SOHO Network Implementation

Project Overview

This project involved designing and implementing a secure and efficient network infrastructure for Small network using VLANs, inter-VLAN routing, and DHCP. The network was designed to support three departments, each segmented into different VLANs for improved performance and traffic isolation. A single Cisco router and switch were used to ensure cost-effectiveness while maintaining functionality. Inter-VLAN communication was established through a router-on-a-stick configuration, and DHCP was implemented to provide automatic IP addressing without exclusions. Additionally, a wireless network was configured for customer service devices. The implementation emphasizes scalability, security, and efficient traffic management.

Network Requirements

- **Devices Used:**
    - **1 Router (Cisco)**
    - **1 Switch (Cisco)**
    - **3 PCs (One for each department)**
    - **3 Printers (One for each department)**
    - **1 Laptop (Customer Service Department)**
    - **1 Smartphone (Customer Service Department)**
- **VLANs & Port Assignments:**
    - **VLAN 10 - Admin/IT: Fa0/3, Fa0/4, Fa0/5**
    - **VLAN 20 - Finance/HR: Fa0/6, Fa0/7, Fa0/8**
    - **VLAN 30 - Customer Service/Reception: Fa0/9, Fa0/10, Fa0/11**
- **Additional Requirements:**
    - **Devices must obtain IPv4 addresses automatically via DHCP.**
    - **All departments should be able to communicate.**
    - **Wireless access for customer service devices.**

Subnetting & IP Addressing

The ISP provided the base network 192.168.1.0/24, which was subnetted as follows:

- **VLAN 10 (Admin/IT): 192.168.1.0/26**
  Usable Range: 192.168.1.1 - 192.168.1.62
- **VLAN 20 (Finance/HR): 192.168.1.64/26**
  Usable Range: 192.168.1.65 - 192.168.1.126
- **VLAN 30 (Customer Service/Consultation): 192.168.1.128/26**
  Usable Range: 192.168.1.129 - 192.168.1.190

Network Configuration Steps

1. Creating VLANs & Assigning Ports

Switch(config)# vlan 10

Switch(config-vlan)# name Admin/IT

Switch(config-vlan)# vlan 20

Switch(config-vlan)# name Finance/HR

Switch(config-vlan)# vlan 30

Switch(config-vlan)# name CustomerService/Consultation

Switch(config-vlan)# exit

Switch(config)# interface range Fa0/3-5

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

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

Switch(config)# interface range Fa0/6-8

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

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

Switch(config)# interface range Fa0/9-11

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

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

2. Configuring Inter-VLAN Routing (Router-on-a-Stick)

Router(config)# interface fa0/0.10

Router(config-subif)# encapsulation dot1Q 10

Router(config-subif)# ip address 192.168.1.1 255.255.255.192

Router(config-subif)# exit

Router(config)# interface fa0/0.20

Router(config-subif)# encapsulation dot1Q 20

Router(config-subif)# ip address 192.168.1.65 255.255.255.192

Router(config-subif)# exit

Router(config)# interface fa0/0.30

Router(config-subif)# encapsulation dot1Q 30

Router(config-subif)# ip address 192.168.1.129 255.255.255.192

Router(config-subif)# exit

3. Configuring DHCP Server on the Router (No Excluded IPs)

Router(config)# ip dhcp pool Admin-Pool

Router(dhcp-config)# network 192.168.1.0 255.255.255.192

Router(dhcp-config)# default-router 192.168.1.1

Router(dhcp-config)# exit

Router(config)# ip dhcp pool Finance-Pool

Router(dhcp-config)# network 192.168.1.64 255.255.255.192

Router(dhcp-config)# default-router 192.168.1.65

Router(dhcp-config)# exit

Router(config)# ip dhcp pool Customer-Pool

Router(dhcp-config)# network 192.168.1.128 255.255.255.192

Router(dhcp-config)# default-router 192.168.1.129

Router(dhcp-config)# exit

4. Configuring Wireless Access for Customer Service Devices

5. Testing & Verifying Network Communication

PC> ipconfig

PC> ping 192.168.1.1

PC> ping 192.168.1.65

PC> ping 192.168.1.129

Conclusion

This project successfully implemented a fully functional and efficient network infrastructure for SOHO Networks. The use of VLANs improved traffic management and security, while inter-VLAN routing enabled seamless communication between departments. DHCP automation ensured ease of IP address assignment, and wireless access expanded network connectivity. This implementation serves as a scalable and reliable foundation for future growth and expansion.