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Project Phase II Report On

Blockchain Realty: Modernizing Real Estate

Submitted in partial fulfillment of the requirements for the award of the degree of

Bachelor of Technology

in

Computer Science and Engineering

By

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CERTIFICATE

This is to certify that the project report entitled ***"Blockchain Realty: Modernizing Real Estate"*** *is a bonafide record of the work done by* ***George K. George (U2004035), Hemdan M. K. (U2003092), Jerin Joji (U2003101), Kamil Hadi (U2003115)****, submitted to the Rajagiri School of Engineering & Technology (RSET) (Autonomous) in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology (B. Tech.) in Computer Science and Engineering during the academic year 2023-2024.*

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Abstract

Blockchain technology presents a promising solution to address the entrenched challenges within the real estate industry. This paper introduces a blockchain-based system model aimed at revolutionizing the real estate transaction landscape. Our system model streamlines and tracks the entire real estate transaction process, involving all stakeholders, including property owners, buyers, sellers, and notaries. It facilitates comprehensive management and tracing of property purchase or lease history, encompassing various property types, from land to townhouses and apartments. Key architectural components include blockchain network design, distributed ledger technology, and the use of smart contracts. These elements collectively enable asset digitization, decentralized transaction record storage, encryption for security, and direct peer-to-peer transactions between sellers and buyers. Importantly, our model addresses the challenges of data proliferation, enables concurrent transaction processing, safeguards against data tampering, and shields sensitive information from unauthorized access. The practicality and effectiveness of our approach are substantiated through the development of a prototype, built on the Ethereum blockchain platform, and validated through experimental transactions. By enhancing transparency, removing intermediaries, reducing costs, and fostering trust in real estate transactions, our system model offers a comprehensive solution to the limitations of the conventional Client-Server transaction management systems. Its applicability extends to smart city environments, where it can comprehensively manage and trace real estate transactions, thereby ushering in a new era of efficiency and transparency.

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List of Abbreviations

DApp - Decentralized Application

API - Application Programming Interface

IPFS - Interplanetary File System

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Chapter 1

Introduction

This chapter introduces the research landscape and outlines the study's structure. The background section traces the topic's evolution with historical context. The problem definition identifies specific challenges and gaps in current knowledge, laying the foundation for the research to address relevant issues. The scope and motivation section discusses the study's limits, importance, and reasons for its relevance. Clear objectives articulate the desired results and contributions, guiding the reader through the overall goals of the investigation. Assumptions are outlined, recognizing the fundamental ideas shaping the research.

1.1 Background

The current property transaction system involves a cumbersome process where buyers pay money to sellers, then separately handle stamp duty payments to the government online. Subsequently, buyers schedule appointments at local registry offices, undergo document verification, and manually update owner details in the municipal records This manual and time-consuming process leads to potential loopholes for criminal activities. Fraud cases are on the rise due to the lack of genuine data records available to property buyers, causing a transparency issue in the system. Despite recent government efforts to address these concerns, genuine data availability in the public domain remains a problem. The involvement of middlemen further complicates the process, leading to delays of 10-15 days. While the government has taken steps toward digitization with centralized databases, issues such as data security, fraudulent changes, and the risk of record loss in disaster situations persist. The high cost of the system and the unnecessary involvement of numerous individuals in a digitally advanced world are additional challenges. Transferring property through heredity or will adds another layer of complexity, requiring visits to land

registry offices with death certificates and following extensive procedures. Automation for automatic property transfers is lacking. Financial institutions face difficulties verifying property status for mortgages, even when the property is on lien, making it challenging for others to ascertain its status. Overall, these issues affect numerous people, emphasizing the need for a more efficient and secure property transaction system.

1.2 Problem Definition

The real estate industry faces inefficiencies, security concerns, and a lack of transparency in property transactions, characterized by time-consuming processes, involvement of middlemen, and an increased risk of fraud. This project aims to address these issues by implementing blockchain technology to create a secure, streamlined, and transparent system, reducing cost while ensuring trust in real estate transactions.

1.3 Scope and Motivation

The scope of blockchain in the real estate industry is transformative, offering a secure, transparent, and efficient alternative to traditional methods of recording transactions. From simplifying property transfers to enhancing data security and reducing costs, blockchain has the potential to revolutionize how real estate transactions are conducted and recorded.Real estate digitization encompasses a wide scope, including online property listings, streamlined transactions with e-signatures, and smart contract implementation for secure and automated transactions.

Implementing a blockchain-based real estate transaction system in a country like India is motivated by the urgent need to address prevalent challenges in the sector. India's real estate industry often grapples with issues of fraud, time-consuming manual processes, and a lack of transparent and accessible property data. Introducing blockchain technology promises to enhance security by creating an immutable and transparent ledger, reducing the risk of fraud. Moreover, it streamlines the entire transaction process, eliminating intermediaries and significantly reducing the time and costs associated with property dealings. The decentralized nature of blockchain ensures that property data is securely stored, providing a reliable and easily verifiable record that can boost confidence among buyers, sellers, and financial institutions alike.

1.4 Objectives

1. Digitization: The transition of real estate processes into digital formats involves the conversion of traditional paper-based workflows into electronic systems, enabling easier data management. This digitization allows for the efficient storage, retrieval, and analysis of property-related information, leading to streamlined operations and improved accessibility for stakeholders.

2. Trustless Transactions: By leveraging technology, trustless transactions in real estate become possible, reducing reliance on intermediaries such as brokers or escrow services. Through the use of smart contracts on blockchain, predetermined rules are automatically executed when conditions are met, facilitating secure and transparent transactions without the need for an intermediary to validate the process.

3. Tamper-Proof Records: The implementation of blockchain technology ensures that each transaction is securely stored in a decentralized and immutable ledger, providing an indelible history of ownership transfers and financial transactions. This tamper-resistant feature enhances the integrity of property records, reducing the risk of fraudulent activities and ensuring a reliable and unalterable source of truth.

4. Transparency: Blockchain technology's secure and transparent nature plays a pivotal role in recording property transactions. The decentralized and distributed ledger ensures that all parties involved have access to a consistent and verifiable version of the transaction history. This transparency reduces the likelihood of discrepancies, fosters trust among stakeholders, and contributes to a more accountable and reliable real estate market. Additionally, it allows for easy verification of property details, promoting a clearer understanding of ownership history and transactional authenticity.

5. Security: Blockchain's cryptographic principles enhance the security of property records by creating a highly secure and tamper-proof environment. Transactions are cryptographically linked, making unauthorized changes nearly impossible. This robust security framework ensures the confidentiality and integrity of real estate data, mitigating the risk of data breaches and unauthorized alterations, and ulti-

mately fortifying the overall security posture of the real estate industry.

1.5 Challenges

The implementation of blockchain in real estate faces significant risks and challenges. Regulatory and legal complexities surrounding property rights and compliance with existing laws pose potential obstacles. Convincing diverse stakeholders, including property owners, developers, government agencies, and financial institutions, to adopt blockchain technology may encounter resistance and require substantial effort. Moreover, user education becomes crucial, as ensuring a widespread understanding of blockchain technology among property buyers, sellers, agents, and legal professionals is essential for successful adoption, encompassing managing digital wallets and following secure practices. Addressing these challenges will be pivotal in the successful integration of blockchain into the real estate industry.

1.6 Assumptions

1. Users have access to the internet and basic computer literacy.
2. Legal and regulatory frameworks support the use of blockchain for real estate transactions.
3. Users are willing to provide necessary documentation and information for property verification and legal compliance through the platform.
4. The project will have access to a reliable source of property data, including ownership records and transaction history.

1.7 Societal / Industrial Relevance

The adoption of a blockchain-based real estate decentralized application (DApp) holds profound societal and industrial significance in India. The technology's inherent transparency addresses historical issues of corruption and opacity in real estate transactions, fostering greater trust among stakeholders. By minimizing reliance on intermediaries and

automating bureaucratic processes, the DApp streamlines transactions, making property dealings more accessible and cost-effective. Improved land records management and reduced disputes contribute to a more accurate representation of property ownership. The DApp's potential to attract global investments, empower small-scale developers, and stimulate a specialized tech workforce aligns with India's economic development goals and aspirations for technological innovation. To ensure a smooth integration, the project could be initiated in a localized region in Kerala initially, serving as a pilot phase before gradually expanding its reach, allowing for refinement based on localized needs and regulatory considerations. This phased approach enhances adaptability and minimizes potential challenges during the initial stages of implementation.

1.8 Organization of the Report

The report begins with an introduction that provides context, outlines the problem and the scope and motivation for the project. It also underscores the assumptions and challenges undertaken and the significance of the project. The second chapter then delves into a comprehensive review of existing literature and research in the field, providing a foundation for understanding the project's context within existing knowledge. The third chapter then details the implementation prerequisites in hardware and software. Following this, the fourth chapter details the system design illustrating the architecture and modules involved in the project, as well as the project execution plan using Gantt chart and work schedules. Finally, the concluding chapter summarizes the key findings and outcomes of the project. The references and appendices are then provided to offer a comprehensive resource base for the report

In the introduction chapter, we delve into the complexities and limitations of India's current real estate transaction system, underscoring the urgent need for a transformative solution. Our focus centers on blockchain technology, seen as a promising contender to tackle these challenges. The project outlines clear objectives, including digitization, trustless transactions, tamper-proof records, transparency, and heightened security. Nevertheless, these aspirations come with notable challenges such as regulatory complexities and the necessity for thorough user education. The stated assumptions provide a foun-

dational framework, while the societal and industrial relevance highlights the potential impact on transparency, accessibility, and economic development in India. The phased approach reflects a carefully thought-out implementation strategy, and the subsequent chapters will further delve into the detailed exploration and analysis of these introductory elements.

Chapter 2

Literature Survey

2.1 Real Estate Management System - Ms. Aishwarya Sedamkar

The paper outlines the development of a real estate management system utilizing Python Flask, a lightweight web application framework. This system will include a database to store crucial information about properties, tenants, and invoices, offering features like property search, online payments, maintenance requests, and lease management. Property owners will have the capability to register and post details about their properties, while users can search for properties based on diverse criteria. The development approach involves using HTML, CSS, and JavaScript for the front-end, complemented by Flask for the back-end.

In terms of performance, Python Flask stands out due to its commendable response time and efficient memory usage. Its popularity is attributed to its simplicity and flexibility, contributing to improved performance and reduced development and maintenance efforts. Real estate management systems, crucial tools for property management, find compatibility with Python Flask, recognized as one of the leading frameworks for web application development.

The proposed real estate management system, built on Python Flask, will integrate a database system, likely MySQL, to comprehensively store property information encompassing location, price, size, amenities, and owner/tenant details. The methodology involves detailed documentation of the user interface design, Flask application, MySQL database integration, admin dashboard, user registration and authentication, search view functionality, and security measures.

The envisioned system will empower property owners to register and showcase their properties, while users can effortlessly search for properties based on various criteria such as location, price, and size. The paper includes a performance comparison of Python Flask

with other popular frameworks, highlighting its efficiency in terms of response time and memory usage.

2.2 Business Process Models of Blockchain and South African Real Estate Transactions - Jack Laurie Tilbury[8]

The current real estate purchasing process in South Africa is marred by inefficiency, characterized by heavy reliance on multiple third parties, resulting in elevated transaction costs and prolonged completion times. This manual process involves paper-based documents, making it susceptible to errors and fraudulent activities. To address these issues, the study explores the potential of blockchain technology to streamline transactions by reducing dependence on third parties and automating manual processes.

The research focuses on two distinct approaches to real estate transactions: the existing South African case and an international use case incorporating blockchain technology. Two conceptual models are presented, utilizing Business Process Modelling and Notation (BPMN) to visually illustrate the contrasting processes involved.

Methodologically, the study adopts an interpretivist paradigm, employing case study methodology to investigate the contemporary phenomenon of blockchain in real estate transactions. The case study approach is chosen for its ability to facilitate empirical inquiry into real-life contexts, particularly when the boundaries between the phenomenon and context are not clearly defined. Cases were derived from the current real estate purchasing method in South Africa and the utilization of blockchain technology in real estate transactions.

Data collection involves a comprehensive document review, where information pertinent to the use cases is gathered and assessed. Document analysis serves as a qualitative method to scrutinize the collected data, contributing to the development of BPMN conceptual models. The analysis aids in organizing data into themes and categories, providing a visual representation of the distinct processes.

The study concludes that the existing real estate purchasing process in South Africa is inefficient, with manual processes, paper-based documents, and heavy reliance on third parties contributing to high transaction costs and delays. Blockchain technology emerges

as a promising solution, offering more efficient transactions by reducing reliance on intermediaries and automating processes.

The presented conceptual models underscore the differences between the traditional South African real estate transaction process and blockchain-based transactions. Five areas of opportunity for blockchain in real estate are identified, encompassing smart contracts, cost reduction, accessibility and speed, transparency, and immutable record-keeping. Additionally, five challenges are acknowledged, including adoption, initial information capture, human involvement, legality, and fraud.

While acknowledging that blockchain-based systems do not resolve all transactional issues, the study emphasizes their substantial benefits compared to manual processes. The research contributes valuable insights into the integration of blockchain technology into the real estate purchasing process, both in the South African context and internationally.

2.3 Blockchain based Application: Decentralized Financial Technologies for Exchanging Crypto Currency - P.Shamili[11]

The paper delves into a comprehensive analysis of blockchain-based applications, specifically focusing on the decentralized financial technologies employed in the exchange of cryptocurrencies. It elucidates the intricate dynamics of a distributed decentralized network, where nodes can access data from any location, emphasizing its potential across diverse industries. The scope extends to financial services, cryptocurrency exchange, identity security, healthcare, real estate, as well as supply chain and logistics monitoring, underscoring the versatility of blockchain technology.

A significant portion of the paper zooms in on the Uniswap protocol, a pivotal player facilitating the decentralized exchange of crypto-coins through Ethereum smart contracts. The Uniswap protocol is lauded for its trustworthiness and efficiency in executing token exchanges within the blockchain network. The inherent attributes of blockchain technology, such as data immutability, peer-to-peer network functionality without central server reliance, and the assurance of confidentiality, integrity, non-repudiation, and authentication, are highlighted. The paper goes on to elucidate the intricacies of token acquisition from liquidity pools and their subsequent utilization in trading, showcasing the practicality and efficacy of blockchain-based financial technologies, particularly through the lens

of the Uniswap protocol.

The uniswap protocol allows users to exchange crypto coins. The automated liquidity protocol provision on the blockchain Ethereum platform is defined as the Uniswap protocol. A user can use the uniswap to buy or sell ERC20 tokens in the decentralized distributed network using an Ethereum smart contract. This paper will assist blockchain network users in using the uniswap protocol as a trustworthy and efficient way of exchanging crypto coins or tokens in the blockchain network.

2.4 The Real Estate Transaction Trace System Model Based on Ethereum Blockchain Platform - Khoa Tan VO[1]

The paper introduces the Real Estate Transaction Trace (RETT) system model, leveraging blockchain technology to enhance the efficiency and transparency of real estate transactions in Vietnam. The RETT system model is designed to comprehensively manage and track real estate transactions, encompassing both purchase and lease histories. Notably, it eliminates the need for intermediaries, thereby reducing costs and fostering increased mutual trust between buyers and sellers. The model is built on the Ethereum blockchain platform, employing distributed ledger and smart contract technologies to digitize assets, securely store transaction history, enable encryption, and facilitate direct transactions between parties.

The RETT system model brings forth several benefits, including the reduction of data explosion, enabling simultaneous transactions, prevention of data tampering, and protection of sensitive information. The paper further discusses the practical applicability of the model through experimental transactions, demonstrating its effectiveness in a real-world context.

In terms of methodology, the paper follows a structured approach. It begins with a review of related studies, providing a foundation for the proposed RETT system model. Subsequently, an analysis of the real estate transaction process in Vietnam is presented. The introduction to the platform technology outlines the use of the Ethereum blockchain and its key components, namely the blockchain network architecture, distributed ledger, and smart contract. The authors have developed a prototype of the RETT system model on the Ethereum blockchain platform and conducted experimental transactions to validate

its effectiveness. The system architecture is described, comprising the front end for user interaction and the distributed ledger for decentralized record-keeping.

The functions of the RETT system model are delineated, showcasing its capabilities in digitalizing real estate, providing a centralized source of verified data by the government, enabling smart contract functionality for direct transactions, and utilizing a distributed ledger for transparent and tamper-resistant record-keeping. The government's role in examining and verifying information ensures the accuracy and integrity of data stored in the system.

In conclusion, the paper contributes to the advancement of real estate transactions in Vietnam by proposing the RETT system model. Through its systematic methodology, experimental validations, and detailed functions, the paper provides a comprehensive guide for the adoption and implementation of blockchain technology in the real estate sector.

2.5 Real Estate Management System based on Blockchain - Ankit Mittal[10]

This paper introduces a blockchain-powered real estate management system with the overarching goal of infusing transparency, security, and efficiency into the existing processes. Utilizing a distributed permissioned blockchain, the proposed system securely stores all transactions, mitigating the risks associated with hacking. The system adopts a pragmatic approach by centralizing the overall structure while concurrently decentralizing data storage. Through cryptographic measures, data security is heightened, rendering the system adept at verifying property status for mortgage loans. Furthermore, the paper envisions automating land registration processes, offering a faster and more efficient means of handling this crucial aspect of real estate management.

The proposed solution is a centralized system with a distributed blockchain network for secured and immutable data storage. It will be synchronized with the different departments for the real-time and efficient property transfer system. The data of the property will be in the public domain through a channel in the system and will be easily accessible to the people and all the departments for the trustworthy system. It can also be extended to have the details of the property on lease. The transfer of the property will be cryptographically secured with the public key-private key cryptography and will be blockchain

secured for the immutable data records. The security and consistency of the data is the primary aim which is possible by the blockchain technology.

In the blockchain, each block contains a calculated hash, and crucially, it includes the hash of the preceding block, forming a linked chain as illustrated in Figure 3. This interconnection ensures the integrity of the entire chain. If any data within a block is tampered with, the hash of that block will no longer match the stored hash, signaling a problem. This mechanism is vital for detecting fraudulent changes in a distributed system where data consistency across all nodes is imperative.

The system employs Byzantine fault tolerance for its consensus protocol, with nodes continually cross-verifying data with each other. Any disparity triggers a corrective process through the Byzantine fault tolerance consensus protocol, rectifying real-time data discrepancies. This robust approach significantly heightens the system's security, making it exceptionally resistant to hacking attempts aiming to manipulate data.

The Byzantine fault tolerance protocol, in essence, gathers feedback from all nodes and bases decisions on the majority's consensus, typically requiring agreement from 51% or more of the systems. Even in the event of a node failure, the distributed nature of the system ensures data continuity and integrity, as other operational nodes can seamlessly compensate for any potential losses, providing a robust and reliable mechanism for maintaining the consistency and security of the entire blockchain.

The Merkle tree serves as a highly efficient method for calculating the hash of a block in the blockchain. This tree structure operates by initially computing the hash of adjacent leaf nodes. Subsequently, the hash of each pair of adjacent hash nodes is calculated, a process that iterates until a singular Merkle root node is derived, creating a tree-like configuration. Illustrated in Figure 4 is the Merkle Tree structure, vividly demonstrating this sequential hashing process.

This tree-based structure offers a powerful means of identifying malicious data, particularly when there is fraudulent alteration. By traversing through the non-matching hashing nodes, one can efficiently pinpoint the malicious leaf node responsible for the inconsistency. The Merkle tree, with its hierarchical arrangement, enhances the security and integrity of the blockchain system by providing an effective mechanism for detecting and localizing any unauthorized changes in the data.

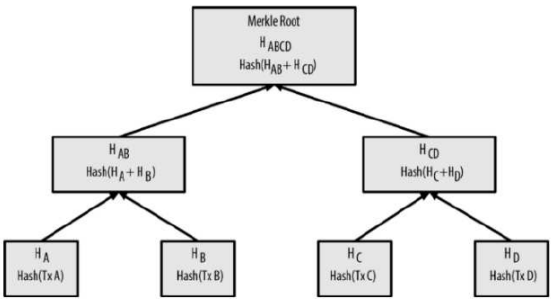

Figure 2.1: Merkle Tree structure for hashing elements to get the Merkle root

2.6 Summary and Gaps Identified

2.6.1 Summary

Paper	Author	Advantages	Disadvantages
"Real Estate Management System"	Aishwarya Sedamkar	The system exhibits ease of development, requiring minimal effort for both initial development and ongoing maintenance.	The database lacks transparency, potentially contributing to susceptibility to fraudulent activities.
"Business Process Models of Blockchain and South African Real Estate Transactions"	Jack Laurie Tilbury	Using land with blockchain leads to more efficient transactions.	The paper does not involve the integration of the two identified conceptual models.
"Blockchain based Application: DecentralizedFinancial Technologies for Exchanging Crypto Currency"	P.Shamili	Eliminates mediator	Does not consider real world problems
"The Real Estate Transaction Trace System Model Based on Ethereum Blockchain Platform"	Khoa Tan VO	Digitized assets on the Blockchain and stored decentralized transaction history.	The system model is tailored for property transactions in Vietnam, not designed for the Indian real estate market.
"Real Estate Management System based on Blockchain"	Ankit Mittal	Outlines smart contracts for property transactions, covering purchase, sale, and verification with land inspectors.	Neglects exploring securing loans from financial institutions during the property acquisition.

Table 2.1: Summary of the Literature Survey

2.6.2 Gaps Identified

1. Limited Scalability: The current state of the art reveals a limitation in scalability, particularly concerning the blockchain technology's ability to handle a growing number of transactions efficiently. As real-world applications increase, the scalability of existing systems becomes a critical gap.

2. Interoperability Challenges: There is a noticeable gap in achieving seamless interoperability between different blockchain networks. The lack of standardized protocols and interfaces hinders the smooth exchange of information and assets across diverse blockchain platforms, hindering the potential for a more integrated and interconnected blockchain ecosystem.

3. Energy Efficiency Concerns: The environmental impact of blockchain technologies, notably the energy consumption associated with consensus mechanisms like Proof of Work (PoW), poses a significant gap. Exploring and implementing more energy-efficient consensus mechanisms is crucial to address sustainability concerns and align blockchain solutions with broader environmental goals.

4. User-Friendly Interfaces: The user interfaces of current blockchain applications often lack user-friendliness, deterring widespread adoption. Improving the overall user experience, ensuring simplicity in interactions, and enhancing accessibility will be essential for broader acceptance and utilization of blockchain technologies.

5. Regulatory Ambiguity: The regulatory landscape surrounding blockchain and cryptocurrencies remains uncertain and varies across jurisdictions. This lack of regulatory clarity poses a considerable gap, inhibiting the full potential of blockchain applications, particularly in industries where compliance is a critical factor. Clear and consistent regulatory frameworks are needed to encourage widespread adoption and integration into existing systems.

In conclusion, the literature survey provides valuable insights into diverse aspects of real estate management systems, blockchain applications, and their intersection. The utilization of Python Flask in developing a real estate management system showcases the adaptability and efficiency of this framework, offering a potential solution to streamline

property-related processes. The exploration of blockchain in South African real estate transactions sheds light on the inefficiencies of existing manual processes and proposes blockchain as a transformative solution, highlighting both opportunities and challenges. The analysis of decentralized financial technologies, with a focus on the Uniswap protocol, underscores the broader applications of blockchain beyond real estate, emphasizing trustworthiness and efficiency. The introduction of the Real Estate Transaction Trace (RETT) system model in Vietnam demonstrates the practical implementation of blockchain for enhanced transparency and trust in real estate transactions. The proposed blockchain-powered real estate management system introduces innovative features like automated land registration, contributing to a more secure and efficient real estate landscape.

Despite these advancements, certain gaps persist in the current state of the art. These include scalability challenges, interoperability issues, concerns about the environmental impact of energy-intensive consensus mechanisms, the need for more user-friendly interfaces, and regulatory ambiguities. Addressing these gaps is crucial for the continued evolution and widespread adoption of blockchain technologies in real estate and other industries. Overall, the literature survey sets the stage for the subsequent chapters, providing a foundation for further exploration and development in the field.

Chapter 3

Requirements

3.1 Hardware and Software Requirements

Software Requirements:

1. Node js
2. Ethereum , Metamask
3. Ganache

Hardware Requirements:

1. Robust network connectivity
2. High-performance processors
3. Sufficient memory

Chapter 4

System Architecture

In this chapter, we explore a detailed overview that includes the system's structure, design, module breakdown, and a visual timeline presented as a Gantt Chart. The System Overview gives a high-level view, outlining the main components and how they work together. Moving on, the Architectural Design section goes into the system's structure, explaining the principles behind how it's built. The Module Division part breaks down the system into different modules, explaining what each one does and how they connect. To make the project's progress more understandable, the chapter ends with a Work Schedule shown as a Gantt Chart. This chart acts as a roadmap, showing the planned timeline for different project activities. It helps clarify the expected milestones and how they depend on each other.

4.1 System Overview

The proposed solution is a decentralized system with a distributed blockchain network for secured and immutable data storage. It will be synchronized with the different departments for the real-time and efficient property transfer system. The data of the property will be in the public domain through a channel in the system and will be easily accessible to the people and all the departments for the trustworthy system. The transfer of the property will be cryptographically secured with the public key-private key cryptography and will be blockchain secured for the immutable data records.
The different Components and Participants involved in the proposed system are :

1. Seller and Buyer: The Seller and Buyer are the primary parties engaged in the real estate transaction. The Seller initiates the process by listing their property on the decentralized application (dApp), and the Buyer explores available properties through the same platform.

2. DApp (Decentralized Application): The DApp serves as the intermediary platform connecting the Seller and Buyer to the blockchain. It acts as the user interface, facilitating their interaction with the distributed ledger.

3. Blockchain: The Blockchain is the foundational technology that underpins the entire real estate transaction process. It functions as a decentralized ledger, storing immutable records of all data pertinent to the transaction. This includes property details, offers, approvals, and other critical information.

4. Deed Writer: The Deed Writer is a service integrated into the system to generate essential legal documents for the real estate transaction.

5. Registration Department: The Registration Department represents the government agency responsible for formalizing and recording property transactions.

6. Bank: The Bank plays a pivotal role in facilitating real estate transactions by providing financial support to the Buyer.

The buyer kicks off the process by registering on the dApp, creating an account and providing necessary details. Meanwhile, independently of the buyer's registration, the seller lists their property on the platform, specifying its features and price. Once registered, the buyer explores the platform's listings, and the platform, in turn, presents a curated list of properties aligning with the buyer's criteria. Upon finding a suitable property, the buyer submits an offer through the platform, detailing their proposed terms. The platform relays these offer details to the seller, who, if satisfied, formally accepts the offer through the platform. Subsequently, the platform initiates a transaction session, facilitating further steps like document exchange and payment processing, with the inclusion of smart contract execution.

The buyer instigates the property verification process through the platform, triggering a request for an encumbrance certificate sent by the platform to the relevant authority. Upon issuance, the authority sends the encumbrance certificate back to the platform, verifying the property's legal status and potential encumbrances. Both the buyer and seller download and review the certificate from the platform. Satisfied with the property's legal standing, the buyer places a holding deposit, signifying their serious intent to

purchase. The platform notifies the seller of the holding deposit and requests confirmation, to which the seller responds by confirming receipt, expressing their acceptance of the buyer's intention to proceed.

The buyer and seller collaboratively agree on a sales contract, defining the terms of the property sale. The buyer initiates the stamp duty payment process, ensuring legal compliance. Upon payment, the authority acknowledges receipt and releases the stamp duty for transaction use. The authority then provides stamp paper to the deed writer, legally validating sale documents. Either the buyer or seller uploads the signed sales contract to the platform, which is then downloaded by both parties for their records. Both parties individually sign and upload their copies to the platform, alongside the deed writer, who uploads the prepared legal documents.

In the final process, the buyer deposits the ultimate payment, sourced either from personal funds or a loan. Both parties receive and review a draft version of the sales deed, indicating formal acceptance. The seller then uploads the signed sales deed to the platform for processing, and upon completion, the seller receives the final payment for the property. In loan-based payments, the conditional process involves the buyer applying for a loan, with the bank subsequently approving the application and providing the necessary funds. The bank, in turn, receives the final sales deed, marking the conclusion of the transaction. For non-loan payments, the alternative process sees the buyer directly receiving the final sales deed upon the transaction's completion.

All outlined processes, from property registration and offer submission to sales contract finalization and payment receipt, can be seamlessly automated through the use of smart contracts. Smart contracts, deployed on the blockchain, would execute predefined actions automatically, streamlining the real estate transaction journey. The blockchain, functioning as a secure and tamper-proof distributed ledger, ensures transparency and immutability of transaction data, providing a robust foundation for a trustworthy and efficient real estate ecosystem.

4.2 Architectural Design

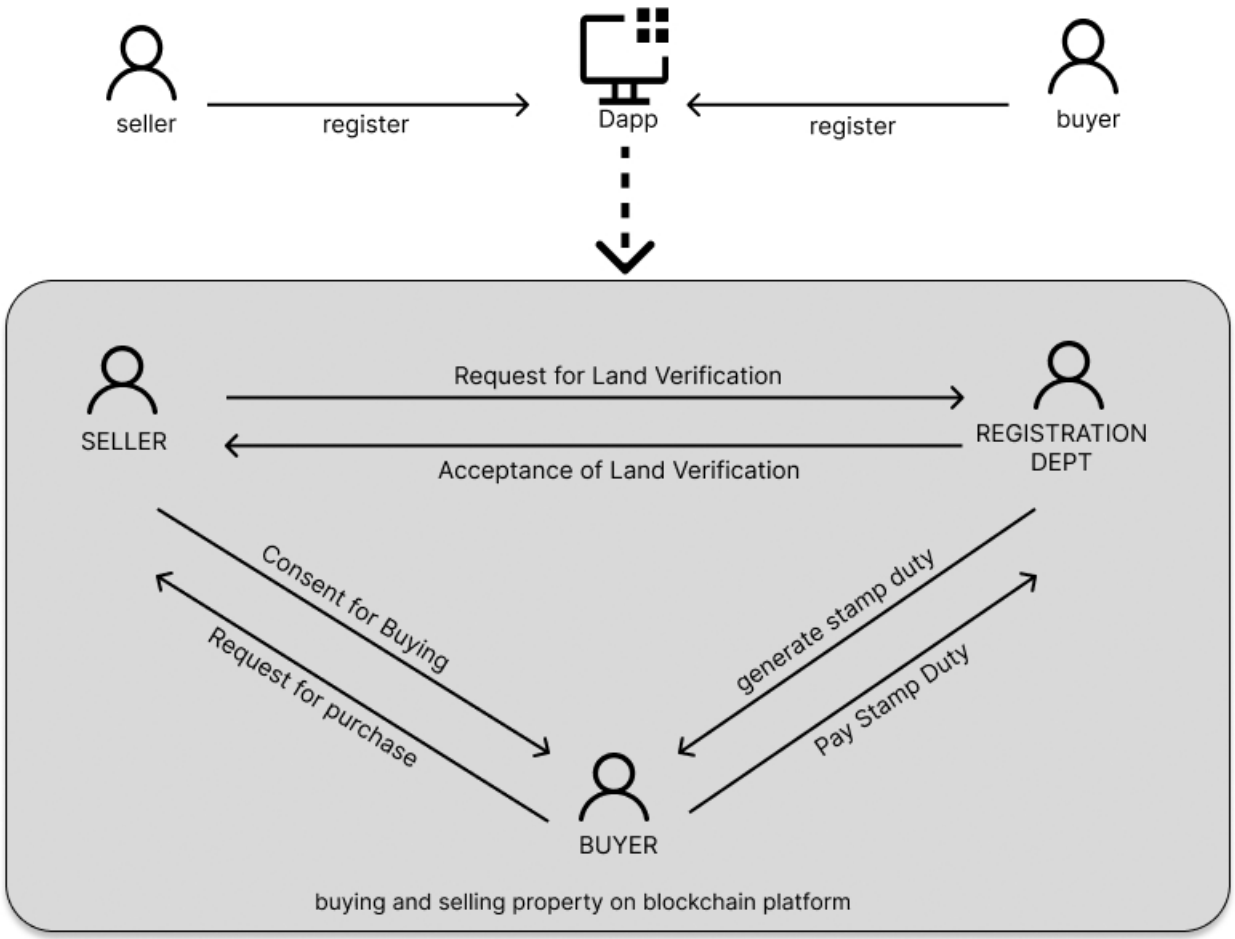

Figure 4.1: Architecture Diagram

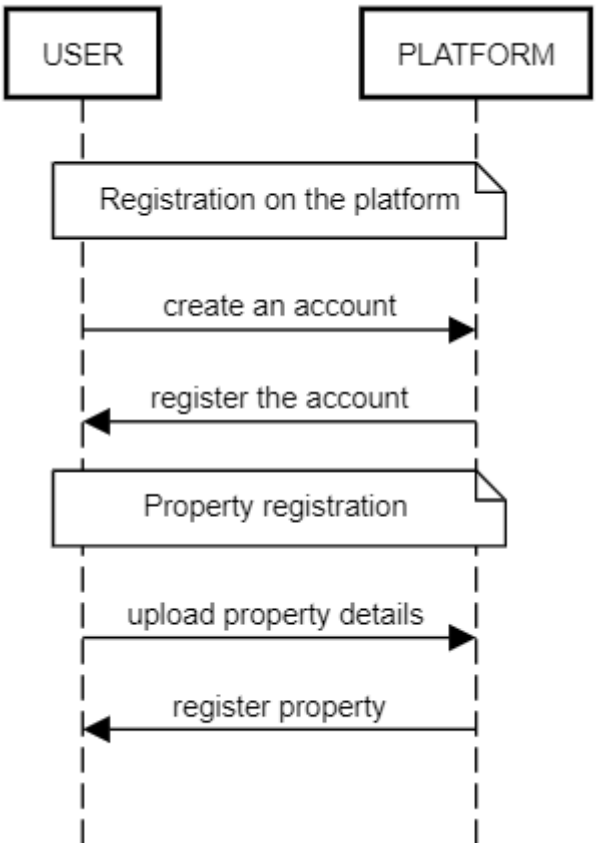

Figure 4.2: Sequence Diagram I - Registration on the Platform

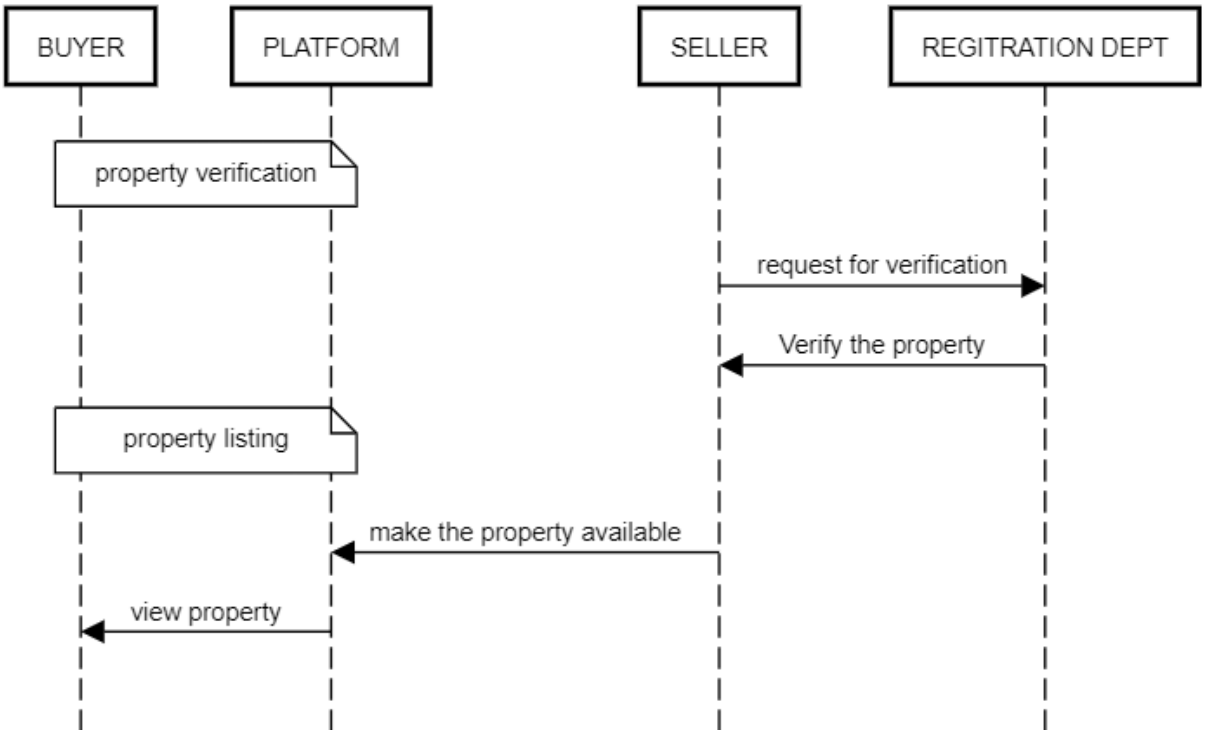

Figure 4.3: Sequence Diagram II - Property Verification and Listing

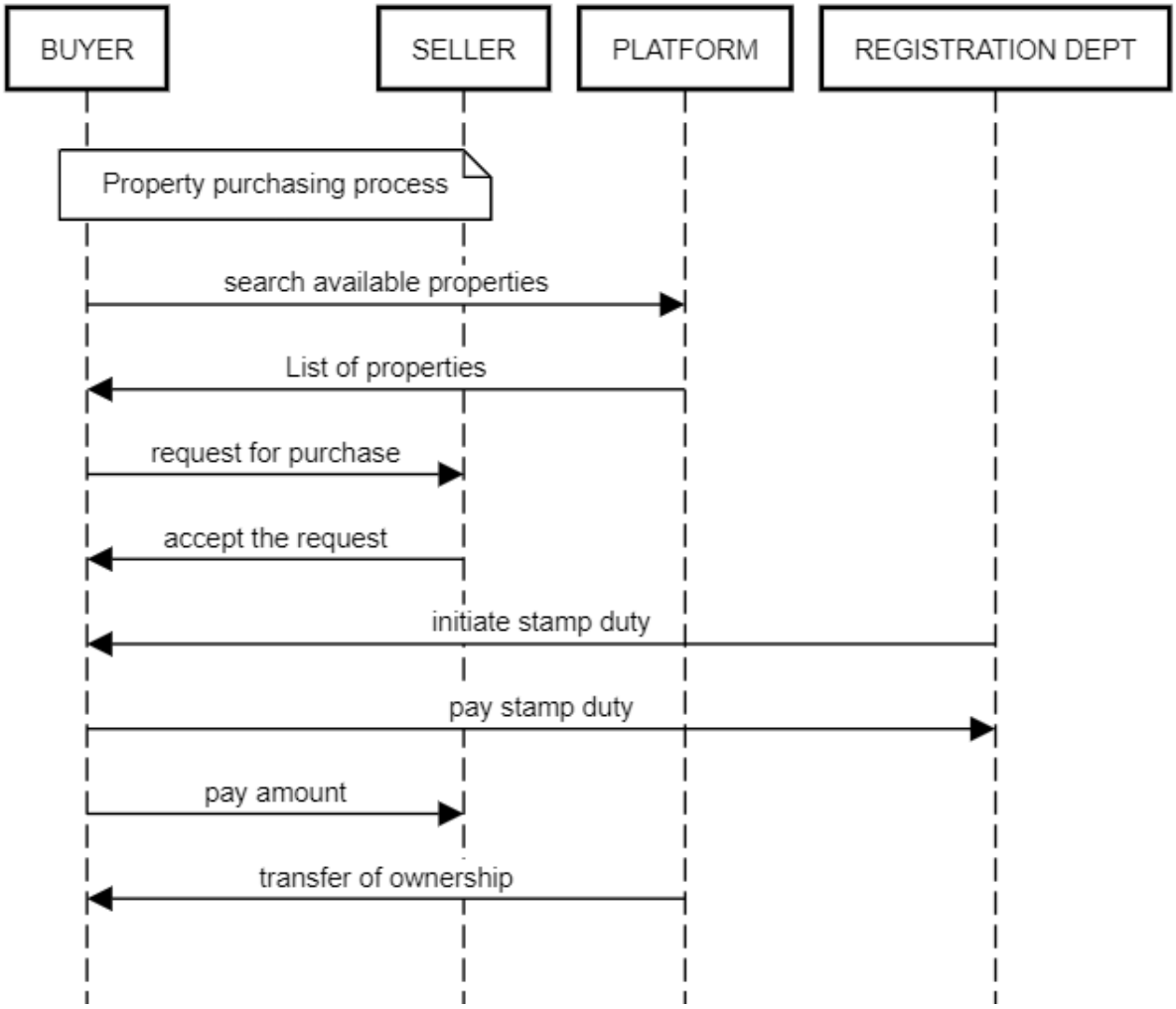

Figure 4.4: Sequence Diagram III - Property Purchasing

4.3 Module Division

4.3.1 Buyer Module

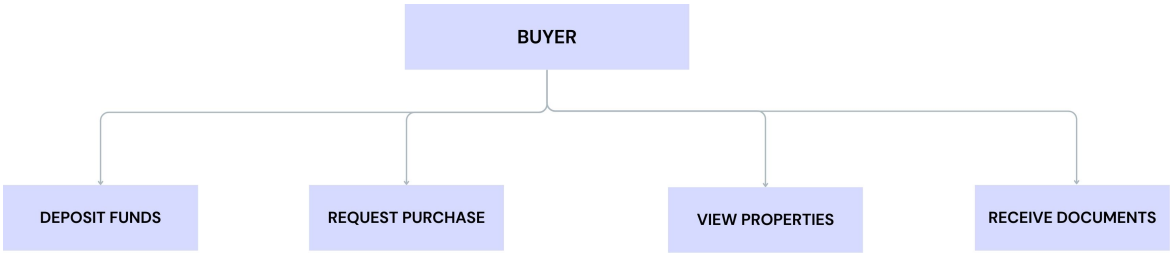

Figure 4.5: Buyer Module

This module within the real estate DApp offers a user-friendly interface for essential transaction activities. Buyers can effortlessly deposit funds, utilizing either personal finances or loans from affiliated banks. The module streamlines price negotiation, allowing buyers to submit and negotiate offers directly through the platform. Additionally, users can withdraw funds as needed, providing flexibility in managing financial transactions. It also ensures a seamless process for receiving crucial documentation, including sales contracts and encumbrance certificates, enhancing transparency and facilitating a smooth real estate transaction experience.

4.3.2 Seller Module

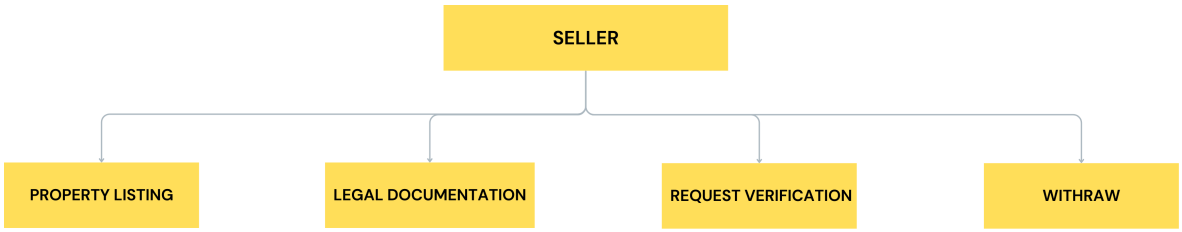

Figure 4.6: Seller Module

The seller module within the real estate DApp offers an intuitive platform for property owners to engage in key transactional activities. Sellers can effortlessly list their properties on the platform, providing comprehensive details about features and pricing. The module streamlines the process of handling legal documentation, facilitating the creation and submission of necessary paperwork such as sales deeds. Additionally, the seller module

allows for seamless withdrawal of funds, ensuring a straightforward and efficient financial aspect to the real estate transaction. This comprehensive functionality empowers property sellers to manage their listings, legal documentation, and financial transactions seamlessly within the decentralized application.

4.3.3 Interaction Module

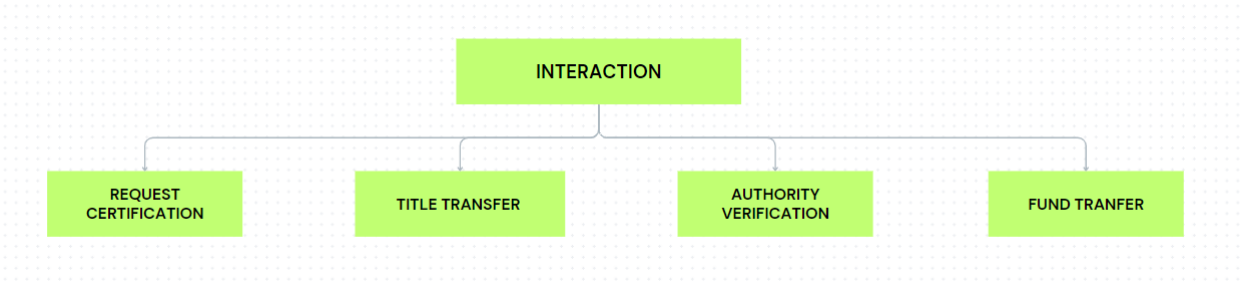

Figure 4.7: Interaction Module

The interaction module serves as a pivotal component facilitating essential transactional interactions. Users can seamlessly request property verification, initiating a process where the platform collaborates with relevant authorities to verify the legal status and potential encumbrances of a property. The module enables smooth title transfers, streamlining the transfer of ownership between buyers and sellers upon successful completion of the transaction. Additionally, it oversees authority verification, ensuring that regulatory requirements such as stamp duty payments are met. The interaction module also plays a crucial role in fund transfers, managing the secure and transparent transfer of funds between involved parties during the real estate transaction.

4.4 Work Schedule - Gantt Chart

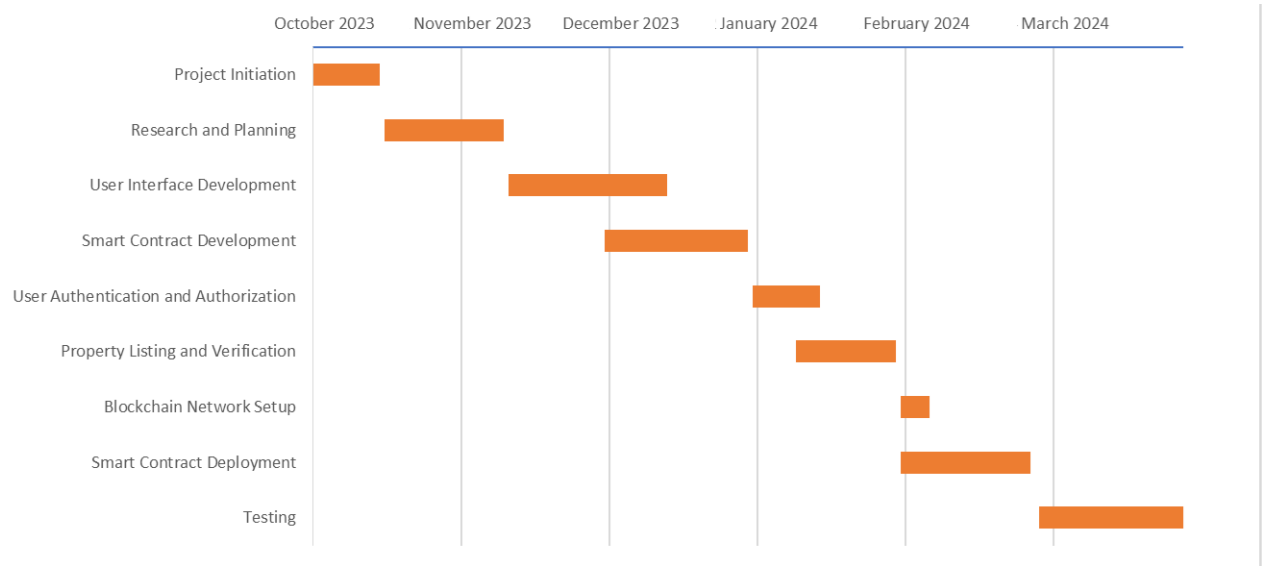

Figure 4.8: Gantt Chart

In summary, this chapter looked closely at the key aspects of our project. It began with a detailed System Overview, giving a clear understanding of how the whole design works. The Architectural Design section explained the structure of the system and the basic ideas behind how it was made. Breaking the system into smaller parts in the Module Division section helped clarify what each part does and how they are connected. The Gantt Chart, like a visual timeline, makes our tasks and deadlines clear, ensuring transparency and a roadmap for executing the project.

Chapter 5

System Implementation

5.1 Proposed Methodology/Algorithms

The proposed methodology for the LandRegistry project entails leveraging blockchain technology, particularly Ethereum, to establish a decentralized land registry. This approach involves the use of smart contracts for registering land details, ownership transfers, and transaction processes, ensuring transparency and security. Additionally, the methodology integrates cryptographic algorithms for user authentication, data encryption, and transaction validation, enhancing the overall integrity of the registry. Advanced data structures and algorithms are employed for efficient management of land details, user profiles, and transaction records, facilitating seamless operation and retrieval of information. By combining blockchain technology with robust data management algorithms, the proposed methodology aims to modernize land registration processes, mitigate fraud risks, and provide a reliable platform for transparent and secure land transactions.

5.1.1 Blockchain

Blockchain technology, particularly Ethereum, plays a pivotal role in the proposed methodology for the LandRegistry project. Ethereum, as a decentralized platform, provides a robust infrastructure for implementing smart contracts, which are self-executing contracts with predefined terms encoded directly into code. These smart contracts are utilized within the LandRegistry to facilitate various functionalities, including registering land details, executing ownership transfers, and managing transaction processes. Ethereum's blockchain ensures transparency, immutability, and security by maintaining a tamper-proof record of transactions across a distributed network of nodes. This decentralized architecture eliminates the need for intermediaries, such as traditional land registries or government agencies, thereby reducing bureaucratic overhead and minimizing the risk of

fraud or manipulation. Moreover, Ethereum's support for programmable money enables the automation of complex transactions, ensuring efficient and reliable execution of land-related processes. Overall, Ethereum's blockchain technology provides the foundation for establishing a transparent, secure, and decentralized land registry system, revolutionizing the way land transactions are conducted and recorded.

5.1.2 Smart Contract

Smart contracts serve as the cornerstone of the LandRegistry project, facilitating automated and self-executing agreements between parties involved in land transactions. These contracts, written in Solidity programming language and deployed on the Ethereum blockchain, encode the rules and conditions governing various aspects of land registration, ownership transfer, and transaction validation. For instance, when a user registers land details, a smart contract is deployed to record the information securely on the blockchain, ensuring its immutability and transparency. Similarly, smart contracts manage the process of requesting approval for land transactions, verifying the legitimacy of requests, and executing ownership transfers upon approval.

The use of smart contracts in the LandRegistry project streamlines the land registration process, eliminates the need for intermediaries, and enhances the security and efficiency of transactions. By automating key aspects of land management, smart contracts reduce the risk of errors, fraud, and disputes, while also providing a transparent and auditable record of transactions. Moreover, the decentralized nature of smart contracts ensures that no single entity has control over the registry, promoting trust and integrity in the land registration system. Overall, smart contracts revolutionize the way land transactions are conducted, offering a reliable and transparent mechanism for managing land ownership and transfers.

The LandRegistry smart contract implements several functions, methods, and algorithms to facilitate land registration, ownership transfer, and transaction processing:

1. addUser: This function adds a new user to the system by creating a user struct with details such as name, contact information, email, postal code, and city. The user's address is used as the key in the ‘users‘ mapping, and their existence is tracked in the ‘userarr‘ array.

2. Registration: This method registers a new land entry in the system, storing

details such as the owner's address ('id'), IPFS hash for document storage, land address, amount, key, government approval status, availability, requester (if any), and request status. The 'computeId' function generates a unique key for each land entry based on its address and amount.

3. viewAssets: This function allows users to view the list of land assets they own by retrieving the asset list associated with their address from the 'profile' mapping.

4. makeAvailable : It changes the availability status of a land property to "Available" only if the caller is the owner of the property.

5. requstToLandOwner : This method allows users to request ownership of a particular land property by setting its availability status to "Pending" and updating the request status accordingly.

6. processRequest : It enables landowners to process ownership requests by updating the request status to "Approved" or "Rejected". If rejected, the property becomes available again, and the requester and request status are reset.

7. buyProperty : This function facilitates the purchase of a land property by transferring the specified amount to the property owner and updating ownership details. It also handles the updating of ownership and status, similar to processing a request.

8. updateIPFSHash : This method allows the owner of a land property to update the IPFS hash associated with it, ensuring the integrity of document storage.

These functions, methods, and algorithms collectively enable the LandRegistry smart contract to manage user profiles, land details, ownership transfers, and transaction processing securely and efficiently on the Ethereum blockchain.

5.2 User Interface Design

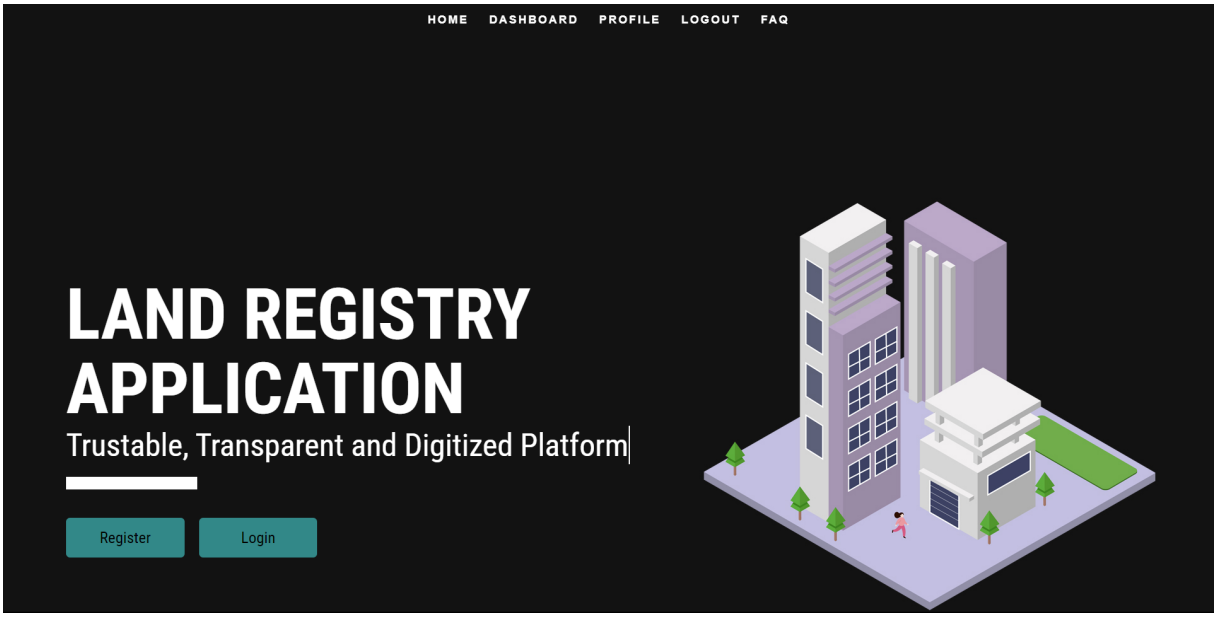

Figure 5.1: Home Page

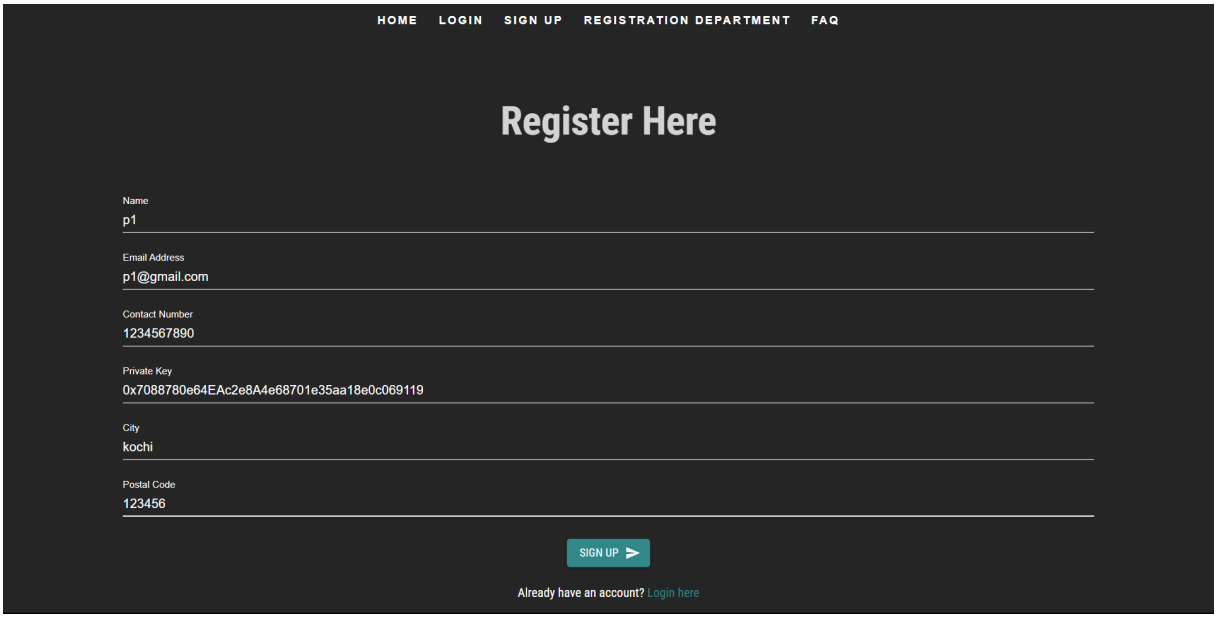

Figure 5.2: Registration Page

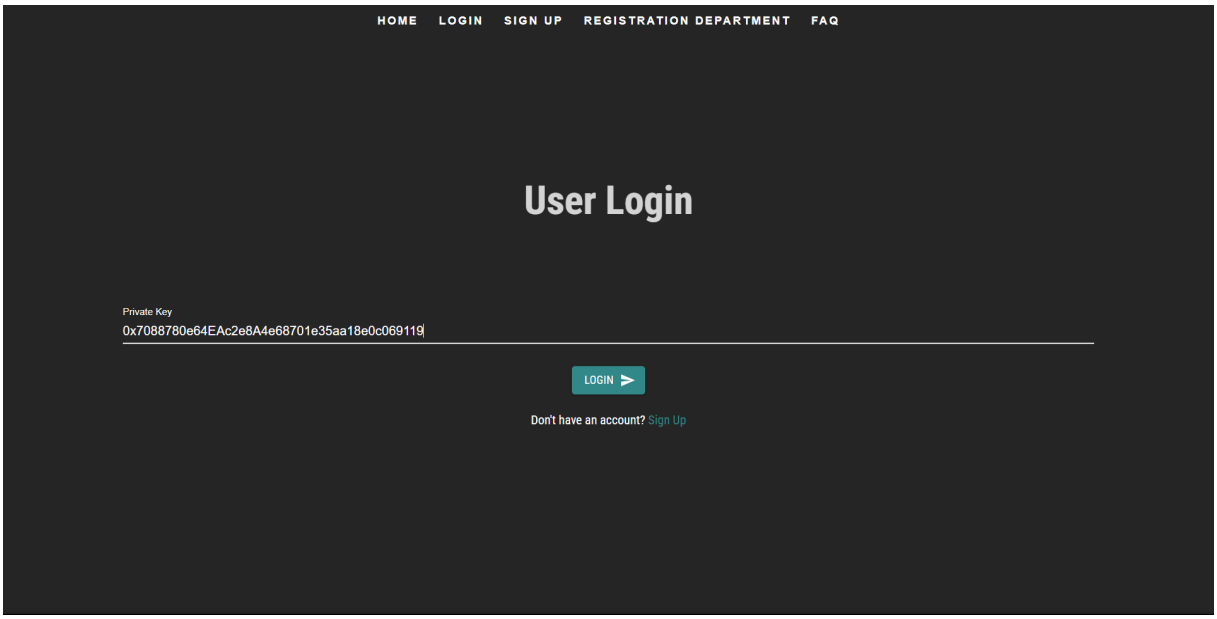

Figure 5.3: Login Page

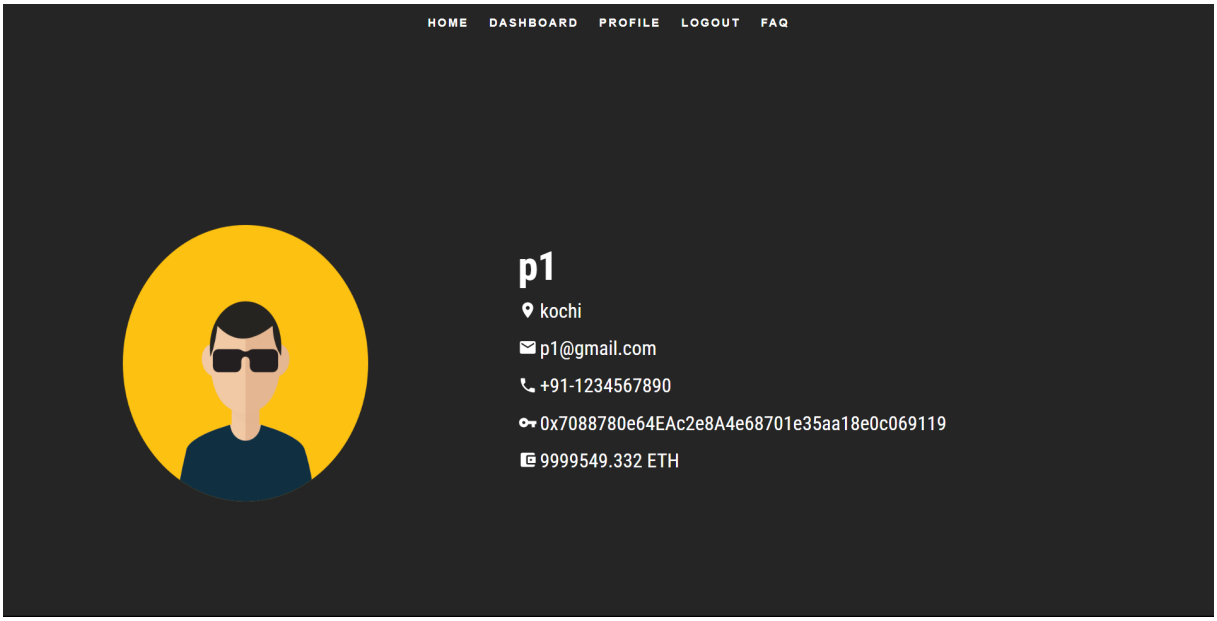

Figure 5.4: Profile Page

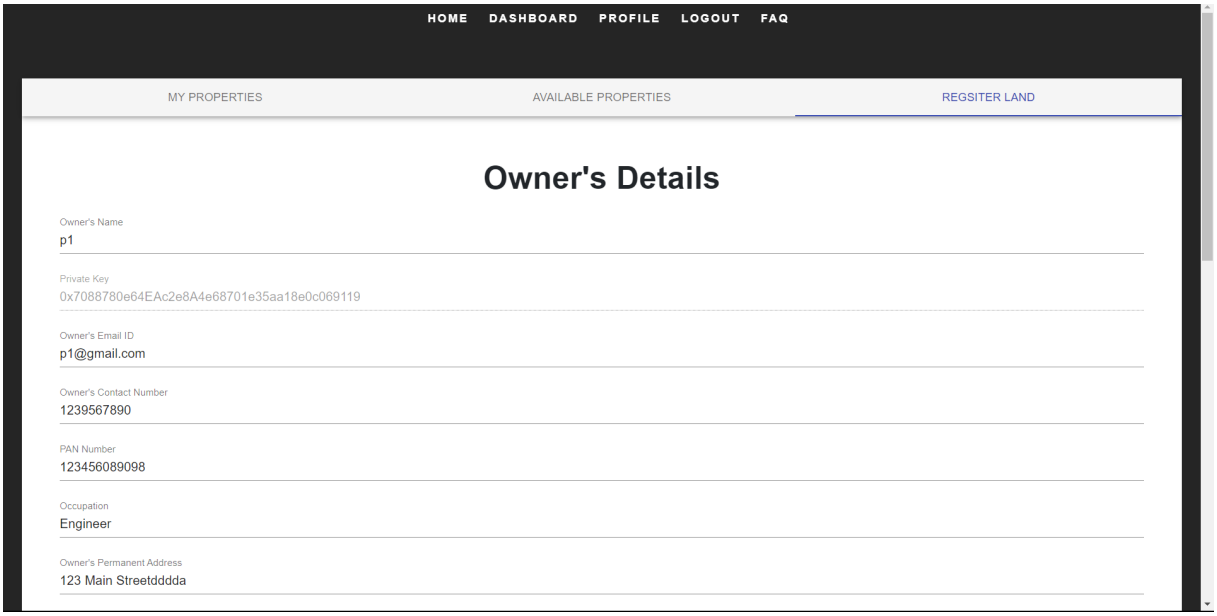

Figure 5.5: Land Registration page

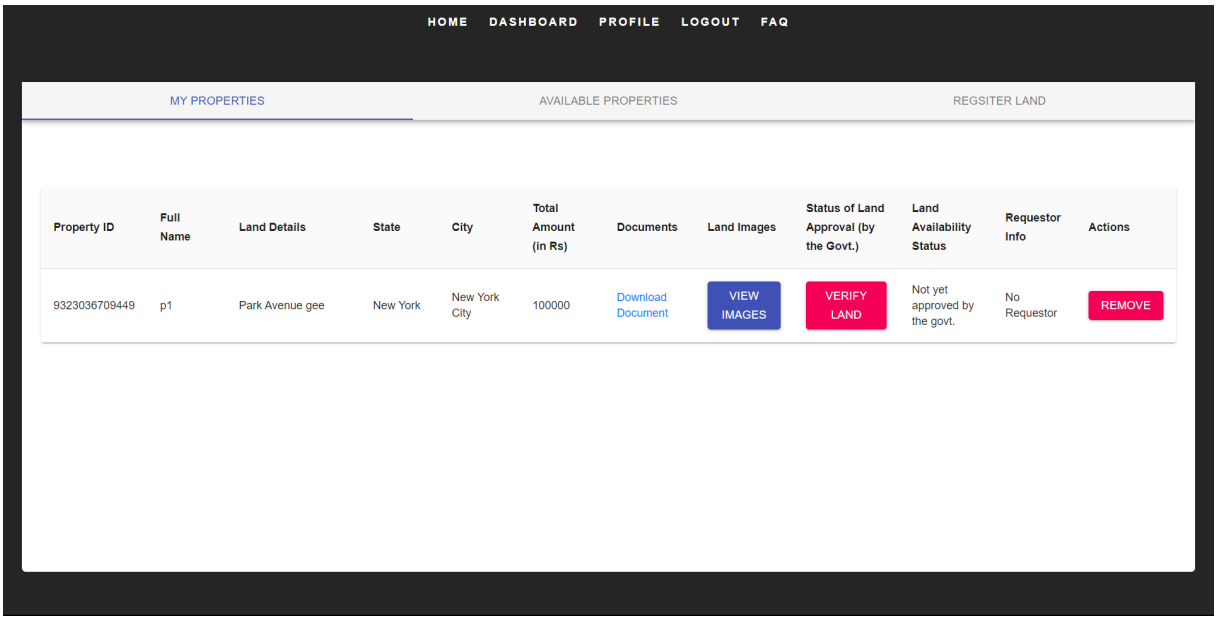

Figure 5.6: User Dashboard

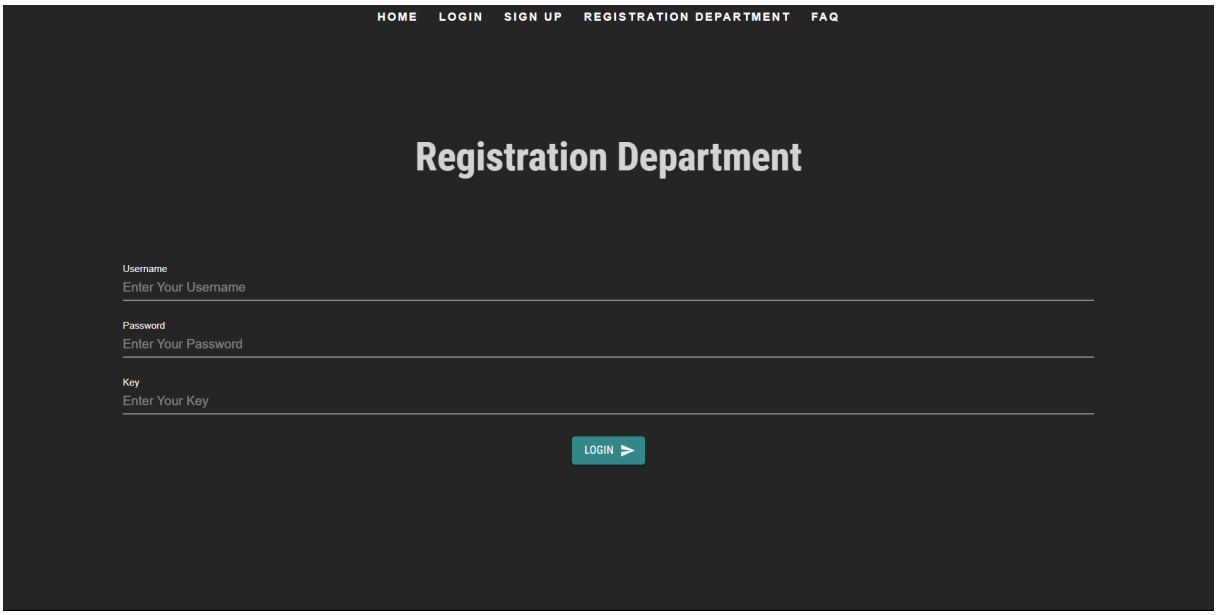

Figure 5.7: Registration Dept Login

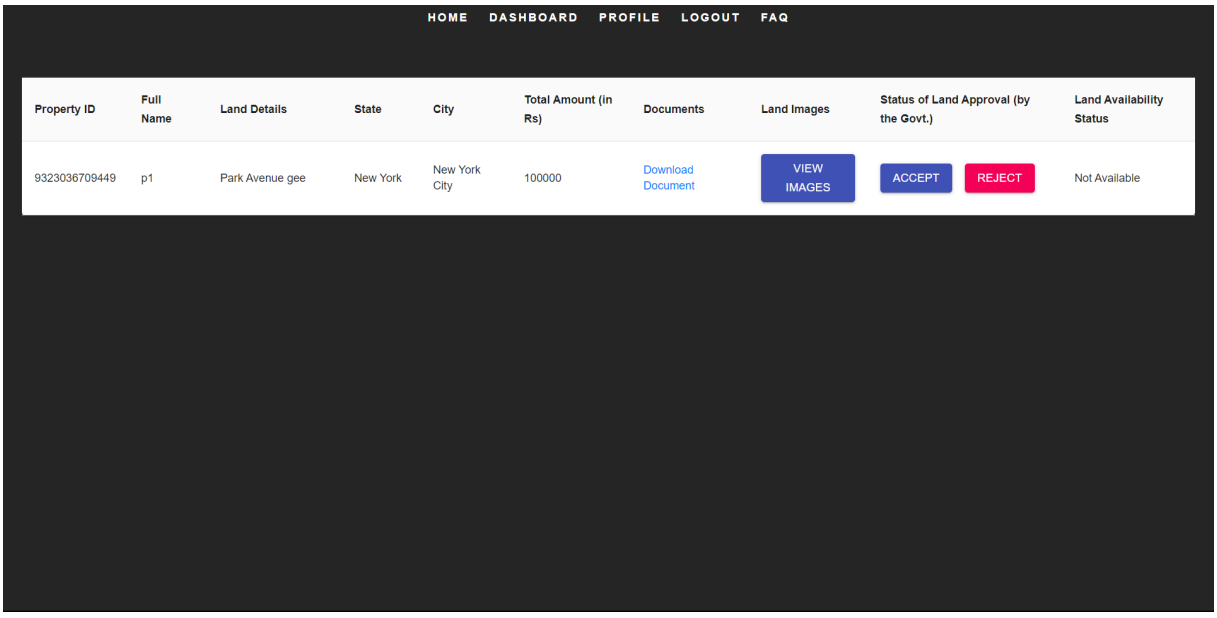

Figure 5.8: Registration Dept Dashboard

5.3 Database Design

5.3.1 Blockchain

In the LandRegistry project, a blockchain-based approach is employed, which fundamentally differs from traditional centralized databases. Instead of a conventional database management system (DBMS), Ethereum blockchain is utilized as the underlying database for storing land ownership records and related information. The choice of Ethereum blockchain is justified by its decentralized nature, immutability, and tamper-resistant properties, which are crucial for ensuring the integrity and security of land registry data.

1. Land Details: Information such as the IPFS hash representing the land document, the physical address of the land, the ownership details, and whether the land is government-approved and available for sale.

2. User Profiles: Details of users participating in the land registry system, including their Ethereum addresses, contact information, email addresses, postal codes, and city information.

3. Asset Ownership: Each user's ownership of land assets is recorded, including a list of properties owned by each user.

4. Transaction Records: Details of transactions related to land ownership, such as requests for ownership transfer, approval status, and any associated payments made for property purchases.

By storing this information on the blockchain, the LandRegistry project ensures transparency, immutability, and security, as all transactions and data changes are recorded in a decentralized and tamper-resistant manner. This approach enhances trust in the land registry system and provides an auditable trail of ownership and transaction history for all participants.

5.3.2 IPFS

In the LandRegistry project, IPFS (InterPlanetary File System) is utilized as a decentralized storage solution for storing land documents and related files. IPFS is a peer-to-peer network protocol designed to create a distributed method of storing and sharing hypermedia in a distributed file system.

Storing Land Documents: Land documents, such as deeds, contracts, and certificates,

are uploaded to the IPFS network. Each document is given a unique IPFS hash, which serves as its identifier on the network. By leveraging IPFS for storing land documents, the LandRegistry project enhances security, reliability, and accessibility of important land-related information. Additionally, IPFS aligns with the decentralized nature of blockchain technology, further strengthening the integrity of the land registry system.

5.4 Description of Implementation Strategies

In the LandRegistry project, several implementation strategies are employed to ensure the effective deployment and functionality of the system:

1. Solidity Smart Contracts: The core functionality of the land registry system is implemented using Solidity smart contracts on the Ethereum blockchain. Solidity is the programming language specifically designed for writing smart contracts on the Ethereum platform. Smart contracts define the rules and logic governing land registration, ownership transfer, and transaction processing.

2. IPFS Integration: The project integrates with the InterPlanetary File System (IPFS) for decentralized storage of land documents and related files. The implementation involves using IPFS APIs to interact with the IPFS network, upload documents, retrieve content based on hash identifiers, and ensure data integrity through content-addressable storage.

3. User Interface (UI) Development: For the frontend interface, HTML, CSS, and JavaScript are used to create a user-friendly web application. Frameworks like React.js may be employed to build dynamic and interactive UI components that interact with the blockchain and IPFS backend.

In summary, This project proposes a comprehensive methodology leveraging blockchain technology, particularly Ethereum, to establish a decentralized land registry system. Smart contracts, encoded in Solidity, automate land registration, ownership transfers, and transaction processes, ensuring transparency and security. The integration of cryptographic algorithms enhances data integrity, while advanced data structures and algorithms manage land details efficiently. Ethereum's blockchain offers transparency, immutability, and security, eliminating the need for intermediaries and reducing fraud risks. The project incorporates IPFS for decentralized storage of land documents, further enhancing security

and accessibility. Implementation strategies include developing Solidity smart contracts, integrating with IPFS, and creating a user-friendly frontend interface. Collectively, these efforts aim to modernize land registration processes, mitigate fraud risks, and provide a reliable platform for transparent and secure land transactions.

Chapter 6

Results and Discussions

The Blockchain Realty project represents a groundbreaking initiative poised to revolutionize the traditional real estate transaction landscape through the innovative integration of blockchain technology and smart contracts. By leveraging these cutting-edge tools, the project aims to automate and enhance every aspect of property transactions, ensuring a seamless, secure, and transparent experience for both buyers and sellers. This introduction sets the stage for a comprehensive exploration of how Blockchain Realty is reshaping the real estate industry and the promising future it holds for advancing efficiency, accessibility, and inclusivity in property transactions.

6.1 Overview

The LandRegistry project has successfully developed a decentralized platform for managing land ownership records and facilitating property transactions. By leveraging Ethereum blockchain technology and smart contracts, the system ensures transparency, security, and efficiency in land registry operations. Users can register their land details, including location, ownership, and government approval status, which are stored securely on the blockchain. The platform enables seamless interaction between landowners, government authorities, and potential buyers, streamlining processes such as property registration, ownership transfer, and transaction settlement. Through advanced cryptographic algorithms and data structures, the system maintains the integrity of records and enhances trust among stakeholders. Overall, the LandRegistry project delivers a reliable and transparent solution for land registry management, promoting confidence in property ownership and transactions within the community.

6.2 Testing

The project underwent comprehensive testing to ensure the reliability and functionality of its smart contract. Utilizing the Truffle testing framework, the project's testing approach aimed to verify every aspect of the contract's functionality, covering a wide range of scenarios and user interactions.

The testing process began with a meticulous review of the smart contract's specifications and requirements, outlining the expected behaviors and functionalities. Test cases were then designed to validate each aspect of the contract's functionality, including land registration, ownership transfer, government approvals, and error handling mechanisms.

Test cases were executed systematically, with each test focusing on specific functionalities or scenarios. This approach allowed for thorough validation of the contract's behavior under various conditions, ensuring its robustness and reliability in real-world usage.

Special attention was paid to error scenarios to verify that the contract reverted transactions appropriately and maintained data integrity. This involved deliberately triggering error conditions such as invalid inputs, insufficient funds, and unauthorized actions to validate the contract's error handling mechanisms.

6.2.1 Test Cases

Deployment Test The deployment test validated the successful deployment of the LandRegistry contract on the Ethereum network. A valid contract address was obtained, indicating that the contract was deployed as expected and is ready for use.

User Addition Test The user addition test verified the functionality to add new users to the LandRegistry contract. New user details were successfully recorded in the contract, demonstrating its capability to manage user data effectively.

Land Registration Test The land registration test evaluated the process of registering land in the LandRegistry contract. The registered land details were accurately stored in the contract, affirming its ability to manage land registration effectively.

Update Land IPFS Hash Test The update land IPFS hash test assessed the function-

ality to update the IPFS hash associated with registered land. The IPFS hash update functionality successfully updated the hash associated with the registered land, reflecting the updated metadata in the contract.

Land Request Processing Test The land request processing test validated the process of processing requests for land ownership within the LandRegistry contract. Ownership transfers and request statuses were updated correctly, highlighting the contract's robust handling of ownership transactions.

Make Land Available Test The make land available test verified the capability to mark land as available for purchase within the LandRegistry contract. The land availability status was successfully updated to indicate that the land is available for sale, showcasing the contract's ability to manage land availability effectively.

Land Purchase Test The land purchase test evaluated the process of purchasing land within the LandRegistry contract. The land purchase transaction executed without errors, transferring ownership to the buyer as expected and updating relevant details in the contract.

Government Status Update Test The government status update test validated the functionality to update the government approval status of land within the LandRegistry contract. The government status update operation completed successfully, indicating its responsiveness to changes in government approvals.

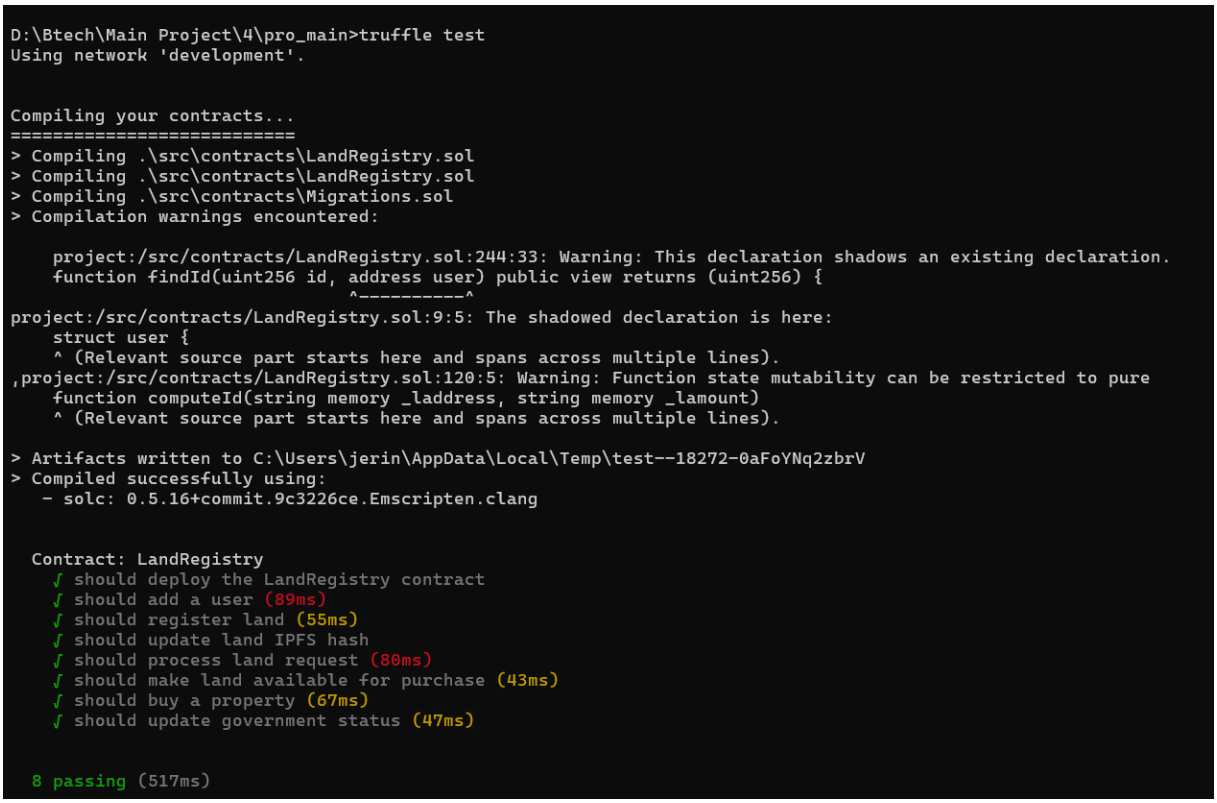

Figure 6.1: Smart contract testing

Chapter 7

Conclusions & Future Scope

In conclusion, Blockchain Realty: Modernizing Real Estate Decentralized Application represents a trans-formative solution that leverages blockchain technology and smart contracts to revolutionize the traditional real estate transaction process. By automating and enhancing each stage, from property listing and offer submission to legal documentation and fund transfers, the DApp ensures a streamlined, secure, and transparent experience for both buyers and sellers. The decentralized nature of the blockchain not only provides a tamper-proof and immutable ledger but also promotes efficiency by automating complex tasks, reducing the reliance on intermediaries, and expediting the overall transaction timeline. This innovation has the potential to make real estate transactions more accessible, cost-effective, and trustworthy for a diverse range of participants.
Looking forward, the project's success lies in its ability to reshape the real estate industry, making property transactions more efficient and inclusive. The integration of blockchain technology and smart contracts not only addresses existing challenges in the real estate sector, such as delays, high costs, and security concerns but also opens avenues for future advancements. As the adoption of decentralized technologies continues to grow, this project paves the way for a new era in real estate, where transparency, efficiency, and accessibility become the hallmarks of property transactions, fostering a more inclusive and equitable real estate landscape.

The future scope of the project holds promising potential for further advancements in the real estate industry. As blockchain technology evolves, the project could integrate additional features such as Artificial Intelligence for property valuation, machine learning algorithms for personalized property recommendations, and enhanced security measures. Additionally, the decentralized application could expand its reach to accommodate a broader range of real estate transactions, the global real estate markets, fostering a more comprehensive and globally accessible real estate ecosystem.

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Appendix A: Presentation

Blockchain Realty : Modernizing Real Estate

George K George
Hemdan M K
Jerin Joji
Kamil Hadi

RSET

May 3, 2024
Guided by :Mr. Sandy Joseph

Contents

Contents

Problem Definition

- In the real estate industry, there is a need for a more secure, efficient, and transparent system for property transactions.
- Current processes often involve middlemen, and the risk of fraud.
- This project aims to address these issues by implementing blockchain technology to digitize and streamline real estate transactions, ensuring trust and reducing the time and cost involved in property deals.

Project Objective

- Digitization: Transition real estate processes into digital formats for easier data management.
- Trustless Transactions: Establish trust through technology, reducing the need for intermediaries.
- Tamper-Proof Records: Ensure that property records are secure and resistant to fraud.
- Efficiency Gains: Automate real estate processes to save time and reduce cost, making transactions more efficient.

Novelty Of Idea And Scope Of Implementation

Design and develop a decentralized web application (dApp) that will allow buyers and sellers to interact with the private Ethereum network and modifying adopted smart contracts according to Indian rules and Regulation.

Literature Survey

[1] Real Estate Management System - Ms. Aishwarya Sedamkar

- Real estate management system using Python Flask for efficient property management.
- Incorporates a database for property, tenant, and invoice information.
- Features include property search, online payments, maintenance requests, and lease management.
- Property owners can register and post property details.
- Users can search for properties based on various criteria.

Literature Survey

- Advantage: The system exhibits ease of development, requiring minimal effort for both initial development and ongoing maintenance.
- Disadvantage: The database lacks transparency, potentially contributing to susceptibility to fraudulent activities.

Literature Survey

[2] Business Process Models of Blockchain and South African Real Estate Transactions - Jack Laurie Tilbury

- This research looks at two approaches to real estate transaction execution: the South African case and an international blockchain technology use case.
- Using Business Process Modelling and Notation, two conceptual models are presented. Document review was used to provide adequate information on the real estate transactions.
- According to the findings, the South African real estate transaction process is inefficient because it is manual, and is heavily reliant on third parties, resulting in numerous bottlenecks. According to the study, blockchain based transactions are more efficient and reduce the need for third parties.

Literature Survey

- Advantage: Using land with blockchain leads to more efficient transactions..
- Disadvantage: The paper does not involve the integration of the two identified conceptual models.

Literature Survey

[3] The Real Estate Transaction Trace System Model Based on Ethereum Blockchain Platform - Khoa Tan VO

- The paper proposes a Real Estate Transaction Trace (RETT) system model based on blockchain technology to improve property transactions in Vietnam.
- The RETT system model can manage and track real estate transactions.
- It digitizes assets, stores transaction history, and enables direct transactions.
- The system model improves transparency.
- A prototype of the system model has been built and tested on the Ethereum Blockchain platform.

Blockchain Realty : Modernizing Real Estate
Literature Survey

Literature Survey

- Advantage: Digitized assets on the Blockchain and stored decentralized transaction history.
- Disadvantage: The system model has been specifically designed to cater to property transactions in Vietnam, as opposed to being tailored for the Indian real estate market.

Literature Survey

[4] Smart Contract Definition for Land Registry in Blockchain - Archana Sahai

- The paper discusses the application of Blockchain Technology and smart contracts for land registry management. It addresses the challenges in the current land registry process in India, emphasizing the need for transparency, accountability, and coherent data sets.
- The paper highlights the potential benefits of using smart contracts and Blockchain for land registry, aiming to streamline the process and reduce fraudulent cases.

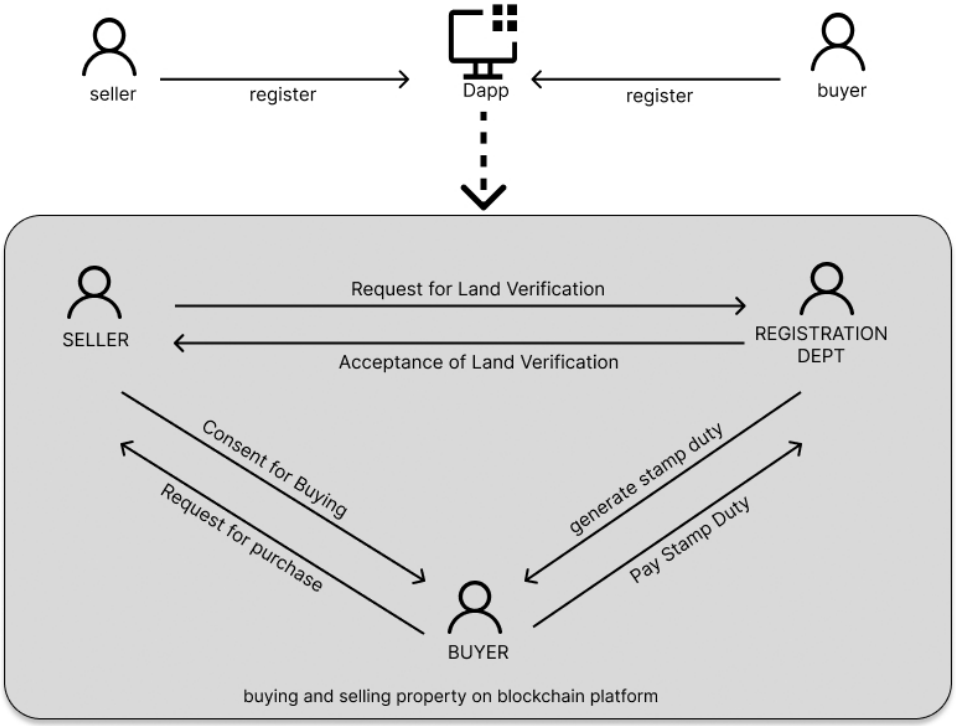
Literature Survey

- Advantage: The paper defines smart contracts for the facilitation of property transactions, encompassing both purchase and sale processes, alongside verification procedures involving land inspectors.
- Disadvantage: The paper does not delve into the possibilities of securing loans through financial institutions during the property acquisition process.

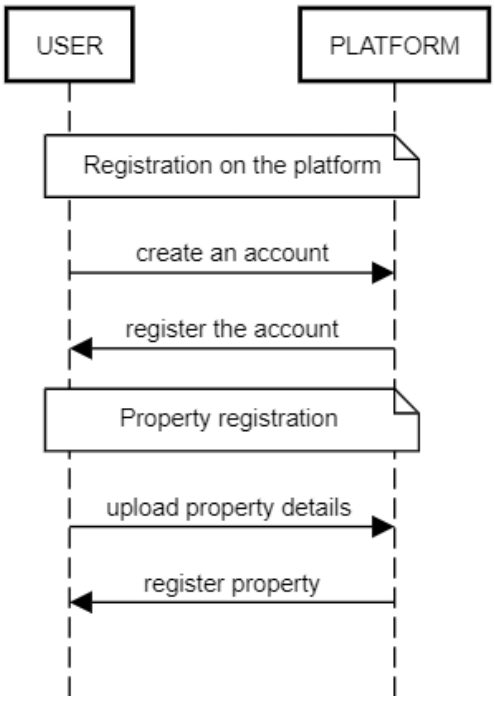
Proposed Method

- Design and develop a decentralized web application (dApp) that will allow buyers and sellers to interact with the private Ethereum network and modifying adopted smart contracts according to Indian rules and Regulation

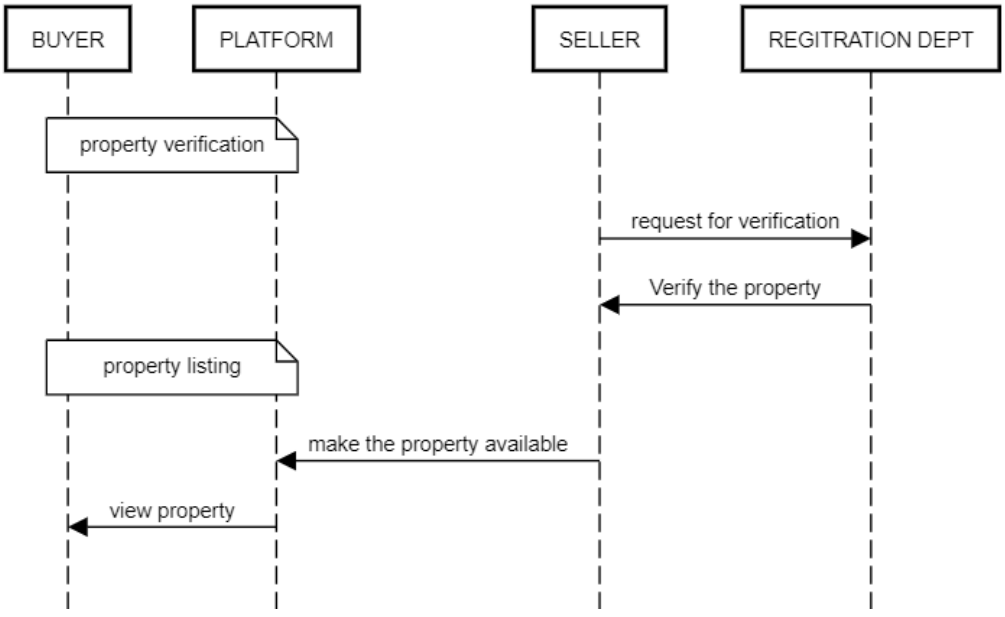
Architecture Diagram



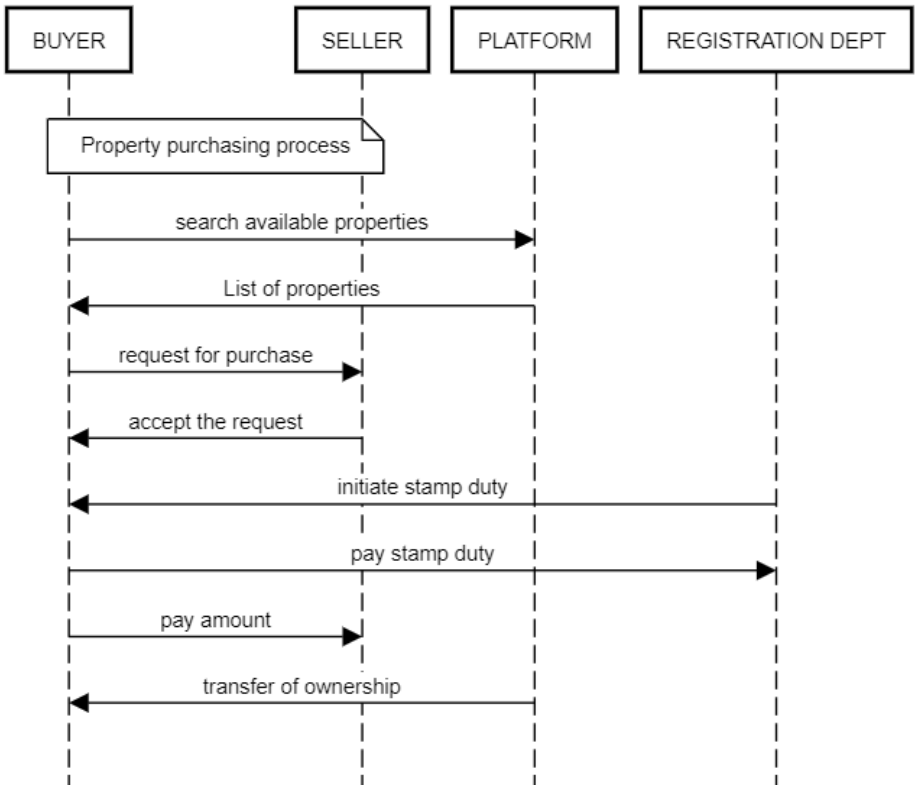
Sequence Diagram I



Sequence Diagram II



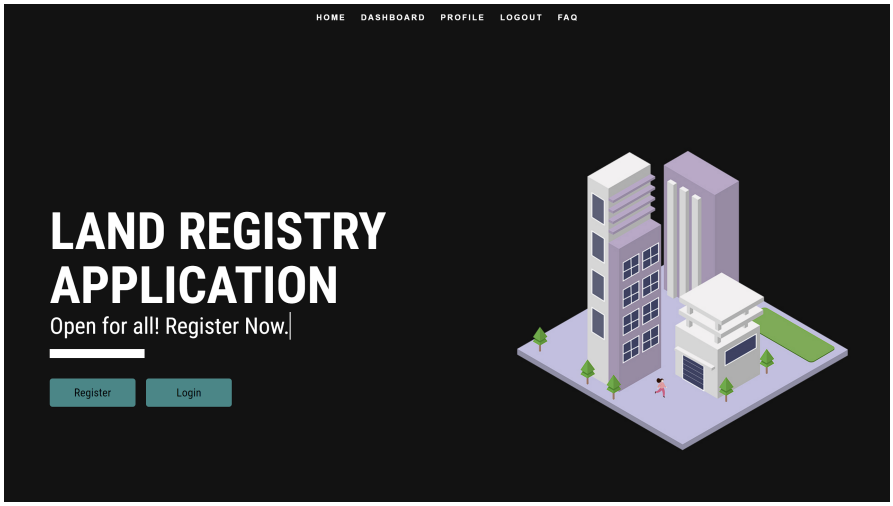
Sequence Diagram III

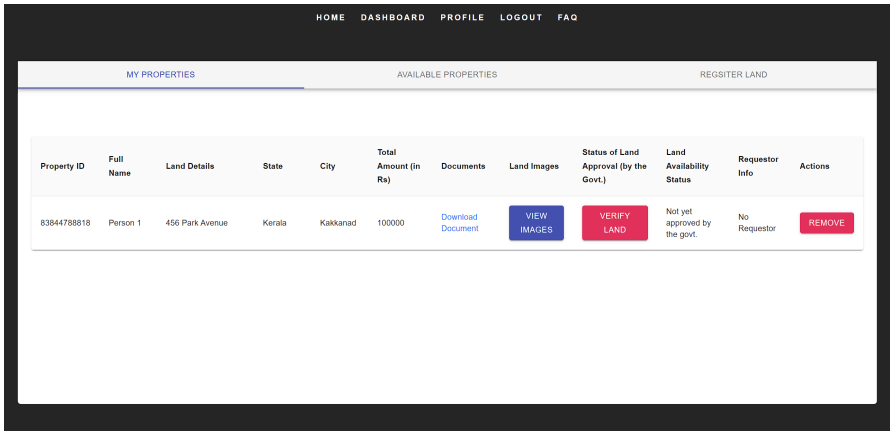


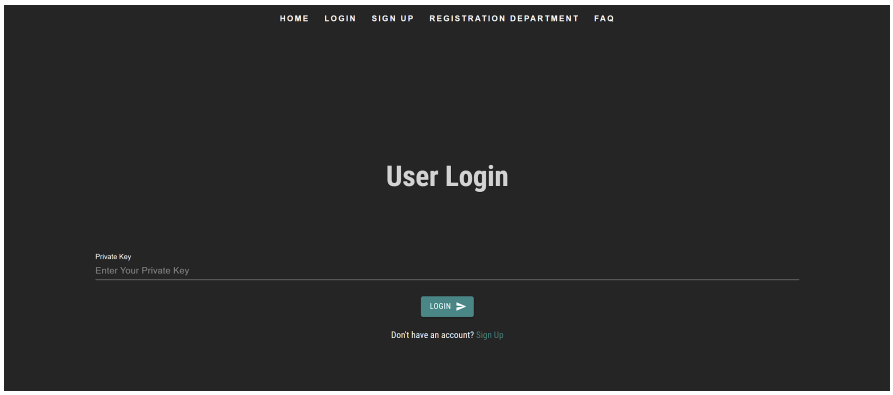
Results

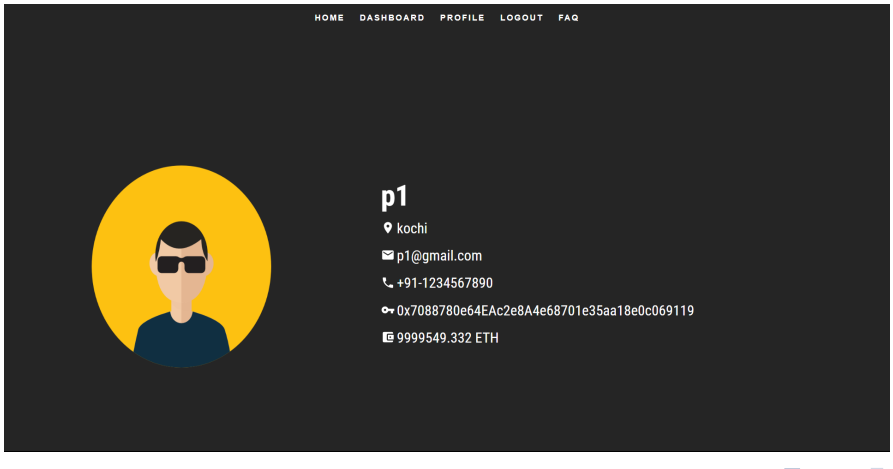
A comprehensive platform leveraging blockchain technology for secure and transparent property transactions.

- User-friendly interfaces for property browsing, registration, and purchase.
- Integration with Metamask wallet for secure transactions.
- Development and deployment of smart contracts on the blockchain.
- Government verification of property details for regulatory compliance.
- IPFS integration for secure storage of property documents.
- Payment gateway for stamp duty fees.
- Robust user and government dashboards for efficient management and oversight.


HOME DASHBOARD PROFILE LOGOUT FAQ
LAND REGISTRY APPLICATION
Open for all! Register Now.
Register
Login


HOME DASHBOARD PROFILE LOGOUT FAQ
MY PROPERTIES
AVAILABLE PROPERTIES
REGSITER LAND
Property ID
Full Name
Land Details
State
City
Total Amount (in Rs)
Documents
Land Images
Status of Land Approval (by the Govt.)
Land Availability Status
Requestor Info
Actions
83844788818
Person 1
456 Park Avenue
Kerala
Kakkanad
100000
Download Document
VIEW IMAGES
VERIFY LAND
Not yet approved by the govt.
No Requestor
REMOVE


HOME LOGIN SIGN UP REGISTRATION DEPARTMENT FAQ
User Login
Private Key
Enter Your Private Key
LOGIN
Don't have an account? Sign Up


HOME DASHBOARD PROFILE LOGOUT FAQ
p1
kochi
p1@gmail.com
+91-1234567890
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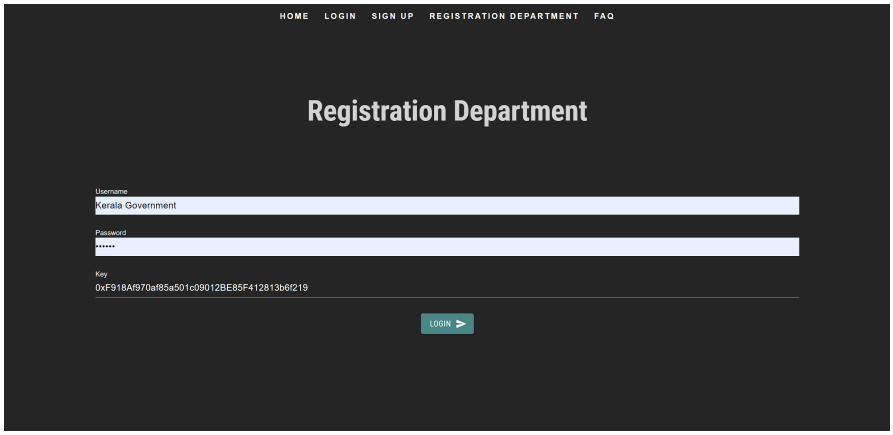
9999549.332 ETH


HOME LOGIN SIGN UP REGISTRATION DEPARTMENT FAQ
Registration Department
Username
Kerala Government
Password
Key
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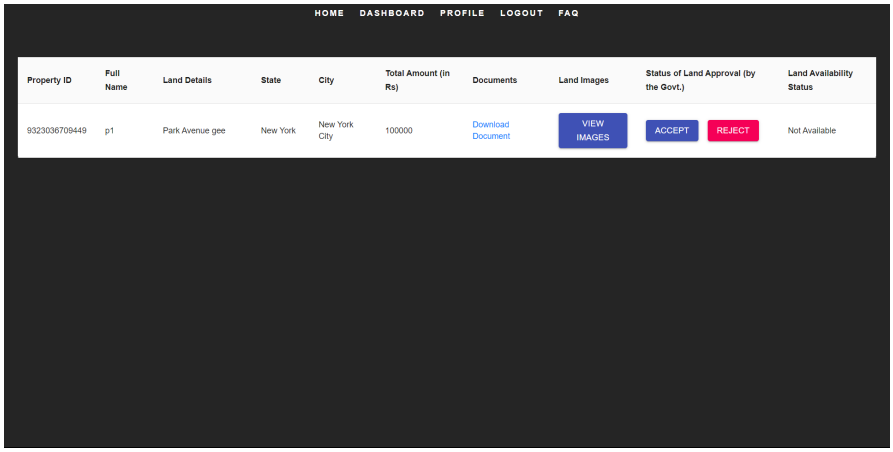
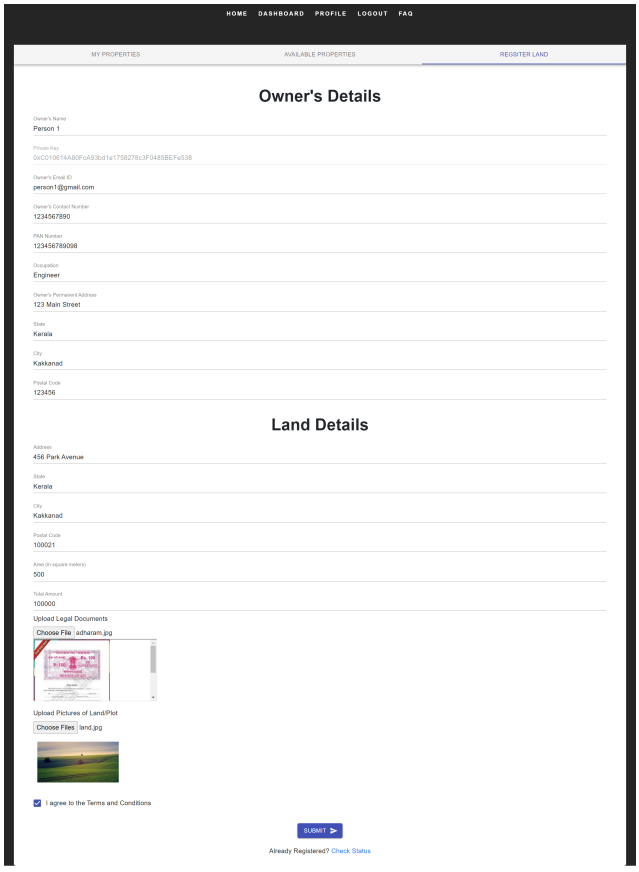
LOGIN


HOME DASHBOARD PROFILE LOGOUT FAQ
Property ID
Full Name
Land Details
State
City
Total Amount (in Rs)
Documents
Land Images
Status of Land Approval (by the Govt.)
Land Availability Status
9323036709449
p1
Park Avenue gee
New York
New York City
100000
Download Document
VIEW IMAGES
ACCEPT
REJECT
Not Available


HOME DASHBOARD PROFILE LOGOUT FAQ
MY PROPERTIES
AVAILABLE PROPERTIES
REGISTER LAND
Owner's Details
Person 1
person1@gmail.com
1234567890
123456789098
Engineer
123 Main Street
Kerala
Kakkanad
123456
Land Details
456 Park Avenue
Kerala
Kakkanad
100021
500
100000
Upload Legal Documents
Choose File adharam.jpg
Upload Pictures of Land/Plot
Choose Files land.jpg
I agree to the Terms and Conditions
SUBMIT
Already Registered? Check Status

Work-breakdown and responsibilities

- Installing the required hardware and software components and integration. (Hemdan & Kamil)
- User interface development (Hemdan & Jerin)
- Smart contract development (George & Jerin)
- Ipfs storage and fetching data (George & Kamil) (George & Kamil)
- Blockchain Network setup and smart contract deployment (Jerin & Kamil)
- MongoDB connection (George & Hemdan)

Conclusion

Project aims to simplify property transactions, enhance security, and build trust among users. This project has the potential to bring efficiency and transparency to the real estate industry, benefiting both buyers and sellers.

Future Scope

- Expansion to include rental transactions enhances project's potential.
- Integration of rental features provides comprehensive property solution.
- Widens project's scope and meets additional real estate market needs.
- Overall value of the project is enhanced through expansion.

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Appendix B: Vision, Mission, Programme Outcomes and Course Outcomes

Vision, Mission, Programme Outcomes and Course Outcomes

Institute Vision

To evolve into a premier technological institution, moulding eminent professionals with creative minds, innovative ideas and sound practical skill, and to shape a future where technology works for the enrichment of mankind.

Institute Mission

To impart state-of-the-art knowledge to individuals in various technological disciplines and to inculcate in them a high degree of social consciousness and human values, thereby enabling them to face the challenges of life with courage and conviction.

Department Vision

To become a centre of excellence in Computer Science and Engineering, moulding professionals catering to the research and professional needs of national and international organizations.

Department Mission

To inspire and nurture students, with up-to-date knowledge in Computer Science and Engineering, ethics, team spirit, leadership abilities, innovation and creativity to come out with solutions meeting societal needs.

Programme Outcomes (PO)

Engineering Graduates will be able to:

1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and Team work: Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

10. Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

A graduate of the Computer Science and Engineering Program will demonstrate:

PSO1: Computer Science Specific Skills
The ability to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas by understanding the core principles and concepts of computer science and thereby engage in national grand challenges.

PSO2: Programming and Software Development Skills
The ability to acquire programming efficiency by designing algorithms and applying standard practices in software project development to deliver quality software products meeting the demands of the industry.

PSO3: Professional Skills
The ability to apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs thereby evolving as an eminent researcher and entrepreneur.

Course Outcomes (CO)

Course Outcome 1: Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).

Course Outcome 2: Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).

Course Outcome 3: Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).

Course Outcome 4: Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).

Course Outcome 5: Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).

Course Outcome 6: Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

Appendix C: CO-PO-PSO Mapping

CO-PO AND CO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	2	1	2	2	2	1	1	1	1	2	3		
CO2	2	2	2		1	3	3	1	1		1	1		2	
CO3									3	2	2	1			3
CO4					2			3	2	2	3	2			3
CO5	2	3	3	1	2							1	3		
CO6					2			2	2	3	1	1			3

3/2/1: high/medium/low

JUSTIFICATIONS FOR CO-PO MAPPING & CO-PSO MAPPING

MAPPING	LOW/MEDIUM/ HIGH	JUSTIFICATION
100003/ CS722U.1-PO1	M	Knowledge in the area of technology for project development using various tools results in better modeling.
100003/ CS722U.1-PO2	M	Knowledge acquired in the selected area of project development can be used to identify, formulate, review

		research literature, and analyze complex engineering problems reaching substantiated conclusions.
100003/ CS722U.1-PO3	M	Can use the acquired knowledge in designing solutions to complex problems.
100003/ CS722U.1-PO4	M	Can use the acquired knowledge in designing solutions to complex problems.
100003/ CS722U.1-PO5	H	Students are able to interpret, improve and redefine technical aspects for design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
100003/ CS722U.1-PO6	M	Students are able to interpret, improve and redefine technical aspects by applying contextual knowledge to assess societal, health and consequential responsibilities relevant to professional engineering practices.
100003/ CS722U.1-PO7	M	Project development based on societal and environmental context solution identification is the need for sustainable development.
100003/ CS722U.1-PO8	L	Project development should be based on professional ethics and responsibilities.
100003/ CS722U.1-PO9	L	Project development using a systematic approach based on well defined principles will result in teamwork.

100003/ CS722U.1-PO10	M	Project brings technological changes in society.
100003/ CS722U.1-PO11	H	Acquiring knowledge for project development gathers skills in design, analysis, development and implementation of algorithms.
100003/ CS722U.1-PO12	H	Knowledge for project development contributes engineering skills in computing & information gatherings.
100003/ CS722U.2-PO1	H	Knowledge acquired for project development will also include systematic planning, developing, testing and implementation in computer science solutions in various domains.
100003/ CS722U.2-PO2	H	Project design and development using a systematic approach brings knowledge in mathematics and engineering fundamentals.
100003/ CS722U.2-PO3	H	Identifying, formulating and analyzing the project results in a systematic approach.
100003/ CS722U.2-PO5	H	Systematic approach is the tip for solving complex problems in various domains.
100003/ CS722U.2-PO6	H	Systematic approach in the technical and design aspects provide valid conclusions.

100003/ CS722U.2-PO7	H	Systematic approach in the technical and design aspects demonstrate the knowledge of sustainable development.
100003/ CS722U.2-PO8	M	Identification and justification of technical aspects of project development demonstrates the need for sustainable development.
100003/ CS722U.2-PO9	H	Apply professional ethics and responsibilities in engineering practice of development.
100003/ CS722U.2-PO11	H	Systematic approach also includes effective reporting and documentation which gives clear instructions.
100003/ CS722U.2-PO12	M	Project development using a systematic approach based on well defined principles will result in better teamwork.
100003/ CS722U.3-PO9	H	Project development as a team brings the ability to engage in independent and lifelong learning.
100003/ CS722U.3-PO10	H	Identification, formulation and justification in technical aspects will be based on acquiring skills in design and development of algorithms.
100003/ CS722U.3-PO11	H	Identification, formulation and justification in technical aspects provides the betterment of life in various domains.
100003/ CS722U.3-PO12	H	Students are able to interpret, improve and redefine technical aspects with mathematics, science and

		engineering fundamentals for the solutions of complex problems.
100003/ CS722U.4-PO5	H	Students are able to interpret, improve and redefine technical aspects with identification formulation and analysis of complex problems.
100003/ CS722U.4-PO8	H	Students are able to interpret, improve and redefine technical aspects to meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
100003/ CS722U.4-PO9	H	Students are able to interpret, improve and redefine technical aspects for design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
100003/ CS722U.4-PO10	H	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools for better products.
100003/ CS722U.4-PO11	M	Students are able to interpret, improve and redefine technical aspects by applying contextual knowledge to assess societal, health and consequential responsibilities relevant to professional engineering practices.
100003/ CS722U.4-PO12	H	Students are able to interpret, improve and redefine technical aspects for demonstrating the knowledge of, and need for sustainable development.

100003/ CS722U.5-PO1	H	Students are able to interpret, improve and redefine technical aspects, apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
100003/ CS722U.5-PO2	M	Students are able to interpret, improve and redefine technical aspects, communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
100003/ CS722U.5-PO3	H	Students are able to interpret, improve and redefine technical aspects to demonstrate knowledge and understanding of the engineering and management principle in multidisciplinary environments.
100003/ CS722U.5-PO4	H	Students are able to interpret, improve and redefine technical aspects, recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
100003/ CS722U.5-PO5	M	Students are able to interpret, improve and redefine technical aspects in acquiring skills to design, analyze and develop algorithms and implement those using high-level programming languages.
100003/ CS722U.5-PO12	M	Students are able to interpret, improve and redefine technical aspects and contribute their engineering skills in

		computing and information engineering domains like network design and administration, database design and knowledge engineering.
100003/ CS722U.6-PO5	M	Students are able to interpret, improve and redefine technical aspects and develop strong skills in systematic planning, developing, testing, implementing and providing IT solutions for different domains which helps in the betterment of life.
100003/ CS722U.6-PO8	H	Students will be able to associate with a team as an effective team player for the development of technical projects by applying the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
100003/ CS722U.6-PO9	H	Students will be able to associate with a team as an effective team player to Identify, formulate, review research literature, and analyze complex engineering problems
100003/ CS722U.6-PO10	M	Students will be able to associate with a team as an effective team player for designing solutions to complex engineering problems and design system components.
100003/ CS722U.6-PO11	M	Students will be able to associate with a team as an effective team player, use research-based knowledge and research methods including design of experiments, analysis and interpretation of data.

100003/ CS722U.6-PO12	H	Students will be able to associate with a team as an effective team player, applying ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
100003/ CS722U.1-PSO1	H	Students are able to develop Computer Science Specific Skills by modeling and solving problems.
100003/ CS722U.2-PSO2	M	Developing products, processes or technologies for sustainable and socially relevant applications can promote Programming and Software Development Skills.
100003/ CS722U.3-PSO3	H	Working in a team can result in the effective development of Professional Skills.
100003/ CS722U.4-PSO3	H	Planning and scheduling can result in the effective development of Professional Skills.
100003/ CS722U.5-PSO1	H	Students are able to develop Computer Science Specific Skills by creating innovative solutions to problems.
100003/ CS722U.6-PSO3	H	Organizing and communicating technical and scientific findings can help in the effective development of Professional Skills.