

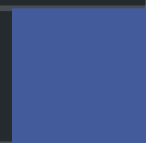


# Security Assessment

## TheBacker

May 13th, 2022

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# Summary

This report has been prepared for TheBacker to discover issues and vulnerabilities in the source code of the TheBacker 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	TheBacker
Platform	EVM Compatible
Language	Solidity
Codebase	<a href="https://github.com/thebacker-co/vtvl-app">https://github.com/thebacker-co/vtvl-app</a>
Commit	8fe585ffdd1acfc2651d00e1c274a76763e0e800

## Audit Summary

Delivery Date	May 13, 2022 UTC
Audit Methodology	Static Analysis, Manual Review

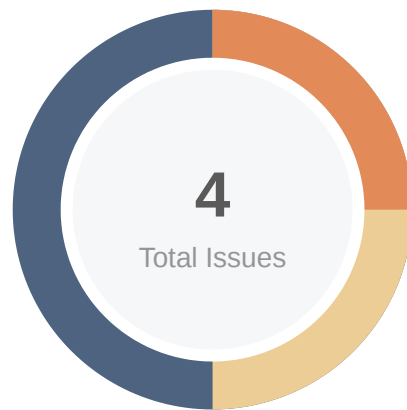
## Vulnerability Summary

Vulnerability Level	Total	Pending	Declined	Acknowledged	Mitigated	Partially Resolved	Resolved
<span>●</span> Critical	0	0	0	0	0	0	0
<span>●</span> Major	1	0	0	1	0	0	0
<span>●</span> Medium	0	0	0	0	0	0	0
<span>●</span> Minor	1	0	0	1	0	0	0
<span>●</span> Informational	2	0	0	2	0	0	0
<span>●</span> Discussion	0	0	0	0	0	0	0

## Audit Scope

ID	File	SHA256 Checksum
APT	AccessProtected.sol	eaeac720d7edfd6993d14b2c5ecd1664913e43d6ec581cf0a1006b5fbb99a542
VTV	VTVLVesting.sol	3126c709fe568fbb893724004c073f424c49422f262a2b6d768c7a2c8b9631f2

# Findings



Critical	0 (0.00%)
Major	1 (25.00%)
Medium	0 (0.00%)
Minor	1 (25.00%)
Informational	2 (50.00%)
Discussion	0 (0.00%)

ID	Title	Category	Severity	Status
<a href="#">GLOBAL-01</a>	Financial Models	Logical Issue	● Informational	ⓘ Acknowledged
<a href="#">TBK-01</a>	Improper Usage Of <code>public</code> And <code>external</code> Type	Gas Optimization	● Informational	ⓘ Acknowledged
<a href="#">VTL-01</a>	Missing Emit Events	Coding Style	● Minor	ⓘ Acknowledged
<a href="#">VTV-01</a>	Centralization Related Risks	Centralization / Privilege	● Major	ⓘ Acknowledged

## GLOBAL-01 | Financial Models

Category	Severity	Location	Status
Logical Issue	● Informational		ⓘ Acknowledged

### Description

The main function of TheBacker can be described as follows:

1. The admins of TheBacker have the authority to create a claim for the claimer.
2. The token will be unlocked over time and the claimer can take it out.

### Recommendation

Financial models of blockchain protocols need to be resilient to attacks. They need to pass simulations and verifications to guarantee the security of the overall protocol.

The financial model of this protocol is not in the scope of this audit.

### Alleviation

TheBacker team acknowledged this finding and does not change the code for current version.

## TBK-01 | Improper Usage Of `public` And `external` Type

Category	Severity	Location	Status
Gas Optimization	● Informational	VTVLVesting.sol: 83, 207, 215, 222, 330, 364, 380; AccessProtected.sol: 24	ⓘ Acknowledged

### 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

TheBacker team acknowledged this finding and does not change the code for current version.



## VTL-01 | Missing Emit Events

Category	Severity	Location	Status
Coding Style	● Minor	VTVLVesting.sol (fix): 301, 364	🕒 Acknowledged

### 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

TheBacker team acknowledged this finding and does not change the code for current version.

## VTV-01 | Centralization Related Risks

Category	Severity	Location	Status
Centralization / Privilege	● Major	VTVLVesting.sol: 364	ⓘ Acknowledged

### Description

In the contract VTVLVesting.sol the role `admin` has authority over the functions shown in the diagram below.

- `withdrawAdmin()`: withdraw the excess tokens.
- `createClaim()`: create a `claim` for the user.
- `createClaimsBatch()`: create `claims` for the users batchly.
- `revokeClaim()`: give all the tokens in the `claim` to the user whether the time has come or not.

Any compromise to the `admin` account may allow a hacker to take advantage of this authority and withdraw all the extra tokens.

### 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., multi-signature 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 ( $\frac{2}{3}$ ,  $\frac{3}{5}$ ) 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.

*Noted: Recommend considering the long-term solution or the permanent solution. The project team shall make a decision based on the current state of their project, timeline, and project resources.*

## Alleviation

**[TheBacker Team]:** Our team has reviewed the issues and we won't be making any changes to the current version.

We understand that there is a risk should the admin account be compromised but we will be incorporating disclaimers into our frontend to ensure that the admin is aware that they will need to carefully safeguard their keys/wallet to prevent any hacks.

There is a need for the admin account to retain these functions for eg the revocation function, as should an employee were to leave the company before the vesting schedule is complete, the admin should be able to revoke the contract and recover the unvested tokens. As our platform is not a custodian for these tokens, the responsibility will lie with the admin to safeguard their own wallet addresses.

We may introduce a mitigation in future but not for this current version.

# 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.

### 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.

### 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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## About

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