CERTIK

Preliminary Comments

ADX

Aug 15th, 2021

Table of Contents

Summary

This report has been prepared for ADX to discover issues and vulnerabilities in the source code of the ADX 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	ADX
Platform	Ethereum, BSC
Language	Solidity
Codebase	https://bscscan.com/token/0x6bff4fb161347ad7de4a625ae5aa3a1ca7077819 https://etherscan.io/token/0xade00c28244d5ce17d72e40330b1c318cd12b7c3
Commit	

Audit Summary

Delivery Date	Aug 15, 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	2	2	0	0	0	0
● Informational	2	2	0	0	0	0
● Discussion	0	0	0	0	0	0

Audit Scope

ID	File	SHA256 Checksum
ADX	bsc/ADXToken.sol	9513071424736dd7ccf8c5ebf1e7340cf656c6221f5880c924144dc7d7f5dc70
ADT	ether/ADXToken.sol	c1f4edbf2f8362db5fd1acda9aaa7ca2257e9af41d75f182c0074acbbd864098

System Overview

The `ADXToken` token deployed on the Binance Smart Chain.

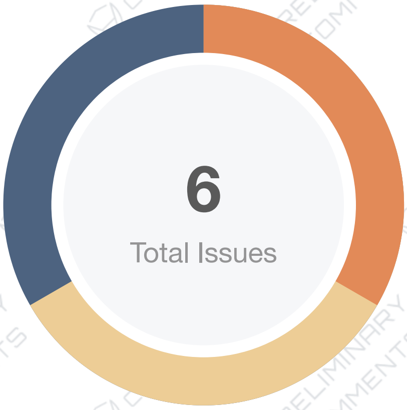
Here is some information on the `ADX` token that we found on the Binance Smart Chain:

- Total Supply: 9300000e18
- Max Cap: Unlimit
- SupplyController: 0x515144d4708a43927cf2edcbd429fb08524766fb
- SupplyController privileges:
  - SupplyController has the privilege to transfer or renounce the ownership.
  - SupplyController has the privilege to mint uncapped `ADX` to itself.

As for the `ADX` token deployed on Ethereum :

- Total Supply: 160064429672926627981986396
- Max Cap: Unlimit
- Minter: 0x9d47f1c6ba4d66d8aa5e19226191a8968bc9094e
- SupplyController privileges:
  - SupplyController has the privilege to mint `ADX` tokens to any account by the `mint()` function.
  - SupplyController has the privilege to change minter by the `changeSupplyController()` function.

Findings



🟥 **Critical**	**0** (0.00%)
🟧 **Major**	**2** (33.33%)
🟨 **Medium**	**0** (0.00%)
🟨 **Minor**	**2** (33.33%)
🟦 **Informational**	**2** (33.33%)
🟩 **Discussion**	**0** (0.00%)

ID	Title	Category	Severity	Status
ADT-01	Unlocked Compiler Version Declaration	Language Specific	● Informational	(!) Pending
ADT-02	Lack of Input Validation	Volatile Code	● Minor	(!) Pending
ADT-03	Centralization Risk	**Centralization / Privilege**	● **Major**	(!) Pending
ADX-01	Lack of Input Validation	Volatile Code	● Minor	(!) Pending
ADX-02	Centralization Risk	**Centralization / Privilege**	● **Major**	(!) Pending
ADX-03	Unlocked Compiler Version Declaration	Language Specific	● Informational	(!) Pending

ADT-01 | Unlocked Compiler Version Declaration

Category	Severity	Location	Status
Language Specific	● Informational	ether/ADXToken.sol: 5	ⓘ Pending

Description

The compiler version utilized throughout the project uses the `^` prefix specifier, denoting that a compiler version that is greater than the version will be used to compile the contracts.

Recommendation

It is a general practice to instead lock the compiler at a specific version rather than allow a range of compiler versions to be utilized to avoid compiler-specific bugs and be able to identify ones more easily. We recommend locking the compiler at the lowest possible version that supports all the capabilities wished by the codebase. This will ensure that the project utilizes a compiler version that has been in use for the longest time and as such is less likely to contain yet-undiscovered bugs.

ADT-02 | Lack of Input Validation

Category	Severity	Location	Status
Volatile Code	● Minor	ether/ADXToken.sol: 129, 138, 145, 153, 171, 176	ⓘ Pending

Description

The input value `supplyControllerAddr`, `to`, `from`, `spender`, `owner` and `newSupplyController` should be verified as non-zero address to prevent being mistakenly assigned as address(0) in the functions. Violation of this may cause losing the minting ability

Recommendation

We advise the client to check that the address is not zero by adding the following checks in the functions:

```
129 constructor(address supplyControllerAddr, address prevTokenAddr) public {
130    require(supplyControllerAddr != address(0), "supplyController is zero address");
131    supplyController = supplyControllerAddr;
132    PREV_TOKEN = prevTokenAddr;
133 }
```

```
138 function transfer(address to, uint amount) external returns (bool success) {
139    require(to != address(0), "transfer to the zero address");
140    balances[msg.sender] = balances[msg.sender].sub(amount);
141    balances[to] = balances[to].add(amount);
142    emit Transfer(msg.sender, to, amount);
143    return true;
144 }
```

```
145 function transferFrom(address from, address to, uint amount) external returns (bool
success) {
146    require(from != address(0), "transfer from the zero address");
147    balances[from] = balances[from].sub(amount);
148    allowed[from][msg.sender] = allowed[from][msg.sender].sub(amount);
149    balances[to] = balances[to].add(amount);
150    emit Transfer(from, to, amount);
151    return true;
152 }
```

```
153 function approve(address spender, uint amount) external returns (bool success) {
154    require(spender != address(0), "spender is zero address");
```

```
    allowed[msg.sender][spender] = amount;
    emit Approval(msg.sender, spender, amount);
    return true;
}
```

```
function mint(address owner, uint amount) external {
    require(owner != address(0), "owner is zero address");
    require(msg.sender == supplyController, 'NOT_SUPPLYCONTROLLER');
    innerMint(owner, amount);
}
```

```
function changeSupplyController(address newSupplyController) external {
    require(newSupplyController != address(0), "newSupplyController is zero address");
    require(msg.sender == supplyController, 'NOT_SUPPLYCONTROLLER');
    supplyController = newSupplyController;
}
```

ADT-03 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	● Major	ether/ADXToken.sol: 171~174, 176~179, 130	ⓘ Pending

Description

The supplyController of the contract `ADXToken` has permission to:

- mint unlimited amount of tokens to any account by calling the function `mint()`,
- change supplyController by calling the function `changeSupplyController()`,

without obtaining the consensus of the community.

Recommendation

We recommend the client carefully managing the supplyController 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

`[Certik]`: By the time of 2021-08-12 07:25 UTC, the supplyController of this contract `ADXToken.sol` is 0x9d47f1c6ba4d66d8aa5e19226191a8968bc9094e, at block height 13009490 on the Ethereum Chain.

Contract deployment is at https://etherscan.io/token/0xade00c28244d5ce17d72e40330b1c318cd12b7c3

ADX-01 | Lack of Input Validation

Category	Severity	Location	Status
Volatile Code	● Minor	bsc/ADXToken.sol: 133, 142, 149, 157, 175, 180	ⓘ Pending

Description

The input value `supplyControllerAddr`, `to`, `from`, `spender`, `owner` and `newSupplyController` should be verified as non-zero address to prevent being mistakenly assigned as address(0) in the functions. Violation of this may cause losing the minting ability

Recommendation

We advise the client to check that the address is not zero by adding the following checks in the functions:

```
129 constructor(address supplyControllerAddr, address prevTokenAddr) public {
130    require(supplyControllerAddr != address(0), "supplyController is zero address");
131    supplyController = supplyControllerAddr;
132    PREV_TOKEN = prevTokenAddr;
133 }
```

```
138 function transfer(address to, uint amount) external returns (bool success) {
139    require(to != address(0), "transfer to the zero address");
140    balances[msg.sender] = balances[msg.sender].sub(amount);
141    balances[to] = balances[to].add(amount);
142    emit Transfer(msg.sender, to, amount);
143    return true;
144 }
```

```
145 function transferFrom(address from, address to, uint amount) external returns (bool
success) {
146    require(from != address(0), "transfer from the zero address");
147    balances[from] = balances[from].sub(amount);
148    allowed[from][msg.sender] = allowed[from][msg.sender].sub(amount);
149    balances[to] = balances[to].add(amount);
150    emit Transfer(from, to, amount);
151    return true;
152 }
```

```
153 function approve(address spender, uint amount) external returns (bool success) {
154    require(spender != address(0), "spender is zero address");
```

```
  allowed[msg.sender][spender] = amount;
  emit Approval(msg.sender, spender, amount);
  return true;
}
```

```
function mint(address owner, uint amount) external {
  require(owner != address(0), "owner is zero address");
  require(msg.sender == supplyController, 'NOT_SUPPLYCONTROLLER');
  innerMint(owner, amount);
}
```

```
function changeSupplyController(address newSupplyController) external {
  require(newSupplyController != address(0), "newSupplyController is zero address");
  require(msg.sender == supplyController, 'NOT_SUPPLYCONTROLLER');
  supplyController = newSupplyController;
}
```

ADX-02 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	● **Major**	bsc/ADXToken.sol: 175~178, 180~183, 134	ⓘ Pending

Description

The supplyController of the contract `ADXToken` has permission to:

- mint unlimited amount of tokens to any account by calling the function `mint()`,
- change supplyController by calling the function `changeSupplyController()`,

without obtaining the consensus of the community.

Recommendation

We recommend the client carefully managing the supplyController 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

`[Certik]`: By the time of 2021-08-12 07:02 UTC, the supplyController of this contract `ADXToken.sol` is 0x515144d4708a43927cf2edcbd429fb08524766fb, at block height 9960960 on the Binance Smart Chain.

Contract deployment is at https://bscscan.com/address/0x6bff4fb161347ad7de4a625ae5aa3a1ca7077819

ADX-03 | Unlocked Compiler Version Declaration

Category	Severity	Location	Status
Language Specific	● Informational	bsc/ADXToken.sol: 9	ⓘ Pending

Description

The compiler version utilized throughout the project uses the `^` prefix specifier, denoting that a compiler version that is greater than the version will be used to compile the contracts.

Recommendation

It is a general practice to instead lock the compiler at a specific version rather than allow a range of compiler versions to be utilized to avoid compiler-specific bugs and be able to identify ones more easily. We recommend locking the compiler at the lowest possible version that supports all the capabilities wished by the codebase. This will ensure that the project utilizes a compiler version that has been in use for the longest time and as such is less likely to contain yet-undiscovered bugs.

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.

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.

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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