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Blockchain Security | Smart Contract Audits | KYC

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Metacelo

Audit

Security Assessment
14. February, 2022

For



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

Network

Celo Network

Website

<https://metacelo.io/>

Telegram

https://t.me/metacelo_ann

Twitter

https://twitter.com/Meta_Celo

Discord

<https://discord.gg/SnXAAewAyC>



Description

The First Play-To-Earn Metaverse NFT Game built on Celo Network

Project Engagement

During the 12th of February 2022, **MetaCelo 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://explorer.celo.org/address/0xF3608F846cA73147F08FdE8D57f45E27CeEA4d61/contracts>

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.

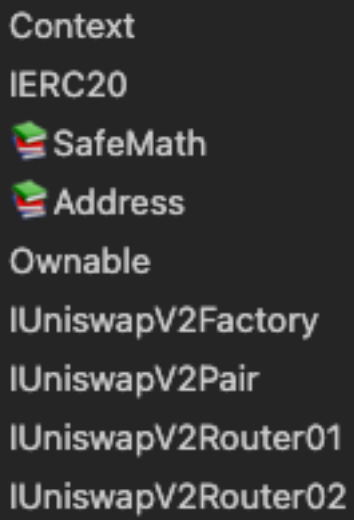
Methodology



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:



```
Context
IERC20
 SafeMath
 Address
Ownable
IUniswapV2Factory
IUniswapV2Pair
IUniswapV2Router01
IUniswapV2Router02
```


Tested Contract Files

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

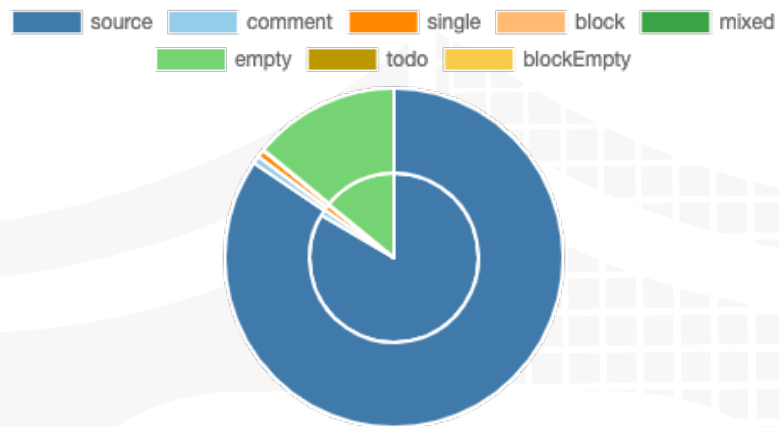
A file with a different Hash has been modified, intentionally or otherwise, after the security review. A different Hash could be (but not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of this review.

v1.0

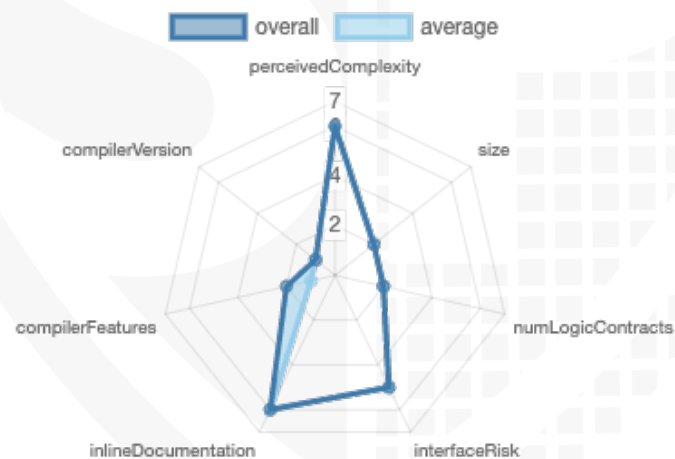
File Name	SHA-1 Hash
contracts/metacelo.sol	060f169ff57250233418e0a6d53bfe42115efb0b

Metrics

Source Lines v1.0



Risk Level v1.0



Capabilities

Components

Version	Contracts	Libraries	Interfaces	Abstract
1.0	1	2	5	2

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	105	5

Version	External	Internal	Private	Pure	View
1.0	81	93	21	20	44

State Variables

Version	Total	Public
1.0	40	15

Capabilities

Version	Solidity Versions observed	Experimental Features	Can Receive Funds	Uses Assembly	Has Destroyable Contracts
1.0	<code>>0.8.0</code>		yes	yes (2 asm blocks)	

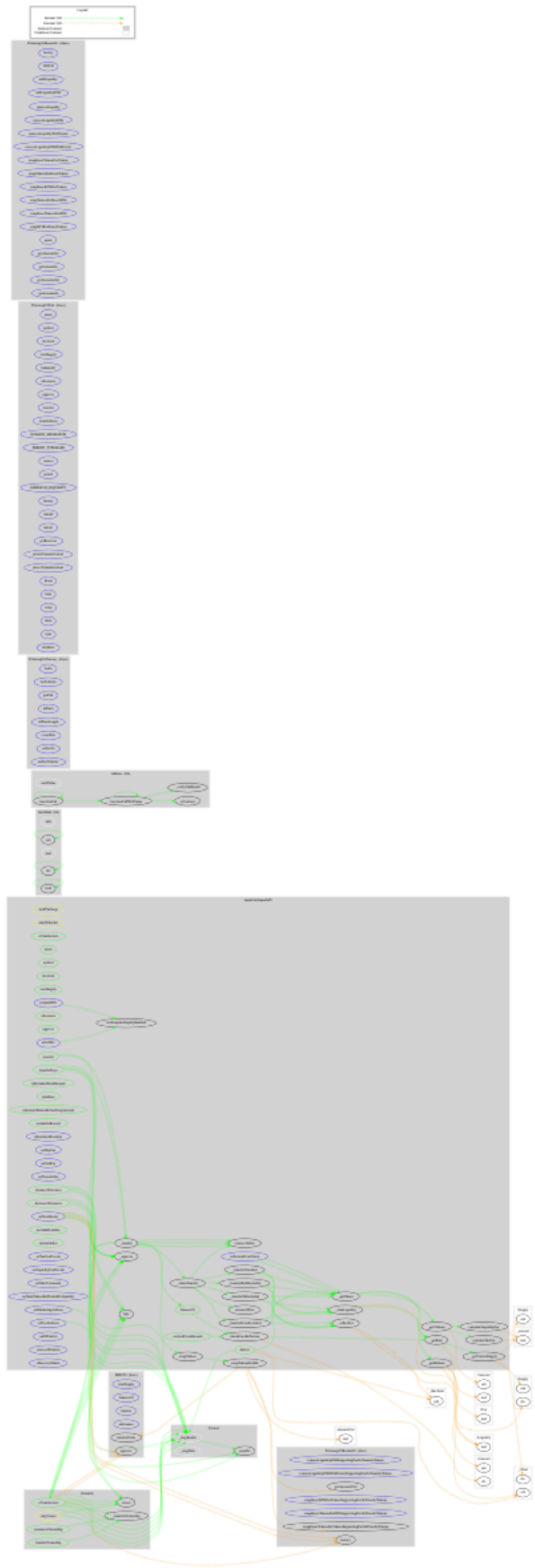
Inheritance Graph

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. 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

1. addWhitelist →

2. afterIDO →

3. approve →

4. decreaseAllowance →

5. deliver →

6. excludeFromFee →

7. excludeFromReward →

8. includeInFee →

9. includeInReward →

10. increaseAllowance →

11. prepareIDO →

12. removeWhitelist →

13. renounceOwnership →

14. setBuyFee →

15. setLiquidityFeePercent →

16. setMarketingAddress →

17. setMaxTxAmount →

18. setNewRouter →

19. setNumTokensSellToAddToLiquidity →

20. setPoolAddress →

21. setSellFee →

22. setSwapAndLiquifyEnabled →

23. setTaxFeePercent →

24. setTransferFee →

25. transfer →

26. transferFrom →

27. transferOwnership →

28. receive ⓘ →

Deployer cannot mint any new tokens

Name	Exist	Tested	Status
Deployer cannot mint	—	—	—
Max / Total Supply	100_000_000		



Deployer cannot burn or lock user funds

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

Comments:

v1.0

- Default `_maxTxAmount` is $1_000_000 * 10^{18}$ but it can minimum set to $1 * 10^{18}$. AfterIDO function set `_maxTxAmount` to $10_000 * 10^{18}$

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

transfer	
approve	
transferFrom	
increaseAllowance	
decreaseAllowance	
deliver	
excludeFromReward	
onlyOwner	Ⓜ
includeInReward	
onlyOwner	Ⓜ
setBuyFee	
onlyOwner	Ⓜ
setSellFee	
onlyOwner	Ⓜ
setTransferFee	
onlyOwner	Ⓜ
setNewRouter	
onlyOwner	Ⓜ
setMarketingAddress	
onlyOwner	Ⓜ
setPoolAddress	
onlyOwner	Ⓜ
excludeFromFee	
onlyOwner	Ⓜ
includeInFee	
onlyOwner	Ⓜ
setTaxFeePercent	
onlyOwner	Ⓜ
setLiquidityFeePercent	
onlyOwner	Ⓜ
setMaxTxAmount	
onlyOwner	Ⓜ
setNumTokensSellToAddToLiquidity	
onlyOwner	Ⓜ
setSwapAndLiquifyEnabled	
onlyOwner	Ⓜ
prepareIDO	
onlyOwner	Ⓜ
afterIDO	
onlyOwner	Ⓜ
addWhitelist	
onlyOwner	Ⓜ
removeWhitelist	
onlyOwner	Ⓜ

Comments





- Deployer can set following state variables without any limitations
 - minimumTokensBeforeSwap
- Deployer can set following state variables higher than 0
 - _maxTxAmount
- Deployer can set following state variables with a limit of
 - 10
 - _buyTaxFee + _buyPoolAndMarketingFee
 - _taxFee

- `_liquidityFee`
- `15`
- `_sellTaxFee + _sellPoolAndMarketingFee`
- `_transferTaxFee + _transferPoolAndMarketingFee`
- Deployer can enable/disable following state variables
 - `_isExcluded`
 - `_excluded`
 - `_isExcludedFromFee`
 - `swapAndLiquifyEnabled`
 - `_whitelist`
- Deployer can set following addresses
 - `uniswapV2Router`
 - `_routerAddress`
 - `_marketing`
 - `_pool`
- Deliver function cannot be called by addresses which are excluded
- Only whitelisted addresses can send ether to contract

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/metacelo.sol	5	5	1353	840	711	10	607	
	Totals	5	5	1353	840	711	10	607	

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	Main	Contract doesn't import npm packages from source (like OpenZeppelin etc.)	-	We recommend to import all packages from npm directly without flatten the contract. Functions could be modified or can be susceptible to vulnerabilities
#2	Main	A floating pragma is set	1	The current pragma Solidity directive is „^0.“.
#3	Main	Missing Zero Address Validation (missing-zero-check)	1244	Check that the address is not zero
#4	Main	State variable visibility is not set	597, 641	It is best practice to set the visibility of state variables explicitly
#5	Main	Local variables shadowing	872, 876, 879, 880, 729, 735	Rename the local variables that shadow another component

#6	Main	Missing Events Arithmetic	1212, 1213, 1224, 1225, 1236, 1237	Emit an event for critical parameter changes
#7	Main	Tautology or contradiction	1294, 1287	Fix the incorrect comparison by changing the value type or the comparison
#8	Main	Contracts that lock ether	1352	Add a withdraw function because of the receive function

Informational issues

Issue	File	Type	Line	Description
#1	Main	State variables that could be declared constant (constable-states)	596, 613, 611, 612, 607	Add the `constant` attributes to state variables that never change
#2	Main	Missing require statement message	670	Provide an error message to require statement

Commented Code exist

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

Line	Comment
90	// assert(a == b * c + a % b); // There is no case in which this doesn't hold

Recommendation

Remove the commented code, or address them properly.

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.

14. February 2022:

- 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	NOT 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 "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.

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

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