

MPEG-7 Quick Reference

MPEG-7 overview:

- Part 1: Systems architecture
- Part 2: Description definition language
- Part 3: Visual
- Part 4: Audio
- Part 5: Multimedia description schemes (MDS)
- Part 6: Reference software
- Part 7: Conformance testing
- Part 8: Extraction and use of MPEG-7 descriptions

Parts 1-5 specify the core MPEG-7 technology. Parts 6-8 are supporting parts.

MPEG-7 part 2 summary:

Element and attribute declarations: Elements have first letter capitalized, like Frame.
<element name="Frame">.

Attributes have first letter lower case, like rate.

<attribute name="rate">.

Together they look like this: <Frame rate="15"/> or <Title xml:lang="en-us">.

Type definitions: There are simple, complex, and derived types. Simple types cannot have children elements and cannot carry attributes. Complex types can have children elements and can carry attributes. Derived types are defined in one of two ways: extensions of already-defined types or restrictions of already-defined types.

```
<complexType name="PersonType">  
  <extension base="mpeg7:AgentType">  
</complexType>
```

```
<complexType name="PersonNameType">  
  <restriction base="string">  
    <enumeration value="variant">  
  </restriction>  
</complexType>
```

Descriptors and Description Schemes, which are introduced in part 5, clause 4, are generally complex types.

```
<complexType name="CreationInformationType">  
  <extension base="mpeg7:DSType">  
</complexType>
```

Most type definitions involve extensions rather than restrictions.

MPEG-7 Quick Reference

MPEG-7 uses standard XML built-in primitive and derived data types, but also had to add extensions for MPEG-7, such as array and matrix and built-in derived data types basicTimePoint and basicDuration. Data types usually begin with a lower case letter, like string, boolean, date, language, integer.

Principal writer of part 2 is Jane Hunter, a ViDe member, and member of the ViDe videoaccess working group created by Grace Agnew. Jane is at the Distributed Systems Technology Centre, University of Queensland.

MPEG-7 part 3 summary:

Visual descriptors grouped into five categories (color, texture, shape, motion, face features). All these are useful for similarity searches and retrievals, in other words, content-based queries of video databases.

Color descriptors: (a) color space, (b) dominant color, (c) scalable color, (d) group of frames, (e) color structure, (f) color layout. Involve using histograms, then computing a number like a centroid or other vector quantity that characterizes that color aspect of an image or video segment.

Texture descriptors: (a) homogeneous texture, (b) texture browsing (analogous to human perceptual characterization, such as regularity, coarseness, directionality), (c) edge histogram.

Shape descriptors: (a) contour-based, (b) region-based, (c) 3-D, (d) multiple-view.

Motion descriptors: (a) motion activity, (b) camera motion, (c) motion trajectory, (d) parametric motion (including translational parameters, rotational/scaling parameters, and perspective parameters).

Face descriptor: contains basis vectors that are computed for various features of face images.

MPEG-7 part 5 schema overview:

- 4.2. Definition of base types
- 4.3. Definition of root element
- 4.4. Definition of top level types
5. Definition of data types
6. Definition of timepoint, duration, locator, etc. data types
7. Definition of textual, classification scheme, controlled vocabulary, agent data types

MPEG-7 Quick Reference

8. Definition of MediaInformation (MediaIdentification, MediaProfile (MediaFormat, MediaInstance))
9. Definition of CreationInformation (Creation (Title, Creator), Classification (Genre, Subject, Language, etc.), RelatedMaterial (MaterialType, MediaLocator, MediaInformation, CreationInformation, UsageInformation))
10. Definition of UsageInformation (Rights, Availability)
11. Definition of segments (visual and audio structural units), spatial and temporal decomposition, masks

MPEG-7 part 5 multimedia description schemes (clauses):

1. Scope
2. Normative references
3. Terms, definitions, symbols, abbreviated terms (Ds and DSs)
4. Schema tools
5. Basic datatypes
6. Links to the media and localization
7. Basic tools
8. Media description tools
9. Creation and production description tools
10. Usage description tools
11. Structure of the content
12. Semantics of the content
13. Content navigation and access
14. Organization of the content
15. User interaction
16. Bibliography
17. Annex A: classification schemes
18. Annex B: xPath datatype definition
19. Annex C: MDS schema definition
20. Annex D: Example description

MPEG-7 part 5 closer look:

4. Schema tools
 - 4.1 Base types
 - 4.1.1 VisualDType, AudioDType, VisualDSType, AudioDSType
 - 4.2 Mpeg7 root element, DescriptionMetadata,
 - 4.3 Top-level types
 - 4.3.1 BasicDescription (ContentDescription and ContentManagement)
 - 4.3.2 ContentDescription
 - ContentEntity
 - MultimediaContent
 - ContentAbstraction

MPEG-7 Quick Reference

Summarization, etc.

- 4.3.3 ContentManagement
 - UserDescription (User, UserPreferences, UsageHistory)
 - CreationDescription (CreationInformation)
 - UsageDescription (UsageInformation)
- 4.4.1 MultimediaContent DS (Image, Video, Audio, Audiovisual, etc.)
- 4.5 Package DS
- 4.6 DescriptionMetadata DS

- 6. Links to the media and localization
 - 6.2 UniqueID
 - 6.3.1 Time datatype
 - 6.3.2 TimePoint
 - 6.3.3 Duration
 - 6.3.4 IncrDuration
 - 6.3.5 RelTimePoint
 - 6.3.6 RelIncTimePoint
 - 6.3.9 MediaTime
 - 6.3.10 MediaTimePoint
 - 6.3.11 MediaDuration
 - 6.3.12 MediaIncrDuration
 - 6.3.13 MediaRelTimePoint
 - 6.3.14 MediaRelIncTimePoint
 - 6.4.1 MediaLocator datatype (MediaURI for external, InlineMedia, StreamID)
 - 6.4.2 InlineMedia (embeds binary AV data in a textual description)
 - 6.4.3 TemporalSegmentLocator (specifies a MediaTime element or Byte Position)
 - 6.4.4 ImageLocator (specifies a MediaTime element or BytePosition)
 - 6.4.5 AudioVisualSegmentLocator (specifies a URI or MediaTime element)

- 7. Basic tools
 - 7.1.1 xml:lang attribute
 - 7.2.2 TextAnnotation (FreeTextAnnotation, StructuredAnnotation, etc.)
 - 7.3 Classification schemes and terms (controlled term use, etc.)
 - 7.4.1 Agent DS
 - 7.4.2 Person DS (Name, Organization, Address, ElectronicAddress, etc.)
 - 7.4.3 PersonGroup DS (Name (type attr.), Address, ElectronicAddress, etc.)
 - 7.4.4 Organization DS (Name (type attr.), Address, ElectronicAddress, etc.)
 - 7.4.5 PersonName (GivenName, FamilyName, dateFrom, dateTo, etc.)
 - 7.4.6 ElectronicAddress (Telephone, Fax, Email, URL)
 - 7.5.1 Place DS
 - 7.5.1.4 GeographicPointType DS (longitude, latitude, altitude)
 - 7.6.1 Graph DS
 - 7.8.1 Affective DS (audience mood)

- 8. Media description tools
 - 8.1.1 MediaInformation DS (MediaIdentification, MediaProfile)

MPEG-7 Quick Reference

- 8.1.2 MediaIdentification (EntityIdentifier)
- 8.1.3 MediaProfile DS (MediaFormat, MediaInstance, etc.)
- 8.1.4 MediaFormat
 - Content (image, audio, visual, audiovisual)
 - Medium (physical storage medium)
 - FileFormat (MPEG7FileFormatCS or MIME)
 - FileSize
 - System (MPEG7SystemCS)
 - Bandwidth (Hz)
 - BitRate (attributes: minimum, average, maximum)
 - VisualCoding
 - Format (MPEG7VisualCoding CS; attribute: colordomain)
 - Pixel (attributes: resolution, aspectRatio, bitPer (accuracy))
 - Frame (attributes: height, width, aspectRatio, rate)
 - AudioCoding
 - Format (MPEG7AudioCodingCS)
 - AudioChannels
 - Sample (attributes: rate, bitPer)
 - Presentation (MPEG7AudioPresentationCS)
- 8.1.5 MediaTranscodingHints
- 8.1.6 MediaQuality
- 8.1.7 MediaInstance DS (InstanceIdentifier, MediaLocator, LocationDescription)
- 9. Creation and production description tools
 - 9.1.1 CreationInformation DS (Creation, Classification, RelatedMaterial)
 - 9.1.2 Creation DS
 - Title (attributes: main (default), alternative, popular, seriesTitle, etc.)
 - TitleMedia (TitleImage, TitleVideo (videoclip), TitleAudio (a jingle))
 - Abstract
 - Creator (Role and Agent (name and type of agent))
 - CreationCoordinates (CreationLocation, CreationDate)
 - 9.1.3 Classification DS
 - Form (recommend LC's migfg)
 - Genre (recommend LC's migfg)
 - Subject (recommend LCSH or other)
 - Language (also SubtitleLanguage, ClosedCaptionLanguage, etc.)
 - Release (Country and Date)
 - Target (Market; Age; (for example, audience, such as higher education))
 - 9.1.4 RelatedMaterial DS
 - PublicationType (MPEG7PublicationTypeCS)
 - MaterialType (recommend Ruth Bogan list of MaterialTypes)
 - MediaLocator
 - MediaInformation
 - CreationInformation
 - UsageInformation

MPEG-7 Quick Reference

10. Usage description tools

10.1.1 UsageInformation DS (Rights, Availability, UsageRecord, etc.)

10.1.2 Rights (RightsID)

10.1.4 Availability DS

PublicationType (MPEG7PublicationTypeCS)

OriginPlace

Distributor

Financial

Rights

AvailabilityPeriod

10.1.5 UsageRecordDS (number of users, financial info, etc.)

11. Structure of the content

11.1.1 Segment DS (an abstract, parent DS from which elements are inherited)

MediaInformation

MediaLocator

StructuralUnit

CreationInformation

UsageInformation

TextAnnotation

Relation (to other segments, objects, etc., spatially, temporally)

11.1.2 StillRegion DS (SpatialLocator, MediaTimePoint, SpatialDecomposition)

11.1.3 ImageText DS (text, language, superimposed, scene, fontSize, fontType)

11.1.4 Mosaic DS (mosaic or panoramic view of a video segment)

11.1.5 StillRegion3D DS (MultipleView, SpatialDecomposition, etc.)

11.1.6 VideoSegment DS (MediaTime, Mosaic, various decompositions)

11.1.7 MovingRegion DS (SpatioTemporalLocator, various decompositions)

11.1.8 VideoText DS (text, language, superimposed, scene, fontSize, fontType)

11.1.9 InkSegment DS (InkMediaInfo, MediaTime, various masks, decomp)

11.1.10 AudioSegment DS (MediaTime, Temporal and MediaSource decomp)

11.1.11 AudioVisualSegment DS (MediaTime, masks, decompositions)

11.1.12 AudioVisualRegion DS (VisualSpatioTemporalLocator, decomp)

11.1.13 MultiMediaSegment DS (MediaSourceDecomposition)

11.1.14 EditedVideoSegment DS (Analytic, AnalyticClip, Shot, Transition, etc)

11.2 Various masks, matching hints, points of view, etc.

11.3 Various decomposition tools (StillRegion, VideoSegment, MediaSource, etc)

11.4 Segment relation description tools (before, after, starts, finishes, keyFor, etc.)

17. Classification schemes

17.1.2.1.1 MPEG7FileFormatCS

17.1.2.1.2 IPTCMimeTypeCS

17.1.2.2.1 MPEG7MediumCS

17.1.2.3.1 MPEG7SystemCS

17.1.2.4.1 MPEG7VisualCodingFormatCS

17.1.2.5.1 MPEG7AudioPresentationCS

17.1.2.6.1 MPEG7AudioCodingFormatCS

MPEG-7 Quick Reference

17.2.3.1.1 MPEG7PublicationTypeCS

In describing an image, video, audio, etc, use the CreationInformation, UsageInformation, MediaInformation, and specialized Segment description tools. See example MPEG-7 record in XML.

MPEG-7 Quick Reference

For further reading:

Introduction to MPEG-7: multimedia content description interface / edited by B. S. Manjunath, Philippe Salembier, Thomas Sikora. (New York : Wiley, c2002).
Contents: Introduction to MPEG-7 -- Context, goals, and procedures -- Systems architecture -- Description definition language -- Binary format -- Overview of multimedia description schemes and schema tools -- Basic elements -- Description of a single multimedia document -- Navigation and summarization -- Content organization -- User interaction -- Overview of visual descriptors -- Color descriptors -- Texture descriptors -- Shape descriptors -- Motion descriptors -- Fundamentals of audio descriptions -- Spoken content -- Sound classification and similarity -- Search and browsing -- Mobile applications.

Information Technology: multimedia content description interface: part 5: multimedia description schemes. (ISO/IEC 15938-5). [the schema]. <
<http://smil.nist.gov/M7Validation.html> >

Text of 15938-5 FCD Information Technology: multimedia content description interface: part 5: multimedia description schemes / editors: Peter van Beek, Ana B. Benitez, Joerg Heuer, Jose Martinez, Philippe Salembier, Yoshiaki Shibata, John R. Smith, Toby Walker. March 2001, Singapore. (ISO/IEC 15938-5). [the big part 5 printout, about 780 p.)]
< <http://www.itscj.ipsj.or.jp/sc29/open/29view/29n4161t.doc> >
also via: < <http://www.diffuse.org/meta.html#MPEG-7> >
also at: <http://mpeg.telecomitalialab.com/working_documents/mpeg-07/mds/mds_xm.zip >

Programme of work [progress of the MPEG-7 working groups, such as the MultiMedia Description Schemes (MDS) Group (Peter van Beek, Ana Benitez, Jose Martinez, Philippe Salembier, John R. Walker, etc.).
< <http://www.itscj.ipsj.or.jp/sc29/29w42911.htm> >

MPEG-7 overview. version 8. Editor: Jose Martinez. July 2002. (102 p.)
< <http://mpeg.telecomitalialab.com/standards/mpeg-7/mpeg-7.htm> >

MPEG7: transforming digital video description / Jane Hunter (DSTC, University of Queensland). (PowerPoint and RealVideo of her 1 hour, 15 min. talk at the two day workshop in Atlanta, Managing Digital Video Content, Aug. 15-16, 2001).
< <http://www.vide.net/conferences/mdvc2001/index.html> >

MPEG7 implementation / Ana Benitez (Columbia University). (PowerPoint and RealVideo of her 1 hour, 15 min. talk at the two day workshop in Atlanta, Managing Digital Video Content, Aug. 15-16, 2001).
< <http://www.vide.net/conferences/mdvc2001/index.html> >

MPEG-7 Quick Reference

Hunter, Jane; Martinez, Jose M.; Oltmans, Erik. MPEG-7 Harmonization with Dublin Core: current status and concerns, 2000. (ISO/IEC/JTC1/SC29/WG11, MPEG00/M6160, July 2000, Beijing)

< <http://archive.dstc.edu.au/RDU/staff/jane-hunter/m6160.doc> >

Hunter, Jane. An Application Profile which Combines Dublin Core and MPEG-7 Metadata Terms for Simple Video Description. 2002-02-12.

< http://metadata.net/harmony/video_appln_profile.html >