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SMART CONTRACT

Security Audit Report

Project: CatoCoin(CATO)
Platform: Evolve Network
Language: Solidity
Date: January 6th, 2025

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THIS IS SECURITY AUDIT REPORT DOCUMENT AND WHICH MAY CONTAIN INFORMATION WHICH IS CONFIDENTIAL. WHICH INCLUDES ANY POTENTIAL VULNERABILITIES AND MALICIOUS CODES WHICH CAN BE USED TO EXPLOIT THE SOFTWARE. THIS MUST BE REFERRED INTERNALLY AND ONLY SHOULD BE MADE AVAILABLE TO THE PUBLIC AFTER ISSUES ARE RESOLVED.

Introduction

EtherAuthority was contracted by CatoCoin to perform the Security audit of the CATO Token smart contract code. The audit was performed using manual analysis and automated software tools. This report presents all the findings regarding the audit performed on January 6th, 2025.

The purpose of this audit was to address the following:

- Ensure that all claimed functions exist and function correctly.
- Identify any security vulnerabilities that may be present in the smart contract.

Project Background

The Solidity code defines an ERC20 token named CatoCoin using OpenZeppelin's standard contracts. Here's a summary of the key points:

Key Points:

1. **OpenZeppelin Integration**:
    - The contract uses OpenZeppelin's ERC20, IERC20, and IERC20Metadata standards for implementation.
    - This ensures the token adheres to the ERC20 standard and provides functionalities like transferring tokens, approving allowances, and checking balances.
2. **Custom Token Details**:
    - **Name**: CatoCoin
    - **Symbol**: CATO
    - **Decimals**: Defaulted to 18 as specified in OpenZeppelin's ERC20 implementation.
3. **Initial Token Supply**:
    - The total supply is set to **10 billion tokens** (10,000,000,000), adjusted for 18 decimals (10**decimals()).
    - The entire supply is minted to the deployer's wallet (msg.sender).

4. **Code Simplicity**:
   - The token contract inherits all required functionality from OpenZeppelin's ERC20 base contract.
   - The constructor initializes the token name, symbol, and total supply without additional customization.

Audit scope

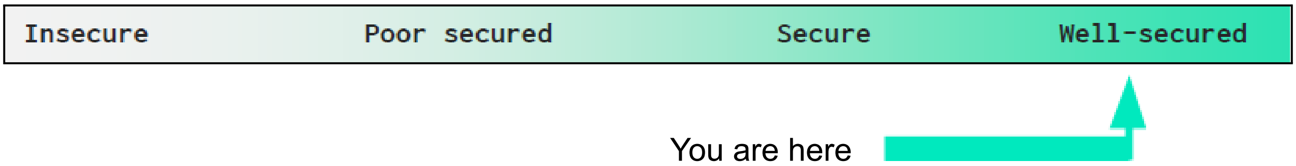
Name	Code Review and Security Analysis Report for CatoCoin Smart Contract
Platform	**Evolve Network / Solidity**
File	CatoCoin.sol
Smart Contract	0x0513CBFB9C21e72E0c2AF4314625d851f87f6845
Audit Date	January 6th, 2025

Claimed Smart Contract Features

Claimed Feature Detail	Our Observation
Token Details: • Name: CatoCoin • Symbol: CATO • Decimals: 18 • Total Supply: 10 billion	YES, This is valid.
Key Features: 1. **ERC-20 Compliance:** This contract implements the ERC-20 standard, allowing the token to be transferred between accounts, approve spending, and allow for checks of balances. 2. **Minting:** The constructor calls the _mint() function to create an initial supply of 10 billion tokens, which is assigned to the contract deployer's address. 3. **Decimals:** The token uses 18 decimal places by default, which is standard for many ERC-20 tokens.	YES, This is valid.
Other Specification: • This contract does not have any ownership control, hence it is 100% decentralized.	YES, This is valid.

Audit Summary

According to the standard audit assessment, Customer`s solidity-based smart contracts are **"Well Secured"**. This contract does not have any ownership control, hence it is 100% decentralized.



We used various tools like Slither, Solhint, and Remix IDE. At the same time, this finding is based on a critical analysis of the manual audit.
All issues found during automated analysis were manually reviewed and applicable vulnerabilities are presented in the Audit Overview section. The general overview is presented in the AS-IS section and all identified issues can be found in the Audit overview section.

We found 0 critical, 0 high, 0 medium, 0 low, and 0 very low-level issues.

Investor Advice: A technical audit of the smart contract does not guarantee the ethical nature of the project. Any owner-controlled functions should be executed by the owner with responsibility. All investors/users are advised to do their due diligence before investing in the project.

Technical Quick Stats

Main Category	Subcategory	Result
Contract Programming	The solidity version is not specified	Passed
	The solidity version is too old	Passed
	Integer overflow/underflow	Passed
	Function input parameters lack check	Passed
	Function input parameters check bypass	Passed
	Function access control lacks management	Passed
	Critical operation lacks event log	Passed
	Human/contract checks bypass	Passed
	Random number generation/use vulnerability	N/A
	Fallback function misuse	Passed
	Race condition	Passed
	Logical vulnerability	Passed
	Features claimed	Passed
	Other programming issues	Passed
Code Specification	Function visibility not explicitly declared	Passed
	Var. storage location not explicitly declared	Passed
	Use keywords/functions to be deprecated	Passed
	Unused code	Passed
Gas Optimization	"Out of Gas" Issue	Passed
	High consumption 'for/while' loop	Passed
	High consumption 'storage' storage	Passed
	Assert() misuse	Passed
Business Risk	The maximum limit for mintage is not set	Passed
	"Short Address" Attack	Passed
	"Double Spend" Attack	Passed

Overall Audit Result: PASSED

Business Risk Analysis

Category	Result
Buy Tax	0%
Sell Tax	0%
Cannot Buy	No
Cannot Sell	No
Max Tax	0%
Modify Tax	No
Fee Check	No
Is Honeypot	Not Detected
Trading Cooldown	Not Detected
Can Pause Trade?	No
Pause Transfer?	Not Detected
Max Transaction amount?	No
Is it Anti-whale?	Not Detected
Is Anti-bot?	Not Detected
Is it a Blacklist?	Not Detected
Blacklist Check	No
Can Mint?	No
Is it a Proxy?	No
Can Take Ownership?	No
Hidden Owner?	Not Detected
Self Destruction?	Not Detected
Auditor Confidence	High

Overall Audit Result: PASSED

Code Quality

This audit scope has 1 smart contract. Smart contracts contain Libraries, Smart contracts, inherits, and Interfaces. This is a compact and well-written smart contract.

The libraries in the CATO Token are part of its logical algorithm. A library is a different type of smart contract that contains reusable code. Once deployed on the blockchain (only once), it is assigned a specific address and its properties/methods can be reused many times by other contracts in the CATO Token.

The CatoCoin team has not provided scenario and unit test scripts, which would help to determine the integrity of the code automatically.

The smart contracts comment on code parts well, using Ethereum's NatSpec commenting style, which is a good thing.

Documentation

We were given a CATO Token smart contract code in the form of an evoexplorer weblink.

As mentioned above, the code parts are well commented on. And the logic is straightforward. So, it is easy to understand the programming flow and complex code logic quickly. Comments are very helpful in understanding the overall architecture of the protocol.

Use of Dependencies

As per our observation, the libraries used in this smart contract infrastructure are based on well-known industry standard open-source projects.

Apart from libraries, its functions are not used in external smart contract calls.

AS-IS overview

Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	name	read	Passed	No Issue
3	symbol	read	Passed	No Issue
4	decimals	read	Passed	No Issue
5	totalSupply	read	Passed	No Issue
6	balanceOf	read	Passed	No Issue
7	transfer	write	Passed	No Issue
8	allowance	read	Passed	No Issue
9	approve	write	Passed	No Issue
10	transferFrom	write	Passed	No Issue
11	decreaseAllowance	write	Passed	No Issue
12	increaseAllowance	write	Passed	No Issue
13	_transfer	internal	Passed	No Issue
14	_mint	internal	Passed	No Issue
15	_burn	internal	Passed	No Issue
16	_approve	internal	Passed	No Issue
17	_spendAllowance	internal	Passed	No Issue
18	_beforeTokenTransfer	internal	Passed	No Issue
19	_afterTokenTransfer	internal	Passed	No Issue

Severity Definitions

Risk Level	Description
Critical	Critical vulnerabilities are usually straightforward to exploit and can lead to token loss etc.
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
Medium	Medium-level vulnerabilities are important to fix; however, they can't lead to tokens lose
Low	Low-level vulnerabilities are mostly related to outdated, unused, etc. code snippets, that can't have a significant impact on execution
Lowest / Code Style / Best Practice	Lowest-level vulnerabilities, code style violations, and info statements can't affect smart contract execution and can be ignored.

Audit Findings

Critical Severity

No critical severity vulnerabilities were found.

High Severity

No high-severity vulnerabilities were found.

Medium

No medium-severity vulnerabilities were found.

Low

No low-severity vulnerabilities were found.

Very Low / Informational / Best practices:

No very low-severity vulnerabilities were found.

Centralization Risk

The CatoCoin Token smart contract does not have any ownership control, **hence it is 100% decentralized.**

Therefore, there is **no** centralization risk.

Conclusion

We were given a contract code as an evoexplorer weblink, and we used all possible tests based on the given objects. We have not observed any issues. **So, the smart contract is ready for mainnet deployment.**

Since possible test cases can be unlimited for such smart contracts protocol, we provide no such guarantee of future outcomes. We have used all the latest static tools and manual observations to cover the maximum possible test cases to scan everything.

Smart contracts within the scope were manually reviewed and analyzed with static analysis tools. Smart Contract's high-level description of functionality was presented in the As-is overview section of the report.

The audit report contains all security vulnerabilities and other issues found in the reviewed code.

The security state of the reviewed smart contract, based on standard audit procedure scope, is **"Well Secured".**

Our Methodology

We like to work with a transparent process and make our reviews a collaborative effort. The goals of our security audits are to improve the quality of the systems we review and aim for sufficient remediation to help protect users. The following is the methodology we use in our security audit process.

Manual Code Review:

In manually reviewing all of the code, we look for any potential issues with code logic, error handling, protocol and header parsing, cryptographic errors, and random number generators. We also watch for areas where more defensive programming could reduce the risk of future mistakes and speed up future audits. Although our primary focus is on the in-scope code, we examine dependency code and behavior when it is relevant to a particular line of investigation.

Vulnerability Analysis:

Our audit techniques included manual code analysis, user interface interaction, and white box penetration testing. We look at the project's website to get a high-level understanding of the functionality of the software under review. We then meet with the developers to gain an appreciation of their vision of the software. We install and use the relevant software, exploring the user interactions and roles. While we do this, we brainstorm threat models and attack surfaces. We read design documentation, review other audit results, search for similar projects, examine source code dependencies, skim open issue tickets, and generally investigate details other than the implementation.

Documenting Results:

We follow a conservative, transparent process for analyzing potential security vulnerabilities and seeing them through successful remediation. Whenever a potential issue is discovered, we immediately create an Issue entry for it in this document, even though we have not yet verified the feasibility and impact of the issue. This process is conservative because we document our suspicions early even if they are later shown to not represent exploitable vulnerabilities. We generally follow a process of first documenting the suspicion with unresolved questions, and then confirming the issue through code analysis, live experimentation, or automated tests. Code analysis is the most tentative, and we strive to provide test code, log captures, or screenshots demonstrating our confirmation. After this, we analyze the feasibility of an attack in a live system.

Suggested Solutions:

We search for immediate mitigations that live deployments can take, and finally, we suggest the requirements for remediation engineering for future releases. The mitigation and remediation recommendations should be scrutinized by the developers and deployment engineers, and successful mitigation and remediation is an ongoing collaborative process after we deliver our report, and before the details are made public.

Disclaimers

EtherAuthority.io Disclaimer

EtherAuthority team has analyzed this smart contract in accordance with the best industry practices at the date of this report, in relation to: cybersecurity vulnerabilities and issues in smart contract source code, the details of which are disclosed in this report, (Source Code); the Source Code compilation, deployment, and functionality (performing the intended functions).

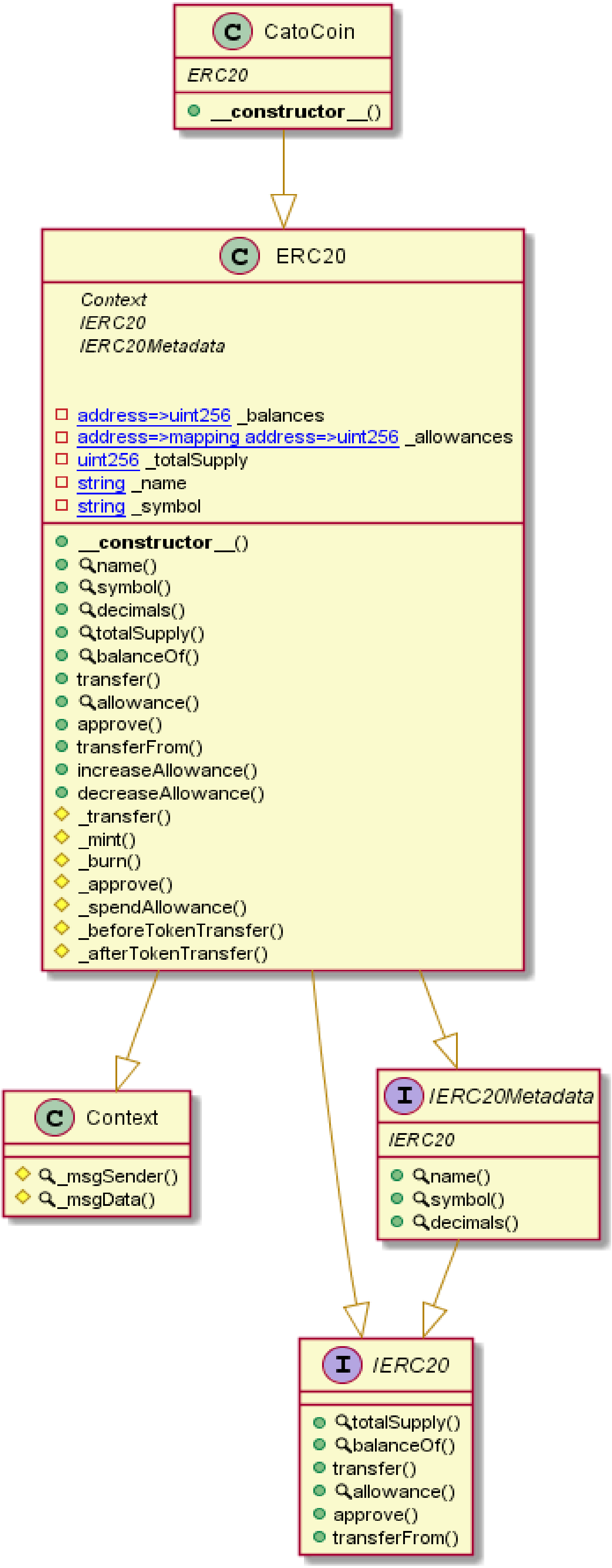
Due to the fact that the total number of test cases is unlimited, the audit makes no statements or warranties on the security of the code. It also cannot be considered a sufficient assessment regarding the utility and safety of the code, bug-free status, or any other statements of the contract. While we have done our best to conduct the analysis and produce this report, it is important to note that you should not rely on this report only. We also suggest conducting a bug bounty program to confirm the high level of security of this smart contract.

Technical Disclaimer

Smart contracts are deployed and executed on the blockchain platform. The platform, its programming language, and other software related to the smart contract can have their own vulnerabilities that can lead to hacks. Thus, the audit can't guarantee the explicit security of the audited smart contracts.

Appendix

Code Flow Diagram - CatoCoin



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Slither Results Log

Slither Log >> CatoCoin.sol

```
INFO:Detectors:
CatoCoin.constructor().totalSupply (CatoCoin.sol#535) shadows:
	- ERC20.totalSupply() (CatoCoin.sol#230-232) (function)
	- IERC20.totalSupply() (CatoCoin.sol#54) (function)
Reference:
https://github.com/crytic/slither/wiki/Detector-Documentation#local-variable-shadowing
INFO:Detectors:
Context._msgData() (CatoCoin.sol#22-24) is never used and should be removed
ERC20._burn(address,uint256) (CatoCoin.sol#421-437) is never used and should be removed
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code
INFO:Detectors:
Version constraint 0.8.19 contains known severe issues
(https://solidity.readthedocs.io/en/latest/bugs.html)
	- VerbatimInvalidDeduplication
	- FullInlinerNonExpressionSplitArgumentEvaluationOrder
	- MissingSideEffectsOnSelectorAccess.
It is used by:
	- 0.8.19 (CatoCoin.sol#5)
Reference:
https://github.com/crytic/slither/wiki/Detector-Documentation#incorrect-versions-of-solidity
INFO:Detectors:
CatoCoin.constructor() (CatoCoin.sol#533-539) uses literals with too many digits:
	- totalSupply = 10000000000 (CatoCoin.sol#535)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#too-many-digits
INFO:Slither:CatoCoin.sol analyzed (5 contracts with 93 detectors), 5 result(s) found
```

Solidity Static Analysis

CatoCoin.sol

Gas costs:
Gas requirement of function CatoCoin.transfer is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)
Pos: 249:4:

Gas costs:
Gas requirement of function CatoCoin.increaseAllowance is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)
Pos: 317:4:

Gas costs:
Gas requirement of function CatoCoin.decreaseAllowance is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)
Pos: 337:4:

Constant/View/Pure functions:
ERC20._afterTokenTransfer(address,address,uint256) : Potentially should be constant/view/pure but is not.
Pos: 520:4:

Similar variable names:
ERC20._mint(address,uint256) : Variables have very similar names "account" and "amount".
Pos: 405:43:

Solhint Linter

CatoCoin.sol

```
Compiler version 0.8.19 does not satisfy the ^0.5.8 semver
requirement
Pos: 1:4
Explicitly mark visibility in function (Set ignoreConstructors to
true if using solidity >=0.7.0)
Pos: 5:189
Error message for require is too long
Pos: 9:339
Error message for require is too long
Pos: 9:366
Error message for require is too long
Pos: 9:367
Error message for require is too long
Pos: 9:372
Error message for require is too long
Pos: 9:421
Error message for require is too long
Pos: 9:426
Error message for require is too long
Pos: 9:456
Error message for require is too long
Pos: 9:457
Code contains empty blocks
Pos: 24:503
Code contains empty blocks
Pos: 24:523
Explicitly mark visibility in function (Set ignoreConstructors to
true if using solidity >=0.7.0)
Pos: 5:532
```

Software analysis result:

This software reported many false positive results and some are informational issues. So, those issues can be safely ignored.

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