Nasdaq Reduces Costs, Increases Availability of Core Customer Quote Applications

Overview

Country or Region: United States
Industry: Financial services

Customer Profile

The Nasdaq Stock Market was founded in the early 1970s as the world's first purely automated trading system. Today, it is home to companies that are leaders in technology, retail, communications, financial services, transportation, media, and biotechnology.

Business Situation

Facing fierce competition in the 1990s from electronic trading, Nasdaq needed to update its costly legacy infrastructure while providing powerful market-data and quote applications to its customers.

Solution

Nasdaq streamlined its hardware and operating system infrastructure using Dell servers and Microsoft Windows Server System™ and migrated three mission-critical quote applications to the new infrastructure.

Benefits

- Less costly deployment and maintenance
- More accurate views of real-time quotes
- Rapidly available security updates

"Thanks to the distributed nature of an environment based on Microsoft Windows Server System, we've enjoyed greater and greater availability as we've migrated applications from the mainframe."

Mike Viola, Principal Technologist, Open Systems, The Nasdaq Stock Market

The Nasdaq Stock Market is not only the world's first electronic stock exchange but also the largest in the United States, with listings of more than 3,300 companies and trading on average more shares per day than any other securities market. Since the late 1990s, Nasdaq has been moving its IT environment from a mainframe foundation to one based largely on microprocessor-based servers and the Microsoft® Windows® operating system. Most recently, the company migrated three real-time quote applications from a Unisys mainframe environment to one based on Intel-based servers, Microsoft Windows Server™ 2003, and Microsoft SQL Server™ 2000. As a result, Nasdaq is saving money for itself and its customers on maintenance and support, enjoying a far easier approach to security updates, and realizing levels of reliability and availability far greater than before.

Windows Server 2003

Situation

Despite its leadership position as the largest electronic stock exchange in the United States, the Nasdaq Stock Market faced fierce competition starting in the late 1990s from electronic trading systems that diluted Nasdaq's stature by fragmenting pools of liquidity. Nasdaq IT executives recognized that to meet this challenge they needed to deliver market-data and quote applications with the power and functionality that would help their customers compete. The IT executives also needed to ensure that the applications could be developed and supported in the most efficient and cost-effective way possible.

To meet these objectives, the company needed to address the high cost of deployment, maintenance, and support inherent in a legacy infrastructure based largely on mainframe hardware and relying on more than a half dozen operating systems. In particular, the company needed a faster way of implementing software security updates, higher availability of key applications, and a wider choice of development tools and resources for enhancing those applications and building new ones.

Solution

In response, the company has been implementing a major, multiyear project to transform the Nasdaq IT environment from a mainframe-based infrastructure to one based on clusters of microprocessor-based servers and just two or three operating systems. One of those operating systems is the Microsoft® Windows Server™ 2003 Enterprise Edition operating system.

Mission-Critical, Real-Time Quote Applications

Among the most recent migrations to a Windows-based environment are three real-time quote applications that were written in a combination of the native Assembler and ANSI C languages while running on a Unisys mainframe platform:

- Broadcast Consolidation Server (BCS) provides national best bid and offer, national last sale data, market statistics, and indices.
- Nasdaq Broadcast Consolidator (NBC) provides market-maker display quotes, Nasdaq proprietary quotes, price depth, and inside quote information.
- Nasdaq Quotation Dissemination Service (NQDS) provides best-priced quotations for all market participants that trade issues listed on the Nasdaq National Market and SmallCap Market. NQDS also reports to the investor community whenever quotes are updated by market makers.

According to Phil Marie, Nasdaq Senior Vice President of Technology Services, these applications are distributed to Nasdaq customers, ranging from the major brokerages to individuals—essentially, any business or individual subscribing to the Nasdaq data feed. Because the applications provide real-time delivery of Level I and Level II quotes*, they are mission critical for the Nasdaq customers that use them.

Microsoft Windows Server: Building on Earlier Success

Marie says his team selected Windows Server 2003 for two primary reasons. One was the successful migration in 2002 of a market-data dissemination application with functionality similar to the BCS, NBC, and NQDS applications to the Microsoft Windows® 2000 operating system. "It was a logical progression to migrate to a Microsoft Windows Server System™ platform because we could leverage the initial investment we had made in the earlier migration," he says.

The second reason for moving the BCS, NBC, and NQDS applications to an environment based on Microsoft Windows Server System

integrated server software was a highly successful proof-of-concept test that Marie's team ran on Microsoft SQL Server™ 2000. "We wanted to ensure that the applications running in a Windows-based environment with SQL Server 2000 could achieve the same or better levels of performance as in the Unisys mainframe and the database management system we were running in that environment," Marie says. "Specifically, we wanted to ensure the applications could minimize latency—the round-trip execution time of a given trade. This is essential for customers that must complete a certain volume of trades per second to remain competitive."

With the help of individuals from Microsoft Consulting Services and the Microsoft Technology Center, a team led by Marie and Mike Viola, Nasdaq Principal Technologist, Open Systems, completed a proof of concept that assured them that a system based on SQL Server 2000 could handle up to twice the number of trades per second they specified. The testing also showed that such a system could restore the state of a batching engine in less than half the time required and could audit all trades entering and leaving the system faster than specified.

To migrate the quote applications from their original Assembler and C-based code to C++, developers relied on an internally developed software-engineering framework and the Microsoft Visual Studio® development system. They deployed the applications on a hardware environment consisting of two-way and four-way Intel-based Dell servers, which have been running at production level since December 2004.

Benefits

After close to a year of operation, the BCS, NBC, and NQDS applications running in the Windows Server 2003– and SQL Server 2000–based environment exceeded the

expectations of Marie, Viola, and their colleagues when they initially envisioned the move to a Windows-based environment. Specifically, the applications are helping them to provide Nasdaq customers a way to execute trades rapidly and efficiently in a manner that is similarly efficient for Nasdaq.

Money Savings for Nasdaq and Its Customers

As expected, Marie reports that running the quote applications in a Windows Server–based environment enables Nasdaq to take advantage of a lower cost of operation as compared with a mainframe-based environment. "This is why we decided years ago to move toward a microprocessor-based hardware environment and the Windows operating system—for a lower cost in general of deployment, maintenance, and support," he says.

Part of the savings in support come from Nasdaq's experience that it is far easier in Windows to maintain the security updates that are so vital to Nasdaq and its customers. "In the mainframe environment, security involved a highly manual process of waiting for tapes to be mailed, installing the updates, and then testing and verification—a process that might take up to a month," Marie says. "But in the Windows environment, the updates are largely automated, which means we get them into production within days, maximizing the level of security we are able to provide to our customers."

Still more savings come from the lower cost of maintaining the hardware and the software that Nasdaq found with Windows and the microprocessor-based servers. "It always costs less to support hardware that's open, as opposed to proprietary," Marie says. "The cost of maintaining the software is lower, too, thanks to the enormous pool of talent and expertise that's available for Windows."

Powerful, Reliable, Available Environment for Nasdaq Customers

The BCS, NBC, and NQDS applications are also proving to be more powerful, reliable, and available running in the Windows Server–based environment than they were when running in the mainframe environment. For example, thanks to a 50 percent reduction in latency, Nasdaq customers enjoy a more accurate view of real-time quote information than before.

Customers also enjoy a higher level of reliability. "We have always worked hard to keep operating-system-caused outages to a minimum, but even still, there would inevitably be a few such outages over the course of a year," says Viola, speaking after the applications were deployed for almost a year. "In contrast, now that we're running the BCS, NBC, and NQDS applications on Windows, I can't think of a single time the applications have stopped running on account of an operating-system problem."

Consequently, the applications are providing Nasdaq—and, more important, Nasdaq customers—with an extraordinary level of availability. "Thanks to the distributed nature of an environment based on Microsoft Windows Server System, we've enjoyed greater and greater availability as we've migrated applications from the mainframe," Viola says. "As a case in point, the BCS, NBC, and NQDS applications are running at a 99.98 percent availability, which is less than two minutes per year of operating-system-caused downtime."

Framework in Place for Future Development

Marie, Viola, and their team are looking forward to realizing similar benefits of cost savings, reliability, and availability by migrating a core trade-reporting application and others to the Windows Server operating system and SQL Server database management system. Viola credits Visual Studio with helping to keep migration costs down by supporting the internally developed software-engineering framework. "It was easy for us to build the engineering framework initially because of the development tools available to us on the Windows Server–based platform," he says. "Now, with the framework in place, we can implement future migrations smoothly and rapidly for a more predictable and efficient operational experience."

In addition, thanks to the better-than-expected results of the proof-of-concept testing against the SQL Server database, team members are evaluating the 64-bit version of SQL Server for future migrations from the Unisys mainframe and for migrations from other environments where an Oracle database management system is used. In such projects, the team may also take advantage of the expertise that was available from Microsoft for the migration of the BCS, NBC, and NQDS applications.

"The partnership provided by the people from Microsoft Consulting Services and the Microsoft Technology Center was indispensable in helping us to make this project a success," Marie says. "They really came to the table to help us see all the development and deployment options and choose the one that has delivered the greatest benefits to us and our customers."

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Windows Server 2003

The Microsoft Windows Server 2003 family helps organizations do more with less. Now you can run your IT infrastructure more efficiently, build better applications faster, and deliver the best infrastructure for enhancing user productivity. And you can do all this faster, more securely, and at lower cost.

For more information about Windows Server 2003, please visit:

http://www.microsoft.com/windowsserver2003

* A Level I quote, the type of quote that most investors receive from their broker or a Web-based quote service, provides the current best bid and ask prices for a given stock. A Level II quote provides that information plus the name of each market maker currently seeking to buy or sell a given stock, current quotations at various price levels, the most recently executed prices, the volume and time of recent related transactions, and the executed price of each of them.

Software and Services
- Microsoft Windows Server System
  - Microsoft Windows Server 2003 Enterprise Edition
  - Microsoft Windows Server 2003 Standard Edition
  - Microsoft SQL Server 2000 Enterprise Edition
  - Microsoft Visual Studio 2003
- Services
  - Microsoft Consulting Services
  - Microsoft Technology Center

Hardware
- Dell PowerEdge 2650
- Dell PowerEdge 6650

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