Library Management Application

A Project Report
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By
Team Dragonite
Khushil Modi (015923115)
Vishnu Vardhan Reddy Yeruva (015917551)
Sarjak Patel (015945046)
Nevil Shah (015964975)

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Sarjak Patel
Nevil Shah
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ABSTRACT

Library Management System

By
Khushil Modi
Vishnu Vardhan Reddy Yeruva
Sarjak Patel
Nevil Shah

The Library Management System is a web-based application that is designed specifically for managing the data of borrowing and returning the books which can be represented more quickly. It is an application for assisting a librarian in managing a book library in any given organization. There are three modules in the system namely Administrator, Employee and User. Each one has their own tasks, like, admin will be responsible for handling the accounts of employee and users in the system, whereas, employee can perform crud operations on books, see basic user details and fine amount of user. Moreover the employee will also be able to provide reservations to the users for any book they have asked for. Lastly, the users have access to browse the library books, make reservations, see books they have, when they have to return it, what amount of fine they have if any and can extend the time limit of a book by a week.

It is a typical MIS (management information system). It is made using Spring Boot for backend and H2 as database and a lot of frameworks which will be mentioned further below. We also used SSO for all, so they can directly sign in from their respective Githubs without logging in again in the portal.

Acknowledgements

We would like to express our deep sense of gratitude and sincere appreciation to our respected and esteemed Prof. Andrew Bond, Assistant Professor, Computer Engineering Department, San Jose State University (SJSU) for his constant support and encouragement regarding the project work throughout this semester.

Yours sincerely,
Khushil Modi
Sarjak Patel
Nevil Shah
Vishnu Vardhan Reddy Yeruva

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Chapter 1. Introduction

1.1 Project goals and objectives:

The goals and objective of our project is to create an online library management application system for any given organization like university, libraries in a city or companies etc. It will ease up the process of a whole library functioning by making it more efficient and speedy. It will facilitate to the hardship of the people who visit a library all the time. The people can evade the accident of not getting the necessary book when required while here they can pre book it and spare the dates, they need to keep, by the rules of the library.

1.2 Problem and motivation

Libraries face maintenance and upkeep problems from time immemorial. In the science and technology age, they are experiencing hardship from many problems that includes improper management, lack of space and ineffective staff. With an improper system in use, most libraries depict a quite disorganized picture to the readers. It is a sedulous and punctilious affair to preserve and maintain ancient materials and records. It also face the problems of a lack of financial resources to amass the in-demand writings and publications.

Therefore, corresponding with the technological advancement around it, it is time for libraries to minimize its reliance on manual work and use computers and sophisticated technology for its services and management.

1.3 Project application and impact

The application of our project results were met and we created a library management system where users have SSO, will be able to use library functions very efficiently sitting anywhere in the world. The impact is that there would be no tiresome long queues, wait and unavailability of books i.e. important time of people won't be wasted on a daily basis.

1.4 Project results and expected deliverables

We will be delivering the project successfully running and deployed on Heroku on 12/09/2021. Following is the image of login screen of the system.

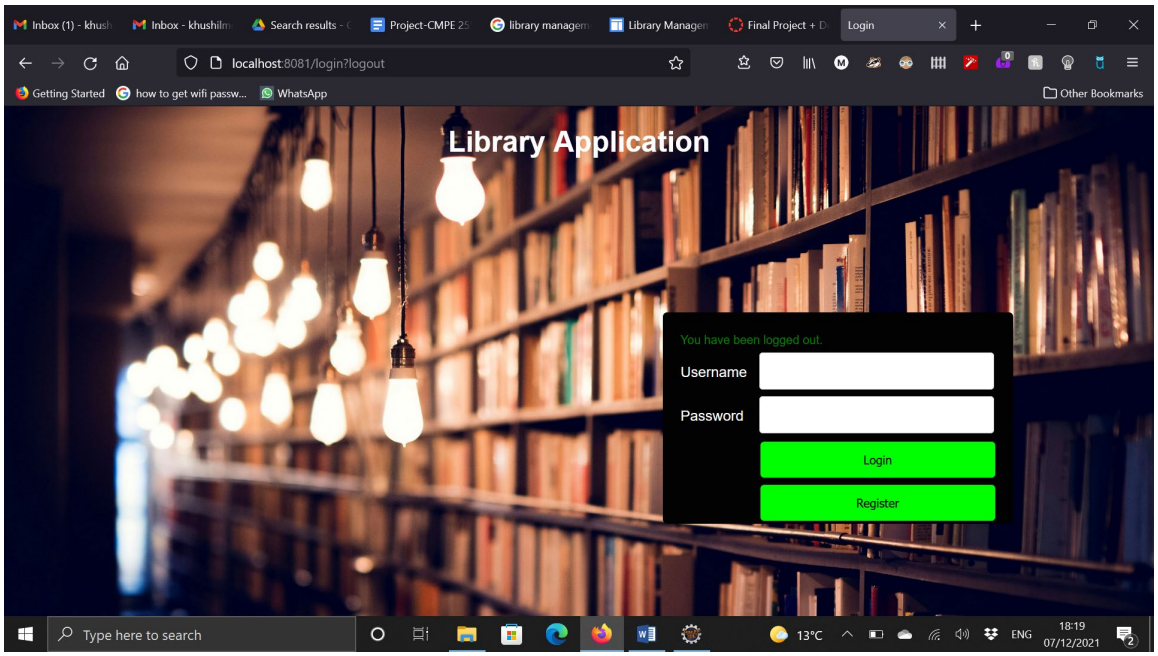

Fig. 1. Login Page

1.5 Market research

The key market companies are CIVICA, INNOVATIVE INTERFACES INC., PROQUEST LLC, AXIELL GROUP, BOOK SYSTEMS, INC, CAPITA PLC, CR2 TECHNOLOGIES LIMITED, INSIGHT INFORMATICS PTY LTD, SIRSI CORPORATION and POWERSCHOOL.

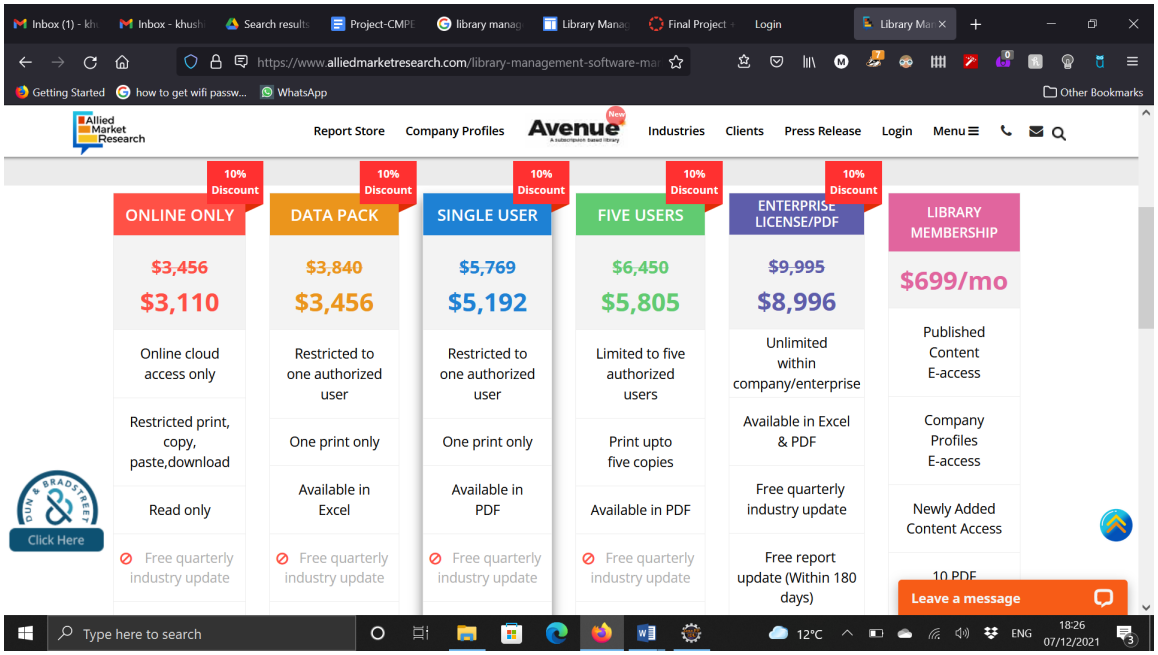

Fig. 2. Shares and Service Prize

Fig. 3. Global Market by 2026

1.6 Solution Description

The solution we proposed is that we created an application using SSO which is convenient for users to directly login through their respective githubs. A library management application in Spring MVC architecture using database H2 and frameworks like Thymeleaf, JPA, Spring Security and JDBC API. Using all this technologies we created a library management application system to tackle all the problems that are mentioned above.

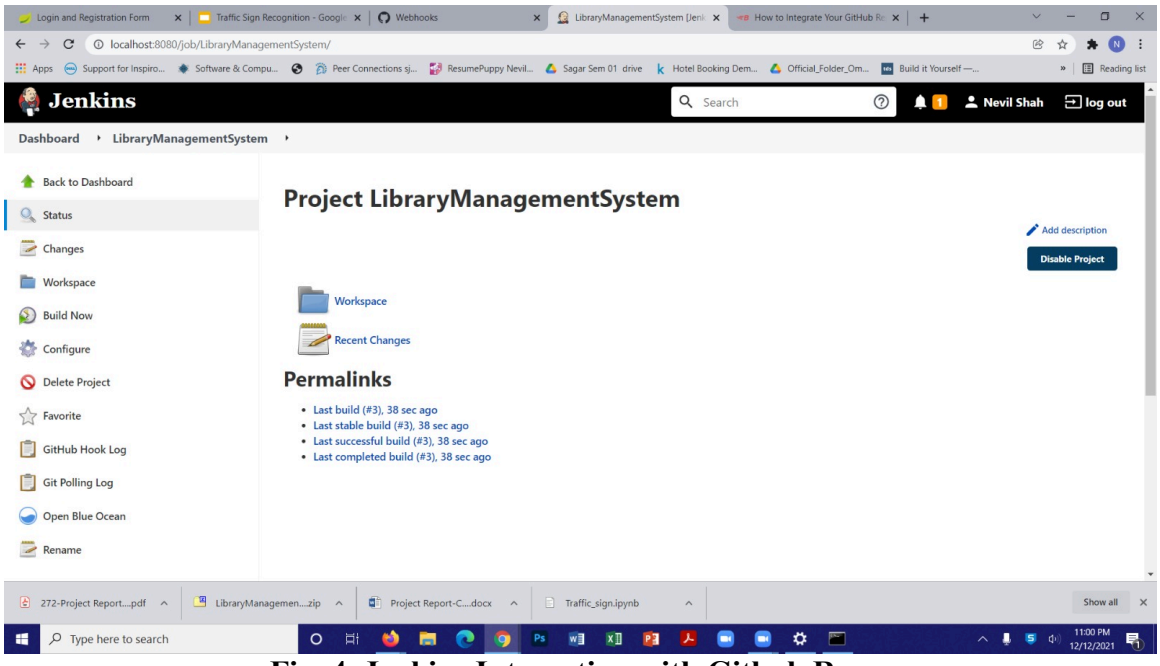

Fig. 4. Jenkins Integration with Github Repo.

Chapter 2 Background and Related Work

2.1 Background and used technologies

Library management system (LMS) known as an automated Library System is software that **is developed to handle basic functions of a Library**, and provides a complete solution for the administration of a library's technical functions and services to the public.

Technologies Used: H2 database, Eclipse IDE, Spring MVC, Spring Security, Github for SSO using OAuth 2.0, Github API, JDBC API, Thymeleaf (HTML & CSS)for frontend ad JPA

2.2 State-of-the-art

The Open Source Library Systems, Chapter 1 of Library Technology Reports (vol. 53, no. 6), "Open Source Library Systems: The Current State of the Art," explores the current landscape of open source and proprietary resource management systems in the library technology industry. While propriety software continues to dominate, open source solutions are presenting an alternative to libraries. This section briefly introduces the open source products available that will be explored further in the report.

Chapter 3 System Requirements and Analysis

3.1. Domain and business Requirements

Because of copyright restrictions, some documents must be deleted immediately on arrival. Depending on the user‘s requirements, these documents will either be printed locally on the system server for manually forwarding to the user or routed to a network printer.

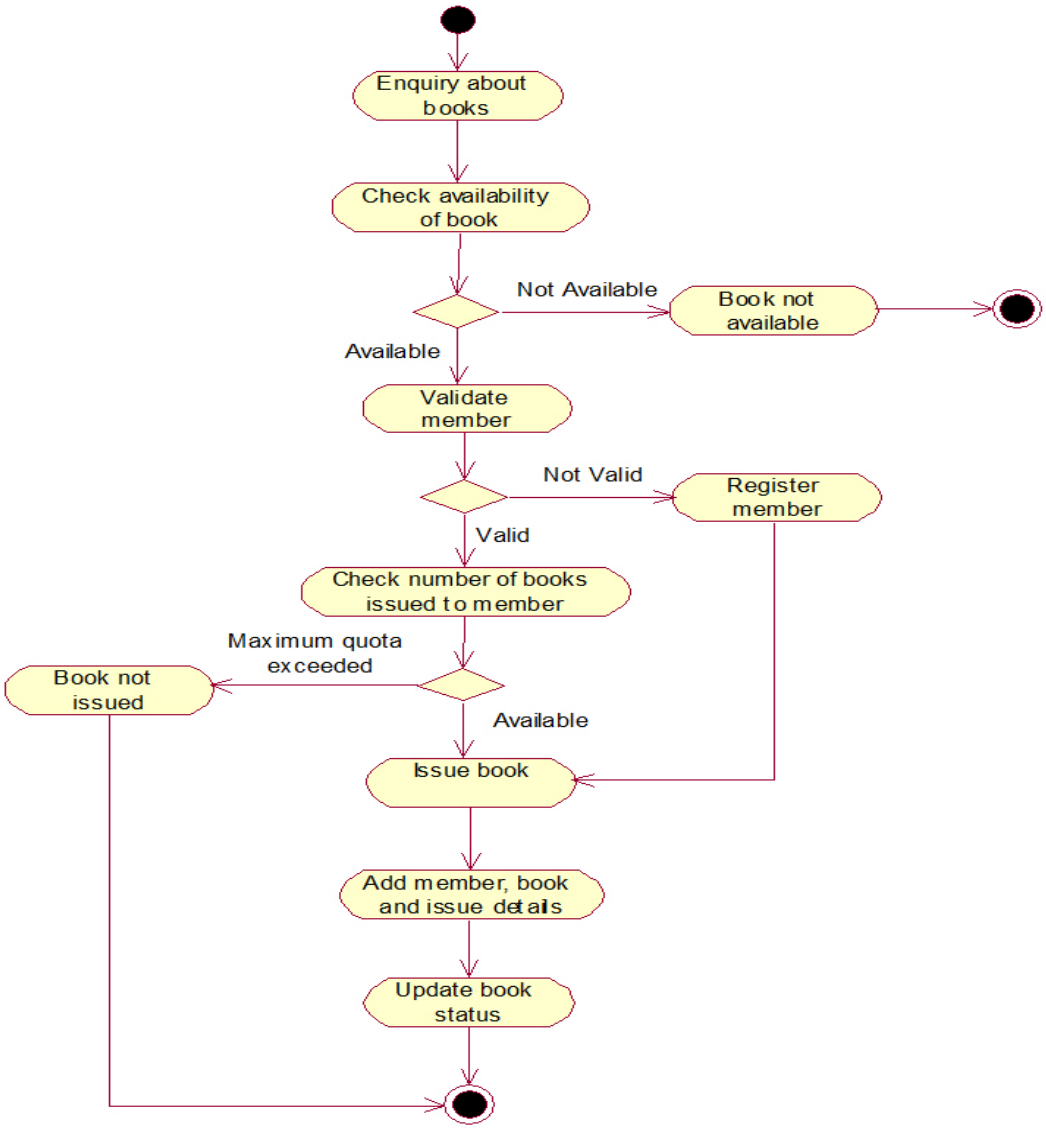

Fig. 5. Activity Diagram

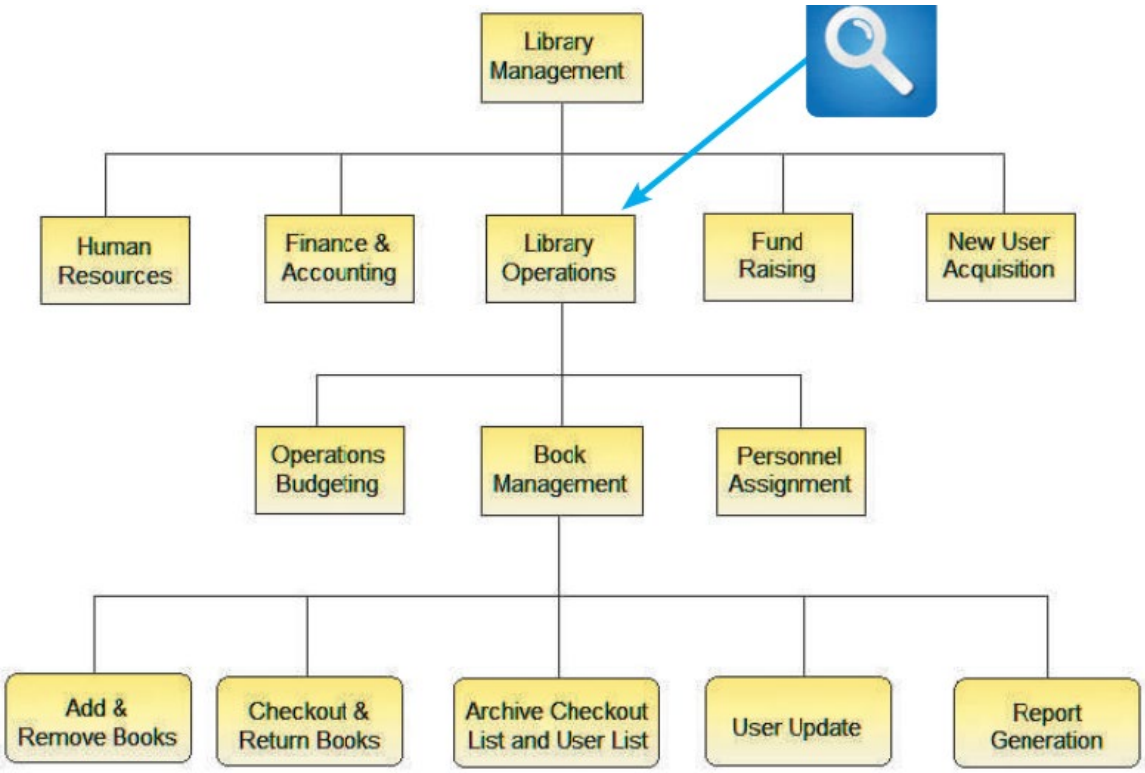

Fig. 6. Process Decomposition Diagram

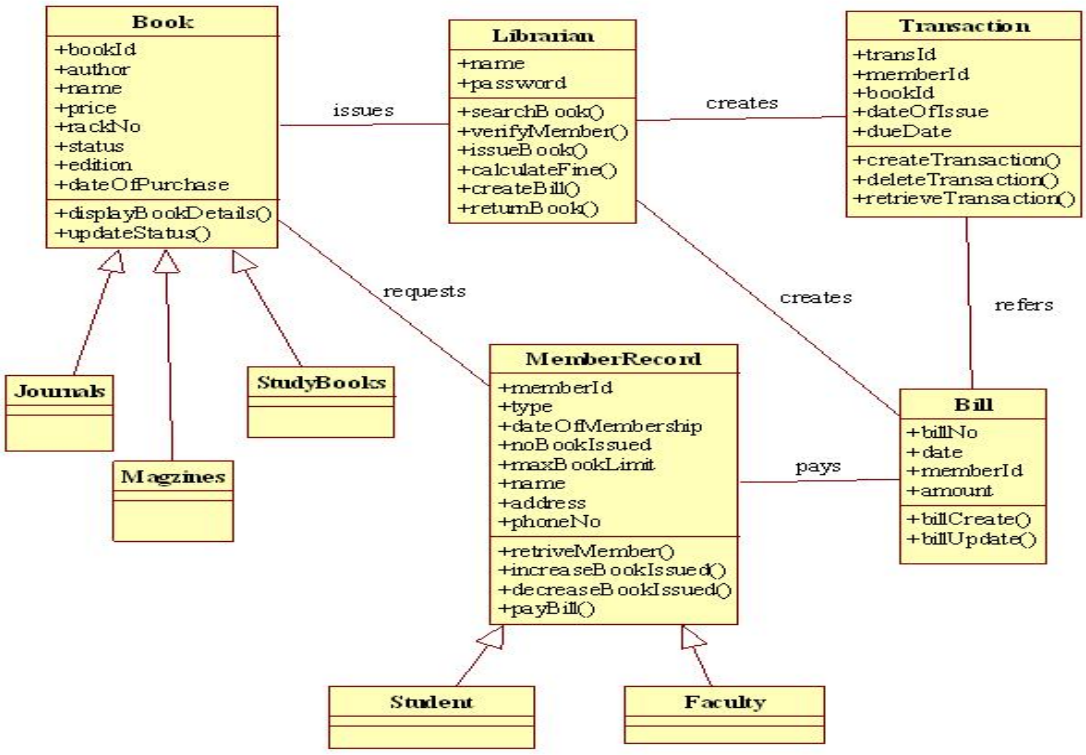

Fig. 7. Class Diagram

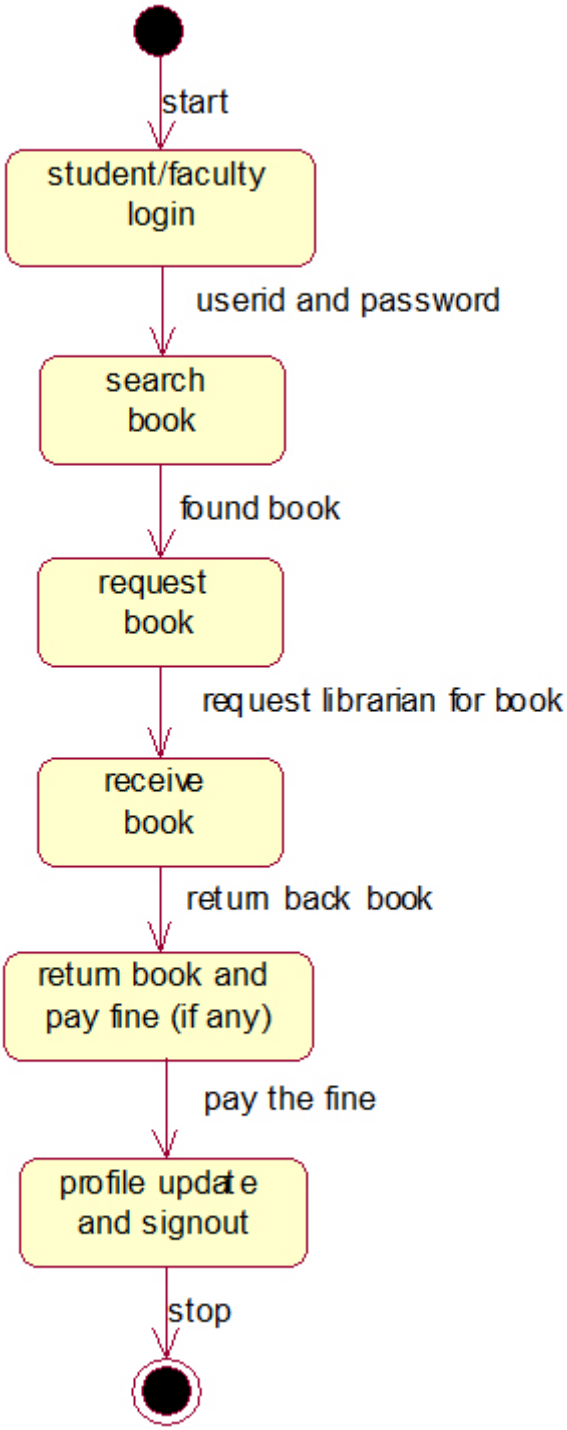

Fig. 8. State Machine Diagram

3.2. Customer-oriented requirements

The expected user groups are Admin, Employee and User.

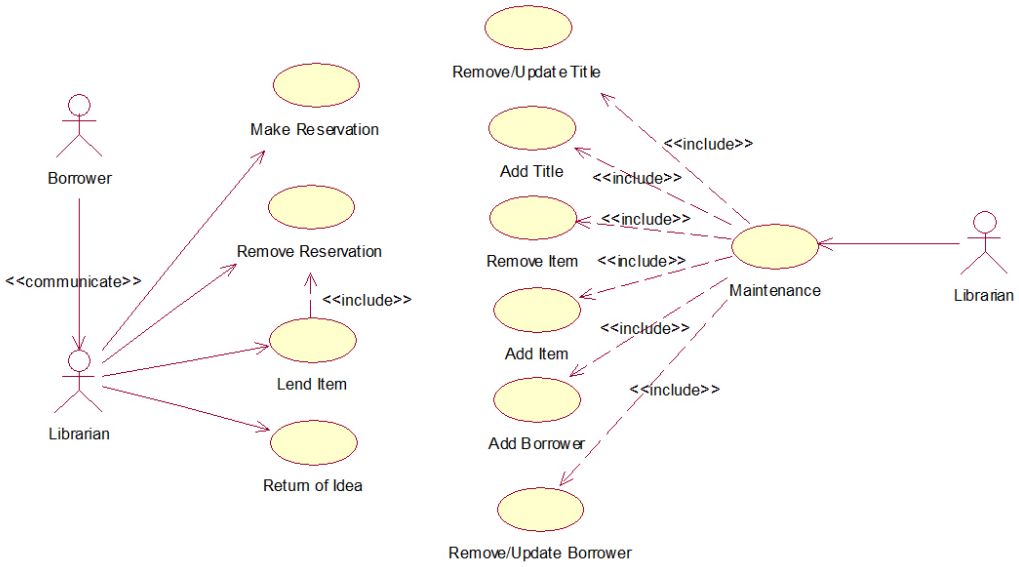

Fig. 9. Use-Case Diagram

3.3. System (or component) function requirements

- Authentic users must only have the entry to the system.
- Employee must be able to perform all of the following:
    - Provide the information regarding books.
    - Add new book to the database.
    - Update the number of books in database.
    - Enter data of issued book in Database.
    - Information of returned books.
- Employee must have the knowledge about the no of copies of a book.
- Data should not be duplicate and redundant.
- Users and employees can be able to search for the books from database.
- Employees must check if the book is available or not before issuing.
- System must enter issue and return date in database.

3.4. System performance and non-function requirements

The system should be available for 24 hours a day, 7 days a week and 52 weeks a year. The Mean Time to Repair (MTTR) the system if it fails, it must be recovered back up within an hour or less. It must accurately provide real time information taking into consideration various concurrency issues and shall provide 100% access reliability. The information is refreshed at regular intervals depending upon whether some updates have occurred or not. Changes like password changes, new patron's addition, and database changes must be verified once per day at least. The system should provide automatically notification to patrons by e-mail about item's overdue, reservation results, availability of reserved item and etc.

3.5. System behavior requirements

The system level behavior of the whole application is shown in Fig. 9 below.

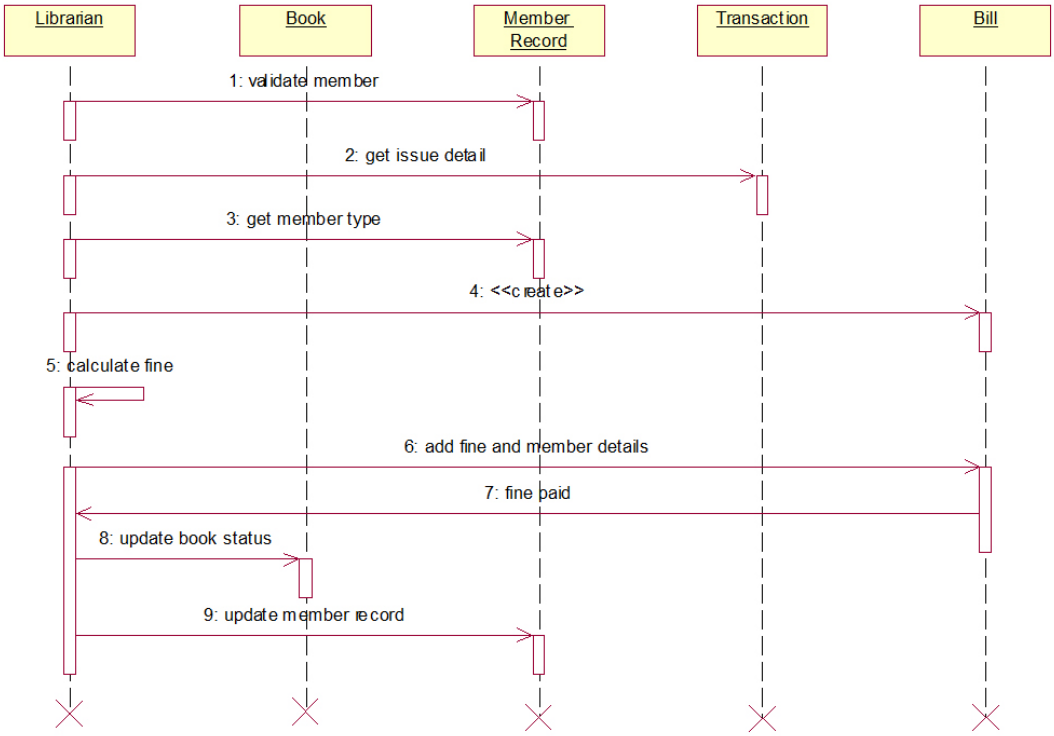

Fig. 10. Sequence Diagram

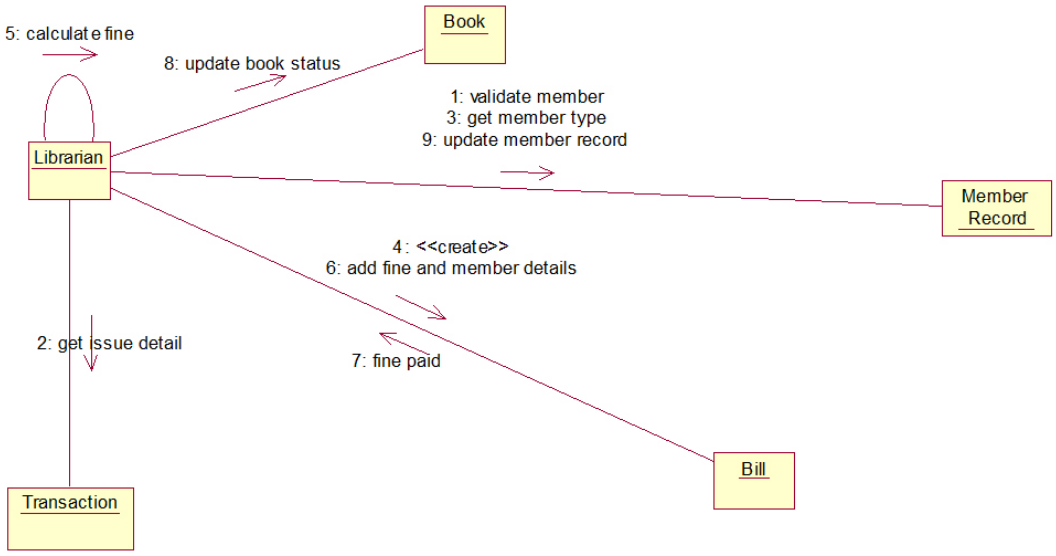

Fig. 11. Collaboration Diagram

3.6. Context and interface requirements

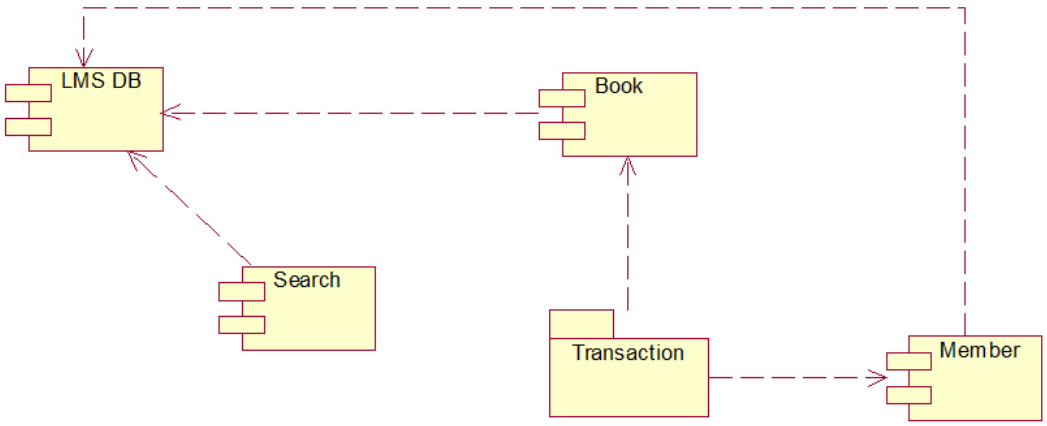

Fig. 12. Component Diagram

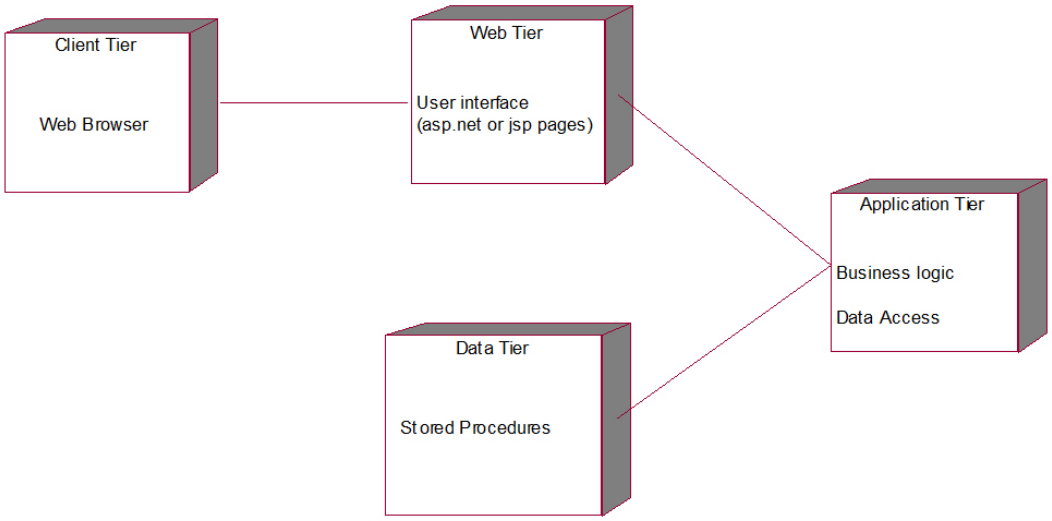

Fig. 13. Deployment Diagram

The context environments supporting our development has been Eclipse IDE and Brackets. In testing our model we use localhost on our web browser that how the system runs and how it handle all the queries and exceptions that were possible in the system. For Deployment we used Heroku cloud-based deployment.

3.7. Technology and resource requirements

Technologies Required: H2 database, Eclipse IDE, Spring MVC, Spring Security, Github for SSO using OAuth 2.0, Github API, JDBC API, Thymeleaf (HTML & CSS)for frontend ad JPA, Jenkins.

Chapter 4 System Implementation

4.1. System implementation summary

The Implementation path you need to follow keeping in my mind the complexity of the project is very important for any system. In this system the first step we did was to create a SSO using OAuth 2.0 in our Eclipse IDE using Github APIs. Then we setup the H2 database and designed and developed the backend code and logic. We used JPA for connection between database and backend and Spring Security for validation and finally designed the frontend using ThymeLeaf.

4.2. Used technologies and tools

Database: H2
SSO: OAuth 2.0
Backend: Spring MVC
Frontend: Thymeleaf, HTML and CSS
API: JDBC, Spring Security, Github, JPA
Github Contiguous Updates: Jenkins
IDE: Eclipse

Chapter 5 Conclusion and Future Work

5.1 Project summary

The Library Management System Application needs to be computerized as we have seen how much huge the current market for this kind of software application is and what are the stock prices of the big companies. It should be done also for increasing the efficiency and reducing human errors.

The proposed Library system here is an online cloud-deployed application to maintain all the daily work of a library. The main focus id to lessen human effort, decrease time and space complexity and increase efficient record keeping.

5.2 Future work

We can expand the current software for multiple libraries throughout the towns or cities and can merge them under one application system for all the libraries.
We can also add multiple options for SSO like google or through any other social media platforms.

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