BEOSIN
Blockchain Security

Kip checker reward

Smart Contract Security Audit

No. 202405111335

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SECURING BLOCKCHAIN ECOSYSTEM

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Contents

Summary of Audit Results

After auditing, 1 High item and 1 Low item were identified in the Kip checker reward project. Specific audit details will be presented in the Findings section. Users should pay attention to the following aspects when interacting with this project:

High

Fixed : 1   Acknowledged: 0

Low

Fixed : 1   Acknowledged: 0

Business overview:

Kip checker reward is a node reward management project that manages node tokens based on the ERC721 standard. It allows ERC721 token owners to set delegation addresses and claim rewards through signed data. Once claimed, rewards can be withdrawn immediately but must wait at least 30 days before withdrawing again. Additionally, fines are allowed to be imposed on the owner to reduce the amount that can be withdrawn.

1 Overview

1.1 Project Overview

Project Name	Kip checker reward
Project language	Solidity
Platform	Ethereum
Code base	https://github.com/KIP-Protocol-Contracts/kip-checker-reward-contract
Commit	4e71c5cb7c253335086feb1cfe415ca0d9d3c801 cb760c2e0cc77232d4b3e806088cac61ac3eb4b8

1.2 Audit Overview

Audit work duration: May 10, 2024 – May 11, 2024

Audit team: Beosin Security Team

1.3 Audit Method

The audit methods are as follows:

1. Formal Verification

Formal verification is a technique that uses property-based approaches for testing and verification. Property specifications define a set of rules using Beosin's library of security expert rules. These rules call into the contracts under analysis and make various assertions about their behavior. The rules of the specification play a crucial role in the analysis. If the rule is violated, a concrete test case is provided to demonstrate the violation.

2. Manual Review

Using manual auditing methods, the code is read line by line to identify potential security issues. This ensures that the contract's execution logic aligns with the client's specifications and intentions, thereby safeguarding the accuracy of the contract's business logic.

The manual audit is divided into three groups to cover the entire auditing process:

The Basic Testing Group is primarily responsible for interpreting the project's code and conducting comprehensive functional testing.

The Simulated Attack Group is responsible for analyzing the audited project based on the collected historical audit vulnerability database and security incident attack models. They identify potential attack vectors and collaborate with the Basic Testing Group to conduct simulated attack tests.

The Expert Analysis Group is responsible for analyzing the overall project design, interactions with third parties, and security risks in the on-chain operational environment. They also conduct a review of the entire audit findings.

3. Static Analysis

Static analysis is a method of examining code during compilation or static analysis to detect issues. Beosin-VaaS can detect more than 100 common smart contract vulnerabilities through static analysis, such as reentrancy and block parameter dependency. It allows early and efficient discovery of problems to improve code quality and security.

2 Findings

Index	Risk description	Severity level	Status
Kip checker reward-01	Can't withdraw reward again after 30 days	High	**Fixed**
Kip checker reward-02	Unable to withdraw all withdrawable amounts	Low	**Fixed**

Finding Details:

[Kip checker reward-01] Can't withdraw reward again after 30 days

Severity Level	**High**
Type	Business Security
Lines	NodeReward.sol#89-91

Description	The logic given in the code is that rewards cannot be withdrawn after 30 days, which is not in line with the design. The correct logic is that can withdraw reward again after 30 days.
	
	``solidity
	        if (lastWithdrawTime[tokenId]+WITHDRAW_INTERVAL <=
	block.timestamp) {
	                revert CanNotWithdrawYet();
	        }
	``

Recommendation	It is recommended to change "<=" in the condition to ">".

Status	**Fixed**.
	
	``solidity
	        if (lastWithdrawTime[tokenId]+WITHDRAW_INTERVAL >
	 block.timestamp) {
	                revert CanNotWithdrawYet();
	        }
	``

[Kip checker reward-02] Unable to withdraw all withdrawable amounts

Severity Level	Low
Type	Business Security
Lines	NodeReward.sol#94-96

Description	When the user calls the `withdraw` function to withdraw all the withdrawable amounts, it will fail.
	
	``
	        if (claimedAmounts[tokenId]-fines[tokenId] <=
	withdrawAmounts[tokenId]+amount) {
	            revert InvalidAmount();
	        }
	``

Recommendation	It is recommended to change "<=" in the condition to "<".

Status	**Fixed**.
	
	``
	         if (claimedAmounts[tokenId]-fines[tokenId] <
	 withdrawAmounts[tokenId]+amount) {
	            revert InvalidAmount();
	        }
	``

3 Appendix

3.1 Vulnerability Assessment Metrics and Status in Smart Contracts

3.1.1 Metrics

In order to objectively assess the severity level of vulnerabilities in blockchain systems, this report provides detailed assessment metrics for security vulnerabilities in smart contracts with reference to CVSS 3.1 (Common Vulnerability Scoring System Ver 3.1).

According to the severity level of vulnerability, the vulnerabilities are classified into four levels: "critical", "high", "medium" and "low". It mainly relies on the degree of impact and likelihood of exploitation of the vulnerability, supplemented by other comprehensive factors to determine of the severity level.

Impact / Likelihood	Severe	High	Medium	Low
Probable	Critical	High	Medium	Low
Possible	High	Medium	Medium	Low
Unlikely	Medium	Medium	Low	Info
Rare	Low	Low	Info	Info

3.1.2 Degree of impact

- **Severe**

Severe impact generally refers to the vulnerability can have a serious impact on the confidentiality, integrity, availability of smart contracts or their economic model, which can cause substantial economic losses to the contract business system, large-scale data disruption, loss of authority management, failure of key functions, loss of credibility, or indirectly affect the operation of other smart contracts associated with it and cause substantial losses, as well as other severe and mostly irreversible harm.

- **High**

High impact generally refers to the vulnerability can have a relatively serious impact on the confidentiality, integrity, availability of the smart contract or its economic model, which can cause a greater economic loss, local functional unavailability, loss of credibility and other impact to the contract business system.

- **Medium**

Medium impact generally refers to the vulnerability can have a relatively minor impact on the confidentiality, integrity, availability of the smart contract or its economic model, which can cause a small amount of economic loss to the contract business system, individual business unavailability and other impact.

- **Low**

Low impact generally refers to the vulnerability can have a minor impact on the smart contract, which can pose certain security threat to the contract business system and needs to be improved.

3.1.3 Likelihood of Exploitation

- **Probable**

Probable likelihood generally means that the cost required to exploit the vulnerability is low, with no special exploitation threshold, and the vulnerability can be triggered consistently.

- **Possible**

Possible likelihood generally means that exploiting such vulnerability requires a certain cost, or there are certain conditions for exploitation, and the vulnerability is not easily and consistently triggered.

- **Unlikely**

Unlikely likelihood generally means that the vulnerability requires a high cost, or the exploitation conditions are very demanding and the vulnerability is highly difficult to trigger.

- **Rare**

Rare likelihood generally means that the vulnerability requires an extremely high cost or the conditions for exploitation are extremely difficult to achieve.

3.1.4 Fix Results Status

Status	Description
Fixed	The project party fully fixes a vulnerability.
Partially Fixed	The project party did not fully fix the issue, but only mitigated the issue.
Acknowledged	The project party confirms and chooses to ignore the issue.

3.2 Audit Categories

No.	Categories	Subitems
1	Coding Conventions	Deprecated Items
		Redundant Code
		require/assert Usage
		Default Values
2	General Vulnerability	Insufficient Address Validation
		Lack Of Address Normalization
		Variable Override
		DoS (Denial Of Service)
		Function Call Permissions
		Call/Delegatecall Security
		Tx.origin Usage
		Returned Value Security
		Mathematical Risk
		Overriding Variables
3	Business Security	Business Logics
		Business Implementations
		Manipulable Token Price
		Centralized Asset Control
		Arbitrage Attack
		Access Control

Beosin classified the security issues of smart contracts into three categories: Coding Conventions, General Vulnerability, Business Security. Their specific definitions are as follows:

● **Coding Conventions**

Audit whether smart contracts follow recommended language security coding practices. For example, smart contracts developed in Rust language should fix the compiler version and do not use deprecated keywords.

● **General Vulnerability**

General Vulnerability include some common vulnerabilities that may appear in smart contract projects. These vulnerabilities are mainly related to the characteristics of the smart contract itself, such as integer overflow/underflow and denial of service attacks.

● **Business Security**

Business security is mainly related to some issues related to the business realized by each project, and has a relatively strong pertinence. For example, whether the lock-up plan in the code match the white paper, or the flash loan attack caused by the incorrect setting of the price acquisition oracle.

3.3 Disclaimer

The Audit Report issued by Beosin is related to the services agreed in the relevant service agreement. The Project Party or the Served Party (hereinafter referred to as the "Served Party") can only be used within the conditions and scope agreed in the service agreement. Other third parties shall not transmit, disclose, quote, rely on or tamper with the Audit Report issued for any purpose.

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The Audit Report issued by Beosin in no way provides investment advice on any project, nor should it be utilized as investment suggestions of any type. This report represents an extensive evaluation process designed to help our customers improve code quality while mitigating the high risks in blockchain.

3.4 About Beosin

Beosin is the first institution in the world specializing in the construction of blockchain security ecosystem. The core team members are all professors, postdocs, PhDs, and Internet elites from world-renowned academic institutions. Beosin has more than 20 years of research in formal verification technology, trusted computing, mobile security and kernel security, with overseas experience in studying and collaborating in project research at well-known universities. Through the security audit and defense deployment of more than 2,000 smart contracts, over 50 public blockchains and wallets, and nearly 100 exchanges worldwide, Beosin has accumulated rich experience in security attack and defense of the blockchain field, and has developed several security products specifically for blockchain.

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