INTERNATIONAL STANDARD

ISO/IEC 23009-8

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

Part 8:
Session-based DASH operations

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Technologies de l'information — Diffusion adaptative dynamique sur HTTP (DASH) —

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Foreword

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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/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 www.iec.ch/national-committees.

Introduction

Dynamic adaptive streaming over HTTP (DASH) enables media-streaming model for delivery of media content in which control lies exclusively with the client. Clients may request data using the HTTP protocol from standard web servers that have no DASH-specific capabilities. Consequently, the ISO/IEC 23009 series focuses not on client or server procedures but on the data formats used to provide a DASH Media Presentation.

This document provides methods, interfaces and data for session-based operations to be used with the DASH standard. Session-based operations allows customization of requested segment URLs based on the information provided for a specific streaming session.

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

Part 8:
Session-based DASH operations

1   Scope

This document specifies the format of the Session-Based Description document and the MPD's extension to be used in session-based operations with MPEG DASH (ISO/IEC 23009-1).

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 23009-1:2019, *Information technology — Dynamic adaptive streaming over HTTP (DASH) — Part 1: Media presentation description and segment formats*

IETF RFC 7230, *Hypertext Transfer Protocol — HTTP/1.1, June 2014*

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

IETF RFC 8259, *The JavaScript Object Notation (JSON) Data Interchange Format, December 2017*

3   Terms, definitions, abbreviated terms and notations

3.1   Terms and definitions

For the purposes of this document, the following terms and definitions 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

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

3.1.1
SBDStart
starting time of the session-based description

3.1.2
session
sequence of DASH client actions resulting in a unique playback of a media asset

3.1.3
session-based description
collection of timed key-value pairs providing a value given a time range within the session

3.1.4
session-based client
client capable of parsing SBD and adding queries to the DASH segment requests accordingly

3.1.5
sidecar document
document that stores data which is not supported by the format of the main document

3.2 Abbreviated terms

DASH dynamic adaptive streaming over HTTP, as specified in ISO/IEC 23009-1

HTTP hypertext transfer protocol, as specified in RFC 7230 (HTTP/1.1).

HTTPS secure version of the hypertext transfer protocol

ISO-BMFF ISO Base Media File Format, as specified in ISO/IEC 14496-12

MIME multipurpose internet mail extensions, as specified in RFC 6838

MPD media presentation description, as specified in ISO/IEC 23009-1

SBD session-based description, as defined in this document

URI uniform resource identifier

URL uniform resource locator

URN uniform resource name

3.3 Notation

This document follows the notation used in ISO/IEC 23009-1.

The following naming conventions apply in this document:

— Elements in an XML document are identified by an upper-case first letter and in boldface as `Element`. To express that an element `Element1` is contained in another element `Element2`, the following format is used: `Element2.Element1`. If an element's name consists of two or more combined words, PascalCase is typically used, e.g. `ImportantElement`. Elements may be present either exactly once, or the minimum and maximum occurrence as defined by <minOccurs> ... <maxOccurs>.

— Attributes in an XML document are identified by a lower-case first letter and they are preceded by an '@'-sign, e.g. `@attribute`. To point to a specific attribute `@attribute` contained in an element `Element`, one may write `Element@attribute`. If an attribute's name consists of two or more combined words, camelCase is typically used after the first word, e.g. `@veryImportantAttribute`. Attributes may have assigned a status in the XML as mandatory (M), optional (O), optional with a default value (OD), and conditionally mandatory (CM).

— Namespace qualification of elements and attributes is used as per XML standards, in the form of `namespace:Element` or `@namespace:attribute`. The fully qualified namespace is provided in the schema fragment associated with the declaration. External specifications extending the namespace of DASH are expected to document the element name in the semantic table with an extension namespace prefix.

— JSON items are identified by a lower-case first letter. If an item consists of two or more combined words, camel-casing is typically used.

— Variables defined in the context of this document are specifically highlighted with *italics,* e.g., *InternalVariable*.

— The term "this clause" refers to the entire clause included within the same first heading number. The term "this subclause" refers to all text contained in the subclause with the lowest hierarchy heading.

4 General overview

4.1 Sessions and session parameters

While the DASH viewing session per client is a unique interaction, the MPD is often cached on the Content Delivery Network (CDN) and shared by multiple viewing sessions of the same asset. The session-based description mechanism allows adding session-specific elements to segment URLs without generating unique per-session MPDs.

Session parameter strings are strings pertaining to a specific time range on the timeline. These strings are parsed by the Session-based description client and are translated into parameters to be added to HTTP segment request(s) issued by the DASH client.

A Session-Based description Document (SBD) includes the time ranges and the corresponding strings, along with additional metadata. The SBD is referenced in the MPD by its URL. This clause describes the overall SBD data model.

For example, let parameters "p1" and "p2" to be expected carrying information in the query part of the segment request URL. For time range 00:00:00-00:00:42, the "p1" value is "foo" and the "p2" value is 42. For the time range 00:00:42-00:04:20, "p1" is "bar" and "p2" is 420. In the case of two-second segments, the first 21 segments would include "p1=foo&p2=42" as a part of their URL query parameters, and the following 109 segments would include "p1=bar&p2=420" as a part of the segment URL in the HTTP GET request.

The information carried in SBD can be conceptually presented in a table with each row corresponding to a time range, and each column corresponding to one named parameter. Table 1 demonstrates the conceptual layout of SBD carrying the information for the above example.

Table 1 — Conceptual sidecar document layout

Start time	p1	p2
00:00:00	foo	42
00:00:42	bar	420
00:04:20	null	null

4.2 General architecture

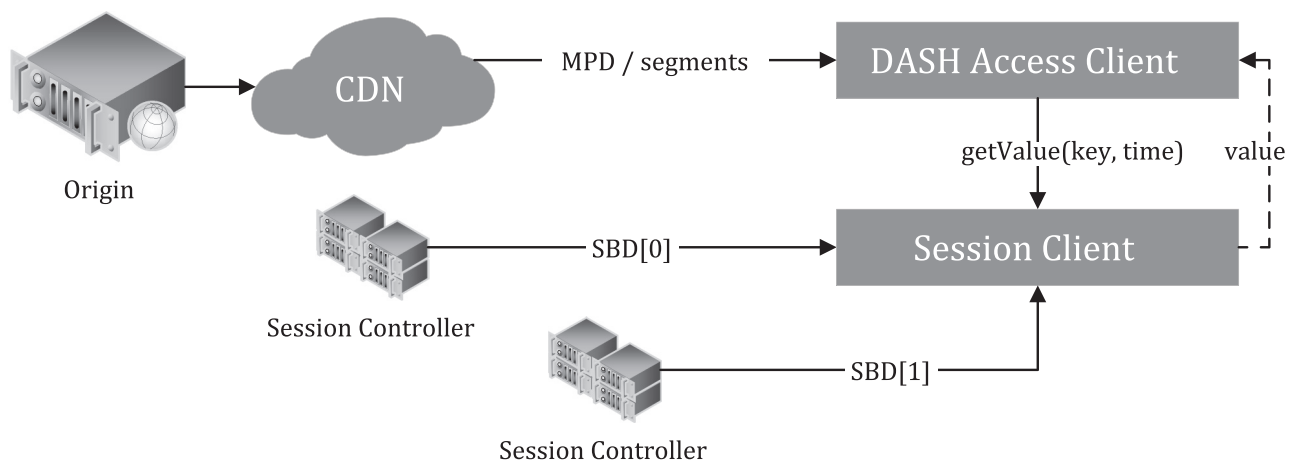Figure 1 shows the general architecture for session-based DASH operations.

Figure 1 — High-level architecture of session-based DASH operations.

In this figure, the media content is described by MPD, and the corresponding media segments are delivered in the media delivery path. MPD also has a reference to an external document, Session-Based Description (SBD) document, which defines the variables and their values for the current session. SBD is parsed and interpreted by an SBD client.

This SBD client is conceptually a simple timed key-value store. It accepts requests for a named variable value given a time range and returns a string value.

The DASH client uses the variables and the associated values provided in the SBD to derive an added part to the segment URL's query when the segment is requested using HTTP GET.

Note that there may be multiple session controllers controlling multiple aspects of the session, each of which providing one SBD document (e.g., one controlling forensic watermarking and another controlling access tokens).

Note   This document does not preclude the use of newer versions of HTTP, such as HTTP/2, as this document only relies on the existence of the GET method.

4.3   Timeline and orderline addressing

The SBD document may conceptually include one or more tables, each containing the key-value pair assignments for different time intervals, as shown in Table 2.

Table 2 — An example of SBD timing table

Start time	k_1	k_2	…	k_n
t_1	$v_{1,1}$	$v_{1,2}$	…	$v_{1,n}$
t_2	$v_{2,1}$	$v_{2,2}$	…	$v_{2,n}$
…	…	…	…	…
t_m	$v_{m,1}$	$v_{m,2}$	…	$v_{m,n}$

In Table 2, t_i indicates the moment i in the media timeline, and $(k_j, v_{i,j})$ are the key-value pair j for time interval (t_i, t_{i+1}).

Alternatively, The SBD document may conceptually include one or more tables, each containing the key-value pair information for segments order as shown in Table 3.

Table 3 — An example of SBD order table

Order	k_1	k_2	…	k_n
n_1	$v_{1,1}$	$v_{1,2}$	…	$v_{1,n}$
n_2	$v_{2,1}$	$v_{2,2}$	…	$v_{2,n}$
…	…	…	…	…
n_m	$v_{m,1}$	$v_{m,2}$	…	$v_{m,n}$

In Table 3, n_i indicates segment i and $(k_j, v_{i,j})$ are the key-value pair j for all segments from segment i to segment $i + 1$ but not including segment $i + 1$.

5   MPD signalling for SBD

5.1   General

To signal the session-based information in the DASH manifest, a descriptor is defined in this clause. This descriptor shall be used in MPD, ISO/IEC 23009-1.

5.2 SBD descriptor

5.2.1 General

An SBD descriptor is an EssentialProperty descriptor with URN "urn:mpeg:dash:sbd:2020" as its @schemeIdUri and may contain one or more **KeyList** elements, as is shown in Table 4.

5.2.2 Semantics

Table 4 — MPD EssentialProperty Descriptor attributes for session-based DASH

Element or Attribute Name	Use	Description
EssentialProperty		instantiation of EssentialProperty (defined in ISO/IEC 23009-1) for session-based DASH operations
@schemeIdUri	M (string)	shall be set to "urn:mpeg:dash:sbd:2020".
@value	M (string)	URL of the SBD document for this session
@template	O	template for applying to the key-value pair found in SBD document. When the value of a **Key**@name in the @template is found in the SBD document, its corresponding key-value pair of SBD document shall replace the string between unescaped '$' characters in the @template. The @template value shall have no whitespace characters. If absent, **Key**@name and its corresponding value in the SBD document, separated by '=', shall be added to the end of the query, where each consecutive key-value pairs are separated by '&'. The order of key-value pairs in the query is defined by the order of **Key** elements in this descriptor.
Key	1..N	a key name to be found in SBD document and its default value. If absent, all keys and corresponding values in the corresponding keyList of the SBD document shall be added to the (sub) segment request URL query.
@name	M	Name of the key of the SBD document to be added to the queries for this session after processing described by @template. This value shall be a string without whitespaces, start with a letter, and contain only unreserved characters per RFC 3986. If @name value does not appear in the keyList of SBD document, the @name value-@defaultValue value pair shall be used in the template or in the absence of the template.
@defaultValue	OD ('null')	default value in key-value pair if @name value not found in SBD document or if there is no value defined for a requested time range or segment number in the SBD document.

Key:

For attributes: M=Mandatory, O=Optional, OD=Optional with Default Value, CM=Conditionally Mandatory.

For elements: <minOccurs>…<maxOccurs> (N=unbounded)

Elements are **bold**; attributes are non-bold and preceded with an @.

The above **EssentialProperty** element may appear at one or more levels for the MPD hierarchical data model, one or more times.

NOTE   Adding parameterized queries to SBD URL can be achieved by using ISO/IEC 23009-1:2019, Annex I.

5.2.3 XML schema