IMS Content Packaging XML Binding

Version 1.1 Final Specification

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1.   Introduction

1.1   Overview

This document describes the XML binding for the IMS Content Packaging specification. This document specifies the binding of the Content Packaging specification in the W3C XML 1.0 Specification.

There are some specific rules that have guided the creation of this XML binding document:

- The XML binding will adhere to the XML 1.0 Specification of the W3C.
- It must maintain the definitional structure of the specification.
- It must permit extensions.

1.2   Scope & Content

This document is the IMS Content Packaging XML Binding specification. As such it will be used as the basis for the production of the following documents:

- IMS Content Packaging XML DTD.
- IMS Content Packaging Best Practice Guide.

This binding has been derived from the agreed IMS Content Packaging Information Model [Content, 00a] and conforms to the XML 1.0 Specification [XML, 98] of the W3C.

1.3   Structure of this Document

The structure of this document is:

2. XML Basics	A brief description of the components within an XML schema.
3. Narrative Description of XML Binding	The description of the elements and attributes used within the XML binding itself.
4. Samples	Several samples of content packages.
Appendix A - Content Packaging DTD	A copy of the uncommented DTD.
Appendix B - Draft Content Packaging W3C XML Schema	A copy of the uncommented W3C XML Schema.
Appendix C - Additional Resources	Refrences to other Content Packaging related resources.
Appendix D - Contributors	A listing of individuals who contributed to the development of this document.

1.4   Nomenclature

CDATA	Character Data
CPI	Content & Packaging Interchange
DTD	Document Type Definition
PCDATA	Parsed Character Date
W3C	World Wide Web Consortium

XDR   XML Data Representation

XML   Extensible Mark-up Language

1.5   References

[ISO/IEC10646]   ISO (International Organization for Standardization). ISO/IEC 10646-1993 (E). Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Part 1: Architecture and Basic Multilingual Plane. [Geneva]: International Organization for Standardization, 1993 (plus amendments AM 1 through AM 7).

[Unicode, 96]   The Unicode Consortium. The Unicode Standard, Version 2.0. Reading, Mass.: Addison-Wesley Developers Press, 1996.

[XML, 98]   XML 1.0 Specification of the W3C: http://www.w3.org/TR/1998/REC-xml-19980210.

[XML, 99]   XML Namespace Recommendation of W3C: http://www.w3.org/TR/1999/REC-xml-names-19990114.

                      XML Schema Recommendation of W3C: http://www.w3.org/XML/Schema.html.

[Content, 00a]   *IMS Content Packaging Information Model*, T.Anderson, Version 1.1, IMS, April 2001.

[Content, 00b]   *IMS Content Packaging Best Practice Guide*, T.Anderson, Version 1.1, IMS, April 2001.

2.   XML Basics

The Content Packaging data model can be defined as a hierarchy. Hierarchical models are convenient for representing data consisting of many elements and sub-elements. XML is perfectly suited for representing hierarchical models. An XML document is a hierarchy comprised of **elements** that have **contents** and **attributes**.

2.1   Elements

An element is a component of a document that has been identified in a way a computer can understand. Each element has a **tag name**. When a tag name is shown as "<TAGNAME>", with less-than and greater-than symbols before and after the tag name, it serves as the **start-tag** to mark the beginning of an element. When that same tag name has a forward slash "/" added, it serves as an **end-tag** such as "</TAGNAME>". An element may have contents between its start and end-tags, and may have one or more **attributes**. When an XML element has a start and end-tag (also called an **opening** and **closing** tag) with a common name, it is considered to be "well-formed" XML. The contents of an element are placed between the start and end-tags as shown below:

```
<TAGNAME>contents</TAGNAME>
```

2.1.1   Element Contents

An element may contain other elements, Parsed Character Data (PCDATA), Character Data (CDATA), or a mixture of PCDATA and elements. The allowable contents of an element are its **content model**. PCDATA really means any character string that does not contain elements. PCDATA is what the bulk of elements will use between their start and end-tags. CDATA is different in that it is a method for adding any character data that should not be processed. For example, you could add some JavaScript code instructions using a CDATA section. A CDATA section tells the parser not to look for any mark-up until after it locates the end of the CDATA section.

2.1.2   Element Attributes

An attribute provides additional information about an element. Attributes are a way of attaching characteristics or properties to the elements of a document. An element may have more than one attribute. Attributes are contained within the start tag of an element. Attributes are represented by an attribute name followed by an equal sign and the attribute value in quotation marks:

```
<timeframe>
<begin restrict="1"> 1999-07-23 </begin>
</timeframe>
```

In this example, the `timeframe` element contains another element: the `begin` element. The `begin` element has one attribute "restrict", with the value "1". The value for the element `BEGIN` is "`1999-07-23`". These two elements then make up a `timeframe` `begin` date.

2.1.3   Element Names

Each element has a unique name, referred to as the tag name. XML is case-sensitive in its processing of tag names. The IMS Content Packaging XML Binding adheres to the following tag name rules:

- All tag names will conform to the rules for element naming as given within the XML 1.0 Specification.

- Names beginning in XML in any case or mix of cases are not permitted.

- The IMS binding will use only lowercase tag and element names.

- Element names may not include words reserved by the XML specification. These include:

  DOCTYPE
  ELEMENT
  ATTLIST
  ENTITY

- Tag names defined by the IMS binding may not be redefined.

2.2   Document Type Definitions

The tag name, content model, and attributes of elements are defined in a **Document Type Definition** (DTD) statement. This may exist as an external file or a block of text internal to an XML document. Internal DTDs are used to override elements defined in external DTD files, so an internal DTD should be used with care. The DTD defines the elements that may be used, and may define the contents of the elements.

This specification defines a DTD (ims_cp_rootv1p1.dtd) as a non-normative reference. Some XML editors may make use of a DTD to help guide the developer in creating the proper elements at the proper locations in an XML file. Other developers will make use of DTDs to validate their XML documents to ensure their document is consistent with all of the element names and locations defined in the DTD. Details of the construction of DTDs are outside the scope of this document, but links to the XML 1.0 Specification are included in section 1.5 of this document.

2.3   XML Schemas

A schema is a formal specification of element names that indicates which elements are allowed in an XML document, and in which combinations. New schema languages, such as those defined in the XML-Schemas Working Group, provide the same baseline functionality as a DTD. However, because these schema languages are extensible, developers can augment them with additional information, such as data types, inheritance, and presentation rules. This makes these new schema languages far more powerful than DTDs. For more information about XML schemas, there is a link to the W3C XML Schema Recommendation in section 1.5.

This specification defines a W3C XML Schema, and a Microsoft XML-Data Schema as non-normative references. Some XML editors may make use of these schemas to help guide the developer in creating the proper elements at the proper locations in an XML file. Other developers will make use of the schemas to validate their XML documents and/or to define extensions to the IMS Content Packaging Binding. Details of the construction of schemas are outside the scope of this document.

2.4   Valid Character Sets

A Content Packaging record must use UTF-8 or UTF-16 encoding of the character sets as defined in ISO 10646. See the XML Version 1.0 for more details on the specification of well-formed XML.

2.5   Special Handling Requirements

2.5.1   XML Reserved Characters

Some characters used in XML must be *escaped* when used outside of their XML-defined usage as found in section 2.4 of the XML 1.0 Specification. These characters are ampersand (&), less than (<), greater than (>), apostrophe ('), and the double-quote character (").

These characters may be represented using either numeric character references or the strings "&", "<", ">", "'", and """.

Below is a more complete quote from the W3C XML standards:

Quote from Extensible Markup Language (XML) 1.0
W3C Recommendation 10-February-1998
2.4 Character Data and Markup

"Text consists of intermingled character data and markup. Markup takes the form of start-tags, end-tags, empty-element tags, entity references, character references, comments, CDATA section delimiters, document type declarations, and processing instructions.

"All text that is not markup constitutes the character data of the document.

"The ampersand character (&) and the left angle bracket (<) may appear in their literal form only when used as markup delimiters, or within a comment, a processing instruction, or a CDATA section. They are also legal within the literal entity value of an internal entity declaration; see "4.3.2 Well-Formed Parsed Entities". If they are needed elsewhere, they must be escaped using either numeric character references or the strings "&" and "<" respectively. The right angle bracket (>) may be represented using the string ">", and must, for compatibility, be escaped using ">" or a character reference when it appears in the string "]]>" in content, when that string is not marking the end of a CDATA section.

"In the content of elements, character data is any string of characters, which does not contain the start-delimiter of any markup. In a CDATA section, character data is any string of characters not including the CDATA-section-close delimiter, "]]>".

"To allow attribute values to contain both single and double quotes, the apostrophe or single-quote character (') may be represented as "'", and the double-quote character (") as """."

2.5.2   White Space Handling

Questions often arise as to whether web-based data transmission tools might inadvertently strip off or transform some of the white space characters embedded in data transmitted between systems using XML. To eliminate concern about this issue, refer to the following quote from the W3C XML standards, which indicate that all white space must be preserved where it is part of the data.

Quote from Extensible Markup Language (XML) 1.0
W3C Recommendation 10-February-1998
2.10 White Space Handling

"In editing XML documents, it is often convenient to use "white space" (spaces, tabs, and blank lines, denoted by the non-terminal S in this specification) to set apart the mark-up for greater readability. Such white space is typically not intended for inclusion in the delivered version of the document. On the other hand, "significant" white space that should be preserved in the delivered version is common, for example in poetry and source code.

> *"An XML processor must always pass all characters in a document that are not mark-up through to the application. A validating XML processor must also inform the application which of these characters constitute white space appearing in element content.*

"A special attribute named xml:space may be attached to an element to signal an intention that in that element, white space should be preserved by applications. In valid documents, this attribute, like any other, must be declared if it is used. When declared, it must be given as an enumerated type whose only possible values are "default" and "preserve". For example:

"<!ATTLIST poem xml:space (default|preserve) 'preserve'>

"The value "default" signals that applications' default white-space processing modes are acceptable for this element; the value "preserve" indicates the intent that applications preserve all the white space. This declared intent is considered to apply to all elements within the content of the element where it is specified, unless overridden with another instance of the xml:space attribute. "

3. Narrative Description of XML Binding

This specification defines the XML format using narrative. XML DTDs and XML Schemas that implement this *abstract* format are referenced as non-normative parts of this specification.

3.1 <manifest> Elements

Description. The first, top-level <manifest> element in the Manifest encloses all the reference data. Subsequent occurrences of the <manifest> elements inside the top-level <manifest> are used to compartmentalize files, meta-data, and organization structure for aggregation, disaggregation, and reuse. The best-practice use of the IMS Content Packaging specification will result in each "learning object" or "atomic unit of learning" being placed within its own <manifest> element.
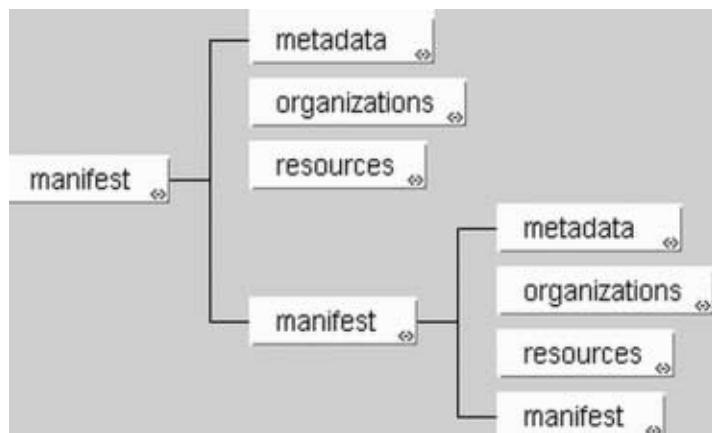
Figure 3.1 <manifest> elements.

Multiplicity. The top-level <manifest> occurs once and only once within the IMS Manifest file.

Attributes

*   **identifier (required).** An identifier, provided by an author or authoring tool, that is unique within the Manifest. Data type = string

*   **version (optional).** Identifies the version of the Manifest. Is used to distinguish between manifests with the same identifier. Data type = string

Elements

*   <metadata>

*   <organizations>

*   <resources>

*   <manifest>

3.1.1 <metadata>
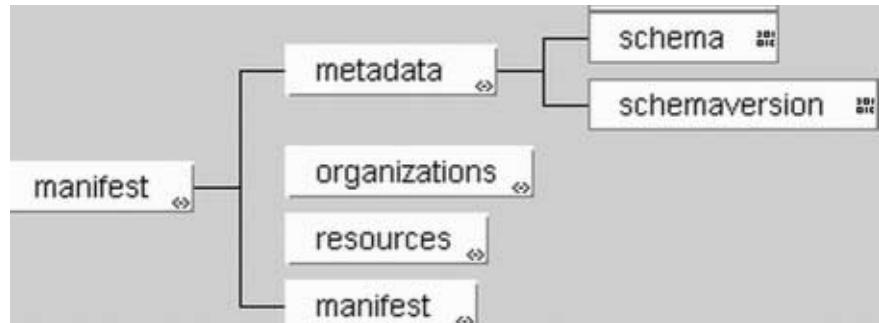
Figure 3.2 <metadata> elements.

Multiplicity. Occurs zero or once within a <manifest> element.

Elements

- <schema>

- <schemaversion>

- IMS Meta-data: Implementers are free to choose from any of the meta-data elements defined in the IMS Meta-data Specification v1.1

Example

```
<metadata>
  <schema>IMS Content</schema>
  <schemaversion>1.1</schemaversion>
  <imsmd:record>
    <imsmd:general>
      <imsmd:title>
        <imsmd:langstring xml:lang="en-US">Simple Manifest</imsmd:langstring>
      </imsmd:title>
    </imsmd:general>
  </imsmd:record>
</metadata>
```

3.1.2 <organizations>

Description. Describes zero, one, or more structures or organizations for this package.

Figure 3.3 <organizations> elements.

Multiplicity. Occurs zero, once, or more within a <manifest> element.

Attributes

- **default (required).** Identifies the default organization to use. Data type = idref.

Elements

- <organization>

Example

```
<organizations default="TOC1">
  <organization identifier="TOC1" structure="hierarchical">
    <title>default</title>
    <item identifier="ITEM1" identifierref="RESOURCE1" isvisible="true">
      <title>Lesson 1</title>
      <item identifier="ITEM2" identifierref="RESOURCE2" isvisible="true">
        <title>Introduction 1</title>
      </item>
      <item identifier="ITEM3" identifierref="RESOURCE3" isvisible="true">
        <title>Content 1</title>
      </item>
      <item identifier="ITEM4" identifierref="RESOURCE4" isvisible="true">
        <title>Summary 1</title>
      </item>
    </item>
    <item identifier="ITEM5" identifierref="RESOURCE5" isvisible="false">
      <title>Lesson 2</title>
      <item identifier="ITEM6" identifierref="RESOURCE6" isvisible="false">
        <title>Introduction 2</title>
      </item>
      <item identifier="ITEM7" identifierref="RESOURCE7" isvisible="false">
        <title>Content 2</title>
      </item>
      <item identifier="ITEM8" identifierref="RESOURCE8" isvisible="false">
        <title>Summary 2</title>
      </item>
    </item>
    <item identifier="ITEM9" identifierref="RESOURCE9" isvisible="true">
      <title>Lesson 3</title>
      <item identifier="ITEM10" identifierref="RESOURCE10" isvisible="true"
parameters="foo">
        <title>Introduction 3</title>
```

```
        </item>
      <item identifier="ITEM11" identifierref="RESOURCE11" isvisible="true">
        <title>Content 3</title>
      </item>
      <item identifier="ITEM12" identifierref="RESOURCE12" isvisible="true">
        <title>Summary 3</title>
      </item>
    </item>
  </organization>
</organizations>
```

3.1.3   <resources>

Description. This element identifies a collection of physical content files.

Figure 3.4 <resources> elements.

Multiplicity. Occurs once and only once within a <manifest> element.

Attributes

- **xml:base (optional).** This provides a relative path offset for the content file(s). The usage of this element is defined in the XML Base Working Draft from the W3C. Data type = string.

Elements

- <resource>

Example

```
<resources>
  <resource identifier="RESOURCE1" type="webcontent" href="lesson1.htm">
    <file href="lesson1.htm"/>
  </resource>
  <resource identifier="RESOURCE2" type="webcontent" href="intro1.htm">
    <file href="intro1.htm"/>
  </resource>
  <resource identifier="RESOURCE3" type="webcontent" href="content1.htm">
    <file href="content1.htm"/>
  </resource>
  <resource identifier="RESOURCE4" type="webcontent" href="summary1.htm">
    <file href="summary1.htm"/>
  </resource>
</resources>
```

3.2 <metadata> Elements

3.2.1 <schema>

Description. Describes the schema used (e.g., IMS Content). If no schema element is present, it is assumed to be "IMS Content". Data type = string.

Multiplicity. Occurs zero or once within <metadata>.

Example

```
<schema>IMS Content</schema>
```

3.2.2 <schemaversion>

Description. Describes version of the above schema (e.g., 1,0, 1.1). If no version is present, it is assumed to be "1.1". Data type = string.

Multiplicity. Occurs zero or once within <metadata>.

Example

```
<schemaversion>1.1</schemaversion>
```

3.2.3 IMS Meta-data

Description. See the IMS Meta-data Specification v1.1 for more detail on the meta-data that are available for describing and cataloguing content packages.

Multiplicity. Defined in the IMS Meta-Data Specification v1.1.

Example: In-line meta-data

```
<metadata>
  <imsmd:record>
    <imsmd:general>
      <imsmd:title>
        <imsmd:langstring xml:lang="en-US">Simple Manifest</imsmd:langstring>
      </imsmd:title>
    </imsmd:general>
  </imsmd:record>
</metadata>
```

3.3 <organizations> Elements

3.3.1 <organization>

Description. This element describes a particular, passive organization of the material.

Multiplicity. Occurs zero or more times within <organizations>.

Attributes

- **identifier (required).** An identifier, provided by an author or authoring tool, that is unique within the Manifest. Data type = id.
- **structure (optional).** Assumes a default value of "hierarchical", such as is common with a tree view or structural representation of data. Data type = string

Elements

- <item>

- <title>

- <metadata>

Example

```
<organization identifier="TOC1">
  <title>default</title>
  <item identifier="ITEM1" identifierref="RESOURCE1" isvisible="true">
    <title>Lesson 1</title>
  </item>
  <item identifier="ITEM2" identifierref="RESOURCE2" isvisible="true">
    <title>Introduction 1</title>
  </item>
</organization>
```

3.3.2   <item>

Description. This element describes a node within a structure.

Multiplicity. Occurs zero or more times within <organization> and zero or more times within <item>.

Attributes

- **identifier (required).** An identifier that is unique within the Manifest. Data type = id.

- **identifierref (optional).** A reference to a <resource> identifier (within the same package) or a (sub)Manifest that is used to resolve the ultimate location of the file. If no identifierref is supplied, it is assumed that there is no content associated with this entry in the organization. Data type = string.

- **isvisible (optional).** Indicates whether or not this resource is displayed when the unit of instruction is rendered. If not present, value is assumed to be 1. Data type = boolean

- **parameters (optional).** Static parameters to be passed to the content file at launch time. Data type = string.

Elements

- <item>

- <title>

- <metadata>

Example

```
<item identifier="ITEM3" identifierref="RESOURCE3" isvisible="true">
  <title>Content 1</title>
</item>
```

3.3.3   <title>

Description. This element describes the title of an <item>.

Multiplicity. Occurs zero or more times within <item>.

3.3.4   <metadata>

Description. This element contains meta-data that describes the resource. Implementers are free to choose from any of the meta-data elements defined in the IMS Meta-data Specification v1.1 or to define their own meta-data schema.

Multiplicity. Occurs zero or once within <organization>.

Example

```
<organization identifier="TOC1">
  <metadata>
```

```
  <!-- schema and schemaversion not given as they apply at manifest level -->
    <imsmd:record>
      <imsmd:educational>
        <imsmd:interactivitylevel>1</imsmd:interactivitylevel>
      </imsmd:educational>
    </imsmd:record>
  </metadata>
</organization>
```

3.4   <resources> Elements

A collection of references to resources. There is no assumption of order or hierarchy. Resources can be described in-line or externally.

3.4.1   <resource>

Description. This element describes a specific content file.

Multiplicity. Occurs zero or more times within <resources>.

Attributes

- **identifier (required).** An identifier, provided by the author or authoring tool, that is unique within the Manifest.
- **type (required).** A string that identifies the type of resource. This specification defines only type "webcontent".
- **xml:base (optional).** This provides a relative path offset for the content file(s). The usage of this element is defined in the XML Base Working Draft from the W3C. Data type = string.
- **href (optional).** A reference to the "entry point" of this resource. External fully-qualified URIs are also permitted.

Elements

- <metadata>
- <file>
- <dependency>

Example: In-line resource

```
<resource identifier="RESOURCE2" type="webcontent" href="topics/index.htm">
  <file href="topics/index.htm"/>
  <file href="images/pic1.gif"/>
  <file href="images/pic2.gif"/>
</resource>
```

3.4.1.1 <metadata>

Description. This element contains meta-data that describes the resource. Implementers are free to choose from any of the meta-data elements defined in the IMS Meta-data Specification v1.1 or to define their own meta-data schema.

Multiplicity. Occurs zero or once within <resource>.

3.4.1.2 <file>

Description. Identifies one or more local files that this resource is dependent on. This includes the resource being referenced in the href attribute of <resource>. If the resource references an absolute URL (using href), <file> element(s) are not required.

Multiplicity. Occurs zero or more times within <resource>.

Attributes

- **href (required).** URL of the file.

Element

- <metadata>

Example

```
<file href="topics/index.htm"/>
```

3.4.1.3 <dependency>

Description. This element identifies a single resource which can act as a container for multiple files that this resource depends upon.

Multiplicity. Occurs zero or more times within <resource>.

Attributes

- **identifierref (required).** An identifier for other resources to reference.

Example

```
<resources>
  <resource identifier="R_A2" type="webcontent" href="sco1.html">
    <metadata/>
    <file href="sco1.html"/>
    <dependency indentiferref="R_A5"/>
  </resource>
  <resource identifier="R_A5" type="webcontent" href="pics\distress_sigs_add.jpg">
    <metadata/>
    <file href="pics\distress_sigs_add.jpg"/>
  </resource>
</resources>
```

3.5 Extensibility

The IMS Content Packaging XML Binding is extensible through the use of XML Namespaces and XML Schemas. It is expected that the extensibility mechanism will be used to describe additional types of meta-data, organizations, and resources. More information and examples of extensibility are contained in the IMS Content Packaging Best Practice Guide.

4.   Samples

The samples referenced by the IMS Content Packaging specification are available for download from
http://www.imsproject.org/specifications.html

4.1   Simple Manifest

Illustrates a simple manifest that makes use of the IMS Content Packaging DTD for document validation.

```xml
<?xml version="1.0"?>
<manifest identifier="MANIFEST1" xmlns="http://www.imsproject.org/xsd/ims_cp_rootv1p1"
xmlns:imsmd="http://www.imsproject.org/xsd/ims_md_rootv1p1"
xmlns:xsi="http://www.w3.org/2000/10/XMLSchema-instance"
xsi:schemaLocation="http://www.imsproject.org/xsd/ims_cp_rootv1p1
http://www.imsproject.org/xsd/ims_cp_rootv1p1.xsd
http://www.imsproject.org/xsd/ims_md_rootv1p1
http://www.imsproject.org/xsd/ims_md_rootv1p1.xsd">
  <metadata>
    <schema>IMS Content</schema>
    <schemaversion>1.1</schemaversion>
    <imsmd:record>
      <imsmd:general>
        <imsmd:title>
          <imsmd:langstring xml:lang="en-US">IMS Content Packaging Sample - Simple
Manifest</imsmd:langstring>
        </imsmd:title>
      </imsmd:general>
    </imsmd:record>
  </metadata>
  <organizations default="TOC1">
    <organization identifier="TOC1" structure="hierarchical">
      <title>default</title>
      <item identifier="ITEM1" identifierref="RESOURCE1">
        <title>Lesson 1</title>
        <item identifier="ITEM2" identifierref="RESOURCE2">
          <title>Introduction 1</title>
        </item>
        <item identifier="ITEM3" identifierref="RESOURCE3">
          <title>Content 1</title>
        </item>
        <item identifier="ITEM4" identifierref="RESOURCE4">
          <title>Summary 1</title>
        </item>
      </item>
      <item identifier="ITEM5" identifierref="RESOURCE5">
        <title>Lesson 2</title>
        <item identifier="ITEM6" identifierref="RESOURCE6">
          <title>Introduction 2</title>
        </item>
        <item identifier="ITEM7" identifierref="RESOURCE7">
          <title>Content 2</title>
        </item>
        <item identifier="ITEM8" identifierref="RESOURCE8">
          <title>Summary 2</title>
        </item>
      </item>
      <item identifier="ITEM9" identifierref="RESOURCE9">
        <title>Lesson 3</title>
        <item identifier="ITEM10" identifierref="RESOURCE10">
```

```
            <title>Introduction 3</title>
          </item>
          <item identifier="ITEM11" identifierref="RESOURCE11">
            <title>Content 3</title>
          </item>
          <item identifier="ITEM12" identifierref="RESOURCE12">
            <title>Summary 3</title>
          </item>
        </item>
      </organization>
    </organizations>
    <resources>
      <resource identifier="RESOURCE1" type="webcontent" href="lesson1.htm">
        <file href="lesson1.htm"/>
      </resource>
      <resource identifier="RESOURCE2" type="webcontent" href="intro1.htm">
        <file href="intro1.htm"/>
      </resource>
      <resource identifier="RESOURCE3" type="webcontent" href="content1.htm">
        <file href="content1.htm"/>
      </resource>
      <resource identifier="RESOURCE4" type="webcontent" href="summary1.htm">
        <file href="summary1.htm"/>
      </resource>
      <resource identifier="RESOURCE5" type="webcontent" href="lesson2.htm">
        <file href="lesson2.htm"/>
      </resource>
      <resource identifier="RESOURCE6" type="webcontent" href="intro2.htm">
        <file href="intro2.htm"/>
      </resource>
      <resource identifier="RESOURCE7" type="webcontent" href="content2.htm">
        <file href="content2.htm"/>
      </resource>
      <resource identifier="RESOURCE8" type="webcontent" href="summary2.htm">
        <file href="summary2.htm"/>
      </resource>
      <resource identifier="RESOURCE9" type="webcontent" href="lesson3.htm">
        <file href="lesson3.htm"/>
      </resource>
      <resource identifier="RESOURCE10" type="webcontent" href="intro3.htm">
        <file href="intro3.htm"/>
      </resource>
      <resource identifier="RESOURCE11" type="webcontent" href="content3.htm">
        <file href="content3.htm"/>
      </resource>
      <resource identifier="RESOURCE12" type="webcontent" href="summary3.htm">
        <file href="summary3.htm"/>
      </resource>
    </resources>
</manifest>
```

4.2   Full Meta-data

Illustrates a simple manifest with a comprehensive meta-data section that draws from the IMS Meta-data specification.

```
<?xml version="1.0"?>
<manifest identifier="MANIFEST1" xmlns="http://www.imsproject.org/xsd/ims_cp_rootv1p1"
xmlns:imsmd="http://www.imsproject.org/xsd/ims_md_rootv1p1"
xmlns:xsi="http://www.w3.org/2000/10/XMLSchema-instance"
xsi:schemaLocation="http://www.imsproject.org/xsd/ims_cp_rootv1p1
http://www.imsproject.org/xsd/ims_cp_rootv1p1.xsd
http://www.imsproject.org/xsd/ims_md_rootv1p1
http://www.imsproject.org/xsd/ims_md_rootv1p1.xsd">
  <metadata>
    <schema>IMS Content</schema>
    <schemaversion>1.1</schemaversion>
    <imsmd:record>
      <imsmd:metametadata>
        <imsmd:catalogentry>
          <imsmd:catalogue>IMS-Test</imsmd:catalogue>
          <imsmd:entry>
            <imsmd:langstring>1999.000003</imsmd:langstring>
          </imsmd:entry>
        </imsmd:catalogentry>
        <imsmd:catalogentry>
          <imsmd:catalogue>ABC123</imsmd:catalogue>
          <imsmd:entry>
            <imsmd:langstring xml:lang="en-US">123A</imsmd:langstring>
          </imsmd:entry>
        </imsmd:catalogentry>
        <imsmd:contribute>
          <imsmd:role>
            <imsmd:langstring xml:lang="en">Author</imsmd:langstring>
          </imsmd:role>
          <imsmd:centity>
            <imsmd:vcard>BEGIN:vCard FN:Chris Moffatt N:Moffatt END:vCard</imsmd:vcard>
          </imsmd:centity>
          <imsmd:date>
            <imsmd:datetime>1999-08-05</imsmd:datetime>
          </imsmd:date>
        </imsmd:contribute>
        <imsmd:metadatascheme>IMS:1.1</imsmd:metadatascheme>
        <!-- English as default metadata language. -->
        <imsmd:language>en_US</imsmd:language>
      </imsmd:metametadata>
      <imsmd:general>
        <imsmd:title>
          <imsmd:langstring xml:lang="en-US">IMS Content Packaging Sample - Full
Metadata</imsmd:langstring>
        </imsmd:title>
        <imsmd:catalogentry>
          <imsmd:catalogue>ISBN</imsmd:catalogue>
          <imsmd:entry>
            <imsmd:langstring>0-534-26702-5</imsmd:langstring>
          </imsmd:entry>
        </imsmd:catalogentry>
        <imsmd:language>en_US</imsmd:language>
        <imsmd:description>
          <!--English description-->
          <imsmd:langstring xml:lang="en-US">A sample content packaging
record</imsmd:langstring>
```

```
          <!--French Description -->
          <imsmd:langstring xml:lang="fr">Un programme...</imsmd:langstring>
        </imsmd:description>
        <imsmd:keywords>
          <!--English Keywords, unordered list-->
          <imsmd:langstring xml:lang="en">content interchange</imsmd:langstring>
          <!--Going to have to fix this problem with keyword rather then keywords and
the issue of multiple langstrings-->
          <!--<imsmd:langstring xml:lang="en">learning objects</imsmd:langstring>-->
          <!--<imsmd:langstring xml:lang="en">e-learning</imsmd:langstring>-->
        </imsmd:keywords>
        <imsmd:coverage>
          <imsmd:langstring xml:lang="en">Sample code</imsmd:langstring>
        </imsmd:coverage>
        <imsmd:structure>
          <imsmd:langstring xml:lang="en">Hierarchical</imsmd:langstring>
        </imsmd:structure>
        <imsmd:aggregationlevel>2</imsmd:aggregationlevel>
      </imsmd:general>
      <imsmd:lifecycle>
        <imsmd:version>
          <imsmd:langstring xml:lang="en">1.0</imsmd:langstring>
        </imsmd:version>
        <imsmd:status>
          <imsmd:langstring xml:lang="en">Final</imsmd:langstring>
        </imsmd:status>
        <!--Contains an unordered list of contribute-->
        <imsmd:contribute>
          <imsmd:role>
            <imsmd:langstring xml:lang="en">Author</imsmd:langstring>
          </imsmd:role>
          <imsmd:centity>
            <imsmd:vcard>BEGIN:vCard FN:Chris Moffatt N:Moffatt END:vCard</imsmd:vcard>
          </imsmd:centity>
          <imsmd:date>
            <imsmd:datetime>2000</imsmd:datetime>
          </imsmd:date>
        </imsmd:contribute>
        <imsmd:contribute>
          <imsmd:role>
            <imsmd:langstring xml:lang="en">Publisher</imsmd:langstring>
          </imsmd:role>
          <imsmd:centity>
            <imsmd:vcard>BEGIN:vCard ORG:IMS Global Learning Corporation
END:vCard</imsmd:vcard>
          </imsmd:centity>
          <imsmd:date>
            <imsmd:datetime>2000</imsmd:datetime>
            <imsmd:description>
              <imsmd:langstring xml:lang="en-US">20th Century</imsmd:langstring>
            </imsmd:description>
          </imsmd:date>
        </imsmd:contribute>
      </imsmd:lifecycle>
      <imsmd:technical>
        <imsmd:format>
          <imsmd:langstring xml:lang="en">XML 1.0</imsmd:langstring>
        </imsmd:format>
        <imsmd:size>70306</imsmd:size>
        <imsmd:location type="URI">http://www.imsproject.org/content</imsmd:location>
        <imsmd:requirements>
```

```
      <imsmd:type>
        <imsmd:langstring xml:lang="en">Binding</imsmd:langstring>
      </imsmd:type>
      <imsmd:name>
        <imsmd:langstring xml:lang="en">XML</imsmd:langstring>
      </imsmd:name>
      <imsmd:minimumversion>1.0</imsmd:minimumversion>
      <imsmd:maximumversion>5.2</imsmd:maximumversion>
    </imsmd:requirements>
    <imsmd:installationremarks>
      <imsmd:langstring xml:lang="en">Download</imsmd:langstring>
    </imsmd:installationremarks>
    <imsmd:otherplatformrequirements>
      <imsmd:langstring xml:lang="en">Requires web browser for
rendering</imsmd:langstring>
    </imsmd:otherplatformrequirements>
    <imsmd:duration/>
  </imsmd:technical>
  <imsmd:educational>
    <imsmd:learningresourcetype>
      <imsmd:langstring xml:lang="en">Samples</imsmd:langstring>
    </imsmd:learningresourcetype>
    <imsmd:interactivitylevel>
      <imsmd:langstring xml:lang="en">3</imsmd:langstring>
    </imsmd:interactivitylevel>
    <imsmd:semanticdensity>2</imsmd:semanticdensity>
    <imsmd:intendedenduserrole>
      <imsmd:langstring xml:lang="en">Technical Implementor</imsmd:langstring>
    </imsmd:intendedenduserrole>
    <imsmd:learningcontext>
      <imsmd:langstring xml:lang="en">Industry</imsmd:langstring>
    </imsmd:learningcontext>
    <imsmd:typicalagerange>
      <imsmd:langstring xml:lang="en">18-99</imsmd:langstring>
    </imsmd:typicalagerange>
    <imsmd:description>
      <imsmd:langstring xml:lang="en">Sample code</imsmd:langstring>
    </imsmd:description>
    <imsmd:language>en_US</imsmd:language>
  </imsmd:educational>
  <imsmd:rights>
    <imsmd:cost>no</imsmd:cost>
    <imsmd:copyrightandotherrestrictions>no</imsmd:copyrightandotherrestrictions>
  </imsmd:rights>
</imsmd:record>
</metadata>
<organizations default="TOC1">
  <organization identifier="TOC1" structure="hierarchical">
    <title>default</title>
    <item identifier="ITEM1" identifierref="RESOURCE1">
      <title>Lesson 1</title>
      <item identifier="ITEM2" identifierref="RESOURCE2">
        <title>Introduction 1</title>
      </item>
      <item identifier="ITEM3" identifierref="RESOURCE3">
        <title>Content 1</title>
      </item>
      <item identifier="ITEM4" identifierref="RESOURCE4">
        <title>Summary 1</title>
      </item>
    </item>
```

```
        <item identifier="ITEM5" identifierref="RESOURCE5">
          <title>Lesson 2</title>
          <item identifier="ITEM6" identifierref="RESOURCE6">
            <title>Introduction 2</title>
          </item>
          <item identifier="ITEM7" identifierref="RESOURCE7">
            <title>Content 2</title>
          </item>
          <item identifier="ITEM8" identifierref="RESOURCE8">
            <title>Summary 2</title>
          </item>
        </item>
        <item identifier="ITEM9" identifierref="RESOURCE9">
          <title>Lesson 3</title>
          <item identifier="ITEM10" identifierref="RESOURCE10">
            <title>Introduction 3</title>
          </item>
          <item identifier="ITEM11" identifierref="RESOURCE11">
            <title>Content 3</title>
          </item>
          <item identifier="ITEM12" identifierref="RESOURCE12">
            <title>Summary 3</title>
          </item>
        </item>
      </organization>
  </organizations>
  <resources>
    <resource identifier="RESOURCE1" type="webcontent" href="lesson1.htm">
      <file href="lesson1.htm"/>
    </resource>
    <resource identifier="RESOURCE2" type="webcontent" href="intro1.htm">
      <file href="intro1.htm"/>
    </resource>
    <resource identifier="RESOURCE3" type="webcontent" href="content1.htm">
      <file href="content1.htm"/>
    </resource>
    <resource identifier="RESOURCE4" type="webcontent" href="summary1.htm">
      <file href="summary1.htm"/>
    </resource>
    <resource identifier="RESOURCE5" type="webcontent" href="lesson2.htm">
      <file href="lesson1.htm"/>
    </resource>
    <resource identifier="RESOURCE6" type="webcontent" href="intro2.htm">
      <file href="intro2.htm"/>
    </resource>
    <resource identifier="RESOURCE7" type="webcontent" href="content2.htm">
      <file href="content1.htm"/>
    </resource>
    <resource identifier="RESOURCE8" type="webcontent" href="summary2.htm">
      <file href="summary1.htm"/>
    </resource>
    <resource identifier="RESOURCE9" type="webcontent" href="lesson3.htm">
      <file href="lesson3.htm"/>
    </resource>
    <resource identifier="RESOURCE10" type="webcontent" href="intro3.htm">
      <file href="intro3.htm"/>
    </resource>
    <resource identifier="RESOURCE11" type="webcontent" href="content3.htm">
      <file href="content3.htm"/>
    </resource>
    <resource identifier="RESOURCE12" type="webcontent" href="summary3.htm">
```

```
        <file href="summary3.htm"/>
      </resource>
    </resources>
</manifest>
```

4.3 All Elements

Illustrates a manifest that uses all elements and attributes defined in the IMS Content Packaging specification.

```
<?xml version="1.0"?>
<manifest identifier="MANIFEST1" xmlns="http://www.imsproject.org/xsd/ims_cp_rootv1p1"
xmlns:imsmd="http://www.imsproject.org/xsd/ims_md_rootv1p1"
xmlns:xsi="http://www.w3.org/2000/10/XMLSchema-instance"
xsi:schemaLocation="http://www.imsproject.org/xsd/ims_cp_rootv1p1
http://www.imsproject.org/xsd/ims_cp_rootv1p1.xsd
http://www.imsproject.org/xsd/ims_md_rootv1p1
http://www.imsproject.org/xsd/ims_md_rootv1p1.xsd">
  <metadata>
    <schema>IMS Content</schema>
    <schemaversion>1.1</schemaversion>
    <imsmd:record>
      <imsmd:general>
        <imsmd:title>
          <imsmd:langstring xml:lang="en-US">IMS Content Packaging Sample - All
Elements</imsmd:langstring>
        </imsmd:title>
      </imsmd:general>
    </imsmd:record>
  </metadata>
  <organizations default="TOC1">
    <organization identifier="TOC1" structure="hierarchical">
      <title>default</title>
      <item identifier="ITEM1" identifierref="RESOURCE1" isvisible="true">
        <title>Lesson 1</title>
        <item identifier="ITEM2" identifierref="RESOURCE2" isvisible="true">
          <title>Introduction 1</title>
        </item>
        <item identifier="ITEM3" identifierref="RESOURCE3" isvisible="true">
          <title>Content 1</title>
        </item>
        <item identifier="ITEM4" identifierref="RESOURCE4" isvisible="true">
          <title>Summary 1</title>
        </item>
      </item>
      <item identifier="ITEM5" identifierref="RESOURCE5" isvisible="false">
        <title>Lesson 2</title>
        <item identifier="ITEM6" identifierref="RESOURCE6" isvisible="false">
          <title>Introduction 2</title>
        </item>
        <item identifier="ITEM7" identifierref="RESOURCE7" isvisible="false">
          <title>Content 2</title>
        </item>
        <item identifier="ITEM8" identifierref="RESOURCE8" isvisible="false">
          <title>Summary 2</title>
        </item>
      </item>
      <item identifier="ITEM9" identifierref="RESOURCE9" isvisible="true">
        <title>Lesson 3</title>
```

```
        <item identifier="ITEM10" identifierref="RESOURCE10" isvisible="true"
parameters="foo">
          <title>Introduction 3</title>
        </item>
        <item identifier="ITEM11" identifierref="RESOURCE11" isvisible="true">
          <title>Content 3</title>
        </item>
        <item identifier="ITEM12" identifierref="RESOURCE12" isvisible="true">
          <title>Summary 3</title>
        </item>
      </item>
    </organization>
  </organizations>
  <resources>
    <resource identifier="RESOURCE1" type="webcontent" href="lesson1.htm">
      <metadata>
        <imsmd:record>
          <imsmd:general>
            <imsmd:title>
              <imsmd:langstring xml:lang="en-US">Simple Manifest</imsmd:langstring>
            </imsmd:title>
          </imsmd:general>
        </imsmd:record>
      </metadata>
      <file href="lesson1.htm"/>
    </resource>
    <resource identifier="RESOURCE2" type="webcontent" href="intro1.htm">
      <file href="intro1.htm"/>
    </resource>
    <resource identifier="RESOURCE3" type="webcontent" href="content1.htm">
      <file href="content1.htm"/>
    </resource>
    <resource identifier="RESOURCE4" type="webcontent" href="summary1.htm">
      <file href="summary1.htm"/>
    </resource>
    <resource identifier="RESOURCE5" type="webcontent" href="lesson2.htm">
      <file href="lesson1.htm"/>
    </resource>
    <resource identifier="RESOURCE6" type="webcontent" href="intro2.htm">
      <file href="intro2.htm"/>
    </resource>
    <resource identifier="RESOURCE7" type="webcontent" href="content2.htm">
      <file href="content2.htm"/>
    </resource>
    <resource identifier="RESOURCE8" type="webcontent" href="summary2.htm">
      <file href="summary2.htm"/>
    </resource>
    <resource identifier="RESOURCE9" type="webcontent" href="lesson3.htm">
      <file href="lesson3.htm"/>
    </resource>
    <resource identifier="RESOURCE10" type="webcontent" href="intro3.htm">
      <file href="intro3.htm"/>
    </resource>
    <resource identifier="RESOURCE11" type="webcontent" href="content3.htm">
      <file href="content3.htm"/>
    </resource>
    <resource identifier="RESOURCE12" type="webcontent" href="summary3.htm">
      <file href="summary3.htm"/>
    </resource>
  </resources>
```

```
</manifest>
```

4.4   Multiple Organizations

Illustrates the use of multiple organizations, to provide multiple paths through a course.

```
<?xml version="1.0"?>
<manifest identifier="MANIFEST1" xmlns="http://www.imsproject.org/xsd/ims_cp_rootv1p1"
xmlns:imsmd="http://www.imsproject.org/xsd/ims_md_rootv1p1"
xmlns:xsi="http://www.w3.org/2000/10/XMLSchema-instance"
xsi:schemaLocation="http://www.imsproject.org/xsd/ims_cp_rootv1p1
http://www.imsproject.org/xsd/ims_cp_rootv1p1.xsd
http://www.imsproject.org/xsd/ims_md_rootv1p1
http://www.imsproject.org/xsd/ims_md_rootv1p1.xsd">
  <metadata>
    <schema>IMS Content</schema>
    <schemaversion>1.1</schemaversion>
    <imsmd:record>
      <imsmd:general>
        <imsmd:title>
          <imsmd:langstring xml:lang="en-US">IMS Content Packaging Sample - Multiple
Organizations</imsmd:langstring>
        </imsmd:title>
      </imsmd:general>
    </imsmd:record>
  </metadata>
  <organizations default="TOC1">
    <organization identifier="TOC1" structure="hierarchical">
      <title>All Lessons</title>
      <item identifier="ITEM1" identifierref="RESOURCE1">
        <title>Lesson 1</title>
        <item identifier="ITEM2" identifierref="RESOURCE2">
          <title>Introduction 1</title>
        </item>
        <item identifier="ITEM3" identifierref="RESOURCE3">
          <title>Content 1</title>
        </item>
        <item identifier="ITEM4" identifierref="RESOURCE4">
          <title>Summary 1</title>
        </item>
      </item>
      <item identifier="ITEM5" identifierref="RESOURCE5">
        <title>Lesson 2</title>
        <item identifier="ITEM6" identifierref="RESOURCE6">
          <title>Introduction 2</title>
        </item>
        <item identifier="ITEM7" identifierref="RESOURCE7">
          <title>Content 2</title>
        </item>
        <item identifier="ITEM8" identifierref="RESOURCE8">
          <title>Summary 2</title>
        </item>
      </item>
      <item identifier="ITEM9" identifierref="RESOURCE9">
        <title>Lesson 3</title>
        <item identifier="ITEM10" identifierref="RESOURCE10">
          <title>Introduction 3</title>
        </item>
```

```
        <item identifier="ITEM11" identifierref="RESOURCE11">
          <title>Content 3</title>
        </item>
        <item identifier="ITEM12" identifierref="RESOURCE12">
          <title>Summary 3</title>
        </item>
      </item>
    </organization>
    <organization identifier="TOC2" structure="hierarchical">
      <title>Content Topics</title>
      <item identifier="TOC2_ITEM3" identifierref="RESOURCE3">
        <title>Content 1</title>
      </item>
      <item identifier="TOC2_ITEM7" identifierref="RESOURCE7">
        <title>Content 2</title>
      </item>
      <item identifier="TOC2_ITEM11" identifierref="RESOURCE11">
        <title>Content 3</title>
      </item>
    </organization>
    <organization identifier="TOC3" structure="hierarchical">
      <title>Summary Topics</title>
      <item identifier="TOC3_ITEM4" identifierref="RESOURCE4">
        <title>Summary 1</title>
      </item>
      <item identifier="TOC3_ITEM8" identifierref="RESOURCE8">
        <title>Summary 2</title>
      </item>
      <item identifier="TOC3_ITEM12" identifierref="RESOURCE12">
        <title>Summary 3</title>
      </item>
    </organization>
  </organizations>
  <resources>
    <resource identifier="RESOURCE1" type="webcontent" href="lesson1.htm">
      <file href="lesson1.htm"/>
    </resource>
    <resource identifier="RESOURCE2" type="webcontent" href="intro1.htm">
      <file href="intro1.htm"/>
    </resource>
    <resource identifier="RESOURCE3" type="webcontent" href="content1.htm">
      <file href="content1.htm"/>
    </resource>
    <resource identifier="RESOURCE4" type="webcontent" href="summary1.htm">
      <file href="summary1.htm"/>
    </resource>
    <resource identifier="RESOURCE5" type="webcontent" href="lesson2.htm">
      <file href="lesson2.htm"/>
    </resource>
    <resource identifier="RESOURCE6" type="webcontent" href="intro2.htm">
      <file href="intro2.htm"/>
    </resource>
    <resource identifier="RESOURCE7" type="webcontent" href="content2.htm">
      <file href="content2.htm"/>
    </resource>
    <resource identifier="RESOURCE8" type="webcontent" href="summary2.htm">
      <file href="summary2.htm"/>
    </resource>
    <resource identifier="RESOURCE9" type="webcontent" href="lesson3.htm">
      <file href="lesson3.htm"/>
    </resource>
```

```
    <resource identifier="RESOURCE10" type="webcontent" href="intro3.htm">
      <file href="intro3.htm"/>
    </resource>
    <resource identifier="RESOURCE11" type="webcontent" href="content3.htm">
      <file href="content3.htm"/>
    </resource>
    <resource identifier="RESOURCE12" type="webcontent" href="summary3.htm">
      <file href="summary3.htm"/>
    </resource>
  </resources>
</manifest>
```

4.5   Using (sub)Manifests for Content Aggregation/Disaggregation

Illustrates the use of (sub)Manifests to promote reuse. This example takes the Simple Manifest example and implements it using (sub)Manifests.

```
<?xml version="1.0"?>
<?xml-stylesheet type="text/xsl" href="../../easel_view.xsl" ?>
<manifest identifier="SUBMAN" version="1.1"
xmlns="http://www.imsproject.org/xsd/ims_cp_rootv1p1"
xmlns:imsmd="http://www.imsproject.org/xsd/ims_md_rootv1p1"
xmlns:xsi="http://www.w3.org/2000/10/XMLSchema-instance"
xsi:schemaLocation="http://www.imsproject.org/xsd/ims_cp_rootv1p1
http://www.imsproject.org/xsd/ims_cp_rootv1p1.xsd
http://www.imsproject.org/xsd/ims_md_rootv1p1
http://www.imsproject.org/xsd/ims_md_rootv1p1.xsd">
  <metadata>
    <schema>IMS Content</schema>
    <schemaversion>1.1</schemaversion>
  </metadata>
  <organizations default="MAIN_TOC1">
    <organization identifier="MAIN_TOC1" structure="hierarchical">
      <title>All Manifest and Submanifest Lessons</title>
      <item identifier="MAIN_ITEM13" identifierref="MANY_R_RESOURCE8">
        <title>Resource h</title>
      </item>
      <item identifier="MAIN_ITEM1" identifierref="MAIN_RESOURCE1">
        <title>Lesson 1</title>
        <item identifier="MAIN_ITEM2" identifierref="MAIN_RESOURCE2">
          <title>Introduction 1</title>
        </item>
        <item identifier="MAIN_ITEM3" identifierref="MAIN_RESOURCE3">
          <title>Content 1</title>
          <item identifier="MAIN_ITEM6" identifierref="MANY_R_RESOURCE1">
            <title>Resource a</title>
          </item>
          <item identifier="MAIN_ITEM7" identifierref="MANY_R_RESOURCE2">
            <title>Resource b</title>
          </item>
          <item identifier="MAIN_ITEM8" identifierref="MANY_R_RESOURCE3">
            <title>Resource c</title>
          </item>
          <item identifier="MAIN_ITEM9" identifierref="MANY_R_RESOURCE4">
            <title>Resource d</title>
          </item>
          <item identifier="MAIN_ITEM10" identifierref="MANY_R_RESOURCE5">
            <title>Resource e</title>
```

```
        </item>
        <item identifier="MAIN_ITEM11" identifierref="MANY_R_RESOURCE6">
          <title>Resource f</title>
        </item>
        <item identifier="MAIN_ITEM12" identifierref="MANY_R_RESOURCE7">
          <title>Resource g</title>
        </item>
      </item>
      <item identifier="MAIN_ITEM4" identifierref="MAIN_RESOURCE4">
        <title>Summary 1</title>
      </item>
    </item>
    <item identifier="BOO_ITEM111" identifierref="MANY_O_RESOURCE1_CCK51">
      <title>Lesson 1</title>
      <item identifier="BOO_ITEM112" identifierref="MANY_O_RESOURCE2">
        <title>Introduction 1</title>
      </item>
      <item identifier="BOO_ITEM113" identifierref="MANY_O_RESOURCE3">
        <title>Content 1</title>
      </item>
      <item identifier="BOO_ITEM114" identifierref="MANY_O_RESOURCE4">
        <title>Summary 1</title>
      </item>
    </item>
    <item identifier="MAIN_ITEM5" identifierref="SINGLE_R_RESOURCE1">
      <title>Summary 1</title>
     <item identifier="MAIN_SINGLE_O_ITEM1" identifierref="SINGLE_O_RESOURCE1_CCK51">
        <title>Lesson 1</title>
        <item identifier="MAIN_SINGLE_O_ITEM2" identifierref="SINGLE_O_RESOURCE2">
          <title>Introduction 1</title>
        </item>
        <item identifier="MAIN_SINGLE_O_ITEM3" identifierref="SINGLE_O_RESOURCE3">
          <title>Content 1</title>
        </item>
        <item identifier="MAIN_SINGLE_O_ITEM4" identifierref="SINGLE_O_RESOURCE4">
          <title>Summary 1</title>
        </item>
      </item>
      <item identifier="MAIN_SINGLE_O_ITEM5" identifierref="SINGLE_O_RESOURCE5">
        <title>Lesson 2</title>
        <item identifier="MAIN_SINGLE_O_ITEM6" identifierref="SINGLE_O_RESOURCE6">
          <title>Introduction 2</title>
        </item>
        <item identifier="MAIN_SINGLE_O_ITEM7" identifierref="SINGLE_O_RESOURCE7">
          <title>Content 2</title>
        </item>
        <item identifier="MAIN_SINGLE_O_ITEM8" identifierref="SINGLE_O_RESOURCE8">
          <title>Summary 2</title>
        </item>
      </item>
      <item identifier="MAIN_SINGLE_O_ITEM9" identifierref="SINGLE_O_RESOURCE9">
        <title>Lesson 3</title>
        <item identifier="MAIN_SINGLE_O_ITEM10" identifierref="SINGLE_O_RESOURCE10">
          <title>Introduction 3</title>
        </item>
        <item identifier="MAIN_SINGLE_O_ITEM11" identifierref="SINGLE_O_RESOURCE11">
          <title>Content 3</title>
        </item>
        <item identifier="MAIN_SINGLE_O_ITEM12" identifierref="SINGLE_O_RESOURCE12">
          <title>Summary 3</title>
        </item>
```

```
          </item>
        </item>
      </organization>
    </organizations>
    <resources>
      <resource identifier="MAIN_RESOURCE1" type="webcontent" href="lesson1.htm">
        <file href="lesson1.htm"/>
      </resource>
      <resource identifier="MAIN_RESOURCE2" type="webcontent" href="intro1.htm">
        <file href="intro1.htm"/>
      </resource>
     <resource identifier="MAIN_RESOURCE3" type="webcontent" href="http://www.bbc.co.uk">
        <file href="http://www.bbc.co.uk"/>
      </resource>
      <resource identifier="MAIN_RESOURCE4" type="webcontent"
href="http://www.farn-ct.ac.uk">
        <file href="summary1.htm"/>
      </resource>
    </resources>
    <manifest identifier="SINGLE_R" xml:base="single_r/">
      <organizations/>
      <resources>
        <resource identifier="SINGLE_R_RESOURCE1" type="webcontent" href="intro1.htm">
          <file href="lesson1.htm"/>
          <file href="intro1.htm"/>
          <file href="content1.htm"/>
          <file href="summary3.htm"/>
        </resource>
      </resources>
    </manifest>
    <manifest identifier="MANY_R" version="1.1">
      <metadata>
        <schema>IMS Content</schema>
        <schemaversion>1.1</schemaversion>
        <imsmd:record>
          <imsmd:general>
            <imsmd:title>
              <imsmd:langstring xml:lang="en-US">CCK Manifest Test Case - Many
Resources</imsmd:langstring>
            </imsmd:title>
          </imsmd:general>
        </imsmd:record>
      </metadata>
      <organizations/>
      <resources>
        <resource identifier="MANY_R_RESOURCE1" type="webcontent" href="lesson1.htm">
          <file href="lesson1.htm"/>
        </resource>
        <resource identifier="MANY_R_RESOURCE2" type="webcontent" href="intro1.htm">
          <file href="intro1.htm"/>
        </resource>
        <resource identifier="MANY_R_RESOURCE3" type="webcontent" href="content1.htm">
          <file href="content1.htm"/>
        </resource>
        <resource identifier="MANY_R_RESOURCE4" type="webcontent" href="summary1.htm">
          <file href="summary1.htm"/>
        </resource>
        <resource identifier="MANY_R_RESOURCE5" type="webcontent" href="lesson2.htm">
          <file href="lesson2.htm"/>
        </resource>
        <resource identifier="MANY_R_RESOURCE6" type="webcontent" href="intro2.htm">
```

```
            <file href="intro2.htm"/>
          </resource>
          <resource identifier="MANY_R_RESOURCE7" type="webcontent" href="content2.htm">
            <file href="content2.htm"/>
          </resource>
          <resource identifier="MANY_R_RESOURCE8" type="webcontent" href="summary2.htm">
            <file href="summary2.htm"/>
          </resource>
        </resources>
    </manifest>
    <manifest identifier="MANY_O" version="1.1" xml:base="many_o/">
      <metadata>
        <schema>IMS Content</schema>
        <schemaversion>1.1</schemaversion>
        <imsmd:record>
          <imsmd:general>
            <imsmd:title>
              <imsmd:langstring xml:lang="en-US">CCK Test Manifest - Many
Organizations</imsmd:langstring>
            </imsmd:title>
          </imsmd:general>
        </imsmd:record>
      </metadata>
      <organizations default="MANY_O_TOC1">
        <organization identifier="MANY_O_TOC1" structure="hierarchical">
          <title>All Lessons</title>
          <item identifier="MANY_O_ITEM1" identifierref="MANY_O_RESOURCE1_CCK51">
            <title>Lesson 1</title>
            <item identifier="MANY_O_ITEM2" identifierref="MANY_O_RESOURCE2">
              <title>Introduction 1</title>
            </item>
            <item identifier="MANY_O_ITEM3" identifierref="MANY_O_RESOURCE3">
              <title>Content 1</title>
            </item>
            <item identifier="MANY_O_ITEM4" identifierref="MANY_O_RESOURCE4">
              <title>Summary 1</title>
            </item>
          </item>
          <item identifier="MANY_O_ITEM5" identifierref="MANY_O_RESOURCE5">
            <title>Lesson 2</title>
            <item identifier="MANY_O_ITEM6" identifierref="MANY_O_RESOURCE6">
              <title>Introduction 2</title>
            </item>
            <item identifier="MANY_O_ITEM7" identifierref="MANY_O_RESOURCE7">
              <title>Content 2</title>
            </item>
            <item identifier="MANY_O_ITEM8" identifierref="MANY_O_RESOURCE8">
              <title>Summary 2</title>
            </item>
          </item>
          <item identifier="MANY_O_ITEM9" identifierref="MANY_O_RESOURCE9">
            <title>Lesson 3</title>
            <item identifier="MANY_O_ITEM10" identifierref="MANY_O_RESOURCE10">
              <title>Introduction 3</title>
            </item>
            <item identifier="MANY_O_ITEM11" identifierref="MANY_O_RESOURCE11">
              <title>Content 3</title>
            </item>
            <item identifier="MANY_O_ITEM12" identifierref="MANY_O_RESOURCE12">
              <title>Summary 3</title>
            </item>
```

```
        </item>
      </organization>
      <organization identifier="MANY_O_TOC3" structure="hierarchical">
        <title/>
        <item identifier="ITEM111" identifierref="MANY_O_RESOURCE1_CCK51">
          <title>Lesson 1</title>
          <item identifier="ITEM112" identifierref="MANY_O_RESOURCE2">
            <title>Introduction 1</title>
          </item>
          <item identifier="ITEM113" identifierref="MANY_O_RESOURCE3">
            <title>Content 1</title>
          </item>
          <item identifier="ITEM114" identifierref="MANY_O_RESOURCE4">
            <title>Summary 1</title>
          </item>
        </item>
      </organization>
    </organizations>
    <resources>
     <resource identifier="MANY_O_RESOURCE1_CCK51" type="webcontent" href="lesson1.htm">
        <file href="lesson1.htm"/>
      </resource>
      <resource identifier="MANY_O_RESOURCE2" type="webcontent" href="intro1.htm">
        <file href="intro1.htm"/>
      </resource>
      <resource identifier="MANY_O_RESOURCE3" type="webcontent" href="content1.htm">
        <file href="content1.htm"/>
      </resource>
      <resource identifier="MANY_O_RESOURCE4" type="webcontent" href="summary1.htm">
        <file href="summary1.htm"/>
      </resource>
      <resource identifier="MANY_O_RESOURCE5" type="webcontent" href="lesson2.htm">
        <file href="lesson2.htm"/>
      </resource>
      <resource identifier="MANY_O_RESOURCE6" type="webcontent" href="intro2.htm">
        <file href="intro2.htm"/>
      </resource>
      <resource identifier="MANY_O_RESOURCE7" type="webcontent" href="content2.htm">
        <file href="content2.htm"/>
      </resource>
      <resource identifier="MANY_O_RESOURCE8" type="webcontent" href="summary2.htm">
        <file href="summary2.htm"/>
      </resource>
      <resource identifier="MANY_O_RESOURCE9" type="webcontent" href="lesson3.htm">
        <file href="lesson3.htm"/>
      </resource>
      <resource identifier="MANY_O_RESOURCE10" type="webcontent" href="intro3.htm">
        <file href="intro3.htm"/>
      </resource>
      <resource identifier="MANY_O_RESOURCE11" type="webcontent" href="content3.htm">
        <file href="content3.htm"/>
      </resource>
      <resource identifier="MANY_O_RESOURCE12" type="webcontent" href="summary3.htm">
        <file href="summary3.htm"/>
      </resource>
    </resources>
  </manifest>
  <manifest identifier="SINGLE_O" version="1.1" xml:base="single_o/">
    <metadata>
      <schema>IMS Content</schema>
      <schemaversion>1.1</schemaversion>
```

```
        </metadata>
      <organizations default="SINGLE_O_TOC1">
        <organization identifier="SINGLE_O_TOC1" structure="hierarchical">
          <title>All Lessons</title>
          <item identifier="SINGLE_O_ITEM1" identifierref="SINGLE_O_RESOURCE1_CCK51">
            <title>Lesson 1</title>
            <item identifier="SINGLE_O_ITEM2" identifierref="SINGLE_O_RESOURCE2">
              <title>Introduction 1</title>
            </item>
            <item identifier="SINGLE_O_ITEM3" identifierref="SINGLE_O_RESOURCE3">
              <title>Content 1</title>
            </item>
            <item identifier="SINGLE_O_ITEM4" identifierref="SINGLE_O_RESOURCE4">
              <title>Summary 1</title>
            </item>
          </item>
          <item identifier="SINGLE_O_ITEM5" identifierref="SINGLE_O_RESOURCE5">
            <title>Lesson 2</title>
            <item identifier="SINGLE_O_ITEM6" identifierref="SINGLE_O_RESOURCE6">
              <title>Introduction 2</title>
            </item>
            <item identifier="SINGLE_O_ITEM7" identifierref="SINGLE_O_RESOURCE7">
              <title>Content 2</title>
            </item>
            <item identifier="SINGLE_O_ITEM8" identifierref="SINGLE_O_RESOURCE8">
              <title>Summary 2</title>
            </item>
          </item>
          <item identifier="SINGLE_O_ITEM9" identifierref="SINGLE_O_RESOURCE9">
            <title>Lesson 3</title>
            <item identifier="SINGLE_O_ITEM10" identifierref="SINGLE_O_RESOURCE10">
              <title>Introduction 3</title>
            </item>
            <item identifier="SINGLE_O_ITEM11" identifierref="SINGLE_O_RESOURCE11">
              <title>Content 3</title>
            </item>
            <item identifier="SINGLE_O_ITEM12" identifierref="SINGLE_O_RESOURCE12">
              <title>Summary 3</title>
            </item>
          </item>
        </item>
      </organization>
    </organizations>
    <resources>
      <resource identifier="SINGLE_O_RESOURCE1_CCK51" type="webcontent"
href="lesson1.htm">
        <file href="lesson1.htm"/>
      </resource>
      <resource identifier="SINGLE_O_RESOURCE2" type="webcontent" href="intro1.htm">
        <file href="intro1.htm"/>
      </resource>
      <resource identifier="SINGLE_O_RESOURCE3" type="webcontent"
href="http://www.bbc.co.uk">
        <file href="http://www.bbc.co.uk"/>
      </resource>
      <resource identifier="SINGLE_O_RESOURCE4" type="webcontent"
href="http://www.farn-ct.ac.uk">
        <file href="summary1.htm"/>
      </resource>
      <resource identifier="SINGLE_O_RESOURCE5" type="webcontent">
        <file href="lesson2.htm"/>
      </resource>
```

```
        <resource identifier="SINGLE_O_RESOURCE6" type="webcontent" href="intro2.htm">
          <file href="intro2.htm"/>
          <file href="http://www.parkers.co.uk"/>
        </resource>
        <resource identifier="SINGLE_O_RESOURCE7" type="webcontent" href="content2.htm">
          <file href="content2.htm"/>
        </resource>
        <resource identifier="SINGLE_O_RESOURCE8" type="webcontent" href="summary2.htm">
          <file href="summary2.htm"/>
        </resource>
        <resource identifier="SINGLE_O_RESOURCE9" type="webcontent" href="lesson3.htm">
          <file href="lesson3.htm"/>
        </resource>
        <resource identifier="SINGLE_O_RESOURCE10" type="webcontent" href="intro3.htm">
          <file href="intro3.htm"/>
        </resource>
        <resource identifier="SINGLE_O_RESOURCE11" type="webcontent" href="content3.htm">
          <file href="content3.htm"/>
        </resource>
        <resource identifier="SINGLE_O_RESOURCE12" type="webcontent" href="summary3.htm">
          <file href="summary3.htm"/>
        </resource>
      </resources>
    </manifest>
</manifest>
```

Appendix A - Content Packaging DTD

```
<!ELEMENT schema  (#PCDATA )>
<!ATTLIST schema  e-dtype NMTOKEN  #FIXED 'string' >
<!ELEMENT schemaversion  (#PCDATA )>
<!ATTLIST schemaversion  e-dtype NMTOKEN  #FIXED 'string' >
<!ELEMENT title  (#PCDATA )>
<!ATTLIST title  e-dtype NMTOKEN  #FIXED 'string' >
<!ELEMENT file  (metadata? )>
<!ATTLIST file  href CDATA  #REQUIRED >
<!ELEMENT dependency EMPTY>
<!ATTLIST dependency  identifierref CDATA  #IMPLIED >
<!ELEMENT resource  (metadata? , file+ , dependency* )>
<!ATTLIST resource  identifier ID    #REQUIRED
                    type       CDATA #REQUIRED
                    href       CDATA #IMPLIED >
<!ELEMENT resources  (resource* )*>

<!ELEMENT item  (title? , item* , metadata? )*>
<!ATTLIST item  identifier   ID        #REQUIRED
                isvisible    CDATA     #IMPLIED
                parameters   CDATA     #IMPLIED
                identifierref CDATA    #IMPLIED
                a-dtype      NMTOKENS  'isvisible boolean' >
<!ELEMENT organization  (title? , item* , metadata? )>
<!ATTLIST organization  identifier ID  #REQUIRED >
<!ELEMENT organizations  (organization* )>
<!ATTLIST organizations  default IDREF  #IMPLIED >
<!ELEMENT metadata  (schema? , schemaversion? )>

<!ELEMENT manifest  (metadata? , organizations , resources , manifest* )>
<!ATTLIST manifest  identifier ID    #REQUIRED
                    version    CDATA #IMPLIED >
```

Appendix B - DRAFT Content Packaging W3C XML Schema

```
<?xml version="1.0"?>
<!-- edited with XML Spy v3.5 (http://www.xmlspy.com) by Thomas Wason (private) -->
<!-- filename=ims+cp+rootv1p1.xsd -->
<!-- Copyright (2) 2001 IMS Global Learning Consortium, Inc. -->
<!-- edited by Thomas Wason  -->
<!-- Conforms to w3c http://www.w3.org/TR/xmlschema-1/ 2000-10-24-->
<xsd:schema xmlns="http://www.imsproject.org/xsd/ims_cp_rootv1p1"
targetNamespace="http://www.imsproject.org/xsd/ims_cp_rootv1p1"
xmlns:xml="http://www.w3.org/XML/1998/namespace"
xmlns:imsmd="http://www.imsproject.org/xsd/ims_md_rootv1p1"
xmlns:xsd="http://www.w3.org/2000/10/XMLSchema" elementFormDefault="unqualified"
version="IMS CP 1.1DRAFT Schema 1.1DRAFT">
  <xsd:annotation>
    <xsd:documentation xml:lang="en">DRAFT XSD for IMS Content Packaging version 1.1
DRAFT</xsd:documentation>
    <xsd:documentation> Copyright (c) 2001 IMS GLC, Inc. </xsd:documentation>
    <xsd:documentation>2000-04-21, Adjustments by T.D. Wason from CP
1.0.</xsd:documentation>
    <xsd:documentation>2001-02-22, T.D.Wason: Modify for 2000-10-24 XML-Schema version.
Modified to support extension.</xsd:documentation>
    <xsd:documentation>2001-03-12, T.D.Wason: Change filename, target and meta-data
namespaces and meta-data fielname. Add meta-data to itemType, fileType and
organizationType.</xsd:documentation>
    <xsd:documentation>Do not define namespaces for xml in XML instances generated from
this xsd.</xsd:documentation>
    <xsd:documentation>Imports IMS meta-data xsd, lower case element names.
</xsd:documentation>
    <xsd:documentation>This XSD provides a reference to the IMS meta-data root element
as imsmd:record</xsd:documentation>
    <xsd:documentation>If the IMS meta-data is to be used in the XML instance then the
instance must define an IMS meta-data prefix with a namespace. The meta-data
targetNamespace should be used. </xsd:documentation>
   <xsd:documentation>2001-03-20, Thor Anderson: Remove manifestref, change resourceref
back to identifierref, change manifest back to contained by manifest. --Tom Wason:
manifest may contain _none_ or more manifests.</xsd:documentation>
    <xsd:documentation>2001-04-13 Tom Wason: corrected attirbute name structure. Was
misnamed type. </xsd:documentation>
  </xsd:annotation>
  <xsd:annotation>
    <xsd:documentation>Inclusions and Imports</xsd:documentation>
  </xsd:annotation>
  <xsd:import namespace="http://www.imsproject.org/xsd/ims_md_rootv1p1"
schemaLocation="ims_md_rootv1p1.xsd"/>
  <xsd:import namespace="http://www.w3.org/XML/1998/namespace"
schemaLocation="ims_xml.xsd"/>
  <xsd:annotation>
    <xsd:documentation>Attribute Declarations</xsd:documentation>
  </xsd:annotation>
  <xsd:attributeGroup name="attr.base">
    <xsd:attribute ref="xml:base" use="optional"/>
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.default">
    <xsd:attribute name="default" type="xsd:IDREF" use="optional"/>
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.href">
    <xsd:attribute name="href" use="optional">
      <xsd:simpleType>
        <xsd:restriction base="xsd:uriReference">
          <xsd:maxLength value="2048"/>
```

```
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:attribute>
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.href.req">
    <xsd:attribute name="href" use="required">
      <xsd:simpleType>
        <xsd:restriction base="xsd:uriReference">
          <xsd:maxLength value="2048"/>
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:attribute>
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.identifier.req">
    <xsd:attribute name="identifier" type="xsd:ID" use="required"/>
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.identifier">
    <xsd:attribute name="identifier" type="xsd:ID" use="optional"/>
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.imsmd">
    <xsd:attribute name="xmlns" use="default"
value="http://www.imsproject.org/xsd/ims_md_rootv1p1"/>
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.isvisible">
    <xsd:attribute name="isvisible" type="xsd:boolean" use="optional"/>
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.parameters">
    <xsd:attribute name="parameters" use="optional">
      <xsd:simpleType>
        <xsd:restriction base="xsd:string">
          <xsd:maxLength value="1024"/>
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:attribute>
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.identifierref">
    <xsd:attribute name="identifierref" use="optional">
      <xsd:simpleType>
        <xsd:restriction base="xsd:string">
          <xsd:maxLength value="2048"/>
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:attribute>
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.identifierref.req">
    <xsd:attribute name="identifierref" use="required">
      <xsd:simpleType>
        <xsd:restriction base="xsd:string">
          <xsd:maxLength value="2048"/>
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:attribute>
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.resourcetype.req">
    <xsd:attribute name="type" use="default" value="webcontent">
      <xsd:simpleType>
        <xsd:restriction base="xsd:string">
          <xsd:maxLength value="1000"/>
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:attribute>
```

```
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.structure.req">
    <xsd:attribute name="structure" use="default" value="hierarchical">
      <xsd:simpleType>
        <xsd:restriction base="xsd:string">
          <xsd:maxLength value="20"/>
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:attribute>
  </xsd:attributeGroup>
  <xsd:attributeGroup name="attr.version">
    <xsd:attribute name="version" use="optional">
      <xsd:simpleType>
        <xsd:restriction base="xsd:string">
          <xsd:maxLength value="20"/>
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:attribute>
  </xsd:attributeGroup>
  <xsd:annotation>
    <xsd:documentation>element groups</xsd:documentation>
  </xsd:annotation>
  <xsd:group name="grp.any">
    <xsd:annotation>
     <xsd:documentation>Any namespaced element from any namespace may be included within
an &quot;any&quot; element. The namespace for the imported element must be defined in
the instance, and the schema must be imported. </xsd:documentation>
    </xsd:annotation>
    <xsd:sequence>
      <xsd:any namespace="##any" processContents="strict" minOccurs="0"
maxOccurs="unbounded"/>
    </xsd:sequence>
  </xsd:group>
  <!-- Elements Declarations -->
  <xsd:annotation>
    <xsd:documentation>Element Declarations</xsd:documentation>
  </xsd:annotation>
  <xsd:element name="dependency" type="dependencyType"/>
  <xsd:element name="file" type="fileType"/>
  <xsd:element name="item" type="itemType"/>
  <xsd:element name="manifest" type="manifestType"/>
  <xsd:element name="metadata" type="metadataType"/>
  <xsd:element name="organization" type="organizationType"/>
  <xsd:element name="organizations" type="organizationsType"/>
  <xsd:element name="resource" type="resourceType"/>
  <xsd:element name="resources" type="resourcesType"/>
  <xsd:element name="schema" type="schemaType"/>
  <xsd:element name="schemaversion" type="schemaversionType"/>
  <xsd:element name="title" type="titleType"/>
  <!-- complexTypes -->
  <xsd:complexType name="dependencyType">
    <xsd:sequence/>
    <xsd:attributeGroup ref="attr.identifierref.req"/>
  </xsd:complexType>
  <xsd:complexType name="fileType">
    <xsd:sequence>
      <xsd:element ref="metadata" minOccurs="0"/>
    </xsd:sequence>
    <xsd:attributeGroup ref="attr.href.req"/>
  </xsd:complexType>
  <xsd:complexType name="itemType">
```

```xml
    <xsd:sequence>
      <xsd:element ref="title" minOccurs="0"/>
      <xsd:element ref="item" minOccurs="0" maxOccurs="unbounded"/>
      <xsd:element ref="metadata" minOccurs="0"/>
    </xsd:sequence>
    <xsd:attributeGroup ref="attr.identifier.req"/>
    <xsd:attributeGroup ref="attr.identifierref"/>
    <xsd:attributeGroup ref="attr.isvisible"/>
    <xsd:attributeGroup ref="attr.parameters"/>
  </xsd:complexType>
  <xsd:complexType name="manifestType">
    <xsd:sequence>
      <xsd:element ref="metadata" minOccurs="0"/>
      <xsd:element ref="organizations"/>
      <xsd:element ref="resources"/>
      <xsd:element ref="manifest" minOccurs="0" maxOccurs="unbounded"/>
    </xsd:sequence>
    <xsd:attributeGroup ref="attr.identifier.req"/>
    <xsd:attributeGroup ref="attr.version"/>
    <xsd:attribute ref="xml:base"/>
  </xsd:complexType>
  <xsd:complexType name="metadataType">
    <xsd:sequence>
      <xsd:element ref="schema" minOccurs="0"/>
      <xsd:element ref="schemaversion" minOccurs="0"/>
      <xsd:element ref="imsmd:record" minOccurs="0"/>
      <xsd:group ref="grp.any"/>
    </xsd:sequence>
  </xsd:complexType>
  <xsd:complexType name="organizationsType">
    <xsd:sequence>
      <xsd:element ref="organization" minOccurs="0" maxOccurs="unbounded"/>
      <xsd:group ref="grp.any"/>
    </xsd:sequence>
    <xsd:attributeGroup ref="attr.default"/>
  </xsd:complexType>
  <xsd:complexType name="organizationType">
    <xsd:sequence>
      <xsd:element ref="title" minOccurs="0"/>
      <xsd:element ref="item" minOccurs="0" maxOccurs="unbounded"/>
      <xsd:element ref="metadata" minOccurs="0"/>
    </xsd:sequence>
    <xsd:attributeGroup ref="attr.identifier.req"/>
    <xsd:attributeGroup ref="attr.structure.req"/>
  </xsd:complexType>
  <xsd:complexType name="resourcesType">
    <xsd:sequence>
      <xsd:element ref="resource" minOccurs="0" maxOccurs="unbounded"/>
      <xsd:group ref="grp.any"/>
    </xsd:sequence>
    <xsd:attributeGroup ref="attr.base"/>
  </xsd:complexType>
  <xsd:complexType name="resourceType">
    <xsd:sequence>
      <xsd:element ref="metadata" minOccurs="0"/>
      <xsd:element ref="file" maxOccurs="unbounded"/>
      <xsd:element ref="dependency" minOccurs="0" maxOccurs="unbounded"/>
      <xsd:group ref="grp.any"/>
    </xsd:sequence>
    <xsd:attributeGroup ref="attr.identifier.req"/>
    <xsd:attributeGroup ref="attr.resourcetype.req"/>
```

```
    <xsd:attributeGroup ref="attr.base"/>
    <xsd:attributeGroup ref="attr.href"/>
  </xsd:complexType>
  <xsd:simpleType name="schemaType">
    <xsd:restriction base="xsd:string">
      <xsd:maxLength value="100"/>
    </xsd:restriction>
  </xsd:simpleType>
  <xsd:simpleType name="schemaversionType">
    <xsd:restriction base="xsd:string">
      <xsd:maxLength value="20"/>
    </xsd:restriction>
  </xsd:simpleType>
  <xsd:simpleType name="titleType">
    <xsd:restriction base="xsd:string">
      <xsd:maxLength value="100"/>
    </xsd:restriction>
  </xsd:simpleType>
</xsd:schema>
```

Appendix C - Additional Resources

IMS Content Documents

IMS Content Packaging Information Model:
http://www.imsproject.org/content/packaging/ims_cp_infov1p1.html

IMS Content Packaging Best Practice Guide:
http://www.imsproject.org/content/packaging/ims_cp_bestv1p1.html

IMS Meta-data Documents

The IMS Meta-data Best Practice and Implementation Guide:
http://www.imsproject.org/metadata/mdbestv1p1.html

The IMS Learning Resource Meta-data Information Model:
http://www.imsproject.org/metadata/mdinfov1p1.html

IMS 1.1 Meta-data DTD: http://www.imsproject.org/xml/ims_md_rootv1p1.dtd

ADL/AICC Documents

Sharable Content Object Reference Model (SCORM[TM]): http://www.adlnet.org/

Aviation Industry CBT Committee (AICC) API for Web Implementation: http://www.aicc.org/

XML

XML Version 1.0 specification of the W3C: http://www.w3.org/TR/1998/REC-xml-19980210

XML Namespace Recommendation of W3C: http://www.w3.org/TR/1999/REC-xml-names-19990114

XML Inclusion Technical Report: http://www.w3.org/TR/xinclude

XML-Data specification: http://www.w3.org/TR/1998/NOTE-XML-data-0105/

XML Schema specification: http://www.w3.org/XML/Schema.html

Appendix D - List of Contributors

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About This Document

Title	IMS Content Packaging XML Binding
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Version	1.1
Version Date	April 2001
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Summary	This document describes the IMS Content Packaging XML Binding that implements the IMS Content Packaging Information Model. The XML encoding is based on the W3C XML Specification 1.0.
Revision Information	19 April 2001
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Revision History

Version No.	Release Date	Comments
Base 1.0	23 December 1999	The first formally released version of the full IMS Content Packaging Information Model Base Document;
Draft 0.9	8 February 2000	Draft of final version 1 specification accepted by IMS Technical Board;
Public Draft 0.91	15 February 2000	Updated to address a) More consistent W3C-like handling of external files b) Cleaner way to handle extended resource in the <resources> section c) Element name change: 'url' to 'href';
0.92	20 March 2000	Format updated with following changes: a) Move "isvisible" attribute from <resource> element to <item> element b) Add <title> to <tableofcontents> c) Revert back to the <resource type="webcontent"> approach introduced in the v0.9 document d) Rename <organization> to <organizations;
1.0	2 May 2000	a) Updated version information to 1.0. b) Included examples (new and removed from Best Practice Guide) c) Tweaks to xml-data schema <file> element d) Adopted IMS 1.1 Meta-data DTD and Schema e) Changed meta-data examples to include <record>.
1.0	25 May 2000	Updated document to address the following open issues: a) Explained basic differences between DTDs and other Schemas for document validation in both the Best Practice Guide and the Binding document. b) Ensured that the samples provided with the specification are separated into different folders depending on whether a DTD or an XDR file is used as the control document. The samples used in the body of the specification documents are only well-formed and do not rely upon a particular control document. c) Added a URL for where users can download the samples. d) Made an explicit comment that none of the samples provided (wherever theyoccur) refer to any sort of control document. e) Reordered the Appendices to fit the order they're mentioned in the specification documents.
Public Draft 1.1	8 December 2000	Made minor text changes and updated the document to address the following issues: a) Replaced <tableofcontents> element with the <organization> element. b) Made <title> a sub-element of <item> rather than an attribute of it. c) Changed resource <item> element attribute "identieref" to "resourceref". d) Made sub-level <manifest> a sub-element of <manifestref>, rather than <manifest>. e) Changed references from URL Base to XML Base. f) Added <dependency> element as a sub-element of <resource>. g) Updated XML samples.

Version No.	Release Date	Comments
Final 1.1	19 April 2001	Updated document to address the following open issues: a) Clarified the use of the <organization> element in section 3.3.1. b) Deprecated the use of XInclude: removed samples from Sections 4.6 and 4.7. c) Extended meta-data functionality to <organization>, <item>, and <file>. d) Changed the "type" attribute on <organization> to "structure" with a default value of "hierarchical". e) Added <dependency> element to Section 3.4.1.3. f) Added sample of meta-data on <organization> to Section 3.3.4. g) Deprecated the use of <manifestref> and moved (sub)Manifests out of the <resources> block. g) Changed resource <item> element attribute back to "identifieref" from "resourceref". h) Made several minor edits; changed references to sub-manifest to (sub)Manifest; updated the graphics. i) Added <dependency> example to Section 3.4.1.3.

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