

Audit Report CATLY

Jul 2023

Network BSC

Address 0x1d78d8b0a7c88421A644230d3E54C8799e30A0A0

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Analysis

CriticalMediumMinor / InformativePass

Severity	Code	Description	Status
•	ST	Stops Transactions	Unresolved
•	OTUT	Transfers User's Tokens	Passed
•	ELFM	Exceeds Fees Limit	Passed
•	MT	Mints Tokens	Passed
•	ВТ	Burns Tokens	Passed
•	ВС	Blacklists Addresses	Passed



Diagnostics

CriticalMediumMinor / Informative

Severity	Code	Description	Status
•	FRV	Fee Restoration Vulnerability	Unresolved
•	MMN	Misleading Method Naming	Unresolved
•	PTRP	Potential Transfer Revert Propagation	Unresolved
•	PVC	Price Volatility Concern	Unresolved
•	MEE	Missing Events Emission	Unresolved
•	RED	Redundant Event Declaration	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
•	L07	Missing Events Arithmetic	Unresolved
•	L13	Divide before Multiply Operation	Unresolved
•	L14	Uninitialized Variables in Local Scope	Unresolved
•	L16	Validate Variable Setters	Unresolved



•	L19	Stable Compiler Version	Unresolved
•	L20	Succeeded Transfer Check	Unresolved



Table of Contents

Analysis	1
Diagnostics	2
Table of Contents	4
Review	6
Audit Updates	6
Source Files	6
Findings Breakdown	7
ST - Stops Transactions	8
Description	8
Recommendation	8
FRV - Fee Restoration Vulnerability	9
Description	9
Recommendation	10
MMN - Misleading Method Naming	11
Description	11
Recommendation	12
PTRP - Potential Transfer Revert Propagation	13
Description	13
Recommendation	13
PVC - Price Volatility Concern	14
Description	14
Recommendation	14
MEE - Missing Events Emission	15
Description	15
Recommendation	15
RED - Redundant Event Declaration	16
Description	16
Recommendation	16
RSML - Redundant SafeMath Library	17
Description	17
Recommendation	17
IDI - Immutable Declaration Improvement	18
Description	18
Recommendation	18
L02 - State Variables could be Declared Constant	19
Description	19
Recommendation	19
L04 - Conformance to Solidity Naming Conventions	20
Description	20



Recommendation	21
L07 - Missing Events Arithmetic	22
Description	22
Recommendation	22
L13 - Divide before Multiply Operation	23
Description	23
Recommendation	23
L14 - Uninitialized Variables in Local Scope	24
Description	24
Recommendation	24
L16 - Validate Variable Setters	25
Description	25
Recommendation	25
L19 - Stable Compiler Version	26
Description	26
Recommendation	26
L20 - Succeeded Transfer Check	27
Description	27
Recommendation	27
Functions Analysis	28
Inheritance Graph	33
Flow Graph	34
Summary	35
Disclaimer	36
About Cyberscope	37



Review

Contract Name	CATLY
Compiler Version	v0.8.4+commit.c7e474f2
Optimization	200 runs
Explorer	https://bscscan.com/address/0x1d78d8b0a7c88421a644230d3 e54c8799e30a0a0
Address	0x1d78d8b0a7c88421a644230d3e54c8799e30a0a0
Network	BSC
Symbol	CATLY
Decimals	18
Total Supply	2,100,000,000

Audit Updates

Initial Audit	01 Jul 2023
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Source Files

Filename	SHA256
CATLY.sol	9d2806e518df56f0cf48e3760ba02439265394a046c5872fe10a10aeb09 48d69



Findings Breakdown



Sev	rerity	Unresolved	Acknowledged	Resolved	Other
•	Critical	0	0	0	0
•	Medium	2	0	0	0
	Minor / Informative	15	0	0	0

ST - Stops Transactions

Criticality	Medium
Location	CATLY.sol#L1061
Status	Unresolved

Description

The contract owner has the authority to stop all users from buying excluding the authorized addresses. The owner may take advantage of it by setting the <code>maxWalletAmount</code> to zero.

```
if (enableWalletLimit && _swapPairList[from]) {
    uint256 _b = balanceOf(to);
    require(
        _b + amount <= maxWalletAmount,
        "Exceeded maximum wallet balance"
    );
}</pre>
```

Recommendation

The contract could embody a check for not allowing setting the <code>maxWalletAmount</code> less than a reasonable amount. A suggested implementation could check that the minimum amount should be more than a fixed percentage of the total supply. The team should carefully manage the private keys of the owner's account. We strongly recommend a powerful security mechanism that will prevent a single user from accessing the contract admin functions. Some suggestions are:

- Introduce a time-locker mechanism with a reasonable delay.
- Introduce a multi-sign wallet so that many addresses will confirm the action.
- Introduce a governance model where users will vote about the actions.
- Renouncing the ownership will eliminate the threats but it is non-reversible.



FRV - Fee Restoration Vulnerability

Criticality	Medium
Location	CATLY.sol#L961
Status	Unresolved

Description

The contract demonstrates a potential vulnerability upon removing and restoring the fees. This vulnerability can occur when the fees have been set to zero. During a transaction, if the fees have been set to zero, then both remove fees and restore fees functions will be executed. The remove fees function is executed to temporarily remove the fees, ensuring the sender is not taxed during the transfer. However, the function prematurely returns without setting the variables that hold the previous fee values.

As a result, when the subsequent restore fees function is called after the transfer, it restores the fees to their previous values. However, since the previous fee values were not properly set to zero, there is a risk that the fees will retain their non-zero values from before the fees were removed. This can lead to unintended consequences, potentially causing incorrect fee calculations or unexpected behavior within the contract.



```
function removeAllFee() private {
   if (
       _buyRewardFee == 0 &&
        _LP_MKTBuyFee == 0 &&
       _sellRewardFee == 0 &&
       _LP_MKTSellFee == 0
    ) return;
   _previousBuyTaxFee = _buyRewardFee;
   _previousSellTaxFee = _sellRewardFee;
   _previousBuyLP_MKTFee = _LP_MKTBuyFee;
   _previousSellLP_MKTFee = _LP_MKTSellFee;
   _buyRewardFee = 0;
   _sellRewardFee = 0;
    _LP_MKTBuyFee = 0;
   _LP_MKTSellFee = 0;
}
```

Recommendation

The team is advised to modify the remove fees function to ensure that the previous fee values are correctly set to zero, regardless of their initial values. A recommended approach would be to remove the early return when both fees are zero.



MMN - Misleading Method Naming

Criticality	Minor / Informative
Location	CATLY.sol#L1160
Status	Unresolved

Description

Methods can have misleading names if their names do not accurately reflect the functionality they contain or the purpose they serve. The contract uses some method names that are too generic or do not clearly convey the underneath functionality. Misleading method names can lead to confusion, making the code more difficult to read and understand. Methods can have misleading names if their names do not accurately reflect the functionality they contain or the purpose they serve. The contract uses some method names that are too generic or do not clearly convey the underneath functionality. Misleading method names can lead to confusion, making the code more difficult to read and understand.

The swapTokensForEth method name indicates that it swaps tokens for ETH. However, its implementation suggests otherwise, meaning it swaps tokens for tokens. As a result, the method name is misleading.

Recommendation

It's always a good practice for the contract to contain method names that are specific and descriptive. The team is advised to keep in mind the readability of the code.

PTRP - Potential Transfer Revert Propagation

Criticality	Minor / Informative
Location	CATLY.sol#L1129
Status	Unresolved

Description

The contract sends funds to a fundAddress as part of the transfer flow. This address can either be a wallet address or a contract. If the address belongs to a contract then it may revert from incoming payment. As a result, the error will propagate to the token's contract and revert the transfer.

```
payable(fundAddress).transfer(address(this).balance);
```

Recommendation

The contract should tolerate the potential revert from the underlying contracts when the interaction is part of the main transfer flow. This could be achieved by not allowing set contract addresses or by sending the funds in a non-revertable way.



PVC - Price Volatility Concern

Criticality	Minor / Informative
Location	CATLY.sol#L805
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 setNumTokensSellToAddToLiquidity(uint256 swapNumber)
    public
    onlyOwner
{
    numTokensSellToAddToLiquidity = swapNumber;
}
```

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.

MEE - Missing Events Emission

Criticality	Minor / Informative
Location	CATLY.sol#L590,1007,1011
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.

```
fundAddress = addr;
enableWalletLimit = false;
enableChangeTax = false;
```

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.

RED - Redundant Event Declaration

Criticality	Minor / Informative
Location	CATLY.sol#L498
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 contract declares certain events that are not used in a meaningful way by the contract. As a result, these events are redundant.

event MinTokensBeforeSwapUpdated(uint256 minTokensBeforeSwap);

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.

RSML - Redundant SafeMath Library

Criticality	Minor / Informative
Location	CATLY.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 to 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 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	CATLY.sol#L518,519,520,521,522,530,540,562,566,571
Status	Unresolved

Description

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

```
name
symbol
decimals
_tTotal
currency
kb
currencyIsEth
_swapRouter
_mainPair
_tokenDistributor
```

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	CATLY.sol#L442
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.

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	CATLY.sol#L279,364,449,470,471,475,476,478,479,481,482,484,485,488, 490,491,812,929,937,945,953,1014,1135,1158
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.



```
address public _owner
function WETH() external pure returns (address);

TokenDistributor public _tokenDistributor
uint256 public _buyRewardFee
uint256 public _sellRewardFee
uint256 public _buyLPFee
uint256 public _buyFundFee
uint256 public _sellLPFee
uint256 public _sellFndFee
uint256 public _sellFundFee
uint256 public _LP_MKTBuyFee
uint256 public _LP_MKTSellFee
uint256 private _previousBuyLP_MKTFee
IUniswapV2Router02 public _swapRouter
```

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	CATLY.sol#L787,809,1015
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.

```
_buyLPFee = customs[0]
numTokensSellToAddToLiquidity = swapNumber
maxWalletAmount = _amount
```

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.



L13 - Divide before Multiply Operation

Criticality	Minor / Informative
Location	CATLY.sol#L1078,1105
Status	Unresolved

Description

It is important to be aware of the order of operations when performing arithmetic calculations. This is especially important when working with large numbers, as the order of operations can affect the final result of the calculation. Performing divisions before multiplications may cause loss of prediction.

Recommendation

To avoid this issue, it is recommended to carefully consider the order of operations when performing arithmetic calculations in Solidity. It's generally a good idea to use parentheses to specify the order of operations. The basic rule is that the multiplications should be prior to the divisions.

L14 - Uninitialized Variables in Local Scope

Criticality	Minor / Informative
Location	CATLY.sol#L1102
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 lpEth

Recommendation

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

L16 - Validate Variable Setters

Criticality	Minor / Informative
Location	CATLY.sol#L566,590
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.

```
_mainPair = swapPair
fundAddress = 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.



L19 - Stable Compiler Version

Criticality	Minor / Informative
Location	CATLY.sol#L3
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 ^0.8.4;
```

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	CATLY.sol#L1123,1182
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.

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	Туре	Bases		
	Function Name	Visibility	Mutability	Modifiers
IERC20	Interface			
	totalSupply	External		-
	balanceOf	External		-
	transfer	External	✓	-
	allowance	External		-
	approve	External	1	-
	transferFrom	External	✓	-
SafeMath	Library			
	add	Internal		
	sub	Internal		
	sub	Internal		
	mul	Internal		
	div	Internal		
	div	Internal		
	mod	Internal		
	mod	Internal		

Context	Implementation			
	_msgSender	Internal		
	_msgData	Internal		
Ownable	Implementation	Context		
		Public	1	-
	owner	Public		-
	renounceOwnership	Public	✓	onlyOwner
	transferOwnership	Public	✓	onlyOwner
IUniswapV2Fac tory	Interface			
	getPair	External		-
	createPair	External	✓	-
IUniswapV2Rou ter01	Interface			
	factory	External		-
	WETH	External		-
	addLiquidity	External	✓	-
	addLiquidityETH	External	Payable	-
IUniswapV2Rou ter02	Interface	IUniswapV2 Router01		
	swapExactTokensForTokensSupporting FeeOnTransferTokens	External	1	-

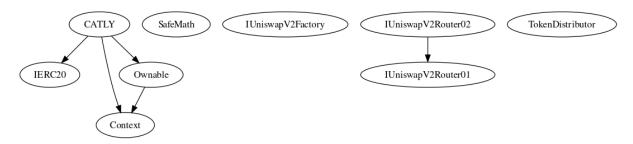


	swapExactETHForTokensSupportingFee OnTransferTokens	External	Payable	-
	swapExactTokensForETHSupportingFee OnTransferTokens	External	✓	-
TokenDistributo r	Implementation			
		Public	✓	-
CATLY	Implementation	Context, IERC20, Ownable		
		Public	✓	-
	setFundAddress	External	✓	onlyOwner
	totalSupply	Public		-
	balanceOf	Public		-
	transfer	Public	✓	-
	allowance	Public		-
	approve	Public	1	-
	transferFrom	Public	✓	-
	increaseAllowance	Public	✓	-
	decreaseAllowance	Public	✓	-
	isExcludedFromReward	Public		-
	totalFees	Public		-
	deliver	Public	✓	-
	reflectionFromToken	Public		-
	tokenFromReflection	Public		-

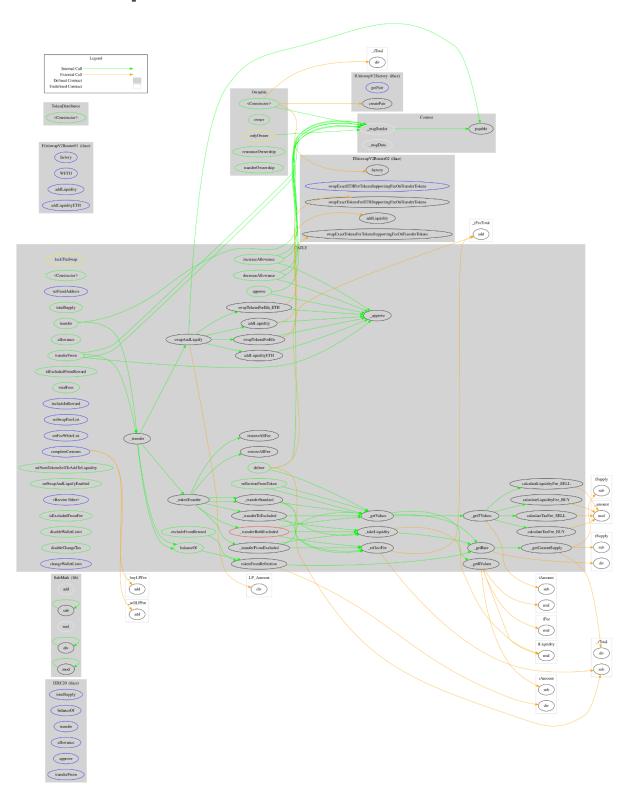
excludeFromReward	Public	✓	onlyOwner
includeInReward	External	✓	onlyOwner
_transferBothExcluded	Private	✓	
setSwapPairList	External	1	onlyOwner
setFeeWhiteList	External	1	onlyOwner
completeCustoms	External	1	onlyOwner
setNumTokensSellToAddToLiquidity	Public	1	onlyOwner
setSwapAndLiquifyEnabled	Public	1	onlyOwner
	External	Payable	-
_reflectFee	Private	✓	
_getValues	Private		
_getTValues	Private		
_getRValues	Private		
_getRate	Private		
_getCurrentSupply	Private		
_takeLiquidity	Private	✓	
calculateTaxFee_BUY	Private		
calculateTaxFee_SELL	Private		
calculateLiquidityFee_BUY	Private		
calculateLiquidityFee_SELL	Private		
removeAllFee	Private	✓	
restoreAllFee	Private	1	
isExcludedFromFee	Public		-

_approve	Private	1	
disableWalletLimit	Public	1	onlyOwner
disableChangeTax	Public	1	onlyOwner
changeWalletLimit	External	1	onlyOwner
_transfer	Private	✓	
swapAndLiquify	Private	1	lockTheSwap
swapTokensForEth_ETH	Private	1	
swapTokensForEth	Private	1	
addLiquidityETH	Private	1	
addLiquidity	Private	1	
_tokenTransfer	Private	1	
_transferStandard	Private	✓	
_transferToExcluded	Private	✓	
_transferFromExcluded	Private	✓	

Inheritance Graph



Flow Graph



Summary

CATLY contract implements a token mechanism. This audit investigates security issues, business logic concerns, and potential improvements. There are some functions that can be abused by the owner like stopping transactions. A multi-wallet signing pattern will provide security against potential hacks. Temporarily locking the contract or renouncing ownership will eliminate all the contract threats. 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.

