Academic Tasks-1

Course Code: CSE307	**Course Title: INTERNET WORKING ESSENTIALS**
Course Instructor: BHUPINDER KAUR	
Academic Task No.: CA 1	**Academic Task Title: UNIVERSITY CAMPUS NETWORK DESIGN**
Date of Allotment: 19/02/2025	**Date of submission: 26/02/2025**
Student's Roll no: K23FSB**24**	**Student's Reg. no: 12310811**
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:

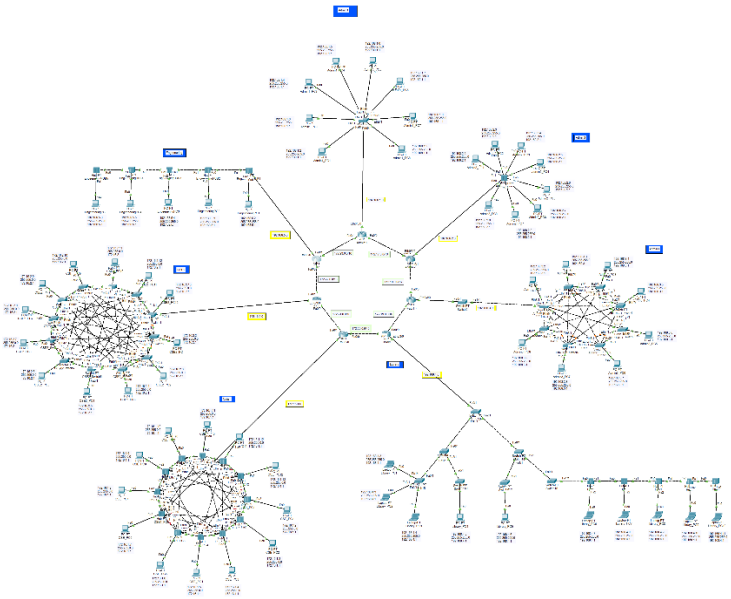
This network design covers seven buildings on a university campus, each with a unique topology. A total of **seven routers** are interconnected in a **ring topology** to ensure reliability and prevent network failures. The connection between buildings utilizes **fiber-optic cables** to support high-speed data transfer.

Implementation:

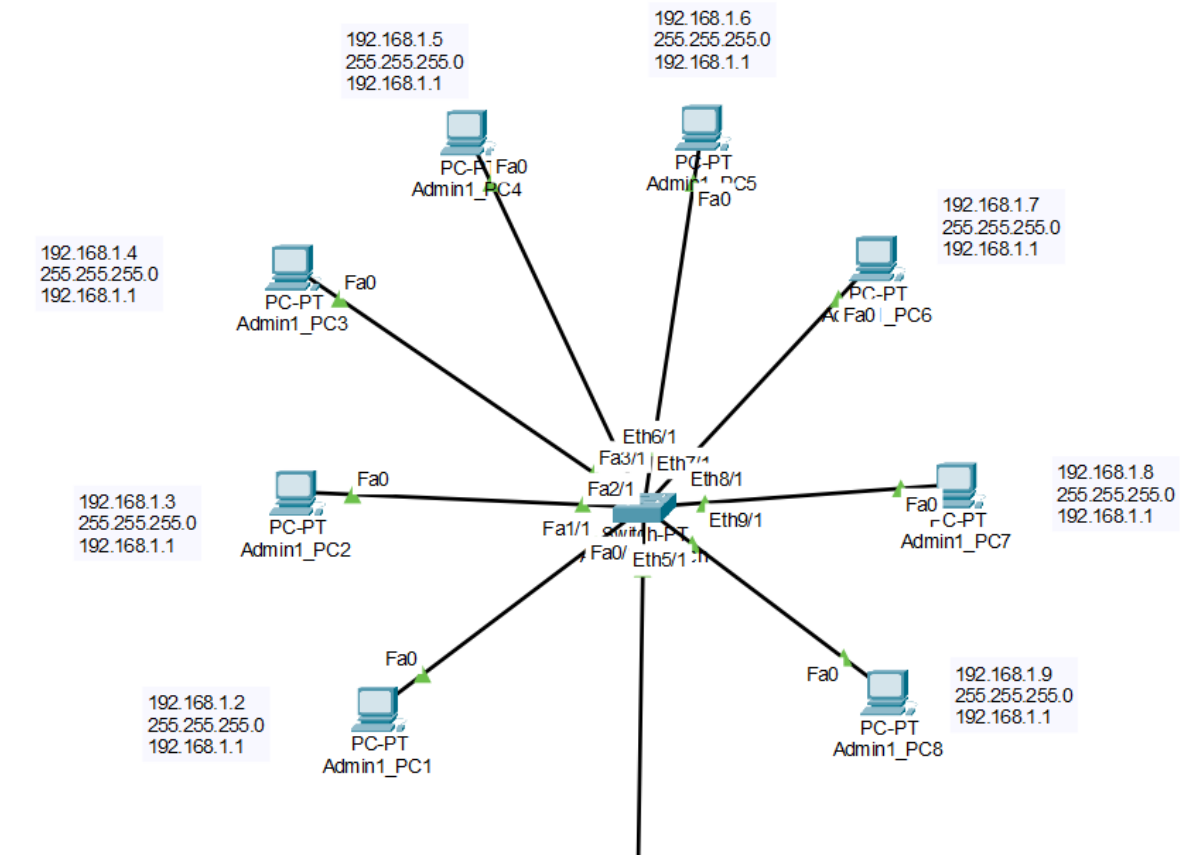
- **Admin Building 1:** Star topology with a switch.
- **Admin Building 2:** Star topology using a hub.
- **Admin Building 3:** Mesh topology with a switch.
- **Library:** Hybrid topology (switch + hub).
- **Computer Science Department 1:** Mesh topology using a hub.
- **Computer Science Department 2:** Mesh topology with switches.
- **Engineering Department:** Bus topology using a hub.

Snapshot:

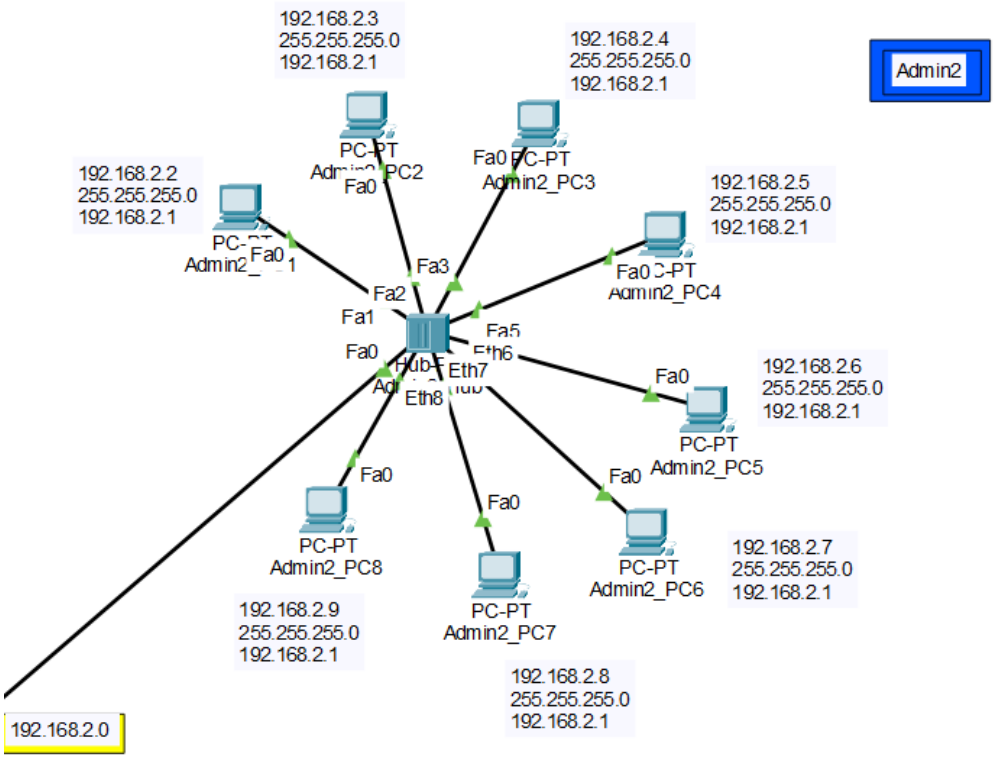
The Network Designed



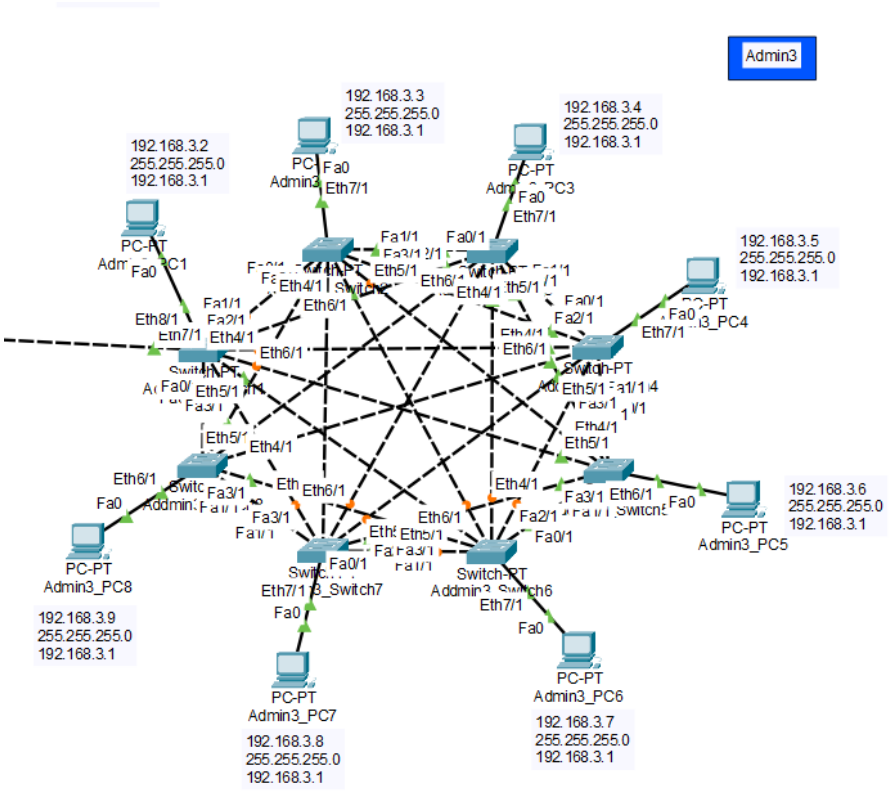
Admin1 – Star topology with Switch



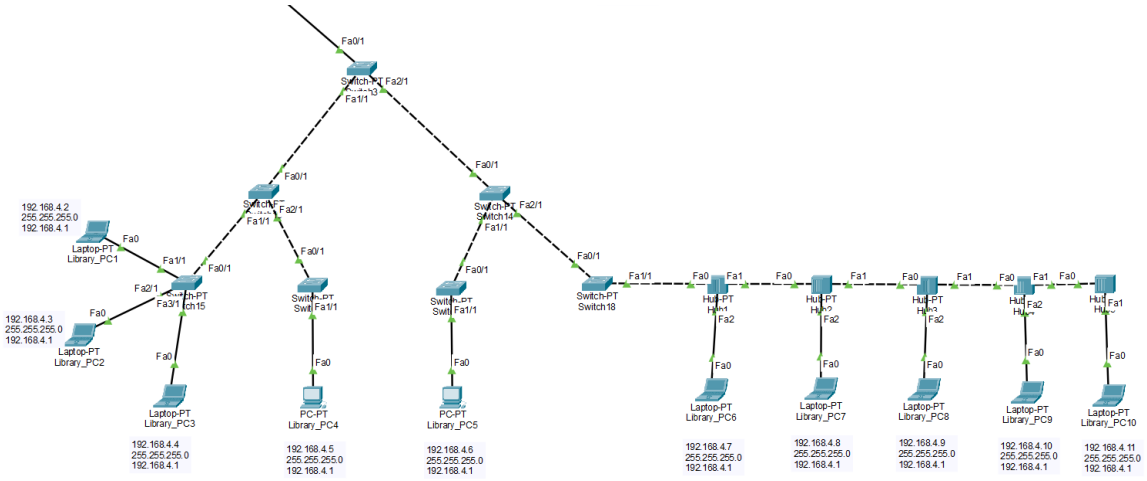
Admin2 – **Star topology with hub**



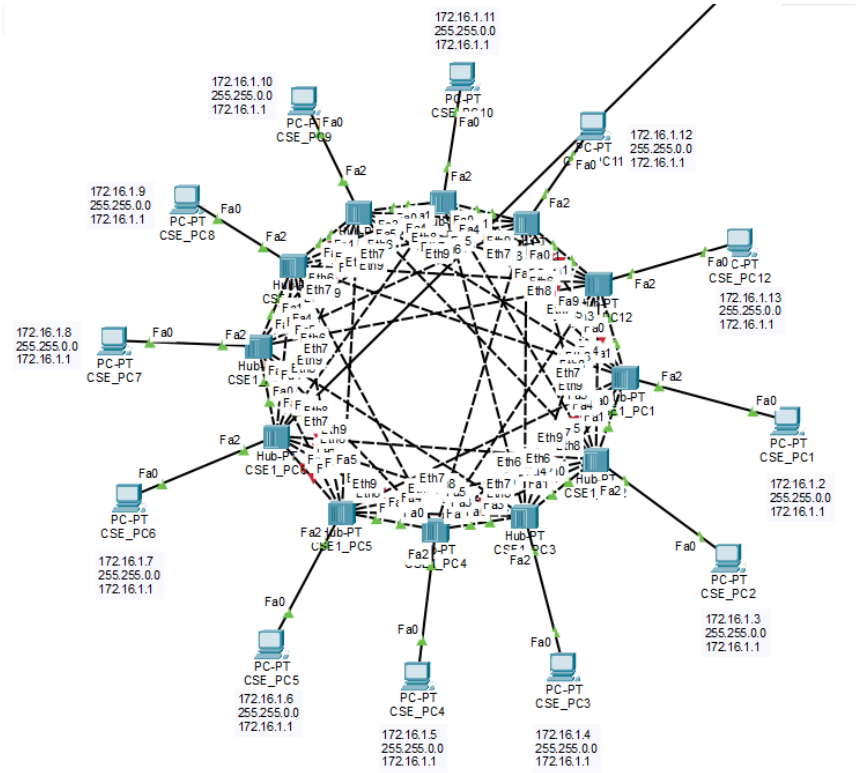
Admin3 – Mesh Topology with switch



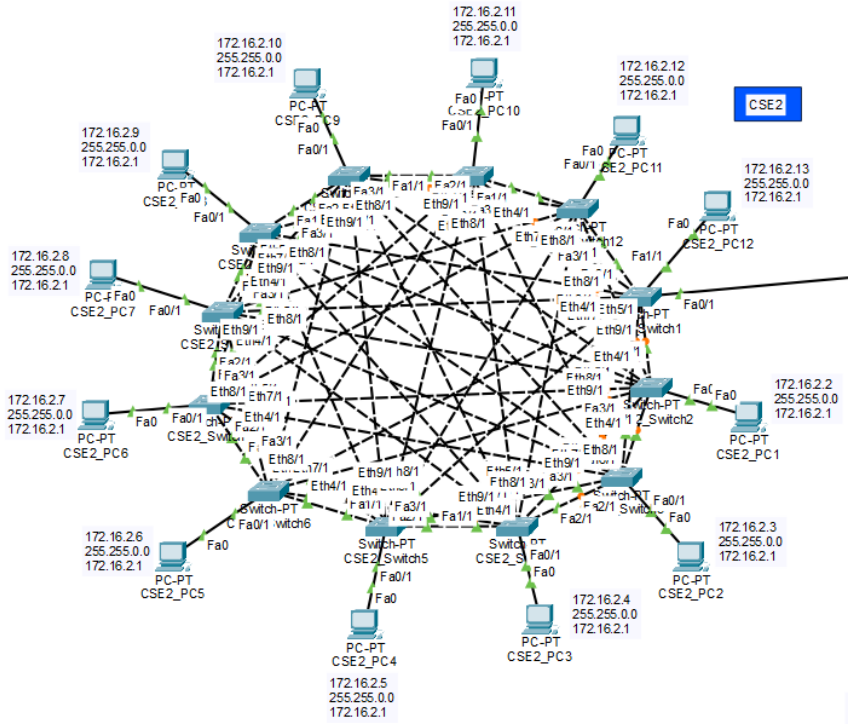
Library – Hybrid Topology with switch and hub (Tree + Bus)



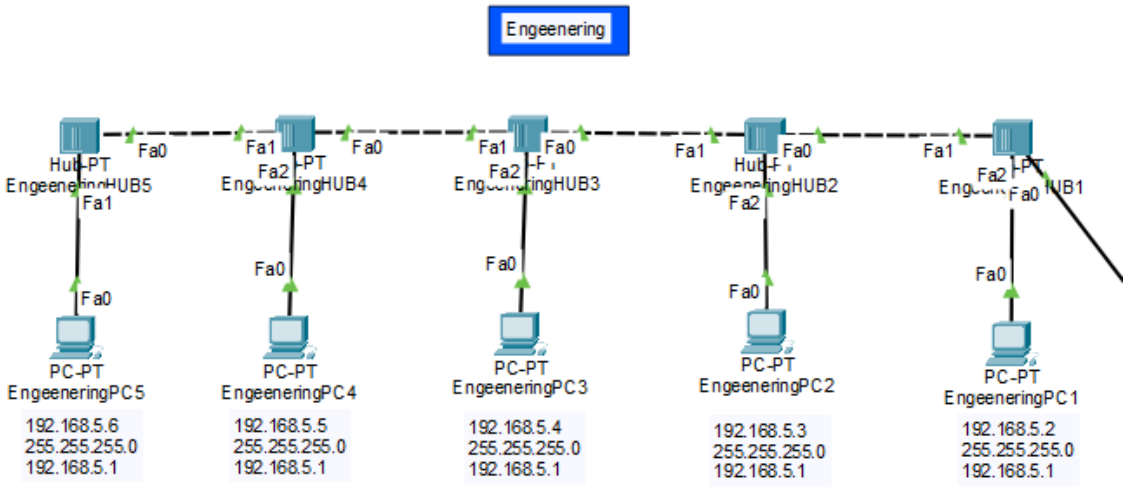
Computer Science Department 1 - Mesh topology using a hub.



Computer Science Department 2 - Mesh topology with switches.



Engineering Department - Bus topology using a hub.



2. IP Addressing Scheme

Overview:

The network is assigned IPv4 addresses from **Class B (172.16.0.0/16) and Class C (192.168.0.0/24)** ranges. Each building has its dedicated subnet, and routers use **/30 subnets** for point-to-point links.

IP Address Allocation:

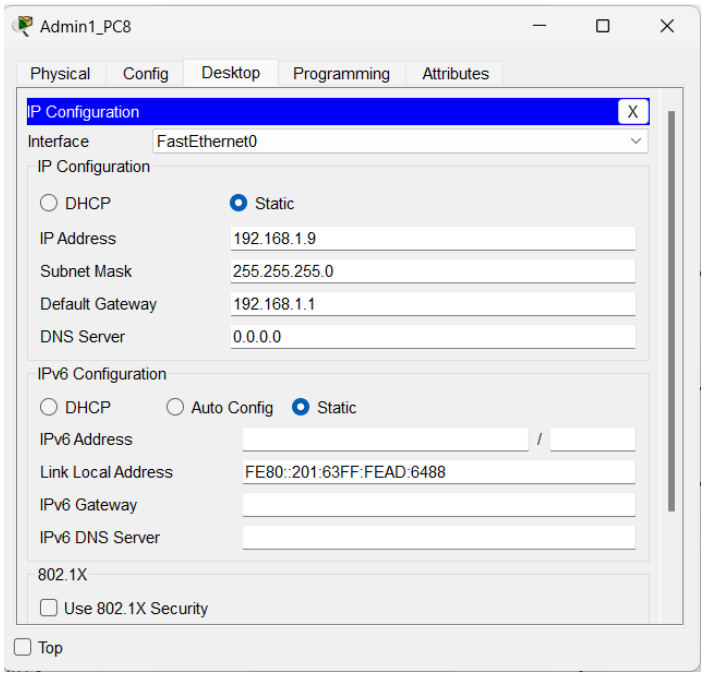
Building	Subnet Assigned	Subnet Mask	IP Range
Admin 1	192.168.1.0	255.255.255.0	192.168.1.1 - 192.168.1.8
Admin 2	192.168.2.0	255.255.255.0	192.168.2.1 - 192.168.2.8
Admin 3	192.168.3.0	255.255.255.0	192.168.3.1 - 192.168.3.8
Library	192.168.4.0	255.255.255.0	192.168.4.1 - 192.168.4.10
CSE 1	172.16.1.0	255.255.255.0	172.16.1.1 - 172.16.1.12
CSE 2	172.16.2.0	255.255.255.0	172.16.2.1 - 172.16.2.12
Engineering	192.168.5.0	255.255.255.0	192.168.5.1 - 192.168.5.5

Router-to-Router Connections:

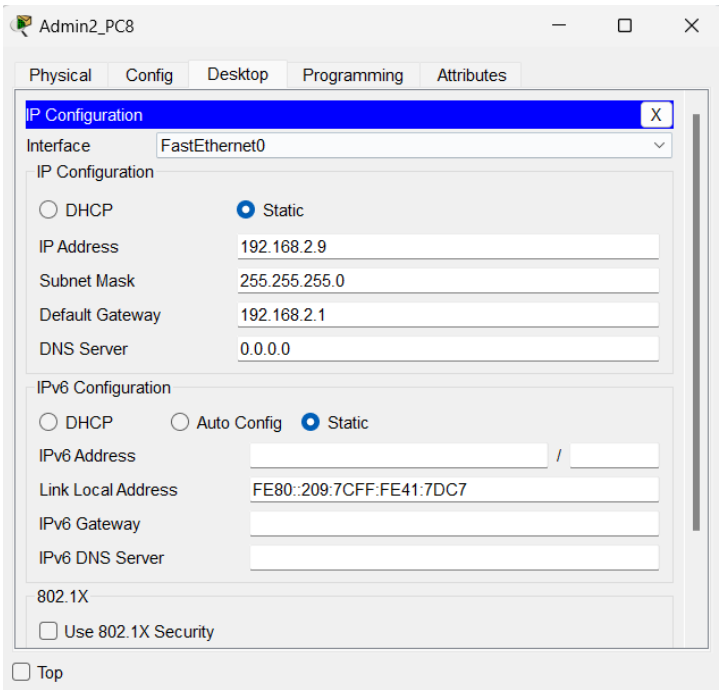
- **Subnet for routers:** 172.17.0.0 - 172.23.0.0 (point-to-point links)

Snapshot:

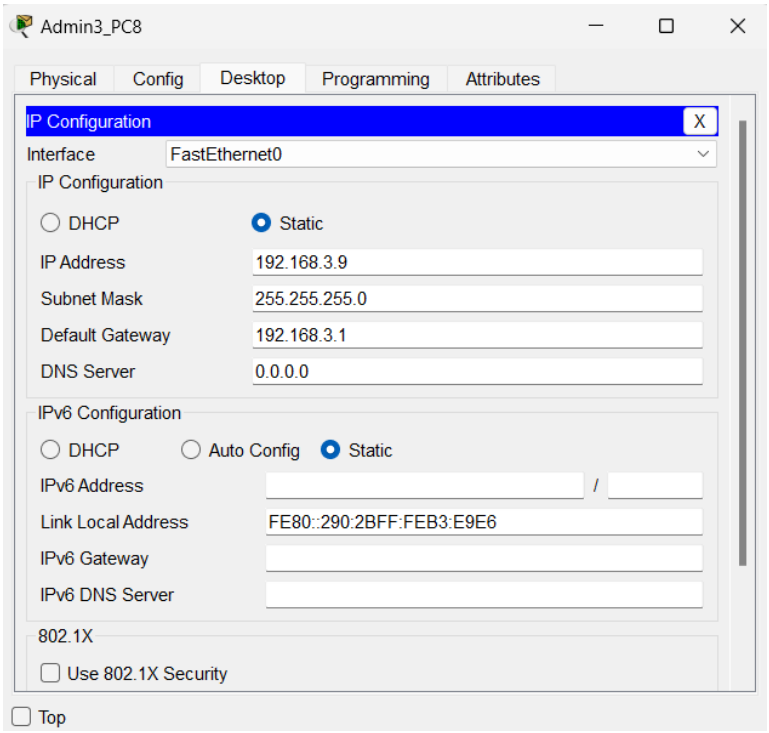
Admin 1 192.168.1.0 255.255.255.0 192.168.1.1 - 192.168.1.8



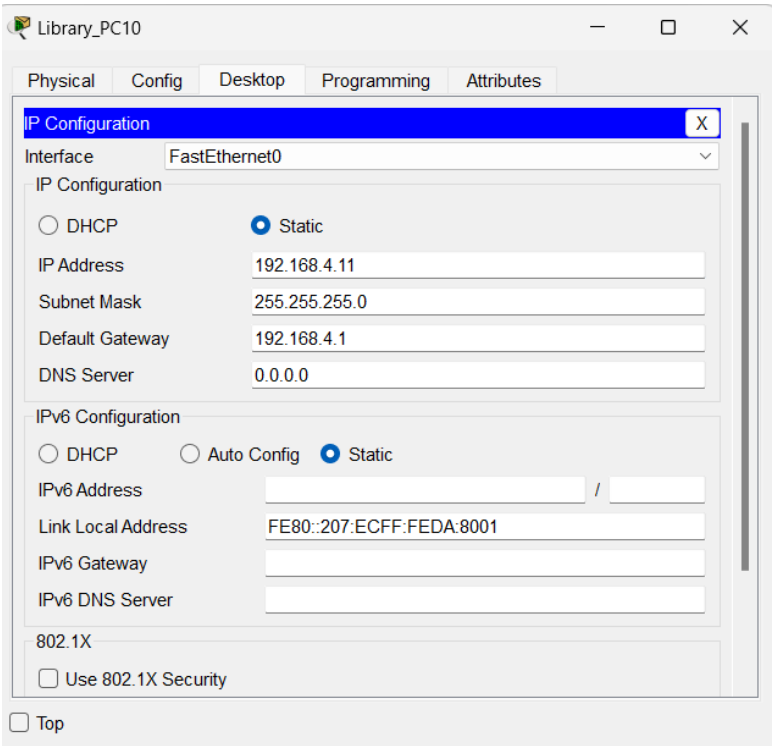
Admin 2 192.168.2.0 255.255.255.0 192.168.2.1 - 192.168.2.8



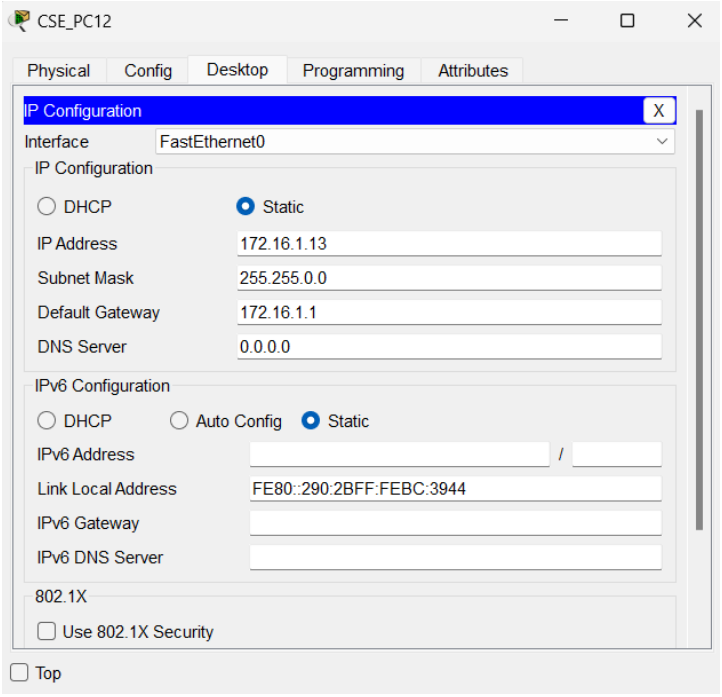
Admin 3 192.168.3.0 255.255.255.0 192.168.3.1 - 192.168.3.8



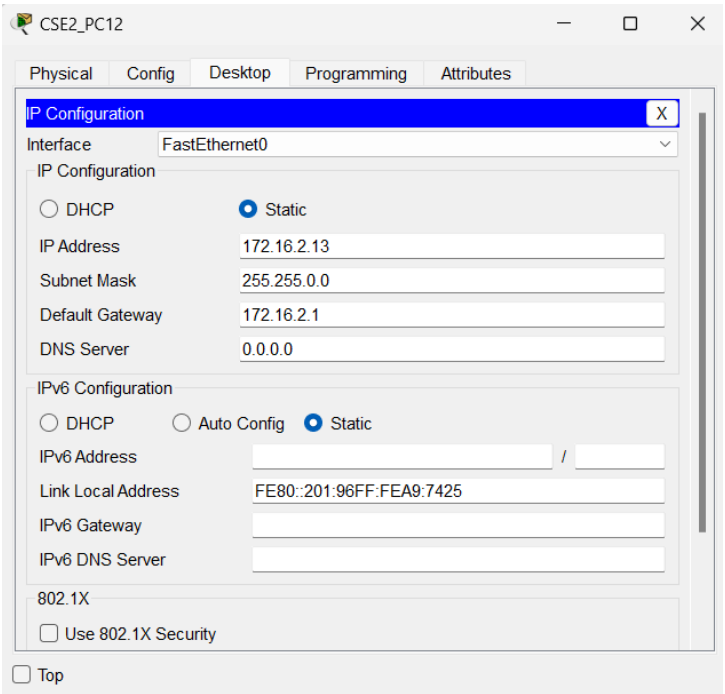
Library 192.168.4.0 255.255.255.0 192.168.4.1 - 192.168.4.10



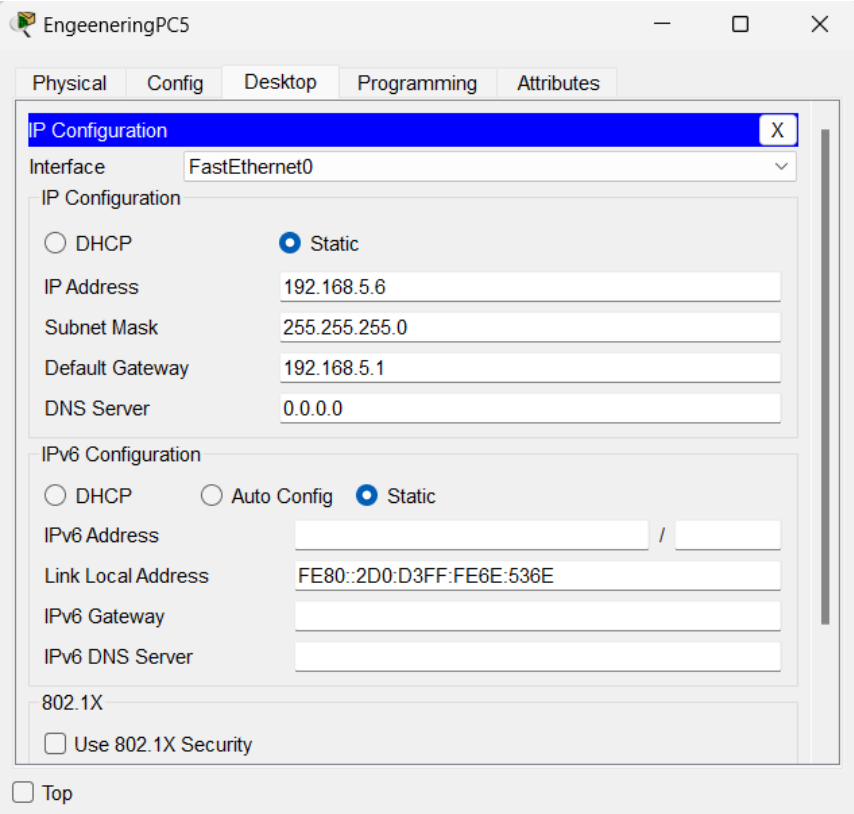
CSE 1 172.16.1.0 255.255.255.0 172.16.1.1 - 172.16.1.12



CSE 2 172.16.2.0 255.255.255.0 172.16.2.1 - 172.16.2.12



Engineering 192.168.5.0 255.255.255.0 192.168.5.1 - 192.168.5.5

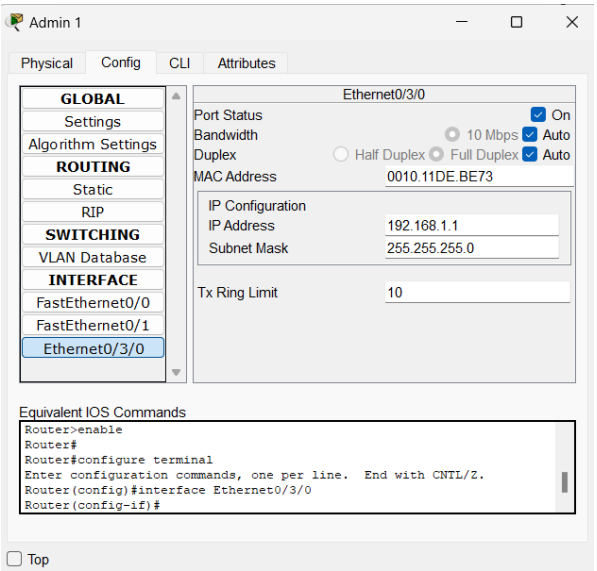


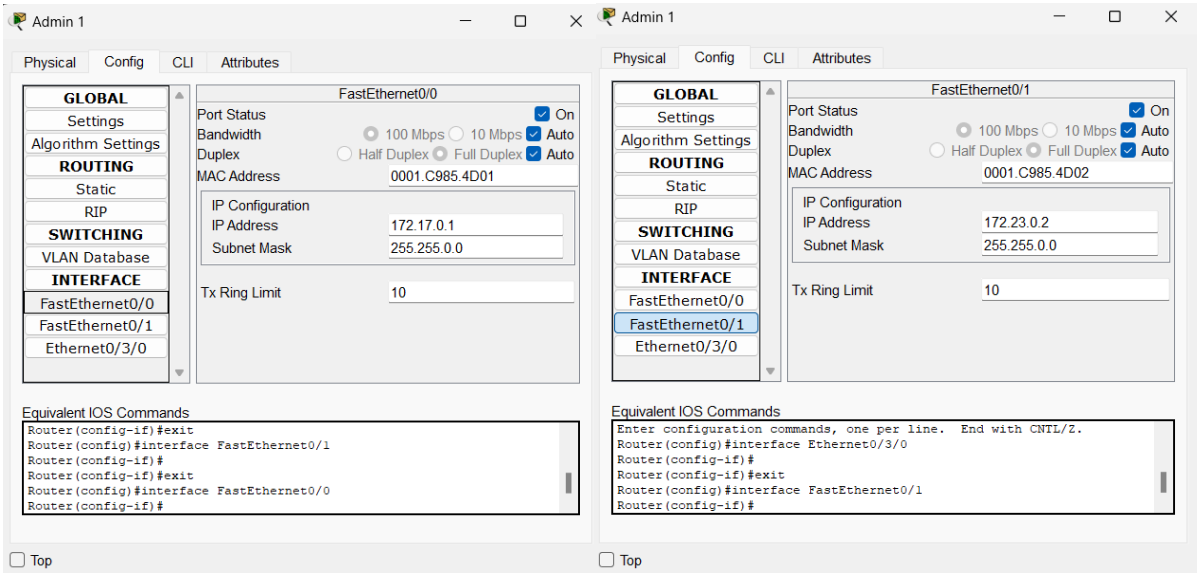
Examples Of IP addressing in routers

In all the routers connected to the topology the IP _._._.1 has been used for routers to put it in simple.

And in the subnetting the routers are given the IP 172.17.0.1 to 172.23.0.2 to make is easy to prepare.

Here are some snapshots for it.

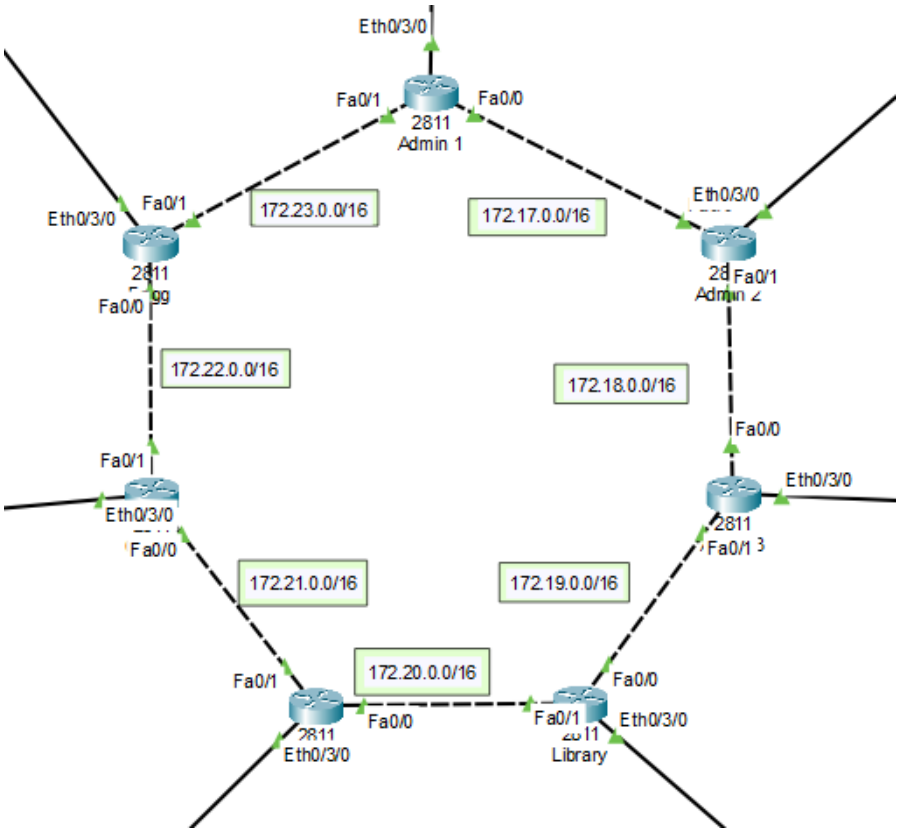




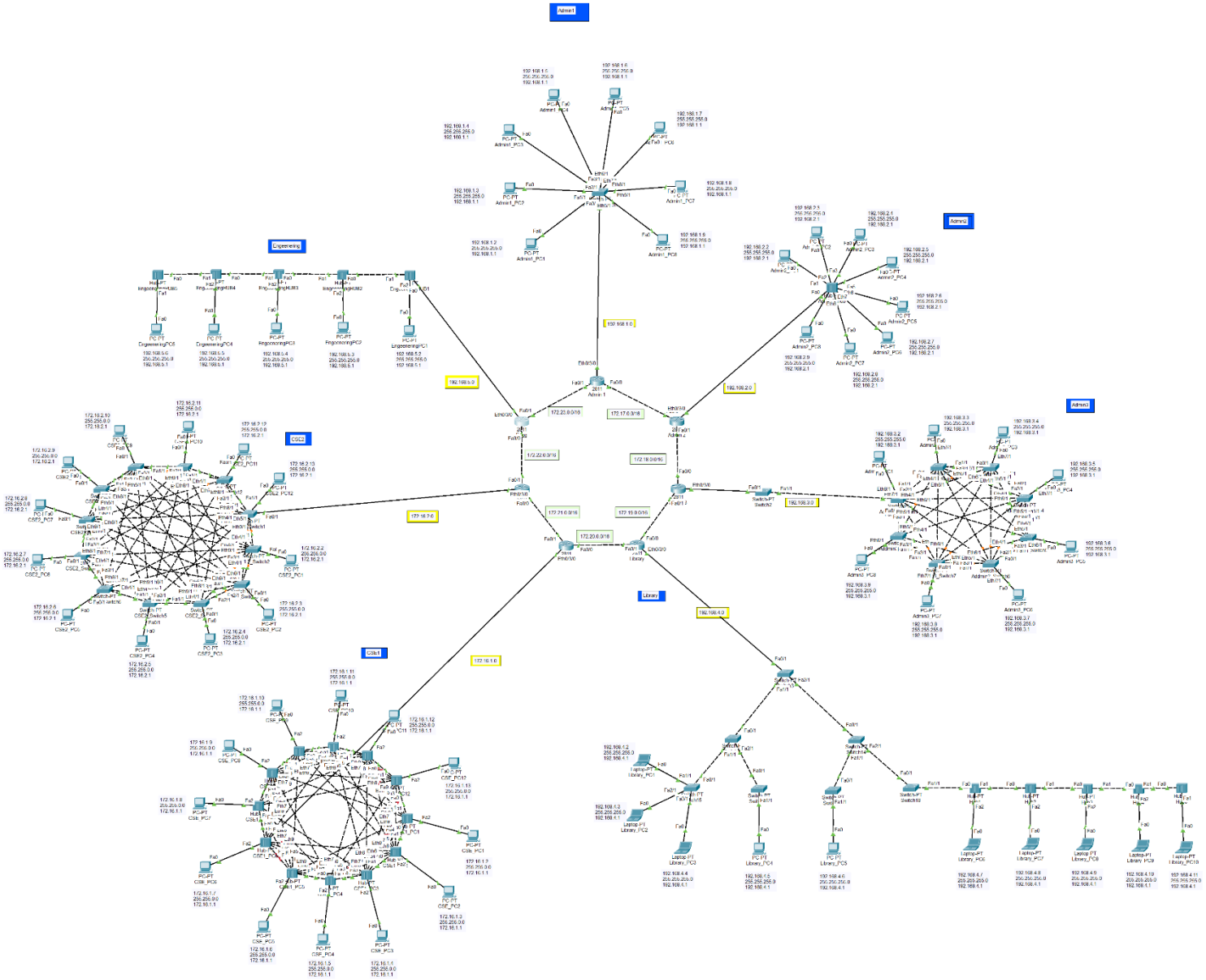
3. Routing Configuration

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:


Admin1
Engineering
Admin2
CSE2
CSE1
Admin3
Library
192.168.1.0
192.168.3.0
192.168.2.0
172.16.0.0
172.17.0.0/16
172.22.0.0/16
172.21.0.0/16
172.15.0.0/16
172.20.0.0/16
192.168.4.0

Admin1 Router

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 192.168.1.0
Router(config-router)#network 172.17.0.0
Router(config-router)#network 172.23.0.0
Router(config-router)#
```

Admin2 Router

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 192.168.2.0
Router(config-router)#network 172.17.0.0
Router(config-router)#network 172.18.0.0
Router(config-router)#
```

Admin3 Router

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 192.168.3.0
Router(config-router)#network 172.18.0.0
Router(config-router)#network 172.19.0.0
Router(config-router)#
```

Library Router

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 192.168.4.0
Router(config-router)#network 172.19.0.0
Router(config-router)#network 172.20.0.0
Router(config-router)#
```

CSE1 Router

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 172.16.1.0
Router(config-router)#network 172.20.0.0
Router(config-router)#network 172.21.0.0
Router(config-router)#
```

CSE2 Router

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 172.16.2.0
Router(config-router)#network 172.21.0.0
Router(config-router)#network 172.22.0.0
Router(config-router)#
```

Engineering Router

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 192.168.5.0
Router(config-router)#network 172.22.0.0
Router(config-router)#network 172.23.0.0
Router(config-router)#
```

4. Network Communication Testing

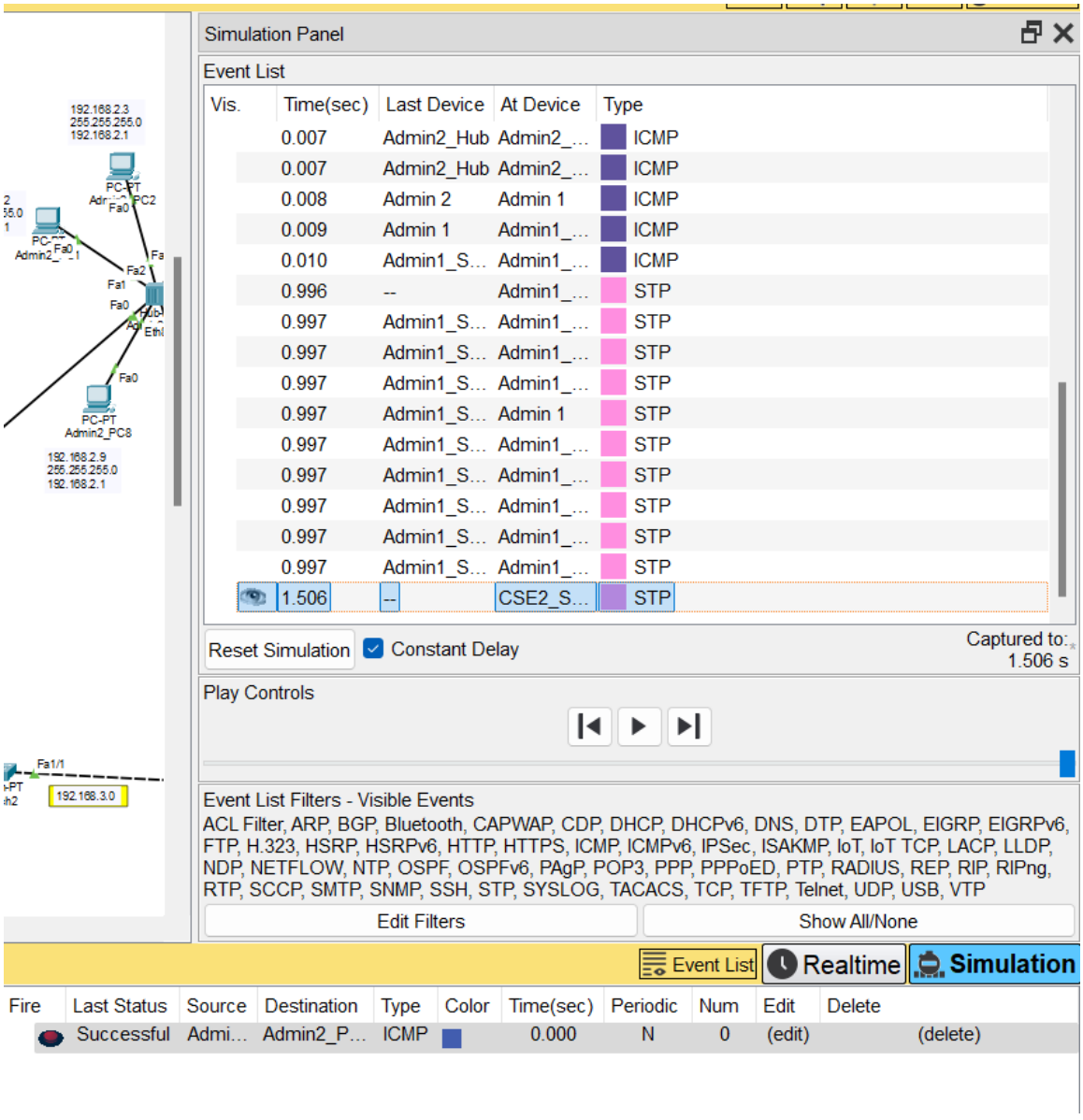
Overview:

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

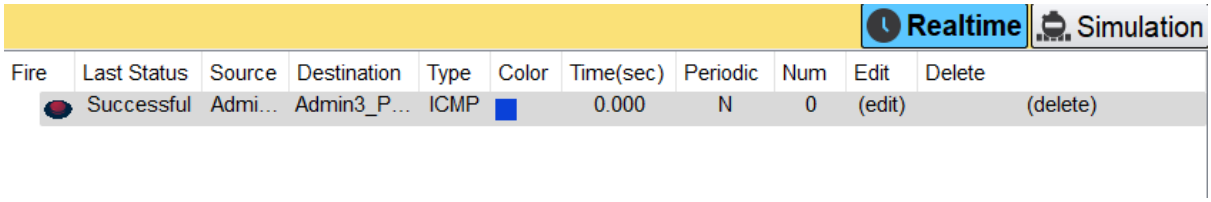
All the networks are fully functional and are properly communicating with each other.

Snapshots:

From Admin1_PC1 to Admin2_PC2

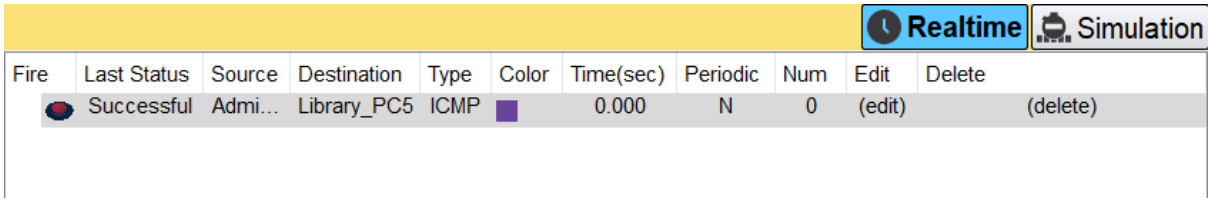


From Admin1_PC2 to Admin3_PC1



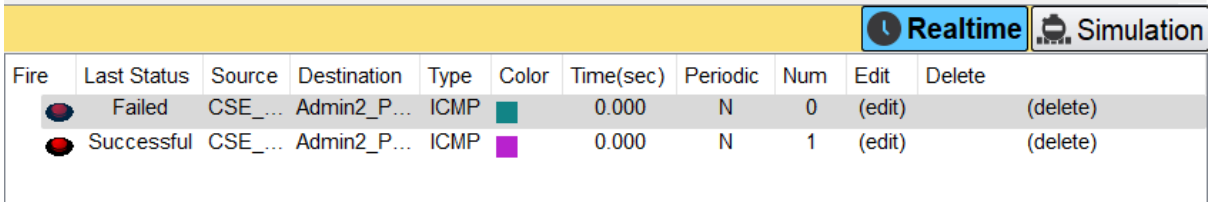
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	Admi...	Admin3_P...	ICMP		0.000	N	0	(edit)	(delete)

From Admin1_PC3 to Library_PC5



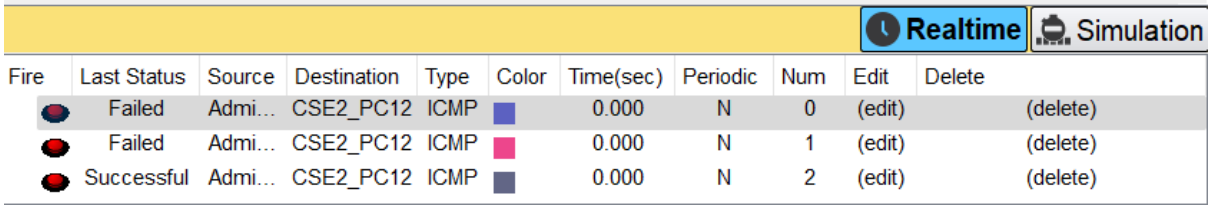
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	Admi...	Library_PC5	ICMP		0.000	N	0	(edit)	(delete)

From CSE1_PC1 to Admin2_PC1



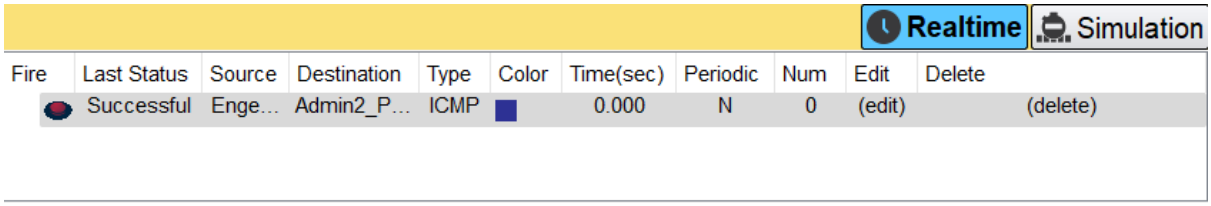
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Failed	CSE_...	Admin2_P...	ICMP		0.000	N	0	(edit)	(delete)
	Successful	CSE_...	Admin2_P...	ICMP		0.000	N	1	(edit)	(delete)

From Admin2_PC8 to CSE2_PC12



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



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 was both an enjoyable and enlightening experience. Exploring multiple strategies to structure the buildings' network led to the innovative idea of connecting routers in a **ring topology** for better efficiency and redundancy. However, some issues were encountered, and I plan to refine the design further to improve network stability and performance in the future.

GitHub : https://github.com/SumitSingh3101/Networking-Laboratory

Yours Faithfull

Sumit Singh Ranawat

12310811