Inter-VLAN Routing ...

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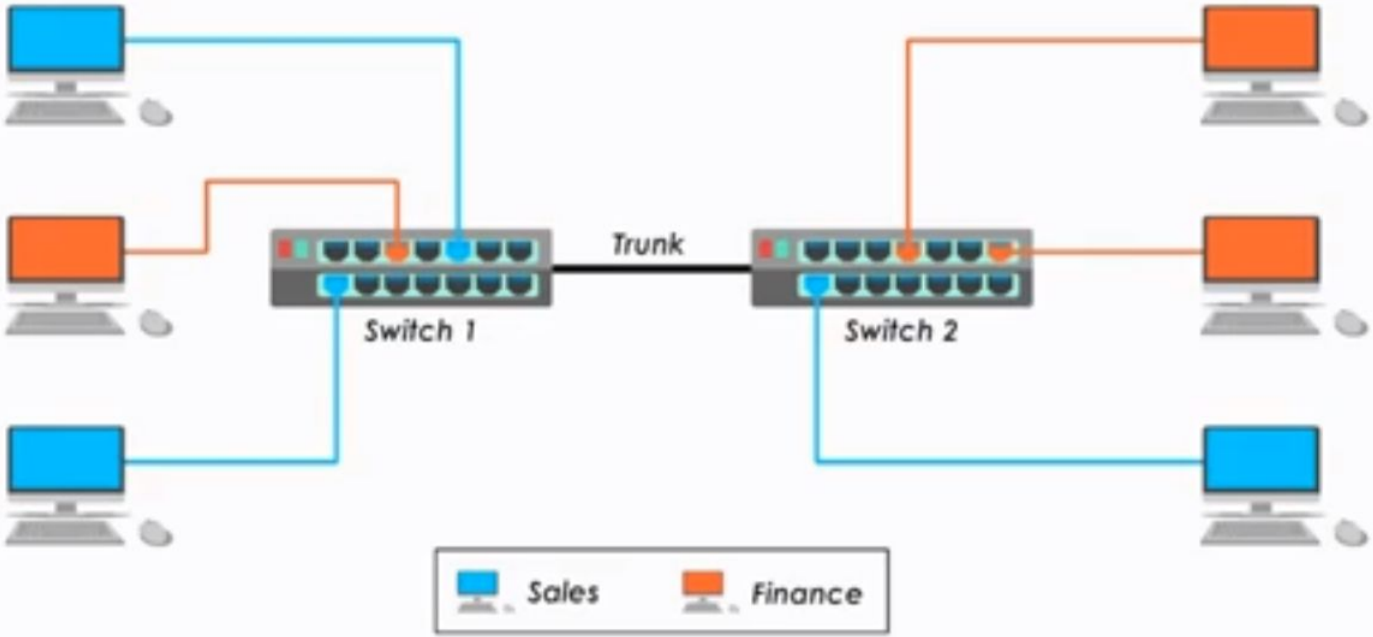
InterVLAN Routing



OVERVIEW

A VLAN is a **broadcast domain**, so computers on **separate VLANs** are unable to communicate without the intervention of a **routing device**

Any device that supports **Layer 3 routing**, such as a router or a multilayer switch (Layer 3 Switch), can be used to perform the necessary routing functionality.

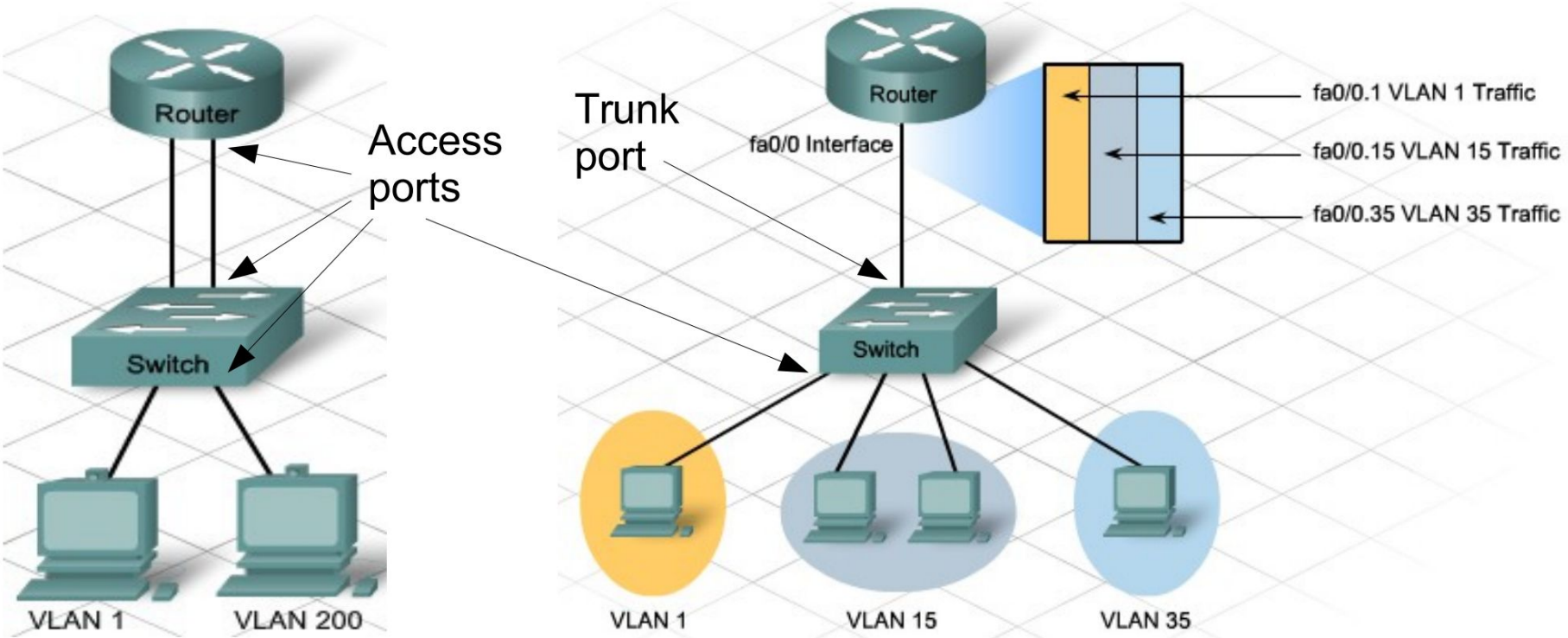
Regardless of the device used, the process of forwarding network traffic from one VLAN to another VLAN using routing is known as **inter-VLAN routing**.

INTER-VLAN ROUTING

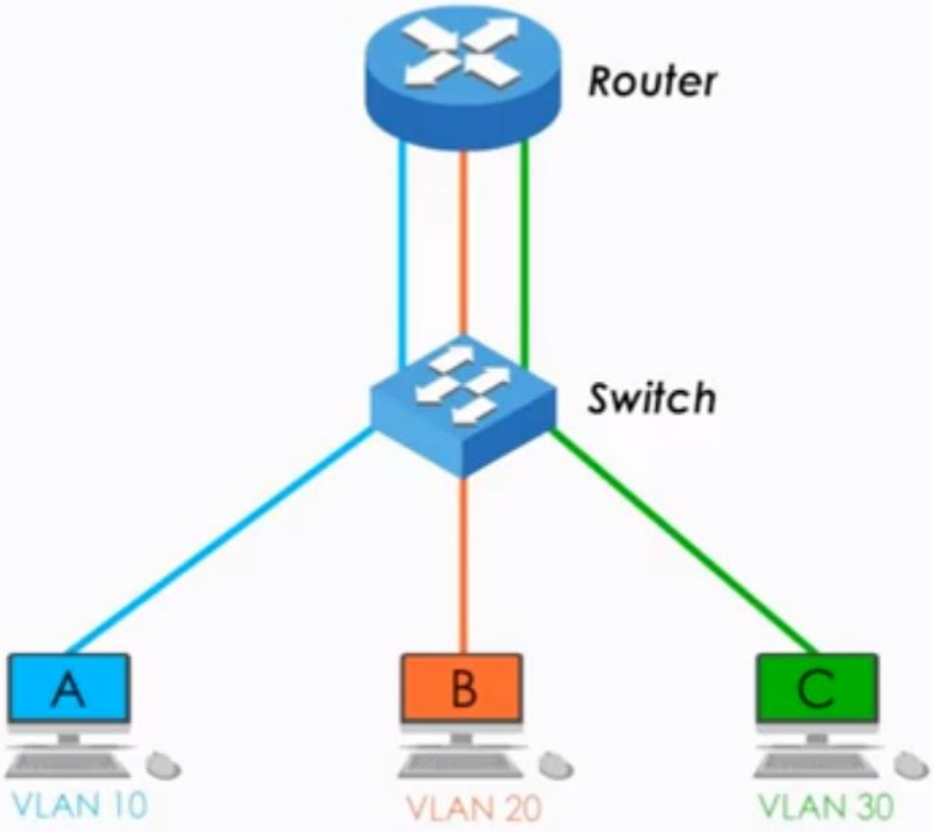
Methods of VLAN Routing

One method requires a **separate interface connection** to the Layer 3 device for each VLAN (legacy inter-VLAN routing)

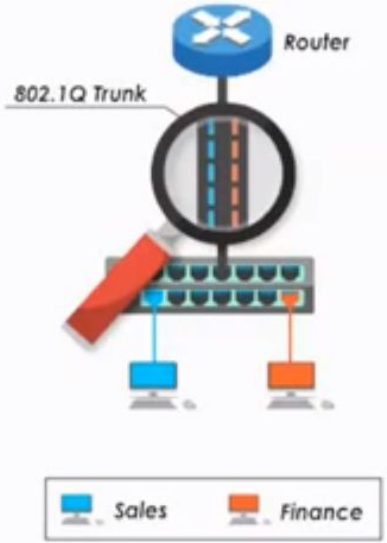
Another method for providing connectivity between different VLANs requires a feature called **subinterfaces and trunk ports (configuration router-on-a-stick)**

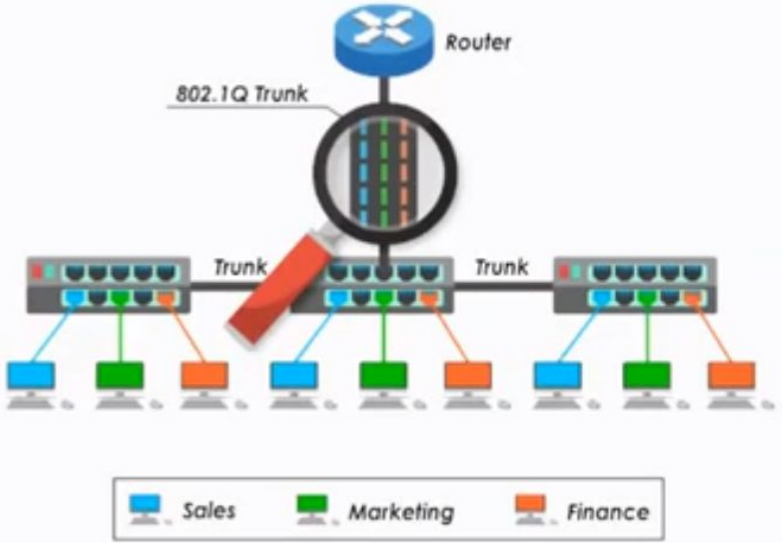

Router
Access
ports
Switch
VLAN 1
VLAN 200
Trunk
port
Router
fa0/0 Interface
fa0/0.1 VLAN 1 Traffic
fa0/0.15 VLAN 15 Traffic
fa0/0.35 VLAN 35 Traffic
Switch
VLAN 1
VLAN 15
VLAN 35

Option 1: Traditional

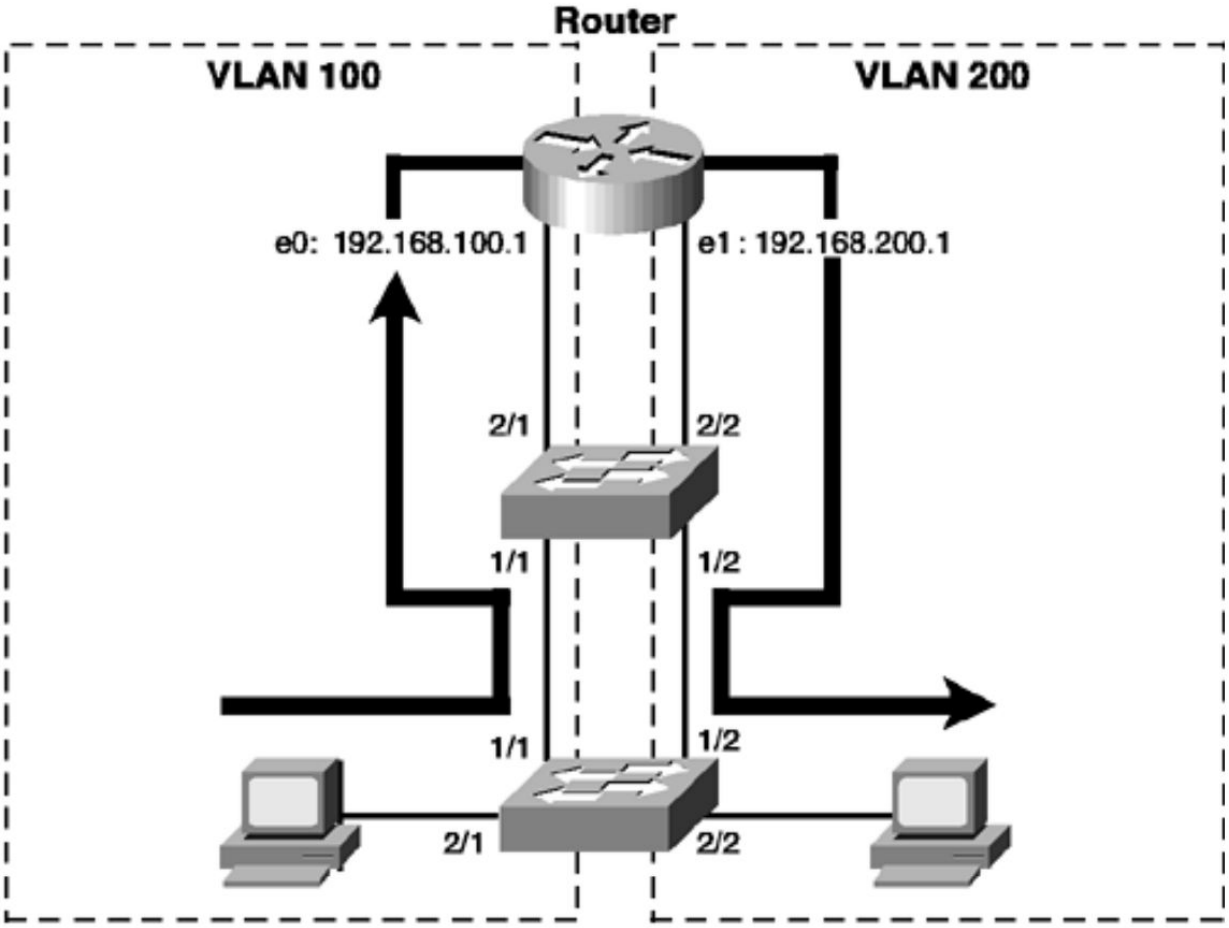


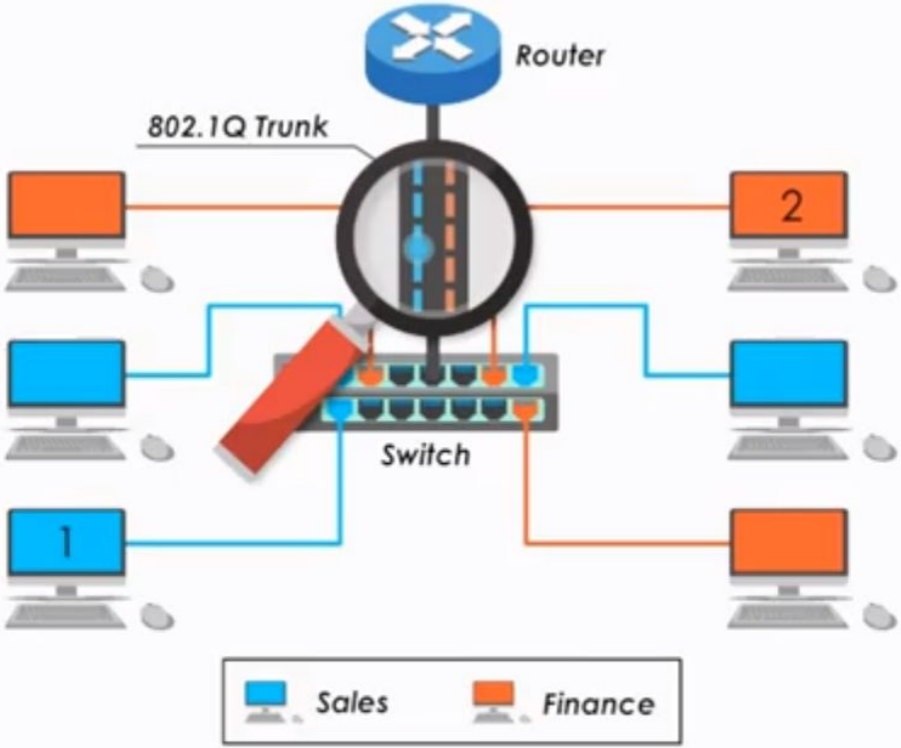
Option 2: Router-on-a-stick





Router-on-a-stick is a setup that consists of a router and a switch,


Router
VLAN 100
VLAN 200
e0: 192.168.100.1
e1 : 192.168.200.1
2/1
2/2
1/1
1/2
1/1
1/2
2/1
2/2


Router
802.1Q Trunk
2
Switch
1
Sales
Finance

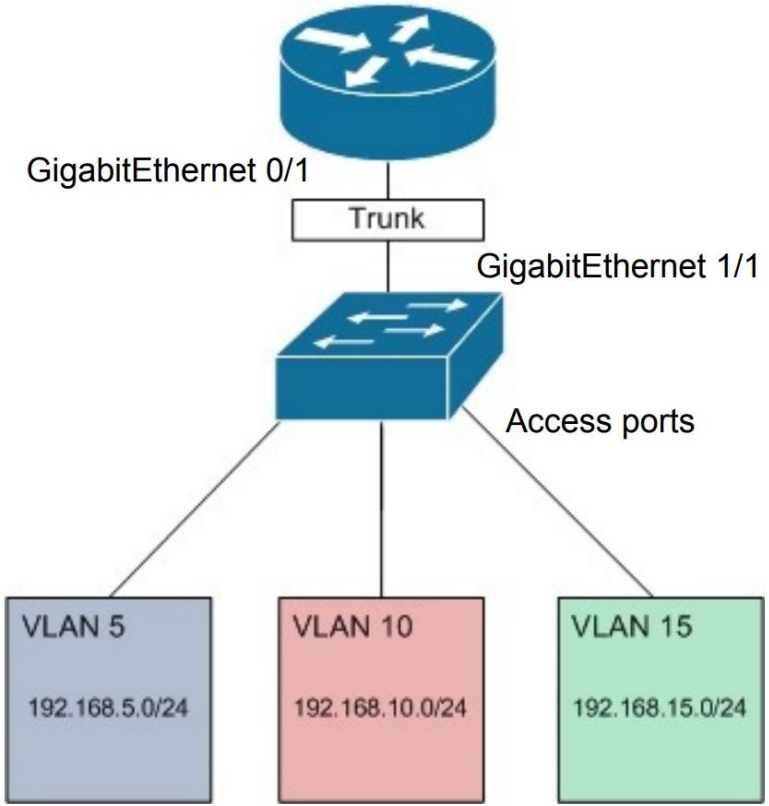
Configure the Switch

- Switch(config)#**vlan 100**
- Switch(config-vlan)#**exit**
- Switch(config)#**vlan 200**
- Switch(config-vlan)#**exit**
- Switch(config)#**interface GigabitEthernet 1/1**
- Switch(config-if)#**switchport access vlan 100**
- Switch(config-if)#**exit**
- Switch(config)#**interface GigabitEthernet 1/2**
- Switch(config-if)#**switchport access vlan 200**
- Switch(config-if)#**exit**
- Switch(config)#**interface FastEthernet 2/1**
- Switch(config-if)#**switchport access vlan 100**
- Switch(config-if)#**exit**
- Switch(config)#**interface FastEthernet 2/2**
- Switch(config-if)#**switchport access vlan 200**
- Switch(config-if)#**exit**

Configure the Router

- Router(config)#**interface GigabitEthernet 0/0**
- Router(config-if)#**ip address 192.168.100.1 255.255.255.0**
- Router(config-if)#**no shutdown**
- Router(config-if)#**exit**
- Router(config)#**interface GigabitEthernet 0/1**
- Router(config-if)#**ip address 192.168.200.1 255.255.255.0**
- Router(config-if)#**no shutdown**
- Router(config-if)#**exit**

Configure Router-on-a-stick



Configure the Switch

- `Switch(config)#vlan 5`
- `Switch(config-vlan)#exit`
- `Switch(config)#vlan 10`
- `Switch(config-vlan)#exit`
- `Switch(config)#vlan 15`
- `Switch(config-vlan)#exit`
- `Switch(config)#interface GigabitEthernet 1/1`
- `Switch(config-if)#switchport mode trunk`
- `Switch(config-if)#exit`

Configure the Router

- On the router, configure a FastEthernet interface with no IP address or subnet mask.
  - `Router(config)#interface ge0/1`
  - `Router(config-if)#no ip address`
  - `Router(config-if)#no shutdown`
- On the router, configure one **subinterface** with an IP address and subnet mask for each VLAN. Each subinterface has an 802.1Q encapsulation.
- For the **VLAN 5**:
  - `Router(config)#interface ge0/1.5`
  - `Router(config-subif)#encapsulation dot1q 5`
  - `Router(config-subif)#ip address 192.168.5.1 255.255.255.0`
  - `Router(config-if)#no shutdown`

Configure the Router

- *For the **VLAN 10**:*
  - `Router(config)#interface ge0/1.10`
  - `Router(config-subif)#encapsulation dot1q 10`
  - `Router(config-subif)#ip address 192.168.10.1 255.255.255.0`
  - `Router(config-if)#no shutdown`
- *For the **VLAN 15:***
  - `Router(config)#interface ge0/1.15`
  - `Router(config-subif)#encapsulation dot1q 15`
  - `Router(config-subif)#ip address 192.168.15.1 255.255.255.0`
  - `Router(config-if)#no shutdown`
- Verify configuration with the commands:
  - `Router#show vlans`
  - `Router#show ip route`
- Test configuration with **ping** and **traceroute**

- Verify the switch access ports are on the correct VLANs
- Verify trunk ports are correctly configured
- The command `show interface` *`interface-id`* `switchport` is useful for identifying VLAN assignment and port configuration issues
- Using the `show interface` and the `show running-config` commands can be useful in troubleshooting router configuration
- Verify router IPs and PC Ips and in the same network wit the same subnet mask

Packet Switching Network

A packet switched network is one of the most commonly used computer networks. It is widely implemented on local networks and the Internet.

A PSN generally works on the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite or the Open Systems Interconnection (OSI) layer. For data to be transmitted over a network, it is first distributed into small packets, which depend on the data's protocol and overall size.

Each packet contains various details, such as a source IP address, destination IP address and unique data and packet identifiers.

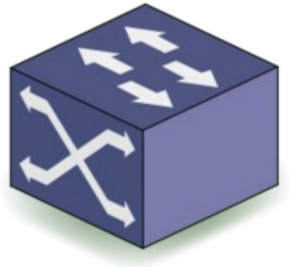
The segregation of data into small packets enables efficient data transportation and better utilization of the network medium/channel. More than one user, application and/or node may take turns sending and receiving data without permanently retaining the underlying medium/channel, as in a circuit switched network.

Layer - 3 SWITCH (Inter-VLAN routing)

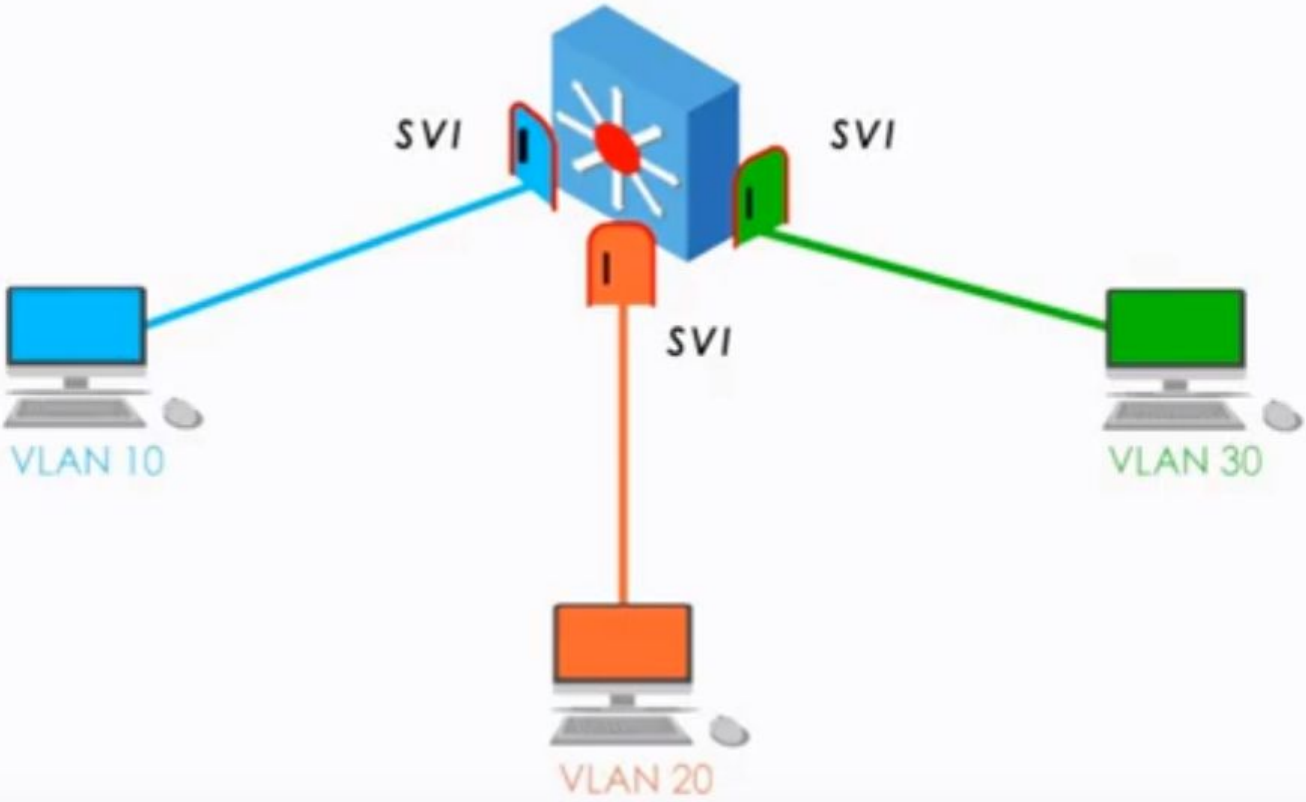
Layer 3 switches usually have **packet-switching** throughputs in the millions of packets per second (pps), whereas traditional routers provide packet switching in the range of 100,000 pps to more than 1 million pps.

- Catalyst 2960 Series switches running IOS Release 12.2(55) or later, support static routing.

- Higher series support more advanced routing features



Option 3: Multilayer Switch InterVLAN Routing



Routed Port VLAN and SVI

A Routed port is a pure Layer 3 interface similar to a physical interface on a Cisco IOS router.

- Unlike an access port, a routed port is not associated with a particular VLAN
- An SVI can be created for any VLAN that exists on the switch.
- An SVI is considered to be virtual because there is no physical port dedicated to the interface.
- It can perform the same functions for the VLAN as a router interface would

Cont...

- Can be configured in much the same way as a router interface (i.e., IP address, inbound/outbound ACLs, etc.).
- The SVI for the VLAN provides Layer 3 processing for packets

Why SVI?

Reasons to configure SVI:

- To provide a gateway for a VLAN so that traffic can be routed into or out of that VLAN
- To provide Layer 3 IP connectivity to the switch
- To support routing protocol and bridging configurations

Advantages of SVIs:

- It is much faster than router-on-a-stick
- No need for external links from the switch to the router for routing.
- Not limited to one link: Layer 2 EtherChannels can be used between the switches to get more bandwidth.
- Latency is much lower, because it does not need to leave the switch.
- The only disadvantage is that multilayer switches are more expensive