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**Report: Design and Implementation of an Extended University Network with Cisco Packet Tracer**

**1. Project Objective:**

The goal of this project is to design a scalable and efficient network topology for a university comprising four academic buildings and one administrative building. The network incorporates VLANs, OSPF routing, and security measures to ensure proper segmentation and controlled communication.

**2. Network Topology Description:**

**University Structure:**

* **Academic Buildings:** A, B, C, D (4 floors each).
* **Administrative Building:** Central hub for administration, HR, and finance.

**Network Design:**

* Each floor in academic buildings has its own router and switch for VLANs and inter-VLAN routing.
* A central router connects all buildings.
* VLANs are configured for professors, students, visitors (academic buildings), and administrators, finance, and HR (administrative building).

**IP Addressing Scheme:** Using VLSM:

* Academic Building A: 192.168.1.0/24
* Academic Building B: 192.168.2.0/24
* Academic Building C: 192.168.3.0/24
* Academic Building D: 192.168.4.0/24
* Administrative Building: 192.168.5.0/24

**3. Technical Configuration:**

**Router Configuration Commands:**

**Step 1: Enable OSPF on Routers**

Router(config)# router ospf 1

Router(config-router)# network 192.168.0.0 0.0.255.255 area 0

Router(config-router)# exit

**Step 2: Configure Inter-VLAN Routing**

Router(config)# interface g0/0

Router(config-if)# no shutdown

Router(config-if)# interface g0/0.10

Router(config-if)# encapsulation dot1Q 10

Router(config-if)# ip address 192.168.1.1 255.255.255.0

Router(config-if)# exit

Router(config)# interface g0/0.20

Router(config-if)# encapsulation dot1Q 20

Router(config-if)# ip address 192.168.2.1 255.255.255.0

Router(config-if)# exit

**Step 3: Configure OSPF for Connectivity Between Routers**

Router(config)# router ospf 1

Router(config-router)# network 192.168.1.0 0.0.0.255 area 0

Router(config-router)# network 192.168.2.0 0.0.0.255 area 0

Router(config-router)# exit

**Switch Configuration Commands:**

**Step 1: Configure VLANs on Access Switches**

Switch(config)# vlan 10

Switch(config-vlan)# name Professors

Switch(config-vlan)# exit

Switch(config)# vlan 20

Switch(config-vlan)# name Students

Switch(config-vlan)# exit

Switch(config)# vlan 30

Switch(config-vlan)# name Visitors

Switch(config-vlan)# exit

**Step 2: Assign VLANs to Ports**

Switch(config)# interface range fa0/1 - 10

Switch(config-if-range)# switchport mode access

Switch(config-if-range)# switchport access vlan 10

Switch(config-if-range)# exit

Switch(config)# interface range fa0/11 - 20

Switch(config-if-range)# switchport mode access

Switch(config-if-range)# switchport access vlan 20

Switch(config-if-range)# exit

**Step 3: Configure Trunk Ports**

Switch(config)# interface g0/1

Switch(config-if)# switchport mode trunk

Switch(config-if)# switchport trunk encapsulation dot1q

Switch(config-if)# exit

**Step 4: Enable Port Security**

Switch(config)# interface fa0/1

Switch(config-if)# switchport port-security

Switch(config-if)# switchport port-security maximum 2

Switch(config-if)# switchport port-security violation restrict

Switch(config-if)# switchport port-security mac-address sticky

Switch(config-if)# exit

**4. Security Measures:**

* ACLs are implemented to control access between VLANs. Example ACL:

Router(config)# access-list 100 deny ip 192.168.1.0 0.0.0.255 192.168.5.0 0.0.0.255

Router(config)# access-list 100 permit ip any any

Router(config)# interface g0/0

Router(config-if)# ip access-group 100 in

* Port security prevents unauthorized devices from accessing the network.

**5. Features Achieved:**

1. Communication within VLANs across buildings.
2. Controlled communication between academic and administrative VLANs.
3. Dynamic routing with OSPF.
4. Optimized IP addressing using VLSM.
5. Secure ports and access using port security and ACLs.

**6. Conclusion:**

The network topology successfully fulfills the requirements for scalability, security, and efficient communication within the university campus. VLANs and OSPF ensure logical segmentation and robust routing. Port security and ACLs enhance network protection. Further expansion can be achieved by adding more VLANs and updating OSPF configurations.

A diagram of a network

AI-generated content may be incorrect.