



TradeGen Public Report

PROJECT: TradeGen Review
Fall 2021

Prepared For:

Xavier Negron | TradeGen, LLC.

Prepared By:

Jonathan Haas | Bramah Systems, LLC.

jonathan@bramah.systems



Table of Contents

Executive Summary	3
Scope of Engagement	3
Engagement Goals	3
Protocol Specification	3
Overall Assessment	3
Timeliness of Content	5
General Recommendations	6
Excess gas consumption	6
Function which awards or assigns a user should emit an event	6
Solidity version out of date	6
Sqrt function should call out lack of precision	6
Style guide deviations in many files	7
Toolset Warnings	8
Overview	8
Compilation Warnings	8
Test Coverage	8
Static Analysis Coverage	8
Directory Structure	9



TradeGen Security Review

Executive Summary

Scope of Engagement

Bramah Systems, LLC was engaged in Fall of 2021 to perform a comprehensive security review of the TradeGen Protocol Solidity repository. Our review was conducted over a period of five business days by a member of Bramah Systems, LLC. executive staff.

Bramah's review pertains to Solidity code (*.sol) as of commit **bc1eea4b5e21536670f3684aa6675c7b0cc3cbcd**.

Engagement Goals

The primary scope of the engagement was to evaluate and establish the overall security of the TradeGen Protocol system, with a specific focus on trading actions. In specific, the engagement sought to answer the following questions:

- Is it possible for an attacker to manipulate the code?
- Does the Solidity code match the specification as provided?
- Is there a way to interfere with the software mechanisms?
- Are the arithmetic calculations trustworthy?

Protocol Specification

A basic specification document was compiled by the review team based upon review of the TradeGen Protocol code and discussion with the team.

Overall Assessment

Bramah Systems was engaged to evaluate and identify multiple security concerns in the codebase of the TradeGen architecture. During the course of our engagement, Bramah Systems denoted numerous instances wherein the software deviated from established best practices and procedures of secure software development. With limited exceptions (as described in this report), these instances were most commonly a result of structural limitations of Solidity and not due to inactions on behalf of the development team. The codebase benefits from detailed code comments throughout, which allowed for Bramah to review the codebase rapidly and without a deeper formal specification. As the code does make heavy usage of third party library code, the TradeGen team should stay abreast of any security considerations of these



protocols. At the point of our review, there were no known high or medium severity risks presently outstanding with the third party code that had been implemented into the TradeGen Protocol codebase.



Disclaimer

As of the date of publication, the information provided in this report reflects the presently held, commercially reasonable understanding of Bramah Systems, LLC.'s knowledge of security patterns as they relate to the TradeGen Protocol, with the understanding that distributed ledger technologies ("DLT") remain under frequent and continual development, and resultantly carry with them unknown technical risks and flaws. The scope of the review provided herein is limited solely to items denoted within "Scope of Engagement" and contained within "Directory Structure". The report does NOT cover, review, or opine upon security considerations unique to the Solidity compiler, tools used in the development of the protocol, or distributed ledger technologies themselves, or to any other matters not specifically covered in this report. The contents of this report must NOT be construed as investment advice or advice of any other kind. This report does NOT have any bearing upon the potential economics of the TradeGen Protocol or any other relevant product, service or asset of TradeGen Protocol or otherwise. This report is not and should not be relied upon by TradeGen Protocol or any reader of this report as any form of financial, tax, legal, regulatory, or other advice.

To the full extent permissible by applicable law, Bramah Systems, LLC. disclaims all warranties, express or implied. The information in this report is provided "as is" without warranty, representation, or guarantee of any kind, including the accuracy of the information provided. Bramah Systems, LLC. makes no warranties, representations, or guarantees about the TradeGen Protocol. Use of this report and/or any of the information provided herein is at the users sole risk, and Bramah Systems, LLC. hereby disclaims, and each user of this report hereby waives, releases, and holds Bramah Systems, LLC. harmless from, any and all liability, damage, expense, or harm (actual, threatened, or claimed) from such use.

Timeliness of Content

All content within this report is presented only as of the date published or indicated, to the commercially reasonable knowledge of Bramah Systems, LLC. as of such date, and may be superseded by subsequent events or for other reasons. The content contained within this report is subject to change without notice. Bramah Systems, LLC. does not guarantee or warrant the accuracy or timeliness of any of the content contained within this report, whether accessed through digital means or otherwise.

Bramah Systems, LLC. is not responsible for setting individual browser cache settings nor can it ensure any parties beyond those individuals directly listed within this report are receiving the most recent content as reasonably understood by Bramah Systems, LLC. as of the date this report is provided to such individuals.



General Recommendations

Best Practices & Solidity Development Guidelines

Excess gas consumption

Excess gas consumption may occur when state variables (`.balance` or `.length`) are used in the condition of a `for` or `while` loop. Every iteration of the “for” loop consumes extra gas with these state variables present. In order to mitigate this excess consumption, if `.balance`, or `.length` are used several times, holding their value in a local variable is more gas efficient.

Resolution: The particular loop of interest (`Pool.withdraw()`) has a compensating control.

Function which awards or assigns a user should emit an event

There is a function (`appendVestingEntry`) that augments users' ability to interact with the contracts. Modification to these should be made clear through event emittance.

Resolution: The function now emits an event.

Solidity version out of date

The Solidity version used within the contracts is out of date (**0.7.6**) and should be updated in order to include new compiler optimizations and security improvements.

Resolution: The team does not intend to update the software version.

Sqrt function should call out lack of precision

While the square root function does call out that seven iterations should suffice, it does not explicitly call out what the deviation would be from an ideal square root function and the number of present iterations. Ideally in a comment it should do so.

Resolution: This risk has been accepted.



Style guide deviations in many files

There is a slight lack of adherence to Solidity style guidelines within the codebase. In particular, certain functions which should follow capitalization guidelines do not (e.g. `read4left`)

Resolution: This risk has been accepted.



Toolset Warnings

Unique to the TradeGen Protocol

Overview

In addition to our manual review, our process involves utilizing concolic analysis and dynamic testing in order to perform additional verification of the presence security vulnerabilities. An additional part of this review phase consists of reviewing any automated unit testing frameworks that exist.

The following sections detail warnings generated by the automated tools and confirmation of false positives where applicable, in addition to findings generated through manual inspection.

Compilation Warnings

No warnings were found at time of compilation that presented material concern.

Test Coverage

The contract repository possesses substantial unit test coverage throughout. This testing provides a variety of unit tests which encompass the various operational stages of the protocol.

Static Analysis Coverage

The contract repository underwent heavy scrutiny with multiple static analysis agents, including:

The contract repository underwent heavy scrutiny with multiple static analysis agents, including:

- [Securify](#)
- [MAIAN](#)
- [Mythril](#)
- [Oyente](#)
- [Slither](#)

In each case, the team had either mitigated relevant concerns raised by each of these tools or provided adequate justification for the risk (e.g. inherent risk of using native Ethereum constructs such as **timestamp**).

Certain tools, like Oyente, do not run on newer versions of Solidity. Where applicable, Bramah manually performed validation checks based upon our understanding of the tool. With the



exception of known issues stemming from the usage of third party code, Bramah did not locate any instances of concern within the modified code.

Directory Structure

At time of review, the directory structure of the TradeGen Protocol appeared as it does below. Our review, at request of TradeGen Protocol, covers the Solidity code (*.sol) as of commit **bc1eea4b5e21536670f3684aa6675c7b0cc3cbcd**.

```
.
├── LICENSE
├── README.md
├── build
├── └── abi
│   ├── ERC20.json
│   ├── HalveningReleaseSchedule.json
│   ├── IERC20.json
│   ├── ILendingPool.json
│   ├── INonTransferrableToken.json
│   ├── IReleaseSchedule.json
│   ├── ISellable.json
│   ├── IStakingRewards.json
│   ├── IStartTime.json
│   ├── ITokenAllocator.json
│   ├── IUbeswapRouter.json
│   ├── NFTPool.json
│   ├── NonTransferrableToken.json
│   ├── Operator.json
│   ├── Ownable.json
│   ├── Owned.json
│   ├── PoolManager.json
│   ├── ReleaseEscrow.json
│   ├── RewardsDistributionRecipient.json
│   └── StakingRewards.json
```



- | | | — TestToken.json
- | | | — TokenAllocator.json
- | | | — TradegenERC20.json
- | — contract_addresses.txt
- | — contracts
- | | — distribution
- | | | — NonTransferrableToken.sol
- | | | — PoolManager.sol
- | | | — TokenAllocator.sol
- | | | — release
- | | | | — HalveningReleaseSchedule.sol
- | | | | — ReleaseEscrow.sol
- | | — interfaces
- | | | — INonTransferrableToken.sol
- | | | — IReleaseSchedule.sol
- | | | — IStartTime.sol
- | | | — ITokenAllocator.sol
- | | | — IUbeswapRouter.sol
- | — openzeppelin-solidity
- | | — README.md
- | | | — contracts
- | | | | — Address.sol
- | | | | — Context.sol
- | | | | — ERC20.sol
- | | | | — IERC20.sol
- | | | | — Math.sol
- | | | | — Ownable.sol
- | | | | — ReentrancyGuard.sol
- | | | | — SafeERC20.sol
- | | | | — SafeMath.sol
- | — synthetix



```
| | └─ LICENSE
| | └─ README.md
| | └─ contracts
| |   └─ Owned.sol
| |   └─ RewardsDistributionRecipient.sol
| |   └─ StakingRewards.sol
| |   └─ interfaces
| |     └─ IERC20.sol
| |     └─ ISellable.sol
| |     └─ IStakingRewards.sol
| └─ test
|   └─ ILendingPool.sol
|   └─ TestToken.sol
└─ utils
    └─ Operator.sol
└─ deploy.js
└─ hardhat.config.js
└─ package-lock.json
└─ package.json
└─ test
  └─ StakingRewards.test.js
└─ truffle-config.js
```

14 directories, 63 files

```
.
└─ LICENSE
└─ Readme.md
└─ build
  └─ abi
    └─ AddressResolver.json
```



- | └─ AssetHandler.json
- | └─ BaseUbeswapAdapter.json
- | └─ DistributeFunds.json
- | └─ ERC20PriceAggregator.json
- | └─ ERC20Verifier.json
- | └─ IAddressResolver.json
- | └─ IAssetHandler.json
- | └─ IAssetVerifier.json
- | └─ IBaseUbeswapAdapter.json
- | └─ IERC20.json
- | └─ ILPVerifier.json
- | └─ IMarketplace.json
- | └─ INFTPool.json
- | └─ IPool.json
- | └─ IPriceAggregator.json
- | └─ ISellable.json
- | └─ ISettings.json
- | └─ IStakingFarmRewards.json
- | └─ IStakingRewards.json
- | └─ ITradegenEscrow.json
- | └─ ITradegenLPStakingRewards.json
- | └─ ITradegenStakingEscrow.json
- | └─ IUbeswapPoolManager.json
- | └─ IUniswapV2Factory.json
- | └─ IUniswapV2Pair.json
- | └─ IUniswapV2Router02.json
- | └─ IVerifier.json
- | └─ Marketplace.json
- | └─ NFTPool.json
- | └─ NFTPoolFactory.json
- | └─ Ownable.json



- | | — Pool.json
- | | — PoolFactory.json
- | | — ReentrancyGuard.json
- | | — RewardsDistributionRecipient.json
- | | — Settings.json
- | | — StakingFarmRewards.json
- | | — StakingRewards.json
- | | — TestTradegenLPStakingRewards.json
- | | — TradegenERC20.json
- | | — TradegenEscrow.json
- | | — TradegenLPStakingEscrow.json
- | | — TradegenLPStakingRewards.json
- | | — TradegenStakingEscrow.json
- | | — TradegenStakingRewards.json
- | | — Treasury.json
- | | — TxDataUtils.json
- | | — UbeswapFarmVerifier.json
- | | — UbeswapLPTokenPriceAggregator.json
- | | — UbeswapLPVerifier.json
- | | — UbeswapRouterVerifier.json
- | | — UserManager.json
- | — contractAddressAlfajores.txt
- | — contracts
 - | | — AddressResolver.sol
 - | | — AssetHandler.sol
 - | | — BaseUbeswapAdapter.sol
 - | | — DistributeFunds.sol
 - | | — ERC20PriceAggregator.sol
 - | | — Marketplace.sol
 - | | — NFTPool.sol
 - | | — NFTPoolFactory.sol



- | | — Ownable.sol
- | | — Pool.sol
- | | — PoolFactory.sol
- | | — Settings.sol
- | | — StakingFarmRewards.sol
- | | — TradegenERC20.sol
- | | — TradegenEscrow.sol
- | | — TradegenLPStakingEscrow.sol
- | | — TradegenLPStakingRewards.sol
- | | — TradegenStakingEscrow.sol
- | | — TradegenStakingRewards.sol
- | | — UbeswapLPTokenPriceAggregator.sol
- | | — deprecated
 - | | | — Treasury.sol
- | | — interfaces
 - | | | — IAddressResolver.sol
 - | | | — IAssetHandler.sol
 - | | | — IAssetVerifier.sol
 - | | | — IBaseUbeswapAdapter.sol
 - | | | — IERC20.sol
 - | | | — ILPVerifier.sol
 - | | | — IMarketplace.sol
 - | | | — INFTPool.sol
 - | | | — IPool.sol
 - | | | — IPriceAggregator.sol
 - | | | — ISellable.sol
 - | | | — ISettings.sol
 - | | | — IStakingFarmRewards.sol
 - | | | — ITradegenEscrow.sol
 - | | | — ITradegenLPStakingRewards.sol
 - | | | — ITradegenStakingEscrow.sol



- | | └─ IVerifier.sol
- | | └─ Ubeswap
- | | └─ IStakingRewards.sol
- | | └─ IUbeswapPoolManager.sol
- | | └─ IUniswapV2Factory.sol
- | | └─ IUniswapV2Pair.sol
- | | └─ IUniswapV2Router02.sol
- | └─ libraries
- | | └─ AddressHelper.sol
- | | └─ BytesLib.sol
- | | └─ SafeMath.sol
- | | └─ TradegenMath.sol
- | | └─ TxDataUtils.sol
- | └─ openzeppelin-solidity
- | | └─ Address.sol
- | | └─ IERC20.sol
- | | └─ Math.sol
- | | └─ ReentrancyGuard.sol
- | └─ test
- | | └─ IStakingRewards.sol
- | | └─ RewardDistributionRecipient.sol
- | | └─ TestTradegenLPStakingRewards.sol
- | | └─ TestUbeswapFarm.sol
- | └─ verifiers
- | | └─ UbeswapFarmVerifier.sol
- | | └─ UbeswapRouterVerifier.sol
- | | └─ assetVerifiers
- | | └─ ERC20Verifier.sol
- | | └─ UbeswapLPVerifier.sol
- └─ deploy.js
- └─ distributeFunds.js



```
|— hardhat.config.js
|— initializeContracts.js
|— package-lock.json
|— package.json
|— tasks
|  └─ lib
|     └─ tokenAddresses.js
|— test
|  └─ AddressResolver.test.js
|  └─ AssetHandler.test.js
|  └─ BaseUbeswapAdapter.test.js
|  └─ DistributeFunds.test.js
|  └─ ERC20PriceAggregator.test.js
|  └─ ERC20Verifier.test.js
|  └─ Marketplace.test.js
|  └─ NFTPoolFactory.test.js
|  └─ PoolFactory.test.js
|  └─ Settings.test.js
|  └─ StakingFarmRewards.test.js
|  └─ TradegenEscrow.test.js
|  └─ TradegenLPStakingRewards.test.js
|  └─ TradegenStakingRewards.test.js
|  └─ UbeswapFarmVerifier.test.js
|  └─ UbeswapLPTokenPriceAggregator.test.js
|  └─ UbeswapLPVerifier.test.js
|     └─ UbeswapRouterVerifier.test.js
└─ truffle-config.js
```

14 directories, 142 files