

Low Latency

Are You Performing?



Market data rates are skyrocketing. Just a few milliseconds make the difference between an optimal order fill and enough slippage to wipe out profit. New opportunities are opening up to leverage high frequency markets. New applications are being deployed atop of low latency architectures. Performance – in every sense – is key to playing in the new markets or being relegated to the second tier. This publication showcases innovative technology providers that live and breathe performance. We hope you find issue 2 to be interesting.

You can keep up with the low latency news at A-Team's Low Latency Portal @ www.low-latency.com and via A-Team's Market Data Insight and Electronic-Trading.com. If it's low latency, you can be sure that we have it covered.

News

29West Unveils Release 2.0 of Ultra Messaging for the Enterprise

29West launched version 2.0 of the Ultra Messaging for the Enterprise (UME) product family. UME 2.0 provides performance improvements and multi-site failover support, and a parallel persistence design offering guaranteed message delivery with under 70 microseconds latency.

Reuters Launches RDFD for OPRA FAST Enabled Datafeed

Reuters launched Reuters Data Feed Direct (RDFD) for the Options Price Reporting Authority's (OPRA) FAST enabled datafeed. Reuters Data Feed Direct OPRA is designed to process more than one million updates per second, to leverage OPRA's FAST implementation and enable clients to reduce bandwidth cost.

NYSE Euronext Acquires Wombat Financial Software

NYSE Euronext acquired Wombat Financial Software, a privately held provider of high performance financial market data management solutions. This acquisition broadens NYSE Euronext's offering of market agnostic connectivity, transaction and data management solutions by integrating Wombat's market data enterprise software and services with the NYSE TransactTools connectivity and messaging business.

News

Quant House, Intel Decode Two Million Messages Per Second on Multicore Intel Xeon Processor

Quant House's QuantFeedhandler, its feed handler technology to standardise exchange raw market data feeds, is able to decode more than two million messages per second, benchmark tests carried out at fasterLAB, the Intel low latency lab in London, on several versions of the multicore Intel Xeon platform, have shown.

Intel Pitches Xeon 5400 “Penryn” Chips at Low Latency Applications

Intel announced its revolutionary Xeon 5400 chip - the first based on its Penryn technology - and expects servers based on the device to deliver significant performance and power consumption benefits across a wide range of low latency financial applications, including risk analytics, market datafeed handling and transactional execution systems, according to Intel executives.

Penryn – characterised by Intel co-founder Gordon Moore as the biggest transistor advancement in 40 years – incorporates so-called Hafnium-based High-k Metal Gate transistors, and 45 nanometre transistor packaging, allowing chips to be built with nearly twice the transistor density as current models (which use 65 nanometre packaging). This equates directly to being able to deliver more compute power for the same amount of electrical power consumed. The 5400 chip (previously known by its codename, Harpertown) also includes a 12 megabyte cache and a 1600 MHz front side bus to boost input/output bandwidth. The chips are incorporated into Intel's Stoakley platform, which power commercial server products from Intel's partners.

InfoDyne and RTI Partner For High Performance Market Data Messaging ...

InfoDyne, a provider of market data technology, has forged a strategic relationship with Real-Time Innovations (RTI), a middleware provider, to offer RTI's ultra low latency messaging middleware as an embedded transport option within InfoDyne's TPS+Plus Market Data Platform. Under this relationship, InfoDyne packages and licenses RTI's messaging software along with TPS+Plus and will provide direct support for the integrated solution. All of InfoDyne's supported datafeeds and system functionality are available as part of the solution.

... As Man Investments Deploys InfoDyne's TPS+Plus Feed Handlers for Bloomberg's B-Pipe On-Demand Datafeeds

Man Investments has deployed InfoDyne's TPS+Plus feed handlers - featuring direct exchange feeds, ultra low latency middleware, entitlements, Excel integration and a complement of managed service options - for Bloomberg's B-Pipe on Demand (BPOD) datafeeds. The solution provides integration of BPOD within Man's existing RMDS production system. InfoDyne's TPS+Plus BPOD feed handlers integrate Bloomberg's global datafeed with Reuters' RMDS system, making Bloomberg's information available to standard RMDS displays and other RMDS applications. The solution allows customers to interactively subscribe to the subset of data they need from the Bloomberg datafeed and performs field and data translation.

Truviso Introduces Algorithmic Trading Solution

Truviso has released its Algorithmic Trading Solution, combining SQL-based continuous event processing, real-time as well as historical data analysis, and zero latency algorithmic decisioning on a single platform. With the Truviso Algorithmic Trading Solution, buy and sell side traders can now develop, test, execute and evaluate proprietary trading strategies in one algorithmic framework, the vendor says.

CME Upgrade Promises Reduced Message Response Time

CME Group's upgraded Globex electronic trading platform significantly reduces message response time, as part of a raft of technology enhancements. During testing, under a replay of peak market conditions, the upgraded platform demonstrated a more than 50 per cent reduction in response time, from an average of 31 milliseconds down to around 16.5 milliseconds. In 2007 an average 8.5 million contracts a day traded electronically at CME Group.

IBM Acquires Solid Information Technology for Real-Time Data Access

IBM has acquired Solid Information Technology, a privately-held company based in Cupertino, California, and Helsinki, Finland, that provides in-memory database software. Financial details were not disclosed. The acquisition of Solid Information Technology supports IBM's global Information on Demand strategy by adding real-time data access capabilities to the company's portfolio of database and information management offerings. Solid Information Technology's software uses in-memory database technology to quickly retrieve data from a computer's memory (or RAM).

Interactive Data's PlusFeed Supports Algo Trading



By Mark Hepsworth, President of Interactive Data Institutional Business.

As firms' algo trading strategies evolve towards a global, multi-asset class approach, Interactive Data's PlusFeedSM low latency, consolidated global data feed, offered through its Real-Time Services business, is positioned to help meet their needs. Indeed, during 2008 Interactive Data plans to continue to round out its PlusFeed offering, adding Level 2 coverage of many emerging European markets and greater coverage of Asian futures and commodities markets, among other content.

Interactive Data is committed to providing data that algorithmic trading firms may require as they continue to expand into new markets. The firm recently added Level 2 pricing from three Asia/Pacific markets – Jasdax Securities Exchange (Japan), SGX (Singapore) and the New Zealand Exchange – and now offers Level 2 data for 10 Asian markets.

Interactive Data also recently added Level 2 data from the OMX Baltic Market, which supports trading in the emerging markets of Latvia, Lithuania and Estonia. Interactive Data also supplies Level 2 data from the Bratislava (Slovak Republic) and Prague stock exchanges, and plans to add Level 2 data from Poland, Hungary and Russia this year.

In 2008, Interactive Data also plans to add Level 2 data from exchanges in Dubai, among other venues.

PlusFeed delivers extensive Level 2 data and is designed to provide full depth of book and every tick of data. Interactive Data does not conflate any

of its Level 2 data, and offers customers the option of receiving all available updates.

Low latency data delivery

PlusFeed, which currently has the capacity to process up to one million messages per second, is also designed to deliver this information with the low latency that algorithmic trading applications generally require.

OMX Nordic Exchange and Euronext. Subsequent phases during the first two quarters of 2008 will add the remainder of the European markets covered by PlusFeed, as well as Middle Eastern venues.

Interactive Data also offers customers the option of a low latency co-location facility. In Europe, customers can co-locate their applications in data centres close to the new London-based ticker

Interactive Data's new European ticker plant is designed to significantly reduce delivery times for European consumers of European real-time data from PlusFeed

Interactive Data's new European ticker plant, which went live early this year, is designed to significantly reduce delivery times for European consumers of European real-time data distributed by PlusFeed. With the rollout of the new ticker plant, we are consistently delivering European data to London-based customers at latency rates of around 60 milliseconds, making data latency comparable to what U.S. consumers of U.S. data experience.

Interactive Data is adopting a phased rollout schedule for adding data sources to the new European ticker plant. Phase 1 adds real-time data services from sources including Borsa Italiana, Deutsche Börse, Eurex, Irish Stock Exchange,

plant to take advantage of the low latency delivery of European data. In the U.S., customers can co-locate their applications alongside PlusFeed in BT Global Financial Services' Radianz data centre in Nutley, N.J.

At the same time, Interactive Data is constantly re-engineering its ticker plants and distribution system to be able to process the increased number of messages resulting from the growing adoption of algorithmic trading across the industry, and to deliver the greater number of messages that algorithmic trading engines require. Currently capable of processing up to one million messages per second, the ticker plants and distribution system are being re-en-

gineered this year to in order to be able to process up to three million messages per second.

Meanwhile, PlusFeed is being moved from TCP/IP to IP multicast technology. Multicast is designed to be more efficient for larger data volumes, and the new technology can help the company to reduce latency even further.

New content in 2008

In addition to equities, PlusFeed also delivers solid coverage of the global futures markets, providing Level 2 data for more than 20 futures and commodities markets around the world. In 2008, Interactive Data will increase coverage of Asian futures and commodities markets, with

a particular focus on Japan and India.

PlusFeed also supplies exceptional coverage of the global options and warrants markets, including the Options Price Reporting Authority (OPRA) in the U.S. PlusFeed is designed to process every tick of OPRA data, providing the clients who need it with comprehensive data coverage of the U.S. options market.

And as firms look to add OTC data to their algo trading strategies, Interactive Data is dedicated to supporting their needs. The company provides coverage of the OTC FX, money and fixed income markets through proprietary services and broker-dealer services including ICAP, Tullett Prebon and Conticap. Inter-

active Data plans to continue to increase coverage of these markets in 2008.

Mark Hepsworth is president of Interactive Data Institutional Business.

Interactive Data Corporation (NYSE: IDC) is a leading global provider of financial market data, analytics and related services to financial institutions, active traders and individual investors.

www.interactivedata.com

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Interactive Data Corporation (NYSE: IDC) is a leading global provider of financial market data, analytics and related services to financial institutions, active traders and individual investors. The Company's businesses supply real-time market data, time-sensitive pricing, evaluations and reference data for millions of securities traded around the world, including hard-to-value instruments. Many of the world's best-known financial service and software companies subscribe to the Company's services in support of their trading, analysis, portfolio management and valuation activities. Through its businesses, Interactive Data Pricing and Reference Data, Interactive Data Real-Time Services, Interactive Data Fixed Income Analytics, and eSignal, the Company has approximately 2,200 employees in offices located throughout North America, Europe, Asia and Australia.

Interactive Data Real-Time Services is a leading provider of real-time global market

data to financial institutions, redistributors and online financial portals worldwide. Offerings from Interactive Data Real-Time Services include PlusFeed, a consolidated, low latency datafeed. Also managed as part of this business is Interactive Data Managed Solutions, a leading provider and operator of customized financial market information systems.



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Fidessa group provides multi-asset trading, portfolio analysis, decision support, compliance, market data and global connectivity solutions for the buy-side and sell-side globally. Fidessa group products support 22,000 users across 520 clients, including 85% of tier-one, global equity brokers, the largest asset managers, smaller specialist managers and hedge funds. Fidessa's global network connects 1,500 buy-sides and 255 brokers across 92 exchanges.

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A-Team Group provides the global community of IT and data professionals in financial markets with the business intelligence they need to excel in their roles. Through its unique mix of media channels – including print publications, online services and research reports, as well as its customised research and strategic marketing services – A-Team helps buyers and sellers of technology and data to understand the strategic and logistical issues involved in technology deployments across the financial services enterprise.

Issue 3 of Low Latency - Are You Performing? will be distributed at the SIFMA Technology Management Show in June.

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Fidessa: Anticipating the Need for Speed



Philip Beevers, Head of Infrastructure Development, Fidessa plc

Trading systems are a low latency business these days. The 'Need for Speed' is often talked about, but is it often understood? What makes low latency so critical for the users, purchasers and builders of these systems? How does Fidessa go about ensuring its systems provide low latency?

Why does it need to be faster?

As developers of trading systems software used by a large majority of tier one brokers, this is a question we at Fidessa often ask. It's useful to understand why our customers need low latency systems, and how that requirement fits in with others, which are potentially conflicting.

Low latency is often mentioned in the same breath as algorithmic trading. This causes confusion, because many trading algorithms do not require low latency access to the market; they use historic analysis of market data to determine the best time to execute. This isn't true of all algorithms, but it is the case for the simpler and thus more widespread types.

So only a small number of trading algorithms have a requirement to see liquidity in the market and hit it. However, this is something our end users want to do; execution traders often watch market data displays very closely, unleashing a volley of orders into the market when they deem conditions to be right. These end users don't just need a low latency back end system; they need a responsive GUI, which not only does what they want quickly, but also lets them do it with the minimum of mouse clicks and key presses. Here, low latency can be seen as a

user interface design problem.

Another perspective is that the need for low latency is being driven by the buy side. Buy side firms have both money and power. With the widespread adoption of FIX, buy sides can switch between brokers more easily than ever before. For example, the 1500 buy side firms on the Fidessa connectivity network can choose from 250 connected brokers. Those brokers need to differentiate themselves in order to keep their customers; they can either do this by offering added functionality, or better service. Something that falls into the 'better service' category is a low latency guarantee.

Addressing the Need

Fidessa has a demanding customer base of brokers all around the world; further, Fidessa supplies market data and connectivity services to those brokers. Across the board, low latency is a requirement. How do we go about building low latency into everything we do?

A pre-requisite for building low latency solutions is to understand where the current platform incurs latency. In a traditional three-tier application, it would be pointless optimizing the business logic if all the latency was in the database tier. As such, at Fidessa we place a high importance on performance testing, and breaking down which parts of the application add latency. Our dedicated performance testing facilities are constantly in use, analyzing existing applications, and comparing the merits of new developments.

At the core of our architecture is a proprietary, 64-bit, in-memory database. As

well as being an extremely high performance database engine, it includes technology for propagating update notifications to interested consumers in a highly scalable manner. This allows us to build systems comprised of many loosely-coupled processes, providing the scalability of multi-threading without the disadvantages of complexity and the need for explicit, application-level synchronization. This database technology is used in all Fidessa applications, across the application domains of trading systems, market data and global connectivity.

For transactional systems (like OMSs and message queues), persistence is required. In Fidessa's technology, persistence involves writing updates to a transaction log on a non-volatile storage medium. For resilience, this is replicated in real-time to a hot standby system, where the updates are applied in parallel to a replica database, allowing very fast failover.

This deceptively simple approach means Fidessa can provide industrial strength resilience to a single point of failure on commodity hardware, with a simple TCP connection required between machines. As such, primary and standby systems can be geographically remote; in Fidessa's hosting environment, typically primary and standby systems are situated in different datacentres, 50 kilometres (30 miles) apart.

However, because of the relative slowness of securing transactions to a non-volatile medium, and sending them via the network to a standby system, the resilience technology becomes latency

critical. Over our 15 year experience of building such systems, many optimizations have been applied. We also recognize that one size does not fit all; different environments have different performance envelopes for particular parts of the infrastructure, and as such we need to support different persistence modes for different deployments.

For example, one environment may include very fast disk technology, but a significant primary-standby network latency; another might have very low network latency, but less highly tuned storage. Furthermore, we want Fidessa to be able to perform on both the cheapest commodity hardware, yet be able to scale and exploit the scalability offered by Enterprise platforms.

The output of these years of tuning and testing is a technology which can receive a simple transaction from a client application, process it, replicate it to primary and standby systems, and send out a message resulting from that transaction to an external system (e.g. an external FIX engine or exchange interface) in an average of around a third of a millisecond in the fastest configuration. Importantly, results in such a test are closely clustered around the mean; standard deviation is around 0.1 milliseconds.

These results measure the performance of the technology alone; they include no application logic. However, because this technology is used across the full suite

of Fidessa applications, every functional area benefits from its high performance. Constant improvements in the technology mean that everything we do is low latency to some degree.

Once the technology has been highly optimized, application logic becomes a significant part of latency. For example, consider a single-threaded program which can process 1000 new orders per second. The least latency this program could possibly add to each order is 1 millisecond. Here, high throughput and low latency – often conflicting requirements – go hand-in-hand.

In Fidessa, key transactions and gateways are optimized for high throughput, thus reducing their contribution to latency. Thanks to our high-performance database technology, adding additional features which require database lookups, whilst always adding to latency, rarely make a significant difference. However, there is still a compromise between functionality and performance.

As an example, Fidessa's European Multi-Market Access gateway offers a highly-optimized transaction for order entry. This transaction has been painstakingly built to include the minimum possible functionality, to provide the highest throughput and thus the lowest latency. Going further, 2007's TradElect upgrade at the London Stock Exchange gave Fidessa an opportunity to rewrite the London market interface specifically

with high throughput in mind. In tandem, these application-level changes mean that the European Multi-Access gateway can send a single order to market adding less than a millisecond of latency, in a fully resilient fashion.

Of course, going back to the buy side, latency of FIX engines, messaging infrastructure and OMSs all contribute to the observed latency, long before the exchange gateway is reached. This is where the hard decisions need to be made; for those with specialized low latency requirements, the only way to provide further optimization is simply to remove some of these layers. Performance-wise, the ideal is to route that incoming FIX stream directly to the exchange gateway, but this bypass removes the flexibility associated with a connectivity network, and the functionality provided by a fully-fledged OMS. Again, this is a compromise, and no one size fits all; at Fidessa, we will continue to provide choice to our customers, allowing them to determine how much functionality they are prepared to trade for performance.

The bottom line

The bottom line is that all Fidessa's customers view performance as a requirement, and usually this means low latency. A combination of unique technology and applications which are optimized for the common case are key to satisfying this need.

The Low Latency Lowdown

By Pete Harris, President Americas and Editor-at-Large, A-Team Group

A year ago, when A-Team released its landmark research, *Faster Than A Speeding Bullet – Low Latency Architectures and Building Blocks For Tomorrow's Trading Applications*, we made a prediction for 2007 that benchmarking efforts would continue but would be restricted to specific vendor stacks or small closed user groups, and that no industry-wide standards would be set. A year on, we feel we called it about right, but looking forward to this year, we're pleased to

see momentum within the industry to work together to form more universal benchmarks.

Over the past year, two organisations – Intel with its fasterLAB and the Securities Technology Analysis Center (STAC) – have been regular publishers of performance results from tests of various configurations of Reuters RMDS and AMQP open source middleware to data fabric software from Gemstone, simulating a transactional workload.

Last September at the High Performance on Wall Street conference, STAC announced its STAC Benchmark Council, which represents a true attempt to bring financial market participants and vendors together to set benchmark standards in a collaborative way.

Already, a number of initiatives have begun to define a range of benchmarks, from market data to transactions.

For more information on the council, see www.stacresearch.com.

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