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Secure Office Network with VLANs, Inter-VLAN Routing & ACLs

Problem Statement / Use Case:

Flat networks allow unrestricted communication between all devices, which leads to potential security risks and inefficient traffic management. This project simulates a secure small-office network using VLANs and ACLs to enforce segmentation and access control between departments

Project Objectives:

Design a logical office network in Cisco Packet Tracer

Implement VLANs to segment departments (HR, IT, Sales)

Configure Inter-VLAN routing using Router-on-a-Stick

Apply ACLs to restrict communication between VLANs

Validate ACL impact using logical ping and connectivity tests

Tools & Technologies Used:

1)Cisco Packet Tracer : Network design, VLAN setup, ACL simulation

Methodology / Implementation Steps:

1. Topology Design

3 PCs (1 each in HR, IT, Sales)

3 Switches connected to 1 Router

VLAN 10 – HR | VLAN 20 – IT | VLAN 30 – Sales

2. VLAN Configuration

Assign ports to respective VLANs on each switch\

Set trunk links between switches and the router

3. Router-on-a-Stick Setup

Create router subinterfaces for each VLAN

Assign appropriate gateway IPs (e.g., 192.168.10.1, 192.168.20.1…)

4. Static IP Addressing

Assign each PC an IP in its VLAN subnet

Test inter-VLAN communication (it should work initially)

5. Access Control Lists (ACLs)

Create ACL to deny IT (192.168.20.0/24) from accessing HR (192.168.10.0/24)

Apply the ACL to the router interface towards VLAN 10

6. Testing & Validation

Ping tests from IT → HR (should fail)

Ping tests from HR → IT (should succeed if ACL is one-way)

Test between Sales and others (should succeed)

Expected Outcome:

Upon successful configuration and testing:

- **Communication within VLANs:** Devices within the same department (e.g., HR PC to another HR PC) will communicate successfully.

- **Inter-VLAN Communication:** Devices in different departments will generally be able to communicate with each other, demonstrating the inter-VLAN routing is functional.

- **Unrestricted Paths:** All other permitted communication paths, such as Sales communicating with HR or IT, will remain open.

This outcome demonstrates the network's logical segmentation and the successful implementation of a critical security access control policy.