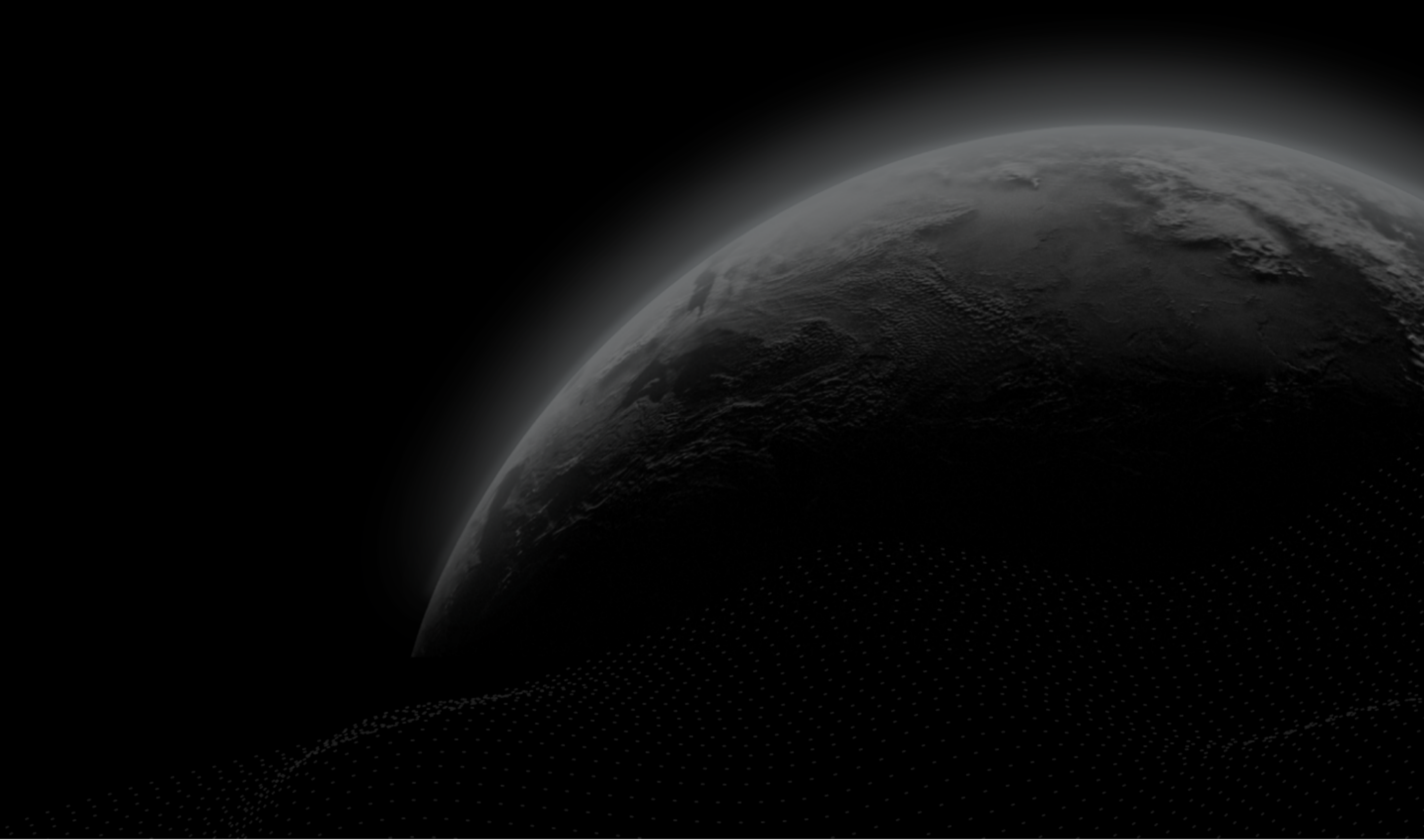
CERTIK

Security Assessment

Venus - Isolated Pools Allow Multiple Rewards Distributors

CertiK Assessed on Aug 24th, 2023



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Venus - Isolated Pools Allow Multiple Rewards Distributors

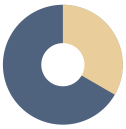
The security assessment was prepared by CertiK, the leader in Web3.0 security.

Executive Summary

TYPES	ECOSYSTEM	METHODS
DeFi	Binance Smart Chain (BSC)	Manual Review, Static Analysis
LANGUAGE	**TIMELINE**	**KEY COMPONENTS**
Solidity	Delivered on 08/24/2023	N/A

CODEBASE	COMMITS
https://github.com/VenusProtocol/isolated-pools/	7603b4ed84040dd883aa3a8f411dd2d2d1fb4956
View All in Codebase Page	View All in Codebase Page

Vulnerability Summary



3	2	0	0	1	0
Total Findings	Resolved	Mitigated	Partially Resolved	Acknowledged	Declined

🟥	0	Critical		Critical risks are those that impact the safe functioning of a platform and must be addressed before launch. Users should not invest in any project with outstanding critical risks.
🟧	0	Major		Major risks can include centralization issues and logical errors. Under specific circumstances, these major risks can lead to loss of funds and/or control of the project.
🟨	0	Medium		Medium risks may not pose a direct risk to users' funds, but they can affect the overall functioning of a platform.
🟨	1	Minor	1 Acknowledged	Minor risks can be any of the above, but on a smaller scale. They generally do not compromise the overall integrity of the project, but they may be less efficient than other solutions.
🟦	2	Informational	2 Resolved	Informational errors are often recommendations to improve the style of the code or certain operations to fall within industry best practices. They usually do not affect the overall functioning of the code.

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CODEBASE | VENUS - ISOLATED POOLS ALLOW MULTIPLE REWARDS DISTRIBUTORS

Repository

https://github.com/VenusProtocol/isolated-pools/

Commit

7603b4ed84040dd883aa3a8f411dd2d2d1fb4956

AUDIT SCOPE | VENUS - ISOLATED POOLS ALLOW MULTIPLE REWARDS DISTRIBUTORS

1 file audited ● 1 file with Acknowledged findings

ID	Repo	File	SHA256 Checksum
● CVP	VenusProtocol/isolated-pools	contracts/Comptroller.sol	700f492c0937a0ff249e683649bccd14aab9ec78b636d24919baef5f2bc9ae8d

APPROACH & METHODS | VENUS - ISOLATED POOLS ALLOW MULTIPLE REWARDS DISTRIBUTORS

This report has been prepared for Venus to discover issues and vulnerabilities in the source code of the Venus - Isolated Pools Allow Multiple Rewards Distributors project as well as any contract dependencies that were not part of an officially recognized library. A comprehensive examination has been performed, utilizing Manual Review and Static Analysis techniques.

The auditing process pays special attention to the following considerations:

- Testing the smart contracts against both common and uncommon attack vectors.
- Assessing the codebase to ensure compliance with current best practices and industry standards.
- Ensuring contract logic meets the specifications and intentions of the client.
- Cross referencing contract structure and implementation against similar smart contracts produced by industry leaders.
- Thorough line-by-line manual review of the entire codebase by industry experts.

The security assessment resulted in findings that ranged from critical to informational. We recommend addressing these findings to ensure a high level of security standards and industry practices. We suggest recommendations that could better serve the project from the security perspective:

- Testing the smart contracts against both common and uncommon attack vectors;
- Enhance general coding practices for better structures of source codes;
- Add enough unit tests to cover the possible use cases;
- Provide more comments per each function for readability, especially contracts that are verified in public;
- Provide more transparency on privileged activities once the protocol is live.

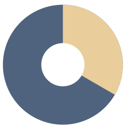
SUMMARY | VENUS - ISOLATED POOLS ALLOW MULTIPLE REWARDS DISTRIBUTORS

This audit concerns the changes made in files outlined in this PR: https://github.com/VenusProtocol/isolated-pools/pull/290.

The change made in this PR was to allow multiple rewards distributors to have the same reward token. This was done by removing the check that a new rewards distributor's reward token was not the reward token of a rewards distributor that have previously been added.

As the audit report was concerned only with changes introduced in this PR, it did not take any centralization risk or other dependencies into consideration. We recommend users review all previous audits here: https://skynet.certik.com/projects/venus.

FINDINGS | VENUS - ISOLATED POOLS ALLOW MULTIPLE REWARDS DISTRIBUTORS



3	0	0	0	1	2
Total Findings	Critical	Major	Medium	Minor	Informational

This report has been prepared to discover issues and vulnerabilities for Venus - Isolated Pools Allow Multiple Rewards Distributors. Through this audit, we have uncovered 3 issues ranging from different severity levels. Utilizing the techniques of Manual Review & Static Analysis to complement rigorous manual code reviews, we discovered the following findings:

ID	Title	Category	Severity	Status
CVP-01	`rewardsDistributors` Array May Contain Inactive Distributors	Logical Issue	Minor	● Acknowledged
CVP-02	Other Protocols May Assume There Is A Single `RewardsDistributor` Per Reward Token	Logical Issue	Informational	● Resolved
CVP-03	Possible To Have Multiple Rewards Distributors Issuing Same Reward Token At Same Time	Logical Issue	Informational	● Resolved

CVP-01 | `rewardsDistributors` ARRAY MAY CONTAIN INACTIVE DISTRIBUTORS

Category	Severity	Location	Status
Logical Issue	● Minor	contracts/Comptroller.sol: 968~969	● Acknowledged

Description

If multiple rewards distributors are allowed for the same token, this may cause the `rewardsDistributors` array to grow excessively large. As the hooks iterate through the entire `rewardsDistributors` array, this may cost a significant amount of gas to be used unnecessarily. In addition, if enough `rewardsDistributors` are added, then this will cause the max loops to need to be adjusted, which may cause issues with other loops that are not dependent on the size of the `rewardsDistributors` array.

Recommendation

Note that this is only an issue when the amount of `rewardsDistributors` significantly exceeds the amount of markets or there is a significant amount of inactive `rewardsDistributors`.

We recommend adding a method to track the active distributors, that is, those distributors who should still be called by the comptroller's hooks. Then the comptroller hooks can iterate only through the active distributors, while the `rewardsDistributors` array can still keep a record of all rewards distributors.

Alleviation

`[Venus, 08/24/2023]`: Issue acknowledged. I won't make any changes for the current version.

We prefer to keep it as it is now and we'll consider a change if the number of RewardsDistributor grows too much in the future.

CVP-02 | OTHER PROTOCOLS MAY ASSUME THERE IS A SINGLE `RewardsDistributor` PER REWARD TOKEN

Category	Severity	Location	Status
Logical Issue	● Informational	contracts/Comptroller.sol: 966	● Resolved

Description

There may be protocols that interact with Venus Isolated-Pools that based their design on the assumption that there is a single `RewardsDistributor` per reward token. For example, they may use a mapping from the reward token to the `RewardsDistributor`, which will not allow them to handle scenarios where there are multiple rewards distributors.

Recommendation

We recommend making a public announcement about this change and how it may cause compatibility issues with any protocol that based their design on this assumption. In addition, we recommend reaching out to any partners to ensure that they did not make design choices based on this assumption and that this change will not significantly affect the functionality of their protocol.

Alleviation

`[CertiK, 08/24/2023]` : The client added comments to the function explaining the new functionality in commit: 3bd2009ddd8577b015263bf082685fa6be113e43 and stated the following regarding informing the public:

`[Venus, 08/24/2023]` : We'll also update the public documentation site (http://docs-v4.venus.io) with this content.

See the commit here: 3576ad14095350f872e414d60313de42371cab9f.

CVP-03 | POSSIBLE TO HAVE MULTIPLE REWARDS DISTRIBUTORS ISSUING SAME REWARD TOKEN AT SAME TIME

Category	Severity	Location	Status
Logical Issue	● Informational	contracts/Comptroller.sol: 966	● Resolved

Description

Currently it is possible to add two distinct rewards distributors that will have the same reward token and have an overlap in the blocks in which the rewards will be distributed. As the reward token speeds and last reward block can be adjusted, a single rewards distributor can be used in the case that there is an overlap in rewards.

Recommendation

We recommend disallowing overlapping rewards for the same token over reward distributors. If the other solutions provided in the other findings present within the report are adopted, then this can be done by ensuring there is at most one active rewards distributor for a given reward token at a time. Alternatively, we recommend only creating multiple reward distributors when necessary to minimize the total amount of rewards distributors.

Alleviation

`[Venus, 08/24/2023]` : This is the expected behaviour. If there is an overlap and we can reuse the same RewardsDistributor contract, we'll do it, extending the last reward block, for example.

But sometimes it's not easy to use only one RewardsDistributor contract. For example, if the distribution speeds are different in RewardsDistributor contract 1 and contract 2, taking into account the changes in the contracts are done with VIP's (it means, without precision on the specific blocks when the changes are done), we won't be able to configure the different speeds correctly. In that case, it would be better to use two different RewardsDistributor contracts.

`[CertiK, 08/24/2023]` : Considering these cases, we agree that there are valid use cases for allowing multiple active `RewardsDistributor` contracts for the same reward token and mark this finding as *resolved*. However, we recommend keeping a single active `RewardsDistributor` per reward token whenever possible.

APPENDIX | VENUS - ISOLATED POOLS ALLOW MULTIPLE REWARDS DISTRIBUTORS

Finding Categories

Categories	Description
Logical Issue	Logical Issue findings indicate general implementation issues related to the program logic.

Checksum Calculation Method

The "Checksum" field in the "Audit Scope" section is calculated as the SHA-256 (Secure Hash Algorithm 2 with digest size of 256 bits) digest of the content of each file hosted in the listed source repository under the specified commit.

The result is hexadecimal encoded and is the same as the output of the Linux "sha256sum" command against the target file.

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