

## **LAB 4: SUBNETTING AND SUPERNETTING USING CISCO PACKET TRACER**

### **OBJECTIVE:**

- To design and simulate a subnetting and supernetting using Cisco Packet Tracer.
- To verify communication between computers using the ping command.

### **SOFTWARE REQUIRED:**

- Cisco Packet Tracer

### **THEORY:**

Subnetting and supernetting are important concepts in computer networking used to manage IP addresses efficiently. They help in better utilization of network resources and improve network performance. Cisco Packet Tracer is a simulation tool that allows users to design, configure, and test networks in a virtual environment.

#### **1. Subnetting:**

Subnetting is the process of dividing a large network into smaller networks called subnets. It is done by borrowing bits from the host portion of an IP address to create additional network addresses. Each subnet has its own network ID, broadcast address, and range of valid host IP addresses.

Subnetting helps reduce network congestion, improves security, and makes network management easier. By using subnetting, network administrators can control traffic within smaller networks and efficiently allocate IP addresses based on requirements.

#### **2. Supernetting:**

Supernetting is the opposite of subnetting. It is the process of combining multiple smaller networks into a single larger network. This is done by reducing the number of network bits and increasing the host bits in the IP address. Supernetting is mainly used in large networks and routing to reduce the size of routing tables.

Supernetting helps simplify routing, improves routing efficiency, and reduces routing overhead in large-scale networks such as the internet.

## **NETWORK DESIGN:**

### **1. Subnetting Calculation:**

Base network: 192.168.1.0/24

Required number of subnets: 4

Number of IP address per subnet: 64 (Block size)

/26 (Borrowed 2 bits:  $2^2 = 4$  subnets)

Subnet Mask: 255.255.255.192

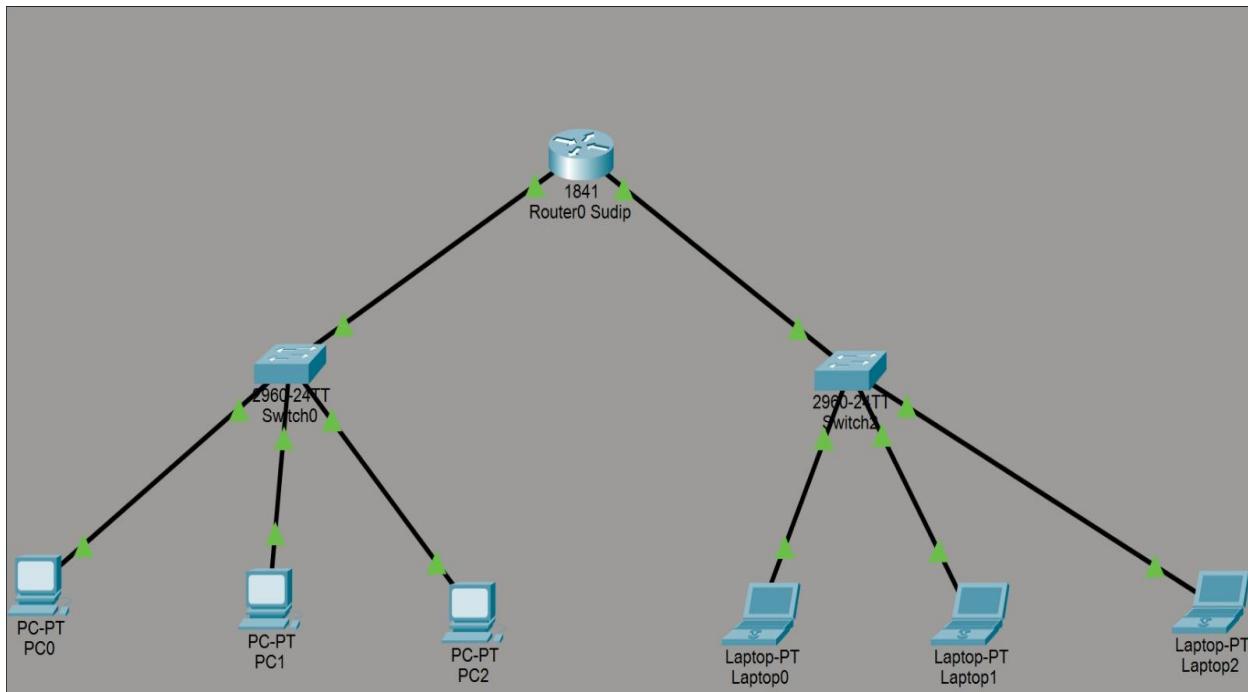
### **Subnet Calculation Table:**

<b>subnet</b>	<b>Network ID</b>	<b>First Host</b>	<b>Last host</b>	<b>Broadcast ID</b>
1	192.168.1.0	192.168.1.1	192.168.1.62	192.168.1.63
2	192.168.1.64	192.168.1.65	192.168.1.126	192.168.1.127
3	192.168.1.128	192.168.1.129	192.168.1.190	192.168.1.191
4	192.168.1.192	192.168.1.193	192.168.1.254	192.168.1.255

### **Network Topology:**

#### **Subnetting:**

A topology was created using Router0 to connect two subnets: 192.168.1.0/26 and 192.168.1.64/26. Switch0 connects PC0, PC1, and PC2 in the first subnet, while Switch1 connects Laptop0, Laptop2 and Laptop3 in the second subnet. Both switches are connected to the router interfaces.

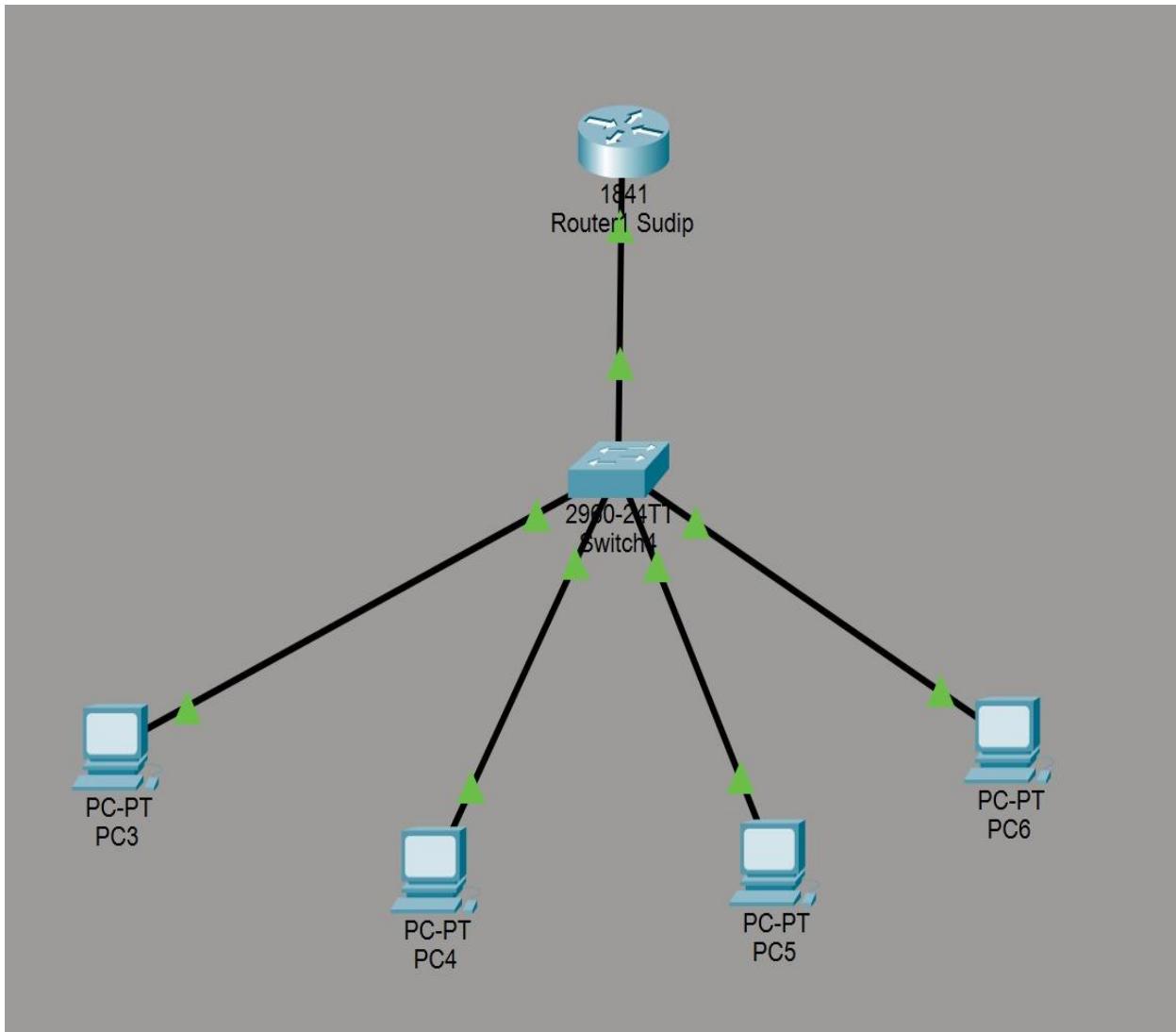


**Configuration Table:**

Device	IPV4	Subnetmask	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
PC0 (Subnet 1)	192.168.1.2	255.255.255.192	192.168.1.1
PC1 (Subnet 1)	192.168.1.3	255.255.255.192	192.168.1.1
PC2 (Subnet 1)	192.168.1.4	255.255.255.192	192.168.1.1
PC3 (Subnet 2)	192.168.1.66	255.255.255.192	192.168.1.65
PC4 (Subnet 2)	192.168.1.67	255.255.255.192	192.168.1.65
PC5 (Subnet 2)	192.168.1.68	255.255.255.192	192.168.1.65

## **Supernetting:**

A topology was created using Router1 to connect a single subnet through a switch. The switch connects five PCs: PC3 , PC4, PC5, and PC6, all within the same network segment. Each device is linked using straight-through Ethernet cables, and the switch is connected to Router1 to enable external network access.



### **Configuration Table:**

Device	IPV4	Subnetmask	Default gateway
Router0 (FastEthernet0/0)	192.168.1.1	255.255.252.0	N/A
PC3	192.168.1.10	255.255.252.0	192.168.1.1
PC4	192.168.1.10	255.255.252.0	192.168.1.1
PC5	192.168.2.10	255.255.252.0	192.168.1.1
PC6	192.168.3.10	255.255.252.0	192.168.1.1

### **DISCUSSION:**

In this lab experiment, subnetting and supernetting were performed using Cisco Packet Tracer to understand IP address allocation and routing. Subnetting helped to divide a large network into smaller sub-networks, making IP address usage more efficient and reducing network congestion. Supernetting was used to combine multiple networks into a single network, which reduced routing table size and simplified routing. The configurations were tested in the simulator, and successful packet transmission confirmed correct implementation of the concepts.

### **CONCLUSION:**

The subnetting and supernetting lab using Cisco Packet Tracer provided practical knowledge of IP address management and routing efficiency. The experiment reinforced theoretical concepts and demonstrated how proper network design improves performance and scalability. Overall, the lab helped build a strong foundation in designing and managing computer networks.