InterFi NETWORK

SMART CONTRACT AUDIT

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PREPARED FOR

PLUTONIUM PROTOCOL

INTRODUCTION

Auditing Firm	InterFi Network
Client Firm	Plutonium Protocol
Methodology	Automated Analysis, Manual Code Review
Language	Solidity
Contract	
Blockchain	Binance Smart Chain
Centralization	Active ownership
Commit	e29667704130850e7e9f68a181dabf4226a6ab11
Website	https://plutoniumprotocol.wixsite.com/plutonium/
Telegram	https://t.me/Plutonium_PU94/
Twitter	https://twitter.com/PLUTONIUM_ERC20/
Report Date	November 27, 2022

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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	2	3	1
Acknowledged	0	1	0	3	0
Resolved	0	0	0	0	0
Noteworthy Privileges	Set Fees, Update Pair and Router, Set Swap Threshold, Set Transaction and Wallet Limits, Withdraw Funds				

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 Plutonium Protocol 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:

- Plutonium.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	Plutonium
Compiler Version	0.8.17
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

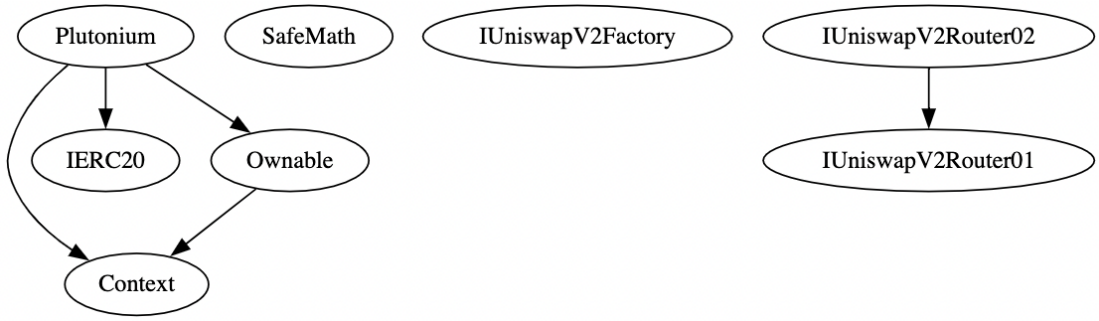
Symbol	Definition
🛑	Function modifies state
💵	Function is payable
🔒	Function is internal
🔐	Function is private
!	Function is important

Context	Implementation			
└	_msgSender	Internal 🔒		
└	_msgData	Internal 🔒		
IERC20	Interface			
└	totalSupply	External !		NO !
└	balanceOf	External !		NO !
└	transfer	External !	🛑	NO !
└	allowance	External !		NO !
└	approve	External !	🛑	NO !
└	transferFrom	External !	🛑	NO !
SafeMath	Library			
└	add	Internal 🔒		
└	sub	Internal 🔒		
└	sub	Internal 🔒		
└	mul	Internal 🔒		
└	div	Internal 🔒		
└	div	Internal 🔒		
Ownable	Implementation	Context		

└	<Constructor>	Public ❗	🛑	NO❗
└	owner	Public ❗		NO❗
└	isOwner	Public ❗		NO❗
└	renouncedOwnership	Public ❗	🛑	onlyOwner
└	transferOwnership	Public ❗	🛑	onlyOwner
IUniswapV2Factory	Interface			
└	getPair	External ❗		NO❗
└	createPair	External ❗	🛑	NO❗
IUniswapV2Router01	Interface			
└	factory	External ❗		NO❗
└	WETH	External ❗		NO❗
└	addLiquidityETH	External ❗	💵	NO❗
IUniswapV2Router02	Interface	IUniswapV2Router01		
└	swapExactTokensForETHSupportingFeeOnTransferTokens	External ❗	🛑	NO❗
Plutonium	Implementation	Context, IERC20, Ownable		
└	<Constructor>	Public ❗	🛑	NO❗
└	name	Public ❗		NO❗
└	symbol	Public ❗		NO❗
└	decimals	Public ❗		NO❗
└	totalSupply	Public ❗		NO❗
└	balanceOf	Public ❗		NO❗
└	allowance	Public ❗		NO❗
└	increaseAllowance	Public ❗	🛑	NO❗
└	decreaseAllowance	Public ❗	🛑	NO❗
└	approve	Public ❗	🛑	NO❗
└	_approve	Private 🔐	🛑	
└	getCirculatingSupply	Public ❗		NO❗
└	<Receive Ether>	External ❗	💵	NO❗

└	transfer	Public ❗	🛑	NO❗
└	transferFrom	Public ❗	🛑	NO❗
└	_transfer	Private 🔐	🛑	
└	_basicTransfer	Internal 🔒	🛑	
└	swapAndLiquify	Private 🔐	🛑	lockTheSwap
└	manualSwap	External ❗	🛑	onlyOwner lockTheSwap
└	swapforLiquidity	Internal 🔒	🛑	
└	swapforMarketing	Internal 🔒	🛑	
└	swapforDeveloper	Internal 🔒	🛑	
└	getFeesInfo	Public ❗	NO❗
└	swapTokensForEth	Private 🔐	🛑	
└	addLiquidity	Private 🔐	🛑	
└	shouldTakeFee	Internal 🔒		
└	takeFee	Internal 🔒	🛑	
└	withdrawFunds	Public ❗	🛑	onlyOwner
└	withdrawTokens	Public ❗	🛑	onlyOwner
└	enableTxLimit	Public ❗	🛑	onlyOwner
└	enableWalletLimit	Public ❗	🛑	onlyOwner
└	setBuyFee	Public ❗	🛑	onlyOwner
└	setSellFee	Public ❗	🛑	onlyOwner
└	setMarketingWallets	Public ❗	🛑	onlyOwner
└	setDeveloperWallets	Public ❗	🛑	onlyOwner
└	setLiquidityWallets	Public ❗	🛑	onlyOwner
└	setExcludeFromFee	Public ❗	🛑	onlyOwner
└	ExcludeWalletLimit	Public ❗	🛑	onlyOwner
└	ExcludeTxLimit	Public ❗	🛑	onlyOwner
└	setNumTokensBeforeSwap	External ❗	🛑	onlyOwner
└	setMaxWalletLimit	External ❗	🛑	onlyOwner
└	setTxLimit	External ❗	🛑	onlyOwner
└	setSwapAndLiquifyEnabled	Public ❗	🛑	onlyOwner
└	changeRouterVersion	Public ❗	🛑	onlyOwner

INHERITANCE GRAPH



MANUAL REVIEW

Identifier	Definition	Severity
CEN-01	Centralization privileges of Plutonium Protocol	Major 🟠

Centralized privileges are listed below:

```
transferOwnership()
withdrawFunds()
withdrawTokens()
enableTxLimit()
enableWalletLimit()
setBuyFee()
setSellFee()
setMarketingWallets()
setDeveloperWallets()
setLiquidityWallets()
setExcludeFromFee()
ExcludeWalletLimit()
ExcludeTxLimit()
setNumTokensBeforeSwap()
setMaxWalletLimit()
setTxLimit()
setSwapAndLiquifyEnabled()
changeRouterVersion()
```


RECOMMENDATION

Deployer and/or contract owner private keys are secured carefully. Please refer to PAGE-09 CENTRALIZED PRIVILEGES for a detailed understanding.

Identifier	Definition	Severity
CEN-02	Initial asset distribution	Minor 🟢

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

```
uint256 private _totalSupply = 500_000_000 * 10**_decimals;
    _balances[msg.sender] = _totalSupply;
    emit Transfer(address(0), msg.sender, _totalSupply);
```


RECOMMENDATION

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

Identifier	Definition	Severity
CEN-04	Privileged role receiving LP tokens	Minor 🟢

Smart contract function `addLiqudity` sends liquidity to `liquidityReciever`.

```
function addLiquidity(uint256 tokenAmount, uint256 ethAmount) private {
    // approve token transfer to cover all possible scenarios
    _approve(address(this), address(uniswapV2Router), tokenAmount);

    // add the liquidity
    uniswapV2Router.addLiquidityETH{value: ethAmount}(
        address(this),
        tokenAmount,
        0, // slippage is unavoidable
        0, // slippage is unavoidable
        liquidityReciever,
        block.timestamp + 15
    );
```


RECOMMENDATION

Send LP tokens to dead address or unreachable address.

Identifier	Definition	Severity
CEN-06	Privileged role updating pair and router	

Privileged role can `changeRouterVersion`

```
    function changeRouterVersion(address newRouterAddress) public onlyOwner returns(address
newPairAddress) {
        IUniswapV2Router02 _uniswapV2Router = IUniswapV2Router02(newRouterAddress);
        newPairAddress = IUniswapV2Factory(_uniswapV2Router.factory()).getPair(address(this),
_uniswapV2Router.WETH());
```


RECOMMENDATION

The current trading pair, e.g., Pancakeswap or Uniswap pair should not be removed from automated market makers.

Identifier	Definition	Severity
LOG-01	Lack of arbitrary limits	Medium 🟡

Below mentioned functions are set without any arbitrary limits.

`setNumTokensBeforeSwap`
`setMaxWalletLimit`
`setTxLimit`

RECOMMENDATION

These functions should be provided arbitrary limits, e.g., put a `require` check that allows minimum wallet limit change to at least 0.1% of the total supply.

Identifier	Definition	Severity
LOG-02	Potential sandwich attack	Minor 🟢

Potential 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:

```
swapTokensForEth
addLiquidity
```


RECOMMENDATION

These functions should be provided reasonable minimum output amounts, instead of zero. Read more: https://coinmarketcap.com/alexandria/article/what-are-sandwich-attacks-in-defi-and-how-can-you-avoid-them

Identifier	Definition	Severity
COD-05	Missing zero address validation	

Below mentioned function inputs should be checked for zero address:

`setMarketingWallets`
`setDeveloperWallets`
`setLiquidityWallets`
`changeRouterVersion`

RECOMMENDATION

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

Identifier	Definition	Severity
COD-06	Unknown externally owned account	Minor 🟢

An externally owned account (EOA) has no code, and one can send messages from an externally owned account by creating and signing a transaction.

```
address public marketingWallet = 0x9E50A542E9de75F8E17669152472c6806dDfA7AE;
address public developerWallet = 0xE6E03bc0ed2D9027880e7cED07608040914C770a;
```


RECOMMENDATION

Private keys of externally owned accounts must be secured carefully.

Identifier	Definition	Severity
COD-09	Contract balance withdraw	Minor 🟢

Smart contract function `withdrawTokens` can withdraw native tokens destined for liquidity add event.

RECOMMENDATION

`withdrawTokens` function should not be able to withdraw native tokens from the smart contract.

Identifier	Definition	Severity
COD-10	Third Party Dependencies	Minor 🟢

Smart contract is interacting with third party protocols e.g., Pancakeswap, Uniswap. 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.

Identifier	Definition	Severity
COD-11	Inaccurate visibility attributes	Unknown

Smart contract Plutonium.sol has incorrect visibility attributes. e.g. some. `onlyOwner` functions can be set to external to optimize gas use.

RECOMMENDATION

External and public calls must be attributed adequately to avoid possible vulnerabilities and improve gas optimization.

Identifier	Definition	Severity
VOL-01	Irrelevant code	Medium 🟡

Redundant code in `SafeMath`

RECOMMENDATION

Remove redundant code.

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.

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