Segmented Enterprise LAN

Type: VLAN Segmentation | Inter-VLAN Routing | ACL Enforcement
Platform: Cisco 2960 Switches | Cisco 2900 Router | Packet Tracer

Objective

Design and implement a segmented enterprise LAN supporting multiple departments using VLAN isolation, 802.1Q trunking, router-on-a-stick inter-VLAN routing, and extended ACL-based traffic control while ensuring loop-free Layer 2 switching.

Network Design

VLAN Structure

- VLAN 10 – HR (192.168.10.0/24)
- VLAN 20 – Finance (192.168.20.0/24)
- VLAN 30 – IT (192.168.30.0/24)

Topology

- 2 Layer 2 switches (access + distribution behavior)
- 1 Router configured for subinterface-based routing
- 6 PCs with static IPs per VLAN subnet validating inter-VLAN routing and ACL enforcement
- 802.1Q trunk links between switches and router

Implementation

VLAN Segmentation

- Created VLANs on both switches
- Assigned departmental endpoints to dedicated access ports
- Verified configuration using `show vlan brief`

802.1Q Trunking

- Configured trunk links SW1 between SW2, and SW1 between R1
- Confirmed encapsulation and VLAN propagation via `show interfaces trunk`

Inter-VLAN Routing (Router-on-a-Stick)

- Configured subinterfaces:
    - G0/0.10 to 192.168.10.1
    - G0/0.20 to 192.168.20.1
    - G0/0.30 to 192.168.30.1
- Verified operational state (`up/up`) using `show ip interface brief`
- Validated cross-VLAN communication through successful ping testing

Access Control (Extended ACL)

- Implemented ACL 100 to block HR (VLAN 10) from accessing Finance (VLAN 20)
- Applied inbound on G0/0.10
- Verified:
    - HR to Finance traffic denied
    - HR to IT traffic permitted
- Confirmed match counters using `show access-lists`

Spanning Tree Verification

- Verified STP root bridge election
- Confirmed VLAN participation and forwarding state
- Ensured loop-free Layer 2 topology

Validation

- VLAN assignment and trunk forwarding verified
- Router subinterfaces active with inter-VLAN routing confirmed
- Inter-VLAN communication and ACL enforcement validated (permit/deny behavior)
- Control-plane stability confirmed via STP