

The NASDAQ Stock Market, Inc.

NASDAQ leverages Adobe® Flex™ and Adobe AIR™ to develop an RIA on the desktop that delivers substantial ROI for NASDAQ and its customers

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www.nasdaq.com



Industry

Financial services

Challenges

- Capture, deliver, and present a huge volume of market transaction data
- Simplify process for analyzing trade activity

Solution

- Rich Internet Application (RIA)
 - Rapid trade analysis and trading activity replay
- NASDAQ is using Adobe Flex and Adobe AIR to develop and deliver a powerful market replay application that gives investment professionals moment-in-time views of trade activity.

Systems At A Glance

- Adobe AIR
- Adobe Flex 3

A financial services leader

Since its debut in 1971 as the world's first electronic stock market, NASDAQ has been at the forefront of innovation by using technology to bring millions of investors together with the world's leading companies.

The responsibility for developing products that can manage enormous amounts of trading data and deliver it to customers in relevant, interactive ways falls to the Market Data Product Development team at NASDAQ. According to Randall Hopkins, senior vice president at NASDAQ OMX Group, Inc., all types of investors, traders, and brokers benefit from being able to replay what happened in the market.

“When investors receive trade confirmations, they often don't know what happened between the time they placed their orders and the moment their trades were executed,” says Hopkins. “They want to know why the final price is different than the ‘real-time’ price they saw when they placed the order. It's really about understanding why they got a price and whether it was fair.”

Checks and balances

To provide in-depth information about what happened between the time an order was placed and when it was executed, the NASDAQ product development team turned to Adobe Flex and Adobe AIR to create NASDAQ Market Replay. The dynamic application is an extremely powerful replay and analysis tool, giving brokers, analysts, and compliance officers a way to view the consolidated order book and trade data for NASDAQ, NYSE, and Amex-listed securities at any point in time. It allows users to rewind and re-examine the order book and time-and-sales data, providing the chance to review trades and monitor compliance with regulations.

Although many firms already have systems designed to resurrect historical market data, they are typically complex, expensive, and difficult to use. NASDAQ Market Replay, on the other hand, is intuitive, cost-effective, and makes it simple to access volumes of trading data. The application enables users to quickly access a complex data set and zoom in to the sub-millisecond level to see exactly when trading events happened.

Quantitative Results

- Reduced frequency of trader stock price adjustments, resulting in possible savings of hundreds or even thousands of dollars per order
- Accelerated service rep resolution of customer questions, lowering costs and boosting productivity by up to 50%
- Estimated savings of thousands of dollars per quarter through improved compliance tracking

Qualitative Results

- Expanded NASDAQ product portfolio with popular offering
- Improved responsiveness to trader inquiries
- Enhanced regulatory compliance efforts
- Accelerated rollout of additional NASDAQ services using standards-based Flex environment

“NASDAQ Market Replay makes it possible to analyze sub-millisecond transactions quickly and efficiently.”

Claude Courbois,
Head of product R&D,
The NASDAQ Stock Market

“Today’s markets are so fast that there is no way for humans to see events as they occur, and it is almost impossible to sift through the massive data sets to find and replay an event,” explains Claude Courbois, head of product R&D for NASDAQ. “NASDAQ Market Replay makes it possible to analyze sub-millisecond transactions quickly and efficiently.”

ROI for Market Replay customers

For customers, NASDAQ Market Replay is saving valuable time and money for trade support centers, and compliance and market research departments by minimizing time spent validating trades, while providing an educational tool to improve trading strategies. The application also helps eliminate price adjustment costs and enables faster and more informed customer support calls, increasing customer satisfaction.

While the complexities of equity trading are enormous, with millions of orders continuously traveling many paths to central markets, one thing remains constant: investors want to obtain the best price possible and ensure that they got a good trade. Hopkins explains that the Adobe AIR application allows brokers to show customers exactly what was going on in the market at the time a trade happened, helping them understand why they received a particular price.

Reducing unnecessary compensation

With NASDAQ Market Replay, brokers and customer service specialists can provide clients with NASDAQ-validated, consolidated market data and screenshots to assure them that their order was handled correctly. Assuring clients that their orders were handled appropriately does more than just enhance customer satisfaction—it can also save money for brokerages. For instance, imagine that a client sees AAPL trading at \$156.40 per share and decides to buy 500 shares. The client submits a market order to buy 500 shares of AAPL at 9:31:45 a.m., Eastern Time (ET). The order is filled at \$156.63 and the customer calls to question the execution price.



NASDAQ Market Replay is a dynamic market replay application and analysis tool that gives users moment-in-time views of trade activity on NASDAQ, NYSE, and Amex-listed securities. This desktop RIA built with Adobe Flex and Adobe AIR can help reduce the frequency of trader stock price adjustments resulting in significant dollars savings per order.

“There’s no doubt that working in Adobe AIR is a huge benefit with these large data sets. The ability to process trading data on the desktop enables NASDAQ to deliver valuable data analysis at a lower cost to everyone involved.”

Randall Hopkins,
Senior vice president,
Global Data Products,
NASDAQ OMX Group

A broker or customer service representative using only time-and-sales or limited National Best Bid and Offer (NBBO) data would see the stock trading at \$156.40 and be tempted to adjust the price to that level, making an unjustified \$0.23 per share price correction—and giving the customer the impression that the brokerage firm made a mistake.

In actuality, the broker would probably determine that the execution was consistent with Reg NMS and best execution standards. Using Market Replay, a broker could determine that this was a market buy order that executed against the national best available offer in the market of \$156.63. Using a NASDAQ-validated Market Replay screen shot, the brokerage firm could provide third-party confirmation that the customer received the best trade at the best available price. Demonstrating that this is a valid and good trade would save the brokerage \$0.23 X 500, or \$115.00. This type of typical trade validation, considering the volumes that most brokerage firms handle, results in dramatic savings over time.

Often, Trade Support Desk managers can find themselves approving compensation for customers many times a day in the amount of hundreds of dollars per instance. But with Market Replay, managers can quickly analyze the market during the time of the trade to determine the validity of customers’ complaints. This can reduce unnecessary compensation back to customers by up to thousands of dollars per day.

Further improving the bottom line for trade support centers

Market Replay also can make trade support analysts far more efficient. Customer queries can be extremely time-consuming and can require a great deal of knowledge and research to substantiate. Until now, technology did not facilitate quick, efficient, unbiased responses for customers.

With Market Replay, trade support centers can provide clients with NASDAQ-validated screen shots of the moment their particular trades occurred. The user-friendly point-and-click functionality of Market Replay and the efficient query tool in the application diminish the amount of time required to address inquiries, ultimately reducing the cost of fielding and satisfying trade quality questions.

Suppose that a typical trade support analyst in a firm can currently field four customer calls per hour, each call lasting 15 minutes. At a rate of \$30 per hour, that costs the firm \$7.50 per call. With Market Replay, analysts can often double their productivity, handling eight calls per hour, and cutting the rate per call in half to \$3.75, an impressive savings that adds up over time.

Simplifying compliance research

The ROI benefits in terms of compliance are also compelling. Compliance officers must continuously monitor the trading activity of their firms, ensuring compliance with market regulations. One such regulation, Reg NMS, requires firms to fulfill “best execution” responsibilities. Reg NMS typically requires significant research to verify that trades were executed in accordance with the Order Protection Rule. This process is very time-consuming and can sometimes be overwhelming. If the compliance officer makes a mistake or misses something that would validate a trade, the firm may incur a fine.

With Market Replay, officers can reconstruct quotes at the time of the trades, moving forward and backward to look for all quote changes that could have affected the execution. The zoom tool even allows users to view quotes that were updated multiple times in a millisecond. After completing the analysis, NASDAQ-official replays or screenshots can be shared with customers or regulators, verifying compliance. Market Replay can greatly reduce the amount time spent researching questionable situations and can ultimately save firms from potentially costly fines.

For example, a compliance officer might spend each day verifying the compliance of the firm’s trading activity. This often involves sorting through an in-house database to rebuild the book in order to research potentially erroneous trades. Validating trade reports is often a chore because databases are not as user-friendly as Market Replay. It’s also valuable to validate internal databases with an external source like NASDAQ. By using Market Replay’s diverse and powerful research functionality, supported by an accurate data set, firms can reduce the risk and cost of regulatory problems, potentially saving tens of thousands of dollars.

“Adobe AIR enabled us to build an extremely powerful application on the client side. As a result there’s no data streaming, no caching, and no messages traveling back and forth between the client and server. This has saved us a tremendous amount of money that would otherwise have been spent building our own database infrastructure and disaster recovery capabilities.”

Claude Courbois,
Head of product R&D
The NASDAQ Stock Market

Seizing opportunities

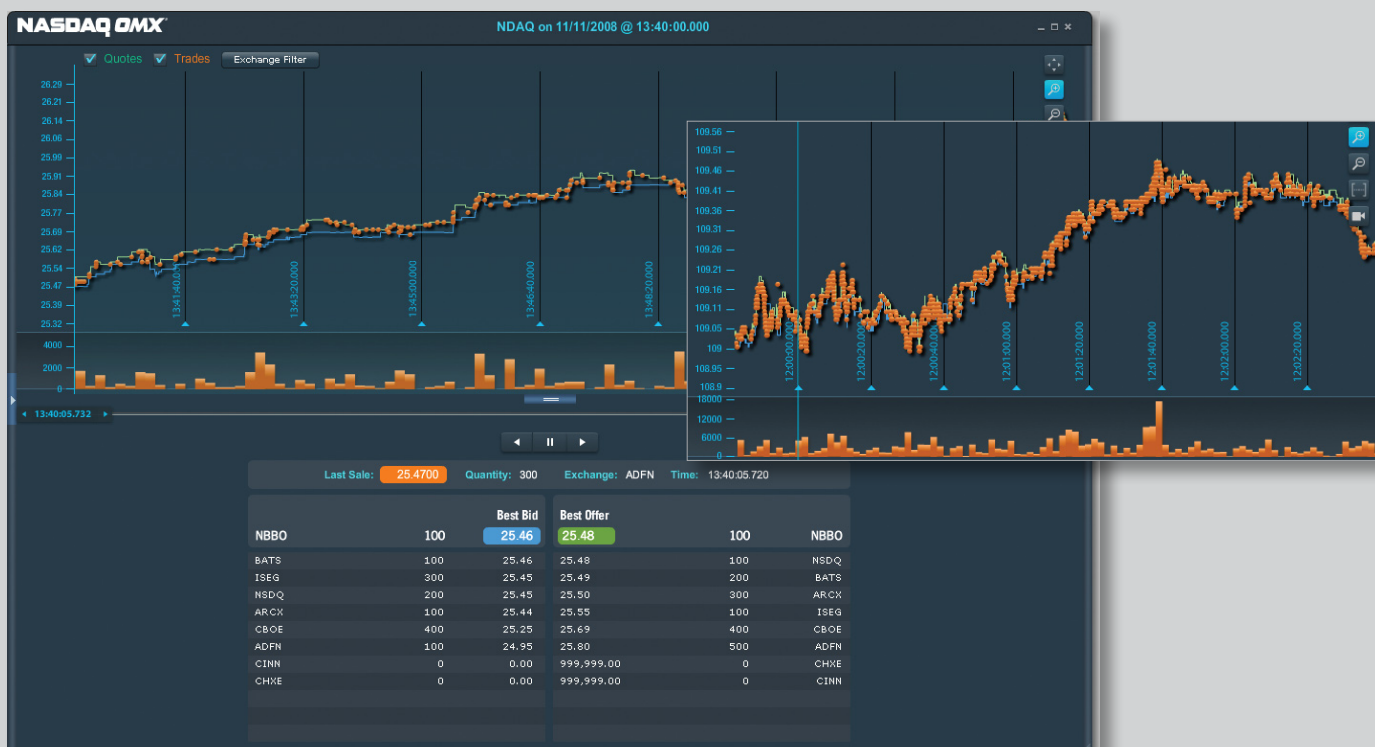
NASDAQ Market Replay can also help firms achieve return on investment through improved market research that helps firms avoid getting caught off guard by missed opportunities or unforeseen events. The markets move fast and, with the increasing popularity of algorithmic trading, they are only getting faster. Traders have very little time to make a decision. Within milliseconds, pricing opportunities may appear and disappear, causing traders to rush execution decisions, which can result in unfavorable trades or missed opportunities.

Market Replay enables traders to review a market event to better understand why it occurred. Instead of wondering what happened, traders can use Market Replay to rewind and review interesting situations. Analyzing these replays can help educate clients and traders about situational trading strategies. The ability for traders to review situations and share their findings can help mitigate future errors and improve the overall trading of the firm.

Dramatic cost benefits for NASDAQ

NASDAQ itself has achieved significant returns by developing NASDAQ Market Replay using Adobe Flex and Adobe AIR. Adobe Flex enabled the company to reuse pre-built Flex software components to develop the application’s user interface, dramatically accelerating development time and reducing costs. “The rich, intuitive user interface of NASDAQ Market Replay stands squarely on the shoulders of pre-built Flex components, and that sped up our development time and reduced costs tremendously,” says Courbois.

Adobe AIR also helped maximize ROI for NASDAQ. To minimize bandwidth demands, the Adobe AIR application manages data analysis, calculations, and data rendering—all on the client side. “There’s no doubt that working in Adobe AIR is a huge benefit with these large data sets,” says Hopkins. “The ability to process trading data on the desktop enables NASDAQ to deliver valuable data analysis at a lower cost to everyone involved.”



NASDAQ Market Replay saves time and money for trade support centers and compliance and market research departments by minimizing time spent validating trades. The RIA desktop application also helps eliminate price adjustment costs and enables faster and more informed customer support calls which can boost productivity by as much as 50%.

Leveraging hosted services

On the server side, all that is required is inexpensive, Internet-based commodity storage for a massive amount of plain text files. Because NASDAQ is using a hosted facility, there is no need for the company to build out its own expensive web- and database-server infrastructure and no need to implement disaster recovery capabilities such as mirroring, replicating, or caching data across several different data centers.

“Adobe AIR enabled us to build an extremely powerful application on the client side,” says Courbois. “As a result, there’s no data streaming, no caching, and no messages traveling back and forth between the client and server. This has saved us a tremendous amount of money that would otherwise have been spent building our own database infrastructure and disaster recovery capabilities.”

Courbois adds that NASDAQ’s budget is more manageable and predictable because the company knows how much it costs for each text file to be sent back and forth to each customer. This has made it possible for NASDAQ to deliver an application that is extremely feature-rich, but so cost-effective that it is affordable not only for brokerage firms and professional traders, but also for the general investing public.

Making the impossible possible

For NASDAQ’s customers, the ROI benefits of NASDAQ Market Replay are clear. Customers can save valuable time and money and help eliminate price adjustment costs—all while improving customer service. They also can streamline regulatory compliance efforts and improve their trading strategies.

For NASDAQ, Adobe Flex and Adobe AIR delivered extreme returns in developing Market Replay. By leveraging off-the-shelf Flex software components and building a powerful desktop application for data-analysis using Adobe AIR, NASDAQ can run Market Replay using an incredibly lightweight IT infrastructure.

“Without the support of AIR to put the analytical functions of Market Replay on the desktop, we could not have built such a low-cost, accessible product because of the back-end hardware investment that would have been required,” says Courbois. “Adobe Flex and Adobe AIR literally made Market Replay possible.”

For More Information

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