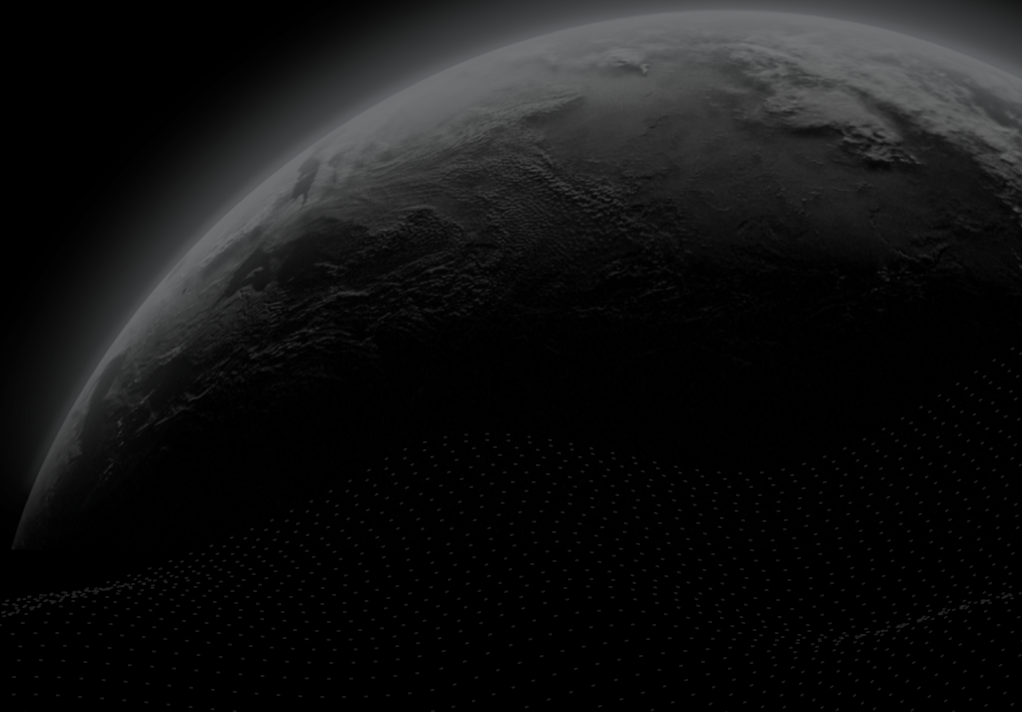




Security Assessment

Morpheus.Network

CertiK Verified on Jul 8th, 2021





CertiK Verified on Jul 8th, 2021

Morpheus.Network

The security assessment was prepared by CertiK, the leader in Web3.0 security.

Executive Summary

TYPES
ERC-20

ECOSYSTEM
Ethereum

METHODS
Manual Review, Static Analysis

LANGUAGE
Solidity

TIMELINE
Delivered on 07/08/2021

KEY COMPONENTS
N/A

CODEBASE

<https://rinkeby.etherscan.io/address/0x48e0505d543190a06a82e4766e59f7b7e0f90da0#code>

[...View All](#)

Vulnerability Summary



0	Critical	Critical risks are those that impact the safe functioning of a platform and must be addressed before launch. Users should not invest in any project with outstanding critical risks.
0	Major	Major risks can include centralization issues and logical errors. Under specific circumstances, these major risks can lead to loss of funds and/or control of the project.
0	Medium	Medium risks may not pose a direct risk to users' funds, but they can affect the overall functioning of a platform.
0	Minor	Minor risks can be any of the above, but on a smaller scale. They generally do not compromise the overall integrity of the project, but they may be less efficient than other solutions.
0	Informational	Informational errors are often recommendations to improve the style of the code or certain operations to fall within industry best practices. They usually do not affect the overall functioning of the code.

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CODEBASE | MORPHEUS.NETWORK

Repository

<https://rinkeby.etherscan.io/address/0x48e0505d543190a06a82e4766e59f7b7e0f90da0#code>

AUDIT SCOPE | MORPHEUS.NETWORK

1 file audited ● 1 file with Resolved findings

ID	File	SHA256 Checksum
● MNW	 MNW.sol	2b0fb620e919fe32e51ba44f896c11e6e2e711 eb312037363eb7928acbf33201

APPROACH & METHODS | MORPHEUS.NETWORK

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

- Testing the smart contracts against both common and uncommon attack vectors;
- 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.

DECENTRALIZATION EFFORTS | MORPHEUS.NETWORK

Description

The `controller` role of the contract `MNW.sol` can transfer any/all amount of tokens to `controller`'s address by calling the following functions:

- `transferToken()`
- `flushToken()`

Such privileges might expose the project to economic exploits if the attackers manage to obtain the `controller` control or an account granted with the `controller` role.

Recommendations

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., multisignature 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 ($\frac{2}{3}$, $\frac{3}{5}$) 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.

■ Status/Alleviations

[Morpheus Network]: These functions only allow transfers from the smart contract itself, like tokens that were received by accident which means that these functions are used to fix user mistakes if made, By company policy and practice, we use multi-signature hardware wallets for all elevated roles.

OPTIMIZATIONS | MORPHEUS.NETWORK

ID	Title	Category	Severity	Status
MNW-02	Proper Usage Of <code>public</code> And <code>external</code>	Gas Optimization	Optimization	● Resolved

MNW-02 | PROPER USAGE OF `public` AND `external`

Category	Severity	Location	Status
Gas Optimization	● Optimization	MNW.sol: 130, 145, 166, 176, 184, 196, 200, 205, 218	● Resolved

Description

`public` functions that are never called by the contract should be declared external to save gas.

These functions should be declared `external` :

- `transfer(address,uint256)`
- `transferFrom(address,address,uint256)`
- `approve(address,uint256)`
- `increaseApproval(address,uint256)`
- `decreaseApproval(address,uint256)`
- `transferToken(address,uint256)`
- `flushToken(address)`
- `burn(uint256)`
- `freeze(address,bool)`

Recommendation

We advise the client to use the external attribute for functions never called from the contract.

Alleviation

[Morpheus.Network] : `public` has been changed to `external` . Updated contract has been deployed at the address [0x88d4067802186dd70704a85866974997f4ded734](https://morpheus.network/contracts/0x88d4067802186dd70704a85866974997f4ded734)

APPENDIX | MORPHEUS.NETWORK

Finding Categories

Categories	Description
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.

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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