LAB 4: Subnetting and Supernetting

OBJECTIVES:

- To learn the concepts of subnetting and supernetting
- To implement and verify these concepts practically using Cisco Packet Tracer

SOFTWARE REQUIREMENTS

- Cisco Packet Tracer
- Windows Operating System
- PDF or MS Word for report documentation

HARDWARE REQUIREMENTS

- Laptop or PC
- Reliable power supply

THEORY:

1. Subnetting

Subnetting refers to the technique of breaking a single large IP network into multiple smaller logical networks known as subnets. This is achieved by borrowing bits from the host portion of the IP address, which allows better utilization of IP addresses and improved network performance.

Base Network: 192.168.1.0/24
Number of Required Subnets: 4
IP Addresses per Subnet: 64

Subnet	Network Address	Broadcast Address	First Usable IP	Last Usable IP
00	192.168.1.0	192.168.1.63	192.168.1.1	192.168.1.62
01	192.168.1.64	192.168.1.127	192.168.1.65	192.168.1.126
10	192.168.1.128	192.168.1.191	192.168.1.129	192.168.1.190
11	192.168.1.192	192.168.1.255	192.168.1.193	192.168.1.254

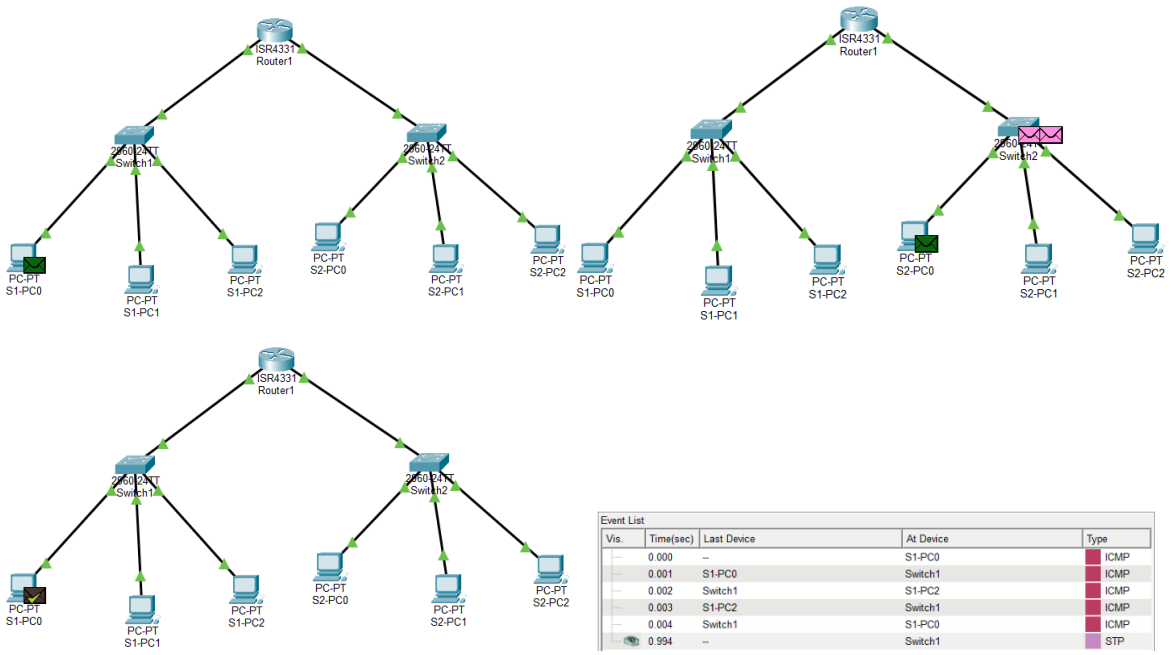
Network Configuration

First Switch

Device	IPv4 Address	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

Second Switch

Device	IPv4 Address	Subnet Mask	Default Gateway
PC-PT S2-PC0	192.168.1.66	255.255.255.192	192.168.1.65
PC-PT S2-PC1	192.168.1.67	255.255.255.192	192.168.1.65
PC-PT S2-PC2	192.168.1.68	255.255.255.192	192.168.1.65



2. Supernetting

Supernetting is the process of merging multiple smaller networks into one larger network. It is also known as CIDR or route aggregation and is achieved by decreasing the subnet mask length, which increases the number of available host addresses.

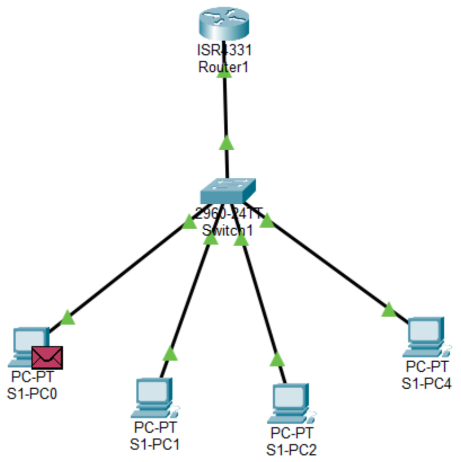
Conditions for Supernetting:

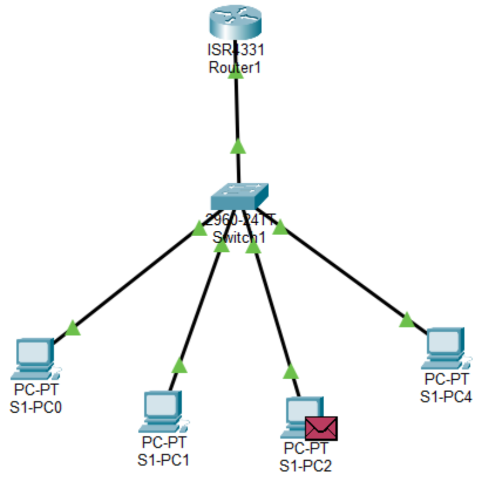
> Networks must be continuous

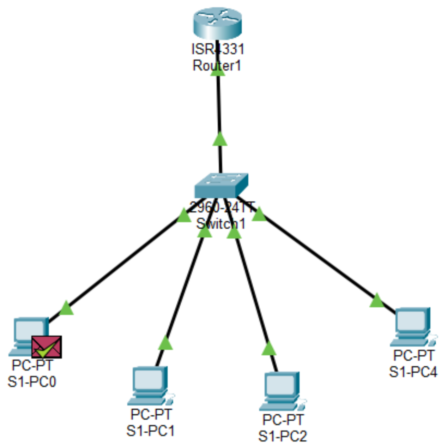
> The number of networks should be a power of two

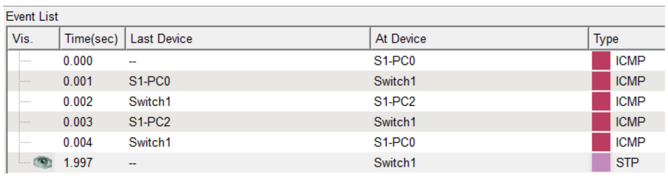
Supernet Configuration

Device	IPv4 Address	Subnet Mask	Default Gateway
PC-PT S1-PC0	192.168.1.10	255.255.252.0	192.168.1.1
PC-PT S1-PC1	192.168.2.10	255.255.252.0	192.168.1.1
PC-PT S1-PC2	192.168.3.10	255.255.252.0	192.168.1.1
PC-PT S1-PC4	192.168.4.10	255.255.252.0	192.168.1.1








Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	S1-PC0	ICMP
	0.001	S1-PC0	Switch1	ICMP
	0.002	Switch1	S1-PC2	ICMP
	0.003	S1-PC2	Switch1	ICMP
	0.004	Switch1	S1-PC0	ICMP
	1.997	--	Switch1	STP

RESULT:

Subnetting and supernetting were implemented successfully using Cisco Packet Tracer. The network 192.168.1.0/24 was divided into four equal subnets using a /26 subnet mask, providing 62 usable host addresses in each subnet. Proper gateway assignment ensured successful communication within the subnets.

For supernetting, several contiguous Class C networks were combined into a single network using a /22 subnet mask. This enabled smooth communication across different networks, which was confirmed through successful ping tests.

DISCUSSION:

The subnetting exercise demonstrated how a large network can be divided into smaller segments to reduce network congestion, enhance security, and improve performance. Supernetting highlighted the advantage of combining multiple adjacent networks into one larger network to simplify routing and reduce routing table entries. Cisco Packet Tracer proved to be an effective tool for visualizing network behavior and testing connectivity. The lab also emphasized the importance of accurate IP addressing and configuration, as minor errors can disrupt communication.

CONCLUSION:

This experiment effectively illustrated the practical application of subnetting and supernetting using Cisco Packet Tracer, strengthening the understanding of IP addressing and network design principles.