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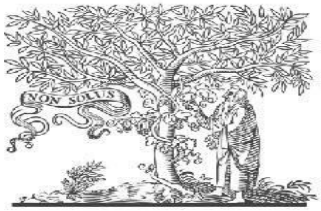

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Title **IMPLEMENTATION OF BANKING SYSTEM USING SMART CONTRACTS AND ETHEREUM BLOCKCHAIN**

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Implementation of Banking System using Smart Contracts and Ethereum Blockchain

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Abstract

Online transactions could be made explicitly from one entity to the other using peer-to-peer electronic cash instead of going via a financial institution. The fundamental advantages of digital signatures are lost if a trusted third party is still needed to prevent double-spending. Double spending can be avoided via Proof-of-Stake (PoS) technique. We employ the Ethereum Blockchain, which secures the network and uses proof of work (PoW) validation to confirm the transactions in each block. The goal of this project is to develop a banking system that mimics online payments using smart contracts, as well as a system of rewards for customers who deposit money in the bank. Money can be sent and received between users. In addition, users can cash out their money. Any users who have deposited money into the bank can receive rewards from the bank's owner when they are due. The bank reserves give the owner access to details about every customer who has made a deposit, as well as the amount of money made. Users can deposit and withdraw funds from a virtual bank according to their preferences, processing online transactions and rewarding users without necessitating their faith in a financial organization.

Keywords: Blockchain, Smart Contracts, Proof Of Stake (POS), Ethereum, Web3.js, Truffle-framework, Ganache, Solidity

Introduction

The traditional banking system has been the primary means of managing financial transactions for centuries. However, it has limitations and inefficiencies that prevent it from fully meeting the needs of modern society. Central banks use a variety of monetary policy strategies to carry out their missions. They do, moreover, have full authority over the amount of cash and interest rates. A central bank, for example, could alter the amount of money in circulation in an economy. Increased consumer spending leads to economic growth. When the economy has less money, people spend less, which results

in a recession. Imports, exports, and foreign investment are all affected by central bank operations. For instance, high interest rates can deter foreign entities from investing in real estate, whereas low interest rates can encourage investment. Decentralized banking, also known as decentralized finance (DeFi), is a rapidly growing field that seeks to address these shortcomings by leveraging blockchain technology. One of the most promising platforms for building decentralized banking applications is Ethereum, which provides a robust infrastructure for creating smart contracts and decentralized applications (dApps).

This paper explores the use of Ethereum blockchain technology for building a decentralized banking system that enables individuals to have full control over their financial transactions. The proposed system leverages the trustless environment created by the Ethereum blockchain to eliminate intermediaries and provide a more transparent, efficient, and secure financial infrastructure accessible to everyone. By eliminating intermediaries, the proposed system can significantly reduce transaction fees, improve transaction speed, and increase the security of financial transactions.

This research paper aims to describe the architecture of the proposed decentralized banking system, evaluate its effectiveness in terms of security, efficiency, and scalability, and discuss the potential implications of decentralized banking for financial inclusion and the future of banking.

Literature Survey

Author Alharbi proposed a research paper with the title "Blockchain-based Decentralized Banking System using Ethereum Smart Contract" on decentralized banking system that uses smart contracts on the Ethereum blockchain [1]. Here, the proposed system is used to facilitate transactions between customers and banks. Rather than proposing the authors argue that this approach could help the banking sector to improve transparency, security, and efficiency.

Authors Kim and Choi have done their research and published a paper with the title "A Survey of Blockchain-based Decentralized Finance" in which they provided an overview of decentralized finance (DeFi) and the role played by the blockchain technology in enabling the DeFi [2]. The authors also discussed about the potential benefits of DeFi, including lower costs, increased accessibility and reduced reliance on intermediaries.

Authors Kumar and Verma proposed a research paper with the title "An Analysis of Decentralized Finance (DeFi) using Ethereum Blockchain" in which they analyzed the DeFi ecosystem and how the Ethereum blockchain is used in the DeFi applications [3]. The authors also discussed about the advantages of DeFi such as increased liquidity and

transparency. Along with the advantages they have also talked about the challenges and risks associated with the emerging field.

Authors Ma and Zhu proposed a research paper with the title "Smart Contract-based Decentralized Banking System with Security Considerations" that proposes a smart contract-based decentralized banking system which considers about the security issues related to current banking system such as data privacy and authentication [4]. The authors also highlighted about the advantages of using smart contracts and Ethereum blockchain in creating a banking system which is more secure and efficient.

Authors Mukherjee and Taneja proposed a research paper with the title "Decentralized Banking using Smart Contracts: A Review of Ethereum-based Solutions" in which they have done a review and provided a summary on various Ethereum-based solutions for decentralized banking using smart contracts [5]. The authors also discussed about the advantages and limitations of these solutions and identify potential the potential areas for future research.

Problem Identification

Decentralized finance (DeFi) has received a lot of attention recently because of its potential to transform traditional financial systems. However, trust, security, and scalability are obstacles to DeFi adoption. By enabling smart contracts and decentralized applications, Ethereum blockchain technology offers a promising solution to these challenges. The goal of this study is to investigate the implementation of a decentralized banking system using Ethereum blockchain technology to address the challenges that traditional banking systems face. The research will look into the advantages and disadvantages of implementing such a system, as well as the potential impact on the financial industry. The research will also investigate the proposed system's design and implementation details, as well as its feasibility, scalability, and security. Overall, the goal of this research is to add to the growing body of knowledge on the use of blockchain technology in the financial sector, as well as to provide insights into the potential benefits and challenges of decentralized banking systems.

Methodology

Decentralized finance does rid of middlemen by enabling individuals, businesses, and organizations to conduct financial transactions using emerging technology. This is accomplished using peer-to-peer financial networks that make advantage of connection, security protocols, software, and hardware advancements. Using software that stores and verifies financial transactions in distributed financial databases, users can lend, trade, and borrow from any location with an internet connection. Accessible

from numerous places, a distributed database gathers and aggregates data from all users and verifies it via a consensus mechanism.

Independent financing By enabling anybody to access financial services, regardless of who they are or where they are located, this technology can be used to eliminate centralized financial models. DeFi programs provide customers with more control over their money through customized trade services and personal wallets. Because its software does not require a lot of human interaction or intervention, cryptocurrencies never stop operating because they use automated ways. Because of this, they are offered every hour of the day, including weekends and holidays.

The proposed decentralized banking system built on the Ethereum blockchain consists of two main components: the smart contract layer and the user interface layer. The smart contract layer provides the underlying logic for the system, while the user interface layer provides an easy-to-use interface for individuals to interact with the system.

A. Smart Contract Layer

The smart contract layer of the proposed decentralized banking system consists of several smart contracts that provide the logic for the system's financial instruments, such as loans, insurance policies, and decentralized exchanges. These smart contracts are written in Solidity, a programming language specific to the Ethereum blockchain, and are deployed on the Ethereum network.

The smart contract layer of the proposed system enables individuals to interact with the system directly without the need for intermediaries. For example, an individual can apply for a loan by submitting a loan application through a decentralized application (dApp) that interacts with the loan smart contract. The loan smart contract executes the terms of the loan automatically, such as determining the interest rate, loan amount, and repayment schedule, without the need for a centralized authority.

B. User Interface Layer

The user interface layer of the proposed decentralized banking system provides an easy-to-use interface for individuals to interact with the system. The user interface layer of several decentralized applications enable individuals to perform financial transactions, such as trading cryptocurrencies.

The user interface layer of the proposed system is designed to be user-friendly and accessible to everyone, regardless of technical expertise. The application provides an easy-to-use interface that guides the individual through the transaction process and displays relevant information.

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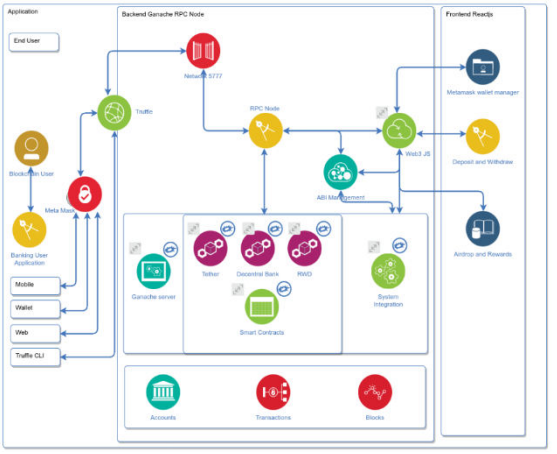

Fig.1 .System Architecture

System Implementation

Typically, cryptocurrency is bought on exchange sites and kept in safe crypto-wallets like Metamask or Ledger. These virtual currencies are run in an extremely safe, decentralised fashion. You only need to have access to the internet and a computer or smartphone.

Cryptocurrencies are unaffected by outside influences in any way. Due to the decentralised structure, there are less human contacts and therefore no biases. Centralized banks judge and profile you, not cryptocurrencies.

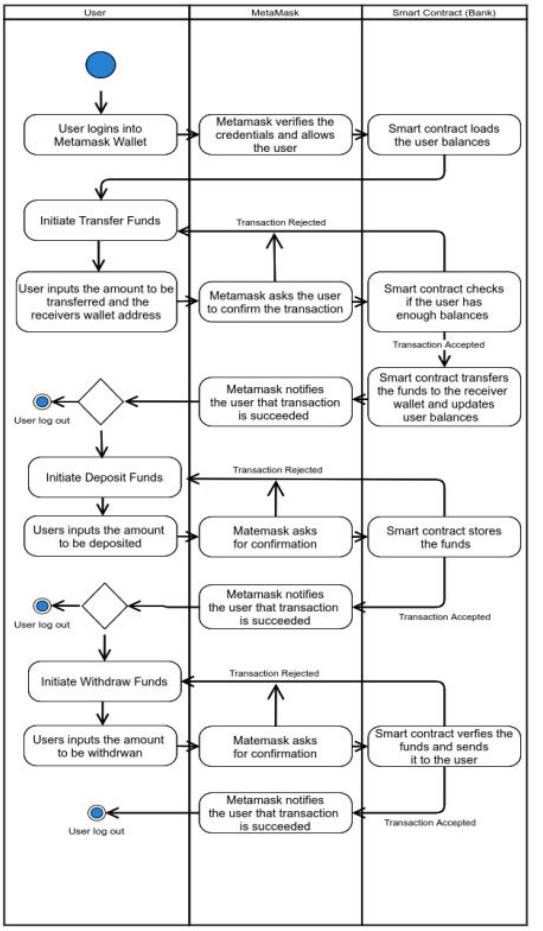

Fig. 2. The process flow

Pseudo code

Step 1: Using Metamask, the user logs in.

if (user == admin)

Admin dashboard is loaded

else

Customer dashboard is loaded

end

Step 2: Customer initiates a deposit action.

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Step 3: Metamask asks the user to approve the allowance for smart contract to access his tokens.

Step 4: Customer approves the allowance

Step 5: Metamask verifies if the customer has enough balances and asks customer to confirm transaction.

Step 6: Customer confirms the transaction.

Step 7: Deposit is succesful and customer balances are updated.

Step 8: End.

Results

After the homepage loads, a pop-up from Metamask appears asking the user to log in and connect their wallet to the app. If the user has a customer account, he or she can transfer funds, deposit and withdraw money, and claim incentives. The user can take the following actions if he is an owner: Issue tokens to the bank's investors, Pay out incentives to customers who made deposits to the smart contract, Investigate the bank reserves.

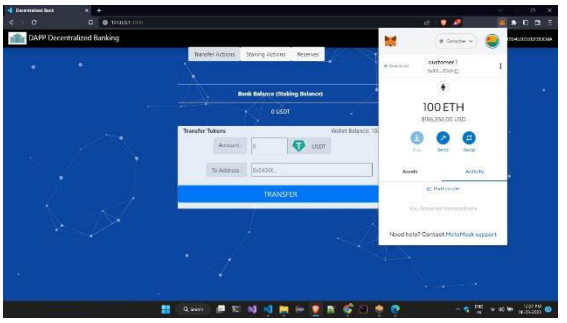

Fig. 3. Transfer Actions page

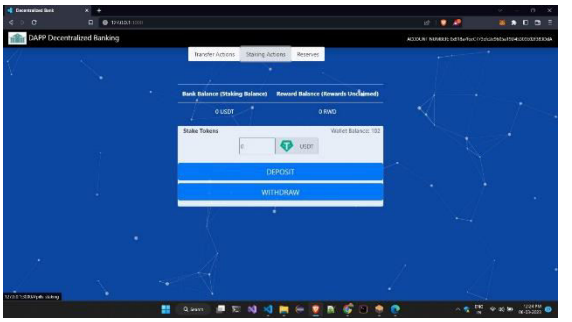

Fig. 4. Staking actions page

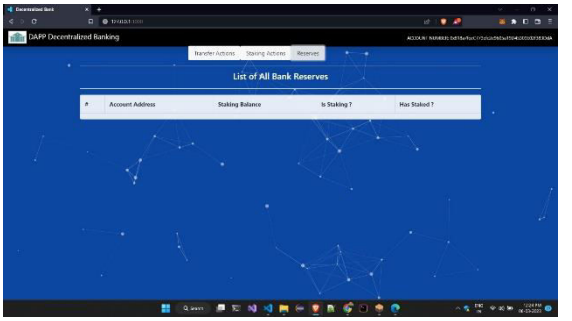

Fig. 5. Reserves page

Security

One of the primary advantages of decentralized banking is increased security. The proposed decentralized banking system built on the Ethereum blockchain eliminates the need for intermediaries, which reduces the risk of fraud and hacking. Additionally, the system's use of smart contracts ensures that transactions are executed automatically and transparently, without the need for human intervention.

However, the proposed decentralized banking system is not immune to security vulnerabilities. Smart contracts can contain bugs and be vulnerable to attacks such as reentrancy attacks and denial-of-service attacks. To mitigate these risks, the system's smart contracts must undergo rigorous testing and auditing to ensure their security and resilience.

Efficiency

The proposed decentralized banking system built on the Ethereum blockchain provides several advantages over traditional banking in terms of efficiency. The system's use of smart contracts enables transactions to be executed automatically, without the need for intermediaries, reducing transaction fees and processing times.

However, the proposed decentralized banking system's efficiency is dependent on the scalability of the Ethereum blockchain. Currently, the Ethereum blockchain can handle approximately 15-45 transactions per second, which may not be sufficient to handle a high volume of financial transactions. To address this scalability issue, the Ethereum community is actively working on solutions such as Ethereum 2.0 and layer 2 scaling solutions.

Scalability

The proposed decentralized banking system built on the Ethereum blockchain is designed to be scalable, but its scalability is dependent on the scalability of the Ethereum blockchain. Currently, the Ethereum blockchain's limited transaction throughput may limit the system's scalability, especially if the system experiences a high volume of transactions.

To address this scalability issue, the Ethereum community is actively working on solutions such as Ethereum 2.0 and layer 2 scaling solutions. Ethereum 2.0 is a major upgrade to the Ethereum network that is designed to increase the network's transaction throughput to up to 100,000 transactions per second. Layer 2 scaling solutions, such as state channels and sidechains, are designed to enable off-chain transactions that can be settled on the Ethereum blockchain, reducing the load on the main chain.

The use of Ethereum blockchain technology in decentralized banking is a promising approach to revolutionize the traditional banking system. This paper discussed how the use of smart contracts, decentralized applications, and the Ethereum Virtual Machine can bring transparency, security, and efficiency to the financial sector. Furthermore, the paper also highlighted the benefits of decentralized banking such as no middlemen, lower fees, and better accessibility to financial services.

Limitations & Future scope

However, there are some limitations to implementing decentralized banking using Ethereum blockchain technology that must be addressed. For starters, the Ethereum network's scalability issue may result in slower transaction processing times and higher transaction fees. Second, in many countries, the regulation of decentralised banking is still uncertain, which may limit its adoption. Finally, a lack of understanding of blockchain technology as well as user resistance may stymie its adoption.

Despite these limitations, decentralised banking using Ethereum blockchain technology has enormous future potential. To begin, more research is needed to improve the scalability of the Ethereum network in order to achieve faster transaction processing times and lower fees. Second, collaborations between the government and financial institutions could result in the development of a decentralized banking regulatory framework. Finally, combining decentralized banking with other emerging technologies like AI and IoT could result in a more comprehensive and efficient financial ecosystem.

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