AberdeenGroup

Middleware: The Technology Foundation to Enable an Agile e-Business

An Executive White Paper

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Preface

As companies weave e-Commerce into the very fabric of their business processes, prospects, customers, and partners will generate exponentially increasing service requests — triggering a series of interconnected transactions striving to quickly and painlessly satisfy this newly empowered and restless client. Today, companies must compete in a new, feverish, Internet-enabled business climate of constant change, compressed time frames, and impatient, empowered customers with high expectations for service. To cope and, in fact, thrive in this new business climate, companies need to adapt their internal and external business processes to be more flexible to change, more responsive to opportunity, and more helpful to customers and partners.

Adapting processes to be more flexible and responsive means companies need to improve the *agility* of their Information Technology (IT) infrastructure. Companies need to establish better linkage between their business processes and the underlying supportive IT processes. A large share of the burden for delivering this new agility falls on an illusively defined and frequently changing category of IT, known generally as "middleware."

In this *Executive White Paper*, Aberdeen defines middleware, describes its value, relates its importance to e-Business, and establishes criteria upon which companies can base middleware acquisition decisions. It cites examples of IBM innovation, descriptions of IBM products, and summaries of IBM proof points to establish a profile — in fact a benchmark — of a leading middleware supplier.

Middleware Defined

Middleware is broadly defined as a collection of enabling software, based on widely accepted industry standards, that creates bridges or conduits between and among a rich set of computing services found on disparate computing platforms and the applications that need easy access to those services. In addition to providing access to computing services, some middleware offerings enable disparate applications to communicate with one another.

There are many types of middleware, each designed to provide a particular class of bridge. Just as there is no single style of bridge or single type of road to meet every need, a particular set of target and source application connectivity needs requires a particular category of middleware to satisfy those needs. For example, there is one middleware category that provides basic connectivity, another that facilitates transaction processing, another to enable application communication, another to facilitate Internet access, and yet another to provide database access. For an overview of the various categories of middleware as well as examples of specific technologies or products, see Table 1.

Table 1: Middleware Categories

Category	Purpose	Examples
Communications	Remote processing	RPC, ORB, RMI
	Point-to-point communications	FTP, HTTP
	Inter-application communication	MOM, EAI APIs, Message Brokers, Distributed Objects, EAI Data Integration
Database	Multi-vendor database access	SQL, ODBC, JDBC, OLE DB
Transaction Processing	Secure, scalable, and manageable transactions across disparate environments	TP Monitor, Application server
Web Access	Web-based applications and services	Web-to-Host, Web server
Component	Fine-grained, reusable, and interoperable processes	Distributed objects

Source: Aberdeen Group, January 2000

How Middleware Delivers Value

Middleware is an important software component because it hides the complexities of the target system — that houses the desired service or application — and makes it available to a variety of systems that house the source application. Middleware is an important category of software because it provides many critical functions for applications but doesn't burden the application developer with the effort and cost to build them. In the fast-paced, rapidly evolving, and fluid world of e-Business, middleware provides the only firm ground from which companies, partners, and suppliers can integrate their IT systems, intelligently link them to business transactions, and share information for competitive and economic advantage.

The business case to justify the investment in middleware is compelling when the investment is amortized over a number of projects. Middleware delivers value by lowering the cost to integrate with disparate applications, systems, and data sources. Forty percent of an average IT budget is spent on integration every year — investments in middleware can lower the cost of this major budgetary line item. Middleware provides value to a company's IT investment by improving the overall value of the IT portfolio; lowering IT complexity, risk, maintenance costs, and training costs; improving organizational flexibility; leveraging existing assets; improving planning and decision-making; enabling organizational learning; improving information consistency and availability, as well as accuracy and timeliness; and enabling process-driven synchronization, as well as event-driven evaluation and decision-making.

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A subtle but important benefit of agile middleware is "discovered value." The integration of multiple applications tends to not only achieve the original goals of improved information consistency and process synchronization, but also introduces new possibilities for further improvements. Using a flexible middleware platform to achieve the integration also enables the introduction of new technologies in the future at much lower cost — again increasing the middleware return on investment.

What is the relationship of middleware technologies to enterprise application suites, business reengineering, business integration, and business transformation?

- Middleware technologies provide the software platform to achieve integration between enterprise applications. They provide a variety of integration techniques, such as data integration and transformation, synchronous and asynchronous transaction processing, asynchronous messaging, and message brokering — a rich set of integration alternatives that enable the selection of the best integration approach for the particular business requirement.
- Middleware technologies enable interoperability between disparate computing platforms and therefore facilitate the development of inter-enterprise processes to help streamline the relationship between companies, partners, and suppliers.
- Middleware technologies provide methodologies and graphical modeling environments to help companies express their business processes, analyze them, reengineer them, and develop a way to continually improve them.
- Middleware component technologies provide an approach for improving interoperability between applications, and they provide a new development paradigm for rapidly assembling new e-Business and e-Commerce applications under compressed time frames.
- Middleware technologies such as Web application servers, workflow, collaboration management, e-Commerce component libraries, and transcoding and language translators enable companies to introduce new methods and procedures that transform their business.

The Customer's View of Middleware

Aberdeen research affirms that IT management views middleware as a critical set of infrastructure technologies to lower the cost, time, and risk of building state-of-the-art applications. IT management views middleware as a key source of technology innovation that enables managers to introduce this innovation at their own pace into their company's multi-vendor, distributed computing environment. IT management also views middleware as a reliable option for significantly leveraging

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and extending the productive life of prior IT assets — helping to protect and prolong the value of the investment.

What investments in middleware skills do customer IT organizations make, and how do their existing middleware skills affect their decisions when selecting middleware technologies and products? The IT managers and application architects Aberdeen interviewed identify middleware knowledge and skill among their professional staff as a key factor in the successful design and implementation of enterprise applications.

IT managers identify middleware skills and knowledge as the most important class of technologies in their distributed, multi-vendor environment. They recognize that investing in the development and maintenance of middleware skills is critical because middleware represents a frequent mechanism for customizing the interoperability and integration of applications and system services to meet the specific requirements of their companies. Once a core set of middleware expertise has been developed by an IT organization, it becomes a major criterion for selecting future technologies. Frequently, the computing environment in which new products and technologies must operate is defined as the set of middleware upon which the company has standardized.

How to Select Middleware

Adopting middleware technologies is most often a strategic, long-term decision, as these technologies form part of the overall IT infrastructure for a company. Consequently, IT decision-makers are advised to understand critical characteristics for these technologies as well as the suppliers that provide them. As previously noted, middleware technologies cross a wide spectrum of capabilities — and there are characteristics unique to each category. Table 2 enumerates the important general middleware characteristics, applicable to all middleware categories, for which IT should look. Middleware technologies that meet these characteristics have a strong chance of being widely accepted by the majority of the marketplace; as a result, they will likely enjoy a lengthy term of use and therefore qualify as a strategic and safe investment.

Typical suppliers of middleware evolved from producing other software products. Many middleware suppliers are system platform suppliers as well, e.g., operating systems, database, and communications. Others are independent software vendors (ISVs) with prior application development experience who have struggled to fill a void left by a missing middleware component. In an effort to fill that void, ISVs have engineered the missing middleware component and then brought it to the market as a product. A third source of middleware technology has come from a consortium of cooperating suppliers or through a standards-based collaboration.

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Table 2: Characteristics of Successful Middleware

Characteristic	Description
Scalability	The product must easily and effectively scale in performance to meet the growth requirements of the business.
Flexibility	The product must easily adapt to new requirements.
Interoperability	The product has been designed to easily communicate with and share data with widely available systems.
Extensibility	The product functionality and behavior must be able to be customized and enhanced quickly with little involvement from the supplier.
Usability	Customers must be able to use the product and any of its features with little training. The product should be designed to appropriately match the skill level of its intended user.
Industry Acceptability	There should be a large number of partners incorporating the technology and delivering solutions based on it.
Efficiency	The product is capable of operating across a wide range of performance levels (e.g., very fast, fast, moderate, and overnight).
Enterprise Integration	The product must be able to seamlessly communicate with and exchange information among all other relevant systems in the enterprise.
Integratable Platform	The product must be able to be integrated with the next tier in the middleware technology platform.
Technological Innovation	The product should provide the latest technology.
Reliability	The product should have features and functions that are proven to work in the expected environment.
Manageability	The product must be able to be configured, deployed, monitored, and optimized to ensure that it works well in its intended environment.
Security	The product must protect the integrity of information and transactions.

Source: Aberdeen Group, January 2000

The characteristics exhibited by middleware suppliers that have demonstrated longevity in the marketplace include the following:

- An established reputation as a technology innovator that promotes the adoption of the technology as an open standard;
- A strong marketing effort to establish middleware partnerships that promote the use of the technology;
- A strategic investment plan to establish a dominant market share by creating and executing an aggressive seeding strategy; and
- A complementary set of available services to assist with the implementation of solutions that use the middleware technology.

Example of a Leading Middleware Supplier: IBM

Aberdeen research has identified IBM as the leading middleware supplier by a wide margin. Consider the strengths that IBM brings to the table: The company is

well known as an innovator in the middleware space — with a long and storied history of providing all of the middleware categories identified in Table 1. It exhibits all of the characteristics — enumerated above — of a supplier with longevity in the marketplace. IBM is a recognized leader of and significant contributor to middleware standards. For example, IBM was an early proponent of Java and now employs 2,500 Java developers in 25 locations worldwide.

The market awareness and market share of many IBM middleware technologies and products further demonstrates IBM leadership in middleware. For example, MQSeries — its message-oriented middleware product — has 72% market share. IBM is frequently cited in product evaluations as having the "best-in-class" for a particular middleware category — WebSphere Application Server is an example. In 1999 alone, IBM received over 47 industry awards for its middleware products when rated for scalability, capability, and ease of use.

Not only does IBM innovate and produce middleware, but it also has an extensive service organization to help its customers use its middleware. The IBM Global Services organization employs a worldwide network of pre- and post-sales advisers and technicians to help customers correctly deploy its middleware technologies. It has completed over 21,000 e-Business engagements. This organization is further enhanced by a large array of partners involved in solutions development and delivery — demonstrating industry acceptance of the IBM middleware technologies and reaffirming the industry's belief in the IBM philosophy toward open systems.

Maintaining a leadership role in middleware technology requires continuous learning from experience — the huge IBM customer base and partner network are both excellent sources of ideas for future product improvements.

As identified in Table 2, a significant attribute for leadership in middleware products is the degree of integration that can be achieved with other middleware products and with other applications — especially legacy applications driven by a broadly used middleware product such as IBM CICS Transaction Server. In a typical business day, CICS handles approximately 30 billion transactions and is used by the majority of the top brokerages around the world.

Fast speed of implementation and customization — as well as quick deployment — are also marks of an agile middleware leader. Rapid application development, implementation, and deployment of applications with middleware services is significantly enhanced when a middleware supplier also provides the Integrated Development Environment (IDE) used to build applications. This enables that supplier to provide the developer with an environment that makes it easy to integrate middleware services. IBM is among a select group of middleware suppliers that also develops and markets an IDE — the VisualAge product family. Outselling the nearest competitor by three to one in 1999, one of its members — VisualAge

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for Java — has received over 25 awards for its ease-of-use, degree of integration with other IBM products, and broad platform support.

All IBM middleware products comply with a powerful programming model that enables IBM's customers and partners to build highly integrated applications that fully leverage the features of middleware. The marriage of this consistent model with the appropriate IDE enables a broad spectrum of developers — no matter what their language of choice — to build these sophisticated applications very quickly. This comprehensive programming model and associated IDE product family also enables IBM to deliver a development environment targeted at the specific skill and experience of a company's or a partner's technical staff. This approach makes each technical staff member more productive by fully leveraging his or her current skills — and by allowing the customer's current skills to evolve while maintaining productivity.

Providing such wide exposure of an easy-to-use, functionally rich middleware product to so many different development environments helps achieve another characteristic identified in Table 2 — Industry Acceptability. When companies and partners find it easy to develop to a middleware service, then they develop to it. And when they all develop to it, that middleware service becomes widely supported. And when it becomes widely supported, more companies find that middleware service an attractive choice because that one development effort enables multiple-application interoperability at low cost.

Another significant feature of dominant middleware, identified in Table 2, is Technical Innovation. IBM invests heavily in technical innovation and is an established thought leader in all middleware categories. IBM received over 900 software patents in 1999, a fact that places them first by a substantial margin among software companies. Aberdeen recognizes IBM as a leader in advancing and adopting open industry standards; for example, it is actively participating in the development of XML and Java through membership in and association with other leadership organizations such as Apache, Sun, W3C, OASIS, XML.org, GCA, XML/EDI Working Group (B2B), OMG, etc. Many middleware improvements and advances began as ideas by IBM, were developed under its funding, were promoted to the industry through its actions, and were widely adopted through its support.

Aberdeen Conclusions

What is the future of middleware and how will it evolve? The technology boundaries in the middleware category are very fluid. By their very nature, middleware functional scope definitions are flexible and dynamic — changing what is considered a permanent middleware category as well as the functionality that belongs in a particular middleware category. Over time the market "votes" to determine what categories and features survive — a form of market convergence and consolidation. Features migrate from one middleware layer to another. Some middleware

features, and whole categories, become part of the operating system. Some middleware categories disappear, and some recede to a dormant state — waiting for the time to become right for their re-emergence.

What does not change — and will never change — is the need for middleware. As e-Business becomes a bigger part of every company's business, the need for a well integrated middleware platform will become even more critical — and therefore the selection of this platform will become a key decision. Combining a selection of middleware technologies from many different companies to build a middleware platform will not yield one that is as well integrated as one that has been designed and built to be well integrated. A cobbled-together solution cannot be expected to have the same levels of consistency, technology breadth, solution choice, or service as a middleware platform designed, marketed, and serviced as a whole. Although standard specifications of functionality, behavior, and interfaces will help, the middleware industry has not achieved this degree of maturity and commodity.

Regardless of the particular "state-of-the-art" middleware technology of the moment, what also will not change is the list of important attributes of middleware in Table 2. A key element of middleware is integration. The leading middleware suppliers will be those organizations with the most experience helping customers solve their integration challenges. As any middleware product improves and technologies evolve, some of the functionality of that product will migrate to another related product. Therefore, it is more important to choose a trusted supplier that will track this continuing evolution than to base a decision on any point product.

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Aberdeen Group is a computer and communications research and consulting organization closely monitoring enterprise-user needs, technological changes and market developments.

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