



CAT Core

Security Assessment

www.catcore.org/

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About

Summary

This report has been prepared to discover issues and vulnerabilities in the source code of the 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 protocols live.

Project Summary

Project Name	Cat Core - (https://catcore.org/)
Platform	CORE DAO
Language	Solidity
Codebase	https://scan.coredao.org/address/0x2af7B47Fcc3dDa01501f1b4735A18686fdB0e951
Commit	87cc90787612fd4537ftf5b845nv543g7l10i472

Audit Summary

Delivery Date	FMarch 6, 2023
Audit Methodology	Static Analysis, Manual Review
Key Components	Core Token





Vulnerability Summary

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

Audit Scope

ID	File	SHA256 Checksum
CKP	contract.sol	fd5b505af11580156108c0573d6000803e3d6000fd5b505050506040513d6020

4 files audited ● 3 files with Acknowledged findings ● 1 file with Resolved findings

ID	Repo	Commit	File	SHA256 Checksum
● APB	coredao-org/dao-contracts	1a550d5	 contracts/AirdropPool.sol	6b107e9cb0aea38712d01b7e40a7ed18aeb91a0e2aa7dd1ccd880b266c0dc728
● COR	coredao-org/dao-contracts	1a550d5	 contracts/CORESales.sol	0323126fc721ae5ea737ad33aeb2568a26b5eeb2fd011006f1cfce1dee7e648
● TVB	coredao-org/dao-contracts	1a550d5	 contracts/TeamVesting.sol	939147a2ac8de592227101e2fb9aeeb4c2d00eefac4679d96eab4f4eef78c635
● SMB	coredao-org/dao-contracts	1a550d5	 contracts/lib/SafeMath.sol	6eeb4a240710a44001fb885f5000495e673c553a0c19e878265a523ad66095ea

Overview

External Dependencies

The contract serves as the underlying entity to interact with third-party protocols (token-wrapping). The scope of the audit treats third-party entities as blackboxes and assumes their functional correctness. However, in the real world, third parties can be compromised and this may lead to lost or stolen assets.

Privileged Functions

The contract contains the following privileged functions that are restricted by role with the modifier. They are used to modify the contract configurations and address attributes. We grouped these functions below.

- `function _devFee()`
- `function _devWalletAddress()`
- `function allowance()`
- `function approve()`
- `function isExcludedFromReward()`
- `function isExcludedFromFee()`
- `function decreaseAllowance()`
- `function owner()`
- `function renounceOwnership()`
- `setSwapAndLiquifyEnabled()`
- `setRouterAddress()`

To improve the trustworthiness of the project, dynamic runtime updates in the project should be notified to the community. Any plan to invoke the aforementioned functions should be also considered to move to the execution queue of the Timelock contract.

01 | Centralization Risk in Function

Description

The `addLiquidity()_hasLiqBeenAdded()` function calls the `coreV2Router.addLiquidityETH` function with the `to()` address specified as `owner()` for acquiring the generated LP tokens from the corresponding pool. As a result, over time the `_owner` address will accumulate a significant portion of LP tokens. If `_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 `to()` the address of the `coreV2Router.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

02 | Centralization Risk in Contract

Category	Severity	Location	Status
Logical Issue	● Medium	projects/contract.sol (98ba012): 243	📄 Acknowledged

Description

In the contract `CoinTokens()`, the role `_owner()` has the authority over the following function:

- `excludeFromReward()` / `includeInReward()` ; the owner of the contract can exclude/include an account from/in rewards.
- `excludeFromFee()` / `includeInFee()` : the owner of the contract can exclude/include an account from/in fee.
- `setTaxFeePercent()` : the owner of the contract can set the percentage of the tax fee.
- `setDevFeePercent()` : the owner of the contract can set the percentage of the dev fee.
- `setLiquidityFeePercent()` : the owner of the contract can set the percentage of liquidity fee.
- `setMaxTxPercent()` : the owner of the contract can set the maximum transaction amount.
- `setDevWalletAddress()` : the owner of the contract can update the arbitrary address.
- `setRouterAddress()` : the owner of the contract can set any arbitrary address as the router address.
- `setNumTokensSellToAddToLiquidity()` : the owner of the contract can set the threshold to trigger liquidity-adding process.

Any compromise to the `_owner()` account may allow the hacker to take advantage of this and modify the significant state of the contract, thus introducing centralization risk.

03 | APPROACH & METHODS

Description

This report has been prepared for Cat Core to discover issues and vulnerabilities in the source code of the Cat Core project as well as any contract dependencies that were not part of an officially recognized library. A comprehensive examination has been performed utilizing Manual Review and Static Analysis techniques.

- 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 leader
- 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.

- testing the smart contracts against both common and uncommon attack vectors
- 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

04 | SetAllowance()

Description

setAllowance() currently poses a risk of a race condition. Consider the scenario

- operator() is allowed to applyFunds() up to 1000
- dao wants to increase the allowance by 100 and calls setAllowance(1100)
- However before this transaction was executed operator calls applyFunds(1000)
- After the allowance is increased operator calls applyFunds(1100)
- In total operator has spent which was not expected by dao

Recommendation

To prevent a possible race condition we recommend introducing increaseAllowance() and decreaseAllowance()

05 | Initial Token Distribution

Category	Severity	Location	Status
Logical Issue	● Medium	projects/contract.sol (98ba012): 817	① Acknowledged

Description

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

Recommendation

We recommend the team to be transparent regarding the initial token distribution process.

06 | Lack of Return Value Handling

Category	Severity	Location	Status
Volatile Code	● Minor	projects/contract.sol (98ba012): 843	ⓘ Acknowledged

Description

The return values of function tryADD() are properly handled.

```
function tryDiv(uint256 a, uint256 b) internal pure returns (bool, uint256) {
    unchecked {
        if (b == 0) return (false, 0);
        return (true, a / b);
    }
}

/**
 * @dev Returns the remainder of dividing two unsigned integers, with a division by zero flag.
 *
 * _Available since v3.4._
 */
function tryMod(uint256 a, uint256 b) internal pure returns (bool, uint256) {
    unchecked {
        if (b == 0) return (false, 0);
        return (true, a % b);
    }
}
```

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.

07 | UNLOCKED COMPILER VERSION

Language Specific	● Informational	contracts/AirdropPool.sol (base): <u>1</u> ; contracts/CORESales.sol (base): <u>1</u> ; contracts/TeamVesting.sol (base): <u>1</u> ; contracts/lib/SafeMath.sol (base): <u>1</u>	● Resolved
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Description

The contracts cited have an unlocked compiler version. An unlocked compiler version in the source code of the contract permits the user to compile it at or above a particular version. This in turn leads to differences in the generated bytecode between compilations due to differing compiler version numbers. This can lead to an ambiguity when debugging as compiler specific bugs may occur in the codebase that would be hard to identify over a span of multiple compiler versions rather than a specific one.

Recommendation

We recommend the compiler version is instead locked at the lowest version possible that the contract can be compiled at. For example, for version v0.8.0 the contract should contain the following line

```
pragma solidity ^0.8.7;
pragma experimental ABIEncoderV2;

/**
 * @dev Interface of the ERC20 standard as defined in the EIP.
 */
```

08 | Lack of Error Message

Category	Severity	Location	Status
Coding Style	● Informational	projects/contract.sol (98ba012): 560	📄 Acknowledged

Description

The require statement can be used to check for conditions and throw an exception if the condition is not met. It is better to provide a string message containing details about the error that will be passed back to the caller.

Recommendation

We advise refactoring the linked codes as below:

```
function functionCallWithValue(
    address target,
    bytes memory data,
    uint256 value,
    string memory errorMessage
) internal returns (bytes memory) {
    require(address(this).balance >= value, "Address: insufficient balance for call");
    require(isContract(target), "Address: call to non-contract");

    (bool success, bytes memory returndata) = target.call{value: value}(data);
    return verifyCallResult(success, returndata, errorMessage);
}

/**
 * @dev Same as {xref-Address-functionCall-address-bytes-}[`functionCall`],
 * but performing a static call.
 *
 * _Available since v3.3._
 */
function functionStaticCall(address target, bytes memory data) internal view returns (bytes memory) {
    return functionStaticCall(target, data, "Address: low-level static call failed");
}
```

09 | Redundant Code

Category	Severity	Location	Status
Logical Issue	● Informational	projects/contract.sol (98ba012): 862	① 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);  
} ...
```

10 | Typos In The Contract

Category	Severity	Location	Status
Coding Style	● Informational	projects/contract.sol (98ba012): 470, 670	📄 Acknowledged

Description

There are several typos in the code and comments.

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

```
contract DxBurnToken is Context, IERC20, Ownable {
    using SafeMath for uint256;
    using Address for address;
    address private dead = 0x0000000000000000000000000000000000000000000000000000000000000000dEaD;
    uint256 public maxTaxFee = 10;
    uint256 public maxDevFee = 10;
    uint256 public maxBurnFee = 10;
    uint256 public minMxTxPercentage = 50;
    uint256 public prevTaxFee;
    uint256 public prevDevFee;
    uint256 public prevBurnFee;

    mapping (address => uint256) private _rOwned;
    mapping (address => uint256) private _tOwned;
    mapping (address => mapping (address => uint256)) private _allowances;
    mapping (address => bool) private _isExcludedFromFee;
    mapping (address => bool) private _isExcluded;
    mapping (address => bool) private _isdevWallet;

    address[] private _excluded;
    address public _devWalletAddress; // team wallet here
    uint256 private constant MAX = ~uint256(0);
    uint256 private _tTotal;
    uint256 private _rTotal;
    uint256 private _tFeeTotal;
    uint256 public _tDevTotal;
    uint256 public _tBurnTotal;
    bool public mintedByDxsale = true;
    string private _name;
    string private _symbol;
    uint8 private _decimals;
```

2. `recieve()` should be `recieve()` `_swapping()` should be `_swapping()` in the line of comment `//to _recieve ETH from coreV2Router when swaping()` .

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.

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.

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 requirements on the input variables than a setter function.

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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