Code Security Assessment

DragonMaster

Jan 8th, 2022

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Summary

This report has been prepared for DragonMaster to discover issues and vulnerabilities in the source code of the DragonMaster 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.

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	DragonMaster
Platform	other
Language	Solidity
Codebase	https://github.com/dragonmasterco/dragonmaster/tree/7572b6bf440a89bbf6d4651c7e3ee861ba491e39
Commit	7572b6bf440a89bbf6d4651c7e3ee861ba491e39

Audit Summary

Delivery Date	Jan 08, 2022
Audit Methodology	Static Analysis, Manual Review
Key Components	

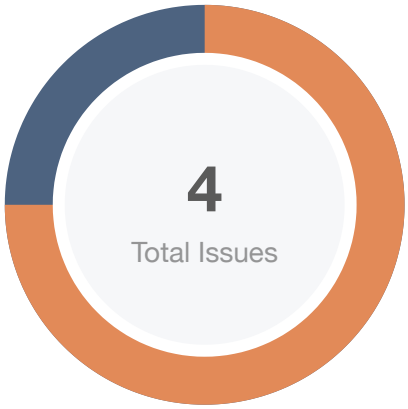
Vulnerability Summary

Vulnerability Level	Total	Pending	Declined	Acknowledged	Partially Resolved	Resolved
Critical	0	0	0	0	0	0
Major	3	0	0	3	0	0
Medium	0	0	0	0	0	0
Minor	0	0	0	0	0	0
Informational	1	0	0	0	0	1
Discussion	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
DMT	dragonmaster/contracts/DMToken.sol	3c3f809435f8c208da3463111897adb2684948afc56db29db47cd69e8f603094
TTC	dragonmaster/contracts/TotemToken.sol	a499cf654913ea4b0f0bc65c943dc0adb8be6732c608d8192e4c7eed43db11ed
TTM	dragonmaster/contracts/TotemTokenMatic.sol	825a2569a1fb5e48a8e9c9a087cdda840d0d2be6cfa169d5b192623b049addd2

Findings



Critical	0 (0.00%)
Major	3 (75.00%)
Medium	0 (0.00%)
Minor	0 (0.00%)
Informational	1 (25.00%)
Discussion	0 (0.00%)

ID	Title	Category	Severity	Status
GLOBAL-01	Unlocked Compiler Version	Language Specific	Informational	Resolved
DMT-01	Initial Token Distribution	Centralization / Privilege	Major	Acknowledged
TTC-01	Centralization Related Risks	Centralization / Privilege	Major	Acknowledged
TTM-01	Centralization Related Risks	Centralization / Privilege	Major	Acknowledged

GLOBAL-01 | Unlocked Compiler Version

Category	Severity	Location	Status
Language Specific	Informational	Global	Resolved

Description

The contract has unlocked compiler version. An unlocked compiler version in the source code of the contract 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 an ambiguity when debugging as compiler specific bugs may occur in the codebase that would be hard to identify over a span of multiple compiler versions rather than a specific one.

Recommendation

We advise that the compiler version is instead locked at the lowest version possible that the contract can be compiled at. For example, for version `v0.6.2` the contract should contain the following line:

```
pragma solidity 0.6.2;
```

DMT-01 | Initial Token Distribution

Category	Severity	Location	Status
Centralization / Privilege	**Major**	dragonmaster/contracts/DMToken.sol: 9	Acknowledged

Description

All of the DMT tokens are sent to the contract deployer when deploying the contract. This could be a centralization risk as the deployer can distribute DMT tokens without obtaining the consensus of the community.

Recommendation

We recommend the team to be transparent regarding the initial token distribution process, and the team shall make enough efforts to restrict the access of the private key.

Alleviation

[DragonMaster Team]: Our developers need these permissions to deploy right now. In future game operations, we will follow the Whitepaper tokenomics, using Multi sign wallets to manage the funds.

TTC-01 | Centralization Related Risks

Category	Severity	Location	Status
Centralization / Privilege	**Major**	dragonmaster/contracts/TotemToken.sol: 16~19	Acknowledged

Description

In the contract `TotemToken`, the role `PREDICATE_ROLE` has authority over the following functions:

- mint

Any compromise to the `PREDICATE_ROLE` account may allow a hacker to take advantage of this authority and mint tokens to an arbitrary account.

The role `DEFAULT_ADMIN_ROLE` has the authority to do the following:

- add/revoke PREDICATE_ROLE

Any compromise to the `DEFAULT_ADMIN_ROLE` account may allow a hacker to take advantage of this authority.

Recommendation

The risk describes the current project design and potentially makes iterations to improve in the security operation and level of decentralization, which in most cases cannot be resolved entirely at the present stage. We advise the client to carefully manage the privileged account's private key to avoid any potential risks of being hacked. In general, we strongly recommend centralized privileges or roles in the protocol 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 a different level in terms of short-term, long-term and permanent:

Short Term:

Timelock and Multi sign (⅔, ⅗) combination *mitigate* by delaying the sensitive operation and avoiding a single point of key management failure.

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
  AND

- Assignment of privileged roles to multi-signature wallets to prevent a single point of failure due to the private key compromised;
  AND
- A medium/blog link for sharing the timelock contract and multi-signers addresses information with the public audience.

Long Term:

Timelock and DAO, the combination, *mitigate* by applying decentralization and transparency.

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
  AND
- Introduction of a DAO/governance/voting module to increase transparency and user involvement.
  AND
- A medium/blog link for sharing the timelock contract, multi-signers addresses, and DAO information with the public audience.

Permanent:

Renouncing the ownership or removing the function can be considered *fully resolved*.

- Renounce the ownership and never claim back the privileged roles. OR
- Remove the risky functionality.

Alleviation

[DragonMaster Team]: Our developers need these permissions to deploy right now. In future game operations, we will follow the Whitepaper tokenomics, using Multi sign wallets to manage the funds.

TTM-01 | Centralization Related Risks

Category	Severity	Location	Status
Centralization / Privilege	Major	dragonmaster/contracts/TotemTokenMatic.sol: 9~34	Acknowledged

Description

In the contract `TotemTokenMatic`, the role `MINTER_ROLE` has authority over the following functions:

- mint

Any compromise to the `MINTER_ROLE` account may allow a hacker to take advantage of this authority and mint tokens to arbitrary addresses.

The role `DEPOSITOR_ROLE` has authority over the following functions:

- deposit

Any compromise to the `DEPOSITOR_ROLE` account may allow a hacker to take advantage of this authority and mint tokens to arbitrary addresses.

The role `DEFAULT_ADMIN_ROLE` has the authority to do the following:

- add/revoke MINTER_ROLE and DEPOSITOR_ROLE

Any compromise to the `DEFAULT_ADMIN_ROLE` account may allow a hacker to take advantage of this authority.

Recommendation

The risk describes the current project design and potentially makes iterations to improve in the security operation and level of decentralization, which in most cases cannot be resolved entirely at the present stage. We advise the client to carefully manage the privileged account's private key to avoid any potential risks of being hacked. In general, we strongly recommend centralized privileges or roles in the protocol 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 a different level in terms of short-term, long-term and permanent:

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- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
  AND
- Assignment of privileged roles to multi-signature wallets to prevent a single point of failure due to the private key compromised;
  AND
- A medium/blog link for sharing the timelock contract and multi-signers addresses information with the public audience.

Long Term:

Timelock and DAO, the combination, *mitigate* by applying decentralization and transparency.

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
  AND
- Introduction of a DAO/governance/voting module to increase transparency and user involvement.
  AND
- A medium/blog link for sharing the timelock contract, multi-signers addresses, and DAO information with the public audience.

Permanent:

Renouncing the ownership or removing the function can be considered *fully resolved*.

- Renounce the ownership and never claim back the privileged roles. OR
- Remove the risky functionality.

Alleviation

[DragonMaster Team]: Our developers need these permissions to deploy right now. In future game operations, we will follow the Whitepaper tokenomics, using Multi sign wallets to manage the funds.

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.

Language Specific

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

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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