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Blockchain-Powered KYC: Transforming Credit Risk Assessment in Modern Banking

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ABSTRACT:

The implementation of Know Your Customer (KYC) strategies in the financial sector enhances operational efficiency and mitigates risks associated with fraudulent activities, money laundering, and other financial crimes. While most financial institutions follow independent KYC procedures, a centralized or blockchain-based system offers a more transparent and efficient alternative. Blockchain technology, with its decentralized, immutable, and cryptographic features, ensures real-time validation and security of customer data, reducing the risk of breaches. Additionally, it streamlines the client experience by eliminating redundant paperwork. This study proposes a blockchain-based KYC framework built on Ethereum, enabling financial institutions to read and write financial data securely. The system ensures transparency and efficiency while addressing critical security concerns, such as Sybil attacks. Furthermore, it enhances financial security by implementing KYC validation for high-value transactions using KYC ID proof. Banks will generate account numbers and IFSC codes while validating users at every transaction, ensuring authenticity. Customers will have access to a real-time ledger of their transactions, while banks maintain centralized control to enforce compliance and mitigate risks.

1-INTRODUCTION

Blockchain is a type of distributed record keeping in a decentralized network by many nodes. Each of these nodes maintains a copy of the entire blockchain of records. Due to its distinctive features such as decentralization, transparency, robustness, auditability and security, blockchain appears to affect many traditional ways of doing business. Although blockchain is an old topic, its awareness has increased with Bitcoin. Bitcoin's technical document is the article titled ''Bitcoin: A Peer-to-Peer Electronic Cash System'' written in 2008 by a person or group named Satoshi Nakamoto. The article proposes the transfer of digital assets using blockchain technology without using a financial intermediary. The article explains in detail how the double spending problem, one of the most serious problems of electronic money transfers, is solved when making these transfers. The infrastructure of this transfer system is built on blockchain technology, which provides a distributed ledger structure. Each network participant is considered a node in the blockchain, and transactions made by nodes are linked together in blocks. Since Satoshi Nakamoto first published his Bitcoin whitepaper in 2008, three generations of blockchains have been adopted. Blockchain 1.0 is used for cryptocurrency transactions, Blockchain 2.0 for financial applications, and Blockchain 3.0 for applications in areas other than finance, such as government, healthcare, and science. In the financial sector, blockchain is used in a variety of ways. The most essential of them are cryptocurrency exchanges, KYC, payment systems, sukuk, non-fungible tokens (NFTs), and crowdfunding. KYC is typically a process carried out individually by banks. It is also possible for banks to share information and conduct the transaction centrally. Apart from this, a KYC procedure can be carried out using blockchain. The use of blockchain technology in the KYC process benefits consumer risk management by making it faster, more transparent, and decentralized. Following the use of a loan, a bank customer is obliged to make periodical loan payments to the bank. In the process, banks should measure their risks by sharing information with other banks on limits, risks and collateral. Banks can more quickly determine the risks related to their customers if they have this information. Conventional credit assessment relies on centralized credit bureaus. These entities gather customer financial information from banks and subsequently monetize it by selling it back to financial institutions. However, this approach raises concerns regarding data ownership and security, as credit bureaus possess the ability to manipulate the information. Furthermore, the data retrieval process is often delayed, as it typically occurs on an end-of-day basis. In contrast, a blockchain-based model fosters a decentralized environment where all participating banks hold identical copies of customer financial data. This shared ledger enables immediate data access for authorized institutions, eliminating the need for a centralized intermediary and associated fees. Decentralized blockchain technology has the potential to significantly enhance the overall

efficiency of KYC processes. This can be achieved through several mechanisms: improved processing speed, minimized onboarding time for customers, reduced risk of fraud and money laundering, and a decrease in total costs incurred by financial institutions. In this study, the method of sharing the limit, risk and collateral information of bank customers using credit between banks using blockchain is explained. Using the Ethereum network, a blockchainbased system was established with the help of a smart contract in the Solidity language. After a bank provides a loan to its customer, it enters the customer's limit, risk and collateral information into the system. At the same time, if that customer has used a loan from another bank, the bank also accesses the limit, risk and collateral information entered by that bank. Since this study is designed on a private blockchain network, it does not pose a problem with the Sybil attack. The authors confirm contribution to the paper as follows: study conception and design: B. Karadag, A.H.Zaim, A. Akbulut; model creation: B. Karadag, A. Akbulut; analysis and interpretation of results: B. Karadag, A.H.Zaim, A. Akbulut; draft manuscript preparation: B. Karadag, A. Akbulut. All authors reviewed the results and approved the final version of the manuscript.

EXISTING SYSTEM

It was easier for individuals and organizations to use financial institutions to launder money. They could move illicit funds through the financial system without being properly identified.

Financial institutions had a harder time detecting and preventing fraudulent activities. The lack of customer verification made it easier for fraudsters to open accounts and carry out fraudulent transactions. Financial institutions were exposed to higher financial risks due to the inability to properly vet customers. This could lead to higher default rates, financial losses, and increased operational costs associated with managing these risks.

PROPOSED SYSTEM

KYC helps in identifying and preventing fraudulent activities. By knowing who their customers are, banks can better detect suspicious transactions and patterns that may indicate fraud.

Many countries have laws and regulations requiring financial institutions to implement KYC procedures. Compliance with these regulations helps banks avoid legal penalties and ensures that they are operating within the law.

All actions related to KYC data are recorded on the blockchain, enhancing transparency and accountability.

2-LITERATURE SURVEY

Title: A review of blockchain approaches for KYC.
Author: N. Mansoor, K. F. Antora, P. Deb, T. A. Arman, A. A. Manaf, and M. Zareei,
Year: 2023.
Description:
The traditional Know Your Customer (KYC) procedure used by banks is deemed unreliable and costly. Therefore, the adoption of emerging technologies is essential for banking firms' future prospects. One such technology that has gained widespread acceptance is Blockchain, which is known for its reliability and security across various fields. This study aims to investigate how the implementation of Blockchain technology can modify the existing banking business, particularly the KYC document verification process, by storing and monitoring of information. The current need for an optimized KYC system is paramount; one that is coupled with a secure and trustworthy technology like Blockchain that can withstand fraudulent activities while also overcoming scalability and privacy challenges. The article analyzes previous relevant works, which highlight how the implementation of Blockchain technology eliminates the need for intermediaries, thereby reducing the possibility of malicious activities and errors that may occur when there are multiple manual tasks involved.

Title: Bank records storage system through blockchain.
Author: R. Rohitchandran, B. Santhoshkumar, and M. Kumar,
Year: 2023.
Description:
This research puts forth a system that utilizes the integration of blockchain, a database for storage, and cryptography to preserve the confidentiality and security of bank records. The blockchain ensures the protection and dependability of data storage through its use, while smart contracts regulate the way the data is stored and shared. The original bank records are kept in a secured, encrypted format on a separate database, with only their hash values recorded on the blockchain. To further secure the data, the off-chain records are frequently connected with the hash information on the blockchain. The utilization of cryptography aids in the encryption of documents and the digital signing of messages. The system has a WebApp interface that enables parties involved in the transaction to communicate in a decentralized manner.

Title: Sybil in the haystack: A comprehensive review of blockchain consensus mechanisms in search of strong Sybil attack resistance
Author: M. Platt and P. McBurney.
Year: 2023.
Description:
Consensus algorithms are applied in the context of distributed computer systems to improve their fault

tolerance. The explosive development of distributed ledger technology following the proposal of "Bitcoin" led to a sharp increase in research activity in this area. Specifically, public and permissionless networks require robust leader selection strategies resistant to Sybil attacks in which malicious attackers present bogus identities to induce byzantine faults. Our goal is to analyse the entire breadth of works in this area systematically, thereby uncovering trends and research directions regarding Sybil attack resistance in today's blockchain systems to benefit the designs of the future. Through a systematic literature review, we condense an immense set of research records (N = 21,799) to a relevant subset (N = 483). We categorise these mechanisms by their Sybil attack resistance characteristics, leader selection methodology, and incentive scheme. Mechanisms with strong Sybil attack resistance commonly adopt the principles underlying "Proof-of-Work" or "Proof-of-Stake" while mechanisms with limited resistance often use reputation systems or physical world linking. We find that only a few fundamental paradigms exist that can resist Sybil attacks in a permissionless setting but discover numerous innovative mechanisms that can deliver weaker protection in system scenarios with smaller attack surfaces.

Title: Exploring the determinants of blockchain acceptance for research data management.
Author: C. Woo and J. Yoo.
Year: 2023.
Description:
Researchers are highly interested in research data management to derive excellent research results. This study analyzes the determinants affecting the acceptance of blockchain-based electronic lab notebooks service as research data management service. A research model was established based on the technology acceptance model. The sample is collected by 585 researchers from universities and research institutes in Korea. The main research results showed that the usefulness and ease of use lowered the perceived risk and increased the intention to use. Social norms also decreased perceived risk factors and increased intention to use. Research implications are that managers should seek ways to lower the technical risks of blockchain when developing blockchain-based services. In addition, they have to allow users to easily use blockchain-based services and recommend them to other users around them.

Title: Bitcoin: A Peer-to-Peer Electronic Cash System.
Author: S. Nakamoto.
Year: 2023.
Description:
A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main benefits are lost if a trusted third party is still required to prevent double-spending. We propose a solution to the double-spending problem using a peer-to-peer network. The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. The longest chain not only serves as proof of the sequence of events witnessed, but proof that it came from the largest pool of CPU power. As long as a majority of CPU power is controlled by nodes that are not cooperating to attack the network, they'll generate the longest chain and outpace attackers. The network itself requires minimal structure. Messages are broadcast on a best effort basis, and nodes can leave and rejoin the network at will, accepting the longest proof-of-work chain as proof of what happened while they were gone.

Title: A review on blockchain applications in fintech ecosystem.
Author: B. Karadag, A. Akbulut, and A. H. Zaim.
Year: 2022
Description:
The term fintech started to become popular from the 90s. With the rapid development of technology and the widespread use of the internet, Fintech has become a sector in itself, especially since 2004. Within the framework of Fintech, there have been a number of advances in ATM, credit cards, debit cards, mobile transactions, internet banking and digital banking infrastructure and transactions. The emergence of Bitcoin in 2008 caused us to hear the term blockchain frequently, and the path of blockchain technology intersected with fintech. The decentralization of the blockchain, thanks to its distributed ledger structure, made it possible to make Bitcoin transfers without intermediaries. After Bitcoin, the emergence of crypto assets like Ethereum opened the way for these transactions to be programmable as an infrastructure. Programmable blockchain infrastructures have started to be used not only in financial transactions, but also in sectors such as health, supply chain, education and insurance. There are different academic studies on applications related to these sectors. However, there is no such a review that includes them all together for finance. In this study, blockchain applications in the fintech ecosystem were investigated and included in a single study. In particular, it was explained in which business it was used and in which business there was a market volume. In addition, possible future blockchain applications were also mentioned.

3-PROJECT DESCRIPTION

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The project aims to develop and implement a blockchain-based Know Your Customer (KYC) model to address the inherent inefficiencies and security vulnerabilities of traditional KYC processes in banking. Traditional KYC procedures, typically managed separately by each bank, often suffer from redundancy, slow processing times, and potential security risks. By leveraging blockchain technology, this project seeks to create a decentralized and secure environment that enhances the speed and efficiency of KYC processes. The blockchain-based model will enable real-time risk assessments and facilitate instant interbank data sharing, eliminating the delays associated with end-of-day transactions. The immutable and transparent nature of blockchain technology will help prevent fraud and ensure data integrity.

METHODOLOGIES

User Interface Design:

To connect with server user must give their username and password then only they can able to connect the server. If the user already exits directly can login into the server else user must register their details such as username, password, Email id, City and Country into the server. Database will create the account for the entire user to maintain upload and download rate. Name will be set as user id. Logging in is usually used to enter a specific page. It will search the query and display the query.

Bank:

Banks play a vital role in the financial system by providing essential services that facilitate economic activity and personal financial management. They offer a secure place for individuals and businesses to deposit and manage their money, ensuring the safekeeping of funds against theft or loss.

Admin:

This is the third module in our project is Admin. Here admin will login with his password and Id who has created by the bc operator. After admin login directely will navigate into admin home page. The purpose of an administrator is to oversee and manage the operations and functionality of an organization, system, or project. Administrators are responsible for coordinating tasks, enforcing policies, and ensuring that processes run smoothly and efficiently.

Customer :

This is the fourth module in our project is Customer. Customers must provide accurate, complete, and up-to-date personal information, address, as requested by the bank. They are also required to submit the necessary documentation promptly and update their details if there are any changes, such as a new address or a name change. Customer bank transactions encompass a range of financial activities performed by account holders through their banking institution. These transactions include deposits, where customers add funds to their accounts; withdrawals, where they remove money; transfers, where they move funds between accounts or to other individuals or institutions. Each transaction is recorded and monitored by the bank to ensure accuracy and to maintain a comprehensive account history.

Transactions:

This is the Fifth module in our project is Transactions. Credit and deposit transactions are fundamental activities in banking where customers interact with their accounts. A credit occurs when funds are added to a customer's account, such as through a paycheck deposit, loan disbursement, or a transfer from another account. Deposits, on the other hand, involve customers placing money into their accounts, which can be done through various methods including cash deposits, checks, or electronic transfers. Banks record these transactions meticulously to ensure account balances are accurately updated and to provide customers with a clear and detailed account of their financial activity.

4-DESIGN ENGINEERING

Design Engineering deals with the various UML [Unified Modelling language] diagrams for the implementation of project. Design is a meaningful engineering representation of a thing that is to be built. Software design is a process through which the requirements are translated into representation of the software. Design is the place where quality is rendered in software engineering. Design is the means to accurately translate customer requirements into finished product.

System Architecture

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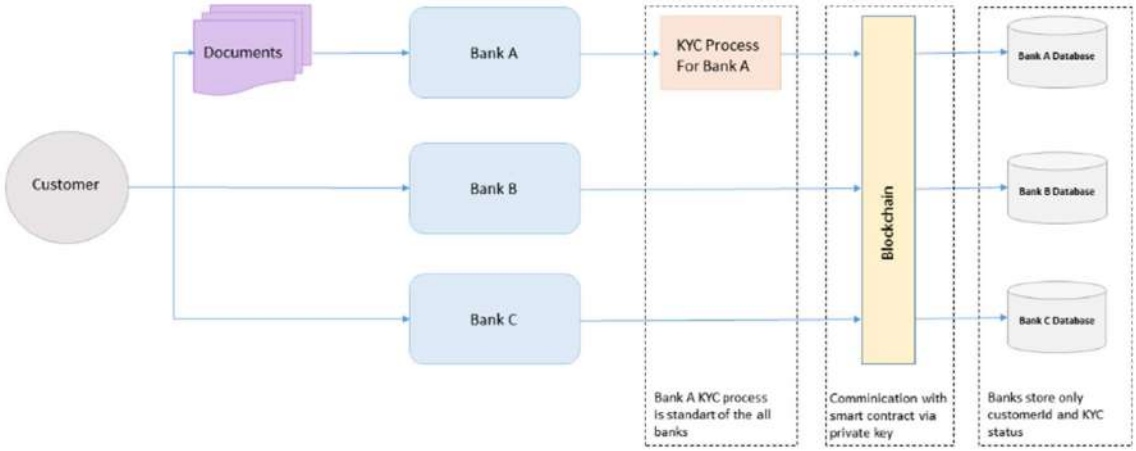

KYC practices encompass the customer identification and due diligence procedures employed by financial institutions. These procedures aim to establish a comprehensive understanding of the customer's identity, risk profile, and financial activities. By gathering and analyzing this information, institutions can effectively mitigate potential risks associated with money laundering, terrorist financing, and other financial crimes. Furthermore, a robust KYC process allows for tailored service configurations that best suit the customer's needs. Blockchain offers several advantages for establishing an integrated platform for secure KYC data storage. The application of blockchain technology presents a compelling opportunity for the secure and transparent storage and exchange of credit allocation data within the financial sector. This distributed ledger system fosters trust and transparency amongst all stakeholders involved in the credit allocation process, including banks, borrowers, and other relevant parties. Furthermore, blockchain technology can significantly enhance the efficiency of credit allocation procedures. By leveraging this technology for credit allocation data, banks can streamline the verification and validation of borrower information, resulting in a reduction in both the time and costs associated with traditional, manual processes.

5-DEVELOPMENT TOOLS

This chapter is about the software language and the tools used in the development of the project. The platform used here is JAVA. The Primary languages are JAVA, J2EE and J2ME. In this project J2EE is chosen for implementation.

THE JAVA FRAMEWORK:

Java is a programming language originally developed by James Gosling at Microsystems and released in 1995 as a core component of Sun Microsystems' Java platform. The language derives much of its syntax from C and C++ but has a simpler object model and fewer low-level facilities. Java applications are typically compiled to byte code that can run on any Java Virtual Machine (JVM) regardless of computer architecture. Java is general-purpose, concurrent, class-based, and object-oriented, and is specifically designed to have as few implementation dependencies as possible. It is intended to let application developers "write once, run anywhere".

Java is considered by many as one of the most influential programming languages of the 20th century, and is widely used from application software to web applications the java framework is a new platform independent that simplifies application development internet. Java technology's versatility, efficiency, platform portability, and security make it the ideal technology for network computing. From laptops to datacenters, game consoles to scientific supercomputers, cell phones to the Internet, Java is everywhere!

EVOLUTION OF COLLECTION FRAMEWORK:

Almost all collections in Java are derived from the **java.util.Collection** interface. Collection defines the basic parts of all collections. The interface states the add() and remove() methods for adding to and removing from a collection respectively. Also required is the toArray() method, which converts the collection into a simple array of all the elements in the collection. Finally, the contains() method checks if a specified element is in the collection. The Collection interface is a sub interface of **java.util.Iterable**, so the iterator() method is also provided. All collections have an iterator that goes through all of the elements in the collection. Additionally, Collection is a generic. Any collection can be written to store any class. For example, Collection<String> can hold strings, and the elements from the collection can be used as strings without any casting required.

SET

Java's java.util.Set interface defines the set. A set can't have any duplicate elements in it. Additionally, the set has no set order. As such, elements can't be found by index. Set is implemented by java.util.HashSet,java.util.LinkedHashSet, and java.util.TreeSet. HashSet uses a hash table. More specifically, it uses a java.util.HashMap to store the hashes and elements and to prevent duplicates. Java.util.LinkedHashSet extends this by creating a doubly linked list that links all of the elements by their insertion order. This ensures that the iteration order over the set is predictable. java.util.TreeSet uses a red-black tree implemented by a java.util.TreeMap. The red-black tree makes sure that there are no duplicates. Additionally, it allows Tree Set to implement java.util.SortedSet.

The java.util.Set interface is extended by the java.util.SortedSet interface. Unlike a regular set, the elements in a sorted set are sorted, either by the element's compareTo() method, or a method provided to the constructor of the sorted set. The first and last elements of the sorted set can be retrieved, and subsets can be created via minimum and maximum values, as well as beginning or ending at the beginning or ending of the sorted set. The SortedSet interface is implemented by java.util.TreeSet

MAP:

Maps are defined by the java.util.Map interface in Java. Maps are simple data structures that associate a key with a value. The element is the value. This lets the map be very flexible. If the key is the hash code of the element, the map is essentially a set. If it's just an increasing number, it becomes a list. Maps are implemented by java.util.HashMap, java.util.LinkedHashMap, and java.util.TreeMap. HashMap uses a hash table. The hashes of the keys are used to find the values in various buckets. LinkedHashMap extends this by creating a doubly linked list between the elements. This allows the elements to be accessed in the order in which they were inserted into the map. TreeMap, in contrast to HashMap and LinkedHashMap, uses a red-black tree. The keys are used as the values for the nodes in the tree, and the nodes point to the values in the map

THREAD:

Simply put, a *thread* is a program's path of execution. Most programs written today run as a single thread, causing problems when multiple events or actions need to occur at the same time. Let's say, for example, a program is not capable of drawing pictures while reading keystrokes. The program must give its full attention to the keyboard input lacking the ability to handle more than one event at a time. The ideal solution to this problem is the seamless execution of two or more sections of a program at the same time.

MYSQL:

A **database** is an organized collection of data that can be easily accessed, managed, and updated. It stores information in a structured way, often using tables, rows, and columns, making it efficient to retrieve, modify, and store large volumes of data. Databases are used in almost every application where data needs to be stored persistently, such as websites, mobile applications, and enterprise systems.

MySQL is a popular, open-source relational database management system (RDBMS) that uses Structured Query Language (SQL) to manage and manipulate data. It provides features such as high performance, reliability, and ease of use, making it a go-to choice for many developers and companies. When **Java** is used in conjunction with MySQL, it allows developers to build dynamic, data-driven applications that can interact with the database efficiently. Java provides the **JDBC (Java Database Connectivity)** API, which is a set of classes and interfaces that enable Java applications to connect to MySQL databases, execute SQL queries, retrieve data, and perform other database operations. This combination allows Java developers to create powerful and scalable applications that can manage and process large amounts of data in real-time, while MySQL handles the database management tasks like storage, indexing, and transaction management. Using MySQL with Java is a popular choice because both technologies are widely supported, robust, and well-suited for building secure and high-performance web and enterprise applications.

6-CONCLUSION

The blockchain-based KYC model was designed considering the private Ethereum network and PoS consensus mechanism. In this way, blockchain technology offers a transformative solution to the shortcomings of traditional KYC in banking. A shared, immutable ledger streamlines onboarding, bolsters data security, and enables real-time risk assessment. Regulatory hurdles persist, but the potential for enhanced efficiency, collaboration, and risk management within a secure and transparent framework is undeniable. As blockchain matures and regulations evolve, it has the potential to revolutionize KYC, ushering in a new era for secure and efficient customer identification in banking.

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