



“WE STRIVE TO  
BE THE MOST  
ADVANCED  
EXCHANGE IN  
THE WORLD.”

Robin Paine, CTO of the  
London Stock Exchange.

# CAPITAL GAINS:

IN THE INCREASINGLY COMPETITIVE AND

# LONDON

GLOBAL FINANCIAL MARKET. THE LONDON STOCK

# STOCK EXCHANGE

EXCHANGE LOOKS TO AMD TO PROVIDE AN EDGE.

By SAMUEL GREENGARD

The success of a Stock Exchange can't be measured simply by the sum of its trades. More likely, it's the sum of its associates that, in the final analysis, will help it achieve success while earning global renown. ¶ Billions of transactions take place every day. And in today's global financial landscape, where capital flows across boundaries and borders at the speed of light, orderly and efficient execution of trades is crucial to the wealth and well-being of investors. Any perception that the systems that drive them can't handle the traffic portends doom for investors, companies and international markets alike.

Among them, the London Stock Exchange (LSE) is at the forefront of today's financial marketplace, thanks, in part, to the companies it has chosen to work with. Home to 3,168 listed companies with over £5.2 trillion of equity business

transacted annually, the 205-year-old market continues to depend on innovative IT strategies to ensure that it not only is able to compete against other global exchanges but that it is also able to position itself as a technology and perfor-

mance leader. "We strive to be the most advanced exchange in the world," says Robin Paine, the chief technology officer of the London Stock Exchange.

To accomplish such a heady goal, over the last three years, the LSE has pursued a Technology Road Map (TRM) that is designed to provide its customers with the fastest, most cost efficient, functionally rich, robust trading environment in the world. In addition to next-generation technology, the sheer processing power of AMD Opteron™ processors will play a key role in achieving that optimal business performance "Today's markets are driven by the need for high velocity information and trade execution," Paine says.

So far, the initiative is paying off, and in a big way. A key TRM milestone was achieved in September 2005 with the implementation of Infolect, which claims to be the fastest real-time information delivery system of any exchange in the world.

Since its implementation, the LSE has reduced information dissemination latency from 30 milliseconds to as little as 2

and has experienced 19 out of its top 20 trading volume days ever, while maintaining continuous service availability.

### Putting Technology to Work

Although the New York Stock Exchange (NYSE) and NASDAQ receive the lion's share of attention in the United States, exchanges in London, Paris, Frankfurt, Hong Kong, Singapore, Tokyo, Australia and dozens of other locales are playing an increasingly important role in supporting global stock trading. For a growing number of companies both large and small, the goal isn't to be listed on an exchange, it's to be listed on the *right* exchange.

That makes the battle for technical leadership no small matter. While geographic proximity often plays a role in determining on which exchange companies list their shares, an exchange's underlying infrastructure must be able to provide fast, efficient transaction processing. This keeps pricing volatility to a minimum and allows the market to function more efficiently. Over the long run, a more liquid stock attracts greater inter-

est from investors and achieves a higher valuation and ability for the firm to raise investment capital.

But liquidity doesn't happen in a vacuum. Neither does satisfying major brokerage firms and banks that use powerful algorithmic trading engines. If order slippage occurs due to system latency—that is, the trading price of a stock changes from the time a buyer or seller receives a market price and attempts to execute the actual trade—there is a greater likelihood that the trade is not completed. For a Stock Exchange, the loss of business—and resulting fees—can prove substantial. "Order execution certainty is a core issue. Every millisecond makes a difference," Paine points out.

For an exchange, achieving outstanding performance increasingly translates into a powerful technology foundation that can execute trades at blinding speeds. Three years ago, the LSE embarked on an ambitious four-year initiative to move its legacy trading systems on to next-generation technology. The most significant introduction of technology



In today's trading markets, mere milliseconds can make a world of difference.

## STRATEGIC MEASURES

Here's a glance at the London Stock Exchange's fundamental business imperatives and what it's doing to support them.

Paramount to the Exchange's business strategy is the goal to compete globally in the market for financial transaction services and be the market of choice. Next, but no less important, is the goal to grow existing business and the reach and scale of operations, through business development initiatives, acquisitions, joint ventures and alliances, where appropriate. To implement this strategy, the Exchange will pursue three objectives, listed below.

1. Reinforce and extend the position as the premier source of equity market liquidity, benchmark prices and market data in the European time zone.
2. Operate a diversified business that capitalizes on the emergence of an increasingly innovative business environment, through leadership in technology and market services.
  - The Exchange has embarked on an initiative to refresh its technology systems and operations through its Technology Roadmap. It will achieve completion of this initiative in 2007. This represents the biggest change in its trading systems since the implementation of the Sequence Programme and SETS between 1994 and 1997.
  - The Exchange pursues a business model that supports choice, accommodates diversity and recognizes different customer business models.
3. Deliver superior value to customers and shareholders.

The result is a business approach that delivers the best value to customers and shareholders.

revolves around the Exchange's SETS order book system. The system, which first appeared in 1997, serves as the underlying engine for executing trades. Although the LSE has achieved significant gains with its existing system—in the last five years SETS volumes have risen at a Compound Annual Growth Rate of 43 percent—a more efficient trading system that will go live in the early part of 2007 promises to drive further speed increases and provide an array of supplemental benefits.

To ensure efficiency, the LSE has chosen to rely solely on AMD Opteron processors, models 275 and 875, running at 2.2 GHz to power the new trading system. In late 2005, after examining a variety of factors, including processing power, performance standards and

bandwidth and speed gains allow the LSE to link two primary data centers with a third facility that acts as an arbitration facility. It constantly checks on the quality of data output from the two main data centers and arbitrates any differences or discrepancies it finds.

What's more, the 64-bit computing environment achieves performance gains that previously weren't possible. The LSE uses a proprietary middleware product called iBus, which it developed in-house, to support real-time replication and arbitration capabilities across its data centers. Using several hundred thousand lines of C# code developed in a .NET framework, IT techs were able to develop functionality specifically suited to the LSE's demanding environment.

The result is high utilization levels

---

**“These companies are trading millions and billions of dollars every day. Fast transactions and exceptional analysis and modeling are the competitive advantages they sell to their customers,” adds Bruce Shaw, director of worldwide commercial marketing for AMD.**

---

scalability, the LSE concluded that the “AMD Opteron processors with Direct Connect Architecture offered a significant advantage over the competition,” Paine recounts. No less attractive was the fact that AMD Opteron processor-based servers allow a commodity-based approach and that IT techs can easily swap them in and out. The LSE committed to purchase 250 AMD Opteron processor-based Hewlett-Packard DL585 and DL385 servers and weave them into their IT infrastructure. The systems run atop the Microsoft Windows Server 2003 operating system.

As it happened, the technical enhancements of AMD's offerings were a huge selling point. AMD Opteron processors have AMD's revolutionary Direct Connect Architecture, an integrated memory controller and HyperTransport™ technology. For the LSE, the combination is ideal. The additional memory

for servers, a reduction in the number of physical servers needed and power savings, all thanks to the AMD Opteron processor's efficient architecture. “While the primary factor for choosing AMD technology is performance characteristics,” Paine notes, “cooling issues are an important issue, and AMD Opteron processors reduce the challenges considerably. Overall, it offers the best combination of price, performance and power characteristics for the Exchange.”

### A Shining Example

Bruce Shaw, director of worldwide commercial marketing for AMD, believes that the LSE's situation is not unique—though its computing demands do push the boundaries on performance. “AMD is able to offer a leading-edge solution for processing performance per watt,” he says. In fact, AMD64's Direct Connect Architecture and HyperTransport technol-



ogy provide a tightly coupled coprocessor expansion capability and address the communications bottlenecks that force systems to off-load activity to coprocessors in other solutions.

These capabilities are just the latest in a string of performance gains that have boosted AMD's market share in the critical computing arena of financial markets. "These companies are trading millions and billions of dollars every day. Fast transactions and exceptional analysis and modeling are the competitive advantages they sell to their customers," Shaw adds. In fact, an overwhelming majority of top Wall Street firms rely on AMD technology.

For the LSE, the efficiencies have come not a minute too soon. With trading volumes increasing on a year-over-year basis and customer expectations growing exponentially, the need for speed and power won't abate any time soon. "It's essential that we keep ahead of an extremely demanding business environment," Paine states.

### Beyond Business As Usual

The list of companies traded on the LSE reads like a Who's Who of global business: Vodafone, Lloyd's, Barclays, BP, Euro Disney, BAE Systems and UK Coal are just a few of the companies that have chosen to join the Exchange's markets. However, the LSE provides more than just another trading platform—it's a comprehensive provider of services for stocks, bonds, covered warrants and international equities.

The LSE's core areas of business fall into three main categories: listing stocks so that companies are able to tap into global funding and maximize their value; offering trading platforms used by the Exchange's 356 member firms; and supplying high-quality, real-time prices, news and other information to the global financial community.

One key factor contributing to the LSE's success is the growth of the SETS platform. The shift to high-volume electronic trading on SETS has been driven by the LSE's investment in technology. To be sure, Infolect, a key component of

TRM, is already changing the face of the business by providing a marked stimulus to the number of SETS trades.

Introduced to replace the London Market Information Link, Infolect enhances the way the LSE delivers data to its customers. Infolect currently broadcasts some 14 million messages a day, with over 106,000 terminals receiving real-time market data from the LSE. It has reduced average message latency 15-fold and peak message latency 25-fold. It supports message dissemination rates of 3,500 mps and is scalable to 100,000 mps. And it's agile and flexible—allowing the LSE to introduce new products and services faster, in order to meet customer demand. For traders, the system has ushered in a new era of dependability and execution assurance.

The combination of hardware and software will also create new opportunities for traders—and the LSE. For instance, the LSE plans to introduce a premium Infolect service that will allow technical traders and automated trading systems to take advantage of faster data feeds and

trading tools for an additional fee. This approach is attractive for those traders attempting to trade shares based on tiny fractional changes. A delay of a few milliseconds could unravel profits.

Make no mistake, when the LSE unveils its new trading platform in 2007, it will be part of a continuing list of upgrades and improvements. Paine says that the LSE is searching for new ways to leverage its massive data warehouse, including more robust use of historical and statistical data. “We’re looking to create new products that will further drive increases in trading volume,” he says. “The goal is to put all the technology to maximum strategic use.”

#### A Healthy Exchange

In today’s financial world, it’s important to have a vision to the future as well

as a view into what drives success. The LSE’s technology roadmap focuses on 10 guiding principles, including future software agility, low cost of ownership, high availability and high performance [see sidebar, Technology Vision: The 10 Guiding Principles]. This approach has helped the LSE to realize the lofty goal of building the fastest real-time information delivery system of any Exchange in the world, to boost its trading capacity and to become the first European Exchange to deliver a next-generation trading system today.

The LSE hopes that its technology path—which so far totals a £36 million investment—will position it three to five years ahead of its competitors.

One thing is certain: other stock Exchanges, including those in New York, Hong Kong and Frankfurt, aren’t

standing still. All are embracing leading-edge IT in an effort to drive improvements and trim precious milliseconds off the time required to make a trade. They’re also opening new offices and using aggressive methods to lure companies—particularly in regions like China. As trading volumes and capital grow, this scenario is likely to continue.

Yet, through it all, the LSE is positioned for success. Its emphasis on advanced IT, such as AMD Opteron processors, and best-practice business methods have kept the storied Exchange in the spotlight. Paine sees the current project as only one part of an ongoing evolution and commitment to change. “In today’s financial world, it’s essential to keep moving forward,” he observes. “There’s no substitute for continuous improvement and innovation.” ■

## TECHNOLOGY VISION: THE 10 GUIDING PRINCIPLES

The Exchange outlined its technology vision and master plan in 2003. At the time, it developed 10 guiding principles for navigating the challenging requirements of the Technology Roadmap project.

### TECHNOLOGY CAPABILITIES

Multiproduct	Able to support multiple markets across multiple asset classes	Flexible	Capability to add functionality, products and capacity quickly and cost-effectively
Multifunctional	Fully integrated cash and derivatives trading functionality	Multiplatform	Able to run on multiple hardware platforms, selected to suit size/value of market
Global capability	Full multi-time zone, multicurrency capability	Cost-efficient	Cost-effective to operate, maintain, enhance and scale
Very high service levels	Continue to provide market-leading levels of service and reliability	Open global access	Able to support current interfaces as well as all emerging standards
Very high performance levels	Able to support step change in current volumes with high levels of performance	New technology	Based on next-generation technologies