

Accedian Financial Services Offering

Market Issues

Capital markets firms are under pressure from all sides. Regulators want more transparency, clients and shareholders want greater margins at reduced cost, and new entrants are eating into already sparse liquidity, making generating those margins harder.

For many firms, finding new sources of liquidity—either through new venues, instruments or new trading strategies—is critical to commercial success. Once connected to these sources, they need to be able to trade quickly and reliably. High frequency competitors are already trading at microsecond intervals. For non-HFT firms to make money, they need to be able to execute trades exactly when needed: a delay of even a few milliseconds could impact execution quality.

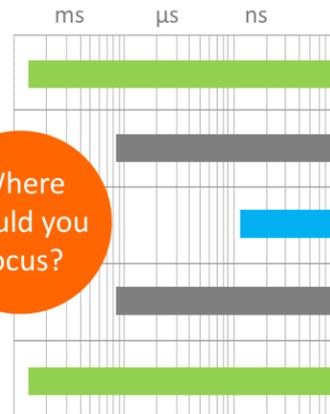
Rather than looking only to new venues as the principal source of new revenues in the future, firms should consider the returns that can be achieved by better instrumenting, and in turn optimising incumbent trading architectures in order to achieve greater revenues/profitability on existing venues. Moreover, in doing so, they will achieve a far better ROI against a backdrop of heavily constrained and diminishing budgets. Extranets—connecting financial services providers’ trading infrastructure to market makers, exchanges, and other wide area network locations—are particularly susceptible to performance issues. On the time-scale of financial transactions, extranets contribute significantly more latency, and risk of packet loss, than the LANs that host critical trading functions.

Recipe for...
A Successful Transaction

- stream of packets sent
- multi-hop transit
- **all Received & Confirmed**

one lost = **start over again**

Where
would you
focus?



- Time to receive market info
- Transit time in data center
- Time to process trade request
- Transit time in data center
- Time to send trade request

As a result, assuring extranet performance delivers a significant trading advantage, directly impacting the bottom line. While many aspects of network reliability are covered by service level agreements with extranet service providers, traditional network monitoring tools often lack granularity in reporting, covering broad, averaged metrics over reporting intervals—from seconds

to minutes, or even daily—that are eons in time-sensitive trading. Measurement precision is also often insufficient: millisecond latency metrics in a sub-microsecond world.

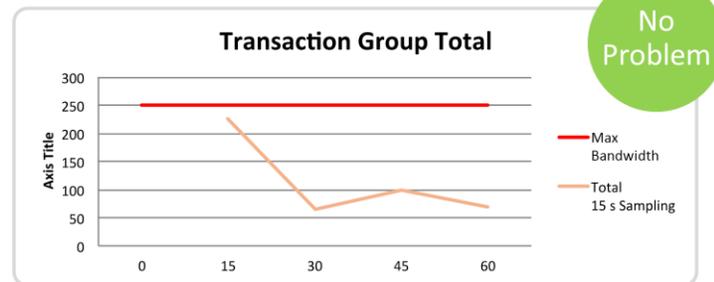
Without having access to highly-precise, granular, real-time, sub-second performance monitoring, it's impossible to

accurately detect latency variations, trade flow gaps or microbursts. Latency spikes and packet loss from bursts of network traffic can disrupt hundreds of trades. Yet without sub-microsecond sampling rates and measurement precision, most existing monitoring tools wouldn't notice.

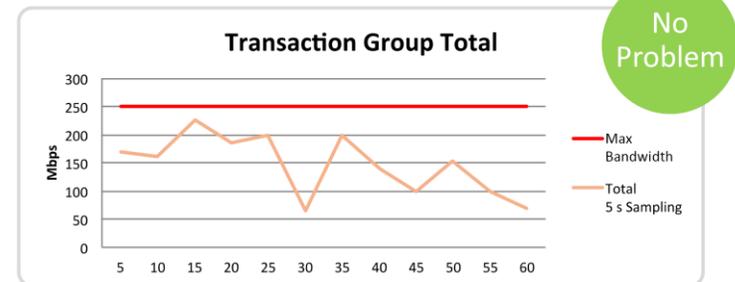
Precise and accurate low latency monitoring requires highly precise and accurate time stamping. Any slight inconsistencies

in time measurement can distort metrics, particularly in situations where traffic is being measured in disparate geographic locations. As critical as accurate timing is for active latency measurements, emerging regulatory regimes such as MIFID-II underline its importance. Precise trade packet time-stamping and capture is required for reporting and analysis, and compliance becomes impossible without granular, precise, distributed network-embedded real-time monitoring.

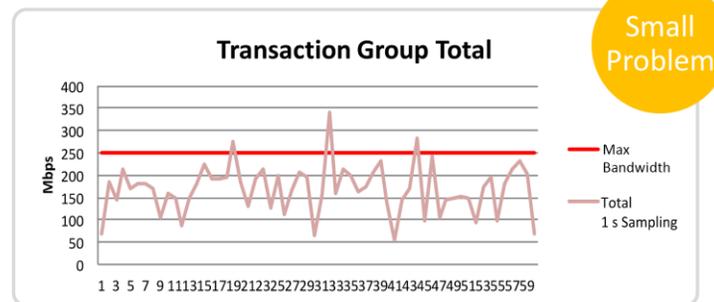
15 seconds



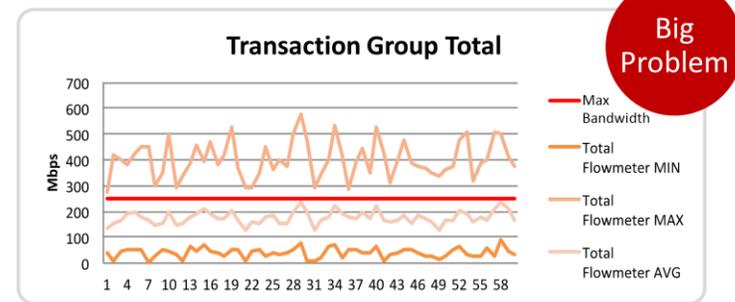
5 seconds



1 second



100 milliseconds



Effect of Sampling Speed on Burst Detection

Accedian's Solution

Accedian's instrumentation empowers banks and brokers to monitor their trading infrastructure to sub-microsecond granularity and with military precision. The unprecedented and cost-efficient licensing model finally allows providers to deploy this cutting edge technology across the firms' full client trading flow lifecycle, from ingress into the bank/brokers buy side FIX Hub all the way down to the executing venues' infrastructure, and back again. It does this without impacting underlying trade flows latency or content. Microbursts, micro-gaps, and instantaneous latency spikes are effortlessly detected. Real-time reporting through leading analytics tools—and Accedian's own secure customer portals—ensures banks and brokers can effortlessly manage and optimise the services they provide to clients with extreme accuracy. This focus on complete, immediate, precise performance visibility provides clear differentiation of QoS and key business metrics within the industry and its peer group.

In addition, Accedian's unique FlowBROKER™ remote, distributed packet brokering solution allows institutions to accurately time-stamp and capture every trade flow packet, at all critical locations to record the exact time of each trading event, and guaranteeing optimal performance, transparency and regulatory conformance of their trading infrastructure. With a unique ability to synchronize time-stamping clocks at each capture point, no new timing distribution infrastructure is required.

FlowBROKER™ simplifies compliance with regulations such as MiFID II and Dodd Frank, while opening up a real-time feed for detailed trade flow analysis. Since time-stamping takes place at the network level—rather than the application level—there is no need to re-instrument potentially hundreds of technology stacks across all the locations an institution operates in.

Benefits & Proof Points

Proven Large-Scale Deployments

Accedian assures the network performance of some of the world's largest financial service providers including global deployments with Thomson Reuters (Globally) and Colt Capital Markets.

Accedian's highly scalable solutions monitor networks spanning over 100 countries.

MiFID II and Dodd Frank Compliant

Accedian's solutions are fully compliant with MiFID II and Dodd Frank regulations.

10ms Microburst Detection

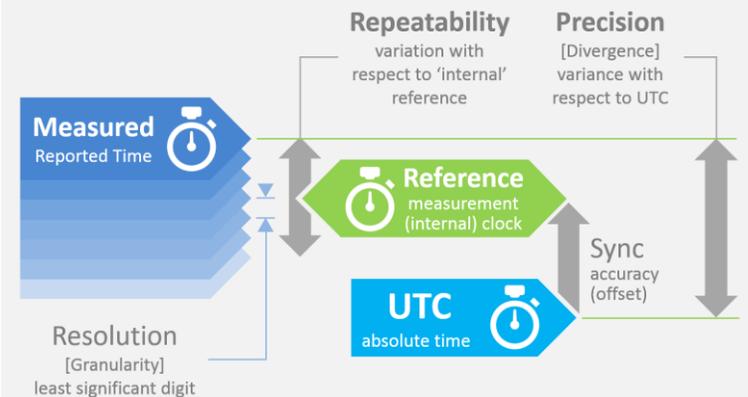
Accedian's FlowMETER™ detects microbursts as short as 10ms¹

Accedian: Precision Timestamping

Resolution [Granularity]	< 1 μ s
Repeatability	< 10 μ s
Precision [Divergence] *	< 10 μ s

* requires sufficiently precise time source / signal - Accedian units synchronize local time-stamping clocks within 100 ns of UTC when served by sufficiently accurate PTP (IEEE 1588v2) / GPS sources.

N.B.: MiFID II regulations require 100 μ s precision



Accurate 1-Way Latency Measurements

Integrated (local) clock synchronization permits high-precision one-way delay measurements over large scale networks (with or without external timing sources).

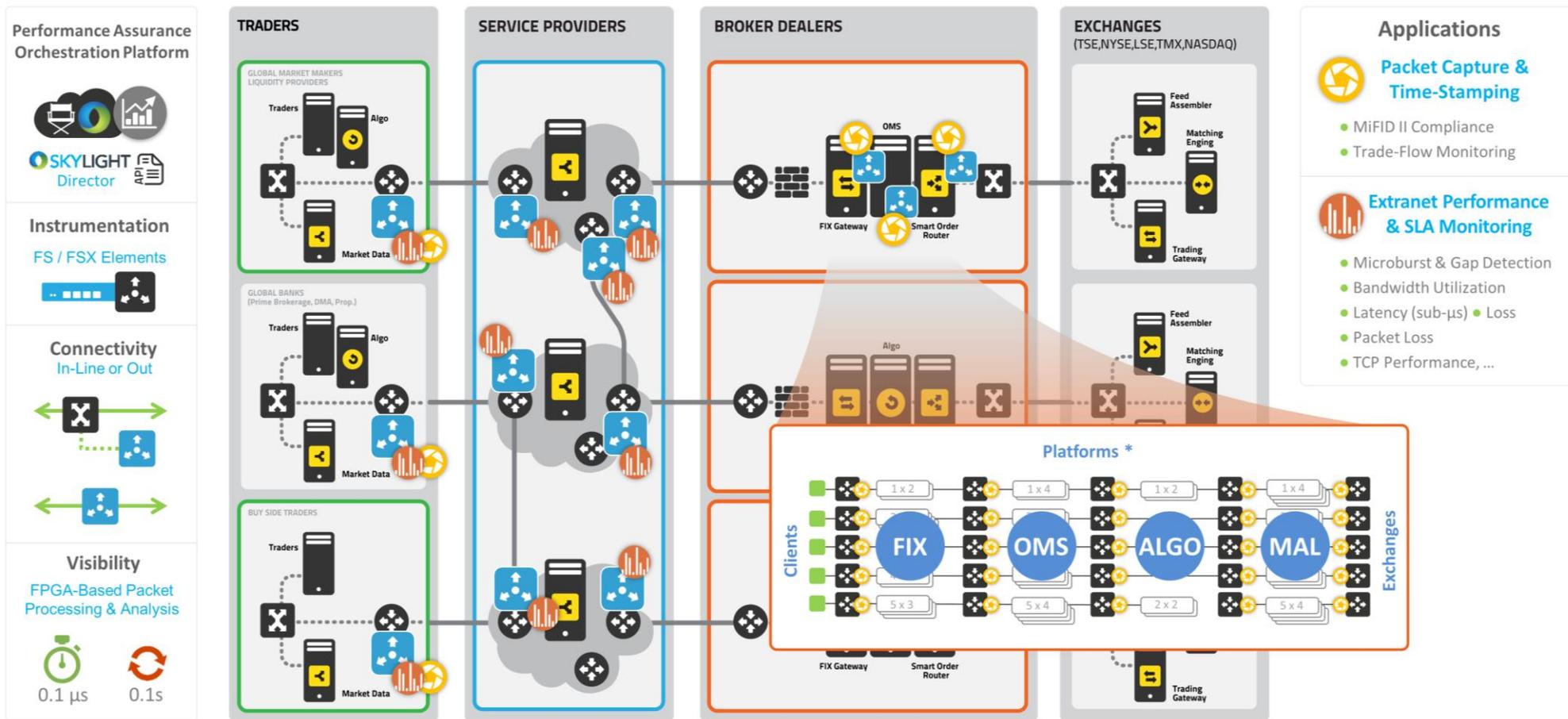
Real-Time Reporting

Per-second performance metrics reporting / streaming (including min/max/averages from 10ms¹ sample intervals)

Efficient Packet Brokering

FlowBROKER™ packet brokering features include time-stamping, packet slicing, efficient bundling, and lossless streaming to analysis platforms.

Accedian Solution Coverage



*FIX = Financial Information eXchange OMS = Order Management System ALGO = ALGORITHMIC TRADING MAL = Market Access Layer

Issues & Solutions Matrix

Market Issue	Details & Challenges	Requirements	Accedian Solution Benefits	Key Attributes							
				Proven Large-Scale Deployments	MiFID II and Dodd Frank Compliant	10ms Microburst Detection	Precise Timestamping	Accurate 1-Way Latency Measurements	Real-Time Reporting	Network-Based	Efficient Packet Brokering
<p>1. Regulation including MiFID II</p>	<p>Participants have to prove best execution in a more stringent way than under MiFID I. New market surveillance rules mean that trade-related communications have to be captured and timestamped. Pre and post trade transparency are key tenets of the regulation and the ability to provide this hinges on being able to prove when trades were made.</p> <p>Institutions need to make sure that recorded trade-related data is searchable and that trades can be completely reconstructed quickly and easily from disparate data sources. In order to do this, it is essential that each piece of information is accurately and consistently timestamped. If it's impossible to pinpoint exactly when trades were made, then there's no way to accurately prove compliance after the fact.</p>	<p>Granularity, accuracy and consistency of measurement across the organisation is the only way that institutions can be sure that trades are recorded and archived correctly. This is not easily achievable across global organisations with trading operations in several different time zones and potentially hundreds of technology stacks needing to be synchronised.</p> <p>Network-based solutions are the most efficient way of quickly instrumenting a disparate stack of systems and ensuring that the entire organisation is synchronised.</p>	<p>Accedian's timestamping tool is network-based meaning that the solution can be deployed without the need to instrument technology stacks across the business and across the globe.</p> <p>Network-based solution means that one consistent time is used across the business doing away with the need for synchronisation.</p> <p>The regulatory requirement is for timestamping to be traceable with a documented methodology.</p>	●	●	●			●	●	
<p>2. Pressure to grow revenues</p>	<p>Institutions are finding it increasingly difficult to maintain margins in the face of a lack of liquidity, an increase in competition and an erosion of traditional revenue streams (such as prop trading).</p> <p>As well as looking for new sources of revenue institutions are looking to make internal systems more efficient, enabling them to reach potential revenue sources faster and realise trading opportunities before the competition. Network speed and capacity needs to be consistent and monitored to ensure that this is the case.</p> <p>Current network monitoring tools don't measure at the level of granularity needed to cope with trading that happens at the microsecond.</p>	<p>Ensuring consistent network capacity and speed is a function of the level of granularity to which it is monitored. The more often that measurements are taken, the more accurate the picture of the network.</p> <p>When measuring at smaller time intervals it becomes possible to detect microbursts and to adjust packet flows to ensure that they don't happen.</p> <p>By increasing the efficiency of the network, institutions can increase the efficiency of the trading desk, and thus the bottom line.</p>	<p>Microsecond-level detection of microbursts.</p> <p>Optimisation of bandwidth utilisation.</p> <p>Latency monitoring.</p> <p>Accedian's network monitoring tool allows institutions to measure the performance of their network with exceptional granularity, to expose microbursts, excess latency, packet loss and other impairments.</p> <p>This real-time, precise visibility allows financial service providers to optimize bandwidth utilization, extranet performance, and trade execution times, and to maximize effectiveness of low latency routes without costly oversubscription.</p>	●		●	●	●	●		

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Issues & Solutions Matrix ...continued

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3. HFT/spoofing	Recent landmark cases have made spoofing illegal and have shown that the practice itself (placing and then cancelling multiple orders in quick succession) needs to be done with the intent to defraud. Proving the intention to defraud will hinge, in part, on the frequency with which trades were made and the regularity with which they occurred.	Accurate and granular timestamping is key to being able to judge whether trades were placed legitimately or not and, in a HFT environment, the level of granularity is all important. Capturing every order at precisely the time it was made (and cancelled) is no mean feat.	<p>Accedian's solutions offer measurement and trade-flow packet timestamping with microsecond granularity, synchronised across the institution with less than 10 microseconds of divergence when paired with accurate timing distribution. Even the fastest HFT houses are able to record and archive all trades and cancellations meaning that a method of proving when and how frequently orders were placed is in place long before it is needed.</p> <ul style="list-style-type: none"> - Integrated, patented remote measurement clock synchronization permits one-way delay measurements over large scale networks without external timing sources - Network-based nature means that one consistent time is used across the business doing away with the need for synchronisation 	●		●	●	●	●		
4. Need to access liquidity	Levels of liquidity in the main markets have dropped substantially in the last few years and participants have expanded operations to seek new sources. These can be new geographies, new asset classes or new venues. Accessing these sources requires systems that are efficient, reliable and stable.	If connections to new (and possibly unsophisticated frontier market) liquidity sources are not sufficiently robust then access to this liquidity will be unusable. It's critical to be able to monitor these connections in as close to real time as possible to make sure that stability and capacity is maintained.	Accedian's network monitoring tool enables institutions to have a real-time picture of the health of their networks without having a detrimental effect on it. Ensuring that access to liquidity is stable and consistent is the first step to ensuring consistent access to liquidity whether in established or frontier markets.	●		●	●	●	●		

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Issues & Solutions Matrix ...continued

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5. Pressure from new players	As a by-product of a lack of liquidity, all markets are under pressure from new entrants seeking whatever liquidity is present, thus putting pressure on existing market participants. Speed and efficiency is key for these players to be able to compete with new entrants who may well have trading systems that are orders of magnitude more sophisticated.	Speed is nothing if it's sporadic and undependable. Consistency and stability are key in an increasingly competitive world and the ability to execute exactly when you need to is essential. Network performance needs to be assured from end-to-end to support flawless market data delivery and trade execution. Utilization and performance metrics need to be monitored and trended to de-risk network-related trade impairments. Extranet customers need to see network performance in real-time to ensure they have visibility into any potential source of transaction delay.	Accedian's network monitoring tool enables institutions to trade more effectively. By ensuring that network performance is constantly monitored and that any spike in activity which threatens capacity is dealt with, trade flows become smoother and consistent network latency is achieved. This ensures that when competing for liquidity, trades are executed without delays, data arrives when it is needed and the network isn't the weak link in the chain. Real-time performance metric feeds, as well as secure online customer reporting portals offer key performance indicators and a variety of methods to visualize them that can be tailored to specific departmental and customer needs.	●		●	●	●	●			
6. Cost reduction	As well as increasing revenues, institutions are under pressure to reduce costs. Headcount efficiencies have been made, non performing departments sold off and unprofitable markets have been exited. There still remain areas for improvement. Many institutions dedicate considerable budget to latency reduction in their networks. However they often do not have a complete view of the network itself. The majority of network monitoring tools simply cannot measure the performance at the granularity needed in today's high speed environment.	By being able to see fluctuations in performance at a more granular level, a truer picture of performance will be discovered and improvement efforts can be directed better. Detecting bottlenecks, instability, capacity issues and network configuration issues with exceptional, real-time visibility is required to target network improvement investments efficiently, while ensuring they offer the best return on investment.	Accedian's network monitoring tool allows institutions to measure the performance of their network with exceptional granularity, to expose microbursts, excess latency, packet loss and other impairments that—if left unattended—significantly impact trade efficiency. This allows financial service providers to ensure that the stated performance levels are accurate, and that any effort to improve performance delivers expected results.	●		●	●	●	●			

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