BadgerDAO PQ Review

Score: 65%

This is a Process Quality Review of BadgerDAO completed on 29 January, 2020. 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 65%, a pass. 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: Yes

They are available at website https://app.gitbook.com/@badger-finance/s/badger-finance/technical/contracts as indicated in the Appendix.

Is the code actively being used? (%)

> Answer: 100%

Activity is *192* transactions a day on contract *MiniMeToken.sol*, as indicated in the Appendix.

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/Badger-Finance/badger-system

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: 70%

with 89 commits and 12 branches, this is a healthy 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

Link: https://badger.finance/about

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://app.gitbook.com/@badger-finance/s/badger-finance/

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

There is minimal documentation of the "Digg" contracts.

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: 10%

There is an extremely minimal amount of software function documentation found in their docs.

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: 28%

There is limited commenting within the contracts.

Code examples are in the Appendix. As per the SLOC, there is 28% 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: 0%

There's no connection between the documentation and the code.

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: 41%

The TtC ratio is 41%, as indicated in the appendix.

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 no evident test for code coverage seen

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: Yes

Test instructions are found in their github.

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 tests are found in the gitHub.

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 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 evident smart contract addresses published on the Kovan or Ropsten Testnet, and therefore no evidence of stress-testing.

Audits

ⓘ Answer: 70%

Badger was released on November 28th, 2020.

Badger recently released an audit from Haechi in late January. This audit is acceptable, though performed after deployment. Based on that a score of 70% is given.

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 with Bryant and Roman. We created guidelines on good processes for blockchain code development. We got EthFoundation funding to assist in their development.

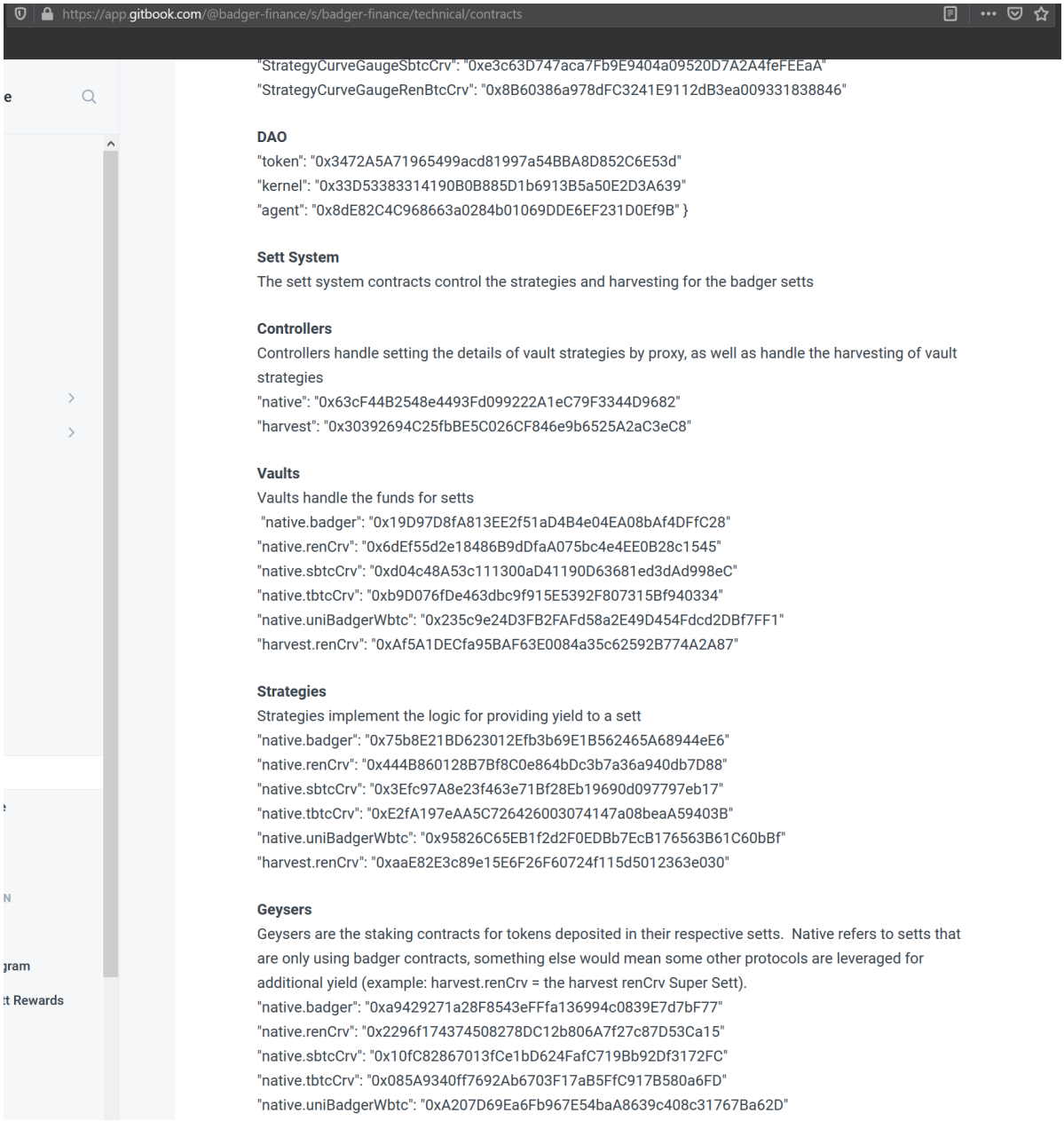
Process Quality Reviews are an extension of the SecurEth guidelines that will further increase the quality processes in Solidity and Vyper development.

Career wise I am a business development manager for an avionics supplier.

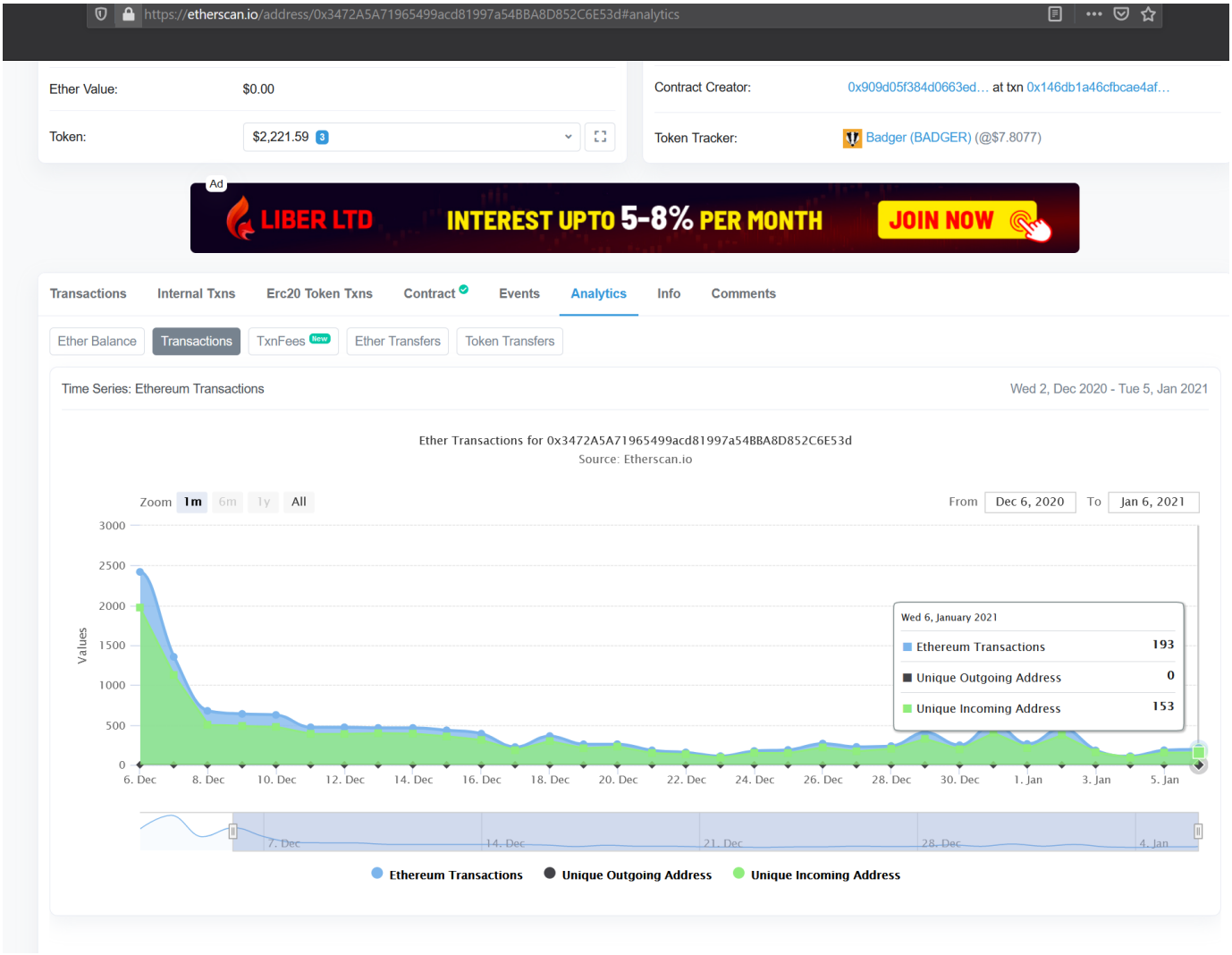
Scoring Appendix

PQ Audit Scoring Matrix (v0.6)	Total Points	BadgerDAO Answer	BadgerDAO Points
Total	240		155
Code and Team			**65%**
1. Are the executing code addresses readily available? (Y/N)	30	Y	30
2. Is the code actively being used? (%)	10	100%	10
3. Is there a public software repository? (Y/N)	5	Y	5
4. Is there a development history visible? (%)	5	70%	3.5
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	10%	1.5
4. Are there sufficiently detailed comments for all functions within the deployed contract code (%)	10	28%	2.8
5 Is it possible to trace from software documentation to the implementation in code (%)	5	0%	0
Testing			
1. Full test suite (Covers all the deployed code) (%)	20	41%	8.2
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	Y	5
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	70%	49
Section Scoring			
Code and Team	70	98%	
Documentation	45	43%	
Testing	55	33%	
Audits	70	70%	

Executing Code Appendix



Code Used Appendix



Example Code Appendix

```
//SPDX-License-Identifier: Unlicense
pragma solidity 0.6.8;

import "interfaces/digg/IMedianOracle.sol";

/* On-chain oracle data source that always push a constant value specified (
contract ConstantOracle {
  uint256 internal _value;
  IMedianOracle internal _medianOracle;

  event UpdatePushed(IMedianOracle medianOracle, uint256 value);

  constructor(uint256 value, IMedianOracle medianOracle) public {
    _value = value;
    _medianOracle = medianOracle;
  }

  function updateAndPush() external {
    _medianOracle.pushReport(_value);
    emit UpdatePushed(_medianOracle, _value);
```

```
21    }
22
23    function value() external view returns(uint256) {
24      return _value;
25    }
26
27    function medianOracle() external view returns(IMedianOracle) {
28      return _medianOracle;
29    }
30  }
31
```

SLOC Appendix

Solidity Contracts

Language	Files	Lines	Blanks	Comments	Code	Complexity
Solidity	40	5884	1104	1052	3728	313

Comments to Code 1052/ 3728 = 28%

Javascript Tests

Language	Files	Lines	Blanks	Comments	Code	Complexity
JavaScript	27	3889	781	1559	1549	97

Tests to Code 1549 / 3728 = 41%