



EAST WEST UNIVERSITY

Project Report

On

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

Course Code: CSE405

Course Title: Computer Networks

Section: 01

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Submitted to:

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Introduction:

Background:

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 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 a complex networked systems to support several of its business process like admissions, advising, results, eTender, library management, accounts and so on.

This complex network infrastructure is sub-netted and switching/routing mechanisms are in practice.

Statement:

Here in this project, I have established a full-fledged network where I work for 7 campus areas. Where in some campuses I have created multiple subnets and also there is a fine set up of future expansion. Here I also established wireless network configuration. In this network, there is a single DHCP server for all network, a DNS server and WEB server.

Features

- Network addresses will be from all 3 classes.
- Incorporation of different subnets.

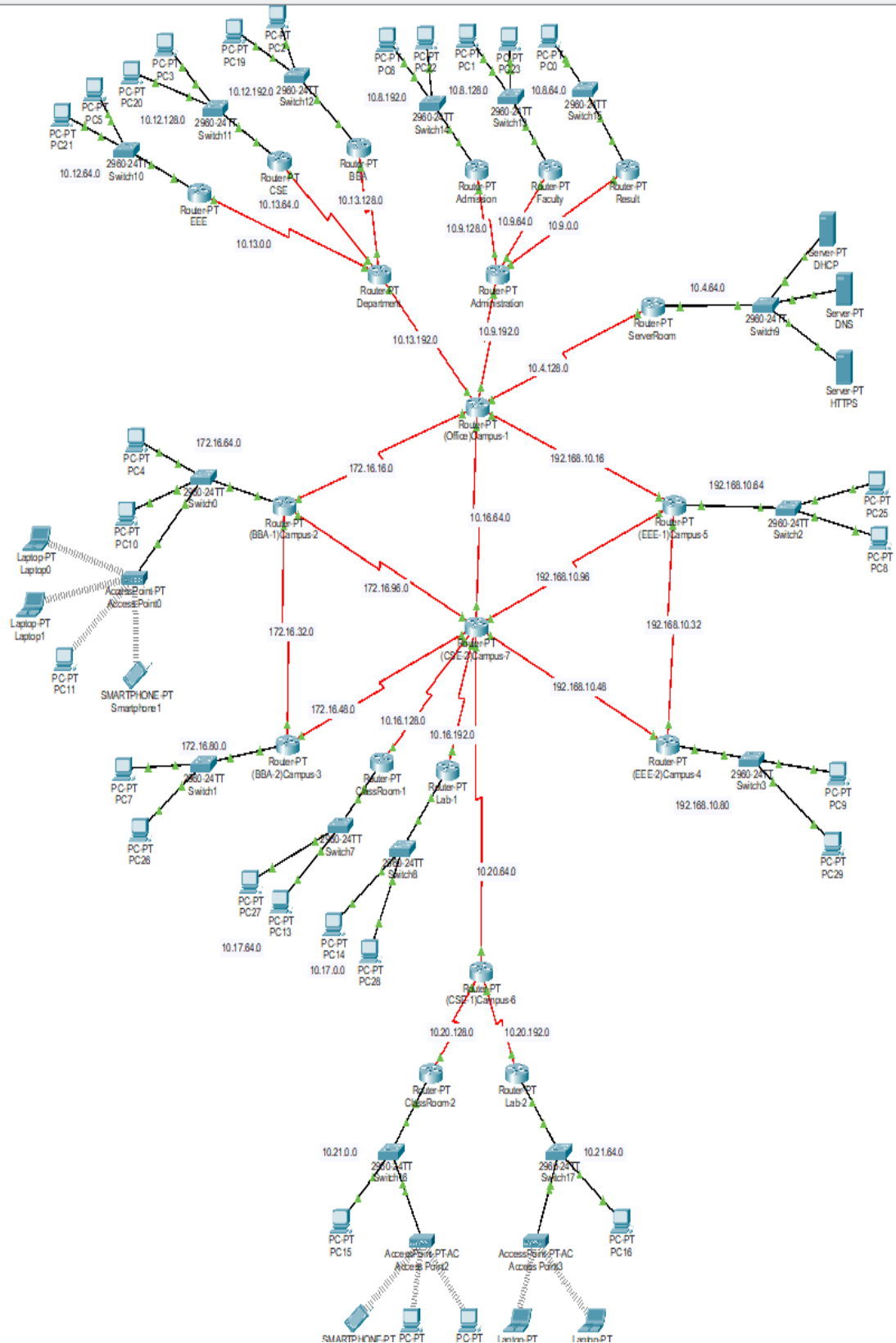
Components:

1. DHCP Server
2. DNS Server
3. WEB Server
4. PT Routers
5. Switches (2960)
6. Access point PT
7. PC
8. Wireless PC
9. Wireless Laptop
10. Wireless Smart phone
11. Connectors

Tools and Used Components:

1. Cisco Packet Tracer
2. 7 Routers for Main Campuses
3. 13 Routers Additional for subnetting
4. 15 Switches
5. 1 DHCP Server.
6. 1 DNS Server
7. 1 WEB Server (HTTP)
8. 3 Access point PTs (for wireless setup)
9. 25 PCs
10. 9 Wireless Devices

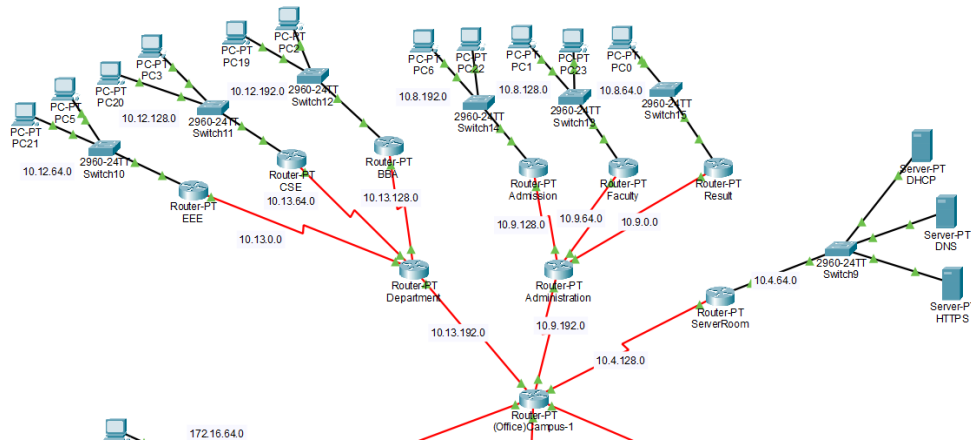
Complete Network Workspace:



Campus Router Interfaces with Diagrams:

Here I have used IP classes A, B and C for the whole network.

Router-1:



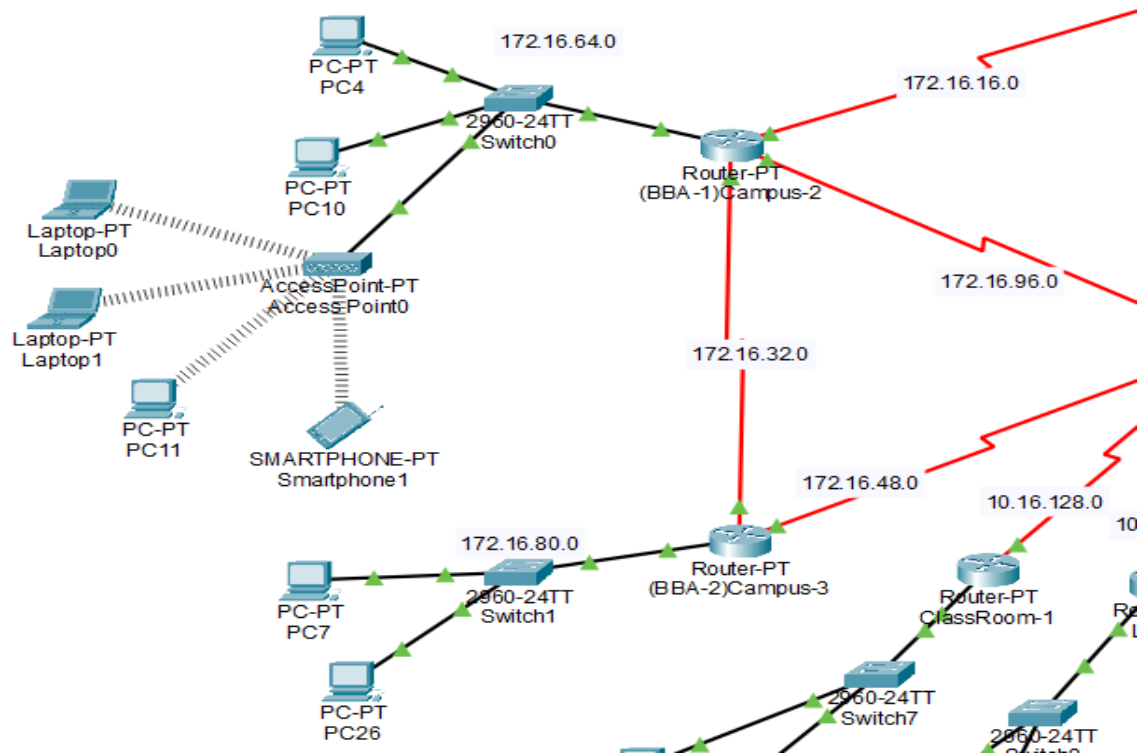
Router-1 is named as (Office)Campus-1. Campus-1 consists ServerRoom, Administration and Departments. For campus-1, I have taken the IP from the A-Class. The network IP for Campus-1 is 10.0.0.0/18. I have sub-netted ServerRoom, Administration and Departments using 3 extra routers. Administration has Admission, Faculty and Result. And Departments are CSE, EEE and BBA. They have been also sub-netted using 6 extra routers. For 1st layer subnet, I have taken 6 bits and 2nd layer subnet, 4 bits.

No of possible total 1st layer subnet: $2^6 - 2 \Rightarrow 62$

No of possible total 2nd layer subnet: $2^4 - 2 \Rightarrow 14$

No of possible total hosts: $(62 * 14) * (2^{14} - 2) \Rightarrow 14219576$

Router-2 & 3:

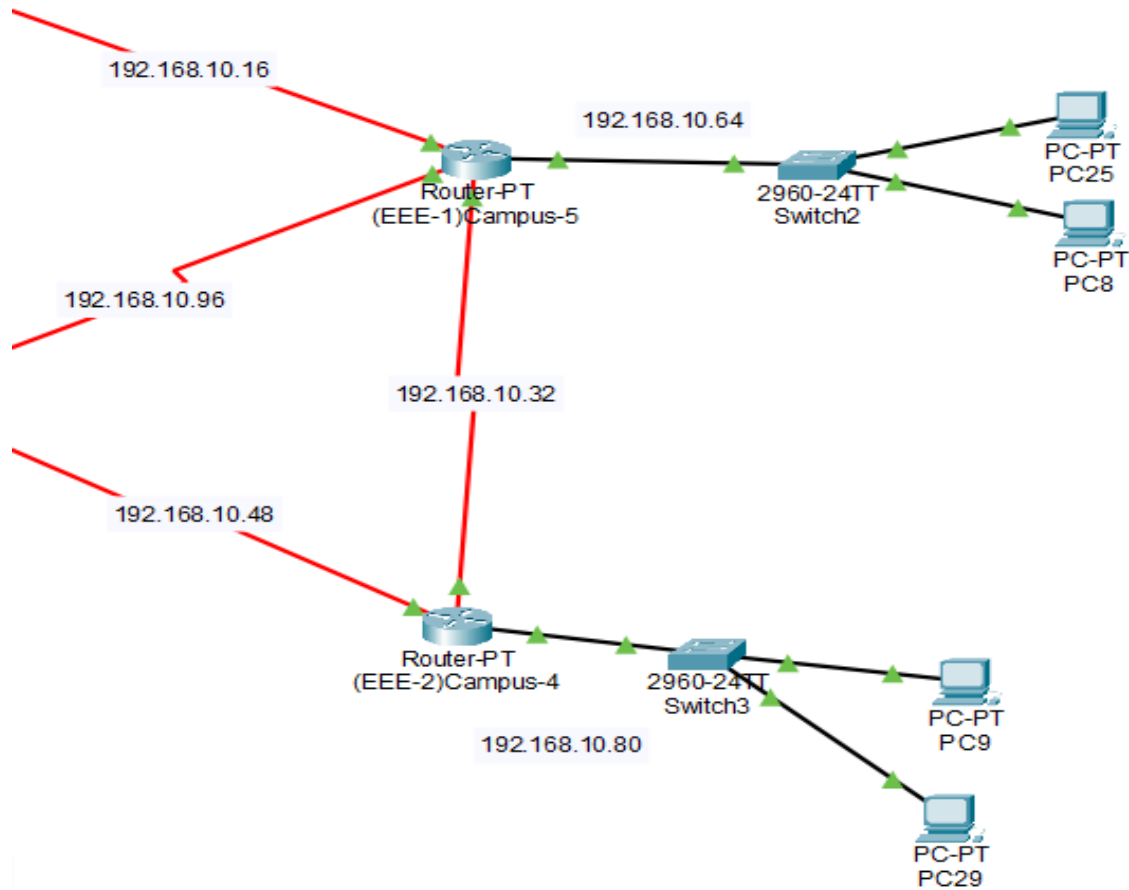


Router-2 & 3 respectively is named as (BBA-1)Campus-2 and (BBA-2)Campus-3. For campus-2 & 3, I have taken the IP from the B-Class. The network IP for Campus-2 & 3 is 172.16.0.0/20. I have sub-netted Campus-2 and Campus-3 with the campus routers. Campus-2 has 2 wired PCs and 4 wireless devices using an Access point PT. For subnet, I have taken 4 bits for additional BBA campuses built in future.

No of possible total 1st layer subnet: $2^4 - 2 \Rightarrow 14$

No of possible total hosts: $14 * (2^{12} - 2) \Rightarrow 57316$

Router-4 & 5:

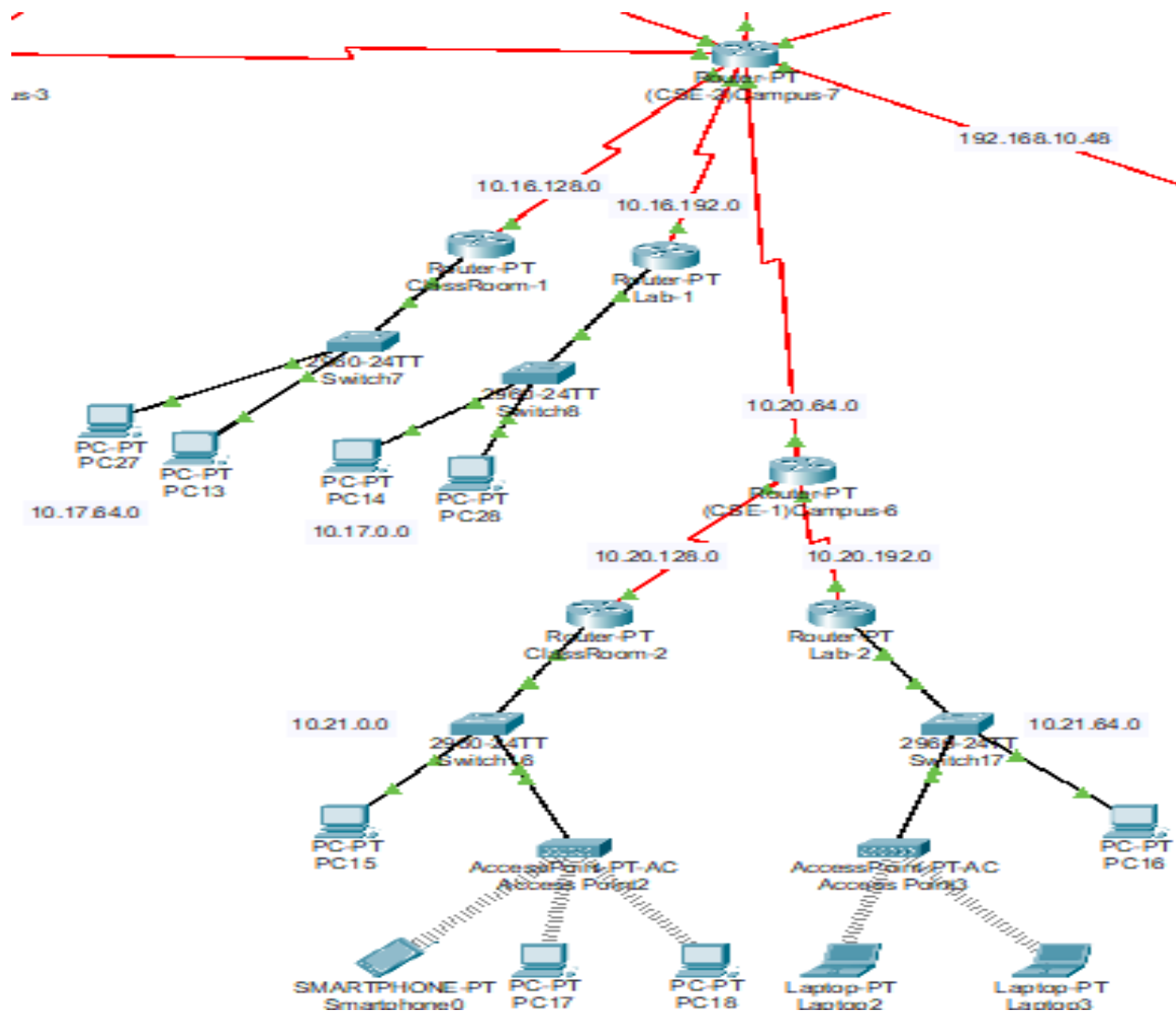


Router-4 & 5 respectively is named as (EEE-2)Campus-4 and (EEE-1)Campus-5. For campus-4 & 5, I have taken the IP from the C-Class. The network IP for Campus-4 & 5 is 192.168.10.0/28. I have sub-netted Campus-4 and Campus-5 with the campus routers. Campus-4 has 2 wired PCs and Campus-5 has 2 wired PCs. For subnet, I have taken 4 bits for additional EEE campuses built in future.

No of possible total 1st layer subnet: $2^4 - 2 \Rightarrow 14$

No of possible total hosts: $14 * (2^4 - 2) \Rightarrow 196$

Router-6 & 7:



Router-6 & 7 respectively is named as (CSE-1)Campus-6 and (CSE-2)Campus-7. For campus-6 & 7, I have taken the IP from the A-Class again. The network IP for Campus-6 & 7 is 10.0.0.0/18. I have sub-netted Campus-6 and Campus-7 with the campus routers. Campus-6 has 2 additional routers and Campus-7 has 2 additional routers. For 1st layer subnet, I have taken 6 bits and 2nd layer subnet, 4 bits.

No of possible total 1st layer subnet: $2^6 - 2 \Rightarrow 62$

No of possible total 2nd layer subnet: $2^4 - 2 \Rightarrow 14$

No of possible total hosts: $(62 * 14) * (2^{14} - 2) \Rightarrow 14219576$

Router Configuration and OSPF routing Table:

(Office)Campus-1

interface Serial2/0

ip address 172.16.16.1 255.255.240.0

clock rate 64000

no shut

do wr

exit

interface Serial3/0

ip address 192.168.10.18 255.255.255.240

clock rate 64000

no shut

do wr

exit

interface Serial6/0

ip address 10.16.64.1 255.255.192.0

clock rate 64000

no shut

do wr

exit

interface Serial7/0

ip address 10.4.128.2 255.255.192.0

clock rate 64000

no shut

do wr

exit

```
interface Serial8/0
ip address 10.9.192.1 255.255.192.0
clock rate 64000
no shut
do wr
exit
```

```
interface Serial9/0
ip address 10.13.192.1 255.255.192.0
clock rate 64000
no shut
do wr
exit
```

```
router ospf 1
network 10.0.0.0 0.255.255.255 area 1
network 172.16.0.0 0.0.255.255 area 1
network 192.168.10.0 0.0.0.255 area 1
exit
```

ServerRoom

```
interface FastEthernet0/0
ip address 10.4.64.254 255.255.192.0
no shut
do wr
exit
```

```
interface Serial2/0
ip address 10.4.128.1 255.255.192.0
no shut
do wr
exit
```

Administration

```
interface Serial2/0
ip address 10.9.0.1 255.255.192.0
clock rate 64000
no shut
do wr
exit
```

```
interface Serial3/0
ip address 10.9.64.1 255.255.192.0
clock rate 64000
no shut
do wr
exit
```

```
interface Serial6/0
ip address 10.9.128.1 255.255.192.0
clock rate 64000
no shut
do wr
exit
```

```
interface Serial7/0
ip address 10.9.192.2 255.255.192.0
no shut
do wr
exit
```

Admission

```
interface FastEthernet0/0
ip address 10.8.192.254 255.255.192.0
ip helper-address 10.4.64.100
no shut
do wr
exit
```

```
interface Serial2/0
ip address 10.9.128.2 255.255.192.0
no shut
do wr
exit
```

Faculty

```
interface FastEthernet0/0
ip address 10.8.128.254 255.255.192.0
ip helper-address 10.4.64.100
no shut
do wr
exit
```

```
interface Serial2/0
ip address 10.9.64.2 255.255.192.0
no shut
do wr
exit
```

Result

```
interface FastEthernet0/0
ip address 10.8.64.254 255.255.192.0
ip helper-address 10.4.64.100
no shut
do wr
exit
```

```
interface Serial2/0.
ip address 10.9.0.2 255.255.192.0
no shut
do wr
exit
```

Department

```
interface Serial2/0
ip address 10.13.192.2 255.255.192.0
no shut
do wr
exit
```

```
interface Serial3/0
ip address 10.13.64.1 255.255.192.0
clock rate 64000
no shut
do wr
exit
```

```
interface Serial6/0
ip address 10.13.128.1 255.255.192.0
clock rate 64000
no shut
do wr
exit
```

```
interface Serial7/0
ip address 10.13.0.1 255.255.192.0
clock rate 64000
no shut
do wr
exit
```

BBA

```
interface FastEthernet0/0
ip address 10.12.192.254 255.255.192.0
ip helper-address 10.4.64.100
no shut
do wr
exit
```

```
interface Serial2/0
ip address 10.13.128.2 255.255.192.0
no shut
do wr
exit
```

EEE

```
interface FastEthernet0/0
ip address 10.12.64.254 255.255.192.0
ip helper-address 10.4.64.100
no shut
do wr
exit
```

```
interface Serial2/0
ip address 10.13.0.2 255.255.192.0
no shut
do wr
exit
```

CSE

```
interface FastEthernet0/0
ip address 10.12.128.254 255.255.192.0
ip helper-address 10.4.64.100
no shut
do wr
exit
```

```
interface Serial2/0
ip address 10.13.64.2 255.255.192.0
no shut
do wr
exit
```

(BBA-1)Campus-2

```
interface FastEthernet0/0
ip address 172.16.64.254 255.255.240.0
ip helper-address 10.4.64.100
no shut
do wr
exit
```

```
interface Serial2/0
ip address 172.16.16.2 255.255.240.0
no shut
do wr
exit
```

```
interface Serial3/0
ip address 172.16.32.1 255.255.240.0
clock rate 64000
no shut
do wr
exit
```



```
interface Serial6/0
ip address 172.16.96.2 255.255.240.0
no shut
do wr
exit
```

```
router ospf 2
network 10.0.0.0 0.255.255.255 area 2
network 172.16.0.0 0.0.255.255 area 2
network 192.168.10.0 0.0.0.255 area 2
exit
```

(BBA-2)Campus-3

```
interface FastEthernet0/0
ip address 172.16.80.254 255.255.240.0
ip helper-address 10.4.64.100
no shut
do wr
exit
```

```
interface Serial2/0
ip address 172.16.32.2 255.255.240.0
no shut
do wr
exit
```

```
interface Serial3/0
ip address 172.16.48.2 255.255.240.0
no shut
do wr
exit
```

```
router ospf 3
network 10.0.0.0 0.255.255.255 area 3
network 172.16.0.0 0.0.255.255 area 3
network 192.168.10.0 0.0.0.255 area 3
exit
```

(EEE-2)Campus-4

```
interface FastEthernet0/0
ip address 192.168.10.94 255.255.255.240
ip helper-address 10.4.64.100
no shut
do wr
exit
```

```
interface Serial2/0
ip address 192.168.10.34 255.255.255.240
no shut
do wr
exit
```

```
interface Serial3/0
ip address 192.168.10.50 255.255.255.240
no shut
do wr
exit
```

```
router ospf 4
network 10.0.0.0 0.255.255.255 area 4
network 172.16.0.0 0.0.255.255 area 4
network 192.168.10.0 0.0.0.255 area 4
exit
```

(EEE-1)Campus-5

```
interface FastEthernet0/0
ip address 192.168.10.78 255.255.255.240
ip helper-address 10.4.64.100
no shut
do wr
exit
```

```
interface Serial2/0
ip address 192.168.10.17 255.255.255.240
no shut
do wr
```

```
exit
interface Serial3/0
ip address 192.168.10.33 255.255.255.240
clock rate 64000
no shut
do wr
exit
```

```
interface Serial6/0
ip address 192.168.10.98 255.255.255.240
no shut
do wr
exit
```

```
router ospf 5
network 10.0.0.0 0.255.255.255 area 5
network 172.16.0.0 0.0.255.255 area 5
network 192.168.10.0 0.0.0.255 area 5
exit
```

(CSE-1)Campus-6

```
interface Serial2/0
ip address 10.20.64.2 255.255.192.0
no shut
do wr
```

```
exit
```

```
interface Serial3/0
```

```
ip address 10.20.128.1 255.255.192.0
```

```
clock rate 64000
```

```
no shut
```

```
do wr
```

```
exit
```

```
interface Serial6/0
```

```
ip address 10.20.192.1 255.255.192.0
```

```
clock rate 64000
```

```
no shut
```

```
do wr
```

```
exit
```

```
router ospf 6
```

```
network 10.0.0.0 0.255.255.255 area 6
```

```
network 172.16.0.0 0.0.255.255 area 6
```

```
network 192.168.10.0 0.0.0.255 area 6
```

```
exit
```

Classroom-2

```
interface FastEthernet0/0
```

```
ip address 10.21.0.254 255.255.192.0
```

```
ip helper-address 10.4.64.100
```

```
no shut
```

```
do wr
```

exit

interface Serial2/0

ip address 10.20.128.2 255.255.192.0

no shut

do wr

exit

Lab-2

interface FastEthernet0/0

ip address 10.21.64.254 255.255.192.0

ip helper-address 10.4.64.100

no shut

do wr

exit

interface Serial2/0

ip address 10.20.192.2 255.255.192.0

no shut

do wr

exit

(CSE-2)Campus-7

interface Serial2/0

ip address 172.16.48.1 255.255.240.0

clock rate 64000

no shut

do wr

exit

```
interface Serial3/0
ip address 192.168.10.49 255.255.255.240
clock rate 64000
no shut
do wr
exit
```

```
interface Serial4/0
ip address 10.16.128.1 255.255.192.0
clock rate 64000
no shut
do wr
exit
```

```
interface Serial5/0
ip address 10.16.192.1 255.255.192.0
clock rate 64000
no shut
do wr
exit
```

```
interface Serial6/0
ip address 10.16.64.2 255.255.192.0
no shut
do wr
exit
```

```
interface Serial7/0
ip address 172.16.96.1 255.255.240.0
clock rate 64000
no shut
do wr
exit
```

```
interface Serial8/0
ip address 192.168.10.97 255.255.255.240
clock rate 64000
no shut
do wr
exit
```

```
interface Serial9/0
ip address 10.20.64.1 255.255.192.0
clock rate 64000
no shut
do wr
exit
```

```
router ospf 7
network 10.0.0.0 0.255.255.255 area 7
network 172.16.0.0 0.0.255.255 area 7
network 192.168.10.0 0.0.0.255 area 7
exit
```


ClassRoom-1

```
interface FastEthernet0/0
ip address 10.17.64.254 255.255.192.0
ip helper-address 10.4.64.100
no shut
do wr
exit
```

```
interface Serial2/0
address 10.16.128.2 255.255.192.
no shut
do wr
exit
```

Lab-1

```
interface FastEthernet0/0
ip address 10.17.0.254 255.255.192.0
ip helper-address 10.4.64.100
no shut
do wr
exit
```

```
interface Serial2/0
ip address 10.16.192.2 255.255.192.0
no shut
do wr
exit
```

Access point configure for wireless network zone:

Access Point0

Physical Config Attributes

GLOBAL

Settings

INTERFACE

Port 0

Port 1

Port 0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

☐ Top

Figure: Access point configure port-0 for wireless network zone

Access Point0

Physical

Config

Attributes

GLOBAL

Settings

INTERFACE

Port 0

Port 1

Port 1

Port Status

☒ On

SSID

Default

2.4 GHz Channel

11

Coverage Range (meters)

1000.00

Authentication

☐ Disabled

☐ WEP

☐ WPA-PSK

☒ WPA2-PSK

WEP Key

PSK Pass Phrase

12345678

User ID

Password

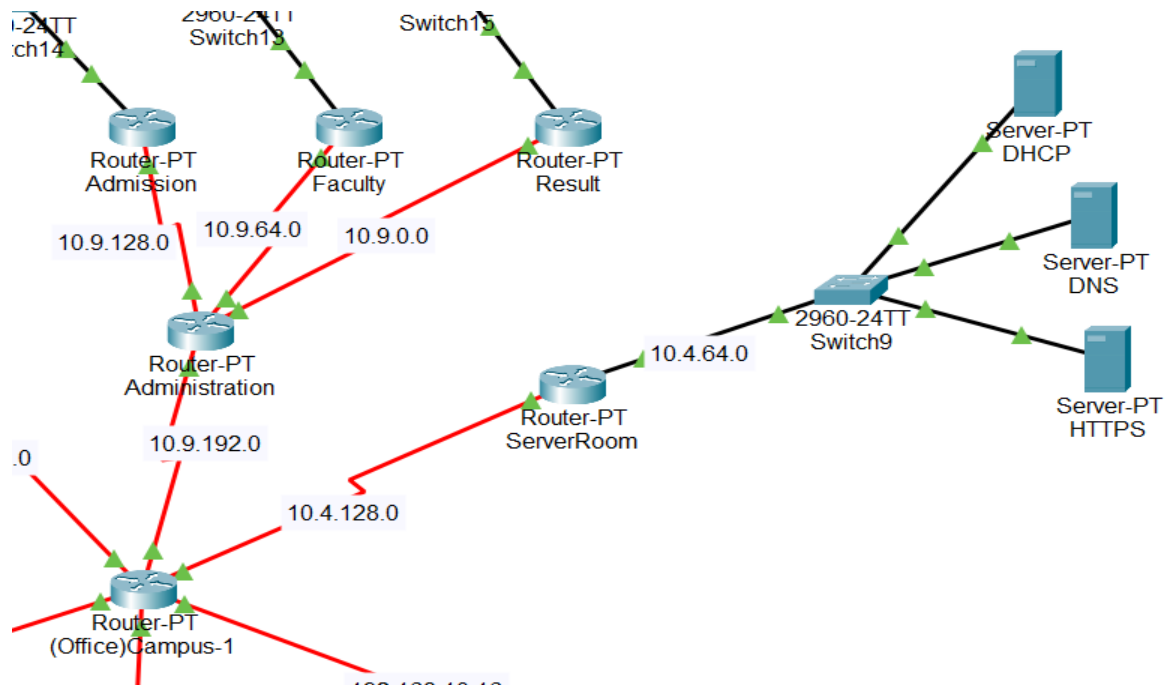
Encryption Type

AES

☐ Top

Figure: Access point configure port-1 for wireless network zone

Server-Room (DHCP, DNS, HTTPS):



Here, with campus-1, there are a server room. Server room consist three servers. They are DHCP, DNS and HTTPS(WEB) servers.

Now,

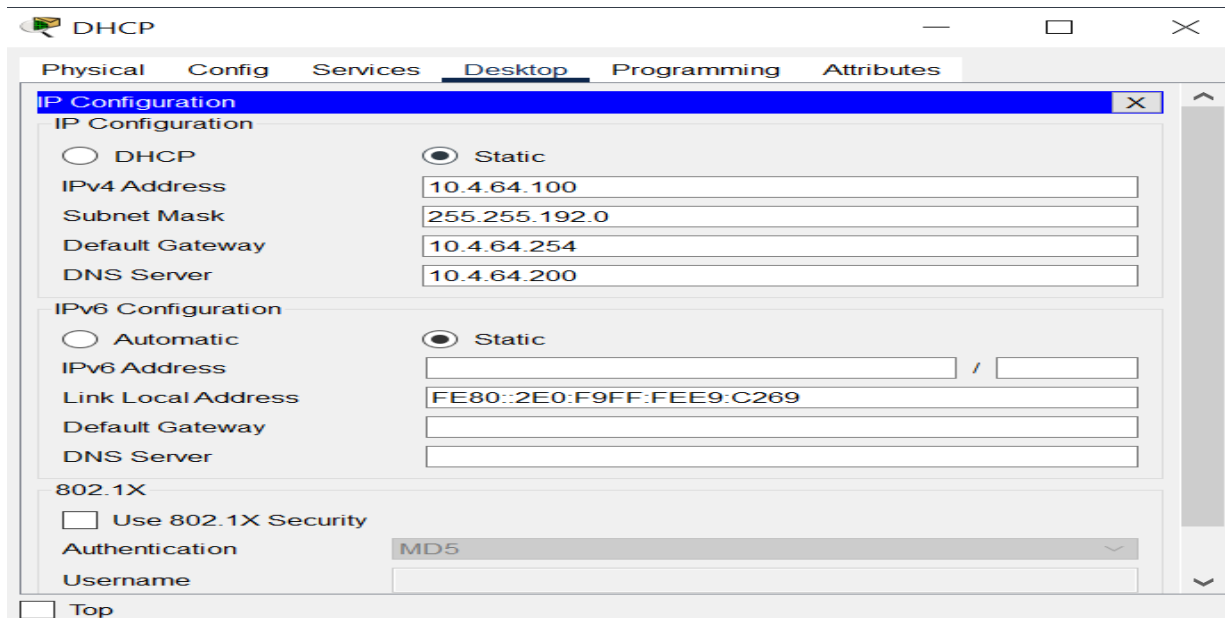


Figure: DHCP Server IP Config.

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP**
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

DHCP

Interface: FastEthernet0 Service: ☒ On ☐ Off

Pool Name: serverPool

Default Gateway: 10.8.64.254

DNS Server: 10.4.64.200

Start IP Address: 10.4.64.255

Subnet Mask: 255.255.192.0

Maximum Number of Users: 16374

TFTP Server: 0.0.0.0

WLC Address: 0.0.0.0

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
Pool11	10.17.64.254	10.4.64.200	10.17.64.0	255.255.192.0	16374	0.0.0.0	0.0.0.0
Pool10	10.17.0.254	10.4.64.200	10.17.0.0	255.255.192.0	16374	0.0.0.0	0.0.0.0
Pool12	10.21.64.254	10.4.64.200	10.21.64.0	255.255.192.0	16374	0.0.0.0	0.0.0.0
Pool13	10.21.0.254	10.4.64.200	10.21.0.0	255.255.192.0	16374	0.0.0.0	0.0.0.0
Pool9	192.168.10.94	10.4.64.200	192.168.10.80	255.255.255.240	16	0.0.0.0	0.0.0.0
Pool8	192.168.10.78	10.4.64.200	192.168.10.64	255.255.255.240	16	0.0.0.0	0.0.0.0
Pool5	10.12.192.254	10.4.64.200	10.12.192.0	255.255.192.0	16374	0.0.0.0	0.0.0.0
Pool6	10.12.128.254	10.4.64.200	10.12.128.0	255.255.192.0	16374	0.0.0.0	0.0.0.0
Pool7	10.12.64.254	10.4.64.200	10.12.64.0	255.255.192.0	16374	0.0.0.0	0.0.0.0

☐ Top

Figure: Server Pool for All Different IP Config.

DNS

Physical Config **Services** **Desktop** Programming Attributes

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 10.4.64.200

Subnet Mask: 255.255.192.0

Default Gateway: 10.4.64.254

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::260:70FF:FEE9:9438

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

☐ Top

Figure: DNS Server IP Config.

DNS

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS**
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

DNS Service ☒ On ☐ Off

Resource Records

Name Type **ARecord**

Address

Add Save Remove

No.	Name	Type	Detail
0	www.scholars.edu.bd	ARecord	10.4.64.201

DNS Cache

☐ Top

Figure: DNS Server Record Config.

HTTPS

Physical Config Services **Desktop** Programming Attributes

IP Configuration

IP Configuration

☐ DHCP ☒ Static

IPv4 Address

Subnet Mask

Default Gateway

DNS Server

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication

Username

☐ Top

Figure: HTTPS(WEB) Server IP Config.

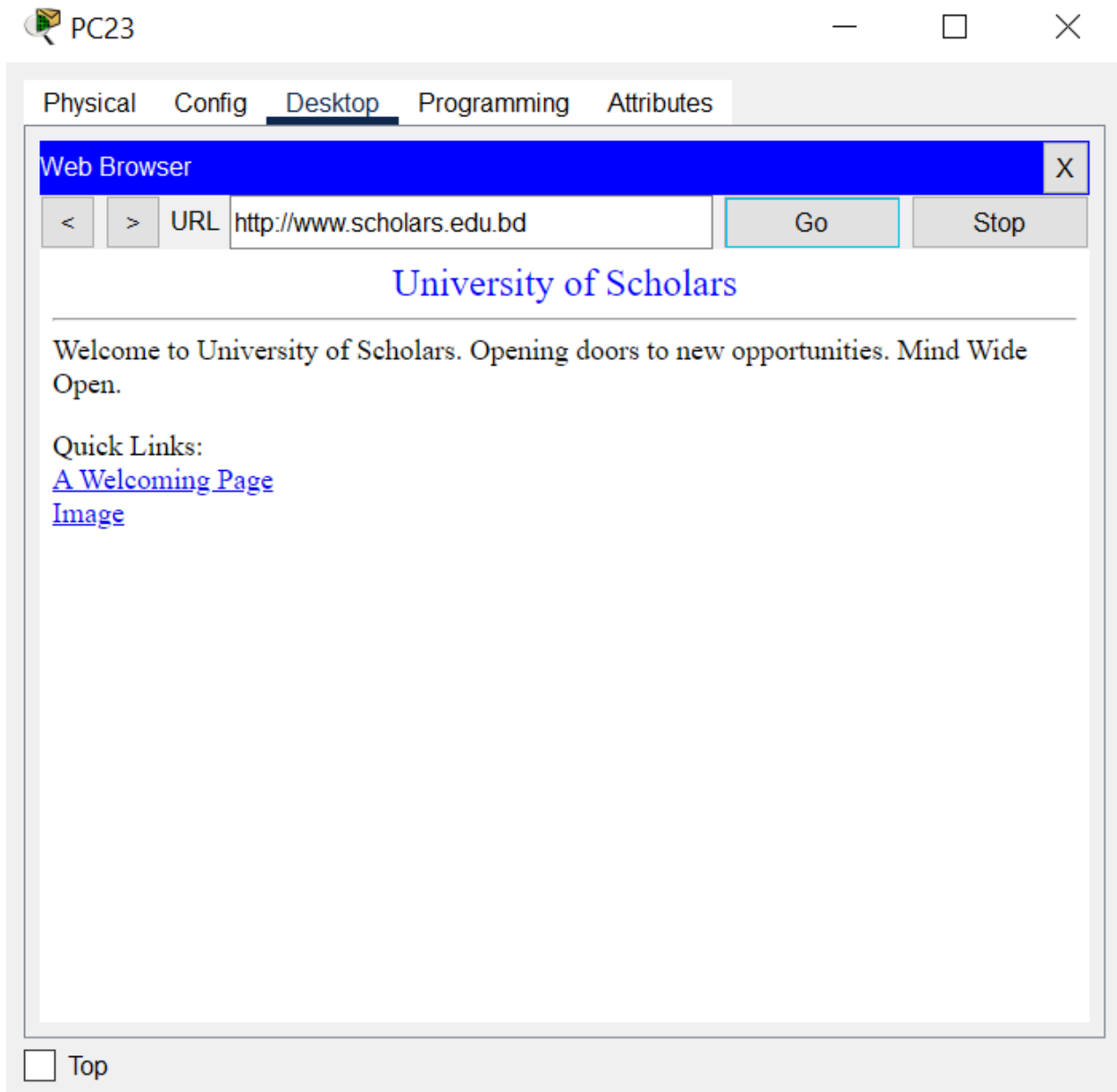


Figure: HTTP(WEB) Page Accessing with URL instead of IP Address

Limitations:

1. We are using CISCO Packet Tracer as networking tool. It has many issues with components.
2. We are IPv4, but it has very IP hosts. So, IPv6 can be a better option.

Conclusion:

In this project, we learned about building a network using CISCO Packet Tracer, and the many advantages of having a network, whether it is wired or wireless. A network allows for the sharing of resources and the exchange of information, making communication and collaboration much more efficient. Despite some difficulties encountered while setting up the network, such as working with subnets and IP classes, and configuring WEB and DNS servers, the project was overall very interesting and provided valuable learning experiences. The successful pings were particularly rewarding, and the knowledge gained will be beneficial in future projects.