

## VW003: Introducing the Value and Governance Model of Service-Oriented Architecture



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## About this module

This module contains six lessons that explain what SOA is as it applies to different people and roles in an organization.

### Objectives

After completing this module, you should be able to:

- ❖ Introduce SOA to people in different roles
- ❖ Build on the concept of services
- ❖ Examine the SOA architectural style
- ❖ Examine the SOA programming model style
- ❖ Approach SOA through a set of agreements
- ❖ Build the SOA life cycle

### Before starting this module

This module assumes you have basic knowledge of IT systems.

### After completing this module

After completing this module, you are ready to move on to module *SOA governance*.

## Lesson 1: Introducing SOA to different people and roles in the organization

### What SOA means to business managers

A service-oriented architecture, or SOA, is seen from a different perspective based on the person's role in the company. While each of these perspectives may not provide a complete picture of what SOA is, they come together to arrive at a definition of a service-oriented architecture.

For business managers, SOA are the capabilities that the business wants to expose as a *set of services* to clients and business partners.



In this context, a *set of services* is made up of the business services provided by the company within the framework of the industry they are in.

Role	What SOA means to that role
Business	SOA provides business managers with capabilities to expose as a set of services to clients and partner organizations.

#### A business definition

The most important characteristic of SOA is the flexibility to treat elements of business processes and the underlying IT infrastructure as secure, standardized components (services) that can be reused and combined to address changing business priorities.

The business view of a service asks the question: "What is needed to support the business process?"



## Lesson 1: Introducing SOA to different people and roles in the organization

### What SOA means to business architects

From an architectural standpoint, SOA represents an *architectural style* which requires a service provider, requester and a service description. An SOA must have a mechanism that enables a consumer, the service requester, to discover a service provider under the context of a service sought by the consumer.

An SOA is an architectural style with characteristics such as loose coupling, reuse and simple and composite implementations. Note: The above-mentioned characteristics of an SOA architectural style are covered in the module Using Web services as an enabling technology for SOA.

Role	SOA means different things to different people
Architecture	SOA is an architectural style that requires a service provider, requester, and a service description. It addresses characteristics such as loose coupling, reuse, and simple and composite implementations.

#### An architectural definition

A system architecture in which application functions are built as components (services) that are loosely coupled and well-defined to support interoperability and to improve flexibility and reuse.



This definition is provided by the book *Service-Oriented Architecture Compass*.

The architectural view of a service poses the question: “How do you define and design these services?”

## Lesson 1: Introducing SOA to different people and roles in the organization

### What SOA means to implementation specialists

From an implementation standpoint, SOA represents a programming model complete with standards, tools, methods and technologies such as Web services.

Role	SOA means different things to different people
Implementation	SOA is a programming model complete with standards, tools, methods, and technologies such as Web services.

#### An implementation definition

SOA is a synonym for solution architectures making use of Web service technologies such as SOAP, WSDL, and UDDI. Here, SOA is defined as any product and project architecture conforming to the [World Wide Web Consortium](#) Web services architecture.



This definition is provided by the book *Service-Oriented Architecture Compass*.

The implementation view of a service asks the question: “How do you implement the service through components deployed on the technical infrastructure?”

## Lesson 1: Introducing SOA to different people and roles in the organization

### What SOA means to operations

From an operations perspective, SOA represents a *set of agreements* among service requesters and service providers that specify the quality of service and identify key business and IT metrics.

Role	SOA means different things to different people
Operations	SOA is a set of agreements among service requesters and service providers that specify the quality of service and identify key business and IT metrics.

#### An operational definition

Services agreements are between entities, namely services providers and consumers. These agreements are based on services specification and not implementation.



This definition is provided by the article *SOA terminology overview* on [IBM developerWorks](#).

The focus of the operational perspective is to ensure that:

- ❖ Each service specification is separate from the implementation.
- ❖ Each service addresses business requirements.

The operational view of a service asks the question: “How do you define and enforce service-level agreements so that service functionality can be predictably and contractually delivered to specific service requesters?”

## Lesson 1: Introducing SOA to different people and roles in the organization

### Checkpoint

Use this checkpoint to assess your mastery of the material covered in this lesson. Match the items in the column of numbered questions on the left with items in the column of answers on the right. After selecting an answer for each question, click **Check answers** to see what you matched correctly.

Further instructions follow the question box.

Quizzes and checkpoint questions appear only in the HTML, or on-line, course.

### Instructions

Submit your answer by selecting the letter for each answer from the drop-down list beside each question. Each answer may apply to none, one, or several of the questions; and each question may have more than one correct answer.

After you click **Check answers**, questions with incorrect answers are displayed in red. If any questions have incorrect answers, you can click **Show answers** to see the solution or continue to select answers as long as you want.

## Lesson 2: Building on the concept of services

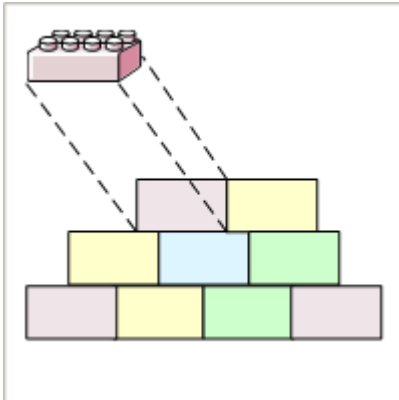
### Describing a service

This page explores some of the key concepts that were referred to in the previous lesson, specifically, SOA as a set of services. It provides a definition of what services are in the context of a business.

From a business view, a service is what is needed to support the business process. Think about what your company does on a day to day basis and break those business processes up into repeatable business tasks or components.

#### What is a service?

A repeatable business task.



*Services as building blocks that snap together to compose business processes*



Examples of services from everyday life include checking a customer's credit history, or opening an account.

Services are the building blocks and they are composed into a business process. Services have the following characteristics:

- ❖ The packaging of business functions from new and existing applications in a simple and standardized way creates services that are available for use.
- ❖ Services are used to help get the right information to the right people at the right time.
- ❖ Services can be reused and combined to deploy composite applications to address new opportunities.
- ❖ Increasing use of Web services based on open standards complements existing services technology

## Lesson 2: Building on the concept of services

### Defining a service

A service defines how two computing entities, such as programs, interact in such a way as to enable one entity to perform a unit of work on behalf of another entity. Service interactions are defined using a description language.

#### A service is

An application component deployed on network-accessible platforms hosted by the service provider. Its interface is described by a service description to be invoked by or to interact with a service requester.



This definition is provided by the book *Service-Oriented Architecture Compass*.

Services are functions or operations accessible across a network with

- ❖ Well-defined interfaces
- ❖ Well-defined quality of service capabilities
- ❖ Well-known endpoints. An endpoint is a destination on the network that receives service requests.

#### Service providers

Offer services with published interfaces, policies and endpoints

#### Service consumers

Use services and access them securely and reliably

#### Service mediators, handlers and intermediaries

Provide extensible discovery, selection, metering, monitoring, logging, and more qualities of service

## Lesson 2: Building on the concept of services

### Locating and publishing services using a registry

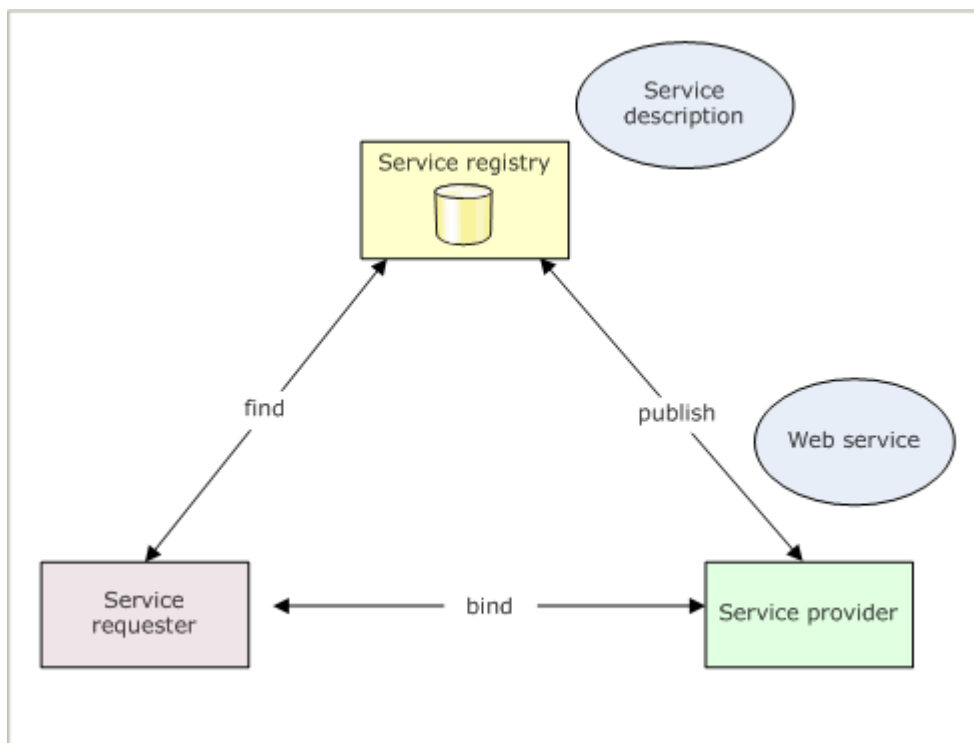
A role service registry plays a key role in locating and publishing Web services.

A service is offered by a service provider, used by a service requester, and mediated by a service mediator.

A service mediator plays an important role in the discovery and selection of a service. One of the mediators is a *service registry*. A service registry is a repository of service descriptions where service providers can publish their service descriptions. Service requesters can discover services and obtain binding information about how to access the services.



The definition of a service registry comes from the book *Service-Oriented Architecture Compass*.



Using a service registry to publish and find service



In everyday life, people offer all sorts of services. How do you find out the services being offered? In practical terms, you would look them up in a directory of services such as the White or Yellow Pages.

In a similar manner, Web services are published and discovered using a service registry.

## Lesson 2: Building on the concept of services

### Becoming service oriented

Becoming service oriented is a paradigm shift from traditional IT approaches. Businesses need to appreciate the underlying reasons for adopting SOA.

#### **CEOs are under intense pressure to innovate**

Sixty-five percent of CEOs recognize that their organizations must make fundamental changes to respond to external forces in the next two years. Yet fewer than half believe they have managed this kind of change successfully in the past.

The ability to adapt to a rapidly changing market fosters an environment for innovation.

#### **Business model innovation is the new strategic differentiator**

Companies that were most successful at growing their profitability have a much stronger focus on business model innovation than others.

#### **Collaborative innovation separates winners and losers**

CEOs say more of their ideas for innovation now come from outside their company, specifically from business partners and clients. Many of the CEOs who see business model innovation as one of their top priorities:

- ❖ Fear that changes in the business model of a competitor could likely result in a radical change to the entire landscape of their industry.
- ❖ Stated that organizational structure changes and major strategic partnerships were the most common business model innovations.
- ❖ Stated that strategic flexibility was a top benefit of business model innovation.
- ❖ Declared that due to pressures from competitive and market forces, they plan to radically change their companies in the next two years.

### Why do companies need SOA?

SOA provides the flexibility to treat business processes as well as the underlying IT infrastructure as components that can be reused and recombined to address changing business priorities. Thus, in essence, SOA is the map that guides you down the road to competitive advantage.



The assertion above comes from the book *Service-Oriented Architecture Compass*

When coupled with Web services technology, SOA can help leverage existing investments, reduce time-to-market through the reuse of components, and better support customers by providing flexible, well-suited solutions appropriate to their needs.



## Lesson 2: Building on the concept of services

### Checkpoint

Use this checkpoint to assess your mastery of the material covered in this lesson. Instructions follow the question box.

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#### Instructions

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### Lesson 3: Adopting the SOA architectural style

## Describing the SOA architectural style

You can adopt the architectural style that SOA supports by:

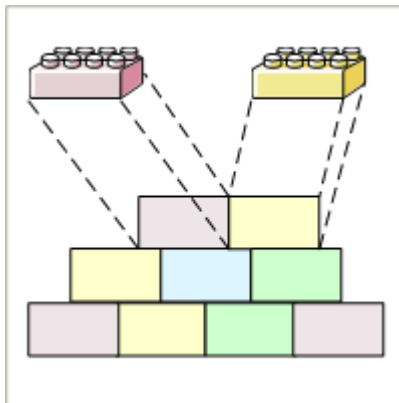
- ❖ Breaking business processes up into repeatable business tasks or components
- ❖ Assembling the solution by snapping components together
- ❖ Becoming service-oriented

### What is service orientation?

Building on the definition of a service, service orientation is a way of integrating your business as linked services and, more importantly, the outcomes that they bring.

### What is SOA?

SOA is the IT architectural style that supports the service orientation thought process and makes it a reality.



*SOA is an architectural style that supports service orientation*

Services are repeatable business tasks. Business processes are a series of services snapped together like building blocks. SOA is an architectural style that makes this possible.

SOA helps make building and adjusting composite applications fast and easy.

### Lesson 3: Adopting the SOA architectural style

## Adhering to key SOA principles and patterns

SOA provides an architectural style and a design principle for application development and integration. It can be described as:

- ❖ An architecture that leverages open standards to represent software assets as services
  - ❖ A focus on application assembly rather than implementation details
  - ❖ A natural evolutionary step to the object-oriented (OO), procedural, and data-centric approaches adopted to date for solution implementation
- With SOA, services are typically implemented using one or more of these technologies
- ❖ The integration of applications and information sources using a shared, standards-based communication protocol
  - ❖ A set of architectural principles and patterns such as modularity, encapsulation, loose coupling, separation of concerns, reuse, and composite and stand-alone implementations.

### Common Principles of SOA

#### Modularity

A module is a component of a larger system that operates independently from the operations of other components.

#### Encapsulation

A service hides information or implementation details by encapsulating the information into a construct which presents an interface.

#### Loose-coupling

Loosely coupled services, even if they use incompatible system technologies, can be joined together dynamically to create composite services, or disassembled just as easily into their functional components.

#### Separation of concerns

Services break down a complex problem in a series of smaller pieces. Each of the smaller pieces addresses a specific concern.

#### Reuse

Reuse in SOA is enabled through pluggable components with standard interfaces.

#### Composite implementation

A set of related and integrated services that can support a business process.

#### Stand-alone implementation

A single service that can support a business process.

SOA promotes flexibility through the use of standardized components and services. As such, SOA also provides you with the opportunity to easily redesign and improve your business processes.

### Lesson 3: Adopting the SOA architectural style

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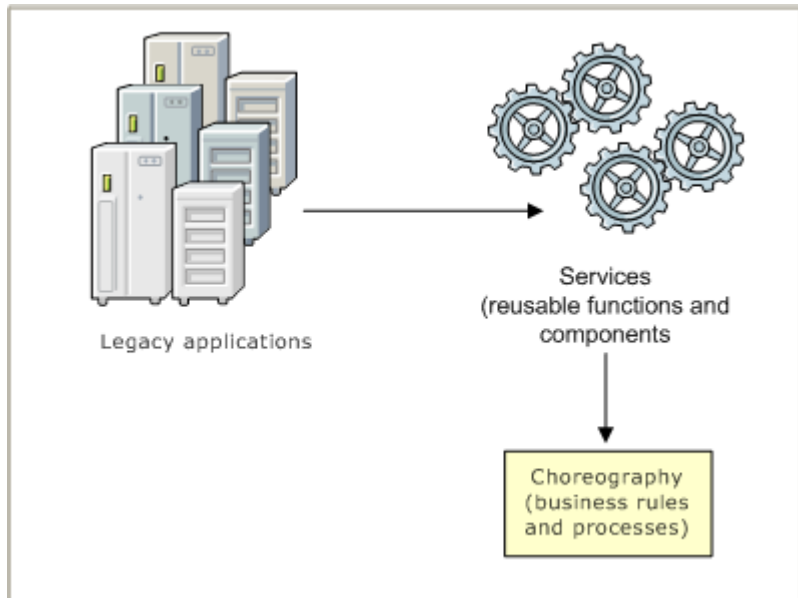
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#### Lesson 4: Adopting the SOA programming model

### Adopting a component-based model

SOA adopts a component-based programming model. Services are made up of components, which is a modular unit of functionality accessed through one or more interfaces.



*Creating services from reusable components*

Later on, the services can be combined or choreographed into a *composite application*.

#### **What is a composite application?**

A composite application is a set of related and integrated services that support a business process built on an SOA.

#### Lesson 4: Adopting the SOA programming model

### Realigning IT around services

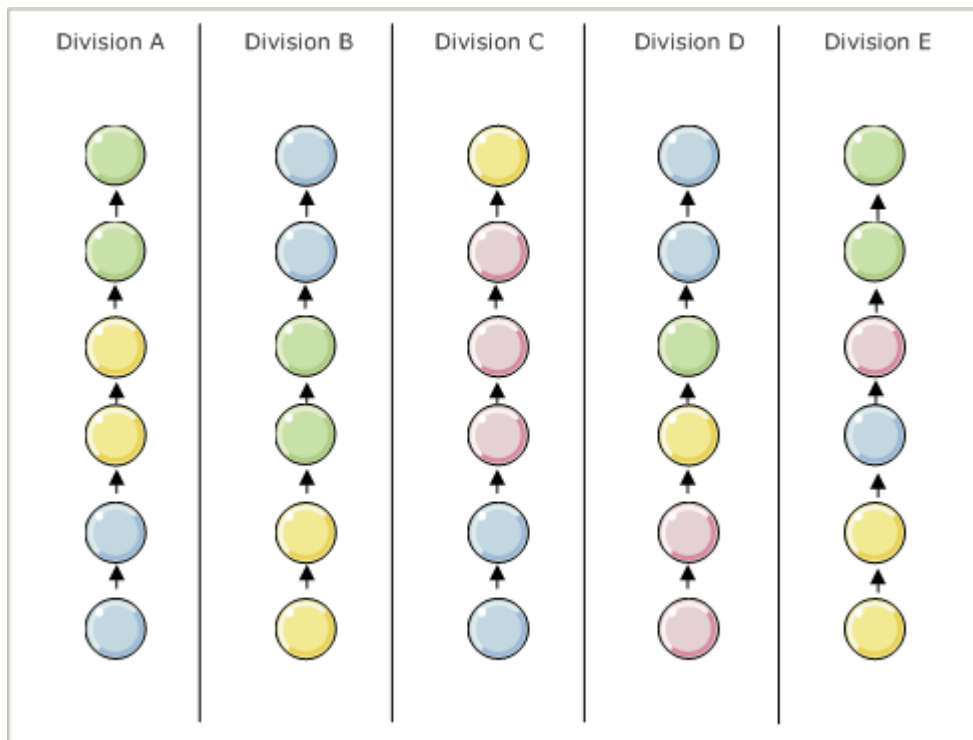
Application views and business processes are closely aligned in an SOA environment.

An SOA focus on developing common components from business processes makes it possible to continually reuse components. Applications, or pieces of software, are now represented as services, matching the business component you can identify. IT now delivers services which are closely aligned with the business goals.

By realigning IT around services, the focus changes from delivering line-of-business, or siloed, systems to an IT organization that delivers reusable business services. The services that are created can now be reused across departmental and organizational boundaries, building up an inventory of services.

Businesses are taking steps to increase their flexibility and reuse through SOA.

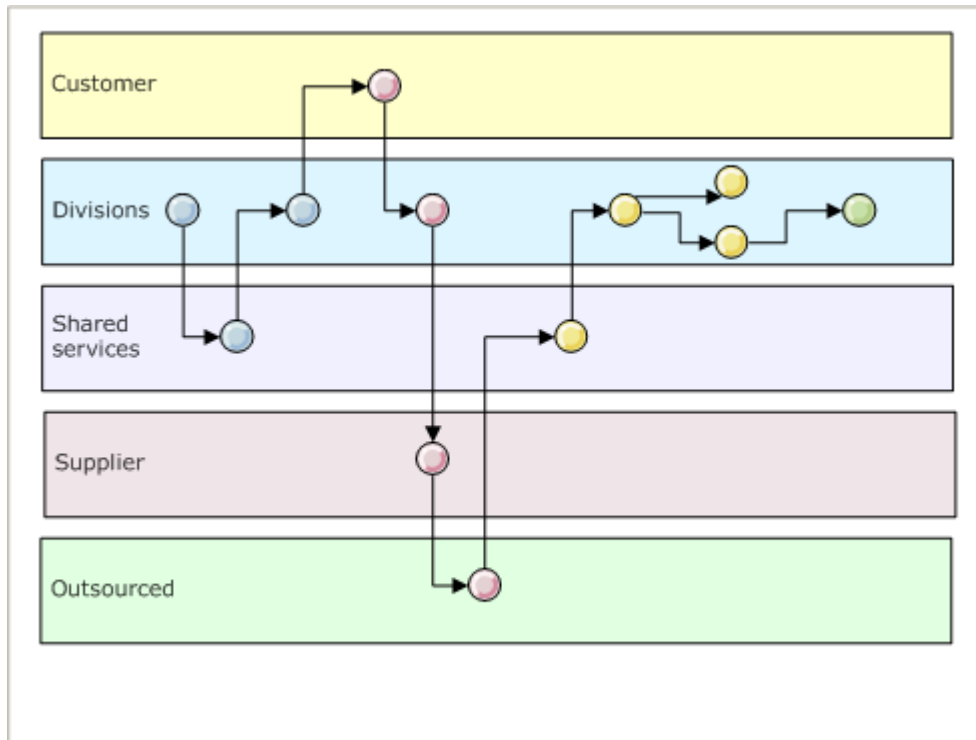
The figure below shows what a sample business process looked like in a traditional business compared to today's world-class businesses. In the past, companies had linear business processes that were handled by an individual department within a company.



*An example of the vertical silo problem*

As sophistication increased, you see the same business processes being broken up and pieces of it being performed in different places. The next figure shows an example where customers place orders directly through the Web, and share services in different parts of the company; suppliers contribute vendor managed inventory; shipping is outsourced, and so forth.

This kind of disaggregation takes a lot of flexibility to establish and even more to change once it is established.



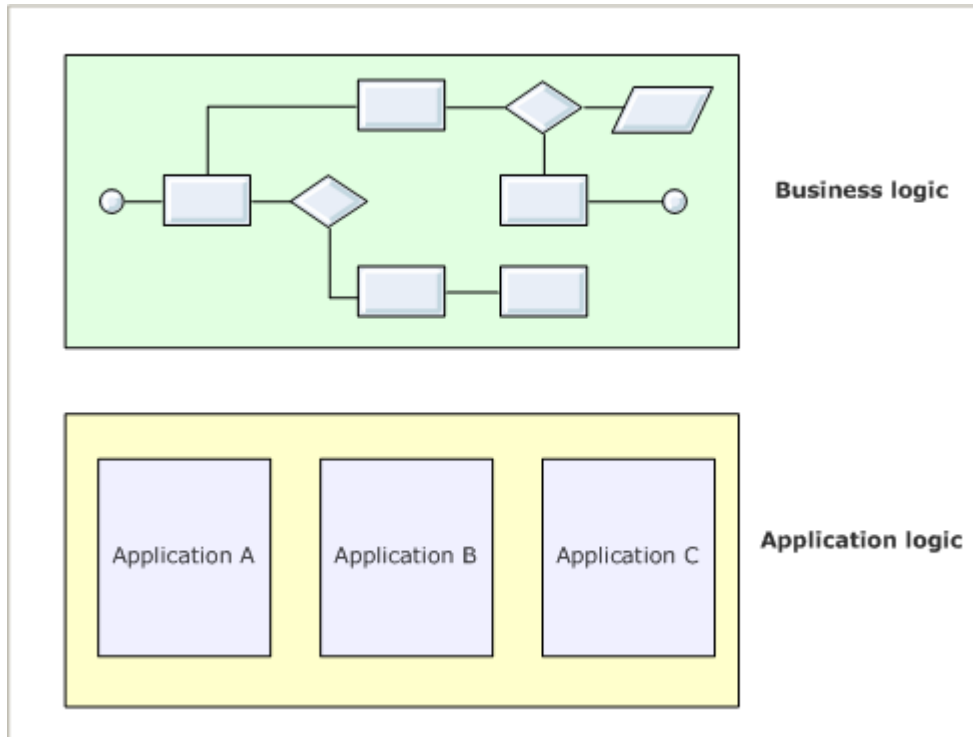
*SOA redistributes business functionality*

#### Lesson 4: Adopting the SOA programming model

### Mapping business processes to application programs

Moving to SOA provides an opportunity to exploit the commonality between the business process and application program views.

Prior to SOA, enterprise applications were developed with separate business and application domains, as shown in the figure below.



*Before SOA business and application occupied separate logic domains*

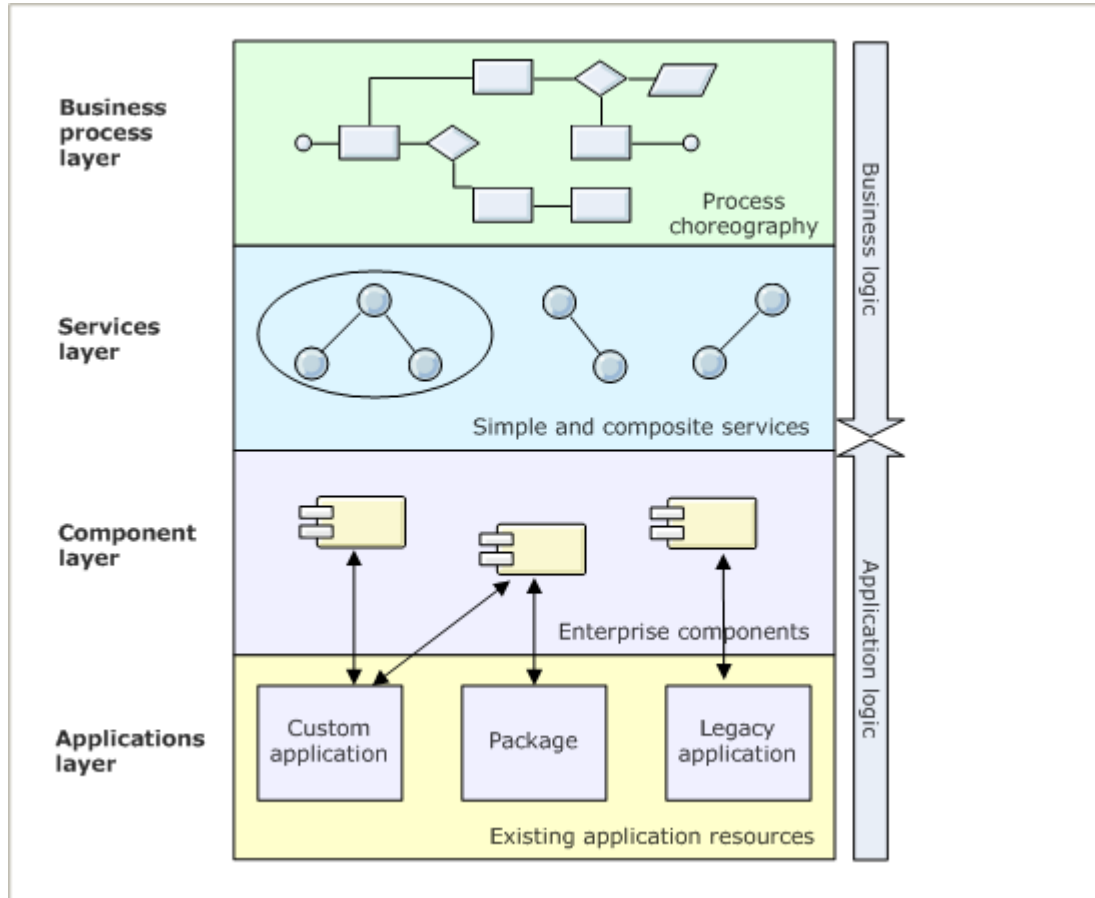
An SOA solution starts by breaking down the applications into their constituent functional components. These components are composed into services with well-defined standard interfaces, making up the services layer of the architecture.



#### Lesson 4: Adopting the SOA programming model

### Exposing business processes as services

This page unites the discussion of the previous two pages with the vision shown in the following figure.



*The services layer is the glue between business processes and enterprise components.*

A service-orientation presents a vision in which business processes are exposed as services. However, there is a clean separation between the logical representation of the business processes and their implementation. The glue between the abstract model and the service implementation are the standards-based interfaces between the layers of an SOA architecture.

Solutions are designed for integration giving rise to solutions that are flexible and can be adapted as business needs change.

SOA requires a true partnership between business and IT units of an organization. A working covenant between business and IT drives project prioritization. The result of this increased cooperation is the delivery of IT systems which closely mirror changes to the business processes.

#### Lesson 4: Adopting the SOA programming model

### Using open standards and specifications

The SOA programming model makes use of open standards and specifications such as Web services.

Although Web services standards are continually evolving, the standards and technology are for delivering on the promise of SOA are finally in place.

Some factors that promote the use of open standards for implementing an SOA include:

- ❖ Broad adoption by multiple vendor implementations
- ❖ Well defined public interfaces and specifications
- ❖ Official standards bodies
  - The [World Wide Web consortium](#) (W3C)
  - The [Organization for the Advancement of Structured Information Standards](#) (OASIS)
  - The [Web Services Interoperability Organization](#) (WS-I)

The widespread adoption of Web-based standards is providing unique potential for interoperability, integration and innovation and fueling the expected growth for SOA deployments.

Service integration components (WSRP, JSR 168)	Security (WS-SEC)	Transactions (WS-TX)	Management
Service orchestration (WS-BPEL)			
Service discovery (WSIL, UDDI, RAS)			
Service invocation and messaging (WS-I, SOAP)			
Service description (WSDL, RAS)			
XML (infoaset, namespace, schema)			
Network protocol (HTTP, SMTP, Other)			

*Key infrastructure standards for SOA*

The figure above shows the high-level descriptions and implementations of these descriptions in the Web Services standards stack.

The value proposition of building SOA solutions based on open standards includes the following benefits.

#### Choice

The choice you make today does not limit the choices you can make in the future.

#### Flexibility

You can connect to internal departments and external partners that made different technology choices.

#### Speed

You can build new solutions that involve multiple hardware and software platforms quickly.

**Agility**

You can adjust to changing business parameters such as new opportunities, partners, and employees quickly.

**Skills**

You can find skilled resources that understand these solutions.

#### Lesson 4: Adopting the SOA programming model

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## Lesson 5: Approaching SOA through a set of agreements

### Specifying quality of service

SOA is governed by a set of agreements between service requesters and service providers.

After a business service is published, the users of that service come to depend on it as a reliable IT asset. The service provider may want to implement policies with the constituent users of the service to help them understand and agree to the quality of service being offered. These policies could cover issues like who has access to the service and the level of security required. These policies could also be used to determine such things as service-level agreements or compliance.

Service-level agreements are used to guarantee levels of application performance for internal and external users of the service. Setting up and managing the service policies is part of the *governance* process. The implementation and monitoring of service usage and performance is the domain of operations.

At a corporate level, communicating policies to developers implementing services and giving them the tools they need to adhere to those policies is another way of approaching SOA through a set of agreements. Quality-of-service agreements answer: “Who does what and how is it done?”

## Lesson 5: Approaching SOA through a set of agreements

### Identifying key business and IT metrics

An SOA solution identifies and aligns business processes and IT metrics.

One of the fundamental goals of SOA is to deploy services that closely model business processes, resulting in an IT infrastructure which has a direct impact on business operations and business agility.

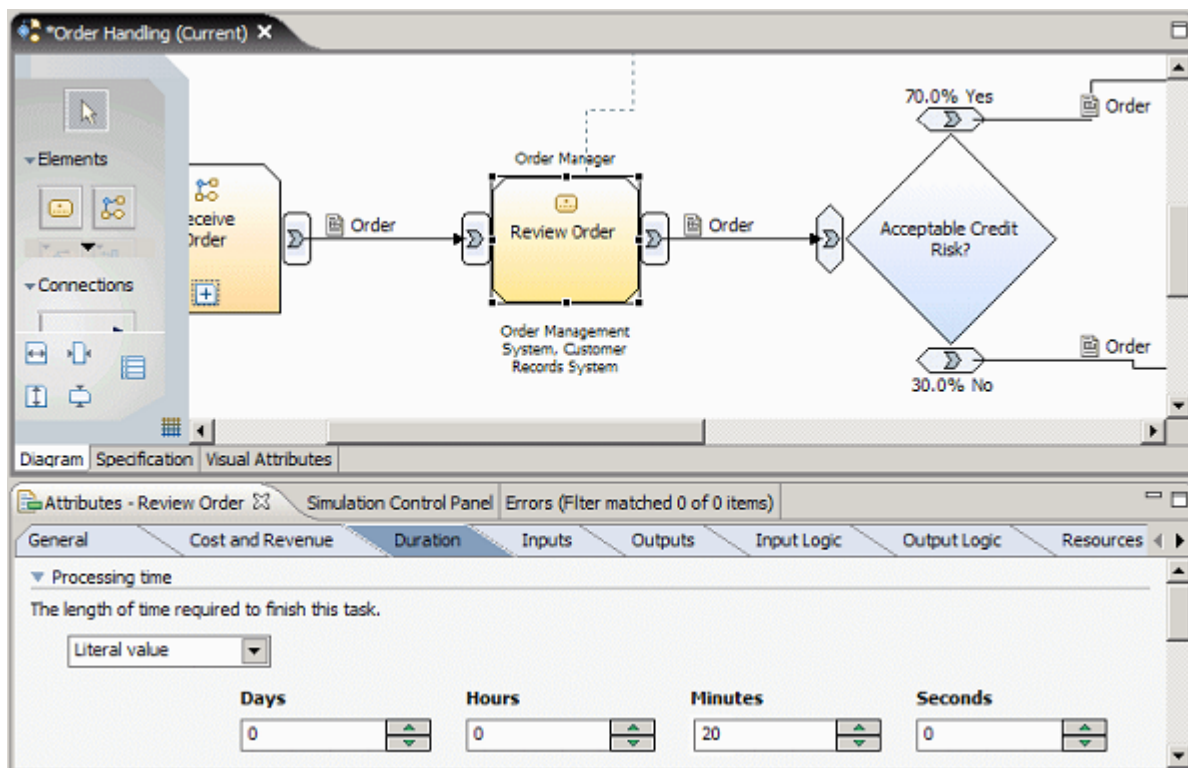
Business and IT units can work together to calculate the value of reusable assets. The componentization of business and their associated IT services allows for a much more precise metric for implementing and measuring the value of these services.

Business analysts are often responsible for designing and developing new business process models, or for adapting existing models to improve how their companies do business.

Business process modeling is a discipline which focuses on identifying business processes for improvement. Process modeling and analysis processes are part of the Rational Unified Process (RUP) discipline.

The purpose of business modeling is to understand the current state of the business and to determine a *to-be* or target state.

In the analysis-and-design discipline, the to-be process model is decomposed into sub-processes in order to identify *candidate services*.



A process modeled in IBM WebSphere Business Modeler

A product like the IBM WebSphere Business Modeler can help organizations fully visualize, comprehend, and document their business processes. You can model business processes, then deploy, monitor, and take actions based upon key performance indicators determined earlier. Business processes then get tightly linked with strategic corporate objectives.

## Lesson 5: Approaching SOA through a set of agreements

### Checkpoint

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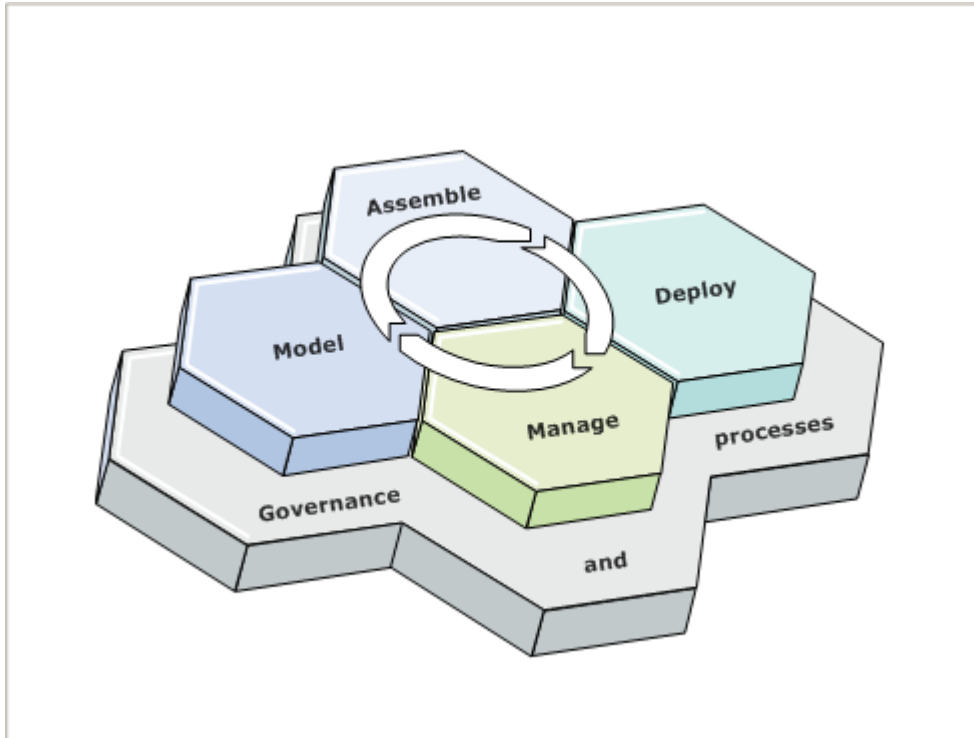
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## Lesson 6: Building the SOA life cycle

### Identifying the phases of the SOA life cycle

The life cycle of a project covers all aspects from its inception to its first realization and on to possible versions and modifications.

Because SOA touches so many parts of your business, undertaking SOA projects involves careful planning and design from the outset. The SOA life cycle is illustrated in the figure below.



*The SOA life cycle*

The SOA life cycle begins with an explicit indication of the importance of modeling business processes and then working those into deployable artifacts that are managed in a way that provides feedback for continuous improvement.

#### **Model**

The first step in a service-oriented architecture project has little to do with technology and everything to do with your business. The first step is to establish what these business activities or processes actually are.

In the model phase you start by gathering business requirements and then you design and optimize their desired business processes.

By simulating, or modeling, your business processes before you write a line of code, you gain a much deeper understanding of them before looking for trying to build software that helps you carry them out.

#### **Assemble**

After business processes are modeled and optimized, developers can implement them by building new services or by reusing existing services, and then assembling them to form composite applications. The assemble phase is about finding functionality that already exists and service-enabling it.



## **Deploy**

When they are modeled and assembled, the assets that make up your SOA are deployed into a secure and integrated environment. The deployment needs to meet the performance and availability needs of your business.

## **Manage**

The deployed system must be managed and monitored, both from an IT and a business perspective. Information gathered during the manage step is used to gain real-time insight into business processes, enabling better business decisions and feeding information back into the life cycle for continuous process improvement. You deal with issues such as quality of service, security, and general system administration.

In this step, you monitor and optimize the system, finding and correcting inefficiencies and problems.

Because SOA is an iterative process, the completion of this step is the start of a new model phase.

## **Governance and best practices**

Governance and best practices influences all the life cycle stages, providing guidance and oversight for the entire SOA system.

## Lesson 6: Building the SOA life cycle

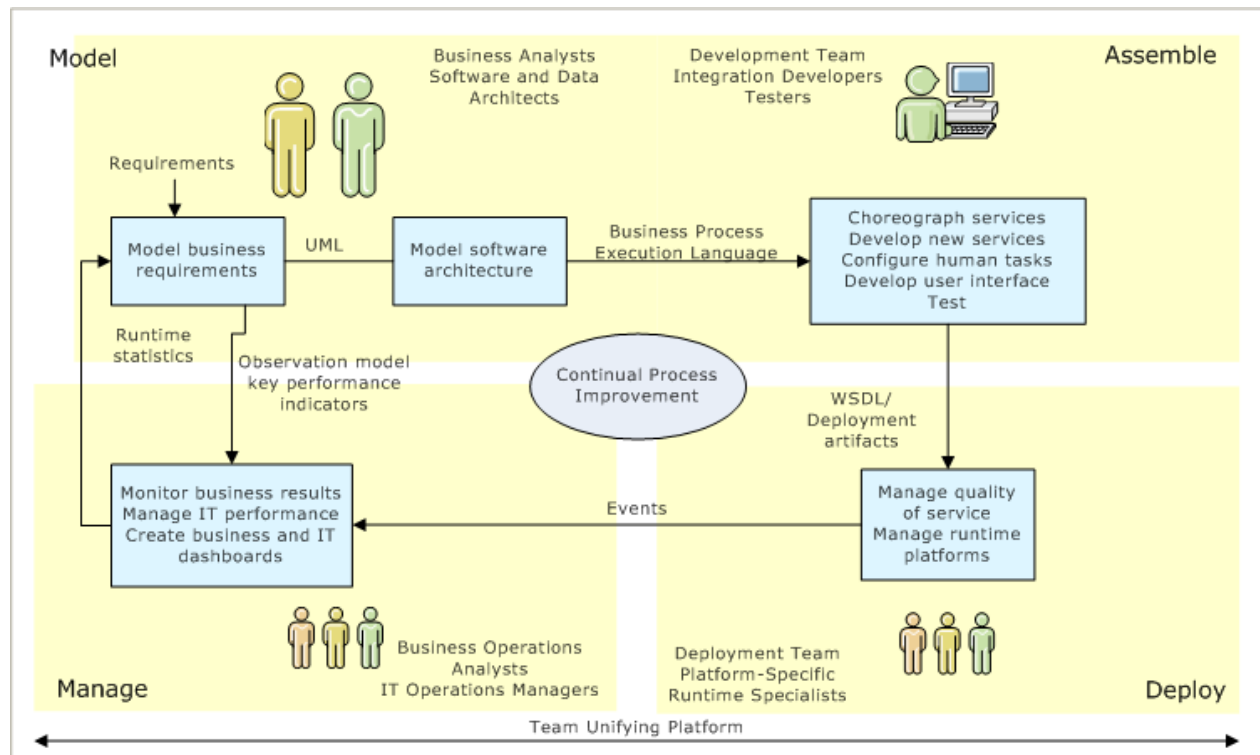
### Letting business drive development

This page discusses the various roles in the SOA life cycle and also describes how business requirements drive the development and management of services in the life cycle.

SOA lets business drive development. As such, business requirements drive downstream design, development and testing.

Every company puts business strategy into action at a business-process level. At the starting point of the SOA life cycle, the business analyst or SOA enterprise architect models the business processes.

From the models, a set of business-aligned IT services are generated. These are the services that a business wants to expose to customers and clients in support of the business process goals and objectives of the organization.



Job descriptions in the SOA life cycle

In the assemble phase, integration developers assemble or choreograph services or work with the development team to create new services. Testers are involved with the functional testing of these services.

The deployment team is involved during the deploy phase of the SOA life cycle to deploy the services on a platform-specific runtime. In the manage phase of the SOA life cycle, the business operations analysts or operations are concerned with the monitoring and managing of the services.

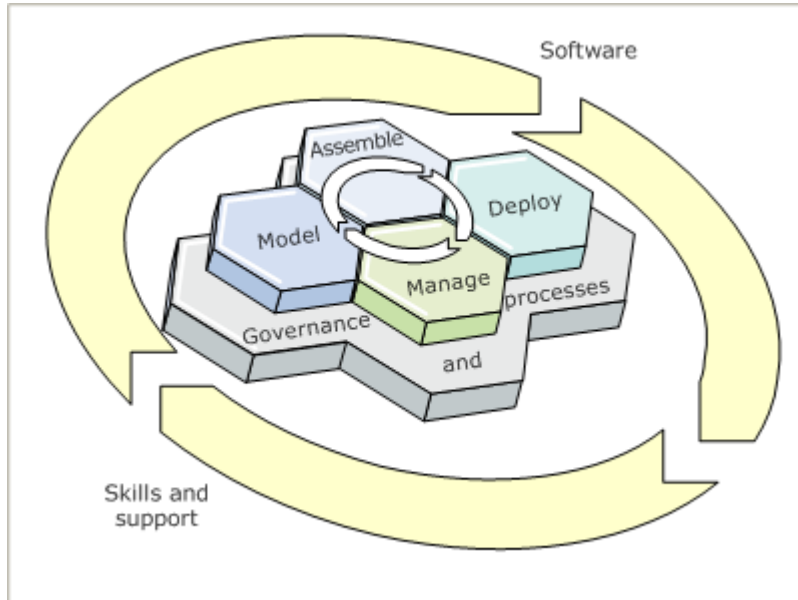
It is during this step that you can identify places to improve not just the technical architecture but also the business architecture, because SOA is an iterative process. The iterative approach helps you to refine both your business processes and the model in meeting your overall business goals.

The completion of this step is the start of a new model step. The data gathered during the manage step is used to revisit the entire SOA life cycle and start again.

## Lesson 6: Building the SOA life cycle

### Following best practices and patterns

The IBM SOA foundation supports the SOA life cycle and gives you what you need to get started with SOA. It is an integrated, open set of software, best practices and patterns. The components are modular allowing you to pick and choose the pieces you need to deliver an immediate impact while knowing that what you implement now continues to work with pieces you add later on.



*The IBM SOA foundation*

The IBM SOA foundation is an integrated, open set of software, best practices, and patterns. It provides the skills and support to help you:

- ❖ Take a modular approach to IT infrastructure through the complete life cycle
- ❖ Extend the value of your existing investments, regardless of vendor
- ❖ Create software that is interoperable and portable by supporting business and IT standards
- ❖ Meet demands of your growing business with scalable software

**Lesson 6: Building the SOA life cycle**

## **Defining SOA**

This final page brings together all the discussion so far and provides a definition of SOA.

### **What is SOA?**

SOA is a business-driven IT architectural approach that supports integrating your business as linked, repeatable business tasks, or services.

SOA helps businesses of today innovate by ensuring that IT systems can adapt quickly, easily and economically to support rapidly changing business needs. SOA helps customers increase the flexibility of their business processes, strengthen their underlying IT infrastructure and reuse their existing IT investments by creating connections among disparate applications and information sources.

## Lesson 6: Building the SOA life cycle

### Checkpoint

Use this checkpoint to assess your mastery of the material covered in this lesson. The questions appear one at a time in the box. Instructions follow the question box.

Quizzes and checkpoint questions appear only in the HTML, or on-line, course.

#### Instructions

Each answer is evaluated the first time you click **Submit**.

- ❖ To answer a multiple-choice question correctly, you must check all options that apply and none that do not apply.
- ❖ To answer a short-answer question correctly, you must type the required answer with exact spelling and no extra white space. Capitalization does affect correctness.

If you submit an incorrect response, you can try again or click **Hint** to see a helpful suggestion. If you submit an incorrect response after seeing the hint, try again or click **Show me** to see the answer. When the correct answer is displayed, click **Next** to continue to the next question or see a feedback statement.

## Summary

This module introduces the concepts of SOA. SOA means different things to different roles in a company.

Role	SOA is all of the following
Business	SOA provides business managers with capabilities to expose as a set of services to clients and partner organizations.
Architecture	SOA is an architectural style that requires a service provider, requester, and a service description. It addresses characteristics such as loose coupling, reuse, and simple and composite implementations.
Implementation	SOA is programming model complete with standards, tools, methods, and technologies such as Web services.
Operations	SOA is a set of agreements among service requesters and service providers that specify the quality of service and identify key business and IT metrics.

SOA can be defined as a business-driven IT architectural approach that supports integrating your business as linked, repeatable business tasks, or services.

### A service

Is a repeatable business task

### Service orientation

Is way of integrating your business as link services

### SOA

Is an IT architectural style that supports service orientation

### The IBM SOA foundation

Is an integrated, open set of software, best practices and patterns.

The SOA life cycle spans all aspects of a project in four phases:

- ❖ Model
- ❖ Assemble
- ❖ Deploy
- ❖ Manage

Applying the best practices and patterns of the IBM SOA foundation to facilitate building software not only extends the value of existing IT investments but also is:

- ❖ Modular
- ❖ Interoperable
- ❖ Portable
- ❖ Scalable

## References

The following resources provide further reading or sources of help.

- ❖ The main reference book for this module is *Service-Oriented Architecture (SOA) Compass: Business Value, Planning, and Enterprise Roadmap* by Norbert Bieberstein, Sanjay Bose, Marc Fiammante, Keith Jones, and Rawn Shah. Published by IBM Press in 2005. ISBN 0131870025.
- ❖ A wealth of technical articles, tutorials, and other resources are available from the [SOA and Web Services zone of IBM developerWorks](#). In particular, refer to the following articles:
  - *SOA terminology overview, Part 1: Service, architecture, governance, and business terms* by Bertrand Fortier at <http://www.ibm.com/developerworks/webservices/library/ws-soa-term1/index.html>
  - *Service-oriented modeling and architecture* by Ali Arsanjani at <http://www.ibm.com/developerworks/webservices/library/ws-soa-design1/>
- ❖ The World Wide Web (W3C) consortium at <http://www.w3c.org> defines many is a forum to realize the potential of the world-wide Web. It provides a definition of SOA at <http://www.w3c.org/TR/ws-arch/>
- ❖ The Organization for the Advancement of Structured Information Standards (OASIS) at <http://www.oasis-open.org> is a non-profit organization that develops and promotes standards for e-business.
- ❖ The Web Services Interoperability Organization (WS-I) at <http://www.ws-i.org> promotes interoperability of Web services among platforms, programming languages and operating systems.