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MADE IN GERMANY

ZonoSwap

Audit

Security Assessment
27. April, 2022

For

ZONOSWAP

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Version	Date	Description
1.0	27. April 2022	• Layout project • Automated- /Manual-Security Testing • Summary

Network
Binance Smart Chain (BEP20)

Website
https://zonoswap.com/#/swap

Telegram
https://t.me/zonoswap

Twitter
https://twitter.com/ZonoSwap

Facebook
https://www.facebook.com/Zonoswap

Github
https://github.com/zono-swap

Description

A decentralized exchange (DEX) is a cryptocurrency exchange that operates without a central authority, allowing users to transact peer-to-peer from wallet-to-wallet whilst maintaining complete control of their assets. DEXs reduce the risk of price manipulation, as well as hacking and theft, because crypto assets are never in the custody of the exchange itselt.

Project Engagement

During the 22nd of April 2022, **ZonoSwap 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

ZONOSWAP

Contract Link

v1.0

- ZonoV3Token
  - https://bscscan.com/address/0xa8de787e6196a991a35e46a5b8d5505e15b486ad#code

- ZonoV3MasterChef
  - https://bscscan.com/address/0xec1b4a45dce66b0ef8ea95e99ce152312378e166

- ZonoV3Lottery
  - https://bscscan.com/address/0x823ca204d56a30a95fcfca6682d4ac54ad9fea62

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:

Lottery

- Context
- Ownable
- ReentrancyGuard
- SafeMath
- IERC20
- Address
- SafeERC20
- IRandomNumberGenerator
- IZonoV3Lottery

Token

- Context
- Ownable
- SafeMath
- IERC20
- AntiBotHelper
- FeeHelper
- Address
- ERC20
- MintableERC20
- IUniswapV2Factory
- IUniswapV2Router01
- IUniswapV2Router02

MasterChef

- Address
- SafeERC20
- Context
- Ownable
- ReentrancyGuard
- SafeMath
- IMintableERC20

Tested Contract Files

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

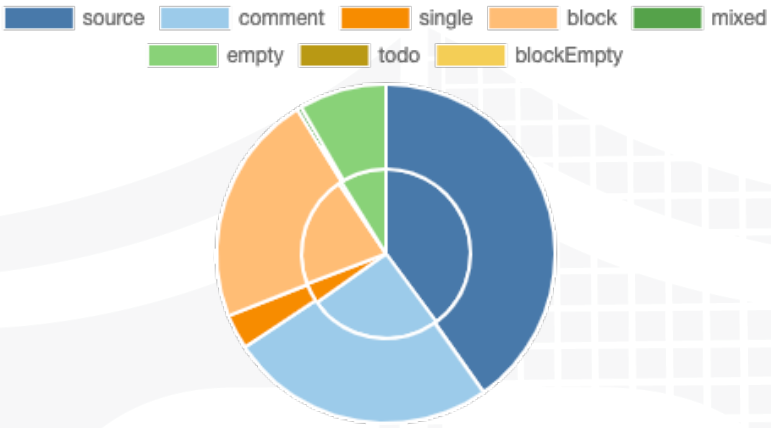
A file with a different Hash has been modified, intentionally or otherwise, after the security review. A different Hash could be (but not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of this review.

v1.0

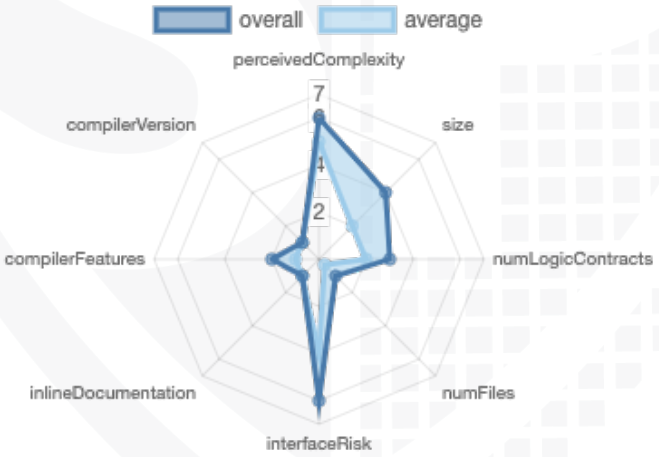
File Name	SHA-1 Hash
contracts/ZonoV3Lottery.sol	01a58cc3d1e69a3eaccec0078c55d7562efcce57
contracts/ZonoV3Token.sol	0ad357cb40f95c1616d985be8de332e38744b961
contracts/ZonoV3MasterChef.sol	1aabcd3daabcabee966ee4b3c91218ff3a46bad4

Metrics

Source Lines
v1.0



Risk Level
v1.0



Capabilities

Components

Version	Contracts	Libraries	Interfaces	Abstract
1.0	7	8	9	8

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	151	6

Version	External	Internal	Private	Pure	View
1.0	123	237	12	42	66

State Variables

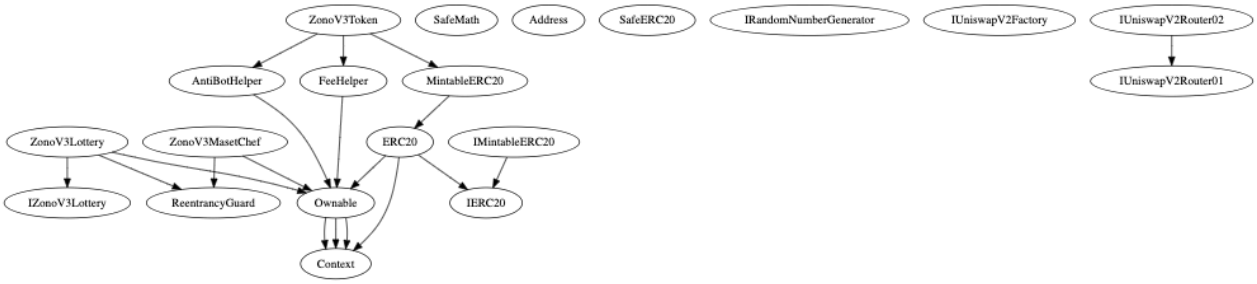
Version	Total	Public
1.0	77	44

Capabilities

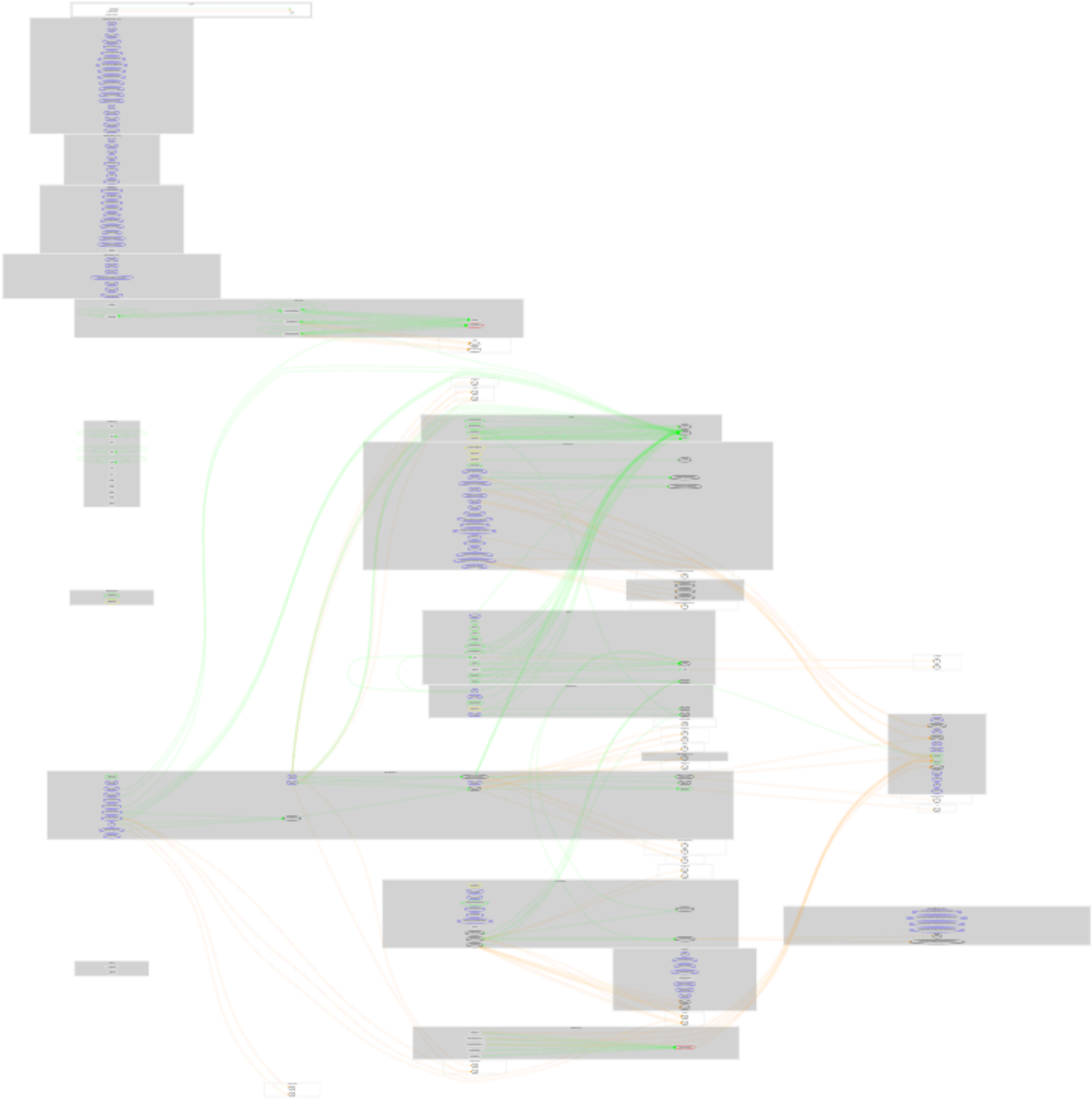
Version	Solidity Versions observed	Experimental Features	Can Receive Funds	Uses Assembly	Has Destroyable Contracts
1.0	`^0.8.0` `>=0.4.0` `^0.8.4` `>=0.5.0` `>=0.6.2`		`yes`	`yes` (7 asm blocks)	

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

Inheritance Graph
v1.0



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

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	✓	✓	✓

Write functions of contract v1.0

Token

1. approve
2. decreaseAllowance
3. excludeAccountFromFee
4. excludeFromBlacklist
5. excludeFromMaxTx
6. excludeFromMaxWallet
7. excludeFromZonoPair
8. includeAccountInFee
9. includeInBlacklist
10. includeInMaxTx
11. includeInMaxWallet
12. includeInZonoPair
13. increaseAllowance
14. mint
15. mint
16. recoverETH
17. recoverToken
18. renounceOwnership
19. setAntiWhalesConfiguration
20. setCharityWallet
21. setFee
22. setMarketingWallet
23. setNumTokensSellToAddToLiquidity
24. setSwapAndLiquifyEnabled
25. setSwapRouter
26. transfer
27. transferFrom
28. transferOperator
29. transferOwnership

MasterChef

1. add
2. deposit
3. emergencyWithdraw
4. massUpdatePools
5. renounceOwnership
6. setDevAddress
7. setDevRewardRate
8. setFeeAddress
9. startFarming
10. transferOwnership
11. updateEmissionRate
12. updatePool
13. updatePoolConfiguration
14. withdraw

Lottery

1. buyTickets
2. changeRandomGenerator
3. claimTickets
4. closeLottery
5. drawFinalNumberAndMakeLotteryClaimable
6. injectFunds
7. recoverWrongTokens
8. renounceOwnership
9. setMaxNumberTicketsPerBuy
10. setMinAndMaxTicketPriceInZonoV3
11. setOperatorAndTreasuryAndInjectorAddresses
12. startLottery
13. transferOwnership

Deployer cannot mint any new tokens

Name	Exist	Tested	Status
Deployer cannot mint	✓	✓	✗

Comments:

v1.0

- Tokens will be minted while updating pool
- OnlyOperator can mint new token to
  - anyone
  - Himself

Deployer cannot burn or lock user funds

Name	Exist	Tested	Status
Deployer cannot lock	✓	✓	✗
Deployer cannot burn	✓	✓	✓

Comments:

v1.0

- Token will be burned while tx
- Owner can lock user funds by setting address to blacklist

Deployer cannot pause the contract

Name	Exist	Tested	Status
Deployer cannot pause	–	–	–

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

Token

```
setSwapRouter
  onlyOwner
setSwapAndLiquifyEnabled
  onlyOwner
setMarketingWallet
  onlyOwner
setCharityWallet
  onlyOwner
setNumTokensSellToAddToLiquidity
  onlyOwner
```

```
excludeFromBlacklist
  onlyOwner
includeInBlacklist
  onlyOwner
excludeFromMaxTx
  onlyOwner
includeInMaxTx
  onlyOwner
excludeFromMaxWallet
  onlyOwner
includeInMaxWallet
  onlyOwner
setAntiWhalesConfiguration
  onlyOwner
```

```
mint
  onlyOperator
transferOperator
  onlyOperator
recoverToken
  onlyOwner
recoverETH
  onlyOwner
```

MasterChef

```
startFarming
  onlyOwner
add
  onlyOwner
updatePoolConfiguration
  onlyOwner
massUpdatePools
updatePool
deposit
  nonReentrant
withdraw
  nonReentrant
emergencyWithdraw
  nonReentrant
setFeeAddress
  onlyOwner
setDevAddress
  onlyOwner
setDevRewardRate
  onlyOwner
updateEmissionRate
  onlyOwner
```

- setFee
  - onlyOwner
- excludeAccountFromFee
  - onlyOwner
- includeAccountInFee
  - onlyOwner
- excludeFromZonoPair
  - onlyOwner
- includeInZonoPair
  - onlyOwner

Lottery

- buyTickets
  - notContract
  - nonReentrant
- claimTickets
  - notContract
  - nonReentrant
- closeLottery
  - onlyOperator
  - nonReentrant
- drawFinalNumberAndMakeLotteryClaimable
  - onlyOperator
  - nonReentrant
- changeRandomGenerator
  - onlyOwner
- injectFunds
  - onlyOwnerOrInjector
- startLottery
  - onlyOperator
- recoverWrongTokens
  - onlyOwner
- setMinAndMaxTicketPriceInZonoV3
  - onlyOwner
- setMaxNumberTicketsPerBuy
  - onlyOwner
- setOperatorAndTreasuryAndInjectorAddresses
  - onlyOwner

```
renounceOwnership
  onlyOwner
transferOwnership
  onlyOwner
```

Comments

- Deployer can set following state variables without any limitations
  - Token
    - _numTokensSellToAddToLiquidity
  - Lottery
    - maxNumberTicketsPerBuyOrClaim
    - minPriceTicketInZonoV3
    - maxPriceTicketInZonoV3
  - MasterChef
    - zonoPerBlock
- Deployer can enable/disable following state variables
  - Token
    - _swapAndLiquifyEnabled
    - _isExcludedFromMaxWallet
    - _isExcludedFromMaxTx
    - _blacklist
    - _blacklist
    - _isExcludedFromFee
    - _isZonoPair
- Deployer can set following addresses
  - Token
    - _swapRouter
    - _marketingWallet
    - _charityWallet
    - _operator
  - Lottery
    - randomGenerator
    - operatorAddress
    - treasuryAddress
    - injectorAddress
    - _owner
    -
  - MasterChef

    - feeAddress
    - devAddress

- We recommend you to use an external library like VRF to generate a random number. For more information please read the following: https://docs.chain.link/docs/chainlink-vrf/
- In the lottery contract is more than one authority to check or call some functions
    - Owner
    - injectorAddress
    - Operator
- If owner is renounced there are actually an authority who can inject funds for example
    - In the contracts there are several powers to do something, although the owner has renounced his property. However, the injector can call some functions that are basically not callable after the renunciation.
- Wrong comment. MinPrice must be lower than maxPrice but the require statement is wrong. You are checking for “equal lower” instead of lower.
    - If the minPrice and maxPrice is set to 0, the amountTonoV3ToTransfer will be 0

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/ZonoV3Lottery.sol	7	3	1845	1508	847	617	452	💻👥🧮🔆Σ
📝📚🔍🎨	contracts/ZonoV3Token.sol	9	4	1738	1409	714	625	539	💻💰📩👥🔆♻️
📝📚🔍🎨	contracts/ZonoV3MasterChef.sol	7	2	1456	1231	688	504	379	💻💰👥🔆Σ
📝📚🔍🎨	**Totals**	**23**	**9**	**5039**	**4148**	**2249**	**1746**	**1370**	💻💰📩👥🧮🔆♻️Σ

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

Issue	File	Type	Line	Description
#1	Main	Contract doesn't import npm packages from source (like OpenZeppelin etc.)	-	We recommend to import all packages from npm directly without flatten the contract. Functions could be modified or can be susceptible to vulnerabilities
#2	All	A floating pragma is set	At the top of source code	The current pragma Solidity directive is „"^0."".
#3	Token	State variable visibility is not set	1474	It is best practice to set the visibility of state variables explicitly
#4	Token	State variables shadowing	1645	Rename the state variables that shadow another component
#5	MasterChef	Missing Events Arithmetic	1059, 1107, 1536	Emit an event for critical parameter changes

Informational issues

Issue	File	Type	Line	Description
#1	MasterChef	State variables that could be declared constant (constable-states)	900	Add the `constant` attributes to state variables that never change
#2	MasterChef	Unused state variables	900	Remove unused state variables
#3	MasterChef	Misspelling	See description	Change following words: - vairables L1179 Make sure to change it everywhere else as well.
#4	Token	Misspelling	See description	Change following words: - MarketingFeeTrasferred L1481 - recieve L1503 - swaping L1503 Make sure to change it everywhere else as well.
#5	Main	NatSpec documentation missing	-	If you started to comment your code, also comment all other functions, variables etc.

Commented Code exist

There are some instances of code being commented out in the following files that should be removed:

File	Line	Comment
Main		

Recommendation

Remove the commented code, or address them properly.

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.

. April 2022:

- Wrong Routeraddress were used for Pancake / Uniswap Router
- There is still an owner (Owner still has not renounced ownership)
- Developer can lock the contract once for 10 minutes
    - Following conditions should be true for locking
        - antiBotTime should be higher than block timestamp
        - Amount should be higher than antiBotAmount
        - Sender should be marked as bot in bots mapping as true with setBots function
- Developer can
    - set maxTxAmount to zero to lock transfer function
    - set buy back upper limit
    - Enable/disable buy back
        - When it's disabled you are not allowed to swap ETH for tokens
    - Enable/disable swap and liquify
        - When it's disabled you are not allowed to swap tokens or use buy back functions
- 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	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	NOT 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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