CERTIK

Preliminary Comments

Bolix Token

May 20th, 2022

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Summary

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

Audit Summary

Delivery Date	May 20, 2022 UTC
Audit Methodology	Static Analysis, Manual Review

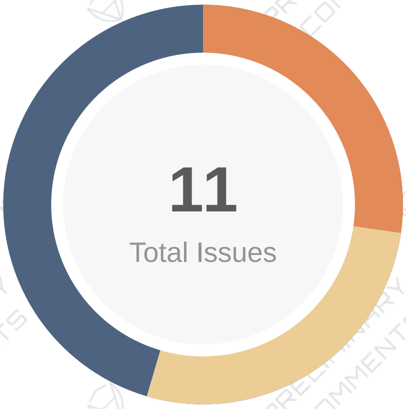
Vulnerability Summary

Vulnerability Level	Total	Pending	Declined	Acknowledged	Mitigated	Partially Resolved	Resolved
● Critical	0	0	0	0	0	0	0
● Major	3	3	0	0	0	0	0
● Medium	0	0	0	0	0	0	0
● Minor	3	3	0	0	0	0	0
● Informational	5	5	0	0	0	0	0
● Discussion	0	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
BCK	Bolix.sol	69329518b3e90f3f1b48c8e74459892d8cc9eabcdda702a8621e4286a70a723a

Findings



🟥 **Critical**	**0** (0.00%)
🟧 **Major**	**3** (27.27%)
🟨 **Medium**	**0** (0.00%)
🟨 **Minor**	**3** (27.27%)
🟦 **Informational**	**5** (45.45%)
🟩 **Discussion**	**0** (0.00%)

ID	Title	Category	Severity	Status
BCK-01	Centralization Related Risks In Contract `Bolix`	**Centralization / Privilege**	● **Major**	Pending
BCK-02	Unused Event	Coding Style	● Informational	Pending
BCK-03	Initial Token Distribution	**Centralization / Privilege**	● **Major**	Pending
BCK-04	Centralization Risk Related To `addLiquidityETH`	**Centralization / Privilege**	● **Major**	Pending
BCK-05	Potential Sandwich Attacks	Logical Issue	● Minor	Pending
BCK-06	Usage Of `transfer()` For Sending Ether	Volatile Code	● Minor	Pending
BCK-07	Potential Denial-of-Service Attack	Logical Issue	● Minor	Pending
BCK-08	Unhandled Return Value	Logical Issue	● Informational	Pending
BCK-09	Missing Emit Events	Coding Style	● Informational	Pending
BCK-10	Function Visibility Optimization	Gas Optimization	● Informational	Pending
BCK-11	Redundant SafeMath Usage	Language Specific	● Informational	Pending

BCK-01 | Centralization Related Risks In Contract `Bolix`

Category	Severity	Location	Status
Centralization / Privilege	● **Major**	Bolix.sol: 317, 322, 630, 636, 642, 648, 654, 661, 666, 671, 675, 683, 691, 696, 708, 717, 725, 898	ⓘ Pending

Description

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

- `Bolix.removeTokens`: Transfer tokens owned by the contract
- `Bolix.enableTrading`: Enable trading
- `Bolix.removeLimits`: Remove limits after token is stable
- `Bolix.disableTransferDelay`: Disable transfer delay
- `Bolix.updateSwapTokensAtAmount`: Change the minimum amount of tokens to sell from fees
- `Bolix.updateMaxTxnAmount`: Change max transaction allowed
- `Bolix.updateMaxWalletAmount`: Set new max wallet size amount
- `Bolix.excludeFromMaxTransaction`: Exclude an address from max transaction restriction
- `Bolix.updateBuyFees`: Change the buy fee
- `Bolix.updateSellFees`: Change the sell fee
- `Bolix.excludeFromFees`: Exclude address from being charged a fee
- `Bolix.setAutomatedMarketMakerPair`: Set address for AMM pair
- `Bolix.updateFeeWallet`: Change address to receive fees
- `Bolix.setSnipers`: Add address to black list
- `Bolix.delSnipers`: Remove address from black list
- `Bolix.withdrawFees`: Withdraw fees
- `Ownable.renounceOwnership`: Remove the owner
- `Ownable.transferOwnership`: Change the owner address

Any compromise to the owner account may allow a hacker to take advantage of this authority and change fees or send and withdraw all the fees and tokens owned by the contract to a desired address.

Recommendation

The risk describes the current project design and potentially makes iterations to improve in the security operation and level of decentralization, which in most cases cannot be resolved entirely at the present stage. We advise the client to carefully manage the privileged account's private key to avoid any potential risks of being hacked. In general, we strongly recommend centralized privileges or roles in the protocol be improved via a decentralized mechanism or smart-contract-based accounts with enhanced security practices, e.g., multisignature wallets. Indicatively, here are some feasible suggestions that would also mitigate the potential risk at a different level in terms of short-term, long-term and permanent:

Short Term:

Timelock and Multi sign (⅔, ⅗) combination *mitigate* by delaying the sensitive operation and avoiding a single point of key management failure.

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
  AND
- Assignment of privileged roles to multi-signature wallets to prevent a single point of failure due to the private key compromised;
  AND
- A medium/blog link for sharing the timelock contract and multi-signers addresses information with the public audience.

Long Term:

Timelock and DAO, the combination, *mitigate* by applying decentralization and transparency.

- Time-lock with reasonable latency, e.g., 48 hours, for awareness on privileged operations;
  AND
- Introduction of a DAO/governance/voting module to increase transparency and user involvement.
  AND
- A medium/blog link for sharing the timelock contract, multi-signers addresses, and DAO information with the public audience.

Permanent:

Renouncing the ownership or removing the function can be considered *fully resolved*.

- Renounce the ownership and never claim back the privileged roles.
  OR
- Remove the risky functionality.

BCK-02 | Unused Event

Category	Severity	Location	Status
Coding Style	● Informational	Bolix.sol: 569~570, 574~575, 575~576	ⓘ Pending

Description

The following events are declared but never used.

- `UpdateUniswapV2Router`
- `AutoNukeLP`
- `ManualNukeLP`

Recommendation

We recommend removing the unused event or emitting it in the right place.

BCK-03 | Initial Token Distribution

Category	Severity	Location	Status
Centralization / Privilege	● **Major**	Bolix.sol: 627~628	ⓘ Pending

Description

All of the Bolix tokens are sent to the contract deployer when deploying the contract. This could be a centralization risk as the deployer can distribute Bolix tokens without obtaining the consensus of the community.

Recommendation

We recommend the team to be transparent regarding the initial token distribution process, and the team shall make enough efforts to restrict the access of the private key.

BCK-04 | Centralization Risk Related To `addLiquidityETH`

Category	Severity	Location	Status
Centralization / Privilege	● **Major**	Bolix.sol: 863	ⓘ Pending

Description

In `addLiquidityETH` function, `uniswapV2Router.addLiquidityETH{value: ethAmount}` will be called with the `to` argument set to the address `owner()` for acquiring the generated LP tokens from the corresponding pool. As a result, over time the wallet with address `owner()` address will accumulate a significant portion of LP tokens. Mishandling its private key can have devastating consequences to the project as a whole.

```
858         uniswapV2Router.addLiquidityETH{value: ethAmount}(
859             address(this),
860             tokenAmount,
861             0, // slippage is unavoidable
862             0, // slippage is unavoidable
863             owner(),
864             block.timestamp
865         );
866     }
```

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 a single point of failure due to the private key;
- Introduction of a DAO/governance/voting module to increase transparency and user involvement.

BCK-05 | Potential Sandwich Attacks

Category	Severity	Location	Status
Logical Issue	● Minor	Bolix.sol: 846~847, 861~863	ⓘ 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`
- `_addLiquidity`

Recommendation

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

BCK-06 | Usage Of `transfer()` For Sending Ether

Category	Severity	Location	Status
Volatile Code	● Minor	Bolix.sol: 899~900	ⓘ Pending

Description

After EIP-1884 was included in the Istanbul hard fork, it is not recommended to use `.transfer()` or `.send()` for transferring ether as these functions have a hard-coded value for gas costs making them obsolete as they are forwarding a fixed amount of gas, specifically `2300`. This can cause issues in case the linked statements are meant to be able to transfer funds to other contracts instead of EOAs.

Recommendation

We advise that the linked `.transfer()` and `.send()` calls are substituted with the utilization of the `sendValue()` function from the `Address.sol` implementation of OpenZeppelin either by directly importing the library or copying the linked code.

BCK-07 | Potential Denial-of-Service Attack

Category	Severity	Location	Status
Logical Issue	● Minor	Bolix.sol: 750	ⓘ Pending

Description

The internal function `_transfer()` sets the `_isSniper` flag of the recipient of a token transfer to `true` if the transaction timestamp is the same as `_launchTime`.

```
750         if (block.timestamp == _launchTime) _isSniper[to] = true;
```

As addresses whose `_isSniper` flag is `true` are unable to use functions that call `_transfer()`, this leads to a possible denial-of-service attack where an attacker obtains tokens before `_launchTime`, such as from the owner, and transfers a token to an address at `_launchTime`. This allows the possibility for important addresses, such as the associated UniswapV2 pair/router to be flagged.

This issue can be fixed through the function `delSnipers()`, but there may be a service disruption shortly after `_launchTime`.

Recommendation

We recommend only allowing transfers after `_launchTime` if the sender and recipient are not the owner, or being very careful about how the initial tokens are distributed.

BCK-08 | Unhandled Return Value

Category	Severity	Location	Status
Logical Issue	● Informational	Bolix.sol: 858~859	ⓘ Pending

Description

In `_addLiquidity()` the return value from `uniswapV2Router.addLiquidityETH()` is not properly handled. If the return values are ignored, this could create unexpected exceptions. This could especially happen in circumstances where the called functions are not reverted automatically.

Recommendation

We recommend checking the return value of the function linked and handling both sided of success and failure cases based on logic needed.

BCK-09 | Missing Emit Events

Category	Severity	Location	Status
Coding Style	● Informational	Bolix.sol: 630~631, 642~643, 648~649, 654~655, 661~662, 666~667, 671~672, 675~676, 683~684, 691~692, 717~718, 725~726	ⓘ Pending

Description

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

- `enableTrading`: Set `tradingActive` to true
- `removeLimits`: Set `limitsInEffect` to true
- `disableTransferDelay`: Set `transferDelayEnabled` to false
- `updateSwapTokensAtAmount`: Change the minimum amount of tokens to sell from fees
- `updateMaxTxnAmount`: Set maximum transfer amount
- `updateMaxWalletAmount`: Set new max wallet size amounts
- `excludeFromMaxTransaction`: Exclude an address from the max transaction restriction
- `updateBuyFees`: Update buy fees
- `updateSellFees`: Update sell fees
- `excludeFromFees`: Exclude an address from buy/sell fees
- `setSnipers`: Blacklist an address
- `delSnipers`: Remove an address from blacklist

Recommendation

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

BCK-10 | Function Visibility Optimization

Category	Severity	Location	Status
Gas Optimization	● Informational	Bolix.sol: 696~697, 713~714, 717~718, 725~726	ⓘ Pending

Description

The following functions are declared as `public`, contain array function arguments, and are not invoked in any of the contracts contained within the project's scope. The functions that are never called internally within the contract should have external visibility.

- `setAutomatedMarketMakerPair`
- `isExcludedFromFees`
- `setSnipers`
- `delSnipers`

Recommendation

We advise that the functions' visibility specifiers are set to `external` and the array-based arguments change their data location from `memory` to `calldata`, optimizing the gas cost of the function.

BCK-11 | Redundant SafeMath Usage

Category	Severity	Location	Status
Language Specific	● Informational	Bolix.sol: 243	ⓘ Pending

Description

Solidity version >=0.8.0 includes checked arithmetic operations and underflow/overflow by default, making SafeMath redundant.

Recommendation

We recommend removing the SafeMath library and use standard arithmetic operators to reduce code complexity.

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.

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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