Cyberscope

Audit Report

ThermAI

May 2025

Repository https://github.com/ThermAI-Organisation/token-audit

Repository 9a02ee5245a25e42f2cbac2c17a13294de712467

Audited by © cyberscope

Analysis

Critical Medium Minor / Informative Pass

Severity	Code	Description	Status
●	ST	Stops Transactions	Unresolved
●	OTUT	Transfers User's Tokens	Passed
●	ELFM	Exceeds Fees Limit	Passed
●	MT	Mints Tokens	Unresolved
●	BT	Burns Tokens	Passed
●	BC	Blacklists Addresses	Passed

Diagnostics

Critical Medium Minor / Informative

Severity	Code	Description	Status
●	UTPD	Unverified Third Party Dependencies	Unresolved
●	ISF	Incomplete Setter Function	Unresolved
●	DTL	Duplicated Transfer Logic	Unresolved
●	IEE	Inconsistent Event Emission	Unresolved
●	MC	Missing Check	Unresolved
●	MU	Modifiers Usage	Unresolved
●	RFC	Redundant Fee Calculation	Unresolved

Table of Contents

Analysis **1**
Diagnostics **2**
Table of Contents **3**
Risk Classification **5**
Review **6**
Audit Updates 6
Source Files 6
Findings Breakdown **7**
ST - Stops Transactions 8
Description 8
Recommendation 9
MT - Mints Tokens 10
Description 10
Recommendation 10
UTPD - Unverified Third Party Dependencies 11
Description 11
Recommendation 11
ISF - Incomplete Setter Function 12
Description 12
Recommendation 13
DTL - Duplicated Transfer Logic 14
Description 14
Recommendation 14
IEE - Inconsistent Event Emission 15
Description 15
Recommendation 16
MC - Missing Check 17
Description 17
Recommendation 17
MU - Modifiers Usage 18
Description 18
Recommendation 18
RFC - Redundant Fee Calculation 19
Description 19
Recommendation 20
Functions Analysis **21**
Inheritance Graph **23**
Flow Graph **24**
Summary **25**

Disclaimer **26**
About Cyberscope **27**

Risk Classification

The criticality of findings in Cyberscope's smart contract audits is determined by evaluating multiple variables. The two primary variables are:

1. **Likelihood of Exploitation**: This considers how easily an attack can be executed, including the economic feasibility for an attacker.
2. **Impact of Exploitation**: This assesses the potential consequences of an attack, particularly in terms of the loss of funds or disruption to the contract's functionality.

Based on these variables, findings are categorized into the following severity levels:

1. **Critical**: Indicates a vulnerability that is both highly likely to be exploited and can result in significant fund loss or severe disruption. Immediate action is required to address these issues.
2. **Medium**: Refers to vulnerabilities that are either less likely to be exploited or would have a moderate impact if exploited. These issues should be addressed in due course to ensure overall contract security.
3. **Minor**: Involves vulnerabilities that are unlikely to be exploited and would have a minor impact. These findings should still be considered for resolution to maintain best practices in security.
4. **Informative**: Points out potential improvements or informational notes that do not pose an immediate risk. Addressing these can enhance the overall quality and robustness of the contract.

Severity	Likelihood / Impact of Exploitation
Critical	Highly Likely / High Impact
Medium	Less Likely / High Impact or Highly Likely/ Lower Impact
Minor / Informative	Unlikely / Low to no Impact

Review

Repository	https://github.com/ThermAI-Organisation/token-audit
Commit	9a02ee5245a25e42f2cbac2c17a13294de712467
Badge Eligibility	Must Fix Criticals

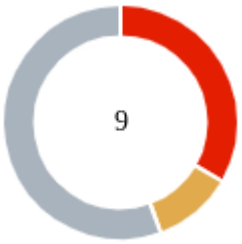
Audit Updates

Initial Audit	24 May 2025

Source Files

Filename	SHA256
contracts/interfaces/IThermAITreasury.sol	cf3ebf0b3e9e33f236036744a39351f9e b6df7dc0130b2cddd0f255dd2beefb9
contracts/interfaces/IThermAIToken.sol	9df67d43c147fb11201d8a414036e33fc 94bd763a94db32bc13877dcf3dcae69
contracts/implementations/TokenImplementation.sol	b02fc6fd5f85a78109732e1ebdd6655e3 b315827b23ba2ba6d3be2d7b4a2f0d4

Findings Breakdown



Critical	3
Medium	1
Minor / Informative	5

Severity	Unresolved	Acknowledged	Resolved	Other
Critical	3	0	0	0
Medium	1	0	0	0
Minor / Informative	5	0	0	0

ST - Stops Transactions

Criticality	Critical
Location	contracts/implementations/TokenImplementation.sol#L171,194,217
Status	Unresolved

Description

The `PAUSER_ROLE` has the authority to stop the sales for all users including the owner. The owner may take advantage of it by calling the `pause` function. As a result, the contract may operate as a honeypot.

Additionally, the owner can stop the transaction by initializing the `feeRecipient` to the zero address

```
   function transfer(address to, uint256 amount) public
override(ERC20Upgradeable, IERC20) nonReentrant returns (bool) {
        require(!paused(), "Token transfers are paused");
      ...
      }

      function transferFrom(address from, address to, uint256 amount)
public override(ERC20Upgradeable, IERC20) nonReentrant returns (bool) {
        require(!paused(), "Token transfers are paused");
    ...
    }

    function pause() external onlyRole(PAUSER_ROLE) {
        _pause();
    }

    function unpause() external onlyRole(PAUSER_ROLE) {
        _unpause();
    }
...

super._transfer(from, feeRecipient, feeAmount);
```

Recommendation

The contract could embody a check for not allowing passing the contract. The team should carefully manage the private keys of the `PAUSER_ROLE` account. We strongly recommend a powerful security mechanism that will prevent a single user from accessing the contract admin functions.

Temporary Solutions:

These measurements do not decrease the severity of the finding

- Introduce a time-locker mechanism with a reasonable delay.
- Introduce a multi-signature wallet so that many addresses will confirm the action.
- Introduce a governance model where users will vote about the actions.

Permanent Solution:

- Renouncing the ownership, which will eliminate the threats but it is non-reversible.

MT - Mints Tokens

Criticality	Critical
Location	contracts/implementations/TokenImplementation.sol#L225
Status	Unresolved

Description

The `DEFAULT_ADMIN_ROLE` has the authority to mint tokens. The `DEFAULT_ADMIN_ROLE` may take advantage of it by calling the `mint` function. As a result, the contract tokens will be highly inflated.

```
    function mint(address to, uint256 amount) external
onlyRole(DEFAULT_ADMIN_ROLE) {
        _mint(to, amount);
    }
```

Recommendation

The team should carefully manage the private keys of the `DEFAULT_ADMIN_ROLE` account. We strongly recommend a powerful security mechanism that will prevent a single user from accessing the contract admin functions.

Temporary Solutions:

These measurements do not decrease the severity of the finding

- Introduce a time-locker mechanism with a reasonable delay.
- Introduce a multi-signature wallet so that many addresses will confirm the action.
- Introduce a governance model where users will vote about the actions.

Permanent Solution:

- Renouncing the ownership, which will eliminate the threats but it is non-reversible.

UTPD - Unverified Third Party Dependencies

Criticality	Critical
Location	contracts/implementations/TokenImplementation.sol#L181
Status	Unresolved

Description

The contract uses an external contract in order to determine the transaction's flow. The external contract is untrusted. As a result, it may produce security issues and harm the transactions.

```
try IThermAITreasury(feeRecipient).receiveFees(feeAmount)
```

Recommendation

The contract should use a trusted external source. A trusted source could be either a commonly recognized or an audited contract. The pointing addresses should not be able to change after the initialization.

ISF - Incomplete Setter Function

Criticality	Medium
Location	contracts/implementations/TokenImplementation.sol#L96
Status	Unresolved

Description

The contract is exposing a `setStakingContractAddress` function, which by its naming implies that it will set and store the address of a designated staking contract. However, the function merely excludes the provided address from fee deductions, an action that is already supported by the existing `excludeFromFees` function. There is no storage or tracking of the staking contract address, nor does the function assign this address to any variable within the contract. This indicates that the function is incomplete or misleadingly named, as it lacks its core purpose of setting a staking-related address. Furthermore, it introduces unnecessary redundancy in functionality and may cause confusion for developers or integrators relying on proper staking integration.

```
   function setStakingContractAddress(address stakingContract) external
onlyRole(FEE_MANAGER_ROLE) {
        require(stakingContract != address(0), "Cannot set zero
address");
        _isExcludedFromFees[stakingContract] = true;
        emit ExcludeFromFees(stakingContract, true);
    }

    function excludeFromFees(address account, bool excluded) external
override onlyRole(FEE_MANAGER_ROLE) {
        _isExcludedFromFees[account] = excluded;
        emit ExcludeFromFees(account, excluded);
    }
```

Recommendation

It is recommended to remove the `setStakingContractAddress` function, as its current implementation does not fulfill its intended purpose and duplicates logic already available via `excludeFromFees`. Alternatively, if the staking contract address is intended to be used elsewhere in the contract logic, the function should be updated to store the address in a dedicated state variable for future reference.

DTL - Duplicated Transfer Logic

Criticality	Minor / Informative
Location	contracts/implementations/TokenImplementation.sol#L170,194
Status	Unresolved

Description

The contract is duplicating identical logic in both the `transfer` and `transferFrom` functions. Each function performs the same core actions, such as pausing checks, fee calculations, conditional fee transfers, and treasury notifications. This results in a redundant codebase where changes or fixes would need to be manually replicated in both functions, increasing the risk of inconsistencies or maintenance errors over time. The duplication also negatively impacts readability and overall contract clarity, especially when future updates are required.

```
 function transfer(address to, uint256 amount) public
override(ERC20Upgradeable, IERC20) nonReentrant returns (bool) {
        ...
    }

    function transferFrom(address from, address to, uint256 amount)
public override(ERC20Upgradeable, IERC20) nonReentrant returns (bool) {
        ...
    }
```

Recommendation

It is recommended to consolidate the shared logic of `transfer` and `transferFrom` into a single internal transfer function. This internal function should handle all common behaviours such as fee calculation, fund transfers, and treasury notification. Both `transfer` and `transferFrom` can then invoke this function, passing only the necessary parameters, improving maintainability and reducing code duplication.

IEE - Inconsistent Event Emission

Criticality	Minor / Informative
Location	contracts/implementations/TokenImplementation.sol#L
Status	Unresolved

Description

The contract is emitting the `FeesProcessingFailed` event exclusively in the `transfer` function when the fee forwarding call to the treasury fails. However, in the `transferFrom` function, the same fee forwarding logic is executed without emitting the corresponding event in the event of failure. This inconsistency introduces challenges in debugging and monitoring, as failed fee processing events from `transferFrom` transactions remain silent and undetected. Consistent event emission is crucial for off-chain systems, monitoring tools, and transparency, especially when both functions perform nearly identical operations.

```
    function transfer(address to, uint256 amount) public
override(ERC20Upgradeable, IERC20) nonReentrant returns (bool) {
        ...
            // Notify treasury of received fees
            try IThermAITreasury(feeRecipient).receiveFees(feeAmount) {
                // Successfully called receiveFees
            } catch (bytes memory reason) {
                // Log the error for debugging
                emit FeesProcessingFailed(feeAmount, reason);
        ...
    }

    function transferFrom(address from, address to, uint256 amount)
public override(ERC20Upgradeable, IERC20) nonReentrant returns (bool) {
        ...
            // Notify treasury of received fees
            try IThermAITreasury(feeRecipient).receiveFees(feeAmount) {}
catch {}
        } else {
            super._trasfer(from, to, amount);
        }
        ...
}
```

Recommendation

It is recommended to emit the `FeesProcessingFailed` event in the `transferFrom` function as well, mirroring the behaviour of the `transfer` function. This ensures consistency across the contract's transfer mechanisms and allows for more reliable tracking and debugging of fee forwarding failures.

MC - Missing Check

Criticality	Minor / Informative
Location	contracts/implementations/TokenImplementation.sol#L55
Status	Unresolved

Description

The contract is processing variables that have not been properly sanitized and checked that they form the proper shape. These variables may produce vulnerability issues.

The contract is missing a check to verify that the values passed is not zero.

```
function initialize(
        string memory name_,
        string memory symbol_,
        uint256 initialSupply_,
        address admin_,
        address treasury_
    ) external initializer {
    ...
    }
```

Recommendation

The team is advised to properly check the variables according to the required specifications.

MU - Modifiers Usage

Criticality	Minor / Informative
Location	contracts/implementations/TokenImplementation.sol#L105,111,117
Status	Unresolved

Description

The contract is using repetitive statements on some methods to validate some preconditions. In Solidity, the form of preconditions is usually represented by the modifiers. Modifiers allow you to define a piece of code that can be reused across multiple functions within a contract. This can be particularly useful when you have several functions that require the same checks to be performed before executing the logic within the function.

```
require(newFee <= 1000, "Fee cannot exceed 10%");
...
require(newFee <= 500, "Fee cannot exceed 5%");
```

Recommendation

The team is advised to use modifiers since it is a useful tool for reducing code duplication and improving the readability of smart contracts. By using modifiers to perform these checks, it reduces the amount of code that is needed to write, which can make the smart contract more efficient and easier to maintain.

RFC - Redundant Fee Calculation

Criticality	Minor / Informative
Location	contracts/implementations/TokenImplementation.sol#L149
Status	Unresolved

Description

The contract is applying a redundant fee deduction mechanism during the `transfer` functionality. Specifically, it calculates two separate fee components, `sendFee` and `receiveFee`, by independently multiplying each fee with the full transfer amount. These two computed fees are then summed and deducted from the original amount. However, since both fees are applied to the same `amount` value, this results in a double-fee deduction on a single transfer event, rather than a combined proportional fee. This design leads to unnecessarily high transaction costs for users and introduces a lack of consistency compared to standard fee mechanisms. It also adds complexity without providing a functional advantage, especially considering that buy and sell fees are calculated using a more consolidated approach.

```
    function _calculateFee(address from, address to, uint256 amount)
internal view returns (uint256) {
        ...
        } else {
            // Regular transfer
            uint256 sendFeeAmount = (amount * sendFee) / FEE_DENOMINATOR;
            uint256 receiveFeeAmount = (amount * receiveFee) /
FEE_DENOMINATOR;
            return sendFeeAmount + receiveFeeAmount;
        }
    }
```

Recommendation

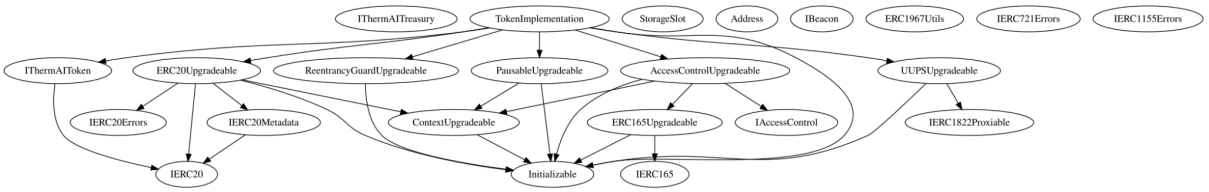
It is recommended to refactor the fee calculation logic to eliminate the redundant application of both `sendFee` and `receiveFee` to the same amount. Consider using a single, consolidated fee variable during transfer operations—similar to the approach used in buy and sell fee calculations—to ensure clarity, maintainability, and consistency while avoiding excessive fee deductions.

Functions Analysis

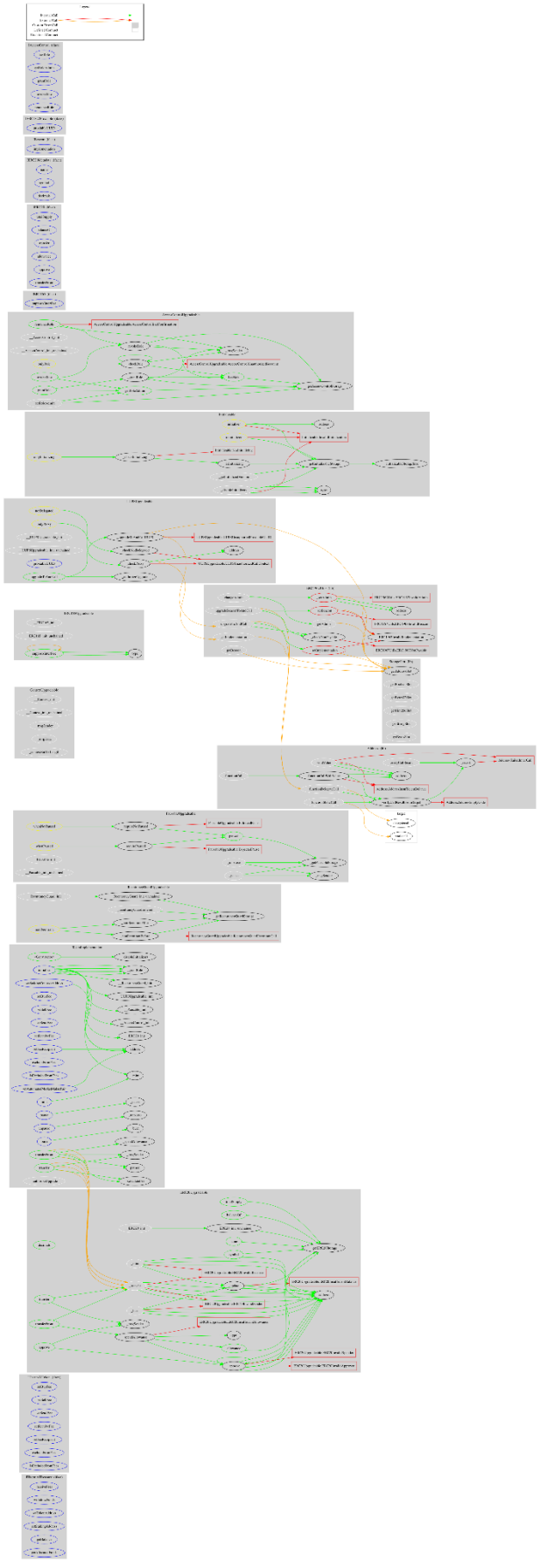
Contract	Type	Bases		
	Function Name	**Visibility**	**Mutability**	**Modifiers**
TokenImplementation	Implementation	Initializable, ERC20Upgradeable, AccessControlUpgradeable, PausableUpgradeable, UUPSUpgradeable, ReentrancyGuardUpgradeable, IThermAIToken		
		Public	✓	-
	initialize	External	✓	initializer
	setStakingContractAddress	External	✓	onlyRole
	setBuyFee	External	✓	onlyRole
	setSellFee	External	✓	onlyRole
	setSendFee	External	✓	onlyRole
	setReceiveFee	External	✓	onlyRole
	setFeeRecipient	External	✓	onlyRole
	excludeFromFees	External	✓	onlyRole
	isExcludedFromFees	External		-
	setAutomatedMarketMakerPair	External	✓	onlyRole

	_calculateFee	Internal		
	transfer	Public	✓	nonReentrant
	transferFrom	Public	✓	nonReentrant
	pause	External	✓	onlyRole
	unpause	External	✓	onlyRole
	mint	External	✓	onlyRole
	burn	External	✓	-
	_authorizeUpgrade	Internal	✓	onlyRole

Inheritance Graph



Flow Graph



Summary

ThermAI contract implements a token mechanism. This audit investigates security issues, business logic concerns and potential improvements. There are some functions that can be abused by the owner like stop transactions and mint tokens. If the contract owner abuses the mint functionality, then the contract will be highly inflated. A multi-wallet signing pattern will provide security against potential hacks. Temporarily locking the contract or renouncing ownership will eliminate all the contract threats. There is also a limit of max 10% fees.

Disclaimer

The information provided in this report does not constitute investment, financial or trading advice and you should not treat any of the document's content as such. This report may not be transmitted, disclosed, referred to or relied upon by any person for any purposes nor may copies be delivered to any other person other than the Company without Cyberscope's prior written consent. This report is not nor should be considered an "endorsement" or "disapproval" of any particular project or team. This report is not nor should be regarded as an indication of the economics or value of any "product" or "asset" created by any team or project that contracts Cyberscope to perform a security assessment. This document does not provide any warranty or guarantee regarding the absolute bug-free nature of the technology analyzed, nor do they provide any indication of the technologies proprietors' business, business model or legal compliance. This report should not be used in any way to make decisions around investment or involvement with any particular project. This report represents an extensive assessment process intending to help our customers increase the quality of their code while reducing the high level of risk presented by cryptographic tokens and blockchain technology.

Blockchain technology and cryptographic assets present a high level of ongoing risk Cyberscope's position is that each company and individual are responsible for their own due diligence and continuous security Cyberscope's goal is to help reduce the attack vectors and the high level of variance associated with utilizing new and consistently changing technologies and in no way claims any guarantee of security or functionality of the technology we agree to analyze. The assessment services provided by Cyberscope are subject to dependencies and are under continuing development. You agree that your access and/or use including but not limited to any services reports and materials will be at your sole risk on an as-is where-is and as-available basis Cryptographic tokens are emergent technologies and carry with them high levels of technical risk and uncertainty. The assessment reports could include false positives false negatives and other unpredictable results. The services may access and depend upon multiple layers of third parties.

About Cyberscope

Cyberscope is a blockchain cybersecurity company that was founded with the vision to make web3.0 a safer place for investors and developers. Since its launch, it has worked with thousands of projects and is estimated to have secured tens of millions of investors' funds.

Cyberscope is one of the leading smart contract audit firms in the crypto space and has built a high-profile network of clients and partners.

The Cyberscope team

cyberscope.io