



**IJIRCCCE**

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

**Volume 9, Issue 7, July 2021**

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

**Impact Factor: 7.542**



9940 572 462



6381 907 438



ijircce@gmail.com



www.ijircce.com

# Blockchain Based Land Record Storage

Monisha B, Monika G, Sruthi S, Abirami K

UG Students, Dept. of IT, Velammal Engineering College, Chennai, India

Assistant Professor, Dept. of IT, Velammal Engineering College, Chennai, India

**ABSTRACT:** Land is an immovable and non-liquid asset having high value. The integrity and proper track of ownership/transfer records of land is a highly challenging task. As the ownership of land can constantly change over time and that too sometimes very frequently, it poses a daunting task of keeping elaborate and long ownership transfer records. The problem further escalates due to presence of fraudulent or incomplete registries which are very difficult to trace back through time. Most of the issues root from the problem of the current land registration systems being either having legacy paper document trails or from poorly kept non-transparent centralized systems. Fraudulent users may try to forge paper documents or modify electronic records to change the land ownership record. This paper proposes a secure record keeping mechanism that addresses these issues using a Blockchain based system which can create record for the physical assets into an immutable liquid Blockchain based token asset. This new block chain token asset can now be used to keep a digitally secured and selectively visible record of ownership, solving the mentioned issues. An implementation of this system has been done using Ethereum and the benchmark data shows that the transaction processing time of such a system is reasonably low thereby making it suitable for practical implementation..

**KEYWORDS:** Blockchain Land registration Liquid asset storage Asset as Token

## I. INTRODUCTION

Every nation has strict set of rules for transfer of land and property ownership among its citizen. Following the established set of rules is a mandatory criterion for the transaction of land and property. Depending on the type of property, whether single owned or multi-owned property, the transaction goes through different procedures. Moreover, any case of dispute among the residents for ownership of the properties is mostly handled by the law of the concerned nation. Despite having strong laws in various nation, the present scenario is inept to handle the various challenges like immutable records of property, handling fraudulent transaction etc. many cases, sale documents deliberately does not mention about the ownership but only of the sales transaction, which is liable to be disputed. Verifying the ownership of such property always involves verification from official based on historical records and so lacks an independent variability. Experiments in some states to build register have not been successful as they suffer from problems arising from lack of updates, fragmentation of lands, informal family partitions, unregistered power of attorney transactions, and numerous boundary and ownership disputes. The opacity and uncertainty of the sale documents mitigate the chances of reliability on the transfer of ownership via the current procedure.

## II. RELATEDWORK

The technical demo that is currently being built as part of this project uses ChromaWay's technology and programming structure Esplix, which creates smart contracts/embedded contracts in a Blockchain. In practice, a chain of messages is saved into a private Blockchain, which can execute the transactions between the parties more quickly. When the contract is finished, it can be summarized into a hash that can be added to other Blockchains like Bitcoin's Blockchain as an extra back up. Everyone involved can also save all or part of the Blockchain, which covers the personal transactions in the system. Both buyers, sellers, banks and real estate agents can therefore verify the history of a transaction. An additional benefit of this procedure is that the solution is even easier to transfer to an alternative Blockchain. Let's assume that a few Government agencies jointly build a Blockchain that they control. The solution they have built in the test bed can be easily secured, even in this Blockchain. A solution with Colored Coins is somewhat more hazardous and difficult to transfer since the code is written on top of a specific cryptocurrency. The Netherlands Land registry is willing to test the Blockchain technology for the real estate data along with Artificial Intelligence for cognitive systems to make predictable models. Other countries like Russia, the United Kingdom and Brazil have initiated their projects on the land registry system.



### III. PROPOSED ALGORITHM

#### A. MODEL

The proposed system, as compared to the single point failure architecture of centralized systems, has found a profound upper hand in terms of the safety and undisputed data storage in the form of Directed Acyclic Graphs in every node of the system. Falling prey to the uni-verification of the landownership management by a single entity has resulted in several forms of fall-outs, which requires a dedicated source of time and financial support for the outcomes which also sometimes result to another class of disputation. In contrast, the system, with its robust nature of storing and securing data, has achieved an enhancing form of scaling and authentication of entities of the system. The single consensus and dual consensus ensures the validity of every transaction of land and property ownership. Moreover, the time-stamp of contracts like testaments and mortgage deeds are also handled with a sense of executing only at the precise hours. Many other edge cases related to transfer of land and property is being handled with the assurance of a discrepancy free system. The system strictly follows the decentralized aspects of a hybrid Blockchain with a consensus mechanism of entities for every transaction. The data on the system shall only be available for viewing by the members of the Blockchain. Members outside the visual range shall only be able to view the properties for sale but at the cost of being enrolled under the Blockchain thus ensuring no outer contact of the Blockchain data with the unauthorized people of the restricted areas. The permission system redefines the core concept of access control for reliable data storage. The detailed model of the proposed system, comprises of various entities interacting with the Decentralized Application. The application mainly consists of a “Genesis list” which initially contains the plot IDs of all the acquired land pieces along with the plot IDs of the land acquired by the highest authority of the state. The dual consensus of the new owner and old owner initiates the process of transactions of land between them without the entry or involvement of the third party like the current centralized system.

**Government Authority:** This entity is given a special address which can never be transferred to any other resident of the state or any other member of the Blockchain. This entity shall initially start the system owning the genesis block. In

the next stage, the plot IDs are distributed among the respective owner addresses. Any kind of disputed land or physical land lost due to unavoidable natural circumstances shall be declared null and void by the government authority address. Thus, such tokens shall never be eligible for any further transfer of ownership. This authoritative address also has the power to terminate the working of the system by declaring all tokens to be null and void in case of emergency or unnatural dissolution

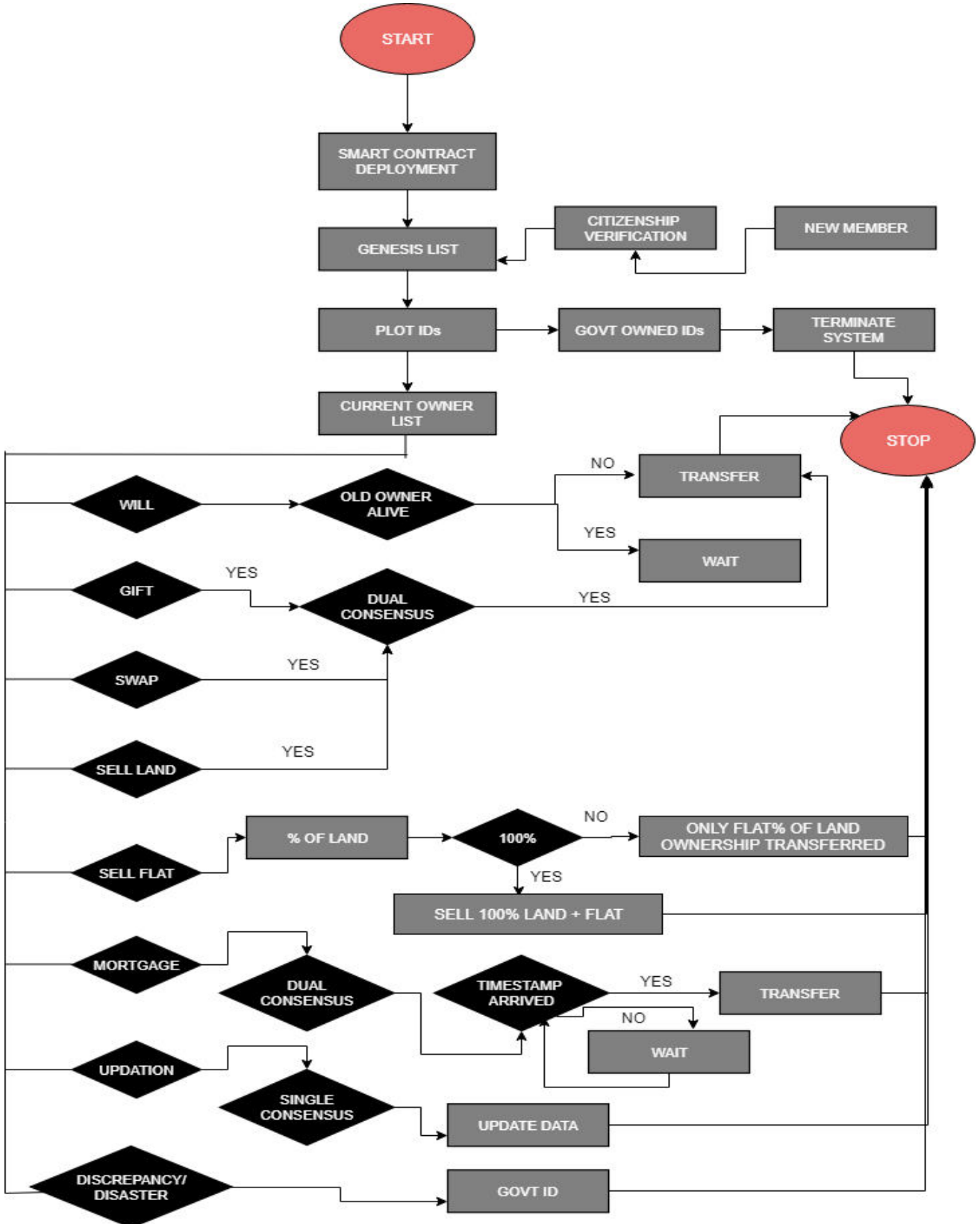
**Land Owner:** Every plot ID shall be mapped to an owner address who has the capability to divide the tokens into sub-tokens and transfer the ownership of the mapped tokens among other nodes in the Blockchain with the consensus of the new owner or a new member of the Blockchain. If the tokens mapped with the owner address are declared null and void, the tokens shall not be capable of subdividing or transfer, although the records of the initial owners shall remain valid.

**Non-members of Blockchain:** Any resident of the country, after being verified by the citizenship record keeping system of the respective nation, can join the Blockchain without any other type of consensus to be met. The node can only view the details of the properties on sale by the existing landowners. After acquiring ownership over a portion of the token, the address gets added to the genesis block and gets recognized as a current owner of tokens.

#### B. ARCHITECTURE

Behind the decentralized interactive application, a decentralized code written in Solidity, a Turing complete language, is responsible for the deployment of the smart contract along with proper execution of the methods to be called by the decentralized applications. The functions altogether act to intertwine the functionality of the application along with input, output, and decisions of the prospects of the system. Below we list out the primary properties of the smart contract and their interactions.

IV. ARCHITECTURE DIAGRAM



#### IV. PROPOSED SYSTEM STEPS

##### A. DATA STRUCTURE:

A Directed Acyclic Graph is used for the storage and duplication of data on every node of the Blockchain. The initial data structure is the Genesis block, which is executed as an “event” due to its cheaper storage alternative, comprises of the mappings of plot IDs against owner addresses along with the location and property acquiring details in the form of a tree. Any division of the land piece, taken as tokens, can be subdivided and the new plot IDs are stored into the genesis block for further ownership transfer. The ancestral data about the line of ownership details of every token is stored against the plot IDs of the group of tokens.

##### B. FUNCTIONALITY:

Adding a node: Any node, on being verified by the citizenship record system of the particular nation, can join the Blockchain for viewing the properties on sale. This is especially with respect to safeguarding the access control of the intricate data of the land owners.

Division of tokens: Every transaction of ownership transfer of land goes through the consensus mechanism where both the participating entities verify the occurrence of each transaction. No transaction can be done without the consensus, thus minimizing an error-prone situation of land ownership transfer. Transfer token: A token as a whole or in collaboration with other consecutive tokens can be transferred, i.e., the owner addresses with respect to the plot IDs can be changed without any manual intervention. There is a restriction followed that the divided tokens cannot be in random numbers but in consecutive sequence in order to secure random sale of physical land area.

Dual Entity verification: Every transaction of ownership transfer of land goes through the consensus mechanism where both the participating entities verify the occurrence of each transaction. No transaction can be done without the consensus, thus minimizing an error prone situation of land ownership transfer.

Data Update: Updating of data related to any information on the nodes is not allowed inculcating the members of the Blockchain to enter details of the transactions devoid of any error. The reason for such restriction is that tokens once transferred can only be returned by again transferring back the tokens to the old owner with the consensus of both the entities. This is to ensure that no discrepancy arises due to transaction delay or swift transactions trying to attack the system.

##### C. IMPLEMENTATION DETAILS:

The participating entities of the system can be defined using the following data structures. Other structures include a mapping from address to string, newMemberList, which serves as a data collector for all the members who are verified by the citizenship record of the nation and who wants to join the proposed Blockchain system. It is checked whether there is a consensus of both the entities for the transfer of land ownership from an existing land owner to another node in the Blockchain. Only on that respect, the new owner(s) of the land or tokens is/are appended into the Genesis list and if all the tokens acquired by the current owner is being sold, the address of the node is removed from the genesis list and appended to the newMemberList, which comprises of the nodes .

**Algorithm1:** Adding to Genesis List

```
function dualConsensus
    (newOwner, oldOwner, timestamp);
if oldOwner & newOwner in record then if token[address].status == 1 then
    return 1;
else
    return fail;
end
function addToGenesisList
    (currAddress, newAddress, token);
if oldOwner & newOwner in record then if dualConsensus then
    append to genesisList(struct ownerInfo)
end else
    return fail;
end
```

**Algorithm2:** Operation

```
function will(oldOwner, govtAddress, newOwner,
```

```

token[plotId],booldeath)
if oldOwner&govtAddressinrecordthenifdualConsensusthen
    while(!death);
    addToGenesisList(newOwner);
endelse
    returnfail;
end
functionswapOrGift
    (newOwner,oldOwner,token[plotId]);
if oldOwner&newOwnerinrecordthenifdualConsensusthen
    addToGenesisList(newOwner);
endelse
    returnfail;
end
functionallApartment
    (oldOwners[],newOwner,token[plotId]);
ifoldOwners[]&newOwnerinrecordthen
    whilen
        ifoldOwners[n].status&oldOwners[n].plotIDissamthen
            addToGenesisList(newOwner);
        endelse
            returnfail;
    end
functiononeApartment
    (oldOwner,newOwner,token[plotId]);
ifoldOwners&newOwner in recordthen
    addToGenesisList(newOwner);
else
    returnfail;
end
functionmortgage
    (oldOwner,deedAddress,token[plotId],
    booltimestamp)
ifoldOwner&deedAddressinrecordthenwhile(!timestamp);addToGenesisList(deedAddre
    ss);
else
    returnfail;
end

```

## V. CONCLUSION AND FUTUREWORK

Traditional land ownership transfers constitute an investment of the prodigious amount of time and money. Many nations employ the presence of middlemen or nominees for a verified transfer of ownership, in spite of which, related concerns long to be raised. Moreover, many cases related to forgery and duplicate papers for one single piece of land can also be produced by a corrupt system. In order to address such challenges, the concept of Blockchain has been applied in the proposed system. The trade-offs have been looked at by designing, implementing and evaluating various cases that may arise in terms of ownership transfer of land. It was found that the smart contracts provide transparency and minimization of any third party entity involved in the designated process, thus reducing the amount of time and money laid out. The implementation has given acceptable transaction rate and transaction cost on the Ethereum platform. However, as the eth cost alters at a very high rate, there is always uncertainty about the amount of gas cost that would be required for each transaction. But regardless the system succeeds in tackling the problem mentioned. Thus, this Blockchain based system proves to be apt for handling all the cases of land ownership transfer at the cost of the participating entities of each transaction in the network



#### REFERENCES

1. L. Lemieux, "Evaluating the use of blockchain in land transactions: An archival science perspective," *European Property Law Journal*, vol. 6, no. 3, pp. 392–440, 2017.
2. Jentzsch, "Decentralized autonomous organization to automate governance," in *White paper* 2016.
3. Baliga "Understanding blockchain consensus models" in *Persistent .*, vol. 7, p. 1419, Sep. 2017.
4. S. Enemark, I. Williamson, and J. Wallace, "Building modern land administration systems in developed economies," *Journal of Spatial Science*, vol. 50, no. 2, pp. 51–68, 2005 .
5. M. Bal et al., "Securing property rights in india through distributed ledger technology," *New Delhi: Observer Research Foundation*, 2017.



**INNO**  **SPACE**  
SJIF Scientific Journal Impact Factor  
**Impact Factor: 7.542**



**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
**INDIA**



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

 **9940 572 462**  **6381 907 438**  **ijircce@gmail.com**



[www.ijircce.com](http://www.ijircce.com)

Scan to save the contact details