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**Q1:What is difference between “VLAN & Inter-VLAN Routing”, explain with**

**Example (draw structure in cisco)**

### **VLAN (Virtual Local Area Network)**

#### **Explanation:**

A **VLAN (Virtual Local Area Network)** is a logical network that divides a physical network into separate broadcast domains. By segmenting networks into different VLANs, you can isolate network traffic, improve security, and optimize network performance.

* **Purpose of VLANs:**
  + **Traffic Isolation:** Devices in one VLAN cannot communicate with devices in another VLAN unless explicitly allowed.
  + **Security:** VLANs prevent unauthorized access between segments.
  + **Network Segmentation:** VLANs allow network segmentation without additional hardware.

#### **Example:**

Consider a company with multiple departments that share a common switch:

* **VLAN 10:** Assigned to the **HR department** (e.g., PCs connected to switch ports 1-5).
* **VLAN 20:** Assigned to the **Finance department** (e.g., PCs connected to switch ports 6-10).
* **Result:** HR devices communicate only with each other within **VLAN 10**, and Finance devices communicate only with each other within **VLAN 20**.

### **Inter-VLAN Routing**

#### **Explanation:**

**Inter-VLAN Routing** is the process of forwarding traffic between different VLANs through a router or a Layer 3 switch. While VLANs provide segmentation, **Inter-VLAN Routing** allows communication between these segmented VLANs, enabling data exchange while maintaining control and security.

* **Purpose of Inter-VLAN Routing:**
  + **Cross-VLAN Communication:** Enables devices on different VLANs to communicate.
  + **Traffic Control:** Allows more granular control of communication paths.
  + **Network Flexibility:** Facilitates seamless communication without merging VLANs.

#### **Example:**

Continuing from the previous scenario:

* **Router/Layer 3 Switch Configuration:**
  + **Router on a Stick:** A common method using one physical router interface with sub-interfaces for each VLAN (e.g., **sub-interface for VLAN 10** and **sub-interface for VLAN 20**). Each sub-interface handles traffic for its corresponding VLAN.
* **Result:** HR devices in **VLAN 10** can communicate with Finance devices in **VLAN 20** via the router, based on routing rules.

### **Cisco Packet Tracer Network Structures for Demonstration**

#### **1. VLAN Structure Only:**

* **Devices and Setup:**
  + A switch is configured with **VLAN 10** (HR) and **VLAN 20** (Finance).
  + Ports on the switch are assigned to each VLAN.
  + Devices in **VLAN 10** can only communicate with other **VLAN 10** devices.

#### **2. Inter-VLAN Routing:**

* **Devices and Setup:**
  + A router or Layer 3 switch connects to the switch configured with VLANs.
  + The router has **sub-interfaces** for each VLAN, allowing routing between **VLAN 10** and **VLAN 20**.
  + Devices from **VLAN 10** can communicate with devices in **VLAN 20** through the router.

### **Summary of Key Differences**

* **VLAN:** Segments a network into isolated parts; no cross-VLAN communication is allowed unless specifically configured.
* **Inter-VLAN Routing:** Allows communication between different VLANs, facilitating interaction while maintaining logical segmentation.