



**SOLIDProof**  
*Bring trust into your projects*

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

MADE IN GERMANY

# Pay Changer Audit

**Security Assessment  
10. May, 2023**

**For**



**SolidProof\_io**



**@solidproof\_io**

Disclaimer	3
Description	5
Project Engagement	5
Logo	5
Contract Link	5
Methodology	7
Used Code from other Frameworks/Smart Contracts (direct imports)	8
Tested Contract Files	9
Source Lines	10
Risk Level	10
Capabilities	11
Inheritance Graph	12
CallGraph	13
Scope of Work/Verify Claims	14
Modifiers and public functions	24
Source Units in Scope	26
Critical issues	27
High issues	27
Medium issues	27
Low issues	27
Informational issues	28
Audit Comments	28
SWC Attacks	29

# Disclaimer

SolidProof.io reports are not, nor should be considered, an “endorsement” or “disapproval” of any particular project or team. These reports are not, nor should be considered, an indication of the economics or value of any “product” or “asset” created by any team. SolidProof.io do not cover testing or auditing the integration with external contract or services (such as Unicrypt, Uniswap, PancakeSwap etc’...)

**SolidProof.io Audits do not provide any warranty or guarantee regarding the absolute bug- free nature of the technology analyzed, nor do they provide any indication of the technology proprietors. SolidProof Audits should not be used in any way to make decisions around investment or involvement with any particular project. These reports in no way provide investment advice, nor should be leveraged as investment advice of any sort.**

SolidProof.io Reports represent an extensive auditing process intending to help our customers increase the quality of their code while reducing the high level of risk presented by cryptographic tokens and blockchain technology. Blockchain technology and cryptographic assets present a high level of ongoing risk. SolidProof’s position is that each company and individual are responsible for their own due diligence and continuous security. SolidProof in no way claims any guarantee of security or functionality of the technology we agree to analyze.

Version	Date	Description
1.0	10. May 2023	<ul style="list-style-type: none"><li>• Layout project</li><li>• Automated- /Manual-Security Testing</li><li>• Summary</li></ul>
1.1	10. May 2023	<ul style="list-style-type: none"><li>• Reaudit</li></ul>

**Note** - This Audit report consists of a security analysis of the PayChanger smart contract. This analysis did not include functional testing (or unit testing) of the contract’s logic.

## **Network**

Binance Smart Chain (BSC)

## **Website**

<https://paychanger.io/>

## **Telegram**

<https://t.me/+ZF8YcnSAh542OGQy>

## **Twitter**

[https://twitter.com/pay\\_changer](https://twitter.com/pay_changer)

## **Facebook**

<https://m.facebook.com/100086031394841/>

## **Discord**

<https://discord.gg/5nE25DAGcm>

## Description

Pay Changer - a modern payment service on the blockchain where all users participate in the distribution of profits from digital acquiring and mining of PACH tokens.

## Project Engagement

During the Date of 10 May 2023, **Paychanger 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

<https://testnet.bscscan.com/address/0x0d4D047ACd330E19184e4c83D571B74aF1e632B0#code>

### v1.1

<https://testnet.bscscan.com/address/0x9830215962c0763bfbdb0a989d375985f42ea3f0#code>

# 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)
<b>Critical</b>	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.
<b>High</b>	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.
<b>Medium</b>	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.
<b>Low</b>	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.
<b>Informational</b>	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:

```
@openzeppelin/contracts/utils/Context.sol  
@openzeppelin/contracts/access/Ownable.sol  
@openzeppelin/contracts/token/ERC20/IERC20.sol  
@openzeppelin/contracts/utils/math/SafeMath.sol  
@openzeppelin/contracts/token/ERC20/utils/SafeERC20.sol  
@openzeppelin/contracts/security/ReentrancyGuard.sol  
@chainlink/contracts/src/v0.8/ChainlinkClient.sol
```



## Tested Contract Files

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

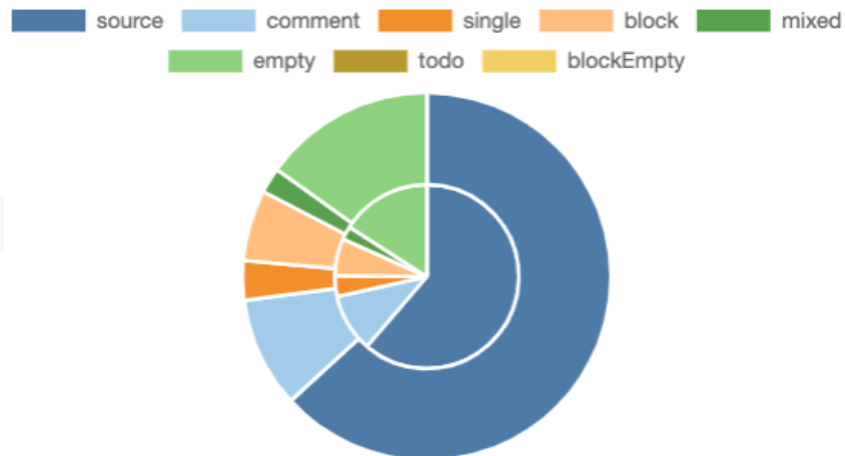
*A file with a different Hash has been modified, intentionally or otherwise, after the security review. A different Hash could be (but not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of this review.*

### v1.0

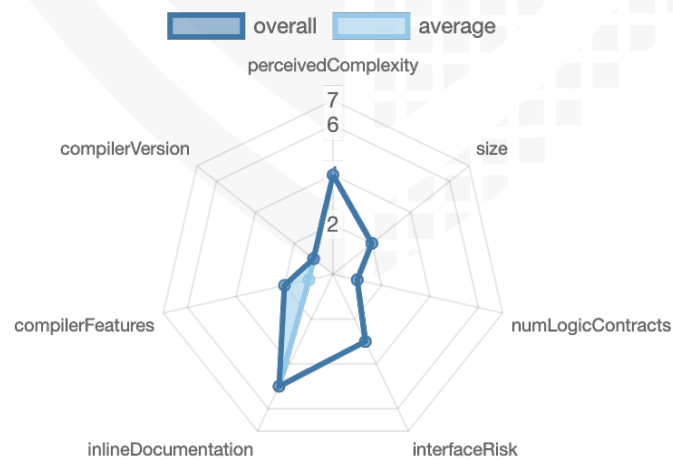
File Name	SHA-1 Hash
contracts/ PayChanger.sol	0e0074c1a88332213c009fdbf1cb70fe24844 019

# Metrics

## Source Lines v1.0



## Risk Level v1.0



# Capabilities

## Components

 Contracts	 Libraries	 Interfaces	 Abstract
4	2	0	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
68	5







External	Internal	Private	Pure	View
6	60	4	11	42

### StateVariables

Total	 Public
47	24

### Capabilities

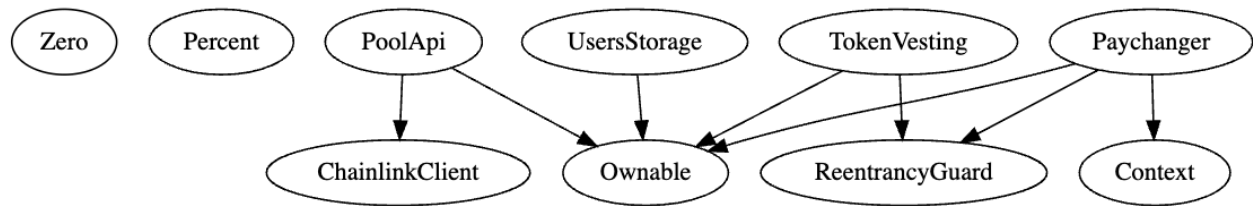
Solidity Versions observed	 Experimental Features	 Can Receive Funds	 Uses Assembly	 Has Destroyable Contracts
0.8.19		yes		

 Transfers ETH	 Low-Level Calls	 DelegateCall	 Uses Hash Functions	 ECRecover	 New/Create/Create2
yes			yes		yes → NewContract:UsersStorage → NewContract:TokenVesting → NewContract:PoolApi

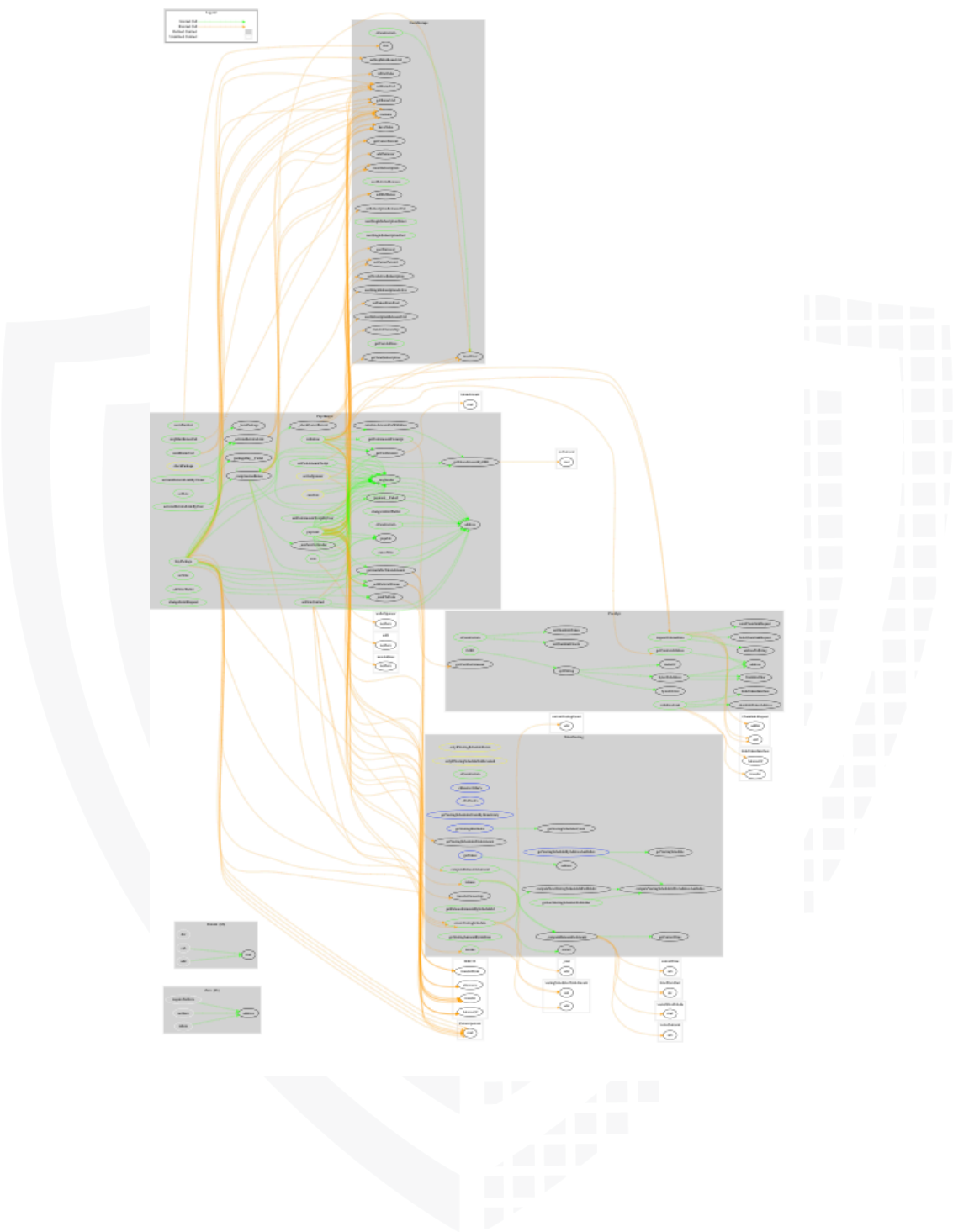
 TryCatch	 Σ Unchecked

# 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. 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. Deployer cannot set fees
7. Deployer cannot blacklist/antisnipe addresses
8. Overall checkup (Smart Contract Security)

## Is contract an upgradeable

Name	
Is contract an upgradeable?	No



## 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

1. activateReferralLinkByOwner (0xa2f13ee3)
2. activateReferralLinkByUser (0x6283c2c9)
3. addVoteWallet (0x85d11931)
4. buyPackage (0xdeb3f2fd)
5. cancelVote (0x95c96554)
6. changeAdminWallet (0x4b43b582)
7. changeLimitRequest (0xb90f9215)
8. payment (0x8a495589)
9. renounceOwnership (0x715018a6)
10. sendBonusUsd (0xfc179235)
11. setNewContract (0x52d22d76)
12. setPoolAmountToApi (0x81900b72)
13. setPoolAmountToApiByUser (0x74c7c7b5)
14. setRate (0x34fcf437)
15. setVote (0x6c6b33d5)
16. stopMintBonusUsd (0xffc9667)
17. transferOwnership (0xf2fde38b)
18. vote (0x632a9a52)
19. withdraw (0x51cff8d9)

## Deployer cannot mint any new tokens

Name	Exist	Tested	Status
Deployer cannot mint	✓	✓	✓
Max / Total Supply	N/A		

Comments:

**v1.0**

- Owner cannot mint new tokens



## 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	—	—	—



## Deployer cannot set fees

Name	Exist	Tested	Status
Deployer cannot set fees over 25%	—	—	—
Deployer cannot set fees to nearly 100% or to 100%	—	—	—



## Deployer can blacklist/antisnipe addresses

Name	Exist	Tested	Status
Deployer cannot blacklist/antisnipe addresses	—	—	—



## 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

◆ createVestingSchedule	◆ requestVolumeData
Ⓜ onlyOwner	Ⓜ onlyOwner
◆ revoke	◆ fulfill
Ⓜ onlyOwner	Ⓜ recordChainlinkFulfillment
Ⓜ onlyIfVestingScheduleNotRevoked	◆ withdrawLink
◆ release	Ⓜ onlyOwner
Ⓜ nonReentrant	◆ buyPackage 💰
Ⓜ onlyIfVestingScheduleNotRevoked	Ⓜ activeSponsor
◆ insertUser	Ⓜ checkPackage
Ⓜ onlyOwner	Ⓜ nonReentrant
◆ insertSubscription	◆ setPoolAmountToApi
Ⓜ onlyOwner	◆ setPoolAmountToApiByUser
◆ setNotActiveSubscription	◆ withdraw 💰
Ⓜ onlyOwner	Ⓜ nonReentrant
◆ setCareerPercent	◆ payment 💰
Ⓜ onlyOwner	Ⓜ nonReentrant
◆ setBonusUsd	◆ activateReferralLinkByOwner
Ⓜ onlyOwner	Ⓜ onlyOwner
◆ setTakenFromPool	Ⓜ activeSponsor
Ⓜ onlyOwner	◆ activateReferralLinkByUser
◆ addTurnover	Ⓜ nonReentrant
Ⓜ onlyOwner	◆ changeAdminWallet
◆ addRefBonus	Ⓜ onlyOwner
Ⓜ onlyOwner	◆ setRate
◆ setStopMintBonusUsd	Ⓜ onlyOwner
Ⓜ onlyOwner	◆ sendBonusUsd
◆ setSubscriptionReleasedUsd	Ⓜ onlyOwner
Ⓜ onlyOwner	◆ stopMintBonusUsd
	Ⓜ onlyOwner
	◆ setVote
	Ⓜ onlyOwner
	◆ cancelVote
	Ⓜ onlyOwner
	◆ vote
	Ⓜ canVote
	◆ addVoteWallet
	Ⓜ onlyOwner
	◆ setNewContract
	Ⓜ onlyOwner
	◆ changeLimitRequest
	Ⓜ onlyOwner



## Ownership Privileges

### ❖ Deployer can set following state variables without any limitations

- \_cliff, \_start
- Career Percent
- Bonus USD address and value

### ❖ Existing Modifiers

- onlyOwner

- The owner can revoke vesting only if the vesting was set to be revokable by the owner at the time of creation.
- Insert user and subscription in the storage contract
- Set not active subscription, career percent
- Add Turnover Token and referral bonus for any account with any arbitrary value
- Disable the minting of Bonus USD
- Set subscription released use amount to any arbitrary value
- Request volume data for an address by ChainLink request
- Withdraw link tokens from the contract
- Activate referral link by owner
- Set rate of the token (which is not recommended)
- Send bonus USD to beneficiaries
- Set new address for voting, and if the vote is passed then the owner has to manually call the setNewContract function in order to transfer the ownership.
- Owner can cancel vote anytime
- Owner can add vote wallets with weights of 1 to 3, this means that the wallet with 3 will have thrice the power of a single vote.
- Set admin wallet which will receive a commission every time a user buys a package.
- Set Limit Request to any arbitrary value including zero, and also a very high value. Thus, this value decides the frequency of how much the users can request volume data from the chainlink oracle.

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

## Source Units in Scope

### v1.0

File	Logic Contracts	Interfaces	Lines	nLines	nSLOC	Comment Lines	Complex. Score
contracts/PayChanger.sol	6	=====	1339	1271	930	139	831
<b>Totals</b>	<b>6</b>	=====	<b>1339</b>	<b>1271</b>	<b>930</b>	<b>139</b>	<b>831</b>

### Legend

Attribute	Description
Lines	total lines of the source unit
nLines	normalised lines of the source unit (e.g. normalises functions spanning multiple lines)
nSLOC	normalised 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

## Critical issues

**No critical issues**

## High issues

**No high issues**

## Medium issues

**Medium Issue Fixed**

Issue	File	Type	Line	Description
#1	Main	Locked ETH	See description	<p>Hence the contract can receive funds there is no function to get out the eth. Every function that has the payable modifier accepts ETH while calling the function.</p> <p>We highly recommend you to add a function to get out the ETH Balance, revert the call or remove payable modifiers and receive function from the contract.</p>

## Low issues

Issue	File	Type	Line	Description
#1	Main	Missing Zero Address Validation (missing-zero-check)	190, 427-493, 1312, 1321, 1290	Check that the address is not zero
#2	Main	Missing Events Arithmetic	Whole Vesting and Storage Contracts, 1276-1336	Emit an event for critical parameter changes

## Informational issues

Issue	File	Type	Line	Description
#1	Main	Unused return values	931, 1075	Ensure that all the return values of the function calls are used and handle both success and failure cases if needed by the business logic
#2	Main	NatSpec documentation missing	—	If you started to comment your code, also comment all other functions, variables etc.
#3	Main	Unused state variables	812	Remove or use unused state variable.
#4	Main	State variables that could be declared immutable	846 842 844 814 850 852	Add the `immutable` attribute to state variables that never change or are set only in the constructor

## Audit Comments

We recommend you to use the special form of comments (NatSpec Format, Follow link for more information <https://docs.soliditylang.org/en/latest/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.

### 10. May 2023:

- There is still an owner (Owner still has not renounced ownership)
- Read whole report and modifiers section for more information

## SWC Attacks

ID	Title	Relationships	Status
<a href="#">SW C-1 36</a>	Unencrypted Private Data On-Chain	<a href="#">CWE-767: Access to Critical Private Variable via Public Method</a>	PASSED
<a href="#">SW C-1 35</a>	Code With No Effects	<a href="#">CWE-1164: Irrelevant Code</a>	PASSED
<a href="#">SW C-1 34</a>	Message call with hardcoded gas amount	<a href="#">CWE-655: Improper Initialization</a>	PASSED
<a href="#">SW C-1 33</a>	Hash Collisions With Multiple Variable Length Arguments	<a href="#">CWE-294: Authentication Bypass by Capture-replay</a>	PASSED
<a href="#">SW C-1 32</a>	Unexpected Ether balance	<a href="#">CWE-667: Improper Locking</a>	PASSED
<a href="#">SW C-1 31</a>	Presence of unused variables	<a href="#">CWE-1164: Irrelevant Code</a>	PASSED
<a href="#">SW C-1 30</a>	Right-To-Left-Override control character (U+202E)	<a href="#">CWE-451: User Interface (UI) Misrepresentation of Critical Information</a>	PASSED
<a href="#">SW C-1 29</a>	Typographical Error	<a href="#">CWE-480: Use of Incorrect Operator</a>	PASSED
<a href="#">SW C-1 28</a>	DoS With Block Gas Limit	<a href="#">CWE-400: Uncontrolled Resource Consumption</a>	PASSED

<a href="#">SW C-1 27</a>	Arbitrary Jump with Function Type Variable	<a href="#">CWE-695: Use of Low-Level Functionality</a>	<b>PASSED</b>
<a href="#">SW C-1 25</a>	Incorrect Inheritance Order	<a href="#">CWE-696: Incorrect Behavior Order</a>	<b>PASSED</b>
<a href="#">SW C-1 24</a>	Write to Arbitrary Storage Location	<a href="#">CWE-123: Write-what-where Condition</a>	<b>PASSED</b>
<a href="#">SW C-1 23</a>	Requirement Violation	<a href="#">CWE-573: Improper Following of Specification by Caller</a>	<b>PASSED</b>
<a href="#">SW C-1 22</a>	Lack of Proper Signature Verification	<a href="#">CWE-345: Insufficient Verification of Data Authenticity</a>	<b>PASSED</b>
<a href="#">SW C-1 21</a>	Missing Protection against Signature Replay Attacks	<a href="#">CWE-347: Improper Verification of Cryptographic Signature</a>	<b>PASSED</b>
<a href="#">SW C-1 20</a>	Weak Sources of Randomness from Chain Attributes	<a href="#">CWE-330: Use of Insufficiently Random Values</a>	<b>PASSED</b>
<a href="#">SW C-11 9</a>	Shadowing State Variables	<a href="#">CWE-710: Improper Adherence to Coding Standards</a>	<b>PASSED</b>
<a href="#">SW C-11 8</a>	Incorrect Constructor Name	<a href="#">CWE-665: Improper Initialization</a>	<b>PASSED</b>
<a href="#">SW C-11 7</a>	Signature Malleability	<a href="#">CWE-347: Improper Verification of Cryptographic Signature</a>	<b>PASSED</b>

<a href="#">SW C-11 6</a>	Timestamp Dependence	<a href="#">CWE-829: Inclusion of Functionality from Untrusted Control Sphere</a>	<b>PASSED</b>
<a href="#">SW C-11 5</a>	Authorization through tx.origin	<a href="#">CWE-477: Use of Obsolete Function</a>	<b>PASSED</b>
<a href="#">SW C-11 4</a>	Transaction Order Dependence	<a href="#">CWE-362: Concurrent Execution using Shared Resource with Improper Synchronization ('Race Condition')</a>	<b>PASSED</b>
<a href="#">SW C-11 3</a>	DoS with Failed Call	<a href="#">CWE-703: Improper Check or Handling of Exceptional Conditions</a>	<b>PASSED</b>
<a href="#">SW C-11 2</a>	Delegatecall to Untrusted Callee	<a href="#">CWE-829: Inclusion of Functionality from Untrusted Control Sphere</a>	<b>PASSED</b>
<a href="#">SW C-11 1</a>	Use of Deprecated Solidity Functions	<a href="#">CWE-477: Use of Obsolete Function</a>	<b>PASSED</b>
<a href="#">SW C-11 0</a>	Assert Violation	<a href="#">CWE-670: Always-Incorrect Control Flow Implementation</a>	<b>PASSED</b>
<a href="#">SW C-1 09</a>	Uninitialized Storage Pointer	<a href="#">CWE-824: Access of Uninitialized Pointer</a>	<b>PASSED</b>
<a href="#">SW C-1 08</a>	State Variable Default Visibility	<a href="#">CWE-710: Improper Adherence to Coding Standards</a>	<b>PASSED</b>
<a href="#">SW C-1 07</a>	Reentrancy	<a href="#">CWE-841: Improper Enforcement of Behavioral Workflow</a>	<b>PASSED</b>
<a href="#">SW C-1 06</a>	Unprotected SELFDESTRUCT Instruction	<a href="#">CWE-284: Improper Access Control</a>	<b>PASSED</b>

<a href="#">SW</a> <a href="#">C-1</a> <a href="#">05</a>	Unprotected Ether Withdrawal	<a href="#">CWE-284: Improper Access Control</a>	<b>PASSED</b>
<a href="#">SW</a> <a href="#">C-1</a> <a href="#">04</a>	Unchecked Call Return Value	<a href="#">CWE-252: Unchecked Return Value</a>	<b>PASSED</b>
<a href="#">SW</a> <a href="#">C-1</a> <a href="#">03</a>	Floating Pragma	<a href="#">CWE-664: Improper Control of a Resource Through its Lifetime</a>	<b>PASSED</b>
<a href="#">SW</a> <a href="#">C-1</a> <a href="#">02</a>	Outdated Compiler Version	<a href="#">CWE-937: Using Components with Known Vulnerabilities</a>	<b>PASSED</b>
<a href="#">SW</a> <a href="#">C-1</a> <a href="#">01</a>	Integer Overflow and Underflow	<a href="#">CWE-682: Incorrect Calculation</a>	<b>PASSED</b>
<a href="#">SW</a> <a href="#">C-1</a> <a href="#">00</a>	Function Default Visibility	<a href="#">CWE-710: Improper Adherence to Coding Standards</a>	<b>PASSED</b>



*Solid  
Proofed*

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

  
MADE IN GERMANY