HACKEN

SMART CONTRACT CODE REVIEW AND SECURITY ANALYSIS REPORT

Customer: VoirStudio
Date: October 29th, 2021

Document

Name	Smart Contract Code Review and Security Analysis Report for VoirStudio.
Approved by	Andrew Matiukhin	CTO Hacken OU
Type	Liquidity Manager
Platform	Ethereum / Solidity
Methods	Architecture Review, Functional Testing, Computer-Aided Verification, Manual Review
Repository	https://github.com/VoirStudio/unipilot-protocol-contract-v2
Commit	0575e61ef7355d20f6238a92ac9e49182835d59b
Technical Documentation	YES
JS tests	YES
Website	voirstudio.io
Timeline	18 OCTOBER 2021 – 29 OCTOBER 2021
Changelog	29 OCTOBER 2021 – INITIAL AUDIT

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Introduction

Hacken OÜ (Consultant) was contracted by VoirStudio (Customer) to conduct a Smart Contract Code Review and Security Analysis. This report presents the findings of the security assessment of the Customer's smart contract and its code review conducted between October 18th, 2021 - October 29th, 2021.

Scope

The scope of the project is smart contracts in the repository:
Repository:
      https://github.com/VoirStudio/unipilot-protocol-contract-v2
Commit:
      0575e61ef7355d20f6238a92ac9e49182835d59b
Technical Documentation: Yes; Business logic, no technical specs
- https://docs.google.com/document/d/1heX04nZ_f7cP7JVgSAzedpXMbuS9erN-YnbJI6NFcR0/edit
- https://docs.google.com/document/d/1-RorxePAvG6yooTtmpX27OwuBljd-qtvOOpviqUtJzk/edit?pli=1
JS tests: Yes; Included ("/test/")
Contracts:
      base\BlockTimestamp.sol
      base\ERC721Permit.sol
      base\PeripheryPayments.sol
      base\ULMState.sol
      base\UniswapLiquidityManager.sol
      interfaces\external\IERC20.sol
      interfaces\external\IERC20PermitAllowed.sol
      interfaces\external\IERC1271.sol
      interfaces\external\IWETH9.sol
      interfaces\uniswap\INonfungiblePositionManager.sol
      interfaces\uniswap\IULMEvents.sol
      interfaces\uniswap\IULMState.sol
      interfaces\uniswap\IUniswapLiquidityManager.sol
      interfaces\IERC721Permit.sol
      interfaces\IHandler.sol
      interfaces\ILiquidityMigrator.sol
      interfaces\IUnipilot.sol
      interfaces\IUniStrategy.sol
      interfaces\IV3Migrator.sol
      libraries\ChainId.sol
      libraries\LiquidityAmounts.sol
      libraries\LiquidityReserves.sol
      libraries\LowGasSafeMath.sol
      libraries\PositionKey.sol
      libraries\Sqrt.sol
      libraries\TransferHelper.sol
      oracle\interfaces\IOracle.sol
      oracle\libraries\OracleLibrary.sol
      oracle\libraries\SafeUint128.sol
      test\ERC20.sol
      LiquidityMigrator.sol

Unipilot.sol
UniStrategy.sol
V3Oracle.sol

We have scanned this smart contract for commonly known and more specific vulnerabilities. Here are some of the commonly known vulnerabilities that are considered:

Category	Check Item
Code review	▪ Reentrancy ▪ Ownership Takeover ▪ Timestamp Dependence ▪ Gas Limit and Loops ▪ DoS with (Unexpected) Throw ▪ DoS with Block Gas Limit ▪ Transaction-Ordering Dependence ▪ Style guide violation ▪ Costly Loop ▪ ERC20 API violation ▪ Unchecked external call ▪ Unchecked math ▪ Unsafe type inference ▪ Implicit visibility level ▪ Deployment Consistency ▪ Repository Consistency ▪ Data Consistency
Functional review	▪ Business Logics Review ▪ Functionality Checks ▪ Access Control & Authorization ▪ Escrow manipulation ▪ Token Supply manipulation ▪ Assets integrity ▪ User Balances manipulation ▪ Data Consistency manipulation ▪ Kill-Switch Mechanism ▪ Operation Trails & Event Generation

Executive Summary

According to the assessment, the Customer's smart contracts are secured.

| Insecure	Poor secured	Secured	Well-secured

You are here

Our team performed an analysis of code functionality, manual audit, and automated checks with Mythril and Slither. All issues found during automated analysis were manually reviewed, and important vulnerabilities are presented in the Audit overview section. All found issues can be found in the Audit overview section.

As a result of the audit, security engineers found **2** medium and **5** low severity issues.

Notice:

Contracts are written in a very SDKish manner which makes it difficult to understand all inputs and outputs. There are some inconsistencies with the provided business logic documentation as well as no technical documentation.

Graph 1. The distribution of vulnerabilities after the audit.

Medium
28,6%

Low
71,4%
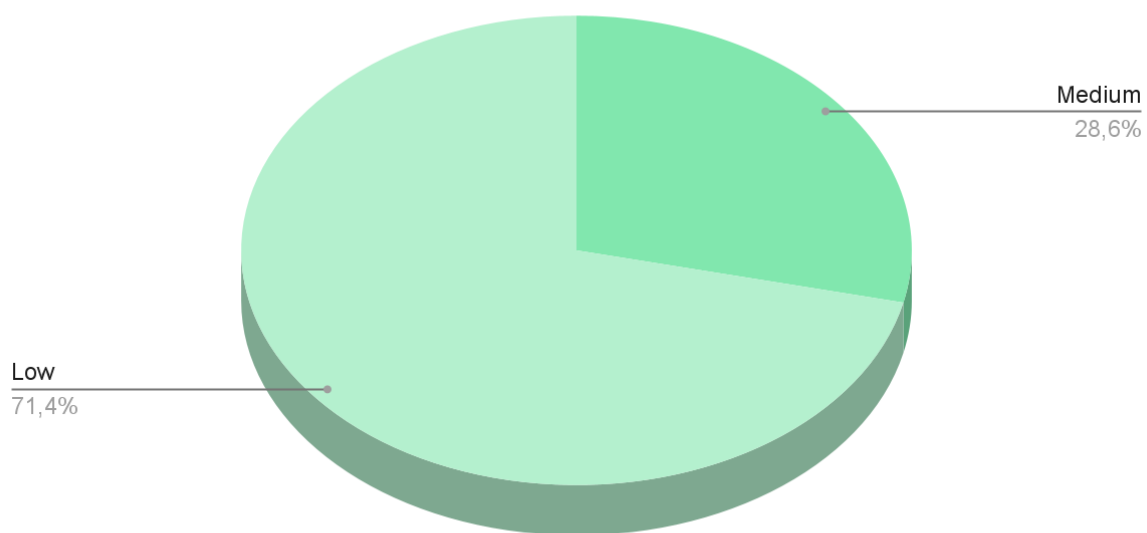
Severity Definitions

Risk Level	Description
Critical	Critical vulnerabilities are usually straightforward to exploit and can lead to assets loss or data manipulations.
High	High-level vulnerabilities are difficult to exploit; however, they also have a significant impact on smart contract execution, e.g., public access to crucial functions
Medium	Medium-level vulnerabilities are important to fix; however, they can't lead to assets loss or data manipulations.
Low	Low-level vulnerabilities are mostly related to outdated, unused, etc. code snippets that can't have a significant impact on execution

Audit overview

■ ■ ■ ■ Critical

No critical issues were found.

■ ■ ■ High

No high severity issues were found.

■ ■ Medium

1.   Tests could not be run.

Following the instruction. Run:

```
$ yarn install
$ yarn compile
$ yarn test
```

but receiving an error:

```
----------------------------|-------------
An unexpected error occurred:

test/stubs.ts:5:32 - error TS2307: Cannot find module '../artifacts/contracts/test/NftManager.sol/NonfungiblePositionManager.json' or its corresponding type
 declarations.

5 import NftManagerArtifact from "../artifacts/contracts/test/NftManager.sol/NonfungiblePositionManager.json";
                                 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

Recommendation: Please make sure tests could be run and cover at least 95% of code branches.

2.   Inconsistency with provided docs.

While it said in the docs:

> 4.   The position could be rebased if the current price/tick is outside the base range or +-15% from the upper and lower tick of the base range.
> 5.   The smart contracts should not allow rebasing for pairs whose twap is diverged 10% from its current price.
> 6.   The PILOT token would be rewarded for the rebasing (gas fees + (150000 gwei * gas price)) if the pair's liquidity exceeds $100,000.

in   the   code,   we   see   that   "$100,000"   is   the   constant (**LIQUIDITY_VALIDATION_AMOUNT**) while it should be changeable by the governance, and also, instead of taking "150000 gwei" which also should be configurable by governance, we couldn't find it at all. As well as items 4-5.

Contracts: UniswapLiquidityManager.sol

Constants: readjustLiquidity
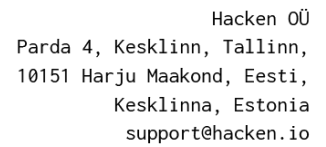
Recommendation: Please make sure contracts are aligned with the docs.

◾ Low

1.   Unused constants.

Contracts: PeripheryPayments.sol

Constants: DAI, USDC, USDT

Recommendation: Remove unused constants.

2.   No events on values changed.

While contract changes critical values it is recommended to emit events so the community may track such changes off-chain.

Contracts: UniStrategy.sol

Functions: setRangeMultiplier, setBaseMutiplier, setMaxTwapDeviation, setTwapDuration

Recommendation: Remove unused constants.

3.   Boolean equality.

Boolean constants can be used directly and do not need to be compared to **true** or **false**.

Contracts: UniswapLiquidityManager.sol

Functions: readjustLiquidity

Recommendation: Remove the equality to the boolean constant.

4.   Too many digits.

Literals with many digits are difficult to read and review.

Contracts: UniswapLiquidityManager.sol, V3Oracle.sol

Functions: readjustLiquidity, slitherConstructorConstantVariables

Recommendation: Please use either scientific notation or ether units suffix (ie: *0.2e18* or *0.2 ether*; *100e6 ether* instead of *1000000000000000000000000*).

5.   A public function that could be declared external

public functions that are never called by the contract should be declared **external** to save gas.

Contracts: V3Oracle.sol, ULMState.sol

Functions: V3Oracle.checkPoolValidation,
ULMState.getPoolAddress,
V3Oracle.getPilotAmountWethPair

Recommendation: Use the **external** attribute for functions never called
from the contract.

Conclusion

Smart contracts within the scope were manually reviewed and analyzed with static analysis tools.

The audit report contains all found security vulnerabilities and other issues in the reviewed code.

As a result of the audit, security engineers found **2** medium and **5** low severity issues.

Notice:

Contracts are written in a very SDKish manner which makes it difficult to understand all inputs and outputs. There are some inconsistencies with the provided business logic documentation as well as no technical documentation.

Disclaimers

Hacken Disclaimer

The smart contracts given for audit have been analyzed in accordance with the best industry practices at the date of this report, in relation to cybersecurity vulnerabilities and issues in smart contract source code, the details of which are disclosed in this report (Source Code); the Source Code compilation, deployment, and functionality (performing the intended functions).

The audit makes no statements or warranties on the security of the code. It also cannot be considered as a sufficient assessment regarding the utility and safety of the code, bug-free status, or any other statements of the contract. While we have done our best in conducting the analysis and producing this report, 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.

Technical Disclaimer

Smart contracts are deployed and executed on a blockchain platform. The platform, its programming language, and other software related to the smart contract can have vulnerabilities that can lead to hacks. Thus, the audit can't guarantee the explicit security of the audited smart contracts.