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Society Network: An Integrated Platform for Smart Community Management and Hyperlocal Services

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Abstract: ***The rapid pace of urbanization has fundamentally altered the landscape of residential living, demanding smarter, more scalable housing society management. As residential complexes grow, traditional paper-based administrative systems have become increasingly inefficient. Current challenges plague managing committees and residents alike, resulting in operational chaos, financial opacity, communication breakdowns, and a heavy reliance on fragmented third-party applications for everyday hyperlocal services. To address these systemic issues, this paper introduces "Society Network," a comprehensive, cloud-based web application built upon a robust 3-tier architecture. Utilizing a React.js frontend and a Supabase (PostgreSQL) Backend-as-a-Service (BaaS) infrastructure, the platform seamlessly automates maintenance billing, grievance tracking, and administrative oversight. The system's most significant innovation is its integrated "One-Stop" marketplace, which empowers residents to securely discover real estate and book verified home services (e.g., deep cleaning, packing and moving) directly within their community portal. Post-deployment evaluations demonstrated that the Society Network successfully eliminated manual accounting errors, enabled highly secure multi-society scaling through advanced access controls, and dramatically boosted overall resident satisfaction by unifying their digital living experience.***

Keywords: Society Management System, Smart Community Ecosystem, Role-Based Access Control (RBAC), Backend-as-a-Service (BaaS), Integrated Hyperlocal Marketplace.

I. INTRODUCTION

As urban centers experience unprecedented growth, residential complexes have scaled rapidly, often accommodating hundreds or even thousands of residents. This massive expansion has rendered traditional, manual management techniques fundamentally obsolete, creating a pressing need for digital transformation within community administration.

1) *Society Management Systems:* A Society Management System (SMS) acts as the operational backbone of a residential community. It is a software ecosystem designed to handle administrative, financial, and daily operational tasks. Traditionally, managing committees relied on cumbersome physical ledgers to track maintenance fees, physical notice boards for community announcements, manual logbooks for security, and paper registers for recording resident complaints.
2) *Traditional Challenges:* Despite the digitalization of many other sectors, a surprising number of housing societies still depend on these archaic, paper-reliant methods. This reliance introduces severe inefficiencies: physical payment tracking frequently leads to financial opacity and human error, critical notices are routinely ignored or missed by busy residents, and maintenance complaints are often lost in the shuffle, leading to frustration and a lack of accountability.
3) *Objectives:* The "Society Network" was conceptualized to resolve these exact pain points. The primary objective is to digitalize and centralize community operations through an intuitive web application. The platform aims to enforce strict security via Role-Based Access Control (RBAC), ensure rapid grievance resolution through digital ticketing, and—most innovatively—incorporate a built-in hyperlocal marketplace that transforms the application from a mere administrative tool into a holistic lifestyle platform.

II. LITERATURE REVIEW

A comprehensive review of existing property management and web architecture literature reveals significant technical advancements, yet highlights a persistent gap in creating unified residential micro-economies.

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1) *Cloud Migration and Financial Transparency:* Recent studies emphasize the transition to centralized cloud ecosystems for housing management. Kumar et al. [1] demonstrate that cloud-based management systems drastically reduce administrative overhead and improve financial data reliability in urban housing. Moreover, their study highlights how cloud ecosystems foster real-time connectivity and transparency between managing committees and residents. However, the primary limitation of their proposed model is its strictly inward-looking focus, failing to integrate the community with external service ecosystems.
2) *Component Architecture and BaaS Efficiency:* To construct scalable cloud platforms, developers must carefully evaluate frontend and backend architectures. Larcher and Gritsch [4] emphasize that React.js enables high modularity and code reusability, significantly accelerating development cycles for complex user interfaces. For data management, Kratzke [5] advocates transitioning from monolithic servers to serverless Backend-as-a-Service (BaaS) to reduce operational costs. This is supported by Chen and Wang [6], whose comparative study validates Supabase for combining robust PostgreSQL relational data integrity with real-time synchronization. The drawback of these architectural studies [4], [5], [6] is their generalized nature; they evaluate infrastructure broadly rather than proposing specialized workflows tailored to the complex, multi-tenant data structures of housing societies.
3) *Security and Multi-Tenant Isolation:* Securing multi-tenant cloud platforms against cross-tenant data leakage is a critical operational requirement. Lee et al. [2] explore the implementation of dynamic Role-Based Access Control (RBAC) to ensure strict data isolation in shared web applications. While their security framework is technically robust for preventing unauthorized access, its limitation lies in its generic approach. It does not address the highly nuanced, multi-tiered hierarchical permissions (e.g., Super Admin, Secretary, Resident, Staff) required for localized residential administration.
4) *Proactive vs. Reactive Maintenance:* Efficient resolution of society issues is a cornerstone of community living. Deshmukh and Joshi [8] propose predictive maintenance models for smart buildings using historical data analytics, advocating for a shift from reactive repairs to proactive asset management to reduce long-term costs. The primary drawback of their research is its strict confinement to physical building IoT and hardware analytics. It entirely bypasses the human-in-the-loop element—such as the digital ticketing and transparent grievance redressal mechanisms needed by everyday residents and maintenance staff.
5) *The Hyperlocal "Micro-Economy" Trust Factor:* Attempts to expand residential applications beyond basic administration remain highly fragmented. Agarwal and Verma [3] note that internalizing real estate discovery within community platforms leverages existing user trust, significantly improving retention. Similarly, Sharma and Gupta [7] outline how integrating hyperlocal e-commerce empowers the surrounding gig economy and adds immense convenience for residents. However, their studies primarily identify these economic opportunities and integration challenges rather than delivering a cohesive, deployable software architecture that unifies these services.

Despite these individual advancements across cloud efficiency, component architecture, and smart maintenance, a critical functional limitation persists: no single solution successfully bridges the gap. Current literature and market solutions force residents to navigate a fragmented landscape—using one app for administration [1], another for trusted real estate [3], and third-party vendors for hyperlocal services [7]. This friction degrades the user experience, validating the urgent need for a unified, RBAC-secured platform like the Society Network.

Table I: Comparative Analysis of Management Methods

Feature/Capability	Standard Web/Mobile Apps	Society Network (Proposed)
Maintenance & Billing	Automated online billing	Billing Track + Real-time analytics
Notice Circulation	Digital push notifications	Digital notices + Interactive event calendars
Complaint Tracking	Basic digital ticketing	Priority-based tracking with resolution status
Role-Based Security	Basic Admin/Resident split	Strict RBAC (Super Admin, Secretary, Resident, Staff)
Hyperlocal Marketplace	Not Available	Integrated (book cleaners, movers, painters)
Real Estate Discovery	Not Available	Integrated local property listings

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III. SYSTEM FLOW

To deliver a seamless, scalable, and secure experience, the Society Network was engineered through an Agile, iterative development lifecycle. This approach resulted in a robust 3-tier cloud workflow that dictates both how the platform was constructed and how it operates in real-time.

1) *Phase 1: Requirement Gathering and UI/UX Conceptualization:* The workflow originated at the ground level with comprehensive requirement-gathering sessions involving society administrators and residents. Because the end-users possess varying levels of technical expertise, the process moved immediately into rigorous UI/UX wireframing. This foundational step ensured that the resulting interfaces would be highly accessible, intuitive, and tailored to real-world community needs.
2) *Phase 2: Frontend Presentation and Interaction Flow:* Following the design phase, implementation was executed in developmental sprints focused on the Presentation Layer. The user interface workflow is powered by React.js. This component-based library allowed the team to create highly responsive, dynamic UIs that function flawlessly across desktop and mobile browsers. By utilizing reusable components, the workflow ensures visual consistency as users navigate from complex administrative dashboards into the interactive service marketplaces.
3) *Phase 3: Backend Integration and Data Processing:* As the frontend sprints progressed, they were systematically integrated with the application and data layers. To accelerate development and ensure enterprise-grade stability, the workflow relies on Supabase as the Backend-as-a-Service (BaaS) provider. User interactions on the frontend seamlessly trigger API requests to Supabase, which manages secure cloud hosting, real-time data subscriptions, and instantly generated APIs linked to a robust PostgreSQL database. Core relational entities—including Users, Societies, Flats, Complaints, Payments, and Marketplace Services—interact and synchronize continuously within this layer.
4) *Phase 4: Security Enforcement and Cloud Deployment:* The final, critical stage of the workflow governs data privacy and system integrity. Before being deployed to a live cloud environment, the integrated system underwent strict unit testing and security validation. The workflow leverages Supabase's Row-Level Security (RLS) policies to enforce strict Role-Based Access Control (RBAC) at the database level. This guarantees that all data queries are automatically filtered by the user's role—ensuring that a resident can only view their own flat's financial data, while a Secretary retains secure, full administrative oversight of their specific building.

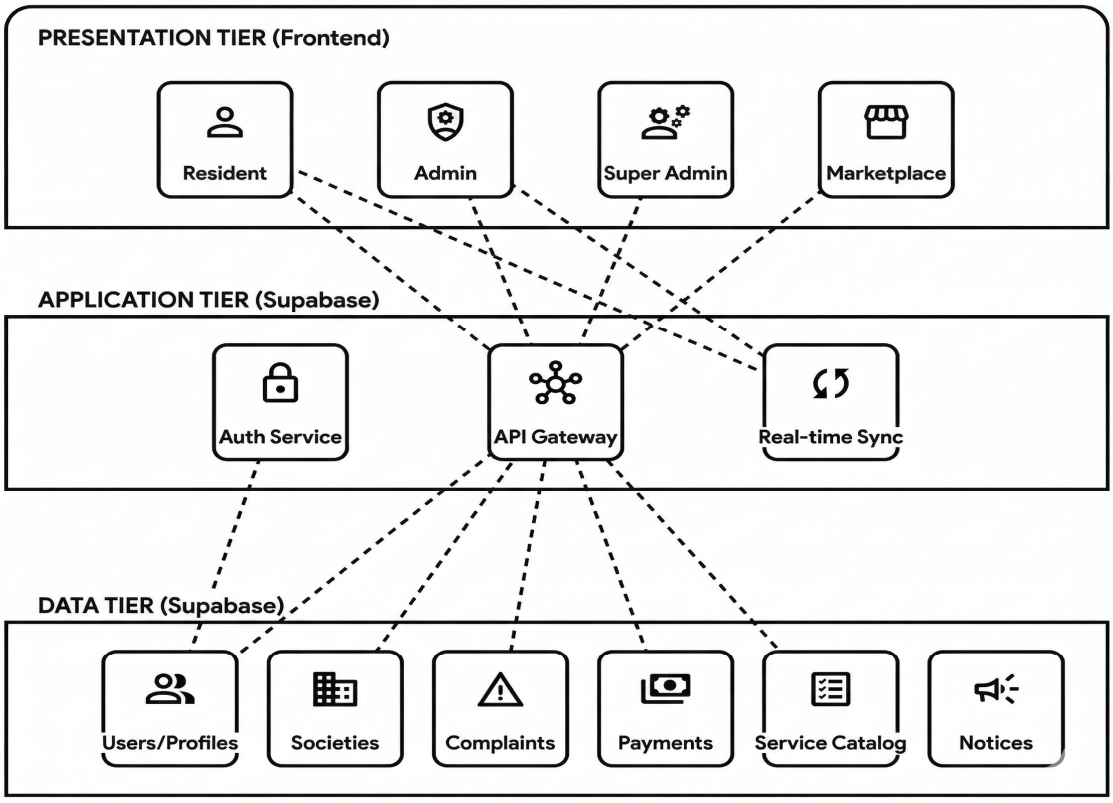


Fig. 1 System Architecture

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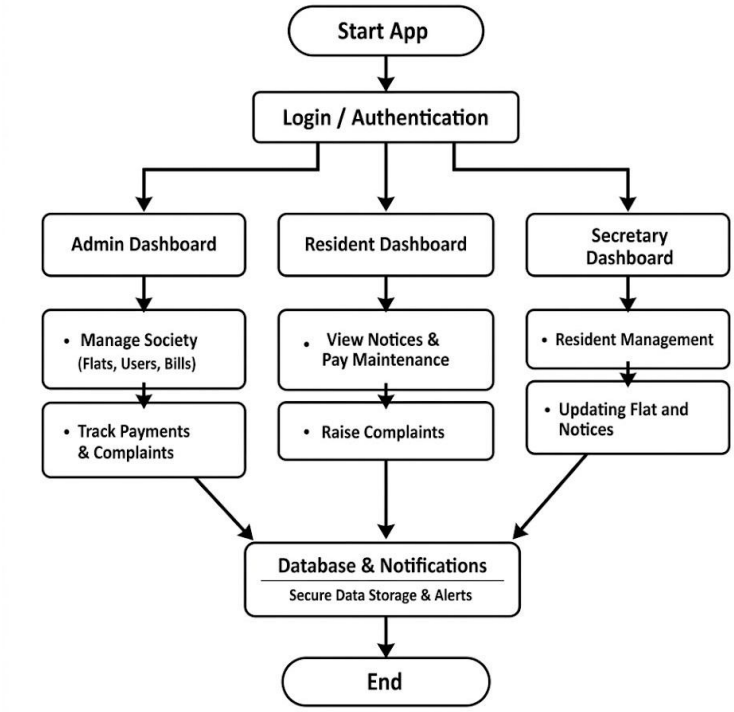


Fig. 2 System Workflow Diagram

IV. RESULTS AND DISCUSSION

The deployment of the Society Network successfully translated the architectural theory into a highly functional, real-world application.

1) *Administrative Dashboards:* The platform successfully replaced manual bookkeeping with an intuitive, data-driven administrative hub. Secretaries are now equipped with visual donut charts that track maintenance dues and collection rates in real-time. Furthermore, the complaint management module effectively categorizes resident grievances by priority (e.g., highlighting emergency plumbing issues over routine landscaping requests), ensuring total accountability through "Open," "In Progress," and "Resolved" status markers.

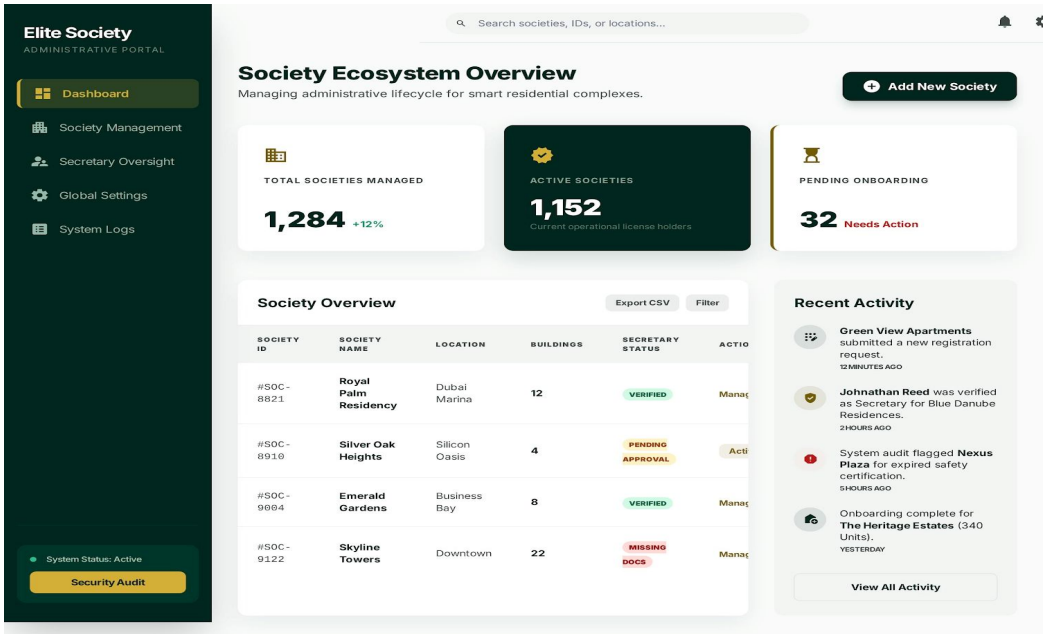


Fig. 3 SuperAdmin Dashboard

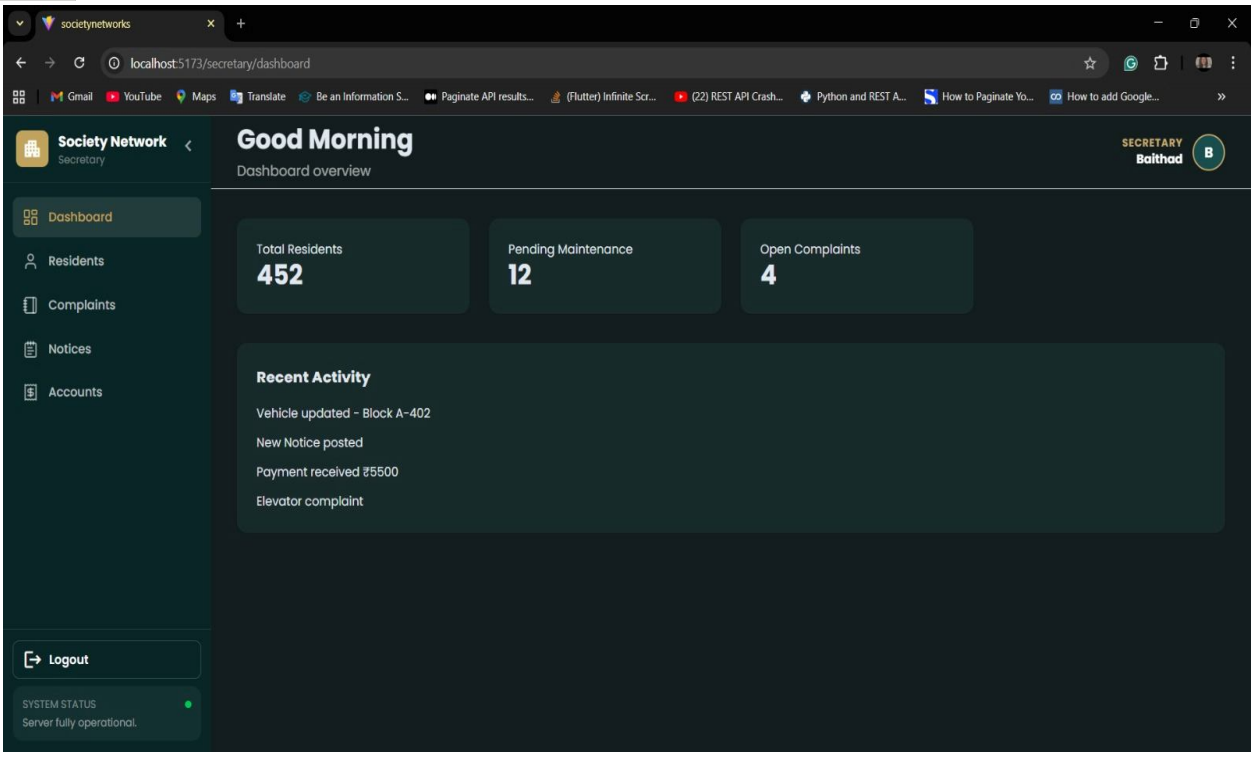


Fig. 4 Secretary Dashboard

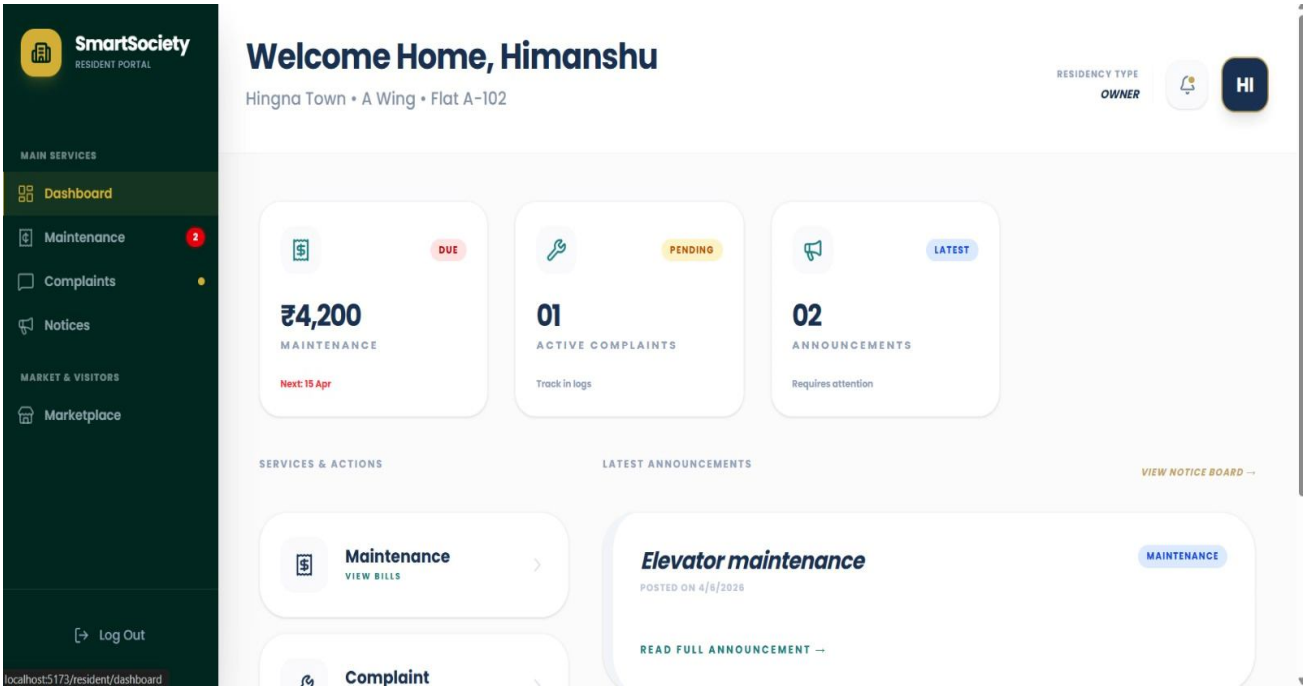


Fig. 5 Resident Dashboard

2) *The Hyperlocal Marketplace:* From the resident's perspective, the "One-Stop Solution" marketplace was deployed seamlessly. The integration allows residents to effortlessly browse and book vetted external vendors—such as Elite Cleaning and Elite Packers—without leaving the trusted ecosystem of their society portal. Additionally, the real estate discovery module successfully enables in-app property listings, bridging the gap between community management and property discovery.

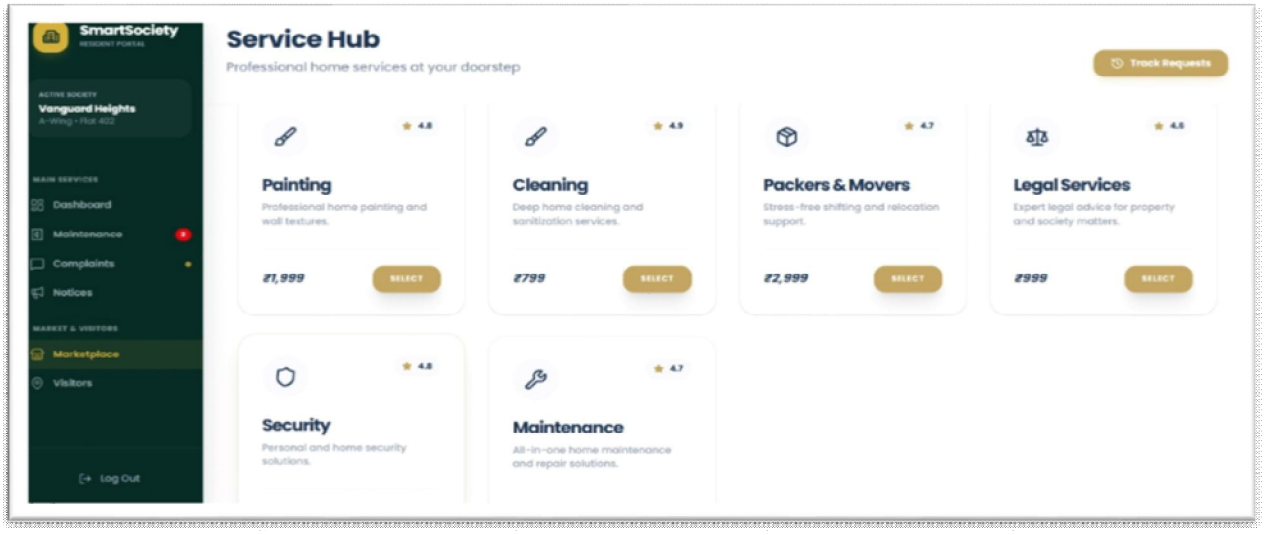


Fig. 6 Market Services

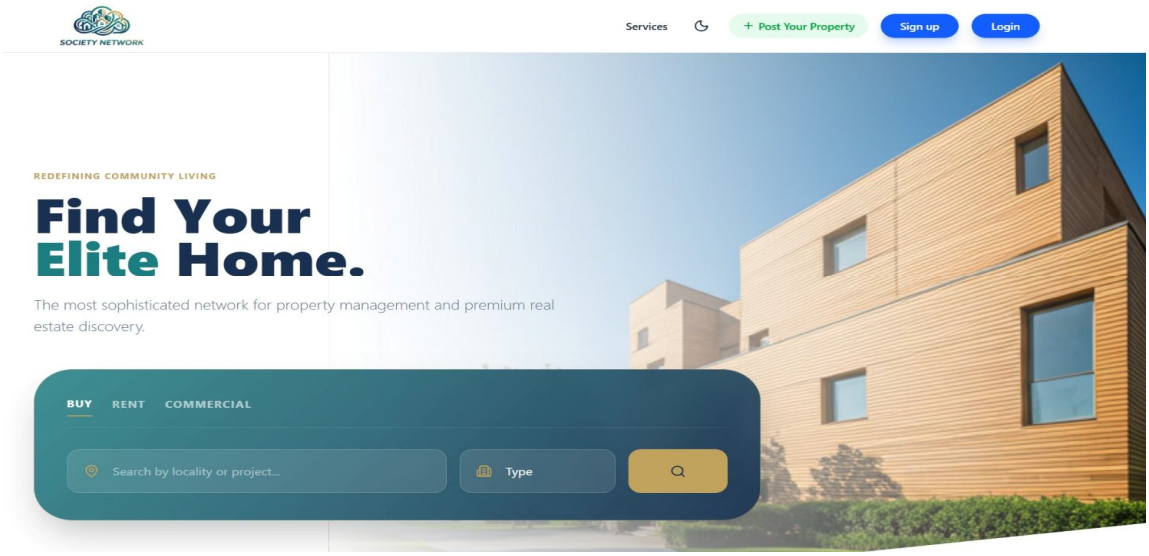


Fig. 7 Browse Real Estate (Buy / Rent / Commercial)

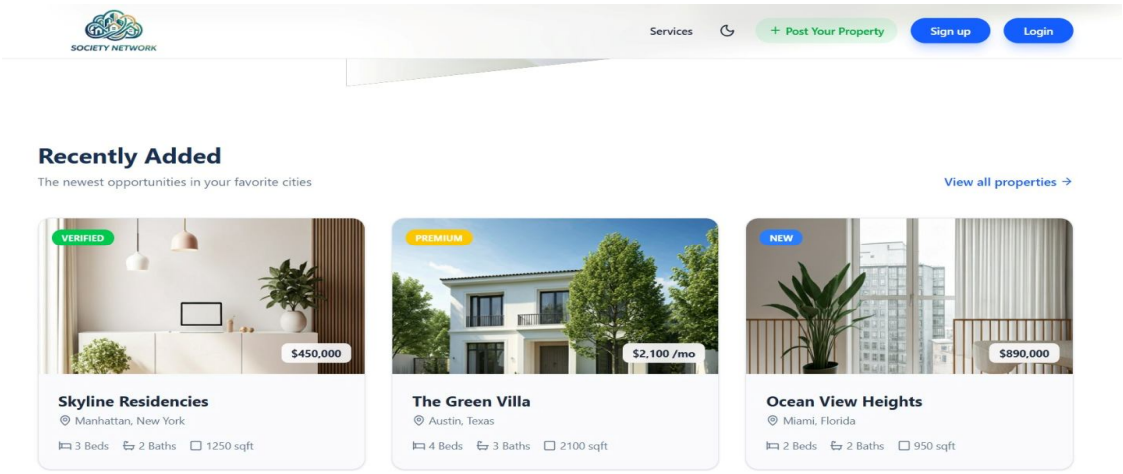


Fig. 7 Discovery Properties

3) *Performance and Scalability:* Performance testing confirmed exceptional system stability. The BaaS infrastructure provided flawless real-time synchronization, meaning a resident's payment instantly reflects on the Secretary's dashboard. Furthermore, the RBAC foundation successfully supports multi-society scaling, allowing a "Super Admin" (such as a real estate developer) to oversee dozens of distinct residential complexes from a single, centralized command center.

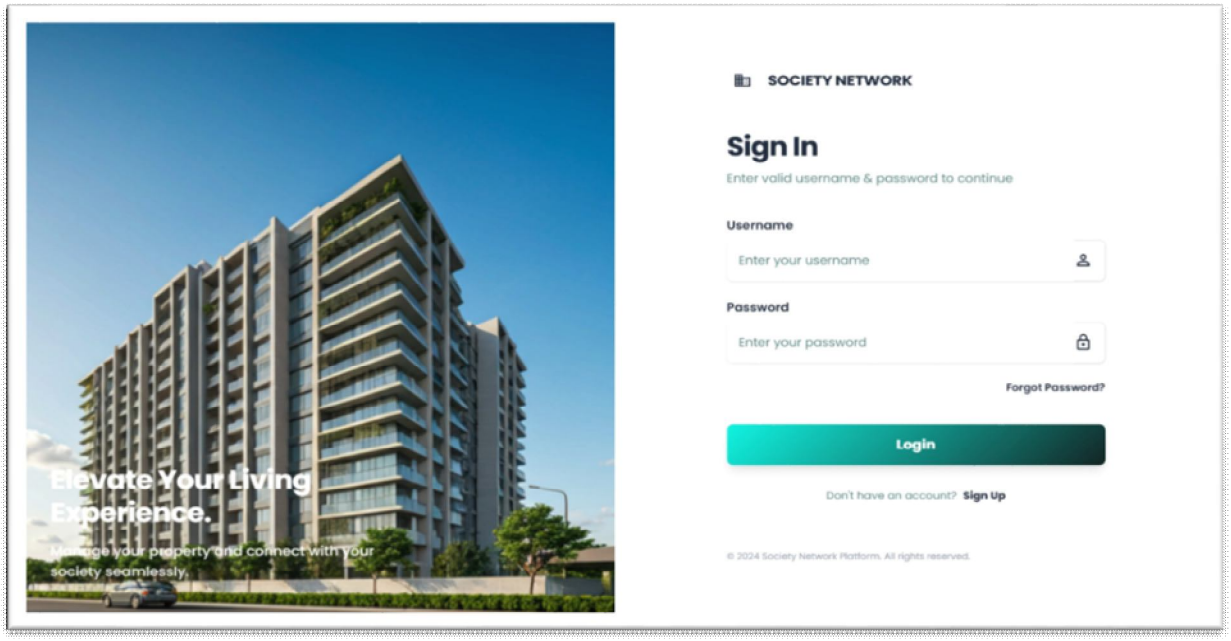


Fig . 9 Sign in Page

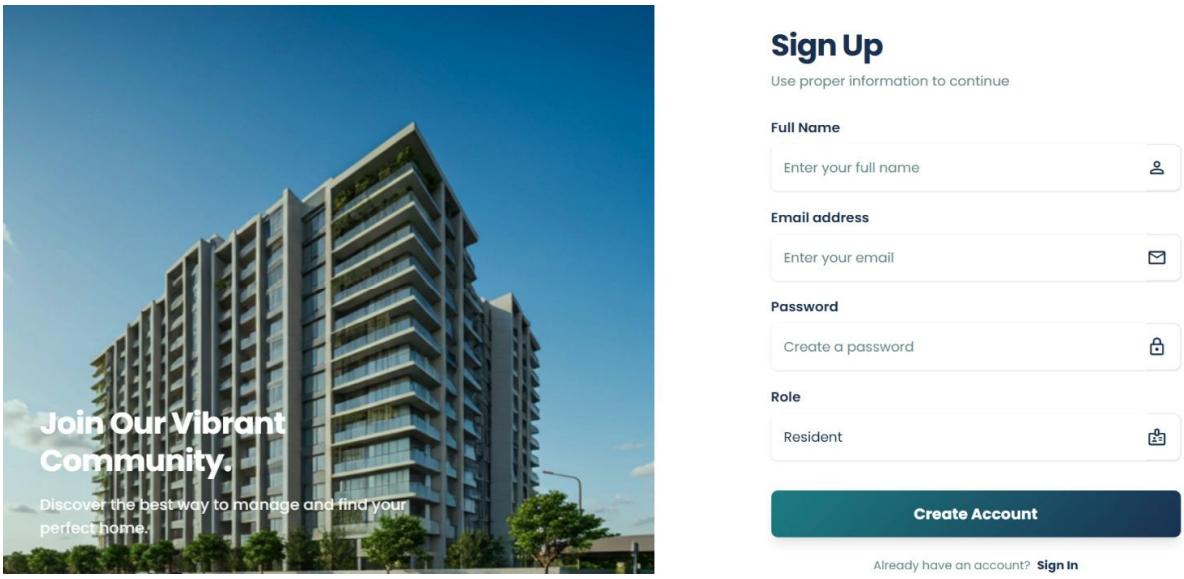


Fig. 10 Sign Up page

V. CONCLUSIONS

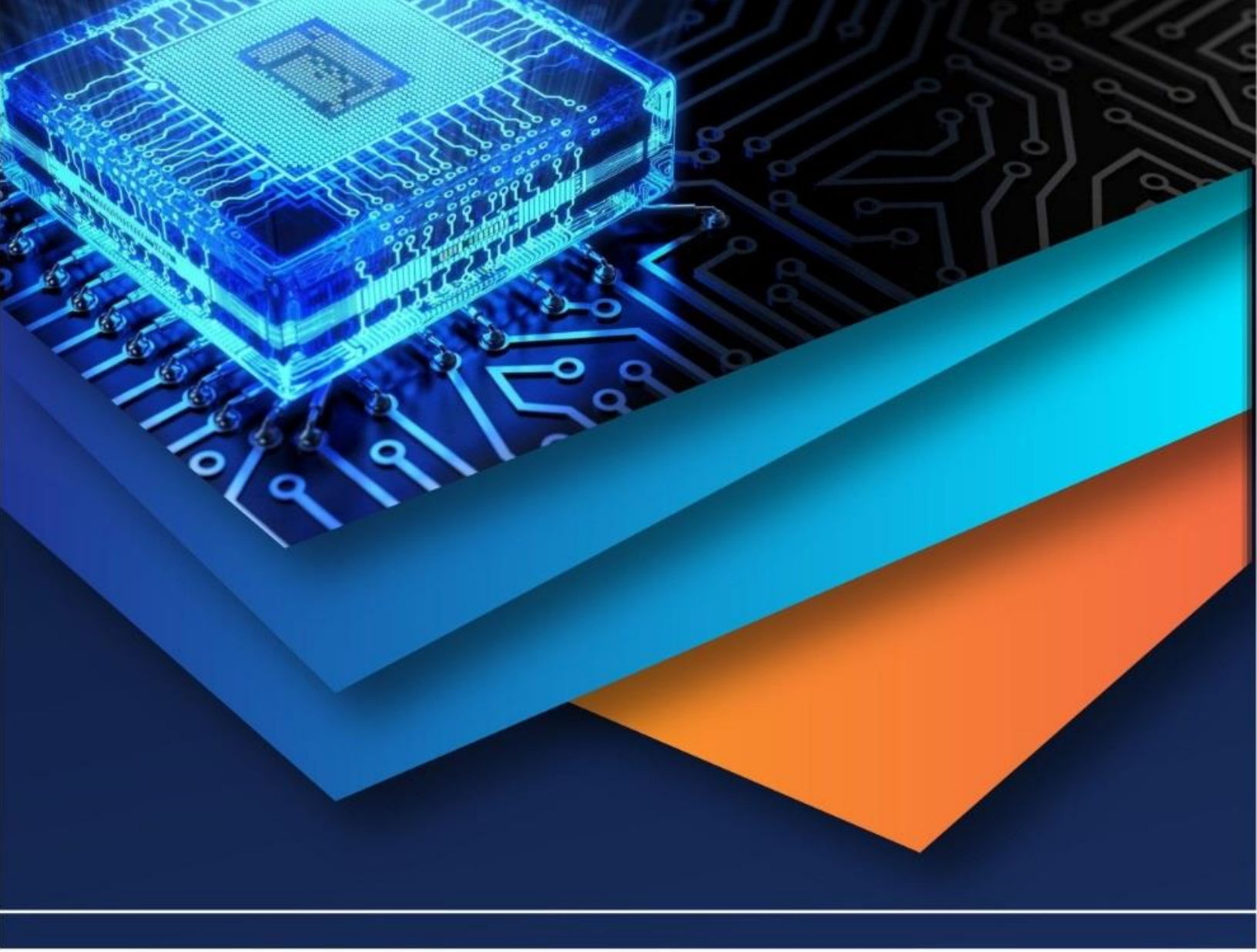
The Society Network marks a significant leap forward in residential property technology, actively transforming paper-based, chaotic management into a highly secure, integrated digital ecosystem. By merging robust administrative automation with an innovative hyperlocal marketplace, the platform solves operational inefficiencies while drastically improving the daily lives of residents. The successful implementation of React.js, Supabase, and strict RBAC validates the Society Network as a true, scalable, one-stop solution for modern communities.

VI. ACKNOWLEDGMENT

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