



# SMART CONTRACT AUDIT

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PREPARED FOR

**APPLE FAN METaverse**



# INTRODUCTION

Auditing Firm	InterFi Network
Client Firm	Apple Fan Metaverse
Methodology	Automated Analysis, Manual Code Review
Language	Solidity
Contract	0x90F730F67ba2E0c5915AD8Aa02f8572A042DfBCA
Blockchain	Binance Smart Chain
Centralization	Active Ownership
Final commit	14c980a7dc7159d4a428b4a739ff3a1009f12ae9
Website	<a href="https://applefanmeta.com">https://applefanmeta.com</a>
Telegram	<a href="https://t.me/AppleFanMetaverse">https://t.me/AppleFanMetaverse</a>
Twitter	<a href="https://twitter.com/applefan_meta">https://twitter.com/applefan_meta</a>
Prelim Review	September 19, 2022
Second Review	October 12, 2022
Third Review	October 24, 2022
Final Report	January 25, 2023


 Verify the authenticity of this report on our website: <https://www.interfi.network/audits>




## 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	1
Acknowledged	0	1	0	4	0
Resolved	0	0	2	2	0
onlyOwner Privileges	Trading State				
checkAuth Privileges	Set Admins, Set Transfer Tax Rates, Set Fees, Set Max Buy, Allow Multi-sig Cooldown and Reset, Set Max Wallet, Withdraw				

 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 Apple Fan Metaverse 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:

- apple-fan-dragon-v4.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://bscscan.com/address/0x90F730F67ba2E0c5915AD8Aa02f8572A042DfBCA#code">https://bscscan.com/address/0x90F730F67ba2E0c5915AD8Aa02f8572A042DfBCA#code</a>	
Contract Name	APPLEFAN
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	<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>
----------------------	---



## 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.

 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

```

| **IERC20** | Interface | |||
|  L | totalSupply | External ! | |NO ! |
|  L | balanceOf | External ! | |NO ! |
|  L | transfer | External ! |  |NO ! |
|  L | allowance | External ! | |NO ! |
|  L | approve | External ! |  |NO ! |
|  L | transferFrom | External ! |  |NO ! |
|||||
| **Context** | Implementation | |||
|  L | _msgSender | Internal  | | |
|  L | _msgData | Internal  | | |
|||||
| **Address** | Library | |||
|  L | isContract | Internal  | | |
|  L | sendValue | Internal   | | |
|  L | functionCall | Internal   | | |
|  L | functionCall | Internal   | | |
|  L | functionCallWithValue | Internal   | | |
|  L | functionCallWithValue | Internal   | | |
|  L | functionStaticCall | Internal  | | |

```



```

| L | functionStaticCall | Internal 🔒 | | | |
| L | functionDelegateCall | Internal 🔒 | 🚫 | |
| L | functionDelegateCall | Internal 🔒 | 🚫 | |
| L | _verifyCallResult | Private 🔒 | | |
|||||
| **Ownable** | Implementation | Context |||
| L | <Constructor> | Public ! | 🚫 | NO ! |
| L | owner | Public ! | | NO ! |
| L | setOwner | Internal 🔒 | 🚫 | | |
|||||
| **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 ! |
|||||
| **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 | burn | External ! | ● |NO! |
| L | swap | External ! | ● |NO! |
| L | skim | External ! | ● |NO! |
| L | sync | External ! | ● |NO! |
| L | initialize | External ! | ● |NO! |
| L | | | | |
| **IUniswapV2Router01** | Interface | | |
| L | factory | External ! | |NO! |
| L | WETH | External ! | |NO! |
| L | addLiquidity | External ! | ● |NO! |
| L | addLiquidityETH | External ! | 🏠 |NO! |
| L | removeLiquidity | External ! | ● |NO! |
| 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! |
|||||
| **AFM** | Implementation | Context, IERC20, Ownable |||
|  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 | <Receive Ether> | External ! | 🚫 |NO! |
|  L | _approve | Private 🔒 | 🚫 | |
|  L | _transfer | Private 🔒 | 🚫 | |
|  L | checkCoolDown | Internal 🔒 | 🚫 | |
|  L | checkTradingStatus | Internal 🔒 | | |

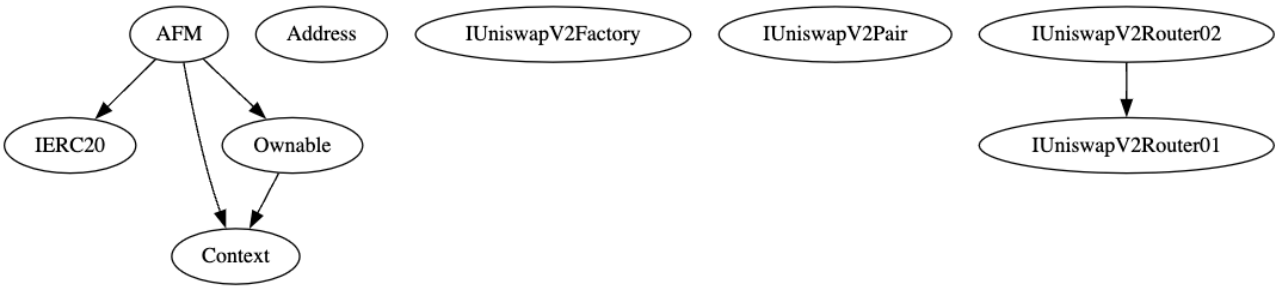
```



	└		tradingStatus		Public	!		🔴		onlyOwner	
	└		checkMaxBuy		Internal	🔒					
	└		checkMaxWallet		Internal	🔒					
	└		resetTotalFees		Internal	🔒		🔴			
	└		takeFee		Internal	🔒		🔴			
	└		_basicTransfer		Internal	🔒		🔴			
	└		swapBack		Private	🔒		🔴			
	└		swapTokensForEth		Private	🔒		🔴			
	└		addLiquidity		Private	🔒		🔴			
	└		resetMultiSignature		Internal	🔒		🔴			
	└		checkAuth		Internal	🔒					
	└		multiSignatureRequirements		Internal	🔒					
	└		multiSignatureTrigger		Internal	🔒		🔴			
	└		setMaxBuy		External	!		🔴		NO !	
	└		setIsFeeExempt		External	!		🔴		NO !	
	└		setIsTxLimitExempt		External	!		🔴		NO !	
	└		setIsTimeLockExempt		External	!		🔴		NO !	
	└		setFees		External	!		🔴		NO !	
	└		setTransferTaxRate		External	!		🔴		NO !	
	└		setSellingFeeAddress		External	!		🔴		NO !	
	└		setFeeReceivers		External	!		🔴		NO !	
	└		setSwapBackSettings		External	!		🔴		NO !	
	└		setAdmins		External	!		🔴		NO !	
	└		renounceContract		External	!		🔴		NO !	
	└		transferOwnership		External	!		🔴		NO !	
	└		setMaxWalletPercent		External	!		🔴		NO !	
	└		forceMultiSignatureReset		External	!		🔴		NO !	
	└		clearStuckBalance		External	!		🔴		NO !	
	└		withdrawTokens		External	!		🔴		NO !	
	└		multiSignatureCooldown		External	!		🔴		NO !	
	└		getCirculatingSupply		Public	!				NO !	



# INHERITANCE GRAPH



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## MANUAL REVIEW

Identifier	Definition	Severity
CEN-01	Centralization privileges of Apple Fan Metaverse	Major 🟡

onlyOwner centralized privileges are listed below:

```
modifier onlyOwner() {  
    require(_owner == _msgSender(), "Ownable: caller is not the owner");  
    _;  
}
```

tradingStatus()

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### RECOMMENDATION

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

### ACKNOWLEDGEMENT

Apple Fan Metaverse team acknowledges the centralization risk. The team will implement privileged accessibility to secure private keys.





Identifier	Definition	Severity
CEN-01-00	Centralization privileges via multi-sig of Apple Fan Metaverse	Unknown 🟡

checkAuth centralized privileges are listed below:

```
function checkAuth(address _msgSender) internal view {
    require(_msgSender == adminZero || _msgSender == adminOne || _msgSender == owner
```

```
setMaxBuy()
setIsFeeExempt()
setIsTxLimitExempt()
setIsTimeLockExempt()
setFees()
setTransferTaxRate()
setSellingFeeAddress()
setFeeReceivers()
setSwapBackSettings()
setAdmins()
renounceContract()
transferOwnership()
setMaxWalletPercent()
forceMultiSignatureReset()
clearStuckBalance()
withdrawTokens()
multiSignatureCooldown()
```

## RECOMMENDATION

Smart contract function setAdmins() set multi-sig signers to change above mentioned functions. This function params should not be influenced at any cost.

## ACKNOWLEDGEMENT

Apple Fan Metaverse team acknowledged this identifier and agreed to keep it as is.



Identifier	Definition	Severity
CEN-02	Initial asset distribution	

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 _totalSupply = 165000000 * 10 ** _decimals;  
_balances[msg.sender] = _totalSupply;  
emit Transfer(address(0), msg.sender, _totalSupply);
```

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Identifier	Definition	Severity
CEN-06	Privileged role protecting and/or manipulating launch	Minor ●

Privileged role calls `pressF`, `slayDragon`, and `killDragon` to manipulate quick and/or bot transactions.

```
function pressF(uint256 _dragonFee) external onlyOwner {
    require(launchedAt == 0, deadDragon);
    totalFee = _dragonFee.mul(launchMultiplier);
    transferTaxRate = _dragonFee.mul(launchMultiplier).mul(2);
    require(totalFee <= feeDenominator
    && transferTaxRate <= feeDenominator, foolMessage);
    tradingOpen = true;
    maxBuyEnabled = true;
    queueEnabled = true;
```

Function state mutability can be modified to function `slayDragon()`.

```
function slayDragon() external onlyOwner {
    require(launchedAt == 0, deadDragon);
function killDragon(bool _maxBuyEnabled) external onlyOwner {
    require(queueEnabled, deadDragon);
    resetTotalFees();
    queueEnabled = false;
    maxBuyEnabled = _maxBuyEnabled..... contd
```

## RECOMMENDATION

Any kind of launch protection and/or manipulation elevates centralization risk.

## RESOLUTION

Apple Fan Metaverse team has removed `pressF()` and `slayDragon()` from the codebase in commit: `db2e310d1b58732ca2086767c98e8391a0f2b1a2`.



Identifier	Definition	Severity
CEN-08	Privileged role initiates trading	

Privileged role can call tradingStatus()

```
function tradingStatus(bool _status) public onlyOwner {  
    require(_status == true, "trading cannot be disabled");  
    tradingOpen = _status;  
}
```

## RECOMMENDATION

Automate public launch. Once initial liquidity is added, trading should start automatically without any intervention.

## ACKNOWLEDGEMENT

Apple Fan Metaverse team acknowledged this identifier and agreed to keep it as is.



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

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:

```
swapExactTokensForETHSupportingFeeOnTransferTokens()
```

## 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>

## ACKNOWLEDGEMENT

Apple Fan Metaverse team acknowledged the identifier and implied that `swapTokensForEth()` is a mandatory function for contract swap.



Identifier	Definition	Severity
COD-02	Timestamp manipulation via <code>block.timestamp</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, this is a critical exploit for contracts calculating random numbers, e.g., lottery.

## RECOMMENDATION

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

## ACKNOWLEDGEMENT

Apple Fan Metaverse team acknowledged this identifier and agreed to keep it as is.



Identifier	Definition	Severity
COD-03	massIncinerate() without allowance limit	Medium ●

## RECOMMENDATION

Fix the allowance and caller requirements.


## RESOLUTION#1

Apple Fan Metaverse team added the balance requirement check to `massIncinerate()`. Modification is reflected in the new commit: `db2e310dlb58732ca2086767c98e8391a0f2b1a2`.

## RESOLUTION#2

Apple Fan Metaverse team has removed `massIncinerate()`. Modification is reflected in the new commit: `14c980a7dc7159d4a428b4a739ff3a1009f12ae9`.



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 adminZero           = 0x33cF975497C4E4b095B6912539c657edcCE9956d;
address public adminOne             = 0x9d9D23864c5601dc328d23281A38662c9d9D7422;
address private MKT                 = 0x9d9D23864c5601dc328d23281A38662c9d9D7422;
address private PROJECT_A          = 0x806d1eE6479a2C36Ac9d03E457BeBf8d655E2f29;
address private PROJECT_B          = 0xA6B996b526d94908673afd323aEdf18e7A9fe4eD;
address private PROJECT_C          = 0x8811665Fa46a4d776D283F73e1De39AB2B4e6E8a;
address private PRESALE_ADDRESS    = 0x407993575c91ce7643a4d4cCACc9A98c36eE1BBE;

```

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## RECOMMENDATION


Private keys of externally owned accounts must be secured carefully.

## ACKNOWLEDGEMENT

Apple Fan Metaverse team understands the centralization risk. The team will implement privileged accessibility to secure private keys.





Identifier	Definition	Severity
COD-08	Missing fallback function	Minor 

Fallback functions are usually executed in one of the following cases: If a function identifier doesn't match any of the available functions in a smart contract. If there was no data supplied along with the function call.

## RECOMMENDATION

Use fallback function with empty data, and mark it external, and payable.

## RESOLUTION

Apple Fan Metaverse team added the fallback check in the new commit:  
db2e310dlb58732ca2086767c98e8391a0f2b1a2.



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.

## ACKNOWLEDGEMENT

Apple Fan Metaverse team acknowledged this identifier and implied that DEX dependencies are mandatory for swaps and transfers.



Identifier	Definition	Severity
COD-11	Unclear use of SafeMath	Medium 🟡

Deploy the smart contract with updated solidity compiler version.

```
pragma solidity ^0.7.6;
```

```
library SafeMath {
```

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## RECOMMENDATION

To avoid probable vulnerabilities, remove SafeMath and deploy the smart contract with updated solidity compiler version adequately.

## RESOLUTION

Apple Fan Metaverse team removed SafeMath in the new commit:

db2e310dlb58732ca2086767c98e8391a0f2b1a2.



## DISCLAIMERS

InterFi Network provides the easy-to-understand audit of solidity source codes (commonly known as smart contracts).

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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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