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Part 9: File Format

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Partie 9: Format de fichier

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Foreword

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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.

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ISO/IEC 21000-9 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 21000 consists of the following parts, under the general title *Information technology — Multimedia framework (MPEG-21)*:

— *Part 1: Vision, Technologies and Strategy*

— *Part 2: Digital Item Declaration*

— *Part 3: Digital Item Identification*

— *Part 5: Rights Expression Language*

— *Part 6: Rights Data Dictionary*

— *Part 7: Digital Item Adaptation*

— *Part 8: Reference Software*

— *Part 9: File Format*

— *Part 10: Digital Item Processing*

— *Part 11: Evaluation Tools for Persistent Association Technologies*

— *Part 12: Test Bed for MPEG-21 Resource Delivery*

— *Part 16: Binary Format*

The following parts are under preparation:

— *Part 4: Intellectual Property Management and Protection Components*

— *Part 15: Event Reporting*

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Introduction

The MPEG-21 File Format is designed to contain a base MPEG-21 XML document with some or all of its ancillary resources, potentially in a single package.

It is forms part of a family of specifications which are box-structured, and is built using tools in from the ISO Base Media File Format, specifically those that provide the unified structural approach to both static meta-data (untimed meta-data) and MPEG-21 integrated document handling.

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Information technology — Multimedia framework (MPEG-21) —

Part 9:
File Format

1 Scope

This International Standard specifies the MPEG-21 file format, in which an MPEG-21 XML document (e.g. Digital Item Declaration (DID)) and some or all of its referenced content can be placed in a single 'content package' file. This enables the interchange, editing, and 'playback' of MPEG-21 documents.

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

ISO/IEC 21000-2, *Information technology — Multimedia framework (MPEG-21) — Part 2: Digital Item Declaration*

3 File Format

3.1 Basic Structure

An MPEG-21 file is an object-structured file as defined in the ISO Base Media File Format, sub-clause 4. The file-type ('ftyp') box specified there is mandatory.

It uses the following other boxes from that format. Section numbers refer to subclauses of The ISO Base Media File Format specification (as amended by amendment 1). Mandatory boxes are marked with an asterisk (*).

ftyp						*	4.3	*file type and compatibility*
mdat							8.2	*media data container*
free							8.24	*free space*
skip							8.24	*free space*
meta						*	8.44.1	*metadata*
	hdlr					*	8.9	*handler, declares the metadata (handler) type*
	dinf						8.12	*data information box, container*
		dref					8.13	*data reference box, declares source(s) of metadata items*
	ipmc						8.45.4	*IPMP Control Box*
	iloc						8.44.3	*item location*
	ipro						8.44.5	*item protection*
		sinf					8.45.1	*protection scheme information box*
			frma				8.45.2	*original format box*

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			imif				8.45.3	*IPMP Information box*
			schm				8.45.5	*scheme type box*
			schi				8.45.6	*scheme information box*
	iinf						8.44.6	*item information*
	xml						8.44.2	*XML container*
	bxml						8.44.2	*binary XML container*
	pitm						8.44.4	*primary item reference*

The brand indicator for a file conformant with this specification is ‘mp21’. If this brand appears in the compatible-brands list, then the file must contain the required structures of this specification. Other structures that are not defined here may be found; if they are not recognized by an MPEG-21 reader, they should be ignored.

> Note: brands indicating compatibility with the ISO Base Media File Format (such as ‘isom’ or ‘iso2’) should only be used if the file also complies with all the requirements of that format, in particular that the mandatory boxes of that format, such as a Movie Box(‘moov’), are present.

All files conformant with this specification must contain exactly one MPEG-21 Document Box, as defined in this specification, at the top-level of the file.

If the major-brand of the file is MPEG-21, the file is delivered under a suitable MIME type and/or file extension.

3.2 MPEG-21 Document

All files conformant with this specification must contain an MPEG-21 Document box (which is derived from the meta-box) at the top-level of the file. The position of this box in the sequence of top-level boxes is not restricted (except that it must follow the file-type box, as that box is required to precede all variable-length boxes).

```
aligned(8) class MPEG21Box extends MetaBox('mp21')
{
}
```

The MPEG-21 DID is stored using a handler-type of ‘mp21’ in the meta-data box. The MPEG-21 XML document must be provided in one or other of:

a) an XML box within the meta-box;

b) the primary item identified by the Primary Item Location box.

A Binary XML (‘bxml’) box may only be used to contain the MPEG-21 document in a binary format defined in ISO/IEC 21000.

3.3 Multi-Purpose Files

Files identified as compatible with other standards (brands) than MPEG-21 shall contain such top-level boxes and other structures as are required by those standards,

3.4 Other Boxes

In addition to the required boxes (and their required content) other boxes from the ISO Base Media File Format, or other box-structured specifications, may be included as needed. Note particularly that the MPEG-21 file format does not mandate a Movie Box (‘moov’), unlike the ISO Base Media File Format and formats based on it.

Specifically, a media-data box (‘mdat’) may be used as a general container for the items referenced from the Item Location Box.

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Annex A
(informative)

Embedding Content in MPEG-21 Files

A.1 Encapsulated Content

Media content that should not be visible at top-level, or that is not box-structured, should be embedded in a suitable box, such as the existing 'mdat' (Media Data) box.

Such hidden media data may be an entire MPEG-21 file, to this specification; that is, this format may be recursively embedded.

This media content should be referenced using the Item Location Box in the MPEG-21 meta-box.

The resource may also be visible at top-level in the file (e.g. the Movie Box of an MP4 file). In that case, the file would be compatible with more than one specification.

A.2 Offsets in Included Files

Some files (e.g. MP4 and this specification) use file-offsets to identify items within their media data. In their specifications, they refer to these offsets as relative to the beginning of file. The base-offset field within the item location box can indicate whether these offsets are relative to the offset of the included media file, or relative to the beginning of the entire MPEG-21 file.

A.3 References from included Media Content

It is highly desirable that it be possible to answer the question 'does this item reference external media?' by examining only the meta-data box. It is also desirable that the XML contain a complete inventory of all the used media.

To this end, this specification strongly encourages that any included media that has external references, reference that external media through a URL form which indirects through the Digital Item Declaration. In the DID the actual external URL will be found.

The URL forms defined in the ISO Base Media File Format are used for this purpose. The XML is addressed by naming the primary item, and within that XML standard MPEG-21 fragment identifiers are used to address the desired URL. For example, if the MPEG-21 has an anchor "thirdmovie", and the primary item is called "myDID.xml" within a file "myItem.m21", then a URL form similar to the following would be used: "http://a.com/d/myItem.m21#item_name=myDID.xml*thirdmovie".

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Annex B
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Streaming

This format is streamable to the extent that the included formats are streamable. For example, say the file included a SMIL layup of three MPEG-4 movies. The MPEG-21 DID and SMIL layup are not streamable; the MPEG-4 movies are. In general, also, it only makes sense to speak of streaming a format with known timing relationships, and the relationships between the elements in an MPEG-21 file may not be a priori decided. However, the individual pieces might be streamable. So, for example, the SMIL layup might include URLs “rtsp://a.b.com/layup.m21/item_ID=23” and “rtsp://a.b.com/layup.m21/item_ID=42”, and these URLs could be passed to an MPEG-21 aware streaming server at a.b.com.

Under some circumstances a DID should be conveyed reliably to the client, which is nonetheless going to stream some of the content. One way to handle this is to have two documents. One file is for the media server, which contains the media content for the streaming server, and optionally the DID. The other file is for the client, and contains a DID with the content references being RTSP URL pointers to the aforementioned streaming server.

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Annex C
(informative)

Examples

C.1 Introduction

In this section some simple examples are presented.

C.2 Simple Case with included image

A file with an MPEG-21 Digital Item Declaration which references a single included image could be structured as follows:

```
ftyp box:   major-brand = 'mp21', compatible-brands = 'mp21'.

meta box:   (container)
      handler box:      hdlr = 'mp21'
      XML box:          contains the MPEG-21 DID XML,
                              with a relative URL "image.jpg" for the image
      Item Location:    itemID = 1, extent_count = 1,
                              extent_offset = X, extent_length = Y;
      Item Information: itemID = 1, item_protection_index = 0 (unused),
                              item_name = "image.jpg",
                              content_type = "image/jpeg",
                              content_encoding = "" (binary)

Media data box:
      JPEG Image (at file offset X, with length Y)
```

C.3 Simple Case with included image in a separate file

A file with an MPEG-21 Digital Item Declaration which references a single included image could be structured as follows:

```
ftyp box:   major-brand = 'mp21', compatible-brands = 'mp21'.

meta box:   (container)
      handler box:      hdlr = 'mp21'
      data reference box:     one data reference to (e.g.) "../images/image.jpg"
      XML box:          contains the MPEG-21 DID XML,
                              with a relative URL "image.jpg" for the image
      Item Location:    itemID = 1, extent_count = 1,
                              extent_offset = 0, extent_length = 0;
                              data_reference_index = 1;
      Item Information: itemID = 1, item_protection_index = 0 (unused),
                              item_name = "image.jpg",
                              content_type = "image/jpeg",
                              content_encoding = "" (binary)
```

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C.4 Dual-Function File

This file is 'dual-headed' and contains both an MP4 presentation and an MPEG-21 DID, and it is permitted to use either an MPEG-21 or MPEG-4 reader.

```
ftyp box:   major-brand = 'mp21', compatible-brands = 'mp21', 'mp42', 'isom'.

meta box:   (container)
      handler box:      hdlr = 'mp21'
      XML box:          contains the MPEG-21 DID XML,
                              with a relative URL "movie.mp4"
                              for the presentation
      Item Location:    itemID = 1, extent_count = 1,
                              extent_offset = 0, extent_length = 0;
                              (the entire file)
      Item Information: itemID = 1, item_protection_index = 0 (unused),
                              item_name = "movie.mp4",
                              content_type = "video/mp4",
                              content_encoding = "" (binary)

Movie Box: (container)
      Movie header, tracks, etc. as required by MP4

Media data box:
      audio/video data etc. as used by the MP4 movie
```

C.5 Digital Item with 'hidden' MPEG-4 presentation

In this example, the MPEG-4 presentation is not visible to an MPEG-4 reader; only MPEG-21-aware readers should read the file.

```
ftyp box:   major-brand = 'mp21', compatible-brands = 'mp21'

meta box:   (container)
      handler box:      hdlr = 'mp21'
      XML box:          contains the MPEG-21 DID XML,
                              with a relative URL "movie.mp4"
                              for the presentation
      Item Location:    itemID = 1, extent_count = 1,
                              extent_offset = X, extent_length = Y,
                                    base_offset = X;
                                    // offsets within the included MP4 file
                                    // are relative to X, not the beginning
                                    // of the MPEG-21 file (which is offset 0)
      Item Information: itemID = 1, item_protection_index = 0 (unused),
                              item_name = "movie.mp4",
                              content_type = "video/mp4",
                              content_encoding = "" (binary)

Media data box:
      ftyp box:   major-brand = 'mp42', compatible-brands = 'mp42', 'isom'
      Movie Box: (container)
            Movie header, tracks, etc. as required by MP4
      Media-data box:
            audio/video data etc. as used by the MP4 movie
```

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