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# Moshnake Audit

**Security Assessment  
12. September, 2022**

**For**



**SolidProof\_io**



**@solidproof\_io**

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Version	Date	Description
1.0	12. September 2022	<ul style="list-style-type: none"><li>• Layout project</li><li>• Automated- /Manual-Security Testing</li><li>• Summary</li></ul>

## **Network**

Binance Smart Chain (BEP20)

## **Website**

<https://moshnake.io/>

## **Telegram**

<https://t.me/MoshnakeOfficial>

## **Twitter**

<https://twitter.com/moshnakeToken>



## Description

Moshnake, a Play-to-Earn NFT game operating on top of BNB Smart Chain is inspired by the all-time classic hit game- Snake. Players can experience those good old days once again with Moshnake but with the added benefit of earning while playing anonymously.

Each player in the game will be able to manoeuvre their own Moshnake NFT to feed them with the different types of eggs and in-game NFT items lying in the arena while also battling with other snakes in the a battle royale arena.

## Project Engagement

During the 12th of September 2022, **Moshnake 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**

- Provided as files

# 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:

Dependency / Import Path	Count
@openzeppelin/contracts-upgradeable/access/OwnableUpgradeable.sol	2
@openzeppelin/contracts-upgradeable/proxy/utils/Initializable.sol	1
@openzeppelin/contracts-upgradeable/token/ERC20/ERC20Upgradeable.sol	2
@openzeppelin/contracts-upgradeable/token/ERC20/IERC20Upgradeable.sol	1
@openzeppelin/contracts-upgradeable/token/ERC20/extensions/ERC20VotesUpgradeable.sol	1
@openzeppelin/contracts-upgradeable/token/ERC20/extensions/draft-ERC20PermitUpgradeable.sol	1
@openzeppelin/contracts/access/Ownable.sol	1
@openzeppelin/contracts/proxy/Clones.sol	1
@openzeppelin/contracts/token/ERC20/ERC20.sol	1
@openzeppelin/contracts/utils/math/SafeMath.sol	1



## Tested Contract Files

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

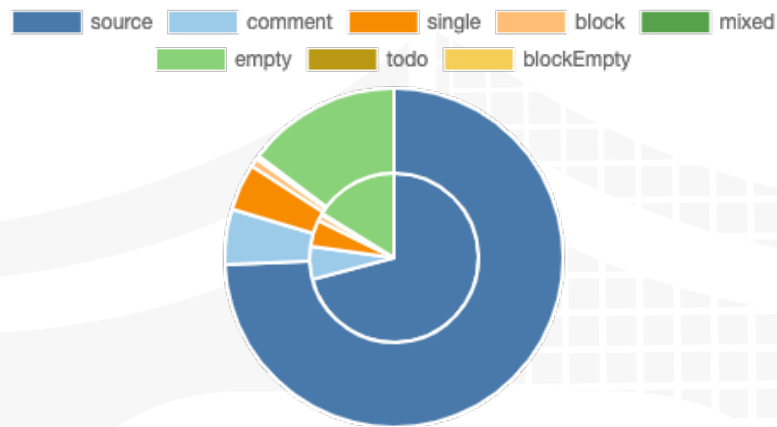
*A file with a different Hash has been modified, intentionally or otherwise, after the security review. A different Hash could be (but not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of this review.*

### v1.0

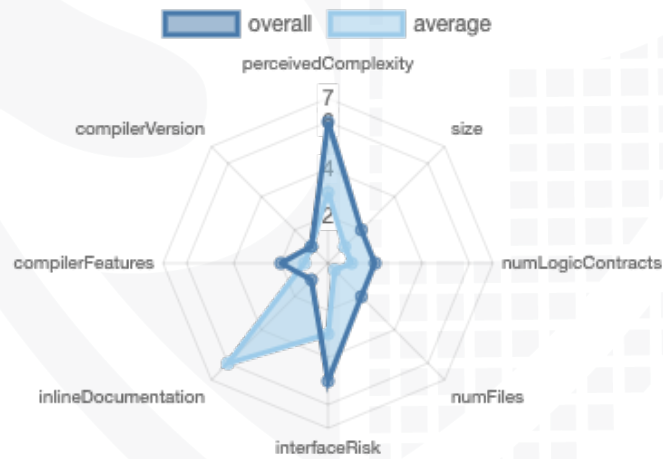
File Name	SHA-1 Hash
contracts/libs/SafeMathUint.sol	6b2ae8e97bac53066b65f5f7ac4c667250e6d346
contracts/libs/SafeMathInt.sol	bbbb2e33e3af95a5ff8525d554497899c3f5bb72
contracts/libs/IterableMapping.sol	97fce8527859afc664798ab48798d4bc6116df67
contracts/Moshnake.sol	a3b2651b76e61f8215dc8037eb639ad17e2860fc
contracts/DividendTokenDividendTracker.sol	e6b951b712f0725aa4257828b60f6d56f9f7bdb5

# Metrics

## Source Lines v1.0



## Risk Level v1.0



## Capabilities

### Components

Version	Contracts	Libraries	Interfaces	Abstract
1.0	3	3	7	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	127	5

Version	External	Internal	Private	Pure	View
1.0	98	95	5	19	50

### State Variables

Version	Total	Public
1.0	39	28

### Capabilities

Version	Solidity Versions observed	Experimental Features	Can Receive Funds	Uses Assembly	Has Destroyable Contracts
1.0	<code>^0.8.13</code>		yes		

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

1.0	yes					
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# 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?	Yes

Comments:

### v1.0


- Owner can deploy a new version of the contract which can change any limit and give owner new privileges
  - Be aware of this and do your own research for the contract which is the contract pointing to

## 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



approve
burnFromFee
claim
decreaseAllowance
delegate
delegateBySig
distributeDividends
excludeFromFees
excludeFromDividends
excludeFromMaxTransacti...
increaseAllowance
initialize
permit
processDividendTracker
renounceOwnership
setAutomatedMarketMake...
setOperationWallet
setSwapTokensAtAmount
transfer
transferFrom
transferOwnership
updateBurnFee
updateClaimWait
updateDividendTracker
updateGasForProcessing
updateLiquidityFee
updateLPWallet
updateMaxTransactionAm...
updateMaxWallet
updateMinimumTokenBala...
updateOperationFee
updatePancakeswapV2Pair
updatePancakeswapV2Ro...

## Deployer cannot mint any new tokens

Name	Exist	Tested	Status
Deployer cannot mint	✓	✓	✓



## Deployer cannot burn or lock user funds

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

Comments:

### v1.0

- Tokens will be send to the contract address as “burnFee” but this is not burning the tokens itself. The owner must call the “burnFromFee” function in L737
- Owner is able to set the “maxTransactionAmount” to nearly 0 in the L612. “MaxWallet” is the same as above in the function in L612

## 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%	✓	✓	✓

Comments:

### v1.0

- Fees can be set up to 30%

## 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

initialize	
initializer	
<Constructor>	💰
setSwapTokensAtAmount	
onlyOwner	
updateDividendTracker	
onlyOwner	
updatePancakeswapV2Pair	
onlyOwner	
updatePancakeswapV2Router	
onlyOwner	
updateMaxWallet	
onlyOwner	
updateMaxTransactionAmount	
onlyOwner	
excludeFromFees	
onlyOwner	
setOperationWallet	
onlyOwner	
updateLPWallet	
onlyOwner	
updateLiquidityFee	
onlyOwner	
updateOperationFee	
onlyOwner	
updateBurnFee	
onlyOwner	
setAutomatedMarketMakerPair	
onlyOwner	
excludeFromMaxTransactionAmount	
onlyOwner	
burnFromFee	
onlyOwner	
updateGasForProcessing	
onlyOwner	
updateClaimWait	
onlyOwner	
updateMinimumTokenBalanceForDivid...	
onlyOwner	
excludeFromDividends	
onlyOwner	
processDividendTracker	
claim	
distributeDividends	

Note: Not listed functions/modifiers was imported from libraries.

## Comments

- Deployer can set following state variables without any limitations
  - minimumTokenBalanceForDividends
    - Can be set to 0 that nobody will get dividends
  - swapTokensAtAmount
- Deployer can enable/disable following state variables
  - tokenHoldersMap
  - excludedFromDividends












- isExcludedFromMaxTransactionAmount
- automatedMarketMakerPairs
- isExcludedFromMaxTransactionAmount
- \_isExcludedFromFees
- Deployer can set following addresses
  - lpWallet
  - \_operationWalletAddress
  - pancakeswapV2Pair
  - pancakeswapV2Router
  - baseTokenForPair
  - dividendTracker
- Anyone can distribute tokens into the dividend token
- Anyone is able to call initialize function. Be aware of it. We recommend you secure this part with a modifier that the owner is the only one who can call it
- “\_operationWalletAddress” will be excluded from fees. After updating the address it is not included back into the fee. Also while updating the address make sure to excluded it from fees and max transaction
- While transferring the ownership the old owner was not included back into the “isExcludedFromMaxTransactionAmount” state variable
- 

**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/libs/SafeMathUint.sol	1	————	9	9	8	1	3	————
	contracts/libs/SafeMathInt.sol	1	————	60	60	33	19	16	————
	contracts/libs/IterableMapping.sol	1	————	73	61	48	2	19	————
	contracts/Moshnake.sol	1	5	1053	628	526	7	516	
	contracts/DividendTokenDividendTracker.sol	2	2	534	408	273	68	188	
	<b>Totals</b>	<b>6</b>	<b>7</b>	<b>1729</b>	<b>1166</b>	<b>888</b>	<b>97</b>	<b>742</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

**No medium issues**

## Low issues

Issue	File	Type	Line	Description
#1	All	A floating pragma is set	Top of source code	The current pragma Solidity directive is „^0.8.13“.
#2	Main	Missing Zero Address Validation (missing-zero-check)	631, 637, 584	Check that the address is not zero
#3	DividendToken DividendTracker	Local variables shadowing	100, 101, 193, 160, 167, 179	Rename the local variables that shadow another component
#4	Main	Missing Events Arithmetic	617, 609	Emit an event for critical parameter changes

## Informational issues

Issue	File	Type	Line	Description
#1	SafeMathInt	Functions that are not used	51, 22, 10	Remove unused functions.  Before removing check the function, it could be possible, that you forget to implement it into the contract
#2	SafeMathInt	Unused state variables	5	Remove unused state variables

#3	Dividen dToken Dividen dTracke r	Error message is missing	109, 217, 323,	Provide an error message for require statement
#4	Main	Error message is missing	497, 498, 508, 509, 608, 616,	Provide an error message for require statement
#5	SafeMat hInt	Error message is missing	14, 15, 24, 35, 44, 52, 57	Provide an error message for require statement
#6	All	NatSpec documentation missing	-	If you started to comment your code, also comment all other functions, variables etc.
#7	Dividen dToken Dividen dTracke r	Unnecessary code	219-226	The following code is not reachable because of the require statement. Feel free to remove it.
#8	Dividen dToken Dividen dTracke r	Wrong error message	318	Replace "BABYTOKEN" with your dividend tracker name

## 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.

## 12. September 2022:

- Owner can deploy a new version of the contract which can change any limit and give owner new privileges
- 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>	NOT 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>NOT 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>NOT 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>



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