

Standards for Web-Based Integration Adapters

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INTRODUCTION

EAI (enterprise application integration) refers to the plans, methods, and tools aimed at modernizing, consolidating, and coordinating the computer applications in an enterprise. Typically, an enterprise has existing legacy applications and databases and wants to continue to use them while adding or migrating to a new set of applications that exploit the Web, e-commerce, extranet, business-to-business (B2B) commerce, and other new technologies. Enterprise application integration is difficult mainly because there is no standard infrastructure for communication between heterogeneous systems. The four types of B2B and A2A integration challenges that most organizations encounter today are user-interface integration, application integration, business-to-business integration, and data integration.

- **User-Interface Integration:** Employees, suppliers, and other trading partners need fast access to relevant and up-to-date information without having to search through a variety of inconsistent Web sites, navigate dissimilar user interfaces, and enter multiple passwords. To access this information, users enter their chosen realm via a *portal* that presents a consistent interface to different applications.
- **Application Integration:** Business processes involving multiple applications require integration of application logic and functions or tasks. To facilitate this integration, applications must communicate to exchange important business information. If a business is interested in selling goods over the Web, then its Web store must be integrated with its payment server. Although these are two separate pieces of software, they are components of the same order-taking business process.
- **B2B Integration:** B2B integration is imperative for businesses to participate in a marketplace or other B2B-exchange environment. These environments bring together buyers and suppliers. When properly architected, a B2B-exchange platform can integrate catalog sources such as supplier-hosted catalogs, specialized vertical exchanges, and other online information.
- **Data Integration:** In most B2B e-commerce environments, data integration is essential, especially when data comes from many different sources. Data integration allows applications to work with data from different computing platforms, databases, and operating systems.

BACKGROUND

Distributed Web and component-based architectures will remain strategic for most organizations for the foreseeable future. Typical enterprise systems include ERP systems, mainframe transaction-processing systems, other technology legacy applications, or big hierarchical databases. For all these strategic systems, the challenge remains the same, that is, to make them full participants in Web-based e-commerce and business-to-business transactions.

To allow such systems to connect and interoperate on the Web, a number of protocols and languages such as XML (extensible markup language) and Java and software such as application adapters have been proposed. The section below discusses their role in application integration on the Web.

XML

Using XML to represent the data being exchanged between applications presents significant advantages from an integration viewpoint because it lets the receiving application obtain the data and metadata simultaneously. The application can more easily understand the data it receives as such data are *self-describing*. Once a system is given the metadata and data, a clear and fairly automated approach can be implemented for mapping the original data into the native format of existing applications using technologies such as the extensible style sheet language (XSLT). Implementing such automated mapping requires companies to provide dictionaries of their business terms. This can help a tool analyze new input document formats and try to associate elements to an existing internal system representation. Several current integration initiatives include XML, for example, OAG, Microsoft's BizTalk, and RossettaNet, which are attempting to establish business semantics and process standards on top of XML technology.

Integration Adapters

An integration adapter is a software component used to connect an application (called *target*) to another application (called *source*) in enterprise application integration so that data from the target application can be interfaced with and transmitted to and from the source application.

Application adapters serve to transform data back and forth from the native format of the target application to that of the source application. To establish a communication line between the two applications, the adapter acts as an agent on the source machine to send and receive requests from and to the target. The purpose of the adapter is to monitor the requests that are performed from a source application and is responsible by selecting an appropriate communication mechanism to send the data to the target for further processing. Adapters can be set to send notifications when an applications data has changed, publish data to one or many other applications, and subscribe to data topics from other applications. Adapters hide the complexity of the application's programming interface. Traditionally, this task has been completed by bespoke in-house utility software that is costly to write and maintain.

Web-Based Integration Adapters

Web-based adapters link applications in one computing environment with information or logic in another computing environment using Web-based protocols for data and communications. Adapters typically consist of run-time components that reside on each end of the communication pipe between the platforms being integrated. An application that invokes an adapter to get access to required resources is often called the source, while the target is the remote data store or application logic the application accesses. Adapters use an application programming interface (API) that shields the application (and its developer) from the complexities involved in accessing data or resources. Historically, APIs have been proprietary, such as Microsoft's component object model (COM). Other common APIs are based on industry standards such as Java database connectivity (JDBC), J2EE (Java 2 Enterprise Edition) connector, simple object access protocol (SOAP), or open database connectivity (ODBC). Transmission control protocol/Internet protocol (TCP/IP) has become the de facto transport for Web-based adapters.

Requirements for Web-Based Adapters

Web-based integration adapters must fulfill certain requirements; that is, they need to be as follows.

- **Lightweight:** small-in-size components that use a simple XML-described API and contain no application logic
- **Standards based:** adapters need to implement open ubiquitous protocols such as XML-based protocols (e.g., SOAP) over HTTP (hypertext transfer protocol)
- **Scalable and reliable:** Adapters need to use XML document handling and interpretation, connector replication, standard exception handling, and management agents with logging and performance instrumentation.
- **Intelligent:** Intelligent adapters minimize message volume and overhead by being able to be interrogated and remotely, dynamically configured to work in the most appropriate way.
- **Supporting transactional integrity:** Adapters can deal with distributed transactions in either synchronous, two-phase commit mode, or asynchronous transaction-messaging mode.
- **Supporting event-driven functionality:** Adapters have historically been unidirectional and request driven. They can facilitate the execution of a database query, detect the presence of a message on a queue for processing, or initiate some remote application logic. However, emerging adapters are bidirectional and event driven by the target system.
- **Handling multiple protocols and data conversions:** Adapters must hide the mundane conversion routines required for information exchange between two disparate platforms. This includes conversion of data types and character sets, as well as network protocols.
- **Supporting schema and metadata support:** Adapters expose schema and metadata information through the source-side API to help ensure ease of use for developers and dynamic processing, especially with updating their configuration when changes occur in the data schema of the target system, without the need for manual intervention.
- **Easy to use for developers and management:** High-quality adapters provide considerable additional value by easing implementation and providing support for system management.

FUTURE TRENDS

An emerging standard, the J2EE connector architecture (JCA), defines an architecture and adapter behavior. JCA provides the ability to create an adapter once, then use it anywhere, including in most integration and application servers. The J2EE connector architecture specifies a standard architecture for integrating Java applications with existing enterprise information systems. The JCA standard proposed by Sun and its Java Community Process partners is part of Version 1.3 of the J2EE specification. JCA defines system-level contracts for connection management, and security and transactions between an application server and a connector. The connector implements these contracts in a way that is specific for the given

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