Software Requirements Specification Document

Title: Design and Implementation of an Online Library Management System

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Abstract

In the contemporary digital age, efficient management systems are crucial for the smooth functioning of libraries. This mini-project aims to design and develop an Online Library Management System (OLMS) that provides basic library functionalities while ensuring data security and concurrency control. The system employs socket programming to enable multiple clients to access the library database concurrently and utilizes system calls for operations such as process management, file handling, file locking, multithreading, and interprocess communication, ensuring optimal performance and resource utilization.

1 INTRODUCTION

1.1 Purpose

The purpose of this document is to define the software requirements for the Online Library Management System (OLMS), which enhances library operations by providing a secure, efficient, and user-friendly platform for managing library resources and user interactions. This system will cater to the needs of both library administrators and members, focusing on data security, concurrency control, and streamlined book and member management.

1.2 Intended Audience and Reading Suggestions

This document is intended for the developers, testers, project managers, and stakeholders involved in the development and maintenance of the OLMS. It serves as a foundational reference for understanding the system requirements and planning implementation strategies. Readers are advised to refer to each section sequentially to build a comprehensive understanding of the system.

1.3 Product Scope

The Online Library Management System (OLMS) will allow users to authenticate and access their accounts securely, manage book inventories, and track member details. Administrators will be able to perform various functions such as adding, deleting, and modifying book information. The system ensures data integrity through file-locking mechanisms and supports concurrent access using socket programming, optimizing performance and resource utilization.

2 OVERALL DESCRIPTION

2.1 Product Perspective

The OLMS is a standalone application with a client-server architecture. It employs socket programming to facilitate multiple concurrent connections and system calls for process management, file handling, and

file locking. This approach ensures efficient resource management, data consistency, and a responsive user experience.

2.2 Product Features

Key features of the OLMS include:

- User authentication for secure member access.
- Administrative functionalities for book and member management.
- File-locking mechanisms for data consistency.
- Concurrent client access using socket programming.
- User-friendly interfaces for both members and administrators.

2.3 Operating Environment

The OLMS is intended to run on server-client architecture, with the server hosted on a system supporting multithreading, interprocess communication, and socket programming. The system is compatible with operating systems that support system calls for file handling and process management (e.g., Unix, Linux).

3 EXTERNAL INTERFACE REQUIREMENTS

3.1 User Interfaces

- **Login Screen:** Allows members and administrators to securely log in.
- **Admin Dashboard:** Provides options for managing books and member details.
- **User Dashboard:** Displays available books and allows users to view account details.
- **Book Management Interface:** Enables adding, updating, and deleting books.

3.2 Hardware Interfaces

- The system requires a server capable of handling concurrent client requests.
- Client devices need a stable network connection to access the server.

3.3 Software Interfaces

- **Operating System:** Unix/Linux for supporting system calls and socket programming.
- **Text Files:** User login details and other information stored in text files.
- **Socket Libraries:** For managing network connections between the server and clients.

4 SYSTEM FEATURES

1. **User Authentication:** Provides secure login functionality for members, ensuring only authorized access.
2. **Administrative Access:** Grants password-protected access to library administrators, allowing them to manage book and member data.
3. **Book Management:** Allows administrators to add, delete, modify, and search for book details.
4. **File-Locking Mechanisms:** Implements file-locking mechanisms to prevent data inconsistencies during concurrent access.
5. **Concurrent Access:** Enables multiple clients to access the system concurrently through socket programming.
6. **Member Management:** Allows administrators to add, update, and delete member information.

5 OTHER NON-FUNCTIONAL REQUIREMENTS

5.1 Performance Requirements

The system should be able to handle multiple concurrent connections with minimal delay. The response time for basic operations such as searching or updating book information should be minimal under standard load conditions.

5.2 Safety Requirements

The system must ensure data safety during concurrent operations through file-locking mechanisms. It will use exception handling to manage errors and prevent crashes during file handling or network interruptions.

5.3 Security Requirements

- Credentials and sensitive information, including data about books and borrowings, will be stored in text files.
- Only authenticated users (administrators and registered members) will have access to sensitive functionalities.

5.4 Software Quality Attributes

- **Reliability:** The OLMS should function consistently under expected load and handle unexpected scenarios gracefully.
- **Usability:** User interfaces will be designed for ease of use, with clear prompts and instructions.
- **Maintainability:** The system will be modular, allowing updates and fixes without major disruptions.
- **Portability:** The system should be compatible with any Unix-like operating system that supports socket programming and system calls.