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Scaling up Banking Operations: Harnessing the power of block chain Technology

K. Syam Prasad[1], G.M. Vema Reddy[2]

[1,2] *JNTUA College of Engineering Pulivendula, Dept. of Computer Science Engineering, Andhra Pradesh, India*

Abstract - *The Blockchain is an encrypted database that is distributed across numerous computers and serves as a virtual record of transactions and contracts. This technology supports bitcoin transactions and has already upended the financial industry. Since blockchain technology has the potential to improve data security, provide a decentralized and transparent network, and lower operational costs, the goal of this study is to examine how it can affect the financial industry. Blockchain's extraordinary properties make it a potential technology for determining the financial sector's future despite its limits. Blockchain technology makes sure that payments are made autonomously and transparently, preventing any fraudulent activity.*

Keywords*: Blockchain, Decentralized, Smart contract, crypto-currency*

1. INTRODUCTION

Blockchain technology is a decentralized peer-to-peer network composed of a series of blocks, hence its named as blockchain. Satoshi Nakamoto first developed and implemented this concept in Bitcoin, and it has since piqued the interest of researchers, with its characteristics increasing its applicability. Blockchain is also known as distributed ledger technology, which preserves the calculation of all nodes in each block, ensuring that the ledger is shared and reliable within the network. Additionally, each block contains a unique and unchangeable value called a hash code, which is derived using a complex mathematical hash function, ensuring immutability. Moreover, transparency is ensured by these reasons, and as transactions do not occur in the traditional manner with individual real user IDs and addresses, both the sender and receiver can remain anonymous. The absence of a central authority also makes the entire system somewhat autonomous . These factors have made blockchain an emerging technology that can be applied in various fields. The implementation of blockchain technology has the potential to eliminate unnecessary intermediaries, resulting in cheaper and more efficient services for both clients and financial institutions. The areas where banks and other financial organizations are likely to adopt blockchain include payment systems, customer identification, loan processing, and credit protection. Blockchain technology is still in its early stages, but it is increasingly seen as a solution that can provide a significant advantage in the context of the transfer of assets within business networks.

Satoshi Nakamoto introduced a new method for peer-to-peer digital cash, using a cryptocurrency called Bitcoin. This was a significant development, as cryptocurrencies are not created or controlled by governments, and have their own set of rules to follow. This type of organization has given rise to the new blockchain technology, which forms the basis for the growing number of authorized blockchain applications. Blockchain technology allows for the exchange of money without intermediaries, enabling people to send money directly and securely without any hassle. It is one of the most promising and revolutionary inventions, attested to be as significant as the internet or electricity. Unfortunately, few people have heard of the technology, but significant social media coverage is helping to raise awareness. It is one of the most promising and positive new technologies for the coming era, an distributed ledger technology that underpins Bitcoin. It offers a new way to record, preserve, and transfer data, and what's even more incredible is the transparency and secure data that is auditable and resistant to tampering.

Many people assume that blockchain and Bitcoin are the same thing, but they are closely related but not the same. In 2008, Bitcoin was introduced as a form of unregulated digital currency created by Satoshi Nakamoto. Blockchain was the ledger solution used to safely record and facilitate the use of this new currency, as there was no bank or government involved to monitor or police the transactions. The confusion between blockchain and Bitcoin often arises because these two concepts were introduced at the same time. The blockchain technology used for Bitcoin allows for the recording of transactions on a distributed ledger across a network of users. The open-source technology allows for the storage of transaction data into blocks. Each block contains a time-stamped record of transactions, with each block linked to the previous one, thus creating a chain [10]. The information stored on the blockchain is entirely transparent and permanent, with no ability to change or remove previous transaction data from the distributed ledger. This feature and solution can be used to address many inefficiencies in different applications and industries.

2. BACKGROUND AND RELATED WORK

2.1 Working of blockchain

Blockchain technology has the potential to revolutionize our systems of trade, identity, and governance by increasing transparency. Every transaction that occurs is recorded in a distributed, immutable ledger, also known as a blockchain. This ledger is shared and stored in multiple locations, removing a single point of failure, and providing transparency across all participants. Once a transaction is agreed upon and attached using cryptography, it is nearly impossible to go back and change the past records.

For a new transaction or edit to be added to the blockchain, a majority of the nodes within the blockchain implementation must execute algorithms to assess and verify the information. If a majority of nodes agree that the information and signature are valid, the new block is added to the chain. This distributed consensus model allows blockchain to run as a distributed ledger without the need for a central authority.

Each page of transactions in a blockchain forms a block, and each block is linked to the next through cryptographic hashing. Before a block can be added to the chain, a cryptographic puzzle must be solved, creating the block. The computer that solves the puzzle shares the answer with all other computers on the network, a process called proof of work. The network then verifies the proof of work, and if correct, the block is added to the chain. This combination of complex math problems and verification by multiple computers ensures the trustworthiness of each block on the chain. By removing the need for a central authority, blockchain allows for real-time direct interaction with data.

Blockchain technology can be classified into two categories:

i. Public Blockchain:

This type of network, also known as a permissionless blockchain network, is completely open-ended, and anyone can participate without requiring permission [9]. The only significant difference between public and private blockchain networks is that anyone can join the permissionless network, perform the consensus protocol, and maintain the shared open public ledger.

i. Private Blockchain:

A private blockchain network requires an invitation to participate in the network, either through the network initiator or by following the regulations/conditions set by the network initiator. A permissioned blockchain network restricts access to participants who meet specific criteria required by the network.

2.2 Blockchain and Crypto-Currency are not the same thing

Blockchain serves as the platform that facilitates the use of cryptocurrencies. It is the technology behind the distributed ledger that documents the network and enables the transfer of value and data.

Cryptocurrencies are the tokens used within blockchain networks to transact and pay for services. They can be seen as a tool or application of blockchain technology and can be used to digitize the value of assets.

While cryptocurrencies are an essential part of the ecosystem, blockchain serves as the underlying technology that enables their use. Transactions involving cryptocurrencies can only occur on a blockchain network, which provides a means to record and transfer them.

3. PROPOSED WORK

In this section, the proposed work is elaborated at a high-level scope. Blockchain technology has the potential to transform not only financial services, but many other industries as well. While traditional financial systems are heavily reliant on paper and vulnerable to issues such as fraud and delays, blockchain technology offers increased security and efficiency. Blockchain's dynamic nature allows it to become a leader in implementation in a chargeable market situation. The advantage of blockchain technology is that it provides a shared database that is accessible to all parties involved.

3.1 Things blockchain can do for the financial sector

In the financial sector, blockchain can offer several benefits, including:

a) On-chain settlement:

The proposed system can provide a platform for banks to reduce fraud and offer on-chain settlement to users, reducing processing time and eliminating the need for centralized confirmation of transactions.

b) Low transfer fees:

The proposed platform will have a transparent cost model for sending money cross-border, eliminating intermediaries, and reducing transaction costs for users.

c) 24/7 Availability:

The platform will be always accessible from anywhere in the world, with nodes in the distributed network verifying transactions and completing processes quickly.

d) Transparency:

The proposed platform will have a transparent conversion rate visible to users, allowing them to view transaction history and conversion rates with ease.

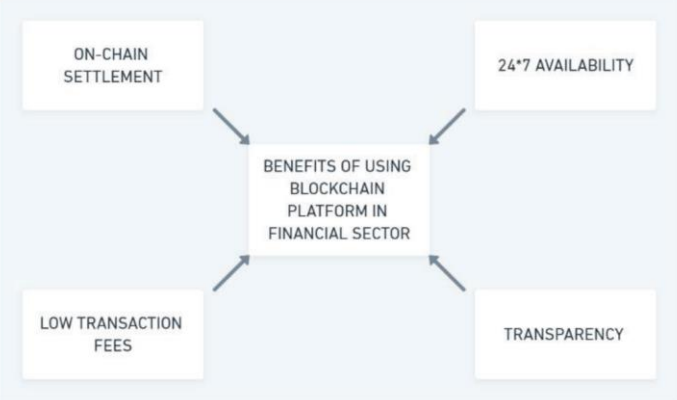

Fig-1: Benefits of using Blockchain

3.2 ***Proposed Working of Platform:***

The platform proposes that every bank registered on the blockchain network must update the encrypted customer data in the ledger to ensure data security. All banks on the platform will share the same ledger, ensuring transparency and transaction history. This model based on distributed ledger technology will ensure 24/7 availability and reduce transaction processing time. Verification of transactions by every node present in the network will eliminate the problem of double spending present in centralized systems. The platform will provide on-chain settlement with minimal transaction costs.

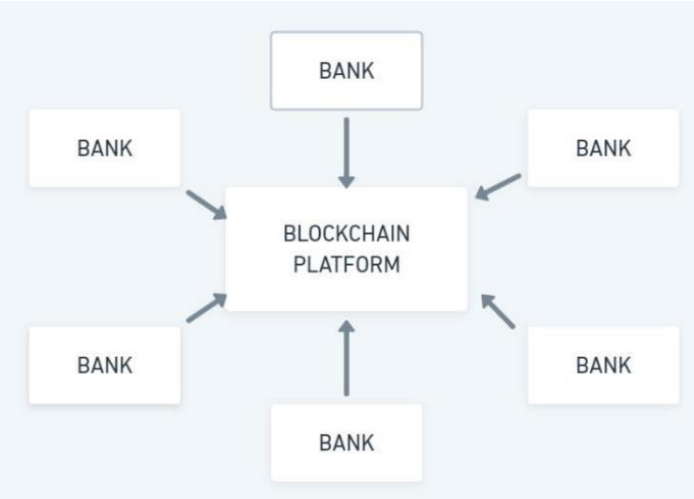

Fig-2: Banks on Blockchain Platform

When a user initiates a money transfer, the proposed platform will offer various benefits over the traditional centralized system. The registered banks on the blockchain platform will interact with each other through the shared ledger. Users can only send money to other users registered on the platform, with all their information stored in the distributed ledger.

The user initiating the transfer will have complete transparency for the transaction and will only pay negligible fees. The funds will be available to the recipient once more than 75% of the nodes in the network verify the transaction. Additionally, the platform's availability will allow users to send money overseas without visiting a physical bank. The transaction will be subjected to a consensus mechanism carried out by the network's nodes.

Compared to the centralized system, the proposed platform will have the advantage of immutability, which reduces the possibility of fraudulent conversions.

3.3 Benefits of the proposed platform:

The proposed platform offers a single database for user information, reducing the need for multiple KYC processes by different banks. The process of transferring money will be automated, resulting in faster transaction times, which will be beneficial to users sending money to any part of the world.

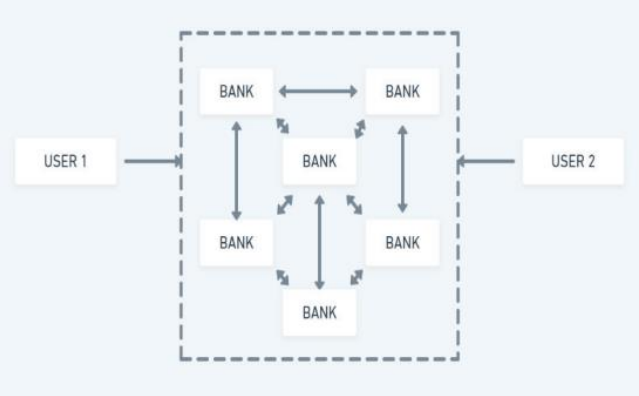

Fig-3: Transaction made through proposed platform

4. SYSTEM DESIGN

The entire system design is divided into two parts namely the diagrams and the implementation. The description of each step is given below.

4.1 UML Diagrams:

Unified Modeling Language (UML) is a widely accepted and standardized modeling language used in the field of object-oriented software engineering. It is managed and created by the Object Management Group with the aim to provide a common language for creating object-oriented software models. UML is composed of two major components - a Meta-model and a notation, and in the future, a method or process may also be added.

UML is not limited to software systems, but also used for business modeling and other non-software systems. It incorporates best engineering practices for modeling large and complex systems, making it a crucial component of object-oriented software development process. UML uses graphical notations to represent the software project design.

i. Usecase Diagram

A use case diagram is a type of behavioural diagram in the Unified Modeling Language (UML) that is created from a use-case analysis. Its purpose is to provide a graphical representation of the system's functionality, including the actors, their goals (represented as use cases), and any dependencies between those use cases. The main objective of a use case diagram is to illustrate the system functions that are carried out for each actor. The roles of the actors in the system can also be depicted.

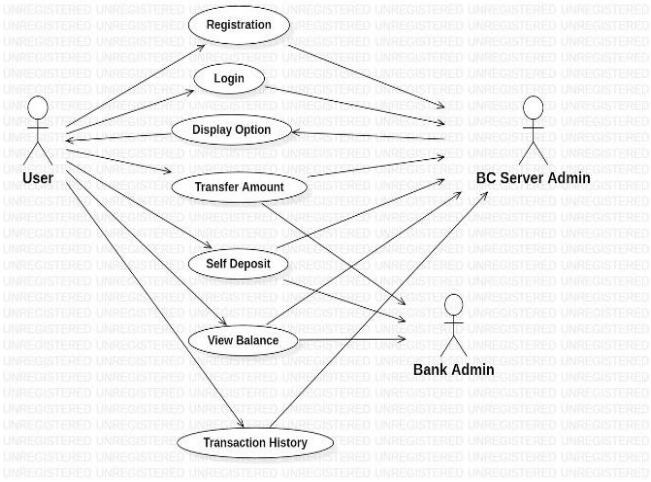

Fig-4: Usecase Diagram

The above use case diagram represents that the system contains multiple use cases and three actors namely user, bank admin and Blockchain server admin.

ii. Class Diagram

A class diagram is a static structure diagram in the Unified Modeling Language (UML) used in software engineering to depict a system's structure. This diagram provides a visual representation of a system's classes, their attributes, operations or methods, and the associations among the classes, including which class stores the information.

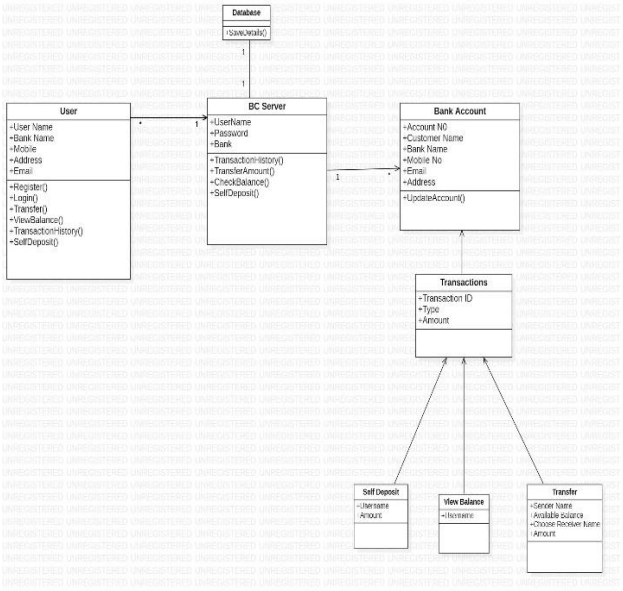

Fig-5: Class Diagram

The above class diagram contains classes named user, Block chain server, bank account, transactions, self deposit,View balance and transfer. Each class contains its own attributes and operations.

iii. Sequence Diagram

A sequence diagram is an interaction diagram in the Unified Modeling Language (UML) that depicts the interactions and ordering of processes. It is based on the Message Sequence Chart construct and is also known as an event diagram, event scenario, or timing diagram.

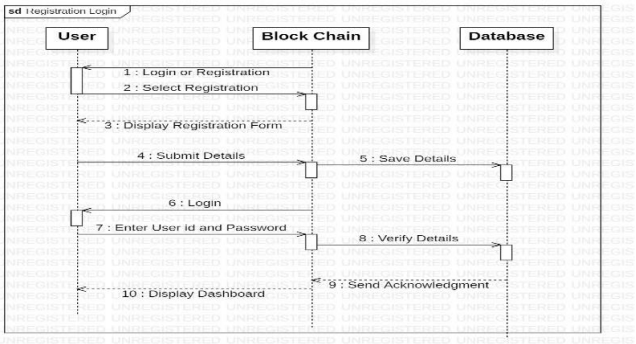

Fig-6 : Sequence Diagram for Registration and Login

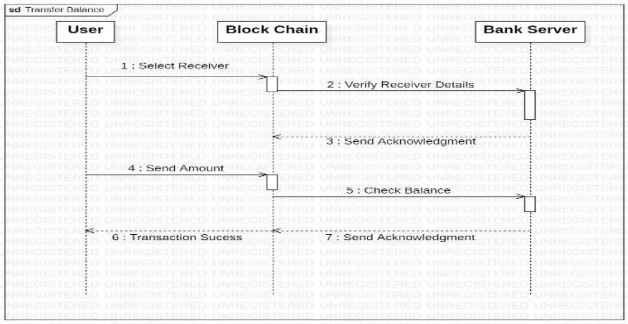

Fig-7 : Sequence Diagram for Transfer

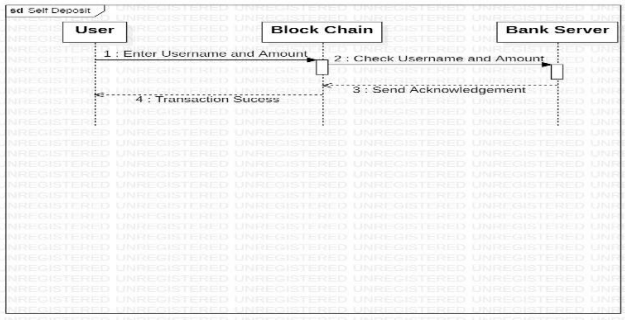

Fig-8: Sequence Diagram for Self Deposit

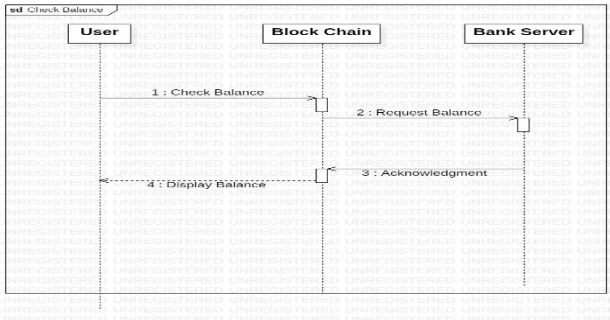

Fig-9 : Sequence Diagram for Check Balance

iv. Activity Diagram

An activity diagram is a workflow or process modeling diagram that is part of the Unified Modeling Language (UML). It provides a visual representation of the sequential flow of activities or control in a system or business process, and is particularly useful for illustrating complex workflows, software processes, and organizational processes. An activity diagram consists of nodes and edges. The nodes represent activities, actions, or decisions, while the edges represent the flow of control or the transition between activities. The nodes are linked by arrows that indicate the direction of flow.

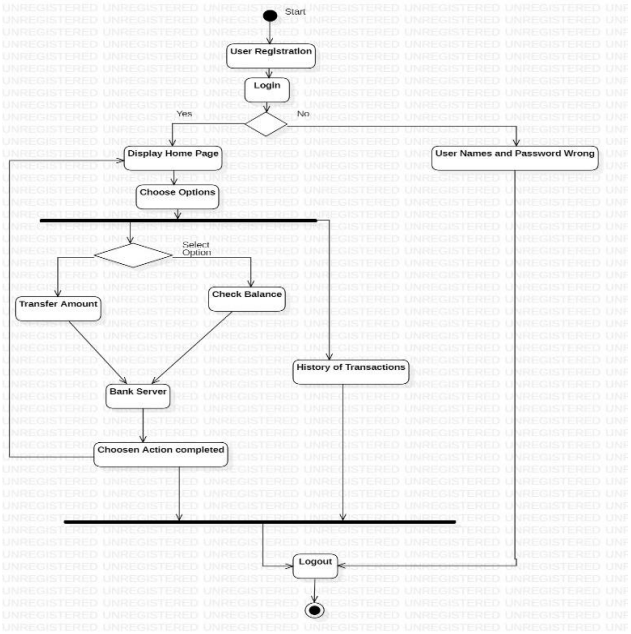

Fig-10: Activity Diagram

5. Implementation

The platform is developed using python language. To implement the system we had first installed the python. We used the TRUFFLE ETHEREUM tool and DJANGO SERVER to run our blockchain application.

The system is developed in such a way that many users can register and login to the website and can perform the following operations:

Deposit Amount : The website contains the link to add amount to user's self account

View Balance: The website contains link to view his balance, link again to view his current balance

Send Amount : The website contains the link to transfer amount to another user

The more detailed implementation is described in results section with proper screenshots of website activities.

6. RESULTS AND OBSERVATIONS

In the proposed system we have developed an online website platform where users can register and login to use the services of banking using blockchain. The following are the results and observations of the proposed system.

Fig-11: Home page

The above figure is the landing page of the website which includes the options for sign up and login.

Click Sign Up button to see the below page where user can register with platform by providing necessary details.

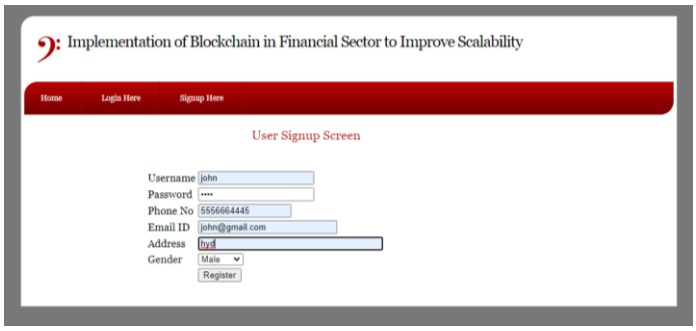

Fig-12: Sign Up page

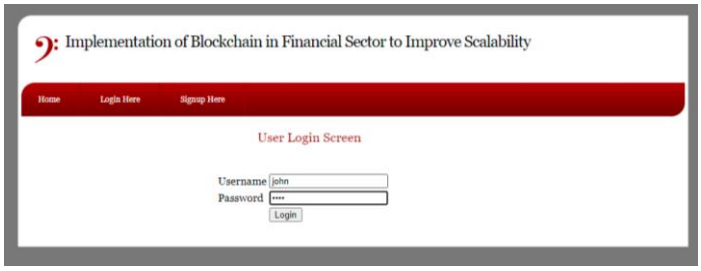

Fig-13: Login Page

Fig-14: Welcome page after Login

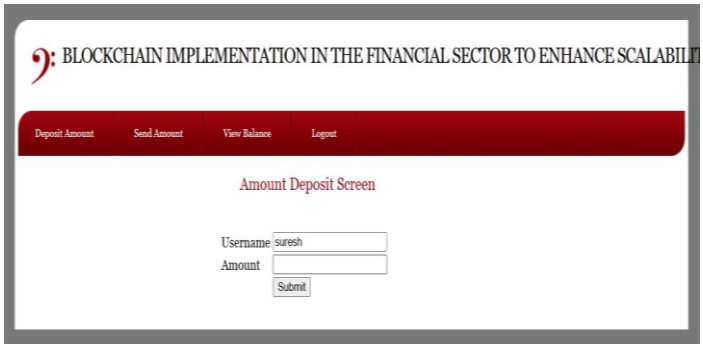

Fig-15: Self Deposit Page

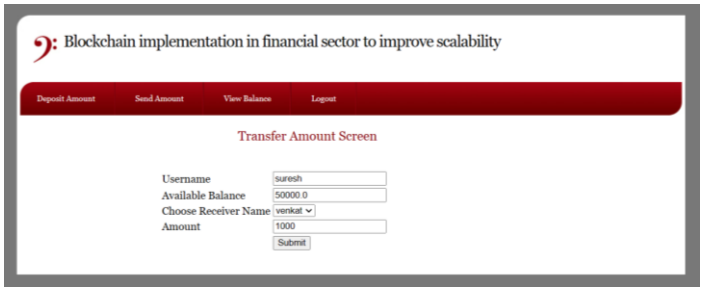

Fig-16: Send Amount Page

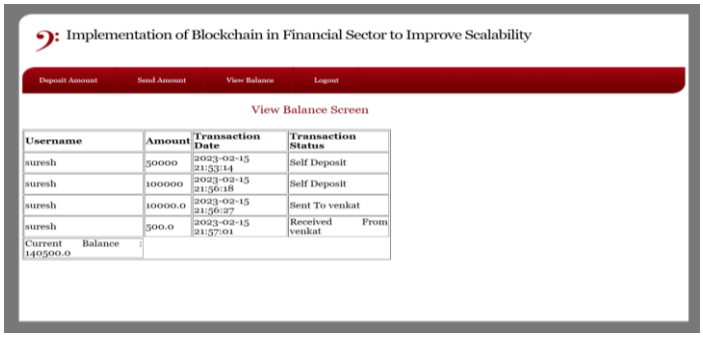

Fig-17: View Balance Page with history of transactions

7. CONCLUSIONS & FUTURE SCOPE

Although blockchain technology is widely seen as having similar potential to early commercial interest, it is crucial for banking firms to understand its key features and how it can address current business issues. While the internet enables the exchange of data, blockchain allows for the exchange of value. Banks must identify opportunities, assess feasibility and impact, and test proof-of-concepts. However, questions regarding regulations will have to be resolved through discussions with competent regulatory authorities and the incorporation of their thought processes. We will also research how to provide off-chain settlement for banks not registered on the platform. One possible solution is to access their database with permission, enabling further transactions to take place between listed and non-listed banks so that both can maintain an equal ledger.

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