Application Note:
Time Synchronization's Role in Real-Time Trading

In today's financial world, transactions occur instantaneously. Supporting this real-time network environment can be complex and overwhelming. These networks incorporate real-time database systems that store and transfer increasingly large amounts of data. As databases and real-time processes merge, there is increased demand for and greater emphasis on the information management timing associated with electronic transactions.

One application involving large amounts of data and demanding time constraints is arbitrage trading. Arbitrage trading deals with trading commodities in different markets at different prices, all in real time. Price discrepancies are short-lived, so automation is necessary to manage large amounts of trading information quickly. Success in arbitrage trading depends on the ability to analyze a wide variety of information sources (databases) in real time, which helps determine when the right conditions exist to execute highly profitable trades.

To monitor these buy-sell events properly, the system must function in a timely matter. In arbitrage trading, time really is money. The transactions associated with this trading are called real-time transactions because they have explicit time constraints associated with them.

Real-time transactions and related data can be categorized into classes depending on certain properties. Among these properties are the timing and synchronization of the transactions. Real-time transactions create the need for precise, synchronized time. If a transaction is not processed within its deadline constraints, the transaction may not be completed. Real-time transactions also follow set transaction sequences that are determined by time stamps. Many problems can occur, if the time-stamp is not accurate in relation the actual transaction or event time. If the time-stamp is ahead of the actual time at which the event occurred, all events from that time forward will be tracked inaccurately because one cannot go backwards in time to correct the differences. To change what has happened disrupts the entire sequence of transactions. This problem also affects the movement of real-time transactions from one system to another. Proper event execution cannot be guaranteed if the systems involved produce conflicting time stamps.

GPS-enabled network time synchronization addresses these problems by providing secure, accurate, and reliable time for events and synchronizing this precise time across all elements in the network. When an event occurs and is logged into the real-time database, the time associated with the event is accurate to national and international time standards. Synchronizing the time at which a transaction is executed from one system to another allows these systems to properly process transactions accurately.

Time synchronization also helps financial institutions comply with industry regulations. The National Association of Securities Dealers (NASD) uses its Order Audit Trail System (OATS) to monitor and regulate financial transactions. OATS rules require each NASD member to provide an "accurate, time-sequenced record of orders and transactions," as well as "market-wide synchronization of clocks used in connection with the audit trail." Time synchronization provides accurate time stamps, ensuring that the time associated with logged events is correct.

How is time synchronized? Doing so requires an accurate, reliable, secure time source. This source must provide Coordinated Universal Time (UTC) and deliver it across a network.

A method for time synchronization that one should approach with caution is to use a time source that is accessible through the Internet. This creates the potential for problems. If the Internet source is unattainable (as any site can be from time to time), the network's time is compromised or unavailable, which can result in incorrect timestamps. Using the Internet for a network's time source also requires opening port 123 in the firewall, creating an entry point for hackers. A "spoofed" or other-wised hacked Internet time source could also result in compromised financial data and lead to real business losses.

The best solution for time synchronization is a dedicated network time server. Such a device provides a common time source used by all devices on a network. Installing a dedicated time server enables a financial services provider to comply with industry regulations, policies, and mandates concerning time stamping and authentication verification.

Spectracom Corporation offers a low-cost solution to the complexity of time synchronization for arbitrage trading. Spectracom's NetClock® time servers provide secure, accurate and reliable time synchronization across the entire network enterprise. The time accuracy can range from ±50 microseconds to 1 millisecond relative to UTC time without having to compromise security. UTC is established through a GPS signal that is legally traceable to national and world time standards to reduce risk and liabilities, thus Spectracom is able to offer Legally Traceable Time®.

Many financial institutions, including some of the world's largest investments banks, rely on Spectracom's NetClock time servers to support their time synchronization and regulatory compliance initiatives.

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