

Land Registry using Block Chain

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Abstract— Property fraud is one of the biggest problems in India. There have been many cases related to document forgery in the past and are chances of it still happening in the future. And hence, to counter these property fraud cases the Blockchain technology is being applied. By using Blockchain we can solve three main problems in case of land registry. One of them is that the land registry papers cannot be replicated, that is, there cannot be two papers of the same land with two different owners. The second problem which can be solved is that the land registry files will be tamper proof, as the Blockchain is a series of immutable record of data. And the third one is that the digital process will be tamper proof. We are going to use Skye platform to build our decentralized application.

Key words: Block Chain, Immutable Record, Skye, Decentralized Application

I. INTRODUCTION

Blockchain is a digitized, decentralized, public ledger i.e. Distributed Ledger Technology (DLT) of all cryptocurrency transactions. It acts as a decentralized computation and information sharing platform that enables multiple authoritative domains, who do not trust each other, to cooperate, coordinate and collaborate in a rational decision making process. It is a digital record of transactions. The name comes from its structure, in which individual records, called blocks, are linked together in single list, called a chain. cryptocurrencies, such as Bitcoin, and have many other applications. It is a shared, distributed ledger which helps in processing any digital transaction over the business network and tracks the tangible or intangible assets involved that facilitates the process of recording transactions and tracking assets in a business network. Asset can be tangible like a house, a car, cash, land, or intangible like intellectual property, such as patents, copyrights, or branding. Virtually anything of value can be tracked and traded on a blockchain network, reducing risk and cutting costs for all involved.

Blockchain was introduced with the invention of bitcoin in 2008 and then with its practical implementation in 2009. The idea of blockchain emerged from the concept of Hash trees, which was put forth by Ralph Merkel in 1979, thus also known as Merkel tree. After which there was huge contribution for the development of blockchain in the world of technology. Among these contributions, the objective of 'Bitcoin' introduced by Satoshi Nakamoto in 2008, caused an upsurge in Blockchain.

Technically, blockchain is a chain of blocks ordered in a network of non-trusted peers. Each block references the previous one and contains data, its own hash, and the hash of the previous block. A hash is a string of numbers and letters, produced by hash functions. A hash function is a mathematical function that takes a variable number of characters and converts it into a string with a fixed number of

characters. Even a small change in a string creates a completely new hash.

While blockchain is widely known for its use in cryptocurrencies such as Bitcoin, Litecoin, and Ether, the technology has several other uses. Blockchain is implemented in financial services for trade processing and settlement, claim processing and cross-border payments. Smart contracts obtained through Blockchain are used in healthcare, music and government. Through smart contracts it not only waives the need for third parties, but also ensures that all ledger participants know the contract details and that contractual terms implement automatically once conditions are met.

The registration process of property in India involves making a stamp duty and paying the requisite registration fee for sale deed and have the documents legally recorded with the sub-registrar of your area. This includes:

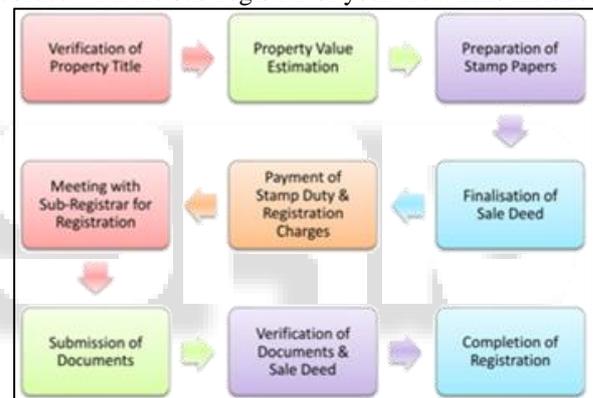


Fig. 1.1: Land Registration Process in India

It is estimated that \$700 million is being paid in bribes at land registrars across India. There have been many land registry fraud cases in India. Many of land properties are sold for much higher prices than actually bought. Signatures in the documents are faked. For the cases of NRIs, there is misuse of power of attorney. There is forgery of title deeds or wills. Every party in the transaction is not accurately authenticated.

Thus Blockchain is being used to create unique digital units for assets like land property, to verify digital file authenticity, identity, order in time and places and to have a secured control on all the processes.

II. RELATED WORK

A tangible or intangible property registrations can be stored on the ledger along with contractual details of others who are allowed ownership in this property. The decentralized ledger also becomes a system for recording and managing property rights as well as enabling smart contracts to be duplicated if records are lost. The blocks in blockchain are formed by a set of data including the hash of transactions and pre-block, timestamp, transactions, version of blockchain and extra data. Each block has the hash of its pre-block so that whoever

wants to modify the data in the front block should modify all of hash of blocks after that block. In blockchain, using hashing every single transaction up to the last point, combined with the new data being added is recorded and stored together. And the output is based on, all previous transactions that have occurred on that blockchain. The work related to this can be explained as below:

- 1) A paper published on “Blockchain in Developing Countries”, by Nir Kshetri & Jeffrey Voas in 2018, explains that creating a tamper-proof digital ledger of transactions and sharing the ledger helps offer transparency and using cryptography allows access to add to the ledger securely. It says that it is extremely difficult to change or remove data recorded on a ledger making it possible to reduce or eliminate integrity violations such as fraud and corruption thus giving an upper hand as compared to other technologies.
- 2) Another paper published on “Proof-of-Property – A Lightweight and Scalable Blockchain Protocol”, by Christopher Ehmke, Florian Wessling, Christoph M. Friedrich in 2018, illustrates how we can use Ethereum to keep the state of the system explicitly in the current block and further include the current system state in new transactions enabling all participants to validate incoming transactions. It further explains how the transactions can be validated without having access to the whole system state, thus enabling users to participate in the network without having to download the blockchain beforehand.
- 3) A paper on “A blockchain revolution sweeps into health care, offering the possibility for a much-needed data solution” made by Leslie Mertz in 2018, was published in IEEE explaining the way by which we can store important information, like prescriptions and precautionary records that are related to a person’s health, using Smart Contracts.
- 4) “A Multiple Blockchains Architecture on Inter-Blockchain Communication”, by Luo Kan, Yu Wei, Amjad Hafiz Muhammad, Wang Siyuan, Gao Linchao and Hu Kai in 2018, elucidates a dynamic network of multi-chain created for inter-blockchain communication for obtaining an interactive multiple blockchain architecture providing atomicity and consistency for crossing-chain transactions.
- 5) “Blockchain Technology Innovations”, by Tareq Ahram, Arman Sargolzaei, Saman Sargolzaei, Jeff Daniels and Ben Amaba in 2017, describes how enabling secure trust frameworks, creating agile value chain production, and tighter integration with technologies such as cloud computing, and IoT work in innovations in blockchain technology.

All these works and many more help us understand blockchain, its implementations in today’s world and how securely it can manage data with atomicity and consistency. It can also monitor supply chains by removing paper-based trails, making businesses able to pinpoint inefficiencies within their supply chains quickly, as well as locate items in real time. It allows businesses, and possibly even consumers, to view how products performed from a quality-control perspective.

III. METHODOLOGY

Due to the lack of maintenance of streamlined land records, there have been litigations, scams and property disputes over land ownership. Hence, a digital and secured department has to be set up, for better maintenance of land records.

The main aim is to computerise all land records, including mutations, improving transparency in the land record maintenance system, digitise maps and surveys, updation of all settlement records and minimization of the scope of land disputes and also to provide clear titles of land ownership that could be monitored easily by government officials, for facilitating quicker transactions.

The proposed Blockchain architecture will have land and identities of parties involved as assets, whole registration process will be done through distributed ledger (DLT) and the transactions done will be through smart contracts.

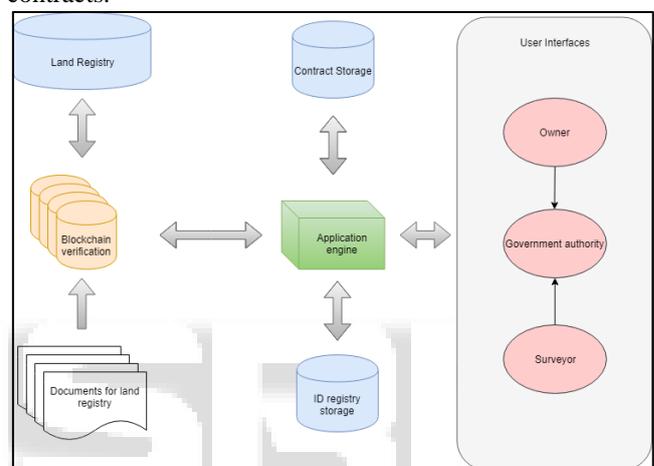


Fig. 3.1: Land Registry Blockchain Architecture

- In the above architecture, entities in user interfaces are further divided into various sub-entities. Owners are divided as renters, buyers, seller, architects and builders and NGOs. Government authority is further splitted in lawyers, notaries, public offices, bond holders, heritage listing public management and usage approvals. Surveyors are broken down into evaluators and auditors.
- As shown above, the user interface will be connected to the Land Registry process through the application engine. The application engine can act as the medium between the user and the database.
- The Application engine is connected to mainly two databases i.e. Contract Storage and ID Registry Storage and the blockchain verification process.
- Contract storage stores the smart contract, which is a piece of software that can store rules of negotiating the terms of an agreement, and after all the parties included in the smart contract agrees to the terms then the verification can be done automatically, and afterwards the smart contract can execute the agreed terms.
- ID Registry storage will maintain a ledger related to the land transactions done in the past as well as the present. These transactions will be unique in every way, so it can be easily identified for future references.
- Another major part of the architecture is the Blockchain verification process, which will be used to make transactions after verifying each aspect of the smart

contract/s, documents and the users related with the land. And after the transaction is successfully done, it will update the details related to the land in the Land Registry database.

- This Land Registry database will store the details of the land and logs of the flow-of-land and transactions related to it till date.

A. Skye Platform

We have selected Skye platform after QFD (Quality Function Development) analysis of the various platform available. The analysis is as follows

Candidate	Ranking	Bitcoin	Ethereum	Eos	Nem	HL	SKYE
TPS*	9	3	27	3	27	6	54
Data structure elasticity	6	3	18	3	18	9	54
Data-scalability	9	3	27	3	27	6	54
Total		72	72		162	72	189

Table 3.2: Comparative Analysis of various Blockchain Platforms

The various platform such as bitcoin, ethereum, eos, nem, hyperledger and Skye are considered. The analysis is done on the basis of TPS (Transactions Per Second), data structure elasticity and data scalability. After the analysis the Skye is selected as the best platform for our project.

B. Algorithms

Blockchain have many consensus algorithms viz. Proof-of-Work, Proof-of-Importance, Proof-of-Stake, Proof-of-Concept, etc. Among these we are going to use Proof-of-Concept consensus algorithm in the development of the project.

C. Proof-of-Concept

For Proof-of-Concept, we are majorly focusing on smart contracts in the development of our project using the Platform Skye. Smart contract as explained above is a piece of software that contains all the negotiating terms and after the agreement of all the parties included in it, it will be executed. Since, every time a transaction will be done a smart contract will be made and will be stored in the transaction log database. Hence, it will create a single source of truth of the ownership status and the history of the concerned property. Due to this, there is an assurance that the land being bought is in the correct plot, and the seller is the correct and authorised owner of the said property, reducing the time involved in the verification process, cost and any disputes that may arise in the future. Hence, it will help in a smooth transition between the buyer and seller.

In our project, it will record and store the details of each and every transactions permanently throughout the sale of a property. Helping in achieving near real-time traceability and transparency into the state of the property.

Let us take an example to visualize of how the process of land registration will be done using Blockchain. Let's say, two parties (citizens) in the state of Maharashtra - a buyer and seller - who have negotiated and settled on the term of agreement, now want to register for the sale deed for the same land with the local government authorities. Now, after the confirmation of going forward with the sale process; both the buyer and seller will go to the government services offices

as they normally would before Blockchain to register the sale deed, which they currently have in their possession.

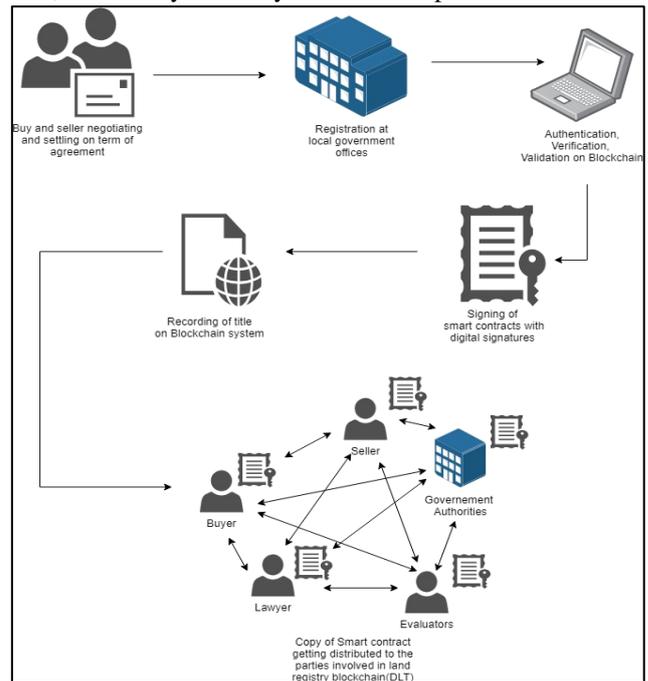


Fig. 3.3: Structure of Proof of Concept

The government office will then enter the sale deed in the presence of the buyer and the seller; into the Blockchain based system. This system will help in the registry of the sale deed and will also process the sign-offs done by both the buyer and the seller and then push the transaction to the approval stage. After successful completion and approval of the transaction have been made, an automatic transfer of ownership will be made. Along with this, the system will also be able to handle land titles with multiple owners.

Due to this system empowered on Blockchain technology, there will be transparency, accuracy and efficiency from an administrator's perspective. As they will be able to view and monitor the state of the property and sale deed in near real-time, as well as well have complete information related to any transactions made on the land from the start.

The main advantage of using this system is that improve the current plans registry process security, as in Blockchain each new node is hashed using the previous node, hence creating a complex connection between the blocks which will be nearly impossible to crack it by any illegal activity by hacking into the system or by trying to tamper with the data.

The main plus point of this system is that the user will be assured that both the buyer and the seller are authorized. And the land that the seller is selling is his/her only, resulting in no further authentication of the seller by the buyer and hence saving a lot of time and money for just the verification process. Also, the user won't have to pay for using the system.

IV. CONCLUSION

In this paper, we have explicated the idea of improved and digitized Land Registry process using Blockchain technology as a platform to build the underlying trust infrastructure.

Blockchain in land registry will bring the transparency in process and not only detect the fraud but it will prevent it too. The solution will also increase citizens' confidence in the government and make the overall customer experience less cumbersome. Most importantly it will enhance data security and ensure authenticity of land records.

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