SMPTE STANDARD

Media Package for Storage, Distribution and Playback of Multimedia File Sets and Internet Resources

Table of Contents

Approved
July 13, 2011

Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices, and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in Part XIII of its Administrative Practices.

SMPTE ST 2053 was prepared by Technology Committee 24TB.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Standard. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

1 Scope

This document describes the physical packaging format of the SMPTE Media Package. This specification is derived from the ISO 29500-2 specification for Open Packaging Conventions.

The SMPTE Media Package Format may combine multiple media files, metadata files, playback applications, and other files, along with an XML Table of Contents, in a single ZIP file that can be stored and distributed as a single object using simple file transfer protocols such as HTTP:.

Systems that have ZIP file readers may read or extract or add individual files in a Media Package. The Table of Contents and related XML files enable a media player to select appropriate media files, tracks, DRM licenses, presentation applications, and other media-specific constructs for playback, download, streaming, or updating. A reader that fully supports Open Packaging Conventions can utilize additional functionality, such as advanced file properties and digital signatures.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword “reserved” indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword “forbidden” indicates “reserved” and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

Unless otherwise specified, the order of precedence of the types of normative information in this document shall be as follows: Normative prose shall be the authoritative definition; Tables shall be next; followed by formal languages; then figures; and then any other language forms, including normatively referenced XML schema files (*.XSD files).

3 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this recommended practice are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

ISO/IEC 29500-2 Open Packaging Conventions (OPC, 2008 November 15), http://standards.iso.org/ittf/PubliclyAvailableStandards/c051459_ISOIEC%2029500-2_2008%28E%29.zip

World Wide Web Consortium (W3C) (2004, February 4). Extensible Markup Language (XML) 1.0 (Third Edition)

World Wide Web Consortium (W3C) (2004, October 28). XML Schema Part 1: Structures (Second Edition)

World Wide Web Consortium (W3C) (2004, October 28). XML Schema Part 2: Datatypes (Second Edition)

RFC 3986 Uniform Resource Identifier (URI); Generic Syntax, The Internet Society, Berners-Lee, T., R. Fielding, and L. Masinter, 2005, http://www.ietf.org/rfc/rfc3986.txt

RFC 3987 Internationalized Resource Identifiers (IRIs), The Internet Society, Duerst, M. and M. Suignard, 2005, http://www.ietf.org/rfc/rfc3987.txt

BCP-47 Best Current Practice, Tags for Identifying Languages, IETF RFC, http://www.rfc-editor.org/rfc/bcp/bcp47.txt (September 2009 edition; includes RFC 5656, and RFC 4647)

This is a multi-element standard and includes as an integral portion of this document: 2053a, 2053b, 2053c, and 2053d.

4 Definitions and Terms

Words intended to convey the meaning defined in this document are capitalized. When a word matching a defined term is not capitalized, it is understood to convey its generic English meaning.

Content Type Component: XML markup (stored in a ZIP item) that identifies the MIME Media Type of each Part in the Package.

DRM: "Digital Rights Management"; usually relying on encryption of files or streams, and control of decryption keys in DRM licenses that manage playback to prevent unintended use of the encrypted content.

File: An ordered sequence of bytes or byte streams stored in a file system that assigns a name to those bytes, including a hierarchical organization ("path") of volumes and directories, and some method by which the named bytes can be read. The bytes of a file have different physical allocations on different storage devices in a file system, on different file systems, when stored as a web resource, or when stored as a Part in a Media Package. However, the logical byte stream and file name are typically maintained independent of the physical storage system, so the term also is used to refer to the logical byte stream and file name.

IRI: International Resource Identifier.

License: A DRM license that manages decryption keys and playback rules for a particular DRM system.

OPC: ISO/IEC 29500-2 Open Packaging Conventions standard.

Package: A structured container file that has independent physical and logical organization and conforms to the ISO 29500-2 OPC standard.

Package Component: Any data component defined in a Package, including Parts, Relationships, and the Content Types Stream.

Package Root: The top organizational level (root) of a Package, represented by the "/" string.

Part: A logical entity of data that has been stored as a physical ZIP item in a Package. Every Part consists of three elements:

- An ordered sequence of bytes (i.e., "a data stream").
- A Part Name that corresponds to the physical name of the ZIP Item in the package. Part Names are constrained by IRI naming conventions as described in the ISO 29500-2 Open Packaging Conventions specification, Section 9.1.1 "Part Names".
- A Content Type specifying the MIME Media Type of the Part, as identified in the Content Type Component.

Part Name: The IRI of a Part in the Package.

Physical Package Format: A specific file format that can implement all the capabilities of a Package (e.g., a Zip Archive and associated logical Package format specification).

Presentation Application: An "application" or computer program ranging from simple playlists and parameters, to more complex declarative markup languages, to procedural code such as interpreted script language, intermediate languages partially compiled for virtual machines, or fully compiled binary code for native execution on specific processor hardware. A Presentation Application's primary purpose is the presentation and control of media essence and related information, including user input and Internet input.

Relationship: A directional association between a Source and a Target. Relationships are expressed as XML in a Package's Relationship Parts, associated with the Package Root via naming convention or with an individual Part, and function like a flexible internal file "directory" system that is independent of physical storage organization.

Relationship Part: A Package Part (XML markup) where Relationships are stored. A Relationships Part can be associated with each Part in the Package, or can be associated with the Package Root. This association is represented by naming convention relative to the associated Part or Package Root.

Resource: A URI-addressable object on the Internet that is used to provide additional data or capabilities to the referring component.

Source: A Package or a Part of a Package that is the origin of the directional association described by a Relationship. The URI of the Source is that of the Part with which the Relationship Part that stores the Relationship markup is associated.

Target: A Part or Resource that is the destination of a directional association described by a Relationship. The URI of the Target Part or Resource is an attribute of the XML element that defines the Relationship.

Track: A logical abstraction usually referring to a single essence stream such as audio, video, or subtitle; but more generally to any data that is delivered or rendered sequentially in combination with audio and video. Physical storage of multiple Tracks may be in a single Track Container or multiple Track Containers.

Track Container: A single A/V file, XML, or Resource that may contain one or more Tracks.

XSD: W3C XML Schema Definition file format

ZIP Archive: A ZIP file as defined in the OPC specification. A ZIP archive contains ZIP items.

ZIP Item: A ZIP item is an atomic set of data in a ZIP Archive that becomes a file when the archive is extracted. A ZIP Item has a "/" delimited name that corresponds to a folder hierarchy such that when a ZIP-based Package is unzipped, an organized set of files and folders results.

5 Architecture

5.1 Overview (Informative)

A SMPTE Media Package is a ZIP-based file container that includes XML documents and naming compliant with the ISO 29500-2 Open Packaging Conventions standard, plus XML documents defined herein for the management and playback of media essence files and their contained streams, and other types of files that may be useful for the description or presentation of the essence files.

Media Packages are useful for storage and electronic distribution of multiple files in a single container where multiple files are required to provide, for example, multiple resolutions, bitrates, codecs, content protection systems, languages, versions, episodes, collections, albums, metadata, and interactive presentation applications.

Media Packages enable dynamic storage in the sense that files can be easily added or removed from a Media Package, similar to a computer file folder. A device can inspect a Media Package and discover files of interest in its Table of Contents and download them from a server for local storage in the Media Package, and subsequent playback and copying of that Media Package. When new content or Presentations become available, they can be identified in an updated Table of Contents, and new Presentations and their related files can be downloaded to the Media Package.

The Table of Contents lists “Presentations”, which can be as simple as linear playback of an audio, or audio/video file, but can also reference Presentation Applications intended for execution that may include menus, interactivity, online components, streaming, etc. A Presentation may combine multiple essence files in sync, in sequence, overlaid, switched, mixed, in “3D”, etc. Presentations listed in the Table of Contents include format identification to enable devices to locate presentations they are capable of playing, and playback options so that they can select preferred Tracks according to language, ratings, accessibility, audio channels, video quality, and other factors.

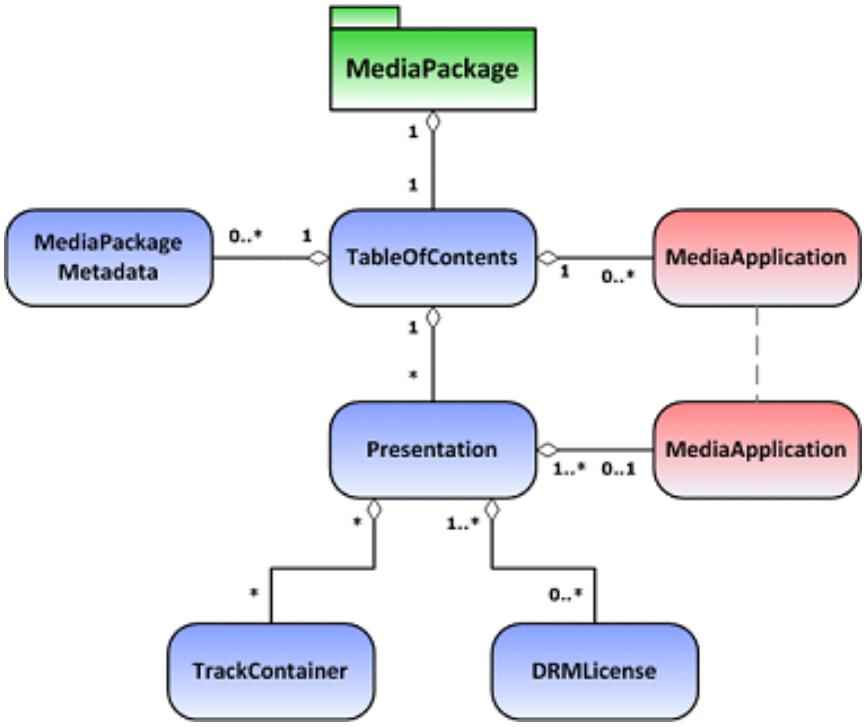

Figure 1 – SMPTE Media Package Architecture, showing components unique to a Media Package (Informative)

5.2 SMPTE Media Package Components

The blue (or dark when black and white) components in the block diagram (Figure 1) are XML documents defined in this specification, and are in addition to structures normally included in a ZIP container that is OPC compliant. The “MediaApplication” boxes indicate contained files or “Parts” that are referenced either by the Table of Contents XML document, or a Presentation XML document. Each component is explained in more detail below.

5.2.1 Media Package

The “MediaPackage” box indicates the container, which appear as a single ZIP file to a file system or file transfer protocol, but to a ZIP file reader as a folder of files (ZIP Items or OPC Parts) with hierarchical path names. Since this is an OPC compliant Package, it also includes OPC Parts that are not shown separately in this diagram. A SMPTE Media Package reader may apply Media Package specific schemas to interpret the XML parts indicated for purposes of multimedia resource management and presentation.

5.2.2 Table of Contents

The logical entry point to a Media Package is the Table of Contents XML document and OPC Part. The Table of Contents contains a list of Presentations. Presentations may share some of the same media and metadata files, but differ in ways that are significant to the author, playback devices, or users. Different Presentations in the Table of Contents could be different episodes of a series, different languages, different resolutions, different aspect ratios, different media formats (codecs, A/V files, DRM, etc.), or different interactive authoring formats (e.g., DVD-Video format). A player may examine the list of Presentations in the Table of Contents and determine compatibility, and either pick the optimal Presentation automatically (based on resolution, screen aspect ratio, etc.), or present choices to a user (such as a menu of episodes).

In general, Resources referred to by the XML documents in the diagram may be currently stored as Parts in the Package, or they may currently reside on the Internet or some local network where they may be accessed or copied to the Package using the referenced URI (RFC 3986) as the source. The file reader or player is responsible for checking the current location of Resources before attempting to access them. In some cases, network access is appropriate, in other cases a complete download or progressive download to the Package may be appropriate.

A valid SMPTE Media Package may contain only a Table of Contents Part, and no media or metadata files. XML Presentation documents listed in that Table of Contents may be downloaded and stored as Parts as needed using their URIs. Resources referenced by those Presentation XML documents may be downloaded as needed using their URIs. A consumer may use the URI and version of the Table of Contents to check the Internet for an updated Table of Contents, which might contain new or updated Presentations referencing new or updated files. The consumer may use these new versions to update the contents of the SMPTE Media Package. A process deploying a SMPTE Media Package to a particular platform, often a less-capable platform, may choose to cull the SMPTE Media Package such that the resultant SMPTE Media Package on the target platform contains only a subset of the Presentations and Media Applications appropriate to that platform. SMPTE Media Packages are designed to take advantage of dynamic content delivery in a multiplatform, online environment.

5.2.3 Media Package Metadata

Presentations listed in the Table of Contents may reference XML metadata files currently located in the Media Package or currently located on the Internet. A limited amount of content metadata is included in Table of Contents and Presentation XML, but advanced content management databases and user interfaces may use referenced metadata files for more extensive descriptive metadata, cast and crew, genre, plot, reviews, actors’ bios, related works, jacket pictures, etc.

5.2.4 Presentation(s)

Presentations are individual XML documents referenced by a list in the Table of Contents. Each Presentation contains a logical representation of a multimedia presentation, with references to the files that are part of the Presentation, and in some cases their purpose, such as media essence, metadata, Media Applications, and DRM Licenses. The XML information is sufficient for a player and user to make the appropriate Presentation selection based on format compatibility and features (e.g., Content identification, language preference, accessibility, quality, performance, etc.) without having to download or parse additional files to obtain that information.

A Presentation includes a set of files that shall be accessible for normal playback, and typically would be delivered in, or downloaded to a Media Package. A Presentation file set stored in a Media Package may also be extracted from the ZIP container and stored in the native file system of a device or storage medium as separate files with their ZIP Item names and/or paths.

Presentations allow for alternate Track sets, Media Applications, and DRM licenses. Depending on the media format, alternate Tracks may be selectable by the user during playback, for instance to change audio or subtitle languages or to change video “angles”. A player may automatically select from different video Tracks encoded at different bitrates in order to optimize video streaming quality to adapt to variable network throughput. Other alternate Tracks may be selected at the start of playback based on decoders available, number of audio channels, etc. Alternate Media Applications and DRM licenses may also be either selected dynamically or in advance and not switched during playback based on player capability and compatibility.

The use of alternative Tracks, alternative Media Applications, alternative DRM licenses, etc. within a single Presentation structure reduces the number of Presentations that would otherwise need to be specified for each possible combination of language, codec, bitrate, Media Application, etc. The alternate Track structure also identifies what Tracks are available for switching during playback, assuming their Track Container is accessible.

5.2.5 Track Container

Track Containers are a logical representation of Parts or Resources containing one or more Tracks. Presentations abstract how Tracks are stored, but Track Containers identify how Tracks are stored so that it is possible to determine what files need to be downloaded or accessible in order to access particular Tracks. For instance, multiple audio codecs or subtitle languages could be stored in the same large audio/video file, or could be stored in separate files to allow downloading and storage of only the Tracks of interest to a particular user. For media formats that support late binding, separately stored Tracks are synchronized at playout by synchronizing each Track to a common time base referenced by each stored Track.

5.2.6 Media Application(s)

“Media Application” is a broad term intended to include a variety of presentation control programs ranging from simple play lists, declarative data, and markup languages; to procedural language programs that are interpreted by players or virtual machines, or compiled to binary to run on specific processors. A player may select and launch the Media Application of the type it prefers from among those referenced by the Presentation Part XML, which are likely stored as a Part in the Media Package.

A Presentation Part’s XML may reference multiple alternate Media Applications for the same Presentation file set. For instance, a DVD-Video file set could reference an *.IFO file as a Media Application that would be registered to a device’s DVD player, which would interpret the IFO data structures to interactively play the *.VOB MPEG-2 program stream files in the file set with menus, subpictures, and other DVD-Video features. The Presentation might also reference an HTML page with an embedded media player application that would decode the MPEG-2 program streams with a different graphical user interface constructed in part from Web resident resources. Another device might only be capable of directly decoding the program streams for simple linear playback without running a Media Application from the Media Package.

A Media Application may also be associated at the Media Package Table of Contents (TOC) level to control all or most of the Presentations in the Media Package. An example would be a menu application that enumerates the available episodes of a TV series as they become available, automatically incorporates titles, descriptions, images, etc. into a selection menu that dynamically adapts to and presents all available content. A TOC-level Media Application could provide a master menu, but transfer control to different Media Applications for each Presentation, for example by navigating from a top level Web page to individual Presentation Web pages and back. Alternatively, the Table of Contents and individual Presentations may reference the same Media Application, which operates in different modes depending upon whether it is operating at the TOC level or Presentation level.

5.2.7 DRM License(s)

Media Packages support distribution of protected content by allowing the inclusion of DRM license information. Presence of a DRM license reference shall inform a device that the referenced essence files are encrypted so it knows in advance not to download them unless it supports a listed DRM that can provide keys to decrypt them. The license acquisition URL provides a link to a server to acquire a license for that content, device or domain, and DRM. A license acquisition object (such as an XML file) may also be referenced and used in the license acquisition process. Another reference also provides a local link to the license once a license has been acquired and stored, so the Media Package may be copied and played on other devices within the domain of the license without additional license downloads.

5.2.8 Version Control

The Table of Contents contains a version number and a “Source” URL to a Web resident copy of the Media Package, which allows a Media Package application to check for a higher (more recent) version number in the Web resident Table of Contents, and download and replace the version currently stored in the local Media Package. The Table of Contents references Presentations and includes “VersionRequired” elements indicating the current Presentation version number, which allows a Media Package application to check for a newer Presentation version in the Web resident Media Package and download and replace the locally stored Presentation XML document. Presentations contain “VersionRequired” elements that may indicate the current Resource versions using whatever version number scheme that may be supported by a particular Resource. A Media Package application may download and replace any locally stored Resource files (OPC Parts or Zip Items) that are older than the Web resident versions. Media Package applications are responsible for determining if playback should be attempted of a Resource or Presentation with a version older than the corresponding VersionRequired. Policy may differ based on the particular resource file, format, and playback usage.

6 Media Package Constraints on OPC

Minimum requirements for ISO/IEC 29500-2 Open Packaging Conventions (OPC)

- **Web-compatible Part Names**
  To facilitate Web access to parts stored in a package the Part Names of all parts (files) stored in a package shall be IRI-compliant (RFC 3987).

- **A “[Content_Types].xml” file**
  Each package shall contain a “/[Content_Types].xml” file as defined in ISO 29500-2, Section 10.2.6[1] that specifies the MIME Media Types for all default file extensions and all parts with non-default file extensions that are stored in the package. (Note 2 below provides an informative example of a “/[Content_Types].xml” file.)

[1] Note that the filename must contain the square brackets.

In addition, a SMPTE Media Package:

- Shall contain a package-level Relationship to a Table of Contents XML Part, as defined in Section 7.1, referenced via a package-level Relationship. The Relationship type of this package-level Relationship shall be:

```
Type="http://www.smpte-ra.org/schemas/2053/2011/MediaPackage/toc"
```

- May contain a Media Package Metadata XML Part referenced via package-level Relationship. The Relationship type of this package-level Relationship, if it is used shall be:

```
Type="http://www.smpte-ra.org/schemas/2053/2011/MediaPackage/metadata"
```

- May contain one or more W3C XML Digital Signatures as specified in ISO 29500-2 Open Packaging Conventions standard, Section 13 “Digital Signatures”.

- May use the file extension ".smpx"[2] if the media package is to be opened with an application on a system where the default application is identified by file extension. May also use the file extension ".zip" if the media package is to be accessed by means of a Zip application, in which case the filename should start with the prefix “smpx” to enable content management applications to easily identify SMPTE Media Packages from other Zip files.

- Shall contain a content-types stream that declares the content types (also called MIME types) for all parts in the package, according to the requirements of the Open Packaging Conventions specification.

Note 1: The following is an informative example of the syntax of the “**/rels/.rels**” package-level Relationships part:

```
<Relationships xmlns="http://schemas.openxmlformats.org/package/2006/relationships">
  <Relationship Target="/Contents.toc" Id="R0"
                Type=" http://www.smpte-ra.org/schemas/2053/2011/MediaPackage/toc"/>
  <Relationship Target="/PackageMetadata.packmeta" Id="R1"
                Type=" http://www.smpte-ra.org/schemas/2053/2011/MediaPackage/metadata "/>
</Relationships>
```

Note 2: The following is an informative example of the syntax of the “**/[Content_Types].xml**” stream:

```
<?xml version="1.0" encoding="utf-8" ?>
<Types xmlns="http://schemas.smpte-ra.org/2053/2011/MediaPackage/content-types">
  <Default Extension="rels" ContentType="application/vnd.openxmlformats-package.relationships+xml" />
  <Default Extension="png" ContentType="image/png" />
  <Default Extension="xml" ContentType="application/xml" />
  <Default Extension="mp3" ContentType="audio/mpeg3" />
  <Default Extension="m4v" ContentType="video/mpeg4" />
  <Default Extension="prs" ContentType="application/text/xml" />
  <Override PartName="/TableOfContents.xml" ContentType="application/text/xml" />
  <Override PartName="/properties/core.xml"
    ContentType="application/vnd.openxmlformats-package.core-properties+xml" />
</Types>
```

[2] ".smpx": SMPTE Media Package, eXtensible

The Table of Contents part:

- May reference via inline markup zero or more Presentation XML parts or Package Application XML parts either locally within the package or external to the package.
- May reference a Media Package Application part via Relationship.

The Presentation part:

- Shall reference via inline markup one or more tracks containing audio, video, subtitle, or other data.
- May also reference via Relationships zero or more DRM licenses.
- May reference a Media Package Application part via Relationship. This Media Package Application part may be the same part referenced by the Table of Contents part or may be an independent part.

A Media Package Application part:

- May reference one or more other Media Package Application parts via Relationship.

This specification shall incorporate by reference in Section 7 XSD schema files for the required Table of Contents Part, and optional Presentation, Resource, and Media Application Parts. Instance documents contained in each Media Package Part shall conform to the syntax defined in the corresponding XML Schema Description XSD file (W3C XML Schema, Parts 1 and 2). Valid documents shall further conform to the semantics and additional syntax constraints specified in the prose and diagrams of Section 7. All XML described in this specification shall be UTF-8 or UTF-16 encoded, conformant with the XML 1.0 specification (W3C XML 1.0), as required by the Open Packaging Conventions specification.

7 Media Package Schemas

This section specifies the elements and attributes of the XML markup for each part in the SMPTE Media Package. The use of the term, “required”, in this section is equivalent to a “shall” provision; and the use of the term, “optional”, is equivalent to a “may” provision.

7.1 Table of Contents Part

The Table of Contents Part specifies the overall list of presentations included within the SMPTE Media Package. The Table of Contents Part shall contain an XML document conformant with the XML Schema Definition file at the following location:

```
http://www.smpte-ra.org/schemas/2053/2011/MediaPackage/2053a-Media-Package-TableOfContents.xsd
```

Note: The following is an informative example of the markup of the Table of Contents part:

```
<?xml version="1.0" encoding="UTF-8"?>
<TableOfContents xmlns="http://www.smpte-ra.org/schemas/2053/2011/MediaPackage"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.smpte-ra.org/schemas/2053/2011/MediaPackage
    SMPTE-Media-Package_TableOfContents.xsd"
    Version="1" Source="http://www.ExampleStudios.com/gwtw/toc.xml">
  <MediaApplications>
    <Application Type="Silverdark"
      RemoteSource="http://www.ContosoStudios.com/gwtw/TocUI/TocUI.xap"
      LocalSource="/gwtw/TocUI/TocUI.xap" />
    <Application Type="Glow"
      RemoteSource="http://www.ExampleStudios.com/gwtw/TocUI/TocUI.swf"
      LocalSource="/gwtw/TocUI/TocUI.swf" />
    <Application Type="HTML"
      RemoteSource="http://www.ExampleStudios.com/gwtw/TocUI/TocUI.htm"
      LocalSource="/gwtw/TocUI/TocUI.htm"/>
  </MediaApplications>
  <PresentationRef Id="ID_1" VersionRequired="1" ProtectionType="cenc"
      RemoteSource="http://www.ExampleStudios.com/trailers/GWTW-Spin.prs"
      LocalSource="/trailers/GWTW-Spin.prs"
      ContentId="ISAN/0000-0000-CCF0-0050-S-0000-0000-R">
    <Title Language="en-us">Gone with the Wind Episode of 'Spin city'</Title>
    <TitleBrief>GWTW</TitleBrief>
    <Rating System="MPAA" Value="PG13" Region="US" Reason="profanity"/>
    <Rating System="ESRB" Value="XXX" Region="" Reason="nudity"/>
    <Copyright>2008 Big Studios/Copyright>
    <Duration>01:30:00</Duration>
    <DescriptiveMetadata>http://www.ExampleStudios.com/metadata/gwtw.xml</DescriptiveMetadata>
  </PresentationRef>
  <PresentationRef Id="ID_2" ContentId="ISAN/0000-0000-9DCE-0000-U-0000-0000-L
    <Title Language="en-us">African Queen</Title>
  </PresentationRef>
  <PresentationRef Id="ID_3" ContentId="ISAN/0000-0001-3449-0000-4-0000-0000-P ">
    <Title Language="en-us">Lord of the Rings</Title>
  </PresentationRef>
  <PresentationRef Id="ID_4" ContentId="ISAN/0000-0001-1CB8-0000-1-0000-0000-Y ">
    <Title Language="en-us"> Lord Of the Rings (anim) </Title>
  </PresentationRef>
</TableOfContents>
```

7.1.1 TableOfContents

The `TableOfContents` element is the single root XML node of the Table of Contents Part.

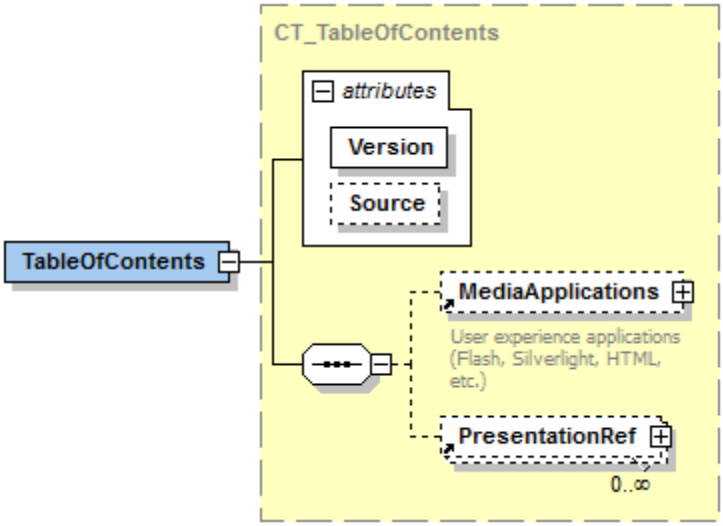

Figure 2 – TableOfContents structure. Dotted lines denote an optional element.

Version (required)

The `Version` attribute shall be assigned by the producer of the SMPTE Media Package as an integer value greater than or equal to 1. The `Version` attribute may be checked against the newest available version of the SMPTE Media Package at the referenced Web location specified by the `Source` attribute. If the available version is greater than the `Version` attribute value, the consumer may replace the entire Table of Contents Part contents with new XML retrieved from the location specified by the `Source` attribute.

Source (optional)

The `Source` attribute specifies the URL from which replacement XML contents for the Table of Contents may be retrieved.

MediaApplications (optional)

The `TableOfContents` element may contain 0 or 1 `MediaApplications` element.

PresentationRef (optional)

The `TableOfContents` element may contain an unbounded sequential sequence of `PresentationRef` elements.

7.1.2 TocPresentationUI

The `MediaApplications` element holds information regarding one or more Media Application Resources or Parts contained within the SMPTE Media Package.

The TocPresentationUI element shall include an XML schema conformant with the XML Schema Definition file at the following location:

```
http://www.smpte-ra.org/schemas/2053/2011/MediaPackage/2053d-Media-Package-MediaApplications.xsd
```

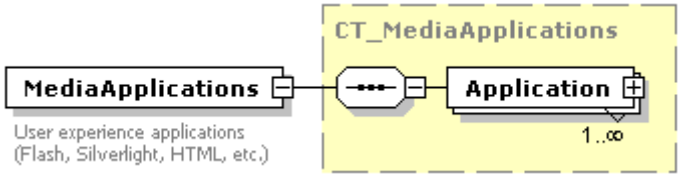

Figure 3 – MediaApplications structure. Dotted lines denote an optional element.

Media Applications

The `MediaApplications` element, if present, shall contain a collection of 1 or more `Application` elements.

7.1.3 Application

The `Application` element describes the location of a Media Application Resource or Part for the top level of the SMPTE Media Package.

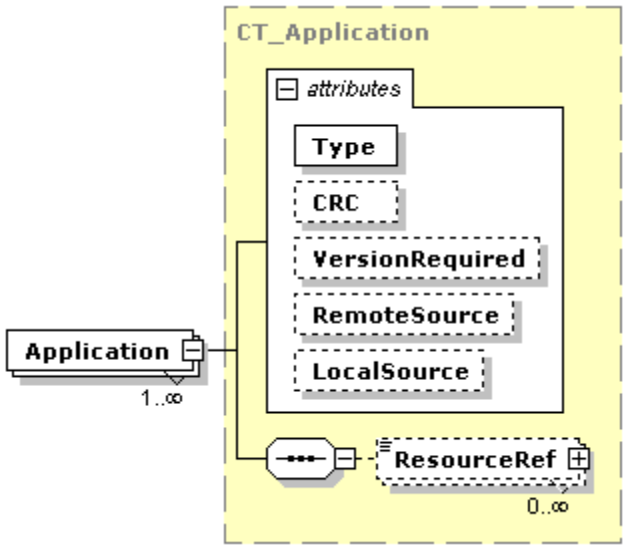

Figure 4 – Application structure. Dotted lines denote an optional element.

Type (required)

The `Type` attribute refers to the application type referenced by the `LocalSource` or `RemoteSource` attributes. Possible values may include a MIME type, a producer-defined type or one of the following values:

- HTML
- Silverlight
- Flash
- Java

CRC (optional)

The CRC attribute may be used to verify that the Media Application referenced by the LocalSource or RemoteSource attributes is valid. The consistency check performed shall be a hash using the CRC32 algorithm, compared to the value of the CRC attribute.

VersionRequired (optional)

The VersionRequired attribute specifies the current version of the Media Application referenced by the LocalSource attribute.

RemoteSource (optional)

The RemoteSource attribute references a location external to the SMPTE Media Package where the Media Application may be downloaded. A producer shall specify a RemoteSource for the location of the Media Application if it exists.

LocalSource (optional)

The LocalSource attribute references a fully-qualified part name, as described in the OPC specification, to a part within the SMPTE Media Package where the Media Application is located. A producer shall specify a LocalSource attribute value if the Media Application is stored as a Part.

7.1.4 PresentationRef

A PresentationRef element contains the basic information about a presentation included in the SMPTE Media Package so that a consumer or device may select an appropriate presentation from the Table of Contents to download or play. It also contains basic metadata about that presentation.

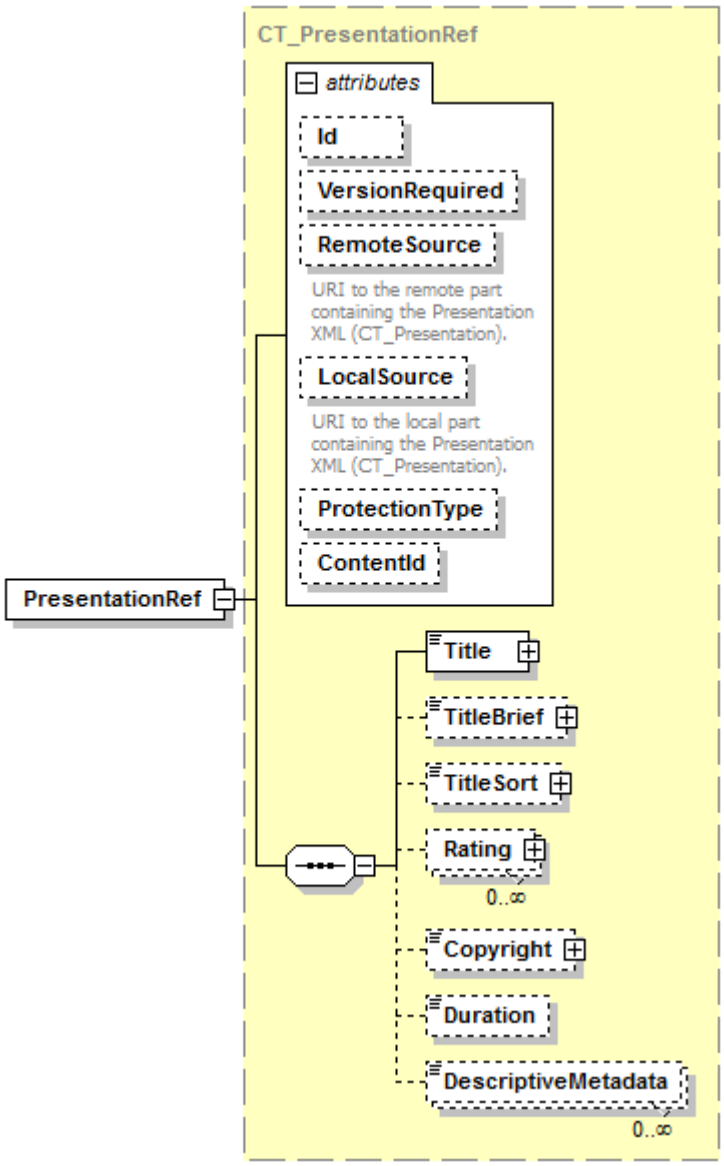

Figure 5 – PresentationRef structure. Dotted lines denote optional elements.

Id (optional)

The `Id` attribute is an identifier unique within this document for this PresentationRef.

RemoteSource (optional)

A URL where the referenced Presentation document is located so that it may be downloaded if not stored in the Media Package or if the referenced version is newer than the stored version.

LocalSource (optional)

The URI within the local Media Package of the part that stores the Presentation document.

VersionRequired (optional)

The `VersionRequired` attribute specifies the version of the Presentation part that is expected. If this Table of Contents reference requires a higher version number than the stored Presentation document it references, then the newer version of the Presentation document should be downloaded to replace the older version.

ProtectionType (optional)

The `ProtectionType` attribute specifies rights management methods applied to the content of the presentation track containers.

ContentId (optional)

The `ContentId` attribute specifies a URN that identifies the audio/video content contained in this Presentation.

Title (required)

This child element specifies the full title of the Presentation.

TitleBrief (optional)

This child element specifies an acceptable shorter version of the title of the Presentation.

TitleSort (optional)

This child element specifies the sort form of the title, e.g., “Natural, The”.

Rating (optional)

This child element specifies ratings assigned to the Presentation by a ratings body or the publisher. Multiple ratings may be assigned, each rating a unique combination of region and rating body. See Section “Rating Element” for more information.

Copyright (optional)

This child element specifies the copyright string (e.g., publisher and date) of the audio/video content in this presentation.

Duration (optional)

This child element specifies the duration of the presentation, or its default or most likely play sequence for non-linear presentations.

DescriptiveMetadata (optional)

This child element provides a reference to zero or more XML metadata files with additional information that may be useful in selecting the preferred presentation.

7.1.5 Rating Element (optional)

The `Rating` element contains a rating value assigned by the producer of a SMPTE Media Package or a content rating body.

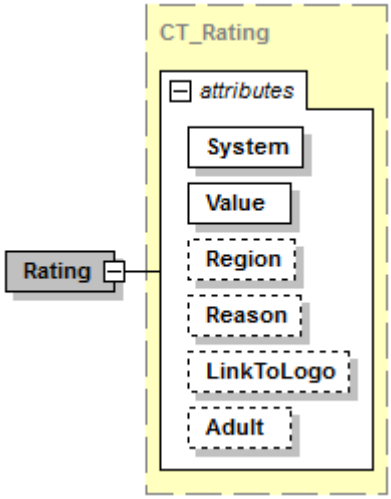

Figure 6 – Rating structure. Dotted lines denote an optional element.

Note: An informative example of the markup for this element follows.

```
<Rating System="MPAA" Value="PG13" Region="US" Reason="profanity"/>
```

System (required)

Rating system name string. May contain the string “unrated” for content where rating has not been assigned.

Value (required)

This attribute is a string containing the rating code assigned by the indicated rating System.

Region (optional)

A geographical region expressed as ISO 3166-1 alpha-2 country code, or 3166-2 or 3166-3 alpha-3 code if necessary.

Reason (optional)

Optional description of reason for restriction level, e.g., “violence”, “nudity”, etc.

LinkToLogo (optional)

Optional URL to the logo of the rating System.

Adult (optional)

Optional Boolean value “true” to indicate that the content is of adult nature. This rating may be assigned by the publisher or any other entity and is not region specific.

7.1.6 Title

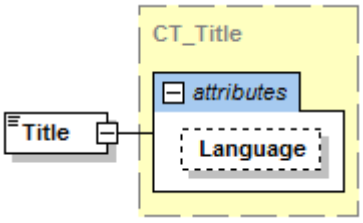

Figure 7 – Title structure used for typically displayed text fields.
(Dotted lines denote an optional element.)

Language (optional)

The Language attribute specifies the language of the presentation. It shall be conformant with BCP-47 and RFC-5646 using ISO 639-1, 2, or 3. Two character codes (ISO 639-1) preferred, and restricted to IANA registered subtags.

http://www.iana.org/assignments/language-subtag-registry

7.2 Presentation Part

A Presentation is primarily an abstract representation of media essence and data streams as synchronized multimedia Tracks. Essence streams may typically be stored in Media Packages as files containing an audio video container format such as MPEG-4 ISO Base Media files, or MPEG-2 Transport Stream or Program Streams. A Presentation may have groups of alternate Tracks of the same type, such as alternate language audio Tracks, alternate bitrate video Tracks, etc., the selection of which may significantly change the Presentation; yet these alternative Tracks are considered options within one Presentation.

The grouping of Tracks in a single Presentation or into multiple Presentations is flexible. Presentation Tracks should generally be grouped in Presentations to match how they are stored in files for efficient download, and for compatibility with intended playback devices. For instance, it would be more efficient to create different Presentations and A/V files for low resolution hand held devices and high definition set top boxes because high definition, high bit rate Tracks could not be decoded by low resolution devices, and would slow download and tax storage capacity if low resolution devices try to access low bit rate Tracks combined with high bit rate Tracks in the same presentation and file set. Low resolution Tracks would be of little value to a high definition device. If both high definition and low definition Tracks are needed, two separate Presentations could be stored in a single Package so that a device may select only the Presentations and files that match decoding capability and display resolution.

In addition to media essence files, a Presentation may include references to a metadata file, alternate Media Application files, alternate DRM files, and a “library” of other files that may be referenced by a Media Application or metadata file, or may be included in the Media Package for any other purpose outside the scope of this specification (e.g., software updates, drivers, codecs, content catalogs, system revocation messages, games, advertising, etc.).

The Presentation Part shall contain an XML document conformant with the XML Schema Definition file at the following location:

```
http://www.smpte-ra.org/schemas/2053/2011/MediaPackage/2053c-Media-Package-
PresentationRef.xsd
```

Note: An informative example of a Presentation Part is included below.

```
<?xml version="1.0" encoding="UTF-8"?>
<Presentation xmlns="http://www.smpte-ra.org/schemas/2053/2011/MediaPackage"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  <TrackGroup FormatCompatibilityCode="BD3D">
    <VideoTrackSelection>
      <VideoTrack Id="VT_1" Codec="AVC" BitRate="1200" ImageWidth="1920" ImageHeight="1080"
          RemoteSource="http://www.examplestudios.com/trailers/gwtw.m4v"
          LocalSource="/trailers/gwtw.m4v"
          Default="true" >
        <VideoSubTrack Id="V07" Codec ="H264" BitRate="1200"
                       ImageWidth="1920" ImageHeight="1080" Type="3D-Right" />
      </VideoTrack>
      <VideoTrack Id="VT_2" Codec="WVC1" BitRate="600" ImageWidth="1280" ImageHeight="720" />
      <VideoTrack Id="VT_3" Codec="H264" BitRate="1200" ImageWidth="640" ImageHeight="480" />
      <VideoTrack Id="VT_4" Codec="H264" BitRate="300" ImageWidth="320" ImageHeight="240" />
    </VideoTrackSelection>
    <AudioTrackSelection>
      <AudioTrack Id="AT_1" Language="en-US" Codec="mp4a" SampleRate="44.1" BitRate="96"
           MaxChannels="6" Default="true"/>
      <AudioTrack Id="AT_2" Language="en-US" Codec="mp4a" SampleRate="44.1" BitRate="96"
           MaxChannels="2"/>
      <AudioTrack Id="AT_3" Language="fr-FR" Codec="mp4a" SampleRate="44.1" BitRate="96"
           MaxChannels="1" Type="Directors Commentary"/>
      <AudioTrack Id="AT_4" Language="es-ES" Codec="mp4a" SampleRate="44.1" BitRate="96"
           MaxChannels="2" Type="Descriptive Audio"/>
    </AudioTrackSelection>
    <SubtitleTrackSelection>
      <SubtitleTrack Id="ST_1" ContentType="Language Translation" Language="en-US"
                     Format="SSA" SDHCaption="true" Default="true" />
      <SubtitleTrack Id="ST_2" ContentType="Language Translation" Language="en-US"
                     Format="SAMI" SDHCaption="false" />
      <SubtitleTrack Id="ST_3" ContentType="Language Translation" Language="en-US"
                     Format="DFXP" SDHCaption="false" />
      <SubtitleTrack Id="ST_4" ContentType="Language Translation" Language="fr-FR"
                     Format="SSA" SDHCaption="true" />
      <SubtitleTrack Id="ST_5" ContentType="Language Translation" Language="es-ES"
                     Format="SSA" SDHCaption="false" />
    </SubtitleTrackSelection>
  </TrackGroup>
  <TrackGroup FormatCompatibilityCode="SD">
    <VideoTrackSelection>
      <VideoTrack Id="VT_5"/>
    </VideoTrackSelection>
    <AudioTrackSelection>
      <AudioTrack Id="AT_5"/>
    </AudioTrackSelection>
    <SubtitleTrackSelection>
      <SubtitleTrack Id="ST_6" ContentType="Language Translation" SDHCaption="false" />
    </SubtitleTrackSelection>
  </TrackGroup>
  <DRM>
    <DRMLicenseIssuer Type="DRM1" URL="http://www.drm1.org/" />
    <DRMLicenseIssuer Type="DRM2" URL="http://www.drm2.com/" />
  </DRM>
</Presentation>
```

7.2.1 Presentation

The `Presentation` element is the root element of a Presentation part.

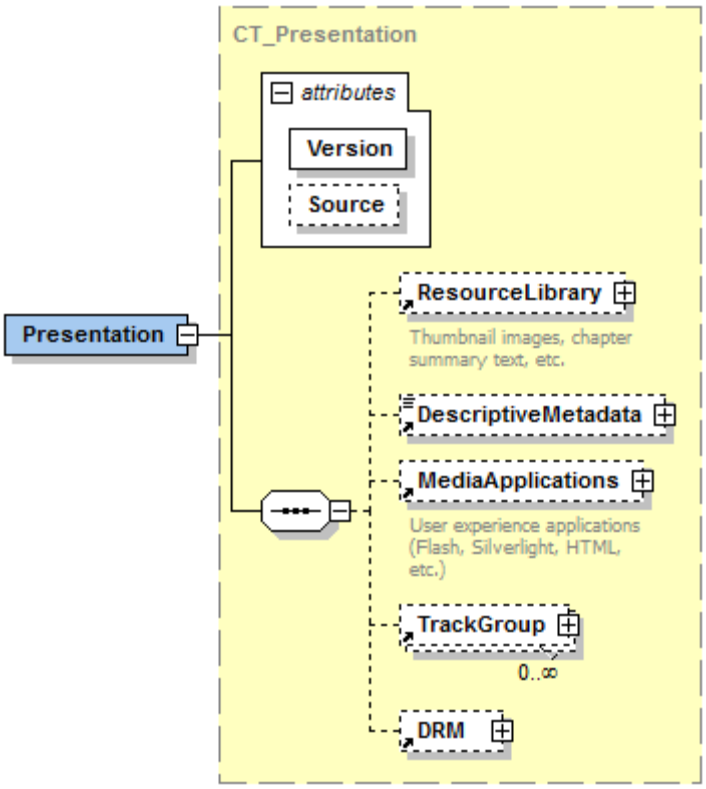

Figure 8 – Presentation structure. Dotted lines denote an optional element.

Version (required)

Version attribute should be a number equal to the VersionRequired attribute in the Table of Contents PresentationReference. A higher number in the Table of Contents indicates availability of a newer version of this Presentation document, which should be downloaded to the Media Package.

Source (optional)

A URL indicating the Internet location of the most recent Version of a Presentation resource corresponding to this Presentation Part.

ResourceLibrary (optional)

The Resource Library contains a list of “other” Resource references associated with this Presentation. It does not need to include references to Resources already associated with the Presentation such as Tracks, descriptive metadata and Media Applications. Some of the same Library Resources referenced by this Presentation may be included by reference in other Presentations although only one copy of each unique file may be stored in the Media Package. A Presentation may require that all of the Resources in the library be downloaded and stored in the Media Package to fully enable Presentation playback.

DescriptiveMetadata (optional)

This element references zero or more XML metadata files that pertain to this Presentation. They may also be shared by other Presentations. The language attribute can be used to distinguish between metadata files in different languages.

MediaApplications (optional)

These elements identify zero or more Media Applications that control playback of this Presentation.

DRM (optional)

These elements identify zero or more DRM systems and license servers where licenses may be acquired, stored in the Media Package, and referenced to enable decryption playback on compatible and authorized DRM systems.

TrackGroup (optional)

Track groups identify groups of alternate media Tracks, metadata, Media Applications, and DRM. Only one item in each group may be selected for playback at one time. Depending on the type of group and its particular format, it may or may not be possible to switch items in the group during playback.

7.2.2 TrackGroup

The `TrackGroup` element specifies all the possible alternative tracks that may be selected among in order to play back the Presentation. It may reference video, audio, and subtitle Tracks that are intended for synchronized playback.

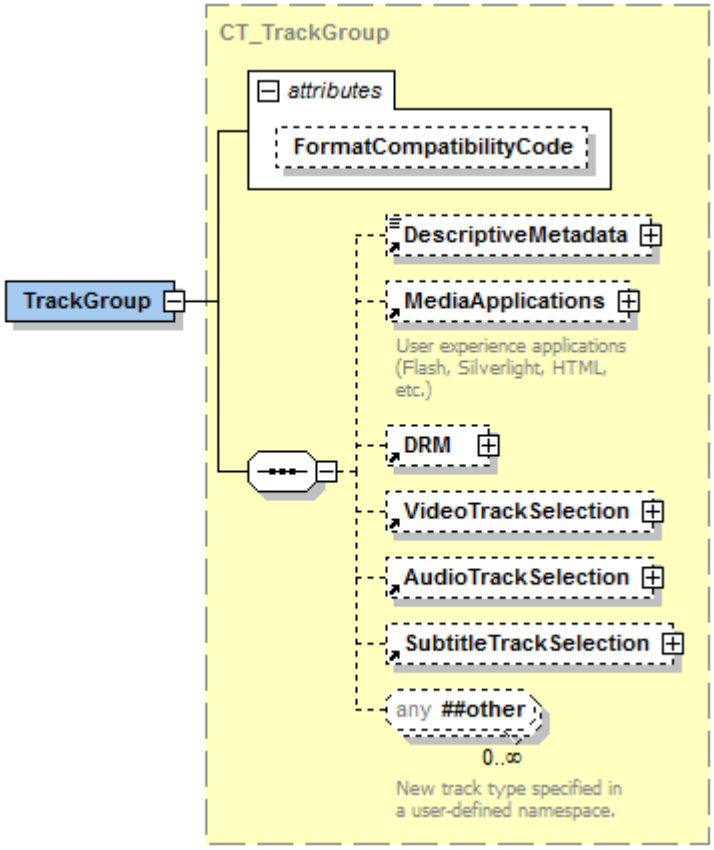

Figure 9 – TrackGroup structure. Dotted lines denote an optional element.

FormatCompatibilityCode (optional)

The format compatibility code is intended to contain a media format identifier to indicate to playback devices what media format these track groups conform to, whether they are compatible with the device, and what properties the media format supports, such as the ability to seamlessly switch between audio, video, or subtitles Tracks during playback. An example of a media format with carefully specified characteristics is DVD-Video.

VideoTrackSelection (optional)

A set of video Tracks that may be selected for playback, and possibly switched during playback. These Tracks may be stored in one or more A/V files.

AudioTrackSelection (optional)

A set of audio Tracks that may be selected for playback, and possibly switched during playback. These Tracks may be stored in one or more A/V files.

SubtitleTrackSelection (optional)

A set of Subtitle Tracks that may be selected for playback, and possibly switched during playback. These Tracks may be stored in one or more A/V files.

##Other track (optional)

Other track elements shall be used to represent track types not defined in this document. Zero or more other track elements may be present in the TrackGroup. When present, other track elements shall be located after any elements defined by this document. When present, other track elements shall have names that belong to a namespace different than the namespace declared by this document. Implementations shall ignore extension elements belonging to an unknown namespace.

Other track elements should indirectly use or extend the structure of Track types defined in this document.

DescriptiveMetadata (optional)

A set of zero or more XML metadata files. More than one file may be included to allow devices to pick from different schemas, different languages, different sizes, etc.

MediaApplications (optional)

A set of zero or more Media Applications to control playback and interaction.

DRM (optional)

A set of zero or more DRM systems and license server locations. Most encrypted files can only be decrypted by a single DRM system, however it is possible for multiple DRM systems using the same encryption method and key management to unlock the same Tracks and files.

7.2.3 VideoTrackSelection

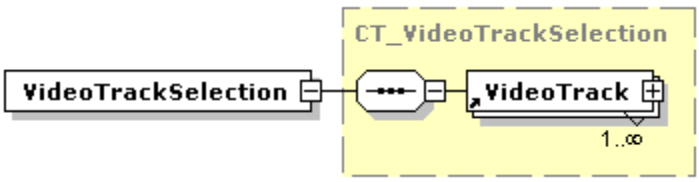

Figure 10 – VideoTrackSelection structure. Dotted lines denote an optional element.

VideoTrack (required)

The `VideoTrack` child element is a member of a Track Selection Group. Only one video Track in the group shall be selected at one time.

7.2.4 VideoTrack

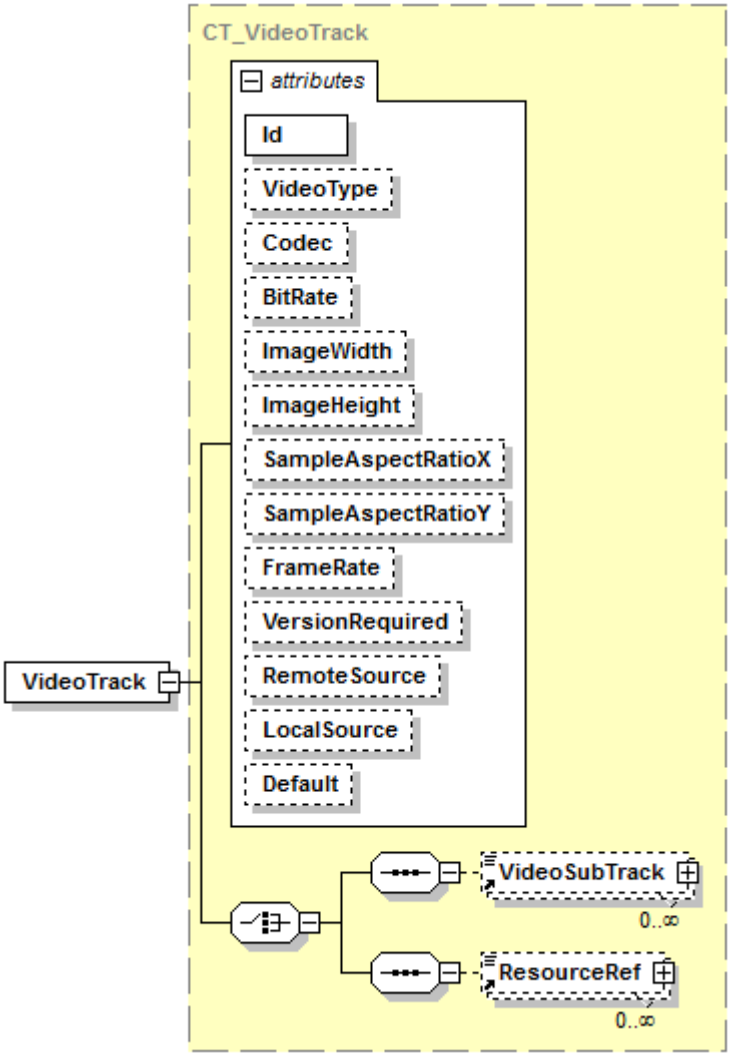

Figure 11 – VideoTrack structure. Dotted lines denote an optional element.

Id (required)

This identifier is used to refer to the video Track uniquely in the Package.

VideoType (optional)

A media type such as an ISO Registered Identifier or IANA registered Internet Media Type (MIME type) that identifies the codec and bitstream format.

Codec (optional)

Codec information, such as Name, Profile, and Level.

BitRate (optional)

The average bitrate for this video Track (size/duration in thousands of bits per second).

ImageWidth (optional)

Maximum number of encoded samples wide after decoder cropping.

ImageHeight (optional)

Maximum number of encoded samples high after decoder cropping.

SampleAspectRatioX (optional)

Relative width of the encoded sample.

SampleAspectRatioY (optional)

Relative height of the encoded sample.

VersionRequired (optional)

Version required shall indicate the video Track version required for this version of the Presentation. A newer version of a Presentation may require download of a newer version of the container file that contains this video Track.

RemoteSource (optional)

URL to download or stream this Track.

LocalSource (optional)

References to Track in a Track Container stored as a Part in the Media Package.

Default (optional)

Indicates that this Track is the default Track selection in the group.

VideoSubTrack (optional)

A reference to the VideoSubTrack(s) that comprise this VideoTrack.

ResourceRef (optional)

A reference to the Resource or Part containing this Track.

7.2.5 VideoSubTrack

Depending on the video type, a video Track may contain an additional SubTrack. For example, an AVC multiview Track can contain an additional SubTrack with a different viewing angle so that left eye and right eye streams can be decoded to present a stereo video image pair that create a “3D” effect.

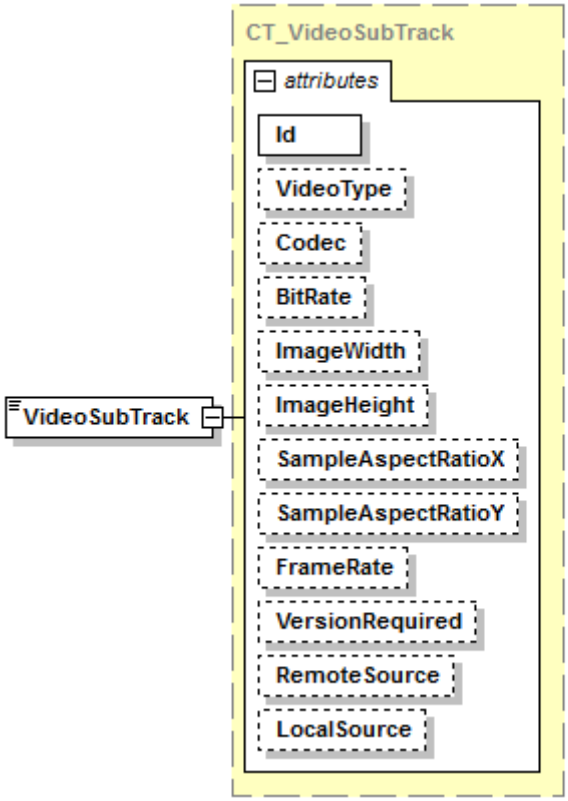

Figure 12 – VideoSubTrack structure. Dotted lines denote an optional element.

Id (required)

This identifier shall refer to the VideoSubTrack uniquely in the Package. Note: For stereo video, most of this is redundant, but multiview allows layering of resolution, frame rate, etc.

VideoType (optional)

A media type such as an ISO Registered Identifier or IANA registered Internet Media Type (MIME type) that identifies the codec and bitstream format.

Codec (optional)

Codec information, such as Name, Profile, and Level.

BitRate (optional)

The average bitrate for this video Track (size/duration in thousands of bits per second).

ImageWidth (optional)

Maximum number of encoded samples wide after decoder cropping.

ImageHeight (optional)

Maximum number of encoded samples high after decoder cropping.

SampleAspectRatioX (optional)

Relative width of the encoded sample.

SampleAspectRatioY (optional)

Relative height of the encoded sample.

VersionRequired (optional)

Version required for this SubTrack in this version of the Presentation. A newer version of a Presentation may require download of a newer version of the container file that contains this video Track.

RemoteSource (optional)

URL to download or stream this SubTrack.

LocalSource (optional)

References to SubTrack in a Track Container stored as a Part in the Media Package.

7.2.6 AudioTrackSelection

An audio Track selection group allows only one of the Tracks in this group to be selected and played at one time. Depending on the audio Track type and its A/V container, it may or may not be possible to change the selected audio Track during playback.

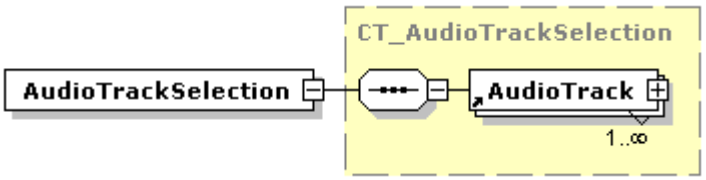

Figure 13 – AudioTrackSelection structure. Dotted lines denote an optional element.

AudioTrack

7.2.7 AudioTrack

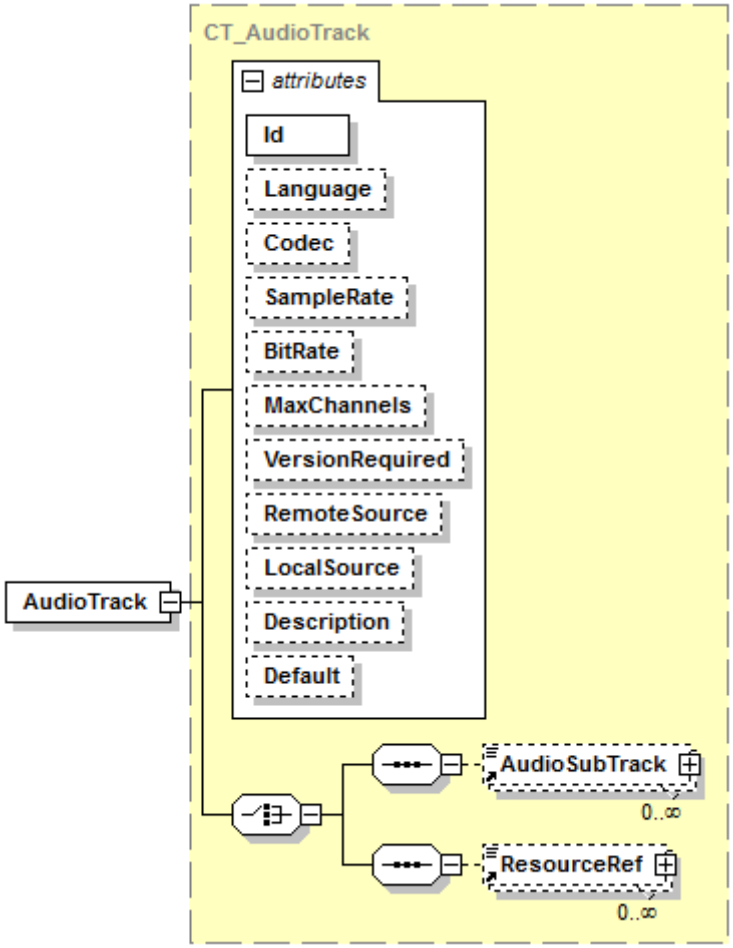

Figure 14 – AudioTrack structure. Dotted lines denote an optional element.

Id (required)

A unique identifier for this Track within the Media Package.

Language (optional)

The Language attribute specifies the language of the presentation. It shall be conformant with BCP-47 and RFC-5646 using ISO 639-1, 2, or 3. Two character codes (ISO 639-1) preferred, and restricted to IANA registered subtags.

Codec (optional)

ISO registered identifier, 4CC code, IANA registered Internet Media Type (MIME type) or other stream identifier.

SampleRate (optional)

In thousands of samples per second; e.g., 44.1, 48, 96, 128, etc.

BitRate (optional)

The average bitrate for this audio Track (size/duration in thousands of bits per second).

MaxChannels (optional)

The maximum decodable channel count, e.g., 2.0, 5.1, 7.1, etc. Some codecs may enable different numbers of channels to be decoded using methods such as substream encoding, “down mix”, or parametric multichannel “up mix”.

VersionRequired (optional)

Resource version required for this version of the Presentation. If VersionRequired is newer than the locally stored Track Container, and application may download the matching version.

RemoteSource (optional)

URL to download or stream this Resource.

LocalSource (optional)

URI to reference the Resource stored as a Part in the Media Package.

Description (optional)

The type of audio track (e.g., “Directors Commentary”, “Descriptive Audio”, etc.),

Default (optional)

Audio Track to be selected by default.

AudioSubTrack (optional)

A reference to the AudioSubTrack(s) that comprise this AudioTrack.

ResourceRef (optional)

A reference to the Resource or Part containing this Track.

7.2.8 AudioSubTrack

Depending on the audio type, an audio Track may contain additional SubTracks. For example, a multichannel audio Track may contain a stereo SubTrack or a lower resolution SubTrack.

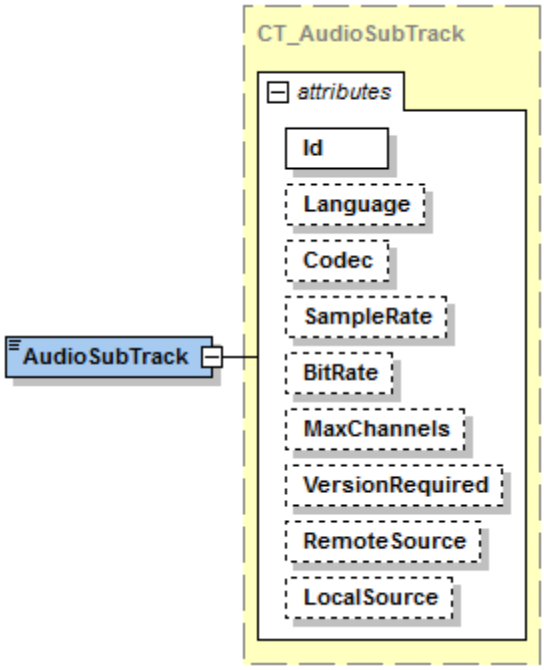

Figure 15 – AudioSubTrack structure. Dotted lines denote an optional element.

Id (required)

This identifier is used to refer to the AudioSubTrack uniquely in the Package. Some codecs enable layering of resolution, sample rate, etc.in substreams.

Language (optional)

The Language attribute specifies the language of the presentation. It shall be conformant with BCP-47 and RFC-5646 using ISO 639-1, 2, or 3. Two character codes (ISO 639-1) preferred, and restricted to IANA registered subtags.

Codec (optional)

ISO registered identifier, 4CC code, or other stream identifier.

SampleRate (optional)

In thousands of samples per second, e.g., 48, 44.1, 96, 128, etc.

BitRate (optional)

The average bitrate for this audio Track (size/duration in thousands of bits per second).

MaxChannels (optional)

The maximum decodable channel count; e.g., 2.0, 5.1, 7.1, etc. Some codecs may enable different numbers of channels to be decoded using methods such as substream encoding, “down mix”, or parametric multichannel “up mix”.

VersionRequired (optional)

Resource version required for this version of the Presentation If VersionRequired is newer than the locally stored Track Container, and application may download the matching version.

RemoteSource (optional)

URL to download or stream this Resource.

LocalSource (optional)

URI to reference the Resource stored as a Part in the Media Package.

7.2.9 SubtitleTrackSelection

A group of Subtitle Tracks, one of which may be selected for playback, depending on player preference settings.

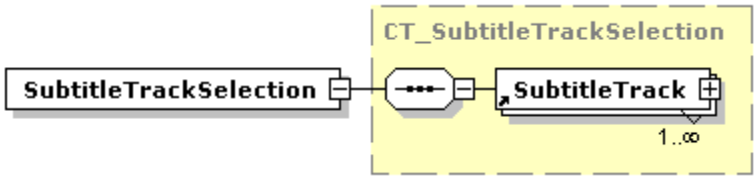

Figure 16 – SubtitleTrackSelection structure. Dotted lines denote an optional element.

7.2.10 SubtitleTrack

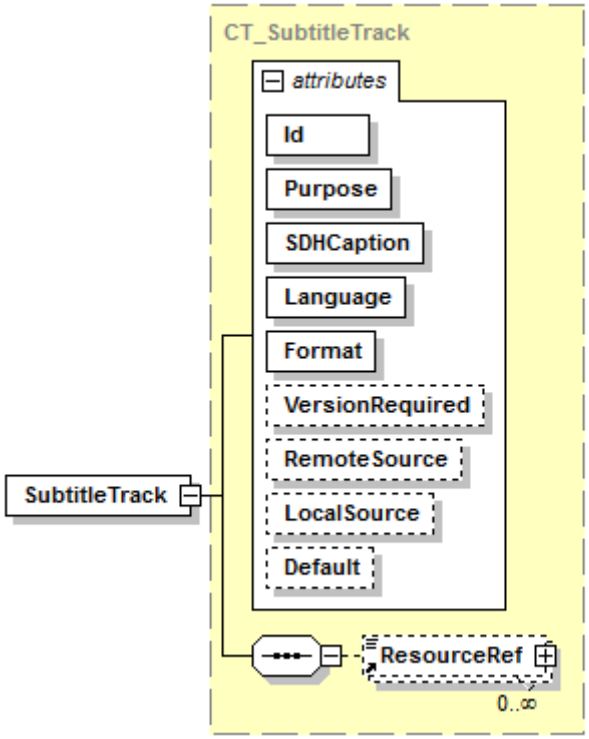

Figure 17 – SubtitleTrack structure. Dotted lines denote an optional element.

Id (required)

A Track ID that is unique in the Media Package.

Purpose (required)

Description of content and purpose of the subtitle track; e.g., language translation, program description commentary, sign language, karaoke etc.

SDHCaption (required)

“true” indicates that this subtitle contains descriptive captions for deaf and hard of hearing. This attribute provides a standard mechanism for devices to automatically select subtitle tracks when playback equipment contains a user preference to play such Tracks by default (similar to “closed caption” systems).

Language (required)

The Language attribute specifies the language of the presentation. It shall be conformant with BCP-47 and RFC-5646 using ISO 639-1, 2, or 3. Two character codes (ISO 639-1) preferred, and restricted to IANA registered subtags.

Format (required)

E.g., SMPTE ST 2052-1, CEA-708-D, CEA-608-E, etc. If the Format is unknown, the string “Unknown” shall be used.

VersionRequired (optional)

Most recent version of the Resource.

RemoteSource (optional)

URL to download or stream the Track.

LocalSource (optional)

URI to reference the Resource stored as a Part in the Media Package.

Default (optional)

The Track to select by default if subtitle display is enabled.

ResourceRef (optional)

A reference to the Resource or Part containing this Track.

7.2.11 ResourceLibrary

The ResourceLibrary element shall include an XML schema conformant with the XML Schema Definition file at the following location:

```
http://www.smpte-ra.org/schemas/2053/2011/MediaPackage/2053b-Media-Package-Resource.xsd
```

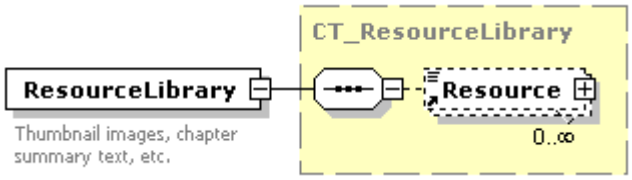

Figure 18 – ResourceLibrary structure. Dotted lines denote an optional element.

Resource (optional)

A Resource that is stored remotely or in the Media Package. Resources are stored only once in the Media Package as a Part, but may be referenced from multiple Presentations.

7.2.12 Resource

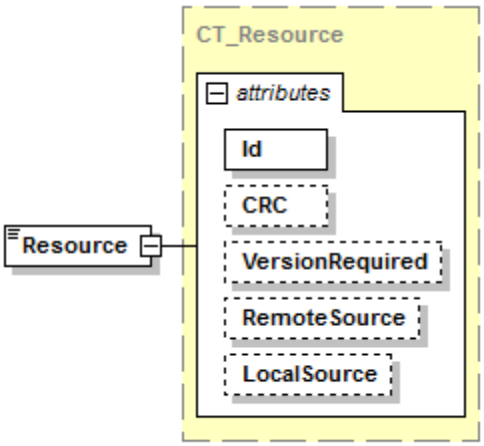

Figure 19 – ResourceLibrary structure. Dotted lines denote an optional element.

Id (required)

An Identifier for this Resource that is unique in the Media Package.

CRC (optional)

A stored value of the CRC32 file hash, which can be checked against a hash of the stored Part to verify integrity.

VersionRequired (optional)

Version number of the Resource that is expected.

RemoteSource (optional)

URL where the Resource can be downloaded.

LocalSource (optional)

URI of the Resource stored as a Part in the Media Package.

7.2.13 ResourceRef

Reference to a Part using its Part ID.

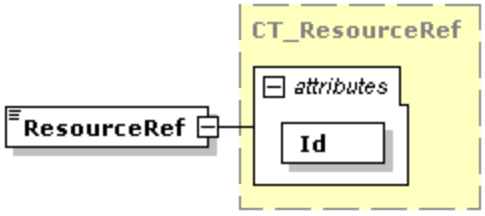

Figure 20 – ResourceRef structure. Dotted lines denote an optional element.

Id (required)

An Identifier for this Resource that is unique in the Media Package.

7.2.14 DescriptiveMetadata

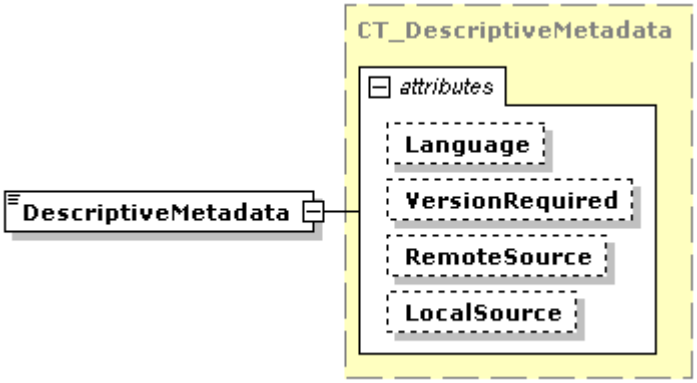

Figure 21 – DescriptiveMetadata structure. Dotted lines denote an optional element.

Language (optional)

The Language attribute specifies the language of the presentation. It shall be conformant with BCP-47 and RFC-5646 using ISO 639-1, 2, or 3. Two character codes (ISO 639-1) preferred, and restricted to IANA registered subtags.

VersionRequired (optional)

Version number of the Resource that is expected.

RemoteSource (optional)

URL where the Resource can be downloaded.

LocalSource (optional)

URI of the Resource stored as a Part in the Media Package.

7.2.15 DRM

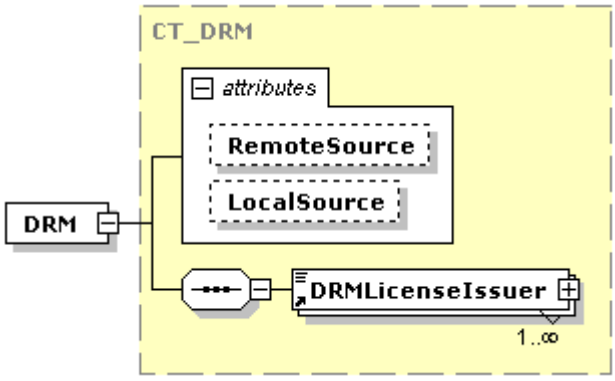

Figure 22 – DRM structure. Dotted lines denote an optional element.

DRMLicenseIssuer (required)

One or more DRM license sources.

7.2.16 DRMLicenseIssuer

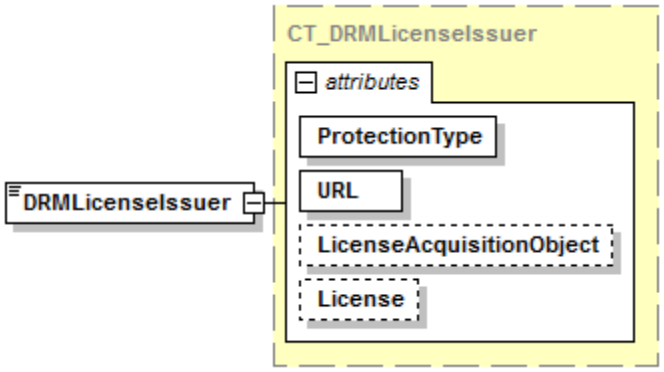

Figure 23 – DRMLicenseIssuer structure. Dotted lines denote an optional element.

ProtectionType (required)

Identification of the DRM system, e.g., OMA, Marlin, PlayReady, WMDRM, etc.

URL (required)

A license acquisition object including a URL that a compatible DRM client can use to acquire a DRM license for this Presentation's content.

LicenseAcquisitionObject (optional)

Information necessary to request a license from the specified URL.

License (optional)

A URI to the license stored in the package as a Part.

7.2.17 MediaApplications

The `MediaApplications` element holds information regarding one or more Media Application Resources or Parts contained within the SMPTE Media Package.

The `MediaApplications` element shall include an XML schema conformant with the XML Schema Definition file at the following location:

```
http://www.smpte-ra.org/schemas/2053/2011/MediaPackage/2053d-Media-Package-MediaApplications.xsd
```

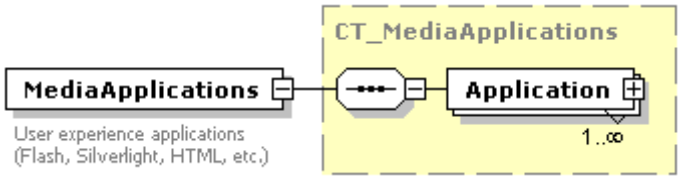

Figure 24 – MediaApplications structure. Dotted lines denote an optional element.

Application

The `MediaApplications` element, if present, shall contain a collection of 1 or more `Application` elements.

7.2.18 Application

The `Application` element describes the location of a Media Application Resource or Part for this Presentation.

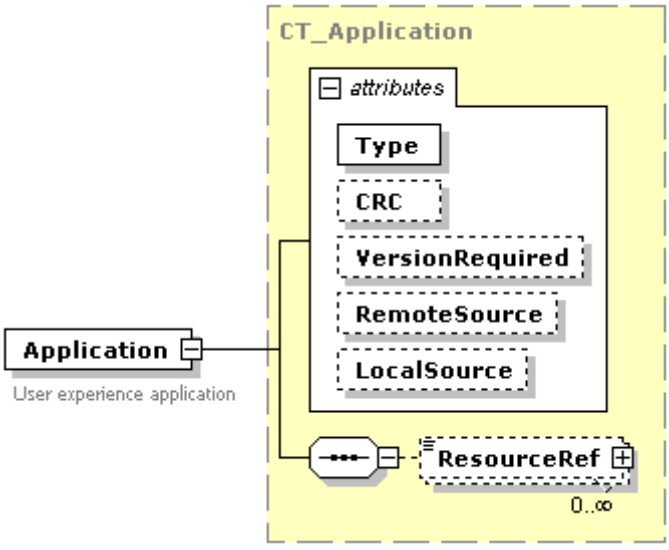

Figure 25 – Application structure. Dotted lines denote an optional element.

Type (required)

The Type attribute refers to the application type referenced by the LocalSource or RemoteSource attributes. Possible values may include a producer-defined type or one of the following values:

- HTML
- Silverlight
- Flash
- Java

CRC (optional)

The CRC attribute may be used to verify that the Media Application referenced by the LocalSource or RemoteSource attributes is valid. The consistency check performed shall be a hash using the CRC32 algorithm, compared to the value of the CRC attribute.

VersionRequired (optional)

The VersionRequired attribute specifies the current version of the Media Application referenced by the LocalSource attribute.

RemoteSource (optional)

The RemoteSource attribute references a location external to the SMPTE Media Package where the Media Application may be downloaded. A producer shall specify a RemoteSource for the location of the Media Application if it exists.

LocalSource (optional)

The LocalSource attribute references a fully-qualified part name, as described in the OPC specification, to a part within the SMPTE Media Package where the Media Application is located. A producer shall specify a LocalSource attribute value if the Media Application is stored as a Part.

7.3 Media Application Part

The Media Application Part contains an executable Media Application file such as a play list, markup language file interpretable by a browser, intermediate language code that can be interpreted by a virtual machine, or binary code that is executable on a particular operating system. The Media Application Part is the initial resource, and it may incorporate other resources in the Media Application once initiated.

7.4 Track Container Part

A Track Container Part stores an audio video container that contains one or more audio, video, or other data streams (e.g., containers such as MPEG-2 Transport or Program Stream; MPEG-4 ISO Base Media file, etc.). Tracks are the logical representation of physical streams in Containers, and may reference Track groups that are stored as streams in one or more Container Parts. Containers that store a single stream allow Tracks to be individually downloaded, but Containers with multiple streams must be downloaded and stored with all streams they contain, even though only one Track may be referenced.

7.5 DRM License Part

A DRM License Part is a DRM license or rights object stored as a file. A digital rights management application may acquire and store a license to access encrypted Tracks, and use the stored license to enable playback of a stored Presentation without additional Internet access on systems the license authorizes.

7.6 Descriptive Metadata Part

An XML file containing descriptions of the media content contained in the Media Package, which may be stored as a Part in the Package.

7.7 Resource Part

A file of unrestricted type that may be referenced by URL as a remote resource, and/or may be stored as a Part in the Package. A single instance of a Resource may be referenced by multiple Presentations, Media Applications, Track Groups, etc.

Annex A Bibliography (Informative)

IANA Language Subtag Registry http://www.iana.org/assignments/language-subtag-registry

Registration Authority for Code-Points in "MP4 Family" Files; http://www.mp4ra.org/index.html13. XML Signature Syntax and Processing, W3C Recommendation, 12 February 2002, http://www.w3.org/TR/2002/REC-xmldsig-core-20020212/

IANA MIME Media Types, http://www.iana.org/assignments/media-types/

CEA: “Line 21 Data Services,” Doc. CEA-608-E, Consumer Electronics Association, Arlington, VA, August 2008

CEA: “Digital Television (DTV) Closed Captioning,” Doc. CEA-708-D, Consumer Electronics Association, Arlington, VA, August 2008

SMPTE ST 2052-1:2010, Timed Text Format (SMPTE-TT)