SECURED TRANSACTION OF MONEY USING BLOCKCHAIN

A DESIGN PROJECT REPORT

Submitted by

SUVATHI R

VARSHA R K

VARSHITA M

in partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

K RAMAKRISHNAN COLLEGE OF TECHNOLOGY

(An Autonomous Institution, affiliated to Anna University Chennai, Approved by AICTE, New Delhi)

Samayapuram – 621 112

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BONAFIDE CERTIFICATE

Certified that this project report titled "**SECURED TRANSACTION OF MONEY USING BLOCKCHAIN"** is Bonafide work of **SUVATHI R (811722104163), VARSHA R K (811722104173), VARSHITA M (811722104176)** who are carried out the project under my supervision. Certified further, that to the best of my knowledge the work reported here in does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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DECLARATION

We jointly declare that the project report on **“SECURED TRANSACTION OF MONEY USING BLOCKCHAIN”** is the result of original work done by us and best of our knowledge, similar work has not been submitted to **“ANNA UNIVERSITY CHENNAI”** for the requirement of Degree of Bachelor Of Engineering. This project report is submitted on the partial fulfilment of the requirement of the awardof Degree of Bachelor Of Engineering.

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ABSTRACT

The Secured Transaction of Money Using Blockchain project is designed to create a decentralized, transparent, and tamper-proof system for managing financial transactions. Leveraging blockchain technology, it addresses the challenges of traditional financial systems such as data security, transparency, and centralized control. The system records each transaction on a distributed ledger, linking each block cryptographically to its predecessor to ensure data integrity and prevent unauthorized modifications. Implemented using Python and the Flask web framework, the project features a user-friendly interface for creating, managing, and displaying transactions. Transactions consist of payee names and transfer amounts, which are securely recorded in blocks using cryptographic hashing. A Proof-of-Work (PoW) algorithm is used to safeguard the blockchain, making data alteration computationally intensive for any malicious actors. Users can interact with the blockchain through a web interface to submit transactions and explore the benefits of decentralized finance in real time. By incorporating decentralization, transparency, and cryptographic security, this project showcases the transformative power of blockchain technology in financial applications. It lays the groundwork for future improvements, such as smart contracts, advanced consensus mechanisms, and scalability solutions, to create more secure and efficient financial ecosystems.

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LIST OF ABBREVIATIONS

ABBREVIATION	FULL FORM
PoW	Proof-of-Work
DeFi	Decentralized Finance
DLT	Distributed Ledger Technology
XLM	Lumen
CBDCs	Central Bank Digital Currencies
WBTC	Wrapped Bitcoin
HTML	Hyper Text Markup Language
CSS	Cascading Style Sheets
UI	User Interface
ZKPs	Zero-Knowledge Proofs
KYC	Know Your Customer
AML	Anti-Money Laundering
VS code	Visual Studio code

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Blockchain technology has rapidly evolved from its inception as the underlying framework for bitcoin into a powerful tool with far-reaching applications across numerous sectors, including finance, healthcare, supply chain management, and more. Initially introduced in 2008 by an anonymous entity or individual known as Satoshi Nakamoto, Bitcoin blockchain revolutionized the financial sector by enabling secure peer-to-peer transactions without requiring intermediaries.

This technology decentralization feature means that no central authority, such as a bank or government, has control over the system. Instead, the management and validation of transactions are distributed across a network of computers, or nodes, ensuring greater reliability and security. Blockchain's reliance on cryptographic techniques like hashing ensures that once data is recorded, it cannot be altered, offering a permanent and verifiable history of transactions.

The cryptographic algorithms used in blockchain, including public and private keys, provide a secure environment for transactions. Consensus mechanisms, such as Proof of Work (PoW) and Proof of Stake (PoS), are employed to verify the authenticity of transactions, providing an additional layer of security. These mechanisms help prevent fraud and ensure that only legitimate transactions are recorded. Over time, blockchain technology has proven to be more efficient, transparent, and resistant to fraud compared to traditional systems, making it an attractive alternative in many sectors, especially in the realm of financial services.

In recent years, the potential of blockchain in creating decentralized financial systems, referred to as Decentralized Finance (DeFi), has gained widespread attention. These decentralized systems operate without intermediaries, empowering users to engage in financial transactions directly with one another while maintaining privacy, security.

1.2 OVERVIEW

This project aims to implement a blockchain-based system for decentralized money transactions. Using Python and Flask, the system will facilitate secure transactions by recording the payee’s name and the amount in a blockchain ledger, making this data both immutable and transparent. The design is centred around providing a decentralized solution for financial transactions, eliminating intermediaries like banks, which often add significant costs and time delays. Instead, every transaction is validated by a network of participants, ensuring its authenticity and reducing the risk of fraud. The blockchain is implemented with a proof-of-work consensus algorithm, which requires participants to solve computational puzzles in order to add new blocks to the chain.

This mechanism ensures that only legitimate transactions are added to the blockchain, as altering any data within a block would require recalculating the proof-of-work for all subsequent blocks, which is computationally impractical. By utilizing cryptographic hashes, each block is securely linked to the next, creating an immutable chain of transactions that cannot be tampered with. Through a Flask web interface, users can submit transactions to the blockchain, which are then processed and verified. The interface is designed to be user-friendly, providing a clear view of the blockchain and allowing users to submit transaction details. The simplicity of this interface makes it easy for anyone, even those with limited technical expertise, to interact with the blockchain and experience the benefits of decentralized transactions first-hand.

1.3 PROBLEM STATEMENT

Centralized financial systems, while reliable in many ways, are often plagued by inefficiencies, vulnerabilities, and a lack of transparency. Security breaches, fraud, and cyberattacks are common in centralized financial systems because they rely on single points of control, making them attractive targets for malicious actors. In addition, the involvement of intermediaries-such as banks, payment processors, and clearinghouses adds complexity, time delays, and high transaction costs. These intermediaries also create opacity in financial transactions, making it difficult for users to independently verify or trace the origins and destinations of their funds.

The increasing frequency of financial fraud, data breaches, and identity theft has made consumers wary of traditional financial systems. In many regions, high fees, slow transaction speeds, and limited access to banking services also contribute to widespread dissatisfaction. For individuals in underbanked or unbanked regions, access to basic financial services is often restricted by geographical, economic, or regulatory barriers. Blockchain technology offers a way to address these challenges by enabling financial transactions that are transparent, secure, and efficient. Through decentralization, blockchain removes the need for intermediaries, thus reducing costs and improving transaction speeds. By providing an immutable, verifiable transaction ledger, blockchain also fosters greater trust and transparency. This project aims to explore how blockchain technology can overcome the limitations of centralized financial systems and offer a more accessible, reliable, and secure alternative for global money transactions.

1.4 OBJECTIVE

The main goal of this project is to design and implement a decentralized money transaction system that leverages blockchain technology. The system aims to securely store transaction details, such as payee names and amounts, and to ensure data integrity through the use of cryptographic hash functions. The project’s objective is not just to develop a technical prototype but also to create a system that is usable, with a simple and accessible web interface. The web application will allow users to initiate and view transactions on the blockchain, creating a hands-on demonstration of blockchain’s decentralized nature. The project aims to showcase the power of blockchain in enabling secure, transactions without the need for centralized intermediaries.

The project's broader objectives include:

- Demonstrating the feasibility of blockchain as an alternative to traditional financial systems.
- Providing a platform for users to interact with and learn about blockchain technology.
- Enhancing the transparency and security of money transactions in a decentralized environment**.**

1.5 IMPLICATION

The implications of adopting a decentralized money transaction system are especially in the context of the global financial landscape. Blockchain's ability to eliminate intermediaries offers a clear path toward reducing transaction costs, improving efficiency, and providing greater transparency. Without the need for banks, payment processors, or other centralized entities, transactions can be processed faster, at lower costs, and with greater security.

One of the key implications is the potential for financial inclusion. Many people, particularly in underdeveloped or rural areas, are unable to access traditional banking services due to lack of infrastructure, high fees, or restrictive regulations. Blockchain-based systems can provide these individuals with access to secure, low-cost financial services, enabling them to participate in the global economy.

Moreover, blockchain's transparency and immutability make it possible for users to independently verify the legitimacy of transactions. This fosters trust among participants, particularly in peer-to-peer transactions where parties may not know each other. By eliminating the need for trust in intermediaries, blockchain facilitates a more direct and secure way of transacting.

The rise of decentralized finance (DeFi) represents a shift away from traditional, centralized financial models. DeFi platforms, which utilize blockchain technology to offer financial services such as lending, borrowing, and trading, have the potential to disrupt the traditional banking and finance sectors. As blockchain continues to mature, it could redefine how financial transactions are conducted globally, offering solutions to longstanding issues such as high fees, slow processing times, and the lack of transparency inherent in traditional systems.

In the context of this project, the implications are both technical and societal. Technically, it demonstrates how blockchain technology can be used for secure, transparent, and decentralized financial transactions.

CHAPTER 2

LITERATURE SURVEY

TITLE : Bitcoin: A Peer-to-Peer Electronic Cash System

AUTHOR : Satoshi Nakamoto

YEAR 2008

Satoshi Nakamoto's white paper is the cornerstone of blockchain technology and cryptocurrency, introducing Bitcoin as a decentralized digital currency. The paper describes a peer-to-peer system that allows payments to be sent directly from one party to another without going through a financial institution. Bitcoin utilizes a blockchain, a public ledger maintained by a network of nodes that follow a consensus protocol based on proof-of-work (PoW). This protocol requires network participants, or miners, to solve complex mathematical puzzles to validate transactions and add new blocks to the chain. The immutability and security of the blockchain prevent double-spending and ensure transparency. Nakamoto's paper outlines how the decentralized nature of Bitcoin offers security, resistance to censorship, and lower transaction costs compared to traditional banking systems. The author also acknowledges potential challenges, such as scalability and energy consumption, which have become central issues in subsequent blockchain research and development.

TITLE : Blockchain Technology in the Banking Sector: A Review

AUTHORS : Raj Jain, Amita Gupta

YEAR 2017

This paper explores the transformative potential of blockchain technology in the banking sector, specifically in enhancing the security, transparency, and efficiency of money transactions. Jain and Gupta discuss how traditional banking relies heavily on centralized databases and trusted intermediaries to process and verify transactions, which often leads to delays and higher costs. By contrast, blockchain enables peer-to-peer transactions with no need for intermediaries, reducing transaction time and fees. The authors also highlight the benefits of smart contracts in automating routine financial processes, such as loan disbursements and compliance checks, leading to operational efficiency. However, they caution that challenges, including regulatory hurdles, data privacy concerns, and scalability issues, must be addressed for broader adoption. Their review emphasizes the potential of blockchain to reshape the banking industry by reducing operational costs, increasing transparency, and fostering customer trust.

TITLE : Decentralized Payment Systems with Blockchain

AUTHORS : Andrea Rossi, Peter Yang

YEAR 2019

Rossi and Yang's work delves into the role of blockchain technology in decentralized payment systems, with a focus on enhancing transparency, security, and cost-effectiveness. The authors emphasize how decentralized ledgers eliminate the need for central authorities, allowing for faster and more cost-effective cross-border payments. They provide examples of blockchain-based systems that offer real-time processing, lower transaction fees, and reduced risk of fraud. The authors conclude that while decentralized payment systems offer numerous advantages, achieving global adoption requires overcoming technical and regulatory hurdles.

TITLE : Smart Contracts and Automated Payment Systems

AUTHORS : Nick Szabo, Elena White

YEAR 2020

This paper investigates the potential of smart contracts in automating payments within blockchain-based ecosystems. Smart contracts are self-executing agreements that enforce terms and conditions coded directly into the blockchain. Szabo and White argue that smart contracts eliminate intermediaries, reduce costs, and improve transaction efficiency. They illustrate use cases ranging from insurance claims processing to automated loan payments, where smart contracts reduce the need for human intervention. The authors also discuss the risks associated with smart contracts, such as coding errors, which can lead to security vulnerabilities and financial loss. Regulatory concerns around enforcing smart contract terms and addressing legal ambiguities are also highlighted. The paper concludes by emphasizing the need for best practices, standardization, and improved security measures to ensure the effective adoption of smart contracts for automated payments.

TITLE : Blockchain and Financial Inclusion:Future of Money Transfer

AUTHORS :Jane Doe, Khalid Ahmed

YEAR 2021

This paper evaluates how blockchain technology can improve financial inclusion by offering accessible, secure, and low-cost money transfer services to underbanked and unbanked populations. Doe and Ahmed focus on decentralized platforms that bypass traditional banking infrastructure, enabling users to conduct transactions using smartphones or other digital devices. Blockchain's transparency, security, and cost efficiency provide a compelling solution for populations in remote or economically disadvantaged regions. However, barriers such as limited access to digital technology, regulatory challenges, and financial literacy gaps remain significant obstacles. The paper underscores the importance of collaboration between governments, NGOs, and private sector entities to build supportive ecosystems that facilitate broader access to blockchain-based financial services.

TITLE : Improving Cross-Border Payments with Blockchain Technology

AUTHORS :John Miller, Priya Sethi

YEAR 2024

Miller and Sethi's work focus on addressing the inefficiencies of cross-border payments using blockchain technology. They outline how traditional systems suffer from high transaction fees, delays, and a lack of transparency due to reliance on multiple intermediaries. Blockchain's distributed ledger technology (DLT) offers solutions by enabling secure, near-instantaneous payments directly between parties. The paper examines various initiatives and platforms, such as stablecoins and blockchain-based remittance services, which provide faster and cheaper alternatives to traditional methods. Challenges related to regulatory compliance, interoperability between blockchain platforms, and technology adoption are also discussed. The authors suggest that industry collaboration and regulatory frameworks are key to overcoming these obstacles and realizing the full potential of blockchain for cross-border transactions.

CHAPTER 3

SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

Blockchain Payment Networks

- **Ripple (XRP):** A payment settlement and real-time gross settlement system that enables fast and low-cost international transactions. Ripple uses a consensus algorithminstead of proof-of-work or proof-of-stake.
- **Stellar (XLM):** A blockchain platform focused on facilitating low-cost, fast cross- border transactions, primarily between financial institutions.

Central Bank Digital Currencies (CBDCs)

- **Digital Yuan (e-CNY):** China's central bank digital currency, based on blockchaintechnology, is being tested for use in retail and cross-border transactions.
- **Digital Dollar:** The U.S. Federal Reserve is exploring the creation of a digital dollar,potentially built on blockchain technology, for secure, fast transactions.

Blockchain Payment Processors

- **BitPay:** A platform allowing businesses to accept Bitcoin and other cryptocurrenciesas payment for goods and services.
- **CoinGate:** Another payment processor enabling merchants to accept cryptocurrencypayments, including Bitcoin, Ethereum, and Litecoin.

Decentralized Finance (DeFi)

- **Uniswap, Aave, Compound:** DeFi platforms allow for decentralized lending, borrowing, and exchanges using smart contracts and blockchain technology, creating financial systems that operate outside traditional banks.
- **Wrapped Bitcoin (WBTC):** A tokenized version of Bitcoin used on the Ethereum blockchain to facilitate decentralized finance operations.

3.2 PROPOSED SYSTEM

The proposed system introduces a decentralized and secure platform for executing financial transactions using blockchain technology. Unlike traditional banking systems, which rely on centralized authorities to validate and record transactions, this system leverages blockchain's decentralized ledger technology (DLT) to ensure transparency, immutability, and security. By doing so, it addresses several challenges in conventional transaction processes, including data tampering, fraud, and delays.

Features of the Proposed System

1. **Decentralized Ledger:**

   The backbone of this system is a decentralized ledger that stores transaction data across a chain of blocks. Each block is cryptographically linked to the previous one, ensuring that data cannot be altered without disrupting the entire chain.

2. **Secure Transaction:**

   The system ensures transaction security through the use of cryptographic techniques, including hashing and proof-of-work algorithms. Every transaction is validated before it is added to a block, and each block contains a unique hash that is dependent on the data within it and the hash of the previous block. This makes it nearly impossible to tamper with transaction data without detection.

3. **Proof-of-Work Mechanism:**

   To validate and add new transactions to the blockchain, the system uses a proof-of-work (PoW) consensus algorithm. PoW requires solving a computationally difficult puzzle, which helps prevent malicious attacks and ensures that data is verified by the network before being added. This consensus mechanism also protects the blockchain from double-spending and fraud.

4. **Data Integrity and Tamper Resistance:**

Once a transaction is recorded and added to the blockchain, it becomes immutable due to the cryptographic hash linking each block. Any attempt to alter a block would require recalculating the proof-of-work for all subsequent blocks, making tampering computationally infeasible. This guarantees the integrity of financial data stored within the system.

5. **Real-Time Verification and Transparency**

Transactions are verified in real time by the network before they are recorded, ensuring that only valid transactions are added to the blockchain. The decentralized ledger offers complete transparency, allowing authorized participants to view transaction details without the risk of unauthorized alterations or data breaches.

Advantages of the Proposed System

- **Enhanced Security**: The use of cryptographic techniques and a decentralized network provides robust protection against fraud and tampering.
- **Transparency and Accountability**: All transactions are publicly available on the blockchain, enabling transparent auditing and tracking.
- **Reduced Dependence on Intermediaries**: By eliminating central authorities, the system reduces transaction costs, enhances privacy, and minimizes delays.
- **Tamper-Proof Data**: Once a transaction is recorded, it cannot be modified without altering every subsequent block, making data tamper-resistant.
- **User Accessibility**: The web interface provides users with an intuitive and accessible way to interact with the blockchain, encouraging widespread adoption.

3.3 BLOCK DIAGRAM OF PROPOSED SYSTEM

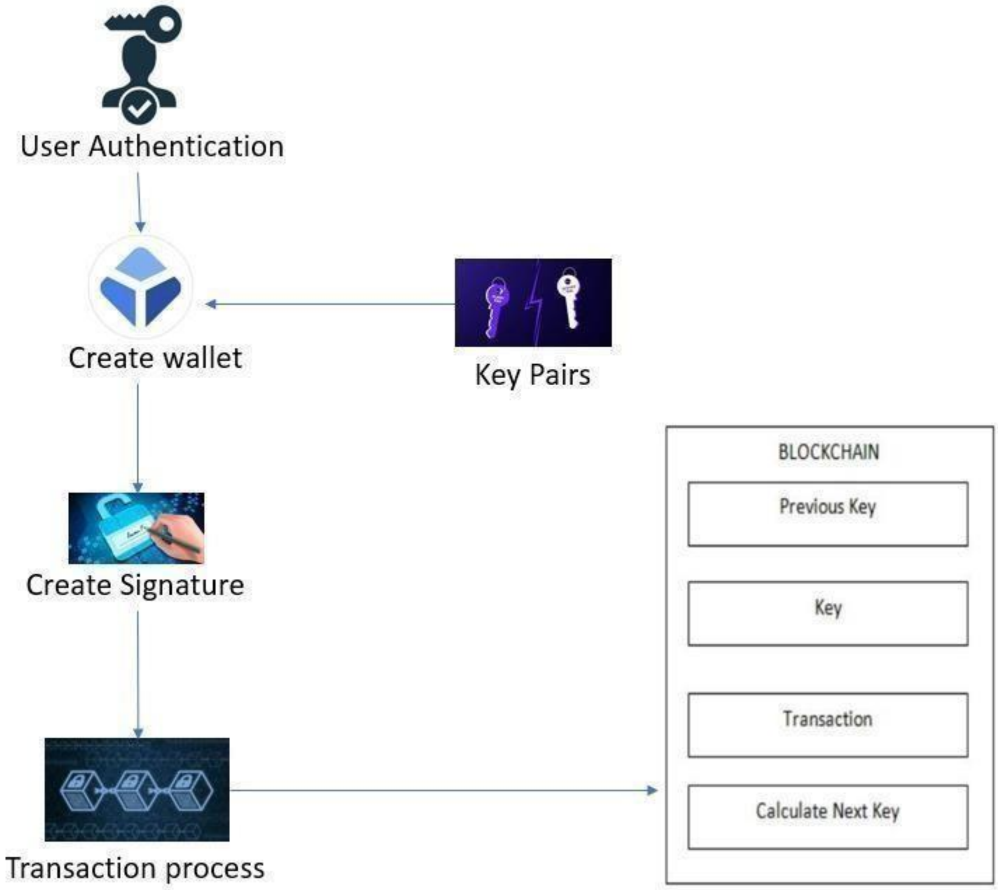


Figure 3.1: Proposed System

3.4 FLOWCHART

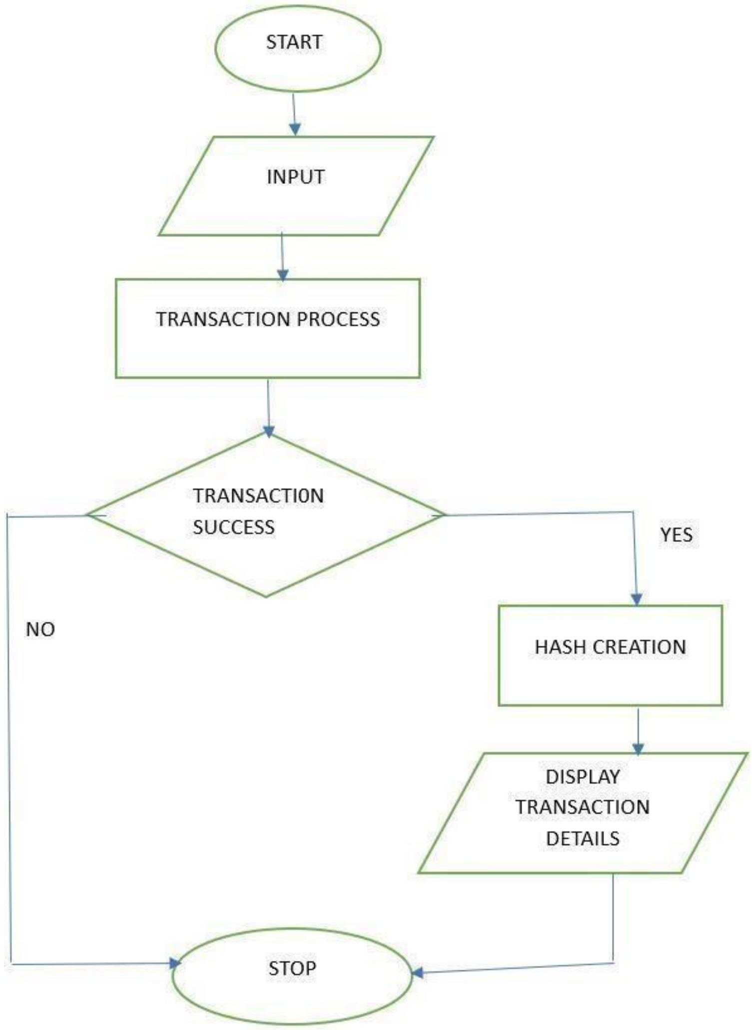


Figure 3.2: Flow Chart

3.5 PROCESS CYCLE

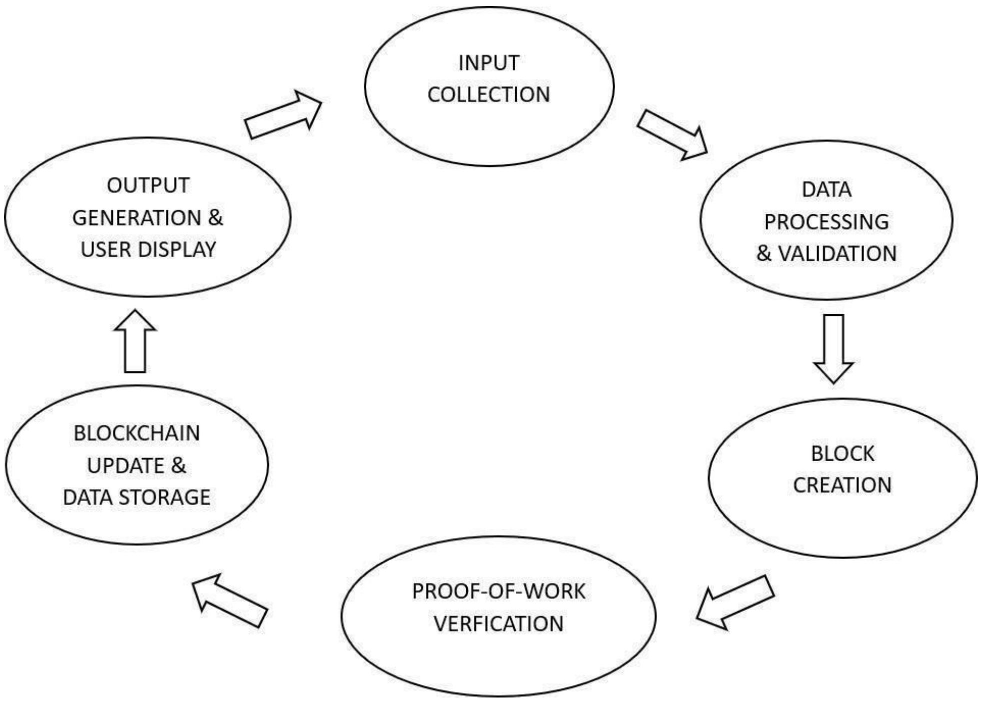


Figure 3.3: Life Cycle Process

3.6 ACTIVITY DIAGRAM

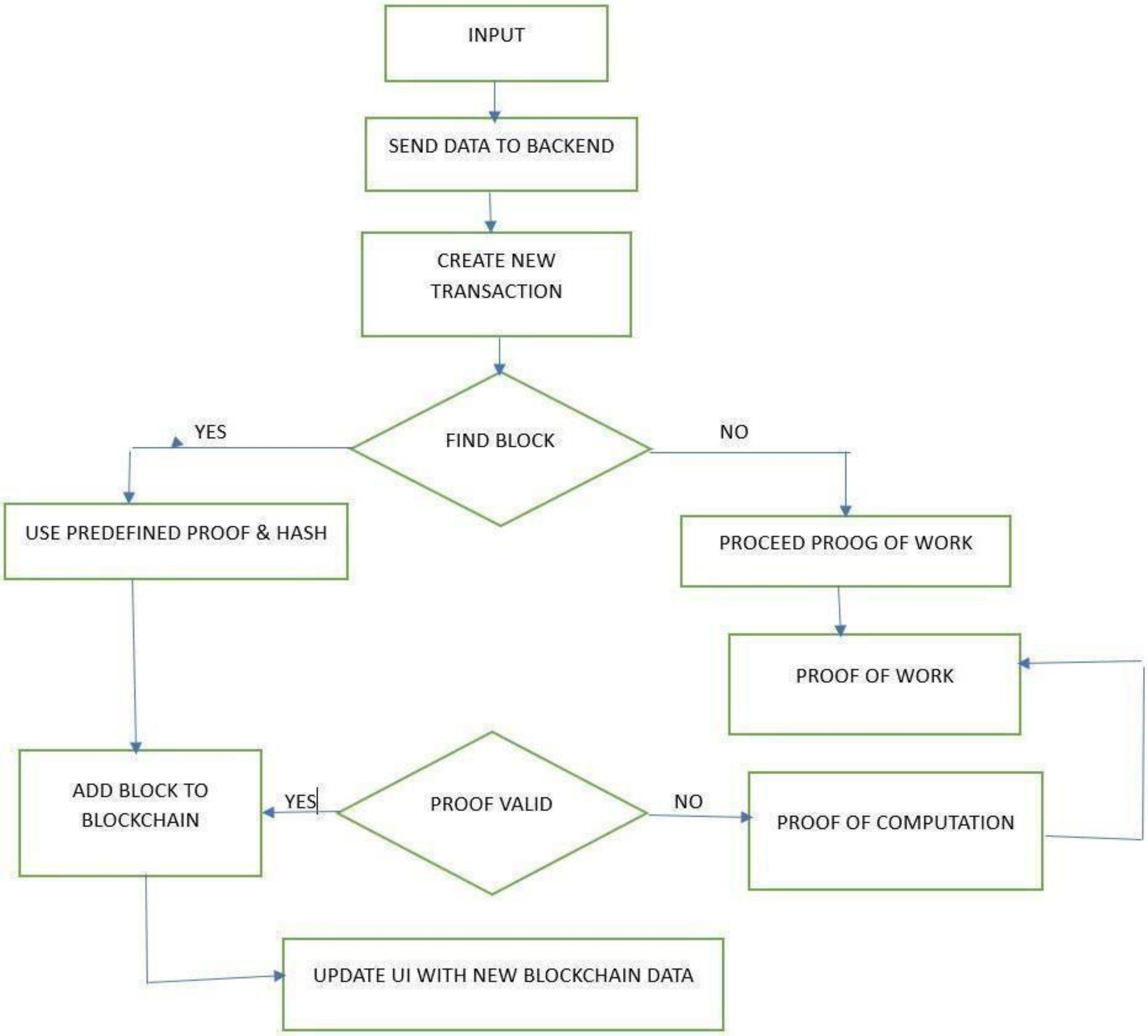


Figure 3.4: Activity Diagram

CHAPTER 4

MODULES

4.1 MODULE DESCRIPTION

- User registration Module
- Transaction management Module
- Blockchain ledger Module
- Security Encryption Module
- Proof-of-work and mining Module
- User interface Module

4.1.1 USER REGISTRATION MODULE

The User Registration Module serves as the initial step for any user who wants to perform a transaction within the blockchain system. It facilitates the process of capturing user inputs, such as the payee's name and the amount to be transferred. The module ensures that all required information is collected and verified for accuracy before the transaction is sent to the backend for further processing.

Through a web-based form, users are prompted to fill in their details, which are then subjected to input validation to ensure data integrity. This includes checking for empty fields, enforcing character limits, and applying data type constraints. If invalid data is detected, this module triggers error messages, providing clear instructions to the user for correction.

Additionally, the User Registration Module offers protection against potential security threats, such as injection attacks, by sanitizing user inputs. This guarantees that only legitimate and well-formatted data enters the system, reducing the risk of data manipulation. The module thus forms a robust mechanism for onboarding users and maintaining accurate transaction data.

4.1.2 TRANSACTION MANAGEMENT MODULE

This module is integral to the seamless execution of transactions. Once user input is validated and collected, the Transaction Management Module handles the processing of this data to create a new transaction. It serves as a liaison between the user interface and the blockchain ledger, ensuring that all data passed through is formatted correctly and consistent with the required standards.

This module organizes transaction data and prepares it for integration into the blockchain. It supports operations such as capturing and structuring transaction details and managing communication with backend processes. The Transaction Management Module ensures that data integrity is maintained throughout the lifecycle of the transaction, facilitating a smooth flow from user input to block creation.

In conjunction with other modules, such as the Blockchain Ledger Module, it ensures that data is correctly transmitted, verified, and linked to the appropriate blocks. Through this coordination, it plays a critical role in creating new transactions and maintaining the smooth operation of the blockchain system

4.1.3 BLOCKCHAIN LEDGER MODULE

The Blockchain Ledger Module forms the backbone of the system by managing the creation, validation, and linkage of blocks in the blockchain. Each block added to the chain contains crucial data, including transaction details, proof-of-work, and a cryptographic hash of the previous block. This structure ensures that the blockchain remains immutable and tamper-proof, providing a secure environment for transaction records.

This module oversees the generation of new blocks through cryptographic functions and links them with preceding blocks using unique hash values. By employing a consensus mechanism, it ensures that all blocks in the chain adhere to strict validation rules. Any discrepancies or tampering attempts are immediately detectable due to changes in hash values, preserving the integrity of the blockchain.

The Blockchain Ledger Module is also responsible for managing the storage and retrieval of blocks, enabling efficient access to transaction history. By maintaining the chain's integrity and linking each block securely, this module guarantees data reliability and trustworthiness.

4.1.4 SECURITY ENCRYPTION MODULE

Security and encryption form the foundation of any blockchain system, and this module is dedicated to safeguarding the data stored within the blockchain. It handles cryptographic operations, including the generation of secure hashes using the SHA-256 algorithm. Each block is assigned a unique hash, which acts as a digital fingerprint and ensures the integrity and authenticity of the block’s data.

The Security and Encryption Module also manages the proof-of-work mechanism that adds an extra layer of protection against unauthorized modifications. By requiring significant computational effort to generate a valid proof for each block, this module ensures that malicious attempts to alter the blockchain become computationally infeasible.

This module works in tandem with other modules, particularly the Blockchain Ledger and Proof-of-Work Modules, to maintain data confidentiality, integrity, and authenticity throughout the blockchain. It secures user transactions, guarantees the immutability of records, and upholds the trustworthiness of the system.

4.1.5 PROOF-OF-WORK AND MINING MODULE

The Proof-of-Work (PoW) and Mining Module is responsible for the consensus mechanism that secures the blockchain network. PoW involves solving complex mathematical puzzles, ensuring that each new block added to the blockchain meets specific validation criteria. The mining process plays a critical role in preventing malicious activities, such as double-spending and unauthorized changes to existing blocks. By requiring significant computational power and time to solve cryptographic puzzles, this module ensures that attackers must expend considerable effort to alter the blockchain, maintaining system security and integrity.

This module coordinates with the Blockchain Ledger and Security and Encryption Modules to validate blocks and ensure they meet network consensus rules. It guarantees that each block added to the blockchain is secure, validated, and unmodifiable, enhancing the robustness and reliability of the entire system.

4.1.6 USER INTERFACE MODULE

The User Interface (UI) Module acts as the front-end interface through which users interact with the blockchain-based money transaction system. This module provides a user-friendly and intuitive way for users to initiate and manage their transactions. It displays input fields for entering the payee's name and transfer amount, along with clear buttons and labels to guide the user through the transaction process.

This module is developed using HTML, CSS, and is integrated with Flask to create a responsive and interactive web-based interface. It features form elements where users can enter data, submit transactions, and view feedback. Upon submission, the module forwards user inputs to the backend for processing. While doing so, it employs client-side validation mechanisms to ensure that data entered by the user is in a valid format, minimizing errors and enhancing the user experience.

The User Interface Module also plays a key role in displaying the current state of the blockchain, including transaction history and block details. It presents the data in a visually appealing and comprehensible manner, allowing users to easily navigate through and understand the flow of their transactions. By providing an engaging, accessible, and functional interface, this module makes the system more user-centric and promotes smoother interactions between users and the underlying blockchain infrastructure.

CHAPTER 5

SYSTEM SPECIFICATION

5.1 SOFTWARE REQUIREMENTS

- Python
- Flask Framework
- HTML/CSS for user interface
- Web browser
- Visual Studio Code

5.2 HARDWARE REQUIREMENTS

- Computer with at least 4 GB RAM
- Processor: Intel i3 or higher (or equivalent)
- Hard Disk: Minimum 100 GB storage
- Stable Internet Connection (for certain functionality testing)

5.1.1 PYTHON

Python is the backbone of the project, providing an intuitive and powerful platform for building the blockchain system. The recommended version of Python for this project is Python 3.8 or above, as newer versions offer improved performance, enhanced syntax features, and support for modern libraries and frameworks. Python's simplicity, combined with its vast ecosystem of libraries, makes it highly suitable for tasks like cryptographic hashing, data processing, and implementing the proof-of-work algorithm.

Key Features and Specifications:

- **Version Compatibility**: Python 3.8+ is recommended.
- **Built-in Libraries Used**: hashlib, datetime, json.
- **Installation Method**: Python can be installed via official Python downloads or through package managers like Anaconda for an integrated environment.
- **Package Management**: pip (Python Package Installer) is used to manage dependencies and install additional libraries as needed.

To ensure seamless execution, developers should verify that Python is correctly installed by running python --version and pip --version commands in the terminal. This confirms that both the interpreter and package manager are available and operational

5.1.2 FLASK FRAMEWORK

Flask is a micro web framework that simplifies web application development by providing essential tools for request handling, routing, and rendering templates. Your project leverages Flask to create the web interface through which users interact with the blockchain system. Flask is lightweight yet powerful, offering flexibility to develop custom APIs and integrate with client-side technologies.

Key Specifications and Installation Steps:

- **Recommended Version:** Flask 1.1.2 or above.
- **Dependencies:** Flask typically requires Werkzeug, Jinja2, and other components that are installed automatically during the setup process.
- **Installation Command**: Use pip install Flask to install the framework.
- **Configuration:** The project should define a app.py file, which serves as the entry point for the Flask application. The app instance is created using Flask(_name_), and various routes are defined for handling user inputs and interactions.
- **Development Server:** The built-in development server of Flask can be initiated using the command python app.py, enabling quick testing and debugging of changes

In this project, Flask handles HTTP requests for user-submitted transactions, processes the data using backend logic, and renders responses via HTML templates. Flask's flexibility allows the seamless integration of blockchain operations, presenting users with a clean and responsive interface.

5.1.3 HTML/CSS for User Interface

HTML structures the content of your web application, while CSS styles and formats this content to provide a visually appealing user interface. The combination of these technologies is essential for creating an engaging user experience, particularly when it comes to capturing transaction data and displaying blockchain information.

Specifications for HTML/CSS Use:

- **HTML5** is recommended for defining the document structure, as it supports modern tags and enhanced semantic elements.
- **CSS3** provides the styling rules used to control layout, colors, fonts, spacing, and responsiveness.
- **Integration with Flask Templates:** Flask uses a templating engine called Jinja2, which allows embedding Python expressions directly into HTML. This facilitates the creation of dynamic pages that reflect real-time data from the blockchain ledger.

HTML Components Utilized:

Form Elements: Used to capture user inputs, such as payee Name and amount Transfer.

Styling Considerations: CSS is applied to enhance the user interface with visually distinct form sections, buttons, and blocks representing individual blockchain entries.

By employing HTML/CSS effectively, the project delivers a user-friendly and visually appealing front end that complements the underlying complexity of blockchain processing.

5.1.4 WEB BROWSER

A web browser serves as the medium through which users access the blockchain application’s user interface. It renders the HTML/CSS content generated by the Flask application, enabling users to interact with the system, submit data, and view transaction details.

Requirements and Specifications:

- **Recommended Browsers**: Google Chrome, Mozilla Firefox, Microsoft Edge.
- **HTML5 and CSS3 Compatibility**: The chosen browser should fully support modern web standards to ensure that all user interface elements render correctly.
- **JavaScript Support**: While your project’s primary reliance is on Python, certain client-side interactions may benefit from JavaScript (e.g., input validation or dynamic UI updates).

Browsers offer debugging tools, such as Chrome’s Developer Tools (accessible via Ctrl+Shift+I or Cmd+Option+I), which can be used to inspect and debug front-end elements, ensuring a seamless and responsive user experience.

5.1.5 VISUAL STUDIO CODE

Visual Studio Code is a robust and highly customizable text editor used to develop and manage the project's source code. It is designed for efficiency, providing an excellent coding environment with features tailored to modern development workflows. Developers use VS Code to write Python scripts, HTML/CSS files, and manage project dependencies.

Key Features and Specifications:

- **Version Compatibility**: Compatible with all modern operating systems (Windows, macOS, Linux).
- **Extension Support**: VS Code offers extensions such as Python for code linting, Flask for scaffolding and debugging, and Live Server for real-time page previews.

- **Integrated Terminal:** This feature allows developers to run commands, activate virtual environments, and launch the Flask development server without leaving the editor.
- **Code Navigation and Formatting:** VS Code supports IntelliSense (intelligent code completion), debugging tools, Git integration for version control, and code formatting.

Using VS Code ensures efficient development cycles with quick iteration, error catching mechanisms, and real-time collaboration through built-in Git support. It is particularly useful for managing complex projects with multiple interconnected components.

CHAPTER 6

METHODOLOGY

6.1 BLOCKCHAIN METHODOLOGY

Blockchain is a revolutionary technology that allows for decentralized, transparent, and immutable data storage. Unlike traditional centralized databases, a blockchain is a distributed ledger that is replicated across multiple nodes (computers) in a network. Each participant in this network maintains a copy of the ledger, and changes are recorded in new blocks that are cryptographically linked to the previous blocks, forming a chain.

In this project, the blockchain methodology is central to maintaining the integrity and security of money transactions. Each transaction is securely recorded in a block, and once a block is added to the chain, its data cannot be altered without changing every subsequent block. This ensures data immutability, which is a key feature of blockchain technology.

How it Applies to the Project:

- The project employs a blockchain class to create and manage a chain of blocks.
- Each block contains transaction data, including payee name, amount, the hash, timestamp and the proof of the previous block. This structure ensures that the data is secure, immutable, and traceable.
- The decentralized ledger approach eliminates the need for intermediaries (e.g., banks), providing transparency, security, and lower transaction costs.

Real-World Relevance: Blockchain is widely used in cryptocurrencies like Bitcoin and Ethereum, where transactions are recorded in a decentralized manner, making it highly secure and resistant to fraud.

6.2 PROOF-OF-WORK ALGORITHM

The Proof-of-Work (PoW) consensus algorithm is a key mechanism used in blockchain systems to ensure the validity of new blocks added to the chain. PoW requires participants, called miners, to solve complex mathematical puzzles that require computational effort.

In the project, PoW ensures that new transactions are validated before being added to the chain. The process begins by finding a valid proof (a number) that satisfies a predetermined condition when hashed together with the previous block's proof. Once the valid proof is found, it is appended to the new block, which is then added to the blockchain.

How it Applies to the Project:

- The project implements PoW to secure the blockchain from tampering by making block addition computationally expensive.
- Each new block undergoes a proof-finding process where an acceptable proof value is determined, ensuring that all transactions are verified before being recorded.

Real-World Relevance: PoW is famously used in the Bitcoin network to maintain consensus and security. It prevents spam attacks and ensures the integrity of transactions. However, it requires significant computational power, prompting discussions on alternative consensus mechanisms such as Proof-of-Stake (PoS).

6.3 WEB APPLICATION DEVELOPMENT METHODOLOGY

Web application development refers to creating web-based solutions that users can access through browsers. In this project, a web application serves as the user interface for interacting with the blockchain. The web app allows users to submit transactions, view the blockchain ledger, and interact with the decentralized system through a simple interface.

The web application is built using the Flask framework, which enables rapid development by providing essential components for web routing, request handling, and HTML template rendering.

How it Applies to the Project:

- Users can enter transaction data (payee name and amount) through an HTML form.

- The backend handles form submissions, validates data, and processes transactions by adding new blocks to the blockchain.
- The web app displays the current state of the blockchain, including all previous transactions, in a user-friendly format.

Real-World Relevance: Web applications are essential for providing user-friendly interfaces for complex systems like blockchain. They enable users to interact with decentralized ledgers without having to understand their underlying complexities.

6.4 FLASH WEB FRAMEWORK METHODOLOGY

Flask is a lightweight web framework for Python that simplifies web application development by providing essential functionalities such as routing, request handling, and template rendering. It follows a "microframework" philosophy, meaning it is designed to be simple and flexible, giving developers the freedom to build applications as needed without unnecessary complexity.

In this project, Flask is used to build the web interface for the blockchain system. The backend logic, including transaction processing and blockchain management, is seamlessly integrated with the frontend interface through Flask routes.

How it Applies to the Project:

- Routes are defined to handle requests from users, such as submitting a transaction or viewing the blockchain.
- Flask's templating engine (Jinja2) enables dynamic rendering of content, such as displaying blockchain data.
- The framework supports rapid development by providing tools for form handling, input validation, and HTML content rendering.

Real-World Relevance: Flask is widely used for building web applications due to its simplicity and flexibility. It is popular for building RESTful APIs, web dashboards, and lightweight applications, making it a good fit for blockchain projects.

6.5 DECENTRALIZED LEDGER TECHNOLOGY(DLT)

Decentralized Ledger Technology (DLT) refers to distributed data storage across multiple nodes in a network, where all participants have equal access and control. This eliminates the need for a central authority, increasing transparency, security, and resistance to tampering. DLT forms the basis of blockchain technology.

In this project, the blockchain functions as a decentralized ledger for recording and managing transactions. Though the project operates as a single-node implementation for demonstration purposes, it follows DLT principles by treating the blockchain as an immutable, transparent, and shared record.

How it Applies to the Project:

- Demonstrates the decentralized and distributed nature of data storage without central control.
- Highlights the benefits of using DLT for financial transactions, such as enhanced security, data immutability, and auditability.

Real-World Relevance: DLT has found applications in finance, supply chain management, healthcare, and more, where transparency and data integrity are crucial.

6.6 CRYPTOGRAPHIC HASHING TECHNIQUES

Cryptographic hashing ensures data integrity and security by converting input data into a fixed-size string of characters, which is unique to the input. Hashing is a one-way operation, meaning it cannot be reversed to obtain the original input. In blockchain, hashing is used to link blocks, generate proof values, and secure data.

In this project, the SHA-256 hashing algorithm is used to create cryptographic hashes for each block. This ensures that any change to a block's data would result in a different hash, making tampering evident.

How it Applies to the Project:

- Each block is hashed using the SHA-256 algorithm to create a unique identifier.
- The hash of each block links it to the previous block, maintaining the integrity of the blockchain.

Real-World Relevance: Hashing is fundamental to cryptography and is widely used in data security, password storage, and digital signatures.

6.7 CLIENT – SERVER ARCHITECTURE

The project employs a client-server architecture, where the client (web browser) interacts with the server (Flask application) to process user requests. The client sends requests to the server, which processes the data and sends a response back to the client.

How it Applies to the Project:

- The server handles requests for creating new blocks and updating the blockchain.
- The client displays transaction forms and renders the blockchain for user interaction.

Real-World Relevance: Client-server architecture is a fundamental model in web development, enabling dynamic interactions between users and backend systems.

6.8 HTML/CSS FRONTEND DESIGN METHODOLOGY

HTML and CSS define the structure and presentation of web pages. In this project, HTML is used to create forms for user inputs and display blockchain data, while CSS controls the visual styling.

How it Applies to the Project:

- HTML defines the form for entering transactions and displays blockchain data.
- CSS ensures that elements are visually appealing and responsive.

Real-World Relevance: HTML and CSS are the building blocks of web design, essential for creating user-friendly interfaces.

6.9 USER INTERFACE MODULE

The user interface module focuses on creating an interactive frontend for the blockchain system. It includes form handling, data input validation, and dynamic content rendering.

How it Applies to the Project:

- Allows users to submit transactions and view blockchain data in real-time.
- Provides a responsive design for seamless user interaction.

Real-World Relevance: A well-designed user interface is crucial for user adoption and engagement with any software application.

CHAPTER 7

CONCLUSION AND FUTURE ENHANCEMENT

7.1 CONCLUSION

The "Secured Transaction of Money Using Blockchain" project leverages blockchain technology to revolutionize traditional financial transactions by offering a secure, decentralized, and transparent solution. Unlike centralized financial systems, the project utilizes a custom blockchain ledger where transaction data such as payee names and amounts are recorded within immutable blocks, linked together using cryptographic hashes. This decentralized ledger prevents tampering, ensuring data integrity and transparency. By employing the Proof-of-Work algorithm, the project further secures the blockchain, making it computationally challenging to alter or compromise data. This focus on immutability and robust security establishes trust and minimizes the risks associated with centralized financial intermediaries.

A key feature of the project is its user-friendly interface, built using the Flask web framework, which allows users to submit transactions and view blockchain data in real-time. This seamless integration between the frontend and backend ensures that complex blockchain operations are accessible to end-users. The project also utilizes cryptographic hashing (SHA-256) to generate unique digital fingerprints for each block, linking them securely while allowing any tampering attempts to be easily detected. Together, these elements demonstrate how blockchain's decentralized and secure nature can transform money transactions.

The project’s modular design, featuring a client-server architecture, highlights its scalability and adaptability.This implementation serves as a model for future enhancements, paving the way for more efficient consensus mechanisms, scalability improvements, and broader applications of blockchain technology in financial systems.

7.2 FUTURE ENHANCEMENT

The "Secured Transaction of Money Using Blockchain" project has immense potential for future enhancements, enabling it to address real-world financial challenges more effectively. One primary area of improvement is scalability. Integrating layer-2 solutions, like state channels and sidechains, would allow for faster and more efficient transaction processing by offloading data from the main chain. Transitioning from proof-of-work to a proof-of-stake consensus mechanism would also reduce energy consumption while maintaining system security.

To further strengthen security, advanced encryption standards and zero-knowledge proofs (ZKPs) could be implemented, enhancing privacy without compromising transaction validity. The integration of smart contracts would automate complex workflows, increasing operational efficiency and reducing manual errors. Enhancing the user interface through mobile accessibility, multi-language support, and multi-factor authentication would make the platform more user-friendly and secure.

Incorporating external payment system integration would bridge traditional finance with blockchain, expanding real-world use cases. Addressing environmental concerns with energy-efficient consensus mechanisms and sharding would ensure sustainability. Ensuring regulatory compliance through KYC and AML protocols would increase trust and legal adherence. AI-driven fraud detection systems could further bolster security by identifying and mitigating suspicious behavior in real-time. By supporting multiple cryptocurrencies and leveraging these advancements, the project can evolve into a robust, user-friendly, and sustainable financial platform.

APPENDIX – 1

SOURCE CODE

App.py

```
from flask import Flask, render_template, request, redirect, url_for
import hashlib
import datetime
import json
import logging

app = Flask(_name_)

# Set up logging to console
logging.basicConfig(level=logging.DEBUG)

# Blockchain class
class Blockchain:
    def___init_(self):
        self.chain = []
        # Create the genesis block
        self.create_block(proof=1, previous_hash='0')

    def create_block(self, proof, previous_hash, data=None):
        block = {
            'index': len(self.chain) + 1,
            'timestamp': str(datetime.datetime.now()),
            'proof': proof,
            'previous_hash': previous_hash,
            'data': data
        }
        block_hash = self.hash(block)
        block['hash'] = block_hash  # Add the block hash to the block
```

```
        self.chain.append(block)
        app.logger.debug(f"New block created: {block}") # Log the block creation
        return block

    def get_previous_block(self):
        return self.chain[-1]

    def proof_of_work(self, previous_proof):
        new_proof = 1
        check_proof = False
        while not check_proof:
            hash_operation = hashlib.sha256(str(new_proof**2 -
previous_proof**2).encode()).hexdigest()
            if hash_operation[:4] == '0000':
                check_proof = True
            else:
                new_proof += 1
        return new_proof

    def hash(self, block):
        encoded_block = json.dumps(block, sort_keys=True).encode()
        return hashlib.sha256(encoded_block).hexdigest()

    def is_chain_valid(self):
        previous_block = self.chain[0]
        block_index = 1
        while block_index < len(self.chain):
            block = self.chain[block_index]
            if block['previous_hash'] != self.hash(previous_block):
                return False
            previous_proof = previous_block['proof']
```

```
            proof = block['proof']
            hash_operation = hashlib.sha256(str(proof**2 -
previous_proof**2).encode()).hexdigest()
            if hash_operation[:4] != '0000':
                return False
            previous_block = block
            block_index += 1
        return True
# Instantiate the Blockchain
blockchain = Blockchain()
@app.route('/')
def index():
    app.logger.debug(f"Current blockchain: {blockchain.chain}") # Log the blockchain
state
    return render_template('index.html', chain=blockchain.chain)
@app.route('/submit_transaction', methods=['POST'])
def submit_transaction():
    payee_name = request.form['payeeName']
    amount_transfer = request.form['amountTransfer']
    data = {
        'PayeeName': payee_name,
        'AmountTransfer': amount_transfer
    }
    previous_block = blockchain.get_previous_block()
    proof = blockchain.proof_of_work(previous_block['proof'])
    previous_hash = previous_block['hash']
    block = blockchain.create_block(proof, previous_hash, data)

    # Print the transaction details along with the hash in the terminal
    app.logger.debug(f"New transaction submitted:")
    app.logger.debug(f"PayeeName: {payee_name}")
```

```
    app.logger.debug(f"AmountTransfer: {amount_transfer}")
    app.logger.debug(f"Block Hash: {block['hash']}")
    app.logger.debug(f"Previous Hash: {previous_hash}")
    return redirect(url_for('index'))
if __name__ == '__main__':
    app.run(debug=True)
```

index.html

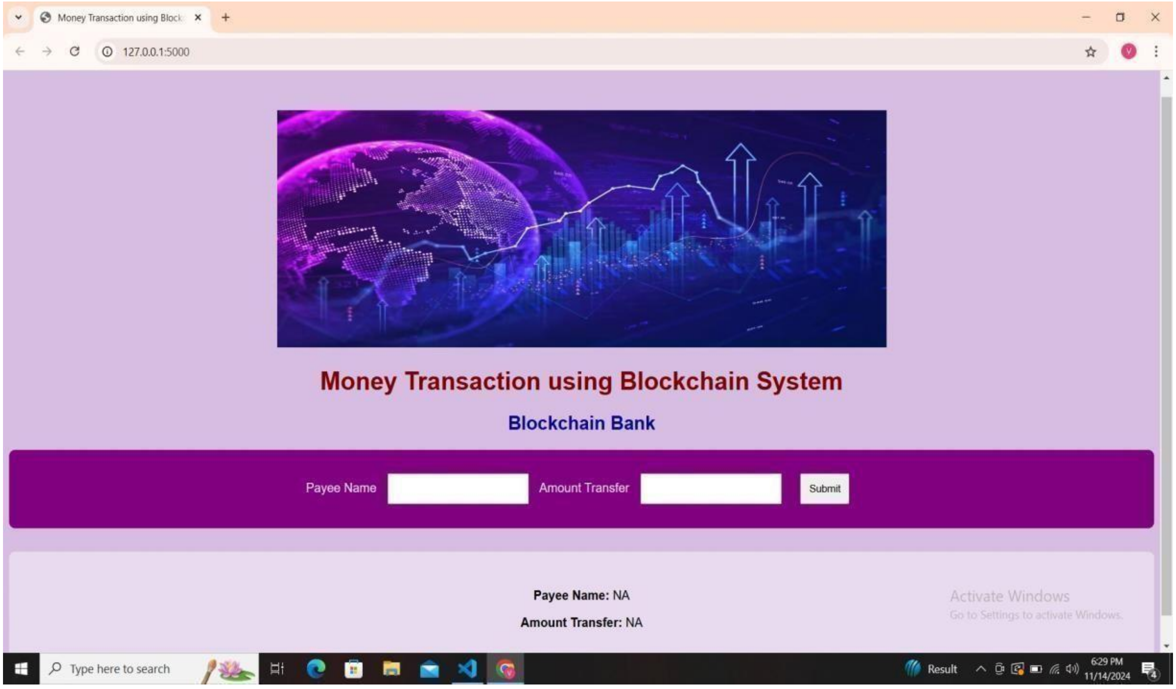
```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Money Transaction using Blockchain System</title>
    <style>
        body { font-family: Arial, sans-serif; }
        .container { text-align: center; margin-top: 50px; }
        #transaction-form { background-color: #800080; padding: 20px; border-radius: 8px; color: #e8daef; }
        .blockchain { margin-top: 30px; padding: 20px; border-radius: 8px; background-color: #e8daef ; }
        h1 { color: #800000; }
        h2 { color: #0000A5; }
        .block { padding: 10px; border: 1px #c39bd3; margin-bottom: 10px; }
        input[type="text"], input[type="submit"] { padding: 10px; margin: 10px; }
    </style>
</head>
<body>
      <div class="container">
        <!-- Adding a logo -->
```

```
        <img src="{{ url_for('static', filename='blockchain.jpg') }}" alt="Bank Logo"
height="300" width="800" style="margin-top: 20px;">
        <body style="background-color: #d7bde2;">
        <h1><b>Money Transaction using Blockchain System</b></h1>
        <h2>Blockchain Bank</h2>

        <!-- Transaction Form -->
        <div id="transaction-form">
            <form action="{{ url_for('submit_transaction') }}" method="POST">
                <label for="payeeName">Payee Name</label>
                <input type="text" name="payeeName" required>
                <label for="amountTransfer">Amount Transfer</label>
                <input type="text" name="amountTransfer" required>
                <input type="submit" value="Submit">
            </form>
        </div>

        <!-- Blockchain Display -->
        <div class="blockchain">
            {% for block in chain %}
            <div class="block">
                <p><strong>Payee Name:</strong> {{ block.data['PayeeName'] if
block.data else 'NA' }}</p>
                <p><strong>Amount Transfer:</strong> {{ block.data['AmountTransfer'] if
block.data else 'NA' }}</p>
            </div>
            {% endfor %}
        </div>
    </div>
 </body>
</html>
```

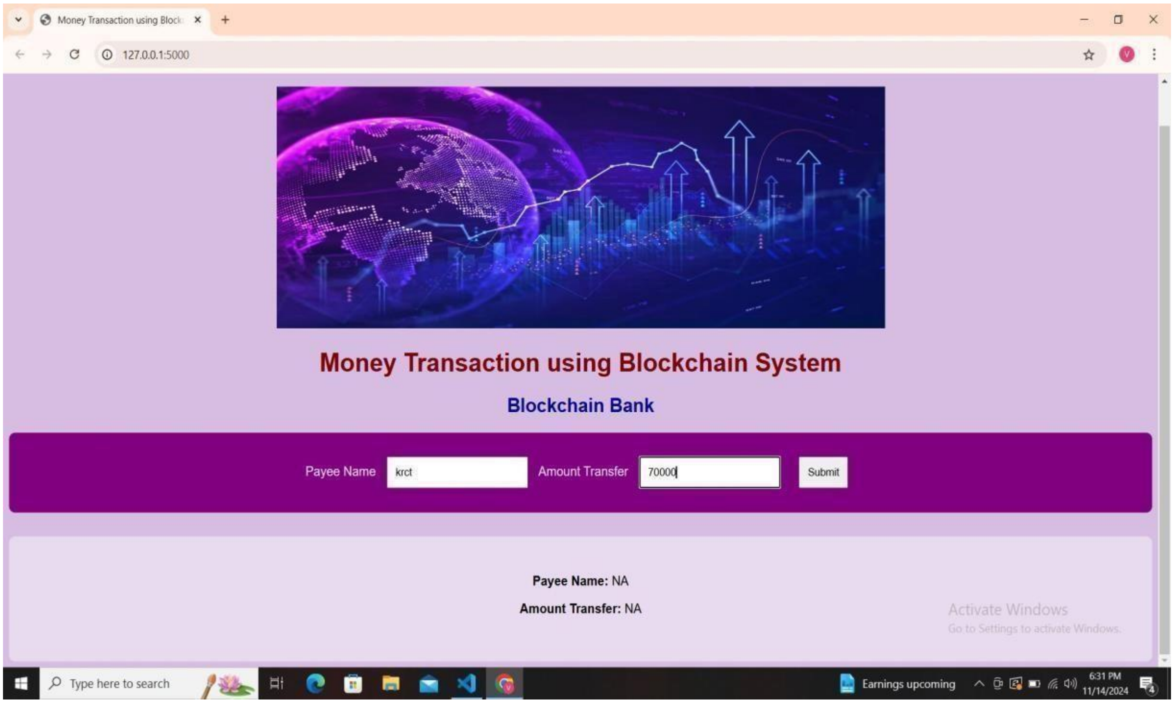
APPENDIX – 2

SCREENSHOTS

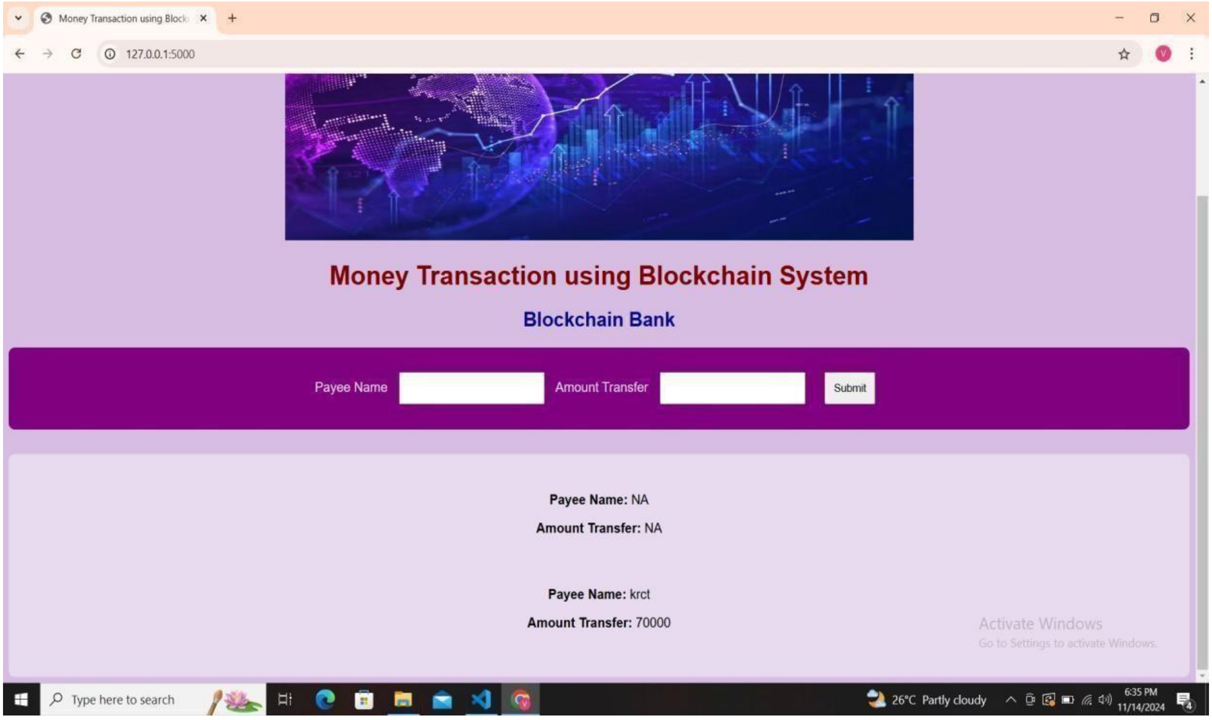
Sample Output



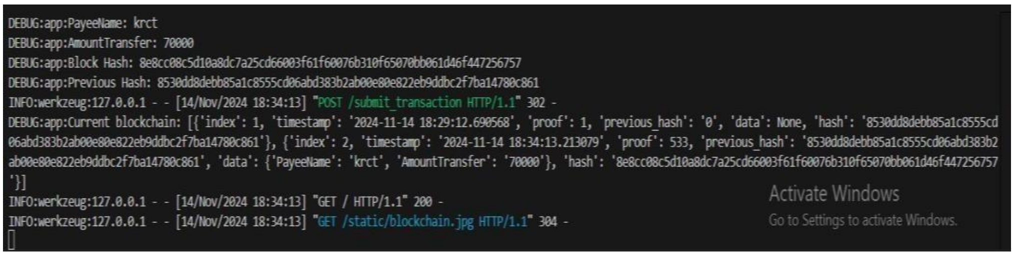
User Interface



Transaction Process



Transaction Details



Hash Values

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