* **VLAN & Inter VLAN Routing**

1. What is VLAN (Virtual Local Area Network)?

A VLAN (Virtual Local Area Network) is a logical segmentation of a network that allows devices to be grouped together even if they are not physically connected to the same switch.

**Key Feature of VLANs:-**

* **Network Segmentation** - Reduces broadcast traffic and improves security.
* **Logical Grouping -** Devices in different locations can be part of the same VLAN.
* **Enhanced Security -** Limits communications between devices unless explicitly allowed.
* **Better Performance -** Reduces network congestion by limiting unnecessary broadcasts.

**Example VLAN Configuration on a Cisco Switch :-**

Switch(config)# vlan 10

Switch(config-vlan)# name HR

Switch(config-vlan)# exit

Switch(config)# interface gigabitEthernet 0/1

Switch(config-if)# switchport mode access

Switch(config-if)# switchport access vlan 10

Switch(config-if)# exit

**2. What is Inter-VLAN Routing?**

VLANs cannot communicate with each other by default. Inter-VLAN routing allows devices in different.

VLANs to communicate using a router or Layer 3 switch.

**Methods of Inter-VLAN Routing :-**

**A. Router-on-a-Stick (Using a Router)**

* A Single router interface (trunk port) carries traffic for multiple VLANs
* Uses sub-Interfaces to handle different VLANs.

**Example Configurations :-**

Router(config)# interface gigabitEthernet 0/0.10

Router(config-subif)# encapsulation dot1Q 10

Router(config-subif)# ip address 192.168.10.1 255.255.255.0

Router(config-subif)# exit

Router(config)# interface gigabitEthernet 0/0.20

Router(config-subif)# encapsulation dot1Q 20

Router(config-subif)# ip address 192.168.20.1 255.255.255.0

Router(config-subif)# exit

Each Sub-Interface is assigned to a VLAN with an IP address acting as the default gateway.

**B. Layer 3 Switch (Using SVI - Switch Virtual Interface)**

* A Layer 3 Switch can perform routing between VLANs without needing an external router.
* Uses Switch Virtual Interface(SVI) for VLAN routing.

**Example Configuration on a Layer 3 Switch :-**

Switch(config)# ip routing

Switch(config)# interface vlan 10

Switch(config-if)# ip address 192.168.10.1 255.255.255.0

Switch(config-if)# no shutdown

Switch(config-if)# exit

Switch(config)# interface vlan 20

Switch(config-if)# ip address 192.168.20.1 255.255.255.0

Switch(config-if)# no shutdown

Switch(config-if)# exit

Here, VLAN interface act as gateways for VLAN communication.

**3. Summary & Best Practices**

* Use VLANs to improve security, manageability, and perfomance.
* Use Router-on-a-Stick for smaller networks with limited Layer 3 switches.
* Use a Layer 3 Switch for efficient Inter-VLAN routing in larger networks.
* Enable trunking (switchport mode trunk) to allow VLAN traffic between switches.
* Use VLAN Access Control Lists (ACLs) to restrict inter-VLAN communication if needed.