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REAL WORLD CASE 3

Wachovia and Others: Trading Securities at the Speed of Light

Securities trading is one of the few business activities where a one-second processing delay can cost a company big bucks. Wachovia Corporate and Investment Bank is addressing the growing competitive push toward instantaneous trading with a comprehensive systems overhaul. In a project that has cost more than \$10 million so far, Wachovia is tearing down its systems silos and replacing them with an infrastructure that stretches seamlessly across the firm's many investment products and business functions.

"Competitive advantage comes from your math, your workflow and your processes through your systems. Straight-through processing is the utopian challenge for Wall Street firms," says Tony Bishop, senior vice president and head of architecture and engineering. The first step in the project, according to Bishop, was to prepare a matrix that cross-referenced every major function (such as research, risk management, selling, trading, clearing, settlement, payment, and reporting) to each major product (debt and equity products, asset-backed finance, derivatives, and so on). The project team then had to take a hard look at the existing systems in each cell. "We looked at the current systems and said, 'Where can we build standardized frameworks, components and services that would allow us to, instead of building it four different times in silos, build it once and extend it into one common sales platform, one common trading platform and so on?'"

The resulting Service Oriented Enterprise Platform is connected to a 10,000-processor grid using GridServer and FabricServer from DataSynapse Inc.

In its data centers, Wachovia brought in Verari Systems Inc.'s BladeRacks with quad-core Intel processors. Bishop says he's creating a "data center in a box" because Verari also makes storage blades that can be tightly coupled with processing blades in the same rack. The processing load at the bank involves a great deal of reading and writing to temporary files, and the intimate linkage of computing and storage nodes makes that extremely efficient.

"We now do pricing in milliseconds, not seconds, for either revenue protection or revenue gain," says Bishop. The advanced infrastructure has tripled processing capacity at one-third the cost, for a ninefold financial return, Bishop adds. Report generation that used to take 16 hours is now done in 15 minutes. "This is where IT becomes the enabler to new business capabilities," he says.

Executing complex strategies based on arcane mathematical formulas, algorithmic trading systems generate thousands of buy and sell orders every second, many of which are canceled and overridden by subsequent orders, sometimes only a few seconds apart. The goal of these computer traders is to profit from minute, fleeting price anomalies and to mask their intentions via "time slicing," or carving huge orders into smaller batches so as not to move the market. A one-millisecond advantage in trading applications

can be worth \$100 million a year to a major brokerage firm, by one estimate.

The fastest systems, running from traders' desks to exchange data centers, can execute transactions in a few milliseconds—so fast, in fact, that the physical distance between two computers processing a transaction can slow down how fast it happens. This problem is called data latency—delays measured in split seconds. To overcome it, many high-frequency algorithmic traders are moving their systems as close to the Wall Street exchanges as possible.

Wall Street's quest for speed is not only putting floor traders out of work but also opening up space for new alternative exchanges and e-communications networks that compete with the established stock markets. E-trading has reduced overall volatility in the equities markets, because volatility is a product of herd buying or selling, and e-trading—responding instantaneously to tiny price fluctuations—tends to smooth out such mass behavior. It has also provided established exchanges with new revenue opportunities, such as co-location services for companies that wish to place their servers in direct physical proximity to the exchanges' systems. E-trading has also created opportunities for a new class of vendors—execution services firms and systems integrators promising the fastest possible transaction times.

At its most abstract level, the data-latency race represents the spear point of the global movement to eradicate barriers—geographic, technical, psychological—to fair and transparent markets. "Any fair market is going to select the best price from the buyer or seller who gets their [*sic*] order in there first," says Alistair Brown, founder of Lime Brokerage, one of the new-school broker-dealers, which uses customized Linux servers to trade some 200 million shares a day. "At that point, speed definitely becomes an issue. If everyone has access to the same information, when the market moves, you want to be first. The people who are too slow are going to get left behind."

Value in Milliseconds

On the New Jersey side of the Lincoln Tunnel, in an anonymous three-story building, is one of the financial world's most important data centers. Pushing the doorbell at the unmarked main entrance won't get you inside. It's merely a facade; the real entrance is harder to find.

The servers for five electronic exchanges are located in this data center, along with computers belonging to dozens of trading firms. Run by hosting company Savvis, the Weehawken facility is home to some of the most advanced trading technology anywhere. Much of Savvis's growth can be traced to the spread of what's known as direct market access. In the past, traders used consolidated feeds, which are market data updates such as those provided by Reuters

and Thomson. Distributing those feeds, however, could take up to 500 milliseconds, far too long for today's automated trading.

"Now you're seeing a lot of the market data providers and vendors who have direct exchange-feed connectivity," says Varghese Thomas, Savvis's vice president of financial markets. Savvis provides connectivity from the exchange directly to the client without having to go through a consolidated system. The exchanges themselves are also profiting from the demand for server space in physical proximity to the markets. Even on the fastest networks, it takes 7 milliseconds for data to travel between the New York markets and Chicago-based servers and 35 milliseconds between the West and East coasts.

Many broker-dealers and execution-services firms are paying premiums to place their servers inside the data centers of the National Association of Securities Dealers (NASDAQ) and the New York Stock Exchange (NYSE).

About 100 firms now co-locate their servers with NASDAQ's, says Brian Hyndman, NASDAQ's senior vice president of transaction services, at a going rate of about \$3,500 per rack per month. NASDAQ has seen 25 percent annual increases in co-location in the last two years.

Physical co-location eliminates the unavoidable time lags inherent in even the fastest wide area networks. Servers in shared data centers typically are connected via Gigabit Ethernet, with the ultra-highspeed switching fabric called InfiniBand increasingly used for the same purpose, says Yaron Haviv, CTO at Voltaire, a supplier of systems that can achieve latencies of less than a microsecond, or one-millionth of a second. Later this year, NASDAQ will shut down its data center in Trumbull, Connecticut, and move all operations to one opened last year in New Jersey, with a backup in the mid-Atlantic region, Hyndman says. (Trading firms and exchanges are reluctant to disclose the exact locations of their data centers.)

The NYSE will begin to reduce its 10 data centers to two in the next couple of years, says CTO Steve Rubinow. Co-location, Rubinow says, not only guarantees fast transactions, but also predictable ones. "If you've got some trades going through at 10 milliseconds and some at 1 millisecond, that's a problem" he says. "Our customers don't like variance."

One of the biggest co-location customers is Credit Suisse, which handles about 10 percent of all U.S. equity trades daily and which helped pioneer black-box trading systems with exotic algorithms that go by monikers like Sniper, Guerrilla, and Inline. Credit Suisse maintains Sun and Egenera blade servers, some running Linux and some Windows, in all the major U.S. markets, says Guy Cirillo, manager of global sales channels for Credit Suisse's Advanced Execution Services (AES) unit, which serves major hedge funds and other buy-side clients.

The AES trading engine in Credit Suisse's Manhattan headquarters is replicated in London, Hong Kong, and Tokyo.

Guaranteed transaction times for AES clients—from the time the order is received on the Credit Suisse system until it gets an acknowledgment from the exchange, e-communications network or "crossing network"—has dropped from 15 milliseconds to 8 in the last year, Cirillo says. Total execution time also includes any delays within the exchange or "liquidity point" itself, a latency variable over which Credit Suisse has no control.

"That response time is something the ECNs [electronic communications networks] and the exchanges compete on as well," Cirillo says. "Their latency, their turnaround time, and their infrastructure are all part of the electronic game."

Source: Adapted from Gary Anthes, "Split Second Securities Trading at Wachovia," *Computerworld*, May 21, 2007; and Richard Martin, "Wall Street's Quest to Process Data at the Speed of Light," *InformationWeek*, April 21, 2007.

CASE STUDY QUESTIONS

1. What competitive advantages can the companies described in the case derive from the use of faster technology and co-location of servers with the exchanges? Which would you say are sustainable, and which ones temporary or easily imitable? Justify your answer.
2. Tony Bishop of Wachovia stated that "Competitive advantage comes from your math, your workflow and your processes through your systems." Referring to what you have learned in this chapter, develop opposing viewpoints as to the role of IT, if any, in the development of competitive advantage. Use examples from the case to support your positions.
3. What companies in industries other than securities trading could benefit from technologies that focus on reducing transaction processing times? Provide several examples.

REAL WORLD ACTIVITIES

1. Most of the discussion in the case was done from the perspective of the trading firms and the value that these technologies add to them and their customer. However, the case also mentions actions taken by stock exchanges to improve their transaction processing and turn these needs into a revenue-generating asset. Research what recent technologies have been implemented by major stock exchanges such as NYSE and NASDAQ and prepare a report detailing what benefits have occurred as a result.
2. The technologies described in the case represent an example of how different barriers to the flow of goods and information are being overcome by the use of IT. Break into small groups and select an industry other than the one described in the case; brainstorm what barriers to commerce you see there and how IT may help to do away with them.