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ACADEMIC TASK-2  
CSE 307  
Internet Working Essential

Submitted by:

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## 1. Introduction

The objective of this project is to design and implement a robust and scalable network for a university campus using Cisco Packet Tracer. This network integrates multiple academic and administrative buildings, allowing for efficient data sharing, resource access, dynamic routing, and deployment of essential services like DNS, DHCP, FTP, and Mail servers.

## 2. Network Topology and Building Setup

Each building uses a different network topology and hosts a specific number of end devices and services. These are interconnected via routers configured with RIP version 2.

Building	Topology Used	Devices Used
Administration Building 1	Star	Switch, 8 PCs, Mail Server
Administration Building 2	Star	Hub, 8 PCs
Administration Building 3	Mesh	Switch, 8 PCs
Library	Hybrid	Switch, Hub, 10 PCs, DHCP Server
Computer Science Department 1	Mesh	Hub, 12 PCs, DNS Server
Computer Science Department 2	Mesh	Switches, 12 PCs
Engineering Department	Bus	Hub, 5 PCs, FTP Server

### 2.1 Devices Used

- **Switch PT:** Used in mesh and hybrid setups for high-performance interconnections.
- **Hub PT:** Shared medium communication in star/bus layouts.
- **Routers:** Provide building-to-building interconnectivity and routing.
- **Servers:** Deployed for DHCP, DNS, Mail, and FTP functionalities.
- **PCs:** Act as end-user devices.
- **Cables:** Straight-through for PC-to-switch/hub; cross cables for switch-to-switch/router.

## 3. IP Addressing

The network utilizes **FLSM** (Fixed-Length Subnet Masking), beginning with 172.11.0.0/16. Each LAN is assigned a /28 subnet to accommodate end devices and servers, while /30 subnets are used for router interconnections.

Subnet No.	Network Address	Usable IP Range	Broadcast Address
1	172.11.0.0	172.11.0.1 – 172.11.0.14	172.11.0.15
2	172.11.0.16	172.11.0.17 – 172.11.0.30	172.11.0.31
3	172.11.0.32	172.11.0.33 – 172.11.0.46	172.11.0.47
4	172.11.0.48	172.11.0.49 – 172.11.0.62	172.11.0.63
5	172.11.0.64	172.11.0.65 – 172.11.0.78	172.11.0.79
6	172.11.0.80	172.11.0.81 – 172.11.0.94	172.11.0.95
7	172.11.0.96	172.11.0.97 – 172.11.0.110	172.11.0.111

Router-to-router links use /30 subnets from 172.11.1.0/30 upwards.

#### 4. Routing Setup

Routing is implemented using **RIP v2** to dynamically share routes between all routers.  
Configuration was done using the CLI:

```
Router> enable
Router# config terminal
Router(config)# router rip
Router(config-router)# version 2
Router(config-router)# no auto-summary
Router(config-router)# network 172.11.0.0
Router(config-router)# network 172.11.1.0
```

This setup allows for automatic route propagation across the building network.

#### 5. Inter-Building Communication

- All buildings are **connected serially** using GigabitEthernet0/1 and GigabitEthernet0/2 interfaces.
- Communication was tested using the ping command:  
  
ping <target IP>
- Successful communication was observed between PCs across all buildings, validating full connectivity.

#### 6. Server Configuration

Building	Server Type	Purpose
Library	DHCP Server	Automatically assigns IP addresses to clients within the library LAN.
CS Department 1	DNS Server	Resolves domain names like ftp.local, mail.local to IP addresses.
Engineering Department	FTP Server	Hosts files for upload/download across the campus.
Admin Building 1	Mail Server	Manages internal mail services (SMTP + POP3).

#### Sample DNS Records

Domain Name	Mapped IP
<a href="#">www.campus.local</a>	172.11.0.33
mail.local	172.11.0.62
ftp.local	172.11.0.110

## 7. Server Implementations

### 7.1 DHCP Server

The screenshot shows the configuration window for PC35. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Interface' is 'FastEthernet0'. The 'DHCP' radio button is selected, and the 'Static' radio button is unselected. The IPv4 Address is 172.11.0.42, Subnet Mask is 255.255.255.240, Default Gateway is 172.11.0.33, and DNS Server is 0.0.0.0. Under 'IPv6 Configuration', the 'Automatic' radio button is unselected and the 'Static' radio button is selected. The IPv6 Address is empty, Link Local Address is FE80::260:47FF:FE7C:96E, Default Gateway is empty, and DNS Server is empty. Under '802.1X', the 'Use 802.1X Security' checkbox is unselected, Authentication is MD5, Username is empty, and Password is empty. A 'Top' button is at the bottom left.

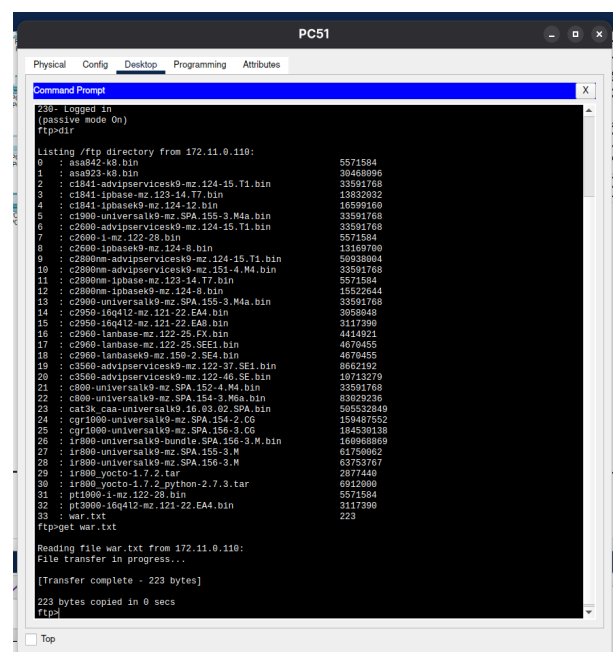
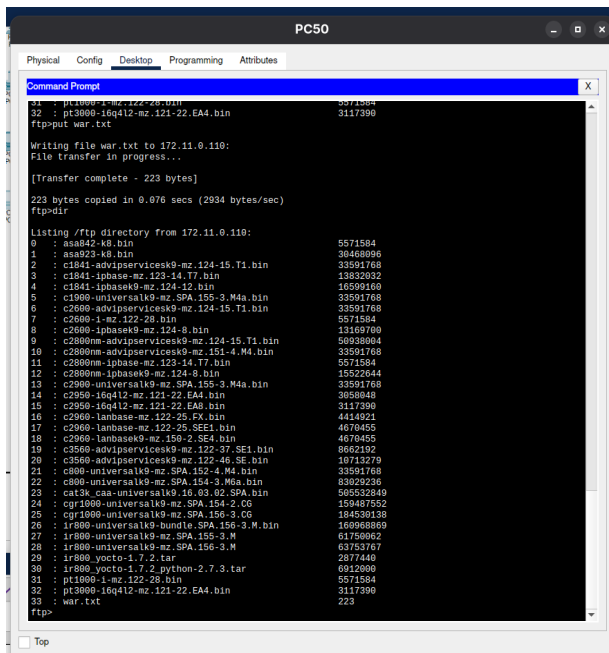
### 7.2 FTP Server

First PC Upload:

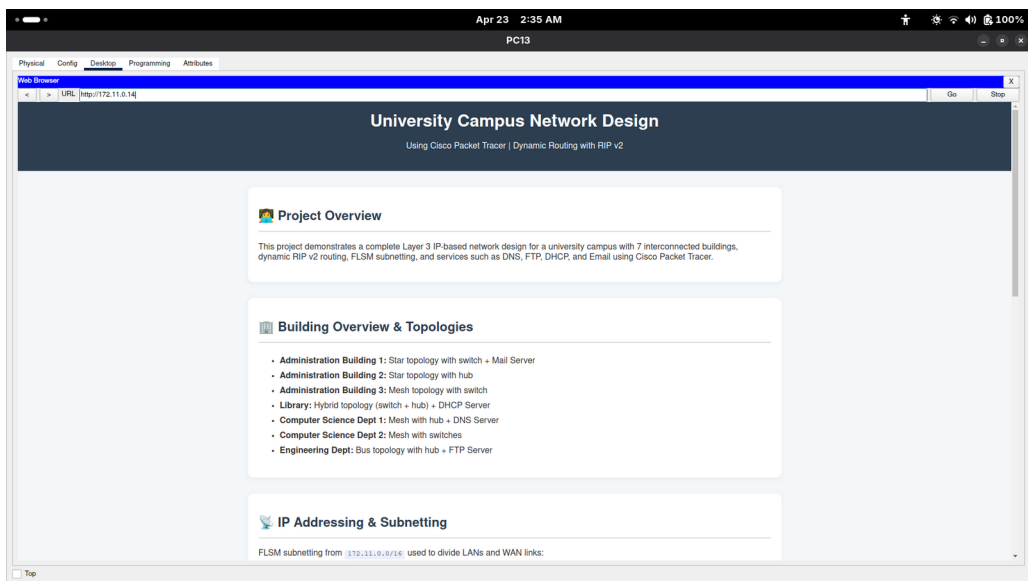
The screenshot shows the configuration window for PC50. The 'Desktop' tab is selected. A 'Text Editor' window is open with the following text:  
File  
Hello Mates,  
We are going to have War with Machal's Country. I hppe we will win and see the future within our boundaries to win and enjoy our upcoming luxury.  
Be HAPPY and win the war for me.  
Peeyush Maurya  
Hail Machal!!!!

Second PC Download;

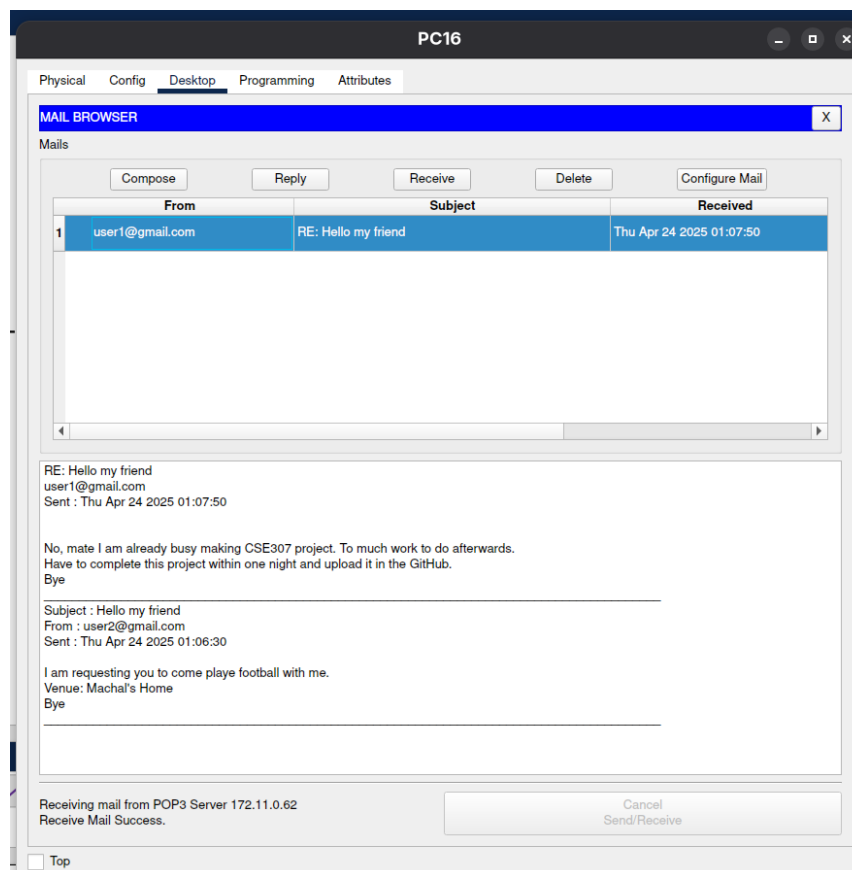
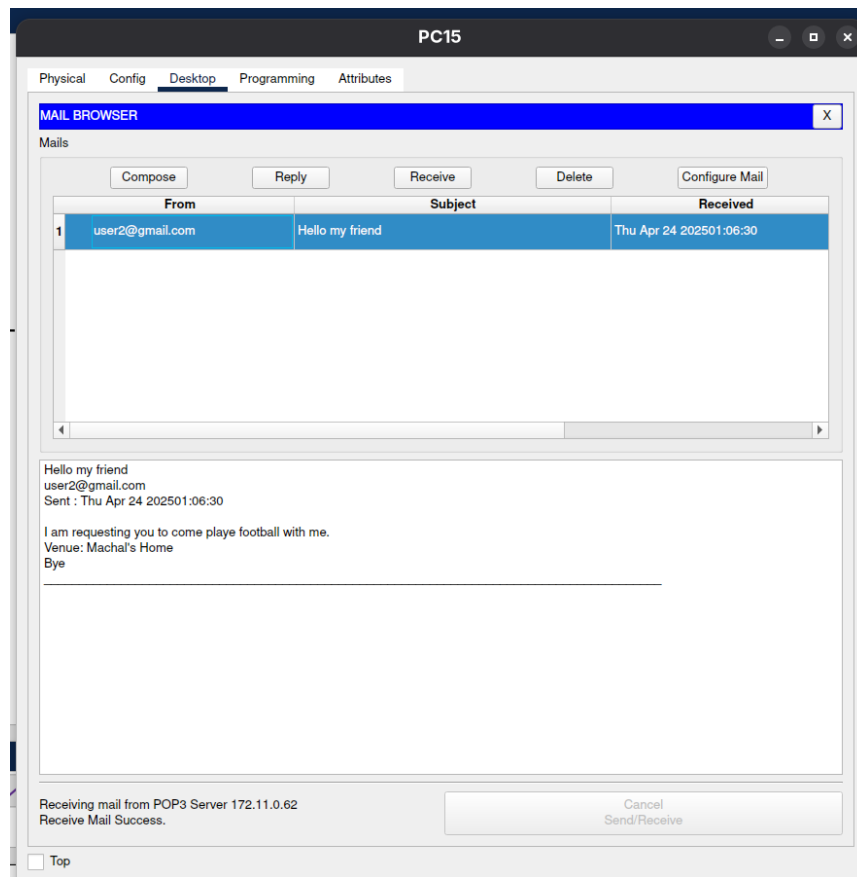
The screenshot shows the configuration window for PC51. The 'Desktop' tab is selected. A 'Text Editor' window is open with the following text:  
File  
Hello Mates,  
We are going to have War with Machal's Country. I hppe we will win and see the future within our boundaries to win and enjoy our upcoming luxury.  
Be HAPPY and win the war for me.  
Peeyush Maurya  
Hail Machal!!!!



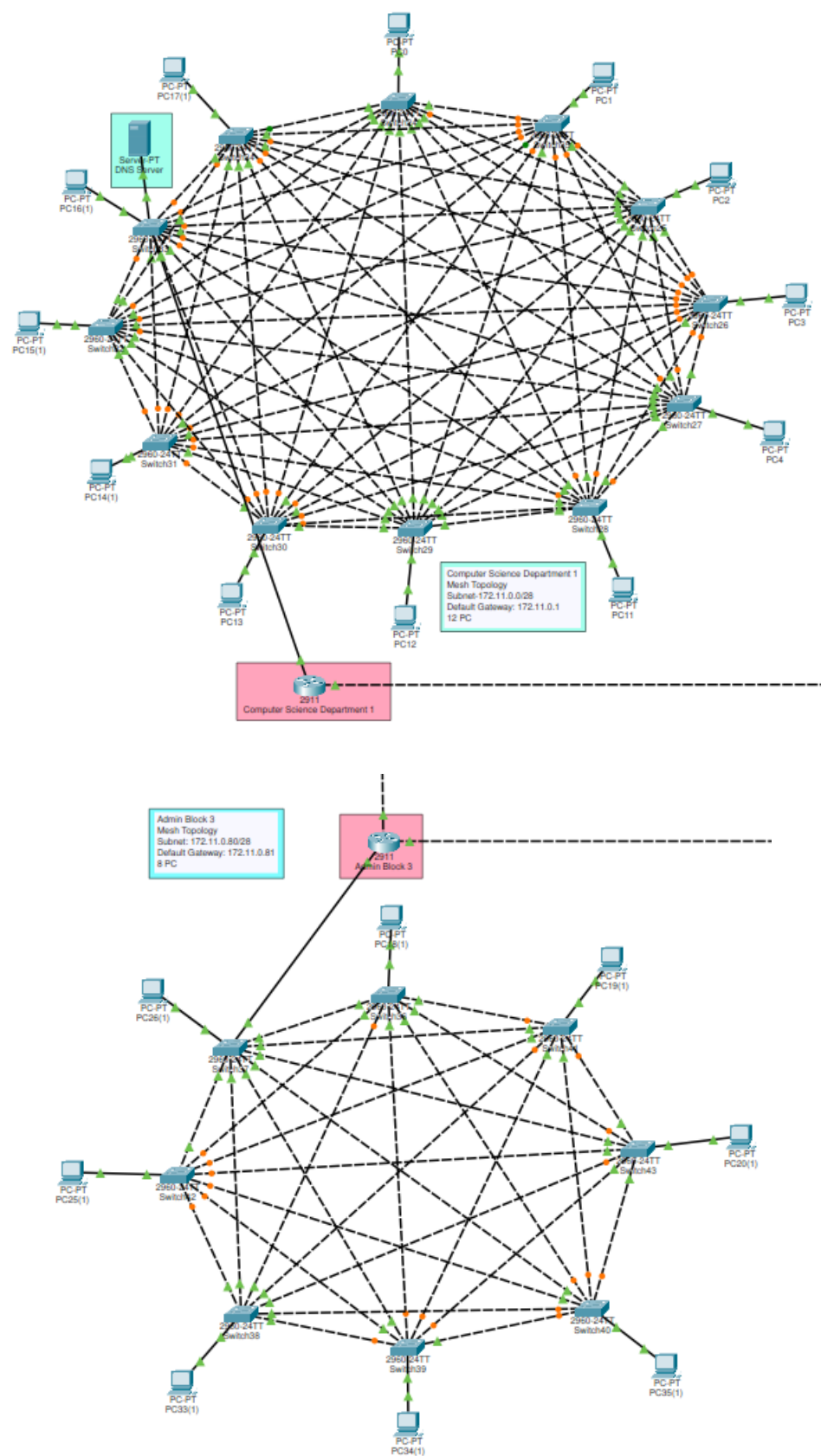
## 7.3 DNS Server

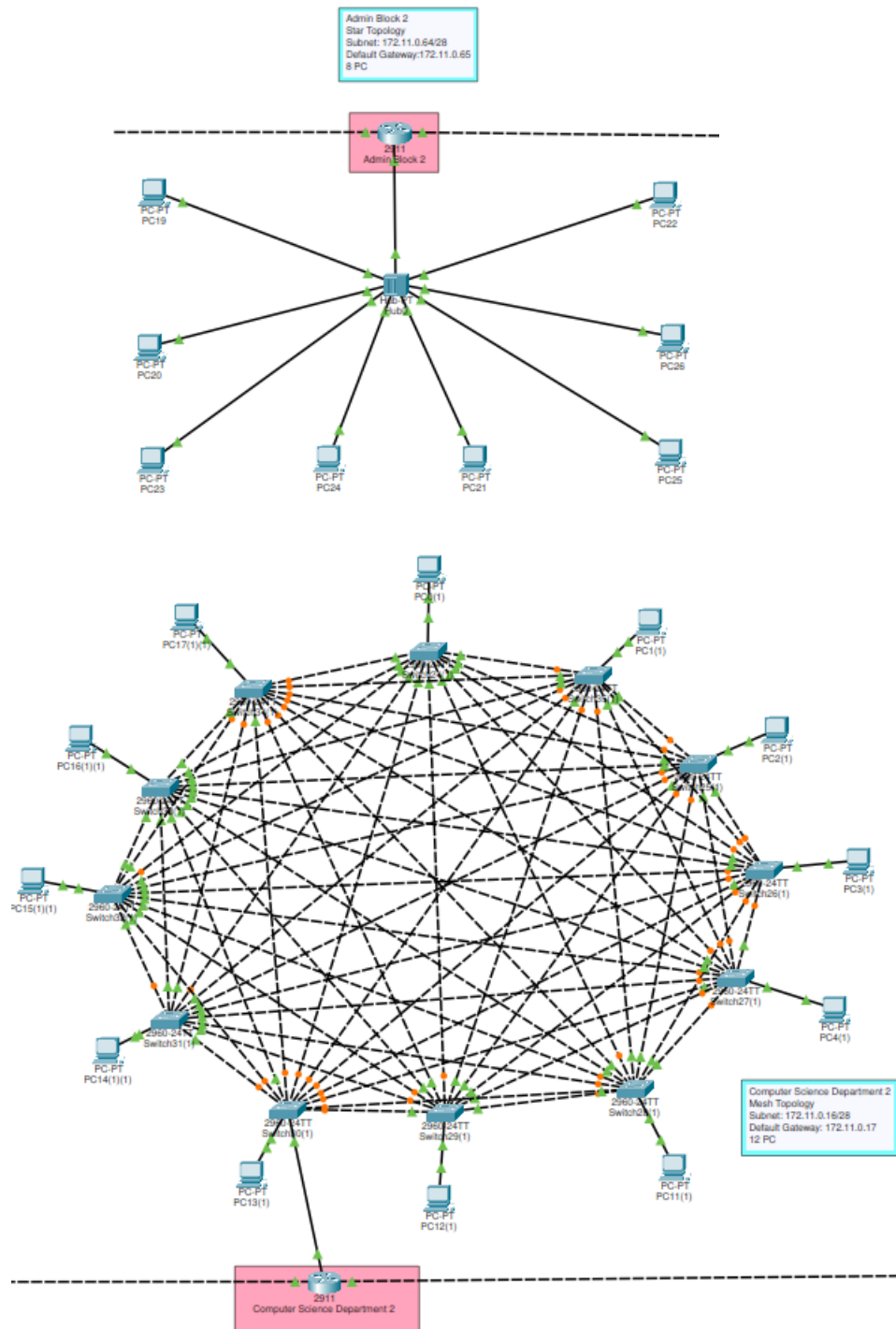


## 7.4 Mail Server



## 8. Structure Implementation

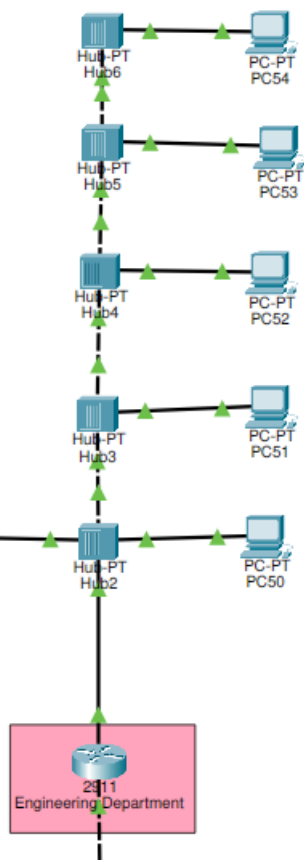






Engineering Department  
Bus Topology  
Subnet-172.11.0.96/28  
Default Gateway: 172.11.0.97  
5 PC

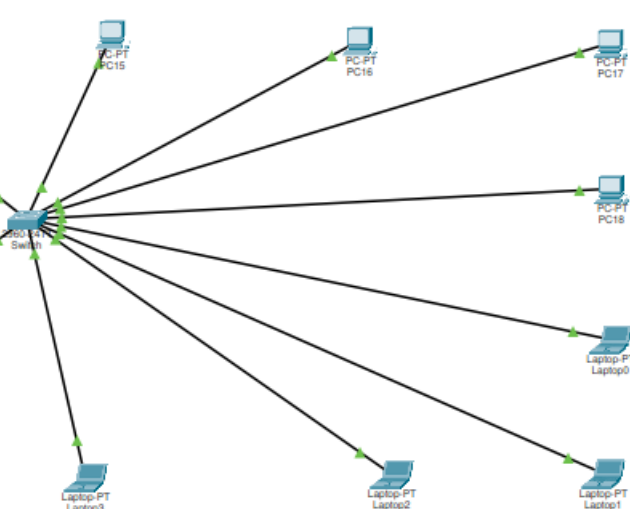
Server-PT  
FTP Server

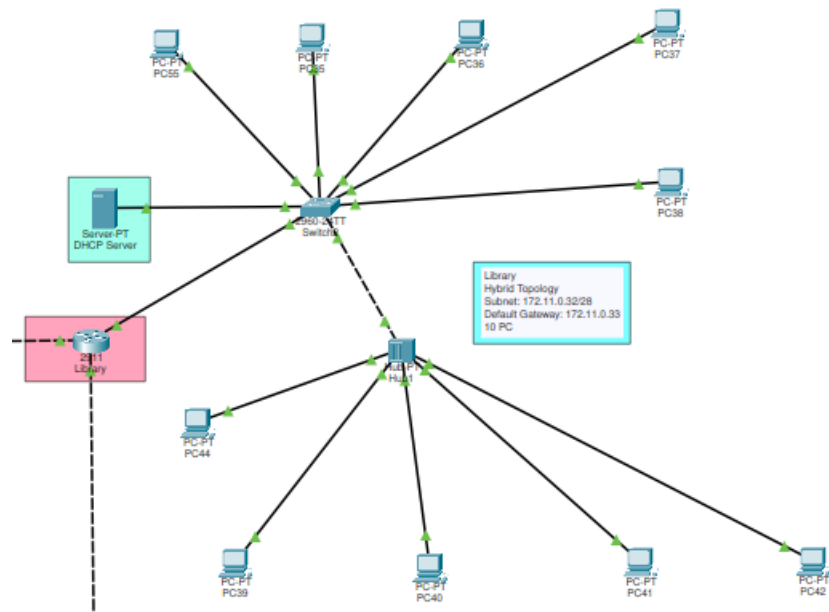


Admin Block 1  
Star Topology  
Subnet: 172.11.0.48/28  
Default Gateway: 172.11.0.49  
8 PC

2911  
Admin Block 1

Server-PT  
Mail Server





## 9. IP Route command

```
R1>en
R1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route
```

Gateway of last resort is not set

```
172.11.0.0/16 is variably subnetted, 15 subnets, 3 masks
C    172.11.0.0/28 is directly connected, GigabitEthernet0/0
L    172.11.0.1/32 is directly connected, GigabitEthernet0/0
R    172.11.0.16/28 [120/1] via 172.11.1.2, 00:00:25, GigabitEthernet0/1
R    172.11.0.32/28 [120/2] via 172.11.1.2, 00:00:25, GigabitEthernet0/1
R    172.11.0.48/28 [120/3] via 172.11.1.2, 00:00:25, GigabitEthernet0/1
R    172.11.0.64/28 [120/4] via 172.11.1.2, 00:00:25, GigabitEthernet0/1
R    172.11.0.80/28 [120/5] via 172.11.1.2, 00:00:25, GigabitEthernet0/1
R    172.11.0.96/28 [120/6] via 172.11.1.2, 00:00:25, GigabitEthernet0/1
C    172.11.1.0/30 is directly connected, GigabitEthernet0/1
L    172.11.1.1/32 is directly connected, GigabitEthernet0/1
R    172.11.1.4/30 [120/1] via 172.11.1.2, 00:00:25, GigabitEthernet0/1
R    172.11.1.8/30 [120/2] via 172.11.1.2, 00:00:25, GigabitEthernet0/1
R    172.11.1.12/30 [120/3] via 172.11.1.2, 00:00:25, GigabitEthernet0/1
R    172.11.1.16/30 [120/4] via 172.11.1.2, 00:00:25, GigabitEthernet0/1
R    172.11.1.20/30 [120/5] via 172.11.1.2, 00:00:25, GigabitEthernet0/1
```

## R1 (CS Dept 1 + DNS)

```
enable
configure terminal
hostname R1

interface GigabitEthernet0/0
description LAN-CSDept1
ip address 172.11.0.1 255.255.255.240
no shutdown

interface GigabitEthernet0/2
description to-R2
ip address 172.11.1.1 255.255.255.252
no shutdown

router rip
version 2
no auto-summary
network 172.11.0.0
network 172.11.1.0

end
write memory
```

## R2 (CS Dept 2)

```
enable
configure terminal
hostname R2

interface GigabitEthernet0/0
description LAN-CSDept2
ip address 172.11.0.17 255.255.255.240
no shutdown

interface GigabitEthernet0/1
description to-R1
ip address 172.11.1.2 255.255.255.252
no shutdown

interface GigabitEthernet0/2
description to-R3
ip address 172.11.1.5 255.255.255.252
no shutdown

router rip
version 2
no auto-summary
network 172.11.0.0
network 172.11.1.0

end
write memory
```

## R3 (Library + DHCP)

```
enable
configure terminal
hostname R3

interface GigabitEthernet0/0
description LAN-Library
ip address 172.11.0.33 255.255.255.240
no shutdown

interface GigabitEthernet0/1
description to-R2
ip address 172.11.1.6 255.255.255.252
no shutdown

interface GigabitEthernet0/2
description to-R4
ip address 172.11.1.9 255.255.255.252
no shutdown

router rip
```

```
version 2
no auto-summary
network 172.11.0.0
network 172.11.1.0
```

```
end
write memory
```

---

## R4 (Admin Bldg 1 + Mail)

```
enable
configure terminal
hostname R4

interface GigabitEthernet0/0
description LAN-AdminB1
ip address 172.11.0.49 255.255.255.240
no shutdown

interface GigabitEthernet0/1
description to-R3
ip address 172.11.1.10 255.255.255.252
no shutdown

interface GigabitEthernet0/2
description to-R5
ip address 172.11.1.13 255.255.255.252
no shutdown

router rip
version 2
no auto-summary
network 172.11.0.0
network 172.11.1.0
```

```
end
write memory
```

---

## R5 (Admin Bldg 2)

```
enable
configure terminal
hostname R5

interface GigabitEthernet0/0
description LAN-AdminB2
ip address 172.11.0.65 255.255.255.240
no shutdown

interface GigabitEthernet0/1
description to-R4
ip address 172.11.1.14 255.255.255.252
no shutdown

interface GigabitEthernet0/2
description to-R6
ip address 172.11.1.17 255.255.255.252
no shutdown

router rip
version 2
no auto-summary
network 172.11.0.0
network 172.11.1.0
```

```
end
write memory
```

---

## R6 (Admin Bldg 3)

```
enable
configure terminal
hostname R6

interface GigabitEthernet0/0
description LAN-AdminB3
```

```
ip address 172.11.0.81 255.255.255.240
no shutdown

interface GigabitEthernet0/1
description to-R5
ip address 172.11.1.18 255.255.255.252
no shutdown

interface GigabitEthernet0/2
description to-R7
ip address 172.11.1.21 255.255.255.252
no shutdown

router rip
version 2
no auto-summary
network 172.11.0.0
network 172.11.1.0

end
write memory
```

---

## **R7 (Eng Dept + FTP)**

```
enable
configure terminal
hostname R7

interface GigabitEthernet0/0
description LAN-EngDept
ip address 172.11.0.97 255.255.255.240
no shutdown

interface GigabitEthernet0/1
description to-R6
ip address 172.11.1.22 255.255.255.252
no shutdown

router rip
version 2
no auto-summary
network 172.11.0.0
network 172.11.1.0

end
write memory
```