
# Department of Computer Science and Engineering

## Islamic University of Technology (IUT)

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# Laboratory Report

CSE 4412 : Data Communication and Networking Lab


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**Section** : **1 (SWE)**


**Semester** : **Winter (4th)**

**Academic Year** : **2021-22**

**Date of Submission** : **03/04/2023**

**Lab No** : **8**

**Title:** Understanding the concept of VLAN and configuration of VLAN to multiple user groups in different locations.

## Objective:

1. Understand VLAN
2. Configuration of VLAN

## Devices Used in the Experiment:

1. Cisco Packet Tracer

## Theory:

### VLAN Definition

**VLAN** is a logical grouping of networking devices. When we create VLAN, we actually break large broadcast domain in smaller broadcast domains.

A LAN is usually associated with an Ethernet (**Layer 2**) broadcast domain, which is the set of network devices an Ethernet broadcast packet can reach.

Once traffic **crosses a router** and engages Layer 3 (IP-related) functions, it is not considered to be on the same LAN, even if everything stays in the same building or floor. As a result, a location could have many interconnected LANs.

A **VLAN**, like the LAN it sits atop, **operates at Layer 2** of the network, the Ethernet level. VLANs **partition** a single switched network into a set of overlaid virtual networks that can meet different functional and security requirements. This **partitioning** avoids the need to have multiple, distinct physical networks for different use cases.

A VLAN can be defined as a **custom network** which is created from one or more local area networks. VLAN allows us to group several devices together based on a **logical function/need**, regardless of the physical locations of the devices.

This enables network administrators to isolate network traffic and secure sensitive data by keeping the data within a specific VLAN (**prevent unauthorized access**).

## Usage of VLAN:

Let's say there are 3 different groups of users in an office: Sales department, Finance department and IT department.

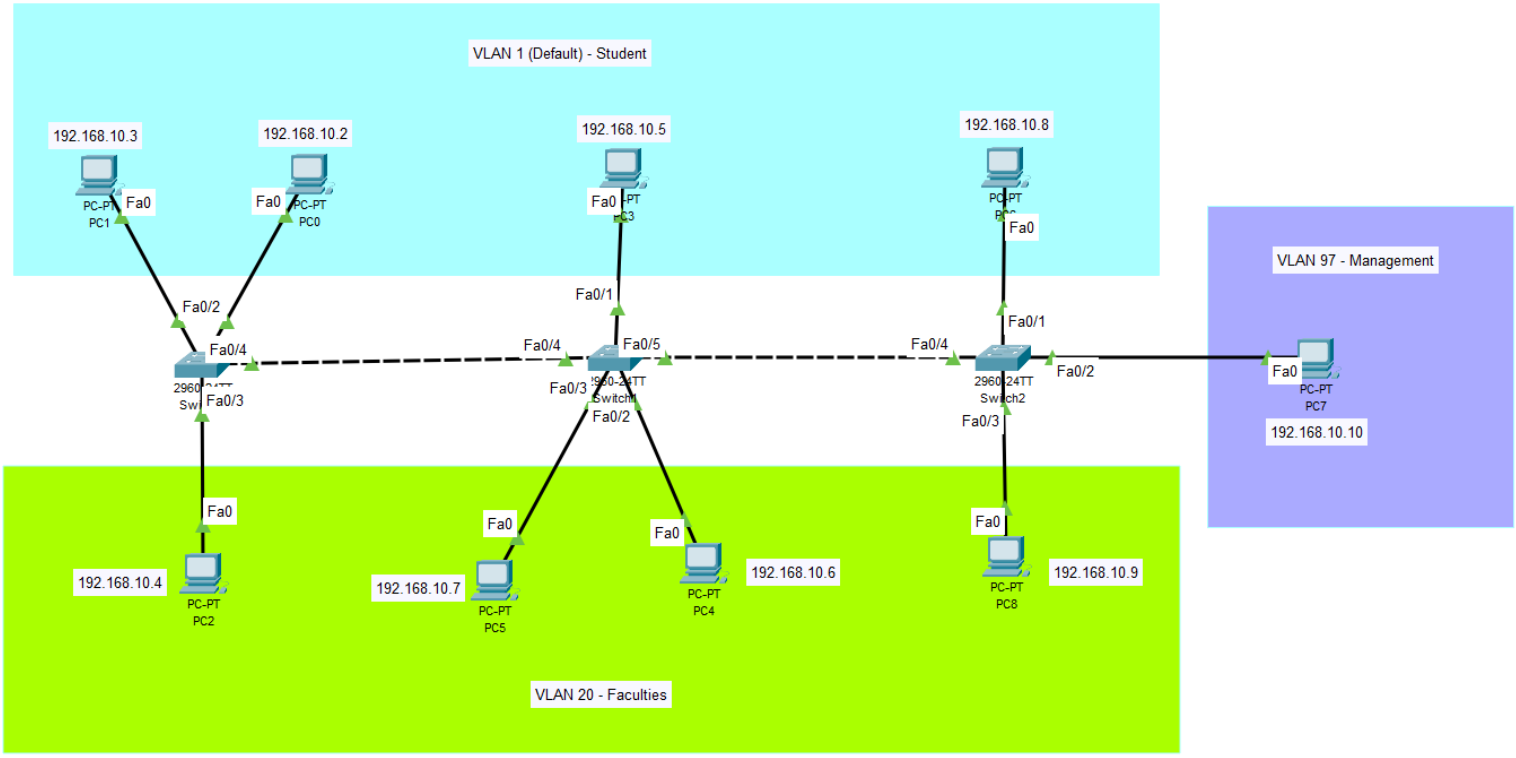
Now, IT department has some sensitive information that needs to be separated from the other two departments. In that case, we can set up a VLAN connection which will create **logical boundaries** over the physical network.

There will be 3 VLANs created for the network and computers will be assigned to them. Each VLAN will have its own name and its own ID.

Physically we changed nothing but logically we grouped devices appropriately according to their function.

Here, each VLAN do not share the same broadcast domain, each department will have their own isolated network, which improves the network **performance**. VLAN also enhances **security** and **flexibility** of the network.

## Diagram of the experiment:




Event List

| Vis. | Time(sec) | Last Device | At Device | Type |
|---|---|---|---|---|
| | 0.000 | -- | PC1 | ARP |
| | 0.001 | PC1 | Switch0 | ARP |
| | 0.002 | Switch0 | PC0 | ARP |
| | 0.002 | Switch0 | Switch1 | ARP |
| | 0.003 | Switch1 | PC3 | ARP |
| | 0.003 | Switch1 | Switch2 | ARP |
| | 0.004 | Switch2 | PC6 | ARP |
| | 0.005 | PC6 | Switch2 | ARP |
| | 0.006 | Switch2 | Switch1 | ARP |
| | 0.007 | Switch1 | Switch0 | ARP |
| | 0.008 | Switch0 | PC1 | ARP |

Observation of ARP

## Configuration of different Switches:

For Switch2: (Creating VLANs and giving them an ID)

```
Switch>
Switch>en
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vlan 20
Switch(config-vlan)#name Faculties
Switch(config-vlan)#end
Switch#
```

```
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vlan 97
Switch(config-vlan)#name Management
Switch(config-vlan)#end
Switch#
```

Since VLAN 1 is default, we can't rename it. Now, we need to **assign the interfaces** to the appropriate VLANs.

For Switch2:

```
Switch>
Switch>enable
Switch#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#interface fa 0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 97
Switch(config-if)#interface fa 0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#end
Switch#
```

```
Switch(config)#
Switch(config)#interface fa 0/4
Switch(config-if)#switchport mode trunk
```

The interface fa 0/4 is not connected to an end device, it's connected to another switch. That's why we're using the command: "**switchport mode trunk**".
If we want to restrict the access of different VLANs, we can use the command: "**switchport trunk allowed vlan** <vlan id>".

If we write "**show vlan**" then we'll see that different interfaces are successfully assigned to their appropriate VLANs.

```
20   Faculties                        active    Fa0/3
97   Management                       active    Fa0/2
```

In full: (“**show vlan**”)

```
Switch#show vlan

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/5, Fa0/6, Fa0/7
                                                 Fa0/8, Fa0/9, Fa0/10, Fa0/11
                                                 Fa0/12, Fa0/13, Fa0/14,
Fa0/15
                                                 Fa0/16, Fa0/17, Fa0/18,
Fa0/19
                                                 Fa0/20, Fa0/21, Fa0/22,
Fa0/23
                                                 Fa0/24, Gig0/1, Gig0/2
20   Faculties                         active    Fa0/3
97   Management                        active    Fa0/2
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
```

The commands are the same for the other switches. For **Switch0**, the interface **fa 0/4** will have switchport mode assigned as “**trunk**”. As for **Switch1**, **fa 0/4** and **fa 0/5,** both will have switchport mode assigned as “**trunk**”.

## Observation:

“show vlan” command of Switch2 is given in the configuration section.

Now for Switch1:

```
Switch#show vlan

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/6, Fa0/7, Fa0/8
                                                 Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                 Fa0/13, Fa0/14, Fa0/15,
Fa0/16
                                                 Fa0/17, Fa0/18, Fa0/19,
Fa0/20
                                                 Fa0/21, Fa0/22, Fa0/23,
Fa0/24
                                                 Gig0/1, Gig0/2
20   Faculties                         active    Fa0/2, Fa0/3
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
```

Now for Switch0:

```
Switch#show vlan

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/5, Fa0/6
                                                 Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                                 Fa0/11, Fa0/12, Fa0/13,
Fa0/14
                                                 Fa0/15, Fa0/16, Fa0/17,
Fa0/18
                                                 Fa0/19, Fa0/20, Fa0/21,
Fa0/22
                                                 Fa0/23, Fa0/24, Gig0/1,
Gig0/2
20   Faculties                         active    Fa0/3
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
```

**show running-config** Switch0:

```
interface FastEthernet0/1
 switchport mode access
!
interface FastEthernet0/2
 switchport mode access
!
interface FastEthernet0/3
 switchport access vlan 20
 switchport mode access
!
interface FastEthernet0/4
 switchport mode trunk
!
```

**show running-config** Switch1:

```
interface FastEthernet0/1
!
interface FastEthernet0/2
 switchport access vlan 20
!
interface FastEthernet0/3
 switchport access vlan 20
!
interface FastEthernet0/4
 switchport mode trunk
!
interface FastEthernet0/5
 switchport mode trunk
!
```

**show running-config** Switch2:

```
interface FastEthernet0/1
 switchport mode access
!
interface FastEthernet0/2
 switchport access vlan 97
 switchport mode access
!
interface FastEthernet0/3
 switchport access vlan 20
 switchport mode access
!
interface FastEthernet0/4
 switchport mode trunk
!
```

With the help of the “show running-config” command we can see the interfaces with trunk access use.

## Challenges:

- It took a lot of time to gather all the necessary information and compile it into a comprehensive report.
- Familiarity issues.