

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

Architecture InterFi "Echelon" Auditing Standard

Language Solidity

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

Final Report Date January 21, 2022

<u>Audit Summary</u>

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, REBASE, SET SERVICE FEE, SET CAP

At the time of the audit, the smart contracts were deployed on testnet, contract owner/developer can modify the contracts before mainnet deployment. For the detailed understanding of risk severity, source code vulnerability, and functional test, kindly refer to the audit.

🖁 Blockchain: Fantom Chain Planned

✓ Verify the authenticity of this report on InterFi's GitHub: https://github.com/interfinetwork



Table Of Contents

Project Information

| Overview | 4 |
|----------------------------------|----|
| InterFi "Echelon" Audit Standard | |
| Audit Scope & Methodology | 6 |
| InterFi's Risk Classification | 8 |
| Smart Contract Risk Assessment | |
| Static Analysis | 9 |
| Inheritance Graph | 14 |
| Manual Analysis | 15 |
| SWC Attacks | 18 |
| Risk Status & Radar Chart | |
| Report Summary | |
| Auditor's Verdict | 21 |
| <u>Legal Advisory</u> | |
| Important Disclaimer | 22 |
| About InterFi Network | 23 |



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 SECULITY AUGIT |
| Website | https://minimum.finance/ |
| Twitter | https://twitter.com/minimum_fi |



Project Logo



Solidity Source Codes On Testnet (Verified Contract Source Codes)

StrategySpartacus

https://ropsten.etherscan.io/address/0x3468619ec0072b3a61CC38FA68c55c2Cc62b012C#code

MinimumVault

https://ropsten.etherscan.io/address/0x5a8f49446f32d779575650387f0ed33ec4a0d5a8#code

Solidity Source Codes On Minimum Finance's GitHub

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

SHA-1 Hash

StrategySpartacus code is audited at hash #dd0d55a83a80b5fcb9cfb435133f240e257dddf5

MinimumVault code is audited at hash #ed19cef8f2e3614e95d97743f0f690f91laa0475



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.

| 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

| Meaning |
|--------------------------|
| Function can be modified |
| Function is payable |
| Function is locked |
| Function can be accessed |
| Important functionality |
| |

```
| **<mark>StrategySpartacus</mark>** | Implementation | StratManager, FeeManager |||
 └ | <Constructor> | Public ! | ● | StratManager |
| L | want | External ! | NO! |
| L | totalRebasing | Public ! | NO! |
| L | unstakedRebasing | Public ! | NO! |
 L | stakedRebasing | Public ! | NO! |
| L | availableRebaseToken | Public ! | NO! |
| L | totalBalance | Public ! | NO! |
| L | isBonding | Public ! | NO! |
| L | numBonds | External ! | |NO! |
| L | isBondValid | Public ! | NO! |
| L | reserve | External ! | • | NO! |
| L | claim | External ! | 🛑 |NO! |
| L | addBond | External ! | 🔴 | onlyOwner |
| L | removeBond | External ! | • | onlyOwner |
| └ | stakeToBondSingleAll | External ! | ● |NO! |
| └ | stakeToBondLPAll | External ! | ● |NO! |
| └ | stakeToBondSingle | Public ! | ● | onlyManager |
| L | stakeToBondLP | Public ! | 🔎 | onlyManager |
| └ | redeemAndStake | External ! | ● | onlyManager |
| L | forcePayout | External ! | 🔴 | onlyOwner |
| L | forcePayoutChunk | External ! | Payout | onlyOwner |
| L | _claim | Internal 🗎 | 🔎 | |
| L | _stake | Internal 🗎 | 🛑 | |
| L | _unstake | Internal 🗎 | 🛑 | |
| └ | _swapRebaseForToken | Internal 🗎 | ● | |
| └ | _provideLiquidity | Internal 🔒 | 🛑 | |
```



```
└ | _redeem | Internal 🗎 | 🔴 | |
| └ | _chargeFees | Internal 🗎 | 🔴 | |
| └ | retireStrat | External ! | ● |NO! |
| └ | panic | External ! | ● | onlyOwner |
| L | pause | External ! | 🔎 | onlyOwner |
| L | unpause | External ! | 📦 | onlyOwner |
| L | stake | External ! | Page | onlyOwner |
| └ | 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! |
| L | tokenToRebase | External ! | NO! |
| L | rebaseTokenPriceInUSD | Public ! | NO! |
| **IRebaseStaker** | Interface | |||
| L | stake | External ! | ● |NO! |
| **IStakingManager** | Interface | |||
| L | unstake | External ! | 🛑 |NO! |
| L | rebase | External ! | WO! |
111111
| **IBondDepository** | Interface | |||
| L | redeem | External ! | • | NO! |
| └ | deposit | External ! | ● |NO! |
| L | bondPrice | External ! | NO! |
| L | pendingPayoutFor | External ! | NO! |
| L | payoutFor | External ! |
                             |N0 ! |
| L | maxPayout | External ! | NO! |
| L | bondInfo | External ! | NO! |
| L | principle | External ! | NO! |
| L | percentVestedFor | External ! | NO! |
| L | bondPriceInUSD | External ! | NO! |
| L | assetPrice | External ! | NO! |
| L | policy | External ! | NO! |
| └ | setBondTerms | External ! | ● |NO! |
| └ | 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 |
| **<mark>StratManager</mark>** | Implementation | Ownable, Pausable |||
```



```
| L | <Constructor> | Public ! | • | NO! |
 └ | setKeeper | External ! | ● | onlyOwner |
| L | setUnirouter | External ! | 📦 | onlyOwner |
| └ | setVault | External ! | ● | onlyOwner |
| └ | setServiceFeeRecipient | External ! | ● | onlyOwner |
| L | setMinDeposit | External ! | Page | onlyOwner |
| L | beforeDeposit | External ! | P | NO! |
| **ERC20** | Implementation | Context, IERC20 |||
| └ | <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 ! | WO! |
| L | transferFrom | Public ! | 🛑 |NO! |
| └ | increaseAllowance | Public ! | ● |NO! |
| L | decreaseAllowance | Public ! | •
| L | _transfer | Internal 🗎 | 🔎 | |
| └ | _approve | Internal 🗎 | ● | |
| **<mark>SafeMath</mark>** | Library |   |||
| L | tryAdd | Internal 🗎 | | |
| L | trySub | Internal 🗎 |
| L | tryMul | Internal 🔒 |
| L | tryDiv | Internal 🔒 |
| L | tryMod | Internal 🗎 |
| L | add | Internal 🔒 |
| L | sub | Internal 🗎 |
| L | mul | Internal 🗎 |
| L | div | Internal 🗎 |
| L | mod | Internal 🗎 |
| L | sub | Internal 🗎 |
| <sup>L</sup> | div | Internal 🔒 |
| <sup>L</sup> | mod | Internal <sup>@</sup> |
                        | |
| **Ownable** | Implementation | Context |||
| L | owner | Public ! | NO! |
| L | renounceOwnership | Public ! | • | onlyOwner |
| L | transferOwnership | Public ! | OnlyOwner |
| **Pausable** | Implementation | Context |||
```



```
L | paused | Public ! | NO! |
| L | _pause | Internal 🗎 | 🛑 | whenNotPaused |
| **<mark>MinimumVault</mark>** | 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 ! | O | NO! |
| L | claim | External ! | • | NO! |
| └ | deposit | Public ! | ● | nonReentrant |
| L | reserve | Public ! | 🔴 | nonReentrant |
| L | earn | Public ! | • | NO! |
| L | setCap | External ! | Page | onlyOwner |
| L | proposeStrat | External ! | 🔎 | onlyOwner |
| L | upgradeStrat | External ! | 🛑 | onlyOwner |
| └ | inCaseTokensGetStuck | External ! | ● | onlyOwner |
| L | getPricePerFullShare | External ! | NO! |
| **ERC20** | Implementation | Context, IERC20 |||
| └ | <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 ! | Public ! | | NO! |
| L | transferFrom | Public ! | Public ! | | NO! |
| L | increaseAllowance | Public ! | Public ! | | NO! |
| L | decreaseAllowance | Public ! | •
| └ | _transfer | Internal 🗎 | ● | |
| L | _approve | Internal 🗎 | 🛑 | |
| **ReentrancyGuard** | Implementation | |||
| **<mark>IStrategy</mark>** | Interface | |||
| L | want | External ! | NO! |
| L | totalBalance | External ! | NO! |
```



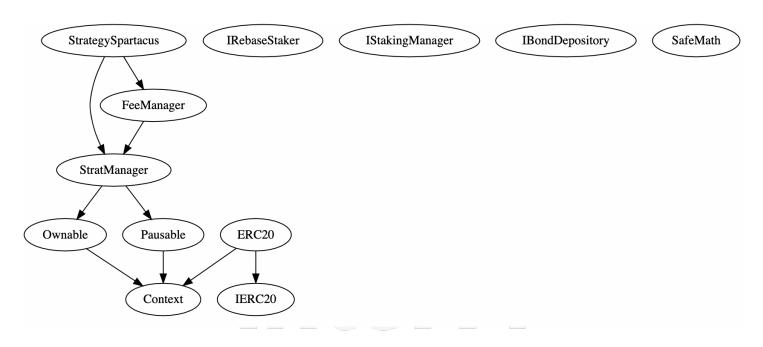
Interfi

Smart Contract
Security Audit



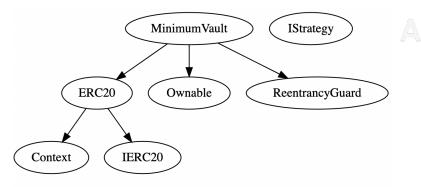
Smart Contract - Inheritance Graph

StrategySpartacus



MinimumVault

Smart Contract





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 = "StrategySpartacus";
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.
 - ❖ StrategySpartcaus contract is *pausable*. The owner can pause or unpause the smart contract function modules.
 - ❖ Minimum Finance uses Rebase. Rebase us when circulating supply adjusts (increases or decreases) automatically according to the price fluctuations
 - * The smart contract has *low severity issue* which may or may not create any functional vulnerability.

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



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



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 https://interfi.network

To view our audit portfolio, visit https://github.com/interfinetwork

To book an audit, message https://t.me/interfiaudits





RELENTLESSLY SECURING THE PUBLIC BLOCKCHAIN | MADE IN CANADA