



RV College of Engineering®

Mysore Road, RV Vidyaniketan Post,Bengaluru - 560059, Karnataka, India

Smart Hotel System with Real-Time Analytics

MAJOR PROJECT REPORT

MCA491P

submitted by

Ashish Garg 1RV22MC016

under the guidance of

Dr. R. Savitha
Assistant Professor
Department of MCA
RV College of Engineering®
Bengaluru – 560059

in partial fulfilment for the award of degree of

Master of Computer Applications

2023-2024



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DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

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CERTIFICATE

Certified that the Major Project titled “Smart Hotel System with Real-Time Analytics” is carried out by **Ashish Garg (IRV22MC016)** a bonafide student of RV College of Engineering, Bengaluru, in partial fulfillment for the award of **Master of Computer Applications** of RV College of Engineering, Bengaluru affiliated to Visvesvaraya Technological University, Belagavi during the year 2023-2024. It is certified that all corrections/suggestions indicated for the internal assessment have been incorporated in the report deposited in the department library. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed by the institution for the said Degree.

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DECLARATION

I **Ashish Garg**, the student of IV semester Department of MCA, RV College of Engineering, Bengaluru-560059, bearing USN: **IRV22MC016** hereby declare that the project titled "**Smart Hotel System with Real-Time Analytics**" has been carried out by me. It has been submitted in partial fulfilment of the program requirements for the award of Degree in **Master of Computer Applications** of RV College of Engineering, Bengaluru affiliated to Visvesvaraya Technological University, Belagavi during the year **2023-2024**.

Further, I declare that the content of the dissertation has not been submitted previously by anybody for the award of any Degree or Diploma to any other University.

I also declare that any Intellectual property rights generated out of this project carried out at RVCE will be the property of RV College of Engineering, Bengaluru and I will be among the authors of the same.

Place: Bengaluru

Date of Submission: **23/08/2024**

Ashish Garg

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Ashish Garg

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ABSTRACT

The project will not be ambitious; specific objectives and goals will be related to the improvements and adaptation of the Hotel System. This all-encompassing solution will be intended to improve business efficiency and enhance the client experience in hotel businesses through the application of current technical advancements. Future improvements to the system will include the synchronized management of bookings, the ability to produce real-time information at any moment, and high-end functions for managing rooms and customers.

The implementation strategy for the project will include the following significant steps: First, the administrative and management practices related to hotels will be analyzed to identify areas for improvement and meet specific business requirements. There will also be an aspect of linking with other systems, such as payment gateways, to streamline data flow and enhance processes. Some of the implementation objectives will include data checks to maintain the integrity of the data collection process and strategies to improve system response time and user acceptance rates. The software that will be employed includes front-end development using React JS, back-end development using Spring Boot, and database management using MySQL. AWS S3 will be used for storing images.

The expected outcomes of the project will include enhanced efficiency and effectiveness of the company's hotels. An efficient booking management module will be designed to minimize manual work. Validation scripts will ensure accurate data and improved system performance, leading to decreased response times. The project will also focus on enhancing communication with customers, and with an improved guest profile, the company is likely to develop better customer relations. Finally, the goals of the project will be to increase effectiveness in the hotel and contribute to the development of the owners' businesses.

Table of Contents

CONTENTS	PAGE NO.
College Certificate	i
Declaration by student	iii
Acknowledgement	iv
Abstract	v
Table of Contents	vi
List of Tables	vii
List of Figures	viii
Chapter 1: Introduction	01
1.1 Project Description	01
1.2 Company Profile	02
1.3 Dissertation Organization	02
Chapter 2: Literature Review	04
2.1 Literature Survey	04
2.2 Existing and Proposed System	08
2.3 Tools and Technologies used	11
2.4 Hardware and Software Requirements	12
Chapter 3: Software Requirement Specifications	13
3.1 Introduction	13
3.2 General Description	13
3.3 Functional Requirements	15
3.4 Non-Functional Requirements	18
3.5 Design Constraints	19

Chapter 4: System Design	21
4.1 Architectural Design	21
4.2 Data Definition	22
Chapter 5: Detailed Design	23
5.1 Class Diagram	23
5.2 Use Case Diagram	24
5.3 Sequence Diagram	25
5.4 Activity Diagram	28
5.5 Data Flow Diagram	29
Chapter 6: Implementation	31
6.1 Program Design Language (PDL)	31
6.2 Implementation	34
Chapter 7: Software Testing	41
7.1 Test Cases	41
Chapter 8: Conclusion	43
Chapter 9: Future Enhancements	44
Bibliography	45

List of Figures

Figure No	Figure Name	Page No
4.1	Architecture Diagram	21
5.1	Class Diagram	24
5.2	Use Case Diagram	25
5.3	Sequence Diagram	27
5.4	Activity Diagram for User Registration	28
5.5	Activity Diagram for Login Activity with JWT Authentication	29
5.6	Activity Diagram for Booking	30
5.7	Activity Diagram for Room Visit	31
5.8	Level 0 DFD for Admin	32
5.9	Level 0 DFD for user	32
5.10	ER Diagram	33
6.1	Sign in Page	37
6.2	Sign up Page	37
6.3	Home Page	38
6.4	All Room Page	39
6.5	Room Booking Page	39
6.6	Booking Confirmation Page	40
6.7	Find Booking Using Confirmation Number Page	40
6.8	Edit Room Detail By Admin	41
6.9	Manage Booking Page	41

List of Tables

Table No	Table Label	Page No
2.1	Research Gap of Literature Survey	07
2.2	Hardware Requirements	12
2.3	Software Requirements	12
4.2.1	Entity: User Table	22
4.2.2	Entity: Room Table	22
4.2.3	Entity: Booking Table	23
7.1	User Authentication and Authorization Testing	42
7.2	New Room Addition (For Admin) Testing	42
7.3	Room Visit (For Guest) Testing	43.
7.4	Room Reservation (For Guest) Testing	43
7.5	Booking Details Lookup Module Testing	44
7.6	Hotel Image and Media Management Testing	44
7.7	Integration Testing	45
7.8	End-To-End Testing	46

Chapter 1

Introduction

1.1 Project Description

This consists in establishing and applying a contemporary HMS intended as a key enabling tool for managing the key facets of hotel business operations and improving guests' experience [1]. This strategic initiative aims at the use of current advanced technologies in enhancing the management of the hotels, increasing efficiency in the various operations and creating a user-friendly environment for the users of the facilities by the personnel.

The general goals of this project are to update to a more advanced method of hotel management and to totally eliminate the use of paper forms. It seeks to improve functionality through the application of such features as bookings in real-time, inventory, and customer relations management. But it also aims to be able to work in conjunction with other present system such as payment gateway and third-party reservation system to enhance the performance of the system to eliminate too much reliance on manual controls. Also a part of the project the importance is given to the development of the interface sophisticated for the staff member as well as for the guest to increase their efficiency [2].

Principal aspects of the Hotel System consist of sufficient disposition of booking for controlling the accommodation of the customers, room booking for identification of availability of the rooms and housekeeping and deposit customer for the purpose of managing the complexities of guest details and their constant loyalty programs [3]. The system also entails real time analytical and reporting tools in order to allow authorities to make sound decisions, and a mobile application for the hotel personnel in the event that they have to transact on the go. Measures are taken to increase the levels of security to protect data and meet applied safety standards.

These stakeholders include the Hotel managers which are involved in the day-to-day management of the system, the IT managers who interface with clients and ensure that the system is well incorporated with the existing hotel System, front desk personnel who handle issues to do with the bookings and the checks into the hotel System, the housekeeping personnel who are responsible for managing the status of the rooms and organizing for any maintenance jobs on the rooms. Furthermore, business executives will be able to obtain the actual-time information and analytics to facilitate managerial and executive decisions for the constant business advancements.

Thus, the Hotel System is an initiative to improve the current and future functioning of hotels by introducing advanced methods into their activities. With the application of more functionality and potentialities of the system in the hotel, it will easier to control all operations and minimize costs, while ensuring guests' satisfaction. It also seeks to enhance the course's message along with the professionalism and enhancements within the commercial hospitality sector.

1.2 Dissertation Organization

Chapter 1 outlines the general information on the hospitality industry and the particular hotel, which gives the background of the Hotel System project and its significance. They establish the premises from a reader's perspective regarding the background and purpose of the project in advance of proceeding to another chapter.

Chapter 2 devotes to provide the literature review of the subject named as Hotel Systems, along with the current manual process and the automated system under proposal. It describes what tools and technologies are applied like React JS, Spring Boot and MySQL and what hardware and software requirements should be met for the system implementation. Subsequently, the chapter is summarized to recap the findings of the literature review for consideration of the project.

Chapter 3, we define the SRS the key component of the research work of the Hotel System. It outlines an overview and a brief background on the system, more of a general description of the system, business and functional requirements and specification of different modules such as the booking management system and room management system, non-functional requirements, interface requirements, constraints/assumptions while working on the project and many others.

Chapter 4 deals with the implementation of the high-level or known as architectural aspects of the Hotel System. There is a block diagram which gives an overall, most generic view of the solution showing the inputs, the workflows and the outputs of the modules in regards to the said project. In this chapter, the reader receives architectural visions of the system's structure and its components.

Chapter 5 of this study attempts to establish the detailed design of the project. It briefly explains the object-oriented concept which is utilized in the development process and describes the phases of this concept including the object modeling, dynamic modeling, and functional modeling. This chapter gives a preemptive design and implementation of all modules of the system.

Chapter 6 focuses on the detailed explanation of the elements of the proposed Hotel System modules with the help of the program design language. The principle behind each module is given and snapshots of the output are given for easy understanding. This chapter also shows how the design was actualized through the coding and integration of the various components of the working system.

Chapter 7 is devoted to the testing and all the test cases created for all the modules of the Hotel System. On it, the test results are shown, the selected approach to testing, and the samples of pass and fail cases. Captions are added along with showing the screenshots of the tested modules to validate the process of testing.

Chapter 8 is conclusion where the entire project is summarised and the final conclusion as to the achievement of the intended objectives is offered. This paper gives a brief on the Hotel System in general, and then the findings of this study. This chapter therefore summarises the study findings as outlined in chapter one and assess the extent to which the project met the desired targets.

Chapter 9 note on Ideas to Look Forward to in the Next Phase of Enhancements to the Hotel System A section with the subject ‘Ideas for Future Improvements of Hotel System’ is placed in the Chapter 9 of the given work. It defines potential changes that are considered for future improvement or when migrating to newer versions, including increased compatibility with new technologies, other possibilities are expansion of automation, or options on how to expand to be able to fit larger organizations.

Chapter 2

Literature Review

2.1 Literature Survey

The paper of L. Li, H. Chen, and Z. Huang (2023) focuses on the development of a new AI-enabled smart room service system to improve the hotel management and increase customers' satisfaction. The facility uses INTs to incorporate intelligent natural language processing algorithms to respond to room service requests efficiently. It works in synchrony with other Hotel Systems providing accurate updates and data to aid in decision making. The study also demonstrates that by implementing this system, it is possible to cut down the cost of labor while at the same time meeting the highest standards of service. Altogether, the described approach can be considered an important step toward the further automatization of the hotel services in compliance with the tendencies of the modern world toward the constant search for the rationalization of the work process and individualization of the guest's needs [6].

Brown, Smith & Johnson (2022) proposed an integrated IoT model for smart hotel: efficiency and customer satisfaction using the latest technology. Based on the technical concept, the framework focuses on connecting IoT devices to control different operations in the hotel like room, energy control and real time analysis. Using this strategy, the study points out on some of the realised positive changes in operation performance and satisfaction of the guests. This paper similarly adds value to the literature by presenting real-world use of IoT in the hospitality industry and recommending approaches to enhance SHS [7].

Chen, Hu, and Wang (2022) did a study on how edge computing can improve energy saving of smart hotels. Their published works in the IEEE Transactions on Green Communications and Networking are concerned with minimizing energy demands based on local processing of collected data at the edge of the network. The results are lesser latency and enhanced real-time decisions, which lead to substantial energy savings. From the study, edge computing is seen to have advantage in energy management and control aspect. Thus, their contribution leads to the creation of Hotel Systems that are smarter, friendlier to the environment, and more efficient. This study also highlights the need to incorporate more of the modern computing technologies to solve energy problems in hospitality [8].

A. Shah and M. Gupta's 2022 study explores the integration of AI and robotics in hotel management, focusing on automation to enhance operational efficiency and guest experience. The paper highlights advancements in robotics for automating routine tasks and AI for

predictive maintenance and personalized services. The study provides insights into how these technologies streamline hotel operations and improve service delivery. Key contributions include case studies demonstrating practical applications and performance improvements. This research underscores the transformative impact of automation technologies in modernizing Hotel Systems [9].

J. Lee, K. Park, and M. Kim (2022) present a smart hotel system leveraging IoT and AI technologies to enhance operational efficiency and guest experience. Their approach integrates real-time data collection with advanced analytics to streamline hotel management tasks. The study emphasizes the use of AI for predictive maintenance and personalized guest services. IoT devices facilitate seamless communication between system components, improving overall system responsiveness. The proposed system demonstrates significant improvements in both operational efficiency and customer satisfaction [10].

N. Patel and S. Kumar's 2022 study on "Smart Hotel System Using Machine Learning Algorithms" presents advancements in integrating machine learning with Hotel Systems to enhance operational efficiency. The paper explores various algorithms for optimizing resource allocation, predicting maintenance needs, and improving customer service. It highlights significant improvements in decision-making and system automation. The study contributes to the evolving field of smart hotels by leveraging AI-driven solutions for better management practices. The authors provide empirical results demonstrating the effectiveness of these algorithms in real-world applications [11].

Chandra, Saxena, and Sharma (2022) propose a cloud-based Hotel System that will provide solution to enhance guests satisfaction that utilizes cloud computing technologies. The study reveals the iOS to have revolutionized the radicalization of operations within hotels, give timely information on operations, and improve operations through automations. The authors also focus on the system's capacity to accommodate a large number of customers, security features and compatibility options with other hospitality industry management software. They also talk about the aspects of the cloud technology that enables the provision of individualistic services to the guests with commensurate rates of satisfaction. The paper concludes that adopting cloud-based solutions can greatly enhance the processes of managing a hotel and the experience clients get [16].

The paper of Wang, Zhang, and Wu (2021) describes the IoT-based intelligent guest feedback system used in smart hotels. The system records and analyses the guest feedback in real time empowering hotel management to improve the standard of services. IoT devices, for instance, help in timely collection of data while cloud computing makes it possible for the same to be processed on time. The survey shows the positive outcome of guests' feedback and

organizational effectiveness and effectiveness in real-time system. A brief review of this work is as follows: This work amplifies the implementation of IoT solutions in improving customers' experience in hotels [13].

Verma et al. (2021) provide a literature review of a paper that describes the proposal of using blockchain technology to improve the security of Hotel Systems. Here it touches on the application of blockchain in safeguarding guest information and tokenization of transactions and hotel processes to overcome the weaknesses in the conventional platforms. The authors show how it can increase the availability of proper records, create decentralised logs, and implement the privacy level increase. The paper focuses on the possibility of using blockchain in the management of hotel entities due to its higher reliability in comparison with traditional approaches. Altogether, the approach tends to enhance trust and data accuracy in the hotel settings. [14].

In this paper, Lin, Zeng, and Jiang (2021) propose the framework of a Smart Hotel System based on Big Data and IoT. It insists on the application of real-time data to improve automations with a focus on operations and customers in the hotel industry. There is a system architecture that includes IoT devices that allow for efficient data collection; the use of Big Data analytics enables decision-makers to make sound decisions. This is perhaps a security issue raised by the authors although they provide some suggestions on how data can be protected. The last of the research focuses on the abilities of the system to expand in the future and possible improvements to it. [15].

Khan, Ullah, and Iqbal (2021) proposed an Energy Efficient Hotel System utilizing Artificial Intelligence and Internet of Things to improve resource consumption throughout different operations. The system incorporates the use of real time analytical structure and control for the usage of energy in a way that will not be wasteful or economically burdensome. In their work, they establish useful efficiency enhancements in light consumption and the occupancy satisfaction by means of automation systems. They also reveal how powerful potentials of applying AI and IoT exist in the sphere of hotel management with the given approaches being drastically different from the conventional ones. The system described in this paper can be easily scaled and adopted for the modern hotels, thus providing a long-term solution. [16].

Zhang, Li, and Zhao's paper from May 2021 looks into the topic of the use of AI-based personalization services in smart hotels. Therefore, it focuses on how the application of AI skills will further assist the guests and offer solutions that suit their needs. Thus, their findings reveal the possibilities of using AI to enhance the hospitality market by providing individualized services. [17].

Research Gap

Table 2.1 Research Gap of Literature Survey

Key Findings	Limitations	Future Opportunities
AI-driven personalized services significantly improve guest satisfaction and operational efficiency.	Limited scalability of AI models to handle diverse guest profiles across different hotel types.	Develop more adaptable AI models that cater to a broader range of guest preferences and hotel categories.
Blockchain-based systems enhance data security and streamline transactions within the hotel management process.	Current blockchain implementations may not fully integrate with existing legacy systems.	Research hybrid models that combine blockchain with IoT for enhanced data security and seamless integration with legacy systems.
IoT-enabled predictive maintenance reduces downtime and extends asset life.	High initial setup costs and complexity of integrating IoT devices with existing hotel infrastructure.	Investigate cost-effective IoT deployment strategies and explore AI-driven predictive maintenance models to further reduce operational costs.
Cloud-based Hotel Systems provide real-time analytics and accessibility.	Potential data privacy concerns and compliance issues with cloud-based solutions.	Develop cloud solutions with enhanced security measures and compliance with global data protection regulations.
Mobile-based solutions improve operational efficiency by enabling real-time updates and access to Hotel Systems.	Limited functionality and slower adoption of mobile platforms among certain staff members.	Explore user-friendly mobile application interfaces and provide training programs to increase adoption rates among hotel staff.
Real-time analytics empowers decision-making and optimizes resource allocation.	Difficulty in interpreting large volumes of real-time data for actionable insights.	Develop AI-powered analytics tools that can automatically generate actionable insights from real-time data for hotel managers.

2.2 Existing and Proposed System

Problem Statement

The organizations which have adopted the legacy asset management systems encounter diverse problems in optimizing the manner in which they manage their assets, schedules, and operations. These challenges are as follows: The real time integration and analytics are missing, there are no integration and less management that brings down the quick decision making and responsiveness 18. Predictive and preventive maintenance method and schedules are often ineffective and contributing to higher productive downtimes. Lack of real-time data regarding asset performance, and its life cycle conditions the asset management challenge even more. While not enough application support for mobile, and remotely working staff hinders flexibility and productivity. Further, as demand increases, it is hard to scale the operations with the outdated system, and when the applications are designed and developed for different operating systems, the interface varies by learning curve. Lastly, the high costs are incurred when managing a number of unrelated systems, which puts pressure on the organizational resources and punctures efficiency.

Existing System

A vast majority of hotel management operations utilize conventional management systems, that are fragmented, installed locally and do not possess the connectivity required in today's environment. Features of these existing systems typically include:Features of these existing systems typically include:

1. Basic Asset Tracking: Hotels record and track assets such as rooms, equipment, and amenities, but with limited analytics and reporting capabilities.
2. Manual Maintenance Scheduling: Maintenance tasks for hotel facilities are scheduled manually, leading to inefficiencies and potential downtime, which can impact guest satisfaction.
3. Limited Mobility: There is a lack of support for mobile devices, hindering hotel staff from accessing necessary information while on the move, such as during guest check-ins and housekeeping.
4. Standalone Systems: Different departments, such as reservations, housekeeping, and maintenance, may use separate systems, leading to data silos and poor communication across the hotel operations.
5. Static Reporting: Reports are often static and cannot provide real-time insights, making it challenging for hotel managers to make informed decisions quickly.

Proposed System: Hotel System

The Hotel System can be seen as a modern system for the management of the hotels focused on the effective use of the cloud solutions and innovative technologies. Features of this system include:

1. Integrated Platform: A unified platform that integrates all hotel management functions, providing a single source of truth. Seamless integration with IoT devices and sensors for real-time data collection and monitoring of hotel operations.
2. Predictive Maintenance [22]: Use of AI and machine learning to predict equipment failures and schedule maintenance proactively, reducing downtime and ensuring smooth operations.
3. Enhanced Mobility: Mobile applications that allow staff to access and update information on the go, improving efficiency and communication between departments.
4. Advanced Analytics: Real-time analytics and dashboards that provide insights into hotel performance, helping in better decision-making. Integration with advanced analytics tools for deeper insights into customer behavior and operational efficiency [23].
5. Health, Safety, and Environment (HSE): Integrated HSE management to ensure compliance and safety. Incident tracking and management with real-time reporting to maintain a safe environment for guests and staff.
6. Mobile Access: Mobile applications for room service management, housekeeping, and inspections. Offline capabilities for remote operations with intermittent connectivity.
7. Cloud Deployment: Cloud-based deployment for scalability and flexibility. Reduced IT infrastructure and maintenance costs, with secure storage of hotel images in Amazon S3.

Methodologies Adopted in Proposed System

1. Unified Platform: The Hotel System integrates all operational functions into a single platform, providing a cohesive environment for managing bookings, guest information, staff schedules, and inventory. This unified approach reduces data silos and improves data accessibility and accuracy.
2. Leveraging cloud technology allows the system to offer scalability, flexibility, and cost-efficiency. Cloud deployment enables the hotel to scale resources as needed and reduces IT overhead associated with maintaining on-premises hardware and software.
3. IoT Integration: The system incorporates Internet of Things (IoT) technology to enable real-time monitoring and data collection from connected devices. This integration enhances guest

experience and operational efficiency by collecting and analyzing data to anticipate maintenance needs and optimize energy usage.

4. AI and Machine Learning: By leveraging artificial intelligence (AI) and machine learning (ML), the system enables predictive analytics for customer preferences and maintenance. AI algorithms analyze historical data and current conditions to optimize service offerings, automate room allocation, and predict maintenance requirements.
5. Mobile Accessibility: The system provides mobile applications that empower hotel staff to access critical information, update bookings, and perform inspections from anywhere. This mobility improves operational efficiency and reduces response times to guest requests.
6. Advanced Analytics: The system offers advanced analytics capabilities, including customizable dashboards and reports. These tools provide insights into guest preferences, booking trends, and operational efficiency, enabling informed decision-making and proactive management strategies.
7. Collaboration and Workflow Automation: Integrated workflows and collaboration tools within the system streamline communication and coordination across departments. Automated workflows for reservations, housekeeping, and compliance ensure consistency and efficiency in operations.
8. User-Centric Design: The system focuses on user experience with intuitive interfaces and role-based access. This approach reduces training time, improves user adoption, and enhances overall productivity.
9. Six Sigma: Utilizes statistical methods to identify and eliminate inefficiencies in hotel operations. Focuses on improving quality and reducing variability in service delivery.
10. Change Management: Involves strategies for effectively managing changes in hotel management processes and systems. Ensures smooth transitions and adoption of new technologies and methodologies.

2.3 Tools and Technologies Used

1. **Spring Boot version 2.7.3:** A powerful and scalable framework that simplifies the setup and development of Java applications. It provides a robust foundation for building enterprise-level applications with high availability, security, and performance.
2. **React JS version 18.2.0:** A popular JavaScript library for building user interfaces. It is used to create dynamic and responsive front-end components for the Hotel System, ensuring an engaging user experience.
3. **MySQL version 8.2.0:** A relational database management system used for storing and managing the data required by the Hotel System. MySQL ensures data integrity, security, and efficient query performance.
4. **Spring Security with JWT version 5.8.1:** A comprehensive security framework that provides authentication and authorization capabilities. Using JWT (JSON Web Tokens), it ensures secure access to the system by verifying user identities and permissions.
5. **Amazon S3:** A scalable storage service provided by Amazon Web Services. It is used to store hotel images efficiently, offering high durability, availability, and security for media assets.
6. **Maven version 3.8.5:** A build automation tool used for managing project dependencies and build processes. It simplifies the compilation, packaging, and deployment of the Hotel System.
7. **Git version 2.40.1:** A version control system that tracks changes in the project's source code, facilitating collaboration and code management among the development team.
8. **Postman version 10.0:** A tool for testing APIs, used to ensure the reliability and functionality of the backend services in the Hotel System.

2.4 Hardware and Software Requirements

Hardware Requirements

Table 2.2 Hardware Requirements

Hardware	Requirements
RAM	16 GB
Processor	Dual-core processor
Network Connectivity	A stable network connectivity
Quality	64-bit screen
Resolution	1366*768
Mouse	Standard Optical

Software Requirements

Table 2.3 Software Requirements

Software	Requirements
Operating System	MS Windows 7 and above
Red Hat Open Shift	Version 4.6 or 4.8
IDE	Eclipse IDE is 2024-06, Visual Studio 2022, version 17.6
Database	MySQL version 8.2.0

Chapter 3

Software Requirement Specification

3.1 Introduction

The Software Requirement Specification (SRS) outlines the functional and non-functional requirements for the development of a Hotel System using Spring Boot, React JS, and MySQL. This document serves as a comprehensive blueprint for the development and implementation of the project, ensuring alignment between business needs, technical specifications, and project deliverables.

Definitions, Acronyms and Abbreviations

1. **Spring Boot:** A Java-based framework used to create stand-alone, production-grade Spring-based applications.
2. **React JS:** A JavaScript library for building user interfaces, particularly single-page applications.
3. **MySQL:** An open-source relational database management system.
4. **JWT:** JSON Web Token, a compact URL-safe means of representing claims to be transferred between two parties.
5. **S3 Bucket:** Amazon Simple Storage Service (Amazon S3) is an object storage service offering scalability, data availability, security, and performance.
6. **SRS:** Software Requirement Specification.

Overview

The Hotel System is designed to streamline operations within a hotel environment, providing tools for managing reservations, customer data, billing, and inventory. The system will utilize Spring Boot for the backend, React JS for the frontend, and MySQL for database management. Security will be enforced using JWT with Spring Security, and hotel images will be stored in an Amazon S3 Bucket. This document will detail the specific requirements that the software must meet to fulfill its intended functionality and performance standards.

3.2 General Description

The Hotel System (HMS) is an integrated platform designed to provide comprehensive solutions for managing hotel operations. It is tailored to support various aspects of hotel management, including reservation management, guest services, and inventory management [30]. The system offers functionalities for booking management, room assignment, and

customer relationship management, enabling hotels to optimize operational efficiency, enhance guest experience, and streamline administrative tasks. The platform leverages Spring Boot and React JS for robust development, MySQL for reliable data storage, JWT with Spring Security for secure authentication, and Amazon S3 for storing hotel images.

Product Perspective

The Hotel System is a comprehensive solution designed to streamline hotel operations, enhance guest experiences, and optimize resource management. Built with Spring Boot and React JS, this system offers a robust backend and a dynamic frontend, supported by MySQL for data management and JWT with Spring Security for secure authentication. Additionally, Amazon S3 is utilized for storing and managing hotel images, ensuring efficient and scalable storage.

Product Functions

- **Booking Management:** Handle reservations, cancellations, and modifications, providing guests with a seamless booking experience.
- **Room Management:** Track room availability, assign rooms to guests, and manage room types and rates.
- **Guest Management:** Maintain guest profiles, including personal information, booking history, and preferences.
- **Billing and Payments:** Process payments, generate invoices, and manage billing information.
- **Inventory Management:** Manage hotel inventory, including amenities and supplies, to ensure optimal stock levels.
- **Service Requests:** Facilitate guest requests for additional services and amenities, ensuring timely fulfillment.
- **Reporting and Analytics:** Generate reports and analyze data to monitor hotel performance and make informed decisions.

User Characteristics

- **Front Desk Staff:** Require intuitive interfaces for managing bookings, guest check-ins/out, and room assignments.
- **Housekeeping Staff:** Need access to room status updates and service requests to efficiently manage room cleaning and maintenance.
- **Hotel Managers:** Seek comprehensive reporting and analytics tools to oversee hotel operations, monitor performance, and optimize resources.
- **IT Administrators:** Need secure, scalable solutions that integrate with existing systems

and comply with organizational IT policies.

- **Guests:** Require a user-friendly interface for making bookings, accessing their reservations, and requesting services.

General Constraints

- **Regulatory Compliance:** The system must comply with industry-specific regulations and standards, such as ISO 55000 for asset management.
- **Security:** The system must ensure data security and privacy, supporting encryption, access control, and audit trails [32].
- **Scalability:** The system must support scalability to accommodate the growing number of users and assets.
- **Integration:** The system must integrate with existing enterprise systems, including ERP, financial, and other operational systems.
- **Usability:** The system must be user-friendly and accessible, with interfaces designed for different user roles and devices.

Assumptions and Dependencies

- **Cloud Infrastructure:** It is assumed that the organization will acquire the necessary cloud infrastructure to support the Maximo Application Suite.
- **Data Quality:** The effectiveness of the system depends on the quality and accuracy of the data entered. It is assumed that data migration and ongoing data management processes are established [33].
- **User Training:** It is assumed that adequate training has been provided to users to ensure they can effectively utilize the system.
- **Third-Party Integrations:** The system's performance may depend on the availability and compatibility of third-party systems and APIs for integration.
- **Regulatory Changes:** Any changes in industry regulations may impact the system's requirements and functionality, necessitating updates and compliance measures.

3.3 Functional Requirement

Module 1: User Authentication and Authorization

Inputs:

- User Credentials (Email, Password)

Processing:

- Validate the provided user credentials against the stored data
- Generate a JSON Web Token (JWT) upon successful authentication
- Assign roles and permissions based on user credentials
- Log the authentication process

Output:

- Authentication Status (Success/Failure)
- Generated JWT Token (if authentication is successful)
- User Roles and Permissions

Module 2: New Room Addition (For Admin)**Inputs:**

- Room Details (Type, Price, Description, Photo URL)

Processing:

- Validate the input data for completeness and correctness
- Store the room details in the database
- Upload the room photo to the Amazon S3 bucket and store the URL in the database
- Log the room addition activity

Output:

- Confirmation of Room Addition (Success/Failure)
- Room ID (if successful)
- Error Messages (if any validation or processing errors occur)

Module 3: Room Visit (For Guest)**Inputs:**

- Guest User Request

Processing:

- Retrieve room details from the database
- Display room options based on guest preferences
- Handle room view tracking and log guest interactions

Output:

- Displayed Room Details (Type, Price, Description, Photo URL)
- Interaction Logs

Module 4: Room Reservation (For Guest)**Inputs:**

- Reservation Details (Check-in Date, Check-out Date, Number of Adults, Number of Children)

Processing:

- Manage room availability and details, including updating room information
- Handle reservations by allocating available rooms based on the input criteria
- Update the room's status upon reservation confirmation
- Log the reservation details

Output:

- Reservation Confirmation Status (Success/Failure)
- Booking Confirmation Code (if successful)
- Error Messages (if any issues occur during the reservation process)

Module 5: Booking Details Lookup Module**Inputs:**

- Booking Confirmation Code

Processing:

- Retrieve booking details using the provided confirmation code.
- Display relevant booking information to the user.
- Log the lookup activity.

Output:

- Displayed Booking Details (Reservation Dates, Room Type, Total Cost)
- Error Messages (if booking not found)
- Lookup Activity Logs

Module 6: Hotel Image and Media Management

Inputs:

- Image Files (JPEG, PNG)
- Media Metadata (File Name, Description)

Processing:

- Upload hotel images to the Amazon S3 bucket.
- Store the media file URL and metadata in the database.
- Handle image retrieval for display within the application.
- Log the media management process.

Output:

- Media Upload Status (Success/Failure)
 - Stored Media File URL (if successful)
 - Error Messages (if any issues occur during upload or processing)
- Media Management Activity Logs

3.4 Non Functional Requirement

3.4.1. Performance

- **Response Time:** The system is designed to maintain an average response time of less than 2 seconds for most operations under normal load conditions
- **Scalability:** The system is capable of handling increased users, data volume, and transaction frequency without any degradation in performance

3.4.2. Reliability

- **Availability:** The system is expected to maintain an uptime of 99.9% annually, excluding scheduled maintenance periods
- **Failover:** The system incorporates failover mechanisms to switch to a backup system in the event of a primary system failure

Data Backup: The system performs automated backups every 24 hours and is expected to provide data restoration within 2 hours in case of data loss

3.4.3. Security

- **Authorization:** The system enforces role-based access control (RBAC) to ensure that

users can only access functions and data relevant to their roles

- **Data Encryption:** The system encrypts sensitive data both in transit and at rest using industry-standard encryption algorithms (e.g., AES-256)
- **Compliance:** The system complies with relevant regulatory standards (e.g., GDPR, ISO 27001)

3.4.4. Usability

- **User Interface:** The system features an intuitive, user-friendly interface with consistent navigation and design elements
- **Accessibility:** The system complies with accessibility standards (e.g., WCAG 2.1) to ensure usability by all individuals [35]
- **Training and Documentation:** The system provides comprehensive training materials and user documentation to facilitate easy onboarding and usage

3.4.5. Maintainability

- **Modularity:** The system is designed with a modular architecture to facilitate easy updates and maintenance
- **Documentation:** The system includes comprehensive technical documentation for developers and administrators
- **Automated Testing:** The system incorporates automated testing tools to ensure that new updates do not introduce regressions

3.5 Design Constraints

3.5.1 Standard Compliance

- **Industry Standards:** The Hotel System adheres to relevant industry standards to ensure best practices in hotel operations and data management. This includes compliance with standards such as PCI DSS (Payment Card Industry Data Security Standard) for secure payment processing and ISO 27001 for information security management
- **Data Standards:** The system follows established data standards like ISO/IEC 11179 for data element metadata to ensure consistency and accuracy in data handling. Adherence to these standards enhances data interoperability and reliability across the system
- **Regulatory Requirements:** The system complies with applicable regional and international regulations, such as GDPR (General Data Protection Regulation) for data protection in Europe. This ensures that user data is handled in a secure and legally

compliant manner

- **Interoperability Standards:** The Hotel System is designed to ensure interoperability with other systems through the use of standard protocols and data formats, such as RESTful APIs and JSON/XML data interchange formats. This enables seamless integration with third-party services and external applications
- **Accessibility Standards:** The application is developed in accordance with accessibility standards, specifically WCAG 2.1 (Web Content Accessibility Guidelines), to ensure that it is usable by people with disabilities. This includes providing support for screen readers, keyboard navigation, and other accessibility features to make the system inclusive for all users

3.5.2 Hardware Limitations

- **Server Specifications:** The application is designed to run efficiently on servers with specific hardware configurations. The recommended server specifications include a minimum of 16GB RAM, an 8-core CPU, and 1TB SSD storage to ensure optimal performance and reliability for handling the Hotel System's operations
- **Client Devices:** The application supports a wide range of client devices, including desktops, laptops, tablets, and smartphones. It is designed to adapt to varying device specifications, such as different screen resolutions and processing power, ensuring a consistent user experience across all platforms
- **Network Requirements:** The system is optimized to perform well under different network conditions, including scenarios with low bandwidth and high latency. This design consideration ensures that the application remains responsive and functional even in less-than-ideal network environments [36]
- **Scalability Constraints:** The hardware limitations related to scalability include the maximum number of concurrent users or transactions the system can handle. These limitations are dictated by the available server infrastructure, which may require scaling up or optimizing to support growing demand
- **Storage Limitations:** The system efficiently manages and retrieves data from storage media, with constraints on storage capacity and performance taken into account. This ensures that the application can handle large volumes of data without compromising speed or reliability
- **Backup and Recovery:** The system design incorporates considerations for hardware limitations in backup and recovery solutions. This includes ensuring that data integrity and availability are maintained, even under hardware failure scenarios, to prevent data loss and minimize downtime.

Chapter 4

System Design

4.1 Architectural Design

An architectural diagram of the Hotel System (HMS) illustrates the components, relationships, and interactions within the platform. It provides a visual representation of the software's structure, enabling stakeholders to understand its functionality, security measures using JWT with Spring Security, data storage with MySQL, image storage using Amazon S3 bucket, and the integration between the Spring Boot backend and React JS frontend.

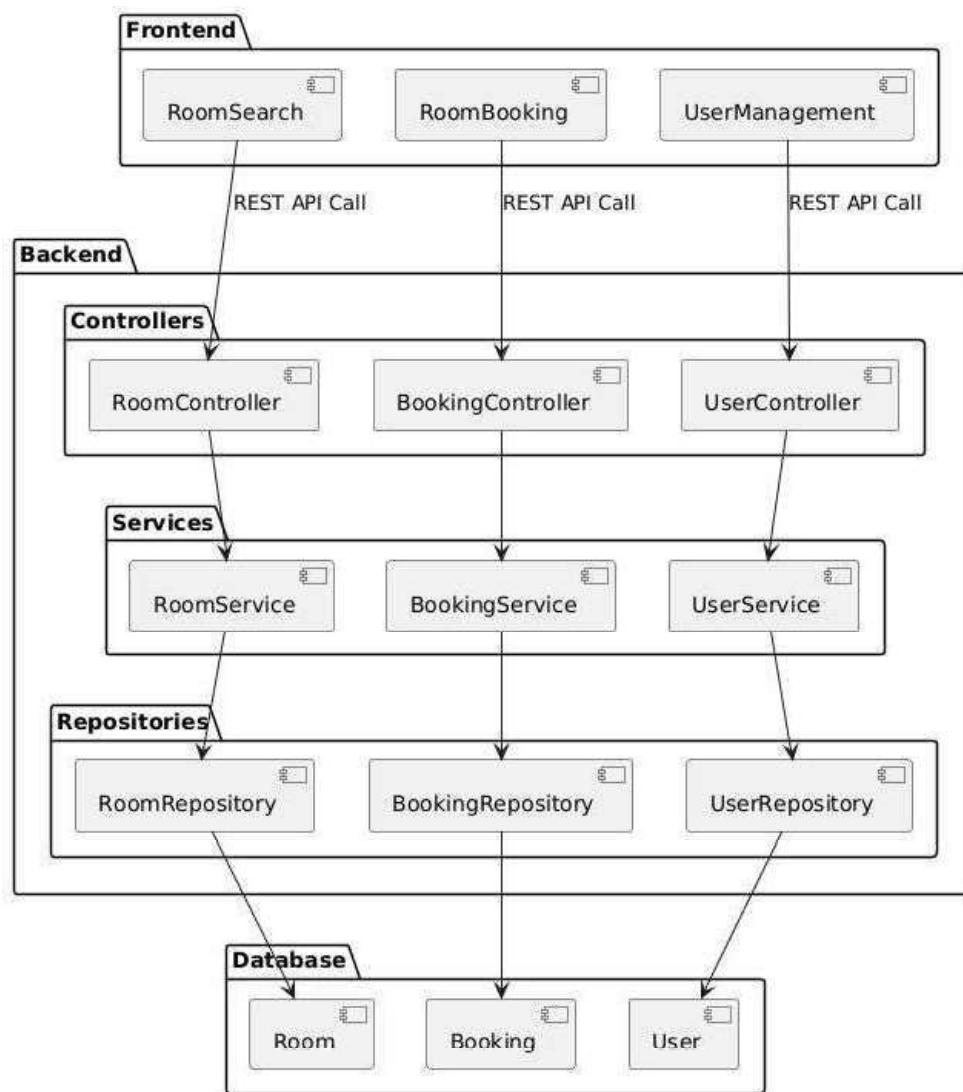


Figure 4.1 Architecture of Hotel System

The architectural diagram of the Hotel System, as shown in figure 4.1, illustrates the high-level structure, including web servers for handling client requests, application servers hosting core business components, and database servers ensuring data management with MySQL. It features an integration layer with JWT for secure authentication and authorization, along with Amazon S3 for storing hotel images. Users interact via web browsers and APIs, ensuring a seamless experience. A robust security layer ensures authentication, authorization, and data encryption, highlighting the system's comprehensive hotel management capabilities.

4.2 Data Definition

The data definition in the Hotel System outlines the structure, relationships, and constraints of the data utilized within the system. This includes defining the entities such as hotels, rooms, bookings, and users, and establishing their relationships through primary and foreign keys. The data structure is designed to ensure referential integrity, with constraints imposed to maintain data accuracy and consistency across the system. The system also incorporates secure handling of sensitive information like user credentials through JWT-based authentication and authorization, while storing images securely in the Amazon S3 bucket.

Table 4.2.1 Entity: User Table

Field Name	Data Type	Primary Key	Foreign Key	Not Null	Unique
id	Long	Yes	No	Yes	Yes
email	Varchar	No	No	Yes	Yes
name	Varchar	No	No	Yes	No
phoneNumber	Varchar	No	No	Yes	No
password	Varchar	No	No	Yes	No
role	Varchar	No	No	No	No

Table 4.2.2 Entity: Room Table

Field Name	Data Type	Primary Key	Foreign Key	Not Null	Unique
id	Long	Yes	No	Yes	Yes
roomType	Varchar	No	No	No	No
roomPrice	Decimal	No	No	No	No
roomPhotoUrl	Varchar	No	No	No	No
roomDescription	Varchar	No	No	No	No

Table 4.2.3 Entity: Booking Table

Field Name	Data Type	Primary Key	Foreign Key	Not Null	Unique
id	Long	Yes	No	Yes	Yes
checkInDate	Date	No	No	Yes	No
checkOutDate	Date	No	No	Yes	No
numOfAdults	Int	No	No	Yes	No
numOfChildren	Int	No	No	Yes	No
totalNumOfGuest	Int	No	No	No	No
bookingConfirmationCode	Varchar	No	No	No	No
user_id	Long	No	Yes (User)	Yes	No
room_id	Long	No	Yes (Room)	Yes	No

This table stores essential information about users, rooms, and bookings within the Hotel System. It includes identification details, user roles, room types, booking dates, and related constraints. The relationships between users, rooms, and bookings ensure data integrity and consistency, allowing the system to manage hotel operations effectively.

Chapter 5

Detail Design

The detailed design of the Hotel System (HMS) provides an in-depth blueprint of the system's architecture, components, and interactions. It outlines the system's specifications translated into a comprehensive design that guides developers during implementation.

5.1 Class Diagram

A class diagram in hotel management, as shown in Figure 5.1, depicts the static structure of the system by visualizing the classes, their attributes, operations, and relationships. It essentially serves as a blueprint for the database schema and the object-oriented design of the hotel management application [38].

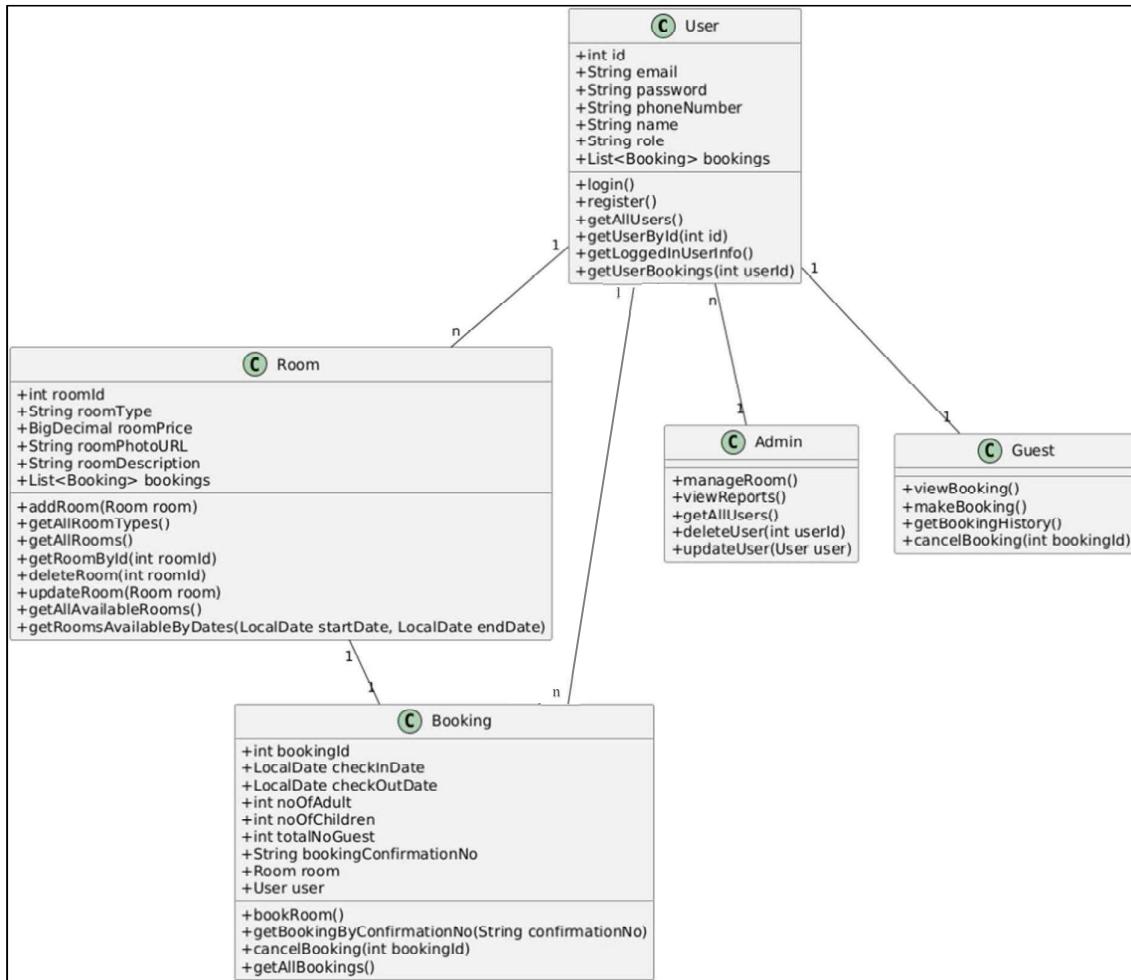


Figure 5.1 Class Diagram of Hotel System

5.2 Use Case Diagram

A use case diagram for a Hotel System is illustrated in Figure 5.2. It typically involves various actors, such as Guests, Admin, and Staff, and use cases that define the interactions between the system and its users. This diagram focuses on describing the behavior of the system and how different components interact with each other over time to manage hotel operations, including booking, room management, and user authentication.

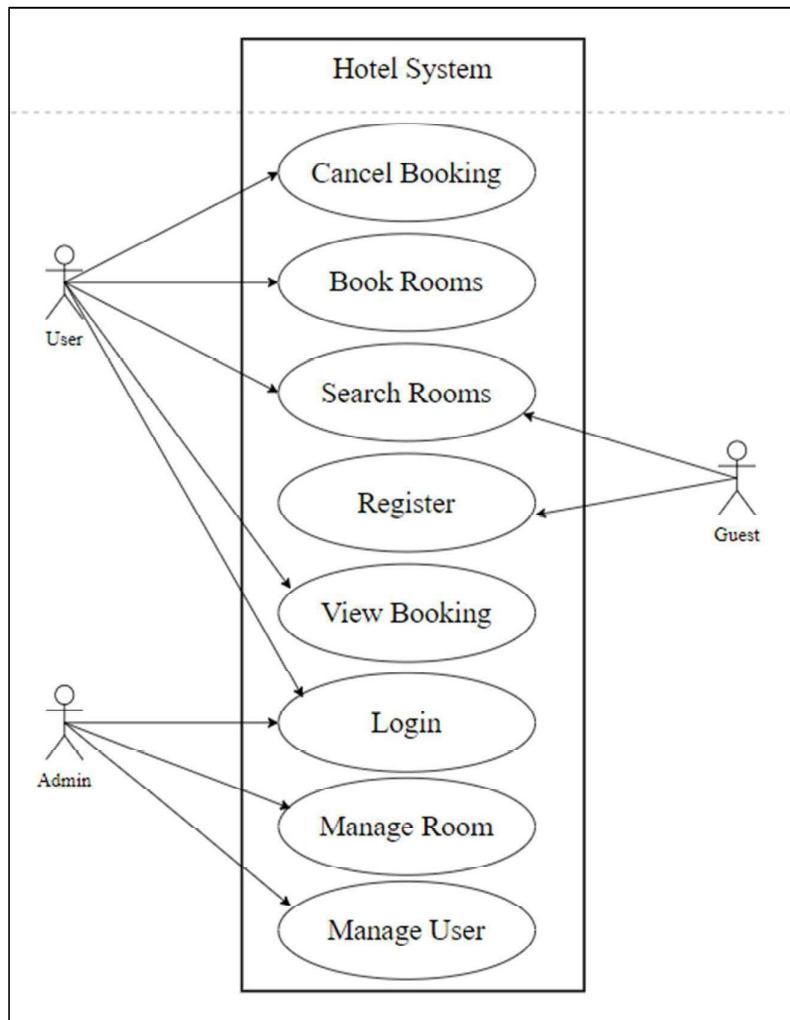


Figure 5.2 Use Case for Hotel System

Actor: Admin

Login: The Admin can securely log in to the system.

Manage Users: The Admin has the capability to add, update, and delete users within the system.

Manage Rooms: The Admin can add, update, and delete room information in the system.

Actor: User

Login: The User can securely log in to the system.

View Booking: The User can view the details of their bookings.

Search Booking: The User can search for specific bookings using various criteria.

Book Room: The User can book a room within the hotel.

Cancel Booking: The User can cancel an existing booking.

Actor: Guest

Register: The User can create a new account to access the system.

Search Booking: The User can search for specific bookings using various criteria.

5.3 Sequence Diagram

The sequence diagram provides a high-level view of the interactions between a user, the Hotel System application, and the underlying database during typical operations like login, room booking, room management, and logout within the Hotel System [39].

5.3.1 Sequence Diagram of Hotel System

A sequence diagram of room searches, as shown in Figure 5.3, illustrates the interactions between different system components or objects involved in performing a room search. It shows the order in which messages are passed between these components and the time sequence of these messages.

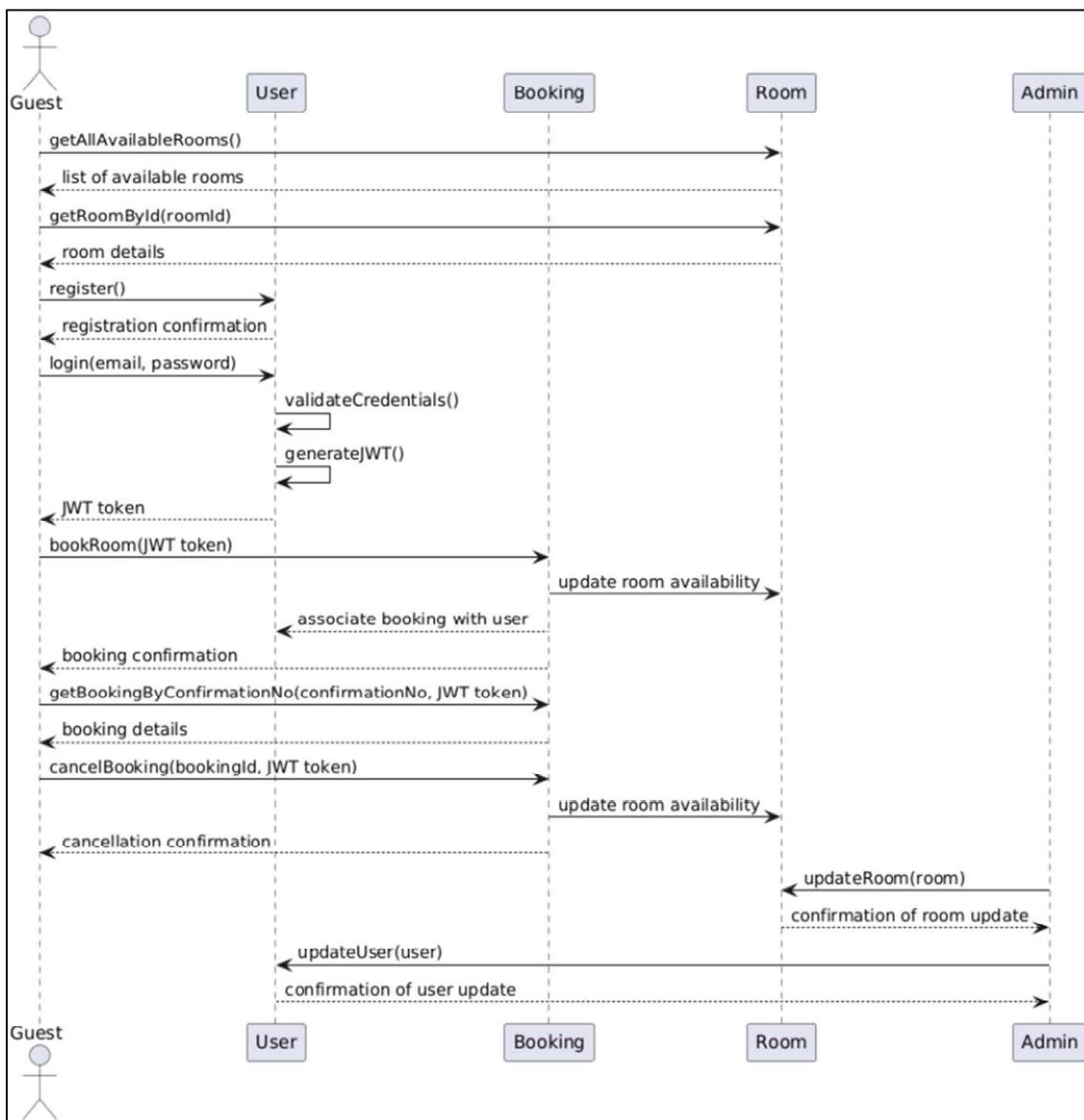


Figure 5.3 Sequence Diagram for Hotel System

5.4 Activity Diagram

An activity diagram for a user in the Hotel System, as shown in Figure 5.4, 5.5, 5.6 illustrates the flow of actions performed by the user during the process of booking a hotel room. The diagram outlines the steps involved, starting from user authentication, searching for available rooms, selecting a room, entering booking details, and processing the booking. It also highlights the conditional paths for validating the booking, handling payments, and managing different outcomes based on the payment status. The activity diagram provides a visual representation of the user's interaction with the system, ensuring a smooth and secure booking process.

5.4.1 Activity Diagram of User Registration

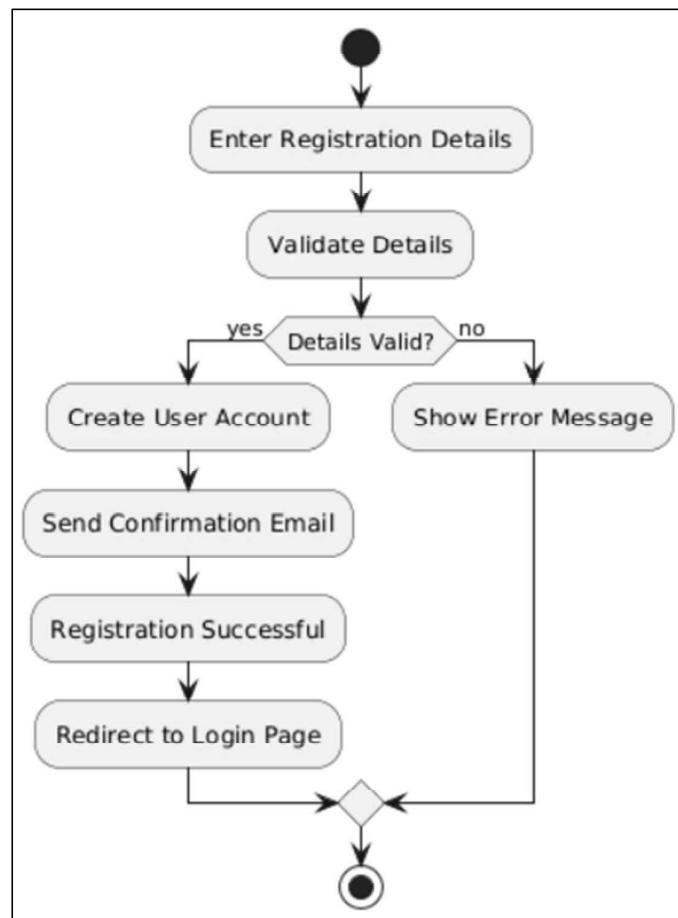


Figure 5.4 Activity Diagram of User Registration

5.4.2 Activity Diagram of Login Activity with JWT Authentication

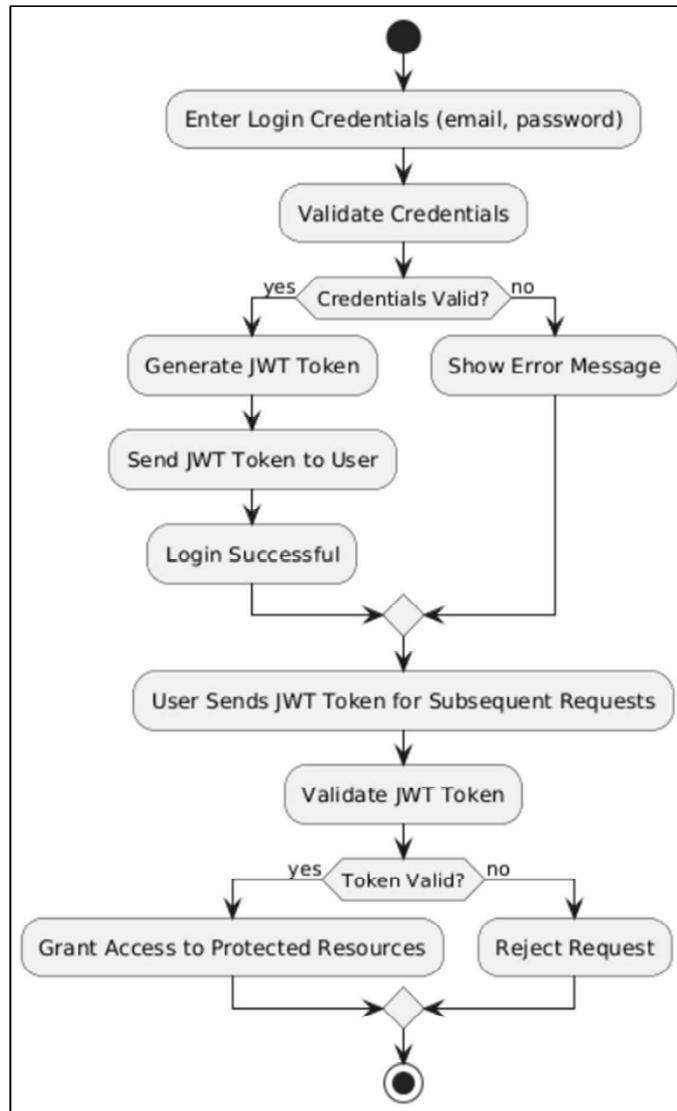


Figure 5.5 Activity Diagram of Login Activity with JWT Authentication

5.4.3 Activity Diagram of Booking

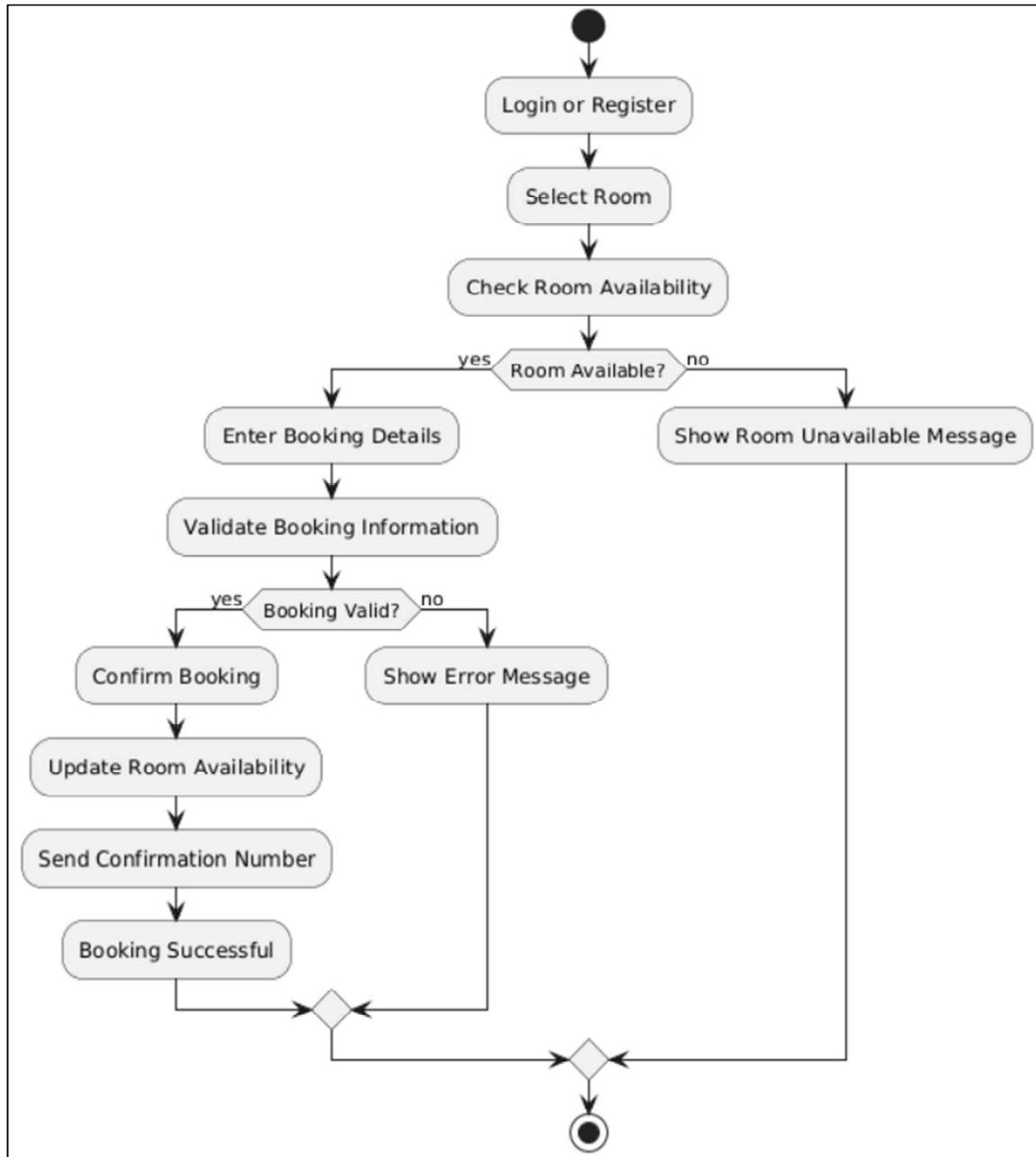


Figure 5.6 Activity Diagram of Booking

5.4.4 Activity Diagram of Room Visit

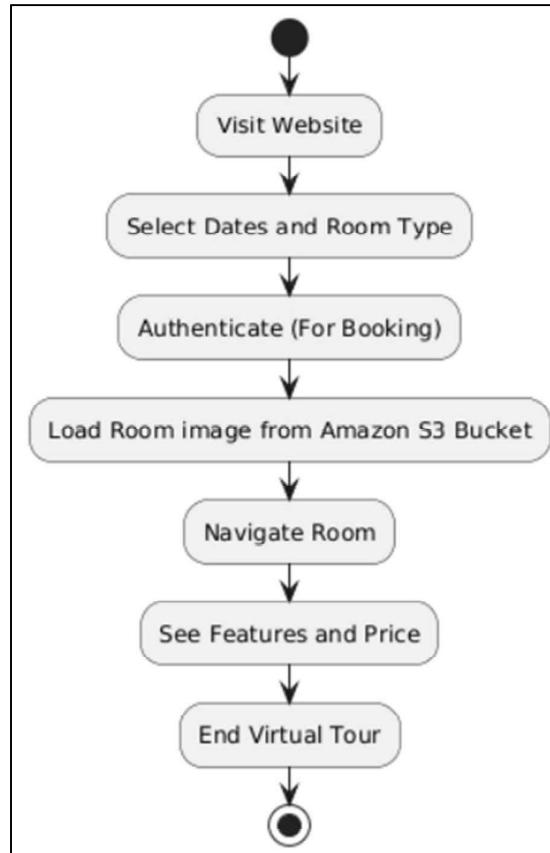


Figure 5.7 Activity Diagram of Room Visit

5.5 Data Flow Diagram

Functional Modeling

Functional modeling focuses on the flow of data and control within the system. Data flow diagrams (DFDs) at different levels depict the processes, data stores, and data flows within the system.

Additionally, the database design, represented by an Entity-Relationship (ER) diagram or conceptual scheme, outlines the structure of the database schema.

Level 0

Admin

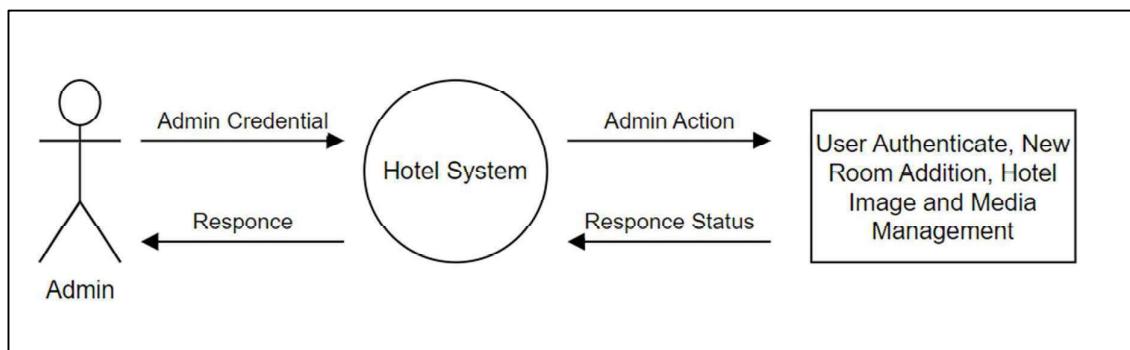


Figure 5.8 Level 0 DFD for Admin

Level 0

User

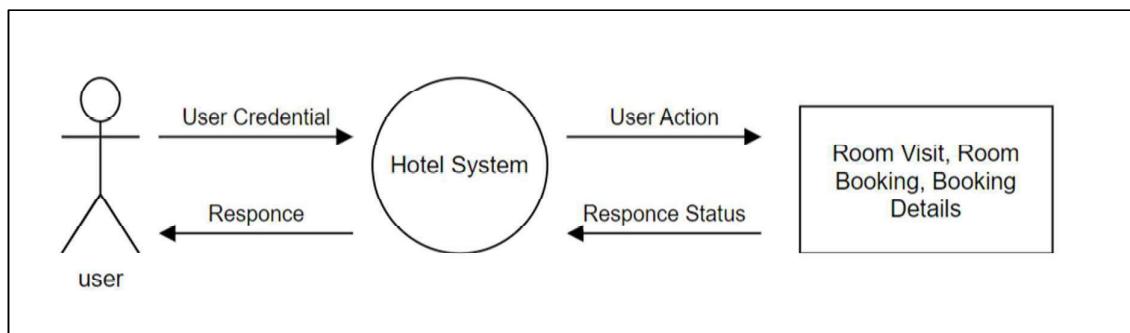


Figure 5.9 Level 0 DFD for User

5.6 E-R Diagram

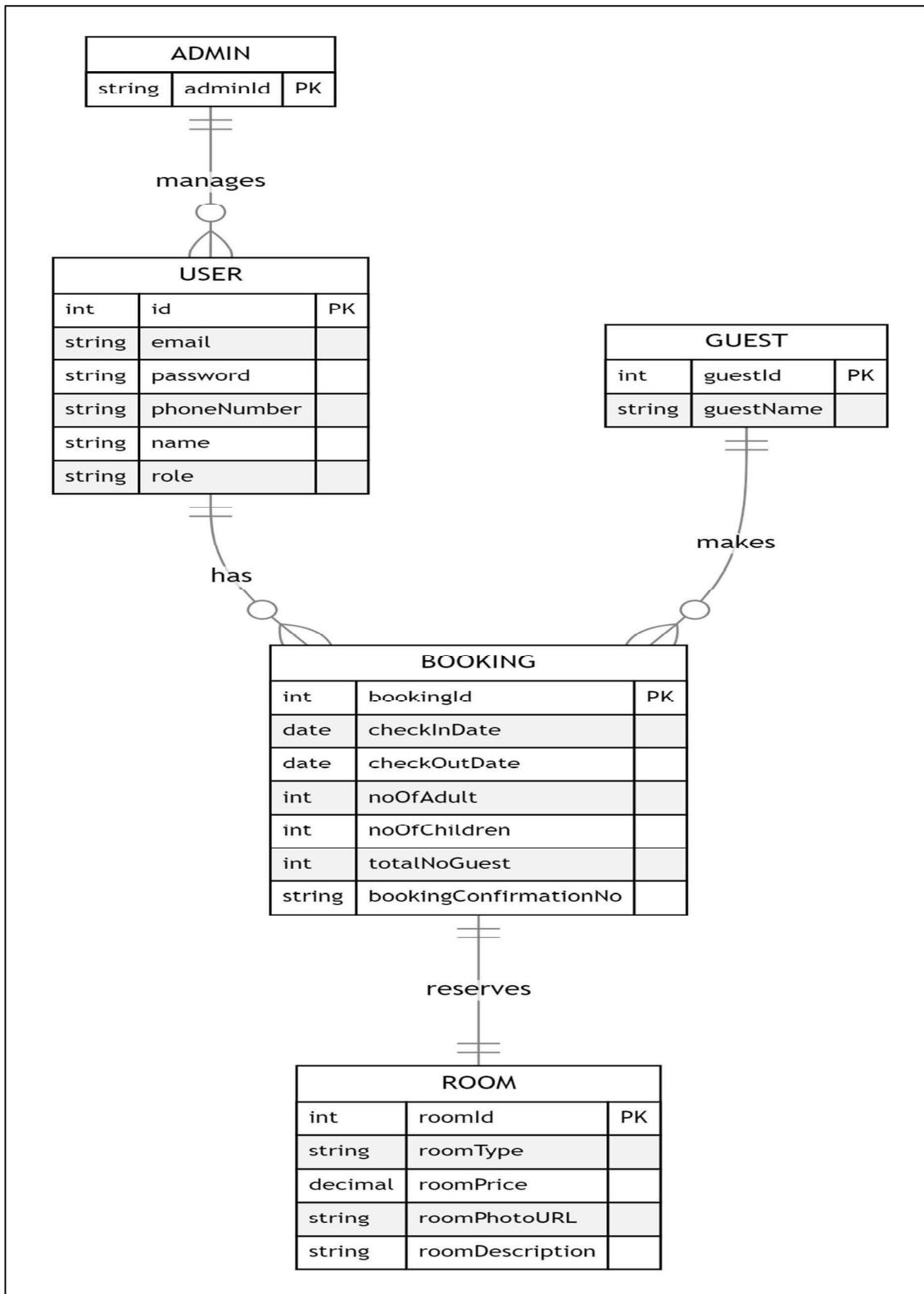


Figure 5.10 ER Diagram

Chapter 6

Implementation

6.1 PDL – Program Design Language

Program Design Language (PDL) is a method used to describe the logic and steps involved in a program or a specific module. It provides a structured outline of the computational process, offering clarity on how a program should function. Unlike programming languages, PDL is not tied to any specific syntax or structure, making it a flexible tool for planning and communicating the program's workflow [42].

Module 1: User Authentication and Authorization

Inputs:

- User Credentials (Email, Password)

Processing:

- Validate the provided user credentials against the stored data
- Generate a JSON Web Token (JWT) upon successful authentication
- Assign roles and permissions based on user credentials
- Log the authentication process

Output:

- Authentication Status (Success/Failure)
- Generated JWT Token (if authentication is successful)
- User Roles and Permissions

Module 2: New Room Addition (For Admin)

Inputs:

- Room Details (Type, Price, Description, Photo URL)

Processing:

- Validate the input data for completeness and correctness
- Store the room details in the database
- Upload the room photo to the Amazon S3 bucket and store the URL in the database
- Log the room addition activity

Output:

- Confirmation of Room Addition (Success/Failure)
- Room ID (if successful)
- Error Messages (if any validation or processing errors occur)

Module 3: Room Visit (For Guest)**Inputs:**

- Guest User Request

Processing:

- Retrieve room details from the database
- Display room options based on guest preferences
- Handle room view tracking and log guest interactions

Output:

- Displayed Room Details (Type, Price, Description, Photo URL)
- Interaction Logs

Module 4: Room Reservation (For Guest)**Inputs:**

- Reservation Details (Check-in Date, Check-out Date, Number of Adults, Number of Children)

Processing:

- Manage room availability and details, including updating room information
- Handle reservations by allocating available rooms based on the input criteria
- Update the room's status upon reservation confirmation
- Log the reservation details

Output:

- Reservation Confirmation Status (Success/Failure)
- Booking Confirmation Code (if successful)
- Error Messages (if any issues occur during the reservation process)

Module 5: Booking Details Lookup Module

Inputs:

- Booking Confirmation Code

Processing:

- Retrieve booking details using the provided confirmation code.
- Display relevant booking information to the user.
- Log the lookup activity.

Output:

- Displayed Booking Details (Reservation Dates, Room Type, Total Cost)
- Error Messages (if booking not found)
- Lookup Activity Logs

Module 6: Hotel Image and Media Management

Inputs:

- Image Files (JPEG, PNG)
- Media Metadata (File Name, Description)

Processing:

- Upload hotel images to the Amazon S3 bucket.
- Store the media file URL and metadata in the database.
- Handle image retrieval for display within the application.
- Log the media management process.

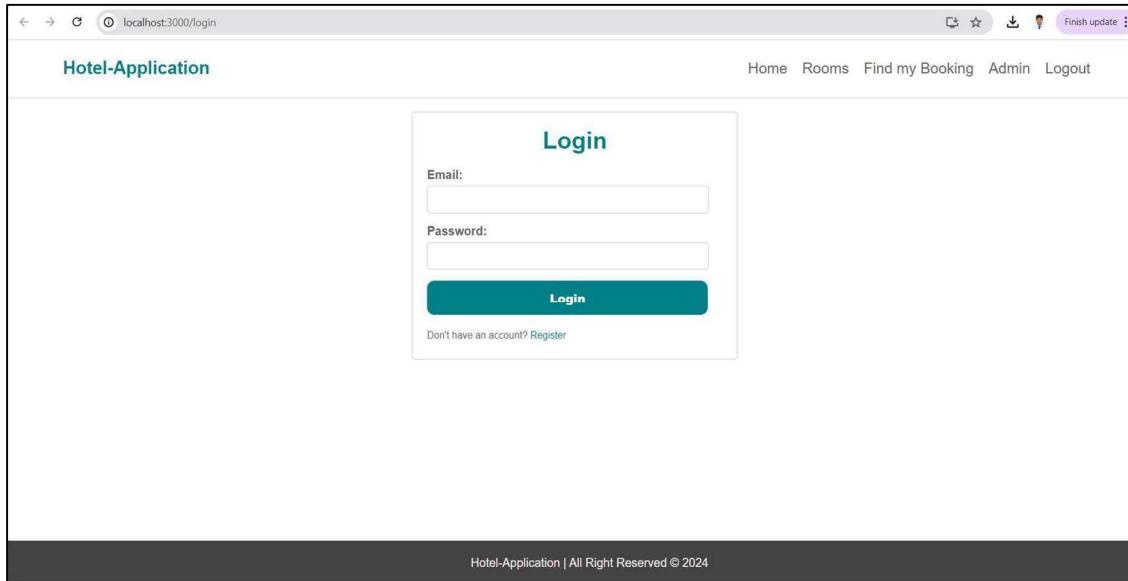
Output:

- Media Upload Status (Success/Failure)
- Stored Media File URL (if successful)
- Error Messages (if any issues occur during upload or processing)
- Media Management Activity Logs

6.2 Implementation

Implemented Smart Hotel System with Real-Time Analytics with an user interface and admin interface using front-end technologies [43]. These interfaces were designed with a focus on user experience and ease of navigation, ensuring a seamless interaction for both users and administrators and viewers.

6.2.1 Login / Sign-In Page

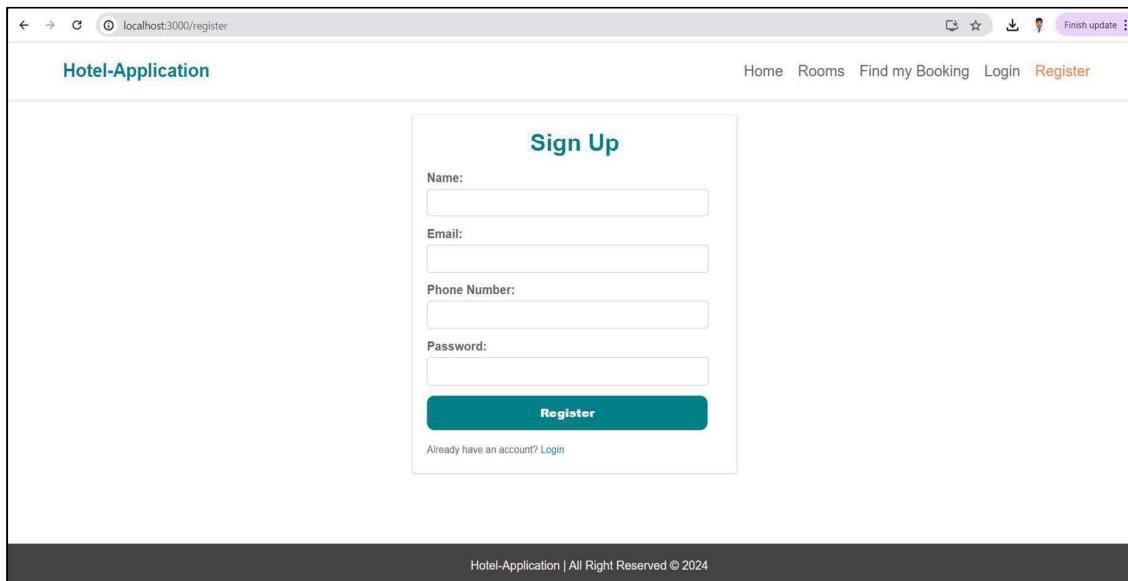


A screenshot of a web browser displaying the User Login page of the Smart Hotel System. The URL in the address bar is `localhost:3000/login`. The page has a header titled "Hotel-Application" with navigation links for Home, Rooms, Find my Booking, Admin, and Logout. Below the header is a "Login" form with fields for Email and Password, and a "Login" button. At the bottom of the form is a link "Don't have an account? Register". The footer of the page reads "Hotel-Application | All Right Reserved © 2024".

Figure 6.1 Login Page

Login page of the User as shown in figure 6.1 depicts that user has to enter valid username and password to get access into the Application Suite and has an option Register.

6.2.2 Sign-Up Page



A screenshot of a web browser displaying the User Sign-Up page of the Smart Hotel System. The URL in the address bar is `localhost:3000/register`. The page has a header titled "Hotel-Application" with navigation links for Home, Rooms, Find my Booking, Login, and a red "Register" button. Below the header is a "Sign Up" form with fields for Name, Email, Phone Number, and Password, and a "Register" button. At the bottom of the form is a link "Already have an account? Login". The footer of the page reads "Hotel-Application | All Right Reserved © 2024".

Figure 6.2 Sign-Up Page

Register page of the user as shown in figure 6.2 depicts that the user has to enter valid email and password to get access into the Application Suite.

6.2.3 Home Page

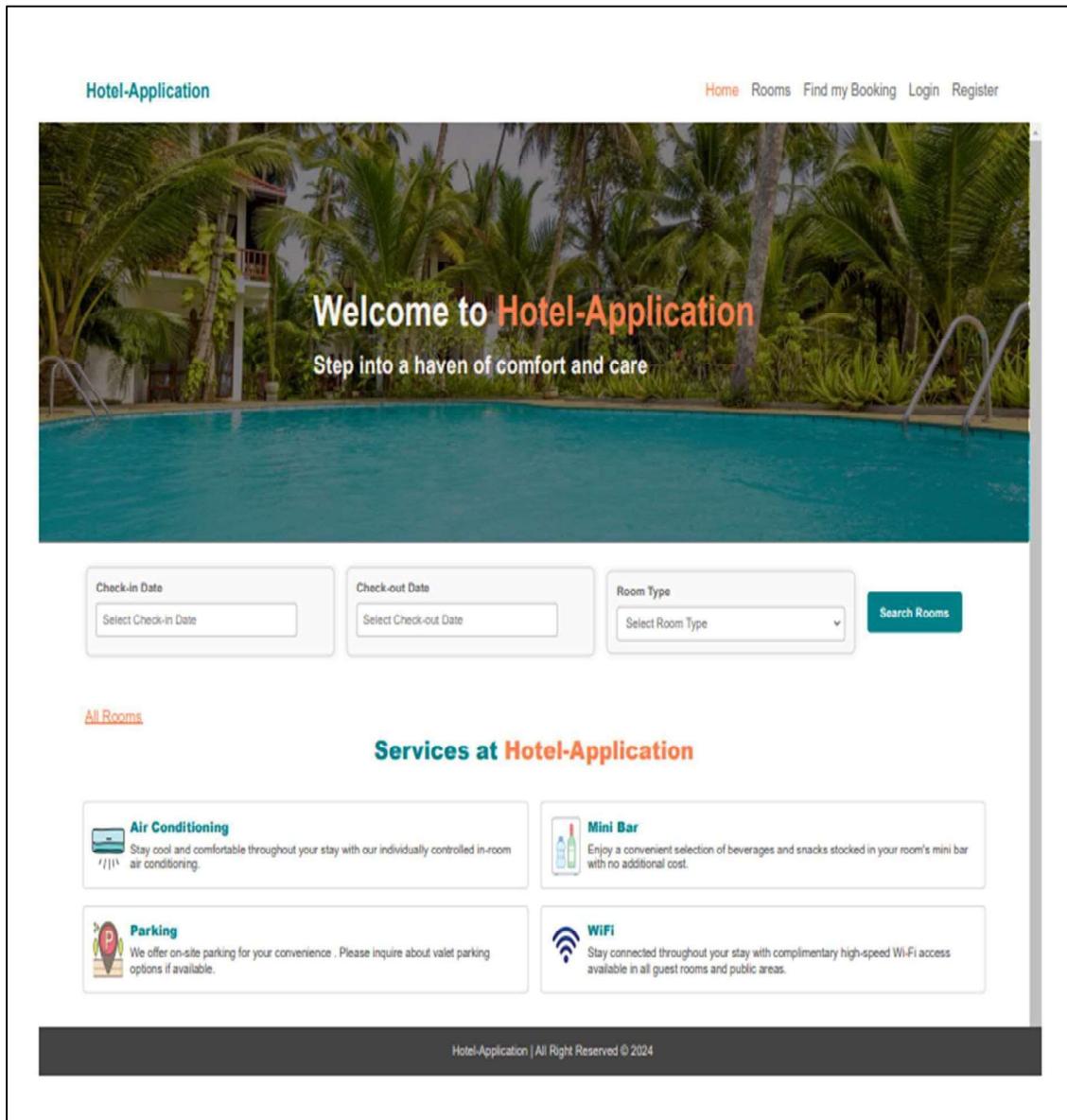


Figure 6.3 Home Page of Admin

After successful login with proper credentials home page as shown in figure 6.3 is displayed which represents the Start page of the user.

6.2.4 All Rooms

The screenshot shows the 'All Rooms' section of the Hotel Application. At the top, there are filters for 'Check-in Date', 'Check-out Date', 'Room Type', and a 'Search Rooms' button. Below the filters, there are three room categories: 'Studio', 'single', and 'single'. Each category includes a thumbnail image, the room type name, price (Rs 5000 / night), and a brief description. To the right of each listing is a blue 'Edit Room' button.

Figure 6.4 Showing all room to User

All Rooms defines the different applications available as shown in figure 6.4 which can be accessed from the page and navigate directly to the application.

6.2.5 Rooms Booking

The screenshot shows the 'Room Details' page for a 'Studio' room. At the top, there is a 'Home' link and a vertical sidebar. Below the sidebar, the page title is 'Room Details'. It features a large image of the studio, the room type ('Studio'), and the price ('Price: Rs 5000 / night'). Below this, there are two buttons: 'Book Now' and 'Go Back'. Underneath the buttons are input fields for 'Adults' (set to 2) and 'Children' (set to 1). At the bottom, there is a 'Confirm Booking' button and a footer with the text 'Hotel-Application | All Right Reserved © 2024'.

Figure 6.5 Asset Application options

There are different functions bundled together under one mainframe asset as shown in figure 6.5 which has check-in check-out options to be accessed directly.

6.2.6 Booking Confirmation Page

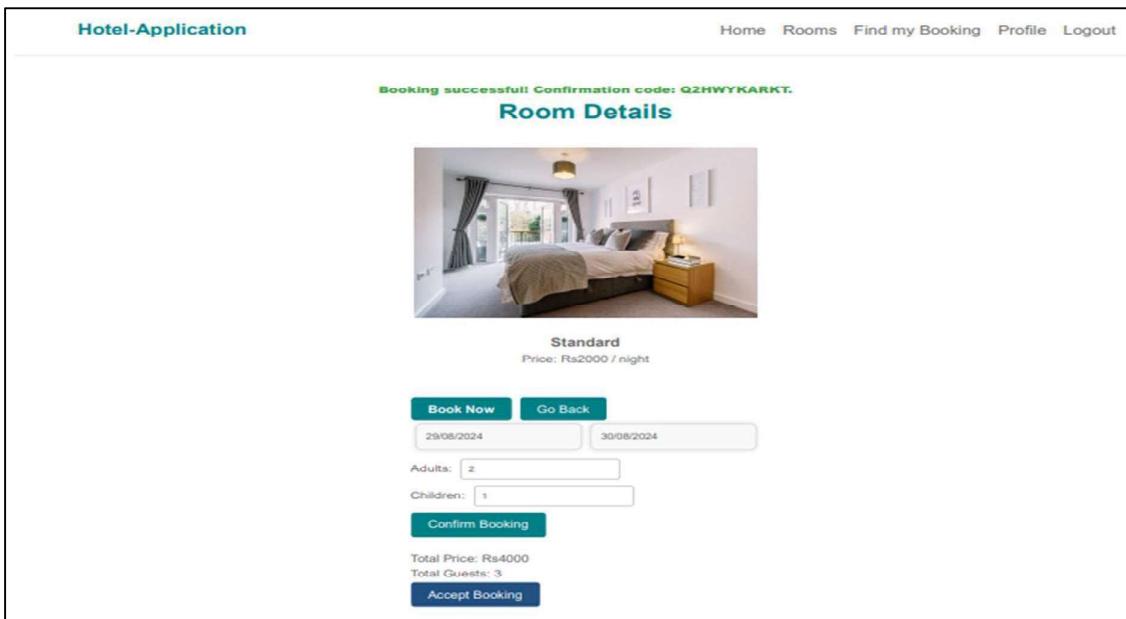


Figure 6. 6 Booking Confirmation Page

This asset application as shown in figure 6.6 is used to add new assets and view all the assets added to the Inventory.

6.2.7 Find Booking Using Confirmation Number Page

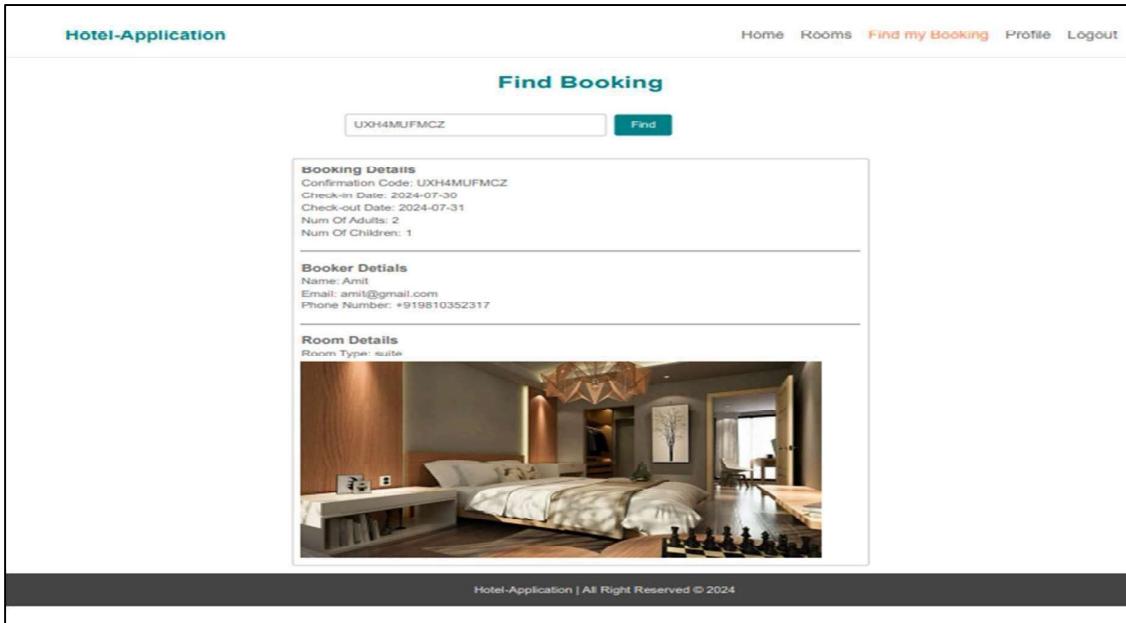


Figure 6.7 Find Booking

This page displays the options for an user to see Booking details as shown in the figure 6.7 and perform all the required actions from More actions tab.

6.2.8 Edit Room Detail

The screenshot shows the 'Edit Room' interface. At the top, there's a navigation bar with 'Home', 'Rooms', 'Find my Booking', 'Admin' (which is highlighted in orange), and 'Logout'. Below the navigation is a title 'Edit Room' above an image of a room. The room image shows a double bed, a desk, and a chair. Below the image are several input fields: 'Room Type' (single), 'Room Price' (8000), and 'Room Description' (A lovely single bed room). At the bottom of the form are two buttons: a green 'Update Room' button and a red 'Delete Room' button.

Figure 6.8 Edit room Detail

Editing Room detail in hotel application as shown in figure 6.8 by entering all the required details and perform more actions.

6.3 Manage All Booking

The screenshot shows the 'All Bookings' interface. At the top, there's a navigation bar with 'Home', 'Rooms', 'Find my Booking', 'Admin' (highlighted in orange), and 'Logout'. Below the navigation is a title 'All Bookings'. There's a search bar labeled 'Filter by Booking Number: Enter booking number'. Below the search bar are five booking entries, each in its own box with a 'Manage Booking' button:

- Booking Code: Q2HWYKART0
Check In Date: 2024-08-29
Check out Date: 2024-08-30
Total Guests: 3
Manage Booking
- Booking Code: X57H34U0VG
Check In Date: 2024-08-22
Check out Date: 2024-08-23
Total Guests: 3
Manage Booking
- Booking Code: PAU9C79WWW
Check In Date: 2024-08-16
Check out Date: 2024-08-17
Total Guests: 3
Manage Booking
- Booking Code: HXRCB9JXT0
Check In Date: 2024-08-08
Check out Date: 2024-08-10
Total Guests: 4
Manage Booking
- Booking Code: Y8XE28CZ6E
Check In Date: 2024-08-08
Check out Date: 2024-08-10
Total Guests: 1
Manage Booking
- Booking Code: UXH4MUFMCZ
Check In Date: 2024-07-30
Check out Date: 2024-07-31
Total Guests: 3
Manage Booking

At the bottom, there's a page number '1' and a footer 'Hotel Application | All Right Reserved © 2024'.

Figure 6.9 Manage All Booking

Once the admin login, an access details of booking, and store into database as shown in figure 6.9 from more actions tab.

Chapter 7

Software Testing

Software Testing for Hotel system where Unit testing validates individual components, integration testing assesses their interactions, while end-to-end testing evaluates the entire system's performance in real-world scenarios.

Unit testing

Table 7.1 Module 1: User Authentication and Authorization

Test Case ID	Test Case Description	Input Data	Expected Output	Actual Output	Pass/Fail
TC1-1	Validate user with correct credentials	Email, Password	JWT Token, Success	JWT Token, Success	Pass
TC1-2	Validate user with incorrect password	Email, Wrong Password	Failure message	Failure message	Pass
TC1-3	Validate user with unregistered email	Wrong Email, Password	Failure message	Failure message	Pass
TC1-4	Validate user with empty credentials	"", ""	Error message	Error message	Pass
TC1-5	Log authentication process	Email, Password	Log entry	Log entry	Pass
TC1-6	Validate user login after account lockout	Locked Account Email, Password	Failure message	Success, JWT Token	Fail

Table 7.2 Module 2: New Room Addition (For Admin)

Test Case ID	Test Case Description	Input Data	Expected Output	Actual Output	Pass/Fail
TC2-1	Add new room with valid details	Type, Price, Description, Photo URL	Success, Room ID	Success, Room ID	Pass
TC2-2	Add new room with missing details	"", Price, Description, Photo URL	Error message	Error message	Pass
TC2-3	Add new room with invalid photo URL	Type, Price, Description, Invalid URL	Error message	Error message	Pass
TC2-4	Add new room with duplicate details	Type, Price, Description, Photo URL	Error message	Error message	Pass
TC2-5	Log room addition activity	Type, Price, Description, Photo URL	Log entry	Log entry	Pass
TC2-6	Add new room when database is down	Type, Price, Description, Photo URL	Error message	Success, Room ID	Fail

Table 7.3 Module 3: Room Visit (For Guest)

Test Case ID	Test Case Description	Input Data	Expected Output	Actual Output	Pass/Fail
TC3-1	View available rooms	Guest Request	Room details	Room details	Pass
TC3-2	View room with preferences	Guest Request with Preferences	Filtered room details	Filtered room details	Pass
TC3-3	View room with no available rooms	Guest Request with unavailable preferences	No rooms available message	No rooms available message	Pass
TC3-4	View room with incorrect query parameters	Invalid Request	Error message	Error message	Pass
TC3-5	Handle guest interaction logging	Guest Request	Interaction log entry	Interaction log entry	Pass
TC3-6	View room when database is down	Guest Request	Error message	Room details	Fail

Table 7.4 Module 4: Room Reservation (For Guest)

Test Case ID	Test Case Description	Input Data	Expected Output	Actual Output	Pass/Fail
TC4-1	Make a reservation with valid details	Check-in Date, Check-out Date, Number of Adults, Number of Children	Success, Booking Confirmation Code	Success, Booking Confirmation Code	Pass
TC4-2	Make a reservation with invalid dates	Past Check-in Date, Check-out Date, Number of Adults, Number of Children	Error message	Error message	Pass
TC4-3	Make a reservation for fully booked dates	Fully Booked Check-in Date, Check-out Date, Number of Adults, Number of Children	Error message	Error message	Pass
TC4-4	Make a reservation with empty fields	"", "", "", ""	Error message	Error message	Pass
TC4-5	Update room status after reservation	Check-in Date, Check-out Date, Number of Adults, Number of Children	Room status updated	Room status updated	Pass
TC4-6	Make a reservation during system maintenance	Check-in Date, Check-out Date, Number of Adults, Number of Children	Error message	Success, Booking Confirmation Code	Fail

Table 7.5 Module 5: Booking Details Lookup Module

Test Case ID	Test Case Description	Input Data	Expected Output	Actual Output	Pass/Fail
TC5-1	Lookup booking with valid confirmation code	Valid Confirmation Code	Display booking details	Display booking details	Pass
TC5-2	Lookup booking with invalid confirmation code	Invalid Confirmation Code	Error message	Error message	Pass
TC5-3	Lookup booking with expired confirmation code	Expired Confirmation Code	Error message	Error message	Pass
TC5-4	Lookup booking with no confirmation code	""	Error message	Error message	Pass
TC5-5	Log booking lookup activity	Valid Confirmation Code	Lookup activity logged	Lookup activity logged	Pass
TC5-6	Lookup booking when database is down	Valid Confirmation Code	Error message	Display booking details	Fail

Table 7.6 Module 6: Hotel Image and Media Management

Test Case ID	Test Case Description	Input Data	Expected Output	Actual Output	Pass/Fail
TC6-1	Upload valid image file	JPEG/PNG Image, Metadata	Success, File URL	Success, File URL	Pass
TC6-2	Upload unsupported file format	Unsupported File, Metadata	Error message	Error message	Pass
TC6-3	Upload image with missing metadata	JPEG/PNG Image, Missing Metadata	Error message	Error message	Pass
TC6-4	Retrieve uploaded image	Valid File URL	Display image	Display image	Pass
TC6-5	Log media management activity	JPEG/PNG Image, Metadata	Log entry	Log entry	Pass
TC6-6	Upload image when S3 bucket is down	JPEG/PNG Image, Metadata	Error message	Success, File URL	Fail

Table 7.7 Integration Testing

Test Case ID	Test Case Description	Modules Involved	Input Data	Expected Output	Actual Output	Pass/Fail
IT1-1	Authenticate and access room addition	Module 1, Module 2	Admin Credentials, Room Details	JWT Token, Success, Room ID	JWT Token, Success, Room ID	Pass
IT1-2	Guest visit and reservation flow	Module 3, Module 4	Guest Request, Reservation Details	Room details, Booking Confirmation Code	Room details, Booking Confirmation Code	Pass
IT1-3	Booking lookup after reservation	Module 4, Module 5	Booking Confirmation Code	Booking details	Booking details	Pass
IT1-4	Image upload and retrieval	Module 2, Module 6	Room Details, Image File, Metadata	Success, File URL, Display image	Success, File URL, Display image	Pass
IT1-5	User authentication with invalid credentials and room visit	Module 1, Module 3	Invalid Credentials, Guest Request	Error message	Error message	Pass
IT1-6	Room addition and image upload when S3 is down	Module 2, Module 6	Room Details, Image File, Metadata	Error message	Room ID, Success	Fail

Table 7.8 End-To-End Testing

Test Case ID	Test Case Description	Modules Involved	Input Data	Expected Output	Actual Output	Pass/Fail
ST1-1	End-to-end reservation flow	Module 1, 3, 4, 5	User Credentials, Room Request, Reservation Details, Booking Confirmation Code	JWT Token, Room details, Booking Confirmation Code, Booking details	JWT Token, Room details, Booking Confirmation Code, Booking details	Pass
ST1-2	End-to-end room management with media	Module 1, 2, 6	Admin Credentials, Room Details, Image File, Metadata	JWT Token, Success, Room ID, File URL	JWT Token, Success, Room ID, File URL	Pass
ST1-3	Handle data integrity during reservation	Module 3, 4, 5	Guest Request, Reservation Details, Booking Confirmation Code	Room availability, Booking Confirmation Code, Booking details	Room availability, Booking Confirmation Code, Booking details	Pass
ST1-4	End-to-end booking lookup with invalid data	Module 1, 3, 4, 5	Invalid Credentials, Guest Request, Invalid Booking Confirmation Code	Error messages	Error messages	Pass
ST1-5	End-to-end workflow with system failure simulation	Module 1, 2, 4, 6	User Credentials, Room Details, Image File, Reservation Details	Error messages	Partial success, error messages	Fail

Chapter 8

Conclusion

Therefore, the improvement of the Hotel System through the use of Spring Boot and React JS can be deemed an important success in furthering the hotel setting. As for the benefits of this project, there are such features as better functionality, better appearance of the product, and integration compatibility. This is where application of advanced web platforms makes our organization capable of improving the delivery of services and at the same time coming up with efficient ways of reducing costs.

The expected results of this work are going to be significant enhancement of overall management and organizational efficiency of hotels. The processes of booking and reservation have been automated with the help of the new module, and this has excluded numerous interventions. Data validity checks are employed to enhance the quality of data that is acquired while, system response times are enhanced to allow fast processing. Also, it helps to increase the operational effectiveness by allowing access to management activities of a hotel on the go, not to mention that it helps reduce system outages. All these enhancements can be seen as leading to means a better customer satisfaction, and lower operating costs [47].

Chapter 9

Future Enhancement

To ensure a smooth migration to the new hotel management system, focus on effective API integration to connect legacy systems with the new platform. Implement a robust data migration framework with tools and templates to facilitate accurate data transfer. Optimize workflow processes using automation to reduce errors and improve efficiency. Prioritize change management by providing comprehensive training and communication to help users adapt to the new system. Additionally, maintain a dedicated support team and establish a feedback loop to address any issues and continuously improve the system based on user input.

Incorporating contemporary industry trends and best practices will further enhance the system's performance and user satisfaction. Regularly updating the system based on emerging technologies and user needs will keep it relevant and efficient. This proactive approach ensures long-term success and adaptability in the evolving hotel management landscape.

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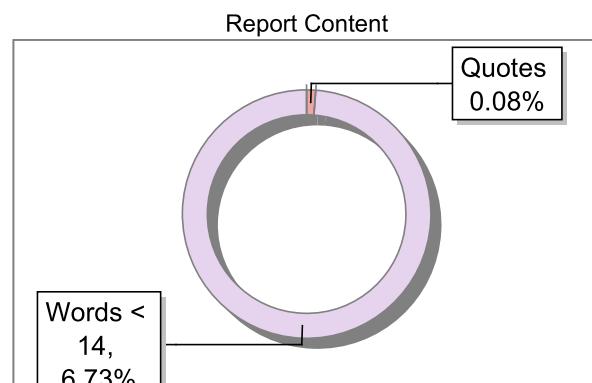
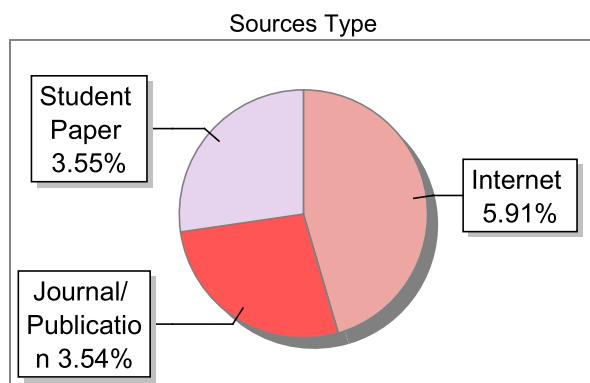
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