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DECENTRALIZED REAL ESTATE PROPERTY MANAGEMENT SYSTEM USING CONSENSUS ALGORITHM

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Abstract: The Land Registry System is a lengthy, intricate process that necessitates several middlemen, increasing the likelihood of fraudulent cases. These issues can be resolved by implementing blockchain technology in land registry management. Every block in a blockchain data structure is related to every other block. A permanent public record of digital transactions may be found in this distributed data ledger. The data in the block is immutable thanks to hashing algorithms, cryptography methods, and consensus procedures, all of which are used before a block is added to the blockchain. The suggested solution will leverage Blockchain to provide a thorough, user-friendly, highly reliable, and user-friendly land register system. The suggested method is designed to follow the guidelines and processes for land registration set out by the Indian government. It guarantees improved security, accuracy, and simple record administration.

IndexTerms **- Blockchain, Land Registration, Ethereum, Smart Contract, Decentralized Architecture, Consensus algorithm, Proof of Stack.**

I. INTRODUCTION

Blockchain was first invented by a person or group of persons with the name “Satoshi Nakamoto” in 2008 to serve the crypto currency Bitcoin as the public transaction ledger.

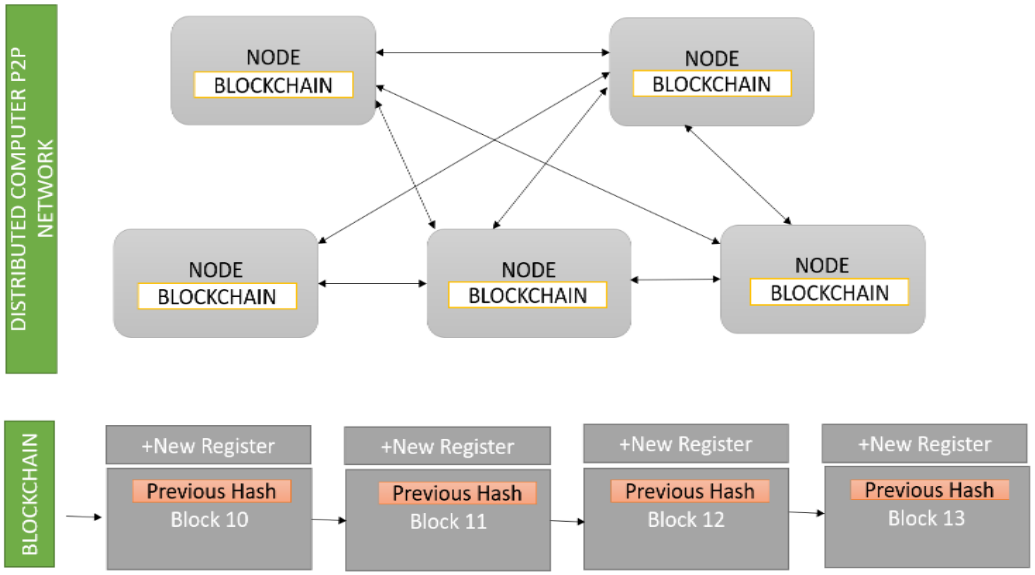
A blockchain is a digital record of information that is protected from hacking and unauthorized access by a network of computers. With the use of technology, people may transact with one another securely without the need for a middleman like a bank, organization, or other third party.

Each block also includes a timestamp, a cryptographic hash of the preceding block, and transaction data that is shown as a Merkle tree. Peer-to-peer computer networks independently verify the transaction, time-stamp it, and add it to the ledger.

Once data has been captured, it is difficult to change it backwards without changing every following block, which necessitates network majority agreement. A DLT of this kind includes blockchain. DLT uses nodes, which are autonomous computers, to record, share, and synchronize transactions in each electronic ledger. The information can be appended at the end of the block but cannot be modified or added in the middle since the data are arranged in a block format.

BLOCKCHAIN SECURITY

The decentralized security and trust are achieved by the Blockchain technology in several ways. To begin with, new blocks are strictly stored continuous and chronologically. In other words, they are constantly added to the blockchain's "end." It is very risky to go back and change the contents of a block after it has been placed to the end of the blockchain unless the network has matured and agreed to do so. That’s because each block has its hash value of itself, along with the hash value of the block before it, as well as the preliminarily mentioned timestamp. Hash canons are created by a fine function that turns digital information into a string of figures and letters. However, also the hash law changes as well, If that information is edited in any way.



SIGNIFICANCE ASPECTS OF BLOCKCHAIN

- The access to records is on-demand.
- Collection of secure transactions.
- The blocks form a chain with links to the previous one using a cryptographic hash.
- Have an irrefutable unique digital signature.
- Records are free from duplicity, corruption, and mutability.
- Records are decentralized
- Regulated without human discretion.

PREPARE YOUR PAPER BEFORE STYLING

Blockchain technology, which is a type of distributed database that stores, organizes and manages a permanent and tamper-proof ledger of transaction data across multiple computers, promises to transfer value, build trust and reduce third-party participants. A blockchain is a lengthen list of records, called blocks, which are linked using hash values called the cryptocurrencies. Each block contains a cryptographic hash of the timestamp, transaction data (generally represented as a Merkle tree root hash) and previous block.

Using Cryptographic hash function all the blocks will be interconnected in blockchain. The data present inside block will also be hashed and stored in the form of Merkle tree. When someone tries to alter the data stored in the block, the value of hash changes and the link between the block breaks. Hence, loss of data happens from which it can be inferred data has been tampered. This is how storing values in blockchain differs from normal storage.

Here a concept called smart contract is used in blockchain technology which is a self-agreement embedded code in a system. This code contains a certain set of rules to be followed by the involved individuals in the land registration process and further procedure will be continued if smart contract conditions are met. This smart contract will be automatically activated if conditions specified in the contract are met. This will help to eliminate the need of third-party person and the registration process will be faster and efficient

Using the smart contract, we build a land registration and management application where people can register their land with government certified document and manage them through online. Every user has a meta mask private key and using that any user can log in to our application and manage their properties like put them on sale or to buy another property via online.

Smart Contract

Smart contracts are simply programs stored on a blockchain that run when destined conditions are met. They generally are used to automate the prosecution of an agreement so that all actors can be incontinently certain of the outgrowth, without any conciliator's involvement or time loss. They can also automate a workflow, driving the coming action when conditions are met.

Within a smart contract, there can be as numerous reservations as demanded to satisfy the actors that the task will be completed satisfactorily. To establish the terms, actors must determine how deals and their data are represented on the blockchain, agree on the "if/when. then" rules that govern those deals, explore all possible exceptions, and define a frame for resolving controversies.

II. Motivation

Digitalization and the development of new technologies is the strongest force of change in society. In the old accustomed system, if a user lost original physical agreements which acts as concrete proof of the ownership or if documents get altered or damaged then it is very difficult to navigate all the details in regards with the assets. Traditionally it takes a huge amount of time for verification of owner, land papers manually which in turn slows down the legitimate transactions. Another intimidating concern is that of fraudulent conditioning including hampering, bribery, phony or revision carried out by middle agents in the process which results in lack of security. Our proposed system was an idea grounded on blockchain grounded land enrollment system to overcome the traditional bone by taking important factors into account. Proposed system will speed up the verification process of owner, land deeds and also accelerate a speedy

recovery of data in case of disaster, cache all the changes done in a blockchain and ensure that no existing transactions are meddled with. Thus, transactions will be more secure.

Data of the proprietor and land is translated so that revision of data will be avoided. We endorse a decentralized system or peer to peer system which doesn't involve a mediator for making deeds and all the deals are directly dealt bet ween buyer and dealer using digitally created and vindicated agreements. So this streamlined system can avoid fraudulent conditioning as blockchain uses mincing ways and any revision is recorded. All changes are stored in the coming block so that no stoner is ignorant of the current state of any asset and all deals are stored in a blockchain with applicable timestamps associated with them for strong auditability.

III. Literature Review

Framework for Property Registration on the Ethereum Blockchain

With the help of this framework, a registration application system will be created, requiring new buyers to register before moving on to the next step. The SHA256 technique, which generates distinct hash values for the messages getting placed in blocks, is used to implement the suggested research project. Ethereum blockchain technology is used to record both the contents of smart contracts and transactions. Ethereum is used in conjunction with a smart contract because it is necessary to securely preserve the data of transactions made using bitcoin. As a result, these documents are likewise kept in the same Ethereum blocks as the smart contract. Security is achieved for the transaction because this is likewise stored on the decentralized server. The programming language solidity is used to create Ethereum-based smart contracts. The SHA256 hash technique is used to produce distinct hash values for each block, which contains all the information about a bitcoin transaction as well as a smart contract.

A Smart Contract Application for Managing Transactions in the Land Administration System

In this essay, we talk about the issues of data tampering, the lengthy process of registering transactions in a land administration system, and the potential for double spending, all of which can contribute to incorrectness in a land administration system. Our research is predicated on the notion that distributed ledger technology, or more specifically, blockchain technology, may be used to address these issues. The answer is offered in the form of a smart contract written in the Solidity programming language, which can address even more specialized use cases in land administration systems, such as dividing or merging real estate, sharing ownership, transferring a portion of ownership, and limiting real estate trading. The suggested smart contract is an implementation of a programming interface designed to meet the unique requirements of land administration systems, and is based on both ERC-20 and ERC-721 token standards. It is shown how some typical LAS issues could be resolved with BCT. In addition to suggesting BCT to address issues with double spending and data tampering, a smart contract is presented to shorten the time required for transaction registration.In addition to suggesting BCT to address issues with double spending and data tampering, a smart contract is presented to shorten the time required for transaction registration. The suggested method may be able to accommodate some of the more unique LAS situations that have not yet been addressed, such as sharing ownership, transferring a portion of ownership, dividing or merging real estate, and restricting the ability to trade in real estate. This is accomplished by creating a programming interface based on two already-existing interfaces (ERC-20 and ERC-721), which by themselves lacked the capability required for managing those more specialized LAS instances.

Using Blockchain for Land Registration and Ownership Management in Bangladesh

This study identifies flaws with manual land registration methods, including their lack of transparency, centralization, validity, and dependability, and suggests a better solution utilizing blockchain technology. This article also examines how digital land record systems based on Blockchain differ between nations. Real-time land ownership verification is made possible by the immutable nature of blockchain, which can prevent the forging of land titles. Some nations, including the United Arab Emirates, Brazil, the Republic of Georgia, and Ukraine, have already implemented Blockchain-based approaches to improve their land registration systems. In this essay, we examine Bangladesh's present land registration system.

Land Registration Digitization Made Possible by Blockchain

The land registration procedure in India is one of the laborious processes, and most of the time, individuals are not aware of all the regulations that must be followed. It takes longer to complete the registration process since additional documents need to be verified. In order to finish this process, the middlemen also take bribes. While processing land records, faults caused by humans or other factors could also happen. The purpose of this study is to create a blockchain-based land register system with a thorough user interface, high dependability, and detailed features. It primarily focuses on outlining the guidelines for land registration that the Indian government has provided. It ensures increased accuracy and record security. The term "land registration" refers to a mechanism by which a government organization registers ownership and rights pertaining to land. Land is a valuable asset, thus keeping accurate records is essential. These papers speed up transactions, prove ownership, and deter fraud. The Tamilnadu government and other state governments have begun digitizing the land registration operations under our current land registration system in India. The entire process is still not fully digitalized, though. Today, there are more security breaches occurring online. Additionally, as security standards and safeguards are being developed, new attack approaches are emerging. Although there are greater risks, digitization cannot be stopped. When it comes to governmental procedures like land registration, nursing security is crucial. Blockchain technology can be used to remedy this issue.

Land record digitization on the blockchain using a consensus process based on trust and value

It promises improved security and precision. In order to digitize real estate transactions and decrease the likelihood of document fraud and other fraudulent activity, this article proposes a blockchain-based approach. A consensus approach that reduces overhead broadcasts for multicasting nodes by around 50% is also suggested by the research. The proposed consensus strategy has been compared to five widely used methods: PoW, PoS, DPoS, load-balanced, and a trust-based approach. The proposed consensus technique is speedier than the approaches that were looked at, according to the comparative study The overhead of message exchange communication can be decreased by up to 50.30% when compared to the traditional PoW technique. The e-stamp documents made available by the e-registry component of the anticipated e-portal system will be used by any buyer or seller to acquire or sell real estate. The technology creates an electronic register to store the transactions. Blockchain technology is being used to implement the intended solution. Any land registry offices that are prepared to accept the proposed system and adhere to a blockchain-based platform should employ the suggested e-register facility. The registry office attests to the ownership of the land and the payment of the registration fee. Data on land ownership

is created in blocks using blockchain technology. The suggested blockchain technology uses a state-of-the-art recommended consensus mechanism to elect leaders.

System for Land Registration using blockchain

The buyer and seller communicate with one another through a middleman known as a "broker" in India's conventional land registration system. For instance, if someone wishes to buy or sell a piece of real estate, the broker will gather all the physical records required to prove ownership of the property. Brokers ensure that the land or property is registered with an authorized government agency, where all of its details are listed in a ledger, and that the complete transaction and sale between the two parties takes place after that. Since anyone with the required authorization can easily access or modify the papers, there is a chance that it will be misplaced or altered in this circumstance, compromising the tangible evidence of labour. Therefore, compared to our suggested approach, which employs a smart contract to manage assets and transactions among users, this type of system is slower, less secure, and unsynchronized. Additionally, it makes it more likely that fraud and corruption will occur when the appropriate procedure is carried out. We suggest a Hyperledger-based blockchain-based land registration system that offers participants a transparent, safe, and decentralized way to carry out transactions. This approach combines the old method's examination and analysis with a consideration of Blockchain's greater transparency, integrity maintenance, and portability.

IV. Problems in the current Land Registry System

The current recorded information regarding land title, ownership, chain of history in the country is poorly managed manually and often does not reflect the real scenario. The government is also facing problems managing and updating the manual records of land registration. Some of the major problems in the current system are mentioned below:

- Lack of coordination among multiple stakeholders such as land records, survey, Registration Department and owner.
- Recorded information such as land title, history of trans- actions, tax-records are stored and updated by different departments at the remote level. The information is not synchronized regularly which creates inconsistency in the record and often leads to incompatibility with the real ground position.
- Lack of accessibility to the ownership history for an asset decreases trust during transactions with unknown parties.
- Paper-based land registration process is a lengthy process that may take more than a month for the handover of ownership for a property.
- Today's inaccurate digital records make it difficult to stop scams and encourage unlawful transactions. People frequently have to bribe government representatives in order to complete their registration process on time

V. Application of Blockchain in Land Management System

Blockchain is an immutable and decentralized digital ledger that is managed by a network of computers, not owned by a single entity. No third party is required to initiate the transaction. The records in the Blockchain database are transparent and the data is accessible to anyone on the internet. Every active peer on the internet keeps a copy of the original records in the Blockchain and no update is possible without agreement among them. The peers can verify transactions in the blockchain using encoded ‘hash’ that has to match with the Blockchain’s history.

Smart Contracts:

The decentralized architecture of Blockchain is made possible with the help of smart contracts. It is a program that can be encoded and run on any Blockchain. The related information that is needed to resolve conflicts is handled by smart contracts. Transactions happen only after fulfilling the pre-set conditions included by the smart contracts.

Public blockchain and Ethereum:

Public blockchain is open-source and anyone can be a part of the consensus. To implement a large-scale system such as land registration, a public and permissionless Blockchain like Ethereum will be the most suitable one. Ethereum also provides unlimited processing facilities. As the history of land records, transactions and other important information are needed to be transparent and accessible to everyone, A public Blockchain-Ethereum is the best-suited environment for this application.

VI. Proposed System Architecture

The smart contracts are developed for the Ethereum blockchain. The system creates an e-register to store the transactions. Each block has a hash function code and that is used to provide a e-stamp certification respected to that project. Any seller or the buyer would buy or sell the properties through the e-stamp papers provided by the e-registry facility of the proposed e-portal system. The system creates an e-register to store the transactions. Blockchain technology is being used to implement the proposed system. All land registry offices willing to adopt the proposed system should adhere to a blockchain based platform and utilize the proposed e-registry facility. The registry office verifies the possession of the land, and payment of the registration fee. Blockchain technology generates blocks for land ownership records of Smart Contract to fetch the block from the Blockchain. This block will contain all the related information and transferred to the land administration system.

The proposed system has an important module call the Validator or the registry office to give a certified document on the land property. That document contains the details about every owner of the property. If a user wants to register his/her property on the digitalized network he/she has to get a certified document and approval from the validator to manage them.

Registration of user

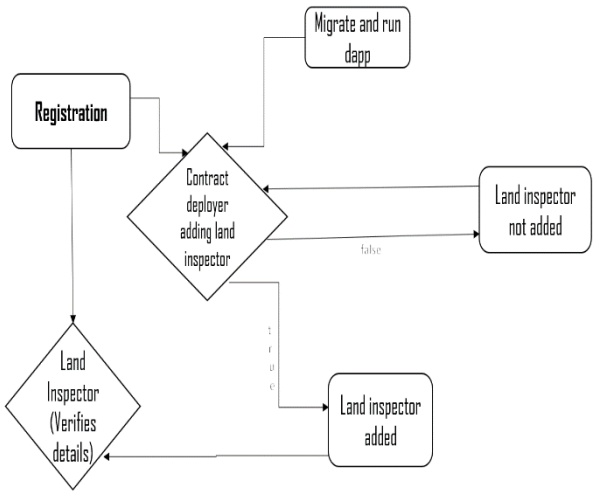
A user has to register themselves to the application and wait for the validator’s approval. The validator runs a thorough background check on the newly registered user information and document and then gives approval after a successful background check. If the

validation process does not end successfully like submitting a fake document or information wrongly registered are declined. The approval or rejection of the user registration will be notified to the respected user via SMS, NEXMO API or mail. The document verified by the validator are the original document of the land, government or citified document in the user's name and other official documents. So, while filling the registration form the user has to provide valid and clean information and documents

Management of properties:

After a successful registration of user with the registry officer approval the land has to be managed by the respected user only. The private key from the meta mask is used to login to the land registration system and the information and properties about the user and his/her properties are uploaded in them.

The proposed system has selling and buying of properties with validators approval and secured successful transaction. The user put their land on sale and put a basic price on it based on the land area. Once a land is put to sale it will be visible on the selling list so everyone who register in this application can view the land and its information. Some other user who saw the land and if they are interested to buy the land can bet on the land with higher amount that the base rate. The seller interested in the amount can confirm the transaction. Then the buyer initializes a transaction request and the transaction will take place. After a successful completion of payment, a new block will be created on that land record and it will be updated to the buyer's name.



VII. METHODOLOGY

A distributed ledger technology that is open source and tailored for business is called the Hyperledger fabric. The work has been done split into two parts, module 1 provides a full description of how the administrator works with respect to registration and triggering smart contracts, and module 2 provides a detailed overview of the steps involved in changing ownership and concluding the acquisition of land. Utilizing the decentralized, transparent, and immutable Ethereum blockchain technology. We are building a land registry platform on the blockchain where all the information about the property that has already been registered will be kept on a decentralized, transparent database so anyone looking to buy a property may cross-verify the full details of the property. To facilitate searches, information about each piece of land will be saved as a block with a digital title attached.

All of the records, including sales, purchases, land-related data, and details on both current and previous owners, are kept in one single location. Due to the difficulty in obtaining and limited utility of phoney documents in judicial proceedings, the method was anticipated to significantly reduce the frequency of land disputes.

VIII. CONCLUSION

A blockchain framework has been proposed for digitalization of land record with the application of Ethereum, smart contract, Meta mask and distributed ledger. This will help in maintaining and access the records in a digitalized way. The main aspect of implementation the system in blockchain is for the security and the vast data collecting ledger. All these aspects are achieved in our system. The land records are personally managed by the owners and the selling and buying of lands are verified by the government or the third parties. The private key provided by the user are created by the meta mask account and they are unique for each one and there can be no fake users or multiple people having ownership on a single record. The selection of the buyer depends on the owner and the payment will be proceeded only after a proper background check of both the seller and buyer, this ensure there is no double stamping and delay of payment. The smart contract is designed in such a way that the seller can choose his option when it comes to selection of buyers who opt for buying the land. To add more dynamic updates in the blockchain environment, new emerging technologies like Artificial Intelligence (AI) and Machine Learning can be integrated with proposed system make the land management system more efficient, secure and responsive.

Reference

1. Xiaolong Liu, Riqing Chen, Yu-Wen Chen, Shyan-Ming Yuan "Off-chain Data Fetching Architecture for Ethereum Smart Contract", Digital Object Identifier 10.1109/ACCESS.2018.2874539 VOLUME 6, 2018

2. Joe AbouJaoudeAndRaafat George Saade, "BlockchainApplications - Usage in Different Domains", Digital Object Identifier 10.1109/ACCESS.2019.2902501 VOLUME 7, 2019

3. Meghali Nandi, RajatKanti Bhattacharjee, Amrit Jha, Ferdous A. Barbhuiya "A secured land registration framework on Blockchain" , Third ISEA Conference on Security and Privacy (ISEA-ISAP) 978-1-7281-6708-4/20 ©2020

4. Elva Leka, BesnikSelimi, and Luis Lamani "Systematic Literature Review of Blockchain Applications: Smart Contracts", IEEE International Conference on Madhurya J A et al., International Journal of Emerging Trends in Engineering Research, 8(9), September 2020, 5209 – 52135213 Information Technologies, 978-1-7281-3274-7/19/$31.00 ©2019 IEEE

5. WeilinZheng, ZibinZheng, Xiangping Chen, KemianDai, Peishan Li, AndRenfei Chen "NutBaaS: A Blockchain-as-a-Service Platform" IEEE Access, Digital Object Identifier 10.1109/ACCESS.2019.2941905 VOLUME 7, 2019

6. Jingjing Chen, TiefengCai, Wenxiu He, Lei Chen, Gang Zhao, WeiwenZou "A Blockchain-Driven Supply Chain Finance Application for Auto Retail Industry" Entropy 2020, 22, 95; DOI:10.3390/e22010095

7. Harry Halpin, Marta Piekarska "Introduction to European Symposium on Security and Privacy Workshops (EuroS&PW)

8. AshwinSekhar, RishavChatterjee, RasDwivedi, RohitNegi, Sandeep K Shukla. Entangled Blockchains in Land Registry Management.

9. Yining Hu, MadhusankaLiyanage, AhsanManzoor, KanchanaThilakarathna, KanchanaThilakarathna, ArunaSeneviratne " Blockchain-based Smart Contracts -Applications and Challenges," arXiv:1810.04699v2 [cs.CY] 8 Jun 2019.

10.https://www.leewayhertz.com/blockchain-land-registry-platform/

11. I.Jeena Jacob , DayanandLal.N , ParikshithNayaka S K , Beena G. Pillai , NidaKouser. Ensuring Network Security using Secured Privileged Accounts. International Journal of Emerging Trends in EngineeringResearch.https://doi.org/10.30534/ijeter/2020/80852020 Volume 8 No.5, 2020