INSTITUTE OF COMPUTER TECHNOLOGY

B. TECH COMPUTER SCIENCE AND ENGINEERING

Subject: Computer Networks[CN]

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SEM : 5

Class : A

Batch : 52 (CS)

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:

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

Procedure:

1) Create network as given below

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

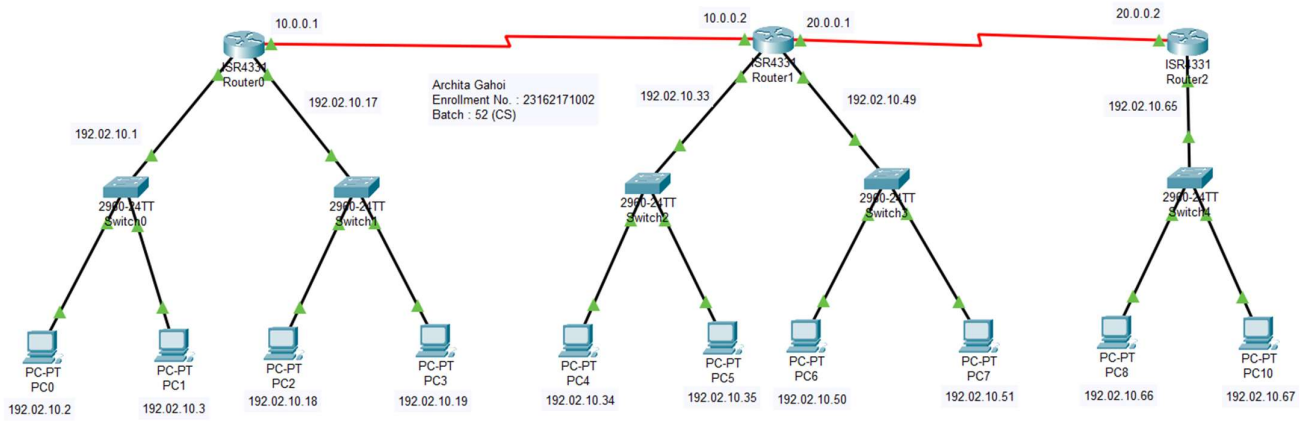
3) Get subnet mask for subnetting

4) Calculate IP address and design a network

5) Configure IP address (All Devices, Routers)

6) Configure static routing table (STATIC in routers)

⇨ Main Circuit



⇨ **Calculate the number of bits required for host:**

$14 <= 2^n - 2$ so n = 4 bit => host

32 bit – 4 bit = 28 bit => subnet

⇨ **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 (Decimal form)	255.255.255.240
New Subnet mask (Binary form)	11111111. 11111111. 11111111. 11110000

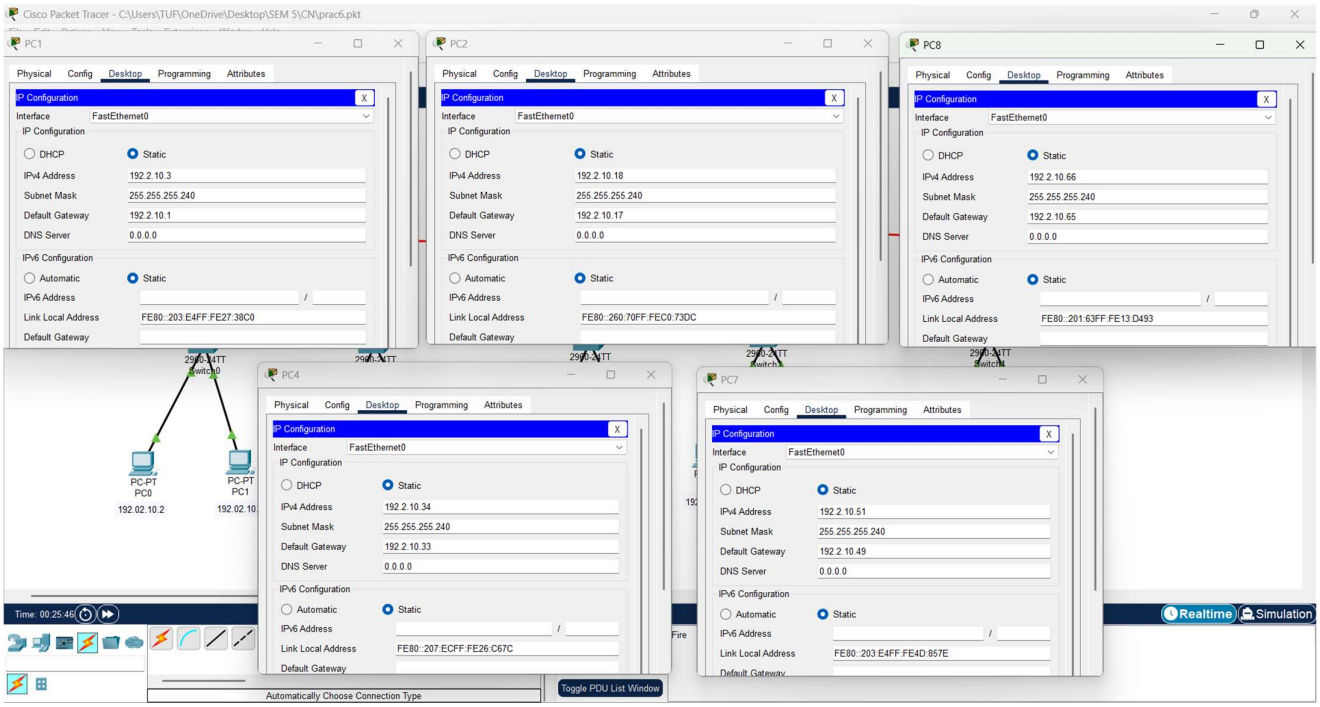
⇨ Calculate IP address and design a network

Dept.	Device	IP Address	Subnet Mask
Dept. 1	Network	192.02.10.0	255.255.255.240
	Default Gateway	192.02.10.1	255.255.255.240
	Host (First)	192.02.10.2	255.255.255.240
	Host (Last)	192.02.10.14	255.255.255.240
	Broadcast	192.02.10.02	255.255.255.240
Dept. 2	Network	192.02.10.16	255.255.255.240
	Default Gateway	192.02.10.17	255.255.255.240
	Host (First)	192.02.10.18	255.255.255.240
	Host (Last)	192.02.10.30	255.255.255.240
	Broadcast	192.02.10.31	255.255.255.240
Dept. 3	Network	192.02.10.32	255.255.255.240
	Default Gateway	192.02.10.33	255.255.255.240
	Host (First)	192.02.10.34	255.255.255.240
	Host (Last)	192.02.10.46	255.255.255.240
	Broadcast	192.02.10.47	255.255.255.240
Dept. 4	Network	192.02.10.48	255.255.255.240
	Default Gateway	192.02.10.49	255.255.255.240
	Host (First)	192.02.10.50	255.255.255.240
	Host (Last)	192.02.10.62	255.255.255.240
	Broadcast	192.02.10.63	255.255.255.240
Dept. 5	Network	192.02.10.64	255.255.255.240
	Default Gateway	192.02.10.65	255.255.255.240
	Host (First)	192.02.10.66	255.255.255.240
	Host (Last)	192.02.10.78	255.255.255.240
	Broadcast	192.02.10.79	255.255.255.240

Configuration:

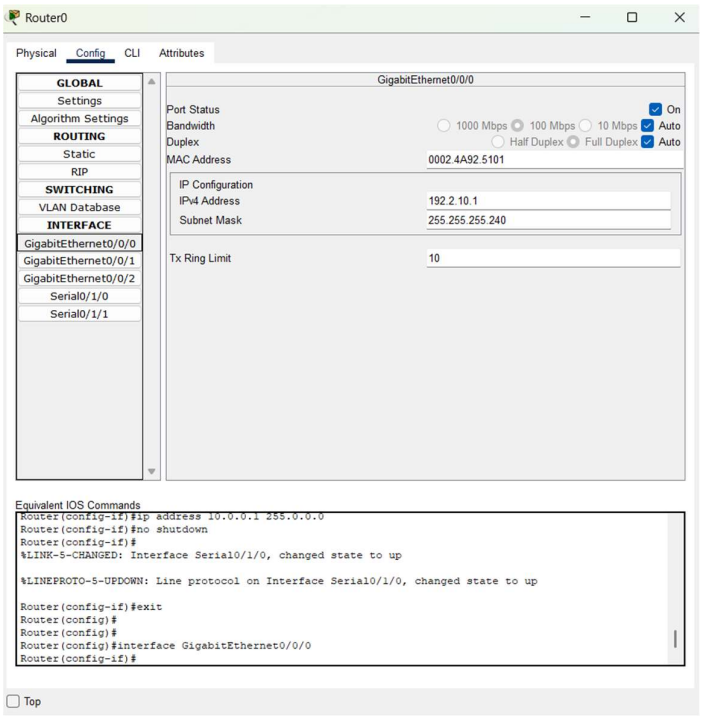
IP Address:

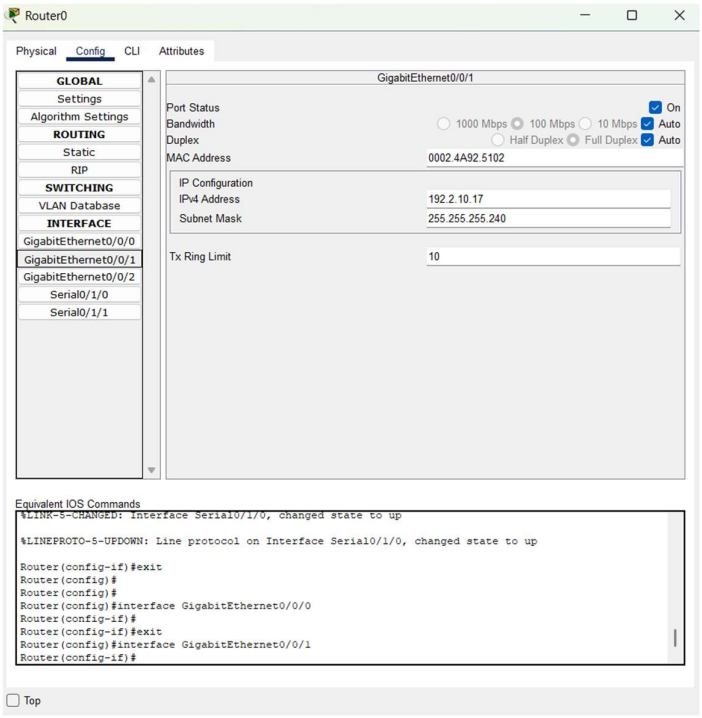
⇨ PCS

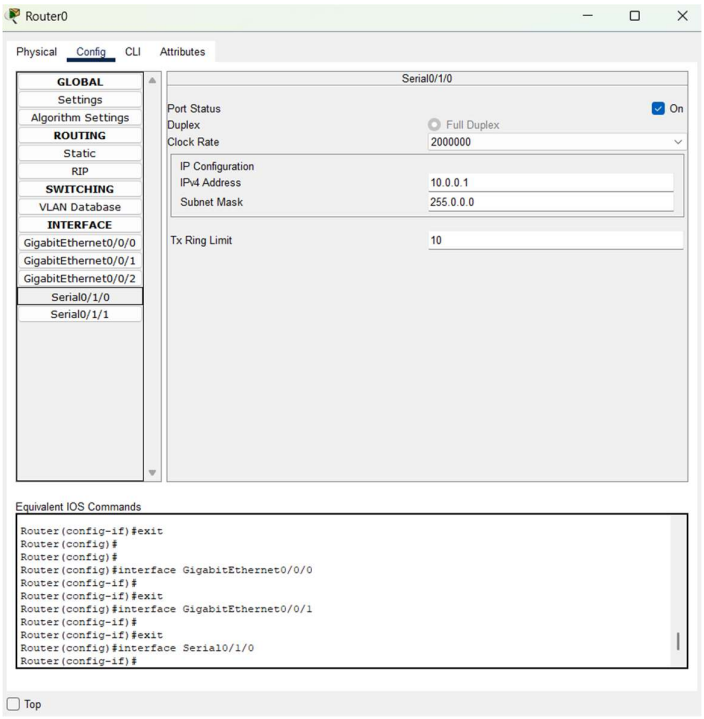


⇨ Routers

Router 0

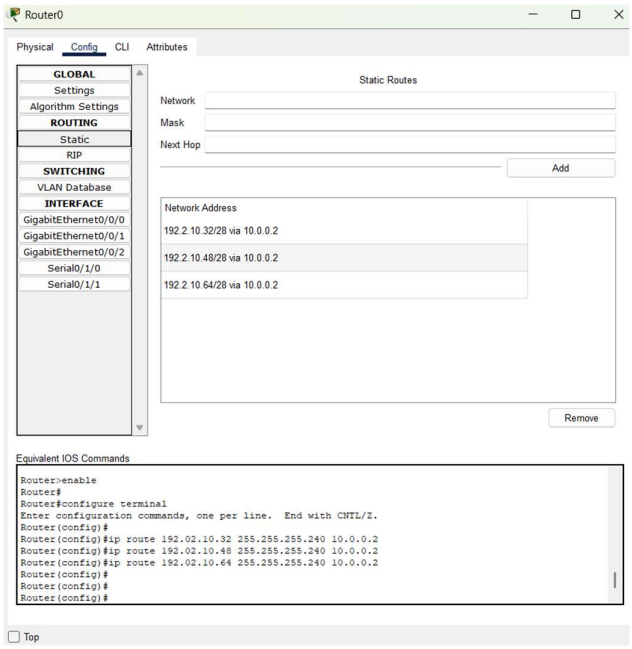


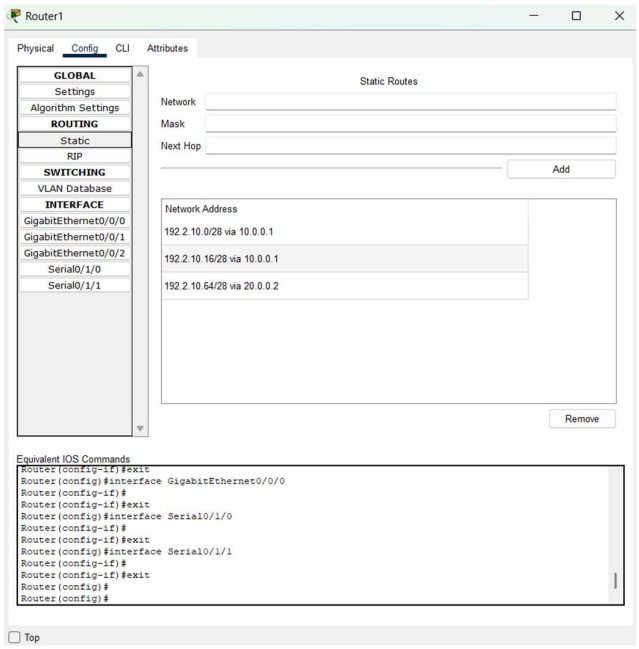


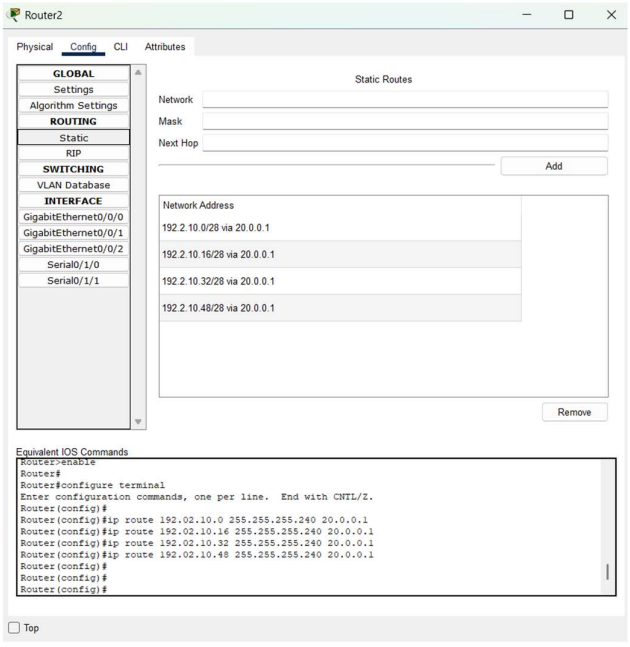


⇨ Configure static routing table (STATIC in routers)

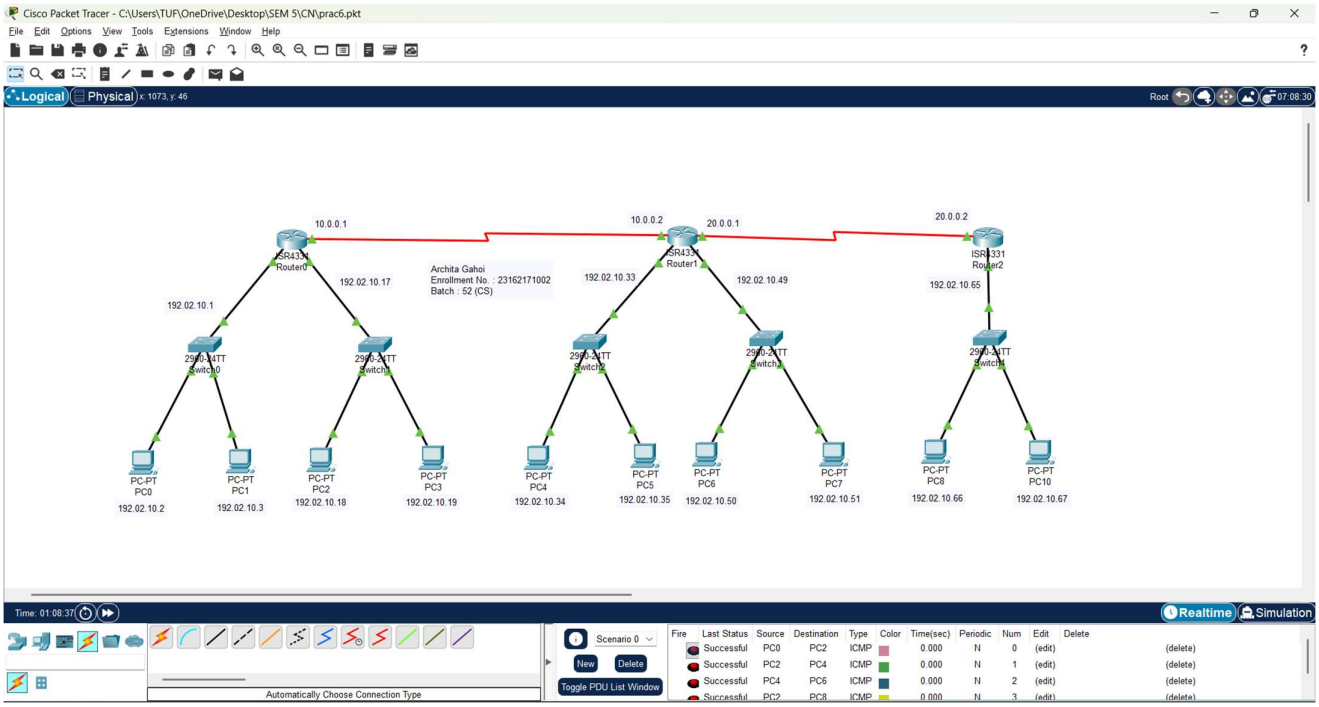
Router	Dept.	Network	Subnet Mask	Next Hop
Router0	Dept.3	192.02.10.32	255.255.255.240	10.0.0.2
	Dept.4	192.02.10.48	255.255.255.240	10.0.0.2
	Dept.5	192.02.10.64	255.255.255.240	10.0.0.2
Router1	Dept.1	192.02.10.0	255.255.255.240	10.0.0.1
	Dept.2	192.02.10.16	255.255.255.240	10.0.0.1
	Dept.5	192.02.10.64	255.255.255.240	20.0.0.2
Router2	Dept.1	192.02.10.0	255.255.255.240	20.0.0.1
	Dept.2	192.02.10.16	255.255.255.240	20.0.0.1
	Dept.3	192.02.10.32	255.255.255.240	20.0.0.1
	Dept.4	192.02.10.48	255.255.255.240	20.0.0.1







Output:



Conclusion:

In this practical, we successfully designed a network for an organization using the principles of subnetting. The process allowed efficient allocation of IP addresses by dividing a larger network into smaller subnets based on departmental needs. This approach enhanced IP address utilization, improved network performance and security, and made management more systematic. Overall, the sub netted network design ensured scalability, organized communication, and readiness for future expansion within the organization.