

*What Is...*

# ADL SCORM?

by Warwick Bailey

## *In Brief*

### What is the SCORM?

**SCORM** is an acronym for Shareable Content Object Reference Model.

**Shareable content objects** (SCOs) are individual, electronic units of learning that may be combined to create a course of study.

**Reference models** are descriptions of how existing technical specifications may be used together to achieve some aim. In the case of the SCORM, the aim is to describe how learning content and the systems that manage that content can interoperate in a standard way.

The SCORM reference model uses existing specifications to standardize the interface between web based content and web based learning technology systems such as learning management systems (LMSs), also known as virtual learning environments (VLEs). The SCORM is not in itself a specification or standard.

The SCORM has been developed by the Advanced Distributed Learning (ADL) initiative following a mandate given to the US Department of Defence in 1997 to develop a strategy for educational and training technology.

Six high level requirements have been developed by ADL to guide the development of the SCORM. Four of the requirements refer to SCOs directly. According to ADL, SCOs should be durable, interoperable, accessible, reusable. The remaining two requirements refer to the impact the SCORM has more generally on e-Learning. According to ADL, adoption of the SCORM promotes adaptable and affordable e-Learning.

Durable SCOs are electronic learning resources that do not need upgrading or modification as learning technology systems develop over time.

Interoperable SCOs are resources that can be launched correctly by different VLEs.

Accessible SCOs can be found as required. The SCOs are linked to a description of their content. This description, or meta-data, is used to facilitate discovery within and across content repositories.

Reusable SCOs are developed once and then used in different courses. ADL suggest that reusability may be achieved when the units of instruction are both small and independent of learning context.

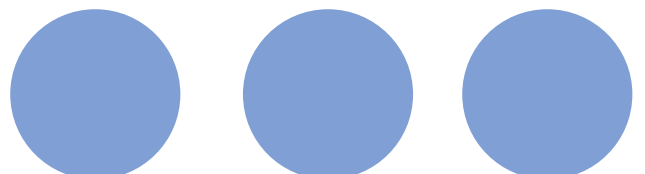
Adaptable e-Learning systems allow instruction to be tailored to the needs of the individual learner. By promoting a common reference model that many vendors can adhere to, the SCORM promotes an economy of scale: affordable e-Learning.

To ensure that the SCORM is meeting the six high level requirements, ADL holds regular technical meetings known as Plugfests. These meetings include sessions where SCOs created by one organization can be tested in VLEs developed by different organizations.

### What is the SCORM for?

The SCORM is for standardizing the way web based content works with the systems that use the content, the VLEs.

Standardizing interoperability is common practice to promote widespread technical adoption and an



economy of scale. For example, the VHS standard enables vendors to sell video tapes that will play in VHS equipment. The SCORM enables vendors to provide learning content that will import and run in SCORM conformant VLEs.

Should you have a SCORM conformant VLE and your content suppliers provide SCORM conformant content, then you can be confident that the content will integrate with the VLE successfully. Alternatively, if your organisation creates content internally, you can use a SCORM conformant authoring tool and be sure that you will be able to launch and track the content from your VLE.

However, you will need to check the SCORM version supported by the VLE and by the content are complementary. To be conformant to one version of SCORM does not imply support for an earlier version. The SCORM has progressed through a number of releases since version 1.0 in January 2000, with each release adding further maturity and functionality. There are currently three main releases:

- SCORM 1.1
- SCORM 1.2
- SCORM 2004

As of writing, the most commonly used version is SCORM 1.2 (released October 2001), which enables you to:

- Provide web-based training for individual learners. The approach is self-paced and self-directed. The SCORM was originally designed to support personalized instruction within the US Department of Defence, and implies a pedagogical model closest to industrial and military training.
- Create individual, electronic units of learning that may be reused in different courses.
- Package instructional material and meta-data for import/export between different VLEs.
- Track and store records of the progress of a learner moving through a unit of learning.

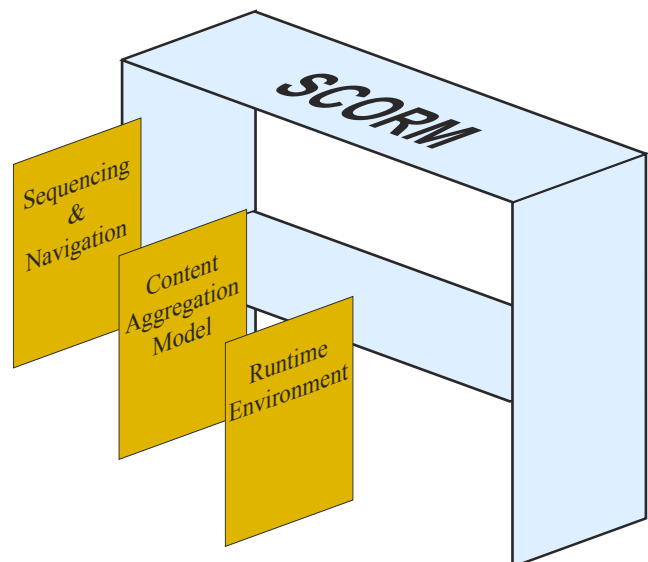
SCORM 2004 adds support for SCORM Sequencing and Navigation. This enables you to control the conditions under which a SCO is selected and delivered, or skipped during presentation to a learner. Typically this functionality is used to test a learner's understanding and re-route them to remedial content if a test pass mark is not achieved.

The reason that the version naming convention changed with the SCORM 2004 release gives an insight into the SCORM development process. The SCORM references a set of sometimes unrelated technical specifications, guidelines and standards, which themselves have their own development and maintenance cycles.

In SCORM versions 1.0 to 1.2, the SCORM profiled a snapshot of these external technical details into two documents, or SCORM "books". When work began on the next version, SCORM version 1.3, a third "book" was added to manage all the documentation associated with sequencing and navigation. It quickly became clear that keeping three SCORM "books" synchronized with a large body of external technical documentation was going to be challenging.

The change in version naming convention, from SCORM 1.3 to SCORM 2004, is used to indicate that each of the three SCORM "books" is now decoupled from each of the others. In this way each SCORM "book" is free to keep pace with changes in the smaller body of external documentation specific to it alone.

The three SCORM "books" provide a convenient way to examine how the SCORM works.



# Technical Details

## How the SCORM Works

The SCORM works by describing the interface between a VLE and the content it uses.

That is, the SCORM describes how learning content is created and packaged for import into a VLE, how content is selected by the VLE for presentation to a learner, and how the progress of a learner is tracked by the VLE.

These three features map to the three SCORM “books”:

The Content Aggregation Model book describes the process of creating, describing and packaging SCOs into a course structure. To achieve this, the book profiles the IMS Content Packaging specification. This means that most SCORM compliant VLEs also support non-SCORM versions of IMS Content Packaging.

The Sequencing and Navigation book describes the controls for managing when a SCOs is selected or skipped during presentation to a learner. For this purpose, the book profiles the IMS Simple Sequencing specification.

The Run Time Environment book outlines the process of launching a SCO from within a VLE and then tracking the learner’s activity with the SCO. To achieve this, the book profiles two IEEE standards about learner tracking information and SCO to VLE communication.

Creating SCOs begins with files called assets. Assets are electronic media, such as text, images, sound, assessment objects or any other data that can be rendered by a web browser. Assets are assembled into SCOs. Describing assets and SCOs is achieved by adding meta-data. For that, the use of the IEEE Learning Object Meta-Data standard is prescribed.

Packaging SCOs into a course structure is managed by a file called a package manifest. To enable learners to navigate between SCOs, a table of contents written into the package manifest is typically exposed in the VLE user interface.

Sequencing rules and controls may also be added to the manifest at this stage, if the target VLE is SCORM 2004 conformant. This sequencing information describes paths through the collection

of SCOs included in the manifest and declares the relative order in which the SCOs are to be presented to a learner. This sequencing information model describes the intended sequencing behaviour that a user will experience as they work with the SCOs: at run time.

Run-time behaviour is managed by the SCORM runtime environment. A key feature of this environment is the ability of a SCO to communicate with a VLE. This feature is provided by a small piece of software provided by the VLE and named an API Adapter. API Adapters are provided by the VLE. When a learner requests a SCO, the SCO searches the VLE to find the API Adapter. Once found, the SCO initiates communication with the VLE via the API Adapter. The communication between the SCO and the VLE is used to track and store records of learner activity.

## Requirements

To create a package of SCOs it is necessary to break down a course into individual units of learning. Each of these units is then created as a web page from electronic assets, such as text and image files. To enable run-time communication with the VLE through the API Adapter, commands in a programming language called JavaScript are added to the web page. Meta-data files are then created describing the assets, the SCOs themselves and the entire course.

Packaging tools are used to assemble the collection of SCOs, their assets and the meta-data files into a course structure. Sequencing instructions may optionally be added at this point if the target VLE is SCORM 2004 conformant. The package is then ready to deploy to a VLE.

To use a content package of SCOs, a SCORM conformant VLE is required. It is often necessary to place some constraints on the browser type and operating system that the learner uses. It is necessary to check that the API Adapter software, typically a Java Applet or Active X control, is supported by the learner’s computer.



# Resources

## Resources on the Internet

The ADL website is the main source of information about the SCORM on the Internet. Visit <http://www.adlnet.org/>

The Learning Systems Architecture Lab at Carnegie Mellon is a major contributor to the development of the SCORM. Visit <http://www.lsal.cmu.edu/>.

The Learning Systems Architecture Lab has produced an interesting set of reports on possible future directions for SCORM. Visit: <http://www.lsal.cmu.edu/lisal/expertise/projects/scorm/scormevolution/index.html>

ADL established the first ADL Partnership Lab in the United Kingdom in 2002. The UKADL Partnership Lab is a collaboration with the Learning Lab located on the campus the University of Wolverhampton in Telford, England. Visit: <http://www.learninglab.org.uk/>

A comprehensive analysis of the SCORM from a UK university perspective is available from the Staffordshire University website, written by Eddie Clarke. The article condenses the technical material available from ADL into an accessible format. Visit: <http://www.staffs.ac.uk/COSE/cosenew/SCORM.doc>.

The CETIS Educational Content Special Interest Group (EC-SIG) offers information, support and advice to people working with the SCORM. Visit: [http://www.cetis.ac.uk/members/educational\\_content](http://www.cetis.ac.uk/members/educational_content)

## About this guide

This guide was produced by CETIS, the Centre For Educational Technology Interoperability Standards, and edited by Wilbert Kraan. For other CETIS briefings, visit <http://www.cetis.ac.uk>.

Warwick Bailey is founding Director of Icodeon Ltd, an e-Learning products and services enterprise. Warwick is a board member of an MIT/Microsoft iCampus project and a contributor to the JISC national e-Learning Framework. Warwick has worked with implementations of SCORM and IMS specifications in VLEs, item banks and web services. Icodeon has recently released the Icodeon Sequencing Engine that enables vendors to rapidly add SCORM 2004 sequencing functionality to their products. Visit <http://www.icodeon.com>

## About CETIS

CETIS is the JISC's Centre For Educational Technology Interoperability Standards. For more information visit the CETIS website at <http://www.cetis.ac.uk/>

