Secure Banking System Using Block-chain Technology

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Abstract: **The growing demand for secure and efficient banking solutions has driven the exploration of blockchain technology. This paper presents a comprehensive study on the implementation of a blockchain-based banking system to enhance security, transparency, and efficiency. By decentralizing data storage and employing cryptographic techniques, blockchain mitigates risks associated with traditional banking systems, such as fraud, data breaches, and operational inefficiencies**

I. INTRODUCTION

A "Secure Banking System Using Blockchain Technology" aims to make banking safer by utilizing blockchain. This technology helps protect data, ensures transparency, and prevents fraud in financial transactions. Our system provides a secure and reliable solution for modern banking needs. By decentralizing the ledger, we reduce the risk of data breaches and enhance customer trust.Incorporating blockchain in banking not only improves security but also enhances privacy through the use of cryptographic techniques. Customers' personal and financial data can be encrypted and accessed only by authorized parties, reducing the risk of data breaches. Smart contracts, self-executing agreements with terms written into code, further enhance the automation and reliability of banking services. They ensure that transactions, loans, and other banking operations are executed automatically when predefined conditions are met. This reduces human error and accelerates processes, making banking more efficient. Blockchain technology also supports financial inclusion by offering services to unbanked populations. Since blockchain systems are decentralized, they can operate without the need for traditional banking infrastructure, enabling cross-border transactions and reducing reliance on centralized financial institutions. Additionally, by using permissioned blockchains, banks can maintain control over access while still benefiting from the security and transparency of distributed ledgers.

II. EASE OF USE

A. User-Friendly Design and Automation:

The "Secure Banking System Using Blockchain Technology" prioritizes ease of use, ensuring a seamless experience for both banking staff and customers. The system features an intuitive, user-friendly interface, allowing users with minimal technical expertise to easily navigate and perform essential banking functions. By integrating smart contracts, the system automates complex transactions, reducing the need for manual intervention and minimizing the risk of human errors. This automation simplifies operations and enhances the overall efficiency of banking processes. Transparency, Security, and Efficiency

B. Transparency, Security, and Efficiency:

Blockchain technology significantly improves transparency by allowing users to track transactions on an immutable ledger, fostering greater trust and accountability. While the system employs advanced cryptographic techniques to ensure robust security, it maintains a balance between security and convenience, allowing users to perform daily banking tasks efficiently without unnecessary complexity.

III. LITERATURE REVIEW

Due to this, system is more vulnerable hackers as the information is located in one place. The know your customer will be stored in block chain so whenever other bank need to verify new customer that bank can directly see that know your customer.

[1] Tong Wu and Xiubo Liang, has proposed the typical architecture of block chain application consists of the application layer, the interface layer, the shared protocol the shared data layer.

[2] Quoc Khanh Nguyen, has introduced the advantages and of block chain like Block chain promotes keenly intellective contracts, which increases the efficiency of transactions.But also has

drawbacks such as it limits the competitiveness between banks to improve their own system asblockchainnetworkwillbe shared among all banks participated in the system . And incompleteness in terms of legal and regulation on Bitcoin and crypto currencies prevents.

[3]. Konstantinos Christidis and Michael Devetsikiotis, motivated by the recent explosion of interest around block chains, it is examine whether they make a good fit for the Internet of Things sector. Block chain allow us to have a distributed peer-to-peer network where nontrusting members can interact with each other without a trusted intermediary

[4]. Xiwei Xu and Shiping Chen, Liming Zhu, has concluded that crypto currency are lowcost,quick,shielded and basically and mostly self-governing of any (not controlled by one central place) authority to move virtual money or issue new units of money. New units of money are issued by the users of the crypto currency through mining by validating transactions. The virtual money can be transferred to users without going trusted authority to buy products and services in real world. through

IV METHODOLOGY

The “Secure Banking System Using Blockchain Technology” development methodology embeds a MetaMask with Web3 technology to provide secure, decentralized interactions with the blockchain. MetaMask will function as a browser extension for users to manage blockchain wallets and perform transactions securely. Web3.js will be injected into the web application to interact transparently between the frontend and blockchain. The system interacts with smart contracts through Web3, which will create user-initiated banking transactions directly from their web browsers, including fund transfers or loan agreements. SHA-256 hashing will be used to ensure the integrity of the data and transactions, while smart contracts will be utilized to manage and automate banking operations requiring lower-touch banking processes. The incorporation of MetaMask with Web3 will provide a decentralized frictionless user interface for users to manage their transactions securely, with the transparency and immutability of blockchain technologies. Various testing will assure compatibility and security of the user's interactions with MetaMask, Web3, and through the blockchain infrastructure.

V PROBLEM STATEMENT

Legacy banking systems are centralized, and therefore highly susceptible to risks, including data breaches, fraud and unauthorized access. This significantly hampers their Legacy banking systems are centralized and, therefore, highly susceptible to risks such as data breaches, fraud, and unauthorized access. This significantly hampers their transparency, leading to customers' concerns about the security of their financial transactions and the authenticity of transaction records. Additionally, these legacy systems suffer from data integrity issues, which can result in data loss or corruption through unauthorized manipulation, introducing transaction errors or invalidated records. Traditional banking is slow and costly due to manual regulatory processes, human error, and reliance on expensive intermediaries. These systems lack the technical strength to protect against modern security risks and meet the growing demand for highly secure, cost effective,and transparent transactions.In our blockchain-based banking application, data is stored in blocks on a decentralized network rather than a centralized database, reducing the risks associated with centralized systems. Users interact with the blockchain through the browser-based wallet, MetaMask, and Web3 technology, which the application is integrated with. Authorized users can access the immutable ledger at any time to inspect transaction data, while also preserving an authorized copy of the transaction in their local system.

These users can verify all transactions in real-time. The system utilizes cryptographic methodologies and hashing algorithms to ensure data quality and safety standards. The application operates using smart contracts, eliminating intermediaries and reducing processing times for financial transactions. A code-based transaction method, integrated into the frontend of the application, facilitates user transactions without browser interruptions. As a result, users do not waste time generating or noting sequences or clicking on a ‘Do a bank transaction’ button—transaction handling is done within the same interface. This innovative, user-friendly approach simplifies the entire transaction process. By future-proofing the system to run on the blockchain main net and aligning it with modern Web3 standards and tools such as MetaMask and Web3, the system ensures the maximum security that blockchain technology offers.

VI. PROPOSED SYSTEM

Communication with the blockchain consists of two key modules: User and Admin. The User module includes sub-modules such as money transfer and Receiver Address generation, while the admin module is responsible for viewing user requests and adding branch details.

a) Functional Elements: The functional analysis process includes validating test cases to confirm the system's functionality. Due to its complexity, the system is further divided into smaller functional elements. Each element represents a functional task and an aspect of productivity, making it testable on an individual level. This applies to entities such as authentication, output, execution, etc. During the verification process, each functionality of the system is thoroughly tested with various types of inputs. Authentication is implemented through MetaMask, ensuring that only users who are verified can operate the system.

b) Authentication Analysis: Once a user successfully adds a beneficiary, they are given the option to transfer funds using Receiver Address generation. The Entered token in the left is secured using JSON Web Tokens (JWT) and travels across two semantic nodes within the blockchain. When the user generates the Receiver Address , the previously generated token is decrypted, and subsequent processing at NODE2 is halted while waiting for a valid token from NODE1. The source code ensures that there are no changes to the token. A set of halts is configured for the corresponding user details, based on how the network transfers the funds. These details are compared with the bank records at NODE2. The Receiver Address completes the transaction if the two sets of data are valid.

c) Non-Functional Requirements: This section indicates the performance, safety, and design of the system. For performance, this includes how quickly the pages load, how efficiently resources are consumed, and the overall security of the system. The system will also provide Receiver Address -based transaction functionality to enhance user experience, making banking transactions more secure and convenient. The user interface design will adhere to standard design styles for modern systems to promote usability and accessibility. Security and a seamless user experience are achieved using tools such as MetaMask, Web3.js, and a basic frontend environment that allows users to interact securely with the blockchain.

d) Perform Requirements Analysis: The system will be evaluated based on the size of the blockchain network, the anticipated volume of transactions, the consensus protocol employed, and latency issues. Performance tests will be conducted to assess whether the blockchain operates smoothly and that processes are not impeded. By establishing these performance requirements, the application will adhere to industry standards to provide an acceptable level of reliability and speed.

e) Safety Requirements: Users need to log in to the system with their credentials before accessing their accounts. To trigger a beneficiary or perform a money transfer, the user is required to generate a Receiver Address after entering a transaction password provided to them during registration. These multi-factor authentication methods help ensure that only authorized users can access their accounts.

f) Security Requirements: Once signed in to the system, users will be directed to their landing pages based on their assigned roles. Access permissions to different pages in the system are granted by the bank's admin, who verifies and approves requests for new user registrations. Admins will also amend user permissions when necessary. For money transfers, the system ensures that the sender and receiver entry details match before executing the payment transaction, thereby ensuring security.

g) Design Requirements: The application is built using various tools, such as Remix IDE for developing smart contracts on the blockchain, along with MetaMask and Web3.js for blockchain interaction. The frontend environment facilitates seamless transactions, with a Receiver Address feature used to initiate transactions for system users. The user experience is effectively designed to allow for simple transactions. processing, but also Feel free to let me know if you need any further adjustments or context

h) System Requirements: Basic system hardware and software component requirements include a secure web browser environment with MetaMask installed, along with a blockchain network supported by Web3.js. Overall,

Receiver Address functionality enables system users to initiate fast, easy, and secure transactions while ensuring the integrity of the system.

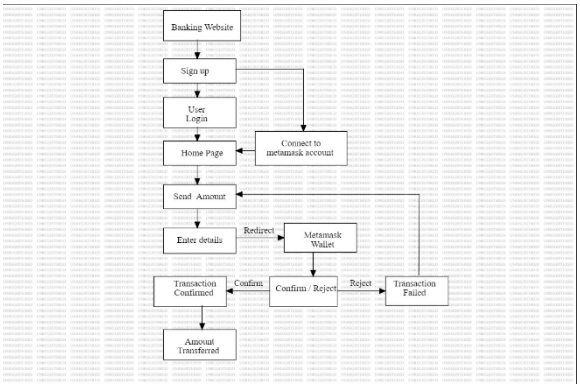
i) Hardware Requirements: Specific hardware components are essential for a computer to fulfill all software requirements.The most common set of requirements includes the physical computer resources needed by a software application. These prerequisites are referred to as system requirements.

VII. OBJECTIVES

The primary aim of the banking system is to significantly improve security by utilizing the technology behind blockchain to provide strong resistance against fraud and unauthorized access. Blockchain technology encrypts data and distributes it throughout a decentralized network, which means that an attacker has virtually no chance of compromising or altering sensitive information, addressing significant vulnerabilities in legacy centralized banking systems. In addition, the proposed banking system is designed to enhance transparency, making all financial transactions visible through an immutable ledger accessible to authorized users. This transparency increases the confidence of customers and regulators, as every transaction can be seen and verified without revealing sensitive information. Finally, the proposed banking system improves data integrity by preventing any changes once information is recorded; using cryptographic mechanisms and consensus protocols, the accuracy of transaction records is maintained.

Complementary purposes include seeking efficiencies in banking processes by reducing manual tasks and eliminating intermediaries. The use of smart contracts automates transactions, leading to faster processing, fewer mistakes, and lower operational costs. Improved efficiencies make banking seamless and more affordable for both banks and customers. Additionally, the adoption of modern blockchain technology ensures that the system is future-proof and will adapt as security threats and industry standards evolve. By utilizing best-in-class blockchains, the system provides a modern, secure, and efficient banking solution that mitigates the limitations of legacy banking infrastructures.

VIII.ARCHITECTURE



The flowchart refers the transaction process on our Banking Website Page. Users commence by creating an account or logging in. Subsequently, they navigate to the homepage and initiate a transaction by entering the desired amount. The system then redirects users to their Metamask wallet for confirmation. Upon confirmation, the transaction is processed, and the funds are successfully transferred. However, if the user rejects the transaction, it is deemed unsuccessful.

This flowchart depicts the transaction flow in a simple manner making it easy for the users to comprehend and be aware of what is going on. Additionally, it serves as a valuable tool for developers and stakeholders, facilitating the analysis and optimization of the transaction process.

IX.CONCLUSIONS

The application of blockchain consensus for embedding banking regulations was our strategy in this project, improving both the efficiency of the consensus model and the rationale for decentralization. There are several advantages of blockchain technology, including the synchronization of different processes, data integrity, and the uniqueness of all information produced across a distributed system. Achieving consensus and establishing trust on the blockchain is one of financial transactions and behaviours, even without being mediated by a central authority, are captured within a distributed ledger. These distributed mechanisms make any substantial attempt to alter data and access to that ledger virtually impossible, enabling the development of a secure and trusted global banking system. Thus, blockchain provides the ability to be decentralized while maintaining a transparent view of all assets—an important characteristic for the banking industry, particularly in reducing fraudulent behaviour. Transparency and decentralization through blockchain consensus are key methods for

addressing recent cases of fraud and unauthorized user access within banks.

X. REFERENCES

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