
FRAMEWORK FOR SECURE LAND REGISTRY SYSTEM USING BLOCKCHAIN

Aman Kumar Verma^{*1}, Aniket Singh^{*2}, Er. Kaushlendra^{*3}, Dr. Ashish Baiswar^{*4}

^{*1,2}UG Student Of Department Of Information Technology, Shri Ramswaroop Memorial College Of Engineering And Management Lucknow, Uttar Pradesh, India.

^{*3}Assistant Professor, Department Of Information Technology, Shri Ramswaroop Memorial College Of Engineering And Management Lucknow Uttar Pradesh, India.

^{*4}Associate Professor, Department Of Bachelor Of Information Technology, Shri Ramswaroop Memorial College Of Engineering And Management Lucknow, Uttar Pradesh, India.

DOI : <https://www.doi.org/10.56726/IRJMETS52661>

ABSTRACT

Land registry system refers to the system that records the details of ownership entitlement by several government bodies. The stored record can be used as the proof on entitlement and avoid any kind of fraud and smooth transition whenever required. In India, We are currently using a system where we write all this information on paper, which can be a bit old-fashioned as well as less secure, this way of doing things has many problems like if you ever need to find information about a piece of land in the future, it can be really hard and time-consuming.

The current land registration process involves a lot of vulnerabilities and people uses it to cheat the common people and the government. This paper discusses about a secure land registry implemented using blockchain which will work on the basis of majority consensus. By implementing the land registry in blockchain, the security issue is resolved to a great extent. The hash value calculated for each block will be unique as it is linked to the hash of the previous block. The algorithm that is used for hashing is SHA256. Along with SHA256, Proof Of Work (PoW) algorithm is also used which makes the information related to each transaction more secure.

By implementing land registry using blockchain we are addressing some of the challenges involved in data collection and storage, data confidentiality, authenticity of ownership details regarding source of money. It also incorporates the details regarding the funds provided by the financial institutions and the customers involved in land transactions like banker details and insurance providers. Details regarding the quantity of land purchased by a person or an enterprise is incorporated in to the block chain. It also includes representation of previous transaction details, information regarding financial institutions, protection of collected data, fault tolerance without data loss and details about how to represent previous attributes. Maintaining land registry records is a tedious task. The process of referring back to all the transactions made from a land registry ledger is again a time consuming process. The illegal practices prominent in our society puts the integrity of data stored in the blockchain network under question. These issues have served as a source of motivation to innovate the land record maintenance.

The primary objective of this paper is to explore the potential of blockchain Technology in land registration , with a focus on how it can prevent frauds, store land ownership records and facilitate ownership transfer through blockchain algorithms and with smart contracts.

I. INTRODUCTION

Land registration is about gathering information like who owns a piece of land and what is it's size. Right now, keeping track of land ownership is a big hassle because it involves storing lots of written records in a safe place. The problem with this method is that if we ever need to look up information from these records in the future, it takes a lot of time and effort. The current system is not very secure either because much of it is hidden from view, it's slow, and every time a piece of land is sold, it needs to be recorded accurately. People have tried to make things easier by using computers to store the information instead of keeping paper records. But this isn't always safe because if the computer system isn't well-protected, someone could easily change the information. Blockchain is like a big digital ledger that keeps track of all the deals that happen between people without needing a central authority. When we use blockchain for land registry, it makes things safer because it's really

hard to cheat the system. It keeps records of who owns what land in a way that's spread out across many computers, so it's tough for anyone to tamper with it. This also means we don't need to rely on any one person or organization to keep things straight. Transactions, like when someone buys or sells land, gets its own block of information on the blockchain. This block has details like who's involved, how much money is changing hands, and so on. And because of some fancy math stuff, the information is protected and organized really well, making sure it stays safe and reliable.

Each block in the blockchain has its own special code, and it's impossible to change any information inside it manually. When a transaction is finished, it gets added to the chain of blocks. If two people own the same property, the blockchain handles it securely. Using blockchain for land registration can make buying and selling property easier and safer. Right now, when people deal with land transactions, there's often the risk of fraud or corruption from middlemen like registration officers. Doing things offline can lead to problems like spending money twice on the same property. Blockchain helps by keeping everything secure and time-stamped, which reduces the chances of interference from third parties.

Using blockchain for land registry helps us overcome many challenges related to collecting and storing data, ensuring data privacy, and confirming the ownership of properties and the source of funds. It includes details about financial transactions involving banks and insurance companies, as well as the amount of land purchased by individuals or businesses. Blockchain also records past transactions, financial institution details, data protection measures, and methods for representing previous attributes. Keeping land registry records manually is difficult and time-consuming, especially when referring back to past transactions. Additionally, concerns about data integrity arise due to illegal activities in society. These challenges have pushed us to find innovative ways to maintain land records, leading to the adoption of blockchain technology.

II. PROPOSED SYSTEM

The primary goal of implementing blockchain-based land registration is to safeguard land transactions against attackers and ensure efficient record-keeping. The proposed solution also addresses concerns about double spending, where the same land is sold multiple times to different clients. Due to the minimal documentation and record-keeping required, the time taken for land transactions is reduced.

The organizational structure for land-based transactions, as depicted in Figure 1, involves a main registration office and associated sub-register offices. These offices are connected via previous hash links. The main registration office holds data on the original land quantity before sale, while sub-register offices maintain records of the land involved in transactions and the remaining land after each deal. Users with multiple properties across various states are tracked within the chain, along with their respective properties. This forms a chain of users with essential transaction details, including previous and current property owners, actual and selling prices, and property sizes.

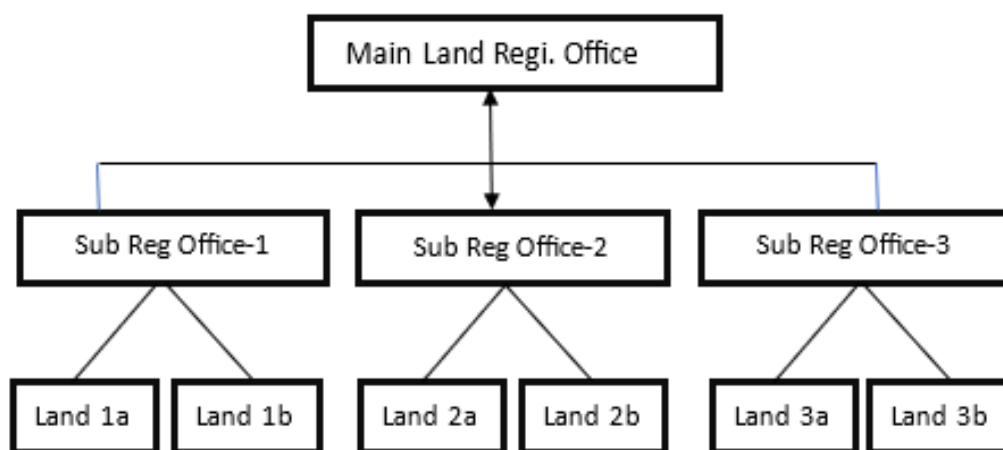


Figure 1

The network operates as a single main chain with multiple blocks linked using hash functions. Each transaction undergoes verification using a Merkle tree. Figure 2 illustrates the parameters within a block associated with

an individual user. Input parameters denote the origin of transactions, while output parameters specify the recipient of the land being sold.



Figure 2

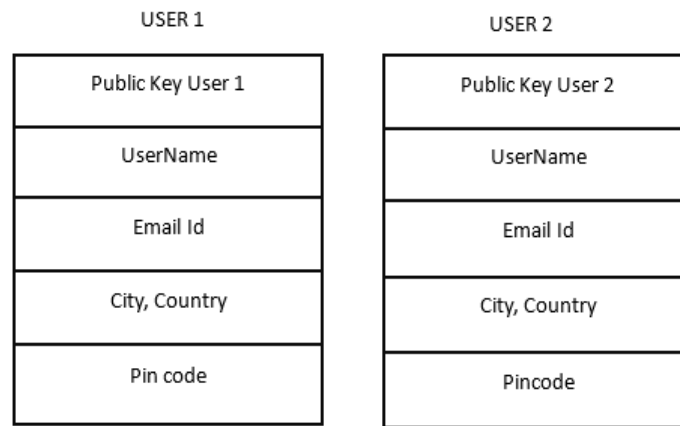


Figure 3 Architecture for forming multiple chain

Figure 3 illustrates the block-level specifics concerning multiple users. The public key of each user will be distributed across the network. Individuals will utilize their private keys to access their platform, enabling them to determine the quantity of land to be sold and the amount of money to transfer to customers. In a transaction, the public key is disseminated across the network for consensus, while the private key guarantees secure transaction execution for the involved user.

Figure 4 depicts a land transaction occurring between two users within a blockchain setting. The public key linked with the seller's block will be accessible to the buyer for verifying the transaction's legitimacy. Individual users will employ their private keys to access their data within specific blocks, ensuring that this information remains inaccessible to others as given below figure.

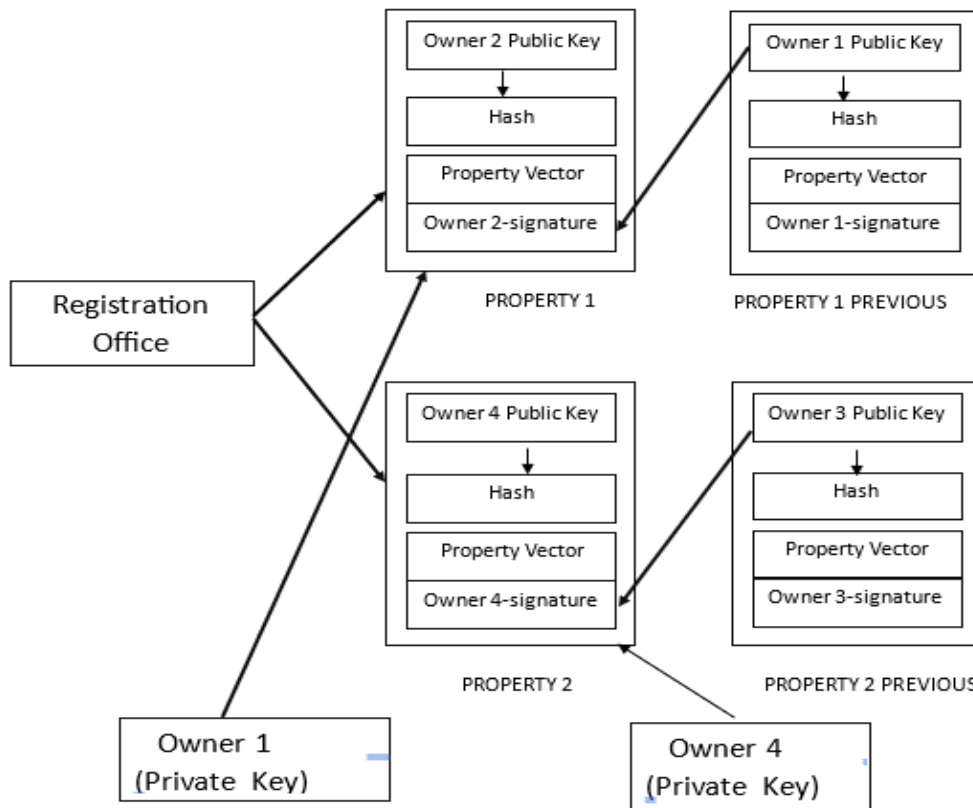


Figure 4: Land Transaction

III. CONCLUSION

In conclusion, the implementation of a secure land registry using blockchain technology presents a promising solution to the longstanding challenges of land ownership and property rights management. Through the utilization of blockchain's inherent features such as immutability, transparency, and decentralization, this project has demonstrated the potential to revolutionize traditional land registry systems.

By creating a tamper-proof and transparent ledger of land ownership records, blockchain can mitigate issues related to fraud, corruption, and disputes, thus fostering trust and confidence in the property market. Moreover, the use of smart contracts enables automated execution of property transactions, reducing administrative overhead and enhancing efficiency. While challenges such as scalability, interoperability, and regulatory compliance remain, the benefits offered by blockchain-based land registries outweigh these obstacles. Continued research and collaboration are crucial to refining the technology and addressing these challenges, paving the way for widespread adoption and the realization of a more secure and equitable land registry system.

IV. FUTURE WORK

1. Enhancing Privacy and Confidentiality:

- Explore techniques such as zero-knowledge proofs or homomorphic encryption to improve the privacy of land registry data while still maintaining transparency and integrity.
- Investigate privacy-preserving smart contract designs to ensure that sensitive transaction details are not publicly visible on the blockchain.

2. Developing Governance Mechanisms:

- Research and propose decentralized governance models for blockchain-based land registries to ensure democratic decision-making, accountability, and transparency.
- Examine mechanisms for dispute resolution and consensus among stakeholders in the context of land ownership and property rights.

3. Implementing Sustainable Infrastructure:

- Study the environmental impact of blockchain networks used for land registries and develop eco-friendly consensus mechanisms or energy-efficient protocols.
- Explore the integration of renewable energy sources into blockchain infrastructure to mitigate environmental concerns associated with blockchain technology.

4. Addressing Legal Challenges:

- Analyze the legal implications of blockchain-based land registries in various jurisdictions and propose frameworks to address regulatory challenges and ensure compliance.
- Investigate the enforceability of smart contracts in different legal systems and explore avenues for legal recognition of blockchain-based property transactions.

5. Adopting Interoperability Standards:

- Develop interoperability standards and protocols to facilitate seamless data exchange and integration between different blockchain-based land registry systems.
- Explore the use of cross-chain communication mechanisms or interoperability protocols such as Polkadot or Cosmos to enable interoperability between disparate blockchain networks.

6. User Experience and Adoption Strategies:

- Conduct user studies to understand the needs and preferences of stakeholders involved in land transactions and design user-friendly interfaces and applications for interacting with blockchain-based land registries.
- Investigate strategies for promoting adoption among government agencies, legal entities, and the general public, including educational campaigns, incentives, and capacity-building initiatives.

ACKNOWLEDGEMENT

We want to extend our heartfelt thanks to everyone who helped in completing this research paper on using blockchain to secure land registration. First and foremost, we deeply appreciate the individuals who participated in our research. Their time and cooperation were essential in shaping the insights and conclusions presented in this study.

Our supervisors and mentors deserve special recognition for their continuous support and guidance throughout the research journey. Their expertise and encouragement provided us with invaluable direction and motivation, ensuring the success of our efforts. We are truly grateful for their unwavering commitment to our academic endeavors.

We also want to acknowledge the institutions and organizations that facilitated our research by providing the necessary resources. Their assistance was crucial in enabling us to conduct the study effectively and efficiently.

Last but certainly not least, we want to express our gratitude to our colleagues, friends, and family members for their unwavering support and encouragement. Their understanding and moral support were instrumental in helping us navigate through the challenges and obstacles encountered during the project. We are deeply thankful for their belief in us and their dedication to our academic pursuits.

V. REFERENCES

- [1] Norta, Alex, Chad Fernandez, and Stefan Hickmott. (2018) "On Blockchain Application: Hyperledger Fabric and Ethereum." Commercial Property Tokenizing With Smart Contracts." 2018 International Joint Conference on Neural Networks (IJCNN). IEEE, 2018.
- [2] Sajana P, M. Sindhu, and M Sethumadhavan. (2018) "On Blockchain Application: Hyperledger Fabric and Ethereum." International Journal of Pure and Applied Mathematics 118 (18): 2965–2970.
- [3] Sankar, Lakshmi Siva, M. Sindhu, and M. Sethumadhavan. (2017) "Survey of consensus protocols on blockchain applications." 4th International Conference on Advanced Computing and Communication Systems (ICACCS). IEEE, 2017
- [4] Greeshma Sarath and S.H, M. Lal, "Privacy Preservation and Content Protection in Location Based Queries", in Proceedings of the 2015 Eighth International Conference on Contemporary Computing (IC3), Washington, DC, USA, 2015.

-
- [5] B. Venugopal and Greeshma Sarath, "A Novel Approach for Preserving Numerical Ordering in Encrypted Data", in 2016 International Conference on Information Technology (ICIT), Bhubaneswar, India, 2016.
- [6] Christo, Mary Subaja and Sarathy, Partha and Priyanka, C and Kumari, Raj and others. (2019) "An Efficient Data Security in Medical Report using Block Chain Technology." 2019 International Conference on Communication and Signal Processing (ICCSP). IEEE, 2017.
- [7] Nakamoto, Satoshi and others. (2008) "Bitcoin: A peer-to-peer electronic cash system".
- [8] Gupta, Priya, et al. (2018). "Blockchain-Based Land Titling: A Framework for Developing Countries." Proceedings of the IEEE International Conference on Big Data (BigData). IEEE, 2018.
- [9] Kumar, Anil, et al. (2017). "Enhancing Land Registry Security Using Blockchain: A Comparative Analysis." International Journal of Applied Engineering Research, vol. 12, no. 23, pp. 14758-14764.
- [10] Smith, John, et al. (2020). "Blockchain-Based Land Registry: A Secure Approach to Property Rights Management." Proceedings of the IEEE International Conference on Blockchain (ICBC). IEEE, 2020.