



# Code Security Assessment

## **Bifrost**

Jan 13th, 2022



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# Summary

This report has been prepared for Bifrost to discover issues and vulnerabilities in the source code of the Bifrost project as well as any contract dependencies that were not part of an officially recognized library. A comprehensive examination has been performed, utilizing Static Analysis and Manual Review 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:

- 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.

# Overview

## Project Summary

Project Name	Bifrost
Platform	Substrate
Language	Rust
Codebase	<a href="https://github.com/paritytech/substrate/blob/master/frame/balances/src/lib.rs#L278-L436">https://github.com/paritytech/substrate/blob/master/frame/balances/src/lib.rs#L278-L436</a>
Commit	<a href="https://github.com/paritytech/substrate/commit/12b6441ef138303f50fa2fb20895fbf57c8e4735">12b6441ef138303f50fa2fb20895fbf57c8e4735</a>

## Audit Summary

Delivery Date	Jan 13, 2022
Audit Methodology	Static Analysis, Manual Review

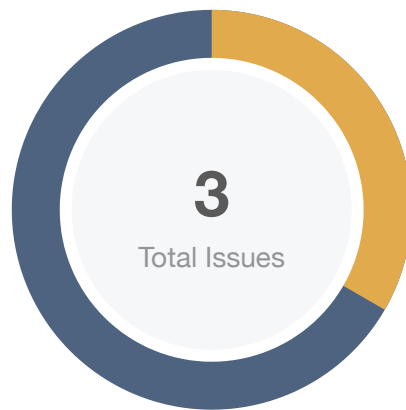
## Vulnerability Summary

Vulnerability Level	Total	⚠ Pending	⊗ Declined	ℹ Acknowledged	🕒 Partially Resolved	✅ Resolved
🔴 Critical	0	0	0	0	0	0
🟠 Major	0	0	0	0	0	0
🟡 Medium	1	0	0	1	0	0
🟠 Minor	0	0	0	0	0	0
🟡 Informational	2	0	0	2	0	0
🟢 Discussion	0	0	0	0	0	0

# Audit Scope

ID	File	SHA256 Checksum
BCP	lib.rs	118d265722f808ddecc34de50590e78f9937487a6c7da7c3a811fc5dadcaf5a

# Findings



Critical	0 (0.00%)
Major	0 (0.00%)
Medium	1 (33.33%)
Minor	0 (0.00%)
Informational	2 (66.67%)
Discussion	0 (0.00%)

ID	Title	Category	Severity	Status
BCK-01	No AccountNonce Update	Logical Issue	Medium	ⓘ Acknowledged
BCK-02	Unknown Implementations	Volatile Code	Informational	ⓘ Acknowledged
BCK-03	Naming Inconsistency	Logical Issue	Informational	ⓘ Acknowledged

## BCK-01 | No `AccountNonce` Update

Category	Severity	Location	Status
Logical Issue	● Medium	lib.rs: 328	ⓘ Acknowledged

### Description

The specification for the function `set_balance` as described in the comments requires that if the `ExistentialDeposit` condition is not met (i.e the net balance for the account should be at least as much as the `existential_deposit` value), the balance is not updated and the `AccountNonce` is changed. The function code ensures that balance is not updated, but fails to update the account nonce in case wipeout (the boolean variable evaluating the `ExistentialDeposit` condition) holds.

### Recommendation

We advise the team to either revise the function specification to not update account nonce (which is not preferred) or update the function code to modify account nonce when wipeout holds

## BCK-02 | Unknown Implementations

Category	Severity	Location	Status
Volatile Code	● Informational	lib.rs: 317	ⓘ Acknowledged

### Description

Function `set_balance`, depends on proper implementation of destruction/drop of `Imbalance` trait (`PositiveImbalance`, `NegativeImbalance`), so extra care has to be taken with this part if dropping `Imbalance` brings back right totals.

### Recommendation

We understand that the business logic of this protocol requires interaction with these functions. We encourage the team to constantly monitor the statuses of 3rd parties to mitigate the side effects when unexpected activities are observed.



## BCK-03 | Naming Inconsistency

Category	Severity	Location	Status
Logical Issue	● Informational	lib.rs: 419	ⓘ Acknowledged

### Description

The comments for the specification of the `transfer_all()` function mention a variable `transferable_balance`, which is expected to store the value of the user's transferable balance. However, the code refers to this variable as the `reducible_balance`.

### Recommendation

We advise the team to update the variable name in the comments or the code to ensure consistency.

# Appendix

## Finding Categories

### Logical Issue

Logical Issue findings detail a fault in the logic of the linked code, such as an incorrect notion on how `block.timestamp` works.

### Volatile Code

Volatile Code findings refer to segments of code that behave unexpectedly on certain edge cases that may result in a vulnerability.

## 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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## About

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