

# Unlocking Real Estate Security: Implementing Blockchain for Ironclad Registration and Owner Identification

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**Abstract:** The real estate industry faces significant challenges with vulnerabilities in current land registration processes, leading to fraudulent activities against both the public and governmental bodies. This project proposes a solution by implementing a secure land registry system using blockchain technology, specifically leveraging the efficiency and scalability of Polygon blockchain. The adoption of Polygon blockchain addresses these security concerns, providing a robust and reliable platform for registration and validation. Each transaction is recorded in blocks uniquely identified through the SHA256 hashing algorithm, ensuring an immutable ledger. Additionally, the Proof of Work (PoW) algorithm enhances security by validating transactions. Elliptic curve cryptography is utilized for signature generation, ensuring transaction authenticity. The implementation of Merkle tree structures optimizes storage efficiency while maintaining data integrity. Through this project, we aim to revolutionize real estate security and owner identification, promising enhanced reliability and efficiency in land registration processes.

**Index Terms –** Block Chain, Distributed Ledger Technology (DLT), Cryptographic Hash Function, Smart Contracts, Reliability, Ethereum, Peer-to-Peer Networking.

## I. INTRODUCTION

In this Revolutionizing real estate era, our project introduces a decentralized blockchain land registration system, ensuring secure, automated transfers through smart contracts. We prioritize integrity, immutability, and regulatory compliance. By employing smart contracts, we aim to fortify property records' integrity, automate secure title transfers, and ensure adherence to local regulations. Our commitment extends to integrating a robust digital identity system, exploring the incorporation of wallet Id for heightened owner verification within the blockchain ecosystem. Through

strategic educational initiatives, we aspire to empower stakeholders and propel the widespread adoption of blockchain technology, heralding a new era of trust and efficiency in the real estate domain.

## II. LITERATURE SURVEY

[1] 'Secured data storage framework for land registration using blockchain technology'

In this study, By Utilizing decentralized ledgers and smart contracts, it offers tamper-resistant land records. The framework enhances transparency, minimizes fraud, and resolves disputes efficiently. Secure Land revolutionizes traditional land registration systems with its decentralized and transparent approach. It sets a new standard for secure and reliable land ownership verification.

[2] 'An Efficient Data Security in Medical Report using Block Chain Technology'

Blockchain's decentralized ledger system prevents unauthorized access and tampering of sensitive medical information. Smart contracts streamline access control and ensure data integrity. Immutable blocks ensure the auditability and traceability of medical data transactions. Enhanced encryption techniques bolster data confidentiality, maintaining patient privacy.

[3] 'A conceptual framework for blockchain smart contract adoption to manage real estate deals in smart cities'

In this paper, Smart contracts automate and secure transactions, reducing the need for intermediaries. Blockchain's decentralized ledger ensures transparency and immutability in property transactions. Integration with IoT devices enables real-time monitoring and management of properties.

Enhanced security measures safeguard sensitive real estate data, bolstering trust among stakeholders. Overall, this framework fosters efficiency, transparency, and trust in real estate dealings within smart city environments.

[4] 'Assessing the performance of land administration system in Punjab after land records computerization'

The study examines the impact of digitalization on land record management and transaction processes. Key metrics such as accuracy, accessibility, and turnaround time are analysed to gauge system effectiveness. Stakeholder feedback and case studies provide insights into user experiences and challenges. Overall, the assessment aims to understand the strengths and weaknesses of Punjab's land administration system in the digital era.

[5] 'A blockchain based secured land registration system'

The system ensures immutable and transparent property records. Smart contracts automate and authenticate land transactions, reducing fraud and disputes. Decentralized ledger technology eliminates the need for intermediaries, streamlining processes and reducing costs. Enhanced encryption ensures data security, safeguarding sensitive information. Overall, this system fosters trust and efficiency in land registration, benefiting both government and citizens.

[6] 'On Blockchain Application: Hyperledger Fabric and Ethereum'

In the study, Hyperledger Fabric emphasizes permissioned networks and modular architecture, suited for enterprise solutions. Ethereum, on the other hand, prioritizes decentralization and smart contract functionality, catering to a wide range of applications including decentralized finance and decentralized applications (DApps).

[7] 'Blockchain characteristics and consensus in modern business processes'

In this paper it ensuring transparency, security, and decentralization. Consensus algorithms such as Proof of Work (PoW) or Proof of Stake (PoS) validate transactions, maintaining the integrity of the distributed ledger. These features enable trustless interactions and streamline operations across various industries, driving innovation and efficiency.

[8] 'Design of land administration and title registration model based on blockchain technology' This research describes the revolutionizes property management. Utilizing blockchain ensures immutable, transparent,

and tamper-proof records of land titles and ownership transfers. Smart contracts automate and authenticate transactions, reducing fraud and enhancing efficiency. This model enhances trust, security, and accessibility in land registration systems, benefiting governments, institutions, and individuals alike.

### III. EXISTING SYSTEM

In the existing system, property transactions are recorded and managed by government agencies or land registries. Processes involve manual paperwork and bureaucratic procedures for property registration and ownership transfers. Access to land registration data is typically restricted to authorized personnel, leading to limited transparency for stakeholders. Security concerns arise due to vulnerabilities in centralized systems, risking data breaches and fraudulent activities. Delays and inefficiencies may occur due to manual processing and verification of documents. Disputes over property ownership and boundaries can arise from inaccuracies or inconsistencies in land records. Overall, the system is characterized by centralization, manual processes, limited transparency, security risks, delays, inefficiencies, and potential for disputes.

Disadvantages:

- Centralization

Land registration data is typically centralized within government agencies or land registries. This centralization leads to a lack of transparency and accountability, as control over the data is concentrated in the hands of a few entities.

- Manual Processes

Property transactions in the existing system rely heavily on manual paperwork and bureaucratic procedures. This manual processing introduces inefficiencies, delays, and errors into the land registration process

- Limited Accessibility

Access to land registration data may be restricted to authorized personnel, hindering transparency and making it difficult for stakeholders to verify information.

- Security Vulnerabilities

Centralized databases are vulnerable to cyberattacks, data breaches, and manipulation, posing risks to the integrity and security of land records.

- Costs and Inefficiencies

Maintaining centralized databases and manual processes incur significant costs and administrative burdens for governments and land registries.

#### IV. PROPOSED SYSTEM

##### A) OVERVIEW

This section has briefly described the experiments and techniques that how revolutionizes real estate practices by integrating blockchain technology. It ensures secure, transparent, and efficient property registration and owner identification processes. Through decentralized ledger and smart contracts, it eliminates intermediaries, reducing fraud risks and enhancing trust. Property details and ownership records are securely stored on the blockchain, ensuring immutability and transparency. Biometric authentication strengthens owner identification, bolstering security measures. Regulatory compliance is embedded within smart contracts, ensuring adherence to real estate laws. The user-friendly interface facilitates seamless interaction for stakeholders, promoting widespread adoption. Educational initiatives and community engagement foster awareness and acceptance of blockchain technology in real estate. Integration with government databases and real estate platforms ensures interoperability and accessibility. Ongoing testing, maintenance, and updates guarantee the system's reliability and adaptability in evolving real estate landscapes.

##### B) RESEARCH METHODOLOGY AND FRAMEWORK DESIGN

The focus of this study is to explore the current systems and bring innovation by the exploration of these existing systems. therefore, we adopted exploratory research. Exploratory research methodology is defined as finding out what is happening, seeking new intuitions, and generating ideas and theories for new research. In the first section, we have explored and analysed what is happening in the land registration process in Pakistan, and from these examination and exploration processes, we have collected new insights. With these new insights, we are in a position to produce some concepts and hypotheses. In the second part, we have explained our

experiments that we have done in preparation of this conceptual framework.

##### C) BLOCKCHAIN INFRASTRUCTURE

The blockchain infrastructure forms the foundation of the proposed system, facilitating secure and transparent property registration and owner identification processes. At its core are smart contracts, programmable agreements that automate and enforce rules governing property transactions. These smart contracts are deployed on a decentralized blockchain network, ensuring immutability and transparency of property records. The decentralized ledger serves as a tamper-proof database, storing immutable records of property ownership, transactions, and owner identities. By leveraging blockchain technology, the system eliminates the need for intermediaries and central authorities, reducing the risk of fraud and manipulation. Participants in the network can securely interact with the blockchain, facilitating seamless property transactions without the need for trust between parties. Additionally, blockchain encryption techniques safeguard sensitive data, such as owner identities and transaction details, from unauthorized access. The blockchain infrastructure provides a scalable and efficient platform for managing real estate assets, enabling rapid and cost-effective property registration and transfer processes. Overall, the blockchain infrastructure ensures the integrity, security, and efficiency of the real estate ecosystem, empowering stakeholders with greater control and transparency over their property transactions.

##### D) PROPERTY REGISTRATION

Evaluation of the model is the vital part of creating an efficient machine learning model. Therefore, it is important to create a model and get suggestions from it in terms of metrics. It will take and continue until we achieve good accuracy according to the value obtained from metric improvements. Evaluation metrics describe one model's results. The ability to distinguish between model outcomes is an important feature of the evaluation metrics. Here, we used Root Mean Squared Error (RMSE) metric for evaluation process. In the proposed system, Property Registration is a streamlined process facilitated by blockchain technology. Through a decentralized property registry, property details including location, size, and ownership are securely recorded on the blockchain.

Smart contracts automate the registration process, reducing reliance on manual paperwork and bureaucratic procedures. Property transactions are executed seamlessly, with ownership changes reflected in real-time on the decentralized ledger. The immutability of blockchain ensures that property records remain tamper-proof and transparent, enhancing trust among stakeholders. Property owners can access and update their registration information with ease, promoting efficiency and accuracy. Additionally, the elimination of intermediaries minimizes the risk of fraud and manipulation in the registration process. The user-friendly interface simplifies interaction for property owners, buyers, and sellers, facilitating smoother transactions. Integration with government databases and real estate platforms ensures compatibility and data interoperability, enhancing the overall registration experience. Overall, Property Registration in this system offers a secure, transparent, and efficient solution for managing real estate assets.

#### E) OWNER IDENTIFICATION

In this system, owner identification is a critical component facilitated through blockchain technology. Decentralized identity management solutions assign unique digital identities to property owners securely. Through this process, individuals are authenticated and verified on the blockchain network, ensuring the integrity of property ownership records. Biometric authentication mechanisms, such as facial recognition or fingerprints, are employed to enhance security and accuracy in owner identification. These biometric data are securely stored and encrypted on the blockchain, safeguarding against unauthorized access and fraudulent activities. By integrating biometric authentication, the system strengthens identity verification processes, reducing the risk of identity theft and fraud in property transactions. Property owners can securely access and manage their digital identities through user-friendly interfaces, enhancing user experience and trust in the system. Additionally, the use of biometric authentication adds an extra layer of security, mitigating risks associated with password-based authentication methods. Overall, owner identification in this system ensures robust security measures and fosters trust among stakeholders in real estate transactions.

#### F) SECURITY AND DATA INTEGRITY

The proposed system prioritizes security and integrity, safeguarding property transactions and ownership records through blockchain technology. Blockchain's immutability ensures that once data is recorded, it cannot be altered or tampered with, providing a reliable and tamper-proof record of property ownership and transactions. Encryption techniques further enhance security, protecting sensitive data such as owner identities and transaction details from unauthorized access. Biometric authentication mechanisms add an extra layer of security, ensuring that only authorized individuals can access and verify property ownership. Smart contracts embedded within the system enforce compliance with real estate laws and regulations, mitigating the risk of fraudulent activities. Regular audits and monitoring mechanisms track and verify the integrity of data stored on the blockchain, maintaining trust and transparency in property transactions. The decentralized nature of the blockchain infrastructure reduces the dependency on central authorities, minimizing the risk of single points of failure and malicious attacks. Overall, the emphasis on security and integrity within the system instills confidence among stakeholders, fostering trust and reliability in real estate transactions.

### V. IMPLEMENTATION

#### Smart Contract

Blockchain is to bitcoin, what the internet is to email. A big electronic system, on top of which you can build applications. Currency is just one. Bitcoin supports an optional and special feature called scripts for conditional transfer of values. Ethereum blockchain extended the scripting feature into a full blown code execution framework called smart contract. A smart contract provided the very powerful capability of code execution for embedding business logic on the blockchain. With addition of code execution comes serious consideration about public access to the blockchain hence the classification of public, private and permissioned blockchain based on access limits. In this project we have implemented a smart contract as the backend which consists of all the terms and conditions for a smooth and secure transfer of property registration.

**Truffle**

Truffle is a world-class development environment, testing framework and asset pipeline for blockchains using the Ethereum Virtual Machine (EVM), aiming to make life as a developer easier. Truffle is widely considered the most popular tool for blockchain application development with over 1.5 million lifetime downloads.

**MetaMask**

MetaMask is a software cryptocurrency wallet used to interact with the Ethereum blockchain. It allows users to access their Ethereum wallet through a browser extension or mobile app, which can then be used to interact with decentralized applications.

**Web3.js**

Web3.js talks to The Ethereum Blockchain with JSON RPC, which stands for "Remote Procedure Call" protocol. Ethereum is a peer-to-peer network of nodes that stores a copy of all the data and code on the blockchain. Web3.js allows us to make requests to an individual Ethereum node with JSON RPC in order to read and write data to the network. It's kind of like using jQuery with a JSON API to read and write data with a web server.

**VI. DEVELOPMENT AND TESTING**

**i) Truffle**

Truffle is a one stop ide for testing and developing decentralized applications like our project. It is very common to write and compile Solidity code manually which is fine for small projects. However, as our project is growing bigger and bigger, it is good to have an automatic way of smart contracts development. In addition, testing Solidity code is crucial to avoid any problematic situation caused by a bug in the smart contract. There are different frameworks available for taking care of the development process. Truffle is one of them and is often regarded as the Ethereum Swiss Knife framework as it is a development environment, testing framework and asset pipeline for Ethereum. We have used truffle for our project for deployment and testing.



**ii) Ganache**

Ganache is an Ethereum simulator that makes developing Ethereum applications faster, easier, and safer. It includes all popular RPC functions and features (like events) and can be run deterministically to make development a breeze. We have used ganache for testing to create blockchain locally. On this we deploy our smart contract, carry out transactions. We can carry out as many transactions as we want for testing purposes.

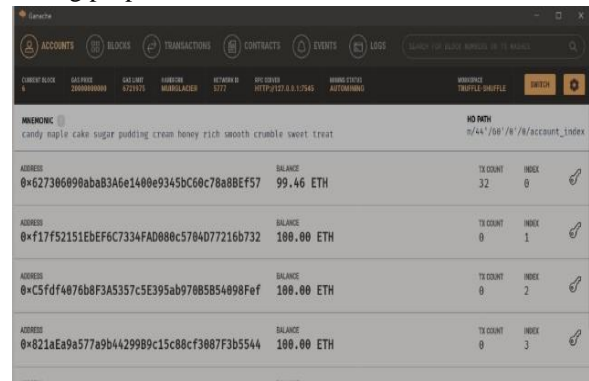


Figure 1: Ganache

Deploy smart contracts onto Ganache, then execute test scripts to verify property registration and transaction functionality, ensuring proper execution before deployment.

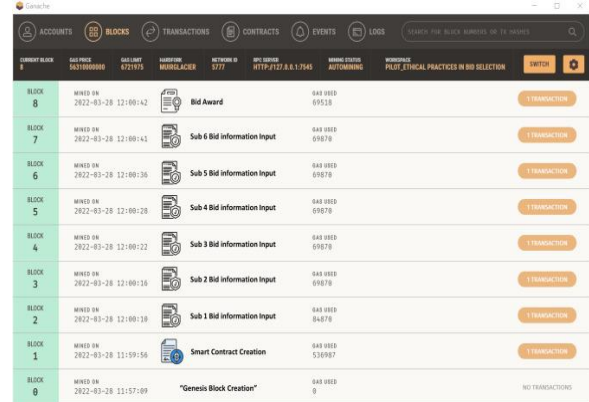


Figure 2: Ganache Transaction

The transactions via test scripts to simulate property registration and ownership transfer, verifying proper execution and integrity of transactions.

## IX. CONCLUSION

The system holds significant promise for enhancing security, transparency, and efficiency within the industry. By leveraging blockchain's inherent features such as immutability, decentralization, and smart contracts, the project aims to address longstanding challenges associated with traditional property registration systems. Through decentralized identity management and automated compliance mechanisms, blockchain can streamline property transactions while ensuring regulatory adherence and mitigating fraud risks. Real-world case studies and existing literature demonstrate the feasibility and potential impact of blockchain-based solutions in revolutionizing real estate security. Moving forward, continued research, collaboration, and innovation will be essential to realizing the full potential of blockchain technology in unlocking real estate security and establishing trust among stakeholders in property transactions.

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