



Cyberscope

Audit Report

Moonlabs

March 2023

SHA256

31cd30ebacbd1d3c336e67f58a0eba2e9b9fe9fa5716fdfe59e3317220dc4e9e
c3803461e1c537ca7cf72e504671bd17f2eeb2bcb42fab84b2101273133f17f6
6004b19aaf6be17db693c1488716e102ed024f315eebb991bca6b43f72d85851
a162ecd4fe206f07160297a15058b9e9b4b26e0b8da6a29cb44986c90b64964b
46a4f16d522bf41f51494863831cefa4cee91c427b14775b84af196fbc11d0d8

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Review

Audit Updates

Initial Audit	09 Mar 2023 https://github.com/cyberscope-io/audits/blob/main/moonlabs/v1/audit.pdf
Corrected Phase 2	20 Mar 2023 https://github.com/cyberscope-io/audits/blob/main/moonlabs/v2/audit.pdf
Corrected Phase 3	24 Mar 2023

Source Files

Filename	SHA256
IDEXRouter.sol	8d6779499e4bb704e8a5172278f4fcd82d299882cd4ef64ddd2fadcd24e202e
MoonLabsLiquidityLocker.sol	31cd30ebacbd1d3c336e67f58a0eba2e9b9fe9fa5716fdfe59e3317220dc4e9e
MoonLabsReferral.sol	c3803461e1c537ca7cf72e504671bd17f2eeb2bcb42fab84b2101273133f17f6
MoonLabsTokenLocker.sol	6004b19aaf6be17db693c1488716e102ed024f315eebb991bca6b43f72d85851
MoonLabsVesting.sol	a162ecd4fe206f07160297a15058b9e9b4b26e0b8da6a29cb44986c90b64964b
MoonLabsWhitelist.sol	46a4f16d522bf41f51494863831cefa4cee91c427b14775b84af196fbc11d0d8

Testing Deploy

Contract Name	Explorer
MoonLabsLiquidityLocker	https://testnet.bscscan.com/address/0x467afa08EaE64d4cee8AFeD9aE0Fb5B5a4f53875#code
MoonLabsReferral	https://testnet.snowtrace.io/address/0xdCF65098B0873153A86C2408dFD012c4847fF299
MoonLabsTokenLocker	https://testnet.bscscan.com/address/0xf7b518558ca23454947D6880c0d904259f40C8c5
MoonLabsVesting	https://testnet.bscscan.com/address/0x2E9b0869603e3Ee86234491c72915C05Bb31e1e5
MoonLabsWhitelist	https://testnet.snowtrace.io/address/0xd0ac48Be795ADA54DC7260680A0379EDE6B54bad

Introduction

The Moonlab ecosystem consists of five contracts as upgradable proxies. Two utility contracts and three locker contracts.

MoonLabsWhitelist

The MoonLabsWhitelist contract is used for creating whitelists for Moon Labs products. Whitelisting a token allows users to waive all fees on related Moon Labs products.

Roles

The contract roles consist of the owner role.

The `owner` is responsible for:

- Adding or removing a whitelisted address.
- Claim all contract deposited balance.
- Claim all `usdContract` token balance.

The users have the authority to:

- Purchase a whitelist with or without a discount code.
- Check the whitelisted address.

MoonLabsReferral

The MoonLabsReferral smart contract is used for creating and managing referral codes. It allows users to create referral codes for customers to use while purchasing Moon Labs products.

Roles

The contract roles consist of the owner role.

The `owner` role is responsible for:

- Delete referral code.
- Add reserved codes.
- Assign or remove reserved codes.
- Add or remove addMoonLabsContract.
- Claim all contract deposited balance.

The user has the authority to:

- Check active codes.
- Get the address to the referral code.
- Get referral code to address.
- Add rewards earned for a code.
- Create, delete, transfer, and reserve referral codes.

MoonLabsVesting

The MoonLabsVesting Contract allows token owners to create ERC20 token locks. The Contract supports creating multiple vesting instances, choosing between linear and standard Locks, and transferring Locks to other addresses. The Contract also includes a feature to buy back and burn the native token, as well as a referral code system and whitelist function. Lock creators cannot modify locks once they have been created, and withdraw owners cannot extend or change lock details.

Roles

The contract roles consist of the owner role.

The `owner` role is responsible for:

- Claim all contract deposited balance.
- Configure contract parameters like address, prices, and thresholds.

The user has the authority to:

- Create one or multiple vesting instances for a single token with fees or without fees or with a discount code.
- Transfer vesting instances ownership.
- Get nonces from address.
- Get the address from nonce.
- Get the lock tokens from the address.
- View claimable tokens.
- Withdraw unlocked tokens.

MoonLabsTokenLocker

The MoonLabsTokenLocker contract is designed to allow users to create locks for ERC20 tokens. Lock creators can extend, transfer, add to, and split locks, but cannot unlock tokens prematurely. Users can create lock instances for the same token and choose either a linear or standard lock. The Contract also includes a feature to buy back and burn the native token, as well as a referral code system and whitelist function.

Roles

The contract roles consist of the owner role.

The `owner` role is responsible for:

- Claim all contract deposited balance.
- Configure contract parameters like address, prices, and thresholds.

The user has the authority to:

- Create one or multiple vesting instances for a single token with fees or without fees or with a discount code.
- Transfer vesting instances ownership.
- Get nonces from address.
- Get the address from nonce.
- Get the lock tokens from the address.
- View claimable tokens.
- Withdraw unlocked tokens.
- Change withdrawal address.
- Relock or add tokens to an existing lock with or without fees.
- Divide a lock into multiple locks with or without fees.

MoonLabsLiquidityLocker

The MoonLabsLiquidityLocker contract is responsible for creating liquidity locks for Uniswap-based AMM tokens. The main purpose of the contract is to allow users to create locks for selected wallets with the option to choose between standard or linear lock types. The lock type is determined by the start date, with the default being a standard lock. The locked tokens remain locked until their respective unlock date without any exceptions, and lock owners are not allowed to unlock them prematurely. The Contract also includes a feature to buy back and burn the native token, as well as a referral code system and whitelist function.

Roles

The contract roles consist of the owner role.

The `owner` role is responsible for:

- Claim all contract deposited balance.
- Configure contract parameters like importance, address, prices, and thresholds.

The user has the authority to:

- Create one or multiple vesting instances for a single token with fees or without fees or with a discount code.
- Transfer vesting instances ownership.
- Get nonces from address.
- Get the address from nonce.
- Get the lock tokens from the address.
- View claimable tokens.
- Withdraw unlocked tokens.
- Change withdrawal address.
- Relock or add tokens to an existing lock with or without fees.
- Divide a lock into multiple locks with or without fees.

Diagnostics

● Critical ● Medium ● Minor / Informative

Severity	Code	Description	Status
●	TPP	Token Pair Prevalidation	Unresolved
●	AAO	Accumulated Amount Overflow	Unresolved
●	PTAI	Potential Transfer Amount Inconsistency	Unresolved
●	MSC	Missing Sanity Checks	Unresolved
●	CO	Code Optimization	Unresolved
●	L04	Conformance to Solidity Naming Conventions	Unresolved
●	L07	Missing Events Arithmetic	Unresolved
●	L16	Validate Variable Setters	Unresolved

TPP - Token Pair Prevalidation

Criticality	Minor / Informative
Location	MoonLabsLiquidityLocker.sol#L887MoonLabsVesting.sol#L733MoonLabsTokenLocker.sol#L1055
Status	Unresolved

Description

The contract allows users to initiate swap transactions between two tokens without first checking if a token pair exists. This could result in the loss of funds if the contract is unable to find a liquidity pool for the specified token pair.

```
function handleBurns() private {
    /// Check if the threshold is met
    uint _burnMeter = burnMeter;
    if (burnMeter >= burnThreshold) {
        /// Buy tokenToBurn via Uniswap router and send to the
        dead address
        address[] memory path = new address[](2);
        path[0] = routerContract.WETH();
        path[1] = address(tokenToBurn);

        routerContract.swapExactETHForTokensSupportingFeeOnTransferTokens{ value: _burnMeter }(0, path,
0x0000000000000000000000000000000000000000000000000000000000000000dEaD, block.timestamp);
        _burnMeter = 0;
        burnMeter = _burnMeter;
    }
}
```

Recommendation

It is recommended to pre-validate that a token pair exists before allowing users to initiate swap transactions. A valid pair address should have token0, token1, factory

AAO - Accumulated Amount Overflow

Criticality	Minor / Informative
Location	MoonLabsLiquidityLocker.solMoonLabsTokenLocker.solMoonLabsVesting.sol
Status	Unresolved

Description

The contract is using the variable `nonce` to accumulate values. The contract could lead to an overflow when the total value of a variable exceeds the maximum value that can be stored in that variable's data type. This can happen when an accumulated value is updated repeatedly over time, and the value grows beyond the maximum value that can be represented by the data type.

```
uint64 public nonce; /// Unique lock identifier
```

Recommendation

The team is advised to carefully investigate the usage of the variables that accumulate value. A suggestion is to add checks to the code to ensure that the value of a variable does not exceed the maximum value that can be stored in its data type.

PTAI - Potential Transfer Amount Inconsistency

Criticality	Minor / Informative
Location	MoonLabsWhitelist.solMoonLabsLiquidityLocker.sol#L854MoonLabsVesting.sol#L651MoonLabsTokenLocker.sol#L1022
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

```
usdContract.safeTransferFrom(  
    address(this),  
    msg.sender,  
    usdContract.balanceOf(address(this))  
);  
  
IERC20Upgradeable(tokenAddress).safeTransferFrom(  
    from,  
    address(this),  
    amount  
);
```

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
```

MSC - Missing Sanity Checks

Criticality	Minor / Informative
Location	MoonLabsLiquidityLocker.solMoonLabsVesting.solMoonLabsTokenLocker.sol
Status	Unresolved

Description

The contract is processing variables that have not been properly sanitized and checked that they form the proper shape. These variables may produce vulnerability issues.

```
function initialize(...){...}
function splitLockETH(address to, uint64 _nonce, uint amount )
external payable {...}
function splitLockPercent(address to, uint64 _nonce, uint
amount) external {...}
function splitLockPercent(address to, address
withdrawalAddress, uint64 _nonce, uint amount ) external {...}
```

Recommendation

The team is advised to properly check the variables according to the required specifications.

- The `initializer` addresses shouldn't be set to zero addresses.
- The `to` addresses shouldn't be set to zero addresses.
- The `withdrawalAddress` addresses shouldn't be set to zero addresses.

CO - Code Optimization

Criticality	Minor / Informative
Location	MoonLabsVesting.sol#L544
Status	Unresolved

Description

There are code segments that could be optimized. A segment may be optimized so that it becomes a smaller size, consumes less memory, executes more rapidly, or performs fewer operations.

The `depositAmount` and `totalDeposit` are the same. Hence the `MathUpgradeable.mulDiv` calculation is redundant.

```
MathUpgradeable.mulDiv(  
    amountSent,  
    depositAmount,  
    totalDeposited  
) ,
```

Recommendation

The team is advised to take these segments into consideration and rewrite them so the runtime will be more performant. That way it will improve the efficiency and performance of the source code and reduce the cost of executing it.

- Redundant code statements could be removed.

L04 - Conformance to Solidity Naming Conventions

Criticality	Minor / Informative
Location	MoonLabsWhitelist.sol#L37,62,80,108,117,126,134,143,173MoonLabsVesting.sol#L42,43,255,286,330,339,348,357,365,373,382,391,399,408,441,459,627,698MoonLabsTokenLocker.sol#L42,43,285,315,316,317,355,392,447,509,578,655,664,673,682,690,698,706,714,723,732,740,749,758,768,813,836,1047,1092MoonLabsReferral.sol#L183,191,257,317MoonLabsLiquidityLocker.sol#L43,44,263,288,321,323,370,372,425,487,558,567,576,585,593,601,609,617,626,635,643,652,662,673,707,811
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.

```
uint _costUSD
address _usdAddress
address _address
uint8 _codeDiscount
uint8 _codeCommission
address _tokenToBurn
address _feeCollector
uint64 _nonce
address _routerAddress
address _referralAddress
uint _burnThreshold
uint _ethLockPrice
uint8 _burnPercent
uint16 _percentLockPrice

...
```

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>.

L07 - Missing Events Arithmetic

Criticality	Minor / Informative
Location	MoonLabsWhitelist.sol#L127,136,145MoonLabsVesting.sol#L358,401MoonLabsTokenLocker.sol#L683,742MoonLabsLiquidityLocker.sol#L586,645
Status	Unresolved

Description

Events are a way to record and log information about changes or actions that occur within a contract. They are often used to notify external parties or clients about events that have occurred within the contract, such as the transfer of tokens or the completion of a task.

It's important to carefully design and implement the events in a contract, and to ensure that all required events are included. It's also a good idea to test the contract to ensure that all events are being properly triggered and logged.

```
costUSD = _costUSD
codeDiscount = _codeDiscount
codeCommission = _codeCommission
burnThreshold = _burnThreshold
burnPercent = _burnPercent
```

Recommendation

By including all required events in the contract and thoroughly testing the contract's functionality, the contract ensures that it performs as intended and does not have any missing events that could cause issues with its arithmetic.

L16 - Validate Variable Setters

Criticality	Minor / Informative
Location	MoonLabsWhitelist.sol#L39MoonLabsVesting.sol#L50MoonLabsTokenLocker.sol#L50MoonLabsLiquidityLocker.sol#L51
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.

```
usdAddress = _usdAddress  
feeCollector = _feeCollector
```

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.

Functions Analysis

Contract	Type	Bases		
	Function Name	Visibility	Mutability	Modifiers
IMoonLabsReferral	Interface			
	checkIfActive	External		-
	getAddressByCode	External		-
	addRewardsEarned	External	✓	-
IMoonLabsWhitelist	Interface			
	getIsWhitelisted	External		-
MoonLabsLiquidityLocker	Implementation	Initializable, Ownable Upgradeable, ReentrancyGuard		

		Upgrade able		
	initialize	Public	✓	initializer
	createLockPercent	External	✓	-
	createLockEth	External	Payable	-
	createLockWithCodeEth	External	Payable	-
	withdrawUnlockedTokens	External	✓	-
	transferLockOwnership	External	✓	-
	relockETH	External	Payable	-
	relockPercent	External	✓	-
	splitLockETH	External	Payable	-
	splitLockPercent	External	✓	-
	claimETH	External	✓	onlyOwner
	setFeeCollector	External	✓	onlyOwner
	setRouter	External	✓	onlyOwner
	setReferralContract	External	✓	onlyOwner
	setBurnThreshold	External	✓	onlyOwner
	setLockPrice	External	✓	onlyOwner
	setSplitPrice	External	✓	onlyOwner

	setRelockPrice	External	✓	onlyOwner
	setCodeDiscount	External	✓	onlyOwner
	setCodeCommission	External	✓	onlyOwner
	setTokenToBurn	External	✓	onlyOwner
	setBurnPercent	External	✓	onlyOwner
	setPercentLockPrice	External	✓	onlyOwner
	setPercentSplitPrice	External	✓	onlyOwner
	setPercentRelockPrice	External	✓	onlyOwner
	getNonceFromOwnerAddresses	External		-
	getNonceFromTokenAddresses	External		-
	getLock	External		-
	createLockInstance	Private	✓	
	transferAndCalculate	Private	✓	
	transferAndCalculateWithFee	Private	✓	
	getClaimableTokens	Public		-
	transferTokensFrom	Private	✓	
	transferTokensTo	Private	✓	
	handleBurns	Private	✓	

	distributeCommission	Private	✓	nonReentrant
	deleteLockInstance	Private	✓	
IMoonLabsReferral	Interface			
	checkIfActive	External		-
	getCodeByAddress	External		-
	getAddressByCode	External		-
	addRewardsEarned	External	✓	-
	addRewardsEarnedUSD	External	✓	-
MoonLabsReferral	Implementation	Initializable, IMoonLabsReferral, Ownable Upgradeable		
	initialize	Public	✓	initializer
	createCode	External	✓	-
	deleteCode	External	✓	-

	deleteCodeOwner	External	✓	onlyOwner
	setCodeAddress	External	✓	-
	addReservedCodes	External	✓	onlyOwner
	assignReservedCode	External	✓	onlyOwner
	addMoonLabsContract	External	✓	onlyOwner
	removeMoonLabsContract	External	✓	onlyOwner
	addRewardsEarned	External	✓	-
	addRewardsEarnedUSD	External	✓	-
	getRewardsEarned	External		-
	getRewardsEarnedUSD	External		-
	getCodeByAddress	External		-
	getAddressByCode	External		-
	claimETH	External	✓	onlyOwner
	removeReservedCode	Public	✓	onlyOwner
	checkIfActive	Public		-
	upper	Private		
	_upper	Private		

IMoonLabs Referral	Interface			
	checkIfActive	External		-
	getAddressByCode	External		-
	addRewardsEarned	External	✓	-
IMoonLabs Whitelist	Interface			
	getIsWhitelisted	External		-
MoonLabs TokenLocker	Implementation	Initializable, Ownable Upgradeable, ReentrancyGuard Upgradeable		
	initialize	Public	✓	initializer
	createLockPercent	External	✓	-
	createLockEth	External	Payable	-
	createLockWithCodeEth	External	Payable	-
	withdrawUnlockedTokens	External	✓	-

	transferLockOwnership	External	✓	-
	setLockWithdrawalAddress	Public	✓	-
	relockETH	External	Payable	-
	relockPercent	External	✓	-
	splitLockETH	External	Payable	-
	splitLockPercent	External	✓	-
	claimETH	External	✓	onlyOwner
	setFeeCollector	External	✓	onlyOwner
	setRouter	External	✓	onlyOwner
	setReferralContract	External	✓	onlyOwner
	setBurnThreshold	External	✓	onlyOwner
	setLockPrice	External	✓	onlyOwner
	setSplitPrice	External	✓	onlyOwner
	setRelockPrice	External	✓	onlyOwner
	setCodeDiscount	External	✓	onlyOwner
	setCodeCommission	External	✓	onlyOwner
	setTokenToBurn	External	✓	onlyOwner
	setBurnPercent	External	✓	onlyOwner
	setPercentLockPrice	External	✓	onlyOwner

	setPercentSplitPrice	External	✓	onlyOwner
	setPercentRelockPrice	External	✓	onlyOwner
	getNonceFromOwnerAddresses	External		-
	getNonceFromWithdrawalAddress	External		-
	getNonceFromTokenAddresses	External		-
	getLock	External		-
	getClaimableTokens	Public		-
	createLockInstances	Private	✓	
	calculateTotalDeposited	Private		
	transferAndCalculate	Private	✓	
	transferAndCalculateWithFee	Private	✓	
	transferTokensFrom	Private	✓	
	transferTokensTo	Private	✓	
	handleBurns	Private	✓	
	distributeCommission	Private	✓	nonReentrant
	deleteLockInstance	Private	✓	
	calculateLinearWithdraw	Private		

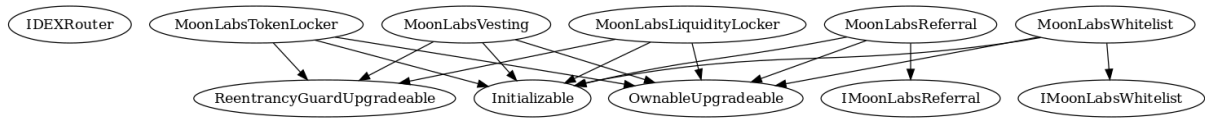
IMoonLabs Referral	Interface			
	checkIfActive	External		-
	getAddressByCode	External		-
	addRewardsEarned	External	✓	-
IMoonLabs Whitelist	Interface			
	getIsWhitelisted	External		-
MoonLabs Vesting	Implementation	Initializable, Ownable Upgradeable, ReentrancyGuard Upgradeable		
	initialize	Public	✓	initializer
	createLockPercent	External	✓	-
	createLockEth	External	Payable	-
	createLockWithCodeEth	External	Payable	-

	withdrawUnlockedTokens	External	✓	-
	transferVestingOwnership	External	✓	-
	claimETH	External	✓	onlyOwner
	setFeeCollector	External	✓	onlyOwner
	setRouter	External	✓	onlyOwner
	setReferralContract	External	✓	onlyOwner
	setBurnThreshold	External	✓	onlyOwner
	setLockPrice	External	✓	onlyOwner
	setCodeDiscount	External	✓	onlyOwner
	setCodeCommission	External	✓	onlyOwner
	setTokenToBurn	External	✓	onlyOwner
	setBurnPercent	External	✓	onlyOwner
	setPercentLockPrice	External	✓	onlyOwner
	getNonceFromWithdrawalAddress	External		-
	getNonceFromTokenAddresses	External		-
	getInstance	External		-
	getClaimableTokens	Public		-
	createLockInstances	Private	✓	

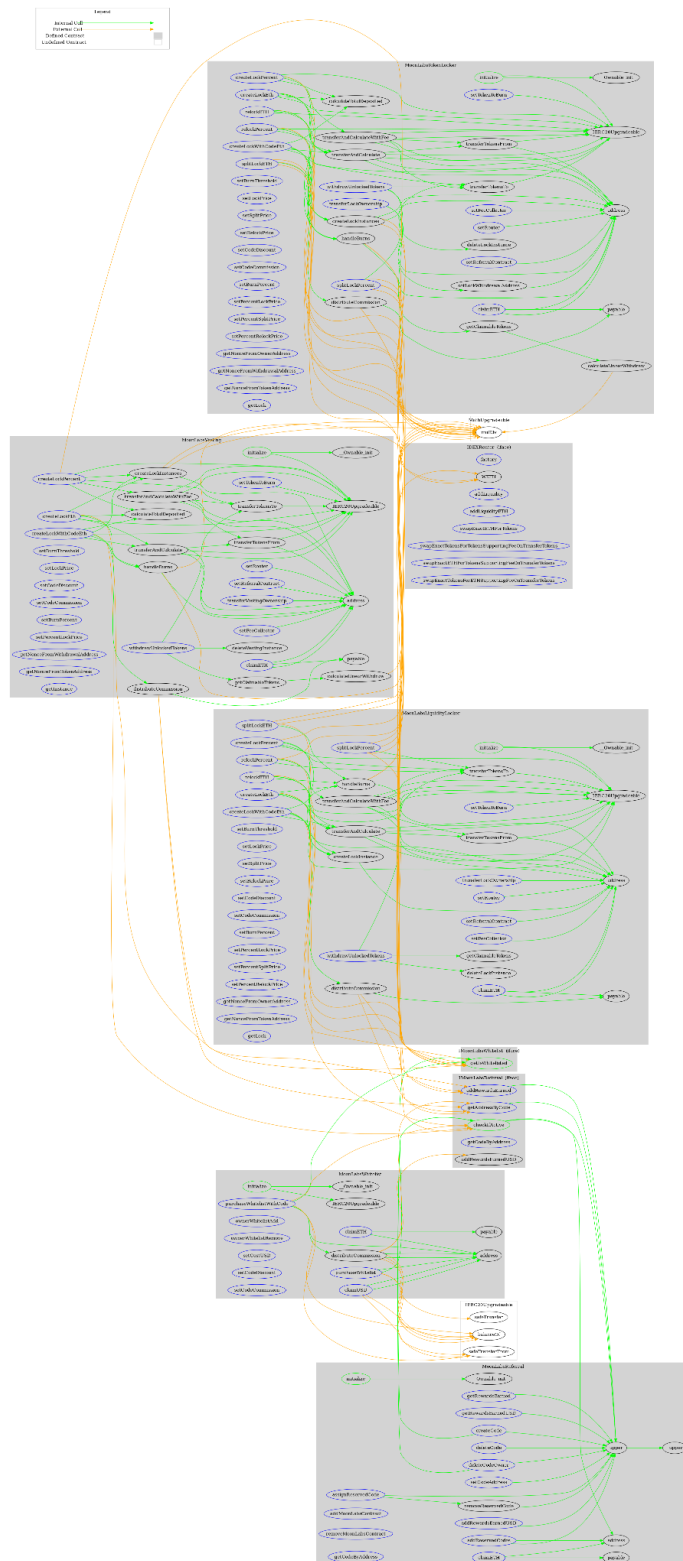
	calculateTotalDeposited	Private		
	transferAndCalculate	Private	✓	
	transferAndCalculateWithFee	Private	✓	
	transferTokensFrom	Private	✓	
	transferTokensTo	Private	✓	
	deleteVestingInstance	Private	✓	
	distributeCommission	Private	✓	nonReentrant
	handleBurns	Private	✓	
	calculateLinearWithdraw	Private		
IMoonLabs Referral	Interface			
	checkIfActive	External		-
	getAddressByCode	External		-
	addRewardsEarnedUSD	External	✓	-
IMoonLabs Whitelist	Interface			
	getIsWhitelisted	External		-

MoonLabs Whitelist	Implementation	Initializable, IMoonLabsWhitelist, Ownable Upgradeable		
	initialize	Public	✓	initializer
	purchaseWhitelist	External	✓	-
	purchaseWhitelistWithCode	External	✓	-
	ownerWhitelistAdd	External	✓	onlyOwner
	ownerWhitelistRemove	External	✓	onlyOwner
	setCostUSD	External	✓	onlyOwner
	setCodeDiscount	External	✓	onlyOwner
	setCodeCommission	External	✓	onlyOwner
	claimETH	External	✓	onlyOwner
	claimUSD	External	✓	onlyOwner
	getIsWhitelisted	Public		-
	distributeCommission	Private	✓	

Inheritance Graph



Flow Graph



Summary

Moonlab's contracts implements a utility, financial, and locker mechanism. This audit investigates security issues, business logic concerns, and potential improvements.

Disclaimer

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Cyberscope is a blockchain cybersecurity company that was founded with the vision to make web3.0 a safer place for investors and developers. Since its launch, it has worked with thousands of projects and is estimated to have secured tens of millions of investors' funds.

Cyberscope is one of the leading smart contract audit firms in the crypto space and has built a high-profile network of clients and partners.



The Cyberscope team

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