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Blockchain Based Legacylock Secure Digital Asset and Will Management System

Parvathy M
Information Technology
Velammal Engineering College,
Anna University Surapet,
Chennai

Jebisha J
Information Technology
Velammal Engineering College,
Anna University Surapet, Chennai

Kaviya M
Information Technology
Velammal Engineering College,
Anna University Surapet,
Chennai

Abstract - The rapid growth of digital technology has created a need for secure systems to manage sensitive personal information such as digital wills and asset distribution. Traditional will management methods are mainly paper-based, which makes them prone to loss, tampering, and limited transparency. To address these issues, this project proposes LegacyLock, a Digital Will Management System that uses modern web technologies combined with blockchain to provide a secure and trustworthy platform for creating and managing digital wills.The system is developed with a React frontend for an interactive user interface, a Spring Boot backend to manage application logic, and a MySQL database for efficient data storage. To strengthen security, blockchain technology is integrated using Solidity smart contracts deployed through the Hardhat environment. Storing will records on the blockchain ensures that once they are verified and recorded, they cannot be altered, thereby preserving authenticity and transparency.LegacyLock allows users to register, create digital wills, assign beneficiaries, and document assets securely. Users can also connect their blockchain wallets to verify identity and record their wills on the blockchain network. The system follows a modular architecture that enables smooth communication between the frontend, backend, and blockchain layers while ensuring scalability and reliable performance.

Keywords: **- Blockchain-Based Will System, Digital Legacy Protection, Ethereum Smart Contract Platform, Decentralized Will Storage, Secure Wallet Authentication, Cryptographic Data Hashing, Blockchain Integrity Verification,Tamper-resistant.**

1. INTRODUCTION

The increasing use of digital technologies has significantly changed the way individuals manage personal, financial, and legal information. Many people now store important assets such as online financial accounts, digital documents, cryptocurrencies, and other digital properties on internet-based platforms. As a result, managing digital inheritance has become an important concern in modern society. Traditional will management methods usually depend on paper documents or centralized digital storage, which may face problems such as document loss, unauthorized modification, or limited accessibility. These limitations highlight the need for a more secure and reliable system to manage digital wills and inheritance records.Blockchain technology has emerged as a promising solution for improving data security, transparency, and integrity in various applications. Because blockchain operates on a decentralized network, information stored on it becomes difficult to alter or tamper with. This feature makes blockchain suitable for applications that require trust and verification, such as legal documentation and asset management. By using blockchain technology, sensitive information can be verified through cryptographic methods, ensuring that the stored data remains authentic and reliable over time.

This paper introduces LegacyLock, a blockchain- based digital will management system designed to provide a secure and efficient platform for creating, storing, and verifying digital wills. The proposed system integrates modern web technologies with blockchain infrastructure to improve the reliability of digital inheritance management. The frontend interface is developed using React to provide a responsive and user-friendly experience, while the backend services are implemented using Spring Boot to manage application logic and system security. A MySQL database is used to store user information, asset details, and beneficiary records. To ensure the authenticity of wills, important data is anchored on the blockchain using smart contracts.The main objective of the proposed system is to provide a secure and transparent environment for managing digital wills while reducing the risks associated with traditional methods. By combining blockchain technology with modern web frameworks, the system aims to improve trust, accessibility, and long-term reliability in digital inheritance management.

2. RELATED WORK

Over the past decade, the rapid growth of digital technologies and online services has significantly changed the way individuals manage personal, financial, and legal information. As people increasingly store valuable data such as financial records, online accounts, cryptocurrencies, and important documents in digital form, the need for secure systems to manage these digital assets has become more important. Traditional methods of will management mainly depend on physical documents or centralized digital storage systems maintained by legal institutions or service providers. Although these methods provide a structured approach to asset distribution, they often face several challenges including

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document loss, unauthorized access, data tampering, and limited accessibility. Centralized systems are particularly vulnerable to cyber-attacks, internal manipulation, and single points of failure, which may lead to serious security risks for sensitive inheritance records. Because of these limitations, researchers have explored the use of modern technologies to create more reliable and secure digital inheritance management systems that can maintain the authenticity and integrity of legal records over time.In recent years, several digital platforms have been introduced to improve the management of legal documents and inheritance records. Many of these systems utilize cloud computing and database technologies to store user information, asset records, and beneficiary details in a centralized environment. These platforms typically provide features such as online will creation, digital document storage, and automated notifications to beneficiaries or legal representatives. While such solutions offer convenience and improved accessibility compared to traditional paper-based methods, they still rely heavily on centralized infrastructures for data management and verification. This dependence on a single authority can lead to issues related to trust, transparency, and long-term data integrity. For instance, if a centralized server is compromised or experiences technical failures, critical legal information may become inaccessible or altered without proper verification. As a result, researchers have begun investigating alternative technologies that can provide decentralized verification and improved security for sensitive digital records.

Blockchain technology has emerged as a promising solution for addressing many of these security and transparency challenges. Blockchain operates as a distributed ledger where data is stored across multiple network nodes rather than a single centralized server. Each record stored on the blockchain is linked to previous records through cryptographic hashing, making it extremely difficult to modify or delete existing information without detection. This inherent immutability makes blockchain highly suitable for applications that require trust, accountability, and data verification. Numerous studies have proposed the use of blockchain for secure document storage, digital identity management, financial transactions, healthcare records, and legal contract verification. In these applications, smart contracts are often used to automate processes and enforce predefined rules without the need for intermediaries. By using blockchain technology, it becomes possible to verify the authenticity of important records while ensuring that the stored information remains secure and tamper-resistant.In the context of digital inheritance and will management, blockchain can provide a reliable mechanism for verifying the authenticity of digital wills and preventing unauthorized modifications. Several research works have proposed systems where the hash value of a digital document is stored on a blockchain network, allowing users to verify whether the document has been altered over time. These systems often combine blockchain infrastructure with web-based interfaces to allow users to upload documents and generate cryptographic hashes for verification. Some platforms also integrate secure authentication mechanisms such as token-based access control, encrypted password storage, and digital signatures to protect user accounts and ensure authorized access. Despite these advancements, many existing solutions focus primarily on document verification and lack a complete system for managing all aspects of digital inheritance, such as asset tracking, beneficiary management, and user-friendly interfaces for non- technical users.To address these challenges, the proposed system, LegacyLock, introduces a blockchain-based digital will management platform that combines decentralized verification with modern web development technologies. The system provides a comprehensive environment where users can securely create digital wills, manage beneficiary information, and record asset details through a web- based interface. The frontend is developed using React to provide a responsive and user-friendly experience, while the backend services are implemented using Spring Boot to manage application logic and ensure secure communication between system components. A MySQL database is used to store structured information such as user profiles, asset records, and beneficiary data. In addition, blockchain smart contracts are used to store verification hashes of will records, ensuring that the authenticity of these records can be validated at any time. By integrating secure authentication mechanisms, decentralized blockchain verification, and efficient data management technologies, the proposed system aims to improve security, transparency, and reliability in digital inheritance management while providing a practical solution for modern digital asset protection.

3. SYSTEM ARCHITECTURE

The diagram presents the architecture and workflow of the LegacyLock Digital Will Management System. The process begins when a user accesses the system and logs in through the React JS frontend interface. After authentication, the user can create a digital will by entering details about assets and nominees. These details are sent from the frontend to the Spring Boot backend through API requests. The backend processes the received data, performs validation, and manages the interaction between the application interface and the storage system.Once the information is processed, the system securely stores the will and asset details in the MySQL database.To maintain confidentiality and prevent unauthorized access, the data is encrypted before storage. In addition, cryptographic hash values are generated and organized using a Merkle tree structure, which helps maintain the integrity of the stored information. The backend also communicates with the Hardhat blockchain environment where Solidity smart contracts are deployed. These smart contracts record important verification data on the blockchain network. During verification, the stored hash and Merkle root are checked against blockchain records to confirm that the information has not been modified. This approach strengthens security, improves transparency, and ensures that the digital will remains reliable and tamperresistant in Figure 1.

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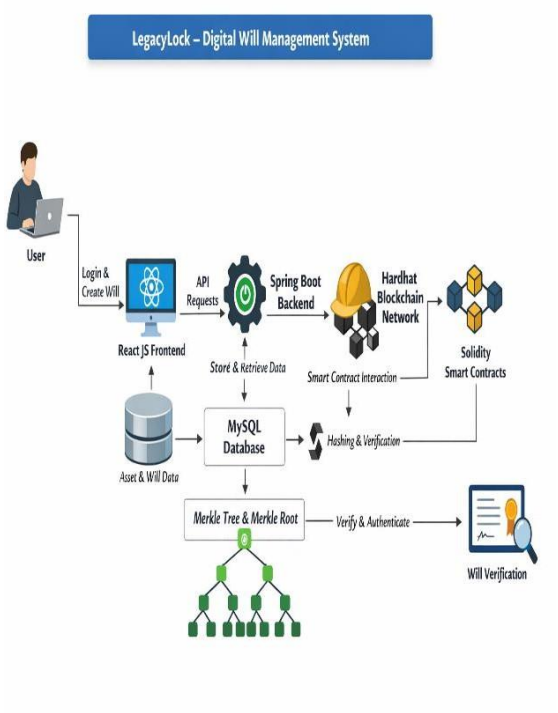

Figure 1. Architecture of Proposed Work

Figure 2 The flow diagram explains the overall process of the Digital Will Management System. The process begins when the user accesses the system and logs in using their credentials. After successful authentication, the user can create a digital will by providing the necessary details such as asset information and nominee details. This information is collected through the application interface and prepared for secure processing.Once the will information is created, the system encrypts the data to ensure that sensitive details remain protected from unauthorized access. The encrypted data is then stored securely in the database for future reference. After storing the data, the system interacts with the smart contract on the blockchain network. The smart contract helps in monitoring and controlling the execution of the will based on predefined conditions. When the required verification or trigger event occurs, the system validates the stored information and allows the authorized nominee to receive the assets. This process ensures data security, transparency, and reliable asset transfer within the digital will management system.

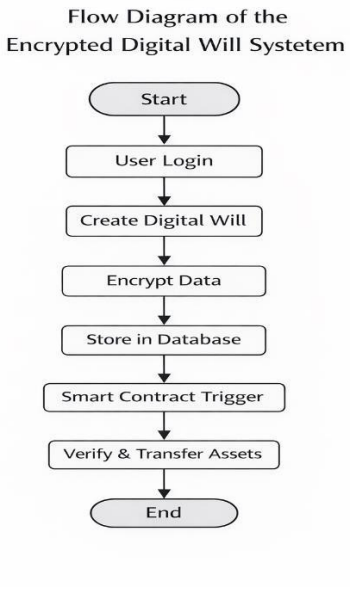

Figure 2. Flowchart of Proposed Work

4. PROPOSED SYSTEM

The proposed system, LegacyLock Digital Will Management System, is designed to provide a secure, reliable, and transparent platform for creating and managing digital wills using modern web and blockchain technologies. The main goal of this system is to overcome the limitations of traditional and centralized digital will management systems by introducing a decentralized verification mechanism and stronger data security techniques. The system allows users to create a digital will by securely entering asset details, beneficiary information, and other necessary data through an interactive web application interface. The frontend of the system is developed using React JS, which provides a responsive and user-friendly interface for managing digital inheritance information.The backend of the system is implemented using Spring Boot, which handles the application logic, user authentication, and communication between different system components. When a user creates or updates a digital will, the frontend sends the information to the backend through secure API requests. The backend processes this information, validates the input data, and stores the will and asset details in a structured MySQL database. Before storing the information, the system applies encryption techniques to ensure that sensitive data is protected from unauthorized access. This layer of security ensures that personal and financial details remain confidential within the system.

To strengthen data integrity and prevent unauthorized modification, the proposed system incorporates cryptographic hashing and a Merkle tree structure. Each will record is converted into a unique hash value, which acts as a digital fingerprint of the stored data. These hash values are organized into a Merkle tree structure where the final Merkle root represents the combined integrity of all stored records. Even a small change in the stored information will produce a completely different hash value, making it easy to detect any

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form of data tampering. This mechanism ensures that the digital will records remain consistent and verifiable over time.Another important feature of the proposed system is the integration of blockchain technology through the Hardhat development environment and Solidity-based smart contracts.. Whenever verification is required, the system compares the stored hash values with the blockchain records to confirm the authenticity of the will data.In addition to security and transparency, the proposed system improves the overall efficiency of digital will management. The platform provides a structured process for creating, storing, and verifying will documents without requiring complex legal procedures during the initial stages. Beneficiaries and authorized individuals can verify the authenticity of the stored will information using the blockchain verification mechanism. This reduces the possibility of disputes and helps ensure that the will information remains trustworthy and accurate.Overall, the LegacyLock Digital Will Management System combines web technologies, database management, cryptographic techniques, and blockchain integration to create a modern solution for digital inheritance management. By providing secure data storage, tamper-resistant verification, and transparent record management, the system offers a more reliable alternative to existing will management methods. This approach not only improves data security but also increases user confidence in the digital management of inheritance information.

5. IMPLEMENTATION

The LegacyLock Digital Will Management System is implemented using a multi-layer architecture that combines modern web development technologies with blockchain-based verification to provide a secure and reliable platform for digital will management. The frontend of the system is developed using React JS, which provides a responsive and interactive interface for users to access the application. Through this interface, users can perform operations such as registration, login, creating a digital will, and entering details related to assets and beneficiaries. The frontend communicates with the backend using RESTful API requests, allowing the system to send and receive data efficiently. The backend of the system is developed using Spring Boot, which manages the core business logic of the application. It processes incoming requests, validates the input data, handles authentication, and controls communication between the user interface and the database. This structured approach ensures that the application maintains proper data flow and system stability.

For storing application data, the system uses a MySQL relational database, where information such as user profiles, asset details, and digital will records are securely stored in structured tables. To protect the integrity of the stored data, the system generates cryptographic hash values for each record. These hash values are further organized using a Merkle tree structure, where multiple hashes are combined to form a single root hash that represents the complete dataset. This structure makes it easy to detect any modification in the stored information because even a small change in the data will result in a different hash value. In addition to database storage, the system integrates blockchain technology using the Hardhat development environment and Solidity-based smart contracts. The backend communicates with the blockchain network to store verification data such as the generated hash values or Merkle root. Because blockchain records are decentralized and immutable, once the data is recorded it cannot be altered, which ensures transparency and trust in the system. During the verification process, the system compares the stored database hash with the blockchain record to confirm the authenticity of the will information. This implementation approach enhances security, improves reliability, and ensures that the digital will data remains tamper-resistant and verifiable over time.

6. RESULT

The implementation of the LegacyLock Digital Will Management System demonstrates the successful development of a secure and reliable platform for managing digital wills using modern web technologies and blockchain integration. The system provides an interactive web interface through which users can register, log in, and create digital wills by entering important details such as asset information and beneficiary data. The React JS frontend ensures a smooth and responsive user experience, allowing users to easily interact with the system. The backend, developed using Spring Boot, efficiently handles user requests, processes the submitted data, and manages communication between the frontend interface and the database. This structured architecture enables the system to operate smoothly and ensures that user information is processed in a secure and organized manner.The results of the system implementation show that digital will records can be securely stored and managed through the application. All user information, asset details, and will data are stored in a structured format using the MySQL database. During the storage process, the system generates cryptographic hash values for each will record to represent the integrity of the stored information. These hash values are then organized using a Merkle tree structure, which produces a unique Merkle root that represents the combined data set. This mechanism ensures that any change made to the stored information can be easily detected because even a minor modification will generate a completely different hash value. As a result, the system provides strong data integrity protection for digital will records.Another important outcome of the system is the integration of blockchain technology to enhance security and transparency.

The backend communicates with the blockchain network using the Hardhat development environment and Solidity smart contracts to store verification data such as hash values or Merkle roots. Once the verification data is recorded on the blockchain, it becomes immutable, meaning it cannot be altered or removed. This property ensures that the digital will records remain tamper-resistant and trustworthy. During the verification process, the system retrieves the stored hash values from the database and compares them with the values recorded on the blockchain. If both values match, the system confirms that the stored will information has not been

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modified.The overall system performance indicates that the proposed solution provides a reliable method for secure digital inheritance management. The integration of blockchain technology improves transparency and trust, while cryptographic hashing techniques protect the integrity of stored information. In addition, the structured architecture of the application ensures efficient data processing and system stability. Compared to traditional will management methods and centralized digital storage systems, the developed system offers stronger security, improved verification mechanisms, and better protection against unauthorized data modification. These results demonstrate that the LegacyLock system can serve as a dependable platform for managing digital wills and ensuring the authenticity of sensitive inheritance information.

7. CONCLUSION AND FUTURE WORK

This project presents LegacyLock, a secure digital will management system that integrates modern web technologies with blockchain to improve the reliability and security of digital inheritance management. The system allows users to create and manage digital wills, add beneficiary and asset details, and securely store this information through a web-based platform. By using technologies such as React for the frontend, Spring Boot for backend services, and MySQL for structured data storage, the system

ensures efficient data handling and user interaction. To enhance data integrity and prevent unauthorized modifications, cryptographic hashing and blockchain- based smart contracts are used to store verification data on the blockchain network. This approach ensures that the will records remain transparent, tamper-resistant, and verifiable at any time. Overall, the proposed system demonstrates how blockchain technology can be effectively used to build a secure and trustworthy platform for managing digital wills and asset transfers.

In the future, the system can be enhanced by integrating additional security and automation features. Advanced identity verification methods such as biometric authentication or multi-factor authentication can be implemented to strengthen user security. The platform can also be expanded to support multiple blockchain networks and cloud-based decentralized storage solutions for improved scalability. Furthermore, artificial intelligence techniques could be integrated to automatically verify legal documents or detect suspicious activities. Mobile application support and improved user interfaces can also be developed to make the system more accessible and user-friendly. These improvements will help extend the capabilities of the LegacyLock system and make it more suitable for real-world digital inheritance management applications.

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