TECHNICAL REPORT

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Information technology — Learning, education, and training — Content packaging —

Part 3: Best practice and implementation guide

Technologies de l'information — Apprentissage, éducation et formation — Paquetage du contenu —
Partie 3: Meilleure pratique et guide de mise en application

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

In exceptional circumstances, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide to publish a Technical Report. A Technical Report is entirely informative in nature and shall be subject to review every five years in the same manner as an International Standard.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC TR 12785-3 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 36, *Information technology for learning, education and training*.

ISO/IEC 12785 consists of the following parts, under the general title *Information technology — Learning, education, and training — Content packaging*:

— *Part 1: Information model*

— *Part 2: XML binding*

— *Part 3: Best practice and implementation guide* [Technical Report]

0. Introduction

0.1 Purpose and overview

The primary focus of this part of ISO/IEC 12785 is on sharing existing best practice and providing suggested practice for implementing the functionality included in this part of ISO/IEC 12785. The ISO/IEC 12785 series has been commonly used in the learning, education, and training (LET) domain and this part of ISO/IEC 12785 is intended to support this use. It focuses on the construction of instances of manifest documents and the content packages they define.

0.2 Compatibility

Given the widespread adoption of IMS Content Packaging and the proliferation of hundreds of thousands of IMS content packages, it is important that existing software components continue to process content packages they were designed to handle, and that new software components conforming to the ISO/IEC 12785 series also process the older IMS content packages as designed. Newer systems will need the ability to process the new extension objects [1)] introduced in the ISO/IEC 12785 series that enable linking and referencing behaviors. The functionality of these new extension objects are described in Clause 5 of this part of ISO/IEC 12785, and normative descriptions are contained in ISO/IEC 12785-1.

The new extension objects are defined in a separate namespace that leverages the extension points and semantics of the ISO/IEC 12785 series without affecting the existing IMS Content Packaging namespace. ISO/IEC 12785 also separates the lists of vocabulary terms used by certain objects in the information model (and a dedicated new namespace) from the model itself. These details are contained in the IMS GLC Specification Development Note 11: Vocabulary Definition, Registration, and Maintenance Procedures.

By taking this approach, we hope that the best of the past is preserved as it provides a strong foundation for future growth without having to alter the structural integrity of the ISO/IEC 12785-1 information model (a detailed, normative description of backwards and forwards compatibility is contained in ISO/IEC 12785-1).

1) The extension refers to those elements that have been newly introduced with IMS Content Packaging version 1.2 which is a source of ISO/IEC 12785.

Information technology — Learning, education, and training — Content packaging

Part 3: Best practice and implementation guide

1 Scope

This part of ISO/IEC 12785 presents use cases and shows how they are satisfied by ISO/IEC 12785-1 which is derived from the IMS Global Learning Consortium (GLC) Content Packaging version 1.2 (v1.2).

Though not exhaustive, the range of use cases presented in this part of ISO/IEC 12785 illustrate how the most common issues in the creation, management, and playback of learning material can be addressed by the ISO/IEC 12785 series. The use cases were contributed by various implementers and users of the IMS Content Packaging and are based on years of practice.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated reference, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 12785-1:2009, *Information technology — Learning, education, and training — Content packaging — Part 1: Information model*

IETF RFC 1951 (1996), *DEFLATE Compressed Data Format Specification version 1.3*

3 Terms and definitions

For purposes of this document, the following terms and definitions apply.

3.1
child manifest
complete, subordinate manifest contained in or referenced by the parent manifest

NOTE 1 According to IMS Content Packaging version 1.2 (and ISO/IEC 12785-1), a manifest can contain more than one child manifest.

NOTE 2 A manifest can include a reference to a child manifest that is external to the interchange package.

NOTE 3 A child manifest describes a complete logical package that is part of the larger logical package defined by its parent manifest.

NOTE 4 A child manifest can be local or remote.

Adapted from ISO/IEC 12785-1:2009.

3.2
content
individual file or multiple files usable in learning, education and training

NOTE 1 A logical unit of usable (and reusable) information can be described by a logical package.

NOTE 2 A logical package can contain one or more units of content.

3.3
content file
collection of files, including at least one manifest file, and conforming to the ISO/IEC 12785-1 information model and the ISO/IEC 12785-2 XML binding

NOTE Content files can be local or remote.

3.4
control file
single computer file that governs the binding of the Content Packaging Information Model (CPIM) to make it suitable for machine processing

NOTE A software component can refer to a control file when assessing the validity of a bound instance of the information model or to guide the creation of a bound instance of the information model. For example, a file containing an XML schema can be used as a control file for an XML binding of a manifest.

[ISO/IEC 12785-1:2009, 3.4]

3.5
interchange package
set of usable (reusable) LET content that is exchanged among computing systems used for information technology for learning, education and training (ITLET) purposes

NOTE An interchange package can be instantiated in a single compressed binary file (package interchange file) or as a collection of files on portable media (e.g. CD, DVD, USB memory device).

[ISO/IEC 12785-1:2009, 3.5]

3.6
manifest
description of files and any logical relationships between them, contained or referenced in a content package

3.7
metadata
〈content packaging〉 descriptive information about logical packages, logical organizations, content, and files

NOTE 1 Metadata can be assigned to any of the components within the logical package including the manifest.

NOTE 2 Any binding of a metadata object is permitted. Each object of metadata can be local or remote.

[ISO/IEC 12785-1:2009, 3.12]

3.8
namespace
XML namespace identified by a URI reference

NOTE Namespace in Content Packaging follows W3C recommendation, *Namespaces in XML 1.0 (Second Edition)*.

[ISO/IEC 12785-1:2009, 3.13]

3.9
organization
logical relationships, such as a hierarchical tree, among a unit of content

NOTE More than one logical organization can be described in a manifest.

3.10
package
unit of usable (and reusable) LET content

NOTE 1 This can be part of a learning course that has instructional relevance outside of a LET content aggregation and can be delivered independently, as an entire learning course or as a collection of learning courses.

NOTE 2 A package is able to stand-alone, that is, it contains all the information needed to use the contents for learning, education, and training when it has been unpacked.

[ISO/IEC 12785-1:2009, 3.14]

3.11
package reader
software that processes an interchange package by checking statements in the manifest against corresponding contents and organization

NOTE 1 A package reader can process both logical and physical packages.

NOTE 2 The term “process” may include the retrieval and storage of information referenced by the manifest, the decompression or unpacking of local files from a PIF, and the retrieval and/or logging of addresses of remote files

3.12
package writer
software that creates or modifies an instance of an interchange package and assembles content file(s) and other files declared local to the interchange package and writes them to the targeted interchange package binding, or delegates those tasks to another software typed process

[ISO/IEC 12785-1:2009, 3.17]

3.13
package interchange file
PIF
instantiation of an interchange package which is physically encapsulated as a compressed binary file conforming to IETF RFC 1951 (1996)

NOTE 1 An interchange package may be instantiated in a format other than a package interchange file (PIF).

NOTE 2 The representation (binding) is usually expressed in XML.

EXAMPLE An interchange package can be instantiated as a collection of files on removable media, e.g. CD, DVD, USB memory device, or compressed using another format such as .zip, .tar, .jar, .cab.

[ISO/IEC 12785-1:2009, 3.15]

3.14
resource (in content packaging)
one URL entry point and zero or more references to files that are required before the content is launched

NOTE The files described by a resource can be local or remote.

3.15
unit of content
either a file or a grouping of files which can be represented within a manifest

4 Abbreviated terms

CPIM	Content Packaging Information Model
ITLET	Information Technology for Learning, Education and Training
LET	Learning, Education, and Training
LMS	Learning Management System
LOM	Learning Object Metadata
METS	Metadata Encoding and Transport Schema
PIF	Package Interchange File
SCO	Sharable Content Object
SCORM	Sharable Content Object Reference Model
URI	Uniform Resource Identifier (IETF RFC 3986)
XML	Extensible Markup Language (W3C XML)
XSD	XML Schema Definition

5 Using content packages — Use cases and practices

The use cases in this clause illustrate key functionalities of ISO/IEC 12785 by focusing on particular goals that users of the standard may have and then outlining how such goals can be achieved. The section is not exhaustive neither in illustrating all features of the standard nor in outlining all uses of a specific feature.

5.1 Typical practice

Typically, a package contains all its resources in the PIF and uses a ZIP archive for its interchange format. It has only one manifest; no child-manifests are included. All content files are declared in the manifest and are included physically in the package. When material needs to be presented in more than one language or accessibility modality, two types of organization are contained in the manifest.

Content packages that comply with the most popular content-packaging profile, ISO/IEC 29163 SCORM, also typically follow this simple pattern.

Simple content packages are likely to be most widely supported in various Learning Management System (LMS), and therefore, are the most robust in interoperability.

Table 1 — Use case of the classic package

Level:	Primary use case
Actors:	Primary: Content authors[2)] Secondary: Content repositories
Stakeholders:	Content developers
Interest:	Content-development tool developers
Basic flow of events:	• The content author creates required content. • A PIF (usually a ZIP file) is created that includes a manifest file and Web content resources simply using a packaging tool such as RELOAD[3)]. • The PIF is deposited into a repository and/or LMS.
Alternative flow of events:	• A content author creates ISO/IEC 29163 SCORM compliant content. • A PIF is created including all ISO/IEC 29163 SCORM compliant files, such as metadata. • The PIF is deposited into a repository and/or LMS.
Success factors:	• All resources are contained within the PIF. • Packages are easily ingested by (legacy) compliant LMS systems.

Note: The “Simple_Manifest_Core” package in the set of examples that is included with this standard is a typical instance of a simple package. The example packages are available on the IMS website: http://www.imsglobal.org/content/packaging/index.html

5.2 Keeping control over resources after a package has been published

Originally, a PIF, such as a ZIP archive, was intended to function solely as a means of transporting a course from one delivery environment (e.g., an LMS) to another. In practice, however, often a course is delivered from the PIF after the PIF has been imported in an LMS, thereby changing the nature and use of the PIF that contains the course from a transport mechanism to a content management device.

Though this does work, there are cases where it is desirable not to copy the content that is aggregated in a PIF, but have it reside on a central server. That way, access to the resources can be controlled more easily; content files can be updated at any point in time and use monitored more accurately by the publisher.

2) Content authors design the logical structure of content,e.g. teacher, professor, and instructional designer.

3) See the reference: http://www.reload.ac.uk/tools.html.

Table 2 — Use case of keeping control over resources

Level:	Primary use case
Actors:	Primary: Content authors Secondary: Content repositories and learners
Stakeholders:	Content managers
Interest:	Content authoring tool developers
Basic flow of events:	1) The content author searches for content files on a variety of repositories. 2) The content author composes a content package manifest that contains absolute references to the remote files in the repositories. 3) The content package manifest is sent to a variety of LMSs. 4) A learner accesses the content package manifest in an LMS. 5) Content files are retrieved from the remote repositories independent from LMS.
Alternative flow of events:	1) The content author creates new content files and deposits them in one or more repositories. 2) The content author composes a content package manifest that contains absolute references to the resources located remotely in the repositories. 3) References in the content package manifest are coded to uniquely identify the instances of the manifest that are sent to a specific LMS or organization. 4) An LMS can be granted or denied access to the resources by the repositories, depending on the construction of the references or some other authentication and authorization mechanism determined by the repository.
Success factors:	• The content owner can control access to content files at any point in time. • The content owner can monitor content file usage at any point in time. • Updates to content files are propagated automatically.

5.3 Aggregate content at an appropriate level of granularity

A sharable content object (SCO) of ISO/IEC 29163 SCORM is the lowest aggregation level at which a learner's progress through a course can be tracked in ISO/IEC 29163 SCORM. Despite this fact, SCOs often contain multiple pages of content. This makes it difficult to track precisely where a learner is in the material.

Child-manifests can be used to resolve this issue. Individual child-manifests can describe individual sub-components (e.g. one manifest for each individual page of content) that would otherwise be undifferentiated in a single SCO. As defined above (3.1) a child-manifest is a complete, subordinate manifest contained within or (from ISO/IEC 12785 onwards) referenced by a main or parent manifest. A child-manifest describes a complete logical package that is part of the larger logical package defined by its parent manifest.

