

Five Steps to SOA

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Without doubt, the Service-Oriented Architecture (SOA) is one of the most important and attractive concepts to sweep across the IT landscape in many years. The implications of breaking up large and inflexible applications into reusable services are vast, particularly in today's rapidly changing business environment. It can be seen as a way of saving money, and most of the pioneering users of web services and related technologies have certainly been driven by the need to cut costs. But SOA is also about long-term revenue growth and competitive advantage, and these are the real goals for most forward-looking enterprises.

For large companies and organizations with a complex IT infrastructure in place, SOA can be a very difficult concept to implement. We're not just talking about the way that technology is organized and managed within the enterprise, though this is a big enough issue in itself. In its fullest sense, SOA involves every IT-related process within the business, the relationships between instances of shared data, and the management of all changes and events related to corporate and IT assets. Before the underlying technology can even be considered, CIOs need to decide how an SOA approach can be deployed effectively within their enterprise. Among other things, they need to decide what level of granularity should be employed in defining various types of reusable service, how services should be grouped (eg enterprise-wide, inter-enterprise, or department/domain-level), and how to map IT services onto business processes.



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The business view

All sizeable businesses have a different mix of high-level common operations and specialized business functions, and the extent to which services can be reused to support these activities will vary significantly from one to the next. For example, a standard service such as 'check account balance' may be reusable across the whole enterprise (assuming that 'account' has the same meaning in every line of business), but more specialized services will have much more limited reusability. Consequently, a great deal of planning must go into the SOA preparation phase, to create a set of rules for deploying services consistently across the enterprise.

In view of the high level of consistency demanded by SOA, the real benefits will only be realized with complete commitment at the highest levels of management. SOA needs governance, and one of the greatest inhibitors to technological progress in the modern enterprise is the conflict that occurs between management groups, particularly when senior staff within different divisions or domains defend conflicting IT strategies. SOA is an extremely pervasive approach to business development, and the potential return on investment and benefit in terms of competitive advantage are very substantial. But while many enterprises will choose to start cautiously with small-scale pilot projects, the SOA strategy must ultimately be 'top-down', with all divisions and departments sharing in the vision, definition and responsibility of service-oriented business processes.

Choice of platform

Underpinning the business view of SOA, of course, is the IT infrastructure. Senior managers need to decide how well their existing IT systems can support SOA, and whether the architecture needs to be more centralized or distributed in nature. In most cases, it is simply not practical to embrace SOA without fundamentally re-thinking the shape of the IT environment. SOA is not just another technical step that can be embraced as part of the natural evolution of information systems. It



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requires a technological framework that is flexible enough to underpin processes dynamically, while providing a level of scalability, security and performance that may only be deliverable by mature, proven technologies.

Most big businesses that are now considering SOA will have gone through many cultural shifts over the years, from mainframe-centric applications to distributed solutions, to loosely- or tightly-integrated heterogeneous systems, and many will see SOA as an opportunity to simplify the complexities that have built up over the years. This might well involve re-centralizing the management and provision of distributed applications on the mainframe, in order to support enterprise-wide services more effectively. Such a decision needs very careful consideration, and will depend on a mixture of cost of ownership, availability of applications and skills, existing investments, and long-term business drivers. Nevertheless, there is growing evidence that the unique strengths of the mainframe platform – superior availability, highly sophisticated security, and unparalleled scalability – give the System z a special role to play within the SOA environment.

In this context, system utilization has once again become a major factor in the choice of platform. It has long been accepted that the mainframe typically offers a much higher level of utilization under normal use than other platforms – often over 90%, compared with around 30-50% under Unix and maybe 10% or less on PC servers. This is dependent to some extent on the way servers are configured and workloads are managed, but most users of distributed systems tend to add a server or a blade every time they need to support a new application or gain more capacity. This is a very inefficient way to increase overall capacity and does nothing to reduce the complexity of managing a large and diverse repertoire of enterprise applications.

In itself there is nothing wrong with ‘scaling out’ if cost and performance are both acceptable. Equally, low utilization is not a problem per se, particularly if other factors make a distributed solution more attractive. But there are a number of issues –such as regulatory compliance, environmental factors, and the total cost of system management and



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support – which make a centralized, high-utilization approach far more logical and desirable from a corporate point of view. Consolidation of distributed applications onto a small number of large systems arguably allows businesses to manage assets, share data, and keep track of changes and events much more effectively than hitherto.

Moreover, SOA is all about increasing IT productivity and making full use of resources wherever they reside. It is also about providing consistent and flexible services to meet changing business requirements. These goals can only be fully met if a single, well-defined IT strategy is deployed across the enterprise to support new development. This does not necessarily mean that a mainframe is essential, but it does suggest that centralized management is highly desirable.

IBM's strategy has been heavily influenced by the principles of SOA in the last two years, and the company is investing heavily in positioning the System z at the centre of the service-oriented environment. With the mainframe supporting the whole range of web service protocols and standards, there are no practical constraints on the interoperability between mainframes and other platforms. Moreover, the System z is once again becoming a showcase platform for new developments in this area, and the cost of entry at the lower end of the range now makes it very feasible for small and medium-sized companies to consider a mainframe-centric approach to their SOA deployment.

In the last few years IBM has rolled out a number of 'specialty' processors which allow users to offload new workloads – particularly Linux applications (with the Integrated Facility for Linux – IFL), Java-based development work (with the Application Assist Processor – zAAP), and new database-centric apps (the Integrated Information Processor – zIIP). These engines allow new workloads to run without incurring additional IBM software costs, and they can drastically reduce the MIPS consumption on the host processors. Thus the cost barrier to new development on the System z is rapidly disappearing from the equation.



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Among existing large systems users there have inevitably been a wide range of responses to the issue of SOA participation. Those with older legacy systems and less long-term commitment to the platform still need some persuasion that the pieces are in place for them to reposition the mainframe strategically. However, according to Arcati's *2006 User Survey*, 53% of users said that their mainframe applications already participate (fully or partly) in their SOA/web services. A further 11% were still at the planning stage, and while a significant number of companies are yet to be convinced that the mainframe has a future at the heart of SOA, momentum is clearly building.

Where to start

Whatever platforms are selected to support the SOA strategy, the biggest question facing users is where to start - or once started, how to progress. As suggested earlier, most large enterprises can show some evidence of small-scale SOA projects, developed to 'test the water' and provide an indication of early ROI. But scaling up from those early pilots in a way that supports the shape and priorities of the business is no trivial task.

IBM's SOA Entry Points are designed specifically to help businesses align their new and existing processes with the underlying technology, and to do so in a way that provides one or more meaningful views of the way that service orientation delivers function to the enterprise.

IBM defines five entry points; three business-focused:

- * people
- * process
- * information

and two that address the design of the underlying technology:

- * connectivity
- * reuse.

The entry points can essentially be seen as a set of services, tools and templates that help CIOs and CEOs to embrace SOA in a way that



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supports their own specific objectives, and to tackle those aspects of business operation that need to be enhanced or streamlined. By focusing on the way that individual employees and customers are viewed and supported, information is managed and delivered, or processes are organized and optimized, SOA functionality can be introduced in the way that best serves the business.

In practice, these five entry points are not intended to be viewed in isolation and the expectation is that users will gain far more benefit by considering

each of these perspectives and combining some or all of them over time. But for companies seeking a way to move from their existing infrastructure (ageing legacy applications, siloed data, and the inevitable complexities of distributed system management) to a consistent SOA-based infrastructure that is well positioned to support and drive the business, the five entry points provide a very strong context within which to move forward.

Let's consider each of the entry points in turn.

Process

Most large businesses are the victims of history: years of mergers and de-mergers, reorganization and repurposing, moulded and shaped to suit the requirements of successive leaders, shareholders and market fashion. With each new generation of change, business processes tend to become more diverse and dislocated, and this in turn makes it harder for the business to respond rapidly to meet new challenges.

One of the objectives of SOA should be for companies to re-assess the way that their end-to-end business processes work, and to make sure that any areas of unproductive inconsistency are eliminated. Business process management is fundamental to future success in the digital economy since, without a clear understanding of the way that business processes work, it becomes impossible to interact with business partners or to respond quickly enough to changing customer demands.



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IBM's Process entry point is designed to help users build a model of their existing processes; identify bottlenecks, inconsistencies, and other problem areas; and move towards a more flexible, standardized process environment.

Depending on the complexity and sophistication of the IT infrastructure in question, process re-engineering can demand considerable consultancy expertise, but (as with all the entry points) IBM asserts that users can undertake the work themselves if they wish using the IBM tools.

The key products in this area are:

- * WebSphere Process Server, IBM's high-performance process execution engine, which allows new core processes to be created and automated while maintaining their security and transactional integrity;
- * WebSphere Integration Developer, which allows existing legacy processes to be broken down and re-constructed as new web services;
- * WebSphere Business Modeler, a tool for constructing a fully documented picture of the user company's processes and how they interact;
- * WebSphere Business Monitor, which offers a real-time monitor to manage the status of the processes.

Much of this functionality is also available through IBM's new vertically-oriented offering, the Business Services Fabric. The Fabric is based on technology recently acquired through the take-over of Webify, which IBM is transforming into a vast library of reusable industry- or domain-specific services, aimed at vertical markets such as banking, insurance or healthcare. The offering combines the strengths of the Process Server and Integration Developer, while the user is able to keep track of its service assets by populating the new metadata-based WebSphere Service Registry and Repository.

While the Fabric owes its basic design to Webify, the real benefit of the IBM development comes from the 'ecosystem' of industry-specialized business partners who are contributing services – currently more than



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3000, which are listed in the burgeoning SOA Business Catalog. The Fabric uses industry standards and interfaces (ACORD, HIPAA, HL7) to encourage addition partners and users to contribute new services, and is designed to integrate closely with existing services that have been created from mainframe applications or other systems.

Not surprisingly the mainframe looms large in many process re-engineering discussions. This is not just because of the focus on 'legacy' operations, but also because there is a strong argument for accommodating new processes in a single centralized environment where common services can be integrated most effectively. Moreover, forty years' worth of system management expertise can be employed to guarantee the security and high performance of new end-to-end processes.

People

SOA is often seen as a way of liberating business processes and data from the constraints of legacy applications and heavyweight business operations. Equally, though, it's a way of liberating the information professionals who are the drivers of new development. Indeed with SOA the division between providers and consumers of services is rapidly blurring, as end-users can increasingly use composite services to create their own applications on the fly.

IBM's second entry point is called People, and its focus is collaboration. With the right tools in place employees, partners and customers can come together and share resources, regardless of the artificial boundaries that have grown up between departments, lines of business or information silos.

WebSphere Portal plays a very important role here. At Version 6.0, the product embraces many of the elements of the Web 2.0 environment, such as AJAX support to provide 'mash-ups' based on components drawn from multiple sources. The solution also offers integration with the WebSphere Portlet Factory, again allowing developers to pool resources and share the results. Portal has many features to increase



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productivity, such as fly-out menus, page navigation and a new workflow builder, and is closely integrated with collaboration and content management technologies in the IBM Workplace and Lotus Notes products.

Information

In many ways 'information' is the flip-side of 'people' in that IT professionals and end-users can only be more productive if the corporate information that they consume is reliable, secure and consistent. Information as a service is now widely discussed, and this is clearly seen by many as the first step towards SOA. Without a company-wide strategy for managing data from all sources – new, legacy, relational, hierarchical and unstructured – the full potential of SOA cannot be realised.

IBM has long been seen as an industry leader in data management, and its Information on Demand strategy supplemented by a long string of related acquisitions has helped the company to build a very strong consultancy and services base that spans all areas of information management. It is this expertise that provides the core of the Information entry point.

Much of the information focus within SOA revolves around the mainframe, partly because the platform already holds and manages around 80% of the world's mission-critical data which needs to be freed up for incorporation into web services, but partly because the System z arguably offers the ideal central data server for a mature SOA environment. As discussed earlier, for distributed services to work consistently and efficiently it makes sense for data and system management to be handled centrally.

The mainframe unquestionably offers the most secure repository available for corporate data through products such as RACF; superior integration of information sources with business intelligence and data warehousing tools; highly resilient and web-enabled database services through DB2 Viper and IMS; and uniquely positioned system



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management services via Tivoli and Omegamon. This level of support for business-critical information makes a very strong case for a mainframe-centric approach to SOA.

Reuse

Reuse is a very broad term in SOA terms, and IBM's entry point is similarly broad in its implications.

The more business-oriented entry points offer a whole range of sources for new component services, and any business that is lucky enough to be starting from scratch should find it relatively straightforward to use these components to create flexible solutions to business problems. Most large enterprises, though, are not starting from scratch, and for some the most important precursor to investment in new SOA services is to discover what resources are already in place and how they interact.

The first step in any reuse exercise, then, is to identify existing assets, understand what role they currently perform within the IT infrastructure, and assess how well they can be reused within a service-oriented architecture. Once this has been done, the company will have a much clearer idea what gaps exist in its new portfolio of services, and conversely what existing functions can be packaged as web services for use elsewhere in the organization or beyond.

For companies with a heavy investment in mainframe applications, there are huge financial implications to reusing as many legacy processes as possible, as these are typically mature and highly tuned services that have sustained extremely high availability levels in mission-critical applications over a number of years. Developing new services of this quality can cost many times the price of exposing the equivalent legacy code with standard interfaces.

Of course, enterprises have been battling with legacy modernization for many years, and integrating older applications with newer services has raised some difficult issues. But SOA has provided the final impetus to



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tackle the problem head-on, and there are now many products in the IBM toolkit that can address reuse from different perspectives.

At the core of the IBM solution are the WebSphere Application Server, which is now tried and tested as an industry-strength app server for integrating legacy and new service components. This is enhanced by WebSphere's Studio Asset Analyser, which allows users to manipulate, analyse and transform applications in preparation for an SOA role.

On the development side, IBM offers an attractive range of products under the Rational label, with its Enterprise Generation Language. Rational is particularly worthy of note in this context as its Application/Business Developer products offer a 3GL escape route for users of legacy 4GL environments, which continue to be a very expensive and limiting technology for mainframe sites that are tied into them.

Ineffective wrapping of legacy code has been another obstacle to reuse in the past, and there is strong progress in this area too. CICS, which has undergone a complete transformation in recent years as it has been positioned to participate in web services, reaches version 3.2 in 2007, and this release brings with it full legacy support for CICS Containers as well as substantial improvements to COBOL and PL/I wrapping. IMS is also experiencing major changes to prepare it for full SOA participation, and version 10 includes native XML support and some other key enhancements. Reuse of key mainframe legacy assets is very much a reality today.

Connectivity

Connectivity is the last of IBM's entry points. Service connectivity takes us beyond the traditional requirements of networking and communications in several respects. The backbone must provide:

- * the flexibility to support a flow of messages of multiple types from any point to any other point;
- * the scalability to manage peaks in network traffic without loss of performance or service degradation;



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- * the security to handle communications beyond the normal boundaries of the organization as users and business partners participate in internal processes in unprecedented ways; and
- * the manageability to monitor diverse network activity and ensure that service delivery meets or surpasses targets.

In addition to these requirements, most enterprises will need to combine lightweight transient messaging workloads (typical of web services) with the heavyweight, high payload traffic generated by mature mission-critical applications. Consequently, the backbone or enterprise service bus that supports the flow of data across the enterprise will need to be capable of supporting message types with very different characteristics.

For users aiming to build their SOA strategy from the ground up, IBM can offer some of the most mature connectivity products on the market. Its WebSphere Enterprise Server Bus (ESB) and Message Broker provide complementary connectivity solutions that can be used together or singly depending on the user's precise requirements. WebSphere ESB (WESB) provides connectivity and integration for web services, and is designed for situations where flexibility, low-overheads and ease of operation are high priorities. It offers a general-purpose web services backbone which is likely to appeal to a broad range of new and existing customers. Message Broker (WMB) offers universal connectivity and any-to-any data transformation, and is ideally suited to more complex heterogeneous environments. These products are supported by IBM's industry-leading MQ messaging technology, which provides a highly secure and manageable framework within which to convey traffic of any kind across the enterprise with the assurance of 'once and once only' delivery.

SOA Governance

The final piece of the IBM SOA range of offerings is SOA Governance. Governance is not an entry point; it is a set of services that over-arch the more specific implementations, designed to help users manage the transition and ensure that SOA is being rolled out effectively.



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At the beginning of this paper, we highlighted the danger of failing to gain acceptance of the SOA strategy from all lines of business and the more senior levels of management. This is a common problem, but without a firmly managed and consistent approach to SOA, it is unlikely that businesses will achieve full success.

IBM's SOA Governance Lifecycle and its associated Management Method is a set of guidelines, recommendations, and project plans that help users to make sure all the pieces are in place at each stage of the roll-out. The methodology is based on IBM's experience in working with early adopters of SOA, and it identifies the pitfalls that need to be avoided along the way.

Only by measuring progress and recognising potential problems as they occur can enterprises really succeed with SOA, and this approach offers an excellent opportunity for CIOs to learn from the mistakes of their peers.

Bottom line

SOA is here to stay, and it represents a fundamental shake-up in the way that IT services are used and delivered both within the enterprise and between provider and consumer. With the fast-paced and constantly evolving nature of today's market, resisting the move towards a service-oriented paradigm is not an option. Nevertheless the complexity of implementing an end-to-end SOA strategy across the enterprise is likely to be prohibitive for many companies unless they find the right partners and tools to help with the transformation.

IBM's Entry Points provide an excellent way to start with SOA, or to scale it up from a small project to an enterprise-wide solution. By embracing SOA from the perspective of one or more entry points, users have the opportunity not just to see the way that the technology can support the growth and profitability of their own business but also what steps they need to take to make sure that the transition is as smooth and manageable as possible.



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Five years ago, it would have been inconceivable to think that the mainframe would occupy a central position in the move towards lightweight, standards-based services. But as users finally gain the necessary tools to break their back-end legacy applications into reusable services, so the System z has reinforced its unique role as the most powerful, secure and scalable application and web server on the market. And as users look for a way to re-centralize the management of their SOA investments and guarantee service delivery in a 24/7 economy, the mainframe offers an increasingly attractive solution.

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