
International Institute of Information Technology Bangalore

# SE Project Report: CampQuest

## Team Name: Team404

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**Github Repository Link:**
https://github.com/Ayush-Mishra-0018/CampQuest-SE_Project/

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# Contents

# Note

A detailed project description, repository structure, and extended testing documentation are available in the README file hosted in the GitHub repository linked above. This report summarizes and formalizes the project work as per Software Engineering life-cycle phases.

# 1 Introduction

CampQuest is a full-stack web application that allows users to discover, create, and review campgrounds. The project is inspired by YelpCamp and was developed to demonstrate the end-to-end Software Development Life Cycle (SDLC) as part of the Software Engineering course.

The system supports authenticated content creation and modification while allowing unauthenticated users to browse campgrounds and reviews. The application emphasizes secure authentication, ownership-based authorization, server-side validation, and robust error handling.

# 2 CampQuest Features

The major features implemented in CampQuest are:

- User registration, login, and logout.
- Session-based authentication and authorization.
- CRUD operations for campground listings.
- Review creation and deletion for campgrounds.
- Ownership-based access control.
- Server-side validation using Joi schemas.
- Centralized error handling using custom error classes.
- Responsive UI using EJS templates and Bootstrap.

# 3 Requirement Analysis Phase

The Requirement Analysis phase resulted in a formal Software Requirements Specification (SRS) document that defines both functional and non-functional requirements for CampQuest.

## 3.1 Functional Requirements

- User authentication and session management.
- Campground management with full CRUD functionality.
- Review creation and deletion with proper ownership checks.
- Server-side validation and authorization enforcement.

## 3.2 Non-Functional Requirements

- Security through password hashing and protected routes.
- Maintainability via modular MVC-based architecture.
- Usability through responsive and intuitive UI design.
- Reliability using centralized error handling mechanisms.

The complete specification is documented in the SRS prepared during this phase.

# 4 Design Phase

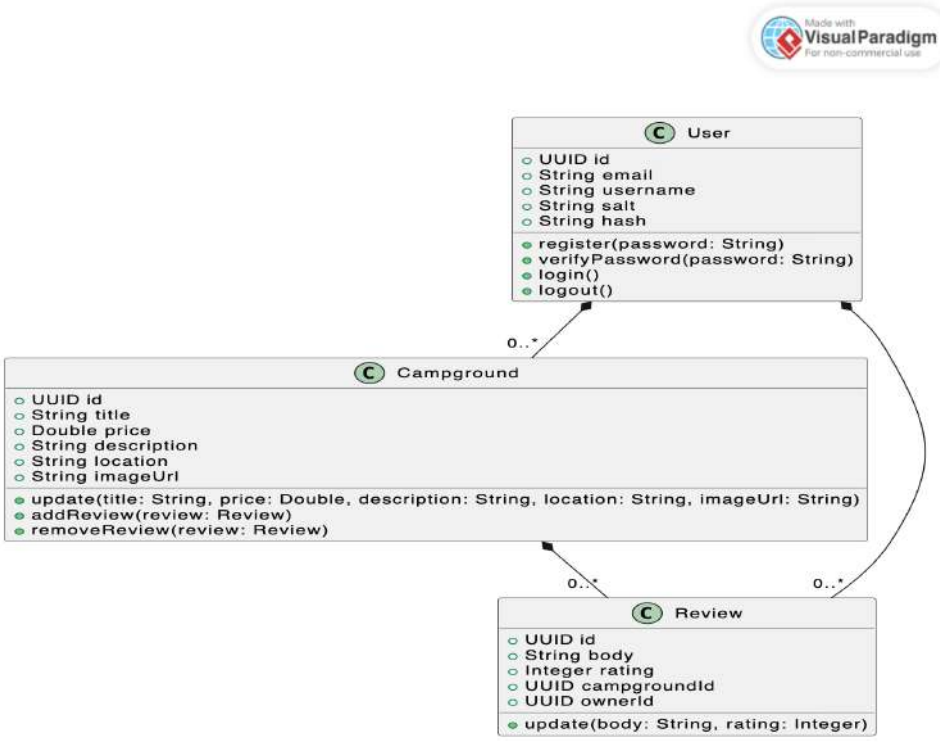
The design phase focused on modeling system behavior, structure, and interactions using standard UML and ER diagrams.

## 4.1 Activity Flow Diagram

Represents high-level user interaction flows such as authentication, campground creation, and review workflows.
(Image is not attached in this pdf as it streching through pages. Please find it in our Design Phase submission)

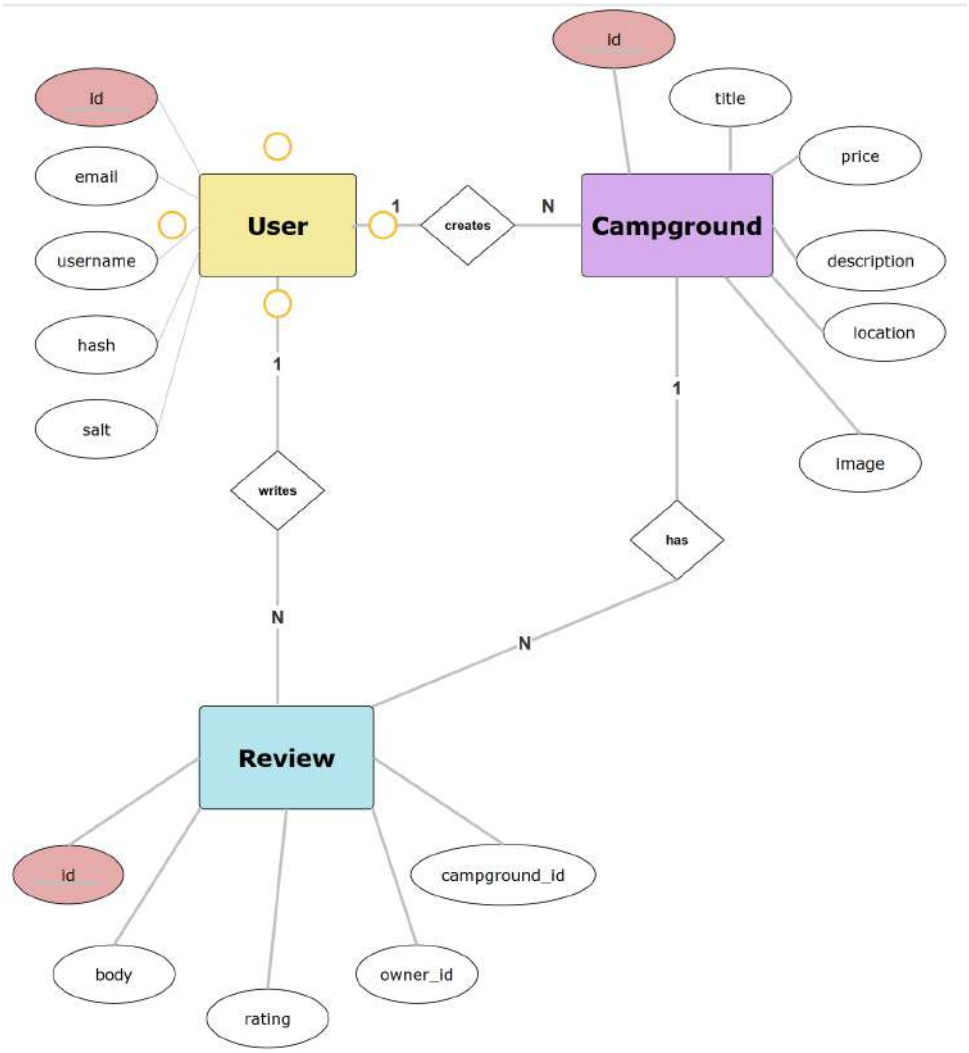
## 4.2 Class Diagram

Defines core entities including User, Campground, and Review along with their attributes and associations.



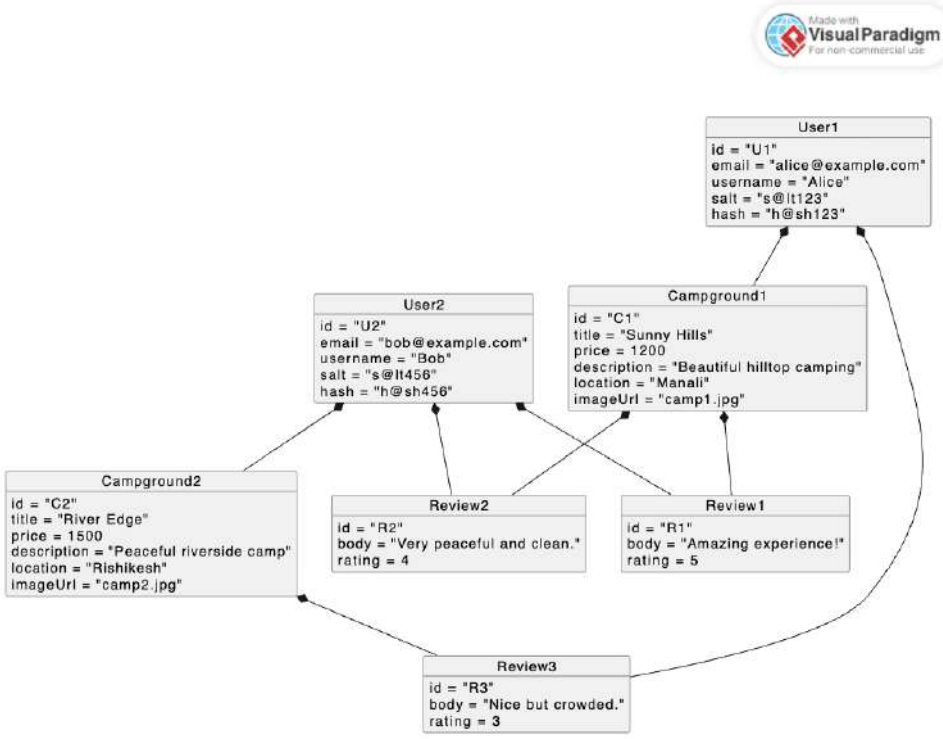
## 4.3 ER Diagram

Illustrates database relationships, including one-to-many relations between Campgrounds and Reviews and user ownership constraints.



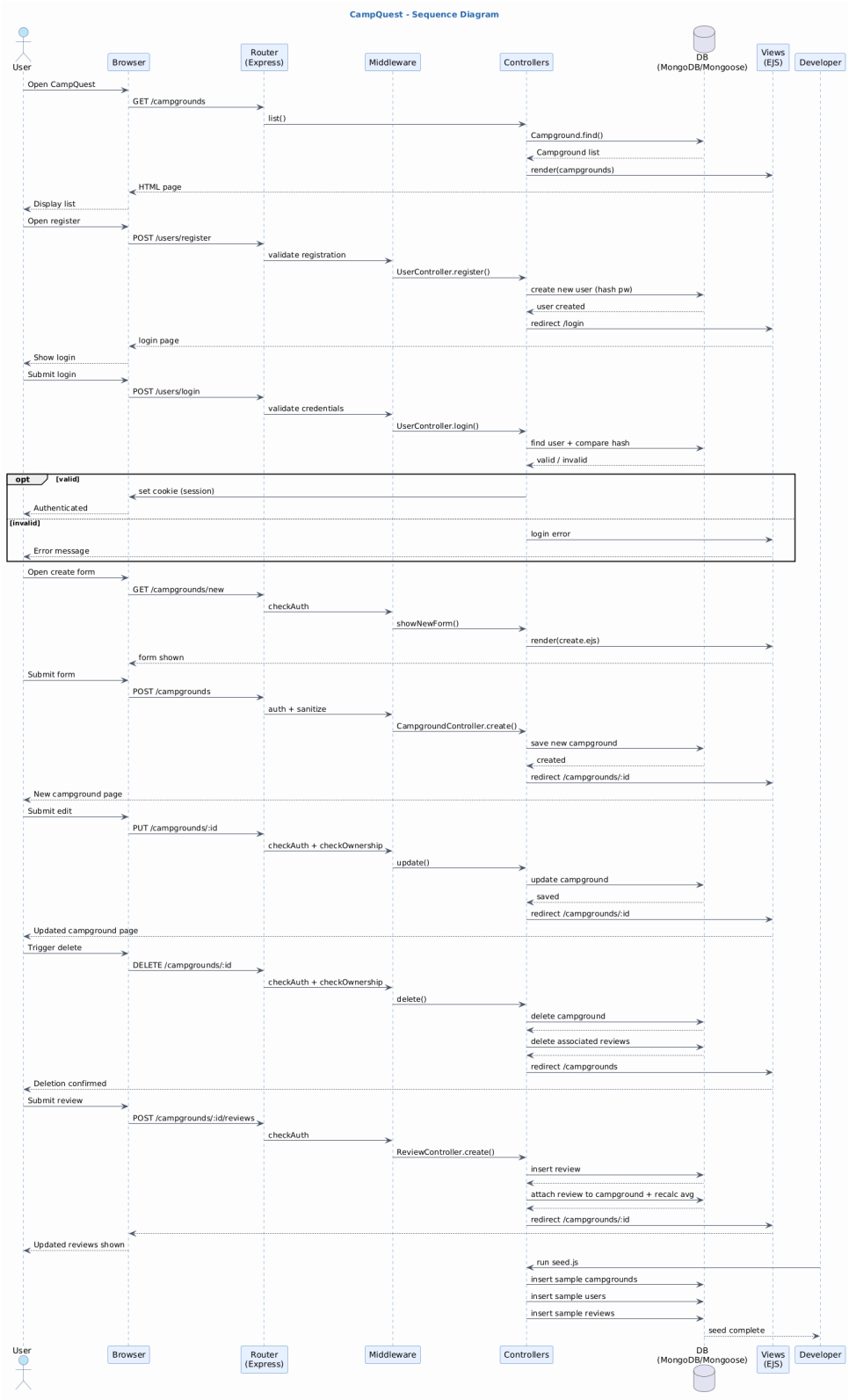
## 4.4 Object Diagram

Shows runtime object instances and their relationships during system execution.



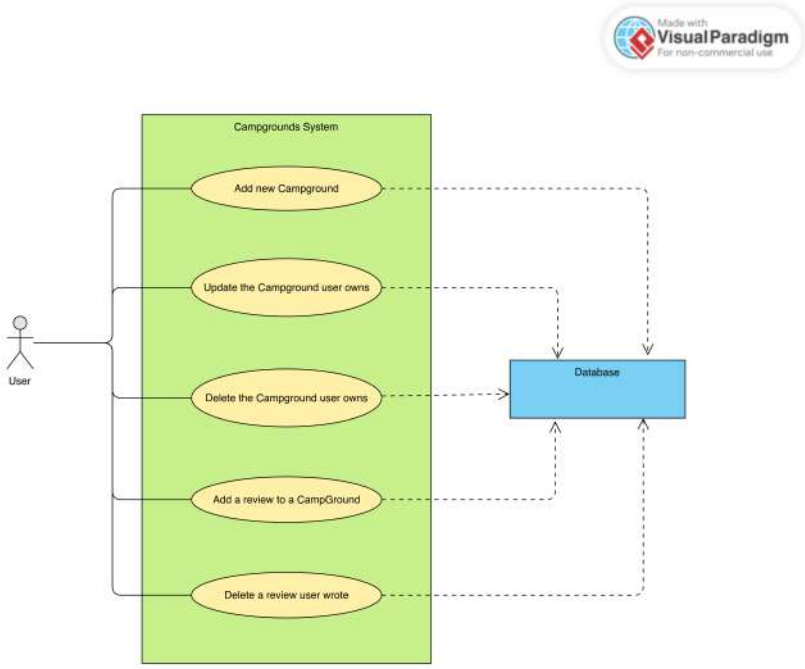
## 4.5 Sequence Diagram

Models interaction sequences between client, server, controllers, models, and database for key operations.



### 4.6 Use Case Diagram

Captures system functionality from the perspective of authenticated and unauthenticated users.




# 5 Construction Phase

The system was implemented using Node.js and Express.js, with MongoDB used for persistent storage. EJS templates were used for server-side rendering, and Bootstrap was used for UI styling.

The codebase follows a modular structure separating concerns into models, controllers, routes, middleware, and views. This structure improves maintainability and testability.

# 6 Comprehensive Test Specifications

The application reliability is verified through a rigorous testing strategy comprising **9 test suites** and over **81 individual tests**. The testing structure is divided into Unit tests (isolated logic) and Integration scenarios (end-to-end flows).

## 6.1 Unit Testing Suites

Unit tests isolate specific functions and models to ensure internal logic correctness.

### 6.1.1 Middleware & Security

- **Authentication (`isLogin`):** Ensures unauthenticated users are redirected to login and flash messages are displayed.
- **Authorization (`hasPermission`):** logic verifies that only the specific author of a resource can modify it, returning 403 Forbidden otherwise.
- **Session Handling (`storeReturnTo`):** Validates the logic for returning users to their previous page after logging in.

### 6.1.2 Data Models & Utilities

- **Schema Validation:**
  - *User Model:* Verified password hashing (plaintext never stored) and unique email indexing.
  - *Review Model:* Tested validation errors for out-of-bound ratings ($> 5$).
- **Error Handling Utilities:**
  - `ExpressError`: verified custom status codes and message propagation.
  - `WrapError`: Tested async wrappers to ensure promise rejections are passed to the global error handler.

## 6.2 Integration Testing Suites

Integration tests utilize a test database to simulate real-world user interactions and data persistence.

### 6.2.1 Campground & Review Management

- **Campground Operations (CRUD):**
  - Verified creation workflows including field validation and authentication requirements.
  - Tested access control: Non-owners are strictly prevented from editing or deleting campgrounds.
  - Validated error handling for non-existent resources (404 responses).

- **Review Logic & Statistics:**
  - Enforced rating constraints (values must be $0 - 5$).
  - Verified statistical aggregation: Algorithms correctly calculate min, max, and average ratings from multiple data points.
  - Tested multi-user scenarios where different users review the same campground.

#### 6.2.2 Advanced User Journeys

- **User Lifecycle:**
  - *Registration:* Validated unique constraints for usernames and emails (preventing duplicates).
  - *Authentication:* Tested login success/failure paths and session persistence across requests.
- **Data Integrity & Cascading:**
  - Verified *Cascade Deletion*: Deleting a campground automatically removes all associated reviews to prevent database orphans.
  - Confirmed that deleting one campground does not affect data integrity of other campgrounds.
- **End-to-End Flows:**
  - *Visitor to Reviewer:* Simulates a full path: Register $\rightarrow$ Create Campground $\rightarrow$ Add Reviews.
  - *Collaborative Flow:* Verifies permission enforcement when multiple users interact simultaneously.

Each test suite runs in isolation with full setup and teardown to ensure reliability and data integrity.

# 7 Project Setup and Execution

## 7.1 Cloning the Repository

```
git clone https://github.com/Ayush-Mishra-0018/CampQuest-SE_Project.git
cd CampQuest-SE_Project
```

## 7.2 Installing Dependencies

```
npm install
```

## 7.3 Environment Setup

Create a `.env` file in the project root directory with the following variable:

```
MONGODB_URI="mongodb://127.0.0.1:<your_mongodb_port>/YELPCAMP"
```

Ensure a MongoDB instance is running and accessible at the above address.

## 7.4 Seeding the Database

(Optional but Recommended for better experience)

```
node Seeds/seed.js
```

## 7.5 Running the Application

```
node index.js
```

The application can be accessed at `http://localhost:3000`.

## 7.6 Running Tests

```
# Run all tests
npm test

# Run unit tests only
npm run test:unit

# Run integration tests only
npm run test:integration

# Run a specific test file
npx jest tests/integration/user.lifecycle.test.js
```