Code Security Assessment

BIT ONE

Feb 16th, 2022

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Disclaimer

About

Summary

This report has been prepared for BIT ONE to discover issues and vulnerabilities in the source code of the BIT ONE 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	BIT ONE
Platform	Tron
Language	Solidity
Codebase	https://tronscan.io/#/token20/TYv86XUwR18xh7iGKEPQbxyKZTGcBVpBrf/code (preliminary report) https://tronscan.org/#/token20/TJhfYTHKrpavuCpDG2GXyf9c8eQTeKhLDZ/code (final report)
Commit	TYv86XUwR18xh7iGKEPQbxyKZTGcBVpBrf TJhfYTHKrpavuCpDG2GXyf9c8eQTeKhLDZ

Audit Summary

Delivery Date	Feb 16, 2022
Audit Methodology	Static Analysis, Manual Review

Vulnerability Summary

Vulnerability Level	Total	Pending	Declined	Acknowledged	Partially Resolved	Mitigated	Resolved
Critical	3	0	0	0	0	0	3
Major	2	0	0	1	0	0	1
Medium	0	0	0	0	0	0	0
Minor	0	0	0	0	0	0	0
Informational	1	0	0	0	0	0	1
Discussion	0	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
BIO	BIO.sol	e256255580b400444bcdb0238fcf8b5ad8645549659ed9806faf35ecd9c2ff42
BIC	BIO.sol	3ca8a897cb2b42c01d5ff5e584b0ad3a24d4bee7a215098ec55e028f84ac6d7f
BIB	BIO.sol	10d498a9798c7d3c9a9c1098c9ba32efe54443f11d91a1c6147f9d62dad39ff0

In the contract, it is noted that `BIO`, the role, `_owner`, has authority over the functions:

- Burn anyone's tokens.
- Mint any amount of tokens to anyone.

Findings

Critical	**3** (50.00%)
Major	**2** (33.33%)
Medium	**0** (0.00%)
Minor	**0** (0.00%)
Informational	**1** (16.67%)
Discussion	**0** (0.00%)

ID	Title	Category	Severity	Status
BIO-01	Initial Token Distribution	**Centralization / Privilege**	**Major**	Resolved
BIO-02	Potential Logic Flaw in `transfer` and `transferFrom`	Logical Issue	Critical	Resolved
BIO-03	Public Functions `mint()` and `burn()`	Control Flow	Critical	Resolved
BIO-04	Centralization Risk in BIO.sol	**Centralization / Privilege**	**Major**	Acknowledged
BIO-05	Unlocked compiler version	Language Specific	Informational	Resolved
BIO-06	Wrong calculation of `_totalSupply`	Logical Issue	Critical	Resolved

BIO-01 | Initial Token Distribution

Category	Severity	Location	Status
Centralization / Privilege	**Major**	BIO.sol (v1): 236~238	Resolved

Description

All of the `BIO` tokens are sent to the `account` when deploying the contract. This could be a centralization risk as the deployer can distribute `BIO` 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

The development team heeded our advice and resolved this issue in the contract whose sha256 value is 3ca8a897cb2b42c01d5ff5e584b0ad3a24d4bee7a215098ec55e028f84ac6d7f by deleting relative codes.

BIO-02 | Potential Logic Flaw In `transfer` And `transferFrom`

Category	Severity	Location	Status
Logical Issue	Critical	BIO.sol (v1): 279~287, 265~268	Resolved

Description

In the `transfer(address recipient, uint256 amount)` function and the `transferFrom(address sender, address recipient, uint256 amount)` function, none of tokens will be transferred from the sender to the recipient.

Recommendation

We advise the client to revisit the function and update transfer logic properly.

Alleviation

The development team heeded our advice and resolved this issue in the contract whose sha256 value is 3ca8a897cb2b42c01d5ff5e584b0ad3a24d4bee7a215098ec55e028f84ac6d7f.

BIO-03 | Public Functions `mint()` And `burn()`

Category	Severity	Location	Status
Control Flow	Critical	BIO.sol (v1): 299~307	Resolved

Description

The aforementioned function `mint()` and `burn()` are public to anyone, so a user can call them to mint tokens to anyone and burn anyone's tokens.

Recommendation

We recommend adding access control for these functions. As bellow:

1. Only the privileged account can mint tokens.
2. Everyone can only burn their owned tokens.

Reference:

- Ownable.sol
- function-modifiers

Alleviation

The development team heeded our advice and resolved this issue in the contract whose sha256 value is 10d498a9798c7d3c9a9c1098c9ba32efe54443f11d91a1c6147f9d62dad39ff0.

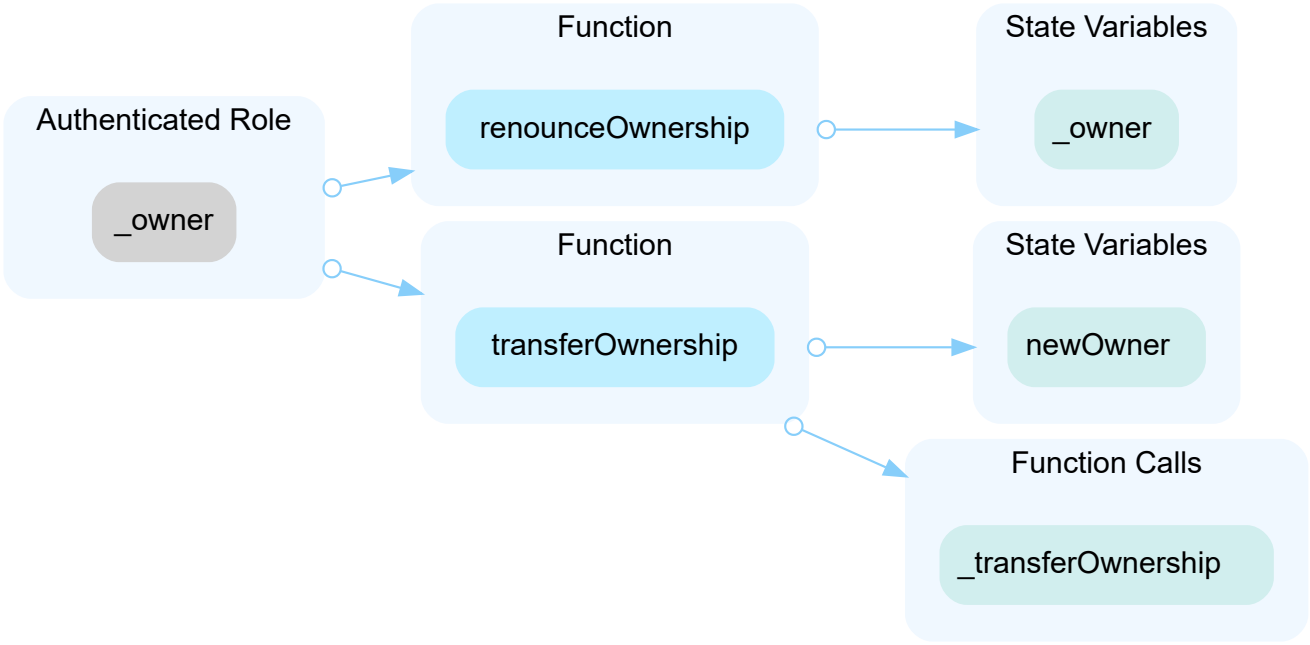
BIO-04 | Centralization Risk In BIO.sol

Category	Severity	Location	Status
Centralization / Privilege	**Major**	BIO.sol (v1): 108~111, 113~115, 166~170, 172~176, 197~201, 203~207	Acknowledged

Description

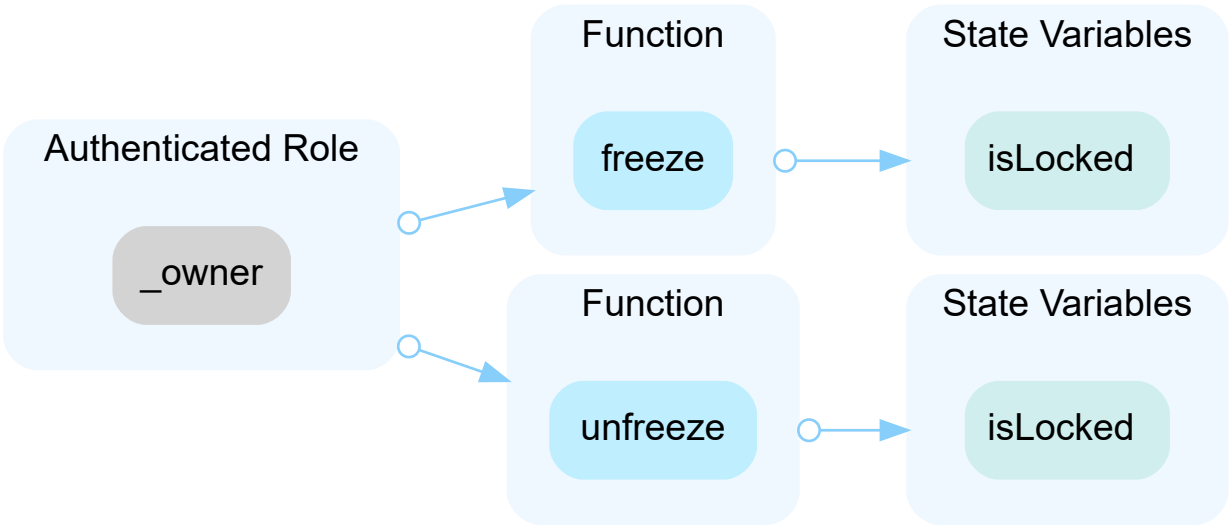
In the contract, `Ownable`, the role, `_owner`, has authority over the functions shown in the diagram below.

Any compromise to the `_owner` account may allow the hacker to take advantage of this authority.



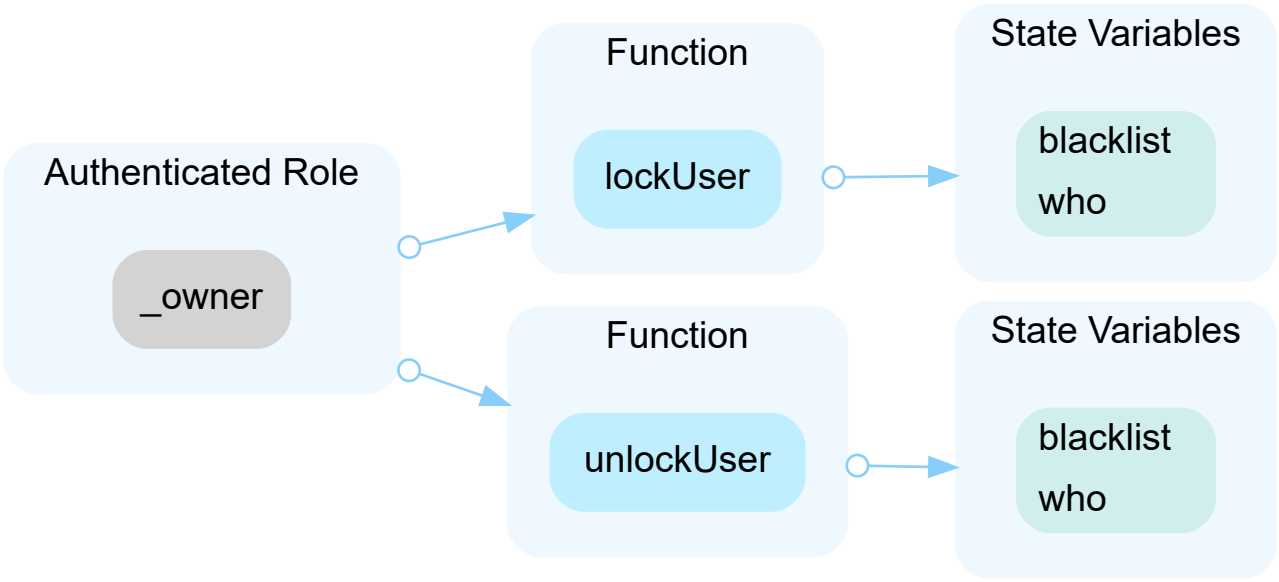
In the contract, `Tokenlock`, the role, `_owner`, has authority over the functions shown in the diagram below.

Any compromise to the `_owner` account may allow the hacker to take advantage of this authority and lock/unlock the contract.



In the contract, `UserLock`, the role, `_owner`, has authority over the functions shown in the diagram below.

Any compromise to the `_owner` account may allow the hacker to take advantage of this authority and add/remove a blacklisted member.



In the contract, `BIO`, the role, `_owner`, has authority over the functions:

- Burn anyone's tokens.
- Mint any amount of tokens to anyone.

Any compromise to the `_owner` account may allow the hacker to take advantage of this authority and add/remove a blacklisted member.

Recommendation

The risk describes the current project design and potentially makes iterations to improve in the security operation and level of decentralization, which in most cases cannot be resolved entirely at the present stage. We advise the client to carefully manage the privileged account's private key to avoid any potential risks of being hacked. In general, we strongly recommend centralized privileges or roles in the protocol be improved via a decentralized mechanism or smart-contract-based accounts with enhanced security practices, e.g., multisignature wallets.

Indicatively, here are some feasible suggestions that would also mitigate the potential risk at a different level in terms of short-term, long-term and permanent:

Short Term:

Timelock and Multi sign (⅔, ⅗) combination *mitigate* by delaying the sensitive operation and avoiding a single point of key management failure.

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
  AND
- Assignment of privileged roles to multi-signature wallets to prevent a single point of failure due to the private key compromised;
  AND
- A medium/blog link for sharing the timelock contract and multi-signers addresses information with the public audience.

Long Term:

Timelock and DAO, the combination, *mitigate* by applying decentralization and transparency.

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
  AND
- Introduction of a DAO/governance/voting module to increase transparency and user involvement.
  AND
- A medium/blog link for sharing the timelock contract, multi-signers addresses, and DAO information with the public audience.

Permanent:

Renouncing the ownership or removing the function can be considered *fully resolved*.

- Renounce the ownership and never claim back the privileged roles.
  OR
- Remove the risky functionality.

Alleviation

No alleviation.

BIO-05 | Unlocked Compiler Version

Category	Severity	Location	Status
Language Specific	Informational	BIO.sol (v1): 1	Resolved

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 `v0.5.16` the contract should contain the following line:

```
pragma solidity 0.5.16;
```

Alleviation

The development team heeded our advice and resolved this issue in the contract whose sha256 value is 3ca8a897cb2b42c01d5ff5e584b0ad3a24d4bee7a215098ec55e028f84ac6d7f.

BIO-06 | Wrong Calculation Of `_totalSupply`

Category	Severity	Location	Status
Logical Issue	Critical	BIO.sol (v1): 332	Resolved

Description

```
_totalSupply = _totalSupply.mul(amount);
```

The above calculation of `_totalSupply` is wrong and should be replaced by the below calculation:

```
_totalSupply = _totalSupply.add(amount);
```

Recommendation

Consider correcting the calculation of the `_totalSupply`.

Alleviation

The development team heeded our advice and resolved this issue in the contract whose sha256 value is 3ca8a897cb2b42c01d5ff5e584b0ad3a24d4bee7a215098ec55e028f84ac6d7f.

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.

Logical Issue

Logical Issue findings detail a fault in the logic of the linked code, such as an incorrect notion on how block.timestamp works.

Control Flow

Control Flow findings concern the access control imposed on functions, such as owner-only functions being invoke-able by anyone under certain circumstances.

Language Specific

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

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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