

Exploration of Blockchain Based Solution for Real-Estate

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ABSTRACT

Blockchain is an evolving technology providing us the ability to design and develop decentralized distributed solutions. It has yields wide-scale impact on finance industry with reducing intermediate authorities. By building digital currency tracking of the transaction has become much easier and immutable nature of block not only give credibility but also is a cheap storage mechanism. So, we decided to explore its feasibility in the real estate industry. Real estate is one of the biggest sectors all across the world and is known to have millions of transactions every day. By making a digital system we can not only reduce redundant paperwork but also increase robustness in the system. It would also help investigating agencies to track transaction like many incidents came where terrorists bought or leased land with fake identities. By developing a system efficient enough to validate citizen and property and provide quick fetching of the transaction would be a revolutionary change for the industry as at present date all transaction are offline at it is impossible to collect data all across the country. This research paper explores one possible model of blockchain in the real estate market particularly rules and regulation followed in India with authentication using AADHAR.

Keywords : Blockchain, Ethereum, Real Estate, AADHAR

I. INTRODUCTION

This paper provides a model for implementation of blockchain on the real-estate market with considering government rules followed in India. For every legal transaction in real-estate, we have to visit many government offices and take an appointment and maintain all sets of documents. This is a really frustrating process where it struck us why not automate many processes. So, we decided to make an Automatic Registrar Machine which is an automated version of registrar doing many processes which don't need registrar intermediation and this machine could be installed at any government office, banks, etc. reducing the load on a single government office and easing the process for citizens. Plus, this machine would work similar to ATMs in the bank could work every single day, unlike government office where there is stipulated time hours and a lot of holidays. As blockchain possess the ability to provide a trustless

decentralized platform this would help in removing many intermediaries.

Blockchain

The blockchain is a chain of similar immutable blocks on a decentralized network. The most popular implementation of blockchain is "Bitcoin" by Satoshi Nakamoto which basically the first known successful implementation of the blockchain. Many more implementation came in existence after that and one such is Ethereum by Ethereum foundation which not only provides us with independent blockchain but also provides smart contracts and dapp to operate and better presentation for our blockchain based application.

On basis of trust there are 3 major classes of blockchain: -

- ❖ Private Blockchain: There are set of nodes with full trust on each other. These are usually in companies and are not much more than a

database. They also find some implementation in research and prototyping experiments.

- ❖ Consortium Blockchain: Restricted to few nodes this blockchain and those network nodes first have to attain rights to enter chain. This makes it permissioned blockchain but also making flexible than private chain.
- ❖ Public Blockchain: There is no central authority controlling network rather works with different consensus algorithm like proof of work or proof of stake etc. to allow establishing a trustless network where a node can join and leave any time they want. This is most commonly used chain and has seen successful implementation as cryptocurrency platform like “Bitcoin” and “Ether”.

Ethereum Foundation is a foundation which works on developing decentralized Ethereum Virtual Machines. EVM provides us with facilities to deploy blockchain and develop Smart Contract that helps in interacting with present blockchain but also interact with other blockchains in the network. This property is called interoperability. Ethereum foundation also came up with the concept of DAPP or a decentralized application. They are like normal web application but they are not hosted on a dedicated server rather hosted on the decentralized network.

Real-Estate in India

One of the biggest known sectors with more than a hundred thousand transactions happening both documented and undocumented, Real-estate is still limited and far away from technological interference. With ground property survey of this sector, many shortcomings were noticed. One major problem is going to the registrar and other government officers for every transaction.

With these concerns in mind, we identified major issues in the next section and a solution model for it. By making everything digitalize and free of intermediaries, we can hope for more transparency, reliability, and consistency in the system. It would also speed up the process and make it efficient.

II. Problems recognized in current Real-estate system

- ❖ Cases of fake land owner document creation.
- ❖ Even for small transaction like lease or direct ownership transfer take appointments and maintain huge paperwork.
- ❖ As all documents are hardbound transaction audit and tracking is difficult for government bodies.
- ❖ Indian citizen can only make transaction on government working days and that too in specific functioning hours.

III. Solution Proposed

A consortium blockchain based system is proposed where land, its owner and all other human parties involved are authenticated before any transaction is done.

Main Controllers of Chain

- ❖ Government officers: These officers would vary from system auditors to handle cases like issuing smart cards and other function that are not automated. They are also responsible for ensuring process is streamlined as once block is made it is immutable and there is no veto process and set of new transactions have to be done to bring original paradigm back.
- ❖ Automated Registrar Machine: A special machine designed to handle transaction using dapp. This machine charges fees according to transaction being performed. It first accepts the property card and make you validate you and then gives you range of possible transaction and then according to transaction validate other involved parties.

Data-storage

As it is a decentralized network data would be separated across the network. But a special smart card would be used for fast access of property's data.

Property Identification

Our solution gives each property a unique id stored in a SMART CARD.

This Smart card would give assurance to buyer that he is owner of the property. This card comprises of:

- ❖ Last block Timestamp
- ❖ Hash of previous block
- ❖ Nonce
- ❖ Property Number [FIXED NON OVERWRITABLE FIELD]
- ❖ AADHAR OF PROPERTY HOLDER

Aadhar verification and block retrieval mechanism ensures card is not tempered. Plus, unique property number ensures that there are no more property fraud happening in the country.

By making chain consortium there are limited nodes with addition to that mostly would be automated machines (similar to Automated Teller Machines) running dapp which allows property owner different real-estate transaction without any human intervention increasing efficiency and reducing time and paper work for users.

Transaction Creators Validator

India is a becoming a technologically advance country and government has been constant supporter. By introducing system of AADHAR each and every citizen is uniquely identified and can be easily validated for any transaction using any biometric scanning.

Block Structure:

Block structure is basic structure defined in Ethereum with

- ❖ Block Creation Timestamp
- ❖ Size of the block
- ❖ Hash Address
- ❖ Parent Hash Address
- ❖ Extra Data

Here extra data is a 32 byte as defined in Ethereum block where we save our transaction data.

So, we propose this distribution structure for optimal use of data

Property Number	Transaction Type	Related Data
32 bits	8 bits	216 bits
Unique for each property	Defines what type of transaction is stored in the block	All the necessary information related to block

Initially whole block is set to 0 and then values are assigned as following:

- ❖ Property number as defined earlier each and every property would be uniquely identified.
- ❖ Transaction Type is 8-bit number with flag style usage to define what type of transaction happened. Below is representation of data inside flag and how related data is stored:

Initially Extra data field of every property would be

Property Number	Transaction Type	Related Data
32 bits	00000000	Data stored: <ul style="list-style-type: none"> ❖ AADHAR OF GR (32 bit) ❖ AADHAR OF OWNER (32 bit) ❖ Rest bits set to 0

First bit of transaction type represents Sale or Leasing transaction:

For Sale related transaction it is set to 0.

1	2	3	4	5	6	7	8
Value= 0 As transaction is Sale	Type of Sale Transaction 0: Normal cases 1: Special Cases	For bit 2 = 0 Bit 3, 4 and 5 would be used to classify transaction	Based on transaction flags are used				
		For bit 2 =1 0: Split the Property 1: Government Acquisition	Not in use for now but as default set to 0				

Next table shows different bit orientation and corresponding related data for sale contracts:

Transaction type	Related Data	Performed by
00 000 100	Making Co-owner; Data stored ❖ AADHAR of Person making Sale (32bits) ❖ AADHAR of co-owner(32bits) ❖ Stake percentage of property(8bits)	GR As new card to co-owner is issued.
00 001 AB0	Imparting of singly owned property A bit is for Sale right B bit is for Lease right So according to AB status (with 1 as giving right): 10: Sale Right Transferred; Data stored ❖ AADHAR of owner (32bits) ❖ AADHAR of receiver (32bits) 01: Lease Right Transferred; Data stored ❖ AADHAR of owner (32bits) ❖ AADHAR of receiver (32bits) 11: Both Transferred; Data stored ❖ AADHAR of owner (32bits) ❖ AADHAR of receiver (32bits)	GR As new card to inheritor is issued.
		ARM
00 010 A00	Sale of singly owned property A bit is set according to: 0: Whole stake sale; Data stored ❖ AADHAR of owner (32bits) ❖ AADHAR of buyer (32bits) 1: Partial stake sale; Data stored ❖ AADHAR of Co-owner (32bits) ❖ AADHAR of buyer (32bits) ❖ Stake percentage of property(8bits)	ARM
		GR As new card to partial stakeholder is issued.
00 011 A00	Sale depends whether owner sells full property or his stake A bit is set according to: 0: Whole stake sale; Data stored ❖ AADHAR of Person making sale(32bits) ❖ AADHAR of buyer (32bits) ❖ Stake received(8bits) 1: Partial stake sale; Stake validation done Data stored ❖ AADHAR of Person making Sale (32bits) ❖ AADHAR of buyer (32bits) ❖ Stake percentage of property(8bits)	GR As new card to stakeholder is issued and all previous card are surrendered.
00 100 000	Making Co-owner; Validate the percentage stake could be allocated Data stored: ❖ AADHAR of Person making Sale (32bits) ❖ AADHAR of co-owner(32bits) ❖ Stake percentage of property(8bits)	GR As new card to co-owner is issued.

00 101 A00	Person holding rights Making sale multiple owners First all validation is done and percentage of property he can sell is checked then transaction is made. A bit is set according to: 0: Whole stake sale; Data stored ❖ AADHAR of Person making sale(32bits) ❖ AADHAR of buyer (32bits) ❖ Stake received(8bits) 1: Partial stake sale; Data stored ❖ AADHAR of Person making Sale (32bits) ❖ AADHAR of co-owner(32bits) ❖ AADHAR of buyer (32bits) ❖ Stake percentage of property(8bits)	GR As new card to stakeholder is issued and all previous card are surrendered.
		GR As new card to partial stakeholder is issued.
00 110 A00	Co-owner Making sale First all validation is done then transaction is made. A bit is set according to: 0: Whole stake sale; Data stored ❖ AADHAR of Co-owner (32bits) ❖ AADHAR of buyer (32bits) 1: Partial stake sale; Data stored ❖ AADHAR of Co-owner (32bits) ❖ AADHAR of buyer (32bits) ❖ Stake percentage of property(8bits)	ARM
		GR As new card to partial stakeholder is issued.
00 111 000	Merger of Stake is defined as is there is a owner who bought stake from different owners and now wants to combine it. Data stored ❖ AADHAR of Merger (32bits) ❖ Final Stake percentage of property(8bits)	GR As single new card is issued.
01000000	Splitting property: Old card is taken by GR and new block and card with new property number is created. This block is just for transaction reference.	GR
01100000	Government acquiring the property Data Stored: ❖ AADHAR OF OWNER (32bits) ❖ Government Registrar AADHAR Number (32 bits) ❖ Government scheme name In this card is taken away from the owner	GR

For Leasing related transaction, it is set to 1.

1	2	3	4	5	6	7	8
Value=1 As transaction is leasing	Type of Leasing Party 0: Single party 1: Multiple parties	Duration type of next 5 bits 0: Months 1: Years	Max contract for speeding transaction is 24 ₁₀ This provide with 2 special cases: 11101: For period more than 24 ₁₀ 11111: For termination of lease.				

Next table shows different bit orientation and corresponding related data for leasing contracts:

Transaction type	Related Data	Performed by
10X00001-10X11000	Single party leasing So, details stored: ❖ AADHAR of Person leasing ❖ AADHAR of Tenant ❖ Price of lease (8 bits)	ARM

11X00001-11X11000	Multi party leasing So, details stored: ❖ AADHAR of Person leasing ❖ Next 8bits used for storing number of parties with maximum limit of 5 per block ❖ AADHAR of Tenants ❖ Price of lease (8 bits)	ARM
10X11101	Single party leasing with big duration So, details stored: ❖ AADHAR of Person leasing ❖ Next 16 bits represent years in lease ❖ next 16 bits represent months in the lease ❖ AADHAR of Tenant ❖ Price of lease (8 bits)	ARM
11X11101	Multi party leasing with big duration So, details stored: ❖ AADHAR of Person leasing ❖ Next 16 bits represent years in lease ❖ next 16 bits represent months in the lease ❖ Next 8bits used for storing number of parties with maximum limit of 4 per block ❖ AADHAR of Tenants ❖ Price of lease (8 bits)	ARM
1XX11111	Contract Termination So, details stored: ❖ AADHAR of Person terminating leasing Prerequisite of block creation ❖ tenants Validate it too in initial steps but details are not stored	ARM

After Transaction and successful block creation a slip is issued to tenants as proof and smart card of owner is updated.

III. CONCLUSION AND FUTURE SCOPE

This proposed system could be implemented and could be one step closer to a clean and green economy. By using our bit manipulation mechanism, we save data and provide much faster access to the transaction. This system at present has many bits left out to cover new rules and transaction types made by the government. Though this system does not cover the financial aspect, the future scope of this system is full integration with finance industry once it advances into blockchain. This would be possible using interoperability nature of blockchain. This would be one of the biggest attacks on corruption, terror funding and many more un-ethical activities going across the world. Also taking this model as a base record system for cars, expensive goods could be made after their sale. Hence, we conclude by showing how blockchain could have a wide-scale impact on our economy.

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