Distance Education Technologies: Standards and Software Systems

Presented by
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Standards and Software Systems

Standards

- HTML
- XML
- SMIL

Systems

- SCORM
- Software Systems
- Courseware System
- Presentation System

Software Systems

- SOAP
- IEEE P1484.1 (LTSA)
- ULF
- QT&I

Presentation System

Courseware System
The Department of Defense of USA established the Advanced Distributed Learning (ADL) initiative in 1997.

The Sharable Content Object Reference Model (SCORM) includes

- Content Aggregation Model
  - Simple Sequencing Specification (in 1.3 Draft)
- Run-time Environment

An Academic Co-Lab of ADL
High-Level Requirements of SCORM

- **Accessibility**: the ability to locate and access instructional components from one remote location and deliver them to many other locations.

- **Interoperability**: the ability to take instructional components developed in one location with one set of tools or platform and use them in another location with a different set of tools or platform.

- **Durability**: the ability to withstand technology changes without redesign, reconfiguration or recoding.

- **Reusability**: the flexibility to incorporate instructional components in multiple applications and contexts.
The SCORM Content Aggregation Model represents a pedagogically neutral means for designers and implementers of instruction to aggregate learning resources for the purpose of delivering a desired learning experience.

The SCORM Content Aggregation Model is made up of the following:

- **Content Model**: Nomenclature defining the content components of a learning experience.
- **Meta-data**: A mechanism for describing specific instances of the components of the content model.
- **Content Packaging**: Defines how to represent the intended behavior of a learning experience (Content Structure) and how to package learning resources for movement between different environments (Content Packaging).
- **Simple Sequencing Specification (SCORM 1.3)**: A learning designer or content developer declares the relative order in which elements of content (SCOs or SCAs) are to be presented to the learner and the conditions under which a piece of content is selected and delivered or skipped during presentation.
The SCORM Content Model is made up of the following components:

- **Assets**: Basic forms, such as text, images, sound, web pages, assessment objects or other pieces of data that can be delivered to a Web client.

- **Sharable Content Assets (SCAs) (1.3 Draft)**: A collection of one or more Assets packaged as a single launchable resource. SCA does not communicate with an LMS via the SCORM Communications API Adapter.

- **Sharable Content Objects (SCOs)**: A collection of one or more Assets. A SCO represents the lowest level of granularity of learning resources that can be tracked by an LMS using the SCORM Run-Time Environment Data Model.

- **Learning Activities (Activities) (1.3 Draft)**: An instructional event or events embedded in a content resource or as an aggregation of activities that eventually resolve to discrete content resources with their contained instructional events.

- **Content Aggregations**: A map (content structure) that can be used to aggregate learning resources into a cohesive unit of instruction (e.g. course, chapter, module, etc.)
The SCORM contains specialized instances of resources: Assets, SCAs and SCOs.

**Assets** are learning content in its most basic form. Assets are electronic representations of media, text, images, sound, web pages, chat sessions, assessment objects or other pieces of data that can be delivered to a Web client.

**SCAs** represent a collection of one or more Assets packaged as a single launchable resource. SCAs do not communicate with an LMS system.

**SCOs** represent a collection of one or more Assets packaged as a single launchable resource that utilizes the SCORM Run-Time Environment to communicate with LMSs. A SCO represents the lowest level of granularity of content that is able to be tracked by an LMS using the SCORM Run-Time Environment Data Model.

**Content Aggregation** is the process of pooling resources (Assets/SCAs/SCOs) into a defined structure (content structure) to build a particular learning experience.
Meta-Data

- Meta-data provide a common nomenclature enabling learning resources to be described in a common way.
- Learning resources that are described with meta-data can be systematically searched for and retrieved for use and reuse.

Meta-Data
- Asset Meta-data
- Sharable Content Asset (SCA) Meta-data
- Sharable Content Object (SCO) Meta-data
- Learning Activities Meta-data
- Content Aggregation Meta-data
SCORM Meta-data Includes

- **Information Model**: defines the meta-data elements ("dictionary" of meta-data tags), the same as the IEEE LOM specification.
- **The SCORM Meta-data XML Binding**: defines how to encode, or bind, the "dictionary" elements in XML, based directly on the IMS Learning Resource Meta-data XML specification.
- **The SCORM Meta-data Application Profiles**: provides specific guidance for how to implement meta-data in the SCORM environment.
The SCORM Meta-data Information Model has nine categories:

- **General** category groups the general information that describes the resource as a whole.
- **Lifecycle** category groups the features related to the history and current state of this resource and those who have affected this resource during its evolution.
- **Meta-metadata** category groups information about the meta-data record itself (rather than the resource that the record describes).
- **Technical** category groups the technical requirements and characteristics of the resource.
- **Educational** category groups the educational and pedagogic characteristics of the resource.
- **Rights** category groups the intellectual property rights and conditions of use for the resource.
- **Relation** category groups features that define the relationship between this resource and other targeted resources.
- **Annotation** category provides comments on the educational use of the resource and information on when and by whom the comments were created.
- **Classification** category describes where this resource falls within a particular classification system.
IMS Package Description

An IMS Content Package contains two major components:

- A (required) special XML document describing the content organization and resources of the package. The special file is called the Manifest file (imsmanifest.xml) because package content and organization is described in the context of manifests.

- The physical files referenced in the Manifest.
Content Packaging Conceptual Diagram

SCORM 1.2

SCORM 1.3 (with Sequencing)

Sequencing information can be associated with the Organization and/or each Item in the Organization.

Package

Manifest
- Meta-data
- Organizations
- Resources
  (sub)Manifest(s)

Physical Files
(The actual Content, Media, Assessment, Collaboration and other files)

manifest File

Package Interchange File

Organizations
- Organization
- Organization
- Organization
- Organization

Item

Item

Item

Item

Item

Item

Item
A learning designer or content developer declares the relative order in which elements of content (SCOs or SCAs) are to be presented to the learner and the conditions under which a piece of content is selected and delivered or skipped during presentation.

It incorporates rules that describe the branching or flow of learning activities through content according to the outcomes of a learner’s interactions with content.

The components of an LMS used to execute the specified rules and behaviors are referred to as a ‘sequencing engine’.

Sequencing does not define the following:
- sequencing capabilities that utilize or are dependent on other actors, such as instructors, mentors, or peers.
- content look and feel and presentation style
- other sequencing techniques (i.e., AI-based, simulation, customized learning, etc.), but does not necessarily preclude
Sequencing Definition Model

- **Sequencing Control Modes** – control the sequencing behavior for a cluster (i.e., Choice, Choice Exit, Flow, and Forward Only)
- **Sequencing Rules** – a set of `if [condition_set] then [action/behavior]`.
- **Limit Conditions** – based on the Tracking Model, override Sequencing Rules (e.g., max number of attempt, max duration, etc).
- **Auxiliary Resource** – additional services or resources associated with an activity.
- **Rollup Rules** – the process of evaluating the Objective and Attempt Progress data for a set of child activities for a parent activity.
- **Objectives** – to associate learning objective(s) with an activity.
- **Objective Map** – defines a mapping of an activity’s local objective information to and from a shared global objective (sharing objective information).
- **Rollup Controls** – three types of tracking status model information for rollup process (i.e., Objective Satisfaction, Objective Measure, and Activity Completion Status).
- **Selection Controls** – include descriptions of how the children of an activity should be selected during the sequencing process.
- **Randomization Controls** – decide whether or not a sequencer shall randomly select activities for delivery.
- **Delivery Controls** – shall be used by LMSs to aid in the tracking of data associated with activities.
Conceptual Model of the Overall Sequencing Process

Overall Sequencing Process

- Navigation Behavior
  - Exit Request
- Exit Behavior
- Rollup Behavior
- Selection and Randomization Behavior
  - Sequencing Request
- Sequencing Behavior
  - Delivery Request
- Delivery Request Behavior

Navigation Event (e.g., Continue, Previous, Choose, Exit, etc...)

Runtime Data Communication

Interact with State Model

State Model

Wait for Navigation Request
SCORM has a common way to start learning resources, a common mechanism for learning resources to communicate with an LMS and a predefined language or vocabulary forming the basis of the communication. These three aspects of the Run-Time Environment are Launch, Application Program Interface (API) and Data Model.
Launch, API and Data Model

The **Launch** mechanism defines a common way for LMSs to start Web-based learning resources. This mechanism defines the procedures and responsibilities for the establishment of communication between the delivered learning resource and the LMS.

The **API** is the communication mechanism for informing the LMS of the state of the learning resource (e.g., initialized, finished or in an error condition), and is used for getting and setting data (e.g., score, time limits, etc.) between the LMS and the Sharable Content Object (SCO).

A **Data Model** is a standard set of data elements used to define the information being communicated, such as, the status of the learning resource.
For More Information

http://www.adl.net.org/
The MINE SCORM Authoring Tool

Timothy K. Shih, Wen-Chih Chang, and Wen-Chieh Ko, MINE Lab, Tamkang University, Taiwan

- Based on the Draft of ADL SCORM Version 1.3 Beta 2, 11/27/02
- SCORM Simple Sequencing Templates & Models, 1st Ed., CMU, 2/7/03
- Drag-and-Drop Courseware Design
  - Define sequence rules
  - Define metadata
  - Define reusable sequence templates
- A CSCW-like Course Development Tool
- http://www.mine.tku.edu.tw/scorm/
Specification for Aggregation

LSAT Template for Aggregation Design Specification

<table>
<thead>
<tr>
<th>Classification Description</th>
<th>Classification Keyword</th>
<th>Size:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

Objective: (Use only if Aggregation has a unique objective)

Articulating the Learning Objectives of Courseware

<table>
<thead>
<tr>
<th>Objective Identification</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

Aggregation Structure

<table>
<thead>
<tr>
<th>Aggregation Structure</th>
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</tbody>
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Sequencing Behaviors

<table>
<thead>
<tr>
<th>Sequencing Behavior</th>
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Carneal Mallen

Learning 8 frames Architecure Labs

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Valid until July 2020. All aggregations. 8/10/94. 2005. 8/10/94. 8/10/94.

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Icon Used in Our Tool

- Private Lecture Component
- Public Lecture Component
- Extracted Lecture Component
- Private Lecture
- Public Lecture

An Academic Co-Lab of ADL
The CSCW Model

A CSCW Discussion Space

Final Courseware
Authoring SCORM Components

Demo

Statistics:
Frames: 0
Rate: 0.00 frames/sec
Length: 00:00
Zoom: 800 x 600 (100%)
Audio:

Properties:
Size: 800 x 600
Colors: 65536
Rate: 20.0 frames/sec
Codec: MS-CRAM

Press Pause or F9 to pause

Internet Explorer  ip113  20030711-0...  AVS

ACD FotoConv...  ip116  hs_en.pthl...  manifest

ACDSee 5.0  ip112  Photoshop

Adobe Acrobat  Sample RTF  Adobe Acrobat

ADL test.avi
Multimedia Synchronization Using ASF

Timothy K. Shih, Y. R. Liu and Sheng-En Yeh, MINE Lab, Tamkang University, Taiwan

- **Automatic Recording**
- Use Commercial Codec and the Advanced Streaming Format (ASF) from Microsoft
- **Video and Slide Synchronization**
- Text and Drawing Annotation Synchronization
- Slide Selection
- **Presentation Editing**
- **Automatic Loading**
**Event-based Synchronization**

- **Event markers** are embedded in an ASF file.
- Arbitrary **activation** of markers.
- Do not record the entire screen as one video clip.
- Video streaming depends on Codec.

*MS Office XP - Presentation Broadcast* provides video and slide synchronization (PowerPoint and IE).
User Interface of Recording Tool

Choose Device

Choose Codec
User Interface of Recording Tool

Presentation Playback

Control Functions

Select Output

Slide Selection
Adaptive Presentation

- Hard to record the entire lecture without making a mistake
- Different presentation needs different level of details
- Lecture summarization and editing
- Atomic presentation object – a PowerPoint Slide (with its video and annotation events)
Layered Presentation Hierarchy

Three Levels of Details

Automatic Loading

Presentation Editing
Automatic Recording and Editing
Presentation Uploading via SCORM PIF

LOM Generated

Content Packaging

Uploading Control

<?xml version="1.0" ?>
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  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.imsglobal.org/xsd/imsmd_rootv1p2p1.xsd">
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    </title>
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    </description>
  </general>
</loM>
SCORM PIF Viewer

Content Aggregation

PowerPoint Slides

Video Window
SCORM-Based Video Presentations
Pocket SCORM

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Capacity Limitations on PDAs
- Memory
- Screen
- Network

User Profiles and Learning Progress
- Database on PDA
- Sync with database of SCORM LMS
Logon Interface and Course List
Knowledge-based and Linear-based Structures
SCORM PDA Reader and SCORM PDA Database

An Overview of the Lesson and Activities

Adobe Photoshop is one of the most powerful image editing software packages in use today. You can color correct images, modify the look of images using effects and filters, select specific elements from an image to combine with a different image, and add text to images.

In this tutorial you will learn how to create interesting and artistic images.
SCORM Reader on PDA
Distance Learning in the Future

Bring Outdoors to Indoors – Virtual Reality-based communication and situated learning

Bring Indoors to Outdoors – wireless communication for encyclopedia and E-books

Edutainment – makes learning easier and more interesting

E-Commerce – learning as a commercial activity (i.e., knowledge is for sale)

E-Inequality – each virtual university has its own uniqueness

E-Problem? – less people-centric natural of learning

Yet another ‘dotcom’ issue? (i.e., not so optimistic?)
Thank You

An Academic Co-Lab of ADL

http://www.mine.tku.edu.tw