



# **TURTLEMOONTOKEN**

## **Smart Contract Review**

**Deliverable: Smart Contract Audit Report**

**Security Report**

**January 2022**

## Disclaimer

The information and views set out in this publication are those of the author(s) and do not necessarily reflect the official opinion of the Company. The content, conclusions and recommendations set out in this publication are elaborated in the specific for only project.

eNebula Solutions does not guarantee the authenticity of the project or organization or team of members that is connected/owner behind the project or nor accuracy of the data included in this study. All representations, warranties, undertakings and guarantees relating to the report are excluded, particularly concerning – but not limited to – the qualities of the assessed projects and products. Neither the Company nor any personating on the Company's behalf may be held responsible for the use that may be made of the information contained herein.

eNebula Solutions retains the right to display audit reports and other content elements as examples of their work in their portfolio and as content features in other projects with protecting all security purpose of customer. The report containing confidential information can be used internally by the Customer, or it can be disclosed publicly after all vulnerabilities fixed - upon a decision of the Customer.

© eNebula Solutions, 2021-2022.

## Report Summary

<b>Title</b>	TURTLEMOONTOKEN Smart Contract Audit		
<b>Project Owner</b>	TURTLEMOONTOKEN		
<b>Type</b>	Public		
<b>Reviewed by</b>	Vatsal Raychura	<b>Revision date</b>	07/01/2022
<b>Approved by</b>	eNebula Solutions Private Limited	<b>Approval date</b>	07/01/2022
		<b>Nº Pages</b>	<b>26</b>

## Overview

### Background

TURTLEMOONTOKEN's team requested that eNebula Solutions perform an Extensive Smart Contract audit of their Smart Contract.

### Project Dates

The following is the project schedule for this review and report:

- **January 07:** Smart Contract Review Completed *(Completed)*
- **January 07:** Delivery of Smart Contract Audit Report *(Completed)*

### Review Team

The following eNebula Solutions team member participated in this review:

- Sejal Barad, Security Researcher and Engineer
- Vatsal Raychura, Security Researcher and Engineer

## Coverage

### Target Specification and Revision

For this audit, we performed research, investigation, and review of the smart contract of TURTLEMOONTOKEN.

The following documentation repositories were considered in-scope for the review:

- TURTLEMOONTOKEN Project:  
<https://testnet.bscscan.com/address/0x6fd137b150ffba34939a01174ead2ea5eef1d49c#code>

## Introduction

Given the opportunity to review TURTLEMOONTOKEN Project's smart contract source code, we in the report outline our systematic approach to evaluate potential security issues in the smart contract implementation, expose possible semantic inconsistencies between smart contract code and design document, and provide additional suggestions or recommendations for improvement. Our results show that the given version of smart contracts is ready to launch after resolving the mentioned issues, there are no critical or high issues found related to business logic, security or performance.

About TURTLEMOONTOKEN: -

Item	Description
<b>Issuer</b>	TURTLEMOONTOKEN
<b>Type</b>	BEP20
<b>Platform</b>	Solidity
<b>Audit Method</b>	Whitebox
<b>Latest Audit Report</b>	January 07, 2022

The Test Method Information: -

Test method	Description
<b>Black box testing</b>	Conduct security tests from an attacker's perspective externally.
<b>Grey box testing</b>	Conduct security testing on code modules through the scripting tool, observing the internal running status, mining weaknesses.
<b>White box testing</b>	Based on the open-source code, non-open-source code, to detect whether there are vulnerabilities in programs such as nodes, SDK, etc.

# Smart Contract Audit

The vulnerability severity level information:

Level	Description
<b>Critical</b>	Critical severity vulnerabilities will have a significant effect on the security of the DeFi project, and it is strongly recommended to fix the critical vulnerabilities.
<b>High</b>	High severity vulnerabilities will affect the normal operation of the DeFi project. It is strongly recommended to fix high-risk vulnerabilities.
<b>Medium</b>	Medium severity vulnerability will affect the operation of the DeFi project. It is recommended to fix medium-risk vulnerabilities.
<b>Low</b>	Low severity vulnerabilities may affect the operation of the DeFi project in certain scenarios. It is suggested that the project party should evaluate and consider whether these vulnerabilities need to be fixed.
<b>Weakness</b>	There are safety risks theoretically, but it is extremely difficult to reproduce in engineering.

The Full List of Check Items:

Category	Check Item
<b>Basic Coding Bugs</b>	Constructor Mismatch
	Ownership Takeover
	Redundant Fallback Function
	Overflows & Underflows
	Reentrancy
	MONEY-Giving Bug
	Blackhole
	Unauthorized Self-Destruct
	Revert DoS
	Unchecked External Call
	Gasless Send
	Send Instead of Transfer
	Costly Loop
	(Unsafe) Use of Untrusted Libraries
	(Unsafe) Use of Predictable Variables
Transaction Ordering Dependence	
Deprecated Uses	
<b>Semantic Consistency Checks</b>	Semantic Consistency Checks
	Business Logics Review

# Smart Contract Audit

<b>Advanced DeFi Scrutiny</b>	Functionality Checks
	Authentication Management
	Access Control & Authorization
	Oracle Security
	Digital Asset Escrow
	Kill-Switch Mechanism
	Operation Trails & Event Generation
	ERC20 Idiosyncrasies Handling
	Frontend-Contract Integration
	Deployment Consistency
	Holistic Risk Management
<b>Additional Recommendations</b>	Avoiding Use of Variadic Byte Array
	Using Fixed Compiler Version
	Making Visibility Level Explicit
	Making Type Inference Explicit
	Adhering To Function Declaration Strictly
	Following Other Best Practices

Common Weakness Enumeration (CWE) Classifications Used in This Audit:

Category	Summary
<b>Configuration</b>	Weaknesses in this category are typically introduced during the configuration of the software.
<b>Data Processing Issues</b>	Weaknesses in this category are typically found in functionality that processes data.
<b>Numeric Errors</b>	Weaknesses in this category are related to improper calculation or conversion of numbers.
<b>Security Features</b>	Weaknesses in this category are concerned with topics like authentication, access control, confidentiality, cryptography, and privilege management. (Software security is not security software.)
<b>Time and State</b>	Weaknesses in this category are related to the improper management of time and state in an environment that supports simultaneous or near-simultaneous computation by multiple systems, processes, or threads.
<b>Error Conditions, Return Values, Status Codes</b>	Weaknesses in this category include weaknesses that occur if a function does not generate the correct return/status code, or if the application does not handle all possible return/status codes that could be generated by a function.
<b>Resource Management</b>	Weaknesses in this category are related to improper management of system resources.

## Smart Contract Audit

<b>Behavioral Issues</b>	Weaknesses in this category are related to unexpected behaviors from code that an application uses.
<b>Business Logics</b>	Weaknesses in this category identify some of the underlying problems that commonly allow attackers to manipulate the business logic of an application. Errors in business logic can be devastating to an entire application.
<b>Initialization and Cleanup</b>	Weaknesses in this category occur in behaviors that are used for initialization and breakdown.
<b>Arguments and Parameters</b>	Weaknesses in this category are related to improper use arguments or parameters within function calls.
<b>Expression Issues</b>	Weaknesses in this category are related to incorrectly written expressions within code.
<b>Coding Practices</b>	Weaknesses in this category are related to coding practices that are deemed unsafe and increase the chances that an exploitable vulnerability will be present in the application. They may not directly introduce a vulnerability, but indicate the product has not been carefully developed or maintained.



## Findings

### Summary

Here is a summary of our findings after analyzing the TURTLEMOONTOKEN's Smart Contract. During the first phase of our audit, we studied the smart contract sourcecode and ran our in-house static code analyzer through the Specific tool. The purpose here is to statically identify known coding bugs, and then manually verify (reject or confirm) issues reported by tool. We further manually review businesslogics, examine system operations, and place DeFi-related aspects under scrutinyto uncover possible pitfalls and/or bugs.

Severity	No. of Issues
<b>Critical</b>	<b>0</b>
<b>High</b>	<b>0</b>
<b>Medium</b>	<b>0</b>
<b>Low</b>	<b>0</b>
<b>Total</b>	<b>0</b>

We have so far identified that there are potential issues with severity of **0 Critical, 0 High, 0 Medium, and 0 Low**. Overall, these smart contracts are well- designed and engineered.

## Functional Overview

(\$) = payable function	[Pub] public
# = non-constant function	[Ext] external
	[Prv] private
	[Int] internal

```
+ [Lib] Address
- [Int] isContract
- [Int] sendValue #
- [Int] functionCall #
- [Int] functionCall #
- [Int] functionCallWithValue #
- [Int] functionCallWithValue #
- [Int] functionStaticCall
- [Int] functionStaticCall
- [Int] functionDelegateCall #
- [Int] functionDelegateCall #
- [Prv] _verifyCallResult

+ Context
- [Int] _msgSender
- [Int] _msgData

+ [Int] IERC20
- [Ext] totalSupply
- [Ext] balanceOf
- [Ext] transfer #
- [Ext] allowance
```

- [Ext] approve #
- [Ext] transferFrom #
  
- + [Int] IPancakeV2Factory
  - [Ext] createPair #
  
- + [Int] IPancakeV2Router
  - [Ext] factory
  - [Ext] WETH
  - [Ext] addLiquidityETH (\$)
  - [Ext] swapExactTokensForETHSupportingFeeOnTransferTokens #
  
- + [Lib] SafeMath
  - [Int] add
  - [Int] sub
  - [Int] mul
  - [Int] div
  - [Int] mod
  - [Int] sub
  
- + [Int] IERC20Metadata (IERC20)
  - [Ext] name
  - [Ext] symbol
  - [Ext] decimals
  
- + Manageable (Context)
  - [Pub] <Constructor> #
  - [Pub] manager
  - [Ext] transferManagement #
    - modifiers: onlyManager

- + Ownable (Context)
  - [Pub] <Constructor> #
  - [Pub] owner
  - [Pub] renounceOwnership #
    - modifiers: onlyOwner
  - [Pub] transferOwnership #
    - modifiers: onlyOwner
  - [Pub] getUnlockTime
  - [Pub] lock #
    - modifiers: onlyOwner
  - [Pub] unlock #
  
- + Liquifier (Ownable, Manageable)
  - [Ext] <Fallback> (\$)
  - [Int] initializeLiquiditySwapper #
  - [Int] liquify #
  - [Prv] \_setRouterAddress #
  - [Prv] \_swapAndLiquify #
    - modifiers: lockTheSwap
  - [Prv] \_swapTokensForEth #
  - [Prv] \_addLiquidity #
  - [Ext] setRouterAddress #
    - modifiers: onlyManager
  - [Ext] setSwapAndLiquifyEnabled #
    - modifiers: onlyManager
  - [Ext] withdrawEth #
    - modifiers: onlyManager
  - [Int] \_approveDelegate #
  
- + Presaleable (Manageable)
  - [Ext] setPreseableEnabled #

- modifiers: onlyManager
- + Tokenomics (Manageable)
  - [Pub] setCharityAddress #
    - modifiers: onlyManager
  - [Pub] setMarketAddress #
    - modifiers: onlyManager
  - [Pub] setBurnAddress #
    - modifiers: onlyManager
  - [Pub] <Constructor> #
  - [Prv] \_addFee #
  - [Pub] RemoveFees #
    - modifiers: onlyManager
  - [Pub] RestoreFees #
    - modifiers: onlyManager
  - [Pub] changeFees #
    - modifiers: onlyManager
  - [Prv] \_addFees #
  - [Int] \_getFeesCount
  - [Prv] \_getFeeStruct
  - [Int] \_getFee
  - [Int] \_addFeeCollectedAmount #
  - [Int] getCollectedFeeTotal
- + Antiwhale (Tokenomics)
  - [Int] \_getAntiwhaleFees
- + BaseRfiToken (IERC20, IERC20Metadata, Ownable, Presaleable, Tokenomics)
  - [Pub] <Constructor> #
  - [Ext] name
  - [Ext] symbol

- [Ext] decimals
- [Ext] totalSupply
- [Pub] balanceOf
- [Ext] transfer #
- [Ext] allowance
- [Ext] approve #
- [Ext] transferFrom #
- [Ext] burn #
- [Int] \_burnTokens #
- [Pub] increaseAllowance #
- [Pub] decreaseAllowance #
- [Ext] isExcludedFromReward
- [Ext] reflectionFromToken
- [Int] tokenFromReflection
- [Ext] excludeFromReward #
  - modifiers: onlyOwner
- [Int] \_exclude #
- [Ext] includeInReward #
  - modifiers: onlyOwner
- [Ext] setExcludedFromFee #
  - modifiers: onlyOwner
- [Pub] isExcludedFromFee
- [Int] \_approve #
- [Int] \_isUnlimitedSender
- [Int] \_isUnlimitedRecipient
- [Prv] \_transfer #
- [Prv] \_transferTokens #
- [Prv] \_takeFees #
- [Int] \_getValues
- [Int] \_getCurrentRate
- [Int] \_getCurrentSupply

- [Int] \_beforeTokenTransfer #
- [Int] \_getSumOfFees
- [Int] \_isV2Pair
- [Int] \_redistribute #
- [Int] \_takeTransactionFees #
  
- + TurtleMoonToken (BaseRfiToken, Liquifier, Antiwhale)
  - [Pub] <Constructor> #
  - [Int] \_isV2Pair
  - [Int] \_getSumOfFees
  - [Int] \_beforeTokenTransfer #
  - [Int] \_takeTransactionFees #
  - [Prv] \_burn #
  - [Prv] \_takeFee #
  - [Prv] \_takeFeeToETH #
  - [Int] \_approveDelegate #
  
- + TurtleMoonTokenV1 (TurtleMoonToken)
  - [Pub] <Constructor> #
    - modifiers: TurtleMoonToken

## Detailed Results

### Issues Checking Status

As there are no security vulnerabilities, business logic issues or coding bugs found in first phase of these smart contracts, there are no detailed results to show.

### Automated Tools Results

Slither: -

```
Liquifier._addLiquidity(uint256,uint256) (TurtleMoonTokenV1.sol#324-345) sends eth to arbitrary user
Dangerous call:
- (TokenAmountSent,ethAmountSent,liquidity) = _router.addLiquidityETH(value: ethAmount)(address(this),tokenAmount,0,0,owner(),block.timestamp)
(TurtleMoonTokenV1.sol#329-341)
Liquifier.withdrawETH(address) (TurtleMoonTokenV1.sol#365-373) sends eth to arbitrary user
Dangerous call:
- recipient.transfer(amount) (TurtleMoonTokenV1.sol#372)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#functions-that-send-ether-to-arbitrary-destinations

BaseRftToken._getValues(uint256,uint256) (TurtleMoonTokenV1.sol#878-888) performs a multiplication on the result of a division:
-tTotalFees = tAmount.mul(feesSum).div(FEES_DIVISOR) (TurtleMoonTokenV1.sol#886)
-rTotalFees = tTotalFees.mul(currentRate) (TurtleMoonTokenV1.sol#884)
BaseRftToken._redistribute(uint256,uint256,uint256,uint256) (TurtleMoonTokenV1.sol#942-948) performs a multiplication on the result of a division:
-tFee = amount.mul(fee).div(FEES_DIVISOR) (TurtleMoonTokenV1.sol#943)
-rFee = tFee.mul(currentRate) (TurtleMoonTokenV1.sol#944)
TurtleMoonToken._burn(uint256,uint256,uint256,uint256) (TurtleMoonTokenV1.sol#1019-1025) performs a multiplication on the result of a division:
-tBurn = amount.mul(fee).div(FEES_DIVISOR) (TurtleMoonTokenV1.sol#1025)
-rBurn = tBurn.mul(currentRate) (TurtleMoonTokenV1.sol#1021)
TurtleMoonToken._takeFee(uint256,uint256,uint256,address,uint256) (TurtleMoonTokenV1.sol#1027-1037) performs a multiplication on the result of a division:
-tAmount = amount.mul(fee).div(FEES_DIVISOR) (TurtleMoonTokenV1.sol#1029)
-rAmount = tAmount.mul(currentRate) (TurtleMoonTokenV1.sol#1030)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#divide-before-multiply

Tokenonics._getFeeStruct(uint256) (TurtleMoonTokenV1.sol#563-566) contains a tautology or contradiction:
- require(bool,string)(index >= 0 && index < fees.length,feesSettings._getFeeStruct: Fee index out of bounds) (TurtleMoonTokenV1.sol#564)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#tautology-or-contradiction

Liquifier._approveDelegate(address,address,uint256).owner (TurtleMoonTokenV1.sol#379) shadows:
- Ownable.owner() (TurtleMoonTokenV1.sol#159-161) (function)
BaseRftToken.allowance(address,address).owner (TurtleMoonTokenV1.sol#653) shadows:
- Ownable.owner() (TurtleMoonTokenV1.sol#159-161) (function)
BaseRftToken._approve(address,address,uint256).owner (TurtleMoonTokenV1.sol#776) shadows:
- Ownable.owner() (TurtleMoonTokenV1.sol#159-161) (function)
BaseRftToken._transferTokens(address,address,uint256,bool).sumOfFees (TurtleMoonTokenV1.sol#856) shadows:
- Tokenonics.sumOfFees (TurtleMoonTokenV1.sol#521) (state variable)
BaseRftToken._takeFees(uint256,uint256,uint256).sumOfFees (TurtleMoonTokenV1.sol#872) shadows:
- Tokenonics.sumOfFees (TurtleMoonTokenV1.sol#521) (state variable)
TurtleMoonToken.constructor(Liquifier,env).env (TurtleMoonTokenV1.sol#865) shadows:
- Liquifier.env (TurtleMoonTokenV1.sol#201) (state variable)
TurtleMoonToken._takeTransactionFees(uint256,uint256).name (TurtleMoonTokenV1.sol#997) shadows:
- BaseRftToken.name() (TurtleMoonTokenV1.sol#823) (function)
- IERC20Metadata.name() (TurtleMoonTokenV1.sol#121) (function)
TurtleMoonToken._approveDelegate(address,address,uint256).owner (TurtleMoonTokenV1.sol#1049) shadows:
- Ownable.owner() (TurtleMoonTokenV1.sol#159-161) (function)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#local-variable-shadowing
```



# Smart Contract Audit

```
Tokenomics.setCharityAddress(address), charityAddress (TurtleMoonTokenV1.sol#510) lacks a zero-check on :
  - charityAddress = _charityAddress (TurtleMoonTokenV1.sol#511)
Tokenomics.setMarketAddress(address), marketingAddress (TurtleMoonTokenV1.sol#513) lacks a zero-check on :
  - marketingAddress = _marketingAddress (TurtleMoonTokenV1.sol#514)
Tokenomics.setBurnAddress(address), _burnAddress (TurtleMoonTokenV1.sol#516) lacks a zero-check on :
  - burnAddress = _burnAddress (TurtleMoonTokenV1.sol#517)
Manageable.transferManagement(address), newManager (TurtleMoonTokenV1.sol#141) lacks a zero-check on :
  - manager = newManager (TurtleMoonTokenV1.sol#143)
Reference: https://github.com/crytic/sllther/wiki/Detector-Documentation#missing-zero-address-validation

Reentrancy in LIquidifier._addLiquidity(uint256,uint256) (TurtleMoonTokenV1.sol#324-345):
  External calls:
  - {tokenAmountSent,ethAmountSent,liquidity} = _router._addLiquidityETH(value: ethAmount)(address(this),tokenAmount,0,0,owner(),block.timestamp) (TurtleMoonTokenV1.sol#329-341)
  State variables written after the call(s):
  - withdrawableBalance = address(this).balance (TurtleMoonTokenV1.sol#343)
Reentrancy in LIquidifier._setRouterAddress(address) (TurtleMoonTokenV1.sol#272-277):
  External calls:
  - _pair = IPancakeV2Factory(_newPancakeRouter.factory()).createPair(address(this),_newPancakeRouter.WETH()) (TurtleMoonTokenV1.sol#274)
  State variables written after the call(s):
  - _router = _newPancakeRouter (TurtleMoonTokenV1.sol#273)
Reentrancy in LIquidifier.swapAndLiquify(uint256) (TurtleMoonTokenV1.sol#279-381):
  External calls:
  - _swapTokensForEth(half) (TurtleMoonTokenV1.sol#292)
  - _router.swapExactTokensForETHSupportingFeeOnTransferTokens(tokenAmount,0,path,address(this),block.timestamp) (TurtleMoonTokenV1.sol#313-321)
  - _addLiquidity(otherHalf,newBalance) (TurtleMoonTokenV1.sol#298)
  - (tokenAmountSent,ethAmountSent,liquidity) = _router.addLiquidityETH(value: ethAmount)(address(this),tokenAmount,0,0,owner(),block.timestamp) (TurtleMoonTokenV1.sol#329-341)
  External calls sending eth:
  - _addLiquidity(otherHalf,newBalance) (TurtleMoonTokenV1.sol#298)
  - (tokenAmountSent,ethAmountSent,liquidity) = _router.addLiquidityETH(value: ethAmount)(address(this),tokenAmount,0,0,owner(),block.timestamp) (TurtleMoonTokenV1.sol#329-341)
  State variables written after the call(s):
  - _addLiquidity(otherHalf,newBalance) (TurtleMoonTokenV1.sol#298)
  - withdrawableBalance = address(this).balance (TurtleMoonTokenV1.sol#343)
Reentrancy in TurtleMoonToken.constructor(Liquidifier.Env) (TurtleMoonTokenV1.sol#965-973):
  External calls:
  - initializeLiquiditySwapper(_env,maxTransactionAmount,numberofTokensToSwapToLiquidity) (TurtleMoonTokenV1.sol#967)
  - _pair = IPancakeV2Factory(_newPancakeRouter.factory()).createPair(address(this),_newPancakeRouter.WETH()) (TurtleMoonTokenV1.sol#974)
  State variables written after the call(s):
  - _exclude(_pair) (TurtleMoonTokenV1.sol#971)
  - _balances[account] = tokenFromReflection(_reflectedBalances[account]) (TurtleMoonTokenV1.sol#754)
  - _exclude(burnAddress) (TurtleMoonTokenV1.sol#972)
  - _balances[account] = tokenFromReflection(_reflectedBalances[account]) (TurtleMoonTokenV1.sol#754)
  - _exclude(_pair) (TurtleMoonTokenV1.sol#971)
  - _excluded.push(account) (TurtleMoonTokenV1.sol#757)
  - _exclude(burnAddress) (TurtleMoonTokenV1.sol#972)
  - _excluded.push(account) (TurtleMoonTokenV1.sol#757)
  - _exclude(_pair) (TurtleMoonTokenV1.sol#971)
  - _isExcludedFromRewards[account] = true (TurtleMoonTokenV1.sol#756)
  - _exclude(burnAddress) (TurtleMoonTokenV1.sol#972)
  - _isExcludedFromRewards[account] = true (TurtleMoonTokenV1.sol#756)
Reentrancy in TurtleMoonTokenV1.constructor() (TurtleMoonTokenV1.sol#1058-1061):
  External calls:
  - TurtleMoonToken(Env.Testnet) (TurtleMoonTokenV1.sol#1058)
  - _pair = IPancakeV2Factory(_newPancakeRouter.factory()).createPair(address(this),_newPancakeRouter.WETH()) (TurtleMoonTokenV1.sol#1074)
  State variables written after the call(s):
  - _approve(owner(),address(_router),_uint256(0)) (TurtleMoonTokenV1.sol#1068)
  - allowances[owner][spender] = amount (TurtleMoonTokenV1.sol#788)
Reentrancy in LIquidifier.initializeLiquiditySwapper(Liquidifier.Env,uint256,uint256) (TurtleMoonTokenV1.sol#234-243):
  External calls:
  - _setRouterAddress(_mainnetRouterV1Address) (TurtleMoonTokenV1.sol#236)
  - _pair = IPancakeV2Factory(_newPancakeRouter.factory()).createPair(address(this),_newPancakeRouter.WETH()) (TurtleMoonTokenV1.sol#274)
  - _setRouterAddress(_mainnetRouterV2Address) (TurtleMoonTokenV1.sol#237)
  - _pair = IPancakeV2Factory(_newPancakeRouter.factory()).createPair(address(this),_newPancakeRouter.WETH()) (TurtleMoonTokenV1.sol#274)
  - _setRouterAddress(_testnetRouterAddress) (TurtleMoonTokenV1.sol#238)
  - _pair = IPancakeV2Factory(_newPancakeRouter.factory()).createPair(address(this),_newPancakeRouter.WETH()) (TurtleMoonTokenV1.sol#274)
  State variables written after the call(s):
  - maxTransactionAmount = maxTx (TurtleMoonTokenV1.sol#240)
  - numberOfTokensToSwapToLiquidity = liquidityAmount (TurtleMoonTokenV1.sol#241)
Reference: https://github.com/crytic/sllther/wiki/Detector-Documentation#reentrancy-vulnerabilities-2
```

# Smart Contract Audit

```
Reentrancy in Lliquifier._addLiquidity(uint256,uint256) (TurtleMoonTokenV1.sol#324-345):
  External calls:
  - {tokenAmountSent,ethAmountSent,liquidity} = _router.addLiquidityETH(value: ethAmount)(address(this),tokenAmount,0,0,owner(),block.timestamp) (TurtleMoonTokenV1.sol#329-341)
  - Event emitted after the call(s):
    - LiquidityAdded(tokenAmountSent,ethAmountSent,liquidity) (TurtleMoonTokenV1.sol#344)
Reentrancy in Lliquifier._setRouterAddress(address) (TurtleMoonTokenV1.sol#272-277):
  External calls:
  - _pair = IPancakeV2Factory(_newPancakeRouter.factory()).createPair(address(this),_newPancakeRouter.WETH()) (TurtleMoonTokenV1.sol#274)
  - Event emitted after the call(s):
    - RouterSet(router) (TurtleMoonTokenV1.sol#276)
Reentrancy in Lliquifier._swapAndLiquify(uint256) (TurtleMoonTokenV1.sol#279-301):
  Internal calls:
  - _swapTokensForEth(half) (TurtleMoonTokenV1.sol#292)
  - _router.swapExactTokensForETHSupportingFeeOnTransferTokens(tokenAmount,0,path,address(this),block.timestamp) (TurtleMoonTokenV1.sol#
313-321)
  - _addLiquidity(etherHalf,newBalance) (TurtleMoonTokenV1.sol#298)
  - {tokenAmountSent,ethAmountSent,liquidity} = _router.addLiquidityETH(value: ethAmount)(address(this),tokenAmount,0,0,owner(),block.ti
mestamp) (TurtleMoonTokenV1.sol#329-341)
  External calls sending eth:
  - _addLiquidity(etherHalf,newBalance) (TurtleMoonTokenV1.sol#298)
  - {tokenAmountSent,ethAmountSent,liquidity} = _router.addLiquidityETH(value: ethAmount)(address(this),tokenAmount,0,0,owner(),block.ti
mestamp) (TurtleMoonTokenV1.sol#329-341)
  - Event emitted after the call(s):
    - LiquidityAdded(tokenAmountSent,ethAmountSent,liquidity) (TurtleMoonTokenV1.sol#344)
    - _addLiquidity(etherHalf,newBalance) (TurtleMoonTokenV1.sol#298)
    - SwapAndLiquify(half,newBalance,etherHalf) (TurtleMoonTokenV1.sol#300)
Reentrancy in TurtleMoonTokenV1.constructor() (TurtleMoonTokenV1.sol#1050-1061):
  External calls:
  - TurtleMoonToken(Env.Testnet) (TurtleMoonTokenV1.sol#1058)
  - _pair = IPancakeV2Factory(_newPancakeRouter.factory()).createPair(address(this),_newPancakeRouter.WETH()) (TurtleMoonTokenV1.sol#274)
  - Event emitted after the call(s):
    - Approval(owner,spender,amount) (TurtleMoonTokenV1.sol#781)
    - _approve(owner(),address(_router),_uint256(0)) (TurtleMoonTokenV1.sol#1060)
Reference: https://github.com/crytic/sltther/wiki/Detector-Documentation#reentrancy-vulnerabilities-3

Ownable.unlock() (TurtleMoonTokenV1.sol#184-189) uses timestamp for comparisons
  Dangerous comparisons:
  - require(bool,string)(block.timestamp < _lockTime,The contract is still locked) (TurtleMoonTokenV1.sol#186)
Reference: https://github.com/crytic/sltther/wiki/Detector-Documentation#block-timestamp

Address.isContract(address) (TurtleMoonTokenV1.sol#14) uses assembly
  - INLINE ASM (TurtleMoonTokenV1.sol#14)
Address._verifyCallResult(bool,bytes,string) (TurtleMoonTokenV1.sol#44-53) uses assembly
  - INLINE ASM (TurtleMoonTokenV1.sol#47-50)
Reference: https://github.com/crytic/sltther/wiki/Detector-Documentation#assembly-usage

Address.verifyCallResult(bool,bytes,string) (TurtleMoonTokenV1.sol#44-53) is never used and should be removed
Address.functionCall(address,bytes) (TurtleMoonTokenV1.sol#19) is never used and should be removed
Address.functionCall(address,bytes,string) (TurtleMoonTokenV1.sol#20) is never used and should be removed
Address.functionCallWithValue(address,bytes,uint256) (TurtleMoonTokenV1.sol#21) is never used and should be removed
Address.functionCallWithValue(address,bytes,uint256,string) (TurtleMoonTokenV1.sol#22-27) is never used and should be removed
Address.functionDelegateCall(address,bytes) (TurtleMoonTokenV1.sol#36-38) is never used and should be removed
Address.functionDelegateCall(address,bytes,string) (TurtleMoonTokenV1.sol#39-43) is never used and should be removed
Address.functionStaticCall(address,bytes) (TurtleMoonTokenV1.sol#48-38) is never used and should be removed
Address.functionStaticCall(address,bytes,string) (TurtleMoonTokenV1.sol#31-35) is never used and should be removed
Address.isContract(address) (TurtleMoonTokenV1.sol#14) is never used and should be removed
Address.sendValue(address,uint256) (TurtleMoonTokenV1.sol#15-18) is never used and should be removed
BaseRftoken._beforeTokenTransfer(address,address,uint256,bool) (TurtleMoonTokenV1.sol#916) is never used and should be removed
BaseRftoken._getBurnOffees(address,uint256) (TurtleMoonTokenV1.sol#926) is never used and should be removed
BaseRftoken._isV2Pair(address) (TurtleMoonTokenV1.sol#931) is never used and should be removed
BaseRftoken._takeTransactionFees(uint256,uint256) (TurtleMoonTokenV1.sol#953) is never used and should be removed
Context._msgData() (TurtleMoonTokenV1.sol#80) is never used and should be removed
Liquifier._approveDelegate(address,address,uint256) (TurtleMoonTokenV1.sol#379) is never used and should be removed
SafeMath.mod(uint256,uint256) (TurtleMoonTokenV1.sol#112) is never used and should be removed
Tokenanlcc.getCollectedFeeTotal(uint256) (TurtleMoonTokenV1.sol#577-580) is never used and should be removed
Reference: https://github.com/crytic/sltther/wiki/Detector-Documentation#dead-code

Pragma version<0.8.9 (TurtleMoonTokenV1.sol#7) necessitates a version too recent to be trusted. Consider deploying with 0.6.12/0.7.0
solc-0.8.9 is not recommended for deployment
Reference: https://github.com/crytic/sltther/wiki/Detector-Documentation#incorrect-versions-of-solidity

Low level call in Address.sendValue(address,uint256) (TurtleMoonTokenV1.sol#15-18):
  - {success} = recipient.call{value: amount}() (TurtleMoonTokenV1.sol#16)
Low level call in Address.functionCallWithValue(address,bytes,uint256,string) (TurtleMoonTokenV1.sol#22-27):
  - {success,returndata} = target.call{value: value}(data) (TurtleMoonTokenV1.sol#25)
Low level call in Address.functionStaticCall(address,bytes,string) (TurtleMoonTokenV1.sol#31-35):
  - {success,returndata} = target.staticcall(data) (TurtleMoonTokenV1.sol#33)
Low level call in Address.functionDelegateCall(address,bytes,string) (TurtleMoonTokenV1.sol#39-43):
  - {success,returndata} = target.delegatecall(data) (TurtleMoonTokenV1.sol#41)
Reference: https://github.com/crytic/sltther/wiki/Detector-Documentation#low-level-calls
```

# Smart Contract Audit

```
Function Pancakev2Router.WETH() (TurtleMoonTokenV1.sol#47) is not in mixedCase
Variable Liquifier_router (TurtleMoonTokenV1.sol#212) is not in mixedCase
Variable Liquifier_half (TurtleMoonTokenV1.sol#213) is not in mixedCase
Parameter Tokenomics.setCharityAddress(address)_charityAddress (TurtleMoonTokenV1.sol#510) is not in mixedCase
Parameter Tokenomics.setMarketAddress(address)_marketingAddress (TurtleMoonTokenV1.sol#511) is not in mixedCase
Parameter Tokenomics.setBurnAddress(address)_burnAddress (TurtleMoonTokenV1.sol#516) is not in mixedCase
Function Tokenomics.RemoveFees() (TurtleMoonTokenV1.sol#531-533) is not in mixedCase
Function Tokenomics.RestoreFees() (TurtleMoonTokenV1.sol#534-536) is not in mixedCase
Parameter Tokenomics.changeFees(uint256,uint256,uint256,uint256,uint256)_rfiFee (TurtleMoonTokenV1.sol#537) is not in mixedCase
Parameter Tokenomics.changeFees(uint256,uint256,uint256,uint256,uint256)_burnFee (TurtleMoonTokenV1.sol#537) is not in mixedCase
Parameter Tokenomics.changeFees(uint256,uint256,uint256,uint256,uint256)_liquidityFee (TurtleMoonTokenV1.sol#537) is not in mixedCase
Parameter Tokenomics.changeFees(uint256,uint256,uint256,uint256,uint256)_charityFee (TurtleMoonTokenV1.sol#537) is not in mixedCase
Parameter Tokenomics.changeFees(uint256,uint256,uint256,uint256,uint256)_marketingFee (TurtleMoonTokenV1.sol#537) is not in mixedCase
Variable Tokenomics_reflectedSupply (TurtleMoonTokenV1.sol#430) is not in mixedCase
Constant Tokenomics.maxTransactionAmount (TurtleMoonTokenV1.sol#430) is not in UPPER_CASE_WITH_UNDERSCORES
Constant Tokenomics.maxWalletBalance (TurtleMoonTokenV1.sol#442) is not in UPPER_CASE_WITH_UNDERSCORES
Constant Tokenomics.numberOfTokensToSwapToLiquidity (TurtleMoonTokenV1.sol#457) is not in UPPER_CASE_WITH_UNDERSCORES
Variable BaseRfiToken_reflectedBalances (TurtleMoonTokenV1.sol#608) is not in mixedCase
Variable BaseRfiToken_balances (TurtleMoonTokenV1.sol#609) is not in mixedCase
Variable BaseRfiToken_allowances (TurtleMoonTokenV1.sol#610) is not in mixedCase
Variable BaseRfiToken_isExcludedFromFee (TurtleMoonTokenV1.sol#612) is not in mixedCase
Variable BaseRfiToken_isExcludedFromRewards (TurtleMoonTokenV1.sol#613) is not in mixedCase
Reference: https://github.com/crytic/sllther/wiki/Detector-Documentation#conformance-to-solidity-naming-conventions

Redundant expression "this (TurtleMoonTokenV1.sol#60)" in Context (TurtleMoonTokenV1.sol#58-61)
Reference: https://github.com/crytic/sllther/wiki/Detector-Documentation#redundant-statements

Variable Liquifier_mainnetRouterV1Address (TurtleMoonTokenV1.sol#284) is too similar to Liquifier_mainnetRouterV2Address (TurtleMoonTokenV1.sol#286)
Variable BaseRfiToken_getValues(uint256,uint256).rTransferAmount (TurtleMoonTokenV1.sol#885) is too similar to BaseRfiToken_transferTokens(address,a
address,uint256,bool).tTransferAmount (TurtleMoonTokenV1.sol#853)
Variable BaseRfiToken_transferTokens(address,address,uint256,bool).rTransferAmount (TurtleMoonTokenV1.sol#853) is too similar to BaseRfiToken_transf
erTokens(address,address,uint256,bool).tTransferAmount (TurtleMoonTokenV1.sol#853)
Variable BaseRfiToken_reflectFromToken(uint256,bool).rTransferAmount (TurtleMoonTokenV1.sol#733) is too similar to BaseRfiToken_transferTokens(add
ress,address,uint256,bool).tTransferAmount (TurtleMoonTokenV1.sol#853)
Variable BaseRfiToken_getValues(uint256,uint256).rTransferAmount (TurtleMoonTokenV1.sol#885) is too similar to BaseRfiToken_getValues(uint256,uint25
6).tTransferAmount (TurtleMoonTokenV1.sol#881)
Variable BaseRfiToken_reflectFromToken(uint256,bool).rTransferAmount (TurtleMoonTokenV1.sol#733) is too similar to BaseRfiToken_getValues(uint256,
uint256).tTransferAmount (TurtleMoonTokenV1.sol#881)
Variable BaseRfiToken_transferTokens(address,address,uint256,bool).rTransferAmount (TurtleMoonTokenV1.sol#853) is too similar to BaseRfiToken_getVal
ues(uint256,uint256).tTransferAmount (TurtleMoonTokenV1.sol#881)
Reference: https://github.com/crytic/sllther/wiki/Detector-Documentation#variable-names-are-too-similar

TurtleMoonTokenV1.slltherConstructorVariables() (TurtleMoonTokenV1.sol#1056-1062) uses literals with too many digits:
- burnAddress = 0x0000000000000000000000000000000299792458 (TurtleMoonTokenV1.sol#581)
TurtleMoonTokenV1.slltherConstructorConstantVariables() (TurtleMoonTokenV1.sol#1056-1062) uses literals with too many digits:
- TOTAL_SUPPLY = 100000000000000 * ZEROES (TurtleMoonTokenV1.sol#419)
Reference: https://github.com/crytic/sllther/wiki/Detector-Documentation#too-many-digits

Liquifier_mainnetRouterV1Address (TurtleMoonTokenV1.sol#284) should be constant
Liquifier_mainnetRouterV2Address (TurtleMoonTokenV1.sol#286) should be constant
Liquifier_testnetRouterAddress (TurtleMoonTokenV1.sol#210) should be constant
Reference: https://github.com/crytic/sllther/wiki/Detector-Documentation#state-variables-that-could-be-declared-constant

manager() should be declared external:
- Manageable.manager() (TurtleMoonTokenV1.sol#136)
renounceOwnership() should be declared external:
- Ownable.renounceOwnership() (TurtleMoonTokenV1.sol#166-169)
transferOwnership(address) should be declared external:
- Ownable.transferOwnership(address) (TurtleMoonTokenV1.sol#170-174)
getUnlockTime() should be declared external:
- Ownable.getUnlockTime() (TurtleMoonTokenV1.sol#175-177)
lock(uint256) should be declared external:
- Ownable.lock(uint256) (TurtleMoonTokenV1.sol#178-183)
unlock() should be declared external:
- Ownable.unlock() (TurtleMoonTokenV1.sol#184-189)
setCharityAddress(address) should be declared external:
- Tokenomics.setCharityAddress(address) (TurtleMoonTokenV1.sol#510-512)
setMarketAddress(address) should be declared external:
- Tokenomics.setMarketAddress(address) (TurtleMoonTokenV1.sol#511-515)
setBurnAddress(address) should be declared external:
- Tokenomics.setBurnAddress(address) (TurtleMoonTokenV1.sol#516-530)
RemoveFees() should be declared external:
- Tokenomics.RemoveFees() (TurtleMoonTokenV1.sol#531-533)
RestoreFees() should be declared external:
- Tokenomics.RestoreFees() (TurtleMoonTokenV1.sol#534-536)
changeFees(uint256,uint256,uint256,uint256,uint256) should be declared external:
- Tokenomics.changeFees(uint256,uint256,uint256,uint256,uint256) (TurtleMoonTokenV1.sol#537-543)
IncreaseAllowance(address,uint256) should be declared external:
- BaseRfiToken.increaseAllowance(address,uint256) (TurtleMoonTokenV1.sol#709-712)
decreaseAllowance(address,uint256) should be declared external:
- BaseRfiToken.decreaseAllowance(address,uint256) (TurtleMoonTokenV1.sol#714-717)
isExcludedFromFee(address) should be declared external:
- BaseRfiToken.isExcludedFromFee(address) (TurtleMoonTokenV1.sol#774)
Reference: https://github.com/crytic/sllther/wiki/Detector-Documentation#public-function-that-could-be-declared-external
```

# Smart Contract Audit

MythX: -

Report for TurtleMoonTokenV1.sol  
<https://dashboard.mythx.io/#/console/analyses/20c8e296-4ca9-40e6-9fe1-ca95b559302d>

Line	SWC Title	Severity	Short Description
108	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "+" discovered
109	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "-" discovered
110	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "*" discovered
111	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "/" discovered
112	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "%" discovered
114	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "-" discovered
181	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "+" discovered
307	(SWC-110) Assert Violation	Unknown	Out of bounds array access
308	(SWC-110) Assert Violation	Unknown	Out of bounds array access
414	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "***" discovered
416	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "***" discovered
419	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "**" discovered
420	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "-" discovered
420	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "%" discovered
430	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "/" discovered
457	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "/" discovered
529	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "+=" discovered
565	(SWC-110) Assert Violation	Unknown	Out of bounds array access
762	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "++" discovered
763	(SWC-110) Assert Violation	Unknown	Out of bounds array access
764	(SWC-101) Integer Overflow and Underflow	Unknown	Compiler-rewritable "<uint> - 1" discovered
764	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "-" discovered
764	(SWC-110) Assert Violation	Unknown	Out of bounds array access
828	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "+" discovered
904	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "++" discovered
905	(SWC-110) Assert Violation	Unknown	Out of bounds array access
906	(SWC-110) Assert Violation	Unknown	Out of bounds array access
907	(SWC-110) Assert Violation	Unknown	Out of bounds array access
996	(SWC-101) Integer Overflow and Underflow	Unknown	Arithmetic operation "++" discovered

# Smart Contract Audit

Mythril: -

```
root@sv-VirtualBox:/home/sv/TurtleMoonToken-TMT-# myth analyze TurtleMoonTokenV1.sol
The analysis was completed successfully. No issues were detected.
```

Solhint: -

## Lint results:

```
TurtleMoonTokenV1.sol:114:18:
Error: Parse error: missing
';' at '{'
```

## Basic Coding Bugs

### 1. Constructor Mismatch

- Description: Whether the contract name and its constructor are not identical to each other.
- Result: PASSED
- Severity: Critical

### 2. Ownership Takeover

- Description: Whether the set owner function is not protected.
- Result: PASSED
- Severity: Critical

### 3. Redundant Fallback Function

- Description: Whether the contract has a redundant fallback function.
- Result: PASSED
- Severity: Critical

### 4. Overflows & Underflows

- Description: Whether the contract has general overflow or underflow vulnerabilities
- Result: PASSED
- Severity: Critical

### 5. Reentrancy

- Description: Reentrancy is an issue when code can call back into your contract and change state, such as withdrawing ETHs.
- Result: PASSED
- Severity: Critical

### 6. MONEY-Giving Bug

- Description: Whether the contract returns funds to an arbitrary address.
- Result: PASSED
- Severity: High

## 7. Blackhole

- Description: Whether the contract locks ETH indefinitely: merely in without out.
- Result: PASSED
- Severity: High

## 8. Unauthorized Self-Destruct

- Description: Whether the contract can be killed by any arbitrary address.
- Result: PASSED
- Severity: Medium

## 9. Revert DoS

- Description: Whether the contract is vulnerable to DoS attack because of unexpected revert.
- Result: PASSED
- Severity: Medium

## 10. Unchecked External Call

- Description: Whether the contract has any external call without checking the return value.
- Result: PASSED
- Severity: Medium

## 11. Gasless Send

- Description: Whether the contract is vulnerable to gasless send.
- Result: PASSED
- Severity: Medium

## 12. Send Instead of Transfer

- Description: Whether the contract uses send instead of transfer.
- Result: PASSED
- Severity: Medium

## 13. Costly Loop

- Description: Whether the contract has any costly loop which may lead to Out-Of-Gas exception.
- Result: PASSED
- Severity: Medium

## 14. (Unsafe) Use of Untrusted Libraries

- Description: Whether the contract use any suspicious libraries.
- Result: PASSED
- Severity: Medium

## 15. (Unsafe) Use of Predictable Variables

- Description: Whether the contract contains any randomness variable, but its value can be predicated.
- Result: PASSED
- Severity: Medium

## 16. Transaction Ordering Dependence

- Description: Whether the final state of the contract depends on the order of the transactions.
- Result: PASSED
- Severity: Medium

## 17. Deprecated Uses

- Description: Whether the contract use the deprecated tx.origin to perform the authorization.
- Result: PASSED
- Severity: Medium

## Semantic Consistency Checks

- Description: Whether the semantic of the white paper is different from the implementation of the contract.
- Result: PASSED
- Severity: Critical



## Conclusion

In this audit, we thoroughly analyzed TURTLEMOONTOKEN's Smart Contract. The current code base is well organized but there are promptly no issues found in the first phase of Smart Contract Audit.

Meanwhile, we need to emphasize that smart contracts as a whole are still in an early, but exciting stage of development. To improve this report, we greatly appreciate any constructive feedbacks or suggestions, on our methodology, audit findings, or potential gaps in scope/coverage.

## About eNebula Solutions

We believe that people have a fundamental need to security and that the use of secure solutions enables every person to more freely use the Internet and every other connected technology. We aim to provide security consulting service to help others make their solutions more resistant to unauthorized access to data & inadvertent manipulation of the system. We support teams from the design phase through the production to launch and surely after.

The eNebula Solutions team has skills for reviewing code in C, C++, Python, Haskell, Rust, Node.js, Solidity, Go, and JavaScript for common security vulnerabilities & specific attack vectors. The team has reviewed implementations of cryptographic protocols and distributed system architecture, including in cryptocurrency, blockchains, payments, and smart contracts. Additionally, the team can utilize various tools to scan code & networks and build custom tools as necessary.

Although we are a small team, we surely believe that we can have a momentous impact on the world by being translucent and open about the work we do.

For more information about our security consulting, please mail us at – [contact@enebula.in](mailto:contact@enebula.in)