Service Incentive:

Towards an SOA-Friendly Acquisition Process

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Abstract. Service Oriented Architectures (SOA) offers the DoD the promise of cost savings, data sharing, interoperability, and increasingly agile operations. As with all things that progress in society, there are obstacles. One of the challenges faced by the DoD involves molding current acquisition processes and cultures to be SOA friendly. This paper discusses these challenges and presents some thoughts on how they might be addressed.

Introduction

Metcalf's Law tells us that the value of a telecommunications network is proportional to the square of the number of users of the system [1]. Service Oriented Architectures (SOAs) capitalize on this phenomenon. Through a set of standard interfaces, services (i.e., software-based capabilities) are made available to any consumer willing to follow the structural and behavioral rules for consumption. The loose coupling provided by standard interfaces enables this plug-and-play capability. Taking advantage of such a notion promises great gains in efficiency for anyone looking to create interoperable, scalable applications that share information across boundaries.

According to Gartner, SOA will be used in more than 80% of mission-critical operational applications and business processes by the year 2010 [2]. Analysis of the literature indicates that the SOA vision leads to a belief of implementation efficiencies and cost savings of epic proportions. As the U.S. DoD moves forward with its vision of highly distributed net-centric capabilities in current and future DoD programs, it will be difficult to deploy, maintain, and evolve capabilities without the benefit that SOA brings to the table.

SOA offers the DoD the promise of cost savings, data sharing, interoperability and increasingly agile operations. But, as with all things that progress in society, there are obstacles. The DoD depends on outside contractors to develop much of its needed capabilities. These contracts may involve delivering a specific platform, such as a quantity of F-22s or F-35s, or they may require the delivery of a set of capabilities to satisfy one or many missions such as Future Combat Systems or Distributed Common Ground Systems. The contractors who deliver these capabilities are, not surprisingly, doing so for a profit. With this profit as a motivator, contractors will be unlikely to choose reusing a network-available capability when they can be paid to develop the solution themselves. Incentives are needed to make the existing capability a desirable option for the contractor.

In addition to technical challenges associated with deploying solutions that take advantage of service-oriented technology, there are cultural and organizational challenges that the DoD is likely to encounter. Contractors, who are being paid to deliver a solution or a capability to a specific customer, are unlikely to think beyond their contractual obligations. When developing a service, a contractor will be uninspired to think about the bigger picture, especially in situations where there is schedule pressure or cost containment issues (a frequent occurrence with many DoD software projects).

This paper describes Service Oriented Architecture and the potential value this technology could bring to the DoD. It then addresses the cultural and organizational aspects associated with getting quality SOA solutions within a contract development scenario. Finally, some suggestions are presented for establishing incentives to encourage SOA-friendly behavior within such a scenario.

What is a Service Oriented Architecture?

Service orientation is not a new concept. We are all providers and consumers of services. If I want power for my toaster, I put the plug into the wall socket and power flows. I require no knowledge of how the power gets from the wall socket into the toaster or what substation generates the power. As a service consumer, all I need is the correct interface (my plug) to get access to the electricity, and a Service Level Agreement with the service provider, in this case the electric company, which indicates my willingness to pay for the service. And throughout the U.S., anyone with that same interface and an agreement with their local electric company can get access to power in the same way.

In the context of software, a Service Oriented Architecture is a paradigm that offers software service providers the potential to share their software solutions with consumers using the same basic business model that utilities have used successfully for years. Service consumers are then able to reuse capabilities developed by others rather than having to develop that capability themselves. An SOA is an architectural

style that allows for distribution of capabilities that need not all be supplied or owned by the same organization or entity, with the same notion of transparency that utilities offer electric consumers. From the DoD's perspective, SOA offers the opportunity to create solutions that get the right information to the right places at the right time.

The Value of SOA

SOA results in two distinct categories of software: services (for example web services published in a global directory) that are published and made available by service providers, and software that consumes these services to create capabilities. These software services can be further characterized as either infrastructure services required by many software applications (such as security, messaging, and routing), or business services that are specific to business requirements or specific missions. Compare this to more traditional software paradigms where the business or mission-specific capabilities are closely meshed with software that supports the infrastructure of the application. Separating the infrastructure from the business rules makes it possible to respond quickly as business rules or mission requirements change. SOA creates an environment where the business drives IT requirements rather than being constrained by them..

By definition, SOA services are to be reusable. In an organization as large as the DoD, the existence of reusable services creates many opportunities to reduce redundancy and increase efficiency. From a mission effectiveness perspective, there are many areas where SOA could add value. SOA promises to increase interoperability within and among the services through discoverable standardized service contracts. Through reusable data services, information can be shared across the enterprise increasing dissemination and knowledge transfer. Readiness can be improved through efficiencies gained in information access. Additionally, widespread SOA throughout the DoD will increase organizational ability to deal with rapid change.

The SOA Acquisition Challenge

It's not too hard to see that SOA may add value to the DoD but there are certainly some technological challenges that must be overcome. Challenges aren't going to stop smart software professionals from developing and delivering quality software to the DoD. There are, however, some cultural and organizational challenges that may stand in the way of successful transition to SOA.

Imagine a contractor who has been awarded the contract (hypothetical) to develop a capability to store food allergy data for all of the Army's soldiers and disseminate this information to all locations where the soldiers are fed—including military bases, theaters of operation, military hospitals, etc. While developing the data services to process this information, the contractor's software engineering team realizes that developing a more generic service to handle all types

of allergies—including food, drug, bee stings, etc.—would be a more valuable service to the DoD as a whole. At the same time, the customer program team realizes that this more useful service will take more time and resources to develop; time and resources not currently in the budget. The contractor's customer program team abandons good SOA practices (facilitating a more widely useable service) to create a point solution to the problem because there is no organizational means to quickly adjust the schedule and budget.

This is, of course, a very simplified example—many opportunities will arise that could provide useful solutions throughout the DoD that may be overlooked because funding is targeted at specific capabilities. A project is not service-oriented just because capabilities are delivered using sharable services. A project is not truly service-oriented unless it takes advantage of existing services where available and develops needed services taking into account the bigger picture of uses beyond the current need. DoD contracts focus on the particular capability being contracted for and make no provisions for delivering beyond that. Contractors are paid for the capability they deliver, making it desirable to maximize capability developed for a specific contract. This is not to suggest that the contractors for particular projects should be responsible for the creation and maintenance of an SOA framework suitable to meet DoD requirements. Contractors working on specific projects should intend to take advantage of existing DoD SOA frameworks. Contractors however, should be encouraged to embrace SOA for their projects by leveraging the use of services existing within that framework and considering the greater good when developing new services to be made available through that framework.

In this way, SOA creates a paradox for the DoD and its contractors. The DoD has specific capabilities that it knows it needs and it has a time frame and budget within which it expects to meet those needs. Within the DoD, the "sponsor" of a specific capability will outsource the fulfillment of this capability to a community of engineers, designers and other software development personnel. Neither the sponsor nor the contractor is rewarded or incentivized to provide a service-based solution, which meets a greater good and provides additional enterprise benefit for the whole of the DoD. There are limited explicit incentives to take advantage of existing services when possible that meet program needs. The DoD has unwittingly tied the hands of these very talented professionals by not providing a mechanism to encourage a specific focus on enterprise benefit.

Cultural and organizational changes are necessary if the DoD is going to be successful with full-scale SOA solutions. Contractors and project sponsors should be encouraged through policy changes and funding incentives to think beyond the current problem. Both the contractor and customer sponsor need to be incentivized to develop services that will solve problems the DoD might not yet realize that they have—

Figure 1
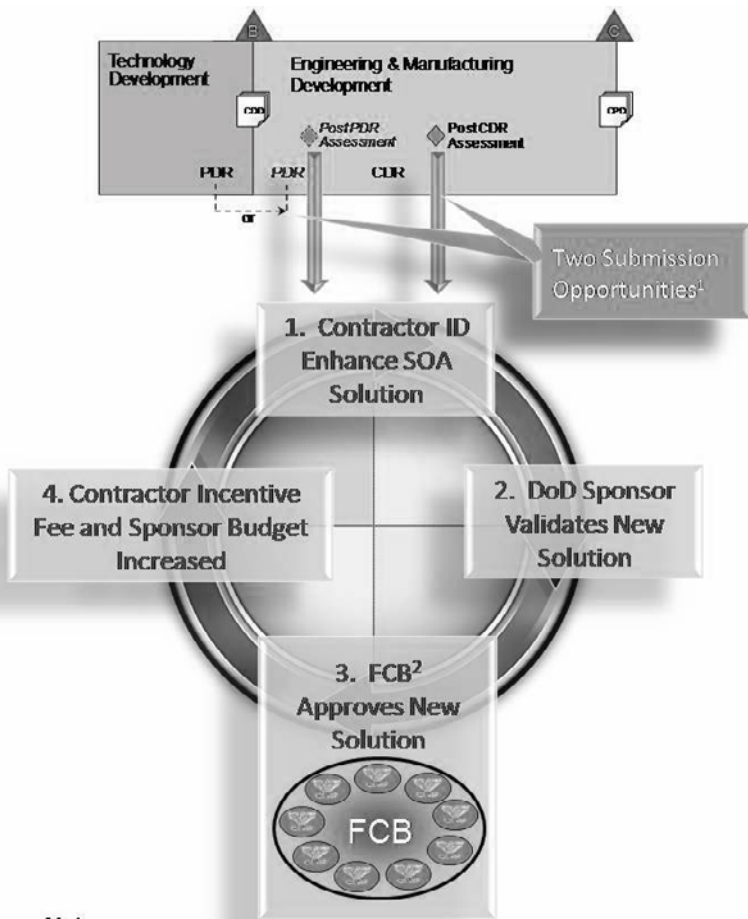
Notes:
1 – Contractor present idea with cost savings as part of assessment
1 – Functional Capabilities Board (FCB) responsible for assessing
   capabilities, priorities, and tradeoffs across the range of functional areas

or issues that might not be relevant to the contracting agency but that could have significant impact on another agency. Suppose there was a process through which contractors can come back to the table during the planning and requirements phases of a project with suggestions for a better, more far-reaching SOA solution than that which was originally contracted. Figure 1 depicts a notional process.

Contractors should be given opportunities to identify enhanced SOA solutions to the contracting agency. This opportunity could be presented to the DoD sponsors, outlining additional costs as well as added value of the enhanced solution. Additionally the contractor should present the cost savings anticipated if the enhanced service is provided in the context of the current program versus having to do it separately as a new program or upgrade. Once the DoD sponsor validates the new solution, the improvements would be passed on to

the Functional Capabilities Board for approval. Ideally, the contractor and the DoD sponsor would be given the opportunity through this mechanism to present suggestions not only to the contracting agency, but to other branches of the DoD that might benefit from such a service. Upon validation of the value added by the new service, a portion of the cost savings incurred could then be provided as both an award fee incentive to the contractor and a budget increase to the sponsor.

There should also be incentives for contractors to include reuse of existing services as part of their bid for the contract. Contractors should be encouraged to work with the contracting agencies and a Functional Capabilities Board to identify services existing in either the DoD or the public domain that would be suitable in the context of the current contract. Contract awards should include provisions for a "finder's fee" based on the anticipated savings to the contracting agency, taking into consideration not only reduced costs for the current program but also recognizing the value in non-duplication of services.

Conclusion

SOA is likely here to stay. It offers great opportunities for the Services and the entire DoD to develop forward-thinking synergistic solutions that transcend current operational requirements. In order for this to happen, the DoD needs to find ways to encourage contractors and DoD sponsors to embrace SOA beyond just the "letter of the law" to the point where they are architecting solutions designed to take advantage of the benefits and cost savings possible with SOA. On the other hand, contractors need to be proactive in their approach to providing quality SOA solutions to the DoD that consider requirements beyond a current contract and look to how contract solutions can add value beyond that contract to other applications across the DoD enterprise.

As SOA evolves within the DoD, acquisition culture needs to shift to enable collaborative behavior that will provide solution synergy. The DoD will benefit by getting the most value out of services contracted for particular programs. The contractors benefit as their proactive behavior in defining opportunities makes them a vital part of the DoD's SOA planning process, bringing them to the table as the DoD works to create SOA Advisory Boards and SOA Centers of Excellence.◆

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