

1inch.exchange Process Quality Review

Score: 31%

This is a Process Quality Review of [1inch.exchange](#) completed on 28 January, 2021. It was performed using the Process Review process (version 0.6.1) and is documented [here](#). The review was performed by ShinkaRex of DeFiSafety. Check out our [Telegram](#).

The final score of the review is 31%, a clear fail. The breakdown of the scoring is in [Scoring Appendix](#).

Summary of the Process

Very simply, the review looks for the following declarations from the developer's site. With these declarations, it is reasonable to trust the smart contracts.

- **Here are my smart contracts on the blockchain**
- **Here is the documentation that explains what my smart contracts do**
- **Here are the tests I ran to verify my smart contract**
- **Here are the audit(s) performed on my code by third party experts**

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Code and Team

This section looks at the code deployed on the Mainnet that gets reviewed and its corresponding software repository. The document explaining these questions is [here](#). This review will answer the questions;

1. Are the executing code addresses readily available? (Y/N)
2. Is the code actively being used? (%)
3. Is there a public software repository? (Y/N)
4. Is there a development history visible? (%)
5. Is the team public (not anonymous)? (Y/N)

Are the executing code addresses readily available? (Y/N)



Answer: No

There are no published executing code addresses.

How to improve this score

Make the Ethereum addresses of the smart contract utilized by your application available on either your website or your GitHub (in the README for instance). Ensure the addresses is up to date. This is a very important question wrt to the final score.

Is the code actively being used? (%)



Answer: 0%

Activity cannot be verified, as the executing addresses are not readily available.

Percentage Score Guidance

100%	More than 10 transactions a day
70%	More than 10 transactions a week
40%	More than 10 transactions a month
10%	Less than 10 transactions a month
0%	No activity

Is there a public software repository? (Y/N)



Answer: Yes

GitHub: <https://github.com/1inch-exchange/1inchProtocol>

Is there a public software repository with the code at a minimum, but normally test and scripts also (Y/N). Even if the repo was created just to hold the files and has just 1 transaction, it gets a Yes. For teams with private repos, this answer is No.

Is there a development history visible? (%)



Answer: 100%

With 244 commits and 11 branches, this is a healthy process software repository.

This checks if the software repository demonstrates a strong steady history. This is normally demonstrated by commits, branches and releases in a software repository. A healthy history

demonstrates a history of more than a month (at a minimum).

Guidance:

100%	Any one of 100+ commits, 10+branches
70%	Any one of 70+ commits, 7+branches
50%	Any one of 50+ commits, 5+branches
30%	Any one of 30+ commits, 3+branches
0%	Less than 2 branches or less than 10 commits

How to improve this score

Continue to test and perform other verification activities after deployment, including routine maintenance updating to new releases of testing and deployment tools. A public development history indicates clearly to the public the level of continued investment and activity by the developers on the application. This gives a level of security and faith in the application.

Is the team public (not anonymous)? (Y/N)



Answer: Yes

The team's head has his name on their twitter.

For a yes in this question the real names of some team members must be public on the website or other documentation. If the team is anonymous and then this question is a No.

Documentation

This section looks at the software documentation. The document explaining these questions is [here](#).

Required questions are;

1. Is there a whitepaper? (Y/N)
2. Are the basic software functions documented? (Y/N)
3. Does the software function documentation fully (100%) cover the deployed contracts? (%)

4. Are there sufficiently detailed comments for all functions within the deployed contract code (%)
5. Is it possible to trace from software documentation to the implementation in codee (%)

Is there a whitepaper? (Y/N)

 Answer: Yes

Location: <https://github.com/1inch-exchange/1inchProtocol>

How to improve this score

Ensure the white paper is available for download from your website or at least the software repository. Ideally update the whitepaper to meet the capabilities of your present application.

Are the basic software functions documented? (Y/N)

 Answer: Yes

Location: <https://github.com/1inch-exchange/1inchProtocol>

How to improve this score

Write the document based on the deployed code. For guidance, refer to the [SecurEth System Description Document](#).

Does the software function documentation fully (100%) cover the deployed contracts? (%)

 Answer: 80%

Only the major functions are documented. These are documented in their [GitHub](#) and their [API](#).

Guidance:

- 100% All contracts and functions documented
- 80% Only the major functions documented
- 79-1% Estimate of the level of software documentation
- 0% No software documentation

How to improve this score

This score can improve by adding content to the requirements document such that it comprehensively covers the requirements. For guidance, refer to the [SecurEth System Description Document](#) . Using tools that aid traceability detection will help.

Are there sufficiently detailed comments for all functions within the deployed contract code (%)



Answer: 4%

There is an extremely minimal amount of comments present.

Code examples are in the [Appendix](#). As per the [SLOC](#), there is 4% commenting to code (CtC).

The Comments to Code (CtC) ratio is the primary metric for this score.

Guidance:

- 100% CtC > 100 Useful comments consistently on all code
- 90-70% CtC > 70 Useful comment on most code
- 60-20% CtC > 20 Some useful commenting
- 0% CtC < 20 No useful commenting

How to improve this score

This score can improve by adding comments to the deployed code such that it comprehensively covers the code. For guidance, refer to the [SecurEth Software Requirements](#).

Is it possible to trace from software documentation to the implementation in code (%)

 Answer: 60%

For almost all documented functions, there is a clear relationship between the code and the software function documentation.

Guidance:

100% - Clear explicit traceability between code and documentation at a requirement level for all code

60% - Clear association between code and documents via non explicit traceability

40% - Documentation lists all the functions and describes their functions

0% - No connection between documentation and code

How to improve this score

This score can improve by adding traceability from requirements to code such that it is clear where each requirement is coded. For reference, check the SecurEth guidelines on [traceability](#).

Testing

This section looks at the software testing available. It is explained in this [document](#). This section answers the following questions;

1. Full test suite (Covers all the deployed code) (%)
2. Code coverage (Covers all the deployed lines of code, or explains misses) (%)
3. Scripts and instructions to run the tests (Y/N)
4. Packaged with the deployed code (Y/N)
5. Report of the results (%)
6. Formal Verification test done (%)
7. Stress Testing environment (%)

Is there a Full test suite? (%)

 Answer: 40%

With a TtC of 4%, this is an extremely limited series of published tests. However, since some tests are published, the score is 40%.

This score is guided by the Test to Code ratio (TtC). Generally a good test to code ratio is over 100%. However the reviewers best judgement is the final deciding factor.


Guidance:

- 100% TtC > 120% Both unit and system test visible
- 80% TtC > 80% Both unit and system test visible
- 40% TtC < 80% Some tests visible
- 0% No tests obvious

How to improve this score

This score can improve by adding tests to fully cover the code. Document what is covered by traceability or test results in the software repository.

Code coverage (Covers all the deployed lines of code, or explains misses) (%)

 Answer: 0%

There is a link to coverage on coveralls, but there are no coverage reports.

Guidance:

- 100% - Documented full coverage
- 99-51% - Value of test coverage from documented results
- 50% - No indication of code coverage but clearly there is a reasonably complete set of tests
- 30% - Some tests evident but not complete
- 0% - No test for coverage seen

How to improve this score

This score can improve by adding tests achieving full code coverage. A clear report and scripts in the software repository will guarantee a high score.

Scripts and instructions to run the tests (Y/N)



Answer: No

There are no scripts or instructions to help you run the tests.

How to improve this score

Add the scripts to the repository and ensure they work. Ask an outsider to create the environment and run the tests. Improve the scripts and docs based on their feedback.

Packaged with the deployed code (Y/N)



Answer: Yes

The testing repository is packaged with the deployed code.

How to improve this score

Improving this score requires redeployment of the code, with the tests. This score gives credit to those who test their code before deployment and release them together. If a developer adds tests after deployment they can gain full points for all test elements except this one.

Report of the results (%)



Answer: 0%

There is no evident report of the testing results.

Guidance:

100% - Detailed test report as described below

70% - GitHub Code coverage report visible

0% - No test report evident

How to improve this score

Add a report with the results. The test scripts should generate the report or elements of it.

Formal Verification test done (%)

Answer: 0%

There is no evidence of formal verification testing having been done.

Stress Testing environment (%)

Answer: 0%

There are no published ropsten or kovan testnet addresses.

Audits

Answer: 0%

There have been 8 audits preformed on 1inch exchange.

However, there are no published contract addresses, and therefore verification of the validity of any of these audits becomes impossible. This therefore makes the score 0%

Guidance:

1. Multiple Audits performed before deployment and results public and implemented or not required (100%)
2. Single audit performed before deployment and results public and implemented or not required (90%)
3. Audit(s) performed after deployment and no changes required. Audit report is public. (70%)
4. No audit performed (20%)
5. Audit Performed after deployment, existence is public, report is not public and no improvements deployed OR smart contract address' not found, question 1 (0%)

Appendices

Author Details

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I started with Ethereum just before the DAO and that was a wonderful education. It showed the importance of code quality. The second Parity hack also showed the importance of good process. Here my aviation background offers some value. Aerospace knows how to make reliable code using quality processes.

I was coaxed to go to EthDenver 2018 and there I started [SecuEth.org](https://secur.eth.org) with Bryant and Roman. We created guidelines on good processes for blockchain code development. We got [EthFoundation funding](#) to assist in their development.

Process Quality Reviews are an extension of the SecurEth guidelines that will further increase the quality processes in Solidity and Vyper development.

DeFiSafety is my full time gig and we are working on funding vehicles for a permanent staff.

Scoring Appendix

PQ Audit Scoring Matrix (v0.6)	Total	1Inch DEX	
	Points	Answer	Points
Total	240		75.4
Code and Team			31%
3. Is there a public software repository? (Y/N)	5	Y	5
4. Is there a development history visible? (%)	5	100%	5
Is the team public (not anonymous)? (Y/N)	20	Y	20
Code Documentation			
1. Is there a whitepaper? (Y/N)	5	Y	5
2. Are the basic software functions documented? (Y/N)	10	Y	10
3. Does the software function documentation fully (100%) cover the deployed contracts? (%)	15	80%	12
4. Are there sufficiently detailed comments for all functions within the deployed contract code (%)	10	4%	0.4
5 Is it possible to trace from software documentation to the implementation in code (%)	5	100%	5
Testing			
1. Full test suite (Covers all the deployed code) (%)	20	40%	8
2. Code coverage (Covers all the deployed lines of code, or explains misses) (%)	5	0%	0
3. Scripts and instructions to run the tests? (Y/N)	5	N	0
4. Packaged with the deployed code (Y/N)	5	Y	5
5. Report of the results (%)	10	0%	0
6. Formal Verification test done (%)	5	0%	0
7. Stress Testing environment (%)	5	0%	0
Audits			
Audit done	70	0%	0
Section Scoring			
Code and Team	70	43%	
Documentation	45	72%	
Testing	55	24%	
Audits	70	0%	

Example Code Appendix

```
1 pragma solidity ^0.5.0;
2
3 import "@openzeppelin/contracts/token/ERC20/IERC20.sol";
4 import "../interface/IBancorContractRegistry.sol";
5 import "../interface/IBancorConverterRegistry.sol";
6 import "../UniversalERC20.sol";
7
8
9 contract BancorFinder {
10     using UniversalERC20 for IERC20;
11
12     IERC20 constant internal ETH_ADDRESS = IERC20(0xEeeeeEeeeEeEeeEeEeEeEeEE);
13     IERC20 constant internal bnt = IERC20(0x1F573D6Fb3F13d689FF844B4cE37794d);
14     IBancorContractRegistry constant internal bancorContractRegistry = IBancorContractRegistry(0x1F573D6Fb3F13d689FF844B4cE37794d);
15
16     function buildBancorPath(
17         IERC20 fromToken,
18         IERC20 destToken
19     )
```

```
20     public
21     view
22     returns(address[] memory path)
23     {
24         if (fromToken == destToken) {
25             return new address[](0);
26         }
27
28         if (fromToken.isETH()) {
29             fromToken = ETH_ADDRESS;
30         }
31         if (destToken.isETH()) {
32             destToken = ETH_ADDRESS;
33         }
34
35         if (fromToken == bnt || destToken == bnt) {
36             path = new address[](3);
37         } else {
38             path = new address[](5);
39         }
40
41         address fromConverter;
42         address toConverter;
43
44         IBancorConverterRegistry bancorConverterRegistry = IBancorConverterRegistry(
45             bancorContractRegistry.addressOf("BancorConverterRegistry")
46         );
47
48         if (fromToken != bnt) {
49             (bool success, bytes memory data) = address(bancorConverterRegistry)
50                 .bancorConverterRegistry.getConvertibleTokenSmartToken.select
51                 fromToken.isETH() ? ETH_ADDRESS : fromToken,
52                 0
53             );
54             if (!success) {
55                 return new address[](0);
56             }
57
58             fromConverter = abi.decode(data, (address));
59             if (fromConverter == address(0)) {
60                 return new address[](0);
61             }
62         }
63
64         if (destToken != bnt) {
65             (bool success, bytes memory data) = address(bancorConverterRegistry)
66                 .bancorConverterRegistry.getConvertibleTokenSmartToken.select
67                 destToken.isETH() ? ETH_ADDRESS : destToken,
68                 0
69             );
70             if (!success) {
71                 return new address[](0);
72             }
73
74             toConverter = abi.decode(data, (address));
```

```

75         if (toConverter == address(0)) {
76             return new address[] (0);
77         }
78     }
79
80     if (destToken == bnt) {
81         path[0] = address(fromToken);
82         path[1] = fromConverter;
83         path[2] = address(bnt);
84         return path;
85     }
86
87     if (fromToken == bnt) {
88         path[0] = address(bnt);
89         path[1] = toConverter;
90         path[2] = address(destToken);
91         return path;
92     }
93
94     path[0] = address(fromToken);
95     path[1] = fromConverter;
96     path[2] = address(bnt);
97     path[3] = toConverter;
98     path[4] = address(destToken);
99     return path;
100 }
101 }

```

SLOC Appendix

Solidity Contracts

Language	Files	Lines	Blanks	Comments	Code	Complexity
Solidity	22	6369	662	233	5474	778

Comments to Code 233/5474 = 4%

Javascript Tests

Language	Files	Lines	Blanks	Comments	Code	Complexity
JavaScript	1	323	48	51	224	0

Tests to Code 224/5474 = 4%

