Security Assessment

Betero

Apr 6th, 2022

Table of Contents

Summary

This report has been prepared for Betero to discover issues and vulnerabilities in the source code of the Betero project as well as any contract dependencies that were not part of an officially recognized library. A comprehensive examination has been performed, utilizing Static Analysis and Manual Review techniques.

The auditing process pays special attention to the following considerations:

- Testing the smart contracts against both common and uncommon attack vectors.
- Assessing the codebase to ensure compliance with current best practices and industry standards.
- Ensuring contract logic meets the specifications and intentions of the client.
- Cross referencing contract structure and implementation against similar smart contracts produced by industry leaders.
- Thorough line-by-line manual review of the entire codebase by industry experts.

The security assessment resulted in findings that ranged from critical to informational. We recommend addressing these findings to ensure a high level of security standards and industry practices. We suggest recommendations that could better serve the project from the security perspective:

- Enhance general coding practices for better structures of source codes;
- Add enough unit tests to cover the possible use cases;
- Provide more comments per each function for readability, especially contracts that are verified in public;
- Provide more transparency on privileged activities once the protocol is live.

Overview

Project Summary

Project Name	Betero
Platform	Ethereum
Language	Solidity
Codebase	https://etherscan.io/address/0x73B708E84837FFCcDE2933e3A1531fe61D5e80Ef#code
Commit	

Audit Summary

Delivery Date	Apr 06, 2022 UTC
Audit Methodology	Static Analysis, Manual Review

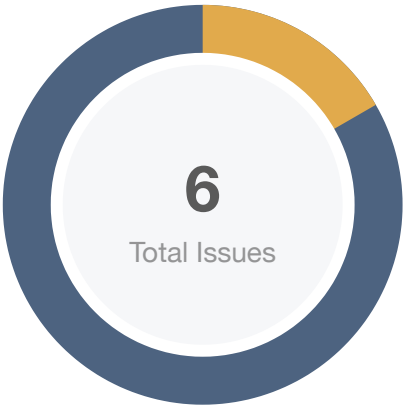
Vulnerability Summary

Vulnerability Level	Total	Pending	Declined	Acknowledged	Mitigated	Partially Resolved	Resolved
Critical	0	0	0	0	0	0	0
Major	0	0	0	0	0	0	0
Medium	1	0	0	0	0	0	1
Minor	0	0	0	0	0	0	0
Informational	5	0	0	5	0	0	0
Discussion	0	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
BCK	Betero.sol	7a9127a1c6c77c7248facb2547604cbfc097214aa8367dceb149845a0182cb10

Findings



Critical	**0** (0.00%)
Major	**0** (0.00%)
Medium	**1** (16.67%)
Minor	**0** (0.00%)
Informational	**5** (83.33%)
Discussion	**0** (0.00%)

ID	Title	Category	Severity	Status
BCK-01	Initial Token Distribution	**Centralization / Privilege**	**Medium**	Resolved
BCK-02	Improper Usage of `public` and `external` Type	Coding Style	Informational	Acknowledged
BCK-03	Unlocked Compiler Version	Language Specific	Informational	Acknowledged
BCK-04	Variables That Could Be Declared as Immutable	Gas Optimization	Informational	Acknowledged
BCK-05	Redundant Code Components	Volatile Code	Informational	Acknowledged
BCK-06	Ambiguous Use of `virtual`	Language Specific	Informational	Acknowledged

BCK-01 | Initial Token Distribution

Category	Severity	Location	Status
Centralization / Privilege	**Medium**	Betero.sol: 304	Resolved

Description

All of the 2,500,000,000 Ether tokens are sent to the contract deployer when deploying the contract. This could be a centralization risk as the deployer can distribute all tokens without obtaining the consensus of the community.

Recommendation

We recommend the team to be transparent regarding the initial token distribution process, and the team shall make enough efforts to restrict the access of the private key.

Alleviation

[Betero Team]: "We locked all tokens of the team and different reserves on Unicrypt as described in our Litepaper.

The full details: https://medium.com/@Beterocoin/team-token-vesting-unicrypt-698e4973c826

The transaction:
https://etherscan.io/tx/0x6c2b63f0fa889b04c7eeac2640b6ac2b5d2e19745543cdf136037710f6bc26b8

Only sold tokens in the presales are unlocked and a small amount to top up or staking contracts when it starts in a week."

BCK-02 | Improper Usage Of `public` And `external` Type

Category	Severity	Location	Status
Coding Style	Informational	Betero.sol: 397, 416, 435	Acknowledged

Description

`public` functions that are never called by the contract could be declared as `external`.

Recommendation

Consider using the external attribute for public functions that are never called within the contract.

Alleviation

The team acknowledged this issue and they will leave it as it is for now.

BCK-03 | Unlocked Compiler Version

Category	Severity	Location	Status
Language Specific	● Informational	Betero.sol: 5	ⓘ Acknowledged

Description

The contract has unlocked compiler version. An unlocked compiler version in the source code of the contract 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 different compiler versions. This can lead to an ambiguity when debugging as compiler specific bugs may occur in the codebase that would be hard to identify over a span of multiple compiler versions rather than a specific one.

Recommendation

We advise that the compiler version is instead locked at the lowest version possible that the contract can be compiled at. For example, for version `v0.6.2` the contract should contain the following line:

```
pragma solidity 0.6.2;
```

Alleviation

The team acknowledged this issue and they will leave it as it is for now.

BCK-04 | Variables That Could Be Declared As Immutable

Category	Severity	Location	Status
Gas Optimization	Informational	Betero.sol: 295	Acknowledged

Description

The linked variables assigned in the constructor can be declared as `immutable`. Immutable state variables can be assigned during contract creation but will remain constant throughout the lifetime of a deployed contract. A big advantage of immutable variables is that reading them is significantly cheaper than reading from regular state variables since they will not be stored in storage.

Recommendation

We recommend declaring these variables as immutable. Please note that the `immutable` keyword only works in Solidity version `v0.6.5` and up.

Alleviation

The team acknowledged this issue and they will leave it as it is for now.

BCK-05 | Redundant Code Components

Category	Severity	Location	Status
Volatile Code	Informational	Betero.sol: 217~285, 308~311	Acknowledged

Description

The contract `Betero` inherits `Ownable` but does not use the owner role. The linked statements do not affect the functionality of the codebase and appear to be either leftovers from test code or older functionality.

Recommendation

We advise to remove the redundant statements for production environments.

Alleviation

The team acknowledged this issue and they will leave it as it is for now.

BCK-06 | Ambiguous Use Of `virtual`

Category	Severity	Location	Status
Language Specific	Informational	Betero.sol: 445, 460	Acknowledged

Description

The linked functions are not expected to be overridden, hence rendering the use of the keyword `virtual` redundant.

Recommendation

We advise to remove redundant code.

Alleviation

The team acknowledged this issue and they will leave it as it is for now.

Appendix

Finding Categories

Centralization / Privilege

Centralization / Privilege findings refer to either feature logic or implementation of components that act against the nature of decentralization, such as explicit ownership or specialized access roles in combination with a mechanism to relocate funds.

Gas Optimization

Gas Optimization findings do not affect the functionality of the code but generate different, more optimal EVM opcodes resulting in a reduction on the total gas cost of a transaction.

Volatile Code

Volatile Code findings refer to segments of code that behave unexpectedly on certain edge cases that may result in a vulnerability.

Language Specific

Language Specific findings are issues that would only arise within Solidity, i.e. incorrect usage of private or delete.

Coding Style

Coding Style findings usually do not affect the generated byte-code but rather comment on how to make the codebase more legible and, as a result, easily maintainable.

Checksum Calculation Method

The "Checksum" field in the "Audit Scope" section is calculated as the SHA-256 (Secure Hash Algorithm 2 with digest size of 256 bits) digest of the content of each file hosted in the listed source repository under the specified commit.

The result is hexadecimal encoded and is the same as the output of the Linux "sha256sum" command against the target file.

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