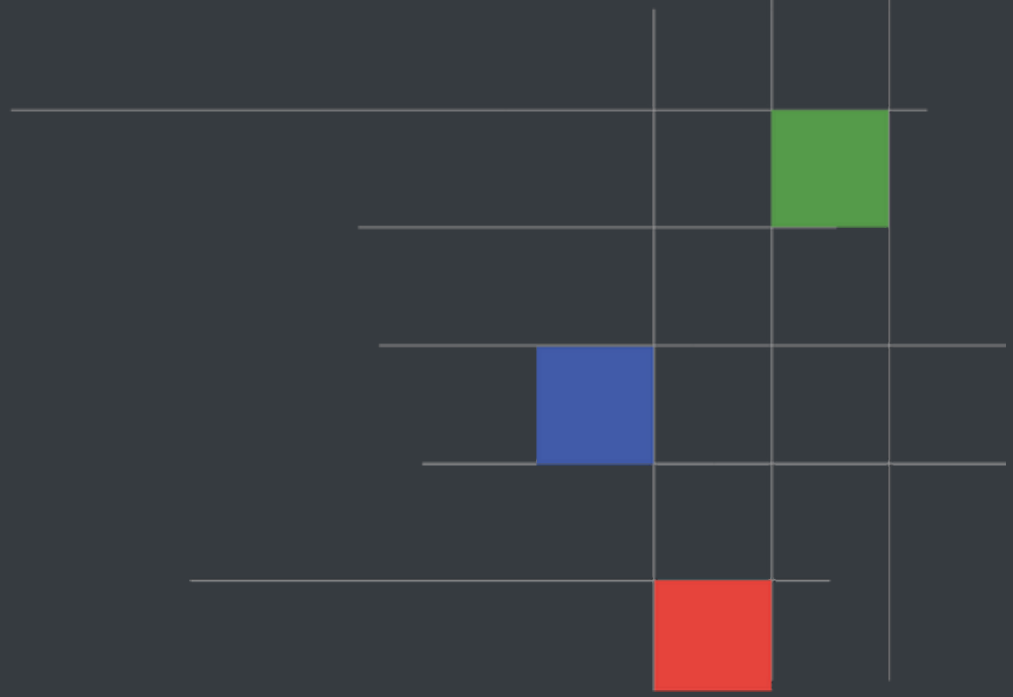
Xend.Finance: Xend Token

Smart Contracts

Security Assessment

January 27th, 2021



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What is a CertiK report?

- A document describing in detail an in depth analysis of a particular piece(s) of source code provided to CertiK by a Client.
- An organized collection of testing results, analysis and inferences made about the structure, implementation and overall best practices of a particular piece of source code.
- Representation that a Client of CertiK has indeed completed a round of auditing with the intention to increase the quality of the company/product's IT infrastructure and or source code.

Overview

Project Summary

Project Name	Xend.Finance: Xend Token
Description	The codebase comprise of ERC20 implementation of Xend token which allows burning, minting and buying of XendToken.
Platform	Ethereum; Solidity, Yul
Codebase	GitHub Repository
Commits	1. 4cf8a749224deac304958bbc1ad54512688db9be 2. ad4f0efb31c87f52477a2653a6d4f70eb94e5571 3. 2d7cfb61ef8797c04da8af0492090664816d7bea

Audit Summary

Delivery Date	January 27th, 2021
Method of Audit	Static Analysis, Manual Review
Consultants Engaged	2
Timeline	November 6th, 2020 - January 27th, 2021

Vulnerability Summary

Total Issues	11
Total Critical	1
Total Major	0
Total Medium	0
Total Minor	1
Total Informational	9

Executive Summary

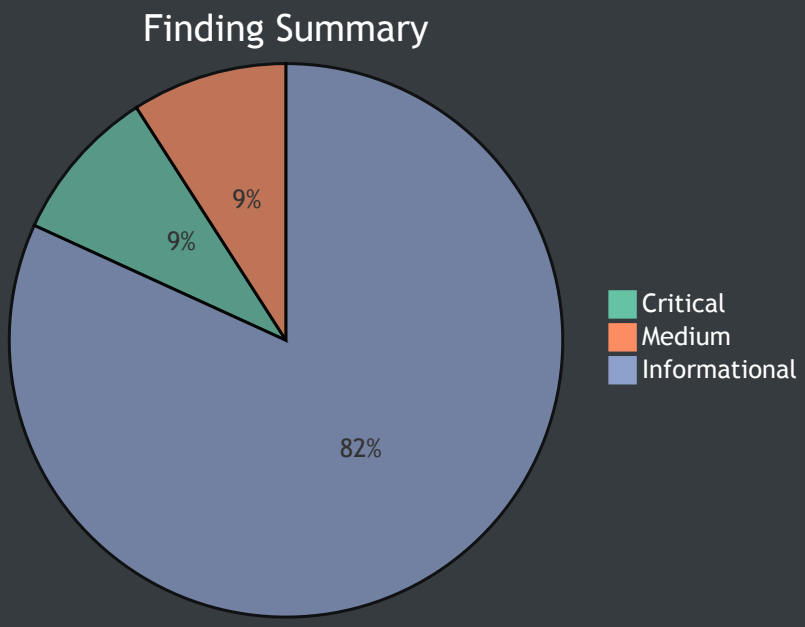
This report represents the results of CertiK's engagement with Xend on their implementation of the Xend Token smart contracts.

Our findings mainly refer to optimizations and a single critical issue. All of the findings except a few informational were remediated. The overall security of the contracts can be deemed as high after the remediations were applied.

Files In Scope

ID	Contract	Location
ERC	ERC20.sol	ERC20.sol
IER	IERC20.sol	IERC20.sol
IXT	IXendToken.sol	IXendToken.sol
XTN	XendToken.sol	XendToken.sol
XTM	XendTokenMinters.sol	XendTokenMinters.sol

Findings



ID	Title	Type	Severity	Resolved
XTN-01	Unlocked Compiler Version	Language Specific	Informational	✓
XTN-02	Imports are not used	Dead Code	Informational	✓
XTN-03	`_price` can be set by any address	Logical Issue	Critical	✓
ERC-01	Unlocked Compiler Version	Language Specific	Informational	✓
ERC-02	Import is not used	Dead Code	Informational	✓
ERC-03	Ineffecutal code	Mathematical Operations	Informational	✓
ERC-04	`Transfer` event is not fired	Volatile Code	Medium	✓
ERC-05	Unused function	Gas Optimization	Informational	✓
XTM-01	Comparison with a literal boolean value	Gas Optimization	Informational	⟳
IXT-01	Unlocked Compiler Version	Language Specific	Informational	✓
IER-01	Unlocked Compiler Version	Language Specific	Informational	✓

XTN-01: Unlocked Compiler Version

Type	Severity	Location
Language Specific	Informational	XendToken.sol L1

Description:

The contract has unlocked compiler version. An unlocked compiler version in the source code of the contract 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 an ambiguity when debugging as compiler specific bugs may occur in the codebase that would be hard to identify over a span of multiple compiler versions rather than a specific one.

Recommendation:

We advise that the compiler version is instead locked at the lowest version possible that the contract can be compiled at. For example, for version `v0.6.2` the contract should contain the following line:

```
pragma solidity 0.6.2;
```

Recommendation:

Alleviations were applied as advised.

XTN-02: Imports are not used

Type	Severity	Location
Dead Code	Informational	XendToken.sol L4, L6

Description:

The contracts from the files imported on the aforementioned lines are never used in the contract.

Recommendation:

We advise to remove the imports from the aforementioned lines to increase the legibility and quality of the codebase.

Alleviation:

Alleviations were applied as advised.

XTN-03: `_price` can be set by any address

Type	Severity	Location
Logical Issue	Critical	XendToken.sol L74

Description:

The function `SetPrice` on the aforementioned line can be called by any address setting the price of XendToken.

Recommendation:

We advise to restrict the execution of function by only the owner of the contract so that a random address could not change the price of token.

Alleviation:

Alleviations were applied as advised.

ERC-01: Unlocked Compiler Version

Type	Severity	Location
Language Specific	Informational	ERC20.sol L3

Description:

The contract has unlocked compiler version. An unlocked compiler version in the source code of the contract 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 an ambiguity when debugging as compiler specific bugs may occur in the codebase that would be hard to identify over a span of multiple compiler versions rather than a specific one.

Recommendation:

We advise that the compiler version is instead locked at the lowest version possible that the contract can be compiled at. For example, for version `v0.6.2` the contract should contain the following line:

```
pragma solidity 0.6.2;
```

Alleviation:

Alleviations were applied as advised.

ERC-02: Import is not used

Type	Severity	Location
Dead Code	Informational	ERC20.sol L9

Description:

The contracts in the file imported on the aforementioned line are never used in the contract.

Recommendation:

We advise to remove the import on the aforementioned line to increase the legibility and quality of the codebase.

Alleviation:

Alleviations were applied as advised.

ERC-03: Ineffecutal code

Type	Severity	Location
Mathematical Operations	Informational	ERC20.sol L70-L71

Description:

The assignments on the aforementioned lines take into account the previous values of the variable. As the code resides inside the constructor and previous values are always zero so the consideration of previous can be ignored.

Recommendation:

We advise to directly the assign the values instead of adding new values to previous values as previous values are always zero.

```
    _totalSupply = totalSupply;
    _balances[address(this)] = totalSupply;
```

Alleviation:

Alleviations were applied as advised.

ERC-04: `Transfer` event is not fired

Type	Severity	Location
Volatile Code	Medium	ERC20.sol L72

Description:

The constructor assigns `totalSupply` as balance to `address(this)` yet does not fire corresponding `Transfer` event for the transfer. It violates the standard implementation of ERC20 tokens and can be problematic as many dApps and Blockchain explorer rely on the `Transfer` event for their operations.

Recommendation:

We advise to fire `Transfer` event inside the constructor of the contract.

```
    emit Transfer(address(0), address(this), totalSupply);
```

Alleviation:

Alleviations were applied as advised.

ERC-05: Unused function

Type	Severity	Location
Gas Optimization	Informational	ERC20.sol L359

Description:

The function on the aforementioned is `internal` and never called from within the contract or any contract inheriting this contract.

Recommendation:

We advise to remove the function on the aforementioned line as it is never used.

Alleviation:

Alleviations were applied as advised.

XTM-01: Comparison with a literal boolean value

Type	Severity	Location
Gas Optimization	Informational	XendTokenMinters.sol L10, L19, L26

Description:

The contract has several occurrences of comparison with a literal boolean values of `true` or `false` that can be replaced replacing with compared expression itself to increase the legibility of the code.

Recommendation:

We advise to use the compared expression itself in place of expression's comparison with a boolean literal. The expression can be replaced as is when the expression is expected to evaluate to `true` and negation of expression can be used when the expression is expected to have `false` value.

Alleviation:

No alleviations.

IXT-01: Unlocked Compiler Version

Type	Severity	Location
Language Specific	Informational	IXendToken.sol L1

Description:

The contract has unlocked compiler version. An unlocked compiler version in the source code of the contract 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 an ambiguity when debugging as compiler specific bugs may occur in the codebase that would be hard to identify over a span of multiple compiler versions rather than a specific one.

Recommendation:

We advise that the compiler version is instead locked at the lowest version possible that the contract can be compiled at. For example, for version `v0.6.2` the contract should contain the following line:

```
pragma solidity 0.6.2;
```

Alleviation:

Alleviations were applied as advised.

IER-01: Unlocked Compiler Version

Type	Severity	Location
Language Specific	Informational	IERC20.sol I3

Description:

The contract has unlocked compiler version. An unlocked compiler version in the source code of the contract 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 an ambiguity when debugging as compiler specific bugs may occur in the codebase that would be hard to identify over a span of multiple compiler versions rather than a specific one.

Recommendation:

We advise that the compiler version is instead locked at the lowest version possible that the contract can be compiled at. For example, for version `v0.6.2` the contract should contain the following line:

```
pragma solidity 0.6.2;
```

Alleviation:

Alleviations were applied as advised.

Appendix

Finding Categories

Gas Optimization

Gas Optimization findings refer to exhibits that 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.

Mathematical Operations

Mathematical Operation exhibits entail findings that relate to mishandling of math formulas, such as overflows, incorrect operations etc.

Logical Issue

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

Control Flow

Control Flow findings concern the access control imposed on functions, such as owner-only functions being invoke-able by anyone under certain circumstances.

Volatile Code

Volatile Code findings refer to segments of code that behave unexpectedly on certain edge cases that may result in a vulnerability.

Data Flow

Data Flow findings describe faults in the way data is handled at rest and in memory, such as the result of a `struct` assignment operation affecting an in-memory `struct` rather than an in-storage one.

Language Specific

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

Coding Style

Coding Style findings usually do not affect the generated byte-code and comment on how to make the codebase more legible and as a result easily maintainable.

Inconsistency

Inconsistency findings refer to functions that should seemingly behave similarly yet contain different code, such as a `constructor` assignment imposing different `require` statements on the input variables than a setter function.

Magic Numbers

Magic Number findings refer to numeric literals that are expressed in the codebase in their raw format and should otherwise be specified as `constant` contract variables aiding in their legibility and maintainability.

Compiler Error

Compiler Error findings refer to an error in the structure of the code that renders it impossible to compile using the specified version of the project.

Dead Code

Code that otherwise does not affect the functionality of the codebase and can be safely omitted.