

# *When Every Trading Second Counts, SmartSockets® RIDE™ Speeds Development of Philadelphia Stock Exchange Quote Feed System*

If stock exchange floor activity conjures the analogy of a silent film for all its quirky haste, set that on fast forward to get a feel for the pace of the options trading business. Options trading growth has accelerated to unprecedented levels in the volatile stock market of the 90s. In comparison with the equity trading world, options trading requires that a much higher volume of messages move through the system because there are oftentimes 50 to 70 more products—different strike prices and maturity dates, for example—to risk.

On a computer network, options trading requires a system that can handle high performance applications that exchange messages in real time at the same extraordinary fast-forward speed as the business itself. And as that business grows, the systems supporting it not only must expand, but must do so without missing one tick on the ticker tape.

The Philadelphia Stock Exchange (PHLX) is one such business that found a way to expand the computer network supporting its Specialized Quote Feed System without compromising the speed or quality of its transactions. PHLX is the nation's leading options exchange with the volume in its 770 equity options through 1997 increasing by 55 percent. That translates in one day's activity to roughly double the number of quotes and triple the number of trades and orders compared to a year ago. In short, phenomenal growth resulting in an urgent demand for a faster, more powerful system. Required? A new paradigm that allows PHLX to rapidly develop the necessary applications and upgrades to keep up with the growth.

## ***New Quote Feed System Outgrows Home-Grown***

PHLX's Specialized Quote Feed System allows trading floor firms to send quotes in from their back offices rather than from workstations on the trading floor. This method lets floor members generate the quotes from their own systems, giving them the ability to use customized quoting



***Leads to X.Station Project for paperless transactions that speeds order handling and trade executions on the PHLX trading floor.***

models. When the quotes are generated in the back office, floor members can better determine the price of the options, thereby improving the accuracy of the quotes they are putting out.

PHLX's existing system used a home-grown sockets-based communications layer, or middleware, for individual applications on the system to send quotes and trade messages back and forth. The home-grown system simply performed too slowly and made upgrades and maintenance too laborious. For example, the messages were routed point to point, which requires that each application know the locations and addresses of other applications that require those messages. Also, developers achieved the required fault tolerance, failover functionality, and message delivery using additional application logic, which contributed to delays in development.

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“We had to design point-to-point messaging into all the applications, both for the sender and receivers” said Options Trading Systems Manager Doug Schafer. “Additional development time was also needed on each project to generate failover logic. As our applications increase in size and complexity these tasks become cost and time prohibitive.”

In addition to knocking down a few walls, adding more workstations, servers, and network computers, PHLX replaced its home-grown communications system with SmartSockets publish-subscribe middleware.

“With industry message volume continuing to grow and communication networks becoming faster and more efficient, it is critical for our interprocess communications to be stable, fast, and efficient,” said Bill Morgan, senior vice president and chief information officer of the PHLX. “SmartSockets publish-subscribe middleware provides the speed and efficiency we need.”

“We did an exhaustive search for that new paradigm that would make application development on our system faster and easier,” said Schafer. “SmartSockets’ publish-subscribe approach was a paradigm shift for us, but the product allows us to concentrate on development of the application and not the infrastructure.”

### ***System Specs***

PHLX’s options trading system supports multiple applications running on twelve UNIX servers and hundreds of workstations, X-Terminals, network computers, and data entry terminals—all connected on a TCP/IP network. Commanding high performance are applications such as the PHLX AutoQuote which generates hundreds of option quotes per second from the trading floor; and the X.Station, which is PHLX’s new electronic order book and trade execution station. The X.Station application demands instantaneous routing and guaranteed delivery of customer orders to the trader on the floor, and provides the ability to generate timely trade executions.

In addition to offering high performance and the ability to scale SmartSockets to an unlimited number of machines, one of the benefits of SmartSockets is that it routes messages easily over networks of mixed topology, which will be critical as PHLX expands its network architecture to include Windows NT servers.

### ***Rapid Infrastructure Development Experience (RIDE)***

PHLX chose SmartSockets for its rapid application development experience, which allows them to implement new products for its trading floor members faster and easier. SmartSockets is a complete publish-subscribe middleware solution that provides the industry’s richest application programming interfaces (APIs) and class libraries, enabling development of distributed solutions faster than any other publish-subscribe middleware product. Talarian refers to the features and programming interfaces enabling rapid development collectively as RIDE (rapid infrastructure development experience.) SmartSockets helps project teams build real-time, highly distributed applications in dynamic, heterogeneous environments.

“SmartSockets does a lot of the work for us so that we don’t have to spend all that time planning for multiple failure scenarios,” said Schafer. “SmartSockets does most of this work right out of the box. We can publish into the SmartSockets cloud, and, with features such as the built-in load balancing and failover handling, we can reliably deliver the information. We no longer have to do any specialized development as in the past, which saves tremendous time and budget for us.”

### ***Publish-Subscribe Meets Critical Demands***

The Philadelphia Stock Exchange selected SmartSockets because, along with RIDE, it is the only message-oriented middleware that provides the publish-subscribe paradigm able to meet the demanding networking requirements of the options trading business activities at the Exchange. Those networking requirements include scalability, high performance, fault tolerance, and the ability to change and upgrade without rewriting code for new and existing applications.

In fact, SmartSockets is the only publish-subscribe middleware that offers the combination of 100 percent fault tolerance, high performance, and unlimited scalability. As a result, it is used for the world’s most demanding, high-performance applications, which, besides financial trading, include traffic control systems, satellite ground control systems, semiconductor manufacturing, and telecommunications fraud detection.

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Publish-subscribe is an increasingly popular middleware technology that allows information to be distributed in real time. When sending a message, programs simply publish the message to a subject, and all programs subscribing to the subject will receive the message regardless of where they are located on the network.

According to William Morgan, senior vice president and CIO, PHLX's Financial Automation Department, "When every second counts, we employ only the technology that optimizes our business in a real-time network computing environment. SmartSockets provides a more open and far more advanced publish-subscribe technology for the high-performance and scalability we require as our trading volume on the options trading floor increases."

"The critical nature of orders and trades on our network demands a middleware that allows us easily to move data around the various applications," said Schafer. "Talarian's publish-subscribe middleware allows us to increase the number of orders and trades without having to change the applications on the system to accommodate the growth. Additionally, there's no margin for error; SmartSockets' hot failover feature ensures that messages are automatically rerouted if the server fails."

### ***Rapid Development of High Performance, Unlimited Scalability***

Using SmartSockets' scalable architecture, the PHLX easily can add more clients, servers, and applications to the new system without having to rewrite code. This scalable architecture uses many of the same techniques that have made the Internet scalable, including a hierarchical namespace, dynamic routing of messages, and recovery from transient network failures. Messages can be routed in real time to large groups of processes, with the processes organized hierarchically to any number of levels. SmartSockets will dynamically reconfigure its routing tables as processes come and go and network topology changes.

Because SmartSockets offers unlimited scalability, the Exchange will have fewer development concerns as its system continues to grow at its unprecedented rapid pace.

### ***Precursor to X.Station Project***

The Specialized Quote Feed system, according to Schafer, was a major step toward the Exchange's X.Station project, a system that eliminates much of the current paper-based transactions, allowing the floor specialist to improve the speed at which transactions can be handled. The X.Station project design relies upon the publish-subscribe paradigm offered by SmartSockets.

"The Specialized Quote Feed System was the first release of our software with SmartSockets publish-subscribe middleware and the first release of a client/server architecture that takes advantage of publish-subscribe messaging," said Schafer. "SmartSockets' RIDE has also contributed tremendously to developing X.Station and getting it to market quickly."

### ***RIDE Cuts Development Time 20 to 30 Percent***

"SmartSockets' RIDE has helped us cut our development time by about 20 to 30 percent," said Schafer. "Using SmartSockets has allowed us to eliminate most of the infrastructure design decisions that needed to be made when developing an application. SmartSockets publish-subscribe paradigm gives us the built-in guaranteed message delivery and failover—and a lot of other things that we used to have to do ourselves—right out of the box and into the application. The result is that we are able to spend more of the project schedule concentrating on the ultimate goal, delivering high quality and reliable functionality to the end-user."



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