



Security Assessment

Kyoko III-p2p

Apr 2nd, 2022



Table of Contents

Summary

Overview

[Project Summary](#)

[Audit Summary](#)

[Vulnerability Summary](#)

[Audit Scope](#)

Findings

[KPP-01 : Centralization Risk in KyokoP2P.sol](#)

[KPP-02 : Potential loss funds when modifying fees](#)

[KPP-03 : No Upper Limit for Fee Rate](#)

[PPC-01 : Missing Emit Events](#)

Appendix

Disclaimer

About

Summary

This report has been prepared for Kyoko III-p2p to discover issues and vulnerabilities in the source code of the Kyoko III-p2p 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	Kyoko III-p2p
Platform	Other
Language	Solidity
Codebase	https://github.com/kyoko-finance/kyoko-p2p-contract
Commit	1. 7d72bff5bc679f163f422b7459e7aa7545022bc4 2. 9f1f61efbb2590eb02e9c93f6bf0341da468e152

Audit Summary

Delivery Date	Apr 02, 2022 UTC
Audit Methodology	Static Analysis, Manual Review

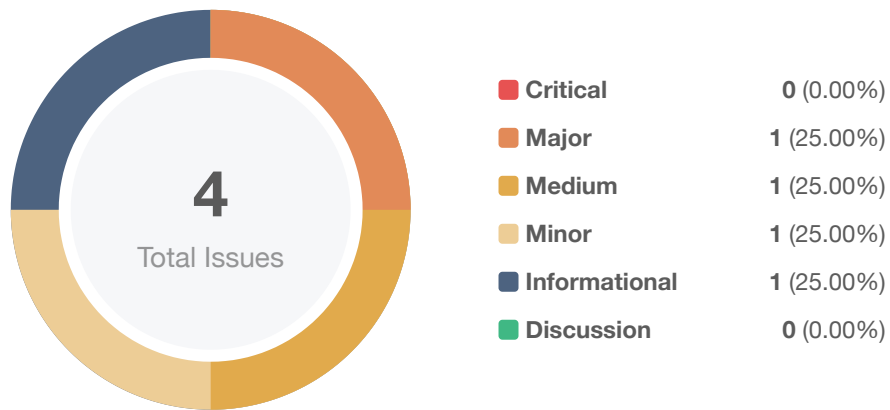
Vulnerability Summary

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

Audit Scope

ID	File	SHA256 Checksum
CPP	Configuration.sol	5e8cc6b4c8eef679d5a44da662c411089673609b7554fceb2693b9e7f0a4b316
DTP	DataTypes.sol	97d0f38259553de11cf732af05918cadb1fab12188365aee84a9aea6e054dfa8
IKP	IKyoko.sol	2434aa2bebe459e9c726d5a0031c2286c9894fe9d02566da47e9c0357e3baead
KPP	KyokoP2P.sol	9538ccd36e05b9b6aa4ac05fa45486a827509a9bf4c178c5c0f36888f2ee1f2d
KSP	KyokoStorage.sol	589a247381a1b4aa21b2e50c857be34e4191e41b87abc80346fe7f9693eeb8c4
LTP	LenderToken.sol	7ed2ff5a2bb22ea40b6e01b214e3dbb99783e7c3a1004b1d2b16084b972f230c

Findings



ID	Title	Category	Severity	Status
KPP-01	Centralization Risk in KyokoP2P.sol	Centralization / Privilege	Major	⌚ Mitigated
KPP-02	Potential loss funds when modifying fees	Logical Issue	Medium	✓ Resolved
KPP-03	No Upper Limit for Fee Rate	Logical Issue	Minor	✓ Resolved
PPC-01	Missing Emit Events	Coding Style	Informational	✓ Resolved

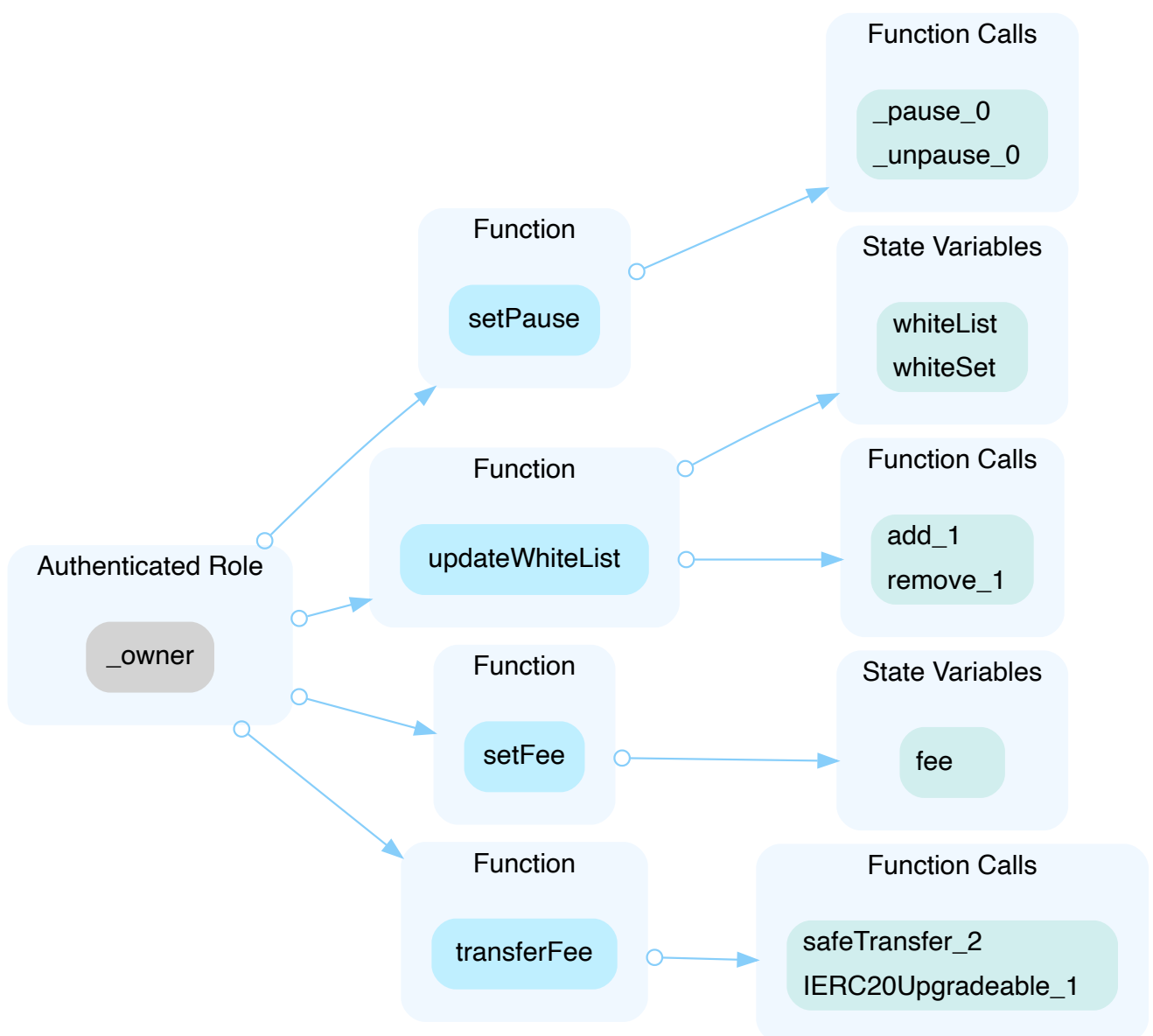
KPP-01 | Centralization Risk In KyokoP2P.sol

Category	Severity	Location	Status
Centralization / Privilege	● Major	KyokoP2P.sol: 57~63, 65~73, 75~78, 540~546	🕒 Mitigated

Description

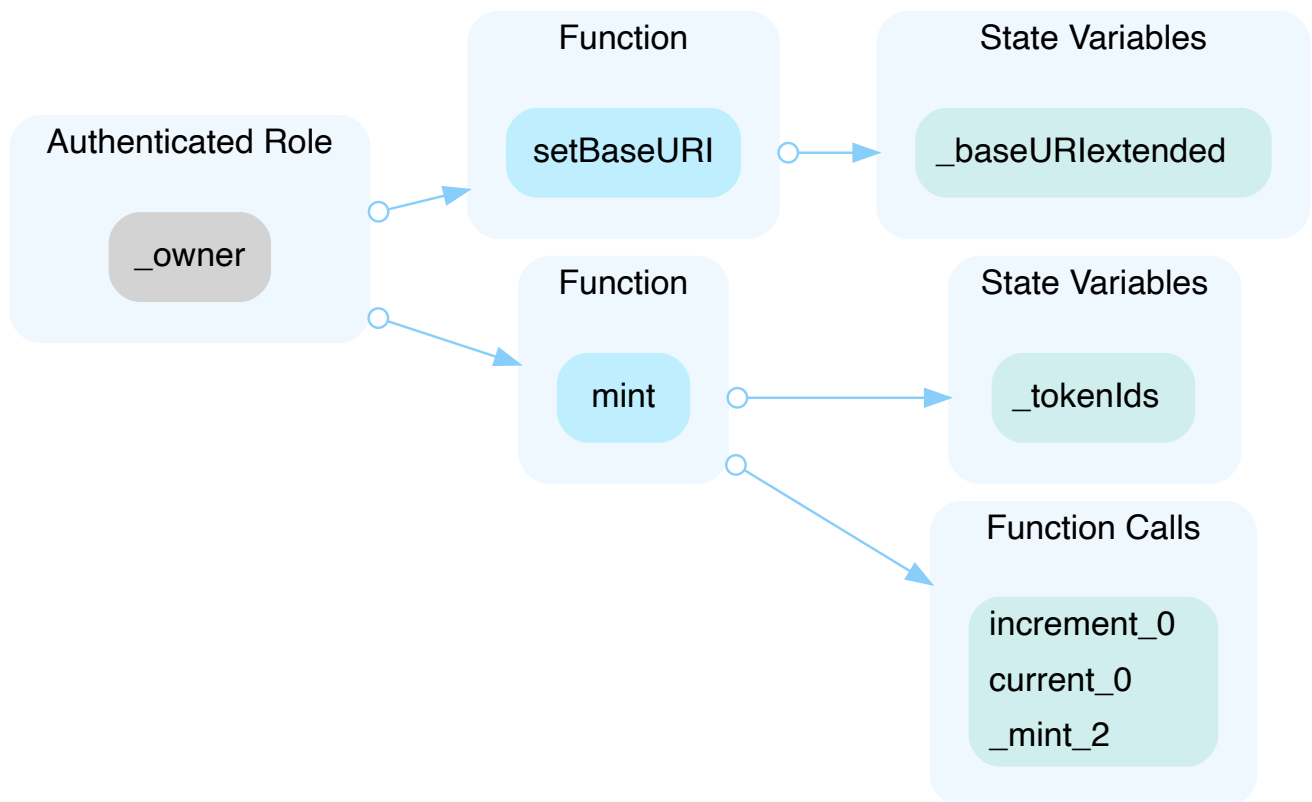
In the contract `KyokoP2P` the role `_owner` has authority over the functions shown in the diagram below.

Any compromise to the `_owner` account may allow the hacker to take advantage of this authority and transfer away all the erc20 tokens in the contract.



In the contract `LenderToken` the role `_owner` has authority over the functions shown in the diagram below.

Any compromise to the `_owner` account may allow the hacker to take advantage of this authority and change the base URL of the NFT token.



Recommendation

The risk describes the current project design and potentially makes iterations to improve in the security operation and level of decentralization, which in most cases cannot be resolved entirely at the present stage. We advise the client to carefully manage the privileged account's private key to avoid any potential risks of being hacked. In general, we strongly recommend centralized privileges or roles in the protocol be improved via a decentralized mechanism or 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 a different level in terms of short-term, long-term and permanent:

Short Term:

Timelock and Multi sign ($\frac{2}{3}$, $\frac{3}{5}$) combination *mitigate* by delaying the sensitive operation and avoiding a single point of key management failure.

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
AND

- Assignment of privileged roles to multi-signature wallets to prevent a single point of failure due to the private key compromised;
AND
- A medium/blog link for sharing the timelock contract and multi-signers addresses information with the public audience.

Long Term:

Timelock and DAO, the combination, *mitigate* by applying decentralization and transparency.

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
AND
- Introduction of a DAO/governance/voting module to increase transparency and user involvement.
AND
- A medium/blog link for sharing the timelock contract, multi-signers addresses, and DAO information with the public audience.

Permanent:

Renouncing the ownership or removing the function can be considered *fully resolved*.

- Renounce the ownership and never claim back the privileged roles.
OR
- Remove the risky functionality.

Alleviation

[Kyoko]:

1. The `owner` account of `KyokoP2P` will be transferred to multi-signature wallets after deployment. The `transferFee()` function has been removed and will be handled through DAO and Timelock later.
2. The `owner` account in `LenderToken` is changed to `AccessControlEnumerableUpgradeable` for management. The mint permission will be authorized to the `KyokoP2P` contract via `script 4`, and the `setBaseURI()` function permission is authorized to another `ROLE_LTOKEN_MANAGER` role.

KPP-02 | Potential Loss Funds When Modifying Fees

Category	Severity	Location	Status
Logical Issue	● Medium	KyokoP2P.sol: 194~196	✓ Resolved

Description

In the `addOffer()`, the contract calculates the price by deducting the fees. In the `cancelOffer()`, the contract calculates the price by adding the fees. Normally, if the `fee` did not change between the two functions being called, the price will not change. However, if the `fee` changes, the prices before and after will be different. It may cause losses.

Recommendation

Record the amount of tokens the lender really pay may be better.

Alleviation

The Kyoko team added a `_offer.fee` in commit `fb879b9a65b53db739cc92a43b4ccf931e3003c5`.

KPP-03 | No Upper Limit For Fee Rate

Category	Severity	Location	Status
Logical Issue	● Minor	KyokoP2P.sol: 76~77	🕒 Resolved

Description

In the current implementation, there is no upper limit for the fee rate. Misuse of these fee setting functions could damage the whole protocol. For example, the owner can set the fee rate to more than 100% to cause all transactions to revert.

Recommendation

We recommend setting a reasonable upper limit of `FeeRate`, such as 10% or 20%.

Alleviation

Kyoko team added a cap for `FeeRate` which should be less than 10%, the change was supplied in commit `fb879b9a65b53db739cc92a43b4ccf931e3003c5`.

PPC-01 | Missing Emit Events

Category	Severity	Location	Status
Coding Style	● Informational	KyokoP2P.sol: 57~63, 540~546 LenderToken.sol: 34~36, 42~47 test/AssetToken.sol: 33~35	☑ Resolved

Description

There should always be events emitted in the sensitive functions that are controlled by centralization roles.

Recommendation

It is recommended emitting events for the sensitive functions that are controlled by centralization roles.

Alleviation

The Kyoko team emitted events for the sensitive functions in commit

9f1f61efbb2590eb02e9c93f6bf0341da468e152.

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.

Logical Issue

Logical Issue findings detail a fault in the logic of the linked code, such as an incorrect notion on how `block.timestamp` works.

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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