SumTotal™

TotalLMS and TotalLCMS

Working with the API for SCORM Extensions in SumTotal

Contents

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Introduction

The SCORM (Shareable Content Object Reference Model) specification defines a standard way for web-based content to communicate with a Learning Management System (LMS). Developed by the Advanced Distributed Learning project (ADL), the SCORM specification defines both a packaging model and a run-time environment. For more information about the SCORM specification, visit www.adlnet.org

This document is intended for programmers. It explains how to develop SCORM content to take advantage of SCORM extensions available in SumTotal 7.0 and 7.1. This document assumes you are familiar with developing SCORM content and can already develop content that passes the SCORM 1.2 Test Suite for both packaging and run-time. Developing content to interface with the SumTotal extended SCORM implementation is not covered by the standard SumTotal technical support programs. Assistance in this area is available through our Professional Services group.

SumTotal 7.x is SCORM 1.2 conformant and has been certified level RTE3 conformant by the ADL. The SCORM extensions discussed in this document do not violate this conformance. To utilize the SCORM extensions in this document, you can use SCORM 1.2 content or SCORM 2004 content. Currently SumTotal 7.1 is not SCORM 2004 conformant.

Purpose for SCORM Extensions in SumTotal

There are some LMS and content considerations that the SCORM specification does not address. In SumTotal, the SCORM extensions address these additional areas:

- Allowing the course to define the appropriate size for the run-time player. SumTotal defines a default size for content that may be smaller or larger than the size the content specifies. Many content developers use Flash files which define a specific size for Flash content, and the run-time player may not open to this size by default. Because of window size differences the course controls may be hidden, leading to a poor end-user experience. In some cases content will not play if the window is not the proper size.
- Allowing the course to control, to a degree, the appearance of the run-time player. SumTotal runs SCORM content in player window that is bordered by graphical elements (the player “footprint”). This footprint may clash with the content or take up valuable screen real estate. Additionally, course navigation is controlled by SumTotal through a Table of Contents (TOC) which has a default color and size. We recognize that course designers may wish to hide the player footprint or change the look and feel of the player.
- Allowing the course to navigate from one SCO to another SCO (inter-SCO navigation). The SCORM specification treats individual SCOs (Shareable Content Objects) as autonomous units. A SCO is not aware of its relationship to other SCOs in a course. We recognize that this is a limitation to course designers and SumTotal allows navigation forward and backward through the course tree between SCOs.
- Allowing the course to control run-time player functions such as exiting. The SumTotal run-time player has additional functions not defined by the SCORM. The exit command, for example, saves all learner data cached in the client side of the SumTotal SCORM player before closing the player window. This was added as a player function to provide the course its own exit function without calling top.close(). Calling top.close() from the content will prematurely close the player resulting in data loss.
- There are additional functions provided by the SumTotal run-time player for viewing course progress and study aids. These functions, typically available on the player navigation bar, can be accessed through the SumTotal Extensions API.

SCORM Packaging Extensions

The SCORM specification defines a packaging methodology for content whereby all resources in a package are described in the imsmanifest.xml file. This file is described in the SCORM 1.2 Content Aggregation Model document. The examples described below are designed for SCORM 1.2 content but could be easily applied to SCORM 2004 content

SCORM Content Packaging Model

Course elements are described in the imsmanifest.xml file. SCORM content designed to play in SumTotal must pass the SCORM 1.2 Packaging Test Suite or the SCORM 2004 Content Packaging Test Suite . Adding SumTotal SCORM Extensions to imsmanifest.xml will not make content non-conformant.

The root element for SumTotal SCORM Extensions is <c2lcp:ItemDataExtra> and this element should always be a child of <manifest>. This element uses the namespace c2lcp and it must be identified in the <manifest> element. The example below shows the proper placement of <c2lcp:ItemDataExtra> as well as the proper entries to be added to the <manifest> element in order to be conformant with SCORM.

Note that the URL highlighted in yellow on the sixth line of Figure 1 will work if using a reference to Click2learn.com, such as `"http://www.click2learn.com/xsd/c2l_cp_rootv1p1"`

Figure 1 Example of imsmanifest.xml file with SCORM Extensions highlighted

```
<?xml version="1.0">
<manifest identifier="sumtotal_extension_manifest" version="1.0"
    xmlns="http://www.imsproject.org/xsd/imscp_rootv1p1p2"
    xmlns:adlcp="http://www.adlnet.org/xsd/adlcp_rootv1p2"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:c2lcp="http://www.sumtotalsystems.com/xsd/c2l_cp_rootv1p1"
    xsi:schemaLocation="http://www.imsproject.org/xsd/imscp_rootv1p1p2
imscp_rootv1p1p2.xsd
       http://www.imsglobal.org/xsd/imsmd_rootv1p2p1 imsmd_rootv1p2p1.xsd
       http://www.adlnet.org/xsd/adlcp_rootv1p2 adlcp_rootv1p2.xsd
       http://www.sumtotalsystems.com/xsd/c2l_cp_rootv1p1 c2l_cp_rootv1p1.xsd">
    <metadata>
        <schema>ADL SCORM</schema>
        <schemaversion>1.2</schemaversion>
        <lom>
            <general>
                <title>SCORM - Extended API Test</title>
                <description>This course tests the SumTotal and Aspen SCORM
Extensions</description>
            </general>
        </lom>
    </metadata>
    <organizations default="org1">
        <organization identifier="org1">
            <title>Only Org</title>
            <item identifier="item1" identifierref="res1">
                <title>sco 01</title>
            </item>
        </organization>
    </organizations>
    <resources>
        <resource
            identifier="res1" type="webcontent" adlcp:scormtype="sco"
href="sco.htm"></resource>
    </resources>
    <c2lcp:ItemDataExtra />
</manifest>
```

SCORM Packaging Extensions Information Model

The following table describes the elements in the SCORM Packaging Extension Model. Any empty property elements will use the default value for that property.

Figure 2 Elements in the SCORM Packaging Extension Model

Level	Element Name	Description	Multiplicity	Data Type
1	manifest	SCORM-defined element: refer to the SCORM 1.2 Content Aggregation Model documentation	1	container
2	c2lcp:ItemDataExtra	Element that describes SumTotal Extensions the SCORM manifest	0 or 1	container
3	c2lcp:ItemData	Element that describes the course	1	container
3.1	Identifier	Attribute that identifies the course; should match the <manifest> identifier attribute	1	ID
3.2	Type	Attribute that describes the type of Item	1	must be "course"
4	c2lcp:ItemSpecificData	Container element	1	container
5	c2lcp:CourseData	Container element	1	container
6	c2lcp:PackageProperties	Container element that describes all extensible properties	1	container
7	c2lcp:CourseDisplay	Container element that describes extensible display properties	1	container
7	c2lcp:Launch	Container element that describes extensible launch properties	1	container
8	c2lcp:Width	Element that defines, in pixels, the launch width of the content pane of the player window Default: 800	1	integer
8	c2lcp:Height	Element that defines, in pixels, the launch height of the content pane of the player window Default: 600	1	integer
8	c2lcp:AllowResize	Element that defines resize behavior of the player window Default: yes	1	yes/no
8	c2lcp:ShowNavBar	Element that turns on or off the player footprint Default: yes	1	yes/no

Level	Element Name	Description	Multiplicity	Data Type
8	c2lcp:TOC	Container element that describes extensible Table of Contents (TOC) properties	1	container
9	c2lcp:MaxWidth	Element that defines, in pixels, the desired width of the TOC Default: 200	1	integer
9	c2lcp:ScrollBar	Element that turns on or off the TOC scrollbar Default: yes	1	yes/no
9	c2lcp:BackgroundColor	Element that describes the background color of the TOC Default: ffffff (white)	1	hex color value

Example of Extended Properties

The following example shows all the extensible properties in the SCORM Packaging Extension Model. This course, when shown in the SumTotal content player, will open with a viewable content area of 787x577 in a non-resizable window. The SumTotal run-time player footprint will be shown and the Table of Contents, if shown, will be 150 pixels wide with a scrollbar and white color.

Figure 3 Example of extensible properties in the SCORM Packaging Extension Model

```
<c2lcp:ItemDataExtra>
    <c2lcp:ItemData Identifier="sumtotal_extension_manifest" Type="Course">
        <c2lcp:ItemSpecificData>
            <c2lcp:CourseData>
                <c2lcp:PackageProperties>
                   <c2lcp:CourseDisplay>
                        <c2lcp:TOC>
                            <c2lcp:MaxWidth>150</c2lcp:MaxWidth>
                            <c2lcp:ScrollBar>yes</c2lcp:ScrollBar>
                            <c2lcp:BackgroundColor>ffffff</c2lcp:BackgroundColor>
                        </c2lcp:TOC>
                        <c2lcp:ShowNavBar>yes</c2lcp:ShowNavBar>
                    </c2lcp:CourseDisplay>
                    <c2lcp:Launch>
                        <c2lcp:Width>787</c2lcp:Width>
                        <c2lcp:Height>577</c2lcp:Height>
                        <c2lcp:AllowResize>no</c2lcp:AllowResize>
                    </c2lcp:Launch>
                </c2lcp:PackageProperties>
            </c2lcp:CourseData>
        </c2lcp:ItemSpecificData>
    </c2lcp:ItemData>
</c2lcp:ItemDataExtra>
```

Single-SCO versus Multiple-SCO Content

Content that has only one item defined in a given organization (one lesson) is referred to as single-SCO content. The example above (figure 1) describes single-SCO content. Multiple-SCO content has multiple items in a given organization.

The Table of Contents is never shown for single-SCO content. The TOC is open by default for multiple-SCO content.

SCORM Run-time Extensions

The SCORM specification defines a run-time API (Application Programming Interface) that allows content to communicate with an LMS in a standard fashion. This SCORM API is described in the SCORM 1.2 Run-time Environment document and the SCORM 2004 Run-time Environment document.

SCORM Run-time Extension API Object

The SCORM API is typically found in a frameset of the run-time player. Many common algorithms exist for locating the SCORM API. The SumTotal SCORM Run-time Extension API is a JavaScript object that is in the same window as the SCORM API and is named API_Extended.

Typically a course will use the SCORM API GetAPI() method which will return the API from this method. A better solution would be to return the window object that holds the API so you can get a handle to both API and API_Extended. See the example on the next page for an illustration of this approach. This example works for SCORM 1.2 content; however, the same approach can be taken for SCORM 2004 content using API_1484_11.

Figure 4 Modified GetAPI( ) code to find API and API_Extended

```
var nFindAPITries = 0;
var API           = null;
var API_Extended  = null;
var maxTries      = 500;

// change this to return a handle to the window object, not the API
function ScanForAPI(win)
{
    while ((win.API == null) && (win.parent != null) && (win.parent != win))
    {
          nFindAPITries++;

          if (nFindAPITries > maxTries)
       {
                 alert("Error in finding API instance -- too deeply nested.");
                 return null;
       }

       win = win.parent;
   }

   return win;
}

function GetAPI()
{
    var apiWin = null;

    if ((win.parent != null) && (win.parent != win))
    {
          apiWin = ScanForAPI(win.parent);
    }

    if ((API == null) && (win.opener != null))
    {
          apiWin = ScanForAPI(win.opener);
    }

    if ( apiWin != null )
    {
        API = apiWin.API;
        API_Extended = apiWin.API_Extended;
    }
}
```

SumTotal Run-time Extensions API

The SumTotal SCORM Run-time Extensions consist of two methods and ten commands. Commands are passed to the methods to perform a specific action.

Figure 5 API Methods for SumTotal SCORM Extensions

Method	Description
GetNavCommandStatus	This method returns the availability status of a given command. syntax: GetNavCommandStatus (command) parameter: command is a vocabulary string for a specific action; see figure 6 on the next page for a list of valid commands returns: boolean true/false example: `var can_nav_next = API_Extended.GetNavCommandStatus("next");`

SetNavCommand	This method performs the specified command if available.
	syntax: SetNavCommand (command)
	parameter: command is a vocabulary string for a specific action
	returns: void
	example:
	`if ( can_nav_next == true )`
	`{`
	`    API_Extended.SetNavCommand("next"); // navigate to next SCO`
	`}`

SCORM Run-time Extensions API Commands

These are the valid commands that can be passed as parameters to the SumTotal Extended API. If an invalid command is passed to either method it is ignored.

Figure 6 Commands for SumTotal SCORM Extensions API

Command	Description
previous	Moves to the previous SCO in the course hierarchy unless on first SCO.
next	Moves to the next SCO in the course hierarchy unless on last SCO.
home	Moves to the first SCO in the course hierarchy.
study-aids	Opens the Study Aids panel in the SumTotal content player. In Aspen 2.5 or 2.1, it opens the Study Aids panel if there is a license for Aspen Personalized Delivery Module.
progress	Opens the Progress panel.
search	Opens the Search panel in the SumTotal content player. In Aspen 2.5 or 2.1, it opens the Search panel if there is a license for Aspen Personalized Delivery Module.
collaborate	Opens the Collaboration panel if Collaboration Centers are licensed and the use of Collaboration Centers has been enabled for the course.
exit	Posts in-state data for the SCO to the LMS and closes the run-time player.
open-toc	Opens the Table of Contents pane if closed. Does nothing for a single-SCO course.
close-toc	Closes the Table of Contents pane if open. Does nothing for a single-SCO course.

Calling `SetNavCommand` with `previous`, `next`, `home`, or `exit` will force the SCO to be unloaded. Therefore you should save and commit any SCORM data before calling `SetNavCommand` with `previous`, `next`, `home`, or `exit.` It is recommended that you also call LMSFinish before making this call unless you call LMSFinish automatically when the SCO is unloaded. Calling an SumTotal extended API method does not violate the SCORM protocol, because the object you are calling with SetNavCommand is not the SCORM API adapter, and communications with the SumTotal Extended API are outside the scope of the SCORM API specification.

Modifying the SumTotal Content Player

You can modify the imsmanifest file to control aspects of the SumTotal content player. In the example shown below, the navigation bar is hidden. This example shows how to modify the tags for SCORM content. The example is a manifest for a course created in the ToolBook authoring product; however, any SCORM conformant content will be structured similarly. Note that there is no need to modify the imsmanifest file if you are using any version of ToolBook 2004 SP2 or higher because the toolbar of the SumTotal content player can be hidden when exporting content from ToolBook (and the toolbar functions can be added to pages using TotalLMS buttons from the catalog).

To follow this example, open the imsmanifest file and add the lines shown with the yellow highlight under the manifest element.

```
<manifest identifier="ToolBookGeneratedSCORMContent" version="1.2"
   xmlns=http://www.imsproject.org/xsd/imscp_rootv1p1p2
   xmlns:adlcp="http://www.adlnet.org/xsd/adlcp_rootv1p2"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xmlns:c2lcp="http://www.sumtotalsystems.com/xsd/c2l_cp_rootv1p1"
   xsi:schemaLocation="http://www.imsproject.org/xsd/imscp_rootv1p1p2
   imscp_rootv1p1p2.xsd
      http://www.imsglobal.org/xsd/imsmd_rootv1p2p1 imsmd_rootv1p2p1.xsd
      http://www.adlnet.org/xsd/adlcp_rootv1p2 adlcp_rootv1p2.xsd
      http://www.sumtotalsystems.com/xsd/c2l_cp_rootv1p1c2l_cp_rootv1p1.xsd">
```

To hide the navigation bar, set the value of the following line equal to no:

```
<c2lcp:ShowNavBar> = no
```

In order for this change to take effect, add the following elements after the resource element.

```
<c2lcp:ItemDataExtra>
  <c2lcp:ItemData  Type="Course">
    <c2lcp:ItemSpecificData>
      <c2lcp:CourseData>
        <c2lcp:PackageProperties>
          <c2lcp:CourseDisplay>

            <c2lcp:ShowNavBar>no</c2lcp:ShowNavBar>

            <c2lcp:TOC>
              <c2lcp:MaxWidth>1</c2lcp:MaxWidth>
              <c2lcp:ScrollBar>yes</c2lcp:ScrollBar>
              <c2lcp:BackgroundColor>ffffff</c2lcp:BackgroundColor>
            </c2lcp:TOC>
          </c2lcp:CourseDisplay>
          <c2lcp:Launch>
            <c2lcp:Width>797</c2lcp:Width>
            <c2lcp:Height>585</c2lcp:Height>
            <c2lcp:AllowResize>no</c2lcp:AllowResize>
          </c2lcp:Launch>
        </c2lcp:PackageProperties>
      </c2lcp:CourseData>
    </c2lcp:ItemSpecificData>
  </c2lcp:ItemData>
</c2lcp:ItemDataExtra>
```