Block Chain Based Evidence Management System

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Abstract
The project focuses on effectively using blockchain technology within the Law Enforcement chain of evidence, which can be considered a type of supply chain for evidence collection. The authors and researchers of this project are using the terms “supply chain” and “chain of custody” interchangeably. Is introducing a blockchain-based evidence management system to alleviate the problems the traditional chain of custody has, including loss of evidence, theft, tampering, and worse, manipulation of evidence within the evidence management system. With the use of blockchain technology, improperly targeted police officers and defendants can be protected from chain of custody issues that can lead to wrongful termination for officers and worse, false imprisonment for defendants. This project will describe the particular challenges of storing evidence on a blockchain, and provide an efficient solution.

Keywords: Block chain, Machine learning

INTRODUCTION

A conservative estimate gathered from various news and scholarly resources suggests that approximately 20,000 people in the U.S. are falsely accused, convicted, and incarcerated every year. The use of various sources and the approximation of the number is required because no single entity collects validated information about exonerations due to false convictions, and even if they did, cannot yet know about the cases which were never exonerated. Of the estimated 20,000 persons falsely accused, convicted, and incarcerated in the US alone, exonerations are few and far between. Exonerations granted by contributing factor include 28% convicted due to mistaken identification, 12% gave false confessions, 23% were due to forensic science problems, 54% are attributed to official misconduct, and 58% are due to perjury and false accusation (Source: The Innocence Project. More than 100% due to some cases having multiple contributing factors.) In fact, according to the National Institutes of Justice, “The most significant number of wrongful convictions in which forensic science is considered a contributing factor is attributable to eyewitness misidentification and official misconduct.” Many people effectively lose their entire lives to false imprisonment as the average term served by those falsely convicted was 10 years. That’s a decade in the life of a brother, sister, father, mother, colleague, or student who will not be allowed to contribute fully to society once falsely convicted of a crime. Even after release, convicts struggle throughout their lives to gain and keep opportunities those without a criminal history are provided.

Blockchain technology has revolutionized various industries by providing a decentralized and immutable ledger system. One of the promising applications of blockchain is in the field of evidence management. Traditional evidence management systems often face challenges related to data integrity, security, and transparency. Blockchain-based evidence management systems aim to address these challenges by leveraging the inherent properties of blockchain, such as transparency, immutability, and decentralized consensus. A blockchain-based evidence management system provides a secure and tamper-proof repository for storing and managing digital evidence. It allows for the secure recording of evidence details, such as timestamps, chain of custody, and metadata, while ensuring that the data remains unchanged and auditable throughout its lifecycle. By utilizing cryptographic techniques and distributed ledger technology, blockchain-based systems offer increased trust, transparency, and efficiency in evidence management processes.

LITERATURE SURVEY

Title: "Blockchain for digital evidence preservation: A systematic literature review" Authors: A. Collotta, L. Grassi, L. Ronga Published: 2020

This literature review provides an overview of the existing research and implementations of blockchain-based systems for digital evidence preservation. It explores different aspects, including data integrity, privacy, access control, and scalability. The review also highlights the challenges and potential future directions in the field.

Title: "Blockchain-based tamper-proof log management for digital forensic investigation" Authors: H. Yang, X. He, K. Ruan, Z. Luo Published: 2020

This paper proposes a blockchain-based log management system for digital forensic investigation. It focuses on ensuring the integrity and non-repudiation of logs, which are critical pieces of evidence in forensic analysis. The study presents a practical implementation and evaluates the system's performance and security using real-world data.

Title: "A blockchain-based approach for ensuring data integrity in digital forensics" Authors: S. R. Rad, M. Z. Alhaddad, M. Dehghantanha, K.-K. R. Choo Published: 2020

This research work introduces a blockchain-based approach for ensuring data integrity in digital forensics investigations. It presents a detailed architecture that combines blockchain with other cryptographic techniques to provide tamper-proof evidence storage and secure data verification. The paper also discusses the potential benefits and challenges of the proposed approach.

Title: "Blockchain technology for improving trust and transparency in supply chains" Authors: D. Khan, R. Khan, R. Z. Khan, M. Ahmed Published: 2021

Although not directly focused on evidence management, this study explores the use of blockchain in supply chain management, which shares similarities with evidence management processes. It discusses the advantages of using blockchain technology for enhancing trust, transparency, and security in supply chain operations, which can be extended to evidence management systems.

Title: "Blockchain-based digital evidence management in criminal justice" Authors: P. Elsden, R. Grasso, A. V. Moere Published: 2019

This research investigates the potential application of blockchain technology in the criminal justice system for evidence management. It discusses the benefits and challenges of using blockchain for preserving digital evidence, ensuring authenticity, and facilitating secure sharing among relevant stakeholders. The paper also explores the legal and ethical implications of blockchain-based evidence management.

These literature sources provide insights into the current state of research and implementation of blockchain-based evidence management systems. They highlight the advantages, challenges, and potential applications of blockchain technology in improving the integrity, security, and transparency of evidence management processes.

PROPOSED SYSTEM CONFIGURATION

The project focuses on effectively using blockchain technology within the Law Enforcement chain of evidence, which can be considered a type of supply chain for evidence collection. The authors and researchers of this project are using the terms “supply chain” and “chain of custody” interchangeably. Alister Inc. is introducing a blockchain-based evidence management system to alleviate the problems the traditional chain of custody has, including loss of evidence, theft, tampering, and worse, manipulation of evidence within the evidence management system. With the use of blockchain technology, improperly targeted police officers and defendants can be protected from chain of custody issues that can lead to wrongful termination for officers and worse, false imprisonment for defendants. This project will describe the particular challenges of storing evidence on a blockchain, and provide an efficient solution.

In the project applying Blockchain technology in financial application as all existing application runs on single centralized server and if this server hack or crash due to request overload then the services will not be available. To overcome from this problem can apply decentralized Blockchain technology which will maintain data at multiple nodes or server and if one node down then users can get service from other working nodes. A conservative estimate gathered from various news and scholarly resources suggests that approximately 20,000 people in the U.S. are falsely accused, convicted, and incarcerated every year. The use of various sources and the approximation of the number is required because no single entity collects validated information about exonerations due to false convictions, and even if they did, cannot yet know about the cases which were never exonerated. Of the estimated 20,000 persons falsely accused, convicted, and incarcerated in the US alone, exonerations are few and far between.

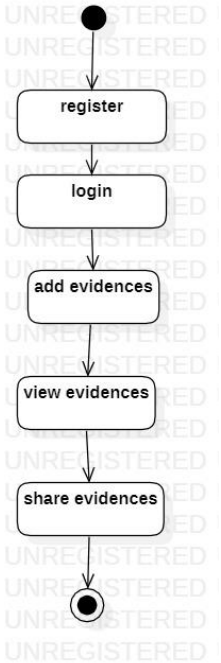

Fig.1 ACTIVITY DIAGRAM

Activity diagram is another important diagram in UML to describe the dynamic aspects of the system. Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. The control flow is drawn from one operation to another. This flow can be sequential, branched, or concurrent. Activity diagrams deal with all type of flow control by using different elements such as fork, join, etc
Blockchain store data as blocks/transactions and associate each block with unique hash code and before storing any new block then Blockchain verify hash code of all existing blocks and if blocks are not attack or alter then it will return same hash code and verification will get successful and then only Blockchain will store new block. If verification failed then Blockchain will not store any new data so Blockchain consider as immutable which cannot be attack or alter its data from backend. If alter then verification get failed.

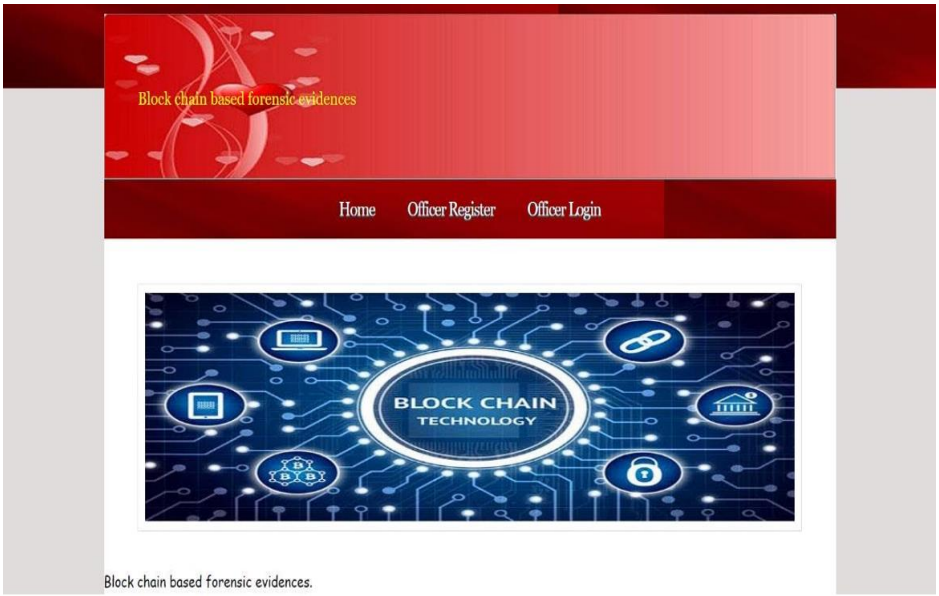

Fig.2 Screenshot of results

The above result screenshot is the home page of the forensic blockchain server website. The options available here are 'Officer register' and 'Officer login', where the officer can register and login to the server.

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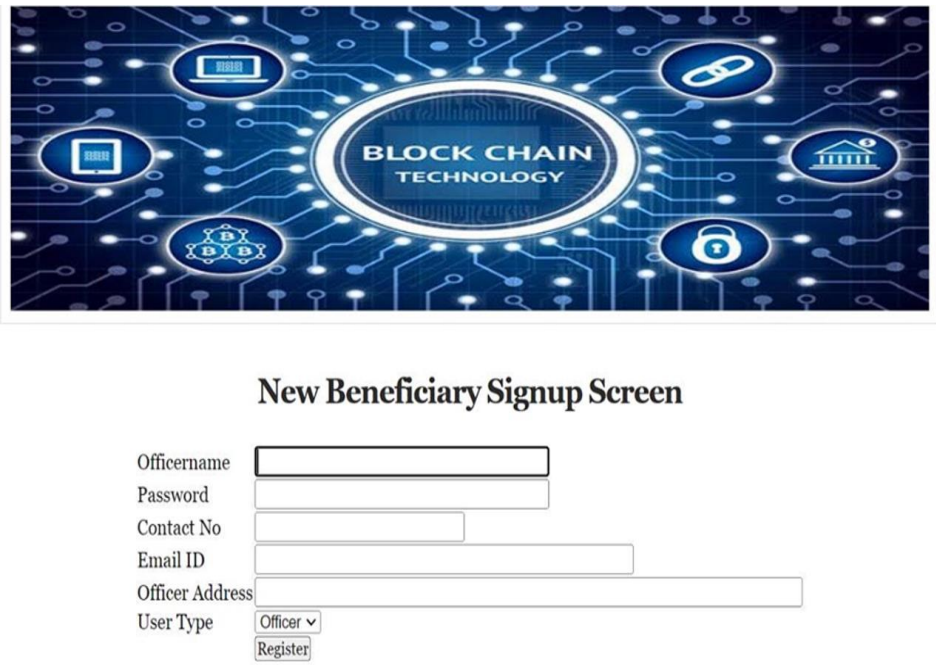

Fig.3 Screenshot of results

With the use of blockchain technology, improperly targeted police officers and defendants can be protected from chain of custody issues that can lead to wrongful termination for officers and worse, false imprisonment for defendants. This paper will describe the particular challenges of storing evidence on a blockchain, and provide an efficient solution.

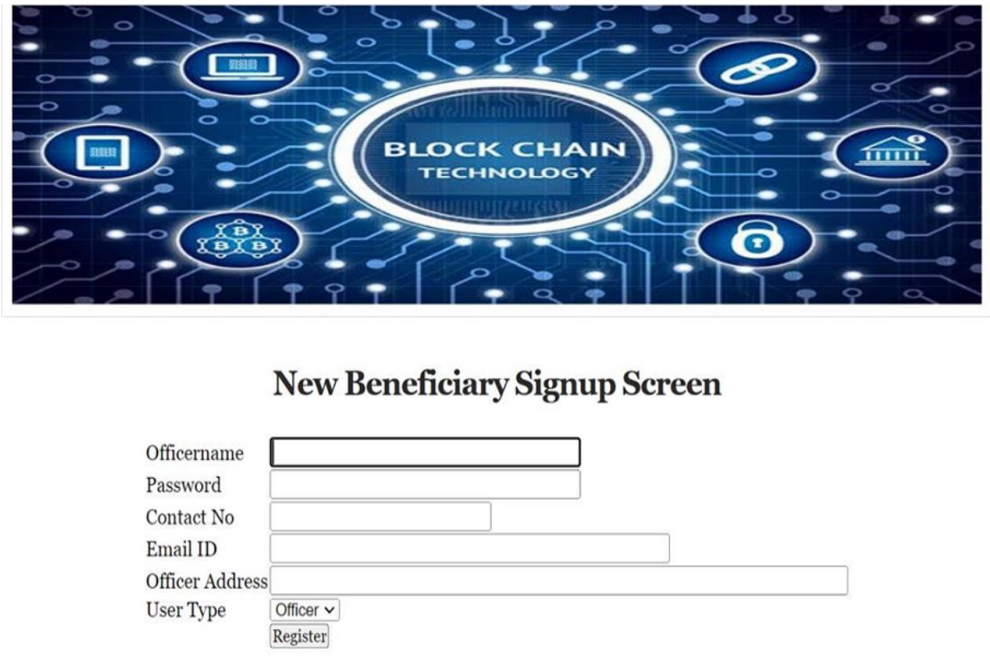

Fig.4 Screenshot of results

The above screenshot is the signup screen that appears when the officer wants to register himself. Once registered, the officer will be able to add and view the evidences in the blockchain.

Blockchain store data as blocks/transactions and associate each block with unique hash code and before storing any new block then Blockchain verify hash code of all existing blocks and if blocks are not attack or alter then it will return same

hash code and verification will get successful and then only Blockchain will store new block. If verification failed then Blockchain will not store any new data so Blockchain consider as immutable which cannot be attack or alter its data from backend. If alter then verification get failed. Advantages of Blockchain influencing all organizations to migrate their application from centralized server to decentralized Blockchain.

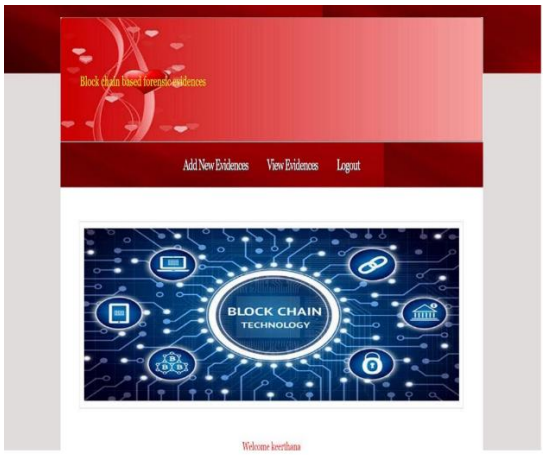

Fig.5 Screenshot of results

The above page is the welcome page after the officer registers himself. The options available after the registration are 'Add new evidences' and 'View evidences'.

Fig.6 Screenshot of results

The above screenshot is the page where the officer can add new forensic evidences that are found

Fig.7 Screenshot of results

The above page is the view evidences page where the officer can view all the evidences that are added in the server and can also share them with other officers who are registered in that blockchain server.

CONCLUSION

The use of blockchain to enhance the integrity of evidence in the criminal justice system is vitally important and just makes sense. It can be an inexpensive and comprehensive solution allowing agencies to continue using all of their existing products while removing most elements of human error and criminal intent from the process. Alister Inc. and LOCARD.EU plan to implement blockchain in the chain of evidence to help restore the public trust in the criminal justice system. Through blockchain, the verified tracking of evidence within different law enforcement agencies will be possible. Only hashes proving the physical evidence "state" will be registered within the system allowing for better and faster processing and more digital storage space. The attribution of hashes to physical pieces of evidence will allow for immutable tracking of evidence from scene to court, and this system will allow for inadmissible evidence to be easily dismissed in a timely manner. Through the unfortunate cases that have been described above, the authors and researchers from Alister Inc. hope to give their readers a firm grasp of the importance blockchain will have within the justice system, and the many ways it will support the fight toward a more just and accurate criminal evidence tracking system. Accurate evidence with proven integrity is critical in maintaining due process within the judicial system worldwide, and using blockchain to track it can help decrease the instances of political turmoil due to false arrests and convictions. If fail to correct this systemic problem within our criminal justice system, will all suffer the loss of many hard-working, honest, and falsely accused Americans who might have been an excellent Police Officer, or the next great Doctor, Lawyer, Researcher, or Inventor. Simply can't afford not to change, and blockchain in the supply chain of evidence is the change need to implement.

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