



SOLIDProof
Bring trust into your projects

Blockchain Security | Smart Contract Audits | KYC

MADE IN GERMANY

Audit

Security Assessment
16. December, 2021

For



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Version	Date	Description
1.0	16. December 2021	<ul style="list-style-type: none">• Layout project• Automated- /Manual-Security Testing• Summary

Network

Binance Smart Chain (BEP20)

Website

<https://www.bitcrush.com/>

Telegram

<https://t.me/Bcarcadechat>

Twitter

<https://twitter.com/bitcrusharcade>



Description

Bitcrush Arcade is a gaming platform aimed to further integrate the world of Defi and iGaming. It is our belief as technologies progress, the line between iGaming and decentralized finance will continue to blur.

Project Engagement

During the 13th of December 2021, **Bitcrush 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

- Github
 - https://github.com/Bitcrush-Arcade/crush_contracts
 - Commit: 19beb8e65533967f1f21e880457339b808a3da2c

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
@chainlink/contracts/src/v0.8/VRFConsumerBase.sol	1
@openzeppelin/contracts/access/Ownable.sol	2
@openzeppelin/contracts/token/ERC20/ERC20.sol	2
@openzeppelin/contracts/token/ERC20/utils/SafeERC20.sol	1
@openzeppelin/contracts/utils/math/SafeMath.sol	2

Tested Contract Files

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

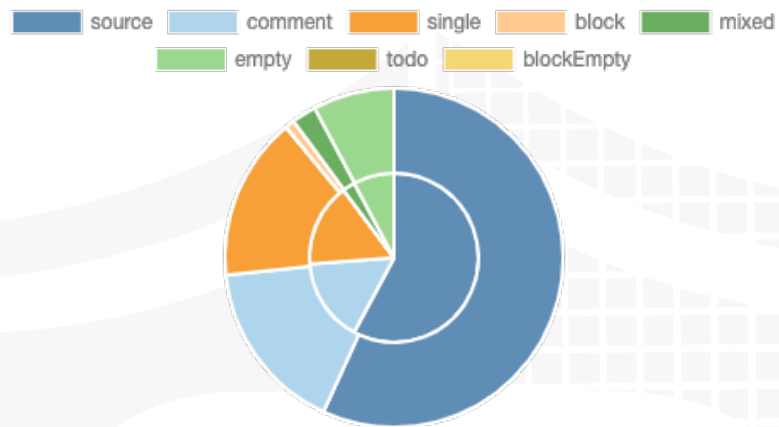
A file with a different Hash has been modified, intentionally or otherwise, after the security review. A different Hash could be (but not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of this review.

v1.0

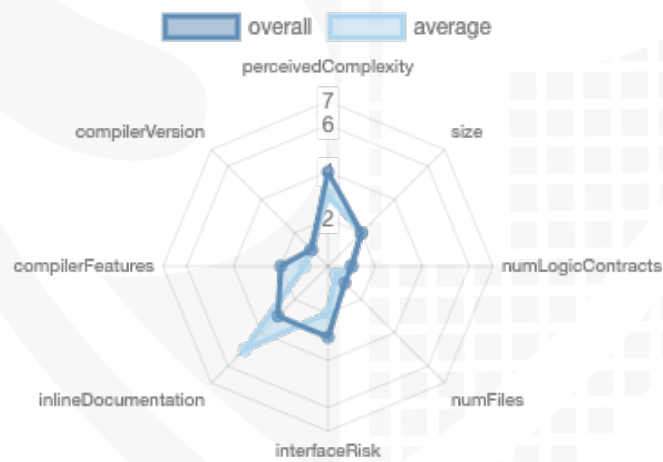
File Name	SHA-1 Hash
contracts/CrushCoin.sol	93e62111f12bb9cb4e5fe820a11d9974f70eb7da
contracts/Lottery.sol	53c5990b3476264ca1d5b051ef3a07fa182d22ff

Metrics

Source Lines v1.0



Risk Level v1.0



Capabilities

Components

Version	Contracts	Libraries	Interfaces	Abstract
1.0	2	0	1	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	21	0

Version	External	Internal	Private	Pure	View
1.0	16	42	0	8	4

State Variables

Version	Total	Public
1.0	44	31

Capabilities

Version	Solidity Versions observed	Experimental Features	Can Receive Funds	Uses Assembly	Has Destroyable Contracts
1.0	^0.8.0			**** (0 asm blocks)	

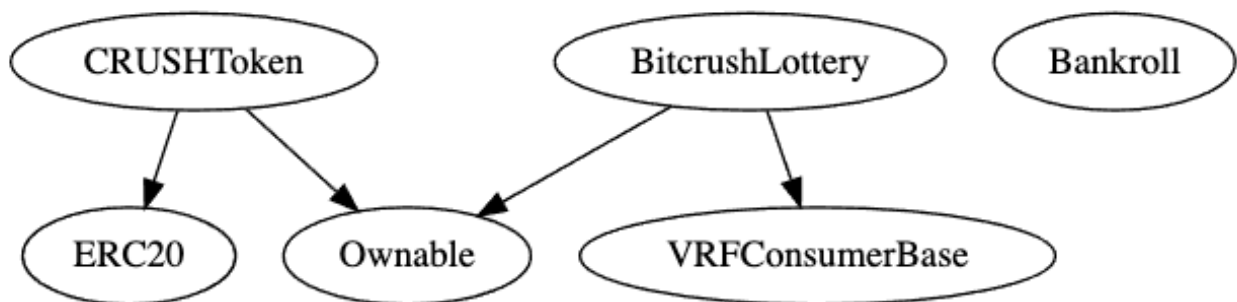
Scope of Work

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)

Inheritance Graph v1.0



Verify Claims

Correct implementation of Token standard

Tested	Verified
✓	✓

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

▼ CRUSHTOKEN	▼ BITCRUSHLOTTERY
approve	addToPool
burn	buyTickets
decreaseAllowance	claimNumber
increaseAllowance	editPartner
mint	endRound
renounceOwnership	exchangeForTicket
transfer	firstStart
transferFrom	rawFulfillRandomness
transferOwnership	renounceOwnership
	rewardTicket
	setBonusCoin
	setBurnThreshold
	setClaimerFee
	setEndHours
	setTicketValue
	setWinner
	toggleOperator
	transferOwnership

Deployer cannot mint any new tokens

Name	Exist	Tested	Verified
Deployer cannot mint	✓	✓	✗

Max / Total Supply: -

Comments:

v1.0

- Owner can mint new tokens as long as minting amount is less than 30.000.000 tokens



Deployer cannot burn or lock user funds

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

Comments:

v1.0

- Anybody can burn tokens

Deployer cannot pause the contract

Name	Exist	Tested	Verified
Deployer cannot pause	—	—	—



Overall checkup (Smart Contract Security)

Tested	Verified
✓	✓

Legend

Attribute	Symbol
Verified / Checked	✓
Partly Verified	⚠
Unverified / Not checked	✗
Not available	—

Modifiers

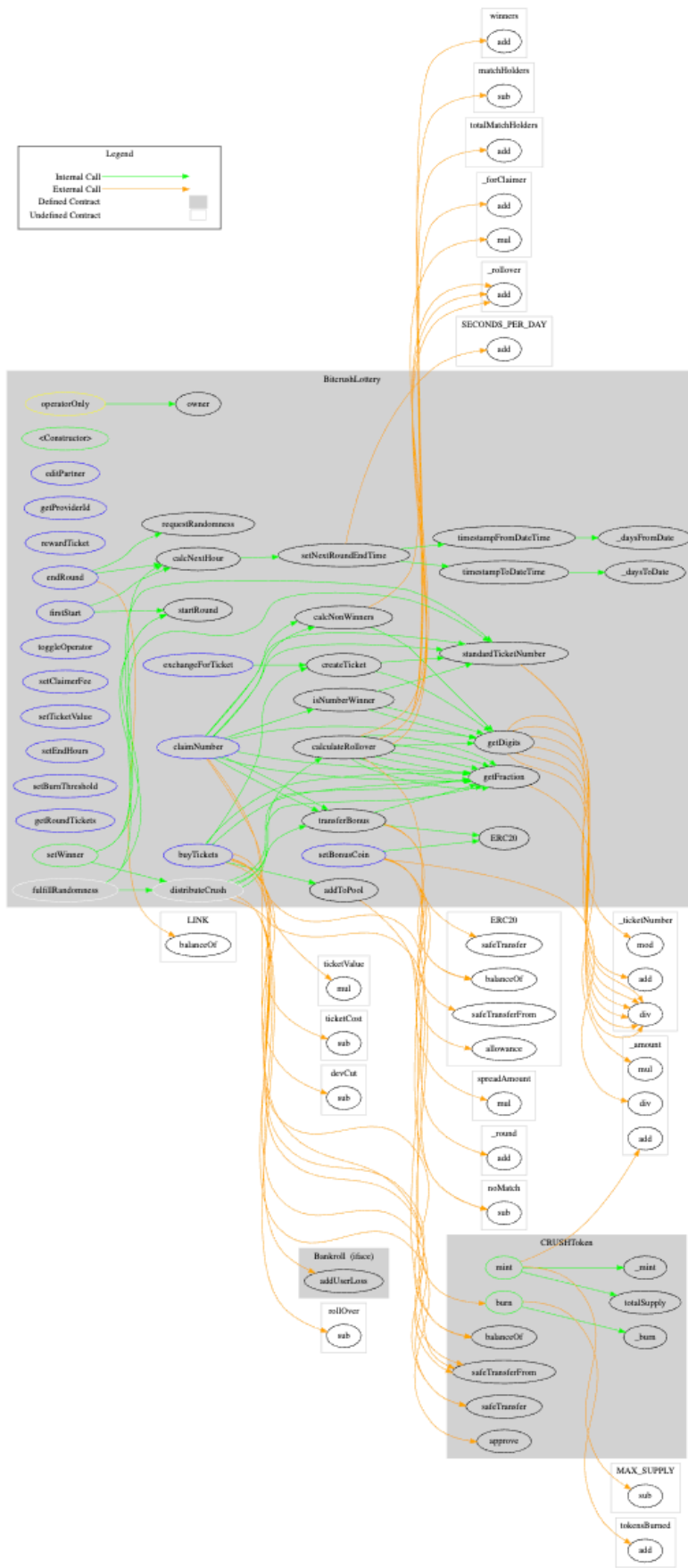
CrushCoin

- onlyOwner
 - Mint

Lottery




- operatorOnly
 - editPartner
 - rewardTicket
 - firstStart
 - toggleOperator
 - setBonusCoin
 - setEndHours
 - setWinner
- onlyOwner
 - setClaimerFee
 - setTicketValue
 - setBurnThreshold

CallGraph



Source Units in Scope

v1.0

Type	File	Logic Contracts	Interfaces	Lines	nLines	nSLOC	Comment Lines	Complex. Score	Capabilities
	contracts/CrushCoin.sol	1	_____	30	30	19	4	19	_____
	contracts/Lottery.sol	1	1	671	660	485	143	360	_____
	Totals	2	1	701	690	504	147	379	_____

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 found -

High issues

- no high issues found -

Medium issues

Issue	File	Type	Line	Description
#1	Lottery	Reentrancy vulnerabilities	166, 240, 488, 558,	Apply the [`check-effects-interactions pattern`](http://solidity.readthedocs.io/en/v0.4.21/security-considerations.html#re-entrancy).or nonReentrant modifier from OpenZeppelin

Low issues

Issue	File	Type	Line	Description
#1	Lottery	A floating pragma is set	2	The current pragma Solidity directive is „^0.8.0“.
#2	CrushCoin	A floating pragma is set	3	The current pragma Solidity directive is „^0.8.0“.
#3	Lottery	Tautology or contradiction	374, 323	Fix the incorrect comparison by changing the value type or the comparison
#4	CrushCoin	Missing Events Arithmetic	26	Emit an event for critical parameter changes

Informational issues

Issue	File	Type	Line	Description
-------	------	------	------	-------------

#1	Lottery	State variables that could be declared constant (constable-states)	103, 89, 92, 101, 100, 99, 98, 97, 96, 102	Add the `constant` attributes to state variables that never change
#2	Lottery	Costly operations in a loop	427	endHourIndex Use a local variable to hold the loop computation result
#3	Lottery	Wrong error message	168	Change 10 to 100 in error message
#4	Lottery	Write more descriptive message	182	Write more descriptive message for the error
#5	Lottery	Change VRF address	142-148, 152-153	Change address of VRF & Key if you deploy the contract in the main net

Audit Comments

16. December 2021:

- [Read 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	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	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	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	NOT 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 "Solid Proofed" in a white, elegant script font. The word "Solid" is positioned above "Proofed". Behind the text is a faint, stylized shield emblem with a grid-like pattern, rendered in a darker shade of blue. The entire composition is set against a solid blue background.

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

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