Departmental Network Design Lab Report: VLANs, Routing, and Security

Group B

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ITI-Cybersecurity-Summer-2025

July 19, 2025

Objectives

- Segment the network using VLANs per department and floor.
- Perform Inter-VLAN routing using a Layer 3 switch.
- Use EtherChannel for link redundancy and load balancing.
- Apply Spanning Tree Protocol (STP) to avoid switching loops.
- Configure OSPF for dynamic routing between switches.
- Add static routing to reach a remote server.
- Enhance security using passwords and interface descriptions.

1. VLANs and Inter-VLAN Routing

1.1 Network Topology Overview

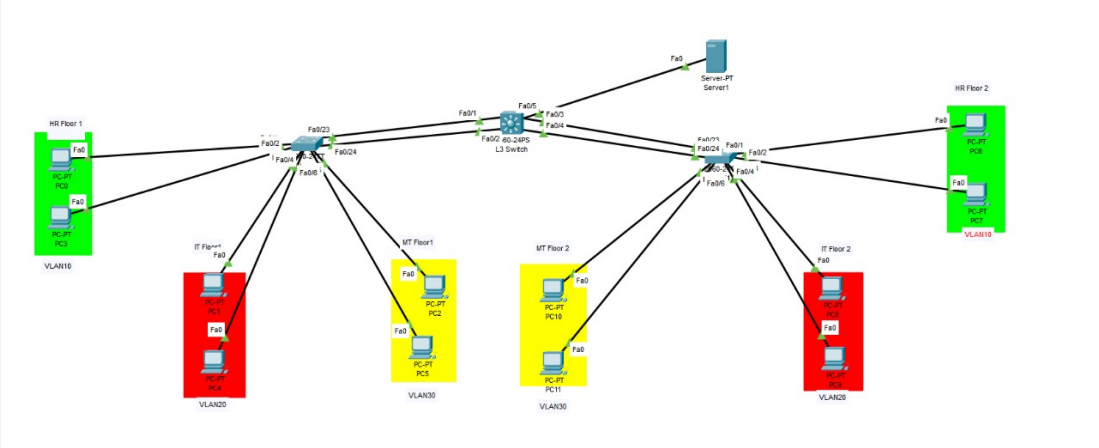

Figure 1: Overall Network Topology with VLAN Distribution

1.2 VLAN Configuration

This section shows VLAN IDs, names, and interface assignments.

```
FastEthernet0/5 is up, line protocol is up
  Internet address is 192.168.100.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.100.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Vlan10 is up, line protocol is up
  Internet address is 192.168.10.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.10.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Vlan20 is up, line protocol is up
  Internet address is 192.168.20.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.20.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
  Index 3/3, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Vlan30 is up, line protocol is up
  Internet address is 192.168.30.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.30.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
  Index 4/4, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
```

Figure 2: VLANs and Interface Assignments

Explanation:

- VLAN10 – HR Dept (Green)
- VLAN20 – IT Dept (Red)

- VLAN30 – MT Dept (Yellow)
- Each access port is assigned to the correct VLAN based on the department.
- SVIs (Switched Virtual Interfaces) configured for inter-VLAN communication.

2. EtherChannel and STP

2.1 Port Channel Configuration

```
Number of channel-groups in use: 2
Number of aggregators:           2

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-------------------

1      Po1(SU)           LACP   Fa0/1(P) Fa0/2(P)
2      Po2(SU)           LACP   Fa0/3(P) Fa0/4(P)
```

Figure 3: EtherChannel Group Configuration

Explanation:

- EtherChannel is configured using LACP (mode active).
- Multiple interfaces grouped into channel-group 1 and 2.
- STP is used to elect a root bridge and block redundant paths.

3. OSPF and Static Routing

3.1 OSPF Summary

```
Routing Process "ospf 1" with ID 1.1.1.1
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
   Area BACKBONE(0)
       Number of interfaces in this area is 4
       Area has no authentication
       SPF algorithm executed 1 times
       Area ranges are
       Number of LSA 1. Checksum Sum 0x00ebe2
       Number of opaque link LSA 0. Checksum Sum 0x000000
       Number of DCbitless LSA 0
       Number of indication LSA 0
       Number of DoNotAge LSA 0
       Flood list length 0
```

Figure 4: OSPF Routing Process Summary

Key Details:

- Router ID: 1.1.1.1
- OSPF Area: 0 (Backbone)
- 4 interfaces included in OSPF
- SPF algorithm executed successfully

3.2 Static Routing

Static route configured to reach a server in another subnet.

```
ip route 192.168.100.0 255.255.255.0 192.168.1.1
```

4. Network Security

Implemented Security Measures:

- Console and VTY lines secured with passwords.

- Interface descriptions added for documentation.
- SSH optionally enabled for secure remote access.

Example Config:

```
! Console security
line console 0
 password cisco
 login

! VTY and SSH
line vty 0 4
 password cisco
 login
 transport input ssh

! Enable password
enable secret class

! Interface Descriptions
interface fa0/1
 description HR-PC1
```

— End of Lab Report —