DeHacker

Code Security Assessment

Rubic Finance

October 11th, 2022

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Summary

DeHacker's objective was to evaluate the repository for security-related issues, code quality, and adherence to specification and best practices.
Possible issues we looked for included (but are not limited to):

- 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 code base 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.

Issue Categories

Every issue in this report was assigned a severity level from the following:

Critical severity issues

A vulnerability that can disrupt the contract functioning in a number of scenarios or creates a risk that the contract may be broken.

Major severity issues

A vulnerability that affects the desired outcome when using a contract or provides the opportunity to use a contract in an unintended way.

Medium severity issues

A vulnerability that could affect the desired outcome of executing the contract in a specific scenario.

Minor severity issues

A vulnerability that does not have a significant impact on possible scenarios for the use of the contract and is probably subjective.

Informational

A vulnerability that has informational character but is not affecting any of the code.

Overview

Project Summary

Project Name	Rubic Finance
Platform	Custom
website	https://rubic.exchange/
Type	Others
Deployed contract	https://github.com/Cryptorubic/CrossChainTokenSwap
Language	Solidity

Audit Summary

Delivery Date	October 11th 2022
Audit Methodology	Static Analysis, Manual Review

Vulnerability Summary

Vulnerability Level	Total	Pending	Declined	Acknowledged	Partially Resolved	Resolved
Critical	0	0	0	0	0	0
Major	1	0	0	2	0	1
Medium	0	0	0	0	0	0
Minor	3	0	0	2	0	3
Informational	0	0	0	0	0	0
Discussion	0	0	0	0	0	0

Audit scope

ID	File	SHA256 Checksum
IPR	interfaces/IPangolinRouter.sol	a74d709bcf8014ce87b2695f380680e44d7387a66a7c4db7833c94bca5d3949c
ERC	libraries/ ECDSAOffsetRecovery.sol	2153a7e16657e037e82b42c09bf053aefe10e0441f3a82584a32a096d6ebd32c
ERC	libraries/FullMath.sol	921e3025fa1fc030a75370d6cff6476126fdc57c613b4aceb3feb5edc861bebf
ERC	SwapContract.sol	bb570c1504c016e99b9a86cab8e4d3abd7ee5c47a538ed3956b115472e4cc771

Findings

ID	Title	Category	Severity	Status
SCR-01	Centralization Risk	Centralization / Privilege	Major	Resolved
SCR-02	Missing Input Validation	Volatile Code	Minor	Resolved
SCR-03	Usage Of send() For Sending Ether	Volatile Code	Minor	Resolved
SCR-04	Documentation Discrepancy	Inconsistency	Minor	Resolved

Major

SCR-01 | Centralization Risk

Category	Severity	Location	Status
Centralization / Privilege	Major	projects/ RubicFinance/ SwapContract. sol (23688cf)	Resolved

Description

In the contract SwapContract , the role OWNER_ROLE has the authority over the following functions:
· addOtherBlockchain()
· removeOtherBlockchain()
· changeOtherBlockchain()
· collectCryptoFee()
· collectTokenFee()
· setMinConfirmationSignatures()
· transferOwnerAndSetManager()
· pauseExecution()continueExecution()
· setRouter()setFeeAmountOfBlockchain()
· setCryptoFeeOfBlockchain()
· setRubicAddressOfBlockchain()
· setMinTokenAmount()
· setMaxTokenAmount()
· setMaxGasPrice()
· setMinConfirmationBlocks()
· setRefundSlippage()
· poolBalancing()

Any compromise to the OWNER_ROLE account may allow the hacker to take advantage of this andmanipulate the entire project. Especially in the functions collectCryptoFee() and collectTokenFee() ,hacker can take advantage of these two functions to withdraw all the ETH/BNB & tokens to the hacker'saddress.

Meanwhile, the role MANAGER_ROLE has the authority over the following functions:

setRouter()
setFeeAmountOfBlockchain()
setCryptoFeeOfBlockchain()
setRubicAddressOfBlockchain()
setMinTokenAmount()
setMaxTokenAmount()
setMaxGasPrice()
setMinConfirmationBlocks()
setRefundSlippage()

Any compromise to the MANAGER_ROLE account may allow the hacker to take advantage of this and changethe sensitive variables without any restriction.

Meanwhile, the role RELAYER_ROLE has the authority over the following functions:

swapTokensToUserWithFee()
swapCryptoToUserWithFee()
refundTokensToUser()
`refundCryptoToUser()``
changeTxStatus()
setCryptoFeeOfBlockchain()

RELAYER_ROLE is supposed to be the relayer contract or EOA to relay the cross-chain swap eventmessages. However, any compromise to the RELAYER_ROLE account may allow the hacker to takeadvantage of this and control the entire cross-chain swap mechanism.

Recommendation

We advise the client to carefully manage the privileged account's private key to avoid any potential risks ofbeing hacked. In general, we strongly recommend centralized privileges or roles in the protocol to beimproved via a decentralized mechanism or smart-contract-based accounts with enhanced securitypractices, e.g., Multisignature wallets.
Indicatively, here is some feasible suggestions that would also mitigate the potential risk at the differentlevel 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 theprivate key;
Introduction of a DAO/governance/voting module to increase transparency and user involvement.

Alleviation

[Rubic Finance Team] : According to medium post published by the team, Multisig wallet will be used forprivileged roles. The addresses are listed as follows:

- MULTISIG ADDRESS: 0x6129B000f43D82E533CF20A7FD89c43E5A772BCD
  - Vladimir Tikhomirov: 0x105A3BA3637A29D36F61c7F03f55Da44B4591Cd1
  - Korneva Alexandra: 0x836f2051cDe3ba744aafE668F6a6070BA80668F9
  - Dmitry Ershov: 0x9499179d309B6Bf0253DcE9A35c2E37a75C41E47

Multisig, which is used for OWNER_ROLE , requires 2 out of 3 signatures for a transaction to be approved.
Reference: Rubic Multi-Chain routing Decentralization https://cryptorubic.medium.com/rubic-multi-chain-routing-decentralization-530241d3c89d

Minor

SCR-02 | Missing Input Validation

Category	Severity	Location	Status
Volatile Code	Minor	ERC20.sol: 242projects/ RubicFinance/ SwapContract.sol (23688cf): 276~285	Resolved

Description

The given input is missing the check for the non-zero address.

Recommendation

We advise adding the check for the passed-in values to prevent unexpected error as below:

```
require( address(_blockchainRouter) != address(0), "_blockchainRouter is address 0" );
```

Alleviation

[Rubic Finance Team] : The client heeded the advice and fixed the issue in the commitaaf37206f3f146de8caca62eabe1b3ee6c68f38a

Minor

SCR-03 | Usage Of send() For Sending Ether

Category	Severity	Location	Status
Volatile Code	Minor	projects/ RubicFinance/ SwapContract. sol (23688cf): 445 ~447, 685	Resolved

Description

After EIP-1884 was included in the Istanbul hard fork, it is not recommended to use . transfer() or.send() for transferring ether as these functions have a hard-coded value for gas costs making themobsolete as they are forwarding a fixed amount of gas, specifically 2300 . This can cause issues in case thelinked statements are meant to be able to transfer funds to other contracts instead of EOAs.

Recommendation

We advise that the linked .transfer() and .send() calls are substituted with the utilization of thesendValue() function from the Address.sol implementation of OpenZeppelin either by directly importingthe library or copying the linked code.

Alleviation

[Rubic Finance Team] : The client heeded the advice and fixed the issue in the commitaaf37206f3f146de8caca62eabe1b3ee6c68f38a

Minor

SCR-04 | Documentation Discrepancy

Category	Severity	Location	Status
Inconsistency	Minor	projects/ RubicFinance/ SwapContract.sol (23688cf): 376, 428	Resolved

Description

Due to refactoring the following functions in the commit a3845b09c4bdea9dec141af0b2166075e0e4312e,the comment of these functions lacks the detailed explanation of the params. Especiallyparams.exactRBCtokenOut and params. tokenInAmount in the function swapTokensToOtherBlockchain() ,as this function is external function, user could be confused.

swapTokensToOtherBlockchain()
swapCryptoToOtherBlockchain()

Recommendation

We advise to rectify the comment on the aforementioned functions to increase the legibility of thecodebase.

Alleviation

[Rubic Finance Team] : The client heeded the advice and updated the annotations in the commit6c55d71932729d7a177c8f68ab0a48ce6e506e2f

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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.

Coding Style

Coding Style findings usually do not affect the generated bytecode but rather comment on how to make the codebase more legible and, as a result, easily maintainable.

Volatile Code

Volatile Code findings refer to segments of code that behave unexpectedly on certain edge cases that may result in a vulnerability.

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.

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.

About

DeHacker is a team of auditors and white hat hackers who perform security audits and assessments. With decades of experience in security and distributed systems, our experts focus on the ins and outs of system security. Our services follow clear and prudent industry standards. Whether it's reviewing the smallest modifications or a new platform, we'll provide an in-depth security survey at every stage of your company's project. We provide comprehensive vulnerability reports and identify structural inefficiencies in smart contract code, combining high-end security research with a real-world attacker mindset to reduce risk and harden code.

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