

Inter VLAN Routing

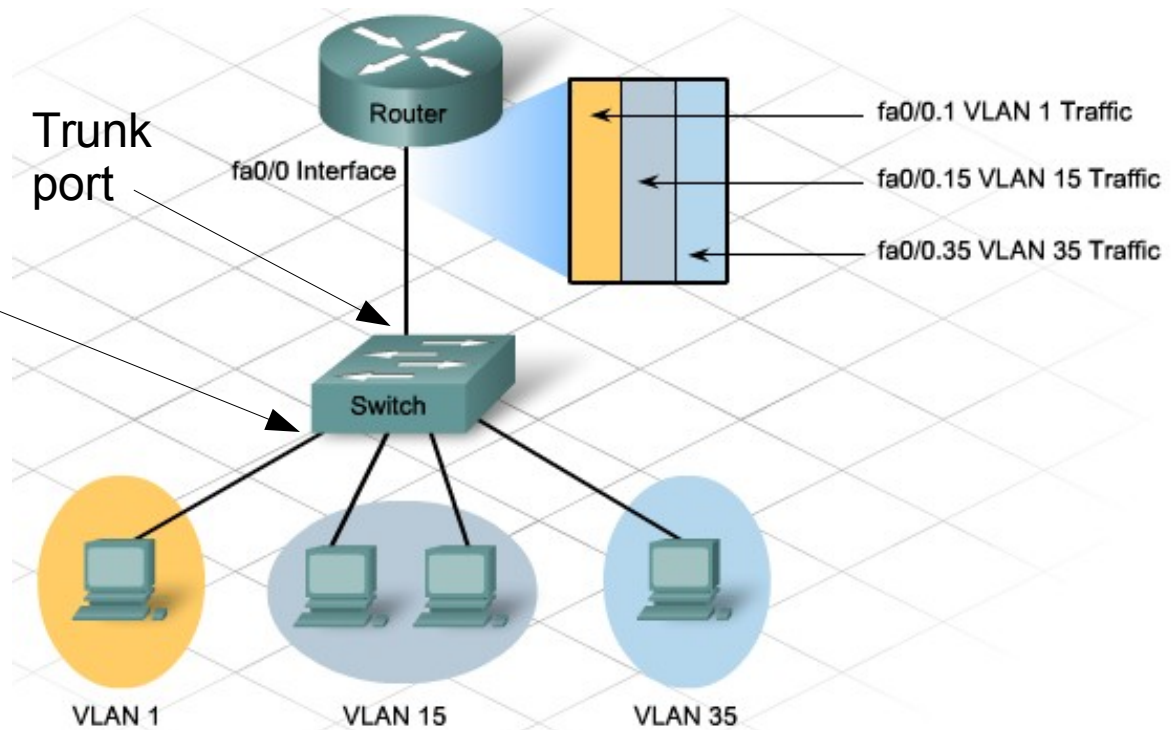
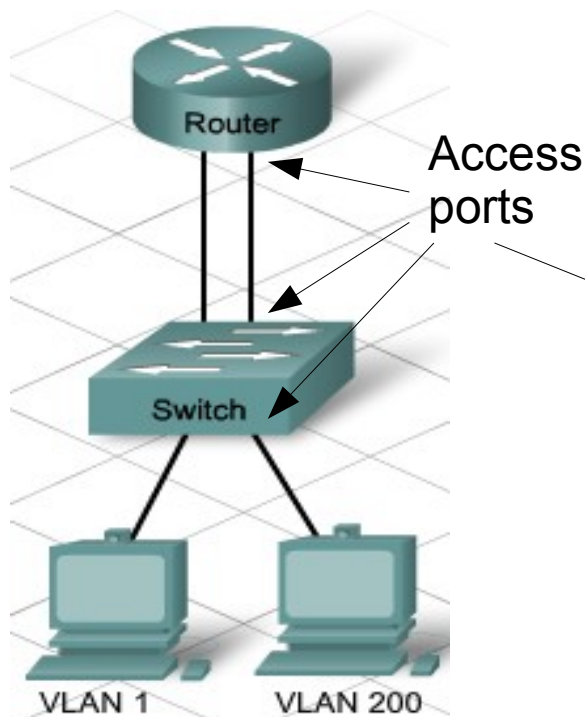
Introducing Routing and Switching in the Enterprise – Chapter 5

Inter-VLAN routing

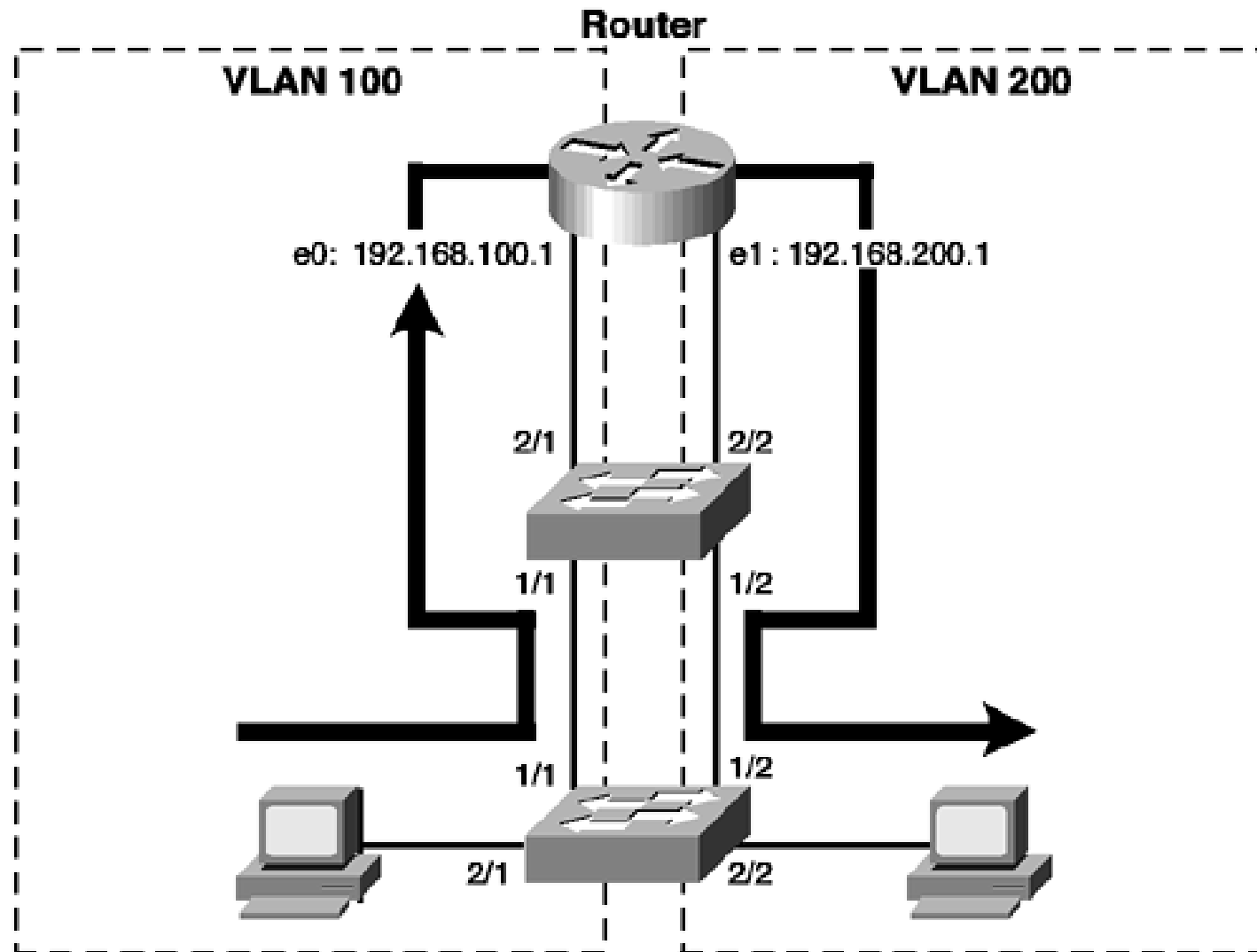
- A **VLAN is a broadcast domain**, so computers on separate VLANs are unable to communicate without the intervention of a routing device.
- Any **device that supports Layer 3 routing**, such as a router or a multilayer switch, can be used to perform the necessary routing functionality.
- Regardless 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

- 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*)



Configure Legacy inter-VLAN routing



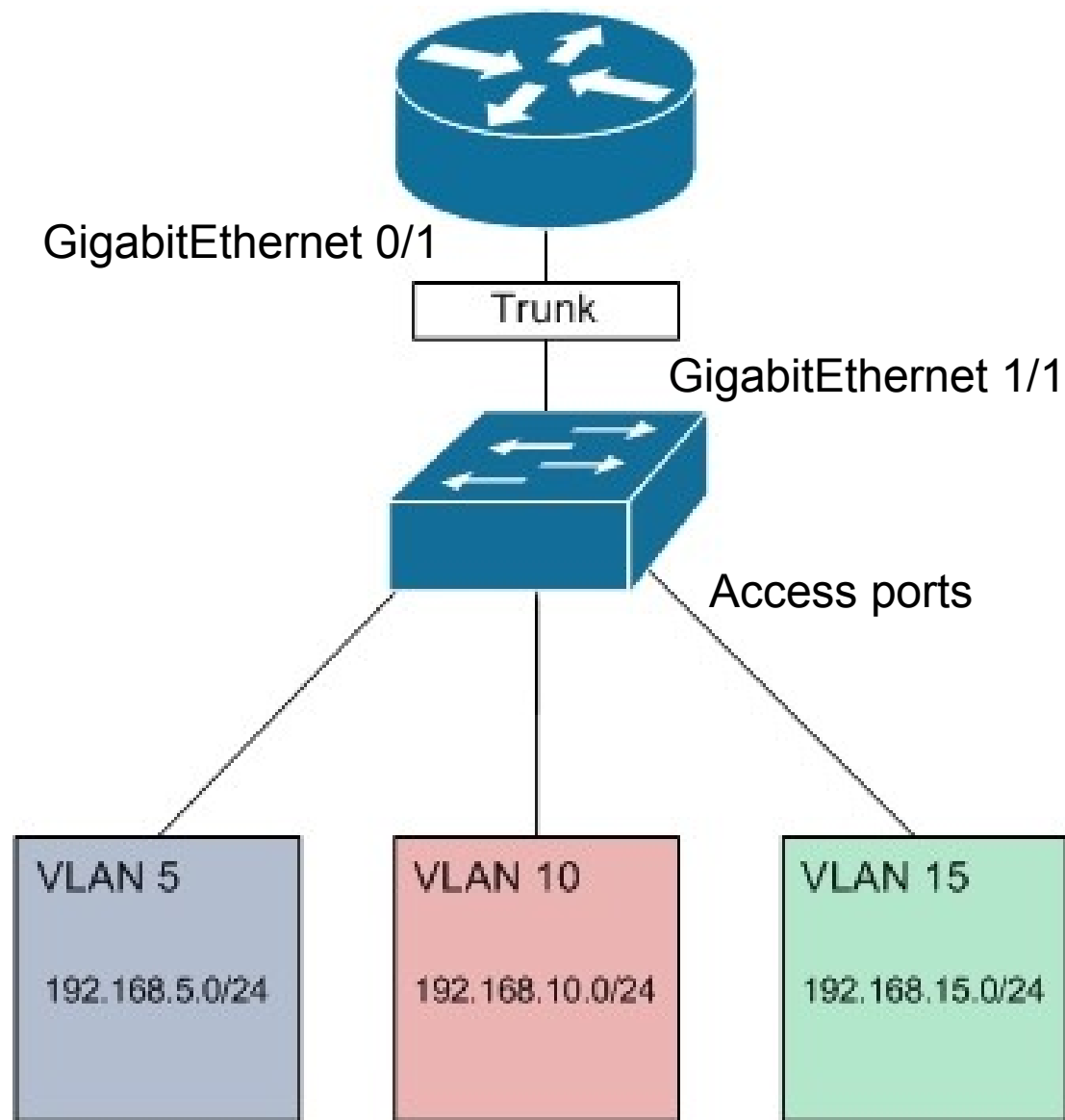
Configure the Switch

- `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

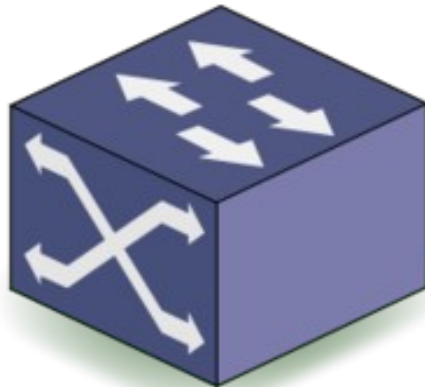
- *For the VLAN 10:*
 - Router(config)#**interface ge0/1.10**
 - Router(config-subif)#**encapsulation dot1q 10**
 - Router(config-subif)#**ip address 192.168.10.1 255.255.255.0**
 - **Router(config-if)#no shutdown**
- *For the VLAN 15:*
 - Router(config)#**interface ge0/1.15**
 - Router(config-subif)#**encapsulation 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**

Troubleshooting

- 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 with the same subnet mask

Layer 3 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



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
- 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

Routed Ports on a Switch

- A routed port behaves like a regular router interface.
- Because Layer 2 functionality has been removed, Layer 2 protocols, such as **STP**, do not function on a routed interface.
- However, some protocols, such as **LACP** and **EtherChannel**, do function at Layer 3.
- Unlike Cisco IOS routers, routed ports on a Cisco IOS switch do not support subinterfaces.
- Routed ports are used for point-to-point links
- Routed ports are mostly configured between switches in the core and distribution layer.
- To configure routed ports, use the **no switchport** interface configuration mode command on the appropriate ports.

Cisco Switch Database Manager

- A Catalyst 2960 switch can function as a Layer 3 device and route between VLANs and a limited number of static routes.
- The Cisco Switch Database Manager (SDM) provides multiple templates for the 2960 switch.
- The templates can be enabled to support specific roles depending on how the switch is used in the network.
- For example, the sdm **lanbase-routing** template can be enabled to allow the switch to route between VLANs and to support static routing.
- The **default** template does not support static routing.
- If IPv6 addressing has been enabled, the template will be **dual-ipv4-and-ipv6 default**.

Manage SDM

- The SDM template can be changed in global configuration mode with the **sdm prefer <template-name>** command
- Use **show sdm prefer** to see the current template and other informations
- IP routing is enabled with the **ip routing** global configuration mode command.
 - The ip routing command is automatically enabled on Cisco routers
- Use **show ip route** to see the configured routes
- Use **ip route <network> <sub-mask> <gateway>** to add a static route

Troubleshooting

- Verify VLAN and assigned ports
- Ensure that ports are in the right VLAN and trunking is working as expected
- Verify each port is correctly in access, trunk or disabled mode
- Verify the SVIs are created with the correct IP address and subnet mask, and enabled
- Verify routing is enabled and static routes are correct
- Verify default gateways on router, switch and hosts

End of lesson