DeHacker

Security Assessment

# CheersLand

Mar. 31th, 2022

# Contents

## Summary

DeHacker's objective was to evaluate the repository for security-related issues, code quality, and adherence to specification and best practices. Possible issues we looked for included (but are not limited to):

- Transaction-ordering dependence
- Timestamp dependence
- Mishandled exceptions and call stack limits
- Unsafe external calls
- Integer overflow/underflow
- Number rounding errors
- Reentrancy and cross-function vulnerabilities
- Denial of service/logical oversights
- Access control
- Centralization of power
- Business logic contradicting the specification
- Code clones, functionality duplication
- Gas usage
- Arbitrary token minting

# Issue Categories

Every issue in this report was assigned a severity level from the following:

## Critical severity issues

A vulnerability that can disrupt the contract functioning in a number of scenarios or creates a risk that the contract may be broken.

## Major severity issues

A vulnerability that affects the desired outcome when using a contract or provides the opportunity to use a contract in an unintended way.

## Medium severity issues

A vulnerability that could affect the desired outcome of executing the contract in a specific scenario.

## Minor severity issues

A vulnerability that does not have a significant impact on possible scenarios for the use of the contract and is probably subjective.

## Informational

A vulnerability that has informational character but is not affecting any of the code.

# Overview

## Project Summary

| | |
|---|---|
| **Project Name** | CheersLand |
| **Platform** | BSC |
| **website** | https://cheersland.org/ |
| **Type** | GameFi |
| **Language** | Solidity |
| **Codebase** | https://github.com/CheersLand/cheersland-igo-smart-contract |
| **Commit** | ec525d786518905c37bcf3142901a50d5344abc4 |

## Audit Summary

| | |
|---|---|
| **Delivery Date** | Mar. 31, 2022 |
| **Audit Methodology** | Static Analysis, Manual Review |

## Vulnerability Summary

| Vulnerability Level | Total | Pending | Declined | Acknowledged | Partially Resolved | Resolved |
|---|---|---|---|---|---|---|
| Critical | 0 | 0 | 0 | 0 | 0 | 0 |
| Major | 2 | 0 | 0 | 1 | 0 | 1 |
| Medium | 1 | 0 | 0 | 0 | 0 | 1 |
| Minor | 2 | 0 | 0 | 0 | 0 | 2 |
| Informational | 1 | 0 | 0 | 0 | 0 | 1 |
| Discussion | 0 | 0 | 0 | 0 | 0 | 0 |

## Audit scope

| ID | File | SHA256 Checksum |
|---|---|---|
| FIP | FundraisingIdoPool.sol | 8cf9607fa80dfafc8de2d2ae2b33220b91c75bec244b13b2ebf0b2e9a4cff4cb |

# Understandings

## Overview

CheersLand is a project for users to purchase lpAddress token.

Users use fundraising Address token to buy the lpAddress.

There is a fundraising goal that is set by the team. When the fundraising goal is reached, the team will only receive the designated amount mandated for the fundraising goal. The remaining tokens will be returned to users.

There is a startTime and endTime which represents the start time and end time of the purchase activity. There is a claimTime. After claim time, users can get lpAddress they purchased, and reclaim the excess proceeds from the remaining fundraisingAddress. The team can only claim the designated amount described per the fundraising Address not greater than the fundraising goal and extract the surplus lpAddress.

There is a whitelist strategy. Variable rand is used to mark users at a whitelist level. rank has four values:0, 1, 2, 3, respectively means: 0: never be a whitelist, 1: normal whitelist, 2: super whitelist, 3: ever a whitelist, and later become not a whitelist. Only users in the whitelist can purchase lpAddress. Users in the normal whitelist have a default purchase limit whitelistQuota. Users in the super whitelist can have a purchase limit that is set by operator.

If the user's mortgage num is greater than the threshold in a third pool poolAddress, he will be set as anormal whitelist when he purchases lpAddress.

Additionally, the contract FundraisingIdoPool can work correctly only when there is enough lpAddress in it. According to the codebase, the amount of lpAddress should be lpQuantitySold when the activity starts.

## Privileged Functions

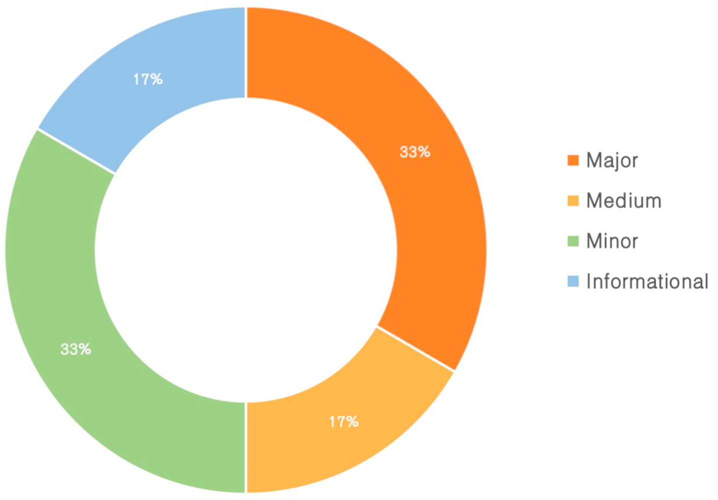
The project contains the following privileged functions. They are used to modify the contract configurationsand address attributes. We grouped these functions below:

The onlyOperator modifier:
contract FundraisingIdoPool.sol:

- function setPoolAddress()
- unction setAdminAddress()
- function setWhiteListQuota()
- function setExchangeRate()
- function setUpperLimit()

- function setEndTime()
- function setClaimTime()
- function addSuperWhiteList()
- function setWhiteList()
- function ownerClaim()
- function extractSurplusLp()

## Findings



| ID | Title | Category | Severity | Status |
|---|---|---|---|---|
| CheersLand-01 | Centralization Related Risks | Centralization / Privilege | Major | Acknowledged |
| FIP-01 | Missing Input Validation | Volatile Code | Minor | Resolved |
| FIP-02 | Function Visibility Optimization | Gas Optimization | Informational | Resolved |
| FIP-03 | Unchecked Value of ERC-20 transfer() / transferFrom() Call | Volatile Code | Minor | Resolved |
| FIP-04 | Potential Reentrancy Attack | Logical Issue | Medium | Resolved |
| FIP-05 | Users May Be Unable To Claim TheTokens They Purchased | Logical Issue | Major | Resolved |

## Major

### CheersLand-01 | Centralization Related Risks

| Category | Severity | Location | Status |
|---|---|---|---|
| Centralization / Privilege | Major | Global | Acknowledged |

### Description

In the contract FundraisingIdoPool, the role operator has the authority over the following function:

1. Update poolAddress through setPoolAddress.
2. Update _adminAddress through setAdminAddress function.
3. Update whiteListQuota through setWhiteListQuota function.
4. Update exchangeRate through setExchangeRate function.
5. Update upperLimit[_account] through setUpperLimit function.
6. Update endTime through setEndTime function.
7. Update claimTime through setClaimTime function.
8. Set super whitelist through addSuperWhiteList function.
9. Set whitelist through setWhiteList function.
10. Claim fundRaisingAddress through ownerClaim function.
11. Extract surplus lpAddress through extractSurplusLp function.

without obtaining the consensus of the community.

### Recommendation

We advise the client to carefully manage the owner, injector, operator account's private key to avoid any potential risks of being hacked. In general, we strongly recommend centralized privileges or roles in the protocol to be improved via a decentralized mechanism or smart-contract-based accounts with enhanced security practices, e.g., Multi signature wallets.

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

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations.
- Assignment of privileged roles to multi-signature wallets to prevent a single point of failure due to the private key.
- Introduction of a DAO/governance/voting module to increase transparency and user involvement.

## Alleviation

No Alleviation

## FIP-01 | Users May Be Unable To Claim The Tokens They Purchased.

| Category | Severity | Location | Status |
|---|---|---|---|
| Logical Issue | Major | FundraisingPool.sol: 271-279 | Resolved |

### Description

Operator can transfer all the lpAddress in contract FundraisingIdoPool to his own account after claimTime through function extractSurplusLp() . This operation may be earlier than the users to callcalim() . This will cause the users unable to get the lpAddress they purchased.

### Recommendation

The team should ensure users can get all the lpAddress they purchased.

### Alleviation

The team heeded our advice and removed the extractSurplusLp function. Added a logic in function ownerClaim to ensure there will be enough lpAddress in the contract for users to claim. Code change was applied in commit: d333c208cc2f1c9f52244f66773eda6f9fd7d3ad.

## Medium

### FIP-02| Potential Reentrancy Attack

| Category | Severity | Location | Status |
|---|---|---|---|
| Logica Issue | Medium | FundraisingIdoPool.Sol: 239-246. 262-266 | Resolved |

### Description

A reentrancy attack can occur when the contract creates a function that makes an external call to another untrusted contract before resolving any effects. If the attacker can control the untrusted contract, they can make a recursive call back to the original function, repeating interactions that would have otherwise not run after the external call resolved the effects.

### Recommendation

We recommend using the Checks-Effects-Interactions Pattern to avoid the risk of calling unknown contracts or applying OpenZeppelin ReentrancyGuard library - nonReentrant modifier for the aforementioned functions to prevent reentrancy attack.

### Alleviation

The team heeded our advice and added an inspector lock. Code change was applied in commit: d333c208cc2f1c9f52244f66773eda6f9fd7d3ad.

## Minor

### FIP-03 | Missing Input Validation

| Category | Severity | Location | Status |
|---|---|---|---|
| Volatile Code | Minor | FundraisingIdoPool.Sol: 92.93.99.108.112 | Resolved |

#### Description

The given input is missing the check for the non-zero address.

#### Recommendation

We advise adding the check for the passed-in values to prevent unexpected error as below:

#### Alleviation

The team heeded our advice and added a zero check. Code change was applied in commit: d333c208cc2f1c9f52244f66773eda6f9fd7d3ad.

## FIP-04 | Unchecked Value of ERC-20 transfer() /transferFrom() Call

| Category | Severity | Location | Status |
|---|---|---|---|
| Volatile Code | Minor | FundraisingIdoPool.Sol: 213.240.243.263.276 | Resolved |

### Description

The linked transfer() / transferFrom() invocations do not check the return value of the function callwhich should yield a true result in case of proper ERC-20 implementation.

### Recommendation

As many tokens do not follow the ERC-20 standard faithfully, they may not return a bool variable in this function's execution meaning that simply expecting it can cause incompatibility with these types of tokens. Instead, we advise that OpenZeppelin's SafeERC20.sol implementation is utilized for interacting with thetransfer() and transferFrom() functions of ERC-20 tokens. The OZ implementation optionally checks for a return value rendering compatible with all ERC-20 token implementations.

### Alleviation

The team heeded our advice and change to safeTransfer and safeTransferFrom. Code change wasapplied in commit: d333c208cc2f1c9f52244f66773eda6f9fd7d3ad.

# Informational

## FIP-05 | Function Visibility Optimization

| Category | Severity | Location | Status |
|---|---|---|---|
| Gas Optimization | Informational | FundraisingIdoPool.Sol: 136. | Resolved |

### Description

The following functions are declared as public, contain array function arguments, and are not invoked in any of the contracts contained within the project's scope. The functions that are never called internally within the contract should have external visibility.

### Recommendation

We advise that the functions' visibility specifiers are set to external, and the array-based arguments change their data location from memory to calldata, optimizing the gas cost of the function.

### Alleviation

The team heeded our advice and change public to external. Code change was applied in commit: d333c208cc2f1c9f52244f66773eda6f9fd7d3ad.

## Disclaimer

# Appendix

## Finding Categories

### Centralization / Privilege

Centralization / Privilege findings refer to either feature logic or implementation of components that act against the nature of decentralization, such as explicit ownership or specialized access roles in combination with a mechanism to relocate funds.

### Coding Style

Coding Style findings usually do not affect the generated bytecode but rather comment on how to make the codebase more legible and, as a result, easily maintainable.

### Volatile Code

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

### 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.

## 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.

## About

DeHacker is a team of auditors and white hat hackers who perform security audits and assessments. With decades of experience in security and distributed systems, our experts focus on the ins and outs of system security. Our services follow clear and prudent industry standards. Whether it's reviewing the smallest modifications or a new platform, we'll provide an in-depth security survey at every stage of your company's project. We provide comprehensive vulnerability reports and identify structural inefficiencies in smart contract code, combining high-end security research with a real-world attacker mindset to reduce risk and harden code.

### BLOCKCHAIINS

| | |
|---|---|
| Ethereum | Cosmos |
| Eos | Substrate |

### TECH STACK

| | |
|---|---|
| Python | Solidity |
| Rust | c++ |

### CONTACTS

https://dehacker.io

https://twitter.com/dehackerio

https://github.com/dehacker/audits_public

https://t.me/dehackerio

https://blog.dehacker.io/

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