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MADE IN GERMANY

CleverAgent Finance

Audit

Security Assessment

08.August,2022

For

Clever Agent

SolidProof_io

@solidproof_io

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Version	Date	Description
1.0	01.August,2022	• Layout project • Automated- /Manual-Security Testing • Summary
1.1	08.August,2022	• Reaudit

Network

Website
https://cleveragent.finance

Twitter
https://twitter.com/Ceveragent

Discord
https://discord.gg/pHAVYf4H

Telegram
https://t.me/cleveragent

YouTube
https://www.youtube.com/channel/UCL86G-Mlwi8LiB8Aj3vBE1g

Medium
https://medium.com/@cleveragentfinance

Description

Clever Agent is a saving protocol that's based on the Binance Smart Chain network which offer investors huge opportunities to earn up to 15% interest rate per year on the deposited stablecoins (USDT, USDC, BUSD or DAI) with instant paid out.

Clever Agent also offers an additional APY in the form of the lottery for lucky depositors besides the constant APY. The more and earlier your stablecoins are deposited, the higher APY and the more chance you will win the lottery.

Project Engagement

During the 1st of August 2022, **Clever Agent** team engaged Solidproof.io to audit the smart contracts that they created. The engagement was technical in nature and focused on identifying the security flaws in the design and implementation of the contracts. They provided Solidproof.io with access to their code repository and whitepaper.

Logo

Contract Links

v1.0

https://github.com/cleveragentfinance/contract/tree/main/contracts

Commit: 78a531b8191ff1dc8efc88b6b75442c4c7db433a

V1.1

https://github.com/cleveragentfinance/contract/tree/main/contracts

Commit: 4c528112e7fc87da4a91d352313ef4e1bbe98467

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 as possible.
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 analyzing 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:

AgentManager

```
@openzeppelin/contracts/token/ERC20/IERC20.sol
@openzeppelin/contracts/access/Ownable.sol
@openzeppelin/contracts/utils/math/SafeMath.sol
@uniswap/v2-periphery/contracts/interfaces/IUniswapV2Router01.sol
@openzeppelin/contracts/proxy/transparent/TransparentUpgradeableProxy.sol
./interfaces/IAgent.sol
```

AutoFarm

```
@openzeppelin/contracts/utils/Address.sol
@openzeppelin/contracts/token/ERC20/ERC20.sol
@openzeppelin/contracts/token/ERC20/IERC20.sol
@openzeppelin/contracts/token/ERC20/utils/SafeERC20.sol
@openzeppelin/contracts/access/Ownable.sol
@openzeppelin/contracts/utils/math/SafeMath.sol
@openzeppelin/contracts/security/ReentrancyGuard.sol
@uniswap/v2-periphery/contracts/interfaces/IUniswapV2Router02.sol
```

CALottery

```
@openzeppelin/contracts/access/Ownable.sol
@openzeppelin/contracts/security/ReentrancyGuard.sol
@openzeppelin/contracts/token/ERC20/IERC20.sol
@openzeppelin/contracts/utils/Address.sol
@openzeppelin/contracts/token/ERC20/utils/SafeERC20.sol
./interfaces/IRandomNumberGenerator.sol
./interfaces/ICALotteryOld.sol
```

Free

```
@openzeppelin/contracts/access/Ownable.sol
@openzeppelin/contracts/utils/math/SafeMath.sol
@openzeppelin/contracts/token/ERC20/ERC20.sol
```

InsuraceAgent

```
@openzeppelin/contracts/utils/Address.sol
@openzeppelin/contracts/token/ERC20/ERC20.sol
@openzeppelin/contracts/token/ERC20/IERC20.sol
@openzeppelin/contracts/token/ERC20/utils/SafeERC20.sol
@openzeppelin/contracts/access/Ownable.sol
@openzeppelin/contracts/utils/math/SafeMath.sol
@openzeppelin/contracts/security/ReentrancyGuard.sol
@uniswap/v2-periphery/contracts/interfaces/IUniswapV2Router02.sol
```

Liquidity

```
@openzeppelin/contracts/utils/Address.sol
@openzeppelin/contracts/token/ERC20/ERC20.sol
@openzeppelin/contracts/token/ERC20/IERC20.sol
@openzeppelin/contracts/token/ERC20/utils/SafeERC20.sol
@openzeppelin/contracts/access/Ownable.sol
@openzeppelin/contracts/utils/math/SafeMath.sol
@openzeppelin/contracts/security/ReentrancyGuard.sol
@uniswap/v2-periphery/contracts/interfaces/IUniswapV2Router02.sol
```

RandomNumberGenerator

```
@openzeppelin/contracts/access/Ownable.sol
@openzeppelin/contracts/token/ERC20/IERC20.sol
@openzeppelin/contracts/utils/Address.sol
@openzeppelin/contracts/token/ERC20/utils/SafeERC20.sol
@chainlink/contracts/src/v0.8/VRFConsumerBase.sol
./interfaces/IRandomNumberGenerator.sol
./interfaces/ICALottery.sol
```

Tested Contract Files

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

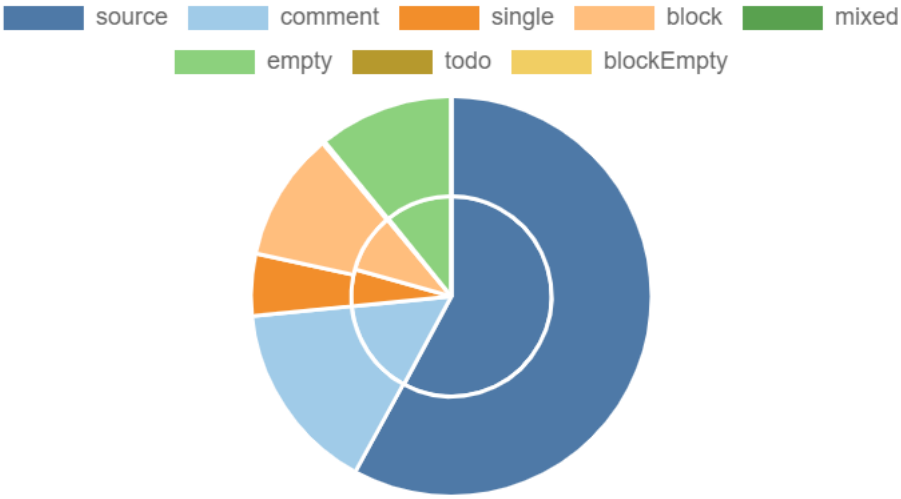
A file with a different Hash has been modified, intentionally or otherwise, after the security review. A different Hash could be (but not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of this review.

v1.0

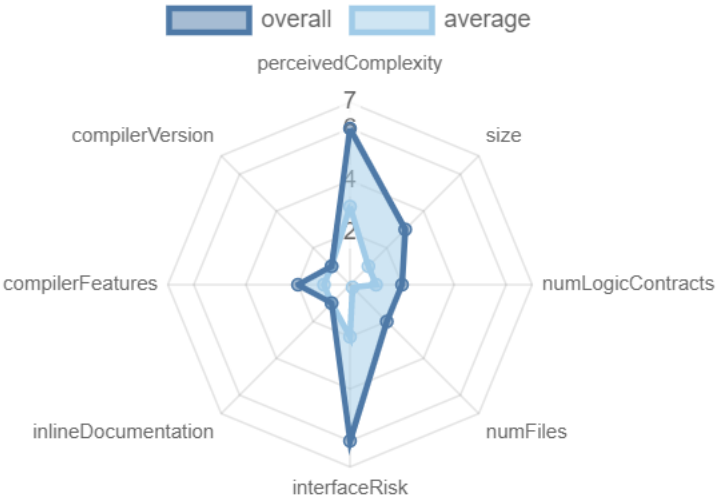
File Name	SHA-1 Hash
contracts/interfaces/IAgentManager.sol	9a9b3e78f7726db06133ae57f2d3531534c38f20
contracts/interfaces/ICALotteryOld.sol	31486420ca96565dece9ca9ab09f3ee11682e550
contracts/interfaces/IRandomNumberGenerator.sol	e7df1ce109dff9a7ef1806e226daa35480d50364
contracts/interfaces/ICALottery.sol	cc505efeb0bbb17ff7429e4925015b8eea6db4a4
contracts/interfaces/IAgent.sol	fefd99032ef5e14e30841c73e7889091908a553b
contracts/Free.sol	931127b24168f6ce60b9b1621b520f5a34130c2f
contracts/AgentManager.sol	26a08991a7a89e801a50708cdb236dce02c8b6a5
contracts/CALottery.sol	6e142ee282537db0d75b6fb28848d2528c7ecaf6
contracts/Helper.sol	59e3fa0674107facf83d313689018592a656dd12
contracts/InsurAceAgent.sol	a378c3fa38a947518837b3fec0050f92a6b271ef
contracts/Timelock.sol	701687061ce625d0cb6f7bfb51c897231d2bcc77
contracts/Liquidity.sol	eb2336b994bcd9b0477b8581920915cc6d5b3b3a
contracts/Randomnumbergenerator.sol	e0b223e13136f087e001ad224b40767ef7ebfa7a
contracts/Autofarm.sol	d706dc954ab423364905648e91c4268515887788

Metrics

Source Lines
v1.0



Risk Level
v1.0



Capabilities

Components

Version	Contracts	Libraries	Interfaces	Abstract
1.0	9	1	13	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.

Version	Public	Payable
1.0	238	10

Version	External	Internal	Private	Pure	View
1.0	157	144	0	36	93

State Variables

Version	Total	Public
1.0	80	74

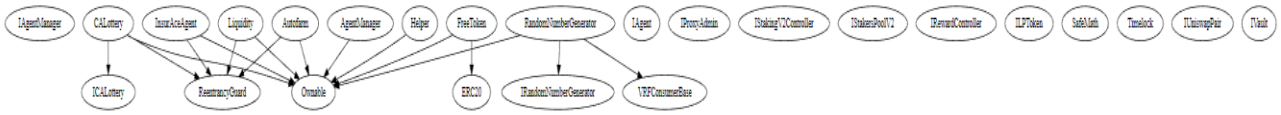
Capabilities

Version	Solidity Versions observed	Experimental Features	Can Receive Funds	Uses Assembly	Has Destroyable Contracts
1.0	`^0.8.0` `^0.8.4`		Yes		

Version	Transfers ETH	Low-Level Calls	DelegateCall	Uses Hash Functions	ECRecover	New/Create/Create2
1.0	Yes			Yes		

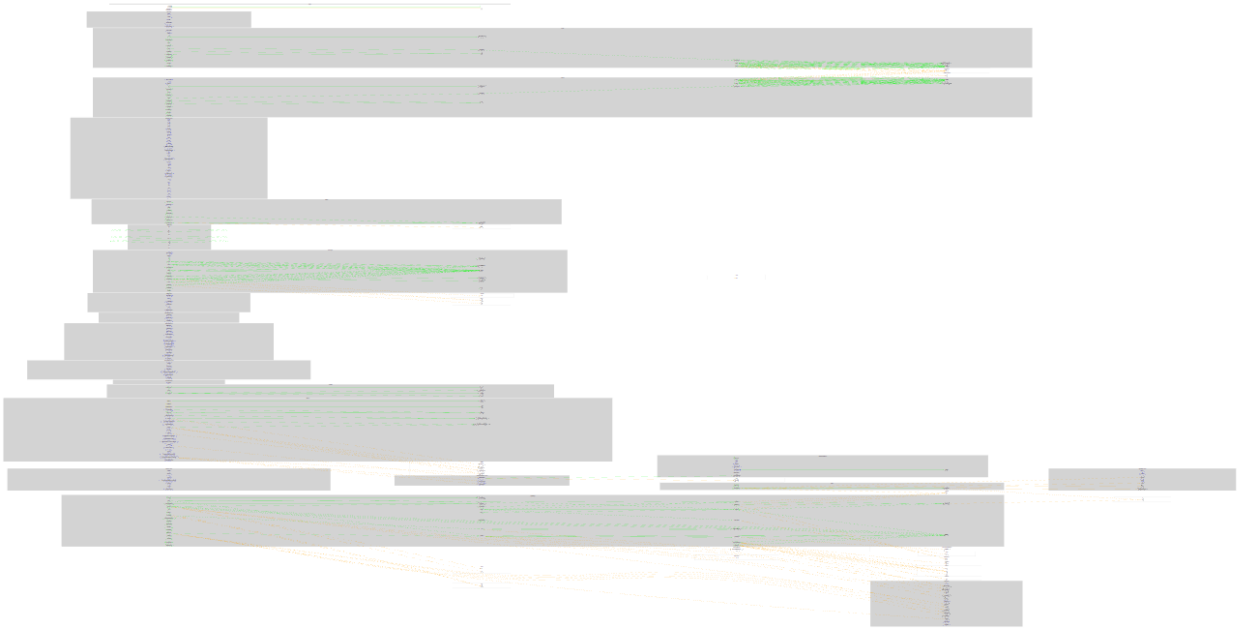
Inheritance Graph

v1.0



Call Graph

v1.0



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. Is contract an upgradeable
2. Correct implementation of Token standard
3. Deployer cannot mint any new tokens
4. Deployer cannot burn or lock user funds
5. Deployer cannot pause the contract
6. Overall checkup (Smart Contract Security)

Is contract an upgradeable

Name	
Is contract an upgradeable?	Yes

Comment:

The owner can update the contract code after deployment by uploading a new one

Correct implementation of Token standard

ERC20				
Function	**Description**	**Exist**	**Tested**	**Verified**
totalSupply	Provides information about the total token supply			
balanceOf	Provides account balance of the owner's account			
transfer	Executes transfers of a specified number of tokens to a specified address			
transferFrom	Executes transfers of a specified number of tokens from a specified address			
approve	Allow a spender to withdraw a set number of tokens from a specified account			
allowance	Returns a set number of tokens from a spender to the owner			

Deployer cannot mint any new tokens

Name	Exist	Tested	Status
Deployer cannot mint			
Max / Total Supply and last Token ID	N/A		

Deployer cannot burn or lock user funds

Name	Exist	Tested	Status
Deployer cannot lock			
Deployer cannot burn			

Deployer cannot pause the contract

Name	Exist	Tested	Status
Deployer cannot pause			

Overall checkup (Smart Contract Security)

Tested	Verified

Legend

Attribute	Symbol
Verified / Checked	
Partly Verified	
Unverified / Not checked	
Not available	

Modifiers and public functions

v1.0

AgentManager

```
initialize
updateUser
updatePool
massUpdatePools
deposit
withdraw
emergencyWithdraw
cancelPendingWithdraw
harvest
harvestAll
add
onlyOwner
addTarget
onlyOwner
UpdateAgents
onlyOwner
updateAgentToNewContract
onlyOwner
setAutoTarget
onlyOwner
toggleAutoTarget
onlyOwner
setFeeAddress
updateConfig
onlyOwner
distributeProfit
onlyOwner
```

AutoFarm

```
<Constructor>
init
deposit
onlyOwner
withdraw
onlyOwner
```

RandomNumberGenerator

```
<Constructor>
getRandomNumber
setFee
onlyOwner
setKeyHash
onlyOwner
setLotteryAddress
onlyOwner
withdrawTokens
```

InsuraceAgent

```
<Constructor>
init
deposit
onlyOwner
withdraw
onlyOwner
unlockWithdraw
onlyOwner
harvest
onlyOwner
unlockHarvest
onlyOwner
```

CALottery

```
buyTickets
notContract
nonReentrant
claimTickets
notContract
nonReentrant
closeLottery
onlyOperator
nonReentrant
drawFinalNumberAndMakeLotteryClaimable
onlyOperator
nonReentrant
changeRandomGenerator
onlyOwner
injectFunds
onlyOwnerOrInjector
startLottery
onlyOperator
```

Comments:

- The owner add targets, update agents to a new contract and distribute profits.
- Owner can manage the lottery like, start lottery, end lottery and inject funds into it.
- Owner can withdraw and harvest from farm

Source Units in Scope

v1.0

Type	File	Logic Contracts	Interfaces	Lines	nLines	nSLOC	Comment Lines	Complex. Score	Capabilities
	contracts/interfaces/IAgentManager.sol		1	46	39	31	3	15	
	contracts/interfaces/ICALotteryOld.sol		1	70	11	3	43	15	
	contracts/interfaces/IRandomNumberGenerator.sol		1	19	8	3	10	7	
	contracts/interfaces/ICALottery.sol		1	68	11	3	42	15	
	contracts/interfaces/IAgent.sol		1	20	5	3	1	31	
	contracts/Free.sol	1		39	35	20	9	16	
	contracts/AgentManager.sol	1	1	561	551	461	43	419	
	contracts/CALottery.sol	1		710	649	379	163	290	
	contracts/Helper.sol	1		40	40	26	8	23	
	contracts/InsurAceAgent.sol	1	4	267	170	145	7	311	
	contracts/Timelock.sol	2		300	288	137	106	87	
	contracts/Liquidity.sol	1	1	232	185	156	9	265	
	contracts/Randomnumbergenerator.sol	1		110	110	48	50	46	
	contracts/Autofarm.sol	1	2	255	198	169	9	298	
	Totals	**10**	**13**	**2737**	**2300**	**1584**	**503**	**1838**	

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

Issue	File	Type	Line	Description
#1	All	A floating pragma is set	7	The current pragma Solidity directive is „“^0.8.0/6".
#2	AgentManager.sol	Access Control	209	The function has public visibility which means any user can update other users.
#3	AgentManager.sol	Access Control	253	The function has public visibility which means users can pass some random _pid for a particular amount. We suggest to

				put a check whether the user exists in the particular pool
#4	AgentManager.sol	Missing Length check	365,398	The function should check that the lengths of the array passed in the parameters is the same
#5	AgentManager.sol	Missing zero check	90,209,350,365,444,464,469	Check that the address is not zero
#6	AgentManager.sol	Missing Events	90,350,365,398,453,460,464,469	Emit an event for critical parameter changes.
#7	AgentManager.sol	Unnecessary Check	403	Unnecessary check because it was checked before und uint256 can't be below 0. It will always be true
#8	Liquidity.sol	Missing Events	133	Emit an event for critical parameter changes.
#9	AutoFarm.sol	Missing Events	100,114	Emit an event for critical parameter changes.
#10	InsurAceAgent.sol	Missing Events	137,114	Emit an event for critical parameter changes.
#11	Free.sol	Missing zero check	19	Check that the address is not zero
#12	RandomNumberGenerator.sol	Missing zero check	75	Check that the address is not zero
#13	Timelock.sol	Missing zero check	207	Check that the address is not zero

Informational issues

Issue	File	Type	Line	Description
#1	AgentManager.sol	Wrong Error Message	456	Misleading error message, there should be "bigger than 0"
#2	AutoFarm.sol	Redundant Code	181,185,189,233,237,247,251	These functions are redundant and have no functionality in code They, should either be removed or used.
#3	AutoFarm.sol	Redundant Code	3	This line is redundant and have no functionality in code. It should be removed.

#4	AgentManager /AutoFarm/Insuraceagent/CALottery/Liquidity.sol	Unused Return Value	-	Always check and take care of the return value from a function call

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.

08. August, 2022:

- There is still an owner (Owner still has not renounced ownership)
- We recommend to use randomizations by external sources like VRF because solidity has no randomization feature of its own.
- We recommend to unit test these tests with more than 95% of test coverage before deployment
- Read the whole report and modifiers section 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-	Presence of unused variables	CWE-1164: Irrelevant Code	PASSED

131			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-	Write to Arbitrary	CWE-123: Write-what-where Condition	PASSED

124	Storage Location		
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	NOT 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	NOT 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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