Lab Assignment: Subnetting and VLAN Implementation in Cisco Packet Tracer

Objective

1. **Understand** the concepts of **IP subnetting** and **subnet mask calculation**.
2. **Perform subnet calculations** for a given network scenario.
3. **Implement VLANs and Subnetting** in Cisco Packet Tracer.
4. **Improve network efficiency** through proper subnet division.

Part 1: Subnet Calculation and IP Addressing

Task 1: Given Network Scenario

- **Network Address:** `192.168.1.0/24`
- **Requirement:** Divide the network into **4 subnets** for different departments.

Task 2: Subnet Calculation

1. **Determine Subnet Mask:**
   - `/24` means default subnet mask: `255.255.255.0`
   - 4 subnets → Need **2 extra bits** (`/26`)
   - New subnet mask: `255.255.255.192`
   - **Each subnet has 62 usable IPs** (`2^6 - 2 = 62`).
2. **Assign Subnets and Host Ranges:**

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

Part 2: Implementing VLANs and Subnetting in Cisco Packet Tracer

Task 3: Create the Network in Cisco Packet Tracer

1. **Devices Required:**
   - **1 Router** (For Inter-VLAN Routing)
   - **1 Layer 3 Switch**
   - **4 PCs** (Each in a separate VLAN)

- **4 VLANs** (e.g., VLAN 10, 20, 30, 40)
- **Connections:** Use Ethernet cables.

2. **VLAN Configuration on Switch:**

```
scss
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Switch(config)# vlan 10
Switch(config-vlan)# name Sales
Switch(config-vlan)# exit

Switch(config)# vlan 20
Switch(config-vlan)# name HR
Switch(config-vlan)# exit

Switch(config)# vlan 30
Switch(config-vlan)# name IT
Switch(config-vlan)# exit

Switch(config)# vlan 40
Switch(config-vlan)# name Finance
Switch(config-vlan)# exit
```

3. **Assign Ports to VLANs:**

```
arduino
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Switch(config)# interface fa0/1
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 10
Switch(config-if)# exit

Switch(config)# interface fa0/2
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 20
Switch(config-if)# exit
```

4. **Enable Inter-VLAN Routing on Router:**

```
arduino
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Router(config)# interface g0/0.10
Router(config-subif)# encapsulation dot1Q 10
Router(config-subif)# ip address 192.168.1.1 255.255.255.192
Router(config-subif)# exit
```

Outcome

✓ Learn **IP subnetting** concepts and perform **subnet calculations**.
✓ Successfully implement **VLANs and Subnets** in **Cisco Packet Tracer**.
✓ Improve **network efficiency** through **structured subnet division**.