# Inter-VLAN Routing Lab Summary

## 📈 Overview

This lab demonstrates the implementation of Inter-VLAN Routing using a router-on-a-stick setup. The objective was to allow communication between multiple departments segmented by VLANs, using subinterfaces on a router to route traffic across VLANs. This simulation reflects a real-world enterprise environment with proper VLAN segregation and routing through a central Layer 3 device.

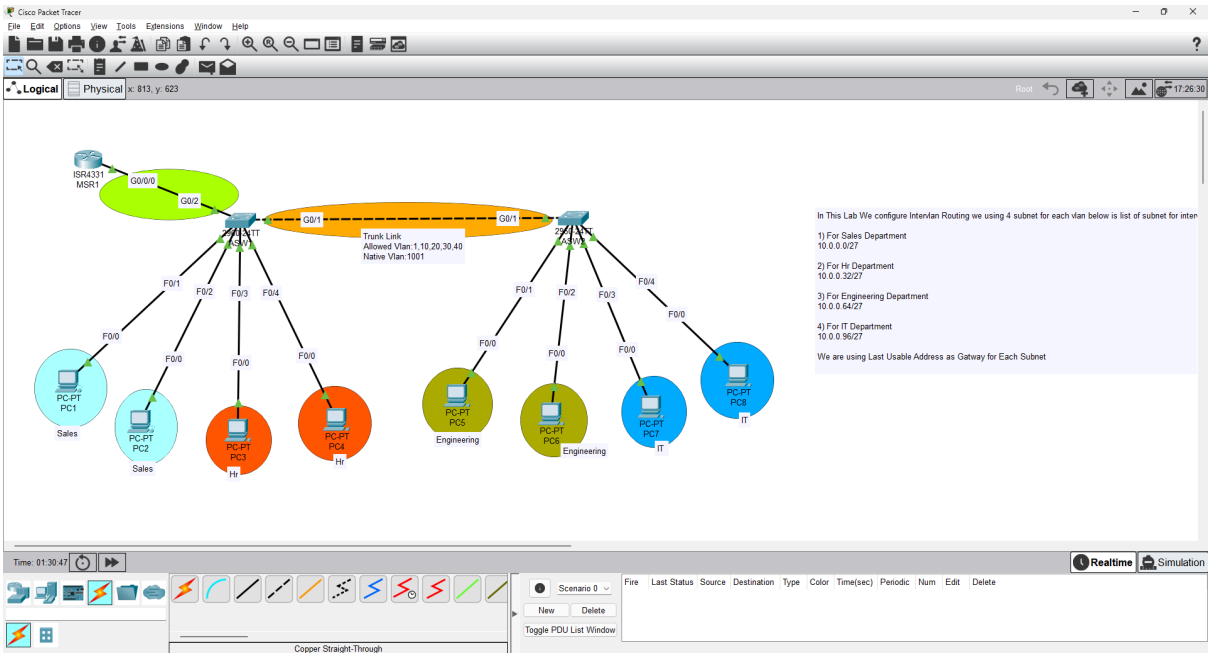
## 🛠️ Network Design

### Devices Used:

- Cisco ISR Router (MSR1)
- 2 x Layer 2 Switches (Cisco 2960)
- 8 PCs representing 4 departments

### Topology:

- Switch 1 (SW1) connects to PCs for Sales and HR
- Switch 2 (SW2) connects to PCs for Engineering and IT
- Gig0/1 on both switches forms a trunk link
- Router interface G0/2 is connected to SW1 for routing



## 🔸 VLAN Assignments & Subnets

Each department is assigned a unique VLAN and /27 subnet. The last usable IP in each subnet serves as the default gateway:

| Department | VLAN ID | Subnet | Gateway (Last Usable IP) |
|---|---|---|---|
| Sales | 10 | 10.0.0.0/27 | 10.0.0.30 |
| HR | 20 | 10.0.0.32/27 | 10.0.0.62 |
| Engineering | 30 | 10.0.0.64/27 | 10.0.0.94 |
| IT | 40 | 10.0.0.96/27 | 10.0.0.126 |

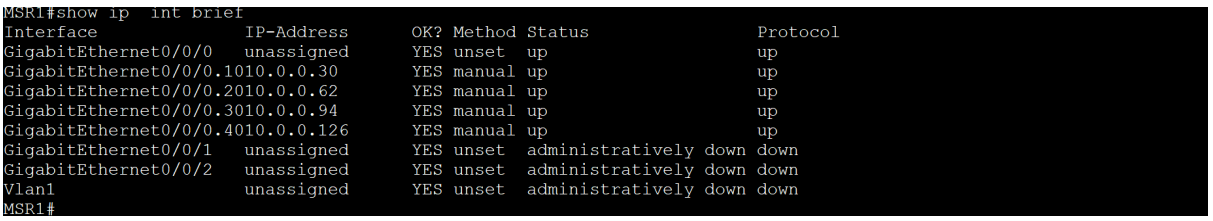
## 📊 Router Configuration (Router-on-a-Stick)

```
interface Gig0/0/0.10
 encapsulation dot1Q 10
 ip address 10.0.0.30 255.255.255.224

interface Gig0/0/0.20
 encapsulation dot1Q 20
 ip address 10.0.0.62 255.255.255.224

interface Gig0/0/0.30
 encapsulation dot1Q 30
 ip address 10.0.0.94 255.255.255.224

interface Gig0/0/0.40
 encapsulation dot1Q 40
 ip address 10.0.0.126 255.255.255.224
```



## 🔒 Security & Best Practices

- Trunk link configured with allowed VLANs only
- Native VLAN set to 1001, an unused VLAN for added security
- Access ports statically assigned per VLAN to avoid DTP risks
- Subnetting used to limit broadcast domains and improve control

## 🔍 Testing & Verification

To verify connectivity and proper configuration:

```
# On switches
show vlan brief
show interfaces trunk

# On router
ping 10.0.0.1  # From a different VLAN to test inter-VLAN reachability
show ip interface brief
```

### 🌟 Outcome

The implementation of router-on-a-stick inter-VLAN routing allowed seamless communication between VLANs, proving the effectiveness of subinterface-based Layer 3 routing. This design reflects a scalable model for enterprise networks with improved security, manageability, and performance.