Ether Authority

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SMART CONTRACT

Security Audit Report

Project:	Cardano Token
Website:	cardano.org
Platform:	Binance Network
Language:	Solidity
Date:	April 15th, 2025

Table of Contents

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Introduction

As part of EtherAuthority's community smart contract audit initiatives, the smart contract of the Cardano Token from cardano.org was audited. The audit was performed using manual analysis and automated software tools. This report presents all the findings regarding the audit performed on April 15th, 2025.

The purpose of this audit was to address the following:

- Ensure that all claimed functions exist and function correctly.
- Identify any security vulnerabilities that may be present in the smart contract.

Project Background

BEP20Cardano is a standard BEP-20 token implementation for the Binance Smart Chain. It represents a token named **Cardano Token** with the symbol **ADA** and **18 decimals**. The contract includes core token functionalities such as balance tracking, transfers, allowances, and minting/burning.

Key features:

- **Total Supply**: 100,000,000 ADA (minted to the deployer on deployment).
- **Ownership**: Managed via Ownable, allowing the contract owner to mint new tokens.
- **Minting & Burning**: The owner can mint new tokens; any holder can burn their tokens.
- **SafeMath**: All arithmetic operations are protected against overflow/underflow.
- **BEP-20 Compliance**: Implements all required methods (transfer, approve, transferFrom, etc.).

This contract can serve as a base for a fungible token on BSC and can be extended with additional features like capping, pausing, or governance mechanisms.

Audit scope

Name	Code Review and Security Analysis Report for Cardano Token Smart Contract
Platform	**Binance Network**
File	BEP20Cardano.sol
File Smart Contract Code	0x3ee2200efb3400fabb9aacf31297cbdd1d435d47
Audit Date	April 15th, 2025

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Claimed Smart Contract Features

Claimed Feature Details	Our Observation
Tokenomics: • Name: Cardano Token • Symbol: ADA • Decimals: 18 • Initial Supply: 100,000,000 ADA minted to the deployer.	**YES, This is valid.**

Key Features:
 	
Standards & Compatibility
 	
• **BEP-20 Compliant**: Fully adheres to the Binance Smart Chain BEP-20 token standard.
• **ERC-20 Compatible**: Functions are interoperable with most Ethereum/BSC tooling.
 	
Ownership & Access Control
 	
• **Ownable**: Uses the Ownable pattern, allowing an owner to control specific privileged functions.
• **Owner Functions**:
  ○ mint(): Mint new tokens.
  ○ Can transfer ownership (via Ownable).
 	
Token Operations
 	
• transfer(): Send tokens to another address.
• approve(): Authorize another address to spend tokens.
	YES, This is valid.

• transferFrom(): Transfer tokens on behalf of another address (with approval). • increaseAllowance() / decreaseAllowance(): Safer allowance modification. • burn(): Destroy tokens from the caller's balance. • burnFrom() (via internal _burnFrom()): Burn tokens on behalf of another user (internal only). **Supply Management** • **Minting**: The Owner can increase the total supply by minting new tokens. • **Burning**: Any holder can reduce the total supply by burning tokens. **Security Features** • **SafeMath**: All arithmetic operations use SafeMath to prevent overflows/underflows. • **Zero Address Checks**: Critical functions guard against sending to or from the zero address. **Events** • Transfer: Emitted on transfers, minting, and burning. • Approval: Emitted on approvals and allowance changes.	

Audit Summary

According to the standard audit assessment, the Customer's solidity-based smart contract is **“Secured.”** Also, these contracts contain owner control, which does not make them fully decentralized.

We used various tools like Slither, Solhint, and Remix IDE. At the same time, this finding is based on a critical analysis of the manual audit.

All issues found during automated analysis were manually reviewed, and applicable vulnerabilities are presented in the Audit overview section. The general overview is presented in the AS-IS section, and all identified issues can be found in the Audit overview section.

We found 0 critical, 0 high, 0 medium, 2 low, and 2 very low-level issues.

Investors' Advice: A Technical audit of the smart contract does not guarantee the project's ethical nature. Any owner-controlled functions should be executed by the owner responsibly. All investors/users are advised to do their due diligence before investing in the project.

Technical Quick Stats

Main Category	Subcategory	Result
Contract Programming	Solidity version not specified	Passed
	Solidity version is too old	Moderated
	Integer overflow/underflow	Passed
	Function input parameters lack of check	Passed
	Function input parameters check bypass	Passed
	Function access control lacks management	Passed
	Critical operation lacks event log	Moderated
	Human/contract checks bypass	Passed
	Random number generation/use vulnerability	N/A
	Fallback function misuse	Passed
	Race condition	Passed
	Logical vulnerability	Passed
	Features claimed	Passed
	Other programming issues	Moderated
Code Specification	Function visibility not explicitly declared	Passed
	Var. storage location not explicitly declared	Passed
	Use keywords/functions to be deprecated	Passed
	Unused code	Passed
Gas Optimization	“Out of Gas” Issue	Passed
	High consumption ‘for/while’ loop	Passed
	High consumption ‘storage’ storage	Passed
	Assert() misuse	Passed
Business Risk	The maximum limit for mintage is not set	Moderated
	“Short Address” Attack	Passed
	“Double Spend” Attack	Passed

Overall Audit Result: **PASSED**

Code Quality

This audit scope has 1 smart contract. Smart contracts contain Libraries, Smart contracts, inheritance, and Interfaces. This is a compact and well-written smart contract.

The libraries in Cardano Token are part of its logical algorithm. A library is a different type of smart contract that contains reusable code. Once deployed on the blockchain (only once), it is assigned a specific address, and its properties/methods can be reused many times by other contracts in the ADA Token.

The EtherAuthority team lacks scenario and unit test scripts, which would have helped to determine the integrity of the code automatically.

Code parts are well commented on in the smart contract. Ethereum's NatSpec commenting style is recommended.

Documentation

We were given an ADA Token smart contract code in the form of a BSCscan web link.

As mentioned above, code parts are well commented on. And the logic is straightforward. So it is easy to quickly understand the programming flow as well as complex code logic. Comments are very helpful in understanding the overall architecture of the protocol.

Use of Dependencies

As per our observation, the libraries used in this smart contract infrastructure that is based on well-known industry standard open-source projects.

Apart from libraries, its functions are not used in external smart contract calls.

AS-IS overview

BEP20Cardano.sol

Sl.	Functions	Type	Observation	Conclusion
1	constructor	write	Passed	No Issue
2	getOwner	external	Passed	No Issue
3	decimals	external	Passed	No Issue
4	symbol	external	Passed	No Issue
5	name	external	Passed	No Issue
6	totalSupply	external	Passed	No Issue
7	balanceOf	external	Passed	No Issue
8	transfer	external	Passed	No Issue
9	allowance	external	Passed	No Issue
10	approve	external	Passed	No Issue
11	transferFrom	external	Passed	No Issue
12	increaseAllowance	write	Passed	No Issue
13	decreaseAllowance	write	Passed	No Issue
14	mint	write	Unlimited Minting Capability, No Event for Mint Wrapper	Refer Audit Findings
15	burn	write	No Event for Mint Wrapper	Refer Audit Findings
16	_transfer	internal	No Check for Zero Amount Transfers	Refer Audit Findings
17	_mint	internal	Passed	No Issue
18	_burn	internal	Passed	No Issue
19	_approve	internal	Passed	No Issue
20	_burnFrom	internal	Missing `burnFrom()` Public Function	Refer Audit Findings
21	owner	read	Passed	No Issue
22	onlyOwner	modifier	Passed	No Issue
23	renounceOwnership	write	access only Owner	No Issue
24	transferOwnership	write	access only Owner	No Issue
25	_transferOwnership	internal	Passed	No Issue

Severity Definitions

Risk Level	Description
Critical	Critical vulnerabilities are usually straightforward to exploit and can lead to token loss, etc.
High	High-level vulnerabilities are difficult to exploit; however, they also have a significant impact on smart contract execution, e.g., public access to crucial
Medium	Medium-level vulnerabilities are important to fix; however, they can't lead to tokens being lost
Low	Low-level vulnerabilities are mostly related to outdated, unused, etc. code snippets, which can't have a significant impact on execution
Lowest / Code Style / Best Practice	Lowest-level vulnerabilities, code style violations, and info statements can't affect smart contract execution and can be ignored.

Audit Findings

Critical Severity

No Critical severity vulnerabilities were found.

High Severity

No High severity vulnerabilities were found.

Medium

No Medium severity vulnerabilities were found.

Low

(1) Unlimited Minting Capability:

The `mint(uint256 amount)` function allows the owner to mint an unlimited number of tokens, which can lead to severe inflation, loss of trust, and economic imbalance.

Resolution: Introduce a `maxSupply` variable and enforce a minting cap.

```
uint256 public maxSupply = 1e9 * 1018;

function mint(uint256 amount) public onlyOwner returns (bool) {
    require(_totalSupply.add(amount) <= maxSupply, "Cap exceeded");
    _mint(_msgSender(), amount);
    return true;
}
```

(2) No Event for Mint or Burn Wrapper:

While the internal `_mint` and `_burn` emit `Transfer`, having a `Minted` or `Burned` event in the public `mint` and `burn` functions could improve clarity in logs.

Resolution: Optionally emit custom events:

```
event Minted(address indexed to, uint256 amount);
event Burned(address indexed from, uint256 amount);
```

Very Low / Informational / Best practices:

(1) No Check for Zero Amount Transfers:

The `_transfer` function does not restrict zero-amount transfers, which may be used for spam or gasless transaction exploits on some platforms.

Resolution: Add - require(amount > 0, "Transfer amount must be greater than zero");

(2) Missing `burnFrom()` Public Function:

The `_burnFrom()` function exists but is not publicly accessible, breaking standard BEP20 behavior where a spender should be able to burn tokens on behalf of a holder.

Resolution: Add a public wrapper

```
function burnFrom(address account, uint256 amount) public returns (bool) {
    _burnFrom(account, amount);
    return true;
}
```

Centralization

This smart contract has some functions that can be executed by the Admin (Owner) only. If the admin wallet's private key is compromised, then it creates trouble. The following are Admin functions:

BEP20Cardano.sol

- mint: Creates `amount` tokens and assigns them to `msg.sender`, increasing the total supply.

Conclusion

We were given a contract code in the form of bscscan web links. We have used all possible tests based on the given objects as files. We observed 2 low and 2 informational issues in the smart contract, and those issues are not critical. So, **it's good to go for production**.

Since possible test cases can be unlimited for such smart contract protocols, we provide no such guarantee of future outcomes. We have used all the latest static tools and manual observations to cover the maximum possible test cases to scan everything.

Smart contracts within the scope were manually reviewed and analyzed with static analysis tools. Smart Contract's high-level description of functionality was presented in the As-is overview section of the report.

The audit report contains all found security vulnerabilities and other issues in the reviewed code.

The security state of the reviewed smart contract, based on the standard audit procedure scope, is **"Secured".**

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Our Methodology

We like to work with a transparent process and make our reviews a collaborative effort. The goals of our security audits are to improve the quality of systems we review and aim for sufficient remediation to help protect users. The following is the methodology we use in our security audit process.

Manual Code Review:

In manually reviewing all of the code, we look for any potential issues with code logic, error handling, protocol and header parsing, cryptographic errors, and random number generators. We also watch for areas where more defensive programming could reduce the risk of future mistakes and speed up future audits. Although our primary focus is on the in-scope code, we examine dependency code and behavior when it is relevant to a particular line of investigation.

Vulnerability Analysis:

Our audit techniques included manual code analysis, user interface interaction, and whitebox penetration testing. We look at the project's website to get a high-level understanding of what functionality the software under review provides. We then meet with the developers to gain an appreciation of their vision of the software. We install and use the relevant software, exploring the user interactions and roles. While we do this, we brainstorm threat models and attack surfaces. We read design documentation, review other audit results, search for similar projects, examine source code dependencies, skim open issue tickets, and generally investigate details other than the implementation.

Documenting Results:

We follow a conservative, transparent process for analyzing potential security vulnerabilities and seeing them through successful remediation. Whenever a potential issue is discovered, we immediately create an Issue entry for it in this document, even though we have not yet verified the feasibility and impact of the issue. This process is conservative because we document our suspicions early, even if they are later shown not to represent exploitable vulnerabilities. We generally follow a process of first documenting the suspicion with unresolved questions, then confirming the issue through code analysis, live experimentation, or automated tests. Code analysis is the most tentative, and we strive to provide test code, log captures, or screenshots demonstrating our confirmation. After this, we analyze the feasibility of an attack in a live system.

Suggested Solutions:

We search for immediate mitigations that live deployments can take, and finally, we suggest the requirements for remediation engineering for future releases. The mitigation and remediation recommendations should be scrutinized by the developers and deployment engineers, and successful mitigation and remediation are an ongoing collaborative process after we deliver our report, and before the details are made public.

Disclaimers

EtherAuthority.io Disclaimer

EtherAuthority team has analyzed this smart contract under the best industry practices at the date of this report, concerning: cybersecurity vulnerabilities and issues in smart contract source code, the details of which are disclosed in this report, (Source Code); the Source Code compilation, deployment and functionality (performing the intended functions).

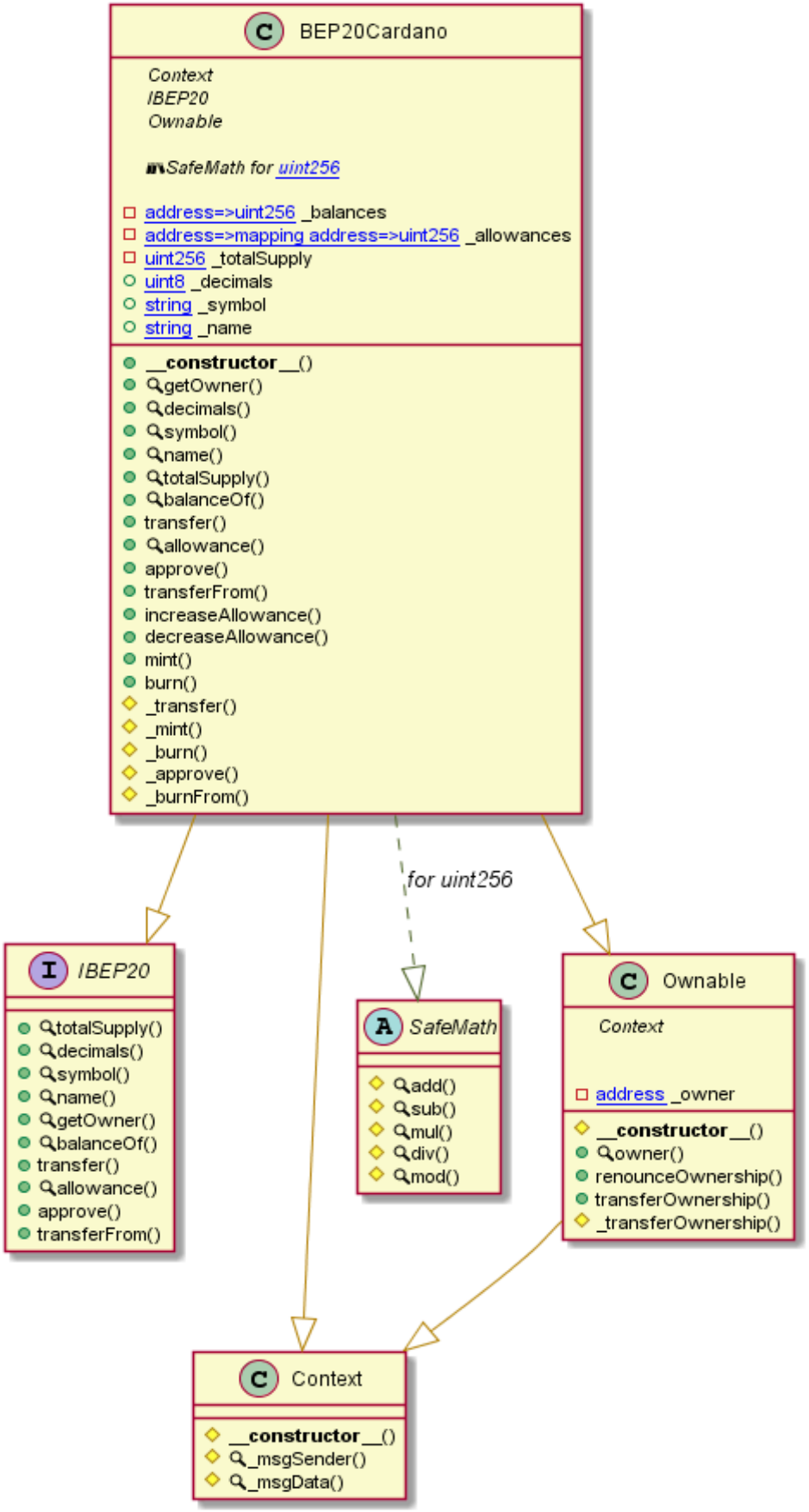
Since the total number of test cases is unlimited, the audit makes no statements or warranties on the security of the code. It also cannot be considered as a sufficient assessment regarding the utility and safety of the code, bug-free status, or any other statements of the contract. While we have done our best in conducting the analysis and producing this report, it is important to note that you should not rely on this report only. We also suggest conducting a bug bounty program to confirm the high level of security of this smart contract.

Technical Disclaimer

Smart contracts are deployed and executed on the blockchain platform. The platform, its programming language, and other software related to the smart contract can have their own vulnerabilities that can lead to hacks. Thus, the audit can't guarantee explicit security of the audited smart contracts.

Appendix

Code Flow Diagram - Cardano Token



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Slither Results Log

Slither is a Solidity static analysis framework that uses vulnerability detectors, displays contract details, and provides an API for writing custom analyses. It helps developers identify vulnerabilities, improve code comprehension, and prototype custom analyses quickly. The analysis includes a report with warnings and errors, allowing developers to quickly prototype and fix issues.

We analyzed the project altogether. Below are the results.

Slither Log >> BEP20Cardano.sol

```
INFO:Detectors:
BEP20Cardano.allowance(address,address).owner (BEP20Cardano.sol#423) shadows:
	- Ownable.owner() (BEP20Cardano.sol#301-303) (function)
BEP20Cardano._approve(address,address,uint256).owner (BEP20Cardano.sol#586) shadows:
	- Ownable.owner() (BEP20Cardano.sol#301-303) (function)
Reference:
https://github.com/crytic/slither/wiki/Detector-Documentation#local-variable-shadowing
INFO:Detectors:
BEP20Cardano._burnFrom(address,uint256) (BEP20Cardano.sol#600-603) is never used and
should be removed
Context._msgData() (BEP20Cardano.sol#117-120) is never used and should be removed
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#dead-code
INFO:Detectors:
Version constraint 0.5.16 contains known severe issues
(https://solidity.readthedocs.io/en/latest/bugs.html)
	- AbiReencodingHeadOverflowWithStaticArrayCleanup
	- DirtyBytesArrayToStorage
	- NestedCalldataArrayAbiReencodingSizeValidation
	- ABIDecodeTwoDimensionalArrayMemory
	- KeccakCaching
	- EmptyByteArrayCopy
	- DynamicArrayCleanup
	- MissingEscapingInFormatting
	- ImplicitConstructorCallvalueCheck
	- TupleAssignmentMultiStackSlotComponents
	- MemoryArrayCreationOverflow
	- privateCanBeOverridden.
It is used by:
	- 0.5.16 (BEP20Cardano.sol#5)
solc-0.5.16 is an outdated solc version. Use a more recent version (at least 0.8.0), if possible.
Reference:
https://github.com/crytic/slither/wiki/Detector-Documentation#incorrect-versions-of-solidity
INFO:Detectors:
```

```
Variable BEP20Cardano._decimals (BEP20Cardano.sol#351) is not in mixedCase
Variable BEP20Cardano._symbol (BEP20Cardano.sol#352) is not in mixedCase
Variable BEP20Cardano._name (BEP20Cardano.sol#353) is not in mixedCase
Reference:
https://github.com/crytic/slither/wiki/Detector-Documentation#conformance-to-solidity-naming-conventions
INFO:Detectors:
Redundant expression "this (BEP20Cardano.sol#118)" inContext (BEP20Cardano.sol#108-121)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#redundant-statements
INFO:Detectors:
BEP20Cardano.constructor() (BEP20Cardano.sol#355-363) uses literals with too many digits:
        - _totalSupply = 100000000 * 10 ** 18 (BEP20Cardano.sol#359)
Reference: https://github.com/crytic/slither/wiki/Detector-Documentation#too-many-digits
INFO:Slither:BEP20Cardano.sol analyzed (5 contracts with 93 detectors), 11 result(s) found
```

Solidity Static Analysis

Static code analysis is used to identify many common coding problems before a program is released. It involves examining the code manually or using tools to automate the process. Static code analysis tools can automatically scan the code without executing it.

BEP20Cardano.sol

```
Gas costs:
Gas requirement of function BEP20Cardano.mint is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)
Pos: 501:2:

Gas costs:
Gas requirement of function BEP20Cardano.burn is infinite: If the gas requirement of a function is higher than the block gas limit, it cannot be executed. Please avoid loops in your functions or actions that modify large areas of storage (this includes clearing or copying arrays in storage)
Pos: 509:2:

Similar variable names:
BEP20Cardano._burn(address,uint256) : Variables have very similar names "account" and "amount". Note: Modifiers are currently not considered by this static analysis.
Pos: 570:18:

Guard conditions:
Use "assert(x)" if you never ever want x to be false, not in any circumstance (apart from a bug in your code). Use "require(x)" if x can be false, due to e.g. invalid input or a failing external component.
Pos: 566:4:
```

Solhint Linter

Solhint Linters are the utility tools that analyze the given source code and report programming errors, bugs, and stylistic errors. For the Solidity language, there are some linter tools available that a developer can use to improve the quality of their Solidity contracts.

BEP20Cardano.sol

```
Code contains empty blocks
Pos: 27:110
Error message for require is too long
Pos: 5:199
Error message for require is too long
Pos: 5:336
Error message for require is too long
Pos: 5:528
Error message for require is too long
Pos: 5:529
Error message for require is too long
Pos: 5:565
Error message for require is too long
Pos: 5:586
Error message for require is too long
Pos: 5:587
```

Software analysis result:

This software reported many false positive results and some are informational issues. So, those issues can be safely ignored.

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