DeHacker

Code Security Assessment

API3

February 7th, 2023

Contents

Summary

DeHacker's objective was to evaluate the repository for security-related issues, code quality, and adherence to specification and best practices.
Possible issues we looked for included (but are not limited to):

- 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 code base 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.

Issue Categories

Every issue in this report was assigned a severity level from the following:

Critical severity issues

A vulnerability that can disrupt the contract functioning in a number of scenarios or creates a risk that the contract may be broken.

Major severity issues

A vulnerability that affects the desired outcome when using a contract or provides the opportunity to use a contract in an unintended way.

Medium severity issues

A vulnerability that could affect the desired outcome of executing the contract in a specific scenario.

Minor severity issues

A vulnerability that does not have a significant impact on possible scenarios for the use of the contract and is probably subjective.

Informational

A vulnerability that has informational character but is not affecting any of the code.

Overview

Project Summary

Project Name	API3
Platform	Ethereum (ETH)
website	http://videofihq.xyz/
Type	Others
Deployed contract	https://github.com/api3dao/stakeable-vesting/tree/b57863407fdf63457ef8b5e41aa34e0253c02181/contracts#code
Language	Solidity

Audit Summary

Delivery Date	February 7, 2023
Audit Methodology	Manual Review, Static Analysis

Vulnerability Summary

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

Audit scope

ID	File	SHA256 Checksum
SVB	StakeableVesting.sol	14fdeb3dd08445c6669897e9aa09cd348976a89f91424fe915d6c12148556942
SVF	StakeableVesting.sol	22a80922848169bacce081fbd1d970de6423bfe50987a8bd22c0c

Findings

ID	Title	Category	Severity	Status
SVB-01	Centralization Risks InStakeableVesting.Sol	Centralization / Privilege	Major	Acknowledged
CON-01	Out Of Scope Dependency	Volatile Code	Informational	Acknowledged
SVF-01	Missing Zero Address Validation	Volatile Code	Informational	Resolved

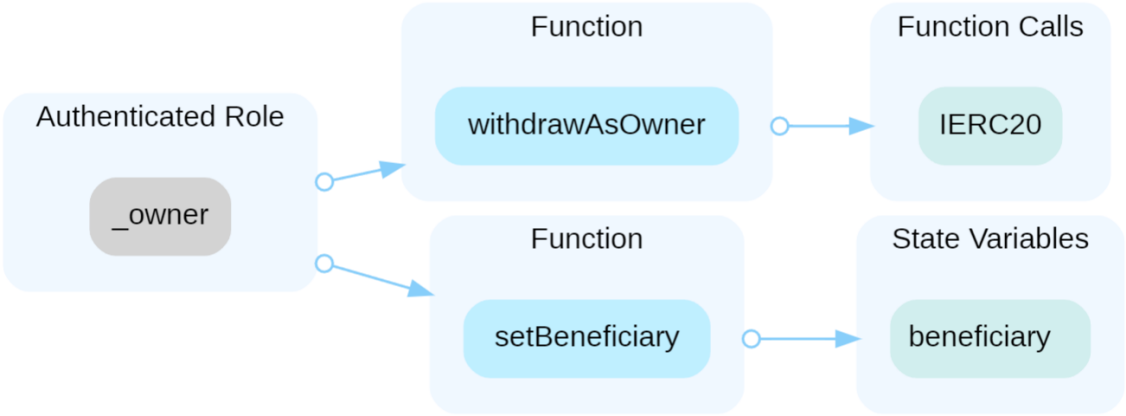
Major

SVB-01 | CENTRALIZATION RISKS IN STAKEABLEVESTING.SOL

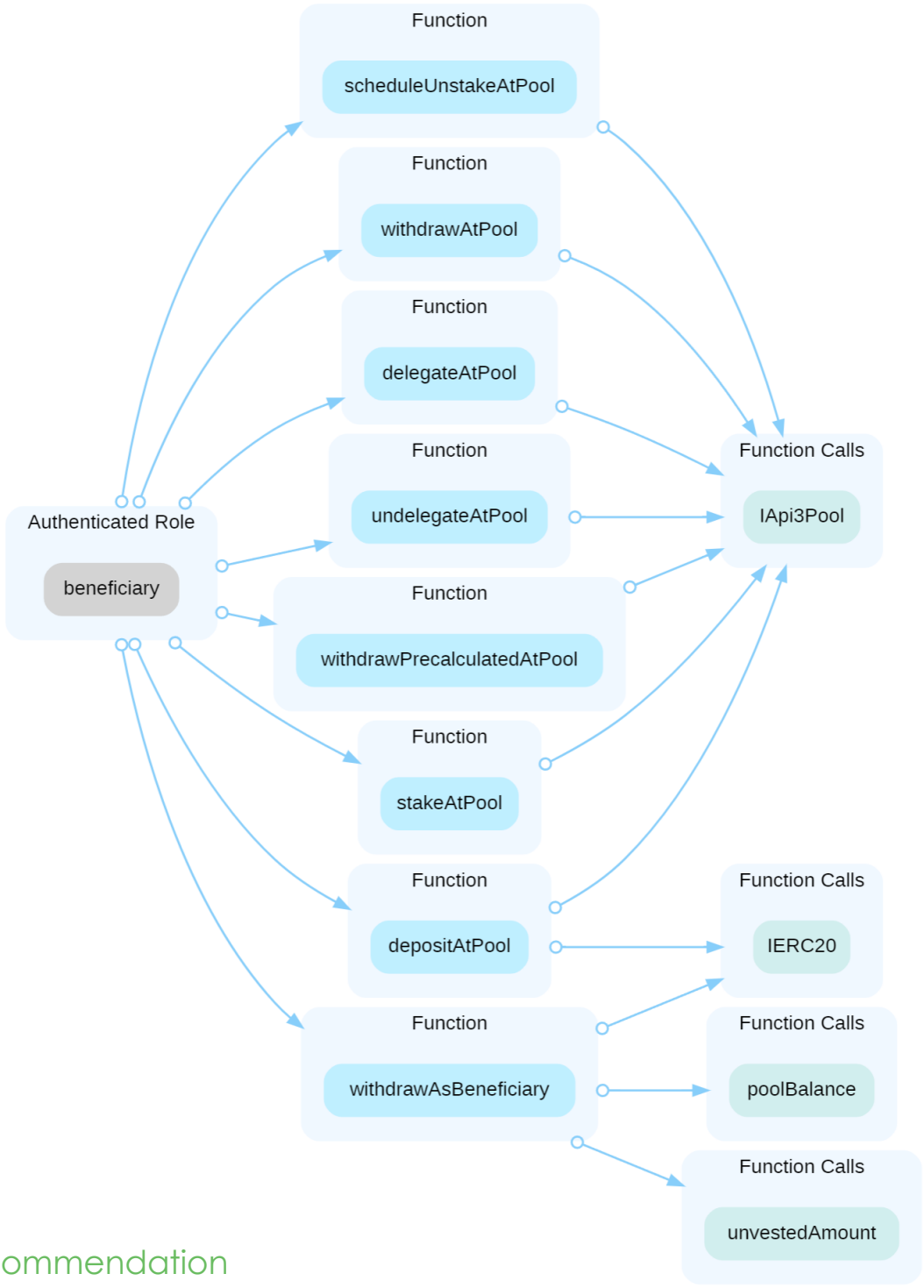
Category	Severity	Location	Status
Centralization / Privilege	Major	StakeableVesting.sol: 119, 128, 137, 158, 166, 180, 189, 196, 215, 223	Acknowledged

Description

In the contract StakeableVesting the role _owner has authority over the functions shown in the diagram below. Anycompromise to the _owner account may allow the hacker to take advantage of this authority and modify criticalconfigurations of the contract.



In the contract StakeableVesting the role beneficiary has authority over the functions shown in the diagram below. Anycompromise to the beneficiary account may allow the hacker to take advantage of this authority and withdraw assetsfrom the contract.



Recommendation

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

multisignature wallets. Indicatively, here are some feasible suggestions that wouldalso 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 keymanagement 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 keycompromised;

AND

A medium/blog link for sharing the timelock contract and multi-signers addresses information with the publicaudience.

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 publicaudience.

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

The API3 team acknowledged this finding and provided the following explanation:

```
The contract's purpose is to timelock tokens in a way that they are linearly
released, and to allow these tokens to be used by `beneficiary` in governance
functions. `owner` is allowed to revoke these tokens at any time. However, this is
only the implementation, and whether there is a centralization risk depends on the
context it is used in.

As README.md states, this contract was developed to enact an API3 DAO proposal that
was passed with the support of the absolute majority. According to this proposal,
`owner` is a multisig (the "hot wallet multisig"), and `beneficiary` is an
individual contributor of the DAO. Furthermore, the API3 DAO has already entrusted
the tokens to be timelocked with the hot wallet multisig, and thus using this
contract does not induce any additional centralization risk.
```

Informational

CON-01 | OUT OF SCOPE DEPENDENCY

Category	Severity	Location	Status
VolatileCode	Informational	StakeableVesting.sol: 29, 32; StakeableVesting Factory.sol:13	Acknowledged

Description

The contract serves as the underlying entity to interact with one or more out-of-scope contracts. The scope of the audit treatsout of scope contracts as black boxes, assumes their functional correctness, and the audited contracts interact with thosecontracts in a correct way. However, in the real world, those contracts might contain logic issues or security vulnerabilities,and this may lead to lost or stolen assets.

```
29      address public immutable override api3Token;
```

The contract StakeableVesting interacts with the out-of-scope contract with IERC20

```
32      address public immutable api3Pool;
```

```
243 staked = IApi3Pool(api3Pool).userStake(address(this));
244         (
245             unstaked,
246             ,
247             ,
248             unstaking,
249             unstakeScheduledFor,
250             lastDelegationUpdateTimestamp,
251
252         ) = IApi3Pool(api3Pool).getUser(address(this));
```

```
281 function poolBalance() private view returns (uint256) {
282     uint256 staked = IApi3Pool(api3Pool).userStake(address(this));
283     (uint256 unstaked, , uint256 unstaking, , , , ) = IApi3Pool(api3Pool)
284         .getUser(address(this));
285     return staked + unstaked + unstaking;
286 }
```

- The contract `StakeableVesting` interacts with the out-of-scope contract with `IApi3Pool` interface via `api3Pool`.

```
13     address public immutable override api3Token;
```

- The contract `StakeableVestingFactory` interacts with the out-of-scope contract with `IERC20` interface via `api3Token`.

Recommendation

We understand that the business logic requires interaction with the out-of-scope contracts. We encourage the team toensure the correctness and security of out-of-scope contracts to prevent unexpected errors from happening.

Alleviation

The API3 team acknowledged this finding and stated that Api3Pool have been audited 4 times and has been used formore than 1.5 years, which is why the file is out of the scope of this audit.

Informational

SVF-01 | MISSING ZERO ADDRESS VALIDATION

Category	Severity	Location	Status
VolatileCode	Informational	StakeableVesting Factory.sol: 23~25	Resolved

Description

Addresses should be checked before assignment or external call to make sure they are not zero addresses.

```
23          stakeableVestingImplementation = address(
24              new StakeableVesting(_api3Token, _api3Pool)
25          );
```

- `_api3Pool` is not zero-checked before being used.

Recommendation

We advise adding a zero-check for the passed-in address value to prevent unexpected errors.

Alleviation

The value is validated in the "StakeableVesting.sol" contract.

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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.

Coding Style

Coding Style findings usually do not affect the generated bytecode but rather comment on how to make the codebase more legible and, as a result, easily maintainable.

Volatile Code

Volatile Code findings refer to segments of code that behave unexpectedly on certain edge cases that may result in a vulnerability.

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.

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.

About

DeHacker is a team of auditors and white hat hackers who perform security audits and assessments. With decades of experience in security and distributed systems, our experts focus on the ins and outs of system security. Our services follow clear and prudent industry standards. Whether it's reviewing the smallest modifications or a new platform, we'll provide an in-depth security survey at every stage of your company's project. We provide comprehensive vulnerability reports and identify structural inefficiencies in smart contract code, combining high-end security research with a real-world attacker mindset to reduce risk and harden code.

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