成都链安
BEOSIN

Smart contract security audit report

Audit Number：202009131810

Report Query Name: dUSDTPool

Smart Contract Name：

dUSDTPool

Smart Contract Address：

0xe1C00a8C32D6944f61277EA5B8146E5157c2531A

Smart Contract Address Link：

https://etherscan.io/address/0xe1c00a8c32d6944f61277ea5b8146e5157c2531a#code

Start Date：2020.09.11

Completion Date：2020.09.13

Overall Result：Pass

Audit Team: Beosin (Chengdu LianAn) Technology Co. Ltd.

Audit Categories and Results:

No.	Categories	Subitems	Results
1	Coding Conventions	Compiler Version Security	Pass
		Deprecated Items	Pass
		Redundant Code	Pass
		SafeMath Features	Pass
		require/assert Usage	Pass
		Gas Consumption	Pass
		Visibility Specifiers	Pass
		Fallback Usage	Pass
2	General Vulnerability	Integer Overflow/Underflow	Pass
		Reentrancy	Pass
		Pseudo-random Number Generator (PRNG)	Pass
		Transaction-Ordering Dependence	Pass
		DoS (Denial of Service)	Pass

		Access Control of Owner	Pass
		Low-level Function (call/delegatecall) Security	Pass
		Returned Value Security	Pass
		tx.origin Usage	Pass
		Replay Attack	Pass
		Overriding Variables	Pass
3	Business Security	Business Logics	Pass
		Business Implementations	Pass

Note: Audit results and suggestions in code comments

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Audit Results Explained:

Beosin (Chengdu LianAn) Technology has used several methods including Formal Verification, Static Analysis, Typical Case Testing and Manual Review to audit three major aspects of smart contracts dUSDTPool, including Coding Standards, Security, and Business Logic. **The dUSDTPool contract passed all audit items. The overall result is Pass. The smart contract is able to function properly.**

1. Coding Conventions

Check the code style that does not conform to Solidity code style.

1.1 Compiler Version Security

- Description: Check whether the code implementation of current contract contains the exposed solidity compiler bug.
- Result: Pass

1.2 Deprecated Items

- Description: Check whether the current contract has the deprecated items.
- Result: Pass

1.3 Redundant Code

- Description: Check whether the contract code has redundant codes.
- Result: Pass

1.4 SafeMath Features

- Description: Check whether the SafeMath has been used. Or prevents the integer overflow/underflow in mathematical operation.
- Result: Pass

1.5 require/assert Usage

- Description: Check the use reasonability of 'require' and 'assert' in the contract.
- Result: Pass

1.6 Gas Consumption

- Description: Check whether the gas consumption exceeds the block gas limitation.
- Result: Pass

1.7 Visibility Specifiers

- Description: Check whether the visibility conforms to design requirement.
- Result: Pass

1.8 Fallback Usage

- Description: Check whether the Fallback function has been used correctly in the current contract.
- Result: Pass

2. General Vulnerability

Check whether the general vulnerabilities exist in the contract.

2.1 Integer Overflow/Underflow

- Description: Check whether there is an integer overflow/underflow in the contract and the calculation result is abnormal.
- Result: Pass

2.2 Reentrancy

- Description: An issue when code can call back into your contract and change state, such as withdrawing ETH.
- Result: Pass

2.3 Pseudo-random Number Generator (PRNG)

- Description: Whether the results of random numbers can be predicted.
- Result: Pass

2.4 Transaction-Ordering Dependence

- Description: Whether the final state of the contract depends on the order of the transactions.
- Result: Pass

2.5 DoS (Denial of Service)

- Description: Whether exist DoS attack in the contract which is vulnerable because of unexpected reason.
- Result: Pass

2.6 Access Control of Owner

- Description: Whether the owner has excessive permissions, such as malicious issue, modifying the balance of others.
- Result: Pass

2.7 Low-level Function (call/delegatecall) Security

- Description: Check whether the usage of low-level functions like call/delegatecall have vulnerabilities.
- Result: Pass

2.8 Returned Value Security

- Description: Check whether the function checks the return value and responds to it accordingly.
- Result: Pass

2.9 tx.origin Usage

- Description: Check the use secure risk of 'tx.origin' in the contract.
- Result: Pass

2.10 Replay Attack

- Description: Check the weather the implement possibility of Replay Attack exists in the contract.
- Result: Pass

2.11 Overriding Variables

- Description: Check whether the variables have been overridden and lead to wrong code execution.
- Result: Pass

3. Business Security

Check whether the business is secure.

3.1 Stake Initialization

- Description:

  As shown in Figure 1, 2 below, the "stake-reward" mode of the contract needs to initialize the relevant parameters (*rewardRate, lastUpdateTime, periodFinish*), call the *notifyRewardAmount* function by the specified reward distribution manager address *rewardDistribution*, and enter the initial reward used to calculate the *rewardRate*, initialize the stake and reward related parameters.

```
contract dUSDTPool is LPTokenWrapper, IRewardDistributionRecipient {
    IERC20 public syfi = IERC20(0xdc38a4846d811572452cB4CE747dc9F5F509820f);
    uint256 public constant DURATION = 7 days;

    uint256 public initreward = 10000*1e18;
    uint256 public starttime = 1599321600; //utc+8 2020 09-06 00:00:00
    uint256 public periodFinish = 0;
    uint256 public rewardRate = 0;
    uint256 public lastUpdateTime;
    uint256 public rewardPerTokenStored;
    mapping(address => uint256) public userRewardPerTokenPaid;
    mapping(address => uint256) public rewards;
```

Figure 1 related parameter source code

```
    function notifyRewardAmount(uint256 reward)
        external
        onlyRewardDistribution
        updateReward(address(0))
    {
        if (block.timestamp >= periodFinish) {
            rewardRate = reward.div(DURATION);
        } else {
            uint256 remaining = periodFinish.sub(block.timestamp);
            uint256 leftover = remaining.mul(rewardRate);
            rewardRate = reward.add(leftover).div(DURATION);
        }
        syfi.mint(address(this),reward);
        lastUpdateTime = block.timestamp;
        if(block.timestamp < starttime){
            periodFinish = starttime.add(DURATION);
        }else {
            periodFinish = block.timestamp.add(DURATION);
        }
        emit RewardAdded(reward);
    }
}
```

Figure 2 Source code of function *notifyRewardAmount*

- Related functions: *notifyRewardAmount, rewardPerToken, lastTimeRewardApplicable*
- Result: Pass

3.2 Stake USDT tokens

- Description:

  As shown in Figure 3 below, the contract implements the *stake* function to stake the USDT tokens. The user approve the contract address in advance. By calling the *transferFrom* function in the USDT contract, the contract address transfers the specified amount of USDT tokens to the contract address on behalf of the user; This function restricts the user to call only after the "stake-reward" mode is

turned on (the specified time is reached); each time this function is called to stake tokens, the reward related data is updated through the modifier *updateReward*; and each call is checked whether the *periodFinish* is reached by the modifier *checkhalve*, and the reward halving operation is performed and the *rewardRate* and the *periodFinish* are updated.

```
function stake(uint256 amount) public updateReward(msg.sender) checkhalve checkStart {
    require(amount > 0, "Cannot stake 0");
    super.stake(amount);
    emit Staked(msg.sender, amount);
}
```

Figure 3 Source code of function *stake*

- Related functions: *stake, safeTransferFrom,rewardPerToken, lastTimeRewardApplicable, earned, balanceOf*

- Result: Pass

3.3 Withdraw USDT tokens

- Description:

  As shown in Figure 4 below, the contract implements the *withdraw* function to withdraw the USDT tokens. By calling the *transfer* function in the USDT contract, the contract address transfers the specified amount of USDT tokens to the user; This function restricts the user to call only after the "stake-reward" mode is turned on (the specified time is reached); each time this function is called to stake tokens, the reward related data is updated through the modifier *updateReward*; and each call is checked whether the *periodFinish* is reached by the modifier *checkhalve*, and the reward halving operation is performed and the *rewardRate* and the *periodFinish* are updated.

```
function withdraw(uint256 amount) public updateReward(msg.sender) checkhalve checkStart {
    require(amount > 0, "Cannot withdraw 0");
    super.withdraw(amount);
    emit Withdrawn(msg.sender, amount);
}
```

Figure 4 Source code of function *withdraw*

- Related functions: *withdraw, safeTransfer, rewardPerToken, lastTimeRewardApplicable, earned, balanceOf*

- Result: Pass

3.4 Withdraw rewards (SYFI token)

- Description:

As shown in Figure 5 below, the contract implements the *getReward* function to withdraw the rewards (SYFI token). By calling the *transfer* function in the SYFI contract, the contract address transfers the specified amount (all rewards of caller) of SYFI tokens to the user; This function restricts the user to call only after the "stake-reward" mode is turned on (the specified time is reached); each time this function is called to stake tokens, the reward related data is updated through the modifier *updateReward*; and each call is checked whether the *periodFinish* is reached by the modifier *checkhalve*, and the reward halving operation is performed and the *rewardRate* and the *periodFinish* are updated.

```
function getReward() public updateReward(msg.sender) checkhalve checkStart {
    uint256 reward = earned(msg.sender);
    if (reward > 0) {
        rewards[msg.sender] = 0;
        syfi.safeTransfer(msg.sender, reward);
        emit RewardPaid(msg.sender, reward);
    }
}
```

Figure 5 Source code of function *getReward*

- Related functions: *getReward, safeTransfer, rewardPerToken, lastTimeRewardApplicable, earned, balanceOf*

- Result: Pass

3.5 Exit the stake participation

- Description:

As shown in Figure 6 below, the contract implements the *exit* function to close the participation of "stake-reward" mode. Call the *withdraw* function to withdraw all stake USDT tokens, call the *getReward* function to receive all rewards. The user address cannot get new rewards because the balance of USDT tokens already staked is empty.

```
function exit() external {
    withdraw(balanceOf(msg.sender));
    getReward();
}
```

Figure 6 Source code of function *exit*

- Related functions: *exit, withdraw, getReward, rewardPerToken, lastTimeRewardApplicable, earned, balanceOf*

- Result: Pass

3.6 Reward related data query function

- Description:

As shown in Figure 7 below, contract users can query the earliest timestamp between the current timestamp and the *periodFinish* by calling the *lastTimeRewardApplicable* function; calling the *rewardPerToken* function can query the gettable rewards for each stake USDT token; calling the *earned* function can query the total gettable stake rewards of the specified address.

```
function lastTimeRewardApplicable() public view returns (uint256) {
    return Math.min(block.timestamp, periodFinish);
}

function rewardPerToken() public view returns (uint256) {
    if (totalSupply() == 0) {
        return rewardPerTokenStored;
    }
    return
        rewardPerTokenStored.add(
            lastTimeRewardApplicable()
                .sub(lastUpdateTime)
                .mul(rewardRate)
                .mul(1e18)
                .div(totalSupply())
        );
}

function earned(address account) public view returns (uint256) {
    return
        balanceOf(account)
            .mul(rewardPerToken().sub(userRewardPerTokenPaid[account]))
            .div(1e18)
            .add(rewards[account]);
}
```

Figure 7 Source code of related functions

- Related functions: *lastTimeRewardApplicable, rewardPerToken, earned*
- Result: Pass

4. Conclusion

Beosin(ChengduLianAn) conducted a detailed audit on the design and code implementation of the dUSDTPool project. The SYFI contract implements the mint function, and the mint function can issue tokens without a certain cap. The governance management address (initially is deployer address) can add minter, and the minter address can call the mint function to issue tokens without limitation, affecting the token swap in the specified swap pool. Cautiously using mint function and adding minter are recommended. The overall audit result of dUSDTPool project is **Pass**.

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