

On demand operating environment solutions
To support your IT objectives



Transforming your business to on demand.

IBM's approach to service-oriented architecture





Doing business in the on demand era

Technological advances and the growing use of the Internet have changed the way businesses operate today. With new technology comes the demand for faster innovation and the flexibility to respond quickly. Competition is global and fierce – challenging you to deliver more products to market faster.

To remain competitive in this daunting environment, your organization needs a robust, just-in-time IT infrastructure, or *on demand operating environment*. One that can quickly adapt to your ever-changing business requirements—including security threats, increasing demands from customers and suppliers, and government regulations. An on demand operating environment enables you to continually improve operating efficiencies by allowing you to incorporate the latest technological advances as needed. An on demand operating environment can also help deliver a faster return on your investment by reducing IT maintenance time and costs – ultimately resulting in a lower total cost of ownership (TCO) for your organization. And a more efficient infrastructure can mean increased employee productivity – further decreasing your costs.

Meeting today's business challenges

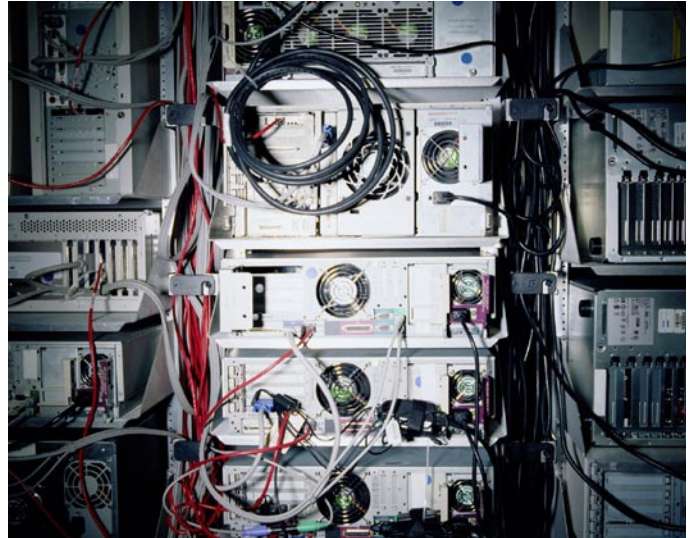
To achieve your business goals, you must begin by understanding what drives your business—including the ability to improve efficiencies at the process level across departments or across your enterprise. To align your IT infrastructure with these goals, you must maximize your organization's ability to be flexible and responsive to competitive threats and new opportunities. How? By making the most of existing systems and investments by integrating them with new systems and applications.

An on demand business requires an on demand operating environment

What does it mean to have an on demand operating environment? An on demand operating environment must:

- *Help you align IT resources with your business priorities.*
- *Be cost-effective—optimizing the assets you already have while enabling you to deliver new value.*
- *Help improve business performance and efficiencies.*

There are two core components of an on demand operating environment: integration and infrastructure management. Integration enables the efficient and flexible combination of resources to optimize operations across and beyond your organization. It's about connecting people, processes and information. Infrastructure management address two objectives. The capability to reduce management complexity to enable better use of assets, improve availability and resiliency, and reduce costs based on business policy and objectives (automation of the environment). Along with the capability to provide easy access and a single, consolidated view of all available resources in a network—no matter where the information resides (virtualization of the environment). A service-oriented architecture (SOA) provides the underlying implementation that can make an on demand operating environment a reality.



Service-oriented architecture—the foundation of an on demand operating environment

Like most businesses, your organization has probably created architectures over the past few decades based on silos of applications and resources designed to solve individual business problems. Besides creating and maintaining these disparate assets, you're dealing with an increasingly complex architecture. One that's causing you to spend more on maintaining existing resources than on new project development. And there's little, if any, standardization and commonality across your applications and systems. All impacting your organization's ability to compete effectively in today's marketplace.

To help you meet these challenges, an SOA takes the next step in the evolution of software architectures, giving you a foundation to develop a successful on demand operating environment. SOAs can meet your needs by allowing you to extend the usefulness of past investments, while enabling you to build new application systems. Begin by evaluating how effective your current infrastructure is. Then, compare and develop a realistic plan for migration to an SOA.



“The value of IT is really in the business processes it supports. Hence, the challenge of modern IT is effectiveness, or in other words, making sure that you do the right things in the right way. This requires a coherent architecture supporting business needs in an on demand fashion. The challenge in developing IT solutions then becomes balancing the process perspective, the functional perspective and the data perspective of the solution, all at the same time. In our experience, the best way of achieving this is thinking in a service-oriented manner. In terms of technology, the process choreography capabilities of IBM WebSphere Studio Application Developer Integration Edition and IBM WebSphere Business Integration Server Foundation help us implement the connection between processes and services, and provide a step towards a service-oriented technological platform.”

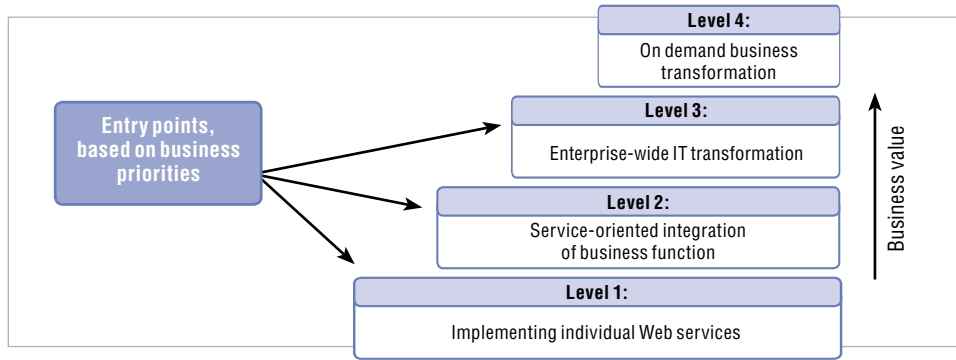
–Claus Torp Jensen, vice president,
IT architecture, competencies and methods
Danske Bank

IBM can help you achieve your SOA objectives

IBM can deliver the capabilities you need to implement an SOA as an application-service integration platform based on open standards. An SOA provides a flexible architecture that unifies business processes by structuring large applications into building blocks or components. You can loosely couple these building blocks, or services, to form new business processes. Your SOA can then create a collection of services that can communicate with each other using a common interface—like passing data from one service to another, or coordinating an activity between one or more services. With an SOA, you can create, deploy and integrate multiple services—and choreograph new business function—by combining new and existing application assets in a logical flow. You can also easily link heterogeneous systems and platforms together into an integrated environment. Because you can customize and modify applications and systems on the fly, your organization can respond faster to changing business requirements—ahead of the competition.

With an SOA based on leading-edge software, hardware, and services from IBM, you can minimize your risk by adopting a flexible, reliable and standards-based application infrastructure. You can unlock the latent value in your enterprise by unifying your heterogeneous IT infrastructure onto a common deployment platform, development paradigm and administration model. IBM’s framework for SOA uses Web services as an open-standards-based integration mechanism to support loosely coupled application assets. By using an integrated Web services process engine, you can provide simple, direct access to information—using internal or external Web services, Java™ technology-based applications or adapters into your existing applications.

IBM has defined four levels of SOA adoption.



Levels of SOA adoption

Improve business imperatives, regardless of your entry point

Many of today’s business leaders and IT architects are implementing some form of SOA. In fact, SOA isn’t a new concept—many businesses have been trying to standardize and create componentized business processes using a variety of architectures over the past decades. However, until recently, there hasn’t been a standard way to integrate applications and assets.

For the first time, Web services make the notion of a true SOA possible. Web services bring a set of common standards, agreed upon by all the major vendors in the industry. You may easily understand the potential—and the value—of this new architecture. But you may be struggling with where you should begin your business-transformation process.

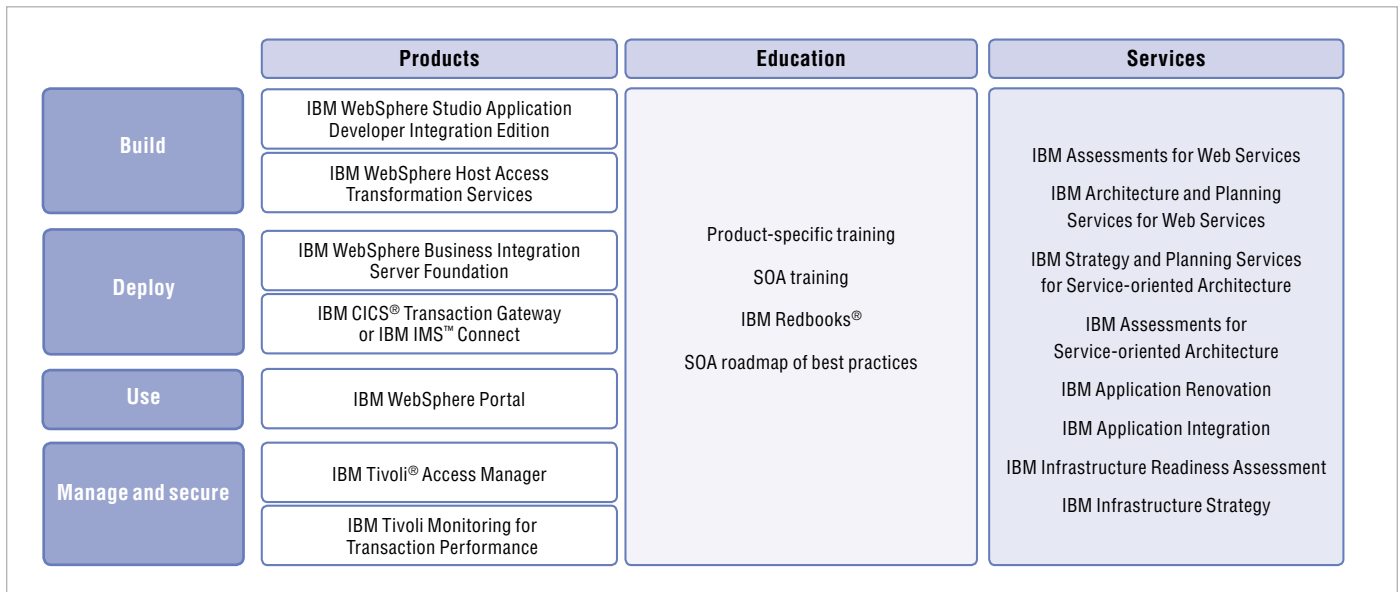
Level 1: Implementing individual Web services

The first level in moving towards a strategic IT transformation is through the implementation of an SOA. An SOA lets you design applications and systems that provide services to other applications through published and discoverable interfaces to be invoked over a network. This method of creating applications gives you a more robust, flexible programming model that can also reduce both development and maintenance costs. An SOA also helps reduce the risks associated with implementation and provides commonality across your development environment.

You can begin developing an SOA by either transforming existing individual applications or creating new applications using Web services technology. The first approach can consist of integrating an existing C++ or COBOL application with a Java application using a simple Web services interface—or writing a Web service as an interface into an individual application or application asset.

	Products	Education	Services
Build	IBM WebSphere® Studio Application Developer	Speed-start Web services Technical briefings Online education	IBM Assessments for Web services IBM Architecture and Planning Services for Web services
Deploy	IBM WebSphere Application Server		

Level 1 products, education and services from IBM



Level 2 products, education and services from IBM

Level 2: Service-oriented integration of business function

The next level after basic Web service implementation is service-oriented integration. This step involves integrating multiple services into a process that accomplishes a particular business task. It must also support a range of integration types, including:

- *Application integration, for developing new interfaces to expose existing Java and non-Java applications.*
- *Information integration, for both interdepartmental and enterprise data.*
- *Process integration, for choreographing the integration of applications and services with multiple interfaces.*
- *System integration, for heterogeneous and legacy system connectivity and application integration.*

This level of SOA adoption focuses on a typical implementation within a department or between a limited number of departments and components. At this level, you can begin to see the benefits of an IT architecture based on open standards that can provide a common interface across applications and assets. An open-standards-based architecture, like IBM's framework for SOA, can be implemented based on your existing investments—rather than requiring a full-scale system and application rewrite. And it can give you the high levels of security, reliability, and scalability you need to operate your business efficiently. Leveraging your organization's existing investments can also offer financial benefits. With an SOA, you can take advantage of current resources—including developers, software languages, hardware platforms, databases and applications—and earn a faster return on your investment.

	Products	Education	Services
Build	<ul style="list-style-type: none"> IBM WebSphere Business Integration Modeler IBM Rational Rose® XDE™ 	<ul style="list-style-type: none"> Product-specific training SOA training IBM Redbooks SOA roadmap of best practices 	<ul style="list-style-type: none"> IBM Component Business Modeling IBM Application Portfolio Rationalization IBM Assessments for Web Services IBM Architecture and Planning Services for Web Services IBM Strategy and Planning Services for Service-oriented Architecture IBM Assessments for Service-oriented Architecture IBM Application Renovation IBM Application Integration IBM Infrastructure Readiness Assessment IBM Infrastructure Strategy
Deploy	<ul style="list-style-type: none"> IBM WebSphere Business Integration Message Broker 		
Use	<ul style="list-style-type: none"> IBM DB2® Information Integrator IBM Lotus® Workplaces 		
Manage and secure	<ul style="list-style-type: none"> IBM Tivoli Identity Manager IBM Tivoli Business System Manager IBM Tivoli Monitoring for Business Integration IBM WebSphere Business Integration Monitor 		

Level 3 products, education and services from IBM

Level 3: Enterprise-wide IT transformation

Once you have implemented an SOA at the departmental or organizational level, the next step involves implementing an SOA across your entire enterprise. At this point, your IT infrastructure (assets and applications) has become consistent across departmental boundaries and can integrate with partners and suppliers. With this level, you should have a common IT infrastructure across your entire organization.

Level 4: On demand business transformation

This highest level of the SOA adoption path represents the strategic goal that business should strive to achieve. At this level, the value that the SOA delivers to your business can increase exponentially. Business imperatives drive IT and the two become closely interlocked. As a result, your business can become more agile—able to respond on the fly to both new opportunities and competitive threats. And your organization can more fully leverage its IT infrastructure across the entire enterprise—and with customers, partners and suppliers. IBM offers a comprehensive suite of consulting services to help you achieve Level 4 of the SOA adoption path. Contact your IBM representative for details.



“IBM WebSphere and Rational® technologies have enabled us to extend and enhance several of our core mainframe applications using J2EE and Web services common interfaces to deliver and SOA. This transformation enabled us to simplify integration across business processes and applications. Our model-driven development process enables us to deliver complex projects that drive our business.”

**– Pat Funk, vice president, claims development
Zurich North America**

Defining an SOA

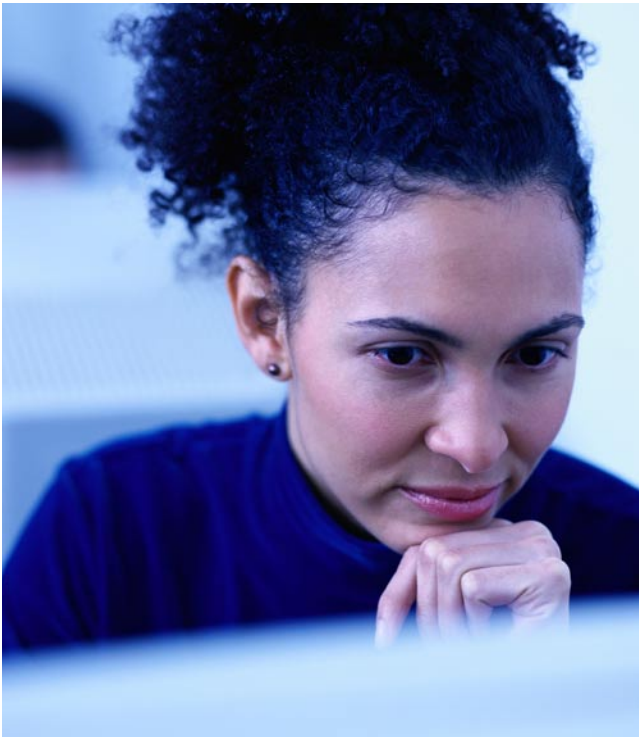
Implementing an SOA at any level of the adoption path requires one or more of the following phases: *build*, *deploy*, *use*, and *manage and secure*. You must also consider the levels of sophistication—based on the scope of your business or project goals—that exist within each of these phases. No matter what level you enter into, your business can leverage these phases to begin reaping the benefits associated with an SOA.

Build

An SOA lets you focus on creating reusable services with common, published interfaces. By implementing a component-based development model, you can create flexible services that can easily be changed to meet future application needs. This can enhance your business by providing you with a highly productive and simplified development environment that can deliver a higher return on your organization’s development investments.

Another benefit to a componentized development model built on an SOA is application maintainability and consolidation of existing assets. A majority of businesses today (50 percent surveyed in 2003) are prioritizing consolidation of applications as their key focus in 2004.* How can you focus on core projects and invest in the key initiatives that will drive revenue? An SOA lets you more easily maintain and reuse applications and code—freeing your organization to invest more of its development budget on projects and activities that can help your organization meet its business objectives.

IBM can help you build applications and services—and integrate new and existing assets—at all stages of the SOA adoption path. An SOA based on leading-edge IBM technology can give you the infrastructure to integrate all of your past investments including legacy assets, CICS, IMS and vendor applications.



Deploy

Implementing an SOA with IBM technology gives you one of the most flexible environments to deploy newly created assets by providing services to other applications through published and discoverable interfaces that can be invoked over a network. Using Web services technologies gives you a new way to build applications within a more robust, flexible programming model. You can choreograph new services with existing applications and assets and deploy these services in a dynamic environment. An IBM SOA also provides a framework that enables you to dynamically locate and manage multiple services to help ensure that needed applications can be securely available.

Use

A key component to implementing an effective SOA framework is the ability to use these services within and across departments—whether as individual components or as a set of components in a longer-running process. In the past, with other programming and deployment paradigms, applications were stand-alone. For example, many banks have implemented separate silos, or self-contained application systems, that don't interoperate with other systems within the bank. The first of these application systems may have been an excellent design—as well as the second, third and so on—but each was produced by and for a different line of business within the bank. Each was also a separately funded, isolated project.

For the bank, business is inhibited in two ways. First, these disparate resources within the bank can't connect with each other, preventing business units from sharing information. If the bank consolidated these applications to perform multiple business or application functions, it could streamline operations and reduce costs. Also, separate processes and applications prevents the bank from reusing code. For example, if the "get account balance" function is repeated across the bank's ATM system, its branch-teller delivery system and its credit-card scoring system, the bank can provide consistent, quick access to the information, whether users access it in the same or multiple databases. Suppose the bank decides to develop an Internet service, online banking or an online loan origination system for its customers to remain competitive. Without an SOA, the new system would just add to the redundant-programming problem, unless existing code can be reused. With IBM's SOA capabilities, the bank—or virtually any other organization—can increase operating efficiencies by enabling multiple users to take advantage of multiple services in a less-complex environment.

Manage and secure

In a distributed architecture that uses Web services, security-rich access to business-critical information is paramount to your success. With the heavy exchange of data between systems and applications—and with partners, suppliers and customers—comes an inherent risk of intrusion from both inside and outside entities. As a result, your systems must manage and secure the invocation of a service or multiple services, as well as the applications, running within your deployment environment.

Security is a key consideration when implementing most IT architectural solutions. In an SOA, adding Web services makes it even more important. Thus, a comprehensive security framework needs to be a primary consideration when you're developing your SOA. These efforts help ensure a comprehensive model that can encompass an SOA based on Web services and an open-standards model. IBM continues to provide leading-edge technology solutions for management and security, including products and services provided by IBM Business Partners.

Connecting it all together—SOA and the enterprise service bus

IBM can provide a comprehensive solution for SOAs based on Web services and service-oriented integration of existing assets. Including the capabilities you need to connect applications and systems over a reliable backbone in a highly secure manner with the quality of service you require. An IBM enterprise service bus gives you the inter-connectivity services to integrate across different locations, using different transport protocols, and across departments within your enterprise.

The enterprise service bus is the single backbone that delivers connectivity for event, message and service-oriented architectures—and smoothly integrates heterogeneous platforms. It also serves as a key component to mediate service requests and responses from all your integrated systems, including transparently transforming data and routing information. With an enterprise service bus, you get the support of multiple protocols—and the ability to convert to different protocols. For example, you can covert Simple Object Access Protocol (SOAP) over HTTP to SOAP over WebSphere MQ and vice versa. This provides the integration capabilities you need to enable an SOA in the latter stages of the adoption path.

Why IBM?

Why is IBM recognized as an industry leader? Because IBM offers a comprehensive solution across virtually all middleware, integration platforms and portal platforms—with the robust development tools you need to succeed. IBM has been a key technology leader in the open standards arena since the mid-1990s—and continues to lead the way in research and development.

With more than 35,000 industry-oriented consultants with expertise in Web services and integration, IBM has the proven leadership and experience to help your company achieve your goals, no matter what stage of the SOA adoption path you are in. IBM offers a comprehensive range of architecture and implementation services supported by an extensive set of tools and information on SOA adoption and development. These include information for the IBM developerWorks® content and tools Web sites, IBM Redbooks and templates for software and business patterns. Finally, IBM provides services through the IBM WebSphere Centers of Excellence worldwide to help its clients achieve their business goals.



What do I need to get started?

No matter where you are on the SOA adoption path, IBM has the tools and the infrastructure capabilities—including education and consulting services, and best practices—to build your organization's SOA. Resources include:

- *The developerWorks Speed-start Web services program –helping thousands of developers understand, create and implement Web services using IBM tools and middleware*
- *The developerWorks SOA and Web services zone –offering an extensive resource for SOA and Web services development and deployment, supported with detailed education options, developer tips and industry best practices*
- *Web services mentoring workshops*
- *IBM provides a comprehensive set of Redbooks and best practices implementation materials including IBM Patterns for e-business literature.*

For more information

To learn how an IBM technology-based SOA can help your business, visit:

ibm.com/ondemand/soa/

To learn more about how you can leverage an on demand operating environment to increase business efficiencies, visit:

ibm.com/software/info/openenvironment/

To locate developer education on SOA and Web services, visit:

ibm.com/developerWorks/webservices



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* Credit Suisse First Boston (CFSB) CIO Survey, January 2004