Security Assessment

SOS Token Staking

Jan 4th, 2022

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Summary

This report has been prepared for SOS Token Staking to discover issues and vulnerabilities in the source code of the SOS Token Staking 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	SOS Token Staking
Platform	Ethereum
Language	Solidity
Codebase	Private Repo https://github.com/The-OpenDAO/contracts/blob/main/contracts/OpenDAOStaking.sol
Commit	3c2df3810c9532dc233bce51ac75f53254af02e7 01208c0a00e808eb2ce5345ac73643ab127b60dd 0d90cec8bb54436cf9928fabf84344c221dad997

Audit Summary

Delivery Date	Jan 04, 2022
Audit Methodology	Static Analysis, Manual Review
Key Components	

Vulnerability Summary

Vulnerability Level	Total	Pending	Declined	Acknowledged	Partially Resolved	Resolved
Critical	0	0	0	0	0	0
Major	1	0	0	1	0	0
Medium	0	0	0	0	0	0
Minor	2	0	0	1	0	1
Informational	4	0	0	1	0	3
Discussion	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
ODA	OpenDAOStaking.sol	24e6d107b2918a2e5c29dc616185aa372b58315a0351798d8f4d0cc3e3a21ab5

Findings

Critical	**0** (0.00%)
Major	**1** (14.29%)
Medium	**0** (0.00%)
Minor	**2** (28.57%)
Informational	**4** (57.14%)
Discussion	**0** (0.00%)

ID	Title	Category	Severity	Status
ODA-01	Centralization Risk	**Centralization / Privilege**	**Major**	Acknowledged
ODA-02	Missing emit events	Coding Style	Informational	Acknowledged
ODA-03	Unlocked compiler version	Language Specific	Informational	Resolved
ODA-04	Unused Variable	Gas Optimization	Informational	Resolved
ODA-05	Lack of Input Validation	Volatile Code	Informational	Resolved
ODA-06	Lack of Input Validation	Volatile Code	Minor	Resolved
ODA-07	The function of the share token `veSOS`	Logical Issue	Minor	Acknowledged

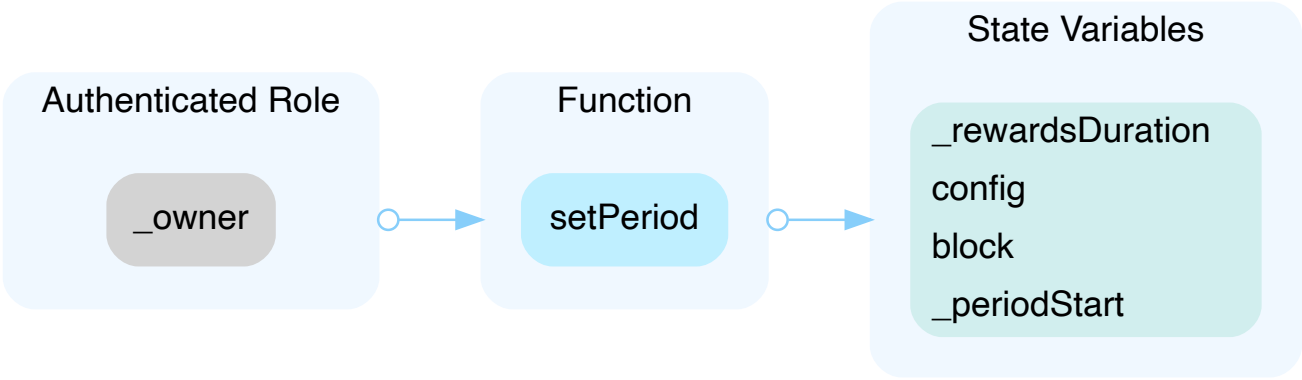
ODA-01 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	Major	contracts/SOS/OpenDAOStaking.sol (faa1b87): 63~73	Acknowledged

Description

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

Any compromise to the privileged account which has access to `_owner` may allow the hacker to take advantage of this.



Recommendation

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 to be improved via a decentralized mechanism or smart-contract-based accounts with enhanced security practices, e.g., Multisignature wallets.

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

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
- Assignment of privileged roles to multi-signature wallets to prevent a single point of failure due to the private key;
- Introduction of a DAO/governance/voting module to increase transparency and user involvement.

Alleviation

No Alleviation.

ODA-02 | Missing emit events

Category	Severity	Location	Status
Coding Style	Informational	contracts/SOS/OpenDAOStaking.sol (faa1b87): 63~73	Acknowledged

Description

There should always be events emitted in the sensitive functions that are controlled by centralization roles.

Recommendation

It is recommended emitting events for the sensitive functions that are controlled by centralization roles.

Alleviation

No Alleviation.

ODA-03 | Unlocked compiler version

Category	Severity	Location	Status
Language Specific	Informational	contracts/SOS/OpenDAOStaking.sol (faa1b87): 3	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 `v0.8.9` the contract should contain the following line:

```
pragma solidity 0.8.9;
```

Alleviation

The development team heeded our advice and resolved this issue in commit 3c2df3810c9532dc233bce51ac75f53254af02e7.

ODA-04 | Unused Variable

Category	Severity	Location	Status
Gas Optimization	Informational	contracts/SOS/OpenDAOStaking.sol (faa1b87): 16	Resolved

Description

The variable `SOS_TOTAL_SUPPLY` on line 16 is declared but never used or updated.

Recommendation

We recommend removing the unused variable if it is not intended to be used.

Alleviation

The development team heeded our advice and resolved this issue in commit 3c2df3810c9532dc233bce51ac75f53254af02e7.

ODA-05 | Lack of Input Validation

Category	Severity	Location	Status
Volatile Code	Informational	contracts/SOS/OpenDAOStaking.sol (faa1b87): 38	Resolved

Description

The given input `_sos` is missing the sanity checks for ensuring non-zero value.

Recommendation

We advise the client to add the following input validation:

```
require(_sos != address(0), "_sos is a zero address");
```

Alleviation

The development team heeded our advice and resolved this issue in commit 01208c0a00e808eb2ce5345ac73643ab127b60dd.

ODA-06 | Lack of Input Validation

Category	Severity	Location	Status
Volatile Code	Minor	contracts/SOS/OpenDAOStaking.sol (faa1b87): 69	Resolved

Description

The input `_periodStart` parameter is expected to be greater than or equal to the `block.timestamp`.

Alleviation

The development team heeded our advice and resolved this issue in commit 3c2df3810c9532dc233bce51ac75f53254af02e7.

ODA-07 | The function of the share token `veSOS`

Category	Severity	Location	Status
Logical Issue	Minor	contracts/SOS/OpenDAOStaking.sol (faa1b87): 141	Acknowledged

Description

It is necessary to inform the users of the function of the share token `veSOS`, which is required to withdraw the principal and interest, to avoid users transferring the share token unexpectedly and incurring the loss.

Alleviation

No Alleviation.

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.

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.

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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