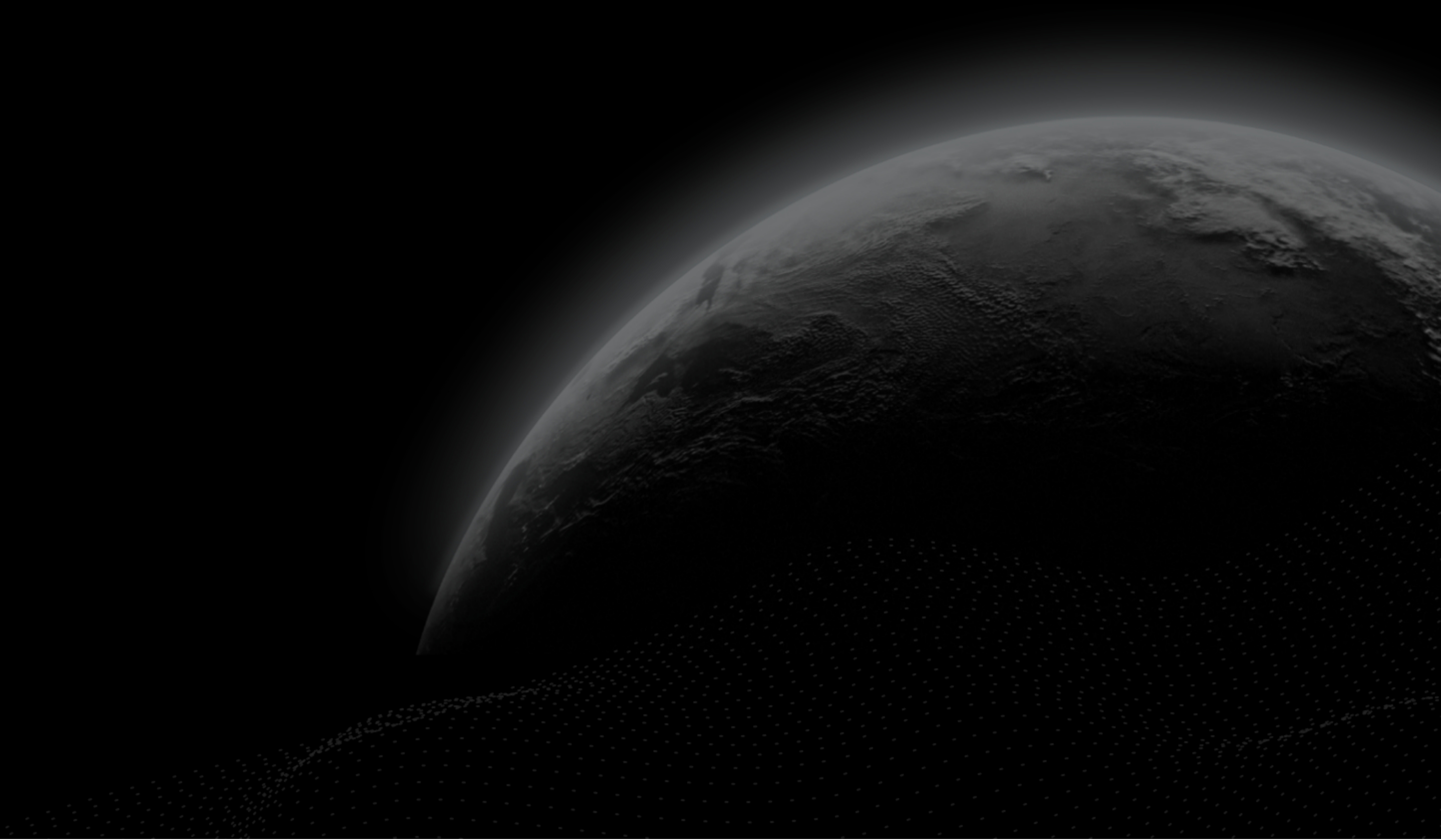
Security Assessment

Venus - VBNBAdmin

CertiK Assessed on Jul 17th, 2024



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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 07/17/2024	N/A

CODEBASE

https://github.com/VenusProtocol/venus-protocol

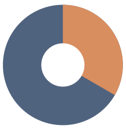
View All in Codebase Page

COMMITS

base: d89969ae25a6715016af56d62cc4a55d773d19a8

View All in Codebase Page

Vulnerability Summary



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

🟥	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.
🟧	1	Major	1 Acknowledged	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.
🟨	0	Minor		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	1 Resolved, 1 Acknowledged	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 - VBNBADMIN

Repository

https://github.com/VenusProtocol/venus-protocol

Commit

base: d89969ae25a6715016af56d62cc4a55d773d19a8

AUDIT SCOPE | VENUS - VBNBADMIN

2 files audited ● 1 file with Acknowledged findings ● 1 file without findings

ID	Repo	File	SHA256 Checksum
● VBN	VenusProtocol/venus-protocol	contracts/Admin/VBNBAdmin.sol	8646ac74183004ac356cfbe1c36a178d404381cbdf7ead8ce088ed483c8bf529
● VBB	VenusProtocol/venus-protocol	contracts/Admin/VBNBAdminStorage.sol	58a549e3f8d64bef479ff79ccf9e55ccc8994d7a4a0d4f9f4f0d5971a7a7abf3

APPROACH & METHODS | VENUS - VBNBADMIN

This report has been prepared for Venus to discover issues and vulnerabilities in the source code of the Venus - VBNBAdmin 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 - VBNBADMIN

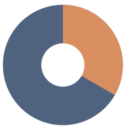
This audit concerns the changes made in PR-487.

Note that any centralization risks present in the existing codebase before these PRs were not considered in this audit and only those added in these PRs are addressed in the audit. We recommend all users to carefully review the centralization risks, much of which can be found in our previous audits which can be found here: https://skynet.certik.com/projects/venus.

In particular, this PR is for the inclusion of the function `setInterestRateModel()` within contract `VBNBAdmin` , which acts as the admin role for the `VBNB` contract at address 0xA07c5b74C9B40447a954e1466938b865b6BBea36. The proxy acting as the `VBNBAdmin` can be found at address 0x9A7890534d9d91d473F28cB97962d176e2B65f1d and at the time of the audit, the current implementation of this proxy contract can be found at address 0x8c15384f1346bd977a689c0c51bd369e8d7313ca.

Note that contract `VBNB` is not upgradeable, but the contract `VBNBAdmin` is upgradeable. Previously, the function `setInterestRateModel()` did not exist within the `VBNBAdmin` contract, limiting the ability to call function `_setInterestRateModel()` within the `VBNB` contract. Including this function in the upgrade of `VBNBAdmin` provides the ability to call this function within `VBNB` and change the interest rate model used within the token contract.

FINDINGS | VENUS - VBNBADMIN



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

This report has been prepared to discover issues and vulnerabilities for Venus - VBNBAdmin. 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
VBN-03	**Centralization Related Risks**	**Centralization**	**Major**	● **Acknowledged**
VBN-01	Potential Update To Unknown `InterestRateModel`	Design Issue	Informational	● Resolved
VBN-02	Type Inconsistency Between `VTokenInterface` Contracts Used	Inconsistency	Informational	● Acknowledged

VBN-03 | CENTRALIZATION RELATED RISKS

Category	Severity	Location	Status
Centralization	● **Major**	**contracts/Admin/VBNBAdmin.sol: 99**	● **Acknowledged**

Description

Note that any centralization risks present in the existing codebase before the PR's in scope of this audit were not considered. Only those added to the in-scope PRs are addressed. We recommend all users carefully review the centralization risks, much of which can be found in our previous audits, which can be found here: https://skynet.certik.com/projects/venus.

In the contract `VBNBAdmin` the role the `DEFAULT_ADMIN_ROLE` of the `AccessControlManager` can grant addresses the privilege to call the function `setInterestRateModel()` .

Any compromise to the `DEFAULT_ADMIN_ROLE` or accounts granted this privilege may allow the hacker to take advantage of this authority and do set the interest rate model to a malicious contract to return borrow or supply rates that are higher or lower than expected.

Recommendation

The risk describes the current project design and potentially makes iterations to improve in the security operation and level of decentralization, which in most cases cannot be resolved entirely at the present stage. We advise the client to carefully manage the privileged account's private key to avoid any potential risks of being hacked. In general, we strongly recommend centralized privileges or roles in the protocol be improved via a decentralized mechanism or smart-contract-based accounts with enhanced security practices, e.g., multisignature wallets.

Indicatively, here are some feasible suggestions that would also mitigate the potential risk at a different level in terms of short-term, long-term and permanent:

Short Term:

Timelock and Multi sign (⅔, ⅗) combination *mitigate* by delaying the sensitive operation and avoiding a single point of key management failure.

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
  AND
- Assignment of privileged roles to multi-signature wallets to prevent a single point of failure due to the private key compromised;
  AND
- A medium/blog link for sharing the timelock contract and multi-signers addresses information with the public audience.

Long Term:

Timelock and DAO, the combination, *mitigate* by applying decentralization and transparency.

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
  AND
- Introduction of a DAO/governance/voting module to increase transparency and user involvement.
  AND
- A medium/blog link for sharing the timelock contract, multi-signers addresses, and DAO information with the public audience.

Permanent:

Renouncing the ownership or removing the function can be considered *fully resolved*.

- Renounce the ownership and never claim back the privileged roles.
  OR
- Remove the risky functionality.

Alleviation

`[Venus, 07/15/2024]` Regarding the DEFAULT_ADMIN_ROLE, we'll use the AccessControlManager (ACM) deployed at https://bscscan.com/address/0x4788629abc6cfca10f9f969efdeaa1cf70c23555. In this ACM, only 0x939bd8d64c0a9583a7dcea9933f7b21697ab6396 (Normal Timelock) has the DEFAULT_ADMIN_ROLE. And this contract is a Timelock contract used during the Venus Improvement Proposals. We'll allow Normal, Fast-track and Critical timelock contracts to execute the mentioned function (setInterestRateModel()).

Current config for the three Timelock contracts:

Normal: 24 hours voting + 48 hours delay Fast-track: 24 hours voting + 6 hours delay Critical: 6 hours voting + 1 hour delay

Addresses of the Timelock contracts:

Normal timelock: https://bscscan.com/address/0x939bD8d64c0A9583A7Dcea9933f7b21697ab6396 Fast-track timelock: https://bscscan.com/address/0x555ba73dB1b006F3f2C7dB7126d6e4343aDBce02 Critical timelock: https://bscscan.com/address/0x213c446ec11e45b15a6E29C1C1b402B8897f606d

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We have been working on the VIP to upgrade the VBNBAdmin implementation and grant permissions. You can check the commands to be executed in that VIP here: https://github.com/VenusProtocol/vips/pull/297/files#diff-0b2889a429701394ce3daae7f9ef0b3dea44e2c71306a20d49c5da05462fdc08 (file bscmainnet.ts in the `vips` folder)

`[CertiK, 06/17/2024]` : Currently the setup described and to be implemented via the VIP will meet our mitigation standards. We can mark this finding as *Mitigated* after the deployment and setup when this can be verified on chain.

VBN-01 | POTENTIAL UPDATE TO UNKNOWN `InterestRateModel`

Category	Severity	Location	Status
Design Issue	● Informational	contracts/Admin/VBNBAdmin.sol: 99~100	● Resolved

Description

The function `setInterestRateModel()` was added to upgradeable contract logic for `VBNBAdmin` in order to make changes to the `interestRateModel` used in the `VBNB` contract at address 0xA07c5b74C9B40447a954e1466938b865b6BBea36 in the case where it is needed.

It is noted that the addition of this function in `VBNBAdmin` now provides the centralized authority with the ability to change the interest rate model of the `VBNB` contract to any interest rate model, including models that have not been reviewed or vetted previously.

Recommendation

We recommend only updating the interest rate model of the `VBNB` contract to interest rate models which have been thoroughly vetted and which are known to be compatible with the logic and configuration of the `VBNB` contract.

Alleviation

`[Venus, 07/17/2024]` : "We will be updating the IR using VIP (via Governance) so contracts will be reviewed and the Venus community will take care of it when updating."

VBN-02 TYPE INCONSISTENCY BETWEEN `VTokenInterface` CONTRACTS USED

Category	Severity	Location	Status
Inconsistency	● Informational	contracts/Admin/VBNBAdmin.sol: 101~102	● Acknowledged

Description

Newly added function `setInterestRateModel()` in contract `VBNBAdmin` uses the following interface to interact with the `_setInterestRateModel()` function in the `VBNB` contract:

```
interface VTokenInterface {
    function _reduceReserves(uint reduceAmount) external returns (uint);

    function _acceptAdmin() external returns (uint);

    function comptroller() external returns (address);

    function _setInterestRateModel(address newInterestRateModel) external returns
(uint);
}
```

However, the `VTokenInterface` used in the `VBNB` contract at address 0xA07c5b74C9B40447a954e1466938b865b6BBea36 declares the function `_setInterestRateModel()` in the following way, using the type `InterestRateModel` rather than type `address` for the input.

```
  function _setInterestRateModel(InterestRateModel newInterestRateModel) public
returns (uint);
```

Recommendation

We recommend correcting the inconsistency between interfaces as a best practice in keeping formatting the same across contracts.

Alleviation

`[Venus, 07/15/2024]`: "The InterestRateModel contract uses a different solidity version (^0.5.16) compared to vBNBAdmin contract (0.8.25). Therefore we cannot use InterestRateModel in the new _setInterestRateModel function added to VTokenInterface"

APPENDIX | VENUS - VBNBADMIN

Finding Categories

Categories	Description
Inconsistency	Inconsistency findings refer to different parts of code that are not consistent or code that does not behave according to its specification.
Centralization	Centralization findings detail the design choices of designating privileged roles or other centralized controls over the code.
Design Issue	Design Issue findings indicate general issues at the design level beyond program logic that are not covered by other finding categories.

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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