Guidelines for Implementation: DASH-IF Interoperability Points

Living Document, 26 February 2019

This version:

https://dashif.org/guidelines/

Issue Tracking:

GitHub

Editors:

DASH Industry Forum

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1. Document editing notes§

Documentation: https://dashif.org/DocumentAuthoring/

Example document repository: https://dashif.org/DocumentAuthoring/

Live discussion in #document-authoring on Slack.

Scope Disclaimer

2. Introduction§

This document defines DASH-IF's InterOperability Points (IOPs). The document includes IOPs for only this version of the document. For earlier versions, please refer to version 1 [DASH-IF-IOP1] and version 2 [2] of this document. DASH-IF recommends to deprecate the IOPs in previous versions and deploy using one of the IOPs and extensions in this document.

As a historical note, the scope of the initial DASH-AVC/264 IOP, issued with version 1 of this document [1] was the basic support high-quality video distribution over the top. Both live and on-demand services are supported.

In the second version of this document [2], HD video (up to 1080p) extensions and several mul-tichannel audio extensions are defined.

In this third version of the DASH-IF IOP document, two new DASH-264/AVC IOPs are defined. Detailed refinements and improvements for DASH-IF live services and for ad insertion were added in these IOPs. One of these IOP is the superset of the simpler one. Additionally, two cor-responding IOPs are defined to also support HEVC [19]. In both cases, AVC and HEVC, the more advanced IOP adds additional requirements on the DASH client to support segment pars-ing to achieve enhancement of live services. This structuring separates the Media Profiles from DASH features.

In the fourth version, beyond minor improvements, corrections and alignment with MPEG-DASH third edition, the key additions are extensions for next generation audio and UHD/HDR video.

This document defines the IOPs in Table 1 and Extensions in Table 2. The Implementation Guideline's version in which each IOP or Extension was added is also provided in the tables.

Note that all version 1 IOPs are also defined in version 2 and therefore referencing version [2] is sufficient.

Table 1: *DASH-IF Interoperability Points*

DASH-IF Interoperability Point	*Identifier*	*Version*	*Reference*
DASH-AVC/264	http://dashif.org/guidelines/dash264	1.0	[2], 6.3
DASH-AVC/264 SD	http://dashif.org/guidelines/dash264#sd	1.0	[2], 7.3
DASH-AVC/264 HD	http://dashif.org/guidelines/dash264#hd	2.0	[2], 8.3
DASH-AVC/264 main	http://dashif.org/guidelines/dash264main	3.0	8.2
DASH-AVC/264 high	http://dashif.org/guidelines/dash264high	3.0	8.3
DASH-IF IOP simple	http://dashif.org/guidelines/dash-if-simple	3.0	8.4
DASH-IF IOP main	http://dashif.org/guidelines/dash-if-main	3.0	8.5
DASH-IF IOP on-demand	http://dashif.org/guidelines/dash-if-ondemand	4.3	3.10.3
DASH-IF IOP mixed on-demand	http://dashif.org/guidelines/dash-if-mixed	4.3	3.10.4

Note that all extensions defined in version 2 of this document are carried over into version 3 without any modifications. In order to maintain a single document, referencing in Table 2 is restricted to this document.

Table 2: *DASH-IF Interoperability Point Extensions*

Extension	*Identifier*	*Version*	*Section*
DASH-IF multichannel audio extension with Enhanced AC-3	http://dashif.org/guidelines/dashif#ec-3	2.0	9.4.2.3
DASH-IF multichannel extension with Dolby TrueHD	http://dashif.org/guidelines/dashif#mlpa	2.0	9.4.2.3
DASH-IF multichannel extension with AC-4	http://dashif.org/guidelines/dashif#ac-4	3.1	9.4.2.3
DASH-IF multichannel audio extension with DTS Digital Surround	http://dashif.org/guidelines/dashif#dtsc	2.0	9.4.3.3
DASH-IF multichannel audio extension with DTS-HD High Resolu-tion and DTS-HD Mas-ter Audio	http://dashif.org/guidelines/dashif#dtsh	2.0	9.4.3.3
DASH-IF multichannel audio extension with DTS Express	http://dashif.org/guidelines/dashif#dtse	2.0	9.4.3.3
DASH-IF multichannel extension with DTS-HD Lossless (no core)	http://dashif.org/guidelines/dashif#dtsl	2.0	9.4.3.3
DASH-IF multichannel audio extension with MPEG Surround	http://dashif.org/guidelines/dashif#mps	2.0	9.4.4.3
DASH-IF multichannel audio extension with HE-AACv2 level 4	http://dashif.org/guidelines/dashif#heaac-mc51	2.0	9.4.5.3
DASH-IF multichannel audio extension with HE-AACv2 level 6	http://dashif.org/guidelines/dashif#heaac-mc71	2.0	9.4.5.3
DASH-IF multichannel audio extension with MPEG-H 3D Audio	http://dashif.org/guidelines/dashif#mpeg-h-3da	4.2	9.4.6.3
DASH-IF audio exten-sion with USAC	http://dashif.org/guidelines/dashif#cxha	4.3	9.4.7.3
DASH-IF UHD HEVC 4k	http://dashif.org/guidelines/dash-if-uhd#4k	4.0	10.2
DASH-IF HEVC HDR PQ10	http://dashif.org/guidelines/dash-if-uhd#hdr-pq10	4.0	10.3

DASH-IF UHD Dual-Stream (Dolby Vision)	http://dashif.org/guidelines/dash-if-uhd#hdr-pq10	4.1	10.4
DASH-IF VP9 HD	http://dashif.org/guide-lines/dashif#vp9	4.1	11.3.1
DASH-IF VP9 UHD	http://dashif.org/guidelines/dash-if-uhd#vp9	4.1	11.3.2
DASH-IF VP9 HDR	http://dashif.org/guide-lines/dashif#vp9-hdr \n http://dashif.org/guidelines/dash-if-uhd#vp9-hdr	4.1	11.3.3

In addition to the Interoperability points in Table 1 and extensions in Table 2, this document also defines several other identifiers and other interoperability values for functional purposes as documented in Table 3.

Table 3: *Identifiers and other interoperability values defined in this Document*

Identifier	*Semantics*	*Type*	*Section*
http://dashif.org/identifiers/vast30	Defines an event for signalling events of VAST3.0	Event	5.6
http://dashif.org/guidelines/trickmode	Defines a trick mode Adaptation Set.	Functionality	3.2.9
http://dashif.org/guidelines/clearKey	Defines name space for the Laurl element in W3C	Namespace	7.6.2.4
e2719d58-a985-b3c9-781a-b030af78d30e	UUID for W3C Clear Key with DASH	Content Protection	7.6.2.4
http://dashif.org/guidelines/last-segment-number	Signaling last segment number	Functionality	4.4.3.6
http://dashif.org/guidelines/thumbnail_tile	Signalling the availability of the thumbnail tile adaptation set	Functionality	6.2.6

DASH-IF supports these guidelines with test and conformance tools:

- DASH-IF conformance software is available for use online at http://dashif.org/conformance.html [32]. The software is based on an open-source code. The frontend source code and documentation is available at: https://github.com/Dash-Industry-Forum/Conformance-Software. The backend source code is available at: https://github.com/Dash-Industry-Forum/Conformance-and-reference-source.
- DASH-IF test assets (features, test cases, test vectors) along with the documentation are available at http://testassets.dashif.org [31].
- DASH Identifiers for different categories can be found at http://dashif.org/identifiers/ [33]. DASH-IF supporters are encouraged that external identifiers are submitted for doc-umentation there as well. Note also that DASH-IF typically tries to avoid defining iden-tifiers. Identifiers in italics are subject to discussion with other organizations and may be deprecated in a later version.

Technologies included in this document and for which no test and conformance material is provided, are only published as a candidate technology and may be removed if no test material is provided before releasing a new version of this guidelines document.

3. References§

See v4.3 references

4. Conventions, Context, Terms and Definitions§

4.1. Relation to MPEG-DASH§

4.2. Conventions§

- usage of keywords
- Formats

see v4.3 and bug filed by Sander

4.3. Abbreviations§

see v4.3

4.4. Terms and Definitions§

see v4.3 (may be hotlinked in bikeshed, auto generated)

5. General DASH Features§

5.1. Architecture§

- High-level end-to-end streaming architecture
- ABR Encoder
- Encryption
- File Format Architecture
- DASH Packager and MPD Generator
- Origin Server
- CDN
- DASH Client
    - DASH access client
        - Selection
        - Download
    - Media Pipeline

Reference other DASH activities (Ingest, CPIX, SAND, etc.)

(re-use low-latency architecture)

5.2. Formats§

(new clause with some usage from clause 3.2.1)

5.2.1. MPD§

- General high-level requirements

5.2.2. Segments§

- Segment Formats in DASH
- Requirements
- Connect to CMAF and cmf2

5.2.3. Segment Addressing Schemes§

- SegmentTemplate
  - $Number$ and $Time$
- Self-Initializing
  - Single Segment with Segment Index
- Explain why we use different addressing
- Follows clause 3.5 of https://dashif-documents.azurewebsites.net//DASH-IF-IOP/pull/210/DASH-IF-IOP.html#timing-addressing

5.3. Protocol Considerations§

See clause 3.4 in v4.3

5.4. Location and Reference Resolution§

See clause 3.2.15 in v4.3

5.5. Client-Server Synchronization§

See clause 3.5 and 4.7 in v4.3

https://dashif-documents.azurewebsites.net//DASH-IF-IOP/pull/210/DASH-IF-IOP.html#timing-sync

5.6. Client Reference Model§

Refer to dash.js and MSE

(new clause) point to CTA WAVE Device Playback

5.7. Media Presentation Data Model§

5.7.1. Timing Model§

- Features

- Content Offering Requirements and Recommendations
- Client Requirements and Recommendations

See 3.2.7 and document from Sander

https://dashif-documents.azurewebsites.net//DASH-IF-IOP/pull/210/DASH-IF-IOP.html#timing-period

https://dashif-documents.azurewebsites.net//DASH-IF-IOP/pull/210/DASH-IF-IOP.html#timing-representation

5.7.2. Content Annotation and Selection§

- Features
- Content Offering Requirements and Recommendations
- Client Requirements and Recommendations

See 3.9 and document from Sander

5.7.3. Adaptive Switching§

- Features
- Content Offering Requirements and Recommendations
- Client Requirements and Recommendations

(Adaptation Set, segment and subsegment alignment)

https://dashif-documents.azurewebsites.net//DASH-IF-IOP/pull/210/DASH-IF-IOP.html#timing-segmentalignment

5.7.4. Segment Timing§

See clause 4.3 as well as document from Sander 3.5-3.5.4

https://dashif-documents.azurewebsites.net//DASH-IF-IOP/pull/210/DASH-IF-IOP.html#timing-sampletimeline

- @duration
- Segment Timeline
- Segment Index

5.8. Bandwidth Signaling§

- Minbuffertime
- @bandwidth
- Segment Index

See clause 3.2.8

5.9. Service Types§

See clause 3.6

On-Demand Services

- On-Demand Services
  - MPD Signaling
  - Reference to clause X
- Live Services
  - Content availability, time shift window and presentation delay concepts (Sander's 3.8-3.9.4)
  - MPD Signaling
  - MPD updates (Sanders 3.8.5)
  - Reference to clause X

5.10. Media in DASH§

(new clause)

5.10.1. Media in one Period§

- Features
- Content Offering Requirements and Recommendations
- Client Requirements and Recommendations
- Text from Sander 3.6

5.10.2. Media Across Periods§

- Features
- Content Offering Requirements and Recommendations
- Client Requirements and Recommendations
- Text from Sander 3.7

5.10.3. Requirements and Recommendation for Media Codecs in DASH§

- General Statements on how to add
- Capabilities
- Requirements on what needs to be defined (CMAF relation)

5.11. Events§

(new clause)

5.12. Remote Elements§

(new clause)

Text from Sander 3.9

https://dashif-documents.azurewebsites.net//DASH-IF-IOP/pull/210/DASH-IF-IOP.html#timing-xlink

5.13. Profiles and Interop§

Clause 2.4

5.14. Examples§

Clause 2.4

6. On-Demand Services§

Clause 3.10

7. Live Services§

Clause 4, but reduced as some issues are moved to general clause

https://dashif-documents.azurewebsites.net//DASH-IF-IOP/pull/210/DASH-IF-IOP.html#timing-dynamic

8. Content Replacement and Ad Insertion§

Newly developed in Ad Insertion TF

- Content conditioning and splicing

9. Content Protection and Security§

Based on Clause

10. Video in DASH§

(new clause adding all codecs in IOP)

(focusses on very specific issues following the general requirements from clause 4)

10.1. General§

10.1.1. MPD and Adaptation Set Signaling§

10.1.2. Segment Formats§

10.2. H.264/AVC§

(add a table with media profiles and reference CMAF) (create a clause with specific issues)

10.3. H.265/HEVC§

(add a table with media profiles and reference CMAF) (create a clause with specific issues)

10.4. VP9§

11. Audio in DASH§

(new clause adding all codecs in IOP) (focusses on very specific issues following the general requirements from clause 4) test;

11.1. General§

11.1.1. MPD and Adaptation Set Signaling§

11.1.2. Segment Formats§

11.2. (Codec 1)§

(add a table with media profiles and reference CMAF) (create a clause with specific issues)

11.3. (Codec 2)§

(add a table with media profiles and reference CMAF) (create a clause with specific issues)

12. Subtitles in DASH§

(new clause adding all codecs in IOP) (focusses on very specific issues following the general requirements from clause 4)

12.1. General§

12.1.1. MPD and Adaptation Set Signaling§

12.1.2. Segment Formats§

12.2. (Codec 1)§

(add a table with media profiles and reference CMAF) (create a clause with specific issues)

12.3. (Codec 2)§

(add a table with media profiles and reference CMAF) (create a clause with specific issues)

13. Other DASH Features§

13.1. Seek Preview and Thumbnail Navigation§

14. Annex Exclusions from MPEG-DASH§

This section list the exclusions and forbidden options of MPEG-DASH. Sanders 3.10 Forbidden techniques goes here

Conformance§

Conformance requirements are expressed with a combination of descriptive assertions and RFC 2119 terminology. The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in the normative parts of this document are to be interpreted as described in RFC 2119. However, for readability, these words do not appear in all uppercase letters in this specification.

All of the text of this specification is normative except sections explicitly marked as non-normative, examples, and notes. [RFC2119]

Examples in this specification are introduced with the words “for example” or are set apart from the normative text with `class="example"`, like this:

> EXAMPLE 1
> This is an example of an informative example.

Informative notes begin with the word “Note” and are set apart from the normative text with `class="note"`, like this:

> Note, this is an informative note.

References§

Normative References§

[RFC2119]
S. Bradner. Key words for use in RFCs to Indicate Requirement Levels. March 1997. Best Current Practice. URL: https://tools.ietf.org/html/rfc2119

Informative References§

[DASH-IF-IOP1]
DASH-IF. DASH-264/AVC Interoperability Points. version 1.0. URL: http://dashif.org/w/2013/06/DASH-AVC-264-base-v1.03.pdf