Hostel Hub: Smart Allocation and Response Architecture

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***Abstract*—This web application represents a comprehensive solution for managing student accommodations since it became quite difficult to manage the various activities that happen in hostel. Making it convenient for students to have a good roommate, sending a change room request, share complaints, issuing out-pass, view hostel authority's details to contact them whenever required and sending a request to vacate the hostel, hostel authority will also get benefited from this platform since they can easily view the student's details when they book a room, view the other requests that students can make such as change room request, vacate hostel request and they can also view the out-passes that were issued by students. This platform aims to reduce the manual effort by Integrating critical functionalities such as real-time notifications, secure authentication and data encryption, ensuring both usability and data security. The platform can help hostel management automate the various activities that are done manually such as issuing out-passes and registering a complaint, it also benefits students since they will have either a roommate from the same department or from the same year, send a change room request whenever required, generate out-pass without having to do it manually and register a complaint.**

***Index Terms*—Hostel Management, Students, AWS, Docker, React**

I. INTRODUCTION

Currently the activities that happen in hostel are done manually which can be time consuming for both students and the hostel authority. "Hostel Hub" web application aims to automate these activities to make it convenient for students and hostel management, automating activities such as issuing an out-pass and registering complaints is beneficial as they are usually done manually. Maintaining students' details might be challenging for hostel management when it is done manually, our platform simplifies this process since students will be able to add their details which are required by the hostel authority.

This platform enables students to book their room automatically based on some conditions that are either their roommate should be from the same department or from the same year. In this platform, students can easily make a request to change their current room since they might not feel comfortable, students will be required to provide the reason for their request and the new room that they want to shift to. This platform allows students to issue their own out-pass which is great since they will not be required to go through the manual process. Students will also be able to register a complaint which will be sent to the hostel

management, students need to mention a description of the complaint which helps the hostel management to do the needful. This platform allows students to view the hostel authority's details to contact them whenever required.

Hostel management can easily manage the requests that are sent by students through this platform which can be a change room request, complaints, vacate hostel request and they can also view the out-passes that are issued by students, students will be required to enter their details in their profile page which help the hostel management in identifying them.

The main goal of this platform is to automate the process that is done manually and making it easy for students and hostel management to perform various activities which can be like selecting a room, requesting to change a room, issuing out-pass, registering a complaint and viewing the requests that are made by students.

This platform intends to ease these activities for students and hostel management which is beneficial and help them save time and effort. Students will be able to send a vacate hostel request to the hostel management which then can be accepted or rejected after it is reviewed.

II. LITERATURE SURVEY

'Hostel Management System' [1] proposed a web application as a framework to overcome the difficulties and obstacles of the existing system by automating the various activities that hostel management is doing manually such as room allotment, store and manage the details of the students.

'Study of Digitalized Hostel Management System' [2] suggested a digitalized android application to automate the activities that are done manually in hostel management systems, In this solution students can apply for hostel admission, discuss complaints with the warden, upload fee receipt and create a leave request.
'Online Hostel Management System for Sanskrithi School of Engineering' [3] presented their idea by showing an application which is an online hostel management system which includes Information about the hostel, room allotment option for the students to choose their room, deposit option where students can make an Initial payment, checkout request which students can make when they are about to leave the hostel and payment receipt which will be sent to students after the payment is made.

'Hostel Management System (HMS)' [4] This project involves the design and implementation of an online Hostel Management system to streamline various hostel activities. With the rapid growth of educational institutions and their hostels, managing these facilities manually has become increasingly challenging. The proposed system aims to address these challenges by offering a more user -friendly, GUI-oriented, and efficient solution that overcomes the limitations of traditional management methods.

'Development of an Automated Hostel Facility Management System' [5] Over the past four decades, the number of educational institutions worldwide has surged, bringing education closer to people and fostering a more enlightened population. However, many of these new institutions still use outdated methods for managing assets, particularly hostel facilities, which hampers their overall efficiency. This paper proposes an automated hostel management system developed with Visual Basic and Microsoft Access, featuring a user-friendly interface and built-in authentication to address the shortcomings of traditional management techniques.

'Hostel Management System '[6] The Hostel Management framework is a web application designed to streamline various hostel activities, reducing manual tasks and simplifying student and administrator processes. It facilitates automated functions such as student selection from waiting lists, mess billing, outpass generation, and complaint registration, with notifications sent to students and updates to guardians. Given the rapid growth of educational institutions and hostels, this system addresses the challenges of manual management and enhances efficiency with its automated features.

'Design and Implementation of Hostel Management System (HOMASY)' [7] The Design and Implementation of Hostel Management System (HOMASY): LASU as Case Study presents an electronic solution to enhance the hostel registration and management processes at Lagos State University (LASU). The document details the transition from inefficient manual procedures to an automated system, aimed at improving efficiency and accuracy. HOMASY leverages technologies like HTML for the user interface and MySQL for database management. The system enables online data entry, including identification photographs, thus reducing paperwork and administrative costs. Key benefits include increased operational efficiency, cost savings, and a user-friendly interface that simplifies the registration process for both students and administrators. The implementation of HOMASY is expected to significantly streamline hostel management, addressing the challenges of manual processes and improving overall productivity.

'Development of an E-Based Hostel Management System' [8] Development of an E-Based Hostel Management System document details a comprehensive solution designed to automate and enhance administrative tasks related to room allocation in universities and colleges. The system features a user-friendly interface and includes functionalities for both users and administrators. Key features include a home page for user registration and login, an admin portal for managing bookings and room allocations, and an interface for adding and managing rooms. The system uses MySQL for database management,

ensuring efficient handling of user and room data. Benefits of the system include increased efficiency through automation, improved user experience via online integration, and streamlined operations for both students and administrators.

'Online Leave Application' [9] The Online Leave Application is a mobile application developed using Android Studio to streamline the leave application process for hostel students. Designed to integrate three key user roles— students, staff, and wardens—the application simplifies the traditionally cumbersome leave request procedure.

It features a user-friendly interface that allows students to submit leave requests, which are then reviewed by staff and approved by wardens. The system supports cloud storage with MySQL and PHP, ensuring efficient data management and real-time processing of leave requests. Key benefits include enhanced communication, reduced paperwork, and emergency handling capabilities. The application aims to foster an eco-friendly environment by reducing paper usage and offers potential for future expansion to include additional administrative features.

The research paper titled "Hostel Management System Using Image Recognition" [10] by Yaw A. Mensah and colleagues explores an advanced system aimed at improving the efficiency of hostel management. The system leverages image recognition technology to streamline hostel operations such as room allocation, item management, and feedback collection. The system is developed as a web application using the C# programming language and incorporates various modules to enhance the overall management process.

III. PROPOSED METHODOLOGY

"Hostel Hub" aims to solve the existing issues that various hostel management and students face such as room and bed allotment, out pass issuing and complaint whenever required. This system is convenient for both hostel management and students since the activities that are done manually will be automated. Here students can easily book a room which will be an automated process, this system also allows users to make other requests such as room change request which will include both the new required room and the reason for changing the room, the admin will then receive the request and either accept or reject, students will also be able to make a request to vacate the hostel and admin can verify the request.

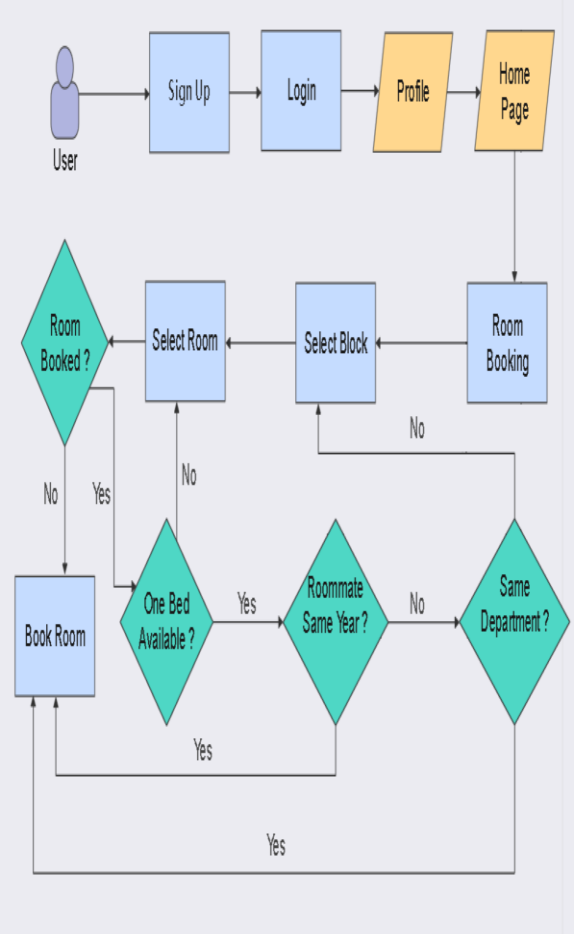

Figure 3. Architecture Diagram

The process in Figure 1 begins with user sign up, login, profile setup, and reaching the home page. From the "Room Booking" option, users select a block and then the required room. If the room is already booked, the system checks if one bed is available, followed by roommate compatibility based on the same year and department. If all criteria are met, the room can be booked successfully.

IV. IMPLEMENTATION

"Hostel Hub" is built using React for the Frontend which is a JavaScript library, Node.js and Express.js for the Backend, MongoDB as a Database, AWS ECS and EC2 for deployment, Docker for testing as it can

provide an isolated environment to run and test the application.

Figure 4. User Profile Page

User profile page will be the initial page that users will see after they login, the form collects personal and academic details of students. It includes fields for full name**,** date of birth**,** gender**,** nationality**,** contact information**,** parent/guardian details**,** and permanent address. Additionally, it requires academic details like student ID and course name and it also requires students some documents such as their admission letter and an Identification. The form is structured to ensure smooth hostel allocation and record-keeping.

Figure 4.1. User Home Page

The user home page includes the navigation bar at the top that includes options like Home, About, Experiences, Resources and Contact, allowing users to explore more about the platform. There are other features as well such as change room request, share complaints, issue out-pass and send a vacate hostel request.

Figure 4.2. Book Room Page

The book room page includes the user profile information which are shown based on the information that users provide in their profile page. Once a user clicks on book my room button, they will be assigned a room automatically based on some conditions that include either their roommate should be from the same department or from the same year.

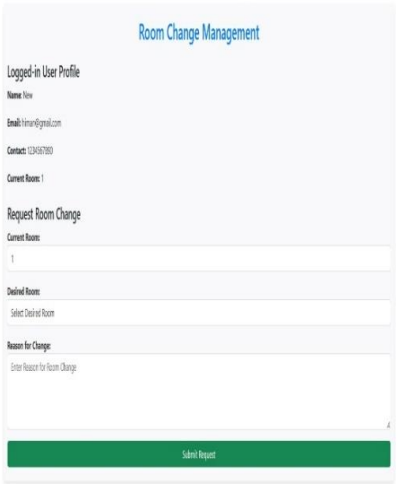

Figure 4.3. Change Room Page

The change room page is the place where students can request a room change due to various reasons, it displays the user's profile information, students are required to mention current room, select the desired room from the dropdown button which will show the available rooms, and provide a reason for the request.

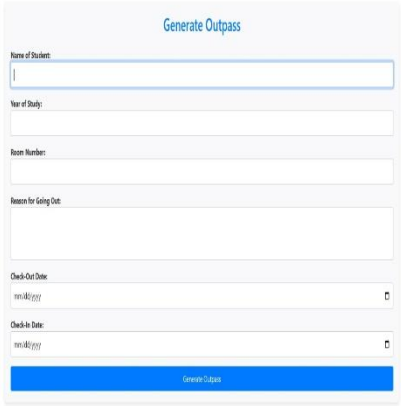

Figure 4.4. Generate Outpass Page

The generate outpass page allows students to issue an outpass on their own without having to wait for the hostel authority's approval, students are required to enter the required details such as name, room number, reason for going out, check out and check in dates to issue the outpass.

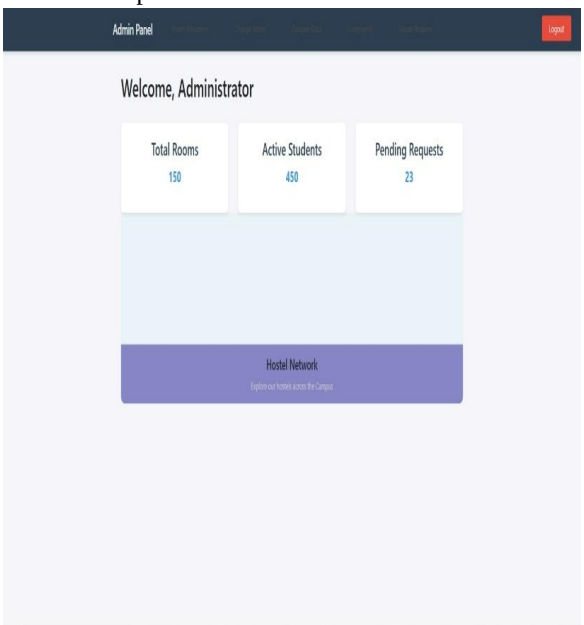

Figure 4.5. Admin Home Page

The admin home page allows the hostel authority to manage hostel related activities such as room allocation management, change room requests, outpass data, complaints and vacate hostel requests, it also displays the total number of rooms, active students and pending requests.

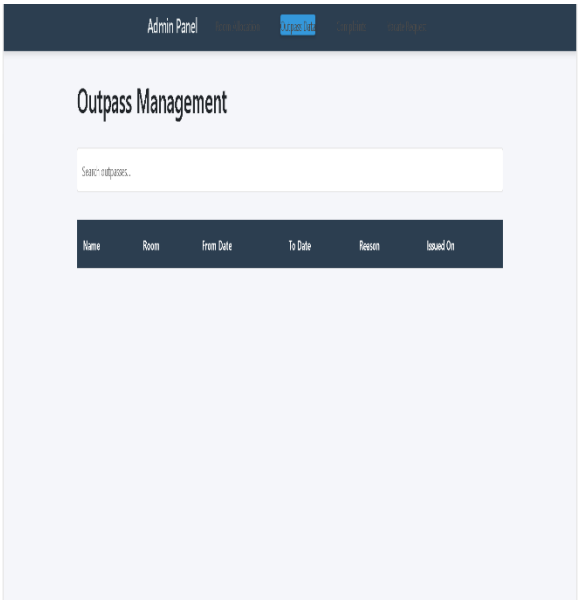

Figure 4.6. Outpass Management Page

Here admins can view the outpasses that were issued by students and their associated details which allow admins to make sure that the student will return to hostel by the date that they mentioned.

Parameter	System [1]	System [2]	System [3]	System [4]	System [5]	System [6]	System [7]	System [8]	System [9]	System [10]	Hostel Hub (Proposed)
Automation Level	Low	Medium	Low	Medium	Medium	High	Medium	Low	Medium	High	High
Technology Stack	PHP/MySQL	VB.NET/SQL	Java/Swing	PHP/MySQL	ASP.NET	MEAN	LAMP	Python/SQLite	JavaFX	MERN	MERN, Docker
Deployment Method	Local	Local	Local	Local	Cloud	Local	Local	Local	Local	Cloud	Cloud
Room Booking	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes
Out-pass Management	No	No	No	Yes	Yes	No	No	No	No	Yes	Yes
Complaint System	No	No	No	No	Yes	No	No	No	Yes	Yes	Yes
Usability	Basic	Moderate	Basic	Basic	Moderate	Good	Basic	Moderate	Moderate	Good	Excellent
Data Security	Low	Medium	Low	Medium	High	Medium	Low	Low	Medium	High	High (JWT)
Scalability	Low	Low	Low	Medium	Medium	Medium	Low	Low	Low	Medium	High
Admin/Student Interface	Basic	Basic	Basic	Moderate	Moderate	Good	Basic	Basic	Moderate	Good	Advanced

Notes:

- All existing systems ([1]–[10]) are based on published research papers focusing on hostel management systems.
- Hostel Hub is the proposed modern solution that is able to enhance user and admin experiences.

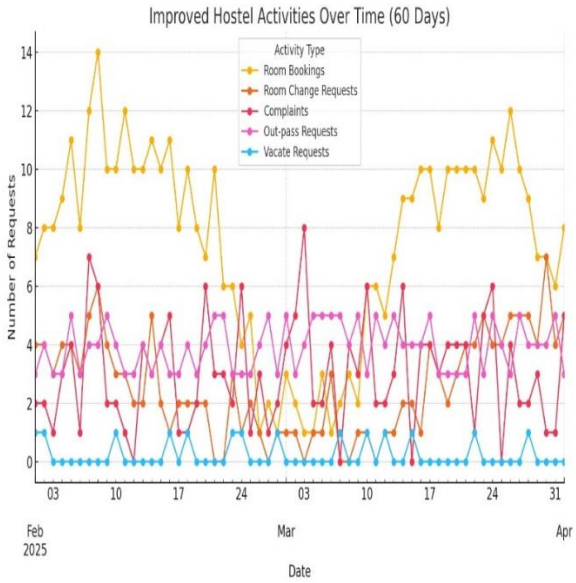

Figure 4.7. Time Graph

Figure 9 shows hostel activity trends over 60 days, with room bookings being the highest and most consistent. Out-pass requests remained steady at around 4-5 per day, complaints and room change requests fluctuated moderately with occasional spikes and vacate requests were minimal.

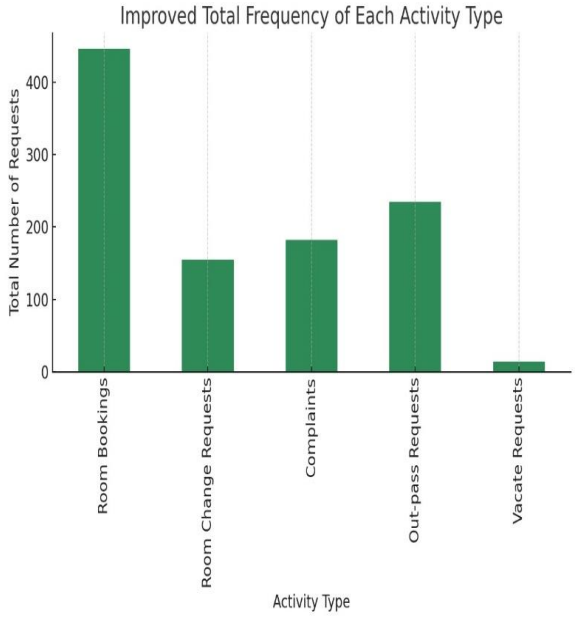

Figure 4.8. Frequency Graph

Figure 10 shows total frequency of various hostel activities. Room bookings are the most frequent, exceeding 400 requests. Out-pass requests and complaints follow with room change requests slightly lower and vacate requests are the least common.

V. CONCLUSION

The present hostel management system was developed to overcome complex problems in hostel administration. As it particularly encounters such problems, educational institutions housing large students' populations have benefited from this system. Using modern web technologies like React.js coupled with the approach of user-centered design the system renders efficient, accessible, and scalable hospitability for the processes related to the hostels Important features such as login/signup, room booking, Change room requests, complaint registration, out-pass management, vacate hostel requests and profile setup are designed to streamline the functioning, reduce paperwork, and make the journey easier and better for both the students and the administration. The system centralizes various activities so that students may access hostel services through a single interface that provides speedy access to tools which they must use in navigating their way through the facility.

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