NETWORKS AND PROTOCOLS

Lab 7

Introduction

The objectives of this lab are to :

- How to configure VLAN

- InterVLAN Routing

What is VLAN

A VLAN (Virtual Local Area Network) is a network segmentation technique that enables the logical grouping of devices, regardless of their physical location. By assigning VLAN tags to network frames, it allows for efficient broadcast control, improved security, and simplified network management, enhancing overall network flexibility and performance.

Instructions

- Both topologies will be implemented via packet tracer following the same principles and approach, namely :

    - mounting,

    - interface configuration,

    - create VLANs and configure switch interfaces,

    - and perform tests after each operation to ensure that it has been corrected before the next step.

- In topology 1, use IP address 192.168.1.0 /24 for all terminal

- In topology 2, use IP addresses 192.168.100.0 /24 and 192.168.200.0 /24 for PC0, PC1 and PC2, PC3 respectively.
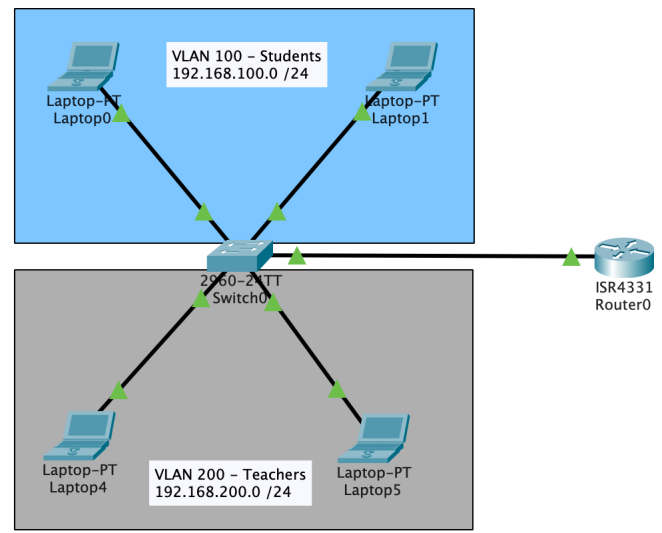
Lab topology

We will create two topologies, topology 1 to create and manage a VLAN, and topology 2 for inter-VLAN routing, see figure 1.

Task 1.
Step 1: Build the topology 1 and configure IP addresses:
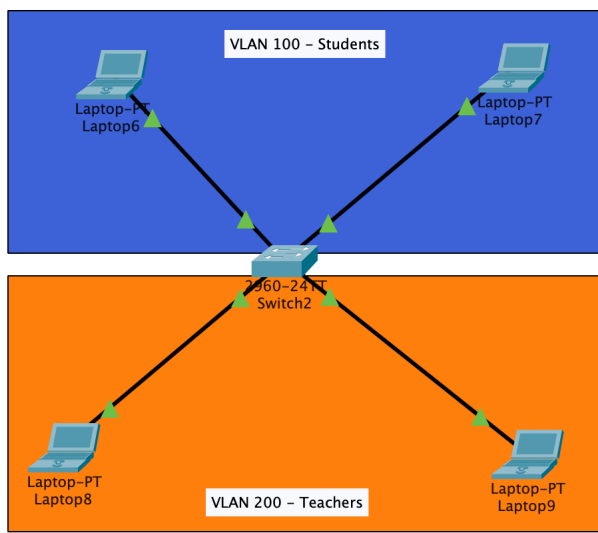
Figure 1: Lab topologies

- Connect the PC0 to fastEthernet0/1 interface (switch side)

- attribute the IP address: 192.168.1.2 /24

- Connect the PC1 to fastEthernet0/2 interface (switch side)

- attribute the IP address: 192.168.1.3 /24

- Connect the PC2 to fastEthernet0/3 interface (switch side)

- attribute the IP address: 192.168.1.4 /24

- Connect the PC3 to fastEthernet0/4 interface (switch side)

- attribute the IP address: 192.168.1.5 /24

Step 2: Create VLANs
Create 2 VLANs on the switch: VLAN 100 and VLAN 200. We can give them custom names.

```
Switch#config terminal

Switch(config)#vlan 100

Switch(config-vlan)#name STUDENTS

Switch(config-vlan)#vlan 200

Switch(config-vlan)#name TEACHERS
```

Step 3: Assign switch ports to VLANs
Remember each VLAN is viewed as separate broadcast domain.
Switch ports could be either access or trunk.

- An access port is assigned to a single VLAN . These ports are configured for switch ports that connect to devices with a normal network card, for example a PC in a network.

- A trunk port on the other hand is a port that can be connected to another switch or router. This port can carry traffic of multiple VLANs.

In our case, we'll configure switch interfaces fa 0/1 through fa 0/4 as access ports to connect to our PCs. Here, interfaces fa 0/1 and fa 0/2 are assigned to VLAN 100 while interfaces fa 0/3 and fa 0/4 are assigned to VLAN 200.

```
Switch>enable

Switch#config terminal


Switch(config)#int fa0/1

Switch(config-if)#switchport mode access

Switch(config-if)#switchport access vlan 100


Switch(config)#int fa0/2

Switch(config-if)#switchport mode access

Switch(config-if)#switchport access vlan 100


Switch(config)#int fa0/3

Switch(config-if)#switchport mode access

Switch(config-if)#switchport access vlan 200


Switch(config)#int fa0/4

Switch(config-if)#switchport mode access

Switch(config-if)#switchport access vlan 200
```

Ping from PC0 to all PCs and from PC3 to all PCs. What do you notice?
....
....
....

Task 2.
Step 1: Build the topology 2 and configure IP addresses:

- Connect the PC0 to fastEthernet0/1 interface (switch side)

- attribute the IP address: 192.168.100.2 /24, with 192.168.100.1 as a gateway address

- Connect the PC1 to fastEthernet0/2 interface (switch side)

- attribute the IP address: 192.168.100.3 /24, with 192.168.100.1 as a gateway address

- Connect the PC2 to fastEthernet0/3 interface (switch side)

- attribute the IP address: 192.168.200.2 /24, with 192.168.200.1 as a gateway address

- Connect the PC3 to fastEthernet0/4 interface (switch side)

- attribute the IP address: 192.168.200.3 /24, with 192.168.200.1 as a gateway address

Step 2: Create VLANs and assign ports to VLANs
Create the VLANs in the same way as the previous task (Task1 - Step 2).
Note: We could have configured all the above interfaces as access ports using interface range command as shown below:

```
Switch(config-if)#int range fa0/1-4

Switch(config-if-range)#switchport mode access
```

In the above commands, we have specified an interface range and then proceeded to configure all the ports specified as access ports.
Interface GigabitEthernet0/1 is configured as trunk and will be used to for inter-VLAN communication.

```
Switch(config)#int gig 0/1

Switch(config-if)#switchport mode trunk
```

Ping PC1 from PC0 both in VLAN 100. Ping test should be successful.
Ping PC3 in VLAN 200 from PC0 in VLAN 100. Ping here will definitely fail. Why?
....
....
....
Now, in order to allow the hosts in the two VLANs to communicate, we need to do something extra. We'll configure the router to permit inter-VLAN communication.

Step 3: Configure inter-VLAN routing on the router

We will configure the router so that it will enable communication between the two VLANs via a single physical interface. We will divide the single physical interface on the router into logical interfaces (sub interfaces). Each sub-interface will then serve as a default gateway for each of the VLANs. This scenario is called **router on a stick (R.O.A.S)** and will allow the VLANs to communicate through the single physical interface.

Note: We cannot assign an IP address to the router's physical interface that we have subdivided into logical sub-interfaces. We will instead assign IP addresses to the sub interfaces.

```
Router>enable

Router#config terminal


Router(config)#int gig0/0/0

Router(config-if)#no shutdown


Router(config-if)#int fa0/0.100

Router(config-subif)#encapsulation dot1q 100

Router(config-subif)#ip add 192.168.100.1 255.255.255.0


Router(config-if)#int fa0/0.200

Router(config-subif)#encapsulation dot1q 200

Router(config-subif)#ip add 192.168.200.1 255.255.255.0
```

The routers physical interface GigabitEthernet0/0/0 was subdivided into two sub-interfaces (gig0/0/0.100 and gig0/0/0.200), which are then configured as trunk interfaces and given IP addresses.

Ping PC3 in VLAN 200 from PC0 in VLAN 100. ing test should be successful.