Cyberscope

Audit Report

PAWDNAH

June 2023

SHA256 7e3846be89d2efb7aee885bf7216912bbc312dd4370bc23a121bd2c7f91b4d21

Audited by © cyberscope

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Review

Testing Deploy	https://testnet.bscscan.com/address/0x754e2c1b60ea7edabc0bf7127de36dffa71600de

Audit Updates

Initial Audit	06 Jun 2023

Source Files

Filename	SHA256
@openzeppelin/contracts/access/AccessControl.sol	afd98330d27bddff0db7cb8fcf42bd4766dda5f60b40871a3bec6220f9c9edf7
@openzeppelin/contracts/access/IAccessControl.sol	d03c1257f2094da6c86efa7aa09c1c07ebd33dd31046480c5097bc2542140e45
@openzeppelin/contracts/security/Pausable.sol	2072248d2f79e661c149fd6a6593a8a3f038466557c9b75e50e0b001bcb5cf97
@openzeppelin/contracts/security/ReentrancyGuard.sol	fa97ea556c990ee44f2ef4c80d4ef7d0af3f5f9b33a02142911140688106f5a9
@openzeppelin/contracts/token/ERC20/IERC20.sol	7ebde70853ccafcf1876900dad458f46eb9444d591d39bfc58e952e2582f5587
@openzeppelin/contracts/utils/Context.sol	1458c260d010a08e4c20a4a517882259a23a4baa0b5bd9add9fb6d6a1549814a
@openzeppelin/contracts/utils/introspection/ERC165.sol	8806a632d7b656cadb8133ff8f2acae4405b3a64d8709d93b0fa6a216a8a6154
@openzeppelin/contracts/utils/introspection/IERC165.sol	701e025d13ec6be09ae892eb029cd83b3064325801d73654847a5fb11c58b1e5
@openzeppelin/contracts/utils/math/Math.sol	85a2caf3bd06579fb55236398c1321e15fd524a8fe140dff748c0f73d7a52345
@openzeppelin/contracts/utils/math/SignedMath.sol	420a5a5d8d94611a04b39d6cf5f02492552ed4257ea82aba3c765b1ad52f77f6
@openzeppelin/contracts/utils/Strings.sol	cb2df477077a5963ab50a52768cb74ec6f32177177a78611ddbbe2c07e2d36de
contracts/testingDeploy/SecureDeposit.sol	7e3846be89d2efb7aee885bf7216912bbc312dd4370bc23a121bd2c7f91b4d21

Overview

The SecureDeposit contract implements a rewards mechanism based on deposits. The users can deposit a specific amount of token. The deposits are tracked from the contract using a FiFo (First in First out) structure. If the total depositors are more than three and the contract has three times the tokens of the first depositor, then the first depositor is applicable to withdraw three times the deposited amount and dequed from the structure. The tokens are idented to be USDC. The deposited amount is defined by the contract owner. The depositors cannot withraw their deposits unless the are applicable.

Roles

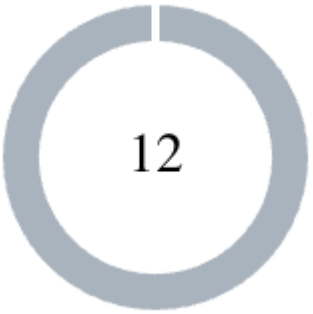
Users

- deposit
- withdraw

Admin

- pause
- unpause
- onlyRole
- addFundsToBackupWallet
- setDepositAmount
- revertState

Findings Breakdown



Critical	0
Medium	0
Minor / Informative	12

Severity	Unresolved	Acknowledged	Resolved	Other
Critical	0	0	0	0
Medium	0	0	0	0
Minor / Informative	12	0	0	0

Diagnostics

Critical Medium Minor / Informative

Severity	Code	Description	Status
	PTAI	Potential Transfer Amount Inconsistency	Unresolved
	RSAC	Redundant Sufficient Amount Check	Unresolved
	RNRM	Redundant No Reentrant Modifier	Unresolved
	RPC	Redundant Precondition Check	Unresolved
	MEE	Missing Events Emission	Unresolved
	RC	Repetitive Calculations	Unresolved
	RPC	Redundant Pause Condition	Unresolved
	IDI	Immutable Declaration Improvement	Unresolved
	L04	Conformance to Solidity Naming Conventions	Unresolved
	L16	Validate Variable Setters	Unresolved
	L19	Stable Compiler Version	Unresolved
	L20	Succeeded Transfer Check	Unresolved

PTAI - Potential Transfer Amount Inconsistency

Criticality	Minor / Informative
Location	contracts/testingDeploy/SecureDeposit.sol#L68
Status	Unresolved

Description

The `transfer()` and `transferFrom()` functions are used to transfer a specified amount of tokens to an address. The fee or tax is an amount that is charged to the sender of an ERC20 token when tokens are transferred to another address. According to the specification, the transferred amount could potentially be less than the expected amount. This may produce inconsistency between the expected and the actual behavior.

The following example depicts the diversion between the expected and actual amount.

Tax	Amount	Expected	Actual
No Tax	100	100	100
10% Tax	100	100	90

```
usdc.transferFrom(msg.sender, address(this), netAmount);
// Update deposits mapping and depositQueue array
deposits[msg.sender] = deposits[msg.sender] + netAmount;
depositQueue.push(Deposit(msg.sender, netAmount, block.timestamp));
```

Recommendation

The team is advised to take into consideration the actual amount that has been transferred instead of the expected.

It is important to note that an ERC20 transfer tax is not a standard feature of the ERC20 specification, and it is not universally implemented by all ERC20 contracts. Therefore, the

contract could produce the actual amount by calculating the difference between the transfer call.

```
Actual Transferred Amount = Balance After Transfer - Balance Before Transfer
```

RSAC - Redundant Sufficient Amount Check

Criticality	Minor / Informative
Location	contracts/testingDeploy/SecureDeposit.sol#L58
Status	Unresolved

Description

The deposit method includes a condition that checks if the `backupWallet` balance is three times the required number of tokens to cover the withdrawal. While this condition may appear to ensure the availability of sufficient funds for withdrawals, it overlooks the state of all previous depositors.

As a result, the redundant check creates a false sense of security as the contract may indeed have the necessary tokens to cover the current depositor's withdrawal but not the previous depositors. This oversight could lead to a situation where the contract fails to fulfill the withdrawal requests of previous depositors due to insufficient token reserves.

```
uint256 backupWalletBalance = usdc.balanceOf(backupWallet);
require(
    backupWalletBalance >= depositAmount * 3,
    "Insufficient funds in backup wallet"
);
```

Recommendation

To address this finding and mitigate potential issues, it is crucial to modify the deposit method's logic to consider the prior deposited amounts and withdrawals. The check should be based on the overall availability of tokens in the contract rather than solely relying on the 'backupWallet' balance. A comprehensive review of the contract's token allocation and withdrawal mechanism is necessary to implement a more accurate and robust solution.

RNRM - Redundant No Reentrant Modifier

Criticality	Minor / Informative
Location	contracts/testingDeploy/SecureDeposit.sol#L94
Status	Unresolved

Description

The contract uses the `nonReentrant` modifier to the `withdraw()` method, which suggests an intention to prevent potential reentrancy attacks. However, the `withdraw()` method exclusively deals with the `usdc` token, which is considered a trusted source within the contract.

Given that the `usdc` token is a trusted entity and no external address can be executed through the `withdraw()` method, the risk of reentrancy vulnerabilities is effectively mitigated. Consequently, the usage of the `nonReentrant` modifier becomes redundant, adding unnecessary complexity to the codebase.

```
function withdraw(uint256 amount) public whenNotPaused nonReentrant
{
    require(
        eligibleWithdrawals[msg.sender] >= amount,
        "Insufficient eligible withdrawal balance."
    );
    // Transfer USDC from contract to user's wallet
    usdc.transfer(msg.sender, amount);
    eligibleWithdrawals[msg.sender] =
eligibleWithdrawals[msg.sender] - amount;
    emit Withdrawn(msg.sender, amount);
}
```

Recommendation

To address this finding and enhance code simplicity and clarity, it is recommended to remove the unnecessary "nonReentrant" modifier from the "withdraw()" method. By removing the modifier, the code becomes more streamlined and easier to comprehend, reducing the gas consuption.

RPC - Redundant Precondition Check

Criticality	Minor / Informative
Location	contracts/testingDeploy/SecureDeposit.sol#L107
Status	Unresolved

Description

The contract contains a private method `removeFirstDepositorFromQueue()` that is invoked by `deposit()` that already checks the length of the `depositQueue` array before calling this method. The caller ensures that the array length is more than three, implying that the array is not empty.

```
if (
    depositQueue.length >= 3 &&
    !paused() &&
    usdc.balanceOf(address(this)) >= depositQueue[0].amount * 3
) {
...
require(depositQueue.length > 0, "Deposit queue is empty.");
```

Recommendation

To address this finding and improve code simplicity and clarity, it is recommended to remove the redundant empty array check within the `removeFirstDepositorFromQueue()` method. By relying on the precondition established by the caller, the codebase becomes more concise, easier to understand, and less prone to redundant or conflicting conditions.

MEE - Missing Events Emission

Criticality	Minor / Informative
Status	Unresolved

Description

The contract performs actions and state mutations from external methods that do not result in the emission of events. Emitting events for significant actions is important as it allows external parties, such as wallets or dApps, to track and monitor the activity on the contract. Without these events, it may be difficult for external parties to accurately determine the current state of the contract.

When the transfer is triggered from the method `deposit()` or the `revertState()` it would be helpful to emit an event as well.

```
usdc.transfer(withdrawalWallet, firstDeposit.amount * 3);
...
revertState()
```

Recommendation

It is recommended to include events in the code that are triggered each time a significant action is taking place within the contract. These events should include relevant details such as the user's address and the nature of the action taken. By doing so, the contract will be more transparent and easily auditable by external parties. It will also help prevent potential issues or disputes that may arise in the future.

RC - Repetitive Calculations

Criticality	Minor / Informative
Location	contracts/testingDeploy/SecureDeposit.sol#L74
Status	Unresolved

Description

The contract contains multiple occurrences of the same calculation being performed. The calculation is repeated without utilizing a variable to store its result, which leads to redundant code, hinders code readability, and increases gas consumption. Each repetition of the calculation requires computational resources and can impact the performance of the contract, especially if the calculation is resource-intensive.

The expression `depositQueue[0].amount * 3` that is the same as `firstDeposit.amount * 3)` is getting called 4 times in the same method.

```
if (
    depositQueue.length >= 3 &&
    !paused() &&
    usdc.balanceOf(address(this)) >= depositQueue[0].amount * 3
) {
    // Send funds to withdrawal wallet
    Deposit memory firstDeposit = depositQueue[0];
    usdc.transfer(withdrawalWallet, firstDeposit.amount * 3);
    withdrawalWalletBalance =
    withdrawalWalletBalance +
    (firstDeposit.amount * 3);
    eligibleWithdrawals[firstDeposit.depositor] =
    eligibleWithdrawals[firstDeposit.depositor] +
    (firstDeposit.amount * 3);
    removeFirstDepositorFromQueue();
}
```

Recommendation

To address this finding and enhance the efficiency and maintainability of the contract, it is recommended to refactor the code by assigning the calculation result to a variable once and then utilizing that variable throughout the method. By storing the calculation result in a

variable, the contract eliminates the need for redundant calculations and optimizes code execution.

Refactoring the code to assign the calculation result to a variable has several benefits. It improves code readability by making the purpose and intent of the calculation explicit. It also reduces code redundancy, making the method more concise, easier to maintain, and gas effective. Additionally, by performing the calculation once and reusing the variable, the contract improves performance by avoiding unnecessary computations

RPC - Redundant Pause Condition

Criticality	Minor / Informative
Location	contracts/testingDeploy/SecureDeposit.sol#L76
Status	Unresolved

Description

The method deposit contains a modifier `whenNotPaused()` which implies that the method should only execute when the contract is not in a paused state. However, the method also includes a condition check within its implementation, explicitly verifying if "!paused()" before proceeding with its logic.

This redundant condition check within the method creates unnecessary complexity and increases unnecessarily gas consumption. Since the `whenNotPaused()` modifier is already responsible for checking if the contract is not paused, the additional condition check is redundant and does not contribute to the intended functionality of the method.

```
function deposit(uint256 amount) public whenNotPaused {
...
if (
    depositQueue.length >= 3 &&
    !paused() &&
    usdc.balanceOf(address(this)) >= depositQueue[0].amount * 3
) {
```

Recommendation

To address this finding and improve code simplicity and readability, it is recommended to remove the redundant condition check within the method. By relying solely on the "whenNotPaused" modifier, the codebase becomes more concise, easier to understand, and less prone to logical errors or inconsistencies.

IDI - Immutable Declaration Improvement

Criticality	Minor / Informative
Location	contracts/testingDeploy/SecureDeposit.sol#L43,45,46,47
Status	Unresolved

Description

The contract declares state variables that their value is initialized once in the constructor and are not modified afterwards. The `immutable` is a special declaration for this kind of state variables that saves gas when it is defined.

```
usdc
withdrawalWallet
backupWallet
maintenanceWallet
```

Recommendation

By declaring a variable as immutable, the Solidity compiler is able to make certain optimizations. This can reduce the amount of storage and computation required by the contract, and make it more gas-efficient.

L04 - Conformance to Solidity Naming Conventions

Criticality	Minor / Informative
Location	contracts/testingDeploy/SecureDeposit.sol#L139
Status	Unresolved

Description

The Solidity style guide is a set of guidelines for writing clean and consistent Solidity code. Adhering to a style guide can help improve the readability and maintainability of the Solidity code, making it easier for others to understand and work with.

The followings are a few key points from the Solidity style guide:

1. Use camelCase for function and variable names, with the first letter in lowercase (e.g., myVariable, updateCounter).
2. Use PascalCase for contract, struct, and enum names, with the first letter in uppercase (e.g., MyContract, UserStruct, ErrorEnum).
3. Use uppercase for constant variables and enums (e.g., MAX_VALUE, ERROR_CODE).
4. Use indentation to improve readability and structure.
5. Use spaces between operators and after commas.
6. Use comments to explain the purpose and behavior of the code.
7. Keep lines short (around 120 characters) to improve readability.

```
uint256 _newAmount
```

Recommendation

By following the Solidity naming convention guidelines, the codebase increased the readability, maintainability, and makes it easier to work with.
Find more information on the Solidity documentation
https://docs.soliditylang.org/en/v0.8.17/style-guide.html#naming-convention.

L16 - Validate Variable Setters

Criticality	Minor / Informative
Location	contracts/testingDeploy/SecureDeposit.sol#L45,46,47
Status	Unresolved

Description

The contract performs operations on variables that have been configured on user-supplied input. These variables are missing of proper check for the case where a value is zero. This can lead to problems when the contract is executed, as certain actions may not be properly handled when the value is zero.

```
withdrawalWallet = _withdrawalWallet
backupWallet = _backupWallet
maintenanceWallet = _maintenanceWallet
```

Recommendation

By adding the proper check, the contract will not allow the variables to be configured with zero value. This will ensure that the contract can handle all possible input values and avoid unexpected behavior or errors. Hence, it can help to prevent the contract from being exploited or operating unexpectedly.

L19 - Stable Compiler Version

Criticality	Minor / Informative
Location	contracts/testingDeploy/SecureDeposit.sol#L2
Status	Unresolved

Description

The `^` symbol indicates that any version of Solidity that is compatible with the specified version (i.e., any version that is a higher minor or patch version) can be used to compile the contract. The version lock is a mechanism that allows the author to specify a minimum version of the Solidity compiler that must be used to compile the contract code. This is useful because it ensures that the contract will be compiled using a version of the compiler that is known to be compatible with the code.

```
pragma solidity ^0.8.19;
```

Recommendation

The team is advised to lock the pragma to ensure the stability of the codebase. The locked pragma version ensures that the contract will not be deployed with an unexpected version. An unexpected version may produce vulnerabilities and undiscovered bugs. The compiler should be configured to the lowest version that provides all the required functionality for the codebase. As a result, the project will be compiled in a well-tested LTS (Long Term Support) environment.

L20 - Succeeded Transfer Check

Criticality	Minor / Informative
Location	contracts/testingDeploy/SecureDeposit.sol#L66,68,81,100,130,135,165
Status	Unresolved

Description

According to the ERC20 specification, the transfer methods should be checked if the result is successful. Otherwise, the contract may wrongly assume that the transfer has been established.

```
usdc.transferFrom(msg.sender, maintenanceWallet, fee)
usdc.transferFrom(msg.sender, address(this), netAmount)
usdc.transfer(withdrawalWallet, firstDeposit.amount * 3)
usdc.transfer(msg.sender, amount)
usdc.transferFrom(msg.sender, withdrawalWallet, amount)
usdc.transferFrom(msg.sender, backupWallet, amount)

usdc.transferFrom(
        backupWallet,
        depositQueue[i].depositor,
        depositQueue[i].amount
      )
```

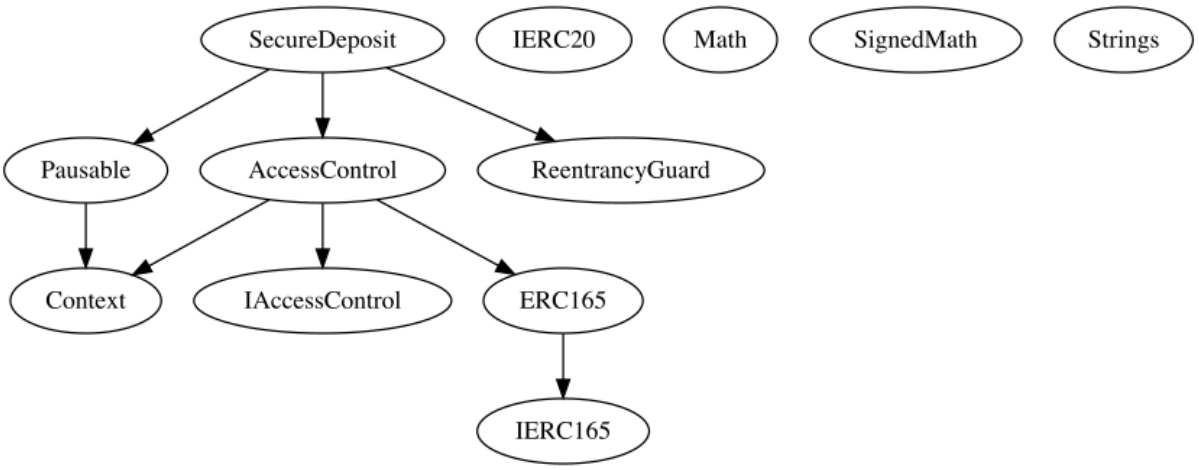
Recommendation

The contract should check if the result of the transfer methods is successful. The team is advised to check the SafeERC20 library from the Openzeppelin library.

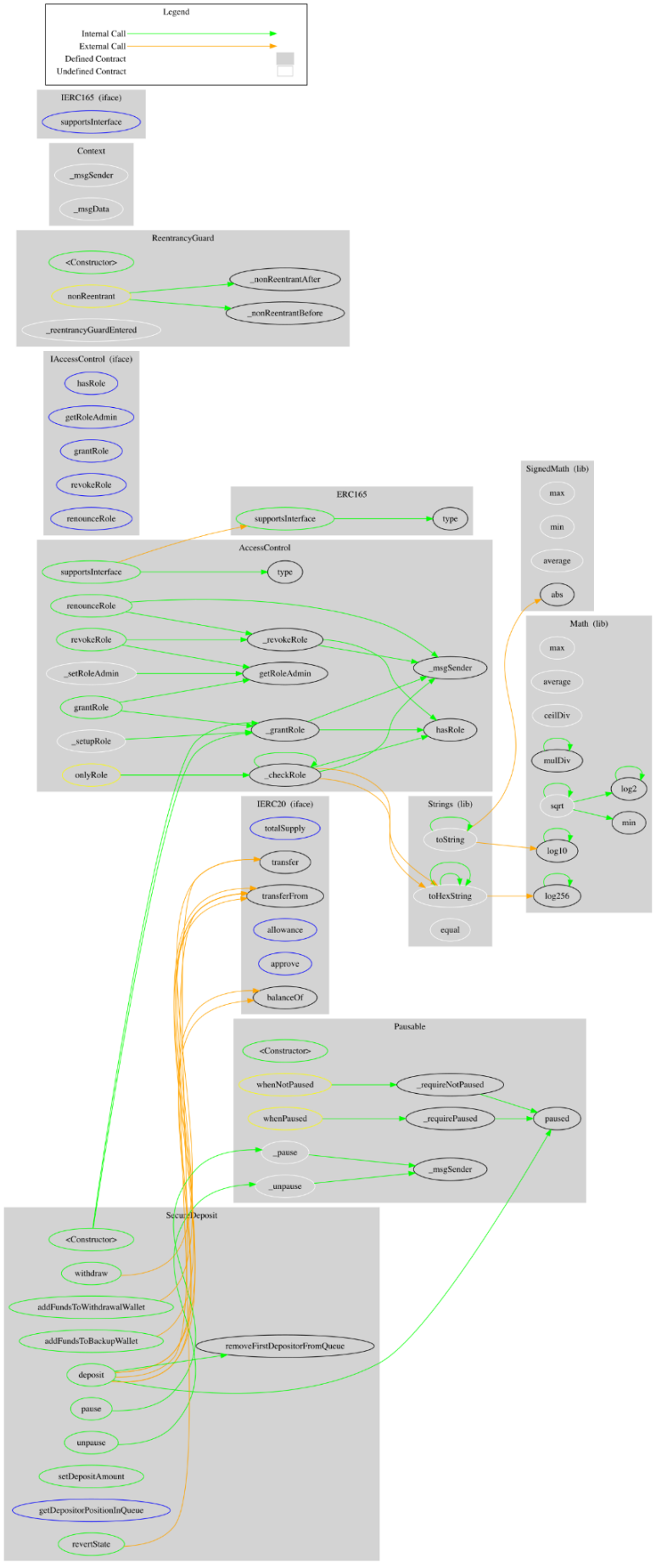
Functions Analysis

Contract	Type	Bases		
	Function Name	**Visibility**	**Mutability**	**Modifiers**
SecureDeposit	Implementation	AccessControl, ReentrancyGuard, Pausable		
		Public	✓	-
	deposit	Public	✓	whenNotPaused
	withdraw	Public	✓	whenNotPaused nonReentrant
	removeFirstDepositorFromQueue	Internal	✓	
	pause	Public	✓	onlyRole
	unpause	Public	✓	onlyRole
	addFundsToWithdrawalWallet	Public	✓	onlyRole
	addFundsToBackupWallet	Public	✓	onlyRole
	setDepositAmount	Public	✓	onlyRole
	getDepositorPositionInQueue	External		-
	revertState	Public	✓	onlyRole

Inheritance Graph



Flow Graph


Legend
Internal Call
External Call
Defined Contract
Undefined Contract
IERC165 (iface)
supportsInterface
Context
_msgSender
_msgData
ReentrancyGuard
<Constructor>
nonReentrant
_reentrancyGuardEntered
_nonReentrantAfter
_nonReentrantBefore
IAccessControl (iface)
hasRole
getRoleAdmin
grantRole
revokeRole
renounceRole
ERC165
supportsInterface
type
SignedMath (lib)
max
min
average
abs
AccessControl
supportsInterface
type
renounceRole
revokeRole
_setRoleAdmin
grantRole
_setupRole
onlyRole
_revokeRole
getRoleAdmin
_grantRole
_checkRole
_msgSender
hasRole
Math (lib)
max
average
ceilDiv
mulDiv
sqrt
log2
min
log10
log256
IERC20 (iface)
totalSupply
transfer
transferFrom
allowance
approve
balanceOf
Strings (lib)
toString
toHexString
equal
Pausable
<Constructor>
whenNotPaused
whenPaused
_pause
_unpause
_requireNotPaused
_requirePaused
paused
_msgSender
SecureDeposit
<Constructor>
withdraw
addFundsToWithdrawalWallet
addFundsToBackupWallet
deposit
pause
unpause
setDepositAmount
getDepositorPositionInQueue
revertState
removeFirstDepositorFromQueue

Summary

Marsmello Burn contract implements a rewards mechanism based on deposits. This audit investigates security issues, business logic concerns and potential improvements.

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Blockchain technology and cryptographic assets present a high level of ongoing risk Cyberscope's position is that each company and individual are responsible for their own due diligence and continuous security Cyberscope's goal is to help reduce the attack vectors and the high level of variance associated with utilizing new and consistently changing technologies and in no way claims any guarantee of security or functionality of the technology we agree to analyze. The assessment services provided by Cyberscope are subject to dependencies and are under continuing development. You agree that your access and/or use including but not limited to any services reports and materials will be at your sole risk on an as-is where-is and as-available basis Cryptographic tokens are emergent technologies and carry with them high levels of technical risk and uncertainty. The assessment reports could include false positives false negatives and other unpredictable results. The services may access and depend upon multiple layers of third parties.

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The Cyberscope team

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