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Title:
Analysis and Design of a Computer Network using Cisco Packet Tracer

Introduction:

Document details comprehensive process for design and implemented a network using Cisco Packet Tracer focus on series of tasks aimed configuring and verify network connectivity. Assignment leverages a specific block IP address derived from students ID (2376340) to establish logical and physical network topology. Tasks include allocation of IP addresses and configuration of network devices and implement security measures followed by verification of networks functionality using Protocol Data Units (PDUs). This systematic approach ensures creation of a robust and efficient network showcasing practical application of theoretical networking concepts. Ultimate goal is to ensure all network components communicate effectively and provide foundation to understand complex network design and troubleshoot techniques.

Objectives and Overview of the Coursework

Objectives

The primary objectives of coursework are:

- ✓ Determine Block IP Address: Calculate block IP address based on specific algorithm using student ID (2376340).
- ✓ Design Logical Network: Analyze and design a logical network topology includes subnetting and IP address allocation.
- ✓ Configure Physical Topology: Develop physical network topology using Cisco Packet Tracer and connect various network devices.
- ✓ Configure Logical Topology: Assign IP addresses to devices within network and ensure proper configuration of seamless communication.

- ✓ Implement Security Systems: Set up security measures on routers and active network devices protect network from unauthorized access.
- ✓ Verify Network Connectivity: Use debugging and verification techniques such as Protocol Data Units (PDUs) and ping commands to ensure network connectivity and functionality.

Overview

This coursework is structured into several interconnected tasks designed to guide student through complete lifecycle of network design and implementation. Starting with determination of block IP address using a student-specific algorithm and coursework progresses through stages of logical and physical network design, device configuration and security implementation. The final stages involve rigorous testing and verification of network connectivity ensure that all components function correctly and efficiently.

The tasks are outlined as follows:

- ✓ Block IP Address Determination: Utilizing the student ID (2376340) block IP address and subnet mask are calculated.
- ✓ Logical Network Design: Subnets are created based on number of required hosts and with detailed analysis and documentation of network addresses, subnet masks and host addresses.
- ✓ Physical Network Configuration: The network topology is designed in Cisco Packet Tracer, connecting routers, switches, servers, and computers as specified.
- ✓ Logical Topology Configuration: IP addresses are assigned to devices in each subnet, ensuring proper configuration and connectivity.
- ✓ Security Implementation: Security settings are configured on network devices, including passwords for Telnet, AUX port, Console, and Enable modes.
- ✓ Connectivity Verification: Network connectivity is tested using PDU simulations and ping commands, with results documented and analyzed.

Design and build computer network using Packet Tracer

Task 1

Determining Each Student's Block IP Address[1][4][7]

As for my case the student id is 2376340 as for taking into the case of all the 3 sections as follow:

Fiest Section: First 3 digits are as 237 which is greater the 224 so this case is not true but for the case as 237 is greater then 223 so we take first section as "**193**".

Second Section: For the second section we take the numbers as 63, for which both are non-Zero so we take the second section as "**63**"

Third Section: In this section we have 40 so we take 3rd section as "**40**"

Fourth Section: the fourth section as "**0**"

Now our Final IP Block will be "**193.63.40.0**"

Making Network Topology in CISCO

There are 6 subnets of this network as "**Subnet A**", "**Subnet B**", "**Subnet C**", "**Subnet D**", "**Subnet E**", "**Subnet F**" but the subnets A, B, C do not contain any computer end device so we take its an single subnet of router for inter router communication our logical network topology and the remaining subnets as: Subnet D: 1 server and 4 computer, total 5

Subnet E: 1 server and 18 computer, total 19

Subnet F: 1 server and 20 computer, total 21

Subnetting calculation of IP:

As the A, B, C have IP as our router IP for IP block is calculated as:

Subnet of D

As it has requirement of 5 IP's so,

$2^3 > 5$

32 - 3 = 29

So, Subnet is: 193.63.40.10/29

Subnet mask is: 255.255.255.248

Network IP Address: 193.63.40.0

Broadcast Address: 193.63.40.7

IP Pool: 193.63.40.1 to 193.63.40.6

Subnet of E

As it has requirement of 19 + 2 = 21 IP required so,

$2^5 > 21$

32 - 5 = 27

So, Subnet is: 193.63.40.8/27

Subnet mask is: 255.255.255.224

Network IP Address: 193.63.40.8

Broadcast Address: 193.63.40.31

IP Pool: 193.63.40.9 to 193.63.40.30

Subnet of F

As it has requirement of 21 + 2 = 23 IP required so,

$2^5 > 23$

32 - 5 = 27

So, Subnet is: 193.63.40.32/27

Subnet mask is: 255.255.255.224

Network IP Address: 193.63.40.32

Broadcast Address: 193.63.40.55

IP Pool: 193.63.40.33 to 193.63.40.54

For Subnet of A

Starting of our starting IP from Block is 193.63.40.72 and for router network IP as we require 3 IP's 1 for router and other 2 for network and broadcast so it will be calculated as:

As it has requirement of 3 IP's so,

$2^2 > 3$

32 - 2 = 30

So, Subnet is: 193.63.40.65/30

Subnet mask is: 255.255.255.252

Network IP Address: 193.63.40.65

Broadcast Address: 193.63.40.67

IP Pool: 192.63.40.65 and 193.63.40.66

Subnet B

As it has requirement of 3 IP's same as A subnet, so,

$2^2 > 3$

32 - 2 = 30

So, Subnet is: 193.63.40.68/30

Subnet mask is: 255.255.255.252

Network IP Address: 193.63.40.68

Broadcast Address: 193.63.40.71

IP Pool: 193.63.40.69 and 193.63.40.70

Subnet C:

As it has requirement of 3 IP's same as B and C so,

$2^2 > 3$

32 - 2 = 30

So, Subnet is: 193.63.40.72/30

Subnet mask is: 255.255.255.252

Network IP Address: 193.63.40.72

Broadcast Address: 193.63.40.75

IP Pool: 193.63.40.73 and 193.63.40.74

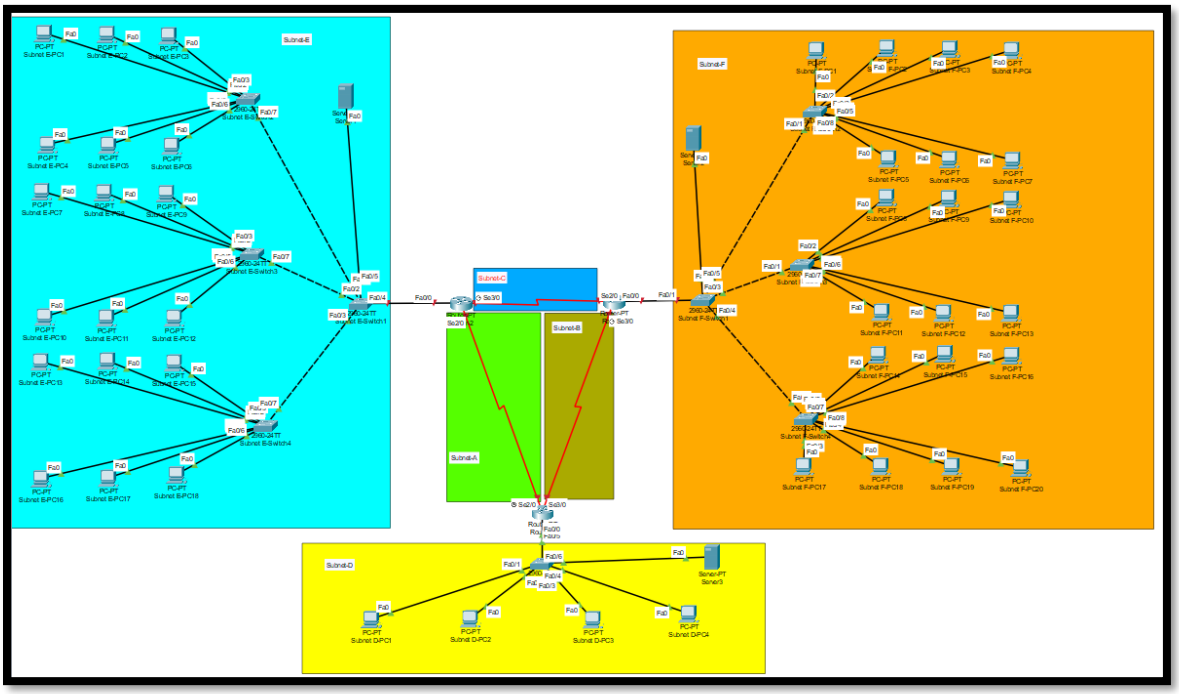
Subnet	Network IP Address	Subnet Mask	First Host Address	Last Host Address	Broadcast Address	Bit mask
Subnet A	193.63.40.64	255.255.255.252	193.63.40.65	193.63.40.66	193.63.40.67	/30
Subnet B	193.63.40.68	255.255.255.252	193.63.40.69	193.63.40.70	193.63.40.71	/30
Subnet C	193.63.40.72	255.255.255.252	193.63.40.73	193.63.40.74	193.63.40.75	/30

Subnet D	193.63.40.0	255.255.255.248	193.63.40.1	193.63.40.6	193.63.40.7	/29
Subnet E	193.63.40.8	255.255.255.224	193.63.40.9	193.63.40.30	193.63.40.31	/27
Subnet F	193.63.40.32	255.255.255.224	193.63.40.33	193.63.40.54	193.63.40.55	/27

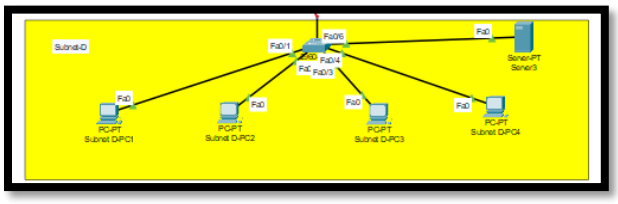
Now filling the table 2 for the IP as :

Initial Topology Design before the network configured:

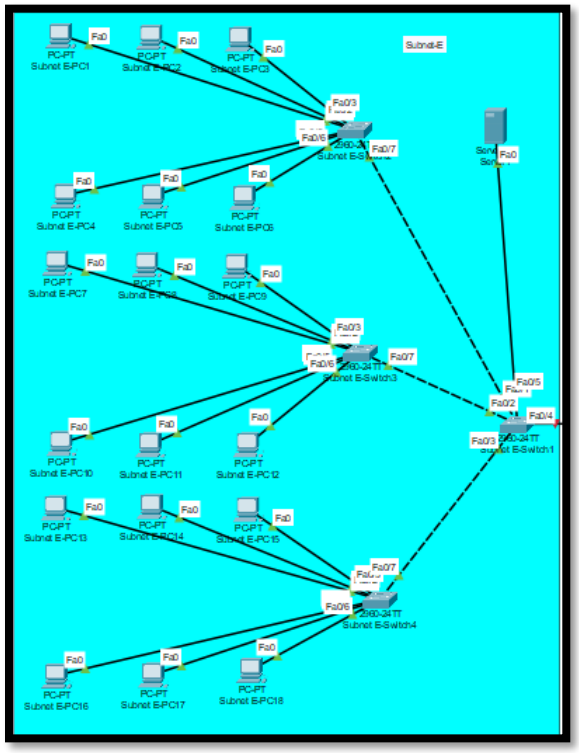
Overall Topology:[2]



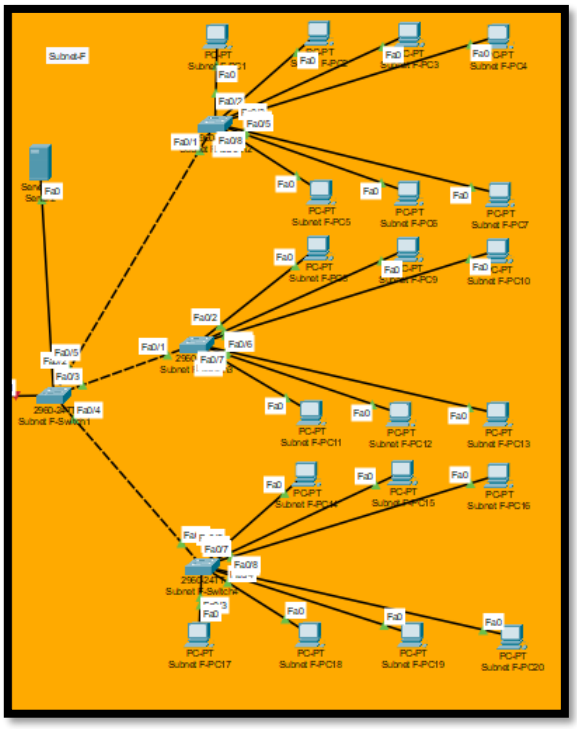
Subnet D:



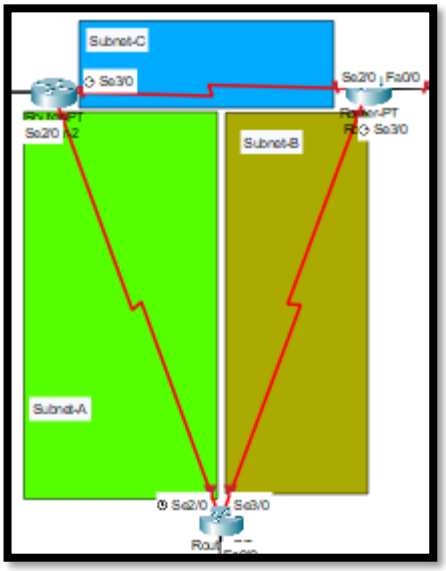
Subnet E:



Subnet F:



Subnet A, B, C:



Now after making we can fill the table 3 easily as:

	Types of cable used
1. Between Routers and Switches	Copper Straight-Through
2. Between Routers	Serial DTE
3. Between Routers and Hosts (PCs)	Copper Cross-Over
4. Between Routers and Hosts	Copper Straight-Through
5. Between Switches	Copper Cross-Over
6. Between Switches and servers	Copper Straight-Through

Now Router Configuration for network so that network can communicate seamlessly(DHCP & RIP:[5][6]

Router 1:

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 193.63.40.6 255.255.255.248
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#ip dhcp pool d
Router(dhcp-config)#network 193.63.40.0 255.255.255.248
Router(dhcp-config)#default-router 193.63.40.6
Router(dhcp-config)#exit
Router(config)#ip dhcp excluded-address 193.63.40.6 193.63.40.7
Router(config)#do write memory
Building configuration...
[OK]
Router(config)#int fa0/1
Router(config-if)#ip address 193.63.40.66 255.255.255.252
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

Router(config-if)#exit
Router(config)#int eth 1/0
Router(config-if)#ip address 193.63.40.70 255.255.255.252
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Ethernet1/0, changed state to up

Router(config-if)#exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
```

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#ver 2
Router(config-router)#network 193.63.40.0
Router(config-router)#network 193.63.40.64
Router(config-router)#network 193.63.40.68
Router(config-router)#no auto-summary
Router(config-router)#exit
Router(config)#do sh 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

     193.63.40.0/24 is variably subnetted, 6 subnets, 3 masks
C       193.63.40.0/29 is directly connected, FastEthernet0/0
L       193.63.40.6/32 is directly connected, FastEthernet0/0
C       193.63.40.64/30 is directly connected, FastEthernet0/1
L       193.63.40.66/32 is directly connected, FastEthernet0/1
C       193.63.40.68/30 is directly connected, Ethernet1/0
L       193.63.40.70/32 is directly connected, Ethernet1/0

Router(config)#
```

Router 2:

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 193.63.40.30 255.255.255.224
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#ip dhcp pool e
Router(dhcp-config)#network 193.63.40.8 255.255.255.224
Router(dhcp-config)#default-router 193.63.40.30
Router(dhcp-config)#exit
Router(config)#ip dhcp excluded-address 193.63.40.30 193.63.49.31
Router(config)#ip dhcp excluded-address 193.63.40.1 193.63.49.8
Router(config)#do write memory
Building configuration...
[OK]
Router(config)#int fa 0/1
Router(config-if)#ip address 193.63.40.65 255.255.255.252
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

Router(config-if)#exit
Router(config)#
```

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#ver 2
Router(config-router)#network 193.63.40.64
Router(config-router)#network 193.63.40.8
Router(config-router)#no auto-summary
Router(config-router)#exit
Router(config)#do sh 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

     193.63.40.0/24 is variably subnetted, 6 subnets, 4 masks
C       193.63.40.0/27 is directly connected, FastEthernet0/0
R       193.63.40.0/29 [120/1] via 193.63.40.66, 00:00:10, FastEthernet0/1
L       193.63.40.30/32 is directly connected, FastEthernet0/0
C       193.63.40.64/30 is directly connected, FastEthernet0/1
L       193.63.40.65/32 is directly connected, FastEthernet0/1
R       193.63.40.68/30 [120/1] via 193.63.40.66, 00:00:10, FastEthernet0/1

Router(config)#
Router(config)#
Router(config)#interface Ethernet1/0
Router(config-if)#no ip address
Router(config-if)#ip address 193.63.40.73 255.255.255.252
Router(config-if)#ip address 193.63.40.73 255.255.255.252
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface Ethernet1/0, changed state to up

Router(config-if)#exit
Router(config)#router rip
Router(config-router)#ver 2
Router(config-router)#network 193.63.40.72
Router(config-router)#no auto-summary
Router(config-router)#exit
```

Router 3:

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 193.63.40.54 255.255.255.224
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#ip
Router(config)#
Router(config)#interface FastEthernet0/0
Router(config-if)#exit
Router(config)#ip dhcp pool f
Router(dhcp-config)#network 193.63.40.32 255.255.255.224
Router(dhcp-config)#default-router 193.63.40.54
Router(dhcp-config)#exit
Router(config)#ip dhcp excluded-address 193.63.40.54 193.63.40.63
Router(config)#do write memory
Building configuration...
[OK]
Router(config)#int fa 0/1
Router(config-if)#ip address 193.63.40.69 255.255.255.252
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

Router(config-if)#exit
```

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#ver 2
Router(config-router)#network 193.63.40.68
Router(config-router)#network 193.63.40.32
Router(config-router)#no auto-summary
Router(config-router)#exit
Router(config)#do sh 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

     193.63.40.0/24 is variably subnetted, 7 subnets, 4 masks
R       193.63.40.0/27 [120/2] via 193.63.40.70, 00:00:10, FastEthernet0/1
R       193.63.40.0/29 [120/1] via 193.63.40.70, 00:00:10, FastEthernet0/1
C       193.63.40.32/27 is directly connected, FastEthernet0/0
L       193.63.40.54/32 is directly connected, FastEthernet0/0
R       193.63.40.64/30 [120/1] via 193.63.40.70, 00:00:10, FastEthernet0/1
C       193.63.40.68/30 is directly connected, FastEthernet0/1
L       193.63.40.69/32 is directly connected, FastEthernet0/1

Router(config)#
Router(config)#
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Ethernet1/0
Router(config-if)#ip address 193.63.40.74 255.255.255.252
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface Ethernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to up

Router(config-if)#exit
Router(config)#router rip
Router(config-router)#ver 2
Router(config-router)#network 193.63.40.72
Router(config-router)#no auto-summary
Router(config-router)#exit
```

Now after enabling DHCP in all the hosts of each subnet, we got the table 4: [3]

Subnet Network D:

Host 1	
IP Address	193.63.40.1
IP Mask	255.255.255.248
Gateway Address	193.63.40.6

Host 2	
IP Address	193.63.40.2
IP Mask	255.255.255.248
Gateway Address	193.63.40.6

Host 1	
IP Address	193.63.40.3
IP Mask	255.255.255.248
Gateway Address	193.63.40.6

Host 1	
IP Address	193.63.40.4

IP Mask	255.255.255.248
Gateway Address	193.63.40.6

Server	
IP Address	193.63.40.5
IP Mask	255.255.255.248
Gateway Address	193.63.40.6

Subnet Network E:

Host 1	
IP Address	193.63.40.9
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 2	
IP Address	193.63.40.10
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 3	
IP Address	193.63.40.11
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 4	
IP Address	193.63.40.12
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 5	
IP Address	193.63.40.13
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 6	
IP Address	193.63.40.14
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 7	
IP Address	193.63.40.15
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 8	
IP Address	193.63.40.16
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 9	
IP Address	193.63.40.17
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 10	
IP Address	193.63.40.18
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 11	
IP Address	193.63.40.19
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 12	
IP Address	193.63.40.20
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 13	
IP Address	193.63.40.21
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 14	
IP Address	193.63.40.22
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 15	
IP Address	193.63.40.24
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 16	
IP Address	193.63.40.25
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 17	
IP Address	193.63.40.26
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Host 18	
IP Address	193.63.40.27
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Server	
IP Address	193.63.40.28
IP Mask	255.255.255.248
Gateway Address	193.63.40.30

Subnet Network F:

Host 1	
IP Address	193.63.40.33
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 2	
IP Address	193.63.40.34
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 3	
IP Address	193.63.40.35
IP Mask	255.255.255.248

Gateway Address	193.63.40.54

Host 4	
IP Address	193.63.40.36
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 5	
IP Address	193.63.40.37
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 6	
IP Address	193.63.40.38
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 7	
IP Address	193.63.40.39

IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 8	
IP Address	193.63.40.40
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 9	
IP Address	193.63.40.41
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 10	
IP Address	193.63.40.42
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 11	
IP Address	193.63.40.43
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 12	
IP Address	193.63.40.44
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 13	
IP Address	193.63.40.45
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 14	
IP Address	193.63.40.46
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 15	
IP Address	193.63.40.47
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 16	
IP Address	193.63.40.48
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 17	
IP Address	193.63.40.49
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 18	
IP Address	193.63.40.50
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 19	
IP Address	193.63.40.51
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Host 20	
IP Address	193.63.40.52
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Server	
IP Address	193.63.40.53
IP Mask	255.255.255.248
Gateway Address	193.63.40.54

Now after enabling Security systems on routers:

Router 1 all Security Systems Enabled: *Router 2 all Security Systems Enabled:*

```
Router>en
Router#
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#en secret myEnableSecret
% Ambiguous command: "en secret myEnableSecret"
Router(config)#enable secret myEnableSecret
Router(config)#
Router(config)#line console 0
Router(config-line)#password myAuxPassword
Router(config-line)#login
Router(config-line)#exit
Router(config)#line aux 0
Router(config-line)#password myAuxPassword
Router(config-line)#login
Router(config-line)#exit
Router(config)#line console 0
Router(config-line)#no password myAuxPassword
Router(config-line)#password myConsolePassword
Router(config-line)#login
Router(config-line)#exit
Router(config)#line vty 0 4
Router(config-line)#password myVTYPassword
Router(config-line)#login
Router(config-line)#exit
Router(config)#line vty 0 4
Router(config-line)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#write memory
Building configuration...
[OK]
Router#
```

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#enable secret myEnableSecretR2
Router(config)#line console 0
Router(config-line)#password myConsolePasswordR2
Router(config-line)#login
Router(config-line)#exit
Router(config)#line aux 0
Router(config-line)#password myAUXPasswordR2
Router(config-line)#login
Router(config-line)#exit
Router(config)#line vty 0 4
Router(config-line)#password myVTYPasswordR2
Router(config-line)#login
Router(config-line)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#write memory
Building configuration...
[OK]
```

Router 3 all Security Systems Enabled:

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#enable secret myEnableSecretR3
Router(config)#line console 0
Router(config-line)#password myConsolePasswordR3
Router(config-line)#login
Router(config-line)#exit
Router(config)#line aux 0
Router(config-line)#password myAUXPasswordR3
Router(config-line)#login
Router(config-line)#exit
Router(config)#line vty 0 4
Router(config-line)#password myVTYPasswordR3
Router(config-line)#login
Router(config-line)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#write memory
Building configuration...
[OK]
```

Explanation of all commands of security systems[8]:

- enable: Enter privilege EXEC mode.
- configure terminal: Enters global configuration mode.
- enable secret myEnableSecret/ myEnableSecretR2/ myEnableSecretR3: Sets encrypted enable password.
- line console 0: Enters console line configuration mode.
- password myConsolePassword/ myConsolePasswordR2/ myConsolePasswordR3: Sets console password.
- login: Ensures console line requires password for access.
- line aux 0: Enters auxiliary line configuration mode.
- password myAuxPassword/ myAuxPasswordR2/ myAuxPasswordR3: Sets AUX port password.
- login: Ensures AUX line requires password for access.
- line vty 0 4: Enters virtual terminal line (Telnet) configuration mode for lines 0 through 4.
- password myVTYPassword/ myVTYPasswordR2/ myVTYPasswordR3: Sets Telnet password.

- login: Ensures Telnet lines require password for access.
- end: Exits configuration mode.
- write memory: Saves configuration to the devices non-volatile memory and ensuring it persists after a reboot.

These commands can be same and easily implemented on the switches also.

Verify all the connections using “Ping command”:

From	TO	IP address	Results
Host 1	Gateway (Router Fa0/0)	193.63.40.6	S
Host 1	Router 1, Fa0/1	193.63.40.66	S
Host 1	Host 2	193.63.40.2	S
Host 1	Host 3	193.63.40.3	S
Host 1	Host 4	193.63.40.4	S
Host 1	Server	193.63.40.5	S
Host 2	Gateway (Router 1, Fa0/0)	193.63.40.6	S
Host 2	Router 1, Fa0/1	193.63.40.66	S
Host 2	Host 1	193.63.40.1	S
Host 2	Server	193.63.40.5	S
Host 3	Gateway (Router 2, Fa0/0)	193.63.40.30	S
Host 3	Router 2, Fa0/1	193.63.40.65	S
Host 3	Host 1	193.63.40.1	S
Host 4	Gateway (Router 2, Fa0/0)	193.63.40.30	S
Host 4	Router 2, Fa0/1	193.63.40.65	S
Host 4	Host 2	193.63.40.2	S
Server	Gateway (Router 2, Fa0/0)	193.63.40.30	S
Server	Router 1, Fa0/1	193.63.40.66	S
Server	Router 2, Fa0/1	193.63.40.65	S
Server	Host 2	193.63.40.2	S

Host 1 Ping results:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 193.63.40.6

Pinging 193.63.40.6 with 32 bytes of data:

Reply from 193.63.40.6: bytes=32 time<1ms TTL=255
Reply from 193.63.40.6: bytes=32 time<1ms TTL=255
Reply from 193.63.40.6: bytes=32 time<1ms TTL=255
Reply from 193.63.40.6: bytes=32 time<1ms TTL=255

Ping statistics for 193.63.40.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 193.63.40.66

Pinging 193.63.40.66 with 32 bytes of data:

Reply from 193.63.40.66: bytes=32 time<1ms TTL=255
Reply from 193.63.40.66: bytes=32 time<1ms TTL=255
Reply from 193.63.40.66: bytes=32 time<1ms TTL=255
Reply from 193.63.40.66: bytes=32 time<1ms TTL=255

Ping statistics for 193.63.40.66:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 193.63.40.2

Pinging 193.63.40.2 with 32 bytes of data:

Reply from 193.63.40.2: bytes=32 time=18ms TTL=128
Reply from 193.63.40.2: bytes=32 time=23ms TTL=128
Reply from 193.63.40.2: bytes=32 time=1ms TTL=128
Reply from 193.63.40.2: bytes=32 time<1ms TTL=128

Ping statistics for 193.63.40.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 23ms, Average = 10ms
```

```
C:\>ping 193.63.40.3

Pinging 193.63.40.3 with 32 bytes of data:

Reply from 193.63.40.3: bytes=32 time<1ms TTL=128
Reply from 193.63.40.3: bytes=32 time<1ms TTL=128
Reply from 193.63.40.3: bytes=32 time<1ms TTL=128
Reply from 193.63.40.3: bytes=32 time<1ms TTL=128

Ping statistics for 193.63.40.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 193.63.40.4

Pinging 193.63.40.4 with 32 bytes of data:

Reply from 193.63.40.4: bytes=32 time<1ms TTL=128
Reply from 193.63.40.4: bytes=32 time<1ms TTL=128
Reply from 193.63.40.4: bytes=32 time<1ms TTL=128
Reply from 193.63.40.4: bytes=32 time<1ms TTL=128

Ping statistics for 193.63.40.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 193.63.40.5

Pinging 193.63.40.5 with 32 bytes of data:

Reply from 193.63.40.5: bytes=32 time=11ms TTL=128
Reply from 193.63.40.5: bytes=32 time<1ms TTL=128
Reply from 193.63.40.5: bytes=32 time=28ms TTL=128
Reply from 193.63.40.5: bytes=32 time=22ms TTL=128

Ping statistics for 193.63.40.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 28ms, Average = 15ms

C:\>
```

Host 2 Pinging Results:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 193.63.40.30

Pinging 193.63.40.30 with 32 bytes of data:

Reply from 193.63.40.30: bytes=32 time<1ms TTL=254
Reply from 193.63.40.30: bytes=32 time<1ms TTL=254
Reply from 193.63.40.30: bytes=32 time<1ms TTL=254
Reply from 193.63.40.30: bytes=32 time<1ms TTL=254

Ping statistics for 193.63.40.30:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 193.63.40.66

Pinging 193.63.40.66 with 32 bytes of data:

Reply from 193.63.40.66: bytes=32 time<1ms TTL=255
Reply from 193.63.40.66: bytes=32 time<1ms TTL=255
Reply from 193.63.40.66: bytes=32 time<1ms TTL=255
Reply from 193.63.40.66: bytes=32 time<1ms TTL=255

Ping statistics for 193.63.40.66:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 193.63.40.1

Pinging 193.63.40.1 with 32 bytes of data:

Reply from 193.63.40.1: bytes=32 time=1ms TTL=128
Reply from 193.63.40.1: bytes=32 time<1ms TTL=128
Reply from 193.63.40.1: bytes=32 time=21ms TTL=128
Reply from 193.63.40.1: bytes=32 time<1ms TTL=128
```

```
Ping statistics for 193.63.40.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 21ms, Average = 5ms

C:\>ping 193.63.40.5

Pinging 193.63.40.5 with 32 bytes of data:

Reply from 193.63.40.5: bytes=32 time<1ms TTL=128
Reply from 193.63.40.5: bytes=32 time<1ms TTL=128
Reply from 193.63.40.5: bytes=32 time<1ms TTL=128
Reply from 193.63.40.5: bytes=32 time=1ms TTL=128

Ping statistics for 193.63.40.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

The remaining will also will be pinged in the same way.

Simulate the designed computer network using Packet Tracer

Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	Subnet E-PC7	ICMP
	0.000	--	Server3	ICMP
	0.000	--	Server2	ICMP
	0.001	Subnet E-PC7	Subnet E-Switch3	ICMP
	0.001	Server3	Switch1	ICMP
	0.001	Server2	Subnet F-Switch1	ICMP
	0.002	Subnet E-Switch3	Subnet E-Switch1	ICMP
	0.002	Switch1	Router-1	ICMP
	0.002	Subnet F-Switch1	Router-3	ICMP
	0.003	Subnet E-Switch1	Router-2	ICMP
	0.003	Router-1	Router-3	ICMP
	0.003	Router-3	Router-2	ICMP
	0.004	Router-2	Router-1	ICMP
	0.004	Router-3	Subnet F-Switch1	ICMP
	0.004	Router-2	Subnet E-Switch1	ICMP
	0.005	Router-1	Switch1	ICMP
	0.005	Subnet F-Switch1	Server2	ICMP
	0.005	Subnet E-Switch1	Server1	ICMP

Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.006	Switch1	Server3	ICMP
	0.006	Server2	Subnet F-Switch1	ICMP
	0.006	Server1	Subnet E-Switch1	ICMP
	0.007	Server3	Switch1	ICMP
	0.007	Subnet F-Switch1	Router-3	ICMP
	0.007	Subnet E-Switch1	Router-2	ICMP
	0.008	Switch1	Router-1	ICMP
	0.008	Router-3	Router-1	ICMP
	0.008	Router-2	Router-3	ICMP
	0.009	Router-1	Router-2	ICMP
	0.009	Router-1	Switch1	ICMP
	0.009	Router-3	Subnet F-Switch1	ICMP
	0.010	Router-2	Subnet E-Switch1	ICMP
	0.010	Switch1	Server3	ICMP
	0.010	Subnet F-Switch1	Server2	ICMP
	0.011	Subnet E-Switch1	Subnet E-Switch3	ICMP
	0.012	Subnet E-Switch3	Subnet E-PC7	ICMP
	1.758	--	Subnet F-Switch2	STP

Capture the simulation results:

Fire	Last Status	Source	Destination	Type	Color
	Successful	Subnet E-PC7	Server3	ICMP	
	Successful	Server3	Server2	ICMP	
	Successful	Server2	Server1	ICMP	

Evaluate the designed network and results of the simulation:

There is successful communication between the subnet E PC 7 and Subnet D Server.[1][5][9][10]

In the same way successful communication between the servers of subnet D and Subnet F.

IN the end also the servers of the Subnet F and Subnet E successfully communication packet send successfully.

Conclusion

In this coursework we successfully implemented a comprehensive network using block IP address 193.63.40.0/25. Key components of the project included configuration of DHCP for automatic IP address assignment and RIP for dynamic routing, and effective subnetting. We also implemented crucial security measures such as Telnet with password protections for Telnet, Auxiliary port, Console and Enable access. Connectivity of end hosts was verified use ping command and confirming successful communication between all network devices. This project not only demonstrates a solid understanding of network design and configuration but also prepares for practical application in real-world networking environments.

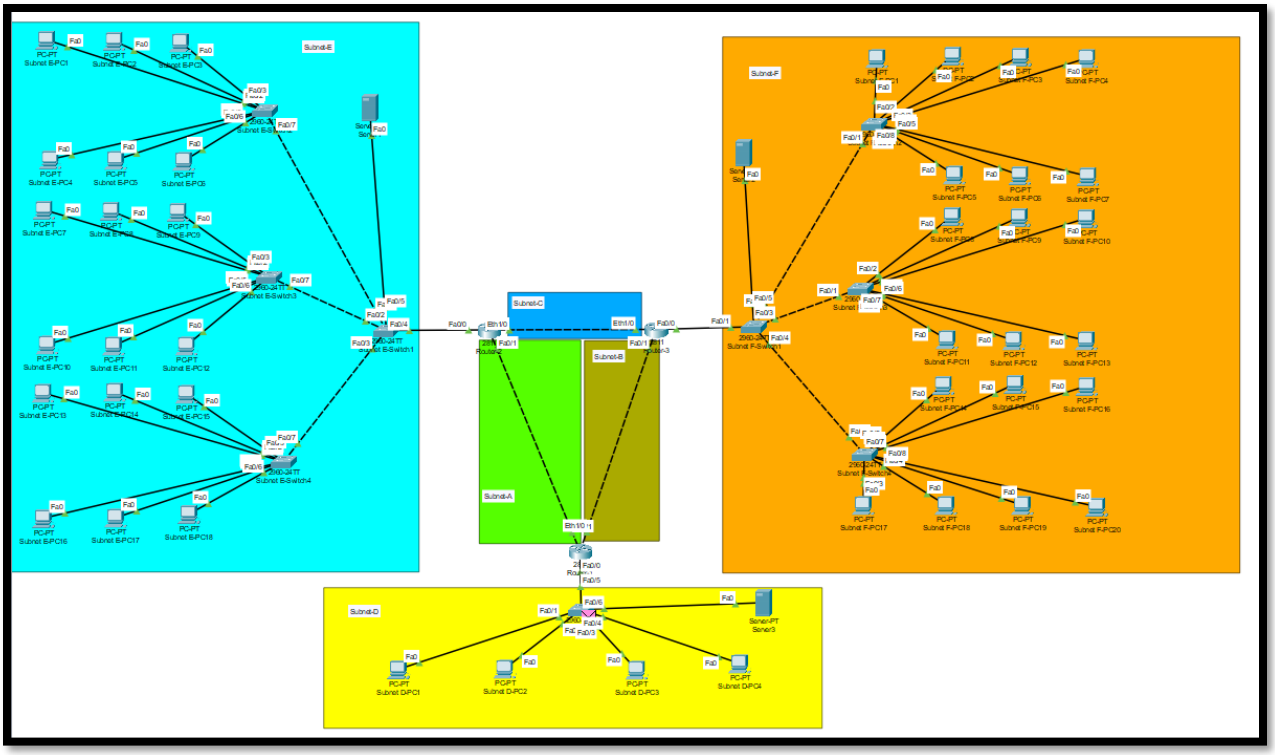
References:

1. **Cisco Networking Academy.** (2024). *Introduction to Networks (CCNAv7) Companion Guide*. Cisco Press.
2. **Odom, W.** (2020). *CCNA 200-301 Official Cert Guide, Volume 1*. Cisco Press.
3. **Cisco Systems, Inc.** (2024). *Cisco Packet Tracer*. Cisco Networking Academy.
4. **Tanenbaum, A. S., & Wetherall, D. J.** (2020). *Computer Networks (5th Edition)*. Pearson.
5. **Doyle, J., & Carroll, J.** (2016). *Routing TCP/IP, Volume I (2nd Edition)*. Cisco Press.
6. **Held, G.** (2013). *Understanding IP Addressing: Everything You Ever Wanted to Know*. CRC Press.
7. **Stallings, W.** (2021). *Network Security Essentials: Applications and Standards (7th Edition)*. Pearson.
8. **Cisco Learning Network.** (2024). *Subnetting Practice Questions and Scenarios*. Cisco Learning Network.
9. **Gibson, D.** (2021). *CompTIA Network+ N10-007 Cert Guide*. Pearson IT Certification.
10. **Cisco DevNet.** (2024). *Cisco Packet Tracer Tutorials and Labs*. Cisco DevNet.

Appendices:

Appendix A: Network Topology Diagram

Below is the visual representation of the designed network using Cisco Packet Tracer:



Appendix B: IP Address Allocation

This table summarizes the IP address allocation for each subnet in the network:

Subnet	Network IP	Subnet Mask	First Host	Last Host	Broadcast
Subnet A	193.63.40.64	255.255.255.252	193.63.40.65	193.63.40.66	193.63.40.67
Subnet B	193.63.40.68	255.255.255.252	193.63.40.69	193.63.40.70	193.63.40.71
Subnet C	193.63.40.72	255.255.255.252	193.63.40.73	193.63.40.74	193.63.40.75
Subnet D	193.63.40.0	255.255.255.248	193.63.40.1	193.63.40.6	193.63.40.7
Subnet E	193.63.40.8	255.255.255.224	193.63.40.9	193.63.40.30	193.63.40.31
Subnet F	193.63.40.32	255.255.255.224	193.63.40.33	193.63.40.54	193.63.40.55

Appendix C: Device Configuration

Details of configuration settings applied to routers, switches, and hosts in the network:

Router Configurations:

Router 1: already shown above

Router 2: already shown above

Router 3: already shown above here]

Switch Configurations:

All the switches were just connected

Host Configurations:

Refer Table 4.

Appendix D: Security Configuration

Steps and commands used to implement security measures on routers and switches were explained above.

Router Security:

Ping Test Results:

Host 1 to Gateway: Successful

Host 1 to Router 1: Successful

Host 1 to Host 2: Successful

Remanning test were also successful

Appendix F: Simulation Results

Summary of simulation results showing successful communication between different network segments and devices.