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Information technology — Multimedia application format (MPEG-A) —

Part 3: MPEG photo player application format

Technologies de l'information — Format pour application multimédia (MPEG-A) —

Partie 3: Format pour application "MPEG photo player"

Reference number
ISO/IEC 23000-3:2007(E)

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Contents

Page

Foreword ... iv
Introduction ... v
1 Scope ... 1
2 Normative references ... 1
3 Terms and definitions ... 2
4 Abbreviated terms ... 2
5 File format ... 3
6 Resource ... 4
7 Metadata ... 4
7.1 General ... 4
7.2 Collection level descriptive metadata ... 5
7.3 Item level descriptive metadata ... 15
8 Conformance testing ... 26
8.1 File format conformance points ... 26
8.2 Photo-player device conformance points ... 27
Annex A (normative) **Schemas** ... 29
Annex B (informative) **Relevant technologies to create photo-player metadata** ... 57
Annex C (informative) **Examples of collection structure** ... 60
Annex D (informative) **Classification schemes** ... 66
Annex E (informative) **Binary syntax** ... 67
Bibliography ... 91

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Foreword

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

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

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

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

ISO/IEC 23000-3 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

ISO/IEC 23000 consists of the following parts, under the general title *Information technology — Multimedia application format (MPEG-A)*:

— *Part 1: Purpose for multimedia application formats* [Technical Report]

— *Part 2: MPEG music player application format*

— *Part 3: MPEG photo player application format*

— *Part 4: Musical slide show application format*

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Introduction

ISO/IEC 23000 (also known as “MPEG-A”) serves specific market needs by facilitating the swift development of innovative multimedia applications and services. Each part of the MPEG-A standard is created by combining selected existing technologies from the published MPEG standards into a multimedia application format (MAF). These are normative specifications of multimedia formats along with reference software implementations, allowing interoperability at the application level.

ISO/IEC 23000-3:2007 specifies a solution for digital photo-library applications. It was developed in response to the need for persistent and interoperable linking of digital image collections with metadata in order to support advanced access to content.

ISO/IEC 23000-3:2007 draws on three principal standards: JPEG for image-coding; MPEG-7 for metadata, and MPEG-4 file format for encapsulation. From these, it derives a flexible but simple structure to package images and their associated metadata. This allows users to annotate and organize images just as they could with proprietary software (or photo-sharing websites) but in a standard format which is interoperable across devices and platforms. It also allows conforming devices to support rich, content-enhanced functionality, including intelligent browsing, content-based search and automatic categorization.

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Information technology — Multimedia application format (MPEG-A) —

Part 3:
MPEG photo player application format

1 Scope

This part of ISO/IEC 23000, also known as “photo player MAF”, specifies a file format for digital photo library applications. It establishes a standardized solution for the carriage of images and associated metadata, to facilitate simple and fully interoperable exchange across different devices and platforms. The set of metadata includes MPEG-7 visual content descriptions, as well as acquisition-based metadata (such as date, time and camera settings). This allows compliant devices to support new, content-enhanced functionality, such as intelligent browsing, content-based search or automatic categorization.

2 Normative references

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

ISO/IEC 10918-1, *Information technology — Digital compression and coding of continuous-tone still images: Requirements and guidelines*

ISO/IEC 10918-2, *Information technology — Digital compression and coding of continuous-tone still images: Compliance testing*

ISO/IEC 14496-12, *Information technology — Coding of audio-visual objects — Part 12: ISO base media file format*

ISO/IEC 14496-14, *Information technology — Coding of audio-visual objects — Part 14: MP4 file format*

ISO/IEC 15938-1, *Information technology — Multimedia content description interface — Part 1: Systems*

ISO/IEC 15938-2, *Information technology — Multimedia content description interface — Part 2: Description definition language*

ISO/IEC 15938-3, *Information technology — Multimedia content description interface — Part 3: Visual*

ISO/IEC 15938-5:2003, *Information technology — Multimedia content description interface — Part 5: Multimedia description schemes*

ISO/IEC 15938-10, *Information technology — Multimedia content description interface — Part 10: Schema definition*

ISO/IEC 21000-17, *Information technology — Multimedia framework (MPEG-21) — Part 17: Fragment Identification of MPEG Resources*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 15938-5 and the following apply.

3.1
JPEG
image coding format defined in ISO/IEC 10918-1

3.2
MPEG-7
multimedia content description interface defined in ISO/IEC 15938

3.3
MPEG-7 schema
schema defined in ISO/IEC 15938-10

3.4
collection
grouping, consisting of image resources and/or nested collections, described by an instance of the MPEG-7 ContentCollection description scheme

3.5
root collection
collection element directly beneath the mpeg7 root element in the photo-player collection-level metadata

3.6
RoleCS
classification scheme defined in ISO/IEC 15938-5:2003, B.2.29

3.7
resource
encoded image bitstream

3.8
primary resource
authoritative instance of a resource

3.9
internal resource
resource included in the current file

3.10
external resource
resource which is available outside of the current file

3.11
codestream
entity of a resource

3.12
BiM
binary MPEG format for XML, defined in ISO/IEC 15938-1

4 Abbreviated terms

CS Classification Scheme

DS Description Scheme

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mp4 MPEG-4 (file format)

XSD XML Schema Definition

XML eXtensible Markup Language

5 File format

Photo-player file format shall use the MPEG-4 (mp4) file format (ISO/IEC 14496-14) to carry both JPEG resources and their associated metadata. Figure 1 shows the basic structure of the mp4 file format for a photo collection. Internal JPEG resources shall be stored in the media data box and their associated metadata shall be stored in the movie box. The linking between metadata and each corresponding internal resource (/codestream) shall be specified by media box. Linkage information to external resources can be specified in the metadata contained in the meta box of each track box.

The identification of the MAF type in the file format shall use the brand mechanism defined by the ISO base media file format (ISO/IEC 14496-12). The brand "`MPPl`" identifies the photo player MAF and shall appear in the compatible-brands list in the file-type box (ftyp).

In the mp4 file, descriptive metadata shall be stored using a “bxml box” inside a “meta box”, which can be instantiated in a movie box or track boxes. The meta box in the movie box shall be used to annotate collection level information and those in the track boxes shall be used for item level information. All the descriptive metadata shall be stored using MPEG-7 BiM, therefore, meta-boxes shall have “mp7b” handler-type.

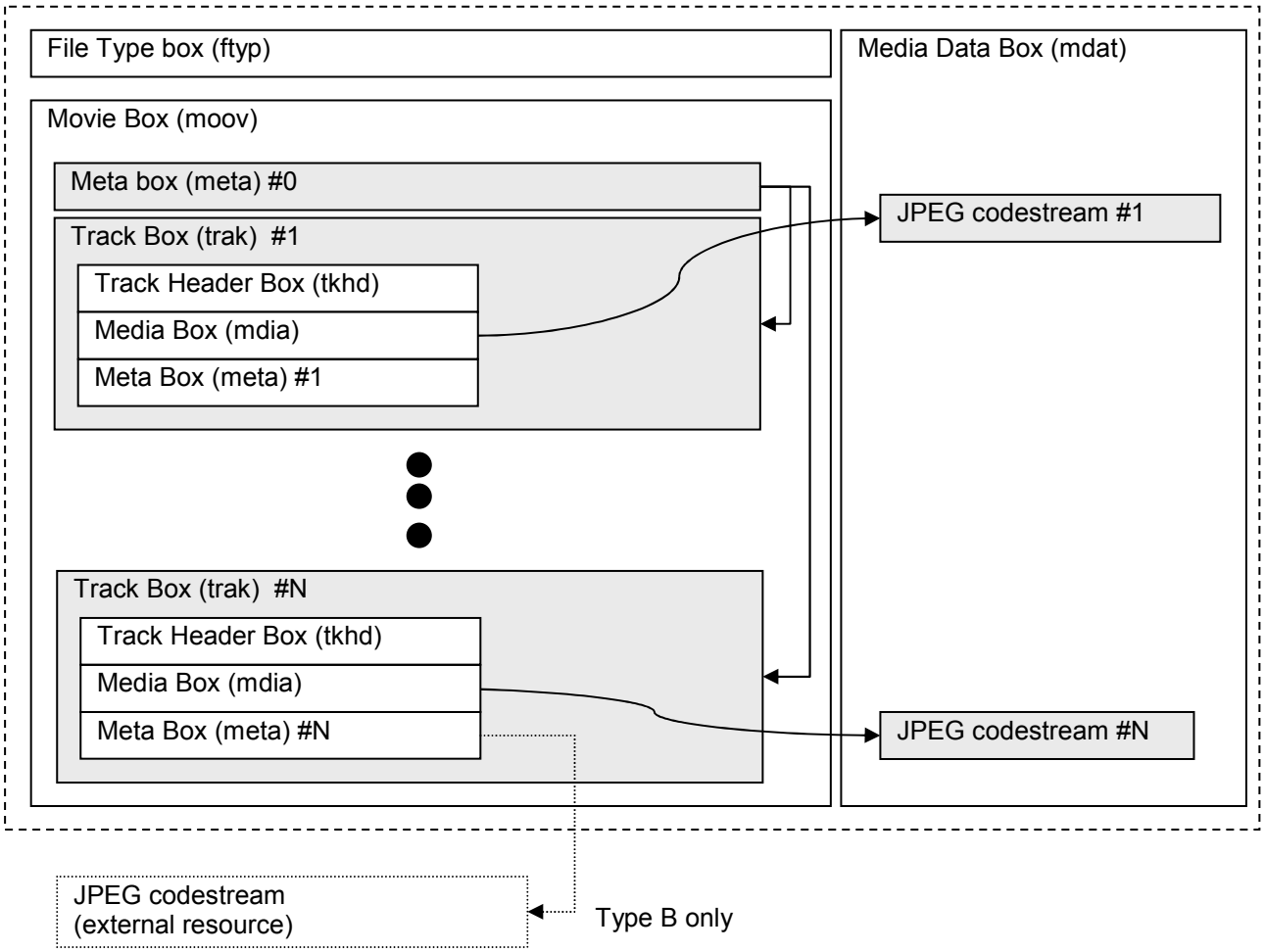

Figure 1 — Basic structure of MPEG photo player application format

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The number of meta-boxes for collection-level descriptive metadata shall be exactly one, while the number of meta-boxes for item-level descriptive metadata shall be the same as the number of resources in a file.

6 Resource

Only JPEG-conforming code-streams may be used as internal or primary external resources. Two different types of file format shall exist:

Type A:

All the primary resources shall be stored inside the file. Type A files can therefore be identified by the absence of any MediaInstance elements which reference JPEG resources.

Type B:

At least one primary (JPEG) resource shall exist outside of the file. To identify the primary resource location, a MediaInstance element shall be used in the corresponding item-level descriptive metadata (See subclause 7.3). Type B files can therefore be identified by the presence of a MediaInstance element which references a JPEG resource. For each item, if such an external JPEG resource is referenced, then that is the primary resource; if not, the primary resource is internal. In the case of an external primary resource, the internal resource data in the Media Data Box shall contain an alternative image to the primary resource. This may be, for example, a thumbnail picture which can be useful for rendering.

In files of either type, locations of supplementary resources can be specified by means of MediaInstance elements (in additional MediaProfiles). To avoid confusion with the primary resource, such supplementary resources cannot be JPEG images – they may be stored in any other format, analogue or digital. This will allow links to be maintained with, for example, uncompressed original images when JPEG compressed (primary) versions are incorporated (internally or externally) in a photo-player file. Note that there is no requirement for photo-player conforming devices to be able to decode (or even be able to access) such supplementary resources.

7 Metadata

7.1 General

This clause specifies the MPEG-7 metadata which is supported by the photo-player format. The metadata shall be stored as binary XML in the bxml boxes, inside the respective meta boxes, for the collection-level and item-level. Two different subsets of MPEG-7 metadata are specified in the following subclauses, for this purpose. Each subset shall be binarised according to MPEG-7 BiM, using a corresponding simplified version of the MPEG-7 schema (ISO/IEC 15938-10).

The full normative specification of the metadata subsets is given in subclauses 7.2.2 and 7.3.2. These subclauses also define the simplified schemas, as modifications with respect to the MPEG-7 Schema. Annex A contains explicit schema definitions, in XSD form, generated by implementing the specified modifications.

Annex E is for information only. It contains explicit binary syntax for collection-level and item-level metadata. This syntax corresponds to encoding the metadata according to the BiM, by using the respective simplified schemas.

NOTE Photo-player devices can be implemented with either a fixed binary encoder/decoder, according to a syntax like that in Annex E, or can include a full BiM encoder/decoder, which infers the binary syntax from the XML Schema. An implementation using fixed syntax might be less complex, whereas a BiM-based solution might allow for more flexibility, for compatibility with potential future extensions.

The metadata subsets and simplified schemas are designed to be compatible with MPEG-7, in the sense that (textual) XML instance documents which conform to either of the photo-player metadata subsets will also be valid to MPEG-7 schema.

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7.2 Collection level descriptive metadata

7.2.1 Overview

A BiM encoded ContentCollection DS shall be used to represent collection-level descriptive metadata. Figure 2 shows an overview of the metadata and Table 1 summarizes the semantics of available tools. The normative specification of all semantics is given in ISO/IEC 15938-2 and ISO/IEC 15938-5.

Table 1 — Semantics of tools in collection-level descriptive metadata

Tag Name		Semantics
DescriptionMetadata/ Creator	Optional	The author of the collection definition. The term “Author” (registered in RoleCS) shall be used as his/her role.
DescriptionMetadata/ CreationTime	Optional	The time stamp when the collection definition was created.
DescriptionMetadata/ LastUpdate	Mandatory	The time stamp of the most recent change to the collection definition.
ContentCollection/ name (attribute)	Optional	The name of (i.e., title for) the collection.
ContentCollection/ CreationInformation/ Creation/ Title	Mandatory	A title of (all) the photos in the collection. Note that this is not the title of the collection itself, which is expressed by ContentCollection/name above.
ContentCollection/ CreationInformation/ Creation/ TitleMedia/ TitleImage	Optional	A representative thumbnail picture for the collection. The image coding format for thumbnails shall be either JPEG or one of the uncompressed formats supported by Exif headers – that is, Baseline TIFF Rev. 6.0 RGB Full Color and TIFF Rev. 6.0 Extension YCbCr Image.
ContentCollection/ CreationInformation/ Creation/ TitleMedia/ TitleImage/ InlineMedia/ type (Attribute)	Mandatory (if InlineMedia is present)	Describing the format of the thumbnail image data. This shall be one of the MIME types "image/jpeg" or "image/tiff".
ContentCollection/ CreationInformation/ Creation/ Creator	Optional	Describing a person or organization who relates to the creation process of the images in the collection, such as photographer, publisher and so on. Their roles should be described using RoleCS. A variety of methods can be used to identify the Creators, including electronic address elements such as url or email. If the Role is set to “Actor”, this field shall describe the identity of persons who appear in the images in the collection.
ContentCollection/ CreationInformation/ Creation/ Date	Optional	The time (or period in time) when the photos in the collection were captured. The creation time of photos in any sub-collections should be included within the time period for the current collection.
ContentCollection/ CreationInformation/ Creation/ Location	Optional	The location where the photos in the collection were captured.
ContentCollection/ TextAnnotation/ FreeTextAnnotation	Optional	Summary text about the collection.
ContentCollection/ TextAnnotation/ KeywordAnnotation	Optional	Any keywords of the collection. The reserved terms of classification scheme "CollectionTypeCS" (Annex D.1) should be used to specify the collection type.
ContentCollection/ ContentRef	Mandatory	The photos which are included in the collection. URL reference shall be employed with MPEG-21 Fragment Identifier compliant format, defined in ISO/IEC 21000-17.
ContentCollection/ ContentCollection	Optional	The sub-collections. Note that the root collection shall include all of the photos in the file. Hierarchical representation of collections is allowed.

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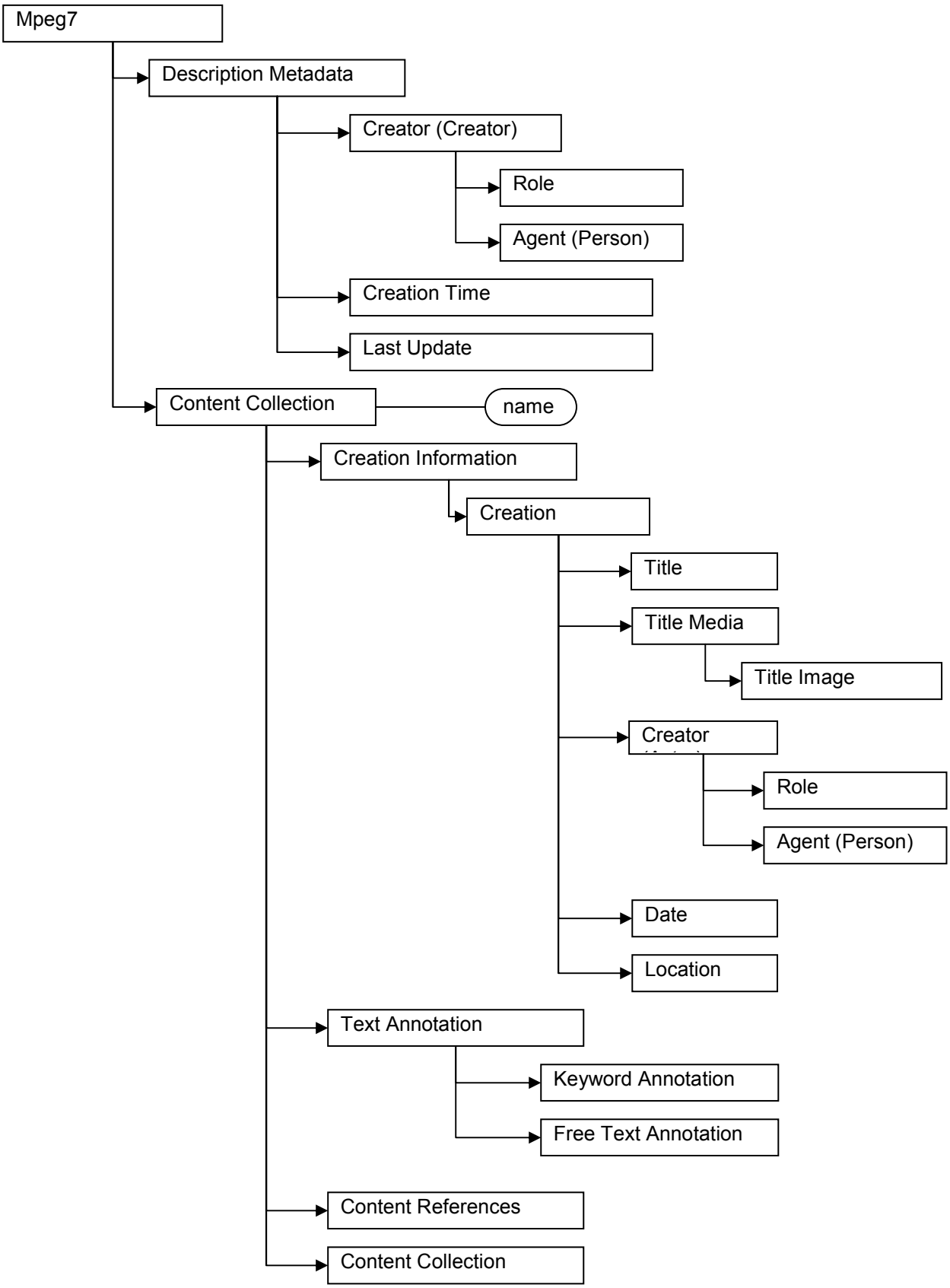

Figure 2 — Overview of collection level descriptive metadata

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7.2.2 Constraints to MPEG-7 Schema

The collection-level photo-player schema is defined with respect to the Version 2 schema as specified in ISO/IEC 15938-10. The namespace of the Version 2 schema providing a basis for the photo-player collection-level schema is “urn:mpeg:mpeg7:schema:2004”. The following table lists the ISO/IEC 15938 description tools (global elements, global attributes, attribute groups, complexTypes and simpleTypes) selected to be included and any further constraints imposed on these description tools for the collection-level metadata schema. The interpretation of the Table is as follows:

- “element/attribute/attributeGroup excluded” – this MPEG-7 metadata shall not be instantiated in the collection-level metadata of a photo-player compliant file;
- xsi:type=”[TypeName]” – the element shall have this attribute, when instantiated in the collection-level metadata. Therefore, it shall only be instantiated with type [TypeName]);
- minOccurs="*n*" – no fewer than *n* occurences of the element shall be instantiated in the collection-level metadata;
- maxOccurs=”*m*” – no more than *m* occurences of the element shall be instantiated in the collection-level metadata.

Where no constraint is listed, the metadata elements/attributes shall be instantiated in accordance with ISO/IEC 15938-10.

Table 2 — Collection-level MPEG-7 metadata (normative)

Global Elements	**Name**	**Constraint**
Mpeg7	DescriptionUnit Description	xsi:type="ContentCollectionType" element excluded
Complex Types	**Element/Attribute Name**	**Constraint**
Mpeg7BaseType		
DSType	Header id timePropertyGrp mediaTimePropertyGrp	element excluded attributeGroup excluded attributeGroup excluded
HeaderType	id	
DescriptionMetadataType	Confidence Version LastUpdate Comment PublicIdentifier PrivateIdentifier Creator CreationLocation CreationTime Instrument Rights Package	element excluded element excluded minOccurs="1" element excluded element excluded element excluded element excluded element excluded element excluded element excluded
Mpeg7Type	DescriptionProfile DescriptionMetadata xml:lang timePropertyGrp mediaTimePropertyGrp	 minOccurs="1" attributeGroup excluded attributeGroup excluded

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CollectionType	CreationInformation CreationInformationRef UsageInformation UsageInformationRef TextAnnotation name	minOccurs="0" element excluded element excluded element excluded
ContentCollectionType	VisualFeature GofGopFeature AudioFeature Content ContentRef ContentCollection ContentCollectionRef	element excluded element excluded element excluded element excluded minOccurs="0" minOccurs="0" element excluded
CreationInformationType	Creation Classification RelatedMaterial	 element excluded element excluded
CreationType	Title TitleMedia Abstract Creator CreationCoordinates Location Date CreationTool CopyrightString	 maxOccurs="1" element excluded maxOccurs="1" element excluded element excluded
TimeType	TimePoint RelTimePoint RelIncrTimePoint Duration Incr Duration	 element excluded element excluded minOccurs="0" element excluded
PlaceType	Name NameTerm PlaceDescription Role GeographicPosition Point datum AstronomicalBody Region AdministrativeUnit PostalAddress AddressLine PostingIdentifier xml:lang StructuredPostalAddress InternalCoordinates StructuredInternalCoordinates ElectronicAddress xml:lang	 element excluded element excluded element excluded element excluded element excluded element excluded element excluded element excluded element excluded attribute excluded
GeographicPointType	longitude latitude altitude	
TitleType	type	attribute excluded

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TitleMediaType	TitleImage TitleVideo TitleAudio	 element excluded element excluded
TextAnnotationType	KeywordAnnotation FreeTextAnnotation StructuredAnnotation DependencyStructure relevance confidence xml:lang	 element excluded element excluded attribute excluded attribute excluded
KeywordAnnotationType	Keyword type xml:lang	
CreatorType	Character Instrument	element excluded element excluded
PersonNameType	GivenName FamilyName Title Numeration LinkingName Salutation dateFrom dateTo type xml:lang	 attribute excluded attribute excluded attribute excluded
NameComponentType	initial abbrev	attribute excluded attribute excluded
MediaAgentType	Role Agent AgentRef	 element excluded
InlineTermDefinitionType	Name preferred Definition Term	maxOccurs="1" attribute excluded element excluded element excluded
ControlledTermUseType	href	
AgentType	Icon	element excluded
PersonType	Name NameTerm Affiliation Organization OrganizationRef PersonGroup PersonGroupRef Citizenship Address AddressRef ElectronicAddress PersonDescription Nationality	maxOccurs="1" element excluded element excluded element excluded element excluded element excluded minOccurs="0" element excluded element excluded element excluded
OrganizationType	Name type NameTerm Kind	 attribute excluded element excluded element excluded

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	Contact ContactRef Jurisdiction JurisdictionRef Address AddressRef ElectronicAddress	element excluded element excluded element excluded element excluded minOccurs="0" element excluded
ElectronicAddressType	Telephone type Fax Email Url	attribute excluded
TextualBaseType	xml:lang phoneticTranscription phoneticAlphabet	attribute excluded attribute excluded
ImageLocatorType	MediaTimePoint MediaRelTimePoint MediaRelIncrTimePoint BytePosition	element excluded element excluded element excluded element excluded
InlineMediaType	MediaData16 MediaData64 type	
MediaLocatorType	MediaURI InlineMedia StreamID	element excluded minOccurs="0" element excluded
DescriptionProfileType	profileAndLevelIndication	
ReferenceType	mpeg7:referenceGroup	
TextualType		
Simple Types	**Element/Attribute Name**	**Constraints**
termURIReferenceType		
termAliasReferenceType		
termReferenceType		
basicDurationType		
durationType		
mimeType		
basicTimePointType		
timePointType		
Attribute Groups	**Attribute Name**	**Constraints**
referenceGrp	idref xpath href	attribute excluded attribute excluded

7.2.3 Instantiation examples (informative)

```
<Mpeg7>
<DescriptionMetadata>
    <LastUpdate>2006-11-06T19:20:25+00:00</LastUpdate>
    <Creator>
```


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```
      <Role href="urn:mpeg:mpeg7:cs:RoleCS:2001:AUTHOR">
        <Name>Author</Name>
      </Role>
      <Agent xsi:type="PersonType">
        <Name>
          <GivenName>Akio</GivenName>
          <FamilyName>Yamada</FamilyName>
        </Name>
      </Agent>
    </Creator>
    <CreationTime>2006-11-06T19:20:25+00:00</CreationTime>
  </DescriptionMetadata>
  <DescriptionUnit xsi:type="ContentCollectionType" name="Yuto's 6th birthday">
    <!-- ########## ROOT COLLECTION  - (AN EVENTCOLLECTION) ########## !-->
    <CreationInformation>
      <Creation>
        <Title>
        </Title>
        <TitleMedia>
          <TitleImage>
            <!-- Thumbnail image (<InlineMedia>) here  -->
          </TitleImage>
        </TitleMedia>
        <CreationCoordinates>
          <Date>
            <TimePoint>2006-11-05T16:14+00:00</TimePoint>
            <Duration>PT6H33M</Duration>
          </Date>
        </CreationCoordinates>
      </Creation>
    </CreationInformation>
    <TextAnnotation>
      <FreeTextAnnotation>Birthday Party</FreeTextAnnotation>
      <KeywordAnnotation>
        <Keyword>EventCollection</Keyword>
      </KeywordAnnotation>
    </TextAnnotation>
    <ContentRef href="#ffp(track_ID=1)" />
    <ContentRef href="#ffp(track_ID=2)" />
    <ContentRef href="#ffp(track_ID=3)" />
    <ContentRef href="#ffp(track_ID=4)" />
    <ContentRef href="#ffp(track_ID=5)" />
    <ContentRef href="#ffp(track_ID=6)" />
    <ContentRef href="#ffp(track_ID=7)" />
    <ContentRef href="#ffp(track_ID=8)" />
    <ContentRef href="#ffp(track_ID=9)" />
    <ContentRef href="#ffp(track_ID=10)" />
    <ContentRef href="#ffp(track_ID=11)" />
    <ContentRef href="#ffp(track_ID=12)" />
    <!-- ........ -->
    <ContentRef href="#ffp(track_ID=15)" />
    <ContentRef href="#ffp(track_ID=16)" />
    <ContentRef href="#ffp(track_ID=17" />
    <ContentRef href="#ffp(track_ID=18)" />
    <!-- ........ -->
    <ContentRef href="#ffp(track_ID=22)" />
    <ContentCollection name="Indoors at the Birthday party">
      <!-- ########## CATEGORYCOLLECTION 1 ########## !-->
      <CreationInformation>
        <Creation>
          <Title>
```

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```
          </Title>
          <TitleMedia>
            <TitleImage>
              <!-- Thumbnail image (<InlineMedia>) here  -->
            </TitleImage>
          </TitleMedia>
        </Creation>
      </CreationInformation>
      <TextAnnotation>
        <FreeTextAnnotation>Yuto and his friends in the kitchen
</FreeTextAnnotation>
        <KeywordAnnotation>
          <Keyword>CategoryCollection</Keyword>
        </KeywordAnnotation>
        <KeywordAnnotation>
          <Keyword>Indoor</Keyword>
        </KeywordAnnotation>
        <KeywordAnnotation>
          <Keyword>Party</Keyword>
        </KeywordAnnotation>
      </TextAnnotation>
      <ContentCollection name="Blowing out the candles">
        <!-- ########## EVENT COLLECTION 1.1 ########## !-->
        <CreationInformation>
          <Creation>
            <Title>
            </Title>
            <CreationCoordinates>
              <Date>
                <TimePoint>2006-11-05T16:14+00:00</TimePoint>
                <Duration>PT7M</Duration>
              </Date>
            </CreationCoordinates>
          </Creation>
        </CreationInformation>
        <TextAnnotation>
          <KeywordAnnotation>
            <Keyword>Candles</Keyword>
          </KeywordAnnotation>
          <KeywordAnnotation>
            <Keyword>Birthday cake</Keyword>
          </KeywordAnnotation>
          <KeywordAnnotation>
            <Keyword>EventCollection</Keyword>
          </KeywordAnnotation>
          <FreeTextAnnotation>Yuto blew out all the candles in one
go!</FreeTextAnnotation>
        </TextAnnotation>
        <ContentRef href="#ffp(track_ID=1)" />
        <ContentRef href="#ffp(track_ID=2)" />
        <ContentRef href="#ffp(track_ID=3)" />
      </ContentCollection>
      <ContentCollection name="Opening presents">
        <!-- ########## EVENT COLLECTION 1.2 ########## !-->
        <CreationInformation>
          <Creation>
            <Title>
            </Title>
            <CreationCoordinates>
              <Date>
                <TimePoint>2006-11-05T16:25+00:00</TimePoint>
```


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```
                <Duration>PT16M31S</Duration>
              </Date>
            </CreationCoordinates>
          </Creation>
        </CreationInformation>
        <TextAnnotation>
          <KeywordAnnotation>
            <Keyword>EventCollection</Keyword>
          </KeywordAnnotation>
          <FreeTextAnnotation>Lots of presents to open - wrapping paper
everywhere!</FreeTextAnnotation>
        </TextAnnotation>
        <ContentRef href="#ffp(track_ID=4)" />
        <ContentRef href="#ffp(track_ID=5)" />
        <ContentRef href="#ffp(track_ID=6)" />
        <ContentRef href="#ffp(track_ID=7)" />
      </ContentCollection>
    </ContentCollection>
    <ContentCollection name="Outdoors at the Birthday party">
      <!-- ########## CATEGORYCOLLECTION 2 ########## !-->
      <CreationInformation>
        <Creation>
          <Title>
          </Title>
          <CreationCoordinates>
            <Location>
              <PlaceDescription>The garden of our house</PlaceDescription>
            </Location>
          </CreationCoordinates>
        </Creation>
      </CreationInformation>
      <TextAnnotation>
        <FreeTextAnnotation>Outdoor</FreeTextAnnotation>
        <FreeTextAnnotation>Party</FreeTextAnnotation>
        <KeywordAnnotation>
          <Keyword>CategoryCollection</Keyword>
        </KeywordAnnotation>
      </TextAnnotation>
      <ContentCollection name="Night time">
        <!-- ########## CATEGORYCOLLECTION 2.1 ########## !-->
        <TextAnnotation>
          <KeywordAnnotation>
            <Keyword>Outdoor</Keyword>
          </KeywordAnnotation>
          <KeywordAnnotation>
            <Keyword>Night</Keyword>
          </KeywordAnnotation>
          <KeywordAnnotation>
            <Keyword>CategoryCollection</Keyword>
          </KeywordAnnotation>
        </TextAnnotation>
        <ContentRef href="#ffp(track_ID=8)" />
        <ContentRef href="#ffp(track_ID=9)" />
        <ContentCollection name="A small fireworks display">
          <!-- ########## EVENTCOLLECTION 2.1.1 ########## !-->
          <CreationInformation>
            <Creation>
              <Title>
              </Title>
              <CreationCoordinates>
                <Date>
```

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```
                  <TimePoint>2006-11-05T20:43+00:00</TimePoint>
                  <Duration>PT9M</Duration>
                </Date>
              </CreationCoordinates>
            </Creation>
          </CreationInformation>
          <TextAnnotation>
            <KeywordAnnotation>
              <Keyword>Night</Keyword>
            </KeywordAnnotation>
            <KeywordAnnotation>
              <Keyword>Fireworks</Keyword>
            </KeywordAnnotation>
            <KeywordAnnotation>
              <Keyword>CategoryCollection</Keyword>
            </KeywordAnnotation>
          </TextAnnotation>
          <ContentRef href="#ffp(track_ID=11)" />
          <ContentRef href="#ffp(track_ID=12)" />
          <!-- ........ -->
          <ContentRef href="#ffp(track_ID=15)" />
        </ContentCollection>
      </ContentCollection>
    </ContentCollection>
    <ContentCollection name="Pictures of Yuto">
      <!-- ########## PERSONCOLLECTION 3 ########## !-->
      <CreationInformation>
        <Creation>
          <Title>
          </Title>
          <Creator>
            <Role href="urn:mpeg:mpeg7:cs:RoleCS:2001:ACTOR" />
            <Agent xsi:type="PersonType">
              <Name>
                <GivenName>Yuto</GivenName>
                <FamilyName>Yamada</FamilyName>
              </Name>
            </Agent>
          </Creator>
        </Creation>
      </CreationInformation>
      <TextAnnotation>
        <KeywordAnnotation>
          <Keyword>PersonCollection</Keyword>
        </KeywordAnnotation>
      </TextAnnotation>
      <ContentRef href="#ffp(track_ID=11)" />
      <ContentRef href="#ffp(track_ID=5)" />
      <ContentRef href="#ffp(track_ID=1)" />
      <ContentRef href="#ffp(track_ID=2)" />
      <ContentRef href="#ffp(track_ID=17)" />
      <ContentRef href="#ffp(track_ID=21)" />
      <ContentRef href="#ffp(track_ID=22)" />
    </ContentCollection>
  </DescriptionUnit>
</Mpeg7>
```


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7.3 Item level descriptive metadata

7.3.1 Overview

A BiM encoded Image DS shall be used to represent item-level descriptive metadata. Figure 3 shows an overview of the metadata and Table 3 summarizes the semantics of available tools. The normative specification of all semantics is given in ISO/IEC 15938-2, ISO/IEC 15938-3 and ISO/IEC 15938-5.

Table 3 — Semantics of tools in item-level descriptive metadata

Tag Name		Semantics
DescriptionMetadata/ Creator	Optional	An author of the item description. The term “Author” (registered in RoleCS) shall be used as his/her role.
DescriptionMetadata/ CreationTime	Optional	The time stamp when the item description was created.
DescriptionMetadata/ LastUpdate	Mandatory	The time stamp of the most recent change to the item description.
DescriptionUnit/ Image/ MediaInformation/ MediaProfile/ MediaFormat	Optional	File properties of a resource. Here resource refers to an external resource if the MediaInstance element is instantiated and the internal resource if not; When appropriate, the FileSize and VisualCoding/Frame child elements should be used to specify the size of code-stream and pixel dimensions of the image, respectively.
DescriptionUnit/ Image/ MediaInformation/ MediaProfile/ MediaFormat/ Content	Mandatory (if MediaFormat is instantiated)	Describing the media. The term "Image" (registered in ContentCS) shall be used
DescriptionUnit/ Image/ MediaInformation/ MediaProfile/ MediaFormat/ FileFormat	Optional	If the resource is external, this element shall be used to specify the format of the image. The terms from FileFormatCS should be used for this purpose.
DescriptionUnit/ Image/ MediaInformation/ MediaProfile/ MediaInstance	Optional	Indicating the location of an external resource. Not more than one instance shall be instantiated in any given MediaProfile. Note that this is an optional element. In the case that no external resource exists, this element shall not be instantiated.
DescriptionUnit Image/ CreationInformation/ Creation/ Title	Mandatory	The title of the resource. It may be obtained by referring to corresponding Exif tags of the resource.
DescriptionUnit Image/ CreationInformation/ Creation/ Creator	Optional	Describing a person or organization who relates to the creation process of the resource, such as photographer, publisher and so on. Their roles should be described using RoleCS. A variety of methods can be used to identify the Creators, including electronic address elements such as url or email. Regarding the photographer, such information may be obtained by referring to corresponding Exif tags of the resource. If the Role is set to “Actor”, this field shall describe the identity of persons who appear in the image.
DescriptionUnit/ Image/ TextAnnotation	Optional	Summary text of the resource. It may be obtained by referring to corresponding Exif tags of the resource.

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DescriptionUnit/ Image/ CreationInformation/ Creation/ Location	Optional	The location where the resource was captured. GPS location information may be obtained by referring to corresponding Exif tags of the resource.
DescriptionUnit/ Image/ CreationInformation/ Creation/ Date	Optional	The time when the resource was captured. This may be obtained by referring to corresponding Exif tags of the resource.
DescriptionUnit/ Image/ VisualDescriptionScheme	Optional	Signal-level characteristics of the resource. Several elements may be instantiated. Suggestions appropriate to certain applications are given in Annex C.

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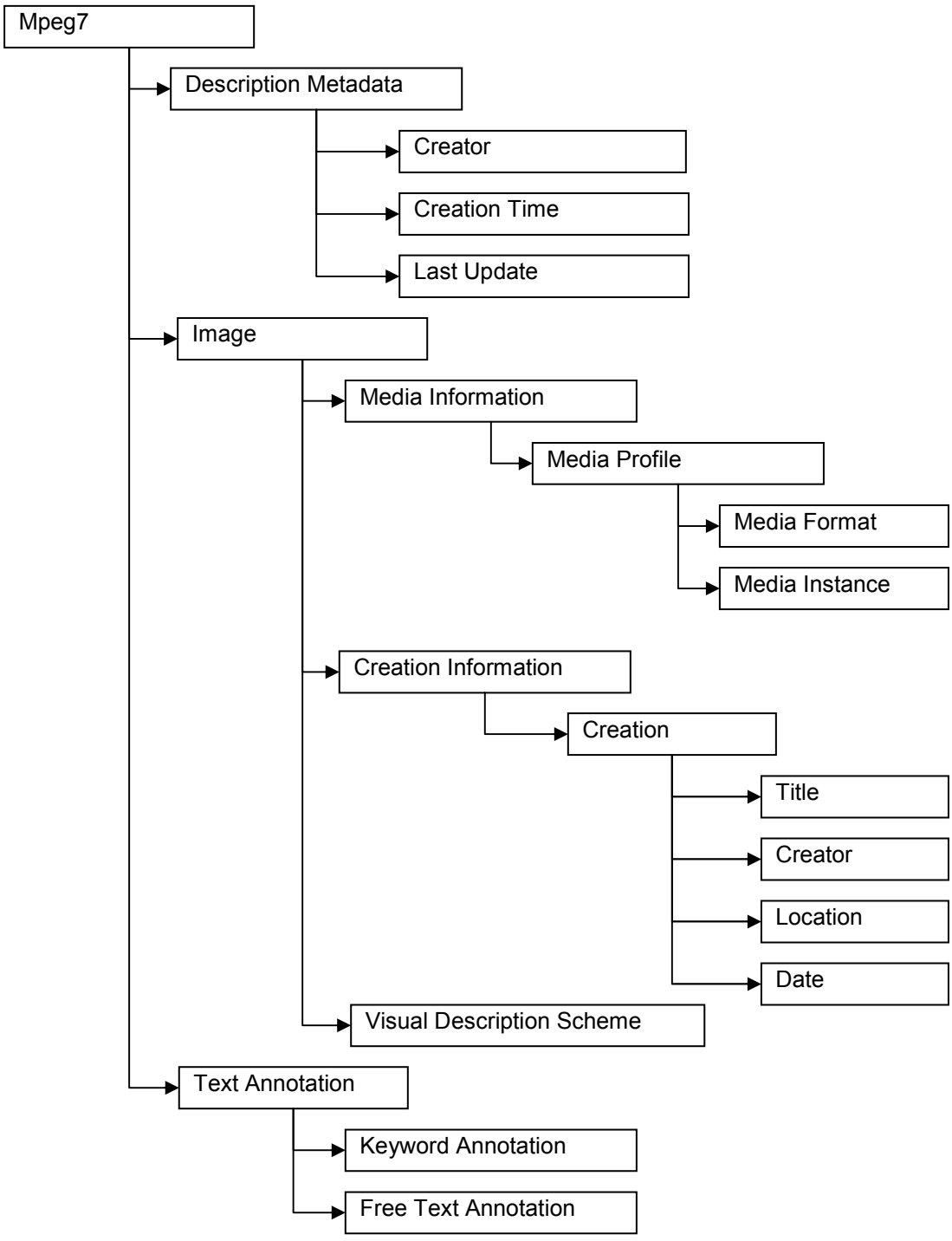

Figure 3 — Overview of collection level descriptive metadata

7.3.2 Constraints to MPEG-7 Schema

The item-level photo-player schema is defined with respect to the Version 2 schema as specified in ISO/IEC 15938-10. The namespace of the Version 2 schema providing a basis for the photo-player item-level schema is “urn:mpeg:mpeg7:schema:2004”. The following table lists the ISO/IEC 15938 description tools (global elements, global attributes, attribute groups, complexTypes and simpleTypes) selected to be included

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and any further constraints imposed on these description tools for the item-level metadata schema. The interpretation of the Table is as follows:

- “element/attribute/attributeGroup excluded” – this MPEG-7 metadata shall not be instantiated in the item-level metadata of a photo-player compliant file;
- xsi:type=”[TypeName]” – the element shall have this attribute, when instantiated in the item-level metadata. Therefore, it shall only be instantiated with type [TypeName]);
- minOccurs="*n*" – at least *n* occurences of the element shall be instantiated in the item-level metadata;
- maxOccurs=”*m*” – no more than *m* occurences of the element shall be instantiated in the item-level metadata.

Where no constraint is listed, the metadata elements/attributes shall be instantiated in accordance with ISO/IEC 15938-10.

Table 4 — Item-level MPEG-7 metadata (normative)

Global Elements	**Name**	**Constraint**
Mpeg7	DescriptionUnit Description	xsi:type="ImageType" element excluded
Complex Types	**Element/Attribute Name**	**Constraint**
Mpeg7BaseType		
DType		
DSType	Header id timePropertyGrp mediaTimePropertyGrp	element excluded attributeGroup excluded attributeGroup excluded
HeaderType	id	
DescriptionMetadataType	Confidence Version LastUpdate Comment PublicIdentifier PrivateIdentifier Creator CreationLocation CreationTime Instrument Rights Package	element excluded element excluded minOccurs="1" element excluded element excluded element excluded element excluded element excluded element excluded element excluded
Mpeg7Type	DescriptionProfile DescriptionMetadata xml:lang timePropertyGrp mediaTimePropertyGrp	 minOccurs="1" attributeGroup excluded attributeGroup excluded
DescriptionProfileType	profileAndLevelIndication	
MultimediaContentType		
ImageType	Image	

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SegmentType	MediaInformation MediaInformationRef MediaLocator StructuralUnit CreationInformation CreationInformationRef UsageInformation UsageInformationRef TextAnnotation type Semantic SemanticRef MatchingHint PointOfView Relation	minOccurs="0" element excluded element excluded element excluded minOccurs="0" element excluded element excluded element excluded attribute excluded element excluded element excluded element excluded element excluded element excluded
MediaInformationType	MediaIdentification MediaProfile	element excluded
MediaProfileType	ComponentMediaProfile MediaFormat MediaTranscodingHints MediaQuality MediaInstance master	element excluded element excluded element excluded maxOccurs="1" attribute excluded
MediaFormatType	Content Medium FileFormat FileSize System Bandwidth BitRate TargetChannelBitRate ScalableCoding VisualCoding Format Pixel Frame height width aspectRatio rate structure ColorSampling AudioCoding SceneCodingFormat GraphicsCodingFormat OtherCodingFormat	 element excluded element excluded element excluded element excluded element excluded element excluded element excluded element excluded attribute excluded attribute excluded attribute excluded element excluded element excluded element excluded element excluded element excluded
MediaInstanceType	InstanceIdentifier MediaLocator LocationDescription	
UniqueIDType	type organization authority encoding	 attribute excluded attribute excluded
MediaLocatorType	MediaUri InlineMedia StreamID	minOccurs="1" element excluded element excluded

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StillRegionType	SpatialLocator SpatialMask MediaTimePoint MediaRelTimePoint MediaRelIncrTimePoint VisualDescriptor VisualDescriptionScheme GridLayoutDescriptors IllumininationInvariantColor MultipleView SpatialDecomposition	element excluded element excluded element excluded element excluded element excluded element excluded xsi:type="StillRegionFeatureType", maxOccurs="1" element excluded element excluded element excluded element excluded
VisualDType		
VisualDSType		
StillRegionFeatureType	DominantColor ScalableColor ColorStructure ColorLayout ColorTemperature IlluminationCompensatedColor Edge HomogeneousPattern TextureBrowsing ShapeMask Contour	 element excluded element excluded element excluded element excluded element excluded
DominantColorType	ColorSpace ColorQuantization SpatialCoherency Value Percentage Index ColorVariance	element excluded element excluded
ScalableColor	Coeff numOfCoeff numOfBitplanesDiscarded	
ColorStructure	Values colorQuant	
ColorLayoutType	YDCCoeff CbDCCoeff CrDCCoeff YACCoeff2 YACCoeff5 YACCoeff9 YACCoeff14 YACCoeff20 YACCoeff27 YACCoeff63 CrACCoeff2 CrACCoeff5 CrACCoeff9 CrACCoeff14 CrACCoeff20 CrACCoeff27 CrACCoeff63 CbACCoeff2	 element excluded element excluded element excluded

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	CbACCoeff5 CbACCoeff9 CbACCoeff14 CbACCoeff20 CbACCoeff27 CbACCoeff63	
HomogeneousTextureType	Average StandardDeviation Energy EnergyDeviation	
EdgeHistogramType	BinCounts	
CreationInformationType	Creation Classification RelatedMaterial	 element excluded element excluded
CreationType	Title TitleMedia Abstract Creator CreationCoordinates Location Date CreationTool CopyrightString	maxOccurs="1" element excluded element excluded maxOccurs="1" element excluded element excluded
TextAnnotationType	KeywordAnnotation FreeTextAnnotation StructuredAnnotation DependencyStructure relevance confidence xml:lang	 element excluded element excluded attribute excluded attribute excluded
KeywordAnnotationType	Keyword type xml:lang	
PlaceType	Name NameTerm PlaceDescription Role GeographicPosition Point datum AstronomicalBody Region AdministrativeUnit PostalAddress AddressLine PostingIdentifier xml:lang StructuredPostalAddress InternalCoordinates StructuredInternalCoordinates ElectronicAddress xml:lang	 element excluded element excluded element excluded element excluded element excluded element excluded element excluded element excluded element excluded attribute excluded
GeographicPointType	Longitude Latitude altitude	

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TitleType	type	attribute excluded
CreatorType	Character Instrument	element excluded element excluded
PersonNameType	GivenName FamilyName Title Numeration LinkingName Salutation dateFrom dateTo type xml:lang	 attribute excluded attribute excluded attribute excluded
NameComponentType	Initial abbrev	attribute excluded attribute excluded
MediaAgentType	Role Agent AgentRef	 element excluded
InlineTermDefinitionType	Name preferred Definition Term	maxOccurs="1" attribute excluded element excluded element excluded
ControlledTermUseType	href	
AgentType	Icon	element excluded
PersonType	Name NameTerm Affiliation Organization OrganizationRef PersonGroup PersonGroupRef Citizenship Address AddressRef ElectronicAddress PersonDescription Nationality	maxOccurs="1" element excluded element excluded element excluded element excluded element excluded minOccurs="0" element excluded element excluded element excluded
OrganizationType	Name type NameTerm Kind Contact ContactRef Jurisdiction JurisdictionRef Address AddressRef ElectronicAddress	 attribute excluded element excluded element excluded element excluded element excluded element excluded element excluded minOccurs="0" element excluded
ElectronicAddressType	Telephone type Fax Email Url	 attribute excluded

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TextualBaseType	xml:lang phoneticTranscription phoneticAlphabet	 attribute excluded attribute excluded
TextualType		
TimeType	TimePoint RelTimePoint RelIncrTimePoint Duration Incr Duration	 element excluded element excluded element excluded element excluded
Simple Types	**Element/Attribute Name**	**Constraints**
termURIReferenceType		
termAliasReferenceType		
termReferenceType		
textureListType		
basicTimePointType		
timePointType		
unsigned1		
unsigned3		
unsigned5		
unsigned6		
unsigned8		
unsigned12		
integerVector		

7.3.3 Instantiation examples (informative)

```
<Mpeg7>
<DescriptionMetadata>
      <LastUpdate>2001-09-20T03:20:25+09:00</LastUpdate>
      <Creator>
        <Role href="urn:mpeg:mpeg7:cs:RoleCS:2001:AUTHOR">
          <Name>Author</Name>
        </Role>
        <Agent xsi:type="PersonType">
          <Name>
            <GivenName>Akio</GivenName>
            <FamilyName>Yamada</FamilyName>
          </Name>
        </Agent>
      </Creator>
      <CreationTime>2001-09-19T15:10:37+09:00</CreationTime>
    </DescriptionMetadata>
    <DescriptionUnit xsi:type="ImageType">
      <Image>
        <MediaInformation>
          <MediaProfile>
            <!-- PRIMARY RESOURCE  -->
            <MediaFormat>
              <Content href="urn:mpeg:mpeg7:cs:ContentCS:2001:4.1">
```

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```
            <Name>Image</Name>
          </Content>
          <FileFormat href="urn:mpeg:mpeg7:cs:FileFormatCS:2001:1">
            <Name>jpeg</Name>
          </FileFormat>
          <FileSize>138474</FileSize>
          <VisualCoding><Frame height="320" width="240"/></VisualCoding>
        </MediaFormat>
        <MediaInstance>
          <InstanceIdentifier></InstanceIdentifier>
          <MediaLocator>
            <MediaUri>http://www.nec.com/fig1.jpg</MediaUri>
          </MediaLocator>
        </MediaInstance>
      </MediaProfile>
      <MediaProfile>
        <!-- SUPPLEMENTARY RESOURCE  -->
        <MediaFormat>
          <Content href="urn:mpeg:mpeg7:cs:ContentCS:2001:4.1">
            <Name>Image</Name>
          </Content>
          <FileFormat href="urn:mpeg:mpeg7:cs:FileFormatCS:2001:18">
            <Name>tiff</Name>
          </FileFormat>
          <FileSize>960512</FileSize>
          <VisualCoding><Frame height="1280" width="960"/></VisualCoding>
        </MediaFormat>
        <MediaInstance>
          <InstanceIdentifier></InstanceIdentifier>
          <MediaLocator>
            <MediaUri>http://www.nec.com/fig1.tif</MediaUri>
          </MediaLocator>
        </MediaInstance>
      </MediaProfile>
      <MediaProfile>
        <!-- INTERNAL RESOURCE (a thumbnail, in this case)  -->
        <MediaFormat>
          <Content href="urn:mpeg:mpeg7:cs:ContentCS:2001:4.1">
            <Name>Image</Name>
          </Content>
          <VisualCoding><Frame height="60" width="40"/></VisualCoding>
        </MediaFormat>
      </MediaProfile>
    </MediaInformation>
    <CreationInformation>
      <Creation>
        <Title>John at the beach</Title>
        <Creator>
          <!-- Person appearing in the photo  -->
          <Role href="urn:mpeg:mpeg7:cs:RoleCS:2001:ACTOR"/>
          <Agent xsi:type="PersonType">
            <Name>
              <GivenName>John</GivenName>
              <FamilyName>Smith</FamilyName>
            </Name>
          </Agent>
        </Creator>
        <Creator>
          <!-- Photographer -->
          <Role href="urn:mpeg:mpeg7:cs:RoleCS:2001:AUTHOR"/>
          <Agent xsi:type="PersonType">
```


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```
                <Name>
                  <GivenName>Mary</GivenName>
                  <FamilyName>Smith</FamilyName>
                </Name>
              </Agent>
            </Creator>
            <CreationCoordinates>
              <Date>
                <TimePoint>2001-09-19T15:10:37+09:00</TimePoint>
            </Date>
            </CreationCoordinates>
          </Creation>
        </CreationInformation>
        <TextAnnotation>
          <KeywordAnnotation>
            <Keyword>Beach</Keyword>
          </KeywordAnnotation>
        </TextAnnotation>
        <VisualDescriptionScheme xsi:type="StillRegionFeatureType">
          <DominantColor>
            <SpatialCoherency>0</SpatialCoherency>
            <Value>
              <Percentage>5</Percentage>
              <Index>0 89 203</Index>
            </Value>
            <Value>
              <Percentage>14</Percentage>
              <Index>120 43 74</Index>
            </Value>
            <Value>
              <Percentage>12</Percentage>
              <Index>243 212 27</Index>
            </Value>
          </DominantColor>
          <ColorLayout>
            <YDCCoeff>48</YDCCoeff>
            <CbDCCoeff>34</CbDCCoeff>
            <CrDCCoeff>32</CrDCCoeff>
            <YACCoeff5>12 10 13 9 10</YACCoeff5>
            <CbACCoeff5>14 15 8 7 3</CbACCoeff5>
            <CrACCoeff5>16 12 9 6 6</CrACCoeff5>
          </ColorLayout>
          <Edge>
            <BinCounts> 2 6 4 4 2 1 7 5 3 2 1 6 4 2 2 2 5 4 5 3 1 5 5 6 5
              2 6 5 4 4 1 6 4 4 4 0 6 3 5 2 1 5 5 6 6 4 2 3 6 7 3 2 5 5 7
              3 2 4 4 7 1 5 6 4 6 1 5 7 4 5 1 6 4 6 5 1 3 4 7 6
            </BinCounts>
          </Edge>
          <HomogeneousPattern>
            <Average>19</Average>
            <StandardDeviation>20</StandardDeviation>
            <Energy> 103 87 99 130 97 73 112 109 122 132 108 102 105 113
              106 141 103 111 78 76 82 117 88 70 69 61 48 68 48 53 </Energy>
            <EnergyDeviation> 106 84 94 130 94 75 107 104 117 128 100 99
              97 107 92 132 90 106 76 64 78 110 83 65 64 52 39 72 35 47
            </EnergyDeviation>
          </HomogeneousPattern>
        </VisualDescriptionScheme>
      </Image>
    </DescriptionUnit>
</Mpeg7>
```

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8 Conformance testing

8.1 File format conformance points

8.1.1 File Structure

Regarding metadata boxes in the mp4 file:

a) Exactly one collection-level descriptive metadata box and at least one item-level descriptive metadata box shall be present.

b) The number of item-level descriptive metadata boxes shall be the same as the number of internal resources in a file.

8.1.2 Resource

8.1.2.1 General

At least one resource (i.e. image) shall be present. All internal resources shall conform to the JPEG specification (ISO/IEC 10918-1).

8.1.2.2 Type A specific

The size of each internal resource shall match the description in the corresponding item-level descriptive metadata. No external JPEG resources shall be referenced.

8.1.2.3 Type B specific

The following requirements relate to referenced external resources.

a) At most one external JPEG resource shall be referenced per image item. If such an external JPEG resource is referenced, this is the primary resource for that item.

b) All primary resources shall conform to the JPEG specification.

c) The sizes of external resources shall match the description in the corresponding item-level descriptive metadata (in MediaProfile instances).

d) The external primary resources specified by MediaInstance instances shall exist, at least when the collection metadata is created.

8.1.3 Metadata

8.1.3.1 General

The following requirements apply to the contents of metadata boxes.

a) The metadata instances shall be valid to the schemas specified in Annex A. The collection level metadata shall be valid to the Schema defined in Annex A.1, and the item-level metadata shall be valid to the schema defined in Annex A.2.

b) The ID attribute of a *DescriptionUnit* instance in item-level descriptive metadata shall be unique in a file.

c) The root collection in the collection-level descriptive metadata shall include all photos in the file.

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d) The following namespaces shall be used: urn:mpeg:maf:schema:photoplayer:collection:2006 for collection-level descriptive metadata, and urn:mpeg:maf:schema:photoplayer:item:2006 for item-level descriptive metadata, respectively.

e) The item-level descriptive metadata for each item shall contain at most one MediaProfile instance which contains no MediaInstance element – that is, at most one MediaProfile instance which does not reference an external resource. This instance shall describe the internal resource.

8.1.3.2 Type A specific

No MediaInstance elements referencing JPEG resources shall be included in item-level descriptive metadata instances.

8.1.3.3 Type B specific

At least one of the item-level descriptive metadata instances shall include a MediaInstance element specifying the location where the primary JPEG resource is available.

8.2 Photo-player device conformance points

8.2.1 Mandatory behaviours

Conforming devices shall have the following mechanisms:

a) to update the modification-date/time elements of both collection-level and item-level descriptive metadata when metadata is modified. The modification-date/time related elements include the following:

   1) *Mpeg7/Description Metadata/Last Update* (collection-level descriptive metadata);

   2) *Mpeg7/Description Metadata/Last Update* (item-level descriptive metadata);

b) to synchronize MPEG-7 visual metadata, specified in an *Image/Visual Feature* instance of item-level descriptive metadata, with modification of the corresponding resource. If the device is not equipped with some of the MPEG-7 visual feature synchronization functions, the corresponding instances in the *Image/Visual Feature* instance shall be removed;

c) if the device cannot access to an external primary resource, the device shall not update/remove the corresponding metadata;

d) to update the list of resources when the resources are removed from or added to the file. The list is specified in the *Content Collection/Content References* instances. All collections (that is, the root collection and all sub-collections) shall be updated when resources are removed from the file. When resources are added, the root collection shall be updated and sub-collections may be updated, as appropriate;

e) conforming products may have resource rendering capability, in which case they shall implement a JPEG decoder (that is, one conforming to ISO/IEC 10918-2).

8.2.2 Optional behaviours

This subclause is an informative section.

Conforming products should

a) copy code-stream properties from the Exif metadata of the resource to the corresponding item-level metadata instances when a file is created from an Exif compliant resource. The corresponding instances include *Image/Media Information/Media Profile/Media Format/Frame* (Exif: ImageWidth and ImageHeight);

b) add code-stream properties, including *Image/Media Information/Media Profile/Media Format/FileSize*;

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c) copy capturing conditions from the Exif metadata of the resource to the corresponding item-level metadata instances, when a file is created from an Exif compliant resource. The corresponding instances include the following:

   1) *Image/Creation Information/Creation/Creation Date* (Exif: DateTimeOriginal),

   2) *Image/Creation Information/Creation/GPS Information* (Exif: GPS Infor IFD);

d) copy annotations from the Exif metadata of the resource to the corresponding item-level metadata instances, when a file is created from an Exif compliant resource. The corresponding instances include the following:

   1) *Image/Creation Information/Creation/Creator/Name* (EIXF: Artist),

   2) *Image/Creation Information/Creation/Title* (Exif: ImageDescription),

   3) *Image/Creation InformationCreation/Abstract* (Exif: UserComment).

Conforming devices may

a) have collection create/update functionalities, by adding/removing *Content Collection* instances in the *Content Collection* instance for the root collection. The following instances may be modified:

   1) *Content Collection/Creation Information/Creation/Title*,

   2) *Content Collection/Content References* (only for sub-collections);

b) have the functionalities to create JPEG files and MPEG-7 documents from a conforming MPEG photo-player application format file.

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Annex A
(normative)

Schemas

A.1 Collection-level descriptive metadata

```
 <schema targetNamespace="urn:mpeg:maf:schema:photoplayer:collection:2006"
elementFormDefault="qualified" attributeFormDefault="unqualified"
xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:mpeg7="urn:mpeg:maf:schema:photoplayer:collection:2006">
    <!-- ########################################################## -->
    <!--  import xml components                                     -->
    <!-- ########################################################## -->
    <import namespace="http://www.w3.org/XML/1998/namespace"
schemaLocation="xml.xsd" />
    <!-- ######################################## -->
    <!--  Definition of MPEG-7 Base types (4.2)  -->
    <!-- ######################################## -->
    <!-- Definition of MPEG-7 base type -->
    <complexType name="Mpeg7BaseType" abstract="true">
        <complexContent>
            <restriction base="anyType" />
        </complexContent>
    </complexType>
    <!-- Definition of generic DS -->
    <complexType name="DSType" abstract="true">
        <complexContent>
            <extension base="mpeg7:Mpeg7BaseType">
                <attribute name="id" type="ID" use="optional" />
            </extension>
        </complexContent>
    </complexType>
    <!-- Definition of Header datatype -->
    <complexType name="HeaderType" abstract="true">
        <complexContent>
            <extension base="mpeg7:Mpeg7BaseType">
                <attribute name="id" type="ID" use="optional" />
            </extension>
        </complexContent>
    </complexType>
    <!-- Definition of Creator datatype -->
    <complexType name="CreatorType">
        <complexContent>
            <extension base="mpeg7:MediaAgentType">
            </extension>
        </complexContent>
    </complexType>
    <!-- Definition of MediaAgent datatype  -->
    <complexType name="MediaAgentType">
        <sequence>
            <element name="Role" type="mpeg7:ControlledTermUseType" />
            <element name="Agent" type="mpeg7:AgentType" />
        </sequence>
    </complexType>
```

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```
    <!-- ################################################ -->
    <!--  Definition of MPEG-7 root element (4.3) (COR/1) -->
    <!-- ################################################ -->
    <!-- Definition of Mpeg7 Type (COR/1)-->
    <complexType name="Mpeg7Type" abstract="true">
        <sequence>
            <element name="DescriptionProfile"
type="mpeg7:DescriptionProfileType" minOccurs="0" />
            <element name="DescriptionMetadata"
type="mpeg7:DescriptionMetadataType" minOccurs="1" />
        </sequence>
        <attribute ref="xml:lang" use="optional" />
    </complexType>
    <!-- Definition of DescriptionProfileType (COR/1) -->
    <complexType name="DescriptionProfileType">
        <attribute name="profileAndLevelIndication" use="required">
            <simpleType>
                <list itemType="anyURI" />
            </simpleType>
        </attribute>
    </complexType>
    <!-- Definition of Mpeg7 Element (COR/1) -->
    <element name="Mpeg7">
        <complexType>
            <complexContent>
                <extension base="mpeg7:Mpeg7Type">
                    <sequence>
                        <element name="DescriptionUnit"
type="mpeg7:ContentCollectionType" />
                        <!-- NB: for compatibility with MPEG-7 schema, xml
instance documents shall
                                explicitly declare the DescriptionUnit with
xsi:type="ContentCollectionType".
                                This is not necessary for validity against the
current schema but its omission
                                would prevent validation against MPEG-7 schema. -->
                    </sequence>
                </extension>
            </complexContent>
        </complexType>
    </element>
    <!-- ################################################ -->
    <!--  Definition of DescriptionMetadata Header (4.5.3)  -->
    <!-- ################################################ -->
    <!-- Definition of DescriptionMetadata Header -->
    <complexType name="DescriptionMetadataType">
        <complexContent>
            <extension base="mpeg7:HeaderType">
                <sequence>
                    <element name="LastUpdate" type="mpeg7:timePointType"
minOccurs="1" />
                    <element name="Creator" type="mpeg7:CreatorType"
minOccurs="0" maxOccurs="unbounded" />
                    <element name="CreationTime" type="mpeg7:timePointType"
minOccurs="0" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ################################################ -->
```


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```
    <!--  Definition of mimeType datatype (5.6.2)  -->
    <!-- ################################################ -->
    <simpleType name="mimeType">
        <restriction base="string">
            <whiteSpace value="collapse" />
            <pattern value='[&#x21;-&#x7f;-
[\(\)&lt;&gt;@,;:\\"/\[\]\?=]]+/[&#x21;-&#x7f;-[\(\)&lt;&gt;@,;:\\"/\[\]\?=]]+'
/>
        </restriction>
    </simpleType>
    <!-- ############################################ -->
    <!--   Definition of Reference datatypes (6.2.1)  -->
    <!-- ############################################ -->
    <!-- Definition of referenceGrp attribute group -->
    <attributeGroup name="referenceGrp">
        <attribute name="href" type="anyURI" use="optional" />
    </attributeGroup>
    <!-- Definition of Reference datatype -->
    <complexType name="ReferenceType">
        <attributeGroup ref="mpeg7:referenceGrp" />
    </complexType>

    <!-- ################################### -->
    <!--  Definition of Time datatype (6.4.2)  -->
    <!-- ################################### -->
    <!-- Definition of Time datatype -->
    <complexType name="TimeType">
        <sequence>
            <element name="TimePoint" type="mpeg7:timePointType" />
            <element name="Duration" type="mpeg7:durationType" minOccurs="0" />
        </sequence>
    </complexType>
    <!-- ######################################### -->
    <!--  Definition of timePoint datatype (6.4.3)  -->
    <!-- ######################################### -->
    <!-- Definition of timePoint datatype -->
    <simpleType name="timePointType">
        <restriction base="mpeg7:basicTimePointType">
            <pattern value="(\-?\d+(\-\d{2}(\-
\d{2})?)?)?(T\d{2}(:\d{2}(:\d{2}(:\d+)?)?)?)?(F\d+)?((\-|\+)\d{2}:\d{2})?" />
        </restriction>
    </simpleType>
    <!-- definition of basicTimePoint dataype -->
    <simpleType name="basicTimePointType">
        <restriction base="string">
            <pattern value="\-?(\d+(\-\d{2}(\-
\d{2})?)?)?(T\d{2}(:\d{2}(:\d{2}(:\d+(\.\d{2})?)?)?)?)?(F\d+)?((\-
|\+)\d{2}:\d{2})?" />
        </restriction>
    </simpleType>
    <!-- ######################################### -->
    <!--  Definition of duration datatype (6.4.4)  -->
    <!-- ######################################### -->
    <!-- Definition of duration datatype -->
    <simpleType name="durationType">
        <restriction base="mpeg7:basicDurationType">
            <pattern value="\-
?P(\d+D)?(T(\d+H)?(\d+M)?(\d+S)?(\d+N)?)?(\d+F)?((\-|\+)\d{2}:\d{2}Z)?" />
        </restriction>
    </simpleType>
    <!-- definition of basicDuration dataype -->
```

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```
    <simpleType name="basicDurationType">
        <restriction base="string">
            <pattern value="\-
?P(\d+D)?(T(\d+H)?(\d+M)?(\d+S)?(\d+N)?(\d{2}f)?)?(\d+F)?((\-|\+)\d{2}:\d{2}Z)?"
/>
        </restriction>
    </simpleType>
    <!-- ################################################ -->
    <!--  Definition of MediaLocator datatype (6.5.2)  -->
    <!-- ################################################ -->
    <!-- Definition of MediaLocator datatype -->
    <complexType name="MediaLocatorType">
        <sequence>
                <element name="InlineMedia" type="mpeg7:InlineMediaType"
minOccurs="0" />
        </sequence>
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of InlineMedia datatype (6.5.3)  -->
    <!-- ################################################ -->
    <!-- Definition of InlineMedia datatype -->
    <complexType name="InlineMediaType">
        <choice>
            <element name="MediaData16" type="hexBinary" />
            <element name="MediaData64" type="base64Binary" />
        </choice>
        <attribute name="type" type="mpeg7:mimeType" use="required" />
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of ImageLocator datatype (6.5.5)  -->
    <!-- ################################################ -->
    <!-- Definition of ImageLocator datatype -->
    <complexType name="ImageLocatorType">
        <complexContent>
            <extension base="mpeg7:MediaLocatorType">
            </extension>
        </complexContent>
    </complexType>
    <!-- ########################################### -->
    <!--  Definition of Textual datatypes (7.3.2)  -->
    <!-- ########################################### -->
    <!-- Definition of TextualBase datatype -->
    <complexType name="TextualBaseType" abstract="true">
        <simpleContent>
            <extension base="string">
                <attribute ref="xml:lang" use="optional" />
            </extension>
        </simpleContent>
    </complexType>
    <!-- Definition of Textual datatype -->
    <complexType name="TextualType">
        <simpleContent>
            <extension base="mpeg7:TextualBaseType" />
        </simpleContent>
    </complexType>
    <!-- ################################################  -->
    <!--  Definition of TextAnnotation datatype (7.3.3)   -->
    <!-- ################################################  -->
    <!-- Definition of TextAnnotation datatype -->
    <complexType name="TextAnnotationType">
        <choice maxOccurs="unbounded">
```


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```
            <element name="FreeTextAnnotation" type="mpeg7:TextualType" />
            <element name="KeywordAnnotation" type="mpeg7:KeywordAnnotationType"
/>
        </choice>
        <attribute ref="xml:lang" />
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of KeywordAnnotation datatype (7.3.5)  -->
    <!-- ################################################ -->
    <!-- Definition of KeywordAnnotation datatype -->
    <complexType name="KeywordAnnotationType">
        <sequence>
            <element name="Keyword" maxOccurs="unbounded">
                <complexType>
                    <simpleContent>
                        <extension base="mpeg7:TextualType">
                            <attribute name="type" use="optional" default="main">
                                <simpleType>
                                    <restriction base="NMTOKEN">
                                        <enumeration value="main" />
                                        <enumeration value="secondary" />
                                        <enumeration value="other" />
                                    </restriction>
                                </simpleType>
                            </attribute>
                        </extension>
                    </simpleContent>
                </complexType>
            </element>
        </sequence>
        <attribute ref="xml:lang" use="optional" />
    </complexType>
    <!-- ######################################### -->
    <!--  Definition of TermUse datatype (7.4.4)  -->
    <!-- ######################################### -->
    <!-- InlineTermDefinition datatype  -->
    <complexType name="InlineTermDefinitionType" abstract="true">
        <sequence>
            <element name="Name" minOccurs="0">
                <complexType>
                    <simpleContent>
                        <extension base="mpeg7:TextualType"/>
                    </simpleContent>
                </complexType>
            </element>
        </sequence>
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of ControlledTermUse datatype (7.4.5)  -->
    <!-- ################################################ -->
    <!-- Definition of ControlledTermUse datatype  -->
    <complexType name="ControlledTermUseType">
        <complexContent>
            <extension base="mpeg7:InlineTermDefinitionType">
                <attribute name="href" type="mpeg7:termReferenceType"
use="required" />
            </extension>
        </complexContent>
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of termReferenceType datatype (7.4.6)  -->
```

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```
    <!-- ################################################ -->
    <!-- Definition of termReference datatype  -->
    <simpleType name="termReferenceType">
        <union memberTypes="mpeg7:termAliasReferenceType
mpeg7:termURIReferenceType" />
    </simpleType>
    <simpleType name="termAliasReferenceType">
        <restriction base="NMTOKEN">
            <whiteSpace value="collapse" />
            <pattern value=":[^:]+:[^:]+" />
        </restriction>
    </simpleType>
    <simpleType name="termURIReferenceType">
        <restriction base="anyURI" />
    </simpleType>
    <!-- ################################ -->
    <!--  Definition of Agent DS (7.5.2)  -->
    <!-- ################################ -->
    <!-- Definition of Agent DS  -->
    <complexType name="AgentType" abstract="true">
        <complexContent>
            <extension base="mpeg7:DSType">
            </extension>
        </complexContent>
    </complexType>
    <!-- ######################################### -->
    <!--  Definition of Person DS (7.5.3) (AMD/2)  -->
    <!-- ######################################### -->
    <!-- Definition of Person DS  (AMD/2) -->
    <complexType name="PersonType">
        <complexContent>
            <extension base="mpeg7:AgentType">
                <sequence>
                    <element name="Name" type="mpeg7:PersonNameType" />
                    <element name="Affiliation" minOccurs="0"
maxOccurs="unbounded">
                        <complexType>
                            <sequence>
                                <element name="Organization"
type="mpeg7:OrganizationType" />
                            </sequence>
                        </complexType>
                    </element>
                    <element name="Address" type="mpeg7:PlaceType" minOccurs="0"
/>
                    <element name="ElectronicAddress"
type="mpeg7:ElectronicAddressType" minOccurs="0" maxOccurs="unbounded" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ###################################### -->
    <!--  Definition of Organization DS (7.5.5)  -->
    <!-- ###################################### -->
    <!-- Definition of Organization DS  -->
    <complexType name="OrganizationType">
        <complexContent>
            <extension base="mpeg7:AgentType">
                <sequence>
                    <element name="Name" minOccurs="0" maxOccurs="unbounded">
                        <complexType>
```


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```
                            <simpleContent>
                                <extension base="mpeg7:TextualType">
                                </extension>
                            </simpleContent>
                        </complexType>
                    </element>
                    <element name="Address" type="mpeg7:PlaceType" minOccurs="0"
/>
                    <element name="ElectronicAddress"
type="mpeg7:ElectronicAddressType" minOccurs="0" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ################################################## -->
    <!--  Definition of PersonName datatype (7.5.6) (AMD/2)  -->
    <!-- ################################################## -->
    <!-- Definition of PersonName datatype (AMD/2)-->
    <complexType name="PersonNameType">
        <sequence>
            <choice maxOccurs="unbounded">
                <element name="GivenName" type="mpeg7:NameComponentType" />
                <element name="LinkingName" type="mpeg7:NameComponentType"
minOccurs="0" />
                <element name="FamilyName" type="mpeg7:NameComponentType"
minOccurs="0" />
                <element name="Title" type="mpeg7:NameComponentType"
minOccurs="0" />
                <element name="Salutation" type="mpeg7:NameComponentType"
minOccurs="0" />
                <element name="Numeration" type="string" minOccurs="0" />
            </choice>
        </sequence>
        <attribute ref="xml:lang" use="optional" />
    </complexType>
    <!-- Definition of NameComponent datatype -->
    <complexType name="NameComponentType">
        <simpleContent>
            <extension base="mpeg7:TextualBaseType">
            </extension>
        </simpleContent>
    </complexType>
    <!-- ########################################################## -->
    <!--  Definition of ElectronicAddress datatype (7.5.7)(AMD/2)  -->
    <!-- ########################################################## -->
    <!-- Definition of ElectronicAddress datatype (AMD/2) -->
    <complexType name="ElectronicAddressType">
        <sequence>
            <element name="Telephone" minOccurs="0" maxOccurs="unbounded">
                <complexType>
                    <simpleContent>
                        <extension base="string">
                        </extension>
                    </simpleContent>
                </complexType>
            </element>
            <element name="Fax" type="string" minOccurs="0" maxOccurs="unbounded"
/>
            <element name="Email" type="string" minOccurs="0"
maxOccurs="unbounded" />
```

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```
            <element name="Url" type="anyURI" minOccurs="0" maxOccurs="unbounded"
/>
        </sequence>
    </complexType>
    <!-- ######################################### -->
    <!--  Definition of Place DS (7.6.2) (AMD/2)  -->
    <!-- ######################################### -->
    <!-- Definition of Place DS (AMD/2)  -->
    <complexType name="PlaceType">
        <complexContent>
            <extension base="mpeg7:DSType">
                <sequence>
                    <element name="Name" type="mpeg7:TextualType" minOccurs="0"
maxOccurs="unbounded" />
                    <element name="PlaceDescription" type="mpeg7:TextualType"
minOccurs="0" maxOccurs="unbounded" />
                    <element name="GeographicPosition" minOccurs="0">
                        <complexType>
                            <sequence>
                                <element name="Point"
type="mpeg7:GeographicPointType" />
                            </sequence>
                            <attribute name="datum" type="string" use="optional"
/>
                        </complexType>
                    </element>
                    <element name="PostalAddress" minOccurs="0">
                        <complexType>
                            <sequence>
                                <element name="AddressLine"
type="mpeg7:TextualType" maxOccurs="unbounded" />
                                <element name="PostingIdentifier"
type="mpeg7:TextualType" minOccurs="0" />
                            </sequence>
                            <attribute ref="xml:lang" use="optional" />
                        </complexType>
                    </element>
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of GeographicPoint datatype (7.6.3)  -->
    <!-- ################################################ -->
    <!-- Definition of GeographicPoint datatype -->
    <complexType name="GeographicPointType">
        <attribute name="longitude" use="required">
            <simpleType>
                <restriction base="double">
                    <minInclusive value="-180.0" />
                    <maxInclusive value="180.0" />
                </restriction>
            </simpleType>
        </attribute>
        <attribute name="latitude" use="required">
            <simpleType>
                <restriction base="double">
                    <minInclusive value="-90.0" />
                    <maxInclusive value="90.0" />
                </restriction>
            </simpleType>
```

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```
        </attribute>
        <attribute name="altitude" type="double" use="optional" />
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of CreationInformation DS (9.2.1)  -->
    <!-- ################################################ -->
    <!-- Definition of CreationInformation DS  -->
    <complexType name="CreationInformationType">
        <complexContent>
            <extension base="mpeg7:DSType">
                <sequence>
                    <element name="Creation" type="mpeg7:CreationType" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ################################### -->
    <!--  Definition of Creation DS (9.2.2)  -->
    <!-- ################################### -->
    <!-- Definition of Creation DS  -->
    <complexType name="CreationType">
        <complexContent>
            <extension base="mpeg7:DSType">
                <sequence>
                    <element name="Title" type="mpeg7:TitleType"
maxOccurs="unbounded" />
                    <element name="TitleMedia" type="mpeg7:TitleMediaType"
minOccurs="0" />
                    <element name="Creator" type="mpeg7:CreatorType"
minOccurs="0" maxOccurs="unbounded" />
                    <element name="CreationCoordinates" minOccurs="0"
maxOccurs="1">
                        <complexType>
                            <sequence>
                                <element name="Location" type="mpeg7:PlaceType"
minOccurs="0" />
                                <element name="Date" type="mpeg7:TimeType"
minOccurs="0" />
                            </sequence>
                        </complexType>
                    </element>
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- Definition of Title datatype  -->
    <complexType name="TitleType">
        <simpleContent>
            <extension base="mpeg7:TextualBaseType">
            </extension>
        </simpleContent>
    </complexType>
    <!-- Definition of TitleMedia datatype -->
    <complexType name="TitleMediaType">
        <sequence>
            <element name="TitleImage" type="mpeg7:ImageLocatorType"
minOccurs="0" />
        </sequence>
    </complexType>
    <!-- ################################### -->
    <!--  Definition of Collection DS (14.2.1)  -->
```

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```
    <!-- ##################################### -->
    <!-- Definition of Collection DS -->
    <complexType name="CollectionType" abstract="true">
        <complexContent>
            <extension base="mpeg7:DSType">
                <sequence>
                    <element name="CreationInformation"
type="mpeg7:CreationInformationType" minOccurs="0" />
                    <element name="TextAnnotation"
type="mpeg7:TextAnnotationType" minOccurs="0" maxOccurs="unbounded" />
                </sequence>
                <attribute name="name" type="string" use="optional" />
            </extension>
        </complexContent>
    </complexType>
    <!-- ##################################################### -->
    <!--  Definition of ContentCollection DS (14.2.2) (AMD/2)  -->
    <!-- ##################################################### -->
    <!-- Definition of ContentCollection DS (AMD/2)-->
    <complexType name="ContentCollectionType">
        <complexContent>
            <extension base="mpeg7:CollectionType">
                <sequence>
                    <element name="ContentRef" type="mpeg7:ReferenceType"
minOccurs="0" maxOccurs="unbounded" />
                    <element name="ContentCollection"
type="mpeg7:ContentCollectionType" minOccurs="0" maxOccurs="unbounded" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
</schema>
```

A.2 Item-level descriptive metadata

```
<schema targetNamespace="urn:mpeg:maf:schema:photoplayer:item:2006"
elementFormDefault="qualified" attributeFormDefault="unqualified"
xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:mpeg7="urn:mpeg:maf:schema:photoplayer:item:2006">
    <!-- ########################################################## -->
    <!--  import xml components                                     -->
    <!-- ########################################################## -->
    <import namespace="http://www.w3.org/XML/1998/namespace"
schemaLocation="xml.xsd" />

    <!-- ##################################### -->
    <!--  Definition of MPEG-7 Base types (4.2)  -->
    <!-- ##################################### -->
    <!-- Definition of MPEG-7 base type -->
    <complexType name="Mpeg7BaseType" abstract="true">
        <complexContent>
            <restriction base="anyType" />
        </complexContent>
    </complexType>
    <!-- Definition of generic D -->
    <complexType name="DType" abstract="true">
        <complexContent>
            <extension base="mpeg7:Mpeg7BaseType" />
```


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```
        </complexContent>
    </complexType>
    <!-- Definition of generic DS -->
    <complexType name="DSType" abstract="true">
        <complexContent>
            <extension base="mpeg7:Mpeg7BaseType">
                <attribute name="id" type="ID" use="optional" />
            </extension>
        </complexContent>
    </complexType>
    <!-- Definition of Visual DS -->
    <complexType name="VisualDSType" abstract="true">
        <complexContent>
            <extension base="mpeg7:DSType" />
        </complexContent>
    </complexType>
    <!-- Definition of Visual D -->
    <complexType name="VisualDType" abstract="true">
        <complexContent>
            <extension base="mpeg7:DType" />
        </complexContent>
    </complexType>
    <!-- Definition of Header datatype -->
    <complexType name="HeaderType" abstract="true">
        <complexContent>
            <extension base="mpeg7:Mpeg7BaseType">
                <attribute name="id" type="ID" use="optional" />
            </extension>
        </complexContent>
    </complexType>
    <!-- Definition of Creator datatype -->
    <complexType name="CreatorType">
        <complexContent>
            <extension base="mpeg7:MediaAgentType">
            </extension>
        </complexContent>
    </complexType>
    <!-- Definition of MediaAgent datatype  -->
    <complexType name="MediaAgentType">
        <sequence>
            <element name="Role" type="mpeg7:ControlledTermUseType" />
            <element name="Agent" type="mpeg7:AgentType" />
        </sequence>
    </complexType>

    <!-- ################################################ -->
    <!--  Definition of MPEG-7 root element (4.3) (COR/1) -->
    <!-- ################################################ -->
    <!-- Definition of Mpeg7 Type (COR/1)-->
    <complexType name="Mpeg7Type" abstract="true">
        <sequence>
            <element name="DescriptionProfile"
type="mpeg7:DescriptionProfileType" minOccurs="0" />
            <element name="DescriptionMetadata"
type="mpeg7:DescriptionMetadataType" minOccurs="1" />
        </sequence>
        <attribute ref="xml:lang" use="optional" />
    </complexType>
    <!-- Definition of DescriptionProfileType (COR/1) -->
    <complexType name="DescriptionProfileType">
        <attribute name="profileAndLevelIndication" use="required">
```

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```
            <simpleType>
                <list itemType="anyURI" />
            </simpleType>
        </attribute>
    </complexType>
    <!-- Definition of Mpeg7 Element (COR/1) -->
    <element name="Mpeg7">
        <complexType>
            <complexContent>
                <extension base="mpeg7:Mpeg7Type">
                    <sequence>
                        <element name="DescriptionUnit" type="mpeg7:ImageType" />
                        <!-- NB: for compatibility with MPEG-7 schema, xml
instance documents shall
                             explicitly declare the DescriptionUnit with
xsi:type="ImageType".
                             This is not necessary for validity against the
current schema but its omission
                             would prevent validation against MPEG-7 schema. -->
                    </sequence>
                </extension>
            </complexContent>
        </complexType>
    </element>
    <!-- ######################################################## -->
    <!--  Definition of Multimedia content entity tools (4.4.5)   -->
    <!-- ######################################################## -->
    <!-- Definition of MultimediaContent Content Entity -->
    <complexType name="MultimediaContentType" abstract="true">
        <complexContent>
            <extension base="mpeg7:DSType" />
        </complexContent>
    </complexType>
    <!-- Definition of Image Content Entity -->
    <complexType name="ImageType">
        <complexContent>
            <extension base="mpeg7:MultimediaContentType">
                <sequence>
                    <element name="Image" type="mpeg7:StillRegionType" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of DescriptionMetadata Header (4.5.3)  -->
    <!-- ################################################ -->
    <!-- Definition of DescriptionMetadata Header -->
    <complexType name="DescriptionMetadataType">
        <complexContent>
            <extension base="mpeg7:HeaderType">
                <sequence>
                    <element name="LastUpdate" type="mpeg7:timePointType"
minOccurs="1" />
                    <element name="Creator" type="mpeg7:CreatorType"
minOccurs="0" maxOccurs="unbounded" />
                    <element name="CreationTime" type="mpeg7:timePointType"
minOccurs="0" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
```


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```
    <!-- ######################################### -->
    <!--  Definition of UniqueID datatype (6.3.1)  -->
    <!-- ######################################### -->
    <!-- Definition of UniqueID datatype -->
    <complexType name="UniqueIDType">
        <simpleContent>
            <extension base="string">
                <attribute name="type" type="NMTOKEN" use="optional"
default="URI" />
                <attribute name="encoding" use="optional" default="text">
                    <simpleType>
                        <restriction base="string">
                            <enumeration value="text" />
                            <enumeration value="base16" />
                            <enumeration value="base64" />
                        </restriction>
                    </simpleType>
                </attribute>
            </extension>
        </simpleContent>
    </complexType>
    <!-- ##################################### -->
    <!--  Definition of Time datatype (6.4.2)  -->
    <!-- ##################################### -->
    <!-- Definition of Time datatype -->
    <complexType name="TimeType">
        <sequence>
            <element name="TimePoint" type="mpeg7:timePointType" />
        </sequence>
    </complexType>
    <!-- ######################################### -->
    <!--  Definition of timePoint datatype (6.4.3)  -->
    <!-- ######################################### -->
    <!-- Definition of timePoint datatype -->
    <simpleType name="timePointType">
        <restriction base="mpeg7:basicTimePointType">
            <pattern value="(\-?\d+(\-\d{2}(\-
\d{2})?)?)?(T\d{2}(:\d{2}(:\d{2}(:\d+)?)?)?)?(F\d+)?((\-|\+)\d{2}:\d{2})?" />
        </restriction>
    </simpleType>
    <!-- definition of basicTimePoint dataype -->
    <simpleType name="basicTimePointType">
        <restriction base="string">
            <pattern value="\-?(\d+(\-\d{2}(\-
\d{2})?)?)?(T\d{2}(:\d{2}(:\d{2}(:\d+(\.\d{2})?)?)?)?)?(F\d+)?((\-
|\+)\d{2}:\d{2})?" />
        </restriction>
    </simpleType>
    <!-- ############################################ -->
    <!--  Definition of MediaLocator datatype (6.5.2)  -->
    <!-- ############################################ -->
    <!-- Definition of MediaLocator datatype -->
    <complexType name="MediaLocatorType">
        <sequence>
                <element name="MediaUri" type="anyURI" minOccurs="1"/>
        </sequence>
    </complexType>
    <!-- ######################################### -->
    <!--  Definition of Textual datatypes (7.3.2)  -->
    <!-- ######################################### -->
    <!-- Definition of TextualBase datatype -->
```

--`,,```,,,,````-`-`,,`,,`,`,,`---

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```
    <complexType name="TextualBaseType" abstract="true">
        <simpleContent>
            <extension base="string">
                <attribute ref="xml:lang" use="optional" />
            </extension>
        </simpleContent>
    </complexType>
    <!-- Definition of Textual datatype -->
    <complexType name="TextualType">
        <simpleContent>
            <extension base="mpeg7:TextualBaseType" />
        </simpleContent>
    </complexType>
    <!-- ################################################  -->
    <!--  Definition of TextAnnotation datatype (7.3.3)   -->
    <!-- ################################################  -->
    <!-- Definition of TextAnnotation datatype -->
    <complexType name="TextAnnotationType">
        <choice maxOccurs="unbounded">
            <element name="FreeTextAnnotation" type="mpeg7:TextualType" />
            <element name="KeywordAnnotation" type="mpeg7:KeywordAnnotationType"
/>
        </choice>
        <attribute ref="xml:lang" />
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of KeywordAnnotation datatype (7.3.5)  -->
    <!-- ################################################ -->
    <!-- Definition of KeywordAnnotation datatype -->
    <complexType name="KeywordAnnotationType">
        <sequence>
            <element name="Keyword" maxOccurs="unbounded">
                <complexType>
                    <simpleContent>
                        <extension base="mpeg7:TextualType">
                            <attribute name="type" use="optional" default="main">
                                <simpleType>
                                    <restriction base="NMTOKEN">
                                        <enumeration value="main" />
                                        <enumeration value="secondary" />
                                        <enumeration value="other" />
                                    </restriction>
                                </simpleType>
                            </attribute>
                        </extension>
                    </simpleContent>
                </complexType>
            </element>
        </sequence>
        <attribute ref="xml:lang" use="optional" />
    </complexType>
    <!-- ######################################## -->
    <!--  Definition of TermUse datatype (7.4.4)  -->
    <!-- ######################################## -->
    <!-- Definition of InlineTermDefinition datatype  -->
    <complexType name="InlineTermDefinitionType" abstract="true">
        <sequence>
            <element name="Name" minOccurs="0">
                <complexType>
                    <simpleContent>
                        <extension base="mpeg7:TextualType"/>
```


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```
                    </simpleContent>
                </complexType>
            </element>
        </sequence>
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of ControlledTermUse datatype (7.4.5)  -->
    <!-- ################################################ -->
    <!-- Definition of ControlledTermUse datatype  -->
    <complexType name="ControlledTermUseType">
        <complexContent>
            <extension base="mpeg7:InlineTermDefinitionType">
                <attribute name="href" type="mpeg7:termReferenceType"
use="required" />
            </extension>
        </complexContent>
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of termReferenceType datatype (7.4.6)  -->
    <!-- ################################################ -->
    <!-- Definition of termReference datatype  -->
    <simpleType name="termReferenceType">
        <union memberTypes="mpeg7:termAliasReferenceType
mpeg7:termURIReferenceType" />
    </simpleType>
    <simpleType name="termAliasReferenceType">
        <restriction base="NMTOKEN">
            <whiteSpace value="collapse" />
            <pattern value=":[^:]+:[^:]+" />
        </restriction>
    </simpleType>
    <simpleType name="termURIReferenceType">
        <restriction base="anyURI" />
    </simpleType>
    <!-- ################################ -->
    <!--  Definition of Agent DS (7.5.2)  -->
    <!-- ################################ -->
    <!-- Definition of Agent DS  -->
    <complexType name="AgentType" abstract="true">
        <complexContent>
            <extension base="mpeg7:DSType">
            </extension>
        </complexContent>
    </complexType>
    <!-- ######################################### -->
    <!--  Definition of Person DS (7.5.3) (AMD/2)  -->
    <!-- ######################################### -->
    <!-- Definition of Person DS  (AMD/2) -->
    <complexType name="PersonType">
        <complexContent>
            <extension base="mpeg7:AgentType">
                <sequence>
                    <element name="Name" type="mpeg7:PersonNameType" />
                    <element name="Affiliation" minOccurs="0"
maxOccurs="unbounded">
                        <complexType>
                            <sequence>
                                <element name="Organization"
type="mpeg7:OrganizationType" />
                            </sequence>
                        </complexType>
```

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```
                    </element>
                    <element name="Address" type="mpeg7:PlaceType" minOccurs="0"
/>
                    <element name="ElectronicAddress"
type="mpeg7:ElectronicAddressType" minOccurs="0" maxOccurs="unbounded" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ######################################## -->
    <!--  Definition of Organization DS (7.5.5)  -->
    <!-- ######################################## -->
    <!-- Definition of Organization DS  -->
    <complexType name="OrganizationType">
        <complexContent>
            <extension base="mpeg7:AgentType">
                <sequence>
                    <element name="Name" minOccurs="0" maxOccurs="unbounded">
                        <complexType>
                            <simpleContent>
                                <extension base="mpeg7:TextualType">
                                </extension>
                            </simpleContent>
                        </complexType>
                    </element>
                    <element name="Address" type="mpeg7:PlaceType" minOccurs="0"
/>
                    <element name="ElectronicAddress"
type="mpeg7:ElectronicAddressType" minOccurs="0" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of PersonName datatype (7.5.6) (AMD/2)  -->
    <!-- ################################################ -->
    <!-- Definition of PersonName datatype (AMD/2)-->
    <complexType name="PersonNameType">
        <sequence>
            <choice maxOccurs="unbounded">
                <element name="GivenName" type="mpeg7:NameComponentType" />
                <element name="LinkingName" type="mpeg7:NameComponentType"
minOccurs="0" />
                <element name="FamilyName" type="mpeg7:NameComponentType"
minOccurs="0" />
                <element name="Title" type="mpeg7:NameComponentType"
minOccurs="0" />
                <element name="Salutation" type="mpeg7:NameComponentType"
minOccurs="0" />
                <element name="Numeration" type="string" minOccurs="0" />
            </choice>
        </sequence>
        <attribute ref="xml:lang" use="optional" />
    </complexType>
    <!-- Definition of NameComponent datatype -->
    <complexType name="NameComponentType">
        <simpleContent>
            <extension base="mpeg7:TextualBaseType">
            </extension>
        </simpleContent>
    </complexType>
```


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```
    <!-- ########################################################## -->
    <!--  Definition of ElectronicAddress datatype (7.5.7)(AMD/2)  -->
    <!-- ########################################################## -->
    <!-- Definition of ElectronicAddress datatype (AMD/2) -->
    <complexType name="ElectronicAddressType">
        <sequence>
            <element name="Telephone" minOccurs="0" maxOccurs="unbounded">
                <complexType>
                    <simpleContent>
                        <extension base="string">
                        </extension>
                    </simpleContent>
                </complexType>
            </element>
            <element name="Fax" type="string" minOccurs="0" maxOccurs="unbounded"
/>
            <element name="Email" type="string" minOccurs="0"
maxOccurs="unbounded" />
            <element name="Url" type="anyURI" minOccurs="0" maxOccurs="unbounded"
/>
        </sequence>
    </complexType>
    <!-- ######################################## -->
    <!--  Definition of Place DS (7.6.2) (AMD/2)  -->
    <!-- ######################################## -->
    <!-- Definition of Place DS (AMD/2)  -->
    <complexType name="PlaceType">
        <complexContent>
            <extension base="mpeg7:DSType">
                <sequence>
                    <element name="Name" type="mpeg7:TextualType" minOccurs="0"
maxOccurs="unbounded" />
                    <element name="PlaceDescription" type="mpeg7:TextualType"
minOccurs="0" maxOccurs="unbounded" />
                    <element name="GeographicPosition" minOccurs="0">
                        <complexType>
                            <sequence>
                                <element name="Point"
type="mpeg7:GeographicPointType" />
                            </sequence>
                            <attribute name="datum" type="string" use="optional"
/>
                        </complexType>
                    </element>
                    <element name="PostalAddress" minOccurs="0">
                        <complexType>
                            <sequence>
                                <element name="AddressLine"
type="mpeg7:TextualType" maxOccurs="unbounded" />
                                <element name="PostingIdentifier"
type="mpeg7:TextualType" minOccurs="0" />
                            </sequence>
                            <attribute ref="xml:lang" use="optional" />
                        </complexType>
                    </element>
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of GeographicPoint datatype (7.6.3)  -->
```

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```
    <!-- ################################################ -->
    <!-- Definition of GeographicPoint datatype -->
    <complexType name="GeographicPointType">
        <attribute name="longitude" use="required">
            <simpleType>
                <restriction base="double">
                    <minInclusive value="-180.0" />
                    <maxInclusive value="180.0" />
                </restriction>
            </simpleType>
        </attribute>
        <attribute name="latitude" use="required">
            <simpleType>
                <restriction base="double">
                    <minInclusive value="-90.0" />
                    <maxInclusive value="90.0" />
                </restriction>
            </simpleType>
        </attribute>
        <attribute name="altitude" type="double" use="optional" />
    </complexType>
    <!-- ########################################### -->
    <!--  Definition of MediaInformation DS (8.2.1)  -->
    <!-- ########################################### -->
    <!-- Definition of MediaInformation DS -->
    <complexType name="MediaInformationType">
        <complexContent>
            <extension base="mpeg7:DSType">
                <sequence>
                    <element name="MediaProfile" type="mpeg7:MediaProfileType"
maxOccurs="unbounded" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ###################################### -->
    <!--  Definition of MediaProfile DS (8.2.3)  -->
    <!-- ###################################### -->
    <!-- Definition of MediaProfile DS -->
    <complexType name="MediaProfileType">
        <complexContent>
            <extension base="mpeg7:DSType">
                <sequence>
                    <element name="MediaFormat" type="mpeg7:MediaFormatType"
minOccurs="0" />
                    <element name="MediaInstance" type="mpeg7:MediaInstanceType"
minOccurs="0" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ################################### -->
    <!--  Definition of MediaFormat D (8.2.4)  -->
    <!-- ################################### -->
    <!-- Definition of MediaFormat D -->
    <complexType name="MediaFormatType">
        <complexContent>
            <extension base="mpeg7:DType">
                <sequence>
                    <element name="Content" type="mpeg7:ControlledTermUseType" />
```


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```
                    <element name="FileFormat" type="mpeg7:ControlledTermUseType"
minOccurs="0" />
                    <element name="FileSize" type="nonNegativeInteger"
minOccurs="0" />
                    <element name="VisualCoding" minOccurs="0">
                        <complexType>
                            <sequence>
                                <element name="Frame" minOccurs="0">
                                    <complexType>
                                        <attribute name="height"
type="nonNegativeInteger" use="optional" />
                                        <attribute name="width"
type="nonNegativeInteger" use="optional" />
                                    </complexType>
                                </element>
                            </sequence>
                        </complexType>
                    </element>
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ######################################### -->
    <!--  Definition of MediaInstance DS (8.2.7)  -->
    <!-- ######################################### -->
    <!-- Definition of MediaInstance DS -->
    <complexType name="MediaInstanceType">
        <complexContent>
            <extension base="mpeg7:DSType">
                <sequence>
                    <element name="InstanceIdentifier" type="mpeg7:UniqueIDType"
/>
                    <choice>
                        <element name="MediaLocator"
type="mpeg7:MediaLocatorType" />
                        <element name="LocationDescription"
type="mpeg7:TextualType" />
                    </choice>
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ############################################### -->
    <!--  Definition of CreationInformation DS (9.2.1)  -->
    <!-- ############################################### -->
    <!-- Definition of CreationInformation DS  -->
    <complexType name="CreationInformationType">
        <complexContent>
            <extension base="mpeg7:DSType">
                <sequence>
                    <element name="Creation" type="mpeg7:CreationType" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- ################################### -->
    <!--  Definition of Creation DS (9.2.2)  -->
    <!-- ################################### -->
    <!-- Definition of Creation DS  -->
    <complexType name="CreationType">
        <complexContent>
```

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```
            <extension base="mpeg7:DSType">
                <sequence>
                    <element name="Title" type="mpeg7:TitleType" maxOccurs="1" />
                    <element name="Creator" type="mpeg7:CreatorType"
minOccurs="0" maxOccurs="unbounded" />
                    <element name="CreationCoordinates" minOccurs="0"
maxOccurs="1">
                        <complexType>
                            <sequence>
                                <element name="Location" type="mpeg7:PlaceType"
minOccurs="0" />
                                <element name="Date" type="mpeg7:TimeType"
minOccurs="0" />
                            </sequence>
                        </complexType>
                    </element>
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- Definition of Title datatype  -->
    <complexType name="TitleType">
        <simpleContent>
            <extension base="mpeg7:TextualBaseType">
            </extension>
        </simpleContent>
    </complexType>
    <!-- ################################################ -->
    <!--  Definition of StillRegion DS (11.4.2)(AMD/2)  -->
    <!-- ################################################ -->
    <!-- Definition of StillRegion DS (AMD/2) -->
    <complexType name="StillRegionType">
        <complexContent>
            <extension base="mpeg7:SegmentType">
                <sequence>
                    <element name="VisualDescriptionScheme"
type="mpeg7:StillRegionFeatureType" minOccurs="0" maxOccurs="1" />
                    <!-- NB: for compatibility with MPEG-7 schema, xml instance
documents shall
                        explicitly declare the VisualDescriptionScheme with
xsi:type="StillRegionFeatureType".
                        This is not necessary for validity against the current
schema but its omission
                        would prevent validation against MPEG-7 schema. -->
                  <!--  <element name="VisualDescriptionScheme"
type="mpeg7:VisualDSType" minOccurs="0" maxOccurs="1" />-->
                </sequence>
            </extension>
        </complexContent>
    </complexType>

    <!-- ################################### -->
    <!--  Definition of Segment DS (11.2.2)  -->
    <!-- ################################### -->
    <!-- Definition of Segment DS -->
    <complexType name="SegmentType" abstract="true">
        <complexContent>
            <extension base="mpeg7:DSType">
                <sequence>
                    <element name="MediaInformation"
type="mpeg7:MediaInformationType" minOccurs="0" />
```


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```
                    <element name="CreationInformation"
type="mpeg7:CreationInformationType" minOccurs="0" />
                    <element name="TextAnnotation" minOccurs="0"
maxOccurs="unbounded">
                        <complexType>
                            <complexContent>
                                <extension base="mpeg7:TextAnnotationType">
                                </extension>
                            </complexContent>
                        </complexType>
                    </element>
                </sequence>
            </extension>
        </complexContent>
    </complexType>

    <!-- ################################################## -->
    <!--  Definition of MPEG-7 Still Region Feature Type   -->
    <!-- ################################################## -->
    <complexType name="StillRegionFeatureType">
        <complexContent>
            <extension base="mpeg7:VisualDSType">
                <sequence>
                    <element name="DominantColor" type="mpeg7:DominantColorType"
minOccurs="0" />
                    <element name="ScalableColor" type="mpeg7:ScalableColorType"
minOccurs="0" />
                    <element name="ColorStructure"
type="mpeg7:ColorStructureType" minOccurs="0" />
                    <element name="ColorLayout" type="mpeg7:ColorLayoutType"
minOccurs="0" />
                    <element name="Edge" type="mpeg7:EdgeHistogramType"
minOccurs="0" />
                    <element name="HomogeneousPattern"
type="mpeg7:HomogeneousTextureType" minOccurs="0" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>

      <!-- ########################################################## -->
  <!-- Definition of DominantColor D -->
  <!-- ########################################################## -->
  <complexType name="DominantColorType" final="#all">
    <complexContent>
      <extension base="mpeg7:VisualDType">
        <sequence>
          <element name="SpatialCoherency" type="mpeg7:unsigned5" />
          <element name="Value" maxOccurs="8">
            <complexType>
              <sequence>
                <element name="Percentage" type="mpeg7:unsigned5" />
                <element name="Index">
                  <simpleType>
                    <restriction>
                      <simpleType>
                        <list itemType="mpeg7:unsigned12" />
                      </simpleType>
                      <length value="3" />
                    </restriction>
                  </simpleType>
```

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```
              </element>
              <element name="ColorVariance" minOccurs="0">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned1" />
                    </simpleType>
                    <length value="3" />
                  </restriction>
                </simpleType>
              </element>
            </sequence>
          </complexType>
        </element>
      </sequence>
    </extension>
  </complexContent>
</complexType>
<!-- ########################################################## -->
<!-- Definition of ScalableColor D                              -->
<!-- ########################################################## -->
<complexType name="ScalableColorType" final="#all">
  <complexContent>
    <extension base="mpeg7:VisualDType">
      <sequence>
        <element name="Coeff" type="mpeg7:integerVector" />
      </sequence>
      <attribute name="numOfCoeff" use="required">
        <simpleType>
          <restriction base="integer">
            <enumeration value="16" />
            <enumeration value="32" />
            <enumeration value="64" />
            <enumeration value="128" />
            <enumeration value="256" />
          </restriction>
        </simpleType>
      </attribute>
      <attribute name="numOfBitplanesDiscarded" use="required">
        <simpleType>
          <restriction base="integer">
            <enumeration value="0" />
            <enumeration value="1" />
            <enumeration value="2" />
            <enumeration value="3" />
            <enumeration value="4" />
            <enumeration value="6" />
            <enumeration value="8" />
          </restriction>
        </simpleType>
      </attribute>
    </extension>
  </complexContent>
</complexType>
<!-- ########################################################## -->
<!-- Definition of ColorLayout D                                -->
<!-- ########################################################## -->
<complexType name="ColorLayoutType" final="#all">
  <complexContent>
    <extension base="mpeg7:VisualDType">
      <sequence>
```


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```
            <element name="YDCCoeff" type="mpeg7:unsigned6" />
            <element name="CbDCCoeff" type="mpeg7:unsigned6" />
            <element name="CrDCCoeff" type="mpeg7:unsigned6" />
            <choice>
              <element name="YACCoeff5">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
                    <length value="5" />
                  </restriction>
                </simpleType>
              </element>
              <element name="YACCoeff9">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
                    <length value="9" />
                  </restriction>
                </simpleType>
              </element>
              <element name="YACCoeff14">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
                    <length value="14" />
                  </restriction>
                </simpleType>
              </element>
              <element name="YACCoeff20">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
                    <length value="20" />
                  </restriction>
                </simpleType>
              </element>
              <element name="YACCoeff27">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
                    <length value="27" />
                  </restriction>
                </simpleType>
              </element>
              <element name="YACCoeff63">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
                    <length value="63" />
```

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```
            </restriction>
          </simpleType>
        </element>
      </choice>
      <choice>
        <sequence>
          <element name="CbACCoeff5">
            <simpleType>
              <restriction>
                <simpleType>
                  <list itemType="mpeg7:unsigned5" />
                </simpleType>
                <length value="5" />
              </restriction>
            </simpleType>
          </element>
          <element name="CrACCoeff5">
            <simpleType>
              <restriction>
                <simpleType>
                  <list itemType="mpeg7:unsigned5" />
                </simpleType>
                <length value="5" />
              </restriction>
            </simpleType>
          </element>
        </sequence>
        <sequence>
          <element name="CbACCoeff9">
            <simpleType>
              <restriction>
                <simpleType>
                  <list itemType="mpeg7:unsigned5" />
                </simpleType>
                <length value="9" />
              </restriction>
            </simpleType>
          </element>
          <element name="CrACCoeff9">
            <simpleType>
              <restriction>
                <simpleType>
                  <list itemType="mpeg7:unsigned5" />
                </simpleType>
                <length value="9" />
              </restriction>
            </simpleType>
          </element>
        </sequence>
        <sequence>
          <element name="CbACCoeff14">
            <simpleType>
              <restriction>
                <simpleType>
                  <list itemType="mpeg7:unsigned5" />
                </simpleType>
                <length value="14" />
              </restriction>
            </simpleType>
          </element>
          <element name="CrACCoeff14">
```


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```
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
                    <length value="14" />
                  </restriction>
                </simpleType>
              </element>
            </sequence>
            <sequence>
              <element name="CbACCoeff20">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
                    <length value="20" />
                  </restriction>
                </simpleType>
              </element>
              <element name="CrACCoeff20">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
                    <length value="20" />
                  </restriction>
                </simpleType>
              </element>
            </sequence>
            <sequence>
              <element name="CbACCoeff27">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
                    <length value="27" />
                  </restriction>
                </simpleType>
              </element>
              <element name="CrACCoeff27">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
                    <length value="27" />
                  </restriction>
                </simpleType>
              </element>
            </sequence>
            <sequence>
              <element name="CbACCoeff63">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
```

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```
                    <length value="63" />
                  </restriction>
                </simpleType>
              </element>
              <element name="CrACCoeff63">
                <simpleType>
                  <restriction>
                    <simpleType>
                      <list itemType="mpeg7:unsigned5" />
                    </simpleType>
                    <length value="63" />
                  </restriction>
                </simpleType>
              </element>
            </sequence>
          </choice>
        </sequence>
      </extension>
    </complexContent>
  </complexType>
  <!-- ########################################################## -->
  <!-- Definition of ColorStructure D                             -->
  <!-- ########################################################## -->
  <complexType name="ColorStructureType" final="#all">
    <complexContent>
      <extension base="mpeg7:VisualDType">
        <sequence>
          <element name="Values">
            <simpleType>
              <restriction>
                <simpleType>
                  <list itemType="mpeg7:unsigned8" />
                </simpleType>
                <minLength value="1" />
                <maxLength value="256" />
              </restriction>
            </simpleType>
          </element>
        </sequence>
        <attribute name="colorQuant" type="mpeg7:unsigned3" use="required" />
      </extension>
    </complexContent>
  </complexType>
    <!-- ########################################################## -->
    <!-- Definition of HomogeneousTexture D                         -->
    <!-- ########################################################## -->
    <!-- Definition of HomogeneousTexture D -->
    <complexType name="HomogeneousTextureType" final="#all">
        <complexContent>
            <extension base="mpeg7:VisualDType">
                <sequence>
                    <element name="Average" type="mpeg7:unsigned8" />
                    <element name="StandardDeviation" type="mpeg7:unsigned8" />
                    <element name="Energy" type="mpeg7:textureListType" />
                    <element name="EnergyDeviation" type="mpeg7:textureListType"
minOccurs="0" />
                </sequence>
            </extension>
        </complexContent>
    </complexType>
    <!-- Definition of textureList datatype -->
```


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```
    <simpleType name="textureListType">
        <restriction>
            <simpleType>
                <list itemType="mpeg7:unsigned8" />
            </simpleType>
            <length value="30" />
        </restriction>
    </simpleType>
    <!-- ########################################################## -->
    <!-- Definition of EdgeHistogram D                              -->
    <!-- ########################################################## -->
    <complexType name="EdgeHistogramType" final="#all">
        <complexContent>
            <extension base="mpeg7:VisualDType">
                <sequence>
                    <element name="BinCounts">
                        <simpleType>
                            <restriction>
                                <simpleType>
                                    <list itemType="mpeg7:unsigned3" />
                                </simpleType>
                                <length value="80" />
                            </restriction>
                        </simpleType>
                    </element>
                </sequence>
            </extension>
        </complexContent>
    </complexType>

    <!-- ########################################### -->
    <!--  Definition of Unsigned datatypes (5.2.2)  -->
    <!-- ########################################### -->
    <!-- Definition of unsigned1 datatype -->
    <simpleType name="unsigned1">
        <restriction base="nonNegativeInteger">
            <minInclusive value="0" />
            <maxInclusive value="1" />
        </restriction>
    </simpleType>
    <!-- Definition of unsigned3 datatype -->
    <simpleType name="unsigned3">
        <restriction base="nonNegativeInteger">
            <minInclusive value="0" />
            <maxInclusive value="7" />
        </restriction>
    </simpleType>
    <!-- Definition of unsigned5 datatype -->
    <simpleType name="unsigned5">
        <restriction base="nonNegativeInteger">
            <minInclusive value="0" />
            <maxInclusive value="31" />
        </restriction>
    </simpleType>
    <!-- Definition of unsigned6 datatype -->
    <simpleType name="unsigned6">
        <restriction base="nonNegativeInteger">
            <minInclusive value="0" />
            <maxInclusive value="63" />
        </restriction>
    </simpleType>
```

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```
    <!-- Definition of unsigned8 datatype -->
    <simpleType name="unsigned8">
        <restriction base="nonNegativeInteger">
            <minInclusive value="0" />
            <maxInclusive value="255" />
        </restriction>
    </simpleType>
    <!-- Definition of unsigned12 datatype -->
    <simpleType name="unsigned12">
        <restriction base="nonNegativeInteger">
            <minInclusive value="0" />
            <maxInclusive value="4095" />
        </restriction>
    </simpleType>
    <!-- ######################################## -->
    <!--  Definition of vector datatypes  (5.4.2)  -->
    <!-- ######################################## -->
    <!-- Definition of integerVector datatype -->
    <simpleType name="integerVector">
        <list itemType="integer" />
    </simpleType>
</schema>
```


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Annex B
(informative)

Relevant technologies to create photo-player metadata

B.1 General

ISO/IEC TR 15938-8 (an informative part of the MPEG-7 standard) provides guidelines and examples of the extraction and use of MPEG-7 descriptions. It includes examples of algorithms which can automatically generate useful groupings (that is, collections) of images, using MPEG-7 metadata. These may be a useful resource for implementing functions like those described in this Annex.

B.2 Technologies to create collections

B.2.1 Situation-based clustering

The idea behind situation-based photo clustering is to use MPEG-7 visual image features to automatically group “similar” pictures. A simple but very efficient collection structure is introduced by grouping images by the occasion or situation in which they were taken. Examples of situations include family dinner, a trip to a beach, etc. Such a structure is very natural for the users since they will often remember the circumstances much better than the event date or filename(s). This provides the user with a simple, intuitive and effective means to browse through their collection, and moreover it is all done automatically based on the visual descriptors and the time information. Figure B.1 shows an example of the situation-based photo clustering applied to a small collection of 15 photographs. Six situations were detected by the grouping algorithm and the user can now assign appropriate labels to the groups, e.g. Situation 1 = school trip, Situation 2 = walk in the park, etc.

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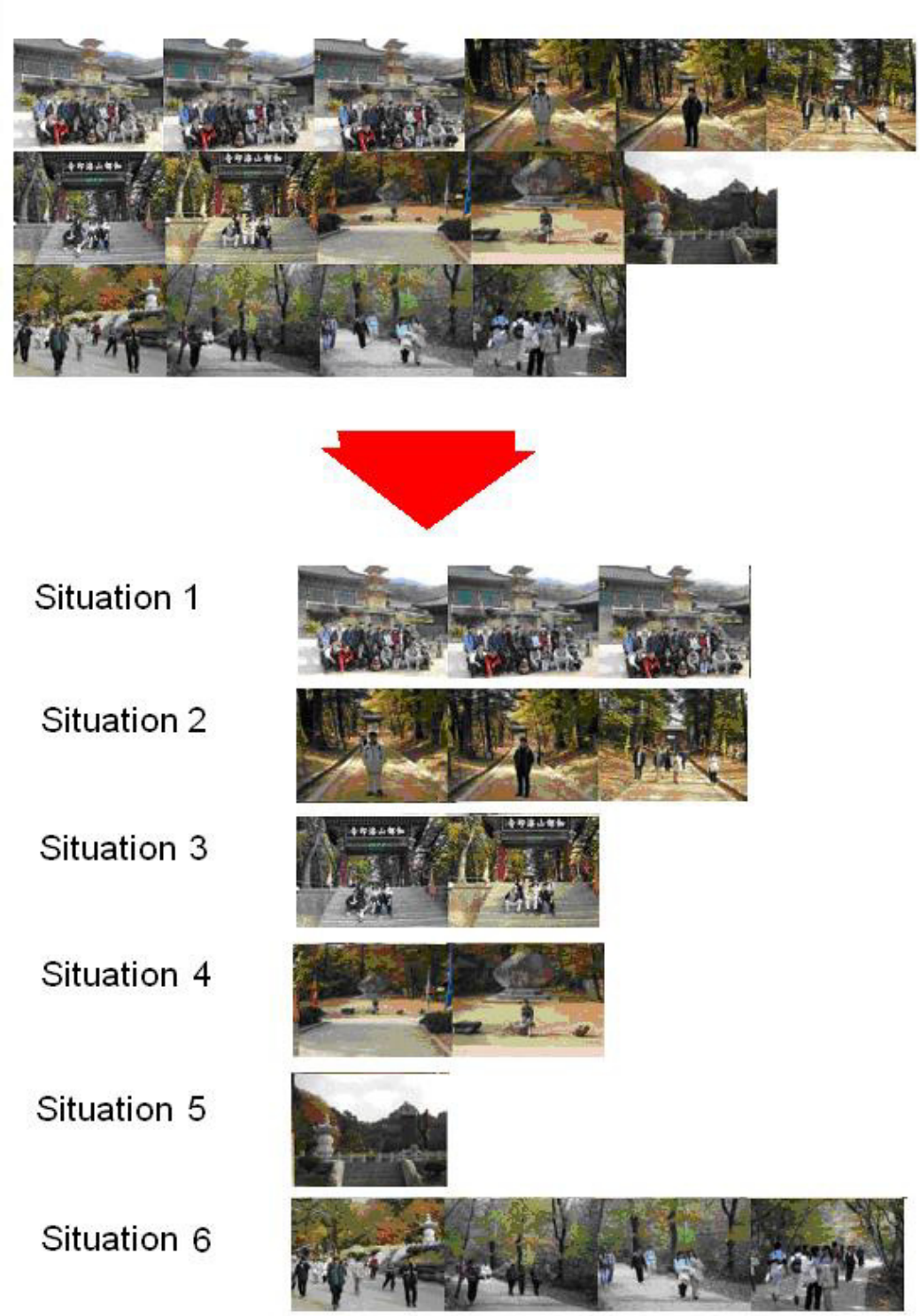

Figure B.1 — Situation-based photo clustering

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B.2.2 Content-based categorization

Manually labeling a large collection is a very tedious task and is seldom performed by the users. However, even quite generic and simple labels often prove very helpful when searching or browsing through large image collections. Simple labels such as indoors/outdoors, landscape, architecture, waterfront, sunset, etc, can be automatically assigned to images based on MPEG-7 Visual descriptors with good accuracy. Figure B.2 — Automatic assignment of simple category labels to Image Collections shows example image categories and corresponding photos.

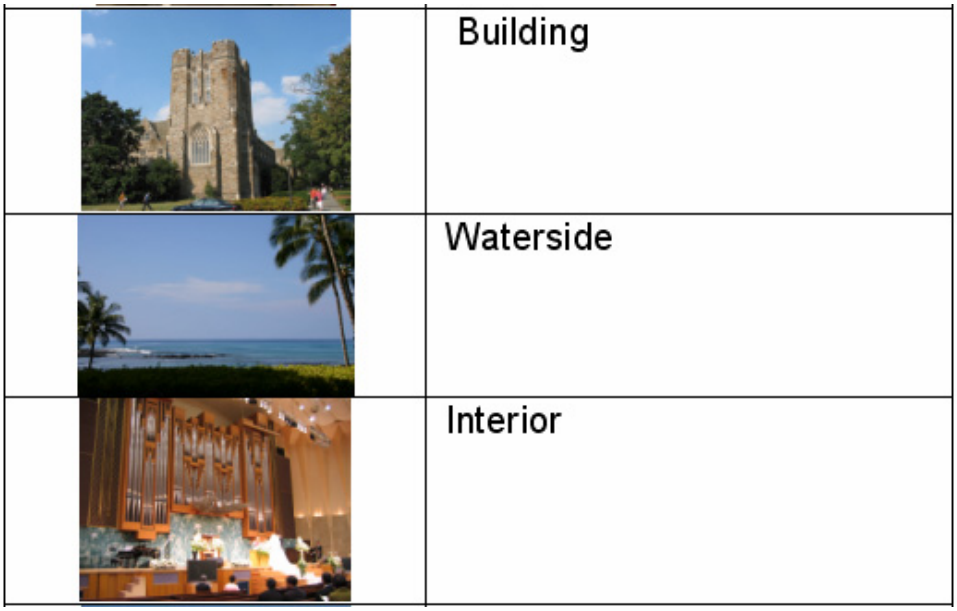

Figure B.2 — Automatic assignment of simple category labels to Image Collections

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Annex C
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Examples of collection structure

C.1 Situation-based collections

```
<Mpeg7>
      <DescriptionMetadata>
         <LastUpdate>2006-07-21T09:20:25+09:00</LastUpdate>
         <Creator>
            <Role href="urn:mpeg:mpeg7:cs:RoleCS:2001:AUTHOR">
               <Name>Author</Name>
            </Role>
            <Agent xsi:type="PersonType">
               <Name>
                  <GivenName>Sang-Kyun</GivenName>
                  <FamilyName>Kim</FamilyName>
               </Name>
            </Agent>
         </Creator>
      </DescriptionMetadata>
      <DescriptionUnit xsi:type="ContentCollectionType" name="Klagenfurt MPEG
Meeting">
         <CreationInformation>
            <Creation>
               <Title></Title>
               <TitleMedia>
                  <TitleImage> <!-- Thumbnail image (InlineMedia) -->
</TitleImage>
               </TitleMedia>
               <CreationCoordinates>
                  <Date>
                     <TimePoint>2006-07-16T14:13+09:00</TimePoint>
                     <Duration>P5D</Duration>
                  </Date>
               </CreationCoordinates>
            </Creation>
         </CreationInformation>
         <TextAnnotation>
            <KeywordAnnotation>
               <Keyword>EventCollection/</Keyword>
            </KeywordAnnotation>
         </TextAnnotation>
         <ContentRef href="#ffp(track_ID=1)"/>
         <ContentRef href="#ffp(track_ID=2)"/>
         <!-- ........ -->
         <ContentRef href="#ffp(track_ID=20)"/>
         <ContentRef href="#ffp(track_ID=21)"/>
         <ContentRef href="#ffp(track_ID=22)"/>
         <!-- ........ -->
         <ContentRef href="#ffp(track_ID=41)"/>
         <ContentRef href="#ffp(track_ID=42)"/>
         <ContentRef href="#ffp(track_ID=43)"/>
         <!-- ........ -->
```


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```
         <ContentRef href="#ffp(track_ID=60)"/>
         <ContentCollection name="Situation1">
            <!-- ########## EVENT COLLECTION 1 ########## !-->
            <CreationInformation>
               <Creation>
                  <Title></Title>
                  <TitleMedia>
                     <TitleImage> <!-- Thumbnail image (InlineMedia) -->
</TitleImage>
                  </TitleMedia>
                  <CreationCoordinates>
                     <Date>
                        <TimePoint>2006-07-16T14:13+09:00</TimePoint>
                        <Duration>P1D</Duration>
                     </Date>
                  </CreationCoordinates>
               </Creation>
            </CreationInformation>
            <TextAnnotation>
               <FreeTextAnnotation>
                  Adhoc group meeting
               </FreeTextAnnotation>
               <KeywordAnnotation>
                  <Keyword>EventCollection/</Keyword>
               </KeywordAnnotation>
            </TextAnnotation>
            <ContentRef href="#ffp(track_ID=1)"/>
            <ContentRef href="#ffp(track_ID=2)"/>
            <!-- ........ -->
            <ContentRef href="#ffp(track_ID=20)"/>
         </ContentCollection>
         <ContentCollection name="Situation 2">
            <!-- ########## EVENT COLLECTION 2 ########## !-->
            <CreationInformation>
               <Creation>
                  <Title></Title>
                  <TitleMedia>
                     <TitleImage> <!-- Thumbnail image (InlineMedia) -->
</TitleImage>
                  </TitleMedia>
                  <CreationCoordinates>
                     <Date>
                        <TimePoint>2006-07-19T18:15+10:00</TimePoint>
                        <Duration>P1D</Duration>
                     </Date>
                  </CreationCoordinates>
               </Creation>
            </CreationInformation>
            <TextAnnotation>
               <FreeTextAnnotation>
                  Pictures from social event
               </FreeTextAnnotation>
               <KeywordAnnotation>
                  <Keyword>EventCollection/</Keyword>
               </KeywordAnnotation>
            </TextAnnotation>
            <ContentRef href="#ffp(track_ID=21)"/>
            <ContentRef href="#ffp(track_ID=22)"/>
            <!-- ........ -->
            <ContentRef href="#ffp(track_ID=41)"/>
         </ContentCollection>
```

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```
         <ContentCollection name="Situation 3">
            <!-- ########## EVENT COLLECTION 3 ########## !-->
            <CreationInformation>
               <Creation>
                  <Title></Title>
                  <CreationCoordinates>
                     <Date>
                        <TimePoint>2006-07-20T14:15+20:00</TimePoint>
                        <Duration>P1D</Duration>
                     </Date>
                  </CreationCoordinates>
               </Creation>
            </CreationInformation>
            <TextAnnotation>
               <FreeTextAnnotation>
                  Lake scenes of Klagenfurt
               </FreeTextAnnotation>
               <KeywordAnnotation>
                  <Keyword>EventCollection/</Keyword>
               </KeywordAnnotation>
            </TextAnnotation>
            <ContentRef href="#ffp(track_ID=42)"/>
            <ContentRef href="#ffp(track_ID=43)"/>
            <!-- ........ -->
            <ContentRef href="#ffp(track_ID=60)"/>
         </ContentCollection>
      </DescriptionUnit>
</Mpeg7>
```

C.2 Categorization-based collections

```
<Mpeg7>
      <DescriptionMetadata>
         <LastUpdate>2005-09-03T09:20:25+09:00</LastUpdate>
         <Creator>
            <Role href="urn:mpeg:mpeg7:cs:RoleCS:2001:AUTHOR">
               <Name>Author</Name>
            </Role>
            <Agent xsi:type="PersonType">
               <Name>
                  <GivenName>Sang-Kyun</GivenName>
                  <FamilyName>Kim</FamilyName>
               </Name>
            </Agent>
         </Creator>
      </DescriptionMetadata>
      <DescriptionUnit xsi:type="ContentCollectionType" name="Trip to Saipan">
         <CreationInformation>
            <Creation>
               <Title></Title>
            </Creation>
         </CreationInformation>
         <ContentRef href="#ffp(track_ID=1)"/>
         <ContentRef href="#ffp(track_ID=2)"/>
         <!-- ........ -->
         <ContentRef href="#ffp(track_ID=20)"/>
         <ContentRef href="#ffp(track_ID=21)"/>
         <ContentRef href="#ffp(track_ID=22)"/>
         <!-- ........ -->
         <ContentRef href="#ffp(track_ID=41)"/>
```


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```
         <ContentRef href="#ffp(track_ID=42)"/>
         <ContentRef href="#ffp(track_ID=43)"/>
         <!-- ........ -->
         <ContentRef href="#ffp(track_ID=60)"/>
         <ContentCollection>
            <!-- ########## CATEGORY COLLECTION 1 ########## !-->
            <CreationInformation>
               <Creation>
                  <Title></Title>
                  <TitleMedia>
                     <TitleImage> <!-- Thumbnail image (InlineMedia) -->
</TitleImage>
                  </TitleMedia>
               </Creation>
            </CreationInformation>
            <TextAnnotation>
               <FreeTextAnnotation>Architecture</FreeTextAnnotation>
               <KeywordAnnotation>
                  <Keyword>CategoryCollection</Keyword>
               </KeywordAnnotation>
            </TextAnnotation>
            <ContentRef href="#ffp(track_ID=1)"/>
            <ContentRef href="#ffp(track_ID=2)"/>
            <!-- ........ -->
            <ContentRef href="#ffp(track_ID=20)"/>
         </ContentCollection>
         <ContentCollection>
            <!-- ########## CATEGORY COLLECTION 2 ########## !-->
            <CreationInformation>
               <Creation>
                  <Title></Title>
                  <TitleMedia>
                     <TitleImage> <!-- Thumbnail image (InlineMedia) -->
</TitleImage>
                  </TitleMedia>
               </Creation>
            </CreationInformation>
            <TextAnnotation>
               <FreeTextAnnotation>Waterside</FreeTextAnnotation>
               <KeywordAnnotation>
                  <Keyword>CategoryCollection</Keyword>
               </KeywordAnnotation>
            </TextAnnotation>
            <ContentRef href="#ffp(track_ID=21)"/>
            <ContentRef href="#ffp(track_ID=22)"/>
            <!-- ........ -->
            <ContentRef href="#ffp(track_ID=41)"/>
         </ContentCollection>
         <ContentCollection>
            <!-- ########## CATEGORY COLLECTION 3 ########## !-->
            <CreationInformation>
               <Creation>
                  <Title></Title>
                  <TitleMedia>
                     <TitleImage> <!-- Thumbnail image (InlineMedia) -->
</TitleImage>
                  </TitleMedia>
               </Creation>
            </CreationInformation>
            <TextAnnotation>
               <FreeTextAnnotation>Terrain</FreeTextAnnotation>
```

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```
               <KeywordAnnotation>
                  <Keyword>CategoryCollection</Keyword>
               </KeywordAnnotation>
            </TextAnnotation>
            <ContentRef href="#ffp(track_ID=42)"/>
            <ContentRef href="#ffp(track_ID=43)"/>
            <!-- ........ -->
            <ContentRef href="#ffp(track_ID=60)"/>
         </ContentCollection>
      </DescriptionUnit>
</Mpeg7>
```

C.3 Person-Identity-based collections

```
<Mpeg7>
      <DescriptionMetadata>
         <LastUpdate>2005-09-03T09:20:25+09:00</LastUpdate>
         <Creator>
            <Role href="urn:mpeg:mpeg7:cs:RoleCS:2001:AUTHOR">
               <Name>Author</Name>
            </Role>
            <Agent xsi:type="PersonType">
               <Name>
                  <GivenName>Sang-Kyun</GivenName>
                  <FamilyName>Kim</FamilyName>
               </Name>
            </Agent>
         </Creator>
      </DescriptionMetadata>
      <DescriptionUnit xsi:type="ContentCollectionType" name="Trip to Hawaii">
         <CreationInformation>
            <Creation>
               <Title></Title>
               <TitleMedia>
                  <TitleImage> <!-- Thumbnail image (InlineMedia) -->
</TitleImage>
               </TitleMedia>
            </Creation>
         </CreationInformation>
         <ContentRef href="#ffp(track_ID=1)"/>
         <ContentRef href="#ffp(track_ID=2)"/>
         <ContentRef href="#ffp(track_ID=3)"/>
         <ContentRef href="#ffp(track_ID=4)"/>
         <ContentRef href="#ffp(track_ID=5)"/>
         <!-- ........ -->
         <ContentRef href="#ffp(track_ID=32)"/>
         <!-- ........ -->
         <ContentRef href="#ffp(track_ID=50)"/>
         <ContentCollection>
            <!-- ########## PERSON COLLECTION 1 ########## !-->
            <CreationInformation>
               <Creation>
                  <Title></Title>
                  <TitleMedia>
                     <TitleImage> <!-- Thumbnail image (InlineMedia) -->
</TitleImage>
                  </TitleMedia>
                  <Creator>
                     <Role href="urn:mpeg:mpeg7:cs:RoleCS:2001:ACTOR">
                        <Name>Actor</Name>
```

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```
                    </Role>
                    <Agent xsi:type="PersonType">
                       <Name>
                          <GivenName>Misun</GivenName>
                          <FamilyName>Oh</FamilyName>
                       </Name>
                    </Agent>
                 </Creator>
              </Creation>
           </CreationInformation>
           <TextAnnotation>
              <FreeTextAnnotation>Hawaii Photos taking
Misun</FreeTextAnnotation>
              <KeywordAnnotation>
                 <Keyword>PersonCollection</Keyword>
              </KeywordAnnotation>
           </TextAnnotation>
           <ContentRef href="#ffp(track_ID=1)"/>
           <ContentRef href="#ffp(track_ID=4)"/>
           <!-- ........ -->
           <ContentRef href="#ffp(track_ID=32)"/>
        </ContentCollection>
        <ContentCollection>
           <!-- ########## PERSON COLLECTION 2 ########## !-->
           <CreationInformation>
              <Creation>
                 <Title></Title>
                 <TitleMedia>
                    <TitleImage> <!-- Thumbnail image (InlineMedia) -->
</TitleImage>
                 </TitleMedia>
                 <Creator>
                    <Role href="urn:mpeg:mpeg7:cs:RoleCS:2001:ACTOR">
                       <Name>Actor</Name>
                    </Role>
                    <Agent xsi:type="PersonType">
                       <Name>
                          <GivenName>Sang-Kyun</GivenName>
                          <FamilyName>Kim</FamilyName>
                       </Name>
                    </Agent>
                 </Creator>
              </Creation>
           </CreationInformation>
           <TextAnnotation>
              <FreeTextAnnotation>Hawaii Photos taking Sang</FreeTextAnnotation>
              <KeywordAnnotation>
                 <Keyword>PersonCollection</Keyword>
              </KeywordAnnotation>
           </TextAnnotation>
           <ContentRef href="#ffp(track_ID=2)"/>
           <ContentRef href="#ffp(track_ID=5)"/>
           <!-- ........ -->
           <ContentRef href="#ffp(track_ID=32)"/>
           <ContentRef href="#ffp(track_ID=50)"/>
        </ContentCollection>
     </DescriptionUnit>
</Mpeg7>
```

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Annex D
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Classification schemes

D.1 CollectionTypeCS

```
<ClassificationScheme uri="urn:mpeg:maf:cs:photoplayer:CollectionTypeCS:2006">
    <Term termID="EVENT">
        <Name xml:lang="en">EventCollection</Name>
            <Definition xml:lang="en">collections aggregating the contents which
are created in certain time-slot</Definition>
    </Term>
    <Term termID="CATEGORY">
        <Name xml:lang="en">CategoryCollection</Name>
        <Definition xml:lang="en">collections aggregating the contents which
belong to the same broad category, such as XXXXXXXXXXXX</Definition>
    </Term>
    <Term termID="PERSON">
        <Name xml:lang="en">PersonCollection</Name>
        <Definition xml:lang="en">collections aggregating the contents where the
same person appear</Definition>
    </Term>
</ClassificationScheme>
```

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Annex E
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Binary syntax

E.1 Specification of binary syntax

This Annex uses Syntactic Description Language (SDL) to describe the binary syntax for metadata storage in the photo-player format. SDL is defined in ISO/IEC 14496-1. The syntax in each case (*i.e.*, for collection- and item-level) is identical to that produced if a BiM encoder uses the schemas given in Annex A to encode the metadata.

E.2 Binary syntax for collection-level metadata

```
class Mpeg7 {
	bit(1) has_lang;
	if(has_lang) {
		string lang;
	}
	Mpeg7Type_content child0;
	ContentCollectionType DescriptionUnit;
}
class Mpeg7Type_content {
	bit(1) opt_group;
	if(opt_group) {
		DescriptionProfileType DescriptionProfile;
	}
	DescriptionMetadataType DescriptionMetadata;
}
class DescriptionProfileType {
	profileAndLevelIndication profileAndLevelIndication;
}
class profileAndLevelIndication {
	vluimsbf5 max;
	for (int t=0;t<max;t++) {
		anyURI item[[t]];
	}
}
class anyURI {
	string value3;
}
class DescriptionMetadataType {
	bit(1) has_id;
	if(has_id) {
		string id;
	}
	timePointType LastUpdate;
	bit(1) opt_group;
	if(opt_group) {
		vluimsbf5 occ10;
		for(int t=0;t<occ10;t++) {
			CreatorType Creator[[t]];
		}
```

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```
    }
    bit(1) opt_group;
    if(opt_group) {
        timePointType CreationTime;
    }
}
class timePointType {
    string value3;
}
class CreatorType {
    MediaAgentType_content child0;
}
class MediaAgentType_content {
    ControlledTermUseType Role;
    AgentType_typecast Agent;
}
class ControlledTermUseType {
    termReferenceType href;
    InlineTermDefinitionType_content child0;
}
class termReferenceType {
    bit(1) choice;
    switch(choice) {
        case 0:
            termAliasReferenceType termAliasReferenceType0;
            break;
        case 1:
            termURIReferenceType termURIReferenceType0;
            break;
        default:
            break;
        }
}
class termAliasReferenceType {
    string value3;
}
class termURIReferenceType {
    string value3;
}
class InlineTermDefinitionType_content {
    bit(1) opt_group;
    if(opt_group) {
        Name_anonymousType_4 Name;
    }
}
class Name_anonymousType_4 {
    bit(1) has_lang;
    if(has_lang) {
        string lang;
    }
    string childvalue;
}
class AgentType_typecast {
    bit(1) typecast;
    if (typecast) {
        bit(1) subtype;
        switch(subtype){
            case 0:
                OrganizationType Agent;
                break;
```


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```
                case 1:
                    PersonType Agent;
                    break;
                default:
                    break;
                }
    } else {
        AgentType Agent;
    }
}
class OrganizationType {
    bit(1) has_id;
    if(has_id) {
        string id;
    }
    bit(1) opt_group;
    if(opt_group) {
        vluimsbf5 occ0;
        for(int t=0;t<occ0;t++) {
            Name_anonymousType_9 Name[[t]];
        }
    }
    bit(1) opt_group;
    if(opt_group) {
        PlaceType Address;
    }
    bit(1) opt_group;
    if(opt_group) {
        ElectronicAddressType ElectronicAddress;
    }
}
class Name_anonymousType_9 {
    bit(1) has_lang;
    if(has_lang) {
        string lang;
    }
    string childvalue;
}
class PlaceType {
    bit(1) has_id;
    if(has_id) {
        string id;
    }
    bit(1) opt_group;
    if(opt_group) {
        vluimsbf5 occ6;
        for(int t=0;t<occ6;t++) {
            TextualType Name[[t]];
        }
    }
    bit(1) opt_group;
    if(opt_group) {
        vluimsbf5 occ7;
        for(int t=0;t<occ7;t++) {
            TextualType PlaceDescription[[t]];
        }
    }
    bit(1) opt_group;
    if(opt_group) {
        GeographicPosition_anonymousType_10 GeographicPosition;
```

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```
    }
    bit(1) opt_group;
    if(opt_group) {
        PostalAddress_anonymousType_11 PostalAddress;
    }
}
class TextualType {
    bit(1) has_lang;
    if(has_lang) {
        string lang;
    }
    string childvalue;
}
class GeographicPosition_anonymousType_10 {
    bit(1) has_datum;
    if(has_datum) {
        string datum;
    }
    GeographicPointType Point;
}
class GeographicPointType {
    bit(1) has_altitude;
    if(has_altitude) {
        double altitude;
    }
    double latitude;
    double longitude;
}
class PostalAddress_anonymousType_11 {
    bit(1) has_lang;
    if(has_lang) {
        string lang;
    }
    vluimsbf5 occ12;
    for(int t=0;t<occ12+1;t++) {
        TextualType AddressLine[[t]];
    }
    bit(1) opt_group;
    if(opt_group) {
        TextualType PostingIdentifier;
    }
}
class ElectronicAddressType {
    bit(1) opt_group;
    if(opt_group) {
        vluimsbf5 occ16;
        for(int t=0;t<occ16;t++) {
            Telephone_anonymousType_6 Telephone[[t]];
        }
    }
    bit(1) opt_group;
    if(opt_group) {
        vluimsbf5 occ17;
        for(int t=0;t<occ17;t++) {
            string Fax[[t]];
        }
    }
    bit(1) opt_group;
    if(opt_group) {
        vluimsbf5 occ18;
```


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```
            for(int t=0;t<occ18;t++) {
                string Email[[t]];
            }
        }
        bit(1) opt_group;
        if(opt_group) {
            vluimsbf5 occ19;
            for(int t=0;t<occ19;t++) {
                anyURI Url[[t]];
            }
        }
}
class Telephone_anonymousType_6 {
        string childvalue;
}
class NameComponentType {
        bit(1) has_lang;
        if(has_lang) {
            string lang;
        }
        string childvalue;
}
class TitleType {
        bit(1) has_lang;
        if(has_lang) {
            string lang;
        }
        string childvalue;
}
class basicDurationType {
        string value3;
}
class durationType {
        string value3;
}
class basicTimePointType {
        string value3;
}
class mimeType {
        string value3;
}

class PersonType {
        bit(1) has_id;
        if(has_id) {
            string id;
        }
        PersonNameType Name;
        bit(1) opt_group;
        if(opt_group) {
            vluimsbf5 occ3;
            for(int t=0;t<occ3;t++) {
                Affiliation_anonymousType_12 Affiliation[[t]];
            }
        }
        bit(1) opt_group;
        if(opt_group) {
            PlaceType Address;
        }
        bit(1) opt_group;
```

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```
    if(opt_group) {
        vluimsbf5 occ5;
        for(int t=0;t<occ5;t++) {
            ElectronicAddressType ElectronicAddress[[t]];
        }
    }
}
class PersonNameType {
    bit(1) has_lang;
    if(has_lang) {
        string lang;
    }
    bit(1) opt_group;
    if(opt_group) {
        vluimsbf5 occ0;
        for(int t=0;t<occ0;t++) {
            bit(3) ch6;
            switch(ch6){
                case 0:
                    NameComponentType FamilyName;
                    break;
                case 1:
                    NameComponentType GivenName;
                    break;
                case 2:
                    NameComponentType LinkingName;
                    break;
                case 3:
                    string Numeration;
                    break;
                case 4:
                    NameComponentType Salutation;
                    break;
                case 5:
                    NameComponentType Title;
                    break;
                default:
                    break;
                }
        }
    }
}
class Affiliation_anonymousType_12 {
    OrganizationType Organization;
}
class AgentType {
    bit(1) has_id;
    if(has_id) {
        string id;
    }
}
class ContentCollectionType {
    CollectionType_attributes child0;
    CollectionType_content child1;
    bit(1) opt_group;
    if(opt_group) {
        vluimsbf5 occ0;
        for(int t=0;t<occ0;t++) {
            ReferenceType ContentRef[[t]];
        }
```


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```
        }
        bit(1) opt_group;
        if(opt_group) {
            vluimsbf5 occ1;
            for(int t=0;t<occ1;t++) {
                ContentCollectionType ContentCollection[[t]];
            }
        }
}
class CollectionType_attributes {
        bit(1) has_id;
        if(has_id) {
            string id;
        }
        bit(1) has_name;
        if(has_name) {
            string name;
        }
}
class CollectionType_content {
        bit(1) opt_group;
        if(opt_group) {
            CreationInformationType CreationInformation;
        }
        bit(1) opt_group;
        if(opt_group) {
            vluimsbf5 occ1;
            for(int t=0;t<occ1;t++) {
                TextAnnotationType TextAnnotation[[t]];
            }
        }
}
class CreationInformationType {
        bit(1) has_id;
        if(has_id) {
            string id;
        }
        CreationType Creation;
}
class CreationType {
        bit(1) has_id;
        if(has_id) {
            string id;
        }
        vluimsbf5 occ2;
        for(int t=0;t<occ2+1;t++) {
            TitleType Title[[t]];
        }
        bit(1) opt_group;
        if(opt_group) {
            TitleMediaType TitleMedia;
        }
        bit(1) opt_group;
        if(opt_group) {
            vluimsbf5 occ4;
            for(int t=0;t<occ4;t++) {
                CreatorType Creator[[t]];
            }
        }
        bit(1) opt_group;
```

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```
    if(opt_group) {
        CreationCoordinates_anonymousType_13 CreationCoordinates;
    }
}
class TitleMediaType {
    bit(1) opt_group;
    if(opt_group) {
        ImageLocatorType TitleImage;
    }
}
class ImageLocatorType {
    MediaLocatorType_content child0;
}
class MediaLocatorType_content {
    bit(1) opt_group;
    if(opt_group) {
        InlineMediaType InlineMedia;
    }
}
class InlineMediaType {
    string type;
    bit(1) ch4;
    switch(ch4){
        case 0:
            hexBinary MediaData16;
            break;
        case 1:
            base64Binary MediaData64;
            break;
        default:
            break;
        }
}
class hexBinary {
    string value3;
}
class base64Binary {
    string value3;
}
class CreationCoordinates_anonymousType_13 {
    bit(1) opt_group;
    if(opt_group) {
        PlaceType Location;
    }
    bit(1) opt_group;
    if(opt_group) {
        TimeType Date;
    }
}
class TimeType {
    timePointType TimePoint;
    bit(1) opt_group;
    if(opt_group) {
        durationType Duration;
    }
}
class TextAnnotationType {
    bit(1) has_lang;
    if(has_lang) {
        string lang;
```


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```
        }
        vluimsbf5 occ1;
        for(int t=0;t<occ1+1;t++) {
            bit(1) ch5;
            switch(ch5){
                case 0:
                    TextualType FreeTextAnnotation;
                    break;
                case 1:
                    KeywordAnnotationType KeywordAnnotation;
                    break;
                default:
                    break;
                }
        }
}
class KeywordAnnotationType {
        bit(1) has_lang;
        if(has_lang) {
            string lang;
        }
        vluimsbf5 occ0;
        for(int t=0;t<occ0+1;t++) {
            Keyword_anonymousType_3 Keyword[[t]];
        }
}
class Keyword_anonymousType_3 {
        bit(1) has_type;
        if(has_type) {
            type type;
        }
        bit(1) has_lang;
        if(has_lang) {
            string lang;
        }
        string childvalue;
}
class type {
            // Enumeration: main{0} other{1} secondary{2}
            bit(2) anonymousType_14;
}
class ReferenceType {
        bit(1) has_href;
        if(has_href) {
            string href;
        }
}
class string {
        vluimsbf5 length;
        for(int t=0;t<length;t++) {
            byte value[[t]];
        }
}
```

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E.3 Binary syntax for item-level metadata

```
class Mpeg7 {
	bit(1) has_lang;
	if(has_lang) {
		string lang;
	}
	Mpeg7Type_content child0;
	ImageType DescriptionUnit;
}
class Mpeg7Type_content {
	bit(1) opt_group;
	if(opt_group) {
		DescriptionProfileType DescriptionProfile;
	}
	DescriptionMetadataType DescriptionMetadata;
}
class DescriptionProfileType {
	profileAndLevelIndication profileAndLevelIndication;
}
class profileAndLevelIndication {
	vluimsbf5 max;
	for (int t=0;t<max;t++) {
		anyURI item[[t]];
	}
}
class anyURI {
	string value3;
}
class DescriptionMetadataType {
	bit(1) has_id;
	if(has_id) {
		string id;
	}
	timePointType LastUpdate;
	bit(1) opt_group;
	if(opt_group) {
		vluimsbf5 occ12;
		for(int t=0;t<occ12;t++) {
			CreatorType Creator[[t]];
		}
	}
	bit(1) opt_group;
	if(opt_group) {
		timePointType CreationTime;
	}
}
class timePointType {
	string value3;
}
class CreatorType {
	MediaAgentType_content child0;
}
class MediaAgentType_content {
	ControlledTermUseType Role;
	AgentType_typecast Agent;
}
```

--`,,```,,,,````-`-`,,`,,`,`,,`---

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```
class ControlledTermUseType {
	termReferenceType href;
	InlineTermDefinitionType_content child0;
}
class termReferenceType {
	bit(1) choice;
	switch(choice) {
		case 0:
			termAliasReferenceType termAliasReferenceType0;
			break;
		case 1:
			termURIReferenceType termURIReferenceType0;
			break;
		default:
			break;
		}
}
class termAliasReferenceType {
	string value3;
}
class termURIReferenceType {
	string value3;
}
class InlineTermDefinitionType_content {
	bit(1) opt_group;
	if(opt_group) {
		Name_anonymousType_34 Name;
	}
}
class Name_anonymousType_34 {
	bit(1) has_lang;
	if(has_lang) {
		string lang;
	}
	string childvalue;
}
class AgentType_typecast {
	bit(1) typecast;
	if (typecast) {
		bit(1) subtype;
		switch(subtype){
			case 0:
				OrganizationType Agent;
				break;
			case 1:
				PersonType Agent;
				break;
			default:
				break;
			}
	} else {
		AgentType Agent;
	}
}
class OrganizationType {
	bit(1) has_id;
	if(has_id) {
		string id;
	}
	bit(1) opt_group;
```

--`,,```,,,,````-`-`,,`,,`,`,,`---

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```
    if(opt_group) {
        vluimsbf5 occ0;
        for(int t=0;t<occ0;t++) {
            Name_anonymousType_9 Name[[t]];
        }
    }
    bit(1) opt_group;
    if(opt_group) {
        PlaceType Address;
    }
    bit(1) opt_group;
    if(opt_group) {
        ElectronicAddressType ElectronicAddress;
    }
}
class Name_anonymousType_9 {
    bit(1) has_lang;
    if(has_lang) {
        string lang;
    }
    string childvalue;
}
class PlaceType {
    bit(1) has_id;
    if(has_id) {
        string id;
    }
    bit(1) opt_group;
    if(opt_group) {
        vluimsbf5 occ11;
        for(int t=0;t<occ11;t++) {
            TextualType Name[[t]];
        }
    }
    bit(1) opt_group;
    if(opt_group) {
        vluimsbf5 occ12;
        for(int t=0;t<occ12;t++) {
            TextualType PlaceDescription[[t]];
        }
    }
    bit(1) opt_group;
    if(opt_group) {
        GeographicPosition_anonymousType_37 GeographicPosition;
    }
    bit(1) opt_group;
    if(opt_group) {
        PostalAddress_anonymousType_38 PostalAddress;
    }
}
class TextualType {
    bit(1) has_lang;
    if(has_lang) {
        string lang;
    }
    string childvalue;
}
class GeographicPosition_anonymousType_37 {
    bit(1) has_datum;
    if(has_datum) {
```


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```
            string datum;
        }
        GeographicPointType Point;
}
class GeographicPointType {
        bit(1) has_altitude;
        if(has_altitude) {
            double altitude;
        }
        double latitude;
        double longitude;
}
class PostalAddress_anonymousType_38 {
        bit(1) has_lang;
        if(has_lang) {
            string lang;
        }
        vluimsbf5 occ18;
        for(int t=0;t<occ18+1;t++) {
            TextualType AddressLine[[t]];
        }
        bit(1) opt_group;
        if(opt_group) {
            TextualType PostingIdentifier;
        }
}
class ElectronicAddressType {
        bit(1) opt_group;
        if(opt_group) {
            vluimsbf5 occ20;
            for(int t=0;t<occ20;t++) {
                Telephone_anonymousType_36 Telephone[[t]];
            }
        }
        bit(1) opt_group;
        if(opt_group) {
            vluimsbf5 occ21;
            for(int t=0;t<occ21;t++) {
                string Fax[[t]];
            }
        }
        bit(1) opt_group;
        if(opt_group) {
            vluimsbf5 occ22;
            for(int t=0;t<occ22;t++) {
                string Email[[t]];
            }
        }
        bit(1) opt_group;
        if(opt_group) {
            vluimsbf5 occ23;
            for(int t=0;t<occ23;t++) {
                anyURI Url[[t]];
            }
        }
}
class Telephone_anonymousType_36 {
        string childvalue;
}
```

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```
class TextualBaseType {
	bit(1) has_lang;
	if(has_lang) {
		string lang;
	}
	string childvalue;
}
class NameComponentType {
	bit(1) has_lang;
	if(has_lang) {
		string lang;
	}
	string childvalue;
}
class TitleType {
	bit(1) has_lang;
	if(has_lang) {
		string lang;
	}
	string childvalue;
}
class UniqueIDType {
	bit(1) has_encoding;
	if(has_encoding) {
		encoding encoding;
	}
	bit(1) has_type;
	if(has_type) {
		string type;
	}
	string childvalue;
}
class encoding {
		// Enumeration: base16{0} base64{1} text{2}
		bit(2) anonymousType_14;
}
class basicTimePointType {
	string value3;
}
class PersonType {
	bit(1) has_id;
	if(has_id) {
		string id;
	}
	PersonNameType Name;
	bit(1) opt_group;
	if(opt_group) {
		vluimsbf5 occ3;
		for(int t=0;t<occ3;t++) {
			Affiliation_anonymousType_10 Affiliation[[t]];
		}
	}
	bit(1) opt_group;
	if(opt_group) {
		PlaceType Address;
	}
	bit(1) opt_group;
	if(opt_group) {
		vluimsbf5 occ5;
		for(int t=0;t<occ5;t++) {
```


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```
                ElectronicAddressType ElectronicAddress[[t]];
            }
        }
}
class PersonNameType {
        bit(1) has_lang;
        if(has_lang) {
            string lang;
        }
        bit(1) opt_group;
        if(opt_group) {
            vluimsbf5 occ0;
            for(int t=0;t<occ0;t++) {
                bit(3) ch6;
                switch(ch6){
                    case 0:
                        NameComponentType FamilyName;
                        break;
                    case 1:
                        NameComponentType GivenName;
                        break;
                    case 2:
                        NameComponentType LinkingName;
                        break;
                    case 3:
                        string Numeration;
                        break;
                    case 4:
                        NameComponentType Salutation;
                        break;
                    case 5:
                        NameComponentType Title;
                        break;
                    default:
                        break;
                    }
            }
        }
}
class Affiliation_anonymousType_10 {
        OrganizationType Organization;
}
class AgentType {
        bit(1) has_id;
        if(has_id) {
            string id;
        }
}
class ImageType {
        bit(1) has_id;
        if(has_id) {
            string id;
        }
        StillRegionType Image;
}
class StillRegionType {
        bit(1) has_id;
        if(has_id) {
            string id;
        }
```

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```
    SegmentType_content child0;
    bit(1) opt_group;
    if(opt_group) {
        StillRegionFeatureType VisualDescriptionScheme;
    }
}
class SegmentType_content {
    bit(1) opt_group;
    if(opt_group) {
        MediaInformationType MediaInformation;
    }
    bit(1) opt_group;
    if(opt_group) {
        CreationInformationType CreationInformation;
    }
    bit(1) opt_group;
    if(opt_group) {
        vluimsbf5 occ2;
        for(int t=0;t<occ2;t++) {
            TextAnnotation_anonymousType_6 TextAnnotation[[t]];
        }
    }
}
class MediaInformationType {
    bit(1) has_id;
    if(has_id) {
        string id;
    }
    vluimsbf5 occ8;
    for(int t=0;t<occ8+1;t++) {
        MediaProfileType MediaProfile[[t]];
    }
}
class MediaProfileType {
    bit(1) has_id;
    if(has_id) {
        string id;
    }
    bit(1) opt_group;
    if(opt_group) {
        MediaFormatType MediaFormat;
    }
    bit(1) opt_group;
    if(opt_group) {
        MediaInstanceType MediaInstance;
    }
}
class MediaFormatType {
    ControlledTermUseType Content;
    bit(1) opt_group;
    if(opt_group) {
        ControlledTermUseType FileFormat;
    }
    bit(1) opt_group;
    if(opt_group) {
        nonNegativeInteger FileSize;
    }
    bit(1) opt_group;
    if(opt_group) {
        VisualCoding_anonymousType_15 VisualCoding;
```


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```
        }
}
class unsigned1 {
        bit(1) value;
}
class unsigned12 {
        bit(12) value;
}
class unsigned3 {
        bit(3) value;
}
class unsigned5 {
        bit(5) value;
}
class unsigned6 {
        bit(6) value;
}
class unsigned8 {
        bit(8) value;
}
class nonNegativeInteger {
        vluimsbf5 value;
}
class VisualCoding_anonymousType_15 {
        bit(1) opt_group;
        if(opt_group) {
                Frame_anonymousType_43 Frame;
        }
}
class Frame_anonymousType_43 {
        bit(1) has_height;
        if(has_height) {
                nonNegativeInteger height;
        }
        bit(1) has_width;
        if(has_width) {
                nonNegativeInteger width;
        }
}
class MediaInstanceType {
        bit(1) has_id;
        if(has_id) {
                string id;
        }
        UniqueIDType InstanceIdentifier;
        bit(1) ch4;
        switch(ch4){
                case 0:
                        TextualType LocationDescription;
                        break;
                case 1:
                        MediaLocatorType MediaLocator;
                        break;
                default:
                        break;
                }
}
class MediaLocatorType {
        anyURI MediaUri;
}
```

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```
class CreationInformationType {
	bit(1) has_id;
	if(has_id) {
		string id;
	}
	CreationType Creation;
}
class CreationType {
	bit(1) has_id;
	if(has_id) {
		string id;
	}
	TitleType Title;
	bit(1) opt_group;
	if(opt_group) {
		vluimsbf5 occ6;
		for(int t=0;t<occ6;t++) {
			CreatorType Creator[[t]];
		}
	}
	bit(1) opt_group;
	if(opt_group) {
		CreationCoordinates_anonymousType_11 CreationCoordinates;
	}
}
class CreationCoordinates_anonymousType_11 {
	bit(1) opt_group;
	if(opt_group) {
		PlaceType Location;
	}
	bit(1) opt_group;
	if(opt_group) {
		TimeType Date;
	}
}
class TimeType {
	timePointType TimePoint;
}
class TextAnnotation_anonymousType_6 {
	bit(1) has_lang;
	if(has_lang) {
		string lang;
	}
	TextAnnotationType_content child0;
}
class TextAnnotationType_content {
	vluimsbf5 occ5;
	for(int t=0;t<occ5+1;t++) {
		bit(1) ch5;
		switch(ch5){
			case 0:
				TextualType FreeTextAnnotation;
				break;
			case 1:
				KeywordAnnotationType KeywordAnnotation;
				break;
			default:
				break;
			}
	}
```


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```
}
class KeywordAnnotationType {
	bit(1) has_lang;
	if(has_lang) {
		string lang;
	}
	vluimsbf5 occ0;
	for(int t=0;t<occ0+1;t++) {
		Keyword_anonymousType_5 Keyword[[t]];
	}
}
class Keyword_anonymousType_5 {
	bit(1) has_type;
	if(has_type) {
		type type;
	}
	bit(1) has_lang;
	if(has_lang) {
		string lang;
	}
	string childvalue;
}
class type {
		// Enumeration: main{0} other{1} secondary{2}
		bit(2) anonymousType_42;
}
class StillRegionFeatureType {
	bit(1) has_id;
	if(has_id) {
		string id;
	}
	bit(1) opt_group;
	if(opt_group) {
		DominantColorType DominantColor;
	}
	bit(1) opt_group;
	if(opt_group) {
		ScalableColorType ScalableColor;
	}
	bit(1) opt_group;
	if(opt_group) {
		ColorStructureType ColorStructure;
	}
	bit(1) opt_group;
	if(opt_group) {
		ColorLayoutType ColorLayout;
	}
	bit(1) opt_group;
	if(opt_group) {
		EdgeHistogramType Edge;
	}
	bit(1) opt_group;
	if(opt_group) {
		HomogeneousTextureType HomogeneousPattern;
	}
}
class DominantColorType {
	unsigned5 SpatialCoherency;
	bit(3) occ10;
	for(int t=0;t<occ10+1;t++) {
```

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```
            Value_anonymousType_3 Value[[t]];
        }
}
class Value_anonymousType_3 {
        unsigned5 Percentage;
        Index_anonymousType_40 Index;
        bit(1) opt_group;
        if(opt_group) {
            ColorVariance_anonymousType_41 ColorVariance;
        }
}
class Index_anonymousType_40 {
        int max=+3;
        for (int t=0;t<max;t++) {
            unsigned12 item[[t]];
        }
}
class ColorVariance_anonymousType_41 {
        int max=+3;
        for (int t=0;t<max;t++) {
            unsigned1 item[[t]];
        }
}
class ScalableColorType {
        numOfBitplanesDiscarded numOfBitplanesDiscarded;
        numOfCoeff numOfCoeff;
        integerVector Coeff;
}
class numOfBitplanesDiscarded {
            // Enumeration: 0{0} 1{1} 2{2} 3{3} 4{4} 6{5} 8{6}
            bit(3) anonymousType_12;
}
class numOfCoeff {
            // Enumeration: 128{0} 16{1} 256{2} 32{3} 64{4}
            bit(3) anonymousType_13;
}
class integerVector {
        vluimsbf5 max;
        for (int t=0;t<max;t++) {
            integer item[[t]];
        }
}
class integer {
        bit(1) sign; // 1 is negative
        vluimsbf5 value;
}
class ColorStructureType {
        unsigned3 colorQuant;
        Values_anonymousType_4 Values;
}
class Values_anonymousType_4 {
        int max=bit(8)+1;
        for (int t=0;t<max;t++) {
            unsigned8 item[[t]];
        }
}
class ColorLayoutType {
        unsigned6 YDCCoeff;
        unsigned6 CbDCCoeff;
        unsigned6 CrDCCoeff;
```


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```
        bit(3) ch4;
        switch(ch4){
            case 0:
                anonymousType_18 YACCoeff14;
                break;
            case 1:
                anonymousType_19 YACCoeff20;
                break;
            case 2:
                anonymousType_20 YACCoeff27;
                break;
            case 3:
                anonymousType_16 YACCoeff5;
                break;
            case 4:
                anonymousType_21 YACCoeff63;
                break;
            case 5:
                anonymousType_17 YACCoeff9;
                break;
            default:
                break;
            }
        bit(3) ch4;
        switch(ch4){
            case 0:
                anonymousType_26 CbACCoeff14;
                anonymousType_27 CrACCoeff14;
                break;
            case 1:
                anonymousType_28 CbACCoeff20;
                anonymousType_29 CrACCoeff20;
                break;
            case 2:
                anonymousType_30 CbACCoeff27;
                anonymousType_31 CrACCoeff27;
                break;
            case 3:
                anonymousType_22 CbACCoeff5;
                anonymousType_23 CrACCoeff5;
                break;
            case 4:
                anonymousType_32 CbACCoeff63;
                anonymousType_33 CrACCoeff63;
                break;
            case 5:
                anonymousType_24 CbACCoeff9;
                anonymousType_25 CrACCoeff9;
                break;
            default:
                break;
            }
}
class anonymousType_18 {
        int max=+14;
        for (int t=0;t<max;t++) {
            unsigned5 item[[t]];
        }
}
class anonymousType_19 {
```

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```
	int max=+20;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_20 {
	int max=+27;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_16 {
	int max=+5;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_21 {
	int max=+63;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_17 {
	int max=+9;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_26 {
	int max=+14;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_27 {
	int max=+14;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_28 {
	int max=+20;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_29 {
	int max=+20;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_30 {
	int max=+27;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_31 {
```


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```
	int max=+27;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_22 {
	int max=+5;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_23 {
	int max=+5;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_32 {
	int max=+63;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_33 {
	int max=+63;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_24 {
	int max=+9;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class anonymousType_25 {
	int max=+9;
	for (int t=0;t<max;t++) {
		unsigned5 item[[t]];
	}
}
class EdgeHistogramType {
	BinCounts_anonymousType_39 BinCounts;
}
class BinCounts_anonymousType_39 {
	int max=+80;
	for (int t=0;t<max;t++) {
		unsigned3 item[[t]];
	}
}
class HomogeneousTextureType {
	unsigned8 Average;
	unsigned8 StandardDeviation;
	textureListType Energy;
	bit(1) opt_group;
	if(opt_group) {
		textureListType EnergyDeviation;
	}
}
class textureListType {
```

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```
        int max=+30;
        for (int t=0;t<max;t++) {
                unsigned8 item[[t]];
        }
}
class string {
        vluimsbf5 length;
        for(int t=0;t<length;t++) {
                byte value[[t]];
        }
}
```


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