North American Systems Group Inc.

SPOTLIGHT REPORT

MQSeries Family

An Overview of New Business Integration Functionality

January 1999

Contents

1. About This Paper

Information Technology provides such a significant source of competitive advantage that it is now a key business driver for many organizations. For instance, the emergence of the Internet and World Wide Web has spawned new marketing and sales channels – and even new markets. The traditional database and transactional systems handle vital customer data and run key business processes. Office systems and e-mail are how employees communicate and collaborate. Therefore, anything that adversely affects IT also adversely affects the business.

Over the past three decades IT has evolved to become increasingly complex and heterogeneous. During this period the trend has been compounded by shifts away from centralized IT control and spending to devolved and distributed functional units. Consequently many organizations now have expensive technological infrastructures that inherently do not interact well together. This reduces the effectiveness of IT and also the business processes that rely on it.

Enterprise Application Integration solves the fragmentation problem by using middleware to direct and control the flow of information between applications. The most powerful form of integration is at the process level where work items are directed and managed between different processes, the essential building blocks of a business. Hence the term Business Integration.

This paper examines IBM's model for Business Integration including the recently announced MQSeries advances that add to the power and functionality of the solution.

2. Business Integration

2.1 The Environment

The pace of change continues to threaten almost every company, whether small or large, in every industrialized country, and in almost every industry sector. This unforgiving business environment demands a flexible IT infrastructure that can accommodate business change easily, drive down costs through increased automation and create a holistic business system of integrated processes and information systems. As we enter a new millennium and increasingly volatile economic times, the move towards enterprise-wide Business Integration will become just as prevalent as the adoption of the PC in the 1980s and the Internet in 1990s.

The demand for Business Integration is universal because several powerful business imperatives are apparent, to varying degrees, in every industry sector today. These include:

- Mergers & Acquisitions - as markets and industries become more globally competitive, many organizations are merging to aggregate market share, exploit increasing economies of scale and reduce costs through greater internal efficiency. However, an acquisition growth strategy can falter if the processes (and IT infrastructures) of the partnering companies are incompatible and cannot interact easily.

- Customer-driven processes - to compete in today's markets, one issue consistently rises above all: customer service. Managing customers is critical to every business. Integrated information systems provide opportunities for better customer care, loyalty programs and cross-selling of products and services.

- ERP integration - a major factor in the adoption of Enterprise Resource Planning systems in the 1990s has been to drive down costs of the fundamental business processes, such as accounting and human resources, and standardize on best-of-breed packages. But for most companies competitive differentiation resides in their proprietary systems and it is with these systems the ERP systems need to integrate.

2.2 Enterprise Application Integration

Business Integration is a complex problem that requires a strategic approach to implement correctly. Before genuine Business Integration can be achieved, the underlying IT infrastructure, and in particular key applications that run the business, must be integrated across the enterprise.

Early attempts at Enterprise Application Integration (EAI) proved inadequate. Writing custom interfaces or data-oriented integration (such as data marts) do not address the fundamental requirements of an integration infrastructure. Integration is not an objective: it is a continuous process requiring technologies that are flexible, scalable and re-usable.

EAI represents a collection of technologies. An understanding of these is important for understanding the issues involved in integrating different IT systems and evaluating the different software components, such as the MQSeries family, that are required in architecting an EAI solution.

The framework in Exhibit 1 shows seven integration components. Its structure is hierarchical to reflect the general premise that each layer requires or encapsulates the functionality of the preceding ones. Also the higher echelons provide an increasing level of abstraction and business value. The lower echelons provide the greater burden relief from the underlying complexity of the IT. All products and services in the EAI market can be placed within this Framework.

Exhibit 1. Integration Framework.

Business Integration	Business Process Development Business Process Design & Modeling, Real Time Decision Support, State Management
Application Integration	Business Event Processing Automatic Event Notification, Flow Control, Content Routing, Transactional Integrity
	Application Content Transformation Format Translation, Data Semantics, Validation, Pre-built Templates
Application Connectivity	Application Bridges & Gateways For Legacy, Web, Database and Packaged Applications
	Application Interaction Styles Publish/Subscribe, Publish/Reply, File Transfer, Request/Reply, Conversational
	Message Handling Services Queuing, Security, Message Management, Administration
	Basic Communications Point-to-Point, Reliable Broadcast, IP Multicast, IIOP/ORB, Database, Web, 3270 SNA

As markets continue to change rapidly, global competition increases and customer expectations rise, EAI addresses key business needs. When implemented correctly, EAI directly increases margin by driving down cost and providing significant opportunities to drive top line revenues higher. The benefits include:

- Containing IT expenditures - leveraging existing information assets.
- Reducing operational cost – improving efficiency through process automation.
- Increasing effectiveness – creating more tightly integrated value and supply chains.
- Improving speed to market – ability to react quickly and accommodate future change.

2.3 The MQSeries Solution

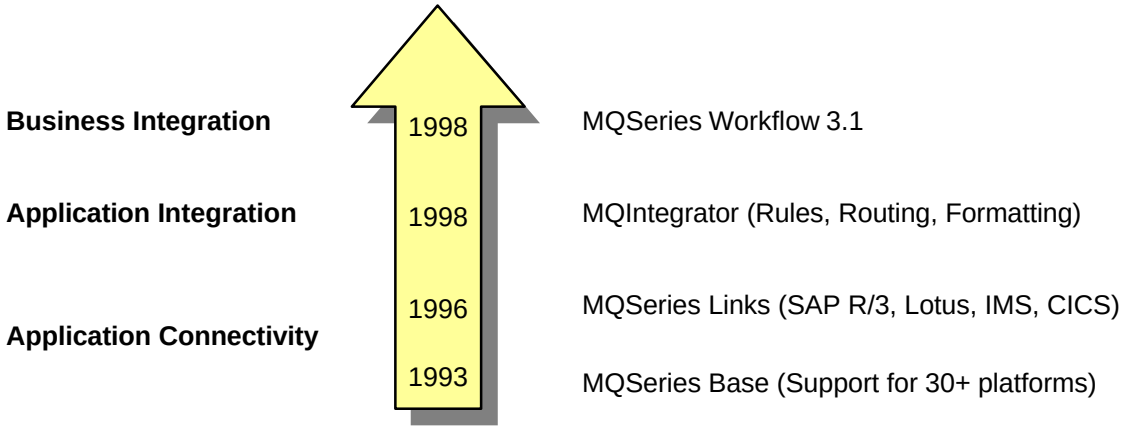
MQSeries was first launched in September 1993. As Exhibit 2 shows, IBM has followed a development and marketing strategy that now very favorably positions the MQSeries Family to take advantage of the rapidly emerging EAI and Business Integration markets.

Since its launch, MQSeries has achieved clear leadership in the messaging middleware market. This success is due to its very wide platform and protocol coverage, guaranteed delivery and transactional performance. And with over 5,000 sites worldwide, no one disputes the fact that MQSeries is proven technology.

During the past few years many bridges and links and have been introduced within the base product family to make it easier to connect different environments, such as SAP R/3, Lotus Notes, IMS and CICS.

In 1998 IBM announced the strategic direction for Business Integration and the deal with New Era Of Networks (NEON) to jointly market and develop MQIntegrator. Later in the summer of 1998 MQSeries Workflow (based on the Flowmark product) was added to the portfolio.

Exhibit 2. MQSeries Evolution (pre 1999).



IBM's recent announcement in January 1999 is arguably one of the most significant since the inaugural release as it represents a milestone for IBM in delivering its Business Integration strategy. New functionality is provided in many of the Integration Framework categories and it confirms IBM's continued development of the MQSeries Family and its intent to lead this market.

The rest of the report looks at the announcement and its significance.

3. New Solution Components

3.1 Overview

The January 1999 announcement includes:

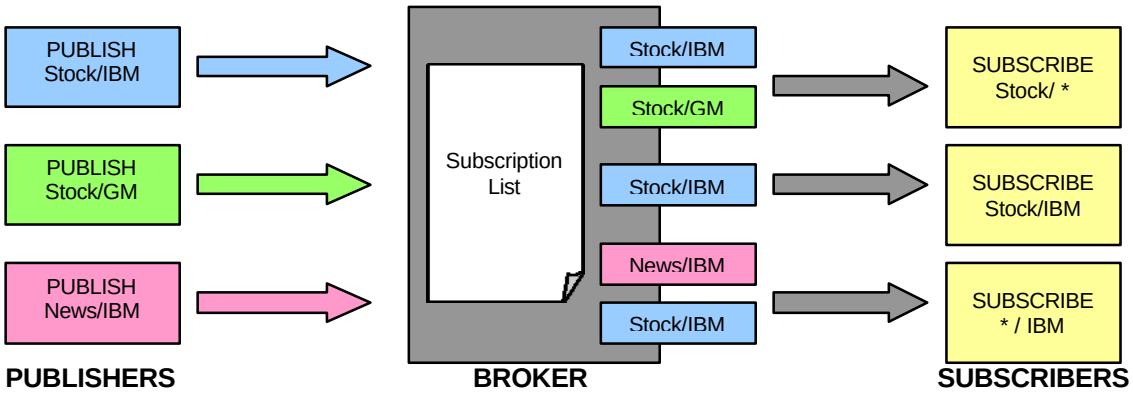
- MQSeries Publish/Subscribe
- MQSeries base enhancements, most notably Dynamic Workload Balancing administration, workload balancing and vastly improved NT integration
- MQSeries Integrator (a wholly IBM branded MQIntegrator)
- MQSeries Workflow for MVS.

The new functionality offers improved scalability, performance, availability and ease of use. This not only strengthens the MQSeries Family but also provides a genuine end-to-end solution capability and, as discussed later in the report, provides a Business Integration framework.

3.2 MQSeries Publish/Subscribe

Publish/Subscribe is a style of interaction between applications. It's basic premise, and advantage over other interaction styles, is that it is very flexible and creates a level of indirection between communicating applications. Applications are able to broadcast information to a community of information users that define the type of information they receive. Exhibit 3 shows a simple Publish/Subscribe model that enables several subscribers to receive the information they require (via a broker which holds a list of the type of information each subscriber has requested).

Exhibit 3. The Publish/Subscribe Model



At the heart of the MQSeries Publish/Subscribe is the Broker, which is an integral part of a queue manager (there is only one per queue manager). Both published information and subscriptions are registered with the Broker which retains subscriptions and publications as necessary and matches them, sending information to other brokers when required. The independence between subscriber and publisher means that either can leave or join the network as required and there is no administrative action for new joiners or leavers.

Subscriptions are topic-based and are defined using character strings of any length. As in Exhibit 3, structure can be implied by the use of delimiters such as "/", although any structural format is transparent to MQSeries. Publishers may specify multiple subjects for a publication and similarly subscribers can use wildcards. For instance, the following subscriptions could be used:

Information Structure = <Information_Type/Company_Name>	
"Stock/ *"	Gets published stock prices for all companies
"News/IBM"	Gets published news relating to IBM
"* /IBM"	Gets all published information relating to IBM

With MQSeries, publish/subscribe can be combined with direct messaging and, because the headers are consistent with MQSeries Integrator, can be used with business rules and data transformation system. This flexibility provides an exceptionally powerful and dynamic information system. And as you would expect with MQSeries, there is assured, once-and-once-only delivery of subscriptions and publications with the usual choice of message service (transactional, persistent and non-persistent).

Benefit Summary – MQSeries Publish/Subscribe

- Assured once-and-once-only delivery of publications and subscriptions
- Independence between publishers and subscribers
- Low administrative overhead
- Flexibility of combining publish/subscribe with direct messaging
- Compatibility with MQSeries Integrator for Business Integration (see section 3.5)

3.3 MQSeries Version 5.1

The latest release of MQSeries is an upgrade to Version 5.0, released in October 1997, and contains some significant enhancements that will benefit both existing and new customers. It is now possible to associate queue managers into a cluster to establish one logical system view that provides dynamic queue discovery, workload balancing, enhanced availability and easier administration. Within the NT environment IBM have made vast improvements to the MQSeries product providing greater functionality, improved ease-of-use and much better integration with the operating system itself.

MQSeries Version 5.1 is available on AIX, HP-UX, OS/2, Sun Solaris and Windows NT.

3.3.1 Dynamic Workload Balancing

In Version 5.1 queues and channels can be clustered across multiple platforms but still appear as a single logical system. This significantly improves configuration and simplifies administration. When a queue or a channel is defined in a cluster it is automatically published to the other members of the cluster, removing the task of matching definitions in other queue managers. Even with just two or three queue managers the benefits are apparent, with no remote definitions, no matching of sender channels and no transmit queues to define. Adding or removing queue managers from a cluster is also simple.

Dynamic Workload Balancing can also be used to increase performance, especially in demanding message processing environments which require power beyond that available in a single piece of

hardware. Increased message processing capacity can be delivered without disruption by adding more instances of a queue on new queue managers within a cluster. MQSeries automatically distributes the workload for a queue to the different queue managers. The capability of the cluster to process these messages is thus increased. Another benefit is increased availability. End users may never notice the effects of a failure when there is more than one instance of a queue in a cluster each performing an equivalent function. Even if one fails the others can continue unaffected. This means that Dynamic Workload Balancing offers strong failure-tolerance in its normal mode of operation, making it a very cost effective fail-over option. Of course, other high-availability technologies can be used in conjunction.

In addition there is a workload balancing user exit which can be exploited by third party vendors to add value by providing more sophisticated solutions for load balancing, failure bypass and least-cost routing algorithms.

With Dynamic Workload Balancing, queue managers can be in more than one group at the same time, with changes to one invisible to others. This is a powerful capability that lets the system reflect the organization it has to support and is not determined by underlying network and hardware deployment.

3.3.2 Windows NT

The enhancements to NT include the features and benefits of Dynamic Workload Balancing (described in 3.3.1) and changes made to take advantage of many Windows NT Version 4.0 operating system features. These include:

- Windows NT performance monitor - used to access and display MQSeries information, such as the current depth of a queue and the rate at which message data is put onto and taken off queues.

- ActiveDirectory - programmable access to MQSeries objects is available through the Active Directory Services Interface (ADSI).

- Windows NT user IDs - all valid Windows NT user IDs are now valid identifiers for MQSeries operations.

- Windows NT Registry - now used to hold all configuration and related data.

- Component Object Model (COM) classes - which allow ActiveX applications to access the MQSeries Message Queue Interface (MQI) and the MQSeries Administration Interface (MQAI).

- The exploitation of extra function provided by the Microsoft Management Console Version 1.1 and Active Directory Services Interface (ADSI) Version 2.0 system updates.

Some of the most impressive features are the graphical tools and applications for managing, controlling, and exploring MQSeries. These create a vastly improved “out-of-the-box” experience and include:

- MQSeries Explorer - a Microsoft management console (MMC) snap-in that allows a user to query, change and create the local, remote and cluster objects across an MQSeries network.

- MQSeries Services - an MMC snap-in that controls the operation of MQSeries components, either locally or remotely within the Windows NT domain. It monitors the operation of MQSeries servers and provides extensive error detection and recovery functions.

- MQSeries API Exerciser - a graphical application for exploring the messaging and queuing programming functions that MQSeries provides. It can also be used in conjunction with the MQSeries Explorer to gain a deeper understanding of the effects of MQSeries operations on objects and messages.

- MQSeries Postcard - a sample application that can be used to verify an MQSeries installation, for either local or remote messaging.

Other enhancements further make the MQSeries very easy to use. These include:

- An online Quick Tour of the product concepts and functions.

- An online Information Center that gives you quick access to help information, reference information and Web-based online books and home pages.

- Simplified installation of MQSeries for Windows NT, with default options and automatic configuration.

- Support for Microsoft Visual Basic for Windows Version 5.0.

Given the importance of Windows NT as a platform for application development and remote MQSeries management and configuration, the new functionality significantly improves MQSeries usability as a whole.

Benefit Summary – MQSeries Version 5.1
- Increased scalability, performance and availability via clustering of queue managers
- Workload balancing and dynamic queue discovery within a cluster
- Vastly improved and easy-to-use product within the Windows NT environment
- Faster set-up and easier management of MQSeries environment
- Increased performance – up to 20% greater throughput

3.4 MQSeries for OS/390

The MQSeries flagship product now runs on OS/390 and uses some of its advanced features, such as Resource Recovery Services and TCP/IP Open Edition Sockets. New features include:

- Dynamic Workload Balancing support (see section 3.3.1). Parallel Sysplex users can combine processors in the Sysplex to increase system throughput or availability without any change to the MQSeries application.

- Improved MQSeries availability via the Automatic Restart Manager, providing automatic restart of a queue manager or its message channel agent on the same or a different OS/390 image following a failure.

- Additional two-phase commit support is provided by Resource Recovery Services (RRS). MQSeries applications can coordinate their database and queueing activity, providing

database and queue integrity in the event of a failure. Previously, this capability was only available using a Transaction Manager such as IMS or CICS. The new support provides two-phase commit for MQSeries applications in the batch, TSO, and DB2 stored procedure environments.

- Compatibility with MQSeries Workflow to enable high-performance workflow applications (see section 3.6).

- Improved performance for non-persistent messages by up to 40%.

These enhancements to the flagship product provide better capabilities for deploying MQSeries within large, mission-critical installations.

Benefit Summary – MQSeries for OS/390
- Increased scalability, performance and availability via clustering of queue managers
- Compatibility with MQSeries Workflow for Business Integration
- Improved availability through the Automatic Restart Manager
- Enhanced native two-phase commit
- Up to 40% throughput improvement for non-persistent messages

The previous product, MQSeries for MVS/ESA, remains available and fully supported. However, do not expect it to be upgraded in the future.

3.5 MQSeries Integrator Version 1

MQSeries Integrator is the wholly IBM-branded version of MQIntegrator, which was jointly marketed by IBM and NEON. Customers will not only receive full IBM support with MQSeries Integrator but they now have an opportunity to buy an end-to-end solution from one vendor.

3.5.1 Overview

The key functions of MQSeries Integrator are:

- Communications - MQSeries provides the underlying messaging middleware on top of which the Integrator solution is built. MQSeries brings its renowned benefits of assured once-and-once-only delivery, mission-critical reliability and a wide range of supported platforms.

- Rules - for a given message, Rules define who or what is supposed to receive the message and what message format is required for the destination system. Rules are essential in building an intelligent integrated enterprise.

- Transformation - this allows different applications to exchange data without modifying the original applications. Without transformation, a consistent format would be required and changing existing applications would mean high costs and risks. Transformation is key to Enterprise Application Integration.

- Templates - these allow connectivity with major packaged applications such as ERP systems.

With the exception of service and support, currently the only major difference between MQSeries Integrator and MQIntegrator is the range of supported databases. MQSeries Integrator adds

support for Sybase for Windows NT and DB2 for both Sun Solaris and HP platforms. Exhibit 4 provides the full listings.

Exhibit 4. MQSeries Integrator Platform Coverage.

Hardware	Software	MQSeries	Database
HP	HP-UX 10.20	V5.0	DB2, Oracle, Sybase
Intel PC	Windows NT 4.0	V5.0	DB2, SQLServer, Oracle, Sybase
RS/6000	AIX 4.2	V5.0	DB2, Oracle, Sybase
SUN Sparc	Solaris 2.5.1	V5.0	DB2, Oracle, Sybase
S/390	MVS 5.2.2	V1.2	DB2

MQSeries Integrator has a central role in IBM's Business Integration strategy. We expect to see it incorporate MQSeries Version 5.1 functionality in the first half of 1999 and also possibly a release of MQSeries Integrator Version 2 later in the year.

During 1999 we also expect to see IBM move towards a Business Integration framework which will allow third parties to supplement or selectively replace integration components supplied by IBM.

3.5.2 MQSeries Integrator Framework

We expect to see a formal delivery of the Framework in the second half of 1999 as part of MQSeries Integrator Version 2. As well as integrating publish/subscribe, it will be an open interface allowing customers to exploit integration components from other vendors using plug-in interfaces that IBM will publish. This will allow customers who have standardized on other EAI products to plug into MQSeries Integrator.

This is another example of MQSeries seamlessly adding value and building the industry, just like the original MQSeries Interface which is open and supported on multiple platforms, protocols, languages and development tools.

Benefit Summary – MQSeries Integrator Version 1

- IBM branding brings new terms and conditions, including support and service
- Provides an end-to-end enterprise application integration solution from one vendor
- Formatter allows message transformation
- Rules allow flexible, high performance, content-based message routing
- Good platform and database support

3.6 MQSeries Workflow for MVS

Workflow enables the separation of business process flow from application logic, making business processes visible and changeable. Automating business processes requires all types of information flow (application-to-application, application-to-people, and people-to-people) and all application types (packaged, new and legacy) to be integrated within an enterprise.

Workflow is generally used for high value and repetitive processes which combine both manual and automated elements. Examples are claims processing, credit approvals and order management. The key derived business benefits are improved time-to-market and customer service.

The release of MQSeries Workflow Version 3.1 on the mainframe meets a critical customer requirement and is another important step for IBM in delivering their overall Business Integration strategy. MQSeries Workflow for MVS/ESA now uses MQSeries for messaging between clients and servers and DB2 for storing input and output containers.

4. Conclusion

The new functionality announced for the MQSeries family is significant. Firstly, the base MQSeries product has been significantly strengthened. The delivery of Dynamic Workload Balancing will make a genuine difference to customers, especially those wishing to deploy large, mission-critical systems. The increased scalability, performance and availability is delivered by workload balancing and the dynamic queue discovery makes the product more powerful and easier to use.

There are additional improvements to MQSeries for Windows NT. In essence, it represents nothing short of a significant transformation of the product, making it far easier to install, set-up and use. These improvements are significant. Windows NT is a significant development platform and, by providing these enhancements, IBM is hoping to attract and keep NT developers to its product and consolidate its strong market position.

The release of MQSeries for OS/390 and Workflow 3.1 for MVS reflect IBM's commitment to fully updating its flagship platform and releasing new Business Integration functionality for the mainframe. We believe the announcement of MQSeries Integrator Version represents a significant step in IBM's delivery on their Business Integration strategy. Not only will the move reassure larger customers that they will immediately receive IBM service and support, more announcements can be expected in 1999.

Without question, MQSeries is one of the jewels in IBM Software's crown. It combines award-winning technology with a strong market-leading position: a rare achievement, not least for IBM in recent times. If IBM does quickly deliver an open framework for Business Integration then it has every right to expect to translate its success in the messaging middleware market to the much more lucrative Enterprise Application Integration space.