L O C K H E E D   M A R T I N

Service Oriented Architecture (SOA) Modeling
Via Reuse of Service Components

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Abstract

In defining Service Oriented Architecture (SOA) government leaders and technical practitioners need to think of SOA as part of an enterprise strategy for enabling reuse of Service Components. Government and industry organizations can leverage the Component Organization and Registration Environment (CORE) repository to publish Service Components, and establish communities of interest to register, certify, graduate and reuse components. Senior executives and system and solution architects interested in innovative approaches to drive government transformation will benefit from understanding how Core.gov supports the development of the governments SOA vision, and from the strategic roadmap provided that advance the realization of the SOA vision.

Introduction

One of the most pressing examples of a performance gap at many federal agencies is the demand for improved on-line business services (internal and external). Finding a solution for this gap in the context of a resource-limited operating environment depends on an agency's ability to see how current resources support existing business functions, as well as to envision what new resources and business processes will be needed based upon an overarching set of guiding principles.

SOA is an application framework that takes everyday business applications and breaks them down into individual business functions and processes, called services. An SOA lets you build, deploy and integrate these services independent of applications and the computing platforms on which they run. The most important aspect of SOA is its focus on reuse of services and components, better known as Service Components.

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The main advantage is that Service Components enable practical reuse of assets within and across organizations.

SOA is not a standard set of technologies; but in concept, an architectural principle. SOA is a method of building the mission services using proven technologies, while following the concept of establishing business and information connectivity based on reusable building blocks with standard interfaces. This concept enables an agency to expeditiously assemble parts of an integrated business solution using predefined standards-based services. The SOA architecture exploits a set of connectivity standards that allow agency applications to access and provide services in a cohesive and managed, yet flexible environment. In a mature SOA environment, changes necessary for the implementation or provision of a service can be made without impact to its interfaces or connected services. From a business perspective, SOA is a set of services that a business wants to expose to their customers and partners or other portions of the organization. According to The Gartner Group, SOA is a key enabler in creating horizontal services in support of e-government. SOA allows departments to leverage common line-of-business opportunities as well as increasing efficiencies of information technology (IT) services.

Gartner estimates that more than 60 percent of enterprises will have adopted service orientation as the guiding principle in the design of mission-critical applications by 2008. According to a Yankee Group survey, two-thirds of early adopters say that a service-oriented architecture has reduced complexity in distributed applications, while more than three-quarters believe it has enhanced their ability to collaborate with business partners.

The adoption of a SOA results in a number of benefits:

- A much more agile environment than that of a traditional isolated, stand-alone application. Well-defined services are knit together through a loose coupling of service components. This allows any reconfiguration to be a much easier task.
- Integration of components is simplified with the use of standard interface technologies. Re-use of service components and standard interfaces reduces complexity and drives down development costs by eliminating duplicate systems and replacing them with systems that are built once and leveraged.
- Flexible business models that are enabled by increasing granularity of processes ("services").
- Offer new services to customers without having to worry about the underlying IT infrastructure.
- Change the focus from technology to business solution, with more emphasis on the understanding the business problem and providing a service that innovatively meets the needs of the business user.
- Help ensure that business knowledge in legacy applications can be accessed in a new, integrated, service-oriented architecture.

SOA Alignment via Federal Enterprise Architecture

Alignment of SOA investments with the enterprise architecture is a significant consideration in the implementation of an SOA.

Source: Gartner Research (March 2005)
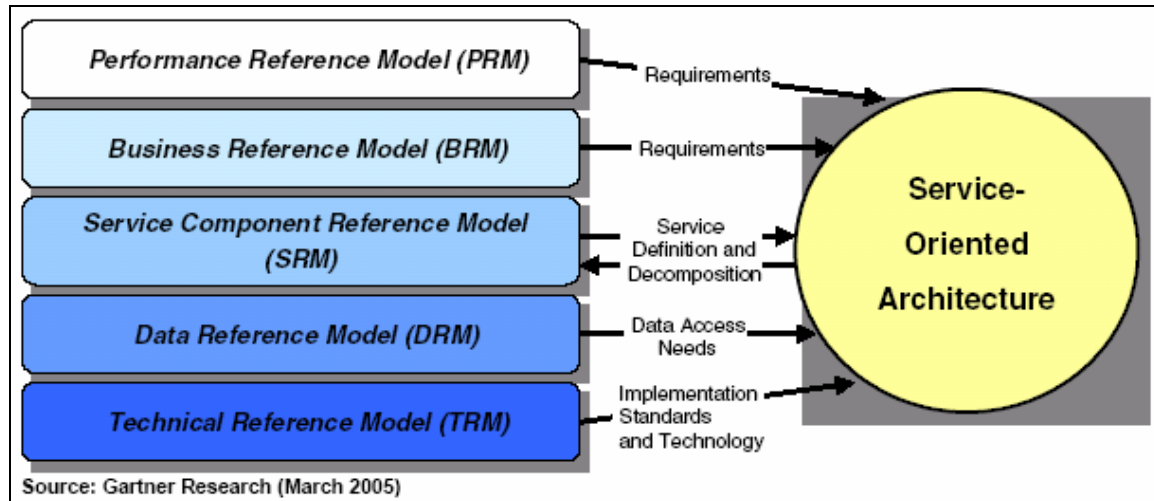
The identification and definition of SOA services in alignment with the enterprise architecture may be achieved using a three-step approach. The first major step is to identify candidate services and the flows between composite services (higher level services that are themselves made up of lower level services). In the second major step, candidate services are selected that will actually be implemented as services and more detailed specifications are developed including the service components that will realize them. The reason for this filtering step is to avoid the tendency to implement every capability as a service. Services require an investment and should be considered an enterprise asset and therefore should be implemented only when needed to meet the needs of the business. The third major step captures realization decisions (concurrently with steps one and two) for the service components. A realization decision, for example, is to build from scratch or perhaps to build by "wrapping" an existing capability of a particular legacy application.

A primary source that can be used to identify candidate services via the FEA reference models is the service reference model (SRM), which provides a standard taxonomy for describing service components and capabilities. Once an agency has mapped its system and investments to the SRM in its Services Repository, this information can be readily "mined" as a starting point for system developers seeking to discover potential services for re-use or sharing. The Business Reference Model (BRM) may also be leveraged to identify potential re-usable functionality or processes that can be "wrapped" and exposed via a standard interface. Finally, the PRM specifies the goals of the business through a performance model. The PRM is a source for identifying needed services that are required to support mission needs and improve mission performance.

There are several heuristics that can be applied to the process of filtering the candidate services to identify those that should truly be implemented as services. First, the service

should be aligned with the needs of the business by being directly aligned to the goals identified in the PRM. In addition, the business should be willing to fund the full life cycle implementation of the service and be willing to share it internally and externally. Second, the service should be self-contained, technology neutral and able to be combined with other services to accomplish larger business functions. The service should also have the ability to be described by an interface that hides the implementation details. Finally, the service should eliminate redundancy by being able to be used in all processes where the function the service implements is required. If a service doesn't satisfy any one these heuristics, then it should not be implemented as a service.

For all the candidate services, a decision needs to be made about which services should be exposed. The services must be traceable back to a business goal, or it may not yield benefits required for SOA implementation. The services need to be based on a principle and meet a technical architecture requirement. Also, the services need to be used by the business stakeholder within all processes where its function is required. Finally, business goals and performance need to be measured for refinement of services or identification of new services.

The FEA will provide agencies with a powerful tool to investigate alternatives to costly (and potentially duplicative) IT investments *up front* and before a significant expenditure of resources. Reciprocally, OMB will be using the FEA to ensure that proposed agency IT investments are not duplicative, and to analyze the architecture throughout the year to identify opportunities for cross-agency collaboration. As such, the FEA will help ensure that the federal government eliminates redundant investments, and that agencies save time and money by leveraging reusable business processes, data stores, and IT components.

Component Organization Resource Environment (CORE).gov

CORE.gov grew out of the Federal Enterprise Architecture (FEA) Project Management Office, the goal of which is to support cross-agency collaboration, transformation to Service Oriented Architecture (SOA) model and governmentwide improvement. CORE.gov offers an environment where component developers and enterprise architects can collaborate seamlessly and easily. Core.gov provides an agency and industry collaboration environment for component development, registration and reuse. CORE.gov began operation in March 2004. Over time, it will become a networked community of component developers and enterprise architects and will offer numerous components of various types and complexities, including business components, e-forms and technical components.

At Core.gov, one can:
- Search for and locate a specific component that meets your needs
- Find components that can be customized to meet unique requirements
- Recommend components for inclusion in CORE.gov.

Using CORE.gov to Develop Service Oriented Architecture Components

In its effort to promote standardization and reuse of agency business functions and IT services, the Federal Enterprise Architecture (FEA) Program Management Office (PMO) initiated the CORE.gov collaboration environment in 2004 for development of service-oriented components. Cited in the 2005 – 2006 FEA PMO Action Plan, the CORE.gov collaborative community assists program managers, enterprise and data architects, and other government stakeholders to capitalize on opportunities to:

- Develop software that provides interoperability agency wide
- Formulate business cases that aim for high return on IT investments
- Design common processes that better manage component life cycles
- Share information resources
- Develop XML and related schemas to enhance information sharing and interoperability
- Develop and share case studies
- Integrate existing toolkits and develop new ones
- Build business-driven, common models and architectures
- Develop policies, procedures, and protocols for inter-agency use
- Brainstorm ideas that help realize FEA goals

CORE.gov is a tool specifically designed for use by federal government agencies and the industry organizations that support them. It holds special promise for program managers, enterprise and data architects, and other government stakeholders as they shape the development of the government SOA. Industry participates with sponsorship by a government organization, and so contractors are welcome to participate in collaborative projects on CORE.gov.

The CORE.gov collaborative environment promotes federal inter-agency and intra-agency as well as vertical (federal, state and local) project integration to avoid reinventing the wheel and duplicating enterprise and architectural component development. It expands the communities already in place, such as the virtual Wiki Collaborative Community pages that benefit government users and others in building components together.

SOA Component Registry and Repository

CORE.gov supports a component resource registry/repository where inter- and intra-agency user teams register processes, capabilities, case studies, best practices, documentation and software that they have developed or modified together in a CORE.gov collaborative environment or at other government-sponsored organizations. Consistent with the 2005 – 2006 Federal Enterprise Architecture (FEA) Program Management Office (PMO) Action Plan, CORE.gov focuses on registering component resources that can be usefully shared or reused by two or more agencies; provides a good return on agencies IT investment portfolio; and aligns with the FEA Business, Service, Performance, and Technical Reference Models. CORE.gov encourages users to submit candidate components. It's all about improving business performance.

Even though federal agencies have unique missions and goals, many processes, standards, and policies are common across the government. Sharing best practices — knowledge and lessons learned concerning these processes, standards, and policies — can improve the quality and efficiency of programs, while reducing their costs. The FEA PMO charges the federal EA community to "move beyond an IT-focused message and concentrate on successful implementation of the FEA Practice and improved business results." Gathering and sharing best practices, case studies, and lessons learned will facilitate collaboration among the EA community and establish baselines for agencies to move toward more mature enterprise architectures.

SOA Component Collaborative Development

The Emerging Technology link on CORE.gov is the entry point for the identification, discovery, and formation of communities of practice (CoPs) around emerging technology (ET) components and specifications of interest to government agencies. The process consists of eight stages.

Identification

During Stage 1 of the process, components are identified by following the two-step process indicated in hyperlinks on the Web site menu. Information regarding proposed components is registered, indexed and made available for browsing and searching. *Anyone* may identify a component using the two-step process indicated on the Web site menu. Components that have been identified thus far can be discovered by searching and browsing on the Search Components screen.

Subscription

During Stage 2 of the process, individuals self-subscribe to components of have significant interest, thereby forming communities of practice (CoPs) around them. Government employees and others subscribe to components of interest to them, thereby joining CoPs around those components.

Stewardship

During Stage 3 of the process, the co-chairs of the CIO Council's (CIOC) Emerging Technology (ET) subcommittee agree to accept stewardship of proposed components based upon the degrees of interest and commitment embodied in the communities of practice (CoPs) formed around them. The ET subcommittee accepts stewardship of components for which sufficient interest exists.

Business rules for stewardship have been formally determined. These rules include criteria related to high degrees of commitment to the CoP among at least three individuals

with high degrees of technical expertise, representing at least three different companies or organizations, together with at least three representatives of government agencies possessing high degrees expertise in the prospective business case for use of the component. In some cases, leadership of the CoP by a government agency Chief Information Officer (CIO), Chief Technology Officer (CTO), or other high-ranking official, may also be required or, at least, be taken into account in determining priorities among candidate components for stewardship.

Stewardship does not necessarily imply any commitment other than recognition that the CoP formed around a component appears to have sufficient resources to determine, in an unbiased manner, its technical viability and utility. However, the process may play a role in helping the CIOC determine priorities for the allocation of any resources available for this purpose.

Graduation

At Stage 4 of the process, components have been demonstrated by communities of practice (CoPs) to be technically viable and to have practical utility.

Emerging information technology components "graduate" to become relatively mature SOA components and, thus, become candidates for consideration by the CIO Council's Components subcommittee for inclusion in CORE.gov for governmentwide usage. Generally, individual government agencies who have the most compelling business need for each component and have participated in its CoP will be prime candidates to become early adopters.

In the case where the component is either a new service component not currently recognized in the Service Component Reference Model (SRM) or a technical specification not already cataloged in the Technical Reference Model (TRM), it will be referred to the CIO Council's Governance Subcommittee for consideration in the governance process for the Federal Enterprise Architecture (FEA) models. The technical viability and utility of components are demonstrated, whereupon they become candidates for use by agencies and multi-agency CoPs and inclusion in CORE.gov for governmentwide access.

Budgeting

Funding for government wide components may be requested in the President's budget or individual agencies may allocate existing funding to them.

Acquisition

Components are acquired for use in government applications.

Maintenance

Components are maintained throughout their life cycles.

Retirement or Replacement

Components are retired or replaced as needed.

Reaching the Target Architecture and Government Transformation

The Federal Enterprise Architecture Roadmap to Government Transformation relies on enterprise architects to take the government into a market-based organization by 2008. Enterprise architects are the drivers and map much of the business-driven blueprint for the entire FEA.

Processes that focus on internal, agency-specific objectives no longer guide enterprise architecture (EA) development. Instead, enterprise architects are focusing on results and processes that provide a cross-agency framework and interagency uses — from government-specific designs and processes to tools already proven in the commercial sector. CORE.gov will help enterprise architects reach the target architecture of the new federal enterprise on time and on budget. The repository's resource records will keep enterprise architects informed about approved EA processes and pertinent case studies, applications, and tools. In addition to the registry or repository of available resources, CORE.gov provides workspaces for enterprise architects to work together on brainstorming ideas, building models, and sharing information across agencies. Users can be given different levels of visibility and different roles on CORE.gov work spaces. Virtual collaboration among enterprise architects will contribute to picking up the pace on EA design and development while reducing the prevalence of redundant efforts government wide.

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Melvin Greer is responsible for business development and technical delivery for enterprise application integration engagements. Mr. Greer is a subject matter expert on emerging and integrating technologies, specifically in Web Services, Java, J2EE, and Object Oriented Analysis and Design. He is an enterprise architect supervising and developing large complex information technology solutions. Mr. Greer has more than 20 years experience in key management, advisory, and leadership positions and supporting major international institutions, large banking and finance organizations, and key U.S. and Canadian government agencies.

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