

BlockChain Project - Report

Title: Decentralised Lending and Borrowing system

Team: CryptoCred

Team Members:-

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1. Introduction:-

This is a Decentralized Lending System DApp built on Ethereum that allows users to lend and borrow funds through smart contracts. The system features a fixed interest rate model (2 ETH per loan) and includes functionalities for requesting loans, funding loans, and repayment. The project uses Truffle for smart contract development, React for the frontend, and MetaMask for wallet integration, with Ganache serving as the local Ethereum test network.

2. Problem Statement:-

Traditional lending systems are centralized, limiting borrowers' access to funds and lenders' control over their investments. Borrowers often face high interest rates and complex approval processes, while lenders struggle with trust issues and lack of transparency. Our project addresses these issues by implementing a decentralized lending system on Ethereum, where:

- ❖ Lenders can add funds to the contract and approve loan requests.
- ❖ Borrowers can request loans directly from the lending pool.
- ❖ Interest rates are fixed and transparent (2 ETH per loan).
- ❖ Loan states and transactions are securely recorded on the blockchain.
- ❖ Smart contracts automatically manage loan lifecycle (request, funding, repayment).
- ❖ All transactions are transparent and verifiable on the blockchain.
- ❖ MetaMask integration ensures secure wallet management and transaction signing.
- ❖ The system operates without intermediaries, reducing costs and increasing efficiency.

3. Blockchain Implementation Details:-

Smart Contract Architecture:-

TheDApp consists of two Solidity contracts:

A) SimpleLendingContract.sol

- ❖ Defines a loan structure: borrower address, requested amount, repay amount, interest rate, state, and timestamp.
- ❖ Implements fixed interest rate model (2 ETH per loan).
- ❖ Tracks available balance and loan status.
- ❖ Includes functions like requestLoan, fundLoan, repayLoan, getLoanDetails, and getRepayAmount.

B) SafeMath.sol

- ❖ Provides secure mathematical operations for the lending contract.
- ❖ Prevents overflow and underflow vulnerabilities.
- ❖ Ensures safe arithmetic operations for loan calculations.
- ❖ Used for balance management and interest calculations.

Key Functions Implementation:

❖ Loan Management:

- requestLoan: Allows borrowers to request new loans
- fundLoan: Enables lenders to fund approved loans
- repayLoan: Handles loan repayment process
- getLoanDetails: Retrieves complete loan information

❖ Fund Management:

- addFunds: Allows lenders to add funds to the contract
- calculateRepayAmount: Computes total repayment amount
- getRepayAmount: Returns specific repayment amount

❖ **State Management:**

- Loan state tracking (Requested, Funded, Repaid, Defaulted)
- Balance management
- Transaction verification

❖ **Security Features:**

- Input validation
- State verification
- Balance checks
- Safe mathematical operations

4. Frontend and Storage Integration:-

Frontend Stack

- Framework: React (with Create React App for development)
- Styling: CSS (custom component styling)
- Wallet: Integrated with MetaMask for blockchain interactions
- Web3 Integration: Web3.js for smart contract interaction

Smart Contract Integration

- Truffle for contract compilation and deployment
- Ganache for local Ethereum network testing
- Contract artifacts stored in client directory for frontend access

Features

- Wallet Connection Interface
 - MetaMask integration
 - Account selection
 - Network verification
 - Connection status display

- Loan Management Interface

- Lender Operations:
 - Add funds to contract
 - Approve loan requests
 - View available balance
- Borrower Operations:
 - Request new loans
 - Repay existing loans
 - View loan status

- User Interface Components

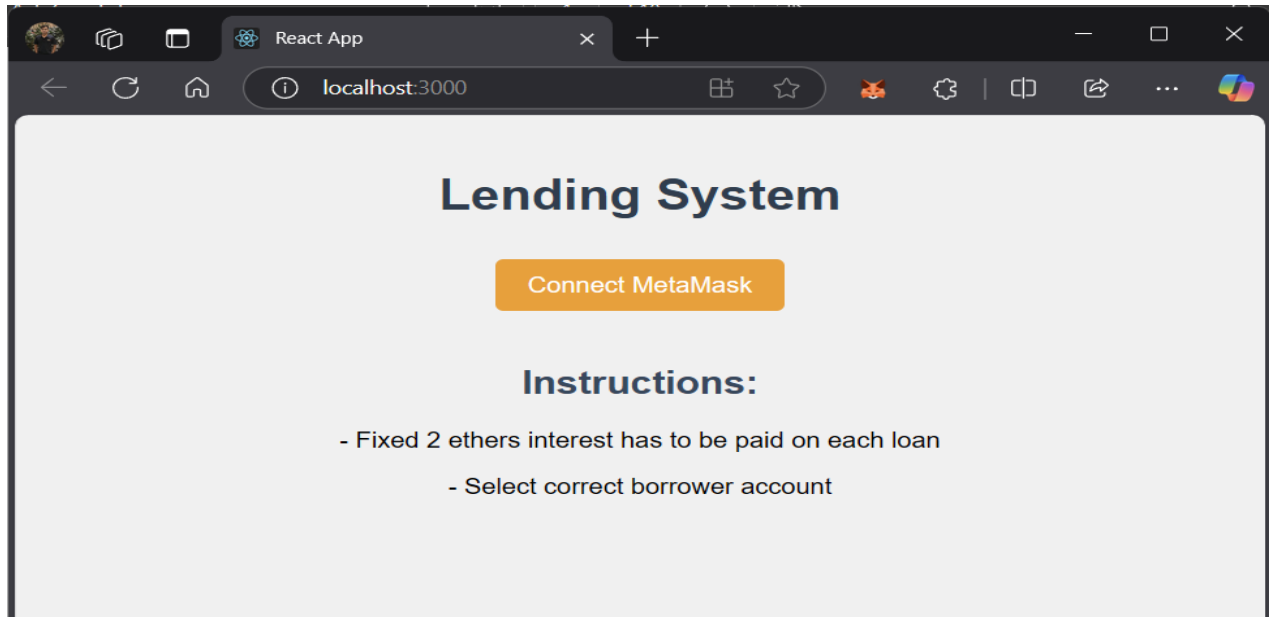
- Account selection dropdown
- Operation selection menu
- Amount input field
- Transaction status display
- Error and success messages

- Responsive Design

- Desktop and mobile compatibility
- Clean and intuitive layout
- Clear operation instructions
- Transaction feedback system

5. Screenshots of the Working Application:-

i) Connect wallet page:-



Ganache accounts:

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK
51

GAS PRICE
20000000000

GAS LIMIT
6721975

HARDFORK
MERGE

NETWORK ID
1337

RPC SERVER
HTTP://127.0.0.1:7545

MINING STATUS
AUTOMINING

WORKSPACE
DAPP LENDING AND BORROWING SYSTEM

SWITCH

MNEMONIC

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HD PATH

m44'60'0'0account_ind

ADDRESS	BALANCE	TX COUNT	INDEX	
0x290de4ff1779EC728eef860ceC77DF82dbF6259B	65.88 ETH	34	0	
ADDRESS	BALANCE	TX COUNT	INDEX	
0x27039a917eD32588a8f869DEb8c443FB656F35c0	102.00 ETH	3	1	
ADDRESS	BALANCE	TX COUNT	INDEX	
0xb9E1A4B107A120926a42aD8FF20EdeACEFEfE708	101.00 ETH	2	2	
ADDRESS	BALANCE	TX COUNT	INDEX	
0x4080836a1C551A000EB37358B3880F8FC7a0bDE0	94.00 ETH	11	3	
ADDRESS	BALANCE	TX COUNT	INDEX	
0x3aFF9D00851887340adF35fd1c8461a86cC37834	100.00 ETH	0	4	
ADDRESS	BALANCE	TX COUNT	INDEX	
0xf06d6a9B7d9462936152b13c21ce8a6Ffe0450b4	100.00 ETH	1	5	
ADDRESS	BALANCE	TX COUNT	INDEX	
0xaA65087258d7bDDca40F119D7fB90F5E5bB6Bb90	100.00 ETH	0	6	

iii)after MetaMask connection:

Lending System

Connected Account: 0x290de4ff1779ec728eef860cec77df82dbf6259b

Network ID: 1337

Instructions:

- Fixed 2 ethers interest has to be paid on each loan
- Select correct borrower account

Select Borrower:

0x27039a917ed32588a8f869deb8c443fb656f35c0

Select an option:

Lender: Add Balance to Contract

Enter MsgValue:

Submit

Wallet connected successfully!

iv)all frontend features:

Select Borrower:

0x27039a917ed32588a8f869deb8c443fb656f35c0

Select an option:

Lender: Add Balance to Contract

Lender: Add Balance to Contract

Lender: Approve Loan

Borrower: Request Loan

Borrower: Repay Loan

Borrower: View Loan Status

Submit

Wallet connected successfully!

v)after adding balance to contract:

Lending System

Connected Account: 0x290de4ff1779ec728eef860cec77df82dbf6259b

Network ID: 1337

Instructions:

- Fixed 2 ethers interest has to be paid on each loan

- Select correct borrower account

Select Borrower:

0x27039a917ed32588a8f869deb8c443fb656f35c0

Select an option:

Lender: Add Balance to Contract

Enter MsgValue:

5

Submit

Wallet connected successfully!

MetaMask

Account 3

Ganache

Transaction request

Request from HTTP localhost:3000

Interacting with 0xDf738...9981C

Amount 5 ETH

Network fee 0.0001 ETH

Speed

Cancel

Confirm

Lending System

Connected Account: 0x290de4ff1779ec728eef860cec77df82dbf6259b

Network ID: 1337

Instructions:

- Fixed 2 ethers interest has to be paid on each loan
- Select correct borrower account

Select Borrower:

0x27039a917ed32588a8f869deb8c443fb656f35c0

Select an option:

Lender: Add Balance to Contract

Enter MsgValue:

5

Submit

Funds added to the contract

vi) after lender funds loan:

Lending System

Connected Account: 0x290de4ff1779ec728eef860cec77df82dbf6259b

Network ID: 1337

Instructions:

- Fixed 2 ethers interest has to be paid on each loan
- Select correct borrower account

Select Borrower:

0x4080836a1c551a000eb37358b3880f8fc7a0bde0

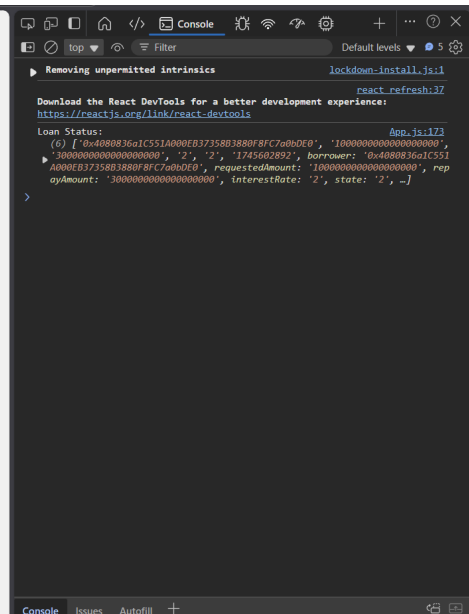
Select an option:

Borrower: View Loan Status

Enter MsgValue:

Submit

Viewed Loan on Console



vii)after repay loan

Lending System

Connected Account: 0x290de4ff1779ec728eef860cec77df82dbf6259b

Network ID: 1337

Instructions:

- Fixed 2 ethers interest has to be paid on each loan
- Select correct borrower account

Select Borrower:

0x4080836a1c551a000eb37358b3880f8c7a0bde0

Select an option:

Borrower: Repay Loan

Enter MsgValue:

3

Submit

Viewed Loan on Console

Ganache

ACCOUNTSBLOCKSTRANSACTIONSCONTRACTSEVENTSLOGS

CURRENT BLOCK53GAS PRICE20000000000GAS LIMIT6721975HARDFORKMERGENETWORK ID1337RPC SERVERHTTP://127.0.0.1:7545MINING STATUSAUTOMININGWORKSPACEDAPP LENDING AND BORROWING SYSTEMSWITCH

MNEMONICbrief assault speed buzz method foster street sniff opera abstract away askHD PATHm44'60'0"0account_index

ADDRESS	BALANCE	TX COUNT	INDEX	
0x290de4ff1779EC728eef860cec77DF82dbF6259B	60.88 ETH	35	0	
0x27039a917eD32588a8f869DEb8c443FB656F35c0	102.00 ETH	3	1	
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0x4080836a1C551A000EB37358B3880F8FC7a0bDE0	94.00 ETH	12	3	
0x3afF9D00851887340adF35fd1c8461a86cC37834	100.00 ETH	0	4	
0xf06d6a9B7d9462936152b13c21ce8a6Ffe0450b4	100.00 ETH	1	5	
0xaA65087258d7bDDca40F119D7fB90F5E5bB6Bb90	100.00 ETH	0	6	

6. Future Enhancements:-

Enhanced Wallet Support:

- Integration with additional wallet providers
- Improved wallet connection experience
- Better cross-platform compatibility

- **Advanced Analytics:**

- Loan performance tracking
- Interest earnings monitoring
- Borrower repayment history
- Financial insights dashboard

- **Multi-Chain Expansion:**

- Support for additional blockchain networks
- Cross-chain loan management
- Chain-specific lending features

- **Credit System:**

- Decentralized credit scoring
- Borrower reputation tracking
- Risk assessment tools
- Trust-based lending options

7.Conclusion:-

The Decentralized Lending System demonstrates the transformative potential of blockchain technology in revolutionizing traditional lending practices. By leveraging Ethereum smart contracts, MetaMask integration, and a user-friendly frontend, the platform delivers transparency, efficiency, and accessibility in financial transactions. The system's fixed interest model and automated loan management provide a fair and predictable environment for both lenders and borrowers. With continued development and the implementation of planned enhancements, this platform has the potential to evolve into a comprehensive decentralized finance (DeFi) solution, offering secure and efficient lending services while maintaining the core principles of blockchain technology.

8. GitHub Repository Link:-

9. Video drive Link:-