SecureLoan: Fraud Resistant Lending Platform

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We are indebted to FAST NUCES University for providing the platform and facilities, which helped us to do this project in the designated time frame.

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Abstract

The current lending landscape is plagued by fraud and inefficiencies, which can hinder economic growth and disproportionately impact underserved communities. Traditional lending systems often rely on intermediaries, leading to delays, high costs, and a lack of transparency. Additionally, loan fraud can cause significant financial losses for both lenders and borrowers. The Secure Loan project aims to develop a block-chain-based, fraud-resistant lending platform that provides a safe and transparent environment for both lenders and borrowers. This project proposes the development of a blockchain-based fraud-resistant platform. Leveraging the features of blockchain, such as decentralization, immutability, and transparency, this platform aims to make it more difficult for fraudsters to commit fraud. The expected outcomes of this project are twofold: first, it will contribute to ongoing research and development in blockchain technology, particularly in the area of fraud prevention, and second, it will provide the Pakistani government with a practical means of effectively and transparently combating fraud.

Table of Content

List of Figures:

List of Tables:

1 Introduction

Lending methods in the current financial environment are tainted by pervasive fraud and inefficiency, which sustain economic growth hurdles and disproportionately impact marginalized populations. Conventional lending systems, which rely on middlemen, frequently cause transaction delays, excessive fees, and opacity, and loan fraud results in large losses for both lenders and borrowers. In response to these difficulties, the SecureLoan project was born, offering a unique method of financing using blockchain technology.

The goal of this project is to create a blockchain-based platform that is especially intended to thwart fraud and advance lending transparency. Through utilising the intrinsic qualities of blockchain technology, like decentralisation, immutability, and transparency, SecureLoan seeks to provide a reliable and secure environment for lenders as well as borrowers. The development of a system that removes the need for middlemen, streamlines procedures, and lowers the dangers connected with fraudulent activity is essential to its goal.

In the midst of a lending environment that is becoming more complicated and is marked by the rise of loan programmes aimed at the poor, SecureLoan is a shining example of honesty. It tackles the unethical business practices that are common in the sector, when businesses take advantage of weaker areas by using unfair interest rates and dishonest loan tactics. Moreover, well-known financial institutions are accused of impeding client repayments and escalating debt through dishonest behaviour.

SecureLoan is essentially a commitment to ethical lending practices and financial inclusiveness rather than only being a technology solution. SecureLoan aims to transform the loan industry by utilising blockchain technology to provide a means of achieving more security, transparency, and equity for all stakeholders involved in the financial system.

1.1 Background

In Pakistan, like in many developing economies, access to fair and transparent lending mechanisms is crucial for fostering economic growth and empowering underserved communities. Nevertheless, the nation's conventional financing methods have frequently failed to achieve these goals. Financial vulnerabilities are made worse by fraudulent schemes and dishonest practices, especially when they affect marginalized communities. Meanwhile, intermediaries in the loan process add complexity and delays.

The proliferation of digital financial services, including mobile money platforms like Easypaisa and JazzCash, initially promised to democratize access to financial services. However, concerns have emerged regarding their role in perpetuating fraudulent practices, including allegations of obstructing customer repayments to inflate interest accruals. Such issues underscore the urgent need for innovative solutions that prioritize security, transparency, and fairness in lending operations.

The SecureLoan initiative became apparent as a proactive attempt to use state-of-the-art blockchain technology to transform lending procedures in Pakistan and other regions in reaction to these difficulties. The decentralised and unchangeable nature of blockchain technology presents a revolutionary remedy for the fundamental flaws in conventional lending arrangements. Through the removal of middlemen, increased transparency, and strengthened security protocols, blockchain technology has the potential to promote a financing environment that is more egalitarian and inclusive.

1.2 Objective

The primary objective of the SecureLoan project is to develop a blockchain-based lending platform that addresses the prevalent issues of fraud, inefficiencies, and lack of transparency in the lending landscape, particularly in Pakistan. The project aims to achieve the following specific objectives:

1.2.1 Fraud Prevention:

Use blockchain technology to implement strong security measures that stop lending operations from becoming fraudulent. The platform attempts to reduce the possibility of fraudulent actions like identity theft, loan misrepresentation, and unauthorised access to financial data by doing away with middlemen and improving data quality.

1.2.2 Transparency and Accountability:

Foster transparency and accountability in lending practices by recording all transactions and agreements on a decentralized blockchain ledger. By providing stakeholders with immutable and verifiable records of loan agreements, repayments, and user interactions, the platform aims to instill trust and confidence in the lending process.

1.2.3 Accessibility and Inclusivity:

Promote financial inclusion by providing underserved communities in Pakistan with access to fair and transparent lending opportunities. Through user-friendly interfaces and seamless interactions, the platform seeks to empower individuals from diverse socio-economic backgrounds to avail themselves of loans without the barriers posed by traditional lending systems.

1.2.4 Responsible Lending Practices:

Encouraging borrowers and lenders to make responsible loan decisions can be achieved by dynamically modifying loan limits according to user transaction history. The platform seeks to promote sustainable lending practices and a culture of financial responsibility by offering incentives for prompt repayments and responsible borrowing.

1.2.5 Technological Innovation:

With research and development, you can help progress blockchain technology and its financial sector applications. The project aims to push the boundaries of fintech innovation and pave the way for future developments in transparent lending solutions by investigating cutting-edge methods of identification, loan administration, and user interface design.

2 RelatedWork

The rise of financial technology (fintech) solutions, especially in the area of peer-to-peer (P2P) lending, is significantly changing the lending landscape. Numerous scholarly articles have investigated the potential of blockchain technology to transform lending practices, tackling concerns including fraud prevention, transparency, and accessibility. An overview of pertinent research articles that have looked into blockchain-based lending systems and their effects on the financial sector is provided below.

2.1 Shared Lending on Blockchain:

In order to improve efficiency and transparency, the first research study investigates the use of blockchain technology into peer-to-peer (P2P) lending networks. The study suggests a blockchain-supported system that expedites the loan process, shortens processing times, and minimizes dependency on middlemen by utilizing Blockchain 2.0 capabilities like smart contracts and decentralization. The report highlights how blockchain might boost operational efficiency and boost stakeholder trust, even if it acknowledges that it might not be able to directly reduce credit risk.

2.2 Loan on Blockchain (LoC) for Financial Management:

In this research paper, the innovative financial loan management system Loan on Blockchain (LoC), which is based on smart contracts over the permissioned blockchain Hyperledger Fabric, is presented. By addressing issues with current loan management systems' lack of transparency and data privacy concerns, LoC provides a safe, traceable alternative for financial transactions. With an emphasis on Chinese poverty alleviation loans as a case study, the article illustrates the applicability of blockchain technology in real-world financial contexts through the usage of digital accounts, locking algorithms, and data protection methods.

2.3 Blockchain-Based Rental and Loan System in Agriculture:

In this research paper, it suggests using blockchain technology to power a leasing and lending system for the agricultural industry. The study presents smart contracts on a blockchain network to enable transparent and safe transactions between farmers and lenders in recognition of the difficulties smallholder farmers encounter when trying to obtain financing and equipment. The system intends to enhance access to equipment for smallholder farmers, decrease fraud, and boost confidence by automating the enforcement of agreement terms and maintaining a decentralized database of transaction information.

2.4 Lower Collateral Loans Using Blockchain:

This research paper addresses the barrier to entry posed by high collateral requirements in blockchain-based loans. By leveraging credit scores derived from blockchain data, the paper proposes a protocol that enables loans with lower collateral while mitigating risk for lenders. Unlike traditional lending models, which often require collateral values to exceed the loan amount, this protocol allows for more accessible loans without compromising lender security.

3 Requirements

3.1 Functional Requirement:

The SecureLoan system comprises the following main modules and their sub-functions:

3.1.1 Lender Module

Lender Module Lender Registration and Verification:

• Lenders register on the platform and provide identity information.

Loan Creation and Management:

• Lenders create loan offers with details such as loan amount, interest rate, and terms.
• Lenders manage their loan offers, including updating loan status and responding to borrower inquiries.

Loan Disbursement and Repayment:

• Lenders approve loan requests and disburse funds through our platform with the help of smart contracts.
• Borrowers make repayments through our platform with the help of smart contracts.

3.1.2 Borrower module:

Borrower Registration and Profile Management:

• Borrowers register on the platform and provide personal and financial information.
• Borrowers maintain their profiles and update their information as needed.

Loan Search and Application:

• Borrowers search for loans based on their criteria, such as loan amount, interest rate, and terms.

Loan Repayment and History:

• Borrowers view their loan details and make repayments through the payment gateway.
• Borrowers access their loan history and repayment status.

3.1.3 Core Functionalities

Blockchain Integration:

• Smart contracts govern loan transactions and ensure immutability and transparency.
• On-chain NFTs bind lender identities to the blockchain, enhancing trust and credibility.

User Interface (UI):

• User-friendly interfaces for both lenders and borrowers facilitate seamless interactions.
• Intuitive design and user testing ensure ease of use and accessibility.

Public Ledger:

• A public ledger displays lending history, terms, and borrower feedback.
• Borrowers make informed decisions based on easily interpretable ledger data.

3.2 Non - Functional Requirements:

3.2.1 Performance Requirements

The SecureLoan system must meet the following performance requirements:

Transaction Speed: The system should process loan applications, loan approvals, and loan disbursements within acceptable time frames to ensure a smooth user experience.

Accuracy: The system should ensure the accuracy of all data processing, including loan calculations, interest accruals, and payment records, to maintain financial integrity.

Concurrency: The system should handle multiple concurrent users and transactions without performance degradation, ensuring scalability to accommodate a growing user base.

Capacity: The system should have sufficient capacity to store and manage a large volume of loan data, user information, and transaction records.

Safety: The system should operate safely and reliably, preventing data loss or corruption and ensuring the integrity of the system's operations.

Dependability: The system should be highly dependable and resilient to failures, ensuring continuous availability and minimizing downtime.

3.2.2 Safety Requirements:

Access Control: The system should enforce strict access control mechanisms to restrict unauthorized access to web pages and data and prevent unauthorized transactions.

Error Handling: The system should implement comprehensive error handling mechanisms to detect, report, and recover from potential errors or exceptions.

Security Audits: The system should undergo regular security audits to identify and address any vulnerabilities or potential security risks.

Data Security: All sensitive data, including personal information and financial details, must be stored securely using industry-standard practices.

User Authentication: Strong user authentication mechanisms must be implemented to protect user accounts from unauthorized access.

Access Control: Granular access controls must be enforced to restrict access to data and functionalities based on user roles and permissions.

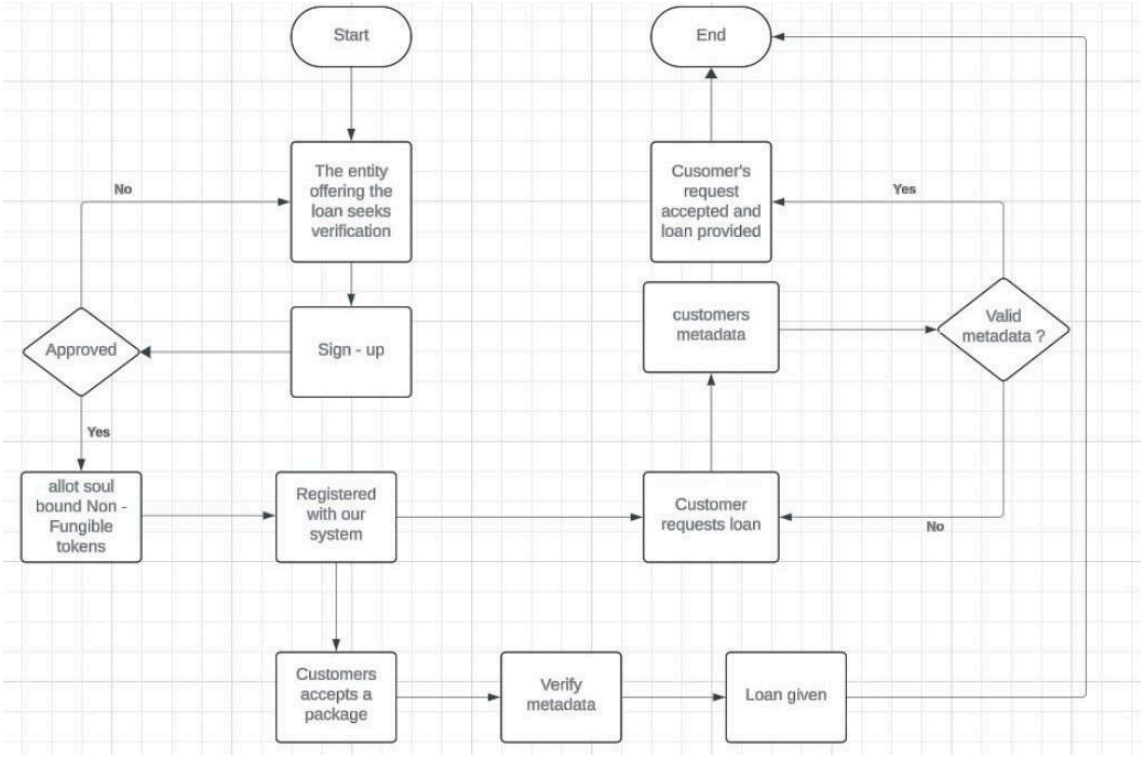
3.2.3 User Documentation:

Comprehensive user documentation must be provided for both lenders and borrowers, covering the following aspects:

- System Overview: A general introduction to the SecureLoan platform and its features.
- User Registration and Profile Management: Step-by-step instructions for registering on the platform and managing user profiles.
- Lender Functionalities: Detailed explanations of lender-specific functionalities, such as loan creation, management, and disbursement.
- Borrower Functionalities: Detailed explanations of borrower-specific functionalities, such as loan search, application, and repayment.
- Troubleshooting and FAQs: A section addressing common issues and frequently asked questions to assist users in resolving problems independently.

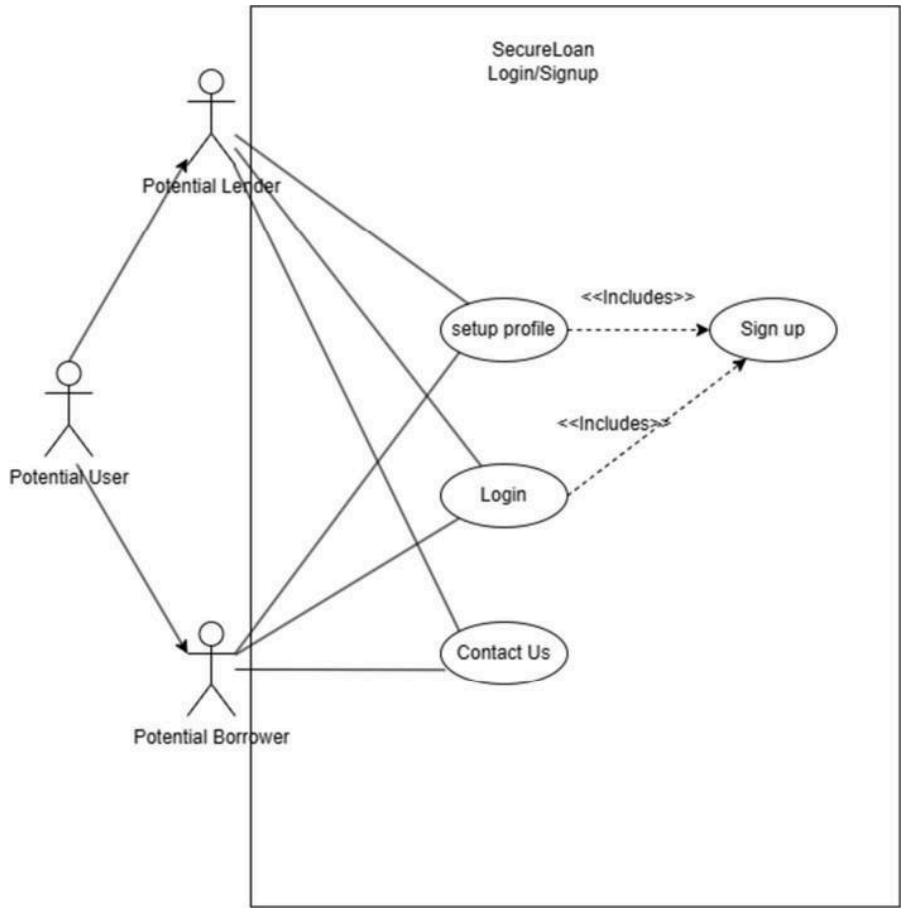
4 Design

4.1 Work-Flow



4.2 Use - Cases:

4.2.1

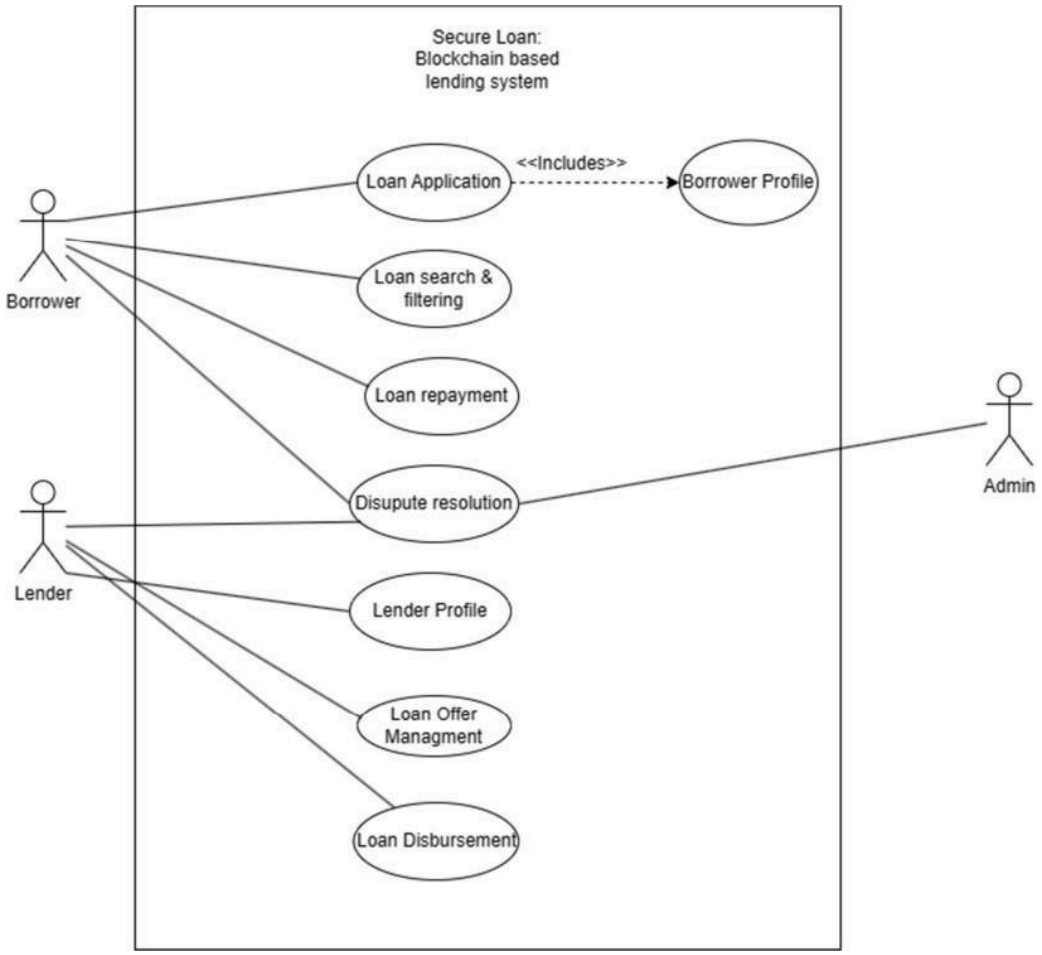


Use Case SL-UC-001: MetaMask Sign-up		
Use case Id:	SL-UC-001	
Actors:	Potential User	
Feature:	Application signup	
Pre-condition:	-	
Scenarios		
Step#	**Action**	**Software Reaction**
1.	User fills the form on the signup page. And clicks on connect wallet button	The system validates user's information
2.	User confirms information, agrees with our privacy policy, and clicks on create	Information is processed and account is created
Alternate Scenarios:		
1a: If the information provided is incomplete or invalid, the system prompts the user to correct the errors before submitting the application.		
Post Conditions		
Step#	**Description**	
1.	Account created;	
Use Case Cross referenced	-	

Use Case SL-UC-002: Login Authorization		
Use case Id:	SL-UC-002	
Actors:	User	
Feature:	Application login	
Pre-condition:	-	
Scenarios		
Step#	**Action**	**Software Reaction**
1.	User enters email, password and connects wallet and presses login button.	The system validates user's information
Alternate Scenarios:		
1a: If the information provided is incomplete or invalid, the system prompts the user to correct the errors before submitting the application.		
Post Conditions		
Step#	**Description**	
1.	User logged in and redirected to lender or borrower dashboard depending on user type;	
Use Case Cross referenced	-	

Use Case SL-UC-003: Contact Us		
Use case Id:	SL-UC-003	
Actors:	User	
Feature:	Contact customer support	
Pre-condition:	-	
Scenarios		
Step#	**Action**	**Software Reaction**
1.	User enters email and query on the form and submits it.	The system validates information provided and send the query to customer support team
Alternate Scenarios:		
1a: If the information provided is incomplete or invalid, the system prompts the user to correct the errors before submitting the application.		
Post Conditions		
Step#	**Description**	
1.	Support team emails back the user with the answer to the query	
Use Case Cross referenced	-	

4.2.2


Secure Loan:
Blockchain based
lending system
Loan Application
<<Includes>>
Borrower Profile
Loan search &
filtering
Loan repayment
Disupute resolution
Lender Profile
Loan Offer
Managment
Loan Disbursement
Borrower
Lender
Admin

Use Case SL-UC-004: Loan Application

Use case Id:	SL-UC-004
Actors:	Borrower, Lender, Administrator
Feature:	Loan application
Pre-condition:	Borrower must be registered in the system.

Scenarios

Step#	Action	Software Reaction
1.	Borrower initiates loan application by completing and submitting the loan application form.	The system validates the borrower's information and loan application details.
2.	The system sends the borrower's loan application to the queue for lender review.	Lists application in the pool
3.	Lender reviews the borrower's loan application and decides to approve or reject the application.	The system updates the loan application status accordingly

Alternate Scenarios:

1a: If the borrower's information or loan application details are incomplete or invalid, the system prompts the borrower to correct the errors before submitting the application.

2a: Borrower notified of rejection.

Post Conditions

Step#	Description
1.	Loan approved; borrower notified of approval.

Use Case Cross referenced	Used by: SL-UC-005 (Loan Disbursement), SL-UC-007 (Dispute Resolution) Uses: SL-UC-008 (Lender Profile Management), SL-UC-009 (Borrower Profile Management)

Use Case SL-UC-005: Loan Disbursement

Use case Id:	SL-UC-005
Actors:	Borrower, Lender, Administrator
Feature:	Loan Disbursement
Pre-condition:	Loan application is approved, and funds are available for disbursement

Scenarios

Step#	Action	Software Reaction
1.	Lender approves loan application and initiates disbursement process.	The system verifies the loan terms and conditions and ensures sufficient funds are available.
2.	The system transfers loan funds to the borrower's account.	The system updates the loan status to "disbursed" and sends notifications to both parties.

Alternate Scenarios:

1a: I there are insufficient funds available for disbursement, the system notifies the lender and delays the disbursement process.

2a: Borrower notified of rejection.

Post Conditions

Step#	Description
1.	Loan funds are transferred to the borrower's account.
2.	Loan status is updated to "disbursed".

Use Case Cross referenced	Used by: SL-UC-006 (Loan Repayment) Uses: SL-UC-004 (Loan Application)

Use Case SL-UC-006: Loan Repayment		
Use case Id:	SL-UC-006	
Actors:	Borrower, Lender, Administrator	
Feature:	Loan Repayment	
Pre-condition:	Borrower has funds available to make a repayment.	
Scenarios		
Step#	**Action**	**Software Reaction**
1.	Borrower initiates loan repayment through our platform.	The system verifies the borrower's payment information and loan repayment details.
2.	The system processes the payment and applies it to the outstanding loan balance.	The system updates the loan status
Alternate Scenarios:		
1a: There are insufficient funds available for disbursement, the system notifies the lender and delays the disbursement process. **2a:** Borrower notified of rejection.		
Post Conditions		
Step#	**Description**	
1.	Loan funds are transferred to the lender's account.	
2.	Loan status is updated to "paid".	
Use Case Cross referenced	Uses: SL-UC-005 (Loan Disbursement)	

Use Case SL-UC-007: Dispute Resolution		
Use case Id:	SL-UC-007	
Actors:	Borrower, Lender, Administrator	
Feature:	Dispute Resolution	
Pre-condition:	Borrower or lender raises a dispute regarding a loan transaction.	
Scenarios		
Step#	**Action**	**Software Reaction**
1.	Borrower or lender submits a dispute resolution request, providing details of the issue.	The system validates the request and assigns it to a dispute resolution specialist.
2.	The specialist investigates the dispute by reviewing relevant information and contacting both parties.	The system provides the specialist with access to loan documents, communication history.
Alternate Scenarios:		
1a: The dispute is simple and requires minimal investigation, the specialist may resolve it directly without administrator involvement. **2a:** The parties are unable to reach a mutually agreeable resolution, the administrator may make a final decision based on the evidence and applicable regulations.		
Post Conditions		
Step#	**Description**	
1.	Dispute is investigated thoroughly and fairly.	
Use Case Cross referenced	Uses: SL-UC-004 (Loan Application), SL-UC-005 (Loan Disbursement), SL-UC-006 (Loan Repayment)	

Use Case SL-UC-008: Lender Profile Management

Use case Id:	SL-UC-008
Actors:	Lender
Feature:	Lender Profile Management
Pre-condition:	Lender is registered in the system.

Scenarios

Step#	Action	Software Reaction
1.	Lender accesses their profile page.	The system displays the lender's profile information, including contact details, business information, and loan portfolio.
2.	Lender edits their profile information.	The system validates the updated information and updates it on the contract

Alternate Scenarios:

1a: The updated profile information is incomplete or invalid, the system prompts the lender to correct the errors.

Post Conditions

Step#	Description
1.	Lender's profile information is updated and maintained accurately.

Use Case Cross referenced	Used by: SL-UC-004 (Loan Application), SL-UC-010 (Loan Search and Filtering)

Use Case SL-UC-009: Borrower Profile Management

Use case Id:	SL-UC-009
Actors:	Borrower
Feature:	Borrower Profile Management
Pre-condition:	Borrower is registered in the system.

Scenarios

Step#	Action	Software Reaction
1.	Borrower accesses their profile page.	The system displays the borrower's profile information, including contact details, and financial information.
2.	Borrower edits their profile information.	The system validates the updated information and updates it on the contract

Alternate Scenarios:

1a: The updated profile information is incomplete or invalid, the system prompts the lender to correct the errors.

Post Conditions

Step#	Description
1.	Borrower's profile information is updated and maintained accurately.

Use Case Cross referenced	Used by: SL-UC-004 (Loan Application)

Use Case SL-UC-010: Loan Search and Filtering

Use case Id:	SL-UC-010
Actors:	Borrower
Feature:	Loan Search and Filtering
Pre-condition:	Borrower is registered in the system

Scenarios

Step#	Action	Software Reaction
1.	Borrower accesses the loan search page.	The system displays a list of available loan offers.
2.	Borrower specifies search criteria, such as loan amount, interest rate, repayment term, and loan purpose.	The system filters the loan offers based on the specified criteria and displays a narrowed-down list of relevant options.

Alternate Scenarios:

1a: the borrower requires assistance with understanding loan terms or comparing different offers, they can access educational resources or contact customer support.

Post Conditions

Step#	Description
1.	Borrower identifies suitable loan offers based on their specific needs and financial situation.

Use Case Cross referenced	Used by: SL-UC-004 (Loan Application) Uses: SL-UC-011 (Loan Offer Management)

Use Case SL-UC-011: Loan Offer Management

Use case Id:	SL-UC-011
Actors:	Lender
Feature:	Loan Offer Management
Pre-condition:	Lender is registered in the system.

Scenarios

Step#	Action	Software Reaction
1.	Lender accesses the loan offer management page.	The system displays a list of the lender's existing loan offers.
2.	Lender creates new loan offers by specifying loan terms, including loan amount, interest rate, repayment term, and eligibility criteria,	The system validates the provided information and creates a new loan offer record.
3.	Lender edits existing loan offers to update information, adjust terms, or change their availability.	The system allows the lender to modify existing loan offer details while ensuring compliance with platform policies.
4.	Lender manages the visibility and availability of their loan offers by activating or deactivating them for borrower search.	

Alternate Scenarios:

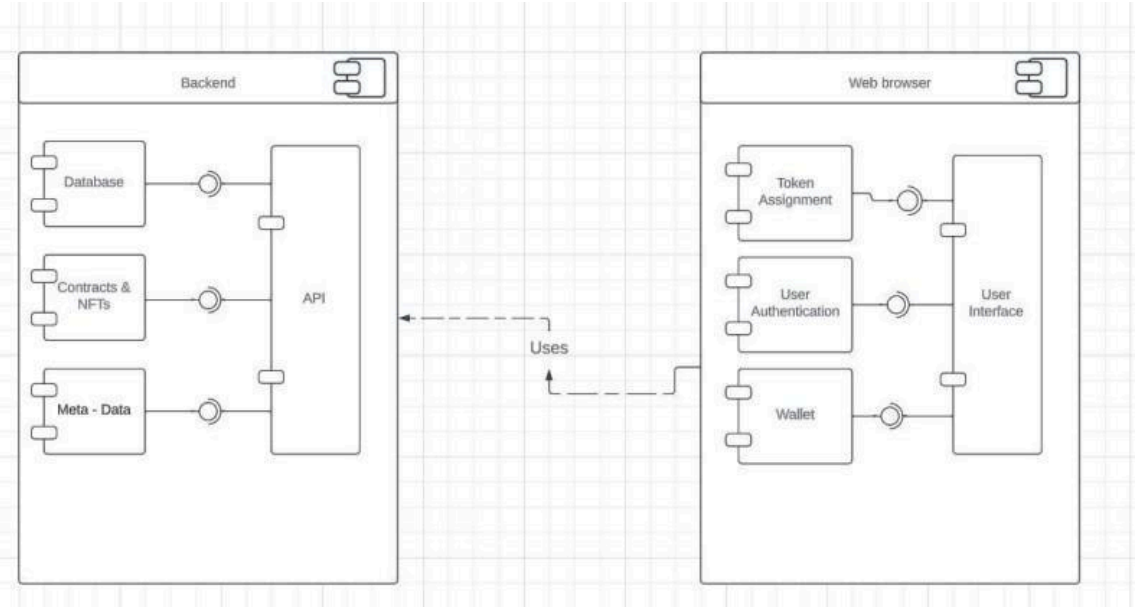
1a: the provided loan offer information is incomplete or invalid, the system prompts the lender to correct the errors.

Post Conditions

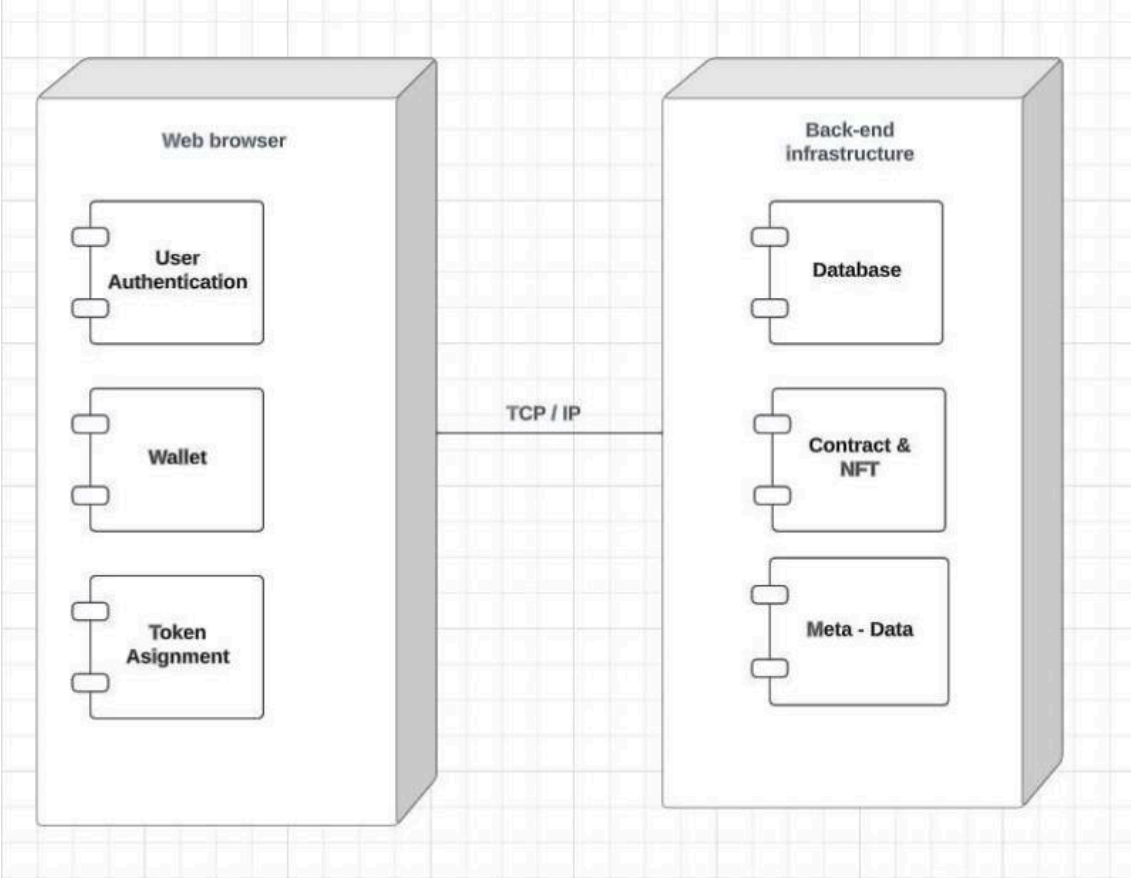
Step#	Description
1.	Lender's loan offers are managed effectively, ensuring access and visibility to relevant borrowers.

Use Case Cross referenced	Used by: SL-UC-004 (Loan Application), SL-UC-010 (Loan Search and Filtering) Uses: SL-UC-008 (Lender Profile Management)

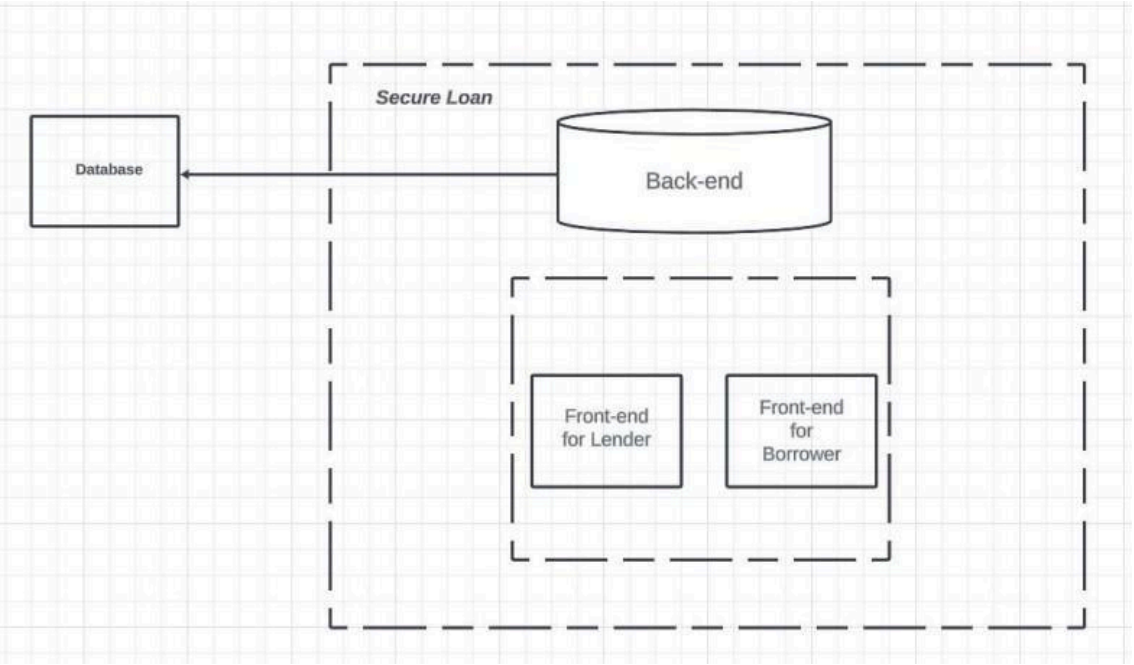
4.3 Component Diagram:



4.4 Deployment Diagram

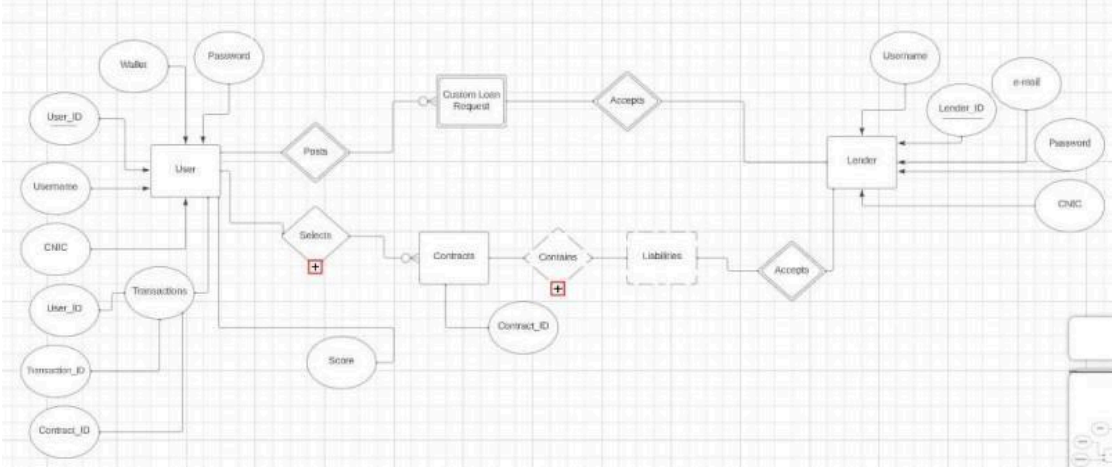


4.5 Software Architecture:



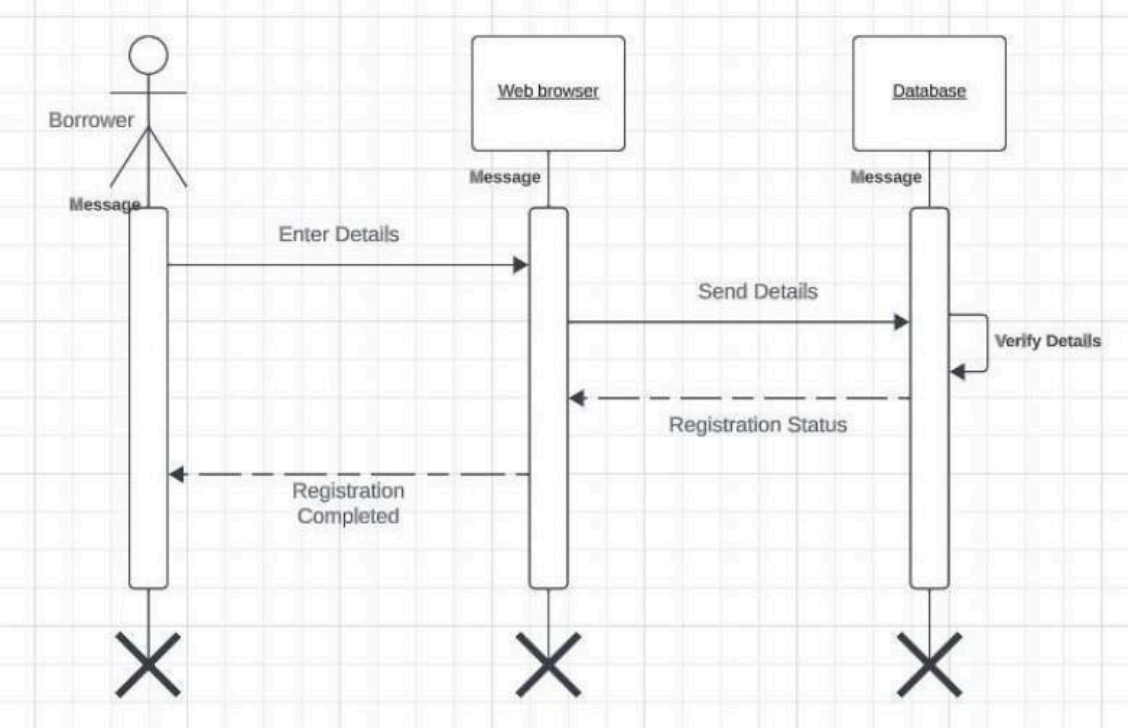
4.6 Database Design

ER - Diagram

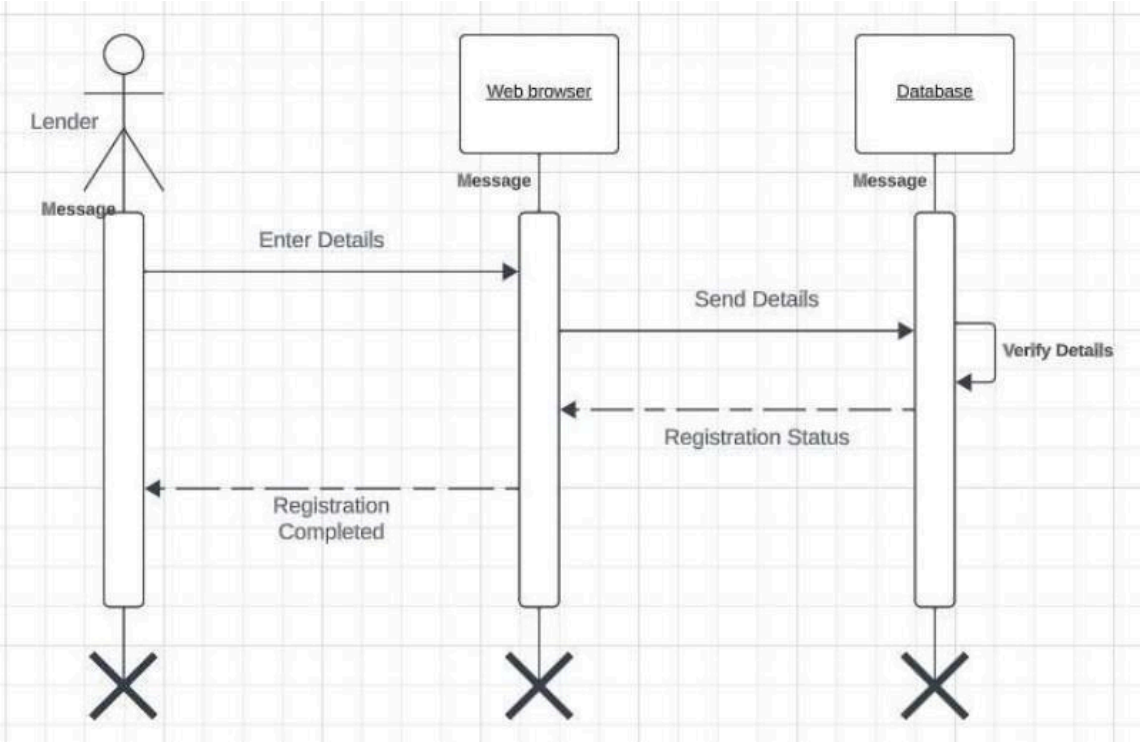


4.7 Sequence Diagram

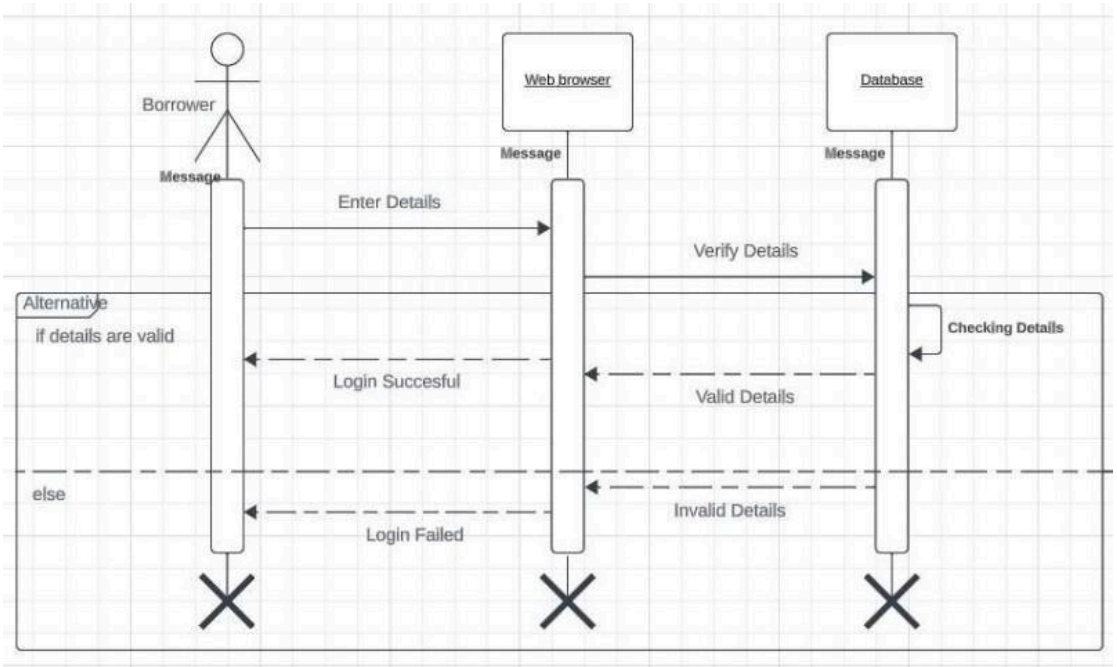
4.7.1 Borrower Registration:



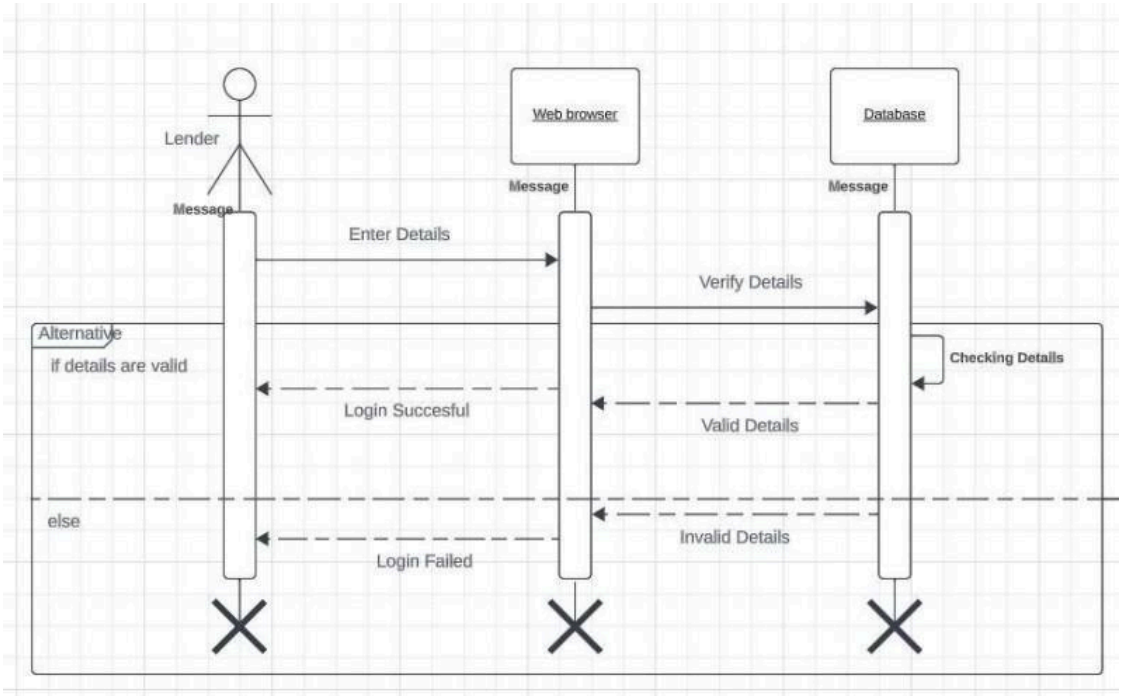
4.7.2 Lender Registration:



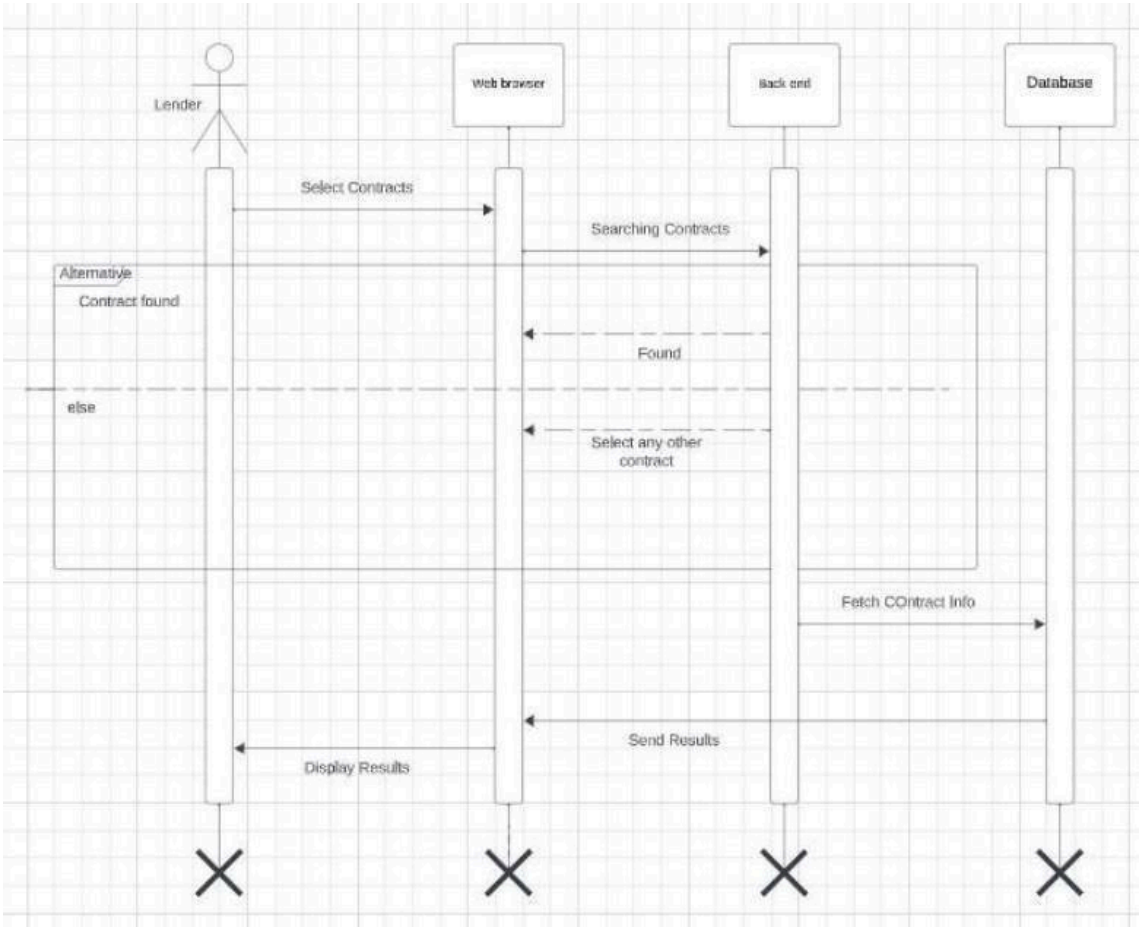
4.7.3 Borrower Log-in:



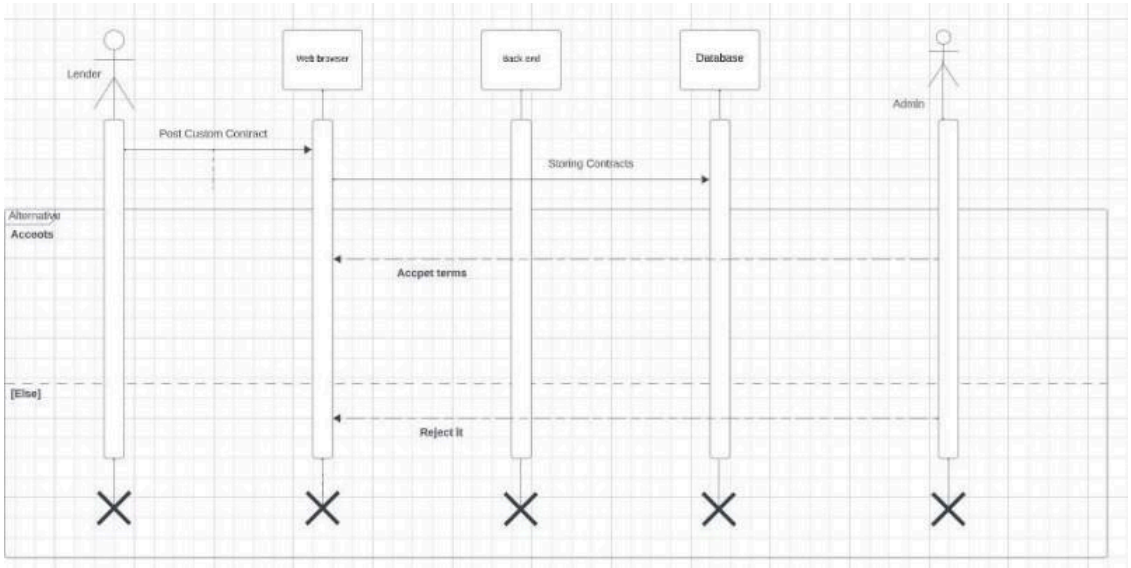
4.7.4 Lender Log-in:



4.7.5 Basic Work - Flow



4.7.6 Custom Contracts:



4.8 Data dictionary:

4.8.1

Borrower						
Name	Customer					
Alias	User					
Where-used/how-used	Used When customer login/signup or selects a contract					
Content description	Composed of people accepting terms of loan contracts					
Column Name	**Description**	**Type**	**Length**	**Null able**	**Default Value**	**Key Type**
customer_id	Unique auto number generated number	Integer	12	No	None	PK
username	Name of customer	String	100	No	None	
email	Unique email of customer	String	100	No	None	
password	Hashed password	String	200	No	None	
CNIC	Govt assigned identity	Integer	12	No	None	
Wallet	Token assigned	String	100	No	None	

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4.8.2

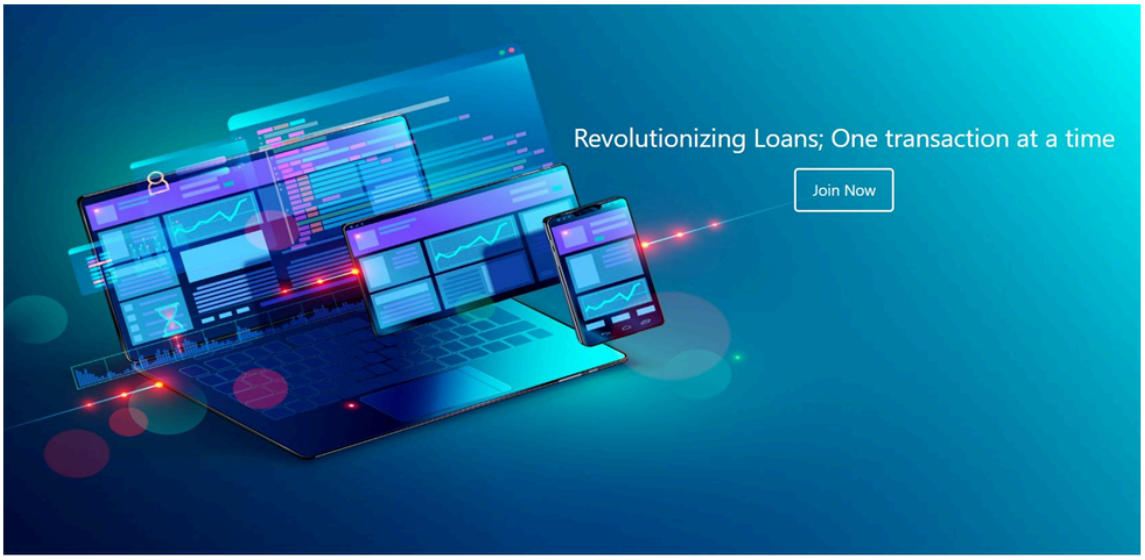
Lender						
Name	Lender					
Alias	User					
Where-used/how-used	Used When Lender login/signup or posts a contract					
Content description	Composed of people posting terms of loan contracts					
Column Name	**Description**	**Type**	**Length**	**Null able**	**Default Value**	**Key Type**
lender_id	Unique auto number generated number	Integer	12	No	None	PK
username	Name of customer	String	100	No	None	
email	Unique email of customer	String	100	No	None	
password	Hashed password	String	200	No	None	
CNIC	Token assigned	String	100	No	None	

4.8.3

Transactions						
Name	Transactions					
Alias	Contracts					
Where-used/how-used	Used When customer accepts term sheets of contracts					
Content description	Composed of loan contracts					
ColumnName	**Description**	**Type**	**Length**	**Null able**	**Default Value**	**Key Type**
transaction_id	Unique auto number generated number	Integer	12	No	None	PK
Customer_id	Unique auto number generated number	Integer	12	No	None	
Contract_ID	Unique auto number generated number	Integer	12	No	None	

4.9. Front - End Figma

WELCOME SCREEN



Sign - up

Sign Up

First Name

Last Name

CNIC

Email

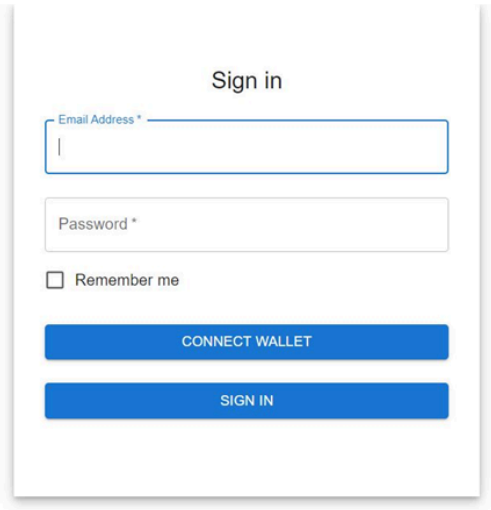
Password

Date of Birth

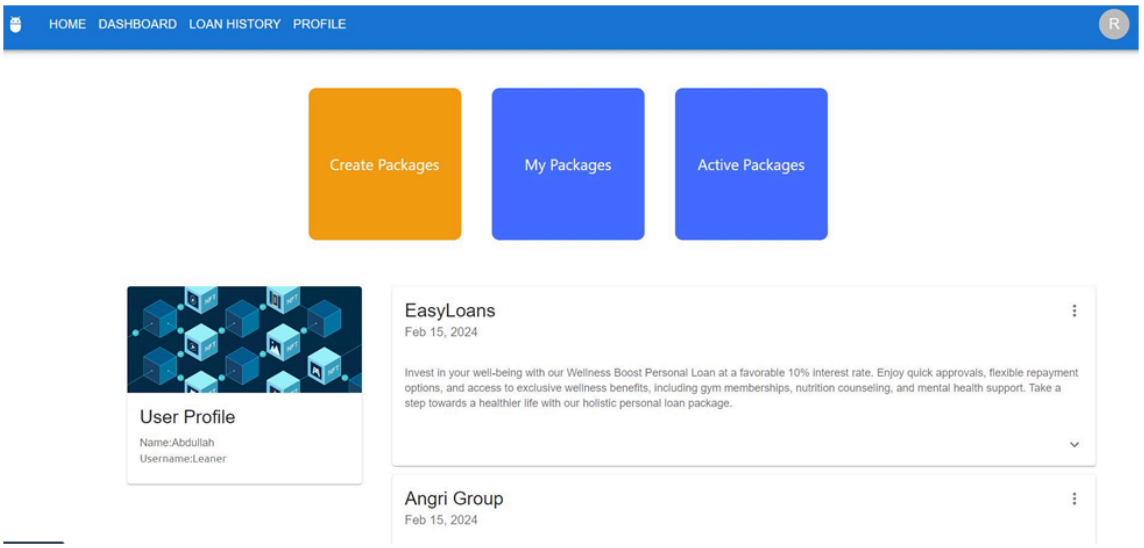
mm/dd/yyyy

CONNECT WALLET

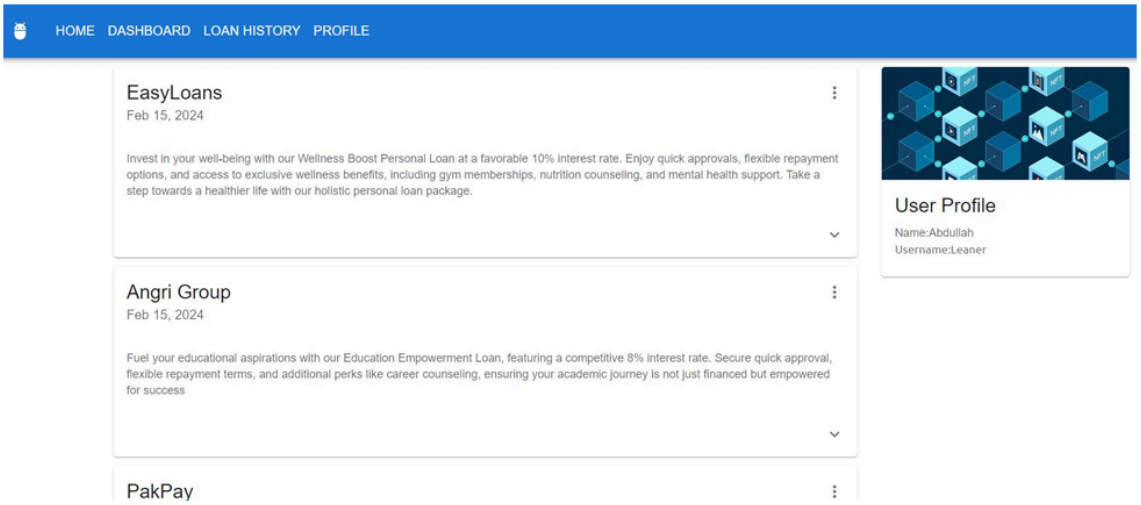
Sign - in



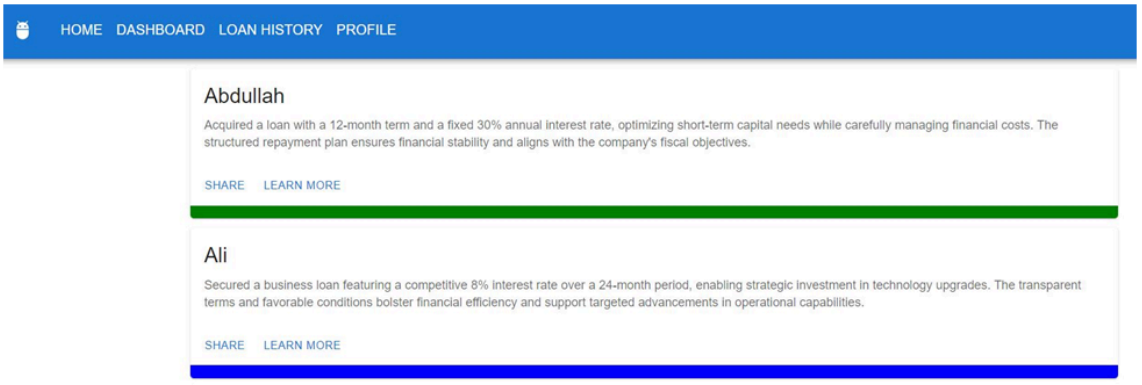
Signed - in - page



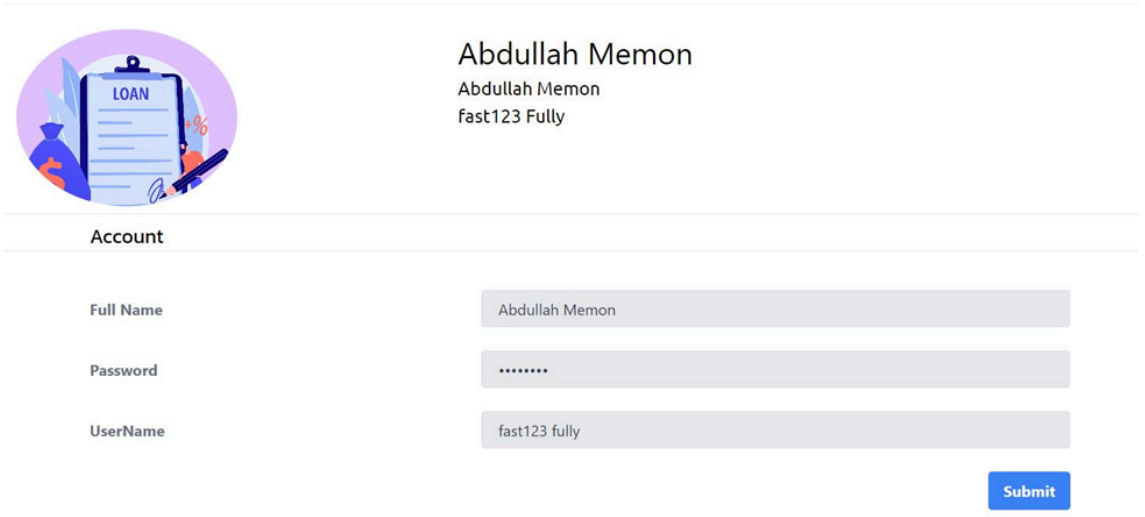
Loans available page



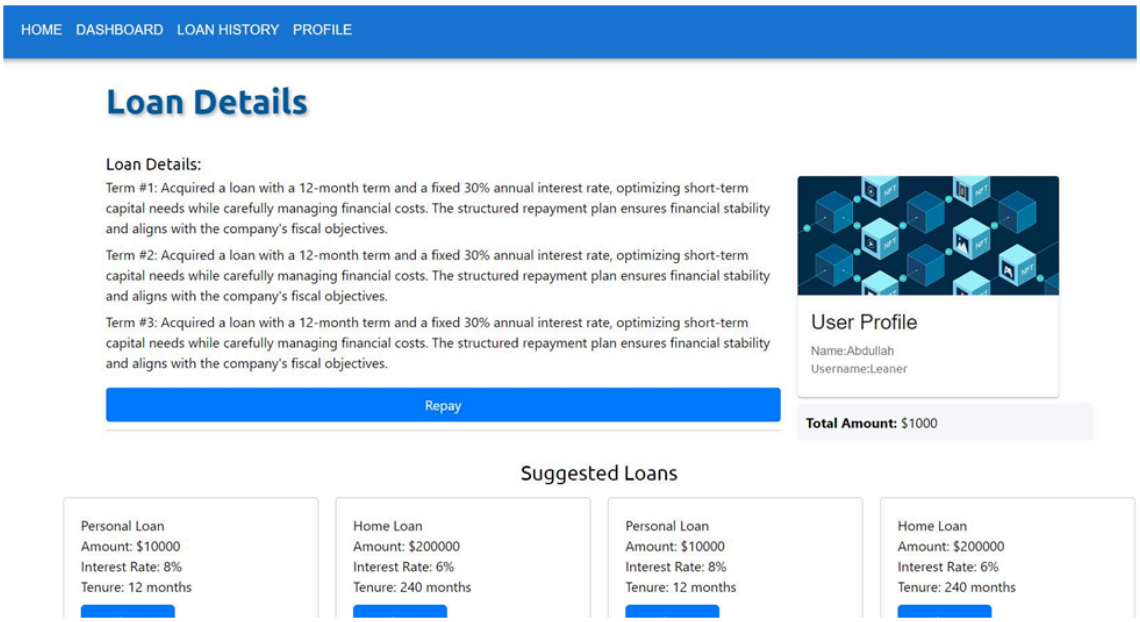
Loan history of users



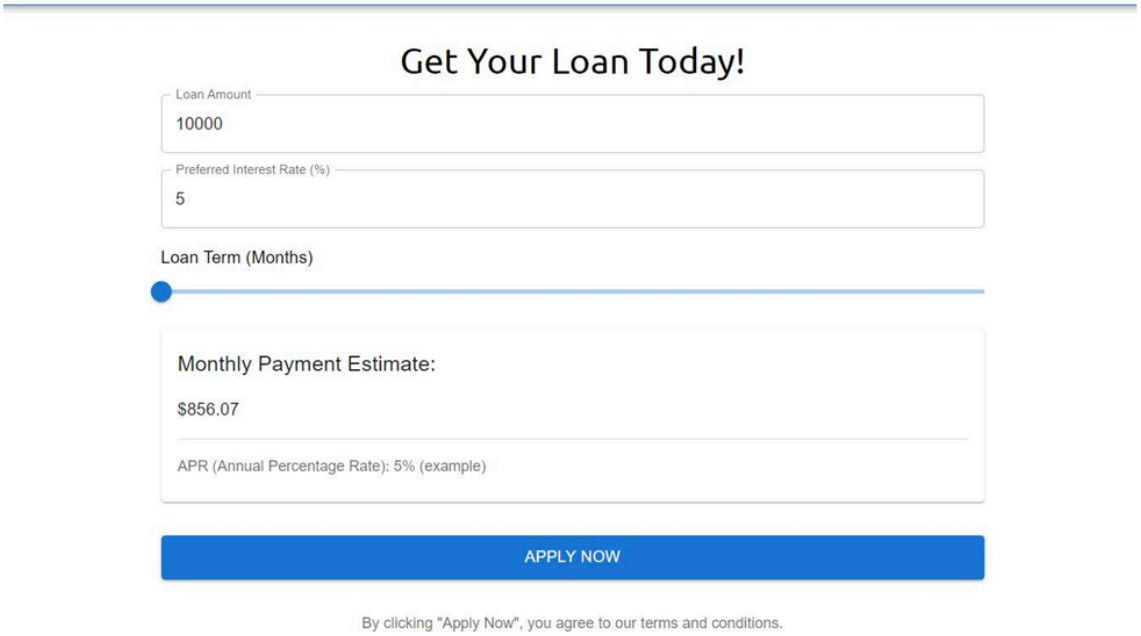
User - profile page



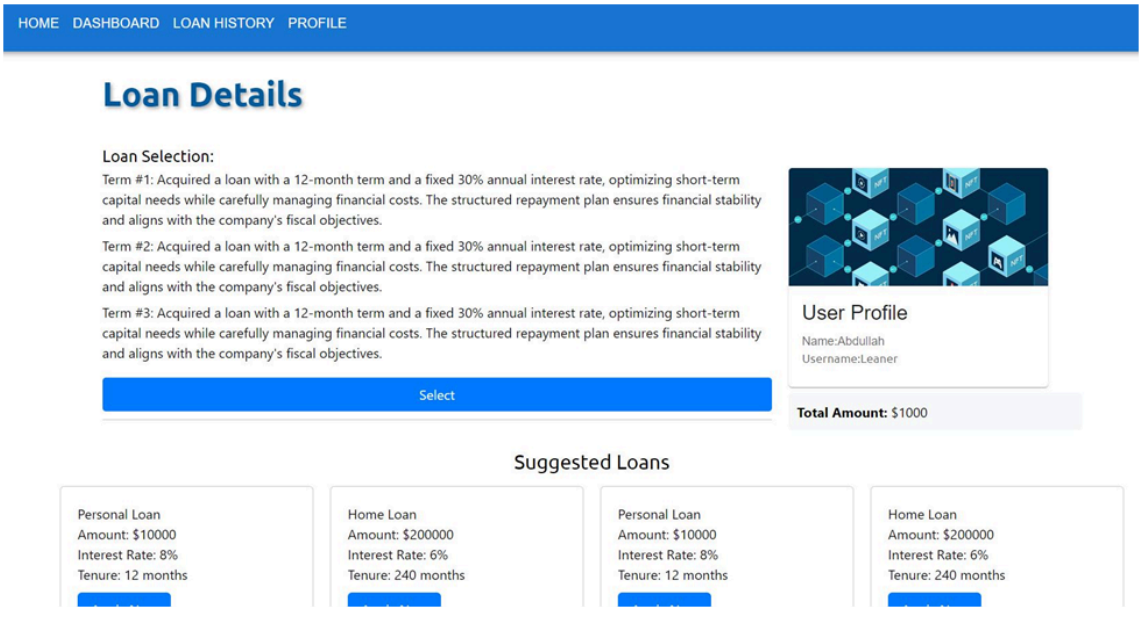
Information about the acquired loan (contains the repay option)



Custom Loan page



Loan Selection page



5.0 Implementation

Phase 1: Borrower Initiation and Authentication Loan Request:

The borrower initiates the process by submitting a loan request through the user-friendly front-end interface. This request specifies the desired loan amount, repayment period, and other relevant details.

Identity Verification:

The CreateLoan smart contract steps in, meticulously verifying the borrower's identity and eligibility based on pre-defined criteria. This likely involves checking on-chain data linked to the borrower's unique ERC721 token, ensuring authenticity, and preventing fraud.

Phase 2: Loan Agreement Negotiation and Contract Creation Negotiation and Terms:

If eligible, the borrower and lender connect through the platform to negotiate loan terms such as interest rate, repayment schedule, and potential collateral. This transparent negotiation ensures both parties are comfortable with the agreement.

Contract Interaction:

Once terms are finalized, the CreateLoan contract takes center stage. It constructs a new loan agreement on the smart contract, permanently etching the negotiated terms onto the blockchain. This immutable record safeguards against any future alterations or disputes.

Lender Funding:

With the contract deployed, the lender transfers the agreed loan amount to the smart contract's address. These funds remain locked until full repayment, creating a secure escrow environment.

Phase 3: Loan Management and Repayment

Repayment Tracking:

Throughout the loan period, the smart contract diligently tracks each borrower repayment processed through the front-end interface. This real-time monitoring updates the remaining loan amount and reflects progress towards completion.

Dynamic Limit Adjustments:

To promote responsible borrowing and lending, the platform implements a dynamic loan limit system. Based on the borrower's successful transaction history, the platform automatically adjusts their permitted loan amount, rewarding responsible financial behavior.

Phase 4: Loan Completion and Collateral Release Full Repayment:

Upon receiving the final repayment, the RepayLoan contract automatically triggers the release of any previously locked collateral back to the borrower. This pre-programmed action ensures a seamless and trustworthy conclusion to the loan agreement.

Contract Archiving:

The loan agreement smart contract, now fulfilled, is marked as completed and archived on the blockchain. This permanent record serves as an indisputable historical reference for both parties.

5.0 Testing and Evaluation

5.1 Functionality

Testing Unit Testing :

Unit testing was done on every platform component to confirm that each one worked as intended. This involved testing the loan origination, repayment monitoring, and collateral release smart contracts.

Integration Testing:

In order to guarantee smooth communication between the various platform parts, integration testing was carried out. Testing the data and transaction flow between the front-end interface and the blockchain backend was part of this process.

End-to-End Testing:

Extensive end-to-end testing was conducted to replicate real-world situations, encompassing the loan origination process and repayment fulfilment. This included testing a range of user interactions, such as applying for a loan, getting it approved, getting money, and paying it back.

5.2 User Experience Testing:

Usability Testing:

User experience (UX) testing was done to assess how intuitive and user-friendly the platform is. Test users' input was gathered to determine where the platform's functionality and design needed to be improved.

5.3 Evaluation of Key Metrics:

Security:

To guarantee the privacy, availability, and integrity of user data, the platform's security features—such as data integrity checks, access controls, and encryption protocols—were assessed.

Efficiency:

To find any bottlenecks and improve system architecture, the platform's effectiveness in terms of transaction processing speed, resource utilisation, and overall system performance was assessed.

6.0 Conclusion

In summary, our research has effectively illustrated how blockchain technology may be used to address important issues facing the lending sector. By using the intrinsic properties of blockchain technology—transparency, immutability, and decentralization—we have created a platform that has the potential to completely transform the loan industry.

Our blockchain-based lending platform's deployment, which provides essential features for easy loan application, approval, distribution, and repayment procedures, represents a noteworthy achievement. Furthermore, the lending ecosystem's security and trust are improved by the incorporation of cutting-edge features like on-chain NFTs for verified lender identities.

Moreover, the accomplishment of producing mockups for the platform highlights our dedication to real-world implementation and user-centered design. These mockups act as concrete examples of our goal of providing underprivileged communities with more equal and accessible financial services in the future.

All things considered, this project is a big step forward in using technology to solve societal issues, which will eventually lead to more financial inclusion and empowerment. We are committed to achieving our platform's full potential in changing the loan environment to the benefit of all parties involved, even as we continue to improve and develop it.

References

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