Commercially Viable Web Services: A New Business Model?

Abstract— Web Services are dynamically changing the way businesses work from program to user interactions to program to program interactions. Web services will provide a platform to enable a class of billable services that support the business model *"Outsource on our servers and charge"* as opposed to the traditional billing model *"deploy and charge"*.

We take the position that Web Services will be responsible for ushering in a change in the way traditional business models work. As argument, we make a strong case for the advantages of using web services over traditional software deployment methods. We also present case studies where commercial vendors and businesses have actually invested in hosted web services to improve the functioning of their organizations.

1. Introduction

Web Services are business and consumer applications, delivered over the Internet, that users can select and combine through almost any device from personal computers to mobile phones. By using a set of shared protocols and standards, these applications permit disparate systems to "talk" with one another-that is, to share data and services-without requiring human beings to translate the conversation. By using a set of shared protocols and standards, these applications permit disparate systems to *'talk'* to each other-to share data and services-without requiring human beings to translate the conversation.

Every emerging technology has to cross the chasm between innovation and acceptance. For any new technology to be pervasive and for it to be acceptable as an industry standard there are certain basic criteria that it should seek to accomplish. The technology adoption life cycle for Web services is no different. This new technology could either result in an increased source of revenue or could make the daily operations of a business less complex, whatever the compelling reasons for adoption; the adopters must be convinced of the strong value proposition for their business.

In section 2 we extend an explanation of how web services enable application integration. We then introduce the evolution of B2B (Business to Business) models using Web Services. We make a strong case for the need of web services in today's business world. In sections 3,4,6 we lay the groundwork for our stand. We present possible service scenarios and 2 case studies in section 7.

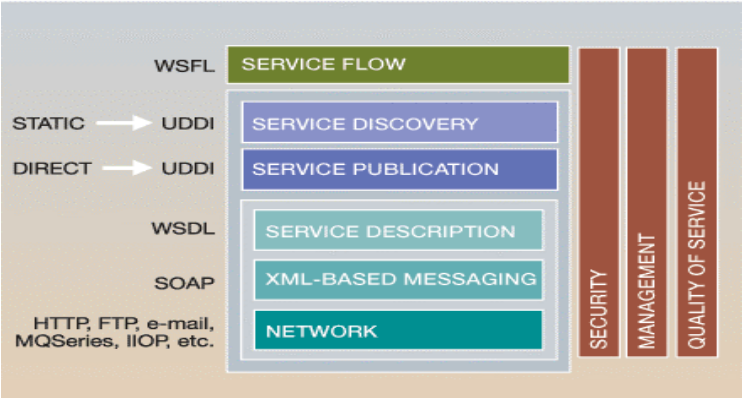
2. Seamless Integration Using Web Services

In order to understand how web services enable application integration, it is necessary to have an understanding of the Web Service Programming Stack.

2.1 Web Services Architecture

The web services stack is a collection of standardized protocols and application programming interfaces (APIs) that let applications locate and utilize Web Services[1].

Figure Web services programming stack



Source: Introduction to Web Services Architecture, IBM Systems Journal, Vol41, 2002

- Network Layer: This is the foundation layer necessary for all transport between services and clients. The network could be based on either HTTP or any other mutually agreeable protocol between client and service. Network Protocol can be made a part of the Service Agreement between clients and providers.
- XML based messaging layer: SOAP (Simple Object Access Protocol)[2] is the XML based messaging layer used for all communications between services and clients. It is a protocol specification that defines a uniform way of passing XML-encoded data. In also defines a way to perform remote procedure calls (RPCs) using HTTP as the underlying communication protocol.
- WSDL (Web Service Description Language)[3]: is a specification that describes the available services to clients.

[1] Introduction to Web Services Architecture, IBM Systems Journal, Vol 41, 2002

[2] For more on SOAP visit http://www.w3.org/TR/soap/

[3] For more on WSDL visit http://www.w3.org/TR/wsdl

These descriptions take the form of XML documents for the describing the programming interface and location of Web Services.

The 3 layers described above are necessary for interoperability of Web Services.

The remaining layers are optional.

- UDDI (Universal Description, Discovery and Integration) An XML-based framework to enable businesses to discover each other, define how they interact and share information in global registry.
- WSFL (Web Services Flow Language) is an XML language for the description of Web Services compositions as part of a business process definition. It was designed by IBM to be part of the Web Service technology framework and relies and complements existing specifications like SOAP, WSDL, and UDDI.

In order for a Web Service application to meet the stringent demand of today's electronic B2B model, enterprise-class infrastructure must be supplied, including security, management, and quality of service considerations. These components are represented by the vertical towers in the figure.

2.2 Solving e-business problems using Web Services

Using the industry standard stack described above, Web Service components use standard APIs to communicate and provide software solutions.

This technology enables processes to integrate applications across different platforms, using different middleware and programming languages by providing:

- A common networking protocol
- Common Standard for message exchange
- Service Description standard for describing services
- Service Publication and service discovery standards for services

What we must realize is that these common standards did not exist in the industry until relatively recently. With the widespread use and acceptance of these standards today, it is now possible to visualize an infrastructure where Web Service Solutions are hosted by providers and customers pay to utilize them with incurring a high cost for service integration.

3. Evolution of Web Services as a B2B Model

From the very beginning of its specification in 1998, the potential of XML serving as a language framework for B2B (Business to Business) data interchange has been recognized.

By defining industry specific vocabularies, XML has served as a common data format for connecting and integrating applications. However, integrating diverse business applications running requires more common ground. For example, how does the data exchange between different applications take place? Or for that matter how can a business find an application that suits its needs?

Web Services are an evolutionary step towards more dynamic and seamless B2B integration. The Web Service standards namely-UDDI, WSDL, and SOAP give us a standard way to implement the functions that are needed for discovering, discovering and connecting to applications on the Internet.

4. Why do Businesses care? : A simple example

The business environment today is very dynamic; companies are constantly striving to improve and adapt to the changing economic scenarios. Today's global economy requires companies to deal with an increasing number of customers as well as suppliers from all over the globe.

Let us take a simple example of a spare parts manufacturing company XYZ, which has been delivering quality parts to domestic customers for a long time. The company has a stable workflow consisting of order entry, production planning, manufacturing, delivery and financial transactions. Now let us say that the XYZ Company wants to tap customers in overseas markets. This requires XYZ to incorporate new business processes like document translation, export approval transactions, overseas delivery and international fund transfers. Some of these new processes are not a part of the company's core competency: hence they can be outsourced to other third parties which charge for providing these specialized solutions. At the same time these new operations should be able to interact with the existing IT workflow flawlessly, independent of software platforms, middleware or programming languages. This is where Web Services come in providing the effective solution of being able to provide a seamless interface between existing and new processes.

In the quest for higher performance, what company can ignore the benefits of partnering with business specialists and of outsourcing non core activities to focused providers? The virtues of business are clear: innovation and efficiency.

In our opinion Web Services have the potential to significantly change the way companies do business. Besides reducing the cost of integration information systems, Web Services can potentially further fragment value chains and make brands and reputations even more important weapons for retaining customers. Market research (International Data Corporation, McKinsey analysis) has shown that systems integration is the single biggest IT expense of most companies. Reductions of upto 20% percent are possible, mainly through reductions in cost of developing interfaces among systems.

Popular support for implementing web services can be gathered from a survey by Forrester Research in which 57%

percent of the companies they interviewed planned to implement web service solutions by 2004. In August 2003, Web services standards reached a milestone when the 170 member-strong Web Services Interoperability Organization (WS-I) approved a test suite to certify that your customers can use your Web service as easily as they can use your Web site.

To summarize *'Business Process Outsourcing'* using Web Services will enable companies to focus on their core competencies, boost their customer base as well as customer satisfaction.

5. Counterclaims and Challenges

Detractors of web services claim that there is too much 'hype' regarding web services. We discuss here some of the 'apparent' shortcomings of this technology.

One of the reasons touted is the lack of a proper security standard in the model. Secure message communication, preservation and archiving is crucial to the widespread adoption of Web services frameworks. But agreement on a common standard for secure messaging among Web services working groups has been elusive. The Web Services Interoperability Group has been working on drafting a security spec since 2002.

However, on April 7th 2004, the WS-Security draft was successfully accepted as a standard by the e-business standard group OASIS (Organization for the Advancement of Structured Information Standards). Forged by Microsoft, IBM and several other high-tech vendors, WS-Security describes a protocol for securing and managing the identity and integrity of Web services messages in complex networks. Based on this recent development, we concur that once the security module is implemented in services, security will no longer be an issue.

Another reason for disapproval of web services is lack of message reliability. Exchange of critical business information such as purchase orders, contracts, and requests for quotes (FRS) or for that matter employee information, credit card numbers must be done reliably. Once again guaranteeing reliable communication is an issue where there has been a lot of contention.

OASIS is working on drafting a WS-Reliability standard. WS-RM will include three types of delivery: guaranteed delivery, which means the message is delivered at least once; duplication elimination, which ensures the message is delivered at most once; and message delivery sequencing, which determines the order in which messages are delivered.

One major reason for concern is regarding storage of data. A story that is repeated over and over again is that customers do not inherently trust web services with storing their data. Users routinely give out sensitive information to web services but would prefer to have the data on their own site. A number of users believe in the tangibility of software services. They would prefer to run a service on their own desktop rather than have a service host it and access it over the network. Our response to this claim is that current web technologies like J2EE and .NET provide as good a 'tangible' feel as any software installed on the user's desktop. As far data storage is concerned, we feel that keeping a data copy on the users site besides on the hosting site could be a probable solution or for that matter making the facility of 'on demand' data copies available could solve this problem.

After companies or organizations discover trading partners and the services they support, and after the companies exchange data in standardized message packages, a basic problem still remains. Companies still need a common understanding of the data exchanged in their message payloads, a subject called business semantics.

The more established Web services specifications, such as SOAP, UDDI, and WSDL, define an infrastructure for the exchange of business data. However, once companies get the right data to the right place at the right time, the trading partners must also share the same understanding of the data delivered. Without that shared understanding in e-business, the companies, if they are lucky, have only wasted their time and efforts. Even worse, and more likely, is the scenario where companies exchange information but interpret the data differently.[i]

With this view in mind, the Web Service Community[4] is working on developing a standard for a Context Aware Data Interpretation Standard that will resolve this issue.

6. Hosting Web Services: The new business model

As better standards and more popularity emerge with the Web Services model, there is growing trend to move towards hosting web services. The original idea of "software as service" emerged before the current hype around web services. It was the notion that applications would run in the network: the user interface could be downloaded and used on the fly on any Internet-connected device, and that substantial portions of the application --- in particular those that were focused on logic and data --- could be exposed and used by other applications easily.

Jeremy Allaire, Chief Technology Office of Allaire

[4] http://www.webservices.org

Corporation which markets the popular Macromedia line of products raises certain interesting issues. He says that Application Service Providers (ASP) will be the true torchbearers of web services. According to him this new technology has the capability to fulfill the shortcomings of erstwhile ASPs. For the layman, an Internet ASP is a company that supplies software applications and/or software-related services over the Internet. One might tend to say that there is too much hype regarding Web Services and the buzz regarding Web Services will fizzle out like it did for ASPs.

However Web Services fill in where ASPs failed. If I was using a hosted Web Service as a software solution what would I look for from my Web Service Provider (WSP):

- **Specialized software service:** Needless to say, the service should provide me effective and well represented service at a lower cost.

- **Rich user interfaces:** An end user would definitely expect productivity applications to be as rich and responsive as any desktop application. While we can tolerate web applications for discrete tasks (filling out an order form, searching a database, getting our web mail), using them everyday as a core of our business is painful. To quote Allaire: 'With the advent of rich clients like the Macromedia Flash Player, it's now possible to deliver software experiences that rival and even surpass what we experience on the pure desktop'.

- **Easy application integration**: Using Web Services, a hosted application can participate in a network of applications, enabling API level integration between internal and external systems. Allaire gives a simple example of a hosted e-commerce application that might need to interface with a customer management and inventory management system.

- **Massive scale and distribution:** Small, medium and large scale software providers need a distribution platform that can scale and at the same time does not require them to make enormous capital investments and increase operating expenses. Web Services provides all these functionalities- a utility based, execution environment that scales well.

We see web service solutions maturing in two ways:

1. Web Service Providers will *'host'* specialized software solutions for their customers that seamlessly integrate with the internal process workflows of each individual customer.
   These will be a class of services that serve the needs of the business rather than forcing business processes to conform to a particular technology unlike current existing software models.

2. Web Service Providers will host 'available for all' general software solutions that could provide a general service to all customers. The customer can then choose to personalize the service content to suit his own needs. With this model Web services not only promise consumers a more consistent and uniform experience but also provide them with a means to integrate and personalize data and services from diverse sources. Taking for example the Google News Service[5], which can be visualized as a web service providing users with the latest news with different perspectives (from different news vendors) all in one place.

7. Potential Business Model Scenarios

Generic revenue models allow web service hosting organizations to reach new customers, expand existing partnerships or build new ones, and expose existing offerings to new delivery channels. After a literature survey of currently proposed billing scenarios for web services we list below some of the billing models that a WSP can implement:

1. *Transactional Model*: is a basic pay per click or fee-for-use model.

2. *Membership Model*: refers to the billing model where a user account is established with specific terms of usage. A user may register for usage based on period regardless of quantity or based on quality alone

3. *Lease or License model* refers to the revenue model that would be common amongst larger business partners who would require large volumes of usage and expect a more customized agreement. Here, a service provider may charge by volume of transactions or maybe the volume of requesting "components" within the service requestor.

4. *Business partnership model* is a new model where business barter services based on a prior usage agreement

5. The *Registration model* refers to a revenue model that would apply more readily to a UDDI Gateway or Green Pages business. Here the concept of collecting revenue based on a pay-to-be-seen concept is feasible. The premise stands as if a service provider wants to be published they will be willing to pay a registration fee.

Case Study: Better Data Management Services

Automatic Data Processing, Inc. : is one of the largest independent computing services firms in the world, with approximately $9 billion in revenue and 500,000 clients. ADP's Employer Services (ES) Division is a leading provider of integrated business administrative solutions that help its approximately 455,000 clients efficiently manage their

internal processes, allowing them to focus on their core competencies.

Challenge for ADP: How do you build an Open-Standard based solution that can ramp up to provide mission critical services to as many as 50 million new self-service users in a few short years?

Solution: ADP is turning to Web Services to help deliver their frequently requested payroll and benefit data to their worldwide corporate clients. ADP is working with IBM to develop an open, robust, scalable four-layer architecture using Web Service Technologies. By using Web Services as a part of their Pay eXpert solution, ADP will be able to enable ADP's customers to integrate these ADP delivered web services into their respective HR Portals

So here we see an effective way in which a business solution provider can use Web Service Technologies to effectively meet the burgeoning demand from clients for their services.

Case Study: Interoperability between multiple business units

Staples, Inc is an $11 billion retailer of office supplies, business services, furniture and technology to consumers and businesses from home-based businesses to Fortune 500 companies in North America and throughout Europe

Challenge for Staples: Staples processes approximately 100 million credit card transactions per year, with an average transaction value of approximately $100. As a result of the rapid growth and success of the company, there is a need to support multiple business lines, with a number of disparate systems that perform similar credit card authorization tasks. This has caused a burden on IT to support the credit card processing function. Aside from concerns about the cost of supporting these systems, Staples has a desire to create flexibility in choosing its banks and clearing-houses in order to achieve the best service at the best price.

Solution: IBM and Digital Evolution deliver a flexible web service for credit card processing. Staples is using Web services technologies for faster, easier and more cost-effective systems integration. The combined IBM and DE solutions use Web services to enable Staples to build flexible business applications. The benefits, in addition to improved speed and reliability, include improving Staples' ability to monitor and manage transactions and deploy on multiple platforms.

Here we see the perfect example of the 'outsource **and charge'** model. A company focusing on its core competencies outsources additional processes to software service providers, which are specialized in developing these particular processes (in this example credit card processing).

Partners in tightly coupled processes may be good at some activities but they cannot be the best at everything. The aim is at bringing together different procceses, each providing its own specialization. Once again, web service technologies enable a seamless integration.

8. Conclusion

The arguments presented in our case clearly show that web services provide organizations with an effective platform to effortlessly connect with partners, providers as well as customers.

Keeping in view all the requirements for a business to survive in today's economy, services that provide specialized functions and charge for making these services available are bound to flourish. We do agree that web service technologies are still maturing in certain aspects. However, as with any other technology, maturity and evolution will always be a constantly engaging process

Web services technology can essentially be visualized as a bridge: one constructed with open standards, that permits businesses to connect flexibly and at a lower cost. Partners in tightly coupled processes may be good at some activities but they cannot be the best at everything. The aim is at bringing together different procceses, each providing its own specialization. Once again, web service technologies enable a seamless integration.

The new business model 'Outsource and charge for specialized services ' is not too far away.

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