CERTIK

Security Assessment

NineChronicles.EthBridge

Aug 18th, 2021

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Summary

This report has been prepared for Nine-chronicles.com to discover issues and vulnerabilities in the source code of the NineChronicles.EthBridge 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	NineChronicles.EthBridge
Platform	Ethereum
Language	Solidity
Codebase	https://github.com/planetarium/NineChronicles.EthBridge/blob/main/contracts/contracts/WrappedNCG.sol
Commit	f5b28bff579b46c26c6ad6add76069bd5d2f40cb

Audit Summary

Delivery Date	Aug 18, 2021
Audit Methodology	Static Analysis, Manual Review
Key Components	

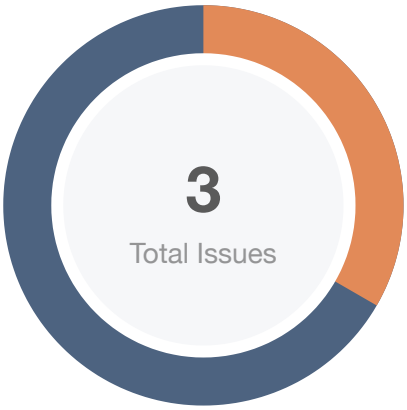
Vulnerability Summary

Vulnerability Level	Total	Pending	Declined	Acknowledged	Partially Resolved	Resolved
Critical	0	0	0	0	0	0
Major	1	0	0	1	0	0
Medium	0	0	0	0	0	0
Minor	0	0	0	0	0	0
Informational	2	0	0	2	0	0
Discussion	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
WNC	WrappedNCG.sol	70c682a8fef9ff9558f3b3bfb535c170f2d56194d1b067be8648fc2c7d4ccfed

Findings



Critical	0 (0.00%)
Major	1 (33.33%)
Medium	0 (0.00%)
Minor	0 (0.00%)
Informational	2 (66.67%)
Discussion	0 (0.00%)

ID	Title	Category	Severity	Status
WNC-01	Unlocked Compiler Version	Language Specific	Informational	Acknowledged
WNC-02	Function Visibility Optimization	Gas Optimization	Informational	Acknowledged
WNC-03	Centralization Risk	**Centralization / Privilege**	**Major**	Acknowledged

WNC-01 | Unlocked Compiler Version

Category	Severity	Location	Status
Language Specific	Informational	WrappedNCG.sol: 3	Acknowledged

Description

The contract contains unlocked compiler versions. An unlocked compiler version in the contract's source code permits the user to compile it at or above a particular version. This, in turn, leads to differences in the generated bytecode between compilations due to differing compiler version numbers. This can lead to ambiguity when debugging as compiler-specific bugs may occur in the codebase that would be difficult to identify over a span of multiple compiler versions rather than a specific one.

Recommendation

It is general practice to alternatively lock the compiler at a specific version rather than allow a range of compiler versions to be utilized to avoid compiler-specific bugs and thus be able to detect emerging ones. We recommend locking the compiler at the lowest possible version that supports all the capabilities required by the codebase. This will ensure that the project utilizes a compiler version that has been in use for the longest time and as such is less likely to contain yet-undiscovered bugs.

Alleviation

No alleviation.

WNC-02 | Function Visibility Optimization

Category	Severity	Location	Status
Gas Optimization	Informational	WrappedNCG.sol: 13, 19, 23	Acknowledged

Description

`public` functions that are never called by the contract could be declared `external`. When the inputs are arrays, `external` functions are more efficient than `public` functions. For example:

- `burn()`
- `mint()`
- `decimals()`

Recommendation

We advise that the functions' visibility specifiers are set to `external` and the array-based arguments change their data location from `memory` to `calldata`, optimizing the gas cost of the function.

Alleviation

No alleviation.

WNC-03 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	**Major**	WrappedNCG.sol: 19	Acknowledged

Description

To bridge the gap in trust between the `owner` and users, the `owner` needs to express a sincere attitude regarding the considerations of the administrator team's anonymity.

The `owner` has the responsibility to notify users about the following capabilities:

- Mint uncapped tokens to any address through `mint()`

Recommendation

We advise the client to carefully manage the `owner` account's private key to avoid any potential risks of being hacked. In general, we strongly recommend centralized privileges or roles in the protocol to be improved via a decentralized mechanism or via 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 the different levels in terms of the short-term and long-term:

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
- Assignment of privileged roles to multi-signature wallets to prevent a single point of failure due to the private key;
- Introduction of a DAO/governance/voting module to increase transparency and user involvement.

Alleviation

No alleviation.

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.

Language Specific

Language Specific findings are issues that would only arise within Solidity, i.e. incorrect usage of private or delete.

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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