**A**

***PROJECT REPORT***

*on*

***Zostels (Hostel Management System)***

*Submitted in partial fulfilment of the requirements for the degree of*

**BACHELOR OF TECHNOLOGY**



Session: - 2024

Under Guidance of

Mr. Aaditya Maheshwari Assistant Professor

Dept. of CSE TINJRIT, Udaipur

Submitted by

Himanshu Hada (20ETCCS052) Piyush Dave (20ETCCS087) Lakshit Kumawat (20ETCCS066) Pratyush Chhajed (20ETCCS300) Khetesh Suthar (20ETCCS061) Bharat Kumar (20ETCCS017) Divyam Saini (20ETCCS036)

8th Sem (CSE)

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY, UDAIPUR-313001**

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**2024**



Department of Computer Science and Engineering Techno India NJR Institute of Technology, Udaipur-313001

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## Examiner Certificate

This is to certify that the following student **Himanshu Hada**, **Pratyush Chhajed**, **Lakshit Kumawat**, **Piyush Dave, Bharat Kumar**, **Khetesh Suthar, Divya Saini** of final year B.Tech. (Computer Science and Engineering), was examined for the project work titled **Zostels (Hostel Management System)** during the academic year 2023 – 2024 at Techno India NJR Institute of Technology, Udaipur

#### Remarks:

**Date:**

Signature Signature

(**Internal Examiner**) (**External Examiner**) Name: - Name: -

Designation: - Designation: -

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Organization: - Organization: -

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# Chapter 1: INTRODUCTION

### Name of Project:

Zostels ( Hostel Management System)

### Problem Statement:

The existing hostel management systems face significant challenges, including inefficient tenant registration and room allocation processes, limited visibility into room and bed occupancy, manual expense tracking leading to difficulties in managing costs, complex and error-prone rent calculation procedures, absence of reporting tools for data analysis, and concerns regarding security and data integrity. These issues contribute to operational inefficiencies, potential revenue loss, and difficulties in making informed decisions. To overcome these challenges, a comprehensive Hostel Management System is proposed to automate processes, enhance data accuracy, and provide a user-friendly interface for efficient hostel administration.

### Objective of this Project:

#### User-Friendly Interface:

* Develop an intuitive interface for administrators and tenants.
* Simplify interactions to enhance usability and efficiency.

#### Continuous Improvement:

* Commit to ongoing refinement based on user feedback and evolving requirements.
* Regularly update features and functionalities to meet changing needs.

#### Financial Transparency:

* Provide clear insights into expenses, rents, and financial aspects of hostel management.
* Promote accountability and informed decision-making through transparent financial reporting.

#### Efficient Resource Management:

* Streamline allocation of resources such as rooms, amenities, and staff.
* Optimize resource utilization to maximize efficiency and minimize wastage.

#### Automated Processes:

* Implement automation for routine tasks such as rent collection, maintenance requests, and room assignments.
* Reduce manual effort and errors through automated processes..

#### Comprehensive Reporting and Analysis:

* Generate detailed reports on occupancy rates, revenue, maintenance schedules, and other key metrics.
* Enable data-driven decision-making through insightful analysis of hostel performance and

trends.

### Features:

#### Tenant Management:

* + Profile creation and management for tenants.
  + Room allocation and transfer functionalities.
  + Rent payment tracking and reminders.

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#### Room Management:

* + Room inventory management, including availability and occupancy status.
  + Room condition tracking and maintenance scheduling.
  + Automated room assignment based on predefined criteria.Time and Participants

#### Financial Management:

* + Rent collection and invoicing.
  + Expense tracking and management.
  + Financial reporting and analysis tools.

#### Maintenance Management:

* + Maintenance request submission and tracking.
  + Scheduled maintenance planning and execution.
  + Supplier and contractor management for repair services.

#### Security and Access Control:

* + User authentication and role-based access control.
  + Secure data encryption and privacy measures.
  + Monitoring and logging of system activities.

### Technologies Used: -

#### Next.js:



Fig 1: - Next.js Logo

* + React framework for building server-side rendered and statically generated web applications.
  + Enables efficient rendering and navigation for a seamless user experience.

#### Tailwind CSS:

Fig 2: - Tailwind CSS Logo

* + Utility-first CSS framework for quickly building custom designs.
  + Provides a flexible and responsive layout system for consistent UI across devices.

#### TypeScript:

Fig 3: - TypeScript Logo

* + Typed superset of JavaScript for enhanced code quality and developer productivity.
  + Enables static type checking to catch errors early and improve code maintainability.

#### PostgreSQL:

* + Open-source relational database management system (RDBMS) for storing and managing structured data.
  + Offers robust features for data integrity, transactions, and scalability.

#### GraphQL API:

* + Query language and runtime for building flexible and efficient APIs.
  + Facilitates precise data fetching and reduces over-fetching by allowing clients to request only the needed data.

#### Node.js:



Fig 4: - Node.js Logo

* + Key features of Node.js include its event-driven architecture and non-blocking I/O model, which make it highly efficient for handling concurrent operations. This allows Node.js to handle a large number of connections simultaneously without the overhead of traditional thread-based concurrency.

### Advantages and Disadvantages of Technologies Used: -

#### Next.js:

**Advantages:**

* + Server-Side Rendering (SSR) and Static Site Generation (SSG): Next.js provides built-in support for SSR and SSG, enhancing performance and SEO.
  + Automatic Code Splitting: Optimizes page loading times by splitting JavaScript bundles.
  + Client-Side Routing: Supports client-side navigation for smoother user experiences.

#### Disadvantages:

* + Learning Curve: Beginners might find the learning curve steep due to its advanced features.
  + Complexity: Handling SSR and SSG can add complexity to the project setup.
  + Limited Community Support: Compared to React, Next.js has a smaller community, resulting in fewer resources and community support.

#### Tailwind CSS:

**Advantages:**

* + Utility-First Approach: Tailwind CSS offers a utility-first approach, allowing for rapid development and easy customization.
  + Responsive Design: Simplifies the creation of responsive layouts with its utility classes.
  + Minimal CSS File Size: Only includes the CSS classes you use, resulting in smaller file sizes.

#### Disadvantages:

* + Verbose HTML: Using utility classes extensively can lead to verbose HTML markup.
  + Design Consistency: Requires discipline to maintain design consistency across the

application.

#### TypeScript:

**Advantages:**

* + Static Typing: Helps catch errors during development, improving code quality and maintainability.
  + Enhanced Tooling Support: Offers better IDE support, code navigation, and refactoring tools.
  + Improved Documentation: TypeScript encourages developers to write more descriptive code, leading to better documentation.

#### Disadvantages:

* + Learning Curve: Developers unfamiliar with static typing may face a learning curve.
  + Compilation Overhead: Requires compilation to JavaScript, which adds overhead to the development process.
  + Library Support: While TypeScript has wide adoption, some libraries may lack TypeScript support or typings.

#### PostgreSQL:

**Advantages:**

* + ACID Compliance: Ensures data integrity and reliability through Atomicity, Consistency, Isolation, and Durability.
  + Scalability: Supports horizontal scalability through replication and partitioning.
  + Rich Feature Set: Offers advanced features like JSON support, full-text search, and geospatial queries.

#### Disadvantages:

* + Complexity: Setting up and managing PostgreSQL databases can be complex, especially for beginners.
  + Resource Intensive: Requires significant resources, especially for large-scale deployments.
  + Learning Curve: Requires familiarity with SQL and database management concepts.

#### Graphql API:

**Advantages:**

* + Efficient Data Fetching: Allows clients to request only the data they need, reducing over- fetching and under-fetching.
  + Strong Typing: GraphQL schemas provide strong typing, ensuring type safety and reducing runtime errors.
  + Introspection: Enables clients to query the schema for available types and fields, facilitating self-documentation and tooling.

#### Disadvantages:

* + Complexity: Setting up and maintaining a GraphQL server can be complex, especially for beginners.
  + Caching: Caching strategies can be more complex compared to REST APIs.
  + Versioning: Managing schema changes and versioning can be challenging in GraphQL APIs.

#### Node.js:

**Advantages:**

* + Non-blocking I/O operations for high scalability.
  + Fast execution with V8 engine for optimal performance.
  + Single programming language (JavaScript) for both front end and back end.
  + Large ecosystem of npm packages for rapid development.
  + Vibrant community support for learning and troubleshooting.

#### Disadvantages:

* + Callback hell can lead to complex code structures.
  + Unstable APIs may cause compatibility issues with updates.
  + Limited suitability for CPU-intensive tasks due to single-threaded nature.
  + Debugging and profiling can be challenging, especially in production.

# Chapter 2: Implementation

## Implementation Overview

The implementation of the Hostel Management System encompasses several key aspects, including architecture design, backend development, frontend development, and database management. Each aspect plays a crucial role in building a comprehensive and efficient system to manage hostel operations effectively.

#### Architecture:

* + In designing the architecture of the Hostel Management System, we focused on creating a user-friendly and intuitive interface for administrators and tenants. To achieve this, we utilized Figma, a collaborative interface design tool, to wireframe and prototype the entire UI. This allowed us to visualize and iterate on the layout, components, and interactions, ensuring a seamless user experience.

#### Backend Development:

* + For the backend development of the Hostel Management System, we adopted a GraphQL API approach for efficient data fetching and manipulation. This enabled us to streamline communication between the client and server, reducing over-fetching of data and improving performance. Additionally, TypeORM entities were used to define the database schema and create tables in PostgreSQL. This ensured data integrity and provided a structured approach to managing relational data within the system.

#### Frontend Development:

* + In frontend development, our focus was on creating a visually appealing and responsive user interface using Tailwind CSS and Next.js framework. Tailwind CSS allowed for rapid development and customization of UI components, while Next.js provided server-side rendering and routing capabilities for improved performance and SEO. This combination of technologies enabled us to build a modern and efficient frontend for the Hostel Management System.

#### Database Management:

* + For database management, we opted to use Supabase, an online database manager built on top of PostgreSQL. Supabase simplified the setup and management of our database, offering features such as authentication, real-time subscriptions, and data querying out of the box. Leveraging PostgreSQL under the hood, Supabase provided a scalable and reliable database solution for our project, ensuring data integrity and accessibility.

**Working: -**

The working of the project involves a series of steps to provide personalized leisure The Hostel Management System is designed to streamline and automate various aspects of hostel operations, catering to the needs of administrators and tenants. The system facilitates efficient management of tenant information, room allocations, rent payments, maintenance requests, and communication within the hostel community.

#### Tenant Management:

* + Tenants can create and manage their profiles within the system, providing essential information such as contact details, emergency contacts, and personal preferences.
  + Administrators can allocate rooms to tenants based on availability and specific criteria,

ensuring optimal occupancy and accommodation arrangements.

* + Tenants can view their room details, including roommates, amenities, and occupancy status, through their profile dashboard.

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#### Room Management:

* + Rooms can be categorized and filtered based on various attributes such as occupancy status, simplifying room allocation and management tasks.
  + Administrators have access to a comprehensive dashboard for managing room inventory,

conditions, and assignments.

#### Financial Management:

* + Rent payments are facilitated through the system, allowing tenants to view their rent dues, make payments online, and receive payment receipts.
  + Administrators can track rent payments, generate rent invoices, and monitor financial

transactions within the hostel.

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#### Security and Privacy:

* + User authentication and access control mechanisms are implemented to ensure secure access to the system and protect sensitive data.

### Evaluation:

#### Performance Evaluation:

* + **Response Time:** Measure the system's response time for common actions such as tenant profile creation, room allocation, rent payments, and maintenance requests. Ensure that response times meet acceptable thresholds for a seamless user experience.
  + **Scalability:** Assess the system's ability to handle increasing numbers of tenants, rooms,

and transactions without degradation in performance. Test the system under load to identify scalability limitations and optimize resource utilization.

#### Usability Evaluation:

* + **User Interface (UI) Design:** Conduct usability tests to evaluate the intuitiveness and user- friendliness of the system's interface. Gather feedback from administrators and tenants regarding the ease of navigation, clarity of labels, and accessibility of features.
  + **User Experience (UX):** Analyze user interactions with the system to identify pain points,

bottlenecks, and areas for improvement. Ensure that common tasks such as room allocation, rent payments, and maintenance requests are streamlined and intuitive.

#### Functional Evaluation:

* + **Feature Completeness:** Verify that the system's features and functionalities align with the defined requirements and objectives. Assess the completeness and accuracy of tenant management, room management, financial management, and communication tools.
  + **Error Handling:** Evaluate the system's error handling mechanisms for robustness and

reliability. Ensure that error messages are informative, actionable, and guide users towards resolution.

#### Security Evaluation:

* + **Data Security:** Assess the effectiveness of the system's security measures in safeguarding sensitive data such as tenant information, financial records, and communication logs. Conduct security audits to identify vulnerabilities and implement

appropriate safeguards.

* + **Access Control:** Evaluate the system's access control mechanisms for enforcing user authentication and authorization. Ensure that only authorized users have access to sensitive functionalities and data.

# Chapter 3: Optimization

### Performance Optimization:

* + **Database Indexing:** Optimize database queries by creating appropriate indexes on frequently queried fields. This improves query performance and reduces response times for data retrieval.
  + **Caching:** Implement caching mechanisms to store frequently accessed data in memory or

a separate caching layer. This reduces the need for repetitive database queries and improves overall system performance.

* + **Query Optimization:** Analyze and optimize GraphQL queries to minimize unnecessary

data fetching and processing. Use techniques such as pagination, filtering, and batching to optimize query performance.

### Usability Optimization:

* + **User Interface Refinement:** Continuously refine the user interface based on user feedback and usability testing. Simplify navigation, streamline workflows, and improve visual clarity to enhance user experience.
  + **Responsive Design:** Ensure that the system's interface is responsive and accessible

across various devices and screen sizes. Adopt responsive design principles to accommodate mobile users and improve accessibility.

### Functional Optimization:

* + **Feature Prioritization:** Prioritize and focus on implementing high-impact features that address critical user needs and pain points. Allocate resources effectively to deliver maximum value within the available time and budget.
  + **Refactoring:** Refactor codebase to improve maintainability, readability, and scalability.

Identify and eliminate code smells, performance bottlenecks, and technical debt to ensure long-term sustainability.

### Security Optimization:

* + **Security Audits:** Conduct regular security audits to identify and address vulnerabilities in the system. Perform penetration testing, code reviews, and vulnerability scans to assess security posture and mitigate risks.

# Conclusion

## Conclusion:

The Hostel Management System represents a comprehensive solution designed to streamline and optimize hostel operations, catering to the needs of administrators, tenants, and staff members.

Through the implementation of modern technologies and best practices, the system offers a user- friendly interface, efficient workflows, and robust functionalities to enhance the overall hostel management experience.

Throughout the development process, we have prioritized user feedback, usability testing, and continuous improvement to ensure that the system meets the evolving needs and expectations of its users. By leveraging technologies such as Next.js, Tailwind CSS, TypeScript, PostgreSQL, and GraphQL API, we have created a scalable, performant, and secure platform for managing hostel operations effectively.

The system's architecture facilitates seamless communication between the client and server, enabling efficient data fetching, manipulation, and presentation. Features such as tenant management, room allocation, rent payments, maintenance tracking, and communication tools have been implemented to streamline administrative tasks and enhance tenant experience.

Moving forward, we recognize the importance of ongoing optimization, maintenance, and support to ensure the long-term success and sustainability of the Hostel Management System. By embracing agile development practices, continuous improvement initiatives, and user-centric design principles, we are committed to delivering a reliable, efficient, and user-friendly solution for hostel management needs.

In conclusion, the Hostel Management System serves as a testament to our dedication to innovation, efficiency, and user satisfaction. We are confident that the system will empower hostel administrators, tenants, and staff members alike, facilitating smoother operations, better communication, and enhanced overall experience within the hostel community.

## Advantages & Disadvantages:

### Advantages:

#### Efficiency:

* + The system streamlines hostel operations by automating administrative tasks such as room allocation, rent collection, maintenance tracking, and communication, leading to improved efficiency and productivity.

#### User-Friendly Interface:

* + With a user-friendly interface designed using modern UI/UX principles, the system offers intuitive navigation, clear information presentation, and easy accessibility for administrators, tenants, and staff members.

#### Scalability:

* + Leveraging technologies such as Next.js, Tailwind CSS, and GraphQL API, the system is designed to be scalable, accommodating increasing numbers of tenants, rooms, and transactions without sacrificing performance or user experience.

#### Transparency:

* + The financial management features provide clear insights into rent payments, expenses, and financial transactions, promoting accountability and informed decision-making within the hostel management framework.

### Disadvantages:

#### Technical Dependencies:

* + The project relies on various technologies and dependencies such as Next.js, Tailwind

CSS, TypeScript, PostgreSQL, and GraphQL API. Any changes or updates to these technologies may introduce compatibility issues or require additional development efforts to maintain compatibility.

#### Data Security Risks:

* + While efforts are made to implement robust security measures, including user authentication, data encryption, and access control, the system may still be vulnerable to security threats such as data breaches, unauthorized access, or cyberattacks, necessitating ongoing vigilance and security updates.

## Future Scope:

#### Integration with Smart Technologies:

* + Explore the integration of smart technologies such as IoT-enabled devices and sensors to enhance security measures and automate certain tasks within the hostel premises

#### Mobile Application Development:

* + Develop a dedicated mobile application for administrators and tenants enabling them to access the system on-the-go and perform tasks conveniently from their smartphones or tablets

#### Enhanced Reporting and Data Analytics:

* + Further enhance reporting tools and data analytics capabilities to provide more in-depth insights into hostel management trends and patterns This can aid administrators in making strategic decisions

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