DeFinance: Decentralised Lending and Borrowing of Digital Assets

Submitted in partial fulfilment of the requirements of the degree of

BACHELOR OF COMPUTER ENGINEERING

by

Sanket Naikwadi, 21202004

Aman Pandey, 21202008

Chinmay Patil, 20102184

Hrugved Parab, 20102045

Guide

Prof. Pranali S. Patil

Department of Computer Engineering

A. P. SHAH INSTITUTE OF TECHNOLOGY, THANE

University of Mumbai

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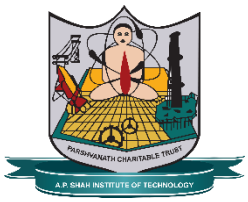

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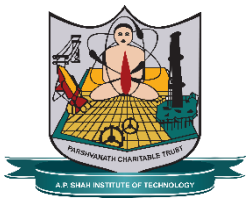
CERTIFICATE

This is to certify that the project entitled "**DeFinance: Decentralised Lending and Borrowing of Digital Assets**" is a bonafide work of **Sanket Naikwadi (21202004), Aman Pandey (21202008), Chinmay Patil (20102184), Hrugved Parab (20102045)** submitted to the University of Mumbai in partial fulfilment of the requirement for the award of the degree of **Bachelor of Engineering** in **Computer Engineering.**

_____	_____
Guide	Project Coordinator
Prof. Pranali S. Patil	Prof. Rushikesh R. Nikam
_____	_____
Head of Department	Principal
Dr. Sachin H. Malave	Dr. Uttam D. Kolekar

Date:



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Project Report Approval for B.E.

This project report entitled **"DeFinance: Decentralised Lending and Borrowing of Digital Assets"** by **Sanket Naikwadi, Aman Pandey, Chinmay Patil, Hrugved Parab** is approved for the degree of **Bachelor of Engineering** in **Computer Engineering**, **2023-2024**.

Examiner Name	Signature
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Declaration

We declare that this written submission represents our ideas in our own words andwhere others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that We have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly citedor from whom proper permission has not been taken when needed.

Sanket Naikwadi - 21202004

Aman Pandey - 21202008

Chinmay Patil - 20102184

Hrugved Parab - 20102045

Date:

Abstract

The financial landscape is evolving rapidly, with traditional systems facing inherent challenges. In response, the decentralized finance (DeFi) sector is emerging, driven by blockchain technology. This project, "Decentralized Money Market," seeks to revolutionize financial services. It aims to provide an efficient, transparent, and inclusive lending and borrowing platform by harnessing blockchain's capabilities. This project encompasses modules like the dashboard, wallet connector, portfolio, markets, lending pool, and borrowing, offering users a comprehensive financial services platform. Key goals include trustless and transparent solutions, capital diversification, real-world asset tokenization, and seamless integration into the DeFi ecosystem. We envision a financial future marked by decentralization, inclusivity, and financial empowerment.

Keywords: Decentralized finance, Blockchain technology, Lending and Borrowing, Bitcoin, Peer-to-Peer, Assets, DeFi ecosystem.

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ABBREVATION

P2P	Peer-to-Peer
DeFi	Decentralized Finance
UML	Unified Modeling Language
DFD	Data Flow Diagram
IDE	Integrated Development Environment
Geth	Go Ethereum
DApps	Decentralized Applications

CHAPTER 1

Introduction

The financial world is undergoing a transformation of unprecedented proportions, driven by the convergence of cutting-edge technologies and a growing desire for financial inclusivity and transparency. At the heart of this transformation lies blockchain technology, a revolutionary innovation that has the potential to reshape how we think about money, transactions, and financial intermediaries. This project, titled "Decentralized Money Market," is a pioneering endeavor that leverages the power of blockchain to create a financial ecosystem that is efficient, transparent, and inclusive.

The Evolution of Finance:

Financial markets have long been the lifeblood of modern economies, facilitating the flow of capital, the allocation of resources, and the creation of wealth. However, traditional financial systems have faced challenges that have left many individuals and businesses underserved or excluded altogether. Centralized financial institutions, intermediaries, and regulatory barriers have limited access, imposed high fees, and created layers of complexity that hinder financial inclusion.

Enter blockchain technology. Originally designed as the foundational technology for cryptocurrencies like Bitcoin, blockchain has evolved far beyond its initial use case. It represents

a paradigm shift in how financial transactions are conducted and recorded. At its core, blockchain is a distributed ledger that operates on a decentralized network of computers, ensuring transparency, security, and immutability. It eliminates the need for intermediaries, reduces friction, and opens the door to a new era of financial innovation.

The Vision of the Decentralized Money Market:

The Decentralized Money Market project emerges from the fusion of blockchain's capabilities and the desire to create a financial system that truly serves everyone, irrespective of their geographical location or financial status. It envisions a future where lending and borrowing are conducted with utmost efficiency, transparency, and inclusivity.

This project's primary objective is to address the limitations of existing financial systems. Traditional online money markets often rely on centralized authorities, which introduce single points of failure, opacity, and inefficiency. High transaction fees and slow processing times can render these markets inaccessible to many, particularly those in underserved regions. Moreover, trust in these systems can be compromised due to a lack of transparency.

In response to these challenges, our project seeks to establish a decentralized money market platform that leverages blockchain technology. This platform will enable peer-to-peer lending and borrowing of digital assets, eliminating the need for intermediaries. Smart contracts, powered by blockchain, will automate lending processes, guaranteeing transparency, and reducing the risk of disputes. Transactions will occur on a trustless network, removing the need for blind faith in intermediaries. Through decentralized governance and community involvement, users will have a say in platform decisions, fostering a sense of ownership and inclusivity.

Our aim is to make financial services more accessible, efficient, and most importantly, democratized. Imagine being able to lend your hard-earned money securely and earning interest on it, all without needing to go through credit checks or waiting for approval from a banking institution. Alternatively, picture being able to borrow money within minutes, no questions asked, as long as you have digital assets to use as collateral.

The Promise of Blockchain Technology:

The beauty of DeFinance lies in its simplicity and user-friendly interface. You start by depositing your chosen cryptocurrency into a smart contract—a self-executing contract with terms directly written into code. Once deposited, your funds are pooled with other users' funds, creating a decentralized money market. You can then choose to either lend your funds to earn interest or borrow against your own assets at reasonable, transparent rates. The entire process is governed by the immutable and secure nature of blockchain technology, ensuring that your assets are as safe as they would be in a traditional bank—perhaps even safer.

Blockchain technology is the cornerstone of our project, and its transformative potential cannot be overstated. Unlike centralized systems, where transactions are processed by a single authority, blockchain operates as a decentralized, peer-to-peer network. It records every transaction across a distributed ledger, which is visible to all network participants. This transparent ledger is secured through advanced cryptographic techniques, ensuring the integrity of the data.

The immutable nature of blockchain means that once a transaction is recorded, it cannot be altered or deleted. This quality alone enhances the transparency and trustworthiness of the financial system. Additionally, smart contracts, self-executing agreements with the terms of the contract directly written into code, automate various aspects of financial transactions. In our context, they facilitate lending and borrowing by enforcing agreements without the need for intermediaries. Smart contracts execute when predefined conditions are met, reducing the risk of disputes and increasing the efficiency of financial processes.

Blockchain technology is not confined by geographical borders. It operates 24/7, making financial services accessible at any time to a global audience. This inclusivity is pivotal in addressing financial exclusion, where billions of people remain underserved by traditional banking systems. The ease of access to blockchain-based financial services can significantly impact individuals and businesses, offering opportunities for economic growth and financial security.

CHAPTER 2

Literature Survey

Satoshi Nakamoto's paper introduces Bitcoin, a decentralized digital currency designed to eliminate the need for intermediaries in financial transactions. It outlines the innovative use of a blockchain to record transactions and ensure security. Nakamoto's proposal sets the foundation for a trustless, peer-to-peer electronic cash system, enabling borderless and efficient financial exchanges [1]. Delves into the realm of decentralized finance (DeFi), highlighting how blockchain and smart contracts are reshaping traditional financial markets. It explores the potential benefits, including increased accessibility and efficiency, while also addressing challenges related to security and regulatory concerns. Schär's work provides valuable insights into the transformative potential of DeFi within the financial industry [2]. Aave is a decentralized finance (DeFi) lending and borrowing protocol built on the Ethereum blockchain. It allows users to deposit cryptocurrencies into liquidity pools, earning interest on their deposits, and borrow other assets by providing collateral. Aave's innovative feature is the use of variable interest rates, determined algorithmically, providing borrowers and depositors with flexibility in their DeFi activities [4]. Into the world of Peer-to-Peer (P2P) lending and its synergy with blockchain technology, with a particular emphasis on the Indian market. Our study dissects the factors shaping the decisions of lenders, borrowers, and P2P platforms. Furthermore, we explore how blockchain's unique features can revolutionize and elevate the P2P lending sector, potentially unlocking greater financial inclusion and democratizing

lending practices [5]. Liquidity math in Uniswap V3 revolves around concentrated liquidity provisioning, involving precise price range decisions, understanding price ticks, and managing impermanent loss. Successful liquidity providers use mathematical models to optimize positions in volatile markets, enhancing capital efficiency and potential returns [15].

	Paper Name	**Strengths**	**Drawback**
[1]	"Bitcoin: A Peer-to-Peer Electronic Cash System" by S. Nakamoto, Oct. 2008	Satoshi Nakamoto's paper introduced the groundbreaking concept of blockchain and decentralized currency, providing the foundation for modern DeFi projects.	The paper does not address specific DeFi concepts or smart contracts, as it primarily focuses on the foundational principles of a peer-to-peer electronic cash system.
[2]	“Decentralized Finance: On Blockchain- and Smart Contract-Based Financial Markets” by Fabian Schär , 2021	The paper provides a comprehensive exploration of the potential of blockchain and smart contracts in decentralized finance, offering valuable insights into this emerging field.	Potential drawback could be that the paper may not cover the most recent developments in the fast-evolving DeFi space.
[3]	“DeFi Protocols for Loanable Funds: Interest Rates, Liquidity and Market Efficiency” by Lewis Gudgeon, Sam	The methodologies used to set interest rates on three prominent DeFi PLFs, namely Compound, Aave and dYdX	The interest rates for a particular token market show dependence across protocols, developing a Vector Error Correction Model for the

	Werner, Daniel Perez, William J. Knottenbelt, 2020		dynamics.
[4]	"AAVE V2 Whitepaper" by Aave Protocol (DAO)	A comprehensive and innovative framework for decentralized lending and borrowing, which aligns with the objectives of our project.	Demands a patient and diligent approach, especially for those new to the realm of DeFi. As beginners, it's vital to recognize the need for dedicated learning and cautious initial steps
[5]	"Peer-to-Peer-Lending-using-Blockchain" by Vijaya Kittu Manda, Satya Yamijala, 2019	Valuable insights into the potential of blockchain-enhanced P2P lending for financial inclusion and democratizing finance.	The specific challenges and practical implementation details are not extensively explored.
[6]	"Decentralized Borrow and Lending of Crypto Assets" by Anup U. Sable, Ashish Patil, Pratik Nimbalkar, Ketan Pathare, Prof. Tushar Rane, 2023	Comprehensive overview of decentralized borrowing and lending in the crypto asset space.	The paper's direct reliance on the Aave protocol as a primary case study might limit its applicability to projects seeking a broader understanding of decentralized borrowing and lending.

[7]	"Decentralized Finance (DeFi): Transformative Potential & Associated Risks" by Francesca Carapella, Edward Dumas, Jacob Gerszten, Nathan Swem, Larry Wall, 2022	Asset management within the DeFi ecosystem is a significant, offering in-depth insights into how decentralized finance can effectively manage assets.	The focus on operational risk (op-risk) in the paper serves as a valuable cautionary perspective.
[8]	"The Technology of Decentralized Finance" by Raphael Auer, Bernhard Haslhofer, Stefan Kitzler, Pietro Saggese, Friedhelm Victor, 2023	The paper leverages the DSR (DeFi Stack Reference) model, which is a valuable framework for understanding and analyzing the intricate layers of the DeFi ecosystem also the focus on DTI (Distributed Ledger Technologies) underscores the significance of blockchain technologies.	The complexity of DeFi protocol interdependencies acknowledging the potential systemic risk assessment.
[9]	"Is decentralized finance actually decentralized? A social network analysis of the Aave protocol on the Ethereum blockchain" by Ziqiao Ao, Gergely Horvath, Luyao Zhang,	Uses terms like "decentralization" without clear definitions. Since decentralization can be multifaceted.	The study is seminal for inspiring future extensions but does not delve into the limitations or potential biases.

	2023		
[10]	"From banks to DeFi: the evolution of the lending markets" by Jiahua Xu, Nikhil Vadgama, 2022	Profound understanding of the inherent flaws in traditional banking systems and articulates the transformative potential of decentralized finance (DeFi) in a highly compelling and insightful manner.	The implications of scaling DeFi systems are yet to be fully understood.
[11]	"A Study of Blockchain Oracles" by Abdeljalil Beniiche, 2020	Oracles can automate processes, enhancing the flexibility making projects more efficient.	Centralization risk, as they rely on a single source of data. Some oracle services may come with associated costs.

Table 2.1: Literature Survey Table

CHAPTER 3

Limitation of Existing System

- **Technology Adoption Challenges:** The success of your project relies on the adoption of blockchain technology, which may still face barriers to entry for some users. Factors like technical complexity, lack of awareness, or resistance to change could limit its initial user base.

- **Regulatory:** The regulatory environment for blockchain and decentralized finance (DeFi) projects is evolving. Navigating these regulations can be challenging, and changes in legal requirements could impact the project's operations and scalability.

- **Security Risks:** Blockchain projects must address security vulnerabilities, including smart contract bugs and potential network attacks. These risks can lead to financial losses and damage to the project's reputation.

- **Scalability:** Blockchain networks, depending on their architecture, can face limitations in transaction processing speed and capacity. Ensuring efficient scalability solutions will be vital.

- **User Education:** Users may require a solid understanding of blockchain technology and

DeFi concepts to use the platform effectively. Providing comprehensive educational resources, simple UX and support will be essential to overcome this limitation.

- **Token Volatility:** If your project involves a native token, its value may be subject to significant volatility. Users and investors may be wary of participating due to concerns about token price fluctuations.

- **Network Congestion:** Blockchain networks can experience congestion during periods of high demand, leading to delays and increased transaction fees. Preparing for such scenarios and optimizing network usage will be important.

- **Liquidity Issues:** Lot of existing systems fails to manage liquidity & user positions, due to lack of market liquidity for specific tokens, in such cases the huge transactions are not settled correctly.

- **Failed Liquidations:** Many existing systems lack liquidation management systems leading to bad debt on protocol, to tackle that there are various ways such as building own liquidation bot or incentivising MEV's to liquidate positions effectively.

CHAPTER 4

Problem Statement, Objectives and Scope

4.1 Problem Statement

Traditional financial systems, the ones we have been using for decades, come with many problems. They can be slow, costly, and they do not always treat everyone fairly. Think about the fees you pay at the bank or how some people in different parts of the world cannot even use these systems.

That is where decentralized finance (DeFi) comes in. It is like a new way of doing money stuff, and it uses something called blockchain technology. This DeFi thing aims to fix all the problems with the old financial systems. It wants to make things faster, cheaper, and make sure everyone, no matter where they are, can use it.

4.2 Objectives

- **To develop a decentralized Money Market platform:** We aim to create an online financial platform that is not controlled by a single company or government. Instead, it runs on a decentralized network of computers, making it more secure and open to everyone.

- **To offer a Trustless & Transparent solution:** We want users to be able to trust our

platform without needing to trust a central authority. We will use blockchain technology, which records all transactions transparently and cannot be tampered with.

- **Implement efficient & dynamic interest rates:** We plan to use smart contracts to automate interest rates, making sure they are always fair and competitive. This also eliminates the need for banks to set interest rates.

- **Ensure Financial Inclusion:** We are committed to making our platform accessible to everyone, even those who might not have access to traditional banks. This means people from all over the world can participate.

- **Improve the cost & capital efficiency:** By cutting out intermediaries and using blockchain technology, we can reduce costs and make better use of capital, ultimately saving users money.

- **Mitigate Counterparty Risks:** We will use smart contracts to handle transactions, reducing the risk of someone not keeping their end of the deal. This makes lending and borrowing safer for everyone involved.

4.3 Scope

- **Usage as a Financial Services Platform:** Our project is not just about creating a cryptocurrency; it is about building a versatile financial services platform. This means users can do more than just send and receive money; they can access a wide range of financial services such as lending, borrowing, and investing.

- **Interoperability with Multiple Tokens & Digital Assets:** We are designing our platform to work with various cryptocurrencies and digital assets, not just one. This means users can utilize different tokens, making it more versatile and accommodating to various financial needs.

- **Scalability of Platform & Cross-Chain Integration:** We are planning for our platform to handle a growing number of users and transactions efficiently. Additionally, we are exploring cross-chain integration, meaning our platform can interact with other blockchain networks, enhancing its capabilities and reach.

- **DeFi Ecosystem Integration:** We are not working in isolation. Our project aims to seamlessly integrate with the broader DeFi ecosystem. This will enable users to tap into a network of DeFi applications and services.

- **Capital Diversification:** We are focused on offering users opportunities to diversify their capital and investments. This means they will not be limited to a single type of investment but can explore a range of options, potentially reducing risk.

- **Real-World Assets Tokenization:** Beyond digital assets, we are exploring the tokenization of real-world assets, such as real estate or commodities. This innovative approach can provide users with exposure to traditional assets in a blockchain-based format, increasing investment possibilities.

CHAPTER 5

Proposed System

5.1 Proposed System:

The proposed system of our project includes a series of modules in which the project work is breakdown and implementation of each module is done by using various software engineering skills required during the process.

5.1.1 Modules:

a. **Dashboard:** The project's central control hub, the dashboard, provides users with an overview of their financial activities and investments. It is the go-to place for tracking assets, loans, and market information.

b. **Wallet Connector:** This module ensures a secure connection between users' wallets and the platform, facilitating easy transactions and providing a gateway for managing their digital assets.

c. **Portfolio:** The portfolio module enables users to monitor their investments and assets. It provides real-time insights into the performance of their holdings, helping them make informed financial decisions.

d. **Markets:** The markets module is where users can explore a variety of digital assets, monitor their prices, and execute trades. It is a gateway to the world of cryptocurrency trading and investment.

e. **Lending Pool:** In the lending pool, users can offer their digital assets for lending, earning interest in return. This feature promotes financial inclusion by allowing users to grow their assets through lending.

f. **Borrowing:** Borrowing allows users to secure loans by using their digital assets as collateral. It is a means to access funds while retaining ownership of their assets, enhancing financial flexibility.

g. **Flash Loan:** Flash Loans allow us to borrow any available amount of assets without putting up any collateral, if the liquidity is returned to the protocol within one block transaction. To do a Flash Loan, you will need to build a contract that requests a Flash Loan. The contract will then need to execute the instructed steps and pay back the loan + interest and fees all within the same transaction.

5.2 Architecture Diagram

An Architectural diagram is a visual representation that maps out the physical implementation of the components of the software system. In our architecture, users interact with the Lending Pool to lend, borrow, or repay assets, managed by the Lending Pool Manager and Liquidation Manager Contract. Tokenization of Tokens represents these financial actions, ensuring easy tracking and management. Real-time asset pricing is fed into the system by the Price Oracle, which is crucial for the Lending Pool Data Provider to calculate loan-to-value ratios and interest rates. The Lending Rate Oracle, relying on a Core Library containing interest rate strategies, state data, and balances, sets the interest rates for the loans. Overseeing all these components and configurations is the Lending Pool Configurator, ensuring the system operates cohesively and securely.

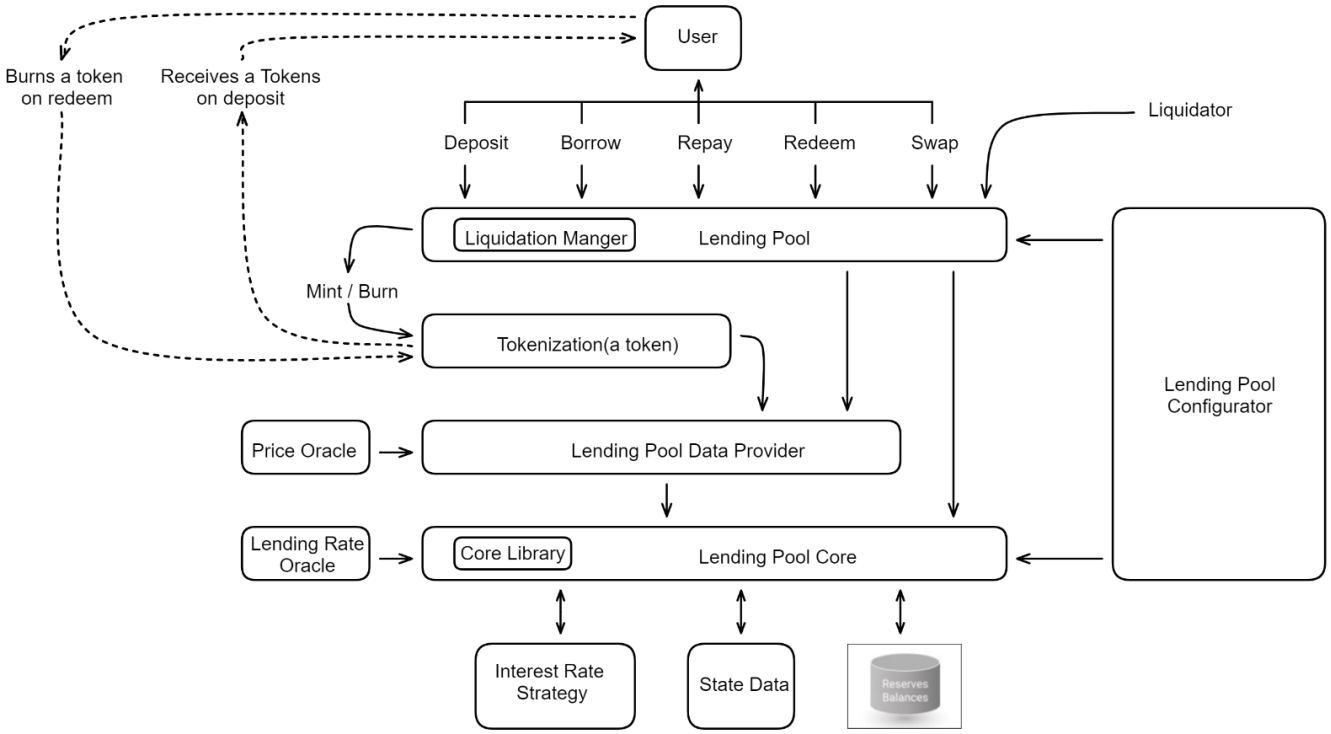

Figure 5.2 – Architecture Diagram

5.3 UML Diagrams:

A UML diagram is a diagram based on the UML (Unified Modelling Language) to visually represent a system along with its main actors, roles, actions, artifacts, or classes, to better understand, alter, maintain, or document information about the system.

5.3.1 DFD Diagram

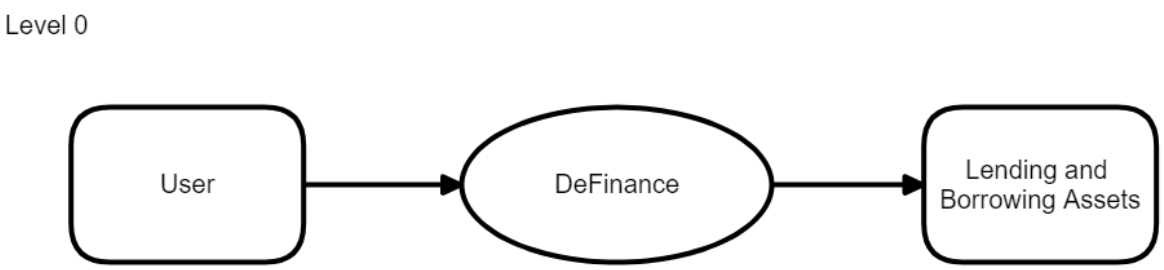

Figure 5.3.1.1 – DFD Level 0 Diagram

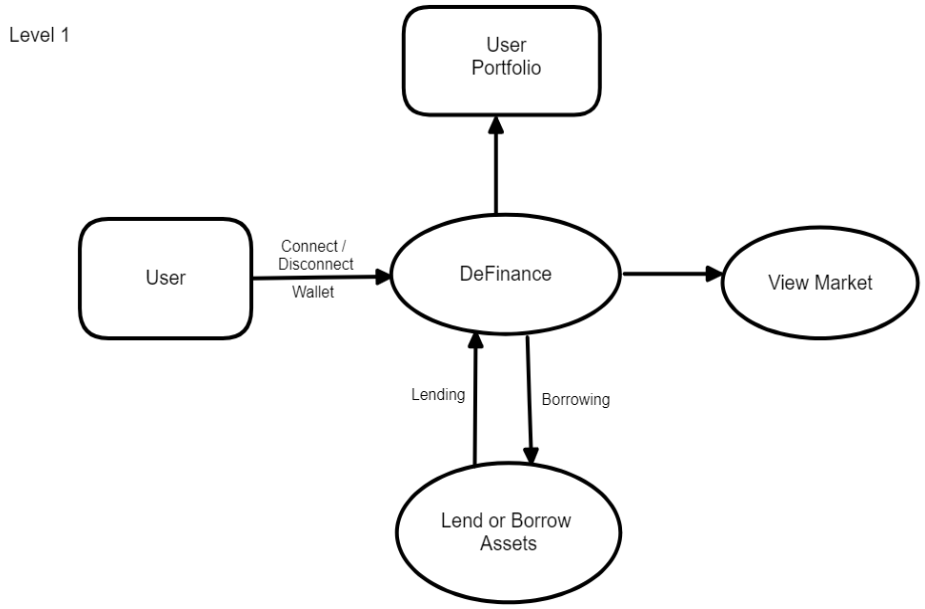

Figure 5.3.1.2 – DFD Level 1 Diagram

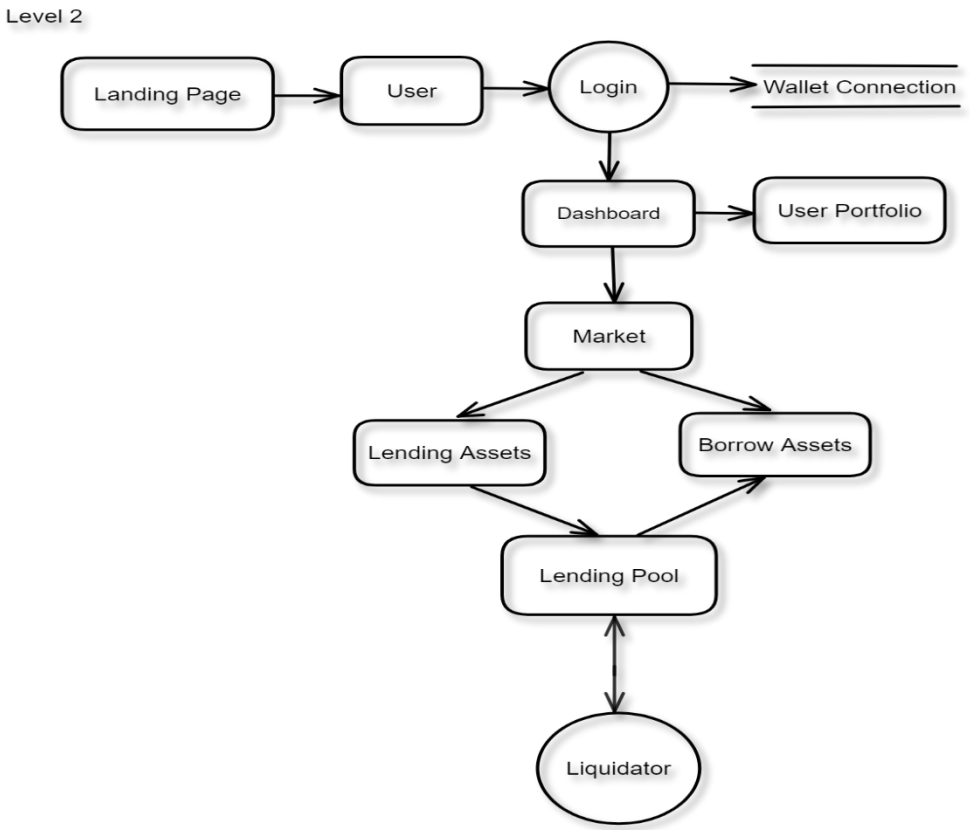

Figure 5.3.1.3 – DFD Level 2 Diagram

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles, and arrows, plus short text labels, to show data inputs, outputs, storage points, and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled. They can be used to analyse an existing system or model a new one. The data flow diagram gives clear a picture of the project and the movement of the data from one object to another object as detailed information about the process and functionalities available in the project.

5.4 Sequence Daigram

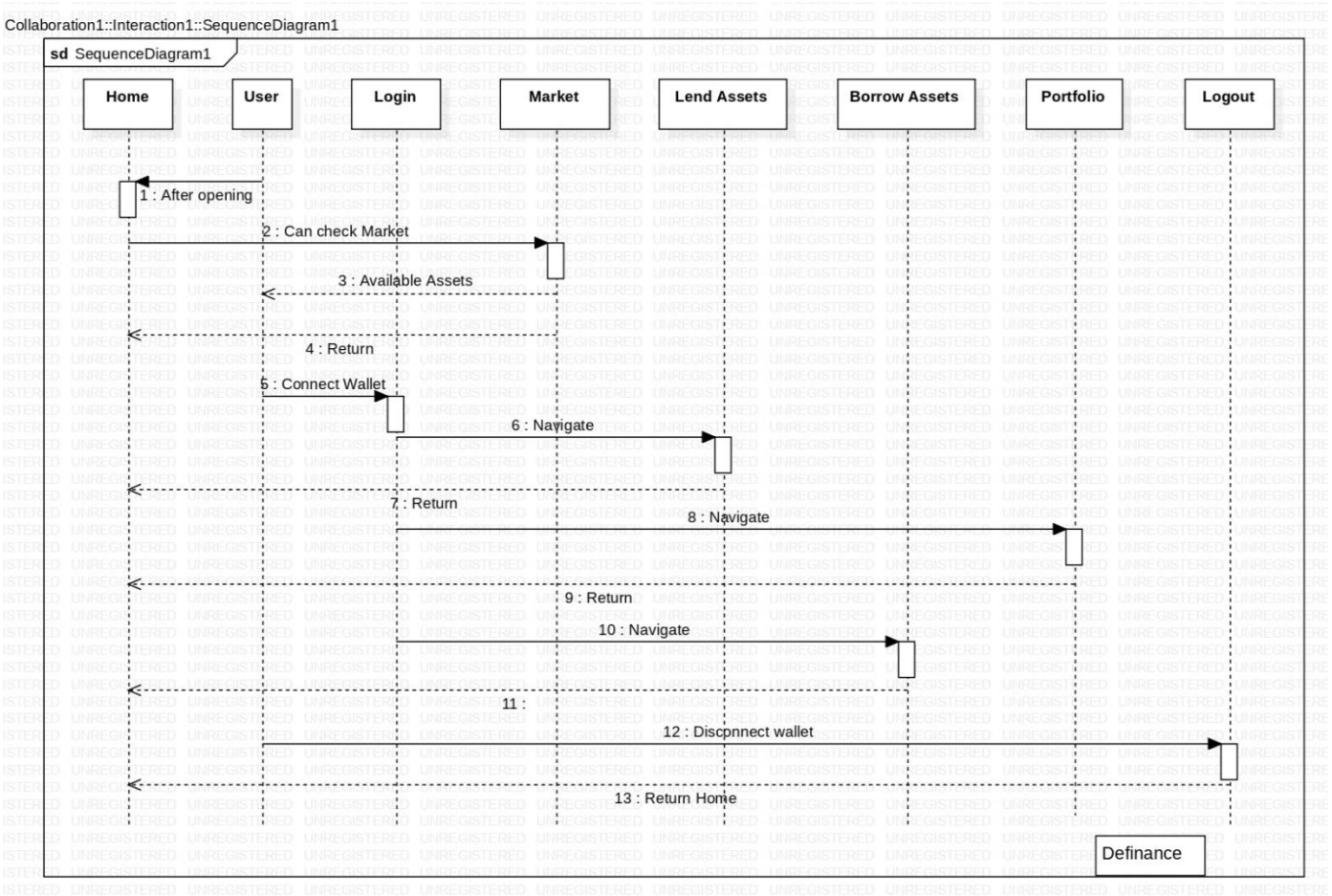

Figure 5.4 – Sequence Diagram

A sequence diagram simply depicts the interaction between objects in sequential order i.e., the order in which these interactions take place. We can also use the terms event diagrams or event scenarios to refer to a sequence diagram. Sequence diagrams describe how and in what order the objects in a system function. These diagrams are widely used by businessmen and software developers to document and understand requirements for new and existing systems. The above sequence diagram talks about the order in which happenings are taking place, and how the objects and their functions are dependent on each other. In the above diagram, objects are shown in the form of a rectangle shape whereas functionalities are represented in a flowing manner by using solid and dotted arrows.

5.5 Activity Diagram

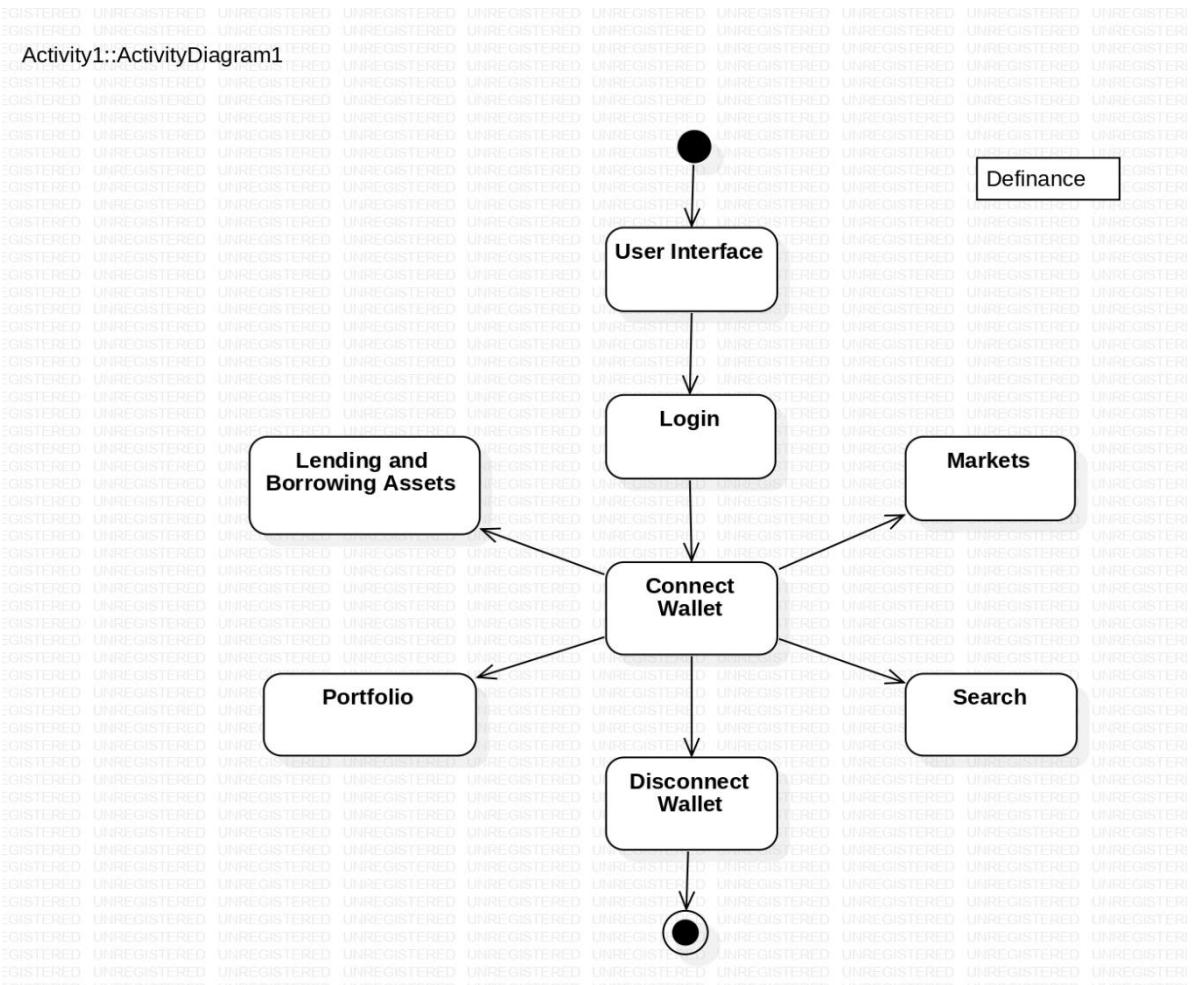

Figure 5.5 – Activity Diagram

The activity diagram is another important diagram in UML to describe the dynamic aspects of the system. An activity diagram is a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system.

The control flow is drawn from one operation to another. This flow can be sequential, branched, or concurrent. Activity diagrams deal with all types of flow control by using different elements such as fork, join, etc. The activity diagram represents the entire work of the application in the flow schema and illustrates each component of the project simply so that the user or the student will be able to understand the whole work of the project.

CHAPTER 6

Experimental Setup

6.1 Technology Stack

6.1.1 Frontend:

For developing the android application to implement our problem definition efficiently and user-friendly, we have used the following technologies:

a. HTML:

The HyperText Markup Language, or HTML is the standard markup language for documents designed to be displayed in a web browser. It can be assisted by technologies such as Cascading Style Sheets (CSS) and scripting languages such as JavaScript.

b. CSS:

Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language such as HTML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript.

c. JS:

JavaScript, often abbreviated as JS, is a versatile and widely-used programming language. It plays a crucial role in web development, enabling dynamic and interactive features on websites and web applications. In blockchain development,

JavaScript is commonly used for building decentralized applications (DApps) and for front-end development. Its compatibility with web browsers and extensive libraries and

frameworks makes it a valuable tool for creating user interfaces that interact with blockchain networks and smart contracts. JavaScript facilitates the integration of blockchain functionality into web-based applications, enhancing user experiences within the decentralized finance (DeFi) ecosystem.

Some key features of JavaScript include:

- Object-oriented programming: JavaScript supports object-oriented programming (OOP) concepts, such as encapsulation, inheritance, and polymorphism.
- Dynamic typing: JavaScript is a dynamically typed language, which means that variables can hold values of any data type.
- Functions as first-class objects: In JavaScript, functions are treated as first-class objects, which means that they can be assigned to variables, passed as arguments to other functions, and returned from functions.
- Support for AJAX: JavaScript can be used to create asynchronous web applications using AJAX (Asynchronous JavaScript and XML), which allows web pages to update content without requiring a full page reload.

6.1.2 Backend:

In the backend part, we have used Solidity and Typescript which provides detailed documentation.

a. Solidity:

Solidity is a high-level, statically-typed programming language specifically designed for writing smart contracts on blockchain platforms like Ethereum. It combines simplicity and security, making it the go-to language for creating self-executing agreements on decentralized networks. Solidity is used to define the rules and behaviors of smart contracts, enabling developers to implement complex financial logic, automate transactions, and ensure trust and transparency within decentralized applications. Its syntax resembles that of JavaScript, making it accessible to a broad range of developers in the blockchain space.

b. TS:

TypeScript is a statically-typed superset of JavaScript, known for enhancing the

development of complex software systems. In the context of blockchain development, TypeScript offers advantages such as type safety, code organization, and scalability. By providing developers with features like static typing, interfaces, and advanced tooling support, TypeScript streamlines the creation of secure and efficient smart contracts. Its ability to catch errors during the development phase helps reduce potential vulnerabilities and improve the overall quality of blockchain applications.

c. JS:

To interact with smart contracts on a blockchain using JavaScript, we will typically use libraries and tools specific to the blockchain we are working with. Ethereum is one of the most popular blockchains for smart contracts, so I will use it as an example.

We can use Web3.js or Ethers.js to connect to a blockchain network. we need to specify the network's URL (e.g., an Ethereum node's URL) to establish a connection.

To interact with a smart contract, we need its ABI (Application Binary Interface). This ABI is a JSON representation of the contract's functions and state variables. Typically, we import this ABI into your JavaScript project. We will use the ABI and the contract address to create instances of the smart contracts in our JavaScript code. This allows us to interact with the contract's functions. We can use the functions provided by Web3.js or Ethers.js to call read-only functions of the smart contract. This does not require a transaction and won't modify the blockchain. we can display the data fetched from the contract on your project's frontend.

For write operations (e.g., sending tokens, updating data), we will use the provided functions from Web3.js or Ethers.js to create and send transactions. These transactions will modify the blockchain, and we may need to sign them with the user's private key.

6.2 Software and Hardware Setup

- **Software Requirements: -**

1. Ethereum Development Environment: Since Solidity is primarily used for Ethereum-based smart contracts, you will need Ethereum-specific tools. These include:
    a. Ethereum Client: Software like Geth or Parity to connect to the Ethereum network.

   b. Remix: An in-browser Solidity IDE for writing, testing, and deploying smart contracts.
   c. MetaMask: A browser extension for managing Ethereum accounts and interacting with Ethereum-based DApps.

2. IDE
3. GIT
4. Node.JS
5. Ganache
6. Tools and Libraries

- **Hardware Requirements:**

1. Computer:
   a. Operating System: Windows, macOS or Linux. Linux is often preferred for server environments.
   b. Processor: A multi-core CPU, such as Intel Core i5 or equivalent, is sufficient.
   c. RAM: At least of 8 GB of RAM is recommended, but more is better for faster development.
   d. Storage: Minimum 5 GB free storage is required. A Solid-State Drive (SSD) is recommended for performance.
2. Graphics Processing Unit (GPU): Blockchain platforms and applications may require GPU resources, especially if they involve mining or complex computations.
3. Internet Connection: A stable and reasonably fast internet connection is essential, especially if you are interacting with remote blockchain networks.
4. Virtual Machine: If you are using virtualization for development or testing, ensure your host system meets the above requirements.

CHAPTER 7

Implementation and Result

7.1 Implementation

- **Integration of Wallet with our DApp**

```
const connectWallet = async () => {
  console.log("1. Connecting to wallet...");
  const { ethereum } = window;
  const failMessage = "Please install Metamask & connect your Metamask";
  try {
    if (!ethereum) return; // console.log(failMessage);
    const account = await ethereum.request({
      method: "eth_requestAccounts",
    });

    window.ethereum.on("chainChanged", () => {
      window.location.reload();
    });
    window.ethereum.on("accountsChanged", () => {
      window.location.reload();
    });

    const provider = new ethers.providers.Web3Provider(window.ethereum);
    const network = await provider.getNetwork();
    const networkName = network.name;
    const signer = provider.getSigner();

    if (networkName != "sepolia") {
      alert("Please switch your network to Sepolia Testnet");
```

```
      return;
    }

    if (account.length) {
      let currentAddress = account[0];
      setMetamaskDetails({
        provider: provider,
        networkName: networkName,
        signer: signer,
        currentAccount: currentAddress,
      });
      console.log("Connected to wallet....");
    } else {
      alert(failMessage);
      return;
    }
  } catch (error) {
    reportError(error);
  }
};
```

Our DApp (DeFinance), sought to integrate seamlessly with the MetaMask wallet. Through a simple code snippet, users gained access to their asset portfolios. MetaMask's user-friendly interface made it the perfect ally for both beginners and experts. With support for a variety of networks like Ethereum, Polygon, Sepolia, and Goerli, it opened doors to a world of possibilities in blockchain technology.

- **Pool Smart Contract**

```
contract LendingPool is ReentrancyGuard {

    using SafeERC20 for IERC20;
    AddressToTokenMap addressToTokenMap;
    LendingConfig lendingConfig;
    LendingHelper lendingHelper;

    enum TxMode { BORROW, WITHDRAW}
    event TransferAsset(address lender, address _token, uint _amount);
    event Lend(address indexed lender, address indexed _token, uint indexed
_amount);
    event Withdraw(address  indexed lender, address indexed  _token, uint
indexed  _amount);
    event Borrow(address  indexed borrower, address  indexed _token, uint
indexed  _amount);
```

```
    event Repay(address  indexed borrower, address  indexed _token,
uint  indexed _amount);

    mapping (address => uint) public reserves;
    address[] public reserveAssets;
    // mapping(address => bool) reserveAssets; //TODO: use mapping & an
array
    mapping(address => UserAsset[]) public lenderAssets;
    mapping(address => UserAsset[]) public borrowerAssets;
```

In our DApp, pools serve as collective repositories where users deposit cryptocurrencies for various financial maneuvers. These virtual reservoirs, overseen by smart contracts, guarantee seamless and transparent transactions, shaping a landscape of trust and efficiency within our DApp.

- **Lending Assets Smart Contract**

```
   /************* Lender functions ************************/
    receive() external payable {}

    /*
    * @dev : this function allows a lender to lend assets to the Dapp
    * @params : address token, uint amount
    */
    function lend(address _token, uint256 _amount) public
    nonReentrant
    updateEarnedInterestOnLend(msg.sender, _token)
    payable
    {
        address lender = msg.sender;
        bool _usageAsCollateralEnabled = addressToTokenMap.isETH(_token) ?
true: false;
        bool _usageAsBorrowEnabled = addressToTokenMap.isETH(_token) ?
false: true;
        string memory _symbol = addressToTokenMap.getSymbol(_token);

        if(!lendingConfig.isTokenInAssets(_token)) {
            lendingConfig.addAsset(
                _token,
                _usageAsBorrowEnabled,
                _usageAsCollateralEnabled,
                false,
                true,
                _symbol,
                lendingConfig.DECIMALS(),
```

```
            lendingConfig.BORROW_THRESHOLD(),
            lendingConfig.LIQUIDATION_THRESHOLD()
        );
    }
```

Users engage in lending various cryptocurrencies like ETH, DAI, USDT, and USDC. These assets can be supplied for interest earnings or utilized as collateral. To maintain precision, our platform diligently tracks the USD value of each asset through the ChainLink Oracle, fostering transparency and trust in asset valuation.

- **Borrowing Assets Smart Contract**

```
/******************** BORROW FUNCTIONS *****************/
    /*
    * @dev : Returns the assets lent by all lenders but only the qty
allowed
    * to be borrowed by the user
    * @params : address borrower
    * @returns : Array of structs of borrowable assets
    */
    function getAssetsToBorrow(address _borrower) public view
returns(BorrowAsset[] memory) {
        require(_borrower != address(0), "Invalid address");
        uint maxAmountToBorrowInUSD =
getUserTotalAvailableBalanceInUSD(_borrower, TxMode.BORROW);
        uint length = reserveAssets.length;
        BorrowAsset[] memory borrowAsset = new BorrowAsset[](length);
        uint borrowAssetsCount;
        for(uint i = 0; i < length; i++) {
            address token = reserveAssets[i];
            if(lendingConfig.isBorrowingEnabled(token)) {
                // borrow qty is either tokens per max borrowbale USD
amount or the ones in reserves of that token
                uint borrowQty =
lendingHelper.min(lendingHelper.getTokensPerUSDAmount(token,maxAmountToBorr
owInUSD), reserves[token]/1e18);
                if (borrowQty > 0){
                    borrowAsset[borrowAssetsCount] = BorrowAsset(token,
borrowQty, lendingConfig.BORROW_RATE());
                    borrowAssetsCount++;
                }
            }
        }
        return borrowAsset;
    }
```

Borrowing cryptocurrency mandates collateral submission in various listed cryptocurrencies. The borrowing amount is capped by a percentage of the deposited collateral, ensuring prudent lending and enabling users to access funds securely and reliably.

- **DAI Token**

```
//SPDX-License-Identifier:MIT
pragma solidity ^0.8.6;

import "@openzeppelin/contracts/token/ERC20/ERC20.sol";

contract LinkToken is ERC20{
    constructor() ERC20("Link Token","LINK"){
        _mint(msg.sender,1000000*10**18);
    }
}

//SPDX-License-Identifier:MIT
pragma solidity ^0.8.6;

import "@openzeppelin/contracts/token/ERC20/ERC20.sol";

contract USDCToken is ERC20{
    constructor() ERC20("USDC Token","USDC"){
        _mint(msg.sender,1000000*10**18);
    }
}
```

Innovatively, our DApp unveils its proprietary tokens, DAI and USDC, adding depth to lending, borrowing, and collateral functions. These native tokens enrich our platform's versatility, providing users with expanded avenues for decentralized finance interactions, fostering a dynamic and inclusive ecosystem.

- **USDC Token**

```
const Home: NextPage = () => {
  const {
    connectWallet,
    metamaskDetails,
    getUserAssets,
    getYourSupplies,
    getAssetsToBorrow,
```

```
    updateInterests,
    getYourBorrows,
  } = useContext(lendContext);

  useEffect(() => {
    // connectWallet();
  }, []);

  useEffect(() => {
    // setInterval(() => connectWallet(), 5000);
    // updateInterests();
    getUserAssets();
    getYourSupplies();
    getAssetsToBorrow();
    getYourBorrows();
  }, [metamaskDetails]);
```

In our DApp's realm, users navigate their lending and borrowing endeavors effortlessly via the portfolio feature. This feature offers a holistic view of their transactions, complemented by real-time market values of digital assets. It's a gateway to valuable insights, empowering users with current market trends and asset performance analysis.

7.2 Results

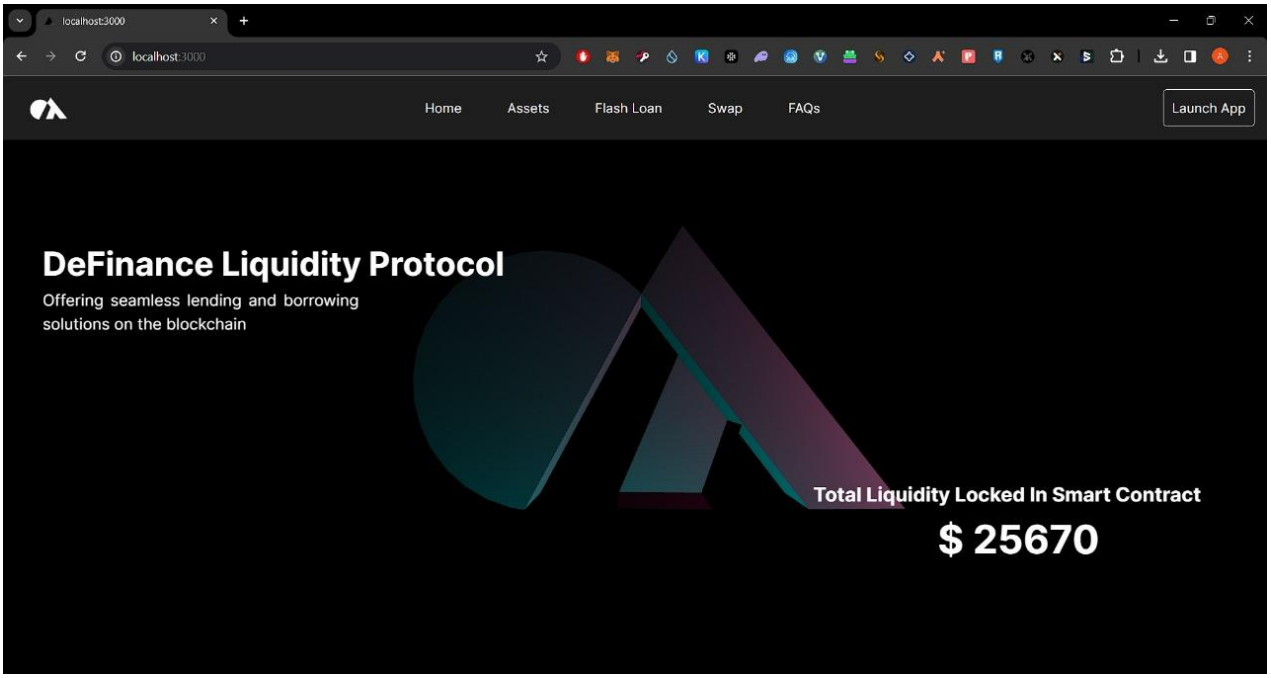

Figure 7.1 – Landing Page

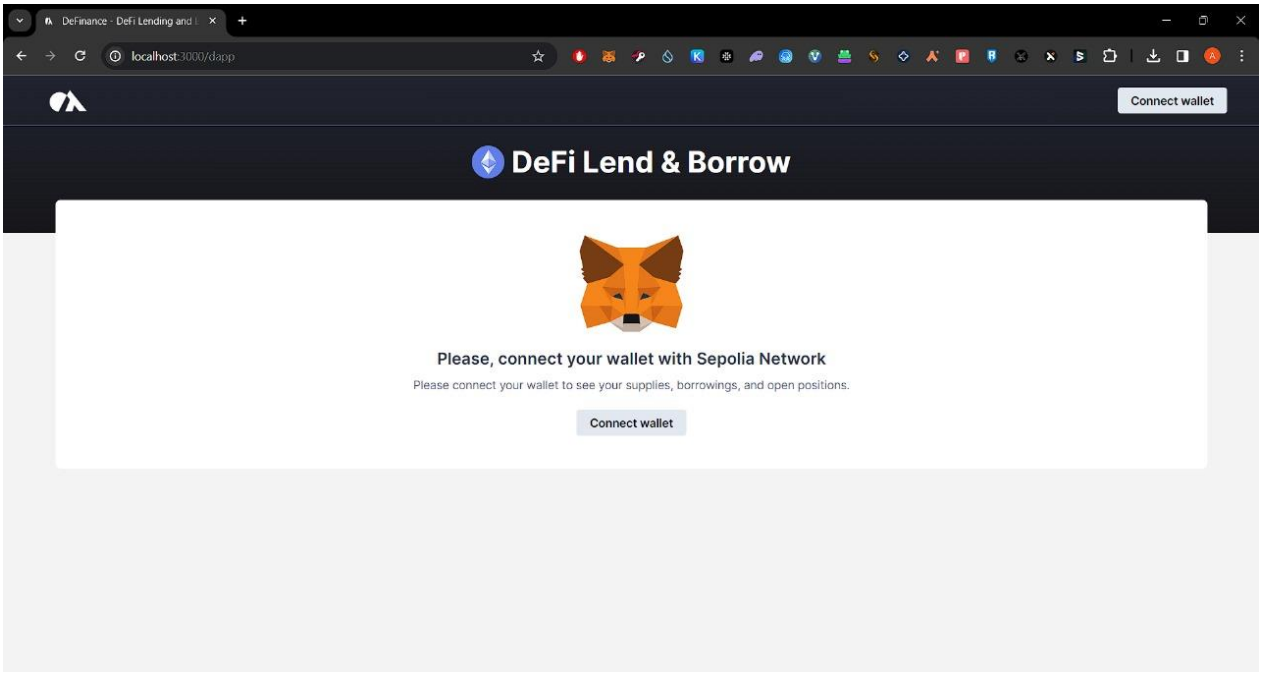

Figure 7.2 – Home Page

Figure 7.1 showcasing our DApp and inviting users to explore further. This dynamic interface provides users with an engaging introduction to our project. Figure 7.2 showcases the Home Page of our DApp, offering users an enticing glimpse into its intuitive interface.

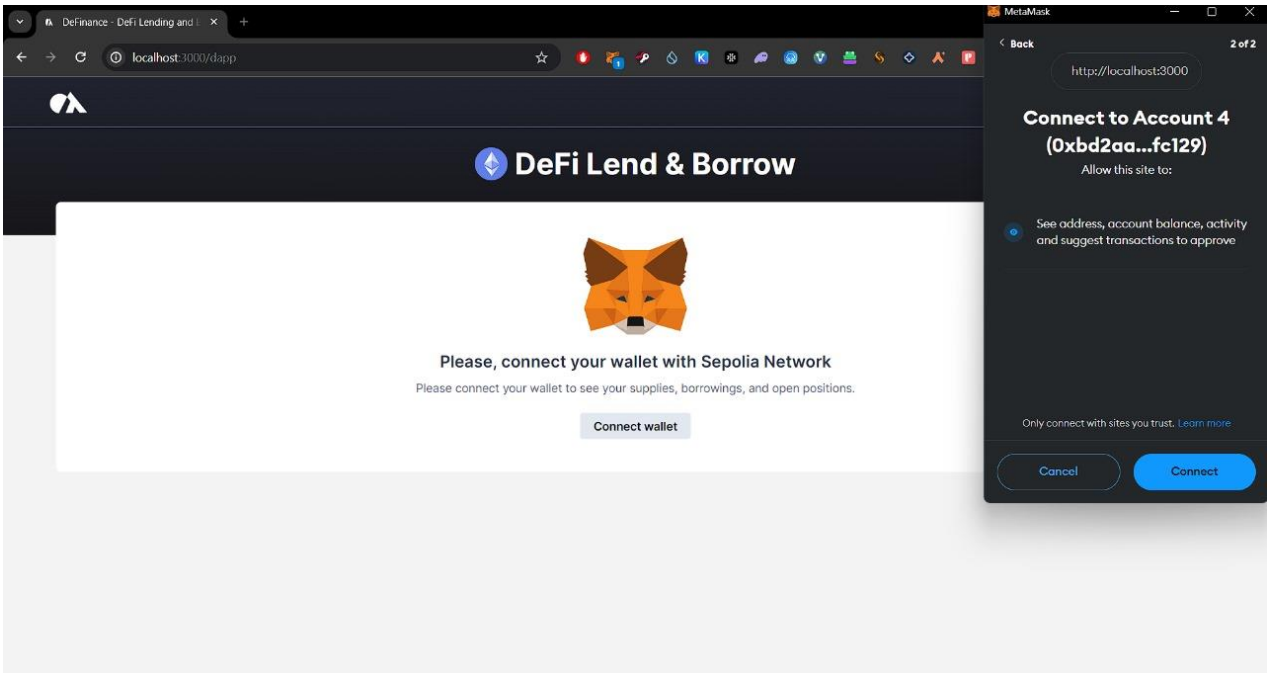

Figure 7.3 – Wallet Connection

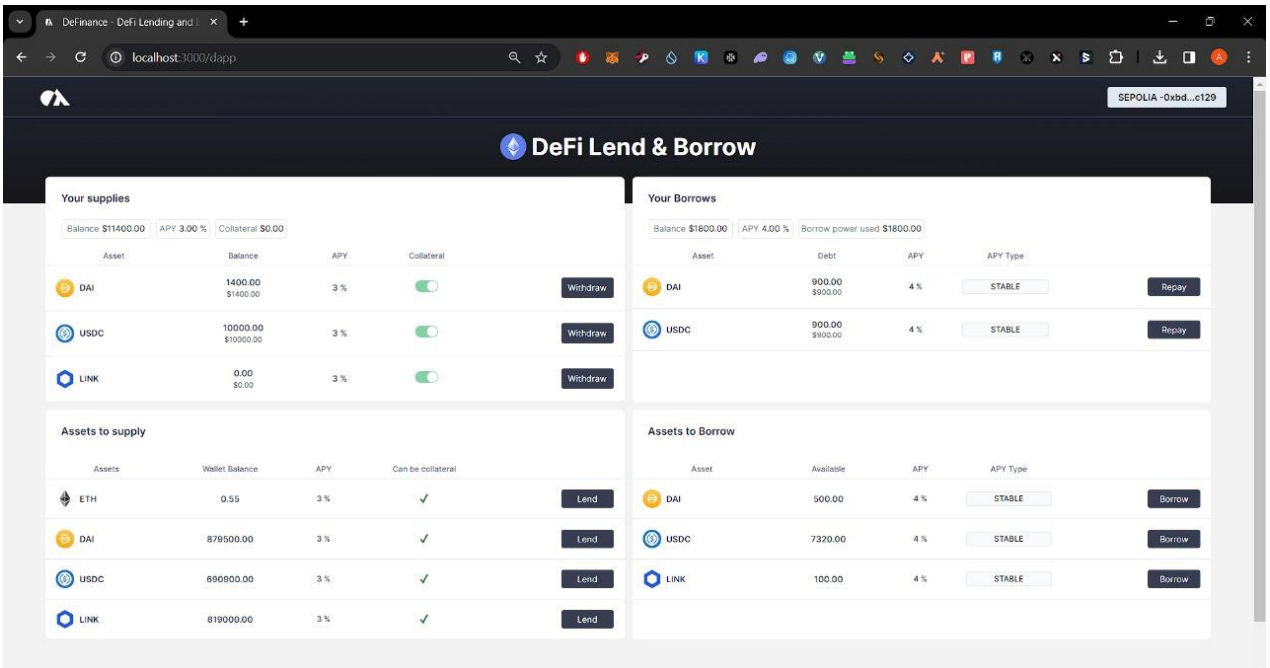

Figure 7.4 – Lending and Borrowing Page

In Figure 7.3, present the MetaMask Wallet Connection for our DApp, highlighting the seamless integration of decentralized wallet functionality for enhanced user experience. In Figure 7.4, the Lending and Borrowing page of our DApp, providing users with a comprehensive platform to engage in decentralized finance activities.

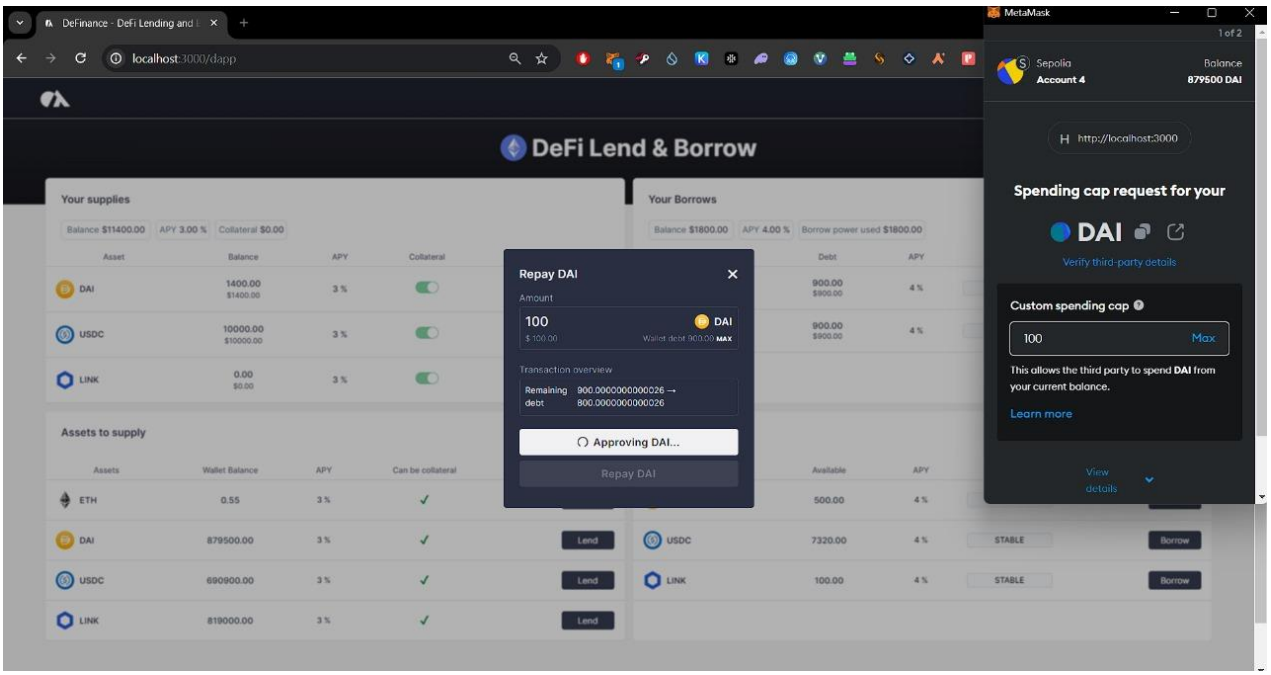

Figure 7.4 – Transaction Approval

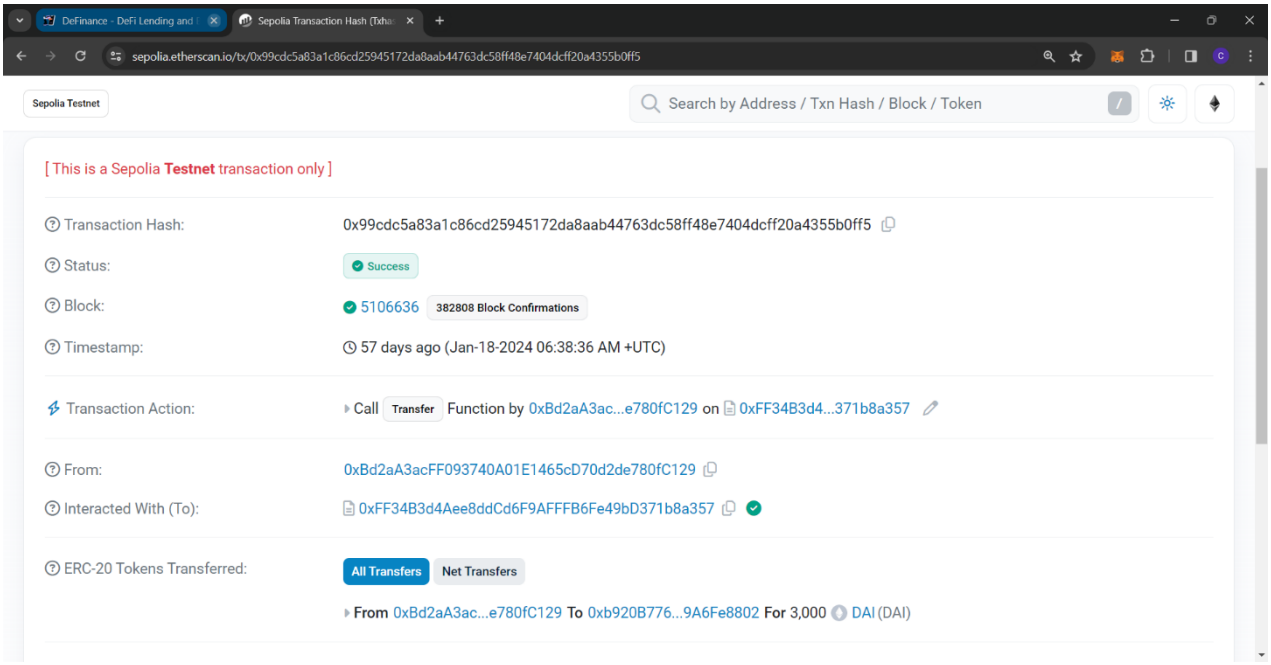

Figure 7.5 – Transaction of transferred DAI on Etherscan

Figure 7.5 showcases the seamless transaction approval process for a DAI Token, emphasizing the user-friendly nature of our interface and the ease of executing transactions. In Figure 7.6, we capture the successful completion of a transaction involving 100 DAI tokens, as evidenced by the transaction record visible on the Etherscan explorer.

CHAPTER 8

Project Plan

- **Gantt Chart**

A. P. Shah Institute of Technology | DeFinance

	Task name	Assigned	Start date	End date	Status
			19/07/2023	**22/01/2024**	
1	**Research & Planning**		**19/07/2023**	**12/10/2023**	
1.1	Research Papers	+2	19/07/2023	04/08/2023	Done
1.2	Find Problem	+2	12/10/2023	12/10/2023	Done
1.3	Define Problem	+2	12/10/2023	12/10/2023	Done
2	Smart Contract Develop...		14/08/2023	02/10/2023	In progre
3	Report - Synopsis		12/10/2023	12/10/2023	Done
4	Blockchain Integration		02/10/2023	20/10/2023	Open
5	UI Design		23/10/2023	10/11/2023	Open
6	Security Audits		13/11/2023	28/11/2023	Open
7	**Testing & Bug Fixing**		**08/01/2024**	**22/01/2024**	
7.1	Unit Testing	unassigned	08/01/2024	22/01/2024	Open
7.2	Deployment	unassigned	08/01/2024	08/01/2024	Open
7.3	Bugs Fixing	unassigned	08/01/2024	08/01/2024	Open
8	Final Report	unassigned	08/01/2024	22/01/2024	Open

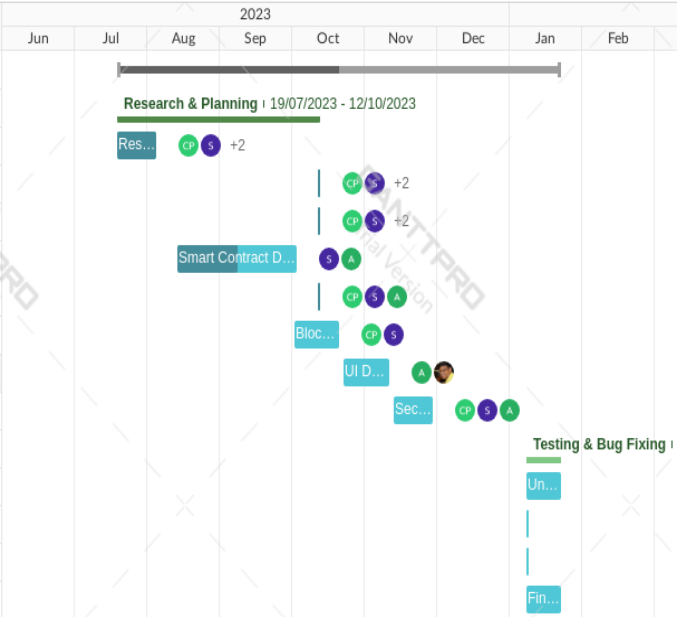

Figure 8.1 – Gantt Chart

CHAPTER 9

Conclusion

The "DeFinance: Decentralised Lending and Borrowing of Digital Assets" project represents a significant step towards redefining the landscape of financial services. Grounded in blockchain technology, the project envisions a future where finance is decentralised, transparent, and accessible to all. The journey from the evolution of finance to the promises of blockchain technology has shaped the core objectives of the project.

The simplicity and user-friendly interface of the " DeFinance: Decentralised Lending and Borrowing of Digital Assets" project offer a transformative experience. Users can seamlessly deposit, lend, borrow, and monitor their financial activities in real-time. The tokenization of transactions adds an extra layer of security and efficiency to the financial processes conducted on the platform. The expected outcomes, including user-friendly decentralised finance, transparent interest rates, and tokenized transactions, align with the project's broader goal of democratizing finance. By making financial services more accessible, efficient, and user-centric, the project aims to contribute to a future where financial empowerment is not confined by geographical borders or traditional banking systems. In conclusion, the "DeFinance: Decentralised Lending and Borrowing of Digital Assets" project is a testament to the transformative power of blockchain technology in reshaping financial systems. As we embark on the journey towards decentralised finance, we acknowledge the collaborative efforts of all those involved in making this project a reality.

CHAPTER 10

Future Scope

1 Cross-Chain Integration:

DeFinance can be expand its reach through cross-chain integration, connecting seamlessly with multiple blockchain networks. This feature can enable users to leverage assets from various blockchains, fostering a more diverse and interconnected ecosystem. The implementation involves integrating with interoperability protocols and developing smart contracts compatible with different blockchain standards.

2 Interest Rate Models:

In our project, interest rate models are based on demand & supply. By implementing more sophisticated models, potentially influenced by real-time market data, we can ensure dynamic and optimized interest rates. This approach can enhance market responsiveness, efficiency.

3 Insurance Mechanisms:

An insurance mechanism can also be introduced offering protection against unexpected events like smart contract exploits or market downturns. This risk mitigation strategy not only safeguards users but also sets our platform apart by providing a safety net. This involves partnerships with decentralised insurance protocols and the development of insurance-related smart contracts.

4 Integration with Real-World Assets:

Tokenizing the real-world assets expands the array of collateral options for users. By allowing borrowing against or lending real estate, commodities, and other tangible assets, platform can offer increased diversity and exposure. This feature aligns with the growing trend of bringing traditional assets into the decentralised finance landscape.

5 Integration with Central Bank Digital Currencies (CBDCs):

The integration of Central Bank Digital Currencies (CBDCs), can bridge the gap between traditional finance and DeFi. Users gain the advantage of interacting with digital representations of fiat currencies, potentially attracting a broader user base. Compliance with regulatory requirements and establishing partnerships with entities involved in CBDC initiatives are crucial steps in this integration.

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Publication

The project titled **'DeFinance: Decentralised Lending and Borrowing of Digital Assets'** has been submitted to the IEEE Conference/Springer Conference, **'ICAIA 2024'**, and are waiting acceptance status.

DeFinance: Decentralised Lending and Borrowing of Digital Assets

Prof. Pranali Patil[1], Prof. Deepak Khachane[2], Sanket Naikwadi[3], Aman Pandey[4], Chinmay Patil[5] and Hrugved Parab[6]

[1] Assistant Professor A. P. Shah Institute of Technology Mumbai, India, pspatil@apsit.edu.in
[2] Assistant Professor A. P. Shah Institute of Technology Mumbai, India, dskhachane@apsit.edu.in
[3] Department of Computer Engineering A. P. Shah Institute of Technology Mumbai India, sanketnaikwadi81@gmail.com
[4] Department of Computer Engineering A. P. Shah Institute of Technology Mumbai, India, amanpandey9038@gmail.com
[5] Department of Computer Engineering A. P. Shah Institute of Technology Mumbai, India, chinmayspatil@outlook.com
[6] Department of Computer Engineering A. P. Shah Institute of Technology Mumbai, India, hsparab13@gmail.com

Abstract. The financial landscape is rapidly evolving, presenting challenges for traditional systems. In response, the decentralised finance (DeFi) sector is emerging, driven by blockchain technology. This project, "DeFinance: Decentralised Lending and Borrowing of Digital Assets" aims to revolutionie financial services by providing an efficient, transparent, and inclusive lending and borrowing platform. Modules such as the dashboard, wallet connector, portfolio, markets, lending pool, and borrowing collectively offer users a comprehensive financial services platform. The key goals include trustless and transparent solutions, capital diversification, real-world asset tokenisation, and seamless integration into the DeFi ecosystem. The project envisions a financial future marked by decentralisation, inclusivity, and financial empowerment.

Keywords: Decentralised finance, Blockchain technology, Lending and Borrowing, Bitcoin, Peer-to-Peer, Assets, DeFi ecosystem

1 Introduction

The financial world is undergoing a transformation fueled by cutting-edge technologies and a growing desire for financial inclusivity and transparency. At the core of this transformation is blockchain technology, a revolutionary innovation with the potential to reshape transactions, money, and financial intermediaries. This project, titled "DeFinance: Decentralised Lending and Borrowing of Digital Assets" leverages blockchain's power to create an efficient, transparent, and inclusive financial ecosystem.

The Evolution of Finance

Financial markets, crucial for modern economies, have faced challenges leading to underserved individuals and businesses. Centralised financial institutions and regulatory barriers limit access and create complexity. Blockchain technology, initially designed for cryptocurrencies like Bitcoin, has evolved into a distributed ledger operating on a decentralised network. It ensures transparency, security, and immutability, eliminating intermediaries and fostering a new era of financial innovation.

Traditional Lending and Borrowing

In the world of traditional lending and borrowing, it is a bit like making a financial arrangement with a bank. When you need some extra cash—maybe to buy a house, start a business, or cover unexpected expenses—you head over to your bank. They take a look at your financial track record, considering things like your credit history and how much money you make. If everything looks good, they agree to lend you the money. Of course, there is a catch: you have to pay them back, and they will charge you extra, called interest, for the favour. The terms of how much you will pay back each month and for how long are all laid out in an agreement. It is a pretty standard way people have been getting financial support for a long time, building a relationship with their local bank to make big things happen in their lives.

Digital Assets

Digital assets are like online versions of things you own or use, but they exist on the internet using a secure technology called blockchain. Examples include cryptocurrencies such as Bitcoin, which are

like digital money, and tokens representing ownership in online networks. Unique digital items, like special edition digital art (called NFTs), also fall into this category. Digital assets make it possible to do things like trade, own, and use stuff in a secure and transparent way on the internet.

The Vision of the DeFinance.

The project emerges from the fusion of blockchain's capabilities and the vision to create a financial system serving everyone, regardless of geographical location or financial status. The primary objective is to address limitations in existing financial systems, fostering decentralisation, transparency, and inclusivity.

In response to challenges faced by traditional online money markets, the project seeks to establish a decentralised platform for peer-to-peer pool based lending and borrowing of digital assets. Smart contracts automate lending processes, guaranteeing transparency, and reducing dispute risks. Through decentralised governance and community involvement, users can actively participate in platform decisions, fostering inclusivity.

The aim is to make financial services more accessible, efficient, and democratised. Users can securely lend their money and earn interest without credit checks or lengthy approval processes. Conversely, borrowing becomes swift and hassle-free, leveraging digital assets as collateral.

The Promise of Blockchain Technology

The beauty of DeFinance lies in its simplicity and user-friendly interface. Users deposit cryptocurrencies into smart contracts, creating a decentralised money market. They can choose to lend their funds, earning interest, or borrow against their assets at transparent rates. Blockchain's immutable nature ensures the security of assets, providing a trustworthy alternative to traditional banking.

Blockchain operates as a decentralised, peer-to-peer network, recording transactions across a visible ledger secured through advanced cryptographic techniques. Smart contracts automate financial transactions, enforcing agreements without intermediaries. Blockchain's global accessibility addresses financial exclusion, offering economic opportunities and security.

2 Background

A. Ethereum

Ethereum is like the wizard of the blockchain world. It is not just about digital money; it is about creating smart contracts, which are like self-executing agreements written in code. This means you can do all sorts of things on Ethereum, from creating your own cryptocurrency to building decentralised applications (DApps). What makes Ethereum stand out is its ability to bring smart contracts to life, allowing people to exchange things like money, property, or even votes without needing a middleman. This has significantly benefited the blockchain industry by making it more than just a ledger for transactions. Ethereum has opened a whole new world of possibilities.

Now, let us talk about the good stuff Ethereum has brought to the table. It is like the backbone of this decentralised revolution. First off, decentralised finance (DeFi) would not be without Ethereum. With smart contracts, people can lend, borrow, and trade digital assets without needing a bank. That is financial freedom right there. Plus, Ethereum is the reason for those NFTs (non-fungible tokens) where Artists and creators can tokenise their work, proving ownership and selling digital art in a way that was never possible before. Ethereum is the platform behind decentralised applications that aim to make everything from social media to gaming more transparent and user-centric. Think of decentralised apps (DApps) — they are like apps on your phone, but no one person or company controls them. Ethereum powers these, making everything from social media to gaming more open and fairer. Ethereum is a game-changer in the blockchain world. It is like the spark that ignites new ideas and challenges how things are typically done.

B. Defi

DeFi or Decentralised Finance is like a financial revolution happening on the internet. It is all about making traditional financial services, like lending or trading, work without the need for banks or other middlemen. Instead of relying on a central authority, DeFi uses smart contracts on blockchains—like Ethereum—to automate and execute transactions. This means you can lend your crypto to someone across the globe and earn interest, or you can borrow without dealing with a bank. It is like turning the old-school finance system on its head, giving more people access to financial services and letting them be in control of their money. This innovation aims to democratise finance, providing global access to financial services while reducing reliance on centralised institutions.

Figure 1 is the visual representation which illustrates key metrics of the decentralized lending platform Aave, specifically focusing on the Total Value Locked (TVL) and the Total Borrowed Amount. The Total Value Locked denotes the cumulative value, expressed in USD, deposited across all digital assets within the lending pool contracts. Conversely, the Total Borrowed Amount represents the sum of digital assets borrowed by users, also expressed in USD. At its peak, Aave reached remarkable figures, with a peak total value locked at $19.44 billion and a concurrent total borrowed amount of $12.15 billion, showing the platform's significant presence and user engagement within the decentralized finance landscape.

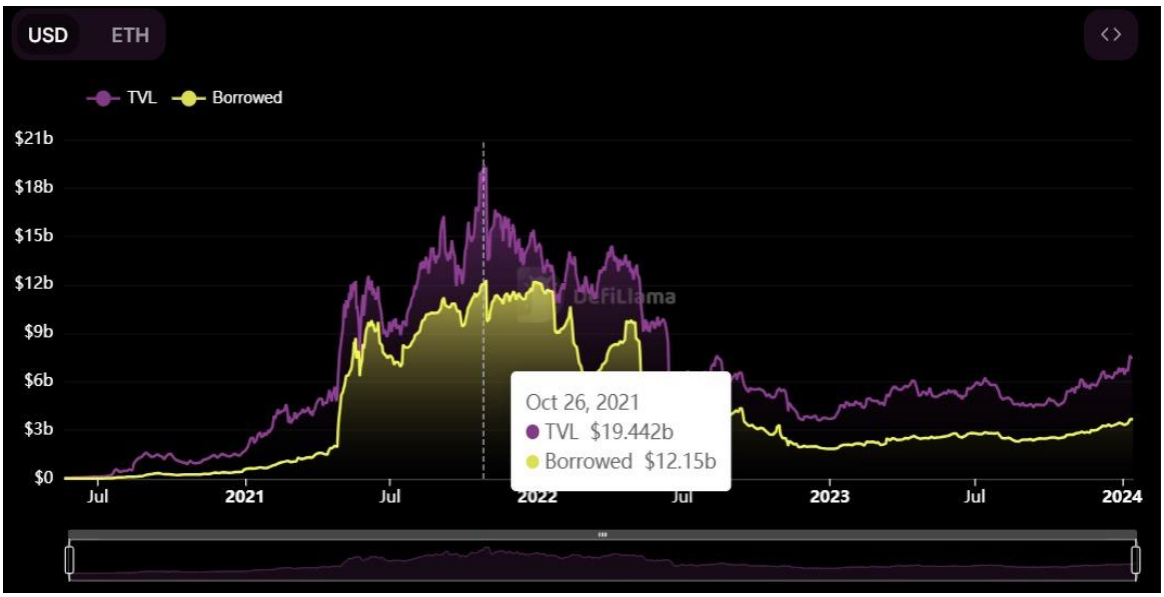

Fig. 1. AAVE Total Valued Locked and Borrowed Digital Assets in USD

3 Existing System

A. Literature Survey

[1] Satoshi Nakamoto's paper introduces Bitcoin, a decentralised digital currency designed to eliminate the need for intermediaries in financial transactions. It outlines the innovative use of a blockchain to record transactions and ensure security. Nakamoto's proposal sets the foundation for a trustless, peer-to-peer electronic cash system, enabling borderless and efficient financial exchanges.

[2] Delves into the realm of decentralised finance (DeFi), highlighting how blockchain and smart contracts are reshaping traditional financial markets. It explores the potential benefits, including increased accessibility and efficiency, while also addressing challenges related to security and

regulatory concerns. Schär's work provides valuable insights into the transformative potential of DeFi within the financial industry.

[3] In the dynamic world of Decentralised Finance (DeFi), Protocols for Loanable Funds (PLFs) are taking centre stage. These protocols, powered by smart contracts, streamline the lending and borrowing of funds. This literature review delves into the intricate world of interest rate methodologies within key DeFi PLFs—Compound, Aave, and dYdX. Through real-world observations, the study explores how interest rates adapt to changing levels of liquidity. It also delves into market efficiency and the connections between different protocols, shedding light on the subtle dynamics of the DeFi landscape. The findings hint at a fascinating interplay between specific token markets, suggesting that changes in interest rates within one protocol might ripple across others, unveiling the intricacies of the DeFi ecosystem.

[4] Aave is a decentralised finance (DeFi) lending and borrowing protocol built on the Ethereum blockchain. It allows users to deposit cryptocurrencies into liquidity pools, earning interest on their deposits, and borrow other assets by providing collateral. Aave's innovative feature is the use of variable interest rates, determined algorithmically, providing borrowers and depositors with flexibility in their DeFi activities.

[5] Into the world of Peer-to-Peer (P2P) lending and its synergy with blockchain technology, with a particular emphasis on the Indian market. Our study dissects the factors shaping the decisions of lenders, borrowers, and P2P platforms. Furthermore, we explore how blockchain's unique features can revolutionise and elevate the P2P lending sector, potentially unlocking greater financial inclusion and democratising lending practices.

[10] In the dynamic landscape of the Internet of Value (IOV), this paper takes us on a journey from traditional banks to the innovative realm of decentralised finance (DeFi) lending protocols such as Maker, Compound, and Aave. Unpacking the challenges faced by traditional money markets, the narrative paints a picture of a future where borrowing and lending seamlessly unfold in a decentralised space, free from the constraints of central intermediaries. The story foresees a merging of traditional money markets and DeFi, driven by evolving regulations and a growing interest in Central Bank Digital Currency (CBDC) development.

[15] Liquidity math in Uniswap V3 revolves around concentrated liquidity provisioning, involving precise price range decisions, understanding price ticks, and managing impermanent loss. Successful liquidity providers use mathematical models to optimise positions in volatile markets, enhancing capital efficiency and potential returns.

B. Limitation of Existing System

In examining the existing financial frameworks, it becomes imperative to acknowledge several challenges that pose constraints on their seamless operation. These challenges, while not insurmountable, underscore the complexities inherent in the integration of blockchain technology and decentralised finance (DeFi). The "DeFinance: Decentralised Lending and Borrowing of Digital Assets" project seeks to address these challenges proactively, recognising that overcoming them is pivotal for the project's success.

1. Technology Adoption Challenges:

The adoption of blockchain technology, a cornerstone of the project's success, may encounter barriers for certain users. Factors such as technical intricacy, limited awareness, and resistance to change could impede the initial uptake of the platform.

2. Regulatory Dynamics:

The regulatory environment surrounding blockchain and DeFi projects is dynamic and evolving.

Navigating through these regulations poses challenges, and alterations in legal requirements could impact the operational landscape and scalability of the project.

3. Security Imperatives:

Addressing security vulnerabilities is paramount for blockchain projects, encompassing concerns such as smart contract bugs and potential network attacks. Failure to mitigate these risks may result in financial losses and tarnish the project's reputation.

4. Scalability Considerations:

Blockchain networks, contingent on their architecture, confront limitations in transaction processing speed and capacity. Implementing effective scalability solutions is crucial to accommodate increased demand and ensure optimal performance.

5. User Education Requirements:

Users may necessitate a robust understanding of blockchain technology and DeFi concepts to engage with the platform effectively. Offering comprehensive educational resources, an intuitive user experience, and robust support mechanisms are indispensable to overcome this educational barrier.

6. Token Volatility Concerns:

If the project involves a native token, its value may be subject to significant volatility. Addressing user concerns related to token price fluctuations is imperative to foster confidence and participation.

7. Network Congestion Challenges:

Blockchain networks may experience congestion during periods of high demand, leading to delays and increased transaction fees. Adequate preparation for such scenarios and optimising network usage are essential considerations.

8. Liquidity Management Issues:

Many existing systems fail to manage liquidity and user positions effectively, often due to insufficient market liquidity for specific tokens. This results in challenges where substantial transactions may not be settled accurately.

9. Failed Liquidation Management:

Several existing systems lack comprehensive liquidation management, resulting in bad debt on protocols. Strategies such as developing proprietary liquidation bots or incentivising MEVs (Miner Extractable Value) to execute liquidations efficiently become crucial to mitigate this challenge.

C. Benefits of our System

1. Financial Inclusion:

Anyone with an internet connection can participate, providing financial services to individuals who may not able to access traditional services due to limitations.

Decentralised platforms operate globally, allowing users from various regions to access financial services.

2. Elimination of Intermediaries:

This system removes traditional intermediaries like banks which lowers transaction costs, making lending and borrowing more cost-effective for users. Smart contracts automate the processes, reducing the need for intermediaries.

3. Transparency and Security:

Transactions recorded on the blockchain are irreversible & immutable, providing a transparent and auditable history of all activities which are happening in the system. Smart contracts, once deployed on the blockchain cannot be tampered so enhancing security and reducing the risk of fraud.

4. Flexibility and Choice:

Users can lend and borrow a variety of digital assets beyond traditional currencies, Cryptocurrencies, and tokenised real-world assets. This system does not limit itself with a fixed rate of interest based on any regulatory changes, interest rates vary based on demand and supply allowing users more flexibility

5. Global Market Access:

Decentralised platforms do not have a time limitations like traditional banking systems. as those are running on blockchain. it enables users to engage in lending and borrowing activities at any time, unlike traditional markets with opening hours.

6. Yield Opportunities:

Lenders can earn interest on deposited assets, providing a source for passive income. Borrowers can access loans without the need for a traditional credit check, expanding opportunities for those with limited to none credit histories.

D. Risks Involved in Decentralised Lending & Borrowing

1. Smart Contract Vulnerabilities:

Smart contracts, the self-executing contracts governing transactions, may have some vulnerabilities that malicious actors can exploit, leading to financial losses. Such exploits can empty the whole TVL (Total Value Locked) from the application leading to loss of user assets as well as protocol's own assets.

2. Market Volatility & Liquidity Risks:

The value of digital assets used as collateral can be highly volatile, exposing borrowers to the risk of liquidation if the value of collateral falls significantly. There could be such a scenario where the market may not have enough available liquidity for the platform to sell & liquidate a user, this could cause bad debt on the platform.

3. Regulatory Uncertainty:

Decentralised finance operates in a regulatory grey area in many jurisdictions. Regulatory changes or Non-crypto-friendly laws could impact the functioning of platforms.

4. Oracle Risks:

DeFi Smart contracts often depend on external data (oracles) to make decisions. Manipulation of this external data can lead to incorrect outcomes ultimately affecting the functioning of contracts with false liquidations.

5. Centralised Points of Failure:

While the ecosystem is decentralised, certain components like user interfaces, websites or wallet providers are usually centralised. Those components expose users to specific scams or phishing attacks.

6. Emerging Challenges:

The rapid evolution of the decentralised finance space introduces new and unforeseen challenges every day. It makes it difficult to anticipate all potential future risks.

6 Methodology

A. Oracle

Smart contracts serve as self-executing pieces of code, automating predefined tasks based on specific conditions. Deployed on a blockchain, they operate in a deterministic and isolated manner, lacking direct access to information beyond the blockchain network. This inherent limitation hinders their ability to interact with real-world data, which is often a crucial requirement for executing complex tasks and applications. To address this limitation, oracles function as intermediaries that facilitate the integration of real-world data into smart contracts. These oracles act as connectors between the isolated nature of smart contracts and the dynamic, external information they may depend on for proper execution. By fetching, validating, and transmitting external data to smart contracts, oracles bridge the gap between the deterministic code of smart contracts and the ever-changing conditions of the external world.

One of the popular oracle service providers is ChainLink, which works on the concept of Oracle Consensus by which multiple independent oracle nodes collectively agree on the accurate value of an external data point, such as a cryptocurrency price. This consensus mechanism is crucial for ensuring the reliability and integrity of the data provided to smart contracts on the blockchain.

B. Modules

1. Dashboard

The dashboard serves as the central control hub of the project, providing users with an overview of their financial activities and investments. It is as a go-to place for tracking assets, loans, and market information.

2. Wallet Connector

This module ensures a secure connection between users' wallets and the platform, facilitating easy transactions and providing a gateway for managing digital assets securely.

3. Portfolio

The portfolio module enables users to monitor their investments and assets. It offers real-time insights into the performance of their holdings, helping them make informed financial decisions.

4. Markets

The markets module is where users can explore a variety of digital assets, monitor their prices, and execute trades. It acts as a gateway to the world of cryptocurrency trading and investment.

5. Lending Pool

In the lending pool, users can offer their digital assets for lending, earning interest in return. This feature promotes financial inclusion by allowing users to grow their assets through lending.

6. Borrowing

The borrowing module allows users to secure loans using their digital assets as collateral. It provides a means to access funds while retaining ownership of their assets, enhancing financial flexibility.

4 Result and Conclusion

A. Expected Outcome

The "DeFinance: Decentralised Lending and Borrowing of Digital Assets" project aims to achieve several key outcomes, contributing to a user-friendly and transparent decentralised finance platform. The expected outcomes include:

1. User-Friendly Decentralised Finance

The platform endeavors to provide a seamless and user-friendly interface, particularly catering to beginners in the decentralised finance space. A user-centric design, intuitive navigation, and educational resources aim to make the platform accessible to a wide range of users. Its interactive nature provides users with a comprehensive overview of their financial status, contributing to an

engaging and informative user experience.
2. Live Asset Value Monitoring
Users will have the capability to monitor the real-time value of their assets through the portfolio module. This feature enhances transparency and allows users to make informed decisions based on the current performance of their holdings.
3. Transparent Interest Rates
The platform ensures transparent interest rates for both lending and borrowing through the Lending Rate Oracle. Users can have confidence in the fairness and openness of the interest rate-setting process, fostering trust within the decentralised finance ecosystem.

4. Tokenised Transactions
Tokenisation of transactions within the system ensures easy tracking and management. This feature simplifies the overall user experience and contributes to the efficiency and security of financial transactions on the platform.
5. Safety and Configuration Oversight
The Lending Pool Configurator oversees system configurations, ensuring cohesive and secure operation. This feature enhances the safety of user funds and provides a robust framework for the platform's functionality.

B. Conclusion
The "DeFinance: Decentralised Lending and Borrowing of Digital Assets" project represents a significant step towards redefining the landscape of financial services. Grounded in blockchain technology, the project envisions a future where finance is decentralised, transparent, and accessible to all. The journey from the evolution of finance to the promises of blockchain technology has shaped the core objectives of the project.
By addressing the limitations of existing financial systems, the project aims to provide a decentralised finance platform that facilitates peer-to-peer lending and borrowing of digital assets. The utilisation of smart contracts powered by blockchain ensures transparency, automates financial processes and eliminates the need for intermediaries. Through decentralised governance and community involvement, the project fosters inclusivity, giving users a stake in platform decisions.
The simplicity and user-friendly interface of the " DeFinance: Decentralised Lending and Borrowing of Digital Assets" project offers a transformative experience. Users can seamlessly deposit, lend, borrow, and monitor their financial activities in real time. The tokenisation of transactions adds an extra layer of security and efficiency to the financial processes conducted on the platform.
The expected outcomes, including user-friendly decentralised finance, transparent interest rates, and tokenised transactions, align with the project's broader goal of democratising finance. By making financial services more accessible, efficient, and user-centric, the project aims to contribute to a future where financial empowerment is not confined by geographical borders or traditional banking systems.
In conclusion, the "DeFinance: Decentralised Lending and Borrowing of Digital Assets" project is a testament to the transformative power of blockchain technology in reshaping financial systems. As we embark on the journey towards decentralised finance, we acknowledge the collaborative efforts of all those involved in making this project a reality.

C. Future Work
1. Cross-Chain Integration:
DeFinance can expand its reach through cross-chain integration, connecting seamlessly with multiple blockchain networks. This feature can enable users to leverage assets from various blockchains, fostering a more diverse and interconnected ecosystem. The implementation involves integrating with interoperability protocols and developing smart contracts compatible with different blockchain standards.
2. Interest Rate Models:

In our project, interest rate models are based on demand & supply. By implementing more sophisticated models, potentially influenced by real-time market data, we can ensure dynamic and optimized interest rates. This approach can enhance market responsiveness and efficiency.

3. Insurance Mechanisms:

An insurance mechanism can also be introduced offering protection against unexpected events like smart contract exploits or market downturns. This risk mitigation strategy not only safeguards users but also sets our platform apart by providing a safety net. This involves partnerships with decentralised insurance protocols and developing insurance-related smart contracts.

4. Integration with Real-World Assets:

Tokenising real-world assets expands the array of collateral options for users. By allowing borrowing against or lending real estate, commodities, and other tangible assets, the platform can offer increased diversity and exposure. This feature aligns with the growing trend of bringing traditional assets into the decentralised finance landscape.

5. Integration with Central Bank Digital Currencies (CBDCs):

The integrating of Central Bank Digital Currencies (CBDCs), can bridge the gap between traditional finance and DeFi. Users gain the advantage of interacting with digital representations of fiat currencies, potentially attracting a broader user base. Compliance with regulatory requirements and establishing partnerships with entities involved in CBDC initiatives are crucial steps in this integration.

6. Flash loans:

Flash Loans enable borrowing any available amount of assets without collateral, provided liquidity is returned to the protocol within one block transaction. It involves building a contract by the borrower that requests a Flash Loan, executing instructed steps, and repaying the loan.

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