

# LIBRANT

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## Domain Analysis Documentation

**Project:** Library Assistant App

**Date:** October 25, 2025

**Version:** 1.0

223005357

1. Name of the project: Librant

## 1. DOMAIN ANALYSIS

### General Field of Business

#### Overview

The Librant App operates within the Library and Information Services (LIS) sector, which is part of the broader education and knowledge management industry. This domain encompasses the organization, preservation, and dissemination of information resources to serve communities, educational institutions, and organizations.

### Terminology and Glossary

#### Circulation Operations:

**Issue/Checkout:** Process of lending a book to a patron

**Return:** Process of receiving a book back from a patron

**Reservation/Hold:** Request to borrow a book currently unavailable

## 3. General Knowledge and Understanding of Business Environment

#### Key Business Challenges :

**Operational Challenges:** Managing large inventories efficiently and Tracking items across multiple locations

**Technological Challenges:** Digital transformation and system migrations, Cybersecurity and data privacy, Integration of legacy and modern systems and Mobile accessibility requirements

## 4. Tasks and Procedures Currently Performed

New User Registration, Account Updates, Account Maintenance, Search and Discovery, Reservation (if book unavailable), Check-Out Process, Renewal Process, Return Process, Fine Calculation, Fine Collection, Fine Waivers/Adjustments, Collection Assessment, Book Selection, Ordering Process, Cataloging and Processing, Regular Inventory Audits, Weeding Process, Digital Collection Development, E-book Circulation, Online Catalog Access (OPAC),

Digital Reference Services, Circulation Reports, Financial Reports, Collection Reports, User Reports, User Role Management, System Configuration, Data Backup and Security

## 5. Customers and Users

Students (K-12 and Higher Education), Academic Researchers and Faculty, General Public/Community Members, Children and Young Adults, Senior Citizens, Library staff

### Competing Software

#### 1. Koha

**Strengths:** Free, highly customizable, large community. **Features:** Full circulation, cataloging, OPAC, acquisitions. **Market:** Small to medium libraries worldwide. **Pricing:** Free (open-source), implementation/support costs vary

#### 1. 2. Evergreen

**Strengths:** Designed for consortia, scalable. **Features:** Multi-library support, advanced circulation. **Market:** Library consortia, public libraries. **Pricing:** Free (open-source)

### Similarities to Other Domains

#### Shared Concepts:

- Inventory Management: Both track items, stock levels, and locations
- User Accounts: Customer profiles with purchase/borrowing history
- Recommendation Systems: Similar algorithms for suggesting products/books
- Returns and Refunds

## 3. DEFINE THE PROBLEM

Libraries rely on manual or disconnected tools, causing slow operations, poor discovery, and stale data for users and staff. This discourages efficiency of both staff and students and chases away students instead of encouraging them to learn, it shouldn't be that hard or it can be easier.

Opportunity

Build a unified, real-time platform with ML recommendations, push/in-app notifications, and self-service mobile + web admin to streamline operations and improve discovery.

#### Expected Benefits

1. 40-60% reduction in staff time per transaction.
2. 30-50% increase in book circulation via personalized recommendations.
3. 50-70% reduction in overdue items through proactive notifications.
4. 20-30% growth in active users and reservations.
5. Real-time data consistency (no manual refresh), improving UX and accuracy.

Also an extra benefit in revenue for the library as there is a much better fine handling and tracking system.

## 4. DEFINE THE SCOPE

Narrowed Problem is Community members struggle to access library resources efficiently, leading to Low reading engagement and literacy rates, Underutilized library collections, Barriers to knowledge access for students and lifelong learners, Missed opportunities for mental wellness through reading

### Integrated Results-Based Management (IRBM)

#### Inputs

Human Resources: Developers, librarians, community volunteers, literacy advocates and Technology: Mobile/web platform, ML algorithms, notification systems

#### Activities

Deploy mobile app for easy book discovery and borrowing and Implement AI recommendations to match readers with relevant books and Train library staff on digital platform management

#### Outputs

- Functional mobile and web library platform and 500+ active registered users

Outcomes (Short to Medium-term: 6-18 months)

- Improved User Engagement: 30-40% increase in active library members and Better Reading Habits: Users discover more diverse books through AI recommendations

Impact is Improved Literacy Rates: Increased access leads to more reading, especially among children and youth and Academic Success: Students have better access to study materials, improving grades and learning outcomes

Assess: What is the current situation? - Community library has outdated manual system and Low usage rates (only 15-20% of community are active members)

Think: What caused it? Who is involved - Outdated technology and manual processes and Lack of awareness about library services.

Envision: What are we going to achieve? - Universal Access, 50%+ of community are active, engaged readers, Educational Excellence: and Digital Inclusion

How (Implementation Strategy): make a system

With Whom (Stakeholders & Partners) - Library Staff, IT Team, Local Schools, Community Centers

When (Timeline):

- Month 1: Platform deployment, staff training
- Month 2: Soft launch with 50 early adopters for feedback
- Month 3: Public launch, marketing campaign, school partnerships
- Months 4-6: Onboarding drives, workshops, feature rollout
- Months 7-12: Full operation, program expansion, impact measurement
- Year 2+: Scale to neighboring communities, add features based on feedback

With What Resources - Human Resources, Technology,

## 5. VISION AND OBJECTIVES

SMART Objectives

Objective : Increase Library Membership and Active Users

Specific: Increase active library membership from 20% to 50% of the target community population.

Measurable - Register 1,500+ new users within 12 months

Achieve - 500+ monthly active users by month 6

Reach - 1,000+ monthly active users by month 12

Achievable: Through mobile app accessibility, community outreach programs, school partnerships, and digital literacy workshops targeting underserved populations.

Relevant: Directly addresses the problem of low library engagement and limited awareness of available resources.

Time-bound: 12 months from public launch (Month 1-12)

## 6. Users of the System

1. LibrariansManage collection, provide reference services, and support users
2. IT Support/System Administrator - Maintain technical infrastructure and ensure system reliability
3. Students, Teachers (people) - Get books, pay fines etc

## 7. Mandatory Functions

Add/Register Data – users, books and funds

Delete/Remove Data – users, books and funds

Update Data – users books and funds

## 8. Functional Requirements

- The system must let users **register, search, borrow, reserve, renew, and return** books online/ on the phone hassle free and help them understand books better

**Inputs:** user details, search keywords, book IDs, reservation/borrowing actions, feedback.

**Outputs:** search results, personalized book suggestions, due reminders, transaction confirmations, and reports.

- **Computations:** fine calculation, recommendation generation (via ML), availability checks, and analytics.
- **Timing & Synchronization** - Real-time data updates across app and web.

## 9. Non-Functional requirements

### **Authentication (Login/Logout):**

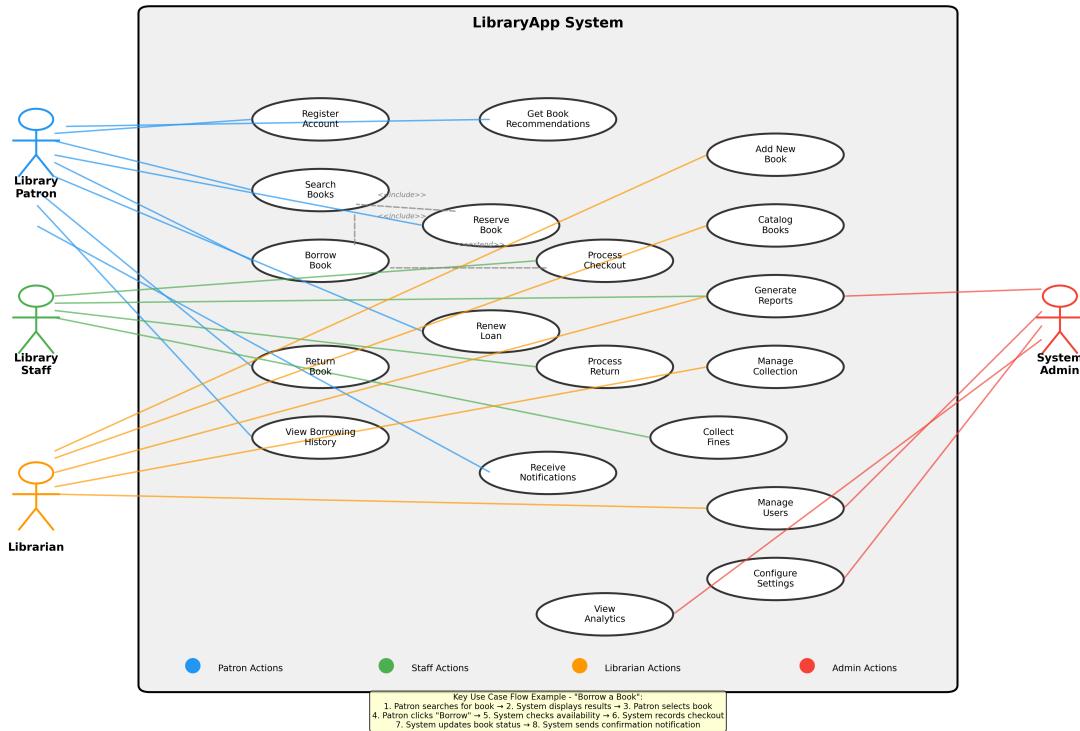
- Secure login with email/password or library ID.
- Session-based access; auto-logout after inactivity.
- Encrypted passwords (SHA-256) for data protection.
- Role-based access (Admin, Librarian, User).

### **Availability:**

- System available **24/7** with **99% uptime**.
- Cloud-hosted for continuous access via web and mobile.
- Automatic data backup every 24 hours.
- Failover and recovery to minimize downtime.

## 10. Use Case

Library Management System - Use Case Diagram



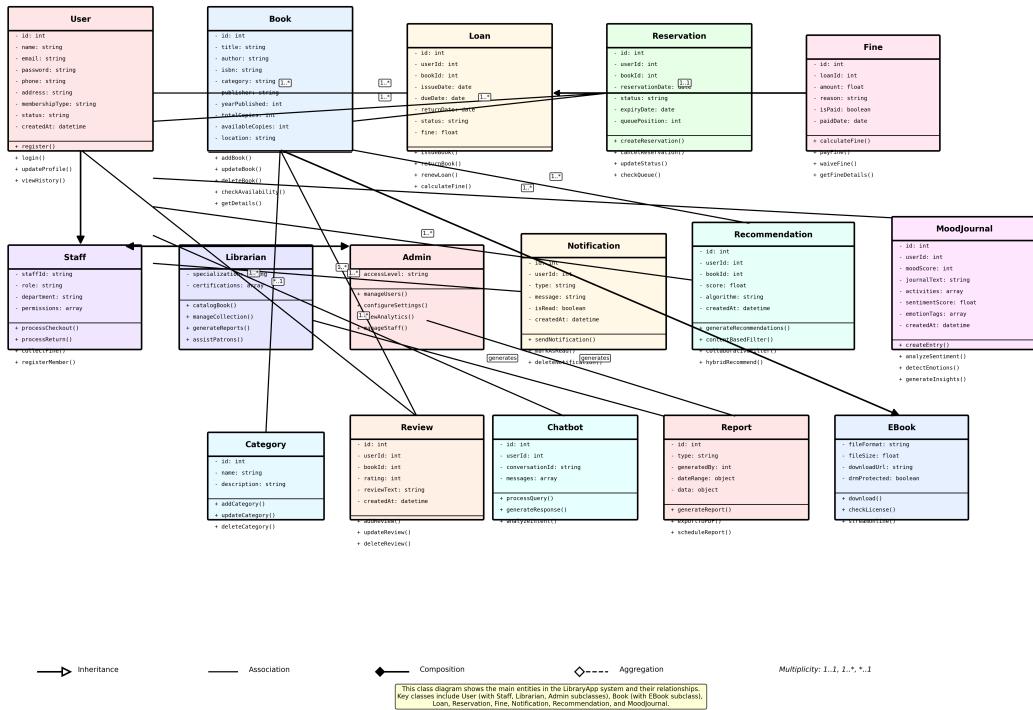
## 11. TOOLS AND TECHNOLOGIES USED

The LibraryApp system is built using **Python with Flask framework** for the backend API and server-side logic, **SQLite/PostgreSQL** for the database management system, **React Native with TypeScript** for the cross-platform mobile application (iOS/Android), and **React with Vite and TypeScript** for the web-based admin dashboard. Additional technologies include **scikit-learn** and **TextBlob** for machine learning-powered book recommendations and sentiment analysis, **Firebase Cloud Messaging (FCM)** for push notifications, **Git/GitHub** for version control, and cloud hosting services (AWS/DigitalOcean) for deployment, with the entire stack leveraging open-source technologies to ensure cost-effectiveness and scalability.

## PHASE 2

### CLASS DIAGRAM

**Library Management System - Class Diagram**



## 2.Sequence Diagram

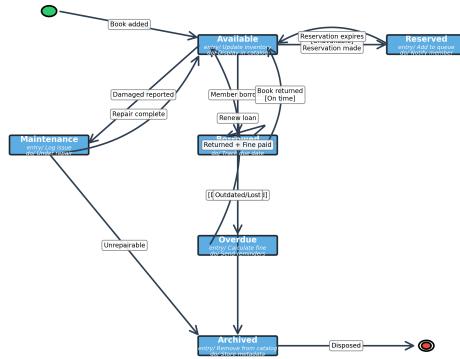
**Library Management System - Sequence Diagrams  
Showing System Interactions and Flow**



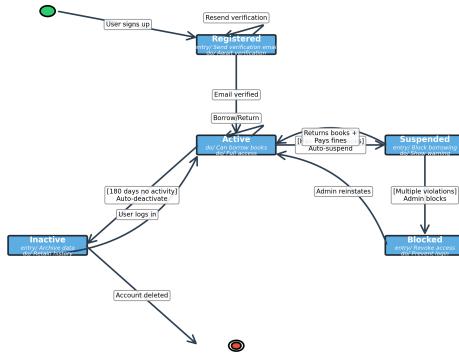
## STATE DIAGRAMS

Library Management System - State Diagrams  
Showing System Behavior and State Transitions

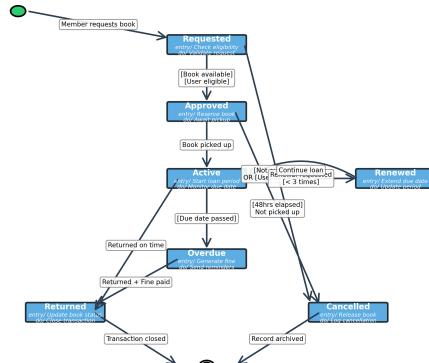
State Diagram 1: Book Lifecycle States



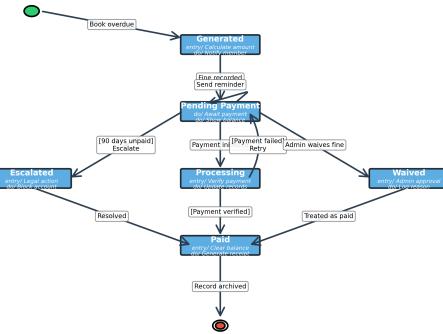
State Diagram 2: User Account States



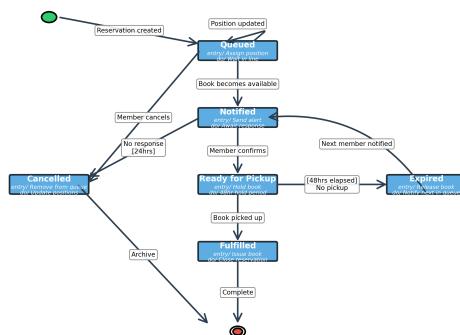
State Diagram 3: Loan Transaction States



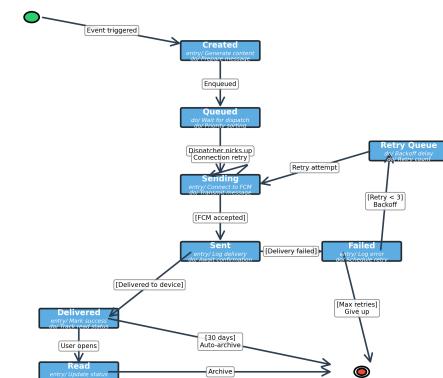
State Diagram 4: Fine/Payment States



State Diagram 5: Reservation Queue States



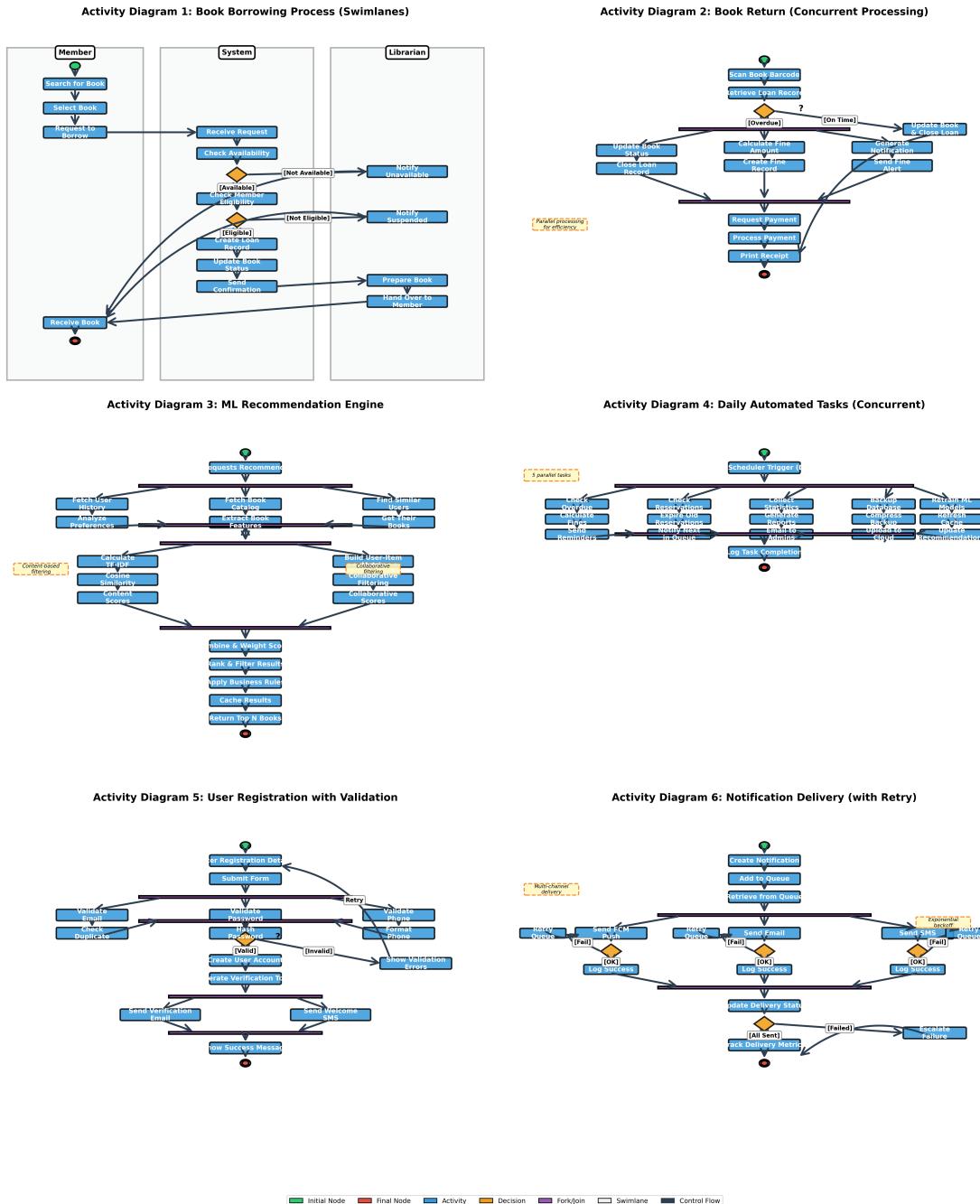
State Diagram 6: Notification System States



Legend: Initial State (Green), Final State (Red), Regular State (Blue), Decision Point (Orange), State Transition (Black), Condition/Event (White)

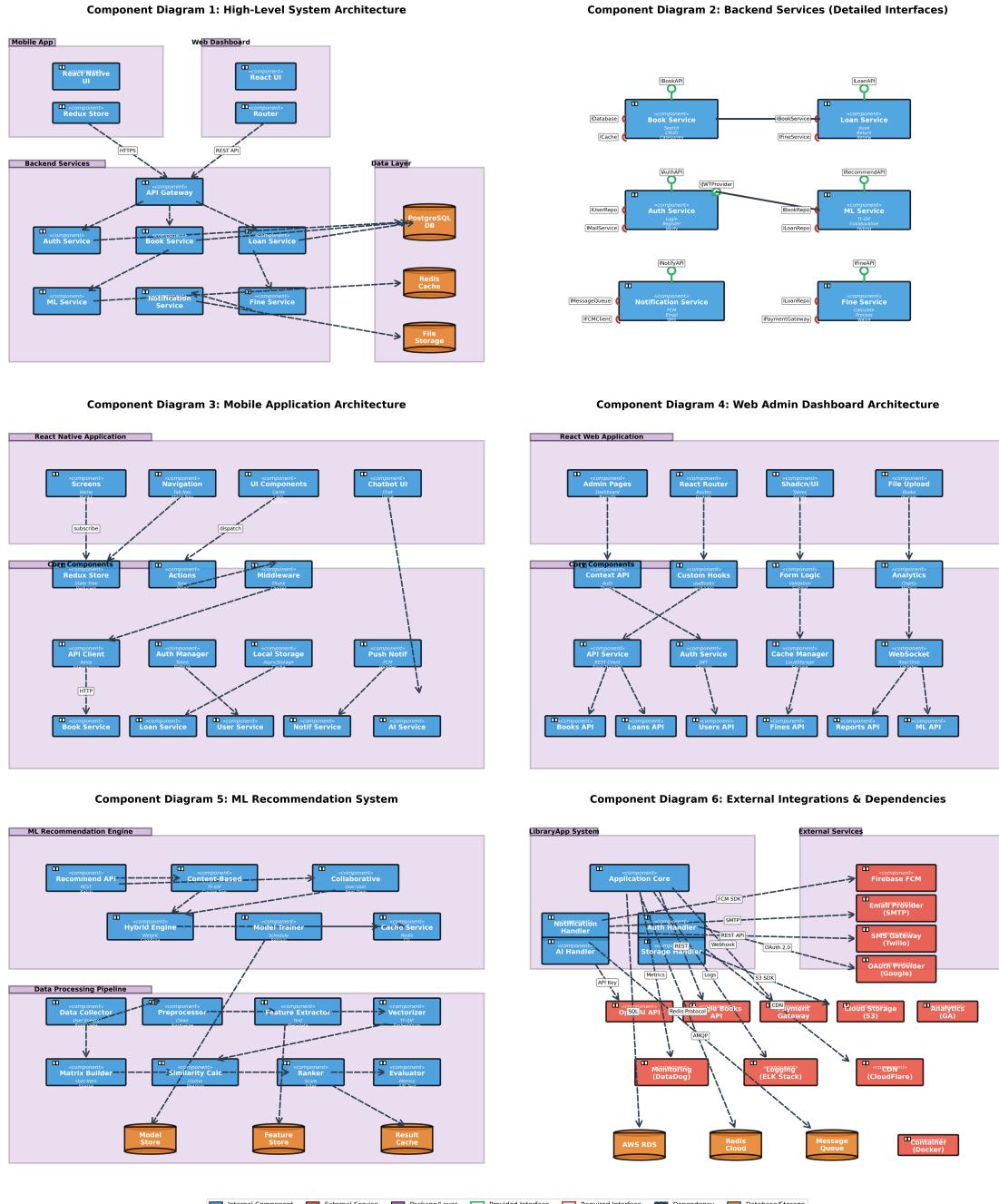
## ACTIVITY DIAGRAMS

**Library Management System - Activity Diagrams  
Showing Process Flow and Concurrent Activities**



## COMPONENT DIAGRAMS

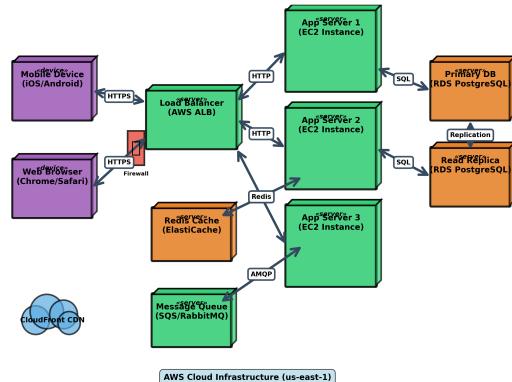
**Library Management System - Component Diagrams  
Showing System Architecture and Component Interactions**



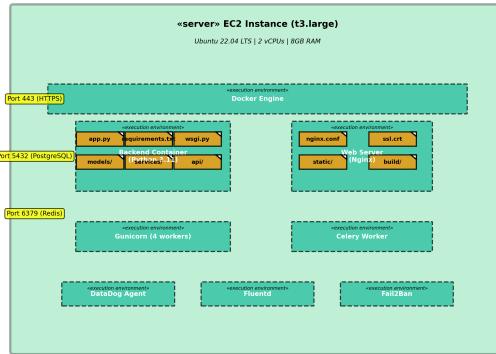
## DEPLOYMENT DIAGRAM

**Library Management System - Deployment Diagrams  
Showing Physical Infrastructure and Network Topology**

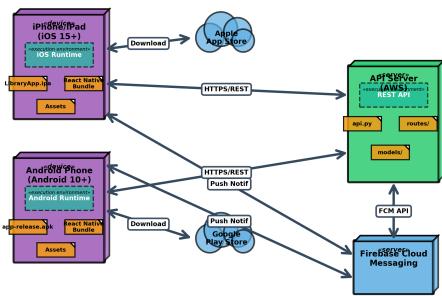
**Deployment Diagram 1: Production Environment - High Level**



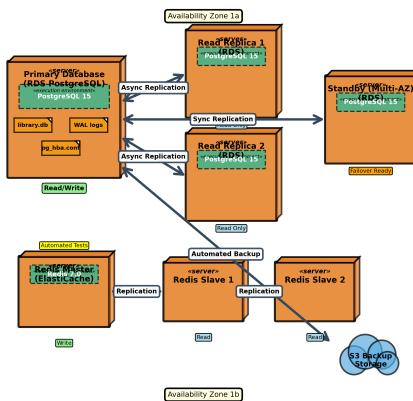
**Deployment Diagram 2: Application Server - Internal Components**



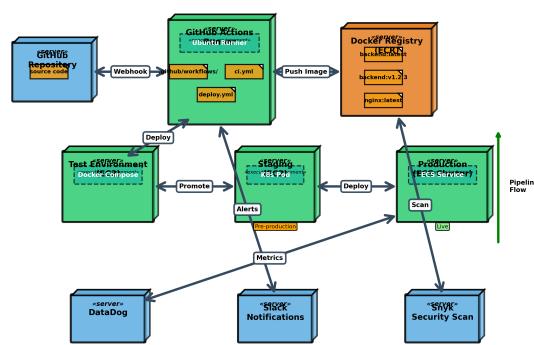
**Deployment Diagram 3: Mobile Application Deployment**



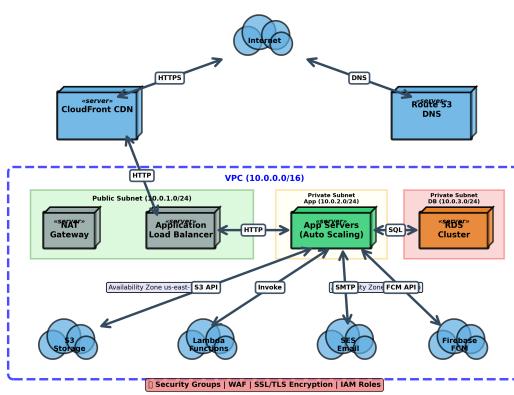
**Deployment Diagram 4: Database Cluster & Caching Layer**



**Deployment Diagram 5: CI/CD Pipeline Infrastructure**



**Deployment Diagram 6: Complete System Network Topology**



Legend: Client Device (Purple), Application Server (Green), Database/Cache (Orange), Cloud Service (Blue), Execution Environment (Yellow), Deployment Artifact (Yellow), Communication Path (Black line).