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

Part 2:

**MPEG music player application format**

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

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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.

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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 23000-2 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 2: MPEG music player application format* [ISO/IEC 23000-2:2006  
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— *Part 1: Purpose for Multimedia Application Formats*

— *Part 3: MPEG photo player application format*

## Introduction

MPEG-1/2 Audio Layer III, also known as MP3, is one of the most widely used MPEG International Standards. At the time of its standardization, it was thought to be somewhat complex, but it has proved to be one of the most future-looking of all MPEG technologies.

Since that time, MPEG has developed a number of International Standards, all of which strive to serve the needs of consumers and industry. Among those are MPEG-4, a next-generation suite of International Standards for media compression, and MPEG-7, a suite of International Standards for meta-data representation. MPEG-4 specifies what MPEG expects to be another very successful specification, the MPEG-4 File Format, while MPEG-7 specifies not only signal-derived meta-data, but also archival meta-data such as Artist, Album and Song Title.

As such, MPEG-4 and MPEG-7 represent an ideal environment to support the current “MP3 music library” user experience, and, moreover, to extend that experience in new directions.

This International Standard shows how to carry MP3 information (music and metadata) within the MPEG-4 and MPEG-7 framework. Moving MP3 into the MPEG-4 world supports, as a baseline, everything that users know and expect, but offers the capability to deliver much richer music experiences with components of MPEG-4, MPEG-7 and MPEG-21 at our disposal.

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

## Part 2: MPEG music player application format

### 1 Scope

ISO/IEC 23000-2 specifies a method to import MPEG-1 Layer III coded media files (i.e. MP3) that may contain ID3V1 meta-data into the framework of MPEG-4 as an MPEG-4 file. Optionally, the media file can have an associated JPEG image (e.g. album cover art). The major components of this part of ISO/IEC 23000 are:

- a method to convert the Layer III bitstream into a series of MPEG-4 Access Units suitable for storage in an MPEG-4 file;
- a method for representing the ID3V1 meta-data using a concise set of MPEG-7 constructs, and how to place that MPEG-7 description into the MPEG-4 file;
- how to encapsulate a JPEG compressed image into the MPEG-4 file.

Additional components permit using the MPEG-21 file format, which supports a more precise association of coded audio, meta-data and image information, and also permits the creation of a “music album” via encapsulation of a set of MPEG-4 files (i.e. songs) within a single MPEG-21 file.

### 2 Overview of MPEG Standards

#### 2.1 MPEG-1 Layer III

ISO/IEC 11172-3:1993 specifies MPEG-1 Audio [1]. From that specification, MPEG-1 Layer III (or MP3) is one of the most widely deployed MPEG audio standards ever. Its wide appeal is due to both its good compression performance and its simplicity of implementation. The vast majority of compressed music archives use MP3 encoding.

One aspect of the simplicity of Layer III is that it specifies a self-synchronizing transport, making it amenable to both storage in a computer file and transmission over a channel without byte framing. In the context of transmission channels, Layer III can operate over a constant-rate isochronous link, and has constant-rate headers (as does Layer I and II). However Layer III is an instantaneously-variable-rate coder, which adapts to the constant-rate channel by using a “bit buffer” and “back pointers.” Each of the headers signals the start of another block of audio signal, however due to the Layer III syntax, the data associated with that next block of audio signal may be in a prior segment of the bitstream, pointed to by the back pointer (see Figure 1, specifically the curved arrow pointing to `main_data_begin`). We note that this is in contrast to the MPEG-4 view of data stream segmentation, in which one Access Unit contains all information necessary to decode one segment of audio.

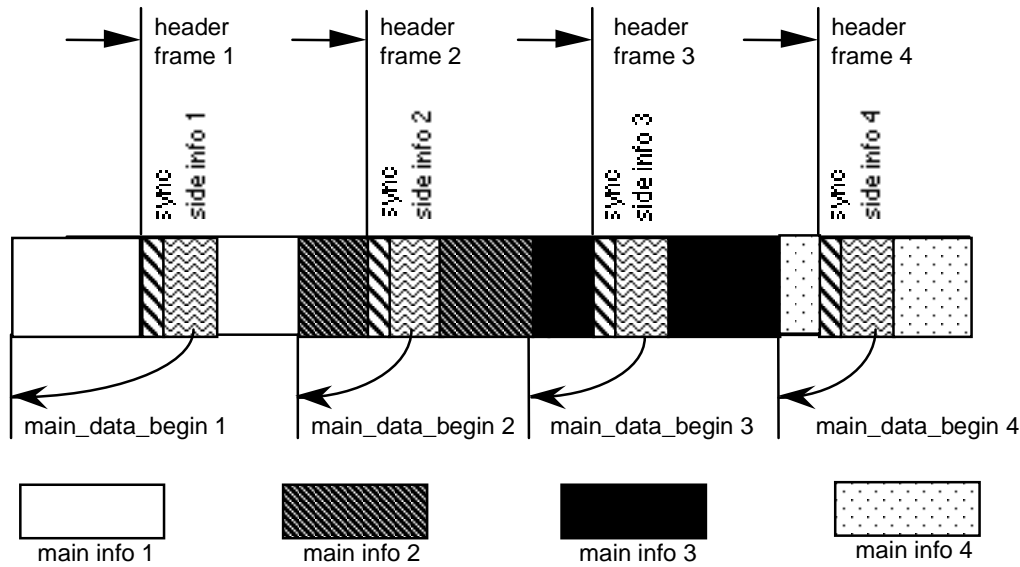


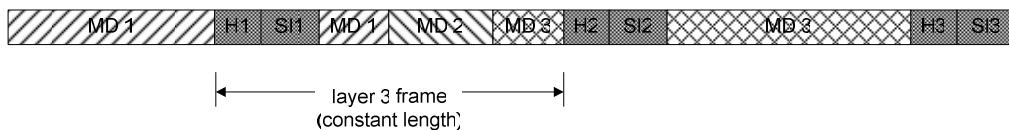
Figure 1 — Layer III bitstream organization

2.2 MPEG-4 “MPEG-1/2 Audio in MPEG-4”

ISO/IEC 14496-3:2005 [3] specifies a method for segmenting and formatting Layer III bitstreams into MPEG-4 Access Units (MPEG-1/2 Audio in MPEG-4), and therefore is often referred to as “MP3onMP4”. This consists primarily of re-arranging the compressed data associated with a given header such that it follows the header. This typically results in new segments that are no longer of constant length, but that is perfectly in accordance with the definition of MPEG-4 Access Units. See example in Figure 2.

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Layer 3 bitstream



access units consisting of mp3\_channel\_elements



Figure 2 — Converting an MPEG-1/2 Layer 3 bitstream into mp3\_channel\_elements

2.3 ISO Base Media File Format

The ISO Base Media File Format is designed to contain timed media information for a presentation in a flexible, extensible format that facilitates interchange, management, editing, and presentation of the media. The ISO Base Media File Format is a base format for media file formats. In particular, the MPEG-4 file format derives from this base file format.



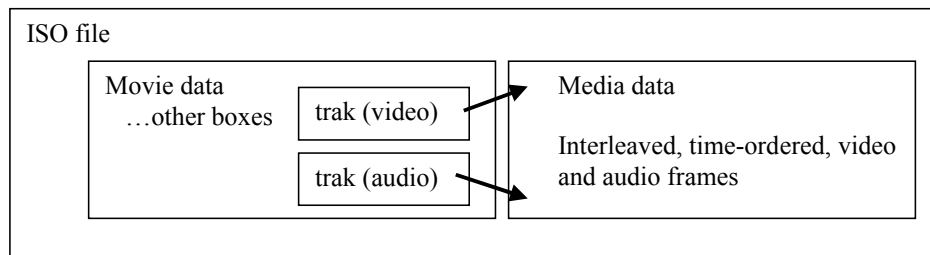


Figure 3 — Example of a simple ISO file used for interchange, containing two streams

The file structure is object-oriented as shown in Figure 3 which means that a file can be decomposed into constituent objects very simply, and the structure of the objects inferred directly from their type. The file format is designed to be independent of any particular network protocol while enabling efficient support for them in general.

## 2.4 The ISO Base Media and MPEG-4 File Formats

ISO/IEC 14496-12:2005 [4], and ISO/IEC 14496-14:2003 [5] together specify the MPEG-4 File Format. This supports storage of compressed audio data (e.g. MP3onMP4) in tracks. It also provides support for metadata in the form of 'meta' boxes at the File, Movie and Track level. This allows support for static (un-timed) metadata. Figure 4 schematically illustrates the location of these un-timed MPEG-7 Metadata boxes. Subclause 3.3 provides details as to when the Metadata boxes at each level are used.

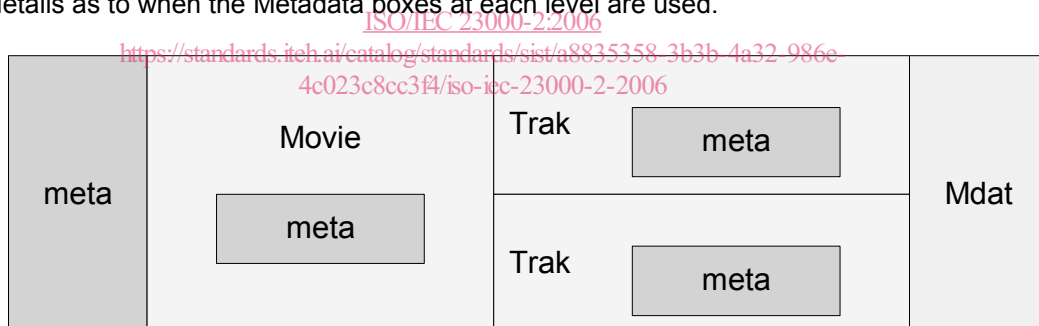


Figure 4 — Support of Static un-timed Metadata in ISO/MP4 Files

## 2.5 MPEG-7 Multi-Media Description Scheme

ISO/IEC 15938-5:2003, the Multimedia Description Scheme (MDS) [6] specifies all non-Visual and non-Audio specific metadata (e.g. Artist, Title, Date) in the MPEG-7 standard. As such it is able to represent all of the information found in the popular ID3V1 [7] metadata specification system.

### 3 A System for Archiving and Playing a Music Library

#### 3.1 Overview

This specification presents a simple architecture for constructing an annotated music library. It defines a process, based completely on MPEG-4 and MPEG-7 standardized modules, for importing mp3 encoded music files containing ID3 tags into this architecture. This is shown in Figure 5.

ISO/IEC 11172-3 Layer III (“MP3”) [1]-[2] specifies a music compression scheme that results in a sequence of bits, or bitstream. In contrast, ISO/IEC 14496-3:2005 [3] specifies a music compression scheme that results in a sequence of packets which can be stored directly into the MPEG-4 File Format, specified in ISO/IEC 14496-14. [4] [5]

The first module required in this architecture is a specification to translate an MP3 bitstream into a series of MP3 packets. This is accomplished by the MP3onMP4 formatter, specified in ISO/IEC 14496-3:2005 [3]. This formatter reads a standard MP3 file (i.e. a bitstream) and converts it to a series of packets (called *Access Units* in MPEG-4 terminology) that can be loaded into an MPEG-4 File.

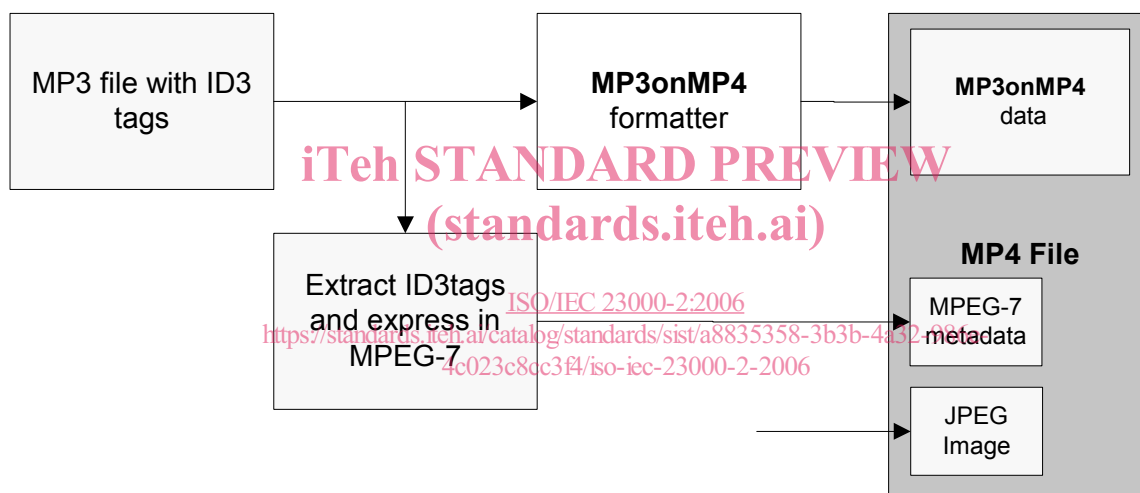


Figure 5 — Encoder System Architecture

The MPEG-4 File supports both compressed media (i.e. MP3), and associated metadata, typically ID3V1 tags [6]. This tag information is easily representable using MPEG-7 nomenclature, as specified in [8]. The specific mapping from ID3V1.1 tags to MPEG-7 metadata is show in Table 1. Parenthetical comments under Artist clarify that MPEG-7 is able to make a distinction between Artist as a *person* and and Artist as a *group name*.

Table 1 — Mapping from ID3 V1.1 Tags to MPEG-7

ID3 V1	Description	MPEG-7 Path
Artist	Artist performing the song	CreationInformation/Creation/Creator[Role/@href="urn:mpeg:mpeg7:RoleCS:2001:PERFORMER"]/Agent[@xsi:type="PersonType"]/Name/{FamilyName, GivenName} ( <i>Artist Name</i> ) CreationInformation/Creation/Creator[Role/@href="urn:mpeg:mpeg7:RoleCS:2001:PERFORMER"]/Agent[@xsi:type="PersonGroupType"]/Name ( <i>Group Name</i> )
Album	Title of the album	CreationInformation/Creation/Title[@type="albumTitle"]
Song Title	Title of the song	CreationInformation/Creation/Title[@type="songTitle"]
Year	Year of the	CreationInformation/CreationCoordinates/Date/TimePoint

ID3 V1	Description	MPEG-7 Path
	recording	(Recording date.)
<b>Comment</b>	Any comment of any length	CreationInformation/Creation/Abstract/FreeTextAnnotation
<b>Track</b>	CD track number of song	Semantics/SemanticBase[@xsi:type="SemanticStateType"]/AttributeValuePair
<b>Genre</b> Example 1 ID 3 V1.1 Genre Shown : Genre 4, Disco	ID 3 V1.1 Genre	CreationInformation/Classification/Genre[@href="urn:id3:v1:4"]
<b>Genre</b> Example 2 ID 3 V2 Genre Shown : ID 3 V1.1 Genre 4, Disco, with ID 3 V2 refinement to Eurodisco	ID 3 V2 TCON	CreationInformation/Classification/Genre[@href="urn:id3:v1:4"]/Term[@termID="urn:id3:v2:Eurodisco"]
<b>Genre</b> Example 3 ID 3 V2 Genre Shown : ID 3 V1.1 Genre 4, Disco, with ID 3 with alternate expression of V2 refinement to Eurodisco	ID 3 V2 TCON	CreationInformation/Classification/Genre[@href="urn:id3:v1:4"] CreationInformation/Classification/Genre[@type="secondary"][@href="urn:id3:v2:Eurodisco"]

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MPEG-7 Path notation is a shorthand for the full XPath notation, and an example of the correspondence between MPEG-7 Path and XPath notation is shown in Table 1.

### 3.2 Playback

Playback consists of

- extracting the metadata from the MPEG-4 file and displaying it on a suitable visual interface. ,
- extracting the MP3onMP4 data from the MPEG-4 file, filtering it with very light-weight de-formatting operation, and playing it through a “classic” MP3 decoder.

In practice, it may be that the MP3onMP4 data is played by an “MP3onMP4 decoder,” consisting of the concatenation of the MP3onMP4 deformatter and the MP3 decoder.