Code Security Assessment

SxpSwap

Mar 21st, 2022

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Summary

This report has been prepared for SxpSwap to discover issues and vulnerabilities in the source code of the SxpSwap 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	SxpSwap
Platform	Ethereum, BSC
Language	Solidity
Codebase	https://github.com/Solar-network/swap-contract
Commit	d340e4a5cd68aed12d0de7a81e0fbc1b84fdf6e5 152ff9c306e212263f6f738f5bb6beaf139f56c3

Audit Summary

Delivery Date	Mar 21, 2022 UTC
Audit Methodology	Static Analysis, Manual Review

Vulnerability Summary

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

Audit Scope

ID	File	SHA256 Checksum
ETH	ethereum.sol	bef8ca499be2f436288b66ae877f28b5a2d28d7ce399136eb1552f107d9b0f3f

Findings

Critical	**0** (0.00%)
Major	**1** (33.33%)
Medium	**0** (0.00%)
Minor	**0** (0.00%)
Informational	**2** (66.67%)
Discussion	**0** (0.00%)

ID	Title	Category	Severity	Status
ETH-01	Centralization Risk	**Centralization / Privilege**	**Major**	Resolved
ETH-02	Variables That Could Be Declared as `constant`	Gas Optimization	Informational	Resolved
ETH-03	Missing Emit Events	Coding Style	Informational	Resolved

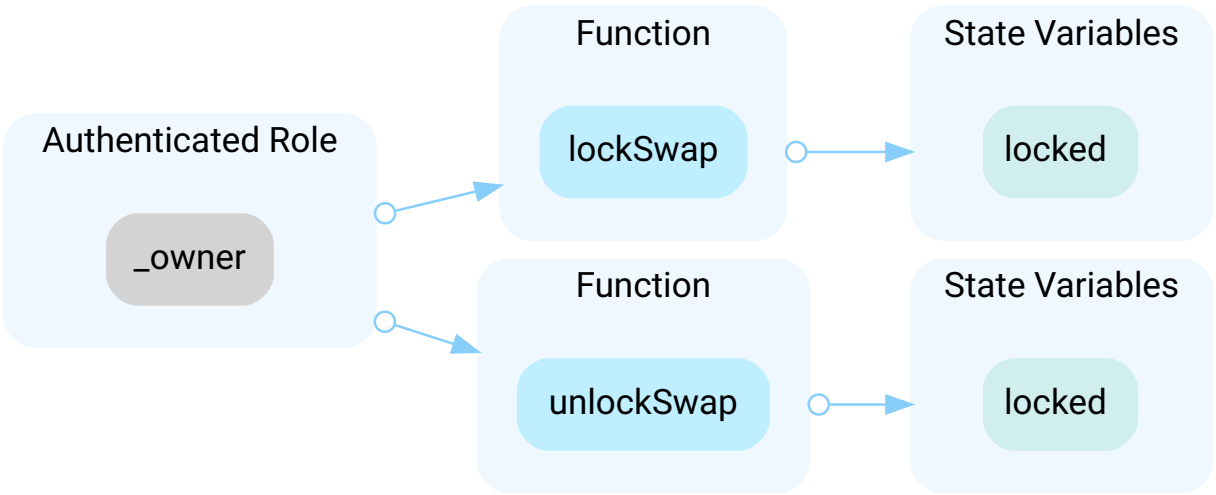
ETH-01 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	Major	ethereum.sol (1): 138~142, 144~148	Resolved

Description

In the contract `ethereum.sol` 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 and unlock the swap.



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

lockSwap() and unlockSwap() are removed from the contract. Fixed in commit 152ff9c306e212263f6f738f5bb6beaf139f56c3

ETH-02 | Variables That Could Be Declared As `constant`

Category	Severity	Location	Status
Gas Optimization	Informational	ethereum.sol (1): 88	Resolved

Description

The linked variables could be declared as `constant` since these state variables are never modified.

Recommendation

We recommend to declare these variables as `constant`.

Alleviation

Fixed in commit 152ff9c306e212263f6f738f5bb6beaf139f56c3

ETH-03 | Missing Emit Events

Category	Severity	Location	Status
Coding Style	Informational	ethereum.sol (1): 138~142, 144~148	Resolved

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

lockSwap() and unlockSwap() are removed from the contract. Fixed in commit 152ff9c306e212263f6f738f5bb6beaf139f56c3

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.

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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