

Asraya Society Hub: A Centralized Society Management and Smart Living

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Abstract - The Asraya Society Hub is a web-based system developed to streamline the administrative, communication, and operational needs of residential communities. Traditional society management depends largely on scattered tools and manual coordination, which often results in delays, poor data traceability, and reduced resident engagement. Asraya introduces a unified, cloud-enabled platform featuring dedicated portals for administrators and residents. Developed using Next.js, React, TypeScript, Firebase, and Tailwind CSS, the platform offers real-time data synchronization, structured workflows, AI-assisted support, automated billing, complaint tracking, parking allocation, community polls, and emergency alerts. The system enhances operational efficiency, improves transparency, and strengthens participation within the community, establishing itself as a scalable model for modern housing societies.

Keywords: Society Management System, Cloud-Based Application, Real-Time Synchronization, Firebase, Next.js, AI-Assisted Support, Community Engagement, Automated Billing, Complaint Tracking, Smart Housing Solutions.

1. INTRODUCTION

Residential communities face increasing operational complexity as they expand, making effective communication, financial management, facility oversight, and issue tracking essential. Conventional methods such as physical registers, messaging groups, and spreadsheet-based tracking limit transparency and result in data fragmentation. Cloud-backed platforms offer the opportunity to centralize information, automate repetitive workflows, and improve accessibility for residents and administrators alike. Asraya Society Hub was designed to address these challenges by offering a role-based system that separates administrative tools from resident-facing features, ensuring clarity and usability.

The platform leverages real-time synchronization, modern UI frameworks, and AI-driven assistance to support essential tasks while maintaining strong security and scalability.

The Asraya Society Hub is designed to bridge this gap by providing a modern, centralized web application that integrates all major society functions under one platform. Unlike conventional systems that operate in isolation, Asraya offers a real-time, cloud-powered, and user-centric solution that enhances convenience for residents and simplifies operations for administrators. The platform operates on a role-based structure, offering two distinct portals—one for Admins and one for Tenants—ensuring that users only access the tools and information relevant to their responsibilities.

1.1 Research Objectives

The aim of this project is to design a complete society management system that enhances communication, automates common tasks, and integrates IoT-based functionalities for real-time monitoring. The project intends to improve the living standards of residents by offering digital access to essential services while giving administrators a centralized, easy-to-manage platform.

1.2 Operational Modes

The Asraya Society Hub operates in two separate user modes—Tenant Mode and Admin Mode—each providing a dedicated set of tools and services.

1. **Tenant Mode** In Tenant Mode, residents can manage most of their society-related activities digitally. They can submit complaints, complete bill payments, book amenities, view announcements, respond to polls, and interact with an AI assistant whenever they need help. The dashboard provides a customized overview of their important updates.

2. Admin Mode Admin Mode is designed as the administrative control center. It gives the management team the tools required to oversee the entire society—from apartments and residents to complaints, payments, votes, and smart devices. Every action made by the admin reflects instantly on tenant dashboards due to real-time cloud syncing.

2. SYSTEM ARCHITECTURE AND METHODOLOGY

The Asraya Society Hub follows a modular architecture combining Next.js for the frontend, Firebase for the backend, and IoT modules that interact through the Blynk cloud. This multi-layered structure ensures speed, reliability, and a seamless user experience.

2.1 Hardware Configuration

This project uses multiple IoT hardware components to automate parking, water-level monitoring, and lighting.

Smart Parking Hardware

- ESP8266 / NodeMCU microcontroller
- Ultrasonic or IR sensors to detect vehicle presence
- Indicator LEDs to show slot availability
- Basic power supply and Wi-Fi access.

Water-Level Monitoring Hardware

- Ultrasonic water-level sensor
- ESP32 or NodeMCU microcontroller
- Blynk IoT interface for real-time updates
- Water tank setup

Smart Light Control Hardware

- PIR or LDR sensor for motion/light detection
- Relay module for switching lights
- ESP8266 controller for wireless operation

General Requirements

- Stable Wi-Fi connection
- Smartphone or laptop for dashboard access.

2.2 Operational Principles

The system works using a continuous cycle of sensing, processing, transmitting, and updating. Each IoT module collects real-time data through sensors, processes it through the microcontroller, and sends it to the Blynk cloud. Meanwhile, the Asraya application fetches these values and displays them instantly on the user interface.

IoT Operation Flow

- Sensors detect environmental changes.
- Microcontroller reads and processes sensor values.
- Data is uploaded to the cloud using Wi-Fi.
- Updated readings appear on the user dashboard automatically.

Web Application Flow

- User performs actions through forms or dashboards.
- Data is stored and updated in Firebase Firestore.
- Firestore triggers instant UI updates across user

2.3 Software Implementation

Frontend (Next.js)

- Uses React and TypeScript for fast, typed components
- UI built with ShadCN and Tailwind CSS
- Real-time data displayed using Firestore listeners Backend (Firebase)
- Firestore used for storing all society-related data
- Authentication manages users and roles securely
- Firebase Hosting deploys the application seamlessly

AI Integration

- Genkit connects with Google Gemini
- Chat-based assistant helps tenants with society rules, booking info, and general queries.

IoT Software

- Arduino IDE for ESP programming
- Blynk Cloud for sensor monitoring and device automation.

2.4 Block Diagram

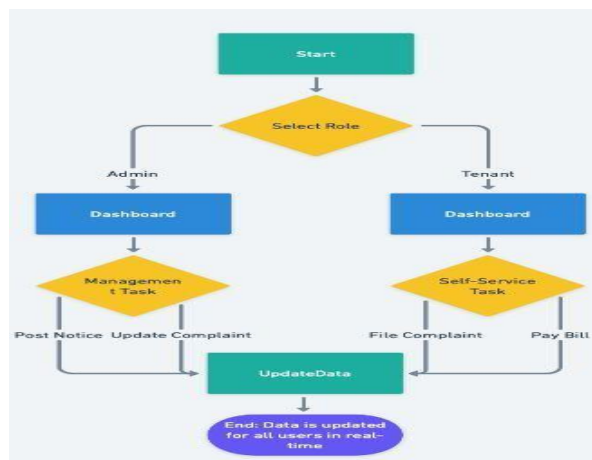


Fig -1: block diagram

2.5 Circuit Diagram

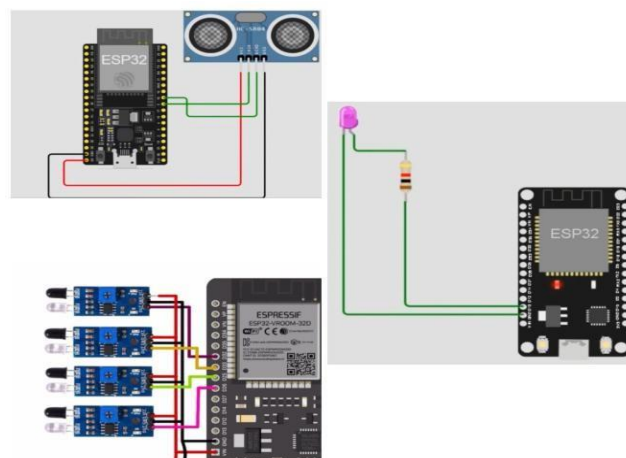


Fig. -2: Circuit architecture

3. RESULTS AND PERFORMANCE ANALYSIS

The Asraya Society Hub was evaluated across software performance and IoT hardware responsiveness to validate its reliability in real-world society operations. The combined system—cloud-based web application and physical IoT modules—demonstrated smooth synchronization, quick response times, and accurate sensor behavior under multiple test conditions.

3.1 Sensor Response Characteristics

During testing, the sensors demonstrated stable and rapid responses. Ultrasonic sensors measured distances accurately with minimal error. Water-level readings updated within milliseconds, and motion sensors reacted instantly to any movement, ensuring efficient automation.

3.2 Control System Performance

The IoT devices responded to user commands in less than a second, ensuring smooth automation. Firestore updates appeared across all connected users immediately, confirming the real-time functionality of the application. Admin operations—such as complaint updates and notice publishing—reflected instantly for tenants



Fig 3.2.1: Complete circuit setup of IoT-Based

3.3 Comparative Analysis

Compared to traditional society operations, Asraya offers major improvements:

- Manual paperwork is eliminated
- Complaints and bills are tracked digitally
- IoT automation simplifies parking, lighting, and water Monitoring
- Instant communication replaces delay-prone notice boards
- AI reduces repetitive queries to admin Overall, the new system delivers faster, more transparent, and more reliable management.

4. CONCLUSION

The Asraya Society Hub successfully integrates IoT-based automation, cloud-backed data management, and AI-driven support into a single digital platform. It transforms traditional society operations into a streamlined, modern, and highly

responsive system. The platform enhances administration, improves resident experiences, and ensures scalability for future expansion. With reliable performance and user-friendly design, Asraya serves as a practical model for smart residential community management.

5. REFERENCES

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BIOGRAPHIES



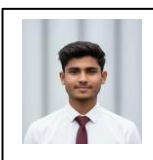
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