Business Process Management, Service-Oriented Architecture, and Web 2.0: Business Transformation or Train Wreck?

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EXECUTIVE OVERVIEW

The challenges faced by today's government agencies and commercial operations are many and varied—and to stay afloat, these organizations must not only promote change from within, but they must also be agile enough to quickly adapt to evolving markets, policies, regulations, and business models. Fortunately for them, the convergence of a trio of technologies and business practices—business process management (BPM), service-oriented architecture (SOA), and Web 2.0—is providing a solution.

INTRODUCTION

As the technologies and business practices surrounding BPM, SOA, and Web 2.0 mature, more and more organizations are adopting them—both individually and collectively. As a result, fundamental changes have arisen in the way IT and business stakeholders work together. Although the opportunities this presents are enormous, so too are the risks: security, inefficiencies, disruptions, and possible organizational misalignment.

To help you in your assessment of these technologies and the benefits they offer (including for executive initiatives such as Lean-Six Sigma, portfolio management, and acquisition transformation as well as mission-focused solutions in areas such as intelligence, defense, and logistics), this white paper assesses the benefits and risks of these solutions and presents real-world perspectives and case studies as the foundational elements for its analysis.[1]

WHAT ARE BPM, SOA, AND WEB 2.0?

If government and commercial organizations are to take advantage of the convergence of BPM, SOA, and Web 2.0 to become more innovative, nimble, and adaptive to change, they must first understand how these technology-based

[1] Information in this white paper was sourced from a chapter entitled "BPM, SOA, and Web 2.0 Convergence: Business Transformation or Train Wreck" in the *2008 BPM and Workflow Handbook* by Linus Chow and Peter Bostrom, April 2008.

solutions work independently of one another. The following subsections provide a brief description of each; the rest of the white paper considers their convergence.

Business Process Management

BPM represents a strategy of managing and improving business performance by continuously optimizing business processes in a closed-loop cycle of modeling, execution, and measurement. Combining a best practice methodology with an integrated technology solution, BPM grew out of an evolution of business processes and the convergence of a number of technology trends. The result is a category of technology solution based on a collection of related, structured activities that combines a variety of functions and features to satisfy a lifecycle driven by organizational goals. By merging these technologies and functions into a seamless integrated design environment, BPM provides technologists and business specialists with a common language for achieving their shared and separate goals—all of which have everything to do with making the organization as a whole stronger and more profitable.

As the communication channel facilitated by BPM technologies and products has evolved, business specialists have become as adept at using the information gleaned from these tools as the IT personnel who install and maintain them. Key business management approaches driving this transformation include Total Quality Management, business process re-engineering, and Six Sigma (including Lean-Six Sigma). In addition, the adoption of enterprise resource planning, customer relationship management, and business intelligence solutions has helped BPM flourish and become more refined in both technology (tools) and methodology (actions).

Service-Oriented Architecture

As an architectural approach that facilitates the creation of loosely coupled, interoperable business services that are easily shared within and among enterprises, SOA derives its true value from the reuse and agility it engenders. An SOA, in fact, encourages the reuse of applications that will last not just years but decades, which means that systems implemented today could outlive their original implementers in the form of virtualized enterprise applications managed as "black boxes" defined by their interfaces.

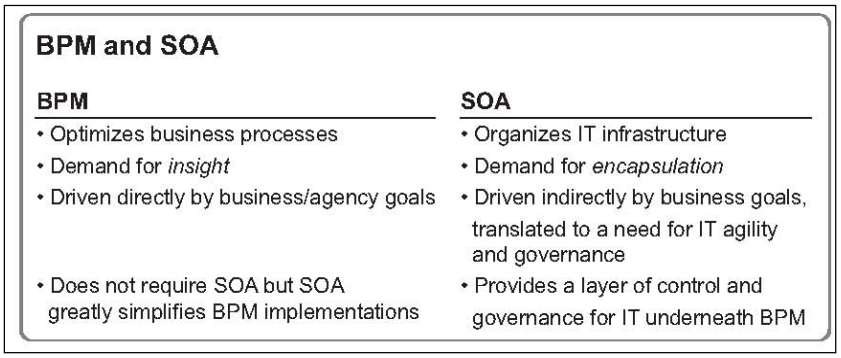

Figure 1: A comparison of BPM and SOA.

Web 2.0

Encompassing a trend in Web design and development, Web 2.0 also serves as a label for a perceived second generation of Web-based communities and hosted services—such as social networking sites, wikis, and folksonomies[2]—which facilitate creativity, collaboration, and sharing among users. The term gained currency following the first O'Reilly Media Web 2.0 conference in 2004, and although it suggests a new version of the Web, it does not refer to an update to any technical specifications, but it refers to changes in the ways end users and software developers use the Web.

"Web 2.0 is the business revolution in the computer industry caused by the move to the Internet as a compute platform and an attempt to understand the rules for success on that new platform."

—Tim O'Reilly, Founder/CEO, O'Reilly Media

According to Tim O'Reilly, who is widely believed to have coined the term *Web 2.0:* "Web 2.0 is the business revolution in the computer industry caused by the move to the Internet as a compute platform and an attempt to understand the rules for success on that new platform. Chief among those rules is this: Build applications that harness network effects to get better the more people use them." To that end, blogs, social bookmarking, wikis, podcasts, Really Simple Syndication (RSS) feeds (and other forms of many-to-many publishing), social software, and Web APIs have emerged to vastly improve and enrich the user experience of the Web.

BPM, SOA, and Web 2.0 in the Enterprise

Customers, industry experts, and vendors are still determining the key value propositions of Web 2.0; however, BPM and SOA solutions are already well established in the enterprise, providing a history of clear and complementary benefits to the organization. This is not surprising, given that BPM and SOA have arisen as the natural result of business and IT users striving to work together more efficiently and effectively.

As shown in Figures 2 and 3, Web 2.0 technologies are still in the early stages of adoption. However, even if organizations at large have not yet gotten fully behind Web 2.0, the CIOs within those organizations have begun to adopt the technologies personally—meaning it's only a matter of time before their organizations follow suit. And indeed social computing and Web 2.0 have already contributed important new designs for online collaborative work and information sharing in the enterprise.

[2] Wikipedia defines *folksonomy* as "the practice and method of collaboratively creating and managing tags to annotate and categorize content" (also known as social tagging).

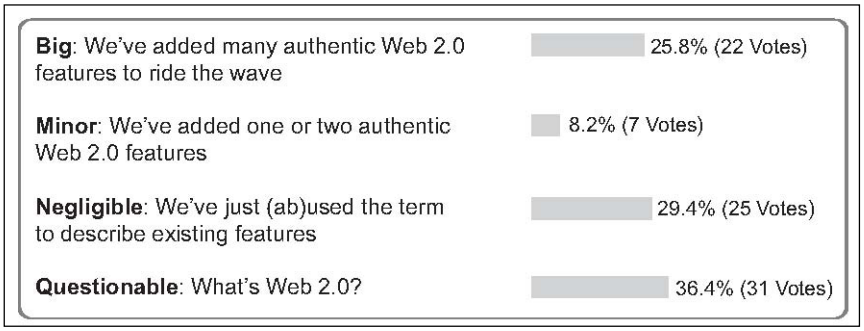

Figure 2: In a 2007 Web survey, Oracle asked its customers, What is the impact of Web 2.0 technologies on your development projects? The results shown reflect the answers of 85 respondents.

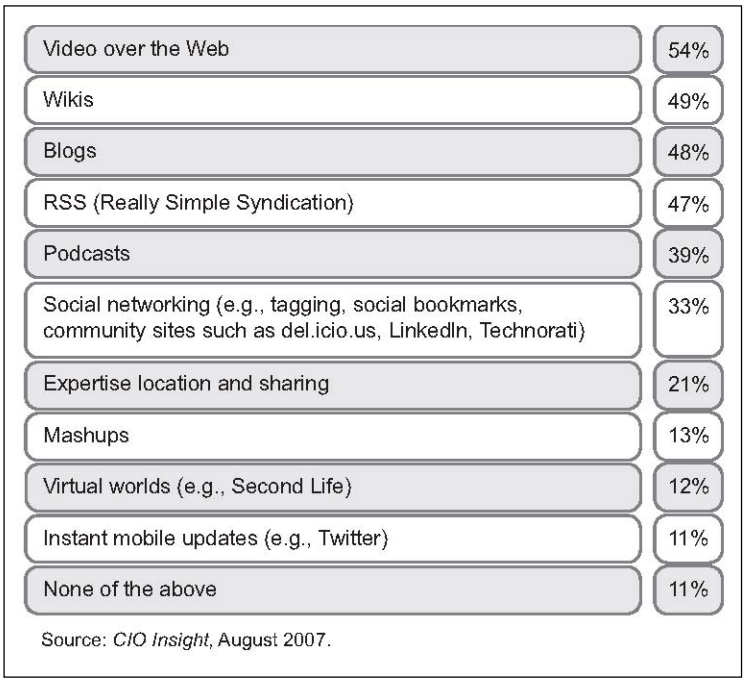

Figure 3: In 2007, *CIO Insight* asked CIOs which Web applications they used personally. The results are shown.

Even from the highly simplified view provided in Figure 4, however, it's easy to see that the intersection of BPM, SOA, and Web 2.0 poses many challenges. One challenge is that a number of different parties normally serve as the chief sponsors of or stakeholders in these technologies. And this means that political and cultural as well as technological compromises will be required if an organization is to derive the full value proposition of this convergence of technologies and business practices.

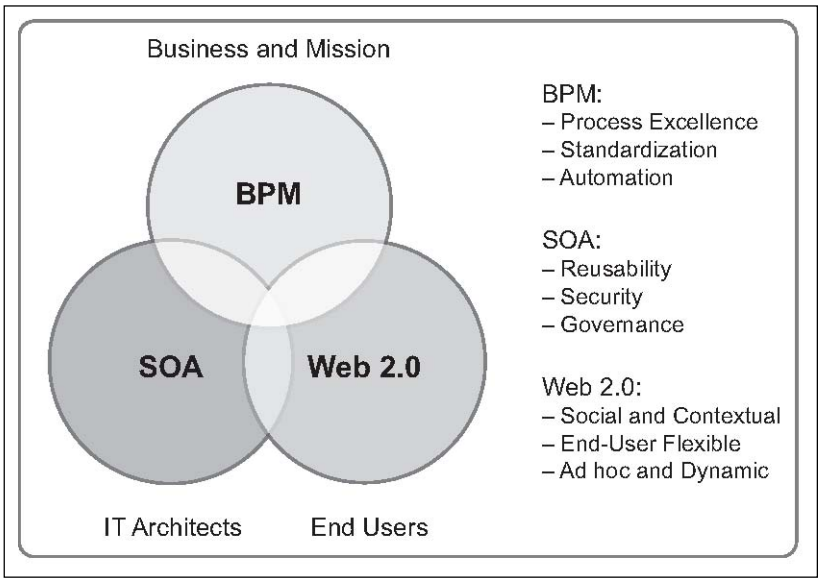

Figure 4: The points of intersection for BPM, SOA, and Web 2.0 are shown.

IMPLEMENTING BPM, SOA, AND WEB 2.0 SOLUTIONS

Despite the challenges, the rewards promise to be many for organizations that are able to manage the convergence of BPM, SOA, and Web 2.0 and implement the technologies based on them successfully. To show you how some organizations are meeting this challenge, in the following subsections this white paper presents the views and experiences of several executives who have already undergone this challenge: Rob Jett, CIO of Redbuffalo, reports on the organizational challenges he's dealt with as an advisor to various segments of the federal government; Kevin M. Brown and Eric Yuan of Booz Allen Hamilton discuss their decision-driven approach to implementing these technologies for the U.S. military; and Robert H. Hodges, chief SOA architect at Lockheed Martin, encapsulates the challenges inherent in bringing these technologies together.

Expert Perspective: Overcoming Organizational Challenges

By Rob Jett, CIO, Redbuffalo

"Without understanding where the business is as well as where it needs to go, you could be looking at a train wreck on your horizon."

—Rob Jett, CIO, Redbuffalo

Early on in our professional experiences, we learn the core business values that we later come to realize are the building blocks of our success. One of these core values goes something like this: To provide solutions, you must understand the business as if it were your own. In other words, a solution is not just about technology. You can look at business transformation in a similar light. Without understanding where the business is as well as where it needs to go, you could be looking at a train wreck on your horizon.

DEFINITIONS

- ***Management business objective*—A set of linked business or policy goals, normally within the context of an organizational structure.**
- ***CXOs*—Refers to the chief executive officers of a business who are responsible and accountable for business strategy, mission, and transformation. This group is also responsible for the policies and cultural values of a business.**
- ***Business orchestration*—Linked procedures or activities used collectively to realize business objectives or policy goals, normally within the context of an organizational structure that defines functional roles and relationships.**
- ***Capability management*—The business area responsible for the services offered to business consumers. It governs approved active services and monitors the maturity and lifecycle of active and new services. Capability management also manages the availability and failover of services.**
- ***EIT*—A business' enterprise information technology group or division (including the systems-level design, development, and support organizations within the organization). This group typically reports to the CXO group for technology or operations.**
- ***R&D*—The research and development group or division of a business. R&D typically has tight bonds with the EIT and CXO groups as well as ties with both academia- and industry-related partners and suppliers.**

Key to successful business transformation is an understanding on the part of all audiences and stakeholders of their roles and the issues that are likely to arise. As long as there are business variables that must be changed to maintain or grow the business, an organization remains an ever-transforming entity. Such changes are usually driven by goal adjustments at the highest levels to adapt to new situations. The driver could be an emerging market trend or changes in the competitive landscape, a core mission objective change, a stakeholder desire, or even just normal growth patterns. Figure 5 provides an organizational, technological, and cultural look at how all of these business characteristics can exist together.

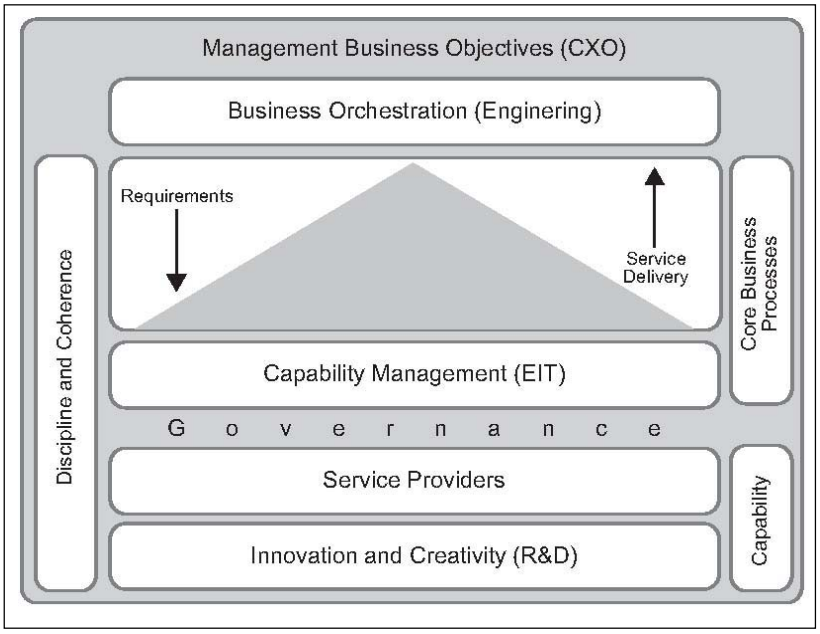

Figure 5: SOA organizational transformation involves many stakeholders.

One of the greatest challenges of practical business transformation is introducing new solutions without disrupting or breaking the business components that are working—particularly in cases where those functional parts are paying the bills. The challenge then becomes maintaining discipline and coherence in your day-to-day business without stifling innovation and creativity.

Addressing Multiple Audiences

Typically, within organizations there are at least three distinct cultural audiences: end users, the enterprise information technology (EIT) group, and the chief executive officers (CXOs) group.

- **End users.** The first group—end users—represents the lifeblood of the organization. These are the people who use information systems every day to complete essential tasks. However, they are not interested in the technologies they're using to do the jobs, and they're certainly not interested in the next "new thing." Not surprisingly, then, it is this group that often poses the most challenges during times of transformation. End users know what their

responsibilities are within the organization, and they're only interested in change if something's irreparably broken or if a clear advantage to the corporation or to them personally can be demonstrated. This audience, or group of users, will even find ways to work around broken processes and systems, and they believe that oftentimes new systems actually result in lost functionality in the name of transformation.

Oftentimes, prior to the implementation of a new system, business analysts with the federal government were using the keyboard as their primary systems interface. Employing a series of keystrokes, they could perform just about any task required of them with the old system. The new system, however, is mouse-centric (emphasizing as few mouse clicks as possible)—and it does not include the keystroke methods employed in the older system. As a result, users accustomed to the old system found their performance hindered. And although new users liked the mouse orientation, they lost their step-by-step process guidance from senior mentors. We found this by capturing their process as a candidate for automation. The senior users would not be satisfied until both methods had been incorporated in the new system.

- **EIT group.** The next group is the EIT group, which in this case includes the engineering and R&D groups. Typically, this group is so self-reliant on its internal culture that outsiders find it difficult to understand. Like end users, members of the EIT group understand the tasks they are responsible for. Unlike end users, however, they are, in most cases, happy to maintain existing business systems while designing and developing new ones. Because this group bridges the gap between end users and CXOs, good leadership, clear roles and responsibilities, and a clear communication strategy are all key to getting the groups to incorporate both vision and business objectives into their solutions.
- **CXOs.** This group of users drives both the business and culture of an organization. To transform the business, the CXO group has to create a vision that can be shared throughout the organization, and then provide the strategic planning that will allow them to achieve their long- and short-term business goals and objectives. The CXO group must also manage the cultural changes that come with adopting a new business structure.

"Any business in the process of transformation should have a sound communication strategy in place—a key component of which is making sure that all parties understand their roles."

—Rob Jett, CIO, Redbuffalo

Communicating Change

Communications are especially important during times of change; thus, any business in the process of transformation should have a sound communication strategy in place—a key component of which is making sure that all parties understand their own roles as well as CXO-level expectations in transformation activities. The communication strategy should also include the high-level vision and the short- and long-term goals and objectives of the groups involved in executing the transformation.

Most businesses involved in such transformations understand that they must evolve to survive. However, each of the previously described audiences responds to change differently. End users, for example, typically find ways to work more efficiently—and, sometimes, just plain more—to produce business-related output. In contrast, CXOs and related management groups deal with change by adopting new strategies, policies, and plans for transformational activities. The EIT group, meanwhile, puts more time into maintaining the system while at the same time looking for ways to continuously improve it.

"How do you bring processes to life and create a service-based architecture that not only maintains the current business practices but also allows for agile change and transformation? The answer is business process management."

—Rob Jett, CIO, Redbuffalo

Once a cultural shift occurs across an organization, it can be difficult to bring transformational activities back in line with the overall vision and management objectives. If this cultural shift and its associated activities are not managed correctly, in fact, the organization begins to take on risk that affects both the current business and its transformational activities. Some of these risks are people related—turnover can rise as more people feel the stress of change. Some have to do with the deterioration of communication channels: an us versus them separation can arise in the business. And still other risks are related to technology—such as building new applications in the same mold as the current system (due to limited funding and a lack of skilled resources).

To get over these hurdles, organizations must keep their long-term vision front and center, and plan for iterative development rather than focus on "stovepipe" or "one-off" solutions that achieve short-term goals at the expense of long-term objectives (creating rework and adding costs). The CXO and EIT groups, in particular, must align around the shared vision, related business objectives, and core business processes and procedures that are vital to the success of the new management objectives. These processes and procedures—along with current services and capabilities—can serve as the common bond among all the groups involved in a business' transformation.

But how do you bring these processes to life and create a service-based architecture that not only maintains the current business practices but also allows for agile change and transformation? The answer is business process management.

Enacting Change Through BPM

The BPM approach understands that all transformation is based on a top-down understanding of the business, its revised vision, and the related goals and objectives. The BPM approach is also based on the understanding that the end user's work is the organization's lifeblood. This top-down understanding drives the scope and priority of requirements for bottom-up process capture and modeling. The BPM provides a common picture of the system as it is to be built. The beauty of this approach is that the people who truly understand the business build the picture of what is needed. Core processes are captured through facilitated sessions, then modeled and simulated to enable a robust process-to-be. The models are then shared and enhanced based on newly visible automation opportunities so that all groups are able to see their new work roles and understand how the system will help them. This in turn provides buy-in and a clear understanding what to expect as

the project moves forward. This picture or model also helps to guide both what service inventory artifacts are required from existing services inventory and where the business must invest in new capabilities. A by-product of the visible model is that businesses can also now see where they don't need to invest as well as where business processes need repairs.

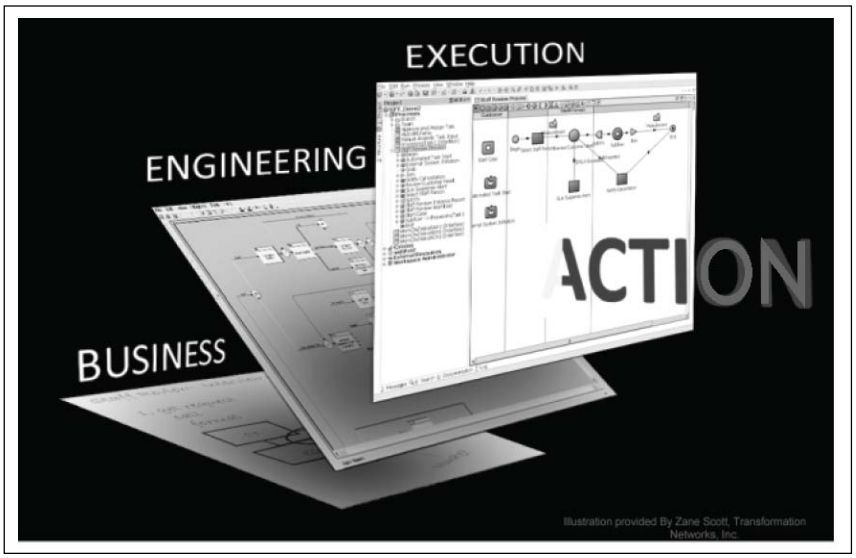

Figure 6: BPM-driven organizational transformation requires business and IT to execute together.

Once developed, these core business models become the basis for more-formal use case and requirements activities. Requirements can be derived directly from the models, providing requirements traceability and the probability of clearer priority weighting of these requirements. The models will also identify pain points for end users as well as return on investment (ROI) areas. Iterative development techniques can be used to tackle prioritized pain points and ROI areas to provide bite-sized chunks of value. By employing core business models and the BPM approach, the EIT and CXO groups are able to see where iterative development concepts can be used. And the ability to see where your biggest returns are aids significantly in the planning and development process. Also, by shifting to an iterative development model, the business can shorten development cycles and better steer activities against overall objectives and vision.

Most BPM tools provide an integrated development environment that allows the CXO and EIT groups to work together via one tool that employs a common set of models. Some BPM tools, in fact, provide a high level of integration right out of the box, including the introspection of back-end services. This introspection and the included code libraries ease development by providing syntactical examples and a standards-based platform. BPM tools also allow for the monitoring of key business performance measures in real or near real time without a lot of development effort. In some cases, CXOs might even have the tools to answer what-if questions based on data captured from live processes or simulations.

By bringing all groups together, iterating development cycles, providing standards-based development, and working from a common picture, BPM tools will help to create a smooth transformation to the new vision for success.

Inventorying Current Systems

Once the plan for transformation has been laid out, the first questions an organization should ask are, Can the business transform with existing services? What do we need to complete the service points and bring our business orchestration layer to life? It's also important to identify single points of failure in the process-related service areas during this stage. In this way, the organization will be able identify areas in which investment is required to complete and maintain the transformed system. The services inventory and its related governance, together with the BPM and its core business processes, serve as the basis for any SOA.

Putting the BPM Tool Suite to Work

When business flows have been captured, services and capabilities have been identified, and everyone in the organization is on the same page, organizations can employ the BPM tool suite to bring processes to life—enabling business process automation and easing enterprise integration with back-end services. Executable models can be built and deployed over many servers spanning myriad geographic areas, allowing the business to grow and transform no matter what its size. Keep in mind, also, that it's never too late to think about the metrics you need from the system. What business questions do you need to answer at which level? How will the answers be presented so that all levels and audiences can take the correct action quickly, based on real data? Transformation is difficult for all businesses, but by using proper technologies such as BPM, businesses can avoid disaster.

Case Study: Booz Allen Hamilton Uses SOA-Enabled Logistics to Aid U.S. Military Client

In the military, the following situation repeats itself daily: A commander is instructed to prepare for a combat mission to take place the following day. When the commander describes the mission and the details of the plan to staff, he or she inevitably poses the following questions: What is the status of our equipment? Will we be able to provide the firepower and support needed to complete our mission and protect our soldiers?

These types of routine status requests are well known in the military—trained for and rehearsed by every member of the commander's team. All members know their parts and are equipped with the latest communications and computer equipment to help in the decision-making process—and all know the importance of providing timely and accurate unit status reports.

Currently, the military is attempting to help commanders obtain this status information by providing several different global databases to manage information, including property book information, maintenance status reports, and parts ordering and tracking information. Unfortunately, the data stored in those systems

is often days or weeks old and not readily accessible by commanders or "warfighters" (the U.S. Department of Defense's term for any member of the U.S. armed forces or a member of any armed forces under the U.S. flag) in the tactical environment. In addition, systems at the edge of the battlefield often provide information as lengthy Microsoft Excel-type reports, which must then be manually converted to a format that leaders can understand and use to make decisions.

As a result—and despite the fact that the military possesses extremely powerful computer systems and massive databases—field combat leaders are still forced to rely on a large number of staff to manually solve a very common problem every day. In fact, the commander's staff must often determine the status of their equipment the old-fashioned way—by making phone calls, sending e-mails, and consolidating notes onto Microsoft PowerPoint slides. The data collected, however timely, might also be prone to errors due to misunderstandings, fatigue, or any number of reasons—all of which can produce dire consequences in actual combat.

The Challenge: Integrating Disparate Datasources and Incorporating Them into Real-Time Processes

The challenge now is to find a way to integrate disparate datasources and incorporate them with the proven real-time processes the combat staff uses to determine unit readiness. This challenge requires overcoming both technological and business process hurdles.

- **Technological hurdles.** These include data integration, nonstandard access, lack of enterprise-level business process management tools, and the lack of an SOA-enabled infrastructure. Although each of these hurdles could be addressed with individual vendor solutions, it is by orchestrating these components that warfighters will be afforded the complete decision-making capabilities they require.
- **Business process hurdles.** Just as important as the technological tools are the business processes used to inform combat decisions. Steeped in tradition, these processes are rigidly followed because commander's staff officers are staking their careers and the lives of many soldiers on the reports they make to the commander. For this reason, staff officers are unlikely to take process change lightly, because current business processes and standard operating procedures have been validated in combat. Not surprisingly, outside vendors attempting to change this culture and its processes to adapt to the tools (or solutions) they're selling face a nearly impossible task.

The Solution: Decision-Driven Design

To overcome these technological and process hurdles for its military client, Booz Allen Hamilton decided to try a new approach: decision-driven design.

Based on the above use case, it was clear that an SOA would be required to integrate the disparate datasources. An architectural paradigm through which monolithic, stovepiped systems (and their data) are transformed and exposed as a

set of loosely coupled Web services, SOA offers warfighters greater access to the information stored across various databases when creating their unit status reports. To ensure that this data gathering can be accomplished quickly, the SOA employs industry open standards and best-of-breed vendor tools. The key to this decision-driven approach, according to Booz Allen Hamilton Project Manager Kevin M. Brown, is using decision-makers' information needs to drive SOA and Web services development. By focusing on the decision (in this case, determining equipment-readiness status) rather than blindly exposing existing data sets, the resulting Web services are more mission oriented and able to directly support warfighters' efforts.

This decision-driven approach to Web services development, however, is just one piece of the story. Also critical was the integration of data and business processes. Following strict military protocols, doctrines, and regulations, which are similar in complexity to business rules in commercial industries, the business process used to determine unit status reports was challenging to model in a BPM tool. However, the result was worth the effort, because Web services could then be orchestrated and managed through the BPM tools. This in turn enabled automated enforcement of the governance and controls on the use of property information, parts status, and vehicle maintenance status—all mission-critical information whose timeliness and accuracy will determine the careers and lives of soldiers.

Booz Allen Hamilton's decision-driven approach focuses specifically on how the data will be used in decision-making. By using a well-defined methodology to collect the metadata used for making the decision—such as data format (PDF, Microsoft Word, PowerPoint, Excel, and other files), frequency of use, and distribution method—the Booz Allen Hamilton approach identifies targeted Web service interfaces that support the creation of automatically generated status reports. This significantly improves the system's operational efficiency and drastically reduces bandwidth requirements.

To support the rapid execution of the BPM process, Booz Allen Hamilton helped the client set up a set of SOA infrastructure services using open standards and commercial off-the-shelf tools, such as Oracle Enterprise Service Bus, an enterprise service management product from AmberPoint, and Microsoft Office SharePoint Server. These foundational services allowed the client to easily reuse existing information systems and datasources, process orchestration, and security, and provided user-defined interface capabilities to enable decision-specific data reporting and manipulation. The integrated architecture is shown in Figure 7.

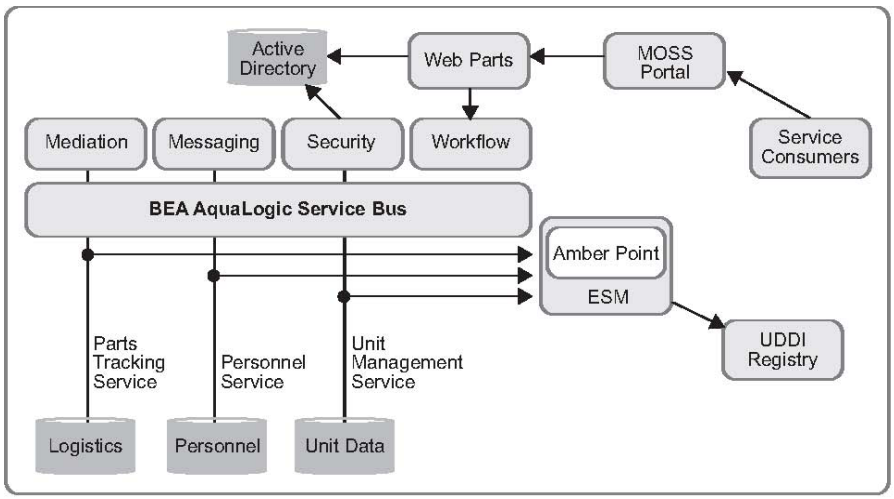

Figure 7: Dynamic decision-specific data reporting and manipulation architecture is shown.

Eric Yuan, Booz Allen Hamilton's program manager for this effort, explained that although the system's initial design was driven by a typical use case for one particular military organization, many similar use cases exist—and they can often employ the same architecture, allowing for a repeatable process for streamlining other decision-making needs. More important, should new decisions need to be made using similar data, the SOA-enabled Web services will be available for rapid consumption—a key tenet of information-sharing and network-centric warfare for today's military.

For Booz Allen Hamilton's military client, the benefits of this innovative solution were significant, allowing the commander's staff to rapidly collect existing data and easily update it based on real-time field reports. In addition, risk was reduced because more staff officers were able to view and double-check data as well as update the authoritative databases. Each unit can view the resulting reports via a collaboration portal, and staff can configure the data to meet their reporting needs, further ensuring that users will adopt and use the new information capability.

Case Study: Lockheed Martin Uses an SOA Approach to Facilitate Intra-Agency Cooperation

By Robert H. Hodges, Chief SOA Architect, Lockheed Martin

Suspecting that SOA workflows could be used to enable networked data-sharing and analysis tools to facilitate cooperation among defense and civilian government organizations, Lockheed Martin recently experimented with using an SOA approach to analyze intelligence and surveillance data and make it available to multiple users in real time. The experiment demonstrated how two distinctly different government organizations were able to work together to respond to a possible threat.

For this experiment, data sharing was enabled in several ways through the technical capabilities of the SOA tested. After the standard operating tasks required for repetitive analysis were programmed into the BPM system, the enterprise service

bus—in concert with Web 2.0 and social computing products such as Oracle Pathways and Oracle WebCenter Interaction—allowed operators to access and extract needed information from a variety of sources. They obtained data from several simulated sensors and Web services from the tested network, and were able to build personalized operational pictures either through workflow-driven tasks or direct intervention with the system. Workflows were preprogrammed in Business Process Execution Language (BPEL) or XML Process Definition Language (XPDL) to drive user-interactive tasks or to automate machine tasks. These workflows took advantage of the previous states to set variables that made it easier to work with the data and to share operator views of it.

During the course of workflow creation, domain experts defined processes on easel paper using colored markers. When the processes were exposed to the workflow engineer, the experts were able to quickly learn a few basic BPM subtleties and then assist with converting processes into BPM workflows. As a result, the engineer completed the workflows and played them back to the experts for evaluation. The experts were then able to see just how their operational concepts flowed (or in some cases did not flow) within the tested scenario. After tweaking the workflow using the BPM development tool, the engineer tested the workflow. The workflow engine is depicted in Figure 8.

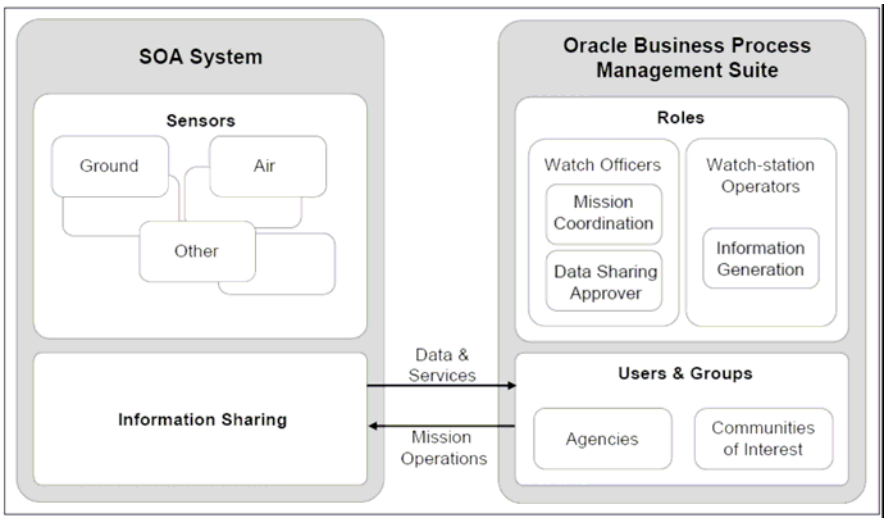

Figure 8: BPM and SOA is applied to a sensor fusion and information-sharing workflow.

One special feature tested was a provision for the operator to download new Web services and Web applications onto operator watch stations. This allowed the operators—using Web 2.0 technologies such as social computing, RSS feeds, mashups, open source software, blogs, and more—to showcase particular analyses and adapt to ever-changing mission timelines. In some cases, the newly added services were even "workflowed" into the operational tasks for inclusion during the next scenario run. In one case, the operator who developed the workflow with the engineer fell ill and had to be replaced at the last minute by a rookie operator for the scenario run. Had the first operator built up workflows for his particular watch station activities, the replacement operator could have performed at or near the

expected level of the first operator. As it was, the rookie operator had to be retrained, thus delaying the scenario run. The vision is to someday have dynamically adjustable workflows based on newly added Web 2.0 technologies available during the scenario run.

Initial test results were mixed. Although BPM provides obvious benefits, considerable engineering skills are still required to translate expert input into viable BPEL and XPDL that couples with the SOA system. In addition, use of the workflows by other systems in a heterogeneous environment is difficult at best. As an agnostic systems integrator, Lockheed Martin envisions a day when workflows (or portions of workflows) can be shared as easily as data in wikis, blogs, and mashups can be shared today.

Although the benefits of using a combination of SOA and BPM technology might be apparent to many, and although its appeal is strengthened by the use of adaptable commercial software, much work is still being done to rethink and test operational tasks for sharing government information. To avoid the problem of ever-expanding Web 2.0 technologies that are not properly workflowed, BPM developers will need to more-tightly couple their products to services and still allow experts to create workflows in real time. There's still much debate over what percentage of operations should be committed to BPM versus those committed to solely human-driven systems (or a combination of both), but it's clear that agility in complex systems must be balanced with controlled collaboration to operate in mission-critical environments.

FUTURE TRENDS IN BPM, SOA, AND WEB 2.0 CONVERGENCE

As more and more enterprises successfully implement these convergent technologies, industry experts and analysts are predicting that the merging of these technologies will change the way business is done. On the following pages, Oracle BPM Specialist John Wylie shows how BPM systems (BPMSs) are evolving to handle the dynamic businesses of the future, adding collaborative elements to normally structured processes. Oracle Systems Engineer Keith Sink discusses how new, real-time event servers are pushing BPM and workflows to the "edge."

Executive Perspective: Enabling Knowledge Workers Through Collaborative BPM

By John Wylie, BPM Specialist, Oracle

Today, organizations are realizing the need to leverage BPMSs in areas previously thought to be too complex to automate, including human-centric nontransactional workflows with unstructured and semistructured data. Not all of the work that employees perform, however, can fit into processes that can be modeled, automated, and repeated; in fact, as much as 80 percent of the tasks we engage in do not fit into a repeatable process. Instead, we rely on knowledge workers to use judgment and insight rather than adhere strictly to a documented procedure or a simple limited set of exception guidelines.

Organizations have tried to help knowledge workers by implementing myriad knowledge management and collaboration-based solutions—only to find that such systems have not been widely adopted due to their lack of scope, difficulty to use, or their inability to meet the specific needs of knowledge workers. For this reason, a new approach to enabling "knowledge working" is emerging—one that provides knowledge workers with easy access to information, improved communications, and greater collaboration technologies. BPM is at the center of this new approach.

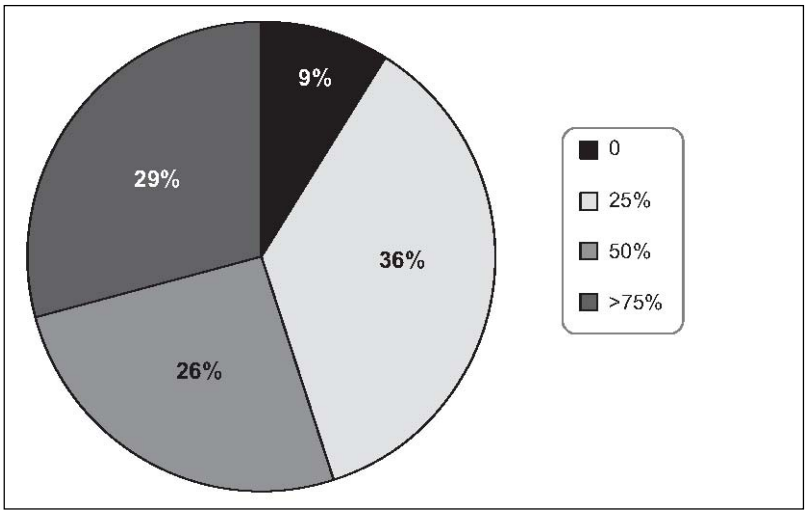

Figure 9: In a 2007 survey, Oracle customers were asked, What percentage of your processes involves collaborative activities among participants? Their responses are shown.

As discussed earlier, BPM does a great job of providing the right information at the right time in the process to help both systems and humans be more productive. And indeed if the information a person needs to complete a task can be captured and included in the workflow work item, BPM can help drive efficiency. Many times, however, the information people need to complete their tasks is not readily available for the BPMS to capture from other systems, documents, or datasources. This need has driven BPMS vendors to further innovate to provide the benefits of BPMSs (greater efficiency, agility, and control) to nontraditional workflows.

As McKinsey, a global management consulting firm, noted: "Some of [software spending] growth will come from continued automation of transactions (which continue to make up 44 percent of labor activity in the United States) … [However, other software spending will need to] empower 'tacit interactions'—the judgment-based, highly collaborative interactions that account for more than 40 percent of workforce activity today … but [that] have not yet had substantial software investment support."[3]

The majority of BPM implementations will remain focused on supporting transactional business processes, but BPM products are also starting to facilitate manual knowledge worker processes, which today are performed largely via e-mail, documents, and spreadsheets.

[3] "Software 2006 Industry Report," McKinsey & Company and Sand Hill Group, 2006.

These highly dynamic and collaborative situations require that BPM play a new role—that of facilitator, delivering the technologies that allow end users to create their own environments and facilitating collaborations within the process.

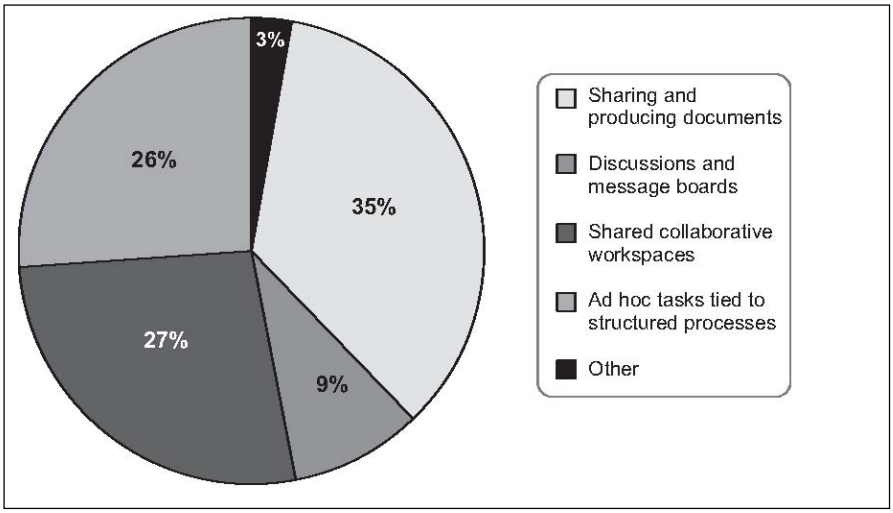

Figure 10: In a 2007 survey, Oracle customers were asked, What collaborative human activities are most important to the business process you manage or plan to manage? Their responses are shown.

Civilian and Commercial Example: Claims Management

Claims management represents a classic transactional workflow, yet it is laden with complex exception handling backed by multiple policies and business rules. Typically, a claims process starts with a request or submission of a claim that is processed through to completion. Many times this represents a straight-through process—meaning it can be completed by routing information provided in the claim through a system-to-system workflow that does not require any direct human intervention. However, in some cases, exceptions are created that require people to apply subject matter expertise and knowledge to complete the claim processing.

From the perspective of a computer program or a modeled process, the work people do is easy. Here, we see the system assigning a task to an individual user with the expectation that the user will complete the task to advance the program or the process. By using BPM, that conversion from structured process to unstructured collaboration back to structured process is modeled and—during the execution of the workflow—the loop outside of the structured process can be tracked and enforced.

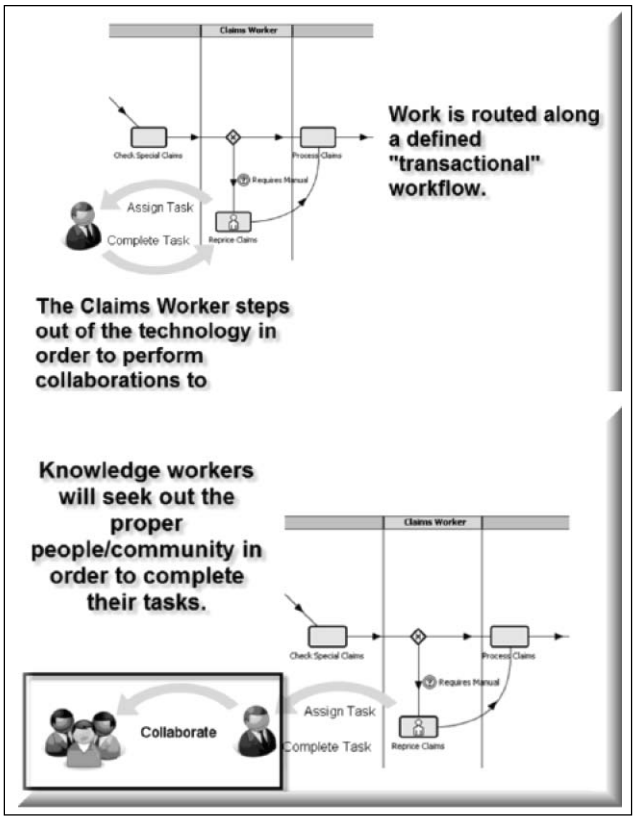

Figure 11: A claims process is depicted in a BPM swim-lane workflow diagram.

We are finding, however, that reality tells a different story about these events. To accomplish this type of knowledge-based task, the individual must often engage other people within the business, working together to achieve the best outcome or sharing information to derive the best solution.

Sometimes we know immediately who those people are, but other times we need to discover them. Discovering the right people in a timely manner, in the context of our needs, saves knowledge workers' time and makes them more efficient.

Effective collaboration is often fed by information we've created and are managing within the business and through external sources. Thus, to complete this assigned task, we must discover the appropriate key pieces of information that will inform our decision and the eventual outcome.

The need for this knowledge has increased the number of people who are now involved in a completely unscripted and undefined chain of events. Without a defined process, the time required to complete the activity increases.

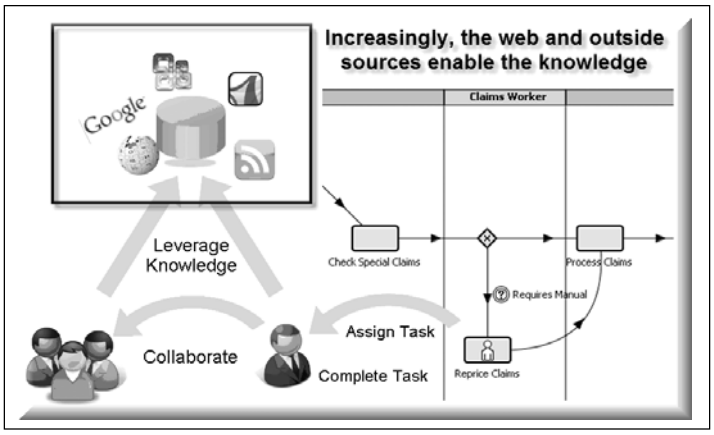

Figure 12: BPM is applied to the complex interactions and unstructured activities within knowledge worker collaborative environments.

In addition to discovering existing information and people who could aid decision-making, we often create new information, using a variety of tools and resources both within and outside our company. These tools are often completely out-of-band and thus not coordinated in the context of what we're working on. Even more troubling, many of our knowledge workers might not have access to them.

Managing complex interactions and unstructured activities, and coordinating them with business processes, represents a real shift—and one that is becoming increasingly critical to organizations' performance. The best way of facilitating these capabilities is through BPMSs—the orchestration engine that provides the knowledge worker with predefined templates of capabilities composed of portal, collaboration, Web 2.0, and SOA services and technologies to create a collaborative environment in which they can complete complex tasks.

The evolution of BPMS is putting the user at the center of each experience, providing the foundation for dynamic applications that provide the right tools and information in the context of each instance of a process.

These dynamic applications, or collaborative workflow capabilities, help address the collaboration issues at the heart of our knowledge workers' needs and the needs of the business at large. Collaborative BPM is poised to create significant productivity gains, allowing organizations to better execute their missions and making them more efficient, agile, and in control.

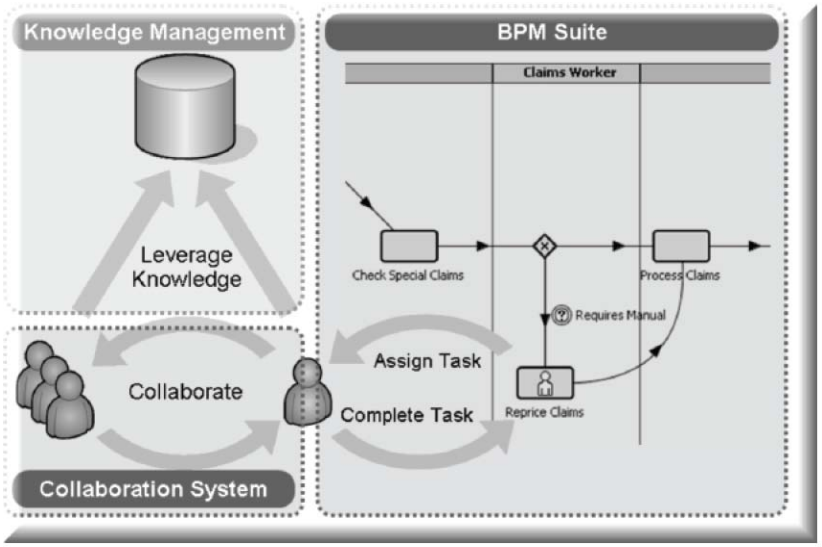

Figure 13: Using collaboration tools and BPM can improve knowledge management.

Case Study: Real-Time BPM for the U.S. Department of Defense

By Keith Sink, Principal Consultant, Oracle

As Program Management Office architects within the U.S. Department of Defense (DoD) find new and innovative ways to support mission systems, SOA has become firmly anchored as the enterprise reference architecture—instrumental to joint programs focusing on collaborating and sharing data among families of systems supporting the warfighter. The Net-Centric Enterprise Services program, for example, is driving the deployment and adoption of a common services infrastructure and improving the efficacy of mission components running within the service fabric. The Net-Enabled Command Capability (NECC) program, meanwhile, extends the notion of a common service infrastructure to provide decision support to the command and control (C2) family of systems. Each of these programs relies heavily on SOA concepts and methodologies.

Through either a subscription process or automated integration points, events flowing within the service fabric are typically processed individually and propagated through robust messaging infrastructures. Although SOA provides the design and runtime structure for building and leveraging these event interfaces, new and interesting capabilities can be achieved when the event streams themselves are treated like actors in the consumption of data. The recognition of patterns within independent and varying event streams is known as complex event processing (CEP)—and CEP engines can interact with an SOA using common, standard, readily available protocols via robust frameworks.

Working in concert with SOA, CEP technologies can be integrated to form a new, supercharged form of event-driven architecture (EDA). The following pages explore the application of this architectural approach to challenging DoD use cases; however, the same approach can be readily applied to federal and commercial cases

as well, ranging from disaster relief to baggage handling and customer service in the airlines industry.

The aggregation of the individual data events used to formulate end-user mission decisions is sophisticated when compared with first-generation IT applications. Individual data points flow through the network as sensor, checkpoint, status, and other event types. For traditional IT applications, those data points only become meaningful after they've been processed, persisted, and aggregated. When a subscription is registered for particular event, the triggering of the event is associated with a single data point or aggregation of a single datatype, analogous to treating events as a single relational database management system table and running a query. CEP, in contrast, supports the notion of time-based conditionals across events in real time, which means context is being conveyed as the events are being produced. As a result, interesting questions can be answered and important issues can be detected with a lower latency and less effort.

From a high level, CEP technologies resemble classic brute-force data capture, with more robust and optimized implementations. This means the determination of patterns and trends is based largely on an optimized implementation that provides the answers faster, with triggers firing within the back-end systems. For example, an event sink, often referred to as a listener, could register a subscription to an event and will be notified via a back-end publish-and-subscribe messaging infrastructure. This approach is highly effective; however, there is data loss from the point that the event occurs and the point that the triggering mechanism is fired. Conceptually, the data loss is the context in which the event itself is firing. Thus, it would be more effective if the streaming data as a whole were an active participant in the processing of individual events.

Next-generation end-user requirements are beginning to force applications to recognize the events that drive the mission application as entities unto themselves. CEP rules engines provide the container to aggregate over high-volume event streams, identify patterns, and act on them in real time. Complex events can range in contextual meaning from logistical delays based on geographical conditions to multichannel sensory data points that reflect a broader threat. Rules are applied over the flow of events as opposed to a query following persistence to a relational data store. Through the use of lightweight adapter frameworks, implementation is made to integrate with complex physical sources and then standardized for event processing query languages.

With a small strategic footprint and adaptation frameworks, CEP engines can be plugged into edge systems to add new, extended capabilities to back-end systems. As a result, CEP technology is a first-class actor within SOA-based systems.

BPM Collaboration and Event-Driven Architecture Within U.S. Department of Defense Systems

BPM provides the backbone for coordinating human interaction with automated back-end systems. This template-based process supports long-running transactions.

From the SOA reference architecture, an enterprise service bus can leverage back-end assets in new and extended capability use cases. Plugging in service-enabled applications that are exposed through an enterprise service bus, BPM systems can consume and invoke services as an orchestration layer that is not tightly coupled with the supporting resources. The value this brings to an organization cannot be understated, because tight coupling often has broad implications for release cycles, operational readiness, and maintenance costs.

From a user interface perspective, enterprise portals provide an effective way to manage back-end assets and coordinate activities that rely on humans within this environment. Using the combination of BPM and service-enabled messaging-based systems, the coordination and collaboration of different forces can be achieved very effectively. The key to future capabilities will be to drive action over reaction, as well as to enable the data flowing within the system itself to recognize patterns before a human resource needs to get involved. Often the struggle in this type of scenario revolves around the sheer volume of events flowing through the network.

Sensor data serves as a perfect example of a high-volume event stream. It has state implications in terms of readiness, demographic information, and operational context. However, the volume of data is often at odds with the traditional notion of IT management techniques. This opposition is further exacerbated in high-volume, mission-critical use cases that require low latency and deterministic performance.

Now consider the notion of processing the streams through a system that can support temporal queries and recognize patterns as events flow through it: Under this approach, the coordination of sensor data, intelligence data, and logistics can be triggered in real time. When you move the processing of the event streams closer to the edge of the network, for example, at a forward command post, BPM and SOA concepts can be extended to these use cases without the overhead of classic processing within IT data centers.

For example, nuclear, biological, and chemical warfare events can be triggered through integrated streams of intelligence, weather, and logistics information, and human involvement in the process can be coordinated proactively. Using SOA constructs, the consuming events can be translated sooner into highly coordinated and traceable downstream results, and the rules driving force projection can be infused into the system in a generic fashion, enabling the event structure and back-end system to vary independently, improving the system's maintainability and operational readiness.

Figure 14 illustrates the ability of CEP technology to consume and operate on event streams with reachback into the SOA enterprise. With this approach, events have more context and event consumers can take more relevant action faster.

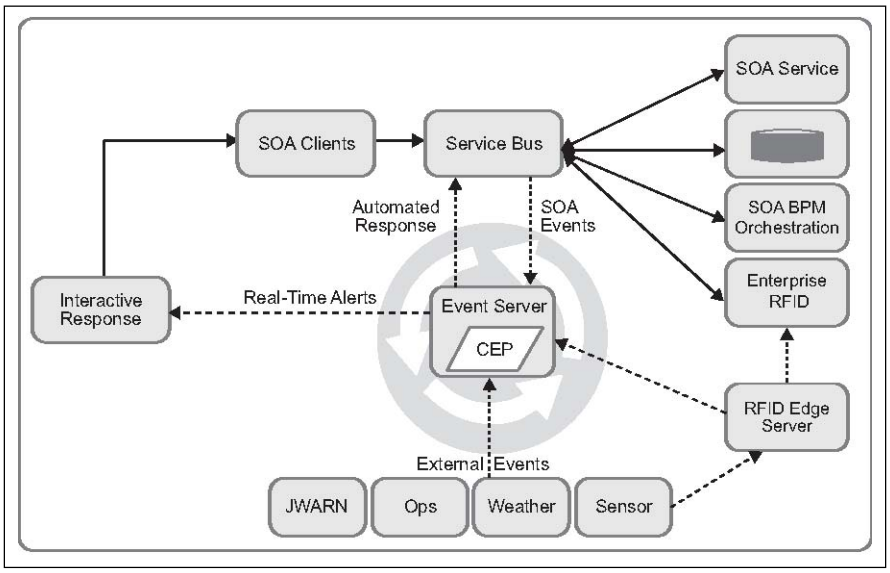

Figure 14: An event-driven infrastructure interacts with the SOA infrastructure at the aggregate level of the streaming data itself.

The advancement and availability of robust event-driven platforms provide a unique opportunity for architects within mission-critical DoD systems to associate high-volume temporal data with traditional operational IT systems from the edge of the network at the points of force projection and threat capture back to centralized command locations.

SOA provides the network to drive and expose the interfaces to operational C2 systems, and the emerging CEP-based systems can provide the decision support and triggering mechanisms. With the powerful combination of SOA and event-driven architecture, new capabilities will support the warfighter with lower latency and less overhead in real time. These emerging platforms supporting EDA, with highly productive design time and runtime frameworks, connect the physical event-oriented networks with the rest of the application ecosystem. In a dynamic world, this extends the benefits of SOA to proactive real-time use cases for the DoD.

CONCLUSION

As organizations strive for greater efficiency and effectiveness, they create or adapt technology to fill their needs, creating a dynamic convergence that can provide opportunities as well as pose threats to these organizations. BPM, SOA, and Web 2.0 are on the frontlines of this war for business transformation. And although battles will be won and lost as stakeholders (including end users, IT, businesses, vendors, and analysts) force organizations to focus on missions in real time, organizations are already implementing these technologies successfully to cope with transformation's challenges and to take advantage of its opportunities.

Business Process Management, Service-Oriented Architecture, and Web 2.0: Business Transformation or Train Wreck?
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