InterFi NETWORK

SMART CONTRACT AUDIT

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PREPARED FOR

DROPS TIER 2 STAKING CONTRACT

INTRODUCTION

Auditing Firm	InterFi Network
Client Firm	Drops
Methodology	Automated Analysis, Manual Code Review
Language	Solidity
Contract	
Blockchain	Ethereum Chain
Centralization	Active Ownership
Commit	119f918cb3359c671bf73da3aff53d75f531fa9f
Website	https://drops.site/
Telegram	https://t.me/DropsERC/
X (Twitter)	https://twitter.com/dropserc/
Report Date	May 22, 2024

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	1	3	0
Acknowledged	0	1	0	1	1
Resolved	0	0	0	4	0
Important Functions	Deposit, Withdraw, Emergency Withdraw				
Noteworthy Privileges	Emergency Reward Withdraw, Stop Reward, Update Reward Per Block, Deposit Reward, Set Total Reward, Calculate Reward Per Block, Update Reward Per Block, Clear Stuck Balance, Recover Wrong Tokens				

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.

TABLE OF CONTENTS

SCOPE OF WORK

InterFi was consulted by Drops 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:

- DropsTier2.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	
Contract Name	DropsTier2
Compiler Version	0.8.0
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

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:

Risk Type	Definition
Critical 🔴	These risks pose immediate and severe threats, such as asset theft, data manipulation, or complete loss of contract functionality. They are often easy to exploit and can lead to significant, irreparable damage. Immediate fix is required.
Major 🟠	These risks can significantly impact code performance and security, and they may indirectly lead to asset theft and data loss. They can allow unauthorized access or manipulation of sensitive functions if exploited. Fixing these risks are important.
Medium 🟡	These risks may create attack vectors under certain conditions. They may enable minor unauthorized actions or lead to inefficiencies that can be exploited indirectly to escalate privileges or impact functionality over time.
Minor 🟢	These risks may include inefficiencies, lack of optimizations, code-style violations. These should be addressed to enhance overall code quality and maintainability.
Unknown 🟤	These risks pose uncertain severity to the contract or those who interact with it. Immediate fix is required to mitigate risk uncertainty.

All statuses which are identified in the audit report are categorized here:

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.

ℹ 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			
└	_msgSender	Internal 🔒		
└	_msgData	Internal 🔒		
└	_contextSuffixLength	Internal 🔒		
ReentrancyGuard	Implementation			
└	<Constructor>	Public !	🛑	NO!
└	_nonReentrantBefore	Private 🔐	🛑	
└	_nonReentrantAfter	Private 🔐	🛑	
└	_reentrancyGuardEntered	Internal 🔒		
IERC20	Interface			
└	totalSupply	External !		NO!
└	balanceOf	External !		NO!
└	transfer	External !	🛑	NO!
└	allowance	External !		NO!
└	approve	External !	🛑	NO!
└	transferFrom	External !	🛑	NO!

| └ | decimals | External ❗ | | |NO❗ |

||||||

| **Ownable** | Implementation | Context |||

| └ | <Constructor> | Public ❗ | 🛑 | |NO❗ |

| └ | owner | Public ❗ | | |NO❗ |

| └ | _checkOwner | Internal 🔒 | | | |

| └ | renounceOwnership | Public ❗ | 🛑 | onlyOwner |

| └ | transferOwnership | Public ❗ | 🛑 | onlyOwner |

| └ | _transferOwnership | Internal 🔒 | 🛑 | | |

||||||

| **Address** | Library | | |||

| └ | isContract | Internal 🔒 | | | |

| └ | sendValue | Internal 🔒 | 🛑 | | |

| └ | functionCall | Internal 🔒 | 🛑 | | |

| └ | functionCall | Internal 🔒 | 🛑 | | |

| └ | functionCallWithValue | Internal 🔒 | 🛑 | | |

| └ | functionCallWithValue | Internal 🔒 | 🛑 | | |

| └ | functionStaticCall | Internal 🔒 | | | |

| └ | functionStaticCall | Internal 🔒 | | | |

| └ | functionDelegateCall | Internal 🔒 | 🛑 | | |

| └ | functionDelegateCall | Internal 🔒 | 🛑 | | |

| └ | verifyCallResult | Internal 🔒 | | | |

||||||

| **SafeERC20** | Library | | |||

| └ | safeTransfer | Internal 🔒 | 🛑 | | |

| └ | safeTransferFrom | Internal 🔒 | 🛑 | | |

| └ | safeApprove | Internal 🔒 | 🛑 | | |

| └ | safeIncreaseAllowance | Internal 🔒 | 🛑 | | |

| └ | safeDecreaseAllowance | Internal 🔒 | 🛑 | | |

| └ | _callOptionalReturn | Private 🔐 | 🛑 | | |

||||||

| **DropsTier2** | Implementation | Ownable, ReentrancyGuard |||

| └ | <Constructor> | Public ❗ | 🛑 | Ownable |

| └ | <Receive Ether> | External ❗ | 💵 |NO❗ |

| └ | initialize | External ❗ | 🛑 |NO❗ |

| └ | changeMinDeposit | External ❗ | 🛑 | onlyOwner |

| └ | deposit | External ❗ | 🛑 | nonReentrant |

| └ | withdraw | External ❗ | 🛑 | nonReentrant |

| └ | emergencyWithdraw | External ❗ | 🛑 | nonReentrant |

| └ | emergencyRewardWithdraw | External ❗ | 🛑 | onlyOwner |

| └ | recoverWrongTokens | External ❗ | 🛑 | onlyOwner |

| └ | clearStuckBalance | External ❗ | 🛑 | onlyOwner |

| └ | stopReward | External ❗ | 🛑 | onlyOwner |

| └ | updatePoolLimitPerUser | External ❗ | 🛑 | onlyOwner |

| └ | updateRewardPerBlock | External ❗ | 🛑 | onlyOwner |

| └ | updateStartAndEndBlocks | External ❗ | 🛑 | onlyOwner |

| └ | pendingReward | External ❗ | |NO❗ |

| └ | _updatePool | Internal 🔒 | 🛑 | | |

| └ | _getMultiplier | Internal 🔒 | | | |

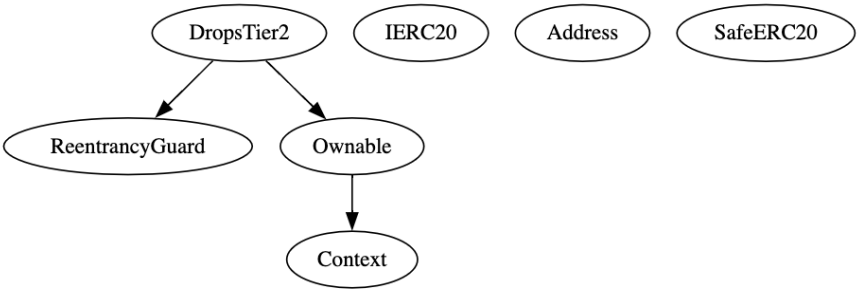
| └ | rewardDuration | Public ❗ | |NO❗ |

| └ | depositReward | External ❗ | 🛑 | onlyOwner |

| └ | setTotalReward | External ❗ | 🛑 | onlyOwner |

| └ | calcRewardPerBlock | Public ❗ | 🛑 | onlyOwner |

INHERITANCE GRAPH



MANUAL REVIEW

Identifier	Definition	Severity
CEN-01	Centralized privileges	Major 🟠
CEN-01-01	Privileged role has authority withdraw rewards	
CEN-01-02	Privileged role can update reward per block and stop reward	

Important `onlyOwner` centralized privileges are listed below:

```
renounceOwnership
transferOwnership
changeMinDeposit
emergencyRewardWithdraw
recoverWrongTokens
clearStuckBalance
stopReward
updatePoolLimitPerUser
updateRewardPerBlock
updateStartAndEndBlocks
depositReward
setTotalReward
calcRewardPerBlock
```

`emergencyRewardWithdraw` allows contract owner to withdraw any amount of reward tokens at any time. This function poses a significant risk of misuse if contract owner's account is compromised or malicious.

`SMART_CHEF_FACTORY` can `initialize` this staking contract.

RECOMMENDATION

Securing private keys or access credentials of deployers, contract owners, operators, and other roles with privileged access is crucial to prevent single points of failure that can compromise contract security.

Use of multi-signature wallets is recommended – These wallets require multiple authorizations to execute sensitive contract functions, reducing the risk associated with single-party control.

Use of decentralized governance model is recommended – This model allows token holders and stakeholders to actively participate in decision-making, such as contract upgrades and parameter adjustments, enhancing overall security and resilience.

ACKNOWLEDGEMENT

Drops team argued that centralized and controlled privileges are used as required.

Identifier	Definition	Severity
LOG-01	Insufficient input validation	Medium 🟡

Below mentioned functions are set without sufficient input validating require statements:

`initialize`
`changeMinDeposit`
`updateRewardPerBlock`
`setTotalReward`

RECOMMENDATION

Establish clear input validation. All operational parameters remain within safe and rational ranges.

Identifier	Definition	Severity
LOG-02	Potential front-running	Minor

Since mentioned transactions are public on the blockchain, malicious actors can watch mempool and execute transactions with higher gas fees to get their transactions mined first.

```
initialize
deposit
withdraw
emergencyWithdraw
```


RECOMMENDATION

Functions that execute critical state changes should enforce minimum output thresholds. Setting these minimums above zero can deter malicious actors by reducing the predictability and profitability of front-running strategies.

Implement commit-reveal schemes or transaction ordering to protect against front-running.

ACKNOWLEDGEMENT

Drops team has recognized this finding, and argued that front-running is an inherent issue on Ethereum, due to public nature of pending transactions. While we strive to mitigate its impact through careful design, complete prevention within the current Ethereum framework is not feasible.

Identifier	Definition
LOG-03	Re-entrancy

Below mentioned functions are used with a re-entrancy guard:

```
deposit
withdraw
emergencyWithdraw
```

Identifier	Definition	Severity
LOG-05	Possible denial of service (DoS)	Minor

By exploiting `emergencyWithdraw`, an attacker may potentially create conditions where legitimate users are unable to process their transactions due to gas cost spikes or maxing out block gas limits.

NOTE

Re-entrancy guard is applied to `emergencyWithdraw`, hence, recursive calls may be stopped by the guard. If contract balance is depleted, legitimate users cannot withdraw their funds.

Identifier	Definition	Severity
COD-02	Timestamp dependence	Minor

Be aware that the timestamp of the block can be manipulated by miners. Since miners can slightly adjust the timestamp, they may influence contract outcomes to their advantage.

RECOMMENDATION

Avoid relying solely on timestamp of the block for critical contract functions. Follow 15 seconds rule, and scale time dependent events accordingly.

RESOLUTION

Drops team argued that smart contract is not using timestamp dependency to generate random numbers, or to compute chances. Miner manipulation should be minimal.

Identifier	Definition	Severity
COD-04	Missing or inaccurate error messages	Minor

Below mentioned functions have missing or inaccurate error messages:

`deposit`
`clearStuckBalance`

RECOMMENDATION

Provide accurate information strings for `require` related errors.

Identifier	Definition	Severity
COD-10	Direct and indirect dependencies	Unknown 🟤
COD-11	Reliance on `rewardToken` and `stakedToken`	
COD-12	Security of `SMART_CHEF_FACTORY`	

Smart contract is interacting with third party protocols e.g., DEX routers, smart chef factory, external reward and staked token contracts, web3 applications, *OpenZeppelin* upgradeable and ERC20 libraries. The scope of the audit treats these entities as black boxes and assumes their functional correctness. However, in the real world, all of them can be compromised, and exploited. Moreover, upgrades in these entities 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

Drops team will inspect third party dependencies regularly, and push upgrades whenever required.

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. Some functions are missing event emits.

RECOMMENDATION

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

Identifier	Definition
COD-17	Note regarding flash loan vulnerabilities

Smart contract is not directly susceptible to flash loan attacks, which usually exploit some form of arbitrage opportunity. However, when smart contract interacts with malicious staked or reward token contracts, technically flash loan vulnerabilities can be introduced. For example, when “approved” underlying token contract turns out to be a malicious, it can be used to introduce flash-loan vulnerabilities. Be cautious while interacting with third-party contracts, tokens, and protocols.

Identifier	Definition	Severity
VOL-01	Use of `delegatecall`	Minor 🟢

`delegatecall` is present, and is not clearly used in the smart contract.

RECOMMENDATION

Verify the user input and do not allow contract to perform `delegatecall` calls to untrusted contracts. Use of `delegatecall` in the contract is not recommended, as managing the storage layout in multiple contracts during logic update can be disruptive.

RESOLUTION

Drops team has commented that – `delegatecall` has not been used in the smart contract. It is redundant.

Identifier	Definition	Severity
VOL-02	Assembly code	Minor

Inline assembly is a way to access the Ethereum Virtual Machine (EVM) at low level. This bypasses several important safety features and checks of Solidity. Moreover, automated and manual checks are not confidently possible for inline assembly codes.

RECOMMENDATION

Use high level Solidity constructs instead of `assembly`.

RESOLUTION

Drops team has commented that – main assembly code is used for gas savings in byte manipulation and was written by *Consensys*, and is considered safe.

Identifier	Definition	Severity
COM-01	Floating pragma	Minor

Compiler is set to `^0.8.0`

RECOMMENDATION

Pragma should be fixed to stable compiler version.

RESOLUTION

Smart contract will be deployed with stable compiler.

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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SMART CONTRACT AUDITS | SOLIDITY DEVELOPMENT AND TESTING

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