Final Project: Configure Inter-VLAN Routing

Cisco Packet Tracer Network Implementation

1. Project Overview

This project demonstrates the configuration of Inter-VLAN Routing in Cisco Packet Tracer. The network is divided into multiple VLANs to separate departments and management traffic. A router-on-a-stick configuration is used on R1 to provide communication between VLANs. EtherChannel links connect the switches, while DHCP automatically assigns IP addresses to client devices.

2. Network Components

Device	Purpose
R1	Router-on-a-stick and DHCP server
S1	Main switch connected to R1 and distribution switches
S2	Access switch connected through EtherChannel Po1
S3	Access switch connected through EtherChannel Po2
PCs	Client devices assigned to VLANs

3. VLAN and IP Addressing Plan

VLAN	Name	Network	Default Gateway
10	ADMIN	192.168.10.0/24	192.168.10.1
20	FINANCE	192.168.20.0/24	192.168.20.1
30	STUDENT	192.168.30.0/24	192.168.30.1
99	MANAGEMENT	192.168.99.0/24	192.168.99.1

4. Inter-VLAN Routing

R1 uses subinterfaces on GigabitEthernet0/0 for each VLAN. Each subinterface is configured with IEEE 802.1Q encapsulation and the corresponding default gateway address. The connection between R1 GigabitEthernet0/0 and S1 FastEthernet0/24 operates as a trunk and carries VLANs 10, 20, 30, and 99.

5. EtherChannel and Trunking

Two PAgP EtherChannels are configured on S1. Port-channel 1 (Po1) bundles FastEthernet0/1 and FastEthernet0/2 to connect S1 and S2. Port-channel 2 (Po2) bundles FastEthernet0/3 and FastEthernet0/4 to connect S1 and S3. Both EtherChannels operate as Layer 2 trunks and allow VLANs 10, 20, 30, and 99.

6. DHCP Configuration

R1 provides DHCP services for the client VLANs. Separate DHCP pools are configured for the ADMIN, FINANCE, STUDENT, and MANAGEMENT networks. Reserved address ranges protect gateway and infrastructure addresses, while client PCs receive their IP address, subnet mask, default gateway, and DNS server automatically.

7. Switch Management

The switches use VLAN 99 for management. Management addresses are assigned as follows: S1 = 192.168.99.2, S2 = 192.168.99.3, and S3 = 192.168.99.4. The default gateway for the switches is 192.168.99.1.

8. Testing and Verification

The configuration was verified using Cisco IOS show commands and PC connectivity tests. The commands show interfaces trunk and show etherchannel summary confirmed that Po1, Po2, and the router uplink were trunking correctly. The EtherChannel summary showed bundled member ports in use. DHCP testing confirmed that PCs could obtain addresses from the appropriate subnet. Ping tests were used to verify connectivity to the local gateway, between VLANs, and to management devices.

9. Results

The final network successfully provides VLAN segmentation, trunking, PAgP EtherChannel redundancy, router-on-a-stick Inter-VLAN Routing, centralized DHCP addressing, and switch management through VLAN 99. Devices in different VLANs can communicate through R1 while remaining logically separated at Layer 2.

10. Conclusion

This project demonstrates how VLANs can improve network organization and segmentation while Inter-VLAN Routing allows controlled communication between separate networks. The combination of trunk links, EtherChannel, DHCP, and router-on-a-stick provides a practical enterprise-style network design.