CERTIK

Preliminary Comments

Bloxxy

Dec 21st, 2021

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Summary

This report has been prepared for Bloxxy to discover issues and vulnerabilities in the source code of the Bloxxy project as well as any contract dependencies that were not part of an officially recognized library. A comprehensive examination has been performed, utilizing Static Analysis and Manual Review techniques.

The auditing process pays special attention to the following considerations:

- Testing the smart contracts against both common and uncommon attack vectors.
- Assessing the codebase to ensure compliance with current best practices and industry standards.
- Ensuring contract logic meets the specifications and intentions of the client.
- Cross referencing contract structure and implementation against similar smart contracts produced by industry leaders.
- Thorough line-by-line manual review of the entire codebase by industry experts.

The security assessment resulted in findings that ranged from critical to informational. We recommend addressing these findings to ensure a high level of security standards and industry practices. We suggest recommendations that could better serve the project from the security perspective:

- Enhance general coding practices for better structures of source codes;
- Add enough unit tests to cover the possible use cases;
- Provide more comments per each function for readability, especially contracts that are verified in public;
- Provide more transparency on privileged activities once the protocol is live.

Overview

Project Summary

Project Name	Bloxxy
Platform	Ethereum
Language	Solidity
Codebase	https://github.com/la-cucina/lac-token/
Commit	f660281ea4fece462e8dad47be7e61627f863e9f 741e10ac2f8a86ac3cbfddcac019171a98dc95c8

Audit Summary

Delivery Date	Dec 21, 2021
Audit Methodology	Static Analysis, Manual Review
Key Components	

Vulnerability Summary

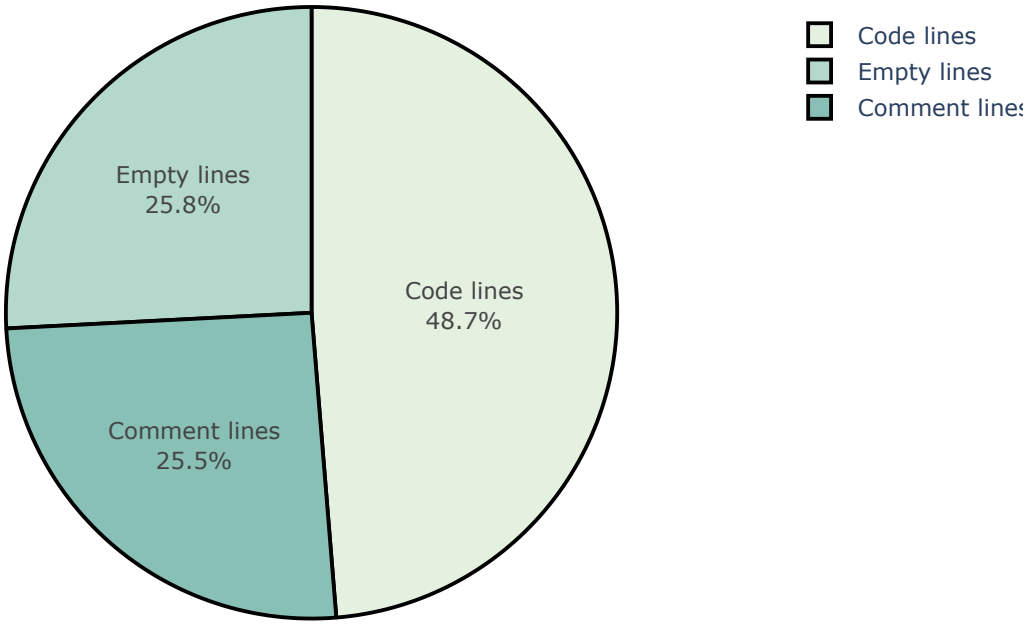
Vulnerability Level	Total	Pending	Declined	Acknowledged	Partially Resolved	Resolved
Critical	0	0	0	0	0	0
Major	2	0	0	1	0	1
Medium	1	0	0	0	0	1
Minor	0	0	0	0	0	0
Informational	2	0	0	0	0	2
Discussion	0	0	0	0	0	0

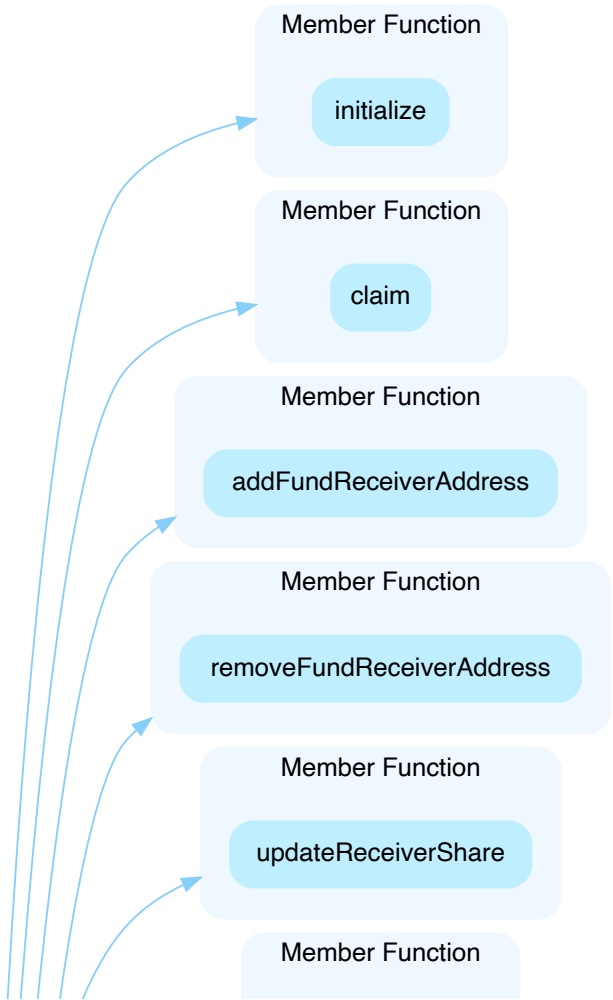
Audit Scope

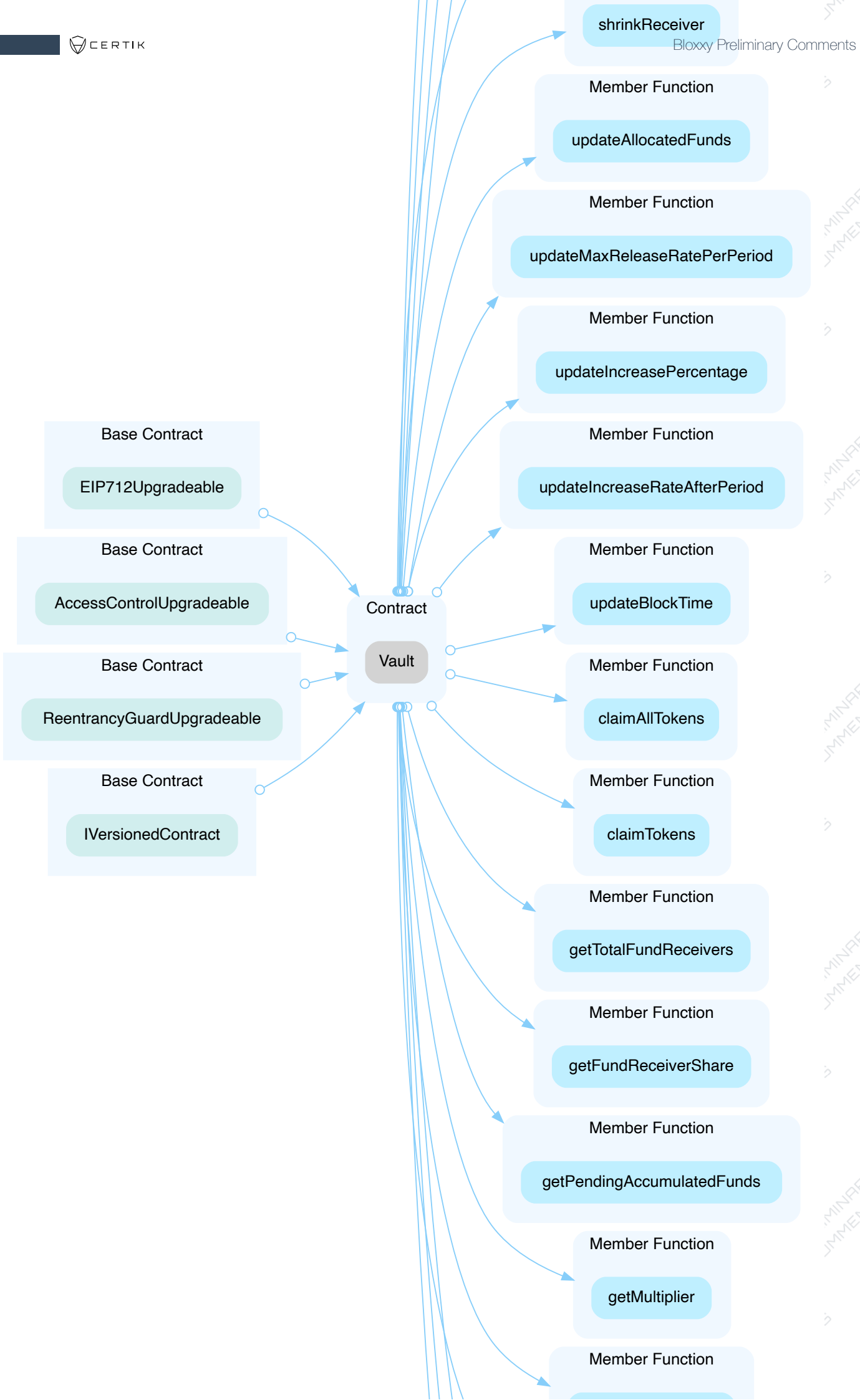
ID	File	SHA256 Checksum
IVC	interfaces/IVersionedContract.sol	348ad8746a4954f46a23e198a275d5825284adc85137bcb4b09265b30de5502d
LTU	library/LacTokenUtils.sol	a1aae63dadcfc9b3ff7de67649a73db46430b3497a3edd517d9948acfef438bc
LTB	LacToken.sol	83ff81799c85d586137c976bc3f88f32c925e6de267a83aace787111d97aecb8
VBC	Vault.sol	579c16159e201eedfa32c526a3842c07177f83545f8595e605f96d73521ad6a0

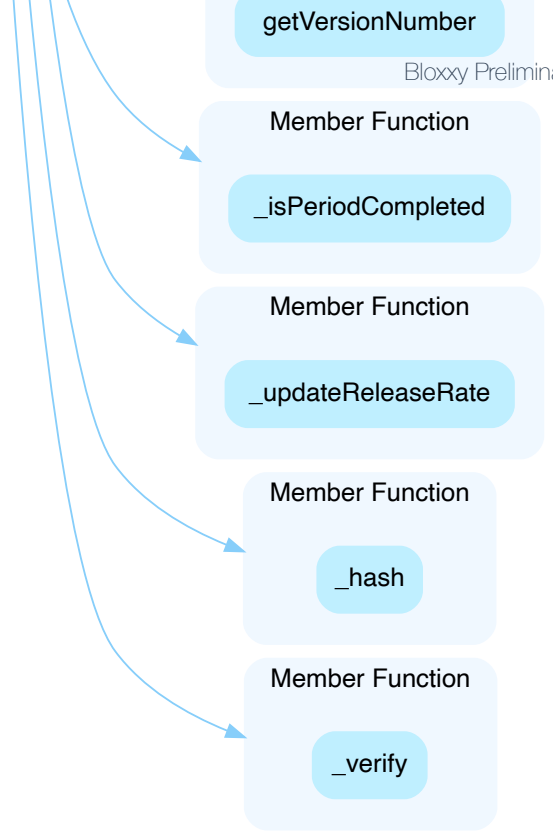
Diagrams

Source Line Chart






shrinkReceiver
Member Function
updateAllocatedFunds
Member Function
updateMaxReleaseRatePerPeriod
Member Function
updateIncreasePercentage
Base Contract
EIP712Upgradeable
Member Function
updateIncreaseRateAfterPeriod
Base Contract
AccessControlUpgradeable
Member Function
updateBlockTime
Contract
Base Contract
Vault
ReentrancyGuardUpgradeable
Member Function
claimAllTokens
Base Contract
Member Function
IVersionedContract
claimTokens
Member Function
getTotalFundReceivers
Member Function
getFundReceiverShare
Member Function
getPendingAccumulatedFunds
Member Function
getMultiplier
Member Function


getVersionNumber
Member Function
_isPeriodCompleted
Member Function
_updateReleaseRate
Member Function
_hash
Member Function
_verify

Findings

Critical	0 (0.00%)
Major	2 (40.00%)
Medium	1 (20.00%)
Minor	0 (0.00%)
Informational	2 (40.00%)
Discussion	0 (0.00%)

ID	Title	Category	Severity	Status
LTB-01	Initial Token Distribution	**Centralization / Privilege**	**Major**	Resolved
VBC-01	Centralization Risk	**Centralization / Privilege**	**Major**	Acknowledged
VBC-02	Missing Emit Events	Coding Style	Informational	Resolved
VBC-03	Unnecessary API Exposure	Coding Style	Informational	Resolved
VBC-04	Logical Flaw In `getPendingAccumulatedFunds()`	Logical Issue	Medium	Resolved

LTB-01 | Initial Token Distribution

Category	Severity	Location	Status
Centralization / Privilege	Major	projects/Bloxxy/contracts/LacToken.sol (eaca569): 26	Resolved

Description

All of the Lac tokens are sent to the contract deployer when deploying the contract. This could be a centralization risk as the deployer can distribute Lac tokens without obtaining the consensus of the community.

Recommendation

We recommend the team to be transparent regarding the initial token distribution process, and the team shall make enough efforts to restrict the access of the private key.

Alleviation

`[Bloxxy team]`: We have addressed the risk of LTB-01 | Initial Token Distribution in the following ways:

- The LAC token has been minted with a final, hard capped supply of 500 million. The final balance was sent to the issuer/deployer until the initial allocation, which will take place within the next 14 days (24th December, 2021). With 18% the LACs being allocated to the Team, 17% for our referral program and future business development and 5% as seed liquidity on our liquidity pool(s).
- 60% of all LAC tokens are destined to be locked in the Vault smart contract as rewards for our community members. The Vault will continuously release rewards over a period of 10 years. The below graph and table describes our current concept for the release schedule. However, the exact schedule will be set as soon as the LaCucina Pilot is over (by January 31st, 2022). Until then, it will be released at a fixed rate of ±8 LAC tokens per block. The final release schedule will be announced throughout our community and social media channels. Once the final schedule has been determined, our aim is to have the schedule coded into the smart contract, such that we (or anyone else in this respect) will not be able to change it again. As for transparency, the proposed allocation will be published on our Whitepaper, documentation and via our blog on Medium.
- With regards to the private key and access to it, the private key of the deployer is saved on a cold wallet device in a physical vault, in a secure location. Only one person has access to this.

For more information on LaCucina's LAC Tokenomics, learn more via our blog on Medium: https://medium.com/@lacucina/lac-tokenomics-part-i-928ca266e689.

VBC-01 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	Major	projects/Bloxxy/contracts/Vault.sol (eaca569): 176, 188, 204, 224, 271, 276, 281, 286, 294, 309	Acknowledged

Description

In the contract `Vault.sol`, the role `admin` has the authority over the following function:

- `addFundReceiverAddress()`
- `removeFundReceiverAddress()`
- `updateReceiverShare()`
- `shrinkReceiver()`
- `updateMaxReleaseRatePerPeriod()`
- `updateIncreasePercentage()`
- `updateIncreaseRateAfterPeriod()`
- `updateBlockTime()`
- `claimAllTokens()`
- `claimTokens()`

Any compromise to the `admin` account may allow the hacker to take advantage of this and manipulate the sensitive functionalities of the system, like claim tokens/all tokens from the contract.

Recommendation

We advise the client to carefully manage the `admin` account's private key to avoid any potential risks of being hacked. In general, we strongly recommend centralized privileges or roles in the protocol to be improved via a decentralized mechanism or smart-contract-based accounts with enhanced security practices, e.g., Multisignature wallets.

Indicatively, here is some feasible suggestions that would also mitigate the potential risk at the different level in term of short-term and long-term:

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
- Assignment of privileged roles to multi-signature wallets to prevent a single point of failure due to the private key;
- Introduction of a DAO/governance/voting module to increase transparency and user involvement.

Alleviation

`[Bloxxy team]`: We have addressed the centralization risk of VBC-01 | Centralization Risk in the following ways:

- The privileged roles will be assigned to a multi-signature wallet, as suggested.
- Governance voting - Upon launch we are introducing a non-binding voting mechanic allowing our users to submit propositions, and vote on other user's proposals regarding future changes to the platform. In the future, this module might be upgraded to a full governance model, hence handing over the governance of some aspects of the platform, to the community.

VBC-02 | Missing Emit Events

Category	Severity	Location	Status
Coding Style	Informational	projects/Bloxxy/contracts/Vault.sol (eaca569): 176, 188, 204, 224, 271, 276, 281, 286, 294, 309	Resolved

Description

The function that affects the status of sensitive variables should be able to emit events as notifications.

- `addFundReceiverAddress()`
- `removeFundReceiverAddress()`
- `updateReceiverShare()`
- `shrinkReceiver()`
- `updateMaxReleaseRatePerPeriod()`
- `updateIncreasePercentage()`
- `updateIncreaseRateAfterPeriod()`
- `updateBlockTime()`
- `claimAllTokens()`
- `claimTokens()`

Recommendation

We advise the client to add events for sensitive actions, and emit them in the function.

Alleviation

`[Bloxxy team]`: We have fixed the VBC-02 | Missing Emit Events issue by adding the events in mentioned methods.

VBC-03 | Unnecessary API Exposure

Category	Severity	Location	Status
Coding Style	Informational	projects/Bloxxy/contracts/Vault.sol (eaca569): 244	Resolved

Description

If a function is not needed to be exposed to external user, then it visibility should be set to internal/private

Recommendation

We advise the client to update the visibility of `updateAllocatedFunds()` to `internal` as there's no need for external user to call it.

Alleviation

`[Bloxxy team]`: We advise the client to update the visibility of updateAllocatedFunds() to internal as there's no need for external user to call it.

VBC-04 | Logical Flaw In `getPendingAccumulatedFunds()`

Category	Severity	Location	Status
Logical Issue	Medium	projects/Bloxxy/contracts/Vault.sol (eaca569): 358~362	Resolved

Description

In the function `getPendingAccumulatedFunds()`, the `totalPeriodsCompleted` is used to calculated `totalBlocks` when `totalPeriodsCompleted` is greater than 0. However, this calculation is not accurate and the remainder of the division in L358 will be ignored, which in turn that the `totalBlocks` value is always less than or equal to the real block number appended to the blockchain.

```
358 uint256 totalPeriodsCompleted = (block.timestamp - (periodEndTime)) /
359     increaseRateAfterPeriods;
360
361 if (totalPeriodsCompleted > 0) {
362     totalBlocks = (totalPeriodsCompleted * 1 weeks) / blockTime;
```

For example, if `(block.timestamp – (periodEndTime)) / increaseRateAfterPeriods` equals to `2.5` arithmetically, the value that is assigned to `totalPeriodsCompleted` would be just 2, which turns out the value of `totalBlocks` is 2 * 1 weeks / blockTime, which is inaccurate.

Recommendation

We advise the client to revise the function and improve the calculation implementation.

Alleviation

`[Bloxxy team]`: We have addressed the risk of VBC-04 | Logical Flaw in the following ways:

- We have removed the times tamp based calculation of blocks and are using the block.number for more precision.
- The updated getPendingAccumulatedFunds() method calculates the accumulatedTokens for receiver according to the currentReleaseRatePerBlock of the respective period.
- The getPendingAccumulatedFunds method calculates the accumulated funds considering the following conditions :
- One period is completed, and the time passed after period completion is greater than the one period duration:
    - One period is completed and a certain number of blocks are then passed in current period.

- Total blocks passed in current perSome number of blocks are passed in current period.
- This updated method ensures accumulated funds are calculated up to the current block.

In this logic, if totalPeriodsCompleted gets the fractional value like 2.5, then the do-while loop will run only for 2 times, and it will calculate the accumulated funds according to the rates of the respective period.

This logic ensures that the remaining blocks of current period (up to the current block) are also considered for calculating the accumulatedFunds.

Appendix

Finding Categories

Centralization / Privilege

Centralization / Privilege findings refer to either feature logic or implementation of components that act against the nature of decentralization, such as explicit ownership or specialized access roles in combination with a mechanism to relocate funds.

Logical Issue

Logical Issue findings detail a fault in the logic of the linked code, such as an incorrect notion on how block.timestamp works.

Coding Style

Coding Style findings usually do not affect the generated byte-code but rather comment on how to make the codebase more legible and, as a result, easily maintainable.

Checksum Calculation Method

The "Checksum" field in the "Audit Scope" section is calculated as the SHA-256 (Secure Hash Algorithm 2 with digest size of 256 bits) digest of the content of each file hosted in the listed source repository under the specified commit.

The result is hexadecimal encoded and is the same as the output of the Linux "sha256sum" command against the target file.

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