

Value Chain Integration: The Next Frontier

INTERNET WORLD, JULY 2002

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In April and May, we introduced Business Process Management (BPM) and the Business Process Management System (BPMS). This month we join forces with colleague Jeanne Baker to tie it all together and put teeth into the vision by first describing the Business Process Modeling Language (BPML) and then showing how it is being adopted in a real company for real competitive advantage. This game-changing business technology is already deployed in game-changing companies that intend to dominate their industries.

Large companies currently spend over 30% of their IT budgets integrating their business applications under the banner of Enterprise Application Integration (EAI), trying to get their internal act together for yet another step, B2B Integration (B2Bi). Why are they going to all this effort and expense? They are tying together fragments of their stovepipe applications to create end-to-end, multi-company business processes – those activities that bring ultimate value to customers. It is indeed the entire value chain, not a single company that delivers the goods or services. Value chain management is now clearly recognized as the next frontier for gaining new productivity and competitive advantage.

If end-to-end business processes are the focus of internal and cross-company integration, why not deal *directly* with the "business process" instead of "applications?" Past approaches to both human and application integration have delivered *the partially integrated enterprise* – a partially satisfying state, ill prepared for the future. To achieve integration, companies have deployed limited purpose middleware – file transfer, EDI, message queuing, workflow, Internet B2B gateways, direct database access and synchronization, EAI brokers, and custom point-to point-coded interfaces. This software has delivered important efficiencies, but has also created stovepipe integrations – specific pockets of integrated applications across an overall value chain that remains substantially un-integrated and unmanaged.

Correspondingly, internal and cross-company integration initiatives must begin to be managed and deployed in a coherent fashion. A systematic approach to integration is required. Increasingly, firms are realizing this and are viewing integration as a long-term strategic requirement. They also have come to realize that the target, and hence the *focus* of the effort, must be the end-to-end business process, not technical integration of applications and data. A business process approach to integration requires a new type of strategic integration solution software, the Business Process Management System (BPMS). The BPMS must deliver a rich integration toolset that supports both internal EAI and external B2B interactions as well as leverage today's limited purpose middleware. It must complement this toolset with a framework that can rapidly and securely deliver emerging visions for collaborative cross-business and cross-business unit processes.

A Business Process Approach to Integration

A "business process" is, simply put, a goal-driven ordered flow of integration activities. Common examples of such activities include:

- XML, EDI, ordinary file translation, transformation and filtering
- ERP/CRM application adapter interactions
- Spawn of nested processes and the execution of parallel operations
- Content-based and meta-based routing and data publishing
- B2B protocol execution
- Human interaction via a browser interface

These types of activities are well known and commonly deployed, but historically in a piecemeal fashion. With a business process approach, on the other hand, integration activities can be combined and coordinated to deliver new higher order e-business and value chain propositions.

Some simple business process examples include: 1) Fire-and-forget publishing of a business event to a group of interested participants. In this case, the business process might just have two steps: the actual triggering of the business process and the subsequent publishing of the business event to interested parties. 2) A point-to-point data exchange between two applications perhaps involving data translation and single request-response interaction. A complex business process, in contrast, might require multiple interactions among many applications in a start-and-stop request-response mode along with human interaction, occurring over a long period of time.

A business process approach to integration delivers a consistent methodology and deployment environment for integration. It deploys integration scenarios as modeled business processes – even when the basic requirement only means a simple exchange of data between two applications. It therefore facilitates the most complex style of application integration, but in so doing it can embrace any style of integration.

A business process approach to integration facilitates change management and re-use.

It addresses a fundamental management and productivity problem inherent in first generation middleware solutions: the reliance on a technology view of integration rather than a business view of integration. Low-level integration products deal with low-level integration objects, such as file names, queues, directories, executable program names, and low-level transport semantics. A business process approach to integration provides a layered approach that graphically represents interaction flows among participants in a process. It makes explicit the implicit relationships among separate point-to-point integrations, and extends those integrations into broader realms.

A business process approach to integration provides a strategic framework for incremental advances in business process management. Most end-to-end business processes today involve substantial manual processes. Even in cases where manual processes are recognized as inefficient and substantial automation is viewed as the cure, an overnight conversion into a 100% people-less electronic process flow doesn't make good business sense. There are substantial organizational barriers to a revolutionary upheaval and an exhaustive upfront business process re-engineering analysis effort would be required for a "big bang" approach to automation. It is much more expedient to introduce automation incrementally. A business process approach to integration facilitates gradualism. It provides for the integration of human processes (workflow) with application integration, enabling a general two-phase automation and management strategy. First, processes that currently involve a high degree of manual activities can be brought under a management umbrella, providing – for the first time – a framework for process tracking and problem diagnosis. Second, once initial process management is in place, greater amounts of automation can be introduced incrementally, sometimes unbeknownst to humans involved in the process.

Business Process Management With Teeth

Imagine a world where people speak a language that brilliantly describes the molecular structure of a large object but can't tell you what the object is - or that it's about to fall on you. You've just glimpsed the arcane world of business process applications. Fortunately, the Business Process Management Language (BPML) standard changes all that. BPML is utilitarian enough to describe the process of hosting a dinner party yet sophisticated enough to handle describing how computer system "A" talks to computer system "B" while computer system "C" may drop in or out of the conversation in the same way real business processes behave in the real world.

BPML is open to all developers and creates a standard language that helps businesses coordinate data internally and with outside partners. BPML can share process descriptions without divulging implementation details, which will help break the proprietary programming cycle that spawned too many custom solutions – solutions that developers can't manipulate and users can't read.

BPML is unique because, as an XML-based language, it's easy for most developers to use, and as an *executable language*, it can be executed directly by a Business Process Management System (BPMS), obviating the need for the software development process. The heart of the BPMS is a virtual machine for BPML processes. While direct execution

is a quantum leap from an IT perspective, an equally great potential of the language remains unrealized until business people can communicate using it. To that end a graphical notation, BPMN is vital. Business people are the ones with expertise in their processes and they need to be able to communicate in a way that's comfortable for them. The graphical notation system uses a set of drawing symbols that represent BPML elements. Users manipulate the symbols (various geometric shapes, arrows, etc.) and link process flows graphically. Underneath its "graphic skin," the model is expressed in a BPML form that application developers can use and the BPMS can execute directly. The clear advantage is the ability to depict processes in a way that business users can understand them, while offering complete support for executable processes.

The BPML syntax supports multiple process participants, data flow separation from control flow, produce/consume messaging, dynamic process branching, transparent persistence, embedded business rules, nested processes, distributed transactions and exception handling. In BPML, process models can contain as many execution details as the modeler considers necessary. And yet, BPML also supports a level of abstraction where execution details may be hidden. This process model abstraction promotes collaboration between partners, where a meta-model of the process can be shared, while implementation details can be left to each partner, even those that have not yet adopted BPMS technology.

The chief benefits of BPML are its capabilities both to model and to execute complete business processes. These processes are end-to-end, that is, wide across multiple participants; and deep, that is, able to model deep into the existing IT infrastructure. The execution of those processes creates persistent process data that becomes the new enterprise asset. Earlier workflow systems model role-based interactions (such as escalation procedures) but lack sufficient detail to make these models executable, thereby limiting their benefit to IT. BPML represents the next evolutionary step in workflow management systems. It provides a standard XML-based syntax for process models and a rich set of execution features, including security and transaction integrity.

BPML describes the interaction of *participants* in a business process. Participants can be people, applications, partners, integration activities, such as data translation, or even other business processes. In a process model, a process is a sequence of activities launched by a business event and concluded when a business goal has been achieved. Each activity receives a document (business data or a request), manipulates the document, adds other information to some document context, evaluates what to do next, and passes the document and its context along to the next appropriate activity. Because a simple sequence is too confining to handle the dynamic decision-making most business processes require, it's useful to think of the flow of activities following a variety of patterns:

- A choice, where an evaluation of some expression is made and the next activity is chosen based on the result
- A split, where multiple activities are spawned from the current activity and the child activities run in parallel.

- A join, where the results of a number of activities are united to be further processed by a common activity
- A fault handler, a sub-process launched to compensate for errors detected by the process.
- A loop, where a sequence of activities repeats for a specified number of iterations or until some condition is met.

A single business process can have multiple simultaneous activities and nested processes running through the use of a “split.” A “join” allows the multiple threads to be collected back together to create a single process thread as illustrated in Figure 1.

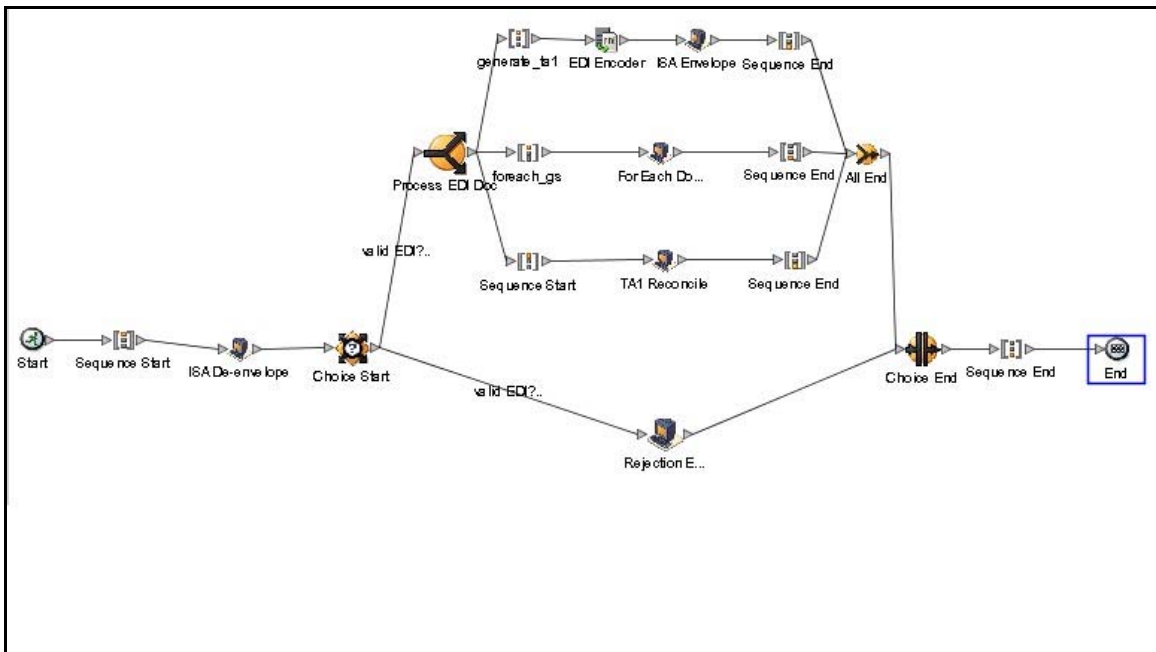


Figure 1. Coordinating Multiple Simultaneous Activities and Nested Processes (Source: Sterling Commerce)

These and other patterns are found throughout most complex, end-to-end business process as shown in Figure 2. These patterns make the business process quite flexible and the primitive patterns provide the new first class modeling entity that can support both bottom up and top down development. By adding the additional capability to interpret business rules for dynamic decision-making, the result is the ability to manage complex, yet agile, systems capable of responding to changing business needs at Internet speed.

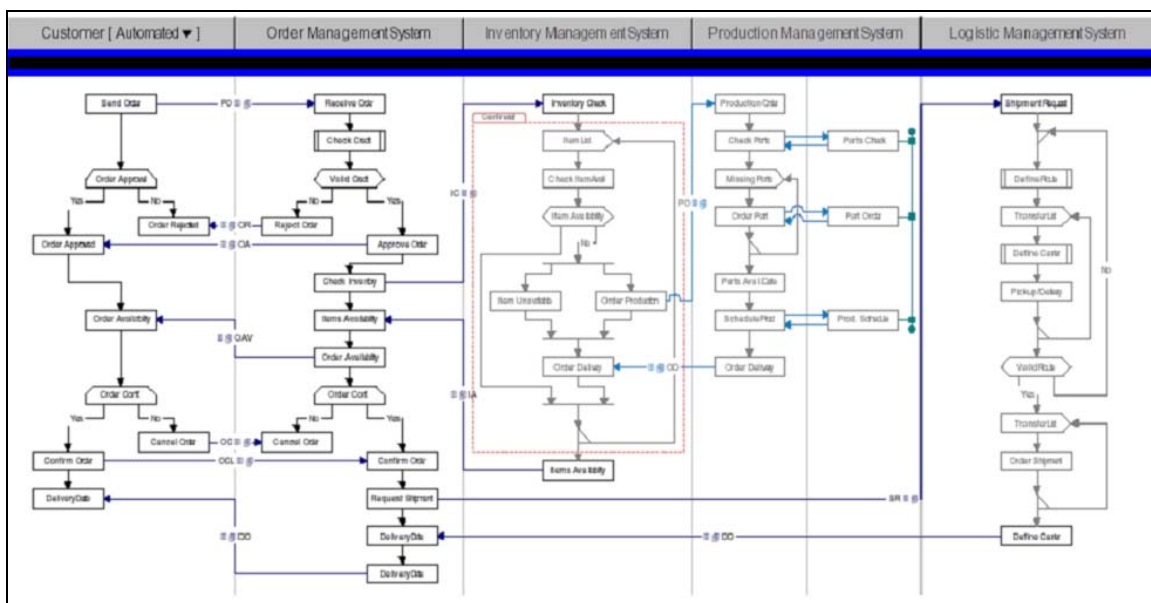


Figure 2. Complexity and Patterns in Real Business Processes (Source: Intalio)

The process model supports an incremental project approach where larger processes can be built from other processes. This incremental approach is particularly inviting to business personnel outside of IT. From a pallet of predefined processes, the business analyst can construct a higher-level flow of activities without concern for the finer-grained details already configured in processes used as the building blocks. Even without having to manipulate these details, the process the business analyst constructs is still fully executable –and the details can be monitored and audited.

Process state management goes beyond maintaining the status of a business process instance. It also maintains the current versions of business data associated with each process step. Whenever a business document associated with a business process changes (perhaps via translation), a copy of the document is persisted. Such functionality is critical for full process recoverability. It also generates the process data that represents the past, present and future plan of the process that is necessary to monitor, evaluate and improve the process. Such an approach can eradicate the need, common in IT, to baseline data associated with different process steps, something that has created huge data replication in many businesses today. By contrast, BPML process models that focus on objectives inherently define what data needs to be persisted and no more than that. In traditional architecture the approach is normally to keep all possible data sets, just because they may be needed. This is a delightful but unexpected benefit of the shift from data management to process management.

These persistence features of business process technologies also are critical in the management of long-lived processes. Through checkpointing of the business process state (including versions of documents at each step of an executing business process) long-lived processes can be managed as easily as large data sets. Business processes can be recovered on any edge and all process data can be queried as easily as traditional data held in database management systems. Such facilities extend to the management of the process designs themselves. This is achieved through version metadata that enable an already-in-flight, long-lived process to utilize a specific version of a translation map, nested business processes, or adapters – even though an administrator may have updated those objects for future process instances.

Long-lived processes impose considerable challenges in managing the computing resources involved. Executing business processes must release resources at each step within a process when they are no longer critical to process completion. For example, long-lived processes waiting on a resource (or a human process) to become available or to complete, must free up their use of computer memory during the wait.

For each executing process, process technology typically maintains an internal data structure (or in the case of parallel processes, a chain of data structures) representing the current state of the process. In addition, as documents pass through a business and are changed, versions of the documents are maintained.

In summary, the Business Process Modeling Language is an XML-based metalanguage that is directly executable and includes specifications for synchronous and asynchronous distributed transactions, compensating transactions, dataflow, messages, scheduled events, business rules, security roles and exceptions. Because it is used to model and deploy mission-critical applications over the Internet, its implementations offer reliable security mechanisms; and because it will be used throughout integrated development environments, it should encompass project management capabilities. In short, BPML puts teeth into the notion of business process management across the value chain.

BPML at Work

Companies that recognize the momentous impact of BPML for competitive advantage are already quietly (or secretly) putting the breakthrough to work. A real \$9 billion consumer goods company (wishing to remain anonymous) makes household, personal care, and pet nutrition products. After considerable business analysis, the company determined that it needed to optimize its existing Vendor Managed Inventory (VMI) process. The company was looking to solve complex problems involving information exchange and data validation with external partners and internal divisions. The scale of requirements dictated an approach that could ease its integration challenges throughout its worldwide trading community of customers, suppliers and carriers, including EDI, SAP, and Internet-based transactions with internal applications – all within a single manageable platform.

After due consideration the company realised that although the barriers to implementing the required end-to-end processes were largely technical, the company also realized it needed to focus upon more than the technical issues. The technical barriers were a manifestation of the complexity and diversity of the systems it had acquired and developed over the years, as well as the varied choices it's partners had made in the deployment of their systems. Going beyond the technical issues, the company also wanted the ability to directly enable business processes and, critically, the ability to derive insight and decision making based on data passed between participants in the process as it executed. In order to improve order and forecasting accuracy with its customers, the data had to be understood in the context of its use, as business processes proceeded from activity to activity, right across the value chain.

The company decided to deploy a business process integration solution rather than a technical systems integration solution. The processes deployed were complex. It was necessary to pre-evaluate incoming EDI messages before moving the data into a SAP system. This was accomplished by posting the data to a Web extension component, much like a portal, where a knowledge worker could correct misapplied information and direct the flow to a SAP application. The data is transformed from an incoming X12 EDI format to XML where the Web extension component can read it. Afterwards, the data is transformed to BAPI format for the SAP application interface. The reverse flow is enacted for information coming out of the SAP system. Although these problems could have been solved using point-to-point integration, process maps were used to define the solution and process technologies were able to implement the flows directly.

The company was most pleased with the smooth integration of a human intervention step into a primarily automated process. The design of BPML helped in achieving this. BPML provides sufficient balance between executable detail capture and implementation independent abstraction so that manual processes and automated processes can be modelled to easily interoperate.

Taking the business process approach to integration meant that the company now has the ability to continuously improve and modify its processes. Having solved the technical

integration problems within the process system just *once*, future processes can be modeled and implemented at the business, not the technical, level. The lifetime cost benefits will accrue over and over during the coming years. In addition, the process-centric approach isolates business design decisions from the complexity of the technical middleware infrastructure, and supports both real-time and batch-oriented business-to-business interactions. The company now has a complete process foundation for its business units to coordinate, automate and manage e-business processes today and tomorrow. It has taken its first step to becoming a process-managed enterprise.

Putting It All Together

Few worthwhile endeavors are easy, and BPML is no exception. Move the document payload out of the center of the universe and centering, instead, on business processes is a paradigm shift. But it's a necessary shift. Although BPML and all that goes with it may exceed one-off integration needs, companies that have implemented significant integration projects using previous technologies view the old proprietary and point-to-point world as an even more daunting prospect. The representation of an integration solution at a business process level, rather than a message or data level, gives users a business view of integration instead of a technology view. As a result, business users can become more engaged in developing solutions and alleviate some of the burden on IT.

BPML integration solutions are more likely to be successful because they more closely match the business problems that need to be solved. By shifting the focus from applications (data and procedure) to the business process (interaction), IT will move closer to supporting the business the way really is – constantly changing, messy, unordered and chaotic. It will also reflect another important reality, that every business person, department, company and supplier in the value chain works in parallel, yet is trying to achieve a common goal – compelling value for customers.

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Directory: C:\Xitami\webpages\docs\bpm\papers\Internet
World\part 3
Template: C:\Program Files\Microsoft
Office\Templates\Normal.dot
Title: The Evolution of IT Integration
Subject:
Author: Howard N Smith
Keywords:
Comments:
Creation Date: 31/05/02 07:29
Change Number: 5
Last Saved On: 31/05/02 16:12
Last Saved By: Howard Smith
Total Editing Time: 5 Minutes
Last Printed On: 31/05/02 16:13
As of Last Complete Printing
Number of Pages: 10
Number of Words: 5,490 (approx.)
Number of Characters: 31,296 (approx.)