Smart Contract Audit Report

October, 2023

DEFIMOON PROJECT

Audit and
Development

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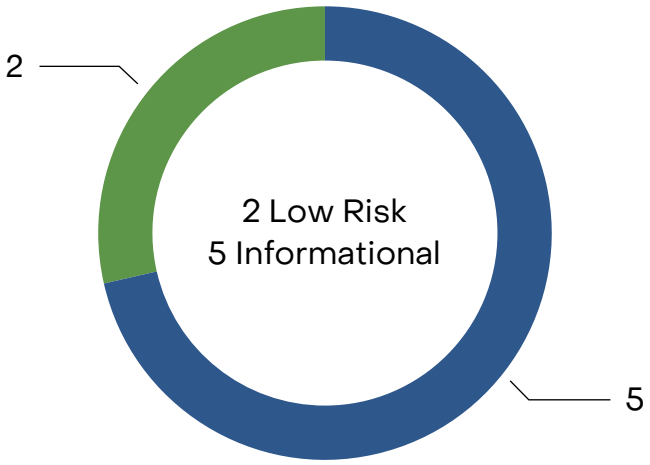
be secure

6 October 2023

This audit report was prepared by DefiMoon for ComTechGold.

Audit information

Description	ERC-20 Token and Maker-Checker Smart Contract
Timeline	5 October 2023 - 6 October 2023
Approved by	Artur Makhnach, Kirill Minyaev
Audit Scope	CGOController.sol, Goldtoken.sol
Languages	Solidity
Methods	Architecture Review, Unit Testing, Functional Testing, Manual Review
Project Site	https://comtechgold.com/
Source code	https://github.com/yodaplus/comtech-gold-contract/tree/bc1d94ed12e15c4ca8f9410938ab251aef2e21cc
Network	EVM-like
Status	Passed



	High Risk	A fatal vulnerability that can cause the loss of all Tokens / Funds.
	Medium Risk	A vulnerability that can cause the loss of some Tokens / Funds.
	Low Risk	A vulnerability which can cause the loss of protocol functionality.
	Informational	Non-security issues such as functionality, style, and convention.

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Audit Information

Defimoon utilizes both manual and automated auditing approach to cover the most ground possible. We begin with generic static analysis automated tools to quickly assess the overall state of the contract. We then move to a comprehensive manual code analysis, which enables us to find security flaws that automated tools would miss. Finally, we conduct an extensive unit testing to make sure contract behaves as expected under stress conditions.

In our decision making process we rely on finding located via the manual code inspection and testing. If an automated tool raises a possible vulnerability, we always investigate it further manually to make a final verdict. All our tests are run in a special test environment which matches the "real world" situations and we utilize exact copies of the published or provided contracts.

While conducting the audit, the Defimoon security team uses best practices to ensure that the reviewed contracts are thoroughly examined against all angles of attack. This is done by evaluating the codebase and whether it gives rise to significant risks. During the audit, Defimoon assesses the risks and assigns a risk level to each section together with an explanatory comment.

Audit overview

No major vulnerabilities were found.

The contracts are well written, but we recommend paying attention to some findings and upgrading to a newer (but stable) version of Solidity.

Summary of findings

ID	Description	Severity
DFM-1	Potential loss of owner	Low Risk
DFM-2	Balance reservation	Low Risk
DFM-3	Tokens are not minted in the constructor	Information
DFM-4	Unused function arguments	Information
DFM-5	Extra checks	Information
DFM-6	Field indexing in events	Information
DFM-7	Solidity version too old	Information

Application security checklist

Compiler errors	Passed
Possible delays in data delivery	Passed
Timestamp dependence	Passed
Integer Overflow and Underflow	Passed
Race Conditions and Reentrancy	Passed
DoS with Revert	Passed
DoS with block gas limit	Passed
Methods execution permissions	Passed
Private user data leaks	Passed
Malicious Events Log	Passed
Scoping and Declarations	Passed
Uninitialized storage pointers	Passed
Arithmetic accuracy	Passed
Design Logic	Passed
Cross-function race conditions	Passed

Detailed Audit Information

Contract Programming

Solidity version not specified	Passed
Solidity version too old	Not Passed
Integer overflow/underflow	Passed
Function input parameters lack of check	Passed
Function input parameters check bypass	Passed
Function access control lacks management	Passed
Critical operation lacks event log	Passed
Human/contract checks bypass	Passed
Random number generation/use vulnerability	Passed
Fallback function misuse	Passed
Race condition	Passed
Logical vulnerability	Passed
Other programming issues	Passed

Code Specification

Visibility not explicitly declared	Passed
Variable storage location not explicitly declared	Passed
Use keywords/functions to be deprecated	Passed
Other code specification issues	Passed

Gas Optimization

Assert () misuse	Passed
High consumption ‘for/while’ loop	Passed
High consumption ‘storage’ storage	Passed
“Out of Gas” Attack	Passed

Findings

DFM-1 «Potential loss of owner» | CGOController

Severity: Low Risk

Description: The CGOController contract inherit the Ownable contract from OpenZeppelin which includes the renounceOwnership function. This function resets the owner of the contract without the possibility of restoring it, which can lead to irreparable consequences if this function is called, since most of the functionality of contracts is available only to the owner.

Also, the Ownable::transferOwnership function is not safe either, because it does not check the address of the new owner.

Recommendation: Main functions in your contract require owner permissions, and as a result, loss of permissions can become critical. The best solution would be to stop using OpenZeppelin's renounceOwnership function. For example, like this:

```
function renounceOwnership() public override onlyOwner {
    revert("Renounce ownership disabled");
}
```

It's also best practice to use transfer the owner in two steps, like this.

DFM-2 «Balance reservation» | CGOController

Severity: Low Risk

Description: The burn function burns tokens from the contract address, however, by the time the burn function is called, the balance may be insufficient. After checking the balance in the initiateBurn function, it can be withdrawn through the withdrawFunds function, resulting in an error when calling burn.

Recommendation: We recommend reserving the balance for burning in a separate variable and prohibiting its withdrawal through the withdrawFunds function..

DFM-3 «Tokens are not minted in the constructor» | Goldtoken

Severity: Information

Description: While deploying Goldtoken, call in constructor would mint 0 tokens since 0**18 is still 0. It would not severely affect project logic, but the call itself is redundant in this case.

Recommendation: If mint tokens are needed in the constructor, you should change 0 to 10 like this:

```
_mint(msg.sender, 10000000 * 1e18);
```

Otherwise, redundant logic should be removed.

DFM-4 «Unused function arguments» | CGOController

Severity: Information

Description: The mint function takes to and amount as arguments, however to must always equal minterWalletAddr and amount must always equal 1000. Similarly, the burn function takes amount as an argument, but amount must always equal 1000.

Recommendation: We recommend eliminating passing to and amount as arguments and eliminating the corresponding checks to make the code simpler and more gas-efficient. The modified functions code is given in DFM-5.

DFM-5 «Extra checks» | CGOController

Severity: Information

Description: In the initiateMint function, you can avoid checking the status of BURN_INITIATED, BURN_COMPLETED and MINT_INITIATED since the function can only be called with the NOT_EXIST status. Example of modified code:

```
function initiateMint(
    string memory Bar_Number,
    string memory Warrant_Number
) external onlyInitiator {
    if (
      keccak256(abi.encodePacked(barNumWarrantNum[Bar_Number])) ==
      keccak256(abi.encodePacked(Warrant_Number))
    ) {
      revert("Bar already exist");
    }
    if (
      txnStatusRecord[Bar_Number][Warrant_Number] != txnStatus.NOT_EXIST
    ) {
      revert("Already initiated");
    }

    txnStatusRecord[Bar_Number][Warrant_Number] = txnStatus.MINT_INITIATED;
    emit MintInitiated(Bar_Number, Warrant_Number, txnStatus.MINT_INITIATED,
block.timestamp);
}
```

In the cancelInitiateMint function, you can refuse to check the status on BURN_INITIATED and BURN_COMPLETED, since the function can only be called with the status MINT_INITIATED.

You can also avoid with the Bar_Number and Warrant_Number checks, since these checks are previously performed in the initiateMint function. Example of modified code:

```
function cancelInitiateMint(
    string memory Bar_Number,
    string memory Warrant_Number
) external onlyExecutor {
    if (
      txnStatusRecord[Bar_Number][Warrant_Number] != txnStatus.MINT_INITIATED
    ) {
      revert("Mint initiation request not exist");
    }

    txnStatusRecord[Bar_Number][Warrant_Number] = txnStatus.NOT_EXIST;
    emit MintCancelled(Bar_Number, Warrant_Number, txnStatus.NOT_EXIST,
block.timestamp);
}
```

In the mint function, you can avoid the Bar_Number and Warrant_Number checks, since this check is previously performed in the initiateMint function. Example of modified code (includes fix from DFM-4):

```
function mint(
    string memory Bar_Number,
    string memory Warrant_Number
) external onlyExecutor {
    address recipient = minterWalletAddr;
    if (recipient == address(0)) {
        revert("Invalid Mint address");
    }

    if (
      txnStatusRecord[Bar_Number][Warrant_Number] != txnStatus.MINT_INITIATED
    ) {
      revert("Mint initiation request not exist");
    }

    barNumWarrantNum[Bar_Number] = Warrant_Number;
    txnStatusRecord[Bar_Number][Warrant_Number] = txnStatus.MINT_COMPLETED;

    emit BarMint(recipient, 1000e18, Bar_Number, Warrant_Number,
block.timestamp);
    IERC20(tokenAddr).mint(recipient, 1000e18);
}
```

In the initiateBurn function, you can avoid checking the status of BURN_INITIATED and BURN_COMPLETED, since the function can only be called with the status MINT_COMPLETED. Example of modified code:

```
function initiateBurn(
    string memory Bar_Number,
    string memory Warrant_Number
) external onlyInitiator {
    if (IERC20(tokenAddr).balanceOf(address(this)) < 1000e18) {
      revert("Insufficient CGO Balance");
    }
    if (
      keccak256(abi.encodePacked(barNumWarrantNum[Bar_Number])) !=
      keccak256(abi.encodePacked(Warrant_Number))
    ) {
      revert("Incorrect Bar details");
    }
    if (
      txnStatusRecord[Bar_Number][Warrant_Number] != txnStatus.MINT_COMPLETED
    ) {
      revert("Mint request not exist");
    }
    txnStatusRecord[Bar_Number][Warrant_Number] = txnStatus.BURN_INITIATED;
    emit BurnInitiated(Bar_Number, Warrant_Number, txnStatus.BURN_INITIATED,
block.timestamp);
}
```

In the cancelInitiateBurn function, you can avoid to check the status for BURN_COMPLETED, since the function can only be called when the status is BURN_INITIATED.

You can also avoid the Bar_Number and Warrant_Number checks, since these checks are previously performed in the initiateBurn function. Example of modified code:

```
function cancelInitiateBurn(
    string memory Bar_Number,
    string memory Warrant_Number
) external onlyExecutor {
    if (
      keccak256(abi.encodePacked(barNumWarrantNum[Bar_Number])) !=
      keccak256(abi.encodePacked(Warrant_Number))
    ) {
      revert("Incorrect Bar details");
    }
    if (
      txnStatusRecord[Bar_Number][Warrant_Number] != txnStatus.BURN_INITIATED
    ) {
      revert("Burn initiation request not exist");
    }

    txnStatusRecord[Bar_Number][Warrant_Number] = txnStatus.MINT_COMPLETED;
    emit BurnCancelled(Bar_Number, Warrant_Number, txnStatus.MINT_COMPLETED,
block.timestamp);
}
```

In the burn function, you can avoid the Bar_Number and Warrant_Number checks, since this check is previously performed in the initiateBurn function. Example of modified code (includes fix from DFM-4):

```
function burn(
    string memory Bar_Number,
    string memory Warrant_Number
) external onlyExecutor {
    if (
      txnStatusRecord[Bar_Number][Warrant_Number] != txnStatus.BURN_INITIATED
    ) {
      revert("Burn initiation request not exist");
    }

    if (IERC20(tokenAddr).balanceOf(address(this)) < 1000e18) {
      revert("Insufficient CGO Balance");
    }

    delete barNumWarrantNum[Bar_Number];
    txnStatusRecord[Bar_Number][Warrant_Number] = txnStatus.BURN_COMPLETED;
    emit BarBurn(address(this), 1000e18, Bar_Number, Warrant_Number,
block.timestamp);
    IERC20(tokenAddr).burn(1000e18);
}
```

DFM-6 «Field indexing in events» | CGOController

Severity: Information

Description: The contract uses events for all major operations, but does not use field indexing.

Recommendation: We recommend using the indexing of the main fields in events to simplify the search for them. Events can be an important part of the integration of smart contracts with the UI of the protocol, and can also be used to collect statistics and analyze data.

DFM-7 «Solidity version too old» | *

Severity: Information

Description: You are using an outdated version of the Solidity compiler.

Recommendation: We recommended using version 0.8.0 or higher.

Automated Analyses

Slither

Slither's automatic analysis not found vulnerabilities, or these false positives results .

Methodology

Manual Code Review

We prefer to work with a transparent process and make our reviews a collaborative effort. The goal of our security audits is to improve the quality of systems we review and aim for sufficient remediation to help protect users. The following is the methodology we use in our security audit process.

Vulnerability Analysis

Our audit techniques include manual code analysis, user interface interaction, and whitebox penetration testing. We look at the project's web site to get a high-level understanding of what functionality the software under review provides. We then meet with the developers to gain an appreciation of their vision of the software. We install and use the relevant software, exploring the user interactions and roles. While we do this, we brainstorm threat models and attack surfaces. We read design documentation, review other audit results, search for similar projects, examine source code dependencies, review open issue tickets, and investigate details other than the implementation.

Documenting Results

We follow a conservative, transparent process for analyzing potential security vulnerabilities and seeing them through successful remediation. Whenever a potential issue is discovered, we immediately create an Issue entry for it in this document, even though we have not yet verified the feasibility and impact of the issue. This process is conservative because we document our suspicions early even if they are later shown to not represent exploitable vulnerabilities. We follow a process of first documenting the suspicion with unresolved questions, then confirming the issue through code analysis, live experimentation, or automated tests. Code analysis is the most tentative, and we strive to provide test code, log captures, or screenshots demonstrating our confirmation. After this we analyze the feasibility of an attack in a live system to make a final decision.

Suggested Solutions

We search for immediate mitigations that live deployments can take, and finally we suggest the requirements for remediation engineering for future releases. The mitigation and remediation recommendations should be scrutinized by the developers and deployment engineers, and successful mitigation and remediation is an ongoing collaborative process after we deliver our report, and before the details are made public.

Appendix A — Finding Statuses

Resolved	Contracts were modified to permanently resolve the finding
Mitigated	The finding was resolved by other methods such as revoking contract ownership or updating the code to minimize the effect of the finding
Acknowledged	Project team is made aware of the finding
Open	The finding was not addressed