InterFi NETWORK

SMART CONTRACT AUDIT

interfinetwork

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PREPARED FOR

BNB MARIO

INTRODUCTION

Auditing Firm	InterFi Network
Client Firm	BNB Mario
Methodology	Automated Analysis, Manual Code Review
Language	Solidity
Contract	0x876bBDDA2d8E189EA13Bef339a96280b66e77d8f
Blockchain	Binance Smart Chain
Centralization	Active ownership
Commit	795d1f7f343929aa34892bc4f06953b3e5423ecf
Website	https://bnb-mario.io/
Telegram	https://t.me/chatbnbmario/ | https://t.me/bnbmario/
X (Twitter)	https://twitter.com/BnbMario2023/
Report Date	September 29, 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	6	0
Acknowledged	0	1	0	2	1
Resolved	0	0	0	2	0
Noteworthy Functions	Deposit, Withdraw				

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 BNB Mario 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:

- BNBMario.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/0x876bBDDA2d8E189EA13Bef339a96280b66e77d8f#code	
Contract Name	BNBMario
Compiler Version	0.8.12
License	GPL-3.0-or-later

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

SafeMath	Library			
└	mul	Internal 🔒		
└	div	Internal 🔒		
└	sub	Internal 🔒		
└	add	Internal 🔒		
Percent	Library			
└	mul	Internal 🔒		
└	div	Internal 🔒		
└	sub	Internal 🔒		
└	add	Internal 🔒		
BNBMario	Implementation	ReentrancyGuard	
└	<Constructor>	Public !	🛑	NO!
└	_setSponsor	Private 🔐	🛑	
└	_deposit	Private 🔐	🛑	

| └ | _reinvest | Private 🔐 | 🛑 | |

| └ | _refPayout | Private 🔐 | 🛑 | |

| └ | deposit | External ❗ | 💵 | nonReentrant onlyUser |

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

| └ | maxPayoutOf | Internal 🔒 | | |

| └ | payoutOf | External ❗ | |NO❗ |

| └ | dailyBonus | Internal 🔒 | | |

| └ | getHoldBonus | Public ❗ | |NO❗ |

| └ | holdBonus | Internal 🔒 | | |

| └ | referralsCount | External ❗ | |NO❗ |

||||||

| **ReentrancyGuard** | Implementation | |||

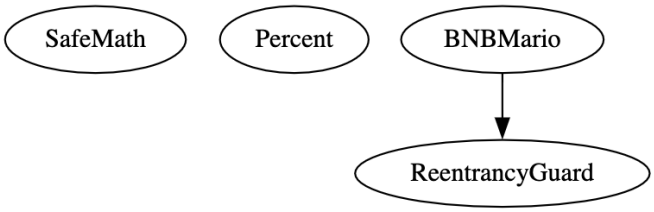
| └ | <Constructor> | Public ❗ | 🛑 |NO❗ |

| └ | _nonReentrantBefore | Private 🔐 | 🛑 | |

| └ | _nonReentrantAfter | Private 🔐 | 🛑 | |

| └ | _reentrancyGuardEntered | Internal 🔒 | | |

INHERITANCE GRAPH



MANUAL REVIEW

Identifier	Definition	Severity
CEN-01	Undefined owner privileges	Minor 🟢

Smart contract defines `owner`, `promote1`, and `promote2` addresses but doesn't specify any functions that are specifically restricted to the owner.

RECOMMENDATION

Specify `owner` privileges if required.

ACKNOWLEDGEMENT

BNB Mario team argued that logic design doesn't require any `owner` privileges.

Identifier	Definition	Severity
LOG-01	Lack of adequate checks	Minor

`deposit()` function – There is no check to ensure `_sponsor` is a valid user.

RECOMMENDATION

Add required checks to function logic.

Identifier	Definition	Severity
LOG-02	Potential front-running	Minor

In current scenario, potential front-running may happen when a malicious actor or miner see a user's intent to deposit or withdraw funds and attempt to insert their own transaction before the user's transaction to potentially benefit from the contract's referral or payout mechanisms. Below mentioned functions are vulnerable to front-running:

```
deposit()
withdraw()
```


RECOMMENDATION

Use commit reveal scheme or process transactions in a specified order.

ACKNOWLEDGEMENT

BNB Mario team argued that front-running is unavoidable on public blockchains, and no method to deter miner manipulation is fool-proof. Team kept the code as-is.

Identifier	Definition
LOG-03	Re-entrancy

Below mentioned functions are used with re-entrancy guard to deter re-entrant calls:

```
deposit()
withdraw()
```

Identifier	Definition	Severity
LOG-03	Use of `.call`	Minor 🟢

Below mentioned use `.call`:

```
_deposit()
withdraw()
```


RECOMMENDATION

Avoid using `.call` whenever possible when executing another contract function as it bypasses type checking, function existence check, and argument packing. Use `.transfer` instead.

Identifier	Definition	Severity
COD-01	Authorization through `tx.origin`	Major 🟠
BNM-01	Access control reliance on `onlyUser` through `tx.origin`	

Modifier `onlyUser` checks if `msg.sender == tx.origin`. This is a known antipattern. `tx.origin` refers to the original sender of the transaction, which can cause vulnerabilities if a user interacts with a malicious contract that forwards the call.

Mentioned functions use `onlyUser` modifier. If the call is malicious, it can introduce access control vulnerabilities.

```
deposit()
withdraw()
```


RECOMMENDATION

Avoid authorizations via global variables `tx.origin` wherever necessary.

ACKNOWLEDGEMENT

BNB Mario team argued that use of `tx.origin` is required as per logic design, `tx.origin` may block all simultaneous calls to these functions.

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.

Identifier	Definition	Severity
COD-06	Hardcoded addresses	Minor

Mentioned addresses are hardcoded, and pushed in constructor:

```
address payable private owner;
address payable private promote1;
address payable private promote2;
```


RECOMMENDATION

Private keys of these addresses must be secured carefully. Ensure that these addresses are valid and trustworthy.

Identifier	Definition
COD-09	Lack of contract balance withdraw

Smart contract may collect tokens, and ethers from external addresses.

RECOMMENDATION

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

Identifier	Definition	Severity
COD-10	Direct and indirect dependencies	Unknown

Smart contract is interacting with internal and external protocols e.g., `ERC20` Token Contracts, External Contracts such as original contracts validating `onlyUser`, Web 3 Applications, Percent library, *OpenZeppelin* tools. 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 dependencies regularly, and mitigate severe impacts whenever necessary.

ACKNOWLEDGEMENT

BNB Mario team argued to monitor these dependencies regularly, and push updates as 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.

RECOMMENDATION

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

Identifier	Definition	Severity
VOL-01	Irrelevant code	Minor

Redundant code in `SafeMath`

RECOMMENDATION

Remove redundant code.

Identifier	Definition	Severity
COM-01	Floating compiler status	Minor

Compiler is set to `^0.8.12`

RECOMMENDATION

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

RESOLUTION

BNB Mario team has deployed contract with stable compiler.

Identifier	Definition	Severity
COM-04	Unbounded loop	Minor

Below mentioned loop may become too big and throw out of gas errors upon executing:

`PERCENT_REFERRAL`

RECOMMENDATION

Set upper bounds for loops.

RESOLUTION

BNB Mario team suggested that loop is only five elements long in the constructor, and it is currently not a concern. However, any future expansion of this loop should be done with caution.

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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RELENTLESSLY SECURING PUBLIC AND PRIVATE BLOCKCHAINS