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Title: MPEG-7 harmonisation with Dublin Core: current status and concerns.

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1	Introduction.....	1
2	Dublin Core	1
3	Mapping of Unqualified Dublin Core to MPEG-7	2
4	Mapping of Qualified Dublin Core to MPEG-7	3
5	Concerns with the MDS	3

1 Introduction

This document presents the current status of the harmonization of MPEG-7 with Dublin Core. It provides mappings between both qualified and unqualified Dublin Core and MPEG-7 Descriptors (Ds) (in the context of their container Description Schemes (DSs)). This mapping also highlights a certain number of problems and concerns with the current MPEG-7 Multimedia DSs and Ds.

Section 2 provides a brief overview of the Dublin Core Metadata Initiative. Section 3 provides a mapping between unqualified Dublin Core and MPEG-7 Ds and DSs. Section 4 provides a mapping between qualified Dublin Core (as recommended by the DC Usage Committee) [2] and MPEG-7 Ds and DSs. Section 5 lists the concerns and issues with the MDS which have been raised as a result of performing these mappings.

2 Dublin Core

The Dublin Core Element Set [1] is a simple content description metadata model for the resource discovery of electronic resources. It is being used by formal resource description communities such as museums, libraries, government agencies, and commercial organizations. The building of an interdisciplinary, international consensus around a core element set (currently 15 elements) is the central feature of the Dublin Core. Many

organizations have identified the need for a further refinement of these 15 elements. This need has been recognized by the DC organization, and mechanisms and procedures have been defined to further qualify the 15 elements. A first set of qualifiers was published in early 2000 [2]. This first set of qualifiers is not intended to satisfy all applications. It is expected that additional local elements and qualifiers will be defined to meet local functional requirements.

3 Mapping of the Dublin Core Element Set to MPEG-7

Since the DC Element Set is far smaller than the set of MPEG-7 Descriptors, then the mapping process consists of choosing the MPEG-7 descriptor which most closely maps semantically to each DC element. Most of the MPEG-7 equivalents can be found in the Content Management functionality class described in the Multimedia DSs [3,4]. However for certain elements there exist multiple matching MPEG-7 descriptors or matching descriptors which lie outside of this class. The following table lists the 15 DC elements, their definition and the MPEG-7 path to the equivalent MPEG-7 descriptor.

	DC Element	Definition	MPEG-7 Path
1	Title	A name given to the resource	CreationMetaInformation.Creation.Title.TitleText (TitleType="original")
2	Creator	An entity primarily responsible for making the content of the resource	CreationMetaInformation.Creation.Creator (role="creator")
3	Subject	The topic of the content of the resource	CreationMetaInformation.Classification.PackagedType
4	Description	An account of the content of the resource	CreationMetaInformation.Creation.CreationDescription
5	Publisher	An entity responsible for making the resource available	UsageMetaInformation.Publication.Publisher <i>or</i> CreationMetaInformation.Creation.Creator (role="publisher")
6	Contributor	An entity responsible for making contributions to the content of the resource	CreationMetaInformation.Creation.Creator (role="contributor")
7	Date	A date associated with an event in the life cycle of the resource	CreationMetaInformation.Creation.CreationDate
8	Type	The nature or genre of the content of the resource	CreationMetaInformation.Classification.Genre
9	Format	File format or mime type (MPEG-1, QuickTime, RealVideo...)	MediaInformation.MediaProfile.MediaFormat.FileFormat
10	Identifier	An unambiguous reference to the resource within a given context	MediaInformation.MediaIdentification.Identifier
11	Source	A Reference to a resource from which the present resource is derived	MediaInformation.MediaProfile.MediaInstance.Identifier
12	Language	A language of the intellectual content of the resource	CreationMetaInformation.Classification.Language.LanguageCode <i>or</i> MediaInformation.MediaProfile.MediaFormat.AudioLanguage
13	Relation	A reference to a related resource	CreationMetaInformation.RelatedMaterial.MediaLocator.MediaURL
14	Coverage	The extent or scope of the content of the resource	CreationMetaInformation.Creation.CreationLocation.PlaceName <i>or</i> CreationMetaInformation.Classification.Country Note: Coverage.Place represents content location not creation location. For fictional creations, a Location (Place) DS is needed within some type of Content DS. CreationMetaInformation.Creation.Date Note: Coverage.Time deals with FictionalTime in the content. Same comments as above for Coverage.Place.
15	Rights	Information about rights held in and over the resource	UsageMetaInformation.Rights.RightsID

4 Mapping Qualified DC to MPEG-7

In April 2000, the DC-Usage Committee completed the ballot for the initial round of proposed Dublin Core Interoperability Qualifiers. These qualifiers are intended to promote interoperability among applications that use element refinements and encoding schemes to increase the semantic precision of metadata. The DC Qualifiers specification is due for release around June 2000, however an informal list can be found at [2]. This document also includes a definition of what constitutes valid qualification i.e. “qualifiers make an element’s meaning more specific without extending its meaning. A refined element shares the meaning of the unqualified element but with a more restricted scope.” The DCMI also recognizes that the current set of qualifiers [2] is not intended to satisfy all applications and that further qualifications are expected to meet local functional requirements of specific communities.

Given these statements we have attempted to identify MPEG-7 descriptors which can be mapped to qualifiers on Dublin Core elements. Table 2 below provides an initial list which has been generated by mapping the recommended list of DC qualifiers to MPEG-7 descriptors as well as mapping obvious MPEG-7 descriptors to qualifiers on DC elements. Further work is required on this list. Those qualifiers which have been approved by the DC Usage Committee have been marked with an asterix. The other qualifiers listed satisfy the requirement for semantic refinement rather than extension.

	Qualified DC Elemt	Definition	MPEG-7 Path
1	Title.Main	A name given to the resource	CreationMetaInformation.Creation.Title.TitleText (TitleType="original")
	*Title.Alternative	Alternative title	CreationMetaInformation.Creation.Title.TitleText (TitleType="alternative")
4	*Description.TableOfContents	Table of Contents of the resource	CreationMetaInformation.Creation.CreationDescription Note: can be related to CreationMediaInformationDS instances in the segment descomposition (or to the Semantic DS?). Also see below.
	*Description.Abstract	Abstract describing the resource’s contents	CreationMetaInformation.Creation.CreationDescription Note: an attribute should be added to CreationDescription to qualify descriptions (abstract, ToC), unless ToC is part of Summary DS. SummaryDS ToC is a multimediaToC or can also be a textual ToC like in DC?
	Description.Transcript	Transcript of the video	CreationMetaInformation.RelatedMaterial.MediaLocator.MediaURL (Note: could be supported by the MPEG-7 Audio SpokenContent DS?)
	Description.KeyFrame	Keyframe that best represents the content of the video	Summarization.SequentialSummary.ImageLocator.MediaURL
6	Contributor.Presenter	Person that contributed to the making of the resource; typically the most important "actor" in the video, e.g. the presenter.	CreationMetaInformation.Creation.Creator (role="presenter")
7	*Date.Created	A date associated with an event in the life cycle of the resource	CreationMetaInformation.Creation.CreationDate
	Date.Published	Date that the resource was published.	UsageMetaInformation.Publication.PublicationDate
9	Format.System	Analogue video system e.g. PAL, NTSC	MediaInformation.MediaProfile.MediaFormat.System
	*Format.Medium	Physical storage medium e.g. tape, CD, DVD	MediaInformation.MediaProfile.MediaFormat.Medium
	Format.Colour	Colour, B&W	MediaInformation.MediaProfile.MediaFormat.Color
	Format.Sound	No sound, stereo, mono, dual	MediaInformation.MediaProfile.MediaFormat.Sound
	Format.FileSize	File size in bytes	MediaInformation.MediaProfile.MediaFormat.FileSize

	Format.Length	Duration of the AV content	MediaInformation.MediaProfile.MediaFormat.Duration
	Format.AudioChannels	Number of Audio Channels	MediaInformation.MediaProfile.MediaFormat.AudioChannels
	Format.Resolution	Resolution of Image/Frame in dpi	MediaInformation.MediaProfile.MediaFormat.Resolution
	Format.FrameWidth	Frame width in pixels	MediaInformation.MediaProfile.MediaFormat.FrameWidth
	Format.FrameHeight	Frame height in pixels	MediaInformation.MediaProfile.MediaFormat.FrameHeight
	Format.FrameRate	Frame rate in Hz	MediaInformation.MediaProfile.MediaFormat.FrameRate
	Format.AudioSamplingRate	Sampling rate for audio in Hz	MediaInformation.MediaProfile.MediaFormat.AudioSamplingRate
	Format.Compression	Compression format (type code like AVI, MPEG-1, MPEG-2...)	MediaInformation.MediaProfile.MediaFormat.FileFormat
	Format.BitRate	Bit rate of compressed stream in bits/s.	MediaInformation.MediaProfile.MediaFormat.BitRate
13	*Relation.IsVersionOf	A reference to a related resource	CreationMetaInformation.RelatedMaterial.MediaLocator.MediaURL Note: an attribute is needed in order to clarify the type of relation of the RelatedMaterial stuff. Note:DC Relation is for resources related to the resource, but it includes segments, so RelationGraphs may be used for some relations (to investigate further).
	*Relation.hasVersion		
	*Relation.IsPartOf		
	*Relation.hasPart		
	*Relation.isFormatOf		
	*Relation.hasFormat		
14	*Coverage.Place	The extent or scope of the content of the resource	CreationMetaInformation.Creation.CreationLocation.PlaceName or CreationMetaInformation.Classification.Country Note: Coverage.Place deals with content location not creation location. For fictional creations, a Location (Place) DS is needed within some type of Content DS.
	*Coverage.Time		CreationMetaInformation.Creation.Date Note: Coverage.Time deals with FictionalTime in the content. Same comments as above for Coverage.Place.

* Qualifies approved by the DC Usage Committee [2]

5 Concerns and Recommendations

The process of performing the above mappings demonstrated a number of problems within the current Multimedia DSs. Some of the problems and comments have been interleaved in the mapping tables, and general ones which have been described below.

5.1 Complexity of DSs and implementation of “Mappings”

The primary problem which the mapping has highlighted is the excessive complexity of the MPEG-7 Description Schemes. The paths to the MPEG-7 Descriptors corresponding to each DC element are up to 4 levels. In order to record the simple 15 DC elements in MPEG-7, you need to create a very complex multi-layered set of DSs e.g.

DC:format = MPEG7:MediaInformation.MediaProfile.MediaFormat.FileFormat

DC:subject=MPEG7:CreationMetaInformation.Classification.PackagedType

Frequently-accessed and core metadata such as the DC elements should be quickly and easily accessed. Using the current hierarchical MPEG-7 structures, some core terms such as 'subject' and 'format' are at the fourth level of Description Schemes.

Since the DC element set corresponds to such a complex set of multilayered Multimedia DSs, it may be necessary to provide a more simple solution to enable access to the DC element set values for a multimedia object, let say, having the functionality of a MPEG-7 Dublin Core DS. There are a number of solutions:

1. To have an MPEG-7 “flat” Dublin Core Description Scheme;
2. To use the XML namespace importation available through the DDL to import the DC element set into an MPEG-7 DS and assign values to each element;
3. Use the proposed Packages DS to provide gateways to existing standards.
4. Use XSLT to implement mappings from MPEG-7 to Dublin Core and vice versa.

Note: the authors agree that core terms such as ‘subject’ should be easily accessed. However hierarchies are seen as a way of organizing information is a ‘rational’ way. Problems arise when trying to reconcile both objectives. Perhaps what is needed is method of extracting the frequently used Ds from the existing hierarchical DSs i.e. the choice is between flat DSs or a mechanism (packages?) for providing this functionality instead of creating new DSs.

5.2 Misleading and Non-intuitive MPEG-7 Terminology

There are a number of MPEG-7 Description Schemes and Descriptors which have unnecessarily complex or misleading names. For example, why is the term “PackagedType” used to represent “Subject”?

Why does the “Person” DS include organisational information? Creators, publishers etc can be organisations as well as people. The “Person” DS should be renamed to something more generic such as “Agent” DS.

Note: propose MDS the renaming.

5.3 Duplication of Data

The mapping process highlighted those metadata elements which are duplicated across multiple Descriptors and Description Schemes. *Identifier* is a classic example. This attribute appears frequently throughout the MPEG-7 DSs. Similarly contributors such as Publisher appear in multiple DSs. Language also appears in multiple locations.

The names can be duplicated but not their scope nor functionality. Identifier can apply to both Content Identification (abstract master) and Instances (the different copies available at different locations but being the same unique content in terms of unique content). Language can refer to the audio in one segment which is different from the language label for the document as a whole.

Note: Nevertheless, a look should be taken at all the cases for identifying possible duplications.

5.5 AHG for Further DC-MPEG-7 Harmonization Work

Since there are many more external standards apart from SMPTE and EBU, which require consideration for MPEG-7 harmonization, we believe that the current Integration AHG (AHG on Integration of MPEG-7, SMPTE, EBU/Pmeta Metadata) [5] should be renamed to have a more generic name and its mandate should be extended to include other external metadata standards apart from SMPTE and EBU, such as Dublin Core, NewsML, ID3 etc.

6 References

- [1] *Dublin Core Metadata Initiative*, <http://purl.org/DC>.
- [2] Approval of Initial Dublin Core Interoperability Qualifiers
<http://www.mailbase.ac.uk/lists/dc-general/2000-04/0010.html>
- [3] MPEG-7 Multimedia Description Schemes XM (v3.0) w3410.doc, 51st MPEG meeting, Geneva, June 2000

[4] MPEG-7 Multimedia Description Schemes WD (v3.0) w3411.doc, 51st MPEGMeeting, Geneva, June 2000

[5] AHG on Integration of MPEG-7, SMPTE, EBU/Pmeta Metadata, w3435.doc, 51st MPEG Meeting, Geneva, June 2000