Blockchain-based Land Registration and Mutation System

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Abstract

Property ownership has always been a foremost problem throughout the world but when it comes to the point to land it gets more violent and complicated. To maintain justice regarding this problem there are a lot of acts had been established so far for example, Land Registration Act 2002 in UK (1), The Registration Act 1908 in Bangladesh and many more. But, acts become futile when there is no one to govern it. With the rapid growth of population and the increasing rate of land transfer, it becomes an impossible deed for under developing countries like Bangladesh to control the operations properly. About 80% of court cases of rural areas are estimated to be related to land conflicts in Bangladesh because of the lack of documentation on land (2). There were no plausible solution for these kinds of physical properties but now after the advent of blockchain, there may be a way to solve the problems with distributive computing system. Blockchain is a distributed ledger technology which provides a way to afford more transparency and scalability and the most important thing each and every organization want these days, which blockchain provides that is efficient and effective governance (3). As developing counties are always in urge of having the best technology but for us this is a must, because our land records are not up to date and they are not even fully digitally stored. So, we can start with land registration and mutation which is in dire position with blockchain technology. In this paper, we proposed a land registration scheme with blockchain. Where every land will be stored in blockchain with its specified attributes. With the authorization of selective personal, a block will be added to the blockchain if it fulfills all the constraints. It will be really beneficial in the long run because in Bangladesh all the lands are not properly digitally stored. This system will both store the data regarding land and also any changes to the respective land will be stored real time in the blockchain. With the consensus algorithm, there will be no need for the authenticity of system because, if something is stored in the blockchain it is unalterable.

1 Problem Area

- **Third party involvements:** Current procedure of land registration requires many steps. Both buyers and sellers of lands need to visit and get clearance from multiple authorities to complete their desired operations. In order to ease the entire process both buyers and sellers prefer to complete the dealings by middlemen and brokers. As a result they are not getting the proper details about their transactions and properties. Middlemen are also getting highly paid for their roles in land dealings.
- **Inaccuracy in documentations:** While doing registration of a land owners need to collect certificates from several authorities. For land mutation many operations needs to be completed alongside clearance of multiple documents. For these reasons mistakes and deregulations happen very often.

- **Manipulation of records:** Currently records of a land are being prepared manually which are based on multiple documents. Therefore errors can be done by authorities willingly or unwillingly which leads to tamper of records. As a result owner identity, proper price, history about land is being manipulated and incidents like land grabbing or creating false ownerships are happening.
- **Time inefficient:** To ensure the registration or mutation of a land stakeholders need to complete many steps of legal work which requires a huge time.

2 Solution

Blockchain will provide autonomy and transparency in entire land registration process. Use case diagram of our solution model in this case is given below.

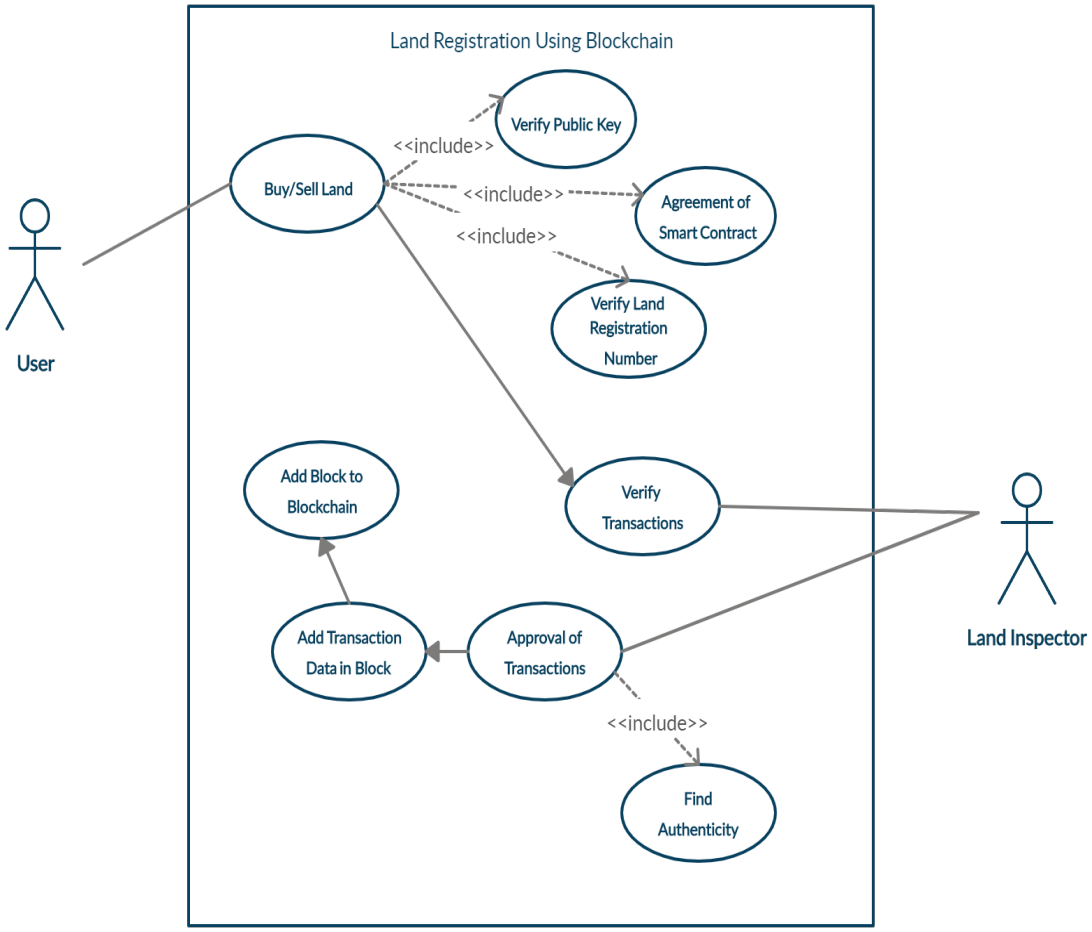

Figure 1: Land Registration Using Blockchain

According to figure 1 when a user wants to buy or sell a land at first his unique identifier which is his public key will be checked whether it is valid or not. After that registration number of the land which is also a unique value will be verified and then he needs to agree the required conditions of blockchain provided smart contract which includes the details of the land with the seller or buyer of the land. The agreement of the contract verified by digital signatures of buyer and seller. After successful smart contract the data will go to the land inspection officer for further verification. He

will check whether all the information of the operation is authentic or not. Then he will add the valid data to the block. Finally valid block containing verified data will be added to the blockchain. The solutions we will get from the model are described below.

- **Extinction of middlemen:** Total process of blockchain based land registration and mutation system requires only the involvement of buyer and seller. Therefore there is no scope of any participation of third parties.
- **Safe record keeping:** The information about the owners and their lands can be saved by proper verification and authentication in blockchain. As it consists distributed and immutable function it is impossible to tamper any data regarding a land.
- **Tracing the data of the land:** Any buyer who is interested to enquire about a land can spectate the real time data of a land. Every verified information about the land such as broadcasted transformation history of the land, ownership changes can be known from blockchain.
- **Secure transaction:** Land mutations will be completed by flexible notarization between buyer and seller like completing agreements according to smart contract and fulfilling the transactions by digital signatures.
- **Efficiency:** In blockchain necessary authentications and transaction verifications of land mutation needs very short time to be completed. As it does not require the approvals from multiple officials from different sectors and many paper works therefore the process is both time and cost efficient.

3 Blockchain

The above mentioned solution model can be implemented by a private blockchain where read permission will be public and writing will require approval from designated authority we prefer land inspector for the role.

User who wants to sell a land, he has to give proper information about the land including expected selling price. Land inspector then investigate about the information and check whether the price is appropriate according to data and equivalent to physical asset then he will approve it and land data will be added to blockchain under the public key of the user where the land will be given a unique identifier which is a hash value. This data cannot be tampered as blockchain is immutable.

When a buyer wants to know about the land information he can see complete data of the regarding the land. If he thinks he will buy the land he can approach to the seller and has to reach agreement by the self-executed and self-enforced smart contract which is transparent. The digital legal contract will be completed by the digital signatures of both stake holders and then the transaction data will be pending for the verification of land inspector. Any violation in smart contract will cause the rejection of the transaction.

It will require the permission of him to be approved and add in block. Inspector then checks the validity of the data and then adds it to block if valid. Otherwise he will reject it. Verified data will be added in block as figure 2. Finally the block will be added in blockchain and new information of owner and changes of the land will be added.

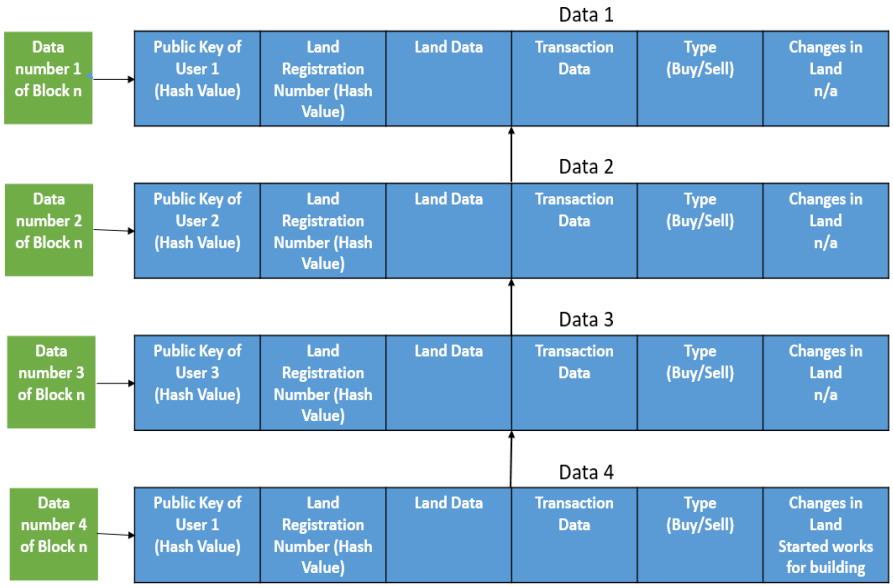

Figure 2: Structure of Data Stored in Block

4 Market Size

This solution will have a great impact factor on the citizens who have land or want to buy or sell the land. It will affect citizens of all categories and will drop the hassles of former land registry scheme. In a consequence, a raft of third party members will lose their job, though this solution will have a huge supporter and a great market size. So, roughly we can say that it will be hard to support this vast amount of user. The most significant thing is that there is no chance of dropping the value of land, on the contrary it will just be increasing day by day. User interface of the system will be very user friendly, for this anyone who has experience of using smart phone can understand our system and its significance. But to authenticate the land's digitalization process we need the land inspection officer from land registry office not only this but also to digitally store all the data correctly we need survey officers on the field. As to live we need food in the same way to stand we need space, in that regard this solution cannot be confined nationally, but for this time our target will be Bangladesh as here land information are not all digital and are not flowing according to how it was supposed to.

5 Partners

The foremost stakeholder of our system will be the end user whose land ownership data are going to be stored in blockchain. But, we need continuous supervision of all lands as it is a physical property. For this reason, Directorate of Land Records and Surveys and Directorate of Housing and Settlement is needed to certify or sign for the authenticity of the land's digital information. The most important of all is that Ministry of Land and Ministry of Law, Justice and Parliamentary Affairs need to have constant observation over the blockchain so that nothing goes south. To overlook all the processes of the whole system we will have land inspection officer. Now for the technical part with the governance of BASIS and ICT division, this system can emerge a new paradigm.

6 Revenue

This system is not any kind of business doing other way it is actually refurbishing the whole land registration scheme in a better, scalable and digital way. After practically using this scheme, it will ameliorate the total situation. There will be no redundant of work and less corruption. For example, land registration is needed when there is an isolated transaction between buyer and seller with land. To record the transaction there are lots of stamping on officials papers not only this but also the notice is sent to the office of Assistant Commissioner's office for recording and it goes on to Ministry of Land. This types of official hierarchy and redundant loads can be deduced if this system will be established. It will eradicate the fraudulent activities of third parties whose sole purpose is to hassle citizens, while they are going through these organizational hierarchical procedure, to swindle money out of them. We always hear situations like, for lack of proper documentations someone loses his/her land and all raise finger to the government. But, the main problem is that there is nothing to authenticate without proper order of documentation. This solution will get remedy of all this complication and provide a sound and sophisticated system for everybody which will ultimately bring a positive impact on all.

7 Distribution

To start this process, all the stakeholders need to be cooperative.

- Firstly, constant discussion with Ministry of Land can bring out the constraints of consensus protocol, the terms and conditions which should be propagated to the end user and the lacking of traditional system.
- Secondly, for signing process, Directorate of Land Records and Surveys need to peruse all the documents and make them digital.
- Lastly, if everything is alright, we can open up with the citizens about the benefits of using blockchain and the whole system so that they can superficially understand the scheme and be optimistic about embracing system.

8 Competitions

There are many organizations all over the work who are working on land registration using blockchain such as BenBen in Ghana or Lantmäteriet in Sweden and many more. Although some of them have already been established in this sector but our model will be able to maintain the proper efficiency and security in land registry.

9 Risks

Deregulations by the land inspector is the main risk in our system. However as blockchain is a distributed system it can only delay the verification of a data or transaction he will not be able to manipulate any information. Another concern is many countries might not be agree to adapt the system considering the violation of mainstream legal issues. But, the actual fact is that blockchain based solution is not tampering any legal activities, its refining it. Lastly, public blockchain is open to all for that reason there are usually indefinite number of full node who can store, validate and add blocks to the blockchian. But in our case, as the blockchain will be private there will be less number of full node which will inflate the chances of external malicious attack. Because, the less

the number of full nude the greater the chances of external attack. So, we need to be careful about the firewall of our solution.

10 Merits

All participants who are involved in land registration will be beneficial by blockchain-based solution.

- Firstly, buyers and sellers. They can complete their deal easily by autonomous smart contract and secured transaction.
- Secondly, land inspectors as they do not need to verify multiple certified papers from different office in order to complete land mutation. They can easily check authenticity of the operation from the data of blockchain.
- Lastly, the governments as they can easily get the history of the lands including the chain of owners.

Team Details

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