LAB 4:

Subnetting and Supernetting using Cisco Packet Tracer

Objectives:

- To understand and implement the concepts of subnetting and supernetting using Cisco Packet Tracer by designing networks, assigning IP addresses, and verifying connectivity using ping.

Theory

Introduction:

In computer networking, efficient IP address utilization and effective routing are crucial for reliable communication. Subnetting and supernetting are two key techniques used to manage IP addressing and routing efficiently. Subnetting involves breaking a large network into smaller, more manageable networks, whereas supernetting combines multiple smaller networks into a single larger network.

Subnetting:

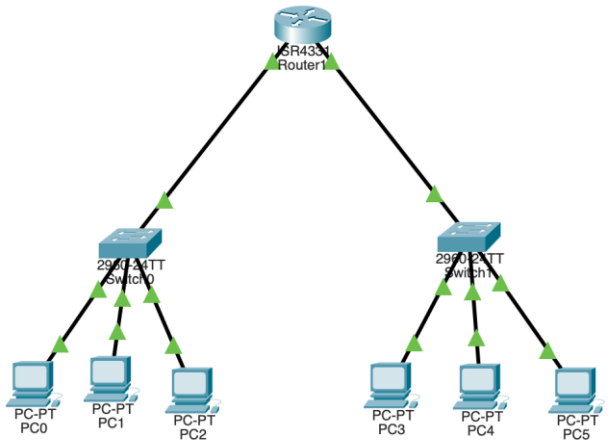
Subnetting is the technique of dividing a large IP network into smaller logical sub-networks by borrowing bits from the host portion of an IP address. This approach improves IP address utilization, reduces network traffic, and enhances security by isolating network segments into well-organized units.

Supernetting:

Supernetting is the reverse process of subnetting. It combines two or more contiguous IP networks into one larger network by reducing the number of network bits. This technique is primarily used to simplify routing and minimize routing table size, particularly in large-scale networks and by Internet Service Providers (ISPs). Together, subnetting and supernetting are essential for efficient network design and routing management.

Network Topology

Network Design – Subnetting:



1. One Router (ISR4331)
2. Two Switches (2960-24TT)
3. Three pcs per subnet(PC-PT)

Base Network Address: 192.168.1.0/24

Required Number of Subnets: 4

Borrowed Bits: 2

New Subnet Mask: /26 (255.255.255.192)

Number of IP addresses per subnet: 64 (62 usable)

Subnet Details:

Subnet 1:

Network ID: 192.168.1.0/26

First Host: 192.168.1.1

Last Host: 192.168.1.62

Broadcast ID: 192.168.1.63

Subnet 2:

Network ID: 192.168.1.64/26

First Host: 192.168.1.65

Last Host: 192.168.1.126

Broadcast ID: 192.168.1.127

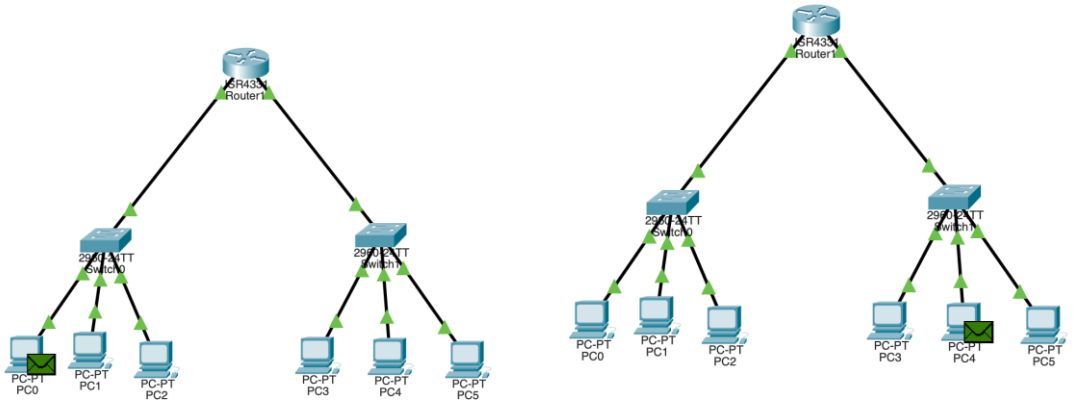
Configuration:

For switch 0 :

Device	IPV4	Subnet Mask	Default gateway
PC-PT S1-PC0	192.168.1.2	255.255.255.192	192.168.1.1
PC-PT S1-PC1	192.168.1.3	255.255.255.192	192.168.1.1
PC-PT S1-PC2	192.168.1.4	255.255.255.192	192.168.1.1

For switch 1:

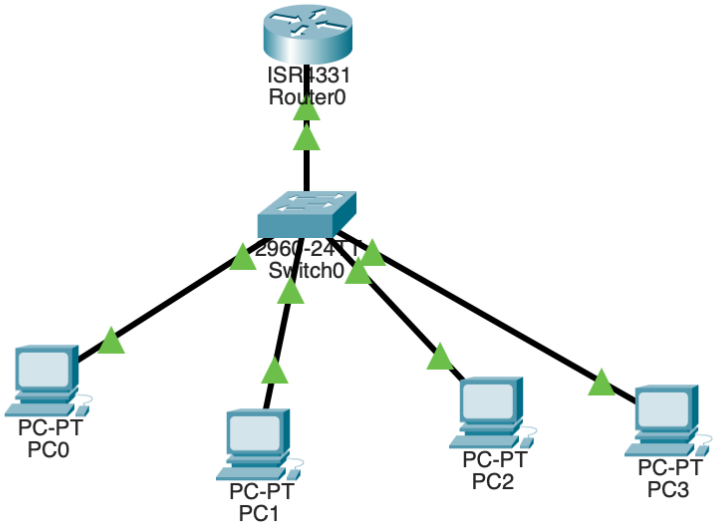
Device	IPV4	Subnet Mask	Default gateway
PC-PT S1-PC3	192.168.1.66	255.255.255.192	192.168.1.65
PC-PT S1-PC4	192.168.1.67	255.255.255.192	192.168.1.65
PC-PT S1-PC5	192.168.1.68	255.255.255.192	192.168.1.65



Event List

Vis.	Time(sec)	Last Device	At Device
	0.000	--	PC0
	0.001	PC0	Switch0
	0.002	Switch0	Router1
	0.003	Router1	Switch1
	0.004	Switch1	PC4

Network Topology – Supernetting:



Given Networks:

192.168.0.0/24

192.168.1.0/24

192.168.2.0/24

192.168.3.0/24

Number of networks: 4 (2^2)

New Supernet Mask: /22 (255.255.252.0)

Supernet Address: 192.168.0.0/22

IP Address Range:

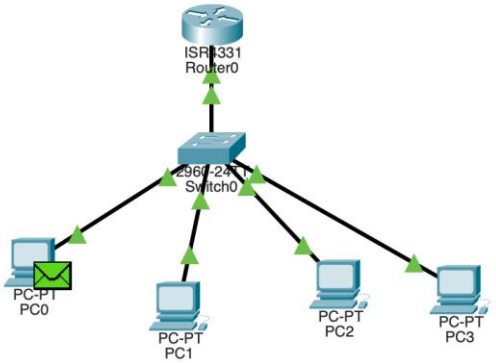
First Host: 192.168.0.1

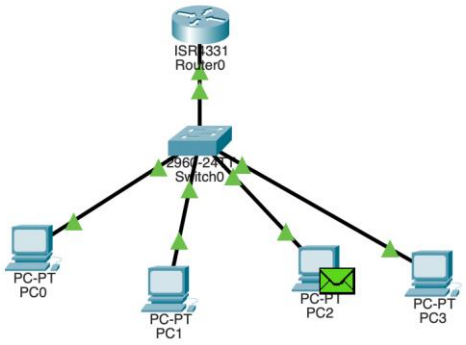
Last Host: 192.168.3.254

Broadcast Address: 192.168.3.255

Configuration :

Device	IPV4	Subnet Mask	Default Gateway
PC-PT PC0	192.168.1.0	255.255.252.0	192.168.1.1
PC-PT PC1	192.168.2.0	255.255.252.0	192.168.1.1
PC-PT PC2	192.168.3.0	255.255.252.0	192.168.1.1
PC-PT PC3	192.168.0.1	255.255.252.0	192.168.1.1





Event List

Vis.	Time(sec)	Last Device	At Device
	0.000	--	PC0
	0.001	PC0	Switch0
	0.002	Switch0	PC2

Result:

Subnetting and supernetting were successfully implemented using Cisco Packet Tracer. The network 192.168.1.0/24 was divided into four equal subnets by applying a /26 subnet mask, providing 62 usable IP addresses in each subnet. Correct configuration of default gateways ensured smooth communication among devices within individual subnets.

In the supernetting implementation, multiple contiguous Class C networks were merged into a single larger network using a /22 subnet mask. This configuration enabled efficient communication across different networks. Successful ping tests confirmed that the IP addressing scheme, subnet masks, and default gateway settings were properly configured.

Discussion and Conclusion:

In conclusion, this experiment effectively demonstrated the concepts of subnetting and supernetting using Cisco Packet Tracer. The practical implementation enhanced understanding of IP addressing, subnet mask calculation, routing, and efficient network design. The successful ping results validated the accuracy and reliability of the network configurations.