Building Cisco Multilayer Switched Networks (BCMSN)

Inter-VLAN Routing

http://www.INE.com

Layer 2 vs Layer 3 Review

- Layer 2 switches do not do frame modification
  - i.e. "Transparent" bridging
- Implies hosts in a VLAN can only reach MAC's directly in the CAM table
  - i.e. the local broadcast domain
- Layer 3 routers/switches perform layer 2 packet rewrite
  - Remove the layer 2 header and rebuild it
- Implies Inter-VLAN traffic must be routed

Switch to Router w/ Multiple Links

- One solution for Inter-VLAN routing is to use one physical link per VLAN between the layer 2 switch and layer 3 router
- How it works
  - Frames leaves switch on link 1 in VLAN 10
  - Router rewrites frame to MAC in VLAN 20 and sends back on link 2
  - Switch uses CAM of VLAN 20 to reach destination

# Switch to Router w/ Multiple Links Example
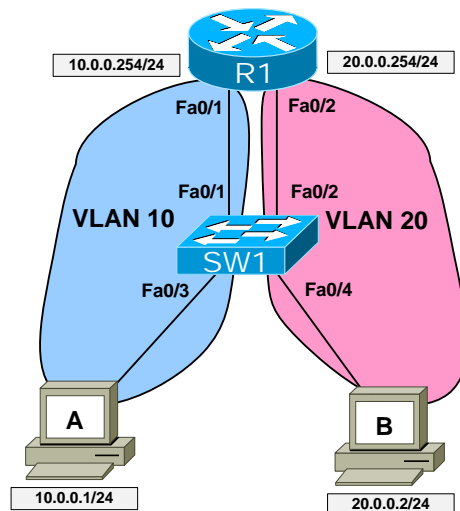
Router-on-a-Stick

- Multiple interfaces work, but not scalable because of port density and cost
- Alternate solution is to use one physical link between layer 2 switch and layer 3 router running as ISL/802.1Q Trunk
- How it works
  - Frame leaves switch on trunk link with VLAN 10 encapsulation
  - Router rewrites frame to MAC in VLAN 20 and sends back on the same trunk link with new encapsulation
  - Switch uses CAM of VLAN 20 to reach destination
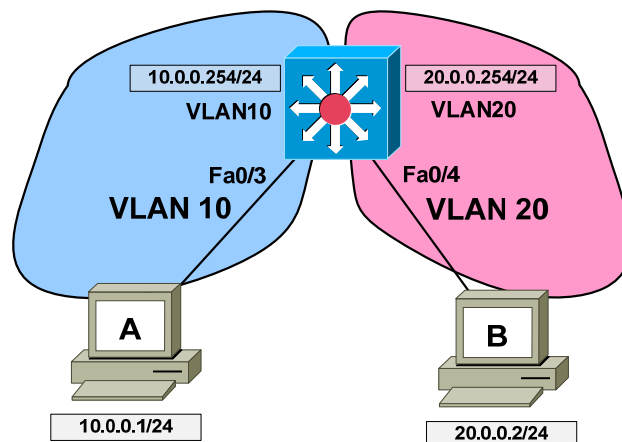
Router-on-a-Stick Example
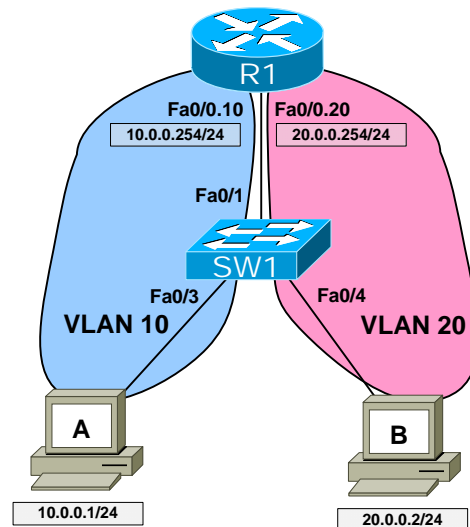
Switched Virtual Interfaces (SVIs)

- Better solution is to combine the layer 2 switch and layer 3 router together
  - i.e. layer 3 switch
- Switch to router communication and rewrite happens on the backplane/fabric
  - e.g RSFC/MSFC
- Implemented as `interface vlan [vlan]` on the layer 3 switch
- Faster, more scalable, and easier to manage

SVIs Example

10.0.0.254/24
VLAN10

20.0.0.254/24
VLAN20

Fa0/3

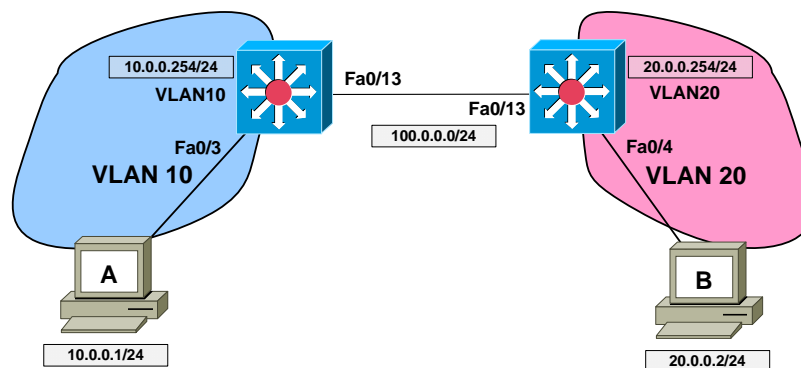Fa0/4

VLAN 10

VLAN 20

A

B

10.0.0.1/24

20.0.0.2/24

Native Layer 3 Routed Ports

- In addition to layer 2 switchports, most layer 3 switches can run ports in native layer 3 routed mode
  - i.e. `no switchport`
- Native layer 3 ports treated just like an Ethernet port on a router
  - IP address assignment, ACLs, QoS, etc.
- Typically used in designs where uplinks are routed
  - Access to distribution layer uplinks
  - Distribution layer to core layer uplinks
- Eliminates STP convergence time
  - Convergence is now a function of layer 3 routing protocol
  - See High Availability Campus Network Design-Routed Access Layer using EIGRP or OSPF for more info

Native Layer 3 Routed Ports Example

Inter-VLAN Routing Q&A