SMART CONTRACT CODE REVIEW AND SECURITY ANALYSIS REPORT

Customer: Alcazar
Date: 01 May, 2023

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Document

Name	Smart Contract Code Review and Security Analysis Report for Alcazar
Approved By	Noah Jelich | Lead Solidity SC Auditor at Hacken OU
Type	ERC20 token;
Platform	EVM; BSC;
Language	Solidity
Methodology	Link
Changelog	01.05.2023 - Initial Review

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Introduction

Hacken OÜ (Consultant) was contracted by Alcazar (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 contracts.

System Overview

LEO is a lossless ERC20 token with the following components:

- *Context*: This abstract contract provides utility functions to access the transaction context, such as the sender of the transaction and the transaction data. It is inherited by the LERC20 contract to make use of these functions.
- *Token*: LERC20 is an ERC-20 token that supports lossless features. It mints the initial supply during deployment and does not allow further minting. It has the following attributes:
  - Name: Leo
  - Symbol: LEO
  - Decimals: 18
  - Total supply: 1.000.000.000
  - Recovery Admin: 0xb2a8ea4b7b385746ca4ea9b9a10a0559721680d5
  - Admin: 0x2ff9d7be466f674c8640466a55ffdd02b3a00864
  - LossLess: 0xdbb5125ceeaf7233768c84a5df570aeecf0b4634
  - Timelock Period: 86400 (1 day)
- *Lossless*: The token interacts with a lossless controller (ILosslessController) to help prevent fraudulent transactions. The lossless feature can be turned on or off by the recovery admin.

Privileged roles

- Admin: The admin can be changed by the recovery admin and has the authority to change certain aspects of the lossless controller.
- Recovery Admin: The recovery admin has several privileges, including transferring recovery admin ownership, accepting recovery admin ownership, setting the lossless admin, and managing the state of the lossless feature (turning it on or off).

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Executive Summary

The score measurement details can be found in the corresponding section of the scoring methodology.

Documentation quality

The total Documentation Quality score is **3** out of **10**.

- Functional requirements are not provided.
- Technical description is partially provided.
  - Only the Lossless token generator is documented
  - NatSpec is not provided.
  - The development environment is not described.

Code quality

The total Code Quality score is **10** out of **10**.

- The code follows best practices.
- The token generator from Lossless was used to deploy the code.

Test coverage

The project has less than 250 lines of code. Tests are not required.

Security score

As a result of the audit, the code contains **1** low severity issue. The security score is **10** out of **10**.

All found issues are displayed in the "Findings" section.

Summary

According to the assessment, the Customer's smart contract has the following score: **9.3**.The system users should acknowledge all the risks summed up in the risks section of the report.

1	2	3	4	5	6	7	8	9	10

The final score

Table. The distribution of issues during the audit

Review date	Low	Medium	High	Critical
01 May 2023	1	0	0	0

Risks

- The LssController contract is not within the scope of the audit but has a significant impact on the audited contracts:
    - it can transfer tokens from the user to itself;
    - it has the ability to reject token transfers;
    - it has the ability to reject changing allowances.
- The LosslessController address defined in the contract points to the **LosslessControllerV3.sol**, the **latest version of the LosslessController is V4**, the contract uses an older version of the controller

Checked Items

We have audited the Customers' smart contracts for commonly known and specific vulnerabilities. Here are some items considered:

Item	Description	Status	Related Issues
Default Visibility	Functions and state variables visibility should be set explicitly. Visibility levels should be specified consciously.	Passed	
Integer Overflow and Underflow	If unchecked math is used, all math operations should be safe from overflows and underflows.	Not Relevant	
Outdated Compiler Version	It is recommended to use a recent version of the Solidity compiler.	Passed	
Floating Pragma	Contracts should be deployed with the same compiler version and flags that they have been tested thoroughly.	Failed	L01
Unchecked Call Return Value	The return value of a message call should be checked.	Passed	
Access Control & Authorization	Ownership takeover should not be possible. All crucial functions should be protected. Users could not affect data that belongs to other users.	Passed	
SELFDESTRUCT Instruction	The contract should not be self-destructible while it has funds belonging to users.	Not Relevant	
Check-Effect-Interaction	Check-Effect-Interaction pattern should be followed if the code performs ANY external call.	Passed	
Assert Violation	Properly functioning code should never reach a failing assert statement.	Passed	
Deprecated Solidity Functions	Deprecated built-in functions should never be used.	Passed	
Delegatecall to Untrusted Callee	Delegatecalls should only be allowed to trusted addresses.	Not Relevant	
DoS (Denial of Service)	Execution of the code should never be blocked by a specific contract state unless required.	Passed	

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Race Conditions	Race Conditions and Transactions Order Dependency should not be possible.	Passed	
Authorization through tx.origin	tx.origin should not be used for authorization.	Passed	
Block values as a proxy for time	Block numbers should not be used for time calculations.	Not Relevant	
Signature Unique Id	Signed messages should always have a unique id. A transaction hash should not be used as a unique id. Chain identifiers should always be used. All parameters from the signature should be used in signer recovery. EIP-712 should be followed during a signer verification.	Not Relevant	
Shadowing State Variable	State variables should not be shadowed.	Passed	
Weak Sources of Randomness	Random values should never be generated from Chain Attributes or be predictable.	Not Relevant	
Incorrect Inheritance Order	When inheriting multiple contracts, especially if they have identical functions, a developer should carefully specify inheritance in the correct order.	Not Relevant	
Calls Only to Trusted Addresses	All external calls should be performed only to trusted addresses.	Passed	
Presence of Unused Variables	The code should not contain unused variables if this is not justified by design.	Passed	
EIP Standards Violation	EIP standards should not be violated.	Passed	
Assets Integrity	Funds are protected and cannot be withdrawn without proper permissions or be locked on the contract.	Not Relevant	
User Balances Manipulation	Contract owners or any other third party should not be able to access funds belonging to users.	Passed	
Data Consistency	Smart contract data should be consistent all over the data flow.	Passed	

Flashloan Attack	When working with exchange rates, they should be received from a trusted source and not be vulnerable to short-term rate changes that can be achieved by using flash loans. Oracles should be used.	Not Relevant	
Token Supply Manipulation	Tokens can be minted only according to rules specified in a whitepaper or any other documentation provided by the Customer.	Passed	
Gas Limit and Loops	Transaction execution costs should not depend dramatically on the amount of data stored on the contract. There should not be any cases when execution fails due to the block Gas limit.	Passed	
Style Guide Violation	Style guides and best practices should be followed.	Passed	
Requirements Compliance	The code should be compliant with the requirements provided by the Customer.	Failed	
Environment Consistency	The project should contain a configured development environment with a comprehensive description of how to compile, build and deploy the code.	Passed	
Secure Oracles Usage	The code should have the ability to pause specific data feeds that it relies on. This should be done to protect a contract from compromised oracles.	Not Relevant	
Tests Coverage	The code should be covered with unit tests. Test coverage should be sufficient, with both negative and positive cases covered. Usage of contracts by multiple users should be tested.	Failed	
Stable Imports	The code should not reference draft contracts, which may be changed in the future.	Not Relevant	

Findings

■■■■ Critical

No critical severity issues were found.

■■■ High

No high severity issues were found.

■■ Medium

No medium severity issues were found.

■ Low

L01. Floating Pragma

Impact	Medium
Likelihood	Low

The project uses floating pragmas `^0.8.0`.

This may result in the contracts being deployed using the wrong pragma version, which is different from the one they were tested with. For example, they might be deployed using an outdated pragma version which may include bugs that affect the system negatively.

Path: LERC20Burnable

Recommendation: Consider locking the pragma version whenever possible and avoid using a floating pragma in the final deployment. Consider known bugs (https://github.com/ethereum/solidity/releases) for the compiler version that is chosen.

Found in: 0x56b331c7e3d68306f26e07492125f0faa9d95343

Status: New

Informational

No informational severity issues were found.

Disclaimers

Hacken Disclaimer

The smart contracts given for audit have been analyzed based on best industry practices at the time of the writing of this report, with 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 report contains no statements or warranties on the identification of all vulnerabilities and security of the code. The report covers the code submitted and reviewed, so it may not be relevant after any modifications. Do not consider this report as a final and sufficient assessment regarding the utility and safety of the code, bug-free status, or any other contract statements.

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.

English is the original language of the report. The Consultant is not responsible for the correctness of the translated versions.

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 Consultant cannot guarantee the explicit security of the audited smart contracts.

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Appendix 1. Severity Definitions

When auditing smart contracts Hacken is using a risk-based approach that considers the potential impact of any vulnerabilities and the likelihood of them being exploited. The matrix of impact and likelihood is a commonly used tool in risk management to help assess and prioritize risks.

The impact of a vulnerability refers to the potential harm that could result if it were to be exploited. For smart contracts, this could include the loss of funds or assets, unauthorized access or control, or reputational damage.

The likelihood of a vulnerability being exploited is determined by considering the likelihood of an attack occurring, the level of skill or resources required to exploit the vulnerability, and the presence of any mitigating controls that could reduce the likelihood of exploitation.

Risk Level	High Impact	Medium Impact	Low Impact
High Likelihood	Critical	High	Medium
Medium Likelihood	High	Medium	Low
Low Likelihood	Medium	Low	Low

Risk Levels

Critical: Critical vulnerabilities are usually straightforward to exploit and can lead to the loss of user funds or contract state manipulation.

High: High vulnerabilities are usually harder to exploit, requiring specific conditions, or have a more limited scope, but can still lead to the loss of user funds or contract state manipulation.

Medium: Medium vulnerabilities are usually limited to state manipulations and, in most cases, cannot lead to asset loss. Contradictions and requirements violations. Major deviations from best practices are also in this category.

Low: Major deviations from best practices or major Gas inefficiency. These issues won't have a significant impact on code execution, don’t affect security score but can affect code quality score.

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Impact Levels

High Impact: Risks that have a high impact are associated with financial losses, reputational damage, or major alterations to contract state. High impact issues typically involve invalid calculations, denial of service, token supply manipulation, and data consistency, but are not limited to those categories.

Medium Impact: Risks that have a medium impact could result in financial losses, reputational damage, or minor contract state manipulation. These risks can also be associated with undocumented behavior or violations of requirements.

Low Impact: Risks that have a low impact cannot lead to financial losses or state manipulation. These risks are typically related to unscalable functionality, contradictions, inconsistent data, or major violations of best practices.

Likelihood Levels

High Likelihood: Risks that have a high likelihood are those that are expected to occur frequently or are very likely to occur. These risks could be the result of known vulnerabilities or weaknesses in the contract, or could be the result of external factors such as attacks or exploits targeting similar contracts.

Medium Likelihood: Risks that have a medium likelihood are those that are possible but not as likely to occur as those in the high likelihood category. These risks could be the result of less severe vulnerabilities or weaknesses in the contract, or could be the result of less targeted attacks or exploits.

Low Likelihood: Risks that have a low likelihood are those that are unlikely to occur, but still possible. These risks could be the result of very specific or complex vulnerabilities or weaknesses in the contract, or could be the result of highly targeted attacks or exploits.

Informational

Informational issues are mostly connected to violations of best practices, typos in code, violations of code style, and dead or redundant code.

Informational issues are not affecting the score, but addressing them will be beneficial for the project.

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Appendix 2. Scope

The scope of the project includes the following smart contracts from the provided repository:

Initial review scope

Repository	https://bscscan.com/token/0x56b331c7e3d68306f26e07492125f0faa9d95343
Commit	0x56b331c7e3d68306f26e07492125f0faa9d95343