



Smart Contract Security Audit Report

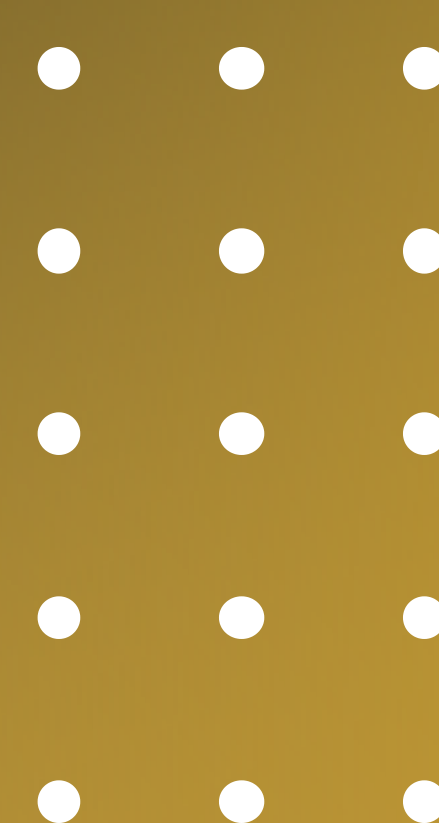
Cartesi

July 2022

Security Status



www.hacksafe.io



Audit Details



Audited project

Cartesi



Deployer address

0x0e28A8f88C6266dF0FE274c15c1d4b27f8B373C0



Client contacts

Cartesi team



Blockchain

Ethereum



Website

<https://cartesi.io/>

Disclaimer

This is a limited report on our findings based on our analysis, in accordance with good industry practice as at the date of this report, in relation to cybersecurity vulnerabilities and issues in the framework and algorithms based on smart contracts, the details of which are set out in this report. In order to get a full view of our analysis, it is crucial for you to read the full report. While we have done our best in conducting our analysis and producing this report, it is important to note that you should not rely on this report and cannot claim against us on the basis of what it says or doesn't say, or how we produced it, and it is important for you to conduct your own independent investigations before making any decisions. We go into more detail on this in the below disclaimer below – please make sure to read it in full.

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The analysis of the security is purely based on the smart contracts alone. No applications or operations were reviewed for security. No product code has been reviewed.

Procedure

Step 1 - In-Depth Manual Review

Manual line-by-line code reviews to ensure the logic behind each function is sound and safe from various attack vectors. This is the most important and lengthy portion of the audit process (as automated tools often cannot find the nuances that lead to exploits such as flash loan attacks).

Step 2 - Automated Testing

Simulation of a variety of interactions with your Smart Contract on a test blockchain leveraging a combination of automated test tools and manual testing to determine if any security vulnerabilities exist.

Step 3 – Leadership Review

The engineers assigned to the audit will schedule meetings with our leadership team to review the contracts, any comments or findings, and ask questions to further apply adversarial thinking to discuss less common attack vectors.

Step 4 - Resolution of Issues

Consulting with the team to provide our recommendations to ensure the code's security and optimize its gas efficiency, if possible. We assist project team's in resolving any outstanding issues or implementing our recommendations.

Step 5 - Published Audit Report

Boiling down results and findings into an easy-to-read report tailored to the project. Our audit reports highlight resolved issues and any risks that exist to the project or its users, along with any remaining suggested remediation measures. Diagrams are included at the end of each report to help users understand the interactions which occur within the project.

Background

HackSafe was commissioned by Cartesi to perform an audit of smart contracts:

- <https://etherscan.io/address/0x491604c0fdf08347dd1fa4ee062a822a5dd06b5d#code>

The purpose of the audit was to achieve the

- Ensure that the smart contract functions as intended.
- Identify potential security issues with the smart contract.

The information in this report should be understood to understand the risk exposure of the smart contract, and as a guide to improve the security posture of the smart contract by remediating the issues that were identified.

Contract Details

Token contract details for 14.07.2022

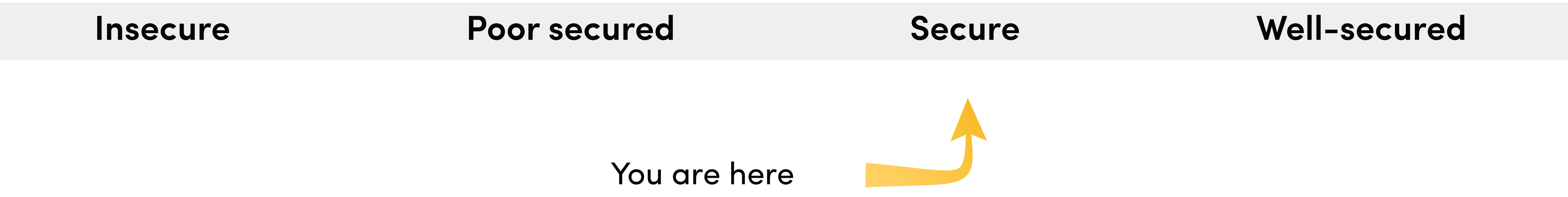
Token Type	: ERC20
Contract name	: CartesiToken
Contract address	: 0x491604c0FDF08347Dd1fa4Ee062a822A5DD06B5D
Compiler version	: v0.5.5+commit.47a71e8f
Total supply	: 1,000,000,000
Token Ticker	: CTSI
Decimals	: 18
Token Holders	: 17,300
Top 100 token holder's dominance	: 99.90%
Transactions count	: 186,102
Contract deployer address	: 0x0e28A8f88C6266dF0FE274c15c1d4b27f8B373C0
Owner address	: No Owner

Social profiles

Twitter Profile	: https://twitter.com/cartesiproject
Github Profile	: https://github.com/cartesi
Facebook Profile	: https://facebook.com/cartesiproject
Whitepaper link	: https://cartesi.io/cartesi_whitepaper.pdf
Telegram Profile	: https://t.me/CartesiProject
LinkedIN Profile	: https://www.linkedin.com/company/cartesiproject/
Medium Profile	: https://medium.com/cartesi
Coinmarketcap profile	: https://coinmarketcap.com/currencies/cartesi/
Coingecko profile	: https://www.coingecko.com/en/coins/cartesi/
Reddit profile	: https://reddit.com/r/cartesi

Audit Summary

According to the standard audit assessment, Customer`s solidity smart contracts are “Secure”. This token contract does not contain owner control, which do make it fully decentralized as owner does not have control over smart contract.



We used various tools like Slither, Mythril and Remix IDE. At the same time this finding is based on critical analysis of the manual audit. All issues found during automated analysis were manually reviewed and applicable vulnerabilities are presented in the issues checking status.

We found 0 critical, 0 high, 0 medium and 2 low and some very low-level issues. These issues are not critical ones.

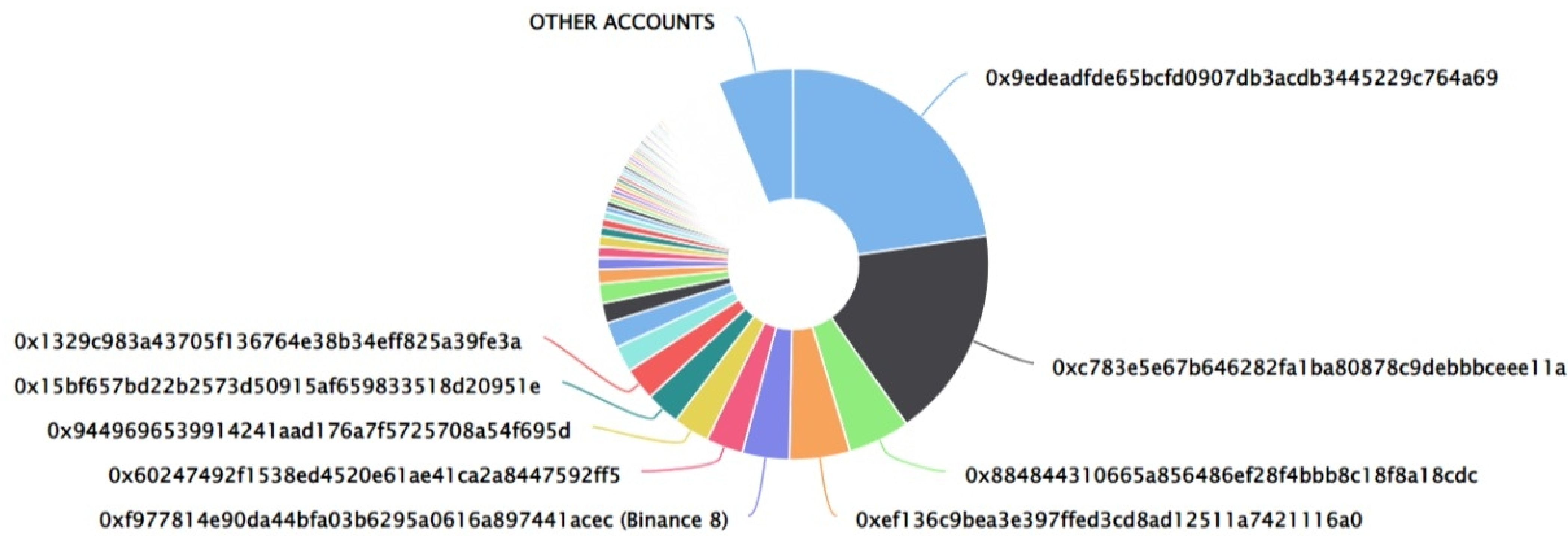
CARTESI Token Distribution

The top 100 holders collectively own 93.76% (937,604,838.52 Tokens) of Cartesi Token

Token Total Supply: 1,000,000,000.00 Token | Total Token Holders: 17,300












Cartesi Token Top 100 Token Holders

Source: Etherscan.io



CARTESI Top 20 Token Holders

(A total of 937,604,838.52 tokens held by the top 100 accounts from the total supply of 1,000,000,000.00 token)

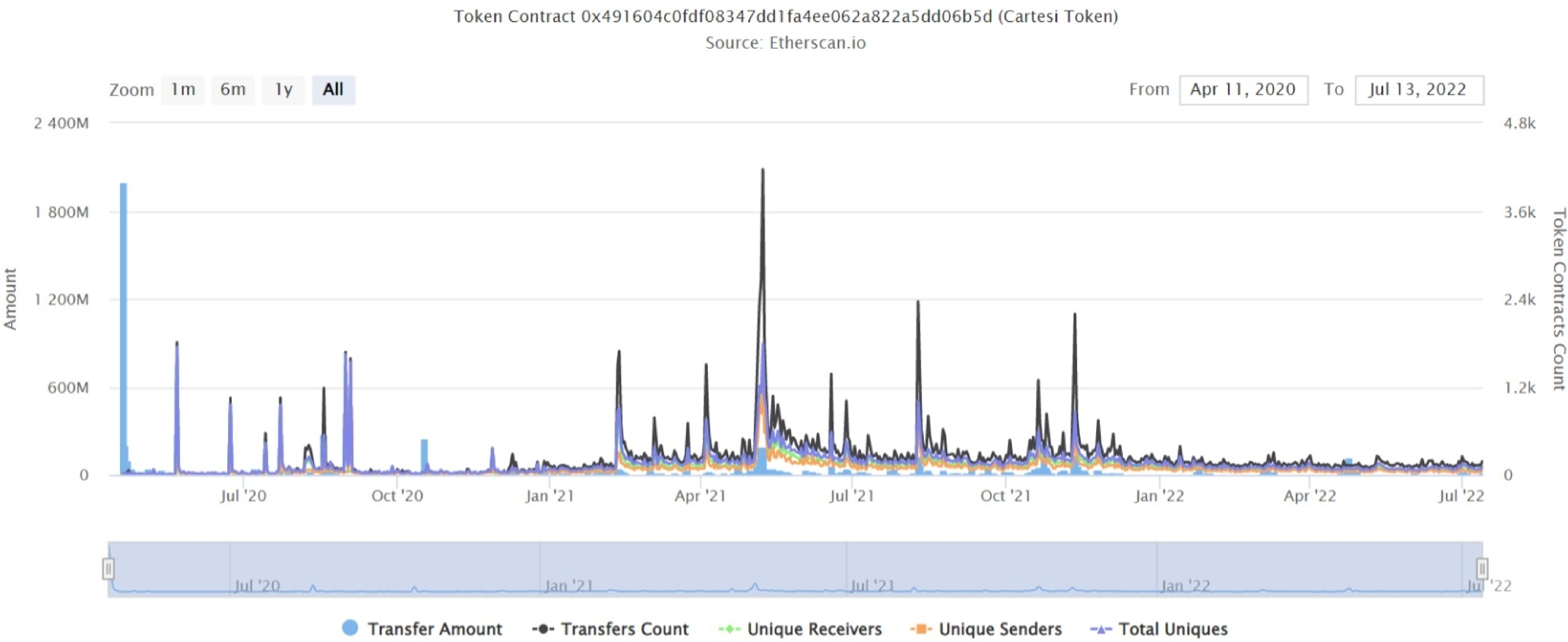
Rank	Address	Quantity (Token)	Percentage
1	 0x9edeadfde65bcfd0907db3acdb3445229c764a69	226,918,260.880513172472152459	22.6918%
2	 0xc783e5e67b646282fa1ba80878c9debbbceee11a	175,000,000	17.5000%
3	 0x884844310665a856486ef28f4bbb8c18f8a18cdc	51,379,604	5.1380%
4	0xef136c9bea3e397ffed3cd8ad12511a7421116a0	50,000,000	5.0000%
5	Binance 8	39,144,709	3.9145%
6	 0x60247492f1538ed4520e61ae41ca2a8447592ff5	30,484,939.099650050261268354	3.0485%
7	 0x9449696539914241aad176a7f5725708a54f695d	29,951,032	2.9951%
8	 0x15bf657bd22b2573d50915af659833518d20951e	28,522,463	2.8522%
9	 0x1329c983a43705f136764e38b34eff825a39fe3a	27,093,891	2.7094%
10	 0xf28cd79373863e08cb2d7b1f563b2ef8f1eb877c	21,428,573	2.1429%
11	 0x145501ee91ea2e09b64dc55a9e3ec39f3d07ef15	21,428,572	2.1429%
12	0x8128a5de02bd24a0fb2869d80bdbf68f41aedef7	16,395,744.476853825326316388	1.6396%
13	 0x2a1eb0fb39312bbf01cf40899975684612a57016	16,307,518.999999992138239509	1.6308%
14	0xe8bb3854a546d2c26d0791b59d34f4111b6cd0ad	11,778,118.23251198	1.1778%
15	Binance 7	10,000,000	1.0000%
16	0x5c096943c87d74d2958980f6d1b5159aa295d630	9,102,470.32196470075032203	0.9102%
17	Binance 14	8,175,158.831370328728200779	0.8175%
18	0x10eff6869391417bf83770e6245d298ed58ded02	7,505,701.827671302832338833	0.7506%
19	0xae8bd82720a87234a4b034ddad085bde4e9ed1df	6,666,667	0.6667%
20	 0xc80d2feef982c809cd09c09432a1439939233149	5,899,938	0.5900%

CARTESI Token Distribution

CARTESI Contract Overview

Time Series: Token Contract Overview

Mon 20, Apr 2020 - Wed 13, Jul 2022



Contract functions details

+ Context

- <constructor> #
- [Int] _msgSender
- [Int] _msgData

+ [Int] IERC20

- [Ext] totalSupply
- [Ext] balanceOf
- [Ext] transfer
- [Ext] allowance
- [Ext] approve
- [Ext] transferFrom

+ [Lib] SafeMath

- [Int] add
- [Int] sub
- [Int] sub
- [Int] mul
- [Int] div
- [Int] div
- [Int] mod
- [Int] mod

+ [Int] IERC20Metadata (IERC20)

- [Pub] name
- [Pub] symbol
- [Pub] decimals

+ ERC20 (Context, IERC20)

- <constructor>
- [Pub] totalSupply
- [Pub] balanceOf
- [Pub] transfer #
- [Pub] allowance
- [Pub] approve #
- [Pub] transferFrom #
- [Pub] increaseAllowance
- [Pub] decreaseAllowance
- [Int] _transfer #
- [Int] _mint#

Contract functions details

- [Int] _burn #
- [Int] _approve #
- [Int] _burnFrom #

+ [Lib] Roles

- [Int] add
- [Int] remove
- [Int] has

+ MinterRole(Context)

- [Int] <constructor>
- [Pub] isMinter
- [Pub] addMinter #
 - modifiers: onlyMinter
- [Pub] renounceMinter #
- [Int] _addMinter #
- [Int] _removeMinter #

+ ERC20Mintable (ERC20, MinterRole)

- [Pub] mint
 - modifiers: onlyMinter

+ ERC20Detailed (IERC20)

- [Pub] <constructor> #
- [Pub] name
- [Pub] symbol
- [Pub] decimals

+ CartesiToken (ERC20Mintable, ERC20Detailed)

- [Pub] < constructor> #
- [Pub] mint #
 - modifiers: onlyMinter
- [Pub] extendMintLockTime #
 - modifiers: onlyMinter

(\$) = payable function

= non-constant function

Issues Checking Status

No.	Title	Status
1.	Unlocked Compiler Version	Low issue
2.	Missing Input Validation	Passed
3.	Race conditions and Reentrancy. Cross-function race conditions.	Passed
4.	Possible delays in data delivery	Passed
5.	Oracle calls.	Passed
6.	Timestamp dependence.	Passed
7.	Integer Overflow and Underflow	Passed
8.	DoS with Revert.	Passed
9.	DoS with block gas limit.	Passed
10.	Methods execution permissions.	Passed
11.	Economy model of the contract.	Passed
12.	Private use data leaks.	Passed
13.	Malicious Event log.	Passed
14.	Scoping and Declarations.	Passed
15.	Uninitialized storage pointers.	Passed
16.	Arithmetic accuracy.	Passed
17.	Design Logic.	Passed
18.	Safe Open Zeppelin contracts implementation and usage.	Passed
19.	Incorrect Naming State Variable	Passed
20.	Too old version	Low issue

Severity Definitions

Risk Level	Description
Critical	Critical vulnerabilities are usually straightforward to exploit and can lead to assets loss or data manipulations.
High	High-level vulnerabilities are difficult to exploit; however, they also have a significant impact on smart contract execution, e.g., public access to crucial functions
Medium	Medium-level vulnerabilities are important to fix; however, they can't lead to assets loss or data manipulations.
Low	Low-level vulnerabilities are mostly related to outdated, unused, etc. code snippets that can't have a significant impact on execution.

Security Issues

✔ Critical Severity Issues

No critical severity issue found.

✔ High Severity Issues

No high severity issue found.

✔ Medium Severity Issues

No medium severity issues found.

✔ Low Severity Issues

Two low severity issue found.

1. Unlocked Compiler Version.

- **Description**

The contract utilizes an unlocked compiler version. An unlocked compiler version in the contract's source code permits the user to compile it at or above a particular version. This, in turn, leads to differences in the generated bytecode between compilations due to differing compiler version numbers. This can lead to ambiguity when debugging as compiler-specific bugs may occur in the codebase that would be difficult to identify over a span of multiple compiler versions rather than a specific one.

- **Recommendation**

It is advisable that the compiler version is alternatively locked at the lowest version possible so that the contract can be compiled. For example, for version ^0.5.0 the contract should contain the following line:

```
pragma solidity 0.5.5;
```

2. Too old compiler

- **Description**

The smart contract has been deployed using too old compiler.

- **Recommendation**

It is advisable that the contract should have been deployed with any of the newest solidity version in order to have the secure contract.

Conclusion

Smart contract contains low severity issues! The further transfer and operations with the fund raised are not related to this particular contract.

HackSafe note: Please check the disclaimer above and note, the audit makes no statements or warranties on business model, investment attractiveness or code sustainability. The report is provided for the only contract mentioned in the report and does not include any other potential contracts deployed by Owner.