Lab 4 : Supernetting and Subnetting

Objectives :

- To understand the concepts of subnetting and supernetting, and to implement them practically using Cisco Packet Tracer

Software Requirements :

- Cisco Packet Tracer
- Operating System: Windows
- PDF/MS Word (for documentation and report writing) **Hardware Requirements :**

- Laptop
- Stable power supply

Theory :

1. **Subnetting :**

   Subnetting is the process of dividing a large IP network into smaller logical networks called subnets. It is done by borrowing bits from the host portion of an IP address to create multiple network addresses.

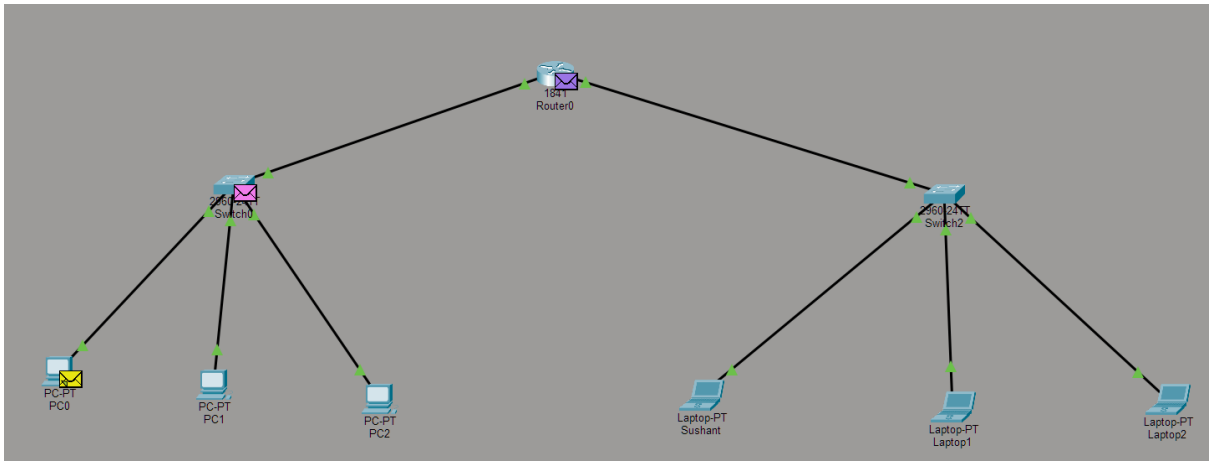
   Base network : 192.168.1.0/24

   Required number of subnets : 4

   No. of 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 Topology :



Configuration :

For first switch :

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

For second switch :

Device	IPV4	Subnet Mask	Default gateway
Router0 (FastEthernet0/0)	192.168.1.1	255.255.255.192	N/A
Router0 (FastEthernet0/1)	192.168.1.65	255.255.255.192	N/A
LAPTOP-PT SUSHANT	192.168.1.66	255.255.255.192	192.168.1.65
LAPTOP-PT LAPTOP1	192.168.1.67	255.255.255.192	192.168.1.65
LAPTOP-PT LAPTOP2	192.168.1.68	255.255.255.192	192.168.1.65

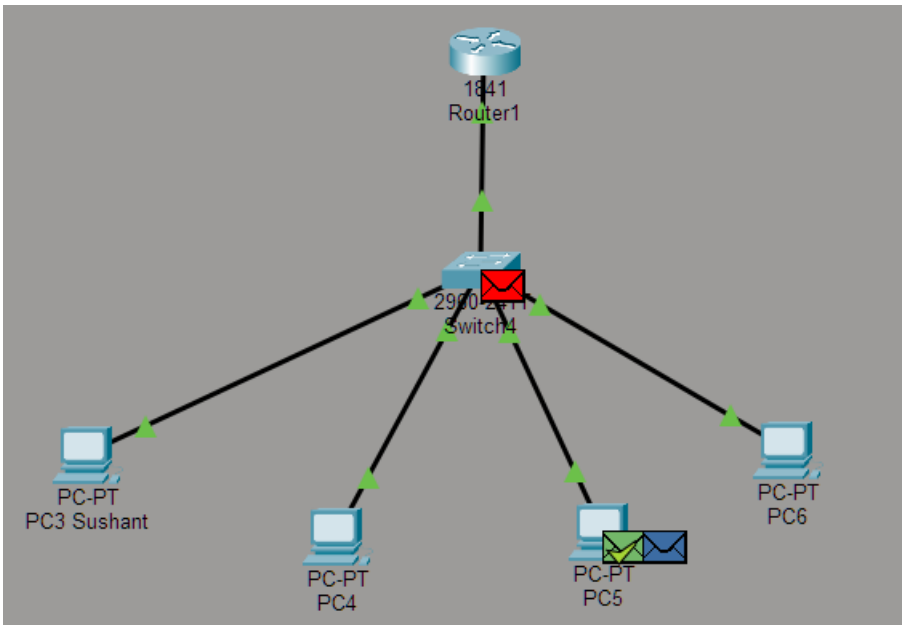
2. **Supernetting :**

Supernetting is the process of combining multiple smaller networks into a single larger network. It is also known as route aggregation or CIDR aggregation. It is done by reducing the subnet mask length, which increases the number of hosts per network.

Key conditions :

- Networks must be contiguous
- Number of networks must be of power of 2

Network Topology :



Configuration :

Device	IPV4	Subnet Mask	Default Gateway
Router1 (FastEthernet0/0)	192.168.1.1	255.255.252.0	N/A
PC-PT PC3 Sushant	192.168.1.10	255.255.252.0	192.168.1.1
PC-PT PC4	192.168.2.10	255.255.252.0	192.168.1.1
PC-PT PC5	192.168.3.10	255.255.252.0	192.168.1.1
PC-PT PC6	192.168.4.10	255.255.252.0	192.168.1.1

Result :

Subnetting and supernetting were successfully implemented using Cisco Packet Tracer. The network 192.168.1.0/24 was divided into four equal subnets using the /26 subnet mask, providing 62 usable IP addresses per subnet and enabling successful communication within each subnet through proper gateway configuration.

For supernetting, multiple contiguous Class C networks were aggregated into a single network using the /22 subnet mask, allowing devices from different networks to communicate efficiently. Successful ping tests verified correct IP addressing, subnet masks, and gateway settings.

Discussion :

Subnetting made it clear how a large network can be split into smaller parts to improve performance, reduce traffic, and increase security while still supporting enough devices. Supernetting showed how multiple nearby networks can be combined into one larger network to simplify routing and reduce routing table size. Cisco Packet Tracer helped in visualizing the network and testing connectivity, and the lab highlighted how small configuration mistakes can affect communication, emphasizing the need for accurate IP planning.

Conclusion :

This lab successfully demonstrated the practical implementation of subnetting and supernetting using Cisco Packet Tracer.