Network Design and Configuration Documentation

1. Introduction

This documentation provides a complete overview of the network design project. It includes the VLAN segmentation, routing configurations, implementation of network services, redundancy mechanisms, and security policies. The network is built to ensure efficient communication, scalability, and high availability.

2. VLAN Configuration

VLANs are configured to segment network traffic and segmentation for performance and security increase security

Switch 1 (Access Switch for Admin - VLAN 10)

```
enable
configure terminal
vlan 10
name Admin
exit
interface range fa0/1 - 4
switchport mode access
switchport access vlan 10
exit
interface fa0/5
switchport mode trunk
switchport trunk allowed vlan 10,20,30,40,50
exit
```

Switch 2 (Access Switch for IT - VLAN 20)

```
enable
configure terminal
vlan 20
name IT
exit
interface range fa0/1 - 4
switchport mode access
switchport access vlan 20
exit
interface fa0/5
switchport mode trunk
switchport trunk allowed vlan 10,20,30,40,50
exit
```

Switch 3 (Access Switch for HR - VLAN 30)

```
enable
configure terminal
vlan 30
name HR
exit
interface range fa0/1 - 4
switchport mode access
switchport access vlan 30
exit
interface fa0/5
switchport mode trunk
switchport trunk allowed vlan 10,20,30,40,50
exit
```

3.1 Router Configuration (Router-on-a-Stick)

The router-on-a-stick approach is used to allow inter-VLAN routing. Allow communication between VLANs through a single physical interface on the router.

```
enable
configure terminal
interface gig0/0
no shutdown

interface gig0/0.10
encapsulation dot1Q 10
ip address 192.168.1.1 255.255.255.0

interface gig0/0.20
encapsulation dot1Q 20
ip address 172.16.1.1 255.255.255.0

interface gig0/0.30
encapsulation dot1Q 30
ip address 192.168.2.1 255.255.255.0

interface gig0/0.40
encapsulation dot1Q 40
ip address 10.10.10.1 255.255.255.0

interface gig0/0.50
encapsulation dot1Q 50
ip address 20.20.20.1 255.255.255.0
exit
```

3.2 Configure IP Addresses Router

```
Router> enable
Router# configure terminal
Router(config)# interface gigabitEthernet 0/0
Router(config-if)# ip address 192.168.1.1 255.255.255.0
Router(config-if)# no shutdown

Router(config)# interface serial 0/0/0
Router(config-if)# ip address 10.0.0.1 255.255.255.252
Router(config-if)# no shutdown
```

4.1 OSPF Configuration for Dynamic Routing

OSPF (Open Shortest Path First) is configured to dynamically route traffic between VLANs.

```
enable
configure terminal
router ospf 1
network 192.168.1.0 0.0.0.255 area 0
network 172.16.1.0 0.0.0.255 area 0
network 192.168.2.0 0.0.0.255 area 0
network 10.10.10.0 0.0.0.255 area 0
network 20.20.20.0 0.0.0.255 area 0
exit
```

4.2 EIGRP Configuration

Cisco proprietary advanced distance vector routing protocol used for automating routing decisions and configurations.

```
Router1(config)# router eigrp 100
Router1(config-router)# network 192.168.1.0 0.0.0.255
Router1(config-router)# network 10.1.1.0 0.0.0.255
Router1(config-router)# exit
Router1# show ip route eigrp
```

5. HSRP Configuration (High Availability on Router Gateway)

HSRP is configured on routers to provide gateway redundancy.

```
interface gig0/0.10
standby 1 ip 192.168.1.254
standby 1 priority 110
standby 1 preempt
exit

interface gig0/0.20
standby 1 ip 172.16.1.254
standby 1 priority 105
standby 1 preempt
exit
```

6. DHCP Server Configuration (VLAN 40)

VLAN 10 Pool (Admin)	VLAN 20 Pool (IT)	VLAN 30 Pool (HR)
Network: 192.168.1.2 / 24	Network: 172.16.1.2 / 24	Network: 192.168.2.2 / 24
Default Gateway: 192.168.1.1	Default Gateway: 172.16.1.1	Default Gateway: 192.168.2.1

7. HTTP Server Configuration (VLAN 50)

Provides internal web services and is accessible only within the network.

Network IP: 10.10.10.10 / 24

Default Gateway: 10.10.10.1 /24

7. ACL (Access Control List) Configuration

Access Control Lists (ACLs) ensure only authorized access between VLANs and allow only certain VLANs to access specific services.

```
enable
configure terminal
access-list 100 permit ip 192.168.1.0 0.0.0.255 any
access-list 100 deny ip any any

interface gig0/0.50
ip access-group 100 in
exit
```

8. EtherChannel Configuration between Switches

EtherChannel: Combines multiple physical links into one logical connection using LACP (Link Aggregation Control Protocol).

```
enable
configure terminal
interface range fa0/5 - 6
channel-group 1 mode active
exit

interface port-channel 1
switchport mode trunk
switchport trunk allowed vlan 10,20,30,40,50
exit
```

9. Dynamic NAT Configuration (For Internet Access Simulation)

Dynamic NAT allows many private IP addresses to share a pool of public IP addresses, making it a more efficient use of available public IPs.

```
R2(config)# ip nat pool NAT-POOL1 209.165.200.226 209.165.200.240 netmask 255.255.255.224
R2(config)# access-list 1 permit 192.168.0.0 0.0.255.255
R2(config)# ip nat inside source list 1 pool NAT-POOL1
R2(config)# interface serial 0/1/0
R2(config-if)# ip nat inside
R2(config-if)# interface serial 0/1/1
R2(config-if)# ip nat outside
```

10. SSH Configuration (Secure Remote Access)

SECURE REMOTE ACCESS: SSH CONFIGURED FOR SWITCH AND ROUTER MANAGEMENT SSH is enabled on routers and switches for secure management.

```
enable
configure terminal
ip domain-name network.local
crypto key generate rsa modulus 1024
username admin privilege 15 password admin123
line vty 0 4
transport input ssh
login local
exit
```

Port Security

It helps secure the network by limiting the number of MAC addresses that can be learned on a particular port, which prevents

```
Switch# configure terminal
Switch(config)# interface fa0/1
Switch(config-if)# switchport mode access
Switch(config-if)# switchport port-security
Switch(config-if)# switchport port-security maximum 1
Switch(config-if)# switchport port-security violation shutdown
Switch(config-if)# switchport port-security mac-address sticky
```

Summary

This configuration covers:

- **VLANs**: Admin, IT, HR, Services
- **Router-on-a-stick**: VLAN routing
- **Configure IP Addresses Router**
- **OSPF**: Dynamic routing
- **Static Routes:** Ip route
- **HSRP**: Redundancy
- **EtherChannel**: Link aggregation
- **DHCP, DNS, HTTP services**
- **Dynamic NAT**: For external access simulation
- **SSH and ACLs**: Secure access and filtering
- **Port Security**