



# SMART CONTRACT AUDIT

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PREPARED FOR

**JOTARO**



# INTRODUCTION

Auditing Firm	InterFi Network
Client Firm	Jotaro
Methodology	Automated Analysis, Manual Code Review
Language	Solidity
Contract	0x4e8bC827197D03184f0E6Ac6D485B95317109b42
Blockchain	Ethereum Chain
Centralization	Active ownership
Commit	1c20bbeb2772a395188bcfef2ad0824ec1846d3f
Website	<a href="https://jotarotoken.com/">https://jotarotoken.com/</a>
Twitter	<a href="https://twitter.com/JotaroToken/">https://twitter.com/JotaroToken/</a>
Report Date	June 07, 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	0	0
Acknowledged	0	1	0	2	1
Resolved	0	0	1	3*	0
Noteworthy Privileges	<b>Set Min State</b> , Set Manual and Auto Liquidity Burn Parameters, Airdrop, Set Fees, Set Transaction and Wallet Limit, Set Transfer Tax				

 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 JOTARO 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:

- Jotaro.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://etherscan.io/token/0x4e8bc827197d03184f0e6ac6d485b95317109b42#code">https://etherscan.io/token/0x4e8bc827197d03184f0e6ac6d485b95317109b42#code</a>	
Contract Name	Jotaro
Compiler Version	0.8.9
License	MIT



# 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>
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Common Contract Vulnerabilities	<ul style="list-style-type: none"> <li>○ Integer Overflow</li> <li>○ Lack of Arbitrary limits</li> <li>○ Incorrect Inheritance Order</li> <li>○ Typographical Errors</li> <li>○ Requirement Violation</li> <li>○ Gas Optimization</li> <li>○ Coding Style Violations</li> <li>○ Re-entrancy</li> <li>○ Third-Party Dependencies</li> <li>○ Potential Sandwich Attacks</li> <li>○ Irrelevant Codes</li> <li>○ Divide before multiply</li> <li>○ Conformance to Solidity Naming Guides</li> <li>○ Compiler Specific Warnings</li> <li>○ Language Specific Warnings</li> </ul>
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## 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  |   |
|||||
| **IUniswapV2Pair** | Interface |   |
|  L | name | External  | |NO  |
|  L | symbol | External  | |NO  |
|  L | decimals | External  | |NO  |
|  L | totalSupply | External  | |NO  |
|  L | balanceOf | External  | |NO  |
|  L | allowance | External  | |NO  |
|  L | approve | External  |  |NO  |
|  L | transfer | External  |  |NO  |
|  L | transferFrom | External  |  |NO  |
|  L | DOMAIN_SEPARATOR | External  | |NO  |
|  L | PERMIT_TYPEHASH | External  | |NO  |
|  L | nonces | External  | |NO  |
|  L | permit | External  |  |NO  |

```



```

|  L | MINIMUM_LIQUIDITY | External ! | |NO ! |
|  L | factory | External ! | |NO ! |
|  L | token0 | External ! | |NO ! |
|  L | token1 | External ! | |NO ! |
|  L | getReserves | External ! | |NO ! |
|  L | price0CumulativeLast | External ! | |NO ! |
|  L | price1CumulativeLast | External ! | |NO ! |
|  L | kLast | External ! | |NO ! |
|  L | mint | External ! | ● |NO ! |
|  L | burn | External ! | ● |NO ! |
|  L | swap | External ! | ● |NO ! |
|  L | skim | External ! | ● |NO ! |
|  L | sync | External ! | ● |NO ! |
|  L | initialize | External ! | ● |NO ! |
|||||
| **IUniswapV2Factory** | Interface | |||
|  L | feeTo | External ! | |NO ! |
|  L | feeToSetter | External ! | |NO ! |
|  L | getPair | External ! | |NO ! |
|  L | allPairs | External ! | |NO ! |
|  L | allPairsLength | External ! | |NO ! |
|  L | createPair | External ! | ● |NO ! |
|  L | setFeeTo | External ! | ● |NO ! |
|  L | setFeeToSetter | External ! | ● |NO ! |
|||||
| **IERC20** | Interface | |||
|  L | totalSupply | External ! | |NO ! |
|  L | balanceOf | External ! | |NO ! |

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```

|  L | transfer | External ! |  | NO ! |
|  L | allowance | External ! |  | NO ! |
|  L | approve | External ! |  | NO ! |
|  L | transferFrom | External ! |  | NO ! |
|||||
| **IERC20Metadata** | Interface | IERC20 |||
|  L | name | External ! |  | NO ! |
|  L | symbol | External ! |  | NO ! |
|  L | decimals | External ! |  | NO ! |
|||||
| **ERC20** | Implementation | Context, IERC20, IERC20Metadata |||
|  L | <Constructor> | Public ! |  | NO ! |
|  L | name | Public ! |  | NO ! |
|  L | symbol | Public ! |  | NO ! |
|  L | decimals | Public ! |  | NO ! |
|  L | totalSupply | Public ! |  | NO ! |
|  L | balanceOf | Public ! |  | NO ! |
|  L | transfer | Public ! |  | NO ! |
|  L | allowance | Public ! |  | NO ! |
|  L | approve | Public ! |  | NO ! |
|  L | transferFrom | Public ! |  | NO ! |
|  L | increaseAllowance | Public ! |  | NO ! |
|  L | decreaseAllowance | Public ! |  | NO ! |
|  L | _transfer | Internal  |  |  |
|  L | _mint | Internal  |  |  |
|  L | _burn | Internal  |  |  |
|  L | _approve | Internal  |  |  |
|  L | _beforeTokenTransfer | Internal  |  |  |

```

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|||||

| **\*\*SafeMath\*\*** | Library | |||| <sup>L</sup> | add | Internal 🔒 | | || <sup>L</sup> | sub | Internal 🔒 | | || <sup>L</sup> | sub | Internal 🔒 | | || <sup>L</sup> | mul | Internal 🔒 | | || <sup>L</sup> | div | Internal 🔒 | | || <sup>L</sup> | div | Internal 🔒 | | || <sup>L</sup> | mod | Internal 🔒 | | || <sup>L</sup> | mod | Internal 🔒 | | |

|||||

| **\*\*Ownable\*\*** | Implementation | Context |||| <sup>L</sup> | <Constructor> | Public ! | 🔴 | NO ! || <sup>L</sup> | owner | Public ! | | NO ! || <sup>L</sup> | renounceOwnership | Public ! | 🔴 | onlyOwner || <sup>L</sup> | transferOwnership | Public ! | 🔴 | onlyOwner |

|||||

| **\*\*ReentrancyGuard\*\*** | Implementation | |||| <sup>L</sup> | <Constructor> | Public ! | 🔴 | NO ! || <sup>L</sup> | \_nonReentrantBefore | Private 🔒 | 🔴 | | || <sup>L</sup> | \_nonReentrantAfter | Private 🔒 | 🔴 | | |

|||||

| **\*\*IUniswapV2Router01\*\*** | Interface | |||| <sup>L</sup> | factory | External ! | | NO ! || <sup>L</sup> | WETH | External ! | | NO ! || <sup>L</sup> | addLiquidity | External ! | 🔴 | NO ! || <sup>L</sup> | addLiquidityETH | External ! | 📄 | NO ! || <sup>L</sup> | removeLiquidity | External ! | 🔴 | NO ! |TERFI  
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```

|  L | removeLiquidityETH | External ! | ● | NO ! |
|  L | removeLiquidityWithPermit | External ! | ● | NO ! |
|  L | removeLiquidityETHWithPermit | External ! | ● | NO ! |
|  L | swapExactTokensForTokens | External ! | ● | NO ! |
|  L | swapTokensForExactTokens | External ! | ● | NO ! |
|  L | swapExactETHForTokens | External ! | 🟡 | NO ! |
|  L | swapTokensForExactETH | External ! | ● | NO ! |
|  L | swapExactTokensForETH | External ! | ● | NO ! |
|  L | swapETHForExactTokens | External ! | 🟡 | NO ! |
|  L | quote | External ! | | NO ! |
|  L | getAmountOut | External ! | | NO ! |
|  L | getAmountIn | External ! | | NO ! |
|  L | getAmountsOut | External ! | | NO ! |
|  L | getAmountsIn | External ! | | NO ! |
|||||
| **IUniswapV2Router02** | Interface | IUniswapV2Router01 |||
|  L | removeLiquidityETHSupportingFeeOnTransferTokens | External ! | ● | NO ! |
|  L | removeLiquidityETHWithPermitSupportingFeeOnTransferTokens | External ! | ● | NO ! |
|  L | swapExactTokensForTokensSupportingFeeOnTransferTokens | External ! | ● | NO ! |
|  L | swapExactETHForTokensSupportingFeeOnTransferTokens | External ! | 🟡 | NO ! |
|  L | swapExactTokensForETHSupportingFeeOnTransferTokens | External ! | ● | NO ! |
|||||
| **Jotaro** | Implementation | ERC20, Ownable, ReentrancyGuard |||
|  L | <Constructor> | Public ! | ● | ERC20 |
|  L | <Receive Ether> | External ! | 🟡 | NO ! |
|  L | enableTrading | External ! | ● | onlyOwner |
|  L | setTransferTaxEnable | External ! | ● | onlyOwner |
|  L | removeLimits | External ! | ● | onlyOwner |

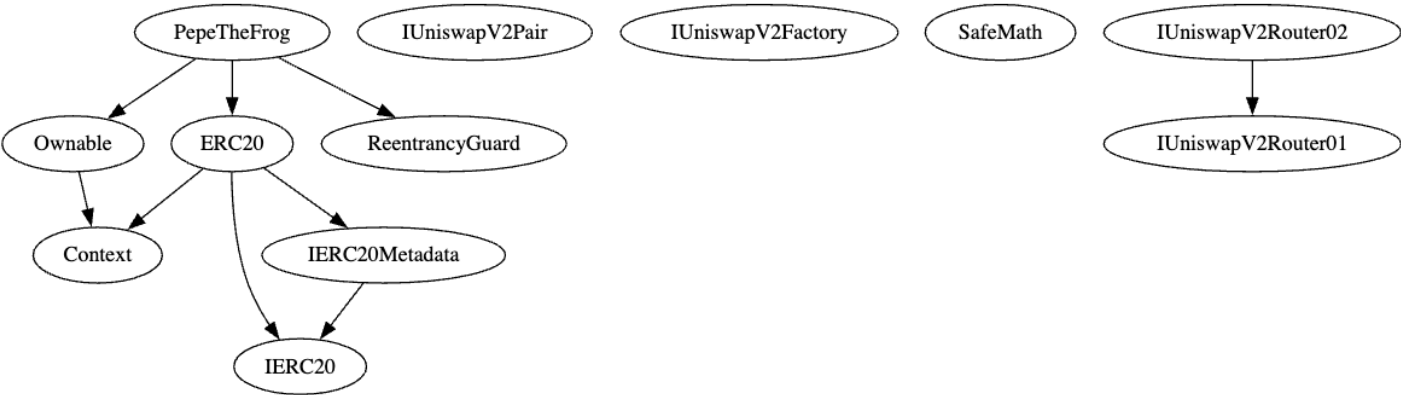
```

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	^		setMinState		External	!		🔴		onlyOwner	
	^		updateSwapTokensAtAmount		External	!		🔴		onlyOwner	
	^		updateMaxTxnAmount		External	!		🔴		onlyOwner	
	^		updateMaxWalletAmount		External	!		🔴		onlyOwner	
	^		excludeFromMaxTransaction		Public	!		🔴		onlyOwner	
	^		updateBuyFees		External	!		🔴		onlyOwner	
	^		updateSellFees		External	!		🔴		onlyOwner	
	^		excludeFromFees		Public	!		🔴		onlyOwner	
	^		setTransferTax		Public	!		🔴		onlyOwner	
	^		setAutomatedMarketMakerPair		Public	!		🔴		onlyOwner	
	^		_setAutomatedMarketMakerPair		Private	🔒		🔴			
	^		updateMarketingWallet		External	!		🔴		onlyOwner	
	^		isExcludedFromFees		Public	!			NO !		
	^		_transfer		Internal	🔒		🔴			
	^		_reflectFee		Private	🔒		🔴			
	^		_getValues		Public	!			NO !		
	^		_getTValues		Private	🔒					
	^		_getRValues		Private	🔒					
	^		_getRate		Private	🔒					
	^		_getCurrentSupply		Public	!			NO !		
	^		swapTokensForEth		Private	🔒		🔴			
	^		addLiquidity		Private	🔒		🔴			
	^		swapBack		Private	🔒		🔴		nonReentrant	
	^		setAutoLPBurnSettings		External	!		🔴		onlyOwner	
	^		autoBurnLiquidityPairTokens		Internal	🔒		🔴			
	^		manualBurnLiquidityPairTokens		External	!		🔴		onlyOwner	
	^		airdropArray		External	!		🔴		onlyOwner	

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# INHERITANCE GRAPH



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## MANUAL REVIEW

Identifier	Definition	Severity
CEN-01	Centralized privileges	Major 🟡

onlyOwner centralized privileges are listed below:

```

transferOwnership()
enableTrading()
setTransferTaxEnable()
removeLimits()
setMinState()
updateSwapTokensAtAmount()
updateMaxTxnAmount()
updateMaxWalletAmount()
excludeFromMaxTransaction()
updateBuyFees()
updateSellFees()
excludeFromFees()
setTransferTax()
setAutomatedMarketMakerPair()
updateMarketingWallet()
setAutoLPBurnSettings()
manualBurnLiquidityPairTokens()
airdropArray()

```

## RECOMMENDATION

Deployers, contract owners, administrators, access controlled, and all other privileged roles' private-keys/access-keys/admin-keys should be secured carefully. These entities can have a single point of failure that compromises the security of the project. Manage centralized and privileged roles carefully, review PAGE 09 for more information.



Identifier	Definition
JOT-01	Arbitrary boundaries set

Mentioned functions are set with arbitrary boundaries to reduce risk of honeypot:

```
updateSwapTokensAtAmount()
    require(
        newAmount >= (totalSupply() * 1) / 100000,
        "Swap amount cannot be lower than 0.001% total supply."
    );
    require(
        newAmount <= (totalSupply() * 5) / 1000,
        "Swap amount cannot be higher than 0.5% total supply."
    );
```

```
updateMaxTxnAmount()
    require(
        newNum >= ((totalSupply() * 1) / 1000) / 1e9,
        "Cannot set maxTransactionAmount lower than 0.1%"
    );
```


```
updateMaxWalletAmount()
    require(
        newNum >= ((totalSupply() * 5) / 1000) / 1e9,
        "Cannot set maxWallet lower than 0.5%"
    );
```

```
updateBuyFees()
    require(buyTotalFees <= 3, "Must keep fees at 3% or less");
```

```
updateSellFees()
    require(sellTotalFees <= 6, "Must keep fees at 6% or less");
```

```
setTransferTax()
    require(taxPercent < 10, "Transfer Tax can't be more than 10");
```



Identifier	Definition	Severity
CEN-02	Initial asset distribution	Minor 

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

```
tTotal = 469000000000* 1e9;
_rTotal = (MAX - (MAX % tTotal));
_mint(msg.sender, tTotal);
```

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## RECOMMENDATION

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

## ACKNOWLEDGEMENT

Jotaro will distribute tokens as per their pre-determined tokenomics.



Identifier	Definition	Severity
LOG-02	Potential front-running	Minor <span style="color: green;">●</span>

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`

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## RECOMMENDATION

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

## ACKNOWLEDGEMENT

Jotaro has acknowledged this finding and agreed to keep the code as-is.



Identifier	Definition	Severity
COD-01	Authorization through tx.origin	Medium ●

Using tx.origin for authorization could make the contract vulnerable as it refers to the original external account that started the transaction.

## RECOMMENDATION

Avoid authorizations via global variables wherever necessary.

## RESOLUTION

Jotaro has removed tx.origin from contract.



Identifier	Definition	Severity
COD-02	Timestamp manipulation via <code>block.timestamp</code> and <code>block.number</code>	Minor 

Be aware that the timestamp of the block can be manipulated by a miner. When the contract uses the timestamp to seed a random number, the miner can actually post a timestamp within 15 seconds of the block being validated, effectively allowing the miner to precompute an option more favorable to their chances.

## RECOMMENDATION

To maintain block integrity, follow 15 seconds rule, and scale time dependent events accordingly.

## PARTIAL RESOLUTION\*

Jotaro has acknowledged this finding and resolved it partially by adding `nonReentrant` modifier to `swapBack()`.



Identifier	Definition	Severity
COD-10	Third Party Dependencies	Unknown 🟤

Smart contract is interacting with third party protocols e.g., Market Makers, Open Zeppelin 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.


## RECOMMENDATION

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

## ACKNOWLEDGEMENT

Jotaro will inspect third party dependencies periodically.



Identifier	Definition	Severity
VOL-01	Irrelevant code	Minor 

- Redundant code in SafeMath, SafeMathInt, SafeMathUint.
- isNotBlocked modifier is declared but not used.
- Remove commented out codelines.
- airdrop, airdropInternal, airdropArray functions can be written as one.

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## RECOMMENDATION


Remove redundant and dead code.

## RESOLUTION

Jotaro has removed most of the irrelevant code lines from contract.





Identifier	Definition	Severity
COM-04	Potential resource exhaustion errors	Minor 

Below mentioned functions may throw out of gas errors upon executing:

`airdropArray()`

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## RECOMMENDATION

Set upper bounds for multi-address calls.

## RESOLUTION

Jotaro has set a require to check both input parameters are the same for aforementioned function.



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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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