



SHERLOCK

SHERLOCK SECURITY REVIEW FOR



SHERLOCK

Prepared for:

Telcoin

Prepared by:

Sherlock

Lead Security Expert:

WATCHPUG

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Introduction

Telcoin leverages blockchain technology to provide access to low-cost, high-quality decentralized financial products for every mobile phone user in the world.

Scope

```
contracts/interfaces/IPlugin.sol
contracts/StakingModule.sol
contracts/libraries/AuxDataLib.sol
contracts/SimplePlugin.sol
contracts/feebuyback/IFeeBuyback.sol
contracts/feebuyback/TieredOwnership.sol
contracts/feebuyback/ISimplePlugin.sol
contracts/feebuyback/FeeBuyback.sol
```

Findings

Each issue has an assigned severity:

- Medium issues are security vulnerabilities that may not be directly exploitable or may require certain conditions in order to be exploited. All major issues should be addressed.
- High issues are directly exploitable security vulnerabilities that need to be fixed.

Issues found

Medium	High
6	1

Issues not fixed or acknowledged

Medium	High
0	0

Security experts who found valid issues



WATCHPUG
hickuphh3
hyh
yixxas
cccZ
rotcivegaf

0x4non
eierina
Bnke0x0
0xheynacho
pashov
Mukund

rvierdiiev
Deivitto
aphak5010
0xAgro



Issue H-1: Flashloan TEL tokens to stake and exit in the same block can fake a huge amount of stake with minimal material cost

Source: <https://github.com/sherlock-audit/2022-11-telcoin-judging/issues/83>

Found by

WATCHPUG

Summary

Checkpoints#getAtBlock() can be faked with falshloan as it may return the value of the first checkpoint in the same block.

Vulnerability Detail

Checkpoints#getAtBlock() will return the value on check point #0 when there are two check points in the same block (#0 and #1).

Therefore, one can take a falshloan of TEL tokens to stake and exit in the same block, which will create two checkpoints.

Impact

Malicious user can fake their stake to gain a high percentage rewards with falshloan and avoid slashing.

Code Snippet

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/StakingModule.sol#L147-L149>

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/StakingModule.sol#L403-L406>

Tool used

Manual Review

Recommendation

Consider requiring the `exit` to be at least 1 block later than the blocknumber of the original stake.



Discussion

amshirif

<https://github.com/telcoin/telcoin-staking/pull/9>



Issue M-1: `claimFromIndividualPlugin()` may end up claiming the reward from a different plugin with wrong `auxData` when the index as changed due to `removePlugin()`

Source: <https://github.com/sherlock-audit/2022-11-telcoin-judging/issues/86>

Found by

WATCHPUG

Summary

When `removePlugin()` happens between the user sends the `claimFromIndividualPlugin()` transaction and before it gets minted, it may lead to lesser rewards as the `auxData` prepared for another plugin will now be used.

Vulnerability Detail

When a user calls `claimFromIndividualPlugin()`, a `pluginIndex` is used to refer to a plugin.

However, if the `PLUGIN_EDITOR` removed a plugin before the transaction gets minted, the plugin referred by the `pluginIndex` can be changed to another plugin.

As a result, the `auxData` supposed to be supplied to the original plugin is now supplied to another plugin.

Impact

The user may end up with lesser rewards as a wrong `auxData` is supplied to the wrong plugin.

Code Snippet

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/StakingModule.sol#L420-L429>

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/StakingModule.sol#L178-L185>

Tool used

Manual Review



Recommendation

Consider using `pluginAddress` instead.

Discussion

amshirif

<https://github.com/telcoin/telcoin-staking/pull/8>



Issue M-2: Unsafe ERC20 methods

Source: <https://github.com/sherlock-audit/2022-11-telcoin-judging/issues/82>

Found by

0x4non, 0xAgro, yixxas, 0xheynacho, Bnke0x0, WATCHPUG, aphak5010, rotcivegaf, Mukund, hickuphh3, pashov, hyh, Deivitto, rvierdiiev, eierina

Summary

Using unsafe ERC20 methods can revert the transaction for certain tokens.

Vulnerability Detail

There are many Weird ERC20 Tokens that won't work correctly using the standard IERC20 interface.

For example, `IERC20(token).transferFrom()` and `IERC20(token).transfer()` will fail for some tokens as they may not conform to the standard IERC20 interface. And if `_aggregator` does not always consume all the allowance given at L72, the transaction will also revert on the next call, because there are certain tokens that do not allow approval of a non-zero number when the current allowance is not zero (eg, USDT).

Impact

The contract will malfunction for certain tokens.

Code Snippet

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/fee-buyback/FeeBuyback.sol#L94-L97>

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/fee-buyback/FeeBuyback.sol#L47-L82>

Tool used

Manual Review

Recommendation

Consider using `SafeERC20` for `transferFrom`, `transfer` and `approve`.



Discussion

amshirif

<https://github.com/telcoin/telcoin-staking/pull/6>



Issue M-3: FeeBuyback native token can not be rescued

Source: <https://github.com/sherlock-audit/2022-11-telcoin-judging/issues/80>

Found by

WATCHPUG

Summary

Lack of methods to rescue native tokens trapped in the FeeBuyback contract.

Vulnerability Detail

Like ERC20 tokens, the native token may also get stuck in the FeeBuyback contract for all sorts of reasons.

For example, at L77, the `_aggregator` is called with a `msg.value`, which means that the native token can be used as an `inToken` for the swap. Therefore, part of the input native token can be sent back to the FeeBuyback contract as a leftover.

However, the current implementation of `rescueERC20()` only supports rescue ERC20 tokens.

Impact

The leftover native tokens trapped in the contract can not be rescued.

Code Snippet

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/fee-buyback/FeeBuyback.sol#L77-L78>

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/fee-buyback/FeeBuyback.sol#L94-L97>

Tool used

Manual Review

Recommendation

Consider adding support to rescue native tokens.



Discussion

amshirif

<https://github.com/telcoin/telcoin-staking/pull/10>



Issue M-4: Native funds can be lost by submit() as msg.value isn't synchronized with amount

Source: <https://github.com/sherlock-audit/2022-11-telcoin-judging/issues/76>

Found by

hyh

Summary

When used with native funds FeeBuyback#submit() doesn't check for the `amount` argument to correspond to `msg.value` actually linked to the call.

Vulnerability Detail

This can lead either to bloating or to underpaying of the actual fee depending on the mechanics that will be used to call `submit()`. I.e. as two values can differ, and only one can be correct, the difference is a fund loss either to the `owner` (when the fee is overpaid) or to `recipient` (when the fee is underpaid vs correct formula).

Impact

Net impact is a fund loss proportional to the difference of the `amount` and `msg.value`. This can be either incomplete setup (native funds case isn't fully covered in a calling script) or an operational mistake (it is covered correctly, but a wrong value was occasionally left from a testing, and so on) situation.

Setting the severity to be medium as this is conditional on the actual usage of `submit()`.

Code Snippet

`submit()` uses `msg.value`, which can differ from `amount`:

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/fee-buyback/FeeBuyback.sol#L35-L82>

```
/**
 * @notice submits wallet transactions
 * @dev a secondary swap may occur
 * @dev staking contract updates may be made
 * @dev function can be paused
 * @param wallet address of the primary transaction
 * @param walletData bytes wallet data for primary transaction
```



```

* @param token address the token that is being swapped from in a secondary
↳ transaction
* @param amount uint256 the quantity of the token being swapped
* @param swapData bytes swap data from primary transaction
* @return boolean representing if a referral transaction was made
*/
function submit(address wallet, bytes memory walletData, address token, address
↳ recipient, uint256 amount, bytes memory swapData) external override payable
↳ onlyOwner() returns (bool) {
    //Perform user swap first
    ...

    //check if this is a referral transaction
    //if not exit execution
    if (token == address(0) || recipient == address(0) || amount == 0 ) {
        return false;
    }

    //if swapped token is in TEL, no swap is necessary
    //do simple transfer from and submit
    if (token == address(_telcoin)) {
        ...
    }

    //MATIC does not allow for approvals
    //ERC20s only
    if (token != MATIC) {
        IERC20(token).transferFrom(_safe, address(this), amount);
        IERC20(token).approve(_aggregator, amount);
    }

    //Perform secondary swap from fee token to TEL
    //do simple transfer from and submit
    (bool swapResult,) = _aggregator.call{value: msg.value}(swapData);
    require(swapResult, "FeeBuyback: swap transaction failed");
    _telcoin.approve(address(_referral), _telcoin.balanceOf(address(this)));
    require(_referral.increaseClaimableBy(recipient,
↳ _telcoin.balanceOf(address(this))), "FeeBuyback: balance was not adjusted");
    return true;
}

```

I.e. the funds in the native case aren't checked (can be zero, can be 100x of the fee needed), provided amount is just ignored.

Tool used

Manual Review



Recommendation

In order to maintain the uniform approach consider requiring that `amount` does exactly correspond to `msg.value`, when MATIC is used, for example:

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/fee-buyback/FeeBuyback.sol#L68-L73>

```
//MATIC does not allow for approvals
//ERC20s only
if (token != MATIC) {
    IERC20(token).transferFrom(_safe, address(this), amount);
    IERC20(token).approve(_aggregator, amount);
+ } else {
+     require(amount == msg.value, "FeeBuyback: wrong amount");
+ }
```

Discussion

amshirif

<https://github.com/telcoin/telcoin-staking/pull/10>



Issue M-5: `slash()` can be frontrunned to avoid the penalty imposed on them

Source: <https://github.com/sherlock-audit/2022-11-telcoin-judging/issues/45>

Found by

yixxas, hickuphh3, cccz

Summary

I believe `slash()` is used to take funds away from a user when they misbehave. However, a malicious user can frontrun this operation or the `pause()` function and call `fullClaimAndExit()` to fully exit before the penalty can affect them.

Vulnerability Detail

Malicious users who have intentionally committed some offenses that would lead to getting slashed can listen to the mempool and frontrun the `slash()` or `pause()` function call by the protocol to protect all his assets before slashing can happen.

Impact

Slashing mechanism implemented can be bypassed by malicious user.

Code Snippet

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/StakingModule.sol#L403-L406>

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/StakingModule.sol#L202-L207>

Tool used

Manual Review

Recommendation

I implore the sponsors to explore alternatives to this slashing mechanism as they can be easily bypassed, especially so by sophisticated users who presumably are the ones who will be getting slashed.



Discussion

amshirif

<https://github.com/telcoin/telcoin-staking/pull/21>



Issue M-6: Slashing fails if claims revert

Source: <https://github.com/sherlock-audit/2022-11-telcoin-judging/issues/5>

Found by

hickuphh3

Summary

Slashing claims yields for the slashed account as part of the process. Should claims revert, slashing attempts will revert too.

Vulnerability Detail

Slashing calls the underlying `_claimAndExit()` function, which claims yield from all plugins. Should one or more claims fail, slashing will revert as well.

Impact

Failing claims brick the slashing functionality until the erroneous plugin(s) are removed. During which, the slashed user could have claimed his yield and exited.

Code Snippet

<https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/StakingModule.sol#L403-L406> <https://github.com/sherlock-audit/2022-11-telcoin/blob/main/contracts/StakingModule.sol#L356-L379>

Tool used

Manual Review

Recommendation

Create another `slash()` method that skips claiming yields of the slashed account.

Discussion

amshirif

<https://github.com/telcoin/telcoin-staking/pull/16>

