**Network Topology and Configuration for Small**

**Enterprise With DHCP and Inter-VLAN Configuration**

**Introduction**

This project involves designing and implementing a secure and efficient network for a small enterprise. The network includes three VLANs for different departments, inter-VLAN routing, DHCP server for dynamic IP assignment, access control for security, and a wireless network for the Admin VLAN. This document outlines

the configurations, testing processes, and results achieved during the project.

**Network Requirements**

1. VLANs:

a. VLAN 10 (Admin): 192.168.10.0/24

b. VLAN 20 (Sales): 192.168.20.0/24

c. VLAN 30 (IT): 192.168.30.0/24

2. **Devices:**

a. 10 devices per VLAN (e.g., PCs and laptops).

b. A server with DNS and Web Server roles.

c. A Wi-Fi Access Point for the Admin VLAN.

3. **Router and Layer 3 Switch**: Used for inter-VLAN routing.

4. **DHCP Server**: Dynamically allocate, IP addresses for each VLAN.

5. **Access Control**: Restrict VLAN 20 devices from accessing VLAN 30 and allow VLAN 10 devices, unrestricted access.

1. **Wi-Fi Security**: Use WPA2 encryption for the Admin VLAN.

**Network Topology Design**

The network topology consists of the following components:

1. A Layer 3 switch connected to a router for inter-VLAN routing.

2. Three VLANs segmented by the Layer 3 switch.

3. A DHCP server to provide dynamic IP addresses for all VLANs.

4. A server connected to VLAN 30 for DNS and web hosting or utilize the router for the same purpose.

5. A Wi-Fi Access Point connected to VLAN 10 with WPA2 security.

**Configuration Details**

**VLAN Configuration**

Below is the configuration for VLAN creation and assignment on the Layer 3 switch:Switch

(config)# vlan 10

Switch(config-vlan)# name Admin

Switch(config)# vlan 20

Switch(config-vlan)# name Sales

Switch(config)# vlan 30

Switch(config-vlan)# name IT

Switch(config)# exit

Switch(config)# interface range fa0/1-10Switch(config-if-range)# switchport mode access

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

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

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

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

Switch(config)# interface range fa0/21-30

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

Switch(config-if-range)# switchport access vlan 30

**Inter-VLAN Routing**

The router is configured with subinterfaces to facilitate communication between VLANs:

Router(config)# interface g0/0.10

Router(config-subif)# encapsulation dot1q 10

Router(config-subif)# ip address 192.168.10.1 255.255.255.0

Router(config)# interface g0/0.20

Router(config-subif)# encapsulation dot1q 20

Router(config-subif)# ip address 192.168.20.1 255.255.255.0

Router(config)# interface g0/0.30

Router(config-subif)# encapsulation dot1q 30

Router(config-subif)# ip address 192.168.30.1 255.255.255.0

**DHCP Configuration**

Dynamic Host Configuration Protocol (DHCP) is configured to allocate IP addresses dynamically:

Router(config)# ip dhcp pool Admin

Router(dhcp-config)# network 192.168.10.0 255.255.255.0

Router(dhcp-config)# default-router 192.168.10.1

Router(dhcp-config)# dns-server 192.168.30.2

Router(config)# ip dhcp pool SalesRouter(dhcp-config)# network 192.168.20.0 255.255.255.0

Router(dhcp-config)# default-router 192.168.20.1

Router(dhcp-config)# dns-server 192.168.30.2

Router(config)# ip dhcp pool IT

Router(dhcp-config)# network 192.168.30.0 255.255.255.0

Router(dhcp-config)# default-router 192.168.30.1

Router(dhcp-config)# dns-server 192.168.30.2

Access Control Lists (ACLs)

Access Control Lists (ACLs) are configured to restrict communication between VLANs:

Router(config)# access-list 100 deny ip 192.168.20.0 0.0.0.255 192.168.30.0 0.0.0.255Router(config)# access-list 100 permit

ip any any

Router(config)# interface g0/0.20

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

**Wi-Fi Configuration**

The wireless network for the Admin VLAN is configured as follows:

1. SSID: AdminWiFi

2. Security Mode: WPA2-PSK

3. Encryption: AES

4. Passphrase: SecureAdmin123

5. VLAN Tagging: VLAN 10

**Testing and Results**

The network was tested for the following functionalities and results:

**Inter-VLAN Communication**

Communication between VLANs was tested to verify connectivity and restrictions:

1. VLAN 10 to VLAN 20: Success

2. VLAN 10 to VLAN 30: Success

3. VLAN 20 to VLAN 30: Blocked

**DHCP Assignments**

DHCP functionality was tested to ensure correct IP allocation:

1. VLAN 10: IPs assigned within 192.168.10.2-254

2. VLAN 20: IPs assigned within 192.168.20.2-254

3. VLAN 30: IPs assigned within 192.168.30.2-254

**Wi-Fi Security**

The wireless network was tested to ensure proper security and connectivity:

1. Admin devices: Successfully connected

2. Unauthorized devices: Access denied

**Conclusion**

The network was successfully implemented and configured. All components, including VLANs, inter-VLAN routing, DHCP, ACLs, and Wi-Fi security, were tested and verified to function as required. The setup ensures efficient, secure, and scalable communication for the enterprise.

**CONTACT: 0538108285**

**YEAR: 14th January, 2025.**