

Mega Lab - SVI

Project Overview:

This is a comprehensive network simulation lab inspired by the **CCNA 200-301 curriculum**. It replicates a real-world enterprise network using VLAN segmentation, dynamic routing, Layer 2 redundancy, and centralized IP addressing using DHCP. Built using Cisco tools (like **Packet Tracer**), the lab emphasizes practical implementation of key Layer 2 & Layer 3 technologies.

Learning Objectives:

- Design a scalable and segmented enterprise network.
- Implement key CCNA concepts such as VLANs, SVI, DHCP, and OSPF.
- Understand how real-world networks function using dynamic protocols.
- Build troubleshooting and configuration skills through simulation.

Lab Components:

- Multiple Layer 2 and Layer 3 Switches
- Cisco Routers
- DHCP Server
- End Devices (PCs/Clients)
- Simulated Internet Connection
- VLAN-configured segments

Technologies Used:

Technology	Purpose
VLANs	Logical segmentation of network traffic
SVI (Switch Virtual Interface)	Enable inter-VLAN routing on Layer 3 switches
STP (Spanning Tree Protocol)	Prevent Layer 2 switching loops and define Root Bridge
EtherChannel (Port Channel)	Combine multiple physical links between switches
DHCP with Multiple Pools	Automatically assign IP addresses to each VLAN
DHCP Relay Agent	Forward DHCP requests across routers
OSPF Multi-Area	Dynamic Layer 3 routing with multiple OSPF areas

Implementation Steps:

1. Configure VLANs on all access and distribution switches.
2. Enable **SVI** on multilayer switches for inter-VLAN routing.
3. Configure **STP** and define the **Root Bridge**.
4. Aggregate links using **EtherChannel** (LACP or PAgP).
5. Set up a **DHCP server** with pools for each VLAN.
6. Enable **DHCP Relay** on routers to support remote VLANs.
7. Configure **OSPF Multi-Area** to manage routing between routers.
8. Verify connectivity using ping, traceroute, and show commands.

Outcomes:

Successfully simulated an enterprise-level Layer 2/3 network.
VLANs function with proper segmentation and IP assignment.
Inter-VLAN routing via SVI is functional.
Redundancy and load balancing achieved via STP and EtherChannel.
OSPF routes propagate correctly across multiple areas.
Full end-to-end connectivity across all network segments.

