



# SMART CONTRACT AUDIT

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PREPARED FOR

**BIRD BRO**



# INTRODUCTION

Auditing Firm	InterFi Network
Client Firm	Bird Bro
Methodology	Automated Analysis, Manual Code Review
Language	Solidity
Contract	0x4e2e3611A93140D95417ceFA2fAE7CA5bCf1401e
Blockchain	Binance Smart Chain
Centralization	Active ownership
Commit	30d636360119ac3e4bce9588c9c8da548eff83fb
Website	<a href="https://birdbro.io/">https://birdbro.io/</a>   <a href="https://app.birdbro.io/">https://app.birdbro.io/</a>
Telegram	<a href="https://t.me/BirdBroToken/">https://t.me/BirdBroToken/</a>   <a href="https://t.me/BirdBroNews/">https://t.me/BirdBroNews/</a>
Twitter	<a href="https://twitter.com/BirdBroToken/">https://twitter.com/BirdBroToken/</a>
Report Date	April 21, 2023


 Verify the authenticity of this report on our website: <https://www.github.com/interfinetwork>




## EXECUTIVE SUMMARY

InterFi has performed the automated and manual analysis of solidity codes. Solidity codes were reviewed for common contract vulnerabilities and centralized exploits. Here's a quick audit summary:

Status	Critical <span style="color: red;">●</span>	Major <span style="color: orange;">●</span>	Medium <span style="color: yellow;">●</span>	Minor <span style="color: green;">●</span>	Unknown <span style="color: brown;">●</span>
Open	0	0	0	2	0
Acknowledged	0	1	0	2	1
Resolved	0	0	0	1	0
Noteworthy Privileges	Set Minimum Token Quantity Needed to Sell, Set Liquidity Fee, Set Transaction and Wallet Limits, Set Manager and Operator Addresses, Set Bridge Address				

 Please note that smart contracts deployed on blockchains aren't resistant to exploits, vulnerabilities and/or hacks. Blockchain and cryptography assets utilize new and emerging technologies. These technologies present a high level of ongoing risks. For a detailed understanding of risk severity, source code vulnerability, and audit limitations, kindly review the audit report thoroughly.

 Please note that centralization privileges regardless of their inherited risk status - constitute an elevated impact on smart contract safety and security.



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## SCOPE OF WORK

InterFi was consulted by Bird Bro to conduct the smart contract audit of their solidity source codes. The audit scope of work is strictly limited to mentioned solidity file(s) only:

- BirdBro.sol

 If source codes are not deployed on the main net, they can be modified or altered before main-net deployment. Verify the contract's deployment status below:

Public Contract Link	
<a href="https://bscscan.com/address/0x4e2e3611a93140d95417cefa2fae7ca5bcf1401e#code">https://bscscan.com/address/0x4e2e3611a93140d95417cefa2fae7ca5bcf1401e#code</a>	
Contract Name	BirdBro
Compiler Version	0.8.19
License	Unlicensed



# AUDIT METHODOLOGY

Smart contract audits are conducted using a set of standards and procedures. Mutual collaboration is essential to performing an effective smart contract audit. Here's a brief overview of InterFi's auditing process and methodology:

## CONNECT

- The onboarding team gathers source codes, and specifications to make sure we understand the size, and scope of the smart contract audit.

## AUDIT

- Automated analysis is performed to identify common contract vulnerabilities. We may use the following third-party frameworks and dependencies to perform the automated analysis:
  - Remix IDE Developer Tool
  - Open Zeppelin Code Analyzer
  - SWC Vulnerabilities Registry
  - DEX Dependencies, e.g., Pancakeswap, Uniswap
- Simulations are performed to identify centralized exploits causing contract and/or trade locks.
- A manual line-by-line analysis is performed to identify contract issues and centralized privileges.

We may inspect below mentioned common contract vulnerabilities, and centralized exploits:

Centralized Exploits	<ul style="list-style-type: none"><li>○ Token Supply Manipulation</li><li>○ Access Control and Authorization</li><li>○ Assets Manipulation</li><li>○ Ownership Control</li><li>○ Liquidity Access</li><li>○ Stop and Pause Trading</li><li>○ Ownable Library Verification</li></ul>
----------------------	---



## Common Contract Vulnerabilities

- Integer Overflow
- Lack of Arbitrary limits
- Incorrect Inheritance Order
- Typographical Errors
- Requirement Violation
- Gas Optimization
- Coding Style Violations
- Re-entrancy
- Third-Party Dependencies
- Potential Sandwich Attacks
- Irrelevant Codes
- Divide before multiply
- Conformance to Solidity Naming Guides
- Compiler Specific Warnings
- Language Specific Warnings

**REPORT**

- The auditing team provides a preliminary report specifying all the checks which have been performed and the findings thereof.
- The client's development team reviews the report and makes amendments to solidity codes.
- The auditing team provides the final comprehensive report with open and unresolved issues.

**PUBLISH**

- The client may use the audit report internally or disclose it publicly.

 It is important to note that there is no pass or fail in the audit, it is recommended to view the audit as an unbiased assessment of the safety of solidity codes.



## RISK CATEGORIES

Smart contracts are generally designed to hold, approve, and transfer tokens. This makes them very tempting attack targets. A successful external attack may allow the external attacker to directly exploit. A successful centralization-related exploit may allow the privileged role to directly exploit. All risks which are identified in the audit report are categorized here for the reader to review:

Risk Type	Definition
Critical 	These risks could be exploited easily and can lead to asset loss, data loss, asset, or data manipulation. They should be fixed right away.
Major 	These risks are hard to exploit but very important to fix, they carry an elevated risk of smart contract manipulation, which can lead to high-risk severity.
Medium 	These risks should be fixed, as they carry an inherent risk of future exploits, and hacks which may or may not impact the smart contract execution. Low-risk re-entrancy-related vulnerabilities should be fixed to deter exploits.
Minor 	These risks do not pose a considerable risk to the contract or those who interact with it. They are code-style violations and deviations from standard practices. They should be highlighted and fixed nonetheless.
Unknown 	These risks pose uncertain severity to the contract or those who interact with it. They should be fixed immediately to mitigate the risk uncertainty.

All statuses which are identified in the audit report are categorized here for the reader to review:

Status Type	Definition
Open	Risks are open.
Acknowledged	Risks are acknowledged, but not fixed.
Resolved	Risks are acknowledged and fixed.





## CENTRALIZED PRIVILEGES

Centralization risk is the most common cause of cryptography asset loss. When a smart contract has a privileged role, the risk related to centralization is elevated.

There are some well-intended reasons have privileged roles, such as:

- Privileged roles can be granted the power to pause() the contract in case of an external attack.
- Privileged roles can use functions like, include(), and exclude() to add or remove wallets from fees, swap checks, and transaction limits. This is useful to run a presale and to list on an exchange.

Authorizing privileged roles to externally-owned-account (EOA) is dangerous. Lately, centralization-related losses are increasing in frequency and magnitude.

- The client can lower centralization-related risks by implementing below mentioned practices:
- Privileged role's private key must be carefully secured to avoid any potential hack.
- Privileged role should be shared by multi-signature (multi-sig) wallets.
- Authorized privilege can be locked in a contract, user voting, or community DAO can be introduced to unlock the privilege.
- Renouncing the contract ownership, and privileged roles.
- Remove functions with elevated centralization risk.



 Understand the project's initial asset distribution. Assets in the liquidity pair should be locked. Assets outside the liquidity pair should be locked with a release schedule.


















# AUTOMATED ANALYSIS

Symbol	Definition
	Function modifies state
	Function is payable
	Function is internal
	Function is private
	Function is important






```

| **Context** | Implementation |   | |
| L | _msgSender | Internal  |   |
| L | _msgData | Internal  |   |

|||||

| **IBirdBro** | Interface |   | | |
| L | totalSupply | External  | |NO  |
| L | balanceOf | External  | |NO  |
| L | transfer | External  |  |NO  |
| L | allowance | External  | |NO  |
| L | approve | External  |  |NO  |
| L | transferFrom | External  |  |NO  |

|||||

| **SafeMath** | Library |   | |
| L | tryAdd | Internal  |   |
| L | trySub | Internal  |   |
| L | tryMul | Internal  |   |
| L | tryDiv | Internal  |   |
| L | tryMod | Internal  |   |

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```

|  L | add | Internal 🔒 |  |  |
|  L | sub | Internal 🔒 |  |  |
|  L | mul | Internal 🔒 |  |  |
|  L | div | Internal 🔒 |  |  |
|  L | mod | Internal 🔒 |  |  |
|  L | sub | Internal 🔒 |  |  |
|  L | div | Internal 🔒 |  |  |
|  L | mod | Internal 🔒 |  |  |
|||||
| **Address** | Library |  |  |
|  L | isContract | Internal 🔒 |  |  |
|  L | sendValue | Internal 🔒 | 🔴 |  |
|  L | functionCall | Internal 🔒 | 🔴 |  |
|  L | functionCall | Internal 🔒 | 🔴 |  |
|  L | functionCallWithValue | Internal 🔒 | 🔴 |  |
|  L | functionCallWithValue | Internal 🔒 | 🔴 |  |
|  L | functionStaticCall | Internal 🔒 |  |  |
|  L | functionStaticCall | Internal 🔒 |  |  |
|  L | functionDelegateCall | Internal 🔒 | 🔴 |  |
|  L | functionDelegateCall | Internal 🔒 | 🔴 |  |
|  L | verifyCallResultFromTarget | Internal 🔒 |  |  |
|  L | verifyCallResult | Internal 🔒 |  |  |
|  L | _revert | Private 🔒🔑 |  |  |
|||||
| **Ownable** | Implementation | Context |||
|  L | <Constructor> | Public ! | 🔴 | NO! |
|  L | owner | Public ! |  | NO! |
|  L | _checkOwner | Internal 🔒 |  |  |

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```

|  L | renounceOwnership | Public ! | 🔴 | onlyContractCreator |
|  L | transferOwnership | Public ! | 🔴 | onlyContractCreator |
|  L | _transferOwnership | Internal 🔒 | 🔴 | |
|||||
| **IUniswapV2Factory** | Interface | |||
|  L | createPair | External ! | 🔴 | NO ! |
|||||
| **IUniswapV2Router02** | Interface | |||
|  L | swapExactTokensForETHSupportingFeeOnTransferTokens | External ! | 🔴 | NO ! |
|  L | factory | External ! | | NO ! |
|  L | WETH | External ! | | NO ! |
|  L | addLiquidityETH | External ! | 💵 | NO ! |
|||||
| **BirdBro** | Implementation | Context, IBirdBro, Ownable |||
|  L | <Constructor> | Public ! | 🔴 | NO ! |
|  L | initRouterAndPair | External ! | 🔴 | onlyOperator |
|  L | updateRouterAndPair | External ! | 🔴 | onlyOperator |
|  L | setQuantityInPercentageForSale | External ! | 🔴 | onlyOperator |
|  L | setBridgeAddress | External ! | 🔴 | onlyOperator |
|  L | setManagerAddress | External ! | 🔴 | onlyContractCreator |
|  L | setOperatorAddress | External ! | 🔴 | onlyContractCreator |
|  L | checkWalletLiquidity | Public ! | | NO ! |
|  L | checkWalletLiquidityAddress | Public ! | | NO ! |
|  L | name | Public ! | | NO ! |
|  L | symbol | Public ! | | NO ! |
|  L | decimals | Public ! | | NO ! |
|  L | totalSupply | Public ! | | NO ! |
|  L | balanceOf | Public ! | | NO ! |

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	^		transfer		Public	!		🔴		NO	!	
	^		allowance		Public	!				NO	!	
	^		approve		Public	!		🔴		NO	!	
	^		transferFrom		Public	!		🔴		NO	!	
	^		increaseAllowance		Public	!		🔴		NO	!	
	^		decreaseAllowance		Public	!		🔴		NO	!	
	^		updateQuantityNeededForSale		External	!		🔴		onlyOperator		
	^		setMaxTxAmount		External	!		🔴		onlyOperator		
	^		setMaxWalletAmount		External	!		🔴		onlyOperator		
	^		setMaxTxAmountAddress		External	!		🔴		onlyOperator		
	^		setMaxWalletAmountAddress		External	!		🔴		onlyOperator		
	^		setExcludedAddressMaxTxAmount		External	!		🔴		onlyOperator		
	^		setExcludedAddressMaxWalletAmount		External	!		🔴		onlyOperator		
	^		setExcludedLiquidityFee		External	!		🔴		onlyOperator		
	^		isExcludedMaxTx		Public	!				NO	!	
	^		isExcludedMaxWallet		Public	!				NO	!	
	^		isExcludedLiquidityFee		Public	!				NO	!	
	^		setLiquidityFeePercent		External	!		🔴		onlyOperator		
	^		setWalletLiquidityAddress		External	!		🔴		onlyOperator		
	^		setSwapAndLiquifyEnabled		External	!		🔴		onlyOperator		
	^		_approve		Internal	🔒		🔴				
	^		_transfer		Internal	🔒		🔴				
	^		_checkSwapAndLiquidityIsAvailable		Private	🔒		🔴				
	^		_transferTokensForWalletLiquidity		Internal	🔒		🔴				
	^		_calculateLiquidityFee		Private	🔒						
	^		swapAndLiquify		Private	🔒		🔴		lockTheSwap		
	^		getTokensFromLiquidityWallet		Private	🔒		🔴				

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```

| L | swapTokensForBnb | Private 🗝️ | 🔴 | |
| L | addLiquidity | Private 🗝️ | 🔴 | |
| L | getContractBalance | Public ! | | NO ! |
| L | getBNBBalance | Public ! | | NO ! |
| L | withdrawToken | External ! | 🔴 | onlyManager |
| L | withdrawBnb | External ! | 🔴 | onlyManager |
| L | _mint | Internal 🗝️ | 🔴 | |
| L | _burn | Internal 🗝️ | 🔴 | |
| L | mint | External ! | 🔴 | onlyBridge |
| L | burn | External ! | 🔴 | onlyBridge |
| L | <Receive Ether> | External ! | 🏠 | NO ! |
|||||
| **BirdBroToken** | Implementation | BirdBro |||
| L | <Constructor> | Public ! | 🔴 | BirdBro |

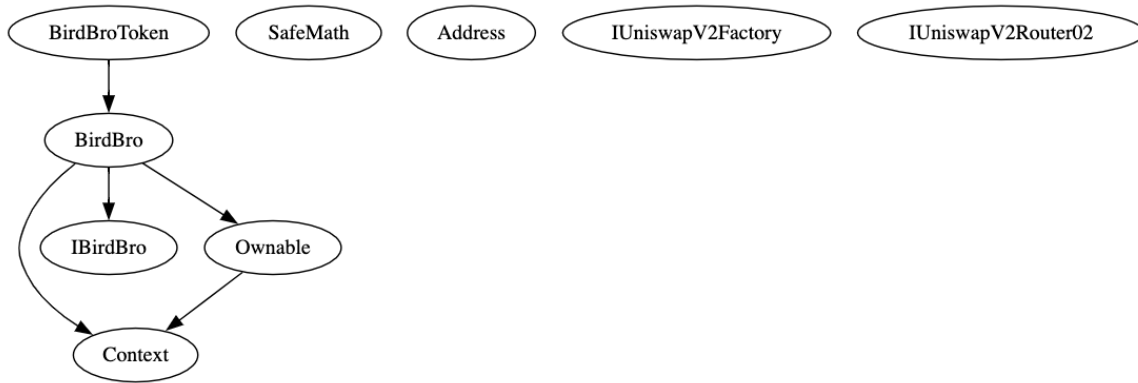
```

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## INHERITANCE GRAPH



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## MANUAL REVIEW

Identifier	Definition	Severity
CEN-01	Centralized privileges	Major 🟡
CEN-11	Privileged role performing mint	
BRO-01	Address specific transaction and wallet limits	
CEN-07	Authorizations and access controls	

onlyContractCreator centralized privilege is provided to:

```

renounceOwnership()
transferOwnership()
setManagerAddress()
setOperatorAddress()

```

onlyOperator centralized privilege is provided to:

```

initRouterAndPair()
updateRouterAndPair()
setQuantityInPercentageForSale()
setBridgeAddress()
updateQuantityNeededForSale()
setMaxTxAmount()
setMaxWalletAmount()
setMaxTxAmountAddress()
setMaxWalletAmountAddress()
setExcludedAddressMaxTxAmount()
setExcludedAddressMaxWalletAmount()
setExcludedLiquidityFee()
setSwapAndLiquifyEnabled()
setLiquidityFeePercent()
setWalletLiquidityAddress()

```

onlyManager centralized privilege is provided to:

```

withdrawToken()
withdrawBnb()

```





onlyBridge access control is provided to:

mint()

burn()

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## RECOMMENDATION

Deployer (Contract Creator), contract owner, administrator, operator, manager and all other privileged roles' private keys must be secured carefully. Refer to PAGE-09 CENTRALIZED PRIVILEGES for detailed understanding.

## ACKNOWLEDGEMENT

Bird Bro team will use Gnosis multi-signature safe to manage centralization risk. 3 out of 4 signatures are required to access privileged modifiers.



Identifier	Definition	Severity
CEN-02	Initial asset distribution	Minor 

All of the initially minted assets are sent to contract creator when deploying the contract. This can be an issue as the contract creator can distribute tokens without consulting the community.

```
uint256 private _totalSupply = 100_000_000 * 10 ** _decimals; // total supply of the token.
```

```
    _balances[_msgSender()] = _totalSupply; // set the initial balance of the sender.
```

```
    emit Transfer(_burnWallet, _msgSender(), _totalSupply); // emit the transfer event.
```

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## RECOMMENDATION

Project must communicate with stakeholders and obtain the community consensus while distributing assets.



Identifier	Definition	Severity
LOG-01	Pre-emptive approval with <code>~uint256(0)</code>	Minor <span style="color: green;">●</span>

This line of code is pre-approving the maximum possible allowance of tokens from the `_deployer` address to the `_uniswapRouter` address. This is often done to save gas and time.

```
// pre-approve the initial liquidity supply (to save a bit of time)
_approve(_deployer, _uniswapRouter, ~uint256(0));
```

By pre-approving a large allowance, `_deployer` address is granted significant control over the token's initial liquidity.

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## RECOMMENDATION

Private keys of `_deployer` address should be secured carefully. All centralized implications should be managed carefully.



Identifier	Definition	Severity
LOG-02	Potential front-running	Minor 


Potential front-running also classified as – sandwich attack happens when an attacker observes a transaction swapping tokens or adding liquidity without setting restrictions on slippage or minimum output amount. The attacker can manipulate the exchange rate by front-running a transaction to purchase assets and make profits by back-running a transaction to sell assets. Below mentioned functions are called without setting restrictions on slippage or minimum output:

```
addLiquidityETH()  
swapExactTokensForETHSupportingFeeOnTransferTokens()
```

## RECOMMENDATION

These functions should be provided reasonable minimum output amounts, instead of zero.



Identifier	Definition	Severity
LOG-12	_liquidityFee to _walletLiquidity	Minor 

Generally, liquidity fee is sent to the token pool to improve the depth of the pool, making the token's price more stable and reducing slippage for users when trading the token.


BirdBro smart contract sends \_liquidityFee to \_walletLiquidity.

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## RECOMMENDATION

Send collected liquidity fee to the liquidity pool directly to lower centralized intervention.



Identifier	Definition	Severity
COD-07	Conformance to solidity writing guide	Minor 

Modifiers are declared at the end of the code. It is recommended to place it after events and before the constructor, following solidity writing guide.

## RECOMMENDATION

Follow coding conventions for writing solidity code. Learn more:

<https://docs.soliditylang.org/en/v0.8.16/style-guide.html>

## RESOLUTION

Bird Bro team has moved modifiers to the top of the logic implementation.



Identifier	Definition	Severity
COD-10	Third Party Dependencies	Unknown 🟤

Smart contract is interacting with third party protocols e.g., Market Makers, OpenZeppelin tools. The scope of the audit treats third party entities as black boxes and assumes their functional correctness. However, in the real world, third parties can be compromised, and exploited. Moreover, upgrades in third parties can create severe impacts, e.g., increased transactional fees, deprecation of previous routers, etc.

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## RECOMMENDATION

Inspect third party dependencies regularly, and mitigate severe impacts whenever necessary.

## ACKNOWLEDGEMENT

Bird Bro team will inspect third party dependencies regularly.



Identifier	Definition	Severity
COM-01	Floating compiler status	

Compiler is set to ^0.8.19

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## RECOMMENDATION

Pragma should be fixed to the version that you're indenting to deploy your contracts with.

## RESOLUTION

Bird Bro team has deployed the contract with the current stable compiler version.





## DISCLAIMERS

InterFi Network provides the easy-to-understand audit of solidity source codes (commonly known as smart contracts).

The smart contract for this particular audit was analyzed for common contract vulnerabilities, and centralization exploits. This audit report makes no statements or warranties on the security of the code. This audit report does not provide any warranty or guarantee regarding the absolute bug-free nature of the smart contract analyzed, nor do they provide any indication of the client's business, business model or legal compliance. This audit report does not extend to the compiler layer, any other areas beyond the programming language, or other programming aspects that could present security risks. Cryptographic tokens are emergent technologies, they carry high levels of technical risks and uncertainty. You agree that your access and/or use, including but not limited to any services, reports, and materials, will be at your sole risk on an as-is, where-is, and as-available basis. This audit report could include false positives, false negatives, and other unpredictable results.

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## ABOUT INTERFI NETWORK

InterFi Network provides intelligent blockchain solutions. We provide solidity development, testing, and auditing services. We have developed 150+ solidity codes, audited 1000+ smart contracts, and analyzed 500,000+ code lines. We have worked on major public blockchains e.g., Ethereum, Binance, Cronos, Doge, Polygon, Avalanche, Metis, Fantom, Bitcoin Cash, Velas, Oasis, etc.

InterFi Network is built by engineers, developers, UI experts, and blockchain enthusiasts. Our team currently consists of 4 core members, and 6+ casual contributors.

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GitHub: <https://github.com/interfinetwork>


Telegram (Engineering): <https://t.me/interfiaudits>

Telegram (Onboarding): <https://t.me/interfisupport>



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SMART CONTRACT AUDITS | SOLIDITY DEVELOPMENT AND TESTING  
RELENTLESSLY SECURING PUBLIC AND PRIVATE BLOCKCHAINS