

**HACKEN**

# SMART CONTRACT CODE REVIEW AND SECURITY ANALYSIS REPORT

**Customer:** BRing Finance  
**Date:** December 10<sup>th</sup>, 2021

This document may contain confidential information about IT systems and the intellectual property of the Customer as well as information about potential vulnerabilities and methods of their exploitation.

The report containing confidential information can be used internally by the Customer, or it can be disclosed publicly after all vulnerabilities are fixed – upon a decision of the Customer.

## Document

<b>Name</b>	Smart Contract Code Review and Security Analysis Report for BRing Finance.
<b>Approved by</b>	Andrew Matiukhin   CTO Hacken OU
<b>Type</b>	ERC20 token; Staking
<b>Platform</b>	Ethereum / Solidity
<b>Methods</b>	Architecture Review, Functional Testing, Computer-Aided Verification, Manual Review
<b>Repository</b>	<a href="https://github.com/ElephantsLab/bRing-contracts-v2">https://github.com/ElephantsLab/bRing-contracts-v2</a>
<b>Commit</b>	99097983924a3ed2ed77e15222c8153c77ef3199
<b>Deployed contract</b>	<a href="https://testnet.bscscan.com/address/0x6462106cc4a3de77d9ceb83b99831e63300132f3">https://testnet.bscscan.com/address/0x6462106cc4a3de77d9ceb83b99831e63300132f3</a>
<b>Technical Documentation</b>	YES
<b>JS tests</b>	YES
<b>Website</b>	bring.finance
<b>Timeline</b>	01 DECEMBER 2021 - 10 DECEMBER 2021
<b>Changelog</b>	06 DECEMBER 2021 - INITIAL AUDIT 10 DECEMBER 2021 - SECOND REVIEW



## Table of contents

Introduction	4
Scope	4
Executive Summary	5
Severity Definitions	8
Audit overview	9
Conclusion	11
Disclaimers	12

## Introduction

Hacken OÜ (Consultant) was contracted by BRing Finance (Customer) to conduct a Smart Contract Code Review and Security Analysis. This report presents the findings of the security assessment of the Customer's smart contract and its code review conducted between December 1<sup>st</sup>, 2021 - December 6<sup>th</sup>, 2021.

Second review conducted on December 10<sup>th</sup>, 2021.

## Scope

The scope of the project is smart contracts in the repository:

**Repository:**

<https://github.com/ElephantsLab/bRing-contracts-v2>

**Commit:**

[99097983924a3ed2ed77e15222c8153c77ef3199](https://github.com/ElephantsLab/bRing-contracts-v2/commit/99097983924a3ed2ed77e15222c8153c77ef3199)

**Deployed contract:**

<https://testnet.bscscan.com/address/0x6462106cc4a3de77d9ceb83b99831e63300132f3>

**Technical Documentation:** Yes, <https://docs.google.com/document/d/1Ywav-c1MZfdQXVc1dVFFpg9JYIW3EPq9uL06n-iuyos/>

**JS tests:** Yes, <https://github.com/ElephantsLab/bRing-contracts-v2/tree/tests>

**Contracts:**

[bRingFarming.sol](#)  
[bRingFarmingOwnable.sol](#)  
[bRingToken.sol](#)

We have scanned this smart contract for commonly known and more specific vulnerabilities. Here are some of the commonly known vulnerabilities that are considered:

Category	Check Item
Code review	<ul style="list-style-type: none"><li>▪ Reentrancy</li><li>▪ Ownership Takeover</li><li>▪ Timestamp Dependence</li><li>▪ Gas Limit and Loops</li><li>▪ DoS with (Unexpected) Throw</li><li>▪ DoS with Block Gas Limit</li><li>▪ Transaction-Ordering Dependence</li><li>▪ Style guide violation</li><li>▪ Costly Loop</li><li>▪ ERC20 API violation</li><li>▪ Unchecked external call</li><li>▪ Unchecked math</li><li>▪ Unsafe type inference</li><li>▪ Implicit visibility level</li><li>▪ Deployment Consistency</li><li>▪ Repository Consistency</li></ul>

	<ul style="list-style-type: none"> <li>Data Consistency</li> </ul>
Functional review	<ul style="list-style-type: none"> <li>Business Logics Review</li> <li>Functionality Checks</li> <li>Access Control &amp; Authorization</li> <li>Escrow manipulation</li> <li>Token Supply manipulation</li> <li>Assets integrity</li> <li>User Balances manipulation</li> <li>Data Consistency manipulation</li> <li>Kill-Switch Mechanism</li> <li>Operation Trails &amp; Event Generation</li> </ul>

## Executive Summary

According to the assessment, the Customer's smart contracts are well-secured.



Our team performed an analysis of code functionality, manual audit, and automated checks with Mythril and Slither. All issues found during automated analysis were manually reviewed, and important vulnerabilities are presented in the Audit overview section. All found issues can be found in the Audit overview section.

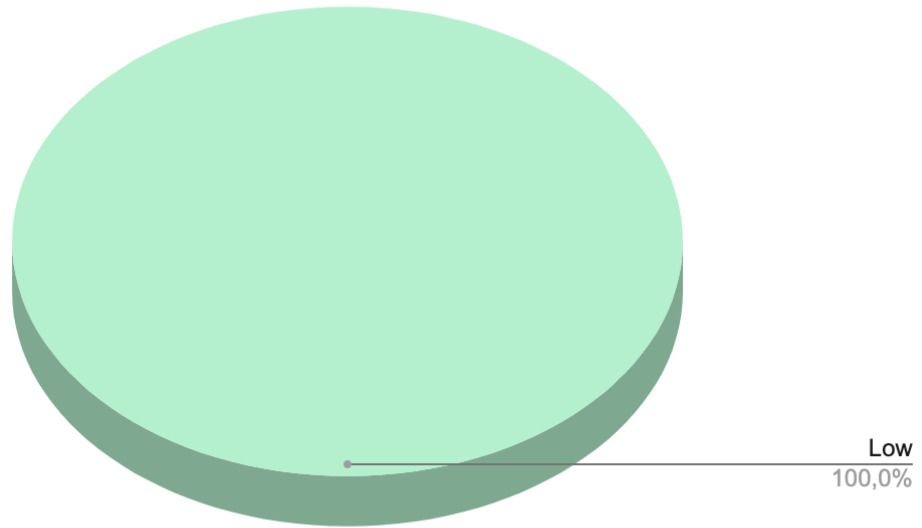
As a result of the audit, security engineers found **1** medium and **4** low severity issues.



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As a result of the second review, security engineers found 1 low severity issue.

*Graph 1. The distribution of vulnerabilities after the audit.*



## Severity Definitions

Risk Level	Description
<b>Critical</b>	Critical vulnerabilities are usually straightforward to exploit and can lead to assets loss or data manipulations.
<b>High</b>	High-level vulnerabilities are difficult to exploit; however, they also have a significant impact on smart contract execution, e.g., public access to crucial functions
<b>Medium</b>	Medium-level vulnerabilities are important to fix; however, they can't lead to assets loss or data manipulations.
<b>Low</b>	Low-level vulnerabilities are mostly related to outdated, unused, etc. code snippets that can't have a significant impact on execution



## Audit overview

### ■ ■ ■ ■ Critical

No critical issues were found.

### ■ ■ ■ High

No high severity issues were found.

### ■ ■ Medium

No tests were provided.

**Contracts:** bRingFarmingOwnable.sol, bRingFarming.sol

It's recommended to cover all non-trivial contracts with tests.

The recommended coverage is minimum 95% for branches, while it should be definitely 100% for the main logic contracts.

**Status:** fixed

### ■ Low

#### 1. Missing input value validation

**Contracts:** bRingFarmingOwnable.sol

**Functions:** configPool

Documentation and other methods imply that *farmSequence[]* size is **10** or less, but there is no validation.

**Recommendation:** Add validation

**Status:** fixed

#### 2. View function iterates over an array of unpredictable size

**Contracts:** bRingFarming.sol

**Functions:** viewStakingDetails

Size of *stakes[userAddress][]* is constantly growing when the user stakes and at some moment function could become inoperable.

**Recommendation:** Add *limit* and *offset* parameter to view function

**Status:** fixed



3. Missing event for changing *pools*, *referralPercents*, *stakingDuration*

**Contracts:** bRingFarmingOwnable.sol

**Functions:** configPool, changeReferralPercents, changeStakingDuration

Changing critical values should be followed by the event emitting for better tracking off-chain.

**Recommendation:** Please emit events on the critical values changing. **These events are not for the contract owner but for the community to track changes off-chain.**

4. A public function that could be declared external.

**public** functions that are never called by the contract should be declared **external** to save gas.

**Contracts:** bRingToken.sol, bRingFarming.sol

**Functions:** batchTransfer, getReferrals, getReferralsNumber

**Recommendation:** Use the **external** attribute for functions never called from the contract.

**Status:** fixed



## Conclusion

Smart contracts within the scope were manually reviewed and analyzed with static analysis tools.

The audit report contains all found security vulnerabilities and other issues in the reviewed code.

As a result of the audit, security engineers found **1** medium and **4** low severity issues.

As a result of the second review, security engineers found **1** low severity issue.



## Disclaimers

### **Hacken Disclaimer**

The smart contracts given for audit have been analyzed in accordance with the best industry practices at the date of this report, in relation to cybersecurity vulnerabilities and issues in smart contract source code, the details of which are disclosed in this report (Source Code); the Source Code compilation, deployment, and functionality (performing the intended functions).

The audit makes no statements or warranties on the security of the code. It also cannot be considered as a sufficient assessment regarding the utility and safety of the code, bug-free status, or any other statements of the contract. While we have done our best in conducting the analysis and producing this report, it is important to note that you should not rely on this report only – we recommend proceeding with several independent audits and a public bug bounty program to ensure the security of smart contracts.

### **Technical Disclaimer**

Smart contracts are deployed and executed on a blockchain platform. The platform, its programming language, and other software related to the smart contract can have vulnerabilities that can lead to hacks. Thus, the audit can't guarantee the explicit security of the audited smart contracts.