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IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

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Survey on Blockchain Based Document Digitization and Secured Storage

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Abstract: Property fraud is one big challenge in India and other developing countries. There have been several instances of fraudulent acts corresponding to land such as forgery, credit frauds relating to bank loans. Hence we propose the usage of blockchain and smart contracts technology to counter these frauds. By using blockchain we can prevent forgery as it is immutable, the transfer of ownership can be done in a secure fashion by using smart contracts and finally we can solve the loan related issues pertaining to banks by assigning a dynamic credit score to the piece of land.
*Keywords: Blockchain, smart contracts, distributed ledger*

I. INTRODUCTION

Blockchain can be defined as a data structure that contains transactional records and ensures transparency and security in a decentralized environment. In other words, blockchain can be thought of as a chain of transactional records with no user holding authority over the blockchain. An important feature of blockchain is that it is distributed which makes it available to all participants on the network. It is not possible to change information stored on a blockchain. The originality of transactions is guaranteed with the help of digital signature. As encryption and digital signatures are used, it is extremely difficult to forge data stored on the blockchain.

A consensus is maintained between all the nodes participating on the network. Data preserved on a blockchain is captured digitally which makes it available to all the contributors of the network. This prevents forgery of transactional records without the need of a third-party user

The concept of hashing is used by blocks present on the blockchain. Each and every block stores data as well as hash of its previous block. The blocks are connected with hash keys that are completely unique. Nodes present in the blockchain network authenticate transactions that take place in the blockchain. The transaction will happen only if the hash is correct. If a small change is done, a different hash would be generated causing the entire network to get disrupted. This indicates an alteration has been done and so forgery could be detected easily

A digital signature, formed by the combination of public and private keys is used for verifying the authenticity of the transactions that take place in the blockchain network. Once authentication is ensured through these keys, we move on to authorize the transactions. Miners are participants in the blockchain network who solve complex mathematical problems and a consensus is approved between nodes participating in the network. The resulting solution from solving the mathematical problem is called Proof-of-Work. A new block created contains cryptographic hash of the previous block, time at which the block was created and public key of the receiver. The validation process starts, when the above block of information is broadcasted throughout the entire network. The block is added to the current blockchain, only when the majority of nodes come to a consensus. The existing copies of blockchain are updated for all the nodes on the network when a new block is appended to the chain.
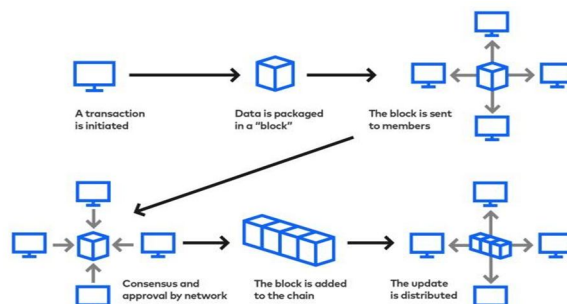
Blockchain- An Overview

II. LITERATURE SURVEY

The contribution of various scholars is studied for survey and analyzing the merits and demerits in order to enhance the consequences for making the system work better.

Vinay Thakur et al [1] proposed adopting blockchain for managing the records pertaining to land in India. It points out the various problems like unaccountability, less transparency and incongruous data sets with the various departments of the government related to the land record management. It also points out the tremendous delay in the existing system. He proposed the use of Blockchain for land titling, to provide right of ownership and make it fool proof.

Ingo Weber et al [2] proposed an architecture for multi-tenant blockchain based system to assure data integrity while preserving data privacy and performance isolation. Though there are difficulties in constructing the multi-tenant blockchain based architecture considering data and performance isolation. Firstly, the data of one tenant must be not available for another tenant to read, also that tenants having higher workload must not affect the read and write operation of the other tenants. Secondly the architecture must be scalable for each tenant and also with the number of tenants. This architecture maintains individual architecture for each tenant's data and smart contracts.

Vedna Sharma [3] suggested that the maintenance of trusted information can be made easier by adopting blockchain technology, making it easy for the government to access and make use of confidential data while ensuring security. A blockchain can be described as an encoded distributed ledger stored on multiple computers on a public or private network. The task of the government agencies to digitize and store it in a secure way is accomplished by using blockchain technology. This paper assures the authenticity, integrity and privacy of the public sector data in a democratic setup. Keyless signatures are proposed as alternative for traditional Public Key Infrastructure.

Ryan Henry et al [4] proposed a solution to challenge the views of the researchers on tackling the privacy issues in blockchain who advocated the use of anonymous communication networks such as Tor Browser to prevent the leak of network-layer information as the user interacts with the blockchain. The authors came up with certain mechanisms that allow users to report their transactions to the blockchain and render them unable to connect their network addresses with their respective transactions, but the major drawback of these mechanisms are that they seek to disconnect the link between the senders and receivers present in a transaction.

Victoria L. Lemieux [5] proposed a solution to use blockchain as, "Trusted Recordkeeping Systems", due to the blockchain which the author quotes as, "An open-sourced technology that supports trusted, immutable records of transactions stored in publicly accessible decentralized and automated ledgers". Though blockchain is praised for its core concept of immutability of records, it faces a major drawback where blockchain being a decentralized ledger, failures in communication between the nodes present in the blockchain could result in inconsistencies in transactional records.

Aravind Ramachandran et al [6] suggested that blockchain can be used to promote the collection of data provenance and verify them accordingly. The proposed system incorporates smart contracts and open provenance model (OPM) to record data transactions that are deemed as immutable. The privacy protection of the proposed system for the provenance data is accomplished by hashing and encryption. A user accepted by the owner can only see the changes made to an inferred document ID by accessing the event log. The major drawback faced here is the owner is able to give access to users who may misuse their access privilege and they might pose a threat to the credibility of the proposed system.

Shuai Wang et al [7] devised a Blockchain-Enabled Smart Contracts architecture, where smart contracts are pacts facilitate the negotiation and implementation of digital contracts without the need of a third party user. One of the key benefits of smart contracts is that the code of smart contracts is recorded on the blockchain making them immutable. But the proposed architecture faces a severe drawback, in the presence of irreversible bugs present in the smart contract that contains a bug which cannot be changed.

Gunit Malik et al [8] proposed a unique model for document verification keeping in mind the use case of the government. The objective is to come up with a blockchain network which is private that allows a person's documents to be shared among legitimate parties. This project makes use of hyper ledger for platform and it makes use of basic web technologies for the user interface. Since storage of documents must be in a decentralized fashion and in order to have quick retrieval, the system makes use of IPFS (Interplanetary File System) for file handling. The proposed model gives a coherent and consistent experience for the clients and is extremely reliable. It also provides security and data cannot be altered. Many governmental operations are trying to implement blockchain technology as it provides many benefits. Due to its automated nature, manpower is reduced in the institutions. A drawback in this system could be the verification process wherein users might need to visit the issuing authorities periodically.

Radha Kamkar et al [9] introduced a system that addresses problems related to document tampering in land repository and how Blockchain is used to counter these property fraud cases. With blockchain being used, the system ensures that land registry papers cannot be replicated and files associated with land registry will be tamper proof. To build the decentralized application, the system

uses Skype platform. The main objective is to computerize all land records, including mutations improving the transparency in the land records maintenance system, digitize maps, surveys, updating all settlement records and minimization of scope of land disputes. Distributed Ledger is used for the whole registration process and transactions are done through Smart Contracts. Proof-of-Concept algorithm, focusing on smart contracts using the platform Skype is used for the development of this project. Using this system, land registry process security is improved and all the participants are authorized. A caveat could be optimized customer experience.

U.M.Ramya et al [10] proposed a system to reduce forgery in land registry using blockchain technology. The system makes use of a private permissioned blockchain called Multichain for land registration. Multichain provides a simple API, command line interface and supports Linux, Windows and Mac servers. As the system uses a private permissioned blockchain it is not necessary to use an algorithm such as Proof-of-Work to show that transactions are taking place between nodes and new blocks are added to the chain. A drawback is that the technology is still developing and it's effectuation is not cheap. Also a minor change on the original document would change the hash which makes verification tedious.

Table 1: Comparison on Various Methods used in Document Digitization and Secured Storage

S.NO	PAPER	TECHNIQUES	RESULTS	ISSUES
1.	Land Records On Blockchain For Implementation Of Land Titling In India	Blockchain, Smart Contracts	Blockchain technology provides cascading benefits such as an immutability of transaction history, authenticity and fool proof.	A generic design for blockchain is not available and it must be scalable to adapt to the increasing load with increase in population.
2.	A Platform Architecture For Multi-Tenant Blockchain Based Systems	Merkle tree	A scalable architecture for multi-tenant blockchain based systems to attain integrity of tenant's data while assuring data privacy and performance isolation.	Flexibility of the anchored chains and integration with other platforms for tenant chains and public chains using a single anchoring component.
3.	BlockChain Based Keyless Signature Infrastructure For Delivering Governmental Services In Democratic Nations	Keyless Signature Infrastructure (KSI)	Keyless signatures are an alternative for traditional PKI. It increases transparency and more efficient workflows	Huge difficulty in understanding the overall security provided by such systems with high availability requirements and strong threat models.
4.	Blockchain Access Privacy: Challenges And Directions	A cryptographic primitive known as PIR (Private Information Retrieval)	Allows users to report their transactions to the blockchain and render them unable to connect their network addresses with their respective transactions	The mechanism seeks to disconnect the link between the senders and receivers present in a transaction.
5.	Blockchain And Distributed Ledgers As Trusted Recordkeeping Systems	Blockchain, which is a decentralised ledger that contains a series of immutable records.	Able to check whether blockchain recordkeeping systems deliver on their promise of producing trustworthy immutable records.	Failures in communication between the nodes present in the blockchain could result in inconsistencies in transactional records.
6.	Using Blockchain And Smart Contracts For Secure Data Provenance Management	Open Provenance Model	Able to securely capture provenance data and prevent any modifications to the provenance data.	The owner is able to give access to users who may misuse their access privilege and they might pose a threat to the credibility of the proposed system
7.	Blockchain-Enabled Smart Contracts: Architecture, Applications, And Future Trends	Ethereum and Hyperledger fabric	Smart contract enforces the negotiation and implementation of digital contracts without the need of a third party user.	Performance issues such as need for scalability, bottleneck and remission of transactions.

8.	Block Chain Based Identity Verification Model	IPFS (Inter Planetary File System)	A permissioned blockchain network that provides seamless experience and is highly reliable.	Though this system provides various applications, there is a drawback in the verification process where users might need to visit the issuing authorities periodically.
9.	Land Registry Using Blockchain	Proof Of Concept	A system that computerises all land records and provides improved transparency in land maintenance system.	Customer experience is cumbersome.
10.	Reducing Forgery in Land Registry System Using Blockchain Technology	Private permissioned blockchain- Multichain	Ensures that land documents cannot be tampered with and hence forgery is prevented.	Implementation is very costly.

III. CONCLUSION AND FUTURE WORK

Use of blockchain technology will bring transparency and prevent frauds. It enhances data security and authenticity of land records. Blockchain could change our perception about trusting records. But the development of blockchain in government sectors is a debatable topic due to the interlinking of various records under different departments and also owing to the immutability aspect of the blockchain extra care must be taken to not make mistakes during the uploading process. In future this idea could be extended with the usage of AI to identify the fraud.

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