hack·a·chain

SECURITY AUDIT REPORT

in favor of META FIGHTER

Summary

This report has been prepared for MetaFighters in the source code of the project as well as in project dependencies that are not part of an officially recognized library. The audit has been conducted by combining static and dynamic code analysis with a manual review of the source code by Hack-a-Chain's research team.

The audit process analyses:

1) Adherence to widely recognized best practices and industry standards;
2) Vulnerability to most common attack vectors;
3) Thorough line-by-line review of the code base;
4) Ensuring that contract logic meets the specifications of the project's whitepaper.

The security audit result is composed of different findings, whose vulnerabilities are classified from critical to informational, according to the following impact versus likelihood matrix:

Impact	High	Medium	Low
High	Critical	High	Medium
Medium	High	Medium	Low
Low	Medium	Low	Low / Informational

Likelihood

After presenting the findings to the client, they are granted a 7 days period to fix the vulnerabilities. This report will specify all vulnerabilities found and whether they were fixed by the team.

Overview

Project Summary

Project Name	Meta Fighter
Description	Token management contract used as an intermediary for transactions between the project's contracts and end users
Platform	BSC (Binance Smart Chain protocol, EVM)
Language	Solidity
Codebase	https://gitlab.com/fruktorum/backend/meta-fighter/contracts/test
Commit	02f4313a36023bc1d422a10ae75267f6ce3cd8ac

Audit Summary

First delivery date	07/10/2022
Final delivery date	07/18/2022
Audit Methodology	Manual review combined with static/dynamic analysis

Audit Scope

ID	File	SHA256 Checksum
TMA	TokenManagement.sol	529060b534f4b1875879483392f762be8b01eae4d53a0d352675f8eb4d1e3175
NFT	MFNFT.sol	3a25b48e4217726980fd5ee2dbccea02680aa7ceab3c5ee68a0196c504ddb442

Findings

ID	Title	Category	Severity	Status
TMA-1	Unnecessary double ERC20 transfer	Gas optimization	Informational	Alleviated
NFT-1	Large unpaginated view method	Denial of service	Informational	Acknowledged

TMA-1 - Unnecessary double ERC20 transfer

Category	Severity	Location	Status
Gas optimization	Informational	TokenManagement.sol: 203	Alleviated

Description

The contract is calling ERC20 method `transferFrom` to transfer funds from user to itself and later calling ERC20 method `transfer` to send the same tokens from itself to the treasury address. This setup is inefficient, `transferFrom` could be used to transfer tokens immediately from the user to the treasury account.

```
token.transferFrom(msg.sender, address(this), _amount);
token.safeTransfer(treasuryAddress, _amount);
```

Recommendation

We advise calling `transferFrom` only once and immediately transferring the tokens from the user to the treasury address.
It is also advisable to utilize `safeTransferFrom` from the `safeERC20` library to adhere to best practices

Alleviation

Team implemented the suggested recommendation.

NFT-1 - Large unpaginated view method

Category	Severity	Location	Status
Denial of service	Informational	MFNFT.sol: 160	Alleviated

Description

The `walletOfUser` method is a view method that performs a loop over all NFTs owned by a specific wallet to return their data. Looping over undetermined variables is a bad practice since the EVM has a gas limit per transaction - which also applies to view calls even though they do not charge for gas. If a wallet owns a significant quantity of NFTs, calling the method will throw an out of gas error, denying the retrieval of the information requested.

```
function walletOfUser(address _user)
        public
        view
        returns (uint256[] memory)
 {
        uint256 ownerTokenCount = balanceOf(_user);
        uint256[] memory tokenIds = new uint256[](ownerTokenCount);
        for (uint256 i; i < ownerTokenCount; i++) {
            tokenIds[i] = tokenOfOwnerByIndex(_user, i);
        }
        return tokenIds;
  }
```

Recommendation

In order to allow the retrieval of large amounts of data without exceeding the transaction's gas limit, it is recommended to apply pagination to the call. The method could accept two parameters `startIndex` and `returnSize`, the loop would then start at `startIndex` and run for `returnSize` iterations. In this case the user can make sure the calls will never exceed the available gas and all information can be retrieved

Alleviation

The team implemented the `paginateWalletOfUser` method, which complies with the recommended specifications.

Appendix

Finding Categories

Code Style

Code style issues refer to the implementation of the contract code deviating from industry standards and best practices in commenting, documenting, naming, formatting and other style components.

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.

Gas optimization

Those findings indicate that the contract is performing operations more expensive than necessary that can be safely substituted for a more efficient approach.

Denial of Service

Denial of service issues arise when a specific code behavior is not available under certain conditions, which might disrupt the application flow, either in direct contract interactions or on dat/transaction flow on a user focused interface.

Checksum

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 specific commit.
The result is hexadecimal encoded and is the same as the output of the Linux "sha256sum" command against the target file.

Issue Checking Status

N°	Issue Description	Checking Status
1	Compiler Warnings.	Passed
2	Race conditions and Reentrancy. Cross-function race conditions.	Passed
3	Possible delays in data delivery.	Passed
4	Oracle calls.	Passed
5	Front running.	Passed
6	Timestamp dependence.	Passed
7	Integer Overflow and Underflow.	Passed
8	DoS with Revert.	Passed
9	DoS with block gas limit.	Passed
10	Methods execution permissions.	Passed
11	Economy model.	Passed
12	The impact of the exchange rate on logic.	Passed
13	Private user data leaks.	Passed
14	Malicious Event log.	Passed
15	Scoping and Declarations.	Passed
16	Uninitialized storage pointers.	Passed
17	Arithmetic accuracy.	Passed
18	Design Logic.	Passed
19	Cross-function race conditions.	Passed
20	Safe Zeppelin Module.	Passed
21	Fallback function security.	Passed
22		
23		
24		
25		

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Hack-a-Chain's goal is to help reduce the attack vectors and the high level of variance associated with utilizing new and consistently changing technologies, and in no way claims any guarantee of security or functionality of the technology we agree to analyze.

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SECURITY AUDIT CERTIFICATE

MetaFighter

We, Hack-a-Chain, Blockchain Specialist Software Development and Audit Company, in this act represented by our Chief Technology Officer, João Antônio Schmidt da Veiga, grant this **Security Audit Certificate** in favor of **MetaFighter**, recognizing that they have passed throw the security audit process and corrected all the issues that have been found in the following smart contracts:

1. **TokenManagement.sol**
2. **MFNFT.sol**

The full security audit report and it's disclaimer can be found in the following link:

https://github.com/hack-a-chain/security-audits

Devoted to enhancing security in the Blockchain Ecosystem and to provide the best quality service for our clients and the community, we sign this Certificate:

João Antônio Schmidt da Veiga
Chief Technology Officer