MOTECH AUDIT

SMART CONTRACT SECURITY AUDIT

SECURITY ASSESSMENT

2021

NAC FOUNDATION VESTING AUDIT REPORT

14 NOV 2021

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SUMMARY

This report has been prepared for NAC Foundation Vesting smart contracts, to discover issues and vulnerabilities in the source code of their Smart Contract as well as any contract dependencies that were not part of an officially recognise ed library. A comprehensive examination has been performed, utilising Static Analysis and ManualReview 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 given they are currently missing in the repository;
- Provide more comments per each function for readability, especially contracts are verified in public;
- Provide more transparency on privileged activities once the protocol is live.

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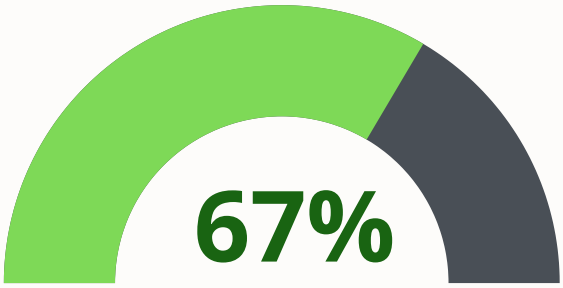
SUMMARY

Pass/Fail	Analyzer	Description
⚠	Motech Audit	Vulnerability analyzer built by Motech Audit that quickly searches within smart contracts for vulnerable code fragments not only exact but also syntactically different clones.
⚠	Formal Verifier	Sound formal verifier built by Motech Audit that analyzes within smart contracts for proving that a program satisfies nonexistence of vulnerability such as integer overflow.
⊗	Achilles	Symbolic analyzer built by Motech Audit that extracts code patterns within smart contracts for finding syntactic and semantic bugs and vulnerabilities based on SWC specification.

✓ Pass ⚠ Compile Error ⊗ Failed



File : NACFoundationVesting.sol

Language : solidity

Size. : 18044 bytes

Date : 2021-11-14T13:30:18.972Z

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DISCLAIMER

This is a limited report on our findings based on our analysis, in accordance with good industry practice as at the date of this report, in relation to cybersecurity vulnerabilities and issues in the framework and algorithms based on smart contracts, the details of which are set out in this report. In order to get a full view of our analysis, it is crucial for you to read the full report. While we have done our best in conducting our analysis and producing this report, it is important to note that you should not rely on this report and cannot claim against us on the basis of what it says or doesn't say, or how we produced it, and it is important for you to conduct your own independent investigations before making any decisions. We go into more detail on this in the below disclaimer below – please make sure to read it in full.

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The analysis of the security is purely based on the smart contracts alone. No applications or operations were reviewed for security. No product code has been reviewed.

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BACKGROUND

Motech Audit was commissioned by Ark Community to perform an audit of smart contracts:

NACFoundationVesting.sol
Report_a78037ffa8fcd139a98738d265349ec465b9515c030c0a21961f5925ab5c1267

The purpose of the audit was to achieve the following:

- Ensure that the smart contract functions as intended.
- Identify potential security issues with the smart contract.

The information in this report should be used to understand the risk exposure of the smart contract, and as a guide to improve the security posture of the smart contract by remediating the issues that were identified.

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VULNERABILITY & RISK LEVEL

24 Total Issues

Risk represents the probability that a certain source-threat will exploit vulnerability, and the impact of that event on the organization or system. Risk Level is computed based on CVSS version 3.0.

Level	Total Issues	Vulnerability	Risk (Required Action)
Critical	0	A vulnerability that can disrupt the contract functioning in a number of scenarios,or creates a risk that the contract may be broken	Immediate action to reduce risk level.
High	3	A vulnerability that affects the desired outcome when using a contract, or provides the opportunity to use a contract in an unintended way.	Implementation of corrective actions as soon as possible.
Medium	2	A vulnerability that could affect the desired outcome of executing the contract in a specific scenario.	Implementation of corrective actions in a certain period.
Low	7	A vulnerability that does not have a significant impact on possible scenarios for the use of the contract and is probably subjective.	Implementation of certain corrective actions or accepting the risk.
Note	12	A vulnerability that have informational character but is not affecting any of the code.	An observation that does not determine a level of risk.

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AUDITING STRATEGY AND TECHNIQUES APPLIED

Throughout the review process, care was taken to evaluate the repository for security-related issues, code quality, and adherence to specification and best practices. To do so, reviewed line-by-line by our team of expert pentesters and smart contract developers, documenting any issues as there were discovered.

Methodology

The auditing process follows a routine series of steps:
1. Code review that includes the following:

- Review of the specifications, sources, and instructions provided to Motech Audit to make sure we understand the size, scope, and functionality of the smart contract.
- Manual review of code, which is the process of reading source code line-byline in an attempt to identify potential vulnerabilities.
- Comparison to specification, which is the process of checking whether the code does what the specifications, sources, and instructions provided to Motech Audit describe.

2. Testing and automated analysis that includes the following:

- Test coverage analysis, which is the process of determining whether the test cases are actually covering the code and how much code is exercised when we run those test cases.
- Symbolic execution, which is analysing a program to determine what inputs causes each part of a program to execute.

3. Best practices review, which is a review of the smart contracts to improve efficiency, effectiveness, clarify, maintainability, security, and control based on the established industry and academic practices, recommendations, and research.

4. Specific, itemized, actionable recommendations to help you take steps to secure your smart contracts.

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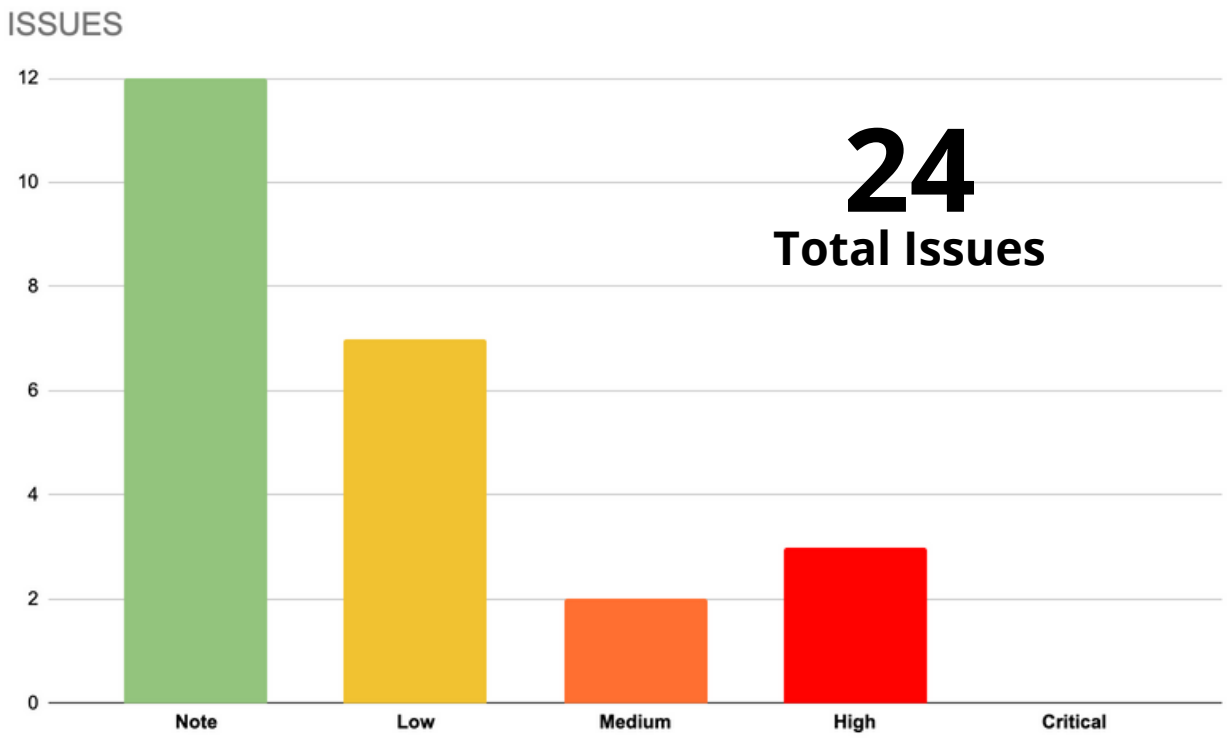
FINDINGS



Severity	Issue	Code Lines
High	SWC-104	224, 230, 239
Medium	SWC-102	0
Medium	SWC-132	205
Low	SWC-103	3, 21, 72, 144, 215, 246, 298
Note	SWC-108	308, 309, 315, 333, 334, 335, 336, 337
Note	SWC-116	360, 377, 497
Note	SWC-131	323

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CODE

1. SWC-104 / lines: 224 High Achilles

A security vulnerability has been detected.

```
223         // bytes4(keccak256(bytes('approve(address,uint256)')));
224         (bool success, bytes memory data) = token.call(abi.encodeWithSelector(0x095ea7b3, to, value));
225         return (success && (data.length == 0 || abi.decode(data, (bool))));
```

In detail

The return value of a message call is not checked. Execution will resume even if the called contract throws an exception. If the call fails accidentally or an attacker forces the call to fail, this may cause unexpected behaviour in the subsequent program logic.

2. SWC-104 / lines: 230 High Achilles

A security vulnerability has been detected.

```
229         // bytes4(keccak256(bytes('transfer(address,uint256)')));
230         (bool success, bytes memory data) = token.call(abi.encodeWithSelector(0xa9059cbb, to, value));
231         // if (token == NACAddr) {
```

In detail

The return value of a message call is not checked. Execution will resume even if the called contract throws an exception. If the call fails accidentally or an attacker forces the call to fail, this may cause unexpected behaviour in the subsequent program logic.

3. SWC-104 / lines: 239 High Achilles

A security vulnerability has been detected.

```
238         // bytes4(keccak256(bytes('transferFrom(address,address,uint256)')));
239         (bool success, bytes memory data) = token.call(abi.encodeWithSelector(0x23b872dd, from, to,
value));
240         return (success && (data.length == 0 || abi.decode(data, (bool))));
```

In detail

The return value of a message call is not checked. Execution will resume even if the called contract throws an exception. If the call fails accidentally or an attacker forces the call to fail, this may cause unexpected behaviour in the subsequent program logic.

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CODE

4. SWC-102 / lines: 0 Medium Achilles

A security vulnerability has been detected.

```
1  // File: contracts/ITRC20.sol
```

In detail

Using an outdated compiler version can be problematic especially if there are publicly disclosed bugs and issues that affect the current compiler version.

5. SWC-132 / lines: 205 Medium Achilles

A security vulnerability has been detected.

```
204      function sendValue(address payable recipient, uint256 amount) internal {
205          require(address(this).balance >= amount, "Address: insufficient balance");
206
```

In detail

Contracts can behave erroneously when they strictly assume a specific Tron balance. It is always possible to forcibly send Tron to a contract (without triggering its fallback function), using selfdestruct, or by mining to the account. In the worst case scenario this could lead to DOS conditions that might render the contract unusable.

6. SWC-103 / lines: 3 Low Achilles

A security vulnerability has been detected.

```
2
3  pragma solidity ^0.5.8;
4
```

In detail

Contracts should be deployed with the same compiler version and flags that they have been tested with thoroughly. Locking the pragma helps to ensure that contracts do not accidentally get deployed using, for example, an outdated compiler version that might introduce bugs that affect the contract system negatively.

SECURITY ASSESMENT

CODE

7. SWC-103 / lines: 21 Low Achilles

```
A security vulnerability has been detected.

20
21  pragma solidity ^0.5.8;
22  /**
```

In detail

Contracts should be deployed with the same compiler version and flags that they have been tested with thoroughly. Locking the pragma helps to ensure that contracts do not accidentally get deployed using, for example, an outdated compiler version that might introduce bugs that affect the contract system negatively.

8. SWC-103 / lines: 72 Low Achilles

```
A security vulnerability has been detected.

71
72  pragma solidity ^0.5.0;
73  // pragma experimental ABIEncoderV2;
```

In detail

Contracts should be deployed with the same compiler version and flags that they have been tested with thoroughly. Locking the pragma helps to ensure that contracts do not accidentally get deployed using, for example, an outdated compiler version that might introduce bugs that affect the contract system negatively.

9. SWC-103 / lines: 144 Low Achilles

```
A security vulnerability has been detected.

143
144 pragma solidity ^0.5.5;
145
```

In detail

Contracts should be deployed with the same compiler version and flags that they have been tested with thoroughly. Locking the pragma helps to ensure that contracts do not accidentally get deployed using, for example, an outdated compiler version that might introduce bugs that affect the contract system negatively.

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CODE

10. SWC-103 / lines: 215 Low Achilles

```
A security vulnerability has been detected.

214
215  pragma solidity ^0.5.15;
216
```

In detail

Contracts should be deployed with the same compiler version and flags that they have been tested with thoroughly. Locking the pragma helps to ensure that contracts do not accidentally get deployed using, for example, an outdated compiler version that might introduce bugs that affect the contract system negatively.

11. SWC-103 / lines: 246 Low Achilles

```
A security vulnerability has been detected.

245
246  pragma solidity ^0.5.0;
247
```

In detail

Contracts should be deployed with the same compiler version and flags that they have been tested with thoroughly. Locking the pragma helps to ensure that contracts do not accidentally get deployed using, for example, an outdated compiler version that might introduce bugs that affect the contract system negatively.

12. SWC-103 / lines: 298 Low Achilles

```
A security vulnerability has been detected.

297
298  pragma solidity ^0.5.0;
299
```

In detail

Contracts should be deployed with the same compiler version and flags that they have been tested with thoroughly. Locking the pragma helps to ensure that contracts do not accidentally get deployed using, for example, an outdated compiler version that might introduce bugs that affect the contract system negatively.

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CODE

13. SWC-108 / lines: 308 Note Achilles

A security vulnerability has been detected.

```
307     event Revoked(address owner, uint256 balance);
308     ITRC20 _token = ITRC20(address(0x415BB46A2DA6957D5FE239713A893E81BF24F2817E));
309     bool _revocable;
```

In detail

Labeling the visibility explicitly makes it easier to catch incorrect assumptions about who can access the variable.

14. SWC-108 / lines: 309 Note Achilles

A security vulnerability has been detected.

```
308     ITRC20 _token = ITRC20(address(0x415BB46A2DA6957D5FE239713A893E81BF24F2817E));
309     bool _revocable;
310
```

In detail

Labeling the visibility explicitly makes it easier to catch incorrect assumptions about who can access the variable.

15. SWC-108 / lines: 315 Note Achilles

A security vulnerability has been detected.

```
314     uint256 public totalReleased;
315     uint256 VESTING_PERIOD = 2629746; //1 month in seconds
316
```

In detail

Labeling the visibility explicitly makes it easier to catch incorrect assumptions about who can access the variable.

SECURITY ASSESMENT

CODE

16. SWC-108 / lines: 333 Note Achilles

A security vulnerability has been detected.

```
332
333     mapping(bytes32 => Schedule) schedules;
334     mapping(bytes32 => mapping (address => uint256)) balances;
```

In detail

Labeling the visibility explicitly makes it easier to catch incorrect assumptions about who can access the variable.

17. SWC-108 / lines: 334 Note Achilles

A security vulnerability has been detected.

```
333     mapping(bytes32 => Schedule) schedules;
334     mapping(bytes32 => mapping (address => uint256)) balances;
335     mapping(bytes32 => mapping (address => uint256)) released;
```

In detail

Labeling the visibility explicitly makes it easier to catch incorrect assumptions about who can access the variable.

18. SWC-108 / lines: 335 Note Achilles

A security vulnerability has been detected.

```
334     mapping(bytes32 => mapping (address => uint256)) balances;
335     mapping(bytes32 => mapping (address => uint256)) released;
336     mapping(bytes32 => mapping (address => bool[])) vested;
```

In detail

Labeling the visibility explicitly makes it easier to catch incorrect assumptions about who can access the variable.

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CODE

19. SWC-108 / lines: 336 Note Achilles

A security vulnerability has been detected.

```
335     mapping(bytes32 => mapping (address => uint256)) released;
336     mapping(bytes32 => mapping (address => bool[])) vested;
337     mapping(bytes32 => address[]) users;
```

In detail

Labeling the visibility explicitly makes it easier to catch incorrect assumptions about who can access the variable.

20. SWC-108 / lines: 337 Note Achilles

A security vulnerability has been detected.

```
336     mapping(bytes32 => mapping (address => bool[])) vested;
337     mapping(bytes32 => address[]) users;
338
```

In detail

Labeling the visibility explicitly makes it easier to catch incorrect assumptions about who can access the variable.

21. SWC-116 / lines: 360 Note Achilles

A security vulnerability has been detected.

```
359         schedule.amountPerPeriod = amountPerPeriod;
360         schedule.addTimestamp = block.timestamp;
361
```

In detail

Contracts often need access to the current timestamp to trigger time-dependent events. As Tron Chain is decentralized, nodes can synchronize time only to some degree. Moreover, malicious miners can alter the timestamp of their blocks, especially if they can gain advantages by doing so. However, miners can't set timestamp smaller than the previous one (otherwise the block will be rejected), nor can they set the timestamp too far ahead in the future. Taking all of the above into consideration, developers can't rely on the preciseness of the provided timestamp.

22. SWC-116 / lines: 377 Note Achilles

A security vulnerability has been detected.

```
376
377         emit AddScheduleDone(block.timestamp);
378
```

In detail

Contracts often need access to the current timestamp to trigger time-dependent events. As Tron Chain is decentralized, nodes can synchronize time only to some degree. Moreover, malicious miners can alter the timestamp of their blocks, especially if they can gain advantages by doing so. However, miners can't set timestamp smaller than the previous one (otherwise the block will be rejected), nor can they set the timestamp too far ahead in the future. Taking all of the above into consideration, developers can't rely on the preciseness of the provided timestamp.

23. SWC-116 / lines: 497 Note Achilles

A security vulnerability has been detected.

```
496         for (uint256 index = 0; index < schedules[_idHash].numPeriods; index++) {
497             if (block.timestamp > startPeriod.add(index.mul(VESTING_PERIOD)) && vested[_idHash][holder]
[index] == false) {
498                 return index;
```

In detail

Contracts often need access to the current timestamp to trigger time-dependent events. As Tron Chain is decentralized, nodes can synchronize time only to some degree. Moreover, malicious miners can alter the timestamp of their blocks, especially if they can gain advantages by doing so. However, miners can't set timestamp smaller than the previous one (otherwise the block will be rejected), nor can they set the timestamp too far ahead in the future. Taking all of the above into consideration, developers can't rely on the preciseness of the provided timestamp.

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CODE

24. SWC-131 / lines: 323 Note Achilles

```
A security vulnerability has been detected.

322
323     Member[] private members;
324
```

In detail

Unused variables are allowed in Solidity and they do not pose a direct security issue. It is best practice though to avoid them as they can:
- cause an increase in computations (and unnecessary gas consumption)
- indicate bugs or malformed data structures and they are generally a sign of poor code quality
- cause code noise and decrease readability of the code

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CONCLUSION

File : NACFoundationVesting.sol
Language : solidity
Size. : 18044 bytes
Date : 2021-11-14T13:30:18.972Z

Motech Audit note: Please check the disclaimer above and note, the audit makes no statements or warranties on business model, investment attractiveness or code sustainability. The report is provided for the only contract mentioned in the report and does not include any other potential contracts deployed by Owner.

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