HACKEN

SMART CONTRACT CODE REVIEW AND SECURITY ANALYSIS REPORT

Customer: Inqubeta
Date: 19 May, 2023

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Document

Name	Smart Contract Code Review and Security Analysis Report for Inqubeta
Approved By	Marcin Ugarenko | Lead Solidity SC Auditor at Hacken OU
Type	ERC20 token
Platform	EVM
Language	Solidity
Methodology	Link
Website	https://inqubeta.ai
Changelog	17.05.2023 - Initial Review 19.05.2023 - Second Review

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Introduction

Hacken OÜ (Consultant) was contracted by Inqubeta (Customer) to conduct a Smart Contract Code Review and Security Analysis. This report presents the findings of the security assessment of the Customer's smart contracts.

System Overview

The scope of this audit is an ERC20 token contract with a fixed supply and burn functionality, that has additional functionality to take fees from UniSwapV2 pairs. The fee amounts and pair addresses are controlled by the fee distributor role, which can be set and changed by the owner of the contract.
The files in the scope:

- **IFeeCollector.sol:** The interface for recording buy and sell fees that took place.
- **InQubeta.sol:** The ERC20 token with fixed supply, burnability, and fee functionality for transfers involving UniswapV2 pairs.

Privileged roles

- Default Admin: Set FEE_DISTRIBUTOR_ROLE, set fees, add/remove pairs.
- FEE_DISTRIBUTION_ROLE: Disable/enable fees, collect fees.

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Executive Summary

The score measurement details can be found in the corresponding section of the scoring methodology.

Documentation quality

The total Documentation Quality score is **9** out of **10**.

- Functional requirements are detailed.
- Technical description is provided, but fee logic is not explained precisely.
- Description of the development environment is present.
- NatSpec is present.

Code quality

The total Code Quality score is **9** out of **10**.

- The development environment is configured.
- Solidity style guides are not followed.

Test coverage

Code coverage of the project is **100%** (branch coverage).

- Since the audit scope has lines of code less than 250, the test coverage does not contribute to the final score.

Security score

As a result of the audit, the code contains **no** issues. The security score is 10 out of **10**.

All found issues are displayed in the “Findings” section.

Summary

According to the assessment, the Customer's smart contract has the following score: **9.7**.

The system users should acknowledge all the risks summed up in the risks section of the report.

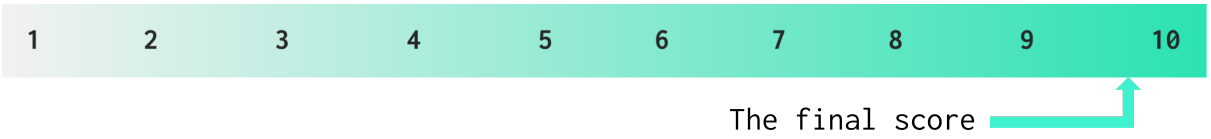

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Table. The distribution of issues during the audit

Review date	Low	Medium	High	Critical
17 May 2023	1	0	0	1
19 May 2023	0	0	0	0

Risks

- The fee amounts can be changed by the Default Admin Role at any moment.
- The fee-on-transfer mechanism will significantly increase the Gas cost of the DEX swaps for pairs added to the fee mechanism.
- The implementation of IFeeCollector.sol is out of this audits scope and the safety of its usage in InQubeta.sol contract cannot be verified.

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Checked Items

We have audited the Customers' smart contracts for commonly known and specific vulnerabilities. Here are some items considered:

Item	Description	Status	Related Issues
Default Visibility	Functions and state variables visibility should be set explicitly. Visibility levels should be specified consciously.	Passed	
Integer Overflow and Underflow	If unchecked math is used, all math operations should be safe from overflows and underflows.	Passed	
Outdated Compiler Version	It is recommended to use a recent version of the Solidity compiler.	Passed	
Floating Pragma	Contracts should be deployed with the same compiler version and flags that they have been tested thoroughly.	Passed	
Unchecked Call Return Value	The return value of a message call should be checked.	Passed	
Access Control & Authorization	Ownership takeover should not be possible. All crucial functions should be protected. Users could not affect data that belongs to other users.	Passed	
SELFDESTRUCT Instruction	The contract should not be self-destructible while it has funds belonging to users.	Not Relevant	
Check-Effect-Interaction	Check-Effect-Interaction pattern should be followed if the code performs ANY external call.	Passed	
Assert Violation	Properly functioning code should never reach a failing assert statement.	Passed	
Deprecated Solidity Functions	Deprecated built-in functions should never be used.	Passed	
Delegatecall to Untrusted Callee	Delegatecalls should only be allowed to trusted addresses.	Not Relevant	
DoS (Denial of Service)	Execution of the code should never be blocked by a specific contract state unless required.	Passed	

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Race Conditions	Race Conditions and Transactions Order Dependency should not be possible.	Passed	
Authorization through tx.origin	tx.origin should not be used for authorization.	Not Relevant	
Block values as a proxy for time	Block numbers should not be used for time calculations.	Not Relevant	
Signature Unique Id	Signed messages should always have a unique id. A transaction hash should not be used as a unique id. Chain identifiers should always be used. All parameters from the signature should be used in signer recovery. EIP-712 should be followed during a signer verification.	Not Relevant	
Shadowing State Variable	State variables should not be shadowed.	Passed	
Weak Sources of Randomness	Random values should never be generated from Chain Attributes or be predictable.	Not Relevant	
Incorrect Inheritance Order	When inheriting multiple contracts, especially if they have identical functions, a developer should carefully specify inheritance in the correct order.	Not Relevant	
Calls Only to Trusted Addresses	All external calls should be performed only to trusted addresses.	Not Relevant	
Presence of Unused Variables	The code should not contain unused variables if this is not justified by design.	Passed	
EIP Standards Violation	EIP standards should not be violated.	Passed	
Assets Integrity	Funds are protected and cannot be withdrawn without proper permissions or be locked on the contract.	Passed	
User Balances Manipulation	Contract owners or any other third party should not be able to access funds belonging to users.	Passed	
Data Consistency	Smart contract data should be consistent all over the data flow.	Passed	

Flashloan Attack	When working with exchange rates, they should be received from a trusted source and not be vulnerable to short-term rate changes that can be achieved by using flash loans. Oracles should be used.	Not Relevant	
Token Supply Manipulation	Tokens can be minted only according to rules specified in a whitepaper or any other documentation provided by the Customer.	Passed	
Gas Limit and Loops	Transaction execution costs should not depend dramatically on the amount of data stored on the contract. There should not be any cases when execution fails due to the block Gas limit.	Not Relevant	
Style Guide Violation	Style guides and best practices should be followed.	Failed	I01
Requirements Compliance	The code should be compliant with the requirements provided by the Customer.	Passed	
Environment Consistency	The project should contain a configured development environment with a comprehensive description of how to compile, build and deploy the code.	Passed	
Secure Oracles Usage	The code should have the ability to pause specific data feeds that it relies on. This should be done to protect a contract from compromised oracles.	Not Relevant	
Tests Coverage	The code should be covered with unit tests. Test coverage should be sufficient, with both negative and positive cases covered. Usage of contracts by multiple users should be tested.	Passed	
Stable Imports	The code should not reference draft contracts, which may be changed in the future.	Passed	

Findings

Critical

C01. Access Control Violation

Impact	High
Likelihood	High

The *burn(address addr, uint256 amount)* function is implemented in a way that allows anyone to call burn for tokens belonging to any other address.

This can lead to losses of funds and issues with access control.

Path: ./contracts/tokens/InQubeta.sol : burn()

Recommendation: Implement the external *burn(address addr, uint256 amount)* function so that it does not have a burn address as input; it should burn tokens from the caller directly.

Found in: e05db0adf7637bda3443f1125467d510894abb08

Status: Fixed (Revised commit: 6bbaa3c) (ERC20Burnable OpenZeppelin library is used for burning functionality.)

High

No high severity issues were found.

Medium

No medium severity issues were found.

Low

L01. Copying of Well-Known Contract

Impact	Low
Likelihood	Medium

The burnability functionality is implemented from scratch instead of importing from Openzeppellin.

It is best practice to use well-known contracts directly.

Path: ./contracts/tokens/InQubeta.sol : burn(), burnFrom()

Recommendation: Consider using ERC20Burnable directly from Openzeppellin.

Found in: e05db0adf7637bda3443f1125467d510894abb08

Status: Fixed (Revised commit: 6bbaa3c) (ERC20Burnable OpenZeppelin library is used for burning functionality.)

Informational

I01. Style Guide Violation / Function Order

The project should follow the official code style guidelines.
Inside each contract, library, or interface, use the following order:

- Type declarations
- State variables
- Events
- Modifiers
- Functions

Functions should be grouped according to their visibility and ordered:

- constructor
- receive function (if exists)
- fallback function (if exists)
- external
- public
- internal
- private

Within a grouping, place the view and pure functions at the end.

Path: ./contracts/tokens/InQubeta.sol

Recommendation: The official Solidity style guidelines should be followed.

Found in: e05db0adf7637bda3443f1125467d510894abb08

Status: Reported (Solidity style guides are not followed.)

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Disclaimers

Hacken Disclaimer

The smart contracts given for audit have been analyzed based on best industry practices at the time of the writing of this report, with 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).

The report contains no statements or warranties on the identification of all vulnerabilities and security of the code. The report covers the code submitted and reviewed, so it may not be relevant after any modifications. Do not consider this report as a final and sufficient assessment regarding the utility and safety of the code, bug-free status, or any other contract statements.

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 recommend proceeding with several independent audits and a public bug bounty program to ensure the security of smart contracts.

English is the original language of the report. The Consultant is not responsible for the correctness of the translated versions.

Technical Disclaimer

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

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Appendix 1. Severity Definitions

When auditing smart contracts Hacken is using a risk-based approach that considers the potential impact of any vulnerabilities and the likelihood of them being exploited. The matrix of impact and likelihood is a commonly used tool in risk management to help assess and prioritize risks.

The impact of a vulnerability refers to the potential harm that could result if it were to be exploited. For smart contracts, this could include the loss of funds or assets, unauthorized access or control, or reputational damage.

The likelihood of a vulnerability being exploited is determined by considering the likelihood of an attack occurring, the level of skill or resources required to exploit the vulnerability, and the presence of any mitigating controls that could reduce the likelihood of exploitation.

Risk Level	High Impact	Medium Impact	Low Impact
High Likelihood	**Critical**	**High**	**Medium**
Medium Likelihood	**High**	**Medium**	**Low**
Low Likelihood	**Medium**	**Low**	**Low**

Risk Levels

Critical: Critical vulnerabilities are usually straightforward to exploit and can lead to the loss of user funds or contract state manipulation.

High: High vulnerabilities are usually harder to exploit, requiring specific conditions, or have a more limited scope, but can still lead to the loss of user funds or contract state manipulation.

Medium: Medium vulnerabilities are usually limited to state manipulations and, in most cases, cannot lead to asset loss. Contradictions and requirements violations. Major deviations from best practices are also in this category.

Low: Major deviations from best practices or major Gas inefficiency. These issues won't have a significant impact on code execution, don’t affect security score but can affect code quality score.

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Impact Levels

High Impact: Risks that have a high impact are associated with financial losses, reputational damage, or major alterations to contract state. High impact issues typically involve invalid calculations, denial of service, token supply manipulation, and data consistency, but are not limited to those categories.

Medium Impact: Risks that have a medium impact could result in financial losses, reputational damage, or minor contract state manipulation. These risks can also be associated with undocumented behavior or violations of requirements.

Low Impact: Risks that have a low impact cannot lead to financial losses or state manipulation. These risks are typically related to unscalable functionality, contradictions, inconsistent data, or major violations of best practices.

Likelihood Levels

High Likelihood: Risks that have a high likelihood are those that are expected to occur frequently or are very likely to occur. These risks could be the result of known vulnerabilities or weaknesses in the contract, or could be the result of external factors such as attacks or exploits targeting similar contracts.

Medium Likelihood: Risks that have a medium likelihood are those that are possible but not as likely to occur as those in the high likelihood category. These risks could be the result of less severe vulnerabilities or weaknesses in the contract, or could be the result of less targeted attacks or exploits.

Low Likelihood: Risks that have a low likelihood are those that are unlikely to occur, but still possible. These risks could be the result of very specific or complex vulnerabilities or weaknesses in the contract, or could be the result of highly targeted attacks or exploits.

Informational

Informational issues are mostly connected to violations of best practices, typos in code, violations of code style, and dead or redundant code.

Informational issues are not affecting the score, but addressing them will be beneficial for the project.

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Appendix 2. Scope

The scope of the project includes the following smart contracts from the provided repository:

Initial review scope

Repository	https://github.com/techbandorg/InQubeta-smartcontract
Commit	e05db0adf7637bda3443f1125467d510894abb08
Requirements	Link
Technical Requirements	Link
Contracts	File: contracts/interfaces/IFeeCollector.sol SHA3: 0b29b3b64a1990a3ebe8037a1b3b7150157f52e6b832ebc8fc760962a3ff3e81 File: contracts/tokens/InQubeta.sol SHA3: 45192a126dbe14970c4bb5cdb4839f5519904db529efe15a269d7e01219346bb

Second review scope

Repository	https://github.com/techbandorg/InQubeta-smartcontract
Commit	6bbaa3cead90678115377eadcf7188d1e823f223
Requirements	Link
Technical Requirements	Link
Contracts Addresses	https://etherscan.io/address/0xE77473C4973ad064E04C80959dd56DD4886efcA9#code
Contracts	File: contracts/interfaces/IFeeCollector.sol SHA3: 0b29b3b64a1990a3ebe8037a1b3b7150157f52e6b832ebc8fc760962a3ff3e81 File: contracts/tokens/InQubeta.sol SHA3: 1de4bd1f0c5d9773572b8dad1a190121f5b4048c7c3a633e889f50197c937623