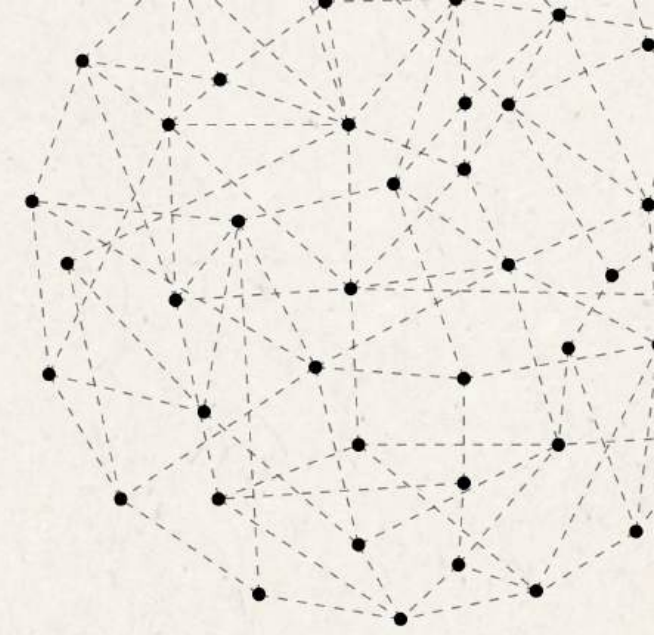


SMART PARKING AND MONITORING SYSTEM

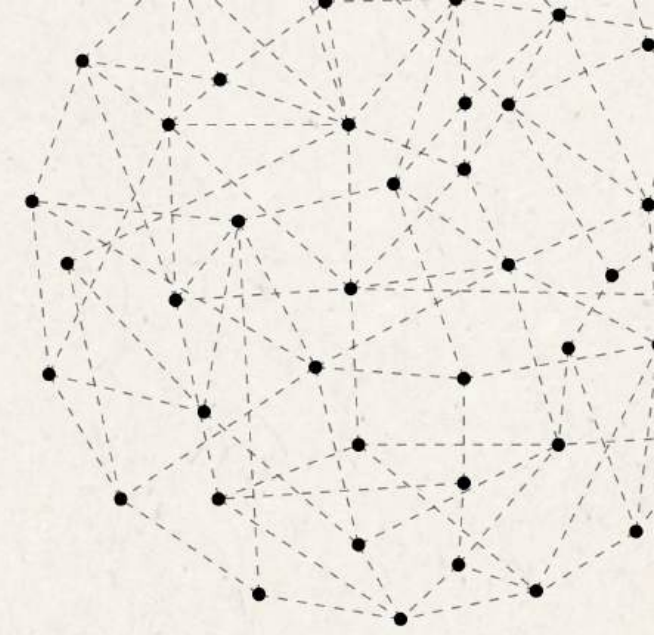
Network Design with RIP & OSPF Protocols

Introduction



This project aims to design a smart system for managing and monitoring parking areas using modern networking technologies. The system leverages the RIP (Routing Information Protocol) to connect devices and enable seamless communication between different network segments. The solution is intended to enhance parking efficiency and simplify monitoring and control operations.

Methodology



To assess the routing protocols, we designed two network scenarios—one using RIP and the other using OSPF. Each configuration was tested by transmitting ICMP echo requests (ping) across the network.

Packet loss was used as the main performance metric, calculated using the formula:

$$\text{Packet Loss (\%)} = (\text{Sent} - \text{Received}) \div \text{Sent} \times 100$$

All simulations were conducted in Cisco Packet Tracer under realistic enterprise conditions.

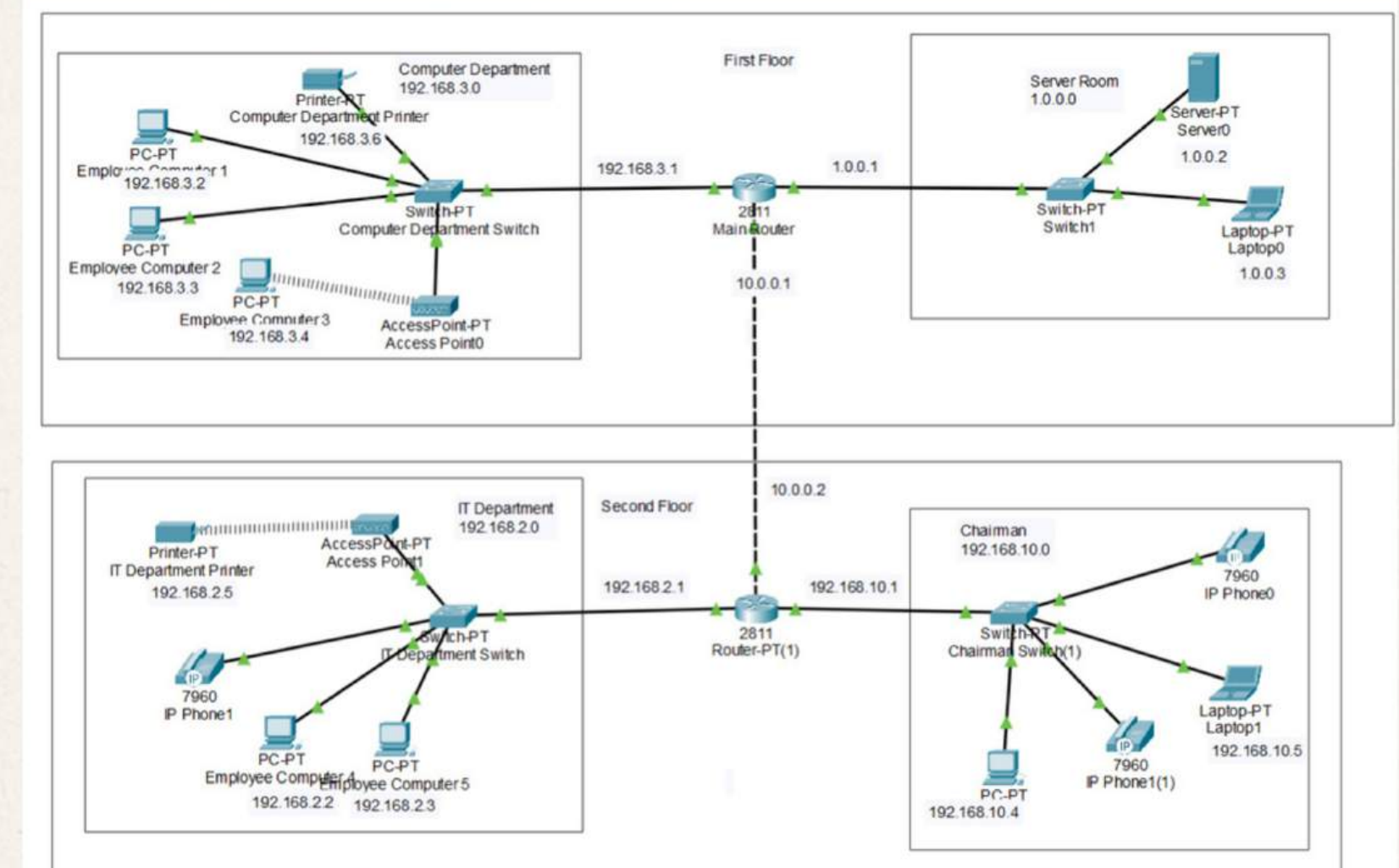
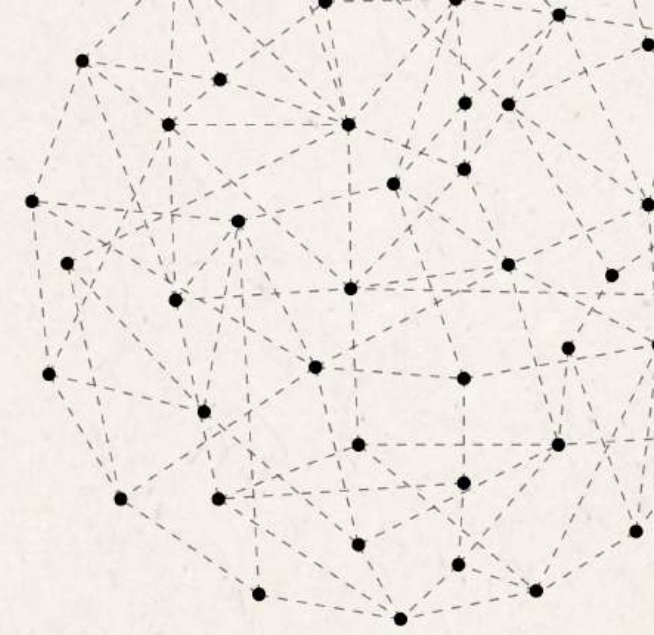
Network Design Overview

The proposed topology integrates:

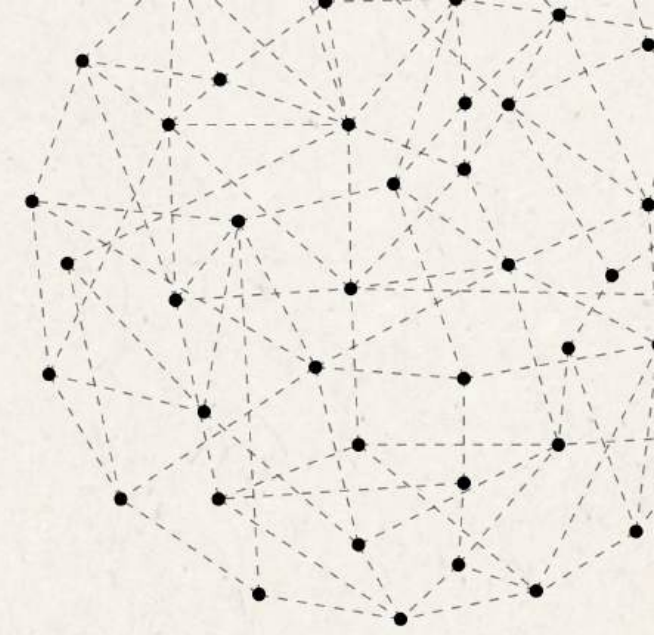
Star topology within each department to connect local devices to switches.

Bus topology to link all routers across different departments.

This hybrid approach ensures both local efficiency and overall structural stability.



Addressing & Devices

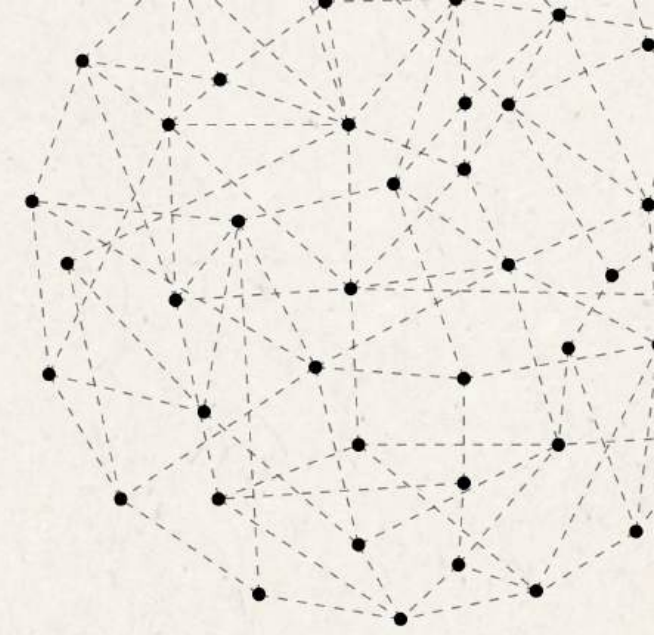


THE NETWORK IS DIVIDED BY DEPARTMENT (IT, CHAIRMAN, COMPUTER, SERVER ROOM).

EACH DEPARTMENT HAS:

- PCS AND LAPTOPS
- IP PHONES
- PRINTERS
- WIRELESS ACCESS POINTS
- CENTRAL SWITCHES AND ROUTERS

RIP vs OSPF – Performance Analysis



RIP:

Distance-vector protocol

Calculates routes based on hop count

Simpler but less efficient in large networks

OSPF:

Link-state protocol

Calculates routes based on bandwidth and cost

Offers faster convergence and more stable performance

Result: Both achieved 0% packet loss, but OSPF showed superior response time and reliability.

Packet Loss Results

In both RIP and OSPF simulations, all transmitted packets were successfully received:

100% packet delivery across all departments

0% packet loss in all test cases

OSPF had better round-trip time, confirming more efficient routing

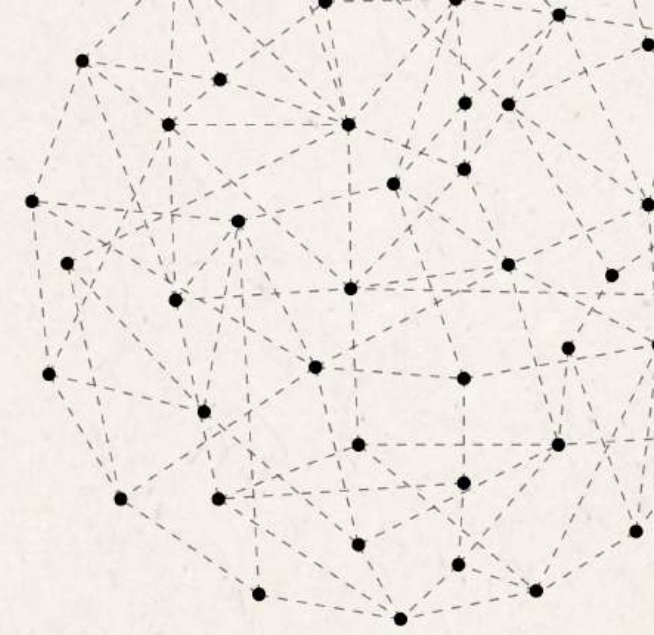
A screenshot of a Cisco Packet Tracer PC Command Line window for 'Employee Computer 1'. The 'Desktop' tab is selected. The command prompt shows a ping command to 192.168.3.6. The output shows four successful replies with 32 bytes of data, all with a time of less than 1ms and a TTL of 128. The ping statistics show 4 packets sent, 4 received, 0 lost (0% loss), and approximate round trip times of 0ms, 14ms, and 3ms.

Figure 3 -RIP Checking Connectivity from Computer Department PC

A screenshot of a Cisco Packet Tracer PC Command Line window for 'Laptop0'. The 'Desktop' tab is selected. The command prompt shows a ping command to 1.0.0.3. The output shows four successful replies with 32 bytes of data, with times of 18ms, 8ms, 1ms, and 37ms, all with a TTL of 128. The ping statistics show 4 packets sent, 4 received, 0 lost (0% loss), and approximate round trip times of 0ms, 37ms, and 15ms.

Figure 2 - RIP Checking Connectivity from server Laptop

A screenshot of a Cisco Packet Tracer PC Command Line window for 'Laptop0'. The 'Desktop' tab is selected. The command prompt shows a ping command to 1.0.0.3. The output shows four successful replies with 32 bytes of data, with times of 4ms, 8ms, 1ms, and 7ms, all with a TTL of 128. The ping statistics show 4 packets sent, 4 received, 0 lost (0% loss), and approximate round trip times of 0ms, 8ms, and 4ms.

Figure 8 -OSPF Checking Connectivity from Computer Department PC

A screenshot of a Cisco Packet Tracer PC Command Line window for 'Employee Computer 2'. The 'Desktop' tab is selected. The command prompt shows a ping command to 192.168.3.3. The output shows four successful replies with 32 bytes of data, with times of 1ms, 5ms, 2ms, and 5ms, all with a TTL of 128. The ping statistics show 4 packets sent, 4 received, 0 lost (0% loss), and approximate round trip times of 0ms, 5ms, and 3ms.

Figure 7 -OSPF Checking Connectivity from Server Room Laptop

A screenshot of a Cisco Packet Tracer PC Command Line window for 'Laptop1'. The 'Desktop' tab is selected. The command prompt shows a ping command to 192.168.10.5. The output shows four successful replies with 32 bytes of data, with times of 1ms, 4ms, 2ms, and 3ms, all with a TTL of 128. The ping statistics show 4 packets sent, 4 received, 0 lost (0% loss), and approximate round trip times of 0ms, 4ms, and 2ms.

Figure 5- RIP Checking Connectivity from chairman Room Laptop

A screenshot of a Cisco Packet Tracer PC Command Line window for 'Employee Computer 4'. The 'Desktop' tab is selected. The command prompt shows a ping command to 192.168.2.2. The output shows four successful replies with 32 bytes of data, with times of 8ms, 18ms, 12ms, and 10ms, all with a TTL of 128. The ping statistics show 4 packets sent, 4 received, 0 lost (0% loss), and approximate round trip times of 8ms, 18ms, and 12ms.

Figure 4- RIP Checking Connectivity from IT Department PC

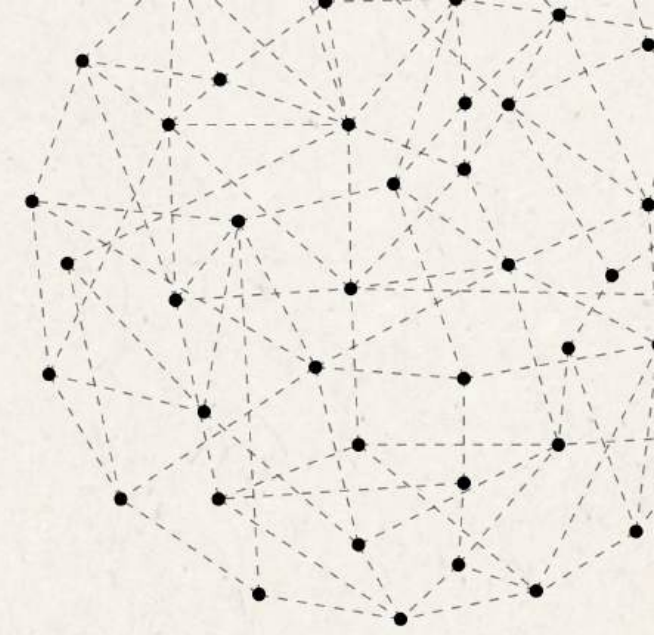
A screenshot of a Cisco Packet Tracer PC Command Line window for 'Employee Computer 4'. The 'Desktop' tab is selected. The command prompt shows a ping command to 192.168.2.2. The output shows four successful replies with 32 bytes of data, with times of 2ms, 3ms, 2ms, and 2ms, all with a TTL of 128. The ping statistics show 4 packets sent, 4 received, 0 lost (0% loss), and approximate round trip times of 2ms, 3ms, and 2ms.

Figure 9 -OSPF Checking Connectivity from IT Department PC

A screenshot of a Cisco Packet Tracer PC Command Line window for 'Laptop1'. The 'Desktop' tab is selected. The command prompt shows a ping command to 192.168.10.5. The output shows four successful replies with 32 bytes of data, all with a time of less than 1ms and a TTL of 128. The ping statistics show 4 packets sent, 4 received, 0 lost (0% loss), and approximate round trip times of 0ms, 1ms, and 0ms.

Figure 10- OSPF Checking Connectivity from Chairman Laptop

Challenges and Solutions



Challenge: IP conflicts

Solution: Reassigned and organized IP addressing

Challenge: RIP misconfiguration

Solution: Verified settings and synchronized routers

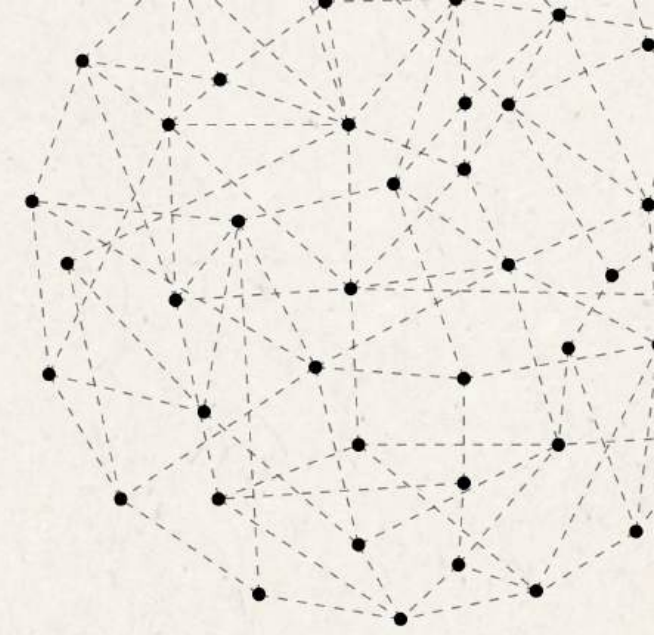
Challenge: Data delay and routing loops

Solution: Optimized topology and tested routing paths

Challenge: Network scalability

Solution: Designed a clean, modular network layout

Conclusion



This project demonstrated the successful deployment of a smart network system using RIP and OSPF.

While both protocols ensured connectivity, OSPF outperformed RIP in terms of convergence speed and path optimization.

As a result, OSPF is more suitable for dynamic, large-scale, and real-time smart environments.

Thank you