



EAST WEST UNIVERSITY

Department of CSE

Course Code
CSE405

Course Title
Computer Networks

Project Report

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

Section : 02 Semester : Spring2025



Submitted By

Name	ID
Abrar Hossain Zahin	2022-2-60-040



Submitted To

Dr. Anisur Rahman
Associate Professor
Department of Computer Science and Engineering
East West University

Date of Report Submitted : 31 May, 2025

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

◇ Description

Apex University, 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 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.

◇ Objective

Our goal 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:

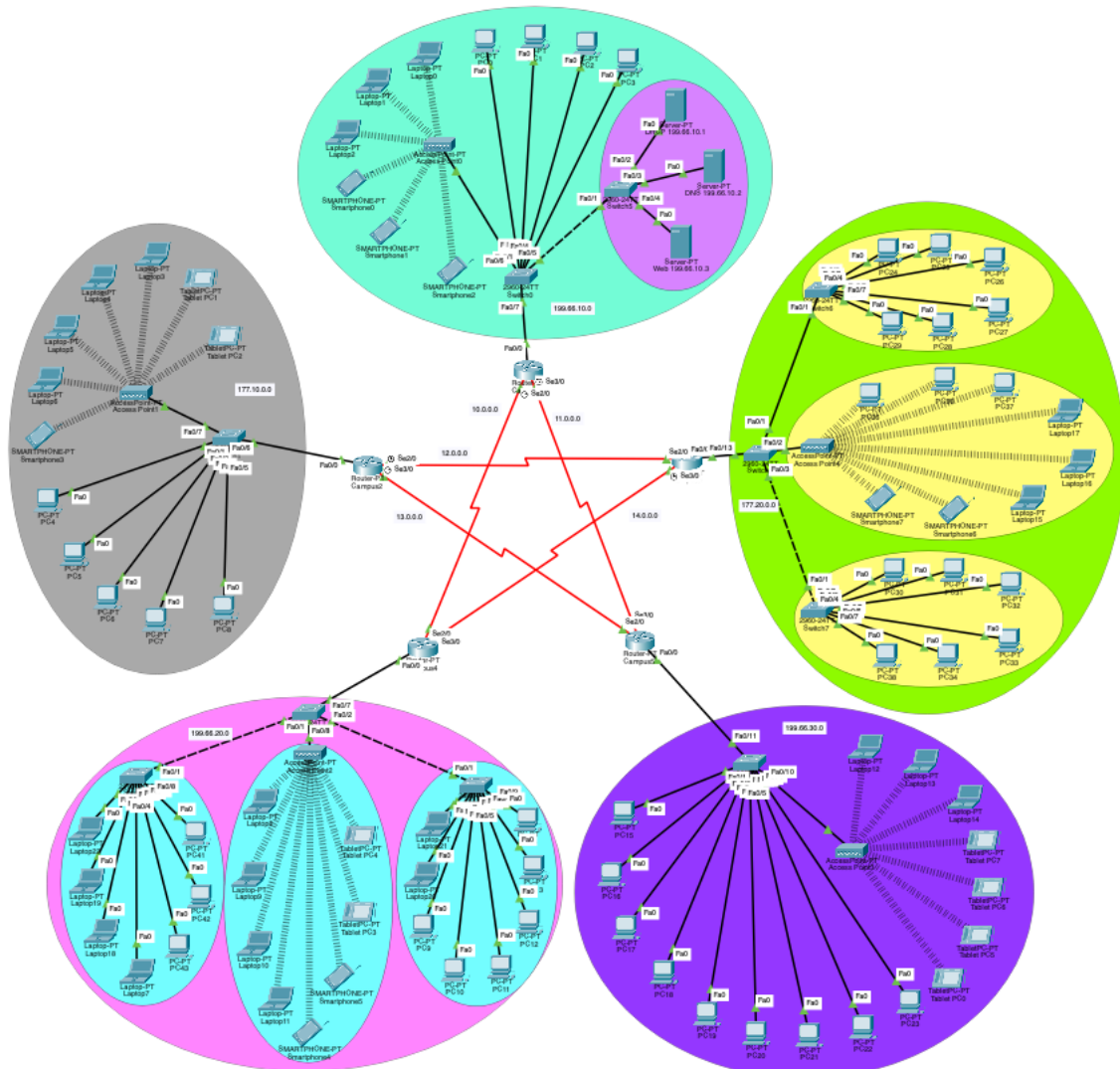
- Web page of the university will reflect 'Apex University' web page.
- A single DNS sever needs to be installed to locate webserver - meaning people will browse University's web site with the following address: <http://www.apex.edu.bd>
- Ensure centralized service deployment, including single DHCP for IP assignment, DNS for name resolution, and a web server for hosting the university website.
- Among the hosts in a network make sure some wireless hosts are added in addition to wired hosts.
- Enable dynamic and scalable routing using OSPF to adapt to future network expansions or changes.
- University's full network has covered its five campuses with five routers
- Connectivity between all the hosts will be established.
- Maintain a structured and modular topology to simplify management, maintenance, and troubleshooting

◇ Requirements

- i. 5 Router (Router-PT)
- ii. 5 AccessPoint-PT
- iii. 5 Switch (2960-24TT)
- iv. PC (PC-PT)
- v. Laptop (Laptop-PT)
- vi. Tablet (TabletPC-PT)
- vii. Smart phone (Smartphone-PT)
- viii. DHCP Server (Dynamic Host Configuration Protocol)
- ix. DNS Server (Domain Name System)
- x. WEB Server
- xi. Straight Through Cable
- xii. Serial DCE Cable
- xiii. Coper Cross-Over Cable

◇ Logical Diagram

The design consists of eight local networks (campuses), with Campus 1 serving as the central hub where all servers are housed in a dedicated server room. These servers provide essential services to the entire university network. Each campus is equipped with both wired and wireless network access, ensuring seamless connectivity for students, faculty, and administrative operations. The diagram below visually represents the structure and interconnections of the network.



◇ Networks Design Specifications

The design consists of five routers denoting each campus. Each campus has a different network of its own. Campus 1, 4 and 5 are assigned with class C network, campus 2 and 3 are assigned with class B network. Every host of each campus are connected with a switch to their respective router. There is also a wireless access point in each network ensuring wireless connectivity.

LAN IP Schemes

Network	IP	IP Class
Campus 1	199.66.10.0	C
Campus 2	177.10.0.0	B
Campus 3	177.20.0.0	B
Campus 4	199.66.20.0	C
Campus 5	199.66.30.0	C

Inter-Router Links

Network	IP	IP Class
Campus 1 to Campus 4	10.0.0.0	A
Campus 1 to Campus 5	11.0.0.0	A
Campus 2 to Campus 3	12.0.0.0	A
Campus 2 to Campus 5	13.0.0.0	A
Campus 3 to Campus 4	14.0.0.0	A

Number of Hosts and Networks

Number of Hosts used: 80

Number of networks used: $5 + 5 = 10$

Configurations of Router

<pre># Router 1 (Campus 1) enable config interface fa0/0 ip address 199.66.10.254 255.255.255.0 ip helper-address 199.66.10.1 no shut no wr exit interface se2/0 ip address 10.0.0.1 255.0.0.0 clock rate 64000 no shut do wr exit interface se3/0 ip address 11.0.0.1 255.0.0.0 clock rate 64000 no shut do wr exit router ospf 1 network 199.66.10.0 0.0.0.255 area 1 network 10.0.0.0 0.255.255.255 area 1 network 11.0.0.0 0.255.255.255 area 1 exit</pre>	<pre># Router 2 (Campus 2) enable config interface fa0/0 ip address 177.10.255.254 255.255.0.0 ip helper-address 199.66.10.1 no shut no wr exit interface se2/0 ip address 12.0.0.1 255.0.0.0 clock rate 64000 no shut do wr exit interface se3/0 ip address 13.0.0.1 255.0.0.0 clock rate 64000 no shut do wr exit router ospf 1 network 177.10.0.0 0.0.255.255 area 1 network 12.0.0.0 0.255.255.255 area 1 network 13.0.0.0 0.255.255.255 area 1 exit</pre>
<pre># Router 3 (Campus 3) enable config interface fa0/0 ip address 177.20.255.254 255.255.0.0 ip helper-address 199.66.10.1 no shut no wr exit interface se2/0 ip address 12.0.0.2 255.0.0.0 no shut do wr exit</pre>	

```

interface se3/0
ip address 14.0.0.1 255.0.0.0
no shut
do wr
exit

router ospf 1
network 177.20.0.0 0.0.255.255 area 1
network 12.0.0.0 0.0.0.255 area 1
network 14.0.0.0 0.0.0.255 area 1
exit

```

Router 4 (Campus 4)

enable
config

```

interface fa0/0
ip address 199.66.20.254 255.255.255.0
ip helper-address 199.66.10.1
no shut
no wr
exit

```

```

interface se2/0
ip address 10.0.0.2 255.0.0.0
clock rate 64000
no shut
do wr
exit

```

```

interface se3/0
ip address 14.0.0.2 255.0.0.0
no shut
do wr
exit

```

```

router ospf 1
network 199.66.20.0 0.0.0.255 area 1
network 10.0.0.0 0.255.255.255 area 1
network 14.0.0.0 0.0.255.255 area 1
exit

```

Router 5 (Campus 5)

enable
config

```

interface fa0/0
ip address 199.66.30.254 255.255.255.0
ip helper-address 199.66.10.1
no shut
no wr
exit

```

```

interface se2/0
ip address 13.0.0.2 255.0.0.0
no shut
do wr
exit

```

```

interface se3/0
ip address 11.0.0.2 255.0.0.0
no shut
do wr
exit

```

```

router ospf 1
network 199.66.30.0 0.0.0.255 area 1
network 13.0.0.0 0.255.255.255 area 1
network 11.0.0.0 0.255.255.255 area 1
exit

```

DHCP

Here is a centralized server room located in Campus 1, which hosts three key servers (DHCP, DNS, Web). The DHCP server is configured with five distinct DHCP pools, each assigned to serve a specific subnet across the five-campus network. This centralized setup ensures automatic IP address assignment for all five wired and wireless LAN segments, streamlining network management and ensuring consistent configuration.

PC33

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IPv4 Address: 177.20.255.30

Subnet Mask: 255.255.0.0

Default Gateway: 177.20.255.254

DNS Server: 199.66.10.2

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::2E0:F7FF:FE77:4669

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

PC(Ethernet)

DHCP 199.66.10.1

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: 199.66.10.254

DNS Server: 199.66.10.2

Start IP Address: 199.66.10.16

Subnet Mask: 255.255.255.0

Maximum Number of Users: 240

TFTP Server: 0.0.0.0

WLC Address: 0.0.0.0

Add Save Remove

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
Campus 4	199.66.20.254	199.66.10.2	199.66.20.16	255.255.255.0	240	0.0.0.0	0.0.0.0
Campus 5	199.66.30.254	199.66.10.2	199.66.30.16	255.255.255.0	240	0.0.0.0	0.0.0.0
Campus 3	177.20.255.254	199.66.10.2	177.20.255.16	255.255.0.0	240	0.0.0.0	0.0.0.0
Campus 2	177.10.255.254	199.66.10.2	177.10.255.16	255.255.0.0	240	0.0.0.0	0.0.0.0
serverPool	199.66.10.254	199.66.10.2	199.66.10.16	255.255.255.0	240	0.0.0.0	0.0.0.0

☐ Top

DHCP

Smartphone5

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface: Wireless0

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IPv4 Address: 199.66.20.41

Subnet Mask: 255.255.0.0

Default Gateway: 199.66.20.254

DNS Server: 199.66.10.2

IPv6 Configuration

☒ Automatic ☐ Static IPv6 request failed.

IPv6 Address: /

Link Local Address: FE80::2E0:F9FF:FE68:67DD

Default Gateway:

DNS Server:

☐ Top

SmartPhone(Wireless)

Laptop13

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface: Wireless0

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IPv4 Address: 199.66.20.40

Subnet Mask: 255.255.0.0

Default Gateway: 199.66.20.254

DNS Server: 199.66.10.2

IPv6 Configuration

☒ Automatic ☐ Static IPv6 request failed.

IPv6 Address: /

Link Local Address: FE80::204:9AFF:FE24:EE50

Default Gateway:

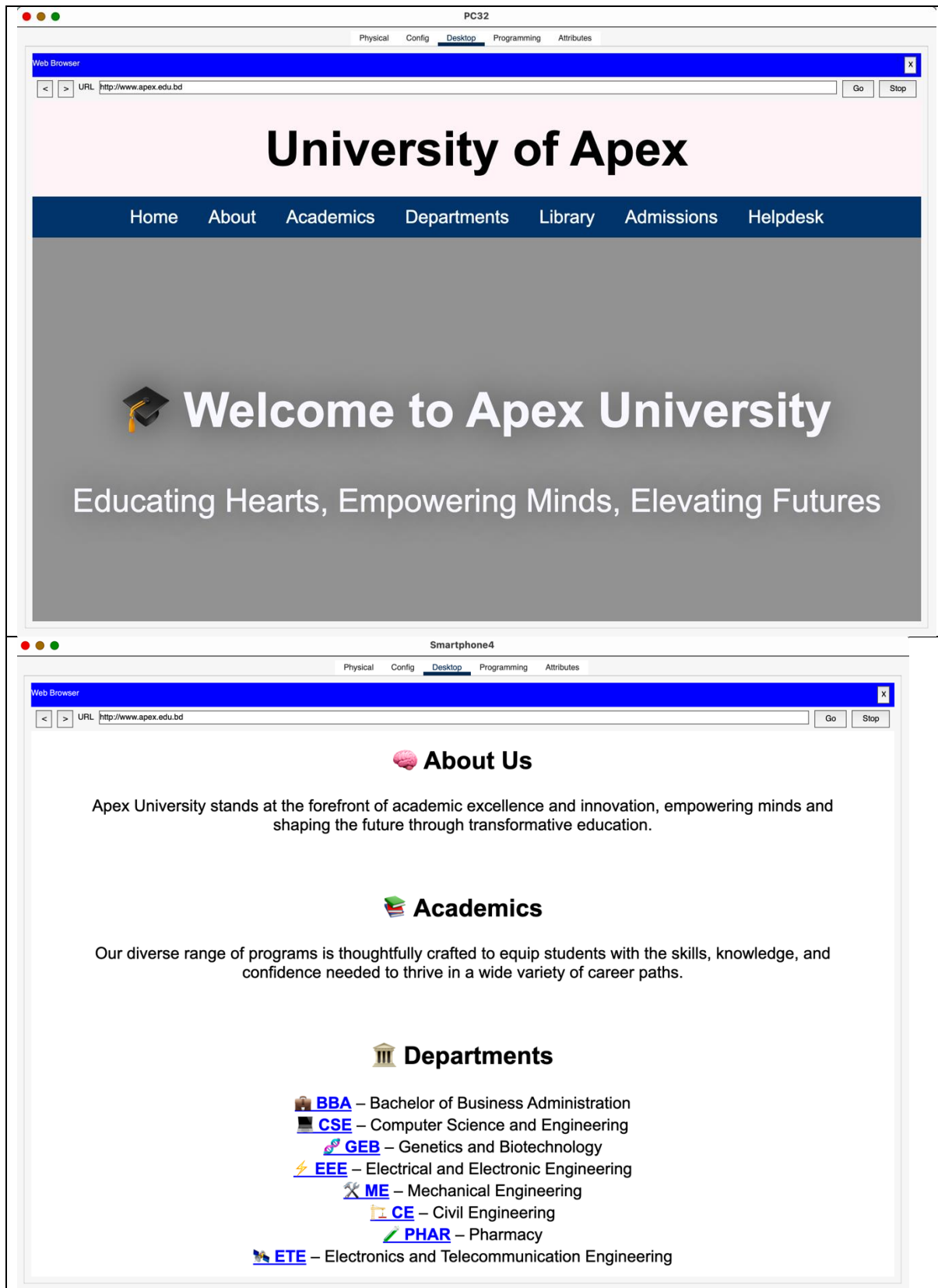
DNS Server:

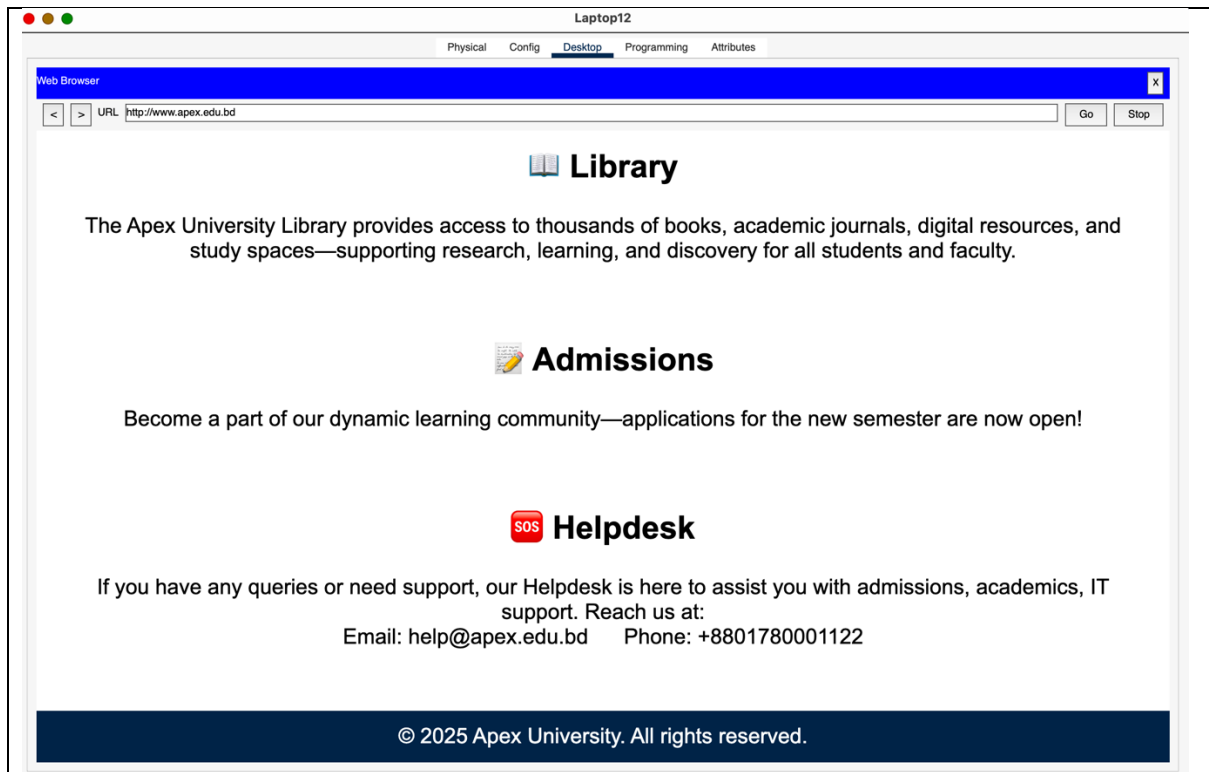
☐ Top

Laptop(Wireless)

Website Page

The web server contains the university webpage. The DNS server is responsible to translate the web server IP to “www.apex.edu.bd”.





DNS WEB

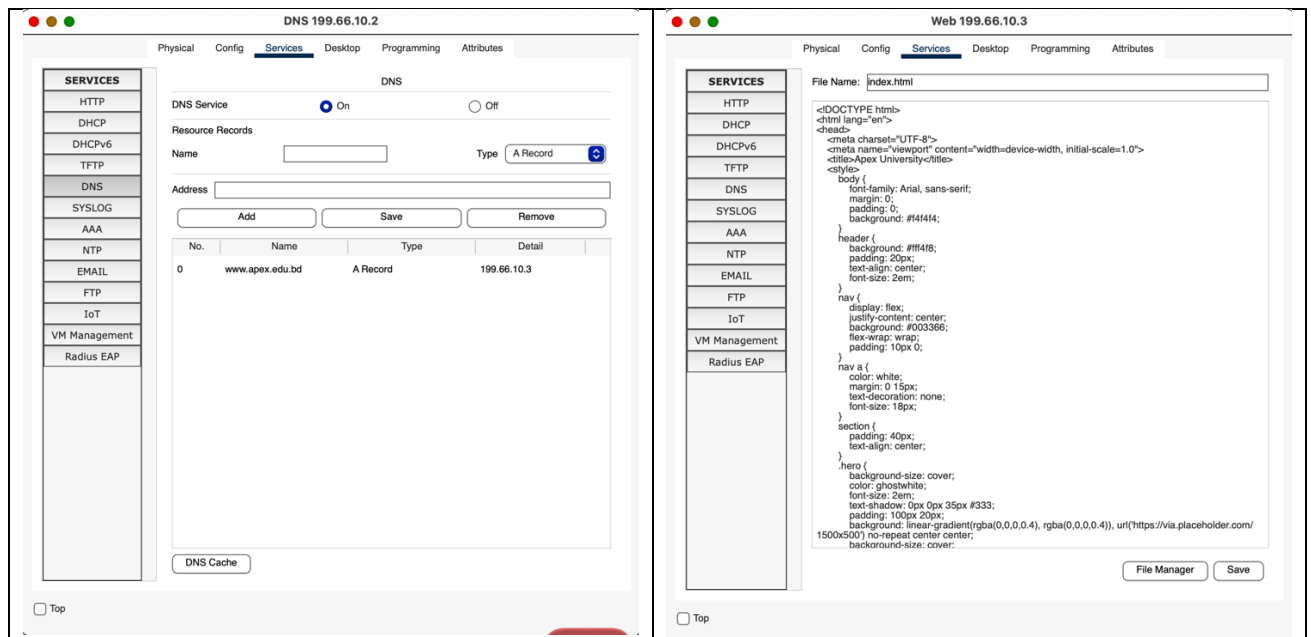
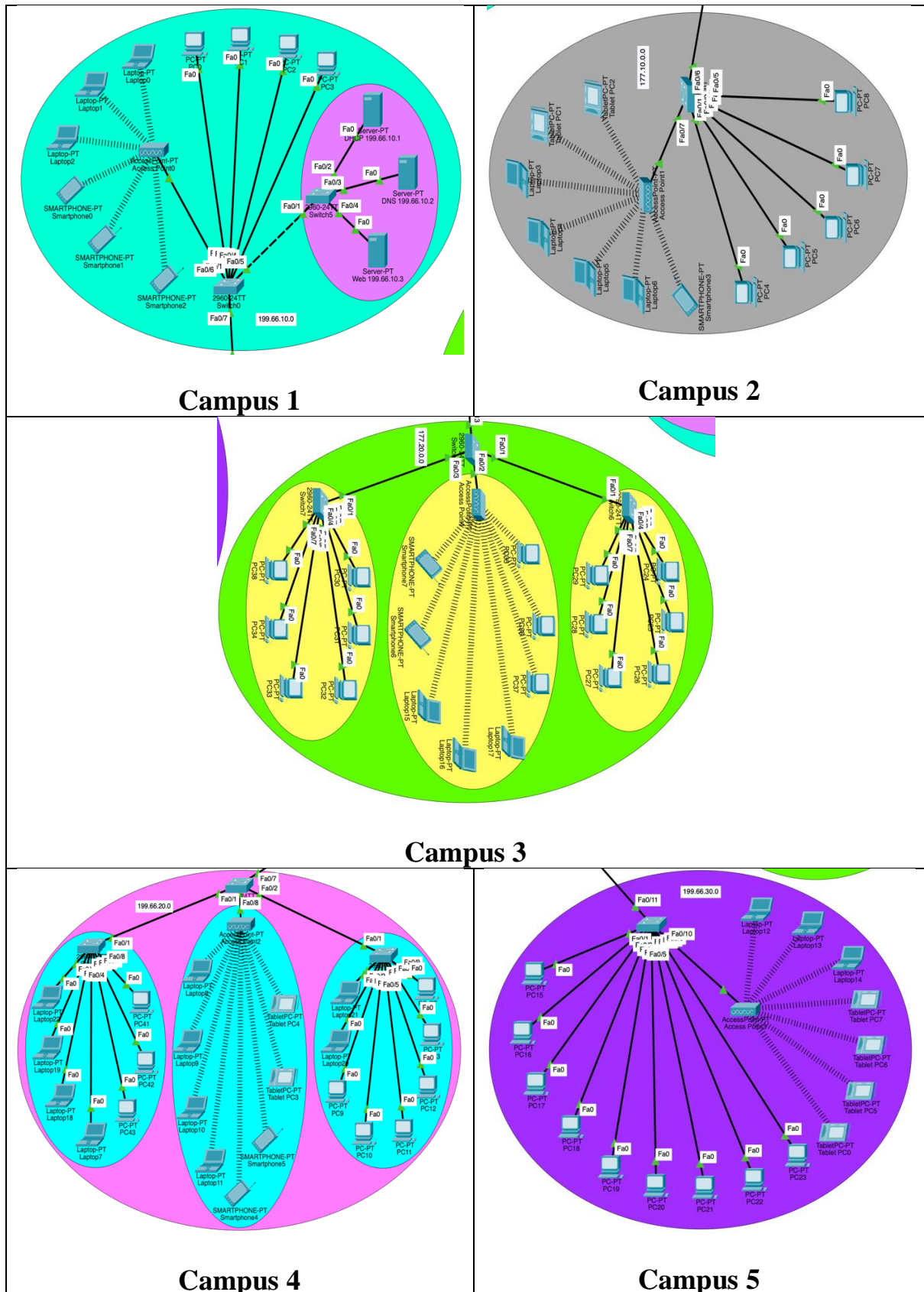


Diagram of Five Campus



Limitations

- **Centralized Vulnerability** – With all servers housed in Campus 1, any disruption in this location could affect network operations across all campuses.
- **Increased Security Exposure** – Although protective measures exist, the use of wireless connectivity introduces additional risks related to cyberattacks.
- **Complex Administration** – Operating and maintaining a widespread, interconnected network demands ongoing oversight and a team of qualified IT professionals.

Conclusion

University network systems play a vital role in the functional and operation of modern education institution. These system provide students, faculty, and staff with access to important information and resources such as class schedules, online course materials, and email. They also enable communication and collaboration among members of the university community, as well as facilitate administrative tasks such as grading and record-keeping.

Overall, a well-planned and proper managed university network system is essential for the success and efficiency of any educational institution.