



Razor DEX

Security Audit Report

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1 | Introduction

1.1 About Razor DEX

Razor DEX is a decentralized exchange built on Uniswap V2's $x * y = k$ constant product model. Powered by the Move Language, Razor DEX aims to provide users with a secure, transparent, and an unparalleled trading experience within the Movement ecosystem.

1.2 Source Code

The following source code was reviewed during the audit:

- <https://github.com/razorlabsorg/razor-dex-contracts>
- CommitID: `bff3d37`

And this is the final version representing all fixes implemented for the issues identified in the audit:

- <https://github.com/razorlabsorg/razor-dex-contracts>
- CommitID: `a7ed230`

2 | Overall Assessment

This report has been compiled to identify issues and vulnerabilities within the `Razor DEX` protocol. Throughout this audit, we identified a total of 6 issues spanning various severity levels. By employing auxiliary tool techniques to supplement our thorough manual code review, we have discovered the following findings.

Severity	Count	Acknowledged	Won't Do	Addressed
Critical	-	-	-	-
High	-	-	-	-
Medium	3	1	-	2
Low	3	-	-	3
Informational	-	-	-	-
Undetermined	-	-	-	-

3 | Vulnerability Summary

3.1 Overview

Click on an issue to jump to it, or scroll down to see them all.

- [M-1](#) Possible Underflow in `m1dex::swap.move`
- [M-2](#) Potential Risks Associated with Centralization
- [M-3](#) Lack of Resource Account Check in `m1dex::swap.move`
- [L-1](#) Revisited Swap Logic in `m2dex::swap.move`
- [L-2](#) Inconsist Error Code in `m1dex::swap.move`
- [L-3](#) Lack of Admin Check in `m1coins::coins.move`

3.2 Security Level Reference

In web3 smart contract audits, vulnerabilities are typically classified into different severity levels based on the potential impact they can have on the security and functionality of the contract. Here are the definitions for critical-severity, high-severity, medium-severity, and low-severity vulnerabilities:

Severity	Description
C-X (Critical)	A severe security flaw with immediate and significant negative consequences. It poses high risks, such as unauthorized access, financial losses, or complete disruption of functionality. Requires immediate attention and remediation.
H-X (High)	Significant security issues that can lead to substantial risks. Although not as severe as critical vulnerabilities, they can still result in unauthorized access, manipulation of contract state, or financial losses. Prompt remediation is necessary.
M-X (Medium)	Moderately impactful security weaknesses that require attention and remediation. They may lead to limited unauthorized access, minor financial losses, or potential disruptions to functionality.
L-X (Low)	Minor security issues with limited impact. While they may not pose significant risks, it is still recommended to address them to maintain a robust and secure smart contract.
I-X (Informational)	Warnings and things to keep in mind when operating the protocol. No immediate action required.
U-X (Undetermined)	Identified security flaw requiring further investigation. Severity and impact need to be determined. Additional assessment and analysis are necessary.

3.3 Vulnerability Details

[M-1] Possible Underflow in m1dex::swap.move

Target	Category	IMPACT	LIKELIHOOD	STATUS
swap.move	Business Logic	Medium	Medium	Addressed

In the swap contract, the mint function is used to mint LP tokens for liquidity providers. While examining its logic, we notice the current mint logic needs to be improved.

To elaborate, we show below the mint() routine. To prevent price manipulation, the first user adding liquidity needs to lock a minimum amount of liquidity into the pool. Therefore, the provided liquidity needs to be greater than the minimum to avoid the risk of underflow.

m1dex::swap::mint()

```

1  public fun mint<X, Y>(
2      coin_x: Coin<X>,
3      coin_y: Coin<Y>
4  ): Coin<LPCoin<X, Y>> acquires LiquidityPool, AdminData, Events {
5      assert!(RazorPoolLibrary::compare<X, Y>(), ERR_PAIR_ORDER_ERROR);
6      assert!(exists<LiquidityPool<X, Y>>(RESOURCE_ACCOUNT_ADDRESS),
7          ERR_PAIR_NOT_EXIST);
8      assert_not_paused();
9      assert_lp_unlocked<X, Y>();
10     let amount_x = coin::value(&coin_x);
11     let amount_y = coin::value(&coin_y);
12     // feeOn
13     let fee_on = mint_fee_interval<X, Y>(lp, admin_data);
14     coin::merge(&mut lp.coin_x_reserve, coin_x);
15     coin::merge(&mut lp.coin_y_reserve, coin_y);
16     let (balance_x, balance_y) = (coin::value(&lp.coin_x_reserve), coin::value(&lp.coin_y_reserve));
17
18     let total_supply = RazorPoolLibrary::get_lpcoin_total_supply<LPCoin<X, Y>>()
19     ;
20     let liquidity;
21     if (total_supply == 0) {
22         liquidity = RazorPoolLibrary::sqrt(amount_x, amount_y) -
23             MINIMUM_LIQUIDITY;
24         mint_coin<X, Y>(&get_resource_account_signer(), MINIMUM_LIQUIDITY, &lp.
25             lp_mint_cap);
26     } else {
27         // normal tx should never overflow
28         let amount_1 = ((amount_x as u128) * total_supply / (reserve_x as u128)
29             as u64);
30         let amount_2 = ((amount_y as u128) * total_supply / (reserve_y as u128)
31             as u64);

```

```

26     liquidity = RazorPoolLibrary::min(amount_1, amount_2);
27 };
28 assert!(liquidity > 0, ERR_INSUFFICIENT_LIQUIDITY_MINT);
29 let coins = coin::mint<LPCoin<X, Y>>(liquidity, &lp.lp_mint_cap);
30 // update interval
31 update_internal(lp, balance_x, balance_y, reserve_x, reserve_y);
32 // feeOn
33 if (fee_on) lp.k_last = (balance_x as u128) * (balance_y as u128);
34 // event
35 let events = borrow_global_mut<Events<X, Y>>(RESOURCE_ACCOUNT_ADDRESS);
36 event::emit_event(&mut events.mint_event, MintEvent {
37     amount_x,
38     amount_y,
39     liquidity,
40 });
41 coins
42 }

```

The same issue is also applicable for the `m2-dex::swap::mint()` function.

Remediation Add validation in above-mentioned functions.

[M-2] Risks Associated with CentralizationPotentialn

Target	Category	IMPACT	LIKELIHOOD	STATUS
Multiple Contracts	Security	Medium	Medium	Acknowledged

In the Razor protocol, the existence of a privileged `owner` account introduces centralization risks, as it holds significant control and authority over critical operations governing the protocol. In the following, we show the representative functions potentially affected by the privileges associated with the privileged account.

Example Privileged Operations in Razor

```

100 public entry fun pause(
101     account: &signer
102 ) acquires AdminData {
103     assert_not_paused();
104     let admin_data = borrow_global_mut<AdminData>(RESOURCE_ACCOUNT_ADDRESS);
105     assert!(signer::address_of(account) == admin_data.admin_address,
106         ERR_FORBIDDEN);
107     admin_data.is_pause = true;
108 }
109 public entry fun set_swap_fee(
110     account: &signer,
111     swap_fee: u64

```



```

111 ) acquires AdminData {
112     let admin_data = borrow_global_mut<AdminData>(RESOURCE_ACCOUNT_ADDRESS);
113     assert!(signer::address_of(account) == admin_data.admin_address,
            ERR_FORBIDDEN);
114     assert!(swap_fee <= 1000, ERR_FORBIDDEN);
115     admin_data.swap_fee = swap_fee;
116 }

```

Remediation To mitigate the identified issue, it is recommended to introduce multi-sig mechanism to undertake the role of the privileged account. Moreover, it is advisable to implement timelocks to govern all modifications to the privileged operations.

Response By Team This issue has been confirmed by the team and the multi-sig mechanism will be used to mitigate it.

[M-3] Lack of Resource Account Check in m1dex::swap.move

Target	Category	IMPACT	LIKELIHOOD	STATUS
swap.move	Business Logic	Medium	Medium	Addressed

In Aptos, a resource account is an autonomous account without a corresponding private key used by developers to store resources or publish modules on-chain. In the Razor protocol, clearly the swap module is initialized using an existing resource account, likely denoted as RESOURCE_ACCOUNT_ADDRESS. Hence, it's essential to verify in the init_module function if the initializing resource account is RESOURCE_ACCOUNT_ADDRESS.

m1dex::swap::init_module()

```

160 fun init_module(admin: &signer) {
161     // init admin data
162     let signer_cap = resource_account::retrieve_resource_account_cap(admin, DEV)
163     ;
164     let resource_account = account::create_signer_with_capability(&signer_cap);
165     move_to(&resource_account, AdminData {
166         signer_cap,
167         dao_fee_to: DEPLOYER_ADDRESS,
168         admin_address: DEPLOYER_ADDRESS,
169         dao_fee: 5,           // 1/6 to dao fee
170         swap_fee: 30,        // 0.3%
171         dao_fee_on: true,    // default true
172         is_pause: false,     // default false
173     });
174     // init pair info
175     move_to(&resource_account, PairInfo {

```

```

175         pair_list: vector::empty(),
176     });
177 }

```

Remediation Add resource account validation in `init_module` function.

[L-1] Revisited Swap Logic in `m2dex::swap.move`

Target	Category	IMPACT	LIKELIHOOD	STATUS
swap.move	Business Logic	Low	Low	Addressed

In the Razor protocol, the function `swap_balance_for_balance` accepts balance of two coin types as parameters that are used to perform a swap between the two coins. Hence, the resulting balance of the swap-out coin type should be zero, while the other should not be zero. Therefore, when `amount_x_in` is zero, `amount_y_in` should be non-zero (line 209).

```

                                m2dex::swap.move

200     public fun swap_balance_for_balance<X, Y>(
201         lps: &mut LiquidityPools,
202         clock: &Clock,
203         coins_x_in: Balance<X>,
204         coins_y_in: Balance<Y>,
205     ): (Balance<X>, Balance<Y>) {
206         let (pool, admin_data) = get_pool<X, Y>(lps);
207         let amount_x_in = balance::value(&coins_x_in);
208         let amount_y_in = balance::value(&coins_y_in);
209         assert!((amount_x_in > 0 && amount_y_in == 0) || (amount_x_in == 0
210             amount_x_in > 0), ERR_INPUT_VALUE);
211         if (amount_x_in > 0) {
212             let (reserve_in, reserve_out) = get_reserves_size<X, Y>(pool);
213             let amount_out = get_amount_out(amount_x_in, reserve_in, reserve_out,
214                 admin_data.swap_fee);
215             swap<X, Y>(lps, clock, coins_x_in, 0, coins_y_in, amount_out)
216         } else {
217             let (reserve_out, reserve_in) = get_reserves_size<X, Y>(pool);
218             let amount_out = get_amount_out(amount_y_in, reserve_in, reserve_out,
219                 admin_data.swap_fee);
220             swap<X, Y>(lps, clock, coins_x_in, amount_out, coins_y_in, 0)
221         }
222     }

```

Remediation Add validation to make sure when `amount_x_in` is zero, `amount_y_in` should be non-zero value.

[L-2] Inconsist Error Code in m1dex::swap.move

Target	Category	IMPACT	LIKELIHOOD	STATUS
swap.move	Business Logic	Low	Low	Addressed

In Razor protocol, the `set_swap_fee` function is used by the admin to modify the swap fee. In the current implementation, an error with the code `ERR_FORBIDDEN` is triggered when the swap fee exceeds 1000 (line 580). However, we notice that the explanation in the comment for this error code is unrelated to the value of the swap fee. Therefore, it is suggested to replace the corresponding error code with a more appropriate one.

m1dex::swap::set_swap_fee()

```

574 public entry fun set_swap_fee(
575     account: &signer,
576     swap_fee: u64
577 ) acquires AdminData {
578     let admin_data = borrow_global_mut<AdminData>(RESOURCE_ACCOUNT_ADDRESS);
579     assert!(signer::address_of(account) == admin_data.admin_address,
580         ERR_FORBIDDEN);
581     assert!(swap_fee <= 1000, ERR_FORBIDDEN);
582     admin_data.swap_fee = swap_fee;
583 }
```

Remediation Modify the error code in `set_swap_fee` function.

[L-3] Lack of Admin Check in m1coins::coins.move

Target	Category	IMPACT	LIKELIHOOD	STATUS
coins.move	Business Logic	N/A	N/A	Addressed

The `initialize` function is a public function used to initialize coins with their respective names, symbols, decimals, and other properties. Hence, this initialization of coins should be executed by the admin rather than other account. However, when we examining its logic, we notice that the initialization logic needs improvement to ensure that the account calling this function is the admin.

m1coins::coins::initialize()

```

238 public entry fun initialize(admin: &signer) {
239     // Initialize BTC
240     let (btc_b, btc_f, btc_m) =
241         coin::initialize<BTC>(admin,
```

```

242         utf8(b"Bitcoin"), utf8(b"BTC"), 8, true);
243     // Initialize USDT
244     let (usdt_b, usdt_f, usdt_m) =
245         coin::initialize<USDT>(admin,
246             utf8(b"Tether"), utf8(b"USDT"), 8, true);
247     // Initialize USDC
248     let (usdc_b, usdc_f, usdc_m) =
249         coin::initialize<USDC>(admin,
250             utf8(b"Circle USD"), utf8(b"USDC"), 8, true);
251     // Initialize ETH
252     let (eth_b, eth_f, eth_m) =
253         coin::initialize<ETH>(admin,
254             utf8(b"Ether"), utf8(b"ETH"), 8, true);
255     // Initialize SOL
256     let (sol_b, sol_f, sol_m) =
257         coin::initialize<SOL>(admin,
258             utf8(b"Solana"), utf8(b"SOL"), 8, true);
259     // Initialize BNB
260     let (bnb_b, bnb_f, bnb_m) =
261         coin::initialize<BNB>(admin,
262             utf8(b"Binance Coin"), utf8(b"BNB"), 8, true); // daisy decimal??
263     // Initialize RAZOR
264     let (razor_b, razor_f, razor_m) = coin::initialize<RAZOR>(
265         admin,
266         utf8(b"Razor Token"),
267         utf8(b"RAZOR"),
268         8,
269         true
270     );

272     // Store the capabilities for each coin type under the admin account.
273     move_to(admin, Caps<BTC> { mint: btc_m, freeze: btc_f, burn: btc_b });
274     move_to(admin, Caps<USDT> { mint: usdt_m, freeze: usdt_f, burn: usdt_b });
275     move_to(admin, Caps<USDC> { mint: usdc_m, freeze: usdc_f, burn: usdc_b });
276     move_to(admin, Caps<ETH> { mint: eth_m, freeze: eth_f, burn: eth_b });
277     move_to(admin, Caps<SOL> { mint: sol_m, freeze: sol_f, burn: sol_b });
278     move_to(admin, Caps<BNB> { mint: bnb_m, freeze: bnb_f, burn: bnb_b });
279     move_to(admin, Caps<RAZOR> { mint: razor_m, freeze: razor_f, burn: razor_b
        });

281     // Register all coins for the admin account.
282     register_coins_all(admin);
283 }

```

Remediation Add admin check in initialize function.

4 | Conclusion

Razor DEX is a decentralized exchange built on Uniswap V2's $x * y = k$ constant product model using Move Language. The current code base is well structured and neatly organized. Those identified issues were promptly confirmed and fixed.

5 | Appendix

5.1 About AstraSec

AstraSec is a blockchain security company that serves to provide high-quality auditing services for blockchain-based protocols. With a team of blockchain specialists, AstraSec maintains a strong commitment to excellence and client satisfaction. The audit team members have extensive audit experience for various famous DeFi projects. AstraSec's comprehensive approach and deep blockchain understanding make it a trusted partner for the clients.

5.2 Disclaimer

The information provided in this audit report is for reference only and does not constitute any legal, financial, or investment advice. Any views, suggestions, or conclusions in the audit report are based on the limited information and conditions obtained during the audit process and may be subject to unknown risks and uncertainties. While we make every effort to ensure the accuracy and completeness of the audit report, we are not responsible for any errors or omissions in the report.

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