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# SMART CONTRACT

## Security Audit Report

Project: Starbank Protocol  
Platform: Astar Network  
Language: Solidity  
Date: April 5th, 2022

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# Introduction

EtherAuthority was contracted by the Starbank team to perform the Security audit of the Starbank Protocol smart contracts code. The audit has been performed using manual analysis as well as using automated software tools. This report presents all the findings regarding the audit performed on April 5th, 2022.

**The purpose of this audit was to address the following:**

- Ensure that all claimed functions exist and function correctly.
- Identify any security vulnerabilities that may be present in the smart contract.

## Project Background

The Starbank Contracts have functions like adding a new pool and updating LP, batchSwap, swap, flashLoan, deposit, withdraw, mint, burn, etc. The Starbank contracts also inherits ERC20Burnable, Math, IERC20, SafeERC20, ReentrancyGuard, SafeMath standard smart contracts from the openzepelin library.

## Audit scope

Name	<b>Code Review and Security Analysis Report for Starbank Protocol Smart Contracts</b>
Platform	<b>Astar Network / Solidity</b>
File 1	<a href="#">Authorizer.sol</a>
File 1 MD5 Hash	89FBC1ACC09B9EE2AA0337A7CB94D469
File 2	<a href="#">InvestmentPoolFactory.sol</a>
File 2 MD5 Hash	5735312F2BC1FDD5C0B57695C92853E9
File 3	<a href="#">MetaStablePoolFactory.sol</a>
File 3 MD5 Hash	2E3C6BDF059C3D6A8A86F2E6BE580ABF
File 4	<a href="#">Multicall2.sol</a>
File 4 MD5 Hash	A5539355CC6AB06E648A358E6A3CF27F

<b>File 5</b>	<a href="#">NoProtocolFeeLiquidityBootstrappingPoolFactory.sol</a>
<b>File 5 MD5 Hash</b>	177A8B4CCA7EEFDB9CC5ED5A52537A01
<b>File 6</b>	<a href="#">ProtocolFeesCollector.sol</a>
<b>File 6 MD5 Hash</b>	EC904D61244952C1A004444B0E48AD66
<b>File 7</b>	<a href="#">StablePhantomPoolFactory.sol</a>
<b>File 7 MD5 Hash</b>	F9D53F12E31CCDF316C63F128EB06478
<b>File 8</b>	<a href="#">StablePoolFactory.sol</a>
<b>File 8 MD5 Hash</b>	FD84480294719501B87B5AD179E3A69D
<b>File 9</b>	<a href="#">Vault.sol</a>
<b>File 9 MD5 Hash</b>	668D62234B36AFCB7B3811D76068E137
<b>Updated File 9 MD5 Hash</b>	1CCE76B19C4A0C5BEB8B3FF5899C0EF3
<b>File 10</b>	<a href="#">WeightedPool.sol</a>
<b>File 10 MD5 Hash</b>	65F45CC467D4C918C7C09432B214330C
<b>File 11</b>	<a href="#">WeightedPool2TokensFactory.sol</a>
<b>File 11 MD5 Hash</b>	096ADD93DD8EF6366B4A9474BC09731A
<b>File 12</b>	<a href="#">MasterChef.sol</a>
<b>File 12 MD5 Hash</b>	EC393C79AC1B07DD836B04ABDF67D728
<b>File 13</b>	<a href="#">SBXToken.sol</a>
<b>File 13 MD5 Hash</b>	465E7DC40093C1900142DFEEF27E6724
<b>Audit Date</b>	April 5th,2022
<b>Revise Audit Date</b>	April 25th,2022

## Claimed Smart Contract Features

Claimed Feature Detail	Our Observation
<b>File 1 Authorizer.sol</b> <ul style="list-style-type: none"> <li>The Authorizer can access functions like: renouncePermissions, revokePermissions, grantPermissions, cancel, execute, schedule, etc.</li> </ul>	YES, This is valid.
<b>File 2 InvestmentPoolFactory.sol</b> <ul style="list-style-type: none"> <li>The InvestmentPoolFactory can create a new pool.</li> </ul>	YES, This is valid.
<b>File 3 MetaStablePoolFactory.sol</b> <ul style="list-style-type: none"> <li>The MetaStablePoolFactory can create a new pool.</li> </ul>	YES, This is valid.
<b>File 4 Multicall2.sol</b> <ul style="list-style-type: none"> <li>The Multicall can access functions like: aggregate, blockAndAggregate, tryAggregate, etc.</li> </ul>	YES, This is valid.
<b>File 5</b> <b>NoProtocolFeeLiquidityBootstrappingPoolFactory.sol</b> <ul style="list-style-type: none"> <li>The NoProtocolFeeLiquidityBootstrappingPoolFactory access functions like: disable, create, _canPerform, etc.</li> </ul>	YES, This is valid.
<b>File 6 ProtocolFeesCollector.sol</b> <ul style="list-style-type: none"> <li>Maximum Protocol Swap Fee: 50%</li> <li>Maximum Protocol Flash Loan Fee: 1%</li> </ul>	YES, This is valid. Owner authorized wallet can set some percentage value and we suggest handling the private key of that wallet securely.
<b>File 7 StablePhantomPoolFactory.sol</b> <ul style="list-style-type: none"> <li>The StablePhantomPoolFactory can access functions like: create a Stable Phantom Pool.</li> </ul>	YES, This is valid.

<b>File 8 StablePoolFactory.sol</b>	<b>YES, This is valid.</b>
<ul style="list-style-type: none"> <li>The StablePoolFactory can access functions like: create a Stable Pool.</li> </ul>	
<b>File 9 Vault.sol</b>	<b>YES, This is valid.</b>
<ul style="list-style-type: none"> <li>The Vault contract can access functions like: setPaused, WETH.</li> </ul>	
<b>File 10 WeightedPool.sol</b>	<b>YES, This is valid.</b>
<ul style="list-style-type: none"> <li>The WeightedPool can access functions like: getInvariant, _onSwapGivenIn, _onJoinPool,etc.</li> </ul>	
<b>File 11 WeightedPool2TokensFactory.sol</b>	<b>YES, This is valid.</b>
<ul style="list-style-type: none"> <li>The WeightedPool2TokensFactory can access functions like:create, etc.</li> </ul>	
<b>File 12 MasterChef.sol</b>	<b>YES, This is valid.</b>  <b>Owner authorized wallet can set some percentage value and we suggest handling the private key of that wallet securely.</b>
<b>File 13 SBXToken.sol</b>	<b>YES, This is valid.</b>
<ul style="list-style-type: none"> <li>Name: SBXToken</li> <li>Symbol: SBX</li> <li>Maximum Supply: 250 million SBX</li> </ul>	

# Audit Summary

According to the standard audit assessment, Customer's solidity smart contracts are "**Secured**". These contracts do contain owner control, which does not make them fully decentralized.



We used various tools like Slither, Solhint and Remix IDE. At the same time this finding is based on critical analysis of the manual audit.

All issues found during automated analysis were manually reviewed and applicable vulnerabilities are presented in the Audit overview section. General overview is presented in AS-IS section and all identified issues can be found in the Audit overview section.

**We found 0 critical, 0 high, 0 medium and 4 low and some very low level issues.**

**Investors Advice:** Technical audit of the smart contract does not guarantee the ethical nature of the project. Any owner controlled functions should be executed by the owner with responsibility. All investors/users are advised to do their due diligence before investing in the project.

# Technical Quick Stats

Main Category	Subcategory	Result
Contract Programming	Solidity version not specified	Passed
	Solidity version too old	Passed
	Integer overflow/underflow	Passed
	Function input parameters lack of check	Moderated
	Function input parameters check bypass	Passed
	Function access control lacks management	Passed
	Critical operation lacks event log	Passed
	Human/contract checks bypass	Passed
	Random number generation/use vulnerability	N/A
	Fallback function misuse	Passed
	Race condition	Passed
	Logical vulnerability	Passed
	Features claimed	Passed
	Other programming issues	Moderated
Code Specification	Function visibility not explicitly declared	Passed
	Var. storage location not explicitly declared	Passed
	Use keywords/functions to be deprecated	Passed
	Unused code	Passed
Gas Optimization	“Out of Gas” Issue	Passed
	High consumption ‘for/while’ loop	Passed
	High consumption ‘storage’ storage	Passed
	Assert() misuse	Passed
Business Risk	The maximum limit for mintage not set	Passed
	“Short Address” Attack	Passed
	“Double Spend” Attack	Passed

Overall Audit Result: **PASSED**

## Code Quality

This audit scope has 13 smart contract files. Smart contracts contain Libraries, Smart contracts, inherits and Interfaces. This is a compact and well written smart contract.

The libraries in the Starbank Protocol are part of its logical algorithm. A library is a different type of smart contract that contains reusable code. Once deployed on the blockchain (only once), it is assigned a specific address and its properties / methods can be reused many times by other contracts in the Starbank Protocol.

The Starbank Protocol team has not provided unit test scripts, which would have helped to determine the integrity of the code in an automated way.

Code parts are **not** well commented on smart contracts.

## Documentation

We were given a Starbank Protocol smart contract code in the form of a blockscout astar Web Link and Github weblink. The hash of that code is mentioned above in the table.

As mentioned above, code parts are **not well** commented. So it is not easy to quickly understand the programming flow as well as complex code logic. Comments are very helpful in understanding the overall architecture of the protocol.

## Use of Dependencies

As per our observation, the libraries are used in this smart contracts infrastructure that are based on well known industry standard open source projects.

Apart from libraries, its functions are used in external smart contract calls.

# AS-IS overview

## Autorizer.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	permissionId	write	Passed	No Issue
3	hasPermission	read	Passed	No Issue
4	canPerform	read	Passed	No Issue
5	setDelay	external	Passed	No Issue
6	scheduleDelayChange	external	Passed	No Issue
7	schedule	external	Passed	No Issue
8	execute	external	Passed	No Issue
9	cancel	external	Passed	No Issue
10	grantPermissions	external	Passed	No Issue
11	revokePermissions	external	Passed	No Issue
12	renouncePermissions	external	Passed	No Issue
13	grantPermission	external	Passed	No Issue
14	revokePermission	external	Passed	No Issue
15	schedule	write	Passed	No Issue
16	authenticate	internal	Passed	No Issue
17	executeActionId	internal	Passed	No Issue
18	decodeSelector	internal	Passed	No Issue

## InvestmentPoolFactory.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	create	external	Passed	No Issue
3	getCreationCodeContracts	read	Passed	No Issue
4	getCreationCode	read	Passed	No Issue
5	getCreationCodeWithArgs	read	Passed	No Issue
6	create	internal	Passed	No Issue
7	memcpy	write	Passed	No Issue
8	getVault	read	Passed	No Issue
9	isPoolFromFactory	external	Passed	No Issue
10	create	internal	Passed	No Issue
11	getPauseConfiguration	read	Passed	No Issue

## MetaStablePoolFactory.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	create	external	Passed	No Issue
3	getCreationCodeContracts	read	Passed	No Issue
4	getCreationCode	read	Passed	No Issue
5	getCreationCodeWithArgs	read	Passed	No Issue
6	create	internal	Passed	No Issue
7	_memcpy	write	Passed	No Issue
8	getVault	read	Passed	No Issue
9	isPoolFromFactory	external	Passed	No Issue
10	create	internal	Passed	No Issue
11	getPauseConfiguration	read	Passed	No Issue

## Multicall2.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	aggregate	read	Passed	No Issue
3	blockAndAggregate	write	Passed	No Issue
4	getBlockHash	read	Passed	No Issue
5	getBlockNumber	read	Passed	No Issue
6	getCurrentBlockCoinbase	read	Passed	No Issue
7	getCurrentBlockDifficulty	read	Passed	No Issue
8	getCurrentBlockGasLimit	read	Passed	No Issue
9	getCurrentBlockTimestamp	read	Passed	No Issue
10	getEthBalance	read	Passed	No Issue
11	getLastBlockHash	read	Passed	No Issue
12	tryAggregate	write	Passed	No Issue
13	tryBlockAndAggregate	write	Passed	No Issue

## NoProtocolFeeLiquidityBootstrappingPoolFactory.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	getCreationCodeContracts	read	Passed	No Issue
3	getCreationCode	read	Passed	No Issue
4	_getCreationCodeWithArgs	read	Passed	No Issue
5	_create	internal	Passed	No Issue
6	_memcpy	write	Passed	No Issue
7	getVault	read	Passed	No Issue
8	isPoolFromFactory	external	Passed	No Issue

<b>9</b>	_create	internal	Passed	No Issue
<b>10</b>	getPauseConfiguration	read	Passed	No Issue
<b>11</b>	isDisabled	read	Passed	No Issue
<b>12</b>	disable	external	access by authenticate	No Issue
<b>13</b>	create	external	Passed	No Issue
<b>14</b>	_canPerform	internal	Passed	No Issue
<b>15</b>	authenticate	modifier	Passed	No Issue
<b>16</b>	_authenticateCaller	internal	Passed	No Issue
<b>17</b>	getActionId	read	Passed	No Issue
<b>18</b>	_canPerform	internal	Passed	No Issue

## ProtocolFeesCollector.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
<b>1</b>	constructor	write	Passed	No Issue
<b>2</b>	authenticate	modifier	Passed	No Issue
<b>3</b>	authenticateCaller	internal	Passed	No Issue
<b>4</b>	getActionId	read	Passed	No Issue
<b>5</b>	canPerform	internal	Passed	No Issue
<b>6</b>	nonReentrant	modifier	Passed	No Issue
<b>7</b>	_enterNonReentrant	write	Passed	No Issue
<b>8</b>	exitNonReentrant	write	Passed	No Issue
<b>9</b>	withdrawCollectedFees	external	Function input parameters lack of check	Refer Audit Findings
<b>10</b>	setSwapFeePercentage	external	access by authenticate	No Issue
<b>11</b>	setFlashLoanFeePercentage	external	access by authenticate	No Issue
<b>12</b>	getSwapFeePercentage	external	Passed	No Issue
<b>13</b>	getFlashLoanFeePercentage	external	Passed	No Issue
<b>14</b>	getCollectedFeeAmounts	external	Passed	No Issue
<b>15</b>	getAuthorizer	external	Passed	No Issue
<b>16</b>	_canPerform	internal	Passed	No Issue
<b>17</b>	getAuthorizer	internal	Passed	No Issue

## StablePhantomPoolFactory.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
<b>1</b>	constructor	write	Passed	No Issue
<b>2</b>	getCreationCodeContracts	read	Passed	No Issue
<b>3</b>	getCreationCode	read	Passed	No Issue

4	getCreationCodeWithArgs	read	Passed	No Issue
5	_create	internal	Passed	No Issue
6	memcpy	write	Passed	No Issue
7	getVault	read	Passed	No Issue
8	isPoolFromFactory	external	Passed	No Issue
9	_create	internal	Passed	No Issue
10	getPauseConfiguration	read	Passed	No Issue
11	create	external	Passed	No Issue

## StablePoolFactory.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	getCreationCodeContracts	read	Passed	No Issue
3	getCreationCode	read	Passed	No Issue
4	getCreationCodeWithArgs	read	Passed	No Issue
5	_create	internal	Passed	No Issue
6	memcpy	write	Passed	No Issue
7	getVault	read	Passed	No Issue
8	isPoolFromFactory	external	Passed	No Issue
9	_create	internal	Passed	No Issue
10	getPauseConfiguration	read	Passed	No Issue
11	create	external	Passed	No Issue

## Vault.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	setPaused	external	access by authenticate	No Issue
3	WETH	external	Passed	No Issue
4	swap	external	access by authenticate for	No Issue
5	batchSwap	external	access by authenticate for	No Issue
6	_tokenGiven	write	Passed	No Issue
7	tokenCalculated	write	Passed	No Issue
8	_getAmounts	write	Passed	No Issue
9	swapWithPools	write	Passed	No Issue
10	_swapWithPool	write	Passed	No Issue
11	_processTwoTokenPoolSwapRequest	write	Passed	No Issue
12	_processMinimalSwapInfoPoolSwapRequest	write	Passed	No Issue

13	<code>_callMinimalSwapInfoPool</code> <code>IOnSwapHook</code>	internal	Passed	No Issue
14	<code>_processGeneralPoolSwapRequest</code>	write	Passed	No Issue
15	<code>queryBatchSwap</code>	external	Passed	No Issue
16	<code>flashLoan</code>	external	Passed	No Issue
17	<code>setAuthorizer</code>	external	access by authenticate for	No Issue
18	<code>setAuthorizer</code>	write	Passed	No Issue
19	<code>getAuthorizer</code>	external	Passed	No Issue
20	<code>setRelayerApproval</code>	external	access by authenticate for	No Issue
21	<code>hasApprovedRelayer</code>	external	Passed	No Issue
22	<code>authenticateFor</code>	internal	Passed	No Issue
23	<code>_hasApprovedRelayer</code>	internal	Passed	No Issue
24	<code>canPerform</code>	internal	Passed	No Issue
25	<code>typeHash</code>	internal	Passed	No Issue

## WeightedPool.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	<code>constructor</code>	write	Passed	No Issue
2	<code>normalizedWeight</code>	internal	Passed	No Issue
3	<code>normalizedWeights</code>	internal	Passed	No Issue
4	<code>getLastInvariant</code>	external	Passed	No Issue
5	<code>getInvariant</code>	read	Passed	No Issue
6	<code>getNormalizedWeights</code>	external	Passed	No Issue
7	<code>_onSwapGivenIn</code>	internal	Passed	No Issue
8	<code>onSwapGivenOut</code>	internal	Passed	No Issue
9	<code>_onInitializePool</code>	internal	Passed	No Issue
10	<code>onJoinPool</code>	internal	Passed	No Issue
11	<code>doJoin</code>	read	Passed	No Issue
12	<code>_joinExactTokensInForBPTOut</code>	read	Passed	No Issue
13	<code>_joinTokenInForExactBPTOut</code>	read	Passed	No Issue
14	<code>onExitPool</code>	internal	Passed	No Issue
15	<code>doExit</code>	read	Passed	No Issue
16	<code>_exitExactBPTInForTokenOut</code>	read	Passed	No Issue
17	<code>_exitExactBPTInForTokensOut</code>	write	Passed	No Issue
18	<code>_exitBPTInForExactTokensOut</code>	read	Passed	No Issue
19	<code>_getDueProtocolFeeAmounts</code>	read	Passed	No Issue

20	_invariantAfterJoin	read	Passed	No Issue
21	_invariantAfterExit	read	Passed	No Issue
22	mutateAmounts	read	Passed	No Issue
23	getRate	read	Passed	No Issue
24	onSwap	external	Passed	No Issue
25	_onSwapGivenIn	internal	Passed	No Issue
26	register	internal	Passed	No Issue
27	calculateInvariant	internal	Passed	No Issue
28	calcOutGivenIn	internal	Passed	No Issue
29	_calcInGivenOut	internal	Passed	No Issue
30	_calcBptOutGivenExactTo kensIn	internal	Passed	No Issue
31	_calcTokenInGivenExactB ptOut	internal	Passed	No Issue
32	_calcBptInGivenExactTok ensOut	internal	Passed	No Issue
33	_calcTokenOutGivenExac tBptIn	internal	Passed	No Issue
34	_calcTokensOutGivenExa ctBptIn	internal	Passed	No Issue
35	_calcDueTokenProtocols wapFeeAmount	internal	Passed	No Issue

## WeightedPool2TokensFactory.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	create	external	Passed	No Issue
3	getVault	read	Passed	No Issue
4	isPoolFromFactory	external	Passed	No Issue
5	_register	internal	Passed	No Issue
6	getPauseConfiguration	read	Passed	No Issue

## MasterChef.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	owner	read	Passed	No Issue
3	onlyOwner	modifier	Passed	No Issue
4	renounceOwnership	write	access only Owner	No Issue
5	transferOwnership	write	access only Owner	No Issue
6	_transferOwnership	internal	Passed	No Issue
7	nonReentrant	modifier	Passed	No Issue
8	init	external	access only Owner	No Issue

<b>9</b>	poolLength	external	Passed	No Issue
<b>10</b>	addPool	write	LP Token and reward token	Refer Audit Findings
<b>11</b>	setPool	write	access only Owner	No Issue
<b>12</b>	pendingReward	external	Passed	No Issue
<b>13</b>	getMultiplier	read	Passed	No Issue
<b>14</b>	massUpdatePools	write	Passed	No Issue
<b>15</b>	updatePools	external	Passed	No Issue
<b>16</b>	updatePool	write	Passed	No Issue
<b>17</b>	deposit	write	Passed	No Issue
<b>18</b>	withdraw	write	Passed	No Issue
<b>19</b>	emergencyWithdraw	write	Emergency Withdrawal	Refer Audit Findings
<b>20</b>	harvest	write	Passed	No Issue
<b>21</b>	harvestAll	external	Passed	No Issue
<b>22</b>	harvestSome	external	Passed	No Issue
<b>23</b>	safeRewardTransfer	internal	Passed	No Issue
<b>24</b>	setRewardPerSecond	external	access only Owner	No Issue
<b>25</b>	dev	write	access only Owner	No Issue
<b>26</b>	treasury	write	access only Owner	No Issue
<b>27</b>	reserve1	write	access only Owner	No Issue
<b>28</b>	reserve2	write	access only Owner	No Issue
<b>29</b>	reserve3	write	access only Owner	No Issue
<b>30</b>	communityGrowth	write	access only Owner	No Issue
<b>31</b>	setStartTime	external	access only Owner	No Issue

## SBXToken.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	owner	write	Passed	No Issue
3	onlyOwner	modifier	Passed	No Issue
4	renounceOwnership	write	access only Owner	No Issue
5	transferOwnership	write	access only Owner	No Issue
6	transferOwnership	internal	Passed	No Issue
7	name	read	Passed	No Issue
8	symbol	read	Passed	No Issue
9	decimals	read	Passed	No Issue
10	totalSupply	read	Passed	No Issue
11	balanceOf	read	Passed	No Issue
12	transfer	write	Passed	No Issue
13	allowance	read	Passed	No Issue
14	approve	write	Passed	No Issue
15	transferFrom	write	Passed	No Issue
16	increaseAllowance	write	Passed	No Issue
17	decreaseAllowance	write	Passed	No Issue
18	_transfer	internal	Passed	No Issue
19	mint	internal	Passed	No Issue
20	burn	internal	Passed	No Issue
21	approve	internal	Passed	No Issue
22	_spendAllowance	internal	Passed	No Issue
23	beforeTokenTransfer	internal	Passed	No Issue
24	_afterTokenTransfer	internal	Passed	No Issue
25	burnFrom	write	Passed	No Issue
26	burn	write	Passed	No Issue
27	mint	write	access only Owner	No Issue

# Severity Definitions

Risk Level	Description
Critical	Critical vulnerabilities are usually straightforward to exploit and can lead to token loss etc.
High	High-level vulnerabilities are difficult to exploit; however, they also have significant impact on smart contract execution, e.g. public access to crucial
Medium	Medium-level vulnerabilities are important to fix; however, they can't lead to tokens lose
Low	Low-level vulnerabilities are mostly related to outdated, unused etc. code snippets, that can't have significant impact on execution
Lowest / Code Style / Best Practice	Lowest-level vulnerabilities, code style violations and info statements can't affect smart contract execution and can be ignored.

# Audit Findings

## Critical Severity

No Critical severity vulnerabilities were found.

## High Severity

No High severity vulnerabilities were found.

## Medium

No Medium severity vulnerabilities were found.

## Low

(1) Function input parameters lack of check:

Variable validation is not performed in the functions below:

### ProtocolFeesCollector.sol

- withdrawCollectedFees = recipient

**Resolution:** We advise using validation like address type variables should not be address(0).

(2) Emergency Withdrawal: **MasterChef.sol**

There is no validation for the user for emergency withdrawal. Users who have not deposited can also execute the emergencyWithdraw function.

**Resolution:** We suggest checking whether the pool id belongs to the caller before executing the transfer.

(3) Using experimental ABIEncoderV2: **InvestmentPoolFactory.sol**, **MultiCall.sol**

Because the ABIEncoderV2 is experimental, it would be risky to release the project using it. Moreover, the recent findings show that it is likely that other important bugs are yet to be found.

<https://blog.ethereum.org/2019/03/26/solidity-optimizer-and-abiencoderv2-bug/>

**Resolution:** We suggest avoiding using this if logically possible.

(4) LP Token and reward token: **MasterChef.sol**

In the addPool function , there is a condition that rewardToken is not equal to lpToken. But if we execute the addPool function without initializing, the above condition will always be true and so the LP token can be the same as the reward token.

**Resolution:** We suggest checking whether the Initialize function has been executed or not for all other functions.

### **Very Low / Informational / Best practices:**

(1) rewardToken should be made immutable: **MasterChef.sol**

Variables that are defined within the constructor but further remain unchanged should be marked as immutable to save gas and to ease the reviewing process of third-parties.

**Resolution:** Consider marking this variable as immutable.

(2) SPDX license identifier is Missing: **Multicall2.sol, InvestmentPoolFactory.sol**

The SPDX license identifier is missing for the mentioned files.

**Resolution:** We suggest adding SPDX license identifier.

## Centralization

This smart contract has some functions which can be executed by the Admin (Owner) only. If the admin wallet private key would be compromised, then it would create trouble. Following are Admin functions:

- init: The MasterChef owner can initialize the reward address.
- addPool: The MasterChef owner can add a new lp to the pool.
- setPool: The MasterChef owner can update the given pool's reward allocation point.
- setRewardPerSecond: The MasterChef owner can set rewards per second.
- dev: The MasterChef owner can update the dev address by the previous dev.
- treasury: The MasterChef owner can update the treasury address by the owner.
- reserve1: The MasterChef owner can update the reserve1 address by the owner.
- reserve2: The MasterChef owner can update the reserve2 address by the owner.
- reserve3: The MasterChef owner can update the reserve3 address by the owner.
- communityGrowth: The MasterChef owner can update communityGrowth address by the owner.
- setStartTime: The MasterChef owner can set start time.
- mint: The SBXToken owner can mint an amount from the address.

# Conclusion

We were given a contract code in the form of files. And we have used all possible tests based on given objects as files. We have not observed any major issues in the smart contracts. So, **it's good to go to production.**

Since possible test cases can be unlimited for such smart contracts protocol, we provide no such guarantee of future outcomes. We have used all the latest static tools and manual observations to cover maximum possible test cases to scan everything.

Smart contracts within the scope were manually reviewed and analyzed with static analysis tools. Smart Contract's high-level description of functionality was presented in the As-is overview section of the report.

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

Security state of the reviewed contract, based on standard audit procedure scope, is **“Secured”**.

# Our Methodology

We like to work with a transparent process and make our reviews a collaborative effort. The goals of our security audits are to improve the quality of systems we review and aim for sufficient remediation to help protect users. The following is the methodology we use in our security audit process.

## **Manual Code Review:**

In manually reviewing all of the code, we look for any potential issues with code logic, error handling, protocol and header parsing, cryptographic errors, and random number generators. We also watch for areas where more defensive programming could reduce the risk of future mistakes and speed up future audits. Although our primary focus is on the in-scope code, we examine dependency code and behavior when it is relevant to a particular line of investigation.

## **Vulnerability Analysis:**

Our audit techniques included manual code analysis, user interface interaction, and whitebox penetration testing. We look at the project's web site to get a high level understanding of what functionality the software under review provides. We then meet with the developers to gain an appreciation of their vision of the software. We install and use the relevant software, exploring the user interactions and roles. While we do this, we brainstorm threat models and attack surfaces. We read design documentation, review other audit results, search for similar projects, examine source code dependencies, skim open issue tickets, and generally investigate details other than the implementation.

## **Documenting Results:**

We follow a conservative, transparent process for analyzing potential security vulnerabilities and seeing them through successful remediation. Whenever a potential issue is discovered, we immediately create an Issue entry for it in this document, even though we have not yet verified the feasibility and impact of the issue. This process is conservative because we document our suspicions early even if they are later shown to not represent exploitable vulnerabilities. We generally follow a process of first documenting the suspicion with unresolved questions, then confirming the issue through code analysis, live experimentation, or automated tests. Code analysis is the most tentative, and we strive to provide test code, log captures, or screenshots demonstrating our confirmation. After this we analyze the feasibility of an attack in a live system.

## **Suggested Solutions:**

We search for immediate mitigations that live deployments can take, and finally we suggest the requirements for remediation engineering for future releases. The mitigation and remediation recommendations should be scrutinized by the developers and deployment engineers, and successful mitigation and remediation is an ongoing collaborative process after we deliver our report, and before the details are made public.

# **Disclaimers**

## **EtherAuthority.io Disclaimer**

EtherAuthority team has analyzed this smart contract 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).

Due to the fact that the total number of test cases are unlimited, the audit makes no statements or warranties on security of the code. It also cannot be considered as a sufficient assessment regarding the utility and safety of the code, bugfree 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 also suggest conducting a bug bounty program to confirm the high level of security of this smart contract.

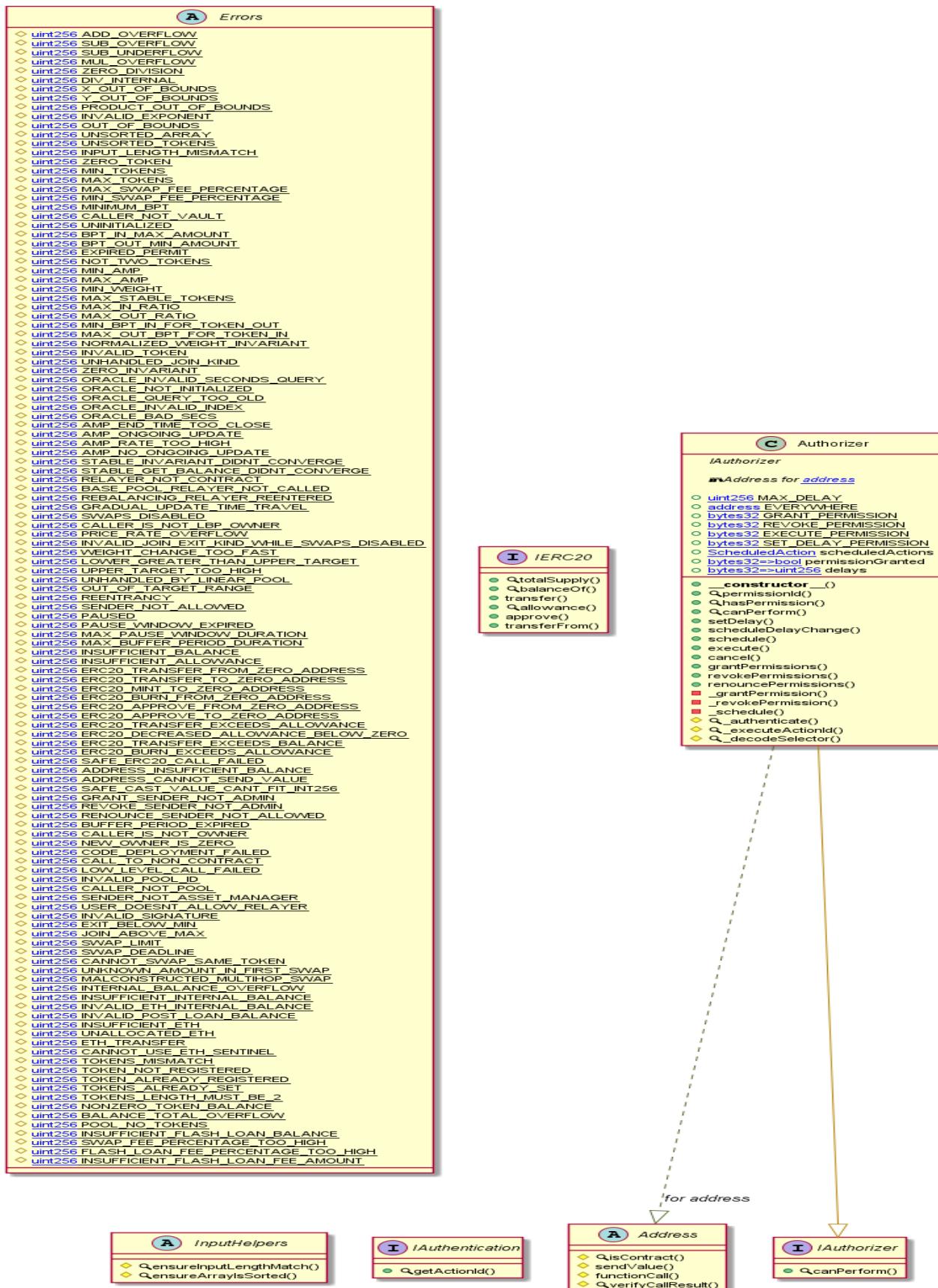
## **Technical Disclaimer**

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

# Appendix

## Code Flow Diagram - Starbank Protocol

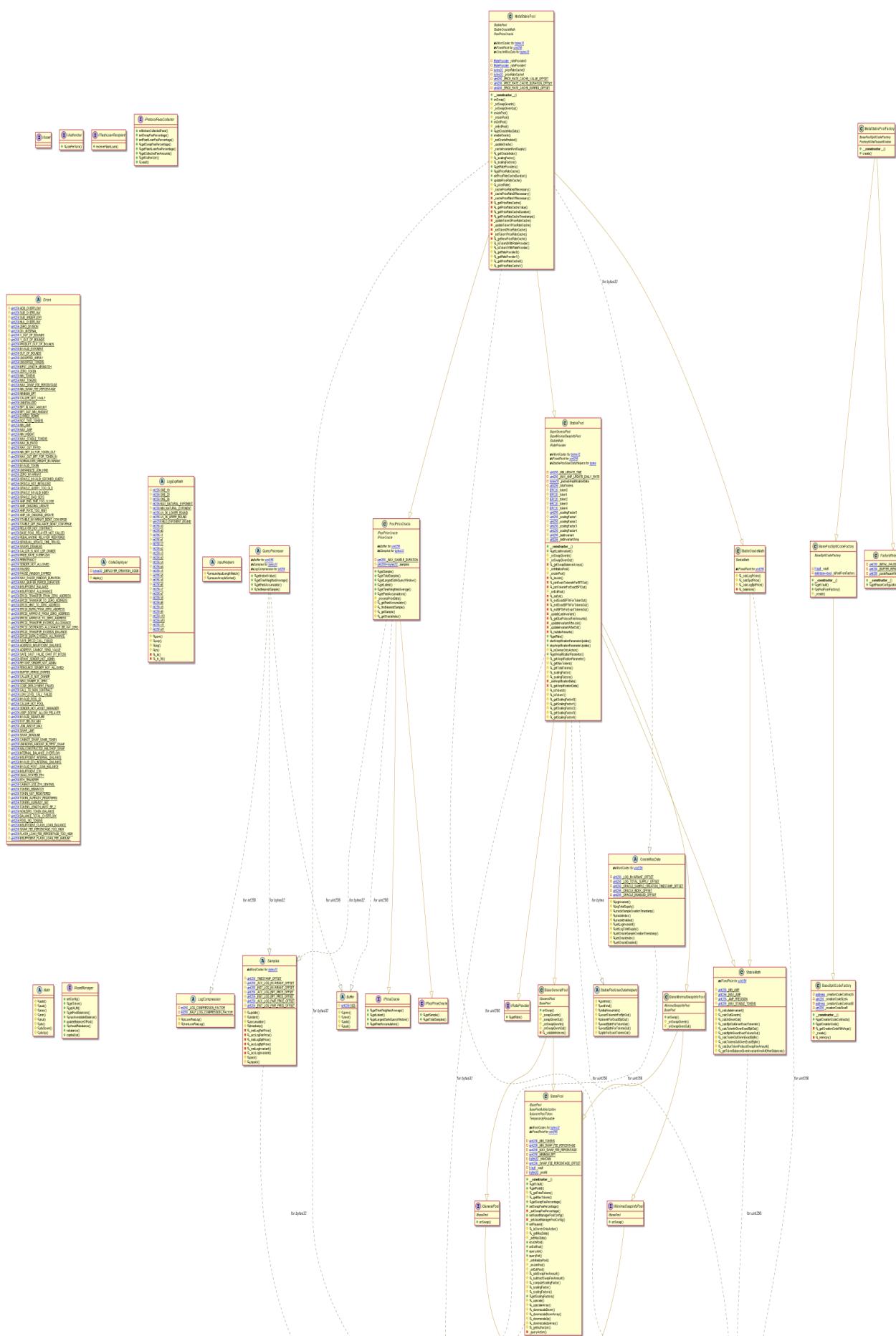
### Authorizer Diagram



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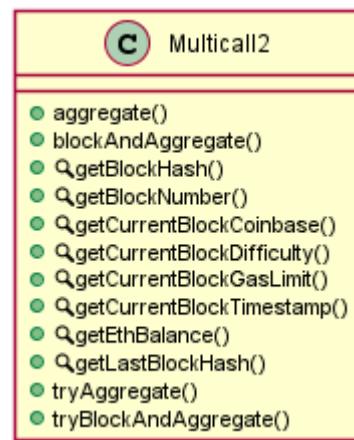
## MetaStablePoolFactory Diagram



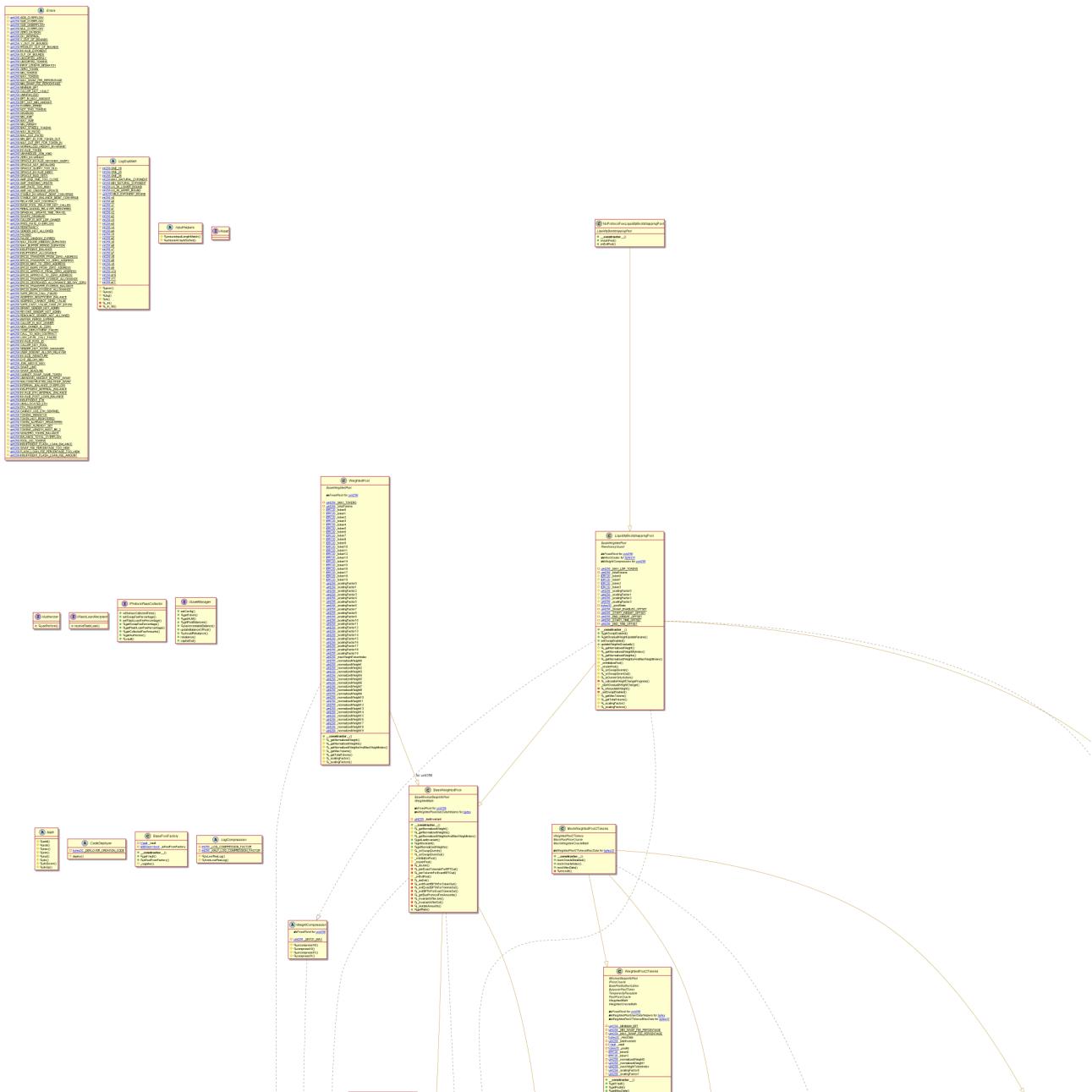
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## Multicall2 Diagram



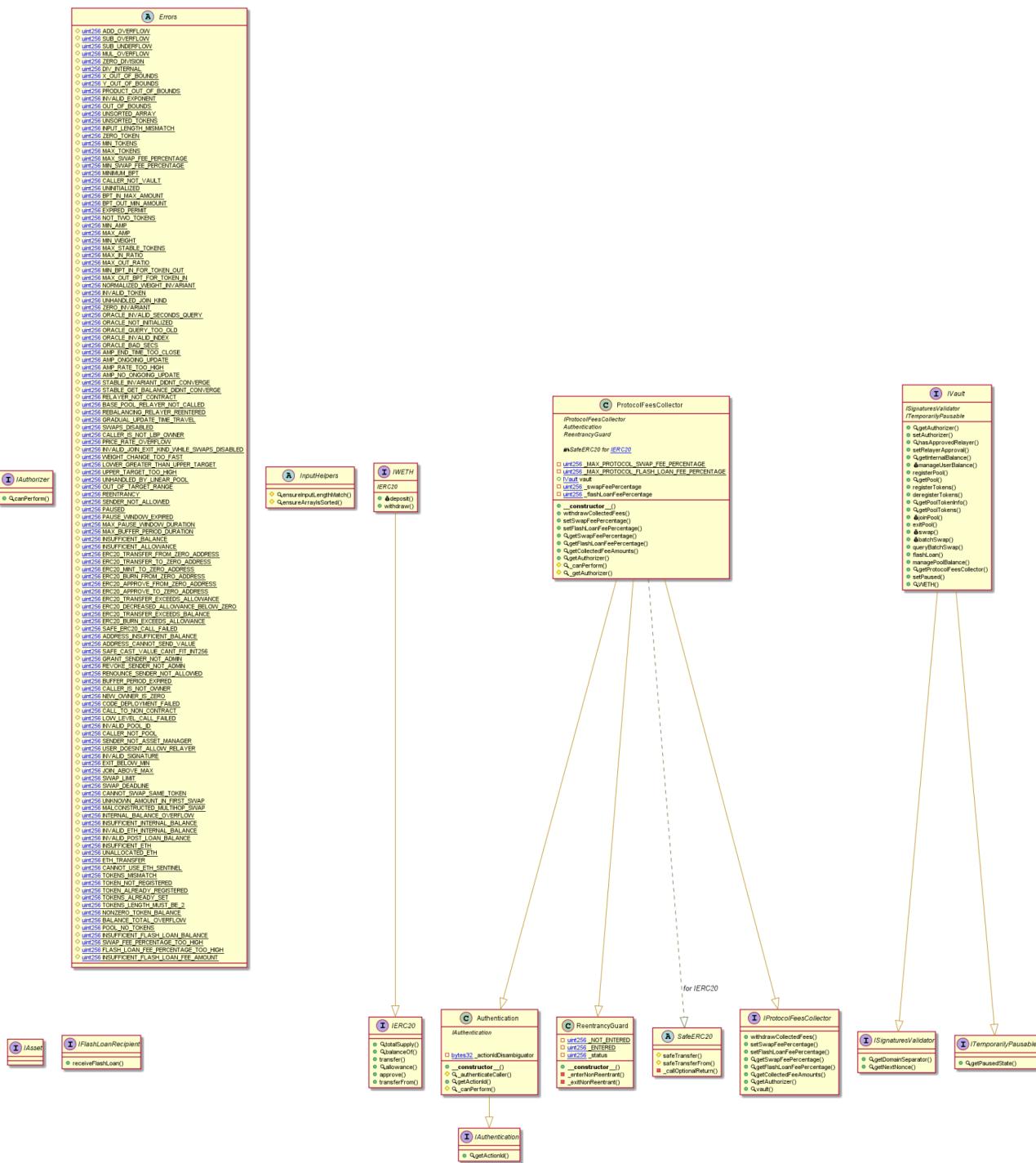
# NoProtocolFeeLiquidityBootstrappingPoolFactory Diagram



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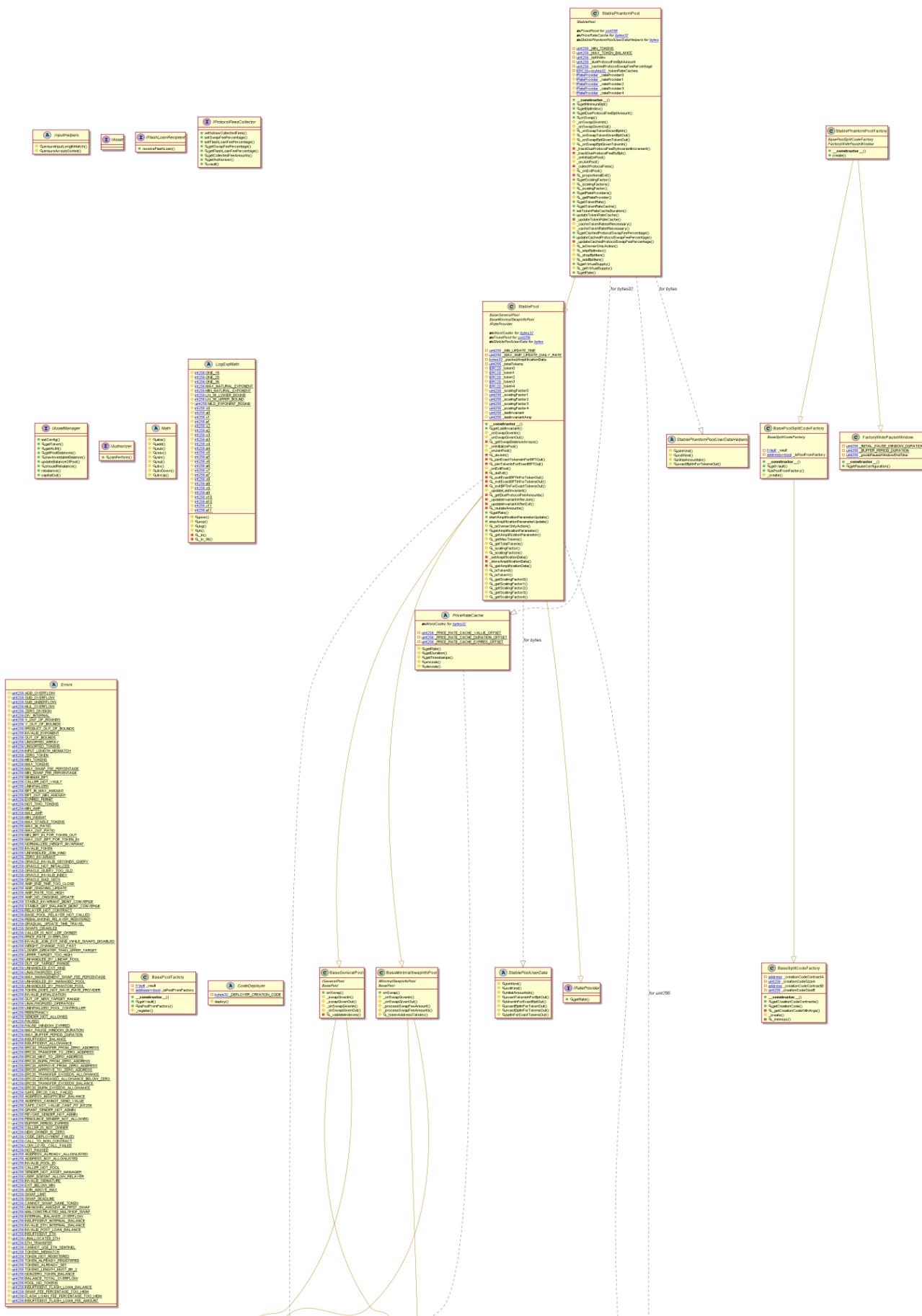
## ProtocolFeesCollector Diagram



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# StablePhantomPoolFactory Diagram

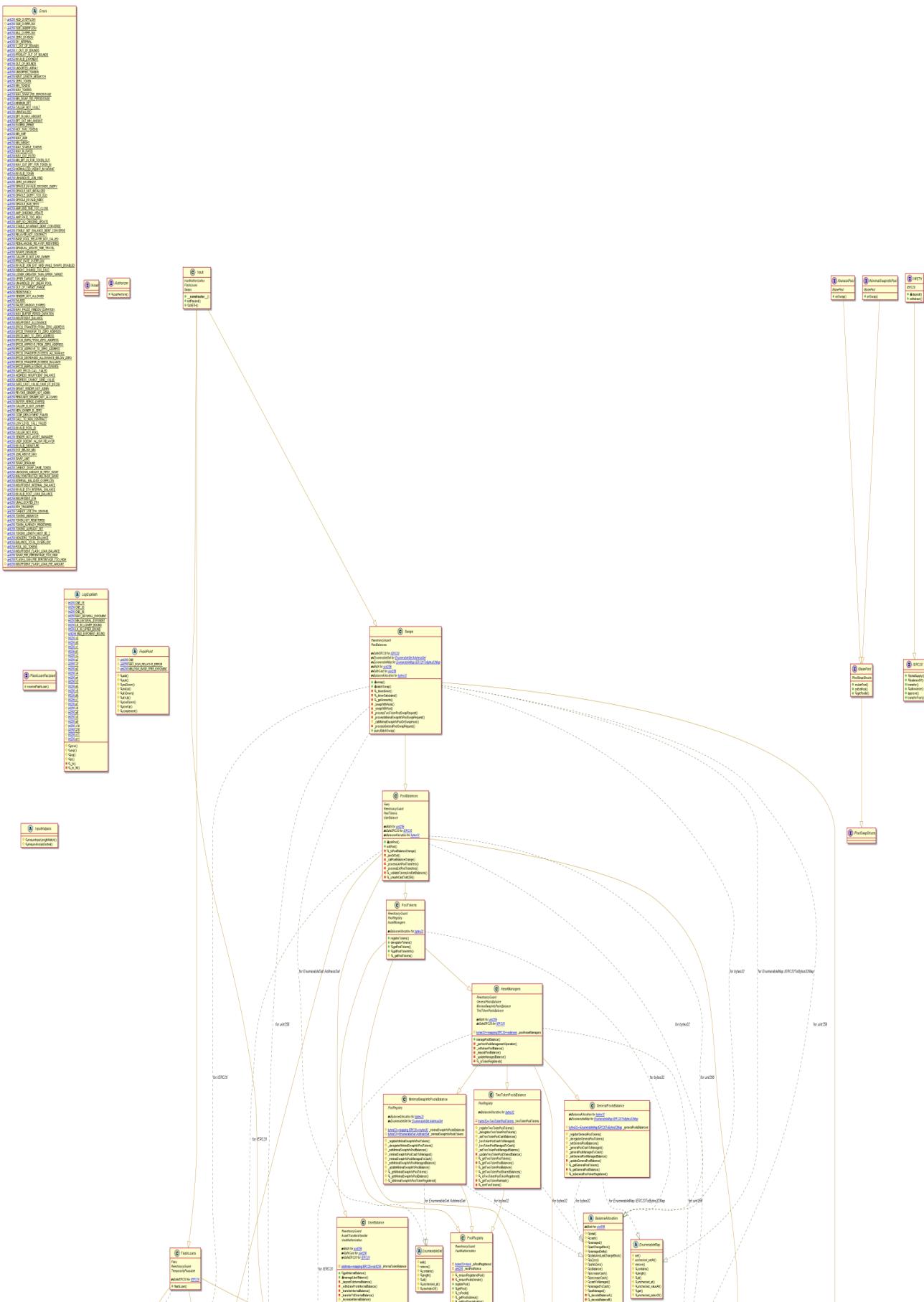


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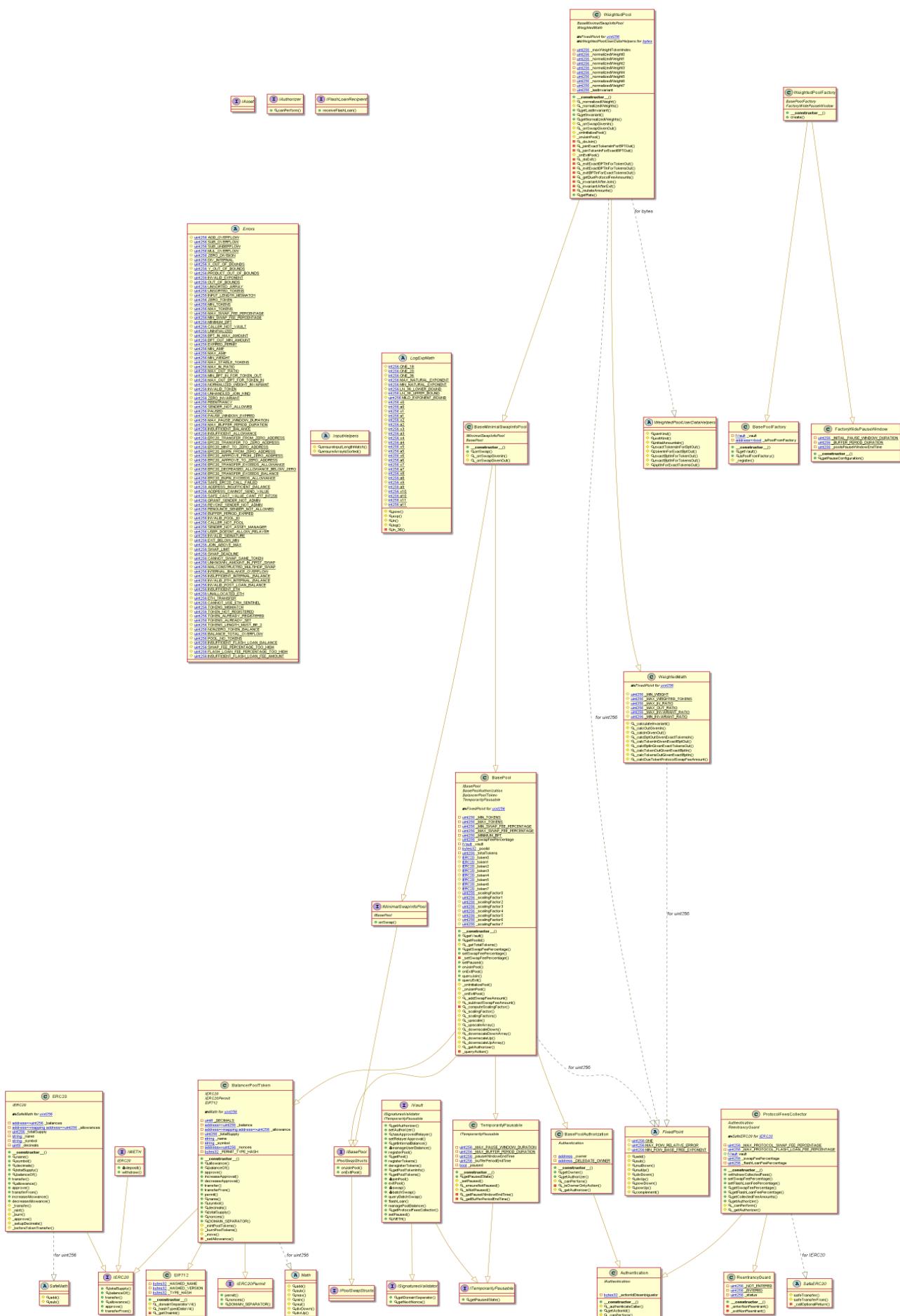
# Vault Diagram



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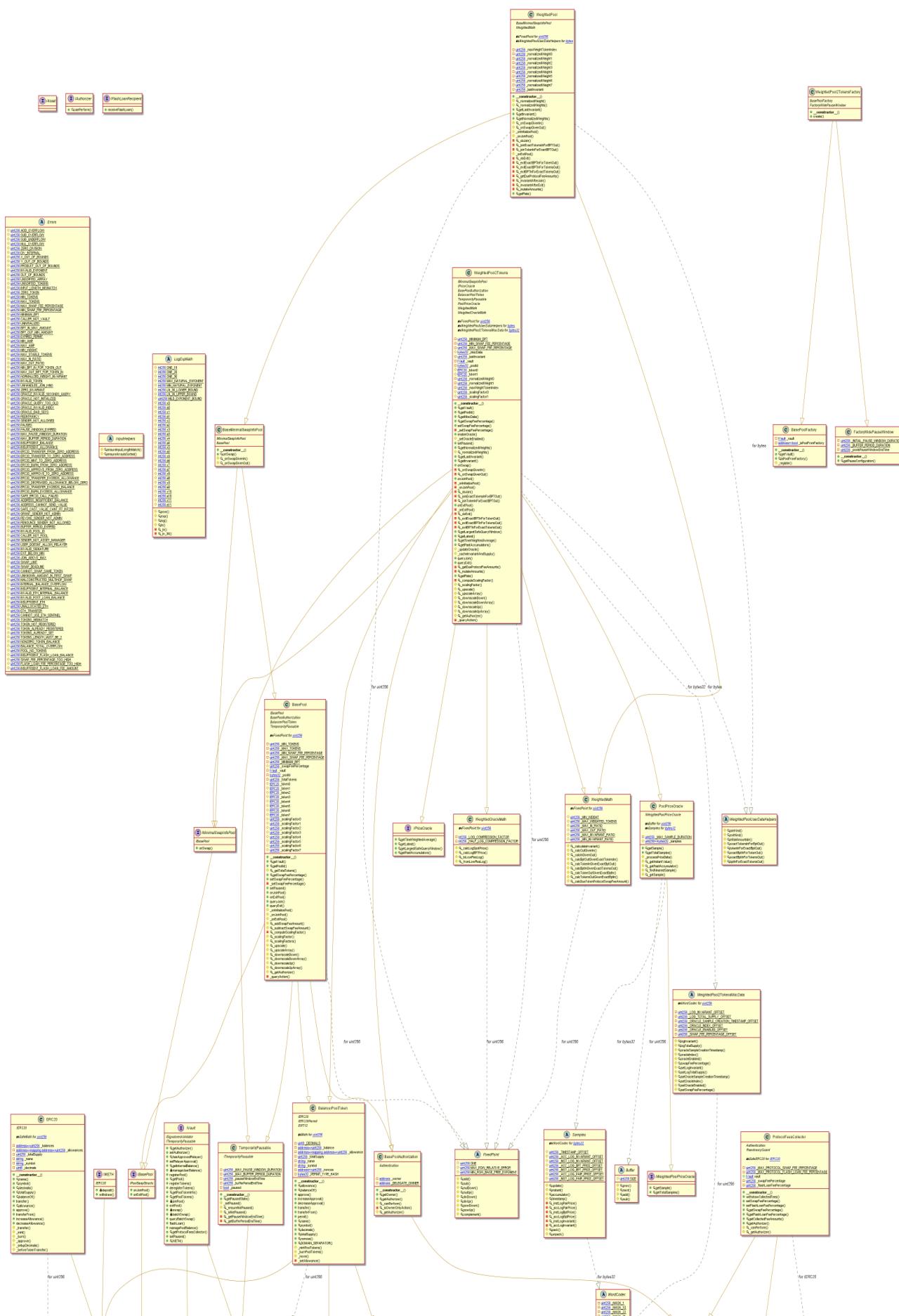
# WeightedPool Diagram



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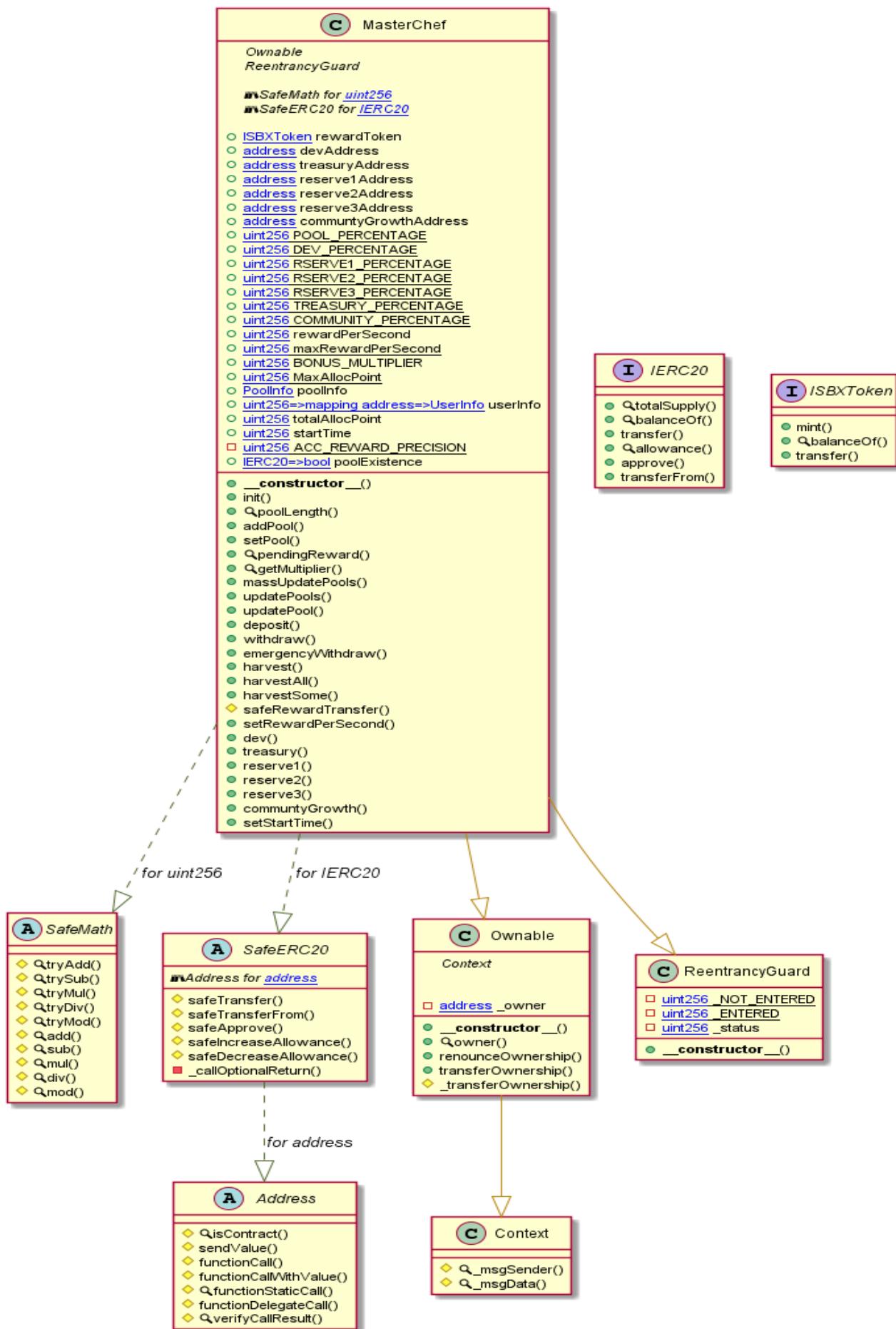
## WeightedPool2TokensFactory Diagram



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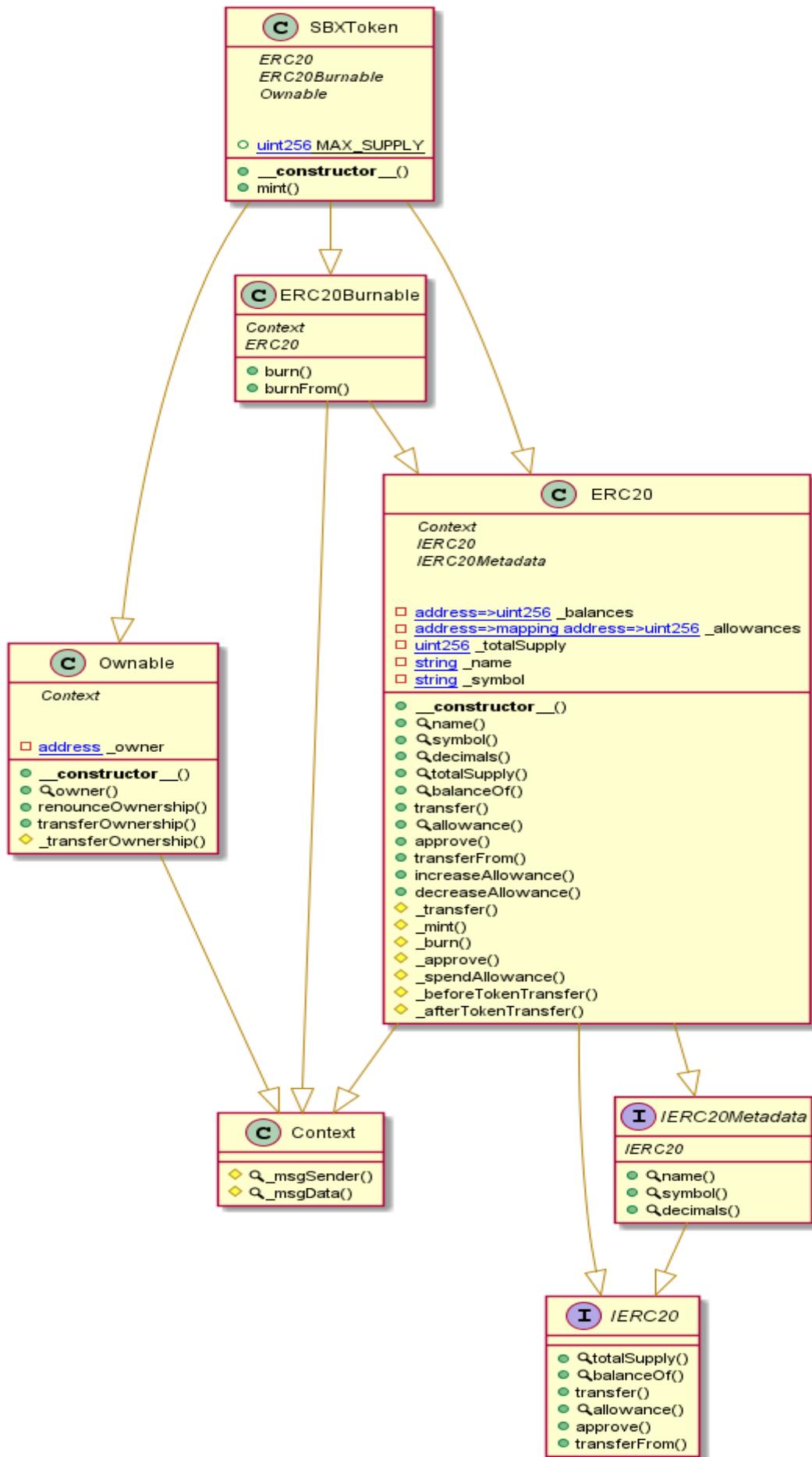
# MasterChef Diagram



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# SBXToken Diagram



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# Slither Results Log

## Slither log >> Authorizer.sol

```
INFO:Detectors:
Reentrancy in Authorizer.execute(uint256) (Authorizer_flat.sol#520-535):
    External calls:
        - result = scheduledAction.where.functionCall(scheduledAction.data) (Authorizer_flat.sol#533)
        Event emitted after the call(s):
            - ActionExecuted(id) (Authorizer_flat.sol#534)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#reentrancy-vulnerabilities-3
INFO:Detectors:
Authorizer.execute(uint256) (Authorizer_flat.sol#520-535) uses timestamp for comparisons
    Dangerous comparisons:
        - require(bool,string)(id < scheduledActions.length,ACTION_DOES_NOT_EXIST) (Authorizer_flat.sol#521)
        - require(bool,string)(block.timestamp >= scheduledAction.executableAt,ACTION_NOT_EXECUTABLE) (Authorizer_flat.sol#527)
Authorizer.cancel(uint256) (Authorizer_flat.sol#540-552) uses timestamp for comparisons
    Dangerous comparisons:
        - require(bool,string)(id < scheduledActions.length,ACTION_DOES_NOT_EXIST) (Authorizer_flat.sol#541)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#block-timestamp
INFO:Detectors:
Address.isContract(address) (Authorizer_flat.sol#165-176) uses assembly
    - INLINE ASM (Authorizer_flat.sol#172-174)
Address.verifyCallResult(bool,bytes) (Authorizer_flat.sol#233-249) uses assembly
    - INLINE ASM (Authorizer_flat.sol#241-244)
InputHelpers.ensureArrayIsSorted(IERC20[]) (Authorizer_flat.sol#340-347) uses assembly
    - INLINE ASM (Authorizer_flat.sol#343-345)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#assembly-usage
INFO:Detectors:
Address.isContract(address) (Authorizer_flat.sol#165-176) is never used and should be removed
Address.sendValue(address,uint256) (Authorizer_flat.sol#194-200) is never used and should be removed
InputHelpers.ensureArrayIsSorted(IERC20[]) (Authorizer_flat.sol#340-347) is never used and should be removed
InputHelpers.ensureArrayIsSorted(address[]) (Authorizer_flat.sol#349-360) is never used and should be removed
InputHelpers.ensureInputLengthMatch(uint256,uint256,uint256) (Authorizer_flat.sol#332-338) is never used and should be removed
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code
INFO:Detectors:
Low level call in Address.sendValue(address,uint256) (Authorizer_flat.sol#194-200):
    - (success) = recipient.call{value: amount}() (Authorizer_flat.sol#198)
Low level call in Address.functionCall(address,bytes) (Authorizer_flat.sol#220-225):
    - (success,returndata) = target.call(data) (Authorizer_flat.sol#223)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#low-level-calls
INFO:Detectors:
Variable Errors.MAX_SWAP_FEE_PERCENTAGE (Authorizer_flat.sol#29) is too similar to Errors.MIN_SWAP_FEE_PERCENTAGE (Authorizer_flat.sol# )
Variable Errors.X_OUT_OF_BOUNDS (Authorizer_flat.sol#14) is too similar to Errors.Y_OUT_OF_BOUNDS (Authorizer_flat.sol#15)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#variable-names-are-too-similar
INFO:Detectors:
canPerform(bytes32,address,address) should be declared external:
    - Authorizer.canPerform(bytes32,address,address) (Authorizer_flat.sol#466-472)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:Authorizer_flat.sol analyzed (7 contracts with 75 detectors), 16 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration
```

## Slither log >> Multicall2.sol

```
INFO:Detectors:
Multicall2.aggregate(Multicall2.Call[]) (Multicall2_flat.sol#17-25) has external calls inside a loop: (success,ret) = calls.all(calls[i].callData) (Multicall2_flat.sol#21)
Multicall2.tryAggregate(bool,Multicall2.Call[]) (Multicall2_flat.sol#53-64) has external calls inside a loop: (success,ret) = target.call(calls[i].callData) (Multicall2_flat.sol#56)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#calls-inside-a-loop
INFO:Detectors:
Pragma version>=0.5.0 (Multicall2_flat.sol#3) allows old versions
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#incorrect-versions-of-solidity
INFO:Detectors:
Low level call in Multicall2.aggregate(Multicall2.Call[]) (Multicall2_flat.sol#17-25):
    - (success,ret) = calls[i].target.call(calls[i].callData) (Multicall2_flat.sol#21)
Low level call in Multicall2.tryAggregate(bool,Multicall2.Call[]) (Multicall2_flat.sol#53-64):
    - (success,ret) = calls[i].target.call(calls[i].callData) (Multicall2_flat.sol#56)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#low-level-calls
INFO:Detectors:
aggregate(Multicall2.Call[]) should be declared external:
    - Multicall2.aggregate(Multicall2.Call[]) (Multicall2_flat.sol#17-25)
blockAndAggregate(Multicall2.Call[]) should be declared external:
    - Multicall2.blockAndAggregate(Multicall2.Call[]) (Multicall2_flat.sol#26-28)
getBlockHash(uint256) should be declared external:
    - Multicall2.getBlockHash(uint256) (Multicall2_flat.sol#29-31)
getBlockNumber() should be declared external:
    - Multicall2.getBlockNumber() (Multicall2_flat.sol#32-34)
getCurrentBlockCoinbase() should be declared external:
    - Multicall2.getCurrentBlockCoinbase() (Multicall2_flat.sol#35-37)
getCurrentBlockDifficulty() should be declared external:
    - Multicall2.getCurrentBlockDifficulty() (Multicall2_flat.sol#38-40)
getCurrentBlockGasLimit() should be declared external:
    - Multicall2.getCurrentBlockGasLimit() (Multicall2_flat.sol#41-43)
getCurrentBlockTimestamp() should be declared external:
    - Multicall2.getCurrentBlockTimestamp() (Multicall2_flat.sol#44-46)
getEthBalance(address) should be declared external:
    - Multicall2.getEthBalance(address) (Multicall2_flat.sol#47-49)
getLastBlockHash() should be declared external:
    - Multicall2.getLastBlockHash() (Multicall2_flat.sol#50-52)
getCurrentBlockTimestamp() should be declared external:
    - Multicall2.getCurrentBlockTimestamp() (Multicall2_flat.sol#44-46)
getEthBalance(address) should be declared external:
    - Multicall2.getEthBalance(address) (Multicall2_flat.sol#47-49)
getLastBlockHash() should be declared external:
    - Multicall2.getLastBlockHash() (Multicall2_flat.sol#50-52)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:Multicall2_flat.sol analyzed (1 contracts with 75 detectors), 15 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration
```

## Slither log >> ProtocolFeesCollector.sol

```
INFO:Detectors:
ProtocolFeesCollector.getCollectedFeeAmounts(IERC20[]) (ProtocolFeesCollector_flat.sol#623-633) has external calls inside a
loop: feeAmounts[i] = tokens[i].balanceOf(address(this)) (ProtocolFeesCollector_flat.sol#631)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#calls-inside-a-loop
INFO:Detectors:
InputHelpers.ensureArrayIsSorted(IERC20[]) (ProtocolFeesCollector_flat.sol#183-189) uses assembly
- INLINE ASM (ProtocolFeesCollector_flat.sol#185-187)
SafeERC20._callOptionalReturn(address,bytes) (ProtocolFeesCollector_flat.sol#280-291) uses assembly
- INLINE ASM (ProtocolFeesCollector_flat.sol#283-288)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#assembly-usage
INFO:Detectors:
Authentication._canPerform(bytes32,address) (ProtocolFeesCollector_flat.sol#231) is never used and should be removed
InputHelpers.ensureArrayIsSorted(IERC20[]) (ProtocolFeesCollector_flat.sol#183-189) is never used and should be removed
InputHelpers.ensureArrayIsSorted(address[]) (ProtocolFeesCollector_flat.sol#191-202) is never used and should be removed
InputHelpers.ensureInputLengthMatch(uint256,uint256,uint256) (ProtocolFeesCollector_flat.sol#175-181) is never used and sho
uld be removed
ProtocolFeesCollector._canPerform(bytes32,address) (ProtocolFeesCollector_flat.sol#639-641) is never used and should be rem
oved
SafeERC20.safeTransferFrom(IERC20,address,address,uint256) (ProtocolFeesCollector_flat.sol#271-278) is never used and shou
ld be removed
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code
INFO:Detectors:
Low level call in SafeERC20._callOptionalReturn(address,bytes) (ProtocolFeesCollector_flat.sol#280-291):
- (success,returndata) = token.call(data) (ProtocolFeesCollector_flat.sol#281)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#low-level-calls
INFO:Detectors:
Function IVault.WETH() (ProtocolFeesCollector_flat.sol#542) is not in mixedCase
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#conformance-to-solidity-naming-conventions
INFO:Detectors:
Variable Errors.MAX_SWAP_FEE_PERCENTAGE (ProtocolFeesCollector_flat.sol#56) is too similar to Errors.MIN_SWAP_FEE_PERCENTAG
E (ProtocolFeesCollector_flat.sol#57)
Variable Errors.X_OUT_OF_BOUNDS (ProtocolFeesCollector_flat.sol#43) is too similar to Errors.Y_OUT_OF_BOUNDS (ProtocolFeesC
ollector_flat.sol#44)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#variable-names-are-too-similar
INFO:Detectors:
ProtocolFeesCollector._MAX_PROTOCOL_SWAP_FEE_PERCENTAGE (ProtocolFeesCollector_flat.sol#573) is never used in ProtocolFeesC
ollector (ProtocolFeesCollector_flat.sol#570-646)
ProtocolFeesCollector._MAX_PROTOCOL_FLASH_LOAN_FEE_PERCENTAGE (ProtocolFeesCollector_flat.sol#574) is never used in Proto
colFeesCollector (ProtocolFeesCollector_flat.sol#570-646)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#unused-state-variables
INFO:Slither:ProtocolFeesCollector_flat.sol analyzed (16 contracts with 75 detectors), 15 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration
```

## Slither log >> MasterChef.sol

```
INFO:Detectors:
Pragma version0.8.4 (MasterChef.sol#2) necessitates a version too recent to be trusted. Consider deploying with 0.6.12/0.7.
6
solc-0.8.4 is not recommended for deployment
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#incorrect-versions-of-solidity
INFO:Detectors:
Low level call in Address.sendValue(address,uint256) (MasterChef.sol#267-272):
- (success) = recipient.call{value: amount}() (MasterChef.sol#270)
Low level call in Address.functionCallWithValue(address,bytes,uint256,string) (MasterChef.sol#335-346):
- (success,returndata) = target.call{value: value}(data) (MasterChef.sol#344)
Low level call in Address.functionStaticCall(address,bytes,string) (MasterChef.sol#364-373):
- (success,returndata) = target.staticcall(data) (MasterChef.sol#371)
Low level call in Address.functionDelegateCall(address,bytes,string) (MasterChef.sol#391-400):
- (success,returndata) = target.delegatecall(data) (MasterChef.sol#398)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#low-level-calls
INFO:Detectors:
Parameter MasterChef.init(address,uint256,uint256)._rewardToken (MasterChef.sol#792) is not in mixedCase
Parameter MasterChef.init(address,uint256,uint256)._startTime (MasterChef.sol#793) is not in mixedCase
Parameter MasterChef.init(address,uint256,uint256)._rewardPerSecond (MasterChef.sol#794) is not in mixedCase
Variable MasterChef.reserve1Address (MasterChef.sol#727) is too similar to MasterChef.reserve3Address (MasterChef.sol#731)
Variable MasterChef.reserve2Address (MasterChef.sol#729) is too similar to MasterChef.reserve3Address (MasterChef.sol#731)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#variable-names-are-too-similar
INFO:Detectors:
MasterChef.BONUS_MULTIPLIER (MasterChef.sol#759) should be constant
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#state-variables-that-could-be-declared-constant
INFO:Detectors:
renounceOwnership() should be declared external:
- Ownable renounceOwnership() (MasterChef.sol#637-639)
transferOwnership(address) should be declared external:
- Ownable transferOwnership(address) (MasterChef.sol#645-648)
addPool(uint256,IERC20,bool) should be declared external:
- MasterChef.addPool(uint256,IERC20,bool) (MasterChef.sol#820-847)
setPool(uint256,uint256,bool) should be declared external:
- MasterChef.setPool(uint256,uint256,bool) (MasterChef.sol#850-868)
deposit(uint256,uint256) should be declared external:
- MasterChef.deposit(uint256,uint256) (MasterChef.sol#950-978)

emergencyWithdraw(uint256) should be declared external:
- MasterChef.emergencyWithdraw(uint256) (MasterChef.sol#1012-1024)
dev(address) should be declared external:
- MasterChef.dev(address) (MasterChef.sol#1088-1090)
treasury(address) should be declared external:
- MasterChef.treasury(address) (MasterChef.sol#1092-1094)
reserve1(address) should be declared external:
- MasterChef.reserve1(address) (MasterChef.sol#1096-1098)
reserve2(address) should be declared external:
- MasterChef.reserve2(address) (MasterChef.sol#1100-1102)
reserve3(address) should be declared external:
- MasterChef.reserve3(address) (MasterChef.sol#1104-1106)
communityGrowth(address) should be declared external:
- MasterChef.communityGrowth(address) (MasterChef.sol#1108-1110)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:MasterChef.sol analyzed (9 contracts with 75 detectors), 129 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration
```

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## Slither log >> SBXToken.sol

```
INFO:Detectors:
SBXToken.constructor() (SBXToken.sol#545-550) uses literals with too many digits:
- _mint(msg.sender,12500000 * 10 ** decimals()) (SBXToken.sol#549)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#too-many-digits
INFO:Detectors:
renounceOwnership() should be declared external:
- Ownable renounceOwnership() (SBXToken.sol#141-143)
transferOwnership(address) should be declared external:
- Ownable.transferOwnership(address) (SBXToken.sol#149-152)
name() should be declared external:
- ERC20.name() (SBXToken.sol#192-194)
symbol() should be declared external:
- ERC20.symbol() (SBXToken.sol#200-202)
balanceOf(address) should be declared external:
- ERC20.balanceOf(address) (SBXToken.sol#231-233)
transfer(address,uint256) should be declared external:
- ERC20.transfer(address,uint256) (SBXToken.sol#243-247)
approve(address,uint256) should be declared external:
- ERC20.approve(address,uint256) (SBXToken.sol#266-270)
transferFrom(address,address,uint256) should be declared external:
- ERC20.transferFrom(address,address,uint256) (SBXToken.sol#288-297)
increaseAllowance(address,uint256) should be declared external:
- ERC20.increaseAllowance(address,uint256) (SBXToken.sol#311-315)
decreaseAllowance(address,uint256) should be declared external:
- ERC20.decreaseAllowance(address,uint256) (SBXToken.sol#331-340)
burn(uint256) should be declared external:
- ERC20Burnable.burn(uint256) (SBXToken.sol#521-523)
burnFrom(address,uint256) should be declared external:
- ERC20Burnable.burnFrom(address,uint256) (SBXToken.sol#536-539)
mint(address,uint256) should be declared external:
- SBXToken.mint(address,uint256) (SBXToken.sol#552-558)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:SBXToken.sol analyzed (7 contracts with 75 detectors), 19 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration
```

## Slither log >> InvestmentPoolFactory.sol

```
INFO:Detectors:
ERC20._totalSupply (InvestmentPoolFactory_flat.sol#264) should be constant
ERC20Permit._PERMIT_TYPEHASH (InvestmentPoolFactory_flat.sol#646-647) should be constant
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#state-variables-that-could-be-declared-constant
INFO:Detectors:
name() should be declared external:
- ERC20.name() (InvestmentPoolFactory_flat.sol#273-275)
symbol() should be declared external:
- ERC20.symbol() (InvestmentPoolFactory_flat.sol#276-278)
decimals() should be declared external:
- ERC20.decimals() (InvestmentPoolFactory_flat.sol#279-281)
totalSupply() should be declared external:
- ERC20.totalSupply() (InvestmentPoolFactory_flat.sol#282-284)
balanceOf(address) should be declared external:
- ERC20.balanceOf(address) (InvestmentPoolFactory_flat.sol#285-287)
transfer(address,uint256) should be declared external:
- ERC20.transfer(address,uint256) (InvestmentPoolFactory_flat.sol#288-291)
approve(address,uint256) should be declared external:
- ERC20.approve(address,uint256) (InvestmentPoolFactory_flat.sol#295-298)
transferFrom(address,address,uint256) should be declared external:
- BalancerPoolToken.transferFrom(address,address,uint256) (InvestmentPoolFactory_flat.sol#681-693)
- ERC20.transferFrom(address,address,uint256) (InvestmentPoolFactory_flat.sol#299-307)
permit(address,address,uint256,uint256,uint8,bytes32,bytes32) should be declared external:
- ERC20Permit.permit(address,address,uint256,uint256,uint8,bytes32,bytes32) (InvestmentPoolFactory_flat.sol#649-666)
nonces(address) should be declared external:
- ERC20Permit.nonces(address) (InvestmentPoolFactory_flat.sol#667-669)
getActionId(bytes4) should be declared external:
- Authentication.getActionId(bytes4) (InvestmentPoolFactory_flat.sol#717-719)
getPauseConfiguration() should be declared external:
- FactoryWidePauseWindow.getPauseConfiguration() (InvestmentPoolFactory_flat.sol#730-739)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:InvestmentPoolFactory_flat.sol analyzed (24 contracts with 75 detectors), 73 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration
```

## Slither log >> MetaStablePoolFactory.sol

```
INFO:Detectors:
FactoryWidePauseWindow.getPauseConfiguration() (MetaStablePoolFactory_flat.sol#67-78) uses timestamp for comparisons
    Dangerous comparisons:
        - currentTime < _poolsPauseWindowEndTime (MetaStablePoolFactory_flat.sol#69)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#block-timestamp
INFO:Detectors:
getPauseConfiguration() should be declared external:
- FactoryWidePauseWindow.getPauseConfiguration() (MetaStablePoolFactory_flat.sol#67-78)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:MetaStablePoolFactory_flat.sol analyzed (6 contracts with 75 detectors), 2 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration
```

## Slither log >> NoProtocolFeeLiquidityBootstrappingPoolFactory.sol

```
INFO:Detectors:
FactoryWidePauseWindow.getPauseConfiguration() (NoProtocolFeeLiquidityBootstrappingPoolFactory_flat.sol#82-93) uses timestamp for comparisons
    Dangerous comparisons:
        - currentTime < _poolsPauseWindowEndTime (NoProtocolFeeLiquidityBootstrappingPoolFactory_flat.sol#84)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#block-timestamp
INFO:Detectors:
Authentication._canPerform(bytes32,address) (NoProtocolFeeLiquidityBootstrappingPoolFactory_flat.sol#68) is never used and should be removed
BalancerPoolToken._burnPoolTokens(address,uint256) (NoProtocolFeeLiquidityBootstrappingPoolFactory_flat.sol#37-39) is never used and should be removed
BalancerPoolToken._mintPoolTokens(address,uint256) (NoProtocolFeeLiquidityBootstrappingPoolFactory_flat.sol#33-35) is never used and should be removed
NoProtocolFeeLiquidityBootstrappingPoolFactory._canPerform(bytes32,address) (NoProtocolFeeLiquidityBootstrappingPoolFactory_flat.sol#118-120) is never used and should be removed
SafeMath.add(uint256,uint256) (NoProtocolFeeLiquidityBootstrappingPoolFactory_flat.sol#8-13) is never used and should be removed
SafeMath.sub(uint256,uint256) (NoProtocolFeeLiquidityBootstrappingPoolFactory_flat.sol#15-17) is never used and should be removed
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code
INFO:Detectors:
getActionId(bytes4) should be declared external:
    - Authentication.getActionId(bytes4) (NoProtocolFeeLiquidityBootstrappingPoolFactory_flat.sol#64-66)
getPauseConfiguration() should be declared external:
    - FactoryWidePauseWindow.getPauseConfiguration() (NoProtocolFeeLiquidityBootstrappingPoolFactory_flat.sol#82-93)
isDisabled() should be declared external:
    - NoProtocolFeeLiquidityBootstrappingPoolFactory.isDisabled() (NoProtocolFeeLiquidityBootstrappingPoolFactory_flat.sol#107-109)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:slither:NoProtocolFeeLiquidityBootstrappingPoolFactory_flat.sol analyzed (6 contracts with 75 detectors), 10 result(s) found
```

## Slither log >> StablePhantomPoolFactory.sol

```
INFO:Detectors:
FactoryWidePauseWindow.getPauseConfiguration() (StablePhantomPoolFactory_flat.sol#311-320) uses timestamp for comparisons
    Dangerous comparisons:
        - currentTime < _poolsPauseWindowEndTime (StablePhantomPoolFactory_flat.sol#313)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#block-timestamp
INFO:Detectors:
CodeDeployer.deploy(bytes) (StablePhantomPoolFactory_flat.sol#181-190) uses assembly
    - INLINE ASM (StablePhantomPoolFactory_flat.sol#183-188)
BaseSplitCodeFactory.constructor(bytes) (StablePhantomPoolFactory_flat.sol#198-222) uses assembly
    - INLINE ASM (StablePhantomPoolFactory_flat.sol#205-208)
    - INLINE ASM (StablePhantomPoolFactory_flat.sol#212-216)
    - INLINE ASM (StablePhantomPoolFactory_flat.sol#218-221)
BaseSplitCodeFactory._getCreationCodeWithArgs(bytes) (StablePhantomPoolFactory_flat.sol#229-252) uses assembly
    - INLINE ASM (StablePhantomPoolFactory_flat.sol#237-244)
    - INLINE ASM (StablePhantomPoolFactory_flat.sol#247-250)
BaseSplitCodeFactory._create(bytes) (StablePhantomPoolFactory_flat.sol#253-266) uses assembly
    - INLINE ASM (StablePhantomPoolFactory_flat.sol#256-258)
    - INLINE ASM (StablePhantomPoolFactory_flat.sol#260-263)
BaseSplitCodeFactory._memcpy(uint256,uint256,uint256) (StablePhantomPoolFactory_flat.sol#267-285) uses assembly
    - INLINE ASM (StablePhantomPoolFactory_flat.sol#273-275)
    - INLINE ASM (StablePhantomPoolFactory_flat.sol#280-284)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#assembly-usage
INFO:Detectors:
Authentication._authenticateCaller() (StablePhantomPoolFactory_flat.sol#148-151) is never used and should be removed
Authentication._canPerform(bytes32,address) (StablePhantomPoolFactory_flat.sol#155) is never used and should be removed
BasePoolFactory._register(address) (StablePhantomPoolFactory_flat.sol#172-175) is never used and should be removed
BasePoolSplitCodeFactory._create(bytes) (StablePhantomPoolFactory_flat.sol#296-301) is never used and should be removed
BaseSplitCodeFactory._create(bytes) (StablePhantomPoolFactory_flat.sol#253-266) is never used and should be removed
ERC20._burn(address,uint256) (StablePhantomPoolFactory_flat.sol#109-115) is never used and should be removed
ERC20._mint(address,uint256) (StablePhantomPoolFactory_flat.sol#103-108) is never used and should be removed
ERC20._setupDecimals(uint8) (StablePhantomPoolFactory_flat.sol#124-126) is never used and should be removed
SafeMath.sub(uint256,uint256) (StablePhantomPoolFactory_flat.sol#26-28) is never used and should be removed
SafeMath.sub(uint256,uint256,uint256) (StablePhantomPoolFactory_flat.sol#29-33) is never used and should be removed

Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code
INFO:Detectors:
Variable BaseSplitCodeFactory._creationCodeContractA (StablePhantomPoolFactory_flat.sol#194) is too similar to BaseSplitCodeFactory._creationCodeContractB (StablePhantomPoolFactory_flat.sol#196)
Variable BaseSplitCodeFactory._creationCodeSizeA (StablePhantomPoolFactory_flat.sol#195) is too similar to BaseSplitCodeFactory._creationCodeSizeB (StablePhantomPoolFactory_flat.sol#197)
Variable BaseSplitCodeFactory.constructor(bytes).creationCodeA (StablePhantomPoolFactory_flat.sol#204) is too similar to BaseSplitCodeFactory.constructor(bytes).creationCodeB (StablePhantomPoolFactory_flat.sol#210)
```

```

Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#variable-names-are-too-similar
INFO:Detectors:
Authentication (StablePhantomPoolFactory_flat.sol#139-156) does not implement functions:
- Authentication._canPerform(bytes32,address) (StablePhantomPoolFactory_flat.sol#155)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#unimplemented-functions
INFO:Detectors:
name() should be declared external:
- ERC20.name() (StablePhantomPoolFactory_flat.sol#49-51)
symbol() should be declared external:
- ERC20.symbol() (StablePhantomPoolFactory_flat.sol#52-54)
decimals() should be declared external:
- ERC20.decimals() (StablePhantomPoolFactory_flat.sol#55-57)
totalSupply() should be declared external:
- ERC20.totalSupply() (StablePhantomPoolFactory_flat.sol#58-60)
balanceOf(address) should be declared external:
- ERC20.balanceOf(address) (StablePhantomPoolFactory_flat.sol#61-63)
transfer(address,uint256) should be declared external:
- ERC20.transfer(address,uint256) (StablePhantomPoolFactory_flat.sol#64-67)
allowance(address,address) should be declared external:
- ERC20.allowance(address,address) (StablePhantomPoolFactory_flat.sol#68-70)
approve(address,uint256) should be declared external:
- ERC20.approve(address,uint256) (StablePhantomPoolFactory_flat.sol#71-74)
transferFrom(address,address,uint256) should be declared external:
- ERC20.transferFrom(address,address,uint256) (StablePhantomPoolFactory_flat.sol#75-82)
increaseAllowance(address,uint256) should be declared external:
- ERC20.increaseAllowance(address,uint256) (StablePhantomPoolFactory_flat.sol#83-86)
decreaseAllowance(address,uint256) should be declared external:
- ERC20.decreaseAllowance(address,uint256) (StablePhantomPoolFactory_flat.sol#87-90)
getCreationCodeContracts() should be declared external:
- BaseSplitCodeFactory.getCreationCodeContracts() (StablePhantomPoolFactory_flat.sol#223-225)
getCreationCode() should be declared external:
- BaseSplitCodeFactory.getCreationCode() (StablePhantomPoolFactory_flat.sol#226-228)
getPauseConfiguration() should be declared external:
- FactoryWidePauseWindow.getPauseConfiguration() (StablePhantomPoolFactory_flat.sol#311-320)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:StablePhantomPoolFactory_flat.sol analyzed (11 contracts with 75 detectors), 39 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration

```

## Slither log >> StablePoolFactory.sol

```

INFO:Detectors:
FactoryWidePauseWindow.getPauseConfiguration() (StablePoolFactory_flat.sol#154-163) uses timestamp for comparisons
    Dangerous comparisons:
        - currentTime < _poolsPauseWindowEndTime (StablePoolFactory_flat.sol#156)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#block-timestamp
INFO:Detectors:
BasePoolFactory._register(address) (StablePoolFactory_flat.sol#142-145) is never used and should be removed
ERC20._beforeTokenTransfer(address,address,uint256) (StablePoolFactory_flat.sol#87-91) is never used and should be removed
ERC20._burn(address,uint256) (StablePoolFactory_flat.sol#69-75) is never used and should be removed
ERC20._mint(address,uint256) (StablePoolFactory_flat.sol#63-68) is never used and should be removed
ERC20._setupDecimals(uint8) (StablePoolFactory_flat.sol#84-86) is never used and should be removed
ERC20._transfer(address,address,uint256) (StablePoolFactory_flat.sol#51-62) is never used and should be removed
SafeMath.sub(uint256,uint256) (StablePoolFactory_flat.sol#11-13) is never used and should be removed
SafeMath.sub(uint256,uint256,uint256) (StablePoolFactory_flat.sol#14-18) is never used and should be removed
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code
INFO:Detectors:
name() should be declared external:
- ERC20.name() (StablePoolFactory_flat.sol#33-35)
symbol() should be declared external:
- ERC20.symbol() (StablePoolFactory_flat.sol#36-38)
decimals() should be declared external:
- ERC20.decimals() (StablePoolFactory_flat.sol#39-41)
increaseAllowance(address,uint256) should be declared external:
- ERC20.increaseAllowance(address,uint256) (StablePoolFactory_flat.sol#44-47)
decreaseAllowance(address,uint256) should be declared external:
- ERC20.decreaseAllowance(address,uint256) (StablePoolFactory_flat.sol#48-50)
getPauseConfiguration() should be declared external:
- FactoryWidePauseWindow.getPauseConfiguration() (StablePoolFactory_flat.sol#154-163)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:StablePoolFactory_flat.sol analyzed (11 contracts with 75 detectors), 15 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration

```

## Slither log >> Vault.sol

```

INFO:Detectors:
ProtocolFeesCollector.getCollectedFeeAmounts(IERC20[]) (Vault_flat.sol#388-398) has external calls inside a loop: feeAmounts[i] = tokens[i].balanceOf(address(this)) (Vault_flat.sol#396)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#calls-inside-a-loop
INFO:Detectors:
BalanceAllocation._decodeBalanceA(bytes32) (Vault_flat.sol#216-219) is never used and should be removed
BalanceAllocation._decodeBalanceB(bytes32) (Vault_flat.sol#220-223) is never used and should be removed
BalanceAllocation._pack(uint256,uint256,uint256) (Vault_flat.sol#237-243) is never used and should be removed
BalanceAllocation.cash(bytes32) (Vault_flat.sol#140-143) is never used and should be removed
BalanceAllocation.cashToManaged(bytes32,uint256) (Vault_flat.sol#199-204) is never used and should be removed
BalanceAllocation.decreaseCash(bytes32,uint256) (Vault_flat.sol#193-198) is never used and should be removed
BalanceAllocation.fromSharedToBalanceA(bytes32,bytes32) (Vault_flat.sol#224-226) is never used and should be removed
BalanceAllocation.fromSharedToBalanceB(bytes32,bytes32) (Vault_flat.sol#227-229) is never used and should be removed
BalanceAllocation.increaseCash(bytes32,uint256) (Vault_flat.sol#187-192) is never used and should be removed
BalanceAllocation.isNotZero(bytes32) (Vault_flat.sol#175-177) is never used and should be removed
BalanceAllocation.isZero(bytes32) (Vault_flat.sol#171-174) is never used and should be removed
BalanceAllocation.lastChangeBlock(bytes32) (Vault_flat.sol#148-151) is never used and should be removed
BalanceAllocation.managed(bytes32) (Vault_flat.sol#144-147) is never used and should be removed
BalanceAllocation.managedDelta(bytes32,bytes32) (Vault_flat.sol#152-154) is never used and should be removed

```

```

Variable BalanceAllocation.toSharedCash(bytes32,bytes32).tokenABalance (Vault_flat.sol#230) is too similar to BalanceAllocation.toSharedCash(bytes32,bytes32).tokenBBalance (Vault_flat.sol#230)
Variable BalanceAllocation.toSharedCash(bytes32,bytes32).tokenABalance (Vault_flat.sol#230) is too similar to BalanceAllocation.toSharedManaged(bytes32,bytes32).tokenBBalance (Vault_flat.sol#234)
Variable BalanceAllocation.toSharedManaged(bytes32,bytes32).tokenABalance (Vault_flat.sol#234) is too similar to BalanceAllocation.toSharedManaged(bytes32,bytes32).tokenBBalance (Vault_flat.sol#234)
Variable BalanceAllocation.toSharedManaged(bytes32,bytes32).tokenABalance (Vault_flat.sol#234) is too similar to BalanceAllocation.toSharedCash(bytes32,bytes32).tokenBBalance (Vault_flat.sol#230)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#variable-names-are-too-similar
INFO:Detectors:
VaultAuthorization._JOIN_TYPE_HASH (Vault_flat.sol#361) is never used in VaultAuthorization (Vault_flat.sol#359-378)
VaultAuthorization._EXIT_TYPE_HASH (Vault_flat.sol#362) is never used in VaultAuthorization (Vault_flat.sol#359-378)
VaultAuthorization._SWAP_TYPE_HASH (Vault_flat.sol#363) is never used in VaultAuthorization (Vault_flat.sol#359-378)
VaultAuthorization._BATCH_SWAP_TYPE_HASH (Vault_flat.sol#364) is never used in VaultAuthorization (Vault_flat.sol#359-378)
VaultAuthorization._SET_RELAYER_TYPE_HASH (Vault_flat.sol#365-366) is never used in VaultAuthorization (Vault_flat.sol#359-378)
VaultAuthorization._approvedRelayers (Vault_flat.sol#368) is never used in VaultAuthorization (Vault_flat.sol#359-378)
ProtocolFeesCollector._MAX_PROTOCOL_SWAP_FEE_PERCENTAGE (Vault_flat.sol#381) is never used in ProtocolFeesCollector (Vault_flat.sol#379-408)
ProtocolFeesCollector._MAX_PROTOCOL_FLASH_LOAN_FEE_PERCENTAGE (Vault_flat.sol#382) is never used in ProtocolFeesCollector (Vault_flat.sol#379-408)
ProtocolFeesCollector._swapFeePercentage (Vault_flat.sol#384) is never used in ProtocolFeesCollector (Vault_flat.sol#379-408)
ProtocolFeesCollector._flashLoanFeePercentage (Vault_flat.sol#385) is never used in ProtocolFeesCollector (Vault_flat.sol#379-408)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#unused-state-variables
INFO:Detectors:
ProtocolFeesCollector._flashLoanFeePercentage (Vault_flat.sol#385) should be constant
ProtocolFeesCollector._swapFeePercentage (Vault_flat.sol#384) should be constant
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#state-variables-that-could-be-declared-constant
INFO:Detectors:
getProtocolFeesCollector() should be declared external:
  - Fees.getProtocolFeesCollector() (Vault_flat.sol#415-417)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:Vault flat.sol analyzed (14 contracts with 75 detectors), 60 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration

```

## Slither log >> WeightedPool.sol

```

INFO:Detectors:
FixedPoint.add(uint256,uint256) (WeightedPool_flat.sol#39-43) is never used and should be removed
FixedPoint.complement(uint256) (WeightedPool_flat.sol#93-95) is never used and should be removed
FixedPoint.divDown(uint256,uint256) (WeightedPool_flat.sol#63-72) is never used and should be removed
FixedPoint.divUp(uint256,uint256) (WeightedPool_flat.sol#73-82) is never used and should be removed
FixedPoint.mulDown(uint256,uint256) (WeightedPool_flat.sol#49-53) is never used and should be removed
FixedPoint.mulUp(uint256,uint256) (WeightedPool_flat.sol#54-62) is never used and should be removed
FixedPoint.powDown(uint256,uint256) (WeightedPool_flat.sol#83-87) is never used and should be removed
FixedPoint.powUp(uint256,uint256) (WeightedPool_flat.sol#88-92) is never used and should be removed
FixedPoint.sub(uint256,uint256) (WeightedPool_flat.sol#44-48) is never used and should be removed
SafeMath.add(uint256,uint256) (WeightedPool_flat.sol#20-24) is never used and should be removed
SafeMath.sub(uint256,uint256) (WeightedPool_flat.sol#25-27) is never used and should be removed
SafeMath.sub(uint256,uint256,uint256) (WeightedPool_flat.sol#28-32) is never used and should be removed
WeightedMath._calcBptInGivenExactTokensOut(uint256[],uint256[],uint256,uint256) (WeightedPool_flat.sol#193-222) is never used and should be removed
WeightedMath._calcBptOutGivenExactTokensIn(uint256[],uint256[],uint256[],uint256,uint256) (WeightedPool_flat.sol#145-176) is never used and should be removed
WeightedMath._calcDueTokenProtocolSwapFeeAmount(uint256,uint256,uint256,uint256,uint256) (WeightedPool_flat.sol#251-267) is ever used and should be removed
WeightedMath._calcInGivenOut(uint256,uint256,uint256,uint256,uint256) (WeightedPool_flat.sol#131-144) is never used and should be removed
WeightedMath._calcOutGivenIn(uint256,uint256,uint256,uint256,uint256) (WeightedPool_flat.sol#117-130) is never used and should be removed
WeightedMath._calcTokenInGivenExactBptOut(uint256,uint256,uint256,uint256,uint256) (WeightedPool_flat.sol#177-192) is never used and should be removed
WeightedMath._calcTokenOutGivenExactBptIn(uint256,uint256,uint256,uint256,uint256) (WeightedPool_flat.sol#223-238) is never used and should be removed
WeightedMath._calcTokensOutGivenExactBptIn(uint256[],uint256,uint256) (WeightedPool_flat.sol#239-250) is never used and should be removed
WeightedMath._calculateInvariant(uint256[],uint256[]) (WeightedPool_flat.sol#106-116) is never used and should be removed
WeightedPool._doExit(uint256[],uint256[],bytes) (WeightedPool_flat.sol#436-442) is never used and should be removed
WeightedPool._doJoin(uint256[],uint256[],bytes) (WeightedPool_flat.sol#394-400) is never used and should be removed
WeightedPool._exitBPTInForExactTokensOut(uint256[],uint256[],bytes) (WeightedPool_flat.sol#457-463) is never used and should be removed
WeightedPool._exitExactBPTInForTokenOut(uint256[],uint256[],bytes) (WeightedPool_flat.sol#443-449) is never used and should be removed

WeightedPool._mutateAmounts(uint256[],uint256[],function(uint256,uint256) returns(uint256)) (WeightedPool_flat.sol#489-495) is never used and should be removed
WeightedPool._normalizedWeight(IERC20) (WeightedPool_flat.sol#323-325) is never used and should be removed
WeightedPool._onExitPool(bytes32,address,address,uint256[],uint256,uint256,bytes) (WeightedPool_flat.sol#416-435) is never used and should be removed
WeightedPool._onInitializePool(bytes32,address,address,bytes) (WeightedPool_flat.sol#353-360) is never used and should be removed
WeightedPool._onJoinPool(bytes32,address,address,uint256[],uint256,uint256,bytes) (WeightedPool_flat.sol#361-393) is never used and should be removed
WeightedPool._onSwapGivenIn(uint256,uint256) (WeightedPool_flat.sol#339-345) is never used and should be removed
WeightedPool._onSwapGivenOut(uint256,uint256) (WeightedPool_flat.sol#346-352) is never used and should be removed
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code
INFO:Detectors:
Variable WeightedPool._normalizedWeight0 (WeightedPool_flat.sol#274) is too similar to WeightedPool._normalizedWeight1 (WeightedPool_flat.sol#275)
Variable WeightedPool._normalizedWeight0 (WeightedPool_flat.sol#274) is too similar to WeightedPool._normalizedWeight2 (WeightedPool_flat.sol#276)
Variable WeightedPool._normalizedWeight0 (WeightedPool_flat.sol#274) is too similar to WeightedPool._normalizedWeight3 (WeightedPool_flat.sol#277)
Variable WeightedPool._normalizedWeight0 (WeightedPool_flat.sol#274) is too similar to WeightedPool._normalizedWeight4 (WeightedPool_flat.sol#278)
Variable WeightedPool._normalizedWeight1 (WeightedPool_flat.sol#275) is too similar to WeightedPool._normalizedWeight2 (WeightedPool_flat.sol#276)
Variable WeightedPool._normalizedWeight1 (WeightedPool_flat.sol#275) is too similar to WeightedPool._normalizedWeight3 (WeightedPool_flat.sol#277)
Variable WeightedPool._normalizedWeight1 (WeightedPool_flat.sol#275) is too similar to WeightedPool._normalizedWeight4 (WeightedPool_flat.sol#278)
Variable WeightedPool._normalizedWeight2 (WeightedPool_flat.sol#276) is too similar to WeightedPool._normalizedWeight3 (WeightedPool_flat.sol#277)

```

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```

INFO:Detectors:
FixedPoint.MAX_POW_RELATIVE_ERROR (WeightedPool_flat.sol#37) is never used in FixedPoint (WeightedPool_flat.sol#35-96)
FixedPoint.MIN_POW_BASE_FREE_EXPONENT (WeightedPool_flat.sol#38) is never used in FixedPoint (WeightedPool_flat.sol#35-96)
WeightedMath._MIN_WEIGHT (WeightedPool_flat.sol#100) is never used in WeightedPool (WeightedPool_flat.sol#270-499)
WeightedMath._MAX_WEIGHTED_TOKENS (WeightedPool_flat.sol#101) is never used in WeightedPool (WeightedPool_flat.sol#270-499)
WeightedMath._MAX_IN_RATIO (WeightedPool_flat.sol#102) is never used in WeightedPool (WeightedPool_flat.sol#270-499)
WeightedMath._MAX_OUT_RATIO (WeightedPool_flat.sol#103) is never used in WeightedPool (WeightedPool_flat.sol#270-499)
WeightedMath._MAX_INVARIANT_RATIO (WeightedPool_flat.sol#104) is never used in WeightedPool (WeightedPool_flat.sol#270-499)
WeightedMath._MIN_INVARIANT_RATIO (WeightedPool_flat.sol#105) is never used in WeightedPool (WeightedPool_flat.sol#270-499)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#unused-state-variables
INFO:Detectors:
getInvariant() should be declared external:
    - WeightedPool.getInvariant() (WeightedPool_flat.sol#334-335)
getRate() should be declared external:
    - WeightedPool.getRate() (WeightedPool_flat.sol#496-498)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:WeightedPool_flat.sol analyzed (5 contracts with 75 detectors), 76 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration

```

## Slither log >> WeightedPool2TokensFactory.sol

```

INFO:Detectors:
ERC20._burn(address,uint256) (WeightedPool2TokensFactory_flat.sol#95-101) is never used and should be removed
ERC20._mint(address,uint256) (WeightedPool2TokensFactory_flat.sol#88-94) is never used and should be removed
ERC20._setupDecimals(uint8) (WeightedPool2TokensFactory_flat.sol#112-114) is never used and should be removed
Math.add(uint256,int256) (WeightedPool2TokensFactory_flat.sol#127-131) is never used and should be removed
Math.add(uint256,uint256) (WeightedPool2TokensFactory_flat.sol#122-126) is never used and should be removed
Math.divDown(uint256,uint256) (WeightedPool2TokensFactory_flat.sol#153-156) is never used and should be removed
Math.divUp(uint256,uint256) (WeightedPool2TokensFactory_flat.sol#157-164) is never used and should be removed
Math.max(uint256,uint256) (WeightedPool2TokensFactory_flat.sol#142-144) is never used and should be removed
Math.min(uint256,uint256) (WeightedPool2TokensFactory_flat.sol#145-147) is never used and should be removed
Math.mul(uint256,uint256) (WeightedPool2TokensFactory_flat.sol#148-152) is never used and should be removed
Math.sub(int256,int256) (WeightedPool2TokensFactory_flat.sol#137-141) is never used and should be removed
Math.sub(uint256,uint256) (WeightedPool2TokensFactory_flat.sol#132-136) is never used and should be removed
SafeMath.sub(uint256,uint256) (WeightedPool2TokensFactory_flat.sol#11-13) is never used and should be removed
SafeMath.sub(uint256,uint256,uint256) (WeightedPool2TokensFactory_flat.sol#14-18) is never used and should be removed
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code
INFO:Detectors:
name() should be declared external:
    - ERC20.name() (WeightedPool2TokensFactory_flat.sol#33-35)
symbol() should be declared external:
    - ERC20.symbol() (WeightedPool2TokensFactory_flat.sol#36-38)
decimals() should be declared external:
    - ERC20.decimals() (WeightedPool2TokensFactory_flat.sol#39-41)
totalSupply() should be declared external:
    - ERC20.totalSupply() (WeightedPool2TokensFactory_flat.sol#42-44)
balanceOf(address) should be declared external:
    - ERC20.balanceOf(address) (WeightedPool2TokensFactory_flat.sol#45-47)
transfer(address,uint256) should be declared external:
    - ERC20.transfer(address,uint256) (WeightedPool2TokensFactory_flat.sol#48-51)
allowance(address,address) should be declared external:
    - ERC20.allowance(address,address) (WeightedPool2TokensFactory_flat.sol#52-54)
approve(address,uint256) should be declared external:
    - ERC20.approve(address,uint256) (WeightedPool2TokensFactory_flat.sol#55-58)
transferFrom(address,address,uint256) should be declared external:
    - ERC20.transferFrom(address,address,uint256) (WeightedPool2TokensFactory_flat.sol#59-67)
increaseAllowance(address,uint256) should be declared external:
    - ERC20.increaseAllowance(address,uint256) (WeightedPool2TokensFactory_flat.sol#68-71)

increaseAllowance(address,uint256) should be declared external:
    - ERC20.increaseAllowance(address,uint256) (WeightedPool2TokensFactory_flat.sol#68-71)
decreaseAllowance(address,uint256) should be declared external:
    - ERC20.decreaseAllowance(address,uint256) (WeightedPool2TokensFactory_flat.sol#72-75)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:WeightedPool2TokensFactory_flat.sol analyzed (4 contracts with 75 detectors), 25 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration

```

# Solidity Static Analysis

## Authorizer.sol

### Security

#### Check-effects-interaction:

Potential violation of Checks-Effects-Interaction pattern in Authorizer.cancel(uint256): Could potentially lead to re-entrancy vulnerability.

[more](#)

Pos: 540:4:



#### Block timestamp:

Use of "block.timestamp": "block.timestamp" can be influenced by miners to a certain degree. That means that a miner can "choose" the block.timestamp, to a certain degree, to change the outcome of a transaction in the mined block.

[more](#)

Pos: 629:31:



### Gas & Economy

#### Gas costs:

Gas requirement of function Authorizer.hasPermission is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 453:4:



#### This on local calls:

Use of "this" for local functions: Never use "this" to call functions in the same contract, it only consumes more gas than normal local calls.

[more](#)

Pos: 496:51:



#### For loop over dynamic array:

Loops that do not have a fixed number of iterations, for example, loops that depend on storage values, have to be used carefully. Due to the block gas limit, transactions can only consume a certain amount of gas. The number of iterations in a loop can grow beyond the block gas limit which can cause the complete contract to be stalled at a certain point. Additionally, using unbounded loops incurs in a lot of avoidable gas costs. Carefully test how many items at maximum you can pass to such functions to make it successful.

[more](#)

Pos: 563:8:



### Miscellaneous

#### Constant/View/Pure functions:

Authorizer.\_executeActionId(uint256) : Is constant but potentially should not be.

[more](#)

Pos: 643:4:



### Similar variable names:

Authorizer.schedule(address,bytes,address[]) : Variables have very similar names "delay" and "delays".

Pos: 512:24:



### Guard conditions:

Use "assert(x)" if you never ever want x to be false, not in any circumstance (apart from a bug in your code). Use "require(x)" if x can be false, due to e.g. invalid input or a failing external component.

[more](#)

Pos: 545:8:



## InvestmentPoolFactory.sol

### Security

#### Check-effects-interaction:

INTERNAL ERROR in module Check-effects-interaction: Cannot read properties of undefined (reading 'name')

Pos: not available



#### Low level calls:

Use of "call": should be avoided whenever possible. It can lead to unexpected behavior if return value is not handled properly. Please use Direct Calls via specifying the called contract's interface.

[more](#)

Pos: 3688:55:



### Gas & Economy

#### Gas costs:

INTERNAL ERROR in module Gas costs: Cannot read properties of undefined (reading 'type')

Pos: not available



### Miscellaneous

#### Constant/View/Pure functions:

INTERNAL ERROR in module Constant/View/Pure functions: Cannot read properties of undefined (reading 'name')

Pos: not available



#### Data truncated:

Division of integer values yields an integer value again. That means e.g.  $10 / 100 = 0$  instead of  $0.1$  since the result is an integer again. This does not hold for division of (only) literal values since those yield rational constants.

Pos: 2938:5:



# MetaStablePoolFactory.sol

## Security

### Check-effects-interaction:

INTERNAL ERROR in module Check-effects-interaction: Cannot read properties of undefined (reading 'name')  
Pos: not available



### Inline assembly:

The Contract uses inline assembly, this is only advised in rare cases. Additionally static analysis modules do not parse inline Assembly, this can lead to wrong analysis results.

[more](#)

Pos: 480:8:



### Block timestamp:

Use of "block.timestamp": "block.timestamp" can be influenced by miners to a certain degree. That means that a miner can "choose" the block.timestamp, to a certain degree, to change the outcome of a transaction in the mined block.

[more](#)

Pos: 4239:64:



## Gas & Economy

### Gas costs:

INTERNAL ERROR in module Gas costs: Cannot read properties of undefined (reading 'type')  
Pos: not available



### This on local calls:

Use of "this" for local functions: Never use "this" to call functions in the same contract, it only consumes more gas than normal local calls.

[more](#)

Pos: 2251:61:



## Miscellaneous

### Constant/View/Pure functions:

INTERNAL ERROR in module Constant/View/Pure functions: Cannot read properties of undefined (reading 'name')  
Pos: not available



### Similar variable names:

BaseSplitCodeFactory.(bytes) : Variables have very similar names "\_creationCodeContractA" and "\_creationCodeContractB". Note: Modifiers are currently not considered by this static analysis.  
Pos: 516:8:



## Multicall2.sol

### Security

#### Check-effects-interaction:



INTERNAL ERROR in module Check-effects-interaction: Cannot read properties of undefined (reading 'name')

Pos: not available

#### Block timestamp:



Use of "block.timestamp": "block.timestamp" can be influenced by miners to a certain degree. That means that a miner can "choose" the block.timestamp, to a certain degree, to change the outcome of a transaction in the mined block.

[more](#)

Pos: 45:20:

### Gas & Economy

#### Gas costs:



Gas requirement of function Multicall2.aggregate is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 17:4:

#### For loop over dynamic array:



Loops that do not have a fixed number of iterations, for example, loops that depend on storage values, have to be used carefully. Due to the block gas limit, transactions can only consume a certain amount of gas. The number of iterations in a loop can grow beyond the block gas limit which can cause the complete contract to be stalled at a certain point. Additionally, using unbounded loops incurs in a lot of avoidable gas costs. Carefully test how many items at maximum you can pass to such functions to make it successful.

[more](#)

Pos: 55:8:

### Miscellaneous

#### Constant/View/Pure functions:



INTERNAL ERROR in module Constant/View/Pure functions: Cannot read properties of undefined (reading 'name')

Pos: not available

#### No return:



INTERNAL ERROR in module No return: Cannot read properties of undefined (reading 'name')

Pos: not available

## Guard conditions:

Use "assert(x)" if you never ever want x to be false, not in any circumstance (apart from a bug in your code). Use "require(x)" if x can be false, due to e.g. invalid input or a failing external component.

[more](#)

Pos: 59:16:



# NoProtocolFeeLiquidityBootstrappingPoolFactory.sol

## Security

### Check-effects-interaction:

INTERNAL ERROR in module Check-effects-interaction: Cannot read properties of undefined (reading 'name')

Pos: not available



### Inline assembly:

The Contract uses inline assembly, this is only advised in rare cases. Additionally static analysis modules do not parse inline Assembly, this can lead to wrong analysis results.

[more](#)

Pos: 612:12:



### Block timestamp:

Use of "block.timestamp": "block.timestamp" can be influenced by miners to a certain degree. That means that a miner can "choose" the block.timestamp, to a certain degree, to change the outcome of a transaction in the mined block.

[more](#)

Pos: 5337:83:



### Low level calls:

Use of "call": should be avoided whenever possible. It can lead to unexpected behavior if return value is not handled properly. Please use Direct Calls via specifying the called contract's interface.

[more](#)

Pos: 5174:55:



## Gas & Economy

### Gas costs:

Gas requirement of function BalancerPoolToken.name is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 902:28:



## Miscellaneous

### Constant/View/Pure functions:

INTERNAL ERROR in module Constant/View/Pure functions: Cannot read properties of undefined (reading 'name')

Pos: not available



## Similar variable names:



LogExpMath.pow(uint256,uint256) : Variables have very similar names "ONE\_18" and "ONE\_20". Note:  
Modifiers are currently not considered by this static analysis.  
Pos: 184:1

## Data truncated:



Division of integer values yields an integer value again. That means e.g.  $10 / 100 = 0$  instead of  $0.1$  since the result is an integer again. This does not hold for division of (only) literal values since those yield rational constants.

Pos: 4956:78:

## ProtocolFeesCollector.sol

### Security

#### Check-effects-interaction:



Potential violation of Checks-Effects-Interaction pattern in  
SafeERC20.\_callOptionalReturn(address,bytes): Could potentially lead to re-entrancy vulnerability.  
Note: Modifiers are currently not considered by this static analysis.

[more](#)

Pos: 280:4:

#### Inline assembly:



The Contract uses inline assembly, this is only advised in rare cases. Additionally static analysis modules do not parse inline Assembly, this can lead to wrong analysis results.

[more](#)

Pos: 185:8:

### Gas & Economy

#### Gas costs:



Gas requirement of function ProtocolFeesCollector.getActionId is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 227:4:

#### For loop over dynamic array:



Loops that do not have a fixed number of iterations, for example, loops that depend on storage values, have to be used carefully. Due to the block gas limit, transactions can only consume a certain amount of gas. The number of iterations in a loop can grow beyond the block gas limit which can cause the complete contract to be stalled at a certain point. Additionally, using unbounded loops incurs in a lot of avoidable gas costs. Carefully test how many items at maximum you can pass to such functions to make it successful.

[more](#)

Pos: 630:8:

### Miscellaneous

### Constant/View/Pure functions:



ProtocolFeesCollector.getCollectedFeeAmounts(contract IERC20[]) : Is constant but potentially should not be. Note: Modifiers are currently not considered by this static analysis.

[more](#)

Pos: 623:4:

### Similar variable names:



ProtocolFeesCollector.withdrawCollectedFees(contract IERC20[],uint256[],address) : Variables have very similar names "token" and "tokens". Note: Modifiers are currently not considered by this static analysis.

Pos: 599:12:

## StablePhantomPoolFactory.sol

### Security

#### Check-effects-interaction:



INTERNAL ERROR in module Check-effects-interaction: Cannot read properties of undefined (reading 'name')

Pos: not available

#### Inline assembly:



The Contract uses inline assembly, this is only advised in rare cases. Additionally static analysis modules do not parse inline Assembly, this can lead to wrong analysis results.

[more](#)

Pos: 33:8:

### Gas & Economy

#### Gas costs:



Gas requirement of function StablePool.getPausedState is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 225:4:

### Miscellaneous

#### Constant/View/Pure functions:



INTERNAL ERROR in module Constant/View/Pure functions: Cannot read properties of undefined (reading 'name')

Pos: not available

#### Similar variable names:



WordCodec.insertUInt10(bytes32,uint256,uint256) : Variables have very similar names "\_MASK\_10" and "\_MASK\_31". Note: Modifiers are currently not considered by this static analysis.

Pos: 96:56:

## Data truncated:

Division of integer values yields an integer value again. That means e.g.  $10 / 100 = 0$  instead of  $0.1$  since the result is an integer again. This does not hold for division of (only) literal values since those yield rational constants.

Pos: 2469:43:



## StablePoolFactory.sol

### Security

#### Check-effects-interaction:

INTERNAL ERROR in module Check-effects-interaction: Cannot read properties of undefined (reading 'name')

Pos: not available



#### Inline assembly:

The Contract uses inline assembly, this is only advised in rare cases. Additionally static analysis modules do not parse inline Assembly, this can lead to wrong analysis results.

[more](#)

Pos: 875:12:



#### Block timestamp:

Use of "block.timestamp": "block.timestamp" can be influenced by miners to a certain degree. That means that a miner can "choose" the block.timestamp, to a certain degree, to change the outcome of a transaction in the mined block.

[more](#)

Pos: 2520:6:



### Gas & Economy

#### Gas costs:

Gas requirement of function MockStableMath.invariant is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 771:28:



### Miscellaneous

#### Constant/View/Pure functions:

INTERNAL ERROR in module Constant/View/Pure functions: Cannot read properties of undefined (reading 'name')

Pos: not available



#### Similar variable names:

LogExpMath.pow(uint256,uint256) : Variables have very similar names "ONE\_18" and "ONE\_20".

Note: Modifiers are currently not considered by this static analysis.

Pos: 210:3:



## No return:



INTERNAL ERROR in module No return: Cannot read properties of undefined (reading 'name')

Pos: not available

## Vault.sol

### Security

#### Check-effects-interaction:



INTERNAL ERROR in module Check-effects-interaction: Cannot read properties of undefined (reading 'name')

Pos: not available

#### Inline assembly:



The Contract uses inline assembly, this is only advised in rare cases. Additionally static analysis modules do not parse inline Assembly, this can lead to wrong analysis results.

[more](#)

Pos: 469:8

### Gas & Economy

#### Gas costs:



Gas requirement of function ProtocolFeesCollector.getActionId is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 379:4

### Miscellaneous

#### Constant/View/Pure functions:



INTERNAL ERROR in module Constant/View/Pure functions: Cannot read properties of undefined (reading 'name')

Pos: not available

#### Similar variable names:



BalanceAllocation.totalsAndLastChangeBlock(bytes32[]) : Variables have very similar names "balance" and "balances". Note: Modifiers are currently not considered by this static analysis.

Pos: 163:32

#### Data truncated:



Division of integer values yields an integer value again. That means e.g. 10 / 100 = 0 instead of 0.1 since the result is an integer again. This does not hold for division of (only) literal values since those yield rational constants.

Pos: 912:46

## WeightedPool.sol

### Security

#### Check-effects-interaction:

INTERNAL ERROR in module Check-effects-interaction: Cannot read properties of undefined (reading 'name')

Pos: not available



#### Inline assembly:

The Contract uses inline assembly, this is only advised in rare cases. Additionally static analysis modules do not parse inline Assembly, this can lead to wrong analysis results.

[more](#)

Pos: 344:8



#### Block timestamp:

Use of "block.timestamp": "block.timestamp" can be influenced by miners to a certain degree. That means that a miner can "choose" the block.timestamp, to a certain degree, to change the outcome of a transaction in the mined block.

[more](#)

Pos: 1056:39



### Gas & Economy

#### Gas costs:

Gas requirement of function BalancerPoolToken.name is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 48:4



### Miscellaneous

#### Constant/View/Pure functions:

INTERNAL ERROR in module Constant/View/Pure functions: Cannot read properties of undefined (reading 'name')

Pos: not available



#### Similar variable names:

ERC20.(string,string) : Variables have very similar names "\_name" and "name\_". Note: Modifiers are currently not considered by this static analysis.

Pos: 44:8



#### Data truncated:

Division of integer values yields an integer value again. That means e.g.  $10 / 100 = 0$  instead of  $0.1$  since the result is an integer again. This does not hold for division of (only) literal values since those yield rational constants.

Pos: 1108:10



# WeightedPool2TokensFactory.sol

## Security

### Check-effects-interaction:

INTERNAL ERROR in module Check-effects-interaction: Cannot read properties of undefined (reading 'name')

Pos: not available



### Inline assembly:

The Contract uses inline assembly, this is only advised in rare cases. Additionally static analysis modules do not parse inline Assembly, this can lead to wrong analysis results.

[more](#)

Pos: 156:8



## Gas & Economy

### Gas costs:

Gas requirement of function ProtocolFeesCollector.getActionId is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 196:4



### For loop over dynamic array:

Loops that do not have a fixed number of iterations, for example, loops that depend on storage values, have to be used carefully. Due to the block gas limit, transactions can only consume a certain amount of gas. The number of iterations in a loop can grow beyond the block gas limit which can cause the complete contract to be stalled at a certain point. Additionally, using unbounded loops incurs in a lot of avoidable gas costs. Carefully test how many items at maximum you can pass to such functions to make it successful.

[more](#)

Pos: 3185:32



## Miscellaneous

### Constant/View/Pure functions:

INTERNAL ERROR in module Constant/View/Pure functions: Cannot read properties of undefined (reading 'name')

Pos: not available



### Data truncated:

Division of integer values yields an integer value again. That means e.g.  $10 / 100 = 0$  instead of  $0.1$  since the result is an integer again. This does not hold for division of (only) literal values since those yield rational constants.

Pos: 3173:64



# MasterChef.sol

## Security

### Check-effects-interaction:

Potential violation of Checks-Effects-Interaction pattern in  
Address.functionCallWithValue(address,bytes,uint256,string): Could potentially lead to re-entrancy vulnerability. Note: Modifiers are currently not considered by this static analysis.

[more](#)

Pos: 335:4:



### Block timestamp:

Use of "block.timestamp": "block.timestamp" can be influenced by miners to a certain degree. That means that a miner can "choose" the block.timestamp, to a certain degree, to change the outcome of a transaction in the mined block.

[more](#)

Pos: 836:63:



## Gas & Economy

### Gas costs:

Gas requirement of function MasterChef.init is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 791:4:



## Miscellaneous

### Constant/View/Pure functions:

Address.functionStaticCall(address,bytes) : Is constant but potentially should not be. Note: Modifiers are currently not considered by this static analysis.

[more](#)

Pos: 354:4:



### Similar variable names:

MasterChef.updatePool(uint256) : Variables have very similar names "reserve2Address" and "reserve3Address". Note: Modifiers are currently not considered by this static analysis.

Pos: 939:25:



### Guard conditions:

Use "assert(x)" if you never ever want x to be false, not in any circumstance (apart from a bug in your code). Use "require(x)" if x can be false, due to e.g. invalid input or a failing external component.

[more](#)

Pos: 1007:8:



### Data truncated:

Division of integer values yields an integer value again. That means e.g.  $10 / 100 = 0$  instead of  $0.1$  since the result is an integer again. This does not hold for division of (only) literal values since those yield rational constants.

Pos: 943:40:



# SBXToken.sol

## Gas & Economy

### Gas costs:

Gas requirement of function ERC20.name is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 192:4:



### Gas costs:

Gas requirement of function SBXToken.mint is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)

Pos: 552:4:



## Miscellaneous

### Constant/View/Pure functions:

IERC20.transfer(address,uint256) : Potentially should be constant/view/pure but is not. Note: Modifiers are currently not considered by this static analysis.

[more](#)

Pos: 24:4:



### Similar variable names:

ERC20Burnable.burnFrom(address,uint256) : Variables have very similar names "account" and "amount". Note: Modifiers are currently not considered by this static analysis.

Pos: 538:23:



### Guard conditions:

Use "assert(x)" if you never ever want x to be false, not in any circumstance (apart from a bug in your code). Use "require(x)" if x can be false, due to e.g. invalid input or a failing external component.

[more](#)

Pos: 553:8:



# Solhint Linter

## Authorizer.sol

```
Authorizer.sol:3:1: Error: Compiler version ^0.6.12 does not satisfy  
the r semver requirement  
Authorizer.sol:198:10: Error: Variable "success" is unused  
Authorizer.sol:223:51: Error: Avoid using low level calls.  
Authorizer.sol:245:20: Error: Code contains empty blocks  
Authorizer.sol:328:73: Error: Code contains empty blocks  
Authorizer.sol:336:21: Error: Code contains empty blocks  
Authorizer.sol:547:9: Error: Variable "action" is unused  
Authorizer.sol:639:73: Error: Code contains empty blocks
```

## InvestmentPoolFactory.sol

```
InvestmentPoolFactory.sol:3:1: Error: Compiler version ^0.6.12 does  
not satisfy the r semver requirement  
InvestmentPoolFactory.sol:139:5: Error: Explicitly mark visibility of  
state  
InvestmentPoolFactory.sol:140:5: Error: Explicitly mark visibility of  
state
```

## MetaStablePoolFactory.sol

```
MetaStablePoolFactory.sol:3820:11: Error: Visibility modifier must be  
first in list of modifiers  
MetaStablePoolFactory.sol:4068:70: Error: Avoid to make time-based  
decisions in your business logic  
MetaStablePoolFactory.sol:4126:16: Error: Code contains empty blocks  
MetaStablePoolFactory.sol:4136:16: Error: Code contains empty blocks  
MetaStablePoolFactory.sol:4136:16: Error: Code contains empty blocks  
MetaStablePoolFactory.sol:4159:17: Error: Avoid to make time-based  
decisions in your business logic  
39:41: Error: Avoid to make  
time-based decisions in your business logic
```

## Multicall2.sol

```
Multicall2.sol:3:1: Error: Compiler version >=0.5.0 does not satisfy  
the r semver requirement  
Multicall2.sol:21:48: Error: Avoid using low level calls.  
Multicall2.sol:45:21: Error: Avoid to make time-based decisions in  
your business logic  
Multicall2.sol:56:48: Error: Avoid using low level calls.
```

## NoProtocolFeeLiquidityBootstrappingPoolFactory.sol

```
NoProtocolFeeLiquidityBootstrappingPoolFactory.sol:4:1: Error:  
Compiler version ^0.6.12 does not satisfy the r semver requirement  
NoProtocolFeeLiquidityBootstrappingPoolFactory.sol:140:5: Error:  
Explicitly mark visibility of state  
NoProtocolFeeLiquidityBootstrappingPoolFactory.sol:142:5: Error:  
Explicitly mark visibility of state  
NoProtocolFeeLiquidityBootstrappingPoolFactory.sol:143:5: Error:  
Explicitly mark visibility of state  
NoProtocolFeeLiquidityBootstrappingPoolFactory.sol:145:5: Error:  
Explicitly mark visibility of state  
NoProtocolFeeLiquidityBootstrappingPoolFactory.sol:146:5: Error:  
Explicitly mark visibility of state  
NoProtocolFeeLiquidityBootstrappingPoolFactory.sol:148:5: Error:  
Explicitly mark visibility of state  
NoProtocolFeeLiquidityBootstrappingPoolFactory.sol:153:21: Error:  
Constant name must be in capitalized SNAKE_CASE
```

## ProtocolFeesCollector.sol

```
ProtocolFeesCollector.sol:3:1: Error: Compiler version ^0.6.12 does  
not satisfy the r semver requirement  
ProtocolFeesCollector.sol:171:73: Error: Code contains empty blocks  
ProtocolFeesCollector.sol:179:21: Error: Code contains empty blocks  
ProtocolFeesCollector.sol:185:9: Error: Avoid using inline assembly.  
It is acceptable only in rare cases  
ProtocolFeesCollector.sol:223:9: Error: Variable "actionId" is unused  
ProtocolFeesCollector.sol:281:51: Error: Avoid using low level calls.  
ProtocolFeesCollector.sol:283:9: Error: Avoid using inline assembly.  
It is acceptable only in rare cases  
ProtocolFeesCollector.sol:281:24: Error: Variable "returndata" is  
unused  
ProtocolFeesCollector.sol:319:1: Error: Code contains empty blocks  
ProtocolFeesCollector.sol:542:5: Error: Function name must be in  
mixedCase
```

## StablePhantomPoolFactory.sol

```
StablePhantomPoolFactory.sol:3:1: Error: Compiler version ^0.6.12  
does not satisfy the r semver requirement  
StablePhantomPoolFactory.sol:21:73: Error: Code contains empty blocks  
StablePhantomPoolFactory.sol:28:21: Error: Code contains empty blocks  
StablePhantomPoolFactory.sol:33:9: Error: Avoid using inline  
assembly. It is acceptable only in rare cases  
StablePhantomPoolFactory.sol:217:38: Error: Avoid to make time-based  
decisions in your business logic  
StablePhantomPoolFactory.sol:240:21: Error: Code contains empty  
blocks  
StablePhantomPoolFactory.sol:242:16: Error: Code contains empty
```

```
blocks
StablePhantomPoolFactory.sol:248:47: Error: Code contains empty
blocks
StablePhantomPoolFactory.sol:251:44: Error: Code contains empty
blocks
StablePhantomPoolFactory.sol:256:16: Error: Avoid to make time-based
decisions in your business logic
StablePhantomPoolFactory.sol:275:40: Error: Variable "errorCode" is
unused
```

## StablePoolFactory.sol

```
StablePoolFactory.sol:3:1: Error: Compiler version ^0.6.12 does not
satisfy the r semver requirement
StablePoolFactory.sol:174:5: Error: Explicitly mark visibility of
state
StablePoolFactory.sol:175:5: Error: Explicitly mark visibility of
state
StablePoolFactory.sol:176:5: Error: Explicitly mark visibility of
state
StablePoolFactory.sol:177:5: Error: Explicitly mark visibility of
state
StablePoolFactory.sol:178:5: Error: Explicitly mark visibility of
state
StablePoolFactory.sol:179:5: Error: Explicitly mark visibility of
state
StablePoolFactory.sol:180:5: Error: Explicitly mark visibility of
state
StablePoolFactory.sol:181:5: Error: Explicitly mark visibility of
state
StablePoolFactory.sol:182:5: Error: Explicitly mark visibility of
state
StablePoolFactory.sol:182:21: Error: Constant name must be in
capitalized SNAKE_CASE
StablePoolFactory.sol:183:5: Error: Explicitly mark visibility of
state
```

## Vault.sol

```
Vault.sol:454:31: Error: Variable name must be in mixedCase
Vault.sol:455:31: Error: Variable name must be in mixedCase
Vault.sol:469:9: Error: Avoid using inline assembly. It is acceptable
only in rare cases
Vault.sol:477:55: Error: Visibility modifier must be first in list of
modifiers
Vault.sol:477:62: Error: Code contains empty blocks
Vault.sol:485:47: Error: Variable "errorCode" is unused
```

## WeightedPools.sol

```
WeightedPool.sol:2:1: Error: Compiler version ^0.6.12 does not
satisfy the r semver requirement
WeightedPool.sol:28:40: Error: Variable "errorCode" is unused
WeightedPool.sol:142:24: Error: Code contains empty blocks
WeightedPool.sol:150:1: Error: Code contains empty blocks
WeightedPool.sol:172:5: Error: Function name must be in mixedCase
WeightedPool.sol:296:9: Error: Variable "actionId" is unused
WeightedPool.sol:343:51: Error: Avoid using low level calls.
WeightedPool.sol:344:9: Error: Avoid using inline assembly. It is
acceptable only in rare cases
WeightedPool.sol:343:24: Error: Variable "returnData" is unused
WeightedPool.sol:587:5: Error: Function name must be in mixedCase
WeightedPool.sol:649:36: Error: Avoid to make time-based decisions in
your business logic
```

## **WeightedPool2TokensFactory.sol**

```
WeightedPool2TokensFactory.sol:3:1: Error: Compiler version 0.6.12
does not satisfy the r semver requirement
WeightedPool2TokensFactory.sol:23:1: Error: Code contains empty
blocks
WeightedPool2TokensFactory.sol:144:73: Error: Code contains empty
blocks
WeightedPool2TokensFactory.sol:151:21: Error: Code contains empty
blocks
WeightedPool2TokensFactory.sol:156:9: Error: Avoid using inline
assembly. It is acceptable only in rare cases
WeightedPool2TokensFactory.sol:163:9: Error: Avoid using inline
assembly. It is acceptable only in rare cases
```

## **MasterChef.sol**

```
MasterChef.sol:11:18: Error: Parse error: missing ';' at '{}'
MasterChef.sol:24:18: Error: Parse error: missing ';' at '{}'
MasterChef.sol:36:18: Error: Parse error: missing ';' at '{}'
MasterChef.sol:53:18: Error: Parse error: missing ';' at '{}'
MasterChef.sol:65:18: Error: Parse error: missing ';' at '{}'
MasterChef.sol:161:18: Error: Parse error: missing ';' at '{}'
MasterChef.sol:184:18: Error: Parse error: missing ';' at '{}'
MasterChef.sol:210:18: Error: Parse error: missing ';' at '{}'
MasterChef.sol:561:18: Error: Parse error: missing ';' at '{}'
```

## **SBXToken.sol**

```
SBXToken.sol:335:18: Error: Parse error: missing ';' at '{}'
SBXToken.sol:368:18: Error: Parse error: missing ';' at '{}'
SBXToken.sol:417:18: Error: Parse error: missing ';' at '{}'
SBXToken.sol:468:22: Error: Parse error: missing ';' at '{}'
```

## **Software analysis result:**

These software reported many false positive results and some are informational issues. So, those issues can be safely ignored.



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