

Practical - 6

Aim:

Design a Network of an organization using fundamentals of subnetting.

Scenario:

Organization named Zenith enterprise has setup a branch office at Noida and hired you as a Network Engineer. The branch office will be having 5 different departments and each department has its own network. Each department has actually 14 devices (including network devices). The IP address range given to you is 192.XX.10.0/24. Design the network such that wastage of IP address is less. So, for designing purpose you can take 2 devices in each department (as first device and last device in network) for ease of the implementation.

Calculation:

Reserved address:

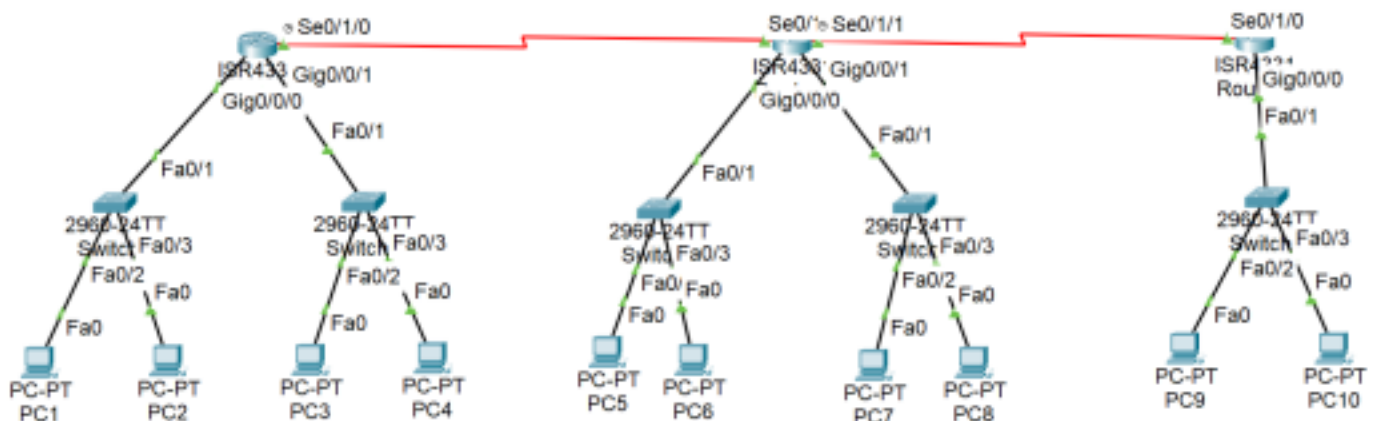
- Network Address
- Broadcast Address

Min host bit requirement:

$$\text{No. of devices} \leq 2^n - 2$$

Procedure:

1) Create network as given below



2) Calculate the number of bits required for host as per the given problem.

3) Get subnet mask for subnetting

Old Subnet mask (Decimal form)	255.255.255.0
Old Subnet mask (Binary form)	11111111. 11111111. 11111111. 00000000
New Subnet mask (Binary form)	255.255.255.240
New Subnet mask (Decimal form)	11111111. 11111111. 11111111. 11110000

4) Calculate IP address and design a network

Dept.	Device	IP Address	Subnet Mask
Dept. 1	Network	192.38.10.0	255.255.255.240
	Default Gateway	192.38.10.1	255.255.255.240
	Host (First)	192.38.10.2	255.255.255.240
	Host (Last)	192.38.10.14	255.255.255.240
	Broadcast	192.38.10.15	255.255.255.240
Dept. 2	Network	192.38.10.16	255.255.255.240
	Default Gateway	192.38.20.17	255.255.255.240
	Host (First)	192.38.10.18	255.255.255.240
	Host (Last)	192.38.10.30	255.255.255.240
	Broadcast	192.38.10.31	255.255.255.240
Dept. 3	Network	192.38.10.32	255.255.255.240
	Default Gateway	192.38.10.33	255.255.255.240

	Host (First)	192.38.10.34	255.255.255.240
	Host (Last)	192.38.10.46	255.255.255.240
	Broadcast	192.38.10.47	255.255.255.240
Dept. 4	Network	192.38.10.48	255.255.255.240
	Default Gateway	192.38.10.49	255.255.255.240
	Host (First)	192.38.10.50	255.255.255.240
	Host (Last)	192.38.10.62	255.255.255.240
	Broadcast	192.38.10.63	255.255.255.240
Dept. 5	Network	192.38.10.64	255.255.255.240
	Default Gateway	192.38.10.65	255.255.255.240
	Host (First)	192.38.10.66	255.255.255.240
	Host (Last)	192.38.10.78	255.255.255.240
	Broadcast	192.38.10.79	255.255.255.240

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5) Configure IP address (All Devices, Routers)

6) Configure static routing table (STATIC in routers)

Router	Dept.	Network	Subnet Mask	Next Hop
Router0	Dept.3	192.38.10.32	255.255.255.240	10.0.0.2
	Dept.4	192.38.10.48	255.255.255.240	10.0.0.2
	Dept.5	192.38.10.64	255.255.255.240	10.0.0.2
Router1	Dept.1	192.38.10.0	255.255.255.240	10.0.0.1
	Dept.2	192.38.10.16	255.255.255.240	10.0.0.1
	Dept.5	192.38.10.64	255.255.255.240	20.0.0.2
Router2	Dept.1	192.38.10.0	255.255.255.240	20.0.0.2

	Dept.2	192.38.10.16	255.255.255.240	20.0.0.2
	Dept.3	192.38.10.32	255.255.255.240	20.0.0.2
	Dept.4	192.38.10.48	255.255.255.240	20.0.0.2

Configuration:

Cisco Packet Tracer - D:\Sem 5\Sem-5_git\Computer_Network\Pr-6_Pt File.pkt

File Edit Options View Tools Extensions Window Help

Logical Physical x 499, y 105

Name: Ayush Patel
Enrolment: 22162171038

Time: 01:48:06

Scenario 0

Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delete

New Delete

Toggle PDU List Window

(Select a Device to Drag and Drop to the Workspace)

06:46 PM
06-10-2024

Cisco Packet Tracer - D:\Sem 5\Sem-5_git\Computer_Network\Pr-6_Pt File.pkt

File Edit Options View Tools Extensions Window Help

Logical Physical x 0, y 160

Name: Ayush Patel
Enrolment: 22162171038

Time: 01:48:47

Scenario 0

Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delete

New Delete

Toggle PDU List Window

(Select a Device to Drag and Drop to the Workspace)

06:46 PM
06-10-2024

PC0

Physical Config Desktop Programming Attributes

IP Configuration

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.38.10.2

Subnet Mask 255.255.255.240

Default Gateway 192.38.10.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address

Link Local Address FE80::200:3E:FF:FEA4:8A6C

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MDS

Username

Password

☐ Top

PC1

Physical Config Desktop Programming Attributes

IP Configuration

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.38.10.14

Subnet Mask 255.255.255.240

Default Gateway 192.38.10.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address

Link Local Address FE80::200:3E:FF:FEA0:82C6

Default Gateway

DNS Server

802.1X

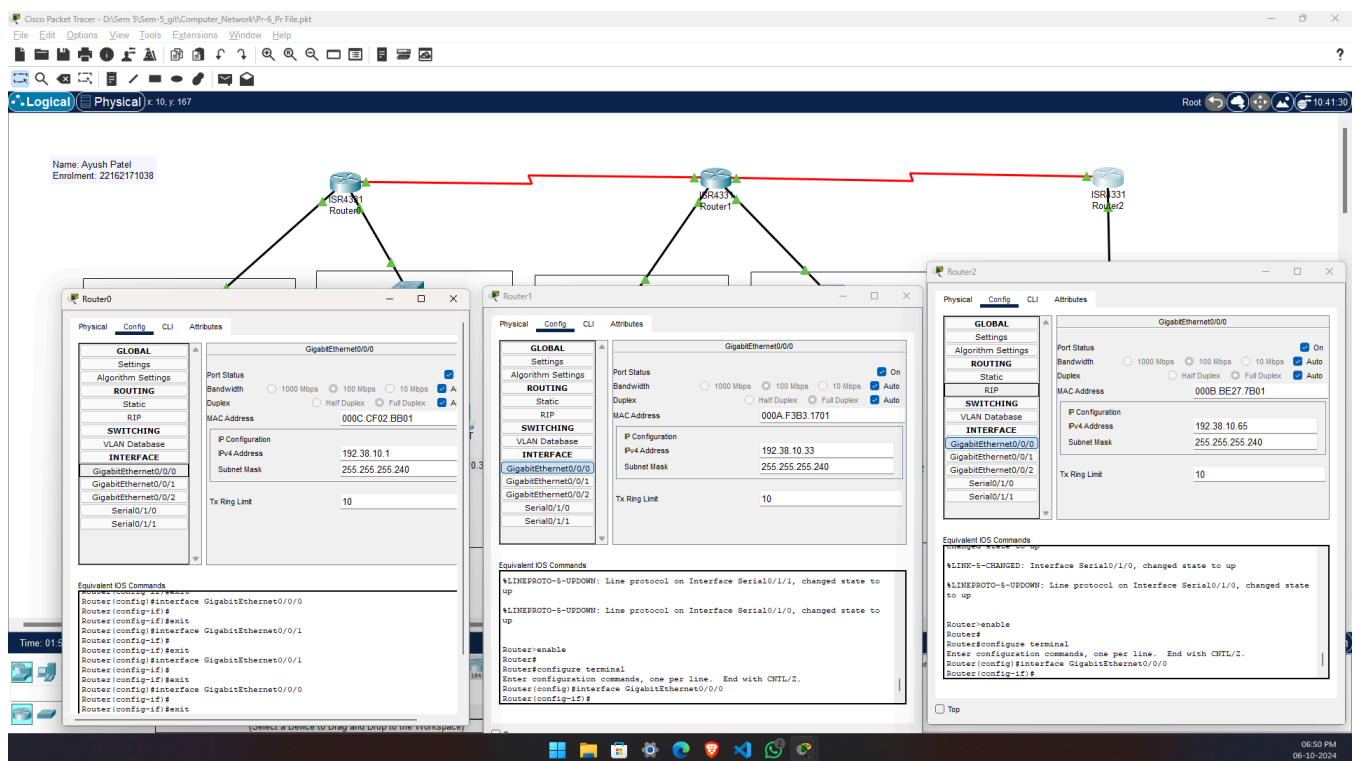
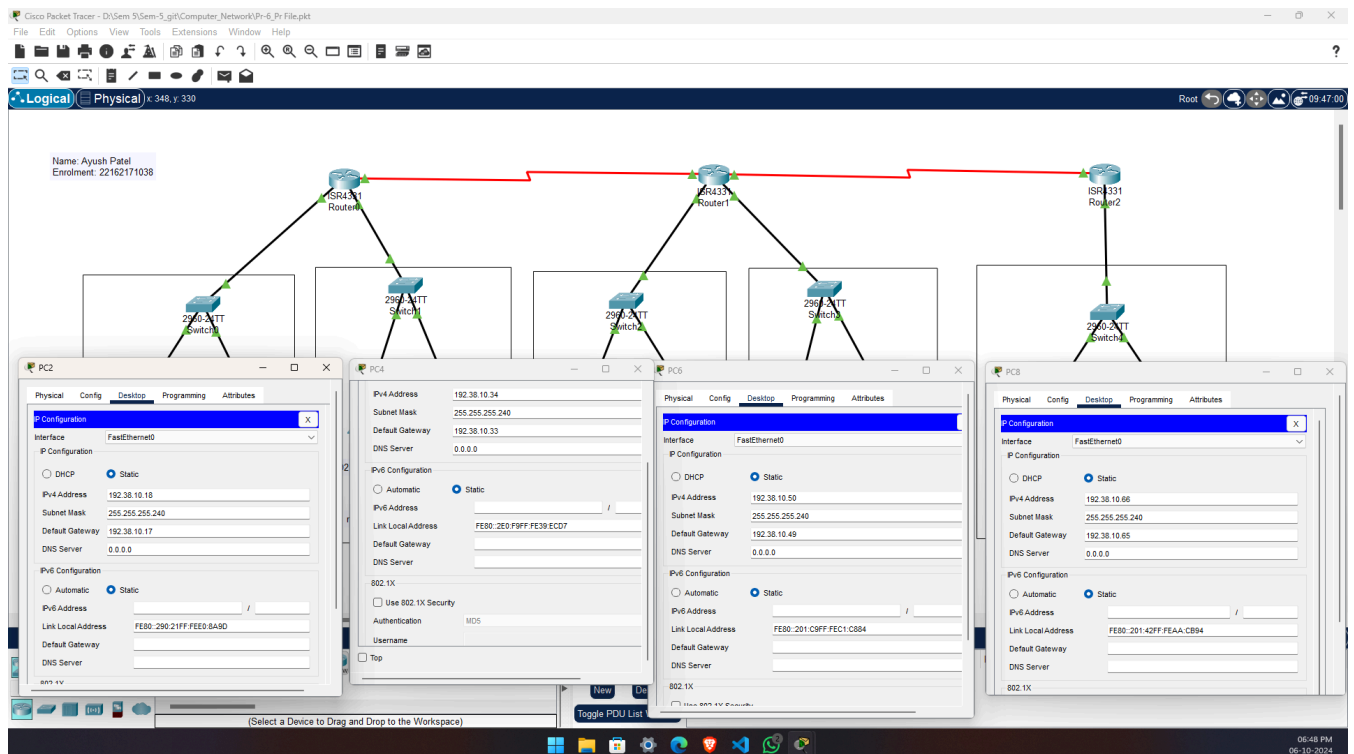
☐ Use 802.1X Security

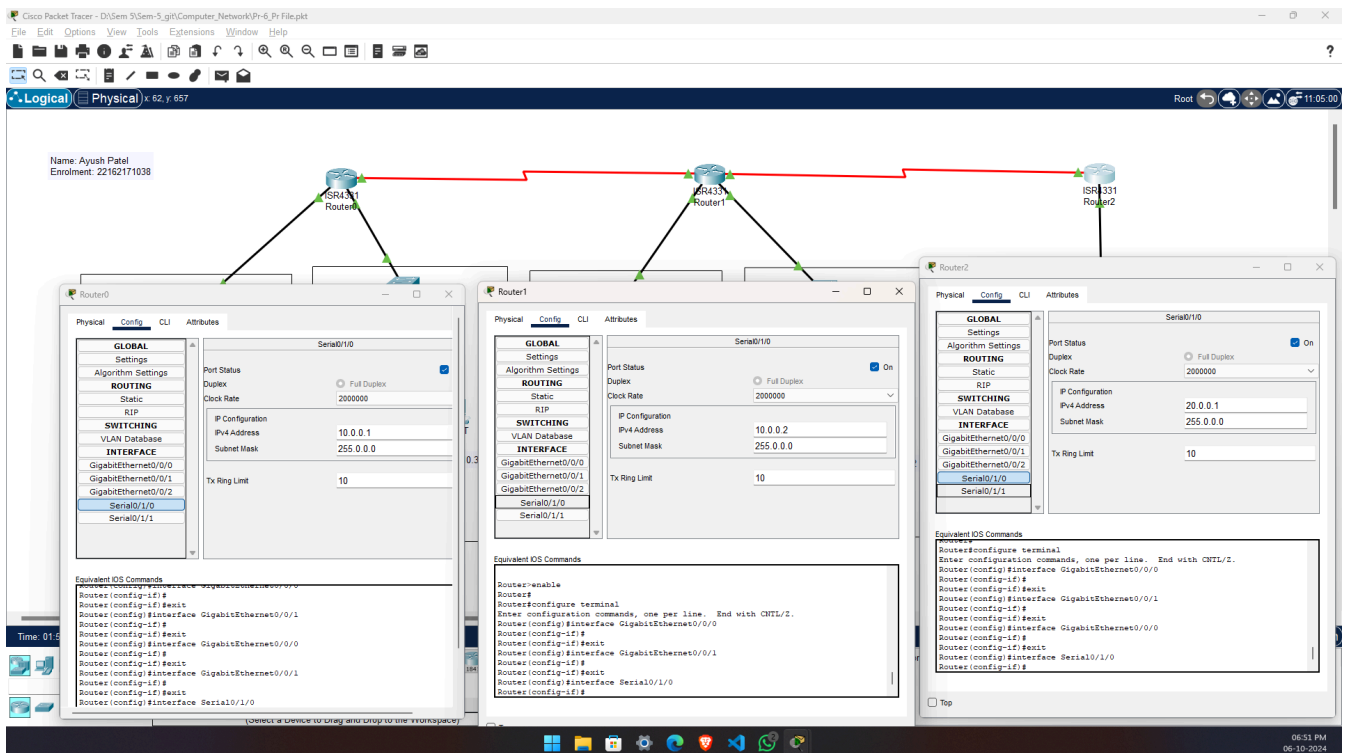
Authentication MDS

Username

Password

☐ Top





The screenshot displays the Cisco Packet Tracer interface with the Logical view selected. The network topology consists of three routers (ISR4331) and five networks (Network 1 to Network 5). Each network contains a 2950-24TT switch and two PC-PT devices. The topology is connected via a central router (ISR4331) and a central switch (2950-24TT Switch). The interface shows the Logical view of the network.

Network Details:

- Network 1:** 192.38.10.0/24, default gate: 192.38.10.1. Contains PC-PT PC0 (192.38.10.2) and PC-PT PC1 (192.38.10.14).
- Network 2:** 192.38.10.16/24. Contains PC-PT PC2 (192.38.10.18) and PC-PT PC3 (192.38.10.30).
- Network 3:** 192.38.10.32/24. Contains PC-PT PC4 (192.38.10.34) and PC-PT PC5 (192.38.10.46).
- Network 4:** 192.38.10.48/24. Contains PC-PT PC6 (192.38.10.50) and PC-PT PC7 (192.38.10.62).
- Network 5:** 192.38.10.64/24. Contains PC-PT PC8 (192.38.10.66) and PC-PT PC9 (192.38.10.78).

Router Configuration:

- ISR4331 Router1:** Connected to Network 1, Network 2, and Network 3.
- ISR4331 Router2:** Connected to Network 4, Network 5, and Network 3.
- ISR4331 Router3:** Connected to Network 1, Network 2, and Network 3.

Interface:

Time: 01:57:19

Scenario 0

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
Successful	PC0	PC2	ICMP	0.000	N	0	(edit)	(delete)		
Successful	PC0	PC4	ICMP	0.000	N	1	(edit)	(delete)		
Successful	PC0	PC5	ICMP	0.000	N	2	(edit)	(delete)		
Successful	PC5	PC3	ICMP	0.000	N	3	(edit)	(delete)		

Note:

Make sure last two digits of your enrollment numbers appears in network IP address that must be visible in snapshot of the cisco packet tracer. i.e. 192.XX.10.1 (XX indicates last two digits of your enrollment no.)