



How service-oriented architecture (SOA) impacts your IT infrastructure

Satisfying the demands of dynamic business processes

Contents
2 Introduction
3 Supporting business objectives with SOA
4 Impacts of SOA on today's IT infrastructure
4 Changes in message handling and the importance of the enterprise service bus(ESB)
5 The importance of the business process server
6 SOA governance, and the service registry and repository
7 Impacts of SOA on performance and testing
7 Changes in IT service management
8 Security and identity management in an SOA
9 IT virtualization to support service virtualization
9 SOA infrastructure services from IBM
10 Meeting SOA expectations

Introduction

More than likely you've heard quite a bit about service-oriented architecture (SOA) and how it holds the promises of quicker response to market trends, improved customer services and lower application development costs. From an infrastructure perspective, an SOA implementation contains all the same pieces and parts as your traditional environment. There are a few new elements but, overall, there are no significant, visible changes. So, it would seem that continuing to plan and manage your infrastructure as you have in the past would deliver the same level of results. This is a misconception that causes many IT organizations to fall short in their ability to handle the new demands that SOA can place on the infrastructure. The change is simply not that obvious; it requires an understanding of the architecture itself.

In the traditional application architecture, and even in the more modern world of Web services, your infrastructure resources typically support a specific application or organization within your enterprise. As you plan for capacity and performance, you can test the limits of your system resources and infrastructure with a fairly good understanding of where the demand will come from and how it will be processed. With SOA, this type of planning and testing is more challenging because your infrastructure resources may support a community of users and applications through services spread throughout your enterprise. Unlike previous types of architecture, SOA introduces changes that most IT organizations have not anticipated; you must ensure that your IT infrastructure can support the dynamic nature of an SOA. Organizations that fail to consider the impact to their infrastructure may find themselves dealing with performance and security issues, a tarnished brand image and lost revenue.

In this paper, you will learn how SOA impacts your IT infrastructure—in particular, how business processes and transactions are handled differently in an SOA environment than in a traditional application architecture. We will discuss the new elements which are necessary for your IT infrastructure to support SOA and share our experience and recommendations to help you meet the new availability, performance, security and management challenges.

Highlights

SOA is a different approach to designing and building systems to support a dynamic business environment.

The ability to dynamically add new capabilities can help reduce development costs and almost eliminate traditional development cycles.

Supporting business objectives with SOA

SOA is not a new concept but a different approach to designing and building systems that are flexible and adaptable to support a dynamic business environment. An SOA lets you design, build, deploy and integrate services independent of applications and the computing platforms on which they run. These services are then linked together through defined business processes to form composite services, applications and composite applications to perform complete business functions. Some examples of possible services might include: locating billing information for a patient, requesting recent transactions for a financial account, identifying the owner of a registered vehicle, checking warehouse inventory for a particular item, or requesting a list of available flights for a given destination.

In this open framework, services can be shared and reused across several business processes. The result is a highly adaptive environment, with lower costs for application development, improved integration and quicker deployments. Business rules, which can be changed dynamically, now define the application layer of business functions. A single SOA-based service can, in fact, be widely reused throughout your enterprise by many business processes. And these business processes can be changed at any time to request other new and different services. Once you deploy SOA for your core business functions, the ability to dynamically add new capabilities through services can help reduce your development costs and almost eliminate traditional development cycles to more quickly deliver new customer services and open new market channels.

A common misconception is that an SOA is a new version of Web services. The distinction between SOA services and Web services lies in their respective designs. SOA defines a model for executing a given process. Web services, on the other hand, can provide the tactical implementation of the SOA model. Thus, Web services are essentially just one of many ways in which an SOA can be implemented.

Highlights

A service may be widely used throughout the enterprise by many applications.

Impacts of SOA on today's IT infrastructure

While a primary benefit of SOA is that applications can be built by combining loosely coupled and interoperable services, the fact that a service may be widely used throughout the enterprise by many applications can lead to the following exposures for your IT infrastructure:

- Poor response times for users and business processes
- Missed service levels for critical business functions
- Noncompliance with industry and government regulations
- Security breaches
- Inadequate service management
- Governance gaps and limitations
- Testing challenges

Until now, your IT organization has most likely been focused on managing the *infrastructure* as an asset to support applications and business units. With SOA, your focus needs to shift toward managing the *services* which support business processes and, therefore, business results. SOA changes the role of the IT infrastructure. You will now need to manage your IT resources so that the services that support the business can leverage that infrastructure.

Changes in message handling and the importance of the enterprise service bus(ESB)

The most significant change as you move toward an SOA is the way in which transactions are processed. With traditional applications, the transport and translation of messages to complete transactions occurs in the application layer. With SOA, the transaction still begins in the application. However, the messaging has moved out of the application layer and now extends into the middleware infrastructure. This extension of the transaction enables the decoupling of the individual services which makes them accessible and reusable across the enterprise. At the same time, the expanded responsibility for messaging places additional performance and scalability requirements on the middleware infrastructure.

SOA places additional performance and scalability requirements on the middleware infrastructure.

Highlights

In traditional applications, all of the steps to complete a transaction are within the application with simple point-to-point connectivity. Your applications which are based on enterprise application integration, the next evolution of development architecture, allow for connection sharing; however, the application is still responsible for the full transaction. With SOA, the business process application initiates the transaction and the enterprise service bus (ESB) provides the messaging, data transformation and intelligent routing.

The ESB performs the following functions:

- Routing messages between services
- Converting transport protocols between requestor and service
- Transforming message formats between requestor and service
- Handling business events from disparate sources

The ESB is a critical component in achieving end-to-end performance.

The ESB renders applications, consumers, and providers independent from each other. Initially, your ESB architecture may simply transport messages. More complex routing and the transformation of messages may be included in a later phase of implementation. Of course, the availability and performance of each independent service in your enterprise is important. However, it is easy to see that the ESB is a critical component in achieving end-to-end performance for all of your business processes and applications. In fact, performance issues are often the direct result of a poorly architected ESB implementation.

The importance of the business process server

The ESB is driven by the business process server where your business processes are defined and managed. The process server manages and orchestrates the requests through the ESB to independent services to complete these business processes. Business process flows are used by the process server to replace the complex interdependencies of your legacy applications.

Highlights

To meet service level commitments, you need the ability to monitor the individual services as well as the complete business process.

SOA governance helps ensure that services are being effectively reused across the enterprise.

SOA provides an opportunity to make processes more efficient and should begin with an exercise to model your current business processes to help improve and eliminate out-of-date steps. These updated process flows should be your source for implementing the business process server. And, then, as you implement new services, the business process flows can be easily modified to include new capabilities. In addition, as services are replaced or upgraded, the ESB will automatically perform a request on behalf of the process server to access the latest version of the service.

It is easy to see how the ability to dynamically change business processes to include new or upgraded services is a significant business benefit. However, this same benefit complicates your ability to control and manage your IT environment. If a business process does not complete or is slow in completing, how will you know where the failure has occurred? To meet service level commitments, your IT organization must be equipped with tools which provide the ability to monitor and manage the individual services of each business process as well as the business process itself.

SOA governance, and the service registry and repository

SOA governance complements your existing corporate, IT and business governance to help ensure that services are being effectively reused across the enterprise. As you can imagine, it is possible that duplicate independent services might still be developed by different groups who may not be aware that they are performing similar functions. Your SOA governance defines who can update a service and what the policies are for updating the service. The policies should be defined, developed and managed by an SOA governance team that includes representatives from IT as well as all the application development and business organizations who are developing and making use of SOA.

The service registry and repository is one of the technologies which can help you enforce your defined governance policies. It provides the ESB with information about available services that can be invoked by applications across your enterprise. Without the service registry, applications would need to make specific calls to specific services. This would undermine, to a degree, the SOA design principles for decoupling applications and services.

Highlights

SOA can have significant performance impacts both on the network and infrastructure components.

Impacts of SOA on performance and testing

SOA makes heavy use of a messaging structure called eXtensible markup language (XML). XML is a verbose message format which can impact the performance of your network and the components of your infrastructure which are responsible for processing this message format. Your SOA services are more than likely distributed throughout your enterprise which will result in multiple interactions back and forth across your network.

For highly reused services, improper infrastructure planning and design can cause overload and even failure in your network or your systems, which may result in poor performance, slow response times and possibly downtime for several applications and users. It is important to consider the number of users, other services and business processes which may request a service. Your objective is to ensure that the time it takes to process a complete transaction in an SOA environment will not be noticeably slower or less reliable than your traditional application environment.

This ability to dynamically create new applications by redefining business processes also creates new challenges for testing. How do you test the performance capabilities of a solution prior to deployment when new services can be implemented and requested by business processes through simple process definition changes? You will need to test the performance capabilities of an individual service, the capability of your ESB architecture and the end-to-end performance of composite business services.

Changes in IT service management

If you haven't already done so, an SOA will force you to transform from a systems-focused systems management approach to an enterprise-focused service management architecture. As we touched on earlier, an unmanaged business service is, in effect, an unreliable business service. Your organization may need to implement or expand your current service management capabilities so your staff can monitor and manage the infrastructure with a view of the business processes which may comprise many loosely coupled and distributed services. The dynamic nature of an SOA environment makes it more challenging to provide effective service management. Basic

SOA requires you to expand your emphasis on IT service management.

Highlights

system management solutions are not sufficient to support quick problem determination or management. Your operations team needs the ability to monitor the composite application and, when service levels are not met, they need a way to understand what services are involved to analyze and resolve the problem. When a service that is solicited by many applications begins to experience performance issues, your staff needs to rapidly understand the full impact on different business functions.

You will also need to implement tools to help your staff automatically discover relationships between all the service components of your underlying infrastructure. It will no longer be effective to maintain static diagrams to map out how transactions work and pinpoint the servers on which they run. This may change from day to day or even from hour to hour. Your staff needs automated tools that display the current topology at the time of the problem.

Along with expanding and integrating your service management tool set, you may need to adjust your organization and processes. A comprehensive evaluation of your current service management implementation can help you develop a strategy to optimize your staff and resources.

You may also need to adjust your IT organization and processes.

Security and identity management in an SOA

Both identity and security policies play key roles in delivering on the promise of service orientation. Identities exist for both users and services and both should be subject to the same security control. Identity services are required in the infrastructure, not the application. With SOA, security becomes a service and is no longer a capability that exists in every application by itself. This means that services can easily be interconnected without worrying about how to map or propagate a user's identity from one service to the next. Security should be a service that is provided consistently across all the services in an auditable manner according to defined policies.

SOA security is a service that should be provided in a consistent and auditable manner.

Highlights

Virtualization and automated provisioning can help your infrastructure adapt more quickly to change.

IBM can help you navigate the IT complexities associated with SOA.

IT virtualization to support service virtualization

With SOA, since deployments are more dynamic, there may not be adequate time to adapt and change the infrastructure. In fact, over time, there may not be such a thing as traditional release cycles. The infrastructure needs to be componentized and standardized, because simplification is now critical to the success of SOA implementations. As usage patterns of SOA-based services change, virtualization and automated provisioning of your IT resources can help the infrastructure adapt more quickly. A flexible IT infrastructure is required.

SOA infrastructure services from IBM

IBM can help you assess your current infrastructure, and develop and execute a roadmap for your SOA implementation. We can help you navigate the inevitable IT complexities associated with SOA adoption by providing guidance and services for architecting, designing and implementing physical and middleware infrastructures. IBM Global Services Methods, which incorporate IT service management best practices, and the IBM SOA infrastructure reference architecture are applied by IBM infrastructure architects and specialists to help you prepare to meet new performance, agility and policy requirements introduced by SOA.

We can help you:

- Perform a health check of your current IT capabilities to enable SOA.
- Define a strategy and identify initiatives as part of a prioritized roadmap.
- Define an infrastructure architecture that embraces SOA to support your business requirements.
- Develop infrastructure conceptual and specification designs to support the requirements of an SOA application framework.
- Design and implement an ESB to help you decouple your Web services, applications and infrastructure.

- Implement an application infrastructure that supports your SOA applications.
- Plan for a test environment to help uncover performance problems.
- Develop new testing processes and perform complex performance testing.
- Design and integrate a security strategy for your SOA.
- Expand your current service management solutions to support your SOA implementation.
- Leverage virtualization capabilities within your infrastructure.



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“It started with IBM’s meticulous preparation. Thanks to the comprehensive readiness engagement and detailed design phases, IBM gained a perfect insight into the needs and the long-term requirements of the new solution. A major success factor was the commitment of the consultants and their capacity to focus on the key areas. They cooperated closely with their customers and with their colleagues across departments.”

– Michael Post, head of ICT, Allianz Netherlands

Meeting SOA expectations

As you move forward on your SOA journey, assessing your current infrastructure and initial SOA implementations will help you evaluate your ability to support new and expanded SOA-based services across your enterprise. Developing a strategic plan and flexible infrastructure design is necessary to support demands for services that may change from one day to the next. With proper planning, you can implement a middleware and physical infrastructure to help deliver the performance, security and service management capabilities you need to enable your business to realize the full benefits of your SOA investment. By enhancing your infrastructure to support an SOA, you can increase the value of IT services to your applications and to your business as a whole.

For more information

For more information about SOA infrastructure services from IBM, part of our IT strategy and architecture services and middleware services portfolios, visit:

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