Cakepie

Security Audit Report

October 1, 2024

Contents

1 Introduction

1.1 About Cakepie

Cakepie is an advanced SubDAO created by the Magpie Kitchen to enhance the long-term sustainability of PancakeSwap's veCAKE design. The primary objective of Cakepie is to accumulate CAKE tokens and lock them as veCAKE, helping to decrease its circulating supply. This allows Cakepie to capitalize on PancakeSwap's structure, optimizing governance power and offering passive income opportunities for DeFi users.

Cakepie provides a platform for users to deposit their assets and automatically receive optimized APR as liquidity providers. Simultaneously, it offers an efficient way for PancakeSwap voters to gain voting power and earn passive income via the CKP token.

1.2 Audit Scope

	LINK	Base Commit	Final Commit
1	https://github.com/magpiexyz/cakepie.../fixesNTestcases	8661eae	bfb0993
2	https://github.com/magpiexyz/cakepie_contract/pull/37	81789fc	f78ea89
3	https://github.com/magpiexyz/cakepie_contract/pull/65	737b125	0778d9e
4	https://github.com/magpiexyz/cakepie_contract/pull/67	6dfd700	297a489
5	https://github.com/magpiexyz/cakepie_contract/pull/71	730b49a	93ffc8c
6	https://github.com/magpiexyz/cakepie_contract/pull/84	8ce2d1e	-
7	https://github.com/magpiexyz/cakepie_contract/pull/88	e60f860	51293a0
8	https://github.com/magpiexyz/cakepie_contract/pull/86	a4b9a99	40add2b
9	https://github.com/magpiexyz/cakepie_contract/pull/92	7c26883	0e104f8
10	https://github.com/magpiexyz/cakepie_contract/pull/115	4735c37	b1ea76b
11	https://github.com/magpiexyz/cakepie_contract/pull/119	b4ed567	4471dbe
12	https://github.com/magpiexyz/cakepie_contract/pull/115	22a09a7	7e496a8

1.3 Changelog

Version	Date
First Audit	December 30, 2023
Second Audit	January 16, 2024
Third Audit	April 8, 2024
Forth Audit	April 25, 2024
Fifth Audit	May 14, 2024
Sixth Audit	May 30, 2024
Seventh Audit	June 15, 2024
Eighth Audit	June 24, 2024
Ninth Audit	June 26, 2024
Tenth Audit	August 24, 2024
Eleventh Audit	September 18, 2024
Twelfth Audit	September 30, 2024

2 | Overall Assessment

This report has been compiled to identify issues and vulnerabilities within the `Cakepie` project. Throughout this audit, we identified several issues spanning various severity levels. By employing auxiliary tool techniques to supplement our thorough manual code review, we have discovered the following findings.

Severity	Count	Acknowledged	Won't Do	Addressed
Critical	-	-	-	-
High	3	-	-	3
Medium	-	-	-	-
Low	4	1	-	3
Informational	1	-	-	1
Undetermined	-	-	-	-

3 | Vulnerability Summary

3.1 Overview

Click on an issue to jump to it, or scroll down to see them all.

3.2 Security Level Reference

In web3 smart contract audits, vulnerabilities are typically classified into different severity levels based on the potential impact they can have on the security and functionality of the contract. Here are the definitions for critical-severity, high-severity, medium-severity, and low-severity vulnerabilities:

Severity	Description
C-X (Critical)	A severe security flaw with immediate and significant negative consequences. It poses high risks, such as unauthorized access, financial losses, or complete disruption of functionality. Requires immediate attention and remediation.
H-X (High)	Significant security issues that can lead to substantial risks. Although not as severe as critical vulnerabilities, they can still result in unauthorized access, manipulation of contract state, or financial losses. Prompt remediation is necessary.
M-X (Medium)	Moderately impactful security weaknesses that require attention and remediation. They may lead to limited unauthorized access, minor financial losses, or potential disruptions to functionality.
L-X (Low)	Minor security issues with limited impact. While they may not pose significant risks, it is still recommended to address them to maintain a robust and secure smart contract.
I-X (Informational)	Warnings and things to keep in mind when operating the protocol. No immediate action required.
U-X (Undetermined)	Identified security flaw requiring further investigation. Severity and impact need to be determined. Additional assessment and analysis are necessary.

3.3 Vulnerability Details

[H-1] Revisited Logic of CakepieIIFOManager::harvestIIFOFromPancake()

Target	Category	IMPACT	LIKELIHOOD	STATUS
CakepieIIFOManager.sol	Business Logic	High	High	Addressed

In the `Cakepie IFO` protocol, the `CakepieIIFOManager` contract is designed for managing `Initial Farm Offering` (IFO) events on `PancakeSwap`, which allows the privileged owner account to generate a dedicated `PancakeIIFOHelper` for each `PancakeSwap IFO`. Users engagement with `PancakeSwap IFOs` is facilitated through interaction with the dedicated `PancakeIIFOHelper` contract, offering a streamlined and simplified user experience.

In particular, the `harvestIIFOFromPancake()` function allows the privileged owner to harvest the specified `PancakeSwap IFO`. The `PancakeStakingBNBChain::harvestIIFO()` is called (line 173) to interact with the specified `PancakeSwap IFO` through the `PancakeStakingBNBChain` contract. After further analysis, we observe the call to retrieve the pid (line 176) is improper and the correct implementation shall be `IPancakeIIFOHelper(_pancakeIIFOHelper).pid()` (line 176).

CakepieIIFOManager::harvestIIFOFromPancake()

```
163 function harvestIIFOFromPancake(address _pancakeIIFO) external onlyOwner {
164     address _pancakeIIFOHelper = iifoToHelper[_pancakeIIFO];
166     (address depositToken, address offeringToken) = IPancakeIIFOHelper(
            _pancakeIIFOHelper)
167         .getDepositnOfferingToken();
169     bool isClaimed = IPancakeIIFOHelper(_pancakeIIFOHelper).isHarvestFromPancake
            ();
171     if (isClaimed) revert AlreadyClaimed();
173     IPancakeStaking(pancakeStaking).harvestIIFO(
174         _pancakeIIFOHelper,
175         _pancakeIIFO,
176         IPancakeIIFOHelper(_pancakeIIFO).pid(),
177         depositToken,
178         offeringToken
179     );
181     IPancakeIIFOHelper(_pancakeIIFOHelper).updateStatus();
183     emit RewardClaimedFor(_pancakeIIFOHelper, _pancakeIIFO);
184 }
```

Remediation Correct the implementation of the `harvestIIFOFromPancake()` function as above mentioned.

[H-2] Revisited Logic of PancakeIIFOHelper::claim()

Target	Category	IMPACT	LIKELIHOOD	STATUS
PancakeIIFOHelper.sol	Business Logic	High	High	Addressed

As previously mentioned, each `PancakeIIFOHelper` instance is assigned to a specific `PancakeSwap IFO`. In particular, the `claim()` function is designed for users to harvest their respective rewards from the `PancakeSwap IFO` after its conclusion. While examining its logic, we identified two issues that need to be corrected.

- The validation of user input `_tokens` is improper (line 187).
- The second `_pid` parameter (line 192) of the call to `CakepieIIFOManager::releaseIIFOFromPancake()` is missing.

PancakeIIFOHelper::claim()

```
176 function claim(address[] calldata _tokens) external nonReentrant whenNotPaused {
177     (address depositToken, address offeringToken) = getDepositnOfferingToken();
178     if (!isHarvestFromPancake) revert claimPhaseNotStarted();
180     if (_tokens.length == 0) revert InvalidTokenLength();
182     for (uint8 i = 0; i < _tokens.length; i++) {
183         UserInfo storage userInfo = userInfos[_tokens[i]][msg.sender];
185         if (userInfo.userDeposit == 0) revert ZeroDeposit();
187         if (_tokens[i] != depositToken  _tokens[i] != offeringToken)
188             revert InvalidTokenAddress();
190         lastClaimVestedTime = block.timestamp;
192         ICakepieIIFOManager(cakepieIIFOManager).releaseIIFOFromPancake(address(
                pancakeIIFO));
194         _updateFor(msg.sender, _tokens[i]);
196         uint256 claimableAmt = userInfos[_tokens[i]][msg.sender].userRewards;
198         if (claimableAmt > 0) _sendReward(_tokens[i], msg.sender, claimableAmt);
200         emit UserClaimed(msg.sender, claimableAmt, offeringToken);
201     }
```

```
202 }
```

Remediation Correct the implementation of the `claim()` function as above mentioned.

[H-3] Revisited Logic of PancakeStakingBNBChain::depositIIFO()

Target	Category	IMPACT	LIKELIHOOD	STATUS
PancakeStakingBNBChain.sol	Business Logic	High	High	Addressed

In the `Cakepie IFO` protocol, the `PancakeStakingBNBChain` contract serves as the primary entry point for interacting with different `PancakeSwap IFOs`. While examining its logic, we observe the call to `depositIIFO()` function will always be reverted.

To provide a more in-depth explanation, we present the relevant code snippet from the contracts below. Inside the `depositIIFO()` function, the `IFOInitializableV7::depositPool()` is called (line 164) to deposit the supported asset into the `PancakeSwap IFO`. Upon further examination of the `IFOInitializableV7::depositPool()` implementation, there is an internal check is for `msg.sender` (line 249). Specifically, only users with an active `PancakeSwap Profile` are granted permission to participate in the `public sale` of the `PancakeSwap IFO`. However, the `PancakeStaking-BNBChain` contract does not have an active `PancakeSwap Profile`.

PancakeStakingBNBChain::depositIIFO()

```
153 function depositIIFO(
154     address _pancakeIIFOHelper,
155     address _pancakeIIFO,
156     uint8 _pid,
157     address _depositToken,
158     address _for,
159     uint256 _amount
160 ) external nonReentrant _onlyIIFOManager {
161     IERC20(_depositToken).safeTransferFrom(_for, address(this), _amount);
162     IERC20(_depositToken).safeIncreaseAllowance(_pancakeIIFO, _amount);

164     IIFO(_pancakeIIFO).depositPool(_amount, _pid);

166     emit DepositedIntoIFO(_pancakeIIFOHelper, _pid, _amount);
167 }
```

IFOInitializableV7::depositPool()

```
function depositPool(uint256 _amount, uint8 _pid) external override nonReentrant
     notContract {
    // Checks whether the pool id is valid
    require(_pid <= MAX_POOL_ID, "Deposit: Non valid pool id");

    if (pancakeProfileAddress != address(0) && _poolInformation[_pid].saleType
        != SaleType.BASIC) {
        // Checks whether the user has an active profile when provided profile
            SC and not basic sale
        require(
            IPancakeProfile(pancakeProfileAddress).getUserStatus(msg.sender),
            "Deposit: Must have an active profile"
        );
    }
    ...
}
```

Remediation Ensure the `PancakeStakingBNBChain` contract has an active `PancakeSwap Profile`.

[L-1] Revisited Pause Functionality in Current Implementation

Target	Category	IMPACT	LIKELIHOOD	STATUS
Multiple Contracts	Business Logic	N/A	N/A	Addressed

The `CakepieIIFOManager` contract showcases proficient code implementation and organization through the utilization of several reference contracts. Notably, it enhances the functionality by inheriting the `PausableUpgradeable` contract to support an emergency stop mechanism that can be triggered by a privileged account.

However, upon examining `CakepieIIFOManager` contract, we notice the absence of public `pause()/unpause()` interfaces, indicating that the emergency stop mechanism will never be activated.

CakepieIIFOManager

```
contract CakepieIIFOManager is
    Initializable,
    OwnableUpgradeable,
    ReentrancyGuardUpgradeable,
    PausableUpgradeable
{...}
```

Remediation Properly implement public `pause()/unpause()` interfaces for `CakepieIIFOManager`, `PancakeIIFOHelper`, and `PancakeStakingBNBChain` contracts.

[L-2] Potential Risks Associated with Centralization

Target	Category	IMPACT	LIKELIHOOD	STATUS
Multiple Contracts	Security	Low	Low	Acknowledged

In the `Cakepie IFO` protocol, the existence of a privileged `owner` account introduces centralization risks, as it holds significant control and authority over critical operations governing the protocol. In the following, we show the representative function potentially affected by the privileges associated with the privileged account.

PancakeStakingBNBChain

```
269 function setVeCakeRewarder(
270     address _veCakeShare,
271     address _veRevenueShare,
272     address _gaugeVoting
273 ) external onlyOwner {
274     ...
275 }

277 function setGaugeVoting(address _gaugeVoting) external onlyOwner {
278     if (_gaugeVoting == address(0)) revert AddressZero();
279     gaugeVoting = IGaugeVoting(_gaugeVoting);
280 }

282 function setCakepieIIFOManager(address _cakepieIIFOManager) external onlyOwner {
283     if (_cakepieIIFOManager == address(0)) revert AddressZero();
284     cakepieIIFOManager = _cakepieIIFOManager;
285 }
```

In the `Cakepie Rewarder` implementation, the existence of a privileged `owner` account also introduces centralization risks, as it holds significant control and authority over critical operations governing the protocol. In the following, we show the representative function potentially affected by the privileges associated with the privileged account.

StreamRewarder

```
305 function setRewardQueuerStatus(address _rewardQueuer, bool status) external
        onlyOwner {
306     isRewardQueuer[_rewardQueuer] = status;

308     emit QueuerStatusUpdated(_rewardQueuer, status);
309 }

311 function setMasterCakepie(address _masterCakepie) external onlyOwner {
312     address oldMasterCakepie = masterCakepie;
```

```
313         masterCakepie = _masterCakepie;

315         emit MasterCakepieUpdated(oldMasterCakepie, _masterCakepie);
316     }
```

Remediation To mitigate the identified issue, it is recommended to introduce multi-sig mechanism to undertake the role of the privileged account. Moreover, it is advisable to implement timelocks to govern all modifications to the privileged operations.

Response By Team This issue has been confirmed by the team and the multi-sig mechanism will be used to mitigate it.

[L-3] Revisited Logic of MasterCakepie::pendingTokens()/allPendingTokens()

Target	Category	IMPACT	LIKELIHOOD	STATUS
MasterCakepie.sol	Business Logic	Low	Low	Addressed

The `MasterCakepie` contract is designed to implement an incentive mechanism that encourages users to stake supported assets. As a result of this staking activity, participants receive rewards in the form of various tokens. Specifically, the `pendingTokens()` function is utilized by users to query the pending rewards associated with the specified `_stakingToken` and `_rewardToken`.

Upon scrutinizing its logic, we've identified that the current implementation neglects the potential existence of two distinct rewarders (i.e., the current rewarder and the legacy rewarder) in specific scenarios. In such instances, the accuracy of the returned pending rewards may be compromised.

MasterCakepie::pendingTokens()

```
269     function pendingTokens(
270         address _stakingToken,
271         address _user,
272         address _rewardToken
273     )
274         external
275         view
276         returns (
277             uint256 pendingCakepie,
278             address bonusTokenAddress,
279             string memory bonusTokenSymbol,
280             uint256 pendingBonusToken
281         )
282     {
283         PoolInfo storage pool = tokenToPoolInfo[_stakingToken];
284         pendingCakepie = _calCakepieReward(_stakingToken, _user);
```

```
286         // If it's a multiple reward farm, we return info about the specific bonus
                token
287         if (address(pool.rewarder) != address(0) && _rewardToken != address(0)) {
288             (bonusTokenAddress, bonusTokenSymbol) = (
289                 _rewardToken,
290                 IERC20Metadata(_rewardToken).symbol()
291             );
292             pendingBonusToken = IBaseRewardPool(pool.rewarder).earned(_user,
                    _rewardToken);
293         }
294     }
```

Remediation Consider the potential existence of two distinct rewarders during the pending rewards calculation in the `pendingTokens()/allPendingTokens()` functions.

[L-4] Improved Reward Send Logic in RewardDistributor::sendVeReward()

Target	Category	IMPACT	LIKELIHOOD	STATUS
RewardDistributor.sol	Business Logic	Low	Low	Addressed

The `RewardDistributor` contract provides an external `sendVeReward()` function for the `pancakeStaking` contract to send revenue shares rewards to the rewarders. Upon examining its logic, we notice that the reward send logic can be improved to prevent potential reverts when certain conditions are met.

Below is the related code snippet. The current code implementation will convert the reward token, i.e., `CAKE` token to `mCake` token if the `feeInfo[i].isMCAKE` is true. However, if the `feeAmount` is 0, the execution of the `_convertToMCake()` function may revert because the `smartConvert()` function requires its input `_feeAmount` to be greater than 0 (line 148).

RewardDistributor::sendVeReward()

```
125 function sendVeReward(
126     address _rewardSource,
127     address _rewardToken,
128     uint256 _amount,
129     bool _isVeCake,
130     uint256 _minRec
131 ) external nonReentrant _onlyRewardQeuer {
132     IERC20(_rewardToken).safeTransferFrom(msg.sender, address(this), _amount);
133     uint256 _leftRewardAmount = _amount;
134     uint256 totalMCake = 0;
135     Fees[] memory feeInfo;

137     if (_isVeCake) feeInfo = veCakeFeeInfos;
```

```
138         else feeInfo = revenueShareFeeInfo;

140         for (uint256 i = 0; i < feeInfo.length; i++) {
141             if (feeInfo[i].isActive) {
142                 address rewardToken = _rewardToken;
143                 uint256 feeAmount = (_amount * feeInfo[i].value) / DENOMINATOR;
144                 uint256 feeToSend = feeAmount;
145                 _leftRewardAmount -= feeToSend;

147                 if(feeInfo[i].isMCAKE) {
148                     feeToSend = _convertToMCake(feeAmount);
149                     rewardToken = mCake;
150                     totalMCake += feeToSend;
151                 }

153                 _distributeReward(feeInfo[i], rewardToken, feeToSend, _rewardSource,
                        true);
154             }
155         }

157         if(totalMCake < _minRec) {
158            revert minReceivedNotMet();
159         }

161         if (_leftRewardAmount > 0) {
162             IERC20(_rewardToken).safeTransfer(owner(), _leftRewardAmount);
163             emit RewardFeeDustTo(_rewardToken, owner(), _leftRewardAmount);
164         }
165     }
```

Note this issue also exists in the `sendRewards()` function of the same contract.

Remediation Execute the `_convertToMCake()` function only if the value of `feeAmount` is greater than 0.

[I-1] Meaningful Events for Key Operations

Target	Category	IMPACT	LIKELIHOOD	STATUS
MasterCakepie.sol	Coding Practices	N/A	N/A	Addressed

The `event` feature is vital for capturing runtime dynamics in a contract. Upon emission, `events` store transaction arguments in logs, supplying external analytics and reporting tools with crucial information. They play a pivotal role in scenarios like modifying system-wide parameters or handling token operations.

However, in our examination of protocol dynamics, we observed that certain privileged routines lack meaningful events to document their changes. We highlight the representative routines below.

MasterCakepie

```
899 function updateWhitelistedAllocManager(address _account, bool _allowed) external
        onlyOwner {
900     AllocationManagers[_account] = _allowed;
901 }

903 function setPancakeV3Helper(address _pancakeV3Helper) external onlyOwner {
904     pancakeV3Helper = IPancakeV3Helper(_pancakeV3Helper);
905 }

907 function setLegacyRewarder(address _stakingToken, address _legacyRewarder)
        external onlyOwner {
908     legacyRewarders[_stakingToken] = _legacyRewarder;
909 }
```

Remediation Ensure the proper emission of meaningful events containing accurate information to promptly reflect state changes.

4 Appendix

4.1 About AstraSec

AstraSec is a blockchain security company that serves to provide high-quality auditing services for blockchain-based protocols. With a team of blockchain specialists, AstraSec maintains a strong commitment to excellence and client satisfaction. The audit team members have extensive audit experience for various famous DeFi projects. AstraSec's comprehensive approach and deep blockchain understanding make it a trusted partner for the clients.

4.2 Disclaimer

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