

# SMART CONTRACT SECURITY AUDIT OF MINIMUM FINANCE

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SMART CONTRACT AUDIT | SOLIDITY DEVELOPMENT & TESTING | PROJECT EVALUATION

RELENTLESSLY SECURING THE PUBLIC BLOCKCHAIN

## Summary

Auditing Firm InterFi Network

Client Firm Minimum Finance

Mandatory Audit Check Static, Software, Auto Intelligent & Manual Analysis

**Final Report Date** January 21, 2022

## **Audit Summary**

InterFi team has performed a line-by-line manual analysis and automated review of the smart contracts. Smart contracts were analyzed mainly for common smart contract vulnerabilities, exploits, and manipulation hacks. According to the smart contract audit:

- ❖ Minimum Finance's smart contract source codes have LOW RISK SEVERITY
- Minimum Finance's smart contracts have an ACTIVE OWNERSHIP
- \* Important owner privileges PAUSE UNPAUSE, SET SERVICE FEE, SET CAP, FORCE FINAL REDEEM, CLAIM TAKE
- ❖ Minimum Finance's smart contract owner has multiple "Write Contract" privileges.
  Centralization risk correlated to the active owner is MEDIUM

Be aware that smart contracts deployed on the blockchain aren't resistant to internal exploit, external vulnerability, or hack. For the detailed understanding of risk severity, source code vulnerability, and functional test, kindly refer to the audit.

- StrategyFantOHM contract address: 0x2e945c73E06e58B63a7DD9F605951fFD4fa3974d
- MinimumVault contract address: 0x8c83417b62254916B06e0b6e14Fa86f6fdA73DCF
- Blockchain: **Fantom Chain**
- Verify the authenticity of this report on InterFi's GitHub: https://github.com/interfinetwork



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# **Project Overview**

InterFi was consulted by Minimum Finance to conduct the smart contract security audit of their solidity source codes.

## **About Minimum Finance**

Yield optimizer (fork of beefy vault/strategy) for rebasing DAOs. Receive funds from users, issue vault IOU tokens, stake funds and then bond them when optimal. Allow users to withdraw only when not bonding (users are able to request to reserve their tokens to withdraw during a bond).

Strategy is upgradeable via retire-strat, and then sending funds back to the vault.

Project	Minimum Finance
Blockchain	Fantom Chain Planned
Language	Smart Contract
Contract	Multiple Files Under Scope SECURITY AUDIT
Website	https://minimum.finance/
Twitter	https://twitter.com/minimum_fi



## **Project Logo**



## Solidity Source Codes On Testnet (Verified Contract Source Codes)

StrategyFantOHM

https://ftmscan.com/address/0x2e945c73E06e58B63a7DD9F605951fFD4fa3974d#code

MinimumVault

https://ftmscan.com/address/0x8c83417b62254916b06e0b6e14fa86f6fda73dcf#code

## Solidity Source Codes On Minimum Finance's GitHub

https://github.com/minimum-finance/minimum.contracts/tree/master/contracts

#### SHA-1 Hash

 $Strategy Fant OHM\ code\ is\ audited\ at\ hash\ \#dd0d55a83a80b5fcb9cfb435133f240e257dddf5$ 

MinimumVault code is audited at hash #ed19cef8f2e3614e95d97743f0f690f911aa0475



# **Audit Scope & Methodology**

The scope of this report is to audit the smart contract source codes of Minimum Finance. InterFi has scanned contracts and reviewed the project for common vulnerabilities, exploits, hacks, and backdoors. Below is the list of commonly known smart contract vulnerabilities, exploits, and hacks:

### Category

- Re-entrancy
- Unhandled Exceptions
- Transaction Order Dependency
- Integer Overflow
- Unrestricted Action
- Incorrect Inheritance Order
- Typographical Errors
- Requirement Violation
- Ownership Takeover
- Gas Limit and Loops
- Deployment Consistency
- Repository Consistency
- Data Consistency
- Token Supply Manipulation
- Access Control and Authorization
- Operations Trail and Event Generation
- Assets Manipulation
- Liquidity Access

#### **Smart Contract Vulnerabilities**

#### **Source Code Review**

#### **Functional Assessment**



#### InterFi's Echelon Audit Standard

The aim of InterFi's "Echelon" standard is to analyze the smart contract and identify the vulnerabilities and the hacks in the smart contract. Mentioned are the steps used by ECHELON-1 to assess the smart contract:

- 1. Solidity smart contract source code reviewal:
  - Review of the specifications, sources, and instructions provided to InterFi to make sure we understand the size, scope, and functionality of the smart contract.
  - Manual review of code, which is the process of reading source code line-byline to identify potential vulnerabilities.
- 2. Static, Manual, and Software analysis:
  - Test coverage analysis, which is the process of determining whether the test cases are covering the code and how much code is exercised when we run those test cases.
  - Symbolic execution, which is analysing a program to determine what inputs causes each part of a program to execute.
- 3. Best practices review, which is a review of the smart contracts to improve efficiency, effectiveness, clarify, maintainability, security, and control based on the established industry and academic practices, recommendations, and research.
- 4. Specific, itemized, actionable recommendations to help you take steps to secure your smart contracts

#### Automated 3P frameworks used to assess the smart contract vulnerabilities

- Slither
- Consensys MythX, Mythril
- SWC Registry
- Solidity Coverage
- Open Zeppelin Code Analyzer
- Solidity Code Complier



## InterFi's Risk Classification

Smart contracts are generally designed to manipulate and hold funds denominated in ETH/BNB. This makes them very tempting attack targets, as a successful attack may allow the attacker to directly steal funds from the contract. Below are the typical risk levels of a smart contract:

**Vulnerable**: A contract is vulnerable if it has been flagged by a static analysis tool as such. As we will see later, this means that some contracts may be vulnerable because of a false-positive.

**Exploitable:** A contract is exploitable if it is vulnerable and the vulnerability could be exploited by an external attacker. For example, if the "vulnerability" flagged by a tool is in a function which requires to own the contract, it would be vulnerable but not exploitable.

**Exploited:** A contract is exploited if it received a transaction on the main network which triggered one of its vulnerabilities. Therefore, a contract can be vulnerable or even exploitable without having been exploited.

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Risk severity	Meaning Security Audit	
! Critical	This level vulnerabilities could be exploited easily, and can lead to asset loss,	
	data loss, asset, or data manipulation. They should be fixed right away.	
! High	This level vulnerabilities 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	This level vulnerabilities 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	This level vulnerabilities can be ignored. They are code style violations, and	
	informational statements in the code. They may not affect the smart contract	
	execution	



# **Smart Contract - Static Analysis**

Symbol	Meaning
	Function can be modified
<u> s</u>	Function is payable
	Function is locked
	Function can be accessed
Ţ	Important functionality

```
| **StrategyFantOHM** | Implementation | StratManager, FeeManager |||
 └ | <Constructor> | Public ! | ● | StratManager |
| L | want | External ! | NO! |
| L | totalRebasing | Public ! | NO! |
| L | unstakedRebasing | Public ! | NO! |
 L | stakedRebasing | Public ! | NO! |
| L | totalBalance | Public ! | NO! | |
| L | isBonding | Public ! | NO! |
| L | numBonds | External ! | NO! |
| L | isBondValid | Public ! | NO! |
| └ | deposit | External ! | ● | whenNotPaused |
| L | reserve | External ! | • |NO! |
 L | claim | External ! | 📦 |NO! |
| └ | <mark>addBond</mark> | External ! | ● | onlyOwner |
| L | removeBond | External ! | PolyOwner |
| └ | stakeToBondSingleAll | External ! | ● |NO! |
| L | stakeToBondLPAll | External ! | • | NO! |
| └ | stakeToBondSingle | Public ! | ● | onlyManager |
| L | stakeToBondLP | Public ! | 🔴 | onlyManager |
| └ | redeemAndStake | External ! | ● | onlyManager |
| L | forcePayout | External ! | 📦 | onlyOwner |
| L | forcePayoutChunk | External ! | Governor |
| L | _claim | Internal 🗎 | 🛑 | |
| L | _swapRebaseForToken | Internal 🗎 | 🛑 | |
| └ | _provideLiquidity | Internal 🗎 | 🔎 | |
| └ | _bondSingleToken | Internal 🍙 | 🔴 | |
```



```
| L | _redeem | Internal 🗎 | 🛑 | |
 └ | _chargeFees | Internal 🗎 | 🛡
| L | retireStrat | External ! | 🛑 | NO! |
| └ | panic | External ! | ● | onlyOwner |
 └ | <mark>pause</mark> | External ! | ● | onlyOwner |
| L | unpause | External ! | • | onlyOwner |
| L | stake | External ! | 🔴 | onlyOwner |
| L | unstakeAll | External ! | 🔎 | onlyOwner |
| L | unstake | External ! | 🔴 | onlyOwner |
| L | inCaseTokensGetStuck | External ! | • | onlyOwner |
| L | maxBondSize | Public ! | NO! |
| L | bondIsPositive | Public ! | NO! |
| L | getAmountIn | External ! | NO! |
| L | getAmountOut | External ! | NO! |
IIIIIII
| **IRebaseStaker** | Interface | |||
| L | stake | External ! | 🔴 |NO! |
| **IStakingManager** | Interface | |||
| L | unstake | External ! | \bigcirc |NO! |
| L | rebase | External ! | 📦 |NO! |
111111
| **IBondDepository** | Interface | |||
| L | redeem | External ! | WO! |
| L | deposit | External ! | P | NO! |
| L | bondPrice | External ! | NO! |
| L | pendingPayoutFor | External ! | NO! |
| L | payoutFor | External ! |
                               |NO ! |
| L | maxPayout | External ! |
                              |N0 ! |
| L | bondInfo | External ! | NO! | |
| L | principle | External ! | NO! |
| L | percentVestedFor | External ! | NO! |
| L | bondPriceInUSD | External ! | NO! |
| L | assetPrice | External ! | NO! |
| L | policy | External ! | NO! |
| L | setBondTerms | External ! | P | NO! |
| L | setBasePrice | External ! | • | NO! |
| L | terms | External ! | NO! |
| L | debtRatio | External ! | NO! |
| L | basePrice | External ! | NO! |
| L | isLiquidityBond | External ! | NO! |
| **FeeManager** | Implementation | StratManager |||
| L | setServiceFee | External ! | • | onlyManager |
| └ | setWithdrawalFee | External ! | ● | onlyManager |
111111
| **<mark>StratManager</mark>** | Implementation | Ownable, Pausable |||
| L | <Constructor> | Public ! | WO! |
| └ | setKeeper | External ! | ● | onlyOwner |
| L | setUnirouter | External ! | 🔎 | onlyOwner |
```



```
| L | setVault | External ! | 🔴 | onlyOwner |
| L | setServiceFeeRecipient | External ! | Particle | onlyOwner |
| L | setMinDeposit | External ! | 🔴 | onlyOwner |
| L | beforeDeposit | External ! | • | NO! |
\Pi\Pi\Pi\Pi
| **ERC20** | Implementation | Context, IERC20 |||
| L | <Constructor> | Public ! | • | NO! |
| L | name | Public ! | NO! |
| L | symbol | Public ! | NO! |
| L | decimals | Public ! | NO! |
| L | totalSupply | Public ! | NO! |
 | L | transfer | Public ! | 🛑 |NO! |
| L | approve | Public ! | 🔴 |NO! |
| L | transferFrom | Public ! | 🔴 |NO! |
| L | increaseAllowance | Public ! | • | NO! |
| L | decreaseAllowance | Public ! | •
                                    |NO ! |
 └ | _transfer | Internal 🔒 | 🛑 | |
| L | _burn | Internal 🗎 | 🛑 | |
| L | _approve | Internal 🗎 | 🔴 | |
| └ | beforeTokenTransfer | Internal ● | ● | |
| **<mark>SafeMath</mark>** | Library | |||
| L | tryAdd | Internal 🗎 | | |
| L | trySub | Internal 🗎 |
| L | tryMul | Internal 🗎 |
| L | tryDiv | Internal 🗎 |
| <sup>L</sup> | tryMod | Internal 🔒 |
| <sup>L</sup> | add | Internal <sup>@</sup> |
| L | sub | Internal 🔒 |
| L | mul | Internal 🔒 |
| L | div | Internal 🔒 |
| L | mod | Internal 🗎 |
| L | sub | Internal 🗎 |
| L | div | Internal 🗎 |
| <sup>L</sup> | mod | Internal 🔒 |
111111
| **Ownable** | Implementation | Context | | |
| L | owner | Public ! | NO! |
| L | renounceOwnership | Public ! | 🔎 | onlyOwner |
| L | transferOwnership | Public ! | 🔴 | onlyOwner |
| **Pausable** | Implementation | Context |||
| └ | <Constructor> | Internal 🗎 | ● | |
| L | paused | Public ! | NO! |
| └ | _pause | Internal 🗎 | 🛑 | whenNotPaused |
```



```
| L | _unpause | Internal 🗎 | 🛑 | whenPaused |
| **MinimumVault** | Implementation | ERC20, Ownable, ReentrancyGuard | | |
| └ | <Constructor> | Public ! | ● | ERC20 |
| L | want | Public ! | NO! |
 L | balance | Public ! | NO! |
| L | available | Public ! | NO! |
| L | isBonding | External ! | NO! |
 L | capRoom | External ! | NO! |
| L | minDeposit | Public ! | NO! | |
| L | depositAll | External ! | 🔎 |NO! |
| L | reserveAll | External ! | | NO! |
 └ | claim | External ! | ● |NO! |
| L | deposit | Public ! | 
| nonReentrant |
| L | reserve | Public ! | left | nonReentrant |
| L | earn | Public ! | • | NO! |
| └ | proposeStrat | External ! | ● | onlyOwner |
| L | upgradeStrat | External ! | 🔎 | onlyOwner |
| L | inCaseTokensGetStuck | External ! | • | onlyOwner |
| L | getPricePerFullShare | External ! | NO! |
| **ERC20** | Implementation | Context, IERC20 |||
| 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 ! | •
                                     |N0 ! |
| L | _transfer | Internal 🗎 | 🛑 | |
| L | burn | Internal | L |
| L | _approve | Internal 🗎 | 🛑 | |
| └ | _setupDecimals | Internal 🗎 | ● | |
| └ | _beforeTokenTransfer | Internal 🗎 | ● | |
| **ReentrancyGuard** | Implementation | |||
| └ | <Constructor> | Internal 🗎 | ● | |
IIIIIII
| **IStrategy** | Interface | |||
| L | want | External ! | NO! |
| L | totalBalance | External ! | NO! |
| └ | beforeDeposit | External ! | ● |NO! |
| L | deposit | External ! | • | NO! |
| └ | claim | External ! | ● |NO! |
```



```
| L | reserve | External ! | NO! |
| L | claim | External ! | NO! |
| L | readyToClaim | External ! | NO! |
| L | isBonding | External ! | NO! |
| L | vault | External ! | NO! |
| L | retireStrat | External ! | NO! |
| L | minDeposit | External ! | NO! |
```

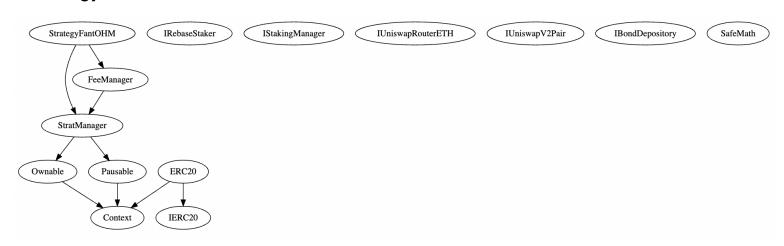
# Interfi

Smart Contract Security Audit

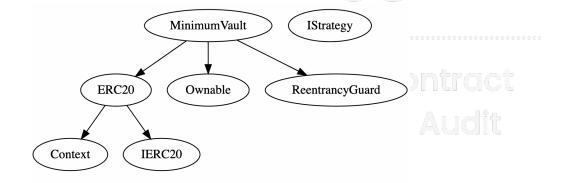


# **Smart Contract - Inheritance Graph**

## **StrategyFantOHM**



## **MinimumVault**





# **Smart Contract – Manual Analysis**

Function	Description	Tested	Verdict
Total Supply	provides information about the total token supply	Yes	Passed
Balance Of	provides account balance of the owner's account	Yes	Passed
Transfer	executes transfers of a specified number of tokens to a specified address	Yes	Passed
Approve	allow a spender to withdraw a set number of tokens from a specified account	Yes	Passed
Allowance	returns a set number of tokens from a spender to the owner	Yes	Passed
Pause	Stops or pauses all function modules of the smart contract	Yes	! Low
Transfer Ownership	executes transfer of contract ownership to a specified wallet	Yes	Passed
Renounce Ownership	executes transfer of contract ownership to a dead address	Yes	Passed



## Best Practices 🗸

- Owner cannot lock or burn the user assets.
- MinimumVault uses "ReentrancyGuard" to prevent reentrant calls to a function. Reentrancy Guard is a contract module that helps prevent reentrant calls to a function. Inheriting from Reentrancy Guard will make the nonReentrant modifier available, which can be applied to functions to make sure there are no nested (reentrant) calls to them.

IMPORTANT: because control is transferred to `recipient`, care must be taken to not create reentrancy vulnerabilities. Consider using {ReentrancyGuard}

The smart contract utilizes "SafeMath" function to avoid common smart contract vulnerabilities.

```
string private _name = "StrategyFantOHM";
library SafeMath {
function add(uint256 a, uint256 b) internal pure returns (uint256) {
    uint256 c = a + b;
    require(c >= a, "SafeMath: addition overflow");

function sub(uint256 a, uint256 b) internal pure returns (uint256) {
    return sub(a, b, "SafeMath: subtraction overflow");

    uint256 c = a * b;
    require(c / a == b, "SafeMath: multiplication overflow");

    return c;

function div(uint256 a, uint256 b) internal pure returns (uint256) {
    return div(a, b, "SafeMath: division by zero");

function mod(uint256 a, uint256 b) internal pure returns (uint256) {
    return mod(a, b, "SafeMath: modulo by zero");
}
```



### Note 4

- - ❖ Be aware that active smart contract owner privileges constitute an elevated impact to smart contract's safety and security.
  - StrategyFantOHM contract is pausable. The owner can pause or unpause the smart contract function modules.
  - \* The smart contract has *low severity issue* which may or may not create any functional vulnerability.

```
{
      "resource": " /StrategyFantOHM.sol",
      "owner": "_generated_diagnostic_collection_name_#0",
      "severity": 8, (! Low Severity)
      "Expected identifier, got 'LParen",
      "source": "solc",
}
```



# **Smart Contract - SWC Attacks**

SWC ID	Description	Verdict
SWC-101	Integer Overflow and Underflow	Passed
SWC-102	Outdated Compiler Version	! Low
SWC-103	Floating Pragma	Passed
SWC-104	Unchecked Call Return Value	Passed
SWC-105	Unprotected Ether Withdrawal	Passed
SWC-106	Unprotected SELFDESTRUCT Instruction	Passed
swc-107	Re-entrancy	Passed
swc-108	State Variable Default Visibility	Passed
SWC-109	Uninitialized Storage Pointer	Passed
SWC-110	Assert Violation Smart Contract	Passed
swc-111	Use of Deprecated Solidity Functions	Passed
SWC-112	Delegate Call to Untrusted Callee	Passed
swc-113	DoS with Failed Call	Passed
SWC-114	Transaction Order Dependence	Passed
SWC-115	Authorization through tx.origin	Passed
SWC-116	Block values as a proxy for time	Passed
swc-117	Signature Malleability	Passed
SWC-118	Incorrect Constructor Name	Passed



SWC-119	Shadowing State Variables	Passed
SWC-120	Weak Sources of Randomness from Chain Attributes	Passed
SWC-121	Missing Protection against Signature Replay Attacks	Passed
SWC-122	Lack of Proper Signature Verification	Passed
SWC-123	Requirement Violation	Passed
SWC-124	Write to Arbitrary Storage Location	Passed
SWC-125	Incorrect Inheritance Order	Passed
SWC-126	Insufficient Gas Griefing	Passed
SWC-127	Arbitrary Jump with Function Type Variable	Passed
SWC-128	DoS With Block Gas Limit	Passed
SWC-129	Typographical Error	Passed
SWC-130	Right-To-Left-Override control character (U+202E)	Passed
SWC-131	Presence of unused variables	Passed
SWC-132	Unexpected Ether balance	Passed
SWC-133	Hash Collisions With Multiple Variable Length Arguments	Passed
SWC-134	Message call with hardcoded gas amount	Passed
SWC-135	Code With No Effects (Irrelevant/Dead Code)	! Low
SWC-136	Unencrypted Private Data On-Chain	Passed



## **Smart Contract - Risk Status & Radar Chart**

**Risk Severity Status** ! Critical None critical severity issues identified None high severity issues identified ! High ! Medium None medium severity issues identified 2 low severity issues identified ! Low Verified 54 functions and instances verified and checked Score out of 100 Compiler Check 85 Interface Safety Static Analysis 80 Manual Analysis Software Analysis



## **Auditor's Verdict**

InterFi team has performed a line-by-line manual analysis and automated review of the smart contract. The smart contract was analyzed mainly for common smart contract vulnerabilities, exploits, and manipulation hacks.

- Minimum Finance's smart contract source code has LOW RISK SEVERITY
- Minimum Finance's smart contract has an ACTIVE OWNERSHIP
- Minimum Finance's smart contract owner has multiple "Write Contract" privileges.
  Centralization risk correlated to the active owner is **MEDIUM**



# Smart Contract Security Audit

## Note for stakeholders

- Be aware that active smart contract owner privileges constitute an elevated impact on smart contract's safety and security.
- Make sure that the project team's KYC/identity is verified by an independent firm.
- Always check if the contract's liquidity is locked. A longer liquidity lock plays an important role in project's longevity. It is recommended to have multiple liquidity providers.
- Examine the unlocked token supply in the owner, developer, or team's private wallets. Understand the project's tokenomics, and make sure the tokens outside of the LP Pair are vested or locked for a longer period of time.
- Ensure that the project's official website is hosted on a trusted platform, and is using an active SSL certificate. The website's domain should be registered for a longer period of time.



## **Important Disclaimer**

InterFi Network provides contract development, testing, auditing and project evaluation services for blockchain projects. The purpose of the audit is to analyse the on-chain smart contract source code, and to provide basic overview of the project. This report should not be transmitted, disclosed, referred to, or relied upon by any person for any purposes without InterFi's prior written consent.

InterFi provides the easy-to-understand assessment of the project, and the smart contract (otherwise known as the source code). The audit makes no statements or warranties on the security of the code. It also cannot be considered as an enough assessment regarding the utility and safety of the code, bug-free status, or any other statements of the contract. While we have used all the data at our disposal to provide the transparent analysis, it is important to note that you should not rely on this report only — we recommend proceeding with several independent audits and a public bug bounty program to ensure the security of smart contracts. Be aware that smart contracts deployed on a blockchain aren't resistant from external vulnerability, or a hack. Be aware that active smart contract owner privileges constitute an elevated impact to smart contract's safety and security. Therefore, InterFi does not guarantee the explicit security of the audited smart contract.

The analysis of the security is purely based on the smart contracts alone. No applications or operations were reviewed for security. No product code has been reviewed.

This report should not be considered as an endorsement or disapproval of any project or team.

The information provided on this report does not constitute investment advice, financial advice, trading advice, or any other sort of advice and you should not treat any of the report's content as such. Do conduct your own due diligence and consult your financial advisor before making any investment decisions.



## **About InterFi Network**

InterFi Network provides intelligent blockchain solutions. InterFi is developing an ecosystem that is seamless and responsive. Some of our services: Blockchain Security, Token Launchpad, NFT Marketplace, etc. InterFi's mission is to interconnect multiple services like Blockchain Security, DeFi, Gaming, and Marketplace under one ecosystem that is seamless, multi-chain compatible, scalable, secure, fast, responsive, and easy-to-use.

InterFi is built by a decentralized team of UI experts, contributors, engineers, and enthusiasts from all over the world. Our team currently consists of 6+ core team members, and 10+ casual contributors. InterFi provides manual, static, and automatic smart contract analysis, to ensure that project is checked against known attacks and potential vulnerabilities.

To learn more, visit <a href="https://interfi.network">https://interfi.network</a>

To view our audit portfolio, visit <a href="https://github.com/interfinetwork">https://github.com/interfinetwork</a>

To book an audit, message <a href="https://t.me/interfiaudits">https://t.me/interfiaudits</a>





RELENTLESSLY SECURING THE PUBLIC BLOCKCHAIN | MADE IN CANADA