



Security Assessment

Buff Doge Coin

Dec 9th, 2021

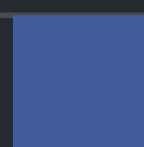


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Disclaimer

About

Summary

This report has been prepared for Buff Doge Coin to discover issues and vulnerabilities in the source code of the Buff Doge Coin 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	Buff Doge Coin
Platform	BSC
Language	Solidity
Codebase	https://bscscan.com/address/0x23125108bc4c63E4677b2E253Fa498cCb4B3298b#code
Commit	

Audit Summary

Delivery Date	Dec 09, 2021
Audit Methodology	Static Analysis, Manual Review
Key Components	

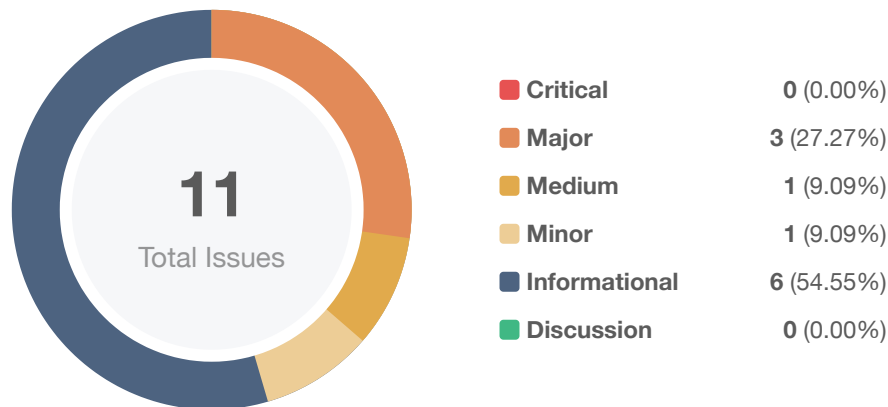
Vulnerability Summary

Vulnerability Level	Total	⚠ Pending	⊗ Declined	ℹ Acknowledged	🔄 Partially Resolved	✅ Resolved
● Critical	0	0	0	0	0	0
● Major	3	0	0	2	1	0
● Medium	1	0	0	0	1	0
● Minor	1	0	0	1	0	0
● Informational	6	0	0	6	0	0
● Discussion	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
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Findings



ID	Title	Category	Severity	Status
BDC-01	Typos in the contract	Coding Style	● Informational	ⓘ Acknowledged
BDC-02	Incorrect error message	Logical Issue	● Informational	ⓘ Acknowledged
BDC-03	Contract gains non-withdrawable BNB via the <code>swapAndLiquify</code> function	Logical Issue	● Medium	🔄 Partially Resolved
BDC-04	Centralized risk in <code>addLiquidity</code>	Centralization / Privilege	● Major	🔄 Partially Resolved
BDC-05	Return value not handled	Volatile Code	● Informational	ⓘ Acknowledged
BDC-06	Variable could be declared as <code>constant</code>	Gas Optimization	● Informational	ⓘ Acknowledged
BDC-07	3rd party dependencies	Control Flow	● Minor	ⓘ Acknowledged
BDC-08	Missing event emitting	Coding Style	● Informational	ⓘ Acknowledged
BDC-09	Redundant code	Logical Issue	● Informational	ⓘ Acknowledged
BDC-10	Privileged ownership	Centralization / Privilege	● Major	ⓘ Acknowledged
BDC-11	Possible to gain ownership after renouncing the contract ownership	Logical Issue, Centralization / Privilege	● Major	ⓘ Acknowledged

BDC-01 | Typos in the contract

Category	Severity	Location	Status
Coding Style	● Informational	BuffDogeCoin.sol (0x23125): 895, 723	① Acknowledged

Description

There are several typos in the code and comments.

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

```
1 event SwapAndLiquify(  
2     uint256 tokensSwapped,  
3     uint256 ethReceived,  
4     uint256 tokensIntoLiquidity  
5 );
```

2. `recieve` should be `receive` and `swaping` should be `swapping` in the line of comment `//to recieve ETH from uniswapV2Router when swaping`.

Recommendation

We recommend correcting all typos in the contract.

Alleviation

[Buff Doge Team]: We acknowledge the findings, and given that deployed contracts cannot be renewed, decided to keep the codebase unchanged.

BDC-02 | Incorrect error message

Category	Severity	Location	Status
Logical Issue	● Informational	BuffDogeCoin.sol (0x23125): 846	ⓘ Acknowledged

Description

The error message in `require(!_isExcluded[account], "Account is already excluded")` does not describe the error correctly.

Recommendation

The message "Account is already excluded" can be changed to "Account is not excluded".

Alleviation

[Buff Doge Team]: We acknowledge the findings, and given that deployed contracts cannot be renewed, decided to keep the codebase unchanged.

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

Category	Severity	Location	Status
Logical Issue	● Medium	BuffDogeCoin.sol (0x23125): 1034	🔄 Partially Resolved

Description

The `swapAndLiquify` function converts half of the `contractTokenBalance` BuffDogeCoin tokens to BNB. The other half of BuffDogeCoin tokens and part of the converted BNB are deposited into the BuffDogeCoin-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 BuffDogeCoin drops after swapping the first half of BuffDogeCoin tokens into BNBs, and the other half of BuffDogeCoin 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 BuffDogeCoin token holders can be:

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

Alleviation

[Buff Doge Team]: In order to maintain the token price, we often use the BNB to buy back. You can check our buy back transactions here:

<https://bscscan.com/token/0x23125108bc4c63E4677b2E253Fa498cCb4B3298b?a=0x357c8ef37AF2E6C751759d22D71A218598A6fB1C>

In the future we will continue to buy back at the right time to increase the price of Buff Doge Coin.- We also use the *DOGECOIN* token for product staking reward on HOTBIT with 50 DOGECOIN.

https://www.hotbit.io/invest/detail/1200?_cf_chl_jschl_tk_=1d8FvrmlHCS7Gp7N1Zvi5dg5BUm08hgNTf51HiTw38w-1638434338-0-gaNycGzNCZE-

BDC-04 | Centralized risk in `addLiquidity`

Category	Severity	Location	Status
Centralization / Privilege	● Major	BuffDogeCoin.sol (0x23125): 1085	🕒 Partially Resolved

Description

```
1 // add the liquidity
2 uniswapV2Router.addLiquidityETH{value: ethAmount}(
3     address(this),
4     tokenAmount,
5     0, // slippage is unavoidable
6     0, // slippage is unavoidable
7     owner(),
8     block.timestamp
9 );
```

The `addLiquidity` function calls the `uniswapV2Router.addLiquidityETH` function with the `to` address specified as `owner()` for acquiring the generated LP tokens from the `BuffDogeCoin-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

[Buff Doge Team]: We decide to take a serious step using Multisignature wallets and we will complete it as soon as possible. We have our LP locked immediately after launching and by increasing LP we will

continue to lock 2, 3, 4, etc, and will continue to do so when LP is not needed. Now, we have locked in \$1 million. And openly, we have a project that we are working on according to the whitepaper. We will not transfer ownership with the aim that we will not be hindered from completing the projects we are working on, facilitating marketing strategies, control so that Buff Doge Coin continues to grow in the long term. These are our LP Locked link:

[https://dxsale.app/app/v2_9/dxlockview?
id=0&add=0x357c8ef37AF2E6C751759d22D71A218598A6fB1C&type=lplock&chain=BSC](https://dxsale.app/app/v2_9/dxlockview?id=0&add=0x357c8ef37AF2E6C751759d22D71A218598A6fB1C&type=lplock&chain=BSC)

[https://dxsale.app/app/v3/dxlockview?
id=0&add=0x357c8ef37AF2E6C751759d22D71A218598A6fB1C&type=lplock&chain=BSC](https://dxsale.app/app/v3/dxlockview?id=0&add=0x357c8ef37AF2E6C751759d22D71A218598A6fB1C&type=lplock&chain=BSC)

[https://dxsale.app/app/v3/dxlockview?
id=1&add=0x357c8ef37AF2E6C751759d22D71A218598A6fB1C&type=lplock&chain=BSC](https://dxsale.app/app/v3/dxlockview?id=1&add=0x357c8ef37AF2E6C751759d22D71A218598A6fB1C&type=lplock&chain=BSC)

[https://dxsale.app/app/v3/dxlockview?
id=2&add=0x357c8ef37AF2E6C751759d22D71A218598A6fB1C&type=lplock&chain=BSC](https://dxsale.app/app/v3/dxlockview?id=2&add=0x357c8ef37AF2E6C751759d22D71A218598A6fB1C&type=lplock&chain=BSC)

BDC-05 | Return value not handled

Category	Severity	Location	Status
Volatile Code	● Informational	BuffDogeCoin.sol (0x23125): 1080~1087	ⓘ Acknowledged

Description

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

```
1     uniswapV2Router.addLiquidityETH{value: ethAmount}(
2         address(this),
3         tokenAmount,
4         0, // slippage is unavoidable
5         0, // slippage is unavoidable
6         owner(),
7         block.timestamp
8     );
```

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

[Buff Doge Team]: We acknowledge the findings, and given that deployed contracts cannot be renewed, decided to keep the codebase unchanged.

BDC-06 | Variable could be declared as `constant`

Category	Severity	Location	Status
Gas Optimization	● Informational	BuffDogeCoin.sol (0x23125)	① 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

[Buff Doge Team]: We acknowledge the findings, and given that deployed contracts cannot be renewed, decided to keep the codebase unchanged.

BDC-07 | 3rd party dependencies

Category	Severity	Location	Status
Control Flow	● Minor	BuffDogeCoin.sol (0x23125)	① 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 BuffDogeCoin protocol requires the interaction PancakeSwap protocol for adding liquidity to BuffDogeCoin-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

[Buff Doge Team]: Yes, we will constantly monitor the 3rd parties. Renouncing ownership of the contract will result in an inability to adapt to 3rd party changes to include exchanges. The team had the foresight to understand this, as our understanding of the Buff Doge Coin smart contract is the best. We already have contingency plans for likely upcoming 3rd party changes and growth.

BDC-08 | Missing event emitting

Category	Severity	Location	Status
Coding Style	● Informational	BuffDogeCoin.sol (0x23125)	① Acknowledged

Description

In contract `BuffDogeCoin`, 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

[Buff Doge Team]: We acknowledge the findings, and given that deployed contracts cannot be renewed, decided to keep the codebase unchanged.

BDC-09 | Redundant code

Category	Severity	Location	Status
Logical Issue	● Informational	BuffDogeCoin.sol (0x23125): 1100	ⓘ Acknowledged

Description

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

Recommendation

The following code can be removed:

```
1 ... else if (!_isExcluded[sender] && !_isExcluded[recipient]) {  
2     _transferStandard(sender, recipient, amount);  
3 } ...
```

Alleviation

[Buff Doge Team]: We acknowledge the findings, and given that deployed contracts cannot be renewed, decided to keep the codebase unchanged.

BDC-10 | Privileged ownership

Category	Severity	Location	Status
Centralization / Privilege	● Major	BuffDogeCoin.sol (0x23125)	ⓘ Acknowledged

Description

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

1. change the address that can receive LP tokens,
2. lock the contract,
3. exclude/include addresses from rewards/fees,
4. set `taxFee`, `liquidityFee` and `_maxTxAmount`,
5. enable `swapAndLiquifyEnabled` without obtaining the consensus of the community.

Recommendation

We advise the client to carefully manage the `[fixme]` 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.

Alleviation

[Buff Doge Team]: Consider the security issue about ownership of privileges. Our plan is to make the Multisignature contract for the contract owner function and set the contract owner for it. Until now, there will be no transfer of ownership, more than extra examination for security with key distribution between current council members. This will require 2/3 keys to take action on the contract. For now, Buff Doge Coin has been listed on Hotbit in November. We have also deal with 2 other CEX which will be listed on December 2021 and January 2022. Each CEX requires KYC, token audit and legal opinion to be listed. The Multisignature is underway and will be completed as soon as possible.

BDC-11 | Possible to gain ownership after renouncing the contract ownership

Category	Severity	Location	Status
Logical Issue, Centralization / Privilege	● Major	BuffDogeCoin.sol (0x23125)	① Acknowledged

Description

An owner is possible to gain ownership of the contract even if he calls function `renounceOwnership` to renounce the ownership. This can be achieved by performing the following operations:

1. Call `lock` to lock the contract. The variable `_previousOwner` is set to the current owner.
2. Call `unlock` to unlock the contract.
3. Call `renounceOwnership` to leave the contract without an owner.
4. Call `unlock` to regain ownership.

Recommendation

We advise updating/removing `lock` and `unlock` functions in the contract; or removing the `renounceOwnership` if such a privilege retains at the protocol level. If timelock functionality could be introduced, we recommend using the implementation of Compound finance as reference.

Reference: <https://github.com/compound-finance/compound-protocol/blob/master/contracts/Timelock.sol>

Alleviation

[Buff Doge Team]: We acknowledge the findings, and given that deployed contracts cannot be renewed, decided to keep the codebase unchanged.

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.

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.

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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