# Exchange Architecture

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## INTRODUCTION

These days there are plenty of trading venues to choose from. Most share a similar underlying architecture, each with their own advantages and disadvantages. While a positive evaluation can be made for each of these trading systems for a certain situation, we decided to assess the scope for an alternative option.

## 1. INSTITUTIONAL TRADING

In the financial sector, traders interact using an exchange-clearer model.

In this model, the exchange and clearer provide matching and financial settlement functions, respectively. The partition between the two intends to reduce conflicts of interest and provide a separation of concerns that allows each business model to focus on their primary objectives. For the exchange, it′s speed, liquidity and product availability; and for the Clearer, it is the optimization of equity and credit lines.

In order to trade, funds must be deposited with the Clearer, who will in turn define and set pre-trade position limits based on account equity. The Clearer may also define post-trade limits on margin, margin haircut (cross-exchange), and Value at Risk, depending on the Trader′s primary strategy.

In the trade life cycle, the exchange handles order matching and liquidity discovery; the clearer provides financial trade settlement between counter-parties.

Advantages of this system:
- Decoupling of business functions.
- Clearing is usually provided by banks which are guaranteed to an extent by insurance.
- Trader-Clearer relationships allow for more flexibility with strategy limits and leverage.
- Regulation, compliance and auditing

Drawbacks of this system:
- Centralized architecture.
- Relies heavily/entirely on closed-source software at all operational levels including the execution platform, exchange and clearing.
- Clearer and Exchange use multiple independent software systems that increase post-trade operational complexity for all parties.

## 2. CENTRALIZED EXCHANGES

In the consumer and semi-professional trader world, online exchanges are used to facilitate trading.

In this model, the exchange also serves as the clearer, providing a holistic trade life cycle.

In order to trade, funds must be deposited with the Exchange, who will in turn define and set pre-trade position limits based on account equity. The Exchange may also define pre- and post-trade limits on margin.

Advantages of this system:
- Entire trade life cycle is managed by the exchange and there is usually little operational management required post-trade.

Disadvantages of this system:
- Centralized architecture.
- Relies heavily/entirely on closed-source software at all operational levels including the execution platform, exchange and clearing.

- Limited / no regulation, compliance and auditing

## 3. DECENTRALIZED EXCHANGES

Focus on counter-party risk when using online Centralized Exchanges has led to the emergence of Decentralized Exchanges in an attempt to mitigate loss caused by manipulation or system weakness.

In this model, the Exchange also serves as the Clearer, however the clearing mechanism differs from convention. Account funding is deposited into a "Smart Contract" - a piece of software that exists on a distributed ledger, secured by Blockchain design. The Exchange will define and set limits based on account positions.

Advantages of this system:
- Funds held in a distributed Smart Contract.
- Smart contracts are usually open-source.

Disadvantages of this system:
- Execution can be relatively slow depending on the smart contract implementation, underlying Blockchain implementation, and liquidity discovery mechanisms (on chain/off chain etc).
- Vulnerable to security exploits in Blockchain.

## 4. PROPOSITION FOR A NEW ARCHITECTURE "EX"

In the new model, Exchange, Clearing and Risk functions are modular and can (if required) be hosted by different parties. No funds are deposited prior to the trade life cycle. Each trade is executed and cleared (in escrow fashion) on a trade-by-trade basis.

In order to ensure counter-party reliability and therefore a healthy market, there must be a feedback mechanism in place to allow for a build up of reputation. Prior to a reputation being established, per-trade funds must be sent to the Clearer before an Order is executed. A Risk module intercepts the new order to ensure that funds to settle the trade exist at the Clearer prior to execution. Once good reputation is established, trades can be settled post-trade by the Clearer module. Any negative reputation from the Clearer would result in a feedback reset to the Client.

Advantages of this system:
- Entirely open-source software.
- The system can be designed to support Any asset including Financial tokens and Data.
- Funds are sent to a clearer per-trade, usually eliminating risk of total loss.
- Modular. Functionality for each module is not limited to any one provider and multiple providers are supported.

Disadvantages of this system:
- Centralized (though funds are only held centrally for immediate escrow).