CERTIK

CertiK Audit Report for TATN

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About CertiK

CertiK is a technology-led blockchain security company founded by Computer Science professors from Yale University and Columbia University built to prove the security and correctness of smart contracts and blockchain protocols.

CertiK, in partnership with grants from IBM and the Ethereum Foundation, CertiK's mission of every audit is to apply different approaches and detection methods, ranging from manual, static, and dynamic analysis, to ensure that projects are checked against known attacks and potential vulnerabilities. CertiK leverages a team of seasoned engineers and security auditors to apply testing methodologies and assessments to each project, in turn creating a more secure and robust software system.

CertiK has served more than 100 clients with high quality auditing and consulting services, ranging from stablecoins such as Binance's BGBP and Paxos Gold to decentralized oracles such as Band Protocol and Tellor. CertiK customizes its engineering tool kits, while applying cutting-edge research on smart contracts, for each client on its project to offer a high quality deliverable. For more information: https://certik.io.

Executive Summary

This report has been prepared for **TATN** to discover issues and vulnerabilities in the source code of their **ERC-20 Smart Contract** as well as any contract dependencies that were not part of an officially recognized library. A comprehensive examination has been performed, utilizing Dynamic Analysis, 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.

Testing Summary

SECURITY LEVEL

Smart Contract Audit

This report has been prepared as a product of the Smart Contract Audit request by TATN.

This audit was conducted to discover issues and vulnerabilities in the source code of TATN's ERC-20 Smart Contract.

TYPE	Smart Contract
SOURCE CODE	https://etherscan.io/address/0x1c8e3d04d04eceebc6ce5925e7e715d6195f0189#code
PLATFORM	EVM
LANGUAGE	Solidity
REQUEST DATE	Aug 20, 2020
DELIVERY DATE	Sept 11, 2020
METHODS	A comprehensive examination has been performed using Dynamic Analysis, Static Analysis, and Manual Review.

Review Notes

Introduction

CertiK team was contracted by the TATN team to audit the design and implementation of their TATN token smart contract and its compliance with the EIPs it is meant to implement.

The audited source code link is:

- The audited source code link: https://etherscan.io/address/0x1c8e3d04d04eceebc6ce5925e7e715d6195f0189#code

The remediated source code link:

- https://github.com/codaelux/TATN-contract/blob/dc1d8397548a206ce2fec44fcbfbcd898d4959d9/TATN.sol

The goal of this audit was to review the Solidity implementation for its business model, study potential security vulnerabilities, its general design and architecture, and uncover bugs that could compromise the software in production.

The findings of the initial audit have been conveyed to the team behind the contract implementations and the source code is expected to be re-evaluated before another round of auditing has been carried out.

Documentation

The sources of truth regarding the operation of the contracts in scope were minimal although the token fulfilled a simple use case we were able to fully assimilate. To help aid our understanding of each contract's functionality we referred to in-line comments and naming conventions.

Summary

The codebase of the project is a typical EIP20 implementation.

Although **certain optimization steps** that we pinpointed in the source code mostly referred to coding standards and inefficiencies, **the two minor flaws** that were identified **should be remediated as soon as possible to ensure the security of the contracts.**

The codebase of the project strictly adheres to the standards and interfaces imposed by the OpenZeppelin open-source libraries and as such its typical ERC-20 functions **can be deemed to be secure**. **However the custom functionality built on top of it possessed flaws** we identified.

Recommendations

Overall, the codebase of the contracts should be refactored to assimilate the findings of this report **to achieve a high standard of code quality and security**.

Findings

Exhibit 1

TITLE	TYPE	SEVERITY	LOCATION
Inefficient Greater-Than Comparison w/ Zero	Optimization	Informational	TATN: L19, L234, L256

[INFORMATIONAL] Description:

The lines above conduct a greater-than `>` comparison between unsigned integers and the value literal `0`.

Recommendations:

As unsigned integers are restricted to the positive range, it is possible to convert this check to an inequality `!=` reducing the gas cost of the functions.

Alleviations:

No alleviations.

Exhibit 2

TITLE	TYPE	SEVERITY	LOCATION
`require` Statements Over `assert`	Coding Style	Informational	TATN: L14, L19, L26, L32

[INFORMATIONAL] Description:

The use of `assert` statements should be avoided, as a failed assertion will lead to gas exhaustion. For that reason, it is a good practice to use `assert` statements for validation after making state changes.

Recommendations:

We advise the team to change the `require` statements with `assert` ones.

Alleviations:

The team opted to take our recommendation into account and changed all the `assert` statements with `require` ones.

Exhibit 3

TITLE	TYPE	SEVERITY	LOCATION
Add Error Messages	Coding Style	Informational	TATN: all “require” statements

[INFORMATIONAL] Description:

It is a generally accepted coding practice to add descriptive error messages to all types of `require` invocations to aid in the debugging of the application.

Recommendations:

We advise that proper error messages are provided for these statements.

Alleviations:

The team opted to take our recommendation into account and added error messages to all `require` statements.

Exhibit 4

TITLE	TYPE	SEVERITY	LOCATION
Revise `SafeMath` Library	Optimization	Minor	TATN: L11 - L35

[MINOR] Description:

The use of an updated version of the `SafeMath` library is very important, as it will impact all token values and user data. It is also essential for preventing integer overflow or underflow after mathematical operations.

Recommendations:

We advise the team to revise the `SafeMath` library and use an updated version, as the current one is missing the following:

- Check for division with zero in the *division* function (`div` invocation).

  Example:

  ```
  require(b != 0, "Error Message");
  ```

- Check for multiplication with zero in the *multiplication* function (`mul` invocation).

  Example:

  ```
  // See: https://github.com/OpenZeppelin/openzeppelin-contracts/pull/522
  if (a == 0) {
      return 0;
  }
  ```

- `require` statements over `assert` ones, as stated in *Exhibit 2*.

Alleviations:

The team opted to take our recommendation into account and used an updated version of the `SafeMath` library.

Exhibit 5

TITLE	TYPE	SEVERITY	LOCATION
Misleading Event Emission	Coding Style	Minor	TATN: L265

[Minor] Description:

When an event is emitted, the event arguments passed will be stored in the transaction logs. So, passing accurate event arguments is mandatory. In L265, the `Transfer` event fired is incorrect, as it refers to the `Burn` event instead of the `Mint` one

Recommendations:

We advise the team to change the emitted `Transfer` event as follows:

emit Transfer(address(0), minter, _value);

Alleviations:

The team opted to take our recommendation into account and changed the `Transfer` event fired to reference a `Mint` event, as it was supposed to be.