



IMS GLOBAL[®]
Learning Consortium

IMS Learning Tools Interoperability™ (LTI) / Common Cartridge and Roster Processing Best Practices

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IMS has developed a set of best practices that will help District and School systems integrate with different tool provider systems.

This document examines a number of pain points currently experienced by District and School Management as it relates to the integration of content providers with District and School systems and offers various scenarios that can facilitate that integration.

We will look at:

- Enabling search of Learning Resources from multiple providers
- Automating the provisioning of roster data between District/School and provider systems – eliminating the need for manual extraction and ingestion processes
- Accessing publisher systems from District/School Systems without having to create custom integrations for each and every provider
- Standardizing the exchange of Content Metadata between content providers and District/School Systems

By using IMS Learning Tools Interoperability™, IMS Common Cartridge and IMS Learning Information Services Specifications, we will demonstrate how these standards can eliminate these pain points and save money in the process.

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Use Cases

IMS “Thin” Common Cartridge with LTI embedded links.

Using IMS Common Cartridge to capture content provider metadata and embedded LTI Links, provides a clean and efficient way to provide access to content provider resources behind their firewall. The Cartridge metadata and embedded LTI links to resources can be stored in a District Learning System.

Use Case 1: District has a Learning System and Provider needs Roster information (use of LTI Roster Service)

A District/School that has a Learning System can use LTI Roster Service to automate the provisioning of Roster information.

The “Thin” Common Cartridge would be used to provide metadata and embedded LTI links to the District Learning System.

Use Case 2: District has a Learning System and Provider does not require Roster information (LTI Direct Launch)

A District Learning System can provide LTI launch information for a user to connect directly to a provider system. Both the Learning System and the provider system need to be IMS LTI compliant. The “Thin” Common Cartridge would be used to provide metadata and embedded LTI links to the District Learning System.

Use Case 3: District does not have a Learning System and Provider does not require Roster Information (LTI via Script)

A District that doesn’t have a Learning System can execute valid LTI requests using a server protected script.

Use case 4: District does not have a Learning System and Provider requires Roster Information (LTI via Script and Roster Provisioning via Learning Information Services (LIS))

A District that doesn’t have a Learning System can execute valid LTI requests using server-protected script.

The District can use **Learning Information Services** to automate the provisioning of Roster information.

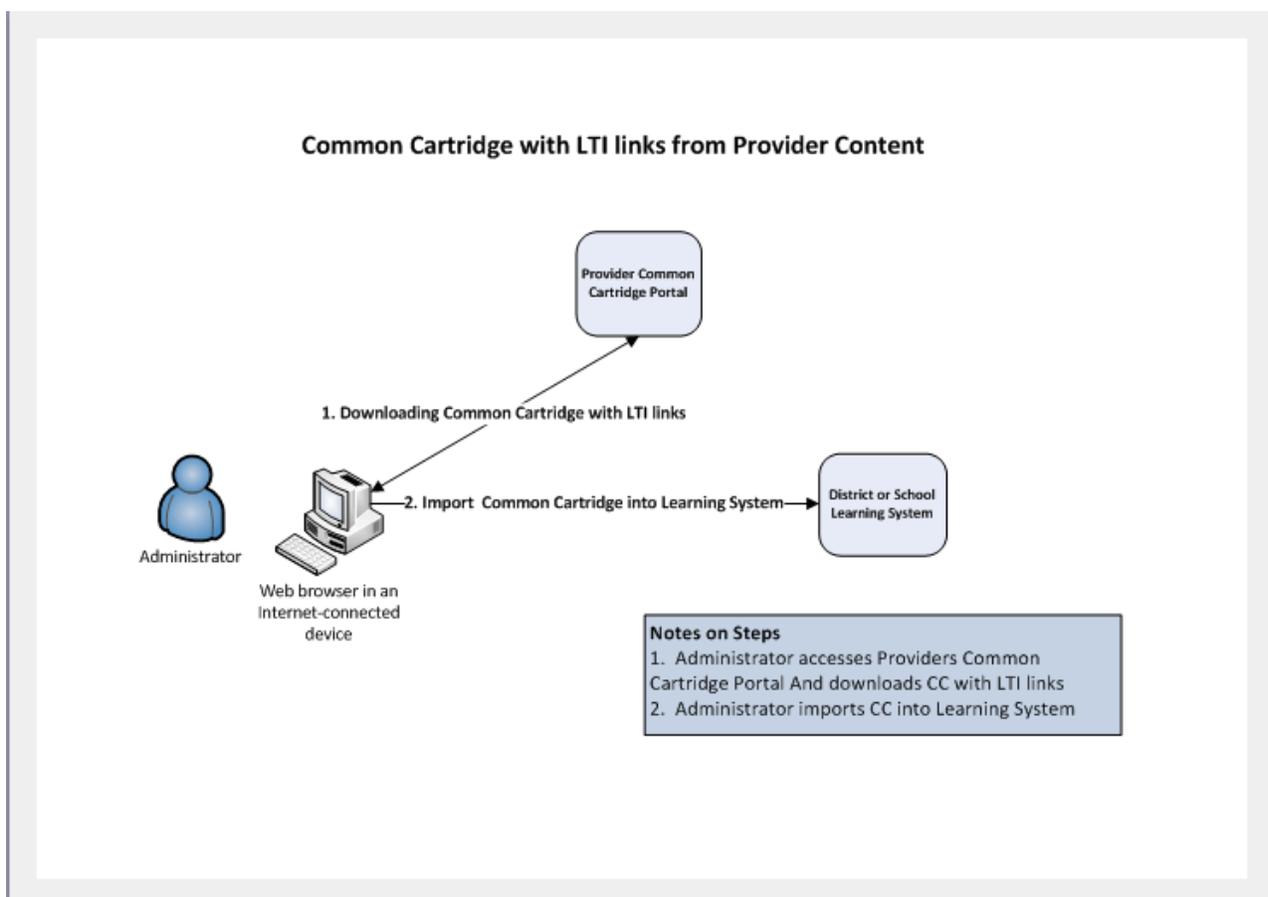
1. IMS “Thin” Common Cartridge with LTI embedded links.

An IMS “Thin” Cartridge is a standard way for content metadata to be loaded into a district Learning System. The Cartridge would contain LTI enabled links and metadata.

The Cartridge can also contain structure in support of a lesson or set of lessons with LTI enables Links to resources.

These cartridges require a one time ingest and configuration by the administrator at the district. Once ingested and authorized, the provider resources could be launched directly from the district system using LTI.

The “Thin” Cartridge Metadata is defined in section Metadata and Launch parameters.

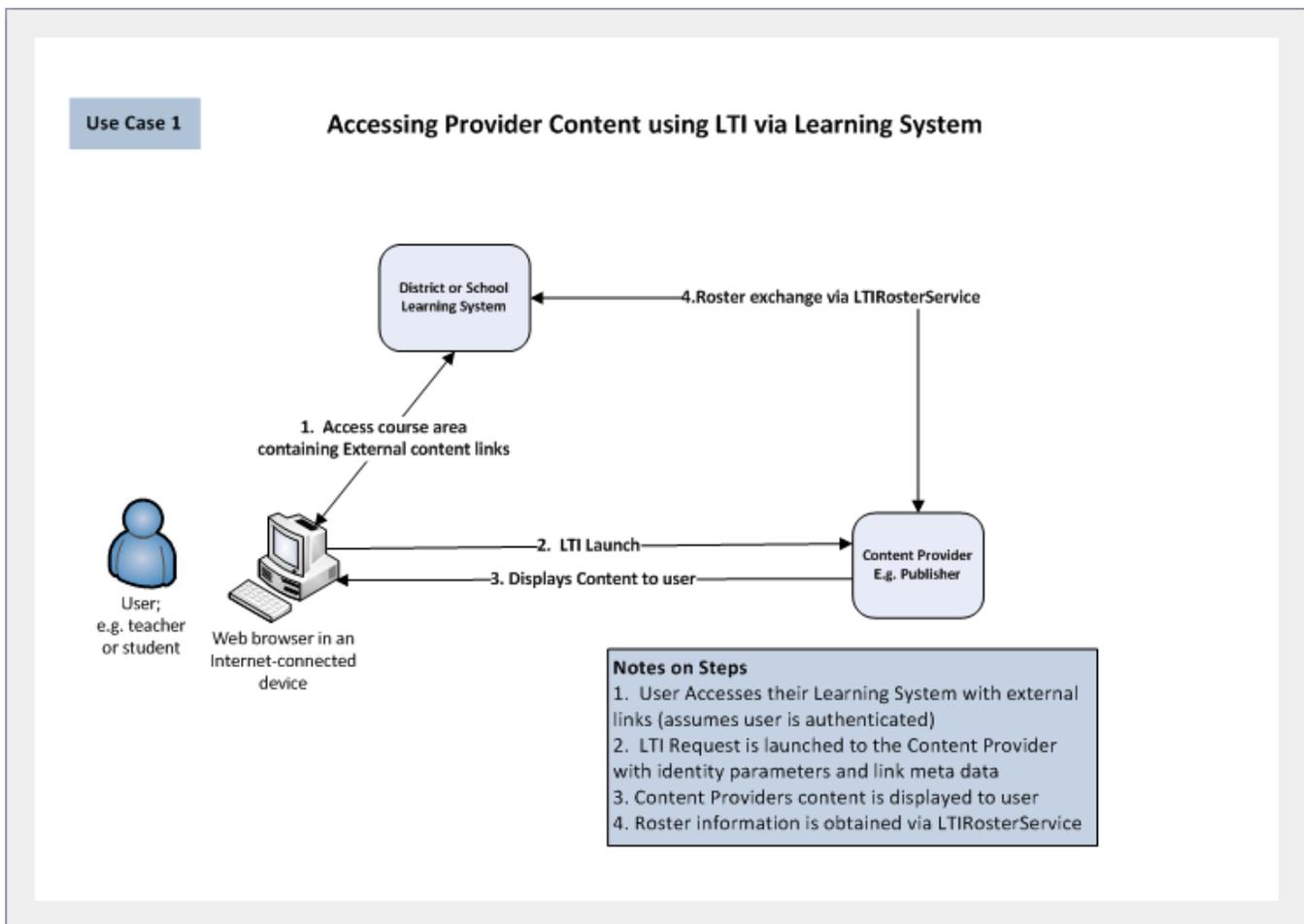


Use Case 1: District has a Learning System and Provider requires Roster Information (use of LTI Roster Service)

The Content Provider uses the LTI Roster Service to provision Roster information from District/School Learning System. The LTI Roster Service can be setup as an automated process that pulls data at designated intervals.

A locally authenticated user can access content from the provider via LTI requests.

This assumes the metadata and LTI enabled links have been loaded into the Learning System via a Common Cartridge.



LTI Services

A standard way of providing functionality, which is not currently included within the LTI specification, would be to encapsulate it in a **web service** secured using the LTI credentials, which are shared between the Tool Consumer and the Tool Provider. Such services can be discovered by the other parties via the Tool Consumer Profile (LTI 1.2 and LTI 2.0) or the Tool Profile (LTI2.0).

In this way, the functionality need only be written once at the Tool Provider end and once for each Tool Consumer with which it wishes to connect.

These services may also be found useful for implementation by other Tool Providers, thereby avoiding duplication of effort.

The Tool Settings service in the LTI 2.0 specification provides a model for writing the service secured using LTI.

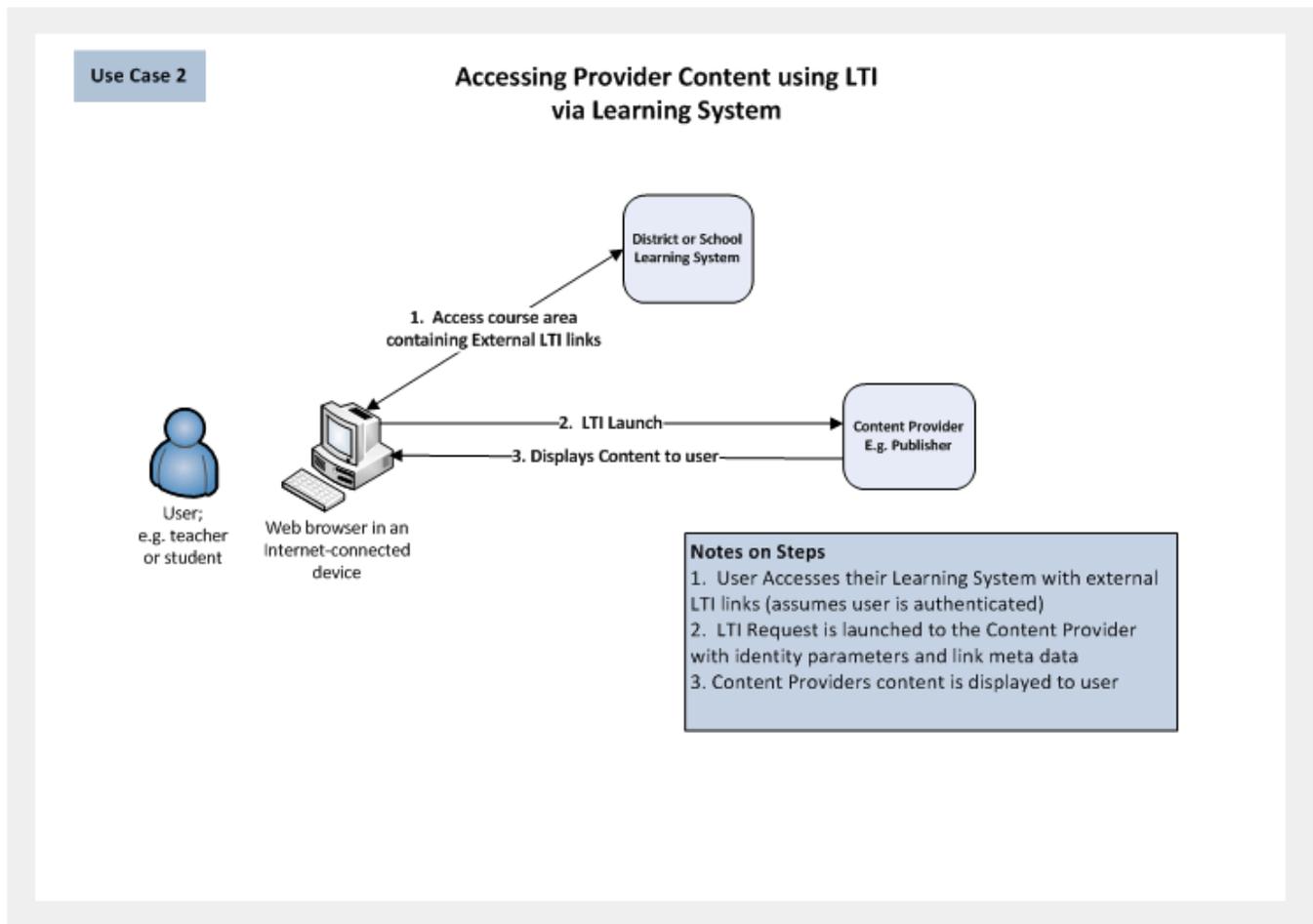
For example, to obtain roster data about all the users authorized to access to a particular context (**e.g. Class**), a roster service could be used. Such a service is currently under development by IMS and a draft is expected to be available in May. At a minimum, it would provide all the data about a user that would be obtained on launch but could also be extended to include information about memberships of groups defined within the context, for example. The request of the service launch can be implemented to execute when a teacher launches a request. The system could check to see if the roster is up to date.

Use Case 2: District has a Learning System and the Provider does not require Roster information (LTI Direct Launch).

A locally authenticated user can access content from the provider via LTI requests.

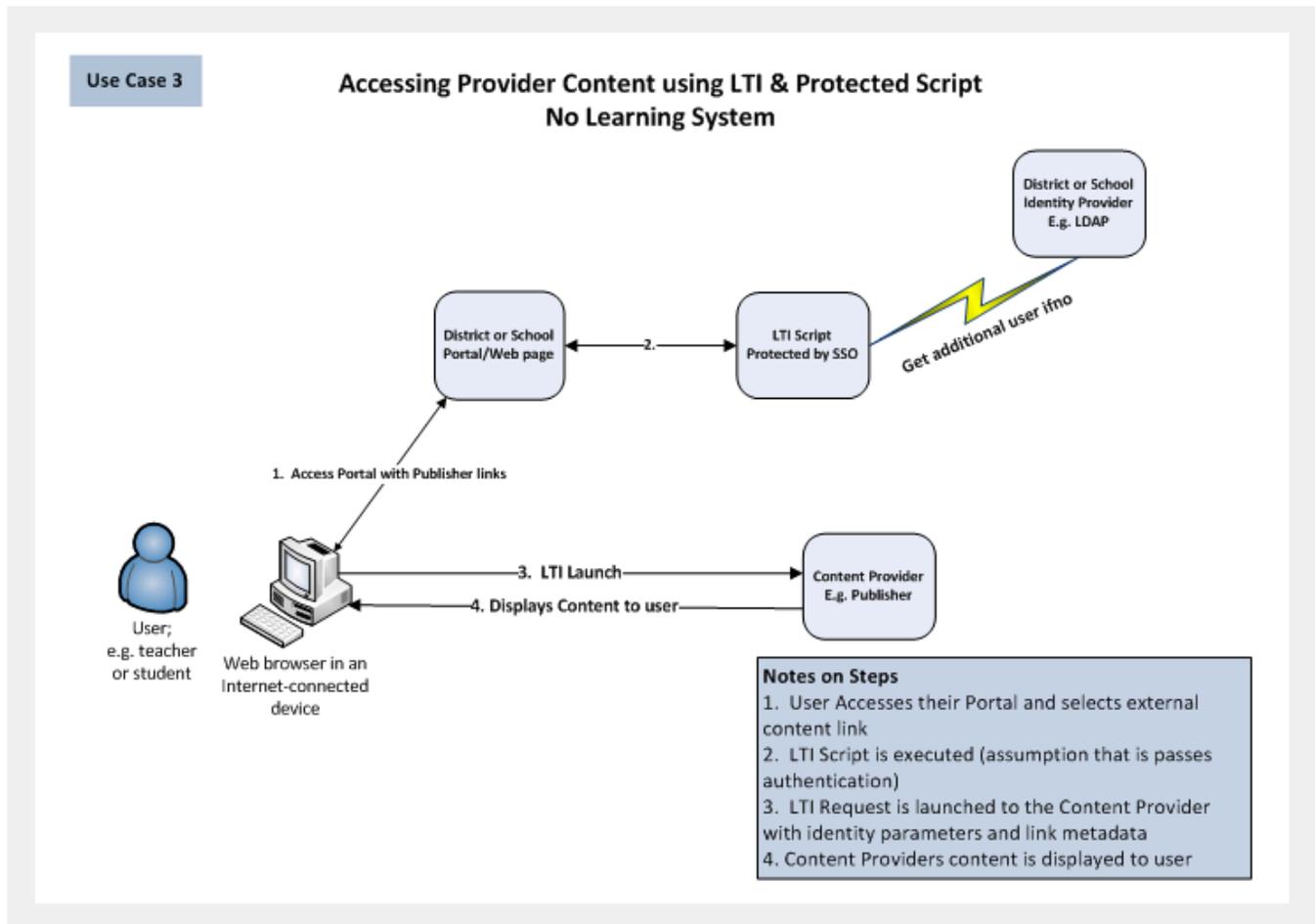
This assumes the metadata and embedded LTI links have been loaded into the Learning System via a Common Cartridge. It also assumes that the Learning System and the Provider System are IMS LTI conformant.

In this scenario, the Learning System provides the LTI launch information and connects the client to the content provider system. The content provider system needs to be an IMS LTI compliant Tool provider.



Use Case 3: District does not have a Learning System and the Provider does not require Roster information (LTI via Script).

If the district doesn't have a Learning System, a user can still execute valid LTI requests using a server protected script. The script generates a valid LTI Launch request to the provider and content is displayed to the user.



LTI script

When no LTI-enabled Learning System (i.e. Tool Consumer) is available, it is still possible to perform an LTI launch to a Tool Provider by writing a simple bespoke script. This script may be in any programming language and should reside behind an SSO system such as Shibboleth, CAS or Cosign (or it could implement its own authentication method).

The main requirement is that the script should be able to securely determine the ID of the user accessing it; an SSO will typically populate the remote user environment variable with this value. If the Tool Provider requires more user information than just a unique ID, the script should also be able to connect to an Identity Management System (e.g. an LDAP server) from which it can extract other attributes about the user, such as their name and email address.

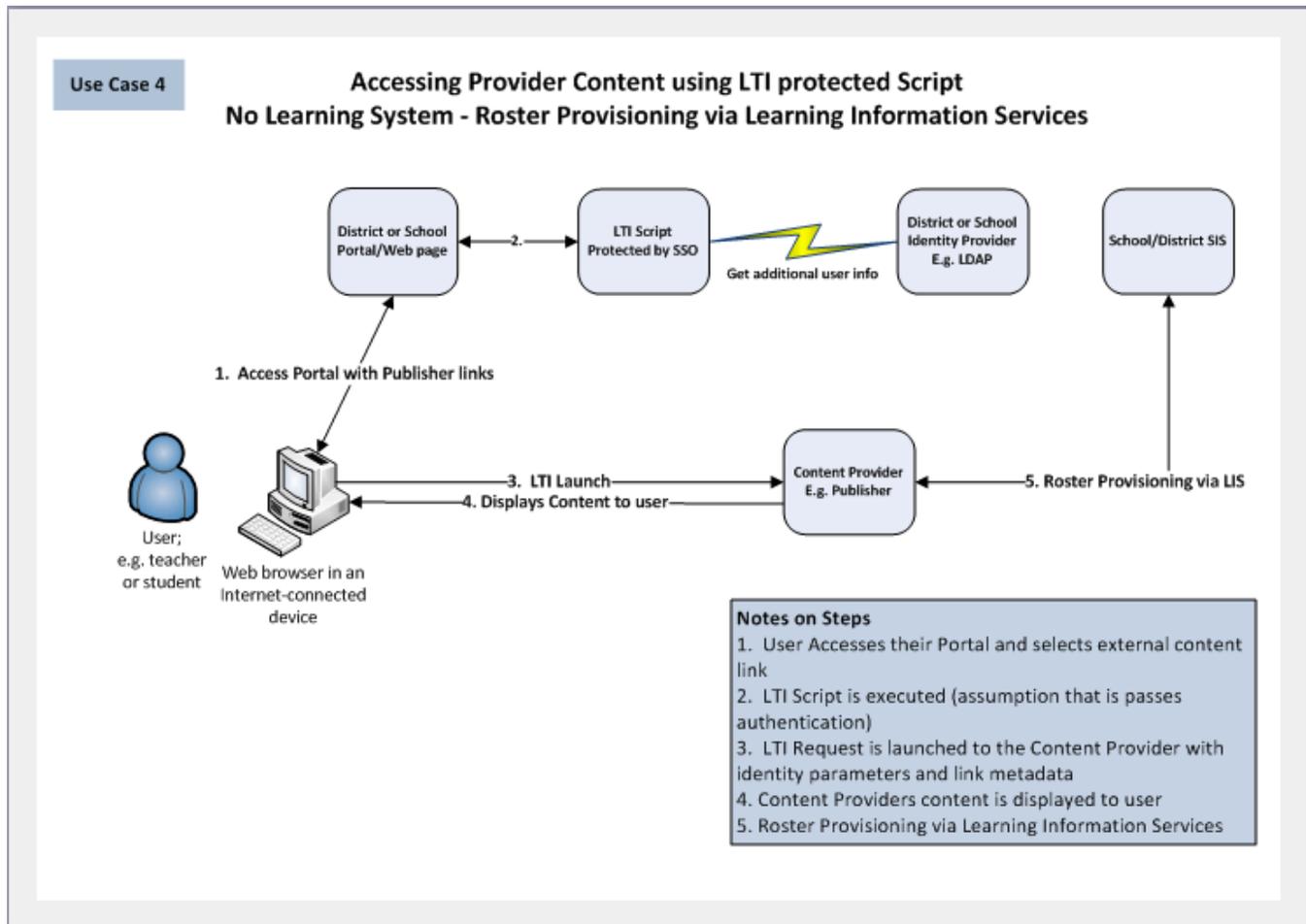
Given data about the user, the script can then return to their browser an HTML page containing an auto-submitted (using JavaScript) form with the LTI launch parameters and OAuth signature (just as a Tool Consumer would have done). The script needs secure access to the consumer key and secret in order to sign the LTI launch request. Since the launch will most likely have no context, it could use a static resource link ID to represent the launch point and the Tool Provider would be expected to redirect the user to a general entry point to its system (custom parameters may need to be included with the other launch parameters to enable the Tool Provider to do this).

A link to this script could be placed on any web page where this launch is required. Since the script is protected by an SSO system, there is no requirement for this page to be protected, but it can be.

Use Case 4: District does not have a Learning System and the Provider requires Roster information (LTI via Script and Roster Provisioning via Learning Information Services (LIS))

If the district doesn't have a Learning System, a user can still execute valid LTI requests using a server protected script. The script generates a valid LTI Launch request to the provider and content is displayed to the user.

The Content Provider uses Learning Information Services to provision Roster information from the Student Information System (SIS).



LTI script

When no LTI-enabled Learning System (i.e. Tool Consumer) is available, it is still possible to perform an LTI launch to a Tool Provider by writing a simple bespoke script. This script may be in any programming language and should reside behind an SSO system such as Shibboleth, CAS or Cosign (or it could implement its own authentication method).

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Tool Provider requires more user information than just a unique ID, the script should also be able to connect to an Identity Management System (e.g. an LDAP server) from which it can extract other attributes about the user, such as their name and email address.

Given data about the user, the script can then return to their browser an HTML page containing an auto-submitted (using JavaScript) form with the LTI launch parameters and OAuth signature (just as a Tool Consumer would have done). The script needs secure access to the consumer key and secret in order to sign the LTI launch request. Since the launch will probably have no context, it could use a static resource link ID to represent the launch point and the Tool Provider would be expected to redirect the user to a general entry point to its system (custom parameters may need to be included with the other launch parameters to enable the Tool Provider to do this).

A link to this script could be placed on any web page where this launch is required. Since the script is protected by an SSO system, there is no requirement for this page to be protected, but it can be.

Learning Information Services for Roster Exchange.

Class rostering can be supported using the IMS Learning Information Services (LIS) 2.0 specification. The LIS specification enables systems to exchange information about people, courses, outcomes and enrollments using SOAP-based Web Services. Obtaining rostering information from an SIS requires the use of the LIS Membership Management Service (MMS) that is used to define the classes for which a learner is registered/assigned. This information can be obtained in real-time using an SIS push or tool/system pull method. Bulk data can be exchanged using the LIS Bulk Data Exchange Management Service (BDEMS): this is typically used at the start of term when the exchange of substantial amounts of course administration is required.

Metadata & Launch Parameters

1. Metadata Definitions

This section contains the recommendation from IMS for the set of metadata that should be produced for exchange of learning content in K12 education. This recommendation includes the exchange of the data using XML and micro-data formats

The key metadata fields are defined in Table 1. The columns in Table 1 denote:

- Name – the name of the field. The term enclosed in the accompanying square brackets denote the equivalent Dublin Core term;
- Type –the data type for the field;
- Occurrence – defines if the field is required ('R') or optional ('O');
- Multiplicity – defines the number of occurrences of the field. This is enumerated as single ('1') or many ('*');
- Description – a short description of how the field is to be used.

Table 1 – The set of metadata fields to be supported.

Name	Type	Occurrence	Multiplicity	Description
GUID [identifier]	String.	R	1	This field is the globally unique identifier of the object from the originator. This will be used to determine if the object already exists in the system in order to avoid duplicates. It will allow the owner of the object to update the metadata or URL when necessary. Systems can also allow direct access to the object within their system by allowing the field to be searched.
LTI URL	String (URL).	O	1	This field is the IMS Global Learning Tools Interoperability launch URL to access the tool within the tool provider. It contains either the direct URL to the tool or the authorization service of LTI while the actual tool or resource is at the Resource URL location.

Name	Type	Occurrence	Multiplicity	Description
Resource URL	String (URL).	R	1	This field is used as a parameter with LTI. It contains the redirect URL that the LTI tool provider requires to access the tool. The LTI URL authorizes and sets up the tool session while the resource URL accesses the specific tool or resource within the tool provider.
Title [title]	String.	R	1	This field contains the metadata title of the object.
Description [description]	String.	R	1	This field contains the metadata description of the object.
Keywords [subject]	String (space delimited).	O	1	This field contains the single words separated by spaces related to the object. This helps organize the object within the system for easier searching and identification.
From Grade	Enumeration: { p k 1 2 3 4 5 6 7 8 9 10 11 12 a }.	O	1	This field contains the lowest grade level that should have access to the object. Any grade level that is lower than this value shall be denied access to the object and it may not even be visible to the user. The grade levels are pre-kindergarten or preschool, kindergarten, 1 st grade, 2 nd grade, etc. Adult represents an object that is post High School.
To Grade	Enumeration: { p k 1 2 3 4 5 6 7 8 9 10 11 12 a }.	O	1	This field contains the highest-grade level that should have access to the object. Any grade level that is higher than this value shall be denied access to the object and it may not even be visible to the user. The grade levels are pre-kindergarten or preschool, kindergarten, 1 st grade, 2 nd grade, etc. Adult represents an object that is post High School.

Name	Type	Occurrence	Multiplicity	Description
Copyright [date]	Year (4 digit string).	O	1	This field contains the year in which the object was created. It represents when the copyright of the object was first introduced.
ISBN [identifier]	String.	O	1	This field contains the ISBN (International Standard Book Number) of the object. This allows quick access to the object during a search.
Type [type]	Enumeration: { video audio image interactive game weblink ebook }.	R		This field contains a descriptor string of what the object is. This is a simpler form of the MIME type (Multipurpose Internet Email Extensions) of an object. The field is used to categorize the object for easier searching and organization.
AccessPermission	Enumeration: { parent student teacher teacher/uploader school admin principal curriculum admin admin }.	R	*	This field contains the permission level needed to access the object. Any user type below the threshold should be denied access to the object and may not be visible to the user.
UseType	Enumeration: { primary secondary teacher assessment question concept assignment }.	O	*	This field contains the use type of the object. It allows the object to be organized based on the purpose of the object. For example, if the object were a LTI link to resource for homework purposes, it would be set to "assignment". That means the object would be available to a student during an assignment. The values can be: <ul style="list-style-type: none"> Primary: within a lesson it would be part of the primary lesson.

Name	Type	Occurrence	Multiplicity	Description
				<ul style="list-style-type: none"> • Secondary: within a lesson it would be a secondary object and not necessarily used and isn't the main focus of the lesson. • Teacher: within a lesson it would be viewable only to a teacher. • Assessment: within a lesson it would be an object that would aid in the assessment. • Question: within a lesson it would be a reference or the main part of a specific question. • Concept: within a lesson it would be part of the concept review. • Assignment: within a lesson it would be part of the assignment.
Visibility	Enumeration: { private shared public }.	R	1	<p>This field pertains to the visibility of the object. On initial load, who has the ability to see it. The values can be:</p> <ul style="list-style-type: none"> • Private: Only the person who imported the object has the right to view the object. • Shared: Users within the school can view it. • Public: Everyone in the district can view it.
Thumbnail	String.	O	1	This field contains the URL to the

Name	Type	Occurrence	Multiplicity	Description
				location of a thumbnail of the object. This would be used in previewing the object while searching or viewing the object. Since the object is a URL and the tool provider may change the object at any time, the thumbnail would be located on the tool provider's servers. Updated when the object is updated and accessible without an LTI launch.
Mapping to Curriculum Standards	List of GUIDs (strings).	O	*	This field (set of fields) contains each state standard or common core standard reference for the object. Along with provider /originator information. In this case the term GUID is used in the sense of any globally unique identifier form e.g. number, URI, etc.
Extension	N/A	O	*	Support for an extension mechanism.

2. Metadata Binding Mappings

The metadata binding mappings are defined in Table 2. The columns in Table 2 denote:

- Name – the name of the field. The term enclosed in the accompanying square brackets denote the equivalent Dublin Core term;
- XML Mapping – mapping when used with IMS specifications directly e.g. in Common Cartridge, APIP, etc. The actual binding formats are:-
 - 'lom.' – mapping to the IEEE LOM using the IMS Metadata v1.3.2 XSD binding
 - 'curriculumStandardsMetadataSet' – mapping to the IMS Curriculum Standards Metadata v1.0 XSD binding;
- Micro Data Mapping – mapping to the Schema.Org micro data format (including the LRMI support). In this column the value <object> denotes a creative work of: { Article | Blog | Book | Clip | Code | Comment | DataCatalog | Dataset | Diet | Episode | ExercisePlan | ItemList | Map | MediaObject | Movie | MusicPlaylist | MusicRecording | Painting | Photograph | Recipe | Review | Sculpture |

Season | Series | SoftwareApplication | TVSeason | TVSeries | WebPage | WebPageElement }. If an explicit creative work is identified then the property is restricted to that creative work.

Name	XML Mapping	Micro Data Mapping
GUID	lom.general.identifier .catalog=GUID .entry	– No mapping available –
LTI URL	lom.technical.installationRemarks	itemtype="http://schema.org/<object>" sameAs="???"
Resource URL	lom.technical.location	itemtype="http://schema.org/<object>" url="???"
Title	lom.general.title	itemtype="http://schema.org/<object>" name="???"
Description	lom.general.description	itemtype="http://schema.org/<object>" description="???"
Keywords	lom.general.keyword	itemtype="http://schema.org/<object>" keywords="???"
From Grade	lom.educational.context .source=FromGrade .type OR lom.educational.typicalAgeRange	itemtype="http://schema.org/<object>" typicalAgeRange="???"
To Grade	lom.educational.context .source=ToGrade .type OR lom.educational.typicalAgeRange	itemtype="http://schema.org/<object>" typicalAgeRange="???"
Copyright	lom.lifeCycle.contribute.date When lom.lifeCycle.contribute.role = publisher	itemtype="http://schema.org/<object>" copyrightYear="???"
ISBN	lom.general.identifier .catalog=ISBN .entry	itemtype="http://schema.org/Book" isbn="???"

Name	XML Mapping	Micro Data Mapping
Type	lom.educational.learningresourcetype .type	itemtype="http://schema.org/<object>" learningResourceType="???"
AccessPermission	lom.educational.intendedEndUserRole .source=AccessPermissionVocabulary .value	itemtype="http://schema.org/EducationalAudience" educationRole="???"
UseType	lom.educational.intendedEndUserRole .source=UseTypeVocabulary .value	itemtype="http://schema.org/<object>" educationalUse="???"
Visibility	lom.educational.intendedEndUserRole .source=VisibilityVocabulary .value	– No mapping available –
Thumbnail	lom.annotation.description	itemtype="http://schema.org/<object>" thumbnailUrl="???"
Mapping to Curriculum Standards	curriculumStandardsMetadataSet @resourceLabel @resourcePartId .curriculumStandardsMetadata @providerId .setOfGUIDs @region @version .labelledGUID .label .GUID	itemtype="http://schema.org/<object>" educationalAlignment="item1" item1 itemtype="http://schema.org/AlignmentObject" alignmentType="???" educationalFramework="???" targetUrl="???" targetDescription="???" targetName="???"
Extension	Require namespace approach as per IMS Metadata v1.3.2 requirements.	Use Schema.Org approach for extension.

3. Example Mappings

3.1. XML-Based Binding

An example of the mapping using the IEEE LOM/IMS Metadata v1.3.2 is shown in Code 1 (this example has been validated against the relevant IMS XSD and the XML instance is available).

Code 1 - Mapping to IEEE LOM/IMS Metadata v1.3.2.

```

0000
0001 <lom xmlns="http://ltsc.ieee.org/xsd/LOM"
0002     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
0003     xsi:schemaLocation="http://ltsc.ieee.org/xsd/LOM
0004         http://www.imsglobal.org/xsd/imsmd_loose_v1p3p2.xsd">
0005
0006 <!-- ***** -->
0007 <!-- GUID, TITLE, DESCRIPTION, KEYWORDS, ISBN ***** -->
0008     <general>
0009         <identifier>
0010             <catalog>GUID</catalog>
0011             <entry>ABCDEFGH...123456789...XYZ</entry>
0012         </identifier>
0013         <title>
0014             <string>...Title...</string>
0015         </title>
0016         <description>
0017             <string>...The description...</string>
0018         </description>
0019         <keyword>
0020             <string>Value1 Value2 Value 2</string>
0021         </keyword>
0022         <identifier>
0023             <catalog>ISBN</catalog>
0024             <entry>...ISBN Value...</entry>
0025         </identifier>
0026     </general>
0027 <!-- ***** -->
0028 <!-- LTI URL, RESOURCE URL ***** -->
0029     <technical>
0030         <installationRemarks>
0031             <string>http://...lti authentication URL ...</string>
0032         </installationRemarks>
0033         <location>http://...lti launch URL...</location>
0034     </technical>
0035 <!-- ***** -->
0036 <!-- FROM GRADE, TO GRADE, TYPE, ACCESS PERMISSION, USETYPE, VISIBILITY ** -->
0037     <educational>
0038         <context>
0039             <source>FromGrade</source>
0040             <value>k</value>
0041         </context>
0042         <context>
0043             <source>ToGrade</source>
0044             <value>a</value>
0045         </context>
0046         <learningResourceType>
0047             <source>...Vocab Source...</source>
0048             <value>..Type of Resource...</value>
0049         </learningResourceType>
0050         <intendedEndUserRole>
0051             <source>Access Permission Vocab</source>
0052             <value>...Access Permission...</value>
0053         </intendedEndUserRole>
0054         <intendedEndUserRole>
0055             <source>UseType Vocab</source>

```

```

0056         <value>...Usetype...</value>
0057     </intendedEndUserRole>
0058     <intendedEndUserRole>
0059         <source>Visibility Vocab</source>
0060         <value>...Visibility...</value>
0061     </intendedEndUserRole>
0062 </educational>
0063 <!-- ***** -->
0064 <!-- COPYRIGHT ***** -->
0065     <lifeCycle>
0066         <contribute>
0067             <role>
0068                 <value>publisher</value>
0069             </role>
0070             <date>
0071                 <dateTime>2014</dateTime>
0072             </date>
0073         </contribute>
0074     </lifeCycle>
0075 <!-- ***** -->
0076 <!-- THUMBNAIL ***** -->
0077     <annotation>
0078         <description>
0079             <string>...URL for the Thumbnail...</string>
0080         </description>
0081     </annotation>
0082 <!-- ***** -->
0083
0084 </lom>
0085

```

An example of the mapping using the IMS Curriculum Standards Metadata v1.0 is shown in Code 2 (this example has been validated against the relevant IMS XSD and the XML instance is available).

Code 2 - Mapping to curriculum standards metadata.

```
0000
0001 <curriculumStandardsMetadataSet
0002   xmlns="http://www.imsglobal.org/xsd/imsccv1p3/imsccsmd_v1p0"
0003     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
0004     xsi:schemaLocation="http://www.imsglobal.org/xsd/imsccv1p3/imsccsmd_v1p0
0005     http://www.imsglobal.org/profile/cc/ccv1p3/ccv1p3_imsccsmd_v1p0.xsd"
0006     resourceLabel="...Human readable label used to identify the type of
0007 resource..."
0008     resourcePartId="...Pointer to Associated Resource-Part...">
0009
0010   <curriculumStandardsMetadata providerId="...The originator of the GUID
0011 scheme...">
0012     <setOfGUIDs region="Florida" version="1.0">
0013       <labelledGUID>
0014         <label>Human readable string about the nature of the
0015 curriculum standard...</label>
0016         <GUID>...GUID for Standard/Standard-part...</GUID>
0017       </labelledGUID>
0018       <labelledGUID>
0019         <label>Human readable string about the nature of the
0020 curriculum standard...</label>
0021         <GUID>...GUID for Standard/Standard-part...</GUID>
0022       </labelledGUID>
0023       <labelledGUID>
0024         <label>Human readable string about the nature of the
0025 curriculum standard...</label>
0026         <GUID>...GUID for Standard/Standard-part...</GUID>
0027       </labelledGUID>
0028     </setOfGUIDs>
0029   </curriculumStandardsMetadata>
0030 </curriculumStandardsMetadataSet>
0031
```

3.2. Micro Data-Based Binding

An example of the mapping using the Schema.Org/LRMI binding is shown in Code 3 (this example has been validated using the Google Structured Data Testing Tool and the HTML instance is available).

Code 3 - Mapping to Schema.Org/LRMI.

```
0000
0001 <!DOCTYPE html SYSTEM "http://www.w3.org/TR/xhtml1/DTD/xhtml1-
0002 transitional.dtd">
0003 <html xmlns="http://www.w3.org/1999/xhtml">
0004
0005     <head>
0006         <meta http-equiv="content-type" content="text/html; charset=utf-8" />
0007         <title:: IEEE 802 LANs/MANs ::</title>
0008     </head>
0009
0010     <body itemscope itemtype="http://schema.org/Book">
0011         <h1 itemprop="name">IEEE 802 LANs/MANs</h1>
0012         <h2>EBook Description</h2>
0013         <p itemprop="description">The <a href="http://www.ieee.org">Institute
0014 of Electrical and Electronic Engineers</a> (IEEE) is a professional
0015 representation organization based in the USA but with a world-wide membership.
0016 The IEEE undertakes a number of standardization activities through various
0017 committees. The IEEE 802 Local Area Networks/Metropolitan Area Networks
0018 (LANs/MANs) Committee is responsible for the standardization of LANs and MANs.
0019 The activity of the <a href="http://www.ieee802.org/">IEEE 802 Committee</a>
0020 is structured as a series of Working Groups and Technical Advisory Groups
0021 (TAGs).</p>
0022
0023         <p>Resource URL: <a itemprop="url"
0024 href="http://www.ieee.org/ebook/ieee802.epub">
0025 http://www.ieee.org/ebook/ieee802.epub</a></p>
0026
0027         <p>Resource LTI URL: <a itemprop="sameAs"
0028 href="http://www.ieee.org/ebook/ieee802/LTI">
0029 http://www.ieee.org/ebook/ieee802/LTI</a></p>
0030
0031         <p>Copyright Year: <span itemprop="copyrightYear">2014</span></p>
0032
0033         <p>ISBN: <span itemprop="isbn">0-123-45678</span></p>
0034
0035         <p>Resource Type: <span
0036 itemprop="learningResourceType">ebook</span></p>
0037
0038         <p>Keywords: <span itemprop="keywords">IEEE 802, LANs, MANs</span></p>
0039
0040         <p itemscope itemtype="http://schema.org/EducationalAudience">Access
0041 Permission: <span
0042     itemprop="educationalRole">teacher</span></p>
0043
0044         <p>Use Type: <span itemprop="educationalUse">primary</span></p>
0045
0046         <p>Typical Age Range: <span itemprop="typicalAgeRange">7-9</span></p>
0047
```

```

0048     <p>Thumbnail: <a itemprop="thumbnailUrl"
0049         href="http://www.ieee.org/ebook/ieee802thumbnail.jpeg">
0050         http://www.ieee.org/ebook/ieee802thumbnail.jpeg</a></p>
0051
0052     <h3>Curriculum Standards Alignment</h3>
0053     <div itemprop="educationalAlignment" itemscope
0054 itemtype="http://schema.org/AlignmentObject">
0055         <p>Alignment Type: <span
0056             itemprop="alignmentType">Teaches</span></p>
0057
0058         <p>Eduactional Framework:<span
0059             itemprop="educationalFramework">Common Core</span></p>
0060
0061         <p>Target Name: <span itemprop="targetName">Alignment Name
0062 1</span></p>
0063
0064         <p>Target URL: <span
0065             itemprop="targetUrl">http://www.commoncore.org/...</span></p>
0066
0067         <p>Target Description: <span
0068             itemprop="targetDescription">...Description of the
0069             alignment...</span></p>
0070     </div>
0071
0072     <div itemprop="educationalAlignment" itemscope
0073 itemtype="http://schema.org/AlignmentObject">
0074         <p>Alignment Type: <span
0075             itemprop="alignmentType">Teaches</span></p>
0076
0077         <p>Eduactional Framework:<span
0078             itemprop="educationalFramework">Common Core</span></p>
0079
0080         <p>Target Name: <span itemprop="targetName">Alignment Name
0081 2</span></p>
0082
0083         <p>Target URL: <span
0084             itemprop="targetUrl">http://www.commoncore.org/...</span></p>
0085
0086         <p>Target Description: <span
0087             itemprop="targetDescription">...Description of the
0088             alignment...</span></p>
0089     </div>
0090 </body>
0091 </html>

```

4. Notes

For the XML bindings the following points should be noted:

- The order of the entries is not defined as required i.e. the general elements are not required to be the first field within the XML instance, etc.
- For the XML-based mapping it is recommended that the CSM information be inserted into the LOM instance using the IEEE LOM namespace extension mechanism: this avoids having two separate

XML instances to exchange the full set of metadata. This would be achieved as part of the profiling of the IEEE LO to support this K-12 metadata exchange.

For the micro-data binding the following points should be noted:

The web page has been constructed to act as a metadata description page for the associated learning resource i.e. an eBook.

5. LTI launch Request Parameters.

Parameter	Example	Notes
lti_message_type	basic-lti-launch-request	Required
lti_version	LTI-1p0	Required
oauth_callback	about:blank	Required
oauth_consumer_key	jisc.ac.uk	Required
oauth_nonce	27f6a2c47a2e70ccfdea59e4f1fc2580	Required
oauth_signature	kS4YiLAFZf//JGYdfLbIENAN+Gs	Required
oauth_signature_method	HMAC-SHA1	Required
oauth_timestamp	139412113	Required
oauth_version	1.0	Required
context_id	6a2c53a282sfcc55a59e4g2g35914f80	Optional
resource_link_id	429785226	Required
roles	teacher	Required
user_id	jsmith	Required
lis_person_name_given	John	Optional if full is provided
lis_person_name_family	Smith	Optional if full is provided
lis_person_name_full	John Smith	Optional
lis_person_email_primary	jsmith@dc.edu	Optional
custom_guid	JY_FL14E_GGH_G03U01L01D5S00_0038	Optional Custom
custom_ldap_dn	CN=jsmith,OU=students,DC=school,DC=edu	Optional Custom
custom_ldap_server	ldap.school.edu	Optional Custom

References

Learning System

This refers to a Learning Management System (LMS), Learning Object Repository (LOR), Learning Content Management System (LCMS).

IMS Learning Tools Interoperability™ (LT™I)

<http://www.imsglobal.org/lti/>

<http://developers.imsglobal.org/>

IMS Common Cartridge Resources

<http://www.imsglobal.org/cc/>

<http://www.imsglobal.org/developers/alliance/ccresources.cfm>

IMS Learning Information Services (LIS)

<http://www.imsglobal.org/LIS/>

<http://www.imsglobal.org/developers/lisalliance/index.cfm>