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Pay Changer Audit

**Security Assessment
11. 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

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

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

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://bscscan.com/address/0xD4866925A216a36417983238C094b13C770345BF>

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 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.

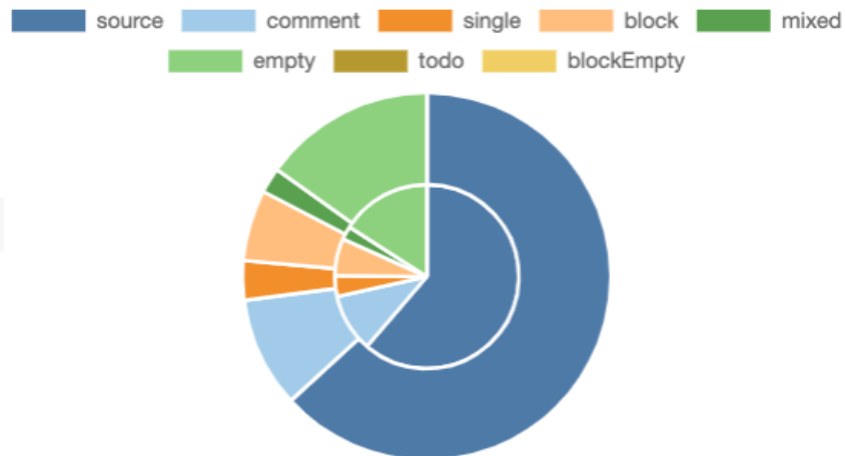
A file with a different Hash has been modified, intentionally or otherwise, after the security review. A different Hash could be (but not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of this review.

v1.0

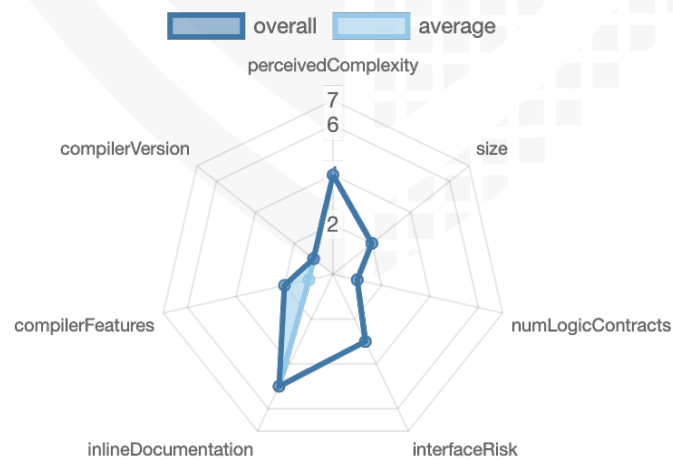
File Name	SHA-1 Hash
contracts/ PayChanger.sol	0e0074c1a88332213c009fdbf1cb70fe24844 019

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

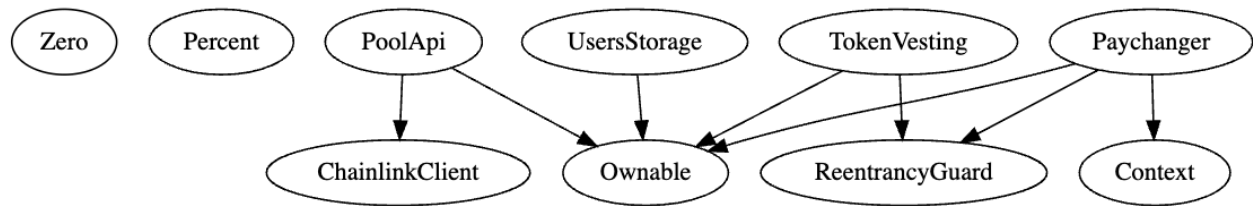
Solidity Versions observed	 Experimental Features	 Can Receive Funds	 Uses Assembly	 Has Destroyable Contracts
0.8.19		yes		

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

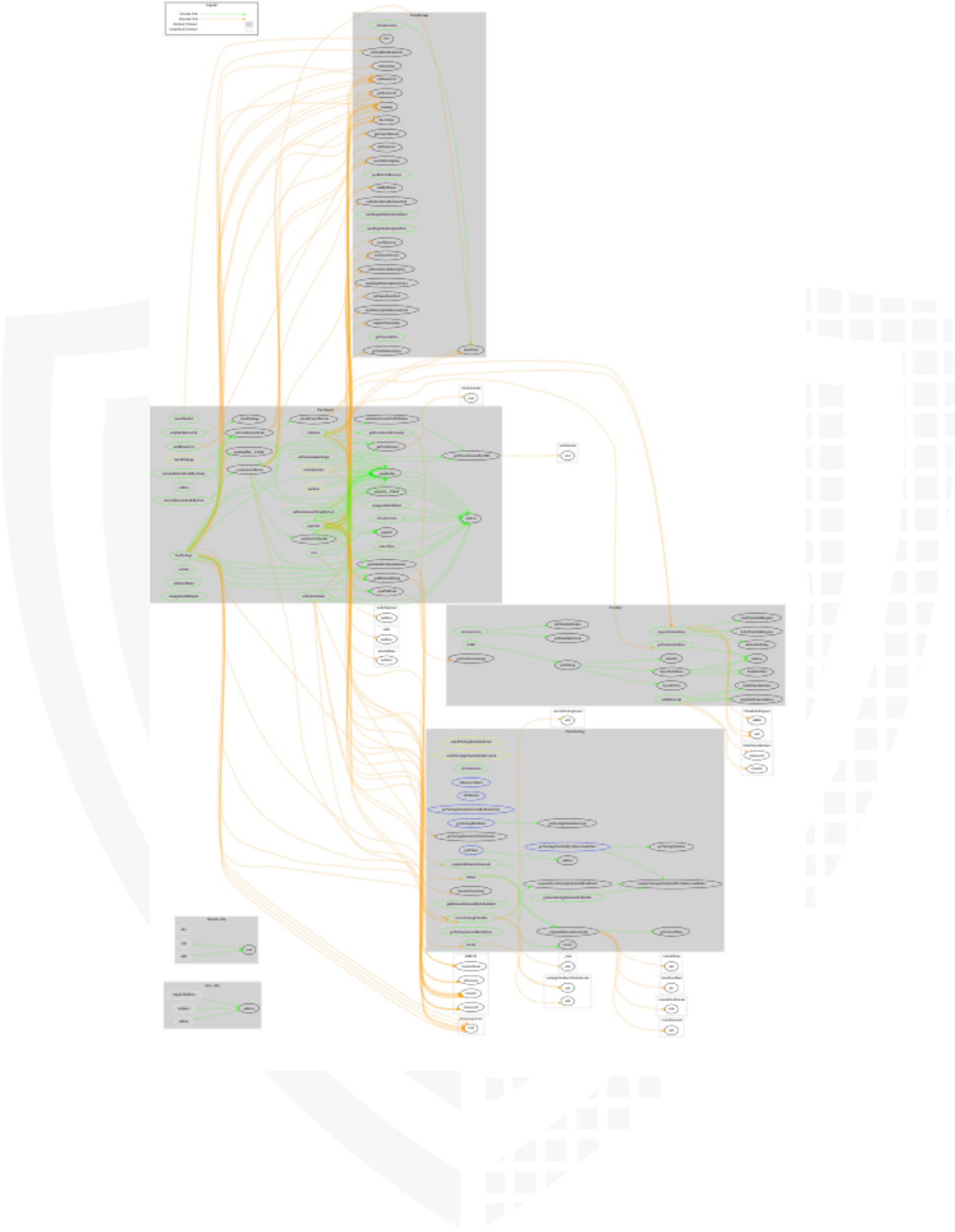
 TryCatch	Σ Unchecked

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
Totals	6	=====	1339	1271	930	139	831

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

Low Issues Acknowledged

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

Informational Issues Acknowledged

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.

11. 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
SW C-1 36	Unencrypted Private Data On-Chain	CWE-767: Access to Critical Private Variable via Public Method	PASSED
SW C-1 35	Code With No Effects	CWE-1164: Irrelevant Code	PASSED
SW C-1 34	Message call with hardcoded gas amount	CWE-655: Improper Initialization	PASSED
SW C-1 33	Hash Collisions With Multiple Variable Length Arguments	CWE-294: Authentication Bypass by Capture-replay	PASSED
SW C-1 32	Unexpected Ether balance	CWE-667: Improper Locking	PASSED
SW C-1 31	Presence of unused variables	CWE-1164: Irrelevant Code	PASSED
SW C-1 30	Right-To-Left-Override control character (U+202E)	CWE-451: User Interface (UI) Misrepresentation of Critical Information	PASSED
SW C-1 29	Typographical Error	CWE-480: Use of Incorrect Operator	PASSED
SW C-1 28	DoS With Block Gas Limit	CWE-400: Uncontrolled Resource Consumption	PASSED

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

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

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

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