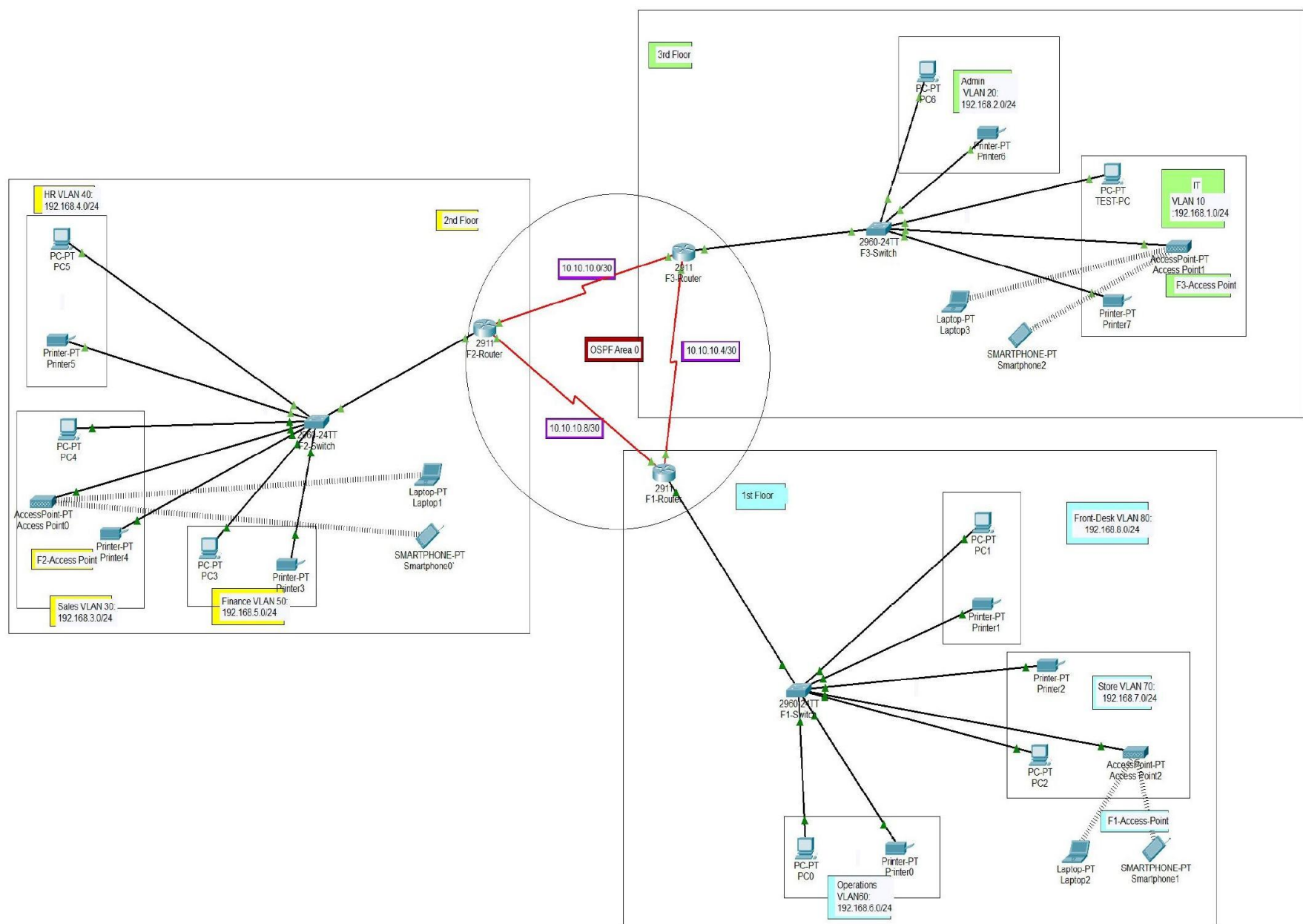# Network Design and Configuration

This document outlines the network design and configuration for a three-floor building, including VLANs, IP addressing, OSPF routing, and DHCP services. The guide includes step-by-step instructions and configuration examples for routers and network devices. This document will guide the reader through the process of implementing a secure and efficient network.

DESIGN

Task 1: Network Design and Planning

1. Define Network Topology, Router, and Connections

The network topology involves three routers (Router 1, Router 2, and Router 3) interconnected via serial interfaces. The connections and IP addressing are as follows:

- Router 1 to Router 2: 10.10.10.8/30
- Router 2 to Router 3: 10.10.10.0/30
- Router 3 to Router 1: 10.10.10.4/30

Example configuration for all routers' serial interfaces:

Router 1 (F1-Router)	bash
	``` F1-Router(config)#interface serial 0/0/1 F1-Router(config-if)#ip address 10.10.10.9 255.255.255.252 F1-Router(config-if)#no shutdown ```
Router 2 (F2-Router)	bash
	``` F2-Router(config)#interface serial 0/2/0 F2-Router(config-if)#ip address 10.10.10.10 255.255.255.252 F2-Router(config-if)#no shutdown ```
Router 3 (F3-Router)	bash
	``` F3-Router(config)#interface serial 0/3/0 F3-Router(config-if)#ip address 10.10.10.5 255.255.255.252 F3-Router(config-if)#no shutdown ```

Task 1: Network Design and Planning

2. VLANs and IP Addressing

VLANs and IP addresses are assigned to each floor, segregating network traffic and facilitating security and management.

First Floor

- Front Desk: VLAN 80, Network: 192.168.8.0/24
- Store: VLAN 70, Network: 192.168.7.0/24
- Operations: VLAN 60, Network: 192.168.6.0/24

Second Floor

- Finance: VLAN 50, Network: 192.168.5.0/24
- HR: VLAN 40, Network: 192.168.4.0/24
- Sales: VLAN 30, Network: 192.168.3.0/24

Third Floor

- Admin: VLAN 20, Network: 192.168.2.0/24
- IT: VLAN 10, Network: 192.168.1.0/24

Task 2: Router Configuration

1. Set Up Serial Interfaces and IP Addresses

The serial interfaces on each router are configured to establish connectivity between them, using the IP addresses and subnet masks defined in the network topology. This ensures seamless communication between routers and the network.

Router 1 (F1-Router)	bash ``` F1-Router(config)#interface serial 0/0/1 F1-Router(config-if)#ip address 10.10.10.9 255.255.255.252 F1-Router(config-if)#no shutdown ```
Router 2 (F2-Router)	bash ``` F2-Router(config)#interface serial 0/2/0 F2-Router(config-if)#ip address 10.10.10.10 255.255.255.252 F2-Router(config-if)#no shutdown ```
Router 3 (F3-Router)	bash ``` F3-Router(config)#interface serial 0/3/0 F3-Router(config-if)#ip address 10.10.10.5 255.255.255.252 F3-Router(config-if)#no shutdown ```

Task 2: Router Configuration

2. Configure OSPF Routing

OSPF (Open Shortest Path First) is a dynamic routing protocol that enables routers to exchange routing information and determine the best path for data packets. This ensures optimal network performance and reliability.

OSPF is enabled and configured on each router, specifying the network segments and areas to which each router belongs. This allows routers to share routing information within the same area, enabling seamless communication between devices on different VLANs.

Router 1 (F1-Router)	bash
| | ```
F1-Router(config)#router ospf 100
F1-Router(config-router)#network 192.168.6.0 0.0.0.255 area 1
F1-Router(config-router)#network 192.168.7.0 0.0.0.255 area 1
F1-Router(config-router)#network 192.168.8.0 0.0.0.255 area 1
F1-Router(config-router)#network 10.10.10.4 0.0.0.3 area 0
F1-Router(config-router)#network 10.10.10.8 0.0.0.3 area 0
``` |
| Router 2 (F2-Router) | bash |
| | ```
F2-Router(config)#router ospf 100
F2-Router(config-router)#network 192.168.3.0 0.0.0.255 area 2
F2-Router(config-router)#network 192.168.4.0 0.0.0.255 area 2
F2-Router(config-router)#network 192.168.5.0 0.0.0.255 area 2
F2-Router(config-router)#network 10.10.10.0 0.0.0.3 area 0
F2-Router(config-router)#network 10.10.10.8 0.0.0.3 area 0
``` |
| Router 3 (F3-Router) | bash |
| | ```
F3-Router(config)#router ospf 100
F3-Router(config-router)#network 192.168.1.0 0.0.0.255 area 3
F3-Router(config-router)#network 192.168.2.0 0.0.0.255 area 3
F3-Router(config-router)#network 10.10.10.4 0.0.0.3 area 0
F3-Router(config-router)#network 10.10.10.0 0.0.0.3 area 0
``` |

Task 2: Router Configuration

3. Set Up DHCP

DHCP (Dynamic Host Configuration Protocol) is used to automatically assign IP addresses to devices on the network. This eliminates the need for manual configuration and simplifies network management.

DHCP pools are configured on each router for the respective VLAN subnets, specifying the network address, subnet mask, and default gateway for each VLAN. This ensures that devices on each VLAN receive the appropriate IP address and routing information.

Router 1 (F1-Router)	bash
| | ```
F1-Router(config)#ip dhcp pool FrontDesk
F1-Router(dhcp-config)#network 192.168.8.0 255.255.255.0
F1-Router(dhcp-config)#default-router 192.168.8.254
F1-Router(config)#ip dhcp pool Store
F1-Router(dhcp-config)#network 192.168.7.0 255.255.255.0
F1-Router(dhcp-config)#default-router 192.168.7.254
F1-Router(config)#ip dhcp pool Operations
F1-Router(dhcp-config)#network 192.168.6.0 255.255.255.0
F1-Router(dhcp-config)#default-router 192.168.6.254
``` |
| Router 2 (F2-Router) | bash |
| | ```
F2-Router(config)#ip dhcp pool Sales
F2-Router(dhcp-config)#network 192.168.3.0 255.255.255.0
F2-Router(dhcp-config)#default-router 192.168.3.254
F2-Router(config)#ip dhcp pool HR
F2-Router(dhcp-config)#network 192.168.4.0 255.255.255.0
F2-Router(dhcp-config)#default-router 192.168.4.254
F2-Router(config)#ip dhcp pool Finance
F2-Router(dhcp-config)#network 192.168.5.0 255.255.255.0
F2-Router(dhcp-config)#default-router 192.168.5.254
``` |
| Router 3 (F3-Router) | bash |
| | ```
F3-Router(config)#ip dhcp pool IT
F3-Router(dhcp-config)#network 192.168.1.0 255.255.255.0
F3-Router(dhcp-config)#default-router 192.168.1.254
F3-Router(config)#ip dhcp pool Admin
F3-Router(dhcp-config)#network 192.168.2.0 255.255.255.0
F3-Router(dhcp-config)#default-router 192.168.2.254
``` |

Task 2: Router Configuration

4. Enable SSH Access

SSH (Secure Shell) is a secure protocol that allows remote access to network devices for administration and troubleshooting purposes. This provides a secure way to connect to routers from remote locations, ensuring data privacy and security.

SSH is configured on each router, enabling secure access via the vty lines. This allows authorized users to connect to the routers remotely using SSH clients and perform various network management tasks.

Router 1 (F1-Router)	bash
	``` F1-Router(config)#enable secret 3456 F1-Router(config)#ip domain-name F1-Router F1-Router(config)#crypto key generate rsa F1-Router(config)#username admin secret password123 F1-Router(config)#line vty 0 4 F1-Router(config-line)#login local F1-Router(config-line)#transport input ssh ```
Router 2 (F2-Router)	bash
	``` F2-Router(config)#enable secret 3456 F2-Router(config)#ip domain-name F2-Router F2-Router(config)#crypto key generate rsa F2-Router(config)#username admin secret password123 F2-Router(config)#line vty 0 4 F2-Router(config-line)#login local F2-Router(config-line)#transport input ssh ```
Router 3 (F3-Router)	bash
	``` F3-Router(config)#enable secret 3456 F3-Router(config)#ip domain-name F3-Router F3-Router(config)#crypto key generate rsa F3-Router(config)#username admin secret password123 F3-Router(config)#line vty 0 4 F3-Router(config-line)#login local F3-Router(config-line)#transport input ssh ```

Recommendations

To ensure a secure and efficient network, it is recommended to:

- Implement strong passwords and access controls for all network devices.
- Regularly update router firmware and software to address security vulnerabilities.
- Monitor network traffic and activity for suspicious or malicious behavior.
- Implement a network intrusion detection and prevention system (IDS/IPS).
- Provide user training on network security best practices.

By following these recommendations, you can create a network that is both secure and reliable.

Conclusion

This document has outlined the network design and configuration for a three-floor building. The guide has provided step-by-step instructions and configuration examples for routers and network devices. This guide has detailed how to implement a secure and efficient network that meets the specific needs of the organization.