Cyberscope

Audit Report
Koala

April 2023

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Review

Contract Name	Koala
Compiler Version	v0.8.17+commit.8df45f5f
Optimization	200 runs
Explorer	https://bscscan.com/address/0x29775f1b1be197bd4481d8426307bd6b31ac6618
Address	0x29775f1b1be197bd4481d8426307bd6b31ac6618
Network	BSC
Symbol	KLA
Decimals	18
Total Supply	990,000,000,000

Audit Updates

Initial Audit	27 Apr 2023
Corrected Phase 2	29 Apr 2023

Source Files

Filename	SHA256
Koala.sol	bd4c499ed653ced992c51d1e3917758d8e711ff1f9c83b4a1cbd3b0eabd6e480

Findings Breakdown
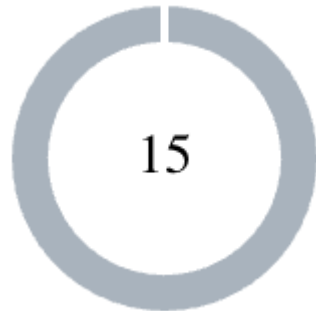
	Critical	0
	Medium	0
	Minor / Informative	15

Severity	Unresolved	Acknowledged	Resolved	Other
Critical	0	0	0	0
Medium	0	0	0	0
Minor / Informative	15	0	0	0

Analysis

● Critical ● Medium ● Minor / Informative ● Pass

Severity	Code	Description	Status
●	ST	Stops Transactions	Passed
●	OCTD	Transfers Contract's Tokens	Passed
●	OTUT	Transfers User's Tokens	Passed
●	ELFM	Exceeds Fees Limit	Passed
●	ULTW	Transfers Liquidity to Team Wallet	Passed
●	MT	Mints Tokens	Passed
●	BT	Burns Tokens	Passed
●	BC	Blacklists Addresses	Passed

Diagnostics

● Critical   ● Medium   ● Minor / Informative

Severity	Code	Description	Status
●	PVC	Price Volatility Concern	Unresolved
●	RSML	Redundant SafeMath Library	Unresolved
●	IDI	Immutable Declaration Improvement	Unresolved
●	L02	State Variables could be Declared Constant	Unresolved
●	L04	Conformance to Solidity Naming Conventions	Unresolved
●	L05	Unused State Variable	Unresolved
●	L07	Missing Events Arithmetic	Unresolved
●	L09	Dead Code Elimination	Unresolved
●	L12	Using Variables before Declaration	Unresolved
●	L14	Uninitialized Variables in Local Scope	Unresolved
●	L15	Local Scope Variable Shadowing	Unresolved
●	L16	Validate Variable Setters	Unresolved
●	L17	Usage of Solidity Assembly	Unresolved
●	L19	Stable Compiler Version	Unresolved

●   L20   Succeeded Transfer Check   Unresolved

PVC - Price Volatility Concern

Criticality	Minor / Informative
Location	Koala.sol#L1502
Status	Unresolved

Description

The contract accumulates tokens from the taxes to swap them for ETH. The variable `swapTokensAtAmount` sets a threshold where the contract will trigger the swap functionality. If the variable is set to a big number, then the contract will swap a huge amount of tokens for ETH.

It is important to note that the price of the token representing it, can be highly volatile. This means that the value of a price volatility swap involving Ether could fluctuate significantly at the triggered point, potentially leading to significant price volatility for the parties involved.

```
function setSwapTokensAtAmount(uint256 amount) public onlyOwner {
    swapTokensAtAmount = amount;
}
```

Recommendation

The contract could ensure that it will not sell more than a reasonable amount of tokens in a single transaction. A suggested implementation could check that the maximum amount should be less than a fixed percentage of the total supply. Hence, the contract will guarantee that it cannot accumulate a huge amount of tokens in order to sell them.

RSML - Redundant SafeMath Library

Criticality	Minor / Informative
Location	Koala.sol
Status	Unresolved

Description

SafeMath is a popular Solidity library that provides a set of functions for performing common arithmetic operations in a way that is resistant to integer overflows and underflows.

Starting with Solidity versions that are greater than or equal to 0.8.0, the arithmetic operations revert on underflow and overflow. As a result, the native functionality of the Solidity operations replaces the SafeMath library. Hence, the usage of the SafeMath library adds complexity, overhead and increases the gas consumption unnecessarily.

```
library SafeMath {...}
```

Recommendation

The team is advised to remove the SafeMath library. Since the version of the contract is greater than `0.8.0` then the pure Solidity arithmetic operations produce the same result.

If the previous functionality is required, then the contract could exploit the `unchecked { ... }` statement.

Read more about the breaking change on
https://docs.soliditylang.org/en/v0.8.16/080-breaking-changes.html#solidity-v0-8-0-breaking-changes.

IDI - Immutable Declaration Improvement

Criticality	Minor / Informative
Location	Koala.sol#L1296,1318
Status	Unresolved

Description

The contract is using variables that initialize them only in the constructor. The other functions are not mutating the variables. These variables are not defined as `immutable`.

```
rewardToken
dividendTracker
```

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.

L02 - State Variables could be Declared Constant

Criticality	Minor / Informative
Location	Koala.sol#L1244
Status	Unresolved

Description

State variables can be declared as constant using the constant keyword. This means that the value of the state variable cannot be changed after it has been set. Additionally, the constant variables decrease gas consumption of the corresponding transaction.

```
uint256 public Optimization = 83120072084608239406422267148308831466
```

Recommendation

Constant state variables can be useful when the contract wants to ensure that the value of a state variable cannot be changed by any function in the contract. This can be useful for storing values that are important to the contract's behavior, such as the contract's address or the maximum number of times a certain function can be called. The team is advised to add the constant keyword to state variables that never change.

L04 - Conformance to Solidity Naming Conventions

Criticality	Minor / Informative
Location	Koala.sol#L539,703,704,721,791,796,864,871,878,888,1013,1161,1164,1170,1174,1178,1189,1232,1233,1234,1236,1244
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.

```
function WETH() external pure returns (address);
function DOMAIN_SEPARATOR() external view returns (bytes32);
function PERMIT_TYPEHASH() external pure returns (bytes32);
function MINIMUM_LIQUIDITY() external pure returns (uint);
address public REWARD_TOKEN
uint256 constant internal magnitude = 2**128
address _owner
address _account

function MAPGet(address key) public view returns (uint) {
        return tokenHoldersMap.values[key];
    }

...
```

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.

L05 - Unused State Variable

Criticality	Minor / Informative
Location	Koala.sol#L138
Status	Unresolved

Description

An unused state variable is a state variable that is declared in the contract, but is never used in any of the contract's functions. This can happen if the state variable was originally intended to be used, but was later removed or never used.

Unused state variables can create clutter in the contract and make it more difficult to understand and maintain. They can also increase the size of the contract and the cost of deploying and interacting with it.

```solidity
int256 private constant MAX_INT256 = ~(int256(1) << 255)
```

Recommendation

To avoid creating unused state variables, it's important to carefully consider the state variables that are needed for the contract's functionality, and to remove any that are no longer needed. This can help improve the clarity and efficiency of the contract.

L07 - Missing Events Arithmetic

Criticality	Minor / Informative
Location	Koala.sol#L1499,1508,1517
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.

```
swapTokensAtAmount = amount
buyTokenRewardsFee = rewardsFee
sellTokenRewardsFee = rewardsFee
```

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.

L09 - Dead Code Elimination

Criticality	Minor / Informative
Location	Koala.sol#L184,210,228,242,262,898
Status	Unresolved

Description

In Solidity, dead code is code that is written in the contract, but is never executed or reached during normal contract execution. Dead code can occur for a variety of reasons, such as:

- Conditional statements that are always false.
- Functions that are never called.
- Unreachable code (e.g., code that follows a return statement).

Dead code can make a contract more difficult to understand and maintain, and can also increase the size of the contract and the cost of deploying and interacting with it.

```
function abs(int256 a) internal pure returns (int256) {
        require(a != MIN_INT256);
        return a < 0 ? -a : a;
    }

function clone(address implementation) internal returns (address
instance) {
...
            mstore(ptr,
0x3d602d80600a3d3981f3363d3d373d3d3d363d73000000000000000000000000)
            mstore(add(ptr, 0x14), shl(0x60, implementation))
            mstore(add(ptr, 0x28),
0x5af43d82803e903d91602b57fd5bf30000000000000000000000000000000000)
            instance := create(0, ptr, 0x37)
        }
        require(instance != address(0), "ERC1167: create failed");
    }

...
```

Recommendation

To avoid creating dead code, it's important to carefully consider the logic and flow of the contract and to remove any code that is not needed or that is never executed. This can help improve the clarity and efficiency of the contract.

L12 - Using Variables before Declaration

Criticality	Minor / Informative
Location	Koala.sol#L1604
Status	Unresolved

Description

The contract is using a variable before the declaration. This is usually happening either if it has not been declared yet or if the variable has been declared in a different scope. It is not a good practice to use a local variable before it has been declared.

```
uint256 claims
uint256 lastProcessedIndex
uint256 iterations
```

Recommendation

By declaring local variables before using them, contract ensures that it operates correctly. It's important to be aware of this rule when working with local variables, as using a variable before it has been declared can lead to unexpected behavior and can be difficult to debug.

L14 - Uninitialized Variables in Local Scope

Criticality	Minor / Informative
Location	Koala.sol#L1566,1570,1604
Status	Unresolved

Description

Using an uninitialized local variable can lead to unpredictable behavior and potentially cause errors in the contract. It's important to always initialize local variables with appropriate values before using them.

```
uint256 fees
uint256 DFee
uint256 iterations
uint256 lastProcessedIndex
uint256 claims
```

Recommendation

By initializing local variables before using them, the contract ensures that the functions behave as expected and avoid potential issues.

L15 - Local Scope Variable Shadowing

Criticality	Minor / Informative
Location	Koala.sol#L816,864,871,878,888,1312
Status	Unresolved

Description

Local scope variable shadowing occurs when a local variable with the same name as a variable in an outer scope is declared within a function or code block. When this happens, the local variable "shadows" the outer variable, meaning that it takes precedence over the outer variable within the scope in which it is declared.

```
string memory _name
string memory _symbol
address _owner
uint256 totalSupply = totalSupply_ * (10**18)
```

Recommendation

It's important to be aware of shadowing when working with local variables, as it can lead to confusion and unintended consequences if not used correctly. It's generally a good idea to choose unique names for local variables to avoid shadowing outer variables and causing confusion.

L16 - Validate Variable Setters

Criticality	Minor / Informative
Location	Koala.sol#L817,1326,1358,1377,1503
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.

```
REWARD_TOKEN = _rewardTokenAddress
uniswapV2Pair = _uniswapV2Pair
_marketingWalletAddress = wallet
deadWallet = addr
```

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.

L17 - Usage of Solidity Assembly

Criticality	Minor / Informative
Location	Koala.sol#L211,229,247
Status	Unresolved

Description

Using assembly can be useful for optimizing code, but it can also be error-prone. It's important to carefully test and debug assembly code to ensure that it is correct and does not contain any errors.

Some common types of errors that can occur when using assembly in Solidity include Syntax, Type, Out-of-bounds, Stack, and Revert.

```
assembly {
        let ptr := mload(0x40)
        mstore(ptr,
0x3d602d80600a3d3981f3363d3d373d3d3d363d730000000000000000000000000)
        mstore(add(ptr, 0x14), shl(0x60, implementation))
        mstore(add(ptr, 0x28),
0x5af43d82803e903d91602b57fd5bf30000000000000000000000000000000000)
        instance := create(0, ptr, 0x37)
...
assembly {
        let ptr := mload(0x40)
        mstore(ptr,
0x3d602d80600a3d3981f3363d3d373d3d3d363d730000000000000000000000000)
        mstore(add(ptr, 0x14), shl(0x60, implementation))
        mstore(add(ptr, 0x28),
0x5af43d82803e903d91602b57fd5bf30000000000000000000000000000000000)
        instance := create2(0, ptr, 0x37, salt)
    }

...
```

Recommendation

It is recommended to use assembly sparingly and only when necessary, as it can be difficult to read and understand compared to Solidity code.

L19 - Stable Compiler Version

Criticality	Minor / Informative
Location	Koala.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 ^0.8.0;
```

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	Koala.sol#L1617
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.

```
IERC20(rewardToken).transfer(_marketingWalletAddress, newBalance)
```

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
Context	Implementation			
	_msgSender	Internal		
	_msgData	Internal		
Ownable	Implementation	Context		
		Public	✓	-
	owner	Public		-
	renounceOwnership	Public	✓	onlyOwner
	transferOwnership	Public	✓	onlyOwner
	_transferOwnership	Internal	✓	
IERC20	Interface			
	totalSupply	External		-
	balanceOf	External		-
	transfer	External	✓	-
	allowance	External		-
	approve	External	✓	-
	transferFrom	External	✓	-

IERC20Metadata	Interface	IERC20		
	name	External		-
	symbol	External		-
	decimals	External		-
SafeMath	Library			
	add	Internal		
	sub	Internal		
	sub	Internal		
	mul	Internal		
	div	Internal		
	div	Internal		
	mod	Internal		
	mod	Internal		
SafeMathInt	Library			
	mul	Internal		
	div	Internal		
	sub	Internal		
	add	Internal		
	abs	Internal		
	toUint256Safe	Internal		

SafeMathUint	Library			
	toInt256Safe	Internal		
Clones	Library			
	clone	Internal	✓	
	cloneDeterministic	Internal	✓	
	predictDeterministicAddress	Internal		
	predictDeterministicAddress	Internal		
ERC20	Implementation	Context, IERC20, IERC20Metadata		
		Public	✓	-
	name	Public		-
	symbol	Public		-
	decimals	Public		-
	totalSupply	Public		-
	balanceOf	Public		-
	transfer	Public	✓	-
	allowance	Public		-
	approve	Public	✓	-
	transferFrom	Public	✓	-
	increaseAllowance	Public	✓	-

	decreaseAllowance	Public	✓	-
	_transfer	Internal	✓	
	_cast	Internal	✓	
	_burn	Internal	✓	
	_approve	Internal	✓	
	_beforeTokenTransfer	Internal	✓	
DividendPaying TokenInterface	Interface			
	dividendOf	External		-
	withdrawDividend	External	✓	-
DividendPaying TokenOptionalI nterface	Interface			
	withdrawableDividendOf	External		-
	withdrawnDividendOf	External		-
	accumulativeDividendOf	External		-
DividendPaying Token	Implementation	ERC20, Ownable, DividendPayi ngTokenInter face, DividendPayi ngTokenOpti onalInterface		
		Public	✓	ERC20
	distributeCAKEDividends	Public	✓	onlyOwner
	withdrawDividend	Public	✓	-
	_withdrawDividendOfUser	Internal	✓	

	dividendOf	Public		-
	withdrawableDividendOf	Public		-
	withdrawnDividendOf	Public		-
	accumulativeDividendOf	Public		-
	_transfer	Internal	✓	
	_cast	Internal	✓	
	_burn	Internal	✓	
	_setBalance	Internal	✓	
TokenDividend Tracker	Implementation	Ownable, DividendPayi ngToken		
		Public	✓	DividendPaying Token
	_transfer	Internal		
	withdrawDividend	Public		-
	setMinimumTokenBalanceForDividends	External	✓	onlyOwner
	excludeFromDividends	External	✓	onlyOwner
	updateClaimWait	External	✓	onlyOwner
	getLastProcessedIndex	External		-
	getNumberOfTokenHolders	External		-
	isExcludedFromDividends	Public		-
	getAccount	Public		-
	getAccountAtIndex	Public		-
	canAutoClaim	Private		
	setBalance	External	✓	onlyOwner

	process	Public	✓	-	
	processAccount	Public	✓	onlyOwner	
	MAPGet	Public		-	
	MAPGetIndexOfKey	Public		-	
	MAPGetKeyAtIndex	Public		-	
	MAPSize	Public		-	
	MAPSet	Public	✓	-	
	MAPRemove	Public	✓	-	
Koala	Implementation	ERC20, Ownable			
		Public	Payable	ERC20	
		External	Payable	-	
	updateMinimumTokenBalanceForDividends	Public	✓	onlyOwner	
	updateUniswapV2Router	Public	✓	onlyOwner	
	excludeFromFees	Public	✓	onlyOwner	
	excludeMultipleAccountsFromFees	Public	✓	onlyOwner	
	setMarketingWallet	External	✓	onlyOwner	
	setAutomatedMarketMakerPair	Public	✓	onlyOwner	
	_setAutomatedMarketMakerPair	Private	✓		
	updateGasForProcessing	Public	✓	onlyOwner	
	updateClaimWait	External	✓	onlyOwner	
	getClaimWait	External		-	
	getTotalDividendsDistributed	External		-	

isExcludedFromFees	Public		-
withdrawableDividendOf	Public		-
dividendTokenBalanceOf	Public		-
excludeFromDividends	External	✓	onlyOwner
isExcludedFromDividends	Public		-
getAccountDividendsInfo	External		-
getAccountDividendsInfoAtIndex	External		-
processDividendTracker	External	✓	-
claim	External	✓	-
getLastProcessedIndex	External		-
getNumberOfDividendTokenHolders	External		-
swapManual	Public	✓	onlyOwner
setSwapTokensAtAmount	Public	✓	onlyOwner
setDeadWallet	Public	✓	onlyOwner
setBuyTaxes	External	✓	onlyOwner
setSelTaxes	External	✓	onlyOwner
_transfer	Internal	✓	
swapAndSendToFee	Private	✓	
swapAndLiquify	Private	✓	
swapTokensForEth	Private	✓	
swapTokensForToken	Private	✓	
addLiquidity	Private	✓	
swapAndSendDividends	Private	✓	

Inheritance Graph
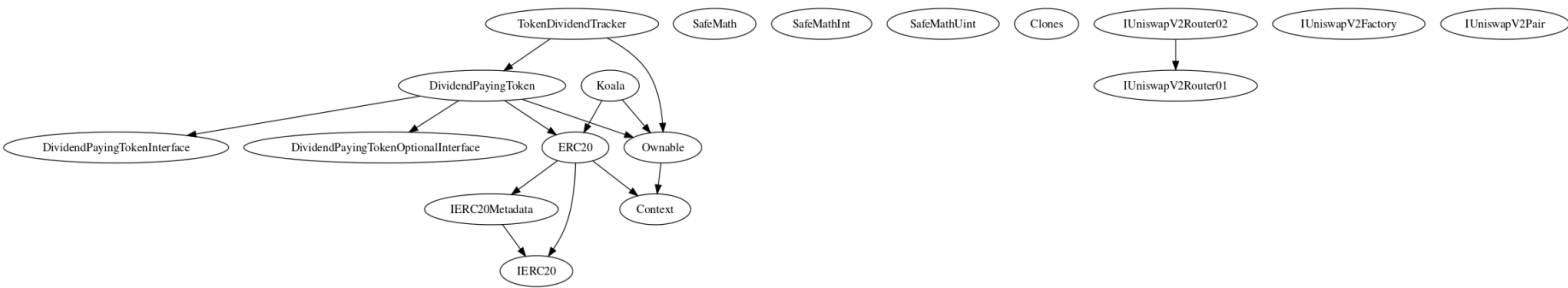
Flow Graph
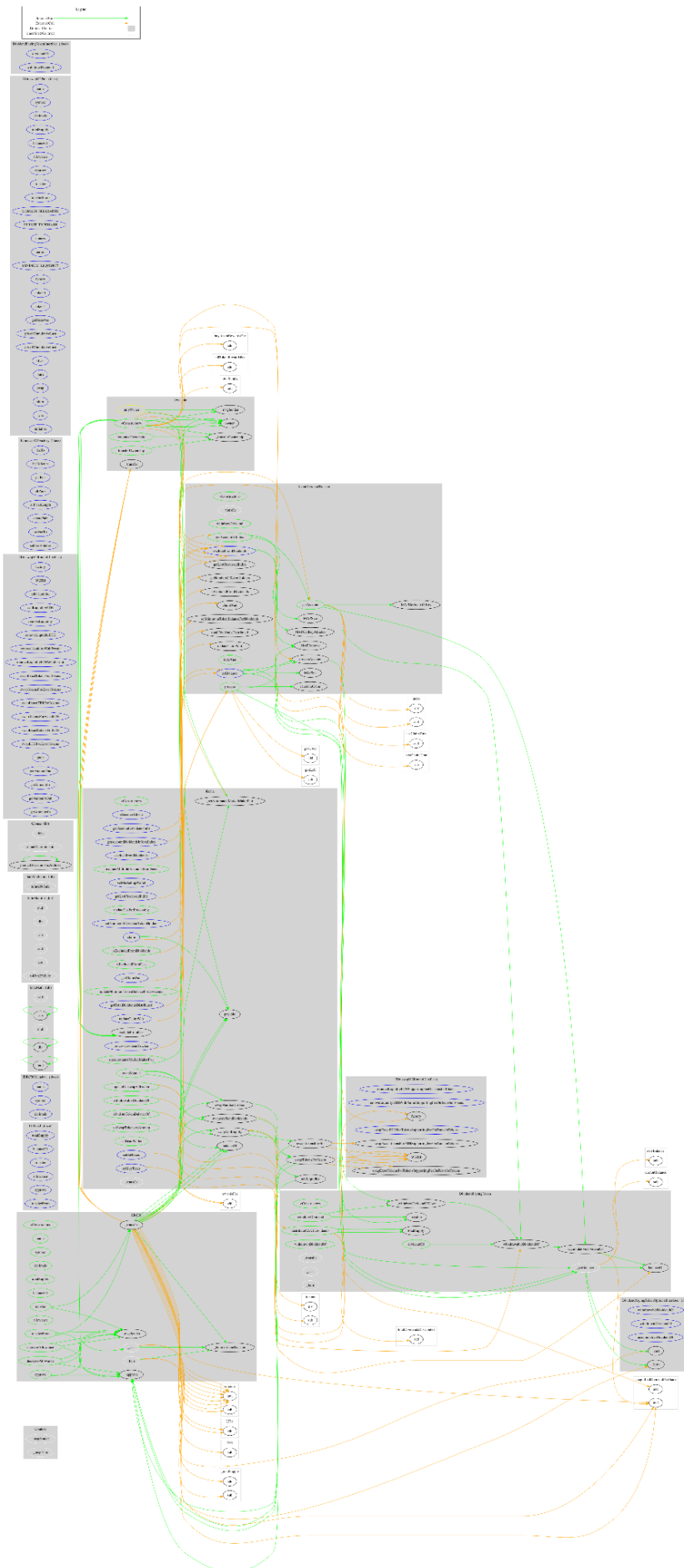
Summary

Koala contract implements a token mechanism. This audit investigates security issues, business logic concerns, and potential improvements. A multi-wallet signing pattern will provide security against potential hacks. The Smart Contract analysis reported no compiler error or critical issues. The contract Owner can access some admin functions that can not be used in a malicious way to disturb the users' transactions. There is also a limit of max 25% fees.

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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

https://www.cyberscope.io