CERTIK

Security Assessment

EthSign

Apr 12th, 2022

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Summary

This report has been prepared for EthSign to discover issues and vulnerabilities in the source code of the EthSign 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	EthSign
Platform	Ethereum
Language	Solidity
Codebase	https://github.com/EthSign/EthSign-4.0-Contract
Commit	

Audit Summary

Delivery Date	Apr 12, 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	1	0	0	1	0	0	0
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
ESP	projects/EthSign/contracts/EthSignPublicEncryptionKeyRegistry.sol	a67b3a2b916bd8bfc149382bf3d9b89639d4b5824bac4f2d056114259196e515
ESK	projects/EthSign/contracts	
ESF	projects/EthSign/contracts/EthSignCommonFramework.sol	e331fe3f60f50499ac21af6fc3063d03cc5c9f282da149def638f283971335ec
ESV	projects/EthSign/contracts/EthSignV4.sol	193a65ee0ce69f129f620a42b82d35cf18de0f44ca6052bdfeca9020d4ee341e
ESC	projects/EthSign	

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
ESF-01	Centralization Risk in EthSignCommonFramework.sol	**Centralization / Privilege**	**Major**	Acknowledged
ESF-02	Missing Emit Events	Coding Style	Informational	Resolved
ESF-03	Improper Usage of `public` and `external` Type	Gas Optimization	Informational	Resolved

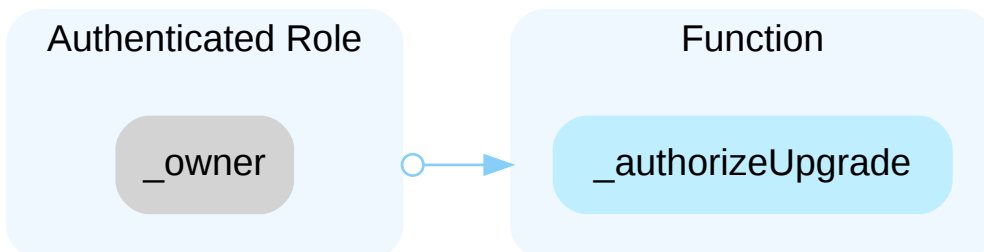
ESF-01 | Centralization Risk In EthSignCommonFramework.sol

Category	Severity	Location	Status
Centralization / Privilege	**Major**	projects/EthSign/contracts/EthSignCommonFramework.sol: 26	Acknowledged

Description

In the contract `EthSignCommonFramework` 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.



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

[EthSign team]: This function _authorizeUpgrade(address newImplementation) is only used to authorize the upgrade, an actual upgrade event event Upgraded(address indexed implementation) is emitted by ERC1967UpgradeUpgradeable up the inheritance tree. Thus, this shouldn't be an issue.

ESF-02 | Missing Emit Events

Category	Severity	Location	Status
Coding Style	Informational	projects/EthSign/contracts/EthSignCommonFramework.sol: 26	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

[EthSign team]: This function _authorizeUpgrade(address newImplementation) is only used to authorize the upgrade, an actual upgrade event event Upgraded(address indexed implementation) is emitted by ERC1967UpgradeUpgradeable up the inheritance tree. Thus, this shouldn't be an issue.

ESF-03 | Improper Usage Of `public` And `external` Type

Category	Severity	Location	Status
Gas Optimization	Informational	projects/EthSign/contracts/EthSignCommonFramework.sol: 15	Resolved

Description

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

Recommendation

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

Alleviation

[EthSign team]: The visibility cannot be external because its child contract, EthSignV4, calls this initialize function, thus it must be public.

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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