International Standard

ISO/IEC 23001-19

Information technology — MPEG systems technologies —

Part 19: Carriage of green metadata

First edition
2026-08

Reference number
ISO/IEC 23001-19:2026(en)

© ISO/IEC 2026



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2026

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms, definitions and abbreviated terms ... **1**
3.1 Terms and definitions ... 1
3.2 Abbreviated terms ... 2
4 Overview ... **2**
4.1 Overall architecture for carriage of green metadata ... 2
4.2 Referenceable code points ... 3
4.2.1 Uniform resource names ... 3
4.2.2 Restricted scheme types ... 3
4.2.3 Sample entry types ... 3
4.2.4 Track reference types ... 3
4.2.5 Box types ... 3
5 Carriage of green metadata in ISO Base Media File Format ... **4**
5.1 General ... 4
5.2 Decoder-power indication metadata ... 4
5.2.1 Definition ... 4
5.2.2 Syntax ... 4
5.2.3 Semantics ... 5
5.3 Display-power reduction metadata ... 5
5.3.1 General ... 5
5.3.2 Display power indication metadata ... 5
5.3.3 Display fine control metadata ... 6
5.3.4 Display attenuation map metadata ... 7
6 Encapsulation and signalling in MPEG-DASH ... **12**
6.1 General ... 12
6.2 Decoder-power indication ... 12
6.3 Display-power indication ... 13
6.4 Display attenuation map information ... 14
6.4.1 Metadata signalling in the MPD manifest file ... 14
6.4.2 Descriptors ... 15
7 Conformance and reference software ... **19**
Annex A (normative) **Green metadata MPEG-DASH schema** ... **20**
Annex B (informative) **MPEG-DASH MPD examples** ... **22**
Annex C (informative) **Conformance and reference software** ... **32**
Annex D (informative) **Generation and use of green metadata** ... **34**
Bibliography ... **41**

© ISO/IEC 2026 – All rights reserved

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see https://www.iso.org/directives or https://www.iec.ch/members_experts/refdocs).

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO and IEC had received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://www.iso.org/patents and https://patents.iec.ch. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see https://www.iso.org/iso/foreword.html. In the IEC, see https://www.iec.ch/understanding-standards.

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

A list of all parts in the ISO 23001 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at https://www.iso.org/members.html and https://www.iec.ch/national-committees.

© ISO/IEC 2026 – All rights reserved

Introduction

Green metadata is used for representing information that will help to reduce the energy consumption in the video distribution chain, towards a more sustainable industry.

This document addresses technologies defining the carriage of green metadata for storage and delivery purposes. This document includes (but is not limited to):

— Storage and carriage of green metadata using the ISO Base Media File Format (ISOBMFF) as specified in ISO/IEC 14496-12;

— Encapsulation, signalling, and streaming of green metadata data in a media streaming system, e.g., dynamic adaptive streaming over HTTP (DASH) as specified in ISO/IEC 23009-1.

© ISO/IEC 2026 – All rights reserved

Information technology — MPEG systems technologies —

Part 19:
Carriage of green metadata

1 Scope

This document defines a storage and delivery format for metadata for energy-efficient decoding, encoding, presentation, and selection of media (green metadata) as defined in ISO/IEC 23001-11. The green metadata are timed metadata which can be associated with other tracks in the ISO Base Media File Format. Timed metadata such as power consumption information and their metrics are defined in this document for carriage in files based on ISO/IEC 14496-12.

In the context of DASH delivery, the green metadata representations and their association to the media representations are also defined using the signalling mechanisms specified in ISO/IEC 23009-1:2022 and ISO/IEC 23009-3[1].

These metadata can be used for multiple purposes, including optimizing power consumption during playback and supporting dynamic adaptive streaming.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 14496-5, *Information technology — Coding of audio-visual objects — Part 5: Reference software*

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

ISO/IEC 14496-15, *Information technology — Coding of audio-visual objects — Part 15: Carriage of network abstraction layer (NAL) unit structured video in the ISO base media file format*

ISO/IEC 23001-10:2020, *Information technology — MPEG systems technologies — Part 10: Carriage of timed metadata metrics of media in ISO base media file format*

ISO/IEC 23001-11:2023, *Information technology — MPEG systems technologies — Part 11: Energy-efficient media consumption (green metadata)*

ISO/IEC 23009-1:2022, *Information technology — Dynamic adaptive streaming over HTTP (DASH) — Part 1: Media presentation description and segment formats*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 23001-11 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

© ISO/IEC 2026 – All rights reserved

— IEC Electropedia: available at https://www.electropedia.org/

3.2 Abbreviated terms

DASH dynamic adaptive streaming over HTTP (specified in ISO/IEC 23009-1)

ISOBMFF ISO base media file format (specified in ISO/IEC 14496-12)

4 Overview

4.1 Overall architecture for carriage of green metadata

Figure 1 shows the functional architecture utilizing green metadata. The media pre-processor is applied to analyse and to filter the content source and a video encoder is used to encode the content to a bitstream for delivery. The bitstream is delivered to the receiver and decoded by a video decoder with the output rendered on a presentation subsystem that implements a display process.

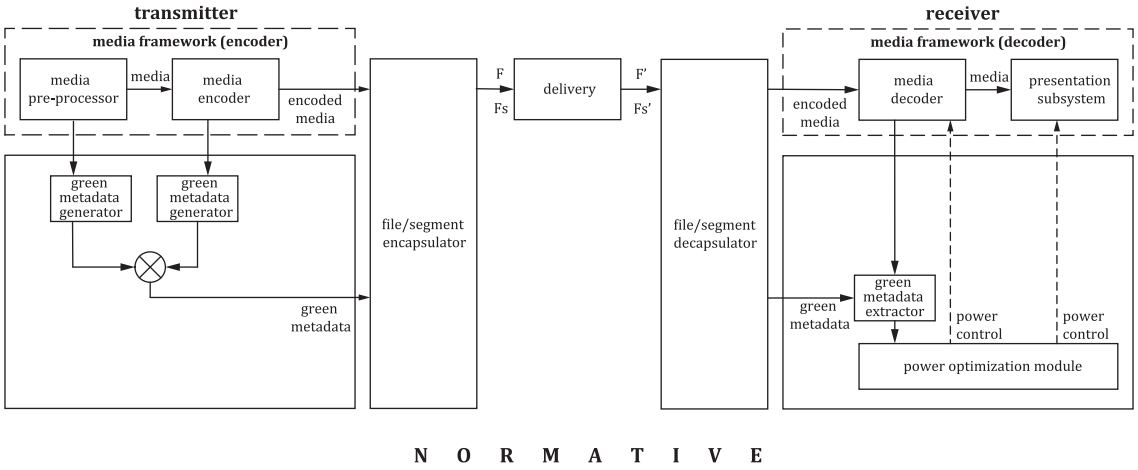


Figure 1 — Functional architecture

The green metadata is extracted from either the media encoder or the media pre-processor. In both cases, the green metadata is multiplexed or encapsulated in the conformant bitstream. Such green metadata is used at the receiver to reduce the power consumption for video decoding and presentation.

The bitstream is packaged into a file (F) or a sequence of an initialization segment and media segments for streaming (Fs), according to a particular media container file format. In this document, the media container file format is the ISO Base Media File Format specified in ISO/IEC 14496-12. The file encapsulator may also include metadata into the file or the segments. Both are delivered using a delivery mechanism to the receiver, for decoding and presentation.

A file decapsulator processes the received file (F') or the received segments (Fs') and extracts the green metadata sample description boxes and coded bitstreams and parses the metadata. The file (F) or segments (Fs) that the file encapsulator outputs are identical to the file (F') or segments (Fs') that the file decapsulator takes as input. At the receiver, the metadata extractor sends the extracted green metadata to a power optimization module for efficient power control. For instance, the power optimization module interprets the green metadata and then applies appropriate operations to reduce the video decoder's power consumption when decoding the video and to reduce the presentation subsystem's power consumption when rendering the video.

The following interfaces are normatively specified in this document:

— F/F': media file including the specification of the track formats, which may contain constraints on the elementary streams contained within the samples of the tracks; see Clause 5 for timed metadata.

© ISO/IEC 2026 – All rights reserved