

VLAN (Virtual Local Area Network)

A VLAN is a group of devices on one or more LANs that are configured to communicate as if they are on the same physical network, regardless of their actual location.

A VLAN is Layer 2 Security.

Divides a Single Broadcast domain into Multiple Broadcast domains.

By default, all switches' ports are in VLAN1. This VLAN1 is known as Administrative VLAN or Management VLAN

VLAN can be created from 2 1001

It can be configured only on a manageable switch.

Types of VLAN Configuration—

1. Static VLAN
2. Dynamic VLAN

1. Static VLAN:—

Static VLANs are based on port numbers.

Need to manually assign a port on a switch to a VLAN.

Also called Port-Based VLANs.

It can be a member of a single VLAN and not multiple VLANs.

Key Features of Static VLAN:

1. Manual Configuration:

- Each port on the switch must be manually assigned to a VLAN.
- Example: Port `FastEthernet 0/1` is assigned to VLAN 10.

2. Port-Based Membership:

- The VLAN membership is determined by the physical switch port.
- A device connected to a port inherits the VLAN of that port.

3. Simple to Implement:

- Easy to configure in small or medium networks where the network topology doesn't change frequently.

4. **Less Flexible:**

- If a device moves to another port, it loses its VLAN membership unless the new port is configured with the same VLAN.

How to Configure Static VLAN on a Cisco Switch

Here is an example of configuring a static VLAN:

1. **Create a VLAN:**

```
Switch> enable
Switch# configure terminal
Switch(config)# vlan 10
Switch(config-vlan)# name Sales
Switch(config)# vlan 20
Switch(config-vlan)# name Market
```

2. **Assign a VLAN to a Port:**

```
Switch(config)# interface fastEthernet 0/1
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 10

Switch(config)# interface fastEthernet 0/2
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 20

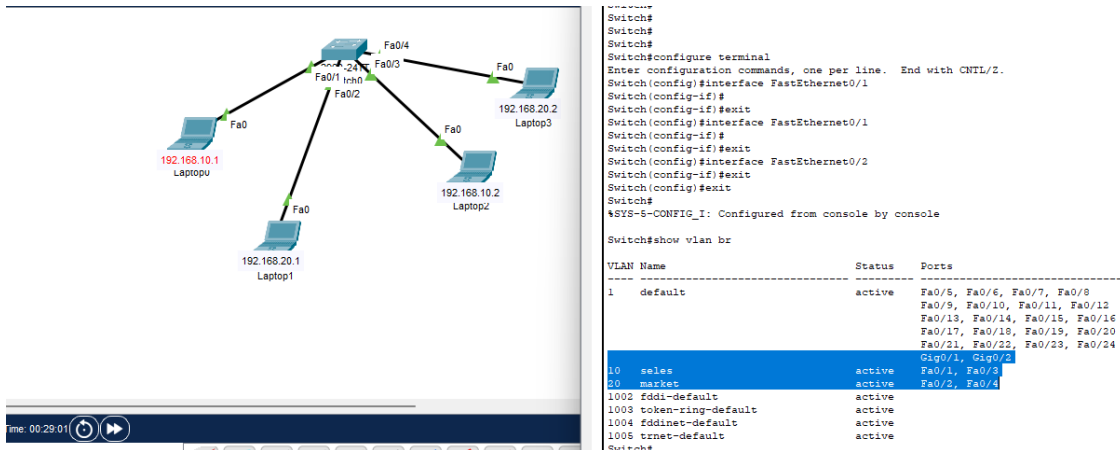
Switch(config)# interface fastEthernet 0/3
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 10

Switch(config)# interface fastEthernet 0/4
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 20
```

3. Verify Configuration:

```
Switch# show vlan brief
```

Output:



When to Use Static VLAN?

- **Small or Static Networks:** Where devices do not move frequently.
- **High-Security Environments:** When strict control over VLAN membership is required.
- **Easier Troubleshooting:** When simplicity is preferred over flexibility.

2. Dynamic VLAN—

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Dynamic VLAN is a type of VLAN configuration where devices are automatically assigned to a VLAN based on attributes such as their **MAC address, IP address, user identity**, or other criteria.

Dynamic VLANs are based on the MAC address of a PC.

Switch automatically assigns the port to a VLAN.

Each port can be a member of multiple VLANs.

For Dynamic VLAN configuration, a software called VMPS(VLAN Membership

Policy
Server) is needed.

Key Features of Dynamic VLAN

1. Automated Assignment:

Devices are automatically assigned to VLANs based on pre-configured policies.

2. Flexibility:

- VLAN membership follows the device, not the port.
- If a device moves to another port, it retains its VLAN assignment.

3. Centralized Management:

- Dynamic VLANs are managed using a **VMPS (VLAN Management Policy Server)**, a centralized database that maps devices to VLANs based on criteria.

4. Scalability:

- Ideal for larger, dynamic networks where devices or users frequently change locations.

Types of links/ports:—

1. Access links:-
2. Trunk links:-

1. Access links:-

This type of link is only part of one VLAN, and it's referred to as the native VLAN of the port

Any device attached to an access link is unaware of a VLAN membership the device just assumes it's part of a broadcast domain, but it has no understanding of the physical network.

Configuration:

Assigns the port to a specific VLAN.

- Example:

```
Switch(config)# interface fastEthernet 0/1
```

```
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 10
```

Trunk links:

Trunks can carry multiple VLANs.

A trunk link is a 100- or 1000Mbps point-to-point link between two switches, between a switch and router, or between a switch and server. These carry the traffic of multiple VLANs from 1 to 1005 at a time.

Trunking allows you to make a single port part of multiple VLANs at the same time

VLAN Tagging: Uses **802.1Q tagging** to identify VLANs. Adds a VLAN tag to the Ethernet frame for each VLAN.

Configuration:

- Example:

```
Switch(config)# interface gigabitEthernet 0/1
Switch(config-if)# switchport mode trunk
Switch(config-if)# switchport trunk allowed vlan 10,20,30
Switch(config-if)# switchport trunk native vlan 1
```

Comparison:

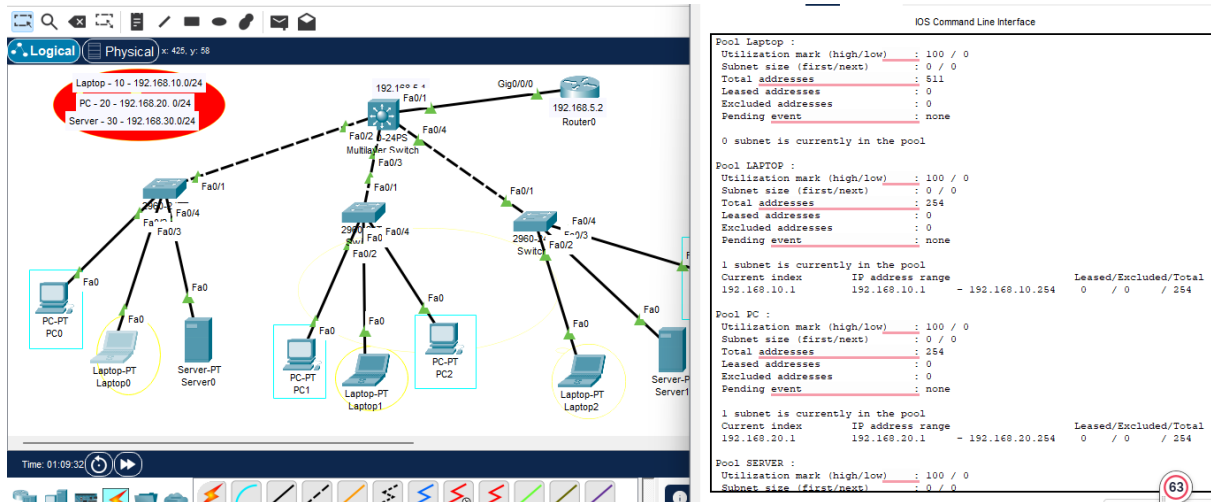
Feature	Access Port	Trunk Port
Traffic Type	Single VLAN	Multiple VLANs
VLAN Tagging	Untagged frames	Tagged frames (except native VLAN)
Connection Type	End devices (PCs, printers)	Network devices (switches, routers)
Use Case	Simple device connection	VLAN communication across switches
Command Example	<code>switchport mode access</code>	<code>switchport mode trunk</code>

1. ISL (Inter-Switch Link)

- **Proprietary Protocol:** Developed by Cisco.
 - **Encapsulation:** Encapsulates the entire Ethernet frame with an additional ISL header and trailer.
 - **Tagging:** Adds a 26-byte header and a 4-byte CRC (Cyclic Redundancy Check) trailer to the frame.
 - **Native VLAN Handling:** Does **not** have a concept of a native VLAN. All VLAN frames are tagged.
 - **Compatibility:** Only supported on Cisco devices.
 - **Frame Size:** Increases frame size significantly due to encapsulation (30 bytes overhead).
 - **Usage:** Legacy protocol; rarely used today.
 - **VLAN Range:** Supports up to 1000 VLANs (1–1005).
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2. 802.1Q

- **Standard Protocol:** Defined by the IEEE (Institute of Electrical and Electronics Engineers).
- **Tagging:** Inserts a 4-byte VLAN tag directly into the Ethernet frame between the Source MAC and Ethertype fields.
- **Native VLAN Handling:** Supports a **native VLAN** where frames belonging to the native VLAN are sent untagged.
- **Compatibility:** Supported by Cisco and non-Cisco devices, making it an industry standard.
- **Frame Size:** Increases frame size by 4 bytes (minimal overhead).
- **Usage:** Widely used and preferred for modern VLAN implementations.
- **VLAN Range:** Supports a larger VLAN range (up to 4094 VLANs).



```

####Sw1###
enable
conf t
hostname Sw1

```

```

vlan 10
name laptop
vlan 20
name pc
vlan 30
name server

```

```

int fa0/2
switchport access vlan 10
int fa0/3
switchport access vlan 20
int fa0/4
switchport access vlan 30
int fa0/1
switchport mode trunk

```

```

####Sw2###

```

```

enable
conf t

```

```
hostname Sw2

vlan 10
name laptop
vlan 20
name pc
vlan 30
name server

int fa0/2
switchport access vlan 10
int fa0/3
switchport access vlan 20
int fa0/1
switchport mode trunk

###Sw3###
enable
conf t
hostname Sw3

vlan 10
name laptop
vlan 20
name pc
vlan 30
name server

int fa0/2
switchport access vlan 10
int fa0/3
switchport access vlan 20
int fa0/4
switchport access vlan 30
int fa0/1
switchport mode trunk
```



```
####Corsw####
enable
conf t
hostname corsw

ip routing

vlan 10
name laptop
vlan 20
name pc
vlan 30
name server

! #### SVI = Switch Virtual Interfaces #####

interface vlan 10
ip address 192.168.10.1 255.255.255.0
no shutdown

interface vlan 20
ip address 192.168.20.1 255.255.255.0
no shutdown

interface vlan 30
ip address 192.168.30.1 255.255.255.0
no shutdown

ip dhcp pool LAPT0P
default-router 192.168.10.1
network 192.168.10.0 255.255.255.0

ip dhcp pool PC
default-router 192.168.20.1
network 192.168.20.0 255.255.255.0
```

```
ip dhcp pool SERVER
default-router 192.168.30.1
network 192.168.30.0 255.255.255.0
```

Corsw ports automatiically become a trunk port.
Still if we want to make it trunk. Here are the configuration

```
int range fa0/2 - 4
    switchport trunk encapsulation dot1q
    switchport mode trunk.
```

```
###cor-sw1###
```

```
int fa0/1
no switchport
ip add 192.168.5.1 255.255.255.0
no shutdown

ip route 0.0.0.0 0.0.0.0 192.168.5.2
```

```
###Router###
```

```
enable
conf t
hostname Gw
```

```
int gig0/0/1
ip add 192.168.5.2 255.255.255.0
no shutdown
```

```
ip route 192.168.10.0 255.255.255.0 192.168.5.1
ip route 192.168.20.0 255.255.255.0 192.168.5.1
ip route 192.168.30.0 255.255.255.0 192.168.5.1
```