OpenOceanExchange Audit Report

Version 1.0.0

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Presented by Fairyproof

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FAIRYPROOF

01. Introduction

This document includes the results of the audit performed by the Fairyproof team on the OpenOceanExchange project.

Audit Start Time:

October 15, 2021

Audit End Time:

October 18, 2021

Audited Source File's Ethereum Onchain Address:

OpenOceanExchange: 26d26b1a0243566d1cd38ff9afd5fd3f0fb6cbb4

Audited Source File's Source Code Address:

https://etherscan.io/address/26d26b1a0243566d1cd38ff9afd5fd3f0fb6cbb4#code

The goal of this audit is to review OpenOceanExchange's solidity implementation for its swap functions, study potential security vulnerabilities, its general design and architecture, and uncover bugs that could compromise the software in production.

We make observations on specific areas of the code that present concrete problems, as well as general observations that traverse the entire codebase horizontally, which could improve its quality as a whole.

This audit only applies to the specified code, software or any materials supplied by the OpenOceanExchange team for specified versions. Whenever the code, software, materials, settings, enviroment etc is changed, the comments of this audit will no longer apply.

— Disclaimer

Note that as of the date of publishing, the contents of this report reflect the current understanding of known security patterns and state of the art regarding system security. You agree that your access and/or use, including but not limited to any associated services, products, protocols, platforms, content, and materials, will be at your sole risk.

The review does not extend to the compiler layer, or any other areas beyond the programming language, or other programming aspects that could present security risks. If the audited source files are smart contract files, risks or issues introduced by using data feeds from offchain sources are not extended by this review either.

Given the size of the project, the findings detailed here are not to be considered exhaustive, and further testing and audit is recommended after the issues covered are fixed.

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— Methodology

The above files' code was studied in detail in order to acquire a clear impression of how the its specifications were implemented. The codebase was then subject to deep analysis and scrutiny, resulting in a series of observations. The problems and their potential solutions are discussed in this document and, whenever possible, we identify common sources for such problems and comment on them as well.

The Fairyproof auditing process follows a routine series of steps:

1. Code review that includes the following
   i. Review of the specifications, sources, and instructions provided to Fairyproof to make sure we understand the size, scope, and functionality of the project's source code.
   ii. Manual review of code, which is the process of reading source code line-by-line in an attempt to identify potential vulnerabilities.
   iii. Comparison to specification, which is the process of checking whether the code does what the specifications, sources, and instructions provided to Fairyproof describe.
2. Testing and automated analysis that includes the following:
   i. 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 the test cases.
   ii. Symbolic execution, which is analyzing a program to determine what inputs cause each part of a program to execute.
3. Best practices review, which is a review of the source code to improve maintainability, security, and control based on the established industry and academic practices, recommendations, and research.

— Structure of the document

This report contains a list of issues and comments on all the above source files. Each issue is assigned a severity level based on the potential impact of the issue and recommendations to fix it, if applicable. For ease of navigation, an index by topic and another by severity are both provided at the beginning of the report.

— Documentation

For this audit, we used the following sources of truth about how the swap functions should work:

https://openocean.finance/

project docs

These were considered the specification.

— Comments from Auditor

No vulnerabilities with critical, high, medium or low-severity were found in the above source code.

Additional notice: 0.

02. About Fairyproof

Fairyproof is a leading technology firm in the blockchain industry, providing consulting and security audits for organizations. Fairyproof has developed industry security standards for designing and deploying blockchain applications.

03. Introduction to OpenOceanExchange

OpenOcean is the world's first full aggregation protocol for crypto trading that source liquidity from DeFi and CeFi, and enable cross-chain swaps. Our intelligent routing algorithm find the best prices from DEXes and CEXes, and split the routes to provide traders the best prices with low slippage and fast settlement. The function is free to use, OpenOcean users only need to pay the normal blockchain gas fees and exchange fees for the trades, which are charged by the exchanges and not OpenOcean.

04. Major functions of audited code

The audited code mainly implements the following functions:

- Users need to transfer crypto assets to OpenOceanExchange's contracts
- OpenOceanExchange executes token swaps that are initiated by users from offchain

Note:

- The application assumes initiations of transactions from offchain are desired and safe: the application executes token swaps that are initiated by users from offchain. Although these transactions are signed by users, these transactions may not be desired. The application assumes all these transaction that are initiated by users from offchain are desired and safe.

05. Admin rights

In this application the admin can disable contracts.

06. Key points in audit

During the audit Fairyproof mainly worked on the following items:

- Integer Overflow/Underflow

We checked all the code sections, which had arithmetic operations and might introduce integer overflow or underflow if no safe libraries were used. All of them used safe libraries.

We didn't find issues or risks in these functions or areas at the time of writing.

- Access Control

We checked each of the functions that can modify a state, especially those functions that can only be accessed by "owner".

We didn't find issues or risks in these functions or areas at the time of writing.

- Admin Rights

We checked whether or not the admin had inappropriate access rights.

We didn't find issues or risks in these functions or areas at the time of writing.

- State Update

We checked some key state variables which should only be set at initialization.

We didn't find issues or risks in these functions or areas at the time of writing.

07. Coverage of issues

The issues that the Fairyproof team covered when conducting the audit include but are not limited to the following ones:

- Re-entrancy Attack
- DDos Attack
- Integer Overflow
- Function Visibility
- Logic Vulnerability
- Uninitialized Storage Pointer
- Arithmetic Precision
- Tx.origin
- Shadow Variable
- Design Vulnerability

- Token Issurance
- Asset Security
- Access Control

08. Severity level reference

Every issue in this report was assigned a severity level from the following:

Critical severity issues need to be fixed as soon as possible.

High severity issues will probably bring problems and should be fixed.

Medium severity issues could potentially bring problems and should eventually be fixed.

Low severity issues are minor details and warnings that can remain unfixed but would be better fixed at some point in the future.

09. List of issues by severity

A. Critical

- N/A

B. High

- N/A

C. Medium

- N/A

D. Low

- N/A

10. List of issues by source file

- N/A

11. Issue descriptions

- N/A

12. Recommendations to enhance the overall security

We list some recommendations in this section. They are not mandatory but will enhance the overall security of the system if they are adopted.

- Removing Redundant Code

Beginning in line 636 of the `OpenOceanExchange` file, it has the following code section:

```
    function universalTransferFrom(
        IERC20 token,
        address from,
        address to,
        uint256 amount
    ) internal {
        //...
    address(uint160(to)).transfer(amount);
```

The `to` variable in `address(uint160(to)).transfer(amount)` is an address data type. There is no need to convert it to `uint160` and then `address`.

Consider removing this conversion.