Code Security Assessment

Derify Protocol

Mar 16th, 2022

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Summary

This report has been prepared for Derify Protocol to discover issues and vulnerabilities in the source code of the Derify Protocol 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	Derify Protocol
Platform	Ethereum
Language	Solidity
Codebase	https://github.com/derivationlab/derify-token
Commit	1. 94171ce87c7e0e48598ee26892ccddeedf058e7c 2. 0e24f79fe0b7bda1f9a7fa7272dfba128dae39fa

Audit Summary

Delivery Date	Mar 16, 2022 UTC
Audit Methodology	Static Analysis, Manual Review

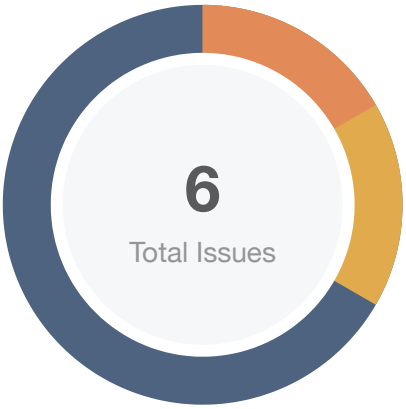
Vulnerability Summary

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

Audit Scope

ID	File	SHA256 Checksum
CVV	CommunityVestingVault.sol	333355c1c57e8215fae0651607af8a06c83f28ffbe0b6fd42f15a702fcd8f190
DRF	DRF.sol	af500c2b94964323cfece28d39f7b666a0bf1dc709d80cc95533b0383915b323
MDC	Migrations.sol	22c39ac3c16f2d613121d276411da6c0fe5378a2446ef022ea46a9cafccad372
PVV	PrivateVestingVault.sol	c7a8d676f95d51d2e92be669c2a6622f4340b1fb9f085331ed3a5e04ec5d05d5
TVV	TeamVestingVault.sol	d0349b3473f7477d076b98a789555c0280cb9cc69ca0a06d09a35eab5ca401c0

Findings



Critical	**0** (0.00%)
Major	**1** (16.67%)
Medium	**1** (16.67%)
Minor	**0** (0.00%)
Informational	**4** (66.67%)
Discussion	**0** (0.00%)

ID	Title	Category	Severity	Status
DCK-01	Centralization Related Risks	**Centralization / Privilege**	**Major**	Mitigated
DCK-02	Missing Emit Events	Coding Style	Informational	Resolved
DCK-03	Function Visibility Optimization	Gas Optimization	Informational	Resolved
DCK-04	Unlocked Compiler Version Declaration	Language Specific	Informational	Resolved
DRF-01	Variables That Could Be Declared as `constant`	Gas Optimization	Informational	Resolved
DRF-02	Initial Token Distribution	**Centralization / Privilege**	**Medium**	Mitigated

DCK-01 | Centralization Related Risks

Category	Severity	Location	Status
Centralization / Privilege	**Major**	CommunityVestingVault.sol (v1): 47, 58, 109 PrivateVestingVault.sol (v1): 48, 60, 113 TeamVestingVault.sol (v1): 47, 58, 109	Mitigated

Description

In the contract `CommunityVestingVault` the role `_owner` has authority over the functions mentioned below.

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

- add tokens that will be granted through `lockToken()`
- add grants through `addGrant()`
- revoke grants through `revokeGrant()`

In the contract `PrivateVestingVault` the role `_owner` has authority over the functions mentioned below.

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

- add tokens that will be granted through `lockToken()`
- add grants through `addGrant()`
- revoke grants through `revokeGrant()`

In the contract `TeamVestingVault` the role `_owner` has authority over the functions mentioned below.

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

- add tokens that will be granted through `lockToken()`
- add grants through `addGrant()`
- revoke grants through `revokeGrant()`

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

`[CertiK]`: By the time of 2022-03-16 8:00 UTC, the ownership of `TeamVestingVault` has been transferred in this transaction to a Gnosis Safe that hosts three owners.

The ownership of `CommunityVestingVault` has been transferred in this transaction to a Gnosis Safe that hosts three owners.

The ownership of `PrivateVestingVault` has been transferred in this transaction to a Gnosis Safe that hosts three owners.

DCK-02 | Missing Emit Events

Category	Severity	Location	Status
Coding Style	Informational	Migrations.sol (v1): 16 CommunityVestingVault.sol (v1): 47 PrivateVestingVault.sol (v1): 48 TeamVestingVault.sol (v1): 47	Resolved

Description

Functions that affect the status of sensitive variables should be able to emit events as notifications to customers.

Recommendation

We advise the client to add events for the sensitive functions that are controlled by centralization roles.

Alleviation

The client resolved the issue in the latest commit.

DCK-03 | Function Visibility Optimization

Category	Severity	Location	Status
Gas Optimization	Informational	Migrations.sol (v1): 16 CommunityVestingVault.sol (v1): 155, 160, 165 PrivateVestingVault.sol (v1): 167, 172, 177 DRF.sol (v1): 45, 50, 55, 60, 65, 70, 80, 87, 94, 106, 113 TeamVestingVault.sol (v1): 155, 160, 165	Resolved

Description

The following functions are declared as `public`, contain array function arguments, and are not invoked in any of the contracts contained within the project's scope. The functions that are never called internally within the contract should have external visibility.

Recommendation

We advise that the functions' visibility specifiers are set to `external` and the array-based arguments change their data location from `memory` to `calldata`, optimizing the gas cost of the function.

Alleviation

The client resolved the issue in the latest commit.

DCK-04 | Unlocked Compiler Version Declaration

Category	Severity	Location	Status
Language Specific	Informational	Migrations.sol (v1): 2 CommunityVestingVault.sol (v1): 3 PrivateVestingVault.sol (v1): 3 DRF.sol (v1): 3 TeamVestingVault.sol (v1): 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

It is a general practice to instead lock the compiler at a specific version rather than allow a range of compiler versions to be utilized to avoid compiler-specific bugs and be able to identify ones more easily. We recommend locking the compiler at the lowest possible version that supports all the capabilities wished by the codebase. This will ensure that the project utilizes a compiler version that has been in use for the longest time and as such is less likely to contain yet-undiscovered bugs.

Alleviation

The client resolved the issue in the latest commit.

DRF-01 | Variables That Could Be Declared As `constant`

Category	Severity	Location	Status
Gas Optimization	Informational	DRF.sol (v1): 16	Resolved

Description

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

Recommendation

We advise the cllient to declare these variables as `constant`.

Alleviation

The client resolved the issue in the latest commit.

DRF-02 | Initial Token Distribution

Category	Severity	Location	Status
Centralization / Privilege	**Medium**	DRF.sol (v1): 21	Mitigated

Description

All of the derify protocol tokens are sent to five addresses when deploying the contract. This could be a centralization risk as the deployer can distribute these 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

`[Client]`: This process is necessary and aligns with our tokenomics.

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.

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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