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Advanced Manual
Smart Contract Audit

November 16, 2022

CoinsultAudits

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Audit requested by

BridgeKeepers

Not Deployed on mainnet/testnet

Table of Contents

Audit Summary

Project Name	BridgeKeepers
Website	https://www.proofofmemes.org/
Blockchain	Ethereum
Smart Contract Language	Solidity
Contract Address	Not Deployed on mainnet/testnet
Audit Method	Static Analysis, Manual Review
Date of Audit	16 November 2022

This audit report has been prepared by Coinsult's experts at the request of the client. In this audit, the results of the static analysis and the manual code review will be presented. The purpose of the audit is to see if the functions work as intended, and to identify potential security issues within the smart contract.

The information in this report should be used to understand the risks associated with the smart contract. This report can be used as a guide for the development team on how the contract could possibly be improved by remediating the issues that were identified.

Audit Scope

Coinsult was comissioned by BridgeKeepers to perform an audit based on the following code:

Not Deployed on mainnet/testnet

Note that we only audited the code available to us on this URL at the time of the audit. If the URL is not from any block explorer (main net), it may be subject to change. Always check the contract address on this audit report and compare it to the token you are doing research for.

Audit Method

Coinsult's manual smart contract audit is an extensive methodical examination and analysis of the smart contract's code that is used to interact with the blockchain. This process is conducted to discover errors, issues and security vulnerabilities in the code in order to suggest improvements and ways to fix them.

Automated Vulnerability Check

Coinsult uses software that checks for common vulnerability issues within smart contracts. We use automated tools that scan the contract for security vulnerabilities such as integer-overflow, integer-underflow, out-of-gas-situations, unchecked transfers, etc.

Manual Code Review

Coinsult's manual code review involves a human looking at source code, line by line, to find vulnerabilities. Manual code review helps to clarify the context of coding decisions. Automated tools are faster but they cannot take the developer's intentions and general business logic into consideration.

Used tools

- Slither: Solidity static analysis framework
- Remix: IDE Developer Tool
- CWE: Common Weakness Enumeration
- SWC: Smart Contract Weakness Classification and Test Cases
- DEX: Testnet Blockchains

Risk Classification

Coinsult uses certain vulnerability levels, these indicate how bad a certain issue is. The higher the risk, the more strictly it is recommended to correct the error before using the contract.

Vulnerability Level	Description
🔵 Informational	Does not compromise the functionality of the contract in any way
🟢 Low-Risk	Won't cause any problems, but can be adjusted for improvement
🟡 Medium-Risk	Will likely cause problems and it is recommended to adjust
🔴 High-Risk	Will definitely cause problems, this needs to be adjusted

Coinsult has four statuses that are used for each risk level. Below we explain them briefly.

Risk Status	Description
Total	Total amount of issues within this category
Pending	Risks that have yet to be addressed by the team
Acknowledged	The team is aware of the risks but does not resolve them
Resolved	The team has resolved and remedied the risk

SWC Attack Analysis

The Smart Contract Weakness Classification Registry (SWC Registry) is an implementation of the weakness classification scheme proposed in EIP-1470. It is loosely aligned to the terminologies and structure used in the Common Weakness Enumeration (CWE) while overlaying a wide range of weakness variants that are specific to smart contracts.

ID	Description	Status
SWC-100	Function Default Visibility	Passed
SWC-101	Integer Overflow and Underflow	Passed
SWC-102	Outdated Compiler Version	Passed
SWC-103	Floating Pragma	Failed
SWC-104	Unchecked Call Return Value	Passed
SWC-105	Unprotected Ether Withdrawal	Passed
SWC-106	Unprotected SELFDESTRUCT Instruction	Passed
SWC-107	Reentrancy	Passed
SWC-108	State Variable Default Visibility	Failed
SWC-109	Uninitialized Storage Pointer	Passed
SWC-110	Assert Violation	Passed
SWC-111	Use of Deprecated Solidity Functions	Passed
SWC-112	Delegatecall to Untrusted Callee	Passed
SWC-113	DoS with Failed Call	Passed
SWC-114	Transaction Order Dependence	Passed
SWC-115	Authorization through tx.origin	Passed

SWC-116	Block values as a proxy for time	Passed
SWC-117	Signature Malleability	Passed
SWC-118	Incorrect Constructor Name	Passed
SWC-119	Shadowing State Variables	Passed
SWC-120	Weak Sources of Randomness from Chain Attributes	Passed
SWC-121	Missing Protection against Signature Replay Attacks	Passed
SWC-122	Lack of Proper Signature Verification	Passed
SWC-123	Requirement Violation	Passed
SWC-124	Write to Arbitrary Storage Location	Passed
SWC-125	Incorrect Inheritance Order	Passed
SWC-126	Insufficient Gas Griefing	Passed
SWC-127	Arbitrary Jump with Function Type Variable	Passed
SWC-128	DoS With Block Gas Limit	Passed
SWC-129	Typographical Error	Passed
SWC-130	Right-To-Left-Override control character (U+202E)	Passed
SWC-131	Presence of unused variables	Passed
SWC-132	Unexpected Ether balance	Passed
SWC-133	Hash Collisions With Multiple Variable Length Arguments	Passed
SWC-134	Message call with hardcoded gas amount	Passed
SWC-135	Code With No Effects	Passed
SWC-136	Unencrypted Private Data On-Chain	Passed

Global Overview

Manual Code Review

In this audit report we will highlight the following issues:

Vulnerability Level	Total	Pending	Acknowledged	Resolved
● Informational	0	0	0	0
● Low-Risk	6	6	0	0
● Medium-Risk	0	0	0	0
● High-Risk	2	0	0	2

Error Code	Description
SWC-116	CWE-829: Inclusion of Functionality from Untrusted Control Sphere

● **Low-Risk:** Could be fixed, will not bring problems.

Avoid relying on block.timestamp

block.timestamp can be manipulated by miners.

```
require(_deadline &gt;= block.timestamp - 300, "Out of time");
```

Recommendation

Do not use `block.timestamp`, now or `blockhash` as a source of randomness

Exploit scenario

```
contract Game {

    uint reward_determining_number;

    function guessing() external{
      reward_determining_number = uint256(block.blockhash(10000)) % 10;
    }
}
```

Eve is a miner. Eve calls `guessing` and re-orders the block containing the transaction. As a result, Eve wins the game.

Error Code	Description
SWC: 103	Floating Pragma

● **Low-Risk:** Could be fixed, will not bring problems.

Floating Pragma

Contracts should be deployed with the same compiler version and flags that they have been tested with thoroughly. Locking the pragma helps to ensure that contracts do not accidentally get deployed using, for example, an outdated compiler version that might introduce bugs that affect the contract system negatively.

```
pragma solidity ^0.8.0;
```

Recommendation

Lock the pragma version and also consider known bugs (https://github.com/ethereum/solidity/releases) for the compiler version that is chosen.

Pragma statements can be allowed to float when a contract is intended for consumption by other developers, as in the case with contracts in a library or EthPM package. Otherwise, the developer would need to manually update the pragma in order to compile locally.

Error Code	Description
SWC: 108	State variable visibility is not set.

● **Low-Risk:** Could be fixed, will not bring problems.

State Variable Default Visibility

Labeling the visibility explicitly makes it easier to catch incorrect assumptions about who can access the variable.

```
uint whitelistedMaxBuy = 1;
uint publicMaxBuy = 1;
```

Recommendation

Variables can be specified as being `public`, `internal` or `private`. Explicitly define visibility for all state variables.

Error Code	Description
SLT: 054	Missing Events Arithmetic

● **Low-Risk:** Could be fixed, will not bring problems.

Missing events arithmetic

Detect missing events for critical arithmetic parameters.

```
function setMaxSupply(uint256 _maxSupply) public onlyOwner {
    maxSupply = _maxSupply;
}

function setPause(bool _pause) public onlyOwner {
    pause = _pause;
}
```

Recommendation

Emit an event for critical parameter changes.

Exploit scenario

```
contract C {

  modifier onlyAdmin {
    if (msg.sender != owner) throw;
    _;
  }

  function updateOwner(address newOwner) onlyAdmin external {
    owner = newOwner;
  }
}
```

`updateOwner()` has no event, so it is difficult to track off-chain changes in the buy price.

Error Code	Description
SLT: 068	Conformity to Solidity naming conventions

🟢 **Low-Risk:** Could be fixed, will not bring problems.

Conformance to Solidity naming conventions

Allow _ at the beginning of the mixed_case match for private variables and unused parameters.

```
address private constant CreatorAddress = 0xf99613B4AE868b1aB1219Ba4FAf933DA928EA8ec;
uint256 private constant min_price = 1 ether;
```

Recommendation

Follow the Solidity naming convention.

Rule exceptions

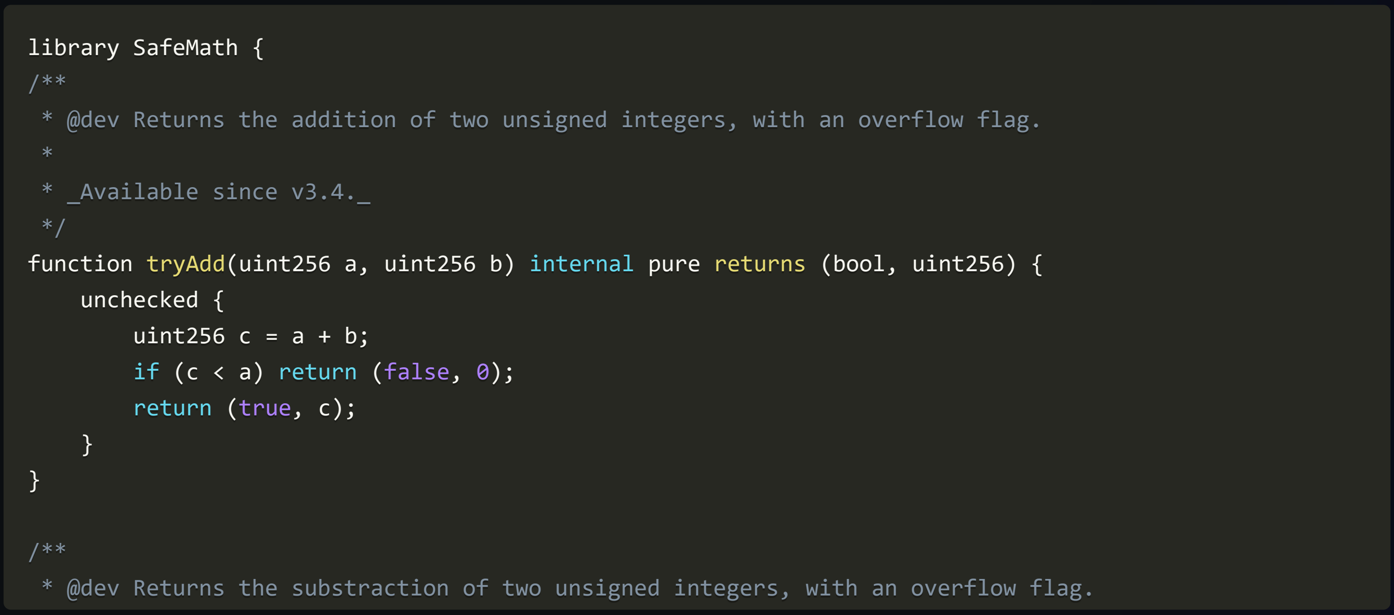
- Allow constant variable name/symbol/decimals to be lowercase (`ERC20`).
- Allow _ at the beginning of the `mixed_case` match for private variables and unused parameters.

Error Code	Description
CS: 071	Using safemath in Solidity 0.8.0+

● **Low-Risk:** Could be fixed, will not bring problems.

Using safemath in Solidity 0.8.0+

SafeMath is generally not needed starting with Solidity 0.8, since the compiler now has built in overflow checking.



```
library SafeMath {
/**
 * @dev Returns the addition of two unsigned integers, with an overflow flag.
 *
 * _Available since v3.4._
 */
function tryAdd(uint256 a, uint256 b) internal pure returns (bool, uint256) {
    unchecked {
        uint256 c = a + b;
        if (c < a) return (false, 0);
        return (true, c);
    }
}

/**
 * @dev Returns the substraction of two unsigned integers, with an overflow flag.
```

Recommendation

Check if you really need SafeMath and consider removing it.

Error Code	Description
CSH-01	Wrong operator used

● **High-Risk:** Must be fixed, will bring problems.

Wrong operator used

```
if(publicTime &lt; block.timestamp){
    _whitlistedBuy[msg.sender] += 1;
} else {
    _publicBuy[msg.sender] += 1;
}
```

Recommendation

Change

Error Code	Description
CSH-02	Wrong operator used

● **High-Risk:** Must be fixed, will bring problems.

Wrong operator used

```
if(publicTime = publicTime - whitelistedTime, "Mint not opened yet for whitelisted");
                require(whitelistedMaxBuy &gt;= _tokensURI.length, "Max Buy Limit");
                require(whitelistedMaxBuy &gt;= _whitlistedBuy[msg.sender] + _tokensURI.length, "Max
    } else {
                require(block.timestamp &gt;= publicTime, "Mint not opened yet for public");
    }
} else {
            require(block.timestamp &gt;= publicTime, "Mint not opened yet for public");
            require(publicMaxBuy &gt;= _tokensURI.length, "Max Buy Limit");
            require(publicMaxBuy &gt;= _publicBuy[msg.sender] + _tokensURI.length, "Max Buy Limit");
}
```

Recommendation

Change if(publicTime block.timestamp){

Error Code	Description
CSH-03	

● **High-Risk:** Must be fixed, will bring problems.

Recommendation

No recommendation

Other Owner Privileges Check

Error Code	Description
CEN-100	Centralization: Operator Priviliges

Coinsult lists all important contract methods which the owner can interact with.

⚠ Owner can set / change max supply, so it is not really a max supply

⚠ Owner can pause mints

⚠ Owner can add and remove to and from whitelist

Notes

Notes by BridgeKeepers

No notes provided by the team.

Notes by Coinsult

Small issues have been communicated with the project owners, they have resolved all small issues which are not relevant for the audit report.

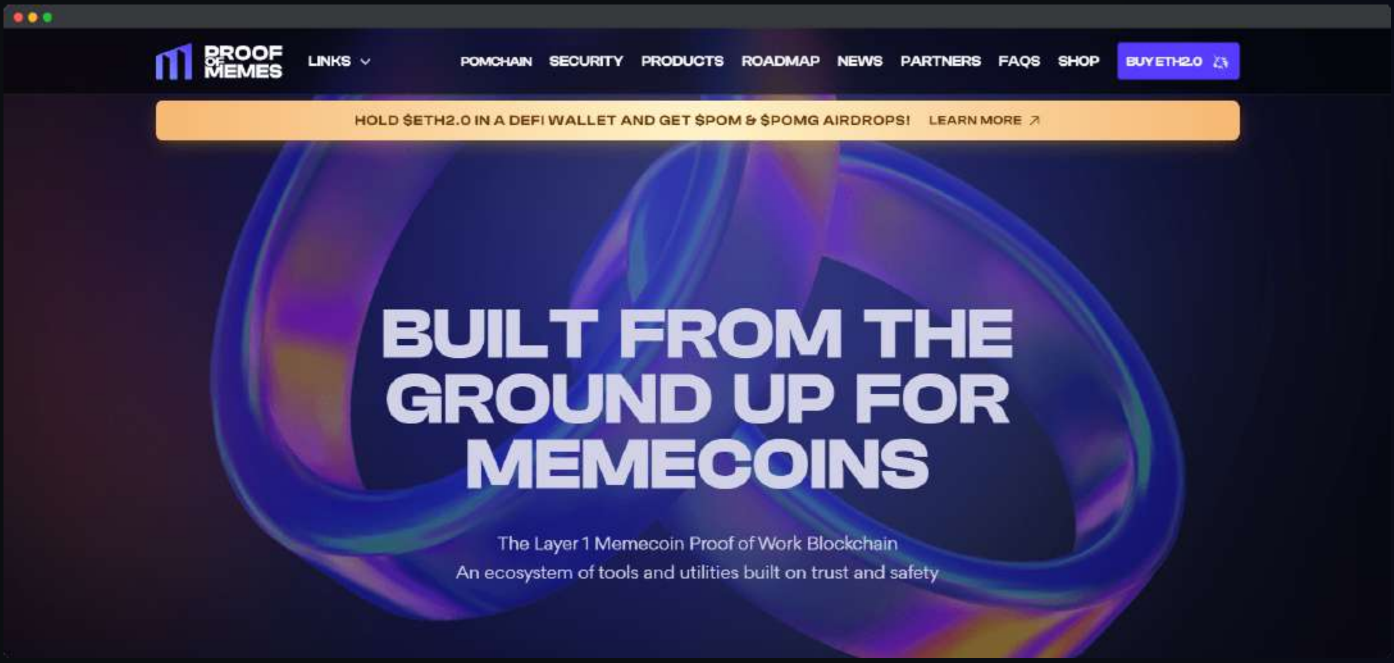
Contract Snapshot

This is how the constructor of the contract looked at the time of auditing the smart contract.

```
contract BridgeKeepers is ERC721, Ownable {
using Strings for uint256;
using SafeMath for uint256;
using Counters for Counters.Counter;

Counters.Counter private _tokenIdTracker;
mapping (uint256 =&gt; string) private _tokenURIs;
mapping (string =&gt; address) private _tokenIDs;
mapping (address =&gt; bool) public _whitlisted;
mapping (address =&gt; uint) public _whitlistedBuy;
mapping (address =&gt; uint) public _publicBuy;

address private constant CreatorAddress = 0xf99613B4AE868b1aB1219Ba4FAf933DA928EA8ec;

string private baseURIextended;
uint256 private constant min_price = 1 ether;
uint256 private maxSupply = 500;
uint256 public publicTime;
uint256 private whitelistedTime = 6 hours;
uint whitelistedMaxBuy = 1;
uint publicMaxBuy = 1;


bool private pause = false;

event NFTMinted(uint256 indexed tokenId, address owner, address to, string tokenURI);
event NFTMintTransfered(address to, uint value);

constructor(string memory _baseURIextended, uint256 _publicTime ) ERC721("BRIDGE KEEPERS", "BKS"){
    baseURIextended = _baseURIextended;
    publicTime = _publicTime;
}

function _setTokenURI(uint256 tokenId, string memory _tokenURI) internal virtual {
    require(_exists(tokenId), "URI set of nonexistent token");
    _tokenURIs[tokenId] = _tokenURI;
```

Website Review

Coinsult checks the website completely manually and looks for visual, technical and textual errors. We also look at the security, speed and accessibility of the website. In short, a complete check to see if the website meets the current standard of the web development industry.



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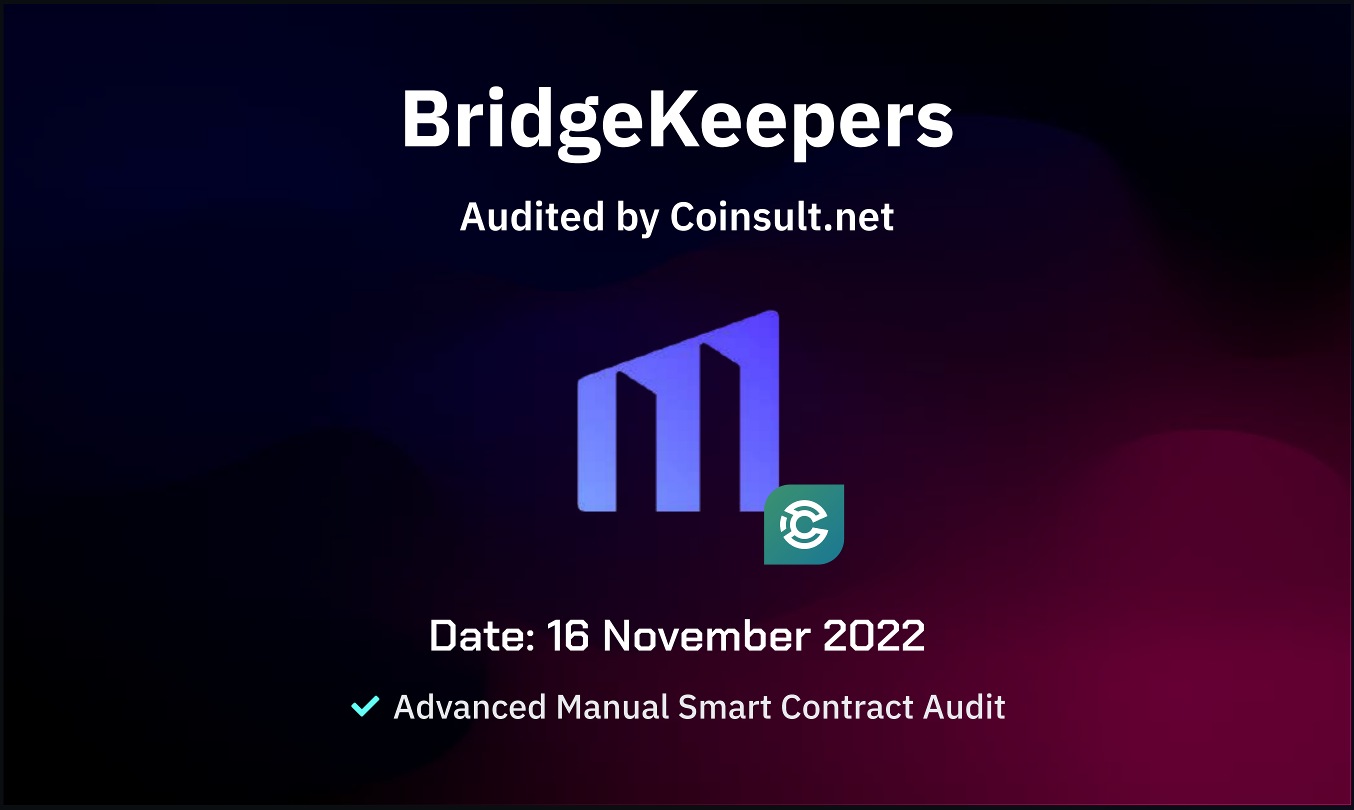
Type of check	Description
Mobile friendly?	● The website is mobile friendly
Contains jQuery errors?	● The website does not contain jQuery errors
Is SSL secured?	● The website is SSL secured
Contains spelling errors?	● The website does not contain spelling errors

Certificate of Proof

● Not KYC verified by Coinsult



BridgeKeepers

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✓ Advanced Manual Smart Contract Audit

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Coinsult is not responsible if a project turns out to be a scam, rug-pull or honeypot. We only provide a detailed analysis for your own research.

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The information provided in this audit is for informational purposes only and should not be considered investment advice. Coinsult does not endorse, recommend, support or suggest to invest in any project.

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End of report
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