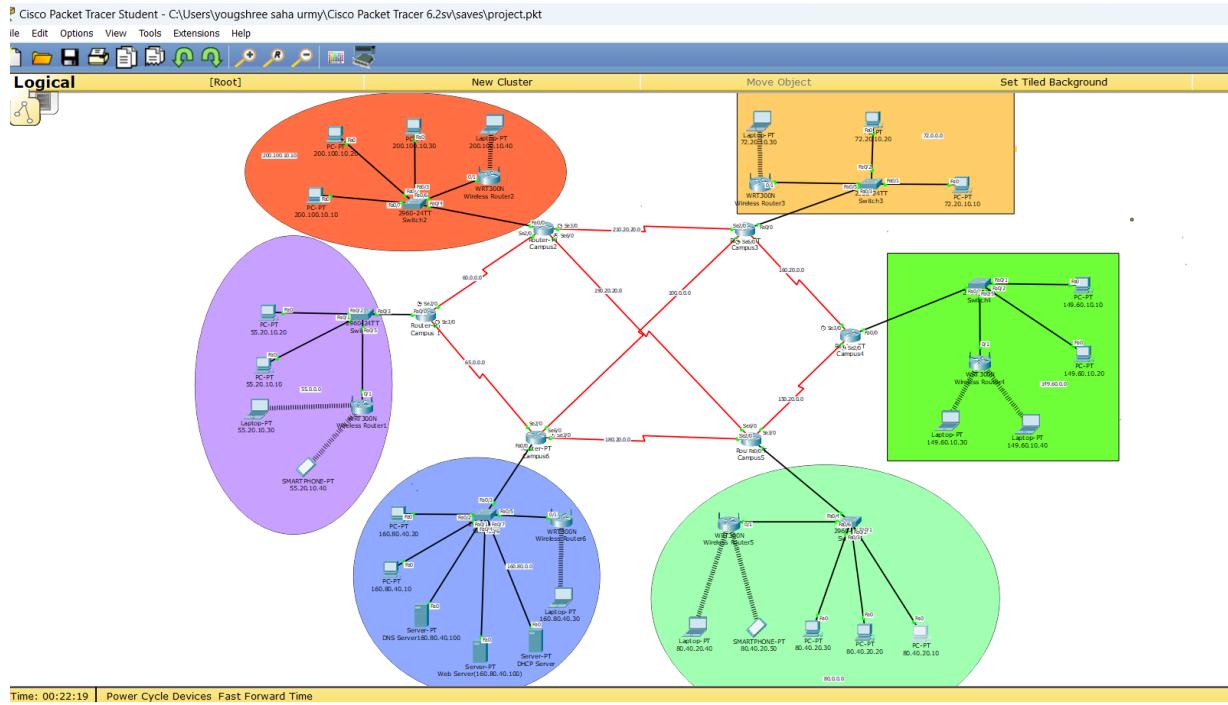
8.Serial DCE,

9.Web Server,

10.DNS server,

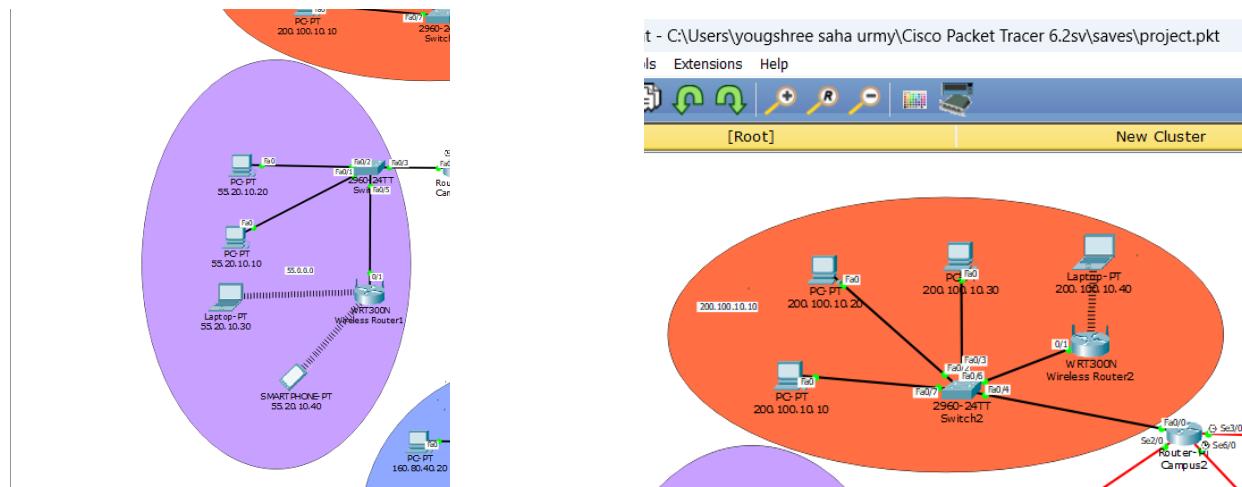
11. DHCP server.

## Physical Diagram:



**Figure 1: Network Model created in Cisco Packet Tracer**

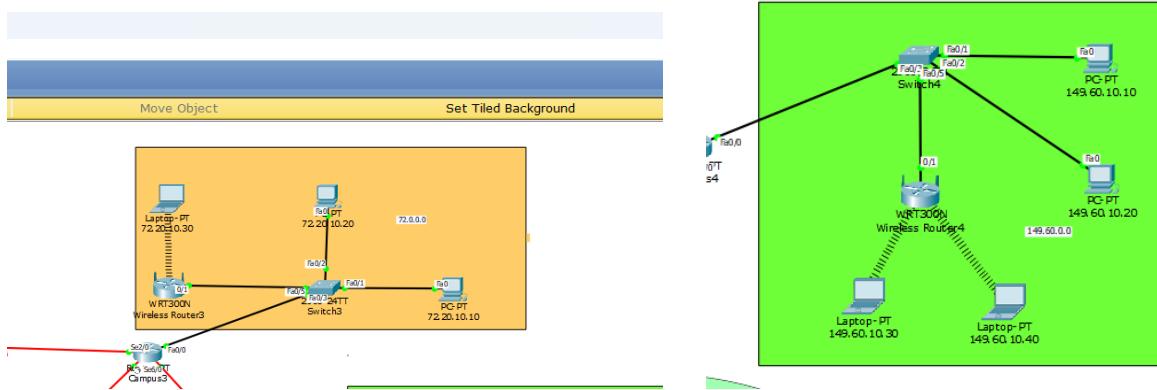
**For better understanding:**



**Router 1****Router 2**

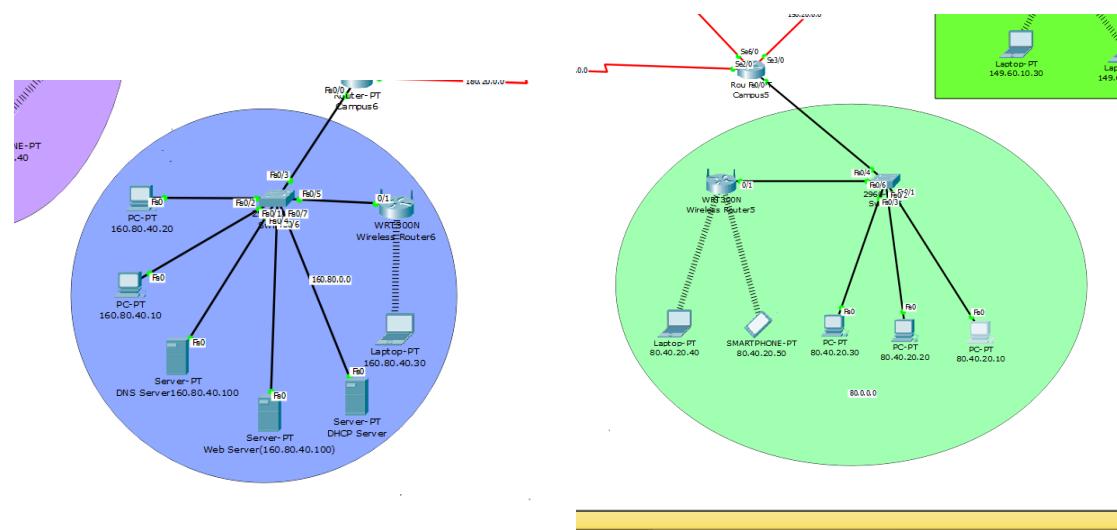
Here in Campus 1 I have taken Class-A. Here the ip address is 55.0.0.0.

Here in Campus 2 I have taken Class-C. Here the ip address is 200.100.10.0.

**Router 3****Router 4**

Here in Campus 3 I have taken Class-A. Here the ip address is 72.0.0.0.

Here in Campus 4 I have taken Class-B. Here the ip address is 149.60.0.0.

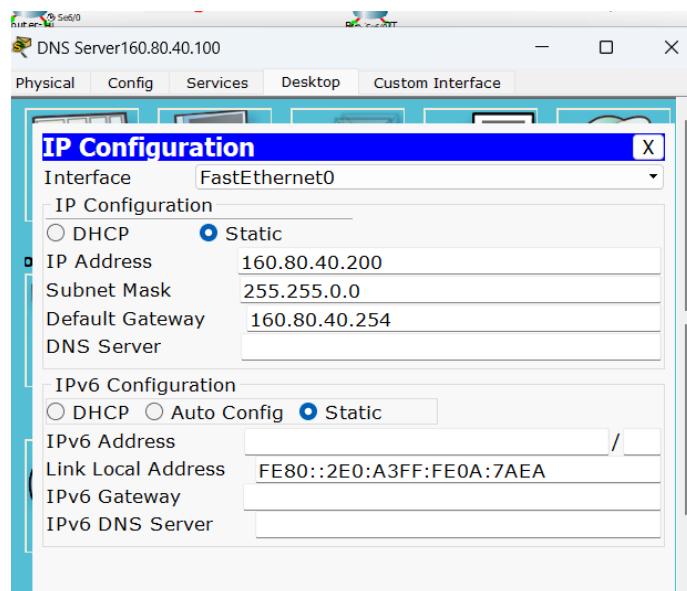
**Router 5****Router 6**

Here in Campus 5 I have taken Class-B. Here the ip address is 160.80.0.0.

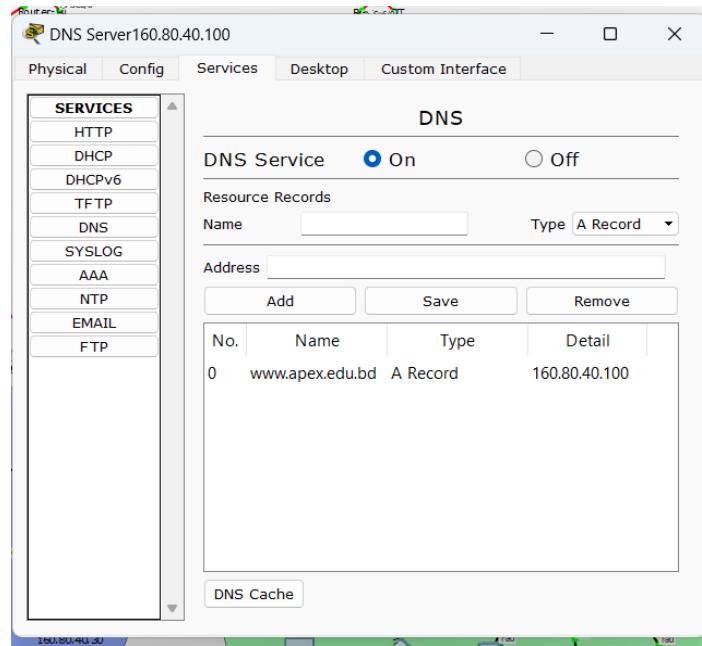
Here in Campus 6 I have taken Class-A. Here the ip address is 80.0.0.0.

**Figure 2: Individual Routers created in Cisco Packet Tracer**

**DNS Server:**

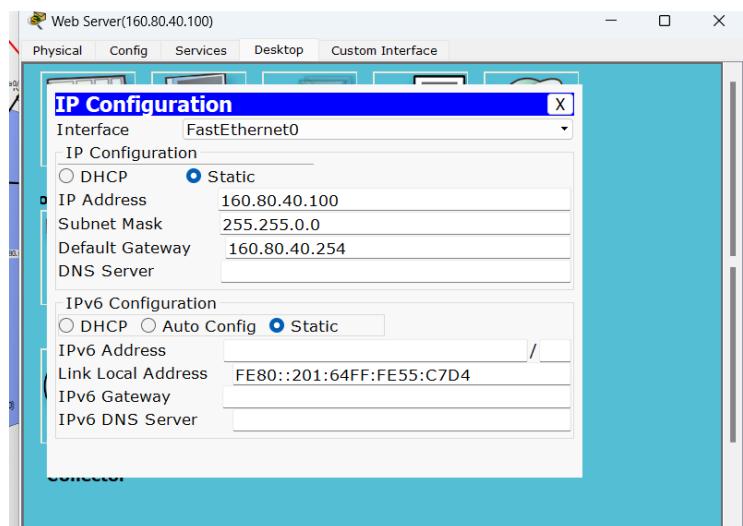


**Figure 3: DNS server IP Configuration**

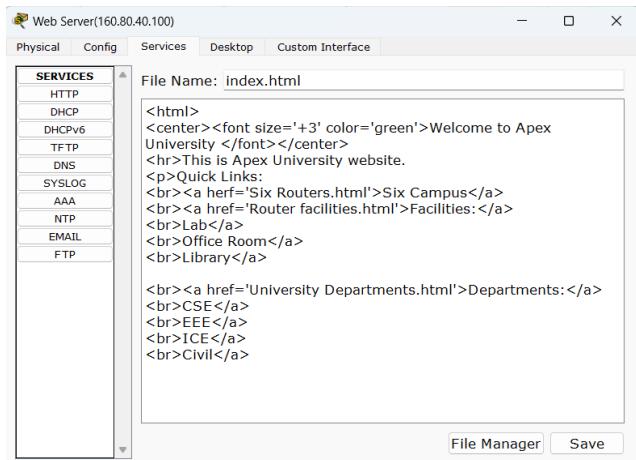


**Figure 4: IP Configuration of DNS Server**

## Web Page:



**Figure 5: Web Server IP configuration**

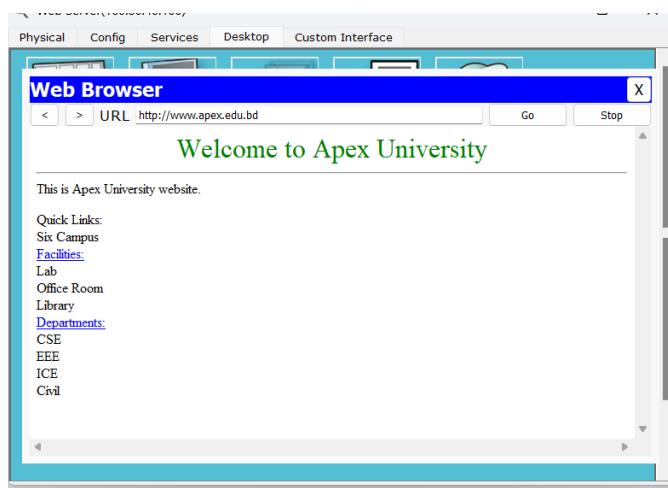


The screenshot shows a software interface titled "Web Server(160.80.40.100)". The top menu bar includes "Physical", "Config", "Services", "Desktop", and "Custom Interface". A sidebar on the left lists various services: HTTP, DHCP, DHCIPv6, TFTP, DNS, SYSLOG, AAA, NTP, EMAIL, and FTP. The main panel displays the content of the file "index.html". The code is as follows:

```
<html>
<center><font size='3' color='green'>Welcome to Apex University </font></center>
<hr>This is Apex University website.
<p>Quick Links:<br>
<a href='Six Routers.html'>Six Campus</a>
<a href='Router facilities.html'>Facilities:</a>
<a href='Lab.html'>Lab</a>
<a href='Office Room.html'>Office Room</a>
<a href='Library.html'>Library</a>
<br><a href='University Departments.html'>Departments:</a>
<br><a href='CSE.html'>CSE</a>
<br><a href='EEE.html'>EEE</a>
<br><a href='ICE.html'>ICE</a>
<br><a href='Civil.html'>Civil</a>
```

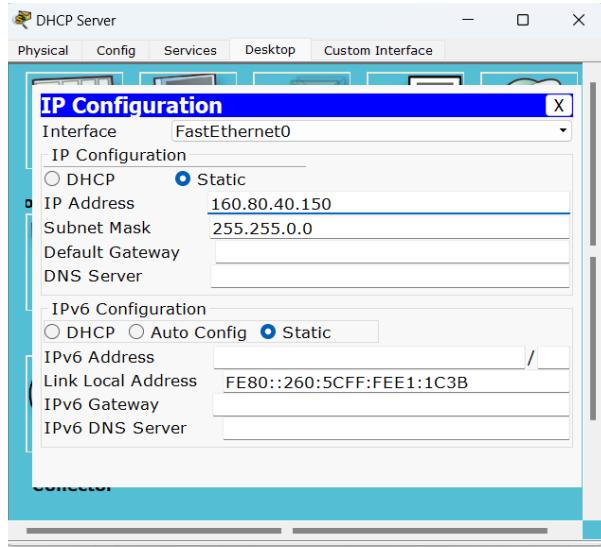
At the bottom right of the main panel are "File Manager" and "Save" buttons.

**Figure 6: Web Server html code**

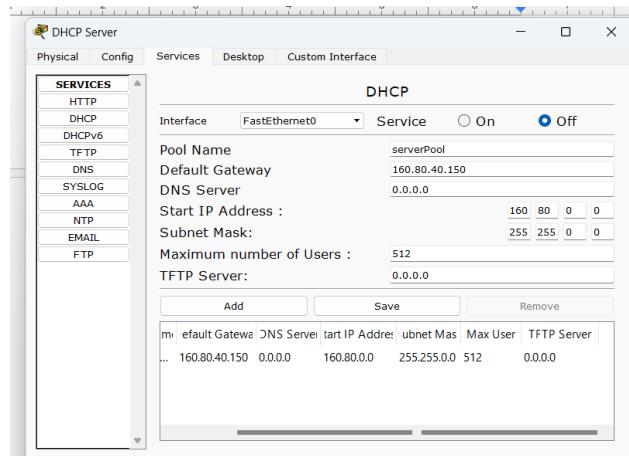


**Figure 7: WEB browser page of Apex University.**

## **DHCP Server:**



**Figure 8: DHCP IP Configuration**



**Figure 9: Creating DHCP Server**

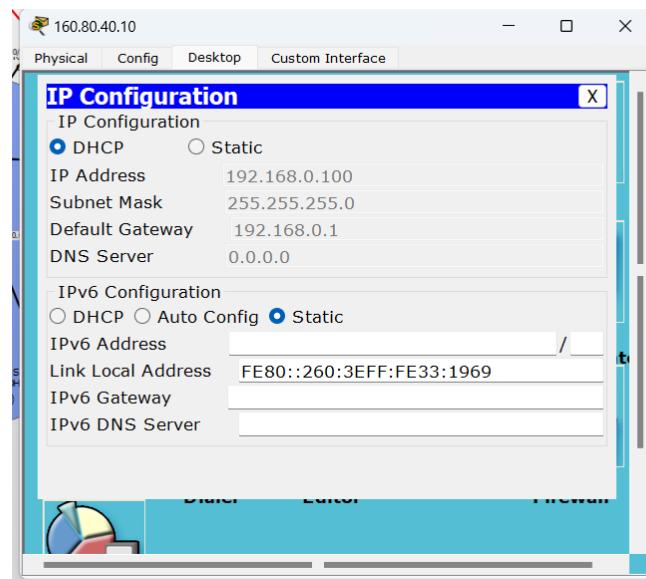


Figure 10: PC DHCP IP address

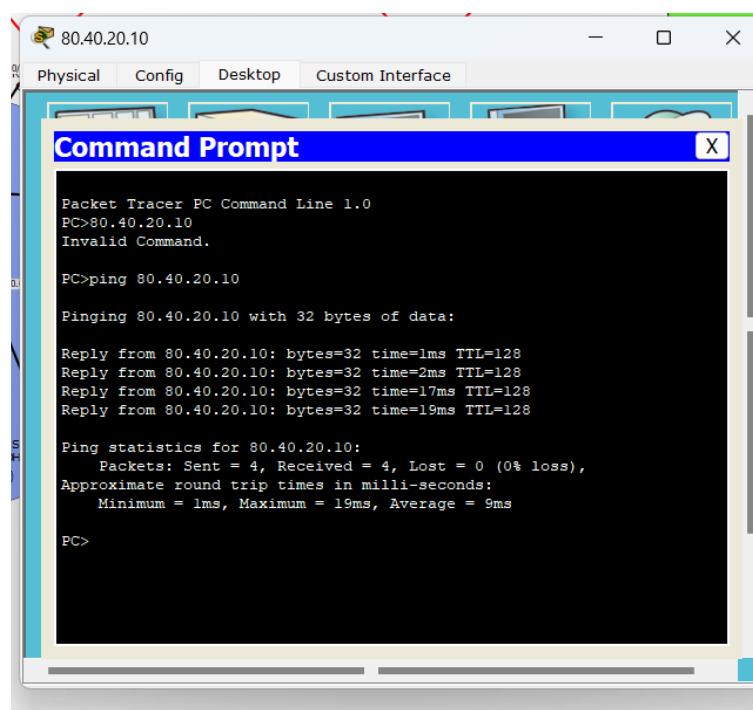


Figure 11: Successful Connection between PC.

## Ping Status:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
Successful	149.6...	55.20.10.10	ICMP	<span style="background-color: green;">█</span>	0.000	N	0	(edit)	(delete)	
Successful	160.8...	80.40.20.30	ICMP	<span style="background-color: green;">█</span>	0.000	N	1	(edit)	(delete)	
Successful	160.8...	DNS Server...	ICMP	<span style="background-color: yellow;">█</span>	0.000	N	2	(edit)	(delete)	

**Figure 12: Ping status of different devices**

## Routing Configuration:

### Campus 1

```
interface fa 0/0
ip address 55.20.10.254 255.0.0.0
no shut
do wr
exit
```

```
interface se 2/0
ip address 60.20.20.1 255.0.0.0
clock rate 64000
do wr
no shut
exit
```

```
interface se 3/0
ip address 65.20.20.1 255.0.0.0
clock rate 64000
do wr
no shut
exit
```

### Campus 2

```
interface fa 0/0
ip address 200.100.10.254 255.255.255.0
no shut
do wr
```

```
exit
```

```
interface se 2/0
ip address 60.20.20.2 255.0.0.0
do wr
no shut
exit
```

```
interface se 3/0
ip address 210.20.20.1 255.255.255.0
clock rate 64000
do wr
no shut
exit
```

```
interface se 6/0
ip address 190.20.20.1 255.255.255.0
clock rate 64000
do wr
no shut
exit
```

```
Campus 3
interface fa 0/0
ip address 72.20.10.254 255.0.0.0
no shut
do wr
exit
```

```
interface se 3/0
ip address 210.20.20.2 255.255.255.0
do wr
no shut
exit
```

```
interface se 3/0
ip address 160.20.20.2 255.255.0.0
do wr
no shut
exit
```

```
interface se 6/0
ip address 100.20.20.1 255.0.0.0
clock rate 64000
do wr
```

```
no shut  
exit
```

#### Campus 4

```
interface fa 0/0  
ip address 149.60.10.254 255.255.0.0  
no shut  
do wr  
exit
```

```
interface se 2/0  
ip address 150.20.20.1 255.255.0.0  
clock rate 64000  
no shut  
do wr  
exit
```

```
interface se 3/0  
ip address 160.20.20.1 255.255.0.0  
clock rate 64000  
no shut  
do wr  
exit
```

#### Campus 5

```
interface fa 0/0  
ip address 80.40.20.254 255.0.0.0  
no shut  
do wr  
exit
```

```
interface se 2/0  
ip address 180.20.20.2 255.255.0.0  
no shut  
do wr  
exit
```

```
interface se 3/0  
ip address 150.20.20.2 255.255.0.0  
no shut  
do wr  
exit
```

```
interface se 6/0
ip address 190.20.20.2 255.255.255.0
no shut
do wr
exit
```

## Campus 6

```
interface fa 0/0
ip address 160.80.40.254 255.255.0.0
no shut
do wr
exit
```

```
interface se 2/0
ip address 65.20.20.2 255.0.0.0
no shut
do wr
exit
```

```
interface se 3/0
ip address 180.20.20.1 255.255.0.0
clock rate 64000
no shut
do wr
exit
```

```
interface se 6/0
ip address 100.20.20.1 255.0.0.0
no shut
do wr
exit
```

```
interface fa 0/0
ip address 160.80.40.254 255.255.0.0
no shut
do wr
exit
```

```
interface se 2/0
ip address 65.20.20.2 255.0.0.0
no shut
do wr
exit
```

```
interface se 3/0
ip address 180.20.20.1 255.255.0.0
clock rate 64000
no shut
do wr
exit
```

```
interface se 6/0
ip address 100.20.20.1 255.0.0.0
no shut
do wr
exit
```

### **Dynamic Routing Algorithm:**

Router 1

```
router OSPF 1
network 55.0.0.0 0.255.255.255 area 1
network 60.0.0.0 0.255.255.255 area 1
network 65.0.0.0 0.255.255.255 area 1
```

exit

Router 2

```
router OSPF 2
network 200.100.10.0 0.0.0.255 area 1
network 60.0.0.0 0.255.255.255 area 1
network 210.20.20.0 0.0.0.255 area 1
network 190.20.20.0 0.0.0.255 area 1
```

exit

Router 3

```
router OSPF 3
network 72.0.0.0 0.255.255.255 area 1
network 210.20.20.0 0.0.0.255 area 1
network 160.20.0.0 0.0.255.255 area 1
network 100.0.0.0 0.255.255.255 area 1
```

```
exit
```

```
Router 4
```

```
router OSPF 4
```

```
network 149.60.0.0 0.0.255.255 area 1  
network 150.20.0.0 0.0.255.255 area 1  
network 160.20.0.0 0.0.255.255 area 1
```

```
exit
```

```
Router 5
```

```
router OSPF 5
```

```
network 80.0.0.0 0.255.255.255 area 1  
network 180.20.0.0 0.0.255.255 area 1  
network 150.20.0.0 0.0.255.255 area 1  
network 190.20.0.0 0.0.255.255 area 1
```

```
exit
```

```
Router 6
```

```
router OSPF 6
```

```
network 160.80.0.0 0.0.255.255 area 1  
network 65.0.0.0 0.255.255.255 area 1  
network 180.20.0.0 0.0.255.255 area 1  
network 100.0.0.0 0.255.255.255 area 1
```

```
exit
```

**Limitations:** There are some limitations in this design. There are some extra ports which can be used later. Cisco Packet Tracer cannot show the actual simulation message for pinging between devices for the first plenty of tries. Here we used many devices which are very costly in real life. Moreover the unique server room needs extra maintenance.

**Conclusion:** The project is about Apex University network web server. In this project there are implementations of DNS, DHCP, HTTP in Cisco Packet Tracer. The full project has been done using an IPv4 address. The network design is incorporated in a way that all the six campuses can conduct their activities. There may have been a couple of

troubles in this assignment due to specific prerequisites, at the end our point was practiced as it was successful.

**THE END**