IMS GLC Common Cartridge Profile: Conformance

Version 1.2 Final Specification

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1 Conformance

The Common Cartridge schema which profiles the CPv1.2 schema and the schemas which profile CC usage of LOM Metadata v1.0 and QTI v1.2.1 have been defined using the IMS SchemaProf tool v1.0. The tool produces a set of derived schemas, corresponding to the CC schema and its profiled auxiliary schemas, against which any cartridge must validate.

SchemaProf also allows the application of additional constraints which further constrain how CC may be used. These encompass:

1) Static constraints: The parameters (e.g. file names) are fixed in the profile (Example: imsmanifest.xml must exist at the root of the package).

2) Dynamic constraints: The parameters are taken from an instance document in the package (Example: href of a resource must point to a QTI file.

3) Conditional constraints: The constraint depends on a condition (Example: If parameter 'contenttype' is 'question' then attribute 'href' must point to a QTI file).

To be deemed to comply with the CC specification, cartridges must:

- Successfully validate against the CC schema set.
- Satisfy all of the additional constraints.

1.1 Conformance Testing Process

IMS Common Cartridge conformance enables interoperability of the packaging and delivery of content. As the use of Common Cartridge grows in use as a way to facilitate the exchange of educational content, the need to both broaden and narrow the scope of the specification's functionality has arisen. This is why the Common Cartridge Accredited Profile Management Group (CCAPMG) revises the specification to include new features, such as Learning Tools Interoperability in CC v1.1 and will revise the specification to include Curriculum standards in CC v1.2.

While the specification's original developers decided on what they believed to be a minimum set of criteria that would enable interoperability between systems and content, in actual use the set of criteria needed may be in fact, less than what was described. As more vendors and individuals are seeing the benefit of using Common Cartridge to package and exchange data, new tools are being developed which wish to make use of the Common Cartridge structure, but these tools may not have all the Common Cartridge functionality inherent in their tools.

In IMS, our goal is to enable interoperability and allow the broadest use of our standards while still maintaining the integrity of the specification and the use of IMS standards at the core of tools.

The CCAMPG is responsible for defining the criteria needed to achieve Common Cartridge conformance. Based on requests from vendors, the CCAMPG has revised the requirements for achieving CC v1.1 Conformance.

There are different processes and/or tests to achieve Common Cartridge Compliance for different types of tools:

- Cartridges
- Read Tools - These are tools which read in cartridges.
- Write Tools - These are tools which export or create cartridges.
- Read/Write Tools - These are tools which both read cartridges and export cartridges. They are tools which are capable of both importing and exporting cartridges, where the cartridge imported will be the same as the cartridge exported.

- Runners - These are tools which allow you to import and play common cartridges.

Up-to-date material on conformance can be found at:
http://www.imsglobal.org/developers/alliance/conformance.cfm

1.1.1 Requirements for CC v1.2 Conformance

Common Cartridge V1.2 Learning Platforms Allowable Exceptions List

Features	Details	Allowed as an exception Common Cartridge v1.2
IMS Manifest File		No
Export in Common Cartridge Format		Yes
Roles Meta-data	Instructor	No
	Student	No
	Mentor	Yes
.imscc file name		No
RESOURCE TYPES		
Basic LTI Links		Yes
Web Content		No
	intended use attribute	Yes
Web Links		No
Associated Content		No
Question Types		
	1) Multiple-Choice (single Response)	No
	2) Multiple - Choice (multiple Response)	Yes
	3) True/False	No
	4) Essay	Yes
	5) Simple fill in the blank	No
	6) Pattern Match	Yes
Discussion Forum		Yes
Authorization		Yes
Curriculum Standards		Yes

The new approach allows tools which do not inherently support functionality (such as discussion forums) the opportunity to gain Common Cartridge conformance. **All systems which do not support a feature of Common Cartridge must fail gracefully and indicate to the user that they do not support the feature. All systems must import cartridges to gain conformance, they may not fail at import regardless of the features contained in the cartridge.**

Applications for Conformance
We have grouped common types of tools together to allow testing for conformance to be done easily. If tools do not fit into one of the categories below, they may apply to the CCAPMG for special requirements.

1.1.2 Cartridge Testing

- Access the online validator (http://validator.imsglobal.org) if you are testing a cartridge. Choose which profile you would like to test against - CC v1.0 ,CC v1.1. or CC v1.2.
- Upload your cartridge, click upload and the test will run.
- When you have tested your cartridge and are ready to apply for conformance, go to the conformance validator (http://www.imsglobal.org/developers/alliance/conformancevalidator.cfm) which will gather some data to make

applying for conformance very easy.

- You will be taken to the online validator. Upload your cartridge. Choose which profile you would like to test against - CC v1.0 ,CC v1.1. or CC v1.2.
- Once the test is complete click on the link that says Apply for Conformance.
- Your cartridge test results will be posted in the form. Fill out the remaining data and click submit.
- You will be contacted and then apply the appropriate conformance mark to the product identified.

1.1.3 Read & Write Tools

- Each of the cartridges in the valid cartridge test data set are loaded into the tool and the contents saved locally in the tool's native database.
- The tool is used to reconstruct each test cartridge in turn, each being exported as a cartridge. The exported cartridge should be renamed to distinguish it from the original test cartridge - i.e., ccvtd0008v1p13.zip would be saved as, e.g., fred0008.zip.
- There is no requirement that the original cartridge metadata be carried forward to the exported cartridge (it is a new cartridge), but a new block of cartridge metadata should be created for the exported cartridge.
- The person conducting the test should compare the original cartridge to that exported to ensure that:
  - There is no loss of content.
  - There is no loss of resource metadata.
  - Any resources requiring authorization, have the authorization requirement carried through to the exported cartridge.
- Each of the exported cartridges should be tested using the online validator ensuring that you choose which profile you would like to test against, i.e., for CCv1.1 conformance the latest version of the CCv1.1 profile should be used, for CC v1.2 the CC v1.2 profile should be chosen.
- Upon satisfactory completion of the above tests, email conformance@imsglobal.org stating:
  - the date that testing was completed,
  - the product tested (and version number),
  - the conformance established (e.g. CCv1.1, CC v1.2),
  - indicate that you have achieved conformance for a read/write tool, indicate if you do not support all targeted Common Cartridge version,
  - the version of the CC valid cartridge test data set used.
- You will be contacted and then apply the appropriate conformance mark to the product identified.

1.1.4 Write Only Tools

- Any cartridge that is exported should be tested using the IMS online validator choosing CC v1.2 profile for testing.
- Upon satisfactory completion of the above test, email conformance@imsglobal.org stating:
  - the date that testing was completed,
  - the product tested (and version number),
  - the conformance established (e.g., CCv1.1, CC v1.2),
  - indicate that you have achieved conformance for a write only tool and any functionality you do not

support.

- You will be contacted and then apply the appropriate conformance mark to the product identified.

1.1.5 Runner Tools

- Download the valid test data set.
- Import all of the test cartridges into your product.
- Ensure that the cartridges display properly and all functionality is working.
- Upon satisfactory completion of the above test, email conformance@imsglobal.org stating:
  - the date that testing was completed,
  - the product tested (and version number),
  - the conformance established (e.g., CCv1.0, CC v1.1, CC v1.2),
  - indicate that you have achieved conformance for a runner tool (indicate if you do not support all of the targeted Common Cartridge functionality.
- You will be contacted and then apply the appropriate conformance mark to the product identified.

1.1.6 Read Tools

- Download the valid test data set.
- Import all of the test cartridges into your product.
- Ensure that the cartridges display properly and all functionality is working.
- Once you have passed all of the tests successfully, send an email to conformance@imsglobal.org including the following:
  - the date that testing was completed,
  - the product tested (and version number),
  - the conformance established (i.e. CCv1.2),
  - the profile version of the CC test tool used,
  - the version of the CC valid cartridge test data set used,
  - the type of tool tested (tool).
- You will be contacted and then apply the appropriate conformance mark to the product identified.

1.1.7 Read/Write and Read Tool Conformance Testing

Conformance testing of an LMS or Tool is performed by self-inspection on the part of the vendor or supplier. A set of valid cartridges (the valid cartridge test data set) is available for this purpose from the CC & LTI Alliance implementer's tools page (http://www.imsglobal.org/developers/alliance/testharness.cfm). This test data set has been designed to cover all of the features of the Common Cartridge specification and each cartridge has been validated using the cartridge testing tool.

Conformance testing of a read/write and read tools should be conducted as follows. For each cartridge in the valid cartridge test data set, the operator should:

- Use the import function to import the cartridge into the database.
- Verify by inspection that the cartridge contents has been correctly identified by the import routine and loaded

appropriately into the database.

- Run through the content, logged-on with instructor privileges to ensure that all of the features present are handled correctly by the tool.
- Run through the content, logged-on with learner privileges to ensure that all of the features present are handled correctly by the tool.

If the tool is able to import and/or export and process without issue, all of the cartridges in the valid cartridge test data set, then the tool is deemed to have successfully passed testing and the CC conformance mark can be applied.

1.1.8 Further Guidance on Tool Conformance Testing

The following areas need to be inspected to establish that an LMS imports and executes a cartridge correctly:

- On import, the tool should confirm that the cartridge has imported correctly or provide notification of any errors that occurred. Error messages should attempt to direct the user to the problem within the cartridge such as identify a resource that could not be located within the cartridge.
- If the cartridge requires import authorization, the tool should prompt the user for an authorization key and confirm the authorization through the specified web service. If the tool does not support authorization, the cartridge should be rejected.
- Verify that each item listed in the manifest appears in the content area for the course. The browsing structure should match that in the manifest.
- Test each media link to confirm that it responds properly. Web content links should direct you to the appropriate site. References to content local to the cartridge should find the referenced media and open the media with the appropriate device. (It is appropriate to attach a style sheet for html content local to the cartridge. These style sheets should be respected in the display of content.)
- If authorization is required at the content level, confirm that the LMS directs the user through the authorization process (same as above) prior to allowing access to the content. Authorization is not required for administrators or instructors. Again, if authorization is not supported, access to the content should be denied.
- Assessment items: Import will vary depending on the tool. However, the tool should support any assessment option (time limit, feedback, question type) that is available for native content.
- Verify that discussion topics import into a discussion forum appropriate for the course.. A new topic should be created using the ‘text’ field in the xml as the prompt. Check each attachment link. Post to the topic as a test.

1.1.9 Common Cartridge Conformance Mark

After you have submitted your successful conformance information to conformance@imsglobal.org, you may then apply the appropriate conformance mark. The CC/BLTI conformance chart will list your conformance details. If you have any questions, please feel free to contact us at any point.

Membership in the Common Cartridge & Learning Tools Interoperability Alliance is the only way to achieve official conformance to the Common Cartridge (CC) standard. Digital content or learning platforms must exhibit the marks shown here, signifying achievement of the official conformance process, to be compliant to IMS CC. Products without these marks are not considered to be compliant by IMS GLC.

1.2 Cartridge Compliance

IMS GLC has an online self-test tool to check cartridges. Users may check for valid cartridges at http://www.imsglobal.org. IMS GLC also supplied valid test cartridges, example cartridges, and other support tools for IMS Common Cartridge Alliance Members. Members of the Alliance can apply for Common Cartridge Compliance.

Note that with the inclusion of Basic Learing Tools Interoperability (BLTI) in CC v1.1 and CC v1.2, it may be useful to consider BLTI Conformance along with CC. For information about Basic Learning Tools Interoperability Conformance, visit: http://www.imsglobal.org/developers/alliance/LTI/blti-cert/index.cfm.

1.2.1 Cartridge Assessments & Question Banks

The Common Cartridge supports profiles of the following question types:

- Multiple Choice (Single Response)
- Multiple Choice (Multiple Response)
- True/False
- Essay
- Simple Fill in the Blank – single response box with single correct answer that is processed as an exact match
- Pattern Match – single response box with multiple potential answers that support exact match, containment matching

The profiles for each of these question types describe how they support optional features such as:

- feedback
- hints
- sample solutions
- relative scoring

In addition, questions support optional meta-data attributes which describe:

- a suggested weighting for the question in the assessment
- a category for the question

Section 4.10 in the *Common Cartridge Profile: Implementation* [CC,11e] document describes the use of these features as they are supported by the CC profile of QTIv1.2.1. Cartridge implementers wishing to use these optional features must adhere to the CC QTI schema and cartridges will be tested for compliance. However, it should be noted that support for these optional features is not mandatory for CC compliant platforms. Thus it cannot be assumed that all optional QTI features harnessed in a cartridge will be supported by a given platform.

1.2.2 Scope of Cartridge Tests

IMS provides an online cartridge validation tool. The tool is located at: http://validator.imsglobal.org.

This test system is made available free-of-charge so that you can perform your own testing of cartridges for conformance with the IMS Common Cartridge v1.2 specification.

The validator will:

- Test unzipping the cartridge.
- Test correctness and completeness of references in imsmanifest.
- Do XML validation of all XML files in the cartridge using namespaces for which profiles are defined in the CC spec (including imsmanifest and all QTI files).
- Report XML files in the package which were not checked (either since they did not concern CC or the namespace given was incorrect).
- Do Schematron validation for all XML files in the package for which the CC spec has defined conditional modifications.

- Enable further Content Packaging specific tests, not currently required by the CC profile (n.b. for inter-package references using xpointer, the test will confirm the existence of the remote package, but will not interrogate its content).
- Add support for additional constraints as created with SchemaProf, including:
    - Checking restriction of Mime types and file size.
    - Validating XML files in the package against arbitrary schemas specified in the domain profile.
    - Check correct use of VDEX vocabularies.
- Perform full validation against auxiliary profiles including an assertions and constraints associated with them.

1.2.3 Limitations of Cartridge Testing

- The testing tool will ensure the presence of appropriate media files for a learning application resource (e.g., mpg, jpg), but not verify their internal structure.
- The testing tool will not apply run-time tests to the cartridge content.
- CC requires that the cartridge meta-data identifies any client-side players or web-browser plug-ins required to run the content. This is expressed as free-text and so will not be tested.

1.3 Tool Compliance

From an tool perspective, the CC specification defines:

- The syntax for cartridges which a platform must be able to successfully import.
- A set of features that the tool must be capable of supporting at runtime.

The criteria for platform compliance are:

- Successful import of compliant cartridges without error.
- Correct runtime delivery of the content and features defined in compliant cartridges.

No runtime model is defined for Common Cartridge, this being left as an issue for the implementer and therefore runtime behavior (in particular presentation) will differ across platforms.

A test data set of cartridges has been constructed for evaluating platform compliance as is described below.

Platform vendors are required to assess compliance by self-inspection using the available test data set corresponding to the version of CC that they have implemented.

1.3.1 CC Compliance

Only platforms which meet the conformance requirements identified in the CC specification and apply through IMS GLC and can claim CC compliance. IMS GLC maintains the only official source of Common Cartridge compliance. See http://www.imsglobal.org/cc/statuschart.html.

1.3.2 CC Authorization

We suggest that protection of content in cartridges be done with Basic Learning Tools Interoperability.

1.3.3 Cartridge Assessments & Question Banks

Section 4.10 describes the use of optional QTI features as they are supported by the CC profile of QTIv1.2.1. learning platforms / tools must support the six basic question types, but it is not mandated that a platform must support any of these optional features. Thus when a compliant platform encounters such optional features included in a cartridge, the platform is at liberty to ignore any which it does not implement.

The IMS QTI specification offers great flexibility for implementers to select those features they wish to support or are required by their users. Given the present variability in existing QTI implementations, it is not feasible at this stage to mandate that all platforms must support all optional features associated with the supported question types.

1.3.4 Basic LTI

Conformance for Basic LTI is granted through the IMS CC-LTI Alliance and consists of certification testing for TC and TP implementations. For additional information about conformance, visit the CC-LTI Alliance here: http://www.imsglobal.org/cc/alliance.html.

1.3.5 Reading or Runner Tool Testing

The tool vendor will conduct a self-administered test, based on the CC test data set. The platform must correctly import, store and deliver all of the examples in the test data set.

The following guidelines are offered for testing import of Common Cartridges into a tool:

- On import, a tool should confirm that package has imported properly or that there were errors importing the package. Error messages should attempt to direct the user to the problem within the package such as identify a resource that could not be located within the package.
- If the package requires import authorization, the tool should prompt the user for an authorization key and confirm the authorization through the specified web service. If the TOOL does not support authorization, the package should be rejected.
- Verify that each item listed in the manifest appears in the content area for the course. The browsing structure should match that in the manifest.
- Test each media link to confirm that it responds properly. Web content links should direct you to the appropriate site. References to content local to the package should a) find the referenced media and b) open the media with the appropriate device. (It is appropriate to attach a style sheet for html content local to the package. These style sheets should be respected in the display of content.)
- If authorization is required at the content level, confirm that the TOOL directs the user through the authorization process (same as above) prior to allowing access to the content. Authorization is not required for administrators or instructors. Again, if authorization is not supported, access to the content should be denied.
- Assessment items: Import will vary depending on the tool. However, the tool should support any assessment option (time limit, feedback, question type) that is available for native content.
- Verify that discussion topics import into a discussion forum appropriate for the course. A new topic should be created using the <text> in the xml as the prompt. Check each attachment link. Post to the topic as a test.
- If an web resource has an *intendeduse* and the tool support special handling, such special handling should be employed.

1.4 Test Data Set

A test data set of cartridges is available to members of the CC Alliance to enable self-testing of platforms for CC compliance. The test data set is comprised of two sets of example cartridges:

- Valid cartridges which exercise the scope of the features supported in the Common Cartridge.
- Known error cartridges which provide coverage of errors liable to occur in cartridges.

Implementers requiring access to the test data set should visit: http://www.imsglobal.org/cc/jointhealliance.cfm

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