



WebSphere Business Integration Server Foundation V5.1

*Building and Deploying Service-Oriented Applications
That Extend and Integrate Existing IT Assets*

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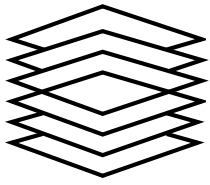
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EXECUTIVE SUMMARY

Under the current economic and business conditions, faster time-to-market of new applications (and faster changes to existing applications) as well as lower IT budgets pose two constraints on IT organizations as they attempt to deliver on their commitments to the business. Given these conditions, the adoption of web services continues to push ahead. One of the driving forces can be found in its rich application functionality, which now serves a company's entire value chain. The expanding use of web services calls for business process integration, both within and outside of an organization. New tools and enhanced deployment environments must be created to deliver these web services and to achieve interoperability. These new capabilities will be targeted at supporting the efforts of both developers and business analysts. Each plays a role in the business process development lifecycle.

Companies that depend on web services view business responsiveness as the key to success. However, achieving enhanced responsiveness is contingent upon the following three factors:

- First, enterprises must be able to quickly create and deploy new business processes as well as make changes to existing processes in response to evolving business conditions.
- Second, a much closer alignment between business functions, IT functions, and their respective participants is required to exploit the new flexibility that services-based solutions offer.
- Third, the increasing exposure of IT assets to a wide range of communities and their participants in business processes calls for tighter security and access controls. This trend toward greater security is accelerated by more stringent requirements on auditability and accountability, which were initiated to ensure that business transactions are executed reliably and in accordance with new and existing regulatory requirements.

A Service-Oriented Architecture (SOA) provides the capabilities for achieving greater responsiveness. SOA permits a company to leverage a componentized approach to application functionality that allows composite applications and business processes to be created dynamically and in near real time. Solutions based on an SOA also deliver benefits: lower development costs, less "pain" when integrating assets across heterogeneous environments, greater reuse of IT assets, and more effective security and manageability.

IBM's latest WebSphere products support the development and deployment of business processes and composite applications based on an SOA approach. Chief

among these products is WebSphere Business Integration Server Foundation V5.1, which forms a core component of IBM's Business Integration Reference Architecture. IBM populates this architecture with a variety of products aimed at facilitating business flexibility and agility and achieving greater alignment between business functions and the work of the IT organization. WebSphere Business Integration Server Foundation enables businesses to capitalize on SOA adoption.

Despite the architecture's capabilities, IBM faces a challenge: The perception that WebSphere implementations require a high level of professional services involvement and a high price. But IBM is on the case and ready to confront this challenge. It is focused on improving the integration among elements of the product family, boosting the efficiency and automation of development through better tools that leverage an open source model, and enthusiastically supporting relevant standards activities (and, in its products, the standards themselves).

This paper looks in detail at WebSphere Business Integration Server Foundation V5.1 and how it enables companies to extend and integrate current IT assets.

DEMANDS ON THE IT ORGANIZATION

Services-based approaches to creating and deploying applications are on the rise across the business scene. Web services allow businesses to capitalize on existing applications while delivering faster and cheaper services to a demanding market. IT organizations are expected to run with the ball. But they face daunting business and technical challenges. A look at these challenges provides a deeper understanding of which solutions will deliver benefit.

From a business perspective, enterprises find themselves contending with an overall environment that features three significant problems:

- *Responding to a rapidly changing competitive landscape* – IT advances in the forms of such well-known trends as the proliferation of the web and services-based implementations afford enterprises tremendous opportunities to deliver products and services more effectively and efficiently and to work more closely with business partners. However, at the same time, an enterprise's competitors are also leveraging these same capabilities; this raises the stakes in terms of the required level of responsiveness. The implication can easily be missed: Businesses can find no magic bullet – a single application or piece of hardware that delivers long-term competitive edge. The IT department must put in place the elements that will allow the company to accelerate the rate at which it can change and adapt its business processes and the applications that support them. The information required to make the business decisions that support these and other business-related changes must be quickly and continuously available. The IT imperative is to enhance, revise, replace, and otherwise ensure that its systems stand at the highest level of responsiveness and flexibility in order to support the company's business goals. This means

adapting more rapidly to changing business priorities. IT must become a key enabler of business agility.

- *Increasing business efficiency and the performance of business functions* – In a tough economy, the same competitive pressures that lead businesses to accelerate their time-to-market while simultaneously lowering costs also have an impact on IT. This business scenario intensifies the need for a tight relationship between IT and business functions. Success is now more closely linked to harnessing technology. Second, an increasingly important component of business efficiency involves business processes that cross organizational boundaries (to embrace business partners, suppliers, governments, and other communities across the value chain). IT must develop core competencies around state-of-the-art integration technologies that empower interoperability mechanisms. Tying together business processes and applications with an eye toward “end-to-end” integration remains a difficult task, but this is needed to fully exploit the benefits of a services-based approach. Third, IT is now the critical link in supporting business activities and processes that must move forward under severe cost and time-to-market pressures.
- *Doing it all while protecting critical business assets* – Today’s IT environment features a high level of both internal and external integration. Business processes and the solutions that support them span multiple communities across a wide range of geographies. When an enterprise’s assets are exposed in this manner, it accentuates the need for solutions that will keep these business-critical assets secure. The goal is both to ensure that their value add in terms of creating competitive advantage is protected and to safeguard the transactions that flow among all parties. Personalized and/or role-based access to functionality, data, and information, as well as privacy, must be securely and reliably maintained. Auditability is a must – particularly in the intensifying regulatory environments of the U.S. and other regions. The bottom-line need rests on a management capability that is in line with the highly integrated IT environments in use today. This capability must allow enterprises to create agile, highly interoperable, and efficient business processes while it simultaneously protects the competitive value of the IT assets involved in the implementation as well as the organizations and individuals that participate in them. Effective and automated detection and resolution of functional problems, particularly as they relate to process failures and performance issues, also ranks as critically important.

As the economy improves, the intense cost-cutting that has been the focus of many IT organizations over the past few years will begin to shift toward creating solutions that increase business opportunity. This change will bring two results. First, it will serve to increase the concentration on new enabling technologies. In addition, it will accentuate an important point made earlier: IT and business strategy must align better so that IT stands in a position to support key revenue and profit growth opportunities with the right solutions. Doing this efficiently will likely mean that the “silos” of functionality that traditionally make up enterprise IT portfolios (which may include applications,

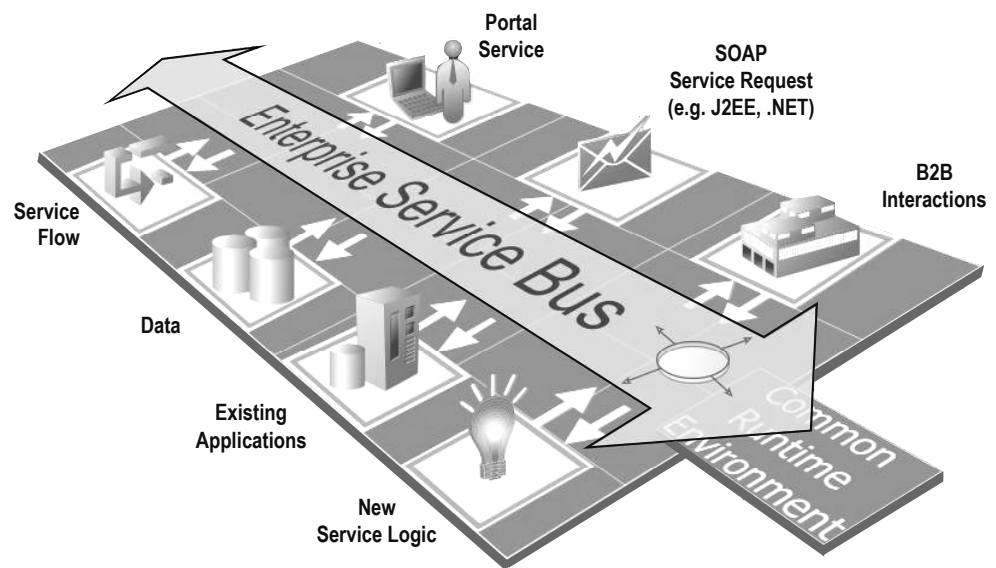
identity stores, databases, and other assets) will continue to be rationalized into a highly integrated, yet secure, IT infrastructure to support business initiatives.

All of this means that IT solution providers will face a community of prospects and customers who will require them to demonstrate the cost-effectiveness of the solutions they provide. Solution providers must also show how their solutions can ease the integration challenge both inside and outside company walls, in a manner that effectively combines the required access levels with security.

ADOPTING A SERVICES-ORIENTED APPROACH

Enterprises today face a daunting integration challenge. Understanding the magnitude of this change requires recognizing the extent to which organizations have deployed a mix of back-end systems, middle-tier business logic, and user interfaces. For an IBM customer, for instance, back-end systems operating on mainframes and based on CICS and IMS (and associated legacy applications and databases) may need to interoperate with J2EE applications running on application servers. The need to interoperate with services and applications outside the enterprise lays on further complexity. Keep in mind that legacy assets may be large, numerous, and implemented using a variety of technologies and languages.

FIGURE 1
A Pictorial Representation of a Service-Oriented Architecture



Source: IBM 2004

As organizations begin to address the integration challenge, service-based solutions can yield powerful benefits. For many organizations, these solutions will be implemented using a *Service-Oriented Architecture (SOA)* as shown in Figure 1. Simply put, an SOA approach allows all software assets to be represented as standards-based, componentized services that can be reused and recombined in order to quickly and flexibly address changing business priorities. Services are, in

effect, “building blocks” that can be assembled into composite applications, and immediately used, to meet a specific set of business needs. A service represents a self-describing asset; therefore, any change in the implementation of a service does not affect the overall application functionality.

Businesses adopt SOAs through four primary paths, depending on their existing infrastructure, e-business maturity, risk averseness, and market pressures. Many will pursue multiple paths simultaneously to reduce risk and maximize opportunity. These paths can lead to the IBM vision of “e-business on demand.”

The first path is a bottoms-up adoption of SOA and occurs at the individual developer or architect level in the organization by means of web services. Such utilization of web services is often driven by a need to reuse the application functionality of an existing asset by decomposing it into services. It can also involve the creation of new functionality for use as a single service. This adoption often occurs spontaneously and each task takes from a few hours to several days to complete, depending on how much transformation of the existing application is required. D.H. Brown Associates, Inc. (DHBA) estimates that many thousands of developers are currently adopting SOA through this route. The result is the creation of millions of such services under construction today. According to IBM, one of its customers, Merrill Lynch, has transformed 23,000 of its legacy applications into services.

A second path to adoption occurs at the business unit or department level, where service-oriented integration is used to create a cross-application business process. These projects are typically less than twelve months in duration. Some common scenarios for these projects may include creating a consolidated view of an account by integrating multiple applications or providing multi-channel access to a back-end service. Almost half the IBM clients are engaged in such projects and most existing case studies of SOA adoption refer to this type of adoption.

Leading-edge organizations are implementing a more visionary form of adoption called enterprise-wide SOA. This is a multi-year undertaking that involves the re-architecting of the entire IT infrastructure by implementing an Enterprise Service Bus (ESB) as the core infrastructure. The ESB is often realized in practice by building on an existing MQ infrastructure, which provides support for web services standards. This adoption path involves an enterprise-wide IT cultural transformation, extending to how applications are developed as well as training of the entire IT staff. Successful execution requires access to enterprise-wide architecture, design, implementation, and governance skills.

The final path to SOA adoption is known as the on-demand transformation. It is driven from the top as part of a specific business strategy, such as a desire to improve business competitiveness, to create a flexible business model, to outsource, to move offshore, etc.

The benefits are considerable. For IT organizations, an enterprise-wide SOA implementation means lower development and maintenance costs, simplified integration across heterogeneous environments, greater leverage of existing IT assets, and more effective management and security. For the business, the ability to easily create new business processes and composite applications to enhance competitive advantage – and to do so without having to be concerned about the underlying IT infrastructure – represents a key benefit. The business also benefits from increased automation that lessens the probability of manual errors. Innovation at the business level, supported by IT and through the use of tools specifically tailored for business professionals, represents additional value.

The SOA stands as the core competency for businesses that leverage IBM's "on-demand" operating environment. Because of this, the company continues working to establish a leadership position vis-à-vis SOA by creating an environment that is based on industry standards, on tools that facilitate and accelerate both the development and deployment of services, and the application of the integration technologies needed to build solutions. IBM is establishing itself as a major player in the creation and proliferation of standards, providing developers and business personnel with an integrated development environment that fosters collaboration and reuse. Further, IBM supports scalable and flexible deployment with a high level of security and manageability, and bringing to bear its experience and best practices.

WEBSPHERE BUSINESS INTEGRATION SERVER FOUNDATION V5.1: IBM'S NEXT STEP IN MAKING SERVICE-ORIENTED ARCHITECTURE A REALITY

IBM recently announced the availability of WebSphere Business Integration Server Foundation V5.1. This product is one of several business integration offerings provided by IBM, each designed to address a different set of customer and application needs.

WebSphere Business Integration Server Foundation V5.1 represents IBM's approach to building and deploying SOA-based applications that can adapt quickly and easily to change. It is designed to support the creation of reusable services (either new ones or those based on existing services, back-end systems, Java assets, and packaged applications). Services can then be combined to form both composite applications and business processes, which can further leverage business rules to make these applications and business processes "adaptable."

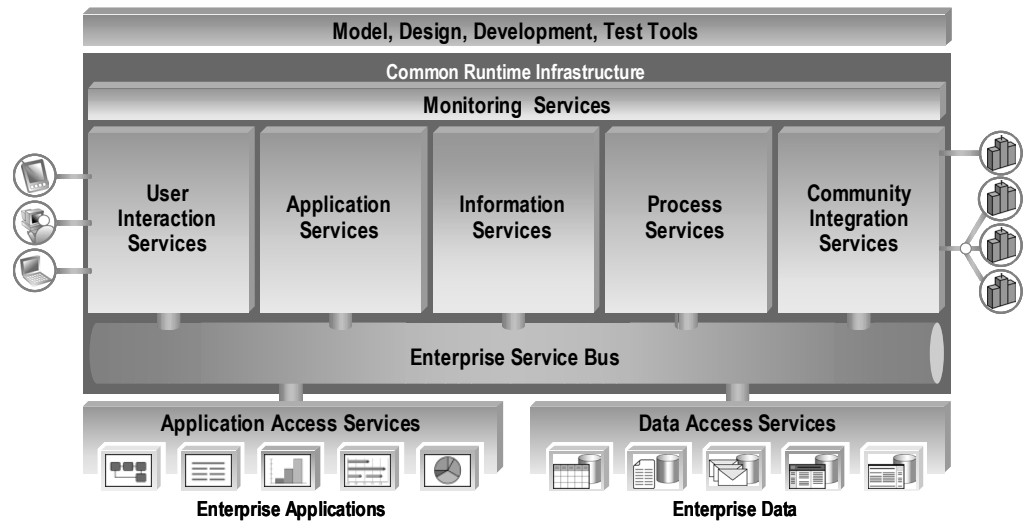
Over the past few years, IBM has positioned the WebSphere Application Server and its various versions and implementations as the foundation for moving forward with SOA-based implementations. Today, while IBM's application server offerings still represent an important core element of how it implements an SOA, the company has broadened its SOA strategy to deliver what it calls the Business Integration Reference Architecture (shown pictorially in Figure 2). Instead of

viewing services-based implementations as a complex, non-integrated stack of software elements and applications, the architecture instead positions functions as services that are connected via an Enterprise Service Bus. According to IBM, the primary services in this architecture are:

- *Information Services*, which provide the capabilities required to federate, replicate, and transform data sources.
- *Process Services*, which deliver the control services required to manage the flow and interactions of multiple services in a way that implements a business process.
- *Application Services*, which offer the set of runtime services required for new applications and new business logic.
- *User Interaction Services*, which include the capabilities required to deliver IT functions and data to end users.
- *Community Integration Services*, which provide the document, protocol, and partner management services required for efficient implementation of business-to-business interactions.

WebSphere Business Integration Server Foundation V5.1 represents one of the lead IBM product offerings in the Process Services space.

FIGURE 2
IBM's Business
Integration Reference
Architecture



Source: IBM 2004

IBM's common runtime infrastructure for all services is based on WebSphere Application Server V5.1, which delivers full J2EE support and a common administration capability with other elements of the IBM reference architecture. From the development standpoint, IBM's approach follows open source via Eclipse. Working through an open consortium called Eclipse.org, IBM and other development tool vendors are working collaboratively to bring users better-integrated development environments. The result is an open-source framework that provides many services that developers need, and permits tools to be "plugged in" via a published and certified set of APIs. All of IBM's tools and

enhancements are designed to work with Eclipse and, therefore, with tools provided by other consortium members. These tools are discussed in relation to WebSphere Business Integration Server Foundation V5.1 in a later section of this paper.

MAXIMIZING RETURN ON INVESTMENT (ROI) BY LEVERAGING OPEN STANDARDS

The initial task in implementing an SOA-based solution is to create services from existing assets. Each service is then available to be integrated into business processes. Last year, IBM introduced the concept of *process choreography* to describe the task of defining the sequence of and the flow of information between individual services to form business processes. Because IBM provides a workflow engine that is fully integrated with the application server, all business processes can be designed, deployed, and controlled within a single environment. This engine, appropriately enough, is what IBM calls the *process choreographer* component. As the name implies, it can be used to manage workflows within business processes in an SOA environment.

The process choreography concept expands upon the traditional notion of a business process. The integrated workflow engine can execute a short-running business process defined at the individual transaction level, or it can execute long-running business processes involving multiple transactions. These long-running processes can:

- connect to other organizations' processes using open standards such as SOAP;
- branch off to do EJB operations as part of implementing a step in a flow; and
- send off and receive JMS messages.

The language used to implement all business processes in WebSphere Business Integration Server Foundation V5.1 is Business Process Execution Language for Web Services (BPEL). BPEL was originally proposed by IBM (in conjunction with BEA and Microsoft) in July 2002 and combined ideas from IBM's Web Services Flow Language (WSFL) and Microsoft's XLANG. A technical committee within OASIS was formed in April 2003, giving BPEL a stronger standards "backbone." The language (which may be more accurately described as a "meta language") is used to define business process models by enabling the description of web services operations, their relationships, and order of execution. It is intended to support the activities of system architects and software developers who are increasingly concentrating on taking the web services created during an earlier phase of their SOA adoption and linking them together to construct workflows.

IBM incorporates native support for BPEL that does not involve converting BPEL to a proprietary internal format (an approach embraced by a number of IBM competitors). IBM's approach avoids an inherent weakness with conversion – the potential loss of information, which derives from incompatibilities between the BPEL standard and the internal format chosen. Another limitation of conversion is the lack of a “round trip” conversion capability when importing or exporting BPEL to and from these non-native implementations. Some of these implementations are limited to a “one way” support of BPEL (import only or export only), while IBM offers the ability to import and export BPEL, thus fulfilling one of the key objectives of BPEL: to enable the sharing of process definitions among environments, runtimes, and tools. IBM's BPEL implementation augments an already rich level of support for web services standards, including XML and SOAP for messaging, WSDL for describing web services, and others related to security and transactions.

LEVERAGING THE SOA FOR INCREASED BUSINESS FLEXIBILITY

As noted earlier, competitive pressures are forcing organizations to become more agile – often on a global level – and to more strongly leverage IT solutions to support business initiatives and operations. Building and deploying applications that allow for the integration of business processes – within the electronic walls of a company as well as outside those walls – represents a single piece of the puzzle. The flexibility to change those applications and adapt business processes to respond to the changing market and competitive pressures that a company faces also represents a key success factor. Customers, partners, and other communities that make up the value chains of an organization will demand solutions that can readily adapt to their needs.

WebSphere Business Integration Server Foundation embraces a service-oriented development approach as a way to help enterprises reduce the cost, timeframes, and complexities of large-scale application development. Because service-based applications are loosely coupled, individual software assets can be developed and modified independently of the rest of the application. The result is a faster turnaround for application updates. A service-oriented approach also carries the potential to reduce the time required to deliver future applications by making it easy to reuse existing business logic from current applications.

WebSphere Business Integration Server Foundation also takes advantage of a business-rules-based approach that permits the creation of highly adaptive applications that adjust easily to changing business conditions. Business rules are extremely practical in this type of situation because they can be used to separate business policies from application code. Any changes to business rules ideally would not require a change in the application itself, and can be performed without involving an application developer.

The degree to which these capabilities deliver increased business flexibility might best be illustrated by an example. Take the case of a bank that would like to process loan applications over the web as a means of expanding its business. As part of this effort, the bank chooses to implement a simple, four step BPEL-based business process. The first step creates a record of the loan application submitted via the web. This procedure might take place using an existing CICS system. The second step looks up information regarding the customer's credit. This might be accomplished using a .NET-based web service provided by another company specializing in credit checks. The third step utilizes a set of business rules to make an "approve/no approve" decision automatically. The fourth step, if necessary, routes the loan application to a loan officer if an automated decision cannot be made.

Suppose the bank decides to acquire a credit check company of its own. Using IBM's SOA-based approach, it could quickly replace the fee-based credit check web service with, say, a J2EE-based service from the acquired company. It could also decide to establish an internal call center as an additional source of loan applications and integrate this channel into its business processes. Additionally, the bank could change the business rules that govern the approve/no approve decision at any time. The point here is that applying the standards-based, service-oriented approach found in WebSphere Business Integration Server Foundation, the bank can build an end-to-end business process to perform its required loan application and approval tasks that leverages business rules and enables real time process modifications. The architecture permits the representation of legacy systems, J2EE components, .NET web services, and human interactions as services that can be choreographed to define the business process. With these capabilities, process modifications are simplified and performed more quickly.

EMPOWERING THE DEVELOPER AND LINKING TO THE BUSINESS ANALYST

Successful implementation of a service-oriented architecture calls for tools and technologies that support increasingly severe time-to-market constraints, lower costs, and, by implication, an emphasis on components and reuse. At the same time, developers understand that to truly reap the benefits of a service-based approach, it must be possible to easily integrate, change, and manage business processes by virtue of advanced tools. Finally, developers must have access to two key elements: features within those tools to augment technologies that support application development (i.e., Java), and web services to more robustly support the transactional, performance, and security demands of service-based applications.

The product IBM provides for developers to accomplish all of these tasks is *WebSphere Studio Application Developer Integration Edition V5.1*. As reflected in its existing functionality as well as new features introduced as part of V5.1, a major focus of this product is developer efficiency. IBM reaches this goal through the incorporation of highly specialized integration functionality. The product allows

users to visually develop business processes by means of a variety of important features to support this style of development. V5.1 updates this capability with a new business process designer and debugger that support the creation of process flows that conform to the BPEL standard. V5.1 also includes a new editor for the Web Services Description Language (WSDL) that simplifies user interaction with the product and adds visual clarity to how the various components interact.

The updated business process debugger offers a first-rate capability. A graphical environment allows the use of process breakpoints and control links, as well as the ability to inspect and update variables. Processes are executed using an integrated unit test environment for WebSphere Business Integration Server Foundation. Business processes can be performed a single step at a time; parallel paths can also be executed through the process. This capability provides simpler and faster time-to-debugging benefits.

Interoperability is the watchword. A great deal of developer effort centers on building adapters that allow the requisite interoperability between existing applications and back-end systems with newly developed business logic. Within the context of a service-based approach, this signifies the ability to build and deploy rich adapters for popular applications such as SAP and CICS that are based on open standards. WebSphere Studio Application Developer Integration Edition allows developers to employ adapters predicated on the Java-based standard JCA 1.0 and then leverage a set of wizards to rapidly create services out of a variety of back-end applications. Take, for example, the wizard that provides the capability to navigate 3270 screens. The approach that made this work grew out of the concept of a business process executing within a single unit of work that permitted the navigation of screen flows. This stands as an example of the use of flows within adapters. In addition to these JCA adapters, WebSphere Business Integration Server Foundation can employ the entire portfolio of WebSphere Business Integration Adapters with support for a variety of packaged applications and technologies. These adapters will eventually conform to a future JCA standard as the robust features currently supported in this set of adapters go well beyond the limitations of JCA 1.0.

With WebSphere Studio Application Developer Integration Edition V5.1, IBM provides developers with a feature-rich environment for building and deploying business processes, creating new business logic, and initiating and integrating services from all application assets. The enhanced support for business-process execution plays out in such a way as to optimize performance, control, and flexibility.

However, performing the required tasks stretches beyond developers. In fact, business analysts and other “non-developer” participants need to be involved in order to fulfill the “business/IT alignment” requirement described earlier in this paper. The first two steps in the business process development lifecycle – generating process requirements and visually modeling processes based on those requirements – involve activities that rely on the participation of business personnel. To meet this need, IBM provides a tool called the WebSphere

Business Integration Modeler V5.1. This product enables business analysts to document and define business requirements, to create a visual model of existing processes (helpful in determining and specifying process improvements) as well as new processes, and to analyze process designs prior to deployment with powerful process simulation capabilities. The output of their efforts can then be exported into BPEL for use by developers using WebSphere Studio Application Developer Integration Edition.

IBM also markets a product for business analysts who are interested in monitoring the operation and performance of business processes. This product is the WebSphere Business Integration Monitor. (The version planned to support WebSphere Business Integration Server Foundation is currently slated for availability in the second half of 2004.) Users can track workloads in real time – down to the level of the individual employee – and can use the results of the monitoring and tracking to control workloads tactically in order to optimize business process performance. The product can also provide business measures that can be used to identify trends. When combined with rules encapsulated in business rule beans these trends can set criteria for work to be shifted among various parties participating in a business process.

With WebSphere Studio Application Developer Integration Edition, WebSphere Business Integration Modeler, and WebSphere Business Integration Monitor, IBM has taken a major step forward in integrating the work of business and IT – key to achieving the flexibility and speed of implementation required for new services-based solutions.

FINAL THOUGHTS

DHBA considers the recent introduction of WebSphere Business Integration Server Foundation V5.1 to be an important step in IBM's efforts to maintain its position as a web services leader and to reinforce the importance of two key concepts: SOA and on-demand applications. The new product, along with WebSphere Studio Application Developer Integration Edition V5.1, WebSphere Business Integration Modeler, and WebSphere Business Integration Monitor, offers a comprehensive suite of capabilities to support enterprise SOA enablement and the considerable benefits that can result. The development environment, designed to accommodate both developers and business personnel (and their collaboration), leverages the prolific open approach inherent in the Eclipse architecture, and offers support for IT asset reuse and unification. The deployment environment, which includes the WebSphere Application Server, is both scalable and secure, and reveals IBM's strong commitment to the development and implementation of standards. In addition, it offers customers the ability to achieve a high level of interoperability across diverse platforms and applications. This not only ensures freedom of choice, it also protects investments in existing platforms, infrastructures, and other assets.

In fact, it is IBM's tendency to work with customers whose environments exhibit high degrees heterogeneity and complexity that presents it with one of its biggest challenges. A perception exists that solutions built using WebSphere products require high levels of professional services involvement – often at a high price. Coupled with the company's visibility and presence, this makes IBM's products vulnerable to competitors' accusations that it seeks a professional services sell. DH Brown believes that with this new announcement, IBM has brought to market a more highly integrated, efficient set of capabilities that will potentially improve enterprises' abilities to use its products at a lower cost and with less effort.

For IBM, success will be achieved by demonstrating to customers that applications which allow the service-oriented model to be implemented and which allow them to achieve the competitive advantages this model has to offer can be built within the cost, time-to-market, and competitive constraints now demanded in the market. Similarly, IBM will work to assure its customers that the SOA they employ will allow a level of flexibility that makes them highly responsive to the markets they serve and the competitors they face.