PROTOFIRE

SMART CONTRACT AUDIT REPORT

SparkDEX - Perp

Version: 1.0

Protofire
July, 2024

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The SparkDEX - Perp audit report

The audit report was prepared for the **SparkDEX team** and includes following Github repository and files:

https://github.com/SparkDEX/perp-smart-contracts/ audited commit [c8371937c7a4f1e9de677bc360dbf985310995c6](c8371937c7a4f1e9de677bc360dbf985310995c6):

- Executor.sol
- FundingTracker.sol
- OrderBook.sol
- PositionManager.sol
- ReferralStorage.sol
- Store.sol
- utils/
    - AddressStorage.sol
    - Api3.sol
    - BatchSender.sol
    - Chainlink.sol
    - **FTSO**.sol
    - Governable.sol
    - **ProxyAdmin**.sol
    - **Pyth**.sol
    - ReferralReader.sol
    - Timelock.sol
    - TradingValidator.sol

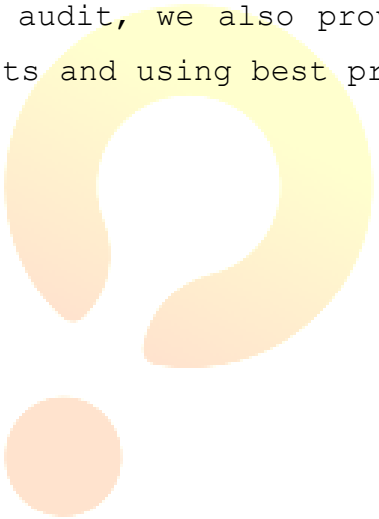
The code repository does not contain any tests.

Procedure

The audit includes the following procedures:

- code analysis by the Slither static analyzer, followed by manual analysis and selection of problems
- manual code analysis, including logic check
- checking the business logic for compliance with the documentation (or white paper)

In addition, during the audit, we also provide recommendations on optimizing smart contracts and using best practices.



Summary of audit findings

Severity	Count
HIGH	0
MEDIUM	0
LOW	1
INFORMATIONAL	2
TOTAL	**3**

Severity classification

High severity issues

High severity issues can lead to a direct or indirect loss of funds by both users and owners, a serious violation of the logic of the contract, including through the intervention of third parties. Such issues require immediate correction.

Medium severity issues

Medium severity issues may cause contract functionality to fail or behave incorrectly. Also, medium severity issues can cause financial damage. Such issues require increased attention.

Low severity issues

Low severity issues do not have a major security impact. It is recommended that such issues be taken into account.

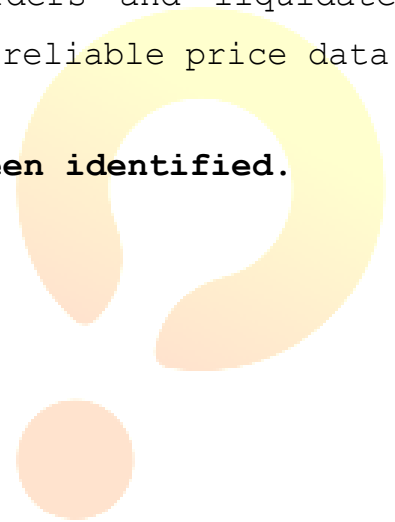
Informational severity issues

These issues provide general guidelines for writing code as well as best practices.

Smart contract Executor [SDP-01]

The Executor contract is a core component of a decentralized trading platform that handles order execution and position liquidation. It works with external keepers to process market, limit, and trailing stop orders, ensuring price accuracy through Pyth price updates. For protection, only whitelisted keepers can initiate these actions. The contract validates orders and liquidates positions based on margin thresholds and reliable price data.

No issues have been identified.



Smart contract FundingTracker [SDP-02]

The FundingTracker contract is responsible for calculating and updating funding rates for different markets and collateral assets in a decentralized trading protocol. Funding rates are determined based on the imbalance between long and short positions in each market. The contract ensures accurate calculations by using time intervals and updates only when the funding interval has elapsed. It integrates with other core protocol contracts (PositionManager and Executor) to manage positions and facilitate funding updates. The FundingTracker is essential for maintaining a fair compensation mechanism between long and short traders on the platform.

No issues have been identified.

Smart contract OrderBook [SDP-03]

The OrderBook contract is the core component of a decentralized exchange, responsible for managing the placement and cancellation of orders. It supports market, limit, stop, and trailing stop orders, allowing users to trade assets with various strategies. The contract validates all orders to ensure market integrity and charges a small execution fee to pay keepers who process orders.

No issues have been identified.

Smart contract PositionManager [SDP-04]

The PositionManager contract is a core component of a decentralized exchange, handling the creation, modification, and closure of trading positions. It allows users to open long or short positions on various markets, add or remove margin to control leverage, and tracks fees generated from order executions. The contract ensures accurate calculation of profit and loss (PnL) and distributes fees to keepers (order executors), a liquidity pool, and the protocol's treasury. It maintains detailed records of open interest (OI) for risk management purposes.

No issues have been identified.

Smart contract ReferralStorage [SDP-05]

The ReferralStorage contract is a core component of a decentralized exchange's referral program. It enables users to earn rewards by referring others and allows referrers to set customized fee discounts or rebates for their referees. The system uses a tier-based approach where different tiers offer varying levels of rebates and discounts. The contract stores referral codes, links them to referrers and referees, and manages the distribution of referral rewards.

ID: **SDP05-01**	Severity: **Low**	Status: **Acknowledged**

A front-run possibility

The function `registerCode()` can be front-run by any user. For example, userA wants to be the owner of a code and sends a transaction to be the owner of this code, but userB front-runs userA and becomes the owner of this code instead of the userA.

Smart contract Store [SDP-06]

The Store contract is a core component of a decentralized exchange, acting as the central repository for assets that back trader positions. It persistently stores data on supported assets and markets, defining parameters like fees and leverage limits. Users can deposit assets to provide liquidity, and these funds are used to settle trader profits and losses. The Store includes a buffer mechanism that temporarily absorbs trader losses to protect liquidity providers. Additionally, the contract manages protocol-generated fees and user deposits/withdrawals.

ID: **SDP06-01**	Severity: **Info**	Status: **Acknowledged**

Keeper backend work

Since the work of the keepers is not within the scope of the audit, we recommend ensuring that the call to `_setGlobalUPLs()` is executed for all assets for which orders will be processed in the `_cancelOrder()` loop.

Smart contract AddressStorage [SDP-07]

The AddressStorage contract serves as a centralized repository for storing addresses used within a larger decentralized application. It provides a secure and organized way to manage these addresses, with access control restricted to the governance mechanism. The contract offers functions for setting and retrieving addresses associated with specific keys. This allows for flexibility and easy updates as the application evolves.

No issues have been identified.

Smart contract Api3 [SDP-08]

The Api3 contract acts as a price feed that integrates with API3's decentralized oracle network. It allows a smart contract to consume external price data from API3 sources. The contract retrieves the latest price from a specified API3 feed and performs necessary validations.

No issues have been identified.

Smart contract BatchSender [SDP-09]

The BatchSender contract facilitates efficient batch transfers of ERC20 tokens. It's primarily designed for scenarios like distributing rewards or airdrops to multiple recipients in a single transaction. The contract allows keepers to execute batch transfers.

No issues have been identified.

Smart contract Chainlink [SDP-10]

The Chainlink contract acts as a price feed that integrates with Chainlink's decentralized oracle network. It enables a smart contract to fetch reliable price data from specified Chainlink feeds. The contract retrieves the latest price and associated metadata from a Chainlink feed, performing validations. It standardizes the retrieved prices to 18 decimals, providing consistency in how the price data is consumed by other smart contracts.

No issues have been identified.

Smart contract Governable [SDP-11]

The Governable contract provides a basic access control mechanism for a decentralized application. It designates a specific address as the "governance" entity, which has exclusive control over sensitive functions within the system.

No issues have been identified.

Smart contract ReferralReader [SDP-12]

The ReferralReader contract simplifies the process of retrieving referral information in bulk. It interacts with an external ReferralStorage contract, which stores the relationship between referral codes and their owners.

No issues have been identified.

Smart contract Timelock [SDP-13]

The Timelock contract introduces a time delay for administrative actions within a related decentralized application. It allows authorized administrators to signal proposed changes, which must wait a predefined buffer period before execution. This mechanism adds a layer of security and prevents hasty or unauthorized changes to the system.

ID: **SDP13-01**	Severity: **Info**	Status: **Acknowledged**

Not all functions have timelock

In the contract only some functions are under the timelock. Almost all functions can be called without any signal/buffer.

Only these functions have timelock:

1. `setGov()`
2. `setAddress()`
3. `setAsset()`
4. `setMarket()`

Also there is a function `setMarketWithoutSignal()` that performs the same action, but without a timelock.

Consider using timelock pattern for all important functions. And add documentation for the rest.

Smart contract TradingValidator [SDP-14]

The TradingValidator contract implements risk controls, primarily focusing on limiting open interest (OI) and potential losses within liquidity pools. It allows governance to set maximum OI thresholds for specific markets and assets, preventing positions from being opened when these limits are reached. The contract also tracks an amortized profit and loss metric for liquidity pools, enforcing profit limits to protect against excessive drawdowns.

No issues have been identified.

Smart contract FTSO [SDP-15]

The FTSO contract integrates with the Flare Network to retrieve and manage price feeds from the Flare Time Series Oracle (FTSO). The contract includes functionalities to set price feed stale periods, and fetch the latest FTSO prices for given token symbols, while enforcing stale period constraints to maintain data accuracy.

ID: **SDP15-01**	Severity: **Info**	Status: **Acknowledged**

Hardcoded testnet address

There is a hardcoded testnet address on L12.

We recommend moving the `FLARE_CONTRACT_REGISTRY` variable into the constructor or updating such value during mainnet deployment.

Smart contract Pyth [SDP-16]

The Pyth contract provides both on-chain and offline support for price updates. The contract includes functionality to update price feeds, either directly from Pyth Protocol oracles or through local storage, emitting events to log updates.

It also features role-based access control to restrict certain functions to the Executor contract, enhancing security and reliability.

No issues have been identified.

Smart contract ProxyAdmin [SDP-17]

The `ProxyAdmin` contract is an administrative contract that leverages role-based access control to manage function calls and token withdrawals. It allows only users with the `ADMIN_ROLE` to execute calls to other contracts with value and to withdraw tokens held by the contract.

No issues have been identified.

Conclusion

During the audit 1 low severity issue was found. However, the provided repository does not contain tests for contracts. Adding tests for project contracts is strongly recommended.

Please note that auditing is not a complete replacement for unit tests and integration tests.

Disclaimer

Note that smart contract audit provided by Protofire 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, Protofire recommends proceeding with several independent audits and a public bug bounty program to ensure the security of smart contract(s). Smart contract audit provided by Protofire shall not be used as investment or financial advice.