

37. Stock Exchange System

Requirements clarification

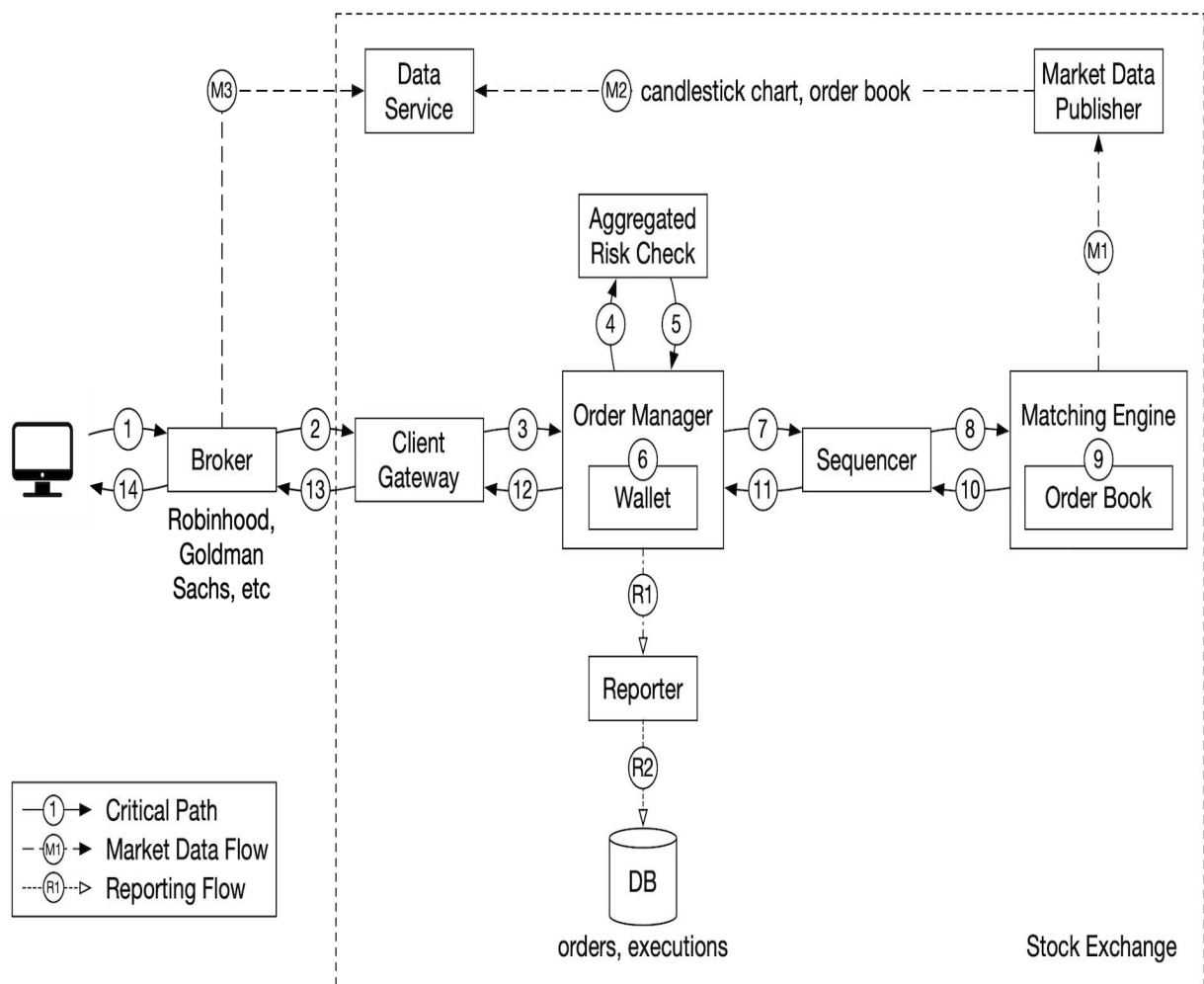
- **Functional requirements**

- User can place and cancel orders.
- User can view the real-time order book (the list of buy and sell orders).
- Only support trading stock.

- **Non-functional requirements**

- High availability
- Availability is crucial for exchanges
- Fault tolerance
- Fault tolerance and a fast recovery mechanism are needed to limit the impact of a production incident.
- Low latency
- The round-trip latency should be at the millisecond level.
- High security
- Verify a user's identity before a new account is opened.
- Prevent web pages from distributed denial-of-service (DDoS) attacks.

High-level design



Client gateway

- The gatekeeper for the exchange.
- Receives orders placed by clients and routes them to the order manager.
- Functions:
 - Authentication
 - Validation
 - Rate limiting
 - Normalization

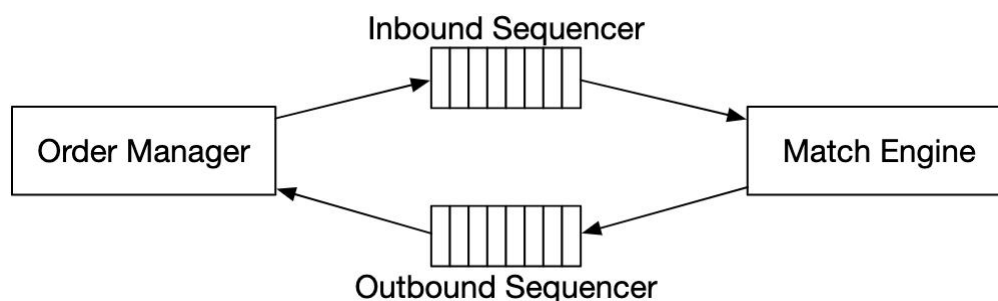
- FIXT support

Order manager

- The order manager receives inbound orders from the client gateway and performs the following:
 - Sends the order for risk checks.
 - Checks the order against the user's wallet and verifies that there are sufficient funds to cover the trade.
 - Sends the order to the sequencer where the order is stamped with a sequence ID.
- the order manager receives executions from the matching engine via the sequencer and performs the following:
 - Returns the executions for the filled orders to the brokers via the client gateway.

Sequencer

- Stamps every incoming order with a sequence ID before it is processed by the matching engine (Inbound).
- Stamps every pair of executions (fills) completed by the matching engine with sequence IDs (Outbound).



Matching engine

- Maintains the order book (the list of buy and sell orders) for each symbol.

- Matches buy and sell orders. A match results in two executions (fills), with one each for the buy and sell sides.
- Distributes the execution stream as market data.