Faculdade de Engenharia da Universidade do Porto

Library System Architecture

Software Systems Architecture

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1. Introduction

In this assignment we've worked on designing a possible architecture for an automated library system. Our main challenge is to provide a well-thought and comprehensible design documentation that could allow for a team of developers to produce a system capable of handling all the needs required by both library patrons and staff.

2. Design Choices

2.1. Major Modules

User Management Module:

- Responsible for managing user accounts (patrons and staff).
- Handles user authentication and authorization.
- Stores user information like name, contact details, and library card information.

Catalog Management Module:

- Manages the library's collection of e-books, audiobooks, digital magazines, books, magazines, DVDs, etc.
- Stores information about each item such as title, author, genre, availability status, and location.
- Tracks additions, removals, and movements of items within the catalog.
- Integrates with the checkout/check-in module for tracking borrowed electronic items.

Search Module:

- Allows patrons and staff to search the catalog using various criteria such as author, title, genre, etc.
- Provides search functionalities at library stations and via the library's mobile app or website.

Checkout/Check-in Module:

- Facilitates the borrowing and returning of items by patrons.
- Tracks due dates and notifies users of upcoming due dates or late returns.
- Handles reservations and holds for items that are currently checked out.

Notification Module:

- Sends notifications to patrons regarding due dates, overdue fines, reservation pickups, etc.
- Supports various communication channels such as email, SMS, and push notifications.

Interlibrary Collaboration Module:

- Facilitates collaboration and resource-sharing between different libraries.

- Allows patrons to access resources from partner libraries and vice versa.
- Handles interlibrary loan requests and exchanges.

Fine Management Module:

- Calculates and manages fines for late returns.
- Tracks payment of fines and maintains fine records for each patron.

2.2. Architectural Diagram

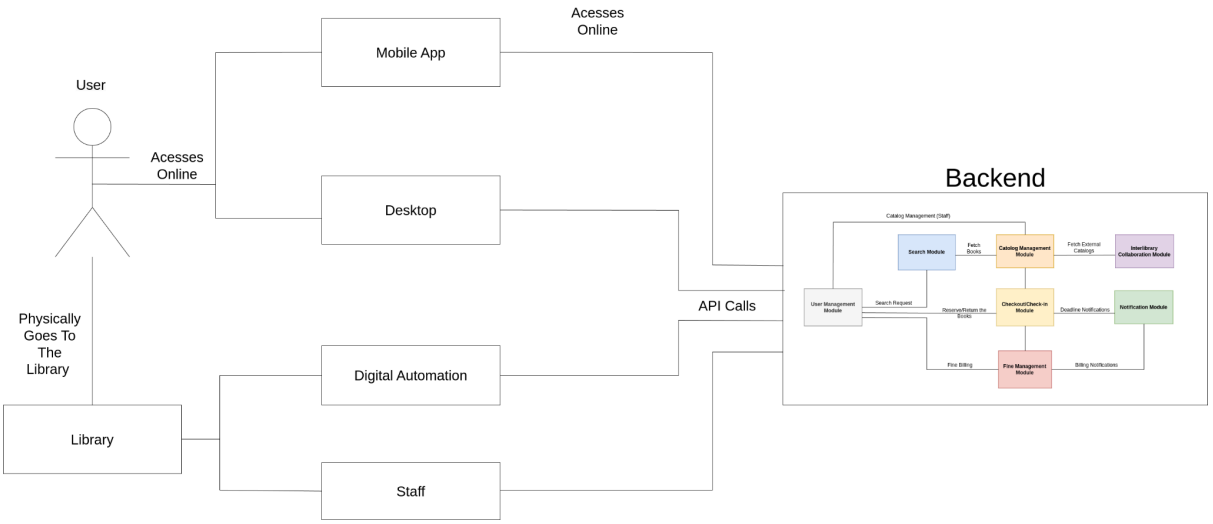

Fig.1 - High Level Context Diagram

This diagram primarily displays the user interaction with the system and highlights the separation of concerns in our design by showing the application's backend as a separated box, accessed via an API, agnostic to the means chosen by the user to interact with it. As explained in the specification there are several ways to interact with the system that we've accounted for namely the online applications or physically in the library.

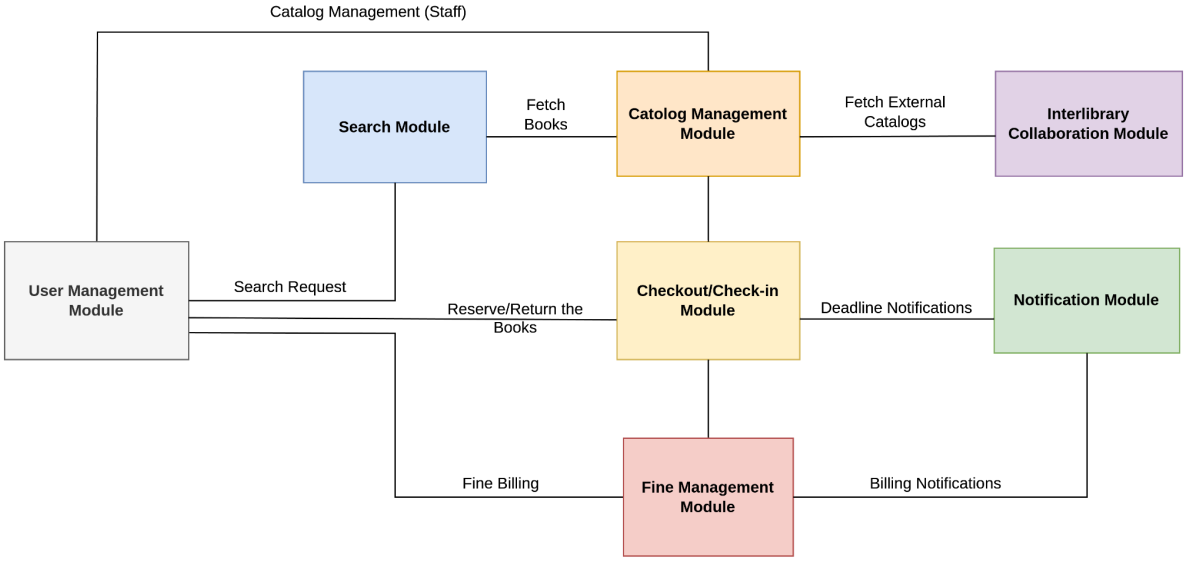

Fig. 2 - Detailed Backend Modules Diagram

The diagram depicts the backend architecture of a library system, orchestrating interactions between patrons, staff, and the library's resources. The lines in the diagram represent data flow between the different modules, for example:

The User Management Module acts as the entry point, handling patron accounts, logins, and library card management.

Fueled by the User Management Module, patrons leverage the Search Module to explore the library's catalog using various criteria. This search triggers interactions with the Catalog Management Module, the central hub for adding, removing, and updating library items. The Catalog Management Module can even retrieve information from external libraries through the Interlibrary Collaboration Module.

When a patron locates a desired item, the Checkout/Check-in Module facilitates borrowing and returns. This module verifies patron identity through the User Management Module and updates the item's status in the Catalog Management Module.

For in-demand items already on loan, the Reserve/Return Module manages reservation queues and notifies patrons when their desired item becomes available.

The Fetch Catalogs Module expands the library's reach by retrieving information on holdings from external catalogs.

The Interlibrary Collaboration Module fosters resource sharing by streamlining loan requests with other libraries.

The Notification Module keeps patrons informed about fines, upcoming due dates, and reserved item availability.

The Fine Billing Module calculates any overdue fines, while the Fine Management Module empowers staff to process payments and manage fines.

This backend architecture exemplifies the concept of separation of concerns. Each module has a well-defined function, promoting loose coupling between them. This modular design fosters maintainability and scalability, ensuring the library system can adapt and grow to meet the ever-evolving needs of patrons and staff alike.

3. Typical Scenarios

Patron Checking Out a Book:

1. Patron accesses the system either through a station in the library or via the mobile app.
2. Searches for desired book using the Search Module.
3. Checks out the book through the Checkout/Check-in Module, scanning their library card.
4. Receives a due date notification via the Notification Module.

Interlibrary Collaboration:

1. Patron searches for a specific item not available in their library's catalog.
2. System automatically initiates an interlibrary loan request through the Interlibrary Collaboration Module.
3. Patron receives the requested item from a partner library.
4. The borrowed item is tracked and managed within the system.

Patron Renewing a Book Online:

1. Patron logs in to the mobile app and views their borrowed items.
2. Selects a book to renew.
3. System checks eligibility and updates due date (or informs patron of denial reason).
4. Confirmation or denial notification is sent to the patron.