RosettaNet and Web Services

An Executive-Level View of RosettaNet and an Emerging Model for Application-Based B2B Commerce

EXECUTIVE OVERVIEW

Competitive and economic pressures are driving improved efficiencies, subjecting the product life cycle to extensive investigation. Partnering throughout the entire cycle has become a model that helps drive business success. Successful partnering requires automating business-to-business (B2B) commerce both intra and inter-enterprise. And in the rapidly changing landscape of business today, enterprises conducting e-business among multiple, dynamic partners must be capable of equally dynamic B2B communications. Successful e-business requires adaptable B2B communications that are accurate and reliable for all partners, both upstream and downstream. This includes company applications that can communicate information with another company's or even companies' applications and information.

B2B communications at this level mandate the use of open industry standards that transcend enterprises, vendors, infrastructures and platforms. Common business practices or standards are a requirement throughout the entire B2B continuum, as they permit e-business to be established among all partners within the product life cycle. The market has chosen XML as the language framework to enable the base level connectivity, but there are many more components to the full set of capabilities that business partners need in order to successfully communicate in an automated manner.

RosettaNet is the standards consortium that has combined and standardized the most complete, successful set of B2B communications components to date. RosettaNet standards operate based on an electronic, document-centric interaction model focused around public, or external processes. The standard has become the "lingua franca" or language for e-business for technology-based industries and is expanding into other adjacent vertical markets. RosettaNet's success is based on the ability to enable B2B automated trading partner exchanges, rapidly and reliably. This can result in considerable savings that net return on investment for trading partner companies within a relatively short time (i.e., several quarters).

Recently, an enhanced model for application-based B2B commerce has emerged, and is called **Web services.** It is founded upon an interaction model that offers Internet-based services that provide application data and functions as if they were local to another application. Web services offer immediate benefits in tightly focused, automated scenarios, and permit the packaging of discrete "service modules" that respond on demand without requiring knowledge of where and how to access the remote data. In time, trading partners will be able to answer their own questions and meet their own needs, within a unique timeframe – all by leveraging their partners systems as if they were applications resident within their own system.

The Web services concept has raised the interest of both RosettaNet users and non-users alike. Questions are being asked, such as *Should I wait to enable e-business until Web services matures?* The simple answer, "No." *Why?* Because implementing RosettaNet standards now will allow users to realize the immediate practicalities and related benefits of automated B2B commerce. *How will the Web services model intersect with the RosettaNet*

model in use today? Although there are a myriad of scenarios that could arise, it is likely that Web services will evolve along with RosettaNet to offer what is considered to be an enhanced set of tools to address cross-enterprise e-business. Convergence will be driven by overall market acceptance, coupled with the needs and directions of the RosettaNet community.

This document attempts to illustrate the benefits of using RosettaNet today and the opportunities associated with the emergence of Web services. To be sure, this document does not portray the future vision of RosettaNet, but rather outlines a potential evolution that could modify and/or enhance the existing business models driving e-business processes.

TRADING PARTNER AUTOMATION

Competitive and economic pressures continue to accelerate the need to increase efficiencies while reducing operational costs. The growing demands of a shifting business climate is motivating companies to expand their partner-to-partner automation, also known as business-to-business (B2B), across the entire supply chain. The leaders in specific industries expand this vision to leverage e-business across the entire product life cycle, from a product's inception through to its end of life. Although implementing B2B at the application level does not come without a cost, the end result benefit will likely outweigh the investment, as integration is the primary basis for driving speed, knowledge and enterprise level success.

Looking within an enterprise, automation requires that all applications involved have a shared or standardized understanding of processes, including language and words, or that they have a method to connect to such a standard. Outside and across enterprises, the automation imperative is even more demanding: companies can choose to deploy standards throughout all levels of B2B connectivity puzzle or commit to customization around each trading partner connection as defined by the N (N-1) model*. To be sure, the concept of total network B2B communication is not complete for many industries, with the exception of high-technology sectors using RosettaNet standards. However, other industries are rapidly discovering what total network automation has accomplished for high tech and many are in pursuit of such a standard.

**N (N-1) is the formula for calculating the number of connections needed when connecting disparate systems without standards.*

The notion of e-business involves multiple options that must be agreed to across industries and for the entire Internet, and these options must be standardized so that energy can be focused on leveraging the B2B communications to the next level of business value. In fact, some leaders are now realizing that competition is evolving to the supply chain level – pitting supply chains rather than companies. The most recent entrant to this arena, Web services, raises questions about this next step in automating B2B.

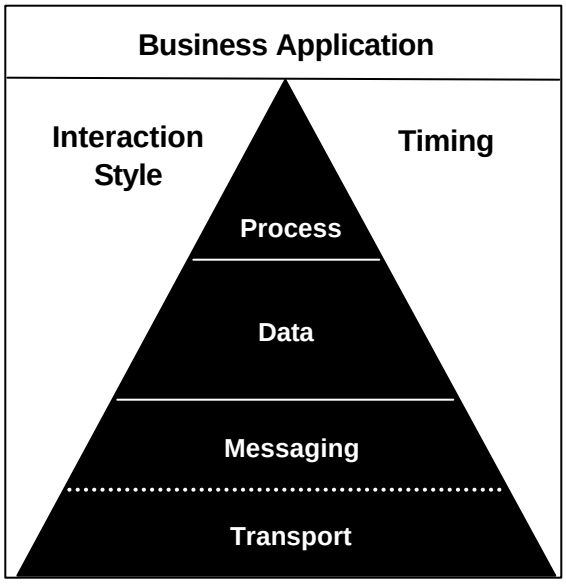

Figure 1. *Standards Evolution/Basic Components*

Although the foundational meaning of Web services continues to spark much discussion, the base level functionality appears to be focused on this definition: ***Web services are modular applications that can be described, published, located and invoked over a network.***

Using this definition, Web services can be viewed as building blocks for services that are assembled from multiple networks to create the desired functionality. This notion influences many business concepts or elements, including e-business, core competency, service offerings, and outsourcing. In the *Harvard Business Review*, October 2001, an article entitled "Your Next IT Strategy" states that "slowly but surely, all your old assumptions about IT management will be overturned … it is an open rather than a proprietary architecture … the standards dramatically simplify and streamline information management … you no longer have to write customized code whenever communication with a new application [or enterprise] is needed."

B2B Automation Models

Conducting e-business across enterprises presents multiple challenges, most of which are currently focused on creating a comprehensive infrastructure and set of processes that provide the basis for partner-to-partner communications. B2B communications require an open, standardized connectivity infrastructure, as well as a set of components that together establish the communications between partners via external or "public" B2B processes, all of which can offer considerable return when fully automated.

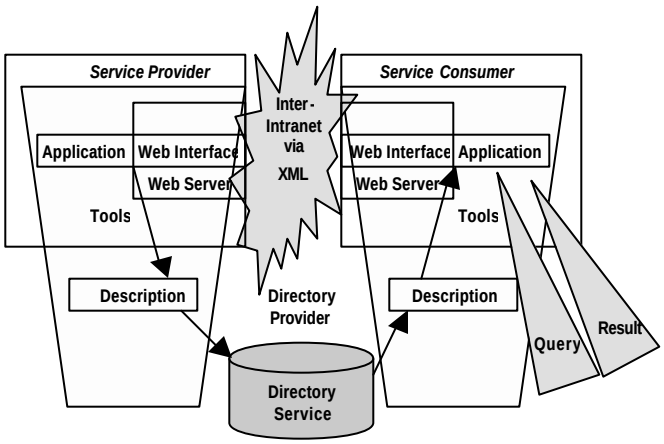

Figure 2.
Web Services Process Model

Transport/Message Standards --

The base level component in this model specifies how to move and deliver the data that enables automation. This core element determines whether the data being delivered is coming from a proprietary connection, Simple Mail Transfer Protocol (SMTP), Transmission Control Protocol (TCP) or Hypertext Transfer Protocol (HTTP). Similarly, it identifies whether the data if being communicated via the Internet or through a third party Virtual Private Network (VPN). The transport level component also includes details such as how to tell if the delivered information is in fact, from the expected party, whether it has been changed or manipulated, and whether it might be considered as a legal commitment.

Transport standards, also known as messaging standards, attempt to define and specify all these factors. Many standards bodies merely look to resolve subcomponents of messaging while others such as RosettaNet endeavor to develop a more comprehensive messaging component that will serve the entire product life cycle of business interactions. Agreement with this level of messaging is required, regardless of the data or process standards that are transported according to the transport or messaging standards.

Data Standards --

Moving up the model, the next level is data standards. Within this layer, XML has become the primary choice, offering independence from platforms and vendors. But XML provides only the language structure; XML does not specify the meaning behind the data.

Within the area of data standards, agreeing on simple things such as a *ShipDate* may not sound difficult, but deciding on the exact meaning can be quite challenging. For example, *ShipDate* could translate to, 1). the date product leaves the production line, 2). the date product is on the shipping dock, *or* 3). the date product is picked up by the carrier.

Interpretation, that is, speaking and understanding a standard language of external business, enables a consistent flow of rapid and

accurate communications between partners. However, often times, the internal systems used by different partners enter the equation, typically mandating that even external standards be translated to meet internal needs. Data standards then fill an intermediate level of the model, providing the business language basis for B2B communications. Fortunately, data standards will cover the majority of cases, and it is within that majority that the true benefits reside: factors that enable one person to handle exceptions in a lengthy ordering process instead of fifty, or savings associated with allowances for a thousand orders to be handled correctly in one-day, versus order backlogs that arise after only one hundred orders.

Process Standards --

The next level in the model is process component, the real foundation of any business communication. Public process demands standards. For example, does a receipt acknowledgment really mean: "they got it," "they can read it," "they understand it," "they legally accept it," *or* all of the above? And based on that meaning, what is the receiver expected to do next?

Process standards establish a dialogue between servers called "choreography," and are applicable throughout the entire model. They exist at the business level to ensure that the total message is understood, all the way up to the top level of business process, through to contract fulfillment and trading partner agreements.

Timing Standards --

Incorporated with standards is a sense of timing and its opportunity. Querying a system to provide information on a specific purchase order requires not only expected external process timing, but also demands that the internal process be capable of understanding and reacting appropriately within a specified time. Without such timing, the overall process, both private and public, will fail.

Interaction Styles --

A). "Batch"

Timing standards also extend into the public process, but in a different way. Within the public process, variations on timing result in different styles of B2B communications. These variations can take the form of single-document exchange, groups of document exchanges, or grouping types of documents into a single exchange; the latter two are forms of "batch" interactions.

Several standards in use today continue to rely on batch interactions. It is a model that, like the postal/mail service or FAX, has served a need for interactions such as Electronic Data Interchange (EDI) and wire transfers. Batch interactions are adequate when delivery requirements for information are loosely defined. If the desired information is expected within a certain timeframe, any tighter than specific time intervals, batching is not an effective method. However, as a standard, these forms of document or message interactions will likely continue to serve for many years into the future. Interactions at this level presume that the business value of more immediate information or the technology do not support or require anything more timely.

B). "Event or Document Centric"

Regardless of the timeliness of the business process, most methods today use the concept of a document as the basis for B2B communications. The practice of using standardized forms has been evolving from the origins of written communications to the current form of XML-based documents. In today's business framework, is customary to send orders whenever convenient (individual-basis, 24/7), and your trading partner will respond accordingly. This is still much in keeping with an evolving document model, pushing more and more value into the document by standardizing its structure and content.

Such interactions styles are typical of the Internet today because a great majority of them operate on the exchange of web pages or electronic documents that are programmatically assembled in "real time," based on some type of

event. This exchange on the Internet relies on standardization in the form of HTML to enable browsers to understand the assembled document.

Event or document centric interaction continues to evolve, enabling single documents to be sent when appropriate or desired. This model reflects the evolving partner-based activities of businesses in the real world. It is based on established relationships, agreeing in advance on the form and meaning of documents or electronic information to be exchanged. A variation on this concept is emerging, and it allows EDI (document standardization based on consortium agreements) to leverage the Internet standard called Applicability Statement 2 (AS2). AS2 is a method of sending EDI documents over the Internet instead of a private network (VAN), using a send function with a request of receipt and a receipt return. Its primary goal is to attempt to save VAN connection fees. AS2 is a good example of a batch coupling evolving to an event or document centric approach with a modicum of process standards (first level acknowledgment) added.

RosettaNet standards are based on XML, using the Internet as transport. The standard is a marked improvement over the AS2 approach as RosettaNet takes the single step AS2 model and improves on it by incorporating an up to three-step standardized business workflow process. It revolves around specific, previously agreed-to standardized documents. In fact, the majority of the RosettaNet standard is focused on these combined document/process models.

RosettaNet's approach combines this document or payload concept in a several-step business workflow to sustain short, choreographed interactions called Partner Interface Processes® or PIPs®. The addition of process to the document model raises RosettaNet's value far above the initial event model or stateless model and acknowledges models of other standards.

This level of value meets the needs of many companies very well. It matches the level of many companies' private processes and internal integrations as well as their system capabilities. Its level of process also begins to address business timing by establishing and answering time requirements for many typical interactions such as "Submit a PO" or "Change a PO."

C). "Services Centric"

Web services will alter several aspects of this base concept of B2B interactions. It will shift the primary emphasis on electronic documents to something similar to a virtual database. These units of information that all the business partners understand in the same way will operate more like components of a virtual database with specific levels of security applied to individual elements, enabling access and updates to the actual business records by multiple parties in long running processes.

Web services will also begin to change the dynamics of partnering. It will impact the timing and the interaction style and thus will change how and where partnering occurs. By permitting direct application linkages, applications can be enabled to use services directly by accessing partner applications as if they were local, and exchanging information directly – and doing so on demand.

B2B interactions using Web services at this sophisticated level will require an even higher level of standardization in some areas but in others it will leverage existing standards. For example, it is anticipated that Web services will initially take advantage of the business document formats developed by RosettaNet as templates for the portable databases needed for most B2B interactions.

Web services will permit B2B interactions between multiple partners directly through their applications during the same process, enabling concepts such as production balancing between partners and suppliers within a chain or across a chain in real time. They will also permit activities such as simultaneously sharing the same PO between the supplier, a financial organization, and a carrier to validate all facets of completing an order at once, enabling each participant to work with their relevant portions of the interaction. Such interactions will change business culture and process, and as such they will take time to be fully enabled. Markets and

industry consortiums such as RosettaNet will undoubtedly drive the pace.

The service-based business model can have great impact on some of today's implementation issues, such as file size. Instead of sending large files to refresh product catalogs at local sites, a Web service would permit real time query of a remote catalog by item, and doing so on an application to application level. Such interactions would drastically reduce the amount of data needed for such interchange, eliminating the need to send the entire catalog. And it would permit application filtering on both the sending and receiving servers – personalizing the data to the exact needs of the local application user. As server-to-server or B2B base level, connectivity continues to mature, B2B interactions will also benefit from a services model that addresses even greater time sensitivities or longer running interactions.

Web services will also impact the long established business model of "no partnering without an interaction-specific, pre-established relationship." It offers this new model by addressing connectivity from a services viewpoint rather than a pre-established relationship view. Each connection, down to the specific element level, can carry its own security, and that security can be shared across business interactions. Thus, an initial relationship set up through downloading a Web services description could be leveraged across the entire range of service offerings, spanning the total enterprise.

Web services implementations are demonstrating modest growth. Several organizations are working small projects all the way up to integrations in various stages of implementations. These projects are only beginning to explore the boundaries of "client service orientation." At a consumer level, options such as incorporating a search engine or accessing a shopping cart hint at the rationalizations possible on an external basis. At the B2B level, functions such as tax calculations, shipping status and customer ID lookup services across a corporation hint at internal possibilities. Each of these services is accessing existing standards, and in the B2B space, they are beginning to leverage the business standards evolving from the "document/payload" models in use today.

Although some aspects of Web services are not fully accredited by standards consortiums or are still in development, other facets of Web services are beginning to be accepted and driven by multiple standards bodies. As an emerging technology, they are limited in market penetration, and where applied, are enabling improvements beyond the event- or document-based models in use today.

ROSETTANET AND WEB SERVICES; AN EVOLUTIONARY PERSPECTIVE

RosettaNet can leverage Web services technology today in multiple ways to offer an even higher level of functionality for the cross-enterprise supply chain communications it serves. Specifically, Web services, itself a standards-based technology, could be incorporated as the underlying infrastructure to enable the deployment of RosettaNet-compliant documents directly onto the Internet, in full accordance with the RosettaNet Architecture. RosettaNet e-business processes or PIPs could then be advertised, discovered and accessed in the similar public settings as other services. Search or intelligent agent-based bidding services could be enabled similar to those that users access daily on the Internet.

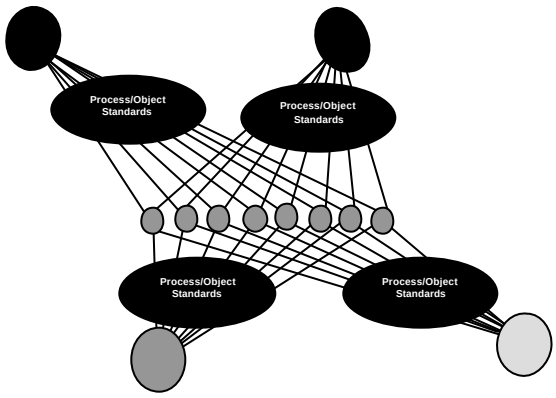

Figure 3.
Web Services; Building on Business Standards

Web services can support the publicly available implementation of RosettaNet PIPs as services with the following types of support:

Document Security. Aside from the current point-to-point message encryption, a Web services infrastructure can also provide complete path (source-to-destination) message encryption for information -- down to the data element level -- rather than encrypting the entire document. This would permit authentication and guaranteed sequential error-free delivery of all elements of RosettaNet payloads or an offered service.

Document Legality. This would permit RosettaNet community members both to enforce and to accept legality constraints such as non-repudiation, authentication, authorization, and "non-alterability" for the documents they exchange with their trusted partners in Internet commerce.

Partner Registration and Discovery. These closely related capabilities could offer concise specifications and descriptions of PIP-based services in a standard, universally recognized format for RosettaNet community members' use. They could also provide secure discovery of RosettaNet Partners in suitable industries, locations, jurisdictions and other domains essential to a trusted business relationship. These same directories could be leveraged as the application-to-application services come on line, providing a broader range of service.

Business Process Sequencing. Partner descriptions can include specification of business process choreographies to ensure that a RosettaNet business sequence driven by Web services is executed as rigorously on the Internet as it is on dedicated systems.

SUMMARY

Web services offer a logical evolutionary path for RosettaNet. Many of the business interactions that are currently serving RosettaNet users today can easily fit within the Web services architecture with minimal effort. In fact, this framework can effectively accommodate "Push Interactions" that need to move information in a reliable way, in a designated time scale other than immediate response. Some of those can be expected to be effective for years, all the while using documents within a Web services architecture.

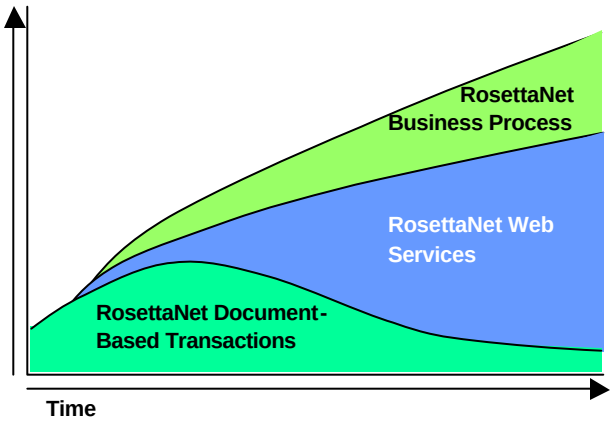

Figure 4.
RosettaNet–Web Services Evolution

However, the evolution will depend upon company business models and their need to adopt a service interaction model to address specific B2B communication challenges. It also can be expected that different partnering scenarios will adopt different interaction styles to conduct e-commerce.

The RosettaNet consortium, driven by industry-leading high-technology companies, continues to explore the opportunities that may exist under the emerging Web services model. The thought leadership exemplified by RosettaNet's Board members, in investigating and understanding these avenues for potential convergence, is consistent with the organization ongoing position of collaboration in the industry In addition, some member companies are directly involved in the development of many of the proposed Web services standards. Such close ties can only assist in driving the continued evolution and convergence of RosettaNet and Web services.

Where Do We Go from Here?

To describe more precisely how RosettaNet PIPs might be deployed atop a Web services infrastructure, how they might operate, and what they might look like requires a deeper discussion of Web services standards and models than this paper is intended to undertake. Throughout 2003, RosettaNet plans to publish a selection of technical white papers that will describe how the more popular Web services models might be mapped to provide the Internet-ready infrastructure for RosettaNet. While there are many different emerging Web services models, the hope is that, over time, these will converge to serve the purpose of assuring B2B communications among trading partners.

ROSETTANET'S VALUE TODAY

Since its inception, RosettaNet has been loosely based on the event- or document-centric model for connecting partners to accomplish tasks within the product life cycle. RosettaNet's level of success is based upon resolving real business issues in a consortium-driven model. Its standards serve the Electronic Components (EC), Information Technology (IT), and Semiconductor Manufacturing (SM) industries very well by responding to the sectors' needs, as the industries become targets for business improvement. RosettaNet is balancing the needs and benefits of a change in architecture with the need to continue expanding business interaction offerings across the entire range of product life cycle.

Business Architecture

The RosettaNet business architecture is based on identifying discrete segments of public business processes and then standardizing the public business interaction processes involved within each of those segments.

The segments themselves are broken into sub-processes until an event- or document-based interchange process is defined: a Partner Interface Processes (PIP). This approach is very beneficial, permitting members to invest in and focus on processes that provide return for them while not forcing completion of the whole range of the standard. Many of the sub-processes in several of specific overall processes have been completed as members focus on individual value based upon their e-business strategies.

The result of this methodology breaks the larger segments into smaller value-based projects so that gains can be achieved along the way. Each project then aggregates specific value, permitting investment in the next stage. This methodology, which in today's high technology economy is pragmatic, has been a successful strategy that garners considerable support. Members who are implementing the standardized processes are obtaining real business value today.

The methodology also leverages investments across members. Projects are undertaken by groups of members, each participating at a level far below that required to develop the entire process individually. It offers the benefit of shared investment while still imparting a very high level of input/involvement. This permits members to involve others in their supply chain in the consortium, spreading the needed investment at each stage while also ensuring that the requirements are truly global. This model is working very well for the members of RosettaNet, providing return on investment (ROI) today.

Technology Architecture

The RosettaNet technical architecture is the most complete architecture available today for connecting business using open standards over the Internet. RosettaNet has developed a model that permits it to meet the needs of external connectivity, of exchanging documents and for controlling important processes to accomplish specific business goals.

RosettaNet's architecture combines several components required for successful B2B communications: **RosettaNet Implementation Framework (RNIF)** defines the layers of messaging services and base infrastructure. **RosettaNet Business Dictionary (RNBD)** and **RosettaNet Technical Dictionary (RNTD)** handle dictionary structure and content. Business messages and choreography are combined into the **Partner Interface Process (PIP)**.

This architecture has served RosettaNet well. It permits growth of functionality as members continue to invest in and develop more and more processes over time while only mandating that the RNIF/RNBD/RNTD is followed as the foundation of the model. Such standardization of the lower levels of the model permits members to focus on their business needs by expanding the range of PIPs over time.

The data model for the PIPs is in the process of transitioning from a DTD/Message Guideline format to an XML Schema and limited ebXML Business Process Specification (BPSS) model. This new format will permit PIP implementations to be automated, simplifying and further reducing costs.

RosettaNet Summary

RosettaNet's architecture echoes the evolving world of business. As such, RosettaNet has weathered the test of both time and global growth. RosettaNet has gained considerable traction in the Electronics Industry, where time is truly money, shelf life is measured in terms of weeks to days, and where product life cycles are being rapidly compressed to optimize market gains.

This stability and continued progress and growth of RosettaNet and its technology offer the industry time to pose the next important question: Are emerging technologies available that might provide the next improvement in architecture for B2B interactions? Looking at what is available in the market today, the question has several facets: Are the evolving technologies relevant to RosettaNet, can any of them be used within the RosettaNet Architecture, should any of them be used within the RosettaNet Implementation Framework, and if so, what might they look like?

This collaborative industry paper was jointly developed by RosettaNet staff and members of the consortium, including key content and editorial contributions by Ralph Hertlein (IBM) Art Kruk (Oracle Corp.) and Todd Freter (Sun Microsystems).