COMPUTER NETWORKS (CS-360L)

PROJECT REPORT ON

“Hotel Network Management System”

Submitted to:

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1. Introduction

This document outlines the project to configure and implement a dynamic and static IP network system specifically tailored for a hotel management network. The objective was to create a robust and scalable network infrastructure that ensures seamless communication, efficient IP allocation, and secure inter-department connectivity.

2. Project Overview

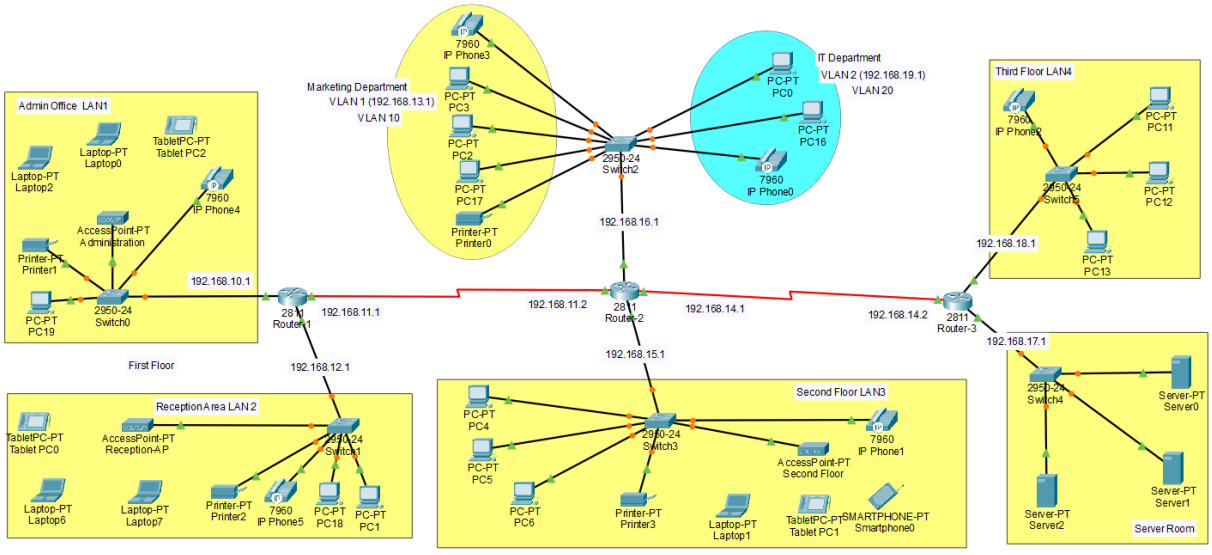
The project aimed to design a networking environment that supports the hotel's operational requirements. These include providing reliable internet access to guests, maintaining secure communication within administrative and operational departments, and enabling dynamic network management.

Key features of the project:

- Static IP assignment for critical devices such as servers and printers.
- Dynamic IP assignment for guest devices and general employee workstations.
- Dynamic routing to ensure efficient data flow across the network.
- VLANs for department-specific traffic segregation and security.

3. Network Diagram

The network diagram represents the topology of the hotel management network, detailing the connections between routers, switches, VLANs, and end devices.



3.1 Description of the Diagram

- **Core Routers**: Three routers form the backbone of the network, connecting different floors and critical departments.
- **Switches**: Switches are used to manage departmental networks and facilitate inter-VLAN communication.
- **Devices**: Includes servers, printers, laptops, and guest devices such as mobile phones.
- **VLAN Segmentation**:
  - VLAN 10 for Marketing Department.
  - VLAN 20 for IT Department.
- **Routing Protocol**: EIGRP ensures dynamic routing between routers for high performance and fault tolerance.

3.2 Key Components

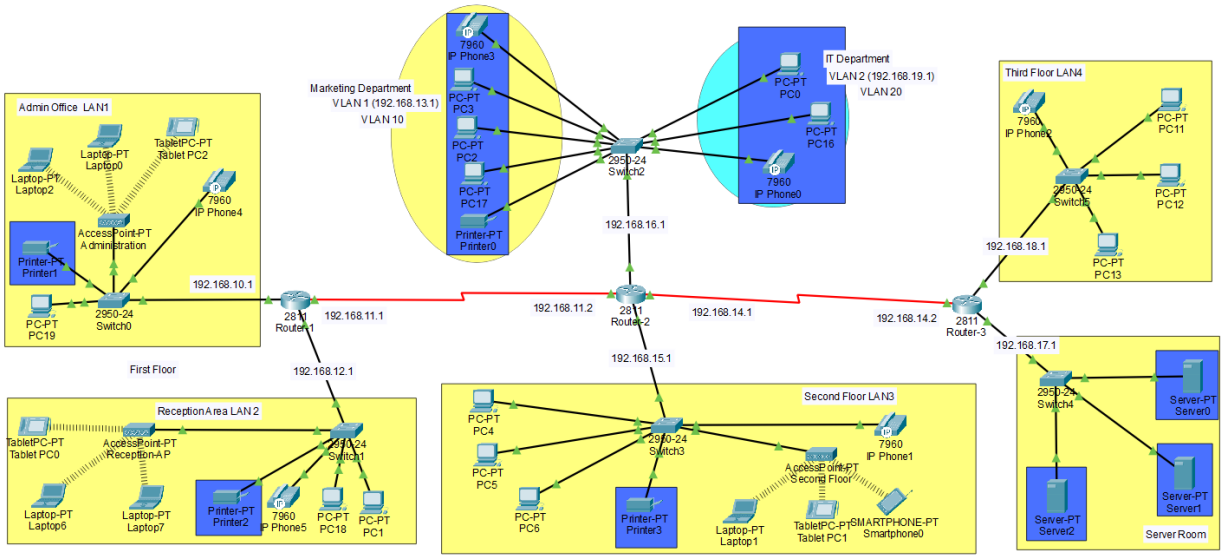
- **Router-1**: Connected to the admin office and main server.
- **Router-2**: Manages connections to the second floor and departmental networks.
- **Router-3**: Handles the third floor and guest network traffic.
- **Switch2**: Configured for VLANs and inter-VLAN routing.

4. Concepts Used

4.1 Static IP Assignment

Explanation

Static IP addresses are manually assigned to devices, ensuring a fixed and predictable IP address. This is particularly important for devices that provide critical services, such as file servers, domain controllers, and network printers, where IP consistency is crucial for proper operation.



Application in the Hotel Network

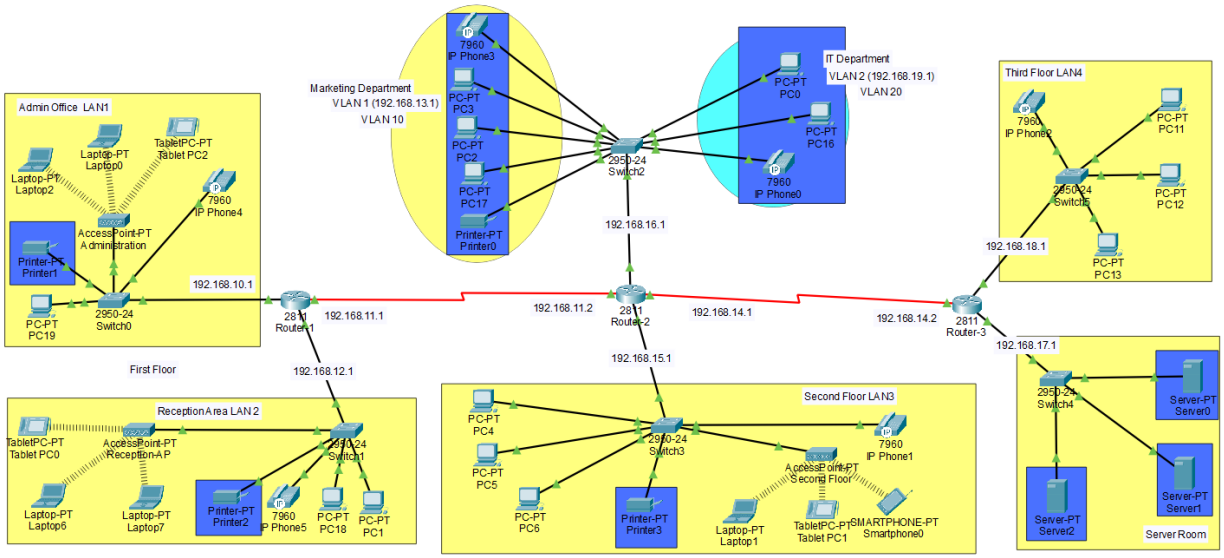
In our project:

- Servers and printers in administrative offices were assigned static IPs to ensure constant availability.
- Static IPs were also allocated to departmental devices in marketing and IT to streamline resource access.

4.2 Dynamic IP Assignment

Explanation

Dynamic IP assignment uses DHCP (Dynamic Host Configuration Protocol) to automatically assign IP addresses to devices. This is ideal for environments with a fluctuating number of devices, such as hotels where guests frequently connect and disconnect from the network.



Technical Details

- DHCP automatically assigns an IP, subnet mask, default gateway, and DNS server to clients.
- Benefits:
    - Reduces administrative overhead.
    - Supports scalability by accommodating varying device counts.
    - Prevents IP conflicts.

Application in the Hotel Network:

DHCP was implemented on each router to provide IP addresses to guest devices and employee laptops.

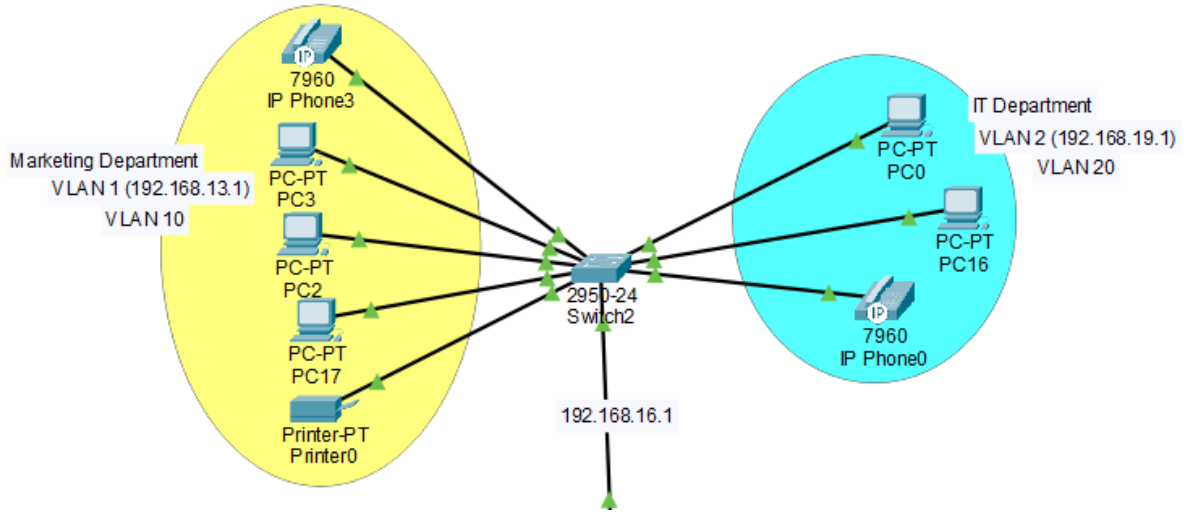
4.3 Inter-VLAN Communication:

VLANs (Virtual Local Area Networks) segment network traffic to isolate different departments or groups within an organization. Inter-VLAN communication enables these isolated VLANs to communicate through each other, enhancing security while maintaining necessary connectivity.

Application in the Hotel Network

In our project:

- VLANs were configured for marketing (`VLAN 10`), IT (`VLAN 20`), and guest devices (`VLAN 30`).
- A Layer 3 switch enabled inter-VLAN routing to facilitate controlled communication between departments.



Following is the configuration done on the Switch-2 for Inter-Vlan communication:

```
Switch(config)#vl 10
Switch(config-vlan)#name marketing
Switch(config-vlan)#vl 20
Switch(config-vlan)#name it
Switch(config-vlan)#int range fa0/4-7
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vl 10
Switch(config-if-range)#int range fa0/9
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vl 10
Switch(config-if-range)#int range fa0/2-3
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vl 20
Switch(config-if-range)#int range fa0/8
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vl 20
Switch(config-if-range)#int fa0/10
Switch(config-if)#switchport mode trunk
Switch(config-if)#
```

4.4 Dynamic IP Routing Using EIGRP

Explanation

EIGRP (Enhanced Interior Gateway Routing Protocol) is a protocol designed for high-performance dynamic routing. It ensures efficient and loop-free routing updates, making it suitable for medium to large networks.

Application in the Hotel Network

In our project:

- EIGRP was used to interconnect the routers on different floors, enabling dynamic routing for optimal path selection.
- Backup routes were configured to maintain connectivity during link failures.

EIGRP routing on Router-1 for dynamic IP routing:

```
Router-1(config-router)#router eigrp 10
Router-1(config-router)#network 192.168.10.0 255.255.255.0
Router-1(config-router)#network 192.168.11.0 255.255.255.0
Router-1(config-router)#network 192.168.12.0 255.255.255.0
Router-1(config-router)#
```

EIGRP configuration on Router-2 for dynamic IP routing:

```
Router-2(config-router)#router eigrp 10
Router-2(config-router)#network 192.168.11.0 255.255.255.0
Router-2(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 10: Neighbor 192.168.11.1 (Serial0/3/0) is up: new adjacency
network 192.168.13.0 255.255.255.0
Router-2(config-router)#network 192.168.14.0 255.255.255.0
Router-2(config-router)#network 192.168.15.0 255.255.255.0
Router-2(config-router)#network 192.168.16.0 255.255.255.0
Router-2(config-router)#network 192.168.19.0 255.255.255.0
```

EIGRP configuration on Router-3 for dynamic IP routing:

```
Router-3(config-router)#router eigrp 10
Router-3(config-router)#network 192.168.14.0 255.255.255.0
Router-3(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 10: Neighbor 192.168.14.1 (Serial0/1/0) is up: new adjacency
network 192.168.17.0 255.255.255.0
Router-3(config-router)#network 192.168.18.0 255.255.255.0
```

5. Implementation Details

5.1 IP Configuration on Routers

Router-1

Configured to communicate with Admin area, Reception Area, and Router-2:

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Router-1
Router-1(config)#
Router-1(config)#interface FastEthernet0/0
Router-1(config-if)#ip address 192.168.10.1 255.255.255.0
Router-1(config-if)#ip address 192.168.10.1 255.255.255.0
Router-1(config-if)#no sh

Router-1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
interface FastEthernet0/1
Router-1(config-if)#
Router-1(config-if)#exit
Router-1(config)#interface FastEthernet0/0
Router-1(config-if)#
Router-1(config-if)#exit
Router-1(config)#interface FastEthernet0/1
Router-1(config-if)#ip address 192.168.12.1 255.255.255.0
Router-1(config-if)#ip address 192.168.12.1 255.255.255.0
Router-1(config-if)#no sh
Router-1(config-if)#
Router-1(config-if)#exit
Router-1(config)#interface FastEthernet0/1
Router-1(config-if)#
Router-1(config-if)#exit
Router-1(config)#interface Serial0/3/0
Router-1(config-if)#ip address 192.168.11.1 255.255.255.0
Router-1(config-if)#ip address 192.168.11.1 255.255.255.0
Router-1(config-if)#clock rate 56000
Router-1(config-if)#no sh
```

Router-2

Configured to handle communication with the second floor, Router-1, Router-3, and also act as router on stick for IT and Marketing department for Inter-Vlan communication:

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int s0/3/0
Router(config-if)#ip add 192.168.11.2 255.255.255.0
Router(config-if)#no sh
Router(config-if)#int s0/1/0
Router(config-if)#ip add 192.168.14.1 255.255.255.0
Router(config-if)#no sh
Router(config-if)#int fa 0/1
Router(config-if)#ip add 192.168.15.1 255.255.255.0
Router(config-if)#no sh
Router(config-if)#int fa 0/0
Router(config-if)#ip add 192.168.16.1 255.255.255.0
Router(config-if)#int fa 0/0.10
Router(config-subif)#encapsulation dot1Q 10
Router(config-subif)#ip add 192.168.13.1 255.255.255.0
Router(config-subif)#no sh
Router(config-subif)#int fa 0/0.20
Router(config-subif)#ip add 192.168.19.1 255.255.255.0
Router(config-subif)#int fa 0/0.20
Router(config-subif)#encapsulation dot1Q 20
Router(config-subif)#ip add 192.168.19.1 255.255.255.0
Router(config-subif)#no sh
Router(config-subif)#exit
Router(config)#
```

Router-3

Configured to communicate with Third floor, Server room, and Router-2:

```
Router-3>en
Router-3#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router-3(config)#
Router-3(config)#interface FastEthernet0/0
Router-3(config-if)#ip address 192.168.18.1 255.255.255.0
Router-3(config-if)#ip address 192.168.18.1 255.255.255.0
Router-3(config-if)#
Router-3(config-if)#exit
Router-3(config)#interface FastEthernet0/1
Router-3(config-if)#ip address 192.168.17.1 255.255.255.0
Router-3(config-if)#ip address 192.168.17.1 255.255.255.0
Router-3(config-if)#
Router-3(config-if)#exit
Router-3(config)#interface Serial0/1/0
Router-3(config-if)#ip address 192.168.14.2 255.255.255.0
Router-3(config-if)#ip address 192.168.14.2 255.255.255.0
Router-3(config-if)#clock rate 56000
```

5.2 DHCP Configuration

DHCP settings for dynamic IP assignment:

- DHCP configuration on Router-1 for dynamic IP assignment:

```
Router-1(config)#ip dhcp pool admin
Router-1(dhcp-config)#network 192.168.10.0 255.255.255.0
Router-1(dhcp-config)#default-router 192.168.10.1
Router-1(dhcp-config)#dns-server 192.168.10.10
Router-1(dhcp-config)#ip dhcp pool reception
Router-1(dhcp-config)#network 192.168.12.0 255.255.255.0
Router-1(dhcp-config)#default-router 192.168.12.1
Router-1(dhcp-config)#dns-server 192.168.12.10
```

- DHCP configuration on Router-2 for dynamic IP assignment:

```
Router(config)#ip dhcp pool secondfloor
Router(dhcp-config)#network 192.168.15.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.15.1 255.255.255.0
                                                ^
% Invalid input detected at '^' marker.

Router(dhcp-config)#default-router 192.168.15.1
Router(dhcp-config)#dns-server 192.168.15.10
Router(dhcp-config)#
```

- DHCP configuration on Router-3 for dynamic IP assignment

```
Router-3(config)#ip dhcp pool thirdfloor
Router-3(dhcp-config)#network 192.168.18.0 255.255.255.0
Router-3(dhcp-config)#default-router 192.168.18.1
Router-3(dhcp-config)#dns-server 192.168.18.10
Router-3(dhcp-config)#
```

6. Results and Outcomes

- **Efficient IP Allocation**: The DHCP setup ensured optimal utilization of the IP address pool, dynamically assigning addresses to a wide range of devices without conflicts.
- **Improved Network Security**: VLAN segmentation restricted access to sensitive resources, ensuring that data specific to marketing and IT.
- **High Availability**: The use of EIGRP dynamic routing provided redundancy and minimized downtime, with automatic route recalculations ensuring seamless data flow during link failures.
- **Scalability**: The network was designed to handle additional departments or devices with minimal reconfiguration. New VLANs or DHCP scopes can be added to accommodate growth.
- **Enhanced Guest Experience**: The dedicated guest VLAN ensured consistent and reliable internet access for hotel guests without interfering with internal operations.
- **Simplified Troubleshooting**: Predictable static IP assignments for critical devices made network diagnostics straightforward, while dynamic assignments reduced administrative overhead for user devices.
- **Operational Efficiency**: Administrative tasks such as device provisioning, monitoring, and network changes were streamlined through centralized configurations.

7. Conclusion

The implementation of the hotel management network was a resounding success, addressing both current needs and future scalability. By integrating static IPs for critical devices and dynamic IPs for guest and staff convenience, the network ensures reliable and secure operations. VLANs segregated sensitive data, while EIGRP optimized routing, providing resilience and efficiency. The system's scalability supports seamless growth, ensuring that additional devices, floors, or services can be accommodated with minimal reconfiguration. This robust infrastructure not only enhances user experience with uninterrupted connectivity but also strengthens operational efficiency, positioning the hotel for technological advancements and sustained customer satisfaction.