

Network Technical Documentation

Inter-VLAN Routing & PAgP EtherChannel Architecture

CONFIGURED BY
Touch Dany

TOPOLOGY PLATFORM
Cisco Packet Tracer

CORE DEVICES
2911 Router / 3560 Switch

1. Technical Overview

This implementation establishes a highly available, multi-VLAN enterprise campus topology using a Cisco 2911 Router, a 3560 Multilayer Core Switch, and two 2960 Access Layer Switches. Key routing and switching protocols include Port Aggregation Protocol (PAgP) EtherChannel for bandwidth aggregation and link redundancy, Router-on-a-Stick (802.1Q Sub-interfaces) for Inter-VLAN routing, and centralized dynamic IP allocation via a Cisco IOS DHCP Server.

2. Network Address Allocation & VLAN Schema

Segment Name	VLAN ID	Subnet Prefix	Gateway IP	Host Interface / Location
Sales	VLAN 10	10.10.10.0/24	10.10.10.1	Laptop0 (Fa0/3 on Left Switch)
Marketing	VLAN 20	20.20.20.0/24	20.20.20.1	Laptop1 (Fa0/7 on Core Switch)
HR	VLAN 30	30.30.30.0/24	30.30.30.1	Laptop2 (Fa0/1 on Right Switch)

3. Device Interconnections & Physical Port Mapping

Core Switch (3560 Multilayer)

- Gig0/1:** Trunk uplink to 2911 Gateway Router interface Gig0/1.
- Fa0/1 - Fa0/2:** 802.1Q Trunk / EtherChannel link to Left Switch (2960).
- Fa0/3 - Fa0/6:** PAgP EtherChannel trunk bundle (Channel Group 1) to Right Switch.
- Fa0/7:** Access port assigned directly to VLAN 20 (Laptop1).

Left Switch (2960 Access Switch)

- Fa0/1 - Fa0/2:** Trunk link to Multilayer Core Switch.
- Fa0/3:** Access port assigned to VLAN 10 (Laptop0).

Right Switch (2960 Access Switch)

- Fa0/3 - Fa0/6:** PAgP EtherChannel bundle configured in auto/desirable mode.
- Fa0/1:** Access port assigned to VLAN 30 (Laptop2).

4. Cisco Device Configuration Commands

1. Multilayer Switch Setup (VLANs & PAgP EtherChannel)

```
Switch> enable
Switch# configure terminal
Switch(config)# hostname Core-Switch

! Create Core VLANs
Core-Switch(config)# vlan 10
Core-Switch(config-vlan)# name Sales
Core-Switch(config-vlan)# vlan 20
Core-Switch(config-vlan)# name Marketing
Core-Switch(config-vlan)# vlan 30
Core-Switch(config-vlan)# name HR
Core-Switch(config-vlan)# exit

! Configure Local Access Port for Laptop1
Core-Switch(config)# interface FastEthernet0/7
Core-Switch(config-if)# switchport mode access
Core-Switch(config-if)# switchport access vlan 20
Core-Switch(config-if)# exit

! Configure PAgP EtherChannel Bundle to Right Switch
Core-Switch(config)# interface range FastEthernet0/3 - 6
Core-Switch(config-if-range)# switchport mode trunk
Core-Switch(config-if-range)# channel-protocol pagp
Core-Switch(config-if-range)# channel-group 1 mode desirable
Core-Switch(config-if-range)# exit
```

2. Gateway Router Setup (Inter-VLAN Routing & DHCP Server)

```
Router> enable
Router# configure terminal
Router(config)# hostname Gateway-Router

! Enable Main Trunk Interface
Router(config)# interface GigabitEthernet0/1
Router(config-if)# no shutdown
Router(config-if)# exit

! Sub-interface for VLAN 10
Router(config)# interface GigabitEthernet0/1.10
Router(config-subif)# encapsulation dot1Q 10
Router(config-subif)# ip address 10.10.10.1 255.255.255.0

! Sub-interface for VLAN 20
Router(config)# interface GigabitEthernet0/1.20
Router(config-subif)# encapsulation dot1Q 20
Router(config-subif)# ip address 20.20.20.1 255.255.255.0

! Sub-interface for VLAN 30
Router(config)# interface GigabitEthernet0/1.30
Router(config-subif)# encapsulation dot1Q 30
Router(config-subif)# ip address 30.30.30.1 255.255.255.0
Router(config-subif)# exit

! Configure Dynamic IP Pools
```

```
Router(config)# ip dhcp pool VLAN10_POOL
Router(dhcp-config)# network 10.10.10.0 255.255.255.0
Router(dhcp-config)# default-router 10.10.10.1

Router(config)# ip dhcp pool VLAN20_POOL
Router(dhcp-config)# network 20.20.20.0 255.255.255.0
Router(dhcp-config)# default-router 20.20.20.1

Router(config)# ip dhcp pool VLAN30_POOL
Router(dhcp-config)# network 30.30.30.0 255.255.255.0
Router(dhcp-config)# default-router 30.30.30.1
```

5. Verification & Testing Commands

- **show ip interface brief** — Verify operational status of sub-interfaces on Gateway-Router.
- **show etherchannel summary** — Confirm active status of PAgP bundling (SU / P state) across switches.
- **show vlan brief** — Validate VLAN database and port assignments.
- **ping 30.30.30.2** — Confirm end-to-end routing between distinct VLAN subnets from Laptop0.