Technical Protocol: Sports Exercise Battle (SEB)

Project Overview

The Sports Exercise Battle (SEB) is an HTTP/REST-based server application designed to track push-ups. The system enables users to compete against each other in 2-minute push-up tournaments, with automatic ELO rating adjustments based on performance. This protocol documents the technical implementation, challenges faced and solutions applied during development.

System Architecture

The application follows a layered architecture:

1. Server Layer: Manages HTTP connections and request routing
2. Controller Layer: Contains business logic for user, profile, and tournament operations
3. Repository Layer: Handles data persistence and database operations
4. Model Layer: Defines data structures for system entities
5. Database Layer: Provides connection management to PostgreSQL

Core Functionality

User Management

- Secure registration and authentication using token-based security
- Editable user profiles with customizable display name, bio, and image
- Password handling with salt-based hashing for security

Tournament System

- Automatic 2-minute tournaments triggered by push-up submissions
- Real-time participant tracking with push-up count aggregation
- ELO rating adjustments: +2 for winners, -1 for losers, +1 for ties
- Comprehensive tournament logs for historical reference

Push-up Tracking

- Recording of individual push-up sessions with count and duration
- Historical view of all push-up activities
- Statistical analysis of performance (total, average, maximum)

Unique Feature: Streak System

- Tracks consecutive days of user activity
- Rewards consistent participation with achievement recognition
- Provides motivational feedback for maintaining exercise habits

Technical Challenges and Solutions

Challenge 1: Token Authentication

Problem: Initial implementation created duplicate tokens during user login, causing database constraint violations.
Solution: Modified the token management system to replace existing tokens for users, ensuring database integrity while maintaining security.

Challenge 2: Tournament Timing

Problem: Determining when tournaments expire required precise timing management.
Solution: Implemented a timestamp-based approach that checks tournament expiration on every interaction, completing tournaments automatically when their 2-minute window expires.

Challenge 3: Endpoint Compatibility

Problem: Initial endpoint design didn't match curl script requirements for testing.
Solution: Adjusted endpoint paths and response formats to align with test expectations without compromising architectural integrity.

Unit Testing Strategy

The testing approach focuses on critical system components:

1. Security Components: Password hashing, token validation (high security impact)
2. Core Business Logic: Tournament expiration, ELO calculation (functionality impact)
3. Data Integrity: User profile management, push-up recording (reliability impact)

Integration tests validate complete workflows through the system, such as:

- User registration and authentication flow
- Tournament participation and completion
- Push-up recording and history tracking

Development Metrics

Task Category	Time Investment
Architecture and setup	8 hours
Core functionality	15 hours
Unique feature implementation	4 hours
Testing and refinement	9 hours
Documentation	2 hours
Total	**38 hours**

Conclusion

The Sports Exercise Battle system successfully implements a competitive platform for tracking push-up exercises. The application balances security, performance, and user experience while meeting all specified requirements. The project demonstrates effective use of layered architecture and database design principles, providing a good foundation for future enhancements.

GitHub Link: https://github.com/floerychristopher/sports-exercise-battle