CERTIK

Preliminary Comments

TelmoCoin

Sept 11th, 2021

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Summary

This report has been prepared for TelmoCoin to discover issues and vulnerabilities in the source code of the TelmoCoin project as well as any contract dependencies that were not part of an officially recognized library. A comprehensive examination has been performed, utilizing Static Analysis and Manual Review techniques.

The auditing process pays special attention to the following considerations:

- Testing the smart contracts against both common and uncommon attack vectors.
- Assessing the codebase to ensure compliance with current best practices and industry standards.
- Ensuring contract logic meets the specifications and intentions of the client.
- Cross-referencing contract structure and implementation against similar smart contracts produced by industry leaders.
- Thorough line-by-line manual review of the entire codebase by industry experts.

Additionally, this audit is based on a premise that all external smart contracts are safely implemented.

The security assessment resulted in findings that ranged from critical to informational. We recommend addressing these findings to ensure a high level of security standards and industry practices. We suggest recommendations that could better serve the project from the security perspective:

- Enhance general coding practices for better structures of source codes;
- Add enough unit tests to cover the possible use cases;
- Provide more comments per each function for readability, especially contracts that are verified in public;
- Provide more transparency on privileged activities once the protocol is live.

Overview

Project Summary

Project Name	TelmoCoin
Platform	Ethereum
Language	Solidity
Codebase	https://github.com/rcarrion14/TLM
Commit	7ef1930712234251b50998c3052da7a43142fdb1

Audit Summary

Delivery Date	Sept 11, 2021
Audit Methodology	Static Analysis, Manual Review
Key Components	

Vulnerability Summary

Vulnerability Level	Total	Pending	Declined	Acknowledged	Partially Resolved	Resolved
Critical	0	0	0	0	0	0
Major	2	2	0	0	0	0
Medium	0	0	0	0	0	0
Minor	3	3	0	0	0	0
Informational	4	4	0	0	0	0
Discussion	4	4	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
ERC	ERC20.sol	5e239077babc72ca96141aa3e897b59285612c5a6410c8b1e4504b5fab81fa4d
TLM	TLM.sol	820cb2dd244542ca3bad4f7ec9db50128426a75ea5649c70b45806ed9dabafa4
TLT	TLMbase.sol	45a8bb840abe9f5b8a1594a324da9638438b03ce12e6c9328a8edda772711d7e
TVT	TiendaVault.sol	004fbd91f9ebcc1529e4a2b0319925f1384d2a8814feb93291336df97caa716e
VTC	Vaulteable.sol	d45031bea5b9d5be471cef6ec834cc51f37b766851ea65bf28063f19003c1c65

Understandings

Overview

TelmoCoin is a project that allows users to swap and buy the `TLM` token through the `TiendaVault` contract.

Exchange Rate

`TLM` token is backed with the `backingCoin` token that belongs to the `TiendaVault` contract. By calling the `backingCreation()` function, the `owner` deposits a fixed amount of `backingCoin` and the corresponding amount, which is calculated by formula `backingCoin amount * exchange rate`, of `TLM` token is minted to `owner`.

The exchange rate between those two tokens is initialized when the `TiendaVault` contract is deployed and never changed unless the `owner` depositing more `backingCoin` into the contract to lower it and then the value of `TLM` is increased. Because after a swap the `TLM` token is not burned, the two key state variables, `tlmWithBacking` and `tlmWithOutBacking`, are used to keep the exchange rate unaltered when the amount of `backingCoin`, which belong to `TiendaVault` contract, is changed.

Swap

By calling `backingWithdraw()` function, users can deposit `TLM` and retrieve `backingCoin` . If the caller is not the `adminWallet`, 0.5% transaction commission in `backingCoin` is transferred to the `adminWallet`.

By calling the `buy()` function, users can use `backingCoin` to buy `TLM`. If the `tlmWithoutBacking` equals zero, the `backingCoin` is directly transferred to `adminWallet` because no more `TLM` needs to be backed with `backingCoin`. If the `TLM` token, which is not backed with the `bBTC` token, is not enough for the purchase amount, the excess part of `backingCoin` is transferred to the `adminWallet`, not the `TiendaVault` contract, to keep `TLM` and `backingCoin` exchange rate unchanged.

Privileged Functions

The contract contains the following privileged functions that are restricted by modifiers. We group these functions below:

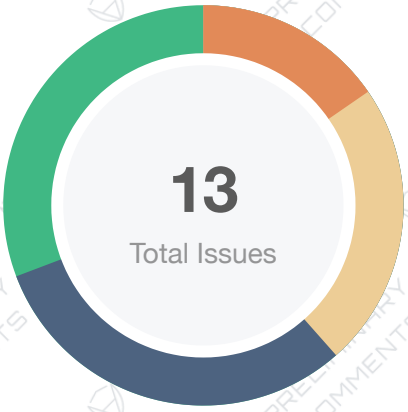
The `onlyVault` modifier used to manage the `TLM` token issue:

- `mint()` in `TLM.sol`
- `burn()` in `TLM.sol`

The `onlyOwner` modifier to initialize `TiendaVault` contract, modify exchange rate, and transfer to or out `TLM` token:

- `backingCreation()` in `TiendaVault.sol`
- `profitPayment()` in `TiendaVault.sol`
- `upForSale()` in `TiendaVault.sol`
- `outOfSale()` in `TiendaVault.sol`

Findings



Critical	**0** (0.00%)
Major	**2** (15.38%)
Medium	**0** (0.00%)
Minor	**3** (23.08%)
Informational	**4** (30.77%)
Discussion	**4** (30.77%)

ID	Title	Category	Severity	Status
GLOBAL-01	Unlocked Compiler Version	Language Specific	Informational	Pending
GLOBAL-02	Centralization Risk	**Centralization / Privilege**	**Major**	Pending
TLM-01	Inconsistency With The Documentation	Logical Issue	Discussion	Pending
TVT-01	Too Many Digits	Coding Style	Informational	Pending
TVT-02	Variable Declare As Immutable	Gas Optimization	Minor	Pending
TVT-03	Missing Input Validation	Volatile Code	Minor	Pending
TVT-04	Redundant Statements	Volatile Code	Informational	Pending
TVT-05	Incorrect Boolean Expression	Logical Issue	Discussion	Pending
TVT-06	Inconsistency With The Documentation	Logical Issue	Discussion	Pending
TVT-07	Function Is Executed Only Once	Logical Issue	Major	Pending
TVT-08	Check Effect Interaction Pattern Violated	Logical Issue	Minor	Pending
TVT-09	Unclear State Variable	Logical Issue	Discussion	Pending
TVT-10	Variable Could Be Declared As `constant`	Gas Optimization	Informational	Pending

GLOBAL-01 | Unlocked Compiler Version

Category	Severity	Location	Status
Language Specific	Informational	Global	Pending

Description

The contract has an unlocked compiler version. An unlocked compiler version in the contract's source code permits the user to compile it at or above a particular version. This, in turn, leads to differences in the generated bytecode between compilations due to differing compiler version numbers. This can lead to ambiguity when debugging as compiler-specific bugs may occur in the codebase that would be difficult to identify over a span of multiple compiler versions rather than a specific one.

Recommendation

We advise the compiler version is alternatively locked at the lowest version possible that the contract can be compiled at. For example, for version `v0.8.0`, the contract should contain the following line:

```
pragma solidity 0.8.0;
```

GLOBAL-02 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	Major	Global	Pending

Description

The role `owner` has the authority over the listed functions:

- `backingCreation()` in `TiendaVault.sol`
- `profitPayment()` in `TiendaVault.sol`
- `upForSale()` in `TiendaVault.sol`
- `outOfSale()` in `TiendaVault.sol`

The role `vault` has the authority over the listed functions:

- `mint()` in `TLM.sol`, mint any amount of token to any account.
- `burn()` in `TLM.sol`, burn any amount token belong to any account.

Any compromise to the key role account may allow a potential hacker to take advantage of this and execute malicious acts.

Recommendation

We advise the client to carefully manage the key role 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., Multisignature 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 scenarios:

- 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.

TLM-01 | Inconsistency With The Documentation

Category	Severity	Location	Status
Logical Issue	Discussion	TLM.sol: 15	Pending

Description

According to the documentation, `TLM` would be created with a fixed supply. We don't see the supply restriction when the `TLM` token is minted. As such who will act in the role of `vault` after the `TLM` contract is deployed on the blockchain?

Recommendation

Please provide more information regarding the design concept behind the `TLM` token issue.

TVT-01 | Too Many Digits

Category	Severity	Location	Status
Coding Style	Informational	TiendaVault.sol: 15	Pending

Description

Literals with too many digits are difficult to read and review.

Recommendation

We recommend modifying as below:

```
15  uint256 ceros = 10**18;
```

TVT-02 | Variable Declare As Immutable

Category	Severity	Location	Status
Gas Optimization	Minor	TiendaVault.sol: 12~13, 19	Pending

Description

The linked variables should be declared as `immutable`. Immutable state variables can be assigned during contract creation but will remain constant throughout the lifetime of a deployed contract. A big advantage of immutable variables is that reading them is significantly cheaper than reading from regular state variables since will not be stored in storage. Still, values will directly insert the values into the runtime code.

Recommendation

We advise using an immutable state variable for the linked state variables.

TVT-03 | Missing Input Validation

Category	Severity	Location	Status
Volatile Code	Minor	TiendaVault.sol: 26~32	Pending

Description

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

Recommendation

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

```
  26  constructor (address tlmAddress, address backingCoinAddress, uint256 setRate,
address setAdminWallet) {
  27      require(address(0) != tlmAddress, "TiendaVault: set tlm to the zero address");
  28      require(address(0) != backingCoinAddress, "TiendaVault: set backingCoin to the
zero address");
  29      require(setRate > 0, "TiendaVault: set rate to be zero");
  30      require(address(0) != setAdminWallet, "TiendaVault: set adminWallet to the zero
address");
  31      tlm = TLM(tlmAddress);
  32      backingCoin = ERC20(backingCoinAddress);
  33      rate = setRate * ceros;
  34      adminWallet = setAdminWallet;
  35  }
```

TVT-04 | Redundant Statements

Category	Severity	Location	Status
Volatile Code	Informational	TiendaVault.sol: 64~92	Pending

Description

The linked statements are duplicated.

Recommendation

We advise removing one of them to better prepare the code for production environments.

```
64  function backingWithdraw(uint256 amount) public {
65
66      require(tlm.balanceOf(msg.sender)>= amount, "Cliente no tiene suficiente TLM");
67
68      tlmWithBacking = tlmWithBacking - amount;
69      tlmWithOutBacking = tlmWithOutBacking + amount;
70
71      if (msg.sender== adminWallet){
72          backingCoin.transfer(msg.sender, ((amount *ceros/ rate)));
73      }else{
74          backingCoin.transfer(msg.sender, (amount *ceros/ rate)*9950/10000);
75          backingCoin.transfer(adminWallet, (amount *ceros/ rate)*50/10000);  //  la
diferencia anterior se transifere al dueño
76      }
77
78      tlm.transferFrom(msg.sender, address(this), amount);
79
80      emit backingWithdrawn(amount / rate, amount);
81
82  }
```

TVT-05 | Incorrect Boolean Expression

Category	Severity	Location	Status
Logical Issue	Discussion	TiendaVault.sol: 126	Pending

Description

Even if the linked boolean expression is true, the subtraction overflow may occur when the statement `tlmWithOutBacking = tlmWithOutBacking - amount * rate /ceros;`, at line 128, is executed.

Recommendation

Please provide more information about the design concept regarding the `buy()` function.

TVT-06 | Inconsistency With The Documentation

Category	Severity	Location	Status
Logical Issue	Discussion	TiendaVault.sol: 123	Pending

Description

When users utilize `bBTC` to buy `TLM` in one transaction, 99.5% amount of `TLM` would be transferred to users and 0.5% amount is still kept in the `TiendaVault` contract. Is the 0.5% amount designated as transaction commission? Why isn't it transferred to the `adminWallet`? And does the `adminWallet` only receive the `bBTC` token in this project?

The documentation doesn't mention the 0.5% amount of the purchased `TLM` token.

Recommendation

Please provide more information about the design concept regarding the `buy()` function.

TVT-07 | Function Is Executed Only Once

Category	Severity	Location	Status
Logical Issue	Major	TiendaVault.sol: 37~45	Pending

Description

According to the documentation, the total supply of the `TLM` token is fixed. However, the linked function allows `owner` to mint `TLM` token without restriction. And the state variables `tlmWithOutBacking` and `tlmWithBacking` would be overwritten.

Recommendation

We advise adding the `initializer` modifier, which is linked by the following GitHub url, to the `backingCreation()` function.

https://github.com/OpenZeppelin/openzeppelin-contracts/blob/v4.3.1/contracts/proxy/utils/Initializable.sol

TVT-08 | Check Effect Interaction Pattern Violated

Category	Severity	Location	Status
Logical Issue	Minor	TiendaVault.sol: 64~92	Pending

Description

The order of external call/transfer and storage manipulation must follow the check-effect-interaction pattern.

Recommendation

We advise checking if storage manipulation is before the external call/transfer operation refer to the following codes:

```
64  function backingWithdraw(uint256 amount) public {
65
66      require(tlm.balanceOf(msg.sender)>= amount, "Cliente no tiene suficiente TLM");
67
68      tlmWithBacking = tlmWithBacking - amount;
69      tlmWithOutBacking = tlmWithOutBacking + amount;
70
71      if (msg.sender== adminWallet){
72          backingCoin.transfer(msg.sender, ((amount *ceros/ rate)));
73      }else{
74          backingCoin.transfer(msg.sender, (amount *ceros/ rate)*9950/10000);
75          backingCoin.transfer(adminWallet, (amount *ceros/ rate)*50/10000);  //  la
diferencia anterior se transifere al dueño
76      }
77
78      tlm.transferFrom(msg.sender, address(this), amount);
79
80      emit backingWithdrawn(amount / rate, amount);
81
82  }
```

Reference: check-effect-interactions

TVT-09 | Unclear State Variable

Category	Severity	Location	Status
Logical Issue	Discussion	TiendaVault.sol: 41~42	Pending

Description

According to the linked statements, we can infer that the sum of `tlmWithBacking` and `tlmWithOutBacking` equals the total supply of the `TLM` token. Is the aforementioned inference valid during the lifecycle of this project?

Recommendation

Please provide more information about the design concept regarding the linked two state variables.

TVT-10 | Variable Could Be Declared As `constant`

Category	Severity	Location	Status
Gas Optimization	Informational	TiendaVault.sol: 15	Pending

Description

Variable `ceros` could be declared as `constant` since these state variables are never to be changed.

Recommendation

We advise that those state variables should be declared `constant` to save gas.

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.

Gas Optimization

Gas Optimization findings do not affect the functionality of the code but generate different, more optimal EVM opcodes resulting in a reduction on the total gas cost of a transaction.

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.

Volatile Code

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

Language Specific

Language Specific findings are issues that would only arise within Solidity, i.e. incorrect usage of private or delete.

Coding Style

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

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.

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