CERTIK

Security Assessment

Umbrella Network 3

Apr 18th, 2022

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Summary

This report has been prepared for Umbrella Network 3 to discover issues and vulnerabilities in the source code of the Umbrella Network 3 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	Umbrella Network 3
Platform	Ethereum
Language	Solidity
Codebase	https://github.com/umbrella-network/overture-private/tree/develop/contracts
Commit	6e805e16f6207133f1397fccd7e45532b9d0bc19

Audit Summary

Delivery Date	Apr 18, 2022 UTC
Audit Methodology	Static Analysis, Manual Review

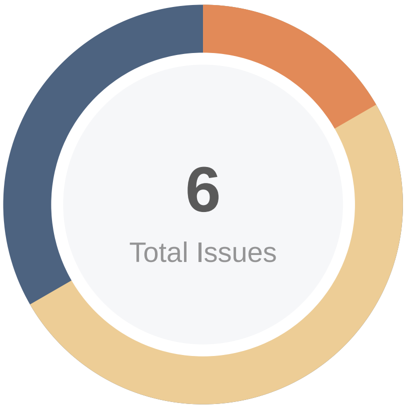
Vulnerability Summary

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	3	0	0	1	0	0	2
● Informational	2	0	0	0	0	0	2
● Discussion	0	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
SRB	staking/StakingRewards.sol	8063b0668774143f9c6daf0b94c24dc5a58e5f0a48cebf1e913116c6176610e8

Findings



🟥 **Critical**	**0** (0.00%)
🟧 **Major**	**1** (16.67%)
🟨 **Medium**	**0** (0.00%)
🟨 **Minor**	**3** (50.00%)
🟦 **Informational**	**2** (33.33%)
🟩 **Discussion**	**0** (0.00%)

ID	Title	Category	Severity	Status
SRB-01	Centralization Related Risks	**Centralization / Privilege**	● **Major**	ⓘ Acknowledged
SRB-02	SafeMath Not Used	Mathematical Operations	● Minor	✓ Resolved
SRB-03	Potential Underflow in the function `rescueToken()`	Mathematical Operations	● Minor	✓ Resolved
SRB-04	Logical issue of the function `_getReward()`	Logical Issue	● Minor	ⓘ Acknowledged
SRB-05	Missing Emit Events	Coding Style	● Informational	✓ Resolved
SRB-06	Improper Usage of `public` and `external` Type	Gas Optimization	● Informational	✓ Resolved

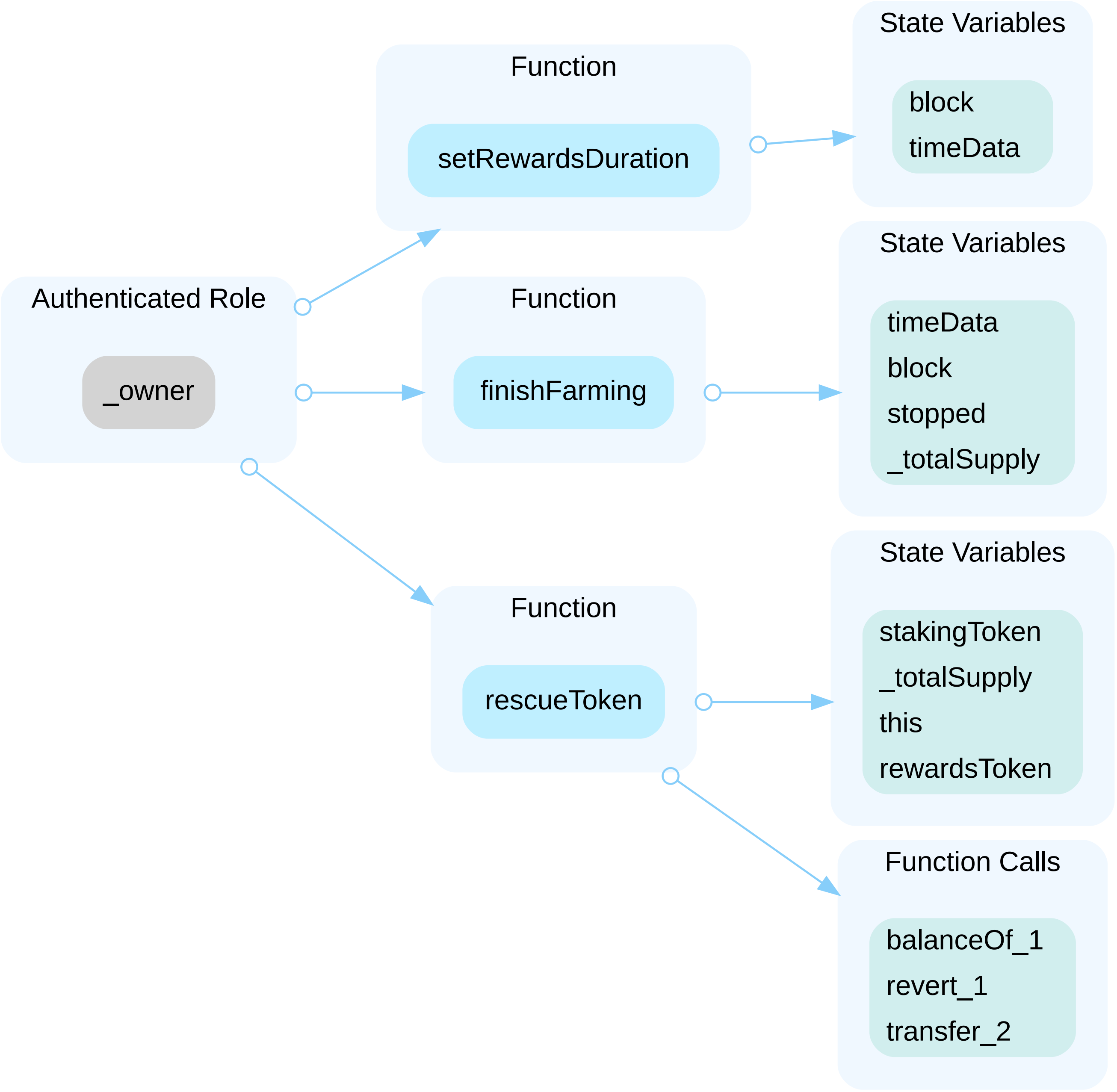
SRB-01 | Centralization Related Risks

Category	Severity	Location	Status
Centralization / Privilege	● **Major**	staking/StakingRewards.sol: 95, 125, 140, 167	ⓘ Acknowledged

Description

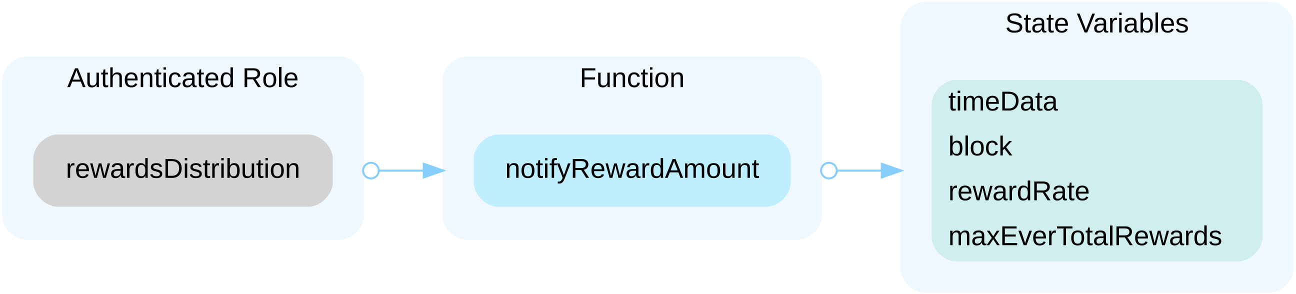
In the contract `StakingRewards` the role `_owner` has authority over the functions shown in the diagram below.

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



In the contract `StakingRewards` the role `rewardsDistribution` has authority over the functions shown in the diagram below.

Any compromise to the `rewardsDistribution` 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

The team acknowledged this issue and they will transfer ownership to the multisignature wallet.

SRB-02 | SafeMath Not Used

Category	Severity	Location	Status
Mathematical Operations	● Minor	staking/StakingRewards.sol	✓ Resolved

Description

SafeMath from OpenZeppelin is not used in the following functions which makes them possible for overflow/underflow and will lead to an inaccurate calculation result.

- `notifyRewardAmount()`
- `finishFarming()`
- `rescueToken()`
- `rewardPerToken()`
- `earned()`
- `_stake()`

Recommendation

We advise the client to use OpenZeppelin's SafeMath library for all of the mathematical operations.

Reference: https://github.com/OpenZeppelin/openzeppelin-contracts/blob/master/contracts/utils/math/SafeMath.sol

Alleviation

The team heeded our advice and added the comments to explain why overflow/underflow is not possible in commit `880e5505acfaec5b70748466e044613eaec33a9e`.

SRB-03 | Potential Underflow In The Function `rescueToken()`

Category	Severity	Location	Status
Mathematical Operations	● Minor	staking/StakingRewards.sol: 167	✓ Resolved

Description

The function `rescueToken()` is a centralized function that is used to rescue the accidentally transferred tokens. The check on L169 is used to ensure that the users' staking tokens will not be transferred out.

```
167     function rescueToken(ERC20 _token, address _recipient, uint256 _amount) external onlyOwner() {
168         if (address(_token) == address(stakingToken)) {
169             require(_totalSupply <= stakingToken.balanceOf(address(this)) - _amount, "amount is too big to rescue");
170         } else if (address(_token) == address(rewardsToken)) {
171             revert("reward token can not be rescued");
172         }
173
174         _token.transfer(_recipient, _amount);
175     }
```

SafeMath from OpenZeppelin is not used in the check on L169 which makes it possible for underflow and will lead to an inaccurate calculation result.

The result of `stakingToken.balanceOf(address(this)) - _amount` may underflow. As a result, the check may not actually in effect when the `_token.transfer()` has special logic.

Recommendation

We advise the client to use OpenZeppelin's SafeMath library for all of the mathematical operations.

Reference: https://github.com/OpenZeppelin/openzeppelin-contracts/blob/master/contracts/utils/math/SafeMath.sol

Alleviation

The team heeded our advice and removed the function `rescueToken()` in commit `0c5865087105bb828d0e8ac54ae90f3abbe92c3e`.

SRB-04 | Logical Issue Of The Function `_getReward()`

Category	Severity	Location	Status
Logical Issue	● Minor	staking/StakingRewards.sol: 276	ⓘ Acknowledged

Description

According to the following codes, the rewards are distributed to users through minting.

```
    function _getReward(address user, address recipient)
        internal
        virtual
        nonReentrant
        updateReward(user)
        returns (uint256 reward)
    {
        reward = rewards[user];

        if (reward != 0) {
            rewards[user] = 0;
            OnDemandToken(address(rewardsToken)).mint(recipient, reward);
            emit RewardPaid(user, reward);
        }
    }
```

The `OnDemandToken(address(rewardsToken))` has a max mint limit.

In the function `notifyRewardAmount()`, the variable `maxEverTotalRewards` is used to check whether the `totalRewardsSupply` is over the max mint limit of the `OnDemandTokenaddress(rewardsToken)`. The `totalRewardsSupply` is the total rewards minted to the users. However, the `OnDemandTokenaddress(rewardsToken)` can be minted by the minters.

As a result, the reward distribution may fail due to this limit unless the `OnDemandTokenaddress(rewardsToken)` will not be minted by minters directly.

Recommendation

We recommend stating for this.

Alleviation

The team acknowledged this issue and they stated:

"This function allows them disconnect the pool from token in case of any issue. This is by design."

SRB-05 | Missing Emit Events

Category	Severity	Location	Status
Coding Style	● Informational	staking/StakingRewards.sol: 167	✓ 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

The team heeded our advice and removed the function `rescueToken()` in commit `0c5865087105bb828d0e8ac54ae90f3abbe92c3e`.

SRB-06 | Improper Usage Of `public` And `external` Type

Category	Severity	Location	Status
Gas Optimization	● Informational	staking/StakingRewards.sol: 211	✓ 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

The team heeded our advice and resolved this issue in commit `4c6b317197a88bbe72b34b10d60c6a62e52bbdd1`.

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.

Mathematical Operations

Mathematical Operation findings relate to mishandling of math formulas, such as overflows, incorrect operations etc.

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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