Practical 4: Subnetting Implementation

Practical Title: Divide a class C network into multiple subnets, Implement subnet plan in a simulated network.

Aim: To divide a given Class C IP address space into multiple subnets and implement this subnet plan in a Cisco Packet Tracer simulation.

Objective:

- To understand the concept of subnetting.
- To create a subnetting plan for a Class C network.
- To configure devices with the appropriate IP addresses and subnet masks for each subnet.
- To verify communication within and between the created subnets.

Theory: Subnetting is the process of dividing a single large network into smaller, more manageable sub-networks. This improves network efficiency, security, and scalability. For a Class C network (e.g., 192.168.1.0/24), we can borrow bits from the host portion of the IP address to create new subnets. The subnet mask determines how many bits are used for the network and how many for the host.

Steps:

1. **Subnetting Plan:**
    - ○ Given the network 192.168.1.0/24.
    - ○ To create 4 subnets, we need to borrow 2 bits from the host portion (22=4 subnets).

○ The new subnet mask will be 255.255.255.192 (binary 11000000).

○ The subnets will be:

■ Subnet 1: 192.168.1.0/26 (Network Address: 192.168.1.0, Host Range: 192.168.1.1 to 192.168.1.62, Broadcast: 192.168.1.63)

■ Subnet 2: 192.168.1.64/26 (Network Address: 192.168.1.64, Host Range: 192.168.1.65 to 192.168.1.126, Broadcast:

192.168.1.127)

- Subnet 3: 192.168.1.128/26 (Network Address: 192.168.1.128,
  Host Range: 192.168.1.129 to 192.168.1.190, Broadcast: 192.168.1.191)
- Subnet 4: 192.168.1.192/26 (Network Address: 192.168.1.192,
  Host Range: 192.168.1.193 to 192.168.1.254, Broadcast: 192.168.1.255)

2. **Create the Network Topology:**
   - Use Cisco Packet Tracer to create a topology with one router, and two switches, each with a few PCs connected to it. Connect the switches to different FastEthernet ports on the router.
3. **Assign IP Addresses and Subnet Masks:**
   - **Router:**
     - Configure FastEthernet0/0 with an IP address from Subnet 1, e.g., 192.168.1.1 with subnet mask 255.255.255.192.
     - Configure FastEthernet0/1 with an IP address from Subnet 2, e.g., 192.168.1.65 with subnet mask 255.255.255.192.
   - **PCs on Subnet 1:**
     - Assign IP addresses from 192.168.1.2 to 192.168.1.62 with subnet mask 255.255.255.192. The default gateway for these PCs will be 192.168.1.1.
   - **PCs on Subnet 2:**
     - Assign IP addresses from 192.168.1.66 to 192.168.1.126 with subnet mask 255.255.255.192. The default gateway for these PCs will be 192.168.1.65.
4. **Verify Connectivity:**
   - Ping from a PC in Subnet 1 to another PC in the same subnet (e.g., ping 192.168.1.3).
   - Ping from a PC in Subnet 1 to its default gateway (e.g., ping 192.168.1.1).
   - Ping from a PC in Subnet 1 to a PC in Subnet 2 (e.g., ping 192.168.1.67).

This verifies that the router is correctly routing between the subnets.

Conclusion: This practical successfully demonstrated the process of subnetting a Class C network. By dividing the network into smaller segments and configuring the router and hosts accordingly, we were able to establish and verify communication both within and between the newly created subnets.

Viva / Oral Questions:

1. What is the primary purpose of subnetting?
2. How do you calculate the number of subnets and hosts per subnet from a given subnet mask?
3. Explain how a router uses the subnet mask to determine which network a packet belongs to.
4. What is a broadcast address, and why is it important in subnetting?
5. What are the advantages of using subnetting in a large organization?

CLI COMMANDS:-

```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.192
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface fastethernet1/0
Router(config-if)#ip address 192.168.1.65 255.255.255.192
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
```

VERIFY CONNECTIVITY:-

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

Pinging 192.168.1.3 with 32 bytes of data:

Reply from 192.168.1.3: bytes=32 time=1ms TTL=128
Reply from 192.168.1.3: bytes=32 time<1ms TTL=128
Reply from 192.168.1.3: bytes=32 time<1ms TTL=128 Reply from 192.168.1.3: bytes=32
time<1ms TTL=128

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

C:\>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
```

Reply from 192.168.1.1: bytes=32 time<1ms TTL=255 Reply from 192.168.1.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.1.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 0ms, Average = 0ms