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Dorm and Dish: A Cloud-Native Student Housing and Mess Finder with Proximity-Based Search and Personalized Recommendations

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Abstract: *This research paper introduces an improved Cloud-based Student Accommodation and Mess Service Finder, which serves as a centralized platform aimed at simplifying the process of locating verified housing and dining options for students. Developed on a serverless AWS architecture that incorporates Lambda, DynamoDB, and Cognito, this system offers a highly scalable and secure environment for students, service providers, and administrators alike. A key aspect of this study is the application of sophisticated location intelligence, utilizing the Haversine formula for accurate proximity-based filtering, alongside a dual-layer geolocation approach that merges browser APIs with IP-based alternatives to guarantee dependable search outcomes across various devices. By incorporating Google Maps and a robust Role-Based Access Control (RBAC) system, the platform effectively tackles market fragmentation, providing verified listings and an automated end-to-end booking management system that enhances transparency and operational efficiency in the process of student relocation. Also an advanced Recommendation Engine that can propose listings based on student preferences and proximity.*

Keywords: Cloud Computing, RoleBased Access Control, Serverless Architecture, Location-Based-Search& Filter, Recommendation system.

I. INTRODUCTION

Relocating to a new city for the purpose of pursuing higher education represents a crucial milestone for students; however, it often commences with the daunting challenge of securing trustworthy accommodation and dining facilities. Students typically rely on unverified listings or informal recommendations, which can result in uncertainty and potential financial pitfalls[1]. Although various digital platforms have sought to remedy this issue, many fall short of offering the comprehensive features necessary for a smooth experience, such as verified provider management and integrated booking systems [2]. This paper introduces an improved "Cloud-based Student Accommodation and Mess Service Finder" that utilizes a serverless AWS architecture to deliver a secure and scalable solution. The system evolves beyond mere listings by integrating Role-Based Access Control (RBAC) and sophisticated location intelligence [3]. By employing the Haversine formula for accurate distance measurement and a dual-layered geolocation strategy that combines browser-based APIs with IP-based fallbacks, the platform guarantees that students can identify the most convenient options "near them" with a high degree of precision. This centralized hub, developed using React.js, AWS Lambda, and DynamoDB, aspires to eliminate the fragmentation present in the current market and create a reliable environment for both students and service providers[4][5].

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II. LITERATURE REVIEW

StaySage is an advanced recommendation system designed for hostel and mess services, built on Node.js and MongoDB. It utilizes a hybrid approach that merges content-based and collaborative filtering techniques to deliver personalized recommendations with an accuracy rate of 80-90%. Notable features encompass JWT-based authentication, Google Maps integration for proximity visualization, and payment gateways that facilitate smooth booking processes. Additionally, the platform features an admin dashboard for managing user interactions and listings. Despite its high efficiency, the system's performance is currently constrained by its reliance on internet connectivity. It is engineered for scalability across multiple cities and is poised for future enhancements, including AI-driven sentiment analysis[6].

This study introduces a cloud-native Software as a Service (SaaS) application aimed at enhancing student housing by replacing outdated legacy systems. The application is built on React.js and Node.js, leveraging an AWS microservices architecture with auto-scaling capabilities to accommodate peak enrolment traffic. It implements a hybrid database approach, utilizing both PostgreSQL and MongoDB to ensure effective data management. Adhering to Agile methodology, the platform underwent validation through User Acceptance Testing (UAT) utilizing the System Usability Scale. The findings revealed a 92% success rate for students in securing room bookings and a 40% decrease in manual administrative tasks. This research underscores the importance of human-centric design in the successful adoption of cloud-based educational tools[7].

Campus Comforts serves as a comprehensive online platform aimed at simplifying the process of finding student housing and dining options. Utilizing a React frontend, an Express backend, and a MongoDB database, this platform offers a user-friendly interface that facilitates location-based searches and filtering. It employs a Weighted Sum Method ranking algorithm to assess hostels based on various factors, including ratings, pricing, and booking frequency. The system promotes a sense of community through a peer-driven rating and review system, enabling students to make well-informed decisions regarding their living arrangements. Administrative management is ensured through a centralized dashboard that oversees user interactions and listing moderation. Ultimately, this initiative seeks to connect local service providers with the student population while improving overall campus welfare[8].

This study presents a content-driven recommendation system designed to enhance the process of selecting hostels and mess facilities for students through sophisticated data analytics and machine learning techniques. The suggested algorithm computes relevance scores by examining multi-dimensional datasets, which encompass factors such as location, pricing, amenities, meal choices, and dietary needs, thereby offering tailored recommendations. The architecture of the system accommodates three key roles: Students, PG owners, and Mess owners, each equipped with specific portals for managing listings or reservations. By incorporating a continuous feedback mechanism and user-generated ratings, the platform improves transparency and facilitates informed decision-making for all parties involved. In conclusion, the system offers a scalable approach to simplify the often complex and time-intensive task of locating appropriate institutional housing and dining options[9].

This study introduces a comprehensive web application developed with React, Node.js, and Supabase aimed at digitizing the process of property group (PG) discovery for urban students. The application incorporates sophisticated search filters that allow users to specify location and budget, in addition to providing secure, role-based dashboards for both tenants and property owners. Security measures are upheld through the use of hashed passwords and JSON Web Token (JWT) authentication. Furthermore, the platform features secure payment gateways and real-time notifications to ensure a smooth booking experience. User trials indicated a high level of reliability, achieving an 85% satisfaction rate during the testing phase. Future objectives include the integration of AI-driven recommendations and the verification of government-issued identification[10].

III. PROBLEM STATEMENT

The rising trend of students migrating to urban centers for higher education has resulted in a substantial demand for affordable housing and reliable mess services. Nevertheless, the existing information ecosystem is significantly

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fragmented, compelling students to depend on unverified recommendations from peers, local advertisements, and unreliable online listings. This absence of a centralized and verified platform frequently results in considerable stress, financial risks, and less than ideal living conditions [11].

Moreover, conventional manual booking and communication methods are inefficient, susceptible to errors, and lack real-time updates on availability. On the side of service providers, proprietors of small-scale accommodations and mess services encounter limited market visibility and do not possess a cohesive digital tool to effectively manage their listings and booking inquiries. Additionally, most current digital solutions fail to deliver accurate proximity-based search results, highlighting an urgent need for a scalable, cloud-based platform that incorporates precise location intelligence and secure, role-based management [12].

IV. PROPOSED SYSTEM

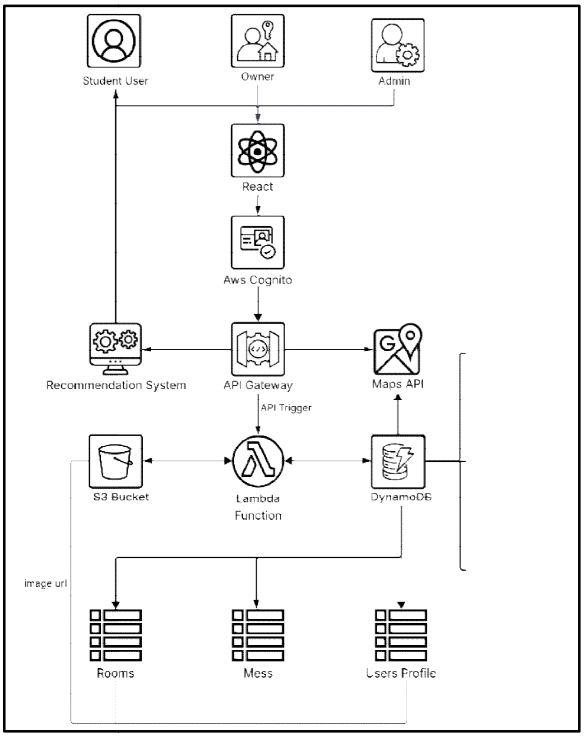

Fig. 1. System Architecture

The proposed system is built upon a robust cloud-native serverless architecture aimed at delivering a scalable and secure environment for managing student accommodation and mess services.The workflow initiates at the Presentation Layer, where Students, Owners, and Admins engage through a React-based frontend, with AWS Cognito facilitating secure authentication and Role-Based Access Control (RBAC).All user requests are directed through AWS API Gateway, serving as a secure entry point that triggers AWS Lambda functions to execute serverless business logic [13].

This processing layer is coupled with a Recommendation System to enable personalized discovery and incorporates a Maps API for accurate location-based visualization for users.For data persistence, the system employs Amazon DynamoDB to handle structured NoSQL tables for Users, Bookings, Rooms, Mess facilities, and User Profiles.Moreover, high-resolution property images and assets are securely stored in Amazon S3 Buckets, with image URLs linked back to the database, ensuring a high-performance, data-driven user experience[14].

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V. MODULES DEVELOPED

5.1. User Authentication & Role Management

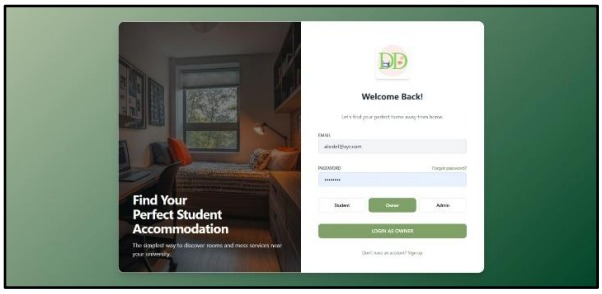

Fig. 2. Login Page

This module oversees secure user onboarding and access control via AWS Cognito. It employs Role-Based Access Control (RBAC) to establish specific permissions for Students, Owners, and Administrators. The system enforces customized entry points, ensuring that users can only access features pertinent to their designated role [15].

5.2. Listing and Approval Workflow

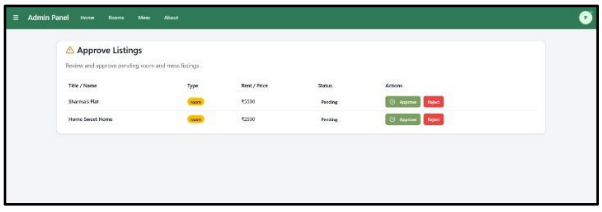

Fig. 3. Approval Workflow

Service providers (Owners) are able to create and manage comprehensive listings for rooms and mess services, which include descriptions, pricing, and facility checklists. To uphold platform integrity, all new listings are subjected to a compulsory multistage approval process, requiring an Administrator to review and authorize submissions prior to their public visibility[16].

5.3. Profile Management

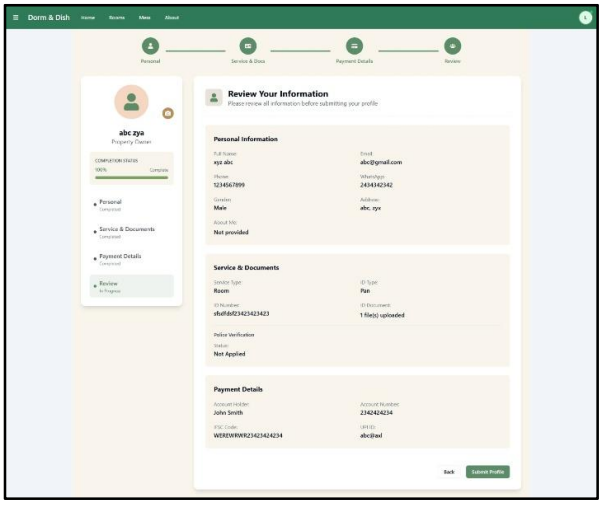

Fig. 4. Profile Completion Page

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This module is responsible for the creation and upkeep of user profiles, which is essential for accessing fundamental platform features. It enables students to manage their personal information and allows owners to furnish detailed information about their services, thereby enhancing trust and transparency [17].

5.4. Booking Management Lifecycle

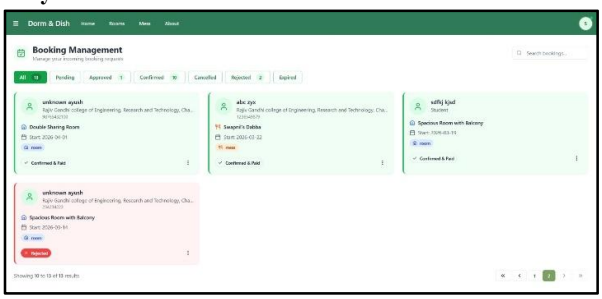

Fig. 5. Booking Lifecycle

The platform incorporates an automated, comprehensive booking management system that supersedes manual coordination. Students can initiate secure booking requests, while owners can monitor, manage, and respond to these requests in real-time through specialized dashboards [18].

5.5. Location-Based Search and Filter

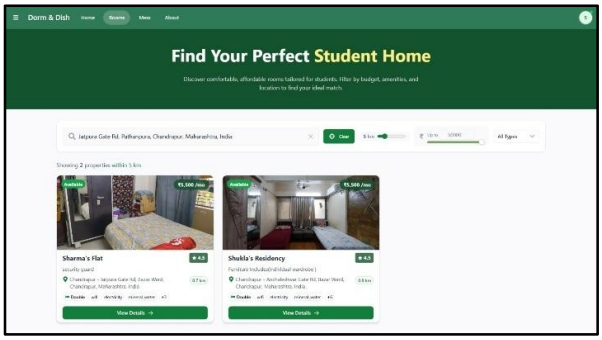

Fig. 6. Search and Filter

This essential module facilitates advanced service discovery through the integration of Google Maps API. It includes a "Near Me" feature that utilizes a dual-layer geolocation approach (Browser API and IP-based fallback) and the Haversine formula to accurately filter and sort listings within a 1–20 km radius based on user proximity[19].

5.6. Ratings and Review

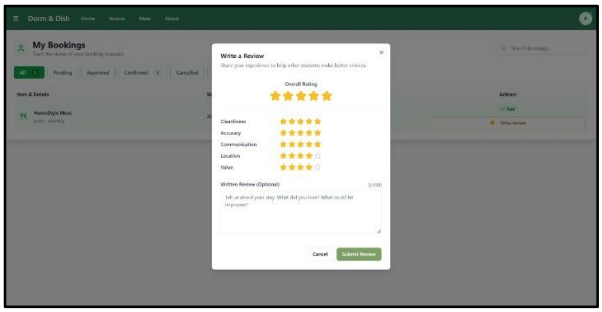

Fig. 7. Ratings and Review

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To cultivate a trustworthy community, this module enables students to offer feedback and evaluate the services they have used. These reviews, driven by peers, assist other students in making well-informed choices and motivate service providers to uphold high quality standards [20].

5.7. Payment Interface

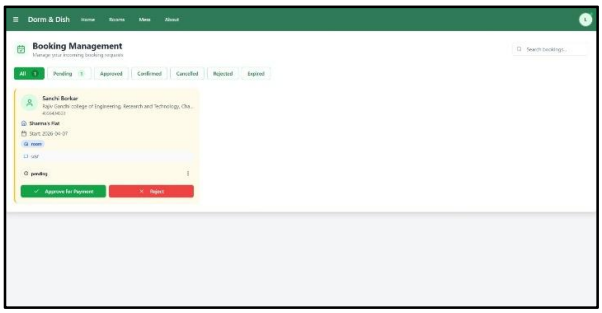

Fig. 8. Payment Interface

The system incorporates secure prototype payment interface modules to ensure smooth financial transactions for room and mess reservations. It guarantees that payments are processed through encryptedchannel, creating a safe and dependable environment for both students and service providers[21].

5.8. Recommendation Integration

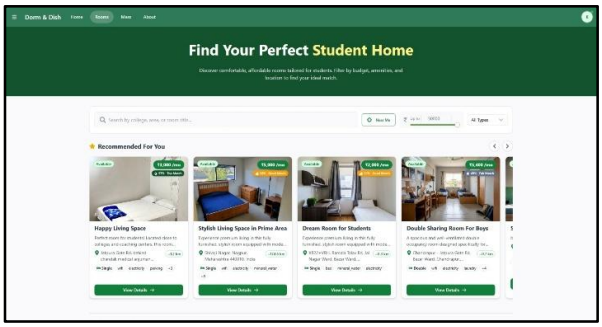

Fig. 9. Recommedation System

As a component of the system's intelligent service hub architecture, this module is designed to facilitate data-driven discovery. It establishes the foundation for a Recommendation Engine that can propose listings based on student preferences and proximity, advancing towards a more tailored user experience[22].

VI. FUTURE SCOPE

The platform is set to incorporate an automated image processing pipeline that utilizes Amazon Rekognition and AWS Lambda, facilitating real-time moderation and automatic tagging of property features within DynamoDB. This automation minimizes manual effort and enhances search accuracy, while also enabling a tailored Recommendation Engine that responds to individual user behaviors. These innovations are designed to create a highly secure, efficient, and data-driven digital environment for all stakeholders.

Subsequent versions will incorporate Government ID Verification through official APIs to mitigate fraud and establish a secure environment for students. An integrated Secure Payment Gateway and AI-powered Chatbots will be employed to enable automated rent tracking and continuous communication around the clock. These innovations are designed to close the trust gap, thereby evolving the platform into a more inclusive and dependable digital ecosystem for all parties involved.

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VII. CONCLUSION

The Cloud-based Student Accommodation and Mess Service Finder signify a notable progression in the digitization of the disjointed search for student housing and dining options. By utilizing a serverless AWS architecture that incorporates Lambda and DynamoDB, this platform offers a highly scalable and economically viable solution for various stakeholders. This study particularly emphasizes the efficacy of location intelligence, employing the Haversine formula alongside a dual-layered geolocation strategy to provide accurate, proximity-based outcomes within a nearest rangewithin threshold value.

The adoption of Role-Based Access Control (RBAC) and a compulsory administrative approval process guarantees a secure and reliable environment for both students and service providers. Additionally, the automated booking lifecycle supersedes ineffective manual coordination, thereby improving transparency and alleviating the administrative load on property owners. In conclusion, this initiative illustrates how contemporary cloud technologies and intelligent algorithms can be integrated to establish a dependable, student-focused digital ecosystem that streamlines the relocation experience.

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