



Real-Time Event Management in Financial Markets

Overview

Competition, regulatory changes and market volatility necessitate extremely sophisticated decision making tools for financial institutions to thrive in this complex marketplace. Further, the data volumes that are generated in real-time (e.g., market data) or need to be analyzed (reference data, historical data) have also increased significantly. This forces firms to have systems in place that not only can enable high-speed decision making but can also constantly infer the impact of data changes and drive appropriate changes to trading strategies and decisions.

Bad decisions or slow decisions result in direct loss of money and hence there is significant importance in identifying profitable opportunities and executing on those with no latency. Today's trading environments lack the ability to sift through the information deluge and discern specific patterns of interest. In certain cases, custom applications can sense and respond to pre-defined scenarios of interest, but the changes in market conditions require changes to the patterns being monitored. Since these hard-coded applications cannot handle this dynamic environment, they can potentially lead to incorrect decision-making and an increased risk in trading operations.

Today's market needs the flexibility to deal with real-time market data, run sophisticated algorithms and analytics on this data and respond to events derived from these algorithms instantaneously. Some of these analyses require historical data to be available on demand. The ultimate goal would be have a black box that receives streaming market data, computes various aggregates of the data streams, makes decisions based on rules learned from historical data, and execute trades automatically with limited human interference.

GemFire™ Real-Time Events (RTE) is a next generation event management system that enables financial institutions to gain competitive insight from the most up-to-date market data while correlating it to other sources of information. Whether it is forecasting price movements based on "pairs" trading strategy, capitalizing on price differences in related asset categories or monitoring violations of trading limits on instruments, GemFire Real-Time Events makes it extremely simple to configure such strategies and profit significantly. Users can use intuitive tools and APIs to define event patterns or conditions and specify intervals in which notifications have to be sent based on real-time data feeds.

Technologically speaking, RTE is a main-memory based active event management system that can analyze thousands of events and distribute events of interest to hundreds of remote clients in real-time. With RTE, financial institutions can instantly identify relevant events based on real-time information that is constantly changing; immediately analyze these events with the ability to correlate with other sources of information like historical data and reference data; intelligently distribute appropriate information to relevant clients and applications that have to react to these business events.

Key Benefits of this solution include:

- Increased speed in decision-making for trading environments.
- High performance and scalability in large scale event processing.
- Ability to correlate real-time events with historical data and reference data.
- Easy deployment, intuitive to use and lower trading infrastructure costs.
- Increased use of sophisticated strategies and value-added calculations to assist trading decisions.
- Ability to handle large volume of events and data including news, data from various markets, etc.

Real-Time Events Use-Cases in Finance

Electronic Trading

Profitable trading requires the ability to cope with the deluge of market information and identifying opportunities of relevance. GemFire Real-Time Events can help traders do exactly that.

Pattern-based Alerts: "generate an alert when MSFT price>30, S&P > 1500 and news item exists for MSFT, IBM and HP". Even more complex conditions can be used to automatically drive buy/sell decisions and execute profitable transactions.

Time-based calculations: Event streams with information about specific securities can be analyzed and metrics like VWAP, moving averages and other analytic measures monitored to ensure if they are within accepted values.

Trading strategies: Techniques like pair trad-

ing, futures and options spreads trading or arbitrage strategies (like index and statistical arbitrage) can be easily accomplished by configuring RTE to monitor multiple market data feeds across instruments and asset categories as the case may be. For e.g., one could configure RTE to monitor the price of IBM in different exchanges to rapidly capitalize on price differences or monitor the price of IBM and HP over time and execute a buy/sale when the spread between the two violates historical norms. Further, events from multiple sources like options exchanges and equities markets can be correlated with each other to identify profitable trading opportunities.

Risk Management

Managing risk in real-time requires monitoring multiple data sources and event streams efficiently. A solution like RTE can facilitate portfolio management operations by highlighting market events that impact metrics like VaR. Real-time event analysis is also critical in accurate computation of sensitivity and market volatility for instance in derivative markets (ala 'Greeks').

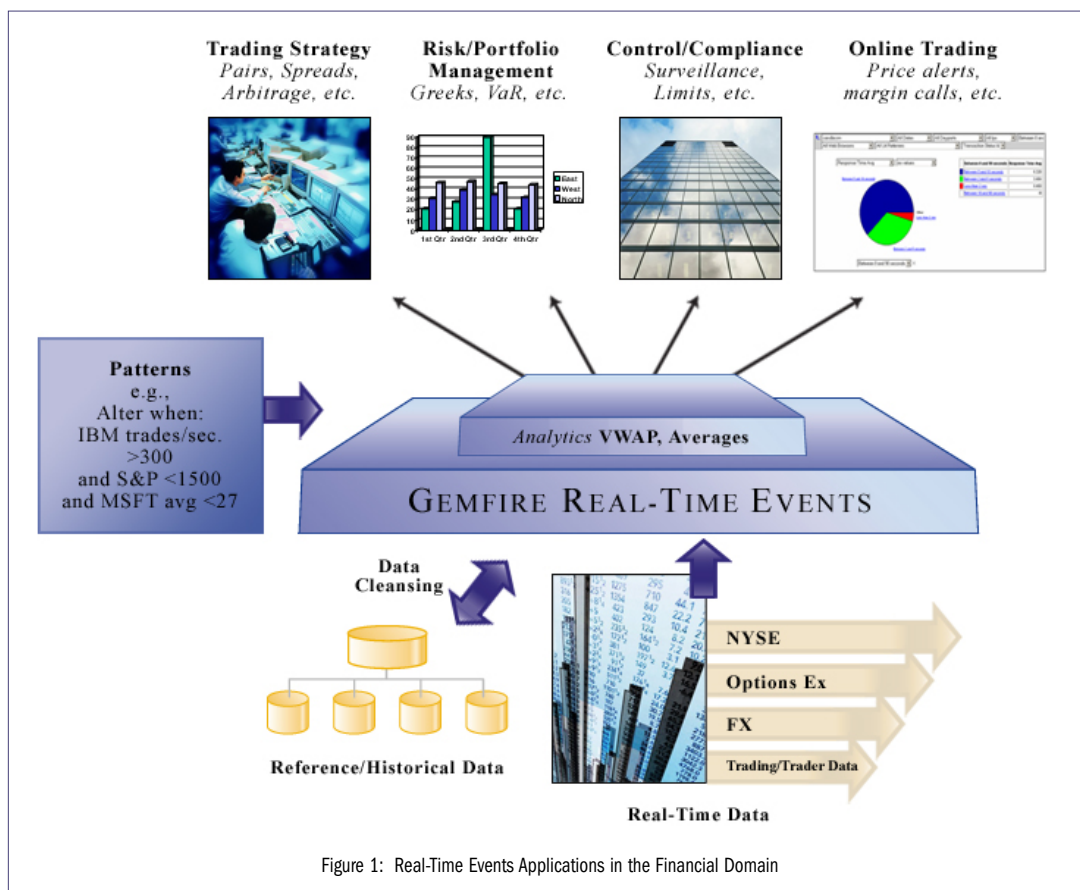


Figure 1: Real-Time Events Applications in the Financial Domain

In certain instances time-based risk analysis can be performed by analyzing events in time windows and by correlating the data with other sources of information like historical data and reference data.

Enterprise risk management entails understanding relationships in the changes that occur across multiple asset categories and across multiple risk domains (credit, market and operational risk). RTE can provide the ability to analyze events in these different fronts and assist in comprehensive risk assessment especially while dealing with complex financial instruments, which are sensitive to market fluctuations in many dimensions.

Compliance and Control

These days financial institutions have to be cognizant of an increasing amount regulations, both internal and external, that impact their operations like trading, clearing, settlement and risk management. The ability to track any violation or potentially fraudulent activity can save firms a significant amount of money, reduce risk and avoid any legal headache.

For instance, if there exists an internal control limit on the overall percentage of IBM shares that can be held by an asset management firm across all their portfolios, RTE can be easily configured to model a scenario such as: 'generate an alert if any of the trades results in overall percentage of IBM > 10 (update every 100ms)'.

Also, trading data can be investigated as and when trades are executed to monitor specific patterns of trades and detect any fraudulent activity. Alerts can be configured using RTE to detect genuine cases of wash trades or any

other form of pre-arranged trades that violate regulations. In such instances ability to monitor multiple event streams in real-time and in a time-phased manner becomes important.

Retail Brokerage

Given the current market volatility, retail investors can greatly benefit from real-time alerts that are generated based on market data as well as related news items. Similar to the scenarios discussed under trading strategy, RTE can be used to create real-time alerting mechanisms that signal retail investors about portfolio positions, margin calls, etc.

Such services can help brokerage firms greatly improve customer service and rebuild investor confidence.

Data Cleansing and Fault Detection

Increasing data volumes that have to be processed in financial systems further burdens the data infrastructure that supports them. Further, erroneous records in areas like reference data can cause significant operational inefficiencies in trading and related activities.

In such situations, RTE can help in identifying data inconsistencies and faults as and when reference data is published into the system. This can be accomplished by monitoring incoming data and checking for relationships and expected patterns. Such approaches to cleanse the data prior to storage in reference databases can prevent incorrect data from becoming pervasive in the system and avoid any errant decisions to be made based on this data. This also eases the data management operations in such financial IT systems.



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