CERTIK

Preliminary Comments

BonusCake

Oct 1st, 2021

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Summary

This report has been prepared for BonusCake to discover issues and vulnerabilities in the source code of the BonusCake 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	BonusCake
Platform	BSC
Language	Solidity
Codebase	https://bscscan.com/address/0xb84ddc645c27d4dc4bfa325c946f9d89d3afcc7a#code
Commit	

Audit Summary

Delivery Date	Oct 01, 2021
Audit Methodology	Static Analysis, Manual Review
Key Components	

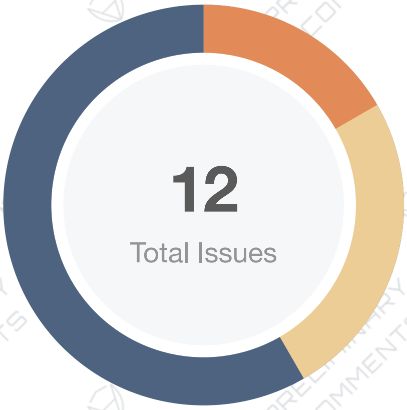
Vulnerability Summary

Vulnerability Level	Total	Pending	Declined	Acknowledged	Partially Resolved	Resolved
● Critical	0	0	0	0	0	0
● Major	2	2	0	0	0	0
● Medium	0	0	0	0	0	0
● Minor	3	3	0	0	0	0
● Informational	7	7	0	0	0	0
● Discussion	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum

Findings



🟥 **Critical**	**0** (0.00%)
🟧 **Major**	**2** (16.67%)
🟨 **Medium**	**0** (0.00%)
▨ **Minor**	**3** (25.00%)
🟦 **Informational**	**7** (58.33%)
🟩 **Discussion**	**0** (0.00%)

ID	Title	Category	Severity	Status
BCC-01	Centralization Risk	**Centralization / Privilege**	● **Major**	ⓘ Pending
BCC-02	Potential Sandwich Attacks	Logical Issue	● Minor	ⓘ Pending
BCC-03	Third Party Dependencies	Volatile Code	● Minor	ⓘ Pending
BCC-04	Risk For Weak Randomness	Logical Issue	● Minor	ⓘ Pending
BCC-05	Missing Emit Events	Coding Style	● Informational	ⓘ Pending
BCC-06	Unreachable code	Coding Style	● Informational	ⓘ Pending
BCC-07	Irrelevant comments	Coding Style	● Informational	ⓘ Pending
BCC-08	Return value not handled	Volatile Code	● Informational	ⓘ Pending
BCC-09	Confusing naming	Coding Style	● Informational	ⓘ Pending
BCC-10	Unlocked Compiler Version	Language Specific	● Informational	ⓘ Pending
BCC-11	Minor typos	Coding Style	● Informational	ⓘ Pending
BCC-12	Centralized risk in `addLiquidity`	**Centralization / Privilege**	● **Major**	ⓘ Pending

BCC-01 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	● Major	bonuscake/BonusCake.sol	ⓘ Pending

Description

In the contract `BonusCake`, the role `owner` has the authority over the following functions:

- `updateDividendTracker()`
- `updateUniswapV2Router()`
- `excludeFromFees()`
- `BonusCakeexcludeFromDividends()`
- `excludeMultipleAccountsFromFees()`
- `setAutomatedMarketMakerPair()`
- `updateLiquidityWallet()`
- `updateGasForProcessing()`
- `updateClaimWait()`
- `updateL()`
- `updateS()`
- `updateM()`
- `updateLUCKHODL()`
- `updateSellFees()`
- `updateBuyFees()`
- `updateCAKEReward()`
- `updateProject()`
- `updateLiquidity()`
- `setAddress()`
- `setAddress()`

Regarding contract `BonusCakeDividendTracker`, the role `owner` has the authority over the following functions:

- `excludeFromDividends()`
- `updateClaimWait()`
- `getLuckAddress()`
- `setBalance()`

- `processAccount()`

Any compromise to the `owner` account may allow the hacker to take advantage of this and update the uniswap router (currently being the pancakeswap V2 router), exclude addressess from paying fees or receiving dividends amongst other critical actions.

Based on the record on chain, we could identify the owner as an EOA, and the owner address is `0x248cffa0524342eb47e6bffcd2abc169e5d65707` https://bscscan.com/address/0xb84ddc645c27d4dc4bfa325c946f9d89d3afcc7a#readContract.

Recommendation

We advise the client to carefully manage the `owner` 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.

BCC-02 | Potential Sandwich Attacks

Category	Severity	Location	Status
Logical Issue	● Minor	bonuscake/BonusCake.sol: 422~440, 442~459	ⓘ Pending

Description

A sandwich attack might happen when an attacker observes a transaction swapping tokens or adding liquidity without setting restrictions on slippage or minimum output amount. The attacker can manipulate the exchange rate by frontrunning (before the transaction being attacked) a transaction to purchase one of the assets and make profits by backrunning (after the transaction being attacked) a transaction to sell the asset.

The following functions are called without setting restrictions on slippage or minimum output amount, so transactions triggering these functions are vulnerable to sandwich attacks, especially when the input amount is large:

- `swapTokensForEth()`
- `swapTokensForCake()`

Recommendation

We recommend setting reasonable minimum output amounts, instead of 0, based on token prices when calling the aforementioned functions.

BCC-03 | Third Party Dependencies

Category	Severity	Location	Status
Volatile Code	● Minor	bonuscake/BonusCake.sol	ⓘ Pending

Description

The contract interacts with third party PancakeSwap protocols. The scope of the audit would treat those 3rd party entities as black boxes and assume its functional correctness. However in the real world, 3rd parties may be compromised that led to assets lost or stolen. In addition, upgrades of 3rd parties can possibly create severe impacts, such as increasing fees of 3rd parties, migrating to new LP pools, etc.

Recommendation

We understand that the business logic of BonusCake requires interaction with Pancakeswap. We encourage the team to constantly monitor the statuses of 3rd parties to mitigate the side effects when unexpected activities are observed.

BCC-04 | Risk For Weak Randomness

Category	Severity	Location	Status
Logical Issue	● Minor	bonuscake/BonusCake.sol: 576~578	Pending

Description

The `_randomByModulus()` function is returning a pseudorandom number with `block.timestamp` and `block.difficulty`, and then generating the module of `numberOfTokenHolders`. The values of `block.timestamp`,`block.difficulty` and `numberOfTokenHolders` can be queried, so we think the returned value based on inner operations can be predicted. It is now well understood that the difficulty or timestamp is not a source of randomness; they can be manipulated if the attacker is also a miner.

```
function _randomByModulus(uint256 numberOfTokenHolders) private view returns(uint256) {
    return uint256(keccak256(abi.encodePacked(block.timestamp, block.difficulty))).mod(numberOfTokenHolders);
}
```

Recommendation

Consider obtaining random numbers based on a third-part random service such as Chainlink (https://docs.chain.link/docs/get-a-random-number/). According to Solidity Documentation, it is not recommended to use `block.timestamp`, `block.difficulty`, `gasLeft` or `blockhash` as a source of randomness (https://docs.soliditylang.org/en/latest/units-and-global-variables.html?highlight=block#block-and-transaction-properties).

BCC-05 | Missing Emit Events

Category	Severity	Location	Status
Coding Style	● Informational	bonuscake/BonusCake.sol: 461~476, 442~459, 422~440, 309~311, 246~248, 242~244, 238~240, 234~236, 230~232, 226~228, 222~224, 218~220, 214~216, 210~212, 168~170, 180~183, 250~252, 254~256	Pending

Description

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

- `BonusCakeexcludeFromDividends()`
- `setAutomatedMarketMakerPair()`
- `updateClaimWait()`
- `updateL()`
- `updateS()`
- `updateM()`
- `updateLUCKHODL()`
- `updateSellFees()`
- `updateBuyFees()`
- `updateCAKEReward()`
- `updateProject()`
- `updateLiquidity()`
- `setAddress()`
- `claim()`
- `swapTokensForEth()`
- `swapTokensForCake()`
- `addLiquidity()`

Recommendation

Consider adding events for sensitive actions, and emit them in the function.

BCC-06 | Unreachable code

Category	Severity	Location	Status
Coding Style	● Informational	bonuscake/BonusCake.sol: 537~539, 541~543	ⓘ Pending

Description

Given the require(false) statement, the code block from the functions `_transfer()` and `withdrawDividend()` of the `BonusCakeDividendTracker` contract will never be executed and is unnecessary.

Recommendation

We recommend removing the unreachable/unnecessary code block.

BCC-07 | Irrelevant comments

Category	Severity	Location	Status
Coding Style	● Informational	bonuscake/BonusCake.sol: 411	Pending

Description

The comment `this breaks the ETH -> HATE swap when swap+liquify is triggered` found in BonusCale.sol is not relevant to BonusCake.

```
        swapTokensForEth(half); // <- this breaks the ETH -> HATE swap when swap+liquify
is triggered
```

Recommendation

We recommend removing irrelevant comments.

BCC-08 | Return value not handled

Category	Severity	Location	Status
Volatile Code	● Informational	bonuscake/BonusCake.sol: 467~474	ⓘ Pending

Description

The return values of function `addLiquidityETH` are not properly handled.

```
        // add the liquidity
        uniswapV2Router.addLiquidityETH{value: ethAmount}(
            address(this),
            tokenAmount,
            0, // slippage is unavoidable
            0, // slippage is unavoidable
            liquidityWallet,
            block.timestamp
        );
```

Recommendation

We recommend using variables to receive the return value of the functions mentioned above and handle both success and failure cases if needed by the business logic.

BCC-09 | Confusing naming

Category	Severity	Location	Status
Coding Style	● Informational	bonuscake/BonusCake.sol: 250~256	ⓘ Pending

Description

The BonusCake smart contract had two different `setAddress` functions with different arguments that would do a completely different task from each other. The first one (with just one argument) would update the `projectAddress` (currently the owner of the project `0x248cFFa0524342eB47E6bfFcD2abc169E5D65707`):

```
function setAddress(address payable projectAddress) public onlyOwner {
  _projectAddress = projectAddress;
}
```

While the second one, with 2 arguments, would add/remove the `addr` address to/from the blacklist depending on the value of the boolean `isBlack`:

```
function setAddress(address addr, bool isBlack) public onlyOwner {
  blacklist[addr] = isBlack;
}
```

Given the generic naming used and the different purpose of both functions, it is believed that the function names could lead to confusion.

Recommendation

We would recommend to adjust the naming or the logic to the function intentions.

BCC-10 | Unlocked Compiler Version

Category	Severity	Location	Status
Language Specific	● Informational	bonuscake/BonusCake.sol: 16	ⓘ Pending

Description

The `BonusCake` and `BonusCakeDividendTracker` contracts have unlocked compiler version. An unlocked compiler version in the source code of the contract permits the user to compile it at or above a particular version. This, in turn, leads to differences in the generated bytecode between compilations due to differing compiler version numbers. This can lead to an ambiguity when debugging as compiler specific bugs may occur in the codebase that would be hard to identify over a span of multiple compiler versions rather than a specific one.

The following pragma statement is used:

```
pragma solidity ^0.6.2;
```

Recommendation

We advise that the compiler version is instead locked at the lowest version possible that the contract can be compiled at. For example, for version `v0.6.2` the contract should contain the following line:

```
pragma solidity 0.6.2;
```

BCC-11 | Minor typos

Category	Severity	Location	Status
Coding Style	● Informational	bonuscake/BonusCake.sol: 58	ⓘ Pending

Description

The spelling of 'exlcude' is a typo

Recommendation

Change it to 'exclude'

BCC-12 | Centralized risk in `addLiquidity`

Category	Severity	Location	Status
Centralization / Privilege	● Major	bonuscake/BonusCake.sol: 467~473	ⓘ Pending

Description

```
        uniswapV2Router.addLiquidityETH{value: ethAmount}(
            address(this),
            tokenAmount,
            0, // slippage is unavoidable
            0, // slippage is unavoidable
            liquidityWallet,
            block.timestamp
        );

```

The `addLiquidity` function calls the `uniswapV2Router.addLiquidityETH` function with the `to` address specified as `liquidityWallet` for acquiring the generated LP tokens from the `BonusCake-BNB` pool. As a result, over time the `liquidityWallet` address will accumulate a significant portion of LP tokens.If the `liquidityWallet` is an EOA (Externally Owned Account), mishandling of its private key can have devastating consequences to the project as a whole.

Recommendation

We advise the `to` address of the `uniswapV2Router.addLiquidityETH` function call to be replaced by the contract itself, i.e. `address(this)`, and to restrict the management of the LP tokens within the scope of the contract’s business logic. This will also protect the LP tokens from being stolen if the `liquidityWallet` account is compromised. In general, we strongly recommend centralized privileges or roles in the protocol to be improved via a decentralized mechanism or via smart-contract based accounts with enhanced security practices, f.e. Multisignature wallets.

Indicatively, here are some feasible solutions that would also mitigate the potential risk:

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

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.

Volatile Code

Volatile Code findings refer to segments of code that behave unexpectedly on certain edge cases that may result in a vulnerability.

Language Specific

Language Specific findings are issues that would only arise within Solidity, i.e. incorrect usage of private or delete.

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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