

TRADEexpress™ Trading System

A low-latency, high-throughput trading engine that meets the needs of the most demanding trading venues within the financial, commodity and energy sectors.

Introduction

TRADEexpress™ Trading System is a low-latency, high-throughput trading engine that meets the needs of the most demanding trading venues within the financial, commodity and energy sectors. While accommodating advanced business functionality it still delivers market leading performance in terms of speed and throughput.

The system is also prepared for implementation of customer unique adaptations. The product-based approach combined with readiness to implement customizations ensures short time-to-market.

Scalability is an important design factor and capacity can easily be increased with growing volumes and changing trading patterns.

The instrument structure is fully flexible, thus allowing combination orders with derivatives and underlying products. Some key features are:

- A high performance trading system that is well proven and ready for immediate deployment
- A long track record of operational stability
- Quick and easy specification of trading rules
- Full redundancy and fault tolerance
- Easy integration with other systems
- Support of standard protocols, such as FIX

Configurable and extendable

In today's world, time to market is paramount. At the same time, quality may never be compromised.

The Trading System is designed so that many features of the system are configurable, rather than requiring code changes. Examples include user and instrument models, extendable messaging protocol, and configurable permissioning.

This allows many complex changes and additions to be made in a controlled way.

Trading Beans – plug-ins

In addition to configuring and extending data models and protocols, Trading Beans allow you to change or add new functionality without rebuilding the system.

All services offered in the Trading System are defined as processing flows made up of Trading Beans. Each individual Bean offers a specific functionality, and by defining a processing flow of Beans, you choose the business logic used to process an incoming message.

The processing flows are defined in an XML-based script language which is pre-parsed by the system in order to eliminate execution overhead.

For instance, the "Daily Opening" business process specifies a set of Beans. One of the Beans is the uncross algorithm. If another algorithm or a minor change is needed, the new algorithm can be developed and tested separately. It can then be deployed to the production system without rebuilds and long quality assurance cycles. This saves you time and money.

Business functionality

Each installation of the Trading System will be delivered customized to suit your specific needs.

The system contains a rich library of business functionality and new functionality can be added with short time-to-market.

Flexible instrument structure

The Trading System is built on an architecture that makes it suitable for any instrument that can be traded in a regular orderbook. The orderbook, where the actual trading takes place, is separated from the instrument structure. In turn, it is associated with an instrument.

There are several advantages with this approach, including:

- Cash and derivatives can be traded in the same system.
- Cash and derivatives can be included in a combination order.
- The same instrument can be traded in several orderbooks which for example is useful when the same instrument is traded in several currencies.
- New instrument types can easily be accommodated.

This approach has thus far been used to implement instrument structures as diverse as equities, derivatives and fixed income.

Matching mechanisms

The TRADExpress Trading System supports the following matching mechanisms:

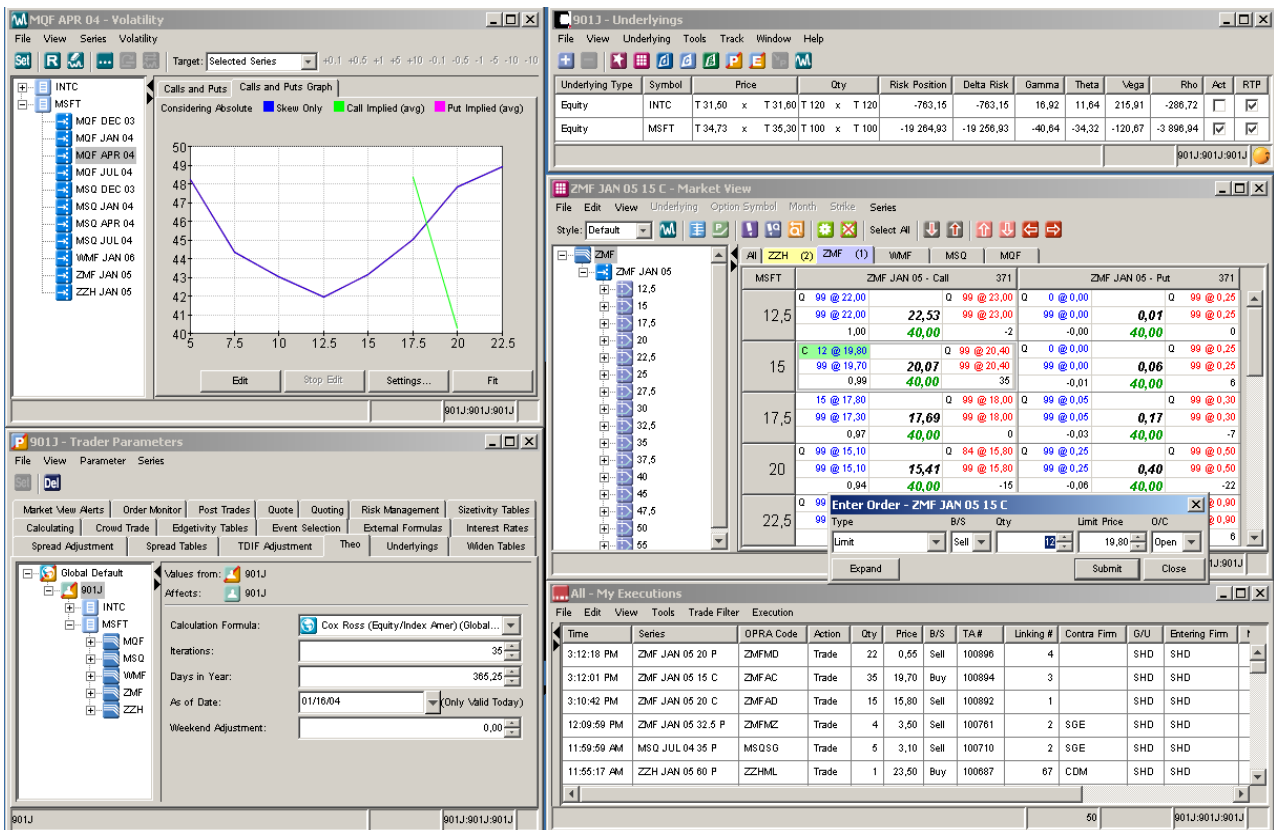
- Continuous trading — support for both standard price/time priority as well as parity. When using parity a trade is allocated between the quotes at the relevant price level.

price algorithm maximizes the traded volume. This guarantees that there are no crossing prices in an orderbook after a call auction has been executed. All orders/quotes better than the equilibrium price are filled, and orders/quotes on the equilibrium price are filled according to a FIFO or the order volume proportional algorithm.

- Accept matching — allows a trader to match directly against an order potentially bypassing normal prioritization rules. Utilized when users have preferences (credit worthiness etc.) not reflected in the volume/price of an order.
- Request for quote (RFQ) — users may request and receive quotes from market makers outside the normal orderbook. This allows market makers to individualize quotes per counterparty.

RFQ is basically a system replacement for the phone. Having RFQ functionality built into the system has several advantages:

- It allows automated responses by market makers.
- It makes it easier to monitor market makers' performance.
- Bulletin board (BB) — non-executable quotes. The BB is used to indicate interest but not commitment to trade.
- Trade reporting — reporting trades negotiated by users outside the normal orderbook, such as via the RFQ feature.



View of a TRADExpress Trading System trading client

Both single-side as well as two-sided trade reporting is supported. In the case of two-sided reporting, the two halves are matched. Trade matching criteria can easily be modified; this is facilitated by the Trading Bean architecture described above.

Order types

The Trading System supports the standard order types:

- Limit, Market and Stop-loss orders
- Fill and Kill (Immediate or Cancel) / Fill or Kill
- Good till Date, Good for Day, Good till Cancelled, Good until Next Uncross
- Iceberg orders
- Pegged orders
- Dark orders
- AoN orders

The system also supports free combination orders, which means it is not necessary to pre-define the orderbook. The user simply defines the combination at time of entry. Combination orders generate baits (implied orders) both from combination orderbook to the underlying orderbook and vice versa.

Transparency

The following market transparency levels are available in the system:

- Market-By-Order (MBO) i.e. full orderbooks
- Market-By-Level (MBL), N-levels, aggregated per price level

The following counterparty transparency levels are available in the system:

- Full/No pre-trade counterparty information
- Full/No post-trade counterparty information
- No-name-give up, i.e. central counterparty

High performance and scalability

The Trading System is based on a high-performance architecture that scales well according to the number of processors or machines in question. This means that you quickly can respond to changing conditions and increasing volumes through partitioning – without needing to make any software changes.

The system supports around-the-clock operation.

Redundancy and fault tolerance

An exchange system must never go down – there is quite simply too much at stake. The system is thus designed to have no single point of failure.

A typical system setup consists of a primary and a secondary system deployed at two different sites. The system architecture allows the distance between the sites to be quite far, with latency being the only limiting factor.

The ability to place the secondary system a significant distance from the primary eliminates the need for a dedicated disaster recovery site:

- Failover between the primary and secondary system is fully automatic for single points of failure. The secondary system runs in a hot-standby mode. This means that failover is fast and that no trading state is lost during the process.
- Safe automatic failover is facilitated by a vote server (quorum node). This eliminates the risk of “split-brain” scenarios
- If both the primary and secondary system fail, it is possible to recover the system from the transaction logs. Two basic types of recovery mechanisms are provided:
 - Roll Forward (RF) recovery - restores the whole trading state; all orders, trades, session states, etc. are restored. This mode is typically used in order-driven markets.
 - Fast Application Dependent Recovery (FADR). This restores a customer-unique subset of the trading state. This recovery mode is normally used in price-driven markets where there is normally no need or desire to restore quotes.

The TRADExpress Platform

Trading System, as with all of Cinnober’s offerings, is based on the TRADExpress platform, which includes all infrastructural components needed for mission-critical transaction solutions. It provides outstanding performance in terms of low latency, high throughput, scalability, easy monitoring and fault tolerance.

TRADExpress is currently in production in several demanding, high-transaction environments.

TRADExpress is implemented in Java and is thus platform-independent. It runs on all hardware and software platforms that support Java Virtual Machine (JVM) and supports a wide range of operating systems and databases (Oracle, MySQL, IBM DB2, Sybase, Microsoft SQL Server databases).

The platform has a fault-tolerant architecture that runs servers in redundant pairs, usually at two different sites. If a primary server fails, the hot standby immediately takes over without missing a beat – or a single byte. This means that no transactions are lost and the failover time is virtually zero.

Moreover, there is no need for specialized, expensive clustered disks or databases. This reduces the cost of production and test environments and simplifies deployment.

You can optimize the choice of HW and SW platforms considering both procurement and support costs as well as the operating experience of your own organization.

Passion for change | Cinnober is the world's leading independent provider of innovative marketplace and clearing technology. Our solutions are tailored to handle high transaction volumes with assured functionality and low latency.

We are passionate about one thing: applying advanced financial technology to help trading and clearing venues seize new opportunities in times of change.

Among our customers are leading exchanges such as the Chicago Board Options Exchange, the London Metal Exchange and NYSE Liffe. We also power new initiatives and alternative trading systems such as Alpha Trading Systems, Markit BOAT and Turquoise. Our clients rely on our platform-independent, Java-based technology for leveraging change quickly and cost-effectively.

Cinnober is headquartered in Stockholm and employs 170 people together having more than 1500 man years of experience from developing exchange and post-trade systems.

We are an independent technology provider and do not operate a market of our own, avoiding any conflicts of interest. We are not owned by — nor have any ownership interests in — any market operator.

Our track record says it all. We help our customers turn change into a competitive advantage.



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