**2006 COMMAND AND CONTROL RESEARCH AND TECHNOLOGY SYMPOSIUM**
**The State of the Art and the State of the Practice**

**"The Emerging Importance of Business Process Standards in the Federal Government"**

**Track:  C2 Architectures**

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Today's world is increasingly defined by one term:  Collaboration or the ability to share information easily using the platform of Web services.  As commercial organizations evolve to a service-based technology based on application-to-application communications, they require a higher level view of how to develop and implement processes across the enterprise.  Workflows tied to the automation of repeatable series of tasks are being replaced by an environment that demands an understanding of processes in the context of systems, services and the resulting task.

This trend is being supported by the emergence of three trends in standards in commercial IT:  the rise of the Business Process Modeling Notation standard under the OMG, the steady movement toward a services-based IT strategy using Service-Oriented Architecture (SOA), and the widespread adoption of the Business Process Execution Language (BPEL) standard.  All three standards have evolved independently, but are now merging into the IT landscape to offer organizations an unparalleled opportunity to more closely align their systems and processes to their business goals.

In the commercial world, these standards are propelling organizations to move from simple workflow applications to an architecture-based paradigm that supports collaboration using Web services.  The maturing of these commercial standards comes at a time when defense agencies are moving to a net-centric environment where collaboration is key.  These new commercial technologies can play a key role in that evolution.

These standards provide the platform to facilitate use of enterprise architectures as a mechanism to facilitate collaboration for these types of decisions, whether in the area of support services, operations or war-fighting.  Enterprise architectures can help defense agencies guide their IT strategy, technology investments and process improvement while ensuring their systems and processes align to their goals, mission and capabilities.

The value of these standards lies in their applicability to helping agencies evolve to new technologies. Services-based technology, like SOA, help enable architecture and help organizations avoid adopting yet another new technology without gaining the long-term benefits.  Enterprise architecture provides a high-level view that helps agencies put order to the randomness of the discrete applications and processes being layered together to create a collaborative environment.  By using architecture to ensure applications and processes are reconfigurable and viable in a services-based technology, defense

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agencies will benefit from a new level of agility in delivering the knowledge needed to the right people to perform new tasks in new ways.

**The Rise of the Standards**
Standards are an important aspect of IT.  A standard represents broad community consensus in solving a business need.  Based on best practices, standards offer advantages such as wide vendor support and a collaborative base for development. Standards enable a smoother transition to emerging technologies as organizations share experiences about their adoption.
Standards give organizations the flexibility of selecting the most appropriate methodologies and techniques for their program, yet enable them to draw on techniques that are widely used and understood in the IT world.

Technology standards have characteristics and a lifecycle that must be understood so they can be properly utilized.  For example, each standard has an ecosystem, or a group of interested organizations solving a common business problem using a group of agreed-to technologies. A collective of intellectual capital converges to form a nucleus of an industry standard. This nucleus then hits critical mass as the number and size of the participating organizations increase. This momentum continues until the standard delivers enough value for its commercialization into the general industry.

Today, we are seeing standards such as SOA, BPMN and BPEL hit that critical mass as a result of the evolution to Web services. They are solving a need shared by many organizations worldwide.  The standards are reaching maturity as organizations drive their iterative improvement.

**SOA:  A Service-Oriented Approach for IT Applications**
Service Oriented Architecture (SOA) is an architectural approach that advocates a loose coupling of services that talk to each other.  This ranges from the simple passing of data between two applications or multiple services coordinating an activity.   SOA supports integration and consolidation of service activities. A service is a well-defined, self-contained, stand-alone function that is part of the execution of a task.

SOA is gaining popularity as a mechanism for IT to deliver against requirements.  SOA enables the structured mapping of various services to ensure they meet the needs of either a net-centric or business environment.  SOA takes an architecture view of the services, without getting caught up in technical standards.  The development of an SOA standard, independent of any specific technology, is currently under the leadership of the OASIS SOA Reference Model Technical Committee.

**BPM and BPEL:  The Technical Underpinnings of SOA**
BPM or business process management is often defined as the coordination of end-to-end activities (manual, automated) to accomplish tasks and add value.  It is an increasingly popular practice because the optimization of business processes can drive efficiency, improve service and control costs for a business entity.

Business process management incorporates many standards, including the Business Process Modeling Notation (BPMN) and the Business Process Execution Language (BPEL).   BPMN provides a standard representation for capturing and illustrating higher-level processes and the details about them.  It can be used for both project-based modeling as well as analysis of process at the enterprise level.  The latter is the type that we discuss in this article.

BPEL (Business Process Execution Language) is an XML-based language that formally specifies process and interaction protocols for a distributed computing environment, including those multiple organizations, using Web services.  BPEL is the XML 'glue' that binds Web services into cohesive units and acts as the intermediary that translates business process models into execution.  The combination of BPMN and BPEL offers organizations the potential to standardize processes in a distributed environment, enabling separate entities to connect their applications and data.

Both standards are recognized worldwide.  BPMN, now in its first official release, is under the guidance of the Object Management Group (OMG) Business Modeling and Integration Domain Task Force, where it is in the fast-track "Request for Comment" (RFC) adoption process.  The second official revision of BPEL was released by a technical committee under OASIS in December 2005 and continues to undergo industry review.

**The Rise of SOA and BPM**
The advent of Web services is changing the face of how organizations view their processes and workflows.  Web services require organizations to take a higher-level view of how their processes and technology interact.

SOA is one of the driving forces of this new environment.    SOA is an architecture that ties together services and shapes them into potential applications.  Business processes are examined in the context of the applications, services and the tasks that need to be accomplished.

Along with SOA comes the need for an IT infrastructure that is reconfigurable, not static. There is a strong requirement for flexibility and the ability to adjust to change.  SOA enables organizations to reuse legacy systems and leverage new technologies.  This environment requires agile and reconfigurable interactions supported by process, systems and data exchanges.

The need for reconfigurability demands the structured practice of business process modeling, where organizations use models to understand and modify existing processes as well as analyze the need for new processes that support service-based applications. Historically speaking, workflow applications, because they are rules-driven and application-specific, were not designed to be easily reconfigurable, as defined in today's world.  By its very nature, business process management is dynamic.  It touches on the interactions or processes that are part of the loose coupling of many different applications and services under an SOA.

Business and system or IT architectures are often used by IT teams to help them assess how applications interact.  These architectures provide a context for understanding how data can be moved securely and to support a specific purpose.  Many commercial organizations are taking this analysis one step further by developing enterprise architectures.  Enterprise architecture provides the structure for understanding the relationships among business processes, systems and business goals. or in the case of the defense community, goals missions & capabilities.

**Frameworks:  The Platform for New Enterprise Architecture**
Frameworks are a key part of any enterprise architecture environment.  The framework provides the structure for the capture of the information, facilitating a common approach to data collection. Frameworks provide a commonly accepted classification system for enterprise architecture, providing a complete checklist of the people, systems, processes, and internal and external factors that contribute to making an organization function.  The most popular defense framework is the Dept. of Defense Architecture Framework (DoDAF).  Other frameworks include MoDAF (the UK Ministry of Defense) and the NATO C3 System Architecture Framework (NC3SAF) , AUSTRALIA DoDAF, similar to the US DoDAF.  These defense frameworks share similarities but take different perspectives, particularly in procurement and data classification.

Frameworks offer a common vocabulary and a common format for information capture and dissemination. They guide the technically complex process of integrating heterogeneous, multi-vendor architectures and models. They help simplify the architecture development process into discrete, understandable pieces and enable organizations to determine which systems and applications are tied to missions and capabilities. They provide insight into how their processes and systems fit within the broader organization.  Frameworks are the structure for tying together the many modeling standards.

**Collaboration & Enterprise Architecture: Achieving the Potential of a Services-Based Environment**

Today's world finds both commercial organizations and government agencies evolving toward collaboration. Collaboration requires a move away from discrete IT systems into an environment based on machine to machine communications that leverage the power of Intranets or the Internet. This trend extends beyond simple applications to an enterprise view of processes, systems and data interactions. Collaboration requires an organization to understand the changing relationships between people, systems and data.

The need for collaboration is most visible in defense net-centric initiatives, including operations and war-fighting. To make decisions that support business goals and strategies, organizations must look at the bigger picture of how to efficiently and effectively enable SOA. BPM is the high-level understanding of all the pieces that make a collaborative environment work. Enterprise architecture provides the roadmap of how all these elements—technologies, processes and data--fit together in the enterprise and address an organization's IT requirements. Enterprise architecture helps organizations understand the whole process involved—human/machine interactions, system interaction and inter-business entity actions.

Enterprise architecture is the first step in starting to do new things in new ways and not doing the same old things using new technology. Information can be gathered into a central repository, enabling the visualization of the relationships of systems with processes and the formalization of the intellectual pieces that become the architecture. Using enterprise architecture tools and frameworks, organizations can stay at the forefront of using new technologies to reinvent how they do things and automating manual tasks to execute them faster and more accurately. This, in turn, supports flexibility and agility.

Enterprise architecture enables IT teams to gain the flexibility of assembling and analyzing applications in the context of processes and examining the relationships at a much higher level of complexity. A well-developed enterprise architecture can be used to effectively manage SOA and utilize IT as a piece of intellectual property. When managed effectively, IT applications become more than execution mechanisms; they become a key part of the elements that enable an organization to be agile in the way they operate.

**Standards Provide Best Practices**

The trend toward collaboration is evolving quickly in the commercial IT world as described above. While the goals of the commercial and defense environments are very different, commercial standards and methodologies can be used to understand the issues around collaboration. In both sectors, the overriding goal is similar: to connect different systems and processes to facilitate collaboration. In both, enterprise architecture is the facilitating technology.

For example, both the BPM and SOA standards are almost directly applicable to the back-end operations that support defense environments, such as contracting, purchasing and financial. They provide a proven platform for the execution of back-end businesses processes found in any organizational infrastructure.

These standards also can provide guidance on best practices in development of service-oriented technologies to address the operational and war-fighting needs of net-centric warfare environments. For example, SOA can be viewed as a commercial implementation of the net-centric environment. The application of SOA to facilitate collaboration is meeting requirements very similar to the commercial environment. Both require an enterprise view of the environment and a machine-understandable form called BPEL, an XML form that allows the information to be readily exchanged. It is only the type of collaborative environment—business vs. net-centric—that differs.

Under SOA are the modeling representations, the architecture frameworks and languages and standards, all of which can be tailored to the requirements of each type of defense environment. Because these standards support the exchange of information and can potentially represent the

requirements of a net-centric-based system, and be applied within a national IT infrastructure or one involving a coalition.

There are many advantages to considering commercial (COTS) standards. While they would require modification to accommodate the special requirements of defense, these standards offer a solid, proven platform for development.   These standards provide a learning lesson on how to successfully move data to the right place at the right time. The DoDAF would need to examine the addition of security layers and its vertical vocabulary to any standard.

The defense community has the opportunity to utilize the collective knowledge of the commercial industry when it comes to SOA and BPM and apply it to its IT strategy.  In addition to their individual benefits, these modeling standards can be easily integrated into the methodologies and visualization capabilities of an enterprise architecture to loosely coupled systems. Their applicability extends beyond our borders and could extend to other countries that use defense architectural frameworks, including NATO, the UK and Australia.

There are currently many examples of defense agencies looking at how architecture can help improve decision-making around technology investments and process improvement.  It is hoped that these pilots provide important feedback on the development of best practices for the how to implement a service-based technology in a defense environment.

**Collaboration:  The Future of Defense IT**
The evolution toward worldwide collaboration is inevitable, as seen in many areas of the commercial and government worlds.   Thomas Friedman in his book, "The World is Flat," states that the new 'application-to-application' paradigm is helping to drive worldwide collaboration.  He describes how this force is helping "flatten the world," creating multiple forms and tools for collaboration across the globe.

Development environments are no longer individual projects; they are part of a community of interrelated projects.  This means good application design is no longer just writing code that can execute. Applications must now talk to each other at many levels and in an intimate way.  This requires application developers to understand many more aspects of IT infrastructure: data flows, services, what parts need to talk to each other.  And this opens the door to architecture as a master roadmap of how the pieces fit together.

Along with this comes an increased emphasis on the closer alignment of IT to business goals and strategies to improve organizational performance. Architecture used to be considered application development using certain internal construction techniques so that the application could be maintained; this was referred to as application architecture.  The commercial world focuses on building the right applications to fit into a process that serves the entire enterprise.

Applications are now part of a process of delivering benefits to customers or citizens.   The strategy must reflect a customer-value proposition, whether customer service, manufacturing efficiencies, or efficiency proposition, such as e-government or net-centric operations.   All these share the requirement that an IT system have a direct link to the business goal that it supports.  This results from an increased focus on having the right application with the right features available within the right period of time. Service-oriented technology supports this type of alignment.

Also driving collaboration is the move from building stand-alone systems to integrated system development.  Twenty years ago, applications were developed as stand-alone systems doing a specific task.  The application was developed with an equal emphasis on the manual processes required to support it. Today, applications can no longer exist as islands.  Their benefits are tied closely to their ability to interoperate and share data with other applications.  Just as important is the ability to integrate legacy systems with new technologies to provide greater IT flexibility.

Examples of this can also be found in the aerospace/defense world where enterprise systems engineering is the label for architecting systems.  Systems integration is the process of putting many applications together with hardware, including embedded microprocessors.

Collaboration is driving today's IT environment; standards are the key to enabling it.  New standards, such as SOA, BPMN and BPEL, give organizations the opportunity to extend IT well beyond simple process automation and present a visualization of the relationships among applications, systems, and data. This enterprise view is the first step toward the consideration of a Web services as a key, new technology strategy.

Defense agencies have much to gain by considering a services-based IT strategy that offers whole new levels of interoperability.  However, like the commercial sector, agencies should consider that technologies like SOA are not just another new technology to move data.  Those that remember this will avoid incurring the cost of deploying yet another new technology without gaining the long-term benefits.  By using architecture combined with established standards to implement these technologies, defense agencies ensure that new applications support a larger enterprise goal, mission or capability.

Enterprise architecture is the first step in the defense world accomplishing new things in new ways instead of executing the same processes using new technology. Enterprise architecture serves as the key intellectual component that enables new ways of thinking because it enables the analysis of relationships at a much higher level of complexity. An enterprise architecture gives defense agencies the platform for utilizing commercial technologies to deliver the knowledge needed to perform new tasks in new ways, and to avoid the trap of formalizing old ways of doing things using new technology. Information can be gathered into a central place, offering the ability to visualize the relationships of systems with processes and to formalize the intellectual knowledge that forms the basis of the architecture. The resulting blueprint enables reconfigurability and agility—requirements for success in today's net-centric world.


By Jan Popkin
Jan Popkin is the Chief Strategist for Telelogic®, a leading developer of enterprise architecture, business process and application development products and services.  For the past 25 years, his name has been synonymous with enterprise architecture and modeling. Prior to the acquisition of Popkin Software in 2005, Jan Popkin served as CEO and founder of Popkin Software. Under his leadership, the company grew to be the leading enterprise architecture and modeling tool vendor worldwide, according to industry analysts.  Today, more than 70,000 users worldwide use the flagship SYSTEM ARCHITECT® tool suite.  Popkin is on the board of the Object Management Group™ (OMG™), the advisory board of the E-Gov Institute and a board member of the New York Software Industry Association (NYSIA).