InterFi NETWORK

SMART CONTRACT AUDIT

interfinetwork

hello@interfi.network

https://interfi.network

PREPARED FOR

JUSTUS (JTT)

INTRODUCTION

Auditing Firm	InterFi Network
Client Firm	Justus
Methodology	Automated Analysis, Manual Code Review
Language	Solidity
Contract	0x3a4A9bd0884a3993bb9c854f1dd5c1db1578d8Db
Blockchain	Binance Smart Chain
Centralization	Active ownership
Commit	ed0ac0a5220374c7e58acd69656576b6785e315f
Website	
Telegram	
Twitter	
Report Date	August 09, 2023

ℹ 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 🔴	Major 🟠	Medium 🟡	Minor 🟢	Unknown 🟤
Open	0	0	0	1	0
Acknowledged	0	1	0	2	1
Resolved	0	0	2*	6	0
Noteworthy Privileges	**Set Service Account, Set Treasury, Toggle Taxes, Adjust Fee Distribution,** Set Pair and Router, Adjust Buyback and Sell Thresholds				
Noteworthy `Public` Functions	**Burn From,** Burn				

ℹ️ 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.

ℹ️ 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 Justus 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:

- JTT.sol

ℹ️ 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	
https://bscscan.com/address/0x3a4a9bd0884a3993bb9c854f1dd5c1db1578d8db#code	
Contract Name	JTT
Compiler Version	0.8.19
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	○ Token Supply Manipulation ○ Access Control and Authorization ○ Assets Manipulation ○ Ownership Control ○ Liquidity Access ○ Stop and Pause Trading ○ Ownable Library Verification

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.

ℹ️ 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.

ℹ️ 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

JTT	Implementation	ERC20, ERC20Burnable, Ownable		
└	<Constructor>	Public !	🛑	ERC20
└	`toggleTax`	External !	🛑	onlyOwner
└	getRouterAddress	Public !		NO!
└	`alterRouterAddress`	Public !	🛑	onlyOwner
└	getPairAddress	Public !		NO!
└	`alterPairAddress`	Public !	🛑	onlyOwner
└	getAddressExemptFromFees	Public !		NO!
└	`alterExemptAddress`	Public !	🛑	onlyOwner
└	`setServiceAccount`	Public !	🛑	onlyOwner
└	`setTreasuryWallet`	Public !	🛑	onlyOwner
└	`adjustFeeDistribution`	Public !	🛑	onlyOwner
└	checkBuybackThreshold	Public !		NO!
└	checkSellThreshold	Public !		NO!
└	`adjustBuybackThreshold`	Public !	🛑	onlyOwner
└	`adjustSellThreshold`	Public !	🛑	onlyOwner
└	_transfer	Internal 🔒	🛑	

| └ | _transferWithFee | Private 🔐 | 🛑 | |

| └ | triggerSell | External ❗ | 🛑 | nonReentrant|

| └ | triggerBuyback | External ❗ | 🛑 | nonReentrant |

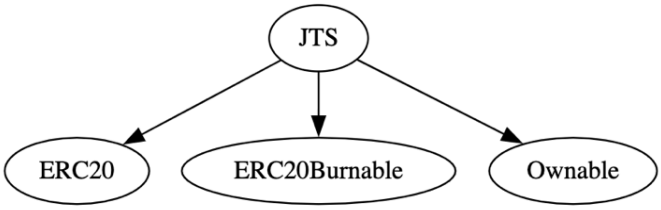
| └ | _sellTokens | Internal 🔒 | 🛑 | |

| └ | _buybackTokens | Internal 🔒 | 🛑 | |

| └ | withdrawBNB | External ❗ | 🛑 | onlyOwner |

| └ | withdrawERC20 | External ❗ | 🛑 | onlyOwner |

INHERITANCE GRAPH



MANUAL REVIEW

Identifier	Definition	Severity
CEN-01	Centralized privileges	Major 🟠
JUS-03	Privileged role can withdraw native token from contract	
CEN-07	Authorizations and access controls	

`onlyOwner` centralized privileges are listed below:

```
toggleTax()
alterRouterAddress()
alterPairAddress()
alterExemptAddress()
setServiceAccount()
setTreasuryWallet()
adjustFeeDistribution()
adjustBuybackThreshold()
adjustSellThreshold()
withdrawBNB()
withdrawERC20()
```

`_serviceAccount` access control privileges are provided to:

```
triggerSell()
triggerBuyback()
```

RECOMMENDATION

Deployers, contract owners, administrators, access controlled such as `_serviceAccount`, 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 funds and the security of the project. Make sure `_serviceAccount` is a trusted address/contract.

Implement multi-signature wallets: Require multiple signatures from different parties to execute certain sensitive functions within contracts. This spreads control and reduces the risk of a single party having complete authority.

Use a decentralized governance model: Implement a governance model that enables token holders or other stakeholders to participate in decision-making processes. This can include voting on contract upgrades, parameter changes, or any other critical decisions that impact the contract's functioning.

ACKNOWLEDGEMENT

Justus team has argued that privileged roles are used as intended, and accepted to use multi-signature wallets to manage centralization wherever possible.

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.

```
uint256 initialSupply = 22700000 * (10 ** decimals());
_mint(msg.sender, initialSupply);
```


RECOMMENDATION

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

ACKNOWLEDGEMENT

Justus team will distribute initially minted assets as per their pre-determined tokenomics.

Identifier	Definition	Severity
JUS-02	Flash loan attack vector	

While smart contract itself doesn't have flash loan functions, it's susceptible to being attacked through a flash loan. An attacker can take a flash loan from another protocol, interact with smart contract, and exploit potential pricing discrepancies.

NOTE

Smart contract isn’t inherently flawed, but its interactions with broader DeFi ecosystem can create vulnerabilities, and exploits.

Identifier	Definition	Severity
LOG-01	Lack of appropriate arbitrary boundaries	Minor

Below mentioned functions are set without appropriate input checks:

```
adjustFeeDistribution()
adjustBuybackThreshold()
adjustSellThreshold()
```


RECOMMENDATION

These functions should be provided appropriate input checks.

RESOLUTION

Justus team has added input checks to aforementioned functions.

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:

```
swapExactTokensForETHSupportingFeeOnTransferTokens()
swapExactETHForTokensSupportingFeeOnTransferTokens()
```


RECOMMENDATION

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

ACKNOWLEDGEMENT

Justus team argued that front-running is a by-product of EVM based blockchains e.g., Ethereum. Users will consider this while making transactions.

Identifier	Definition	Severity
LOG-03	Re-entrancy	Medium 🟡

Below mentioned functions are used without re-entrancy guard:

`_sellTokens()`
`_buybackTokens()`

RECOMMENDATION

Use Checks Effects Interactions pattern when handing over the flow to an external entity and guard functions against re-entrancy attacks.

LOG-03 RESOLUTION

Justus team has added `nonReentrant` modifiers to `triggerSell()` and `triggerBuyback()`, which subsequently protects `_sellTokens()` and `_buybackTokens()` against re-entrancy.

LOG-03-00 COMMENT*

Even though re-entrancy guard is added, if `_serviceAccount` is a malicious (untrusted) contract, it can potentially make contract's state inconsistent or vulnerable position during the callback.

Identifier	Definition	Severity
COD-02	Timestamp manipulation via `block.timestamp`	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.

RESOLUTION

Justus team has added `+30` variance to `block.timestamp.`

Identifier	Definition	Severity
COD-03	Potential for price manipulation	Minor

Functions `triggerSell()` and `triggerBuyback()` can potentially be exploited in tandem with other strategies to manipulate the token price on exchanges. An attacker can make small trades to influence the token's price, then execute these functions, and further amplify or take advantage of the price change.

RECOMMENDATION

Introduce a cooldown period between calls to `triggerSell()` and `triggerBuyback()`. Moreover, you can also limit frequency of trades, or introduce maximum volume restriction in a given time-frame. These will prevent rapid consecutive calls which could be used to exploit price movements.

Identifier	Definition	Severity
COD-05	Missing zero address validation	

Below mentioned functions are missing zero address input validation:

`alterRouterAddress()`
`alterPairAddress()`
`setServiceAccount()`
`setTreasuryWallet()`

RECOMMENDATION

Validate if the modified address is `dead(0)` or not.

RESOLUTION

Justus team has added zero address input checks.

Identifier	Definition	Severity
COD-09	Lack of contract balance withdraw	Minor 🟢

Smart contract may collect tokens, and ethers from external addresses. Some swap, and liquidity-add events may accumulate residual ethers, and tokens.

RECOMMENDATION

Add `withdraw()` function to take out tokens and ethers from the contract.

RESOLUTION

Justus team has added functions to withdraw tokens and ethers from smart contract.

NOTE ** Ideally, smart contract owner should not be able to withdraw native token from smart contract. Add a require check to `withdrawERC20` that `tokenAddress` is not `address(this).`

Identifier	Definition	Severity
COD-10	Third Party Dependencies	Unknown

Smart contract is interacting with third party protocols e.g., Market Makers, Dex Address, Service Account, Web 3 Applications, External Contracts, 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

Justus team will inspect third party dependencies regularly, and push updates when necessary.

Identifier	Definition	Severity
COD-12	Lack of event-driven architecture	Minor

Smart contract uses function calls to update state, which can make it difficult to track and analyze changes to the contract over time.

RECOMMENDATION

Use events to track state changes. Events improve transparency and provide a more granular view of contract activity.

RESOLUTION

Justus team has added missing events to the smart contract code.

Identifier	Definition	Severity
VOL-01	Irrelevant code	Minor

Redundant code in `SafeERC20`.

RECOMMENDATION

Remove redundant code. `SafeERC20` is imported, but not used.

RESOLUTION

Justus team has removed `SafeERC20` import.

Identifier	Definition	Severity
COM-03	Potential logical errors	Medium 🟡

In `_buybackTokens` function, `serviceWallet1.balance` to get the balance of BNB is used. This will return the balance of BNB in service wallet 1. Ideally in buyback, balance of contract is used, not service wallet 1.

In `_transferWithFee`, calculation of `serviceWallet1Share` and `serviceWallet2Share` based on `amount` and `taxAmount` is inconsistent. Ensure their sum equals `amount` minus `postTaxAmount`.

When selling tokens, approval is set for the contract's tokens on behalf of the contract itself. However, `_sellTokens` checks the balance of `_serviceWallet1`. This may lead to an issue where the contract has the approval but doesn't have the tokens to sell.

RECOMMENDATION

Please review and amend logic.

RESOLUTION

Justus team has made amendments to source code and pushed required updates.

Identifier	Definition	Severity
COM-04	Gas optimization	Minor 🟢

Below mentioned functions are provided `onlyOwner` modifier:

`getRouterAddress`
`getPairAddress`

RECOMMENDATION

Adding `onlyOwner` modifier is unnecessary as these are view functions, and restricting them to the owner is not recommended.

RESOLUTION

Justus team has removed `onlyOwner` modifier from aforementioned functions.

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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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.

Website: https://interfi.network

Email: hello@interfi.network

GitHub: https://github.com/interfinetwork

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

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

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hello@interfi.network

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SMART CONTRACT AUDITS | SOLIDITY DEVELOPMENT AND TESTING

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