SOLIDProof

Bring trust into your projects

Blockchain Security | Smart Contract Audits | KYC

MADE IN GERMANY

vEmpire

Audit

Security Assessment

03. May, 2022

For

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Version	Date	Description
1.0	26. April 2022	• Layout project • Automated- /Manual-Security Testing • Summary
1.1	03. May 2022	• Reaudit
2.0	16. May 2022	• Reaudit + MasterChefASXLP
2.1	26. May 2022	• Blacklist functionality added to LiquidityPool

Network
Ethereum (ERC20)

Website
https://v-empire.io/

Telegram
https://t.me/vempirediscussion

Twitter
http://twitter.com/vempiredigital

Medium
https://medium.com/@v-empire.digital

Discord
https://discord.gg/Wk3aF3PNKM

Youtube
https://youtube.com/c/vEmpireDDAO

Description

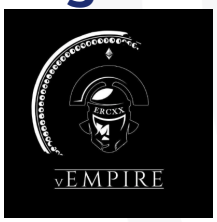
vEmpire DDAO is the world's largest Decentralized Metaverse Investment Organization. The official vEmpire protocol incorporates different strategies to incentivize Metaverse token staking to fund the battle against centralisation.

vEmpire is entirely focused on protecting decentralized technologies through virtual property and Metaversal asset acquisition.

Project Engagement

During the 24th of March 2022, **vEmpire Team** engaged Solidproof.io to audit smart contracts that they created. The engagement was technical in nature and focused on identifying security flaws in the design and implementation of the contracts. They provided Solidproof.io with access to their code repository and whitepaper.

Logo



Contract Link

v1.0

- Github
  - https://github.com/v-Empire/vEmpire/commit/474a9e2ece8afbbf2532e0c04a2f80a364a36428
  - Commit: 474a9e2ece8afbbf2532e0c04a2f80a364a36428

v2.0

- Github
  - https://github.com/v-Empire/vEmpire/commit/6dd2f22862722bfcb533cc7c878c959f3ebba62c
  - Commit: 6dd2f22862722bfcb533cc7c878c959f3ebba62c

v2.1

- Github
  - https://github.com/v-Empire/vEmpire/blob/master/smart-contract/contracts/staking/LiquidityPoolV2.sol
  - Commit: f5012806bc73ef479dc36c7d423e4cf785110e8a

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. 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 evaluate the repository for security-related issues, code quality, and adherence to specification and best practices. To do so, reviewed line-by-line by our team of expert pentesters and smart contract developers, documenting any issues as there were discovered.

Methodology

The auditing process follows a routine series of steps:

1. Code review that includes the following:
    i) Review of the specifications, sources, and instructions provided to SolidProof to make sure we understand the size, scope, and functionality of the smart contract.
    ii) Manual review of code, which is the process of reading source code line-by-line in an attempt to identify potential vulnerabilities.
    iii) Comparison to specification, which is the process of checking whether the code does what the specifications, sources, and instructions provided to SolidProof describe.

2. Testing and automated analysis that includes the following:
    i) Test coverage analysis, which is the process of determining whether the test cases are actually covering the code and how much code is exercised when we run those test cases.
    ii) Symbolic execution, which is analysing a program to determine what inputs causes each part of a program to execute.

3. Best practices review, which is a review of the smart contracts to improve efficiency, effectiveness, clarify, maintainability, security, and control based on the established industry and academic practices, recommendations, and research.

4. Specific, itemized, actionable recommendations to help you take steps to secure your smart contracts.

Used Code from other Frameworks/Smart Contracts (direct imports)

Imported packages:

Dependency / Import Path	Count
@openzeppelin/contracts/GSN/Context.sol	2
@openzeppelin/contracts/math/SafeMath.sol	2
@openzeppelin/contracts/token/ERC20/IERC20.sol	2
@openzeppelin/contracts/token/ERC20/SafeERC20.sol	2
@openzeppelin/contracts/utils/Address.sol	2

Tested Contract Files

This audit covered the following files listed below with a SHA-1 Hash.

A file with a different Hash has been modified, intentionally or otherwise, after the security review. A different Hash could be (but not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of this review.

v1.0

File Name	SHA-1 Hash
contracts/LiquidityPool.sol	0562ee6d6682e025f7f0e74c1bb30c6056ad31e6
contracts/MasterChefLP.sol	d01749ab998b456661cf1d40ee00e992909c924e

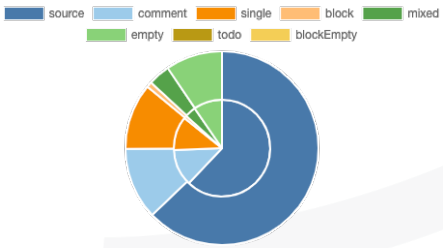
v2.0

File Name	SHA-1 Hash
contracts/LiquidityPool.sol	9eedbc7f123533db54c682d6e87e46b9196da4f5
contracts/MasterChefAXSLP.sol	d68e3568351f1a4379495b4d1614a78fa245f122
contracts/MasterChefLP.sol	a48f021117007a26e35f6bccdb597fe24f3a0e11

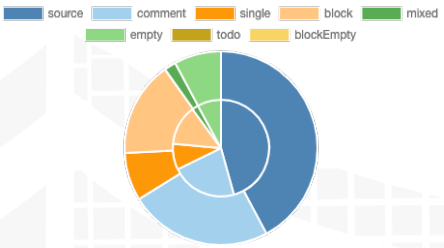
Metrics

Source Lines

v1.0

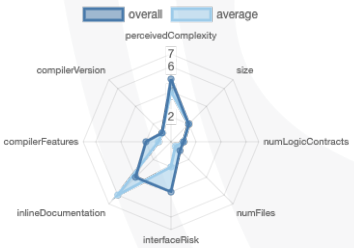


v2.0

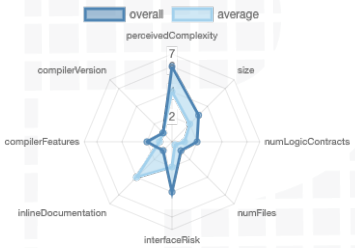


Risk Level

v1.0



v2.0



Capabilities

Components

Version	Contracts	Libraries	Interfaces	Abstract
1.0	3	0	1	0
2.0	5	3	2	2

Exposed Functions

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

Version	Public	Payable
1.0	34	0
2.0	58	0

Version	External	Internal	Private	Pure	View
1.0	5	33	0	1	4
2.0	14	98	3	16	17

State Variables

Version	Total	Public
1.0	30	30
2.0	45	42

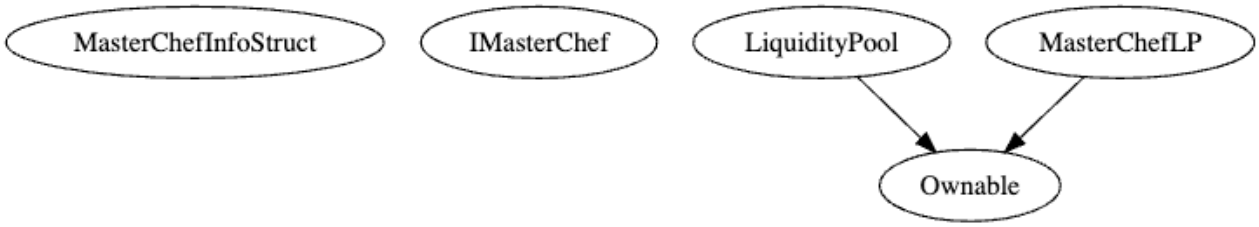
Capabilities

Version	Solidity Versions observed	Experimental Features	Can Receive Funds	Uses Assembly	Has Destroyable Contracts
1.0	`=0.6.12`	`ABIEncoderV2`			
2.0	`=0.6.12`	`ABIEncoderV2`		`yes` (2 asm blocks)	

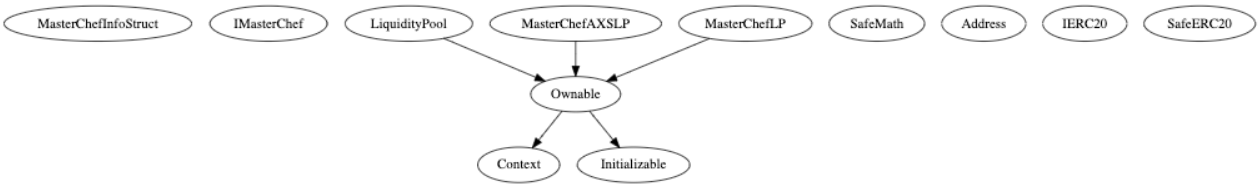
Version	Transfers ETH	Low-Level Calls	DelegateCall	Uses Hash Functions	EC Recover	New/Create/Create2
1.0	`yes`					
2.0	`yes`		`yes`			

Inheritance Graph

v1.0

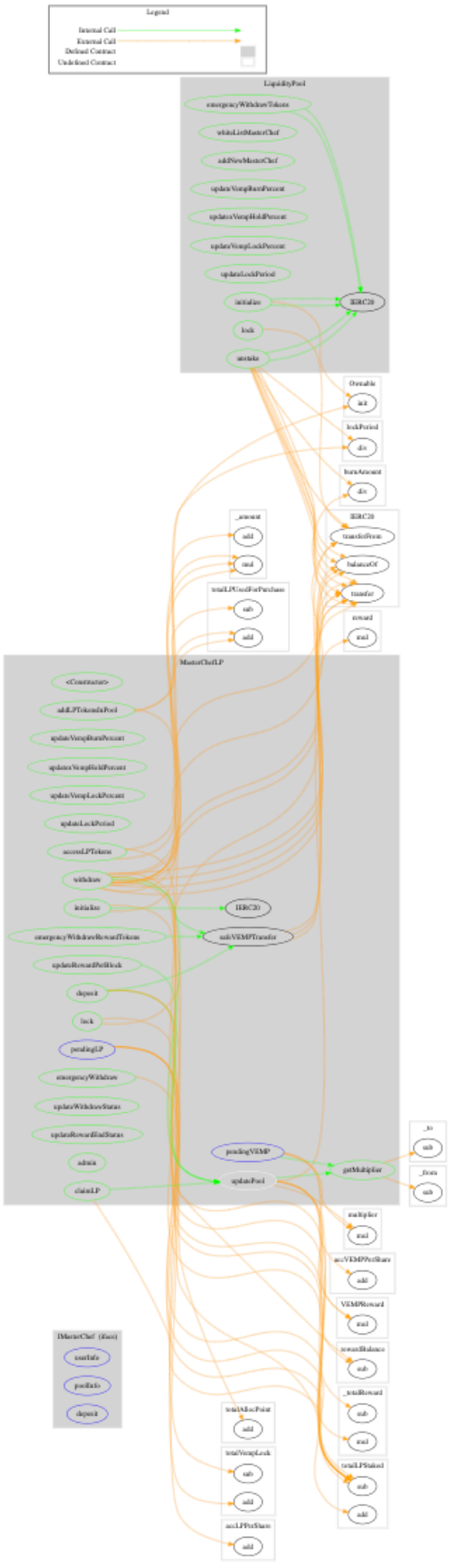


v2.0

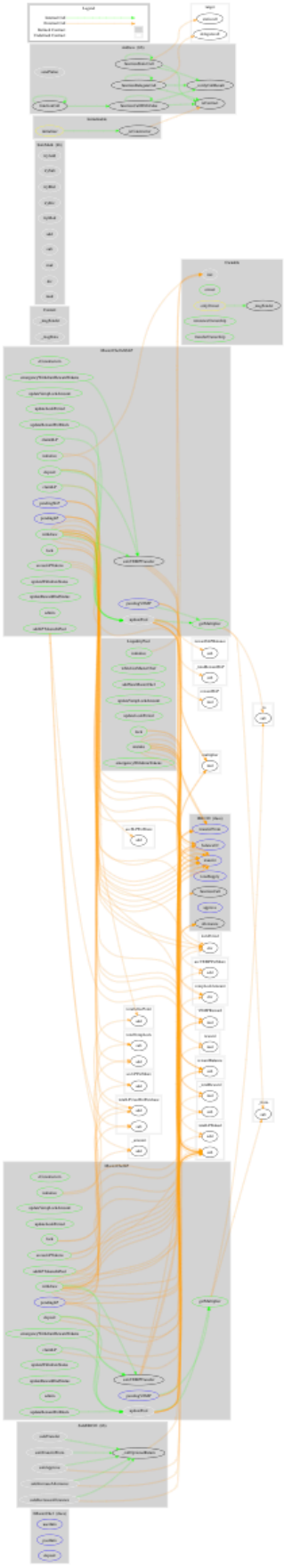


CallGraph

v1.0



v2.0



Scope of Work/Verify Claims

The above token Team provided us with the files that needs to be tested (Github, Bscscan, Etherscan, files, etc.). The scope of the audit is the main contract (usual the same name as team appended with .sol).

We will verify the following claims:

1. Correct implementation of Token standard
2. Overall checkup (Smart Contract Security)

Write functions of contract v1.0

MasterChefLP	LiquidityPool
1. addNewMasterChef	1. addNewMasterChef
2. emergencyWithdrawTokens	2. emergencyWithdrawTokens
3. initialize	3. initialize
4. lock	4. lock
5. renounceOwnership	5. renounceOwnership
6. transferOwnership	6. transferOwnership
7. unstake	7. unstake
8. updateLockPeriod	8. updateLockPeriod
9. updateVempBurnPercent	9. updateVempBurnPercent
10. updateVempLockPercent	10. updateVempLockPercent
11. updatexVempHoldPercent	11. updatexVempHoldPercent
12. whiteListMasterChef	12. whiteListMasterChef

v2.0

MasterChefLP

1. accessLPTokens
2. addLPTokensInPool
3. admin
4. claimLP
5. deposit
6. emergencyWithdrawRewardTokens
7. initialize
8. lock
9. renounceOwnership
10. transferOwnership
11. updateLockPeriod
12. updateRewardEndStatus
13. updateRewardPerBlock
14. updateVempLockAmount
15. updateWithdrawStatus
16. withdraw

LiquidityPool

1. addNewMasterChef
2. emergencyWithdrawTokens
3. initialize
4. lock
5. renounceOwnership
6. transferOwnership
7. unstake
8. updateLockPeriod
9. updateVempLockAmount
10. whiteListMasterChef

MasterChefAXSLP

1. accessLPTokens
2. addLPTokensInPool
3. admin
4. claimLP
5. claimSLP
6. deposit
7. emergencyWithdrawRewardTokens
8. initialize
9. lock
10. renounceOwnership
11. transferOwnership
12. updateLockPeriod
13. updateRewardEndStatus
14. updateRewardPerBlock
15. updateVempLockAmount
16. updateWithdrawStatus
17. withdraw

Overall checkup (Smart Contract Security)

Tested	Verified
✓	✓

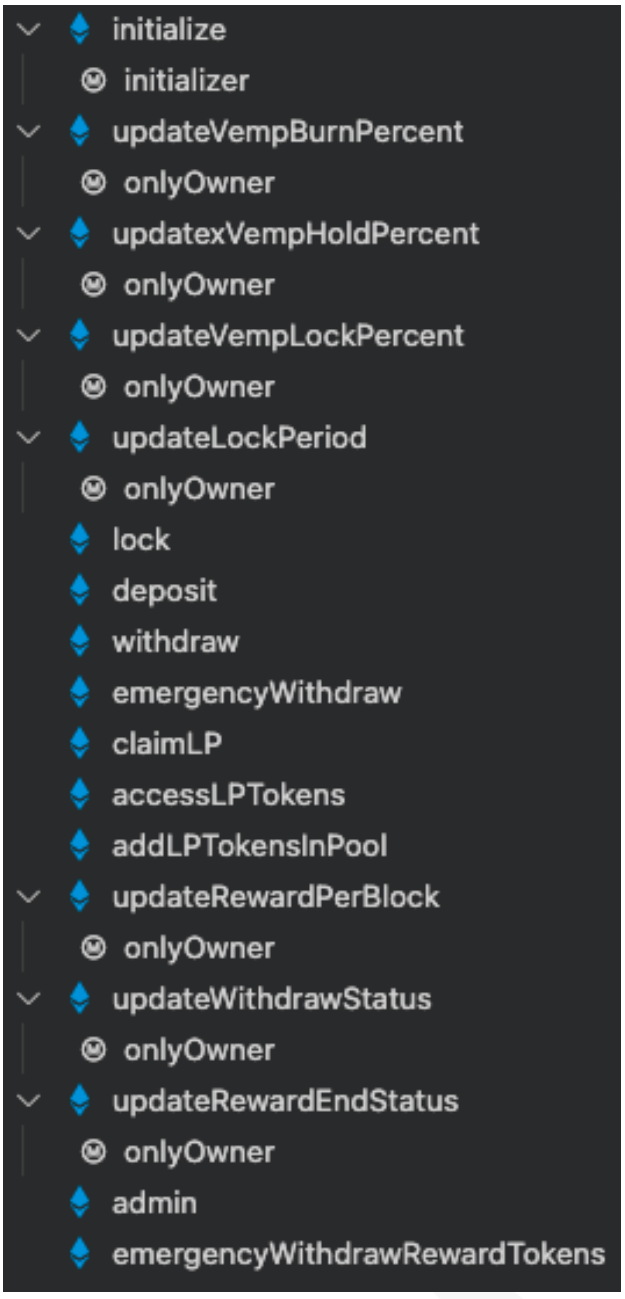
Legend

Attribute	Symbol
Verfified / Checked	✓
Partly Verified	⚑
Unverified / Not checked	✗
Not available	-

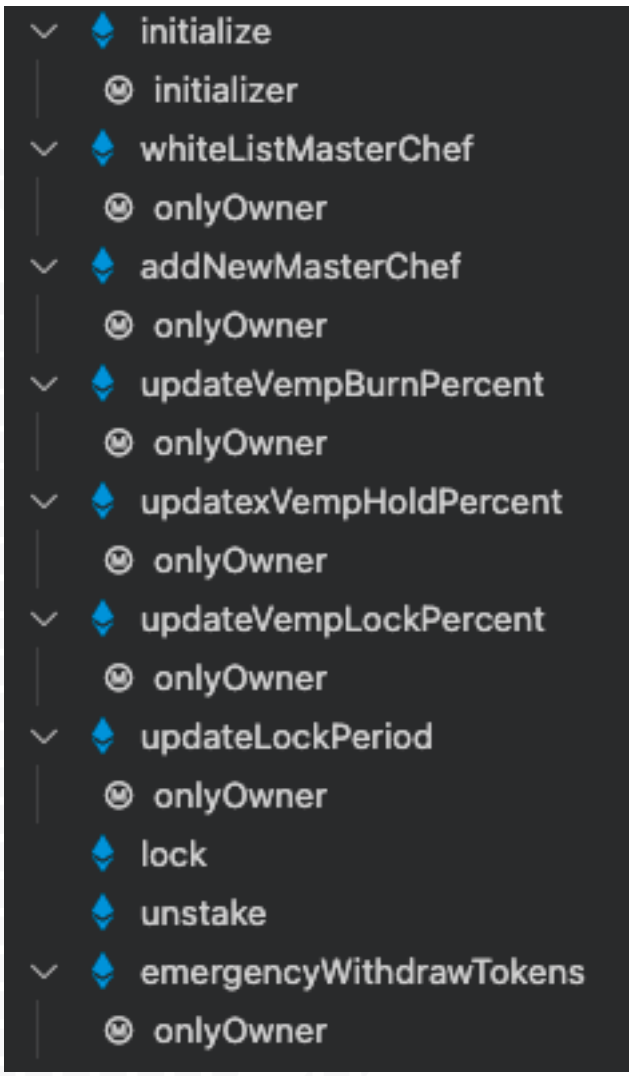
Modifiers and public functions

v1.0

MasterChefLP



LiquidityPool



Information: Not listed functions are directly imported functions from library (openzeppelin)

Comments

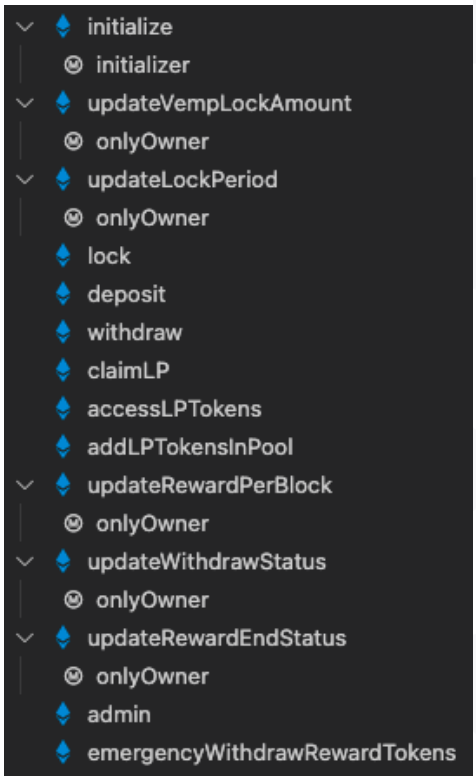
- Deployer can set following state variables without any limitations
  - MasterChefLp
    - vempBurnPercent
    - xVempHoldPercent
    - vempLockPercent

        - lockPeriod
    - LiquidityPool
        - vempBurnPercent
        - xVempHoldPercent
        - vempLockPercent
        - lockPeriod

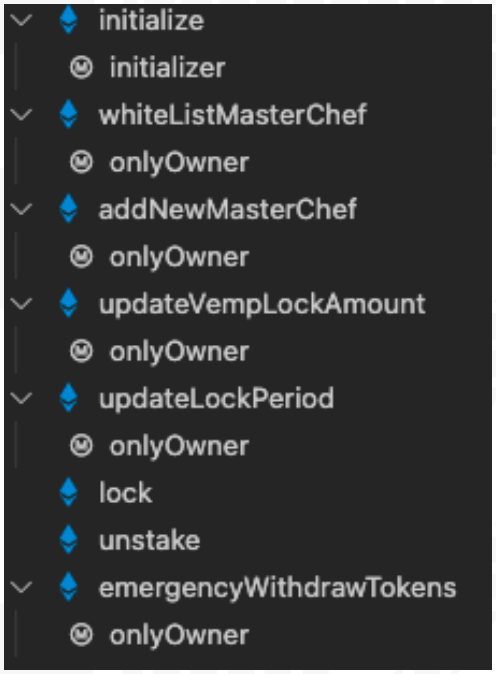
- Deployer can enable/disable following state variables
    - LiquidityPool
        - masterChefStatus
        - chef

v2.0

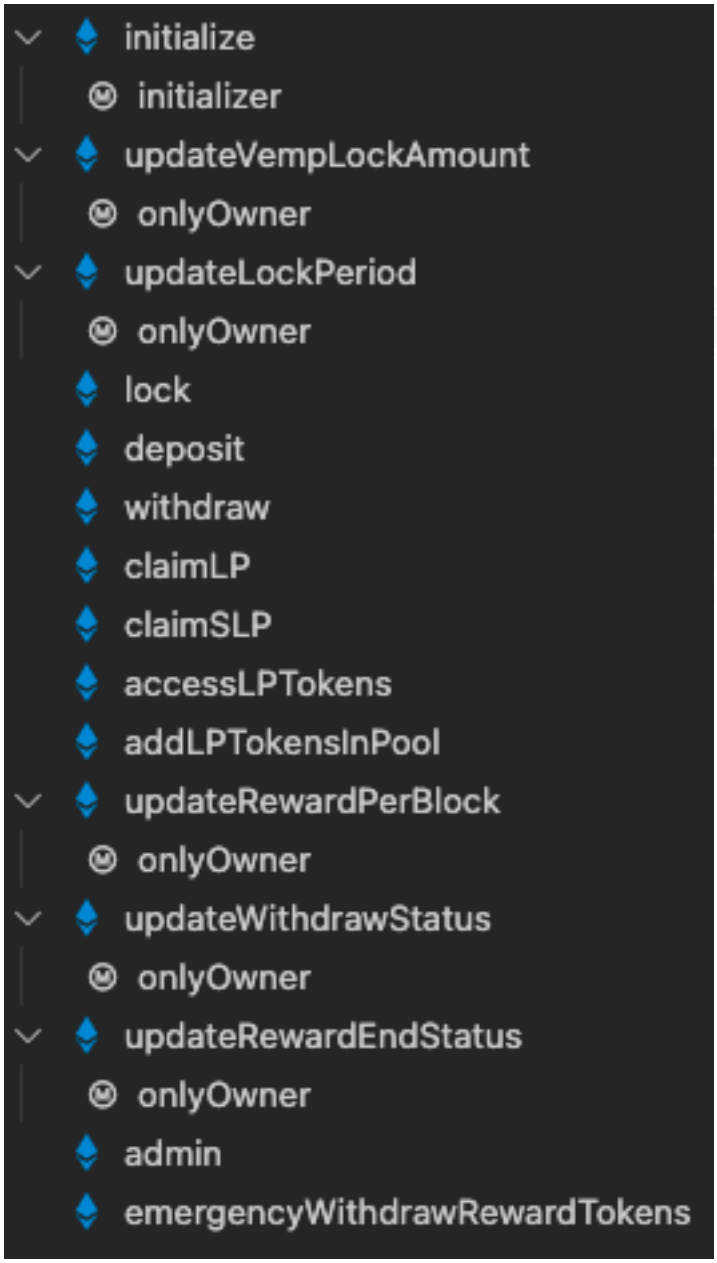
MasterChefLP



LiquidityPool



MasterChefAXSLP



Information: Not listed functions are directly imported functions from library (openzeppelin)

Comments

- Deployer can set following state variables without any limitations
  - MasterChefLp
    - lockPeriod
    - rewardEndBlock
    - VEMPPerBlock
    - vempLockAmount
  - MasterChefAXSLP
    - vempLockAmount

        - lockPeriod
        - VEMPPerBlock
        - rewardEndBlock

    - LiquidityPool
        - lockPeriod
        - vempLockAmount

- Deployer can enable/disable following state variables
    - LiquidityPool
        - masterChefStatus
        - blacklistUser
    - MasterChefLp
        - rewardEndStatus
        - withdrawStatus
    - MasterChefAXSLP
        - withdrawStatus
        - rewardEndStatus

- Deployer can set following addresses
    - LiquidityPool
        - chef
    - MasterChefAXSLP
        - adminaddr

Please check if an OnlyOwner or similar restrictive modifier has been forgotten.

Source Units in Scope

v1.0

Type	File	Logic Contracts	Interfaces	Lines	nLines	nSLOC	Comment Lines	Complex. Score	Capabilities
📝 🔍	contracts/LiquidityPool.sol	2	1	194	186	149	28	157	🧮📥
📝	contracts/MasterChefLP.sol	1	————	426	415	316	64	276	📥
📝 🔍	**Totals**	**3**	**1**	**620**	**601**	**465**	**92**	**433**	🧮📥

v2.0

Type	File	Logic Contracts	Interfaces	Lines	nLines	nSLOC	Comment Lines	Complex. Score	Capabilities
📝 🔍	contracts/LiquidityPool.sol	2	1	189	181	144	28	143	🧮📥
📝	contracts/MasterChefAXSLP.sol	1	————	480	471	356	76	312	📥
📝 📚 🔍 🎨	contracts/MasterChefLP.sol	7	1	1085	1005	528	479	395	💻📥👥🔆
📝 📚 🔍 🎨	**Totals**	**10**	**2**	**1754**	**1657**	**1028**	**583**	**850**	💻🧮📥👥 🔆

Legend

Attribute	Description
Lines	total lines of the source unit
nLines	normalized lines of the source unit (e.g. normalizes functions spanning multiple lines)
nSLOC	normalized source lines of code (only source-code lines; no comments, no blank lines)
Comment Lines	lines containing single or block comments
Complexity Score	a custom complexity score derived from code statements that are known to introduce code complexity (branches, loops, calls, external interfaces, ...)

Audit Results

AUDIT PASSED

Critical issues

No critical issues

High issues

No high issues

Medium issues

No medium issues

Low issues

No low issues

Informational issues

No informational issues

Audit Comments

We recommend you to use the special form of comments (NatSpec Format, Follow link for more information https://docs.soliditylang.org/en/v0.5.10/natspec-format.html) for your contracts to provide rich documentation for functions, return variables and more. This helps investors to make clear what that variables, functions etc. do.

26. April 2022:

- Read whole report for more information

16. May 2022:

- Read whole report for more information

26. May 2022:

- Read whole report for more information

SWC Attacks

ID	Title	Relationships	Status
SWC-136	Unencrypted Private Data On-Chain	CWE-767: Access to Critical Private Variable via Public Method	PASSED
SWC-135	Code With No Effects	CWE-1164: Irrelevant Code	PASSED
SWC-134	Message call with hardcoded gas amount	CWE-655: Improper Initialization	PASSED
SWC-133	Hash Collisions With Multiple Variable Length Arguments	CWE-294: Authentication Bypass by Capture-replay	PASSED
SWC-132	Unexpected Ether balance	CWE-667: Improper Locking	PASSED
SWC-131	Presence of unused variables	CWE-1164: Irrelevant Code	PASSED
SWC-130	Right-To-Left-Override control character (U+202E)	CWE-451: User Interface (UI) Misrepresentation of Critical Information	PASSED
SWC-129	Typographical Error	CWE-480: Use of Incorrect Operator	PASSED
SWC-128	DoS With Block Gas Limit	CWE-400: Uncontrolled Resource Consumption	PASSED

SWC-127	Arbitrary Jump with Function Type Variable	CWE-695: Use of Low-Level Functionality	PASSED
SWC-125	Incorrect Inheritance Order	CWE-696: Incorrect Behavior Order	PASSED
SWC-124	Write to Arbitrary Storage Location	CWE-123: Write-what-where Condition	PASSED
SWC-123	Requirement Violation	CWE-573: Improper Following of Specification by Caller	PASSED
SWC-122	Lack of Proper Signature Verification	CWE-345: Insufficient Verification of Data Authenticity	PASSED
SWC-121	Missing Protection against Signature Replay Attacks	CWE-347: Improper Verification of Cryptographic Signature	PASSED
SWC-120	Weak Sources of Randomness from Chain Attributes	CWE-330: Use of Insufficiently Random Values	PASSED
SWC-119	Shadowing State Variables	CWE-710: Improper Adherence to Coding Standards	PASSED
SWC-118	Incorrect Constructor Name	CWE-665: Improper Initialization	PASSED
SWC-117	Signature Malleability	CWE-347: Improper Verification of Cryptographic Signature	PASSED

SWC-116	Timestamp Dependence	CWE-829: Inclusion of Functionality from Untrusted Control Sphere	PASSED
SWC-115	Authorization through tx.origin	CWE-477: Use of Obsolete Function	PASSED
SWC-114	Transaction Order Dependence	CWE-362: Concurrent Execution using Shared Resource with Improper Synchronization ('Race Condition')	PASSED
SWC-113	DoS with Failed Call	CWE-703: Improper Check or Handling of Exceptional Conditions	PASSED
SWC-112	Delegatecall to Untrusted Callee	CWE-829: Inclusion of Functionality from Untrusted Control Sphere	PASSED
SWC-111	Use of Deprecated Solidity Functions	CWE-477: Use of Obsolete Function	PASSED
SWC-110	Assert Violation	CWE-670: Always-Incorrect Control Flow Implementation	PASSED
SWC-109	Uninitialized Storage Pointer	CWE-824: Access of Uninitialized Pointer	PASSED
SWC-108	State Variable Default Visibility	CWE-710: Improper Adherence to Coding Standards	PASSED
SWC-107	Reentrancy	CWE-841: Improper Enforcement of Behavioral Workflow	PASSED
SWC-106	Unprotected SELFDESTRUCT Instruction	CWE-284: Improper Access Control	PASSED

SWC-105	Unprotected Ether Withdrawal	CWE-284: Improper Access Control	PASSED
SWC-104	Unchecked Call Return Value	CWE-252: Unchecked Return Value	PASSED
SWC-103	Floating Pragma	CWE-664: Improper Control of a Resource Through its Lifetime	PASSED
SWC-102	Outdated Compiler Version	CWE-937: Using Components with Known Vulnerabilities	PASSED
SWC-101	Integer Overflow and Underflow	CWE-682: Incorrect Calculation	PASSED
SWC-100	Function Default Visibility	CWE-710: Improper Adherence to Coding Standards	PASSED

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