



CredShields

Smart Contract Audit

Sept 22nd, 2023 • CONFIDENTIAL

Description

This document details the process and result of the Smart Contract audit performed by CredShields Technologies PTE. LTD. on behalf of ZHD Coin between Sept 20th, 2023, and Sept 21st, 2023. A retest was performed on September 21st, 2023.

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Prepared for

ZHD Coin

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1. Executive Summary

ZHD Coin engaged CredShields to perform a smart contract audit from Sept 20th, 2023, to Sept 21st, 2023. During this timeframe, Three (3) vulnerabilities were identified. **A retest was performed on Sept 21st, 2023, and all the bugs have been addressed.**

During the audit, Zero (0) vulnerabilities were found with a severity rating of either High or Critical. These vulnerabilities represent the greatest immediate risk to "ZHD Coin" and should be prioritized for remediation, and fortunately, none were found.

The table below shows the in-scope assets and a breakdown of findings by severity per asset. Section 2.3 contains more information on how severity is calculated.

Assets in Scope	Critical	High	Medium	Low	info	Gas	Σ
Smart Contract	0	0	1	2	0	1	3
	0	0	1	2	0	1	3

Table: Vulnerabilities Per Asset in Scope

The CredShields team conducted the security audit to focus on identifying vulnerabilities in Smart Contract's scope during the testing window while abiding by the policies set forth by Smart Contract's team.

State of Security

To maintain a robust security posture, it is essential to continuously review and improve upon current security processes. Utilizing CredShields' continuous audit feature allows both ZHD Coin's internal security and development teams to not only identify specific vulnerabilities, but also gain a deeper understanding of the current security threat landscape.

To ensure that vulnerabilities are not introduced when new features are added, or code is refactored, we recommend conducting regular security assessments. Additionally, by analyzing the root cause of resolved vulnerabilities, the internal teams at ZHD Coin can implement both manual and automated procedures to eliminate entire classes of vulnerabilities in the future. By taking a proactive approach, ZHD Coin can future-proof its security posture and protect its assets.

2. Methodology

ZHD Coin engaged CredShields to perform a ZHD Coin Smart Contract audit. The following sections cover how the engagement was put together and executed.

2.1 Preparation phase

The CredShields team meticulously reviewed all provided documents and comments in the smart contract code to gain a thorough understanding of the contract's features and functionalities. They meticulously examined all functions and created a mind map to systematically identify potential security vulnerabilities, prioritizing those that were more critical and business-sensitive for the refactored code. To confirm their findings, the team deployed a self-hosted version of the smart contract and performed verifications and validations during the audit phase.

A testing window from Sept 20th, 2023, to Sept 21st, 2023, was agreed upon during the preparation phase.

2.1.1 Scope

During the preparation phase, the following scope for the engagement was agreed-upon:

IN SCOPE ASSETS
https://bscscan.com/address/0x3Cb15BeD2830C1c66f61041928D409260Ec9D8EA#code

Table: List of Files in Scope

2.1.2 Documentation

Documentation was not required as the code was self-sufficient for understanding the project.

2.1.3 Audit Goals

CredShields uses both in-house tools and manual methods for comprehensive smart contract security auditing. The majority of the audit is done by manually reviewing the contract source code, following SWC registry standards, and an extended industry standard self-developed checklist. The team places emphasis on understanding core concepts, preparing test cases, and evaluating business logic for potential vulnerabilities.

2.2 Retesting phase

ZHD Coin is actively partnering with CredShields to validate the remediations implemented towards the discovered vulnerabilities.

2.3 Vulnerability Classification and Severity

CredShields follows OWASP's Risk Rating Methodology to determine the risk associated with discovered vulnerabilities. This approach considers two factors - Likelihood and Impact - which are evaluated with three possible values - **Low**, **Medium**, and **High**, based on factors such as Threat agents, Vulnerability factors, Technical and Business Impacts. The overall severity of the risk is calculated by combining the likelihood and impact estimates.

Overall Risk Severity				
Impact	HIGH	Medium	High	Critical
	MEDIUM	Low	Medium	High
	LOW	Note	Low	Medium
		LOW	MEDIUM	HIGH
	Likelihood			

Overall, the categories can be defined as described below -

1. Informational

We prioritize technical excellence and pay attention to detail in our coding practices. Our guidelines, standards, and best practices help ensure software stability and reliability. Informational vulnerabilities are opportunities for improvement and do

not pose a direct risk to the contract. Code maintainers should use their own judgment on whether to address them.

2. Low

Low-risk vulnerabilities are those that either have a small impact or can't be exploited repeatedly or those the client considers insignificant based on their specific business circumstances.

3. Medium

Medium-severity vulnerabilities are those caused by weak or flawed logic in the code and can lead to exfiltration or modification of private user information. These vulnerabilities can harm the client's reputation under certain conditions and should be fixed within a specified timeframe.

4. High

High-severity vulnerabilities pose a significant risk to the Smart Contract and the organization. They can result in the loss of funds for some users, may or may not require specific conditions, and are more complex to exploit. These vulnerabilities can harm the client's reputation and should be fixed immediately.

5. Critical

Critical issues are directly exploitable bugs or security vulnerabilities that do not require specific conditions. They often result in the loss of funds and Ether from Smart Contracts or users and put sensitive user information at risk of compromise

or modification. The client's reputation and financial stability will be severely impacted if these issues are not addressed immediately.

6. Gas

To address the risk and volatility of smart contracts and the use of gas as a method of payment, CredShields has introduced a "Gas" severity category. This category deals with optimizing code and refactoring to conserve gas.

2.4 CredShields staff

The following individual at CredShields managed this engagement and produced this report:

- **Shashank, Co-founder CredShields**
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Please feel free to contact this individual with any questions or concerns you have around the engagement or this document.

3. Findings

This chapter contains the results of the security assessment. Findings are sorted by their severity and grouped by the asset and SWC classification. Each asset section will include a summary. The table in the executive summary contains the total number of identified security vulnerabilities per asset per risk indication.

3.1 Findings Overview

3.1.1 Vulnerability Summary

During the security assessment, Three (3) security vulnerabilities were identified in the asset.

VULNERABILITY TITLE	SEVERITY	SWC Vulnerability Type
Floating and Outdated Pragma	Low	Floating Pragma (SWC-103)
Large Number Literals	Gas	Gas & Missing Best Practices
Outdated Openzeppelin ERC20 Contract	Low	Outdated Code

Table: Findings in Smart Contracts

3.1.2 Findings Summary

SWC ID	SWC Checklist	Test Result	Notes
SWC-100	Function Default Visibility	Not Vulnerable	Not applicable after v0.5.X (Currently using solidity v >= 0.8.6)
SWC-101	Integer Overflow and Underflow	Not Vulnerable	The issue persists in versions before v0.8.X .
SWC-102	Outdated Compiler Version	Not Vulnerable	Version 0 [^] .8.0 and above is used
SWC-103	Floating Pragma	Vulnerable	Contract uses floating pragma
SWC-104	Unchecked Call Return Value	Not Vulnerable	call() is not used
SWC-105	Unprotected Ether Withdrawal	Not Vulnerable	Appropriate function modifiers and require validations are used on sensitive functions that allow token or ether withdrawal.
SWC-106	Unprotected SELFDESTRUCT Instruction	Not Vulnerable	selfdestruct() is not used anywhere
SWC-107	Reentrancy	Not Vulnerable	No notable functions were vulnerable to it.
SWC-108	State Variable Default Visibility	Not Vulnerable	Not Vulnerable
SWC-109	Uninitialized Storage Pointer	Not Vulnerable	Not vulnerable after compiler version, v0.5.0

SWC-110	Assert Violation	Not Vulnerable	Asserts are not in use.
SWC-111	Use of Deprecated Solidity Functions	Not Vulnerable	None of the deprecated functions like <code>block.blockhash()</code> , <code>msg.gas</code> , <code>throw</code> , <code>sha3()</code> , <code>callcode()</code> , <code>suicide()</code> are in use
SWC-112	Delegatecall to Untrusted Callee	Not Vulnerable	Not Vulnerable.
SWC-113	DoS with Failed Call	Not Vulnerable	No such function was found.
SWC-114	Transaction Order Dependence	Not Vulnerable	Not Vulnerable.
SWC-115	Authorization through tx.origin	Not Vulnerable	<code>tx.origin</code> is not used anywhere in the code
SWC-116	Block values as a proxy for time	Not Vulnerable	<code>Block.timestamp</code> is not used
SWC-117	Signature Malleability	Not Vulnerable	Not used anywhere
SWC-118	Incorrect Constructor Name	Not Vulnerable	All the constructors are created using the <code>constructor</code> keyword rather than functions.
SWC-119	Shadowing State Variables	Not Vulnerable	Not applicable as this won't work during compile time after version <code>0.6.0</code>
SWC-120	Weak Sources of Randomness from Chain Attributes	Not Vulnerable	Random generators are not used.
SWC-121	Missing Protection against Signature Replay Attacks	Not Vulnerable	No such scenario was found

SWC-122	Lack of Proper Signature Verification	Not Vulnerable	Not used anywhere
SWC-123	Requirement Violation	Not Vulnerable	Not vulnerable
SWC-124	Write to Arbitrary Storage Location	Not Vulnerable	No such scenario was found
SWC-125	Incorrect Inheritance Order	Not Vulnerable	No such scenario was found
SWC-126	Insufficient Gas Griefing	Not Vulnerable	No such scenario was found
SWC-127	Arbitrary Jump with Function Type Variable	Not Vulnerable	Jump is not used.
SWC-128	DoS With Block Gas Limit	Not Vulnerable	Not Vulnerable.
SWC-129	Typographical Error	Not Vulnerable	No such scenario was found
SWC-130	Right-To-Left-Override control character (U+202E)	Not Vulnerable	No such scenario was found
SWC-131	Presence of unused variables	Not Vulnerable	No such scenario was found
SWC-132	Unexpected Ether balance	Not Vulnerable	No such scenario was found
SWC-133	Hash Collisions With Multiple Variable Length Arguments	Not Vulnerable	abi.encodePacked() or other functions are not used.
SWC-134	Message call with hardcoded gas amount	Not Vulnerable	Not used anywhere in the code
SWC-135	Code With No Effects	Not Vulnerable	No such scenario was found
SWC-136	Unencrypted Private Data On-Chain	Not Vulnerable	No such scenario was found

4. Remediation Status

ZHD Coin is actively partnering with CredShields from this engagement to validate the discovered vulnerabilities' remediations. **A retest was performed on Sept 21st, 2023, and all the issues have been addressed.**

Also, the table shows the remediation status of each finding.

VULNERABILITY TITLE	SEVERITY	REMEDICATION STATUS
Floating and Outdated Pragma	Low	Won't Fix
Large Number Literals	Gas	Won't Fix
Outdated Openzeppelin ERC20 Contract	Low	Won't Fix

Table: Summary of findings and status of remediation

5. Bug Reports

Bug ID #1 [Won't Fix]

Floating and Outdated Pragma

Vulnerability Type

Floating Pragma ([SWC-103](#))

Severity

Low

Description

Locking the pragma helps ensure that the contracts do not accidentally get deployed using an older version of the Solidity compiler affected by vulnerabilities.

The contract allowed floating or unlocked pragma to be used, i.e., `>= 0.8.9`. This allows the contracts to be compiled with all the solidity compiler versions above the limit specified.

The following contracts were found to be affected -

Affected Code

- <https://bscscan.com/address/0x3Cb15BeD2830C1c66f61041928D409260Ec9D8EA#code#L509>

Impacts

If the smart contract gets compiled and deployed with an older or too recent version of the solidity compiler, there's a chance that it may get compromised due to the bugs present in the older versions or unidentified exploits in the new versions.

Incompatibility issues may also arise if the contract code does not support features in other compiler versions, therefore, breaking the logic.

The likelihood of exploitation is really low therefore this is only informational.

Remediation

Keep the compiler versions consistent in all the smart contract files. Do not allow floating pragmas anywhere. It is suggested to use the 0.8.20 pragma version

Reference: <https://swcregistry.io/docs/SWC-103>

Retest

Since this is not exploitable the team decided to keep it as it is and the CredShields team agrees with the decision.

Bug ID #2 [Won't Fix]

Large Number Literals

Vulnerability Type

Gas & Missing Best Practices

Severity

Gas

Description

Solidity supports multiple rational and integer literals, including decimal fractions and scientific notations. The use of very large numbers with too many digits was detected in the code that could have been optimized using a different notation also supported by Solidity.

Affected Code

- <https://bscscan.com/address/0x3Cb15BeD2830C1c66f61041928D409260Ec9D8EA#code#L514>

Impacts

Having large number literals in the code increases the gas usage of the contract during its deployment and when the functions are used or called from the contract.

It also makes the code harder to read and audit and increases the chances of introducing code errors.

Remediation

Scientific notation in the form of $2e10$ is also supported, where the mantissa can be fractional, but the exponent has to be an integer. The literal MeE is equivalent to $M * 10^{**E}$. Examples include $2e10$, $2e10$, $2e-10$, $2.5e1$, as suggested in official solidity documentation.

<https://docs.soliditylang.org/en/latest/types.html#rational-and-integer-literals>

It is recommended to use numbers in the form " $35 * 1e7 * 1e18$ " or " $35 * 1e25$ ".

The numbers can also be represented by using underscores between them to make them more readable such as " $35_00_00_000$ "

Retest

Since this is not exploitable the team decided to keep it as it is and the CredShields team agrees with the decision.

Bug ID #3 [Won't Fix]

Outdated Openzeppelin ERC20 Contract

Vulnerability Type

Outdated Code

Severity

Low

Description

Openzeppelin has been constantly fixing and upgrading their contracts remediating a number of CVEs and potential exploits. Recently they removed functions to increase and decrease allowance, updated mapping parameters to have names, etc. The pragma version was also updated to ^0.8.20 in their latest GitHub branch.

The ZHDCOIN contract is found to be using an outdated Openzeppelin package and libraries.

Affected Code

- <https://bscscan.com/address/0x3Cb15BeD2830C1c66f61041928D409260Ec9D8EA#code>

Impacts

Using an outdated version of the library and contracts will make the dependent contract vulnerable to a number of publicly disclosed exploits and CVEs. A complete list of potential vulnerabilities and improvements can also be found in the commit history of the ERC20 contract -

<https://github.com/OpenZeppelin/openzeppelin-contracts/commits/master/contracts/token/ERC20/ERC20.sol>

Remediation

It is recommended to update the pragma and the whole code to include the most updated version of the Openzeppelin contracts.

Retest

The old version is not exploitable the team decided to keep it as it is and the CredShields team agreed with the decision.

6. Disclosure

The Reports provided by CredShields is not an endorsement or condemnation of any specific project or team and do not guarantee the security of any specific project. The contents of this report are not intended to be used to make decisions about buying or selling tokens, products, services, or any other assets and should not be interpreted as such.

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