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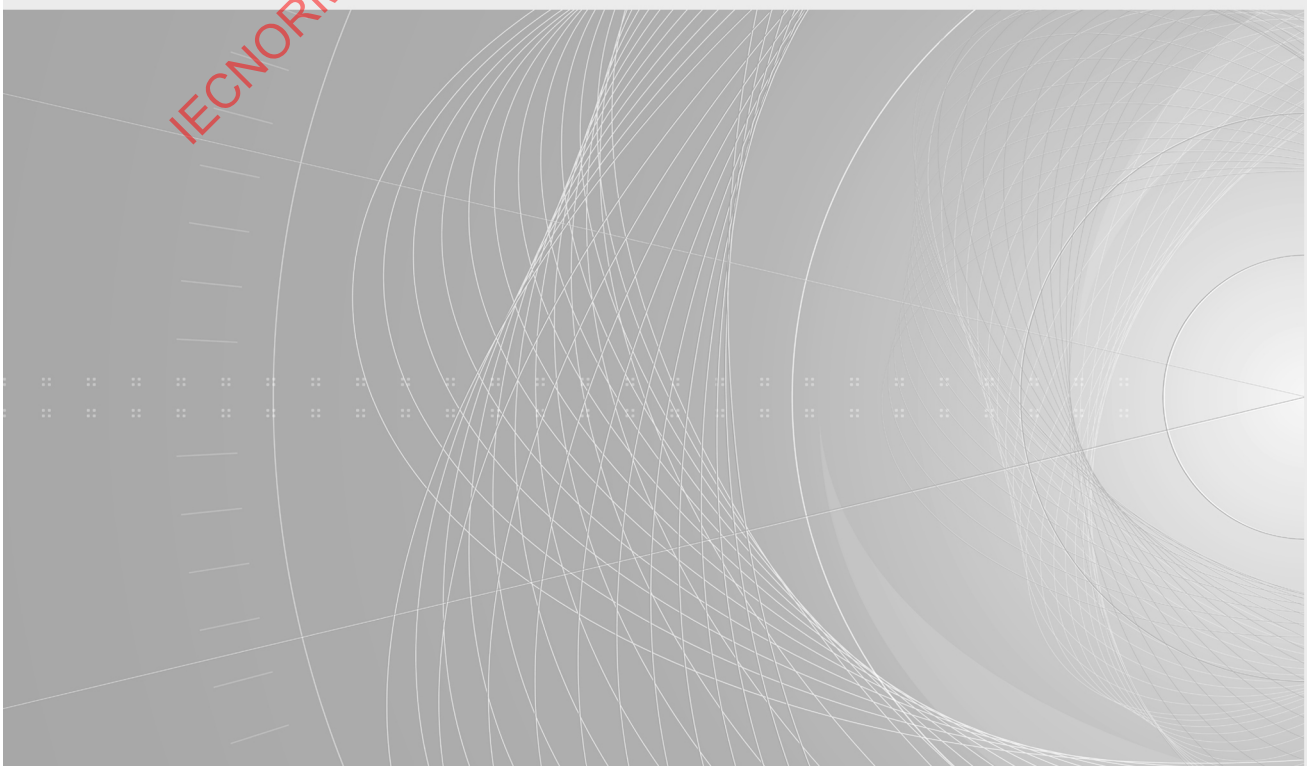
INTERNATIONAL STANDARD

colour inside

Digital living network alliance (DLNA) home networked device interoperability guidelines –
Part 9: HTTP Adaptive Delivery



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Part 9: HTTP Adaptive Delivery

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DIGITAL LIVING NETWORK ALLIANCE (DLNA) HOME NETWORKED DEVICE INTEROPERABILITY GUIDELINES –

Part 9: HTTP Adaptive Delivery

FOREWORD

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International Standard IEC 62481-9 has been prepared under technical area 8: Multimedia home systems and applications for end-user network, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this International Standard is based on the following documents:

CDV	Report on voting
100/2748/CDV	100/2891/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.

A list of all parts of IEC 62481 series, published under the general title *Digital Living Network Alliance (DLNA) home networked device interoperability guidelines,* 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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

Consumers are acquiring, viewing, and managing an increasing amount of digital media (photos, music, and video) on devices in the consumer electronics (CE), mobile, and personal computer (PC) domains. As such, they want to conveniently enjoy the content, regardless of the source, across different devices and locations in the home. The digital home vision integrates the internet, mobile, and broadcast networks through a seamless, interoperable network, which will provide a unique opportunity for manufacturers and consumers alike. In order to deliver on this vision, a common set of industry design guidelines is needed that allows vendors to participate in a growing marketplace, leading to more innovation, simplicity, and value for consumers. This document serves that purpose and provides vendors with the information needed to build interoperable networked platforms and devices for the digital home.

DIGITAL LIVING NETWORK ALLIANCE (DLNA) HOME NETWORKED DEVICE INTEROPERABILITY GUIDELINES –

Part 9: HTTP Adaptive Delivery

1 Scope

This part of IEC 62481 specifies guidelines for the DLNA Adaptive Delivery using HTTP protocol.

The DLNA interoperability guidelines for Adaptive Delivery are based on ISO/IEC 23009-1:2014 standard and enables content authors to describe content in timed segments at various bit rates and media formats. Client rendering devices can select the appropriate timed segments (e.g. bit rate) based on network congestion to maintain smooth streaming of content for display.

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 62481-1-1:2017, *Digital living network alliance (DLNA) home networked device interoperability guidelines – Part 1-1: Architecture and protocols*

IEC 62481-2:2017, *Digital living network alliance (DLNA) home networked device interoperability guidelines – Part 2: Media format profiles*

IEC 62481-6-1:2017, *Digital living network alliance (DLNA) home networked device interoperability guidelines – Part 6-1: Remote user interface – HTML5*

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

IETF RFC 2616, *Hypertext Transfer Protocol – HTTP/1.1*, R. Fielding, UC Irvine, J. Gettys, Compaq/W3C, J. Mogul, Compaq, H. Frystyk, W3C/MIT, L. Masinter, Xerox, P. Leach, Microsoft, T. Berners-Lee
http://www.ietf.org/rfc/rfc2616.txt

3 Terms, definitions, abbreviated terms and conventions

For the purposes of this document, the terms, definitions and abbreviated terms given in IEC 62481-1-1:2017, IEC 62481-2:2017, ISO/IEC 23009-1:2014 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

3.1 Definitions

3.1.1
Adaptive Content
multimedia content encoded into multiple streams using different parameters (i.e. different bitrate) for the purpose of dynamic switching between different streams during a media delivery session

3.2 Abbreviated terms

HTTP-AD	HTTP Adaptive Delivery
MPEG DASH	MPEG Dynamic Adaptive Streaming over HTTP
MPD	Media Presentation Description
XDMR	Extended Digital Media Renderer

3.3 Convention

In IEC 62481-1-1:2017 and this document, a number of terms, conditions, mechanisms, sequences, parameters, events, states, or similar terms are printed with the first letter of each word in uppercase and the rest lowercase (e.g., Adaptive Content). Any lowercase uses of these words have the normal technical English meanings.

4 Networking architecture and guideline conventions

4.1 DLNA home networking architecture

This specification extends the DLNA home networking architecture that is defined in Clause 4 of IEC 62481-1-1:2017.

4.2 HTTP Adaptive Delivery

HTTP Adaptive Delivery Device Option provides guidelines for the dynamic and adaptive HTTP streaming of multimedia content.

HTTP Adaptive Delivery can include sources of content both within the home network and from the internet. The content MPD is intended to be discoverable and deliverable from any device that acts as a content source and exposes content using the DIDL-Lite framework.

4.3 Document conventions

See Clause 6 of IEC 62481-1-1:2017 for a description of the DLNA document conventions.

4.4 Guideline structure

See 7.1 of IEC 62481-1-1:2017 for guideline and attribute table layout descriptions.

5 DLNA device model

5.1 General

Refer to Clause 5 of IEC 62481-1-1:2017, for detailed descriptions of existing DLNA home networking architecture device model. This specification extends the existing DLNA system usages.

5.2 Device capabilities and roles

HTTP Adaptive Delivery Device Option specified in these guidelines provides extensibility for DLNA HTTP streaming to deliver adaptive and dynamic multimedia content by dynamically requesting different representations of the same content item from a server.

On the Serving Endpoint side, the HTTP Adaptive Delivery Device Option has the role of exposing and sourcing the content using the Adaptive Delivery mode, including both the MPD and the media itself (segments for different representations). This functionality maps to the MPD delivery function and segment delivery function in MPEG-DASH.

On the client side, the HTTP Adaptive Delivery Device Option has the role of requesting appropriate content MPD and media representation (segments), assembling, and rendering the media.

5.3 System usages

5.3.1 General

The HTTP Adaptive Delivery enhances the following standard DLNA media delivery system usages with the Adaptive Delivery Device Option, with or without the DLNA Link Protection:

– 2-box Pull system usage as described in 5.3.2;
– 2-box Push system usage as described 5.3.3;
– 3-box system usage as described in 5.3.4;
– 2-box and 3-box RUI with AV system usage as described in 5.3.5;
– Adaptive Internet Resource Media delivery from outside of the DLNA Network as described in 5.3.6.

5.3.2 2-box Pull system usage

Figure 1 illustrates the 2-box Pull system usage for HTTP Adaptive Delivery.

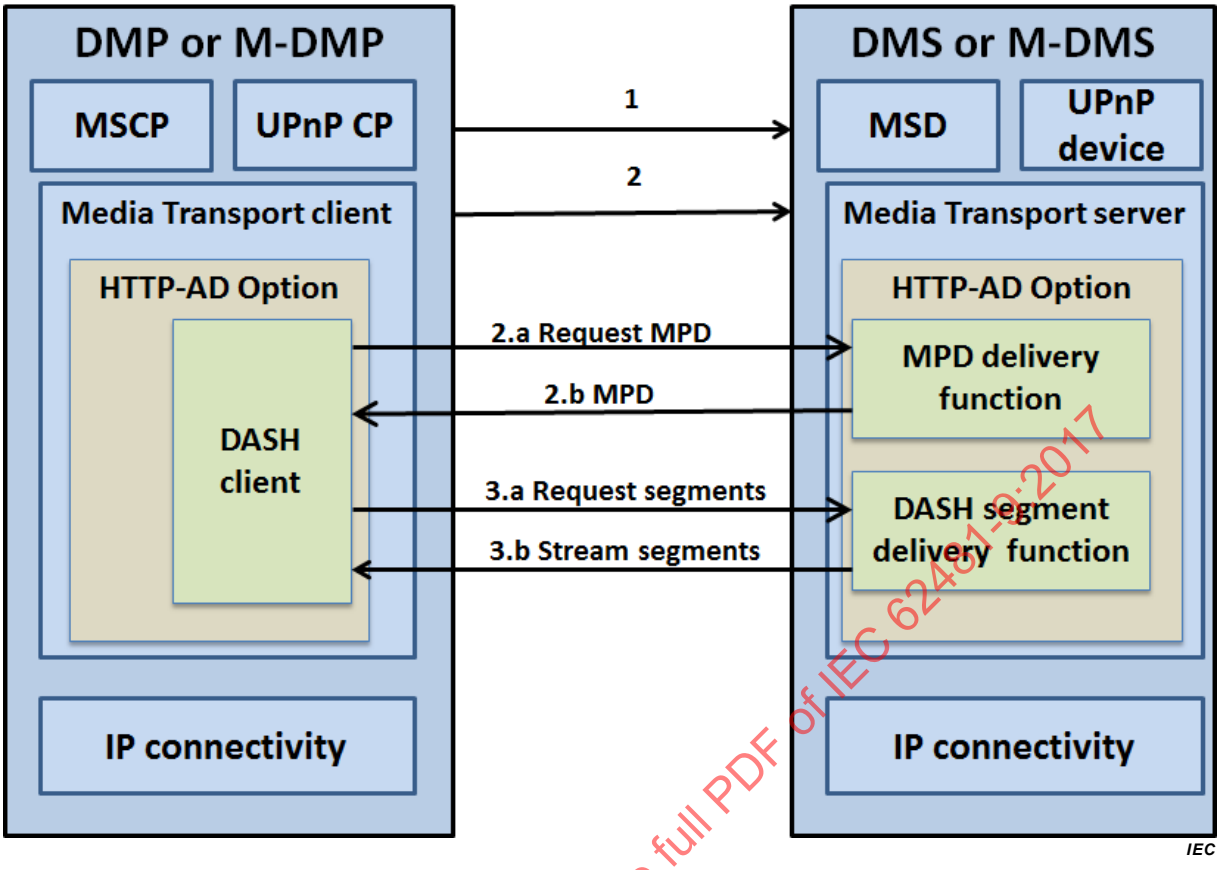

Figure 1 – 2-box Pull system usage with HTTP Adaptive Delivery

Steps:

1. Invoke UPnP actions to set up a playback session.
2. Request content for playback:
   a) request MPD;
   b) obtain MPD.
3. Transport the content to the DMP:
   a) request media segment(s);
   b) stream media.

5.3.3 2-box Push system usage

Figure 2 illustrates the 2-box Push system usage for HTTP Adaptive Delivery.

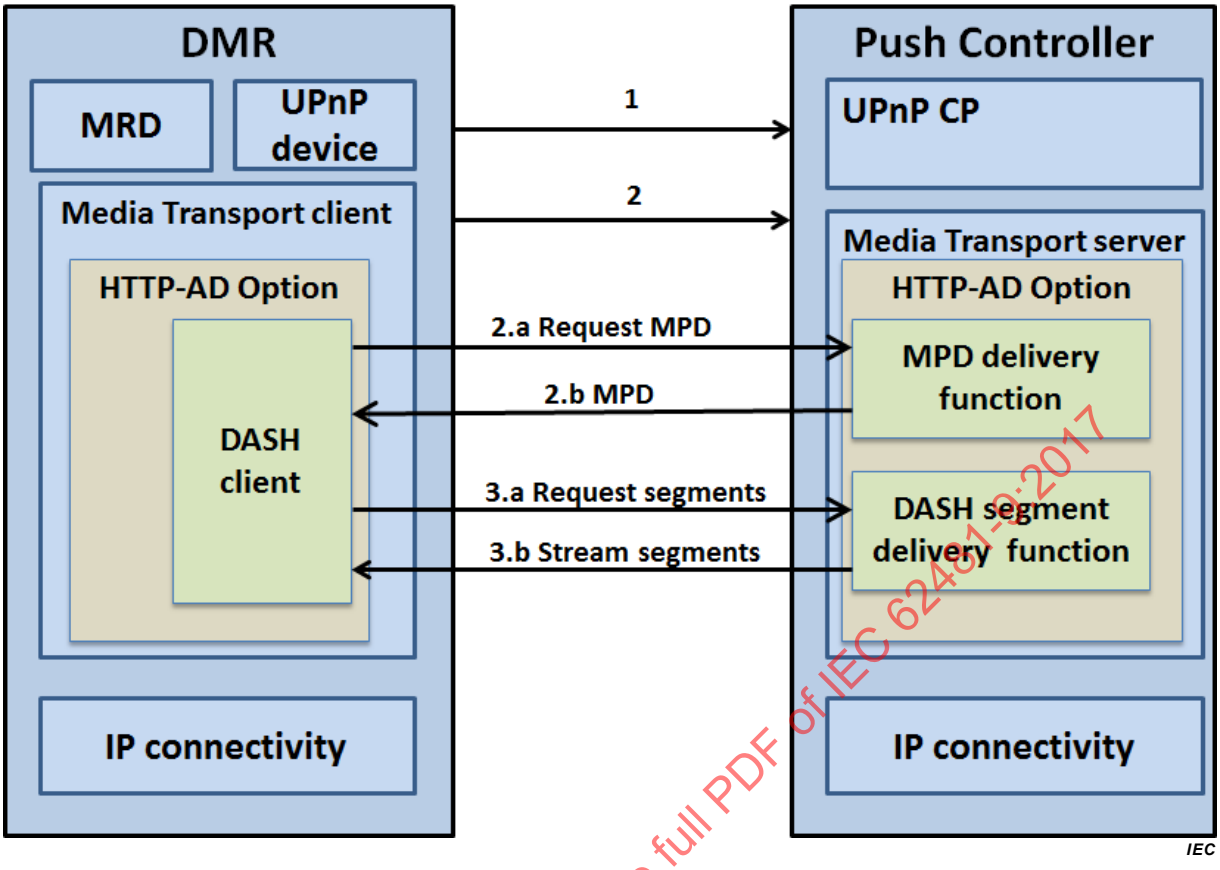

Figure 2 – 2-box Push system usage with HTTP Adaptive Delivery

Steps:

1) Invoke UPnP actions to set up a playback session.
2) Request content for playback:
   a) request MPD;
   b) obtain MPD.
3) Transport the content to the DMR:
   a) request media segment(s);
   b) stream media.

5.3.4 3-box system usage

Figure 3 illustrates the 3-box system usage for HTTP Adaptive Delivery.

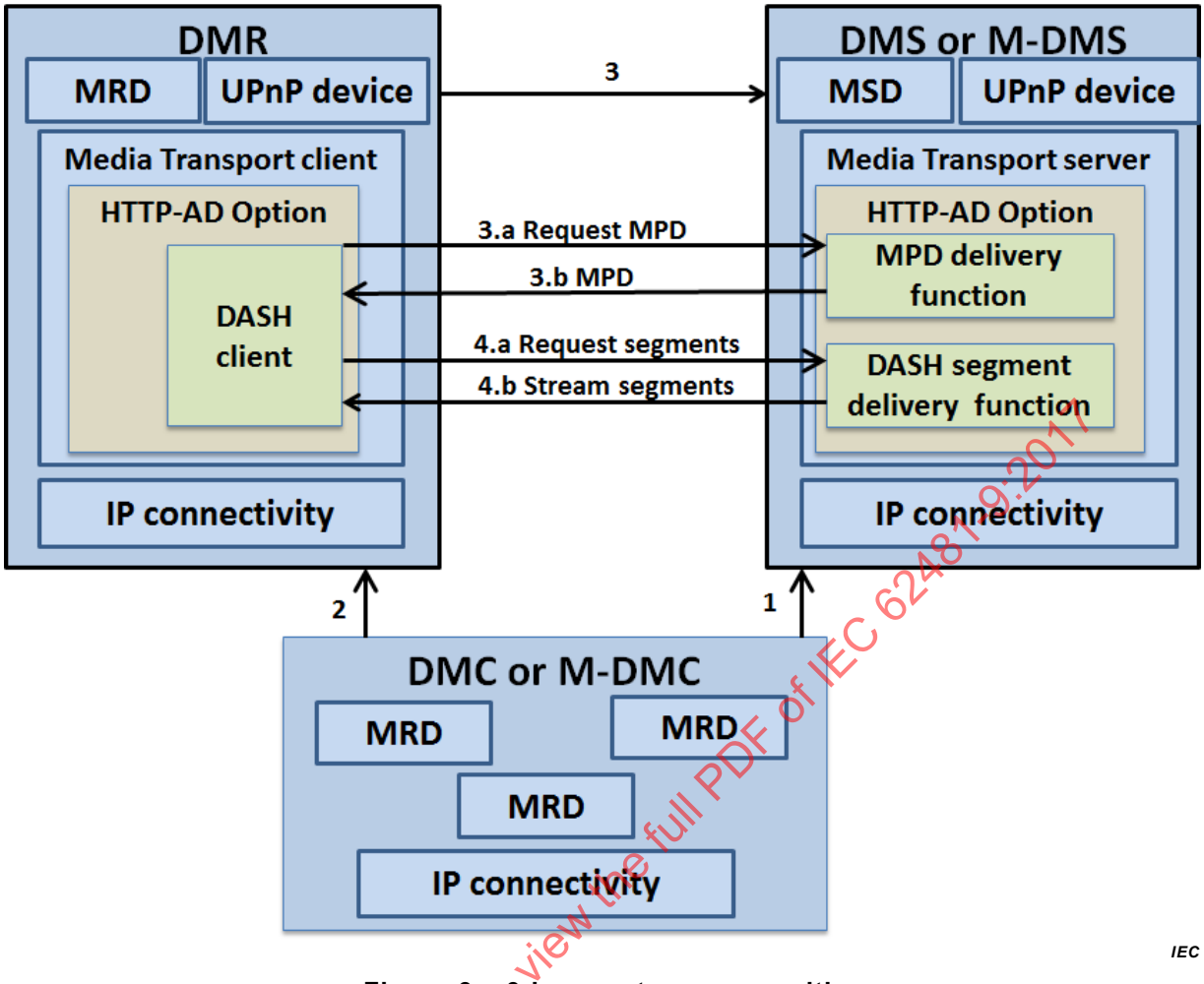

Figure 3 – 3-box system usage with HTTP Adaptive Delivery

Steps:

1) Invoke UPnP Actions browse and select content.
2) Invoke UPnP actions to verify that the DMR has the capability to render the selected content and then set up a connection for the selected content between the DMR and the DMS or the M-DMS.
3) Request content for playback:
   a) request MPD;
   b) obtain MPD.
4) Transport the content to the DMR:
   a) request Media segment(s);
   b) stream media.

5.3.5 2-box and 3-box RUI with AV system usage

Figure 4 illustrates the 2-box and 3-box RUI AV system usage for HTTP Adaptive Delivery.

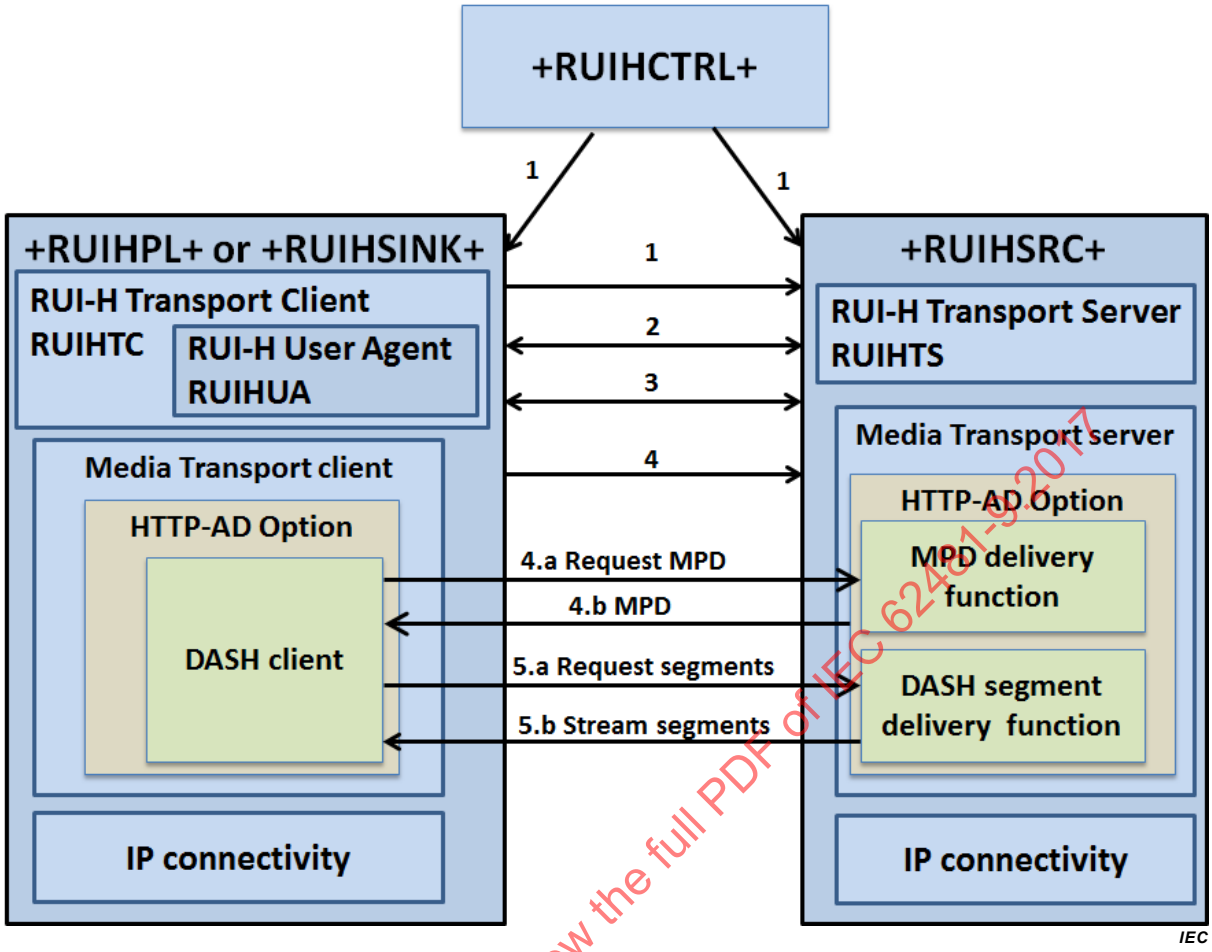

Figure 4 – 2-box and 3-box RUI AV system usage with HTTP Adaptive Delivery

Steps:

1) Invoke Actions to find remote UI content.
2) Request UI Content and transport UI content to RUI Client.
3) Interactions between RUI endpoints via Remote UI connection.
4) Request content for playback:
   a) request MPD;
   b) obtain MPD.
5) Transport the content to the +RUIHPL+ or +RUIHSINK+:
   a) request media segment(s);
   b) stream media.

5.3.6 Adaptive Internet Resource Media delivery usage

Figure 5 illustrates the adaptive Internet Resource Media delivery usage for HTTP Adaptive Delivery.

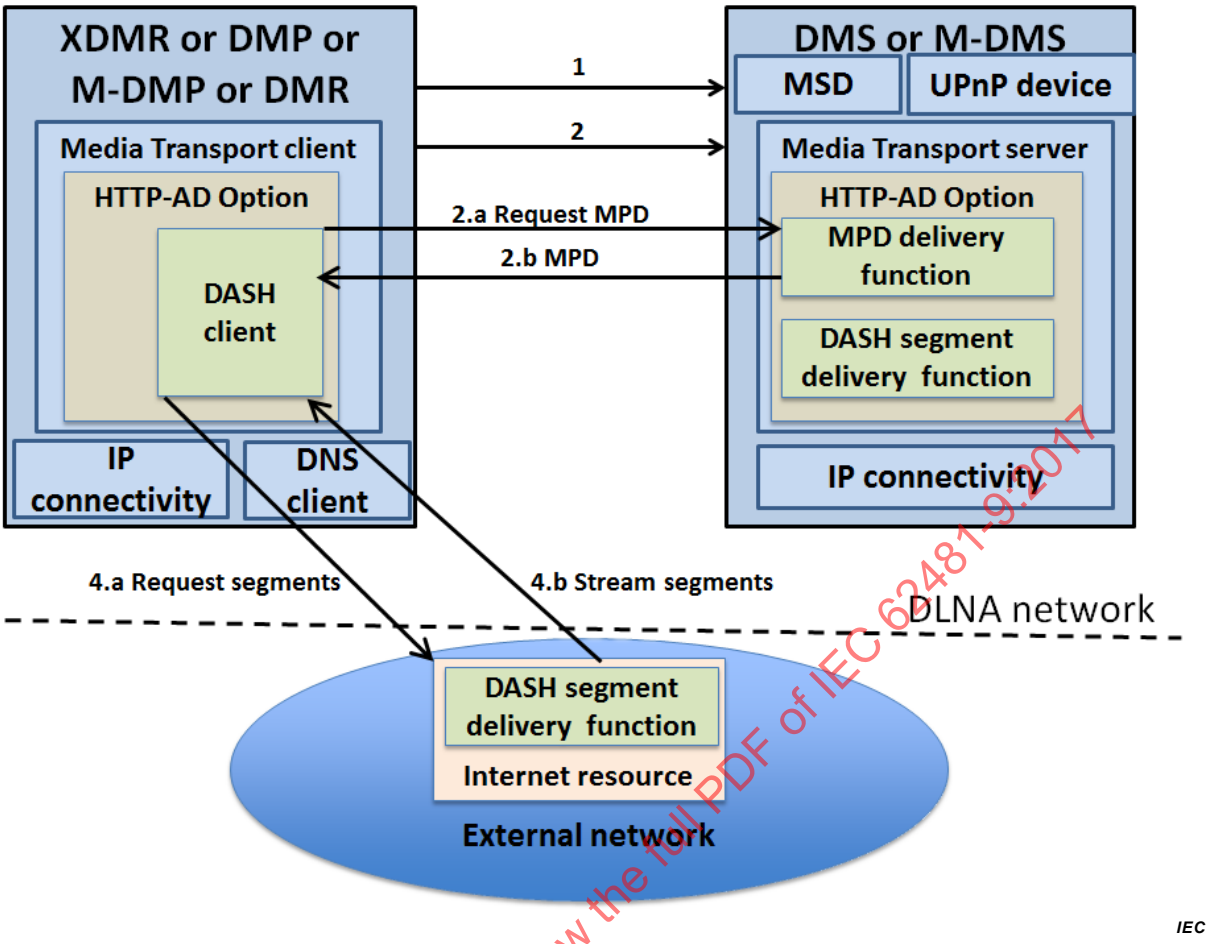

Figure 5 – Adaptive Internet Resource Media delivery usage with HTTP Adaptive Delivery

Steps:

1) Invoke UPnP Actions to set up a playback session.
2) Request content for playback:
   a) request MPD;
   b) obtain MPD.
3) Transport the Internet Media Resource content to the XDMR:
   a) request media segment(s);
   b) stream media.

6 HTTP Adaptive Delivery media management guidelines

6.1 General

This section of the DLNA home networked device interoperability guidelines covers guidelines for implementing capabilities for the Adaptive Delivery of multimedia content using HTTP protocol in the DLNA network.

6.2 General compliance guidelines

6.2.1 Overview

[GENERAL] The guidelines contained in 6.2 are used to implement the DLNA system usages enabled by the HTTP Adaptive Delivery Device Option.

DLNA Device Classes and Device Capabilities that implement HTTP Adaptive Delivery Device Option indicate so by inserting a value of "DASH_MPD" in the pn-param (DLNA.ORG_PN) in the fourth field of a protocolInfo property as appropriate.

– On Serving Endpoints by inserting the value of "DASH_MPD" in the pn-param (DLNA.ORG_PN) in the fourth field of a protocolInfo property within the CMS.SourceProtocolInfo state variable.
– On Serving Endpoints by inserting the value of "DASH_MPD" in the pn-param (DLNA.ORG_PN) in the fourth field of a res@protocolInfo property for the Adaptive Content item exposed via a Content Directory Service.
– On Rendering Endpoints by inserting the value of "DASH_MPD" in the pn-param (DLNA.ORG_PN) in the fourth field of a res@protocolInfo property within the CMS.SinkProtocolInfo state variable.

6.2.2 MPEG DASH compliance

[GUIDELINE] The DLNA Device Classes and Device Capabilities implementing HTTP Adaptive Delivery Device Option shall implement all normative clauses of the MPEG-DASH in ISO/IEC 23009-1:2014.

[ATTRIBUTES]

M	A	DMS, DMP, DMR, XDMR, +PU+, +RUIHPL+, +RUIHSINK+, +RUIHSRC+	M-DMS, M-DMP	n/a	ISO/IEC 23009-1:2014	8HZDG	

6.2.3 DASH_MPD media profile compliance

[GUIDELINE] The DLNA Device Classes and Device Capabilities implementing HTTP Adaptive Delivery Device Option shall support the DASH_MPD Media Format Profiles as defined in IEC 62481-2:2017.

[ATTRIBUTES]

M	A	DMS, DMP, DMR, XDMR, +PU+, +RUIHPL+, +RUIHSINK+, +RUIHSRC+	M-DMS, M-DMP	n/a	IEC 62481-2:2017	89X2P	

6.3 Adaptive content description

6.3.1

[GENERAL] The guidelines in 6.3 define exceptions to DLNA guidelines for res@protocolInfo fields when these fields are used to describe adaptive content (content item with pn-param value DASH_MPD). An important exception is that res@protocolInfo fields for trick modes do not apply because server trick mode behaviours have not been defined for adaptive content. Specifically, there is no definition regarding server trick mode behaviour across AV content file segments. In addition, res@protocolInfo fields that cannot describe multiple content representations, such as the link protection flag, are deferred to fields within the MPD.

The res@protocolInfo guidelines in 6.3 also apply to RUI HTML5 capabilities given in the getContentFeatures.dlna.org header requirement in Guideline 6.3.3.7 (5JUFF) of IEC 62481-6-1:2017 .

6.3.2

[GUIDELINE] If a DIDL-Lite document or fragment contains the pn-param (DLNA.ORG_PN) in the fourth field of a res@protocolInfo property with the value of DASH_MPD, then the context of the res@protocolInfo shall be to describe adaptive content.

[ATTRIBUTES]

M	A	DMS, DMP, DMR, XDMR, +PU+	M-DMS, M-DMP	n/a	IEC 62481-1-1:2017 IEC 62481-2:2017 ISO/IEC 23009-1:2014	RI2DS

[COMMENT] This guideline establishes the profile name DASH_MPD as the identifier to a CDS object that is associated with adaptive content.

6.3.3

[GUIDELINE] If the context of a res@protocolInfo property is to describe adaptive content, then the <res> property URI value shall reference the MPEG-DASH MPD file for the content.

[ATTRIBUTES]

M	A	DMS, DMP, DMR, XDMR, +PU+	M-DMS, M-DMP	n/a	IEC 62481-1-1:2017 ISO/IEC 23009-1:2014	D5AQ6

6.3.4

[GUIDELINE] If the context of a res@protocolInfo property is to describe adaptive content, then the third field of the res@protocolInfo property shall be the MIME type of the MPEG-DASH MPD file – application/dash+xml.

[ATTRIBUTES]

M	C	DMS, DMP, DMR, XDMR, +PU+	M-DMS, M-DMP	n/a	IEC 62481-1-1:2017 ISO/IEC 23009-1:2014	TZDIE

[COMMENT] This guideline establishes the res@protocolInfo third field as the MIME type for the MPD file.

6.3.5

[GUIDELINE] If the context of a res@protocolInfo property is to describe adaptive content, then the value of res@size property shall be the size of the MPEG-DASH MPD file.

[ATTRIBUTES]

M	C	DMS, DMP, DMR, XDMR, +PU+	M-DMS, M-DMP	n/a	IEC 62481-1-1:2017 ISO/IEC 23009-1:2014	3JJSI

6.3.6

[GUIDELINE] If the context of a res@protocolInfo property is to describe adaptive content, then only the pn-param shall be included in the fourth field of the res@protocolInfo property.

[ATTRIBUTES]

M	L	DMS, DMR, XDMR, +PU+, +RUIHSRC+	M-DMS,	n/a	IEC 62481-1-1:2017 ISO/IEC 23009-1:2014	B3C94	N

[COMMENT] The manner in which DLNA Trick Modes (as specified in 11.4.3.38 to 11.4.3.58 in IEC 62481-1-1:2017) are advertised is not valid for adaptive content. Note, however, that standard HTTP Range requests are allowed; this is addressed in 6.3.7.

6.3.7

[GUIDELINE] A rendering endpoint shall support HTTP Range header for HTTP adaptive content as defined in IETF RFC 2616.

[ATTRIBUTES]

M	C	DMP, DMR, XDMR, +RUIHPL+	M-DMP	n/a	IEC 62481-1-1:2017 ISO/IEC 23009-1:2014 IETF RFC 2616	I89W4	N

[COMMENT] DLNA guidelines for HTTP Range requests do not apply to HTTP adaptive content, because serving endpoints are prohibited from advertising support for DLNA trick modes (6.3.6). Specifically, IEC 62481-1-1:2017 Guideline 11.4.3.11.7 (P7NKR) does not apply.

6.3.8

[GUIDELINE] A serving endpoint supporting ISO base media format On Demand profile (8.1, 8.3.1 and 8.3.2 of ISO/IEC 23009-1:2014) content shall support HTTP Range header as defined in IETF RFC 2616.

[ATTRIBUTES]

M	C	DMS, +PU+, +RUIHSRC+	M-DMS	n/a	IEC 62481-1-1:2017 ISO/IEC 23009-1:2014 IETF RFC 2616	9FWF8	N

6.3.9

[GUIDELINE] A serving endpoint supporting HTTP adaptive content should support HTTP Range header as defined in IETF RFC 2616.

[ATTRIBUTES]

S	C	DMS, +PU+, +RUIHSRC+	M-DMS	n/a	IEC 62481-1-1:2017 ISO/IEC 23009-1:2014 IETF RFC 2616	843DE	N

6.3.10

[GUIDELINE] The value of the contentFeatures.dlna.org HTTP header for adaptive content shall use a pn-param appropriate for the specific content referenced by the URL and contain no other parameters.

[ATTRIBUTES]

M	C	DMS, DMR, XDMR, +PU+, +RUIHSRC+	M-DMS	n/a	IEC 62481-1-1:2017 ISO/IEC 23009-1:2014 IEC 62481-2:2017	Z2GG8	N

[COMMENT] Guideline 11.4.3.11.6 (TU5R3) in IEC 62481-1-1:2017 states that the contentFeatures.dlna.org header is required to return the same value as the content's res@protocolInfo 4th field. This would imply that for the segment files a pn-param of DASH_MPD would be returned. This guideline overrides 11.4.3.11.6 (TU5R3) in IEC 62481-1-1:2017 and allows a pn-param appropriate for the media being fetched to be returned as the response to a segment request.

6.4 MPD and segment guidelines

6.4.1 MPD format requirements for Serving Endpoints

[GUIDELINE] An MPD exposed by a Serving Endpoint using the DASH_MPD profile ID shall conform to at least one of the following profiles:

– ISO base media file format On Demand profile, 8.1, 8.3.1 and 8.3.2 of ISO/IEC 23009-1:2014;

– ISO base media file format Live profile, 8.4.1 and 8.4.2 of ISO/IEC 23009-1:2014;

– MPEG2 TS simple profile, 8.7.1 and 8.7.2 of ISO/IEC 23009-1:2014.

[ATTRIBUTES]

M	A	DMS, +PU+, +RUIHSRC+	M-DMS	n/a	ISO/IEC 23009-1:2014	MBFV3

[COMMENT] MPD could also contain elements of ISO/IEC 23009-1:2014 or profiles that are not listed above.

6.4.2 MPD handling requirements for Rendering Endpoints

[GUIDELINE] A Rendering Endpoint shall be able to process an MPD complying with any of the following profiles:

– ISO base media file format On Demand profile, 8.1, 8.3.1 and 8.3.2 of ISO/IEC 23009-1:2014;

– ISO base media file format Live profile, 8.4.1 and 8.4.2 of ISO/IEC 23009-1:2014;

– MPEG2 TS simple profile, 8.7.1 and 8.7.2 of ISO/IEC 23009-1:2014.

[ATTRIBUTES]

M	A	DMP, DMR, XDMR, +RUIHPL+, +RUIHSINK+	M-DMP	n/a	ISO/IEC 23009-1:2014	VFA2D

[COMMENT] MPD could also contain elements of ISO/IEC 23009-1:2014 or profiles that are not listed above. First, the process of 8.1 of ISO/IEC 23009-1:2014 will be applied to obtain the profile-specific MPD and then the additional guidelines are applied to that profile-specific MPD.