
**Information technology — Dynamic
adaptive streaming over HTTP
(DASH) —**

**Part 1:
Media presentation description and
segment formats**

*Technologies de l'information — Diffusion en flux adaptatif
dynamique sur HTTP (DASH) —*

*Partie 1: Description de la présentation et formats de remise des
médias*





COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2022

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

Foreword.....	vii
Introduction.....	viii
1 Scope.....	1
2 Normative references.....	1
3 Terms, definitions, symbols and abbreviated terms	2
3.1 Terms and definitions	2
3.2 Symbols and abbreviated terms	7
3.3 Conventions	9
4 Overview	10
4.1 System description	10
4.2 DASH Client model.....	11
4.3 DASH data model overview	12
4.4 Protocols	15
4.5 Media stream and Representation properties	16
4.5.1 Switching and Random Access Support.....	16
4.5.2 Media stream access points	16
4.5.3 Non-overlapping Segments and Subsegments	17
4.5.4 Conforming Segment track.....	18
4.6 Brands.....	18
4.7 Schemes	19
5 Media Presentation	22
5.1 General.....	22
5.2 Media Presentation Description.....	22
5.2.1 General	22
5.2.2 Schema.....	23
5.2.3 Elements and Attributes added in revisions and amendments.....	24
5.3 Hierarchical data model	26
5.3.1 General	26
5.3.2 Period.....	33
5.3.3 Adaptation Sets.....	39
5.3.4 Media content component.....	50
5.3.5 Representation	51
5.3.6 Sub-Representation	62
5.3.7 Common attributes and elements	63
5.3.8 Subsets.....	70
5.3.9 Segments and Segment information	71
5.3.10 Label and Group Label	93
5.3.11 Preselection.....	95
5.3.12 Initialization Set, Group and Presentation	99
5.3.13 Resynchronization	103
5.4 Media Presentation Description updates.....	106
5.4.1 General	106
5.4.2 MPD Reset.....	108
5.5 MPD assembly	108
5.5.1 General	108
5.5.2 Syntax and semantics	108
5.5.3 Processing	109
5.6 Base URL Processing.....	110

5.6.1	Overview	110
5.6.2	Semantics	111
5.6.3	XML syntax.....	112
5.6.4	Reference resolution.....	112
5.6.5	Alternative base URLs.....	113
5.7	Program information.....	113
5.7.1	Overview	113
5.7.2	Semantics	113
5.7.3	XML syntax.....	114
5.8	Descriptors	114
5.8.1	General.....	114
5.8.2	Semantics of generic descriptor	115
5.8.3	XML syntax of generic descriptor.....	115
5.8.4	Specific descriptors	116
5.8.5	Specific scheme definitions	122
5.9	DASH metrics descriptor	133
5.9.1	Overview	133
5.9.2	Semantics	133
5.9.3	XML syntax.....	134
5.9.4	Metric reporting	135
5.10	Events	135
5.10.1	Overview	135
5.10.2	MPD Events.....	135
5.10.3	Inband Event Signalling	139
5.10.4	DASH-specific events.....	142
5.11	MPD Chaining	146
5.11.1	General.....	146
5.11.2	Regular Chaining	146
5.11.3	Fallback Chaining.....	147
5.12	Producer Reference Time	148
5.12.1	General.....	148
5.12.2	Semantics	148
5.12.3	XML Syntax	150
5.13	Leap seconds.....	150
5.13.1	Overview	150
5.13.2	Semantics	151
5.13.3	XML-Syntax.....	151
5.13.4	Leap second information updates.....	152
5.14	Content Popularity Rate	152
5.14.1	General.....	152
5.14.2	Semantics	153
5.14.3	XML syntax.....	154
5.15	MPD patch framework.....	155
5.15.1	Overview	155
5.15.2	MPD Patch Location.....	155
5.15.3	MPD patch document.....	156
5.15.4	Processing Model	158
5.15.5	Recommended Client Operation.....	159
6	Segment formats.....	159
6.1	General	159
6.2	Segment types.....	160
6.2.1	General.....	160
6.2.2	Initialization Segment	160
6.2.3	Media Segment.....	160

6.2.4	Index Segment	162
6.2.5	Bitstream Switching Segment	162
6.2.6	Missing Content Segment.....	162
6.3	Segment formats for ISO base media file format.....	162
6.3.1	General	162
6.3.2	Preliminaries: Refinements of generic concepts	163
6.3.2.5	Resynchronization Point	163
6.3.3	Initialization Segment format	164
6.3.4	Media Segment types.....	164
6.3.5	Self-Initializing Media Segment formats	166
6.4	Segment formats for MPEG-2 transport streams	166
6.4.1	General	166
6.4.2	Preliminaries: Refinements of generic concepts	167
6.4.3	Initialization Segment types and formats.....	168
6.4.4	Media Segment types and formats	169
6.4.5	Bitstream Switching Segment	169
6.4.6	Index Segment	170
6.4.7	Boxes used with MPEG-2 TS Index Segments	172
7	Combined semantics of MPD and Segment formats	172
7.1	Overview	172
7.2	General.....	173
7.2.1	Media Presentation timeline	173
7.2.2	Segment Index	174
7.2.3	Segment alignment	174
7.2.4	Subsegment alignment	174
7.3	Media Presentation based on the ISO base media file format	174
7.3.1	General	174
7.3.2	Media presentation timeline	175
7.3.3	Authoring Rules for specific MPD attributes	175
7.3.4	Sub-Representations	176
7.3.5	Segment Timeline without Segment Index.....	176
7.4	Media Presentation based on MPEG-2 TS	176
7.4.1	General	176
7.4.2	Media presentation timeline	177
7.4.3	Authoring rules for specific MPD attributes.....	177
7.4.4	Sub-Representations	178
8	Profiles.....	178
8.1	Definition	178
8.2	Full profile	180
8.2.1	General	180
8.2.2	Media Presentation Description constraints.....	180
8.2.3	Segment format constraints	180
8.3	ISO Base media file format On Demand profile.....	180
8.3.1	General	180
8.3.2	Media Presentation Description constraints.....	181
8.3.3	Segment format constraints	182
8.4	ISO Base media file format live profile.....	182
8.4.1	General	182
8.4.2	Media Presentation Description constraints.....	182
8.4.3	Segment format constraints	183
8.5	ISO Base media file format main profile.....	183
8.5.1	General	183
8.5.2	Media Presentation Description constraints.....	184

8.5.3	Segment format constraints	184
8.6	MPEG-2 TS main profile	185
8.6.1	General.....	185
8.6.2	Media Presentation Description constraints	185
8.6.3	Segment format constraints	185
8.6.4	Comments and recommendations	185
8.7	MPEG-2 TS simple profile	186
8.7.1	General.....	186
8.7.2	Media Presentation Description constraints	186
8.7.3	Segment format constraints	186
8.7.4	Recommendations	187
8.8	ISO Base media file format extended live profile.....	187
8.8.1	General.....	187
8.8.2	Media Presentation Description constraints	187
8.8.3	Segment format constraints	188
8.8.4	Inband Events	188
8.9	ISO Base media file format extended On Demand profile	188
8.9.1	General.....	188
8.9.2	Media Presentation Description constraints	189
8.9.3	Segment format constraints	190
8.10	ISO Base media file format common profile.....	190
8.10.1	General.....	190
8.10.2	Media Presentation Description constraints	190
8.10.3	Segment format constraints	191
8.11	ISO Base media file format broadcast TV profile.....	191
8.11.1	General.....	191
8.11.2	Media Presentation Description constraints	191
8.11.3	Segment format constraints	193
8.11.4	MPD Updates and Inband Event Streams	193
8.12	DASH profile for CMAF content	194
8.12.1	General.....	194
8.12.2	CMAF content model for DASH profile definition.....	194
8.12.3	CMAF to DASH Mapping Principles	197
8.12.4	DASH profiles for CMAF content - Common constraints	200
8.12.5	DASH CMAF Core Profile	208
8.12.6	DASH CMAF Extended Profile	208
8.12.7	Conformance Checking Considerations	208
	Annex A (informative) Example DASH Client behaviour	210
	Annex B (normative) MPD schema	234
	Annex C (normative) MIME type registration for MPD and other resources.....	235
	Annex D (normative) DASH Metrics	242
	Annex E (normative) Byte range requests with regular HTTP GET methods	251
	Annex F (informative) Guidelines for extending DASH with other delivery formats.....	254
	Annex G (informative) MPD Examples and MPD Usage.....	256
	Annex H (normative) Spatial Relationship Description.....	284
	Annex I (normative) Flexible Insertion of URL Parameters	293
	Annex J (informative) Open GOP resolution change	307
	Annex K (normative) DASH Service Description	308
	Bibliography.....	319

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 www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see patents.iec.ch).

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 www.iso.org/iso/foreword.html. In the IEC, see 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*.

This fifth edition cancels and replaces the fourth edition (ISO/IEC 23009-1:2020), which has been technically revised.

The main changes are as follows:

- DASH profile for using Common Media Application Format (CMAF) are added;
- The concept Resynchronization is added in order to identify stream access points in Segments;
- MPD patching is updated to support explicit MPD updates of smaller size, not only as inband messages;
- A client processing model for Event Streams and Timed Metadata tracks is introduced;
- Extensions are added to content protection for efficient signalling and to support robustness levels.
- A descriptor is added in order to describe the minimum required device output protection security;
- More flexible bandwidth signalling is provided to signal variable bitrate encoding.

A list of all parts in the ISO/IEC 23009 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 www.iso.org/members.html and <https://www.iec.ch/national-committees>.

Introduction

Dynamic adaptive streaming over HTTP (DASH) is intended to support a media-streaming model for delivery of media content in which control lies primarily with the client. Clients may request data using the HTTP protocol from standard web servers that have no DASH-specific capabilities. Consequently, this document focuses not on client or server procedures but on the data formats used to provide a DASH Media Presentation.

The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) draw attention to the fact that it is claimed that compliance with this document may involve the use of a patent.

ISO and IEC take no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured ISO and IEC that he/she is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO and IEC. Information may be obtained from the patent database available at www.iso.org/patents or <https://patents.iec.ch>.

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

Information technology — Dynamic adaptive streaming over HTTP (DASH) —

Part 1: Media presentation description and segment formats

1 Scope

This document primarily specifies formats for the Media Presentation Description and Segments for dynamic adaptive streaming delivery of MPEG media over HTTP. It is applicable to streaming services over the Internet.

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 13818-1, *Information technology — Generic coding of moving pictures and associated audio information — Part 1: Systems*

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

ISO/IEC 23000-19, *Information technology — Multimedia application format (MPEG-A) — Part 19: Common media application format (CMAF) for segmented media*

ISO/IEC 23091-2, *Information technology — Coding-independent code points — Part 2: Video*

ISO/IEC 23091-3, *Information technology — Coding-independent code points — Part 3: Audio*

IETF RFC 2397, *The “data” URL scheme*

IETF RFC 3629, *UTF-8, a transformation format of ISO 10646*

IETF RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax*

IETF RFC 4122, *A Universally Unique Identifier (UUID) URN Namespace*

IETF RFC 4337, *MIME Type Registration for MPEG-4*

IETF RFC 4648, *The Base16, Base32, and Base64 Data Encodings*

IETF RFC 5234, *Augmented BNF for Syntax Specifications: ABNF*

IETF RFC 5261, *An Extensible Markup Language (XML) Patch Operations Framework Utilizing XML Path Language (XPath) Selectors*

IETF RFC 5646, *Tags for Identifying Languages*

IETF RFC 6381, *The ‘Codecs’ and ‘Profiles’ Parameters for “Bucket” Media Types*

ISO/IEC 23009-1:2022(E)

IETF RFC 6838, *Media Type Specifications and Registration Procedures*

IETF RFC 7231, *Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content*

IETF RFC 7233, *Hypertext Transfer Protocol (HTTP/1.1): Range Requests*

IETF RFC 8141, *URN Syntax*

IETF RFC 8673, *HTTP Random Access and Live Content*

HTML 4.01 Specification, W3C Recommendation, 24 December 1999

W3C Canonical XML Version 1.1, W3C Recommendation, 2 May 2008

W3C Extensible Markup Language (XML) 1.0 (Fifth Edition), W3C Recommendation, 26 November 2008

W3C XLINK, XML Linking Language (XLink) Version 1.1, W3C Recommendation 06, May 2010

W3C Media Fragments URI 1.0 (basic), W3C Recommendation, 25 September 2012