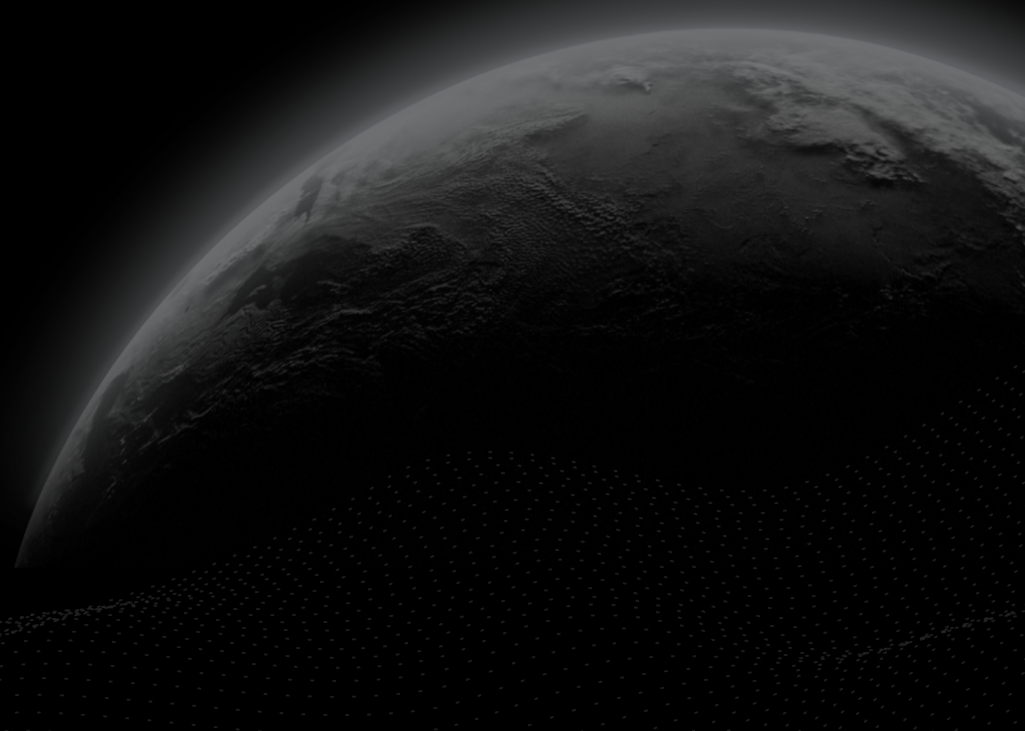
CERTIK

Security Assessment

Orbs single-nominator

CertiK Verified on Dec 15th, 2022



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Orbs single-nominator

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

Executive Summary

TYPES	ECOSYSTEM	METHODS
Other-Contract	TON	Manual Review

LANGUAGE	TIMELINE	KEY COMPONENTS
FunC	Delivered on 12/15/2022	N/A

CODEBASE

update 924658d0579c2692f919092127d3b8b70e569573

base 540d684c2de586d35bfdb85753143c6f9e1c376c

...View All

Vulnerability Summary

6	5	0	0	1	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.
0	Major		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.
5	Minor	4 Resolved, 1 Acknowledged	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.
1	Informational	1 Resolved	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.

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CODEBASE | ORBS SINGLE-NOMINATOR

Repository

update 924658d0579c2692f919092127d3b8b70e569573

base 540d684c2de586d35bfdb85753143c6f9e1c376c

AUDIT SCOPE | ORBS SINGLE-NOMINATOR

2 files audited ● 1 file with Acknowledged findings ● 1 file without findings

ID	File	SHA256 Checksum
SIG	single-nominator.fc	84f485686c03d1b7bc076bef4d3d6e4482c33cbf7cd77902d7c1ebdcd7ed0376
SIL	single-nominator.fc	203f9e67c4af187c31c29101ddad45812f57c733876a50745d9270a9f3188f72

APPROACH & METHODS | ORBS SINGLE-NOMINATOR

This report has been prepared for Orbs to discover issues and vulnerabilities in the source code of the Orbs single-nominator 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 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 | ORBS SINGLE-NOMINATOR

6	0	0	0	5	1
Total Findings	Critical	Major	Medium	Minor	Informational

This report has been prepared to discover issues and vulnerabilities for Orbs single-nominator. Through this audit, we have uncovered 6 issues ranging from different severity levels. Utilizing the techniques of Manual Review to complement rigorous manual code reviews, we discovered the following findings:

ID	Title	Category	Severity	Status
SIG-01	`end_parse()` Is Missing	Coding Style	Minor	Resolved
SIG-02	Range Check Exception Is Thrown If `amount` Is Negative	Volatile Code	Minor	Resolved
SIG-03	`OP::NEW_STAKE` Message Construction Can Be Improved	Volatile Code	Minor	Resolved
SIG-04	Messages From Unknown Senders With Unrecognized Payloads Are Silently Accepted	Volatile Code	Minor	Resolved
SIG-05	Third Party Dependencies	Volatile Code	Minor	Acknowledged
SIG-06	Simple Transfer Is Accepted Before `load_data()` Validates The Initial State	Volatile Code	Informational	Resolved

SIG-01 | `end_parse()` IS MISSING

Category	Severity	Location	Status
Coding Style	Minor	single-nominator.fc (base): 38~39	Resolved

Description

`get_data()` contains 2 fields: `owner_address` and `validator_address`. The function `load_data()` reads all of them, however, it does not ensure that the slice is empty after that.

Recommendation

We recommend calling `ds.end_parse()` to ensure the slice doesn't contain more data.

SIG-02 RANGE CHECK EXCEPTION IS THROWN IF `amount` IS NEGATIVE

Category	Severity	Location	Status
Volatile Code	Minor	single-nominator.fc (base): 86~87	Resolved

Description

```
86              amount = min(amount, my_balance - msg_value - MIN_TON_FOR_STORAGE);
```

In case the contract's balance is less than `MIN_TON_FOR_STORAGE`, the `amount` can become negative. That will lead to a range check exception during `send_raw_message()`.

Recommendation

We recommend explicitly checking the `amount` correctness for better error reporting:

```
87      throw_unless(ERROR::INSUFFICIENT_BALANCE, amount > 0);
```

SIG-03 `OP::NEW_STAKE` MESSAGE CONSTRUCTION CAN BE IMPROVED

Category	Severity	Location	Status
Volatile Code	Minor	single-nominator.fc (base): 127~128	Resolved

Description

```
 127    send_msg(elector_address(), stake_amount, begin_cell().store_uint(op,
32).store_uint(query_id, 64).store_slice(msg).end_cell(), BOUNCEABLE,
MODE::SEND_MODE_REMAINING_AMOUNT); ;; bounceable, validator pays gas fees
```

The message sent to `elector-code` is built directly as the function argument. This decreases the code readability.

`op` sent to `elector-code` must be `OP::NEW_STAKE`. But `op` sent to `single-nominator` can be any. Passing `op` as an argument decreases the code maintainability.

Recommendation

We recommend constructing the message sent to `elector-code` in separate statements. We recommend using `OP::NEW_STAKE` explicitly instead of passing `op`. For example:

```
 126      cell payload = begin_cell().store_uint(OP::NEW_STAKE,
32).store_uint(query_id, 64).store_slice(msg).end_cell();
```

SIG-04 MESSAGES FROM UNKNOWN SENDERS WITH UNRECOGNIZED PAYLOADS ARE SILENTLY ACCEPTED

Category	Severity	Location	Status
Volatile Code	Minor	single-nominator.fc (base): 63~66	Resolved

Description

`recv_internal()` explicitly accepts the messages with empty `in_msg_body`. However, the messages with non-empty `in_msg_body` or from unauthorized senders are also implicitly accepted. This can lead to accidental errors.

Recommendation

We recommend explicitly `return ()` after each recognized command and rejecting all unsupported messages, like this:

```
136   ;; if op higher bit is zero, throw an exception (the message is an
137   ;; unsupported query) to bounce the message back to the sender
138   throw_unless(ERROR::UNSUPPORTED_QUERY, op & (1 << 31));
139   ;; do nothing for responses from the elector
```

Alleviation

[Orbs]: We think the recommendation has a higher risk. In case the elector will be upgraded in the future and the elector will change the returned format of the message it might result in a loss of funds in some scenarios. Therefore from our perspective, it's safer to not throw errors in this scenario.

[CertiK]: We took the **[Orbs]** position and marked the finding as Resolved.

SIG-05 | THIRD PARTY DEPENDENCIES

Category	Severity	Location	Status
Volatile Code	Minor	single-nominator.fc (base): 187~188	Acknowledged

Description

The contract is supposed to be interacted with by a third-party **mytonctrl** tool. The audit scope treats third-party entities as black boxes and assumes their functional correctness. However, the tool's functionality can be changed in the future, which may lead to incorrect `single-nominator` work.

Recommendation

We recommend constantly monitoring the functionality of **mytonctrl** tool to mitigate the side effects when unexpected changes are introduced.

Alleviation

[Orbs]: However, in this case there is no risk to staked funds, but you might need to fork **mytonctrl** code to support `single-nominator` api.

SIG-06 SIMPLE TRANSFER IS ACCEPTED BEFORE `load_data()` VALIDATES THE INITIAL STATE

Category	Severity	Location	Status
Volatile Code	Informational	single-nominator.fc (base): 75~76	Resolved

Description

In `recv_internal()` `load_data()` is performed after accepting of empty and bounced messages. In case the contract was initialized with incorrect initial state, it can still accept the stakes.

`load_data()` validates the storage is in correct format.

Recommendation

We recommend calling `load_data()` at the beginning of the function.

APPENDIX | ORBS SINGLE-NOMINATOR

Finding Categories

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