webMethods B2B v3.1
White Paper

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EXECUTIVE SUMMARY

This document is an overview of webMethods B2B software solutions as they relate to business-to-business integration (B2Bi). It presents an architecture for integration that transcends categories typically imposed on business-to-business relationships.

By design, webMethods B2B addresses cross-enterprise integration as a fundamentally distinct discipline. It uniquely provides flexible options for integrating data seamlessly from many disparate sources, regardless of communication protocol. This includes flexibility in both the selection of integration models and the distribution of responsibility for integration efforts.

Simply defined, webMethods B2B is a scalable, XML-based platform for B2Bi that enables open, Internet-based integration of enterprise applications with those of customers, partners and suppliers. As reliable as it is secure, webMethods B2B offers rapid, cost-effective deployment and real-time, transactional exchange of business data. webMethods B2B:

- Extends automated e-commerce links to more trading partners than any other solution
- Supports open standards, allowing companies to sidestep one of the most challenging barriers to B2Bi: the politics of deploying proprietary technologies throughout partner organizations
- Integrates with, leverages and extends existing business processes and applications (including EDI, ERP, databases, e-commerce and other operational systems) beyond corporate boundaries

All told, webMethods B2B enables tighter integration and greater efficiencies within business communities.
Over the years various technologies have emerged for coordinating how information flows within companies and across organizational boundaries.

These technologies attempt to resolve the problems caused by a variety of different internal integration issues, as well as the very complex requirements of integrating data and processes between companies. For example, Enterprise Application Integration (EAI) and middleware technologies provide tightly linked, back-end data flow across multiple applications or divisions within a single organization. Electronic Data Interchange (EDI), in contrast, enables loosely linked, long-term relationships between trading partners.

While these technologies have enabled companies to solve some of their business integration problems, they are proving over time to be inadequate due to high cost, inflexibility and inability to help companies integrate across many corporate security infrastructures. Additionally, Information Systems (IS) departments are becoming overloaded with multiple proprietary solutions, not to mention potential overhead that could ultimately impede business opportunities.

Business-to-Business Integration

While significant internal integration issues remain, transacting business across corporate firewalls has become the higher profile issue for many companies, primarily due to increased demand for tighter relationships with suppliers, buyers and other trading partners. This focus on external trading relationships between companies, now called business-to-business integration (B2Bi), and has spawned a whole new class of software solutions.

Basically, B2Bi is achieved when all business partners within a trading community can easily exchange information electronically with each other – preferably without significant modifications to existing technology or security infrastructure, and in real time over the Internet.

Past experience with both EDI and EAI/middleware have provided valuable lessons for future B2Bi solutions. For example, next-generation business integration infrastructures must be able to realize more fine-grained interactions and exchanges, with richer and more flexible data structures. The majority of these interactions are, and will continue to be, document-based. Since various partner applications do not need to reference one another directly, documents need to be created and sent, received and processed, in batch or near real-time.

Other interactions (e.g. middleware technologies) require a service-based approach to integration. These real-time interactions allow tighter links between partner applications and processes. Distributed resources will need to interact with each other as peers. A SAP Financials application, for instance, should be able to “see” a Baan Manufacturing application as a native SAP resource, even when the two applications are separated by corporate firewalls.

B2Bi Requirements

A comprehensive B2Bi solution must provide companies with integrated direct links to their major customers and suppliers, while also facilitating participation in B2B marketplaces to leverage their networks of buyers and
suppliers. It should allow companies to offer their business partners the ability to exchange information and conduct transactions across the Internet securely, reliably and in real time, regardless of installed technology infrastructure.

Above all, the total B2Bi solution must minimize the business risks of adopting its infrastructure. Understanding the cost of entering into new business relationships, while managing the ongoing costs associated with changing existing relationships, is essential.

From a technical perspective, a comprehensive B2Bi solution must include a B2B infrastructure to manage the integration process over time, route requests and translate messages that conform to different Document Type Definitions (DTDs). It also must:

- Leverage existing enterprise and business partner infrastructures
- Integrate heterogeneous systems across firewalls
- Provide authorization and security across corporate firewalls
- Guarantee delivery of messages
- Support both document- and service-based integration
- Manage change and support ongoing evolution
- Support XML-based vocabularies and technologies
- Pose minimal impact on partners’ IT infrastructures
- Transform and map data
- Deliver scalability and performance

Once a business community is fully integrated, an organization’s enterprise applications such as enterprise resource planning (ERP), customer relationship management (CRM) and legacy applications can interact seamlessly and securely with those of their external business partners – without cumbersome manual processes or significant changes to the organization’s technology infrastructure.

As a result of B2Bi, orders can be entered more rapidly and with fewer errors, products can be shipped sooner, compliance can be monitored in real time, and customer queries (such as price quotes and product availability) can be addressed more efficiently.

The Role of XML (eXtensible Markup Language) in B2Bi

As indicated above, a B2Bi solution must address the complexity of integrating application services from any number of disparate information systems. The message format must be open and flexible enough for different applications to understand and process—a need met by XML.

XML is a metadata language that defines a universal standard for structuring data. It is an extremely simple dialect of the Standard Generalized Markup Language (SGML), the International Organization for Standards (ISO) standard
for defining the structure and content of electronic documents. Though its initial focus was the exchange of structured documents over the Web, XML supports a wide variety of applications.

For the first time, businesses can agree on how data is structured, whether that data is passed as a document or encoded in a message format for service requests and responses. In fact, XML enables business data to be served, received and processed on the Web as easily as HTML.

Not surprisingly, XML is playing a critical role as a number of standards bodies and an increasing number of proprietary technology vendors address the challenges of B2Bi. Applications of XML run the gamut:

- Simple generation of XML documents from flat files
- Configuration and log file formats
- Capture of statistics for performance analysis
- Sophisticated XML document routing and transformation engines
- XML encoding for real-time information exchange

In February 1998, the World Wide Web Consortium (W3C) adopted XML as a formal recommendation. Since that time XML usage has soared. Technology heavyweights, including Microsoft, SAP, IBM, Sun and Oracle have all announced their support for XML. This wide acceptance is also exemplified by vertical industry groups who are defining specific XML vocabularies, including the Open Application Group Interface Specifications (OAGIS), RosettaNet’s Partner Interface Processes (PIPs) Framework, and Ariba’s Commerce XML (cXML).

webMethods B2B is a powerful, cross-platform suite of software products that enable companies to rapidly and cost effectively integrate their existing enterprise applications with those of their customers, suppliers and other business partners, over the Internet and in real time. These products can be used to achieve varying levels of integration, from integration with a single business partner to full integration across an entire trading network.

webMethods B2B provides companies a number of business advantages, including increased revenue opportunities, tighter relationships with customers, suppliers and other business partners, improved supply chain efficiencies and increased return on investment on existing IT investments.

**Figure 1 – B2B via webMethods B2B**

The webMethods B2B Suite of Products

The webMethods B2B suite of products resolves complex integration challenges by leveraging open, ubiquitous Internet standards, including XML, HTTP, SSL and X.509 digital certificates. Throughout a business community or portal customer base, webMethods B2B seamlessly links data, information systems and collaborative processes in real time:

- **webMethods B2B** facilitates secure, guaranteed bidirectional information exchange between disparate applications within a business community. Critical business applications, such as customer relations, procurement and financial services, easily extend beyond the firewall to integrate with EDI/ERP systems, legacy applications, databases and Web sites.
• **webMethods B2B for Portals** extends webMethods B2B to manage vast online business communities. The "hub" for hub and spoke, as well as for multi-buyer/multi-seller marketplaces, it provides rapid, cost-effective links between operational systems of business partners over the Internet. And it is the transaction engine at the center of prominent B2B portals, including mySAP.com, Grainger.com, MRO.com, Tech Trader, VerticalNet, and Dun & Bradstreet’s Global Access Platform.

• **webMethods B2B for Partners** delivers fast implementation and activation. It cost effectively links key business partners, regardless of partner size or technical capabilities. Supporting both hub-and-spoke and federated architectures for partner integration, it also provides partners with the full enterprise integration capabilities of webMethods B2B.

**Broad XML Support**

The webMethods B2B product suite supports XML on a broad scale. It uses XML for all of the above-noted functions as well as for an abstraction layer above all B2B services.

To advance the adoption of XML-based technologies, webMethods actively participates in standards groups. These include the World Wide Web Consortium (W3C), the Open Applications Group (OAG), the Supply Chain Council, the Financial Products Markup Language (FpML) technical committee, and RosettaNet, to name a few.

A member of W3C’s XSL and RDF working groups, webMethods co-authored XQL, an XML Query Language, in 1998 with Microsoft and Texcel. In addition, webMethods works closely with leading technology vendors on XML efforts such as Microsoft’s BizTalk, SAP’s XML BAPIs and IDOCs, Sun’s Java API for XML Parsing, and Ariba’s cXML. All of these technologies and initiatives are supported natively by webMethods B2B.
B2B Registry

webMethods B2B is a 100% Java process that runs on any operating system supporting a Java runtime (version 1.1 or later). It provides a common platform for applications to exchange information with other applications and data resources that reside locally or across the Internet behind firewalls.

Architecturally, all applications and data resources made accessible by webMethods B2B are exposed as services that reside in a common registry. A B2B service is uniquely identified and invoked by an interface name and service name, assigned when an administrator registers the service in the B2B Registry. The interface name may be nested to any level, enabling a descriptive registry.

In general, a B2B service accepts inputs from a client application, processes them, then returns output to that client. All B2B services and interactions that flow through webMethods B2B are represented with XML -- used to describe the data transformations that must occur when data is exchanged between different business applications. Addressing inevitable changes within cross-organizational systems, this approach provides a critical layer of abstraction between one business system and another, while allowing linked systems to be modified dynamically without requiring coding, code generation or modification of source systems. Disparate sources of information, including ERP and legacy systems, databases, and online e-commerce Web sites, are seamlessly linked and uniformly accessed.
FLOW

At the heart of webMethods B2B v3.1 is FLOW, a process-oriented language developed by webMethods for visually linking B2B services between business systems.

A B2B service represents a single, discrete function. However, there are times when it is necessary to execute a set of services together. With FLOW, new B2B services can be defined as a sequence of B2B services to be processed in a pipeline that includes rich semantics for sequencing, branching, looping, as well as a full complement of data transformation capabilities.

A B2B service defined by FLOW allows webMethods B2B users to access multiple XML or HTML documents; perform transformations, database queries and updates; invoke services in ERP applications or on systems that reside behind firewalls at partner sites; and return desired-result sets to the clients.

FLOW can be used to implement synchronous, real-time data exchange, asynchronous document delivery, or complex long-running transactions such as RosettaNet PIPs. For example, a B2B service can be created that takes a purchase order (P.O.) from a buyer, then executes the following series of B2B services before submitting it to an internal ordering system:

1. Receive a P.O. submitted by a buyer
2. Log the receipt of the P.O. to an audit file
3. Perform a credit check and location verification against Dun & Bradstreet’s Global Access Platform
4. Post the P.O. into an ERP system
5. Return an acknowledgement to the sender

Figure 3 - webMethods Flow
Using the visual editing tools provided with webMethods B2B, developers can visualize a “pipeline” of data flowing across a set of B2B services. Pipeline is a general term used to refer to the data structure in which input and output values are maintained for a FLOW service. It allows B2B services in the FLOW to share data. The pipeline starts with the input to the FLOW service and collects inputs and outputs from subsequent services in the FLOW. When a service in the FLOW executes, it has access to all the data in the pipeline at that point.

In building a FLOW service, the webMethods B2B Pipeline Editor enables data elements to be visually mapped to and from B2B services. It allows different, but compatible, data types to be mapped to one another. For example, a string value called AccountNumber can be mapped to a string list called Accounts. At run time, webMethods B2B automatically performs the structural transformation necessary to map the data in AccountNumber to Accounts. The webMethods B2B Pipeline Editor also provides ‘Value Modifier’ operators to set default values for variables, to ‘override’ pipeline values by hardcoding specific values, as well as to reference other pipeline variables at runtime.

Besides using different variable names and data structures to represent sets of data, B2B services can represent data in different formats. This is common with date and time variables, where, for instance, one service might use “01/01/99” and another “January 1, 1999.” To resolve data differences, webMethods B2B provides a set of value-transformation services that enable transformation of values from one format to another.

Note: FLOW represents a superset of the functionality previously provided by Web Interface Definition Language (WIDL). While WIDL is still supported by webMethods B2B for backwards compatibility, all new B2B services are implemented in FLOW. FLOW is more generic and considerably more powerful than WIDL, and not so explicitly targeted to Web Automation.

FLOW introduces the ability to manage long-running conversational transactions such as the PIPs defined by RosettaNet. Like WIDL, FLOW is a 100% XML-based vocabulary, and any WIDL construct can be represented in FLOW. In addition to maintaining 100% compatibility with WIDL, webMethods provides a WIDL-to-FLOW Assistant for conversion of existing WIDLs to FLOWs.

Protocol Manager

Protocol “listeners” accept incoming requests for B2B services. The primary protocol for webMethods B2B is HTTP/HTTPS, which provides access to B2B services via XML messaging, remote invocations from other instances of webMethods B2B, or directly from browsers. webMethods B2B is extensible to support any number of simultaneous protocols including SAP RFC, FTP, IIOP and RMI.

Security Manager

webMethods B2B provides comprehensive security features as a foundation for industrial-strength B2B applications:

- **Authentication** - All client connections to a webMethods B2B server are authenticated by either a user ID and a password, or through the use of an X.509 digital certificate. webMethods B2B can authenticate itself to other clients or remote servers by use of its own digital certificate.
• **Authorization** - Security policies can be enforced by the use of Access Control Lists (ACLs). ACLs define what users (or groups of users) are authorized—or denied—access to a B2B service or to an interface that includes a collection of B2B services. Each B2B service can have its own ACL.

• **Data Privacy** - Both inbound and outbound requests can be secured using the Secure Socket Layer protocol (SSL). This is the standard protocol for providing secure communications over the public Internet. SSL libraries are embedded in webMethods B2B.

webMethods B2B can be configured to obtain user and group information from external directories supporting Lightweight Directory Access Protocol (LDAP) or Network Information Service (NIS).

**Context Manager**

Each B2B service is a multi-threaded process. This means that the server does not generate a new “instance” of a service each time a client requests it, but simply spawns a new thread for the service. As a result, the server can process multiple, concurrent requests using a single copy of the service in memory.

Internally, webMethods B2B uses a Context Manager to maintain information about the state of each request-in-process. This context manager enables clients to maintain a multi-transaction conversation with a webMethods B2B server or server cluster. A client’s context is cleared when the client’s session terminates or expires.

**Cache Manager**

Each B2B service supports result-caching, which can greatly improve throughput when many clients request the same service with identical inputs. Caching can be dynamically enabled or disabled on a service-by-service basis. A service cache may also be configured to pre-fetch data at pre-determined intervals. Cache expiration can be set for each individual service.

**Cluster Manager**

Highly scalable, webMethods B2B supports the clustering of multiple webMethods servers. The Cluster manager provides session replication and load balancing across servers and multiple, concurrent client connections—each of which can make multiple, asynchronous service requests. The cluster manager also provides fail-over capabilities to eliminate a single point of failure.

**Transaction Manager**

webMethods B2B eliminates the need for client applications to address network and system failures. It does this by providing persistent, secure, guaranteed store-and-forward capabilities over the Internet—capabilities that have the following attributes:

- Once a request is submitted, it is guaranteed to either be processed once and only once (idempotence) by the target webMethods B2B server, or to fail outright, irrespective of network or system failures.
- All failures are fully logged so that state may be recovered.
webMethods B2B includes a Transaction Manager that registers transactions in a local job store and monitors the progress of each transaction. If the Transaction Manager does not receive a result for a transaction in its job store, it resubmits that request to execute the service. It continues to resubmit requests until it either receives a result or the transaction expires.

A guaranteed delivery transaction has two attributes that determine how long it stays in the job store before it expires. These are the time-to-live (TTL) and the retry limit. The TTL specifies the number of minutes that a transaction is to remain in the job store before expiring. The retry limit specifies the maximum number of times that the Transaction Manager can resubmit a request. A transaction expires when the TTL or the retry limit (if specified) is reached, whichever comes first.

Database Manager

webMethods B2B accesses databases using JDBC. The B2B Database Manager provides automated generation of B2B services directly from SQL statements and database table structures. B2B services generated via this method do not require compilation; they are immediately available in the B2B registry. The B2B Database Manager also provides a simplified API to JDBC drivers to make it easier to create B2B services that perform more complex database operations.

Integration Modules

Integration modules are custom-developed services that run within a thread of a webMethods B2B server process. They can be used to extend the integration capability of webMethods B2B to other resources not supported “out of the box”.

Integration modules allow legacy APIs to be exposed as B2B services. Previously complex, low-level APIs can be made accessible to browsers, B2B clients, other integration modules, and other applications via guaranteed, secure XML messaging.

Integration modules also extend ERP packages (e.g. SAP, Baan, Peoplesoft, Oracle), EDI and traditional middleware (e.g. MQ Series, MSMQ, Oracle AQ, Active Software) beyond corporate boundaries—securely, easily and rapidly.

webMethods B2B Administrator

Administration tasks such as updating license keys, adding users, monitoring server activity, and setting configuration options for individual services are performed via the webMethods B2B Administrator.

This administrator also provides a view with sliding window statistics on all B2B services, and enables configuration for SMTP based notification when individual B2B services fail.
Logging Facilities

The Audit Log

The Audit Log maintains an audit trail for all services that the server executes. For each service, the server adds two records that contain information about the service. It adds one record when it begins execution, and includes the timestamp of when execution began. It adds the second record when the service terminates, and includes the timestamp of when the service terminated.

The Error Log

The Error Log maintains information about all errors and exceptions that have occurred in the B2B system.

The Server Log

The Server Log maintains information about the version of the webMethods B2B server that is running, and the operations that the server has performed. Additionally, this data can be used for general debugging purposes.

The Session Log

The Session Log maintains information about all sessions in the B2B system. webMethods B2B creates a session when a developer connects to the server or a client connects to the server to execute services. Each record in the Session Log includes a timestamp indicating when a user established a connection with the webMethods B2B server.
The Statistics Log

The Statistics Log maintains statistical information about the consumption of system resources:

- Total memory
- Free memory
- Number of threads in use
- Number of current connections/lifetime average of number of connections
- Average number of connections for last poll cycle
- Number of current requests/lifetime average of number of requests
- Average number of requests in last poll cycle
- New requests per minute at the beginning of the poll cycle
- New requests per minute at the end of the poll cycle

Transaction Logs

The Transaction Logs maintain information about guaranteed delivery transactions. They contain a record of all critical operations that the server performs for each guaranteed delivery transaction. The server maintains one log for inbound guaranteed delivery transactions and a separate log for outbound transactions.

These logs can be used in conjunction with the appropriate job store to identify specific information about a transaction. For example, if a transaction fails, the log can determine how far the transaction traveled before failing, enabling appropriate measures to recover that transaction.

Package Management and Replication

A package contains a set of services and related files, such as specifications, records, and output templates. By placing related files in a package, all the services and files in the package can be managed as a unit. Packages can be selectively enabled, disabled, refreshed or deleted with one action.

B2B services can be grouped using any package structure, though most organizations group services into packages by function or application. For example, you might put all purchasing-related services in a package called “Purchase Order Mgt” and all time-reporting services into “TimeCards.”

If you have more than one instance of webMethods B2B installed, you can use the package replication feature to copy all the services and files in a package to another instance of webMethods B2B. Package Replication makes it easy to maintain a package on one instance of webMethods B2B, as well as automatically propagate changes to other webMethods B2B instances that may reside behind firewalls across the Internet. Package Replication is also used to “Promote” packages to production by publishing packages from development to test to deployment installations.
Additional HTTP and XML Functionality

Web Automation automates all HTTP interactions with XML and HTML documents and forms. While e-commerce Web sites are intended for human access via browsers, they, in fact, provide interfaces to corporate applications that have been Web-enabled.

Web Automation provides a mechanism that treats the functionality of all Web sites (Web-enabled applications) as B2B services. These services can be invoked natively from business applications to enable existing Web sites, whether they deliver data in XML or HTML, to be leveraged as the lowest-barrier building block for B2B.

If partners have not yet exposed business functionality to Web sites, they can select the Web-enabling technologies that best suit their environment to securely expose interfaces to business partners. Web Automation provides a general method of representing request/response interactions over standard Web protocols—allowing the Web to be utilized as a universal integration platform.

Through its WebTap feature, webMethods B2B acts as a proxy between browser clients and Web sites or Web-based applications. WebTap controls an end user's browser experience while allowing B2B services to intercept and modify data that passes through webMethods B2B. And its “triggers” can intercept Web transactions and substitute local logic and/or pages for what would otherwise be performed by the third-party site.
SUMMARY

The goals of B2Bi are to increase the efficiencies of distributed communications across organizations while decreasing the cost of such communications. By more closely coordinating activities between business partners, businesses can realize dramatic productivity gains. EDI has achieved limited success in this regard. B2Bi moves beyond the limited transaction sets supported by EDI to automate all data flows across the community.

The challenges of B2Bi are threefold:

- Enterprises want to integrate their systems with those of their business partners.
- Customers must first agree on a methodology and a technology base to achieve integration. This includes agreement to invest in both the products and resources (including training) required to deploy B2B solutions in all partner organizations.
- Companies must next overcome technical barriers, including security, data representation and process definition.

Yet, the largest barriers to achieving integration with business partners are political barriers—deciding to invest in technology, implementation, and training of staff. webMethods B2B overcomes these barriers, providing a frictionless path toward tighter integration with business partners over time.

Widely deployed, webMethods B2B combines the benefits of both document- and service-based approaches to B2Bi, leveraging XML as a core technology for the integration of diverse business systems. The integration architecture that underpins webMethods B2B supports a variety of emerging standards. It allows enterprise systems to be integrated once, and functionality to be exposed as either documents or services (real-time interfaces), as part of a RosettaNet PIP or an OBI transaction, as an EDI document, a CBL document, a cXML document, an arbitrary XML message, a thin client library (C/C++, Java, Visual Basic), or via browser-based applications.

Bottom line, webMethods B2B is a scalable, reliable and secure solution for B2Bi. It extends the reach of your e-commerce systems, ERP and legacy applications to enable industrial-strength automated links with your customers, partners and suppliers.