Republic Token

AUDIT REPORT

Version 1.0.0

Serial No. 20230329000012024

Presented by Fairyproof

March 29, 2023

01. Introduction

This document includes the results of the audit performed by the Fairyproof team on the Republic's token issuance project.

Audit Start Time:

March 24, 2023

Audit End Time:

March 27, 2023

Audited Source File's Address:

https://etherscan.io/token/0x408e41876cccdc0f92210600ef50372656052a38#code

The goal of this audit is to review Republic's solidity implementation for its token issuance function, study potential security vulnerabilities, its general design and architecture, and uncover bugs that could compromise the software in production.

We make observations on specific areas of the code that present concrete problems, as well as general observations that traverse the entire codebase horizontally, which could improve its quality as a whole.

This audit only applies to the specified code, software or any materials supplied by the Republic team for specified versions. Whenever the code, software, materials, settings, environment etc is changed, the comments of this audit will no longer apply.

— Disclaimer

Note that as of the date of publishing, the contents of this report reflect the current understanding of known security patterns and state of the art regarding system security. You agree that your access and/or use, including but not limited to any associated services, products, protocols, platforms, content, and materials, will be at your sole risk.

The review does not extend to the compiler layer, or any other areas beyond the programming language, or other programming aspects that could present security risks. If the audited source files are smart contract files, risks or issues introduced by using data feeds from off-chain sources are not extended by this review either.

Given the size of the project, the findings detailed here are not to be considered exhaustive, and further testing and audit is recommended after the issues covered are fixed.

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— Methodology

The above files' code was studied in detail in order to acquire a clear impression of how the its specifications were implemented. The codebase was then subject to deep analysis and scrutiny, resulting in a series of observations. The problems and their potential solutions are discussed in this document and, whenever possible, we identify common sources for such problems and comment on them as well.

The Fairyproof auditing process follows a routine series of steps:

1. Code Review, Including:

- Project Diagnosis

Understanding the size, scope and functionality of your project's source code based on the specifications, sources, and instructions provided to Fairyproof.

- Manual Code Review

Reading your source code line-by-line to identify potential vulnerabilities.

- Specification Comparison

Determining whether your project's code successfully and efficiently accomplishes or executes its functions according to the specifications, sources, and instructions provided to Fairyproof.

2. Testing and Automated Analysis, Including:

- Test Coverage Analysis

Determining whether the test cases cover your code and how much of your code is exercised or executed when test cases are run.

- Symbolic Execution

Analyzing a program to determine the specific input that causes different parts of a program to execute its functions.

3. Best Practices Review

Reviewing the source code to improve maintainability, security, and control based on the latest established industry and academic practices, recommendations, and research.

— Structure of the document

This report contains a list of issues and comments on all the above source files. Each issue is assigned a severity level based on the potential impact of the issue and recommendations to fix it, if applicable. For ease of navigation, an index by topic and another by severity are both provided at the beginning of the report.

— Documentation

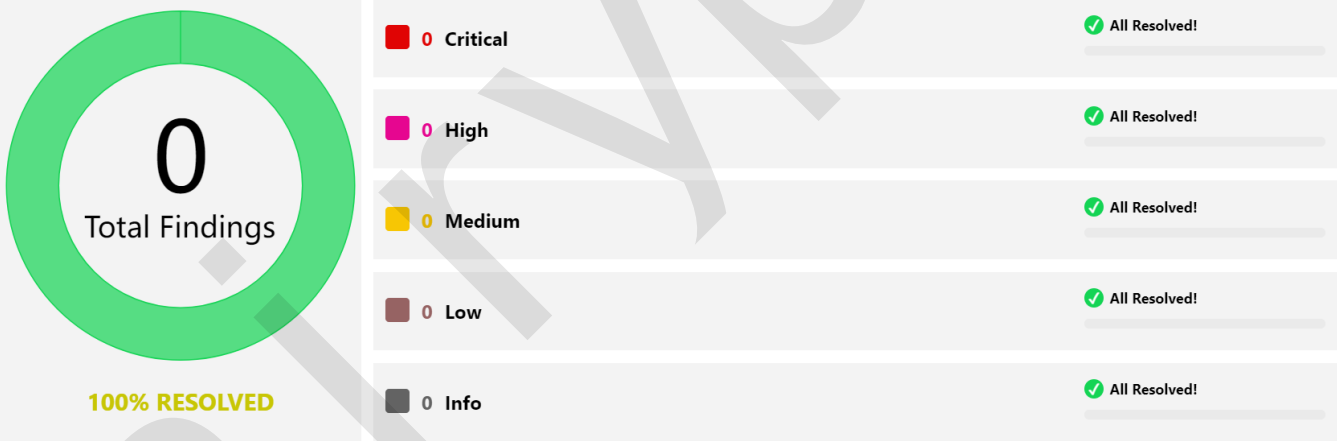
For this audit, we used the following source(s) of truth about how the token issuance function should work:

Source Code: https://etherscan.io/token/0x408e41876cccdc0f92210600ef50372656052a38#code

This was considered the specification, and when discrepancies arose with the actual code behavior, we consulted with the Republic team or reported an issue.

— Comments from Auditor

Serial Number	Auditor	Audit Time	Result
2023032900012024	Fairyproof Security Team	Mar 24, 2023 - Mar 27, 2023	Passed



Summary:

The Fairyproof security team used its auto analysis tools and manual work to audit the project. During the audit, no issues were uncovered.

02. About Fairyproof

Fairyproof is a leading technology firm in the blockchain industry, providing consulting and security audits for organizations. Fairyproof has developed industry security standards for designing and deploying blockchain applications.

03. Introduction to RepublicToken

Ren (REN) is an open protocol built to provide interoperability and liquidity between different blockchain platforms.

The protocol's native token, REN, functions as a bond for those running nodes which power RenVM, known as Darknodes.

Ren aims to expand the interoperability, and hence accessibility, of decentralized finance (DeFi) by removing hurdles involved in liquidity between blockchains

The above description is quoted from relevant documents of Republic.

04. Major functions of audited code

The audited code mainly implements a token issuance function. Here are the details:

- Blockchain: Ethereum
- Token Standard: ERC-20
- Token Address: 0x408e41876cccdc0f92210600ef50372656052a38
- Token Name: Republic Token
- Token Symbol: REN
- Decimals: 18
- Current Supply: 999,999,633
- Max Supply: 1,000,000,000
- Burnable: Yes
- Mintable: Yes
- Pausable: Yes

Note:

The access control of owner has been revoked.

05. Coverage of issues

The issues that the Fairyproof team covered when conducting the audit include but are not limited to the following ones:

- Access Control
- Admin Rights
- Arithmetic Precision
- Code Improvement
- Contract Upgrade/Migration
- Delete Trap
- Design Vulnerability
- DoS Attack
- EOA Call Trap
- Fake Deposit
- Function Visibility
- Gas Consumption
- Implementation Vulnerability
- Inappropriate Callback Function
- Injection Attack
- Integer Overflow/Underflow
- IsContract Trap
- Miner's Advantage
- Misc
- Price Manipulation
- Proxy selector clashing
- Pseudo Random Number
- Re-entrancy Attack
- Replay Attack
- Rollback Attack
- Shadow Variable
- Slot Conflict
- Token Issuance
- Tx.origin Authentication
- Uninitialized Storage Pointer

06. Severity level reference

Every issue in this report was assigned a severity level from the following:

Critical severity issues need to be fixed as soon as possible.

High severity issues will probably bring problems and should be fixed.

Medium severity issues could potentially bring problems and should eventually be fixed.

Low severity issues are minor details and warnings that can remain unfixed but would be better fixed at some point in the future.

Informational is not an issue or risk but a suggestion for code improvement.

07. Major areas that need attention

Based on the provided source code the Fairyproof team focused on the possible issues and risks related to the following functions or areas.

- Function Implementation

We checked whether or not the functions were correctly implemented.
We didn't find issues or risks in these functions or areas at the time of writing.

- Access Control

We checked each of the functions that could modify a state, especially those functions that could only be accessed by owner or administrator
We didn't find issues or risks in these functions or areas at the time of writing.

- Token Issuance & Transfer

We examined token issuance and transfers for situations that could harm the interests of holders.
We didn't find issues or risks in these functions or areas at the time of writing.

- State Update

We checked some key state variables which should only be set at initialization.
We didn't find issues or risks in these functions or areas at the time of writing.

- Asset Security

We checked whether or not all the functions that transfer assets were safely handled.
We didn't find issues or risks in these functions or areas at the time of writing.

- Miscellaneous

We checked the code for optimization and robustness.
We didn't find issues or risks in these functions or areas at the time of writing.

08. issues by severity

- N/A

09. Issue descriptions

- N/A

10. Recommendations to enhance the overall security

We list some recommendations in this section. They are not mandatory but will enhance the overall security of the system if they are adopted.

- N/A

11. Appendices

11.1 Unit Test

1. Ren

```
const{
    time,
    loadFixture,
} = require("@nomicfoundation/hardhat-network-helpers");
const { expect, assert } = require("chai");
const { ethers } = require("hardhat")

describe("RepublicToken Uint Test", function(){
    async function deployRebFixture(){
        const DECIMALS = 18;
        const INITIAL_SUPPLY = ethers.utils.parseEther("1000000000");
        const Zero_Address = ethers.constants.AddressZero;


        const [owner, user1, user2] = await ethers.getSigners();
        const RepublicToken = await ethers.getContractFactory("RepublicToken");
        const instance = await RepublicToken.deploy();
        return {owner, instance, user1,user2,Zero_Address, INITIAL_SUPPLY,};
    }

    describe("Deployment on ethereumn chain", function(){
        it("Initial state should be equal with params of constructor", async function(){
            const {owner,instance,user1,Zero_Address, INITIAL_SUPPLY} = await
loadFixture(deployRebFixture);
            expect(await instance.name()).to.equal("Republic Token");
            expect(await instance.symbol()).to.equal("REN");
            expect(await instance.decimals()).to.equal(18);
            expect(await instance.totalSupply()).to.equal(INITIAL_SUPPLY);
            expect(await instance.balanceOf(owner.address)).to.equal(INITIAL_SUPPLY);
            expect(await instance.owner()).to.equal(owner.address);
            expect(await instance.paused()).to.equal(false);


        })

    });

    describe("Approve and Transfer uint test", function() {
        it("Transfer uint test", async function(){
            const {owner, instance, user1, user2,INITIAL_SUPPLY} = await
loadFixture(deployRebFixture);
            transferAmount = ethers.utils.parseEther("10000")
            await expect( instance.transfer(user1.address,
transferAmount)).to.emit(instance,"Transfer")
```

```
            .withArgs(owner.address, user1.address, transferAmount);
            expect(await instance.balanceOf(user1.address)).equal(transferAmount);
            expect(await
instance.balanceOf(owner.address)).equal(INITIAL_SUPPLY.sub(transferAmount));
        });

        it("IncreaseApproval uint test", async function(){
            const {owner, instance, user1, user2,INITIAL_SUPPLY} = await
loadFixture(deployRebFixture);
            transferAmount = ethers.utils.parseEther("10000")
            await expect(instance.transfer(user1.address,
transferAmount)).to.emit(instance,"Transfer")
            .withArgs(owner.address, user1.address, transferAmount);
            expect(await instance.balanceOf(user1.address)).equal(transferAmount);
            expect(await
instance.balanceOf(owner.address)).equal(INITIAL_SUPPLY.sub(transferAmount));

            // IncreaseApproval
            const firstApproveAmount = ethers.utils.parseEther("5000");
            expect( await instance.connect(user1).approve(user2.address,
firstApproveAmount)).to.emit(instance,"Approval")
            .withArgs(user1.address, user2.address, firstApproveAmount);
            expect(await
instance.allowance(user1.address,user2.address)).to.equal(firstApproveAmount);

            const secondApproveAmount = ethers.utils.parseEther("5001");
            await expect(instance.connect(user1).increaseApproval(user2.address,
secondApproveAmount)).to.emit(instance,"Approval")
            .withArgs(user1.address, user2.address,
firstApproveAmount.add(secondApproveAmount));

        });

        it("decreaseApproval uint test", async function(){
            const {owner, instance, user1, user2,INITIAL_SUPPLY} = await
loadFixture(deployRebFixture);
            await expect(instance.approve(user1.address, 100)).to.emit(instance,
"Approval")
            .withArgs(owner.address, user1.address, 100);

            await expect(instance.decreaseApproval(user1.address, 10)).to.emit(instance,
"Approval")
            .withArgs(owner.address, user1.address, 90);

        });

       it("transferFrom uint test", async function(){
            const {owner, instance, user1, user2,INITIAL_SUPPLY} = await
loadFixture(deployRebFixture);
            await expect(instance.approve(user1.address, 100)).to.emit(instance,
"Approval")
            .withArgs(owner.address, user1.address, 100);
```

```
            await expect(instance.connect(user1).transferFrom(owner.address, user2.address,
50)).
            to.emit(instance, "Transfer").withArgs(owner.address, user2.address, 50);

            expect(await instance.allowance(owner.address, user1.address)).to.equal(50);

        });


    });

    describe("Burn uint test", function(){
        it("burn test", async function(){
            const {owner, instance, user1, user2,INITIAL_SUPPLY} = await
loadFixture(deployRebFixture);
            await expect(instance.burn(100)).to.emit(instance,
"Burn").withArgs(owner.address, 100);
            expect(await instance.totalSupply()).to.equal(INITIAL_SUPPLY.sub(100));

            await expect(instance.transfer(user1.address, 100)).to.emit(instance,
"Transfer")
            .withArgs(owner.address,user1.address,100)
            await expect(instance.connect(user1).burn(50)).to.emit(instance,
"Burn").withArgs(user1.address, 50);
            expect(await instance.balanceOf(user1.address)).to.equal(100-50);
            expect(await instance.totalSupply()).to.equal(INITIAL_SUPPLY.sub(100+50));

        })
    })
    describe("OnlyOwner uint test", function(){
        it("transferOwnership test", async function(){
            const {owner, instance, user1, user2,INITIAL_SUPPLY} = await
loadFixture(deployRebFixture);
            await expect(instance.transferOwnership(user1.address)).to.emit(instance,
"OwnershipTransferred")
            .withArgs(owner.address, user1.address);

            await
expect(instance.connect(user2).transferOwnership(user1.address)).to.reverted;
        });

        it("pause test", async function(){
            const {owner, instance, user1, user2,INITIAL_SUPPLY} = await
loadFixture(deployRebFixture);
            expect(await instance.paused()).to.equal(false);
            await expect(instance.connect(user1).pause()).to.reverted;
            await expect(instance.pause()).to.emit(instance, "Pause").withArgs();
            expect(await instance.paused()).to.equal(true);

            //paused then transfer()
            await expect( instance.transfer(user1.address, 100)).to.reverted;

        })
```

```
        it("unpause test", async function(){
            const {owner, instance, user1, user2,INITIAL_SUPPLY} = await
loadFixture(deployRebFixture);
            expect(await instance.paused()).to.equal(false);
            await expect(instance.connect(user1).pause()).to.reverted;
            await expect(instance.pause()).to.emit(instance, "Pause").withArgs();
            expect(await instance.paused()).to.equal(true);

            await expect(instance.unpause()).to.emit(instance, "Unpause").withArgs();
            expect(await instance.paused()).to.equal(false);

        })

        it("transferTokens test", async function(){
            const {owner, instance, user1, user2,INITIAL_SUPPLY} = await
loadFixture(deployRebFixture);
            await expect(instance.transferTokens(user1.address, 100)).to.emit(instance,
"Transfer")
            .withArgs(owner.address, user1.address, 100);
            expect(await instance.balanceOf(user1.address)).to.equal(100);

        })


    })

})
```

11.2 External Functions Check Points

1. Ren.md

File: ren_token/contracts/Ren.sol

(Empty fields in the table represent things that are not required or relevant)

contract: RepublicToken is PausableToken, BurnableToken

Index	Function	Visibility	StateMutability	Permission Check	IsUserInterface	Unit Test	Notes
1	name(string)	public	constant			pass	
2	symbol(string)	public	constant			pass	
3	decimals(uint256)	public	constant			pass	
4	totalSupply(string)	public				pass	
5	INITIAL_SUPPLY(uint256)	public	constant			pass	

Index	Function	Visibility	StateMutability	Permission Check	IsUserInterface	Unit Test	Notes
6	balances(mapping(address => uint256))					pass	
7	transferTokens(address,uint256)	public		onlyOwner		pass	
8	burn(uint256)	public			true	pass	
9	transferFrom(address,address,uint256)	public			true	pass	whenNotPaused
10	approve(address,uint256)	public			true	pass	whenNotPaused
11	allowance(address,address)	public	view			pass	
12	increaseApproval(address,uint)	public			true	pass	whenNotPaused
13	decreaseApproval(address,uint)	public			true	pass	whenNotPaused
14	transfer(address,uint256)	public			true	pass	whenNotPaused
15	balanceOf(address)	public	view			pass	
16	pause()	public		onlyOwner		pass	whenNotPaused
17	unpause()	public		onlyOwner		pass	whenPaused
18	transferOwnership(address)	public		onlyOwner		pass	

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