



Three Sigma

Code Audit



Syrup Lending Protocol

Disclaimer

Code Audit

Syrup Lending Protocol

Disclaimer

The ensuing audit offers no assertions or assurances about the code's security. It cannot be deemed an adequate judgment of the contract's correctness on its own. The authors of this audit present it solely as an informational exercise, reporting the thorough research involved in the secure development of the intended contracts, and make no material claims or guarantees regarding the contract's post-deployment operation. The authors of this report disclaim all liability for all kinds of potential consequences of the contract's deployment or use. Due to the possibility of human error occurring during the code's manual review process, we advise the client team to commission several independent audits in addition to a public bug bounty program.

Table of Contents

Code Audit

Syrup Lending Protocol

Table of Contents

Disclaimer	3
Summary	7
Scope	9
Methodology	11
Project Dashboard	13
Code Maturity Evaluation	16
Findings	19
3S-Sy-L01	19
3S-Sy-N01	20
3S-Sy-N02	21
3S-Sy-N03	22
3S-Sy-N04	23

Summary

Code Audit

Syrup Lending Protocol

Summary

Three Sigma audited Syrup in a 5 days engagement. The audit was conducted from 19-08-2024 to 23-08-2024.

Protocol Description

The Syrup platform, built by Maple Labs, enables users permissionless access to secured, institutional lending for the first time. By depositing USDC into the platform, users receive LP tokens (syrupUSDC) and begin earning yield immediately. All of the yield generated by Syrup is sourced from secured loans to the largest institutions in crypto, fully collateralized with digital assets.

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00000030	65 31 35 61 30 38 39 63	36 38 64 36 31 39 30 30	e15a089c638
00000040	30 30 30 30 30 30 30 30	39 38 32 30 35 31 66 64	00000009820
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00000110	66 32 30 35 32 61 30 31	30 30 30 30 30 30 34 33	f2052a01000
00000120	34 31 30 34 39 36 62 35	33 38 65 38 35 33 35 31	4104946b538
00000130	39 63 37 32 36 61 32 63	39 31 65 36 31 65 63 31	9c726ac91e6
00000140	31 36 30 30 61 65 31 33	39 30 38 31 33 61 36 32	16000ae1390
00000150	37 63 36 36 66 62 38 62	65 37 39 34 37 62 65 36	7c66fb8be79
00000160	33 63 35 32 64 61 37 35	38 39 33 37 39 35 31 35	3c52da73589
00000170	64 34 65 30 61 36 30 34	66 38 31 34 31 37 38 31	d4e0a646381
00000180	65 36 32 32 39 34 37 32	31 31 36 36 62 66 36 32	e6224947321
00000190	31 65 37 33 61 38 32 63	62 66 32 33 34 32 63 38	1e73a823cbf
000001A0	35 38 65 65 61 63 30 30	30 30 30 30 30 30	58eacc00000
00000000	30 31 30 30 30 30 30 30	34 38 36 30 65 62 31 38	01000000486

Scope

Code Audit

Syrup Lending Protocol

Scope

Filepath
mpl-migration/Migrator.sol
syrup-utils/SyrupDrip.sol
syrup-utils/SyrupUserActions.sol
syrup-utils/MPLUserActions.sol
fixed-term-loan/MapleLoan.sol
open-term-loan/MapleLoan.sol

Assumptions

The scope of the audit was carefully defined to include the contracts at the lowest level of the inheritance hierarchy, as these are the ones that will be deployed to the mainnet. The libraries used in the implementation of these contracts are internal contracts that have been previously audited and shown to be secure. Additionally, the Balancer and Makerdao codebases are considered to be safe.

Methodology

Code Audit

Syrup Lending Protocol

Methodology

To begin, we reasoned meticulously about the contract's business logic, checking security-critical features to ensure that there were no gaps in the business logic and/or inconsistencies between the aforementioned logic and the implementation. Second, we thoroughly examined the code for known security flaws and attack vectors. Finally, we discussed the most catastrophic situations with the team and reasoned backwards to ensure they are not reachable in any unintentional form.

Taxonomy

In this audit we report our findings using as a guideline Immunefi's vulnerability taxonomy, which can be found at immunefi.com/severity-updated/. The final classification takes into account the severity, according to the previous link, and likelihood of the exploit. The following table summarizes the general expected classification according to severity and likelihood; however, each issue will be evaluated on a case-by-case basis and may not strictly follow it.

Severity / Likelihood	LOW	MEDIUM	HIGH
NONE	None		
LOW	Low		
MEDIUM	Low	Medium	Medium
HIGH	Medium	High	High
CRITICAL	High	Critical	Critical

Project Dashboard

Code Audit

Syrup Lending Protocol

Project Dashboard

Application Summary

Name	Syrup
Commit	syrup-utils 52d7d2252193ce24edea3e983ed3016557bac7d6 open-term-loan f71cc276f88a98cccd7b72ce8333b0f7477f2c87 fixed-term-loan 622c3b5d14799bfca02f9f59dd743fc13c4a9cb4 mpl-migration 3d49ab895cf4a13d26d3331a004aacb7858d9877
Language	Solidity
Platform	Ethereum

Engagement Summary

Timeline	19-08-2024 to 23-08-2024
N° of Auditors	2
Review Time	5 days

Vulnerability Summary

Issue Classification	Found	Addressed	Acknowledged
Critical	0	0	0
High	0	0	0
Medium	0	0	0
Low	1	1	0

None	4	2	2
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Category Breakdown

Suggestion	1
Documentation	0
Bug	0
Optimization	2
Good Code Practices	2

Code Maturity Evaluation

Code Audit

Syrup Lending Protocol

Code Maturity Evaluation

Code Maturity Evaluation Guidelines

Category	Evaluation
Access Controls	The use of robust access controls to handle identification and authorization and to ensure safe interactions with the system.
Arithmetic	The proper use of mathematical operations and semantics.
Centralization	The presence of a decentralized governance structure for mitigating insider threats and managing risks posed by contract upgrades
Code Stability	The extent to which the code was altered during the audit.
Upgradeability	The presence of parameterizations of the system that allow modifications after deployment.
Function Composition	The functions are generally small and have clear purposes.
Front-Running	The system's resistance to front-running attacks.
Monitoring	All operations that change the state of the system emit events, making it simple to monitor the state of the system. These events need to be correctly emitted.
Specification	The presence of comprehensive and readable codebase documentation.
Testing and Verification	The presence of robust testing procedures (e.g., unit tests, integration tests, and verification methods) and sufficient test coverage.

Code Maturity Evaluation Results

Category	Evaluation
Access Controls	Satisfactory. The codebase has a strong access control mechanism.
Arithmetic	Satisfactory. The codebase uses Solidity version >0.8.0 as well as takes the correct measures in rounding the results of arithmetic operations.
Centralization	Weak. The Syrup protocol has significant privileges over the codebase.
Code Stability	Satisfactory. The code was stable during the audit.
Upgradeability	Satisfactory. Most contracts are upgradeable except for the stateless ones.
Function Composition	Satisfactory. Certain components are similar, and the codebase would benefit from increased code reuse.
Front-Running	Satisfactory. No front-running issues were found.
Monitoring	Satisfactory. Events are correctly emitted and the Syrup Router keeps track of on chain activity.
Specification	Satisfactory. In-depth and well structured high-level specification as well as codebase documentation.
Testing and Verification	Satisfactory. Extensive test code coverage as well as usage of tools and different test methods.

Findings

Code Audit

Syrup Lending Protocol

Findings

3S-Sy-L01

Deadline parameter in **SyrupUserActions::_swapViaBalancer()** could be set to minimize MEV

Id	3S-Sy-L01
Classification	Low
Severity	Low
Likelihood	Medium
Category	Suggestion
Status	Addressed in #4614e56

Description

SyrupUserActions sets a minimum amount out limit to prevent excessive MEV. However, as the deadline parameter is set to **block.timestamp** there is still some room for MEV.

Recommendation

Send a deadline parameter instead of hardcoding **0** to further mitigate MEV.

3S-Sy-N01

Extra spaces found in some instances of the codebase

Id	3S-Sy-N01
Classification	None
Category	Good Code Practices
Status	Addressed in #e9e7dff .

Description

Some extra spaces were found in the codebase which could be fixed for increased readability.

Recommendation

```
bytes32 public immutable override poolId; in SyrupUserActions.
```

```
// 4. If asset out is USDC, swap DAI to USDC in SyrupUserActions::_swap().
```

3S-Sy-N02

Duplicated slippage check in **SyrupUserActions**

Id	3S-Sy-N02
Classification	None
Category	Optimization
Status	Addressed in #50438b9

Description

SyrupUserActions::_swap() checks the slippage at the end **require(amountOut_ >= minAmountOut_, "SUA:S:INSUFFICIENT_AMOUNT_OUT");**. When the asset out is **USDC**, it double checks the slippage in **SyrupUserActions::_swapDaiForUsdc()** as **require(usdcOut_ >= minUsdcOut_, "SUA:SDU:INSUFFICIENT_AMOUNT_OUT");**.

Recommendation

There is no need to check the slippage in **SyrupUserActions::_swapDaiForUsdc()**.

3S-Sy-N03

Duplicated `_permit()` function

Id	3S-Sy-N03
Classification	None
Category	Good Code Practices
Status	Acknowledged

Description

The `_permit()` function, utilized in the **MplUserActions**, **SyrupRouter**, and **SyrupUserActions** contracts, is duplicated across them.

Recommendation

To enhance code reusability and maintainability, this function can be relocated to the **utils** folder.

3S-Sy-N04

Immutable variables are emitted in events

Id	3S-Sy-N04
Classification	None
Category	Optimization
Status	Acknowledged

Description

The following immutable variables are unnecessarily included in event emissions:

- **SyrupUserActions::_swap()** - **syrupUsdc** in **Swap** event.
- **MplUserActions::_redeemAndMigrateAndStake()** - **xmpl** in **RedeemedAndMigratedAndStaked** event.

Recommendation

Immutable variables can not be changed, unless upgraded, so an event may not be necessary.