

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Consumer terminal function for access to IPTV and open internet multimedia services –  
Part 2-2: HTTP adaptive streaming**

**Fonction des terminaux grand public pour l'accès aux services IPTV et multimédias de l'internet ouvert –  
Partie 2-2: Diffusion en flux adaptatif sur HTTP**



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AND OPEN INTERNET MULTIMEDIA SERVICES –**

**Part 2-2: HTTP adaptive streaming**

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The text of this standard is based on the following documents:

CDV	Report on voting
100/2488/CDV	100/2658/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This International Standard is to be used in conjunction with IEC 62766-1.

A list of all parts in the IEC 62766 series, published under the general title *Consumer terminal function for access to IPTV and open internet multimedia services*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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## INTRODUCTION

The IEC 62766 series is based on a series of specifications that was originally developed by the OPEN IPTV FORUM (OIPF). They specify the user-to-network interface (UNI) for consumer terminals to access IPTV and open internet multimedia services over managed or non-managed networks as defined by OIPF.

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# CONSUMER TERMINAL FUNCTION FOR ACCESS TO IPTV AND OPEN INTERNET MULTIMEDIA SERVICES –

## Part 2-2: HTTP adaptive streaming

### 1 Scope

This part of IEC 62766 specifies media formats for adaptive unicast content streaming over HTTP.

Two HTTP adaptive streaming formats are specified. The first is based entirely on MPEG DASH. The second is the OIPF “HTTP adaptive streaming” (HAS) format, which is based upon 3GPP’s release 9 adaptive HTTP streaming (AHS) format, with some profiling and extensions to add the features of media components and support for MPEG-2 transport stream content segment format. The latter format was specified before MPEG DASH had been published. It is retained due to usage in some legacy applications.

### 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.

IEC 62766-1<sup>1</sup>, *Consumer terminal function for access to IPTV and open Internet multimedia services – Part 1: General*

IEC 62766-2-1, *Consumer terminal function for access to IPTV and open Internet multimedia services – Part 2-1: Media formats*

IEC 62766-3, *Consumer terminal function for access to IPTV and open Internet multimedia services – Part 3: Content metadata*

IEC 62766-4-1<sup>2</sup>, *Consumer terminal function for access to IPTV and open Internet multimedia services – Part 4-1: Protocols*

IEC 62766-5-1<sup>3</sup>, *Consumer terminal function for access to IPTV and open Internet multimedia services – Part 5-1: Declarative application environment*

IEC 62766-6<sup>4</sup>, *Consumer terminal function for access to IPTV and open Internet multimedia services – Part 6: Procedural application environment*

IEC 62766-7<sup>5</sup>, *Consumer terminal function for access to IPTV and open Internet multimedia services – Part 7: Authentication, content protection and service protection*

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2 Under preparation. Stage at the time of publication: IEC/CDV 62766-4-1:2015

3 Under preparation. Stage at the time of publication: IEC/CDV 62766-5-1:2015

4 Under preparation. Stage at the time of publication: IEC/CDV 62766-6:2015

5 Under preparation. Stage at the time of publication: IEC/CDV 62766-7:2015

ISO/IEC 13818-1:2014, *Information technology – Generic coding of moving pictures and associated audio information – Part 1: Systems*

ISO/IEC 14496-12:2012, *Information technology – Coding of audio-visual objects – Part 12: ISO base media file format*

ISO/IEC 23001-7:2015, *Information technology – MPEG systems technologies – Part 7: Common encryption in ISO base media file format files*

ISO/IEC 23009-1:2014, *Information technology – Dynamic adaptive streaming over HTTP (DASH) – Part 1: Media presentation description and segment formats*

ISO 639 (all parts), *Codes for the representation of names of languages*

ETSI TS 101 154 V1.11.1 (2012-11), *Digital Video Broadcasting (DVB); Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream*

3GPP TS 26.234 V9.3.0 (2010-06), *Transparent end-to-end Packet-switched Streaming Service (PSS) Protocols and codecs (Release 9)*

3GPP TS 26.244 V9.2.0 (2010-06), *Transparent end-to-end packet switched streaming service (PSS), 3GPP file format (3GP) (Release 9)*

3GPP TS 26.247 V10.1.0 (2011-11), *Transparent end-to-end Packet-switched Streaming Service (PSS), Progressive Download and Dynamic adaptive streaming over HTTP (3GP-DASH) (Release 10)*

IEC 62766-2-2:2016

Marlin Developer Community, *Marlin adaptive streaming Specification – Simple Profile, Version 1.0, July 2011, available at <<http://www.marlin-community.com/develop/downloads>>*

Marlin Developer Community, *Marlin adaptive streaming Specification – Full Profile, Version 1.0, August 2011, available at <<http://www.marlin-community.com/develop/downloads>>*

### 3 Terms, definitions and abbreviated terms

#### 3.1 General

The terms and definitions specified in 3.2 apply to the OIPF HAS format specified in Clause 6. Where MPEG DASH defines the same terms in ISO/IEC 23009-1 the DASH definitions apply to the specification of DASH usage in Clause 5.

#### 3.2 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62766-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

##### 3.2.1 content

instance of audio, video, audio-video information, or data

Note 1 to entry: The content is as defined in IEC 62766-1.

### **3.2.2 component**

element of a content item, for example an audio or subtitle stream in a particular language or a video stream from a particular camera view

### **3.2.3 component stream**

bit stream that is the result of encoding a component with a certain codec and certain codec parameters

Note 1 to entry: Examples of parameters are bitrate, resolution.

### **3.2.4 content resource**

content item that is provided in multiple representations to enable adaptive streaming of that content item

Note 1 to entry: Such representations are multiple qualities, bitrates, camera views, etc.

### **3.2.5 period**

temporal clause of a content resource

### **3.2.6 representation**

version of a content resource within a period

Note 1 to entry: Representations may differ in the included components and the included component streams.

### **3.2.7 segment**

temporal clause of a representation in a specific systems layer format (either MPEG-2TS or MP4), referred to via a unique URL

## **3.3 Abbreviated terms**

3GPP	ETSI 3rd Generation Partnership Project
3GP-DASH	3GPP Dynamic Adaptive Streaming over HTTP
AAC	Advanced Audio Coding
AAC LC	AAC Low Complexity
ATSC	Advanced Television Systems Committee
BBTS	Broadband Transport Stream
CA	Conditional Access
CAT	Conditional Access Table
DAE	Declarative Application Environment
DCF	DRM Content Format
DRM	Digital Rights Management
DVB	Digital Video Broadcasting
ECM	Entitlement Control Message
EMM	Entitlement Management Message
ETSI	European Telecommunications Standards Institute
GOP	Group Of Pictures
IPMP	Intellectual Property Management and Protection

IV	Initialisation Vector
JPEG	Joint Photographic Experts Group
MIPMP	Marlin Intellectual Property Management Protocol
MP4	MP4 File Format
MPD	Media Presentation Description
MPEG	Moving Pictures Expert Group
nPVR	Network Personal Video Recorder
NTP	Network Time Protocol
OMA	Open Mobile Alliance
PAE	Procedural Application Environment
PAT	Program Association Table
PDCF	Packetised DRM Content Format
PF	Protected Format
PID	Packet Identifier
PMT	Program Map Table
RAP	Random Access Point
TCA	Terminal Centric Approach

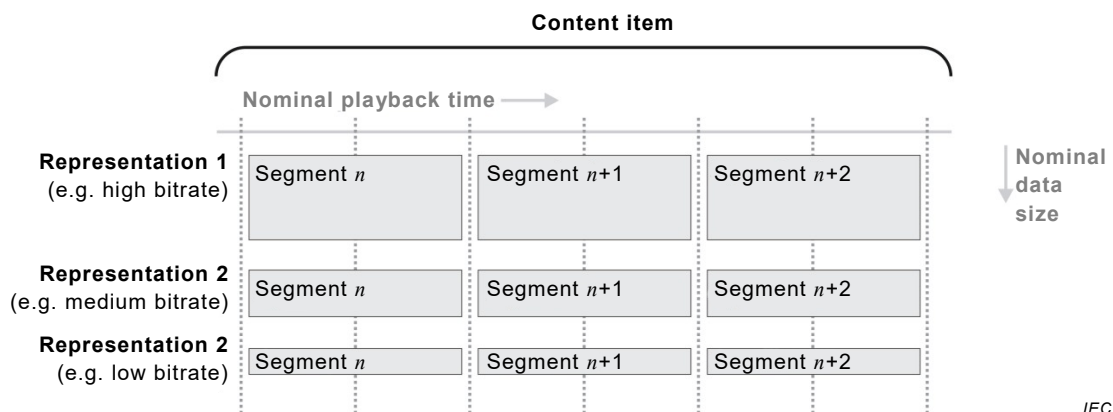
#### 4 Adaptive streaming in the OIPF IPTV solution

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Rather than providing a content asset as a single file or stream, in the case of HTTP adaptive streaming, a service provides a content item in multiple bitrates in a way that enables a terminal to adapt to (for example) variations in the available bandwidth by seamlessly switching from one version to another, at a higher or lower bitrate, while receiving and playing the content. This is achieved by encoding a content item in alternative representations of different bitrates and segmenting these representations into temporally aligned and independently encoded segments. This results in a matrix of segments, as depicted generically in Figure 1.

A content item may consist of several components.

Service discovery procedures refer to a content resource. A content resource consists of one or more time-sequential periods.



**Figure 1 – Content segmentation for HTTP adaptive streaming**

The Segments are offered for HTTP download from a URL that is unique per segment. After completion of the download (and playback) of a certain segment of a certain representation, a

terminal may switch to an alternate representation simply by downloading (and playing) the next segment of a different representation. This requires the terminal to have a description of the available representations and segments and the URLs from which to download the segments. This description is provided as a separate resource, the media presentation description (MPD).

The media data in a segment are formatted in compliance with the media formats as defined in IEC 62766-2-1. However, in the context of HTTP adaptive streaming, additional requirements are put on the usage of these formats, especially regarding the systems layers.

Similarly, the retrieval mechanisms of segments are in compliance with 6.3.2.2 of IEC 62766-4-1, with the usage in the context of HTTP adaptive streaming as defined in this document.

IEC 62766-5-1 specifies the initiation of HTTP adaptive streaming from the DAE.

IEC 62766-6 specifies the initiation of HTTP adaptive streaming from the PAE.

This generic model of adaptive streaming is valid for both variants of adaptive streaming format defined in this standard.

Clause 5 provides the specification of MPEG DASH based adaptive streaming within the OIPF IPTV solution.

MPEG DASH can be applied also to the delivery of content to mobile devices via mobile data networks. This is specified by 3GPP in specification 3GPP TS 26.247. Further details on the use of 3GP-DASH within the OIPF IPTV solution, as an adaptive bit-rate streaming service to mobile devices, is out of the scope of the present specification.

Clause 6 provides the equivalent specification based on the OIPF HAS format, which is maintained only for legacy applications.

## 5 MPEG DASH based adaptive streaming

### 5.1 General

This clause specifies the preferred format for adaptive bit-rate streaming content, based on MPEG DASH (ISO/IEC 23009-1).

One of the profiles defined by MPEG DASH is adopted for use for each of the systems layer formats specified in IEC 62766-2-1, namely MPEG-2 TS and MP4 file format. Subclauses 5.2 and 5.3 specify the application of DASH to each of the OIPF systems layers.

Subclause 5.4 specifies constraints and recommendations for operational parameters with the two selected DASH profiles.

Subclause 5.5 makes provisions and recommendations about audio and video source coding within an Adaptation Set, including concerning the variations of audio-video coding parameters that enable different bit-rate versions of the content to be provided.

Subclause 5.6 specifies constraints for key management of protected content.

MPEG DASH based adaptive bit-rate streaming content is also relevant for the “embedded CSPG” concept described in Annex F of IEC 62766-7:—<sup>6</sup>. Usage of MPEG DASH in this scenario is described in Annex D.

## 5.2 DASH usage for the TS systems layer format

### 5.2.1 General

For MPEG-2 TS based content (system format TS, as specified in IEC 62766-2-1), the MPEG-2 TS simple profile, as defined in 8.7 of ISO/IEC 23009-1:2014, is adopted, with the additional restrictions and constraints as specified in this subclause. This constitutes the definition of an interoperability point of the MPEG DASH MPEG-2 TS simple profile. This interoperability point is identified with the URI “urn:oipf:dash:profile:ts:2012” and is called the “OIPF MPEG-2 TS simple” interoperability point.

Additional constraints are placed on the use of the MPEG-2 TS simple profile regarding PID value allocations to the component streams contained in the DASH segments. These are specified in 5.2.2.

This document does not provide any adaptive bit-rate streaming method for use with the TTS format.

### 5.2.2 PID allocation

The value of the id attribute in each component element, if present, shall be set equal to the PID value of the TS packets that carry the component.

The following rules apply regarding TS PID values used in the segments belonging to representations within an adaptation set:

- component streams of the same component shall be carried in TS packets that have the same PID (in transport stream packet header) and the same stream\_id (in PES packet header);
- component streams of different components shall be carried in TS packets that have different PIDs (in TS packet header).

The following depicts some examples:

- "audio in Spanish" and "audio in English" have different PIDs;
- "audio in English" and "audio description for hearing impaired in English" have different PIDs;
- "audio description in English at 64 kbit/s" and "audio description in English at 128 kbit/s" have the same PID;
- "video angle 1 in ITU-T Recommendation H.264 at 720x576" and "video angle 1 in H.264 at 320x288" have the same PID.

### 5.2.3 Protected TS content

#### 5.2.3.1 General

The BBTS and PF protected formats are compatible with provision by adaptive bit-rate streaming as specified in this subclause.

The following general requirements apply if segments are protected.

<sup>6</sup> Under preparation. Stage at the time of publication: IEC/CDV 62766-7:2015.

- The DRM related metadata (i.e. PMT containing CA descriptors, CAT, EMM streams or ECM streams) in relation to a certain elementary stream shall be delivered as part of the media segments that carry the samples of the elementary stream or the initialisation segment.
- The DRM related metadata (i.e. ECM stream) of the CA system that applies to a certain elementary stream shall have the same PID in all segments, in all representations, in which it is included.

The following subclauses specify further specific details of DASH usage that apply to the BBTS and PF formats.

The MPEG2-TS Simple profile defined in DASH guarantees that the OITF can play any bitstream generated by the concatenation of consecutive segments from any representation within the same adaptation set. The same guarantee shall apply to protected MPEG2-TS segments. Note that BBTS and PF formats are conformant with ISO/IEC 13818-1. This guarantee may be achieved by using the same crypto-period boundaries and control words across different representations, in which case there is no further impact from adaptive streaming on the CSP solutions specified in IEC 62766-7.

### 5.2.3.2 DASH usage for BBTS format

For the TCA, content items provided in the BBTS format shall include the DASH `ContentProtection` element in the MPD, as specified in Clause 2 of Marlin adaptive streaming specification – simple profile or Marlin adaptive streaming specification – full profile. The `ContentProtection` element shall contain mandatory Marlin related information (i.e. the `@schemeIdUri` attribute with specified URI signalling that the segments are protected by Marlin).

### 5.2.3.3 DASH usage for PF format

Content items provided in the PF protected format for the CSPG-CI+ content protection scheme, as defined in IEC 62766-7, shall include the DASH `ContentProtection` element in the MPD, as specified for ISO/IEC 13818-1 (MPEG-2 transport stream) in 5.8.5.2 of ISO/IEC 23009-1:2014.

The `@value` attribute shall be set to the required representation of the appropriate DVB `CA_system_id`. The DVB `CA_system_id` usage is specified in IEC 62766-7.

## 5.3 DASH usage for the MP4 systems layer format

### 5.3.1 General

For MP4 file format based content (system format MP4, as specified in IEC 62766-2-1 the ISO base media file format `live_profile`, as defined in 8.4 of ISO/IEC 23009-1:2012, is adopted, with the additional restrictions and constraints as specified in the present clause. This constitutes the definition of an interoperability point of the MPEG DASH ISO BMFF live profile. This interoperability point is identified with the URI `urn:oipf:dash:profile:isoff-live:2012` and is called the “OIPF ISO BMFF live” interoperability point.

### 5.3.2 Protected content

#### 5.3.2.1 General

The present document does not provide any adaptive bit-rate streaming method for use with the DCF or PDCF protected format.

The MP4 common encryption format specified in ISO/IEC 23001-7 and the MIPMP protected format are compatible with provision by adaptive bit-rate streaming as specified in this subclause.