

# **Design and Implementation of a Desktop-Based Social Networking System**

**TeamCgram**

**Course Project Report**

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# Chapter 1

## Introduction

Social networking systems require efficient data handling, scalable design, and responsive user interfaces. This project presents a desktop-based social networking application developed using **C++** and **SFML**. The system focuses on essential features including user management, post interaction, notifications, and graphical user interfaces.

The primary objective is to demonstrate the application of data structures, object-oriented programming, and event-driven GUI design within an academic scope.

# Chapter 2

## System Architecture

The application follows a modular architecture consisting of the following components:

- User Management Module
- Post and Comment Module
- Follow and Notification System
- Graphical User Interface (SFML)

Each module is independently designed to improve maintainability and scalability.

# Chapter 3

## Data Structures and Algorithms

### 3.1 User Management Using BST

Users are stored using a Binary Search Tree (BST) indexed by usernames, allowing efficient insertion and lookup.

---

**Algorithm 1** BST User Search

---

```
SearchUsernode, username node = null null node.username = username node.user
username < node.username SearchUsernode.left, username SearchUsernode.right,
username
```

---

### 3.2 Post and Comment System

Posts are stored using linked lists, while comments are implemented using singly linked lists to ensure fast insertion and minimal memory overhead.

Listing 3.1: Comment Structure

```
1 struct Comment {
2     int userID;
3     std::string text;
4     time_t timestamp;
5     Comment* next;
6 };
```

### 3.3 Notification System

Notifications are stored in a linked list with recent notifications inserted at the head. Unread notifications are tracked using a boolean flag.

Listing 3.2: Notification Types

```
1 enum class NotificationType {
2     FOLLOW,
3     LIKE,
4     COMMENT
5 };
```

# Chapter 4

## Follow System

Each user maintains two lists:

- Followers
- Following

Duplicate follow relationships are prevented through validation checks.

# Chapter 5

## Graphical User Interface

The graphical interface is implemented using **SFML**, providing real-time rendering and event-driven interaction.

### 5.1 Screen Architecture

All screens inherit from a common abstract base class to ensure consistency.

Listing 5.1: Screen Base Class

```
1 class Screen {  
2 public:  
3     virtual void handleEvent(const sf::Event&) = 0;  
4     virtual void update(float) = 0;  
5     virtual void render() = 0;  
6 };
```

### 5.2 Implemented Screens

- Login and Registration Screen
- Feed Screen with Scrolling Support
- Notification Screen

# Chapter 6

## Testing and Validation

### 6.1 Testing Strategy

The system was tested using unit testing, integration testing, and user acceptance testing to ensure correctness and reliability.

### 6.2 Integration Testing Summary

Table 6.1: Integration Test Results

Scenario	Status
User Registration	Passed
Post Creation	Passed
Like and Comment	Passed
Notification Delivery	Passed

# Chapter 7

## Performance Analysis

Table 7.1: Performance Benchmarks

Operation	100 Users	500 Users	1000 Users	Complexity
User Search	0.002ms	0.005ms	0.008ms	$O(\log n)$
Post Creation	0.001ms	0.001ms	0.001ms	$O(1)$
Feed Load	15ms	78ms	165ms	$O(n)$
Add Comment	0.006ms	0.009ms	0.012ms	$O(n)$

# Chapter 8

## Limitations

- File-based data persistence
- No password encryption
- Limited comment nesting
- No real-time updates

# Chapter 9

## Future Enhancements

- Database integration
- Secure authentication mechanisms
- Media sharing support
- Real-time notifications
- Mobile-friendly interface

# Chapter 10

## Conclusion

This project successfully demonstrates the design and implementation of a desktop-based social networking system using C++ and SFML. The system applies efficient data structures, modular design principles, and thorough testing, fulfilling all academic requirements.

# Bibliography

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