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

**Definition:**  
A **VLAN** is a logical grouping of devices in a network, segmented by function, department, or any other grouping criteria. It allows for creating broadcast domains within a network, reducing broadcast traffic and improving network security and performance.

**Key Points:**

* **Segmentation**: VLANs divide a physical network into multiple logical networks, where devices in the same VLAN can communicate with each other directly, but devices in different VLANs cannot communicate directly unless routed.
* **Layer 2**: VLANs operate at Layer 2 (Data Link Layer) of the OSI model. Devices in the same VLAN share the same subnet and can communicate via Layer 2 switches.
* **Isolation**: Devices in different VLANs are isolated from each other, even if they are connected to the same physical switch. This isolation is critical for security and management.

**Example:**  
Imagine we have 3 departments in a university:

* **VLAN 10**: Faculty (IP range: 192.168.10.0/24)
* **VLAN 20**: Students (IP range: 192.168.20.0/24)
* **VLAN 30**: Admin (IP range: 192.168.30.0/24)

Each department will have its own VLAN, and devices within each VLAN (e.g., Faculty PCs in VLAN 10) will communicate directly within that VLAN without needing routing.

**2. Inter-VLAN Routing:**

**Definition:**  
**Inter-VLAN Routing** is the process of enabling communication between devices located in different VLANs. Since VLANs are isolated from each other, routing is required to enable communication across VLANs. This is typically done by a **router** or a **Layer 3 switch** that can perform routing between the VLANs.

**Key Points:**

* **Routing Between VLANs**: To allow devices in different VLANs to communicate, we need to route traffic between them using a Layer 3 device (either a router or a Layer 3 switch).
* **Router-on-a-Stick**: This is a common configuration where a router uses a **single physical interface** with subinterfaces to handle routing between VLANs.
* **Layer 3 Switch**: Some switches, called **Layer 3 switches**, can perform inter-VLAN routing directly without requiring a separate router.

**Example:**

* **Router-on-a-Stick**: The router has one physical interface connected to the switch, but it creates **subinterfaces** (e.g., GigabitEthernet0/0.10, GigabitEthernet0/0.20, and GigabitEthernet0/0.30) to handle routing for each VLAN (VLAN 10, VLAN 20, and VLAN 30).
* **Layer 3 Switch**: A Layer 3 switch can route traffic between the VLANs internally without requiring a router.