



EAST WEST UNIVERSITY

## Project Report **CSE 405**

Computer Networks

### **Project Title:**

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

### **Submitted By**

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Submission Date

**September 18, 2022**

### **Introduction:**

University of Professionals, is an enterprise like East West University, 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. On top of that the university runs a number of 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 subnetted and switching/routing mechanisms are in practice.

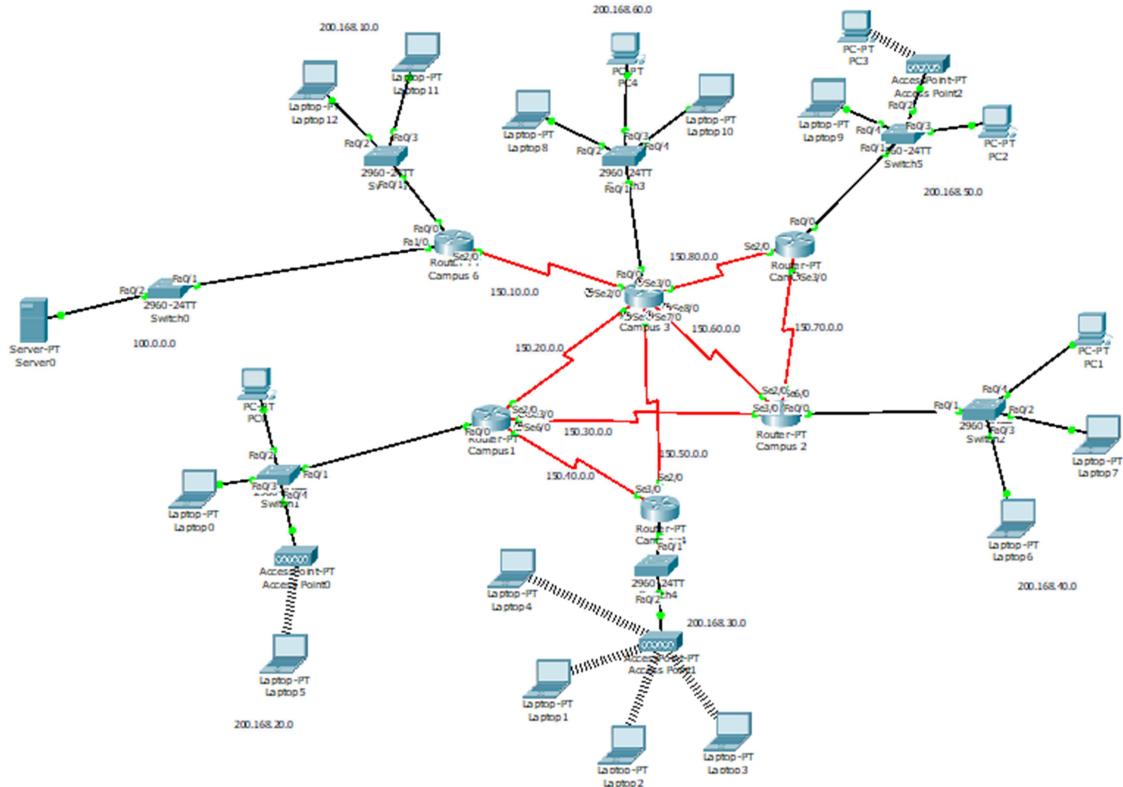
### **Tools Used:**

- Cisco Packet Tracer Software (version 5.3.3)
- Laptop-Pt, Pc-Pt
- Switches (2960)
- Routers (Generic)
- Access Point-PT (Wireless Device)
- Server-PT (Single Server For WEB, DHCP and DNS)
- Connectors (Copper straight through, Serial DCE)

### **Tasks Done:**

- Web page of the university reflects University of Professionals' web page because of all devices is connected to the server which is acting as WEB, DHCP & DNS server.
- DNS sever was installed to locate webserver which redirects us to the website of University of Professionals.
- Single DHCP server provides all of the required IP to all of the networks.
- Wireless links to the networks are available.
- University's full network has covered its six campuses with six routers;
- Connectivity between all the hosts has been established.

## Network Diagram:



## Setup and configuration:

I have used Class C network for the hosts (200.168.10.0, 200.168.20.0, 200.168.30.0, 200.168.40.0, 200.168.50.0, 200.168.60.0), Class B networks for Router's Connector networks (130.10.0.0, 130.20.0.0, 130.30.0.0, 130.40.0.0, 130.50.0.0, 130.60.0.0, 130.70.0.0, 130.80.0.0), and for Server network I have used class A network 100.0.0.0.

For The Router IP Setup We have used a CLI code for each router,

```
//for router 1

interface fa0/0
ip address 200.168.20.254 255.255.255.0
no shut
do wr

interface se2/0
ip address 150.20.0.254 255.255.0.0
clock rate 64000
no shut
do wr

interface se3/0
ip address 150.30.0.254 255.255.0.0
no shut
do wr

interface se6/0
ip address 150.40.0.254 255.255.0.0
no shut
do wr
```

```
//for router 2

interface fa0/0
ip address 200.168.40.254 255.255.255.0
no shut
do wr

interface se2/0
ip address 150.60.0.254 255.255.0.0
clock rate 64000
no shut
do wr

interface se6/0
ip address 150.70.0.254 255.255.0.0
no shut
do wr

interface se3/0
ip address 150.30.0.254 255.255.0.0
no shut
do wr
```

```
//for router 3

interface fa0/0
ip address 200.168.60.254 255.255.255.0
no shut
do wr

interface se2/0
ip address 150.10.0.254 255.255.0.0
clock rate 64000
no shut
do wr

interface se3/0
ip address 150.80.0.254 255.255.255.0
clock rate 64000
no shut
do wr

interface se6/0
ip address 150.20.0.254 255.255.0.0
clock rate 64000
no shut
do wr

interface se7/0
ip address 150.0.50.254 255.255.0.0
clock rate 64000
no shut
do wr

interface se8/0
ip address 150.60.0.254 255.255.0.0
clock rate 64000s
no shut
do wr
```

```
//for router 4

interface fa0/0
ip address 200.168.30.254 255.255.255.0
no shut
do wr

interface se2/0
ip address 150.50.0.254 255.255.0.0
clock rate 64000
no shut
do wr

interface se3/0
ip address 150.40.0.254 255.255.0.0
no shut
do wr
```

|   |   |
|---|---|
| //for router 5  | //for router 6  |
| <pre> interface fa0/0 ip address 200.168.50.254 255.255.255.0 no shut do wr  interface se3/0 ip address 150.70.0.254 255.255.0.0 clock rate 64000 no shut do wr  interface se2/0 ip address 150.80.0.254 255.255.0.0 no shut do wr </pre> | <pre> interface fa0/0 ip address 200.168.10.254 255.255.255.0 no shut do wr  interface fa1/0 ip address 100.0.0.254 255.0.0.0 no shut do wr  interface se2/0 ip address 150.10.0.254 255.255.0.0 no shut do wr </pre> |

To setup the Routing Table I have used the following CLI Code,

|  |  |
|--|--|
| //Router 1   | //Router 3   |
| <pre> router ospf 1  network 200.168.20.0 0.0.0.255 area 1 network 200.168.30.0 0.0.0.255 area 1 network 200.168.40.0 0.0.0.255 area 1  network 200.168.20.0 0.0.0.255 area 1 </pre> | <pre> router ospf 3  network 200.168.60.0 0.0.0.255 area 1  network 150.10.0.0 0.0.255.255 area 1 network 150.20.0.0 0.0.255.255 area 1 network 150.50.0.0 0.0.255.255 area 1 network 150.60.0.0 0.0.255.255 area 1 network 150.80.0.0 0.0.255.255 area 1 </pre> |
| //Router 2   | //router 4   |
| <pre> router ospf 2  network 150.30.0.0 0.0.255.255 area 1 network 150.60.0.0 0.0.255.255 area 1 network 150.70.0.0 0.0.255.255 area 1  network 200.168.40.0 0.0.0.255 area 1 </pre> | <pre> router ospf 4  network 200.168.30.0 0.0.0.255 area 1 netrk 150.40.0.0 0.0.255.255 area 1 network 150.50.0.0 0.0.255.255 area 1 </pre>  |

```

//router 5
router ospf 5
network 200.168.50.0 0.0.0.255 area 1

network 150.70.0.0 0.0.255.255 area 1
network 150.80.0.0 0.0.255.255 area 1


//router 6

router ospf 6
network 200.168.10.0 0.0.0.255 area 1

network 150.10.0.0 0.0.255.255 area 1
network 100.0.0.0 0.255.255.255 area 1

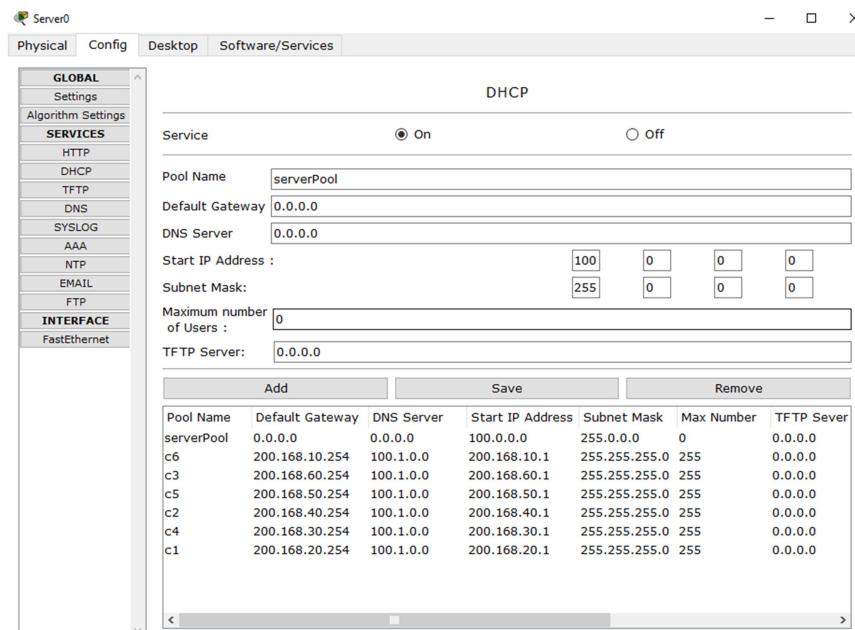
```

To establish connection between the server with all the other networks, I have used IP helper address as it's a remote DHCP for other networks.

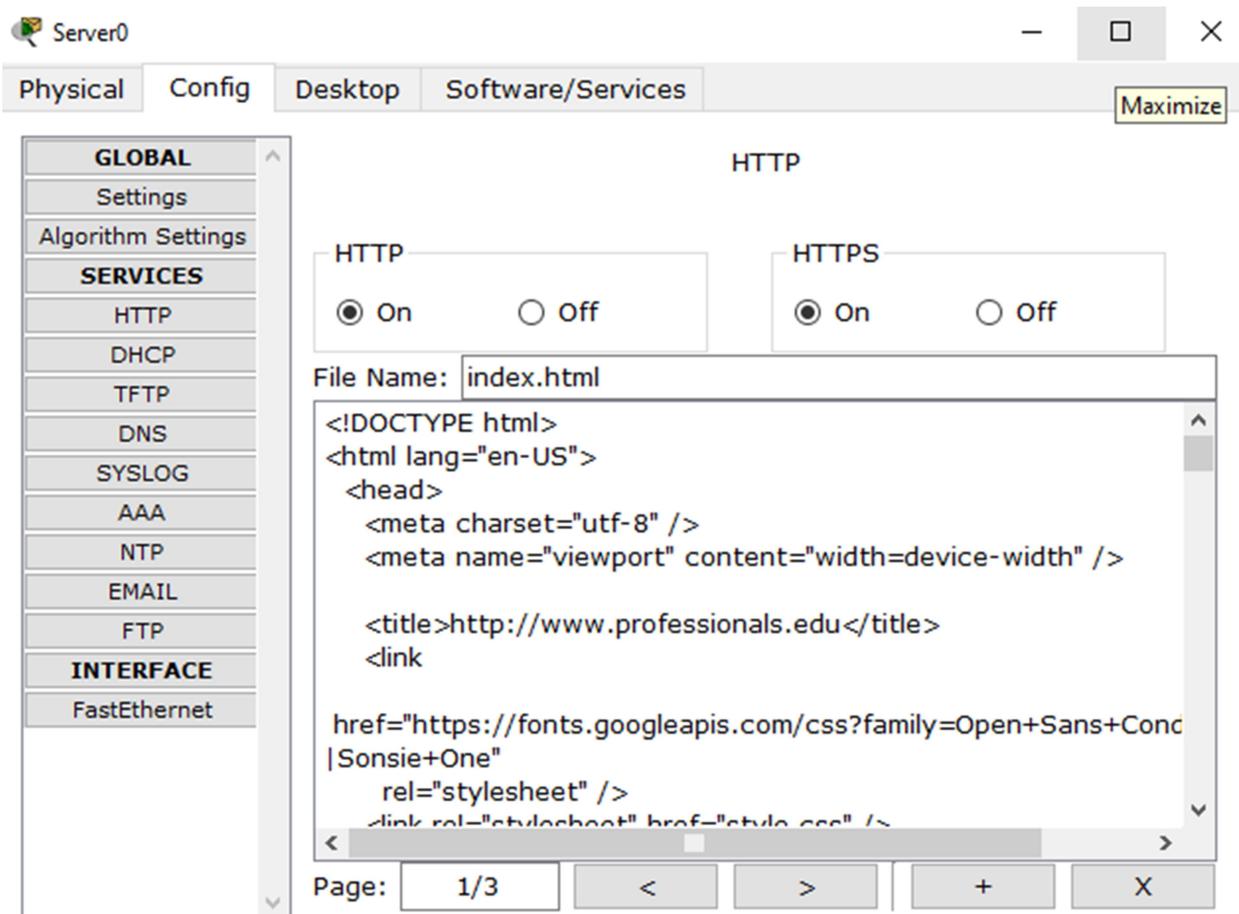
We have set the IP of the server to 100.1.0.0 and set the helper address to all the interfaces as cli code,

### **IP helper-address 100.1.0.0**

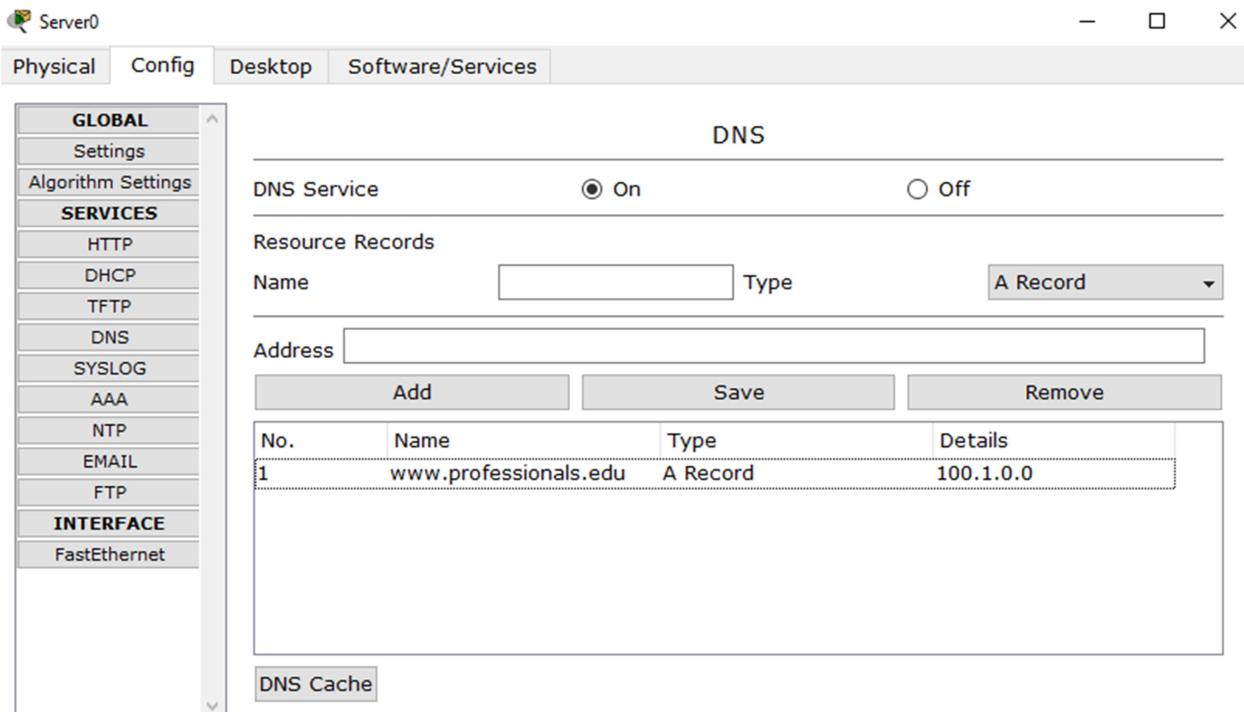
#### **Server Setup:**



Here, we have made some pools that would generate the IP range for different networks In the DHCP server.

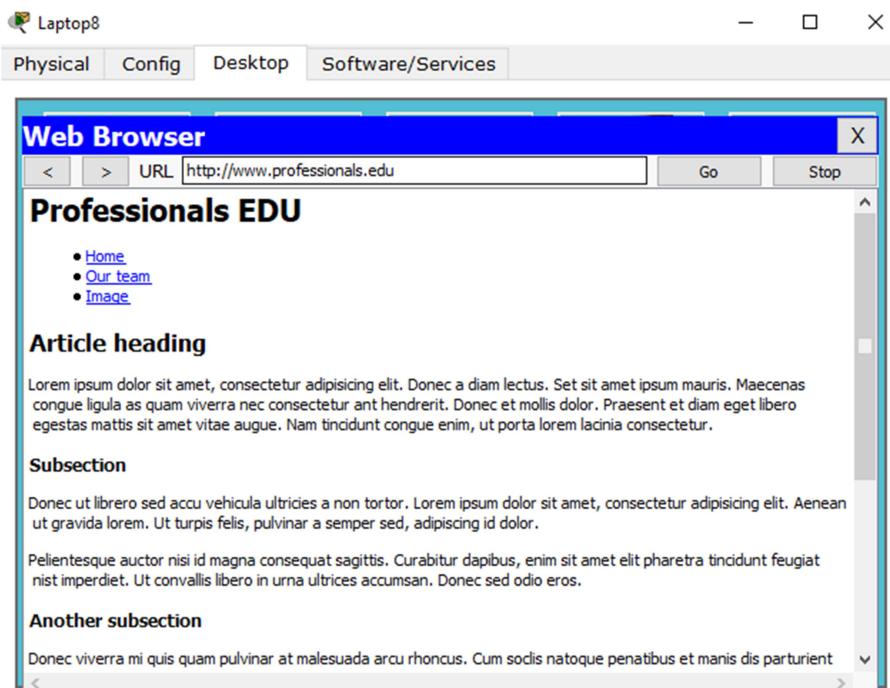


This will work as our http server and run the page index.html.

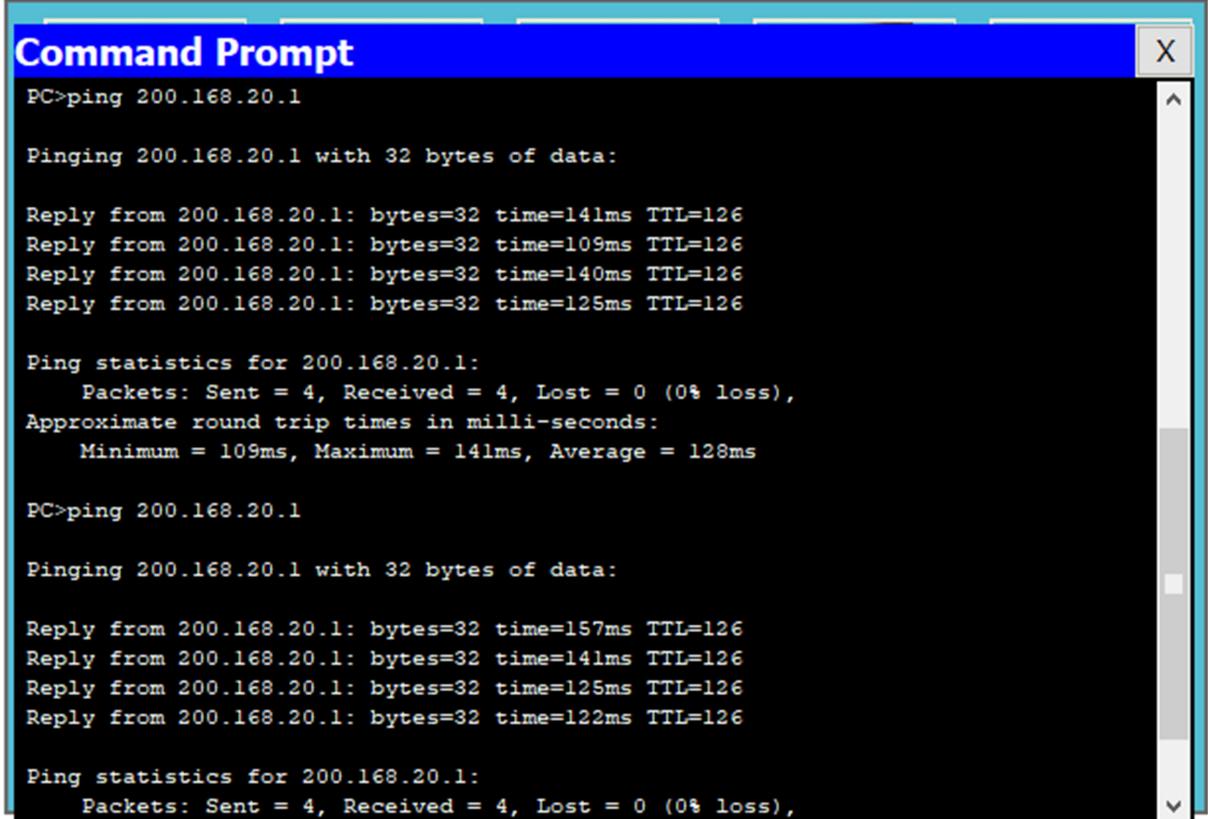


this is the DNS server.

### Running the webpage from a PC:



## Establishing The Connection between hosts:



The screenshot shows a Windows-style Command Prompt window titled "Command Prompt". The window contains the following text output from a ping command:

```
PC>ping 200.168.20.1

Pinging 200.168.20.1 with 32 bytes of data:

Reply from 200.168.20.1: bytes=32 time=141ms TTL=126
Reply from 200.168.20.1: bytes=32 time=109ms TTL=126
Reply from 200.168.20.1: bytes=32 time=140ms TTL=126
Reply from 200.168.20.1: bytes=32 time=125ms TTL=126

Ping statistics for 200.168.20.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 109ms, Maximum = 141ms, Average = 128ms

PC>ping 200.168.20.1

Pinging 200.168.20.1 with 32 bytes of data:

Reply from 200.168.20.1: bytes=32 time=157ms TTL=126
Reply from 200.168.20.1: bytes=32 time=141ms TTL=126
Reply from 200.168.20.1: bytes=32 time=125ms TTL=126
Reply from 200.168.20.1: bytes=32 time=122ms TTL=126

Ping statistics for 200.168.20.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

## Limitations:

There were a lot of bugs I have faced during the design of the network which is surely the limitation of our project, especially when designing wireless devices it would automatically connect to the first wireless device even if we use connect the device to other wireless device.

**Conclusion:**

Using OSPF network architecture helped me to configure the routers easily, I could also use wireless routers but because of great complexity and lack of knowledge about wireless routers I have not used that here. Furthermore, There could be 3 different servers instead of one for DHCP,WEB, and DNS respectively but I preferred using one server for 3 services.