

# SMART CONTRACT

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## Security Audit Report

Project: Libra Finance  
Website: <http://librafinance.xyz>  
Platform: Astar Network  
Language: Solidity  
Date: April 25th, 2022

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# Introduction

EtherAuthority was contracted by the Libra Finance team to perform the Security audit of the Libra Finance 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 25th, 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 Libra Finance Contracts have functions like stake, withdraw, earned, setTaxTiersRate, mint, burn, setPeriod, setEpoch, twap, safeLibraTransfer, etc. The Libra Finance contract inherits the IERC20, SafeERC20, Math, ReentrancyGuard, Ownable, SafeMath, ERC20Burnable, ERC20 standard smart contracts from the OpenZeppelin library. These OpenZeppelin contracts are considered community-audited and time-tested, and hence are not part of the audit scope.

## Audit scope

<b>Name</b>	<b>Code Review and Security Analysis Report for Libra Finance Protocol Smart Contracts</b>
<b>Platform</b>	<b>Astar Network / Solidity</b>
<b>File 1</b>	RebateTreasury.sol
<b>File 1 MD5 Hash</b>	E47E3B0F229E0AEF5C189B155AE16BE3
<b>File 2</b>	Treasury.sol
<b>File 2 MD5 Hash</b>	9FC141FB230D3E477E8C59A4A8EACF68
<b>File 3</b>	Boardroom.sol
<b>File 3 MD5 Hash</b>	D5DB6E807C7AD5C7AEE42F7C6E57E6F5
<b>File 4</b>	LBond.sol

<b>File 4 MD5 Hash</b>	38AA3DEE2FCE8AAB9AC7101E2255E384
<b>File 5</b>	Libra.sol
<b>File 5 MD5 Hash</b>	DDC50DCB39D71472C423E3D20FA45428
<b>File 6</b>	LShare.sol
<b>File 6 MD5 Hash</b>	187A780003A79C87B459EA162E28CCA1
<b>File 7</b>	Oracle.sol
<b>File 7 MD5 Hash</b>	CEDE169255BB09E06B929403162CE52B
<b>File 8</b>	LibraGenesisRewardPool.sol
<b>File 8 MD5 Hash</b>	B3618BE29B29169AA85CAA2BA1EF7201
<b>File 9</b>	LibraRewardPool.sol
<b>File 9 MD5 Hash</b>	62BBC991E6B8DE5C1E29C8DE17C9F461
<b>File 10</b>	LShareRewardPool.sol
<b>File 10 MD5 Hash</b>	8858D9A5DA0E3E7B8C2D3E41CAF0D6B5
<b>Audit Date</b>	April 25th,2022

## Claimed Smart Contract Features

Claimed Feature Detail	Our Observation
<b>File 1 Boardroom.sol</b> <ul style="list-style-type: none"> <li>Withdraw Lockup Epochs: 6 epochs</li> <li>Reward Lockup Epochs: 3 epochs</li> <li>Decimals: 18</li> </ul>	<b>YES, This is valid.</b>
<b>File 2 LBond.sol</b> <ul style="list-style-type: none"> <li>Name: Libra Finance BOND</li> <li>Symbol: LBOND</li> <li>Decimals: 18</li> <li>Max Minting Limit: No limit. An operator can mint unlimited tokens</li> </ul>	<b>YES, This is valid.</b>
<b>File 3 Libra.sol</b> <ul style="list-style-type: none"> <li>Name: LIBRA</li> <li>Symbol: LIBRA Token</li> <li>Decimals: 18</li> <li>Initial Genesis Pool Distribution: 11,000 Tokens</li> <li>Initial Libra Pool Distribution: 140,000 Tokens</li> <li>Initial Airdrop Wallet Distribution: 10,000 Tokens</li> <li>Initial Supply: 1 LIBRA</li> <li>Burn Threshold: 1.1</li> <li>Max minting limit: No limit. An operator can mint unlimited tokens.</li> </ul>	<b>YES, This is valid.</b>
<b>File 4 LShare.sol</b> <ul style="list-style-type: none"> <li>Name: Libra Finance SHARE</li> <li>Symbol: LSHARE</li> <li>Decimals: 18</li> <li>Farming Pool Reward Allocation: 45500 Tokens;</li> <li>Treasury Fund Pool Allocation: 3500 Tokens</li> <li>Community Fund Pool Allocation: 14000 Tokens</li> </ul>	<b>YES, This is valid.</b>

<ul style="list-style-type: none"> <li>• Dev Fund Pool Allocation: 7000 Tokens</li> <li>• Vesting Duration: 365 Days</li> </ul>	
<b>File 5 Oracle.sol</b> <ul style="list-style-type: none"> <li>• Oracle has functions like: update, consult, twap.</li> </ul>	<b>YES, This is valid.</b>
<b>File 6 RebateTreasury.sol</b> <ul style="list-style-type: none"> <li>• Bond Vesting: 3 days</li> <li>• Bound Factor: 800,000</li> <li>• Bound threshold: 200,000</li> <li>• Buy Back Amount: 100,000</li> <li>• Denominator: 1 million</li> <li>• Secondary Factor: 150,000</li> <li>• Secondary Threshold: 700,000</li> </ul>	<b>YES, This is valid.</b>
<b>File 7 Treasury.sol</b> <ul style="list-style-type: none"> <li>• Period: 6 hours</li> <li>• Treasury has functions like: nextEpochPoint, setOperator, setLibraOracle, etc.</li> </ul>	<b>YES, This is valid.</b>
<b>File 8 LibraGenesisRewardPool.sol</b> <ul style="list-style-type: none"> <li>• Libra Per Second: 0.11574 LIBRA</li> <li>• Running Time: 24 hours</li> <li>• Total Rewards: 10000 LIBRA</li> </ul>	<b>YES, This is valid.</b>
<b>File 9 LibraRewardPool.sol</b> <ul style="list-style-type: none"> <li>• Pool Start Time: 4 days</li> <li>• Pool End Time: 5 days after start time</li> <li>• LibraRewardPool has functions like: checkPoolDuplicate, getGeneratedReward, etc.</li> </ul>	<b>YES, This is valid.</b>
<b>File 10 LShareRewardPool.sol</b> <ul style="list-style-type: none"> <li>• LShare Per Second: 0.00187687 Lshare</li> <li>• Running Time: 370 days</li> <li>• Total Rewards: 60000 Lshare</li> </ul>	<b>YES, This is valid.</b>

## Audit Summary

According to the standard audit assessment, Customer's solidity smart contracts are **"Secured"**. Also, 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 2 low and some very low level issues.**

**These are fixed / acknowledged in the revised code.**

**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	Moderated
	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	Passed
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	Acknowledged
	"Short Address" Attack	Passed
	"Double Spend" Attack	Passed

**Overall Audit Result: PASSED**

## Code Quality

This audit scope has 10 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 Libra Finance 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 Libra Finance Protocol.

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

Some code parts are **not** well commented on smart contracts. We suggest using Ethereum's NatSpec style for the commenting.

## Documentation

We were given a Libra Finance Protocol smart contract code in the form of a github link. 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

## Boardroom.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	checkSameOriginReentranted	internal	Passed	No Issue
3	checkSameSenderReentranted	internal	Passed	No Issue
4	onlyOneBlock	modifier	Passed	No Issue
5	totalSupply	read	Passed	No Issue
6	balanceOf	read	Passed	No Issue
7	stake	write	Passed	No Issue
8	withdraw	write	Passed	No Issue
9	onlyOperator	modifier	Passed	No Issue
10	memberExists	modifier	Passed	No Issue
11	updateReward	modifier	Passed	No Issue
12	notInitialized	modifier	Passed	No Issue
13	initialize	write	Passed	No Issue
14	setOperator	external	access only Operator	No Issue
15	setLockUp	external	access only Operator	No Issue
16	latestSnapshotIndex	read	Passed	No Issue
17	getLatestSnapshot	internal	Passed	No Issue
18	getLastSnapshotIndexOf	read	Passed	No Issue
19	getLastSnapshotOf	internal	Passed	No Issue
20	canWithdraw	external	Passed	No Issue
21	canClaimReward	external	Passed	No Issue
22	epoch	external	Passed	No Issue
23	nextEpochPoint	external	Passed	No Issue
24	getLibraPrice	external	Passed	No Issue
25	rewardPerShare	read	Passed	No Issue
26	earned	read	Passed	No Issue
27	stake	write	access only One Block	No Issue
28	withdraw	write	access only One Block	No Issue
29	exit	external	Passed	No Issue
30	claimReward	write	Passed	No Issue
31	allocateSeigniorage	external	access only One Block	No Issue
32	governanceRecoverUnsupported	external	access only Operator	No Issue

## LBond.sol

### Functions

Sl.	Functions	Type	Observation	Concluburnsion
1	constructor	write	Passed	No Issue
2	burn	write	Passed	No Issue
3	burnFrom	write	Passed	No Issue
4	operator	read	Passed	No Issue
5	onlyOperator	modifier	Passed	No Issue
6	isOperator	read	Passed	No Issue
7	transferOperator	write	access only Owner	No Issue
8	_transferOperator	internal	Passed	No Issue
9	mint	write	access only Operator	No Issue
10	burn	write	Passed	No Issue
11	burnFrom	write	access only Operator	No Issue

## Libra.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	burn	write	Passed	No Issue
3	burnFrom	write	Passed	No Issue
4	operator	read	Passed	No Issue
5	onlyOperator	modifier	Passed	No Issue
6	isOperator	read	Passed	No Issue
7	transferOperator	write	access only Owner	No Issue
8	_transferOperator	internal	Passed	No Issue
9	onlyTaxOffice	modifier	Passed	No Issue
10	onlyOperatorOrTaxOffice	modifier	Passed	No Issue
11	getTaxTiersTwapsCount	read	Passed	No Issue
12	getTaxTiersRatesCount	read	Passed	No Issue
13	isAddressExcluded	read	Passed	No Issue
14	setTaxTiersTwap	write	access only TaxOffice	No Issue
15	setTaxTiersRate	write	access only TaxOffice	No Issue
16	setBurnThreshold	write	access only TaxOffice	No Issue
17	_getLibraPrice	internal	Passed	No Issue
18	_updateTaxRate	internal	Passed	No Issue
19	enableAutoCalculateTax	write	access only TaxOffice	No Issue

20	disableAutoCalculateTax	write	access only TaxOffice	No Issue
21	setLibraOracle	write	access only Operator Or TaxOffice	No Issue
22	setTaxOffice	write	access only Operator Or TaxOffice	No Issue
23	setTaxCollectorAddress	write	access only TaxOffice	No Issue
24	setTaxRate	write	access only TaxOffice	No Issue
25	excludeAddress	write	access only Operator Or TaxOffice	No Issue
26	includeAddress	write	access only Operator Or TaxOffice	No Issue
27	mint	write	access only Operator	No Issue
28	burn	write	Passed	No Issue
29	burnFrom	write	access only Operator	No Issue
30	transferFrom	write	Passed	No Issue
31	transferWithTax	internal	Passed	No Issue
32	distributeReward	external	access only Operator	No Issue
33	governanceRecoverUnsu pported	external	access only Operator	No Issue

## LShare.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	burn	write	Passed	No Issue
3	burnFrom	write	Passed	No Issue
4	operator	read	Passed	No Issue
5	onlyOperator	modifier	Passed	No Issue
6	isOperator	read	Passed	No Issue
7	transferOperator	write	access only Owner	No Issue
8	_transferOperator	internal	Passed	No Issue
9	setCommunityFund	external	access only Operator	No Issue
10	setTreasuryFund	external	access only Operator	No Issue
11	setDevFund	external	Passed	No Issue

12	unclaimedCommunityFund	read	Passed	No Issue
13	unclaimedDevFund	read	Passed	No Issue
14	unclaimedTreasuryFund	read	Passed	No Issue
15	claimRewards	external	Passed	No Issue
16	distributeReward	external	access only Operator	No Issue
17	burn	write	Passed	No Issue
18	governanceRecoverUnsupported	write	access only Operator	No Issue

## Oracle.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	checkStartTime	modifier	Passed	No Issue
3	checkEpoch	modifier	Passed	No Issue
4	getCurrentEpoch	read	Passed	No Issue
5	getPeriod	read	Passed	No Issue
6	getStartTime	read	Passed	No Issue
7	getLastEpochTime	read	Passed	No Issue
8	nextEpochPoint	read	Passed	No Issue
9	setPeriod	external	access only Operator	No Issue
10	setEpoch	external	access only Operator	No Issue
11	update	external	Passed	No Issue
12	consult	external	Passed	No Issue
13	twap	external	Passed	No Issue

## RebateTreasury.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	onlyAsset	modifier	Passed	No Issue
8	bond	external	access only Asset	No Issue
9	claimRewards	external	Passed	No Issue
10	setLibra	external	access only Owner	No Issue
11	setLibraOracle	external	access only Owner	No Issue

12	setTreasury	external	access only Owner	No Issue
13	setAsset	external	access only Owner	No Issue
14	setBondParameters	external	access only Owner	No Issue
15	redeemAssetsForBuyback	external	access only Owner	No Issue
16	_claimVested	internal	Passed	No Issue
17	getLibraReturn	read	access only Asset	No Issue
18	getBondPremium	read	Passed	No Issue
19	getLibraPrice	read	Passed	No Issue
20	getTokenPrice	read	access only Asset	No Issue
21	claimableLibra	external		No Issue

## Treasury.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	checkSameOriginReentranted	internal	Passed	No Issue
3	checkSameSenderReentranted	internal	Passed	No Issue
4	onlyOneBlock	modifier	Passed	No Issue
5	onlyOperator	modifier	Passed	No Issue
6	checkCondition	modifier	Passed	No Issue
7	checkEpoch	modifier	Passed	No Issue
8	checkOperator	modifier	Passed	No Issue
9	notIntialized	modifier	Passed	No Issue
10	isIntialized	read	Passed	No Issue
11	nextEpochPoint	read	Passed	No Issue
12	getLibraPrice	read	Passed	No Issue
13	getLibraUpdatedPrice	read	Passed	No Issue
14	getReserve	read	Passed	No Issue
15	getBurnableLibraLeft	read	Passed	No Issue
16	getRedeemableBonds	read	Passed	No Issue
17	getBondDiscountRate	read	Passed	No Issue
18	getBondPremiumRate	read	Passed	No Issue
19	initialize	write	Passed	No Issue
20	setOperator	external	access only Operator	No Issue
21	setBoardroom	external	access only Operator	No Issue
22	setBondTreasury	external	access only Operator	No Issue
23	setLibraOracle	external	access only Operator	No Issue
24	setLibraPriceCeiling	external	access only Operator	No Issue

25	setMaxSupplyExpansionPercents	external	access only Operator	No Issue
26	setSupplyTiersEntry	external	access only Operator	No Issue
27	setMaxExpansionTiersEntry	external	access only Operator	No Issue
28	setBondDepletionFloorPercent	external	access only Operator	No Issue
29	setMaxSupplyContractionPercent	external	access only Operator	No Issue
30	setMaxDebtRatioPercent	external	access only Operator	No Issue
31	setBootstrap	external	access only Operator	No Issue
32	setExtraFunds	external	access only Operator	No Issue
33	setMaxDiscountRate	external	access only Operator	No Issue
34	setMaxPremiumRate	external	access only Operator	No Issue
35	setDiscountPercent	external	access only Operator	No Issue
36	setPremiumThreshold	external	access only Operator	No Issue
37	setPremiumPercent	external	access only Operator	No Issue
38	setMintingFactorForPayingDebt	external	access only Operator	No Issue
39	setBondSupplyExpansionPercent	external	access only Operator	No Issue
40	updateLibraPrice	internal	Passed	No Issue
41	getLibraCirculatingSupply	read	Passed	No Issue
42	buyBonds	external	access only One Block	No Issue
43	redeemBonds	external	access only One Block	No Issue
44	_sendToBoardroom	internal	Passed	No Issue
45	_sendToBondTreasury	internal	Passed	No Issue
46	_calculateMaxSupplyExpansionPercent	internal	Passed	No Issue
47	allocateSeigniorage	external	access only One Block	No Issue
48	governanceRecoverUnsupported	external	access only Operator	No Issue
49	boardroomSetOperator	external	access only Operator	No Issue
50	boardroomSetLockUp	external	access only Operator	No Issue



51	boardroomAllocateSeigniorage	external	access only Operator	No Issue
52	boardroomGovernanceRecoverUnsupported	external	access only Operator	No Issue

## LibraGenesisRewardPool.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	onlyOperator	modifier	Passed	No Issue
3	checkPoolDuplicate	internal	Passed	No Issue
4	add	write	access only Operator	No Issue
5	set	write	access only Operator	No Issue
6	getGeneratedReward	read	Passed	No Issue
7	pendingLIBRA	external	Passed	No Issue
8	massUpdatePools	write	Passed	No Issue
9	updatePool	write	Passed	No Issue
10	deposit	write	Passed	No Issue
11	withdraw	write	Passed	No Issue
12	emergencyWithdraw	write	Passed	No Issue
13	safeLibraTransfer	internal	Passed	No Issue
14	setOperator	external	access only Operator	No Issue
15	governanceRecoverUnsupported	external	access only Operator	No Issue

## LibraRewardPool.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	onlyOperator	modifier	Passed	No Issue
3	checkPoolDuplicate	internal	Passed	No Issue
4	add	write	access only Operator	No Issue
5	set	write	access only Operator	No Issue
6	getGeneratedReward	read	Passed	No Issue
7	pendingLIBRA	external	Passed	No Issue
8	massUpdatePools	write	Passed	No Issue
9	updatePool	write	Passed	No Issue
10	deposit	write	Passed	No Issue
11	withdraw	write	Passed	No Issue

12	emergencyWithdraw	write	Passed	No Issue
13	safeLibraTransfer	internal	Passed	No Issue
14	setOperator	external	access only Operator	No Issue
15	governanceRecoverUnsuported	external	access only Operator	No Issue

## LShareRewardPool.sol

### Functions

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	onlyOperator	modifier	Passed	No Issue
3	checkPoolDuplicate	internal	Passed	No Issue
4	add	write	access only Operator	No Issue
5	set	write	access only Operator	No Issue
6	getGeneratedReward	read	Passed	No Issue
7	pendingShare	external	Passed	No Issue
8	massUpdatePools	write	Passed	No Issue
9	updatePool	write	Passed	No Issue
10	deposit	write	Passed	No Issue
11	withdraw	write	Passed	No Issue
12	emergencyWithdraw	write	Passed	No Issue
13	safeLShareTransfer	internal	Passed	No Issue
14	setOperator	external	access only Operator	No Issue
15	governanceRecoverUnsuported	external	access only Operator	No Issue

## Severity Definitions

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

```
function mint(address recipient_, uint256 amount_) public onlyOperator returns (bool) {  
    uint256 balanceBefore = balanceOf(recipient_);  
    _mint(recipient_, amount_);  
    uint256 balanceAfter = balanceOf(recipient_);  
  
    return balanceAfter > balanceBefore;  
}
```

It is advisable to set an upper minting limit in the LIBRA and LBOND tokens contracts. This is considered good for healthy tokenomics.

**Resolution:** We advise setting a max minting limit. On the other hand, this also can be acknowledged by the owner to mint it responsibly.

**Status:** Acknowledged

(2) Missing Event Log: There are some events missing in the `LibraRewardPool.sol`, `LibraGenesisRewardPool` and `LShareRewardPool.sol` smart contracts. It is recommended to fire appropriate events in case of important state change.

Some functions need an event log.

- `add`
- `set`
- `updatePool`
- `governanceRecoverUnsupported`

**Resolution:** We suggest adding an event log for above listed functions.

**Status: Acknowledged**

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

(1) Function input parameters lack of check:

Input variable validation is not performed in the function of `LibraGenesisRewardPool.sol`, `LibraRewardPool.sol`, `LShareRewardPool` smart contracts.

Variable validation is not performed in below functions :

- `governanceRecoverUnsupported`

**Resolution:** We advise using validation like address type variables should not be `address(0)`. This helps protect the information to be added mistakenly.

**Status: Acknowledged**

(2) Variables should be made immutable:

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.

- **LibraGenesisRewardPool.sol**
  - libra, poolStartTime, poolEndTime
- **LibraRewardPool.sol**
  - libra, poolStartTime, epochEndTimes, epochLibraPerSecond
- **LShareRewardPool.sol**
  - lshare, poolStartTime, poolEndTime
- **Treasury.sol**
  - libra, lbond, lshare, libraPriceOne
- **LShare.sol**
  - startTime, endTime, communityFundRewardRate, devFundRewardRate, treasuryFundRewardRate

**Resolution:** We suggest setting these variables as immutable.

**Status: Acknowledged**

# 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:

- setOperator: Boardroom operator can set operator address.
- setLockUp: Boardroom operator can withdraw Lockup Epochs, reward Lockup Epochs values set.
- allocateSeigniorage: Boardroom operators can allocate seigniorage.
- governanceRecoverUnsupported: Boardroom operators can governance recover unsupported tokens.
- mint: LBond Operator mints basis bonds to a recipient.
- burnFrom: LBond Operator can burn from amount.
- governanceRecoverUnsupported: LBond operators can governance recover unsupported tokens.
- distributeReward: Libra operators can distribute to the reward pool.
- burnFrom: Libra operators can burn from amount.
- mint: Libra Operator mints LIBRA to a recipient.
- includeAddress: Libra operators can include addresses.
- setTaxOffice: Libra operators can set tax office addresses.
- setLibraOracle: Libra operators can set libra oracle addresses.
- governanceRecoverUnsupported: LShare operators can governance recover unsupported tokens.
- distributeReward: LShare operators can distribute to the reward pool.
- setTreasuryFund: LShare operators can set treasury fund addresses.
- setCommunityFund: LShare operators can set community fund addresses.
- setLibra: RebateTreasury owner can set libra token address.
- setLibraOracle: RebateTreasury owner can set libra oracle address.
- setTreasury: RebateTreasury owner can set Libra treasury address.
- setAsset: RebateTreasury owner can set bonding parameters of token.
- setBondParameters: RebateTreasury owners can set bond pricing parameters.
- redeemAssetsForBuyback: RebateTreasury owners can redeem assets for buyback under peg.

- add: LibraGenesisRewardPool owner can add a new token to the pool.
- set: LibraGenesisRewardPool owner can update the given pool's LIBRA allocation point.
- setOperator: LibraGenesisRewardPool owner can set operator address.
- governanceRecoverUnsupported: LibraGenesisRewardPool operators can governance recover unsupported tokens.
- add: LibraRewardPool owner can add a new token to the pool.
- set: LibraRewardPool owner can update the given pool's LIBRA allocation point.
- setOperator:LibraRewardPool owner can set operator address.
- governanceRecoverUnsupported: LibraRewardPool operators can governance recover unsupported tokens.
- governanceRecoverUnsupported: LShareRewardPool operators can governance recover unsupported tokens.
- setOperator: LShareRewardPool can set operator address.
- set: LShareRewardPool owner can update the given pool's ISHARE allocation point.
- add: LShareRewardPool owner can add a new lp to the pool.

To make the smart contract 100% decentralized, we suggest renouncing ownership in the smart contract once its function is completed.



# 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 had observed some issues in the smart contracts, but they were resolved / acknowledged in the revised smart contract code. **So, the smart contracts are ready for the mainnet deployment.**

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.

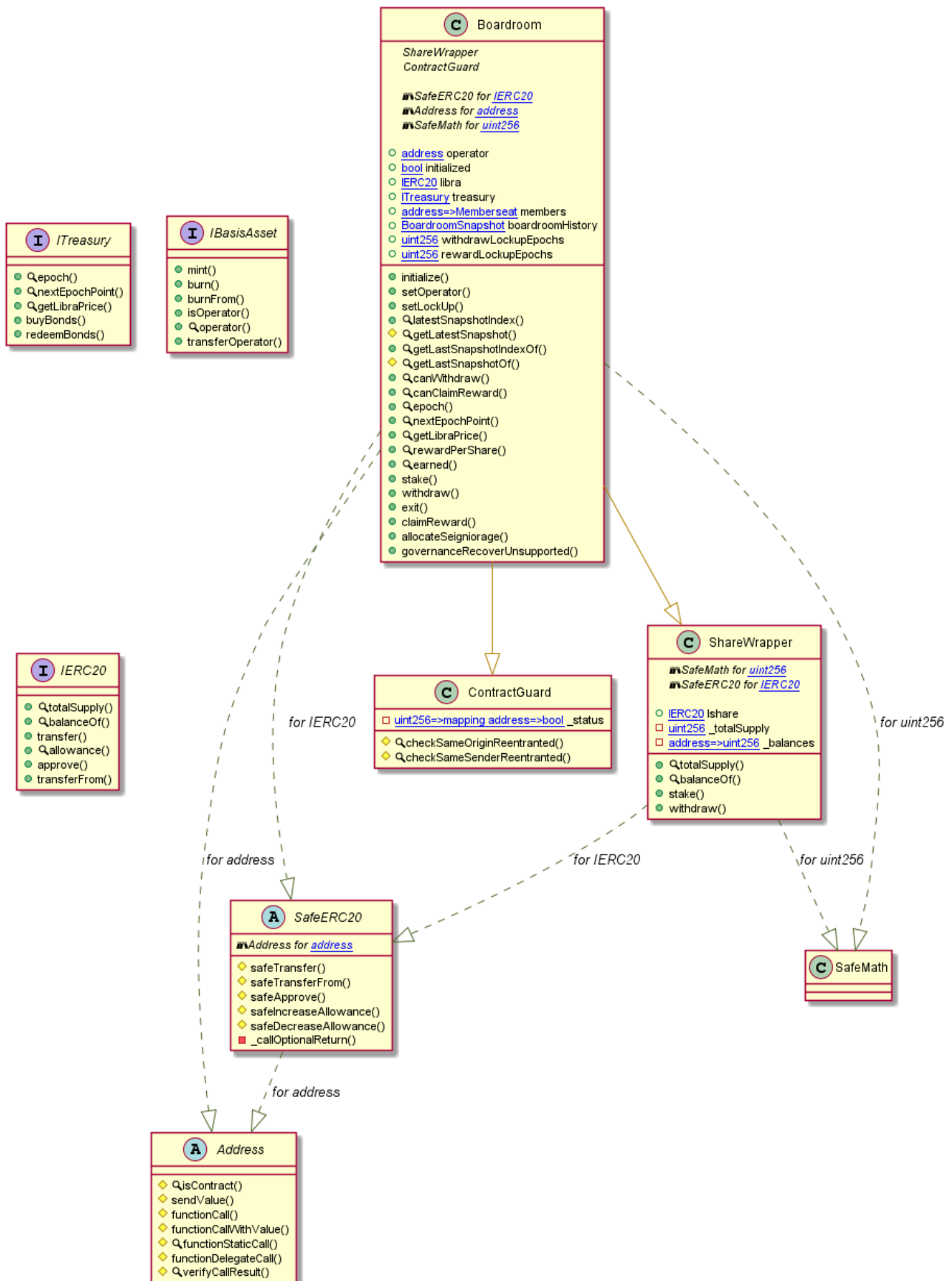
## Technical Disclaimer

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 - Libra Finance Protocol

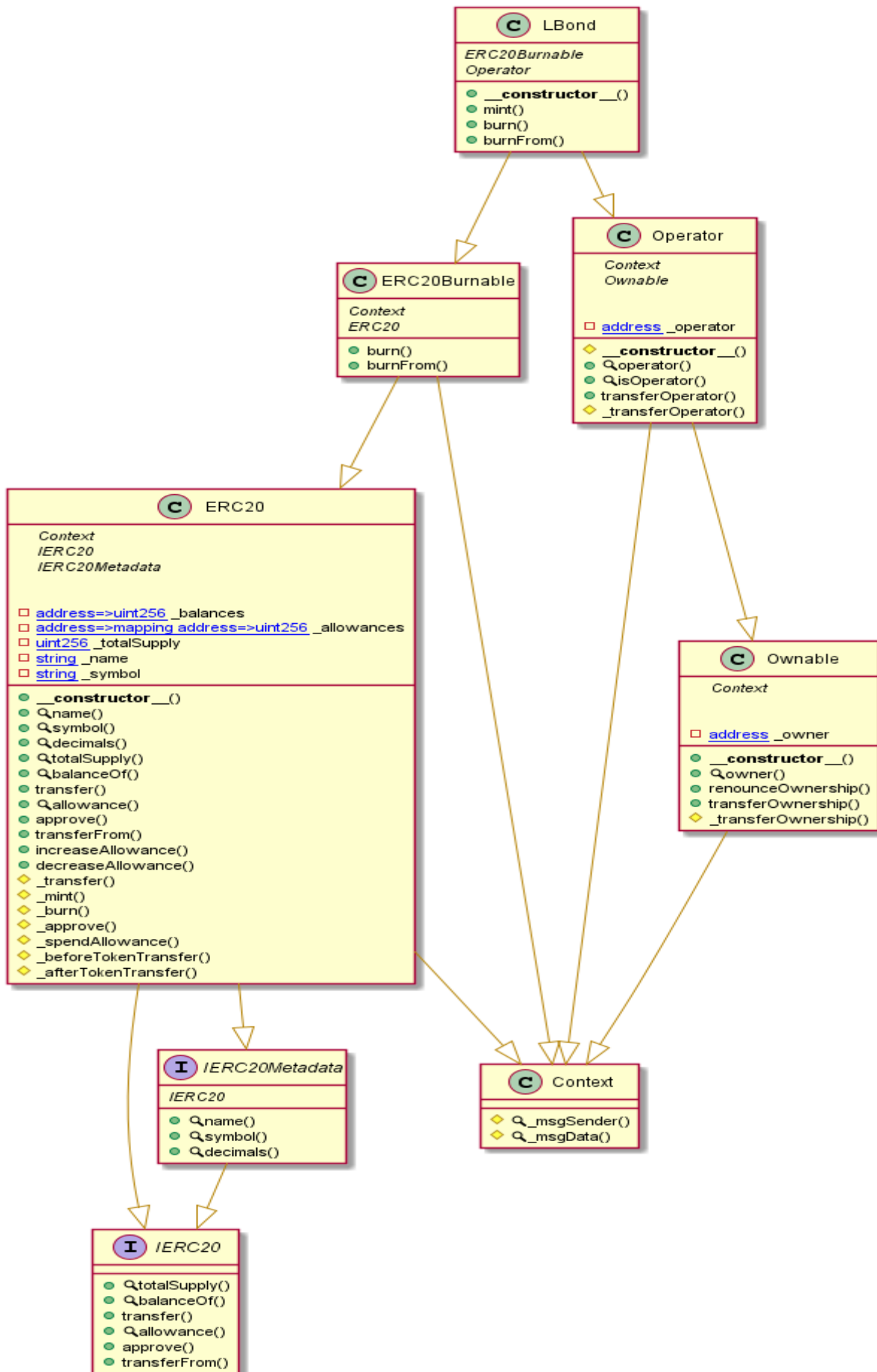
### Boardroom Diagram



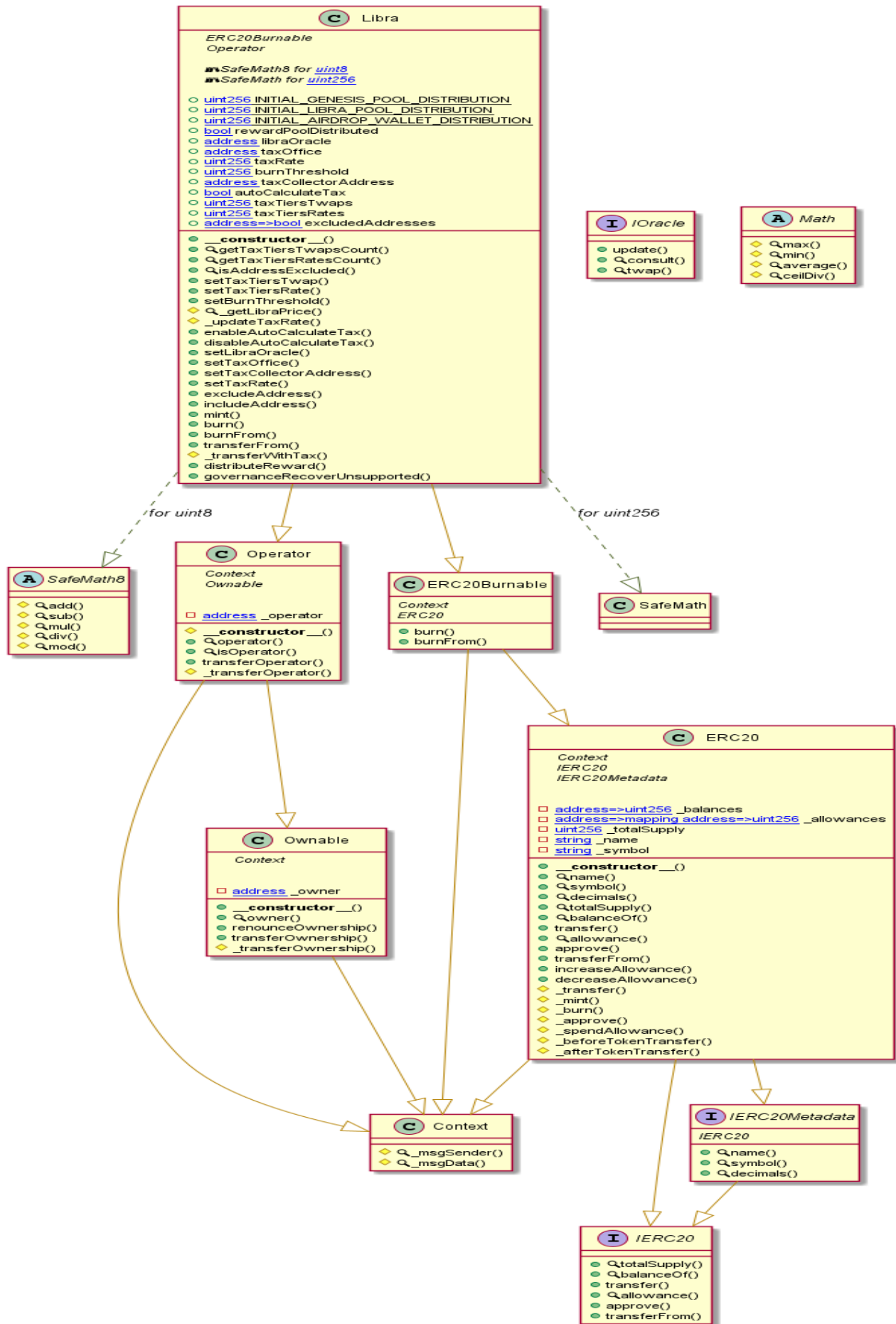
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## LBond Diagram



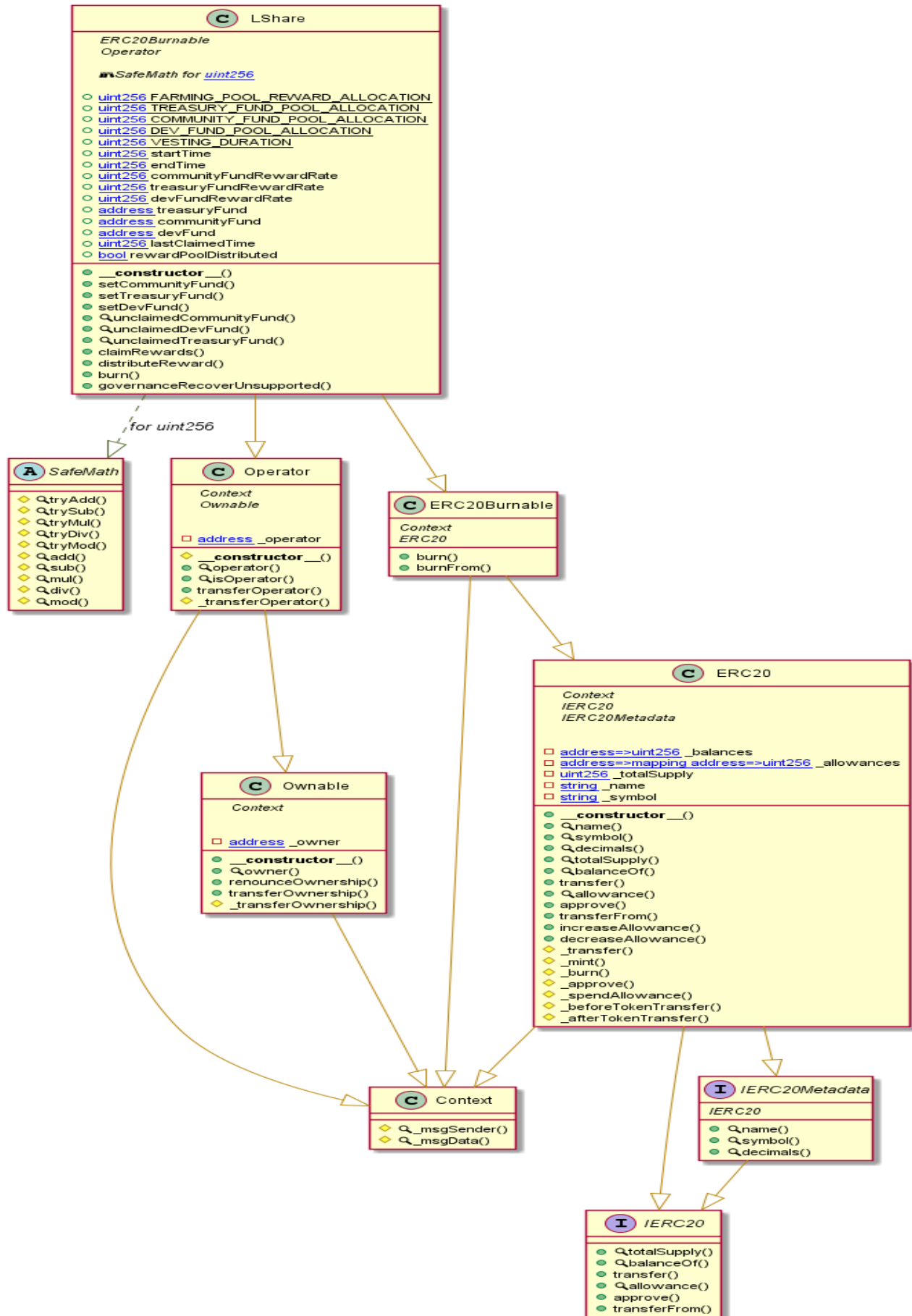
# Libra Diagram



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# LShare Diagram

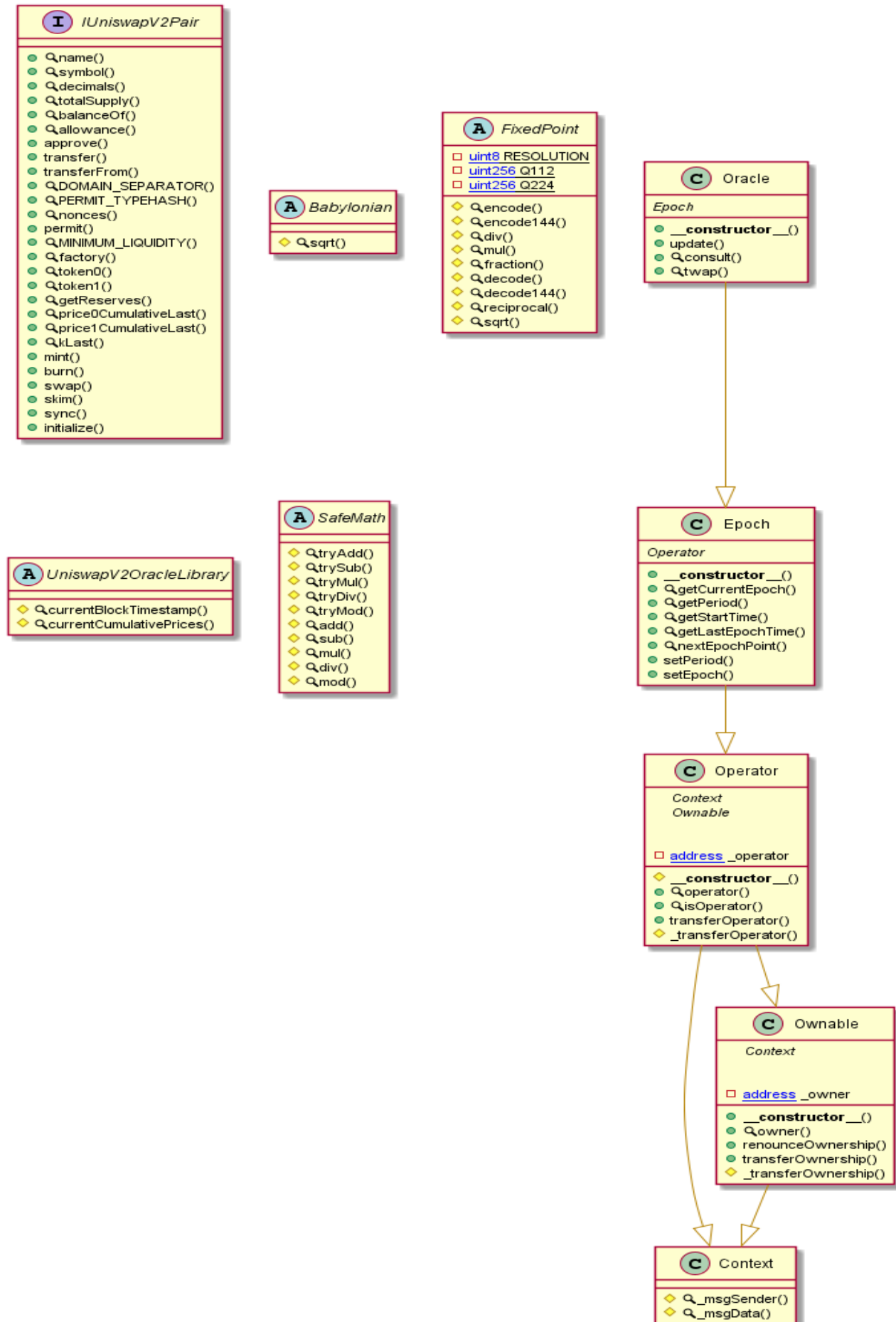


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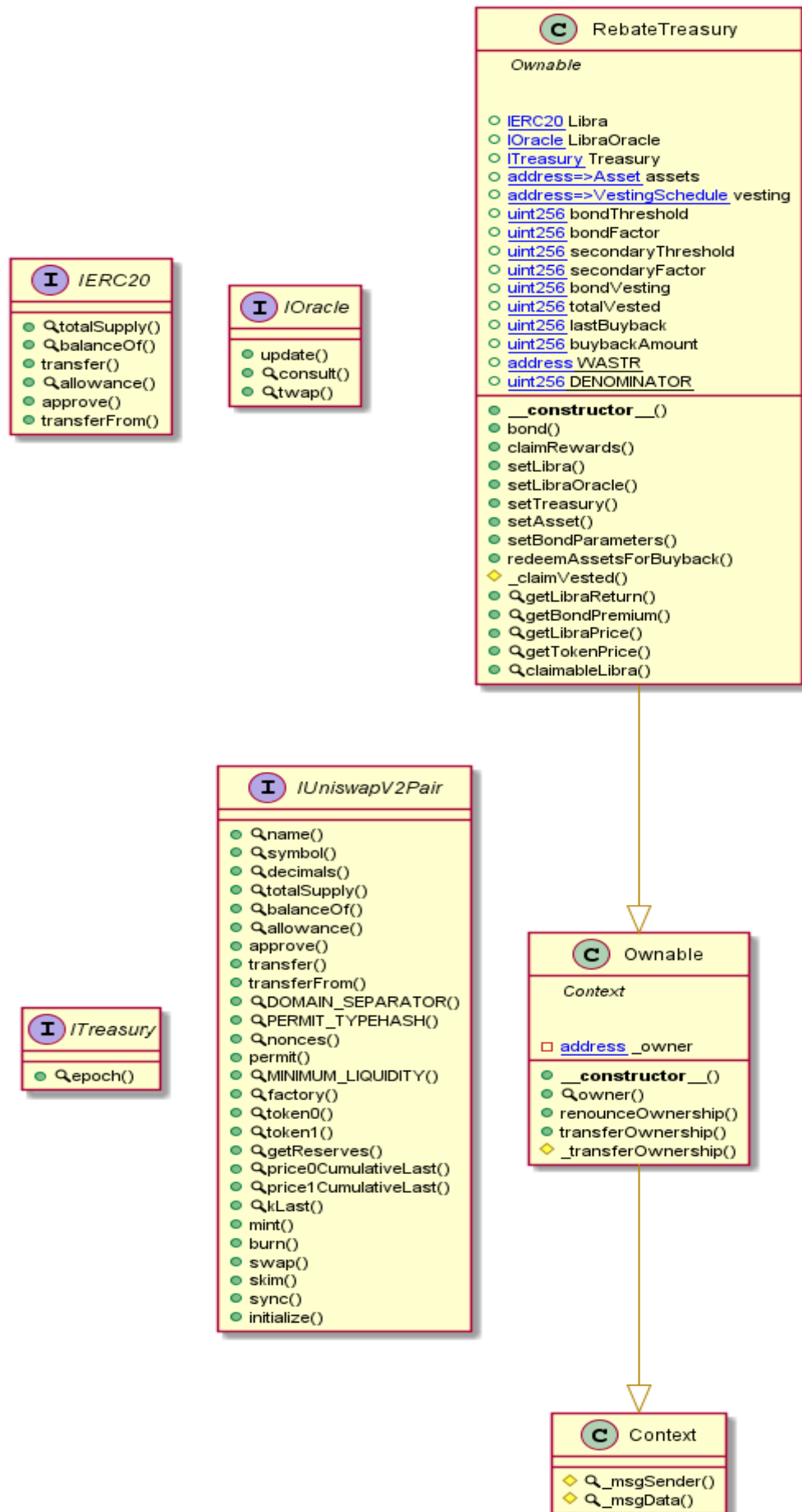
# Oracle Diagram



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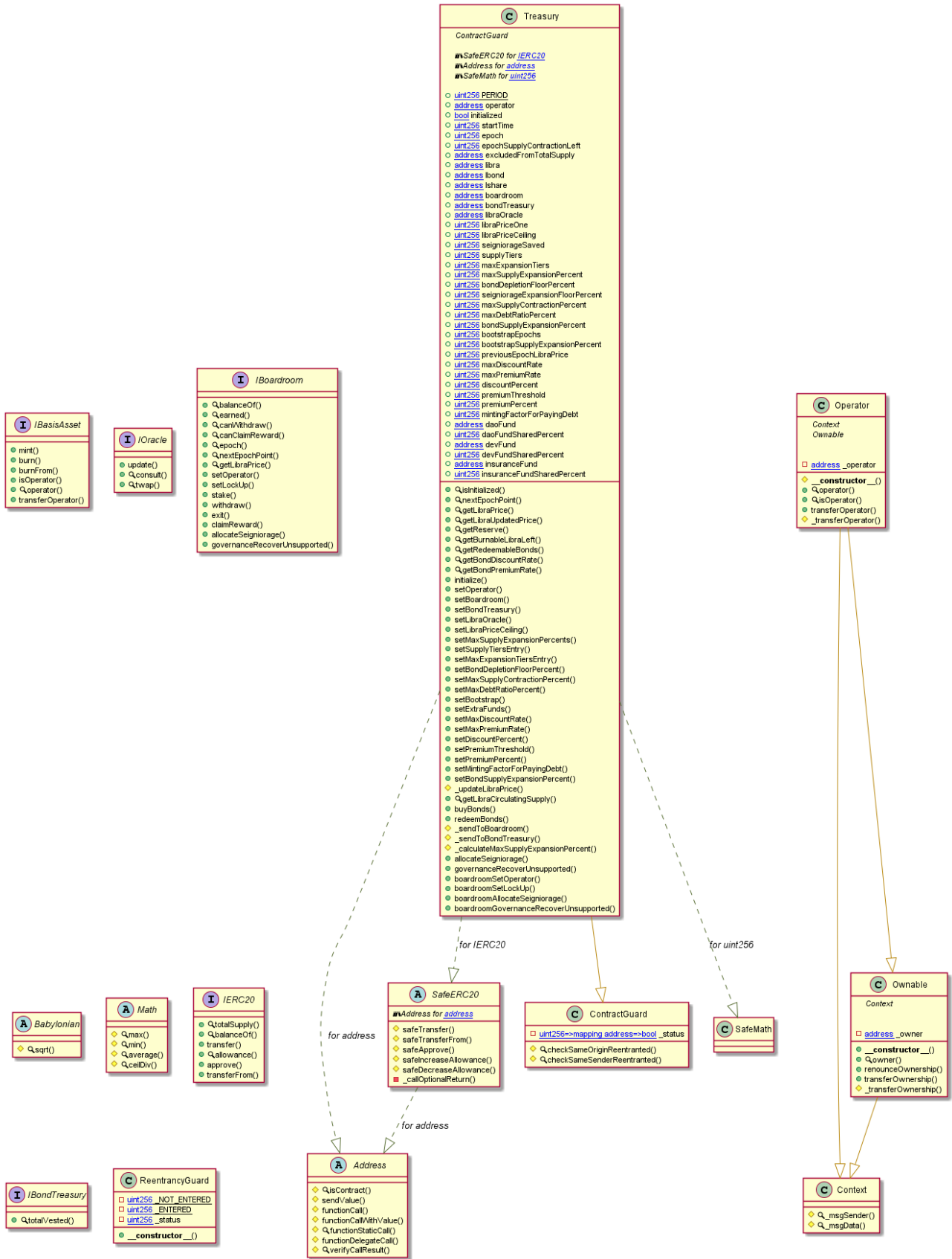
## RebateTreasury Diagram



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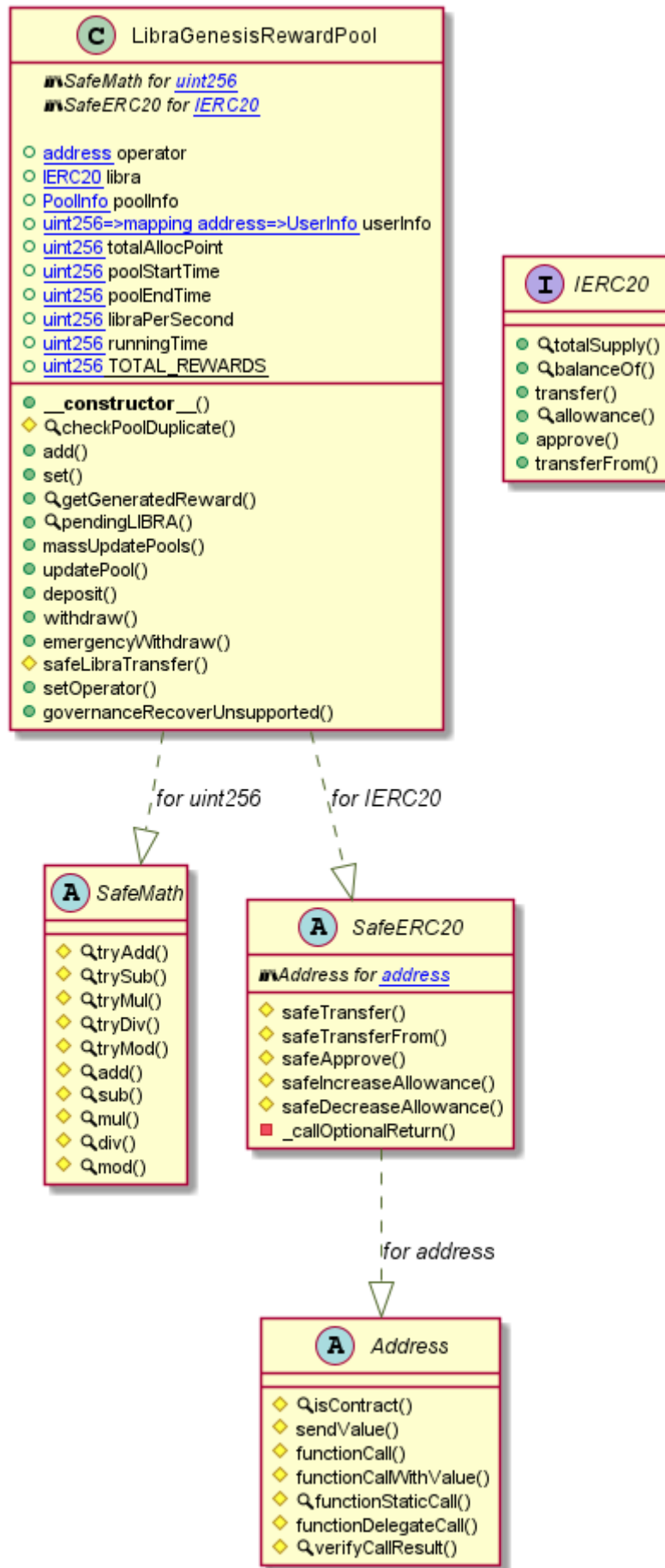
## Treasury Diagram



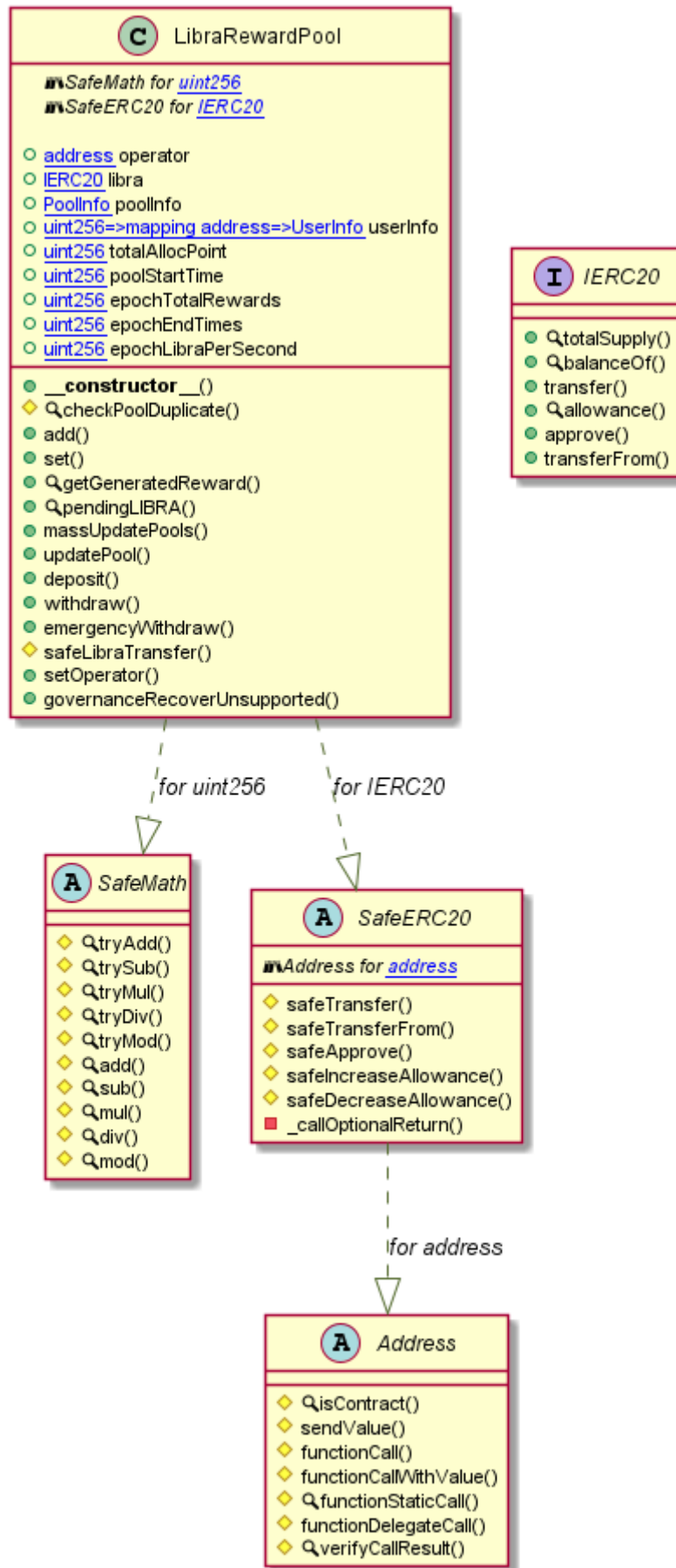
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Email: [audit@EtherAuthority.io](mailto:audit@EtherAuthority.io)

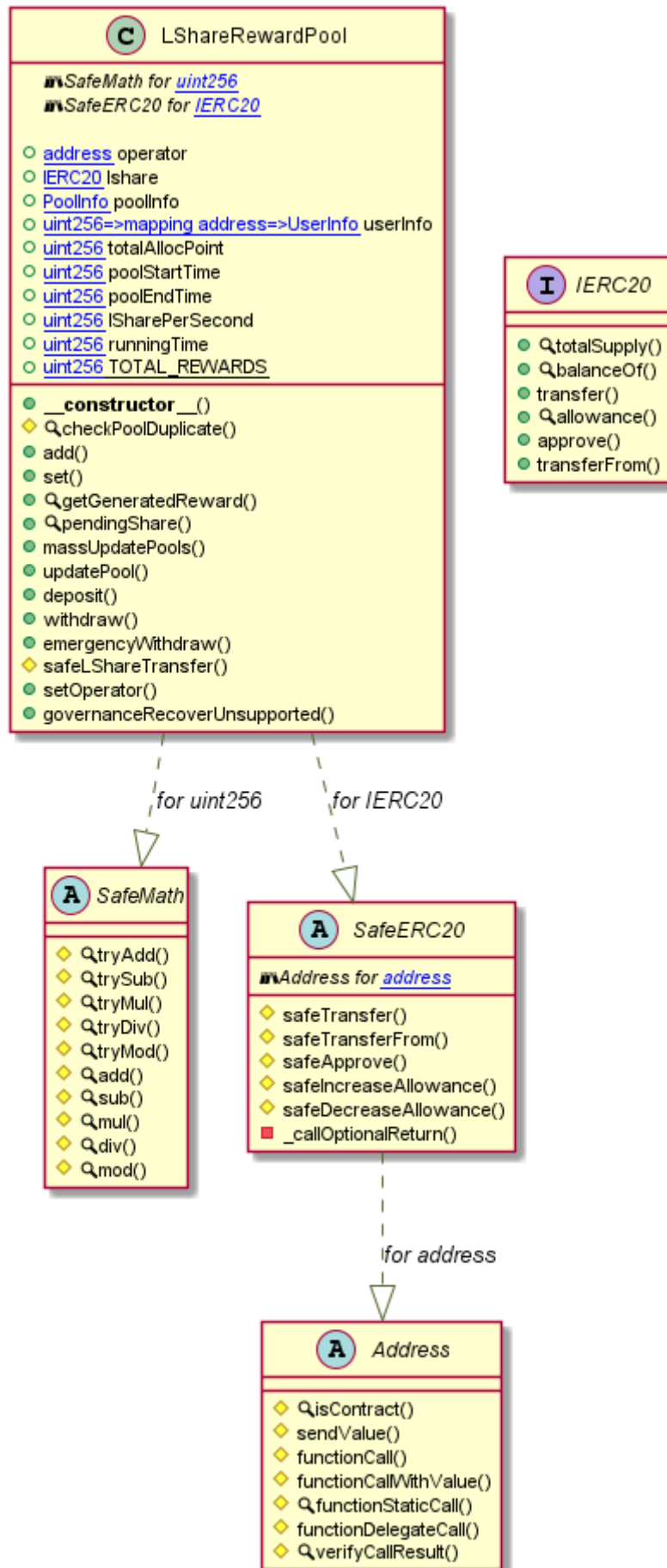
## Libra Genesis Reward Pool Diagram



## Libra Reward Pool Diagram



## LShare Reward Pool Diagram





# Slither Results Log

## Slither log >> Boardroom.sol

```
INFO:Detectors:
Boardroom.setOperator(address) (Boardroom.sol#763-765) should emit an event for:
- operator = _operator (Boardroom.sol#764)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-events-access-control
INFO:Detectors:
Boardroom.setLockUp(uint256,uint256) (Boardroom.sol#767-771) should emit an event for:
- withdrawLockupEpochs = _withdrawLockupEpochs (Boardroom.sol#769)
- rewardLockupEpochs = _rewardLockupEpochs (Boardroom.sol#770)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-events-arithmetic
INFO:Detectors:
Boardroom.setOperator(address)._operator (Boardroom.sol#763) lacks a zero-check on :
- operator = _operator (Boardroom.sol#764)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-zero-address-validation
INFO:Detectors:
Reentrancy in Boardroom.allocateSeigniorage(uint256) (Boardroom.sol#858-875):
  External calls:
  - libra.safeTransferFrom(msg.sender,address(this),amount) (Boardroom.sol#873)
  Event emitted after the call(s):
  - RewardAdded(msg.sender,amount) (Boardroom.sol#874)
Reentrancy in Boardroom.claimReward() (Boardroom.sol#847-856):
  External calls:
  - libra.safeTransfer(msg.sender,reward) (Boardroom.sol#853)
  Event emitted after the call(s):
  - RewardPaid(msg.sender,reward) (Boardroom.sol#854)
Reentrancy in Boardroom.stake(uint256) (Boardroom.sol#828-833):
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code
INFO:Detectors:
Low level call in Address.sendValue(address,uint256) (Boardroom.sol#158-163):
- (success) = recipient.call{value: amount}() (Boardroom.sol#161)
Low level call in Address.functionCallWithValue(address,bytes,uint256,string) (Boardroom.sol#226-237):
- (success,returndata) = target.call{value: value}(data) (Boardroom.sol#235)
Low level call in Address.functionStaticCall(address,bytes,string) (Boardroom.sol#255-264):
- (success,returndata) = target.staticcall(data) (Boardroom.sol#262)
Low level call in Address.functionDelegateCall(address,bytes,string) (Boardroom.sol#282-291):
- (success,returndata) = target.delegatecall(data) (Boardroom.sol#289)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#low-level-calls
INFO:Detectors:
Parameter Boardroom.initialize(IERC20,IERC20,ITreasury)._libra (Boardroom.sol#744) is not in mixedCase
Parameter Boardroom.initialize(IERC20,IERC20,ITreasury)._lshare (Boardroom.sol#745) is not in mixedCase
Parameter Boardroom.initialize(IERC20,IERC20,ITreasury)._treasury (Boardroom.sol#746) is not in mixedCase
Parameter Boardroom.setOperator(address)._operator (Boardroom.sol#763) is not in mixedCase
Parameter Boardroom.setLockUp(uint256,uint256)._withdrawLockupEpochs (Boardroom.sol#767) is not in mixedCase
Parameter Boardroom.setLockUp(uint256,uint256)._rewardLockupEpochs (Boardroom.sol#767) is not in mixedCase
Parameter Boardroom.governanceRecoverUnsupported(IERC20,uint256,address)._token (Boardroom.sol#878) is not in mixedCase
Parameter Boardroom.governanceRecoverUnsupported(IERC20,uint256,address)._amount (Boardroom.sol#879) is not in mixedCase
Parameter Boardroom.governanceRecoverUnsupported(IERC20,uint256,address)._to (Boardroom.sol#880) is not in mixedCase
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#conformance-to-solidity-naming-conventions
INFO:Detectors:
initialize(IERC20,IERC20,ITreasury) should be declared external:
- Boardroom.initialize(IERC20,IERC20,ITreasury) (Boardroom.sol#743-761)
rewardPerShare() should be declared external:
- Boardroom.rewardPerShare() (Boardroom.sol#815-817)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:Boardroom.sol analyzed (9 contracts with 75 detectors), 44 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration
```

## Slither log >> LBond.sol

```
INFO:Detectors:
Context._msgData() (LBond.sol#101-103) 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() (LBond.sol#133-135)
symbol() should be declared external:
- ERC20.symbol() (LBond.sol#141-143)
decimals() should be declared external:
- ERC20.decimals() (LBond.sol#158-160)
totalSupply() should be declared external:
- ERC20.totalSupply() (LBond.sol#165-167)
transfer(address,uint256) should be declared external:
- ERC20.transfer(address,uint256) (LBond.sol#184-188)
approve(address,uint256) should be declared external:
- ERC20.approve(address,uint256) (LBond.sol#207-211)
transferFrom(address,address,uint256) should be declared external:
- ERC20.transferFrom(address,address,uint256) (LBond.sol#229-238)
increaseAllowance(address,uint256) should be declared external:
- ERC20.increaseAllowance(address,uint256) (LBond.sol#252-256)
decreaseAllowance(address,uint256) should be declared external:
- ERC20.decreaseAllowance(address,uint256) (LBond.sol#272-281)
renounceOwnership() should be declared external:
- Ownable.renounceOwnership() (LBond.sol#517-519)
transferOwnership(address) should be declared external:
- Ownable.transferOwnership(address) (LBond.sol#525-528)
operator() should be declared external:
- Operator.operator() (LBond.sol#551-553)
isOperator() should be declared external:
- Operator.isOperator() (LBond.sol#560-562)
transferOperator(address) should be declared external:
- Operator.transferOperator(address) (LBond.sol#564-566)
mint(address,uint256) should be declared external:
- LBond.mint(address,uint256) (LBond.sol#587-593)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:LBond.sol analyzed (8 contracts with 75 detectors), 16 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration
```

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## Slither log >> Libra.sol

```
INFO:Detectors:
Libra.setBurnThreshold(uint256) (Libra.sol#1072-1074) should emit an event for:
  - burnThreshold = _burnThreshold (Libra.sol#1073)
Libra.setTaxRate(uint256) (Libra.sol#1120-1124) should emit an event for:
  - taxRate = _taxRate (Libra.sol#1123)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-events-arithmetic
INFO:Detectors:
Libra.constructor(uint256,address)._taxCollectorAddress (Libra.sol#1026) lacks a zero-check on :
  - taxCollectorAddress = _taxCollectorAddress (Libra.sol#1035)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-zero-address-validation
INFO:Detectors:
Variable 'Libra._getLibraPrice().price (Libra.sol#1077)' in Libra._getLibraPrice() (Libra.sol#1076-1082) potentially used before declaration: uint256(_price) (Libra.sol#1078)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#pre-declaration-usage-of-local-variables
INFO:Detectors:
Libra._updateTaxRate(uint256) (Libra.sol#1084-1094) has costly operations inside a loop:
  - taxRate = taxTiersRates[tierId] (Libra.sol#1089)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#costly-operations-inside-a-loop
INFO:Detectors:
Context.msgData() (Libra.sol#288-290) is never used and should be removed
Math.average(uint256,uint256) (Libra.sol#175-178) is never used and should be removed
Math.ceilDiv(uint256,uint256) (Libra.sol#186-189) is never used and should be removed
Math.max(uint256,uint256) (Libra.sol#160-162) is never used and should be removed
```

Reference: <https://github.com/crytic/slither/wiki/Detector-Documentation#conformance-to-solidity-naming-conventions>

```
INFO:Detectors:
renounceOwnership() should be declared external:
  - Ownable.renounceOwnership() (Libra.sol#326-328)
transferOwnership(address) should be declared external:
  - Ownable.transferOwnership(address) (Libra.sol#334-337)
operator() should be declared external:
  - Operator.operator() (Libra.sol#360-362)
transferOperator(address) should be declared external:
  - Operator.transferOperator(address) (Libra.sol#373-375)
name() should be declared external:
  - ERC20.name() (Libra.sol#411-413)
symbol() should be declared external:
  - ERC20.symbol() (Libra.sol#419-421)
decimals() should be declared external:
  - ERC20.decimals() (Libra.sol#436-438)
totalSupply() should be declared external:
  - ERC20.totalSupply() (Libra.sol#443-445)
transfer(address,uint256) should be declared external:
  - ERC20.transfer(address,uint256) (Libra.sol#462-466)
approve(address,uint256) should be declared external:
  - ERC20.approve(address,uint256) (Libra.sol#485-489)
transferFrom(address,address,uint256) should be declared external:
  - ERC20.transferFrom(address,address,uint256) (Libra.sol#507-516)
  - Libra.transferFrom(address,address,uint256) (Libra.sol#1160-1185)
increaseAllowance(address,uint256) should be declared external:
  - ERC20.increaseAllowance(address,uint256) (Libra.sol#530-534)
decreaseAllowance(address,uint256) should be declared external:
  - ERC20.decreaseAllowance(address,uint256) (Libra.sol#550-559)
isAddressExcluded(address) should be declared external:
  - Libra.isAddressExcluded(address) (Libra.sol#1048-1050)
setTaxTiersTwap(uint8,uint256) should be declared external:
  - Libra.setTaxTiersTwap(uint8,uint256) (Libra.sol#1052-1063)
setTaxTiersRate(uint8,uint256) should be declared external:
  - Libra.setTaxTiersRate(uint8,uint256) (Libra.sol#1065-1070)
setBurnThreshold(uint256) should be declared external:
  - Libra.setBurnThreshold(uint256) (Libra.sol#1072-1074)
```

```
setBurnThreshold(uint256) should be declared external:
  - Libra.setBurnThreshold(uint256) (Libra.sol#1072-1074)
enableAutoCalculateTax() should be declared external:
  - Libra.enableAutoCalculateTax() (Libra.sol#1096-1098)
disableAutoCalculateTax() should be declared external:
  - Libra.disableAutoCalculateTax() (Libra.sol#1100-1102)
setLibraOracle(address) should be declared external:
  - Libra.setLibraOracle(address) (Libra.sol#1104-1107)
setTaxOffice(address) should be declared external:
  - Libra.setTaxOffice(address) (Libra.sol#1109-1113)
setTaxCollectorAddress(address) should be declared external:
  - Libra.setTaxCollectorAddress(address) (Libra.sol#1115-1118)
setTaxRate(uint256) should be declared external:
  - Libra.setTaxRate(uint256) (Libra.sol#1120-1124)
includeAddress(address) should be declared external:
  - Libra.includeAddress(address) (Libra.sol#1132-1136)
mint(address,uint256) should be declared external:
  - Libra.mint(address,uint256) (Libra.sol#1144-1150)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:Libra.sol analyzed (12 contracts with 75 detectors), 74 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration
```

## Slither log >> LShare.sol

```
INFO:Detectors:
LShare.unclaimedCommunityFund() (LShare.sol#851-856) uses timestamp for comparisons
  Dangerous comparisons:
    - now > endTime (LShare.sol#853)
    - lastClaimedTime >= now (LShare.sol#854)
LShare.unclaimedDevFund() (LShare.sol#858-863) uses timestamp for comparisons
  Dangerous comparisons:
    - now > endTime (LShare.sol#860)
    - lastClaimedTime >= now (LShare.sol#861)
LShare.unclaimedTreasuryFund() (LShare.sol#865-870) uses timestamp for comparisons
  Dangerous comparisons:
    - now > endTime (LShare.sol#867)
    - lastClaimedTime >= now (LShare.sol#868)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#block-timestamp
```

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```

INFO:Detectors:
renounceOwnership() should be declared external:
- Ownable.renounceOwnership() (LShare.sol#352-354)
transferOwnership(address) should be declared external:
- Ownable.transferOwnership(address) (LShare.sol#360-363)
operator() should be declared external:
- Operator.operator() (LShare.sol#386-388)
isOperator() should be declared external:
- Operator.isOperator() (LShare.sol#395-397)
transferOperator(address) should be declared external:
- Operator.transferOperator(address) (LShare.sol#399-401)
name() should be declared external:
- ERC20.name() (LShare.sol#437-439)
symbol() should be declared external:
- ERC20.symbol() (LShare.sol#445-447)
decimals() should be declared external:
- ERC20.decimals() (LShare.sol#462-464)
totalSupply() should be declared external:
- ERC20.totalSupply() (LShare.sol#469-471)
balanceOf(address) should be declared external:
- ERC20.balanceOf(address) (LShare.sol#476-478)
transfer(address,uint256) should be declared external:
- ERC20.transfer(address,uint256) (LShare.sol#488-492)
approve(address,uint256) should be declared external:
- ERC20.approve(address,uint256) (LShare.sol#511-515)
transferFrom(address,address,uint256) should be declared external:
- ERC20.transferFrom(address,address,uint256) (LShare.sol#533-542)
increaseAllowance(address,uint256) should be declared external:
- ERC20.increaseAllowance(address,uint256) (LShare.sol#556-560)
decreaseAllowance(address,uint256) should be declared external:
- ERC20.decreaseAllowance(address,uint256) (LShare.sol#576-585)
burnFrom(address,uint256) should be declared external:
- ERC20Burnable.burnFrom(address,uint256) (LShare.sol#781-784)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:LShare.sol analyzed (9 contracts with 75 detectors), 38 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration

```

## Slither log >> Oracle.sol

```

INFO:Detectors:
UniswapV2OracleLibrary.currentCumulativePrices(address) (Oracle.sol#194-218) uses timestamp for comparisons
Dangerous comparisons:
- block.timestampLast != block.timestamp (Oracle.sol#209)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#block-timestamp

```

```

INFO:Detectors:
Babylonian.sqrt(uint256) (Oracle.sol#95-107) is never used and should be removed
Context._msgData() (Oracle.sol#439-441) is never used and should be removed
FixedPoint.decode(FixedPoint.uq112x112) (Oracle.sol#159-161) is never used and should be removed
FixedPoint.div(FixedPoint.uq112x112,uint112) (Oracle.sol#138-141) is never used and should be removed
FixedPoint.encode(uint112) (Oracle.sol#128-130) is never used and should be removed
FixedPoint.encode144(uint144) (Oracle.sol#133-135) is never used and should be removed
FixedPoint.reciprocal(FixedPoint.uq112x112) (Oracle.sol#169-172) is never used and should be removed

```

```

Variable UniswapV2OracleLibrary.currentCumulativePrices(address).price0Cumulative (Oracle.sol#198) is too similar to UniswapV2OracleLibrary.currentCumulativePrices(address).price1Cumulative (Oracle.sol#199)
Variable Oracle.price0Average (Oracle.sol#632) is too similar to Oracle.price1Average (Oracle.sol#633)
Variable Oracle.twap(address,uint256).price0Cumulative (Oracle.sol#688) is too similar to Oracle.twap(address,uint256).price1Cumulative (Oracle.sol#688)
Variable Oracle.price0CumulativeLast (Oracle.sol#630) is too similar to Oracle.price1CumulativeLast (Oracle.sol#631)
Variable Oracle.update().price0Cumulative (Oracle.sol#657) is too similar to Oracle.twap(address,uint256).price1Cumulative (Oracle.sol#688)
Variable Oracle.twap(address,uint256).price0Cumulative (Oracle.sol#688) is too similar to Oracle.update().price1Cumulative (Oracle.sol#657)
Variable Oracle.update().price0Cumulative (Oracle.sol#657) is too similar to Oracle.update().price1Cumulative (Oracle.sol#657)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#variable-names-are-too-similar

```

```

INFO:Detectors:
renounceOwnership() should be declared external:
- Ownable.renounceOwnership() (Oracle.sol#477-479)
transferOwnership(address) should be declared external:
- Ownable.transferOwnership(address) (Oracle.sol#485-488)
isOperator() should be declared external:
- Operator.isOperator() (Oracle.sol#520-522)
transferOperator(address) should be declared external:
- Operator.transferOperator(address) (Oracle.sol#524-526)
getCurrentEpoch() should be declared external:
- Epoch.getCurrentEpoch() (Oracle.sol#583-585)
getPeriod() should be declared external:
- Epoch.getPeriod() (Oracle.sol#587-589)
getStartTime() should be declared external:
- Epoch.getStartTime() (Oracle.sol#591-593)
getLastEpochTime() should be declared external:
- Epoch.getLastEpochTime() (Oracle.sol#595-597)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:Oracle.sol analyzed (10 contracts with 75 detectors), 48 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration

```

## Slither log >> RebateTreasury.sol

```

INFO:Detectors:
RebateTreasury.redeemAssetsForBuyback(address[]) (RebateTreasury.sol#362-373) has external calls inside a loop: Token.transfer(owner(),Token.balanceOf(address(this))*buybackAmount/DENOMINATOR) (RebateTreasury.sol#371)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#calls-inside-a-loop
INFO:Detectors:
RebateTreasury.bond(address,uint256) (RebateTreasury.sol#280-295) uses timestamp for comparisons
Dangerous comparisons:
- require(bool,string)(LibraAmount <= Libra.balanceOf(address(this)) - totalVested,RebateTreasury: insufficient libra balance) (RebateTreasury.sol#283)
RebateTreasury.claimVested(address) (RebateTreasury.sol#381-394) uses timestamp for comparisons
Dangerous comparisons:
- block.timestamp <= schedule.lastClaimed || schedule.lastClaimed >= schedule.end (RebateTreasury.sol#384)
- claimable == 0 (RebateTreasury.sol#388)
- block.timestamp > schedule.end (RebateTreasury.sol#388)
- block.timestamp > schedule.end (RebateTreasury.sol#391)
RebateTreasury.claimableLibra(address) (RebateTreasury.sol#462-467) uses timestamp for comparisons
Dangerous comparisons:
- block.timestamp <= schedule.lastClaimed || schedule.lastClaimed >= schedule.end (RebateTreasury.sol#464)
- block.timestamp > schedule.end (RebateTreasury.sol#465)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#block-timestamp

```

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```
INFO:Detectors:
Context._msgData() (RebateTreasury.sol#148-150) is never used and should be removed
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code
INFO:Detectors:
Function IUniswapV2Pair.DOMAIN_SEPARATOR() (RebateTreasury.sol#106) is not in mixedCase
Function IUniswapV2Pair.PERMIT_TYPEHASH() (RebateTreasury.sol#107) is not in mixedCase
Function IUniswapV2Pair.MINIMUM_LIQUIDITY() (RebateTreasury.sol#124) is not in mixedCase
Variable RebateTreasury.Libra (RebateTreasury.sol#228) is not in mixedCase
Variable RebateTreasury.LibraOracle (RebateTreasury.sol#229) is not in mixedCase
Variable RebateTreasury.Treasury (RebateTreasury.sol#230) is not in mixedCase
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#conformance-to-solidity-naming-conventions
INFO:Detectors:
RebateTreasury.buybackAmount (RebateTreasury.sol#244) 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() (RebateTreasury.sol#186-188)
transferOwnership(address) should be declared external:
- Ownable.transferOwnership(address) (RebateTreasury.sol#194-197)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:RebateTreasury.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 >> Treasury.sol

```
INFO:Detectors:
Treasury.setOperator(address) (Treasury.sol#1100-1102) should emit an event for:
- operator = _operator (Treasury.sol#1101)
Treasury.setBoardroom(address) (Treasury.sol#1104-1106) should emit an event for:
- boardroom = _boardroom (Treasury.sol#1105)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-events-access-control
INFO:Detectors:
Treasury.setLibraPriceCeiling(uint256) (Treasury.sol#1116-1119) should emit an event for:
- libraPriceCeiling = _libraPriceCeiling (Treasury.sol#1118)
Treasury.setMaxSupplyExpansionPercents(uint256) (Treasury.sol#1121-1124) should emit an event for:
- maxSupplyExpansionPercent = _maxSupplyExpansionPercent (Treasury.sol#1123)
Treasury.setExtraFunds(address,uint256,address,uint256,address,uint256) (Treasury.sol#1169-1191) should emit an event for:
- daoFundSharedPercent = _daoFundSharedPercent (Treasury.sol#1185)
- devFundSharedPercent = _devFundSharedPercent (Treasury.sol#1188)
Treasury.setMaxDiscountRate(uint256) (Treasury.sol#1193-1195) should emit an event for:
- maxDiscountRate = _maxDiscountRate (Treasury.sol#1194)
Treasury.setDiscountPercent(uint256) (Treasury.sol#1201-1204) should emit an event for:
- discountPercent = _discountPercent (Treasury.sol#1203)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-events-arithmetic
INFO:Detectors:
Treasury.initialize(address,address,address,address,address,address,address,address,uint256)._libra (Treasury.sol#1048) lacks a zero-check on :
- libra = _libra (Treasury.sol#1057)
Treasury.initialize(address,address,address,address,address,address,address,address,uint256)._lbond (Treasury.sol#1049) lacks a zero-check on :
- lbond = _lbond (Treasury.sol#1058)
Treasury.initialize(address,address,address,address,address,address,address,address,uint256)._lshare (Treasury.sol#1050) lacks a zero-check on :
- lshare = _lshare (Treasury.sol#1059)
```

[illegible]

## Slither log &gt;&gt; LibraGenesisRewardPool.sol

```
INFO:Detectors:
LibraGenesisRewardPool.setOperator(address) (LibraGenesisRewardPool.sol#840-842) should emit an event for:
  - operator = _operator (LibraGenesisRewardPool.sol#841)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-events-access-control
INFO:Detectors:
LibraGenesisRewardPool.add(uint256,IERC20,bool,uint256) (LibraGenesisRewardPool.sol#665-703) should emit an event for:
  - totalAllocPoint = totalAllocPoint.add(_allocPoint) (LibraGenesisRewardPool.sol#701)
LibraGenesisRewardPool.set(uint256,uint256) (LibraGenesisRewardPool.sol#706-715) should emit an event for:
  - totalAllocPoint = totalAllocPoint.sub(pool.allocPoint).add(_allocPoint) (LibraGenesisRewardPool.sol#710-712)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-events-arithmetic
```

```

Parameter LibraGenesisRewardPool.getGeneratedReward(uint256,uint256)._toTime (LibraGenesisRewardPool.sol#718) is not in mixedCase
Parameter LibraGenesisRewardPool.pendingLIBRA(uint256,address)._pid (LibraGenesisRewardPool.sol#732) is not in mixedCase
Parameter LibraGenesisRewardPool.pendingLIBRA(uint256,address)._user (LibraGenesisRewardPool.sol#732) is not in mixedCase
Parameter LibraGenesisRewardPool.updatePool(uint256)._pid (LibraGenesisRewardPool.sol#754) is not in mixedCase
Parameter LibraGenesisRewardPool.deposit(uint256,uint256)._pid (LibraGenesisRewardPool.sol#777) is not in mixedCase
Parameter LibraGenesisRewardPool.deposit(uint256,uint256)._amount (LibraGenesisRewardPool.sol#777) is not in mixedCase
Parameter LibraGenesisRewardPool.withdraw(uint256,uint256)._pid (LibraGenesisRewardPool.sol#798) is not in mixedCase
Parameter LibraGenesisRewardPool.withdraw(uint256,uint256)._amount (LibraGenesisRewardPool.sol#798) is not in mixedCase
Parameter LibraGenesisRewardPool.emergencyWithdraw(uint256)._pid (LibraGenesisRewardPool.sol#818) is not in mixedCase
Parameter LibraGenesisRewardPool.safeLibraTransfer(address,uint256)._to (LibraGenesisRewardPool.sol#829) is not in mixedCase
Parameter LibraGenesisRewardPool.safeLibraTransfer(address,uint256)._amount (LibraGenesisRewardPool.sol#829) is not in mixedCase
Parameter LibraGenesisRewardPool.setOperator(address)._operator (LibraGenesisRewardPool.sol#840) is not in mixedCase
Parameter LibraGenesisRewardPool.governanceRecoverUnsupported(IERC20,uint256,address)._token (LibraGenesisRewardPool.sol#845) is not in mixedCase
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#conformance-to-solidity-naming-conventions
INFO:Detectors:
LibraGenesisRewardPool.libraPerSecond (LibraGenesisRewardPool.sol#631) should be constant
LibraGenesisRewardPool.runningTime (LibraGenesisRewardPool.sol#632) should be constant
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#state-variables-that-could-be-declared-constant
INFO:Detectors:
set(uint256,uint256) should be declared external:
- LibraGenesisRewardPool.set(uint256,uint256) (LibraGenesisRewardPool.sol#706-715)
deposit(uint256,uint256) should be declared external:
- LibraGenesisRewardPool.deposit(uint256,uint256) (LibraGenesisRewardPool.sol#777-795)
withdraw(uint256,uint256) should be declared external:
- LibraGenesisRewardPool.withdraw(uint256,uint256) (LibraGenesisRewardPool.sol#798-815)
emergencyWithdraw(uint256) should be declared external:
- LibraGenesisRewardPool.emergencyWithdraw(uint256) (LibraGenesisRewardPool.sol#818-826)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:LibraGenesisRewardPool.sol analyzed (5 contracts with 75 detectors), 74 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration

```

## Slither log >> LibraRewardPool.sol

```

INFO:Detectors:
LibraRewardPool.setOperator(address) (LibraRewardPool.sol#844-846) should emit an event for:
- operator = _operator (LibraRewardPool.sol#845)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-events-access-control
INFO:Detectors:
LibraRewardPool.add(uint256,IERC20,bool,uint256) (LibraRewardPool.sol#669-699) should emit an event for:
- totalAllocPoint = totalAllocPoint.add(_allocPoint) (LibraRewardPool.sol#697)
LibraRewardPool.set(uint256,uint256) (LibraRewardPool.sol#702-709) should emit an event for:
- totalAllocPoint = totalAllocPoint.sub(pool.allocPoint).add(_allocPoint) (LibraRewardPool.sol#706)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-events-arithmetic
INFO:Detectors:
LibraRewardPool.setOperator(address)._operator (LibraRewardPool.sol#844) lacks a zero-check on :
- operator = _operator (LibraRewardPool.sol#845)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-zero-address-validation
INFO:Detectors:
Reentrancy in LibraRewardPool.deposit(uint256,uint256) (LibraRewardPool.sol#781-799):
  External calls:
  - safeLibraTransfer(_sender,_pending) (LibraRewardPool.sol#789)
  - returndata = address(token).functionCall(data,SafeERC20: low-level call failed) (LibraRewardPool.sol#581)
  - libra.safeTransfer(_to,_libraBal) (LibraRewardPool.sol#837)
  - libra.safeTransfer(_to,_amount) (LibraRewardPool.sol#839)
  - (success,returndata) = target.call{value: value}(data) (LibraRewardPool.sol#420)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#block-timestamp
INFO:Detectors:
Address.verifyCallResult(bool,bytes,string) (LibraRewardPool.sol#484-504) uses assembly
- INLINE ASM (LibraRewardPool.sol#496-499)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#assembly-usage
INFO:Detectors:
Address.functionCall(address,bytes) (LibraRewardPool.sol#368-370) is never used and should be removed
Address.functionCallWithValue(address,bytes,uint256) (LibraRewardPool.sol#397-403) is never used and should be removed
Address.functionDelegateCall(address,bytes) (LibraRewardPool.sol#457-459) is never used and should be removed
Address.functionDelegateCall(address,bytes,string) (LibraRewardPool.sol#467-476) 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) (LibraRewardPool.sol#343-348):
- (success) = recipient.call{value: amount}() (LibraRewardPool.sol#346)
Low level call in Address.functionCallWithValue(address,bytes,uint256,string) (LibraRewardPool.sol#411-422):
- (success,returndata) = target.call{value: value}(data) (LibraRewardPool.sol#420)
Low level call in Address.functionStaticCall(address,bytes,string) (LibraRewardPool.sol#440-449):
- (success,returndata) = target.staticcall(data) (LibraRewardPool.sol#447)
Low level call in Address.functionDelegateCall(address,bytes,string) (LibraRewardPool.sol#467-476):
- (success,returndata) = target.delegatecall(data) (LibraRewardPool.sol#474)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#low-level-calls
INFO:Detectors:
Parameter LibraRewardPool.checkPoolDuplicate(IERC20)._token (LibraRewardPool.sol#661) is not in mixedCase
Parameter LibraRewardPool.add(uint256,IERC20,bool,uint256)._allocPoint (LibraRewardPool.sol#670) is not in mixedCase
Parameter LibraRewardPool.add(uint256,IERC20,bool,uint256)._token (LibraRewardPool.sol#671) is not in mixedCase
Parameter LibraRewardPool.add(uint256,IERC20,bool,uint256)._withUpdate (LibraRewardPool.sol#672) is not in mixedCase
Parameter LibraRewardPool.add(uint256,IERC20,bool,uint256)._lastRewardTime (LibraRewardPool.sol#673) is not in mixedCase
Parameter LibraRewardPool.set(uint256,uint256)._pid (LibraRewardPool.sol#702) is not in mixedCase
Parameter LibraRewardPool.set(uint256,uint256)._allocPoint (LibraRewardPool.sol#702) is not in mixedCase

```

```

Parameter LibraRewardPool.governanceRecoverUnsupported(IERC20,uint256,address)._token (LibraRewardPool.sol#849) is not in mixedCase
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#conformance-to-solidity-naming-conventions
INFO:Detectors:
set(uint256,uint256) should be declared external:
- LibraRewardPool.set(uint256,uint256) (LibraRewardPool.sol#702-709)
deposit(uint256,uint256) should be declared external:
- LibraRewardPool.deposit(uint256,uint256) (LibraRewardPool.sol#781-799)
withdraw(uint256,uint256) should be declared external:
- LibraRewardPool.withdraw(uint256,uint256) (LibraRewardPool.sol#802-819)
emergencyWithdraw(uint256) should be declared external:
- LibraRewardPool.emergencyWithdraw(uint256) (LibraRewardPool.sol#822-830)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:LibraRewardPool.sol analyzed (5 contracts with 75 detectors), 73 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration

```

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## Slither log >> LShareRewardPool.sol

```
INFO:Detectors:
LShareRewardPool.setOperator(address) (LShareRewardPool.sol#838-840) should emit an event for:
  - operator = _operator (LShareRewardPool.sol#839)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-events-access-control
INFO:Detectors:
LShareRewardPool.add(uint256,IERC20,bool,uint256) (LShareRewardPool.sol#663-701) should emit an event for:
  - totalAllocPoint = totalAllocPoint.add(_allocPoint) (LShareRewardPool.sol#699)
LShareRewardPool.set(uint256,uint256) (LShareRewardPool.sol#704-713) should emit an event for:
  - totalAllocPoint = totalAllocPoint.sub(pool.allocPoint).add(_allocPoint) (LShareRewardPool.sol#708-710)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-events-arithmetic
INFO:Detectors:
LShareRewardPool.setOperator(address)._operator (LShareRewardPool.sol#838) lacks a zero-check on :
  - operator = _operator (LShareRewardPool.sol#839)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#missing-zero-address-validation
INFO:Detectors:
Reentrancy in LShareRewardPool.deposit(uint256,uint256) (LShareRewardPool.sol#775-793):
  External calls:
    - safeLShareTransfer(_sender,_pending) (LShareRewardPool.sol#783)
    - returndata = address(token).functionCall(data,SafeERC20: low-level call failed) (LShareRewardPool.sol#581)
    - lshare.safeTransfer(_to,_lshareBal) (LShareRewardPool.sol#831)
    - safeLShareTransfer(_sender,_pending) (LShareRewardPool.sol#804)
    - (success,returndata) = target.call{value: value}(data) (LShareRewardPool.sol#420)
  Event emitted after the call(s):
    - Withdraw(_sender,_pid,_amount) (LShareRewardPool.sol#812)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#reentrancy-vulnerabilities-3
INFO:Detectors:
LShareRewardPool.constructor(address,uint256) (LShareRewardPool.sol#639-648) uses timestamp for comparisons
  Dangerous comparisons:
    - require(bool,string)(block.timestamp < _poolStartTime,late) (LShareRewardPool.sol#643)
LShareRewardPool.checkPoolDuplicate(IERC20) (LShareRewardPool.sol#655-660) uses timestamp for comparisons
  Dangerous comparisons:
    - pid < length (LShareRewardPool.sol#657)
    - require(bool,string)(poolInfo[pid].token != _token,LShareRewardPool: existing pool?) (LShareRewardPool.sol#658)
LShareRewardPool.add(uint256,IERC20,bool,uint256) (LShareRewardPool.sol#663-701) uses timestamp for comparisons
  Dangerous comparisons:
    - block.timestamp < poolStartTime (LShareRewardPool.sol#673)
LShareRewardPool.governanceRecoverUnsupported(IERC20,uint256,address) (LShareRewardPool.sol#842-853) uses timestamp for comparisons
  Dangerous comparisons:
    - block.timestamp < poolEndTime + 7776000 (LShareRewardPool.sol#843)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#block-timestamp
INFO:Detectors:
Address.verifyCallResult(bool,bytes,string) (LShareRewardPool.sol#484-504) uses assembly
  - INLINE ASM (LShareRewardPool.sol#496-499)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#assembly-usage
INFO:Detectors:
Address.functionCall(address,bytes) (LShareRewardPool.sol#368-370) is never used and should be removed
Address.functionCallWithValue(address,bytes,uint256) (LShareRewardPool.sol#397-403) is never used and should be removed
Address.functionDelegateCall(address,bytes) (LShareRewardPool.sol#457-459) is never used and should be removed
Address.functionDelegateCall(address,bytes,string) (LShareRewardPool.sol#467-476) is never used and should be removed
Address.functionStaticCall(address,bytes) (LShareRewardPool.sol#430-432) is never used and should be removed
Address.functionStaticCall(address,bytes,string) (LShareRewardPool.sol#440-449) is never used and should be removed
Parameter LShareRewardPool.governanceRecoverUnsupported(IERC20,uint256,address)._token (LShareRewardPool.sol#842) is not in mixe
Case
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#conformance-to-solidity-naming-conventions
INFO:Detectors:
LShareRewardPool.LSharePerSecond (LShareRewardPool.sol#630) should be constant
LShareRewardPool.runningTime (LShareRewardPool.sol#631) should be constant
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#state-variables-that-could-be-declared-constant
INFO:Detectors:
set(uint256,uint256) should be declared external:
  - LShareRewardPool.set(uint256,uint256) (LShareRewardPool.sol#704-713)
deposit(uint256,uint256) should be declared external:
  - LShareRewardPool.deposit(uint256,uint256) (LShareRewardPool.sol#775-793)
withdraw(uint256,uint256) should be declared external:
  - LShareRewardPool.withdraw(uint256,uint256) (LShareRewardPool.sol#796-813)
emergencyWithdraw(uint256) should be declared external:
  - LShareRewardPool.emergencyWithdraw(uint256) (LShareRewardPool.sol#816-824)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#public-function-that-could-be-declared-external
INFO:Slither:LShareRewardPool.sol analyzed (5 contracts with 75 detectors), 74 result(s) found
INFO:Slither:Use https://crytic.io/ to get access to additional detectors and Github integration
```

# Solidity Static Analysis

## Boardroom.sol

### Security

#### Check-effects-interaction:

Potential violation of Checks-Effects-Interaction pattern in Boardroom.withdraw(uint256): Could potentially lead to re-entrancy vulnerability. Note: Modifiers are currently not considered by this static analysis.

[more](#)

Pos: 835:4:

#### Low level calls:

Use of "delegatecall": should be avoided whenever possible. External code, that is called can change the state of the calling contract and send ether from the caller's balance. If this is wanted behaviour, use the Solidity library feature if possible.

[more](#)

Pos: 289:50:

### Gas & Economy

#### Gas costs:

Gas requirement of function Boardroom.claimReward 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: 847:4:

#### Gas costs:

Gas requirement of function Boardroom.allocateSeigniorage 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: 858:4:

### Miscellaneous

#### Constant/View/Pure functions:

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

[more](#)

Pos: 877:4:

### Similar variable names:

Boardroom.earned(address) : Variables have very similar names "member" and "members". Note: Modifiers are currently not considered by this static analysis.  
Pos: 823:85:

### 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: 883:8:

### 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: 607:19:

## LBond.sol

### Gas & Economy

#### Gas costs:

Gas requirement of function LBond.burn 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: 595:4:

#### Gas costs:

Gas requirement of function LBond.burnFrom 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: 599:4:

### Miscellaneous

#### Constant/View/Pure functions:

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

[more](#)

Pos: 599:4:

### Similar variable names:

LBond.burnFrom(address,uint256) : Variables have very similar names "account" and "amount".

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

Pos: 600:32:

### 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: 569:8:

## Libra.sol

### Gas & Economy

#### Gas costs:

Gas requirement of function Libra.transferFrom 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: 1160:4:

#### Gas costs:

Gas requirement of function Libra.distributeReward 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: 1213:4:

### Miscellaneous

#### Constant/View/Pure functions:

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

[more](#)

Pos: 1156:4:

### Similar variable names:

Libra.burnFrom(address,uint256) : Variables have very similar names "account" and "amount".

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

Pos: 1157:32:

### No return:

Libra.setBurnThreshold(uint256): Defines a return type but never explicitly returns a value.

Pos: 1072:4:

### 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: 1221:8:

### 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: 943:19:

## LShare.sol

### Security

#### 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: 852:23:

### Gas & Economy

#### Gas costs:

Gas requirement of function LShare.distributeReward 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: 894:4:

#### Gas costs:

Gas requirement of function LShare.burn 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: 901:4:

### Miscellaneous

#### 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: 783:23:



### 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: 896:8:

## Oracle.sol

### Security

#### Block timestamp:

Use of "now": "now" does not mean current time. "now" is an alias for "block.timestamp". "block.timestamp" can be influenced by miners to a certain degree, be careful.

[more](#)

Pos: 576:20:

### Gas & Economy

#### Gas costs:

Gas requirement of function Oracle.consult 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: 678:4:

#### Gas costs:

Gas requirement of function Oracle.twap 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: 687:4:

## ERC

### ERC20:

ERC20 contract's "decimals" function should have "uint8" as return type

[more](#)

Pos: 13:4:

## Miscellaneous

### Constant/View/Pure functions:

Oracle.twap(address,uint256) : Is constant but potentially should not be. Note: Modifiers are currently not considered by this static analysis.

[more](#)

Pos: 687:4:

### Similar variable names:

Oracle.twap(address,uint256) : Variables have very similar names "price0Cumulative" and "price1Cumulative". Note: Modifiers are currently not considered by this static analysis.  
Pos: 693:55:

### 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: 650:8:

### 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: 691:54:

## RebateTreasury.sol

### Security

#### Check-effects-interaction:

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

[more](#)

Pos: 280:4:

#### 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: 386:76:

### Gas & Economy

#### Gas costs:

Gas requirement of function RebateTreasury.getTokenPrice 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: 435:4:

### 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: 368:8:

## ERC

### ERC20:

ERC20 contract's "decimals" function should have "uint8" as return type

[more](#)

Pos: 97:4:

## Miscellaneous

### Constant/View/Pure functions:

`RebateTreasury.getLibraReturn(address,uint256)` : Is constant but potentially should not be. Note: Modifiers are currently not considered by this static analysis.

[more](#)

Pos: 404:4:

### Similar variable names:

`RebateTreasury.setLibra(address)` : Variables have very similar names "Libra" and "libra". Note: Modifiers are currently not considered by this static analysis.

Pos: 312:23:

### 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: 369:12:

### 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: 466:15:

### Check-effects-interaction:

Potential violation of Checks-Effects-Interaction pattern in Treasury.\_sendToBoardroom(uint256): Could potentially lead to re-entrancy vulnerability. Note: Modifiers are currently not considered by this static analysis.

[more](#)

Pos: 1288:4:

### Block timestamp:

Use of "now": "now" does not mean current time. "now" is an alias for "block.timestamp". "block.timestamp" can be influenced by miners to a certain degree, be careful.

[more](#)

Pos: 1302:31:

## Gas & Economy

### Gas costs:

Gas requirement of function Treasury.getLibraPrice 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: 1003:4:

## 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: 536:4:

### Similar variable names:

Treasury.setExtraFunds(address,uint256,address,uint256,address,uint256) : Variables have very similar names "\_daoFund" and "\_devFund". Note: Modifiers are currently not considered by this static analysis.

Pos: 1177:16:

### 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: 1182:8:

## Security

### Check-effects-interaction:

Potential violation of Checks-Effects-Interaction pattern in `LibraGenesisRewardPool.updatePool(uint256)`: Could potentially lead to re-entrancy vulnerability. Note: Modifiers are currently not considered by this static analysis.

[more](#)

Pos: 754:4:

### 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: 645:16:

## Gas & Economy

### Gas costs:

Gas requirement of function `LibraGenesisRewardPool.set` 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: 706:4:

## 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: 430:4:

### Constant/View/Pure functions:

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

[more](#)

Pos: 844:4:

### No return:

`Address.isContract(address)`: Defines a return type but never explicitly returns a value.

Pos: 319:4:

### 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: 855:16:

## LibraRewardPool.sol

### Security

#### Check-effects-interaction:

Potential violation of Checks-Effects-Interaction pattern in `LibraRewardPool.updatePool(uint256)`: Could potentially lead to re-entrancy vulnerability. Note: Modifiers are currently not considered by this static analysis.

[more](#)

Pos: 758:4:

#### 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: 690:58:

### Gas & Economy

#### Gas costs:

Gas requirement of function `LibraRewardPool.set` 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: 702:4:

### 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: 430:4:

#### No return:

`Address.isContract(address)`: Defines a return type but never explicitly returns a value.

Pos: 319:4:

### 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: 859:16:

## LShareRewardPool.sol

### Security

#### Check-effects-interaction:

Potential violation of Checks-Effects-Interaction pattern in LShareRewardPool.updatePool(uint256): Could potentially lead to re-entrancy vulnerability. Note: Modifiers are currently not considered by this static analysis.

[more](#)

Pos: 752:4:

#### 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: 735:12:

### Gas & Economy

#### Gas costs:

Gas requirement of function LShareRewardPool.set 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: 704:4:

#### Gas costs:

Gas requirement of function LShareRewardPool.emergencyWithdraw 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: 816:4:

#### Gas costs:

Gas requirement of function LShareRewardPool.setOperator 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: 838:4:



### 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: 430:4:

### Constant/View/Pure functions:

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

[more](#)

Pos: 842:4:

### No return:

`Address.isContract(address)`: Defines a return type but never explicitly returns a value.

Pos: 319:4:

### 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: 845:12:

### 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: 849:16:

### 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: 125:15:

### 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: 187:19:



# Solhint Linter

## Boardroom.sol

```
Boardroom.sol:3:1: Error: Compiler version 0.6.12 does not satisfy the r semver requirement
Boardroom.sol:134:71: Error: Code contains empty blocks
Boardroom.sol:161:28: Error: Avoid using low level calls.
Boardroom.sol:235:51: Error: Avoid using low level calls.
Boardroom.sol:289:51: Error: Avoid using low level calls.
Boardroom.sol:311:17: Error: Avoid using inline assembly. It is acceptable only in rare cases
Boardroom.sol:408:38: Error: Avoid to use tx.origin
Boardroom.sol:421:31: Error: Avoid to use tx.origin
```

## LBond.sol

```
LBond.sol:3:1: Error: Compiler version 0.6.12 does not satisfy the r semver requirement
LBond.sol:433:24: Error: Code contains empty blocks
LBond.sol:453:24: Error: Code contains empty blocks
LBond.sol:579:63: Error: Code contains empty blocks
```

## Libra.sol

```
Libra.sol:3:1: Error: Compiler version 0.6.12 does not satisfy the r semver requirement
Libra.sol:711:24: Error: Code contains empty blocks
Libra.sol:731:24: Error: Code contains empty blocks
```

## LShare.sol

```
LShare.sol:3:1: Error: Compiler version 0.6.12 does not satisfy the r semver requirement
LShare.sol:737:24: Error: Code contains empty blocks
LShare.sol:757:24: Error: Code contains empty blocks
LShare.sol:852:24: Error: Avoid to make time-based decisions in your business logic
LShare.sol:859:24: Error: Avoid to make time-based decisions in your business logic
LShare.sol:866:24: Error: Avoid to make time-based decisions in your business logic
LShare.sol:888:27: Error: Avoid to make time-based decisions in your business logic
```

## Oracle.sol

```
Oracle.sol:3:1: Error: Compiler version 0.6.12 does not satisfy the r semver requirement
Oracle.sol:31:5: Error: Function name must be in mixedCase
Oracle.sol:33:5: Error: Function name must be in mixedCase
Oracle.sol:52:5: Error: Function name must be in mixedCase
Oracle.sol:113:5: Error: Contract name must be in CamelCase
Oracle.sol:119:5: Error: Contract name must be in CamelCase
Oracle.sol:190:23: Error: Avoid to make time-based decisions in your business logic
Oracle.sol:559:17: Error: Avoid to make time-based decisions in your business logic
Oracle.sol:559:35: Error: Use double quotes for string literals
Oracle.sol:566:13: Error: Avoid to make time-based decisions in your business logic
Oracle.sol:567:47: Error: Use double quotes for string literals
Oracle.sol:576:21: Error: Avoid to make time-based decisions in your business logic
Oracle.sol:606:60: Error: Use double quotes for string literals
```

## RebateTreasury.sol

```
RebateTreasury.sol:2:1: Error: Compiler version ^0.6.12 does not satisfy the r semver requirement
RebateTreasury.sol:106:5: Error: Function name must be in mixedCase
RebateTreasury.sol:107:5: Error: Function name must be in mixedCase
RebateTreasury.sol:124:5: Error: Function name must be in mixedCase
RebateTreasury.sol:228:19: Error: Variable name must be in mixedCase
RebateTreasury.sol:229:20: Error: Variable name must be in mixedCase
RebateTreasury.sol:230:22: Error: Variable name must be in mixedCase
RebateTreasury.sol:291:24: Error: Avoid to make time-based decisions in your business logic
RebateTreasury.sol:293:32: Error: Avoid to make time-based decisions in your business logic
RebateTreasury.sol:370:13: Error: Variable name must be in mixedCase
RebateTreasury.sol:384:13: Error: Avoid to make time-based decisions in your business logic
RebateTreasury.sol:386:29: Error: Avoid to make time-based decisions in your business logic
RebateTreasury.sol:386:77: Error: Avoid to make time-based decisions in your business logic
RebateTreasury.sol:391:32: Error: Avoid to make time-based decisions in your business logic
RebateTreasury.sol:391:80: Error: Avoid to make time-based decisions in your business logic
RebateTreasury.sol:437:9: Error: Variable name must be in mixedCase
RebateTreasury.sol:442:9: Error: Variable name must be in mixedCase
RebateTreasury.sol:464:13: Error: Avoid to make time-based decisions in your business logic
RebateTreasury.sol:465:29: Error: Avoid to make time-based decisions in your business logic
RebateTreasury.sol:465:77: Error: Avoid to make time-based decisions
```

in your business logic

## Treasury.sol

```
Treasury.sol:602:17: Error: Avoid using inline assembly. It is acceptable only in rare cases
Treasury.sol:771:38: Error: Avoid to use tx.origin
Treasury.sol:784:31: Error: Avoid to use tx.origin
Treasury.sol:866:1: Error: Contract has 38 states declarations but allowed no more than 15
Treasury.sol:959:17: Error: Avoid to make time-based decisions in your business logic
Treasury.sol:965:17: Error: Avoid to make time-based decisions in your business logic
Treasury.sol:998:61: Error: Code contains empty blocks
Treasury.sol:1229:43: Error: Code contains empty blocks
Treasury.sol:1229:52: Error: Code contains empty blocks
Treasury.sol:1295:32: Error: Avoid to make time-based decisions in your business logic
Treasury.sol:1302:32: Error: Avoid to make time-based decisions in your business logic
Treasury.sol:1310:30: Error: Avoid to make time-based decisions in your business logic
Treasury.sol:1313:34: Error: Variable "_amount" is unused
```

## LibraGenesisRewardPool.sol

```
LibraGenesisRewardPool.sol:3:1: Error: Compiler version 0.6.12 does not satisfy the r semver requirement
LibraGenesisRewardPool.sol:319:71: Error: Code contains empty blocks
LibraGenesisRewardPool.sol:346:28: Error: Avoid using low level calls.
LibraGenesisRewardPool.sol:420:51: Error: Avoid using low level calls.
LibraGenesisRewardPool.sol:474:51: Error: Avoid using low level calls.
LibraGenesisRewardPool.sol:496:17: Error: Avoid using inline assembly. It is acceptable only in rare cases
LibraGenesisRewardPool.sol:645:17: Error: Avoid to make time-based decisions in your business logic
LibraGenesisRewardPool.sol:675:13: Error: Avoid to make time-based decisions in your business logic
```

## LibraRewardPool.sol

```
LibraRewardPool.sol:3:1: Error: Compiler version 0.6.12 does not satisfy the r semver requirement
LibraRewardPool.sol:319:71: Error: Code contains empty blocks
LibraRewardPool.sol:346:28: Error: Avoid using low level calls.
```

```
LibraRewardPool.sol:420:51: Error: Avoid using low level calls.
LibraRewardPool.sol:474:51: Error: Avoid using low level calls.
LibraRewardPool.sol:496:17: Error: Avoid using inline assembly. It is
acceptable only in rare cases
LibraRewardPool.sol:641:17: Error: Avoid to make time-based decisions
in your business logic
LibraRewardPool.sol:679:13: Error: Avoid to make time-based decisions
in your business logic
LibraRewardPool.sol:690:59: Error: Avoid to make time-based decisions
in your business logic
LibraRewardPool.sol:691:35: Error: Avoid to make time-based decisions
in your business logic
LibraRewardPool.sol:694:85: Error: Avoid to make time-based decisions
in your business logic
LibraRewardPool.sol:741:13: Error: Avoid to make time-based decisions
in your business logic
LibraRewardPool.sol:742:80: Error: Avoid to make time-based decisions
in your business logic
LibraRewardPool.sol:760:13: Error: Avoid to make time-based decisions
in your business logic
LibraRewardPool.sol:765:35: Error: Avoid to make time-based decisions
in your business logic
LibraRewardPool.sol:773:80: Error: Avoid to make time-based decisions
in your business logic
LibraRewardPool.sol:777:31: Error: Avoid to make time-based decisions
in your business logic
LibraRewardPool.sol:853:13: Error: Avoid to make time-based decisions
in your business logic
```

## LShareRewardPool.sol

```
LShareRewardPool.sol:3:1: Error: Compiler version 0.6.12 does not
satisfy the r semver requirement
LShareRewardPool.sol:319:71: Error: Code contains empty blocks
LShareRewardPool.sol:346:28: Error: Avoid using low level calls.
LShareRewardPool.sol:420:51: Error: Avoid using low level calls.
LShareRewardPool.sol:474:51: Error: Avoid using low level calls.
LShareRewardPool.sol:496:17: Error: Avoid using inline assembly. It
is acceptable only in rare cases
LShareRewardPool.sol:643:17: Error: Avoid to make time-based
decisions in your business logic
LShareRewardPool.sol:673:13: Error: Avoid to make time-based
decisions LShareRewardPool.sol:771:31: Error: Avoid to make
time-based decisions in your business logic
LShareRewardPool.sol:843:13: Error: Avoid to make time-based
decisions in your business logic
```

## Software analysis result:

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



This is a private and confidential document. No part of this document should be disclosed to third party without prior written permission of EtherAuthority.

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