



SOLIDProof
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MADE IN GERMANY

Fraktal Audit

Security Assessment
01. March, 2022

For



FRAKTAL

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Version	Date	Description
1.0	25. February 2022	<ul style="list-style-type: none">• Layout project• Automated- /Manual-Security Testing• Summary
1.1	01. March 2022	<ul style="list-style-type: none">• Reaudit

Network

Ethereum Chain

Website

<https://www.fraktal.io/>

Twitter

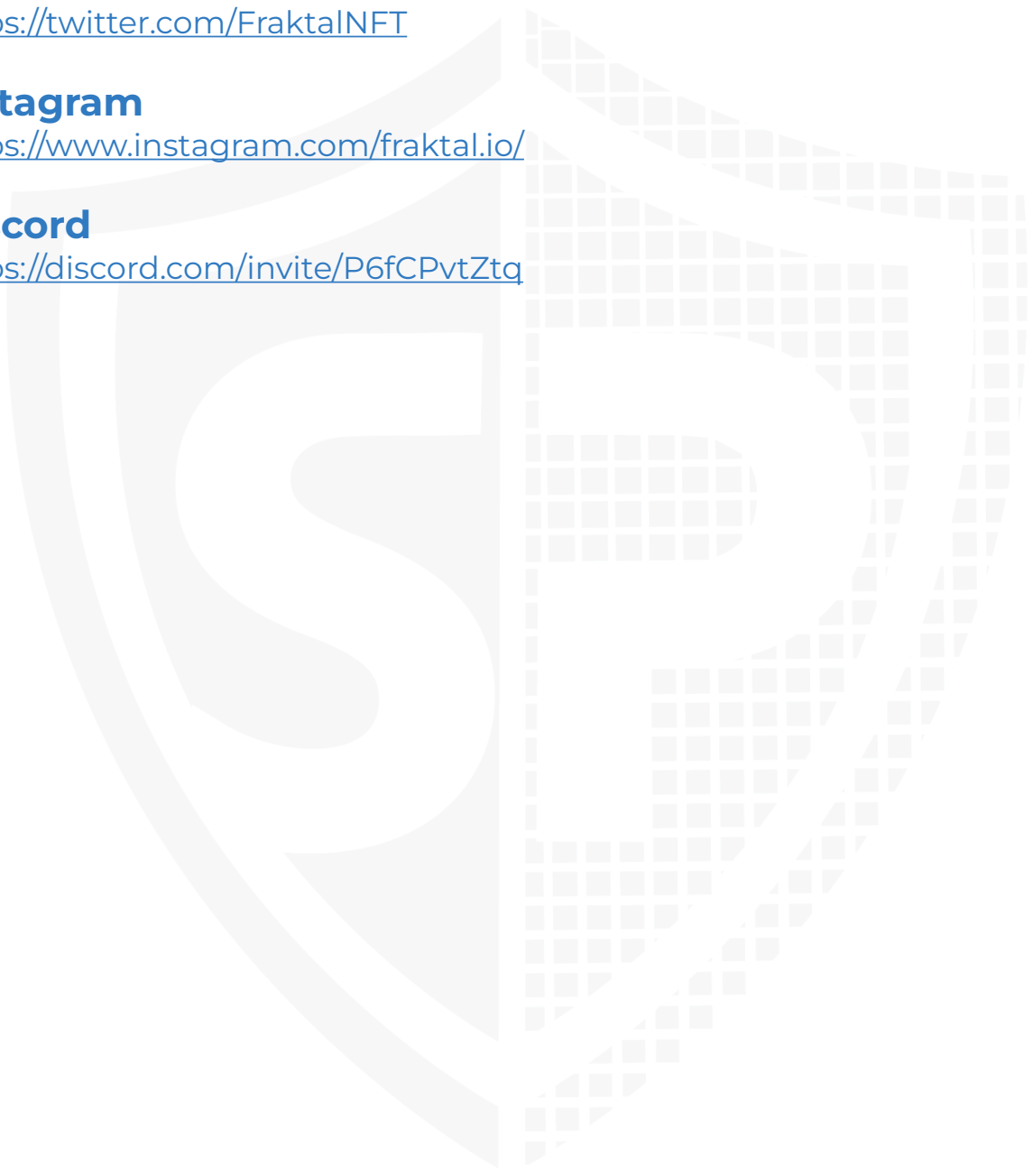
<https://twitter.com/FraktalNFT>

Instagram

<https://www.instagram.com/fraktal.io/>

Discord

<https://discord.com/invite/P6fCPvtZtq>



Description

Fraktal is a community first project, with a mission to to empower artists to be in full control of their work and have unlimited creative freedom.

Project Engagement

During the 23rd of February 2022, **Fraktal 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



FRAKTAL

Contract Link

v1.0

- Github
 - <https://github.com/FraktalNFT/contracts>
 - Commit: 99aaeaac28ddfcff49b3ff1d3d9b51969aedb60f

v1.1

- Github
 - <https://github.com/FraktalNFT/contracts>
 - Commit: 97bd5b4bae97e3e2cdfef26b2d814f8185e40448

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:

Dependency / Import Path	Count
@openzeppelin/contracts-upgradeable/access/OwnableUpgradeable.sol	2
@openzeppelin/contracts-upgradeable/proxy/ClonesUpgradeable.sol	3
@openzeppelin/contracts-upgradeable/proxy/utils/Initializable.sol	3
@openzeppelin/contracts-upgradeable/security/ReentrancyGuardUpgradeable.sol	1
@openzeppelin/contracts-upgradeable/token/ERC1155/ERC1155Upgradeable.sol	3
@openzeppelin/contracts-upgradeable/token/ERC1155/utils/ERC1155HolderUpgradeable.sol	2
@openzeppelin/contracts-upgradeable/token/ERC721/ERC721Upgradeable.sol	1
@openzeppelin/contracts-upgradeable/token/ERC721/utils/ERC721HolderUpgradeable.sol	2
@openzeppelin/contracts-upgradeable/utils/AddressUpgradeable.sol	3
@openzeppelin/contracts-upgradeable/utils/ContextUpgradeable.sol	1
@openzeppelin/contracts/proxy/ERC1967/ERC1967Proxy.sol	1
@openzeppelin/contracts/token/ERC1155/IERC1155.sol	1
@openzeppelin/contracts/token/ERC1155/utils/ERC1155Holder.sol	1
@openzeppelin/contracts/token/ERC721/IERC721.sol	1
@openzeppelin/contracts/utils/structs/EnumerableMap.sol	2
@openzeppelin/contracts/utils/structs/EnumerableSet.sol	1

Tested Contract Files

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

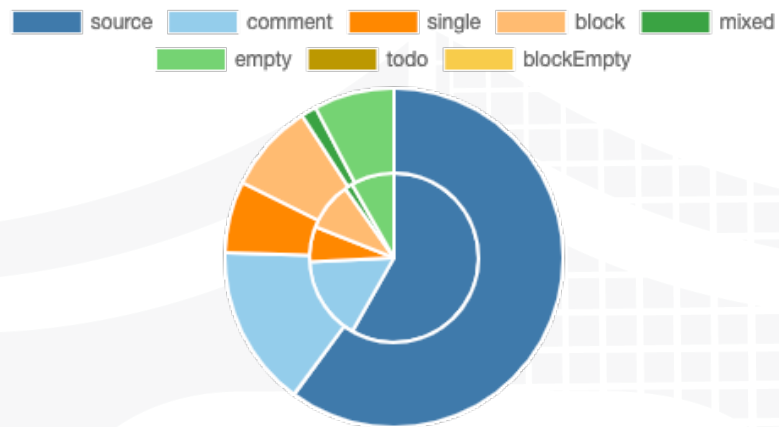
A file with a different Hash has been modified, intentionally or otherwise, after the security review. A different Hash could be (but not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of this review.

v1.0

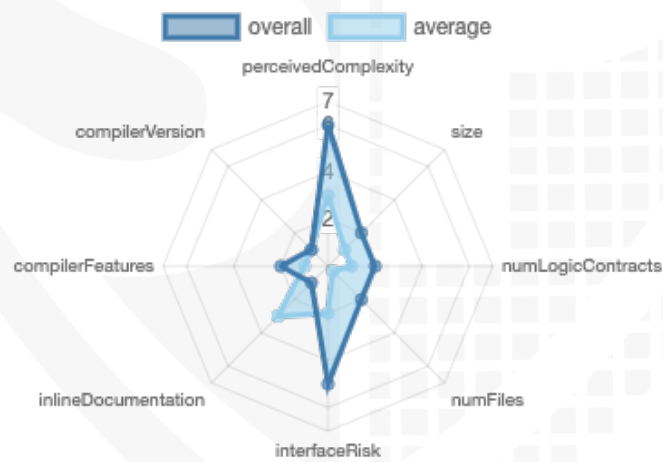
File Name	SHA-1 Hash
contracts/FraktalFactory.sol	bf21f535b72b788b604ce08f18aba445386a6bfd
contracts/IFraktalNFT.sol	579589bb8a28cd6cb5f1276e323ebc2db8f74eb9
contracts/PaymentSplitterUpgradeable.sol	d853821ad97e7fce819dc566aa341ae4326f7cfa
contracts/TransparentUpgradeableProxy.sol	e30ee41beab2ba8951eeef7d21da31f909655cf6
contracts/IPaymentSplitter.sol	9c366ac852cb83dbcc02559da937f7d0fc10c22a
contracts/FraktalNFT.sol	a26e08f227e913463f4b0983c7ff93a94c40d8b6
contracts/FraktalMarket.sol	c46adec5fad7bcd31645fa77d30fddd3169c1ff

Metrics

Source Lines v1.0



Risk Level v1.0



Capabilities

Components

Version	Contracts	Libraries	Interfaces	Abstract
1.0	5	0	2	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	85	12

Version	External	Internal	Private	Pure	View
1.0	75	61	1	1	27

State Variables

Version	Total	Public
1.0	41	23

Capabilities

Version	Solidity Versions observed	Experimental Features	Can Receive Funds	Uses Assembly	Has Destroyable Contracts
1.0	<code>^0.8.0</code>		yes		

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

Inheritance 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. 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

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



Deployer cannot mint any new tokens

Name	Exist	Tested	Status
Deployer cannot mint	✓	✓	✗

Comments:

v1.0

- Everybody can mint



Deployer cannot burn or lock user funds

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

Comments:

v1.0

- Everybody can 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

```

  ▾ 🔹 initialize
    |   Ⓜ initializer
  ▾ 🔹 setFraktalImplementation
    |   Ⓜ onlyOwner
  ▾ 🔹 setRevenueImplementation
    |   Ⓜ onlyOwner
  🔹 mint
  🔹 importERC721
  🔹 importERC1155
  🔹 claimERC721
  🔹 claimERC1155

```

```

  ▾ 🔹 init
    |   Ⓜ initializer
  🔹 fraktionalize
  🔹 defraktionalize
  🔹 setMajority
  🔹 soldBurn
  🔹 lockSharesTransfer
  🔹 unlockSharesTransfer
  🔹 createRevenuePayment 💰
  🔹 sellItem 💰
  🔹 claimContainedERC721
  🔹 claimContainedERC1155
  🔹 setCollateral

```

```

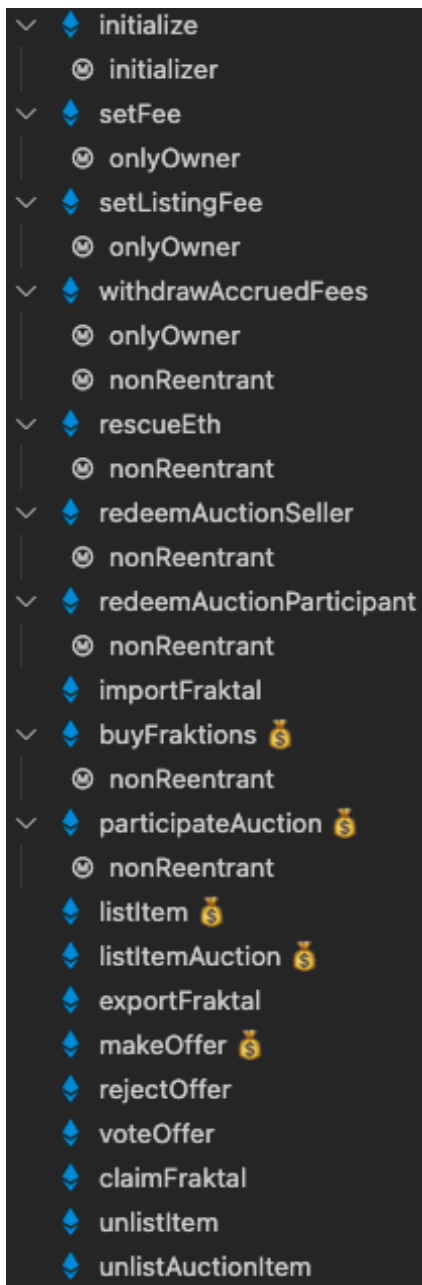
  🔹 release

```

```

  ▾ 🔹 admin
    |   Ⓜ ifAdmin
  ▾ 🔹 implementation
    |   Ⓜ ifAdmin
  ▾ 🔹 changeAdmin
    |   Ⓜ ifAdmin
  ▾ 🔹 upgradeTo
    |   Ⓜ ifAdmin
  ▾ 🔹 upgradeToAndCall 💰
    |   Ⓜ ifAdmin

```



Comments

Information: Not listed functions are from imported libraries

- Deployer can set following addresses
 - FraktalFactory
 - Fraktalimplementation
 - revenueChannellImplementation
- FraktalMarket
 - Following state variable can be set to 99 percent
 - Fee
 - listingFee
 - Owner can withdraw feesAccrued

















- listItem must have more mag.value than listingFee which can be set by the owner. The same for listItemAuction
- collateral can only be set by factory

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/FraktalFactory.sol	1	_____	167	167	140	15	146	_____
	contracts/IFraktalNFT.sol	_____	1	20	5	3	1	31	_____
	contracts/PaymentSplitterUpgradeable.sol	1	_____	187	178	98	55	81	
	contracts/TransparentUpgradeableProxy.sol	1	_____	123	123	41	72	43	 
	contracts/IPaymentSplitter.sol	_____	1	11	5	3	1	13	_____
	contracts/FraktalNFT.sol	1	_____	293	263	190	58	188	 
	contracts/FraktalMarket.sol	1	_____	477	434	370	39	311	
	Totals	5	2	1278	1175	845	241	813	 

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	FraktalFactory	A floating pragma is set	2	The current pragma Solidity directive is „^0.8.0“.
#2	FraktalMarket	A floating pragma is set	2	The current pragma Solidity directive is „^0.8.0“.
#3	FraktalNFT	A floating pragma is set	2	The current pragma Solidity directive is „^0.8.0“.
#4	PaymentSplitterUpgradable	A floating pragma is set	2	The current pragma Solidity directive is „^0.8.0“.
#5	FraktalFactory	Missing Zero Address Validation (missing-zero-check)	43, 50, 54	Check that the address is not zero
#6	FraktalNFT	Missing Zero Address Validation (missing-zero-check)	58, 281	Check that the address is not zero

#7	Fraktal NFT	State variable visibility is not set	18, 19, 31	It is best practice to set the visibility of state variables explicitly
#8	Fraktal Market	State variable visibility is not set	39	It is best practice to set the visibility of state variables explicitly
#9	PaymentSplitter Upgradeable	State variable visibility is not set	36, 37, 39	It is best practice to set the visibility of state variables explicitly
#10	Fraktal Market	Tautology or contradiction	96, 103	Fix the incorrect comparison by changing the value type or the comparison

Informational issues

Issue	File	Type	Line	Description
#1	Fraktal Market	Require message is missing	All require statements	Provide an error message to the require statement
#2	Fraktal NFT	Require message is missing	All require statements	Provide an error message to the require statement
#3	TransparentUpgradeableProxy	Functions that are not used	112	Remove unused functions

Commented Code exist

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

File	Line	Comment
FraktalFactory	38-41	// constructor(address _implementation, address _revenueChannelImplementation) { // FraktalImplementation = _implementation; // revenueChannelImplementation = // _revenueChannelImplementation; // }
	81	// ERC721Upgradeable(_tokenAddress).transferFrom(_msgSender(), address(this), _tokenId);
	95	// ERC1155Upgradeable(_tokenAddress).safeTransferFrom(_msgSender(), address(this), _tokenId, 1, "");

FraktalNFT	54	// constructor() initializer {}
	88-90	// require(this.balanceOf(_msgSender(), 0) == 1); // require(fraktionalized == false); // require(indexUsed[_tokenId] == false);
	108-109	// require(newValue <= 10000*10**18); // require(newValue > 0);
	119-121	// if (_msgSender() != owner) { // require(isApprovedForAll(owner, _msgSender())); // }
	184	// uint256 bal = this.balanceOf(holders.at(i), fraktionsIndex);
	224-246	// function getRevenue(uint256 index) external view returns (address) { // return revenues.get(index); // } // function getFraktions(address who) external view returns (uint256) { // return this.balanceOf(who, fraktionsIndex); // } // function getLockedShares(uint256 index, address who) // external // view // returns (uint256) // { // return lockedShares[index][who]; // } // function getLockedToTotal(uint256 index, address who) // external // view // returns (uint256) // { // return lockedToTotal[index][who]; // }
	258-259	// require(fraktionalized==false); // require(IERC721(contractAddress).ownerOf(index) == address(this));
	286-292	// function getStatus() external view returns (bool) { // return sold; // } // function getFraktionsIndex() external view returns (uint256) { // return fraktionsIndex; // }
Payment SplitterUpgradeable	138	// uint256 bal = IFraktalNFT(tokenParent).getFraktions(_msgSender());

Recommendation

Remove the commented code, or address them properly.

Audit Comments

25. February 2022:

- Read whole report for more information

01. March 2022:

- Medium issue fixed
- Read whole report 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	NOT 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	NOT 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

The logo features the words "SolidProof" in a white, handwritten-style script. The "P" is large and stylized, with a long horizontal stroke that extends to the left. The background is a solid blue color with a faint, large shield emblem. The shield has a grid-like pattern on its right side and a solid blue area on its left side.

SolidProof

Blockchain Security | Smart Contract Audits | KYC

A small horizontal bar representing the German flag, with black, red, and gold stripes.

MADE IN GERMANY