

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 3 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 MarketData Insight and Electronic Trading. If it’s low latency, you can be sure that we have it covered.

News

IBM Tests Blue Gene ‘Stream Supercomputing’ With TD Bank

IBM is working with Canada’s TD Bank to test its new ‘stream computing’ software, which uses IBM’s Blue Gene supercomputer to manage massive volumes of data.

The stream computing architecture uses algorithms to analyse live structured and unstructured data from any source and, says

IBM, can examine thousands of information sources in real time, so the bank can capitalise on changing market conditions as they happen.

IBM Acquires Infodyne

IBM has acquired Infodyne Corp., a provider of market data feed handling and integration software.

Infodyne’s TPS+Plus ticker plant provides support for an array of low-latency direct exchange feeds, including those from the

NYSE, Nasdaq, Deutsche Borse and the London Stock Exchange, as well as for consolidated feeds such as Reuters RDF and Bloomberg’s B-Pipe.

For its part, IBM offers its IBM Websphere Front Office for Financial Markets and Websphere MQ Low Latency Messaging packages for market data delivery.

IBM’s general manager for Websphere, Tom Rosamilia, says it will provide “great acceleration” in terms of integration of the Websphere products with new datafeeds.

News

Reuters Launches Market Data Latency Monitoring; Partners with Endace, Trading Metrics

Reuters has launched its Reuters Latency Monitor (RLM), developed in conjunction with Endace and Trading Metrics, and billed as enabling Reuters customers to understand the amount of network delay between the origination of market data and its delivery to their trading applications. Measurements can be made right across a network or focused on specific areas within it. The monitoring is passive, causes no additional strain on the network and needs no modifications to the existing Reuters Market Data System (RMDS).

RLM is delivered using Endace's Ninjabox-LM hardware platform and the Trading Metrics software for latency performance analysis. The solution is co-marketed by Reuters, Endace and Trading Metrics across each of their existing and prospective customer bases.

Deutsche Börse Systems Extends Corvil Deployment to 20 Appliances Worldwide

Low-latency networking solution provider Corvil, has installed 20 appliances globally for Deutsche Börse Systems (DBS), measuring latency between the DBS's Frankfurt data centres and all Eurex access points worldwide. DBS selected Corvil last year and the system is now fully operational and integrated with the DBS management system. The Corvil technology is, says DBS, critical to supervising the ultra low levels of latency and loss for customers of Eurex Enhanced Broadcast Systems (EBS) worldwide.

Tervela Breaks 10 Million Messages per Second Barrier in First Real World Test Environment

Tervela, provider of high-performance messaging systems, says its Tervela Message Network can process more than 10 million messages per second in a real-world test environment. Tervela's fault-tolerant message switches can route US market data – including all equities, derivatives, commodities and FX instruments – and send it out to more than 1,500 subscribers.

The mean baseline roundtrip message latency was 58 microseconds with a standard deviation of eight microseconds. The mean latency numbers increased by only 18 microseconds during peak load conditions – even during sensitive phases such as market open and close – which are subject to radical changes in volatility. The test conditions were constructed using parameters that best matched the operations of most large financial services firms including Gigabit Ethernet, 150 byte messages and UDP point-to-point transport. The tests were performed at Advanced Micro Devices' (AMD's) Sunnyvale, California headquarters.

Solace Systems Introduces Next-Generation Content Router and Blades in Technical Arms Race

Solace Systems, supplier of low-latency content networking solutions for enterprises and service providers, has launched the Solace 3260 Content Router, the next-generation platform in its 3200 Series Content Networking System product family, capable of processing millions of messages per second thanks to its modular hardware blades and microsecond latency, claims the vendor.

Azul Introduces Vega 3 Appliance For Java Acceleration

Azul Systems launched its Vega 3 Series appliances, designed to run, process, and manage Java applications in business critical environments. Compared to the company's first generation devices, Vega 3 products represent a fivefold improvement in performance, packaged in compact 5U or 14U appliance.

The new Vega 3 appliances are purpose-built for Java applications, and are based on a 54-core processor, designed to support the needs of scalable multi-threaded applications built on application Virtual Machine platforms, such as Java. The new Vega 3 appliances extend Azul's pauseless garbage collection capability to 670 GBytes in a single Java Heap.

Tibco Enters Hardware Market with its First Messaging Appliance

Tibco Software has made its first foray into hardware with the unveiling of a hardware messaging appliance specifically designed to accelerate the capabilities and performance of its low latency Tibco Rendezvous messaging software.

Tibco has chosen Solace Systems to act as its manufacturing partner in bringing its new messaging appliance to market, which is expected to be released in late 2008.

Volante Streamer Offers Market Data Integration for Ultra Low-Latency

Data integration solutions provider Volante Technologies has launched Volante Streamer for low-latency applications, combining handlers for market data feeds with microsecond integration into internal applications. Volante currently offers Streamer modules for Reuters RMDS 6.0, OPRA, and Bloomberg B-Pipe.

Tackling the challenges of direct exchange data



By Don Finucane, Vice President of Product Management and OTC Data Services, Interactive Data Real-Time Services

As firms cope with the creation of multiple new trading venues, the need to source ultra-low latency data to support electronic and algorithmic trading applications and also manage the high costs involved in taking in and maintaining direct feeds, hosted market data services such as Interactive Data's DirectPlusSM are becoming increasingly appealing.

DirectPlus is a fully managed, ultra-low latency direct exchange data service offered through Interactive Data's Real-Time Services business that has been measuring data latency generally with a range of 80 to 130 microseconds (0.08 to 0.13 milliseconds) since being rolled out one year ago. Clients using the service co-locate applications alongside DirectPlus at BT Global Financial Services' Radianz New York metro data center.

DirectPlus has been measuring data latency generally with a range of 80 to 130 microseconds since being rolled out one year ago

The DirectPlus service can allow clients to get the benefits of ultra-low latency data with direct exchange feeds without many of the costs traditionally associated with going direct. That's because the ultra-low latency ticker plant technology is fully managed by Interactive Data including all exchange feed changes.

In addition, communications costs for inbound delivery of exchange feeds are dramatically reduced, because clients cross connect to DirectPlus within the hosting facility.

What's more, the fully managed service reduces firms' market data infrastructure requirements.

Supplementing direct data

Firms generally do not get all the data they need for their applications from an exchange. As a result, they may have to source this data externally and integrate it with the direct exchange data (e.g., value-added calculated data, reference data and corporate actions data). This integration can be complex, laborious and costly.

DirectPlus integrates several components of Interactive Data's real-time product set at the Radianz hosting facility, resulting in a feature-rich offering. Using the same protocol/API, DirectPlus can allow clients to access a plethora of supplemental data to support the directly sourced data, including data from global markets, fundamental data, cross reference data and historical tick data.

The supplemental data is available Interactive Data's PlusFeedSM low latency consolidated global datafeed. PlusFeed provides data from over 450 sources and exchanges worldwide, covering in excess of 5 million instruments. In addition, PlusFeed provides extensive Level 2 data for a wide range of global exchanges across all asset classes.

Reducing total cost of ownership

The cost to take in direct feeds from the exchanges to the client location can be staggering, in large part due to the considerable amounts of data bandwidth required to bring in the generally uncompressed data from an exchange. In addition, for redundancy, these costs may double.

DirectPlus can allow clients to get the benefits of direct exchange feeds without many of the costs traditionally associated with going direct

With a managed service such as Interactive Data's DirectPlus, the vendor sources the exchange data from diverse carriers into the Radianz hosting facility and incurs the communication costs associated with acquiring the data.

Once in the data center, clients just need to pay for the appropriate level of "cross connect" bandwidth to pull the data from Interactive Data's ultra-low latency ticker plant to their co-hosted application.

Another major expense involves ticker plant maintenance. Firms taking in direct feeds generally allocate a substantial amount of their technical resources to maintenance projects, and in particular keeping up with the frequent changes exchanges make to data formats and protocols.

With a fully managed service such as Interactive Data's DirectPlus, direct exchange feeds are fully maintained by Interactive Data, and all data format and protocol changes that the exchanges make are implemented centrally by Interactive Data at the hosting facility.

Managing data volumes

Ticker plant capacity planning is another key aspect of going direct that is often underestimated. Market data volumes have increased by at least 90 percent for five out of the last six years.

Based on historical numbers, firms must factor in the need for constant systems expansion and reengineering to double processing capacity annually at a considerable cost.

Interactive Data's ultra-low latency ticker plant infrastructure is engineered to handle current market data volumes, with up to 40 percent excess capacity. Interactive Data also monitors bandwidth capacity to confirm that incoming exchange lines are provisioned with sufficient excess capacity.

By taking all of these factors into con-

sideration, Interactive Data believes that institutions can make more informed decisions about project plans and budgets for their ultra-low-latency data needs.

This article is provided for information purposes only. Nothing herein should be construed as legal or other professional advice or be relied upon as such.

The logo for Interactive Data, featuring a stylized graphic of blue squares forming a staircase or upward-pointing arrow above the text "Interactive Data" in a blue serif font.

Complexity vs. Speed



By Jeff Wootton, Vice President, Product Strategy, Aleri

Performing complex analysis takes time. Yet today's fast paced markets require low-latency response. Sometimes it feels like walking a tightrope.

A lot of attention has been focused on low-latency trading over the last couple of years. As the pace of the markets has accelerated, it's an arms race to see who can get to the trade first. After all, what's the definition of how low your latency needs to be? It's simply to be faster than the other guy.

But it's not good enough to just be faster than the other guy; you also have to be smarter. And therein lays the challenge: making smart decisions means making informed decisions and understanding all the available information. Markets are more complex than ever. Making smart decisions means factoring more information into the equation. It means understanding complex relationships. Combining multiple inputs,

relating them, and using them to make a smart decision takes time – which of course is the enemy of low-latency trading.

Before we look at how to walk the tightrope of balancing speed with complexity, let's take a closer look at what's driving the increase in complexity. The days of trading single securities on a single market are over. The markets for most securities are now fragmented, with many choices of where to trade, and liquidity is on the move. The landscape is continually shifting as new venues emerge, existing ones expand into new markets, and consolidation merges startups with stalwarts. Cross-asset and cross-border trading plays off the interrelationships of multiple securities. Bottom line: in deciding what, when and where to trade, there are simply more options these days around both the "what" and the "where" question.

Many off-the-shelf and existing in-

house trading applications can't handle this increased complexity. In many cases they also can't handle market data message rates and can't deliver low-latency response. This calls for new applications. But building applications, especially ones that scale and perform, is time consuming. And with the rate at which the markets are changing, by the time a new application is built, it's already out of date.

So we've really introduced a third leg to the challenge: it's now speed vs. complexity vs. agility. After all, if you put enough time and resources into it, you can build applications that perform the complex analysis that you need, in a way that keeps pace with the markets, but you can't respond quickly enough to the changes in the market that represent threats or opportunities. You lack agility.

Complex Event Processing (CEP) technology offers agility in the race to master the complexity of the markets and still deliver low-latency response. CEP is an

enabling technology that provides for rapid application development in a real-time environment. High level authoring tools allow an application developer to focus on the business logic, and eliminates the need for mastering the intricacies of high performance, low-latency programming.

Take multi-threaded programming, for example: as we've hit the performance limits of single CPUs, hardware manufacturers are now delivering performance increases through the use of multi-CPU and multi-core architectures. But to take full advantage of these architectures, an application has to be multi-threaded. The design and implementation of efficient multi-threaded applications is an advanced programming skill. The use of a high-performance CEP platform, however, eliminates the need for multi-threaded programming skills. The CEP engine takes care of scalability, freeing the application developer to focus on the

business logic.

One example of how CEP can be used to overcome complexity in the markets while still achieving performance goals is Aleri's Market Liquidity Analysis (MLA) engine which is implemented on the Aleri CEP platform. This application consolidates and analyzes full depth order book information across multiple markets in order to enable intelligent trading and order routing decisions. It overcomes complexity in the markets in several ways: scattered pools of liquidity are recombined into a single virtual market, so a trader or trading application can know what liquidity is available and where it is located.

This includes cross border trading, combining markets quoting in different currencies into a single currency. It can dynamically filter venues based on market sessions or conditions and can apply price offsets to overcome differences between markets. Then to take it

a step further, the high level authoring tools provided by the CEP engine allow the user to implement custom analytics against market depth, without having to do any low-level programming in Java or C++.

CEP is just one tool that can help you balance the competing challenge of keeping up with the pace of the markets while still coping with the complexity of the markets to make intelligent decisions on where, when and how to trade. Being fast isn't enough. It's being fast, smart and agile that determines success – and that's the technology challenge.

Note: Aleri will be providing live demos of Aleri MLA as well as debuting version 3.0 of the Aleri CEP platform at SIFMA booth 2102.



For news, thought leadership and resources on low latency applications, technologies and architectures...

www.low-latency.com

The new online resource from A-Team Group

A-TEAMGROUP

Golf, Parallelism and Low Latency Technology



By Jeff Wells, Vice President of Product Marketing, Exegy

Hole 1

The financial markets and associated trading and technology industry has long been associated with golf. The culture, ways and wherefores of the traders and techs involved in the markets have many similarities with golf. Let's compare and contrast.

Hole 2

Some of the terms are the same, hackers for example – bad in both cases.

Hole 3

The Scots seem to be good at money management, engineering and apparently invented golf. There is even a region of Scotland called Silicon Glen. (Life is so mysterious.)

Hole 4

Both domains are male-dominated, though we hope to see change in both club-houses, so to speak.

Hole 5

Competitive drive to perform. There is only one winner (Did you ever see a Scotsman who came second? Was he happy?).

Hole 6

Inevitably there are a large number of braggers and hangers-on and a truly small number of the elite.

Hole 7

The higher the level, the more it costs just to be involved. And the winnings are enormous.

Hole 8

The "players" are always seeking advantage through better equipment. The high-end equipment is normally very expensive.

Hole 9

But, at the same time, golf and technology have become commoditized. The Callaway clubs and all sort of handy enhancements have made the job of whacking a small sphere accurately through mock wilderness somewhat less risky. Google finance is free, but a Bloomberg is still a requirement for most traders. Direct feeds are the sine qua non for the top traders these days...

Hole 10

The widespread building of links has made the sport more widely available. And now that the exchanges are electronic trading hubs, reachable over the internet, arguably both communities have been democratized.

Hole 11

Intel and AMD chips have allowed "hackers" to enhance their techniques and ultimately write an enormous body of code that lives on server farms at various trading centers around the world. Municipal golf courses have done the same for the masses. It's all about availability and affordability.

Hole 12

But the trading centers face a difficult challenge. High Frequency Traders relying on technology are in a sand trap, of their own

making. How could this be? Bear with me on this. Since decimalization tore into the profits of the ancien trading régime, the exchanges, trading venues and proprietary trading shops have been competing for liquidity by sending more quotes and orders quicker and faster than before. This is unsustainable with current technology and business architectures.

Hole 13

Skip this one. It might be unlucky. Ever heard of a version 13 of any product but Apollo?

Hole 14

The legendary progressive miniaturization of Intel's ASIC can only go so far, given the laws of physics (and economics). This means that the clusters of machines that search for low latency around the trade matching engines of the world's leading liquidity centers cannot keep up **and** stay in the same place. You can't keep scaling horizontally ad infinitum.

Hole 15

Parallelism in the form of FPGAs, multi-core and other platforms is riding to the rescue of the golfing techno-trader. Now this really does change the trading game. Thousands of algorithms can be done in parallel. It's like hitting the ball a thousand times in less than a millisecond.

Hole 16

We're now going through a "back to the roots" phase – in golf that would mean Scottish roots – windy damp unpredictable conditions. In computing dedicated

to high frequency trading, it is where you really need to know about the hardware in-depth again.

Hole 17

Questions of signal integrity, lanes, channels, chip cache, VHDL, Verilog and impedance rise to the fore, not to mention analysis of business algorithms that particularly take advantage of parallelism as opposed to sequentialism. In other words you need your swing analyzed by an expert.

Hole 18

So the tough technology trading question today is: can you take advantage of

parallelism? To do so you need to get hold of talent or technology that combines hardware, software and financial domain knowledge. If you can't, you'll have to keep swinging with the old style progressively heavy clubs.

Hole 19

This hole is a vital part of the culture in trading, technology and market data. Buy drinks, when you get there. If you drink enough, you'll be seeing in parallel and everything will seem easy to understand, especially in advanced low-latency computing. Trading decisions are also easier to make.

Issue 4 of *Low Latency - Are You Performing?* will be out in the fall, with distribution at High Performance on Wall Street.

If you are interested in contributing to, or advertising in, the next issue please contact: ben.duckworth@at-teamgroup.com

Directory

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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. 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 2,300 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 customised financial market information systems.

For more information about Interactive

Data Corporation and its businesses, please visit www.interactivedata.com.

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Aleri is a leading provider of enterprise-class complex event processing (CEP) technology for financial institutions and beyond. Aleri's CEP Platform was designed from the ground up to provide the most robust architecture available for the rapid implementation of mission critical applications within the most demanding environments. Built for high throughput with minimal latency, Aleri's event processing technology allows customers to analyze and respond instantly to high-volume, high-speed data to minimize risk and increase competitive advantage.

Aleri is the first to develop and deploy commercial enterprise-class applications built on event processing technology, the Aleri Liquidity Management System, which is used by some of the largest global bank treasuries in the world, and the Aleri Market Liquidity

Analysis engine, which consolidates multiple order book feeds from individual exchanges to provide a powerful tool for trading in fragmented markets.

Aleri is a global company headquartered in Chicago with offices in New York, New Jersey, London, and Paris. For more information, visit www.aleri.com.

exegy

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Exegy, Inc., provides high performance hardware accelerated computing appliances that efficiently process and enrich market data for the world's leading financial organizations. Exegy's unique market data products, such as the Exegy Ticker Plant, respond to financial organizations' growing demands for low latency, reduced cost of ownership and flexibility.

The Exegy Ticker Plant easily integrates into existing infrastructures and is compatible with leading operating systems and interconnects. For more information, please visit www.exegy.com.

Algorithmic Trading Directory

The Who, What, When and Why of the Algorithmic Trading Universe

The A-Team Algorithmic Trading Directory is the industry's only reference for professionals active in the algorithmic and electronic trading community.

The directory provides:

- An easy to use guide to help buy-side professionals understand the algorithms on offer from their brokers and other trading counterparties and suppliers.
- A series of detailed supplier profiles that offer descriptive information on the algorithms available.
- Analysis of who should be using the algorithms, under what market conditions and when.

Plus, coming soon...

- Cross-reference comparative tables to provide a fast and easy, apples-to-apples comparison of the key characteristics of the various algorithms on offer.

Download your free copy of A-Team's Algorithmic Trading Directory at www.algotradingdirectory.com

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Profiles																																																																																													
<p>JPMorgan</p> <p>JPMorgan's algorithmic trading products are part of its Electronic Client Solutions Group offers a broad array of capabilities including execution clearing and custody products as well as a dedicated trading analytics team. The ECS Group has specialists in each discipline as well as the asset groups the bank participates in, namely equities, derivatives, FX, credit and rates.</p> <p>According to John Edge, head of sales for European equities ECS at JPMorgan, "The aim is to deliver a complete vertical service offering from investment decision, through execution to post-trade services". While there has been a focus on the execution services piece, it is becoming increasingly</p>	<p>to evident to JPMorgan that innovative post-trade solutions will count as clients look for value from their providers.</p> <p>JPMorgan claims it holds a Top 3 market share position in FX, ECS and credit/rates ECS, a market leading position in futures and options ECS. With equities building momentum, the bank is confident of realising its overall ambition to be a Top 5 ECS provider across the board.</p> <p>Each asset class is operated as a global offering with regional cross asset coordination in place to maximise client service provision. In each group, electronic trading capabilities are used to</p>																																																																																												
<p>Description of Algorithms</p> <p>Arist A rapid execution algorithm for liquid securities aimed at seeking and extracting liquidity when there is a need to execute quickly</p> <p>Arist Arist is an implementation-shortfall algorithm designed specifically for less liquid securities. It will post liquidity (demand), take liquidity of advantageous size or price and try to effect trades within the spread without moving the market. The behaviour of the algorithm is modified according to the characteristics of the security being traded and the urgency level set by the trader.</p> <p>Common Algorithms</p> <p>Implementation Shortfall ✓ Peg ✓ Percent of Volume ✓ TWAP ✓ VWAP ✓</p>	<p>Markets</p> <table border="1"> <tr><td>Algeria</td><td>✓</td><td>Malaysia</td><td>✓</td></tr> <tr><td>Australia</td><td>✓</td><td>Mexico</td><td>✓</td></tr> <tr><td>Austria</td><td>✓</td><td>Netherlands</td><td>✓</td></tr> <tr><td>Belgium</td><td>✓</td><td>New Zealand</td><td>✓</td></tr> <tr><td>Brazil</td><td>✓</td><td>Norway</td><td>✓</td></tr> <tr><td>Canada</td><td>✓</td><td>Poland</td><td>✓</td></tr> <tr><td>China</td><td>✓</td><td>Peru</td><td>✓</td></tr> <tr><td>China</td><td>✓</td><td>Philippines</td><td>✓</td></tr> <tr><td>Czech Republic</td><td>✓</td><td>Portugal</td><td>✓</td></tr> <tr><td>Denmark</td><td>✓</td><td>Russia</td><td>✓</td></tr> <tr><td>France</td><td>✓</td><td>Singapore</td><td>✓</td></tr> <tr><td>France</td><td>✓</td><td>South Africa</td><td>✓</td></tr> <tr><td>Germany</td><td>✓</td><td>Spain</td><td>✓</td></tr> <tr><td>Hong Kong</td><td>✓</td><td>Sri Lanka</td><td>✓</td></tr> <tr><td>India</td><td>✓</td><td>Sweden</td><td>✓</td></tr> <tr><td>Indonesia</td><td>✓</td><td>Switzerland</td><td>✓</td></tr> <tr><td>Israel</td><td>✓</td><td>Taiwan</td><td>✓</td></tr> <tr><td>Italy</td><td>✓</td><td>Thailand</td><td>✓</td></tr> <tr><td>Japan</td><td>✓</td><td>Turkey</td><td>✓</td></tr> <tr><td>Latvia</td><td>✓</td><td>United Kingdom</td><td>✓</td></tr> <tr><td>Lithuania</td><td>✓</td><td>United States</td><td>✓</td></tr> <tr><td>Luxembourg</td><td>✓</td><td>USA</td><td>✓</td></tr> <tr><td></td><td></td><td>Wentzuela</td><td>✓</td></tr> </table>	Algeria	✓	Malaysia	✓	Australia	✓	Mexico	✓	Austria	✓	Netherlands	✓	Belgium	✓	New Zealand	✓	Brazil	✓	Norway	✓	Canada	✓	Poland	✓	China	✓	Peru	✓	China	✓	Philippines	✓	Czech Republic	✓	Portugal	✓	Denmark	✓	Russia	✓	France	✓	Singapore	✓	France	✓	South Africa	✓	Germany	✓	Spain	✓	Hong Kong	✓	Sri Lanka	✓	India	✓	Sweden	✓	Indonesia	✓	Switzerland	✓	Israel	✓	Taiwan	✓	Italy	✓	Thailand	✓	Japan	✓	Turkey	✓	Latvia	✓	United Kingdom	✓	Lithuania	✓	United States	✓	Luxembourg	✓	USA	✓			Wentzuela	✓
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