Fitness App: System Design Document

Project Name: Fitness App
Release Version: v1.0 (Initial MVP Release)
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1. Introduction

This document provides an overview of the system design for the Fitness App, detailing the architecture, main classes and their responsibilities, interactions, and error-handling strategies. This initial design may evolve over time to accommodate new features or integrate improved solutions. Our tech stack includes full stack: React native expo database: SQL + Prisma External API: Api Ninja, Clerk

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2. CRC Cards

Class: User

- **Responsibilities**:
    - Register and log in users using Clerk.
    - Manage user session information.
    - Retrieve and update user profile information.
- **Collaborations**:
    - **AuthenticationService**: For validating user credentials.
    - **Profile**: For storing and managing user-specific data.

Class: Profile

- **Responsibilities**:
    - Store user profile data (e.g., name, email).
    - Enable user updates to profile information.
- **Collaborations**:
    - **User**: Owned by a single user, interacts with the User class to link profile data.
    - **Database**: Saves and retrieves profile data in the backend database.

Class: Workout

- **Responsibilities**:
    - Add, remove, and manage exercises within a workout plan.
    - Save and retrieve workout plans for each user.
- **Collaborations**:
    - **Exercise**: Uses exercises to build a workout plan.
    - **Database**: Interacts with the database for storing and retrieving workout data.

Class: Exercise

- **Responsibilities**:
    - Display and manage exercise information based on muscle groups.
    - Store exercise details (e.g., name, target muscle, equipment).
- **Collaborations**:
    - **ExerciseAPIService**: Fetches exercise information from an external API.
    - **Workout**: Used by the Workout class to add exercises to a workout plan.

Class: ExerciseAPIService

- **Responsibilities**:
    - Connect to external API to fetch exercise data.
    - Cache exercise data in the database to reduce repeated API calls.
- **Collaborations**:
    - **Exercise**: Supplies exercise data to the Exercise class.
    - **Database**: Stores cached exercise data for future access.

Class: AuthenticationService

- **Responsibilities**:
    - Manage user registration, login, and session validation.
    - Ensure secure handling of authentication using Clerk.
- **Collaborations**:
    - **User**: Verifies and manages user sessions.
    - **Clerk API**: Facilitates authentication with Clerk's service.

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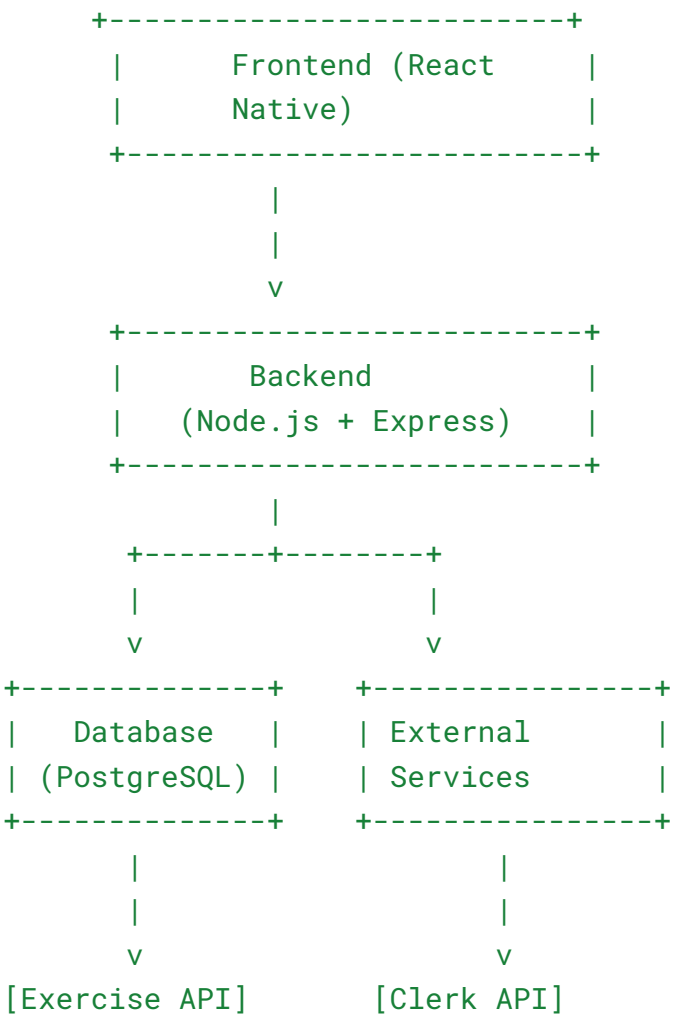
3. System Architecture Diagram

The Fitness App architecture follows a **three-tier structure** consisting of **Frontend**, **Backend**, and **Database** components, with external services for authentication and exercise data.



Explanation:

1. **Frontend**:
    - **Platform**: React Native.
    - **Purpose**: Manages UI and handles user interactions. It makes API requests to the backend to retrieve or modify data.
2. **Backend**:
    - **Platform**: Node.js with Express.
    - **Purpose**: Serves as the main server that handles API requests, processes business logic, and communicates with the database and external services.
3. **Database**:
    - **Platform**: PostgreSQL.
    - **Purpose**: Stores user data, workout plans, and cached exercise data.
4. **External Services**:

- **Clerk API**: Manages user authentication and session handling.
- **Exercise API**: Supplies exercise data categorized by muscle group.

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4. System Decomposition

Components and Roles:

1. **Frontend**:
   - Handles all user interactions, such as registering, logging in, and creating workout plans.
   - Sends API requests to the backend and displays data in a user-friendly format.
2. **Backend**:
   - Exposes API endpoints that the frontend interacts with for user, profile, and workout data.
   - Integrates with Clerk API for authentication and the Exercise API for exercise data.
3. **Database**:
   - Acts as the main repository for all app data, including users, profiles, workouts, and cached exercise details.

Each component serves a distinct purpose, supporting scalability and ease of maintenance. This modular structure also allows for independent updates and testing of each layer.

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5. Error Handling and Exception Management

The error-handling strategy for the Fitness App addresses common issues and unexpected exceptions.

Error Categories and Handling Strategy

1. **User Input Errors**:
   - **Description**: Occur when users enter invalid data.
   - **Handling**: Validate inputs on both frontend and backend, displaying user-friendly error messages if necessary.
2. **Authentication Errors**:
   - **Description**: Related to authentication, such as incorrect credentials.
   - **Handling**: Provide clear error messages for incorrect logins and redirect to login on session expiration.
3. **Network and API Errors**:

    - **Description**: Occur due to network issues or unavailable APIs.
    - **Handling**: Display a message to inform the user of connectivity issues and use cached data if available.
4. **Database Errors**:
    - **Description**: Issues related to accessing or modifying data in the database.
    - **Handling**: Retry operations if the database connection is lost and display a generic error if the issue persists.
5. **Unexpected Errors**:
    - **Description**: Unanticipated errors during runtime.
    - **Handling**: Log the errors for the development team and display a generic error message to the user.

Anticipated Response Summary

- **User Input Errors**: “Invalid input. Please check your entries.”
- **Authentication Errors**: “Session expired. Please log in again.”
- **Network and API Errors**: “Network issues detected. Please check your connection.”
- **Database Errors**: “Technical issue encountered. Please try again later.”
- **Unexpected Errors**: “An unexpected error occurred. Please restart the app.”