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Crime Evidence Over Blockchain

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Abstract - Blockchain is a digital ledger of transactions that is duplicated and spread over the whole network of computer systems on the blockchain, and it is a system of preserving information in a way that makes it difficult or impossible to edit or hack. Collecting, identifying, evaluating, analyzing, preserving, and presenting evidence is a difficult task in existing forensics. That's where the blockchain'sdecentralized nature comes into play, with forensic data being stored in the private network using the blockchain's nodes in a peer-to-peer network. Digital forensics will also be more secure,and the investigation will be more transparent to those on the other side of the jurisdictional border. In the criminal investigation process, information that frequently changes is stored in the hotblockchain, and unchanging data such as videos are stored in the cold blockchain. In this we are using the Ethereum concepts and implementing smart contracts.

Keywords - ledger, chain of custody, Hyperledger fabric, forensic.

1. INTRODUCTION

Blockchain is the newest and potentially most affordable means to access cloud storage, as many small companies contribute to cloud storage through processing power and storage space. Blockchain is a growing series of documents called blocks that are connected together via encryption. The data of users is broken up into small chunks by blockchain cloud storage solutions.

Then build another security layer and scatter around the network. This is feasible using blockchain characteristics like hashing, private public encryption and transaction data (ledgers). Another advantage is that because the node only store the needed information that is required, does not store too much excessive information. The users are only given a portion of the data, so all sensitive information is kept safe and secure.

1. From the time the evidence is collected till it's submissionin the court, the movement of the evidence throughout the investigation should be traceable [1].
2. The evidence should be able to relate to the crime and act as a proof.
3. Each and every entity that has come in contact with the evidence must be able to verify the process.
4. No unauthorized person is allowed to deal with the evidence, to avoid any sort of alteration or manipulation of the evidence [2].

Redundancy of data and load balancing measures are employed to ensure fast access and high availability. Digital forensics is a process of in-depth analysis of digital devices and data within a legal context, such as a criminalinvestigation or civil enquiry [2]. Crime scene refers to the field where criminals commit crimes, generate and leave crime traces, and evidences within a certain range of time andspace. Crime scene analysis is the starting point of crime investigation, thus it is of vital importance to the success of cases solving. improve the security of evidence collected in the course of a criminal investigation.

2. RELATED WORK

For this crime evidence based on blockchain method we searched different surveys on internet based on various features and services. In different research papers digital forensics tools are used daily by analysts in local, state and federal law enforcement agencies. More organizations data cannot be analyzed with the tools because of that it losses encryption and lack of knowledge. So currently several studies are conducted to improve the approach to forensic data and performing operations. All different methods had difficulties in large data management, investigation, and evidence management[3].

Dongyhyo kim, Sun-Young lhm, and Yunsik Son in their research paper they mentioned about the two level blockchain system for digital crime evidence management where in they are using the Hyperledger fabric method and using the permissioned blockchain for to make it more secure[3].

R. Sathyaprakasan, P. Govindan, S. Alvi, L. Sadath, S. Philip and N. Singh conveyed their message in paper is that about the use of chain of custody and Hyperledger fabric. These are the advanced ways that are applied and modified to the crime evidence with blockchain technology[4].

3. OBJECTIVES

1. The use cases of **Crypto currency** is the haven to criminal activities like theft, fraud, hacking, money laundering, and malicious attacks, as there are no regulations or laws following to trace and prosecute thecriminal. The problems can either be faced by investorsor also such activities are conducted for the transfer oftransactions or data. Many companies are trying to work on the security of the process so as to reduce or eradicate such activities. The aims to monitor for fraudulent activities while elliptic aims to identify the potential cryptocurrency financial crime.
2. A **chain of custody** can face issues and be breached with mishandling, corruption, unfair means, lack of evidentiary tracking system, or poor documentation. However, with the help of Blockchain technology, one might not be able to physically protect evidence but canprotect the data efficiently and securely. With blockchain technology, the documentation work and the process are stored along with every change made, so even if one tampers with the evidence, the person will eventually be known and held accountable.
3. Standardizing the distributed crime reports through the interoperable system can aid the victims or people rightfully involved to log onto a platform enabling them to track the progress in their case.
4. Blockchain technology consists of security and interoperability that can help with inter-agency data sharing without worrying about being compromised and tampered. Also, the data or the information can beshared with the means of public blockchain or private blockchain.
5. Blockchain technology through its feature of immutability facilitates complete historical data that can help law enforcement to analyze and have access to potential criminal activities.
6. bitfury is a platform for blockchain analytics solutions that also facilitates tools for anti-money-laundering and works with digital asset providers, government agencies, and financial institutions.
7. Blockchain technology is a platform that can create means to respond during emergency situations across the emergency response agencies and also to the neighboring countries or aid agencies.
8. Approximate 18,000 law enforcement agencies aresaid to be in the United States while the existence of only 200 citizen review boards to facilitate a measure of trust-building accountability but the results of theseboards are stated to be inconsistent. Deloitte facilitates
9. In the blockchain, one can only add data but not alter or tamper the data already in-stored. One cannot control data in blockchain as it consists of distributed ledger leading to being shared amongst large networksof computers. Also, any data stored in blockchain staysforever along with the source just like a timestamp.
10. Blockchain is borderless meaning anyone from anywhere can make use of this technology. So when casework involving two countries can be helped by blockchain as they wouldn't have to go through all the long and time consuming procedural methods.

4. PROPOSED SYSTEM STRUCTURE

With the rapid growth of blockchain technology so we proposed a Forensic-Chain is a blockchain based solution for maintaining and tracing digital forensics chain of custody. Blockchain is a data structure that allows to create a digital ledger for recording and storing transactions (events/records)shared by all participating parties over a distributed network of computers.

Blockchain makes use of cryptography for protecting the process of recording and storing transactions (events/records) that happen within the network, creating unimpeachable audit trail. In relation to chain of custody, the blockchain's capability specifically in combination with cryptographic hashing and encryption could potentially create documentation pertaining to access to evidence that is tamper- proof [4],[5].

The evidence thatis to be preserved is first encrypted securely and have a blockchain capability added on. The

encrypted data would be accessible only to desired party on the blockchain but would simultaneously record the time date and possibly user-ID of theaccessing party and add it to the unalterable record in blockchain all done automatically through smart contract The blockchain itself can be read via a special function ina way that is similar to how the bitcoin blockchain can be decoded. This functionality of blockchain allows courts and associated personnel the ability to examine historical chain of custody without accessing data itself.

5. TECHNOLOGY/PLATFORM USED

Vscode

Visual Studio Code, also commonly referred to as VS Code, is a source-code editor made by Microsoft with the Electron Framework, for Windows, Linux and macOS. Features include support for debugging, syntax highlighting,intelligent code completion, snippets, code refactoring, and embedded Git.

Nodejs

Node.js is a cross-platform, open-source server environment that can run on Windows, Linux, Unix, macOS, and more. Node.js is a back-end JavaScript runtime environment, runs on the V8 JavaScript Engine, and executes JavaScript code outside a web browser

Truffle

Truffle is a world-class development environment, testing framework and asset pipeline for blockchains using the Ethereum Virtual Machine (EVM)

Ganache

Ganache is a private Ethereum blockchain environment that allows to you emulate the Ethereum blockchain so that you caninteract with smart contracts in your own private blockchain.

Ethereum

Ethereum is a decentralized, open-source blockchain with smart contract functionality.

MetaMask

MetaMask is a software cryptocurrency wallet used to interactwith the Ethereum blockchain. It allows users to access their Ethereum wallet through a browser extension or mobile app, which can then be used to interact with decentralized applications.

6. BLOCK DIAGRAM

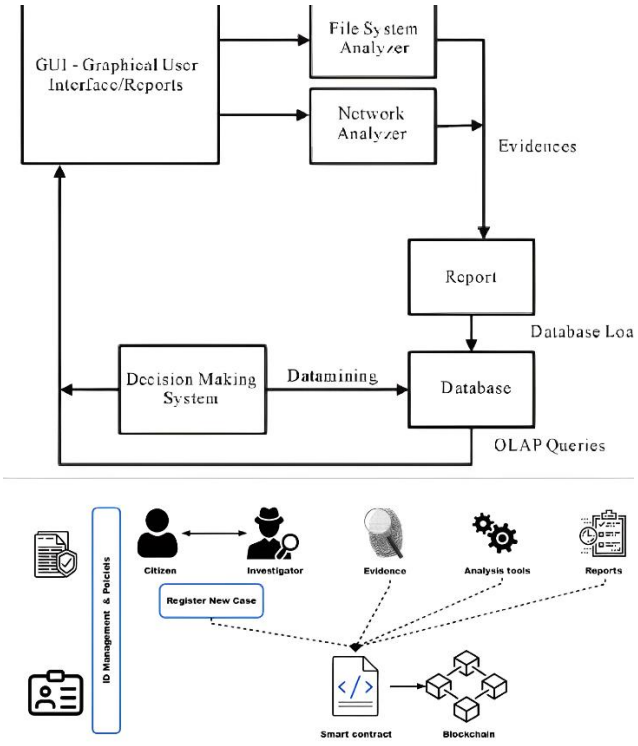

Fig1: Crime Evidence flow with blockchain technology use

7. SOFTWARE REQUIREMENT

Solidity

Solidity is an object-oriented, high-level language for implementing smart contracts. Smart contracts are programs which govern the behavior of accounts within the Ethereum state.

Solidity is a curly-bracket language designed to target the Ethereum Virtual Machine (EVM). It is influenced by C++, Python and JavaScript. You can find more details about which languages Solidity has been inspired by in the language influences section.

Solidity is statically typed, supports inheritance, libraries and complex user-defined types among other features. With Solidity you can create contracts for uses such as voting, crowdfunding, blind auctions, and multi-signature wallets. When deploying contracts, you should use the latest released version of Solidity. Apart from exceptional cases, only the latest version receives security fixes. Furthermore, breaking changes as well as new features are introduced regularly

8. CONCLUSION

We have designed and implemented an "Crime Evidence Over Blockchain" using the Ethereum smart contract for the crime scene reports to be saved that is the important part of crime investigation and evidence collection it gets secure by using the blockchain technology. The aim is used implement the records for the crime evidence and how to keep all that records secure. In this we have used secure algorithms that makes the project more secure and identity secure.

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