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

**Part 3:
Implementation Guidelines**

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

Partie 3: Lignes directrices pour la mise en oeuvre



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2015

All rights reserved. Unless otherwise specified, 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
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

1	Scope	1
2	References	1
3	Terms, Definitions and Abbreviated Terms	2
4	Introduction.....	2
4.1	System overview	2
4.2	Normative parts	3
4.3	Main design principles.....	4
4.3.1	Common timeline	4
4.3.2	Data model	4
4.3.3	Segments	5
4.3.4	Segment types	6
4.3.5	Segment addressing schemes.....	6
4.3.6	Stream access points.....	6
4.4	Background on DASH profile concept.....	7
5	Guidelines for content generation.....	7
5.1	General guidelines	7
5.1.1	Video content generation	7
5.1.2	Audio content generation.....	9
5.1.3	Content preparation for live streaming.....	11
5.1.4	Guidelines for generation of segment file names.....	11
5.2	Guidelines for ISO-BMFF content generation	14
5.2.1	On-demand streaming	14
5.2.2	Live streaming	18
5.2.3	Enabling trick modes	19
5.2.4	Support for SubRepresentations.....	21
5.2.5	Enabling delivery format to storage file format conversion	22
5.3	Guidelines for MPEG-2 TS content generation.....	26
5.3.1	General recommendations	26
5.3.2	Live streaming	27
5.3.3	On demand streaming.....	28
5.4	Support for Advertisement Insertion.....	29
5.4.1	Use cases	29
5.4.2	MPD authoring	30
5.4.3	Example.....	30
5.4.4	The use of inband events	31
6	Client implementation guidelines	32
6.1	General	32
6.2	Client architecture overview	32
6.3	Example of client operation	33
6.4	Timing model for live streaming	33
6.4.1	General	33
6.4.2	MPD information.....	33
6.4.3	MPD times	34
6.4.4	Context derivation	34
6.4.5	Derivation of MPD times	35
6.4.6	Addressing methods.....	35
6.4.7	Scheduling playout	36
6.4.8	Validity of MPD	36
6.5	MPD retrieval.....	36
6.6	Segment list generation.....	37
6.6.1	General	37
6.6.2	Template-based generation of segment list.....	38

6.6.3	Playlist-based generation of segment list.....	39
6.6.4	Media segment list restrictions	39
6.7	Rate adaptation	40
6.8	Seeking	41
6.9	Support for trick modes	42
6.10	Stream switching	42
6.11	Client support for dependent representations	42
6.11.1	General.....	42
6.11.2	Client trick-mode support using SubRepresentations	43

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.

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.

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

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 TR 23009-3, which is a Technical Report of type 3, 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 TR 23009 consists of the following parts, under the general title *Information technology — Dynamic adaptive streaming over HTTP (DASH)*:

- *Part 1: Media presentation description and segment formats*
- *Part 2: Conformance and reference software*
- *Part 3: Implementation guidelines*
- *Part 4: Segment encryption and authentication*

Introduction

This Part of ISO/IEC 23009 provides guidelines for implementation and deployment of streaming media delivery systems based on ISO/IEC 23009 standard. These guidelines include

- guidelines for streaming content generation;
- guidelines for implementation of streaming clients; and
- guidelines for deployment of systems designed based on ISO/IEC 23009 standard.

Information technology — Dynamic adaptive streaming over HTTP (DASH) — Part 3: Implementation guidelines

1 Scope

This part provides technical guidelines for implementing and deploying systems based on ISO/IEC 23009 International Standard.

2 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 23009-1 Information technology — *Dynamic adaptive streaming over HTTP (DASH) — Part 1: Media presentation description and segment formats.*

ISO/IEC 23009-2 Information technology — *Dynamic adaptive streaming over HTTP (DASH) — Part 2: Conformance and reference software.*

ISO/IEC 23009-4 Information technology — *Dynamic adaptive streaming over HTTP (DASH) — Part 4: Format independent segment encryption and authentication.*

ITU-T Rec. H.222.0 | ISO/IEC 13818-1, *Information technology – Generic coding of moving pictures and associated audio information: Systems*

ITU-T Rec. H.262 | ISO/IEC 13818-2, *Information technology – Generic coding of moving pictures and associated audio information: Video*

ISO/IEC 13818-3, *Information technology – Generic coding of moving pictures and associated audio information: Audio*

ISO/IEC 14496-3, *Information technology – Coding of audio-visual objects – Part 3: Audio*

ITU-T Rec. H.264 | ISO/IEC 14496-10, *Information technology – Coding of audio-visual objects – Part 10: Advanced Video Coding*

ISO/IEC 14496-12, *Information technology – Coding of audio-visual objects – Part 12: ISO base media file format (technically identical to ISO/IEC 15444-12)*

ITU-T Rec. H.265 | ISO/IEC 23008-2, *Information technology – Coding of audio-visual objects – Part 2: High Efficiency Video Coding*

ISO/IEC 23003-1, *Information technology – MPEG audio technologies – Part 1: MPEG Surround*

ISO/IEC 23003-3, *Information technology – MPEG audio technologies – Part 3: Unified Speech and Audio Coding*

ISO/IEC 23001-7, *Information technology – MPEG systems technology – Part 7: Common encryption in ISO base media file format files*

ISO/IEC 23001-8, *Information technology – MPEG systems technologies – Part 8: Coding-independent code points*

IETF RFC 1521, *MIME (Multipurpose Internet Mail Extensions) Part One: Mechanisms for Specifying and Describing the Format of Internet Message Bodies*, September 1993

IETF RFC 1738, *Uniform Resource Locators (URL)*, December 1994

IETF RFC 2141, *URN Syntax*, May 1997

IETF RFC 2616, *Hypertext Transfer Protocol – HTTP/1.1*, June 1999

IETF RFC 3023, *XML Media Types*, January 2001

IETF RFC 3406, *Uniform Resource Names (URN) Namespace Definition Mechanisms*, October 2002

IETF RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax*, January 2005

IETF RFC 4122, *A Universally Unique Identifier (UUID) URN Namespace*, July 2005

IETF RFC 4337, *MIME Type Registration for MPEG-4*, March 2006

IETF RFC 5646, *Tags for Identifying Languages*, September 2009

IETF RFC 6381, *The 'Codecs' and 'Profiles' Parameters for "Bucket" Media Types*, August 2011

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

ETSI TS 101 154, *Digital Video Broadcasting (DVB); Implementation guidelines for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream*, September, 2009.

SCTE 172, *Constraints on AVC Video Coding for Digital Program Insertion*, 2011.

W3C, *Media Source Extensions*, W3C Recommendation (Draft), 18, January 2013.

W3C, *Encrypted Media Extensions*, W3C Recommendation (Draft), 22 January 2013.

3 Terms, Definitions and Abbreviated Terms

This document uses definitions, symbols, and abbreviated terms defined in ISO/IEC 23009-1.

Additionally, this document uses video coding terms defined in ISO/IEC 13818-2, ISO/IEC 14496-2, ITU-T Rec. H.264 | ISO/IEC 14496-10, and ITU-T Rec. H.265 | ISO/IEC 23008-2.

Additionally, this document uses audio coding terms defined in ISO/IEC 13818-1, ISO/IEC 14496-3, ISO/IEC 23003-1, and ISO/IEC 23003-3.

4 Introduction

4.1 System overview

Figure 1 shows a typical deployment scenario for Dynamic Adaptive Streaming over HTTP (DASH). The media encoding process generates segments containing different encoded versions of one or several of the media components of the media content. Each segment contains streams required for decoding and displaying a time interval of the content. The segments are then hosted on one or several media origin servers along with a Media Presentation Description (MPD) file. The media origin server may be a plain HTTP server conforming to RFC2616. The MPD information provides instructions on the location of segments as well as the timing and relation of the segments, i.e. how they form a media presentation. Based on this information in