Software Design Document for IMDb Web Platform

Version: 1.0

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Table of Contents

6. **Data Flow**

7. **Security Considerations**

8. **Testing and Validation**

9. **Deployment Strategy**

10. **Future Enhancements**

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1. Introduction

1.1 Purpose

The purpose of this document is to outline the software design for the IMDb web platform. IMDb is a widely-used online database that provides information about movies, TV shows, actors, and production crew. This document serves as a blueprint for the development, maintenance, and scalability of the platform.

1.2 Scope

The IMDb web platform allows users to:

- Search for and browse movies, TV shows, and celebrity profiles.
- View detailed information about titles, including cast, crew, reviews, and ratings.
- Create user accounts to rate and review titles, create watchlists, and receive recommendations.
- Access APIs for third-party integration.

1.3 Glossary

- **User:** End-user of the IMDb platform.
- **CRUD:** Create, Read, Update, Delete operations.
- **REST:** Representational State Transfer.

1.4 References

- IMDb official website: https://www.imdb.com/

- REST API design principles

- OWASP security guidelines

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2. System Overview

The IMDb web platform is a three-tiered architecture consisting of:

1. **Frontend:** A responsive web interface for user interaction.

2. **Backend:** A scalable service layer handling business logic and APIs.

3. **Database:** A relational and non-relational hybrid system for storing structured and unstructured data.

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3. Requirements

3.1 Functional Requirements

1. **Search Functionality:** Provide robust search with auto-suggestions for movies, TV shows, and actors.

2. **Detailed Pages:** Display detailed information for titles, actors, and crew.

3. **User Accounts:** Enable user registration, login, and profile management.

4. **Watchlist:** Allow users to add titles to personal watchlists.

5. **Reviews and Ratings:** Allow users to review and rate titles.

6. **Recommendation System:** Suggest titles based on user preferences.

7. **Admin Panel:** For managing content and user-generated data.

8. **API Access:** Provide external developers with RESTful API endpoints.

3.2 Non-Functional Requirements

- **Scalability:** Handle millions of daily active users and high traffic volumes.

- **Performance:** Ensure page loads within 2 seconds.

- **Security:** Protect user data and prevent unauthorized access.

- **Availability:** 99.9% uptime.

- **SEO Optimization:** Optimize pages for search engine indexing.

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4. System Architecture

4.1 High-Level Architecture

1. **Frontend:**
   - Technology Stack: React.js, Next.js
   - Features: Responsive UI, server-side rendering, SEO optimization.

2. **Backend:**
   - Technology Stack: Node.js, Express.js
   - Features: REST APIs, authentication, business logic.

3. **Database:**
   - **Relational DB:** PostgreSQL for structured data like user accounts, reviews, and ratings.

  - **NoSQL DB:** MongoDB for unstructured data like movie metadata, comments.

4. **Caching:**
  - Redis for session management and caching frequently accessed data.

5. **Load Balancing:**
  - NGINX to distribute traffic evenly across backend servers.

6. **Search Engine:**
  - Elasticsearch for fast and flexible search capabilities.

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5. Detailed Design

5.1 Frontend Design
- **Login/Signup:** User authentication via OAuth or standard email/password.
- **Search Bar:** Auto-suggestions with dropdown filtering by category (movies, TV shows, actors).
- **Responsive Layout:** Grid-based design with breakpoints for desktop, tablet, and mobile.

5.2 Backend Design
- **Authentication:**
  - JWT-based session tokens.
  - Multi-factor authentication for admins.

- **Business Logic:**
  - Controller classes for handling requests.

  - Middleware for request validation and logging.

5.3 Database Design

- **Tables:**
  - Users: `id`, `name`, `email`, `password`, `preferences`.
  - Movies: `id`, `title`, `genre`, `release_date`, `rating`.
  - Reviews: `id`, `user_id`, `movie_id`, `review_text`, `rating`.

- **Indexes:**
  - Full-text search on `title` and `genre` columns.
  - Composite index on `user_id` and `movie_id` for reviews.

5.4 APIs

Example Endpoint: Fetch Movie Details

- **Endpoint:** `GET /api/movies/{id}`
- **Parameters:**
  - `id`: Movie ID (required).
- **Response:**

  ```json
  {
    "id": "123",
    "title": "Inception",
    "genre": ["Sci-Fi", "Thriller"],
    "release_date": "2010-07-16",
    "rating": 8.8
  }
  ```

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6. Data Flow

User Journey: Viewing a Movie

1. User enters the movie title in the search bar.

2. Frontend sends a query to the search API.

3. Elasticsearch processes the query and returns results.

4. User selects a movie from the results.

5. Frontend fetches movie details from the backend API.

6. Backend retrieves data from the database and returns it to the frontend.

7. Frontend renders the movie details page.

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7. Security Considerations

- **Data Encryption:** Use HTTPS and encrypt sensitive data in transit and at rest.

- **Rate Limiting:** Prevent abuse of APIs.

- **Input Validation:** Sanitize all user inputs to prevent SQL injection and XSS attacks.

- **Authentication:** Use OAuth 2.0 and secure password storage (e.g., bcrypt).

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8. Testing and Validation

8.1 Testing Types

1. **Unit Testing:** Validate individual components.

2. **Integration Testing:** Verify interactions between modules.

3. **Load Testing:** Simulate high traffic and measure performance.

4. **Security Testing:** Identify vulnerabilities.

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9. Deployment Strategy

1. **Environment:** Use Docker for consistent environments.

2. **CI/CD Pipeline:** Automate testing and deployment with Jenkins.

3. **Cloud Deployment:** Host on AWS with auto-scaling.

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10. Future Enhancements

- **AI-based Recommendations:** Use ML algorithms for better suggestions.

- **Advanced Analytics:** Provide detailed insights into user behavior.

- **Mobile App Integration:** Develop native apps for iOS and Android.

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