

IEEE Standard for Adaptive Streaming

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IEEE Standard for Adaptive Streaming

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Abstract: The media presentation description (MPD) format and media segment format for dynamic and adaptive streaming over networks such as Hypertext Transfer Protocol (HTTP) are specified in this standard. Particularly, the specified formats support multi-stream synchronization, content protection, and content authentication. The target applications and services include, but are not limited to, Internet media streaming, Internet Protocol television (IPTV), and video on demand.

Keywords: adaptive streaming, content security, IEEE 1857.7™, media presentation, MPD, media presentation description, multi-stream, ownership, segment

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Xilin Chen
Zongming Guo
Cheng Huang
Tiejun Huang

Li Liu
Yongliang Liu
Xin Wang

Yiling Xu
Xinggong Zhang
Haiwu Zhao
Chao Zhou

The following members of the individual balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

Ping An
Demetrio Bucaneg
Keith Chow
Weiming Dong
Wen Gao
Randall Groves
Chenchen Gu
Yun He
Werner Hoelzl
Qingming Huang
Tiejun Huang
Noriyuki Ikeuchi
Meng Jian
Ming Jiang
Guorong Li
Haojie Li

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Fan Liang
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Xiaohui Liu
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Honggang Qi
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Introduction

This introduction is not part of IEEE Std 1857.7-2018, IEEE Standard for Adaptive Streaming.

This standard specifies the media presentation description (MPD) format and media segment format for dynamic and adaptive streaming over networks such as Hypertext Transfer Protocol (HTTP).

Contents

1. Overview	9
1.1 Scope	9
1.2 Purpose	9
2. Normative references.....	9
3. Definitions	10
4. Abbreviations and acronyms	11
5. Conventions.....	12
6. Architecture	12
7. Media presentation description (MPD)	14
7.1 Overview	14
7.2 XML structure	14
7.3 Hierarchical data model.....	14
7.4 Program information.....	41
7.5 Descriptors.....	42
7.6 Events	43
8. Segment.....	50
8.1 Introduction	50
8.2 Segment types.....	50
8.3 Segment formats for ISO base media file format (ISOBMFF).....	51
8.4 Segment formats for MPEG-2 TS	52
9. Content security.....	53
9.1 Introduction	53
9.2 MPD security	54
9.3 Media content segment encryption	55
9.4 Media content authentication.....	58
9.5 URL authorization	60
Annex A (normative) MPD Schema	61
Annex B (informative) Examples for XML encryption of MPD confidential elements and attributes	68
Annex C (informative) Examples for XML signature of MPD elements.....	70
Annex D (informative) Bibliography	72

IEEE Standard for Adaptive Streaming

1. Overview

1.1 Scope

This standard specifies the media presentation description (MPD) format and media segment format for dynamic and adaptive streaming over networks such as Hypertext Transfer Protocol (HTTP). Particularly, the specified formats support multi-stream synchronization, content protection, and content authentication.

1.2 Purpose

This standard specifies the MPD format and media segment format for dynamic and adaptive streaming over networks such as HTTP, with highlighted features of multi-stream synchronization, content protection, and content authentication. The target applications and services include, but are not limited to, Internet video, on-demand streaming, and live streaming.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

GB/T 20090.1, Information technology—Advanced coding of audio and video—Part 1: System.¹

GB/T 20090.9, Information technology—Advanced coding of audio and video—Part 9: File format.

IETF RFC 1738, Uniform Resource Locators (URL).²

IETF RFC 2616, Hypertext Transfer Protocol – HTTP/1.1.

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

¹ GB/T documents are available from the Standardization Administration of China (<https://www.chinesestandard.net>) and from the American National Standards Institute (<http://www.ansi.org/>).

² IETF RFCs are available from the Internet Engineering Task Force (<https://www.ietf.org/rfc.html>).

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

IETF RFC 5646, Tags for Identifying Languages.

ISO/IEC 23009-1, Dynamic adaptive streaming over HTTP (DASH).³

3. Definitions

For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.⁴

adaptation set: Set of interchangeable encoded versions of one or several media content components.

authentication tag: Cryptographic checksum of data, to discover unexpected error or intended tampering.

bitstream switching segment: Segment that, if present, contains essential data to switch to the representation to which it is assigned.

continuous media: Media with an inherent notion of time, for example, speech, audio, video, timed text or timed metadata.

crypto period: Number of consecutive segments encrypted with the same key and initialization vector.

earliest presentation time (EPT): Smallest presentation time of any access unit of a media segment for a media stream.

encryption system: System encrypting media segments with keys provided by key system.

HTTP-URL: Uniform Resource Locator beginning with http:// or https://.

initialization segment: Segment containing metadata that is necessary to present the media streams encapsulated in media segments.

key system: System providing keys to encrypt media segments.

media content: One media content period or a contiguous sequence of media content periods.

media presentation description (MPD): Formalized description for a media presentation for the purpose of providing a streaming service.

media presentation timeline: Concatenation of the timeline of all periods which itself is common to all representations in the period.

media presentation: Collection of data that establishes a presentation of media content.

³ ISO/IEC documents are available from the International Organization for Standardization (<https://www.iso.org/>) and from the International Electrotechnical Commission (<http://www.iec.ch>). These documents are also available from the American National Standards Institute (<http://www.ansi.org/>).

⁴ *IEEE Standards Dictionary Online* is available at: <http://dictionary.ieee.org>.

media segment: Segment that complies with media format in use and enables playback when combined with zero or more preceding segments, and an initialization segment (if any).

period: Interval of the media presentation, where a contiguous sequence of all periods constitutes the media presentation.

representation: Collection and encapsulation of one or more media streams in a delivery format and associated with descriptive metadata.

segment number: A unique integer associated with a media segment in a representation, with the segment following segment N having segment number of N+1.

segment: Unit of data associated with an HTTP-URL and optionally a byte range that are specified by a media presentation description (MPD).

stream access point (SAP): Position in a representation enabling playback of a media stream to be started using only the information contained in representation data starting from that position onwards (preceded by initializing data in the initialization segment, if any).

trick mode: An operation mode enabling user to make quick preview and locate interested video clips.

4. Abbreviations and acronyms

This standard contains the following abbreviations and acronyms:

AVS	audio and video coding standard
AES	Advanced Encryption Standard
DASH	Dynamic Adaptive Streaming over HTTP
EMPT	external media presentation time
EPT	earliest presentation time
HTTP	Hypertext Transfer Protocol
ISOBMFF	ISO base media file format
IV	initialization vector
MPD	media presentation description
SAP	stream access point
TS	transport stream
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
URN	Uniform Resource Name
XML	Extensible Markup Language

5. Conventions

The following naming conventions apply in this standard.

- Elements in an Extensible Markup Language (XML) document are identified by an uppercase first letter and in boldface, e.g., **Element**. To express that an element Element1 is contained in another element Element2, one may write **Element2.Element1**. If an element's name consists of two or more combined words, camel-casing is typically used, e.g., **ImportantElement**. Elements may be present either exactly once or with the minimum and maximum occurrence defined by <minOccurs> ... <maxOccurs>.
- Attributes in an XML document are identified by a lowercase first letter as well as by being preceded by a '@' ("at" 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, camel-casing is typically used after the first word, e.g., @veryImportantAttribute. Attributes may be assigned a status in the XML as mandatory (M), optional (O), optional with default value (OD), and conditionally mandatory (CM).
- Namespace qualification of elements and attributes is used in accordance with XML standards, in the form of namespace:**Element** or @namespace:attribute. The fully qualified namespace will be provided in the schema fragment associated with the declaration.
- Variables defined in the context of this standard are specifically highlighted with italics, e.g., *InternalVariable*.
- Structures that are defined as part of the hierarchical data model are identified by an uppercase first letter, e.g., Period, Adaptation Set, Representation, Segment.

6. Architecture

The architecture of Audio and Video Coding Standard Adaptive Streaming over HTTP (shortened as AVS-AS) is illustrated in Figure 1. AVS-AS mainly specifies the formats of media presentation description (MPD) (a modified version of the MPD defined in ISO/IEC 23009-1)⁵ and segment for adaptive streaming over HTTP.

- MPD
MPD is formatted description of media presentation for providing streaming services. Specifically, the resource identifiers of segments and the context of identified resource in media presentation are defined. The resource identifier is HTTP-URL and may be combined with byte range.
- Segment
Segment format refers to the format of the resource identified in an MPD and requested by IETF RFC 2616. Segments usually contain coded media data and metadata.

⁵ Information on references can be found in Clause 2.

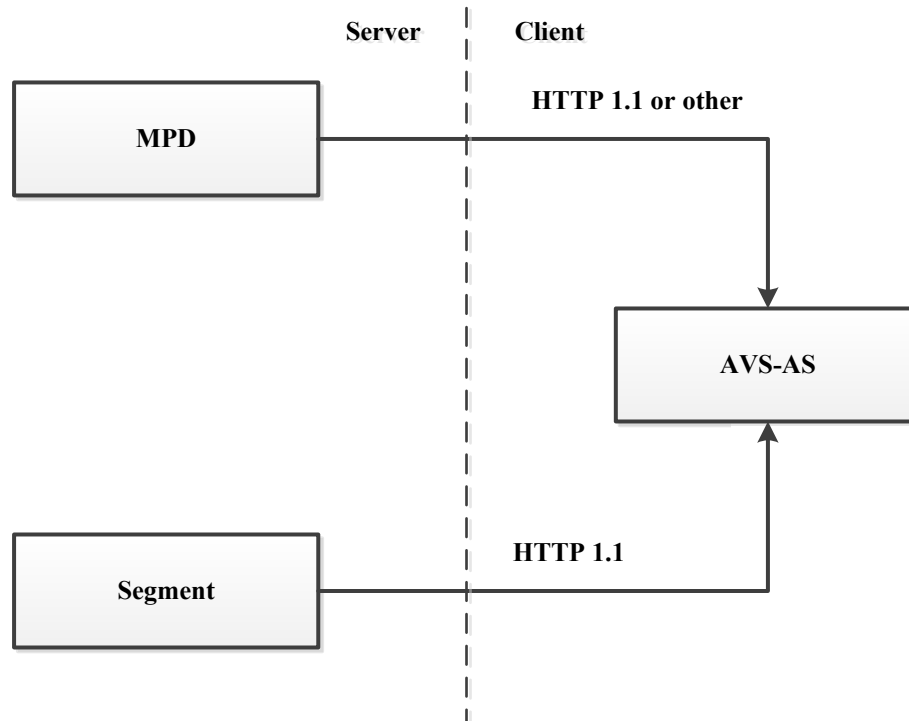


Figure 1—Architecture of AVS-AS

The new features of AVS-AS extended to MPEG Dynamic Adaptive Streaming over HTTP (DASH) include the following:

- Multi-stream
The identifier of multi-stream and its function are defined. During the playback of a video, new streams could be inserted if triggered by specific events. The time of insertion and the relation between inserted stream and original video are specified by properties of a multi-stream.
- Ownership notification
Ownership notification is formed by identifier, author, flag of unauthorized copy, and operation list predefined by the author. AVS-AS client can decide whether to perform the operations listed in the operation list according to the flag of unauthorized copy.
- Alignment of time axis
Signaling of alignment of time axis based on inband events is defined. According to such signaling, AVS-AS client can determine the location of external resources in the event of alignment of time axis and external media presentation time (EMPT) to which the external media resources are mapped.
- Content security
The carriage and signaling of protection information for confidentiality, authenticity, and integrity of media content are specified.

AVS-AS server generates slices for the original video and the corresponding MPD file. MPD provides enough information for the AVS-AS client so that it can request segments from the HTTP server and then de-multiplex, decode, and play media streams contained in segments. If the media content contained in segments is protected, then it is required that the protected media content be decrypted before decoding. Note that the client is not defined by this standard.

7. Media presentation description (MPD)

7.1 Overview

Media presentation is a set of data that is accessed by clients and used to provide streaming media service to users. Media presentation includes coded and transportable media content and its proper description. MPD is an XML document containing metadata, which is used by AVS-AS clients to construct proper HTTP-URLs to access segments and provide streaming media service for users. A media presentation is described by a media presentation description and its updates.

7.2 XML structure

This subclause provides initial parts of XML structure for MPD, including naming space and other definition. Detailed types, elements, and properties are specified in the following subclauses. Annex A presents complete MPD schema. If inconsistency exists between MPD schema in Annex A and XML grammar pieces given in the main body of this standard, then MPD schema in Annex A should be obeyed.

```
<?xml version="1.0"?>
<xs:schema targetNamespace="urn:avs2:p1:schema:mpd:2015"
  attributeFormDefault="unqualified"
  elementFormDefault="qualified"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:xlink="http://www.w3.org/1999/xlink"
  xmlns="urn:avs2:p1:schema:mpd:2015">
  <xs:import namespace="http://www.w3.org/1999/xlink" schemaLocation="xlink.xsd"/>
  <xs:annotation>
    <xs:appinfo>Media Presentation Description</xs:appinfo>
    <xs:documentation xml:lang="en">
      This Schema defines the Media Presentation Description for AVS-AS.
    </xs:documentation>
  </xs:annotation>
  <!-- MPD: main element -->
  <xs:element name="MPD" type="MPDtype"/>
  ...
</xs:schema>
```

7.3 Hierarchical data model

7.3.1 Overview

The collection of encoded and deliverable versions of media content and the appropriate description of these form a Media Presentation. Media content is composed of a single or multiple contiguous media content periods in time. Each media content Period is composed of one or multiple media content components, for example, audio components in various languages. Each media content component has an assigned media content component type, for example, audio or video.

Within a Period, material is arranged into adaptation sets (see 7.3.3). An Adaptation Set represents a set of interchangeable encoded versions of one or several media content components (see 7.3.4). For example, there may be one adaptation set for the main video component and a separate one for the main audio component. If other material is available, for example, captions or audio descriptions, then these may each have a separate adaptation set.

An adaptation set contains a set of representations (see 7.3.7). A Representation describes a *deliverable encoded version* of one or several media content components. Any single representation in an adaptation set is sufficient to render the contained media content components. In other words, typically clients may switch dynamically from representation to representation in an adaptation set in order to adapt to network conditions or other factors. Clients may ignore representations that rely on codecs or other rendering technologies they do not support or that are otherwise unsuitable.

Within a representation, the content may be divided in time into segments (see 7.3.11 and Clause 8) for proper accessibility and delivery. In order to access a Segment, a URL conforming to IETF RFC 1738 is provided for each segment. Consequently, a segment is the largest unit of data that can be retrieved with a single HTTP request.

A media presentation as described in the **MPD** (see Figure 2) consists of the following:

- A sequence of one or more Periods as described in 7.3.2.
- Each period contains one or more adaptation sets as described in 7.3.3. If an adaptation set contains multiple media content components, then each media content component is described individually as defined in 7.3.4.
- Each adaptation set contains one or more representations as described in 7.3.7.
- Each representation may contain one or more sub-representations as described in 7.3.8 to describe and extract partial information from a representation.
- Adaptation sets, representations, and sub-representations share common attributes and elements that are described in 7.3.9.
- Each period may contain one or more subsets that restrict combination of adaptation sets for presentation. Subsets are described in 7.3.10.
- Each Representation consists of one or more segments described in Clause 8. Segments contain media data and/or metadata to access, decode, and present the included media content.

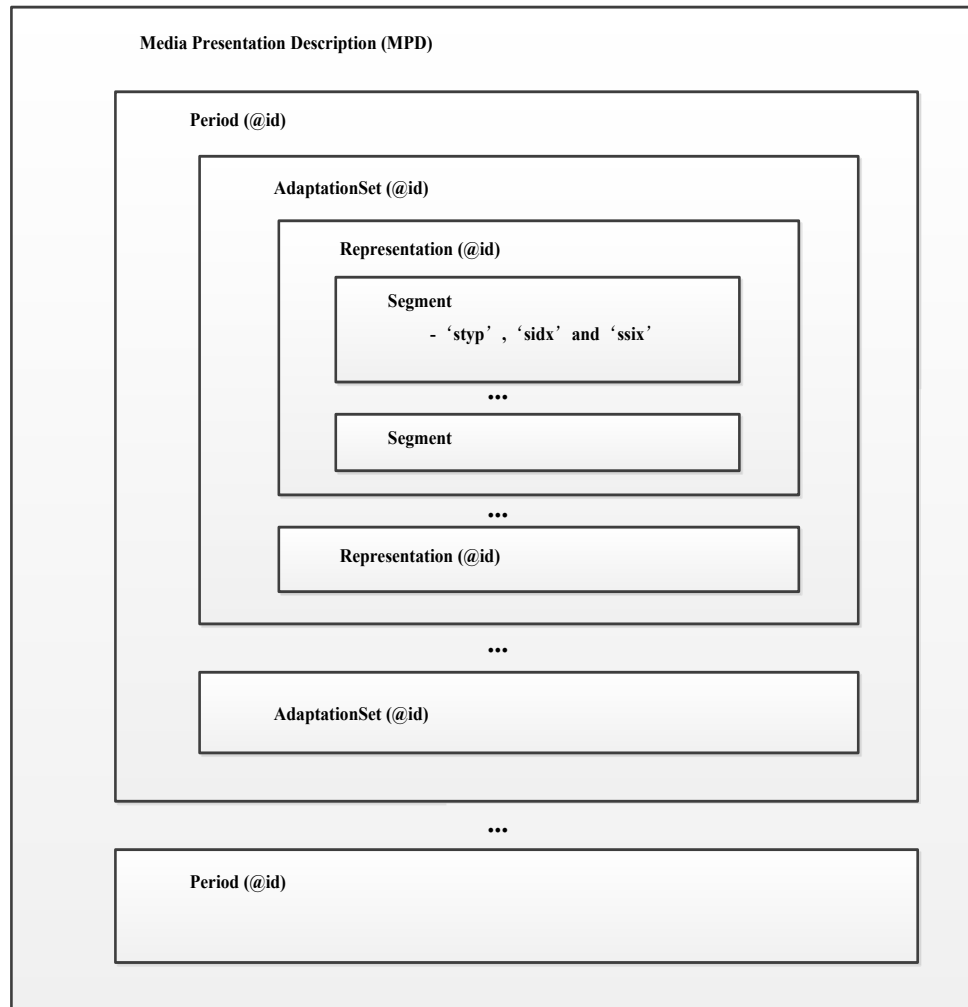


Figure 2—Structure of MPD

7.3.1.1 Semantics of MPD

Table 1—Semantics of MPD element

Element or attribute name	Use	Description
MPD		The root element that carries the Media Presentation Description for a Media Presentation.
@id	O	Specifies an identifier for the Media Presentation. It is recommended to use an identifier that is unique in the scope in which the Media Presentation is published. If not specified, no MPD-internal identifier is provided. However, the URL to the MPD may be used as an identifier for the Media Presentation.

Table 1—Semantics of MPD element (*continued*)

Element or attribute name	Use	Description
@type	OD default: static	Specifies the type of the Media Presentation. For static Media Presentations (@type='static'), all Segments are available between the @availabilityStartTime and the @availabilityEndTime. For dynamic Media Presentations (@type='dynamic'), Segments typically have different availability times. Note that static Media Presentations are typically used for On-Demand services, whereas dynamic Media Presentations are used for live services.
@availabilityStartTime	CM Must be present for @type='dynamic'	For @type='dynamic', this attribute shall be present. In this case, it specifies the anchor for the computation of the earliest availability time (in UTC) for any Segment in the Media Presentation. If not present, all Segments described in the MPD shall become available at the time the MPD becomes available.
@publishTime	OD Must be present for @type='dynamic'	Specifies the wall-clock time when the MPD was generated and published at the origin server. MPDs with a later value of @publishTime shall be an update as defined in 7.6.2.3 to MPDs with earlier @publishTime.
@availabilityEndTime	O	Specifies the latest Segment availability end time for any Segment in the Media Presentation. When not present, the value is unknown.
@mediaPresentationDuration	O	Specifies the duration of the entire Media Presentation. If the attribute is not present, the duration of the Media Presentation is unknown. This attribute shall be present when neither the attribute MPD@minimumUpdatePeriod nor the Period@duration of the last Period are present.
@minimumUpdatePeriod	O	Specifies the smallest period between potential changes to the MPD. If this attribute is not present, it indicates that the MPD does not change. If MPD@type is 'static', @minimumUpdatePeriod shall not be present.
@minBufferTime	M	Specifies a common duration used in the definition of the Representation data rate (see @bandwidth attribute in 7.3.7.2).
@suggestedPresentationDelay	O	When @type is 'dynamic', it specifies a fixed delay offset in time from the presentation time of each access unit that is suggested to be used for presentation of each access unit. When @type is 'static', the value of the attribute is undefined and may be ignored.
@maxSegmentDuration	O	Specifies the maximum duration of any Segment in any Representation in the Media Presentation, i.e., documented in this MPD and any future update of the MPD. If not present, then the maximum Segment duration shall be the maximum duration of any Segment documented in this MPD.
ProgramInformation	0...N	Specifies descriptive information about the program. For more details, refer to the description in 7.4.
Period	1...N	Specifies Period information. For more details, refer to the description in 7.3.2.
BaseURL	0...N	Specifies a base URL that can be used for reference resolution and alternative URL selection. For more details, refer to the description in 7.3.11.
Location	0...N	Specifies a location at which the MPD is available.

7.3.1.2 XML Syntax of MPD

```
<!-- MPD Type -->
<xs:complexType name="MPDtype">
  <xs:sequence>
    <xs:element name="ProgramInformation" type="ProgramInformationType" minOccurs="0"
      maxOccurs="unbounded"/>
    <xs:element name="BaseURL" type="BaseURLType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="Location" type="xs:anyURI" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="Period" type="PeriodType" maxOccurs="unbounded"/>
    <xs:element name="Metrics" type="MetricsType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:attribute name="id" type="xs:string"/>
  <xs:attribute name="profiles" type="xs:string" use="required"/>
  <xs:attribute name="type" type="PresentationType" default="static"/>
  <xs:attribute name="availabilityStartTime" type="xs:dateTime"/>
  <xs:attribute name="availabilityEndTime" type="xs:dateTime"/>
  <xs:attribute name="publishTime" type="xs:dateTime"/>
  <xs:attribute name="mediaPresentationDuration" type="xs:duration"/>
  <xs:attribute name="minimumUpdatePeriod" type="xs:duration"/>
  <xs:attribute name="minBufferTime" type="xs:duration" use="required"/>
  <xs:attribute name="timeShiftBufferDepth" type="xs:duration"/>
  <xs:attribute name="suggestedPresentationDelay" type="xs:duration"/>
  <xs:attribute name="maxSegmentDuration" type="xs:duration"/>
  <xs:attribute name="maxSubsegmentDuration" type="xs:duration"/>
  <xs:anyAttribute namespace="##other" processContents="lax"/>
</xs:complexType>

<!-- Presentation Type enumeration -->
<xs:simpleType name="PresentationType">
  <xs:restriction base="xs:string">
    <xs:enumeration value="static"/>
    <xs:enumeration value="dynamic"/>
  </xs:restriction>
</xs:simpleType>
```

7.3.2 Period

7.3.2.1 overview

A Media Presentation consists of one or more Periods. A Period is defined by a **Period** element in the MPD element. The type of the Period, either a regular Period or an Early Available Period, as well as the PeriodStart time of a regular Period, is determined as follows:

- If the attribute @start is present in the **Period**, then the **Period** is a regular Period, and the PeriodStart is equal to the value of this attribute.
- If the @start attribute is absent, but the previous **Period** element contains a @duration attribute, then this new Period is also a regular Period. The start time of the new Period **Period@Start** is the sum of the start time of the previous Period **Period@Start** and the value of the attribute @duration of the previous Period.
- If (i) @start attribute is absent, (ii) the **Period** element is the first in the MPD, and (iii) the **MPD@type** is 'static', then the **Period@Start** time shall be set to 0.

- If (i) @start attribute is absent, (ii) the previous Period element does not contains a @duration attribute or the Period element is the first in the MPD, and (iii) the **MPD@type** is ‘dynamic’, then this Period is an Early Available Period.

Periods divide a media presentation into multiple parts, each with determined begin and end times. Here, the timestamps used are relative to the entire media presentation. Periods are high-level time intervals, which are often used to insert content segments and advertisements.

7.3.2.2 Semantics

Table 2—Semantics of Period element

Element or attribute name	Use	Description
Period		
@xlink:href		Specifies a reference to a remote element entity that is either empty or contains one or multiple top-level elements of type Period.
@xlink:actuate	OD default: ‘onRequest’	Specifies the processing instructions, which can be either ‘onLoad’ or ‘onRequest’. This attribute shall not be present if the @xlink:href attribute is not present.
@id	O	Specifies an identifier for this Period. The identifier shall be unique in the scope of the Media Presentation. If the MPD@type is ‘dynamic’, then this attribute shall be present and shall not change if the MPD is updated. If not present, no identifier for the Period is provided.
@start	O	If present, specifies the PeriodStart time of the Period. The PeriodStart time is used as an anchor to determine the MPD start time of each Media Segment as well as to determine the presentation time of each access unit in the Media Presentation timeline. If not present, refer to the details in 7.3.2.1.
@duration	O	If present, specifies the duration of the Period to determine the PeriodStart time of the next Period. If not present, refer to the details in 7.3.2.1.
@bitstreamSwitching	OD default:false	When set to ‘true’, this is equivalent to when the AdaptationSet@bitstreamSwitching for each Adaptation Set contained in this Period is set to ‘true’. In this case, the AdaptationSet@bitstreamSwitching attribute shall not be set to ‘false’ for any Adaptation Set in this Period.
BaseURL	0...N	Specifies a base URL that can be used for reference resolution and alternative URL selection. For more details, refer to the description in 7.3.11.
SegmentBase	0...1	Specifies default Segment Base information. Information in this element is overridden by information in AdaptionSet.SegmentBase and Representation.SegmentBase , if present. For more details, see 7.3.11.2.
SegmentList	0...1	Specifies default Segment List information. Information in this element is overridden by information in AdaptionSet.SegmentList and Representation.SegmentList , if present. For more details, see 7.3.11.3.

Table 2—Semantics of Period element (*continued*)

Element or attribute name	Use	Description
SegmentTemplate	0...1	Specifies default Segment Template information. Information in this element is overridden by information in AdaptationSet.SegmentTemplate and Representation.SegmentTemplate , if present. For more details, see 7.3.11.4.
Subset	0...N	Specifies a Subset. For more details, see 7.3.10.
AdaptationSet	0...N	Specifies an Adaptation Set. At least one Adaptation Set shall be present in each Period unless the value of the @duration attribute of the Period is set to 0. For more details, see 7.3.3.
EventStream	0...N	Specifies an event stream. For more details, see 7.6.2.

7.3.2.3 XML syntax

```

<!-- Period -->
<xs:complexType name="PeriodType">
  <xs:sequence>
    <xs:element name="BaseURL" type="BaseURLType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="SegmentBase" type="SegmentBaseType" minOccurs="0"/>
    <xs:element name="SegmentList" type="SegmentListType" minOccurs="0"/>
    <xs:element name="SegmentTemplate" type="SegmentTemplateType" minOccurs="0"/>
    <xs:element name="EventStream" type="EventStreamType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="AdaptationSet" type="AdaptationSetType" minOccurs="0"
      maxOccurs="unbounded"/>
    <xs:element name="Subset" type="SubsetType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:attribute ref="xlink:href"/>
  <xs:attribute ref="xlink:actuate" default="onRequest"/>
  <xs:attribute name="id" type="xs:string"/>
  <xs:attribute name="start" type="xs:duration"/>
  <xs:attribute name="duration" type="xs:duration"/>
  <xs:attribute name="bitstreamSwitching" type="xs:boolean" default="false"/>
  <xs:anyAttribute namespace="##other" processContents="lax"/>
</xs:complexType>

```

7.3.3 Adaptation Sets

7.3.3.1 Overview

Each Period consists of one or more Adaptation Sets. An Adaptation Set is described by an **AdaptationSet** element. **AdaptationSet** elements are contained in a **Period** element. An Adaptation Set contains alternate Representations, i.e., only one Representation in an Adaptation Set is expected to be presented at a time. All Representations contained in one Adaptation Set represent the same media content components and therefore contain media streams that are considered to be perceptually equivalent. The Adaptation Set and the contained Representations shall be prepared and contain sufficient information so that seamless switching across different Representations in one Adaptation Set is enabled.

Representations are arranged into Adaptation Sets according to the media content component properties of the media content components present in the Representations, namely, the following:

- The language as described by the @lang attribute
- The media component type as described by the @contentType attribute
- The picture aspect ratio as described by the @par attribute

Representations shall appear in the same Adaptation Set if and only if they have identical values for all of these media content component properties for each media content component.

If multiple media content components exist, then the properties of each media content component shall be described by a separate **ContentComponent** element as defined in 7.3.4. The **ContentComponent** element shares common elements and attributes with the **AdaptationSet** element. Default values, or values applicable to all media content components, may be provided directly in the **AdaptationSet** element. Attributes present in the **AdaptationSet** shall not be repeated in the **ContentComponent** element.

The **AdaptationSet** element may contain default values for elements and attributes associated with the contained Representations. The list of possible present elements and attributes that are common to **AdaptationSet** and **Representation** (and also **SubRepresentation**) is given in 7.3.9. Any of the common attributes shall be present only either in the **AdaptationSet** element or in the **Representation** element, but not in both.

Adaptation Sets may be further arranged into groups using the @group attribute. The semantics of this grouping are that the media content in one Period is represented by one of the following:

- One Representation from group 0, if present, or
- The combination of at most one Representation from each nonzero group

7.3.3.2 Semantics

Table 3—Semantics of AdaptationSet element

Element or attribute name	Use	Description
AdaptationSet		
@xlink:href	O	Specifies a reference to a remote element entity that shall contain exactly one element of type AdaptationSet.
@xlink:actuate	OD default:onRequest	Specifies the processing instructions, which can be either 'onLoad' or 'onRequest'.
@id	O	Specifies a unique identifier for this Adaptation Set in the scope of the Period. The attribute shall be unique in the scope of the containing Period. The attribute shall not be present in a remote element entity. If not present, no identifier for the Adaptation Set is specified.
@group	O	Specifies an identifier for the group that is unique in the scope of the containing Period. For details, refer to 7.3.3.1.
@lang	O	Declares the language code for this Adaptation Set. The syntax and semantics according to IETF RFC 5646 shall be used. If not present, the language code may be defined for each media component, or it may be unknown.
@contentType	O	Specifies the media content component type for this Adaptation Set. A value of the top-level Content-type 'type' value as defined in section 4 of IETF RFC 6838 (Jan. 2013) [B2] shall be taken. If not present, the media content component type may be defined for each media component, or it may be unknown.
@par	O	Specifies the picture aspect ratio of the video media component type, in the form of a string consisting of two integers separated by ':', e.g., '16:9'. If not present, the picture aspect ratio may be defined for each media component, or it may be unknown.
@minBandwidth	O	Specifies the minimum @bandwidth value in all Representations in this Adaptation Set. This value has the same units as the @bandwidth attribute. If not present, the value is unknown.
@maxBandwidth	O	Specifies the maximum @bandwidth value in all Representations in this Adaptation Set. This value has the same units as the @bandwidth attribute. If not present, the value is unknown.
@minWidth	O	Specifies the minimum @width value in all Representations in this Adaptation Set. This value has the same units as the @width attribute. If not present, the value is unknown.
@maxWidth	O	Specifies the maximum @width value in all Representations in this Adaptation Set. This value has the same units as the @width attribute. If not present, the value is unknown.
@minHeight	O	Specifies the minimum @height value in all Representations in this Adaptation Set. This value has the same units as the @height attribute. If not present, the value is unknown.