Low Latency. Cloud Computing. Big Data. These separate business and technology endeavours continue to evolve, and also converge, in ways that will underpin the next generation of financial trading.

This time, let’s concentrate on low latency and big data, and how the two are connected. But first, it’s worth defining what big data is, especially as it relates to the financial markets, where extremes of data variety, velocity and volume are the norm, and where data value can be huge. Our sister web community - BigDataForFinance.com – has developed this useful definition:

“Datasets whose characteristics - size, data type and frequency - are beyond efficient, accurate and secure processing, as well as storage and extraction, by traditional database management tools.”

Recent research conducted – and soon to be published in partnership with SAP - by BigDataForFinance.com has investigated how big data technologies and approaches can be leveraged by trading and risk management applications.

That research determined that big data as it relates to trading covers a lot of different types and collections of data, as detailed thus:

- Time series price data – as granular as every single tick (trade report) and every order to buy or sell – over an extended period of hours, days, weeks or years. Such data is used to design algorithmic trading models (through back testing), and for transaction cost analysis.
- Structured price – and associated - data, for each transaction. This drives trading systems – both manual and automated – leading to trade executions, which generate more data. Records of transactions need to flow into matching, risk and settlement systems, and need to be archived for compliance.
- Unstructured real-time data, including news stories and social media updates. These can be parsed to extract information, and can be then used to generate sentiment analytics, which can feed into trading algorithms.
- Both structured and unstructured reference data relating to transactions, varying from records of corporate actions, counterparty and legal entity information, contracts and income flows related to derivatives and structured products.
- Audio recordings of transactions negotiated and executed via phone.

Of the above, time series data is probably the best understood, and several vendor solutions exist to support its storage and analysis. For the most part, though, its use is directed mostly towards designing algorithms and determining their efficacy, and not as part of the trade execution process.

Of greater relevance to trade execution is the analysis of unstructured data, including news feeds, and social media, such as twitter. Here, the goal is to leverage information on market moving events before they move the markets in order to trade for advantage. As such, it represents a real combination of big data and low latency technologies.

Not covered in the research is the collection and analysis of operational data from the technology infrastructure underpinning trading. That includes latency data from measurement systems such as from Corvil and TS-Associates.

In that respect, Corvil’s recently introduced its CNE-7300 appliance, capable of storing 60 terabytes of price, timestamp and latency data – enough to store 50 days of options tick data. Such storage allows for deep analysis over an extended period of how infrastructure is performing.

Also adding to the operational data soup is data derived from network switches, reporting the status of internal buffers and message queues, which is vital for designing network architectures that cope with microburst traffic. Both Cisco Systems and Arista Networks have added such functionality to their latest offerings, and they will no doubt serve up masses of diagnostic analytics to help networks run better.

In overview, while low latency and big data might seem to be opposite ends of the technology spectrum, in reality they overlap and combine to make trading strategies more effective, and to reduce the cost of operating the infrastructure that executes them.
As competition in financial markets continues to rise, the desire for speed and ultra-low latency is relentless. Across the global trading environment, emerging business opportunities highlight an increasing need for speed with greater visibility, flexibility, and manageability of the trading fabric. The Cisco® High-Performance Trading Fabric architecture dramatically reduces latency while providing the increased visibility and instrumentation firms need to gain a competitive edge and capture alpha.

**Superior Speed and Flexibility**

Using Cisco’s innovative Algo Boost application-specific integrated circuit (ASIC) technology, the new Cisco Nexus® 3548 Switch platform is the fastest and most flexible, full-featured Layer 2 and Layer 3 switch with three performance modes:

- In “normal” mode, the forwarding latency of the Cisco Nexus 3548 is an industry-leading 250 nanoseconds (ns).
- In Warp mode, latency is further reduced to 190 ns as Layer 2 and Layer 3 operations are combined on a single Ternary Content Addressable Memory (TCAM) region.
- A special mode called Warp SPAN lowers latency to 50 ns for traffic traversing from a single ingress port and replicated to N egress ports. Warp SPAN is critical for market data distribution scenarios where accelerated price discovery is required.

Figure 1 demonstrates the Cisco Nexus 3548 Switch’s flexibility; a market data feed is received and replicated to Ports 1-4 and 25-28 in Warp SPAN mode, while orders are simultaneously sent in normal or Warp mode to the exchange using other ports on the device.

**Proactive Congestion Management**

Visibility in a trading environment is essential for analysing latency characteristics and sources of congestion in application flows. Short-lived congestion, known as a microburst, is a common occurrence that should be closely examined. The active buffer monitoring feature in Cisco Algo Boost provides granular visibility of buffer occupancy in switch ports up to 10 ns resolution. A histogram of this data and various export methods assist applications to proactively detect rising congestion that may cause suboptimal performance. Buffer utilisation is also ideal for troubleshooting increasing latency and packet drops. A triage
can be quickly conducted to correlate this data with latency monitoring tools and thereby detect sources of congestion, duration and exact time of microbursts, and peak levels of buffer utilization at a specific interval.

**Efficient Traffic Analysis**

In high-performance trading environments, real-time data capture and analysis for forensics, latency monitoring, and data correlation purposes is critical. This volume of data often requires significant storage infrastructure. The Cisco Nexus 3548 Switch’s intelligent traffic mirroring capabilities help manage the data deluge. Switch Port Analyzer (SPAN) capabilities allow selection, filtering, and routing of traffic by type to monitoring devices using access control lists (ACLs).

SPAN allows for selective truncation such that the switch can be configured to send only a specific portion of the packet. For example, a market data packet from an exchange could be truncated after the sequence number and sent to a monitoring device. The device can be searching for gaps in the ticks by correlating the sequence numbers in the packet and correlating the info in a dashboard displaying real-time market data fan-out latency to engines building an Order Book.

The firm may choose to swing to an alternate exchange feed where data is being delivered in a more consistent fashion. Encapsulated Remote Switch Port Analyzer (ERSPAN) further enhances capabilities to send mirrored traffic to remote analysers across a Layer 3 network without requiring local analyser tools connected to monitored devices.

**Accurate Time Synchronization**

Time synchronization in the trading fabric is important not only for trading engines, but also for data analytics tools. IEEE 1588 Precision Time Protocol (PTP) is becoming more prevalent, replacing Network Time Protocol (NTP) on Ethernet networks and providing nanosecond clock accuracy. The Cisco Nexus 3548 Switch provides hardware-based PTP clock synchronization and a timing distribution method in a scale-out trading fabric consisting of hundreds of hosts. The hosts can receive clocking from the network and keep the applications synchronized. If traffic needs to be analyzed, ERSPAN with PTP capability can be also be used to insert a nanosecond-level timestamp in captured packets. Furthermore, a pulse-per-second (PPS) port on the Cisco Nexus 3548 Switch can be connected to an oscilloscope to determine if there any drift in the PTP clock accuracy on the switch compared to a grandmaster clock signal.

**Summary**

Trading environments are becoming more complex, as many components in the trading lifecycle work as a complete system. Ultra-low latency, granular data visibility, intelligent traffic monitoring, and precision clock synchronization are increasingly vital for a high-performance trading fabric. Cisco’s commitment to financial market innovations such as Algo Boost ASICs continues to enhance these capabilities while extending them to additional platforms in the future.

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**Converging Technologies for Automated Trading**

Following the success of its Low-Latency Summits in London and New York this year, A-Team will be hosting its Low-Latency Summit in London on February 19, 2013 and New York on May 1, 2013.

Continuing with the theme of Converging Technologies for Automated Trading, the next Low-Latency Summit focuses on the evolution of high performance technology underpinning profitable automated trading strategies, with a focus on real life experience from the European marketplace.

Delegates will learn how to combine low-latency connectivity and processing technologies with those for managing big data and cloud delivery to implement the next generation platforms for success in tomorrow’s trading markets. This is the only event for the financial markets to coherently connect these strategic technologies and align them to the trading process.

For more information on how to get involved, contact Pete Harris on pete@a-teamgroup.com. For sponsorship and exhibitor opportunities, contact Martyn Hodges on martyn.hodges@a-teamgroup.com.
New Imperatives in Trade Monitoring: Speed, Safety and Business Value

By Donal O Sullivan, VP Product Management, Corvil

Reducing latency has been a high priority in electronic trading since at least the introduction of Reg-NMS and MiFID. The rise of new technologies such as wireless and FPGAs shows that the low-latency trend will continue. But over the past year, perspectives have broadened to give increased weight to technology cost, business value, and risk as well as speed. This emerging, more circumspect approach is driving new requirements for trading system monitoring. As participants look for solutions to help them trade not only faster, but also more safely and more intelligently, they are seeking more comprehensive visibility into trade activity across their platforms and all layers of their technology stack. Successful monitoring for electronic trading must provide the scale and breadth of analysis to meet these needs, as well as the precision and performance needed to operate in high-speed environments.

In addition to seeking more integrated views of trading activity, firms are also looking for greater independence between trading and monitoring functions. The need for independence is driven by the important role that monitoring plays in managing technology risks and regulatory compliance. Isolating monitoring from trading improves its resilience during error or outage conditions, and makes it less likely to share common weaknesses with the trading platform. Isolation also ensures that monitoring produces an independent interpretation of trading activity that does not rely on derived inputs. These properties are highly desirable in a system used both to ensure compliance and to guard against technology failures.

The requirements for comprehensive and independent monitoring are contributing to the rise of large-scale network-attached monitoring systems that use raw data from the network to analyse activity within and between trading systems. Since all meaningful trading activity ultimately crosses the network, and the network naturally aggregates streams of activity within the firm, network-attached monitoring provides efficient access to the integrated view of trading activity that firms seek. In addition, this style of monitoring can be fully independent of trading at both the hardware and software levels, using an architecture where network traffic is passively copied to dedicated hardware loaded with independently developed analysis software.

Network-attached systems have two further advantages that make them ideal for monitoring high-speed trading environments. Firstly, the use of dedicated hardware allows monitoring to deploy the computational firepower needed for real-time analysis of ever-growing message volumes, without burdening the trading system. Secondly network-attached monitoring can use highly accurate hardware-based time-stamping, ensuring the nanosecond-level precision that is needed for low latency measurements. Hardware time-stamping is provided as a built-in feature in monitoring appliances and is also spreading into data aggregation devices and switches, making it easier than ever to instrument large scale networks.

In summary, network-attached monitoring promises advantages of comprehensive visibility, independence, performance and precision that are compelling for today’s complex, high-speed trading environments. Delivering these benefits will however require an advanced monitoring system capable of leveraging rich, but raw, network data. The system must provide a multi-layered approach that can work its way from network-layer activity and performance, through to trading-layer behavior and results. Achieving broad visibility across large-scale trading systems requires decoding of multiple order-flow, market data and middleware protocols in real-time at very high message-rates. Support for precision clock synchronization and correlation of event-data across distributed environments are also required to support high-speed trading performance analysis.

These are the demanding requirements that have driven the development of Corvil’s hardware and software trade monitoring products. CorvilNet 8.0, announced in October 2012, is the latest major release of Corvil’s monitoring platform and is at the forefront of the change in how the industry monitors.
trading. CorvilNet is an appliance-based, network-attached solution that decodes raw data from the wire to analyse activity and performance at the network, application and trading business layers. Monitoring workflows are supported at all three layers via real-time dashboards and alerts, and large scale data capture for historical analysis. Our 8.0 release extends trading layer visibility with a new TradeLens module powered by configurable business metrics, and adds a management reporting facility that eases high-level access to monitoring results. This release also introduces a new range of appliances based on Intel’s Sandybridge architecture, pushing processing and storage capacity to new limits to support larger scale monitoring deployments.

Today’s trading environment is a highly demanding one as the speed, scale and complexity of trading technology continue to increase. Leveraging advanced and comprehensive trade monitoring can help participants negotiate this environment safely and successfully. If you are interested in hearing more about Corvil’s solutions for trade visibility, please contact Sheila.carroll@corvil.com or visit our website at www.corvil.com.

Do YOU have a Viewpoint About Low Latency?

Don’t be shy with your smarts. Use Viewpoints on Latency - the quarterly digest from Low-Latency.com - to push your thought leadership to the marketplace.

Use a contribution to Viewpoints on Latency to position your company and offerings - and leadership - to our focused community.

- Contribute an educational article and participate in a virtual round table.
- Enhance your visibility with an advertisement.
- In 2013, there will be three themed issues and one with a broader focus.

Viewpoints on Latency is promoted and distributed online, and also at key financial markets events, including Low-Latency Summits.

For more information on how you can participate, contact Martyn Hodges - martyn.hodges@a-teamgroup.com, +44 (0)7990 606 216.
How would you characterise the current ‘state of play’ of how market participants are actually using analytics - data - from latency and network monitoring devices?

Malik: Achieving and maintaining low latency in today’s fast-moving high performance trading environments is a constant challenge. Typical analytics usage involves latency metric collection at each hop of the infrastructure where the trade flow occurs. Real-time packet capture in co-location and market data distribution segments, order matching, and routing environments are common areas of interest to participants. More advanced analytics usage can influence trading strategies where data mining is used to refine, test and tune algorithms. Real-time modification of execution strategies – based on applications being fed data from analytics tools - is on the leading edge. However, timely event correlation between tick databases, FIX logs, network traffic, and application logs is not a trivial task.

What are the differences between the ways that trading firms are using such analytics, versus exchanges?

Malik: Trading firms are using analytics to understand delays, microbursts visibility, gaps in market data from the venues, and hop-by-hop latency between their trading engines and the exchanges’ matching engines. This allows firms to understand certain order fill rates across multiple liquidity providers while allowing them to conduct latency arbitrage. Firms are using analytics to understand what changes need to be made to trading strategies, especially those that are intra-day. All data is recorded real-time for historical analysis and regulatory purposes. Predictive latency scenario modeling is used for ‘what-if’ scenarios such as, “What impact will a 50% latency increase in the trading environment have on my fill rates, application performance, quotes/trades transmitted and received during a period of time, etc?”

The exchanges leverage latency analytics to understand if they are in compliance with Service Level Agreements for market data delivery to firms to ensure fair access. Constant checks examine round-trip latency through the matching engine and to the perimeter of client connectivity which can be in remote POPs (Points of Presence) or within a co-location hall. Some of the analytics are used to adjust load-balancing algorithms to multiple exchange gateways for different financial products as well. The Order to Quote latency measurements are assessed how they can manage this risk. Monitoring has a significant role to play in this. The fact that monitoring systems can tell you independently and in real-time what is happening in your trading system can be very valuable.
critical since they provide insight into the elapsed time from when an order enters the exchange’s network to the time the same order appears on the data feed.

Toomey: On the infrastructure management side, the use of monitoring and analytics is actually quite similar. Both sides are trying to manage increasing data rates and business challenges while keeping control of spending. This is a tough nut to crack, so knowing where you are really hurting and where you really must invest is critical. Monitoring and analytics tell you this.

For order routing and trade decision making, the participants have more to gain and are correspondingly more active in exploring how the analytics can feed their trading decisions and give them a competitive edge. On the risk management side, again, the participants have potentially more to lose, at least financially, so they are extremely active. Systems that were deemed acceptable from a risk viewpoint 6 months ago are no longer deemed to be so. They are building new systems to oversee all trading activity and provide an independent view to senior management as to what is really happening.

How are market participants using pre-recorded analytics, collected over a period of time?

Malik: Market participants leverage pre-recorded analytics to test existing and new strategies to determine how they would behave in certain market environments (i.e. Triple Witching, interest rate change announcements, key economic indicator news, earnings announcements, etc.). Event correlation is predominantly used to understand the interaction between a market event or trading infrastructure event that is causing overall application performance degradation. Market data replay is used for testing and benchmarking new upcoming applications including some exchanges offering historic market data from the cloud. Key data constructs are also leveraged for capacity planning exercises which is key area of concern in our client base. A prime example is the need to understand available headroom in the infrastructure across several applications infrastructures for a given service under specific quote and trade volumes, pricing history, market feed latency, spread generation and FIX gateway responses.

Toomey: This is a very interesting question. When developing an algorithm, traders will test against a historical database, and tune the algorithm before putting it live. The more complete the data and analytics in the historical database, then this tuning can be more realistic and the algorithm has a better chance of replicating its test bed performance when it goes live.

More broadly, if you are monitoring your trading activity and something goes red, say your response time to a particular market, then the better you understand what that red light means the more appropriate your response can be. So, if it’s just one gateway that’s the problem, switch your trading to another. If it’s an entire venue, the response will be different. But you typically will not know this the first time you see it, so we see participants studying historical analytics to better understand the various signals they see and how these will impact trading outcomes.

And how are they using analytics collected in real time?

Malik: Analytics are collected in real-time with precise instrumentaton that is highly synchronized with granular time stamping. Most firms utilise network taps and Switch Port Analyser (SPAN) capability in low-latency switches to send the real-time traffic to analysers. All traffic in the network is synchronised with precision timing. On Cisco’s Nexus 3548 platform, the Encapsulated Remote Switch Port Analyser (ERSPAN) with Precision Time Protocol feature can be used to consolidate all of the analysers in a central analytic farm and send monitored traffic to a central location. This will save cost in allocating an analyser’s physical port directly to every monitored device. Real-time analytics are used for functions such as conducting risk checks, adjusting strategies, and troubleshooting potential client or exchange order flow issues.

Toomey: I think we’ve covered much of this above. Real-time analytics are used to influence routing decisions, and to indicate problems with infrastructure. They are also used to report on current trading behaviour and risk exposure. However, creating the correct signals and metrics is not trivial, and can take some time. We see participants putting this effort in up front, so that when that light goes red they know exactly what it means and can react immediately.

Not all trading strategies require the lowest latencies. Are latency analytics still relevant for those? How so?

Malik: Latency analytics are still relevant for trading strategies that do not require the absolute lowest latency. Congestion can occur anytime during the trading day, regardless of the strategy or the trading instrument. Congestion results in queuing, which can cause massive delays and potential packet drops. This could result in a firm being out of the market for a period of time. Constant feedback mechanisms from the trading fabric are important. For example, several of Cisco’s clients are excited about the Active Buffer Monitoring feature in the Nexus 3548 platform. This feature allows them to have full visibility of rising congestion on the infrastructure ports where trading systems are connected. Early detection based on congestion thresholds is important to systems that can then proactively take appropriate measures to minimise application performance degradation.

Toomey: There is a significant trend that we are seeing here. Many trading strategies have traditionally not been latency sensitive. However, various developments over the last few years have resulted in a much faster, more automated trading environment. And these strategies have to live in this faster, more automated world. So while latency analytics may not be critical as inputs to these strategies,
the participants who run these strategies want to understand the latency landscape that their strategy inhabits. They are demanding more transparency and, yes, lower latency, from their brokers and venues.

**What part is regulation playing on the need for market participants to collect, store and analyse analytics?**

**Malik:** Regulatory pressures are causing a heightened sense of urgency within firms to increase transparency in their daily trading operations. Firms should be able to produce a highly accurate record of every transaction in which they are involved. Several exchange outages in a few global exchanges in the past months have raised the regulatory focus and scrutiny at the transaction and record level. Long-term data retention and the requirement for timely access and tracing of historical transactions have increased the burden on certain infrastructures. Risk and Compliance officers within a firm are also increasing their stringent requirements to be able to view data in many different forms.

**Toomey:** Certainly, regulation is driving greater demands for collection and storage for participants, but also on the venues. The regulators are demanding more transparency and the many of the traditional methods of providing this are not adequate. For example, if your system performance is measured in microseconds, which it typically is, then providing reports based on software logs is no longer good enough. So the regulators are demanding the transparency, and the sheer speed of the infrastructure is determining that on-the-wire high speed solutions are the means of providing it.

**How do you see the future development of intelligent network switches, and of specialist latency monitoring appliances, and how will they work together to provide complete analytics tools for trading systems?**

**Malik:** Innovation continues to demonstrate that there still is room for improvement on how trading fabrics interact with the business applications and analysis tools. As analytics data of vital performance metrics can be further exposed to the applications and tools via northbound APIs, the entire trading system becomes a competitive differentiator. For example, Cisco’s latest platform, such as the Nexus 3548, allows Python scripting and XML/NETCONF capabilities for architects to leverage via northbound applications. In the future, Software Defined Networking (SDN) constructs will be utilised by business applications and analytical tools to program the network fabric based on certain business policies and real-time health of the infrastructure. The Open Network Environment (ONE) is just one example where Cisco is innovating by making the infrastructure more programmable. Analytical tools will gain from an entire new opportunity to provide higher-level analytics and business metrics dashboards, enabling the trading value chain to interact in real-time with the trading fabric in a more meaningful way.

**Toomey:** Currently, the infrastructure is fairly dumb when it comes to analytics, and all the timestamping and analytics are performed by the monitoring appliances. The first thing that will change is that the timestamping will be performed in the infrastructure, and the monitoring appliance will base its analysis on that timestamp. (Corvil already supports this external timestamp model with a few specialist vendors, and we will add support for 3 or 4 more by end 2012.) Beyond this timestamping, we see that some vendors are starting to put in some queue length reporting, and this is useful also, because the infrastructure is the right place to do that. (Again, Corvil consume and report on Arista’s LANZ feed.) We support all these developments because they ultimately reduce the cost of monitoring and analysis for the customer, and we think this is necessary to support the broader deployment of monitoring solutions. However, once you get to full trading decodes, multi-hop analysis, fill-rates etc., it gets trickier.

Functionally this will probably remain separate from the network for some time, even if physically it is performed by a processing blade in a switch. Probably worthy of a longer conversation...

**How will analytics be used - what analytics will be needed - in the future to provide better execution of trading strategies?**

**Malik:** The world of analytics is growing rapidly and causing data deluge in many of our clients’ environments. Converting ‘big data’ into actionable intelligence for competitive benefit will require further interaction and correlation with latency analytics, arbitrage algorithms, and real-time monitoring systems. Understanding relationships between key components and order fill rates is an important aspect of driving more profitable trading. Aggregating data from various sources of latency from network, compute, storage, applications and analyzer/capture devices themselves for data mining becomes essential. Detailed graphical views of quote and trade latency through hardware and software platforms – with each financial instrument in various trading locations analysed at a firm-wide level – can assist in providing an overall view of certain risk exposures which are not broadly visible today.

**Toomey:** If I knew that… Seriously, we think that the process of automation will continue, and the analytics that will be needed are those that will be required to support that automation. To further remove humans from the decision loop, machines will need to be able to parse more of the complex signals that humans are good at absorbing. So, better intelligent parsing of news feeds to extract reliable trading signals is one area that will continue to develop. TV image processing, Facebook and Twitter integration, all of these offer potential for the future.
Telx Lowers Latency to NYSE Mahwah

Proximity data centre operator Telx is tapping into new fibre routes from Cross River Fiber to lower latency to NYSE Euronext’s Mahwah, NJ data centre.

Cross River’s new fibre runs directly through Clifton, NJ where Telx operates its existing NJR2 data centre, with NJR3 under construction. The fibre then runs on to Secaucus, NJ (where Equinix has facilities) and Weehawken, NJ (where a Savvis facility is located). The Mahwah to Clifton route is the most direct one into Mahwah, offering competitive latency to existing Mahwah to Secaucus connections.

The NYSE’s decision to open up access to Mahwah is driving the construction of fibre into it from data centres housing other markets, in order to facilitate cross-market trading.

TIBCO Taps Pluribus For FTL Message Switch

Tibco Software has added to its messaging arsenal with the introduction of the Tibco FTL Message Switch, the result of a partnership with Pluribus Networks, a startup focused on low-latency virtualised networks. Founded in 2010 in part by former Sun Microsystems executives, Pluribus is located close to Tibco’s headquarters in Palo Alto, Ca. Its funding to date has come from Mohr Davidow Ventures and from NEA.

According to TIBCO’s Denny Page, the partnership will see Tibco “offering messaging that is truly a part of the networking infrastructure.” According to Pluribus product literature, its “F64 Server-Switch” provides “Customer ability to deploy application logic directly onto the switch, improving performance and reducing network latency.” The F64 features 48 ports for 10gE connectivity and four ports for 40gE, providing Layer 2 and 3 switching functionality with latency of less than 400 nanoseconds.

Nasdaq OMX Introduces FPGA Data Feed

Nasdaq OMX has gone live with a version of its TotalView Itch full depth equities feed driven by FPGA technology. The feed is being directed at trading firms that are particularly latency sensitive, with no queuing during data bursts that occur at peak trading periods. The TotalView Itch 4.1 FPGA feed is identical in format to the standard feed, which is processed and distributed using software-only code.

Because there is no queuing, messages on the FPGA feed can contain multiple price updates and so message sizes could be larger than the standard feed, up to 9,000 bytes in total. Recipients need to connect via 10G or 40G links, and should be able to handle data bursts up to 2,000 messages in a millisecond.

Ullink Partners With Azul For Low Latency

Ullink is continuing its focus on squeezing microseconds of latency from its trade execution and pre-trade risk systems, by partnering with Azul Systems, which offers a low and predictable latency Java virtual machine (JVM).

Azul’s Zing JVM is 100% compatible with the standard distribution but is optimised for the Linux operating system, reducing latency and jitter that is often associated with the standard JVM. Applications - such as Ullink’s trading system suite - that are written in Java require a JVM to execute on host operating system and hardware platforms.

Hibernia Connects to Amazon Cloud

Hibernia Atlantic is connecting its global network into Amazon’s AWS cloud platform, via the latter’s AWS Direct Connect facility, which provides higher bandwidth and possibly lower costs, compared to internet connectivity. AWS Direct Connect is available at several Amazon platform instances, including those in New York City, Virginia, California, plus London in the UK and San Paulo in Brazil.

This connectivity could be of interest to financial markets firms looking to run applications on cloud infrastructure, such as back testing and creation of quantitative models. Such applications generally require access to large volumes of time series data.
It’s time to take control of technology in a high-speed world!

**Technology Risk** and the associated high profile impact on trading businesses has become the latest point of concern in the evolution of electronic trading.

High frequency trading has precipitated the deployment of new technology that is now pervasive in global trading infrastructures. Unfortunately, the deployment of monitoring systems to ensure the safe operation and detection of dangerous trading anomalies often take second priority in the rush to improve speed.

No business can be 100% protected from trading technology risk. However, a lot can be done to reduce it. Best practices from industries that use complex technology systems requiring high levels of safety can be leveraged e.g. air traffic control and nuclear power plants.

The starting point for technology risk mitigation is to monitor precisely what is happening on the trading network. It is impossible to manage risk exposure, if one does cannot see the exact state of your trading network and know what it is doing with the trades entrusted to it. Best-practice has shown the deployment of independent monitoring systems strengthen further the barriers that prevent catastrophic failure.

Corvil is the industry leader for monitoring high-speed trading systems. Our products services, and expertise can be used today to lower your risk from technology failure while trading successfully in a high-speed world.

Corvil can help – email us at technology-risk@corvil.com

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