



East West University

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Course Title: Computer Networks

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Section: 2

Mini Project

Submitted To:

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Introduction

University of Scholars, is an enterprise like East West University, owns many computers, with a complex network infrastructure. The motive is this project is to build a whole network connection for the university. Along with 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. To build this complete structure Cisco Packet Tracer will be used and different subnetting for the campus will be considered. The motto of this project is to get the understanding of a complete network with various classes and subnetting.

Tasks

To build this network infrastructure, this task needed to be fulfilled-

- Web page of the university will reflect the University of Professionals' web page.
- A single DNS server needs to be installed to locate the webserver - meaning people will browse University's web site with the following address: <http://www.scholars.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.
- 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 seven campuses with seven routers like this topology.

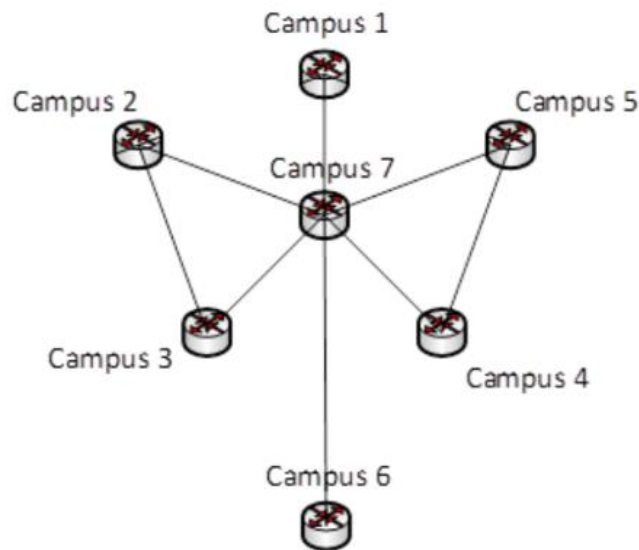


Figure 1: Campus Connection Topology

- Connectivity between all the hosts needs to be established.

Requirements

In this simulation in the 'Cisco Packet Tracer' these softwares have been used

- 18 routers and 2 wireless routers
- 35 switches
- 80 end devices
- 3 servers (DHCP, DNS, WEB)

Implementation

Network Design Diagram

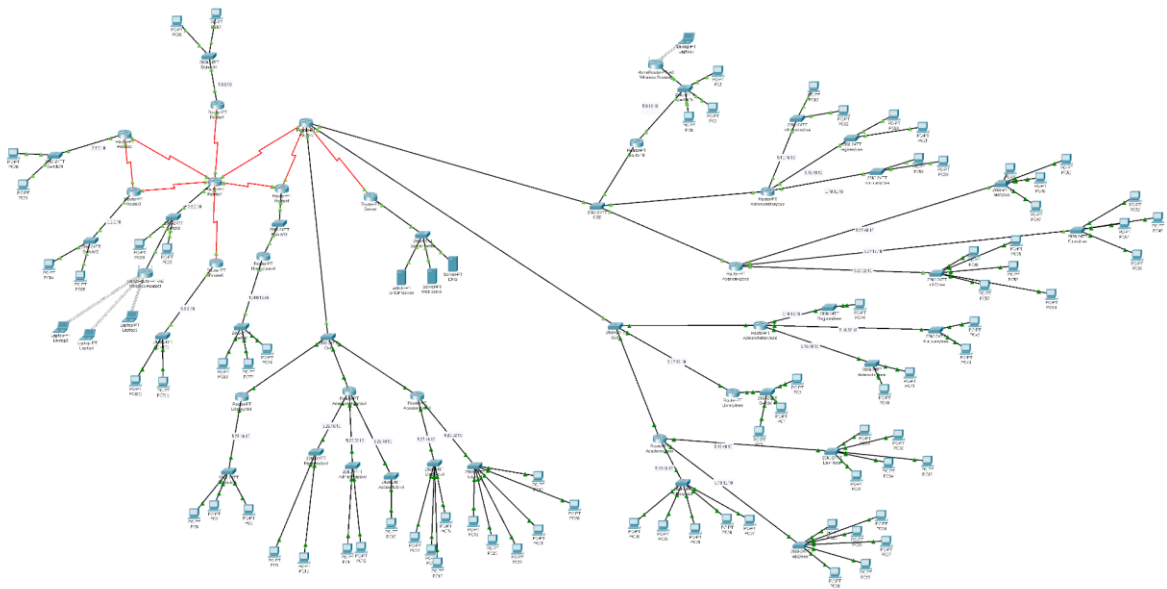


Figure 2: Network diagram

Campus Connection

There are 7 campuses, for the connections of the campus **Class C** IP addresses has been taken, and it has designed in a way that all the campuses are coming to campus 7 along with their other connections using the given topology.

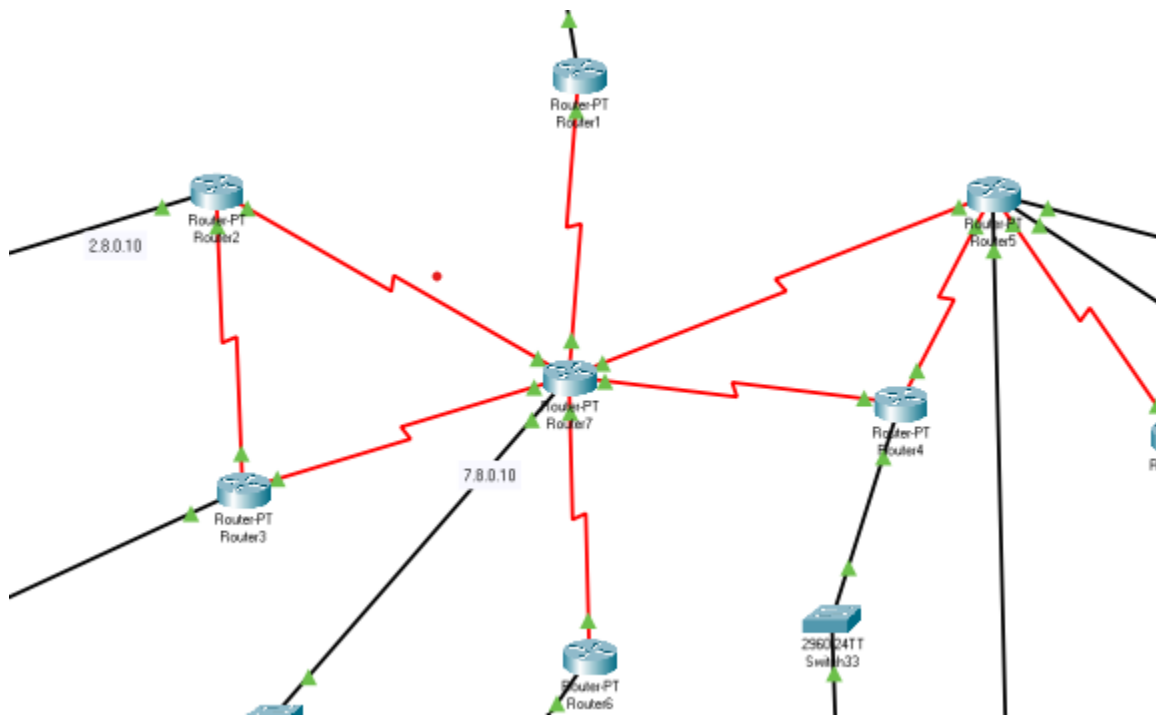


Figure 3: Campus Connections

For the IP **200.** <starting router>. <ending router>.0

For example, the connection is going from router 1 to 7, hence the IP is 200.1.7.0, this follows.

Subnet Configuration

To develop the campus structure **Class A** has been considered. In the class A sub netting follows.

$$\begin{array}{r} \underline{0.0.0.0.0.0.} \\ \text{Campus} \end{array} \quad \begin{array}{r} \underline{00000} \quad \underline{000} \quad \underline{0000} \quad \underline{0000} \quad \underline{00000000} \\ \text{dept.} \quad \text{Section} \quad \text{Activity} \quad \text{host} \end{array}$$

Possible hosts per subnet - $(2^4 \times 2^8) - 2$
Subnet Mask - 255.255.240.0

Here for each campus there is subnetting for the department then, in each department there are sections like administration work or Academic or library, after that in each section there can be activity. For example, in Academics there can be classes or labs in the department or in administration works there will be register, accounts or admission offices. In the design campus 5 has been considered as the main campus and it has been expanded in this manner. The other campuses have also been developed with this subnetting. They all can connect like that.

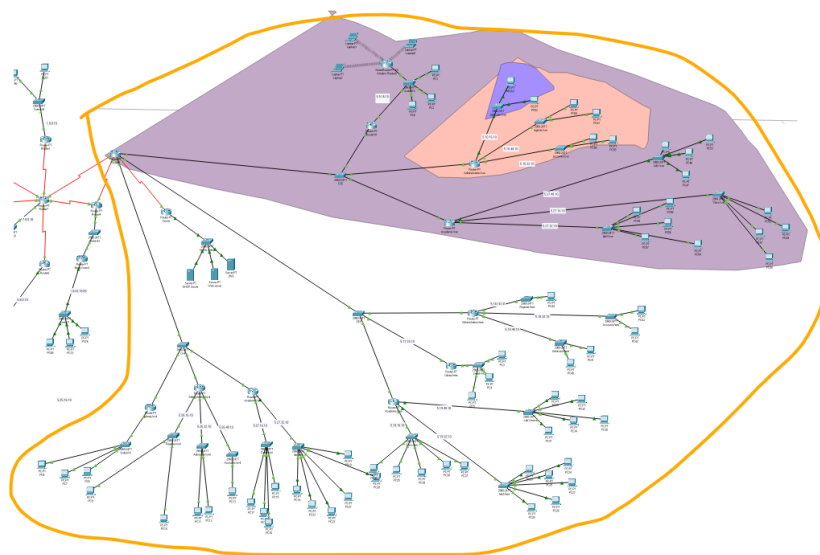


Figure 4: Subnet within Campus

However, it has been assumed that Campus-6 is a small campus in compared to the others. Hence, this has been built with **Class B**. The subnetting-

<u>00000000</u>	<u>00000000</u>	<u>0000</u>	<u>000</u>	<u>0</u>	<u>00</u>	<u>000000</u>
Campus	Network	dept.	Section	Activity	host	

Possible hosts per subnet - $2^6 - 2$
Subnet Mask - 255.255.255.192

Server Room Setup

DHCP

The DHCP server has been configured with different Serverpools across the network.

The screenshot shows the 'DHCP Server' configuration window with the 'Services' tab selected. The 'DHCP' service is enabled. The configuration fields are as follows:

- Interface: FastEthernet0
- Service: ☒ On
- Pool Name: serverPool
- Default Gateway: 5.240.32.30
- DNS Server: 5.240.32.35
- Start IP Address: 5, 240, 32, 41
- Subnet Mask: 255, 255, 240, 0
- Maximum Number of Users: 510
- TFTP Server: 0.0.0.0
- WLC Address: 0.0.0.0

Below the configuration fields are buttons for 'Add', 'Save', and 'Remove'. A table lists the configured pools:

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
p26	2.8.0.10	5.240.32.35	2.8.0.11	255.255.240.0	53	0.0.0.0	0.0.0.0
p20	134.0.18.65	5.240.32.35	134.0.18.71	255.255.255.11	57	0.0.0.0	0.0.0.0
p22	7.8.0.10	5.240.32.35	7.8.0.11	255.255.240.0	53	0.0.0.0	0.0.0.0
p25	3.8.0.10	5.240.32.35	3.8.0.11	255.255.240.0	53	0.0.0.0	0.0.0.0

Figure 5: DHCP server config

DHCP IP

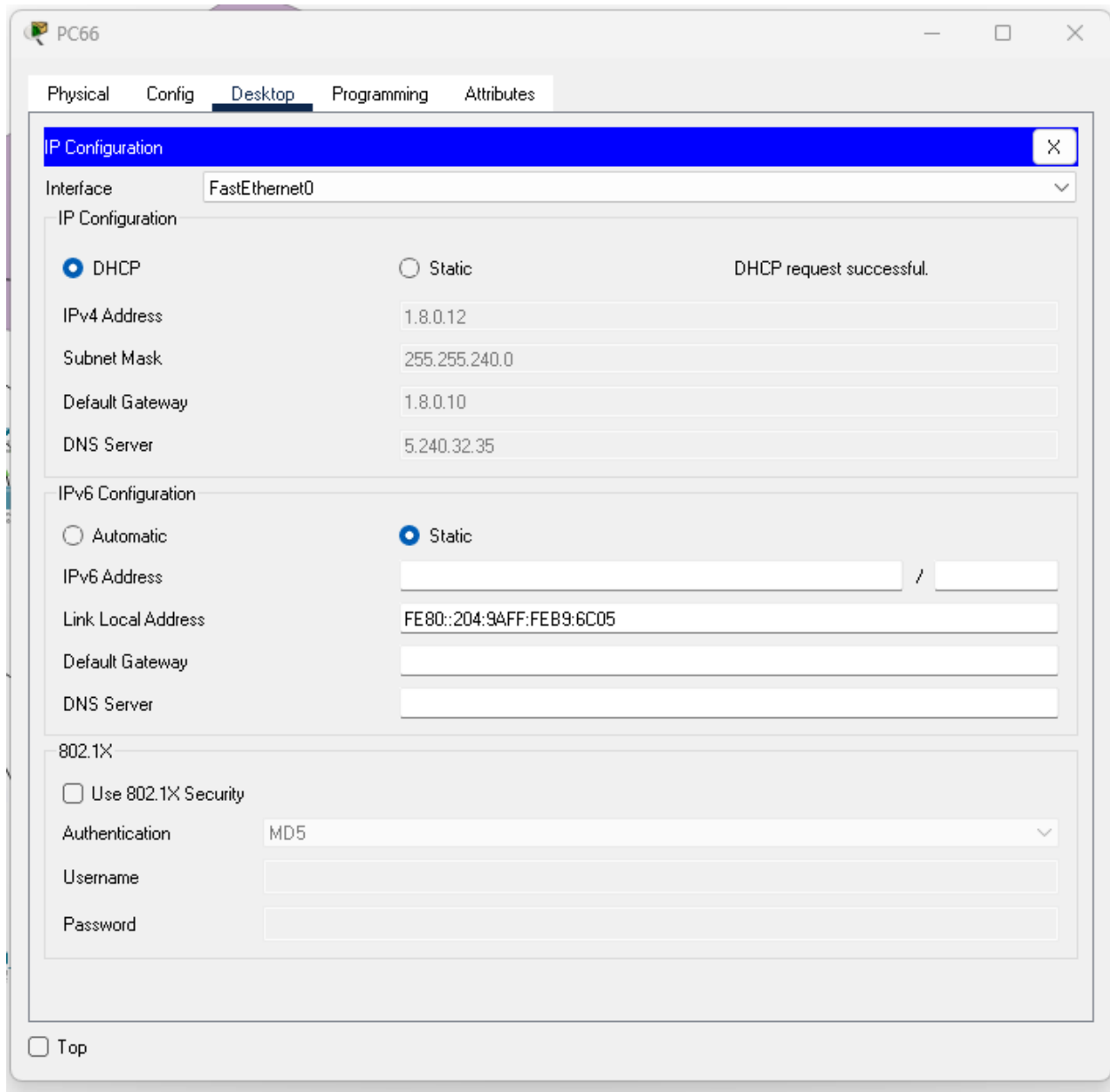


Figure 6: IP Config using DHCP

DNS

The screenshot shows a window titled "DNS" with a tabbed interface. The "Services" tab is selected. On the left, a "SERVICES" list includes HTTP, DHCP, DHCPv6, TFTP, DNS (highlighted), SYSLOG, AAA, NTP, EMAIL, FTP, IoT, VM Management, and Radius EAP. The main area is titled "DNS" and contains the following elements:

- DNS Service:** A toggle switch set to "On".
- Resource Records:** A section for adding and managing DNS records.
- Name:** A text input field.
- Type:** A dropdown menu currently showing "A Record".
- Address:** A text input field.
- Buttons:** "Add", "Save", and "Remove" buttons.
- Table:** A table with columns "No.", "Name", "Type", and "Detail". It contains one record: No. 0, Name www.scholars.edu.bd, Type A Record, and Detail 5.240.32.33.
- DNS Cache:** A button at the bottom left of the main area.

At the bottom left of the window, there is a "Top" button with a checkbox icon.

Figure 7: DNS Server Config

WEB

The screenshot shows a 'Web server' configuration window with the 'Desktop' tab selected. The window has a title bar with standard minimize, maximize, and close buttons. Below the title bar is a tabbed interface with 'Physical', 'Config', 'Services', 'Desktop', 'Programming', and 'Attributes' tabs. The 'Desktop' tab is active, displaying a configuration panel titled 'IP Configuration' with a close button (X). The panel is divided into three sections: 'IP Configuration', 'IPv6 Configuration', and '802.1X'. In the 'IP Configuration' section, the 'Static' radio button is selected, and the fields for IPv4 Address (5.240.32.33), Subnet Mask (255.255.240.0), Default Gateway (5.240.32.30), and DNS Server (0.0.0.0) are filled. The 'IPv6 Configuration' section has the 'Static' radio button selected, with fields for IPv6 Address (empty), Link Local Address (FE80::240:BFF:FE39:B479), Default Gateway (empty), and DNS Server (empty). The '802.1X' section has the 'Use 802.1X Security' checkbox unchecked, and the 'Authentication' dropdown set to 'MD5'. The 'Username' and 'Password' fields are empty. At the bottom left of the window is a 'Top' button.

Web server

Physical Config Services **Desktop** Programming Attributes

IP Configuration X

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 5.240.32.33

Subnet Mask 255.255.240.0

Default Gateway 5.240.32.30

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::240:BFF:FE39:B479

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

☐ Top

Figure 8: WEB server config

Access of WEB server:



Figure 9: WEB server access using DNS

Router Config Codes

Campus 7

```
interface se2/0
ip address 200.1.7.11 255.255.255.0
no shut
do wr
exit
```

```
interface se3/0
ip address 200.2.7.11 255.255.255.0
no shut
do wr
exit
```

```
interface se6/0
ip address 200.5.7.11 255.255.255.0
no shut
do wr
exit
```

```
interface se7/0
ip address 200.3.7.11 255.255.255.0
no shut
do wr
exit
```

```
interface se8/0
ip address 200.4.7.11 255.255.255.0
no shut
do wr
exit
```

```
interface se9/0
ip address 200.6.7.11 255.255.255.0
no shut
do wr
exit
```

```
interface fa0/0
ip address 7.8.0.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

Campus 5

```
interface se2/0
ip address 200.5.7.10 255.255.255.0
clock rate 64000
no shut
do wr
exit
```

```
interface se3/0
ip address 200.5.4.10 255.255.255.0
clock rate 64000
no shut
do wr
exit
```

```
interface se8/0
ip address 5.240.3.10 255.255.240.0
clock rate 64000
no shut
do wr
exit
```

```
interface fa0/0
ip address 5.8.0.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa1/0
ip address 5.16.0.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa6/0
ip address 5.24.0.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

Server router


```
interface se2/0
ip address 5.240.3.20 255.255.240.0
no shut
do wr
exit
```

```
interface fa0/0
ip address 5.240.32.30 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

CSE Library

```
interface fa0/0
ip address 5.8.0.11 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa1/0
ip address 5.9.16.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

CSE administration

```
interface fa0/0
ip address 5.8.0.12 255.255.240.0
```

```
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa1/0
ip address 5.10.16.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa6/0
ip address 5.10.32.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa8/0
ip address 5.10.48.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

CSE Academic

```
interface fa0/0
ip address 5.8.0.13 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
```

exit

interface fa1/0

ip address 5.27.16.10 255.255.240.0

ip helper-address 5.254.254.250

no shut

do wr

exit

interface fa6/0

ip address 5.27.32.10 255.255.240.0

ip helper-address 5.254.254.250

no shut

do wr

exit

interface fa7/0

ip address 5.27.48.10 255.255.240.0

ip helper-address 5.254.254.250

no shut

do wr

exit

Civil Library

interface fa0/0

ip address 5.24.0.11 255.255.240.0

ip helper-address 5.254.254.250

no shut

do wr

exit

interface fa1/0

```
ip address 5.25.16.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

Civil administration

```
interface fa0/0
ip address 5.24.0.12 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa1/0
ip address 5.26.16.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa6/0
ip address 5.26.32.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa8/0
ip address 5.26.48.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
```

```
do wr
exit
```

Civil Academic

```
interface fa0/0
ip address 5.24.0.13 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa1/0
ip address 5.27.16.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa6/0
ip address 5.27.32.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

EEE Library

```
interface fa0/0
ip address 5.16.0.11 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
```

exit

```
interface fa1/0
ip address 5.17.16.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

EEE administration

```
interface fa0/0
ip address 5.16.0.12 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa1/0
ip address 5.18.16.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa7/0
ip address 5.18.32.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa6/0
```

```
ip address 5.18.48.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

EEE Academic

```
interface fa0/0
ip address 5.16.0.13 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa1/0
ip address 5.19.16.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa6/0
ip address 5.19.32.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa7/0
ip address 5.19.48.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
```

```
do wr
exit
```

Router-1

```
interface se2/0
ip address 200.1.7.10 255.255.255.0
clock rate 64000
no shut
do wr
exit
```

```
interface fa0/0
ip address 1.8.0.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

Router-4

```
interface se2/0
ip address 200.4.7.10 255.255.255.0
clock rate 64000
no shut
do wr
exit
```

```
interface se3/0
ip address 200.5.4.11 255.255.255.0
no shut
do wr
exit
```



```
interface fa0/0
ip address 134.0.16.10 255.255.255.192
ip helper-address 5.254.254.250
no shut
do wr
exit
```

CSE Library Campus-4

```
interface fa0/0
ip address 134.0.16.21 255.255.255.192
ip helper-address 5.254.254.250
no shut
do wr
exit
```

```
interface fa1/0
ip address 134.0.18.65 255.255.255.192
ip helper-address 5.254.254.250
no shut
do wr
exit
```

Router-2

```
interface se2/0
ip address 200.2.7.10 255.255.255.0
clock rate 64000
no shut
do wr
```

```
exit
```

```
interface se3/0  
ip address 200.2.3.10 255.255.255.0  
clock rate 64000  
no shut  
do wr  
exit
```

```
interface fa0/0  
ip address 2.8.0.10 255.255.240.0  
ip helper-address 5.254.254.250  
no shut  
do wr  
exit
```

Router -3

```
interface se2/0  
ip address 200.3.7.10 255.255.255.0  
clock rate 64000  
no shut  
do wr  
exit
```

```
interface se3/0  
ip address 200.2.3.11 255.255.255.0  
no shut  
do wr  
exit
```

```
interface fa0/0
ip address 3.8.0.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

Router-6

```
interface se2/0
ip address 200.6.7.10 255.255.255.0
clock rate 64000
no shut
do wr
exit
```

```
interface fa0/0
ip address 6.8.0.10 255.255.240.0
ip helper-address 5.254.254.250
no shut
do wr
exit
```

Router OSPF

Campus-1

```
router ospf 1
network 1.0.0.0 0.0.15.255 area 1
network 200.1.7.0 0.0.0.155 area 1
exit
```

Campus-2

```
router ospf 2
network 2.0.0.0 0.0.15.255 area 1
network 200.2.7.0 0.0.0.155 area 1
network 200.2.3.0 0.0.0.155 area 1
exit
```

Campus-3

```
router ospf 3
network 3.0.0.0 0.0.15.255 area 1
network 200.3.7.0 0.0.0.155 area 1
network 200.2.3.0 0.0.0.155 area 1
exit
```

Campus-4

```
router ospf 4
network 200.4.7.0 0.0.0.155 area 1
network 200.5.4.0 0.0.0.155 area 1
network 134.0.0.0 0.0.0.63 area 1
exit
```

Campus-5

```
router ospf 5
network 5.0.0.0 0.0.15.255 area 1
network 200.5.7.0 0.0.0.155 area 1
network 200.5.4.0 0.0.0.155 area 1
exit
```

Campus-6

```
router ospf 6
network 6.0.0.0 0.0.15.255 area 1
```

```
network 200.6.7.0 0.0.0.155 area 1
exit
```

Campus-7

```
router ospf 7
network 7.0.0.0 0.0.15.255 area 1
network 200.1.7.0 0.0.0.155 area 1
network 200.2.7.0 0.0.0.155 area 1
network 200.3.7.0 0.0.0.155 area 1
network 200.4.7.0 0.0.0.155 area 1
network 200.5.7.0 0.0.0.155 area 1
network 200.6.7.0 0.0.0.155 area 1
exit
```

```
router ospf 8 /server
network 5.0.0.0 0.0.15.255 area 1
exit
```

```
router ospf 9
network 5.0.0.0 0.0.15.255 area 1
exit
```

```
router ospf 10
network 5.0.0.0 0.0.15.255 area 1
exit
```

```
router ospf 11
network 5.0.0.0 0.0.15.255 area 1
exit
```

```
router ospf 12
```

```
network 5.0.0.0 0.0.15.255 area 1
exit
```

```
router ospf 13
network 5.0.0.0 0.0.15.255 area 1
exit
```

```
router ospf 14
network 5.0.0.0 0.0.15.255 area 1
exit
```

```
router ospf 15
network 5.0.0.0 0.0.15.255 area 1
exit
```

```
router ospf 16
network 5.0.0.0 0.0.15.255 area 1
exit
```

```
router ospf 17
network 5.0.0.0 0.0.15.255 area 1
exit
```

Limitations

1. While we can determine the origin of a device within a lab, office, or classroom on a specific floor or department, we cannot specify the exact room.
2. Sometimes routers struggle to navigate, but this could be attributed to the Cisco packet tracer software rather than the routing algorithm
3. Cisco Packet Tracer crashes multiple times due to large files.

Conclusion

To conclude, it can be said that this project provides a detailed idea of the Networks as well as the subnetting in different classes. However, there are more scopes in this project to develop more fruitful system networks.