

# Pennies from heaven

Are you ready for penny pricing?

*"Or that external want of pence, Which vexes public men" - Tennyson.*

In a similar fashion to the equities markets post decimalisation, options exchanges are entering a period of increased competition, fuelled by changing regulation, the growth of electronic trading and the introduction of new pricing and market models.

The massive increase in program and algorithmic trading has driven the need for low latency architectures to increase the chance of beating competitors by being first to respond to changing market conditions.

Expansion of the SEC's Penny Pilot programme for options trading will also be a significant driver of change, not only in the way options are priced and traded but also in the technology solutions required by both the exchange and market participants.

Experience gained during the pilot program has shown that spreads may be compressed by 30-50%, liquidity at the BBO may be reduced by up to 80% and while trade volumes may increase (30-60%), quote traffic could increase considerably (by 100-300%) as quote to trade ratios increase.

Technology will be key battleground, as exchanges and market participants continue to develop lower latency architectures in an environment of exponential market data growth.

## The Challenge - latency, throughput and footprint

The seven options exchanges in the US send their quote data to the Options Price Reporting Authority for consolidation into the OPRA feed and in July 2007 OPRA were forecasting message capacity of 701,000 messages per second by August 2008. Current OPRA feed rates are in excess of 800,000 messages per second with peaks of over 1 million mps.

With the advent of the expansion in penny pricing, message volumes could extend into several million messages per second, posing challenges for trading firms where success is increasingly determined by microsecond differences in reaction time and trading latency is a key differentiator.

While progress has been made in the development of low latency trading architectures, software-only solutions suffer from higher intrinsic latency, degraded performance in faster markets and micro-bursts, and the need for higher server capacity (increasing footprint).

## Our solution – millions of messages/second at microsecond latency

In order to meet the challenges of ultra-low latency and ultra-high throughput in ever-faster markets, Celoxica has developed a set of trading architecture components, which exploit multi-core and

hardware acceleration technologies and are able to process in parallel at every level.

Through a combination of leading edge software design and hardware acceleration we can now offer consistent and deterministic ultra-low latency performance (measured in microseconds) at speeds up to many millions of messages per second.

## Market Data Line Handlers

### ■ 2 - 5 microsecond latency

Our Line Handlers perform line A & B arbitrage, fast decoding and filtering and are designed to stream data into memory as quickly as possible. They are capable of processing market data with a 2-5 microsecond latency (wire to RAM), irrespective of market speed or micro-bursts and can be used standalone in co-location environments.

### ■ Up to 3 million messages per second

Testing at client sites has proven performance is consistent under load with up to 3 million messages per second across varying market conditions.

### ■ US and European Markets

We support all main US and European high frequency Equities, Options and Futures exchanges.

## Feed Handlers with full depth order book

We have extended our line handler offering to provide full feed handler functionality including a local order book cache (full depth) and recovery.

### ■ Sub-15 microsecond latency

As with our line handler offering, our aim is to be the fastest on the market and our feed handlers have sub-15 microsecond latency for full feed handler processing (from wire to updated order book).

### ■ Multi-core sustained throughput

Our feed handlers have been designed to exploit multi-core and hardware acceleration technology and are able to stream data in parallel at every level. We are therefore able to process up to 1 million messages per second per core, are able to operate at line speed under all market conditions, sustaining throughput into many millions of messages per second.

# Celoxica accelerates your trading architecture

## Cost effective

Our accelerated trading & market data components offer a cost effective way to improve performance and can be added incrementally to areas where accelerated performance is required.

## Contact

If you would like to know more about how our products can help accelerate your trading architecture, including a video overview of our product roadmap, please contact us at the addresses below or visit the website.

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