

# 0x Protocol

## Governance

### Security Assessment & Correctness

March 31st

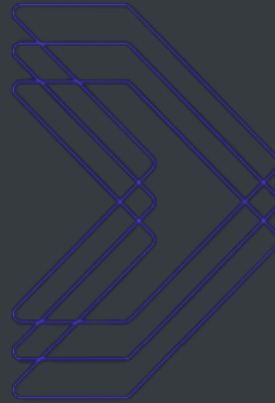
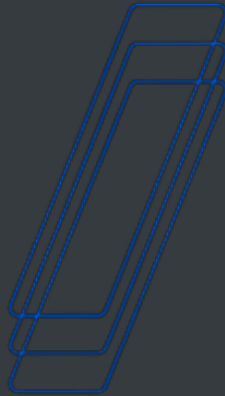
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# Overview

## Project Summary

|              |   |
|--------------|---|
| Project Name | 0x Protocol - Decentralized Governance                    |
| Website      | <a href="#">0x Protocol</a>                               |
| Description  | Decentralized governance for the 0x Protocol and Treasury |
| Platform     | Ethereum; Solidity, Yul                                   |
| Codebase     | <a href="#">GitHub Repository</a>                         |
| Commits      | <a href="#">bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6</a>  |

## Audit Summary

|                 |                                |
|-----------------|--------------------------------|
| Delivery Date   | March 31st                     |
| Method of Audit | Static Analysis, Manual Review |

## Vulnerability Summary

|                       |   |
|-----------------------|---|
| ● Total Issues        | 7 |
| ● Total Major         | 0 |
| ● Total Minor         | 0 |
| ● Total Informational | 7 |

## Executive Summary

The primary goal of this system is to distribute control over the 0x Protocol and its Treasury by using a series of interconnected smart contracts. These contracts aid in the administration of both the decision-making process and the financial resources of the platform.

This system comprises two distinct governors: the `ZeroExProtocolGovernor` and `ZeroExTreasuryGovernor`, each tasked with specific responsibilities. The `ZeroExProtocolGovernor` oversees the guidelines and enhancements for the `0x Protocol`, while the `ZeroExTreasuryGovernor` supervises the platform's financial assets. Both governors work in tandem with their respective time-lock contracts (`ZeroExTimelock`), ensuring that any system changes are implemented after a predefined delay.

A wrapped ZRX token (`wZRX`) is introduced to promote community participation in the decision-making process. This token has a one-to-one correspondence with the original `ZRX` token, enabling users to vote on proposals and effortlessly exchange between `ZRX` and `wZRX`. The token also supports delegation, which allows users to transfer their voting power to someone else if they so desire.

One notable aspect of this system is quadratic voting for Treasury-related decisions. This method ensures that as a voter accumulates more tokens, their influence gradually decreases, preventing individuals or organizations from dominating the decision-making process.

Additionally, the system features a Security Council, comprised of trusted members with the authority to cancel proposals related to the treasury or protocol governors and, if necessary, revert the Protocol to a previous version. The Security Council serves as a safety mechanism, maintaining the platform's security and preventing potentially harmful proposals from being executed.

An essential aspect of this system is the code quality and security of the smart contracts involved. The development team has put significant effort into ensuring that these contracts are designed and implemented with best practices in mind, utilizing industry-standard tools and libraries such as `OpenZeppelin`. Regular due diligence and thorough testing are also

conducted to identify and address potential vulnerabilities, further enhancing the system's overall security. This rigorous approach to code quality and safety demonstrates the team's commitment to providing a reliable, trustworthy, and robust platform that instills confidence in its users and promotes the long-term success of the 0x Protocol ecosystem.

In summary, this system, built on a set of smart contracts, strives to decentralize the governance of the 0x Protocol and its Treasury. It enables token holders to be actively involved in decision-making and implements safeguards to prevent a single party from exerting excessive control. By incorporating features like quadratic voting and the Security Council, the system maintains a balanced power distribution among community members, fostering a fair and secure environment for the ongoing development and management of the 0x Protocol . Through these measures, the platform encourages transparency, inclusivity, and fairness, cultivating a solid and secure ecosystem that benefits all participants within the 0x Protocol community.

## Files In Scope


| Contract                       | Location  |
|--------------------------------|---|
| src/CallWithGas.sol            | <a href="https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/CallWithGas.sol">https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/CallWithGas.sol</a>                       |
| src/IZeroExGovernor.sol        | <a href="https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/IZeroExGovernor.sol">https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/IZeroExGovernor.sol</a>               |
| src/IZeroExVotes.sol           | <a href="https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/IZeroExVotes.sol">https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/IZeroExVotes.sol</a>                     |
| src/SecurityCouncil.sol        | <a href="https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/SecurityCouncil.sol">https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/SecurityCouncil.sol</a>               |
| src/ZeroExProtocolGovernor.sol | <a href="https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/ZeroExProtocolGovernor.sol">https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/ZeroExProtocolGovernor.sol</a> |
| src/ZeroExTimelock.sol         | <a href="https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/ZeroExTimelock.sol">https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/ZeroExTimelock.sol</a>                 |
| src/ZeroExTreasuryGovernor.sol | <a href="https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/ZeroExTreasuryGovernor.sol">https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/ZeroExTreasuryGovernor.sol</a> |
| src/ZeroExVotes.sol            | <a href="https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/ZeroExVotes.sol">https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/ZeroExVotes.sol</a>                       |
| src/ZRXWrappedToken.sol        | <a href="https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/ZRXWrappedToken.sol">https://github.com/0xProject/protocol/tree/bcbfbfa16c2ec98e64cd1f2f2f55a134baf3dbf6/contracts/governance/src/ZRXWrappedToken.sol</a>               |

## Findings

| ID         | Title                           | Type             | Severity      |
|------------|---------------------------------|------------------|---------------|
| <u>F-1</u> | Unlocked Compiler Version       | Coding Style     | informational |
| <u>F-2</u> | Unused Returned Value           | Inconsistency    | informational |
| <u>F-3</u> | Explicit Variable Return        | Coding Style     | informational |
| <u>F-4</u> | Unused Function                 | Dead Code        | informational |
| <u>F-5</u> | `modifier` Optimization         | Gas Optimization | informational |
| <u>F-6</u> | `return` Statement Optimization | Gas Optimization | informational |
| <u>F-7</u> | Input Sanity Check              | Inconsistency    | informational |



## F-1: Unlocked Compiler Version

| Type         | Severity  | Location   |
|--------------|---|--|
| Coding Style |  informational | <a href="#">ZeroExProtocolGovernor L19</a> , <a href="#">ZeroExTimelock L19</a> ,<br><a href="#">ZeroExTreasuryGovernor L19</a> , <a href="#">ZeroExVotes L19</a> ,<br><a href="#">ZRXWrappedToken L19</a> |

### 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 `v0.8.19` the contract should contain the following line:  
`pragma solidity =0.8.19;`

### Alleviation:

TBA



## F-2: Unused Returned Value

| Type          | Severity        | Location   |
|---------------|-----------------|--|
| Inconsistency | ● informational | <u>ZRXWrappedToken L74-L82</u> , <u>L94-L98</u> , <u>L154-L162</u> |

### Description:

The linked invocations do not check or utilize the values returned by their respective function calls, leading to potential inconsistencies or inefficiencies in the code.

### Recommendation:

It is recommended that the returned values are either appropriately utilized within the logic of the smart contracts or removed from the function declarations, ensuring cleaner and more efficient code execution. This will help maintain best practices and minimize any potential issues stemming from unused or unchecked return values.

### Alleviation:

TBA





## F-3: Explicit Variable Return

| Type         | Severity        | Location                         |
|--------------|-----------------|----------------------------------|
| Coding Style | ● informational | <a href="#">ZeroExVotes L256</a> |

### Description:

The linked statement returns a local variable explicitly, which could lead to decreased readability of the code.

### Recommendation:

It is recommended to declare and utilize a named return variable at [L255](#), which will improve code clarity and maintainability. By using a named return variable, developers can better understand the purpose and context of the returned value, leading to more efficient debugging and future code enhancements.

### Alleviation:

TBA



## F-4: Unused Function

| Type      | Severity        | Location  |
|-----------|-----------------|---|
| Dead Code | ● informational | <u>CallWithGas L27-L80</u> , <u>SecurityCouncil L56-L59</u> |

### Description:

The linked functions are not being used or referenced throughout the entire project. This presence of dead code can lead to confusion and increase the difficulty of maintaining the code.

### Recommendation:

It is recommended to remove the unused code to enhance code readability and maintainability. By eliminating dead code, developers can focus on the functionality that is actually relevant to the project, reducing the likelihood of introducing errors or overlooking important aspects during future updates.

### Alleviation:

TBA



## F-5: `modifier` Optimization

| Type             | Severity        | Location  |
|------------------|-----------------|---|
| Gas Optimization | ● informational | <u><code>SecurityCouncil</code> L28-L31</u> , <u><code>ZeroExVotes</code> L46-L49</u> |

### Description:

The linked `modifier` s present an opportunity for further optimization, which can lead to reduced gas consumption during contract execution.

### Recommendation:

It is recommended to move the `require` statements from the `modifier` to a newly declared `private` function and then use that function within the `modifier` . By doing so, you reduce gas costs, making the smart contracts more efficient and cost-effective for users interacting with them.

### Alleviation:

TBA



## F-6: `return` Statement Optimization

| Type             | Severity   | Location                             |
|------------------|--|--------------------------------------|
| Gas Optimization | <span style="color: green;">●</span> informational | <a href="#">ZeroExVotes L75, L83</a> |

### Description:

The linked `return` statements present an opportunity for further optimization, which can lead to reduced gas consumption during contract execution.

### Recommendation:

It is recommended to wrap the linked statements in an `unchecked` block, considering that the local variable is bound within the values of the `uint96` type. By doing so, you can eliminate unnecessary overflow checks and reduce gas costs, making the smart contracts more efficient and cost-effective for users interacting with them.

### Alleviation:

TBA



## F-7: Input Sanity Check

| Type          | Severity        | Location                                      |
|---------------|-----------------|---|
| Inconsistency | ● informational | <u><a href="#">ZeroExTimelock L43-L49</a></u> |

### Description:

The linked function omits a check on the length of the input array. Addressing this issue can help ensure that the function handles edge cases appropriately and operates consistently under various conditions.

### Recommendation:

It is recommended to add a `require` statement that checks whether the length of the `target` array is not zero. By implementing this check, you can prevent potential issues arising from an empty array and ensure that the function operates as expected.

### Alleviation:

TBA

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