

**COMPUTER NETWORKS LAB**

**LAB 12**

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**Difference Between VLAN and Inter-VLAN Routing**

**1. VLAN (Virtual Local Area Network):**

* **Definition:** A VLAN is a logical grouping of devices in the same broadcast domain, regardless of their physical location. VLANs improve network segmentation, security, and traffic management.
* **Purpose:** Segregate networks logically to isolate traffic and reduce broadcast domains.
* **Key Characteristics:**
  + Devices within the same VLAN can communicate directly.
  + VLANs are identified by VLAN IDs (e.g., VLAN 10, VLAN 20).
  + Traffic is isolated between VLANs unless routing is configured.
* **Example:**  
  Suppose there are two VLANs in an organization:
  + **VLAN 10:** IT Department (Subnet: 192.168.1.0/24).
  + **VLAN 20:** HR Department (Subnet: 192.168.2.0/24).

Devices in VLAN 10 can communicate directly with other devices in VLAN 10, but they cannot communicate with devices in VLAN 20.

**2. Inter-VLAN Routing:**

* **Definition:** Inter-VLAN routing is a process that enables communication between devices located in different VLANs using a Layer 3 device (Router or Layer 3 Switch).
* **Purpose:** Allow traffic to flow between separate VLANs.
* **Key Characteristics:**
  + Requires a Layer 3 device.
  + Uses subinterfaces (Router-on-a-Stick) or Layer 3 switches with SVIs (Switched Virtual Interfaces).
  + Enables inter-department communication in a network.
* **Example:**  
  Continuing from the VLAN example:
  + If a device in VLAN 10 (192.168.1.10) needs to communicate with a device in VLAN 20 (192.168.2.20), Inter-VLAN routing must be configured on a router or Layer 3 switch.

**Comparison Table**

| **Aspect** | **VLAN** | **Inter-VLAN Routing** |
| --- | --- | --- |
| **Definition** | Logical grouping of devices in a single broadcast domain. | Routing traffic between different VLANs. |
| **Communication** | Devices in the same VLAN can communicate. | Enables communication between devices in different VLANs. |
| **Purpose** | Isolate network segments for security and efficiency. | Facilitate inter-VLAN communication. |
| **Devices Required** | Layer 2 switches support VLANs. | Requires Layer 3 device (Router or Layer 3 Switch). |
| **Traffic Isolation** | Broadcast traffic is limited to one VLAN. | Routes traffic between VLANs as needed. |

**Configuration Example**

**Scenario:**

* **VLAN 10:** IT Department (192.168.1.0/24).
* **VLAN 20:** HR Department (192.168.2.0/24).

**Step 1: VLAN Configuration on a Switch**

Create VLANs

Switch(config)# vlan 10

Switch(config-vlan)# name IT

Switch(config-vlan)# exit

Switch(config)# vlan 20

Switch(config-vlan)# name HR

Switch(config-vlan)# exit

Assign Ports to VLANs

Switch(config)# interface GigabitEthernet0/1

Switch(config-if)# switchport mode access

Switch(config-if)# switchport access vlan 10

Switch(config)# interface GigabitEthernet0/2

Switch(config-if)# switchport mode access

Switch(config-if)# switchport access vlan 20

**Step 2: Inter-VLAN Routing on a Router (Router-on-a-Stick)**

Create Subinterfaces for Each VLAN

Router(config)# interface GigabitEthernet0/0.10

Router(config-subif)# encapsulation dot1Q 10

Router(config-subif)# ip address 192.168.1.1 255.255.255.0

Router(config-subif)# exit

Router(config)# interface GigabitEthernet0/0.20

Router(config-subif)# encapsulation dot1Q 20

Router(config-subif)# ip address 192.168.2.1 255.255.255.0

Router(config-subif)# exit

**Step 3: Verify Inter-VLAN Communication**

* **Ping Test from VLAN 10 to VLAN 20:**  
  From a device in VLAN 10 (e.g., 192.168.1.10), ping a device in VLAN 20 (e.g., 192.168.2.20).
* ping 192.168.2.20

**Summary**

* **VLAN:** Segments the network into logical broadcast domains.
* **Inter-VLAN Routing:** Bridges communication between these segmented domains using a Layer 3 device.  
  Both VLANs and Inter-VLAN routing together provide a scalable and secure network solution.