IMS GLC Common Cartridge Profile: Overview

Version 1.1 Final Specification

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1 Overview

Common Cartridge is a set of open standards, freely available and without royalty, developed by a global industry consortium with over 80 voting members. These standards, if followed by content developers and learning platforms, enable strict interoperability between content and systems. They also support great flexibility in the type of digital content supported (content can actually be applications) and where such content is located (content and applications in a Common Cartridge can be distributed).

Common Cartridge solves two problems. The first is to provide a standard way to represent digital course materials for use in online learning systems so that such content can be developed in one format and used across a wide variety of learning systems (often referred to as course management systems, learning management systems, virtual learning environments, or instructional management systems). The second is to enable new publishing models for online course materials and digital books that are modular, web-distributed, interactive, and customizable. The focus of Common Cartridge is interactive collaborative learning situations, typically with a teacher, professor, or instructor involved in guiding learners. The learning materials can be online, offline, or both - a situation often referred to as hybrid or blended learning. Common Cartridge may be used to facilitate self-paced online learning as well, but Common Cartridge was developed specifically to enable support the online or blended interactive and collaborative courses and seminars that have become mainstream in the last 10 years for various types of education scenarios.

Use of Common Cartridge advances the state of digital content and systems for learning. It supports and enhances the dominant and proven paradigm for quality learning and educational experiences: Internet supported learning. Common Cartridge enhances learning experiences by enabling flexible combinations of learning resources in an assessment-rich and collaboration-rich environment. Common Cartridge also provides standards that are a base platform for interoperability, reusability, and customization of digital learning content, assessments, collaborative discussion forums, and a diverse set of learning applications. These standards support market efficiency and open up the market for greater choice in both content and platforms.

Common Cartridge specifies six things.

1. A format for exchange of content between systems so that there is a common way to interpret what the digital learning content is and how it is organized (IMS Common Cartridge). The content is described in a manifest and the components that make up the manifest may be in the exchanged package or external to the package (referenced by URL).

2. A standard for the metadata describing the content in the cartridge (IMS Learning Object Metadata) - Common Cartridge is extensible to allow other metadata schemas.

3. A standard for test items, tests, and assessments (IMS Question and Test Interoperability). This standard allows learning systems to understand imported assessments as natively - so they can be manipulated (such as deciding what items are to be used and where in the flow of a course) as needed in the learning system. Common Cartridge includes a question bank (i.e., a QTI objectbank), offering instructors additional questions to those contained within the pre-configured assessments, which they can configure around the core material.

4. A standard for launching and exchanging data with external applications so that they can be part of a single learning experience orchestrated through the learning system (IMS Basic Learning Tools Interoperability). These can be literally any type of application in any location, such as social networking, wiki, external assessment systems, adaptive tutors, varieties of web-based content libraries, or other learning systems.

5. A schema for populating online discussion forums for collaboration among students. This allows such forums to be pre-populated with potential exercises, discussion threads, and so forth.

6. A schema for populating web links. This allows learning platforms to be pre-populated with links to relevant external resources.

7. An authorization standard (access rules) for each component of the package (IMS Authorization Web Service). This allows "protected" content or applications (those requiring a license) to be contained in a cartridge in a flexible way along with unprotected content.

   Note: Authorization support, as specified for Common Cartridge, does not represent a complete and coherent approach. Authorization in this context should be adopted with care and may best be left unimplemented until a future version of Common Cartridge addresses existing concerns.

For more information on Common Cartridge, consult the Frequently Asked Questions section of the IMS GLC website: http://www.imsglobal.org/cc/ccfaqs.html.

1.1 References

[BLTI, 10] *IMS Basic Learning Tools Interoperability (BLTI) v1.0*, IMS GLC, May, 2010.

[DC, 03] *Dublin Core Metadata Element Set, Version 1.1* (ISO 15836:2003).

[IEEE LOM, 05] *IEEE LOM Schema Binding* (1484.12.3-2005).

2 What's New in Common Cartridge 1.1

The Common Cartridge defines an open format for the distribution of rich, web-based content. It is designed to ensure the correct installation and operation of content across any Common Cartridge conformant platforms and tools. Version 1.0 was designed to offer existing implementations a low barrier to adoption of the Common Cartridge. Version 1.1 reflects feedback from market adoption resulting in, most significantly, the inclusion of Basic Learning Tools Interoperability.

Recent modifications to Version 1.0 approved by the Common Cartridge Accredited Profile Management Group (CC APMG):

- Support for Pattern Match assessment question type is now optional for learning platforms that do not support such a question type natively.
- CC Version 1.0 Lite compliance has been removed and support for authorization is now optional. Further, do to concerns raised during implementation efforts, IMS recommends against implementing authorization, as is, until an improved formulation appears in a future version of Common Cartridge.

Modifications included in Version 1.1:

- Cartridge manifest metadata must refer to version 1.0.0 or version '1.1.0'.
- Cartridges must now be packaged with the extension '.imscc', which replaces the use of '.zip' in Version 1.0.
- Support for Basic Learning Tools Interoperability Resources.
- Inclusion of a third end user role: '*Mentor'*. A context is no longer required when specifying a role.
- The only Resource metadata context value in Common Cartridge v1.0 was 'higher education'. In version 1.1, the values 'school', 'training' and 'other' are also permitted.
- Addition of an optional *intendeduse* attribute for Web Content Resources; initial attribute values to include: '*lessonplan'*, '*syllabus'* and *'unspecified'*.
- The 'rubric' element has been returned to the Assessment object (it is still prohibited in the Section and Item objects). Multiple 'rubric' entries are permitted and each 'rubric' has 'material as its sole child. The 'rubric' field is used to supply provide instructions relevant to the Assessment.
- New namespace locations for all schemas.
- Updated Weblink and Discussion topic Schemas.
- Increased QTI testing via schematron rules.
- Best Practice Updates: No spaces in filenames, directory and file references should employ all lowercase or all uppercase – no mixed case, all xml should be written in an xml editor to increase the chances of producing well-formed XML, percent (%) encoding is recommended for any addresses.
- Only one *object bank* is permitted per cartridge.
- *Matimage* documentation updated.
- *Setvar* attributes only can contain set.
- Guidance on QTI multiple/choice – multiple/response: while scoring is defined, feedback on a specific aggregation of responses it not. The community should not expect interoperability with respect to processing multiple responses consistently. For example, one should not expect to be able to consistently differentiate among different level of incorrectness.

2.1 Cartridge Metadata Specifying Version 1.1.0

The Common Cartridge must be described at the manifest level using meta-data according to the Common Cartridge profile of the IEEE LOM (loose binding) [IEEE LOM, 05], which describes the range of a mapping from the core elements of the Dublin Core specification v1.1 [DC, 03] to IEEE LOM. This application profile is restrictive. It uses the namespaces:

http://ltsc.ieee.org/xsd/imsccv1p1/LOM/manifest
http://ltsc.ieee.org/xsd/imsccv1p1/LOM/resource

which differ from the IEEE LOM namespaces. In contrast, meta-data for resources (see below) need to use the original IEEE LOM namespace.

The meta-data element as well as its schema and schema version element are required at the manifest level. They must be expressed as follows.

```
<metadata>
    <schema>IMS Common Cartridge</schema>
    <schemaversion>1.1.0</schemaversion>
      … metadata according to Common Cartridge profile of IEEE LOM …
</metadata>
```

2.2 New Extension for Common Cartridge Package

In Common Cartridge version 1.0, the package file should have the extension '.zip'; in Common Cartridge version 1.1, the extension must be '.imscc'. The principal reason why a new extension has been introduced is to aid in the rapid identification of files that are likely to be Common Cartridges.

2.3 Basic Learning Tools Interoperability (BLTI) Content Type

IMS Basic Learning Tools Interoperability (BLTI) v1.0 [BLTI, 10] provides a single framework or standard way of integrating rich learning applications or premium content with platforms such as Learning Management Systems, portals, or other systems from which applications can be launched—called Tool Consumers. The basic use case is to allow the seamless and secure integration of web-based, externally hosted applications and content, or Tools (from simple communication applications such as chat, to domain-specific learning environments for complex subjects such as math or science) to platforms that present them to users. In other words, if you have an interactive assessment application or virtual chemistry lab, it can be securely connected to learning/course management systems, portals, etc. in standard ways without having to develop and maintain custom integrations.

- A Basic LTI Link is a Learning Application Object that represents a self-contained LTI link.
- BLTI Link content is represented as a Resource object.
- It may be directly referenced from a folder Item object.
- The characteristic object Type must be the value 'imsbasiclti_xmlv1p0'.
- The Resource object *href* characteristic object is prohibited.
- The Resource object must contain a single File object, which references the BLTI Link descriptor XML file, which conforms to the http://www.imsglobal.org/xsd/imsbasiclti_v1p0 schema (see below).

A Basic LTI link is a simplified and self-contained LTI link. The Basic LTI link is defined in the resource section of an IMS Common Cartridge as follows:

```
<resource identifier="I_00010_R" type="imsbasiclti_xmlv1p0">
   <file href="I_00001_R/BasicLTI.xml"/>
</resource>
```

The *href* in the resource entry refers to a file path in the cartridge that contains an XML description of the Basic LTI

link.

```
<?xml version="1.0" encoding="UTF-8"?>
<cartridge_basiclti_link xmlns="http://www.imsglobal.org/xsd/imslticc_v1p0"
    xmlns:blti = "http://www.imsglobal.org/xsd/imsbasiclti_v1p0"
    xmlns:lticm ="http://www.imsglobal.org/xsd/imslticm_v1p0"
    xmlns:lticp ="http://www.imsglobal.org/xsd/imslticp_v1p0"
    xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation = "http://www.imsglobal.org/xsd/imslticc_v1p0
http://www.imsglobal.org/xsd/lti/ltiv1p0/imslticc_v1p0.xsd
                          http://www.imsglobal.org/xsd/imsbasiclti_v1p0
http://www.imsglobal.org/xsd/lti/ltiv1p0/imsbasiclti_v1p0.xsd
                          http://www.imsglobal.org/xsd/imslticm_v1p0
http://www.imsglobal.org/xsd/lti/ltiv1p0/imslticm_v1p0.xsd
                          http://www.imsglobal.org/xsd/imslticp_v1p0
http://www.imsglobal.org/xsd/lti/ltiv1p0/imslticp_v1p0.xsd">
    <blti:title>Grade Book</blti:title>
    <blti:description>Grade Book with many column types</blti:description>
    <blti:custom>
        <lticm:property name="keyname">value</lticm:property>
    </blti:custom>
    <blti:extensions platform="my.lms.com">
        <lticm:property name="keyname">value</lticm:property>
    </blti:extensions>
    <blti:launch_url>url to the basiclti launch URL</blti:launch_url>
    <blti:secure_launch_url>secure url to the basiclti launch URL</blti:secure_launch_url>
    <blti:icon>url to an icon for this tool (optional)</blti:icon>
    <blti:secure_icon>secure url to an icon for this tool (optional)></blti:secure_icon>
    <blti:vendor>
        <lticp:code>vendor.com</lticp:code>
        <lticp:name>vendor.name</lticp:name>
        <lticp:description>This is a vendor of learning tools.</lticp:description>
        <lticp:url>http://www.vendor.com/</lticp:url>
        <lticp:contact>
            <lticp:email>support@vendor.com</lticp:email>
        </lticp:contact>
    </blti:vendor>
    <cartridge_bundle identifierref="BLTI001_Bundle"/>
    <cartridge_icon identifierref="BLTI001_Icon"/>
</cartridge_basiclti_link>
```

The *launch_url* contains the URL to which the LTI Launch is to be sent. The *secure_launch_url* is the URL to use if secure http is required. One of either the *launch_url* or the *secure_launch_url* must be specified. It is acceptable to specify both and if both are specified, the Tool Consumer (TC) decides which to use. Typically, the TC will use a *secure_launch_url* when embedding the Tool in a secure page and the *launch_url* when embedding the tool in a non-secure page. So, it's important that the Tool Provider (TP) provides the same functionality whether the *launch_url* or *secure_launch_url* is used.

The **icon** and *secure_icon* are both optional and indicate a URL to be used for an icon to the tool.

Once the Basic LTI link is defined in the resources section of the cartridge manifest, it can be referenced in the organization section of the manifest as needed:

```
<item identifier="BasicLTI1" identifierref="I_00010_R">
   <title>Homework Problems</title>
</item>
```

The TC will generally display the *title* in the *item* entry in the user interface rather than **title** in the *basic_lti_link* entry.

The optional *custom* section can contain a set of key value pairs that were placed in the link in the system that originally authored the link. For example if the link were a section in an eTextbook, there might be a setting like:

```
<parameter key="section">1.2.7</parameter>
```

These parameters are sent back to the external tool when the tool is launched. If Basic LTI link is imported and then exported the *custom* should be maintained across the import/export process unless the intent is to re-author the link.

The **extensions** section allows the hosting TC to add its own key/value pairs to the link. The TC may use extensions to store information that the TC or authoring environment might use across an export-import cycle. In order to allow multiple sets of extensions to be contained in the same Basic LTI descriptor, authoring environments should add the *platform* attribute and include an identifier that identifies the authoring environment.

It is possible to include the icon for the link in the cartridge instead of including it as a URL using the *cartridge_icon* entry in the descriptor. The *identifierref* attribute points to a link that includes the icon image and a dependency is added to the resource section of the Basic LTI resource entry in the manifest as shown below.

```
<resource identifier="I_00010_R" type="imsbasiclti_xmlv1p0">
   <file href="I_00001_R/BasicLTI.xml"/>
   <dependency identifierref="BLTI001_Icon"/>
</resource>

<resource identifier="BLTI001_Icon"
   type="associatedcontent/imscc_xmlv1p0/learning-application-resource">
   <file href="BLTI001_Media/learning_icon.gif"/>
</resource>
```

2.4 New Mentor Role Metadata

There are situations where resources may need to be specified within the organization, but should not be made visible in player mode upon default import of the cartridge. One such situation is the inclusion of instructor manuals, lesson plans, instructor notes and solution files that should only be visible to instructors or perhaps instructors and mentors. In other situations, publishers may wish to provide additional, optional resources that may be selectively released to students or mentors and students, or mentors only, by the instructor at some later date. In each case, there is a need to indicate where the resources should appear within the organization even though the resources are not initially visible to learners in the cartridge player. These resources must be made visible in cartridge editors so that the settings may be modified when and if appropriate.

To meet these needs, the common cartridge applies optional “roles” meta-data associated with the resource in the manifest file. If not present, then the default behavior is that the resource would be viewable by all users. If present, then it declares the roles for which the resource would be viewable. The roles for which a specific resource is released are declared in the resource meta-data as the content of the elements:

```
lom/educational/intendedEndUserRole/vocabulary/value
```

The following supported roles are defined in the vocabulary:

```
IMSGLC_CC_Rolesv1p1
```

	Learner	**Instructor**	**Mentor**
CC version 1.0	√	√	
CC version 1.1	√	√	√

For example:

```
<lom:lom>
   <lom:educational>
      <lom:intendedEndUserRole>
         <lom:source>IMSGLC_CC_Rolesv1p0</lom:source>
         <lom:value>Learner</lom:value>
      </lom:intendedEndUserRole>
        <lom:intendedEndUserRole>
         <lom:source>IMSGLC_CC_Rolesv1p0</lom:source>
         <lom:value>Instructor</lom:value>
      </lom:intendedEndUserRole>
   </lom:educational>
</lom:lom>
```

Note:
In the CCv1.0 documentation the use of the LOM for resource metadata example is incorrect (sub-section 4.5.2). It makes use of the <lom:vocabulary> and has a duplicated <lom:value> entry. Instead the <lom:vocabulary> element is not used (this is not a permitted element in LOM) and a single instance of <lom:value> within each instance of <lom:intendedEndUserRole>, which is itself duplicated. In some cases the <lom:vocabulary> is replaced by a <voc:vocabulary> element and the 'voc' prefix is defined using a vocabulary namespace. This is also incorrect. No separate namespace/prefix is required and the 'vocabulary' element must not be used.

Also, a context is no longer required when specifying an intended end user role.

2.5 Additional Attribute for Cartridge Web Content Type

2.5.1 Cartridge Web Content Type

- Cartridge web content represents web content that may be referenced by any Learning Application Object in the cartridge.
- Cartridge web content is represented as a Resource object.
- It may be directly referenced from a folder Item object.
- The characteristic object Type must be the value 'webcontent'.
- *The characteristic object IntendedUse is optional and must be one of the values" 'lessonplan', 'syllabus', or 'unspecified'.*

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