EAST WEST UNIVERSITY

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CSE405: Computer Networks

Section: 01

Project Report

On

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

Submitted to

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

Background

Similar to East West University, Apex University, is an organization that has a sophisticated network infrastructure and a large number computer. The institution offers wireless internet access to all students in addition to wired internet connection to all classrooms, labs, staff PCs, the library, and other academic and administrative wings. Additionally, to support other business processes such as admissions, advising, results, library administration, accounts, also, the institution maintains a variety of intricate networked systems. Subnetted switches and routing methods are used in this intricate network architecture.

Objective:

complex network interconnectivity of the systems and subnetworks, which will reflect the Apex University.

University's structure and facilities, features within the network will include the followings:

Web page of the university will reflect International Apex University's web page.

DNS sever needs to be installed to locate webserver - meaning people will browse

University's web site with the following address: http://www.apex.edu.bd

Among the hosts make sure wireless links to the networks are available.

University's full network has covered its six campuses with six routers; Connections

between the campus routers are given at the end of handout.

Connectivity between all the hosts needs to be established.

Features:

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.

Network addresses will be from all 3 classes.

Incorporation of different subnets.

Requirements:

- 7 (PT-Router)
- 7 (Switch-2960)
- DHCP Server (Dynamic Host Configuration Protocol)
- DNS Server (Domain name System)
- WEB Server
- Straight Through Cable to connect route with switch
- Serial DCE Cable to connect router with router

- PC
- Laptop
- Access-Point (WIFI zone)

Network design:

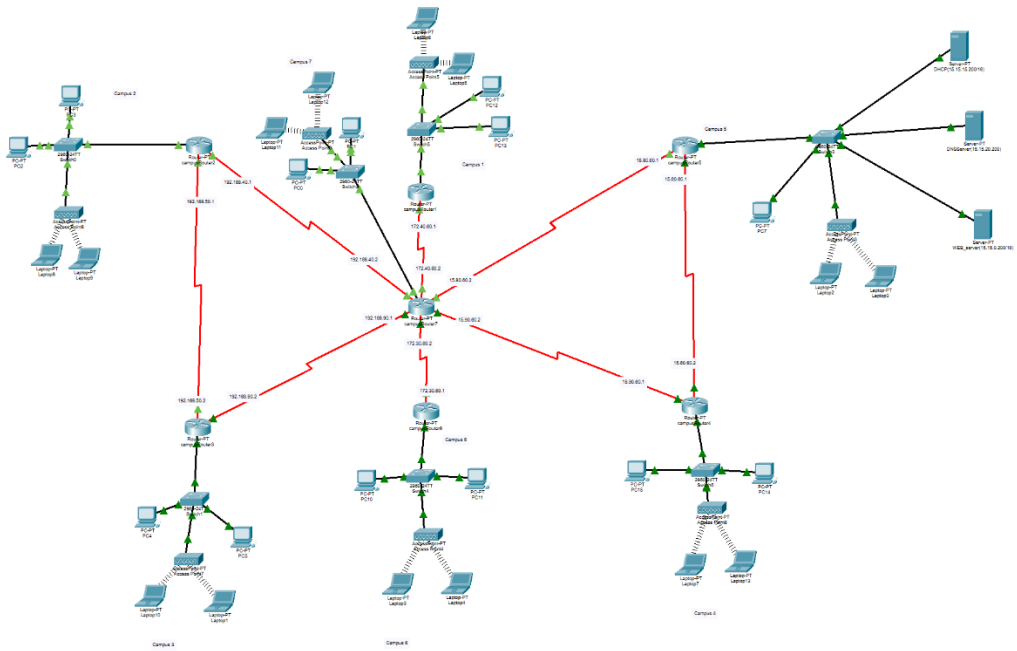


Fig: full-fledged network for Apex University with multiple subnets.

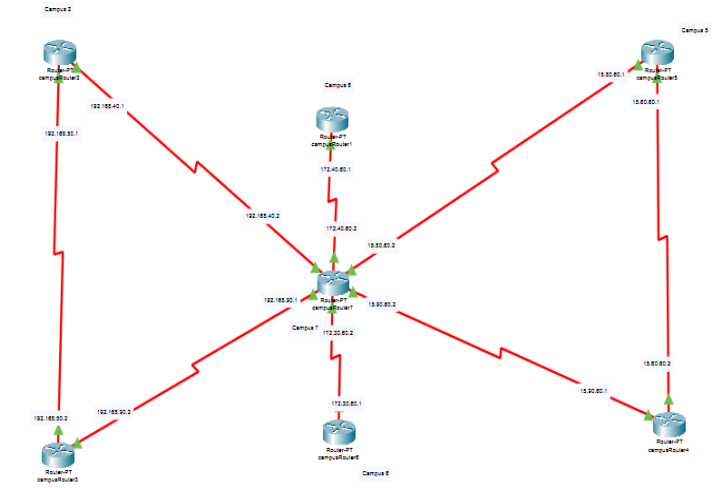


Fig: Interconnectivity Between 7 Campus Router

Router Interfaces:

1. serial DCE cable campusrouter1 to campuserouter7 where campusrouter1(se2/0) and campusrouter7(se8/0) clock apply campusrouter1, net 172.40.60.0/30
2. serial DCE cable campusrouter2 to campusrouter7 where campusrouter2(se3/0) and campusrouter7(se2/0) clock apply campusrouter2, net 192.168.40.0/30
3. serial DCE cable campusrouter2 to campusrouter3 where campusrouter2(se2/0) and campusrouter7(se2/0) clock apply campusrouter2, net 192.168.50.0/30
4. serial DCE cable campusrouter3 to campusrouter7 where campusrouter3(se3/0) and campusrouter7(se3/0) clock apply campusrouter3, net 192.168.90.0/30
5. serial DCE cable campusrouter6 to campusrouter7 where campusrouter6(se2/0) and campusrouter7(se7/0) clock apply campusrouter6, net 172.30.60.0/30
6. serial DCE cable campusrouter4 to campusrouter7 where campusrouter4(se3/0) and campusrouter7(se9/0) clock apply campusrouter4, net 172.30.60.0/30
7. serial DCE cable campusrouter5 to campusrouter4 where campusrouter5(se3/0) and campusrouter4(se3/0) clock apply campusrouter5, net 15.60.60.0/30
8. serial DCE cable campusrouter5 to campusrouter7 where campusrouter5(se2/0) and campusrouter7(se6/0) clock apply campusrouter5, net 15.80.60.0/30

Number of hosts and number of networks:

The total number of hosts in this design 27 and 15 networks from all 3(three) class.

Network IP campuses:

1. *Campus1: campusrouter1 Net IP (172.20.0.0/24) subnet 8bit for networks and 8bit for host*
2. *Campus2: campusrouter2 Net IP (192.168.10.0/24) subnet 24bit for networks and 8bit for host*
3. *Campus3: campusrouter3 Net IP (192.168.30.0/24) subnet 24bit for networks and 8bit for host*
4. *Campus4: campusrouter4 Net IP (15.50.0.0/16) subnet 8bit for networks and 8bit for host*
5. *Campus5: campusrouter5 Net IP (15.15.0.0/16) subnet 8bit for networks and 8bit for host*
6. *Campust6: campusrouter6 Net IP (172.50.0.0/24) subnet 8bit for networks and 8bit for host*
7. *Campus7: campusrouter7 Net IP (15.20.0.0/16) subnet 8bit for networks and 8bit for host*

7 Router Design with IP address Configuration

Here, uses multiple Subnet IP from all Three Class (A, B, C) and take subnet mask separation in 30^{th} bit. so that no loss IP address. If I take here subnet separation mask in 30^{th} bit then my useable IP 2

32-30 = 2 bits

2^2 – 2(broadcast and network) = 2 IP so for each network router to router 2 IP is enough.

Configurations for Router and OSPF Dynamic routing Table:

Router1(Campus1):

interface se2/0

ip address 172.40.60.1 255.255.255.252

clock rate 64000

no shut

do wr

exit

interface fa0/0

ip address 172.20.255.254 255.255.0.0

no shut

do wr

exit

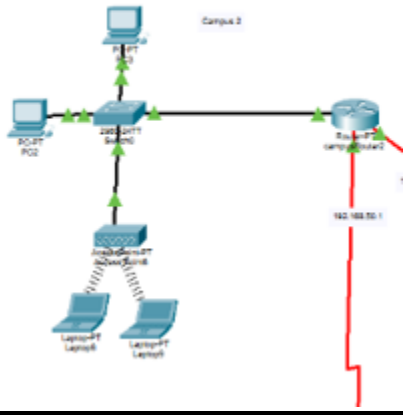
router OSPF 1

network 172.20.0.0 0.0.255.255 area 1

network 172.40.60.0 0.0.0.3 area 1

exit

Router2(Campus2):



interface se3/0

ip address 192.168.40.1 255.255.255.252

clock rate 64000

no shut

do wr

exit

interface se2/0

ip address 192.168.50.1 255.255.255.252

clock rate 64000

no shut

do wr

exit

interface fa0/0

ip address 192.168.10.254 255.255.255.0

no shut

do wr

exit

router OSPF 2

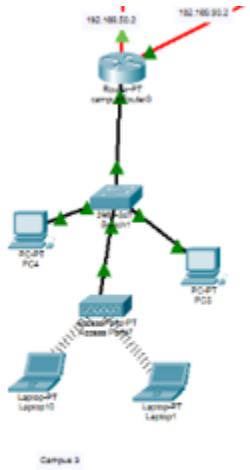
network 192.168.10.0 0.0.0.255 area 1

network 192.168.40.0 0.0.0.3 area 1

network 192.168.50.0 0.0.0.3 area 1

exit

Router3(Campus3):



interface fa0/0

ip address 192.168.30.254 255.255.255.0

no shut

do wr

exit

interface se2/0

ip address 192.168.50.2 255.255.255.252

no shut

do wr

exit

interface se3/0

ip address 192.168.90.1 255.255.255.252

clock rate 64000

no shut

do wr

exit

router OSPF 3

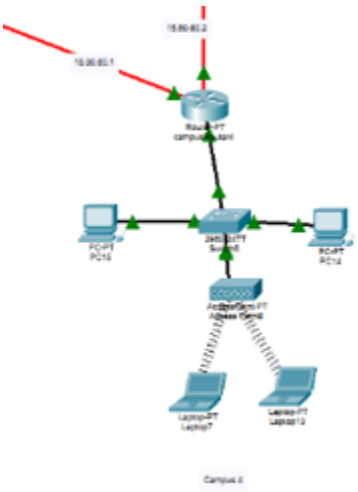
network 192.168.30.0 0.0.0.255 area 1

network 192.168.90.0 0.0.0.3 area 1

network 192.168.50.0 0.0.0.3 area 1

exit

Router4(Campus4):



interface fa0/0

ip address 15.50.255.254 255.255.0.0

no shut

do wr

exit

interface se2/0

ip address 15.60.60.2 255.255.255.252

no shut

do wr

exit

interface se3/0

ip address 15.90.60.1 255.255.255.252

clock rate 64000

no shut

do wr

exit

router OSPF 4

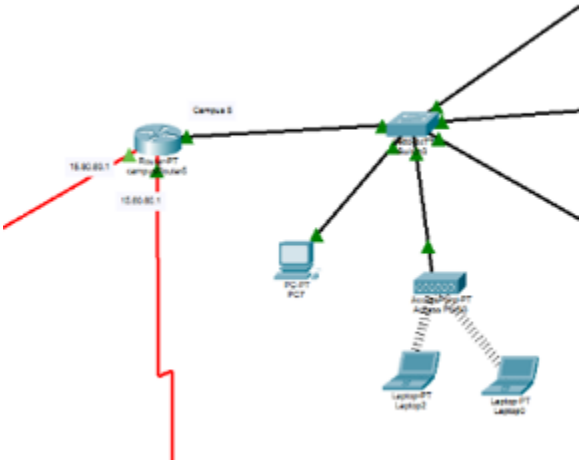
network 15.50.0.0 0.0.255.255 area 1

network 15.60.60.0 0.0.0.3 area 1

network 15.90.60.0 0.0.0.3 area 1

exit

Router5(Campus5):



interface fa0/0

ip address 15.15.255.254 255.255.0.0

no shut

do wr

exit

interface se2/0

ip address 15.80.60.1 255.255.255.252

clock rate 64000

no shut

do wr

exit

interface se3/0

ip address 15.60.60.1 255.255.255.252

clock rate 64000

no shut

do wr

exit

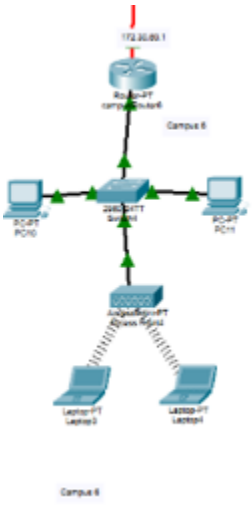
router OSPF 5

network 15.15.0.0 0.0.255.255 area 1

network 15.60.60.0 0.0.0.3 area 1

network 15.80.60.0 0.0.0.3 area 1

Router6(Campus6):



interface se2/0

ip address 172.30.60.1 255.255.255.252

clock rate 64000

no shut

do wr

exit

interface fa0/0

ip address 172.50.255.254 255.255.0.0

no shut

do wr

exit

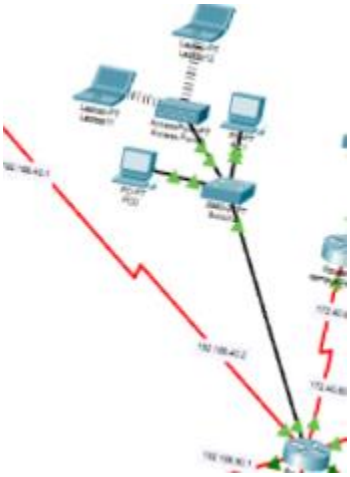
router OSPF 6

network 172.50.0.0 0.0.255.255 area 1

network 172.30.60.0 0.0.0.3 area 1

exit

Router7(Campus7):



interface fa0/0

ip address 15.20.60.254 255.255.0.0

no shut

do wr

interface se2/0

ip address 192.168.40.2 255.255.255.252

no shut

do wr

exit

interface se3/0

ip address 192.168.90.2 255.255.255.252

no shut

```
do wr
exit
interface se6/0
ip address 15.80.60.2 255.255.255.252
no shut
do wr
exit
interface se7/0
ip address 172.30.60.2 255.255.255.252
no shut
do wr
exit
interface se8/0
ip address 172.40.60.2 255.255.255.252
no shut
do wr
exit
interface se9/0
ip address 15.90.60.2 255.255.255.252
no shut
do wr
exit
router OSPF 7
network 15.20.0.0 0.0.255.255 area 1
network 192.168.40.0 0.0.0.3 area 1
network 192.168.90.0 0.0.0.3 area 1
network 15.80.60.0 0.0.0.3 area 1
network 172.30.60.0 0.0.0.3 area 1
network 172.40.60.0 0.0.0.3 area 1
```

network 15.90.60.0 0.0.0.3 area 1

exit

Server room (DHCP, DNS, WEB-Server):

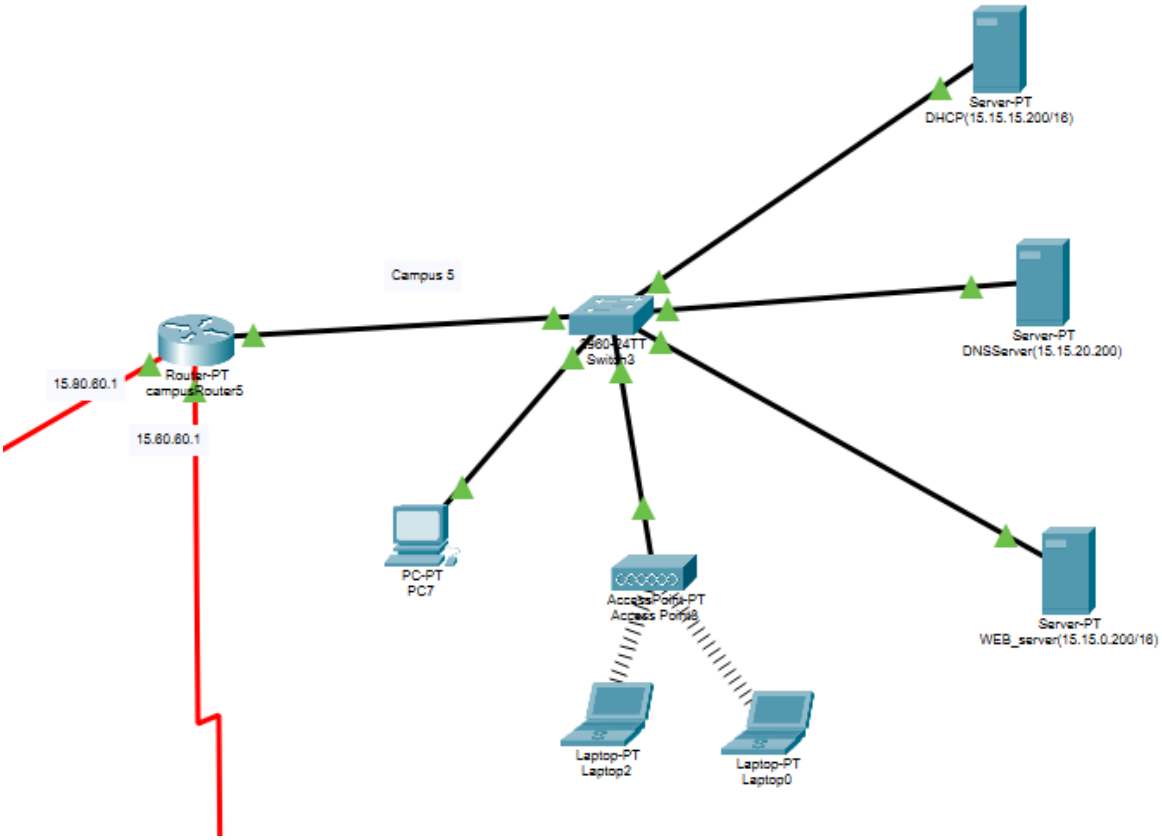


Fig: DHCP, DNS, WEB-Server connected with campus-5

IP address generate from DHCP server:

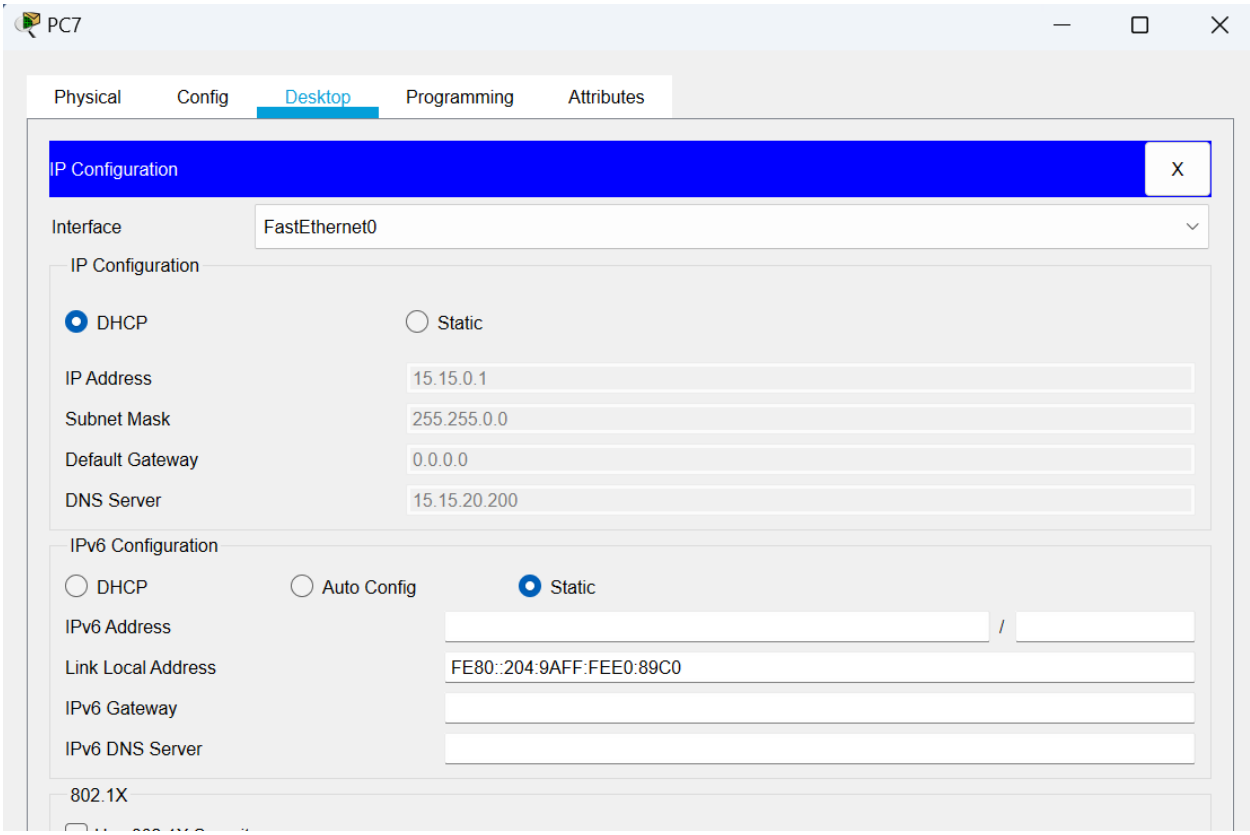


Fig: IP address generate from DHCP server

DHCP SERVER IP Configuration:

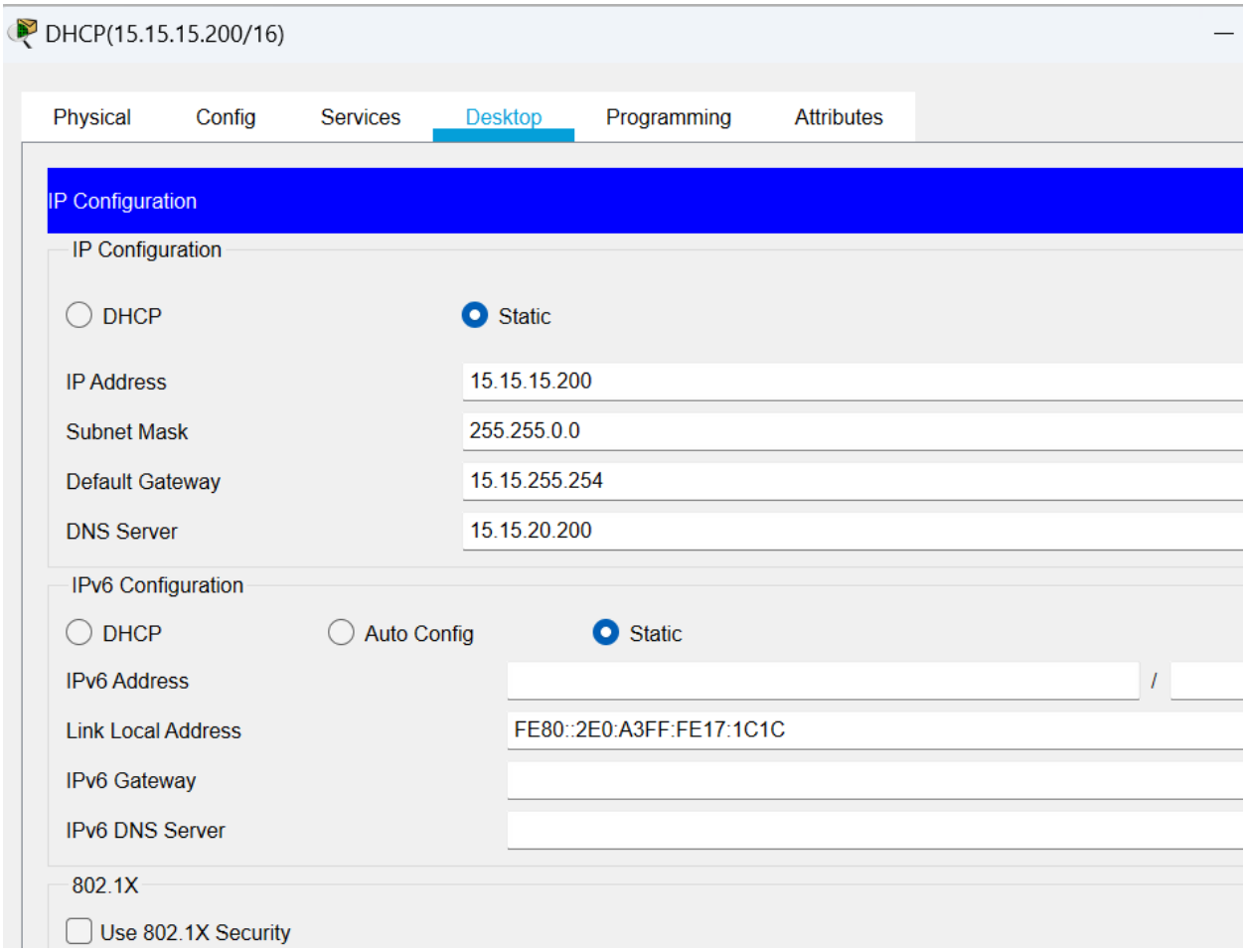


Fig: static configuration DHCP server IP address, subnet mask, default gateway, DNS server IP address

DHCP Server pool:

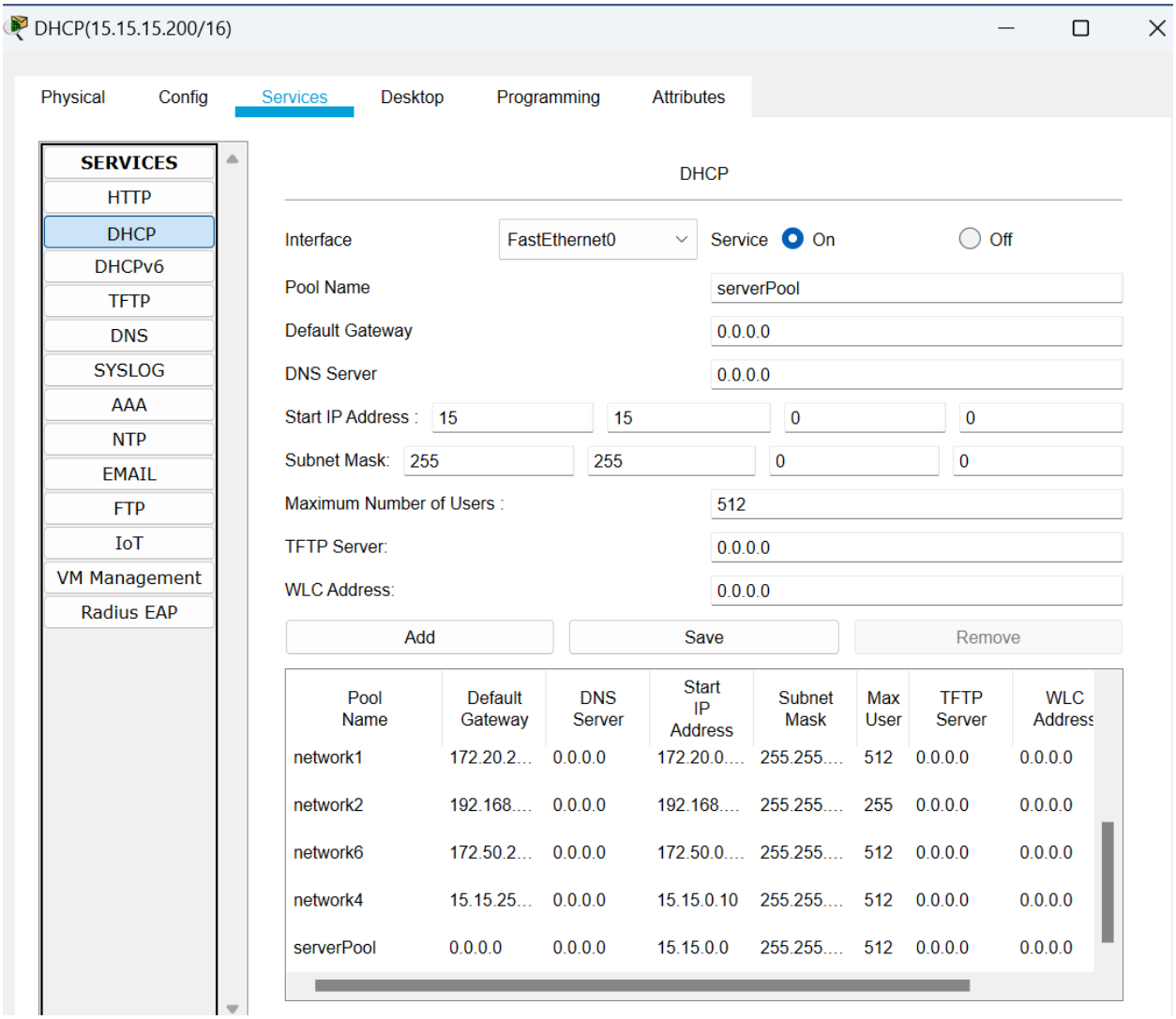


Fig: Configure server pool for all 7 networks (campuses)

Limitations:

Using a single DHCP server for the entire network of Apex University, which spans seven campuses, comes with several limitations and challenges:

- If the single DHCP server fails, none of the hosts across all campuses will be able to obtain IP addresses, resulting in widespread network disruption.
- The distance between clients and the DHCP server can introduce latency, causing delays in IP address assignment, especially during peak times.
- One wrong routing configuration may stop other campuses from accessing the web site.

Conclusion: Though there are limitation in using one DHCP Server in this network but Apex University's network structure effectively meets the organization's requirements for a thorough, linked, and future-proof infrastructure. LAN integration, DNS, DHCP, dynamic routing, and other crucial issues are addressed by the project to guarantee dependable and effective network performance on all campuses.