Library System Architecture

Software Systems Architecture

Group 7 – Class 3

Master in Informatics and Computing Engineering

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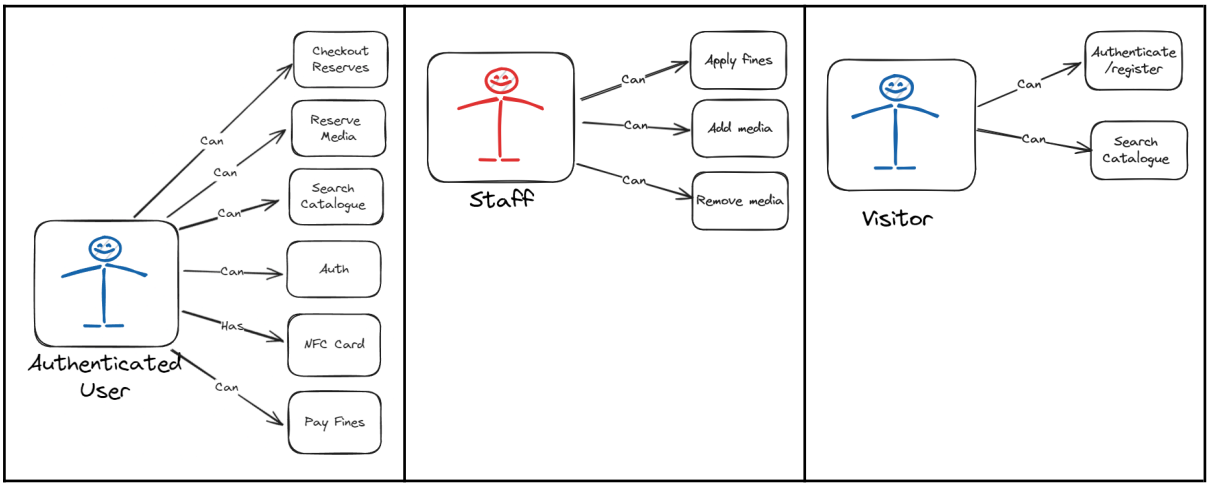
Part 1 - Actors and Use Cases

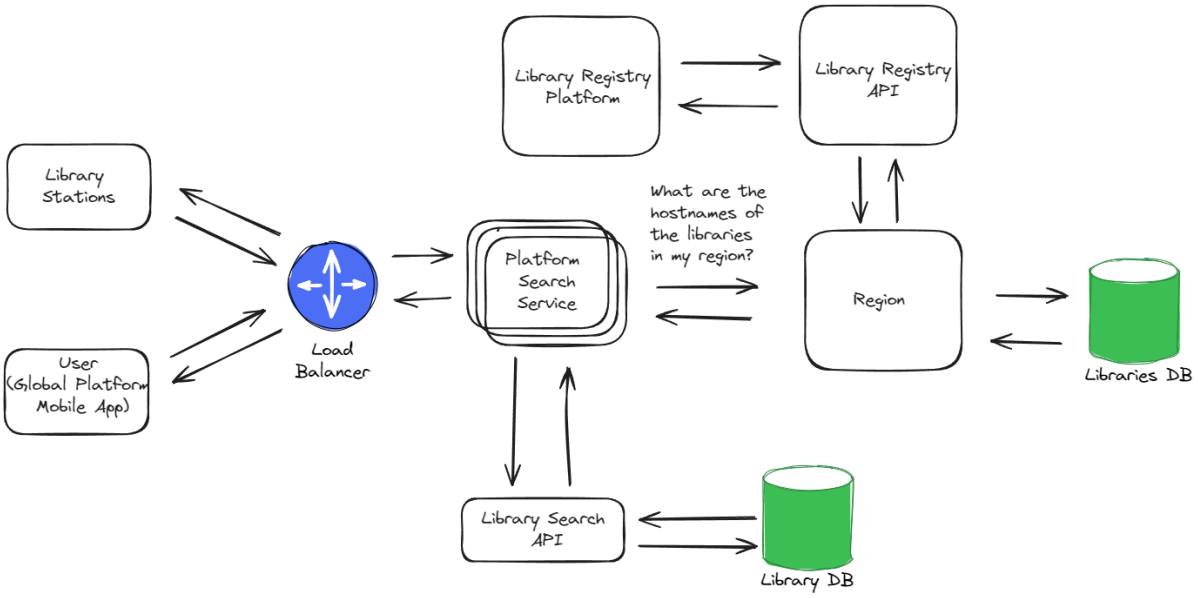
Firstly, we started by identifying the different roles of users who could use the system, as well as their respective possible tasks.



There are three different roles; Visitor, User, and Staff:

- A **Visitor** is someone who needs to be Authenticated and can only use the search catalog or authenticate.
- An **Authenticated user** (also referred to as Patron in the context of media check out) has all the actions of the visitor, plus the possibility to Check out reserves, Reserve media, use the NFC Card associated with the account, or Pay Fines.
- The **staff** is responsible for the application of fines and for the management of the media.

Part 2 - Search System



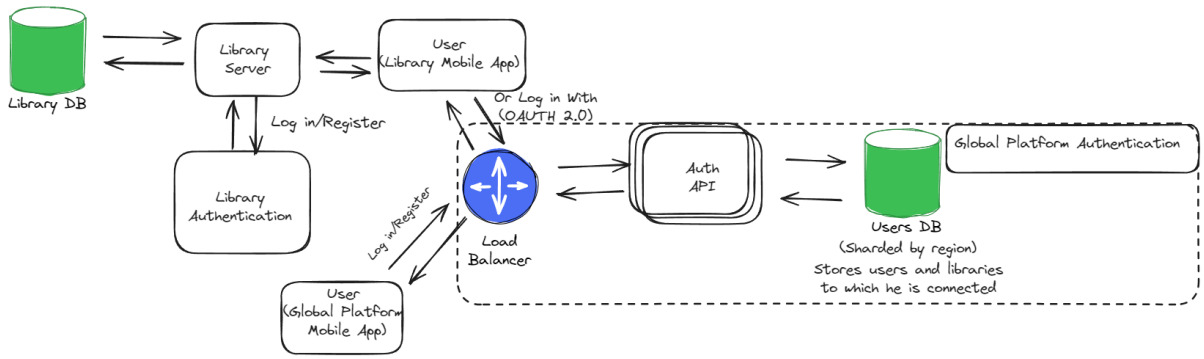
Libraries within the system can operate independently or choose to register with the Global Platform to make their books accessible through the centralized search catalog. This process is facilitated by the Library Registry Platform. Behind the scenes, the Library Registry API manages registration requests by assigning a region (e.g., Porto, Paris) to the new library and forwarding the request to the corresponding regional server. The regional server then stores information about the new library in its local database.

When a user initiates a search request, they may specify a particular library, a range of libraries (e.g., in the same region), or request results from all libraries. The platform's search service acts as an intermediary, coordinating the search process. Additionally, search requests can also be triggered by stations within a library.

For example, if a library visitor wishes to locate a specific book while within the library premises using a station's interface, the platform search service facilitates this process by directly communicating with the individual library's Search API.

Alternatively, if the search request extends beyond the scope of the individual library, the platform search service communicates with the corresponding regional server to retrieve information about available libraries in that region. Subsequently, individual requests are made to each library's Search API. Finally, the search service aggregates the responses and presents the combined result to the user or station.

Part 3 - Authentication System



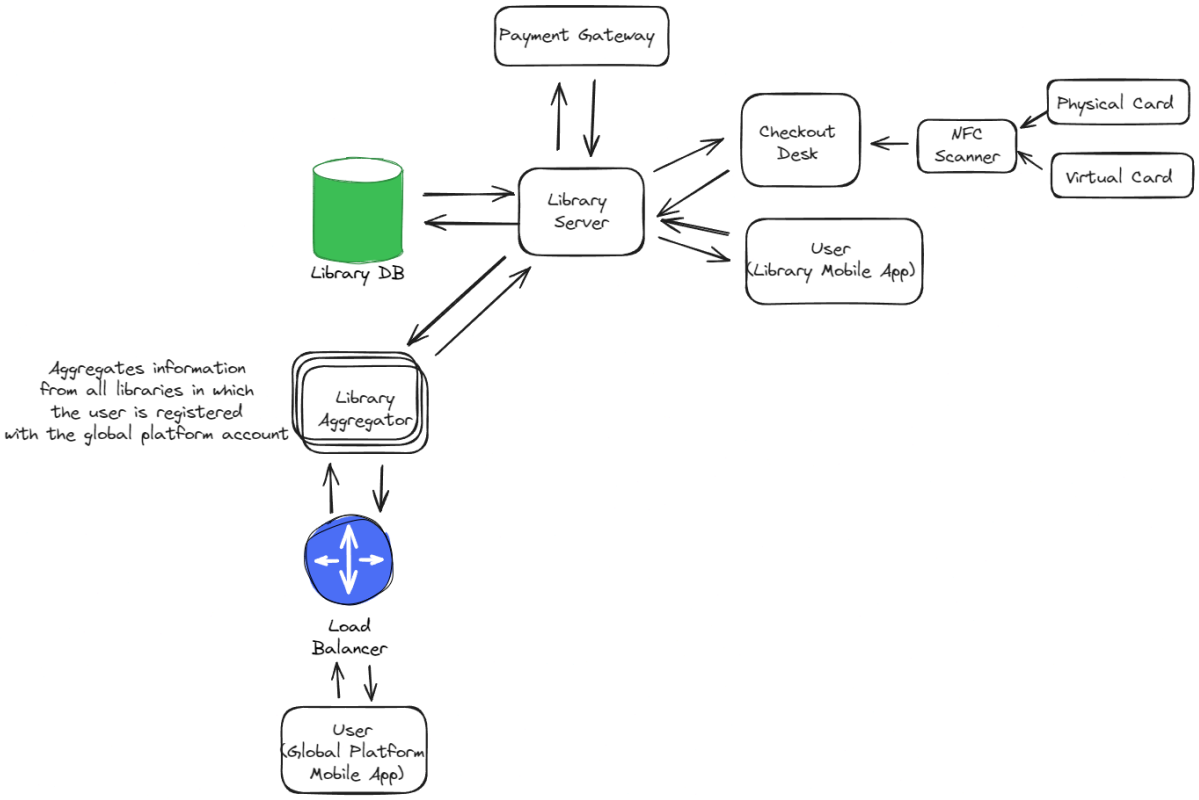
The diagram represents the authentication system that offers a two-pronged approach, providing flexibility for users by providing two distinct login paths: library-specific login and a global platform login.

For users who prefer a library-centric approach, they can log in directly using credentials specific to their library account. Here, the user interacts with the library mobile app and enters their credentials. These credentials are then transmitted securely to the library's dedicated user database for verification.

The system also offers an alternative login method through integration with the global platform. This option allows users to leverage their existing credentials on that platform for a streamlined login experience.

This two-pronged approach offers significant flexibility, particularly for libraries. The design allows a library to potentially separate from the global platform in the future.

Part 4 - Library System



Individual Library System

Users have the flexibility to authenticate themselves at the checkout desk using either a physical library card or a virtual one stored on their phone. This dual authentication process ensures the security of actions requiring both user and staff verification, such as checking out a book. Additionally, the NFC scanner at the desk serves a dual purpose, allowing users to read their bank cards for paying fines on the spot. Alternatively, fines can be settled conveniently through the library application online. Regardless of the chosen payment method, the library server securely communicates with a payment gateway to process the transaction.

Global Platform Mobile Application

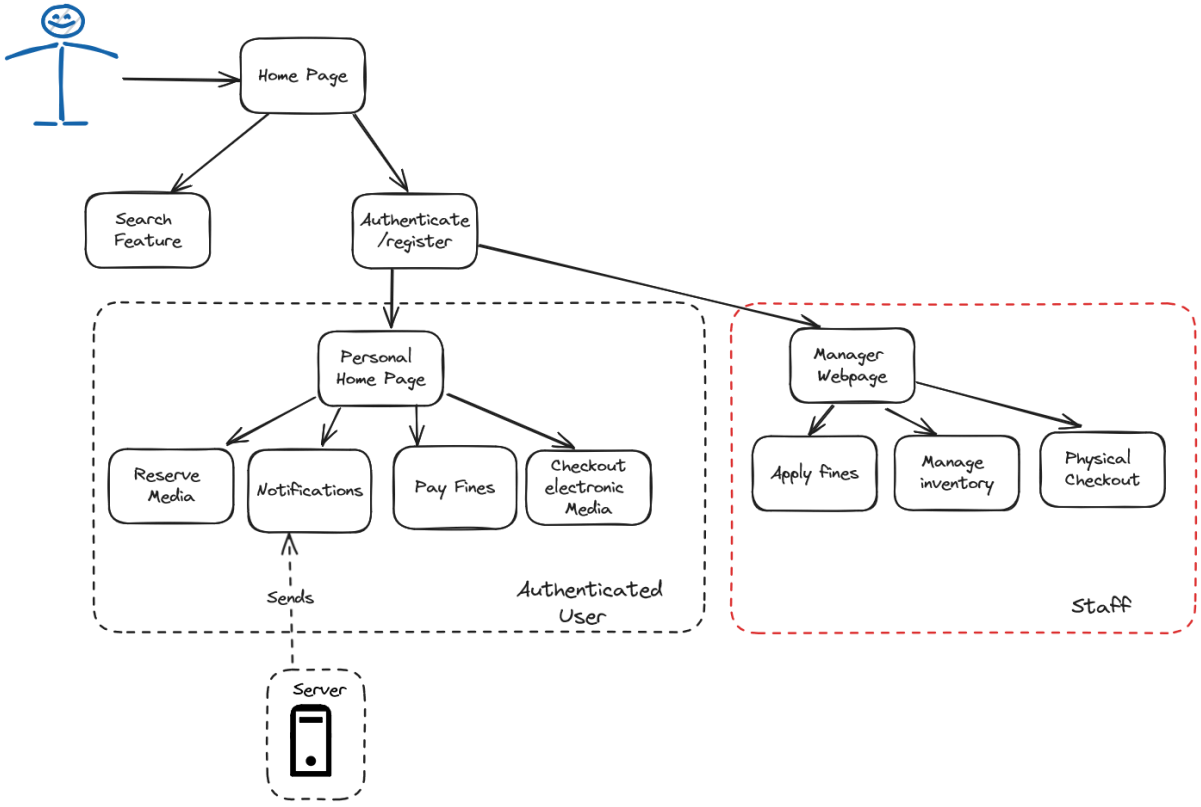
In the mobile application, users can seamlessly access all their library-related information from libraries they've authenticated with using the global platform. This includes but is not limited to borrowing history, reserved items, account status, and fines. The application acts as a unified interface, providing users with a streamlined experience to manage their library activities

Integration with Library APIs

Behind the scenes, a library aggregator facilitates communication between the mobile application and the servers of various libraries. This aggregator connects to the servers of each authenticated library, gathering and consolidating the user's information. For example, consider a user who has logged into both the New York Public Library and the British Library. The library aggregator seamlessly connects to the servers of both libraries, collecting relevant data to present a unified view within the mobile app.

Through integration with the respective library APIs, users can perform a range of actions directly within the mobile app. This includes reserving books, renewing borrowed items, paying fines, and other library-related tasks.

User interaction with library system



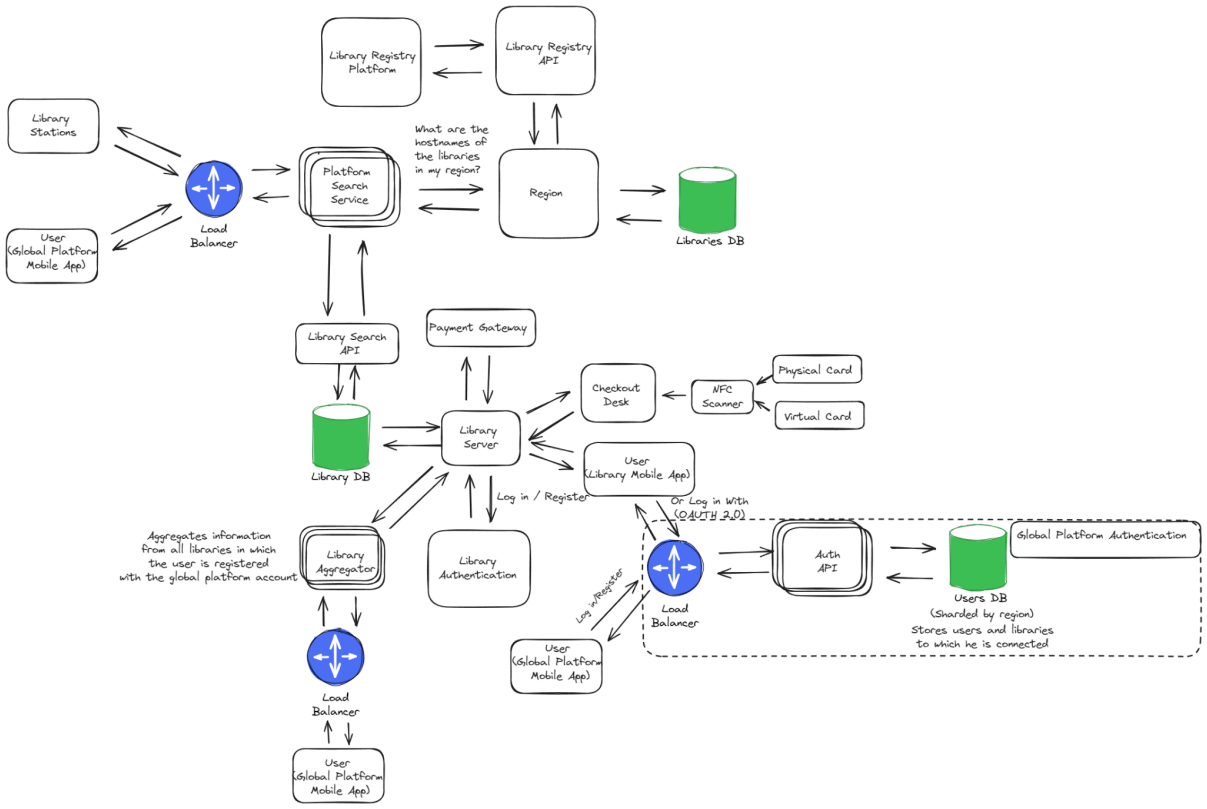
This diagram depicts **a high-level overview** of a user interacting with the library system. This system has 3 different user roles, already mentioned above. When the user accesses the home page of the application it can login and/or search for different media. After the authentication, 2 different roles can be assigned:

- The **authenticated user** is a general user that can reserve media, pay fines, checkout electronic media etc… This user can authenticate using the global platform authentication or the library specific authentication.
- The **staff** user holds the responsibility for overseeing library operations. This includes administering fines in cases where users fail to return media on time

or damage it. Additionally, staff members manage inventory and handle the physical checkout process of media items.

The authenticated user can also **receive notifications** from the server regarding due dates, appliance of fines etc.

Big Picture



This illustration depicts the comprehensive integration of components within our architecture. By enabling search functionality across multiple libraries, our system consolidates information from all libraries into a single application. This eliminates the necessity for individual accounts per library and removes the need for physical cards for each library. Centralizing information not only streamlines operations but also enhances user experience. With this centralized approach, users no longer need to navigate through multiple private library applications to check due dates, search for media, or reserve items. All these functions can be conveniently performed within a single application.

Summary

The architecture delineates three distinct user roles: a visitor, an authenticated user, and staff. These roles play a crucial role in the dynamics of reserving media and in the organizational structure of the libraries. Our design includes a search system capable of querying across multiple libraries. To enhance centralization, we devised a global

authentication platform that, when paired with a corresponding app, consolidates all libraries into a single application. This integration facilitates the use of NFC cards across different library branches. By clearly defining the actions available to each user and the sequential flow of operations, we aimed to eliminate ambiguity for developers tasked with implementing our architecture.