

SOA Adoption and Context Levels

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1. Intended Audience

The intended audience for this paper includes program managers, CTOs, enterprise SOA engineers, and others involved with IT leadership. In general, this paper would serve individuals involved with technical leadership of organizations that are currently, or are considering pursuing SOA, especially those who are looking at large scale SOA initiative.

2. Goal of Document

As a starting point for achieving success with your SOA initiative, you must first recognize that not all SOA environments are the same, but rather that success depends upon recognizing and understanding your particular *SOA Context*, and how best to pursue SOA with that background knowledge. Once your context has been identified, obstacles to SOA success can be avoided at the particular context level. This would include how your SOA initiative relates to others around you.

To that end, the goal of this paper is first to define the SOA context levels, and then to describe how the strengths and weakness of the given level can be taken into consideration to improve the chances of success of your SOA initiative.

3. Background – Historical Challenges to SOA Adoption

SOA technology has been around for many years now. Yet we haven't seen the great strides we expected or the realization of the promises of SOA relating to making integration between system simple and rapid. Further, using SOA technology does not seem to have replaced the need for traditional IT middleware components (such as EAI and/or MOM infrastructure) to facilitate sharing across organizational or business boundaries.

However, the need for information sharing at all organizational levels, whether through SOA or other mechanisms, remains an imperative of most organizations. SOA is not going away, but it must be better understood and better implemented. What follows are historical challenges to successful SOA implementations.

3.1. Assuming SOA Success is Mostly Successful Implementation of Technology

A common misunderstanding of the SOA COTS customers has been that once the "SOA tools" are installed, the promises of SOA will instantly materialize. This simply is not the case. There is a significant amount of complicated configuration that must be done with the tools to begin to realize the promise of sharing data and behavior.

Some of this misunderstanding can be laid at the feet of the SOA COTS vendors. The vendors are experts at selling their technology as "SOA in a box". Their sales pitch can usually be boiled down to: "all you have to do is install the software and your SOA will be up and running." As if SOA was a thing that you could buy, roll off of the truck and plug right into the wall.

As a consequence of misunderstanding the limitations of SOA technology, and not recognizing that success requires more than some installation and configuration, SOA implementations often go underutilized.

3.2. Lack of Appropriate Process and Governance

Historically, most SOA environments have some mix of SOA process and governance, but it is often not implemented appropriately. SOA needs the correct level of governance and oversight, or else successful SOA adoption will not take place. Sometimes it's a matter of degree. Too much governance means the rules to both providers and consumers are burdensome creating a very high "barrier to entry", which discourages participation. Without participation, the SOA infrastructure sits unused.

Similarly, if there is an absence of governance and oversight guiding adoption, resources will remain unused. For instance, if there are misunderstandings or un-reconciled issues for a SLA against a service, such as why it has intermittent availability, or why a resource has suddenly and unexpectedly ceased operating for a consumer, users will grow discouraged and adoption will stop.

3.3. Organizational/Structural Challenges

Organizational differences have historically created an impediment to SOA adoption. For instance, if "buy-in" to SOA is missing because of a lack of organizational incentive or commitment, then SOA adoption will not be successful.

Even when a certain level of SOA adoption has become successful, further adoption is often hampered by organizational impediments. As an example, an enterprise may attempt to co-opt an organization's application infrastructure in order to realize its goals, putting it in direct conflict the host organization.

3.4. Communication Challenges

Historically, people have tended to talk about SOA in a way that is almost magical, and certainly naive. It has been a common misunderstanding that SOA is a thing. Further, there has been a tendency to assume "*successful SOA infrastructure deployment = successful SOA deployment*". This idea was alluded to earlier in the discussion about the tendency for vendors to take the plug-and-play sales approach, which at the least is misleading, and helps to perpetuate the oversimplification of SOA.

At its core, SOA success depends intrinsically upon sharing of software resources across an organization, enterprise, or federation. However all the fancy SOA plumbing in the world will not translate into greater software reuse, greater IT efficiency, or saved costs, without the corresponding processes and governance in place required to enable a successful SOA marketplace, and at their core, those processes and governance depend heavily on successful communication.

4. Context Levels

In order to help determine how best to implement SOA in a given environment, we needed to describe the context in which it operated. We have found that there are generally three different operating contexts for SOA infrastructures. Your organization or enterprise may have more or less contexts but we're sure you will find that these three main SOA contexts relate to you in important ways.

Figure 1 – Context Levels Diagram depicts the three context levels, and how they interrelated. What follows is a definition of the context levels.

4.1. Context Level 1

Context Level 1 is the level of individual enterprise organizations. Context level 1 examples could include the accounting department, HR department, or finance department of a larger controlling corporation. In general, the community is comparatively small, internally cohesive, and disciplined as a unit, and is thus more agile with regard to evaluating different ideas and following through on them.

4.2. Context Level 2

Context Level 2 is enterprise level. Commercial examples are Walmart, Citibank, and Microsoft. In the Federal Government, examples are the Navy, the Air Force, and IRS. The community is much larger, more complex, and more heterogeneous than those at level 1. Due to the complexity and scale of the community, decisions must be driven in a top-down fashion, as regards major IT and related initiatives (e.g., SOA) that require the individual organizations to work together to achieve major goals.

4.3. Context Level 3

Context Level 3 is a federation of enterprises. Commercial examples include General Motors and General Electric. Federal Government examples include the Department of Defense and the Department of Homeland Security. IT initiatives at a federated level are a tremendously complex undertaking. The constituent enterprises may or may not have a history of working together to achieve major shared technology goals. An independent overarching governing body is generally required to guide and manage the shared IT initiatives as well as serve as the conduit for disseminating all related governance, process, and other information required to successfully achieve the shared goals.

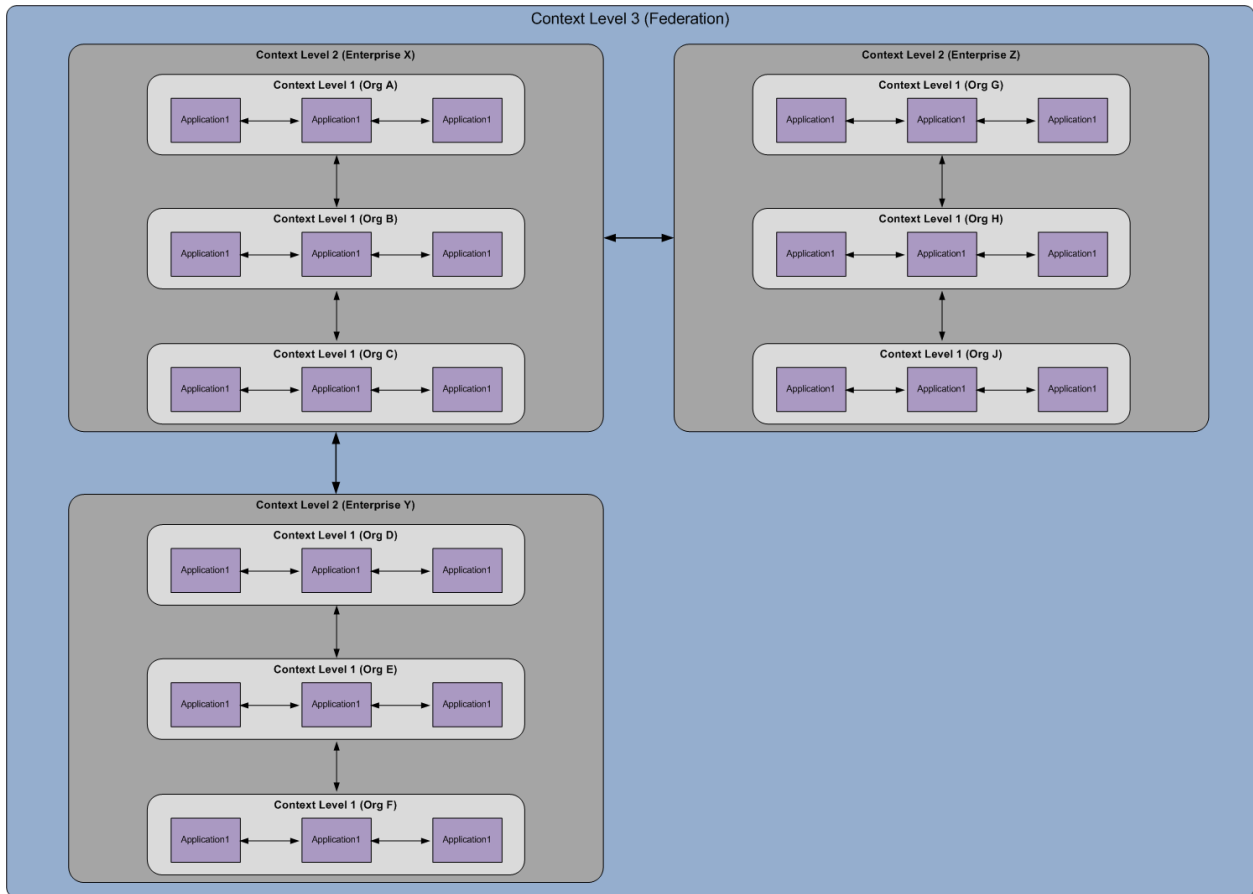


Figure 1 – Context Levels Diagram

5. Solution Definition

Now that the context levels have been introduced and defined, it is time to discuss how to leverage the characteristics of a given context level to improve the chances for success of your SOA initiative.

5.1. Context Level 1

5.1.1. Summary

Technology

- Design and development approaches are uniform and consistent.
- Well-understood (by developers and other stakeholders) technical infrastructure.
- More technical complexity and risk can be undertaken due to intimate nature of organization.

Process and Governance

- Comparatively little required for SOA initiatives started at this level.
- Spontaneous SOA adoption and organic approach to process definition.

Organization

- The fewest challenges of the three levels.
- Internally cohesive.
- Incentives and goals are uniform and consistent

Communication

- Simple structure allows for efficient collaboration and communication.
- Educating “what SOA is and how we should do it” is easiest at this level.

5.1.2. Details

5.1.2.1. Technology Challenges

At context level 1, since the physical environment scope is relatively limited, technology approaches tend to be uniformly defined and implemented. Within level 1, there is a well-understood history of technology commitment in the area of IT infrastructure, design and other standards, methodologies and software frameworks. Technical decisions can be imposed and mandated completely by the organization; to the extent it has authority over its own IT goal-setting and strategy. Technology choices can be safely dictated by the principle sponsors and stakeholders, because the operating environment is well-defined and well-understood by most of the SOA community. In many instances, more design complexity and technology risk can be undertaken (as compared with levels 2 or 3) by virtue of the fact that the community is small, organizationally simple, and comparatively few communication challenges exist. In other words, more technical complexity can be taken on because the service provider developers, potential consumers, and others have few communication challenges to overcome.

5.1.2.2. Process and Governance Challenges

For this level, process and governance needs are comparatively simple. Level 1 SOA could simply be a SOA initiative within a single organization (say the financial department of a corporation) and might be more aimed at keeping up with technology or anticipating the future needs of other corporate departments/organization by creating services to a popular application or data store as part of a normal software upgrade to a system. In this instance, SOA adoption is an anticipated need rather than an initiative mandated by an overarching enterprise (level 2), or federated space (level 3). SOA adoption is organic and spontaneous (i.e. adoption by the other organizations), and no process or governance need

be put in place to promote it since the initiating organization was acting independently. The other organizations may choose to consume their new services or not.

5.1.2.3. Organizational Challenges

This level presents the least organizational challenges. The scope is the organization itself and therefore differing organizational goals, resources, skill sets, and technology are not at issue, assuming the organization is stable, internally cohesive, and that it operates effectively.

There is a high likelihood that the organization operates in lockstep, and that incentives and goals are consistent, making organizational and communication challenges minimal. At level 1 an organization is less encumbered by enterprise level politics and differing goals and agendas, and is therefore better able to pursue SOA in a way that it feels best serves potential consumers.

5.1.2.4. Communication Challenges

SOA initiatives operating in a level 1 context should take advantage of their simple structure to collaborate internally to design and build an effective SOA-enabled environment. Level 1 will present the least challenges for communication, since the community is comparatively small, the business domain, technical skill set, and IT environment are consistent and mutually understood. Also, educating the organization as to “what SOA is”, and how best to define and following up on goals, is easiest to realize at this level.

5.2. Context Level 2

5.2.1. Summary

Technology

- Heterogeneous technology landscape (as compared to level 1).
- Technology risk and complexity should be moderate (as compared to level 1)
- Numerous organizations each with unique IT investments.
- Define and embrace enterprise-level standards of information formats and interface definitions.
- Technology decisions that affect the enterprise are best disseminated from the enterprise itself.

Process and Governance

- Process and governance is an imperative at this level.
- Consider the definition of a service-sharing “marketplace”.
- Must define policies to ensure service delivery quality.

Organization

- SOA initiatives are top-down rather than bottom-up (as with level 1).
- Organizational structure “is what it is” and you must work within it in order to achieve success.
- Take advantage of enterprise mechanisms (i.e. for process, governance, standards, etc) to facilitate SOA adoption.

Communication

- Effective and efficient communication is critical.
- Define and implement a communication plan at the enterprise level.

5.2.2. Details

5.2.2.1. Technology Challenges

At context level 2, since the scope of the physical environment has increased greatly from level 1, the technology landscape, infrastructure, design and other approaches tend to be much more heterogeneous than at level 1. At this level, you have numerous organizations within the enterprise that have unique IT investments they have committed to and that must be respected. As a consequence of this, technical decisions regarding SOA initiatives require greater flexibility. Further, most enterprise technical decisions, such as the choice of standards (i.e. schema types and definitions, interface and message types such as soap versus REST), are best disseminated from the enterprise itself (although technical decisions may have originated within one or more child organizations). Ideally, you might already have enterprise level standards that can be embraced (e.g., standards for interface definitions, messaging commitment soap-versus-REST, schema standards for data input/output). If they don't exist, the enterprise typically provides mechanisms (standards groups, etc) for introducing them. Technical complexity and risk should be at a moderate level compared with Level1, because you have to be realistic about the limitations (i.e. technical skills, skill set disparity, differing organizational needs and thus differing abilities to commit time/money/resources to the SOA initiative, communication challenges typical of enterprises, etc.) inherent in a comparatively larger SOA community of service providers and consumers.

5.2.2.2. Process and Governance Challenges

For this level, process and governance needs are an imperative. A SOA initiative from an enterprise (and higher) level cannot be successful without processes and governance in place that facilitate adoption. Successful SOA adoption at levels 2 and 3 is, large measure, about facilitating the creation of a thriving service-sharing marketplace, and like any marketplace, processes must be in place to “sign-up” (or register) producers, to generate awareness of their services (existing and future) to consumers within the enterprise, and to smoothly manage the runtime operation of these enterprise services once they are deployed to an operational environment. Further, to ensure the quality of the services created and

consumed, governance and policies must be in place to ensure that all services delivered work as advertised (as regards such things as availability, throughput, and latency).

Ultimately, a successful enterprise level SOA initiative transforms the enterprise because of the new interdependence of its constituent organizations, and the success of the enterprise may become wholly dependent on the SOA initiative's long-term success. For this reason, comprehensive processes and governance are of paramount importance at level 2.

5.2.2.3. Organizational Challenges

Organizational challenges to SOA adoption at the enterprise level are numerous. However, since the organizational structure "is what it is", overcoming organizational challenges cannot be about changing the structure, but working within it. At the same time, since SOA enterprise initiatives are typically top-down, one can take advantage of the power of the overarching enterprise to gently impose its will upon the various organizations. The organizational challenges are overcome largely through the policies, processes, and governance defined and dictated by the enterprise itself as discussed in the previous sections. At least with the enterprise level, there is an imperative for the constituent organizations to "fall in line" to the way of thinking of the enterprise.

5.2.2.4. Communication Challenges

Communication challenges at level 2 are far greater than with level 1. Whether the SOA initiative was kicked off at the enterprise level, or has moved sideways across the enterprise from a specific organization or department, it is always easier to pursue major IT initiatives in the manner your organization thinks is best rather than having another organization or the enterprise itself foist their SOA goals, expectations, and ideas upon you. For this reason, effective communication is very important at level 2. Probably the only way a SOA initiative can be truly successful at level 2 is if a communication plan is established, defined, and managed at the enterprise level. Most enterprises already have plans and processes in place for disseminating sharable information and resources such as best practices, business goals, organizational standards, etc. For this reason, the enterprise should leverage this past experience for effective communication related to level 2 SOA initiative and adoption.

5.3. Context Level 3

5.3.1. Summary

Technology

- Requires the greatest flexibility of the three levels.

- SOA technology decisions should be of minimal complexity and risk (as compared with the other two levels).
- Embrace popular, mature, and well-understood open standards where possible.

Process and Governance

- Federated body must be created above the individual enterprises to define, manage, and disseminate technology, policy, governance, and other decisions.
- Process and governance at this level must be finessed rather than imposed.
- Success depends upon inspiring and facilitating service adoption and information sharing.
- Must create an effective service-sharing “marketplace”.
- Must streamline the process of service discovery.

Organization

- Relationship initiated by a mutually-recognized need to share information.
- Management of the relationships is driven by the federated body.
- Must address the mutually agreed-upon goals of the federation in order to achieve successful SOA adoption.

Communication

- Effective and efficient communication is critical.
- Individual enterprises may have little history of working together.
- No established lines of communication may exist.
- All communication is channeled through the federated body.

5.3.2. Details

5.3.2.1. Technology Challenges

Level3 technology decisions require the highest level of flexibility of the three levels. Since this is a federated community, you may no longer have enterprise resources to rely open for defining your standards, and for technical governing bodies. As a result, an overarching and independent “federated body” needs to be created to arbitrate the disparate needs of the underlying enterprises.

Technology guidance by the federated body might promote embracing popular, mature, and well-understood open standards for schema types, etc, where possible (as opposed to the standards of any one enterprise). It may recommend trying to avoid the complexities and “lock-in” of soap and instead embrace REST where possible, since the implementation is easier to design, implement, and communicate than soap. In general, technical complexity and risk should be minimized as compared with Levels 1 and 2, because you can make no assumptions about the skill set , etc of your

provider/consumer community, and thus technical decisions should embrace the path of least resistance (if that can be defined).

5.3.2.2. Process and Governance Challenges

In many respects, defining processes and governance to promote SOA adoption at a federated level is the trickiest of the three. Level 2 SOA adoption can be mandated by an enterprise, and thereby forced upon an otherwise reluctant collection of organizations within the enterprise. By comparison, federated SOA adoption must be finessed. Success depends more upon inspiring adoption and sharing than forcing it on the enterprises in the federation. Enterprise A will typically not have the authority to impose its SOA-initiative-will on enterprise B and visa-versa. For this reason, adoption of SOA cannot take the draconian approach to policy and governance more typical of level 2 (where an enterprise very survival could ultimately depend on SOA success). Level 3 must be more like a real-world marketplace of goods and services, that promotes the bringing together of service producers and consumers and that fosters and enables the forming of relationships between all parties. Governance at this level serves primarily to streamline the discovery of potential services on behalf of service consumers and to provide a means to initiate relationships and dialog between the producer and consumer community.

Also, as with technology decisions, the process and governance decisions need to be defined, implemented, and managed by the federated body that oversees all the enterprises.

5.3.2.3. Organizational Challenges

In all likelihood, the federated SOA initiative was spawn from an awareness of the value of sharing one another's data and other resources. In fact, it is entirely possible that these enterprises are becoming federated expressly for the need to share information (and by extension, data and IT resources). This is not to say they their mutual self-interest mitigates organizational challenges. Organization challenges at a federated level can only be overcome by the SOA initiative ensuring that it addresses mutually-agreed-upon goals as defined by the federated body.

5.3.2.4. Communication Challenges

Level 3 presents the greatest challenges to effective communication in support of initiating, managing, and encouraging the adoption of a federated SOA initiative. The individual enterprises making up the federation may have little or no formal relationship with one another, and little history of working together, no established lines of communication, much less formal communication plans. For this reason, communication mechanisms need to be channeled through the federated body.

6. Conclusions

It is safe to say that the promise of SOA has yet to live up to the hype that accompanied it. SOA is very complicated from a technology perspective, and probably at least as complicated from a solution-

delivery and adoption perspective. However, the primary goal of SOA, enabling the sharing of IT information and capability across vast communities of users, is as important and as relevant as it ever has been.

As communicated in this paper, in order for SOA to achieve this goal, you must first examine and understand the context in which your community operates. This paper defined three context levels, and each one has unique characteristics that must be taken into consideration in order to maximize the likelihood of a successful SOA initiative.