TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

PULCHOWK CAMPUS

LAB REPORT ON

COMPUTER NETWORK

Mini-Project

Network Design

Submitted To:

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

PULCHOWK CAMPUS

LALITPUR, NEPAL

Submitted By:

Suraj Pathak (076BCT090)

AUGUST 29, 2023

Network Design for a Software Company

This project outlines a computer network design for XYZ Software Company. It will use technologies like VLAN, OSPF, DHCP, and more to improve how different parts of the company's network communicate and share information.

Project Objectives

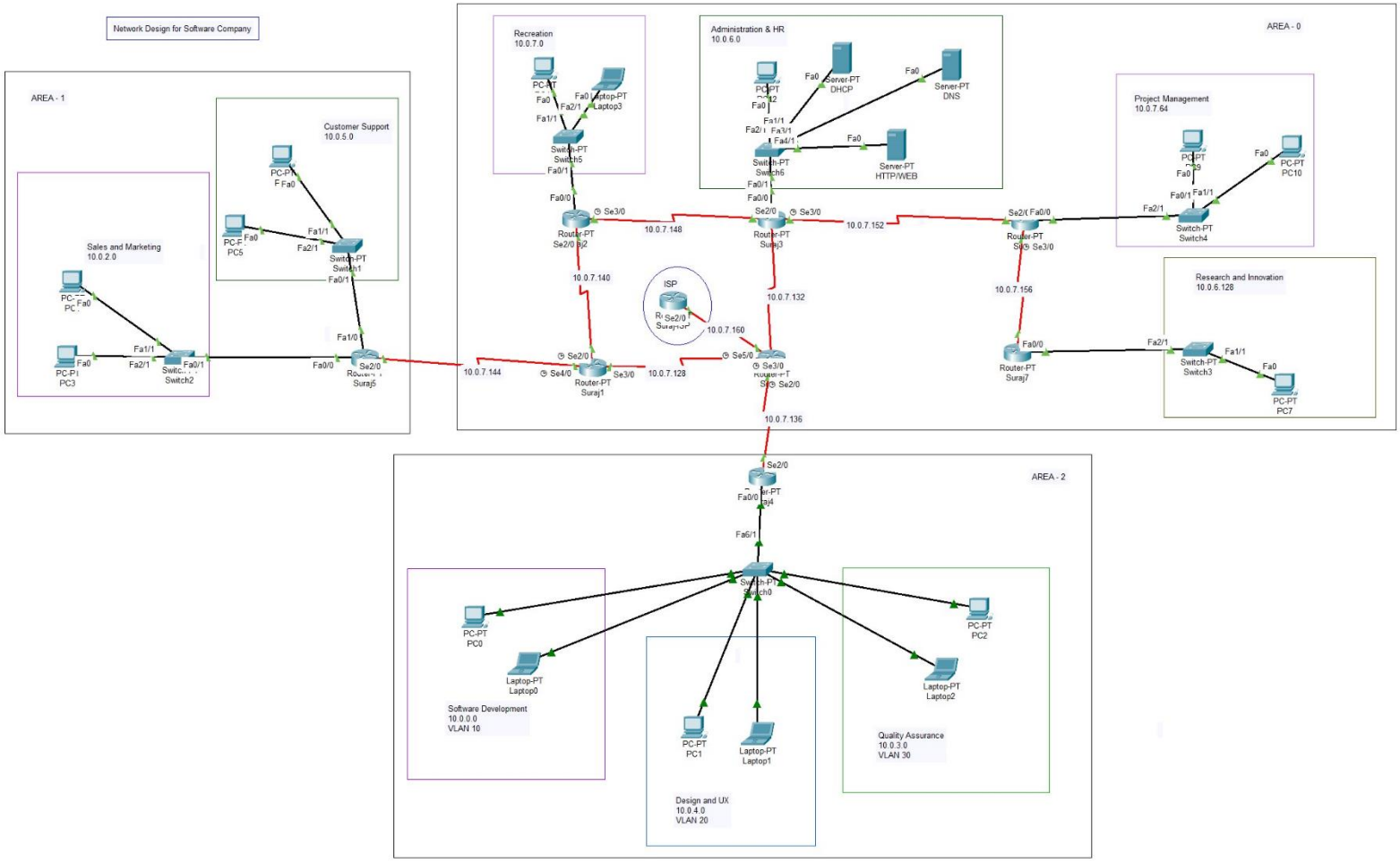
1. Create a network with efficient routing and connections using OSPF.
2. Set up separate areas for each department using VLANs.
3. Install special switches and access points in different areas.
4. Arrange automatic IP addresses using DHCP services.

Network Topology

The software company has been allocated the IP address range of 10.0.0.0/22 to establish a computer network infrastructure. The company is composed of various departments, each characterized by specific device counts:

1. Software Development: 300 devices
2. Sales and Marketing: 200 devices
3. Quality Assurance: 175 devices
4. Design and User Experience: 150 devices
5. Customer Support: 130 devices
6. Administration and HR: 80 devices
7. Research and Innovation: 75 devices
8. Recreation: 50 devices
9. Project Management: 50 devices

Network Topology



Division of Address

The available IP address range will be divided as below to ensure every department and function has its own unique space.

Department/Area	Network Address	Subnet Mask	Broadcast Address
Software Development	10.0.0.0	255.255.254.0	10.0.1.255
Sales and Marketing	10.0.2.0	255.255.255.0	10.0.2.255
Quality Assurance	10.0.3.0	255.255.255.0	10.0.3.255
Design and UX	10.0.4.0	255.255.255.0	10.0.4.255
Customer Support	10.0.5.0	255.255.255.0	10.0.5.255
Administration and HR	10.0.6.0	255.255.255.128	10.0.6.127
Research and Innovation	10.0.6.128	255.255.255.128	10.0.6.255
Recreation	10.0.7.0	255.255.255.192	10.0.7.63
Project Management	10.0.7.64	255.255.255.192	10.0.7.127
R0 – R1	10.0.7.128	255.255.255.252	10.0.7.131
R0 – R3	10.0.7.132	255.255.255.252	10.0.7.135
R0 – R4	10.0.7.136	255.255.255.252	10.0.7.139
R1 – R2	10.0.7.140	255.255.255.252	10.0.7.143
R1 – R5	10.0.7.144	255.255.255.252	10.0.7.147
R2 – R3	10.0.7.148	255.255.255.252	10.0.7.151
R3 – R6	10.0.7.152	255.255.255.252	10.0.7.155
R6 – R7	10.0.7.156	255.255.255.252	10.0.7.157
R0 – R(ISP)	10.0.7.160	255.255.255.252	10.0.7.163

Network Description

Networks: There are 9 networks having different sizes.

Routers: There are 9 routers in total. Suraj0-Suraj7 and Suraj-ISP

Routing: OSPF is used for internal routing. Also, all Internet traffic has been forwarded to upstream service provider. There are 3 OSPF areas.

OSPF Area	Departments Included
Area 1	Sales and Marketing, Customer Support
Area 2	Software Development, Design & UX, Quality Assurance
Area 0	Rest of the network

Servers: There are DHCP server, DNS server and Web Server in the Administration and HR department.

VLAN

Three separate VLANs are extended across the network using switches to provide distinct communication environments for different departments.

Department	VLAN
Software Development	10
Design & UX	20
Quality Assurance	30

Routing Strategy

Open Shortest Path First (OSPF) protocol will be used. This will allow for dynamic routing, adapting to changes in the network.

Managing IP Addresses

To make things simpler, the routers are configured to act as a DHCP server. This dynamically assigns IP addresses, subnet masks, gateway addresses and other network configuration parameters to devices that connect to the network.

Results and Observation

The network design project yielded the following results:

- By implementing DHCP, IP addresses were assigned dynamically to devices within the network.
- During the project, the "ping" and "tracert" commands were utilized to observe the connectivity and trace the routes of data packets.
- Each internal network could be reached from any computer or laptop within the setup.
- The routing mechanisms performed as anticipated.

Conclusion

The intended network design for the software development company seeks to create a secure and resilient communication framework. By intelligently deploying VLANs, OSPF routing, automatic IP allocation, and dedicated access points, this network is focused on enhancing collaboration and resource distribution across different departments and areas within the workspace. This project offers valuable insights into real-world applications of networking concepts.