

Financial industry solutions

White paper

September 2006



**WebSphere** software

## **IBM WebSphere Front Office for Financial Markets software.**

*Supporting an adaptive front office with a low-latency,  
reliable, open, market data distribution platform*

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**Introduction**

Market data is the lifeblood of financial markets firms. And evolving marketplace drivers are putting more and more demands on IT departments as firms race to use technology to their advantage. Today, the ability to manage an increasing flood of data to stay competitive and gain business advantages is critical. In recent years, market data volumes and speeds from securities markets have accelerated rapidly. In 2005 alone, ticks (price changes) per second increased from 25,000 to 120,000. At the same time, firms have introduced machine-based trading programs that employ algorithms and advanced execution strategies, creating a need for lower-latency data delivery. Today, a microsecond delay in a response to price changes in the securities markets can mean the difference between significant gains and losses. As if that weren't enough to deal with, there are compliance issues to address. More exchanges and data sources, combined with the accelerating speed and volume of data, increase the complexity of complying with exchange and government rules and regulations.

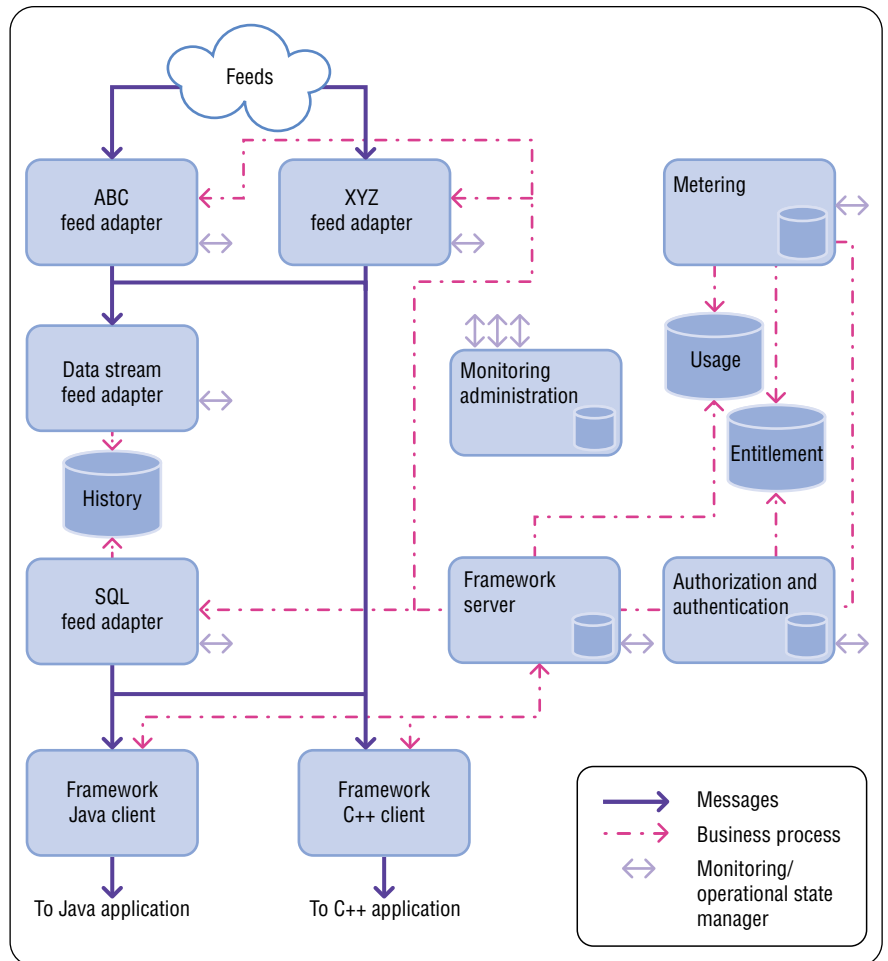
Business executives are turning to their IT managers to provide data management solutions that can bring strategic and tactical advantages to their firms. In the financial markets arena, IT departments must, for example, be able to scan a host of securities markets quickly, transparently and simultaneously to find the best securities prices. And, as IT departments look for solutions, speed is only one consideration. Reliability, security, flexibility and scalability are also paramount for long-term success.

IBM WebSphere® Front Office for Financial Markets software is a data vendor neutral solution that IT managers can deploy to meet their complex market data requirements. This white paper introduces the WebSphere Front Office for Financial Markets (WebSphere Front Office) software solution and provides an overview of how its technical features and capabilities can help financial markets firms address key business challenges related to data distribution.

**WebSphere Front Office for Financial Markets software solution overview**

WebSphere Front Office software provides a single platform that financial markets firms can use to manage all of their complex market data requirements across the enterprise. It is a highly flexible and modular front-office

feed processing and distribution platform that is designed to deliver high performance and low latency. WebSphere Front Office software is data feed agnostic and enables the collection and high-speed distribution of aggregated and direct-exchange data to machine-based trading and decision-support applications. The platform includes leading-edge technology from IBM Research that delivers sub-millisecond latency and high throughput while providing safeguards against data loss. And it can store large amounts of time-series data (for example, the entire tick content for a feed during a trading session) in memory for applications that are sensitive to price variations.



Functional layout of IBM WebSphere Front Office for Financial Markets software solution components.

The following are high-level descriptions of each of the major components and features in a WebSphere Front Office software solution:

- **Feed adapters.** Handle all feed data coming into or out of the infrastructure; are customized to be source specific; use a shared library that runs on a common feed adapter run time
- **Intraday history cache.** Acts as a streaming market data cache that receives data from the custom feed adapter in real time to provide a time series capability; allows the solution to capture received or generated market data
- **Framework client.** Provides an application programming interface (API) through which end user applications access market data
- **Framework server.** Coordinates the operation of the various solution components to service individual client requests by the end user application
- **Authorization and authentication.** Ensures that users and/or applications are authorized to access the platform and are entitled to receive the data they wish to consume; audit trails support vendor and regulatory compliance
- **Metering.** Records changes to the data in the security system and the authorization of requests for data and extracts them to a long-term storage data warehouse for auditing purposes
- **Monitoring.** Enables the administrator to assess the health and availability of each infrastructure component from a single location
- **Administration.** Creates a single point of control for the separate components and hardware services in a WebSphere Front Office solution through IBM Tivoli® desktop system administration software
- **Global configuration repository.** Provides an XML schema that helps simplify the configuration of the different components and servers
- **High availability.** Supports a component redundancy approach to high availability

The role of SOA in WebSphere Front Office solution development

To help optimize solution flexibility, IBM used service-oriented architecture (SOA) concepts and development techniques when it created WebSphere Front Office software. The solution provides access to business functions in a way that is specific to the industry semantics of the operations to be performed by solution APIs. As a result, business functions are expressed via market data semantics rather than a generic API set like Java™ Message Service (JMS). The market data semantics are expressed in XML and resemble Web services semantics. To lighten the development burden, the underlying code required to implement these functions is almost completely abstracted from the developer making the API call.

IBM WebSphere Application Server software is the foundation for WebSphere Front Office software control functions. WebSphere Application Server software uses an internal messaging bus (similar to an enterprise service bus) to facilitate messaging and functional invocation between the framework server and internal components, such as feed adapters.

There are several advantages to incorporating SOA attributes into WebSphere Front Office software. Web services that offer simple and complex business functions between an application and a trading system or marketplace interface are being defined now and will become increasingly common. And as standards-based Web services are defined for financial markets, WebSphere Front Office software can provide interfaces to these functions. Additionally, the solution can link with IBM's full SOA product portfolio.

**Business benefits and technical enablers: a closer look**

WebSphere Front Office software delivers five key business benefits to financial markets firms. This section examines each of the benefits along with the technical functions and capabilities that enable them.

Delivers low latency and high throughput through patented technology

Financial markets firms must adapt to both the exponential growth of data volume and the need for low-latency data delivery. And electronic trading, model-based trading and “best-execution” regulations all necessitate a market data platform that can provide low-latency delivery of high volumes of data.

The feed adapter framework helps firms address these challenges. It is optimized C code that handles all feed data coming into or out of the solution infrastructure. The feed adapter framework supports faster price discovery and enables firms to process hundreds of thousands of messages per second. It can also store a large amount of online full-tick time-series data. And templates that are part of the feed adapter framework offer extensive configuration capabilities.

The feed adapter framework contains a transport abstraction layer that enables developers to build agnostic transport connectors. They can code for TCP/IP, multicast, other middleware or API layers (for example, Bloomberg B-Pipe). The framework supports feed normalization and translation along with high-speed in-line computations and analytics, cache insertion and update. Subscription-based distribution to consuming applications uses the Reliable Multicast Messaging (RMM) transport in IBM’s patented Binary Self-Describing Tick (BSDT) format. A patented zero-delay batching technology, RMM facilitates highly efficient on-the-wire network packetization. Multiple messages can be fit into a single network packet, helping to optimize use of the network and deliver up to one million messages per second with only microseconds of latency. BSDTs are lightweight, compact, platform-independent on-the-wire message structures. They provide XML semantics and flexibility with the compactness of C machine-native structures.

Facilitates best execution with flexible, customizable feed adapters

Financial markets firms buy and sell securities across multiple marketplaces, each of which produces unique feeds in disparate formats. New government regulations will soon require that dealers and market makers trade at the best price available across all quoting marketplaces. To document compliance, activity history must be available for after-the-fact auditing purposes. To support their cross-marketplace operations, firms can either consume data through direct feeds from multiple marketplaces or they can receive data through a higher latency, consolidated feed from an aggregating vendor.

WebSphere Front Office software feed adapters can improve the ability to see a cross-marketplace best price and help meet best execution requirements. By providing the capability to consume and blend multiple direct feeds, the solution enables applications to update best prices on a per-security basis. The ability to create a cross-marketplace best price for best execution—a key business driver—illustrates the flexible customization and feed processing capabilities of WebSphere Front Office software.

To compute a cross-marketplace best price, separate feed adapters are created, each tailored to the individual marketplace's feed characteristics. The output streams from these separate adapters have a common data model and format, and are distributed to consuming applications via low-latency RMM transport. An additional feed adapter, a blending adapter, subscribes to the output from the multiple streams created by the array of individual market data feed adapters and builds a single cache from the multiple feeds. Rules are applied to the cached data to compute a single best price, which is continuously updated on a tick-by-tick basis as data comes in from the multiple streams. The blending adapter does not need to parse, translate or normalize the data, as those functions—along with marketplace-specific calculations (for example, volume weighted average price)—are performed by the upstream adapters.

A consuming application can subscribe to the best price output of the blending adapter, thus facilitating best price discovery. The application can also invoke business rules that meet requirements for best execution and/or implement specific trading strategies. Additionally, applications that need to consume data directly from an individual marketplace can still subscribe to the data directly from that marketplace's feed adapter. WebSphere Front Office software authorization features enable firms to ensure that users of the blended data have the licenses that entitle them to the underlying feeds. And WebSphere Front Office time series data storage features provide an audit trail to document best execution for regulators or post-trade analysis.

Supports high reliability and adaptability to volume changes

Electronic exchange access and program trading require highly automated integration of market data into front-office trading applications. As a result, availability checking and reinforcement is critical, as is checking and avoiding market data loss. At the same time, a trading solution must be able to scale to accommodate higher data volumes.

A number of WebSphere Front Office software features support financial markets firms' needs for solution reliability, scalability, availability and security. The following are brief explanations of how WebSphere Front Office software supports each of these key requirements:

- **Reliability.** *Accurate, quick RMM messaging technology supports the reliable transmission of messages to consuming applications.*
- **Scalability.** *The feed adapter framework provides fully partitionable, horizontal scaling through configuration parameters. Within the solution, all configurations are expressed using the global configuration repository (GCR), which provides an abstraction layer that allows a generic XML representation of the entire platform function, deployment and major configuration areas. Because each component and the underlying middleware potentially accept confirmation information in different formats, the GCR can translate configuration data from the WebSphere Front Office software semantics to native configuration formats.*



- **High availability.** *WebSphere Front Office software provides a comprehensive and integrated approach to supporting cross-platform, high availability. A distributed consistency service (DCS) component acts as a high-availability facilitator to provide consistency of service among components. It provides component monitoring of all group members and enables rapid identification of component start up, shut down or abnormal termination. DCS also provides high-speed synchronization of message and cache states.*
- **Security.** *A standard feature of the infrastructure, security capabilities include full user definition functions, which are provided via access to standard Lightweight Directory Access Protocol (LDAP) directories. The solution also includes a database that can be used to define users, feeds and their redistributable data products, and user entitlements.*

Provides flexibility to access market data through simpler XML-based options  
Financial markets firms have different requirements for feed delivery to front-office applications. To support their full array of applications, firms need to optimize feeds from direct exchanges and data aggregation services.

WebSphere Front Office software uses XML to support the creation of feed connectors that consume, normalize and uniformly present data from multiple sources. The solution enables firms to mix and match feeds with applications using only two functions: get and put. Unlike complex API sets, the simple XML format enables firms to quickly add an existing or new application to the infrastructure. The XML approach also ensures that IBM can add new functions to the infrastructure in the future without changing the API call patterns.

Simplifies application integration through feed adapter framework and flexible APIs  
Whether it is rapid increases in market data volume or the proliferation of program trading based on algorithms and advanced execution strategies, change happens fast in today's financial marketplace. And to stay competitive, traders and investment managers continually need new functions dynamically integrated within their front-office applications.

WebSphere Front Office software can help the IT team hasten the delivery of new business functions to investment traders and managers. It requires less development expertise and time (most adapters can be developed in two to four weeks) than many competitive offerings. And it provides choices in how firms receive and compute their market data. Many of the capabilities and features discussed earlier support these benefits. For example, the feed adapter framework and flexible APIs mitigate the need for low-level coding and ease application integration tasks. And a vendor-agnostic market data programming model and XML parameters in industry-specific terminology further simplify development tasks.

**System requirements**

A basic installation of IBM WebSphere Front Office for Financial Markets V1 software requires multiple servers and operating systems. At minimum, a firm must meet the hardware and software requirements enumerated in the chart below to support a basic installation.

**IBM WebSphere Front Office for Financial Markets software minimum requirements**

Operating system	Software	Hardware
Linux®	Red Hat Enterprise Linux AS Version 3, Update 7 or higher	<p><b>Two servers</b></p> <ul style="list-style-type: none"> <li>• Processor: an Intel® technology-based dual-processor IBM System x™ server (or equivalent) with a minimum processor speed of 3.2GHz</li> <li>• Minimum memory: 2GB</li> <li>• Minimum direct access storage device (DASD): 2x36GB</li> </ul> <p><b>Two servers</b></p> <ul style="list-style-type: none"> <li>• Processor: an Intel technology-based multiprocessor System x server (or equivalent) containing four processors with a minimum processor speed of 3.2GHz</li> <li>• Minimum memory: 2GB</li> <li>• Minimum DASD: 2x36GB</li> </ul>
Microsoft® Windows®	Microsoft Windows 2003 Enterprise Edition, Service Pack 1 or higher	<p><b>One server</b></p> <ul style="list-style-type: none"> <li>• Processor: an Intel technology-based dual-processor System x server (or equivalent) with a minimum processor speed of 3.2GHz</li> <li>• Minimum memory: 2GB</li> <li>• Minimum DASD: 2x36GB</li> </ul>



## Conclusion

With marketplace and data access requirements growing ever more complex, financial markets firms must have a platform in place that can help them provide a host of business-critical functionality and capabilities to support traders and investment managers. And the ability to differentiate operations while keeping IT costs down is more important than ever.

WebSphere Front Office for Financial Markets software provides a single platform that can meet firms' business and technical needs related to data access. And as data volumes and speeds continue to increase, it can meet the performance requirements of low-latency, time-sensitive applications. Overall, WebSphere Front Office for Financial Markets software is a superior long-term solution for two reasons: innovative technology and exceptional platform flexibility.

## For more information

To learn more about IBM WebSphere Front Office for Financial Markets software, contact your IBM representative or visit:

[ibm.com/software/integration/wfo](http://ibm.com/software/integration/wfo)

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