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Secure Land Registry System using block-chain

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Abstract: Land registry in India as well as in many parts of the world is very slow and cumbersome process. There are an also many intermediaries involved in the process of land registration. Developing a system that not only accelerate the process of land registration, but also make it easier for Buyers, Sellers and Government registrars to transfer the land ownership from seller to a new buyer, is only possible by creating a distributed system that store all the transactions made during the process of land buying. In this paper we'll try to explore the possibilities and problems solved by using a block-chain based system for land ownership transfer. The system that we are trying to implement is based on Ethereum's Block-chain that will store all the transactions made during the process of land ownership transfer. Using the concept of smart contracts of block-chain technology we can triggers various events like access of land documents to a land inspector and fund transfer event from buyer to seller after successful verification of the land ownership transfer. This system will solve the problems faced by all the three parties during the land registration and will also remove the intermediaries like property dealers. This system makes the process of land registration resilient and decrease the cases of fraud in the process. Using the system, validation of the lands is also possible as immutable transactions are being stored in the public ledger.

Keywords: Ethereum, block-chain, Secure Land Registy System.

I. INTRODUCTION

The Internet is the best invention ever made by humans.Land registration involves collection of details like ownership and size of the property. Currently the entire process of land registry maintenance is too tedious since it involves safekeeping of large volumes of registers in written form. The main issue with the method of land registry maintenance is that any future reference that needs to be taken from these hard copies will involve too much labor. This process is time consuming. Current system is not secure since majority of the process is not transparent, system is slow, and selling a property more than once needs to be recorded accurately. Several approaches have been made to automate the land registry data maintenance by eliminating the process of keeping bookish records. This is initially done by storing the data in huge databases. But such a method is not efficient in terms of data security as the data contents are breached easily as data tampering can happen in case of poorly maintained databases.

The distributed ledger technology known as block chain records all transactions that have ever occurred on a peer-to-peer network in the past [5]. By implementing a land register utilizing block-chain, the system is made more safe by preventing fraudulent activity. Implementing a land register is complicated since it is difficult to replicate the block-chain.Using this technology aids in avoiding any illicit land transaction operations. Contract information and ownership information are kept in a decentralized manner. Due to the lack of physical involvement required by the block chain implementation, it is simpler to track data transactions, which enhances user security overall. Block-chain offers the chance to create a reliable system for digital identity. Each block in the network of a block chain indicates the Data related to land transactions, such as property identification numbers, owner information, transaction amounts, payment methods, and last transaction information, such as the total amount paid for the transaction, are included. By properly implementing encryption techniques like the SHA256 algorithm, we may guarantee data protection and orderly organization of obtained data.

Block chain-based application implementation ensures the usability of high-quality digital data. Identity theft and data security breaches are well-addressed privacy issues in the digital world[7]. Today's technology relies on a password-based method to access private data. It is also unreliable to store data in unsecured systems. Block-chain-based applications use strict identity verification based on public key cryptography for their authentication mechanisms. Block-chain hashing using cryptography verifies the relationship between the relevant transaction and the private key used. The databases of the existing automated land registers are accessible to businesses and the general public, ensuring greater documentation of transaction details.To ensure greater oversight of the regions up for sale, local terrestrial maps and pictures of the affected areas are also included in these databases. In this study, the elliptic cryptography curve algorithm is employed to generate the signature for each block that creates a set of public and private keys. The transaction is made

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more secure by utilizing a private key to sign the transaction's hash. In order to provide additional legitimacy for the block-chain, the Merkle root is also calculated in a method that saves disc space, checks and validates the transaction, and is used to like the blocks using the root hashes. By integrating the transaction from each individual unit to the root unit, The elliptic cryptography algorithm, the merkle root, and the land information are all used to generate the hash, which increases the security of the transaction data. This merkle root hash is also included in the land block. The block-chain's PoW algorithm aids in decentralizing events. When a new transaction takes place, the poof of work algorithm broadcasts the transaction to each node in the network first. The POW will be determined by each node. One who discovers the POW notifies other network nodes and adds the transaction to the block [6]. The difficulty factor is a POW setting that serves to shorten the time it takes to produce a new block, preventing attackers from creating or duplicate a block within this time. Always the longest growing chain is taken as the genuine chain.As each block on the block-chain has a distinct identification number, it is impossible to manually correct or otherwise tamper with the data contained within a block. When a transaction is finished, it is added to the chain of blocks, and if there are two owners of the same piece of property, the block chain is used to manage it in a good and safe way. the block-chain.Land registration has the ability to boost liquidity, lower costs, and minimize risk, all of which would make buying real estate more alluring.

II. LITERATURE SURVEY

A highly valuable immovable, non-liquid asset is land. Maintaining the accuracy and correctness of land ownership/transfer data is a very difficult task. The work of maintaining detailed and extensive ownership transfer records is onerous since the ownership of land might change over time, and sometimes very often. Nandi M et al. (2020) discussed due to the existence of false or incomplete registers, which are exceedingly difficult to track down over time, the issue only gets worse. Due to ownership issues in the system, years-long litigation results, resulting in the waste of precious time, effort, and resources to resolve these disagreements. The majority of the problems arise from either the present land registration systems' historical paper document trails or from their poorly maintained, opaque centralized systems. Fraudulent users may attempt to alter electronic or paper records to alter the land ownership record. In order to overcome these difficulties, this article suggests a safe record-keeping method based on the Block-chain that may convert physical assets' records into immutable liquid token assets. The aforementioned problems can now be resolved by using this new block chain token asset to maintain a digitally secured and selectively viewable record of ownership. This system has been implemented using Ethereum, and benchmark data reveals that the transaction processing time of such a system is rather low, making it appropriate for real-world use.

The existing property registration procedure has several flaws, and people take advantage of them to defraud both the general public and the government. This paper examines the implementation of a secure land register using block-chain that relies on majority consensus. The land registry's block-chain implementation greatly reduces security concerns. Each block's hash value will be distinct since it is connected to the hash of the one before it. The hashing algorithm utilized is called SHA256. The Proof of Work (POW) technique, which is also employed with SHA256, increases the security of the data associated with each transaction. Each hash in the message digest that is produced for each block represents the entire set of transactions contained in that block and has a fixed size. Krishnapriya, S., & Sarath, G. (2020) had proposed block-chain network for the land register has 12 nodes that calculate the proof of work. A node is in charge of mining new blocks, adding them to the block-chain, and confirming transactions. Using the block-chain technology, which offers a tamper-proof and modernized version of land register, 200 land transactions in total are recorded. The production of signatures using the elliptic curve cryptography technique allows for the verification of whether the owner of the transaction actually signed the transaction or not. Merkle trees are used to link transactions together using hashes, which lowers the amount of storage space needed. Thus, the suggested use of block-chain to conduct land register offers a 99% reduction in manual record-keeping effort

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In recent decades, information and communication technologies have been implemented as part of modernization efforts for land registration systems used in Europe and around the world. Such changes have gradually made it easier to obtain property information, made land registration processes more efficient, and even opened the door to the possibility of disposing of land ownership electronically by creating electronic conveyancing procedures. Kaczorowska, M. (2019) has proposed the use of block-chain technology in the land registration industry is another cutting-edge idea that is now receiving a lot of attention. A number of nations are now testing this solution. Block-chain's underlying distributed ledger technology is anticipated to revolutionize land registration by providing a safe architecture for storing land transactions using cryptography protocol. Gains from this will include higher levels of processing effectiveness and trust, as well as cost savings. The "original" block-chain model's assumptions that transactions are irreversible and carried out without intermediaries mean that there is no need for external oversight or independent verification of the transactions to be recorded, which 4 raises questions about the aforementioned notion. The article looks at the potential advantages and drawbacks of automating land transactions as well as the real-world results of some countries' adoption of block-chain

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technology for land registration. This information will be used to determine whether block-chain based registration may actually replace the current system for registering land rights.

The immovable property of land is a significant asset for which essential factors such as ownership rights, the security of land records, potential conflicts, corruption concerns, and various transparency issues of land register processes evolve. Traceability of records, risks of document fraud, and susceptibility to numerous faults are crucial challenges. In order to combat corruption, reduce red tape, increase transparency, speed up the stated public service, and eliminate the possibility of disputes, modern governments must provide responsible land register systems, with a focus on boosting the validity of land titles. Additionally, incorporating block-chain technology into land registries results in a disruptive systemic revolution of public service delivery. This Georgia-focused case study-based study investigates how block-chain technology addresses the aforementioned problems with current land register systems and looks at factors that contribute to a successful implementation of the new technology. We examine and analyse the results of semi structured interviews and document studies in order to evaluate the Georgian government's current block-chain concept. Additionally, Lazuashvili, N et al.(2019) offer suggestions for managing the block-chain-based digital solutions integrated into the system that delivers public land registry services.

The existing property registration procedure has several flaws, and people take advantage of them to defraud both the general public and the government. This paper examines the implementation of a secure land register using block-chain that relies on majority consensus. The land registry's block-chain implementation greatly reduces security concerns. Each block's hash value will be distinct since it is connected to the hash of the one before it. The hashing algorithm utilised is called SHA256. The Proof Of Work (POW) technique, which is also employed with SHA256, increases the security of the data associated with each transaction. Each block's message digest is constructed with a defined size, and each hash represents an entire message.The proposed block-chain network for the land register has 12 nodes that calculate the proof of work. A node is in charge of mining new blocks, adding them to the block-chain, and confirming transactions. Using the block-chain technology, which offers a tamper-proof and modernized version of land register, 200 land transactions in total are recorded. The production of signatures using the elliptic curve cryptography technique allows for the verification of whether the owner of the transaction actually signed the transaction or not. Merkle trees are used to link transactions together using hashes, which lowers the amount of storage space needed. So, the suggested use of block-chain to conduct land register offers a 99% reduction in manual record-keeping effort.

A distributed, transparent, and unchangeable ledger is what block-chain is. block-chain's consensus process is its fundamental component. They control how a block-chain functions. Researchers are eager to identify a well-optimized Byzantine fault tolerant consensus algorithm in light of the emergence of new possibilities in block-chain technology. Ideas of great interest include designing a universal consensus protocol or a cross-platform plug-and-play software programme enabling the implementation of different consensus protocols. Because it incorporates the ideas of quorum slices and federated byzantine fault tolerance, the Stellar Consensus Protocol (SCP), which is regarded as a global consensus protocol, promises to be Byzantine Fault Tolerant (BFT).The effectiveness of this consensus and how it stacks up against other earlier-proposed procedures are examined here. Also mentioned here is hyper-ledger, a Linux Foundation open-source project that implements the idea of realistic byzantine fault tolerance and serves as a framework for the deployment of a number of additional consensus protocols and block-chain applications. This study focuses on examining various consensus procedures that have already been put out, as well as their viability and effectiveness in achieving the goals they set out to achieve.

Data security is crucial in today's society, and many industrial sectors are working to protect their data from hackers. block-chain is a cutting-edge technology that allows peers to digitally transfer money, financial documents, real estate, and other things. Peer-to-peer peer-to-peer network where all transactions, value transfers, and data shared by a single node would be verified by all other connected nodes in the network. It is an open-source public network where no central authority is required. The chances of a fraudulent or phoney property transfer are highest during the lengthy, intermediary, and slow traditional land registration process.In this paper, a potential solution for safely transferring land ownership using block-chain technology is presented. Without the need for any middlemen, buyers and sellers are making a land ownership deal utilizing the ethereum network.

block-chain is a very secure method of transferring data (such records, events, or transactions) from one party to another. Because it is an electronic record of information, digital security is necessary. Once a piece of data joins the block-chain, it cannot be changed.

It is virtually hard to change the value of a block-chain. The decentralized model of the block-chain, which allows it to function without a central authority, has replaced the old business model's centralized one. Instead of the Peer-Mediator-

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Peer model, it operates on a peer-to-peer basis. Because to its peer-to-peer structure, the block-chain makes dealing with businesses simpler, faster, and more reliable. Because it is the safest, quickest, most transparent, and easiest to execute business model in several industries, including the construction industries. Decentralization, self-control, peer-to-peer relationships, fixed records, and time stamping are key aspects of the block-chain that make it one of the most promising technologies available today. As a result, the emphasis of this chapter is on how block-chain technology is being used to digitise land records in the Indian Context.

III. PROPSED METHODOLOGY

3.1 SYSTEM ARCHITECTURE

Land transactions are protected from hackers and made easy to preserve records thanks to the introduction of block chain technology in land registration. The suggested approach also monitors instances of double spending, which deal with situations in which the same piece of land is sold more than once to different customers. The time needed to complete a land purchase is further reduced because very little documentation and record keeping is necessary.

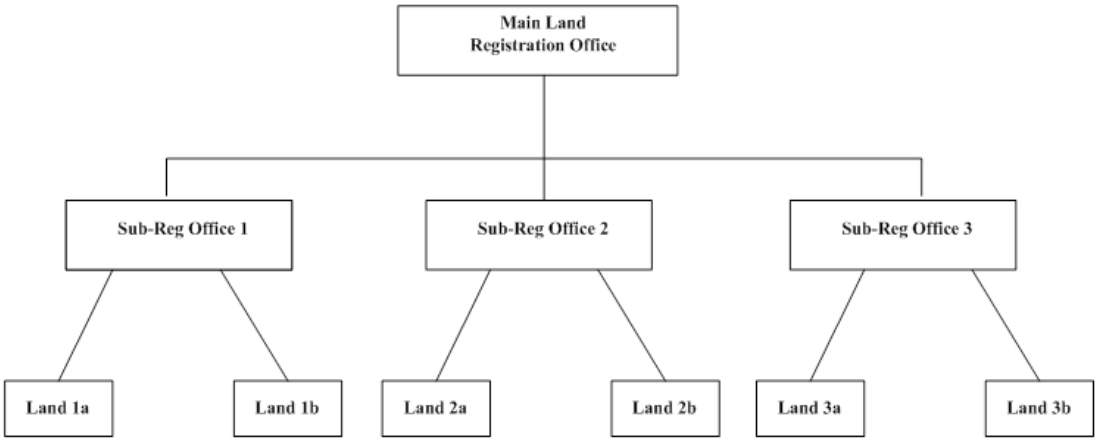

Fig 3.1 System Arcihitecture

Fig.3.1 depicts the hierarchical structure of the organizations participating in land-based transactions, which consists of a main registration office and related sub-register offices. Using a previous hash, the main registration office is connected to the sub-register offices. Data linked to the initial amount of land present prior to sale is kept by the main registration office, whereas data related to the amount of land that has been transacted and the amount of land that is still available following a specific deal is kept by sub-register offices. People that have numerous lands in different states and are connected to each one through the chain are likewise tracked.So, it creates a chain of users with fundamental transaction-related information including the property's prior and current owners, its true price and selling price, as well as its size.

3.2 Land Transaction In Land Registry

A land transaction between two users in a block-chain system is depicted in Fig. 3.2. The buyer will have access to the public key linked to the seller block in order to confirm the legitimacy of the transaction.Each users will use a private key to access their data within specific blocks that can only be accessible by them.any other individual.

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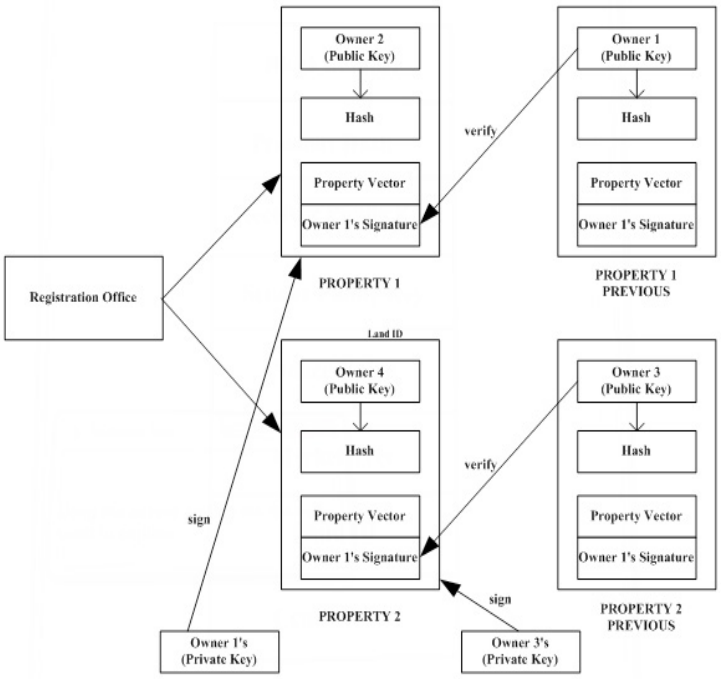

Fig3.2 Land Transaction

IV. RESULT AND DISCUSSIONS

The anticipated results are More security is offered by utilizing the block-chain's immutable nature. Each transaction is transparently visible to all peers while maintaining confidentiality. Start an application offline. Provide truthful and dependable information.The predicted results are Further security can be achieved using block-chain's immutable characteristic. Since every transaction is visible to every peer, confidentiality is apparent. Launch a programme in offline mode. Provide true and trustworthy information Analysis is carried out to examine the block-chain-based land transaction in which we attempt to transfer the land from the main account to a fictitious account while using an incorrect signature. The block-chain network has a total of 12 nodes, and there are 200 legitimate transactions. The attacker node is provided with a port number and a test output. A private and public key pair is generated using the Edwards-curve Digital Signature technique to indicate that an attack is being attempted. The network receives a block with a signature.Blocks with signatures are distributed to the network using the attacker's private key, and once it has reached every node, it checks the public keys of all the other nodes, leading to failure due to POW algorithm. As a result, each time an attacker tries to add a new block to the block-chain, it will fail.

V. CONCLUSION

block-chain is used to implement land registration, providing a more secure platform than its forerunners. There were 200 transactions completed in total, involving 12 nodes. An method called SHA256, which aids in producing a distinct hash for each block, is utilised to ensure the security of the land transaction. After a transaction's hash value has been discovered, the original message cannot be recovered. The only ways to obtain the original message are by brute force or trial and error.Using the PoW algorithm, a transaction is verified, a block is mined, distributed to all nodes, and then added to the block chain.

User data is kept on a server operated by a dependable third party and signed using the elliptic curve cryptographic technique. High performance, independence from the random number generator, and speed are all benefits of this technique. It is possible to list all the land details associated with a person by using their public key. The registration office website, which includes all the information about users and the properties he acquired and sold, is also listed. We have assessed if mining is taking place securely by using difficulty level.. Merkle trees are used to validate and connect the chain, as well as to save disc space. A 99% decrease in manual work is ensured by using numerous nodes for proper testing, which also provides accurate record keeping.

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