



# LendHub

A DeFi Lending & Borrowing App



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# Introduction

LendHub is a decentralized lending and borrowing platform. This platform enables individuals and organizations to lend and borrow digital assets in a trustless and transparent manner, without the need for intermediaries such as banks or credit unions.

The platform is built on top of the Ethereum blockchain and smart contracts. The lending and borrowing process will be governed by a set of rules encoded in smart contracts, which will automatically execute when certain conditions are met. These rules will include parameters such as interest rates and collateralization ratios, ensuring that the platform operates in a secure and efficient manner.

The platform will support a range of digital assets, including stablecoins, cryptocurrencies, and tokens issued on the Ethereum blockchain. Users will be able to lend and borrow these assets, earning interest on their loans and paying interest on their borrowings. The platform will also allow users to withdraw their funds at any time, subject to certain conditions such as repayment of outstanding loans.

# Why LendHub?

One of the key benefits of LendHub is that it allows users to earn interest on their digital assets by lending them to other users. This can provide a passive income stream and help users put their digital assets to work.

Additionally, LendHub aims to provide lower borrowing rates than traditional lending institutions, making it an attractive option for borrowers. The platform also incorporates a reputation system to help users evaluate the creditworthiness of potential borrowers.

Overall, LendHub is designed to offer a more efficient, transparent, and accessible way to lend and borrow digital assets.

# Comparison to AAVE & Other DeFi Platforms

LendHub is a newer DeFi platform that aims to provide a more user-friendly experience, while Aave and Compound are more established protocols that offer more advanced features and a wider range of cryptocurrency assets. LendHub features an intuitive user interface, low transaction fees, and flexible lending and borrowing terms. It is designed to attract users from the non-technical background to intuitively perform lending and borrowing and also offer products that cater to users that traditional banks offer but in the crypto world.

# Tech Stack



SOLIDITY



Hardhat



ethers.js



INFURA



METAMASK



Chainlink



ethereum



Chai



git

NEXT.js



tailwindcss

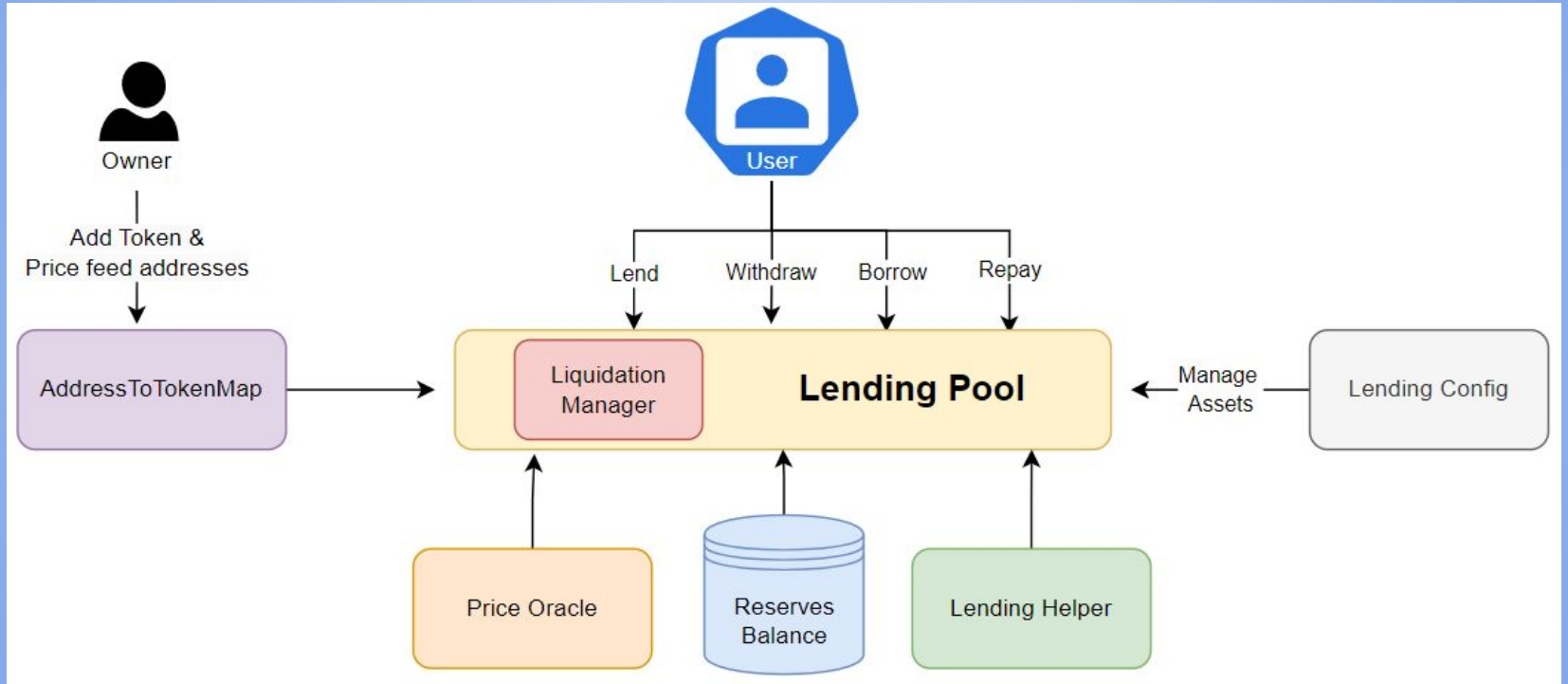


netlify

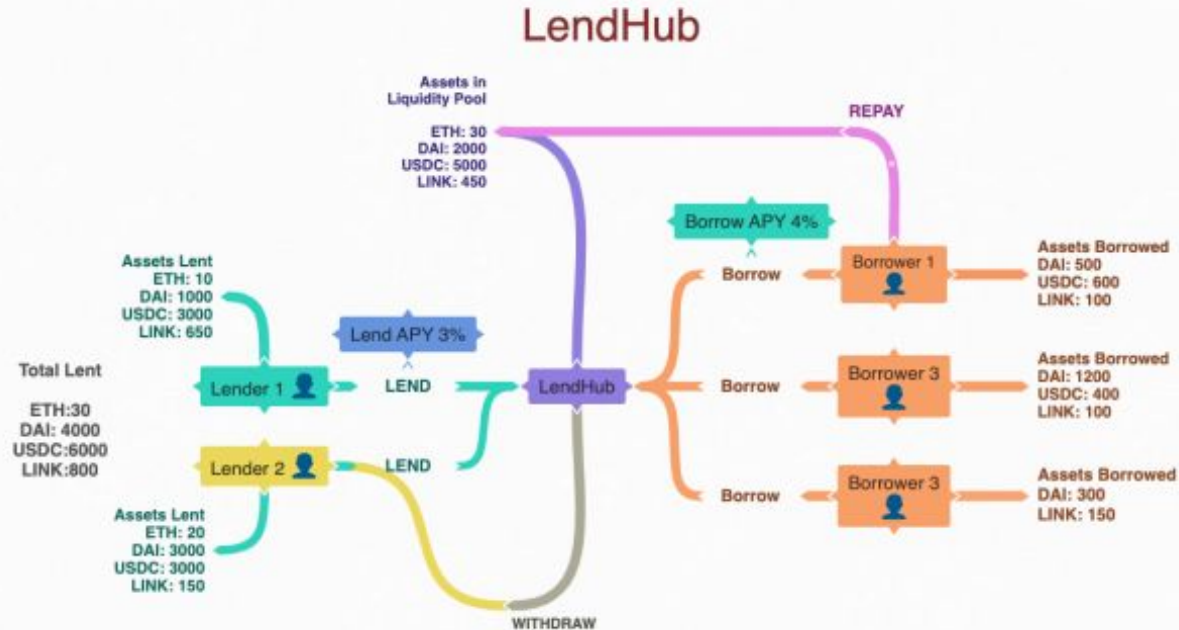


OpenZeppelin

# Architecture



# Architecture



- 1) **Lend** will transfer asset from the Lender's wallet to LendHub
- 2) **Borrow** will remove from LendHub Pool and add to Borrower's wallet
- 3) **Repay** will transfer asset from Borrower's wallet to the LendHub
- 4) **Withdraw** will transfer asset from LendHub contract back to the Lender

Total Lend - Total Borrow = Reserve/Liquidity Pool  
User Lend x Borrow Threshold (80%) - User Borrow = Available to Borrow  
User Lend - User Borrow = Available to Withdraw



# TDD - Test Cases

## LendHub Tests

- ✓ 1. Should be able to retrieve all token symbols
- ✓ 2. Should be able retrieve all price feed
- ✓ 3. Lender1 Should be able to lend 10 ETH
- ✓ 4. Lender1 lendQty Should be able to update with 10 more ETH
- ✓ 5. Lender1 Should be able to lend 1000 DAI
- ✓ 6. Not lend user should not be able to withdraw ETH
- ✓ 7. Not lend user should not be able to withdraw DAI
- ✓ 8. Lender1 Should be able to withdraw ETH assets
- ✓ 9. Lender1 Should be able to withdraw DAI
- ✓ 10. Lender2 Should be able to lend 5 ETH
- ✓ 11. Borrower2 Should be able to borrow 100 DAI
- ✓ 12. Borrower2 Should not be able to borrow more than 80% of his supplied
- ✓ 13. Borrower2 Should not be able to borrow more than reserve qty
- ✓ 14. Borrower2 Should be able to borrow 100 DAI again
- ✓ 15. Borrower2 Should be able to repay

# Gas Report - Pre Optimization

Solc version: 0.8.6		Optimizer enabled: true		Runs: 200	Block limit: 30000000 gas	
Methods		15 gwei/gas			1756.60 usd/eth	
Contract	Method	Min	Max	Avg	# calls	usd (avg)
AddressToTokenMap	_setAddress	47257	47281	47272	4	1.25
AddressToTokenMap	_setPriceFeedMap	46589	46601	46598	4	1.23
DAIToken	approve	-	-	46268	2	1.22
DAIToken	transfer	-	-	51490	1	1.36
LendingPool	borrow	268833	284890	276862	2	7.30
LendingPool	lend	101391	458642	334649	14	8.82
LendingPool	repay	-	-	108595	1	2.86
LendingPool	withdraw	118932	133449	126191	4	3.33
LinkToken	approve	-	-	46268	1	1.22
LinkToken	transfer	-	-	51490	1	1.36
USDCToken	approve	-	-	46268	1	1.22
USDCToken	transfer	-	-	51478	1	1.36
Deployments					% of limit	
AddressToTokenMap		-	-	402738	1.3 %	10.61
DAIToken		-	-	616152	2.1 %	16.23
LendingConfig		-	-	1171036	3.9 %	30.86
LendingHelper		-	-	561609	1.9 %	14.80
LendingPool		-	-	3418839	11.4 %	90.08
LinkToken		-	-	616005	2.1 %	16.23
USDCToken		-	-	616005	2.1 %	16.23

# Gas Report - Post Optimization

Solc version: 0.8.6		Optimizer enabled: true		Runs: 200	Block limit: 30000000 gas	
Methods		13 gwei/gas			1749.72 usd/eth	
Contract	Method	Min	Max	Avg	# calls	usd (avg)
AddressToTokenMap	_setAddress	47971	47995	47986	4	1.09
AddressToTokenMap	_setPriceFeedMap	46824	46836	46833	4	1.07
DAIToken	approve	-	-	46268	2	1.05
DAIToken	transfer	-	-	51490	1	1.17
LendingPool	borrow	269853	285548	277701	2	6.32
LendingPool	lend	102200	482843	345847	14	7.87
LendingPool	repay	-	-	111528	1	2.54
LendingPool	withdraw	117126	134058	125592	4	2.86
LinkToken	approve	-	-	46268	1	1.05
LinkToken	transfer	-	-	51490	1	1.17
USDCToken	approve	-	-	46268	1	1.05
USDCToken	transfer	-	-	51478	1	1.17
Deployments					% of limit	
AddressToTokenMap		-	-	483645	1.6 %	11.00
DAIToken		-	-	616152	2.1 %	14.02
LendingConfig		-	-	1259766	4.2 %	28.66
LendingHelper		-	-	585574	2 %	13.32
LendingPool		-	-	3472530	11.6 %	78.99
LinkToken		-	-	616005	2.1 %	14.01
USDCToken		-	-	616005	2.1 %	14.01

# Smart Contract Audit

[lendhub] **myth analyze contracts/AddressToTokenMap.sol**

The analysis was completed successfully. No issues were detected.

[lendhub] **myth analyze contracts/LendingConfig.sol**

The analysis was completed successfully. No issues were detected.

[lendhub] **myth analyze contracts/LendingPool.sol --solc-json solc-mappings.json**

The analysis was completed successfully. No issues were detected.

[lendhub] **myth analyze contracts/LendingHelper.sol --solc-json solc-mappings.json**

**==== Dependence on predictable environment variable ====**

SWC ID: 116

Severity: Low

Contract: LendingHelper

Function name: rewardPerToken(uint256,uint256)

PC address: 2043

Estimated Gas Usage: 2994 - 37981

A control flow decision is made based on The block.timestamp environment variable.

The block.timestamp environment variable is used to determine a control flow decision. Note that the values of variables like coinbase, gaslimit, block number and timestamp are predictable and can be manipulated by a malicious miner. Also keep in mind that attackers know hashes of earlier blocks. Don't use any of those environment variables as sources of randomness and be aware that use of these variables introduces a certain level of trust into miners.

**==== Dependence on predictable environment variable ====**

SWC ID: 116

Severity: Low

Contract: LendingHelper

Function name: rewardPerToken(uint256,uint256)

PC address: 2066

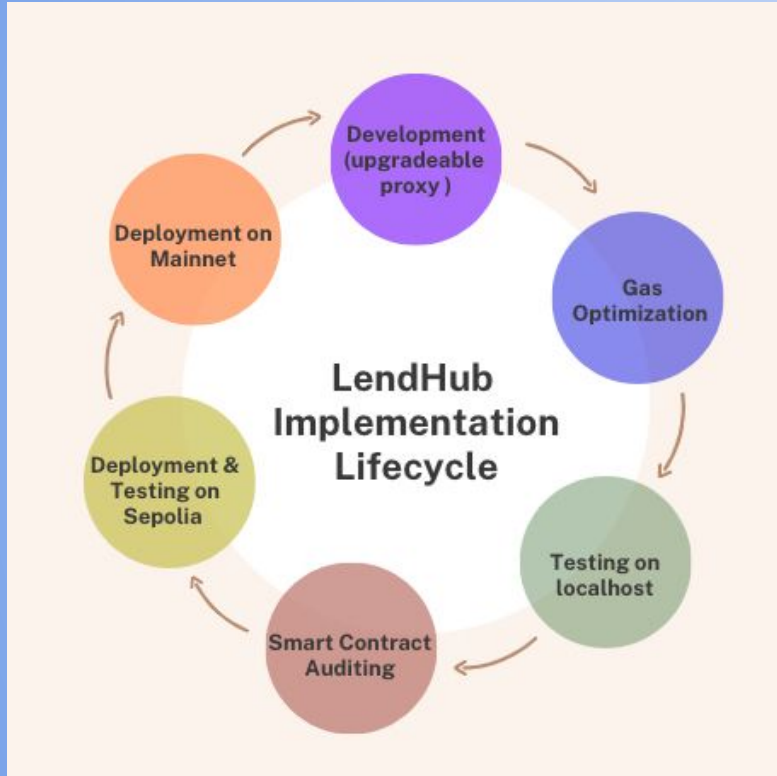
Estimated Gas Usage: 362 - 457

A control flow decision is made based on The block.timestamp environment variable.

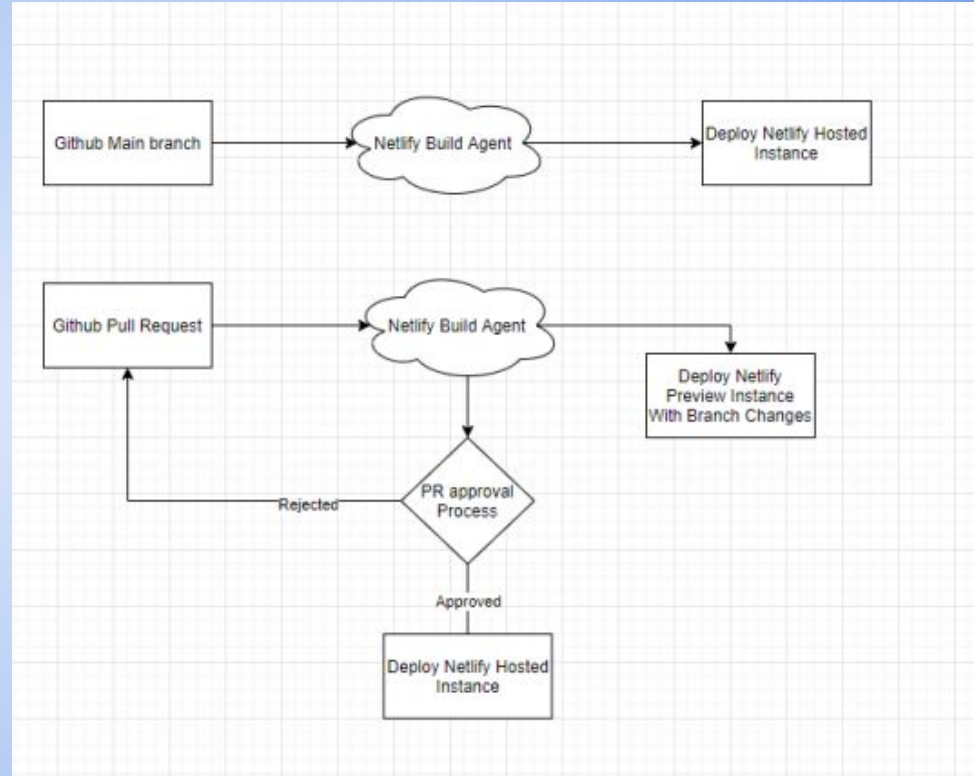
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# Development Cycle



Development Lifecycle



Netlify CI/CD

# GitHub Repo

Code:

<https://github.com/shubhamprajapati241/lendhub>

ReadMe:

<https://github.com/shubhamprajapati241/lendhub/blob/main/README.md>

# Version 2 - Improvements & Enhancements

**Time-lock for lent assets:** Implement time-lock features for both the lender. This would ensure that assets are locked up for a specific period, providing certainty for lenders and borrowers parties during the loan term. This is planned to be accomplished using proxy upgrade Implementation.

**Off-chain data computation:** LendHub could implement off-chain data computation to determine more optimal loan options. This would enable LendHub to analyze data from various sources to provide borrowers with more personalized loan options based on their creditworthiness and other factors.

**DAO for governance purposes:** LendHub could incorporate a DAO (Decentralized Autonomous Organization) for governance purposes. This would enable token holders to participate in decision-making processes related to the platform's development, management, and future direction.

**Dynamic interest rates & Interest rate per asset:** LendHub could integrate dynamic interest rates and interest rate per asset based on the Beta or volatility.. This approach would incentivize lenders to lend their assets to borrowers who are more likely to repay their loans, while discouraging borrowers who pose a higher risk of default.

**Mutual Funds implementation:** LendHub could also incorporate mutual funds implementation to enable diversification of assets for both lenders and borrowers. By pooling assets from multiple lenders and offering them as a single investment option, LendHub can provide borrowers with access to a wider range of assets while enabling lenders to spread their risk across multiple assets.

**LendRank:** Implement "LendRank," that assigns a score to borrowers based on their creditworthiness

**Chainlink Automation:** LendHub could leverage Chainlink's upkeep automation to enable liquidation based on price fluctuations. This approach would enable LendHub to monitor the price of assets being lent and borrowed in real-time, and automatically trigger liquidation in the event of a price drop. This would reduce the risk of default and enable lenders to minimize losses.