CERTIK

Security Assessment

Dogbsc

May 18th, 2021

Summary

This report has been prepared for Dogbsc smart contracts, to discover issues and vulnerabilities in the source code of their Smart Contract 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 given they are currently missing in the repository;
- Provide more comments per each function for readability, especially contracts are verified in public;
- Provide more transparency on privileged activities once the protocol is live.

Overview

Project Summary

Project Name	Dogbsc
Platform	BSC
Language	Solidity
Codebase	https://bscscan.com/address/0xd22ED812130737cb851A92e3C6a61393135811Cb#code
Commits	Address of contract: 0xd22ED812130737cb851A92e3C6a61393135811Cb

Audit Summary

Delivery Date	May 18, 2021
Audit Methodology	Static Analysis, Manual Review
Key Components	

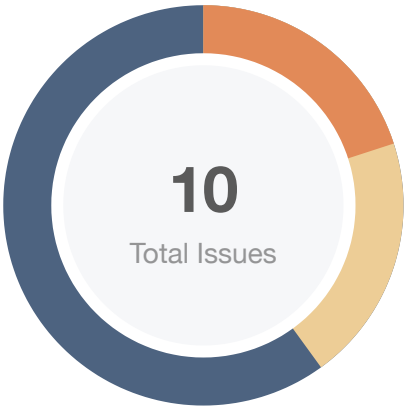
Vulnerability Summary

Total Issues	10
Critical	0
Major	2
Medium	0
Minor	2
Informational	6
Discussion	0

Audit Scope

ID	file	SHA256 Checksum
DOG	DOGBSC.sol	0517ac2ca5aab0b19c1cac6d28b10fc3bb5abfd341971d765ee22fc6807ead88

Findings



Critical	**0** (0.00%)
Major	**2** (20.00%)
Medium	**0** (0.00%)
Minor	**2** (20.00%)
Informational	**6** (60.00%)
Discussion	**0** (0.00%)

ID	Title	Category	Severity	Status
DOG-01	Missing event emitting	Coding Style	Informational	Acknowledged
DOG-02	Typos in the contract	Coding Style	Informational	Acknowledged
DOG-03	Contract gains non-withdrawable BNB via the `swapAndLiquify` function	Logical Issue	Major	Partially Resolved
DOG-04	Return value not handled	Volatile Code	Informational	Acknowledged
DOG-05	Redundant code	Logical Issue	Informational	Acknowledged
DOG-06	Centralized risk in `addLiquidity`	**Centralization / Privilege**	**Major**	**Partially Resolved**
DOG-07	Variable could be declared as `constant`	Gas Optimization	Informational	Acknowledged
DOG-08	3rd party dependencies	Control Flow	Minor	Acknowledged
DOG-09	Privileged ownership	**Centralization / Privilege**	**Minor**	**Acknowledged**
DOG-10	The purpose of function `deliver`	Control Flow	Informational	Acknowledged

DOG-01 | Missing event emitting

Category	Severity	Location	Status
Coding Style	Informational	DOGBSC.sol	Acknowledged

Description

In the contract, there are a bunch of functions can change state variables. However, these function do not emit event to pass the changes out of chain.

Recommendation

Recommend emitting events, for all the essential state variables that are possible to be changed during runtime.

Alleviation

No alleviation.

DOG-02 | Typos in the contract

Category	Severity	Location	Status
Coding Style	Informational	DOGBSC.sol: 728	Acknowledged

Description

There are several typos in the code and comments.

1. In the following code snippet, `tokensIntoLiqudity` should be `tokensIntoLiquidity`.

```
event SwapAndLiquify(
        uint256 tokensSwapped,
        uint256 ethReceived,
        uint256 tokensIntoLiqudity
    );
```

Recommendation

We recommend correcting all typos in the contract.

Alleviation

No alleviation.

DOG-03 | Contract gains non-withdrawable BNB via the `swapAndLiquify` function

Category	Severity	Location	Status
Logical Issue	Major	DOGBSC.sol: 883	Partially Resolved

Description

The `swapAndLiquify` function converts half of the `contractTokenBalance` DOGBSC tokens to BNB. The other half of DOGBSC tokens and part of the converted BNB are deposited into the DOGBSC-BNB pool on pancakeswap as liquidity. For every `swapAndLiquify` function call, a small amount of BNB leftover in the contract. This is because the price of DOGBSC drops after swapping the first half of DOGBSC tokens into BNBs, and the other half of DOGBSC tokens require less than the converted BNB to be paired with it when adding liquidity. The contract doesn't appear to provide a way to withdraw those BNB, and they will be locked in the contract forever.

Recommendation

It's not ideal that more and more BNB are locked into the contract over time. The simplest solution is to add a `withdraw` function in the contract to withdraw BNB. Other approaches that benefit the DOGBSC token holders can be:

- Distribute BNB to DOGBSC token holders proportional to the amount of token they hold.
- Use leftover BNB to buy back DOGBSC tokens from the market to increase the price of DOGBSC.

Alleviation

[DOGBSC]: Our business requires fair and equitable transactions, and everyone buys and sells equally, so technically speaking, it is impossible for us to use these two kinds of reserves to calculate the perfect amount to increase liquidity without any surplus. However, this is complicated and may cause errors. In addition, it will produce more gas. There is indeed a bit of bnb left, but it can be tolerated.

DOG-04 | Return value not handled

Category	Severity	Location	Status
Volatile Code	Informational	DOGBSC.sol: 1053~1060	Acknowledged

Description

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

```
        uniswapV2Router.addLiquidityETH{value: ethAmount}(
            address(this),
            tokenAmount,
            0,
            0,
            owner(),
            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.

Alleviation

No alleviation.

DOG-05 | Redundant code

Category	Severity	Location	Status
Logical Issue	Informational	DOGBSC.sol: 1072	Acknowledged

Description

The condition `!_isExcluded[sender] && !_isExcluded[recipient]` can be included in `else` .

Recommendation

The following code can be removed:

```
... else if (!_isExcluded[sender] && !_isExcluded[recipient]) {
    _transferStandard(sender, recipient, amount);
} ...
```

Alleviation

No alleviation.

DOG-06 | Centralized risk in `addLiquidity`

Category	Severity	Location	Status
Centralization / Privilege	Major	DOGBSC.sol	Partially Resolved

Description

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

The `addLiquidity` function calls the `uniswapV2Router.addLiquidityETH` function with the `to` address specified as `owner()` for acquiring the generated LP tokens from the `DOGBSC-BNB` pool. As a result, over time the `_owner` address will accumulate a significant portion of LP tokens.If the `_owner` 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 `_owner` 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.

Alleviation

[DOGBSC]: The community decides development, and community users holding tokens can decide many things through DAO or governance or the board of directors. If the community decides to burn them, the token will be sent to the blacklisted address.

DOG-07 | Variable could be declared as `constant`

Category	Severity	Location	Status
Gas Optimization	Informational	DOGBSC.sol	Acknowledged

Description

Variables `_tTotal`, `numTokensSellToAddToLiquidity`, `_name`, `_symbol` and `_decimals` could be declared as `constant` since these state variables are never to be changed.

Recommendation

We recommend declaring those variables as `constant`.

Alleviation

No alleviation.

DOG-08 | 3rd party dependencies

Category	Severity	Location	Status
Control Flow	Minor	DOGBSC.sol	Acknowledged

Description

The contract is serving as the underlying entity to interact 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.

Recommendation

We understand that the business logic of the DOGBSC protocol requires the interaction PancakeSwap protocol for adding liquidity to DOGBSC-BNB pool and swap tokens. We encourage the team to constantly monitor the statuses of those 3rd parties to mitigate the side effects when unexpected activities are observed.

Alleviation

No alleviation.

DOG-09 | Privileged ownership

Category	Severity	Location	Status
Centralization / Privilege	Minor	DOGBSC.sol	Acknowledged

Description

The owner of contract `DOGBSC` has the permission to:

1. change the address that can receive LP tokens,
2. exclude/include addresses from rewards/fees,
3. set `taxFee`, `liquidityFee` and `_maxTxAmount`,
4. enable `swapAndLiquifyEnabled`

without obtaining the consensus of the community.

Recommendation

Renounce ownership when it is the right timing, or gradually migrate to a timelock plus multisig governing procedure and let the community monitor in respect of transparency considerations.

Alleviation

No alleviation.

DOG-10 | The purpose of function `deliver`

Category	Severity	Location	Status
Control Flow	Informational	DOGBSC.sol	Acknowledged

Description

The function `deliver` can be called by anyone. It accepts an uint256 number parameter `tAmount`. The function reduces the DOGBSC token balance of the caller by `rAmount`, which is `tAmount` reduces the transaction fee. Then, the function adds `tAmount` to variable `_tFeeTotal`, which represents the contract's total transaction fee. We wish the team could explain more on the purpose of having such functionality.

Alleviation

No alleviation.

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.

Gas Optimization

Gas Optimization findings do not affect the functionality of the code but generate different, more optimal EVM opcodes resulting in a reduction on the total gas cost of a transaction.

Mathematical Operations

Mathematical Operation findings relate to mishandling of math formulas, such as overflows, incorrect operations etc.

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.

Control Flow

Control Flow findings concern the access control imposed on functions, such as owner-only functions being invoke-able by anyone under certain circumstances.

Volatile Code

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

Data Flow

Data Flow findings describe faults in the way data is handled at rest and in memory, such as the result of a struct assignment operation affecting an in-memory struct rather than an in-storage one.

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.

Inconsistency

Inconsistency findings refer to functions that should seemingly behave similarly yet contain different code, such as a constructor assignment imposing different require statements on the input variables than a setter function.

Magic Numbers

Magic Number findings refer to numeric literals that are expressed in the codebase in their raw format and should otherwise be specified as constant contract variables aiding in their legibility and maintainability.

Compiler Error

Compiler Error findings refer to an error in the structure of the code that renders it impossible to compile using the specified version of the project.

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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