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DEVELOPING A BLOCK CHAIN BASED EVAULT SYSTEM FOR LEGAL RECORDS

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Abstract - This paper presents the design and development of a block chain-based eVault system tailored for managing legal records. The system encompasses comprehensive features for registering judges and users, facilitating document upload, and enabling judges to review cases and provide judgments securely. Through a meticulous registration process, judges are authenticated and assigned roles and permissions, ensuring accountability and integrity within the system. Similarly, users undergo a secure registration process, and their credentials are stored safely, prioritizing data privacy. User-friendly interfaces empower registered users to effortlessly upload legal documents and associated information while ensuring end-to-end encryption and secure storage through the Interplanetary File System (IPFS). Judges access the system to review uploaded documents and deliver verdicts, leveraging secure functionalities to ensure confidentiality and accuracy. Crucially, all actions within the system are recorded on the blockchain, ensuring transparency and immutability of judgments and document metadata. By amalgamating blockchain technology with robust encryption mechanisms, the proposed eVault system offers a secure, transparent, and efficient platform for managing legal records, fostering trust and confidence in the legal processes.

Keywords:- Block chain, eVault, Legal records, Judges, User registration, Document upload, Interplanetary File System (IPFS), Encryption, Transparency, Immutability.

I. INTRODUCTION

In the digital age, the security and integrity of legal records have become increasingly paramount. Traditional methods of storing legal documents are often cumbersome, prone to human error, and susceptible to unauthorized access or tampering. In response to these challenges, blockchain technology has emerged as a promising solution, offering

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unparalleled levels of security, transparency, and immutability. Leveraging the decentralized nature of blockchain, a new paradigm in legal record management is evolving – the blockchain-based eVault system.

The blockchain, originally devised as the underlying technology of crypto currencies like Bitcoin, is a distributed ledger that records transactions across a network of computers. Each transaction, or block, is cryptographically linked to the previous one, forming an immutable chain. This inherent immutability ensures that once data is recorded on the block chain, it cannot be altered or deleted, providing a secure and tamper-proof record of events.

The eVault system, built on block chain technology, offers a transformative approach to storing and managing legal records. By digitizing legal documents and storing them on a block chain network, the eVault system provides several key advantages over traditional paper-based or centralized electronic systems.

First and foremost, security is significantly enhanced. The cryptographic algorithms used in block chain technology make it virtually impossible for unauthorized parties to alter or manipulate the stored records. Each record is time stamped and linked to previous records, creating an immutable audit trail of changes and ensuring the integrity of the data.

Furthermore, the decentralized nature of block chain eliminates the need for a central authority or intermediary to oversee the storage and retrieval of legal records. Instead, records are stored and verified by a distributed network of nodes, reducing the risk of single points of failure or malicious attacks.

In addition to security, the eVault system offers improved accessibility and efficiency. Authorized users can securely access and retrieve records from anywhere in the world, at any time, with minimal friction. This streamlined access not only accelerates the pace of legal proceedings but also reduces the administrative burden associated with record management.

Overall, the block chain-based eVault system represents a significant advancement in legal record management, offering unprecedented levels of security, transparency, and efficiency. As the digital transformation of the legal industry continues to unfold, eVaults are poised to become the gold standard for safeguarding sensitive legal documents in the 21st century.

II. LITERATURE SURVEY

Blockchain technology, originally devised for Bitcoin, has garnered significant attention for its potential beyond crypto currencies. Its immutable and decentralized nature makes it appealing for various industries, including legal and forensic systems. In this literature survey, we explore several scholarly works and reports focusing on the application of block chain in legal chain management, criminal record management, evidence generation, and forensic data sharing.

In their paper titled "Legal Chain Vault Using Block chain," Mrs. Pallavi R. et al. propose a legal chain vault system utilizing block chain technology, ensuring the integrity and transparency of legal documents. This system addresses the challenge of document tampering and unauthorized modifications within legal frameworks [1].

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Another notable contribution is the "CRAB: Block chain Based Criminal Record Management System" by Maisha Afrida Tasnim et al. The authors present a block chain-based solution for managing criminal records, enhancing data security and accessibility while mitigating the risk of data manipulation or corruption [2].

In the realm of electronic evidence generation, Shijie Chen et al. introduce a study and implementation of blockchain in their paper published in Science Direct. Their work explores the application of block chain technology to ensure the integrity and authenticity of electronic evidence, crucial for legal proceedings [3].

Donghyo Kim et al. propose a "Two-Level Block chain System for Digital Crime Evidence Management," offering a robust framework for managing digital crime evidence. This system leverages blockchain's decentralized architecture to enhance the reliability and integrity of digital evidence [4].

Shritesh Jamulkar et al. present an "Evidence Management System Using Blockchain and Distributed File System (IPFS)" in their research published on ResearchGate. Their system combines blockchain and IPFS (InterPlanetary File System) to create a secure and decentralized platform for evidence management, reducing reliance on centralized authorities [5].

Furthermore, Ashitha C. A. et al. discuss the "Screening Forensic Evidence Employing Blockchain" in their paper published in the International Journal of Scientific Development and Research. Their work focuses on utilizing blockchain for screening forensic evidence, ensuring its authenticity and preventing tampering [6].

In the domain of forensic data sharing, Karthik et al. introduce "ENIGMA - A SECURE FORENSIC DATA SHARING USING BLOCKCHAIN." Their system facilitates secure and transparent sharing of forensic data among authorized parties, enhancing collaboration and trust in forensic investigations [7].

Apart from legal and forensic applications, blockchain technology finds relevance in other domains as well. Prasanth Varma Kakarlapudi and Qusay H. Mahmoud present a "Blockchain-Based System for Private Data Management," emphasizing data privacy and security in their work [8].

Moreover, initiatives such as the "UK police - blockchain solutions on the horizon" highlight the growing interest in blockchain adoption within law enforcement agencies. These initiatives aim to leverage blockchain technology to enhance data integrity, streamline processes, and improve transparency [15].

In conclusion, the literature reviewed demonstrates the diverse applications of blockchain technology in legal, forensic, and related domains. From legal document management to criminal record management and evidence generation, blockchain offers innovative solutions to address critical challenges while fostering trust, transparency, and security in the legal and forensic ecosystems.

III. METHODOLOGY

To implement this system, begin by installing and configuring Ganache on your local machine, setting up accounts, and ensuring it's accessible via local host. Then, install Metamask in Chrome and connect it to your local Ganache network to validate the connection. Next, install and configure an IPFS

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server for decentralized file storage, ensuring it runs smoothly and configuring settings like CORS as needed. Set up a Flask server for handling business logic and communication with the blockchain and IPFS, implementing APIs for user registration, document management, and more. Implement a registration process for judges, ensuring authentication and assigning appropriate roles, securely storing their information. Similarly, implement user registration, authentication, and account management functionalities. Allow registered users to upload legal documents through a user-friendly interface, encrypting them before storing on IPFS and recording metadata on the blockchain. Enable judges to log in, review uploaded documents, provide judgments securely, and record these on the blockchain for transparency and immutability. By integrating these components seamlessly, you'll establish a robust legal document management system that leverages blockchain and IPFS technologies for security, transparency, and efficiency in legal proceedings.

A) System Architecture

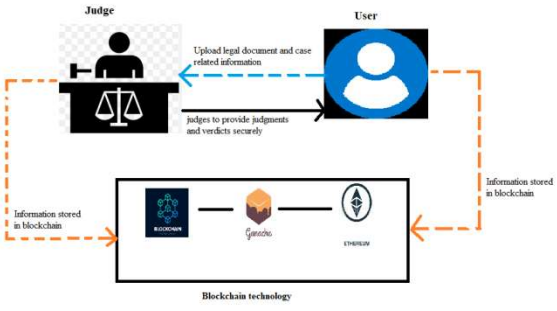

Fig 1: System Architecture

Proposed work

The proposed system is a comprehensive blockchain-based eVault solution designed to streamline legal record management. It includes a user-friendly interface for registering both judges and users securely. Through authentication mechanisms, judges and users are granted appropriate roles and permissions, ensuring accountability. Registered users can upload legal documents seamlessly, with encryption applied before storage on the InterPlanetary File System (IPFS) for enhanced security. Document metadata and references are recorded on the blockchain, ensuring transparency and immutability. Judges can securely access uploaded documents, providing them with the necessary information for review and judgment. Functionalities are implemented to facilitate secure judgments and verdicts, with all actions recorded on the blockchain for transparency. By integrating blockchain technology with secure authentication and encryption protocols, the proposed system offers a robust platform for legal record management, fostering trust and efficiency within the legal system.

B) Modules

1. Hosting Ganache in Local Host:

- Install and configure Ganache, a local blockchain network, on your development machine.

- Set up accounts and configure the network according to your project requirements.

- Ensure Ganache is running and accessible on localhost.

2. Starting Metamask in Chrome to Validate:

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- Install the Metamask browser extension in Chrome.

- Connect Metamask to your local Ganache network.

- Validate the connection by interacting with Ganache accounts through Metamask.

3. Starting IPFS Server:

- Install and configure an IPFS server for decentralized file storage.

- Start the IPFS server and ensure it's running properly.

- Configure IPFS settings to work with your application, such as CORS settings.

4. Running the Flask Server:

- Set up a Flask server or any other backend framework for handling business logic and communication with the blockchain and IPFS.

- Start the Flask server and ensure it's listening for incoming requests.

- Implement APIs for user registration, document upload/download, and other necessary functionalities.

5. Registering Judge:

- Implement a registration process for judges.

- Authenticate judges and assign appropriate roles and permissions.

- Store judge information securely on the blockchain or in a database.

6. Registering User:

- Implement a registration process for users.

- Authenticate users and securely store their credentials.

- Provide necessary functionalities for users to manage their accounts.

7. User Document Upload:

- Allow registered users to log in to the system.

- Provide a user-friendly interface for uploading legal documents and case-related information.

- Encrypt documents before uploading them to IPFS for secure storage.

- Record document metadata and references on the blockchain.

8. Judge Review and Judgment:

- Allow judges to log in to the system using their credentials.

- Provide judges with access to uploaded documents for review.

- Implement functionalities for judges to provide judgments and verdicts securely.

- Record judgments on the blockchain for transparency and immutability.

C) BLOCKCHAIN INTEGRATION

1. Utilize blockchain technology to record document metadata and references, ensuring transparency and immutability of legal records. Each transaction, including document uploads, judgments, and verdicts,

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is securely recorded on the blockchain, providing a transparent audit trail.

2. Leverage blockchain's decentralized architecture and cryptographic algorithms to enhance the security of the eVault system. By distributing data across a network of nodes and employing consensus mechanisms, blockchain ensures that documents are tamper-proof and resistant to unauthorized alterations.

3. Implement smart contracts on the blockchain to manage access control and permissions for judges and users. Smart contracts can enforce predefined rules and permissions, ensuring that only authorized individuals can access specific documents or perform certain actions within the system.

4. By integrating blockchain technology, the eVault system instills trust and accountability in the legal record management process. Judges, users, and other stakeholders can rely on the integrity and transparency provided by the blockchain, thereby fostering confidence in the system's fairness and reliability.

D) METAMASK

- Metamask is both an Ethereum wallet and a browser extension. It simplifies cryptocurrency management and provides direct access to DApps, making interactions with blockchain applications easier.

- In the project, Metamask ensures secure Ethereum transactions, promoting transparency by showing the deduction of ETH as fees. This transparency maintains accuracy and ensures confident, reliable financial interactions within the system.

E) GANACHE

- Ganache is a user-friendly interface for monitoring Ethereum blockchain activities. It simplifies tracking of accounts, transactions, and smart contracts, making it accessible even for users without in-depth blockchain expertise. Ganache offers detailed transaction information, including sender, receiver, amounts, gas usage, and success status, aiding debugging and ensuring transaction accuracy. It also tracks smart contract deployments, confirming correct deployment and functionality. This transparency simplifies monitoring and verification processes.

- Ganache lets us dive into the details of each block on the Ethereum blockchain. We can find out when a particular block was added, what transactions took place within it, and how much computing power (gas) was used. Ganache also enables data retrieval from stored blocks, allowing developers to access and analyze specific block information.

IV. RESULTS

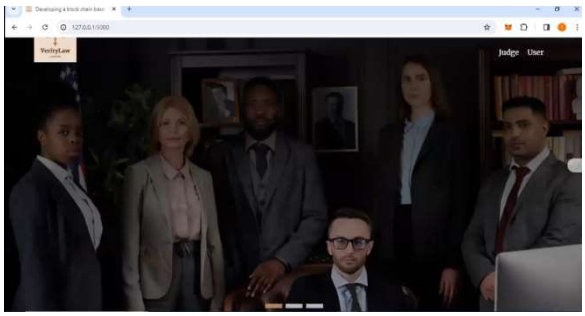

Fig 2: Home Page

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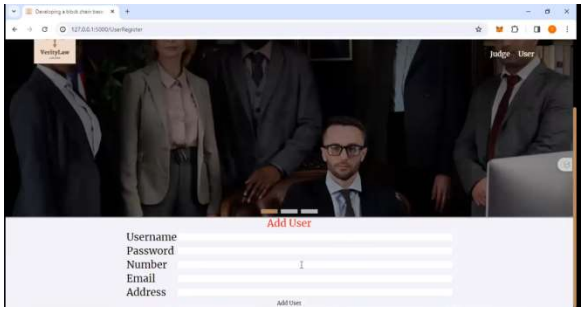

Fig 3: Add User

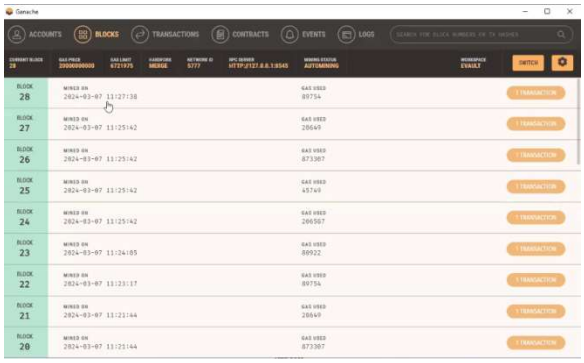

Fig 4: Ganache Blocks

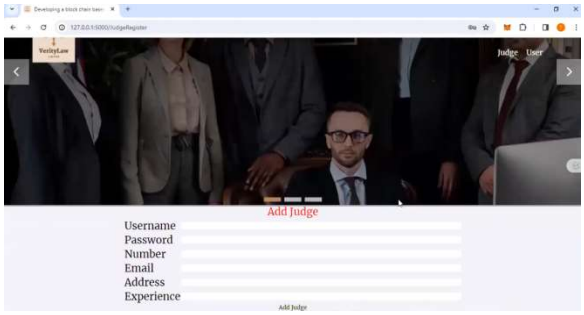

Fig 5: Add Judge

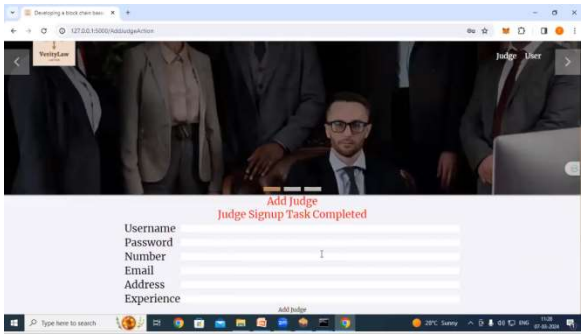

Fig 6: Judge Signup Task Completed

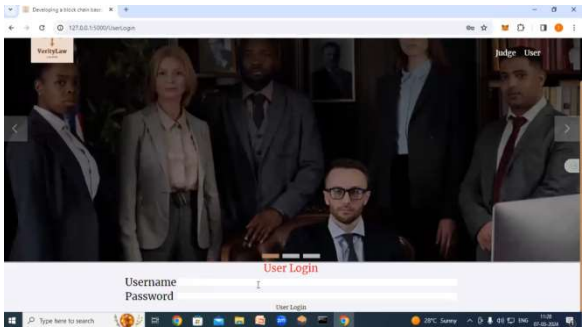

Fig 7: User Login

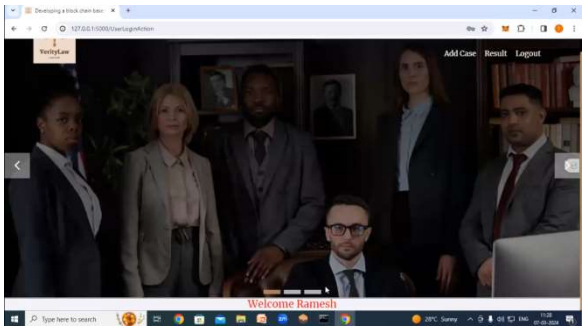

Fig 8: Welcome Page

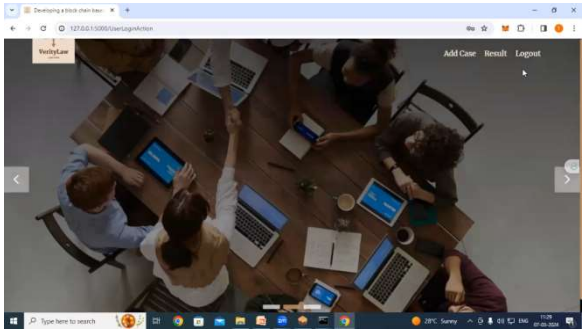

Fig 9: User Dashborad

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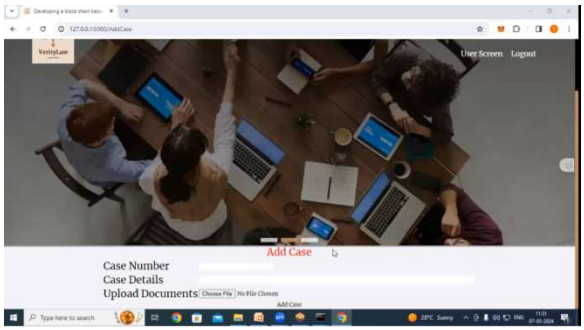

Fig 10: Add Case

Fig 11: Upload Docs

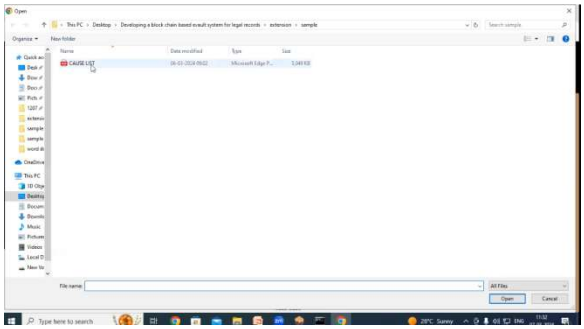

Fig 12: Select Docs

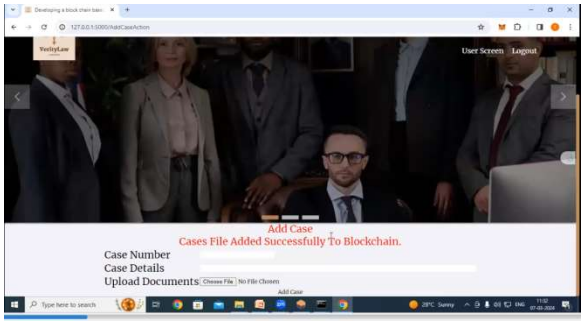

Fig 13: Cases file Added successfully to block chain

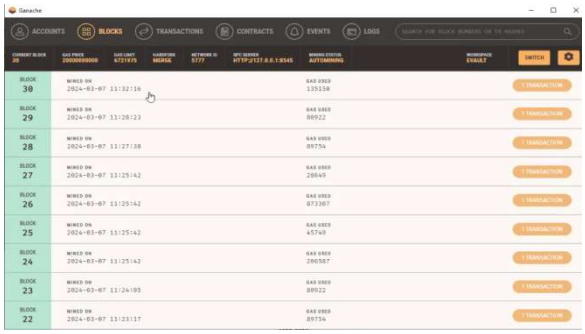

Fig 14: Add Details as Blocks

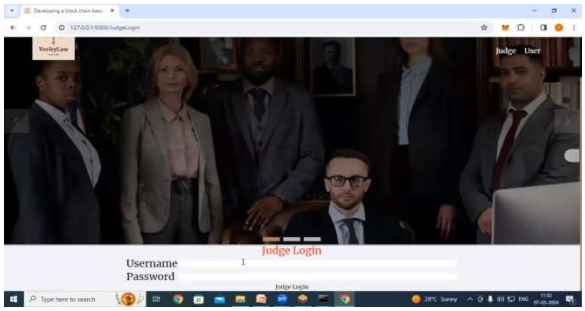

Fig 15: Judge Login

Fig 16: Welcome Page

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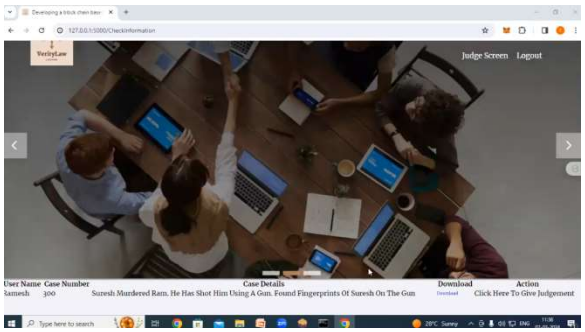

Fig 17: Cases Details

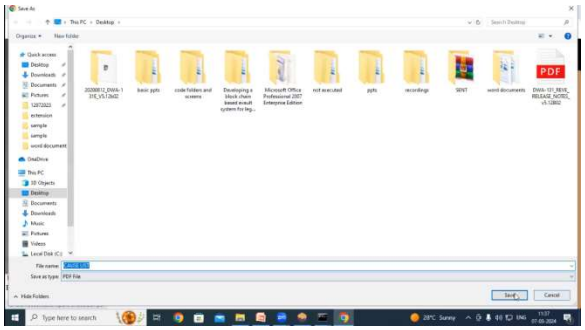

Fig 18: Download cases

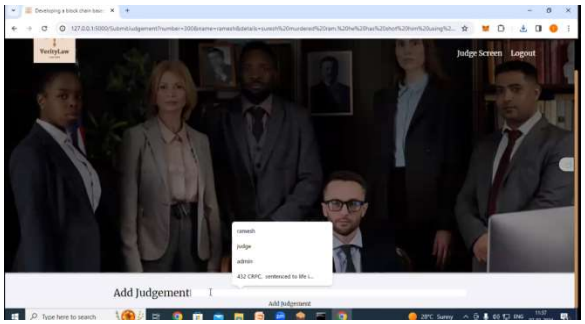

Fig 19: Add Judgement

Fig 20:Enter details

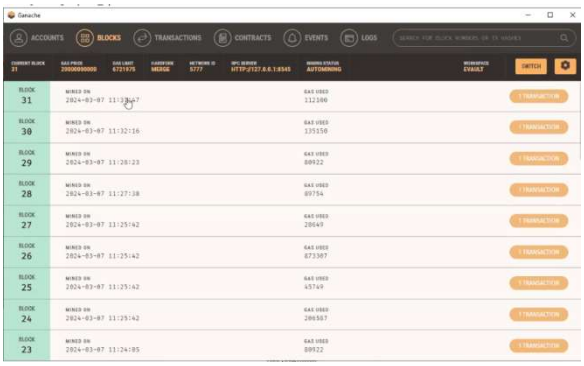

Fig 21: Added details as blocks

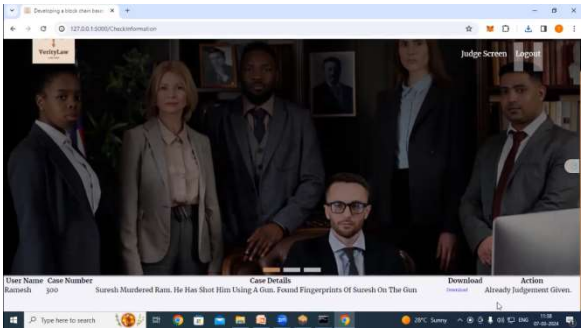

Fig 22: Case details

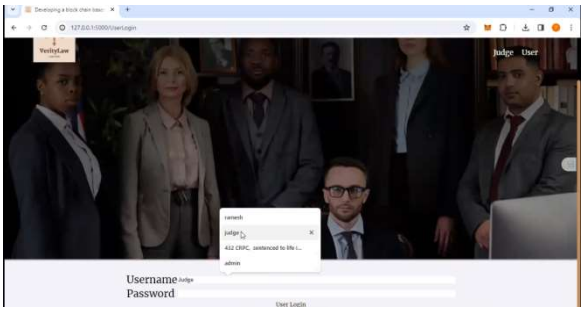

Fig 23: User Login

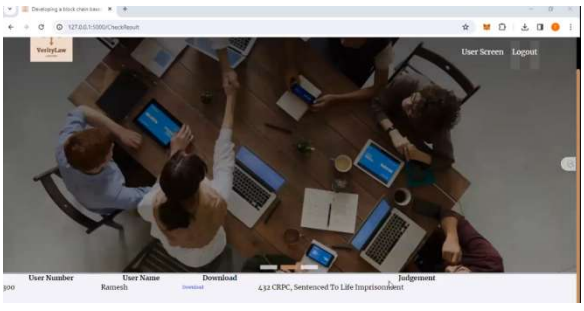

Fig 24: received updates of cases

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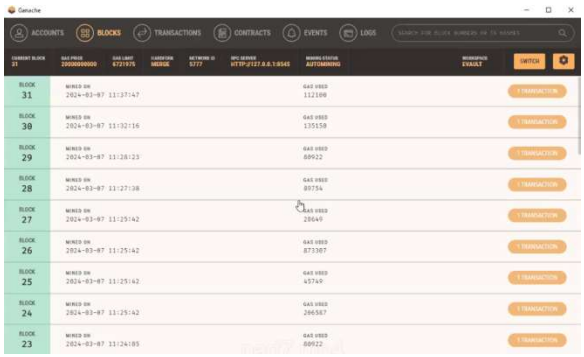

Fig 25: Details saved in Ganache as Blocks

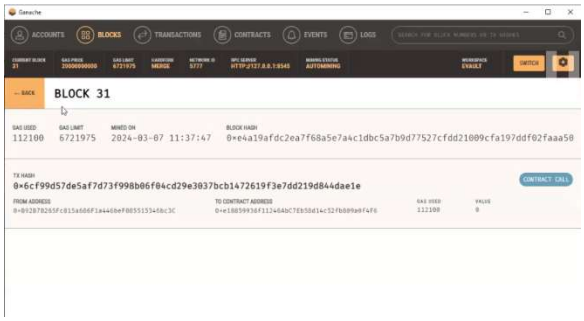

Fig 26: block Hash Code & contract details

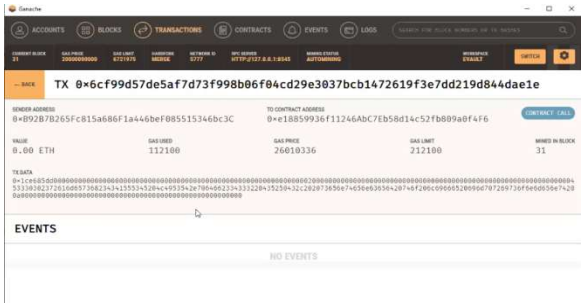

Fig 27: Block Transaction Codes

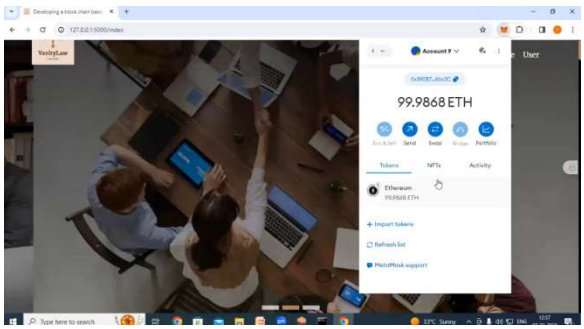

Fig 28: Meta mask details

V. CONCLUSION

In conclusion, the proposed blockchain-based eVault system presents a transformative solution to address the challenges associated with traditional legal record management. By integrating blockchain technology with secure authentication and encryption protocols, the system ensures transparency, integrity, and security throughout the entire process. Through user-friendly interfaces and robust authentication mechanisms, judges and users can securely register, upload documents, and access necessary information for review and judgment. The encryption of documents before storage on the InterPlanetary File System (IPFS) ensures confidentiality, while blockchain recording of metadata guarantees transparency and immutability. This amalgamation of technologies not only enhances data security but also streamlines operations, promoting efficiency within the legal system. While the existing system based on consortium blockchain and homomorphic encryption offers certain advantages, such as data confidentiality, the proposed system surpasses it by providing enhanced decentralization, simplified user experience, improved security, and scalability. Overall, the proposed eVault system represents a significant step forward in modernizing legal record management, fostering trust, accountability, and efficiency within the legal domain.

VI. FUTURE SCOPE

In the future, the eVault system can be expanded to incorporate advanced AI and machine learning algorithms for automated document analysis, case categorization, and prediction of legal outcomes. Integration with emerging technologies like smart contracts and decentralized identity systems can

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further enhance security and streamline processes. Additionally, exploring interoperability with other blockchain networks and adoption of tokenization mechanisms for incentivizing participation could unlock new possibilities for collaboration and innovation in the legal industry.

REFERENCES

[1] Mrs. Pallavi R, Aaqib Bashir, Ankita Choudhary, Goel Ananya Devendra, Manish Pikhan, "A Survey on: Legal Chain Vault Using Blockchain", published in Ijraset Journal For Research in Applied Science and Engineering Technology, DOI Link: https://doi.org/10.22214/ijraset.2023.56911

[2] Maisha Afrida Tasnim, Shahriar Rahman, Md. Zakirul Alam Bhuiyan, "CRAB: Blockchain Based Criminal Record Management System", published in The 11th International Conference on Security, Privacy and Anonymity in Computation, Communication and Storage, available in https://www.researchgate.net/publication/329489346_CRAB_Blockchain_Based_Criminal_Record_Management_System

[3] Shijie Chen,Chengqiang Zhao, Lingling Huang ,Jing Yuan,Mingzhe Liu, et. al., "Study and implementation on the application of blockchain in electronic evidence generation" published in science direct open Access, available at https://www.sciencedirect.com/science/article/abs/pii/S2666281720300573.

[4] Donghyo Kim,Sun-Young Ihm and Yunsik Son; et. al., "Two-Level Blockchain System for Digital Crime Evidence Management" published in mdpi open Access, available at https://www.mdpi.com/1424-8220/21/9/3051.

[5] Shritesh Jamulkar ,Preeti Chandrakar, Rifaqat Ali,Aman Agrawal, et. al., "Evidence Management System Using Blockchain and Distributed File System (IPFS)" published in research gate open Access, available at https://www.researchgate.net/publication/354964804.

[6] Ashitha C A, Asik Anwar M N,Fathima Shani, Rizwanul Haq, Chithra Rani P R, et. al., "Screening Forensic Evidence Employing Blockchain" published in ijsdr open Access, available at https://www.ijsdr.org/papers/IJSDR2305294.pdf.

[7] Karthik, Trishar T Suvarna, Karthik Shetty, U Ashvitha, et. al., "ENIGMA - A SECURE FORENSIC DATA SHARING USING BLOCKCHAIN " published in ijeast open Access, available at https://www.ijeast.com/papers/222-228,%20Tesma0703,IJEAST.pdf.

[8] Prasanth Varma Kakarlapudi , Qusay H. Mahmoud,"Design and Development of a Blockchain-Based System for Private Data Management", Department of Electrical, Computer, and Software Engineering, Ontario Tech University,Oshawa, ON L1G 0C5, Canada.

[9] Olumide Malomo, Danda Rawat and Moses Garuba "Security through block vault in a blockchain enabled federated cloud framework", Danda Rawat and Moses Garuba contributed equally to this work. Department of Electrical Engineering and Computer Science College of Engineering and Architecture Howard University, Washington, DC, USA.

[10] Karan Singh, Nikita Singh,Dharmender Singh Kushwaha "An Interoperable and Secure E-Wallet Architecture based on Digital Ledger Technology using Blockchain", 2018 International Conference on

ISSN 2347–3657

Volume 12, Issue 2, 2024

Computing, Power and Communication Technologies (GUCON) Galgotias University, Greater Noida, UP, India. Sep 28-29, 2018.

[11] Mohammad Hossein Ronaghi, "E-DOC WALLET US ING BLOCKCHAIN", Proceedings of the International Conference on Communication and Electronics Systems (ICCES 2018)IEEE Xplore Part Number:CFP18AWO-ART; ISBN:978-1-5386-4765-3

[12] Z. Liu, L. Jiang, M. Osmani, and P. Demian, "Building informationmanagement (BIM) and blockchain (BC) for sustainable building design information management framework", Electronics, vol. 8, no. 7, pp. 115.

[13] M. Al-Essa, The impact of blockchain technology on nancial technology (FinTech), Univ. degli Studi di Salerno, San Fisciano, CA, USA, Tech. Rep., 2019, doi: 10.13140/RG.2.2.27279.12961.

[14] Ariq, M., Shakeel, S., Ali, Z.: Report on criminal record manage-ment system. https://www.slideshare.net/hashimabbasi786/criminal-recordmanagementsystem-report

[15] Open Trading Network: UK police - blockchain solutions on the horizon.https://medium.com/@otncoin/uk-police-blockchain-solutions-on- the-horizon-60e3e1932ef3