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Real Estate Management using Block Chain Technology

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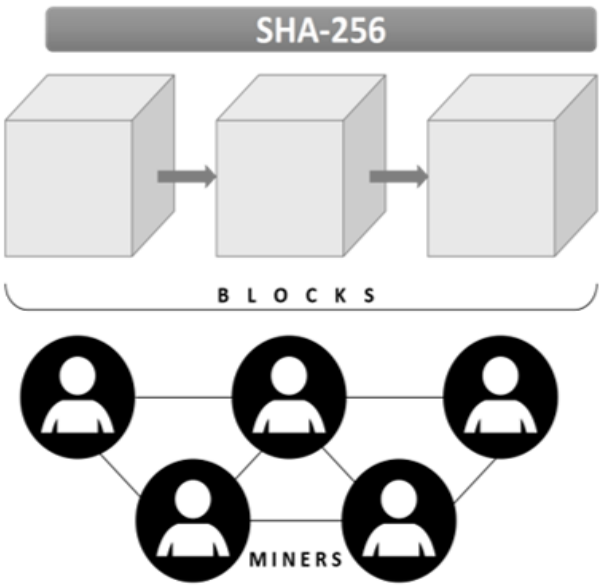
Abstract—An initiative of making real estate management paperless and maintain integrity among the ownership of properties with the help of Block Chain technology. In block chain we use cryptograpic technology where an information in a network is being secured with the help of hash values. These hash values are unique for each block and it depends on various factors in the blockchain. Block Chain is being used here because once data is written in the ledger any changes made in it without authentication will break the network. Only authenticated persons will be able to access the data and only they will also be able to update the data. The concept of Decentralization will make the data stored in a distributed way. The persons in the network will validate every block of data and receive rewards and they are called as 'miners'. Miners make sure that no data in the blockchain in accessed by unauthenticated persons. Smart contract help us in management of properties in real estate. Smart contracts defines the process of a operation taking place in the network. With the help of smart contracts we can make a transaction or any operation take place properly without the intervention of any third person involvement. This makes the operations free from involvement of any third-party or governmental organization. Even the miners can only read the data in the blocks and could not overwrite any part of data in the blockchain. The data and the smart contract rules are immutable. The use of blockchain will make the process more transparent to us.

Keywords—BlockChain, Cryptography, hash, decentralization, miners, smart contract

I. REAL ESTATE MANAGEMENT

Real estate is one of the growing fields which captured the market long years ago. Real estate deals with the real properties like lands, architectures, buildings, houses, etc. The real estate management deals with handling of ownership of a property with authentication.

The management of properties like land and architectures are important because it accounts proper management of lands and distinguishes a property as government entity or a private property. It helps us to define a boundary of legal documentation of grounds and designate a property for various departments like administrative offices, hospitals, educational institutions, warehouses, forest reserves, embassies of various foreign countries,etc. It also deals with the transfer of one property from one person to another person after verification.



Block diagram A

The need to verify these transfer of ownership is to maintain these defined boundaries as per norms and prevent larceny of public properties. The flaw with the system is the ownership can be manipulated by fraudulent persons when

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the have necessary documents copies. The authentication of ownership and transfer of properties must be handled transparently making sure that no flaws are made in the transfer of ownership and integrity is maintained.

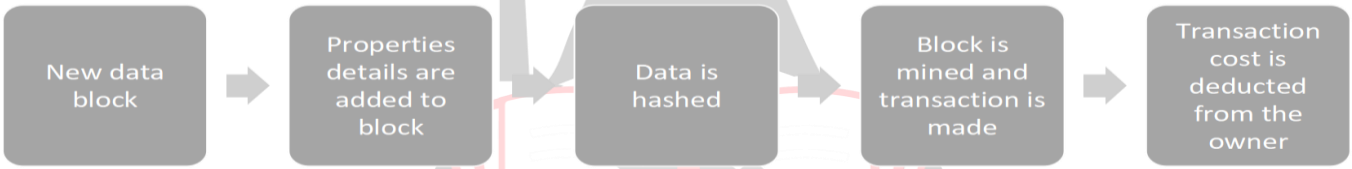
II. BLOCK CHAIN

Block Chain is a distributed ledger which stores our data as blocks and each block has a unique hash value generally representing as identity of that block. A block is actually a collection of records or documents. Each block stores data for example in real estate it stores information of ownership of a property and group of properties. Whenever a new block is added the hash value of current block is generated based on hash value of previous block and data of current block. Blockchain uses different hashing algorithms and most common one is SHA-256 hashing algorithm. Each block will be given a encoded 256 characters as hashed output and any changes made in the input will make huge changes in the hash value of the block.

The person with the right hash value can access the block and read those data. The reason behind doing this is whenever a change in data of a particular block is made, the hash values of concurrent blocks won't match and the data can't be accessed. Only authorized persons with right identity can access the data in the block chain.

Newer data and transaction data will be added inside a new block. The hash value of newer block will be based on older blocks and newer data. No individual will be able to change the older blocks because any change in the older blocks will also change the hash of the blocks. The concept of decentralization makes the data even more secure because these hash values of blocks won't be accessible in a particular server by a particular person. Each block added to the blockchain will be available to everyone in the network and the hash values will be verified by miners in the network and legit data is maintained among the network. Proof of work is done by the people in the network will always end up in a growing blockchain network .

Whenever newer block is added miners verify the block and proof of work is done thereby reward is given to the miners and the network remains a valid storage of data. The data will be distributed among the network so intruding the network will be harder for the intruder to access or modify the data. If a modification is made in the block in the network the data in the decentralized network is verified and the hash values will also be checked because of the mismatch in the data as well as the hash value the modification will not be taken into account and the past data before such modification will remain in the network.



A.Block diagram to list a property for sale

B.Block diagram to buy a property

The advantage of being decentralized gives us faster access to the data and no need for traditional servers and their maintenance. No loss of data will be seen in using blockchain and integrity checks are made consistently making the network trustable. Moreover the data as well as the data will not be owned by anyone even the administration authorities of a nation will also not able to manipulate or control the data in the network.

III. SOLIDITY & SMART CONTRACTS

Solidity is a programming language used to build smart contracts which are core for implementation of project to solve the issues in the real estate management. Smart contracts are similar to real life contracts made between persons and organizations or between persons but here they are in digital forms.

A digital form of a contract is a smart contract which has blocks of code to implement the things in a real life contract. The need for smart contract in is it is immutable and distributed in the network. Once a smart contract is written it becomes immutable ie.no one can re-write or change the codes in the smart contract. A smart contract basically has functions which will do a bit of task that is to be carried out. In real estate management most of the operations are either managed by third party persons or by the government so implementing a smart contract will make the field of real estate independent of group of people to take care. Our solution is to provide services of real estate using smart contract by using solidity. Solidity helps us to build smart contracts for real estate management and implement in the network of blockchain. The solidity has a address datatype which stores the eth address assigned to a person which serves as a identity of that person in the blockchain network. When a new property is being registered the data belonged to the property is being stored in data blocks. The structure datatype is used for storing the information about a property.

A function to set a property of sale is created which display the details of the property and owner contact details along with the price the owner sets for the property for sale. Another

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function for buying the desired property that is put for sale which first checks for the property in sale list. Then the person who wants to buy the property must have sufficient funds to buy the property. After checking the authentication of the person fund sufficiency is verified.

Once the person meets the conditions then proposal for the buying the property is send to the owner and with owners approval the ownership of the property is being transferred to the next owner. The fund is transferred to the property owner's account and the transaction is completed. The smart contract makes sure that the transfer of ownership and funds takes place completely without any flaws. The total process is free from any third person involvement in between the seller and the buyer Smart cities and smart houses are in a fashion where they can be kept in blockchain. We can focus on building a system which can manage all real estate contracts through blockchain technology. The usage of blockchain will enhance the security of properties and their ownership. They will also help us to go paperless transfer of properties making it digitally compatible.

Every person is given a unique address id in the application and if a person is authenticated owner of a property then the unique id of the owner is attached with the data block. If a transfer of property is to be made then authenticity of the property is verified using smart contracts and the owner of the property is notified. If all documentations are genuine then transfer of property is carried out. If any one of the process is not genuine then the whole process will be suspended and no changes are made.

IV. IMPLEMENTATION

The solution provided is a software solution in which these services can be provided by using an mobile application supported by the blockchain in the backend. Firstly to list a property for sale our smart contract first creates a new block and add the details of the property that need to be put for sale. Once the details of the property and address of the owner of that property is being stored in the block the whole block is hashed using our hashing algorithm and the block is added to the network making transaction successful in the network. The transaction cost is deducted from the owner. The whole process is depicted in the block diagram A. Another operation we use is to buy a property where the property is identified by the property id. Once the property id is given it is verified whether the property is put for sale. If the property is for sale the contract checks for sufficient funds for buying the property. Then the ownership is transferred to the buyer and the property sale price is transferred to the owner. The new data is updated and the block is mined. Transaction is made successful. The whole process to buy a property is depicted in the block diagram B.

We also need the blockchain in two areas in our solution. One is to verify and maintain the identity of people in the society and another one for holding a wallet for making transactions. The blockchain that used for holding a wallet must be able to either use Ethereum , Bitcoin or other cryptocurrencies for transactions through the application. The transactions will be managed by the blockchain network and they also inherit the properties of blockchain.

The following image is the output seen in the Remix IDE which is an integrated environment for solidity and smart contracts. The output shows the list property for sale function called and the property function displaying the details related to the property. Finally the buy property function once being called will transfer the ownership of the property to the buyer.

The change in the ownership can be verified in the properties section where the address of the owner will by changed to the buyer after the property is bought.

V. CONCLUSION

Thus the management of real estate properties can be handed with the help of solidity and blockchain. Our solution make the management possible by

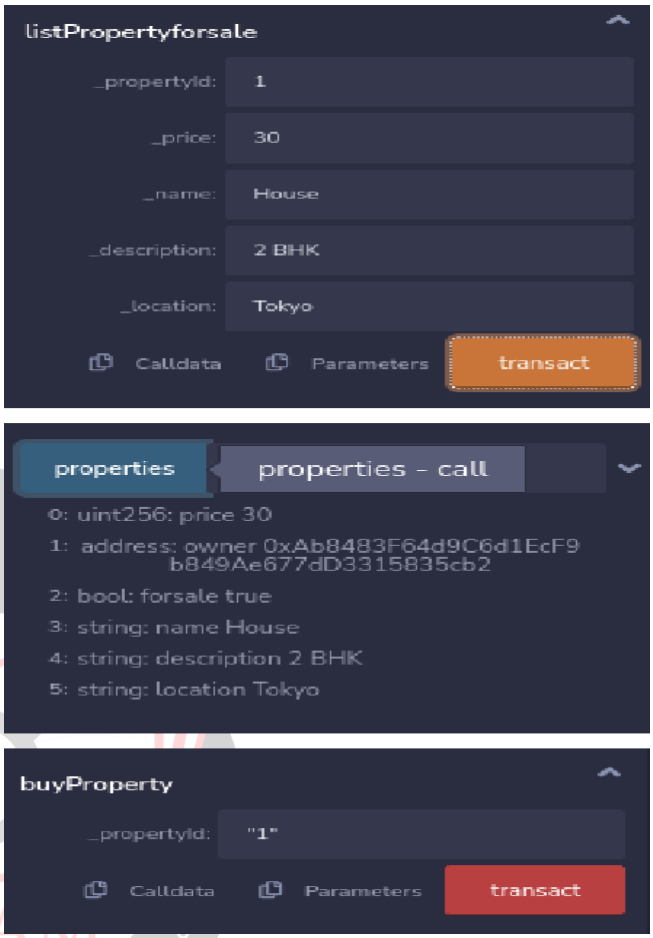

Diagram B

using smart contracts and deploying them in the blockchain network where the data is secured more than any of the current technologies exist currently. Using this at backend of our prominent software today will update our technologies till date. This distributed ledger will be very reliable and efficient in data identity. Still maintaining the network to be a legit network is necessary to make our database work in a secure way. The security of our system relies on the network rather than code or libraries. Decentralizing a network has various pros and cons including its power to oppose false modification in the data. This paper shows how this management works.

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