Bank Network System

Submitted By

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MINI LAB PROJECT REPORT

This Report Presented in Partial Fulfillment of the course **CSE314: Computer Networks Lab in the Computer Science and Engineering Department**

DAFFODIL INTERNATIONAL UNIVERSITY

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DECLARATION

We hereby declare that this lab project has been done by us under the supervision of **Fatema Tuj Johora**, **Assistant Professor**, Department of Computer Science and Engineering, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere as lab projects.

Submitted To:

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COURSE & PROGRAM OUTCOME

The following course have course outcomes as following:

Table 1: Course Outcome Statements

CO’s	Statements
CO1	Understand and apply advanced networking concepts such as VLANs, OSPF, DHCP, and their integration in banking network systems.
CO2	Design and configure efficient networks using tools like Cisco Packet Tracer by implementing routing protocols and server configurations.
CO3	Develop scalable solutions for real-world networking challenges, such as VLAN segmentation, OSPF routing, and DHCP, ensuring optimal communication and security.

Table 2: Mapping of CO, PO, Blooms, KP and CEP

CO	PO	Blooms	KP	CEP
CO1	PO1	C1, C2	KP3	EP1, EP3
CO2	PO2	C3	KP3	EP1, EP3
CO3	PO3	C4, A3, P3	KP4	EP1, EP3, EP4

The mapping justification of this table is provided in section **4.3.1**, **4.3.2** and **4.3.3**.

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Chapter 1

Introduction

This project report is submitted as part of our course requirements. The project was designed and implemented using Cisco Packet Tracer to simulate a **Bank Network System**, employing VLAN, OSPF, and DHCP technologies to ensure efficient and secure network communication.

1.1 Introduction

The "Bank Network System" is a simulation of a robust and scalable network design for modern banking institutions. It integrates VLAN, OSPF, and DHCP, along with essential servers like DHCP, HTTP, DNS, and E-mail to provide dynamic IP management, secure interconnectivity, and efficient communication.

1.2 Motivation

A well-designed network infrastructure is critical for banking systems to ensure secure communication, operational efficiency, and customer satisfaction. The motivation behind this project is to simulate a real-world banking network architecture to meet these requirements effectively.

1.3 Objectives

The key objectives of this project are:

- Develop a secure, segmented, and scalable network using VLANs, OSPF, and essential servers (DHCP, HTTP, DNS, and Email).
- Implement a prototype adhering to industry standards for dynamic routing and efficient communication.

1.4 Feasibility Study

The project involved analyzing existing banking network setups. By comparing modern routing protocols and configurations, VLAN, OSPF, and DHCP were identified as feasible technologies for implementation. Cisco Packet Tracer was chosen for its simulation capabilities and ease of configuration.

1.5 Gap Analysis

Most traditional banking systems face challenges like inefficient routing, lack of segmentation, and difficulty in managing IP addresses. This project addresses these gaps by:

- Introducing VLANs for better segmentation.
- Using OSPF for dynamic and efficient routing.
- Employing DHCP for automatic IP configuration and management.
- Overcomes these gaps through VLANs for segmentation, OSPF for scalability, and DHCP for dynamic IP assignment.

1.6 Project Outcome

- Enhanced security through VLAN segmentation and OSPF authentication.
- Improved scalability and flexibility using OSPF.
- Operational efficiency via DHCP for dynamic IP allocation.
- Real-world prototyping of a banking network.

Chapter 2

Proposed Methodology/Architecture

This chapter provides an overview of the proposed system's methodology and design architecture, detailing the requirements analysis, network design, and implementation strategies. It outlines how VLANs, OSPF, and DHCP were integrated to create a scalable, efficient, and secure banking network.

2.1 Requirement Analysis & Design Specification

2.1.1 Overview

The project involves a multi-floor banking system with departmental VLANs, inter-floor routing using OSPF, and essential servers (DHCP, HTTP, DNS, and E-mail) for operational efficiency.

2.1.2 Proposed Methodology

The network is divided into multiple VLANs based on departments (Management, Research, HR, etc.), ensuring efficient traffic segregation and enhanced security. Each floor is equipped with dedicated routers and switches that are interconnected using OSPF to enable dynamic and scalable routing between floors. Subnetting is applied to optimize IP address utilization, allowing efficient allocation of addresses to each VLAN. The design also includes a hierarchical approach to routing, ensuring minimal latency and seamless communication across departments.

- **VLAN**: Segmentation for each department to ensure data security and reduce broadcast traffic.
- **OSPF**: Dynamic routing between floors to enable efficient data transfer.
- **DHCP**: Dynamic IP allocation to reduce manual errors.
- **HTTP, DNS, E-mail Servers**: For web-based services, domain resolution, and interdepartmental communication.

2.1.3 Network Topology

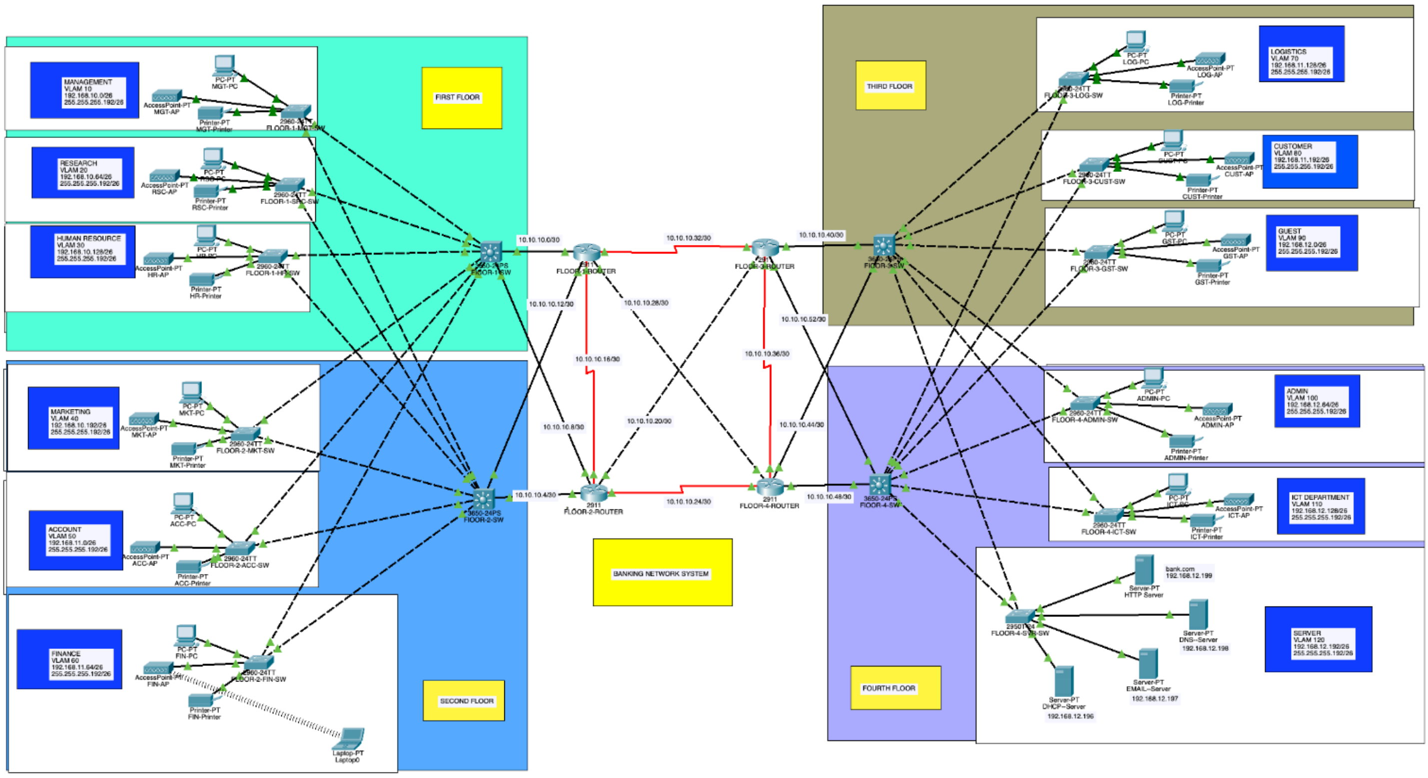

Fig. Bank Network System

2.2 Overall Project Plan

Week 1	Requirement gathering and design of the network architecture.
Week 2	Implementation of VLANs, OSPF, and DHCP.
Week 3	Integration of HTTP, DNS, and E-mail servers.
Week 4	Testing and performance analysis.

Chapter 3

Implementation and Results

This chapter focuses on the practical implementation of the Bank Network System, including the configuration of VLANs, OSPF, and DHCP, and evaluates the system's performance. It also discusses the results achieved, highlighting the network's efficiency, scalability, and reliability.

3.1 Implementation

- VLANs were configured for departmental segmentation:
  - VLAN 10: Management
  - VLAN 20: Research
  - VLAN 30: HR
  - VLAN 40-120: Various other departments.
- OSPF was used to ensure efficient routing between the floors.
- DHCP servers were set up to provide IP addresses automatically within each VLAN.
- Deployed HTTP, DNS, and E-mail servers for communication and operational tasks.

3.2 Performance Analysis

Performance testing was conducted by simulating network traffic between devices in different VLANs and floors. The results showed:

- Verified VLAN segmentation for isolating departmental traffic.
- Tested OSPF routing for dynamic and efficient packet transfer.
- Evaluated DHCP server for seamless IP allocation.
- Confirmed HTTP and DNS server functionality for banking applications.

3.3 Results and Discussion

The simulated banking network achieved the desired objectives, providing a secure and scalable network with minimal latency and effective IP management. The use of VLANs ensured proper traffic segmentation, enhancing security and reducing broadcast traffic across departments. OSPF dynamically adjusted routing paths, ensuring efficient data flow even during link failures. Additionally, the implementation of DHCP streamlined IP address allocation, reducing administrative overhead and improving network reliability.

Chapter 4

Engineering Standards and Mapping

This chapter explores the adherence to engineering standards and how the project aligns with sustainable practices, ethical considerations, and societal impact. It also addresses complex engineering problems and maps them to program outcomes and problem-solving frameworks.

4.1 Impact on Society, Environment and Sustainability

4.1.1 Impact on Life

The Bank Network System improves daily operations by providing seamless and secure communication between departments. Automation through DHCP and efficient routing via OSPF reduces manual tasks, enhancing productivity. By addressing potential communication bottlenecks, the system ensures faster banking services. This positively impacts employees' workflow and customers' banking experience, ultimately contributing to better financial services in society.

4.1.2 Impact on Society & Environment

The project promotes sustainability by optimizing network resources and reducing energy consumption through efficient VLAN configurations. By isolating traffic, the system minimizes unnecessary data transmissions, conserving bandwidth. This environmentally conscious design reduces the carbon footprint of network operations. Additionally, secure communication in banking operations strengthens public trust in financial institutions, fostering societal well-being.

4.1.3 Ethical Aspects

Ethics were carefully considered throughout the project to ensure data security and confidentiality. VLANs were utilized to safeguard sensitive departmental communications, while automated IP allocation ensures fairness and accuracy. Ethical considerations also influenced the choice of scalable and cost-effective solutions, ensuring responsible use of resources. The project adheres to ethical principles, promoting integrity and professionalism in engineering practices.

4.1.4 Sustainability Plan

The project emphasizes long-term sustainability through scalable designs that can adapt to future requirements, such as IPv6 implementation. Efficient use of resources, like centralized DHCP, reduces operational costs and energy usage. By incorporating modular architecture, the network allows for incremental upgrades without significant overhauls. These features ensure that the system remains viable and efficient over time, contributing to economic and environmental sustainability.

4.2 Project Management and Team Work

The success of the Bank Network System project was a result of strong teamwork and effective project management. Team members were assigned specific roles, such as VLAN configuration, OSPF implementation, and network testing, ensuring efficient task distribution and accountability. Regular meetings were conducted to discuss challenges, brainstorm solutions, and maintain progress alignment. Collaboration and open communication allowed the team to address complex technical issues collectively. The division of responsibilities and a unified vision contributed to the project's timely and successful completion. This experience highlights the importance of teamwork in handling complex engineering projects.

4.3 Complex Engineering Problem

4.3.1 Mapping of Program Outcome

In this section, provide a mapping of the problem and provided solution with targeted Program Outcomes (PO's).

Table 4.1: Justification of Program Outcomes

PO's	Justification
PO1	Application of advanced networking concepts such as VLANs, OSPF, DHCP, and server integration in real-world systems.
PO2	Design and implementation of a scalable and secure banking network using simulation tools like Cisco Packet Tracer.
PO3	Analysis and optimization of network reliability, scalability, and performance using routing protocols and logical segmentation.

4.3.2 Complex Problem Solving

Table 4.2: Mapping with complex problem solving.

EP1 Dept of Knowledge	**EP2** Range of Conflicting Requirements	**EP3** Depth of Analysis	**EP4** Familiarity of Issues	**EP5** Extent of Applicable Codes	**EP6** Extent Of Stakeholder Involvement	**EP7** Inter-dependence
✔	✔	✔	✔			✔

4.3.3 Engineering Activities

Table 4.3: Mapping with complex engineering activities.

EA1 Range of resources	**EA2** Level of Interaction	**EA3** Innovation	**EA4** Consequences for society and environment	**EA5** Familiarity
✔	✔	✔	✔	✔

Chapter 5

Conclusion

This chapter summarizes the project outcomes, identifies limitations, and proposes future enhancements for the Banking Management System. It highlights the key achievements of the project and provides a roadmap for further development.

5.1 Summary

The Bank Network System project has successfully demonstrated the implementation of a secure and efficient network using VLANs, OSPF, and DHCP. The segmentation of departments through VLANs enhances security and isolates traffic. OSPF ensures dynamic routing for inter-floor communication, while DHCP automates IP management, reducing administrative overhead. The simulation results confirm the network's scalability, performance, and reliability. This project serves as a strong foundation for designing real-world banking networks.

5.2 Limitation

The project was implemented in a simulation environment using Cisco Packet Tracer, which may not fully replicate real-world complexities. The current design lacks advanced security measures such as Access Control Lists (ACLs) or firewalls, which could further enhance the system. Additionally, failover mechanisms, like redundancy in routing, were not addressed. Real-world testing and optimization may reveal hardware or performance challenges. Scalability for large-scale banking operations remains theoretical.

5.3 Future Work

Future enhancements can include integrating advanced security protocols such as ACLs, firewalls, and VPNs to protect sensitive data. Implementing redundancy mechanisms like HSRP or load balancing would improve fault tolerance. Expanding the system to include additional features like QoS (Quality of Service) for prioritizing critical traffic could enhance performance. Real-world testing and deployment would validate the system's reliability. Finally, adopting IPv6 will ensure future compatibility and address scalability challenges.

References

[1] Cisco Packet Tracer Documentation.
[2] Online resources on VLAN, OSPF, and DHCP.
[3] Relevant research papers on banking network systems.