Security Assessment

DogeX

Oct 4th, 2021

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Summary

This report has been prepared for DogeX to discover issues and vulnerabilities in the source code of the DogeX 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	DogeX
Platform	Ethereum
Language	Solidity
Codebase	
Commit	

Audit Summary

Delivery Date	Oct 04, 2021
Audit Methodology	Static Analysis, Manual Review
Key Components	

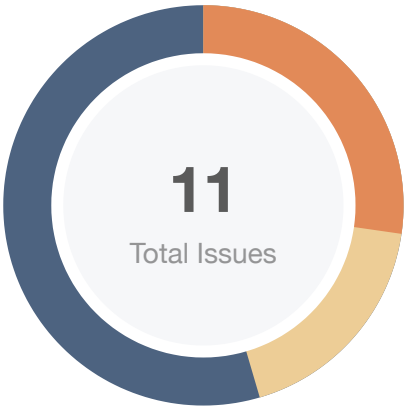
Vulnerability Summary

Vulnerability Level	Total	Pending	Declined	Acknowledged	Partially Resolved	Resolved
Critical	0	0	0	0	0	0
Major	3	0	0	3	0	0
Medium	0	0	0	0	0	0
Minor	2	0	0	2	0	0
Informational	6	0	0	6	0	0
Discussion	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
DXD	DogeX-main/DogeX.sol	bb2a7940d931c0603e1c85249186a7ce8421d763a775e2d11d931e0330946e11

Findings



Critical	0 (0.00%)
Major	3 (27.27%)
Medium	0 (0.00%)
Minor	2 (18.18%)
Informational	6 (54.55%)
Discussion	0 (0.00%)

ID	Title	Category	Severity	Status
DXD-01	Potential Sandwich Attacks	Logical Issue	Minor	Acknowledged
DXD-02	Proper usage of public and private type	Coding Style	Informational	Acknowledged
DXD-03	Centralization Risk	**Centralization / Privilege**	**Major**	Acknowledged
DXD-04	Fee Distribution	Logical Issue	Informational	Acknowledged
DXD-05	Owner can add an address as a bot arbitrarily	**Centralization / Privilege**	**Major**	Acknowledged
DXD-06	3rd party dependencies	Control Flow	Minor	Acknowledged
DXD-07	Centralized risk in `addLiquidity`	**Centralization / Privilege**	**Major**	Acknowledged
DXD-08	Variable could be declared as `constant`	Gas Optimization	Informational	Acknowledged
DXD-09	Return value not handled	Volatile Code	Informational	Acknowledged
DXD-10	Missing event emitting	Coding Style	Informational	Acknowledged
DXD-11	Missing check for the valid input	Logical Issue	Informational	Acknowledged

DXD-01 | Potential Sandwich Attacks

Category	Severity	Location	Status
Logical Issue	Minor	DogeX-main/DogeX.sol: 641~653	Acknowledged

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

- `getTokenPriceBNB()`

Recommendation

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

DXD-02 | Proper usage of public and private type

Category	Severity	Location	Status
Coding Style	Informational	DogeX-main/DogeX.sol: 429~435	Acknowledged

Description

The following private state variables are only visible for the contract they are defined in. Even though it might be potential design, we recommend the team to let users be aware of the following addresses.

- `_marketingAddress`
- `_buybackAddress`
- `_projectMaintainence`
- `_developmentAddress`
- `presaleRouter`
- `presaleAddress`

Recommendation

We recommend to use `public` attribute.

DXD-03 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	**Major**	DogeX-main/DogeX.sol	Acknowledged

Description

In the contract `DogeX`, the role `owner` has the authority over the following function:

- `excludeFromFee()`
- `includeInFee()`
- `removeBot()`
- `addBot()`
- `excludeFromContractWallet()`
- `includeInContractWallet()`
- `includeInExchange()`
- `excludeFromExchange()`
- `includeInBridge()`
- `excludeFromBridge()`
- `setMaxTxAmount()`
- `setMaxWalletAmount()`
- `setPercents()`
- `setTaxes()`
- `setPriceImpact()`
- `setManualETHvalue()`
- `updateOraclePriceFeed()`
- `setPresaleRouterAndAddress()`
- `endPresale()`
- `enablePriceOracle()`
- `disablePriceOracle()`
- `setFloor()`
- `setFloorPercent()`
- `updateTaxFreeBlocks()`
- `updatePairSwapped()`
- `updateMinBuySellBNB()`
- `updateMaxSellAmountBNB()`
- `enableSellCoolDown()`

- `disableSellCoolDown()`
- `enableDailyMax()`
- `disableDailyMax()`
- `setFloorFees()`
- `setSlideFees()`
- `updateBuyBackAddress()`
- `updateMarketingAddress()`
- `updateDevelopmentAddress()`

In the contract `DogeX`, the role `_marketingAddress` has the authority over the following function:

- `manualswap()`
- `manualsend()`

Any compromise to the `owner` and `_marketingAddress` account may allow the hacker to take advantage of these.

Recommendation

We advise the client to carefully manage the `owner` account's and `_marketingAddress` 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.

DXD-04 | Fee Distribution

Category	Severity	Location	Status
Logical Issue	Informational	DogeX-main/DogeX.sol: 343~377, 393~396, 574~583	Acknowledged

Description

There're six types of taxes depending on the situation: `BuybackFee`, `MarketingFee`, `LiquidityFee`, `ReflectionFee`, `DevFee` and `_projectMaintainencePercent`. All above tax rates are different under four different scenes: buying, selling, golden hour 1 and golden hour 2. The details of fees are listed as below. In the buy scenario:

- _buyBuybackFee = %5;
- _buyMarketingFee = %3;
- _buyReflectionFee = %2;
- _buyLiquidityFee = %3;
- _buyDevFee = %1;

In the sale scenario:

- _sellBuybackFee = %7;
- _sellMarketingFee = %3;
- _sellReflectionFee = %2;
- _sellLiquidityFee = %4;
- _sellDevFee = %1;

In golden hour 1:

- _floorBuybackFee = %21;
- _floorMarketingFee = %7;
- _floorLiquidityFee = %5;
- _floorReflectionFee = %4;
- _floorDevFee = %3;

In golden hour 2:

- _slideBuybackFee = %13;
- _slideMarketingFee = %5;
- _slideLiquidityFee = %3;
- _slideReflectionFee = %2;

- _slideDevFee = %1;

If the transaction comes from a bot address or is sent to a bot address, in the buy scenario,

- _buyMarketingFee = 45;
- _buyBuybackFee = 45;
- _buyReflectionFee = 0;
- _buyDevFee = 0;

in the sale scenario,

- _sellMarketingFee = 45;
- _sellBuybackFee = 45;
- _sellReflectionFee = 0;
- _sellDevFee = 0;

60% of fees will be sent to the `_buybackAddress`, 25% will be used in marketing, 10% will be sent to the `_developmentAddress`, and the rest 5% will be used for project maintenance.

Recommendation

This is the business logic of the DogeX protocol, however, users should be aware of the fee distribution.

DXD-05 | Owner can add an address as a bot arbitrarily

Category	Severity	Location	Status
Centralization / Privilege	**Major**	DogeX-main/DogeX.sol: 1115~1117	Acknowledged

Description

Owner can add an address as a bot arbitrarily.

Recommendation

We recommend the team listing the conditions for making an address to a bot.

DXD-06 | 3rd party dependencies

Category	Severity	Location	Status
Control Flow	Minor	DogeX-main/DogeX.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 DogeX protocol requires the interaction PancakeSwap protocol for adding liquidity to DogeX-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.

DXD-07 | Centralized risk in `addLiquidity`

Category	Severity	Location	Status
Centralization / Privilege	Major	DogeX-main/DogeX.sol: 859~871	Acknowledged

Description

```
// add the liquidity
uniswapV2Router.addLiquidityETH{value: ethAmount}(
    address(this),
    tokenAmount,
    0, // slippage is unavoidable
    0, // slippage is unavoidable
    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 `DogeX-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.

DXD-08 | Variable could be declared as `constant`

Category	Severity	Location	Status
Gas Optimization	Informational	DogeX-main/DogeX.sol	Acknowledged

Description

Variables `_threshold` could be declared as `constant` since this state variable is never to be changed.

Recommendation

We recommend declaring the variable as `constant`.

DXD-09 | Return value not handled

Category	Severity	Location	Status
Volatile Code	Informational	DogeX-main/DogeX.sol: 859~871	Acknowledged

Description

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

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

DXD-10 | Missing event emitting

Category	Severity	Location	Status
Coding Style	Informational	DogeX-main/DogeX.sol	Acknowledged

Description

In contract `DogeX`, 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.

DXD-11 | Missing check for the valid input

Category	Severity	Location	Status
Logical Issue	Informational	DogeX-main/DogeX.sol: 1103~1109	Acknowledged

Description

The above functions don't check the account to see if it's already included/excluded from fee.

Recommendation

We recommend performing checks before excluding/including the account from fee.

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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