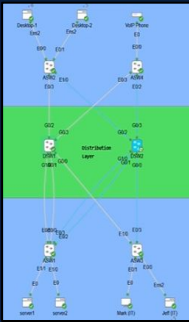


Cisco-based Enterprise Network Topologies



Problem

With growing network complexity in enterprise environments, there is a critical need for simulation-based learning to validate designs and configurations. Traditional command-line-only methods can be time-consuming and error-prone for new learners. Platforms like Cisco Modeling Labs (CML) offer a visual, controlled, and reproducible environment for mastering real-world networking tasks efficiently.

Current System

Configuring complex topologies manually across physical devices is resource-intensive and not scalable for iterative testing. CML provides a GUI-based interface with topology templates, packet tracing, and automation support, making it ideal for simulating multi-protocol network environments such as STP, HSRP, routing, and automation tools like Ansible.

Requirement

- CML environment with licensed Cisco images
- Three distinct labs:
 - Lab 1: MST, VLANs, trunks, EtherChannel, SVIs, HSRP
 - Lab 2: OSPF, EIGRP, eBGP, PBR, NAT, PAT
 - Lab 3: Ansible-based automation targeting Cisco routers and switches
- Support for Layer 2 and Layer 3 simulation
- Automation framework integration

System Design

1. Build logical topology in CML for each lab
2. Configure initial device templates (routers, switches)
3. Implement required features for each lab
4. Validate connectivity and failover scenarios
5. Automate selected configurations using Ansible in Lab 3

Object Design

- Topology Modules: Separate visual workspaces for Labs 1-3
- Routing Module: Implements OSPF, EIGRP, eBGP per design
- HA Module: Includes HSRP failover verification
- Automation Module: Pushes config using Ansible playbooks

Implementation

- Deployed all labs in CML v2 on Ubuntu host
- Verified MST and EtherChannel in Lab 1
- Configured and tested routing protocols in Lab 2 with redistribution
- Built inventory and playbooks in Lab 3 for switches and routers configuration
- Validated output and connectivity through automated Ansible runs

Verification

- Confirmed VLAN trunking and HSRP failover via CML console logs
- Used ping and traceroute to validate routing paths in Lab 2
- Captured Ansible logs and config states before/after deployment
- Compared CLI outputs across all devices to expected configurations

Summary

Cisco Modeling Labs is a robust and flexible platform for simulating complex network environments. Across three labs, this project demonstrated practical implementations of Layer 2 switching, dynamic routing, NAT, and automation. CML's ease of use, visual layout, and integration with tools like Ansible make it an essential resource for both learning and validating enterprise-grade network designs.

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