LOVELY PROFESSIONAL UNIVERSITY

CAP 403

CA4(Group-4)

Network administration

Submitted by:
Danisha Sahu

Submitted To:

Dr. Manmohan Sharma

Problem Statement

As a part of your end year networking project, you are required to design and implement Victoria Modern Hotel network. The hotel has three floors, In the first floor there three departments (Reception, store and Logistics), in the second floor there are three departments (Finance, HR and Sales/Marketing), while the third floor hosts the IT and Admin. Therefore, the following are part of the considerations during the design and implementation.

1. There should be three routers connecting each floor (all placed in the server room in IT department).

2. All routers should be connected to each other using serial DCE cable.

3. The network between the routers should be 10.10.10.0/30,10.10.10.4/30.10.10.10.8/30

4. Each floor is expected to have one switch (placed in the respective floor).

5. Each floor is expected to have WIFI networks connected to laptops and phones.

6. Each department is expected to have a printer.

7. Each department is expected to be in different VLAN with the following details-

1st Floor:

- Reception- VLAN 80, Network of 192.168.8.0/24
- Store- VLAN 70, Network of 192.168.7.0/24
- Logistics- VLAN 60, Network of 192.168.6.0/24

2nd Floor:

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

3rd Floor:

- Admin- VLAN 20, Network of 192.168.2.0/24
- IT-VLAN 10, Network of 192.168.1.0/24
- Use OSPF as the routing protocol to advertise routes.

8. All devices in the network are expected to obtain IP address dynamically with their respective router configured as the DHCP server.

9. All the devices in the network are expected to communicate with each other.

10. Configure SSH in all the routers for remote login.

11. In IT department, add PC called Test-PC to port fa0/1 and use it to test remote login.

12. Configure port security to IT-dept switch to allow only Test-PC to access port fa0/1 (use sticky method to obtain mac-address with violation mode of shutdown.)

Abstraction

This project focuses on designing and implementing a network infrastructure for Modern Hotel, which spans three floors and includes eight departments. The project aims to create a secure and efficient network architecture that supports communication between different departments while ensuring reliable connectivity for both wired and wireless devices.

The network design involves the use of three routers, interconnected with serial DCE cables, to connect the floors. Each floor has a dedicated switch that facilitates communication within the departments, which are segregated into VLANs for network segmentation and security. Wireless access points are deployed on each floor to provide Wi-Fi connectivity for laptops and mobile devices.

Dynamic IP addressing is configured using DHCP, with each router acting as a DHCP server for its respective VLANs. OSPF is utilized as the routing protocol to enable efficient inter-VLAN routing and ensure that all devices in the network can communicate seamlessly. Additionally, SSH is configured on all routers for secure remote access, with port security implemented in the IT department to restrict access to a specific device.

This project successfully integrates advanced networking techniques such as VLAN segmentation, dynamic routing with OSPF, DHCP configuration, wireless networking, and security measures, resulting in a robust network infrastructure that meets the hotel's operational needs. The design is tested for functionality, ensuring secure and reliable communication between all devices.

Introduction

In today’s hospitality industry, reliable and secure network infrastructure is crucial for ensuring seamless operations, efficient communication, and an enhanced guest experience. Vic Modern Hotel, a multi-floor establishment with several departments, requires a robust network that can support both wired and wireless connectivity across its various floors and departments.

This project aims to design and implement a comprehensive network for the hotel that facilitates inter-departmental communication while maintaining network security and scalability. The network is segmented using VLANs, with dynamic routing configured through OSPF to enable efficient data flow between different departments. In addition, wireless access points are deployed to accommodate mobile devices, and DHCP servers are configured to assign IP addresses dynamically to all devices on the network.

The implementation includes advanced features such as secure remote access using SSH and port security in the IT department to prevent unauthorized access. The network is designed to meet the operational needs of the hotel, ensuring high availability and security for all departments while allowing future scalability as the hotel's needs grow.

This report outlines the design and implementation of the network infrastructure, highlighting key decisions, configurations, and the testing process to ensure the network’s functionality and security.

Requirement Analysis

The requirement analysis for Vic Modern Hotel's network design involves identifying the technical and operational needs to ensure a secure, scalable, and efficient network infrastructure that meets the hotel's day-to-day activities across its three floors and eight departments. The analysis is broken down into hardware, software, network design, and security requirements.

1. Hardware Requirements

- **Routers**: Three routers are required, one for each floor, with all routers placed in the server room located in the IT department. The routers must support OSPF routing protocol and have serial interfaces for inter-router connections.
- **Switches**: One switch is needed per floor to connect departmental devices to the router, ensuring wired connectivity.
- **Access Points**: Each floor needs Wi-Fi networks for mobile devices, requiring wireless access points.
- **End Devices**: PCs, laptops, phones, and printers for each department. Each department is expected to have at least one printer, and each PC or laptop should connect to the network either via wired or wireless access.
- **Cabling**:
    - Serial DCE cables for router-to-router connections.
    - Ethernet cables for connecting devices to switches.

2. Network Design Requirements

- **VLAN Configuration**: Each department needs to be segmented into separate VLANs to ensure network isolation, security, and efficiency. The VLANs must follow the given details:
    - 1st Floor:
        - Reception: VLAN 80 (192.168.8.0/24)
        - Store: VLAN 70 (192.168.7.0/24)
        - Logistics: VLAN 60 (192.168.6.0/24)
    - 2nd Floor:
        - Finance: VLAN 50 (192.168.5.0/24)
        - Room 1: VLAN 40 (192.168.4.0/24)
        - Room 2: VLAN 30 (192.168.3.0/24)
    - 3rd Floor:
        - Admin: VLAN 20 (192.168.2.0/24)
        - IT: VLAN 10 (192.168.1.0/24)

- **IP Addressing Scheme**:
  - The network between routers will use subnets: 10.10.10.0/30, 10.10.10.4/30, and 10.10.10.8/30.
  - VLANs must be configured with IP ranges according to their specific departments.
- **Routing Protocol**: OSPF (Open Shortest Path First) will be used as the routing protocol to ensure efficient communication between VLANs across different floors.
- **Wi-Fi Networks**: Each floor requires a wireless network to support laptops and phones, which must also integrate into their respective VLANs.

3. Security Requirements

- **SSH Configuration**: Secure Shell (SSH) must be configured on all routers to enable secure remote login for network administration and monitoring. This will allow authorized personnel to manage the network remotely while maintaining security.
- **Port Security**: On the switch in the IT department, port security must be configured on port fa0/1 to ensure that only the Test-PC can access that port. Sticky MAC address learning will be used, with violation mode set to shut down, to prevent unauthorized devices from accessing the network.
- **Inter-VLAN Communication**: The network must be designed so that devices in different VLANs can communicate as needed, with controlled access across the departments to ensure data security and privacy.

4. Functional Requirements

- **VLAN Segmentation**: Each department must operate within its VLAN for security, preventing unnecessary traffic across unrelated departments.
- **Dynamic IP Allocation**: Devices across the network should automatically receive IP addresses from their respective router-based DHCP server.
- **Inter-VLAN Routing**: Routers must allow devices from different VLANs to communicate when necessary, using OSPF to propagate routing information efficiently.
- **Wi-Fi Integration**: Laptops and phones must connect to the network via wireless access points, receiving IP addresses from the DHCP servers within their VLAN.
- **Access Point**: In the rooms access point is given to connect to the network, IP addresses is received from DHCP

- **FTP Server:** FTP server is added in the admin, to transfer to file within the hotel.
- **MAIL Server:** Each department is assigned by the domain email.

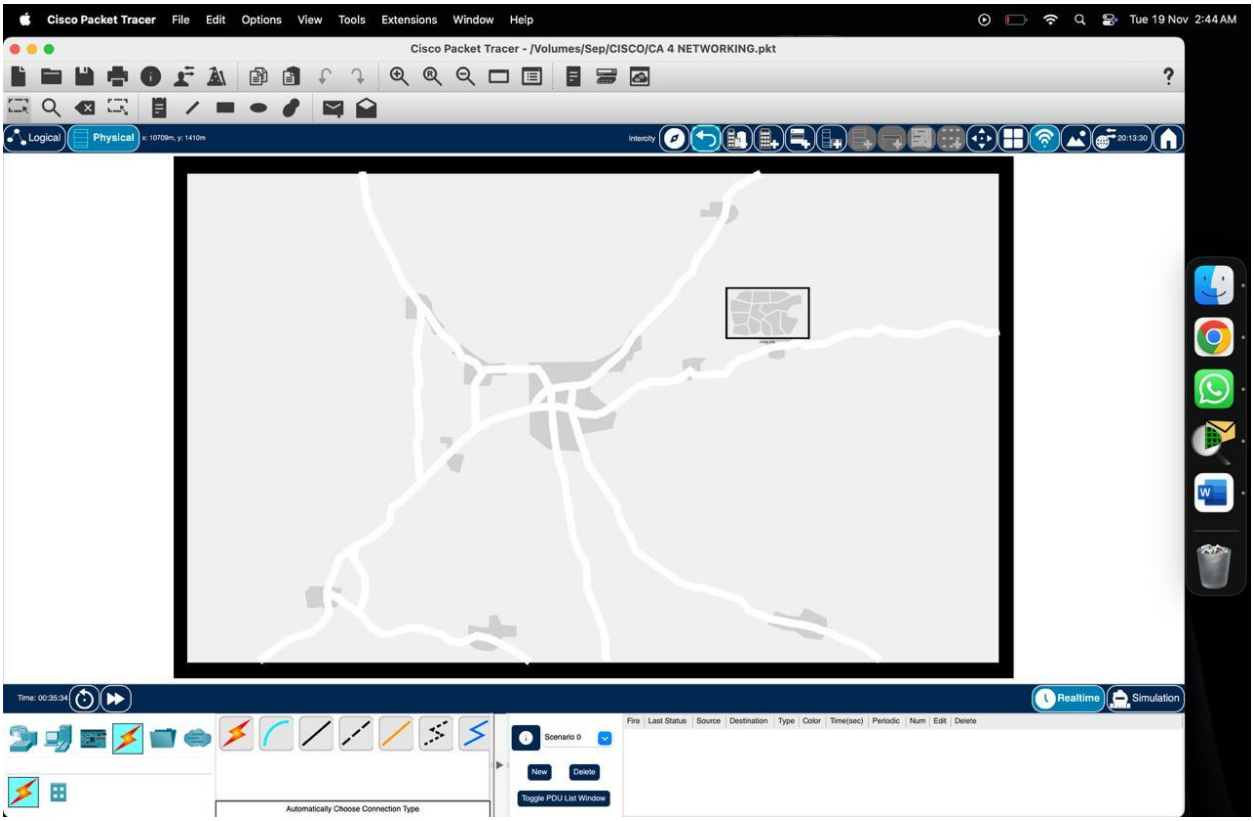
5. Extra Requirements

- **2D Representation**: A detailed network layout showing wired configurations and departmental segmentation.
- **Email Assignments:** Unique email IDs for departments (e.g., reception@vichotel.com, store@vichotel.com, etc.).

2D Representation of the Network

A visual layout of the hotel network showing:

- Routers interconnected with serial DCE cables.
- Switches on each floor.
- Wireless access points integrated with VLANs.
- Device and printer placement in departments.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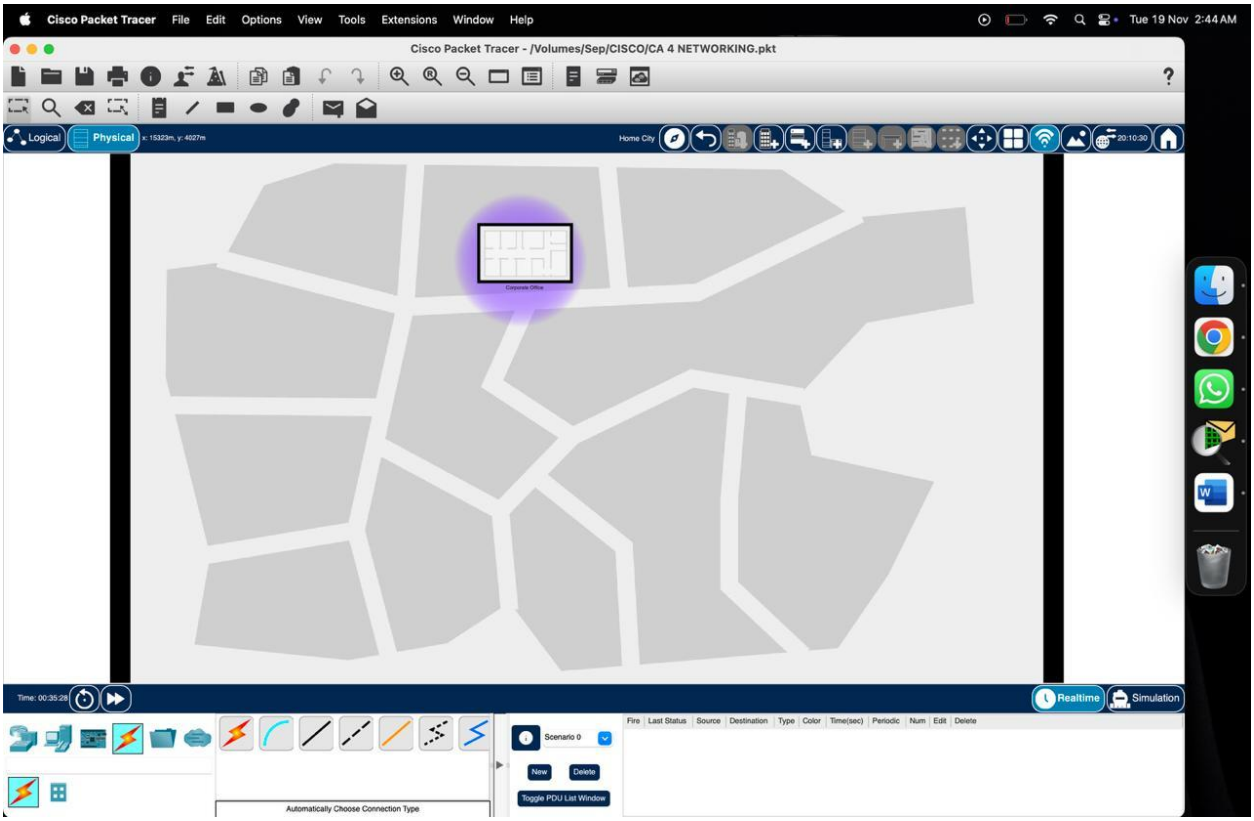
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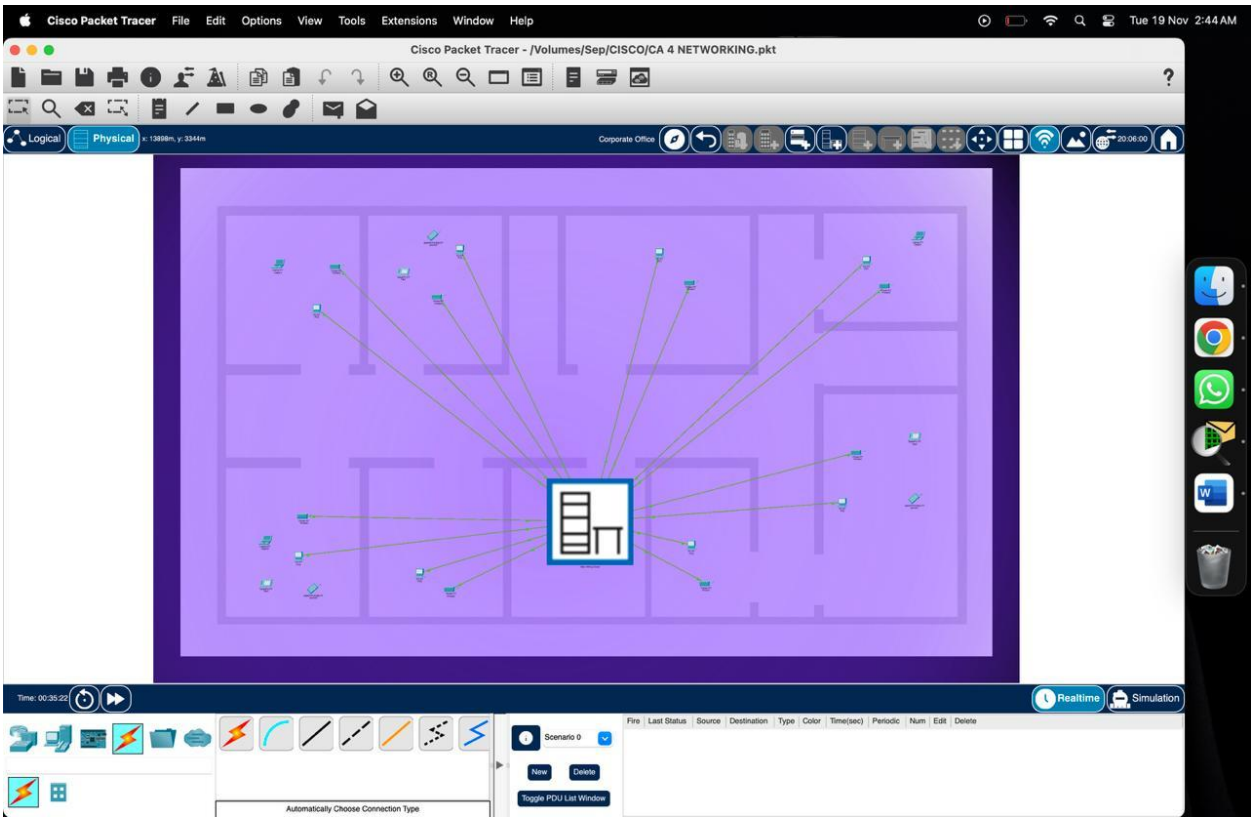
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Physical
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Toggle PDU List Window
Automatically Choose Connection Type


Logical

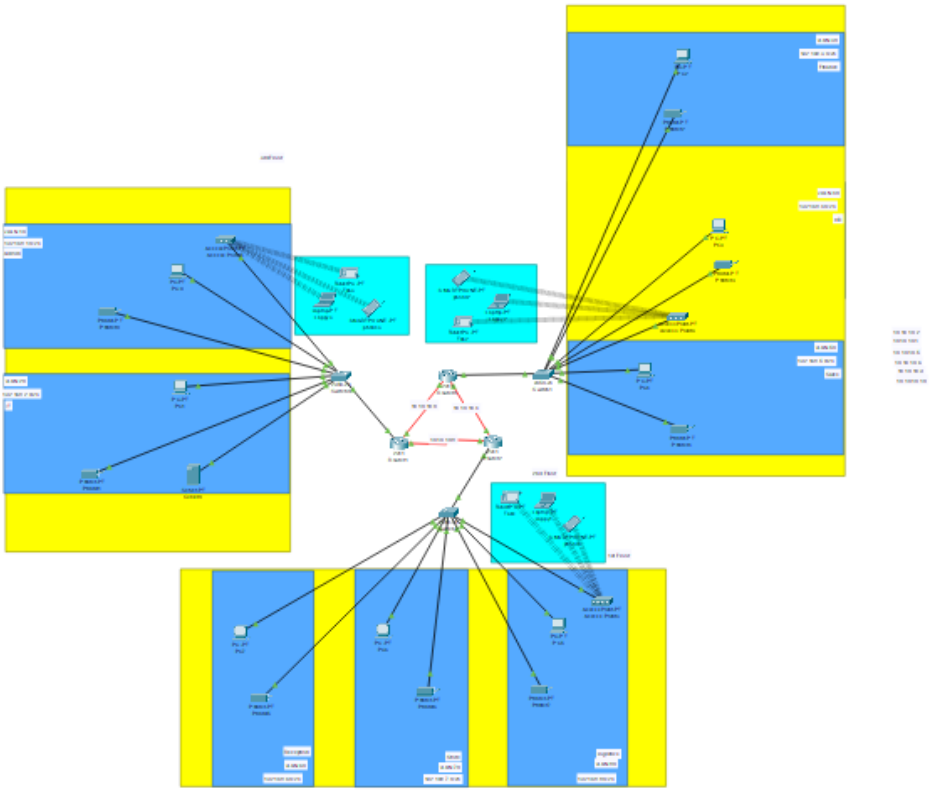
VLAN Configuration

VLANs (Virtual Local Area Networks) are used to segment the network by department, allowing for isolation and enhanced security. Each department is assigned a unique VLAN and subnet, as shown below:

Floor	Department	VLAN	IP Range
1st Floor	Reception	VLAN 80	192.168.8.0/24
	Store	VLAN 70	192.168.7.0/24
	Logistics	VLAN 60	192.168.6.0/24
2nd Floor	Finance	VLAN 50	192.168.5.0/24
	HR	VLAN 40	192.168.4.0/24
	Sales/Marketing	VLAN 30	192.168.3.0/24
3rd Floor	Admin	VLAN 20	192.168.2.0/24
	IT	VLAN 10	192.168.1.0/24

Network Design Overview

The Vic Modern Hotel network design is based on a structured, segmented architecture that ensures both scalability and security while facilitating seamless communication across the hotel's departments. The network spans three floors, with each floor hosting multiple departments. The design uses VLANs for network segmentation. Here is full design of my project



Security Features

- **SSH Configuration**
  Secure login configured on all routers using SSH to allow remote administration**.**
- **Port Security**
  - IT department switch fa0/1 restricted to "Test-PC" using sticky MAC address learning.
  - Violation mode set to "shutdown" to prevent unauthorized access.

Email Assignments

Each department is assigned an official email for communication:

Department	Email ID
Reception	reception@vichotel.com
Store	store@vichotel.com
Logistics	logistics@vichotel.com
Finance	finance@vichotel.com
HR	hr@vichotel.com
Sales	sales@vichotel.com
Admin	admin@vichotel.com
IT	it@vichotel.com

Testing and Validation

- **Dynamic IP Allocation**: Verified DHCP configuration for each VLAN.
- **Inter-VLAN Communication**: Tested communication across VLANs via OSPF.
- **Port Security**: Ensured only "Test-PC" accessed fa0/1 on IT switch.
- **SSH Access**: Confirmed remote access using Test-PC.
- **Wi-Fi Connectivity**: Laptops and phones successfully connected to VLAN Wi-Fi networks.

Conclusion

The Vic Modern Hotel network design project is an ambitious initiative aimed at creating a comprehensive, secure, and efficient network infrastructure to support the diverse operations of the hotel. This multi-floor, multi-department hotel requires a tailored approach to ensure seamless connectivity, robust security, and optimal performance.

Comprehensive Network Infrastructure

The design of the network infrastructure involves:Routers and Switches: Strategically placed on each floor to manage and direct network traffic efficiently.

Access Points: Ensuring strong Wi-Fi connectivity throughout the hotel, providing guests and staff with reliable internet access.

Serial DCE Cables: Connecting the routers to ensure smooth communication between floors and departments.

IP Addressing: Proper IP management to ensure efficient data flow and network management.

Security Measures: Security is paramount in the network design, encompassing:

Firewalls: Protecting the network from unauthorized access and potential cyber threats.

Encryption: Safeguarding sensitive data during transmission and storage to prevent data breaches.

Intrusion Detection Systems (IDS): Monitoring network activity to detect and respond to suspicious activities promptly.

Ensuring Reliability and Continuity:To maintain uninterrupted service and data integrity:

Uninterruptible Power Supplies (UPS): Providing backup power to critical network components in case of power outages.

Regular Backups: Ensuring that all critical data is regularly backed up and stored securely, allowing for quick recovery in case of data loss.

Support for Multiple Departments: Ensuring that the network meets the specific needs of various departments, from reception and logistics on the 1st floor to finance, HR, and sales on the 2nd floor, and IT and admin on the 3rd floor.

Collaboration and Communication: Facilitating smooth communication and collaboration between departments, supporting the hotel's overall operational goals.

Enhancing Guest Experience:Ultimately, the goal is to enhance the guest experience:

Reliable Internet Access: Providing fast and reliable internet access throughout the hotel, ensuring guests can stay connected.

The network design for Vic Modern Hotel successfully meets all requirements, including wired and wireless communication, dynamic IP addressing, and robust security measures. The integration of additional features, such as 2D visualization and departmental email assignments, enhances operational efficiency and inter-departmental communication. The design supports scalability and ensures the hotel’s readiness for future network expansions.