

Services and SCORM 2.0

It is clear that supporting the wide variety of learning environments possible today requires an extensible, modularized architecture. Such architectures rely on the packaging of distinct sets of operations into services and then providing a framework that enables the sharing of data between these services. The purpose of this document is to clarify some of the high-level concepts related to services and service-oriented architectures. This is done by defining common terms (buzzwords) and discussing how they all fit together. While it is assumed that the reader has little to no experience with these concepts, a minimal level of technical competence is assumed.

Services

A service can be defined simply as a collection of technical operations. By providing a common interface, a service can make its operations accessible to any number of other software components or applications. Packaging a set of operations as a service can reduce code redundancy and overall system complexity.

Services that are accessible via the Internet are typically classified as *web services*. Internet-based services have become so common that the terms *service* and *web service* are sometimes used interchangeably. Nevertheless, The AWG acknowledges the distinction between the more general term *service* and more specific terms *web service*, *data service*, etc. Not only does this distinction emphasize the true relationship between these terms, but it also highlights the important fact that the AWG has an interest in supporting learning environments in which the Internet may not be accessible.

Perhaps the most significant advantage of services is that they can enable software integration in a platform-independent manner. Using standard communication protocols over the Internet or local intranets, services can exchange data with other software applications regardless of whether those applications are hosted on the same machine, written in the same programming language, or even run from same operating system. This level of interoperability has huge implications for the types of learning environments now possible.

Service-oriented Architecture

Service-oriented architecture or *service-orientated architecture* (SOA) is a software development model based on packaging related operations into distinct services and then providing the framework necessary to enable the exchange of data between these services. Two common and related implementations of SOA are *data as a service* (DaaS) and *software as a service* (SaaS), in which an organization provides access to data or entire pieces of software (respectively) through services. These types of modular approaches foster interoperability, accessibility, and extensibility in a software system.

Service-related Technologies and Resources

The AWG is more primarily interested in identifying the types of services required to enable learning environments and the types of frameworks required to integrate these services rather than the particular technologies that could be used to implement this architecture. However, an understanding of the technologies that exist is helpful.

REST

Representational state transfer (REST) is a model for distributing electronic media over computer networks. The term was introduced in the doctoral dissertation of Roy Fielding^[3], one of the principle authors of the HTTP specification. REST is not itself an implementation, but a collection of principles to be used in implementing a software system. Software systems or components that are built on the principles of REST are often described as *RESTful*. In terms of the AWG's goals, REST outlines principles that could potentially be used in the design of an architecture for SCORM 2.0.

SOAP

SOAP is defined as a protocol for exchanging structured data over a computer network^[4]. SOAP has also been described as a framework for defining communication protocols to enable exchange of such data. Data communicated via SOAP are encoded using a W3C standard XML format^[4], and are typically transmitted via RPC over HTTP. However, SOAP allows for bindings to a variety of additional network protocols (HTTPS, SMTP, etc). In terms of the AWG's goals, SOAP represents a commonly used technology for implementing services that should be considered for support in SCORM 2.0

SOAP originally served as an acronym for *simple object access protocol*. However, SOAP has changed significantly since its original drafting^[1], and with no clear mapping from the acronym to any of SOAP's current features, it remains known simply as SOAP. Similarity between this acronym and the SOA acronym is coincidental.

WSDL

Web service description language (WSDL) is an XML-based language that provides a model for describing services^[2]. A WSDL document represents services as endpoints (or ports), describes the operations that can be performed on each service, and the format of the data involved. While the most recent version of WSDL provides improved support for RESTful services, WSDL is typically used in conjunction with SOAP to provide a framework to enable communication between services and other software applications. In terms of AWG's goals, WSDL represents a potential format for describing services in the SCORM 2.0 architecture.

Miscellanea

There are various other technologies and resources that could be used in the development of an architecture for SCORM 2.0. The *e-Framework for Education and Research* is an international initiative that provides documentation for developing IT

infrastructures. It discusses models and best practices for development, placing heavy emphasis on services and SOAs to maximize interoperability and reduce development costs. The *OASIS Consortium* and the *IMS Global Consortium* have both documented specifications for web service implementations and may prove useful in the AWG's efforts. In terms of AWG's goals, these represent valuable resources that could be used in designing the SCORM 2.0 architecture. There may be additional relevant and useful resources, and the AWG is open to consider any such resource.

References

1. Box, Don et al. *Simple Object Access Protocol (SOAP) 1.1*. Submission, World Wide Web Consortium, 8 May 2000.
2. Chinnici, Roberto et al. *Web Services Description Language (WSDL) Version 2.0*. Recommendation, World Wide Web Consortium, 26 June 2007.
3. Fielding, Roy Thomas. *Architectural Styles and the Design of Network-based Software Architectures*. Doctoral dissertation, University of California, Irvine, 2000.
4. Gudgin, Martin et al. *SOAP Version 1.2*. Recommendation, World Wide Web Consortium, 27 April 2007.

