

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 ping.

SOFTWARE REQUIRED:

- Cisco Packet Tracer
- Windows PC/Laptop

THOERY:

1. Subnetting:

Subnetting is a method used in computer networks to break down a large network into smaller, more manageable sections called subnets. This helps make better use of IP addresses, reduces traffic congestion, and makes network management and security easier. By taking some bits from the host portion of an IP address, you can create multiple logical networks from a single network. Companies often use subnetting to separate different departments or areas while staying within the same main network.

2. Supernetting:

Supernetting is basically the reverse of subnetting where it merges several smaller networks into a bigger one. This helps cut down the number of entries in routing tables and makes routing simpler. It works by taking bits from the network part of an IP address so that a group of consecutive networks can be treated as a single route. Large networks and the Internet often use supernetting to make routing more efficient and scalable.

NETWORK DESIGN:

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

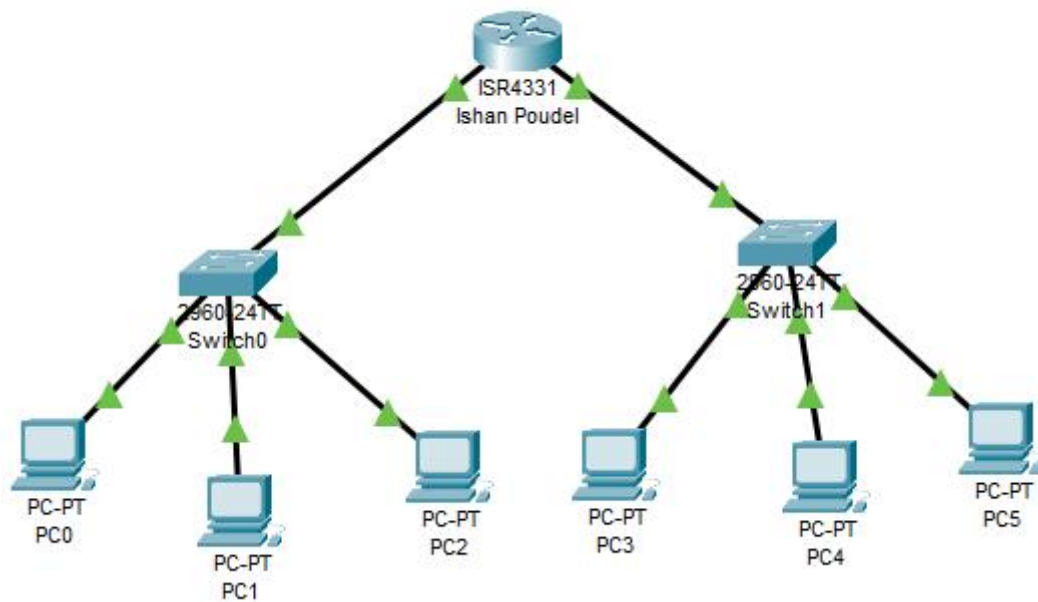
Subnet Table:

Subnet	Network address	Broadcast Address	1st usable	Last usable
1	192.168.1.0/26	192.168.1.63/26	192.168.1.1/26	192.168.1.62/26
2	192.168.1.64/26	192.168.1.127/26	192.168.1.65/26	192.168.1.126/26
3	192.168.1.128/26	192.168.1.191/26	192.168.1.129/26	192.168.1.190/26
4	192.168.1.192/26	192.168.1.255/26	192.168.1.193/26	192.168.1.254/26

NETWORK TOPOLOGY:

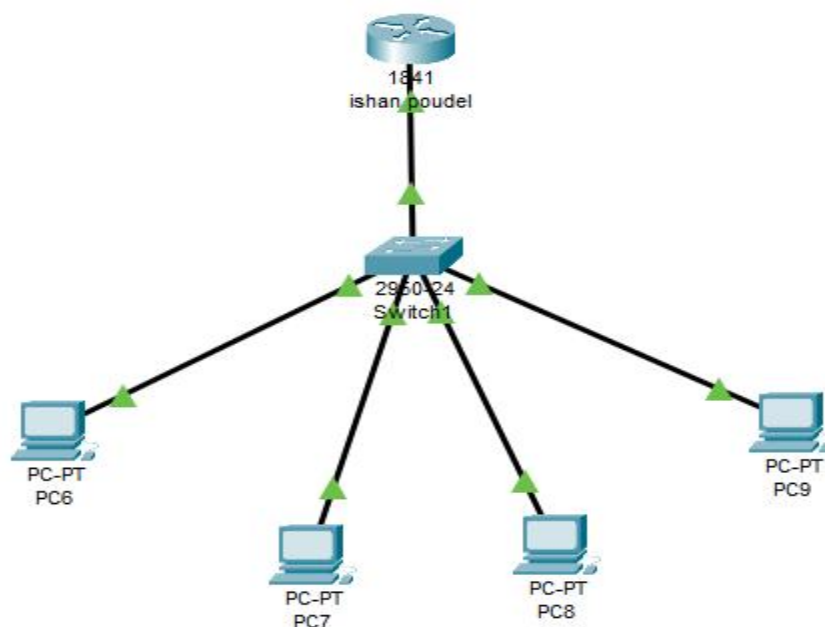
Subnetting:

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 PC3, PC4, and PC5 in the second subnet. Both switches are connected to the router interfaces.



Supernetting:

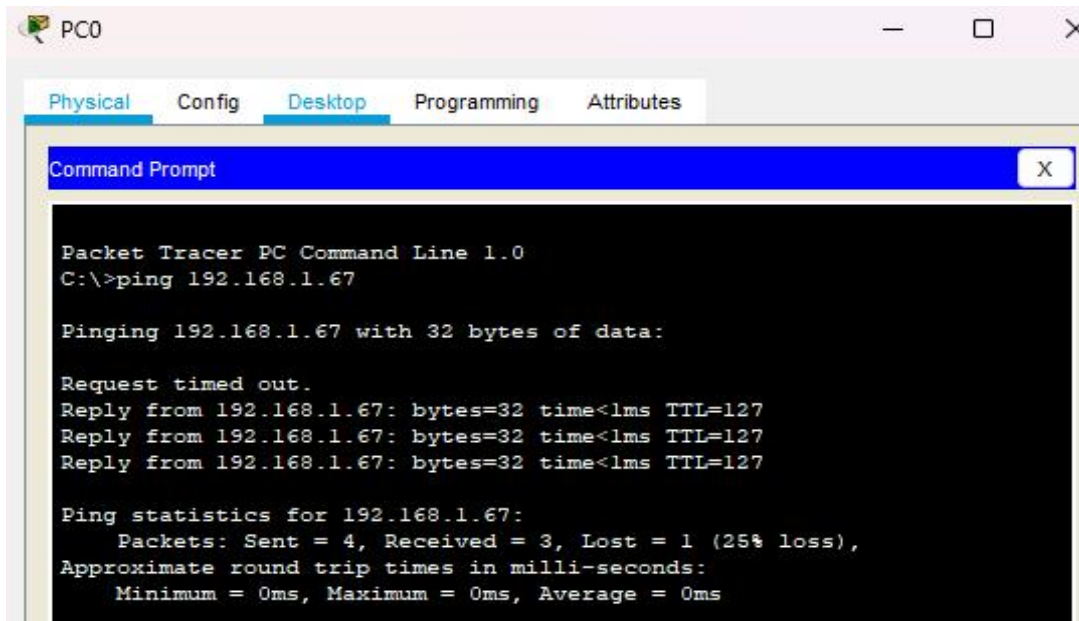
The topology consists of one router, one switch, and four PCs (PC6–PC9). All PCs connect to the switch, which is connected to the router.



Subnetting 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

PC0 to PC4



```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.67

Pinging 192.168.1.67 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.67: bytes=32 time<1ms TTL=127
Reply from 192.168.1.67: bytes=32 time<1ms TTL=127
Reply from 192.168.1.67: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.1.67:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

PC3 to PC1

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.3

Pinging 192.168.1.3 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.3: bytes=32 time<1ms TTL=127
Reply from 192.168.1.3: bytes=32 time<1ms TTL=127
Reply from 192.168.1.3: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

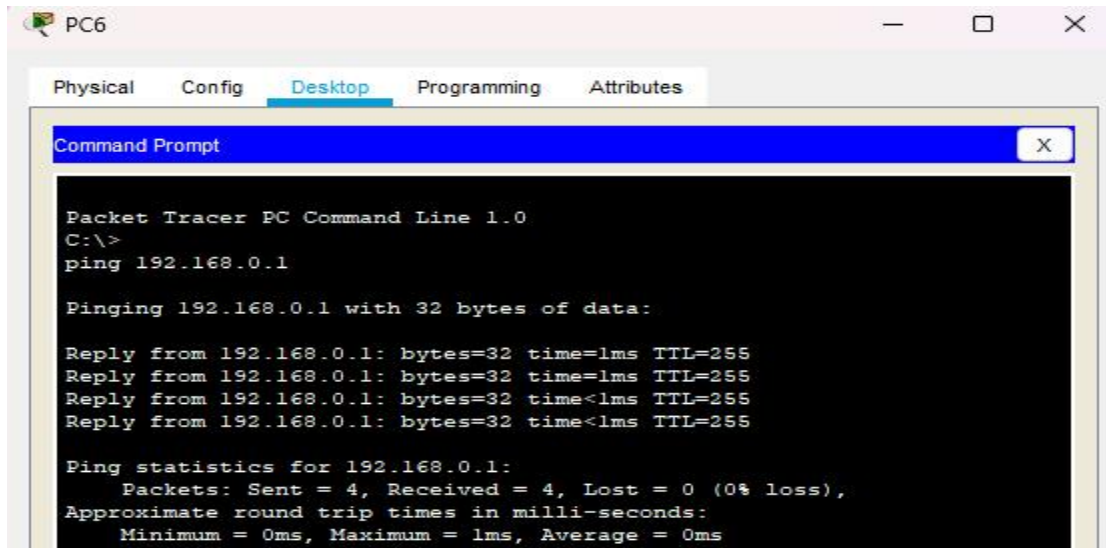
Reply from 192.168.1.2: bytes=32 time<1ms TTL=127
Reply from 192.168.1.2: bytes=32 time<1ms TTL=127
Reply from 192.168.1.2: bytes=32 time<1ms TTL=127
Reply from 192.168.1.2: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Supernetting Configuration Table

Device	IPv4	Subnetmask	Default gateway
Router0 (FastEthernet0/0)	192.168.0.1	255.255.252.0	N/A
PC6	192.168.0.10	255.255.252.0	192.168.0.1
PC7	192.168.1.10	255.255.252.0	192.168.0.1
PC8	192.168.2.10	255.255.252.0	192.168.0.1
PC9	192.168.3.10	255.255.252.0	192.168.0.1

PC6 to Router



The screenshot shows a Packet Tracer PC window for PC6. The 'Desktop' tab is active, displaying a 'Command Prompt' window. The command prompt shows the execution of the 'ping 192.168.0.1' command. The output indicates that four packets were sent and received successfully with 0% loss. The round trip times are all less than 1ms.

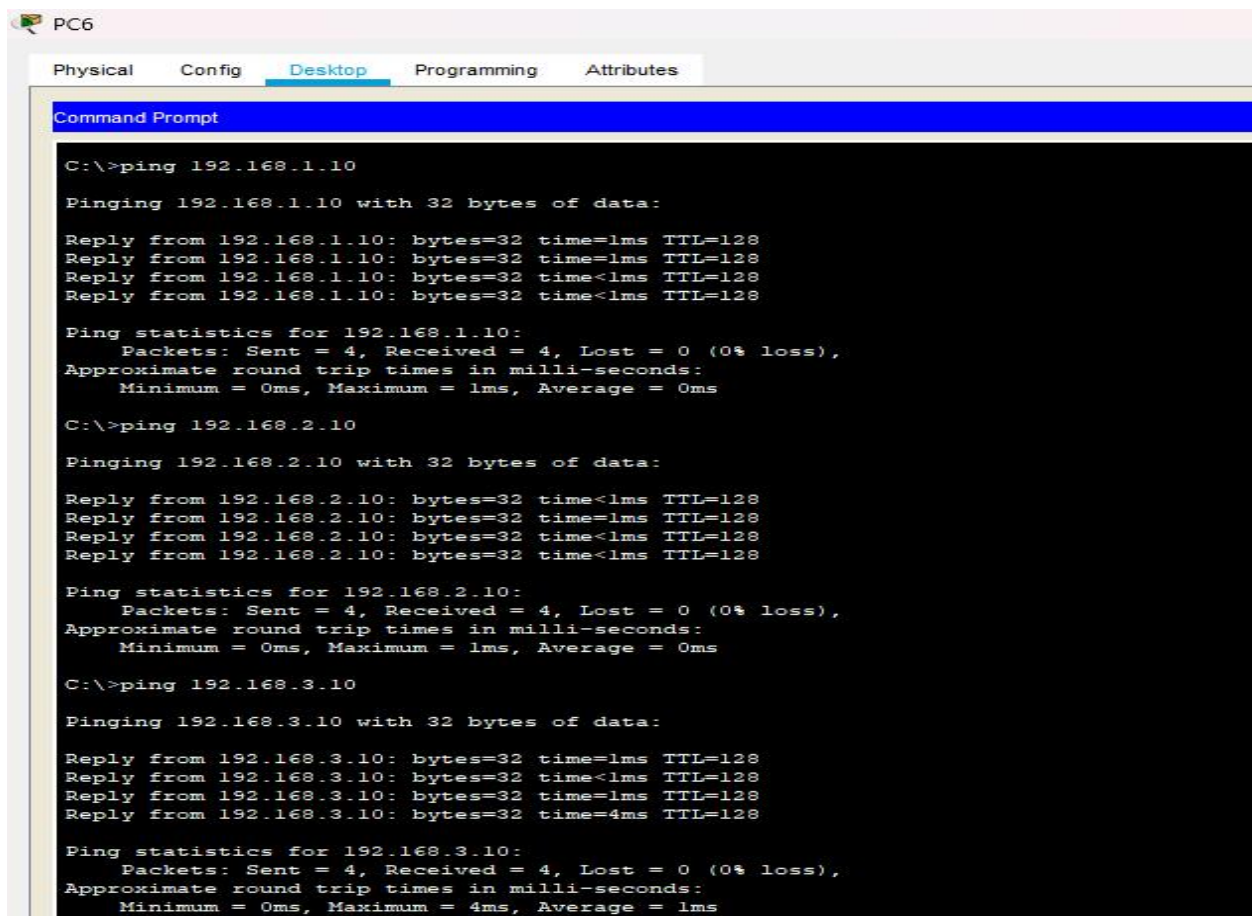
```
Packet Tracer PC Command Line 1.0
C:\>
ping 192.168.0.1

Pinging 192.168.0.1 with 32 bytes of data:

Reply from 192.168.0.1: bytes=32 time<1ms TTL=255
Reply from 192.168.0.1: bytes=32 time<1ms TTL=255
Reply from 192.168.0.1: bytes=32 time<1ms TTL=255
Reply from 192.168.0.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

PC6 to PC7,8,9



The screenshot shows the same Packet Tracer PC window for PC6. The 'Command Prompt' window displays three consecutive ping commands to 192.168.1.10, 192.168.2.10, and 192.168.3.10. All three pings were successful with 0% loss. The round trip times for the first two are less than 1ms, while for the third, the maximum is 4ms and the average is 1ms.

```
C:\>ping 192.168.1.10

Pinging 192.168.1.10 with 32 bytes of data:

Reply from 192.168.1.10: bytes=32 time<1ms TTL=128
Reply from 192.168.1.10: bytes=32 time<1ms TTL=128
Reply from 192.168.1.10: bytes=32 time<1ms TTL=128
Reply from 192.168.1.10: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.2.10

Pinging 192.168.2.10 with 32 bytes of data:

Reply from 192.168.2.10: bytes=32 time<1ms TTL=128
Reply from 192.168.2.10: bytes=32 time<1ms TTL=128
Reply from 192.168.2.10: bytes=32 time<1ms TTL=128
Reply from 192.168.2.10: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.2.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.3.10

Pinging 192.168.3.10 with 32 bytes of data:

Reply from 192.168.3.10: bytes=32 time<1ms TTL=128
Reply from 192.168.3.10: bytes=32 time<1ms TTL=128
Reply from 192.168.3.10: bytes=32 time<1ms TTL=128
Reply from 192.168.3.10: bytes=32 time=4ms TTL=128

Ping statistics for 192.168.3.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 4ms, Average = 1ms
```

DISCUSSION:

In this lab, we carried out subnetting and supernetting using Cisco Packet Tracer to get hands-on experience with IP address allocation and routing. Subnetting allowed us to split a large network into smaller segments, which made better use of IP addresses and reduced network congestion. On the other hand, supernetting combined several networks into a single larger network, helping to simplify routing and decrease the number of entries in routing tables. All configurations were tested within the simulator, and successful packet delivery confirmed that the concepts were applied correctly.

CONCLUSION:

This lab provided practical insight into managing IP addresses and improving routing efficiency. It reinforced the theoretical ideas of subnetting and supernetting, showing how thoughtful network design can enhance performance and scalability. Overall, the experiment offered a solid foundation for designing and managing efficient computer networks.