East West University

CSE 405(Section 03)

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Project Report

Project Title:

Design a full-fledged network for an organizations with multiple subnets

Submitted by-

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Problem Statement:

University of Scholars, is an enterprise like East West University, owns many computers, with a complex network infrastructure. Apart from wired internet access to all 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 subnetter and switching/routing mechanisms are in practice.

Tasks:

My 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:

- Web page of the university will reflect the University of Professionals' web page.
- A single DNS server needs to be installed to locate web server - meaning people will browse University's website 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; Connections between the campus routers are given at figure 0; you will have to follow the exact topology.
- Connectivity between all the hosts needs to be established.

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

Implementation:

In this project, I have established a comprehensive network infrastructure across seven different campus locations where I work. I have implemented multiple subnets within certain campuses to support the network's scalability and accommodate future growth. Moreover, I have successfully configured wireless network setups in some of the campuses. The network is efficiently managed through a single DHCP server that caters to all the networks, complemented by a DNS server and a web server.

Requirements:

In this project, I have used Cisco Packet Tracer for the implementation.

To implement this project, I have used:

1. 7 Routers

2. 11 Switches

3. 1 DHCP Server.

4. 1 DNS Server

5. 1 HTTP Server

6. 2 Access point PT
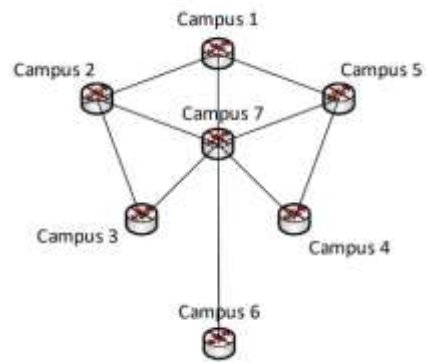
Figure 1: topology of the campuses
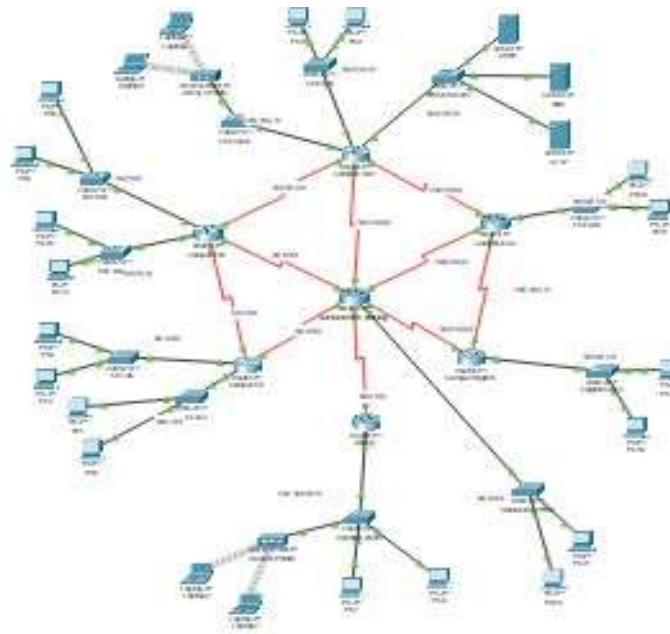
Figure 2: Demo Design of the entire network of University of Scholars.

Network IP for Campuses:

Campus-1: R1 Net IP (154.10.0.0/24) subnet 8bit for networks and 8bit for host
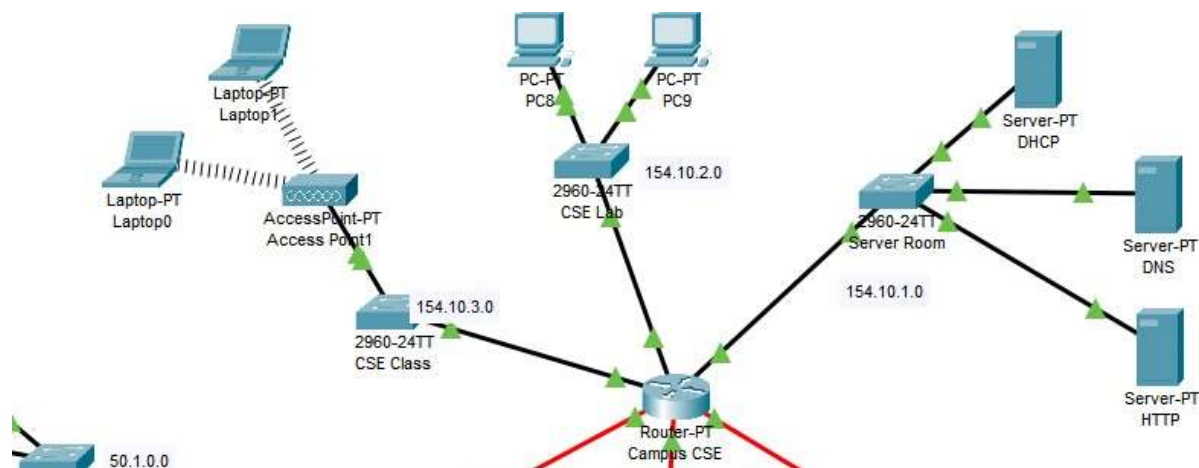
Campus-2, 3, and 7: R2 Net IP (50.0.0.0/16) subnet 8bit for networks and 16bit for host

Campus-4, 5: R3 Net IP (168.20.0.0/24) subnet 8bit for networks and 8bit for host

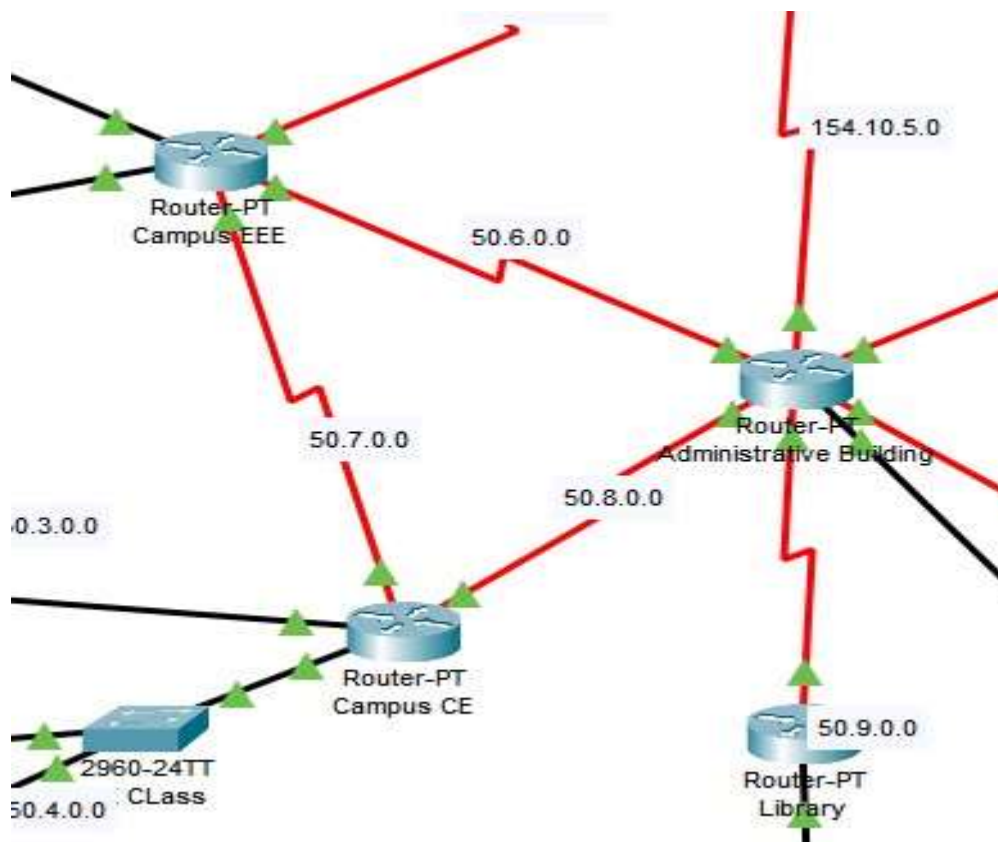Campus-6: R6 Net IP (192.168.10.0) 8bit for host

Description:

Campus 1:

'B' Class IP has been used.

Network IP is 154.10.0.0/24 as 8bit has been taken for subnet

Total Subnet: $2^8 - 2$

Total Host: $(2^8 - 2)*(2^8-2)$

Campus 2, 3, 7:

'A' Class IP has been used.

Network IP is 50.0.0.0/16 as 8bit has been taken for subnet

Total Subnet: $2^8 - 2$

Total Host: $(2^8 - 2)*(2^{16}-2)$

Campus 4, 5:
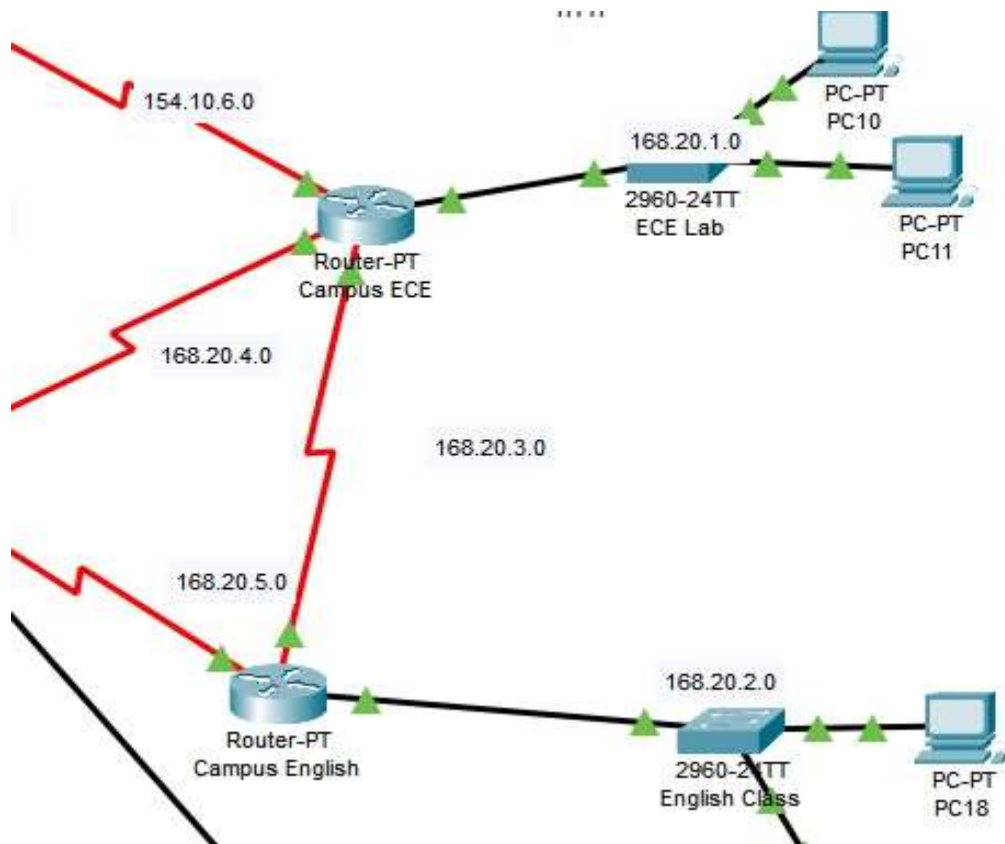
'B' Class IP has been used.

Network IP is 168.20.0.0/24 as 8bit has been taken for subnet

Total Subnet: $2^8 - 2$

Total Host: $(2^8 - 2)*(2^8-2)$

<u>Campus 6:</u>
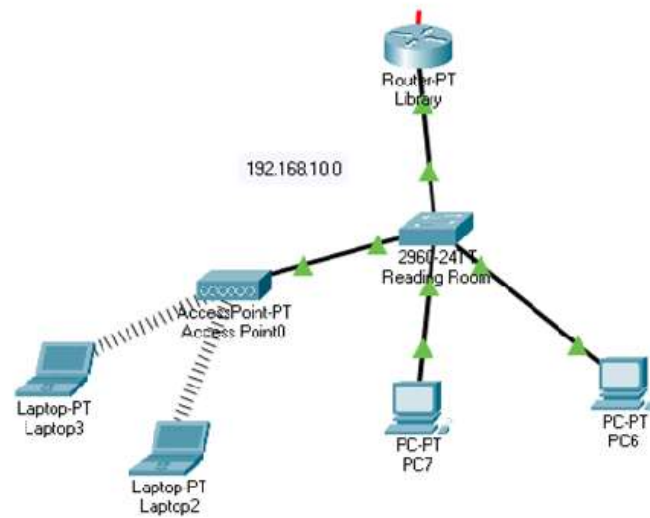
'C' Class IP has been used.

Network IP is 192.168.10.0

Total Host: 2^8-2

Access Point0 (Wireless):

Access Point1 (Wireless):

DHCP server IP configuration:

DHCP Server pool for different configuration:

Http server IP configuration:

DNS server IP configuration:

Accessing Web browser Page using a pc from different network:
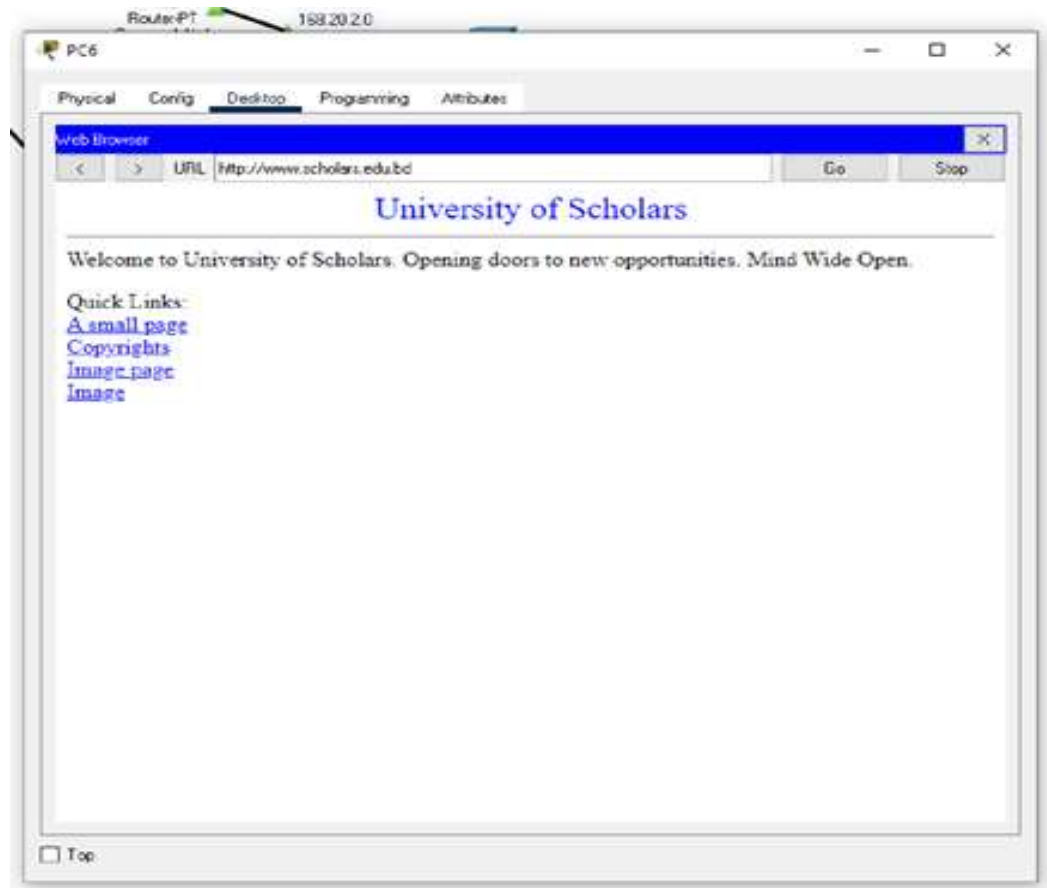
Router to Router Configurations and OSPF Dynamic routing Table:

Campus 1- CSE

interface FastEthernet0/0

ip address 154.10.1.254 255.255.255.0

ip helper-address 154.10.1.100

no shut

do wr

exit

interface FastEthernet1/0

ip address 154.10.2.254 255.255.255.0

ip helper-address 154.10.1.100

no shut

do wr

exit

interface FastEthernet2/0

ip address 154.10.3.254 255.255.255.0

ip helper-address 154.10.1.100

no shut

do wr

exit

interface Serial3/0

ip address 154.10.4.1 255.255.255.0

Clock rate 64000

no shut

do wr

exit

interface Serial6/0

ip address 154.10.6.1 255.255.255.0

no shut

do wr

exit

interface Serial7/0

ip address 154.10.5.1 255.255.255.0

no shut

do wr

exit

router ospf 1

network 50.0.0.0 0.255.255.255 area 1

154.10.0.0 0.0.255.255 area 1

168.20.0.0 0.0.255.255 area 1

192.168.10.0 0.0.0.255 area 1

Campus 2 - EEE

interface FastEthernet0/0

ip address 50.1.0.254 255.255.0.0

ip helper-address 154.10.1.100

no shut

do wr

exit

interface FastEthernet1/0

ip address 50.2.0.254 255.255.0.0

ip helper-address 154.10.1.100

no shut

do wr

 exit

interface Serial2/0

ip address 50.6.0.1 255.255.0.0

Clock rate 64000

no shut

do wr

exit

interface Serial3/0
ip address 154.10.4.2 255.255.255.0

no shut

do wr

exit

interface Serial6/0

ip address 50.7.0.1 255.255.0.0

no shut

do wr

exit

router ospf 2

network 50.0.0.0 0.255.255.255 area 2

154.10.0.0 0.0.255.255 area 2

168.20.0.0 0.0.255.255 area 2

192.168.10.0 0.0.0.255 area 2

Campus 3 - CE

```
interface FastEthernet0/0
ip address 50.3.0.254 255.255.0.0
no shut
do wr
exit
interface FastEthernet1/0

ip address 50.4.0.254 255.255.0.0

ip helper-address 154.10.1.100

no shut

do wr

exit


interface Serial2/0

ip address 50.8.0.1 255.255.0.0

Clock rate 64000
```

no shut

do wr

exit

interface Serial3/0

ip address 50.7.0.1 255.255.0.0

no shut

do wr

exit

router ospf 3

network 50.0.0.0 0.255.255.255 area 3
154.10.0.0 0.0.255.255 area 3

168.20.0.0 0.0.255.255 area 3

192.168.10.0 0.0.0.255 area 3

Campus 4 - English

interface FastEthernet1/0

ip address 168.20.2.254 255.255.255.0

ip helper-address 154.10.1.100

no shut

do wr

exit

interface Serial2/0
ip address 168.20.5.1 255.255.255.0
 Clock rate 64000
no shut
do wr
exit
interface Serial3/0

ip address 168.20.3.2 255.255.255.0

no shut

do wr

exit

router ospf 6

network 50.0.0.0 0.255.255.255 area 6
154.10.0.0 0.0.255.255 area 6

168.20.0.0 0.0.255.255 area 6

192.168.10.0 0.0.0.255 area 6

Campus 5 - ECE

interface FastEthernet0/0

ip address 168.20.1.254 255.255.255.0

ip helper-address 154.10.1.100

no shut

do wr

exit

interface Serial2/0

ip address 168.20.4.1 255.255.255.0

Clock rate 64000

no shut

do wr

exit

interface Serial3/0

ip address 154.10.6.2 255.255.255.0

no shut

do wr

exit

interface Serial6/0

ip address 168.20.3.1 255.255.255.0 Clock

rate 64000

no shut

do wr

exit

router ospf 5

network 50.0.0.0 0.255.255.255 area 5

154.10.0.0 0.0.255.255 area 5

168.20.0.0 0.0.255.255 area 5

192.168.10.0 0.0.0.255 area 5

Campus 6 - Library

interface FastEthernet0/0

ip address 192.168.10.254 255.255.255.0

no shut

do wr

exit

interface Serial2/0

ip address 50.9.0.1 255.255.0.0

Clock rate 64000

no shut

do wr

exit

router ospf 4

network 50.0.0.0 0.255.255.255 area 4

154.10.0.0 0.0.255.255 area 4

168.20.0.0 0.0.255.255 area 4

192.168.10.0 0.0.0.255 area 4

Campus 7 - Administration

interface FastEthernet0/0

 ip address 50.5.0.254 255.255.0.0

ip helper-address 154.10.1.100

```
no shut

do wr

exit


interface Serial2/0
ip address 154.10.5.2 255.255.255.0
Clock rate 64000
no shut
do wr

 exit


interface Serial3/0

ip address 50.6.0.2 255.255.0.0

no shut

do wr

exit


interface Serial6/0

ip address 50.8.0.2 255.255.0.0

no shut

do wr
```

exit

interface Serial7/0

ip address 50.9.0.2 255.255.0.0

no shut

do wr

exit

interface Serial8/0

ip address 168.20.5.2 255.255.255.0

no shut

do wr

exit

interface Serial9/0

ip address 168.20.4.2 255.255.255.0

no shut

do wr

exit

router ospf 7

network 50.0.0.0 0.255.255.255 area 7

154.10.0.0 0.0.255.255 area 7

168.20.0.0 0.0.255.255 area 7

192.168.10.0 0.0.0.255 area 7

Limitations:

1. The network's major drawback is the restricted capacity for accommodating end devices, particularly within the lab section. This problem can be resolved by implementing the IPv6 protocol.

2. While it is possible to determine the device's location within the building (lab, office, class, department), accurately pinpointing the specific room remains a challenge.

3. Occasionally, routers encounter difficulties in navigating the network, although this may be attributed more to limitations of the Cisco Packet Tracer software rather than the routing algorithm itself.

Conclusion:

This project demonstrated the complexity involved in implementing a network, especially when dealing with the configuration of subnets and working with various IP classes. Furthermore, the inclusion of a single DHCP server to allocate IP addresses posed an additional level of challenge. However, despite these difficulties, I successfully completed the project. The experience gained from this endeavor has provided valuable insights that will be beneficial for future undertakings involving the construction of larger networks.