CERTIK

Security Assessment

API3 - audit

CertiK Verified on Feb 7th, 2023

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API3 - audit

The security assessment was prepared by CertiK, the leader in Web3.0 security.

Executive Summary

TYPES	ECOSYSTEM	METHODS
Others	Ethereum (ETH)	Manual Review, Static Analysis

LANGUAGE	TIMELINE	KEY COMPONENTS
Solidity	Delivered on 02/07/2023	N/A

CODEBASE

https://github.com/api3dao/stakeable-vesting/tree/b57863407fdf63457ef8b5e41aa34e0253c02181/contracts

...View All

Vulnerability Summary

3	1	0	0	2	0	0
Total Findings	Resolved	Mitigated	Partially Resolved	Acknowledged	Declined	Unresolved

0	Critical		Critical risks are those that impact the safe functioning of a platform and must be addressed before launch. Users should not invest in any project with outstanding critical risks.
1	Major	1 Acknowledged	Major risks can include centralization issues and logical errors. Under specific circumstances, these major risks can lead to loss of funds and/or control of the project.
0	Medium		Medium risks may not pose a direct risk to users' funds, but they can affect the overall functioning of a platform.
0	Minor		Minor risks can be any of the above, but on a smaller scale. They generally do not compromise the overall integrity of the project, but they may be less efficient than other solutions.
2	Informational	1 Resolved, 1 Acknowledged	Informational errors are often recommendations to improve the style of the code or certain operations to fall within industry best practices. They usually do not affect the overall functioning of the code.

TABLE OF CONTENTS | API3 - AUDIT

Summary

Executive Summary

Vulnerability Summary

Codebase

Audit Scope

Approach & Methods

Findings

SVB-01 : Centralization Risks in StakeableVesting.sol

CON-01 : Out of Scope Dependency

SVF-01 : Missing Zero Address Validation

Appendix

Disclaimer

CODEBASE | API3 - AUDIT

Repository

https://github.com/api3dao/stakeable-vesting/tree/b57863407fdf63457ef8b5e41aa34e0253c02181/contracts

AUDIT SCOPE | API3 - AUDIT

2 files audited ● 2 files with Acknowledged findings

ID	File	SHA256 Checksum
● SVB	StakeableVesting.sol	14fdeb3dd08445c6669897e9aa09cd348976a89f91424fe915d6c12148556942
● SVF	StakeableVestingFactory.sol	22a80922848169bacce081fbd1d970de6423bfe50987a8bd22c0c3a7551e9a2f

APPROACH & METHODS | API3 - AUDIT

This report has been prepared for API3 to discover issues and vulnerabilities in the source code of the API3 - audit project as well as any contract dependencies that were not part of an officially recognized library. A comprehensive examination has been performed, utilizing Manual Review and Static Analysis 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:

- Testing the smart contracts against both common and uncommon attack vectors;
- 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.

FINDINGS | API3 - AUDIT

3	0	1	0	0	2
Total Findings	Critical	Major	Medium	Minor	Informational

This report has been prepared to discover issues and vulnerabilities for API3 - audit. Through this audit, we have uncovered 3 issues ranging from different severity levels. Utilizing the techniques of Manual Review & Static Analysis to complement rigorous manual code reviews, we discovered the following findings:

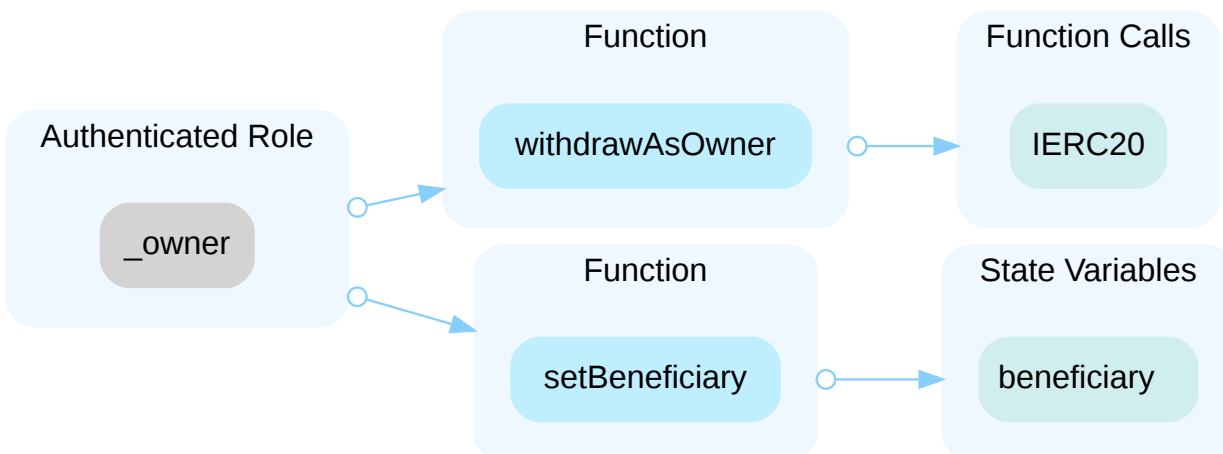
ID	Title	Category	Severity	Status
SVB-01	**Centralization Risks In StakeableVesting.Sol**	**Centralization / Privilege**	**Major**	**Acknowledged**
CON-01	Out Of Scope Dependency	Volatile Code	Informational	Acknowledged
SVF-01	Missing Zero Address Validation	Volatile Code	Informational	Resolved

SVB-01 | CENTRALIZATION RISKS IN STAKEABLEVESTING.SOL

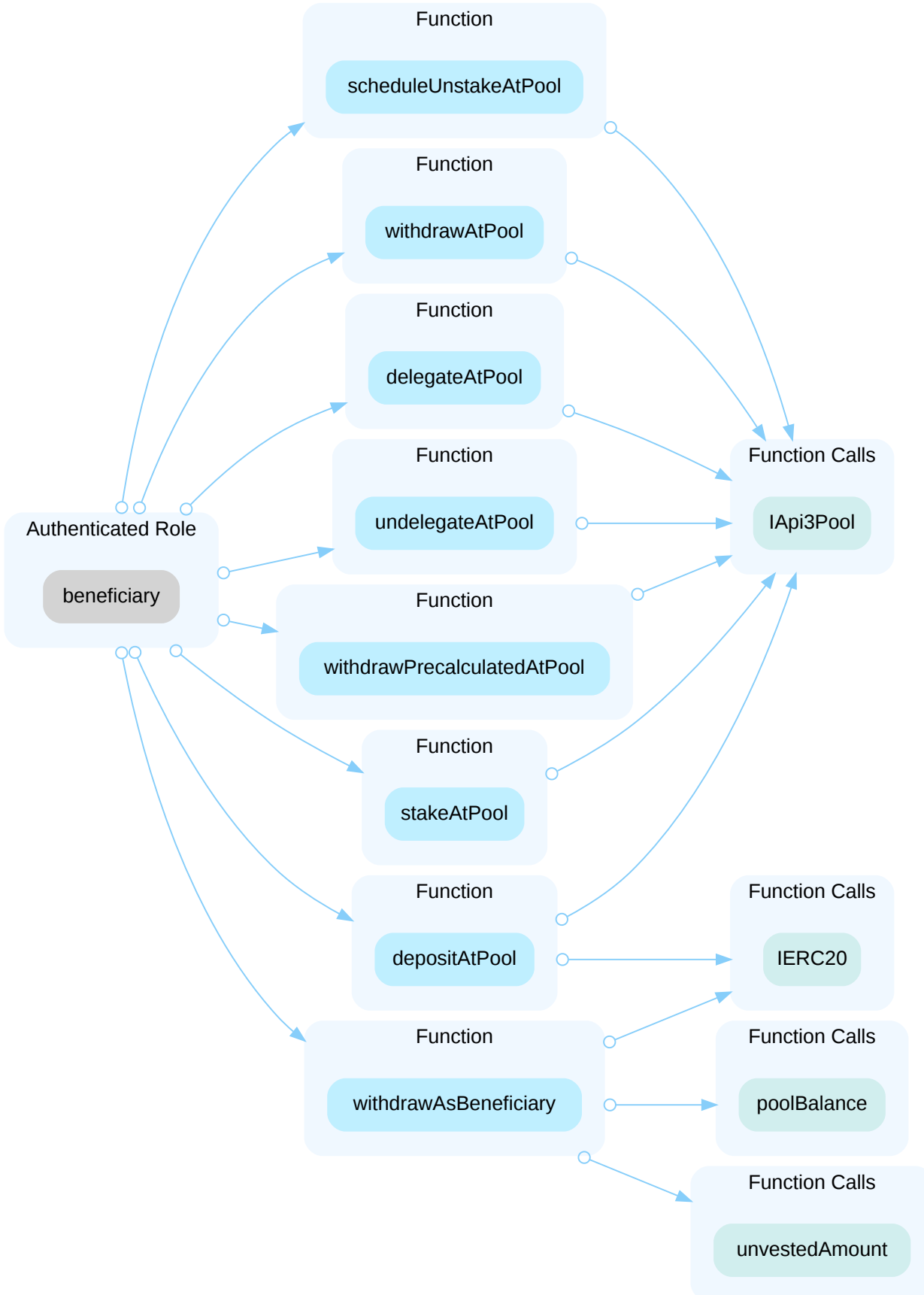
Category	Severity	Location	Status
Centralization / Privilege	**Major**	**StakeableVesting.sol: 119, 128, 137, 158, 166, 180, 189, 196, 215, 223**	**Acknowledged**

Description

In the contract `StakeableVesting` the role `_owner` has authority over the functions shown in the diagram below. Any compromise to the `_owner` account may allow the hacker to take advantage of this authority and modify critical configurations of the contract.



In the contract `StakeableVesting` the role `beneficiary` has authority over the functions shown in the diagram below. Any compromise to the `beneficiary` account may allow the hacker to take advantage of this authority and withdraw assets from the contract.



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

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.

CON-01 | OUT OF SCOPE DEPENDENCY

Category	Severity	Location	Status
Volatile Code	Informational	StakeableVesting.sol: 29, 32; StakeableVestingFactory.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 treats out of scope contracts as black boxes, assumes their functional correctness, and the audited contracts interact with those contracts 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` interface via `api3Token`.

```
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 to ensure 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 for more than 1.5 years, which is why the file is out of the scope of this audit.

SVF-01 | MISSING ZERO ADDRESS VALIDATION

Category	Severity	Location	Status
Volatile Code	Informational	StakeableVestingFactory.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.

APPENDIX | API3 - AUDIT

Finding Categories

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

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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