A Project report on

Decentralized crime registry platform using Blockchain Ethereum and web3

A Dissertation submitted to JNTU Hyderabad in partial fulfillment of the academic requirements for the award of the degree.

Bachelor of Technology

in

Computer Science and Engineering

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2020- 2024

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the Major Project Phase I report entitled **"Decentralized crime registry platform using Blockchain Ethereum and web3"** being submitted by G.Venkata Muralidhar Reddy (20H51A05C5), K.Sruthi (20H51A05H2), K. Chandu (20H51A05H5) in partial fulfillment for the award of **Bachelor of Technology in Computer Science and Engineering** is a record of bonafide work carried out his/her under my guidance and supervision.

The results embodies in this project report have not been submitted to any other University or Institute for the award of any Degree.

Dr.P. Senthil   **Dr. Siva Skandha Sanagala**

Associate Professor   **Associate Professor and HOD**

Dept. of CSE   **Dept. of CSE**

ACKNOWLEDGEMENT

With great pleasure we want to take this opportunity to express my heartfelt gratitude to all the people who helped in making this project work a grand success.

We are grateful to **Dr.P. Senthil, Associate Professor** , Department of Computer Science and Engineering for his valuable technical suggestions and guidance during the execution of this project work.

We would like to thank **Dr. Siva Skandha Sanagala,** Head of the Department of Computer Science and Engineering, CMR College of Engineering and Technology, who is the major driving forces to complete my project work successfully.

We are very grateful to **Dr. Vijaya Kumar Koppula**, Dean-Academics, CMR College of Engineering and Technology, for his constant support and motivation in carrying out the project work successfully.

We are highly indebted to **Major Dr. V A Narayana,** Principal, CMR College of Engineering and Technology, for giving permission to carry out this project in a successful and fruitful way.

We would like to thank the **Teaching & Non- teaching** staff of Department of Computer Science and Engineering for their co-operation

We express our sincere thanks to **Shri. Ch. Gopal Reddy**, Secretary, CMR Group of Institutions, for his continuous care.

Finally, We extend thanks to our parents who stood behind us at different stages of this Project. We sincerely acknowledge and thank all those who gave support directly and indirectly in completion of this project work.

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ABSTRACT

Traditional record-keeping systems might involve a lot of paperwork and manual processes to retrieve information. With a blockchain-based system, authorized individuals, like judges, lawyers, or law enforcement, can access the required records quickly and efficiently. This can help speed up legal processes.

When information about crimes is added to the blockchain, it becomes very difficult to change. This creates a high level of trust in the accuracy and integrity of the data. Courts can rely on this data, knowing that it hasn't been manipulated. Once a crime record is added to the blockchain. Since blockchain records are cryptographically secure and can't be easily changed, it reduces the chances of fraudulent activities, such as someone trying to manipulate or forge crime records

Unlike centralized databases that can be vulnerable to single points of failure, a blockchain operates on a decentralized network of nodes. This ensures that even if one node fails, the data remains accessible from other nodes in the network. This decentralized nature guarantees continuous availability of criminal records, reducing the risk of data loss. By adopting this comprehensive approach, the proposed system not only enhances the efficiency of criminal data management but also significantly reduces the scope of corruption and tampering, thereby strengthening the overall law enforcement framework.

CHAPTER 1
INTRODUCTION

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INTRODUCTION

1.1.Problem Statement

In traditional criminal records management systems, the reliance on paperwork and manual processes leads to inefficiencies, delays, and vulnerabilities. Paper-based records are susceptible to damage, loss, and forgery. Additionally, the centralized nature of existing databases creates a single point of failure, making them susceptible to unauthorized access and tampering. These challenges compromise the integrity, security, and efficiency of law enforcement, legal proceedings, and cross-agency collaborations.

Moreover, the lack of a standardized, transparent, and secure method for storing and accessing criminal records hampers the timely exchange of critical information among authorized entities. The absence of a tamper-proof system undermines the trustworthiness of criminal data, leading to potential miscarriages of justice, delayed legal proceedings, and increased instances of corruption and fraud within the criminal justice system.

There is an urgent need for a robust, decentralized, and tamper-proof criminal evidences management system that leverages blockchain technology to address these challenges. Such a system should ensure the immutability of records, enhance data security and privacy, facilitate streamlined cross-agency collaboration, automate processes, and preserve the integrity of criminal data for the long term. Addressing these issues is crucial to fostering trust in the legal system, improving the efficiency of legal processes, and upholding the principles of justice and transparency in law enforcement and criminal proceedings.

1.2.Research Objective

The research objective of implementing a Blockchain-based Criminal Evidences Management System is to develop a secure, transparent, and efficient platform that revolutionizes the management, accessibility, and integrity of criminal records. The primary goals of this research endeavor include:

- Design and Implementation of a Secure Blockchain Architecture
- Development of Tamper-Proof Smart Contracts
- Integration of Decentralized Data Storage
- Implementation of User-Friendly Interfaces
- Enhancement of Cross-Agency Collaboration
- Ensuring Data Integrity and Immutability

By achieving these research objectives, the study aims to contribute valuable insights and practical solutions to the domain of criminal records management, enhancing the efficiency, trustworthiness, and integrity of the legal processes within the criminal justice system.

1.3. Project Scope and Limitations

Scope:
- Criminal Records Management: Designing a comprehensive system for storing, retrieving, and managing criminal records securely and efficiently on a blockchain network.
- User Access and Authorization: Implementing user authentication and authorization mechanisms to ensure that only authorized individuals, such as law enforcement agencies, courts, lawyers, and judges, can access specific records.

- Data Integrity and Immutability: Ensuring the immutability of criminal records through cryptographic hashing and blockchain technology, making it tamper-proof and enhancing the trustworthiness of the data.

- Cross-Agency Collaboration: Facilitating seamless sharing of criminal records among multiple agencies and jurisdictions, enabling efficient collaboration and information exchange.

- Decentralized Data Storage: Utilizing IPFS for decentralized and secure storage, ensuring data availability and integrity even in the face of network failures or localized outages.

- User-Friendly Interface: Developing intuitive and user-friendly interfaces for authorized users, enabling easy navigation and interaction with the system.

- Smart Contract Automation: Implementing smart contracts to automate processes within the system, such as notifications, data validation, and transaction execution, enhancing operational efficiency.

- Security and Privacy Measures: Incorporating advanced security measures to protect sensitive data, ensuring privacy, and preventing unauthorized access to confidential information.

Limitations:

1. Legal and Regulatory Constraints: Adhering to legal frameworks and regulations related to data privacy, access control, and blockchain technology in different jurisdictions may pose challenges.

2. Technological Constraints: The technology's scalability and the time required for transaction confirmation on the blockchain may impact the system's responsiveness, particularly during periods of high network activity.

3. User Adoption Challenges: Training and transitioning existing law enforcement personnel and legal professionals to the new system might face resistance and require comprehensive training programs.

4. Integration Complexity: Integrating the system with existing legacy databases and technologies within law enforcement agencies and legal institutions may be complex and time-consuming.

5. Data Migration and Initial Setup: Migrating existing criminal records from traditional systems to the blockchain and setting up the initial database structure may require significant effort and careful validation processes.

6. Dependency on External Services: Relying on external services such as Infura for blockchain interaction and hosting services like Heroku and MLAB might introduce dependency risks if these services experience downtime or policy changes.

7. Cost Implications: Building and maintaining a blockchain-based system, along with ensuring its security, might involve substantial initial and ongoing costs for the organizations involved.

CHAPTER 2
BACKGROUND WORK

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CHAPTER 2

BACKGROUND WORK

2.1. criminal record management using ASP.net framework

2.1.1. Introduction

The Crime Registration System presented in this project is designed with a focus on distributed client-server computing technology. It utilizes normalized specifications up to 3NF to ensure data consistency and eliminate anomalies arising from database transactions. The system provides browser-specific user interfaces for distributed accessibility, implementing strict authentication and authorization protocols. Access is divided into administrative and normal user zones, ensuring security and confidentiality.

2.1.2. Merits, Demerits and Challenges
Merits:

Efficiency: Provides efficient tracking and management of crime-related data, aiding law enforcement agencies in their investigations.

User-Friendly: Intuitive user interfaces enhance user experience and facilitate easy data input and retrieval.

Data Integrity: Normalized specifications ensure data consistency and eliminate anomalies, enhancing the accuracy of the stored information**.**

Demerits:

Technology Limitation: Relies on Windows 7, SQL SERVER 2005, and Visual Studio 2008, which are outdated technologies. Upgrading to more recent technologies would improve system performance and security.

Limited Scalability: The system might face challenges in scaling up to handle a large volume of data and users due to hardware and software limitations.

Challenges:

Integration Complexity: Integrating the system with newer technologies and ensuring seamless data migration might be challenging due to the differences in architecture and data formats.

Training and Adoption: Training existing users to transition from the current system to the new one could face resistance and require comprehensive training programs.

Security Concerns: Ensuring data security, especially during the transition phase, is crucial to prevent unauthorized access or data breaches.

2.1.3. Implementation

The implementation of the Crime Registration System harnesses the robust features of the .NET framework to create a secure and efficient platform. Beginning with user authentication and login pages, the system ensures authorized access for users and administrators. The Police Stations Registration module captures detailed information about registered police stations, integrating employee data seamlessly. The Victims FIR Registration module systematically records essential details for first investigation reports, ensuring structured crime data capture. Meanwhile, the Investigating Evidence Registration module dynamically catalogs vital evidential data, adapting to the changing nature of investigations. Administrators, accessing a secure dashboard, can generate detailed crime reports using .NET's reporting tools, aiding data-driven decision-making. Advanced security measures, including SSL encryption and role-based access control, safeguard sensitive information.

This comprehensive implementation guarantees law enforcement agencies a user-friendly, secure, and streamlined solution for managing and documenting crime data, contributing significantly to public safety and an efficient criminal justice system

2.2. Crime record management using php and mysql

2.2.1. Introduction

The Online Crime Record Management System, developed using PHP and MySQL Database, offers a comprehensive solution for managing FIR records, criminals' details, and victim information. The system consists of three main modules: Admin, Police Staff, and Users. Admins oversee the overall system, managing police stations, police staff, crime categories, and FIR records. Police staff handle new FIR requests, manage criminals, generate charge sheets, and update FIR statuses. Users can file FIRs, track their status, view charge sheets, and search FIR records.

2.2.2. Merits, Demerits and Challenges

Merits:
This system provides a user-friendly dashboard for admins and police staff to monitor FIRs, criminals, and crime categories. Admins can generate reports based on specific periods, enhancing data-driven decision-making. Users benefit from an intuitive interface to file FIRs and monitor their progress. The system fosters transparency and efficiency in crime record management.

Demerits:
One limitation is the system's reliance on PHP and MySQL, which might face challenges in scalability for larger databases and complex queries. Additionally, while the system offers essential functionalities, more advanced features such as data analytics or predictive crime

pattern analysis are lacking. The system might also lack real-time data synchronization between police stations, potentially leading to data inconsistencies.

Challenges:

Integrating real-time data synchronization between police stations and ensuring consistent data accuracy across the system pose significant challenges. Upgrading the system to handle larger datasets and optimizing query performance are crucial. User training and system adoption can be challenging, especially for older law enforcement personnel unfamiliar with digital systems. Addressing these challenges is vital for the system's effectiveness and user acceptance.

Implementation:

The implementation of the Online Crime Record Management System involves leveraging PHP and MySQL's capabilities. User authentication and login mechanisms are created to ensure secure access for admins, police staff, and users. The system's modular design enables seamless interaction between admin, police, and user interfaces. Admin functionalities include managing police stations, staff, and crime categories, along with generating comprehensive reports. Police staff can handle FIR requests, manage criminals, and generate charge sheets, ensuring efficient workflow. Users can easily file FIRs, monitor their status, view charge sheets, and search records. Thorough testing and ongoing maintenance are integral parts of the implementation to guarantee system reliability and performance. Addressing challenges such as real-time data synchronization and optimizing system performance ensures the Online Crime Record Management System operates seamlessly, providing a reliable platform for law enforcement agencies and users alike.

2.3. Criminal record management using java swing API

2.3.1. Introduction

The main purpose of our project is automating the traditional way of storing criminal records. Here, we could add, update and delete criminal records. We could also add, update and delete FIR details which are being filed down manually traditionally. We store all the data into a database from where we could use it further. Thus this project provides a very user friendly interface for the officials to store and manage the criminal records.

This project intends to provide an effective way for storing, retrieving and managing criminal records. It also aims at providing a user friendly interface for effortless interaction with the user. This project is confined to storing, retrieving and managing criminal records. In further developments of the project, we could integrate it with AI and make features such as face detections.

2.3.2. Merits, Demerits and Challenges
Merits:

Intuitive User Interface: Java Swing API enables the creation of a visually appealing and intuitive user interface, enhancing user experience across all modules.

Dynamic Data Management: The system allows real-time updates and dynamic data management, ensuring accuracy and consistency of records.

Comprehensive Admin Dashboard: Admins benefit from detailed dashboards, offering insights into police stations, staff, crime categories, and case statuses, enhancing oversight and decision-making

Demerits:

Learning Curve: Developers unfamiliar with Java Swing API may face a learning curve, potentially impacting the speed of development and feature implementation

Scalability Challenges: Handling extensive datasets and complex queries might pose challenges, potentially impacting system performance as the database grows.

Interoperability Issues: Integrating Java Swing with other technologies may present interoperability challenges, particularly when connecting with external systems and databases.

Challenges:

Real-time Collaboration Features: Implementing real-time collaboration features, ensuring simultaneous access and updates by multiple users, presents a significant technical challenge.

Scalability Optimization: Optimizing the system to handle large datasets efficiently, especially when querying extensive records, requires careful planning and performance tuning.

User Training and Acceptance: Ensuring user acceptance and providing comprehensive training, especially for law enforcement personnel unfamiliar with digital interfaces, is crucial for system adoption and effectiveness.

2.3.3. Implementation

The Crime Record Management System's implementation involves leveraging Java Swing API's GUI components to create secure authentication and login pages. The intuitive interfaces for Admin, Police Staff, and Users are designed to streamline interactions. Admin functionalities, including police station and staff management, are implemented using event-driven programming. Police staff can efficiently handle FIR requests and manage criminal records through dynamic UI elements. Users can easily file FIRs, track statuses, and access charge sheets, enhancing transparency and user satisfaction. Rigorous testing and ongoing maintenance address challenges, ensuring a seamless and dependable Crime Record Management System for law enforcement agencies and users.

CHAPTER 3
RESULTS AND DISCUSSION

CHAPTER 3

RESULTS AND DISCUSSION

Prior to implementing the Crime Record Management System using blockchain technology, various solutions were developed using technologies such as PHP, MySQL, Java Swing API, and other conventional databases. These solutions provided basic functionality for managing criminal records, FIR filing, and user interactions. While these systems were functional, they lacked the robust security and immutability offered by blockchain technology.

Adopting Blockchain for Enhanced Security:

In order to overcome the limitations of traditional solutions and to enhance data security, the decision was made to implement the Crime Record Management System using blockchain technology. Blockchain offers a decentralized and tamper-proof ledger system, ensuring the authenticity and integrity of criminal records. By adopting blockchain, the system aims to provide an unparalleled level of security and trust in the stored data, addressing the shortcomings of previous solutions.

Results:

The implementation of the Crime Record Management System using blockchain technology has yielded significant results, particularly in terms of data security, immutability, and transparency:

Enhanced Data Security: Blockchain technology ensures that the data stored in the system is cryptographically secure and tamper-proof. Each transaction is recorded in a block, and once added to the blockchain, it cannot be altered, ensuring the highest level of data security.

Immutability and Trust: The use of blockchain guarantees the immutability of criminal records. This means that once a record is added to the blockchain, it becomes permanent and cannot be changed, providing a high level of trust in the accuracy and authenticity of the data.

Decentralization and Transparency: The decentralized nature of blockchain technology eliminates the need for a central authority, providing transparency and accessibility to authorized users. Law enforcement agencies, administrators, and users can securely access and verify records in a transparent manner.

Discussions:

Security Enhancement: By transitioning to blockchain technology, the system has significantly enhanced its security features. Data tampering and unauthorized access are virtually eliminated, providing a secure platform for managing sensitive criminal records.

Immutability and Legal Validity: The immutability of blockchain records holds legal validity in many jurisdictions. Records stored on the blockchain can be considered legally binding, providing a reliable source of information for legal proceedings and law enforcement activities.

User Confidence: The implementation of blockchain instills confidence in both law enforcement agencies and the public. Users can trust the integrity of their records, and law enforcement personnel can rely on the accuracy of the information available to them, leading to more effective law enforcement practices.

Future Scalability: Blockchain technology offers scalability advantages, allowing the system to handle a growing volume of records and user interactions. As the system expands, the blockchain infrastructure can seamlessly accommodate increased data without compromising performance.

Second Level DFD - Online Crime Reporting System
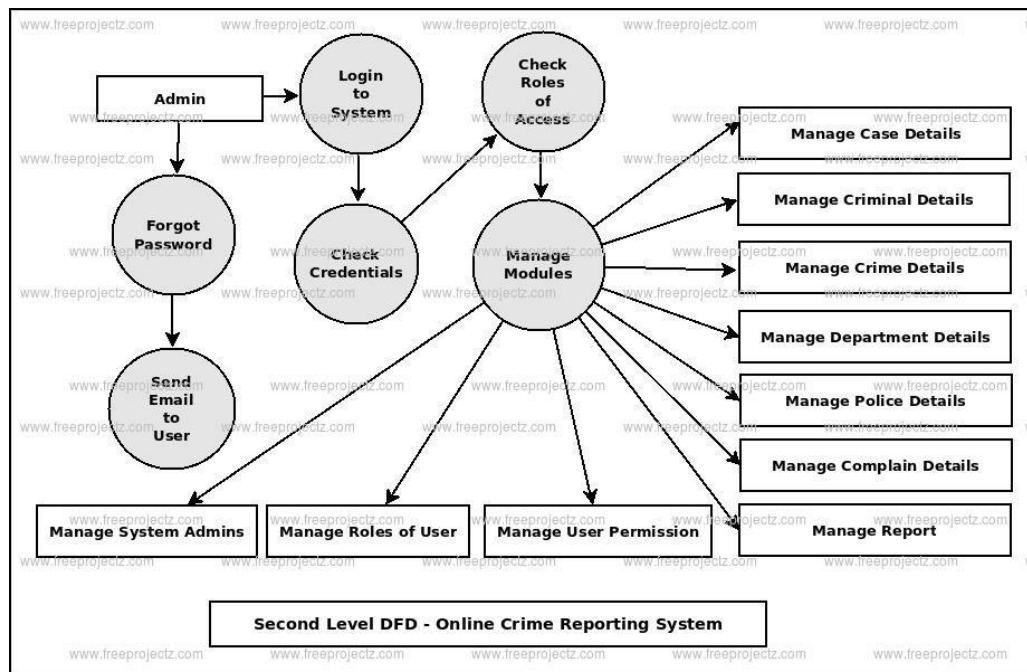
CHAPTER 5
CONCLUSION

CHAPTER 5

CONCLUSION

In conclusion, the implementation of a blockchain-based record-keeping system for legal processes is a significant step forward in enhancing the efficiency, security, and trustworthiness of the legal system. By utilizing technologies such as ReactJs, Bootstrap, NodeJs, MongoDB, Ethereum, and web3, we have created a robust and reliable platform that addresses many of the challenges associated with traditional paper-based systems.

The blockchain technology integrated into the system has ensured the highest level of data integrity. Once information related to crimes is added to the blockchain, it becomes virtually immutable and cryptographically secure. This inherent immutability instills a significant level of trust in the accuracy and reliability of the records. Courts and other stakeholders can confidently rely on this data, knowing it remains unaltered and tamper-proof.

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