BASICS OF VLAN CONCEPT

Basic Settings and Configurations ..

Concept Overview (VLAN)

*Virtual LAN (VLAN)* is a concept in which we can divide the devices logically on layer 2 (data link layer). Generally, **layer 3 devices divides broadcast domain but broadcast domain can be divided by switches using the concept of VLAN.**

A broadcast domain is a network segment in which if a device broadcast a packet then all the devices in the same broadcast domain will receive it. The devices in the same broadcast domain will receive all the broadcast packet but it is limited to switches only as routers don't forward out the broadcast packet.

To forward out the packets to different VLAN (from one VLAN to another) or broadcast domain, inter Vlan routing is needed.

ID

- **VLAN 0, 4095:** These are **reserved VLAN** which cannot be seen or used.
- **VLAN 1:** It is the default VLAN of switches. By default, all switch ports are in VLAN. This VLAN can't be deleted or edit but can be used.
- **VLAN 2-1001:** This is a **normal VLAN range**. We can create, edit and delete these VLAN.
- **VLAN 1002-1005:** These are CISCO defaults for fddi and token rings. These VLAN can't be deleted.
- **Vlan 1006-4094:** This is the **extended range** of Vlan.

Fa0/0

Fa0/1

Fa0/2

192.168.1.1/24
Vlan 2

192.168.2.1/24
Vlan 3

192.168.1.2/24
Vlan 2
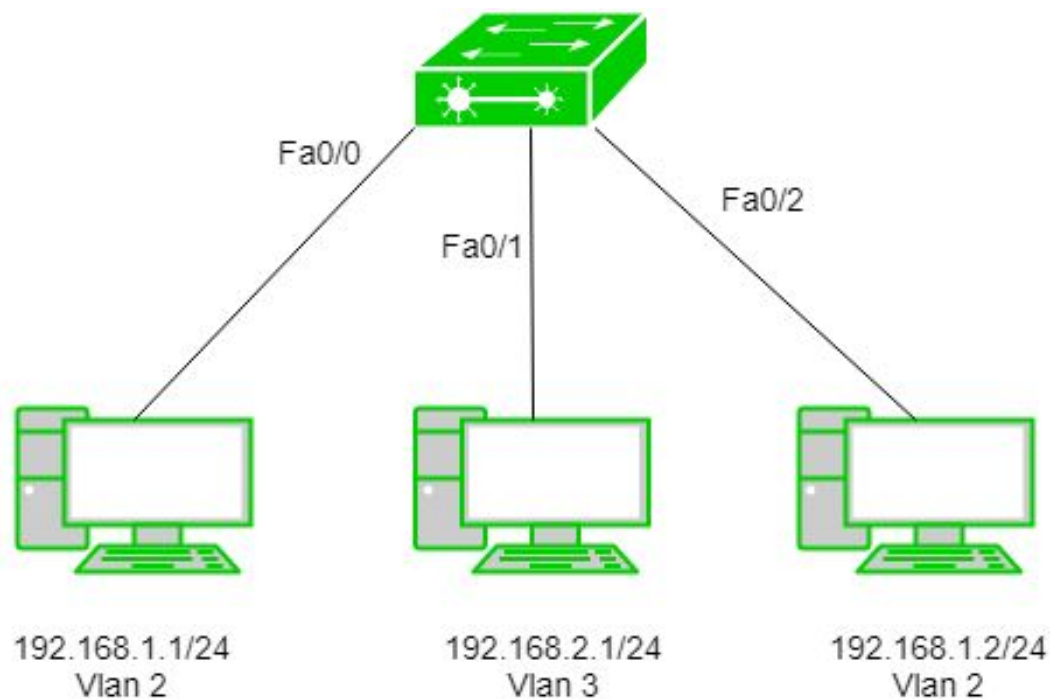
Example:

Configuration –

We can simply create VLANs by simply assigning the vlan-id and Vlan name.

#switch1(config)#vlan 2

#switch1(config-vlan)#vlan accounts

Here, 2 is the Vlan I'd and accounts is the Vlan name. Now, we assign Vlan to the switch ports.e.g-

Switch(config)#int fa0/0

Switch(config-if)#switchport mode access

Switch(config-if)#switchport access Vlan 2

Also, switchport range can be assigned to required vlans.

Switch(config)#int range fa0/0-2

Switch(config-if)#switchport mode access

Switch(config-if) #switchport access Vlan 2

By this, switchport fa0/0, fa0/1, fa0-2 will be assigned Vlan 2.

Assigning IP address 192.168.1.1/24, 192.168.1.2/24 and 192.168.2.1/24 to the PC's. Now, we will create Vlan 2 and 3 on switch.

Switch(config)#vlan 2

Switch(config)#vlan 3

We have made VLANs but the most important part is to assign switch ports to the VLANs .

Switch(config)#int fa0/0

Switch(config-if)#switchport mode access

Switch(config-if) #switchport access Vlan 2

Switch(config)#int fa0/1

Switch(config-if)#switchport mode access

Switch(config-if) #switchport access Vlan 3

Switch(config)#int fa0/2

Switch(config-if)#switchport mode access

Switch(config-if) #switchport access Vlan 2

As seen, we have assigned Vlan 2 to fa0/0, fa0/2 and Vlan 3 to fa0/1.

Advantages –

- **performance –**The network traffic is full of broadcast and multicast. VLAN reduces the need to send such traffic to unnecessary destination.e.g-If the traffic is intended for 2 users but as 10 devices are present in the same broadcast domain therefore all will receive the traffic i.e wastage of bandwidth but if we make VLANs, then the broadcast or mulicast packet will go to the intended users only.

- **formation of virtual groups –** As there are different departments in every organisation namely sales, finance etc., VLANs can be very useful in order to group the devices logically according to their departments.

- **security –** In the same network, sensitive data can be broadcast which can be accessed by the outsider but by creating VLAN, we can control broadcast domains, set up firewalls, restrict access. Also, VLANs can be used to inform the network manager of an intrusion. Hence, VLANs greatly enhance network security.

- **Flexibility –** VLAN provide flexibility to add, remove the number of host we want.
- **Cost reduction –** VLANs can be used to create broadcast domains which eliminate the need for expensive routers.
- By using Vlan, the number of small size broadcast domain can be increased which are easy to handle as compared to a bigger broadcast domain.
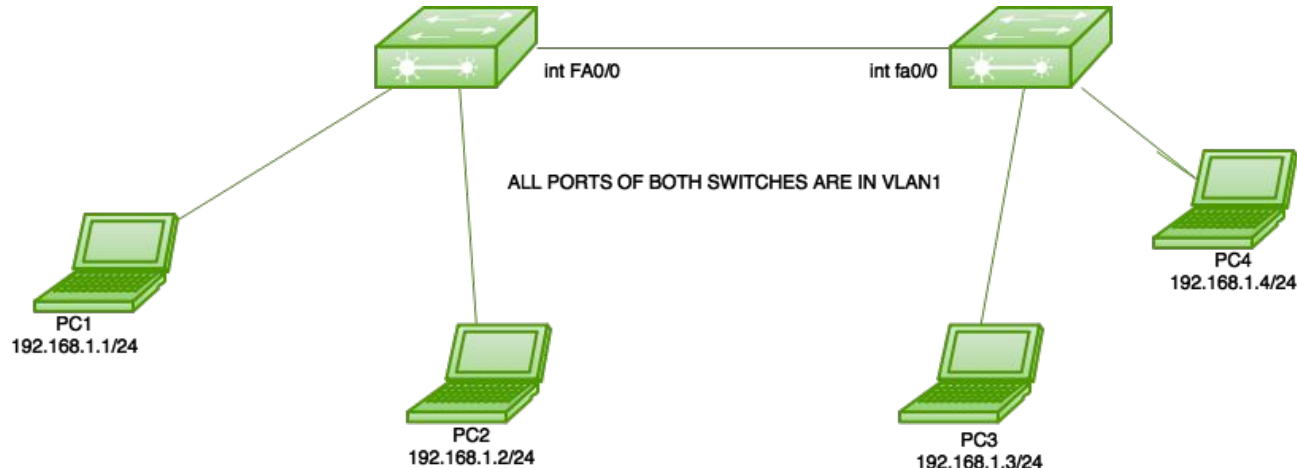
Access and trunk ports

Switch ports are layer 2 interfaces which are used to carry layer 2 traffic. A single switch port can carry single VLAN traffic whether it is an access port or trunk port. Frames are handled differently according to the type of link they are traversing.

Note: All switch ports are assigned VLAN 1 by default (VLAN 1 cannot be modified or deleted).

There are 2 different types of ports in a switched environment:

Access ports –

This switch ports belongs to carry the traffic of only one vlan. By default, it will carry the traffic of native vlan (VLAN 1) .If the switch ports are assigned as access ports then it can be considered as the switch ports belongs to a single broadcast domain. Any traffic arriving on these switch ports are considered as it belongs to the VLAN assigned to the port.

int FA0/0   int fa0/0

ALL PORTS OF BOTH SWITCHES ARE IN VLAN1

PC1
192.168.1.1/24

PC2
192.168.1.2/24

PC3
192.168.1.3/24

PC4
192.168.1.4/24

2 switches are connected and only the default VLAN (VLAN 1) is configured on both switches i.e **all the switch ports of both switches belongs to single broadcast domain.**

Now, note that the **link between the switches has to be configured as an access port because only a single VLAN (VLAN 1) data has to be exchanged**. Now after assigning IP address to PC1-12.168.1.1/24, PC2-192.168.1.2/24, PC3-192.168.1.3/24, PC3-192.168.1.4/24, user shall configure the link between 2 switches as access port.

Switch1(config)#interface fa0/0

Switch1(config-if)#switchport mode access

Here, there is no need to assign VLAN to the ports as all the switch ports on both switches are configured as VLAN 1 by default.

Trunk ports –

These switch ports belongs to and carry the traffic of more than one VLAN. This is a great advantage as to carry the traffic of group of VLAN, a single switch port can be used. These are of great use if user wants to exchange traffic between more than one switches having more than one vlan configured.To identify traffic belongs to which vlan, VLAN identification method (802.1q or ISL) are used.

Note: Trunk links can carry the traffic of different VLANs across them but by default, if the links between switches are not trunk then only information from the configured access VLAN will be exchanged.

Simple Topology
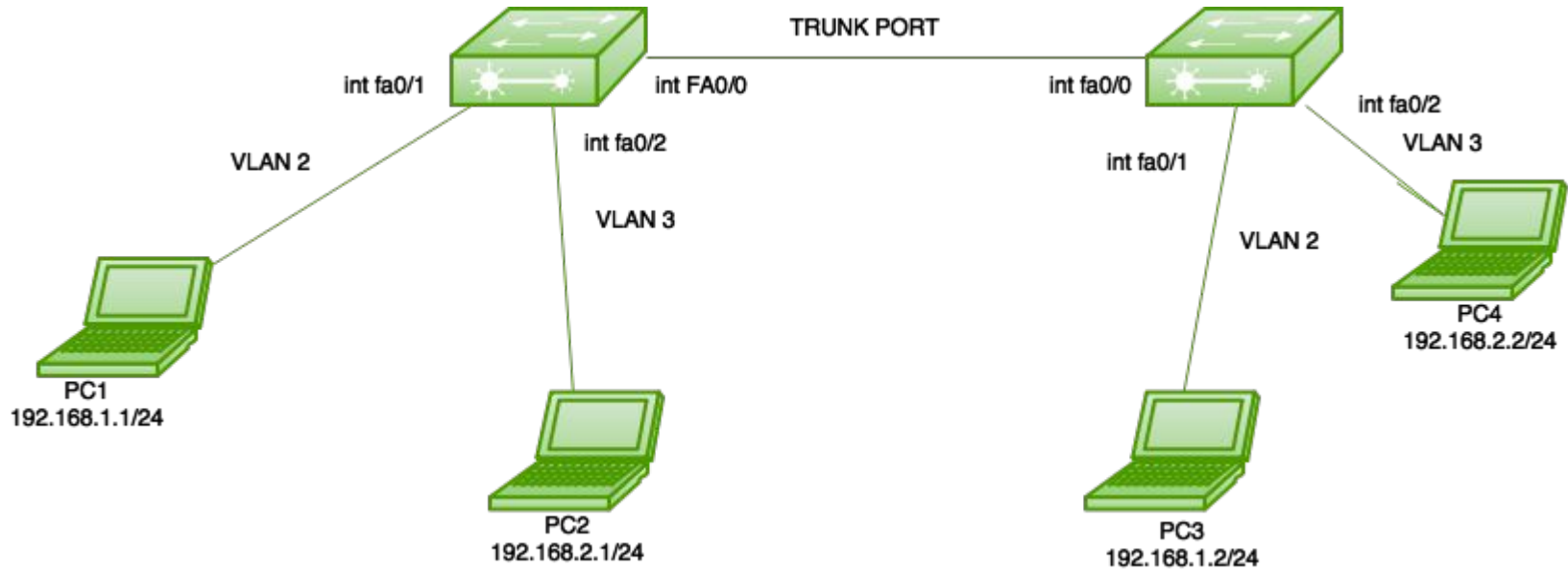
As user has not assigned any VLANs to other ports of switches therefore the other ports will be in VLAN 1 by **default**.

Now, note that the **link between the switches has to be configured as trunk port because here more than one VLAN (VLAN 1, 2, 3) frame has to be exchanged between the switches**. Now assigning IP address to PC1-12.168.1.1/24, PC2-192.168.2.1/24, PC3-192.168.1.2/24, PC3-192.168.2.2/24.

Now, first user has to make VLANs on both switches.

Switch1(config)#vlan 2

Switch1(config)#vlan 3

Switch2(config)#vlan 2

Switch2(config)#vlan 3

Now, as user has more than one vlan configured on both switches. Therefore, user have to assign the VLANs to their respective ports on Switch1.

```
Switch1(config)#interface fa0/1

Switch1(config-if)#switchport access vlan 2

Switch1(config)#interface fa0/2

Switch1(config-if)#switchport access vlan 3
```

Now, configure VLANs on their respective ports on Switch2 .

Switch2(config-if)#interface fa0/1

Switch2(config-if)#switchport access vlan 2

Switch2(config)#interface fa0/2

Switch2(config-if)#switchport access vlan 3

Now, configure the link between 2 switches as trunk port.

Switch1#interface fa0/0

Switch1#switchport trunk encapsulation dot1q

Switch1#switchport mode trunk

As a result of this, now user can carry more than one VLAN traffic from one switch to another switch (here, only configuration of switch ports are shown not the configuration of router is shown. To perform inter vlan routing, configuration of router is also needed).