



November 11th 2020 — Quantstamp Verified

Radix XRD Staking

This security assessment was prepared by Quantstamp, the leader in blockchain security

Executive Summary

Type	Liquidity Mining				
Auditors	Martin Derka, Senior Research Engineer Kacper Bqk, Senior Research Engineer Jake Goh Si Yuan, Research Engineer				
Timeline	2020-11-02 through 2020-11-10				
EVM	Muir Glacier				
Languages	Solidity				
Methods	Architecture Review, Unit Testing, Functional Testing, Computer-Aided Verification, Manual Review				
Specification	None				
Documentation Quality	<div><div></div></div> Medium				
Test Quality	<div><div></div></div> Low				
Source Code	<table><tr><td>Repository</td><td>Commit</td></tr><tr><td>eXRD-staking</td><td>a9a042c</td></tr></table>	Repository	Commit	eXRD-staking	a9a042c
Repository	Commit				
eXRD-staking	a9a042c				

⚠ High Risk	The issue puts a large number of users' sensitive information at risk, or is reasonably likely to lead to catastrophic impact for client's reputation or serious financial implications for client and users.
⚠ Medium Risk	The issue puts a subset of users' sensitive information at risk, would be detrimental for the client's reputation if exploited, or is reasonably likely to lead to moderate financial impact.
✓ Low Risk	The risk is relatively small and could not be exploited on a recurring basis, or is a risk that the client has indicated is low-impact in view of the client's business circumstances.
ℳ Informational	The issue does not post an immediate risk, but is relevant to security best practices or Defence in Depth.
❓ Undetermined	The impact of the issue is uncertain.

Goals	<ul style="list-style-type: none">• Access to staked tokens• Security of the reward distribution
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Total Issues	0
High Risk Issues	0 (0 Resolved)
Medium Risk Issues	0 (0 Resolved)
Low Risk Issues	0 (0 Resolved)
Informational Risk Issues	0 (0 Resolved)
Undetermined Risk Issues	0 (0 Resolved)



⚠ Unresolved	Acknowledged the existence of the risk, and decided to accept it without engaging in special efforts to control it.
⚠ Acknowledged	The issue remains in the code but is a result of an intentional business or design decision. As such, it is supposed to be addressed outside the programmatic means, such as: 1) comments, documentation, README, FAQ; 2) business processes; 3) analyses showing that the issue shall have no negative consequences in practice (e.g., gas analysis, deployment settings).
ℳ Resolved	Adjusted program implementation, requirements or constraints to eliminate the risk.
✓ Mitigated	Implemented actions to minimize the impact or likelihood of the risk.

Summary of Findings

Quantstamp audited the XRD staking platform as a fork of the Ampleforth Geyser. The implementation adds a new function for computing the token reward amount, but otherwise remains identical. Quantstamp did not discover any issues in the code, however, points the low test coverage and recommends additional work on the test suite.

Quantstamp Audit Breakdown

Quantstamp's objective was to evaluate the repository for security-related issues, code quality, and adherence to specification and best practices.

Possible issues we looked for included (but are not limited to):

- Transaction-ordering dependence
- Timestamp dependence
- Mishandled exceptions and call stack limits
- Unsafe external calls
- Integer overflow / underflow
- Number rounding errors
- Reentrancy and cross-function vulnerabilities
- Denial of service / logical oversights
- Access control
- Centralization of power
- Business logic contradicting the specification
- Code clones, functionality duplication
- Gas usage
- Arbitrary token minting

Methodology

The Quantstamp 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 Quantstamp to make sure we understand the size, scope, and functionality of the smart contract.
 - 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 Quantstamp 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 those 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 smart contracts to improve efficiency, effectiveness, clarify, maintainability, security, and control based on the established industry and academic practices, recommendations, and research.
4. Specific, itemized, and actionable recommendations to help you take steps to secure your smart contracts.

Toolset

The notes below outline the setup and steps performed in the process of this audit.

Setup

Tool Setup:

- [Slither](#) v0.6.6

Steps taken to run the tools:

1. Installed the Slither tool: `pip install slither-analyzer`
2. Run Slither from the project directory: `slither .`

Automated Analyses

Slither

All reported issues were assessed as benign or false positives.

Adherence to Specification

The code adheres to the specification outlined in the code. External specification was not provided.

Code Documentation

The code is appropriately documented.

Adherence to Best Practices

The code adheres to best practices.

Test Results

Test Suite Results

The project contains a single test with no assertions. Quantstamp strongly recommends additional work on the test suite.

```
Contract: RewardPool
Your project has Truffle migrations, which have to be turn into a fixture to run your tests with Buidler
-
account1 stakingShareSeconds 1123202
account2 stakingShareSeconds 259202
account1 stakingShares 1
account2 stakingShares 1
totalStakingShareSeconds 1382405
1056254995838712772291
243754263420546486966
  ✓ (1784ms)

1 passing (3s)
1 pending
```

Code Coverage

The test coverage is low. Quantstamp strongly recommends additional work on the test suite.

File	% Stmts	% Branch	% Funcs	% Lines	Uncovered Lines
contracts/	80.71	48.15	64.29	80.85	
IStaking.sol	0	100	0	0	21
Migrations.sol	0	0	0	0	9,13,17
RewardPool.sol	83.72	52.08	73.68	83.85	... 588,594,597
TokenPool.sol	60	0	75	60	27,29
eXRD.sol	100	50	100	100	
All files	80.71	48.15	64.29	80.85	

Appendix

File Signatures

The following are the SHA-256 hashes of the reviewed files. A file with a different SHA-256 hash has been modified, intentionally or otherwise, after the security review. You are cautioned that a different SHA-256 hash could be (but is not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of the review.

Contracts

b2b9113a01870a1740bae457dd7c817342c2705fc6bcbce55266aef25e5c05a8 ./contracts/RewardPool.sol

36da619366ad45e1fbab37cee99fc7f4752a54dc67cdffe58afa7f5cd421631e ./contracts/eXRD.sol

af517e1c7773edd612f148b79be5f99b710770d16f3b90a59e79c0c438a622b2 ./contracts/Migrations.sol

e42d0a9d34feb3c01f05709131f0bc9b5982d3d9c061b6eea8debc65779e66f9 ./contracts/TokenPool.sol

83eb53155ff5ac81a61f08b38fe1b7cf3075355a78a6134fa32c31edacbba77b ./contracts/IStaking.sol

Tests

5e8a923cb6fa7dd1b1ab5e4543b85c68e9513469f6bf07c068236ec66ef92773 ./test/_utils.js

b9f8b4829c627358a20d9d89fe1b5245b77e518d9d3da4619694e4051b3fea1b ./test/RewardPool.spec.js

Changelog

- 2020-11-11 - Initial report

About Quantstamp

Quantstamp is a Y Combinator-backed company that helps to secure blockchain platforms at scale using computer-aided reasoning tools, with a mission to help boost the adoption of this exponentially growing technology.

With over 1000 Google scholar citations and numerous published papers, Quantstamp's team has decades of combined experience in formal verification, static analysis, and software verification. Quantstamp has also developed a protocol to help smart contract developers and projects worldwide to perform cost-effective smart contract security scans.

To date, Quantstamp has protected \$5B in digital asset risk from hackers and assisted dozens of blockchain projects globally through its white glove security assessment services. As an evangelist of the blockchain ecosystem, Quantstamp assists core infrastructure projects and leading community initiatives such as the Ethereum Community Fund to expedite the adoption of blockchain technology.

Quantstamp's collaborations with leading academic institutions such as the National University of Singapore and MIT (Massachusetts Institute of Technology) reflect our commitment to research, development, and enabling world-class blockchain security.

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