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SMART CONTRACT

Security Audit Report

Project: Mad Viking Games
Website: madvikingstudios.com
Platform: BNB Smart Chain
Language: Solidity
Date: March 11th, 2023

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THIS IS SECURITY AUDIT REPORT DOCUMENT AND WHICH MAY CONTAIN INFORMATION WHICH IS CONFIDENTIAL. WHICH INCLUDES ANY POTENTIAL VULNERABILITIES AND MALICIOUS CODES WHICH CAN BE USED TO EXPLOIT THE SOFTWARE. THIS MUST BE REFERRED INTERNALLY AND ONLY SHOULD BE MADE AVAILABLE TO THE PUBLIC AFTER ISSUES ARE RESOLVED.

Introduction

EtherAuthority was contracted by Mad Viking Games to perform the Security audit of the Mad Viking Games smart contracts code. The audit has been performed using manual analysis as well as using automated software tools. This report presents all the findings regarding the audit performed on March 11th, 2023.

The purpose of this audit was to address the following:
- Ensure that all claimed functions exist and function correctly.
- Identify any security vulnerabilities that may be present in the smart contract.

Project Background

- Mad Viking Games platform which creates demand for the MVG token.
- MVG is the native token for the Mad Viking Games metaverse.
- MVG is a blockchain gaming company founded in 2021.
- The project leaders are a group of Danish crypto enthusiasts and gamers who have known each other since kindergarten and got into crypto a long time ago.

Audit scope

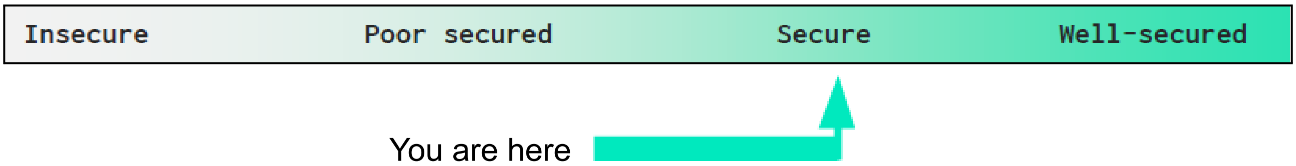
Name	**Code Review and Security Analysis Report for Mad Viking Games Smart Contracts**
Platform	**BSC / Solidity**
File 1	GEMS.sol
File 1 MD5 Hash	D2F248F722DB3B87C6E0D303AFF259BB
File 2	MVG.sol
File 2 MD5 Hash	A8F6BD45F8B053B8A630D6725D613876
Audit Date	March 11th,2023

Claimed Smart Contract Features

Claimed Feature Detail	Our Observation
File 1 GEMS.sol ● Name: GEMS ● Symbol: GEMS ● Decimals: 18 ● Total Supply: 100 billion	**YES, This is valid.**
File 2 MVG.sol ● Name: Mad Viking Games ● Symbol: MVG ● Decimals: 18 ● Total Supply: 14 billion	**YES, This is valid.**

Audit Summary

According to the standard audit assessment, Customer`s solidity smart contracts are **"Secured"**. Also, these contracts do contain owner control, which does not make them fully decentralized.



We used various tools like Slither, Solhint and Remix IDE. At the same time this finding is based on critical analysis of the manual audit.

All issues found during automated analysis were manually reviewed and applicable vulnerabilities are presented in the Audit overview section. General overview is presented in AS-IS section and all identified issues can be found in the Audit overview section.

We found 0 critical, 0 high, 0 medium and 0 low and some very low level issues.

Investors Advice: Technical audit of the smart contract does not guarantee the ethical nature of the project. Any owner controlled functions should be executed by the owner with responsibility. All investors/users are advised to do their due diligence before investing in the project.

Technical Quick Stats

Main Category	Subcategory	Result
Contract Programming	Solidity version not specified	Passed
	Solidity version too old	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	N/A
	Fallback function misuse	Passed
	Race condition	Passed
	Logical vulnerability	Passed
	Features claimed	Passed
	Other programming issues	Passed
Code Specification	Function visibility not explicitly declared	Passed
	Var. storage location not explicitly declared	Passed
	Use keywords/functions to be deprecated	Passed
	Unused code	Passed
Gas Optimization	“Out of Gas” Issue	Passed
	High consumption ‘for/while’ loop	Passed
	High consumption ‘storage’ storage	Passed
	Assert() misuse	Passed
Business Risk	The maximum limit for mintage not set	Passed
	“Short Address” Attack	Passed
	“Double Spend” Attack	Passed

Overall Audit Result: PASSED

Code Quality

This audit scope has 2 smart contract files. Smart contracts contain Libraries, Smart contracts, inherits and Interfaces. This is a compact and well written smart contract.

The libraries in the Mad Viking Games Protocol are part of its logical algorithm. A library is a different type of smart contract that contains reusable code. Once deployed on the blockchain (only once), it is assigned a specific address and its properties / methods can be reused many times by other contracts in the Mad Viking Games Protocol.

The Mad Viking Games team has not provided unit test scripts, which would have helped to determine the integrity of the code in an automated way.

Code parts are well commented on smart contracts.

Documentation

We were given a Mad Viking Games Protocol smart contract code in the form of a file. The hash of that code is mentioned above in the table.

As mentioned above, code parts are **well** commented.So it is easy to quickly understand the programming flow as well as complex code logic. Comments are very helpful in understanding the overall architecture of the protocol.

Another source of information was its official website: https://madvikingstudios.com which provided rich information about the project architecture and tokenomics.

Use of Dependencies

As per our observation, the libraries are used in this smart contracts infrastructure that are based on well known industry standard open source projects.

Apart from libraries, its functions are used in external smart contract calls.

AS-IS overview

GEMS.sol

Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	onlyOwner	modifier	Passed	No Issue
3	owner	read	Passed	No Issue
4	_checkOwner	internal	Passed	No Issue
5	renounceOwnership	write	access only Owner	No Issue
6	transferOwnership	write	access only Owner	No Issue
7	_transferOwnership	internal	Passed	No Issue
8	name	read	Passed	No Issue
9	symbol	read	Passed	No Issue
10	decimals	read	Passed	No Issue
11	totalSupply	read	Passed	No Issue
12	balanceOf	read	Passed	No Issue
13	transfer	write	Passed	No Issue
14	allowance	read	Passed	No Issue
15	approve	write	Passed	No Issue
16	transferFrom	write	Passed	No Issue
17	increaseAllowance	write	Passed	No Issue
18	decreaseAllowance	write	Passed	No Issue
19	_transfer	internal	Passed	No Issue
20	_mint	internal	Passed	No Issue
21	_burn	internal	Passed	No Issue
22	_approve	internal	Passed	No Issue
23	_spendAllowance	internal	Passed	No Issue
24	_beforeTokenTransfer	internal	Passed	No Issue
25	_afterTokenTransfer	internal	Passed	No Issue

MVG.sol

Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	onlyOwner	modifier	Passed	No Issue
3	owner	read	Passed	No Issue
4	_checkOwner	internal	Passed	No Issue
5	renounceOwnership	write	access only Owner	No Issue
6	transferOwnership	write	access only Owner	No Issue
7	_transferOwnership	internal	Passed	No Issue
8	name	read	Passed	No Issue
9	symbol	read	Passed	No Issue

10	decimals	read	Passed	No Issue
11	totalSupply	read	Passed	No Issue
12	balanceOf	read	Passed	No Issue
13	transfer	write	Passed	No Issue
14	allowance	read	Passed	No Issue
15	approve	write	Passed	No Issue
16	transferFrom	write	Passed	No Issue
17	increaseAllowance	write	Passed	No Issue
18	decreaseAllowance	write	Passed	No Issue
19	_transfer	internal	Passed	No Issue
20	_mint	internal	Passed	No Issue
21	_burn	internal	Passed	No Issue
22	_approve	internal	Passed	No Issue
23	_spendAllowance	internal	Passed	No Issue
24	_beforeTokenTransfer	internal	Passed	No Issue
25	_afterTokenTransfer	internal	Passed	No Issue

Severity Definitions

Risk Level	Description
Critical	Critical vulnerabilities are usually straightforward to exploit and can lead to token loss etc.
High	High-level vulnerabilities are difficult to exploit; however, they also have significant impact on smart contract execution, e.g. public access to crucial
Medium	Medium-level vulnerabilities are important to fix; however, they can't lead to tokens lose
Low	Low-level vulnerabilities are mostly related to outdated, unused etc. code snippets, that can't have significant impact on execution
Lowest / Code Style / Best Practice	Lowest-level vulnerabilities, code style violations and info statements can't affect smart contract execution and can be ignored.

Audit Findings

Critical Severity

No Critical severity vulnerabilities were found.

High Severity

No High severity vulnerabilities were found.

Medium

No Medium severity vulnerabilities were found.

Low

No Low severity vulnerabilities were found.

Very Low / Informational / Best practices:

(1) Multiple Pragma: **MVG.sol, GEMS.sol**

```
// OpenZeppelin Contracts v4.4.1 (utils/Context.sol)

pragma solidity ^0.8.0;

/** ...
abstract contract Context { ...
}

// File: @openzeppelin/contracts/access/Ownable.sol


// OpenZeppelin Contracts (last updated v4.7.0) (access/Ownable.sol)

pragma solidity ^0.8.0;
/** ...
abstract contract Ownable is Context { ...
}

// File: @openzeppelin/contracts/token/ERC20/IERC20.sol
// OpenZeppelin Contracts (last updated v4.6.0) (token/ERC20/IERC20.sol)
pragma solidity ^0.8.0;
```

There are multiple pragma with different versions.

Resolution: We suggest keeping one pragma line at the top of the code.

(2) SPDX license identifier missing: **MVG.sol, GEMS.sol**

SPDX license identifier not provided in source file.

Resolution: We suggest adding an SPDX license identifier.

Centralization

This smart contract has some functions which can be executed by the Admin (Owner) only. If the admin wallet private key would be compromised, then it would create trouble. Following are Admin functions:

Ownable.sol

- renounceOwnership: Deleting ownership will leave the contract without an owner, removing any owner-only functionality.
- transferOwnership: Current owner can transfer ownership of the contract to a new account.
- _checkOwner: Thrown when the sender is not the owner.

To make the smart contract 100% decentralized, we suggest renouncing ownership in the smart contract once its function is completed.

Conclusion

We were given a contract code in the form of files. And we have used all possible tests based on given objects as files. We had observed some informational severity issues in the smart contracts. But those are not critical ones. **So, the smart contracts are ready for the mainnet deployment**.

Since possible test cases can be unlimited for such smart contracts protocol, we provide no such guarantee of future outcomes. We have used all the latest static tools and manual observations to cover maximum possible test cases to scan everything.

Smart contracts within the scope were manually reviewed and analyzed with static analysis tools. Smart Contract's high-level description of functionality was presented in the As-is overview section of the report.

Audit report contains all found security vulnerabilities and other issues in the reviewed code.

Security state of the reviewed contract, based on standard audit procedure scope, is **"Secured".**

Our Methodology

We like to work with a transparent process and make our reviews a collaborative effort. The goals of our security audits are 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.

Manual Code Review:

In manually reviewing all of the code, we look for any potential issues with code logic, error handling, protocol and header parsing, cryptographic errors, and random number generators. We also watch for areas where more defensive programming could reduce the risk of future mistakes and speed up future audits. Although our primary focus is on the in-scope code, we examine dependency code and behavior when it is relevant to a particular line of investigation.

Vulnerability Analysis:

Our audit techniques included 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, skim open issue tickets, and generally 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 generally 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.

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.

Disclaimers

EtherAuthority.io Disclaimer

EtherAuthority team has analyzed this smart contract in accordance with the best industry practices at the date of this report, in relation to: cybersecurity vulnerabilities and issues in smart contract source code, the details of which are disclosed in this report, (Source Code); the Source Code compilation, deployment and functionality (performing the intended functions).

Due to the fact that the total number of test cases are unlimited, the audit makes no statements or warranties on security of the code. It also cannot be considered as a sufficient assessment regarding the utility and safety of the code, bugfree status or any other statements of the contract. While we have done our best in conducting the analysis and producing this report, it is important to note that you should not rely on this report only. We also suggest conducting a bug bounty program to confirm the high level of security of this smart contract.

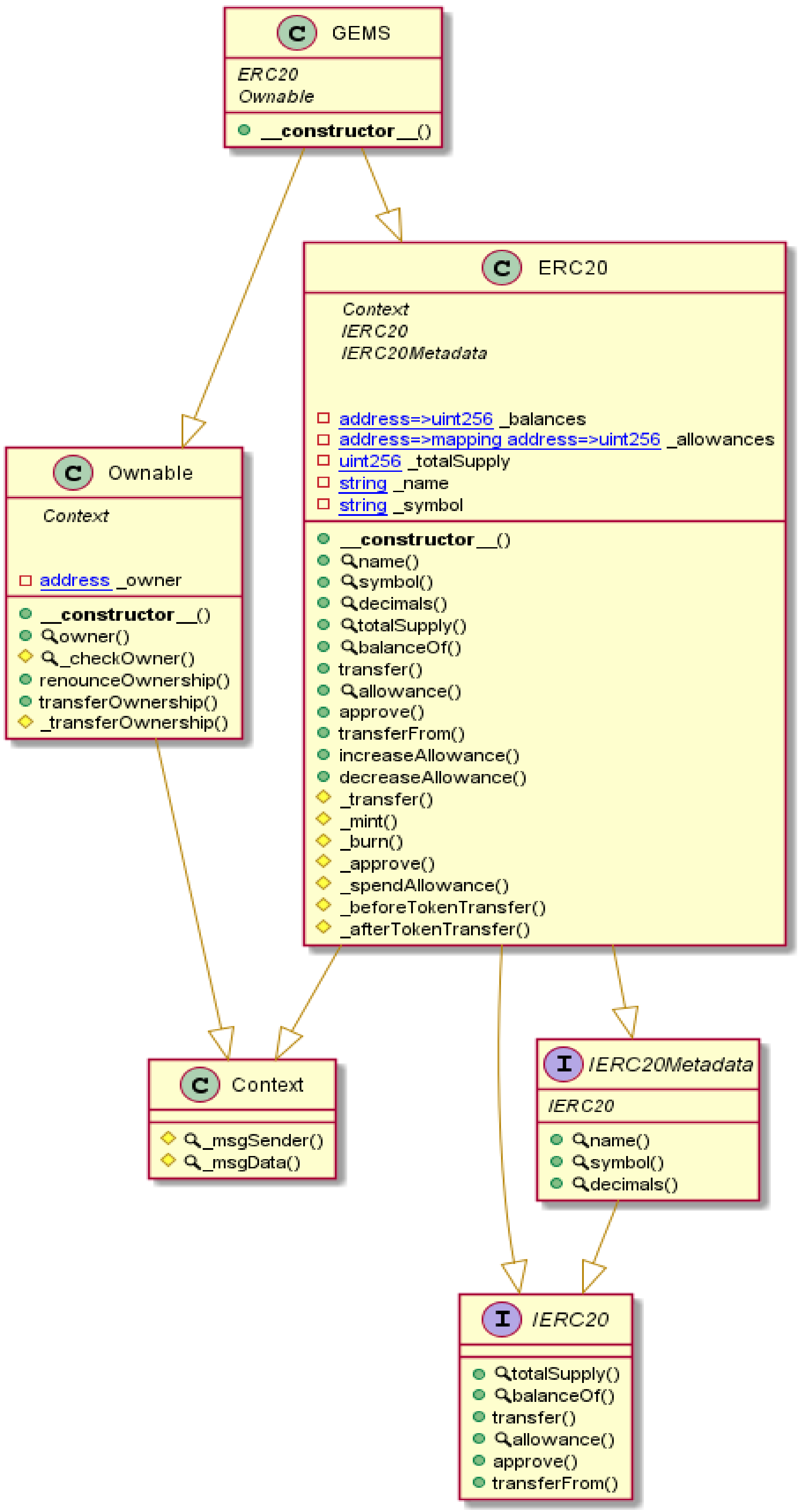
Technical Disclaimer

Smart contracts are deployed and executed on the blockchain platform. The platform, its programming language, and other software related to the smart contract can have their own vulnerabilities that can lead to hacks. Thus, the audit can’t guarantee explicit security of the audited smart contracts.

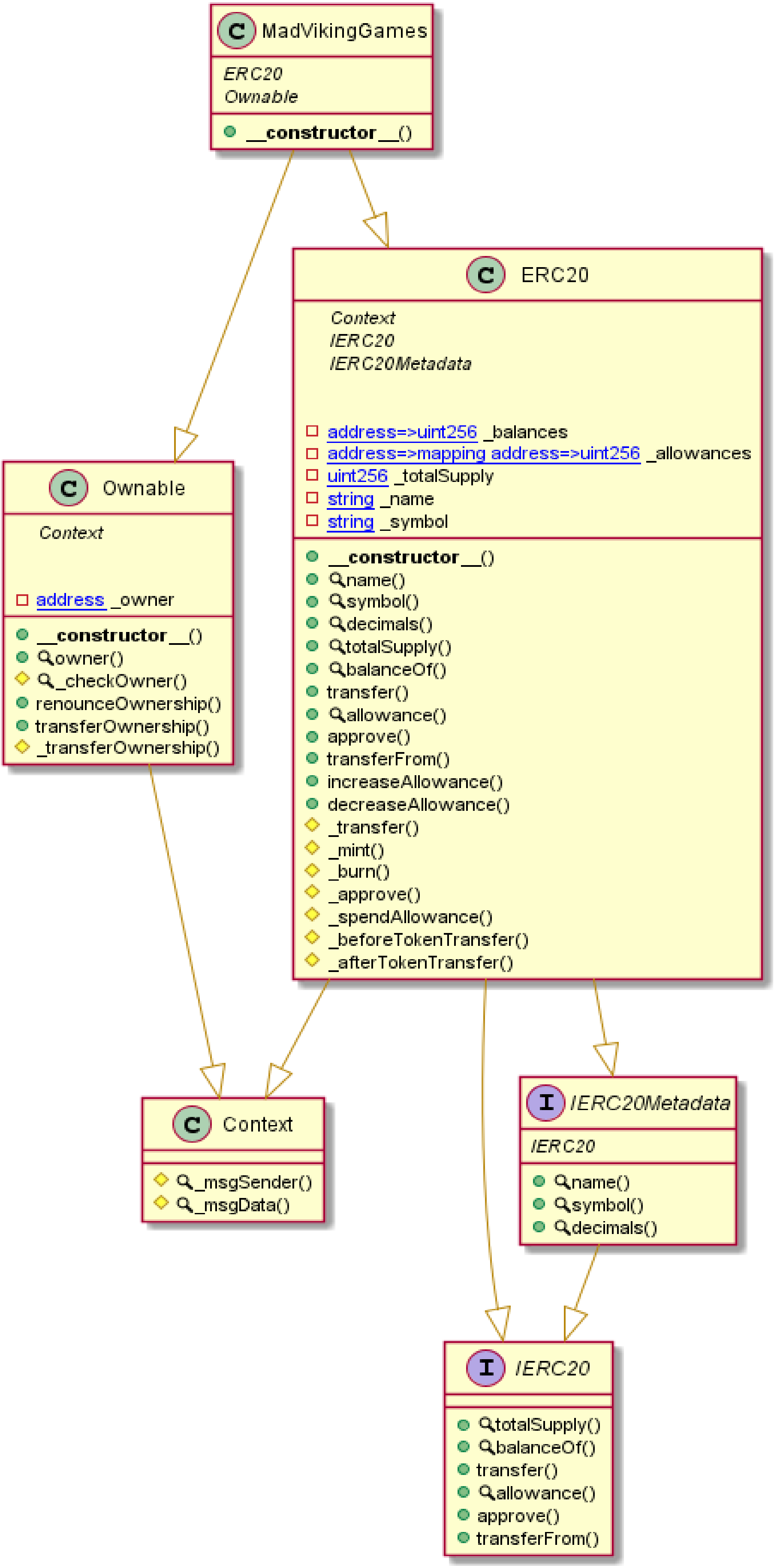
Appendix

Code Flow Diagram - Mad Viking Games

GEMS Diagram



MVG Diagram


MadVikingGames
ERC20
Ownable
__constructor__()
ERC20
Context
IERC20
IERC20Metadata
address=>uint256 _balances
address=>mapping address=>uint256 _allowances
uint256 _totalSupply
string _name
string _symbol
__constructor__()
name()
symbol()
decimals()
totalSupply()
balanceOf()
transfer()
allowance()
approve()
transferFrom()
increaseAllowance()
decreaseAllowance()
_transfer()
_mint()
_burn()
_approve()
_spendAllowance()
_beforeTokenTransfer()
_afterTokenTransfer()
Ownable
Context
address _owner
__constructor__()
owner()
_checkOwner()
renounceOwnership()
transferOwnership()
_transferOwnership()
Context
_msgSender()
_msgData()
IERC20Metadata
IERC20
name()
symbol()
decimals()
IERC20
totalSupply()
balanceOf()
transfer()
allowance()
approve()
transferFrom()

Slither Results Log

Slither log >> GEMS.sol

```
Context._msgData() (GEMS.sol#24-26) is never used and should be removed
ERC20._burn(address,uint256) (GEMS.sol#514-530) is never used and should be removed
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code

Pragma version^0.8.0 (GEMS.sol#7) allows old versions
Pragma version^0.8.0 (GEMS.sol#34) allows old versions
Pragma version^0.8.0 (GEMS.sol#119) allows old versions
Pragma version^0.8.0 (GEMS.sol#204) allows old versions
Pragma version^0.8.0 (GEMS.sol#234) allows old versions
solc-0.8.0 is not recommended for deployment
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#incorrect-versions-of-solidity

GEMS.constructor() (GEMS.sol#625-627) uses literals with too many digits:
        - _mint(msg.sender,100000000000 * 10 ** decimals()) (GEMS.sol#626)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#too-many-digits
GEMS.sol analyzed (6 contracts with 84 detectors), 9 result(s) found
```

Slither log >> MVG.sol

```
Context._msgData() (MVG.sol#24-26) is never used and should be removed
ERC20._burn(address,uint256) (MVG.sol#514-530) is never used and should be removed
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code

Pragma version^0.8.0 (MVG.sol#7) allows old versions
Pragma version^0.8.0 (MVG.sol#34) allows old versions
Pragma version^0.8.0 (MVG.sol#119) allows old versions
Pragma version^0.8.0 (MVG.sol#204) allows old versions
Pragma version^0.8.0 (MVG.sol#234) allows old versions
solc-0.8.0 is not recommended for deployment
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#incorrect-versions-of-solidity

MadVikingGames.constructor() (MVG.sol#621-623) uses literals with too many digits:
        - _mint(msg.sender,14000000000 * 10 ** decimals()) (MVG.sol#622)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#too-many-digits
MVG.sol analyzed (6 contracts with 84 detectors), 9 result(s) found
```

Solidity Static Analysis

GEMS.sol

Gas & Economy

Gas costs:

Gas requirement of function GEMS.decreaseAllowance is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 430:4:

Miscellaneous

Constant/View/Pure functions:

ERC20._afterTokenTransfer(address,address,uint256) : Potentially should be constant/view/pure but is not. Note: Modifiers are currently not considered by this static analysis.

more

Pos: 613:4:

Similar variable names:

ERC20._burn(address,uint256) : Variables have very similar names "account" and "amount". Note: Modifiers are currently not considered by this static analysis.

Pos: 529:49:

Guard conditions:

Use "assert(x)" if you never ever want x to be false, not in any circumstance (apart from a bug in your code). Use "require(x)" if x can be false, due to e.g. invalid input or a failing external component.

more

Pos: 572:12:

Email: audit@EtherAuthority.io

Gas & Economy

Gas costs:

Gas requirement of function MadVikingGames.transfer is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)
Pos: 342:4:

Miscellaneous

Constant/View/Pure functions:

IERC20.transferFrom(address,address,uint256) : Potentially should be constant/view/pure but is not. Note: Modifiers are currently not considered by this static analysis.
more
Pos: 192:4:

Similar variable names:

ERC20._mint(address,uint256) : Variables have very similar names "account" and "amount". Note: Modifiers are currently not considered by this static analysis.
Pos: 498:43:

Guard conditions:

Use "assert(x)" if you never ever want x to be false, not in any circumstance (apart from a bug in your code). Use "require(x)" if x can be false, due to e.g. invalid input or a failing external component.
more
Pos: 572:12:

Solhint Linter

GEMS.sol

```
GEMS.sol:434:18: Error: Parse error: missing ';' at '{'
GEMS.sol:467:18: Error: Parse error: missing ';' at '{'
GEMS.sol:494:18: Error: Parse error: missing ';' at '{'
GEMS.sol:521:18: Error: Parse error: missing ';' at '{'
GEMS.sol:573:22: Error: Parse error: missing ';' at '{'
```

MVG.sol

```
MVG.sol:434:18: Error: Parse error: missing ';' at '{'
MVG.sol:467:18: Error: Parse error: missing ';' at '{'
MVG.sol:494:18: Error: Parse error: missing ';' at '{'
MVG.sol:521:18: Error: Parse error: missing ';' at '{'
MVG.sol:573:22: Error: Parse error: missing ';' at '{'
```

Software analysis result:

These software reported many false positive results and some are informational issues. So, those issues can be safely ignored.

EtherAuthority

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