



# SMART CONTRACT AUDIT REPORT

for

Hybra Finance



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PeckShield  
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# 1 | Introduction

Given the opportunity to review the design document and related source code of the Hybra protocol, we outline in the report our systematic approach to evaluate potential security issues in the smart contract implementation, expose possible semantic inconsistencies between smart contract code and design document, and provide additional suggestions or recommendations for improvement. Our results show that the given version of smart contracts can be further improved due to the presence of several issues related to either security or performance. This document outlines our audit results.

## 1.1 About Hybra

Hybra Finance is the public liquidity layer on HyperliquidX, fully community-owned with no insider allocations. It features an upgraded `ve(3,3)` flywheel with in-house, highly competitive dynamic-fee `CL` pools and introduces `G33`, a PVP-style mechanism that rewards loyal LPs with higher yields while reducing rewards for short-term capital — reinforcing long-term alignment and making liquidity incentives more sustainable. The basic information of audited contracts is as follows:

Table 1.1: Basic Information of Hybra Finance

Item	Description
Name	Hybra Finance
Type	Smart Contract
Language	Solidity
Audit Method	Whitebox
Latest Audit Report	September 29, 2025

In the following, we show the Git repository of reviewed files and the commit hash value used in this audit.

- <https://github.com/hybra-finance/hybra-finance.git> (8496c32)

And this is the commit ID after all fixes for the issues found in the audit have been checked in:

- <https://github.com/hybra-finance/hybra-finance.git> (e056e64)

## 1.2 About PeckShield

PeckShield Inc. [9] is a leading blockchain security company with the goal of elevating the security, privacy, and usability of current blockchain ecosystems by offering top-notch, industry-leading services and products (including the service of smart contract auditing). We are reachable at Telegram (<https://t.me/peckshield>), Twitter (<http://twitter.com/peckshield>), or Email ([contact@peckshield.com](mailto:contact@peckshield.com)).

Table 1.2: Vulnerability Severity Classification

Impact	High	Critical	High	Medium
	Medium	High	Medium	Low
	Low	Medium	Low	Low
		High	Medium	Low
		Likelihood		

## 1.3 Methodology

To standardize the evaluation, we define the following terminology based on OWASP Risk Rating Methodology [8]:

- Likelihood represents how likely a particular vulnerability is to be uncovered and exploited in the wild;
- Impact measures the technical loss and business damage of a successful attack;
- Severity demonstrates the overall criticality of the risk.

Likelihood and impact are categorized into three ratings: *H*, *M* and *L*, i.e., *high*, *medium* and *low* respectively. Severity is determined by likelihood and impact, and can be accordingly classified into four categories, i.e., *Critical*, *High*, *Medium*, *Low* shown in Table 1.2.

To evaluate the risk, we go through a list of check items and each would be labeled with a severity category. For one check item, if our tool or analysis does not identify any issue, the contract is considered safe regarding the check item. For any discovered issue, we might further

Table 1.3: The Full List of Check Items

Category	Check Item
Basic Coding Bugs	Constructor Mismatch
	Ownership Takeover
	Redundant Fallback Function
	Overflows & Underflows
	Reentrancy
	Money-Giving Bug
	Blackhole
	Unauthorized Self-Destruct
	Revert DoS
	Unchecked External Call
	Gasless Send
	Send Instead Of Transfer
	Costly Loop
	(Unsafe) Use Of Untrusted Libraries
	(Unsafe) Use Of Predictable Variables
	Transaction Ordering Dependence
	Deprecated Uses
Semantic Consistency Checks	Semantic Consistency Checks
Advanced DeFi Scrutiny	Business Logics Review
	Functionality Checks
	Authentication Management
	Access Control & Authorization
	Oracle Security
	Digital Asset Escrow
	Kill-Switch Mechanism
	Operation Trails & Event Generation
	ERC20 Idiosyncrasies Handling
	Frontend-Contract Integration
	Deployment Consistency
	Holistic Risk Management
Additional Recommendations	Avoiding Use of Variadic Byte Array
	Using Fixed Compiler Version
	Making Visibility Level Explicit
	Making Type Inference Explicit
	Adhering To Function Declaration Strictly
	Following Other Best Practices

deploy contracts on our private testnet and run tests to confirm the findings. If necessary, we would additionally build a PoC to demonstrate the possibility of exploitation. The concrete list of check items is shown in Table 1.3.

In particular, we perform the audit according to the following procedure:

- Basic Coding Bugs: We first statically analyze given smart contracts with our proprietary static code analyzer for known coding bugs, and then manually verify (reject or confirm) all the issues found by our tool.
- Semantic Consistency Checks: We then manually check the logic of implemented smart contracts and compare with the description in the white paper.
- Advanced DeFi Scrutiny: We further review business logics, examine system operations, and place DeFi-related aspects under scrutiny to uncover possible pitfalls and/or bugs.
- Additional Recommendations: We also provide additional suggestions regarding the coding and development of smart contracts from the perspective of proven programming practices.

To better describe each issue we identified, we categorize the findings with Common Weakness Enumeration (CWE-699) [7], which is a community-developed list of software weakness types to better delineate and organize weaknesses around concepts frequently encountered in software development. Though some categories used in CWE-699 may not be relevant in smart contracts, we use the CWE categories in Table 1.4 to classify our findings. Moreover, in case there is an issue that may affect an active protocol that has been deployed, the public version of this report may omit such issue, but will be amended with full details right after the affected protocol is upgraded with respective fixes.

## 1.4 Disclaimer

Note that this security audit is not designed to replace functional tests required before any software release, and does not give any warranties on finding all possible security issues of the given smart contract(s) or blockchain software, i.e., the evaluation result does not guarantee the nonexistence of any further findings of security issues. As one audit-based assessment cannot be considered comprehensive, we always recommend proceeding with several independent audits and a public bug bounty program to ensure the security of smart contract(s). Last but not least, this security audit should not be used as investment advice.

Table 1.4: Common Weakness Enumeration (CWE) Classifications Used in This Audit




Category	Summary
<b>Configuration</b>	Weaknesses in this category are typically introduced during the configuration of the software.
<b>Data Processing Issues</b>	Weaknesses in this category are typically found in functionality that processes data.
<b>Numeric Errors</b>	Weaknesses in this category are related to improper calculation or conversion of numbers.
<b>Security Features</b>	Weaknesses in this category are concerned with topics like authentication, access control, confidentiality, cryptography, and privilege management. (Software security is not security software.)
<b>Time and State</b>	Weaknesses in this category are related to the improper management of time and state in an environment that supports simultaneous or near-simultaneous computation by multiple systems, processes, or threads.
<b>Error Conditions, Return Values, Status Codes</b>	Weaknesses in this category include weaknesses that occur if a function does not generate the correct return/status code, or if the application does not handle all possible return/status codes that could be generated by a function.
<b>Resource Management</b>	Weaknesses in this category are related to improper management of system resources.
<b>Behavioral Issues</b>	Weaknesses in this category are related to unexpected behaviors from code that an application uses.
<b>Business Logics</b>	Weaknesses in this category identify some of the underlying problems that commonly allow attackers to manipulate the business logic of an application. Errors in business logic can be devastating to an entire application.
<b>Initialization and Cleanup</b>	Weaknesses in this category occur in behaviors that are used for initialization and breakdown.
<b>Arguments and Parameters</b>	Weaknesses in this category are related to improper use of arguments or parameters within function calls.
<b>Expression Issues</b>	Weaknesses in this category are related to incorrectly written expressions within code.
<b>Coding Practices</b>	Weaknesses in this category are related to coding practices that are deemed unsafe and increase the chances that an exploitable vulnerability will be present in the application. They may not directly introduce a vulnerability, but indicate the product has not been carefully developed or maintained.



## 2 | Findings

### 2.1 Summary

Here is a summary of our findings after analyzing the implementation of the Hybra Finance protocol. During the first phase of our audit, we study the smart contract source code and run our in-house static code analyzer through the codebase. The purpose here is to statically identify known coding bugs, and then manually verify (reject or confirm) issues reported by our tool. We further manually review business logics, examine system operations, and place DeFi-related aspects under scrutiny to uncover possible pitfalls and/or bugs.

Severity	# of Findings	
Critical	0	
High	0	
Medium	2	
Low	6	
Informational	1	
Total	9	

We have so far identified a list of potential issues: some of them involve subtle corner cases that might not be previously thought of. For each uncovered issue, we have therefore developed test cases for reasoning, reproduction, and/or verification. After further analysis and internal discussion, we determined a few issues of varying severities need to be brought up and paid more attention to, which are categorized in the above table. More information can be found in the next subsection, and the detailed discussions of each of them are in [Section 3](#).

## 2.2 Key Findings

Overall, this smart contract is well-designed and engineered, though the implementation can be improved by resolving the identified issues (shown in Table 2.1), including 2 medium-severity vulnerabilities, 6 low-severity vulnerabilities, and 1 informational issue.

Table 2.1: Key Hybra Finance Audit Findings

ID	Severity	Title	Category	Status
PVE-001	Medium	Improper transferFrom() Logic in RewardHYBR	Business Logic	Resolved
PVE-002	Low	Revisited withdraw() Logic in Reward-HYBR	Business Logic	Resolved
PVE-003	Informational	Possible ERC7702 Incompatibility in Contract Check	Business Logic	Resolved
PVE-004	Low	Accommodation of Non-ERC20-Compliant Tokens	Coding Practice	Resolved
PVE-005	Low	Simplified removeRole() Logic in PermissionsRegistry	Coding Practices	Resolved
PVE-006	Low	Voting Delegate Denial-of-Service With Dust Delegates	Numeric Errors	Mitigated
PVE-007	Medium	Trust Issue of Admin Keys	Security Features	Mitigated
PVE-008	Low	Improved Dynamic Fee Calculation in DynamicSwapFeeModule	Business Logic	Resolved
PVE-009	Low	Improper estimateAmount0/1() Logic in SugarHelper	Business Logic	Resolved

Beside the identified issues, we emphasize that for any user-facing applications and services, it is always important to develop necessary risk-control mechanisms and make contingency plans, which may need to be exercised before the mainnet deployment. The risk-control mechanisms should kick in at the very moment when the contract is being deployed on mainnet. Please refer to Section 3 for details.

## 3 | Detailed Results

### 3.1 Improper transferFrom() Logic in RewardHYBR

- ID: PVE-001
- Severity: Medium
- Likelihood: Medium
- Impact: Medium
- Target: RewardHYBR
- Category: Business Logic [6]
- CWE subcategory: CWE-841 [3]

#### Description

The Hybra protocol has a core RewardHYBR contract that implements a dynamic conversion rate mechanism to encourage long-term locking. This contract is implemented as an ERC20-compliant rHYBR token and our analysis shows its current transfer logic should be revisited.

To elaborate, we show below the related transferFrom() routine. It has a rather straightforward logic in transferring tokens from the given sender to the intended recipient. However, it comes to our attention that it does not check the sender's allowance to the calling user. As a result, any use may steal tokens from others. Fortunately, throughout the entire lifecycle of rHYBR, no normal users will ever directly hold rHYBR tokens.

```
287     function transferFrom(address from, address to, uint256 amount) external returns (
288         bool) {
289         _transfer(from, to, amount);
289         return true;
290     }
291
292     function _transfer(address from, address to, uint256 amount) internal {
293         if (amount == 0) revert ZeroAmount();
294         if (balanceOf[from] < amount) revert InsufficientBalance();
295
296         // Check transfer permissions
297         uint8 allowed = 0;
298         if (_isExempted(from, to)) {
299             allowed = 1;
```

```

300     } else if (gaugeManager != address(0) && IGaugeManager(gaugeManager).isGauge(
301         from)) {
302         exempt.add(from);
303         allowed = 1;
304     }
305     if (allowed != 1) revert TransferNotAllowed();
306
307     balanceOf[from] -= amount;
308     balanceOf[to] += amount;
309     emit Transfer(from, to, amount);
310 }

```

Listing 3.1: RewardHYBR::transferFrom()

**Recommendation** Revisit the above routine to properly validate the sender allowance. If necessary, simply disable the transfer function.

**Status** This issue has been fixed in the following commit: [e056e64](#).

## 3.2 Revisited withdraw() Logic in RewardHYBR

- ID: PVE-002
- Severity: Low
- Likelihood: Low
- Impact: Low
- Target: RewardHYBR
- Category: Business Logic [6]
- CWE subcategory: CWE-841 [3]

### Description

In Section 3.1, we have examined the RewardHYBR contract and reported an issue in its transfer functionality. In this section, we report another issue that mistakenly supports a public withdraw() function.

To elaborate, we show below the implementation of this withdraw() function. It has a rather straightforward logic in simply burning the given amount from the calling user. This function should not be present since rHYBR is only minted via depositEmissionToken() and burned via redeemFor().

```

257     function withdraw(uint256 amount) external {
258         _burn(msg.sender, amount);
259     }

```

Listing 3.2: RewardHYBR::withdraw()

**Recommendation** Remove the above withdraw() function.

**Status** This issue has been fixed in the following commit: [e056e64](#).

### 3.3 Possible ERC7702 Incompatibility in Contract Check

- ID: PVE-003
- Severity: Informational
- Likelihood: N/A
- Impact: N/A
- Target: VotingEscrow
- Category: Business Logic [6]
- CWE subcategory: CWE-841 [3]

#### Description

The voting power in Hybra is represented by ERC721-compliant tokens implemented in `VotingEscrow`. As part of ERC721 compliance, the NFT logic supports `safeTransferFrom()` to transfer the ownership of an NFT from one address to another. As part of the transfer logic, it allows the callback on the recipient if the recipient address is a contract. Our analysis shows that the logic to check whether the given recipient is a contract can be improved.

In the following, we show the implementation of this specific function `_isContract()`. It has a rather straightforward logic in detecting whether the destination is a contract based on `extcodesize(account)>0`, which does not take into consideration of the ERC7702 specification. In particular, the ERC7702 specification allows any EOA to set its code based on any existing smart contract. To accommodate the ERC7702 specification, there is a need to improve the logic to reliably detect whether a given address is a true contract (excluding ERC7702-enabled EOAs).

```

406     function _isContract(address account) internal view returns (bool) {
407         // This method relies on extcodesize, which returns 0 for contracts in
408         // construction, since the code is only stored at the end of the
409         // constructor execution.
410         uint size;
411         assembly {
412             size := extcodesize(account)
413         }
414         return size > 0;
415     }

```

Listing 3.3: `VotingEscrow::_isContract()`

**Recommendation** Revise the above `_isContract()` function to properly detect whether a given address is a contract. An example implementation can be found as follows:

```

339     function _isContract(address account) internal view returns (bool) {
340         // This method relies on extcodesize, which returns 0 for contracts in
341         // construction, since the code is only stored at the end of the
342         // constructor execution.
343         uint256 csize = address(who).code.length;
344
345         // EOA

```

```

346     if (csize == 0) return false;
347
348     // Delegated EOA (EIP-7702)
349     if (csize == 23) {
350         bytes32 word;
351         assembly {
352             let ptr := mload(0x40)
353             extcodecopy(who, ptr, 0, 3) // copy first 3 bytes
354             word := mload(ptr) // load the 32-byte word
355         }
356         return bytes3(word) != 0xef0100;
357     }
358
359     return true;
360 }

```

Listing 3.4: Revised VotingEscrow::\_isContract()

**Status** This issue has been resolved since the current logic does not introduce any business impact, as failed executions will revert as expected.

### 3.4 Accommodation of Non-ERC20-Compliant Tokens

- ID: PVE-004
- Severity: Low
- Likelihood: Low
- Impact: Low
- Target: BasisStrategy
- Category: Coding Practices [5]
- CWE subcategory: CWE-1126 [1]

#### Description

Though there is a standardized ERC-20 specification, many token contracts may not strictly follow the specification or have additional functionalities beyond the specification. In this section, we examine the `approve()` routine and analyze possible idiosyncrasies from current widely-used token contracts.

In particular, we use the popular stablecoin, i.e., `USDT`, as our example. We show the related code snippet below. On its entry of `approve()`, there is a requirement, i.e., `require(!(_value != 0) && (allowed[msg.sender][_spender] != 0))`. This specific requirement essentially indicates the need of reducing the allowance to 0 first (by calling `approve(_spender, 0)`) if it is not, and then calling a second one to set the proper allowance. This requirement is in place to mitigate the known `approve()/transferFrom()` race condition (<https://github.com/ethereum/EIPs/issues/20#issuecomment-263524729>).

```

194     /**
195     * @dev Approve the passed address to spend the specified amount of tokens on behalf
       of msg.sender.

```

```

196 * @param _spender The address which will spend the funds.
197 * @param _value The amount of tokens to be spent.
198 */
199 function approve(address _spender, uint _value) public onlyPayloadSize(2 * 32) {
201     // To change the approve amount you first have to reduce the addresses '
202     // allowance to zero by calling 'approve(_spender, 0)' if it is not
203     // already 0 to mitigate the race condition described here:
204     // https://github.com/ethereum/EIPs/issues/20#issuecomment-263524729
205     require(!((_value != 0) && (allowed[msg.sender][_spender] != 0)));
207     allowed[msg.sender][_spender] = _value;
208     Approval(msg.sender, _spender, _value);
209 }

```

Listing 3.5: USDT Token Contract

Because of that, a normal call to `approve()` is suggested to use the safe version, i.e., `safeApprove()`. In essence, it is a wrapper around ERC20 operations that may either throw on failure or return false without reverts. Moreover, the safe version also supports tokens that return no value (and instead revert or throw on failure). Note that non-reverting calls are assumed to be successful. Similarly, there is a safe version of `transfer()` as well, i.e., `safeTransfer()`.

```

38 /**
39  * @dev Deprecated. This function has issues similar to the ones found in
40  * {IERC20-approve}, and its usage is discouraged.
41  *
42  * Whenever possible, use {safeIncreaseAllowance} and
43  * {safeDecreaseAllowance} instead.
44  */
45 function safeApprove(
46     IERC20 token,
47     address spender,
48     uint256 value
49 ) internal {
50     // safeApprove should only be called when setting an initial allowance,
51     // or when resetting it to zero. To increase and decrease it, use
52     // 'safeIncreaseAllowance' and 'safeDecreaseAllowance'
53     require(
54         (value == 0) & (token.allowance(address(this), spender) == 0),
55         "SafeERC20: approve from non-zero to non-zero allowance"
56     );
57     _callOptionalReturn(token, abi.encodeWithSelector(token.approve.selector,
58         spender, value));
59 }

```

Listing 3.6: SafeERC20::safeApprove()

In current implementation, if we examine the `GovernanceHYBR::executeSwap()` routine that is designed to perform token swaps. To accommodate the specific idiosyncrasy, there is a need to use `safeApprove()`, instead of `approve()` (lines 429 and 435).

```

757     function executeSwap(ISwapper.SwapParams calldata _params) external nonReentrant
758         onlyOperator {
759             require(address(swapper) != address(0), "Swapper not set");
760
761             // Get token balance before swap
762             uint256 tokenBalance = IERC20(_params.tokenIn).balanceOf(address(this));
763             require(tokenBalance >= _params.amountIn, "Insufficient token balance");
764
765             // Approve swapper to spend tokens
766             IERC20(_params.tokenIn).approve(address(swapper), _params.amountIn);
767
768             // Execute swap through swapper module
769             uint256 hybrReceived = swapper.swapToHYBR(_params);
770
771             // Reset approval for safety
772             IERC20(_params.tokenIn).approve(address(swapper), 0);
773
774             // HYBR is now in this contract, ready for compounding
775         }

```

Listing 3.7: GovernanceHYBR::executeSwap()

**Recommendation** Accommodate the above-mentioned idiosyncrasy about ERC20-related `approve()`/`transfer()`/`transferFrom()`. Note this issue affects a number of contracts, including `RewardHYBR`, `RewardsDistributor`, and `GovernanceHYBR`.

**Status** This issue has been fixed in the following commit: `e056e64`.

### 3.5 Simplified `removeRole()` Logic in `PermissionsRegistry`

- ID: PVE-005
- Severity: Low
- Likelihood: Low
- Impact: Low
- Target: `PermissionsRegistry`
- Category: Coding Practices [5]
- CWE subcategory: CWE-1126 [1]

#### Description

To facilitate role management, Hybra has a dedicated `PermissionsRegistry` contract. While reviewing the logic to revoke roles, we notice an issue that does not cleanly reset related storage states.

To elaborate, we show below the implementation of the related `removeRole()` routine. This routine has a rather simple logic in removing a given role. While current implementation does properly remove the given role from the `_roles` array and the `_checkRole` mapping, it does not reset the `_roleToAddresses` array. In addition, the adjustment on the `addressToRoles` array can perform early exit once the removed role is identified and removed (line 114).



```

93     function removeRole(string memory role) external onlyHybraMultisig {
94         bytes memory _role = bytes(role);
95         require(_checkRole[_role], 'not a role');

97         for(uint i = 0; i < _roles.length; i++){
98             if(keccak256(_roles[i]) == keccak256(_role)){
99                 _roles[i] = _roles[_roles.length -1];
100                 _roles.pop();
101                 _checkRole[_role] = false;
102                 emit RoleRemoved(_role);
103                 break;
104             }
105         }

107         address[] memory rta = _roleToAddresses[bytes(role)];
108         for(uint i = 0; i < rta.length; i++){
109             hasRole[bytes(role)][rta[i]] = false;
110             bytes[] memory __roles = _addressToRoles[rta[i]];
111             for(uint k = 0; k < __roles.length; k++){
112                 if(keccak256(__roles[k]) == keccak256(bytes(role))){
113                     _addressToRoles[rta[i]][k] = _roles[_roles.length -1];
114                     _addressToRoles[rta[i]].pop();
115                 }
116             }
117         }

119     }

```

Listing 3.8: PermissionsRegistry::removeRole()

Similarly, the early exit optimization can be applied to another `removeRoleFrom()` routine as well.

**Recommendation** Revise the above-mentioned routines to cleanly reset outdated states.

**Status** This issue has been fixed in the following commit: `e056e64`.

## 3.6 Voting Delegate Denial-of-Service With Dust Delegates

- ID: PVE-006
- Severity: Low
- Likelihood: Low
- Impact: Low
- Target: VotingDelegationLib
- Category: Business Logic [6]
- CWE subcategory: CWE-841 [3]

### Description

As mentioned in Section 3.3, the `VotingEscrow` contract in Hybra escrows the governance tokens in the form of an ERC-721 NFT, which can be delegated from one user to another. While analyzing the

delegation logic, we notice a possible denial-of-service issue.

In the following, we show the implementation of the related `_moveTokenDelegates()` routine. This routine is designed to move the delegated NFT from one user to another. We notice the recipient-side requirement upon the NFT delegation, i.e., `dstRepOld.length + 1 <= MAX_DELEGATES` (line 97). In other words, there is a limit on the maximum number of received NFTs. Further, our analysis shows it is possible to create dust NFT and delegate them to one victim user. As a result, the victim user may not be able to receive legitimate delegation once the number of total delegates reaches the threshold, i.e., `MAX_DELEGATES`.

```

86     if (dstRep != address(0)) {
87         uint32 dstRepNum = self.numCheckpoints[dstRep];
88         uint[] storage dstRepOld = dstRepNum > 0
89             ? self.checkpoints[dstRep][dstRepNum - 1].tokenIds
90             : self.checkpoints[dstRep][0].tokenIds;
91         uint32 nextDstRepNum = findCheckpointToWrite(self, dstRep, block.timestamp);
92         bool _isCheckpointInNewBlock = (dstRepNum > 0) ? (nextDstRepNum != dstRepNum
93             - 1) : true;
94         Checkpoint storage cpDstRep = self.checkpoints[dstRep][nextDstRepNum];
95         uint[] storage dstRepNew = cpDstRep.tokenIds;
96         cpDstRep.timestamp = block.timestamp;
97         require(
98             dstRepOld.length + 1 <= MAX_DELEGATES,
99             "tokens>1"
100         );
101         if(_isCheckpointInNewBlock) {
102             for (uint i = 0; i < dstRepOld.length; i++) {
103                 uint tId = dstRepOld[i];
104                 dstRepNew.push(tId);
105             }
106             dstRepNew.push(_tokenId);
107             self.numCheckpoints[dstRep] = nextDstRepNum + 1;
108         }

```

Listing 3.9: `VotingDelegationLib::_moveTokenDelegates()`

**Recommendation** Improve the above logic by restricting possible dust delegation. Note another routine `_moveAllDelegates()` shares the same issue.

**Status** This issue has been mitigated as it is part of the intended design.

### 3.7 Trust Issue of Admin Keys

- ID: PVE-007
- Severity: Medium
- Likelihood: Medium
- Impact: Medium
- Target: Multiple Contracts
- Category: Security Features [4]
- CWE subcategory: CWE-287 [2]

#### Description

In the Hybra protocol, there is a privileged account `owner` that plays a critical role in governing and regulating the system-wide operations (e.g., configure parameters, assign roles, manage gauges, whitelist tokens, and execute privileged operations). Our analysis shows that the privileged account needs to be scrutinized. In the following, we examine the privileged account and the related privileged accesses in current contracts.

```

83     function addRole(string memory role) external onlyHybraMultisig {
84         bytes memory _role = bytes(role);
85         require(!_checkRole[_role], 'is a role');
86         _checkRole[_role] = true;
87         _roles.push(_role);
88         emit RoleAdded(_role);
89     }
90
91     /// @notice Remove a role
92     /// @dev    set last one to i_th position then .pop()
93     function removeRole(string memory role) external onlyHybraMultisig {
94         ...
95     }
96
97     /// @notice Set a role for an address
98     function setRoleFor(address c, string memory role) external onlyHybraMultisig {
99         ...
100    }
101
102
103    /// @notice remove a role from an address
104    function removeRoleFrom(address c, string memory role) external onlyHybraMultisig {
105        ...
106    }

```

Listing 3.10: Example Privileged Functions in `PermissionsRegistry`

Note that this privileged account only affects protocol fees, and does not pose any security risks to user funds. From another perspective, a better approach is to eliminate the administration key concern by transferring the role to a community-governed DAO. In the meantime, a timelock-based mechanism can also be considered as mitigation.

**Recommendation** Promptly transfer the privileged account to the intended DAO-like governance contract. All changed to privileged operations may need to be mediated with necessary timelocks. Eventually, activate the normal on-chain community-based governance life-cycle and ensure the intended trustless nature and high-quality distributed governance.

**Status** This issue has been mitigated as the team makes use of a multisig to act as the privileged owner.

### 3.8 Improved Dynamic Fee Calculation in DynamicSwapFeeModule

- ID: PVE-008
- Severity: Low
- Likelihood: Low
- Impact: Low
- Target: DynamicSwapFeeModule
- Category: Business Logic [6]
- CWE subcategory: CWE-841 [3]

#### Description

The Hybra protocol allows to customize the swap fee for each specific pool. In the process of reviewing the swap fee logic, we notice it makes use of the built-in geometric mean price oracle to compute the time-weighted average price tick. Our analysis shows the use of average price tick may be improved.

In the following, we show the implementation of the related `_getDynamicFee()` function. The time-weighted average price tick is computed as `twAvgTick = int24((tickCumulatives[1] - tickCumulatives[0]) / _secondsAgo)` (line 189), which may be optimized to round to negative infinity if `tickCumulatives[1] < tickCumulatives[0]`. In fact, an example use can be found in the `periphery/libraries/OracleLibrary` contract.

```

177     function _getDynamicFee(address _pool, uint256 _scalingFactor) internal view returns
178         (uint256) {
179         (, int24 currentTick, uint16 observationCardinality, ) = ICLPool(_pool).slot0()
180         ;
181         uint32 _secondsAgo = secondsAgo;
182
183         if (observationCardinality < _secondsAgo / MIN_SECONDS_AGO) return 0;
184
185         uint32[] memory sa = new uint32[] (2);
186         sa[0] = _secondsAgo;
187         // sa[1] = 0; default is 0
188
189         int24 twAvgTick;
190         try ICLPool(_pool).observe(sa) returns (int56[] memory tickCumulatives, uint160
191             [] memory) {

```

```

189         twAvgTick = int24((tickCumulatives[1] - tickCumulatives[0]) / _secondsAgo);
190     } catch {
191         return 0;
192     }
193
194     int24 tickDelta = currentTick - twAvgTick;
195     uint24 absTickDelta = tickDelta < 0 ? uint24(-tickDelta) : uint24(tickDelta);
196     return absTickDelta * _scalingFactor / SCALING_PRECISION;
197 }

```

Listing 3.11: DynamicSwapFeeModule::\_getDynamicFee()

**Recommendation** Improve the above `_getDynamicFee()` function to better make use of the time-weighted average price tick.

**Status** This issue has been resolved as it follows the original design of Aerodrome.

### 3.9 Improper estimateAmount0/1() Logic in SugarHelper

- ID: PVE-009
- Severity: Low
- Likelihood: Low
- Impact: Low
- Target: SugarHelper
- Category: Business Logic [6]
- CWE subcategory: CWE-841 [3]

#### Description

The Hybra protocol has a `SugarHelper` contract that exposes on-chain helpers for liquidity-related mathematics formulas. Our analysis shows that two reported functions `estimateAmount0()` and `estimateAmount1()` should be improved.

To elaborate, we use `estimateAmount0()` as an example and show below its implementation. This function is used to compute the amount of `token0` for a given amount of `token1` and the intended price range for liquidity addition. It comes to our attention that the built-in sanity check of `sqrtRatioX96 <= sqrtRatioAX96 && sqrtRatioX96 >= sqrtRatioBX96` (line 68) should be revised as `sqrtRatioX96 <= sqrtRatioAX96 || sqrtRatioX96 >= sqrtRatioBX96`. And the final amount is currently computed as `amount0 = SqrtPriceMath.getAmount0Delta(sqrtRatioX96, sqrtRatioBX96, liquidity, false)`, which is better adjusted as `amount0 = SqrtPriceMath.getAmount0Delta(sqrtRatioX96, sqrtRatioBX96, liquidity, true)` for better prevision. Note the `estimateAmount1()` function shares the same issue.

```

57     function estimateAmount0(uint256 amount1, address pool, uint160 sqrtRatioX96, int24
58         tickLow, int24 tickHigh)
59         external
60         view

```

```

60     override
61     returns (uint256 amount0)
62     {
63         uint160 sqrtRatioAX96 = TickMath.getSqrtRatioAtTick(tickLow);
64         uint160 sqrtRatioBX96 = TickMath.getSqrtRatioAtTick(tickHigh);
65
66         if (sqrtRatioAX96 > sqrtRatioBX96) (sqrtRatioAX96, sqrtRatioBX96) = (
67             sqrtRatioBX96, sqrtRatioAX96);
68
69         if (sqrtRatioX96 <= sqrtRatioAX96 && sqrtRatioX96 >= sqrtRatioBX96) {
70             return 0;
71         }
72
73         // @dev If a pool is provided, fetch updated 'sqrtPriceX96'
74         if (pool != address(0)) {
75             (sqrtRatioX96,,,,) = ICLPool(pool).slot0();
76         }
77         uint128 liquidity = LiquidityAmounts.getLiquidityForAmount1(sqrtRatioAX96,
78             sqrtRatioX96, amount1);
79         amount0 = SqrtPriceMath.getAmount0Delta(sqrtRatioX96, sqrtRatioBX96, liquidity,
80             false);
81     }

```

Listing 3.12: SugarHelper::estimateAmount0()

**Recommendation** Revise the above-mentioned routines to properly compute the intended token amounts for liquidity addition.

**Status** This issue has been resolved as this contract is currently unused.

## 4 | Conclusion

In this audit, we have analyzed the design and implementation of the Hybra Finance protocol, which is the public liquidity layer on HyperliquidX, fully community-owned with no insider allocations. It features an upgraded `ve(3,3)` flywheel with in-house, highly competitive dynamic-fee CL pools and introduces `G33`, a PVP-style mechanism that rewards loyal LPs with higher yields while reducing rewards for short-term capital — reinforcing long-term alignment and making liquidity incentives more sustainable. The current code base is well structured and neatly organized. Those identified issues are promptly confirmed and addressed.

Meanwhile, we need to emphasize that [Solidity](#)-based smart contracts as a whole are still in an early, but exciting stage of development. To improve this report, we greatly appreciate any constructive feedbacks or suggestions, on our methodology, audit findings, or potential gaps in scope/coverage.



## References

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