TECHNICAL REPORT

ISO/IEC TR 29163-2

First edition
2009-12-15

Information technology — Sharable Content Object Reference Model (SCORM®) 2004 3rd Edition —

Part 2: Content Aggregation Model Version 1.1

Technologies de l'information — Modèle de référence d'objet de contenu partageable (SCORM®) 2004 3e édition —

Partie 2: Modèle d'agrégation de contenu Version 1.1

Reference number
ISO/IEC TR 29163-2:2009(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC TR 29163-2, which is a Technical Report of type 3, was prepared by the Advanced Distributed Learning (ADL) Initiative (as SCORM® 2004 3rd Edition Content Aggregation Model Version 1.1) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by the national bodies of ISO and IEC.

ISO/IEC TR 29163 consists of the following parts, under the general title *Information technology — Sharable Content Object Reference Model (SCORM®) 2004 3rd Edition*:

— *Part 1: Overview Version 1.1*

— *Part 2: Content Aggregation Model Version 1.1*

— *Part 3: Run-Time Environment Version 1.1*

— *Part 4: Sequencing and Navigation Version 1.1*

Advanced Distributed Learning (ADL)

SCORM® 2004 3rd Edition Content Aggregation Model (CAM) Version 1.1

For questions and comments visit
Ask The Experts at ADLNet.gov

Chief Technical Architect
Philip Dodds

Technical Editor
Schawn E. Thropp

Acknowledgements

ADL would like to thank the following organizations and their members for their continued commitment to building interoperable e-learning standards and specifications:

Alliance of Remote Instructional Authoring & Distribution Networks for Europe (ARIADNE) (http://www.ariadne-eu.org/)

Aviation Industry CBT Committee (AICC) (http://www.aicc.org/)

Institute of Electrical and Electronics Engineers (IEEE) Learning Technology Standards Committee (LTSC) (http://ltsc.ieee.org/)

IMS Global Learning Consortium, Inc. (http://www.imsglobal.org/)

ADL would also like to thank the ADL Community for their commitment and contribution to the evolution of SCORM.

Table of Contents

List of Figures

List of Tables

SECTION 1
SCORM® Content Aggregation Model (CAM) Overview

1.1. Introduction to the SCORM Content Aggregation Model (CAM) Book

The Sharable Content Object Reference Model (SCORM) is often described as a set of books on a bookshelf. The Content Aggregation Model (CAM) book is one of a set of books (refer to Figure 1.1a: *The Content Aggregation Model Book as Part of the SCORM Bookshelf*). More information on the other SCORM books and their relationships to one another can be found in the SCORM 2004 3rd Edition Overview book. The SCORM CAM book describes the components used in a learning experience, how to package those components for exchange from system to system, how to describe those components to enable search and discovery and how to define sequencing information for the components. The SCORM CAM promotes the consistent storage, labeling, packaging, exchange and discovery of learning content.

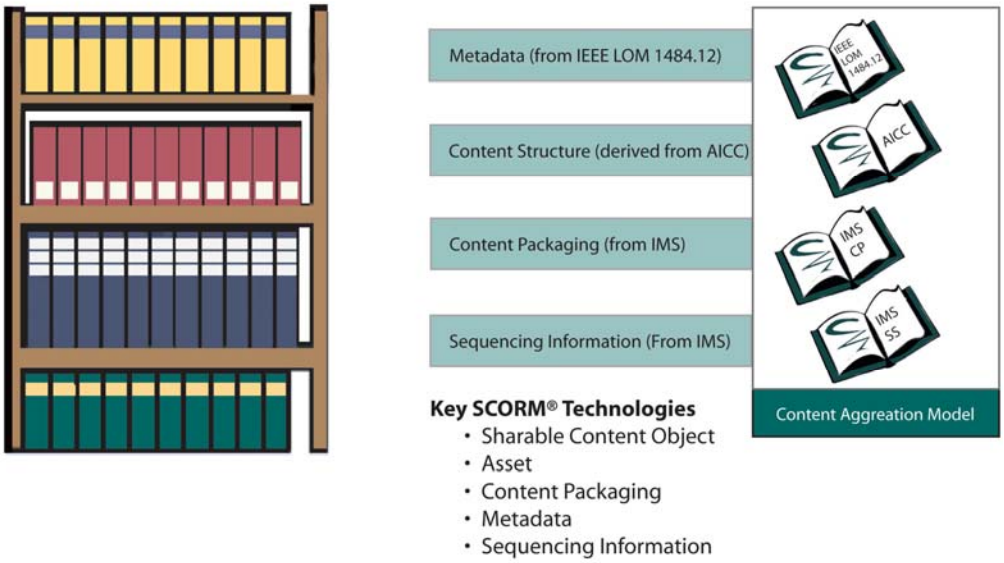

Figure 1.1a: The SCORM Content Aggregation Model Book as Part of the SCORM Bookshelf

1.1.1. What is Covered in the SCORM Content Aggregation Model (CAM) Book?

There are several key concepts that are introduced in the SCORM CAM book. The book describes responsibilities and requirements for building content and content organizations (e.g., course, lessons, modules, etc.). The book contains information on creating content packages, applying metadata to the components in the content package and applying sequencing and navigation details in the context of a content package. SCORM Content Packaging, as described in this book, provides a consistent form for describing content structures, learning content, the metadata that describes the various components of the content structures and sequencing and navigation rules. This consistency facilitates

search and discovery of content packages and their resources (helping facilitate reuse of SCORM conformant content), building of content organizations that will behave in a similar manner from system to system and standard understanding of the contents of the content package. General subjects discussed include:

- Content Model: Definition of common terminology used throughout the CAM book.
- Content Packaging: Descriptions and requirements for aggregating and bundling learning content.
- Metadata: Descriptions and requirements for describing SCORM components.
- Sequencing and Navigation: Descriptions and requirements for defining sequencing and navigation information.

1.1.2. Using the SCORM CAM Book

This book will assist authoring tool vendors, content developers and anyone else wishing to create, edit or use:

- SCORM Content Model Components (Assets, Sharable Content Objects (SCOs), Activities, Content Organizations and Content Aggregations),
- SCORM Content Packages (with or without sequencing and navigation information), or
- Metadata

Various requirements are defined throughout the book that describes how to create, edit or use content packages, metadata and content model components.

Early portions of this book, Section 1: *The SCORM® Content Aggregation Model (CAM) Overview* through Section 2: *The SCORM® Content Model*, cover general SCORM CAM-related concepts. These sections are recommended reading for those seeking an introduction to the concepts behind the SCORM CAM and who may not wish to delve into its technical details. Others who may find these sections useful include those wishing to learn about updates to the SCORM CAM. Section 2.1.3: *Content Organization*, for instance, discusses how Activities affect the SCORM CAM.

Section 3: *SCORM® Content Packaging* is the first section of this book providing technical details specific to the CAM. It describes Manifests, Content Packages, SCORM Content Aggregation Content Package Application Profile, SCORM Resource Content Package Application Profile and Best Practices and Practical Guidelines. This section covers not only the technical details about the various individual components of SCORM Content Packages, but it also covers how to assemble content packages, showing code illustrations of manifests with explanations.

Section 4: *Metadata* covers all aspects of creating metadata for labeling purposes, to include Learning Object Metadata (LOM) Extensible Markup Language (XML) validation approaches and metadata extensions. The section also describes how to associate metadata to SCORM Content Model Components in a content package.

Section 5: *SCORM® Sequencing and Navigation* covers ways in which the introduction of sequencing and navigation information affects the SCORM CAM. The section also outlines how to build sequencing and navigation information in XML and how to place those rules in a content package manifest. The section describes the requirements for building XML that represents the desired sequencing strategies.

1.1.3. Relationship with Other SCORM Books

While the various SCORM books are intended to stand alone, there are areas of overlap or mutual coverage. For instance, while this book focuses primarily on elements of SCORM content such as SCOs and Assets, those objects are launched by SCORM conformant Learning Management Systems (LMSs), and so the SCORM Run-Time Environment (RTE) book [2], covering content launch is mentioned numerous times.

Similarly, while the Sequencing and Navigation (SN) book covers the details of SCORM sequencing and navigation processes, including detailed coverage of how an LMS evaluates navigation requests and related activities, this book deals with manifests which contain the sequencing information described by the SCORM SN book, and so some of the basics of sequencing and navigation are touched on.

To help clarify areas of overlap, Section 1.1.3.1: *The SCORM Run-Time Environment Book* and Section 1.1.3.2: *The SCORM Sequencing and Navigation Book* provides brief descriptions of the contents of these SCORM books.

1.1.3.1. The SCORM Run-Time Environment Book

The purpose of the SCORM RTE book is to provide a means for interoperability between SCOs and LMSs. SCORM provides a means for learning content to be interoperable across multiple LMSs regardless of the tools used to create the content. For this to be possible, there must be a common way to launch content, a common way for content to communicate with an LMS and predefined data elements that are exchanged between an LMS and content during its execution. The three components of the SCORM RTE are defined in this document as Launch, Application Program Interface (API) and Data Model. The technical details of these elements are described in the SCORM RTE book, but a brief overview of each of these elements of the RTE follows.

Launch includes defining the relationship between LMSs and SCORM content such that all SCORM conformant content is dependant upon a SCORM conformant LMS to be delivered and displayed to the learner. In addition, LMSs have the responsibility to determine which SCORM content is to be delivered next. These new responsibilities, described in the SCORM SN book, are also touched on in the SCORM RTE book.

The SCORM API, as described in the SCORM RTE book, provides a set of predefined methods that are agreed upon by both LMS vendors and content authoring tool vendors to be made available for purposes of communication between an LMS and the SCOs it launches. These functions complete the launch process by providing a means to establish a “handshake” between the SCO and the LMS that launched it, and to break that

handshake when the learning session with the SCO is terminated. In addition, they provide the means for SCORM content to "set" and "get" data on the LMS, such as assessment results, and to check for and warn the user about any errors that may occur during these processes.

The SCORM RTE Data Model, as described in the SCORM RTE book, provides the data elements that can be used to "get" and "set" data from and to an LMS. For instance, when passing a test score from a learner, a SCO would use the SCORM RTE Data Model element known as `cmi.score.scaled` to inform the LMS how a user performed in the test. This and all other SCORM Run-Time Environment Data Model elements are described in detail in the SCORM RTE book.

Various concepts described in the SCORM CAM book have impacts on the SCORM RTE. Data defined in a content package manifest impact some initial values for some of the SCORM Run-Time Environment Data Model elements. Data from the manifest is used in the process of delivering and launching content to the learner and impacts the run-time environment. These and other relationships are described throughout the CAM.

1.1.3.2. The SCORM Sequencing and Navigation Book

The SCORM SN book is based on the IMS Simple Sequencing (SS) Specification Version 1.0, which defines a method for representing the intended behavior of an authored learning experience such that any SCORM conformant LMS will sequence discrete learning activities in a consistent way.

The SCORM SN Model defines how IMS SS applies and is extended in a SCORM environment. It defines the required behaviors and functionality that SCORM conformant LMSs must implement to process sequencing information at run-time. More specifically, it describes the branching and flow of learning activities in terms of an Activity Tree, based on the results of a learner's interactions with launched content objects and an authored sequencing strategy. An Activity Tree is a conceptual structure of learning activities managed by the LMS for each learner.

The SCORM SN book describes how learner-initiated and system-initiated navigation events can be triggered and processed, resulting in the identification of learning activities for delivery. Each learning activity identified for delivery will have an associated content object. The SCORM RTE book describes how identified content objects are launched. The sequence of launched content objects, for a given learner and content structure, provides a learning experience (learner interaction with content objects); the SCORM RTE model describes how the LMS manages the resulting learning experience and how that learning experience may affect the Activity Tree.

Various concepts described in the SCORM CAM book have relationships to the SCORM SN book. The SCORM CAM describes how to build sequencing information and represent that information in Extensible Markup Language (XML). The SCORM CAM then describes how to build onto the existing manifest to apply the sequencing information. The SCORM SN book contains more details on the relationship between

the XML binding of the sequencing information and the processes and behaviors of that information.

1.2. The SCORM Content Aggregation Model

The SCORM CAM represents a learning taxonomy neutral means for designers and implementers of instruction to aggregate learning resources for the purpose of delivering a desired learning experience. A learning resource is any representation of information that is used in a learning experience. Learning experiences consist of activities that are supported by electronic or non-electronic learning resources.

One activity in the process of creating and delivering learning experiences involves the creation, discovery and gathering together, or aggregation, of simple assets into more complex learning resources and then organizing the resources into a predefined sequence of delivery. The SCORM CAM supports this process and is made up of the following:

- Content Model: Nomenclature defining the content components of a learning experience.
- Content Packaging: Defines how to represent the intended behavior of a learning experience (Content Structure) and how to aggregate activities of learning resources for movement between different environments (Content Packaging).
- Metadata: A mechanism for describing specific instances of the components of the content model.
- Sequencing and Navigation: A rule-based model for defining a set of rules that describes the intended sequence and ordering of activities. The activities may or may not reference learning resources to be delivered to the learner.