Hotel Reservation System

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Deliverable 1 (week 5)

Project Specification

The project is created to suit a Reservation System for a hotel chain, as present at any hotel desk, operated by a receptionist. In a general manner, it enables the user of the system to make bookings for guests, manage rooms and roomtypes, add guest to the database, manage their details/credentials, view users/admins. There are two types of users: regular and admin privileges *(*see glossary)*. The regular user can login into the platform, make bookings, manage guests and their data. Admins will login with superuser privileges and they are able to create new rooms and roomtypes, as well as manage current registered users.

Regarding the technology stack used, I decided to implement it as a full-stack app in Java using Spring Boot for web support. The system architecture uses a mechanism provided by Spring where the data is stored by Repositories and it is retrieved and managed by Service classes. All the functionality was coded so it is easy to maintain and upgrade, since I depended upon abstractions (for instance, using interfaces for services).

Functional Requirements

- **User registration**: allows users to create user profiles using name and password. The information is stored into an encrypted form in the user database;
- **Main dashboard**: users can modify, delete and add bookings, query guests by their address, email, phone number, modifiy account credentials, view current vacant rooms with their corresponding pricing etc.;
- **Admin dashboard**: admins (users with privileges), besides a regular user, can add new rooms of the hotel in the system, new roomtypes, modify prices of the current available options, run seasonal sales etc.;
- **Payment**: currently, the system will manage payments by setting a flag-like field in a booking entry (called isPaid).

Use Case Model

Use Cases Identification

1	Use-case	login operation
	Level	user goal level
	Primary actor	user/admin
	Main success scenario	- user is prompted with two fields that require input (name and password); - after completion, “login” button may be pressed; - the system will let them know if the credentials match a current user; - the system displays a success splash screen.
	Extensions	- if the user does not have an account, they are prompted to create one.

2	Use-case	create account operation
	Level	user goal level
	Primary actor	user/admin
	Main success scenario	- user will press “create account” button; - user is prompted with two fields that require input (name, password and other credentials); - after completion, “register” button may be pressed - the system will let them know if the current name/email is already assigned to an user; - the system displays a success splash screen.
	Extensions	

3	Use-case	add (hotel) guests
	Level	user goal level
	Primary actor	user/admin
	Main success scenario	- user will login to the platform; - if success, the user will press “add guests” button; - user will complete information about guests (name, email, phone, address); - an available room will be chosen from the UI; - submit button will be pressed by the user.
	Extensions	

4	Use-case	add booking
	Level	user goal level
	Primary actor	user/admin
	Main success scenario	- user will login to the platform; - if success, the user will press “add booking” button; - user will complete information about bookings (check-in date, check-out date, total, paid status); - submit button will be pressed by the user.
	Extensions	- if the paid status is set to false upon creation, the user will follow up later for modification.

5	Use-case	add room type
	Level	user goal level
	Primary actor	admin only
	Main success scenario	- admin will login to the platform; - if success, the admin will press “add new room type” button; - admin will complete information about room types (name, cost and description); - submit button will be pressed by the admin.
	Extensions	

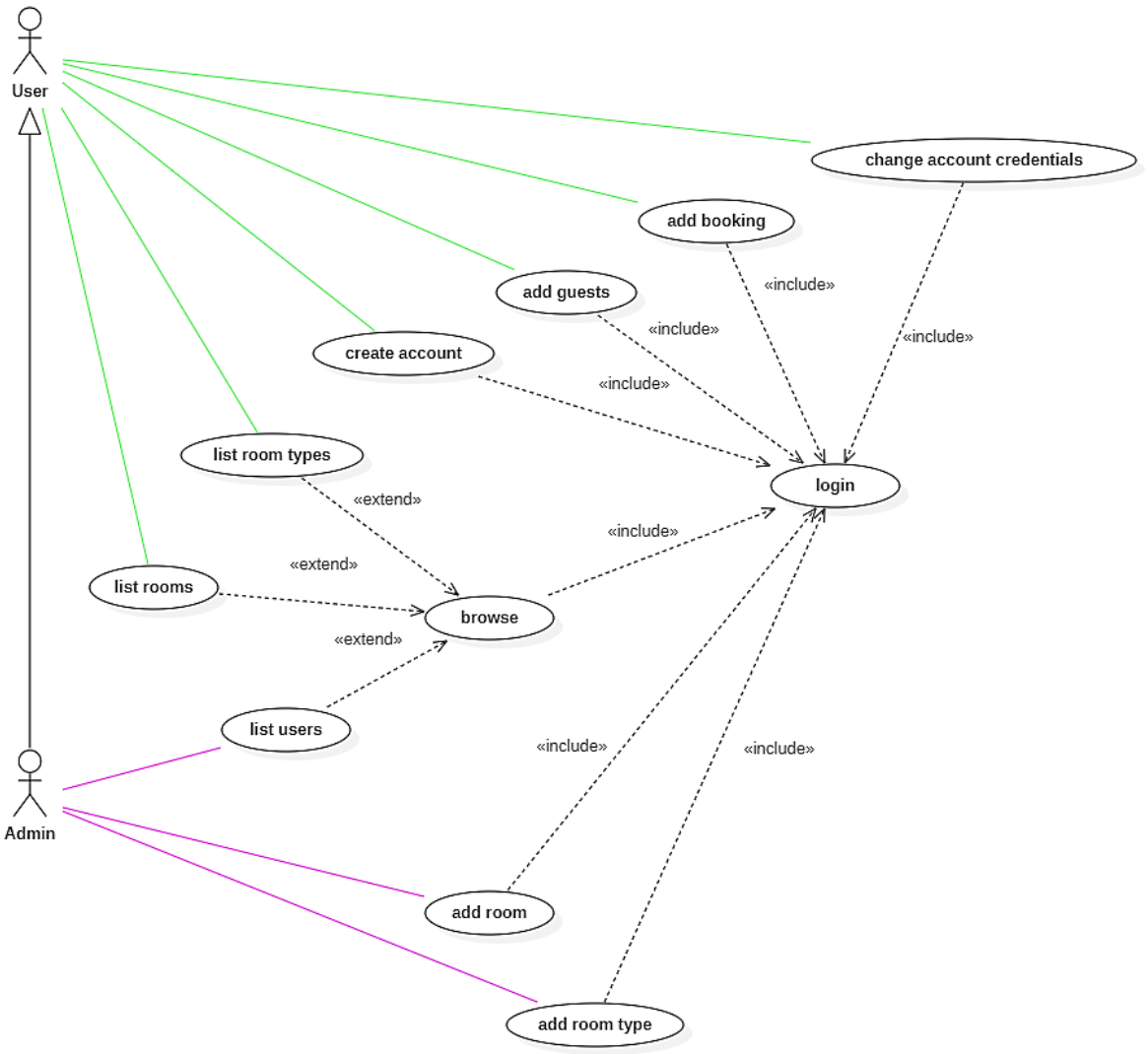
6	Use-case	add room
	Level	user goal level
	Primary actor	Admin only
	Main success scenario	- admin will login to the platform; - if success, the admin will press “add new room” button; - admin will complete information about rooms (number and room type); - submit button will be pressed by the admin.
	Extensions	

7	Use-case	browse for/modify bookings/guests
	Level	user goal level
	Primary actor	user/admin
	Main success scenario	- user will login to the platform; - if success, the user will press “browse bookings” or “browse guests” button; - user can view or modify current bookings or guests.
	Extensions	

8	Use-case	browse for/modify rooms/room types
	Level	user goal level
	Primary actor	admin
	Main success scenario	- admin will login to the platform; - if success, the admin will press “browse rooms” or “browse room types” button; - admin can view or modify current rooms or room types.
	Extensions	

9	Use-case	change account credentials
	Level	user goal level
	Primary actor	user/admin
	Main success scenario	- user will login to the platform; - if success, the user will press “change credentials” button; - user will modify the fields; - the system will let them know if the credentials match a current user; - if true, an error will pop up; - else, the system displays a success splash screen; - the user will be prompted to login with the new credentials.
	Extensions	

UML Use Case Diagrams



Supplementary Specification

Non-functional Requirements

- **Availability and reliability**: the system should be available 24/7 to the receptionist and to the admins. It must suit any type of hotels, especially the ones who operate the front desk during graveyard shifts, where there will be no technical support at that time so it is strictly needed for my implementation;
- **Usability**: the system must be easy to use and browse for users with different levels of computer knowledge. The efficient feedback from the user interface is needed when an action is made;
- **Compliance**: the system must comply with the current GDPR regulations. The guest and user data stored in the system must be encrypted and protected;

- **Scalability**: the system should be easily scalable to accommodate future changes. It is important since a future change could imply adding a roomservice system integrated alltogether, or even integration with a hotel chain. It should also handle big numbers of users, hotel rooms and roomtypes and bookings.

Design Constraints

Regarding the design constraints, I have chosen to use Java along with Spring Boot because it enables you to create standalone apps that run on their own, without relying on an external server. The mechanism behind it uses Tomcat during the initialization process.

As for the dependency manager, I used Maven due to its flexibility and for its user experience, as its longer tenure makes it to be supported by many IDEs (including IntelliJ, the IDE used for this project).

Mockito framework was used for testing purposes. It is an extensive tool great for safe refactoring, for its wide annotation support and also for the lack of handwriting stuff, since you don't have to write your own mock objects (mock artifacts are generated during runtime only).

Glossary

(*) In my system implementation, ***user*** is the most elementary type of actor. With that, an ***admin*** is inherently an user by default, which also acquired elevated access to the system data, such as adding new rooms in the hotel and/or adding new roomtypes. An admin can also remove users or restrict access to the system. The flag present in the User class that marks the superuser is named explicitly "***isAdmin***".

As a consequence, in the following documentation, ***admin*** and ***user*** terms will be sometimes interchanged accordingly.

Deliverable 2 (week 8)

Domain Model

My system consists of 6 main model which create the overall domain model: *Booking, Guest, GuestData, Room, RoomType, User*.

1	Name	Booking
	Attributes	id, checkInDate, checkOutDate, total, isPaid, user
	Associations	Each booking instance will have an user associated to it (the creator) in a **ManyToOne** relationship with User entity.

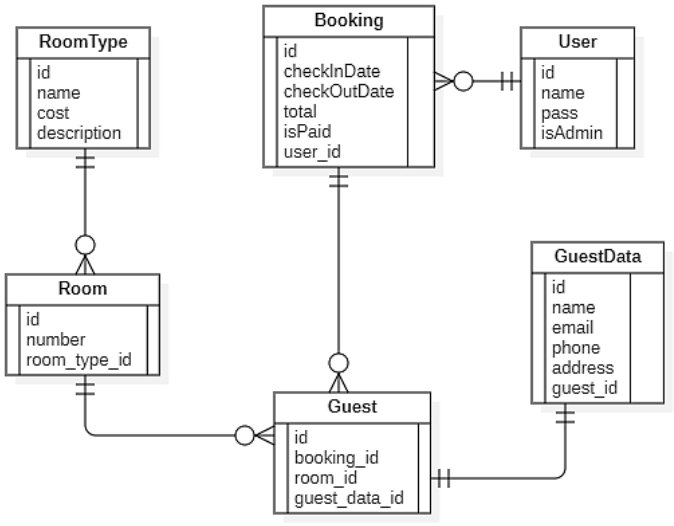
2	Name	Guest
	Attributes	id, booking, room, guestData
	Associations	Each guest instance will have a booking associated to it (every guest in the hotel will have a reservation) in a **ManyToOne** relationship with Booking entity. Also, it will have a room associated to it (every guest will have a room assigned to) in a **ManyToOne** relationship with Room entity. GuestData will be stored for each guest through an **OneToOne** relationship.

3	Name	GuestData
	Attributes	id, guest, name, email, phone, address
	Associations	Each guestData instance will have a guest associated to it (every guest will have an unique corresponding guest data) in a **OneToOne** relationship with Guest entity.

4	Name	Room
	Attributes	id, number, guests (List), roomType
	Associations	Each room instance will have one or more guests associated to it in a **OneToMany** relationship with Guest entity. Also, it will have a roomType associated to it (every room must have a room type) in a **ManyToOne** relationship.

5	Name	RoomType
	Attributes	id, name, cost, description, rooms (List)
	Associations	Each roomType instance will have one or more rooms associated to it in a **OneToMany** relationship with Room entity.

6	Name	User
	Attributes	id, name, pass, isAdmin, bookings (List)
	Associations	Each User instance will have one or more bookings associated to it in a **OneToMany** relationship with Booking entity.



Architectural Design

Conceptual Architecture

Naturally, Spring Boot is built following a ***layered architecture*** in which each layer communicates to other layers. Organized into horizontal layers, where each layer has a specific responsibility and communicates with adjacent ones. This will help achieve separation of concerns and modularity, making the system easier to maintain and modify. Besides that, this approach will also make the system very scalable and flexible as new resources are added to the system later on – so that each part of the system can evolve independently. Testing is also made easier by isolating different parts of the system, as we can test them independently.

Presentation layer consists of views (the front-end of the application). It handles the HTTP requests and performs authentication. It will convert the JSON's to Java Objects and vice-versa. Once it finishes processing, the business layer is called.

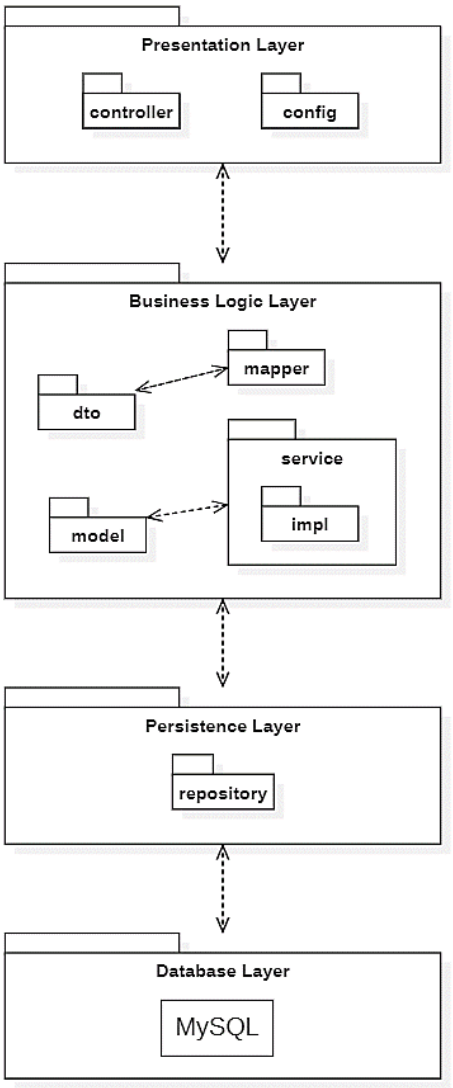
The *business logic layer* contains all the operations on data provided, so it acts as the "brain" or the processor of the system. It consists of services classes. It is responsible for validation and authorization.

The *persistence layer* contains all the database storage logic. It is responsible for converting business objects to the database row and vice-versa.

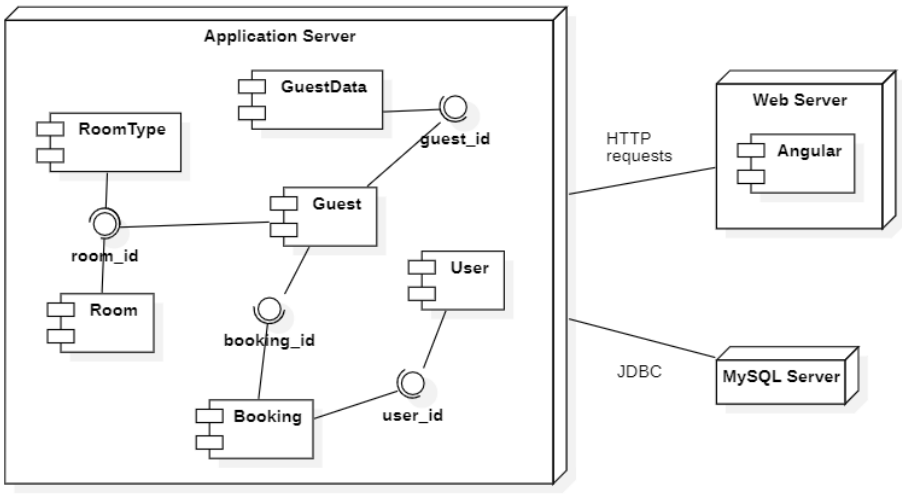
Database layer will consist of CRUD operations. Creating, retrieving, updating and deleting data will be assured by this layer.

The layered architecture is implemented using **dependency injection** (using **@Autowired**) and inversion of control.

Package Design



Component and Deployment Diagram

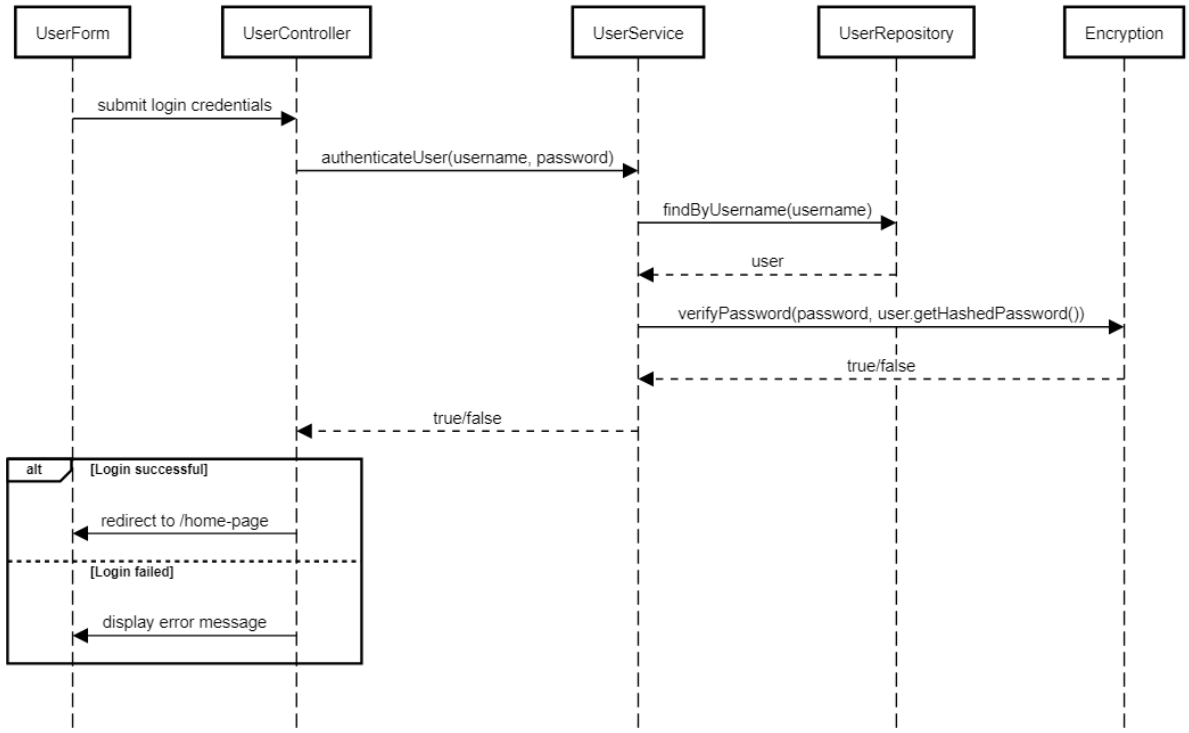


Deliverable 3

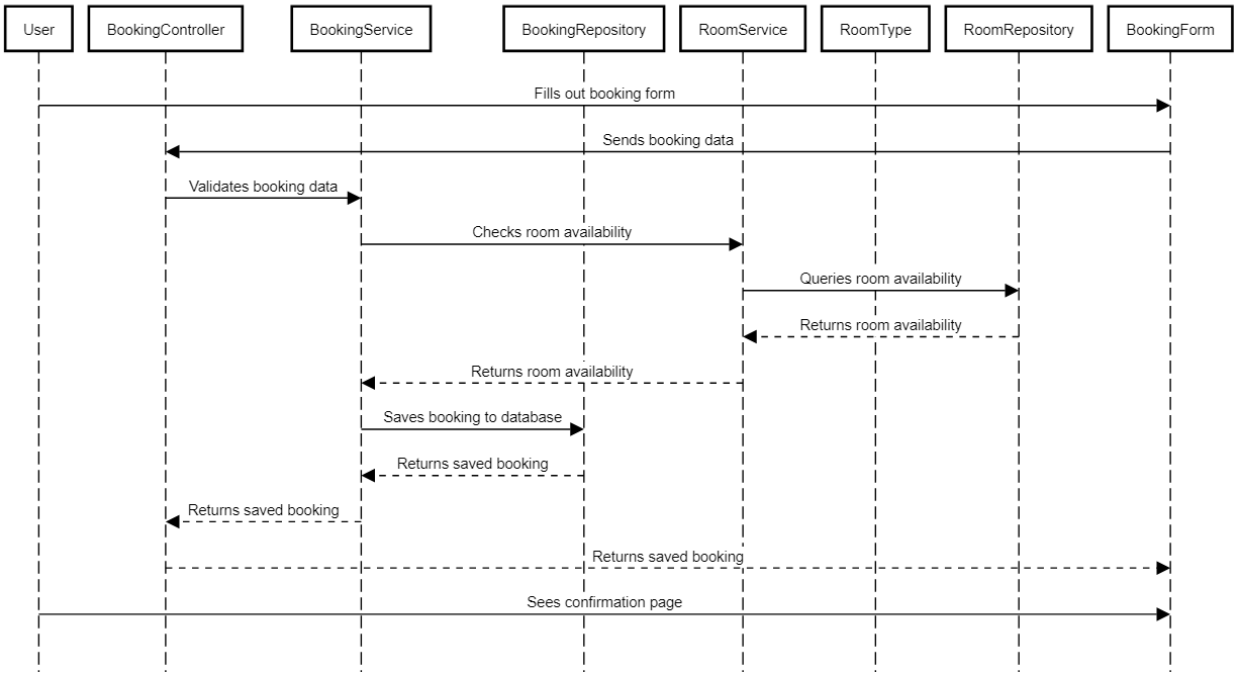
Design Model

Dynamic Behavior

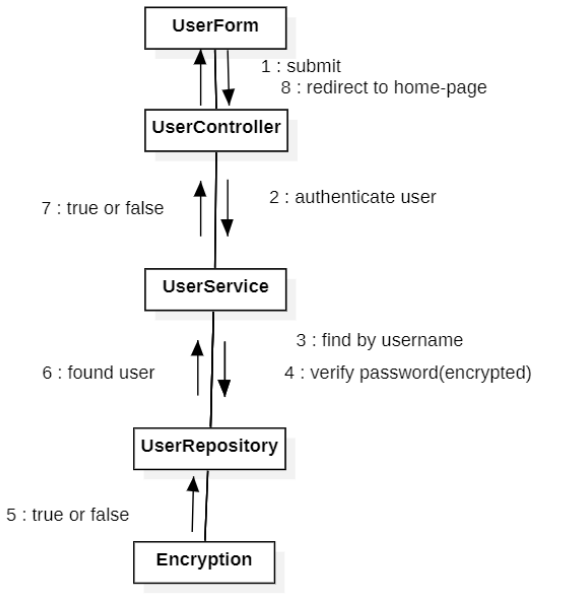
Login operation - sequence diagram



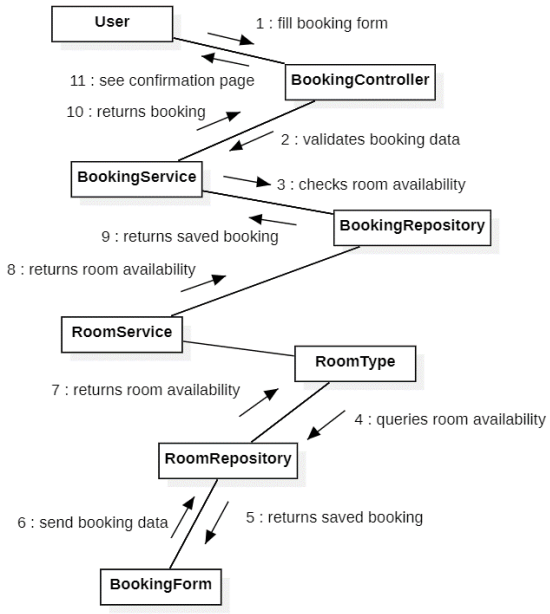
Making a booking - sequence diagram



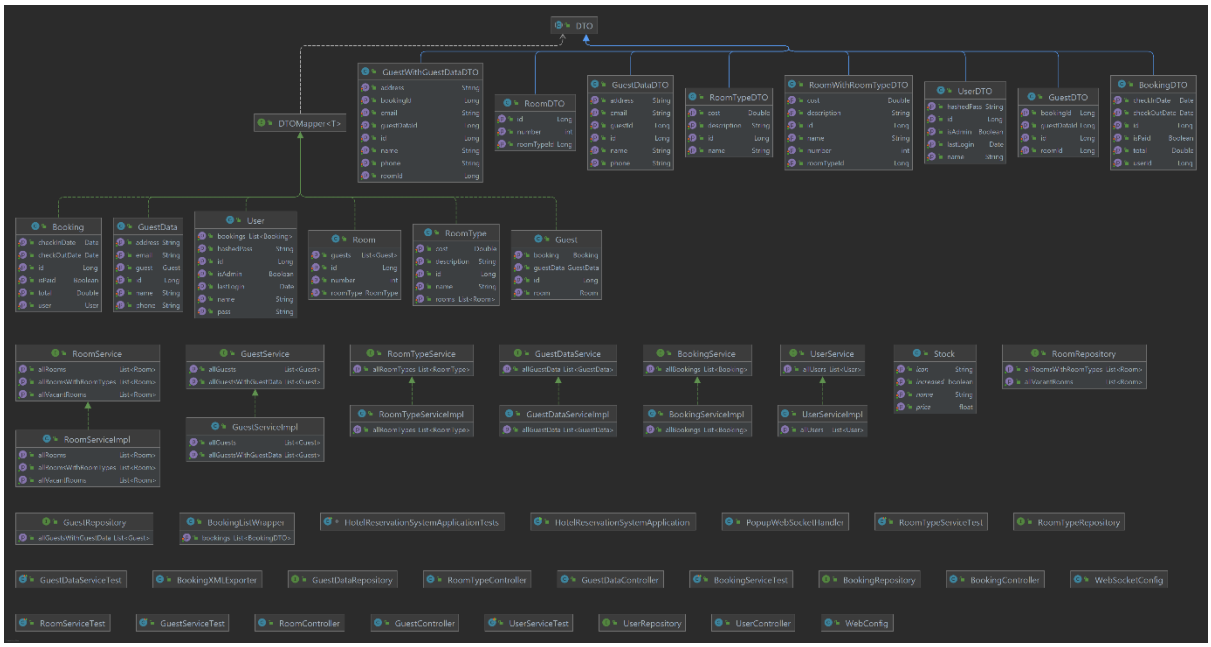
Login Operation - communcation diagram



Making a booking - communication diagram



Class Diagram

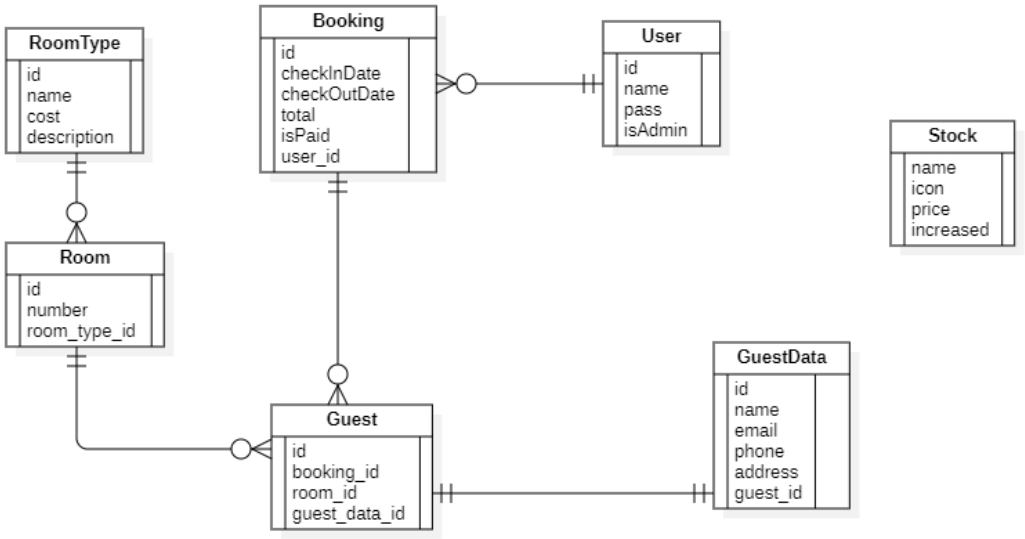


Some significant GoF Design Patterns used in this project:

- **Singleton Pattern** – spring uses singleton to restrict one object per IoC container. In other words, it will create only one bean for each type per application context. It is present in Controllers to fields which are injected (@Autowired).

- **Factory Method Pattern** – spring uses dependency injection framework that will treat a bean container as a factory that produces beans (BeanFactory).
- **Template Method Pattern** – is used when managing queries on the database (connection, execution of the query, cleanup and closing the connection).

Data Model



System Testing

In order to ensure that the system works as expected and meets all the requirements, a comprehensive system testing approach was employed. The testing process was conducted in several phases, and it consisted in testing each service class (that provides the functionality of the overall system). Mockito was used to create the mock objects, and JUnit was used to run the integration tests. The integration tests were successful, and all components were found to be working correctly when integrated with each other.

As an example, in *BookingService* there is a functionality that enables the user or admin to find bookings by an id. The test supposes that the mocked Booking Repository will not contain the requested id, and it should fail (returns null).

```
@Test
void findBookingByIdNotFound() {
    Optional<Booking> booking =
Optional.ofNullable(bookingServiceImpl.findBookingById(ID_NOT));
    assertEquals(booking, Optional.empty());
}
```

Another testing case consisted of mocking a User Repository to simulate creating a new user account in *UserService*. I instantiated an fictive user, set its credentials then performed a save on the repository. The createUser method returns the created user if implemented correctly.

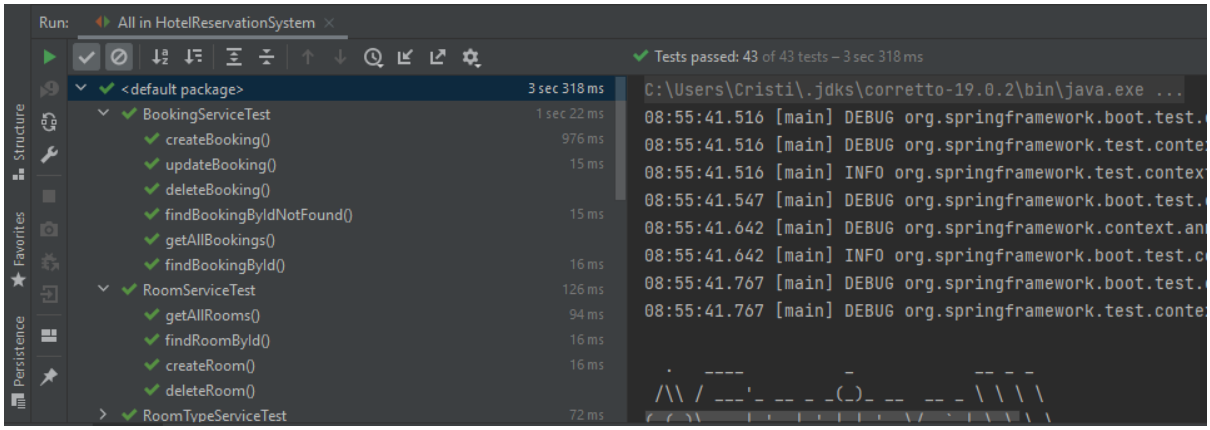
```java
@Test
void testCreateUser() {
    User newUser = new User();
    newUser.setName("test");
    newUser.setPass("testpass1");
    newUser.setIsAdmin(false);

    when(userRepository.save(any(User.class))).thenReturn(newUser);

    User createdUser = userService.createUser(newUser);

    assertEquals(createdUser, newUser);
}
```

The test suite execution (which consists of 43 tests) completed successfully with 100% passing rate.



Future Improvements

I believe that my system can be further developed to include additional features such as payment processing and room service availability, so that the hotel personnel can manage and visualize guests' needs better. Also, statistics could also be included in the dashboard so that admins can monitor users overall progress. I am confident that it will provide a positive user experience for both hotel guests and administrators.

Conclusion

In conclusion, the project has successfully achieved its objectives of developing a hotel reservation system. The system has been designed to be user-friendly, secure and efficient. Through the use of various technologies, such as Java Spring Boot, Angular, and MySQL, I was able to create a web application that allows employees to easily add bookings, manage guests, while providing hotel administrators with tools to manage current rooms, pricing and users. I also included features such as user authentication and data export to provide additional value to our users.

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