

### Academic Tasks-1

Course Code: CSE307	Course Title: INTERNET WORKING ESSENTIALS
Course Instructor: BHUPINDER KAUR	
Academic Task No.: CA 1 DESIGN	Academic Task Title: UNIVERSITY CAMPUS NETWORK
Date of Allotment: 19/02/2025	Date of submission: 26/02/2025
Student's Roll no: K23FSB21	Student's Reg. no: 12320526
Evaluation Parameters: (Parameters on which student is to be evaluated- To be mentioned by students as specified at the time of assigning the task by the instructor)	

**Learning Outcomes:** (Student to write briefly about learnings obtained from the academic tasks)

#### **Declaration:**

I declare that this Assignment is my individual work. I have not copied it from any other student's work or from any other source except where due acknowledgement is made explicitly in the text, nor has any part been written for me by any other person.

**Student's Signature:** Sumit Singh Ranawat

**Evaluator's comments (For Instructor's use only)**

General Observations	Suggestions for Improvement	Best part of assignment

**Evaluator's Signature and Date:**

**Marks Obtained:** \_\_\_\_ **Max. Marks:** .....

# University Campus Network Report

## 1. Physical Network Setup

### Overview:

Design a network for a university campus consisting of seven buildings. Each building has a different number of computers and requires a unique network topology. The design must incorporate IPv4 addressing, network routing and appropriate network topologies for each building. Below are the requirements and guidelines for the network design:

- **Administration Building1:** 8 computers (use of **Star Topology** with a switch)
- **Administration Building2:** 8 computers (use of **Star Topology** with a Hub)
- **Administration Building3:** 8 computers (use of **Mesh** with a switch)
- **Library:** 10 computers (use of **Hybrid Topology** with switch and hub)
- **Computer Science Department1:** 12 computers (use of **Mesh Topology** with Hub)
- **Computer Science Department2:** 12 computers (use of **Mesh Topology** with switches)

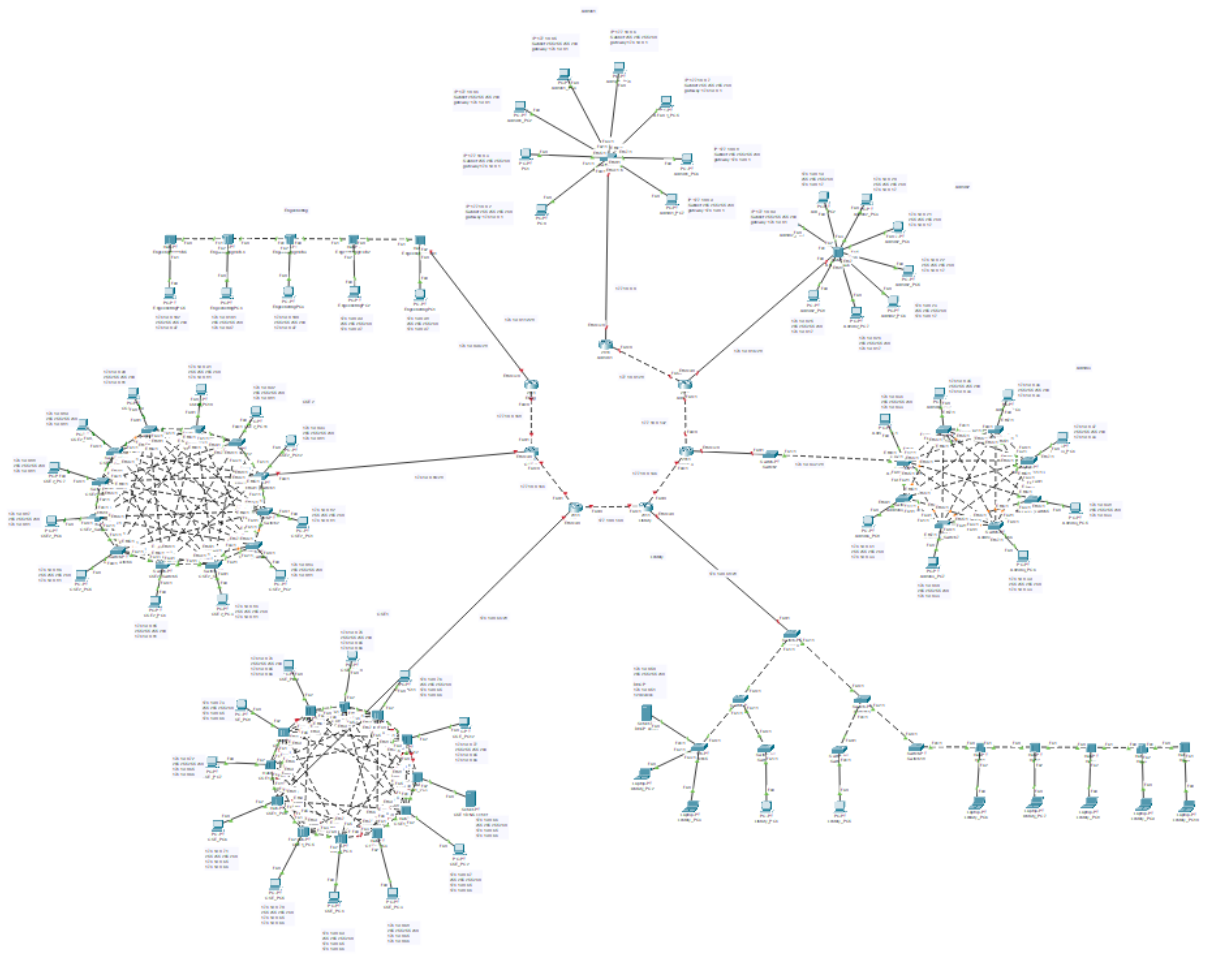
**Engineering Department:** 5 computers (use of **Bus Topology** with a hub)

### Server Configuration:

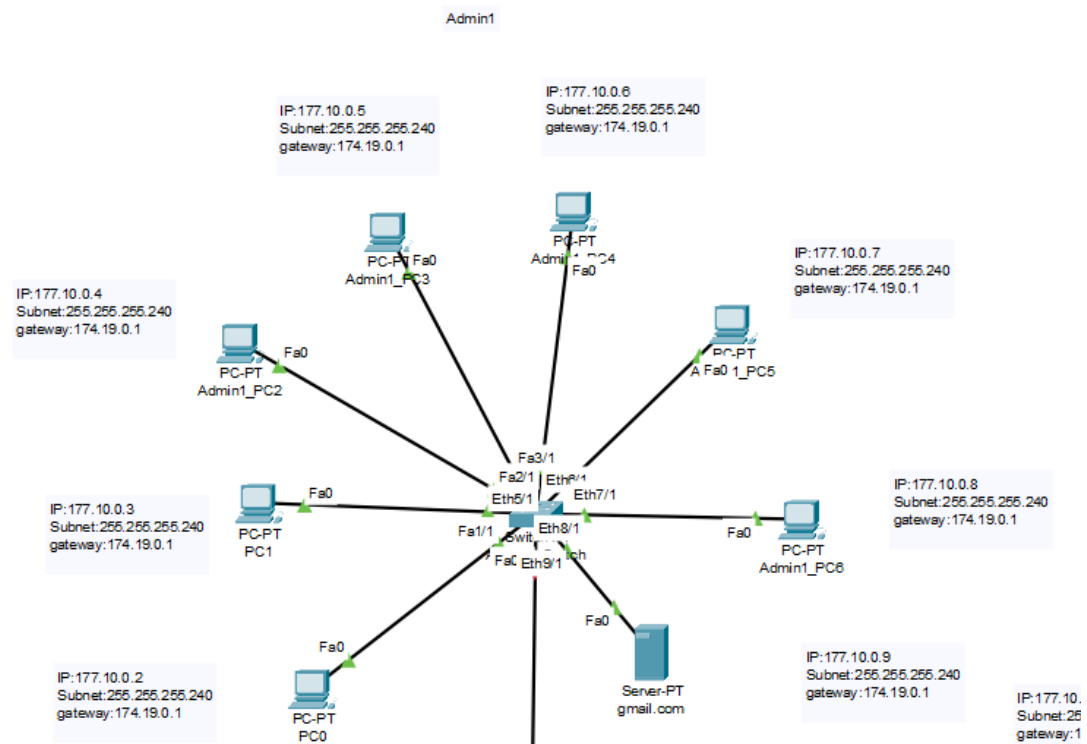
- **DHCP server** is placed in the **Library**.
- **DNS server** is placed in the **Computer Science Department1**.
- **FTP server** is placed in the **Engineering Department**.
- **Mail server** is placed in the **Administration Building1**.

### Snapshot:

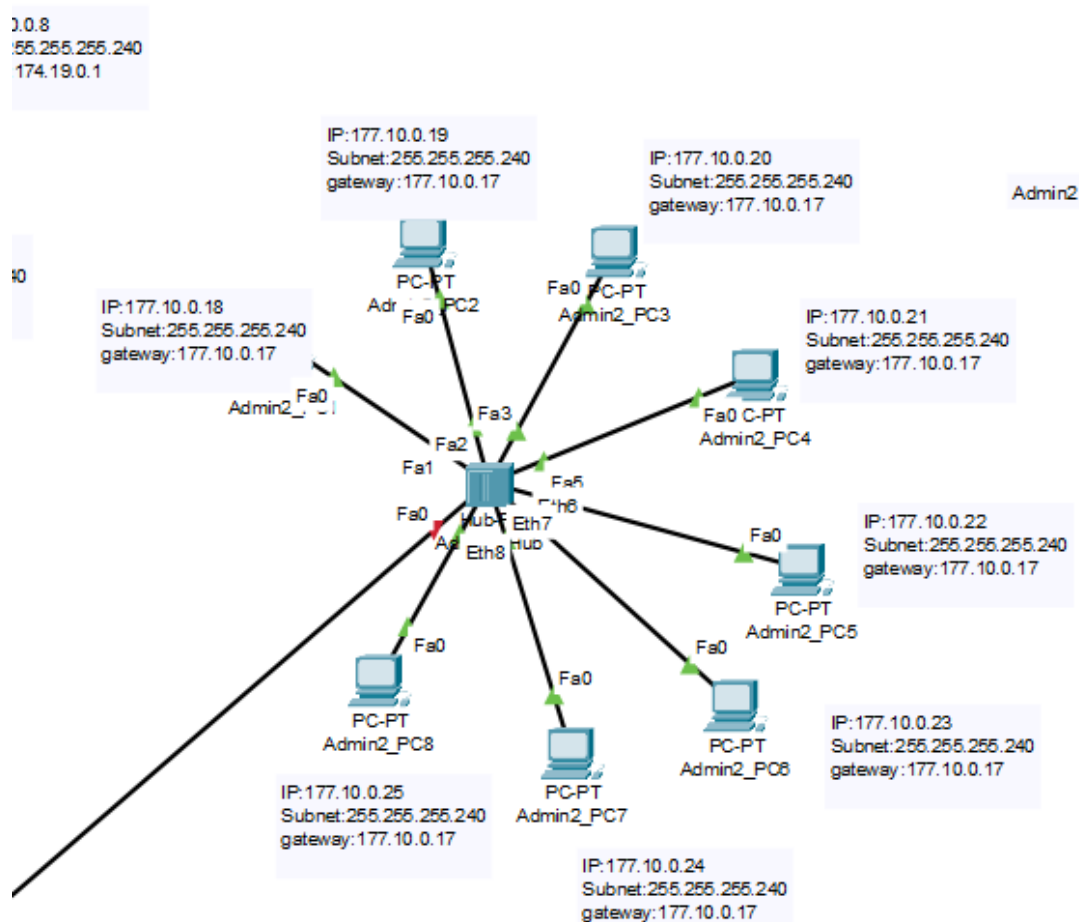
## The Network Designed



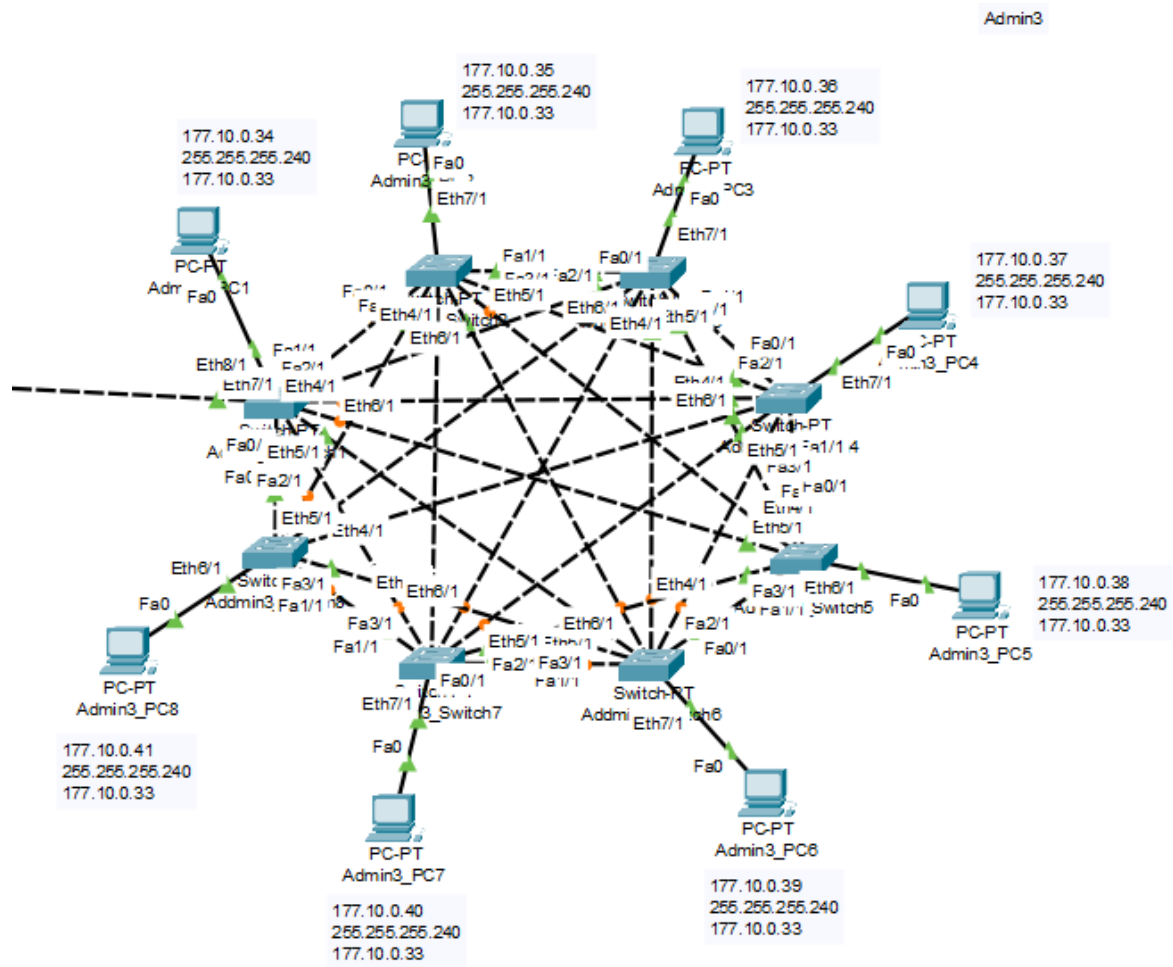
## Admin1 – Star topology with Switch



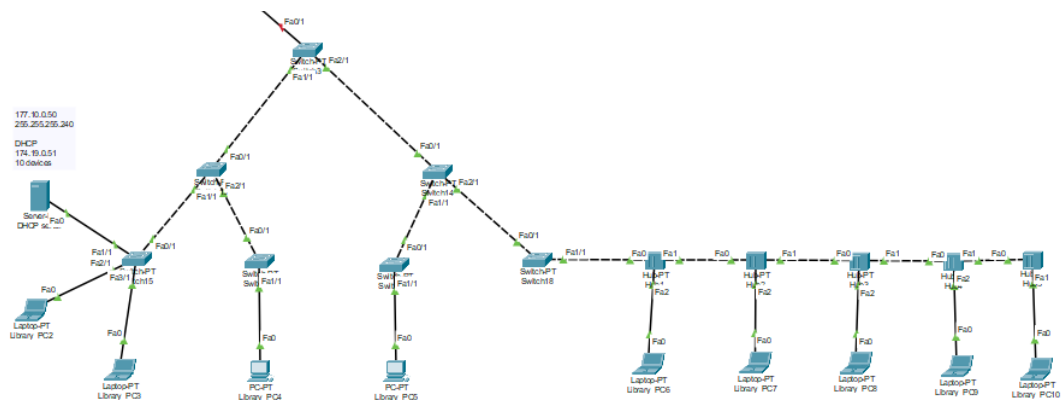
## Admin2 – Star topology with hub



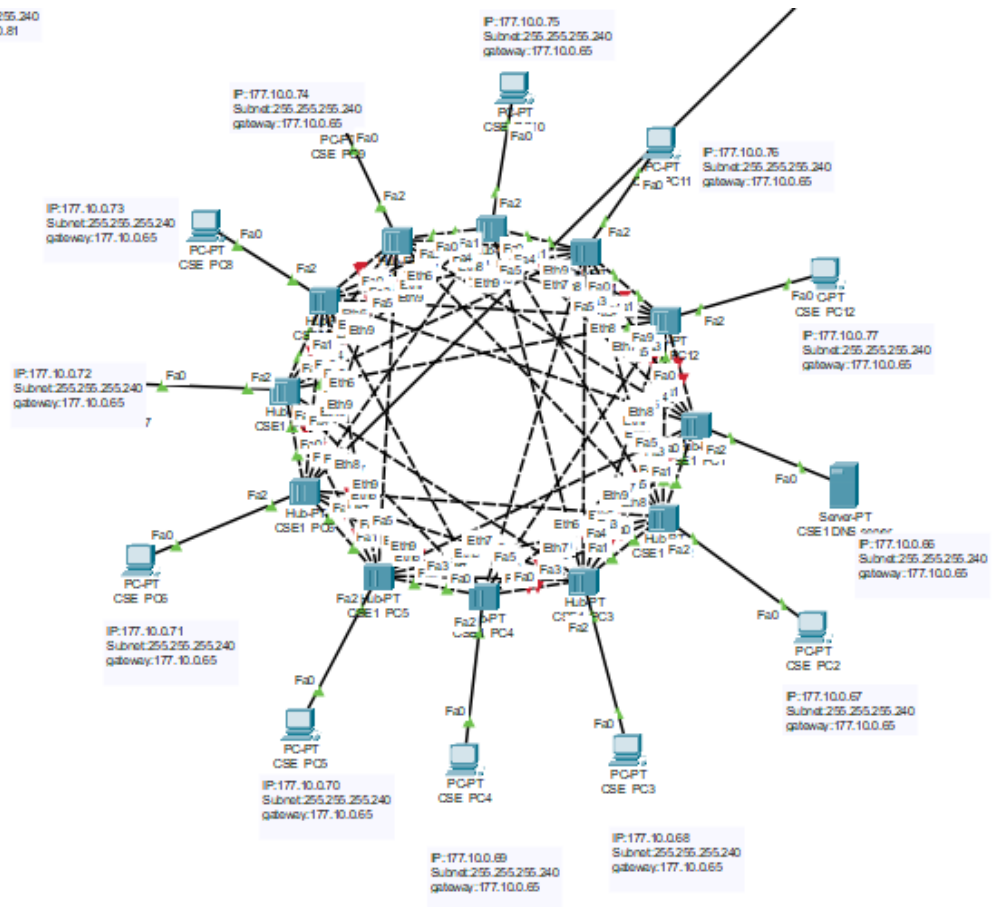
## Admin3 – Mesh Topology with switch



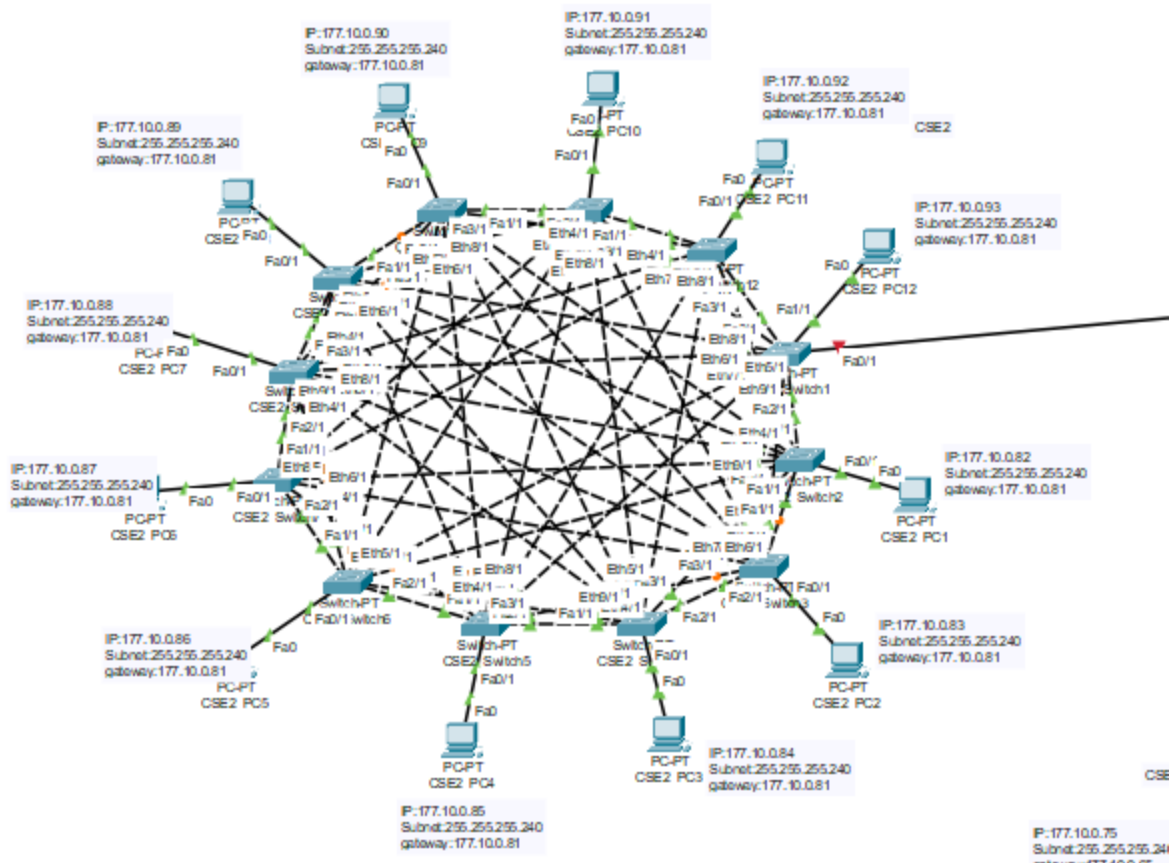
## Library – Hybrid Topology with switch and hub (Tree + Bus)



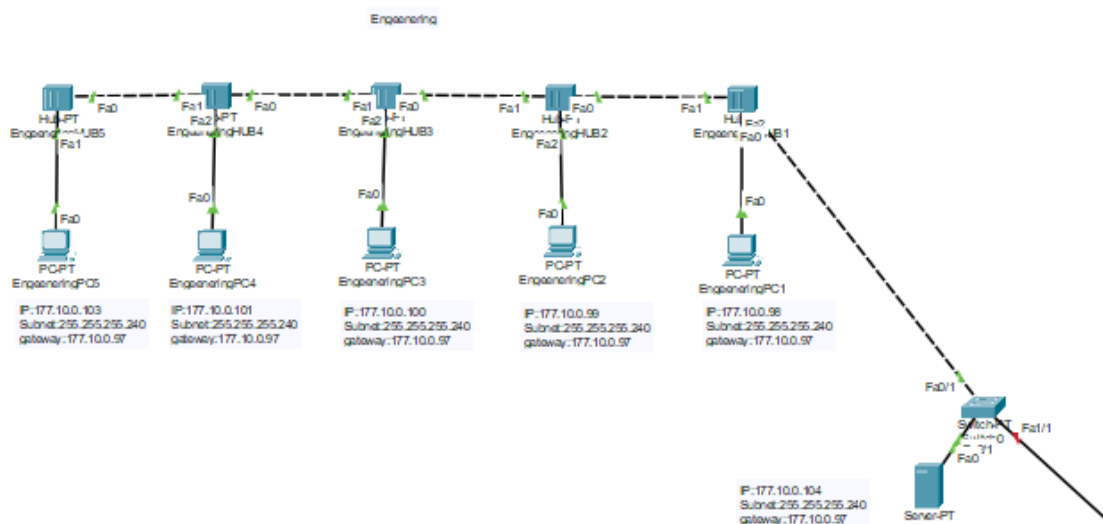
## Computer Science Department 1 - Mesh topology using a hub.



## Computer Science Department 2 - Mesh topology with switches.



## Engineering Department - Bus topology using a hub.



## 2. IP Addressing Scheme

### Overview:

## Building Subnet Allocation

Building	Subnet ID	Network Address	Subnet Mask	First Usable IP	Last Usable IP	Broadcast
Admin 1	0	177.10.0.0	255.255.255.240	177.10.0.1	177.10.0.14	177.10.0.15
Admin 2	1	177.10.0.16	255.255.255.240	177.10.0.17	177.10.0.30	177.10.0.31
Admin 3	2	177.10.0.32	255.255.255.240	177.10.0.33	177.10.0.46	177.10.0.47
Library	3	177.10.0.48	255.255.255.240	177.10.0.49	177.10.0.62	177.10.0.63
CSE 1	4	177.10.0.64	255.255.255.240	177.10.0.65	177.10.0.78	177.10.0.79
CSE 2	5	177.10.0.80	255.255.255.240	177.10.0.81	177.10.0.94	177.10.0.95
Engineering	6	177.10.0.96	255.255.255.240	177.10.0.97	177.10.0.110	177.10.0.111
(Spare)	7	177.10.0.112	255.255.255.240	177.10.0.113	177.10.0.126	177.10.0.127

## Router Interconnection Networks

Connection	Network Address	Subnet Mask	Router 1 IP	Router 2 IP	Broadcast
Admin 1 - Admin 2	177.10.0.128	255.255.255.252	177.10.0.129	177.10.0.130	177.10.0.131
Admin 2 - Admin 3	177.10.0.132	255.255.255.252	177.10.0.133	177.10.0.134	177.10.0.135
Admin 3 - Library	177.10.0.136	255.255.255.252	177.10.0.137	177.10.0.138	177.10.0.139
Library - CSE 1	177.10.0.140	255.255.255.252	177.10.0.141	177.10.0.142	177.10.0.143
CSE 1 - CSE 2	177.10.0.144	255.255.255.252	177.10.0.145	177.10.0.146	177.10.0.147
CSE 2 - Engineering	177.10.0.148	255.255.255.252	177.10.0.149	177.10.0.150	177.10.0.151

## Snapshot:

### Admin 1

PC0

Physical
Config
Desktop
Programming
Attributes

IP Configuration
X

Interface
FastEthernet0

IP Configuration

☐ DHCP
☒ Static

IPv4 Address
177.10.0.2

Subnet Mask
255.255.255.240

Default Gateway
174.19.0.1

DNS Server
0.0.0.0

IPv6 Configuration



Admin 2

Admin2\_PC1

Physical

Config

Desktop

Programming

Attributes

IP Configuration

X

Interface

FastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

177.10.0.18

Subnet Mask

255.255.255.240

Default Gateway

177.10.0.17

DNS Server

0.0.0.0

Admin 3

Admin3\_PC1

Physical

Config

Desktop

Programming

Attributes

IP Configuration

X

Interface

FastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

177.10.0.34

Subnet Mask

255.255.255.240

Default Gateway

177.10.0.33

DNS Server

0.0.0.0

Library

DHCP server

PhysicalConfigServicesDesktopProgrammingAttributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

DHCP

InterfaceFastEthernet0ServiceOnOff

Pool NameserverPool1

Default Gateway174.19.0.49

DNS Server0.0.0.0

Start IP Address : 17710050

Subnet Mask: 255255255240

Maximum Number of Users : 12

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
serverPool1	174.19.0.49	0.0.0.0	177.10.0.50	255.255.2...	12	0.0.0.0	0.0.0.0

## CSE 1

CSE\_PC2

PhysicalConfigDesktopProgrammingAttributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

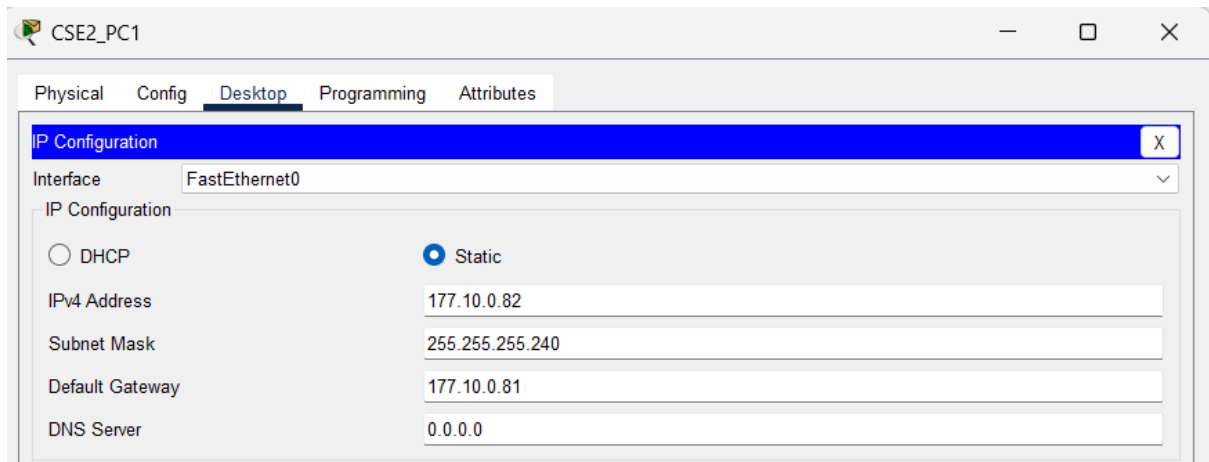
IPv4 Address177.10.0.67

Subnet Mask255.255.255.240

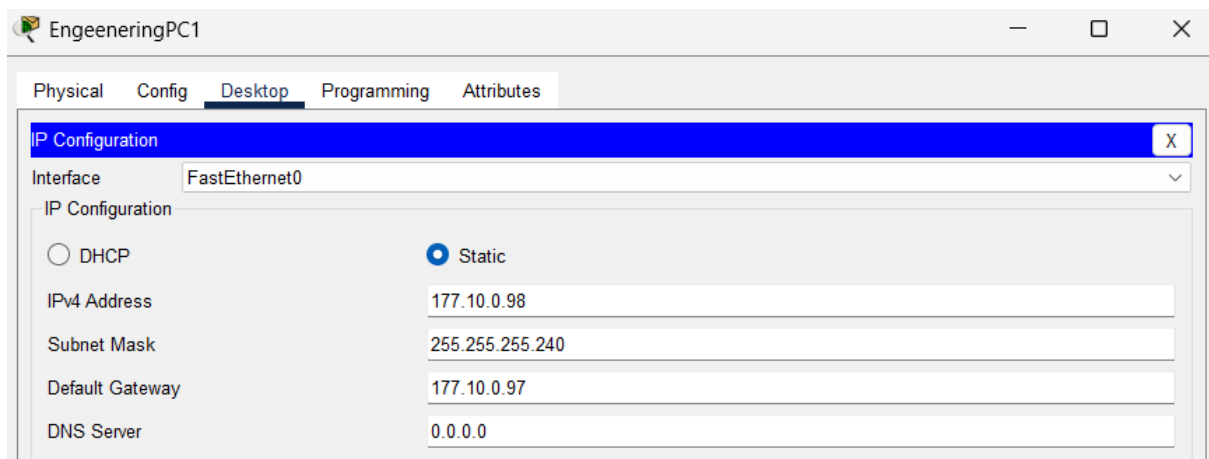
Default Gateway177.10.0.65

DNS Server177.10.0.66

## CSE 2



## Engineering



## Examples Of IP addressing in routers

Here are some snapshots for it.

Admin 1

PhysicalConfigCLIAttributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

FastEthernet0/0

FastEthernet0/1

Ethernet0/3/0

Ethernet0/3/0

Port Status

☒ On

Bandwidth

☐ 10 Mbps

☒ Auto

Duplex

☐ Half Duplex☐ Full Duplex

☒ Auto

MAC Address000C.CF6E.09A7

IP Configuration

IPv4 Address177.10.0.1

Subnet Mask255.255.255.240

Tx Ring Limit10

Equivalent IOS Commands

```
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Ethernet0/3/0
Router(config-if)#ip address 177.10.0.1 255.255.0.0
Router(config-if)#ip address 177.10.0.1 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface Ethernet0/3/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/3/0, changed state to up
```

Admin 1

Physical **Config** CLI Attributes

**GLOBAL**

- Settings
- Algorithm Settings

**ROUTING**

- Static
- RIP

**SWITCHING**

- VLAN Database

**INTERFACE**

- FastEthernet0/0**
- FastEthernet0/1
- Ethernet0/3/0

**FastEthernet0/0**

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☒ Half Duplex ☐ Full Duplex ☒ Auto

MAC Address 00E0.8F35.E644

IP Configuration

IPv4 Address 177.10.0.129

Subnet Mask 255.255.255.240

Tx Ring Limit 10

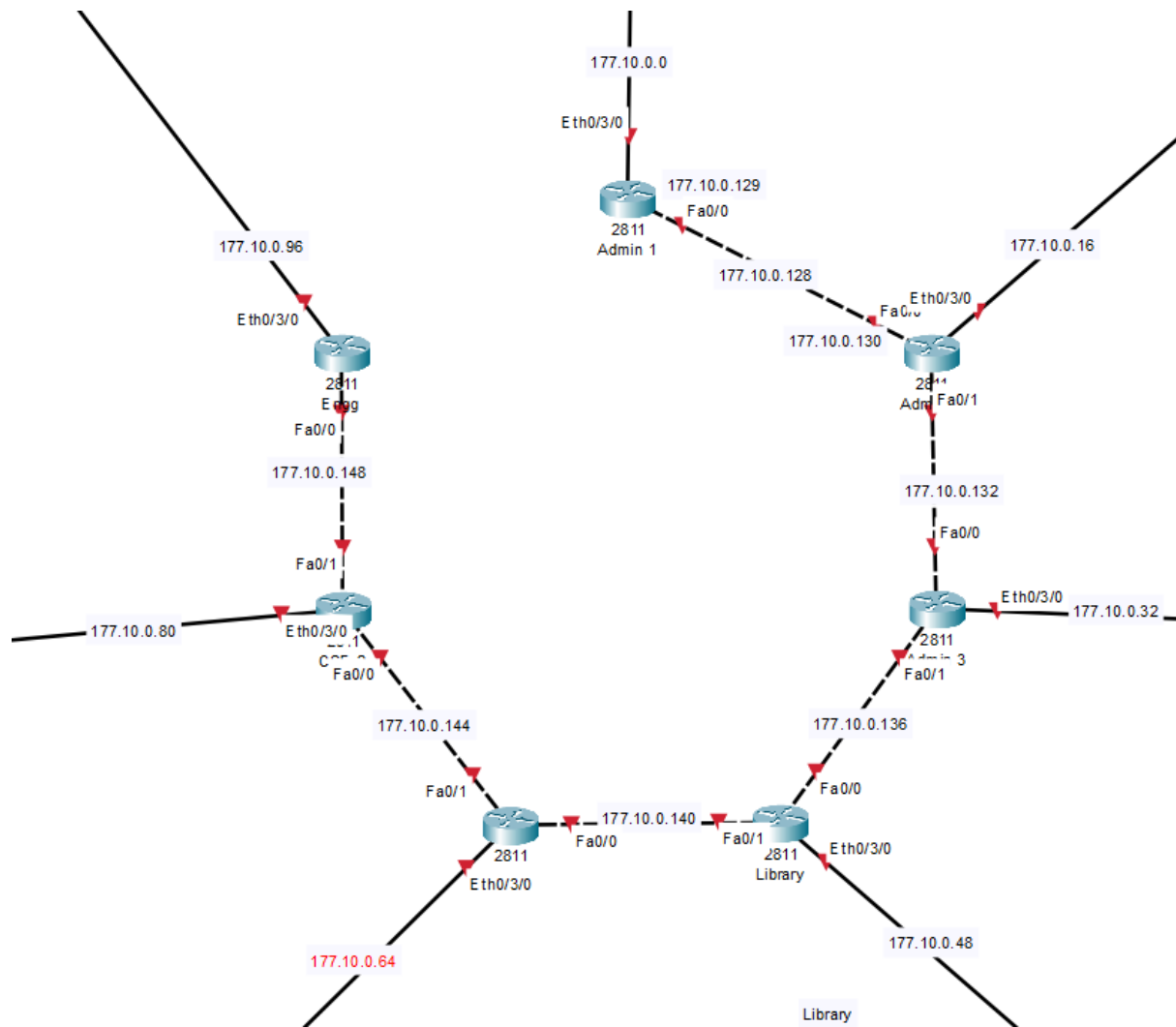
Equivalent IOS Commands

```
%LINK-5-CHANGED: Interface Ethernet0/3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/3/0, changed state to up
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 177.10.0.129 255.255.255.240
Router(config-if)#ip address 177.10.0.129 255.255.255.240
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
```

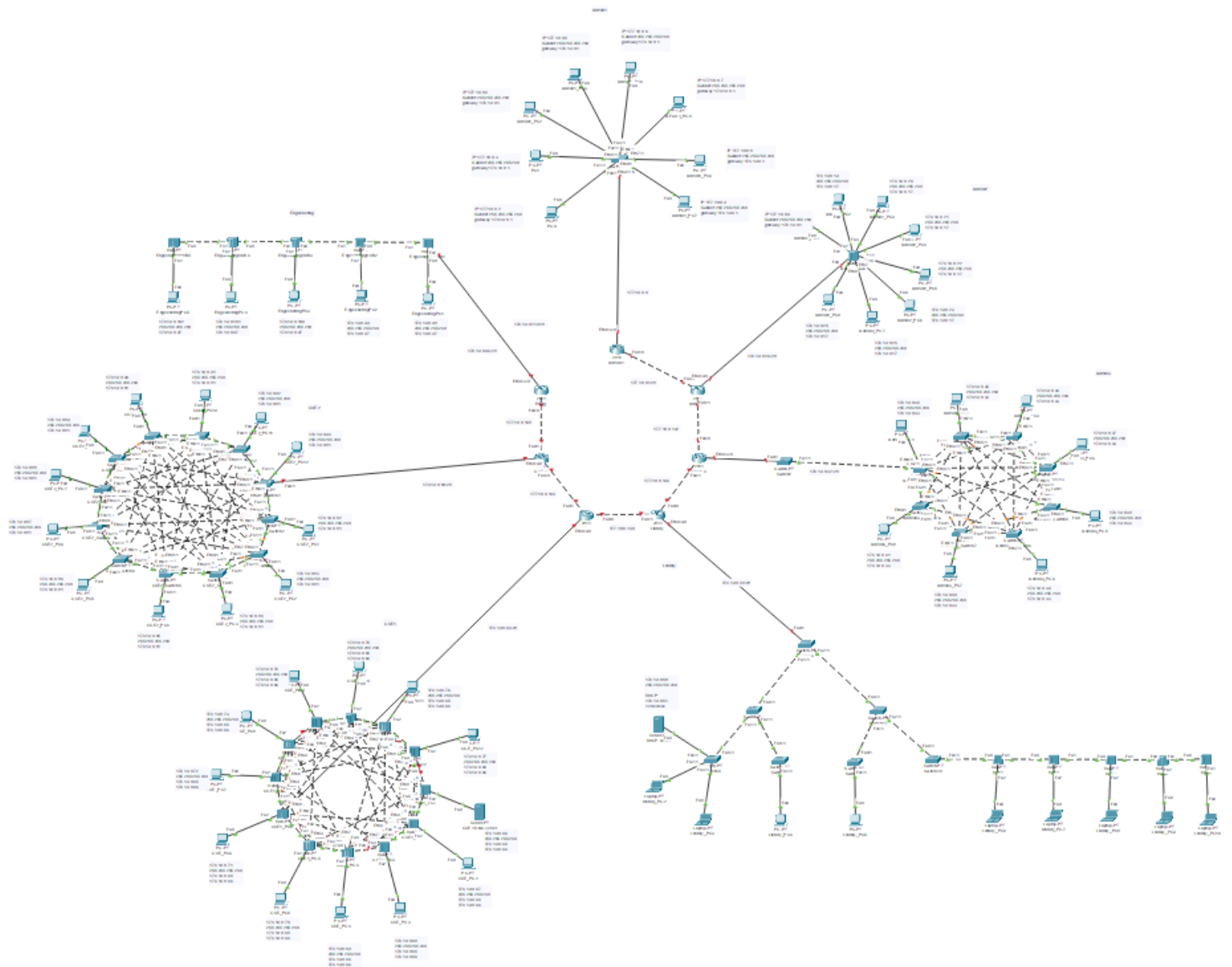
### 3. Routing Configuration

#### Overview:

To enable efficient communication between buildings, **OSPF (Open Shortest Path First) Dynamic Routing** is implemented. OSPF ensures fast convergence and optimized path selection.



# Snapshot:



```
Router>en
Router#config t
Router(config)#router rip
Router(config-router)#network 177.10.0.0
Router(config-router)#network 177.10.0.128
```

#### Admin2 Router

```
Router>en
Router#config t
Router(config)#router rip
Router(config-router)#network 177.10.0.0
Router(config-router)#network 177.10.0.128
Router(config-router)#network 177.10.0.132
```

#### Admin3 Router

```
Router>en
Router#config t
Router(config)#router rip
Router(config-router)#network 177.10.0.0
Router(config-router)#network 177.10.0.132
Router(config-router)#network 177.10.0.136
```

#### Library Router

```
Router>en
Router#config t
Router(config)#router rip
Router(config-router)#network 177.10.0.0
Router(config-router)#network 177.10.0.136
Router(config-router)#network 177.10.0.140
```



### CSE1 Router

```
Router>en
Router#config t
Router(config)#router rip
Router(config-router)#network 177.10.0.0
Router(config-router)#network 177.10.0.140
Router(config-router)#network 177.10.0.144
```

### CSE2 Router

```
Router>en
Router#config t
Router(config)#router rip
Router(config-router)#network 177.10.0.0
Router(config-router)#network 177.10.0.144
Router(config-router)#network 177.10.0.148
```

### Engineering Router

```
Router>en
Router#config t
Router(config)#router rip
Router(config-router)#network 177.10.0.0
Router(config-router)#network 177.10.0.148
```

## 4. Network Communication Testing

### Overview:

To verify connectivity, a **packet sharing test** was performed between devices in different buildings. The successful replies confirm that the network is functioning correctly.

All the networks are fully functional and are properly communicating with each other.

### Snapshots:

From Admin1\_PC1 to Admin2\_PC2

**Simulation Panel**

**Event List**

Vis.	Time(sec)	Last Device	At Device	Type
	0.007	Admin2_Hub	Admin2_...	ICMP
	0.007	Admin2_Hub	Admin2_...	ICMP
	0.008	Admin 2	Admin 1	ICMP
	0.009	Admin 1	Admin1_...	ICMP
	0.010	Admin1_S...	Admin1_...	ICMP
	0.996	--	Admin1_...	STP
	0.997	Admin1_S...	Admin1_...	STP
	0.997	Admin1_S...	Admin1_...	STP
	0.997	Admin1_S...	Admin1_...	STP
	0.997	Admin1_S...	Admin 1	STP
	0.997	Admin1_S...	Admin1_...	STP
	0.997	Admin1_S...	Admin1_...	STP
	0.997	Admin1_S...	Admin1_...	STP
	0.997	Admin1_S...	Admin1_...	STP
	0.997	Admin1_S...	Admin1_...	STP
	1.506	--	CSE2_S...	STP

Reset Simulation
☒ Constant Delay
Captured to: 1.506 s

**Play Controls**

**Event List Filters - Visible Events**  
 ACL Filter, ARP, BGP, Bluetooth, CAPWAP, CDP, DHCP, DHCPv6, DNS, DTP, EAPOL, EIGRP, EIGRPv6, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPsec, ISAKMP, IoT, IoT TCP, LACP, LLDP, NDP, NETFLOW, NTP, OSPF, OSPFv6, PAgP, POP3, PPP, PPPoE, PTP, RADIUS, REP, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, USB, VTP
 

Edit Filters
Show All/None

Event List
 Realtime
 Simulation



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	Admi...	Admin2_P...	ICMP		0.000	N	0	(edit)	(delete)

From Admin1\_PC2 to Admin3\_PC1







Realtime
 Simulation

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	Admi...	Admin3_P...	ICMP		0.000	N	0	(edit)	(delete)









From Admin1\_PC3 to Library\_PC5

										Realtime	Simulation
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete	
	Successful	Admi...	Library_PC5	ICMP		0.000	N	0	(edit)	(delete)	



From CSE1\_PC1 to Admin2\_PC1

										 Realtime	 Simulation
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete	
	Failed	CSE_...	Admin2_P...	ICMP		0.000	N	0	(edit)	(delete)	
	Successful	CSE_...	Admin2_P...	ICMP		0.000	N	1	(edit)	(delete)	

From Admin2\_PC8 to CSE2\_PC12

										 Realtime	 Simulation
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete	
	Failed	Admi...	CSE2_PC12	ICMP		0.000	N	0	(edit)	(delete)	
	Failed	Admi...	CSE2_PC12	ICMP		0.000	N	1	(edit)	(delete)	
	Successful	Admi...	CSE2_PC12	ICMP		0.000	N	2	(edit)	(delete)	

From Engineering\_PC1 to Admin2\_PC1

										Realtime	Simulation
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete	
	Successful	Enge...	Admin2_P...	ICMP		0.000	N	0	(edit)	(delete)	

## Observation

Due to the vast network and the use of outdated software versions, packets are failing multiple times before successfully reaching their destination. This issue highlights the need for upgrading software and optimizing network performance.

## **Conclusion**

Designing this university campus network has been a truly rewarding and insightful journey. Considering various approaches to organizing the buildings' network resulted in the creative concept of implementing a ring topology for enhanced efficiency and redundancy. While challenges arose along the way, they have provided valuable lessons, and I look forward to refining the design further to boost network stability and performance moving forward.

GitHub : <https://github.com/Lucifer2005/CSE307>

Yours Faithfull

Tauseef Baksh

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