



An overview to the TDI 4 product

Company Confidential

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Introduction / Executive summary

This document outlines at an executive level the design concept and application of the Transaction Data Interface (TDI™) as a Real Time 'Ticker Plant'. It is intended to provide an overview without detailing the total capability. In the event that this document results in the need for further information and or meetings we would request that the client provides a summary design specification of their specific project requirements. This results in further discussions being addressed in an efficient manner with focus on the more relevant aspects of TDI for the client.

The overall design goal of the TDI system was to quickly and efficiently move data between processes whilst ensuring the system is both scalable and reliable with low latency and a high throughput capability. Tools are available for users of TDI to further develop the system. Key elements of TDI include:

- Proven product within mission critical blue chip client applications (e.g. the CBOT)
- Low operational and hardware costs
- Industry standard platform
- Fully developed and owned by CMS

1 TDI High Level Description

TDI has been designed and built around a reliable multicast architecture with in-built 'quality of service' functionality. It will effectively allow TDI components to connect themselves to a centralised Network and contend with like components to consume, process and republish information back onto the same Network. The infrastructure provides resilience by means of duplicate standby components contending with the live publishers for the right to handle the data. If a live machine / process fails, the backup will notice this, and start publishing the information. A more detailed description is contained within appendix 3.

2 What is a Ticker Plant

All trading organisations, data vendors or exchanges disseminate real time data to a community that use this data in various ways. Exchanges distribute data using different communication methods and different protocols. Without any common platform on the horizon, consumers of this information are faced with a growing problem of handling the different formats in a timely and cost effective method. As reviewed in section 4 it is not only exchanges that represent a typical potential user of TDI, quote vendors and end users (i.e. trading companies, banks etc) also have potential data transfer projects suitable for TDI. The current problems faced by market data managers in such organisations include:

- Normalisation of Market Data from different incoming protocols
- Changing feed specifications and formats with associated maintenance
- Increasing amounts of data and bandwidth requirements
- New trading methods
- New Trading contracts
- Compliance with new regulatory requirements (e.g. MiFID)

The TDI system sets out to make these issues easier to deal with on a day to day basis ensuring low latency, bandwidth management, contract maintenance and efficient helpdesk support functionality.

3 The TDI Concept

TDI was designed as a low latency and highly scalable messaging solution to today's ever increasing requirements in processing real time market data. The TDI Infrastructure has been designed around speed, flexibility and resilience without the need for expensive computer and network hardware.

TDI is a middleware component-based messaging system that allows applications to share real-time data. TDI uses multicast technology together with a proprietary protocol to transfer data reliably between components. TDI components send data to the network using a self describing tag-based message format. These messages are broadcast to the network and any subscribed TDI components will have the data delivered.

4 Design Ideas

An incoming market data feed will always need to be handled in the same way, regardless of which ticker plant software is used. The common term for this process is a 'Feed Handler' and consists of three main components.

Firstly, the data needs to be reliably collected from the feed source. Secondly, this data will then be normalised and possibly error checked. Finally, the newly formatted data is delivered to the end user.

The TDI system has been designed such that these 3 components can be effectively 'plugged together' in a flexible and configurable manner to provide a Feed Handler solution.

Table 1 together with diagram 1 provides an overview of how various market data companies could employ the TDI System

	Collection	Processing	Distribution
Exchange	An exchange collects its data from various sources. These can include a trading floor, electronic trading system, clearing systems, settlement algorithms etc.	Added value data can be applied to the feeds at this point. This data could include High / Low, session summary and volume calculations, depth of market etc.	Distribution from the exchange is normally to a quote vendor community (eg Reuters, Bloomberg) and in some instances direct to member firms. Methods of delivery include TCP/IP or Multicast.
Quote Vendor	Quote vendors collect data from many different feed sources and in many different formats with the prime category being exchange vendor feeds.	Data normalisation processing including additional calculations that could be applied to the processed data.	The TDI distribution can provide user authentication as well as create an audit log for reporting exchange fees,
End User	Collection from eg a feed consolidator with a selection of additional direct exchange feeds together with in-house generated bespoke feeds.	Normalisation can occur here as well as data basing for charting and data caching for display terminals.	Distribution could be via API to price display terminals again using authentication or via feeds to in-house or external clients (could include MiFiD compliance)

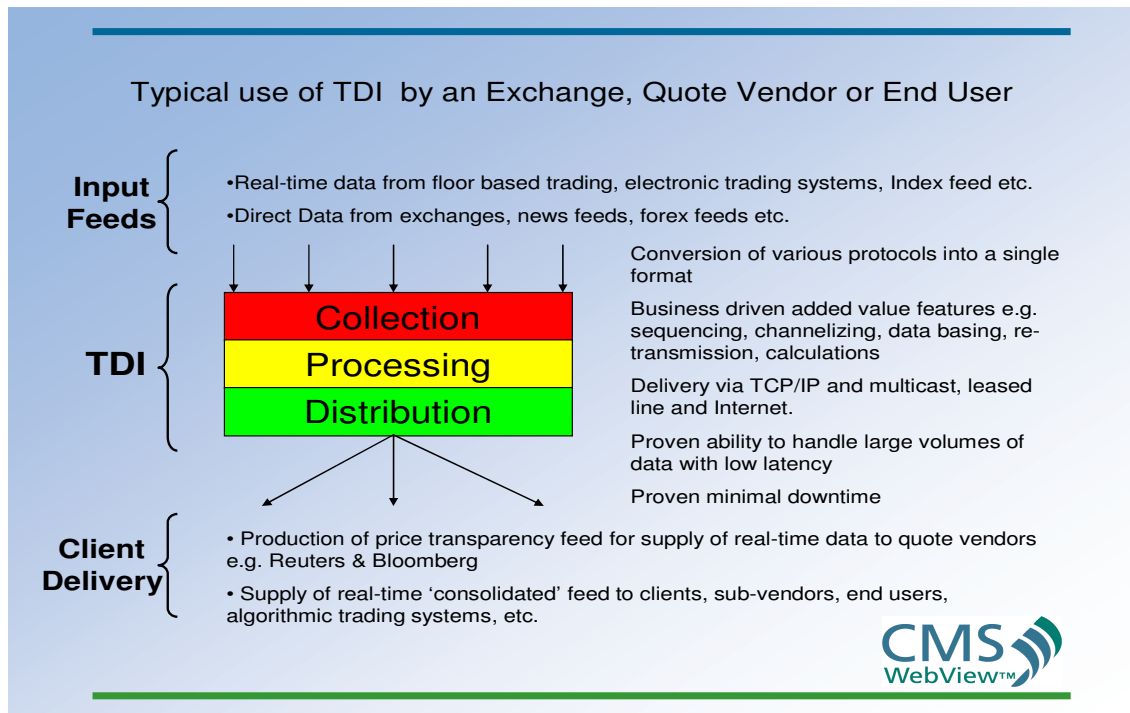


Diagram 1

4.1 Feed Collector

The Feed Collector is used to connect to a market data feed. There are generally two main types of feed collector, passive and interactive. The passive collector will connect to broadcast feeds similar to the formats utilised by American exchanges. The interactive collector is used when the feed process has to be 'logged on' and possibly subscribed to.

The Feed Collector then passes this data onto the TDI Network for publishing. Examples of feed collectors already developed are shown in section 9 however tools are available within the TDI software suite to allow fast and efficient design of new feed collectors for specific client requirements.

4.2 Feed Handler Framework

The Feed Handler Framework provides a development API so that the incoming feed can be converted into a normalised format. The Feed Handler receives its market data by subscribing to the TDI network, and after conversion / normalisation publishes the market data back to the TDI Network.

4.3 Feed Distributor

The Feed Distributor subscribes to the processed data from the TDI network and passes this data to any connected end users.

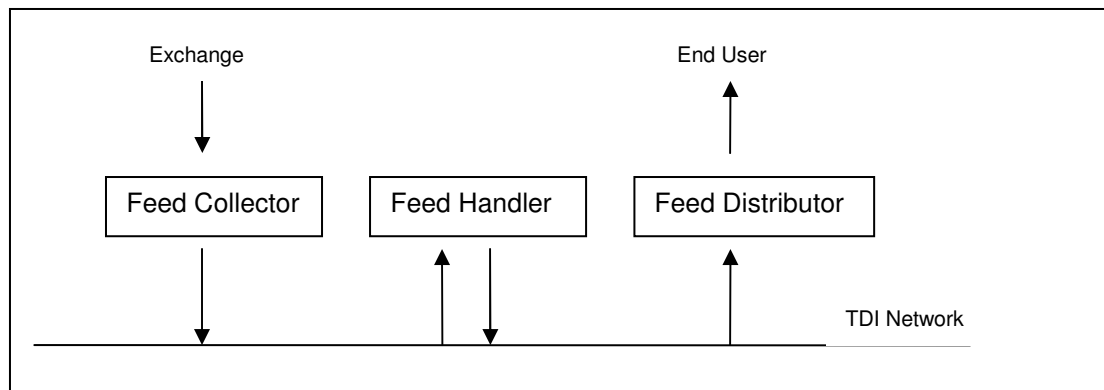


Diagram 2.

5 Building a Ticker Plant Using TDI

The Feed Handlers are only one piece of the Ticker Plant jigsaw. In addition to the feed handling software the following components need to be employed and are included in the TDI software suite:

- Database – used for storing all exchange records, configuration storage, event and audit data
- Entitlements system – used by the system to check users accessing the system
- Value Added data cache – provides calculated information for example, High Low, Total Volume, summary information
- Manager System – monitors and checks the system health
- Statistics and performance monitoring
- Helpdesk Support
- Configuration and contract Maintenance

6 Documentation

Design and functional documentation

Further detailed documentation is available providing additional information regarding the design and capabilities of the TDI system. These include:

6.1 System Documentation

All pre-built components are fully documented detailing how they are configured and used, these include:

- Feed Handler (TDI4 Component, Feed Handler, 21.7.04 etc)
- Feed Collector
- Vendor Gateway (TDI4, Vendor Gateway, 16.11.04 etc)
- TDI 4 Website user manual
- Etc etc

6.2 TDI SDK

The TDI System has a fully documented API (see appendix 1) that allows system developers to create their own applications utilising the TDI Middleware Library. A developer can then

choose to integrate their current systems directly with the TDI system. This could then combine easily with off-the-shelf TDI Applications.

7.0 Example TDI installations

Current and previous clients of TDI include the Chicago Board of Trade (CBOT), Chicago Mercantile Exchange (CME), the London Metal Exchange (LME) and CMS' own use of TDI as a quote vendor producing a consolidated real time data feed. More details of these installations are provided in appendix 2.

Appendices

- 1.0 TDI SDK Documentation (Separate document)
- 2.0 Client installations and business benefits. (Separate document)
- 3.0 Technical Track Presentation. (Separate document)