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# Evidence Protection System Using Blockchain Technology

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**ABSTRACT:** In the realm of forensic science and legal proceedings, the integrity of digital evidence is paramount, necessitating robust methods to ensure its protection from tampering. This paper proposes a Blockchain-based model to secure digital evidence throughout the Chain of Custody (CoC) process. Leveraging cryptographic hashing and the immutable nature of Blockchain, the system guarantees integrity, traceability, and authenticity of evidence from retrieval to courtroom presentation. By digitizing forensic evidence management, utilizing frameworks like Hyperledger Fabric, and implementing smart contracts, this solution addresses shortcomings in traditional evidence protection methods. The study emphasizes the importance of maintaining evidence integrity in the face of technological advancements and increasing cyber threats, advocating for standardized, secure CoC processes in consortium environments. Through the implementation of a Blockchain-based system on platforms like Ethereum, the proposed solution offers transparency, immutability, and heightened security, crucial for safeguarding forensic evidence in the digital.

**KEYWORDS:** Blockchain, Ethereum, CoC, Smart Contract, Forensic Evidence

## I. INTRODUCTION

Blockchain could be a data structure that could be a growing list of information blocks. The knowledge blocks are unit coupled along, such recent blocks can't be removed or altered. Blockchain is the backbone Technology of Digital Cryptocurrency BitCoin. The blockchain is a distributed database of records of all transactions or digital event that have been executed and shared among participating parties. Each transaction verified by the majority of participants of the system. It contains every single record of each transaction. Blockchain Technology Records Transaction in Digital Ledger which is distributed over the Network thus making it incorruptible. Anything of value like Land Assets, Cars, etc. can be recorded on Blockchain as a Transaction. One of the famous uses of Blockchain is Bitcoin. Bitcoin is a cryptocurrency and is used to exchange digital assets online. Bitcoin uses cryptographic proof instead of third-party trust for two parties to execute transactions over the internet. Each transaction protects through digital signature.

## II. LITERATURE SURVEY

Literature survey aims to delve into the depth of existing research on blockchain technology, exploring its fundamental principles, applications, challenges, and future prospects. This survey seeks to provide a comprehensive overview of the current state of knowledge in the field, serving as a foundation for further inquiry and innovation in the realm of blockchain technology.

Here are some research papers on Blockchain Technology:-

It introduces a pioneering methodology for digital evidence management leveraging blockchain technology. The approach utilizes a combination of Blockchain network, Python programming language, and MongoDB database to streamline the handling of digital evidence. One of the notable advantages of this approach is its meticulous recording of the five W's - who, when, why, where, and how - alongside the evidence at each stage of investigation. This meticulous documentation enhances transparency and accountability throughout the investigation process, bolstering the integrity of the digital evidence. However, the research identifies a key disadvantage: the need for a more extensive and private blockchain network to facilitate seamless data sharing among trusted participants[1].

It presents a groundbreaking application of blockchain technology in the realm of forensic evidence management.

Utilizing technologies such as Hyperledger Fabric, Hyperledger Framework, and cryptography, the study proposes a novel approach to enhance the storage and accessibility of critical system details within a single secure network. By leveraging blockchain, the system ensures the integrity and accessibility of forensic evidence, providing users with a secure platform for storage and retrieval. Despite the evident advantages offered by blockchain technology, the research also highlights a significant challenge: the substantial investment required for implementing solutions like Hyperledger Fabric[2].

It explores the development and implementation of a comprehensive digital evidence enforcement protection program. Employing digital forensics techniques and tools, the study introduces an innovative approach aimed at safeguarding digital evidence in investigative procedures. A notable advantage of this program is its utilization of a public key digital signature safety notary server, which provides essential protection for digital evidence. This feature enhances the integrity and authenticity of the evidence, bolstering trust in the investigative process. However, the research underscores

a critical challenge: the ongoing need to ensure the security and safety of digital evidence throughout its lifecycle[3]. It introduces an innovative application of smart contracts in the management of digital evidence's chain-of-custody. Leveraging technologies such as Smart Contracts, Crypto Service, Blockchain network, User Interface, and Gateway of storage, the study proposes a robust framework for ensuring the security, transparency, and immutability of digital evidence throughout its lifecycle. One of the significant advantages of this approach is its ability to provide a secure and transparent mechanism for managing the chain-of-custody, thereby enhancing trust in the integrity of digital evidence. However, the research also highlights certain disadvantages, notably the immutability and irrevocable nature of smart contracts, which may pose challenges in scenarios requiring modifications or legal clarifications[4].

It introduces a pioneering approach to bolstering the security of forensic evidence through the utilization of blockchain technology. Leveraging the Ethereum platform and Solidity language, the study presents a robust framework aimed at enhancing the integrity and transparency of forensic evidence. One of the primary advantages of this approach is its inherent immutability and transparency, ensuring that once recorded on the blockchain, forensic evidence remains tamper-proof and easily verifiable. However, the research also acknowledges a crucial challenge: the need to ensure the safety and security of the evidence throughout its lifecycle[5].

### III. METHODOLOGY

#### A. Architecture Overview

The block diagram shows six key parts that work together to ensure the integrity, immutability, and accessibility of evidential data within a decentralized framework. Six key parts are System .

Users, Application Frontend, Application Backend, Functional Modules, Blockchain Infrastructure, Evidence Repository as shown in Fig 1

1. System-Users: -  
System users include Forensic Officers and Investigators responsible for gathering and recording digital evidence into the Blockchain network.
2. Application-Front-End:  
Model's front-end is developed with the help of JavaScript,Html,Css. It encompasses all modules accessible to users for interacting with the system.

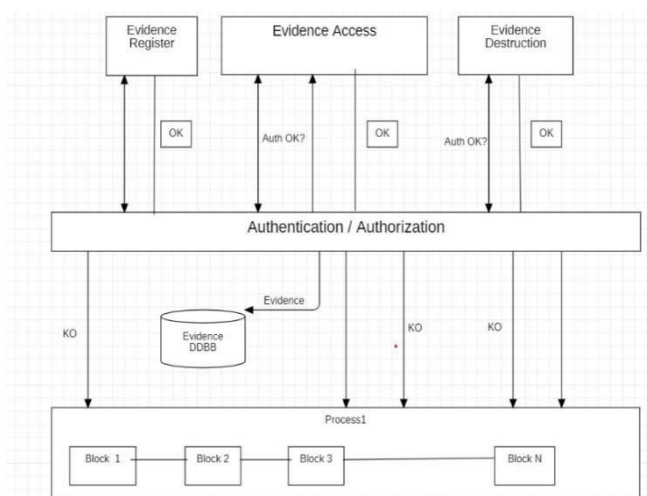


Fig 1:- Architecture of System.

3. Application-Backend:  
To provide Flask, a Python web framework, the application backend encompasses authentication, authorization, and core functionalities.
4. Function-Modules:  
Functional modules encapsulate the primary operations utilized by system users within the blockchain network.
5. Blockchain-Infrastructure:  
The blockchain infrastructure constitutes a decentralized peer-to-peer network connecting all participants, ensuring no central authority.
6. Evidence-Repository:  
The evidence repository stores the entire chain of custody, represented as blocks in MongoDB. Each block contains an index, timestamp, evidence information, proof, and hash of the previous block. Updates to the chain reflect in the database accordingly.

## B. Details of Implementation

### 1) Frontend:-

Model starts with website named “Evidence Protection System” which has four options :- Login as Admin, Login as Police Department, Login as Forensic staff, Login as Evidence Room Staff.

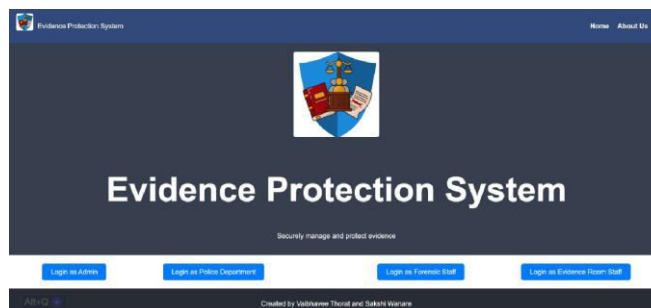


Fig 2:- Main Web Page

### 1.1 Login as Admin:

It provides user to do registration. By entering details like Name, Contact. No, EmailId, Designation, Department its registration is done. It maintains user registration at database. After login admin can add user to the system by and has feature of getting alert if anyone tries to manipulate the data in system.



**Login as Admin**

**Welcome, Admin!**

**USER REGISTRATION**

Name  
Vaibhavee Ramesh Thorat

Contact No.  
07758890266

Email id  
vaibhavithorat123@gmail.c

Designation  
Enter designation

---

Department

Police

Forensic

Evidence Room

---

[Add User](#)

User added Successfully!!

**Fig 3:- To enter details to get Login.**

**1.2 Login as Police Department:**

After login it provides two options View Evidence and View logs. This is accessed by Police.

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**Login as Forensic Staff**

You are logged in as an Forensic Staff.

[Go To Evidence Details](#) [Update Evidence](#)

**Fig 4:- After Logged as Police.**

**1.3 Login as Forensic Staff:**

After login Forensic staff can access the page where they have two options: Add evidence details and update evidence where Forensic officer can add the evidence details and report to System as well as can update the evidence details.

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**Login as Police**

You are logged in as an Police.

[View Evidence](#) [View Logs](#)

**Fig 5:- After Logged as Forensic Staff**

**Update Evidence Details**

Evidence ID:

Updated Description:

[Update Evidence](#)

**Add Evidence Details**

Evidence Photo:

Description:

Forensic Officer Incharge:

Investigating Officer Incharge:

Result:

Date Collected:

[Add Evidence](#)

**Fig 6:- Update and Add evidence details.**

**1.4 Login as Evidence Room Staff:**

After login evidence room staff can access the page where they have 3 options: Registry of Visitors , Search evidence, Fir Reports. In Registry of visitors, they maintain the database of visitors to evidence room



with their name, designation and purpose of visit. In search evidence they can search evidence to which section it is stored in evidence by evidence id which is provided uniquely to each evidence. In FIR reports they can generate fir report details.



Fig 6:- After Logged in as Evidence Room Staff.



Fig 7:- After choosing any option after logged in as Evidence Room.

## 2) Back-End:-

We are using python flask application as backend , mongoDB as database for storing data and for blockchain we are deploying a smart contract on ethereum using solidity language.

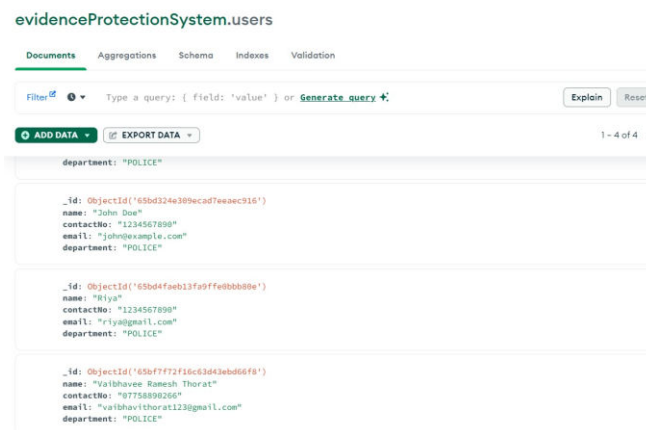


Fig 8:- MongoDB Database

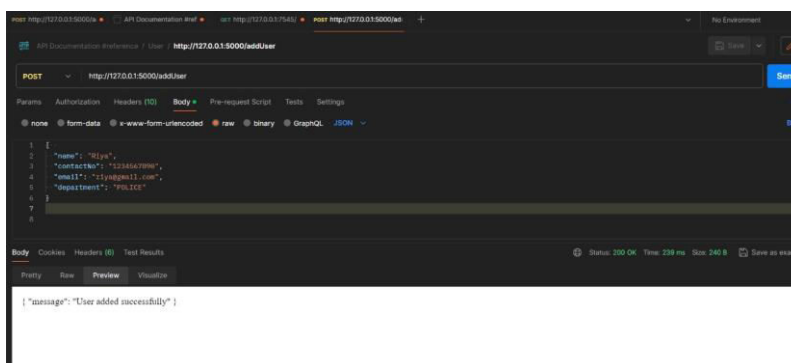


Fig 9:- Postman API.

### 3) Blockchain:-

#### 3.1) User Authentication:-

We have homepage where there are 4 options named as Login as Admin, Login as Police, Login as Forensic Staff and Login as Evidence Room Staff. Here user is authenticated before getting access of their pages. Each gets individual credentials for it which is stored in database.

#### 3.2) Admin:-

Administrator (Admin) has role of registering users on system with adding their individual information and getting an alert if there is any manipulation of evidence in blocks.

#### 3.3) Police:-

Police Staff can after accessing their page can view the evidence details in the form of table and can also download the Forensic report which is uploaded by Forensic Staff.

#### 3.4) Forensic:-

Forensic Staff can add evidence details safely on which gets stored in database and get transacts on blocks and also update the existing evidence details additionally, by adding through their unique evidence Id.

#### 3.5) Evidence Room Staff:-

Evidence Room Staff after accessing their page can maintain the database of visitors to Evidence room by registering their details, also search evidence like which locker no it is stored in Evidence room through Evidence Id and generate Fir Report too.



Fig 10:- Evidence added to Blockchain.



#### IV. CONCLUSION

In conclusion, our proposed system leverages blockchain technology to address challenges in digital evidence management, ensuring integrity and security throughout the forensic process. By utilizing Blockchain's features of integrity, transparency, and auditability, our system preserves the chain of custody from crime scene to court presentation. Through encryption and restricted access, it enhances security while being environmentally friendly. Integration of Hyperledger Fabric streamlines processes, enhancing efficiency and reliability. The synergy with AI/ML promises more insightful analyses. Overall, our system represents a significant advancement in digital evidence management, with the potential to revolutionize forensic practices and contribute significantly to the field of digital forensics and criminal justice.

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