Security Assessment

QANX Bridge

Oct 27th, 2021

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Summary

This report has been prepared for QANX to discover issues and vulnerabilities in the source code of the QANX Bridge 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	QANX Bridge
Description	Bridge
Platform	BSC
Language	Solidity
Codebase	• https://testnet.bscscan.com/address/0xaaa9b664852972283a0907004e62ae8fcbb00aaa#code. • https://github.com/QANplatform/qanx-token/blob/ebf0352af6ccb8d991827a0fba3ac5cfe9ca6b70/contracts/BridgeQANX.sol • https://github.com/QANplatform/qanx-token/blob/40f82ab17e9e713fecf0a20b6781afc63ea83903/contracts/BridgeQANX.sol
Commit	• ebf0352af6ccb8d991827a0fba3ac5cfe9ca6b70 • 40f82ab17e9e713fecf0a20b6781afc63ea83903

Audit Summary

Delivery Date	Oct 27, 2021
Audit Methodology	Static Analysis, Manual Review
Key Components	

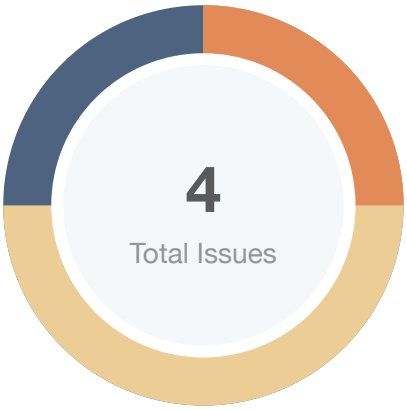
Vulnerability Summary

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

Audit Scope

ID	File	SHA256 Checksum
BQA	BridgeQANX.sol	4031a7540e020e300f4c1ba9f7e9cacd42c76406b6c82637522dc66e33471a27

Findings



Critical	0 (0.00%)
Major	1 (25.00%)
Medium	0 (0.00%)
Minor	2 (50.00%)
Informational	1 (25.00%)
Discussion	0 (0.00%)

ID	Title	Category	Severity	Status
QAN-01	Centralization Risk	**Centralization / Privilege**	**Major**	Partially Resolved
QAN-02	Third Party Dependencies	Volatile Code	Minor	Resolved
QAN-03	Variable Visibility and Event Emit	Coding Style	Minor	Resolved
QAN-04	Lack of Zero Address Validation	Volatile Code	Informational	Resolved

QAN-01 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	Major	projects/qanxbridge/contracts/bridgeQANX.sol (source): 31, 142, 148	Partially Resolved

Description

In the contract `Signed`, the role `signerDelegator` has the authority over the following function:

- `setAddress()`

In the contract `BridgeQANX`, The role `signer` has the authority over the following functions:

- `setFeePercentage()`
- `withdrawFees()`
- `bridgeWithdraw()`, as only the signer is able to pass the check in line 122

Any compromise to the `signerDelegator` or `signer` account may allow the hacker to take advantage of this and withdraw collected fees in the contract, or even all `_qanx` tokens deposited in the contract via the `bridgeWithdraw()` function.

Do note that there will always be a centralized component in a token bridge system that processes data from two chains and connects them. The finding here can be understood as "try to avoid single point of failure". If the signer account is compromised, the attacker might be able to withdraw arbitrary funds from the contract. However, introducing multi-sig, or multiple signers can bring up the cost and complicate the system. The general advice for the finding is to implement security measures that help secure the signer account.

Recommendation

We advise the client to carefully manage the `signerDelegator` and `signer` 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 smart-contract-based accounts with enhanced security practices, e.g., Multisignature wallets.

Indicatively, here is some feasible suggestions that would also mitigate the potential risk at the different level in term of short-term and long-term:

- Assignment of privileged roles to multi-signature wallets to prevent a single point of failure due to the private key;

Alleviation

[QANX Bridge Team]: We added the possibility of multiple signers and a limit for the amount signable for a given address. These signers operate completely separately offsite, even a breach to the API would not expose the keys. Signing keys themselves are contained in RISC-V based custom hardware wallets, no way to extract private keys.

QAN-02 | Third Party Dependencies

Category	Severity	Location	Status
Volatile Code	Minor	projects/qanxbridge/contracts/bridgeQANX.sol (source): 69	Resolved

Description

The contract is serving as the underlying entity to interact with the `_qanx` token defined in the constructor, which is unknown from the deployed contract. The scope of the audit treats 3rd party entities as black boxes and assume their functional correctness. However, in the real world, 3rd parties can be compromised and this may lead to lost or stolen assets. In addition, upgrades of 3rd parties can possibly create severe impacts, such as increasing fees of 3rd parties, migrating to new LP pools, etc.

Recommendation

We understand that the business logic of `bridgeQANX` requires interaction with the `_qanx` token. We encourage the team to constantly monitor the statuses of 3rd parties to mitigate the side effects when unexpected activities are observed.

Alleviation

[QANX Bridge team]: We hardcoded the dependency address instead of being a constructor parameter The contract at that address was audited by you (CertiK) as well, and passed the audit successfully

QAN-03 | Variable Visibility and Event Emit

Category	Severity	Location	Status
Coding Style	Minor	projects/qanxbridge/contracts/bridgeQANX.sol (source): 65, 137~138, 141~144, 147~151	Resolved

Description

Several important variables are `private` and do not have getter functions, such as `_qanx`, `feePercentage`, and `feesCollected`.

Several functions that affects the status of sensitive variables should be able to emit events as notifications to the community, such as `setFeePercentage()` and `withdrawFees()`.

Recommendation

We recommend changing the visibility of these variables to `public` and/or adding getter functions, and adding events for the functions referenced above for transparency with the community.

Alleviation

[QANX Bridge team]: We added a fee related information getter (percentage, total collected) to be more transparent. Fixed in commit: ebf0352af6ccb8d991827a0fba3ac5cfe9ca6b70

QAN-04 | Lack of Zero Address Validation

Category	Severity	Location	Status
Volatile Code	Informational	projects/qanxbridge/contracts/bridgeQANX.sol (source): 30~38	Resolved

Description

In the `setAddress()` function, the `signer` and `signerDelegator` should not be zero addresses.

Recommendation

We advise the client to check that the aforementioned variables are not zero address.

Alleviation

[QANX Bridge team]: We added address validation. Fixed in commit ebf0352af6ccb8d991827a0fba3ac5cfe9ca6b70

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.

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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