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**Blockchain Security | Smart Contract Audits | KYC Development | Marketing**

MADE IN GERMANY

# LyveFinance

# AUDIT

**SECURITY ASSESSMENT**

**16. August, 2023**

**FOR**

SolidProof_io

@solidproof_io

## Introduction

SolidProof.io is a brand of the officially registered company MAKE Network GmbH, based in Germany. We're mainly focused on Blockchain Security such as Smart Contract Audits and KYC verification for project teams.
Solidproof.io assess potential security issues in the smart contracts implementations, review for potential inconsistencies between the code base and the whitepaper/documentation, and provide suggestions for improvement.

## Disclaimer

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# Project Overview

## Summary

| Project Name | Lyve FInance |
|---|---|
| Website | https://www.lyvefi.xyz/ |
| About the project | We will bridge most mainstream LSD tokens to l2 using LayerZero's ProxyOFT technology and directly use them for Lyve's Farming. As l2 matures and people pay more attention to security and privacy, we believe there will be more and more LSD projects supporting l2, and we will see more LSD projects and liquidity on l2 |
| Chain | Linea |
| Language | Solidity |
| Codebase Link | https://github.com/LyveFinance/contract-lsd/tree/main/lsd/contracts |
| Commit | f876cbd |
| Unit Tests | Not Provided |

## Social Medias

| Telegram | N/A |
|---|---|
| Twitter | https://twitter.com/LyveFinance |
| Facebook | N/A |
| Instagram | N/A |
| Github | N/A |
| Reddit | N/A |
| Medium | N/A |
| Discord | N/A |
| Youtube | N/A |
| TikTok | N/A |
| LinkedIn | N/A |

## Audit Summary

| Version | Delivery Date | Changelog |
|---|---|---|
| v1.0 | 03. August 2023 | • Layout Project<br>• Automated- /Manual-Security Testing<br>• Summary |
| v1.1 | 08. August 2023 | • Reaudit |
| v1.2 | 16. August 2023 | • Reaudit |

**Note -** The following audit report presents a comprehensive security analysis of the smart contract utilized in the project. This analysis did not include functional testing (or unit testing) of the contract/s logic. We cannot guarantee 100% logical correctness of the contract as it was not functionally tested by us.

## File Overview

The project provided us with the files that should be tested in the security assessment. This audit covered the following files listed below with an SHA-1 Hash.

| File Name | SHA-1 Hash |
|---|---|
| contracts/interfaces/ILsdRateOracle.sol | 6d77d543f4fa841dda3b59c7b4c1310aa8639b78 |
| contracts/interfaces/ILayerZeroUserApplicationConfig.sol | 619d629e55c336e6297b51444c9751b25d699b7c |
| contracts/interfaces/IxF33dReceiver.sol | 1a810ca1a0856102710b0595a038415ef6397d56 |
| contracts/interfaces/IGauge.sol | 2dcdbb5b18b8b4d1b71571f970c422517566e6aa |
| contracts/interfaces/ILayerZeroReceiver.sol | 40fdfafbbd43411c04fab817e023e5162ab86386 |
| contracts/interfaces/IVoter.sol | 4d5d5b4c1286f2a5bca6377172d0b408fab80d12 |
| contracts/interfaces/IVaultFactory.sol | 37a9b9c77282568b8e1c1cada439814c78fc5a47 |
| contracts/interfaces/AggregatorV3Interface.sol | 5f3eff85813f2f28b9ae44fb86c82274e98e5cdd |
| contracts/interfaces/IVault.sol | 608875320ae0f45ff4f8a661486a5646dbd62f08 |
| contracts/interfaces/ILayerZeroEndpoint.sol | 89e89b610c294d760037ba188a7a470a890a64fa |
| contracts/interfaces/IxF33dAdapter.sol | 30ebfaeb455f03d433284bc42fe52e633973b4be |
| contracts/interfaces/IVotingEscrow.sol | 5b58414c8d5cae855d26d3aa5c7e8a4e424807a5 |
| contracts/xF33dReceiverChainlink.sol | 0d13d4f4fea1870119bd7c9669049ccf50c1effb |
| contracts/xF33dAdapterChainlink.sol | 51dcc01d03b16bff9336cb54704fce39bdac2e91 |
| contracts/factories/VaultFactory.sol | 49edb2bd49763c07c009787f968c4a0ed45498c1 |

| | |
|---|---|
| contracts/xF33dReceiver.sol | 190296da7adee584eacfeccba5803da8dea6c34f |
| contracts/VaultGauge.sol | 5864d1776a83dabd527fa431b1db6473c82f6232 |
| contracts/LsdRateOracle.sol | 90411f81c11d754aab3c554851047f5da95ae52e |
| contracts/Vault.sol | 92d2d04c878f76d949d9b738ab462d3a89db94ce |
| contracts/xF33dSender.sol | 26f59339c7a6aec9b0aaa277c729b04dfcbbac4d |

*Please note: Files with a different hash value than in this table have been modified after the security check, either intentionally or unintentionally. A different hash value may (but need not) be an indication of a changed state or potential vulnerability that was not the subject of this scan.*

## Imported packages

*Used code from other Frameworks/Smart Contracts (direct imports).*

| Dependency / Import Path | Count |
|---|---|
| @openzeppelin/contracts/access/Ownable2Step.sol | 1 |
| @openzeppelin/contracts/governance/utils/IVotes.sol | 1 |
| @openzeppelin/contracts/interfaces/IERC4906.sol | 1 |
| @openzeppelin/contracts/security/ReentrancyGuard.sol | 2 |
| @openzeppelin/contracts/token/ERC20/ERC20.sol | 1 |
| @openzeppelin/contracts/token/ERC20/IERC20.sol | 1 |
| @openzeppelin/contracts/token/ERC20/extensions/ERC20Permit.sol | 1 |
| @openzeppelin/contracts/token/ERC20/utils/SafeERC20.sol | 1 |
| @openzeppelin/contracts/token/ERC721/extensions/IERC721Metadata.sol | 1 |
| @openzeppelin/contracts/utils/math/Math.sol | 1 |
| contracts/interfaces/IBribe.sol | 1 |
| contracts/interfaces/IERC20.sol | 1 |
| contracts/interfaces/IGauge.sol | 1 |
| contracts/interfaces/IVault.sol | 1 |
| contracts/interfaces/IVoter.sol | 1 |
| contracts/interfaces/IVotingEscrow.sol | 1 |
| contracts/libraries/Math.sol | 1 |

**Note for Investors:** We only audited contracts mentioned in the scope above. All contracts related to the project apart from that are not a part of the audit, and we cannot comment on its security and are not responsible for it in any way.

## External/Public functions

*External/public functions are functions that can be called from outside of a contract, i.e., they can be accessed by other contracts or external accounts on the blockchain. These functions are specified using the function declaration's external or public visibility modifier.*

## State variables

*State variables are variables that are stored on the blockchain as part of the contract's state. They are declared at the contract level and can be accessed and modified by any function within the contract. State variables can be defined with a visibility modifier, such as public, private, or internal, which determines the access level of the variable.*

## Components

| 📝Contracts | 📚Libraries | 🔍Interfaces | 🎨Abstract |
|---:|---:|---:|---:|
| 8 | 0 | 12 | 0 |

## Exposed Functions

*This section lists functions that are explicitly declared public or payable. Please note that getter methods for public stateVars are not included.*

| 🌐Public | 💰Payable |
|---:|---:|
| 205 | 3 |

| External | Internal | Private | Pure | View |
|---:|---:|---:|---:|---:|
| 189 | 127 | 0 | 0 | 108 |

## StateVariables

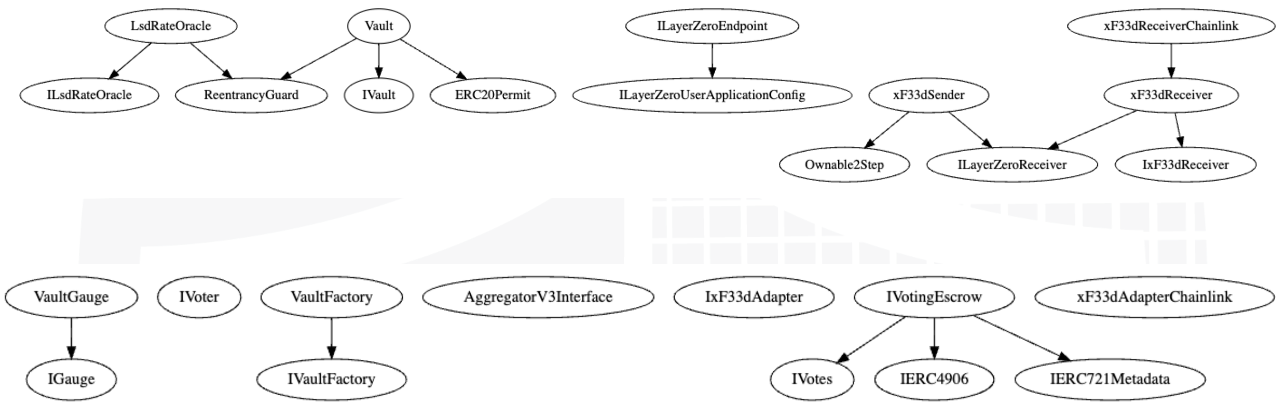
| Total | 🌐Public |
|---:|---:|
| 55 | 44 |

## Capabilities

| Solidity Versions observed | 🧪 Experimental Features | 💰 Can Receive Funds | 🖥 Uses Assembly | 💣 Has Destroyable Contracts |
|---|---|---|---|---|
| `^0.8.0` `>=0.5.0` `0.8.13` `^0.8.13` | ---- | Yes | Yes | ---- |

## Inheritance Graph

*An inheritance graph is a graphical representation of the inheritance hierarchy among contracts. In object-oriented programming, inheritance is a mechanism that allows one class (or contract, in the case of Solidity) to inherit properties and methods from another class. It shows the relationships between different contracts and how they are related to each other through inheritance.*



# Audit Information

## Vulnerability & Risk Level

Risk represents the probability that a certain source threat will exploit vulnerability and the impact of that event on the organization or system. The risk Level is computed based on CVSS version 3.0.

| Level | Value | Vulnerability | Risk (Required Action) |
|---|---|---|---|
| **Critical** | 9 - 10 | A vulnerability that can disrupt the contract functioning in a number of scenarios, or creates a risk that the contract may be broken. | Immediate action to reduce risk level. |
| **High** | 7 – 8.9 | A vulnerability that affects the desired outcome when using a contract, or provides the opportunity to use a contract in an unintended way. | Implementation of corrective actions as soon aspossible. |
| **Medium** | 4 – 6.9 | A vulnerability that could affect the desired outcome of executing the contract in a specific scenario. | Implementation of corrective actions in a certain period. |
| **Low** | 2 – 3.9 | A vulnerability that does not have a significant impact on possible scenarios for the use of the contract and is probably subjective. | Implementation of certain corrective actions or accepting the risk. |
| **Informational** | 0 – 1.9 | A vulnerability that have informational character but is not effecting any of the code. | An observation that does not determine a level of risk |

## Auditing Strategy and Techniques Applied

Throughout the review process, care was taken to check the repository for security-related issues, code quality, and compliance with specifications and best practices. To this end, our team of experienced pen-testers and smart contract developers reviewed the code line by line and documented any issues discovered.

We check every file manually. We use automated tools only so that they help us achieve faster and better results.

## Methodology

The auditing process follows a routine series of steps:

1. Code review that includes the following:
   a. Reviewing the specifications, sources, and instructions provided to
   SolidProof to ensure we understand the size, scope, and functionality of the
   smart contract.
   b. Manual review of the code, i.e., reading the source code line by line to identify potential vulnerabilities.
   c. Comparison to the specification, i.e., verifying that the code does what is described in the specifications, sources, and instructions provided to SolidProof.

2. Testing and automated analysis that includes the following:
   a. Test coverage analysis determines whether test cases cover code and how much code is executed when those test cases are executed.
   b. Symbolic execution, which is analysing a program to determine what inputs cause each part of a program to execute.

3. Review best practices, i.e., review smart contracts to improve efficiency, effectiveness, clarity, maintainability, security, and control based on best practices, recommendations, and research from industry and academia.

4. Concrete, itemized and actionable recommendations to help you secure your smart contracts.

## Overall Security
### Medium or higher issues
### Upgradeability

| Contract is not an upgradeable | ✅ Deployer cannot update the contract with new functionalities |
|---|---|
| Description | The contract is not an upgradeable contract. The deployer is not able to change or add any functionalities to the contract after deploying. |
| Comment | N/A |

## Ownership

| The ownership is not renounced | ❌ The owner is not renounce |
|---|---|
| Description | The owner has not renounced the ownership that means that the owner retains control over the contract's operations, including the ability to execute functions that may impact the contract's users or stakeholders. This can lead to several potential issues, including:<br><br>• Centralizations<br>• The owner has significant control over contract's operations |
| Comment | N/A |

**Note** - If the contract is not deployed then we would consider the ownership to be not renounced. Moreover, if there are no ownership functionalities then the ownership is automatically considered renounced.

## Ownership Privileges

*These functions can be dangerous. Please note that abuse can lead to financial loss. We have a guide where you can learn more about these Functions.*

### Minting tokens

*Minting tokens refer to the process of creating new tokens in a cryptocurrency or blockchain network. This process is typically performed by the project's owner or designated authority, who has the ability to add new tokens to the network's total supply.*

| **Contract owner cannot mint new tokens** | ✅ **The owner cannot mint new tokens** |
|---|---|
| Description | The owner is not able to mint new tokens once the contract is deployed. |
| Comment | N/A |

## Burning tokens

*Burning tokens is the process of permanently destroying a certain number of tokens, reducing the total supply of a cryptocurrency or token. This is usually done to increase the value of the remaining tokens, as the reduced supply can create scarcity and potentially drive up demand.*

| **Contract owner cannot burn tokens** | ✅ **The owner cannot burn tokens** |
|---|---|
| Description | The owner is not able burn tokens without any allowances. |
| Comment | N/A |

## Blacklist addresses

*Blacklisting addresses in smart contracts is the process of adding a certain address to a blacklist, effectively preventing them from accessing or participating in certain functionalities or transactions within the contract. This can be useful in preventing fraudulent or malicious activities, such as hacking attempts or money laundering.*

| **Contract owner cannot blacklist addresses** | ✅ **The owner cannot blacklist addresses** |
|---|---|
| Description | The owner is not able blacklist addresses to lock funds. |
| Comment | N/A |

## Fees and Tax

*In some smart contracts, the owner or creator of the contract can set fees for certain actions or operations within the contract. These fees can be used to cover the cost of running the contract, such as paying for gas fees or compensating the contract's owner for their time and effort in developing and maintaining the contract.*

| **Contract owner cannot set fees more than 25%** | ✅ **The owner cannot levy unfair taxes** |
|---|---|
| Description | The owner is not able to set the fees above 25% |
| Comment | N/A |

## Lock User Funds

*In a smart contract, locking refers to the process of restricting access to certain tokens or assets for a specified period of time. When tokens or assets are locked in a smart contract, they cannot be transferred or used until the lock-up period has expired or certain conditions have been met.*

| **Owner cannot lock the contract** | ✅ **The owner cannot lock the contract** |
|---|---|
| Description | The owner is not able to lock the contract by any functions or updating any variables. |
| Comment | N/A |

## Centralization Privileges

*Centralization can arise when one or more parties have privileged access or control over the contract's functionality, data, or decision-making. This can occur, for example, if the contract is controlled by a single entity or if certain participants have special permissions or abilities that others do not.*

In the project, there are authorities that have access to the following functions:

| File | Privileges |
|---|---|
| **1. Vault.sol** | ❖ onlyFactory<br>- Set Gauge Address |
| **2. xF33dSender.sol** | ❖ onlyOwner<br>- Set Remote src address<br>- Set protected feeds<br>- Set Lz Endpoint address |

### Recommendations

To avoid potential hacking risks, it is advisable for the client to manage the private key of the privileged account with care. Additionally, we recommend enhancing the security practices of centralized privileges or roles in the protocol through a decentralized mechanism or smart-contract-based accounts, such as multi-signature wallets.

Here are some suggestions of what the client can do:

- Consider using multi-signature wallets: Multi-signature wallets require multiple parties to sign off on a transaction before it can be executed, providing an extra layer of security e.g. Gnosis Safe
- Use of a timelock at least with a latency of e.g. 48-72 hours for awareness of privileged operations
- Introduce a DAO/Governance/Voting module to increase transparency and user involvement
- Consider Renouncing the ownership so that the owner cannot modify any state variables of the contract anymore. Make sure to set up everything before renouncing.

## Audit Results

### #1 | Logical Error

| File | Severity | Location | Status |
|---|---|---|---|
| xF33dReceiver | Medium | L60 | Fixed |

**Description -** The xF33dAdapterChainlink is encoding following type: uint80, '*INT256*', uint256, uint256, uint80 and it is being decoded as uint80, '*UINT256*', uint256, uint256, uint80. When the chainlink getLatestData price is negative, the rate will result in an underflow.

**Remediation -** Make sure to decode with the same data type to avoid underflow

### #2 | Missing Timelock

| File | Severity | Location | Status |
|---|---|---|---|
| VaultGauge | Low | L491 | ACK |

**Description -** The contract misses a timelock in the withdraw function. This means that the claim function can be called recursively and the funds will be available for withdrawal right after the deposit

**Remediation -** We recommend putting a timelock so that the withdraw function cannot be called by an external contract recursively and only legitimate users will be able to withdraw funds.

**Alleviation -** This bug doesn't affect the business logic of the contract

### #3 | Missing Zero Address Validation

| File | Severity | Location | Status |
|---|---|---|---|
| VaultGauge | Low | L87—91 | Fixed |

**Description -** Make sure to validate that the address passed in the function parameters is "non-zero".

## #4 | Missing Zero Address Validation

| File | Severity | Location | Status |
|---|---|---|---|
| xF33dReceiver | Low | L33 | Fixed |

**Description -** Make sure to validate that the address passed in the function parameters is “non-zero”.

## #5 | Missing Zero Address Validation

| File | Severity | Location | Status |
|---|---|---|---|
| xF33dSender | Low | L88, 90, 113 | Fixed |

**Description -** Make sure to validate that the address passed in the function parameters is “non-zero”.

## #6 | ChainID Check

| File | Severity | Location | Status |
|---|---|---|---|
| xF33dSender | Low | L87 | Fixed |

**Description -** We recommend using the enumerable set to check for the valid chainIDs

## #7 | Missng “msg.value” check

| File | Severity | Location | Status |
|---|---|---|---|
| xF33dSender | Low | L66, 118 | Fixed |

**Description -** The contract doesn’t have any checks to verify whether the msg.value is zero or not. This may result in users calling this function with almost no ether.

**Remediation -** Check that the “msg.value” is not zero.

### #8 | Missing Zero Address Validation

| File | Severity | Location | Status |
|---|---|---|---|
| xF33dReceiver | Low | L34, 35, 37 | Fixed |

**Description** - Make sure to validate that the address passed in the function parameters is “non-zero”.

### #9 | Missing Zero Address Validation

| File | Severity | Location | Status |
|---|---|---|---|
| LsdRateOracle | Low | L14, 15 | Fixed |

**Description** - Make sure to validate that the address passed in the function parameters is “non-zero”.

### #10 | Missing Zero Address Validation

| File | Severity | Location | Status |
|---|---|---|---|
| Vault | Low | L48, 49 | Fixed |

**Description** - Make sure to validate that the address passed in the function parameters is “non-zero”.

### #11 | Missing Logical Check

| File | Severity | Location | Status |
|---|---|---|---|
| Vault | Low | L90 | Fixed |

**Description** - Make sure to check that the “totalLsd” value must be greater than or equal to “userLsd”

### #12 | Hardcoded Address

| File | Severity | Location | Status |
|---|---|---|---|
| Vault | Low | L86 | Fixed |

**Description** - The function uses a Hardcoded address as access control which is not recommended in any case because this address will always be in the control of this function even if it is hacked or the responsible person is removed from the project.

**Remediation** - We recommend storing the address in a variable and checking it from there.

## #13 | Too Many Digits

| File | Severity | Location | Status |
|---|---|---|---|
| Vault | Informational | L103, 112 | Fixed |

**Description -** Too many digits are being used for comparison. It is recommended to use the ether notation and if this is not possible the n the underscore notation (1_000_000) is also suffice.

## #14 | Syntax Error

| File | Severity | Location | Status |
|---|---|---|---|
| LsdRateOracle | Informational | L23 | Fixed |

**Description -** “External” keyword is used before the “view” keyword.

## #15 | Business Logic Risk

| File | Severity | Location | Status |
|---|---|---|---|
| LsdRateOracle | Informational | L19 | Fixed |

**Description -** The governor address is not able to remove addresses from “_rateManager” mapping. Beware while using this function.

## #16 | Missng Error Message

| File | Severity | Location | Status |
|---|---|---|---|
| xF33dSender | Informational | L147, 152 | Fixed |

**Description -** We recommend returning error messages in the case where the “require” check fails.

## #17 | NatSpec documentation missing

| File | Severity | Location | Status |
|---|---|---|---|
| All | Informational | — | ACK |

**Description -** If you started to comment on your code, also comment on all other functions, variables etc.

## #18 | Missng Error Message

| File | Severity | Location | Status |
|---|---|---|---|
| xF33dReceiver | Informational | L46, 51 | Fixed |

**Description -** We recommend returning error messages in the case where the “require” check fails.

## #19 | Missng Error Message

| File | Severity | Location | Status |
|---|---|---|---|
| VaultGauge | Informational | L105, 526, 527, 542, 546, 560, 567, 570, 577, 584 | Fixed |

**Description -** We recommend returning error messages in the case where the “require” check fails.

## #20 | Contract doesn’t import npm packages from source (like OpenZeppelin etc.)

| File | Severity | Location | Status |
|---|---|---|---|
| All | Informational | N/A | ACK |

**Description -** We recommend importing all packages from npm directly without flattening the contract. Functions could be modified or can be susceptible to vulnerabilities.

**Note for the Project Team and Investors -** Some interfaces used in the contracts’ logic like “IVoter”, “IVotingEscrow” was not the part of the audit scope and we cannot comment on their security.

## Legend for the Issue Status

| Attribute or Symbol | Meaning |
|---|---|
| Open | The issue is not fixed by the project team. |
| Fixed | The issue is fixed by the project team. |
| Acknowledged(ACK) | The issue has been acknowledged or declared as part of business logic. |

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