CERTIK

Security Assessment

Golff Finance IV

Sept 21st, 2021

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Summary

This report has been prepared for Golff Finance to discover issues and vulnerabilities in the source code of the Golff Finance IV 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	Golff Finance IV
Platform	Ethereum
Language	Solidity
Codebase	https://github.com/golfffinance/golff-lock
Commit	806a97eb4da2557545d3a4144165f31e3776378c

Audit Summary

Delivery Date	Sept 21, 2021
Audit Methodology	Static Analysis, Manual Review
Key Components	

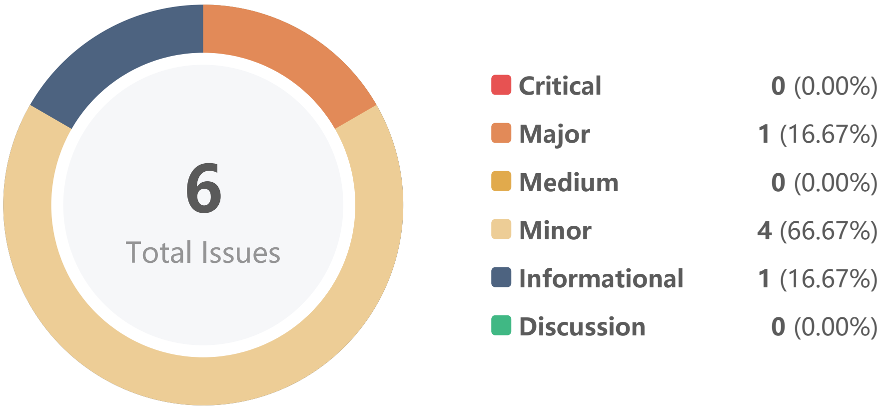
Vulnerability Summary

Vulnerability Level	Total	Pending	Declined	Acknowledged	Partially Resolved	Resolved
Critical	0	0	0	0	0	0
Major	1	0	0	1	0	0
Medium	0	0	0	0	0	0
Minor	4	0	0	4	0	0
Informational	1	0	0	1	0	0
Discussion	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
BAS	Base64.sol	d3d5a42f5541a06b0f9a68fa71d4c02dd6fd33774656f8c61c9ee1aaedf39ff7
GPE	GolffPet.sol	e0c97a76dbb9db5deb16a641665aa7336e395e4178a607f8d828f708b41ec918
IGN	IGofNft.sol	80940b3935094b448705dad174a5067e70d5c0f5b6ab03913dedd8a6a45c5e32
LPE	LockPool.sol	f4f5ce91c5c3c2981b56f0973641ebfbb36b05c6e557d03713dd5bb0dce3db64

Findings



ID	Title	Category	Severity	Status
GOF-01	Inconsistent Solidity Version	Compiler Error	Minor	ⓘ Acknowledged
BAS-01	Ambiguous `assembly` Usage	Logical Issue	Minor	ⓘ Acknowledged
GPE-01	Centralization Risk	**Centralization / Privilege**	**Major**	ⓘ Acknowledged
GPE-02	Risk For Weak Randomness	Logical Issue	Minor	ⓘ Acknowledged
GPE-03	Redundant `abi.encodePacked` Utilization	Gas Optimization	Informational	ⓘ Acknowledged
LPE-01	No Upper Limit For `rewardRate`	Volatile Code	Minor	ⓘ Acknowledged

GOF-01 | Inconsistent Solidity Version

Category	Severity	Location	Status
Compiler Error	Minor	Global	Acknowledged

Description

The contracts use different versions like the below list:

- Base64.sol and GolffPet.sol - pragma solidity ^0.8.0
- IGofNft.sol - pragma solidity ^0.6.12
- LockPool.sol - pragma solidity ^0.6.6

Recommendation

It is okay to try different compiler versions during the development stage.

However, we recommend locking the contract version when it reaches the production stage, and in this case, seems 0.8.0 is more compatible.

Alleviation

Golff team acknowledged this finding.

BAS-01 | Ambiguous `assembly` Usage

Category	Severity	Location	Status
Logical Issue	Minor	Base64.sol: 20	Acknowledged

Description

The statement ambiguously uses assembly to update the in-memory `result` string variable. And below listed statement does not cover all `mod` possible results.

```
switch mod(mload(data), 3)
  case 1 { mstore(sub(resultPtr, 2), shl(240, 0x3d3d)) }
  case 2 { mstore(sub(resultPtr, 1), shl(248, 0x3d)) }
```

Recommendation

We advise avoiding using `evm` assembly, as it is error-prone.

Alleviation

[Golff Finance]: Currently 99 NTF tokens have been minted, and there is no impact at present.

GPE-01 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	**Major**	GolffPet.sol: 200, 204	Acknowledged

Description

In the contract `GolffPet`, the role `owner` has the authority over the following function:

- setRevealedCollectionBaseURL - Modify the value of variable `revealedCollectionBaseURL`.
- addMinters - Maintain the members of the list `minters` which is used to verify the permission to call `claim()`.

Any compromise to the `owner` account may allow the hacker to take advantage of this.

Recommendation

We advise the client to carefully manage the `owner` 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 is some feasible suggestions that would also mitigate the potential risk at the different level in term of short-term and long-term:

- 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.

Alleviation

Golff team removed function `addMinters`, and usually function `setRevealedCollectionBaseURL` is only called when the contract is deployed.

GPE-02 | Risk For Weak Randomness

Category	Severity	Location	Status
Logical Issue	Minor	GolffPet.sol: 177	Acknowledged

Description

The `sumLuckyPower` is obtained by encoding an increment `tokenIndex` to generate the remainder of `greatness`. The values of `_tokenIds.current()` can be queried from function `surplus()`, so we think the private variable `attributeIndex[tokenId]` based on inner operations can be predicted.

If the parameter passed to `pluck()` is not a random number, then the result is not a random number.

Recommendation

Consider refactoring the function `random()` and mixing a seed value based on the chainlink random service(https://docs.chain.link/docs/get-a-random-number/).

Alleviation

Golff team acknowledged this finding.

GPE-03 | Redundant `abi.encodePacked` Utilization

Category	Severity	Location	Status
Gas Optimization	● Informational	GolffPet.sol: 108~109	ⓘ Acknowledged

Description

All variables included in the `abi.encodePacked` invocation cannot be packed under a single 256-bit slot and as such, the invocation is equivalent to `abi.encode` which is more gas efficient. Additionally, when calculating hashes as identifiers it is wise to utilize `abi.encode` instead of `abi.encodePacked` as unaccounted-for tight packs can lead to the same ID being generated with different input variables.

Recommendation

We advise favorring utilizing `abi.encode` over `abi.encodePacked`.

Alleviation

Golff team acknowledged this finding.

LPE-01 | No Upper Limit For `rewardRate`

Category	Severity	Location	Status
Volatile Code	Minor	LockPool.sol: 156	Acknowledged

Description

The owner can set the `rewardRate` when deploying the contract and there is no upper limit on what the rate can be. In the extreme case, the rate can be as high as 100%, which would imply that users cannot get any token back after depositing the token into the contract.

Recommendation

We recommend setting an reasonable upper limit for the `rewardRate` variable.

Alleviation

[Golff Finance]: `rewardRate` is the number of rewarded tokens generated per second. If the reward of the pool is not enough, our team would transfer more tokens to the pool.

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.

Compiler Error

Compiler Error findings refer to an error in the structure of the code that renders it impossible to compile using the specified version of the project.

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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