Virtual Local Area Networks (VLANs)

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VLANs

VLAN is a group of ports in switches in which an end device can only communicate with their own group of members.

Advantages of VLANs

1. Increased security
2. Separate broadcast domains
3. multiple networks on a single switch
4. less data traffic on ports
5. easy to maintain

Types of VLANs

There are two type of VLANs based on configuration

1. **Static VLAN:** Switch ports are added to the particular group manually by the network administrator
2. **Dynamic VLAN:** Switch ports are added to the particular groups dynamically based on the MAC addresses of the end devices.

Types of Ports in VLANs

There are two basic types of ports in VLANs

1. **Access ports:**
    - It carries same VLAN data only
    - Only end devices are connected to the access ports, i.e., computers, laptops, tablets etc
2. **Trunk Ports:**
    - It carries or handles all VLANs data or traffic
    - Use to connect switch to router or switch to switch

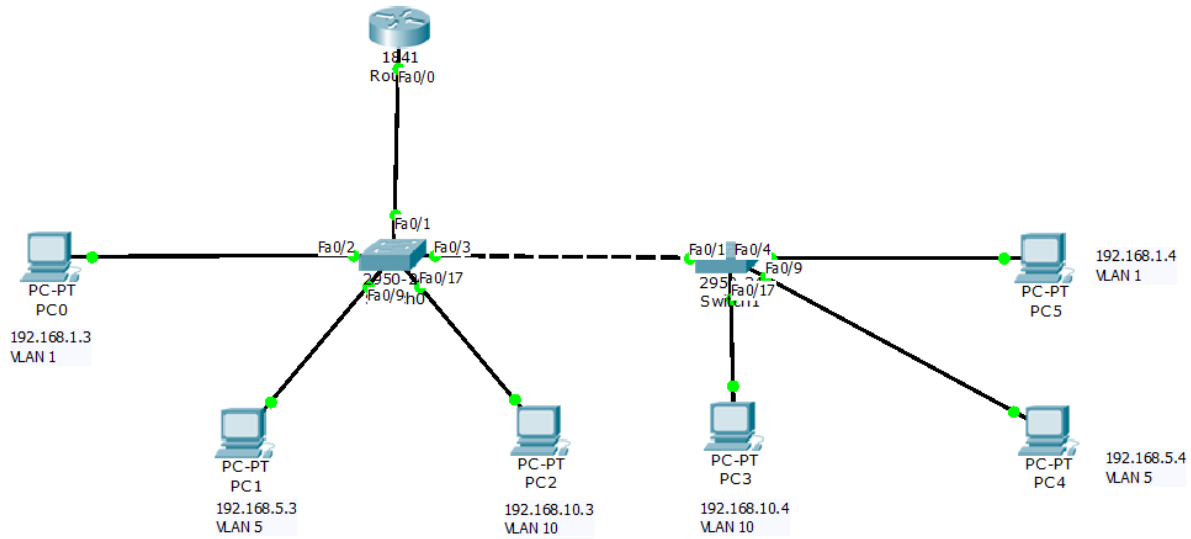

Figure 1: VLAN network

VLANs Configuration

Consider the VLAN network in Figure 1

PC-0 Configuration

```
IP address:  192.168.1.3
Subnet mask:  255.255.255.0
Default Gateway:  192.168.1.1
VLAN 1
```

PC-1 Configuration

```
IP address:  192.168.5.3
Subnet mask:  255.255.255.0
Default Gateway:  192.168.5.1
VLAN 5
```

PC-2 Configuration

```
IP address:  192.168.10.3
Subnet mask:  255.255.255.0
Default Gateway:  192.168.10.1
VLAN 10
```

PC-3 Configuration

```
IP address:  192.168.10.4
Subnet mask:  255.255.255.0
Default Gateway:  192.168.10.1
VLAN 10
```

PC-4 Configuration

```
IP address:  192.168.5.4
Subnet mask:  255.255.255.0
Default Gateway:  192.168.5.1
VLAN 5
```

PC-3 Configuration

```
IP address:  192.168.1.4
Subnet mask:  255.255.255.0
Default Gateway:  192.168.1.1
VLAN 1
```

Switch-0 Configuration

```
Switch>en
Switch#sh vlan
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname Switch0
Switch0(config)#vlan 5
Switch0(config-vlan)#name student
Switch0(config-vlan)#exit
Switch0(config)#vlan 10
Switch0(config-vlan)#name mgt
Switch0(config-vlan)#exit
Switch0(config)#interface range fa0/9-16
Switch0(config-if-range)#switchport mode access
Switch0(config-if-range)#switchport access vlan 5
Switch0(config-if-range)#no shut
Switch0(config-if-range)#exit
Switch0(config)#interface range fastEthernet 0/17-24
Switch0(config-if-range)#switchport mode access
Switch0(config-if-range)#switchport access vlan 10
Switch0(config-if-range)#no shut
Switch0(config-if-range)#exit
Switch0(config)#interface fastEthernet 0/1
Switch0(config-if)#switchport mode trunk
Switch0(config-if)#no shut
Switch0(config-if)#exit
Switch0(config)#interface fastEthernet 0/3
Switch0(config-if)#switchport mode trunk
```

```
Switch0(config-if)#no shut
Switch0(config-if)#exit
Switch0(config)#exit
Switch0#sh vlan
Switch0#sh running-config
Switch0#copy running-config startup-config
```

Switch-1 Configuration

```
Switch>en
Switch#sh vlan
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname Switch1
Switch1(config)#vlan 5
Switch1(config-vlan)#name student
Switch1(config-vlan)#exit
Switch1(config)#vlan 10
Switch1(config-vlan)#name mgt
Switch1(config-vlan)#exit
Switch1(config)#interface range fa0/9-16
Switch1(config-if-range)#switchport mode access
Switch1(config-if-range)#switchport access vlan 5
Switch1(config-if-range)#no shut
Switch1(config-if-range)#exit
Switch1(config)#interface range fastEthernet 0/17-24
Switch1(config-if-range)#switchport mode access
Switch1(config-if-range)#switchport access vlan 10
Switch1(config-if-range)#no shut
Switch1(config-if-range)#exit
Switch1(config)#interface fastEthernet 0/1
Switch1(config-if)#switchport mode trunk
Switch1(config-if)#no shut
Switch1(config-if)#exit
Switch1(config)#interface fastEthernet 0/2
Switch1(config-if)#switchport mode trunk
Switch1(config-if)#no shut
Switch1(config-if)#exit
Switch1(config)#exit
Switch1#sh vlan
Switch1#sh running-config
Switch1#copy running-config startup-config
```

Router-0 Configuration

```
 Router>en Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Router0
Router0(config)#interface fastEthernet 0/0
```

```
Router0(config-if)#no shut
Router0(config-if)#exit
Router0(config)#interface fastEthernet 0/0.1
%LINK-5-CHANGED: Interface FastEthernet0/0.1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.1, changed state to up
Router0(config-subif)#encapsulation dot1Q 1
Router0(config-subif)#ip address 192.168.1.1 255.255.255.0
Router0(config-subif)#exit
Router0(config)#interface fastEthernet 0/0.2
%LINK-5-CHANGED: Interface FastEthernet0/0.2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.2, changed state to up
Router0(config-subif)#encapsulation dot1Q 5
Router0(config-subif)#ip address 192.168.5.1 255.255.255.0
Router0(config-subif)#exit
Router0(config)#interface FastEthernet 0/0.3
%LINK-5-CHANGED: Interface FastEthernet0/0.3, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.3, changed state to up
Router0(config-subif)#encapsulation dot1Q 10
Router0(config-subif)#ip address 192.168.10.1 255.255.255.0
Router0(config-subif)#exit
Router0(config)#exit
```