IEC 62481-6-1

Edition 1.0   2017-07

INTERNATIONAL STANDARD

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Digital living network alliance (DLNA) home networked device interoperability guidelines –
Part 6-1: Remote User Interface – HTML5

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Part 6-1: Remote User Interface – HTML5

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FOREWORD

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International Standard IEC 62481-6-1 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
100/2740/CDV	100/2887/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- withdrawn,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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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 6-1: Remote User Interface – HTML5

1 Scope

This part of IEC 62481-6 specifies guidelines that define HTML5 Remote User Interface (RUI-H). HTML5 allows operators to develop "write once, play anywhere" content applications across a broad range of browsers and platforms. Through native integration, HTML5 enables the repurposing of single codebases, resulting in reduced development costs and the provision of a unique UI for every device.

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 62481-3:2017, *Digital living network alliance (DLNA) guidelines – Part 3: Link protection*

ISO/IEC 14496-22, *Information technology – Coding of audio-visual objects – Part 22: Open Font Format*
http://www.iso.org/iso/catalogue_detail.htm?csnumber=52136

ISO/IEC 29341-1, *Information Technology – UPnP Device Architecture – Part 1-1: UPnP Device Architecture*

ISO/IEC 29341-12-1, *Information Technology – UPnP Device Architecture – Part 12-1: Remote User Interface Device Control Protocol – Remote User Interface Client Device*

ISO/IEC 29341-12-2, *Information Technology – UPnP Device Architecture – Part 12-2: Remote User Interface Device Control Protocol – Remote User Interface Server Device*

ISO/IEC 29341-12-11, *Information Technology – UPnP Device Architecture – Part 12-11: Remote User Interface Device Control Protocol – Remote User Interface Server Service*

ISO/IEC 29341-12-10, *Information Technology – UPnP Device Architecture – Part 12-10: Remote User Interface Device Control Protocol – Remote User Interface Client Service*

ANSI/SCTE 35, Digital Program Insertion Cueing Message for Cable
http://www.scte.org/documents/pdf/standards/ANSI_SCTE%2035%202007%20Digital%20Program%20Insertion%20Cueing%20Message%20for%20Cable.pdf
or J.181
http://www.itu.int/rec/T-REC-J.181/en

IETF RFC 1983, Internet Users' Glossary
https://tools.ietf.org/html/rfc1983

IETF RFC 2246 TLS Protocol Version 1.0
http://tools.ietf.org/html/rfc2246

IETF RFC 3986, Uniform Resource Identifier (URI): General Syntax
https://tools.ietf.org/html/rfc3986

IETF RFC 4346 Transport Layer Security (TLS) Protocol Version 1.1
http://tools.ietf.org/html/rfc4346

IETF RFC 5246 Transport Layer Security (TLS) Protocol Version 1.2
http://tools.ietf.org/html/rfc5246

W3C CSS Background CSS Backgrounds and Borders Module Level 3
http://www.w3.org/TR/css3-background/

W3C CSS Multicolumn, CSS Multi-column Layout Module
http://www.w3.org/TR/css3-multicol/

W3C CSS Namespaces CSS Namespaces Module
http://www.w3.org/TR/css3-namespace/

W3C CSS Text CSS Text Module Level 3
http://www.w3.org/TR/css3-text/

W3C CSS Transforms CSS Transforms Module Level 1
http://www.w3.org/TR/css-transforms-1/

W3C HTML5, Specification, A vocabulary and associated APIs for HTML and XHTML
http://www.w3.org/TR/html5/

W3C Touch Events, Touch Events
http://www.w3.org/TR/touch-events/

W3C Key Values, W3C DOM Level 3 KeyboardEvent key Values
https://dvcs.w3.org/hg/dom3events/raw-file/tip/html/DOM3Events-key.html

W3C WOFF File Format
http://www.w3.org/TR/WOFF/

W3C MSE, Media Source Extensions
http://www.w3.org/TR/media-source/

W3C EME, Encrypted Media Extensions
http://www.w3.org/TR/encrypted-media/

W3C Crypto, Web Cryptography API
http://www.w3.org/TR/WebCryptoAPI/

W3C HTML Sourcing Inband Tracks, Sourcing In-band Media Resource Tracks from Media Containers into HTML
http://dev.w3.org/html5/html-sourcing-inband-tracks/

W3C XML Schema Part 2, Datatypes Second Edition
http://www.w3.org/TR/xmlschema-2/

W3C WebSocket, The WebSocket API
http://www.w3.org/TR/websockets/

3　Terms, definitions and conventions

For the purposes of this document, the terms and definitions given in IEC 62481-1-1:2017 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

3.1.1
RUI
Remote UI
Remote User Interface
user interface provided by an application on a server device that can be rendered by one or more client devices

3.1.2
RUI-H Content
HTML documents containing user interface elements such as Images, JavaScript, CSS, and fonts

Note 1 to entry:　This does not include Audio and A/V resources associated with HTML5MediaElement.

3.1.3
RUI-H
HTML5 Remote User Interface
HTML5-based user interface provided on a serving device that can be rendered by one or more client devices

3.2　Conventions

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 in lowercase (e.g., Move). Any lowercase uses of these words have the normal technical English meanings.

4　Networking architecture, device models 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　Document conventions and conventions

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

4.3　Guideline structure and layout

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

5 DLNA Device Model

5.1 General

See Clause 5 of IEC 62481-1-1:2017 for detailed descriptions of the existing DLNA Device Model. This document extends the existing DLNA devices and system usages.

5.2 HTML5 RUI Device Functions

For the HTML5 Remote User Interface Interoperability guidelines and system usages, the following Device Functions are defined. HTML5 Remote User Interfaces (Subclause 6.3) incorporates functionality for control, transport and rendering of remote user interfaces in the network based on HTML5 to support the HTML5 Remote UI related system usages defined in 5.4.

- RUI-H Server (RUIHS): an RUIHS provides UPnP RUI Server Device functionality to offer one or more remote user interfaces based on HTML5 and handling of UPnP RUI Server Service actions.

- RUI-H Server Control Point (RUIHS-CP): an RUIHS-CP is a controller for browsing and selecting an HTML5 remote UI offered by a RUI-H server.

- RUI-H Client (RUIHC): an RUIHC provides UPnP RUI Client device functionality for exposing HTML5-based RUI capabilities and handling UPnP RUI Client Service actions.

- RUI-H Client Control Point (RUIHC-CP): an RUIHC-CP is a controller for setting up the connection between an RUI-H Client and an HTML5 remote UI offered by an RUI-H Server.

- RUI-H Transport Server (RUIHTS) & RUI-H Transport Client (RUIHTC): an RUI-H Transport Server and an RUI-H Transport Client are the device functions for transport of the RUI-H content between a client and a server.

- RUI-H User Agent (RUIHUA): an RUI-H User Agent functionality on an RUI-H client is responsible for retrieving, decoding, presenting and interacting with the RUI-H content received from the RUI-H server.

5.3 Device Capabilities

In these interoperability guidelines, the following Device Capabilities are defined.

- An RUI-H Pull Controller (+RUIHPL+) with the role of finding and loading RUI-H content exposed by a +RUIHSRC+ capability and rendering the UI content and interacting with it. RUI-H Pull Controller includes the the following functions defined in 5.4: RUI-H Server Control Point (RUIHS-CP), RUI-H Transport Client, RUI-H User Agent and optional DLNA Media Transport Client.

- An RUI-H Source capability (+RUIHSRC+) with the role of exposing and sourcing RUI-H content. RUI-H Source capability includes the following functions defined in 5.4: RUI-H Server (RUIHS), RUI-H Transport Server and optional DLNA Media Transport Server.

- An RUI-H Sink capability (+RUIHSINK+) with the role of exposing HTML5 remote UI functionality and rendering RUI-H content it receives from a +RUIHSRC+ capability. RUI-H Sink capability includes the following functions defined in 5.4: RUI-H Client (RUIHC), RUI-H Transport Client, RUI-H User Agent and optional DLNA Media Transport Client.

- An RUI-H Controller (+RUIHCTRL+) with the role of finding +RUIHSRC+ and +RUIHSINK+ capabilities, and setting up the connection between the +RUIHSINK and +RUIHSRC+. RUI-H Controller capability includes the following functions defined in 5.4: RUI-H Server Control Point (RUIHS-CP), RUI-H Client Control Point (RUIHC-CP).

The Device Functions that are incorporated in these Device Capabilities are illustrated in Figure 1, which provides the details for system usages and their respective device interaction models in 5.4.
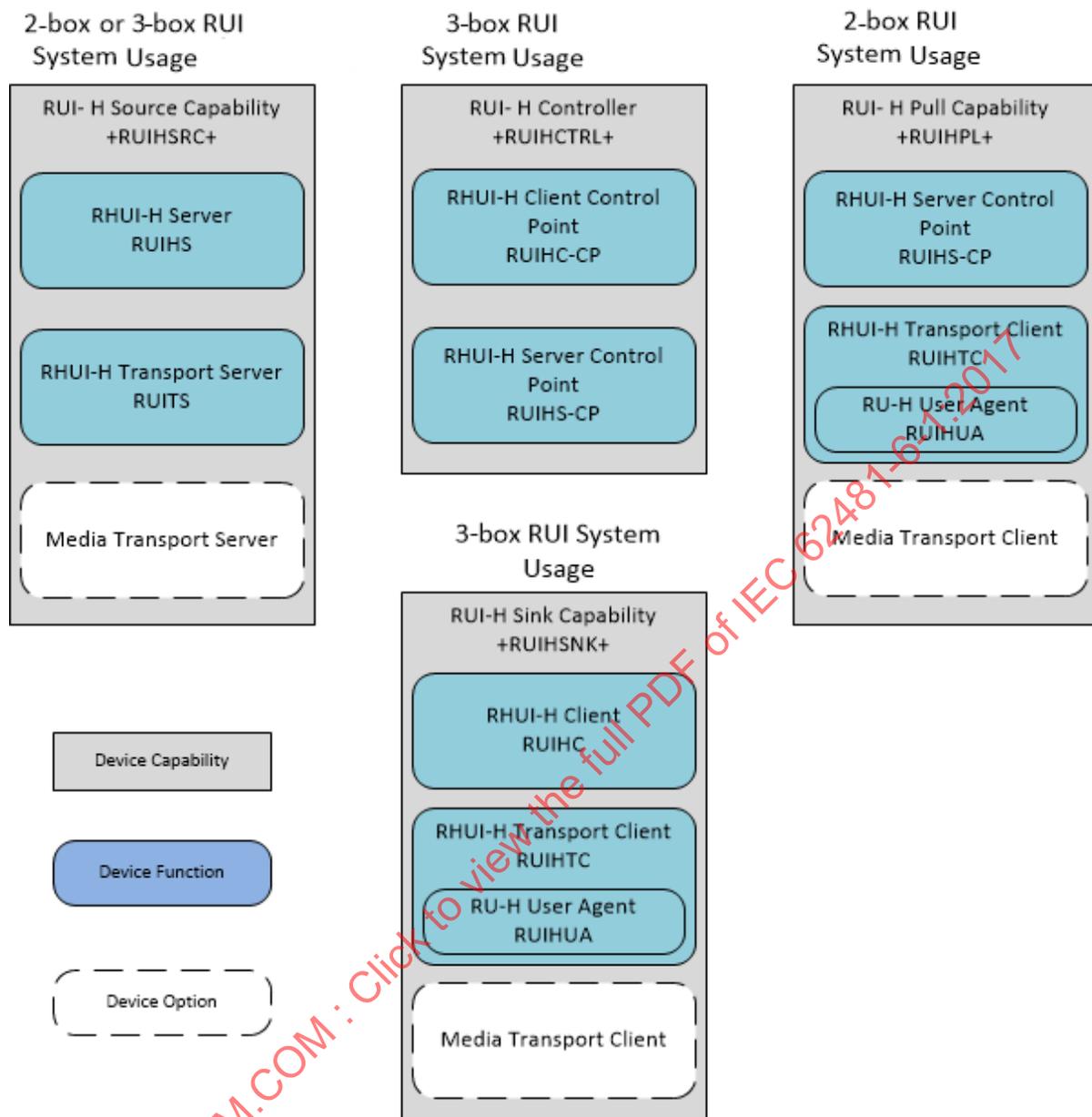
IEC

Figure 1 — Relationship of RUI-H components

5.4 System usages

5.4.1 General

In these interoperability guidelines, the following three system usages are defined that map to all of the use case scenarios being enabled by the detailed guidelines.

- 2-box RUI-H Pull with/without AV system usage

  This usage involves a user at an RUI-H Pull Controller (+RUIHPL+), which enables a user to find and interact with a user interface that is offered by a RUI-H Source (+RUIHSRC+), but which is rendered by the RUI-H Pull Controller. A user interface may control AV content that may be rendered inside the user interface.

- 3-box RUI-H only system usage

  This usage involves a user at an RUI-H Controller (+RUIHCTRL+), which enables a user to set up a remote UI connection between an RUI-H Sink (+RUIHSINK+) and a remote UI

offered by an RUI-H Source (+RUIHSRC+). This system usage does not include control of AV content that is rendered inside the user interface.

- 3-box RUI-H with AV system usage

  This usage involves a user at an RUI-H Controller (+RUIHCTRL+), which enables a user to set up a remote UI connection between an RUI-H Sink (+RUIHSINK+) and a remote UI offered by an RUI-H Source (+RUIHSRC+), that includes control of AV content that is rendered inside the user interface.

Subclauses 5.4.2, 5.4.3 and 5.4.4 briefly describe each of the system usages and their respective device interaction models. Annex D provides scenarios for combining RUI-H with AV

5.4.2   2-box RUI-H Pull with/without A/V system usage

This usage enables DLNA compliant remote UI content to be pulled from a RUI-H Source capability (+RUIHSRC+) in order to be rendered locally by a RUI-H Pull Controller (+RUIHPL+).

Figure 2 illustrates this device interaction model without A/V. The following steps are performed in this system usage.

1) Invoke actions to find remote UI content.

2) Request UI content.

3) Transport UI content to +RUIHPL+.

4) Interaction between +RUIHPL+ and +RUIHSRC+ via Remote UI connection.

Note that the +RUIHSRC+ capability includes a UPnP Device Function in order to make the capability discoverable in the network irrespective of the Device Class to which the capability is added. This means that capability can be added not only to discoverable Device Classes, but also to non-discoverable Device Classes, such as a (M-)DMC or (M-)DMP. There are no restrictions with which Device Class the +RUIHPL+ and +RUIHSRC+ capabilities can be co-located, unless explicitly stated in the guidelines.
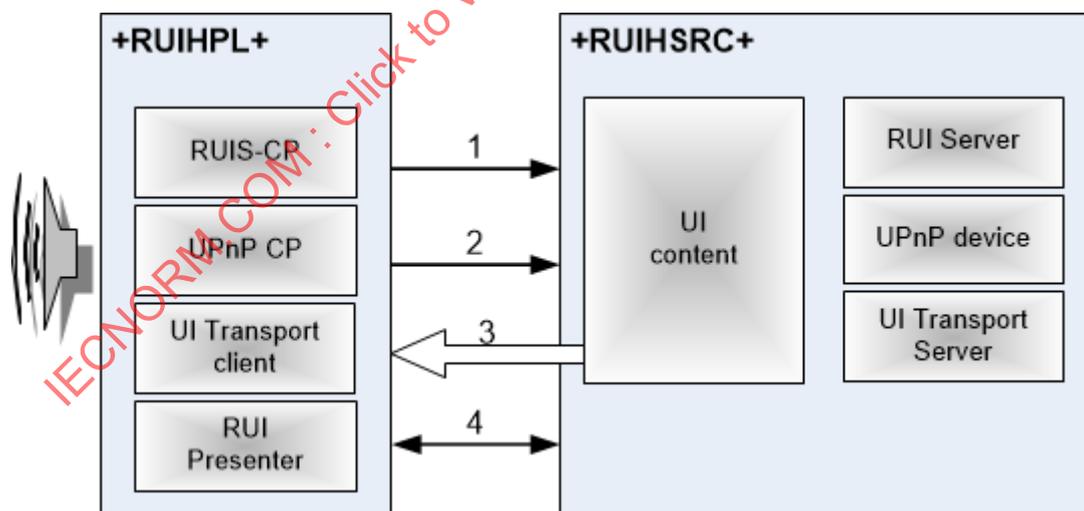
**Figure 2 – RUI-H Pull without A/V system usage
interaction model**

This system usage can be extended to control, transport and render A/V content inside the UI. This is enabled through co-location of the +RUIHPL+ and +RUIHSRC+ capability with the appropriate Media Transport Client/Server device functions of existing Device Classes to which the capabilities are added. Table 1 below shows the possibilities for co-location.

NOTE   For the RUI-H Pull without an A/V system usage as stated above, there are no restrictions on co-location.

**Table 1 – Collocation possibilities of +RUIHPL+ and
+RUIHSRC+ capabilities for A/V**

Capability	Required A/V components for collocation	Existing Device Classes/Capabilities with the required A/V components
+RUIHPL+	• MT Client	• DMR • (M-)DMP
+RUIHSRC+	• Content • MT Server	• (M-)DMS • +PU+ (Push Controller)

Graphically, the RUI-H Pull system usage with A/V rendering and control can be presented as shown in Figure 3, whereby the +RUIHPL+ and +RUIHSRC+ capabilities are displayed together with a hosting device class that will offer the appropriate Media Transport components.
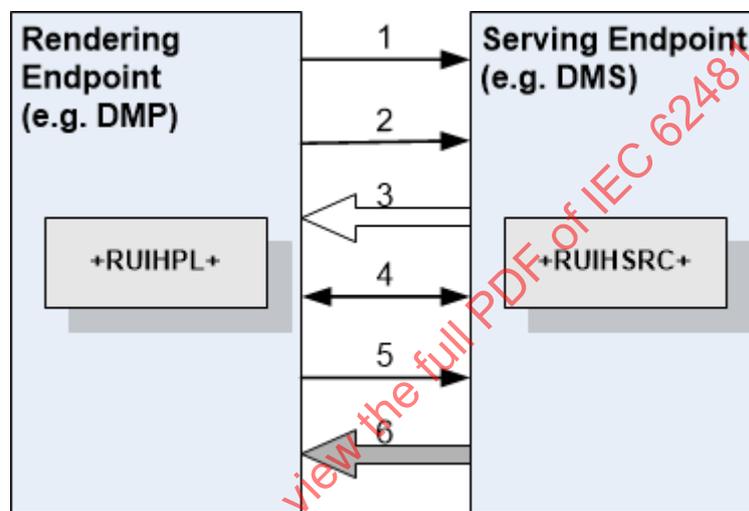
IEC

**Figure 3 – RUI-H Pull with A/V system usage
interaction model**

The +RUIHPL+ and +RUIHSRC+ capabilities and Steps 1 to 4 are the same as shown in Figure 2 and described in 5.4.2. Steps 5 and 6 are defined as follows.

5) Request associated A/V content.

6) Transport the A/V content to the Rendering Endpoint.

5.4.3 3-box UI-only system usage

This usage enables an RUI-H Controller (+RUIHCTRL+) to set up a connection between an RUI-H Sink (+RUIHSINK+) and a remote UI offered by an RUI-H Source (+RUIHSRC+). This only pertains to the initial setup phase from a remote UI point of view. After this point, it is unspecified where the user is located, i.e. for interacting with the remote UI and setting up the A/V. This can, for example, be done by using some means of user input on the +RUIHSINK+ or +RUIHSRC+ or by pairing the +RUIHCTRL+ and the +RUIHSINK+ using an out-of-band mechanism to provide user input (e.g. using infra-red). In the 3-box UI-only case, the system usage does not include A/V content that is rendered as part of the user interface. Including A/V content in the 3-box case is discussed in 5.4.4.

Figure 4 illustrates this device interaction model. The following steps are performed in this system usage.

1) Discover and match RUI-H.

2) Instruct +RUIHSINK+ to set up a remote UI connection to +RUIHSRC+.

3) Request UI content.

4) Transport UI content to +RUIHSINK+.

5) Interaction between +RUIHSINK+ and +RUIHSRC+ via Remote UI connection.
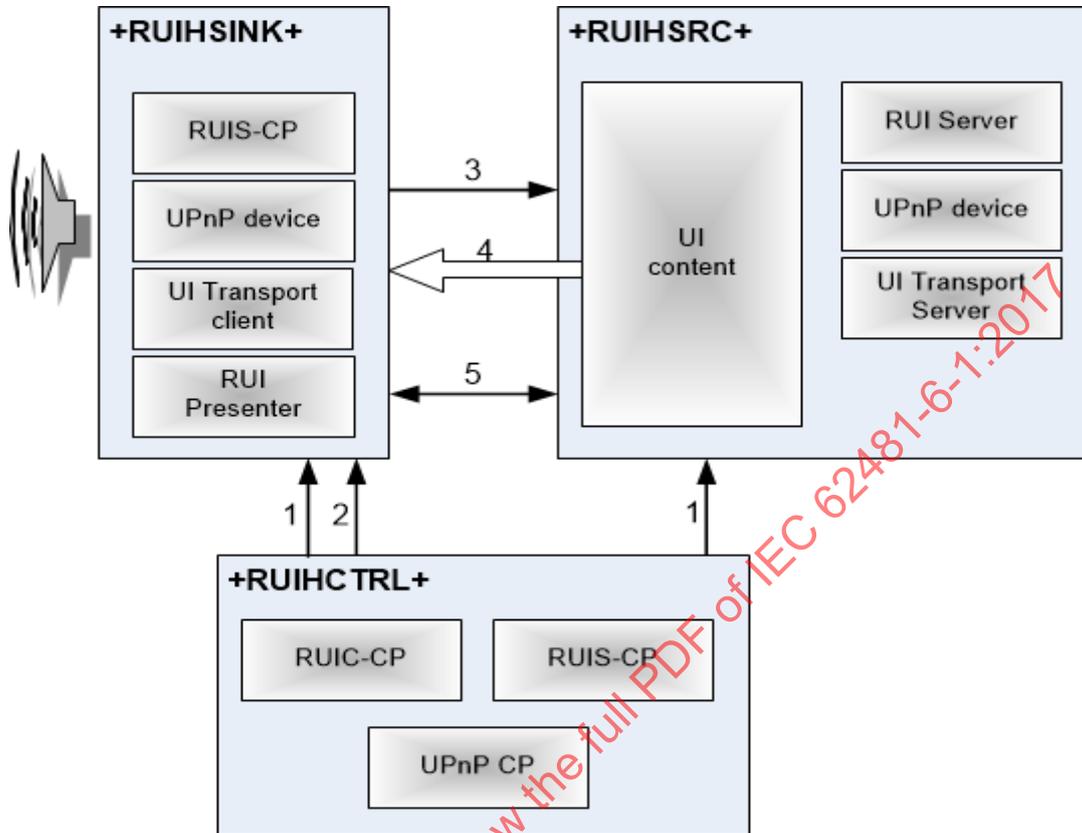
IEC

**Figure 4 – 3-box UI-only system usage
interaction model**

Note that the 3-box model actually refers to having three logical entities and not necessarily three physical entities. As shown in Figure 5 and Figure 6, it is possible to combine the logical components (i.e. +RUIHSINK+, +RUIHSRC+ and +RUIHCTRL+ capabilities) of the 3-box model into two physical entities. In this case, certain use cases (such as remote device configuration and setup) can be implemented either by using the 2-box RUI-H Pull model defined in the previous subclauses, or by using such a 3-box model.
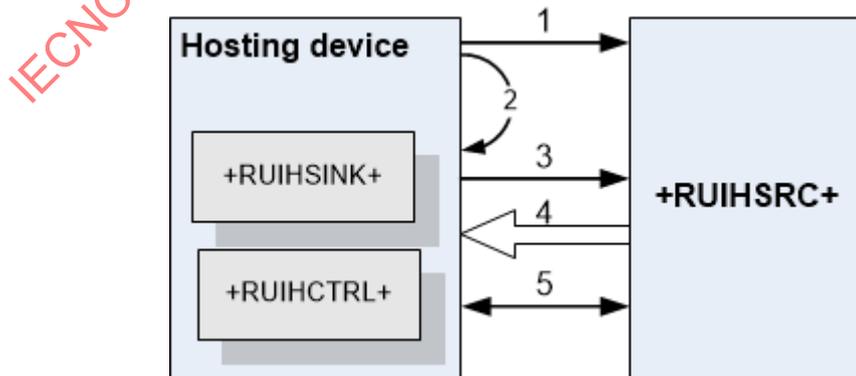
IEC

**Figure 5 – Physical configuration for 3-box UI-only
system usage model**
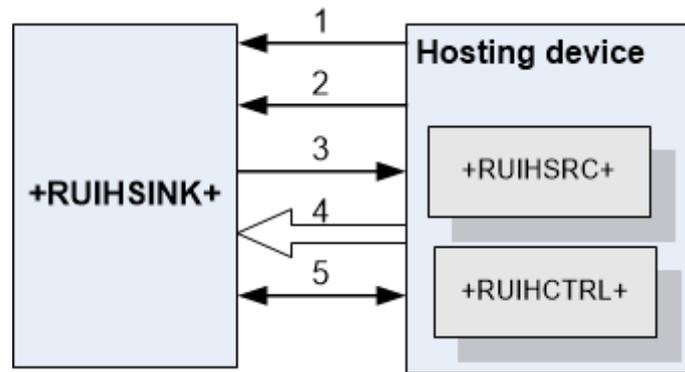
Figure 6 – Physical configuration for 3-box UI-only system usage model

As with any system usage, it is possible to combine different system usages together, or use multiple instances of the same system usage to implement a certain use case. For example, Figure 7 describes a more complicated usage model that is derived from a use case whereby a mobile phone is interacting with a remote UI server, after which the remote UI gets transferred to a large TV set. This use case can be implemented either by combining a 2-box RUI-H Pull with a 3-box RUI-H model simultaneously, or by combining/using two instances of the 3-box RUI-H model.
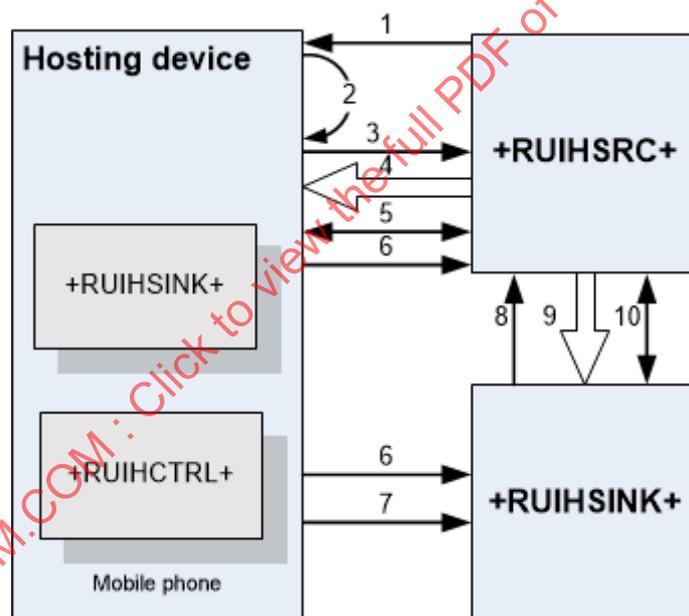
Figure 7 – Combining 2 instances of 3-box UI-only system usage

This system usage model consists of the following steps.

1) Discover and match RUI-H.

2) Instruct +RUIHSINK+ to connect to +RUIHSRC+ (might be done internally, not via the network.

3) Request UI content from +RUIHSRC+.

4) Transport UI content to +RUIHSINK+.

5) Interaction between +RUIHSINK+ and +RUIHSRC+ via Remote UI connection.

6) Discover and match RUI-H.

7) Instruct +RUIHSINK+ to connect to +RUIHSRC+ (can be done internally, not via the network).

8) Request UI content from +RUIHSRC+.

9) Transport UI content to +RUIHSINK+.

10) Interaction between +RUIHSINK+ and +RUIHSRC+ via remote UI connection.

5.4.4   3-box UI with A/V system usage

Rendering A/V in the 3-box model is enabled through the co-location of the +RUIHSRC+ and +RUIHSINK+ Device Capabilities with existing Device Classes that offer the appropriate A/V serving and rendering components, in a similar way as is done for the 2-box RUI-H Pull model with A/V (as defined in 5.4.2). If 3-box RUI-H needs to be combined with A/V, the content of Table 2 holds.

Table 2 – Collocation possibilities of +RUIHSRC+ and +RUIHSINK+ capabilities for A/V

Capability	Required A/V components for collocation	Existing Device Classes/Capabilities with the required A/V components
+RUIHSRC+	• Content • MT Server	• (M-)DMS • +PU+ (Push Controller)
+RUIHSINK+	• MT Client	• DMR • (M-)DMP

However, this only deals with a 2-box like A/V model, while the RUI-H is using a 3-box model. Another 3-box case is whereby the A/V is set up by using a 3-box model. This is for example the case when a proxy server is used to serve a remote UI for a non-remote UI enabled DMS device, whereby the remote UI is used to control A/V content coming from the DMS device. Figure 8 illustrates such a device interaction model whereby a 3-box Remote UI model is combined with a 3-box A/V model. In this case, the +RUIHSINK+ capability is co-located with a DMR, and the +RUIHSRC+ capability is co-located with a (M-)DMC (could also be a DMS itself) that has a control point to discover a DMS in the network. The following steps are performed in this system usage.

1) Discover and match RUI-H.

2) Instruct +RUIHSINK+ to connect to +RUIHSRC+ (can be done internally, not via the network if on the same device).

3) Request UI content.

4) Transport UI content to +RUIHSINK+.

5) Interaction between +RUIHSINK+ and (M)-DMC via Remote UI connection.

6) Browse and select A/V content.

7) Invoke actions to setup connection between DMR and (M)-DMS.

8) Request and control A/V content.

9) Transport the A/V content to the Rendering Endpoint.
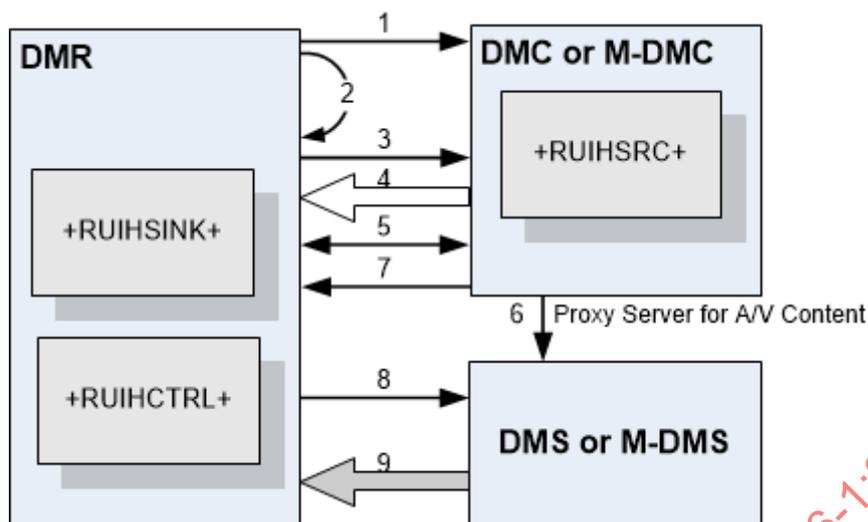
**Figure 8 – 3-box UI with 3-box A/V system
usage interaction model**

6 HTML5 RUI guideline

6.1 General

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

Clause 6 contains guidelines for Device Functions that are elements of DLNA HTML5 RUI capabilities.

6.2 Architecture and protocols

6.2.1

[GUIDELINE] RUI-H capabilities shall conform to all Requirements defined in 9.2 of IEC 62481-1-1:2017 for UPnP endpoints.

[ATTRIBUTES]

M	R	+RUIHPL+, +RUIHSINK+ +RUIHCTRL+ +RUIHSRC+	n/a	n/a	IEC 62481-1-1: 2017	99SDQ	

6.2.2

[GUIDELINE] DLNA Device Classes and Device Capabilities shall fully support the applicable mandatory portions of ISO/IEC 29341-1 for discovery, description, control, eventing, and presentation.

[ATTRIBUTES]

M	R	+RUIHPL+ +RUIHSINK+ +RUIHCTRL+ +RUIHSRC+	n/a	n/a	IEC 62481-1-1: 2017	WPUS6	

[COMMENT] DLNA specifies UPnP Device Architecture 1.0 as the basic protocol framework for Device Classes.

6.2.3

[GUIDELINE] DLNA Device Classes and Device Capabilities shall fully support the mandatory portions of ISO/IEC 29341-1 ref_UPnP_Device_Arch for the GENURL Device Function as well as 10.1.3.11 in IEC 62481-1-1:2017.

[ATTRIBUTES]

M	A	+RUIHPL+	n/a	n/a	ISO/IEC 29341-1	SMCEI	N

6.2.4

[GUIDELINE] A RUI-H Source capability shall use the value of "+RUIHSRC+" for the dlna-dev-capability field as defined in Guideline 9.2.10.2 (GUN 8CA7M) in IEC 62481-1-1:2017.

A RUI-H Sink capability shall use the value of "+RUIHSINK+" for the dlna-dev-capability field as defined in guidelines 9.2.10.2 (GUN 8CA7M) in IEC 62481-1-1:2017.

[ATTRIBUTES]

M	A	+RUIHSRC+ +RUIHSINK+	n/a	n/a	IEC 62481-1-1: 2017	FFA55	

6.3 HTML5 Remote User Interfaces

6.3.1 General

Subclause 6.3 covers the guidelines for implementing DLNA HTML5 Remote User Interfaces based on W3C HTML5, Specification and related W3C specifications. The RUI-H protocol used between RUI-H User Agents and RUI-H Servers compliant with the guidelines in 6.3 is referred to as the DLNA-HTML5-1.0 protocol.

6.3.2 Discovery of HTML5 Remote UI devices

6.3.2.1

[GUIDELINE] A RUI-H Source capability (+RUIHSRC+) shall implement a UPnP RemoteUIServerDevice device and a UPnP RemoteUIServer service with XML device description as defined in ISO/IEC 29341-12-2 and XML service description as defined in ISO/IEC 29341-12-11.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	ISO/IEC 29341-12-11 ISO/IEC 29341-12-2	5O8LQ	

6.3.2.2

[GUIDELINE] A RUI-H Pull Controller capability (+RUIHPL+) shall implement a UPnP RemoteUIServerDevice control point that calls the required actions of the UPnP RemoteUIServer service.

[ATTRIBUTES]

M	A	+RUIHPL+	n/a	n/a	ISO/IEC 29341-12-11 ISO/IEC 29341-12-2	O9F92	

6.3.2.3

[GUIDELINE] A RUI-H Sink capability (+RUIHSINK+) shall implement a UPnP RemoteUIClientDevice device and a UPnP RemoteUIClient service with XML device description as defined in ISO/IEC 29341-12-1 and XML service description as defined in ISO/IEC 29341-12-10.

[ATTRIBUTES]

M	A	+RUIHSINK+	n/a	n/a	ISO/IEC 29341-12-1 ISO/IEC 29341-12-10	G94BE	

6.3.2.4

[GUIDELINE] A RUI-H Controller capability (+RUIHCTRL+) shall implement a UPnP RemoteUIServerDevice control point that calls the required actions of the UPnP RemoteUIServer service.

[ATTRIBUTES]

M	A	+RUIHCTRL+	n/a	n/a	ISO/IEC 29341-12-11 ISO/IEC 29341-12-2	MK65T	

6.3.2.5

[GUIDELINE] A RUI-H Controller capability (+RUIHCTRL+) shall implement a UPnP RemoteUIClientDevice control point that calls the required actions of the UPnP RemoteUIClient service.

[ATTRIBUTES]

M	A	+RUIHCTRL+	n/a	n/a	ISO/IEC 29341-12-1 ISO/IEC 29341-12-10	U4CFX	

6.3.2.6

[GUIDELINE] A RUI-H Client shall include a protocol element with the shortName attribute of "DLNA-HTML5-1.0" in the RemoteUIClient.DeviceProfile state variable.

[ATTRIBUTES]

M	A	+RUIHSINK+	n/a	n/a	ISO/IEC 29341-12-10	2SED2	

6.3.2.7

[GUIDELINE]   If a RUI-H Client implements RemoteUIClient:GetUIListing action, then it shall include a UI element that contains a protocol element with the shortName attribute of "DLNA-HTML5-1.0" in a CompatibleUIList output argument of the action.

[ATTRIBUTES]

M	A	+RUIHSINK+	n/a	n/a	ISO/IEC 29341-12-10	W9IKW	

6.3.2.8

[GUIDELINE]   A RUI-H Client Control Point that discovers a RUI-H Client shall do so as described in ISO/IEC 29341-1 and shall access the RUI-H Client as described in Guidelines 6.3.2.6 and 6.3.2.7.

[ATTRIBUTES]

M	A	+RUIHCTRL+	n/a	n/a	ISO/IEC 29341-1	7ZZKT	

[COMMENT]   The RUI-H Client Control Point discovers the RUI-H Clients based on the properties advertised using Guidelines 6.3.2.6 to 6.3.2.7.

6.3.2.9

[GUIDELINE]   A RUI-H Server serving one or more HTML5 RUIs shall include one or more UI elements that each contains at least one URI sub-element for each protocol sub-element with a short name of "DLNA-HTML5-1.0" in the UIListing output argument of RemoteUIServer:GetCompatibleUIs action, when the InputDeviceProfile input argument contains a protocol element with the shortName attribute set to "DLNA-HTML5-1.0".

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	ISO/IEC 29341-12-11	57UEI	

[COMMENT]   A RUI-H Server can support more than one HTML5 RUI by using multiple UI elements in its service description. These UI elements can be uniquely identified on the client by the 'name' attribute or optional 'description' attribute defined in ISO/IEC 29341-12-11. For each UI element there will be one URI sub element.

6.3.2.10

[GUIDELINE]   A RUI-H Server serving one or more HTML5 RUIs shall include one or more UI elements that each contains at least one URI sub-element for each protocol sub-element with a short name of "DLNA-HTML5-1.0" in the UIListing output argument of RemoteUIServer:GetCompatibleUIs action, ISO/IEC 29341-12-11, when the InputDeviceProfile input argument is an empty string.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	ISO/IEC 29341-12-11	GU6OQ	

6.3.2.11

[GUIDELINE] A RUI-H Server Control Point that discovers a RUI-H Server shall do so as described in ISO/IEC 29341-1 and shall access the RUI-H Server using the information exposed by requirements 6.3.2.9 and 6.3.2.10.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHCTRL+	n/a	n/a	ISO/IEC 29341-1	FQQ46	

6.3.2.12

[GUIDELINE] A RUI-H Server Control Point shall tolerate URIs with IPv6 addresses in the UIListing output argument of RemoteUIServer:GetCompatibleUIs.

[ATTRIBUTES]

M	R	+RUIHPL+ +RUIHCTRL+	n/a	n/a	ISO/IEC 29341-1	ZE3DV	N

[COMMENT] This is not a requirement for support of IPv6. A RUI-H Server Control Point that does not support IPv6 is expected to ignore such URIs and select an appropriate URI from among other URIs. The purpose of this guideline is to ensure that tolerance is tested.

6.3.2.13

[GUIDELINE] A RUI-H Pull Controller (+RUIHPL+), RUI-H Controller (+RUIHCTRL+), and RUI-H Sink (+RUIHSINK+) shall be able to handle URLs that are part of the RemoteUIClient.A_ARG_TYPE_CompatibleUIs state variable or the RemoteUIServer.A_ARG_TYPE_CompatibleUIs state variable.

[ATTRIBUTES]

M	R	+RUIHPL+ +RUIHSINK+ +RUIHCTRL+	n/a	n/a	ISO/IEC 29341-12-10 ISO/IEC 29341-12-11	XVHPX	N

[COMMENT] The purpose of this guideline is to ensure HTML5 clients can handle UI Listing URIs with fully qualified domain names, escaping, and query parameters, providing additional flexibility to server administrators. The purpose of this guideline is to ensure handling of URLs is tested.

6.3.3 RUI-H transport

6.3.3.1

[GUIDELINE] RUI-H Transport Servers and Clients shall support the HTTP specification of [HTTP] reference as defined by W3C HTML5, Specification for transport of the RUI-H content.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+ +RUIHSRC+	n/a	n/a	W3C HTML5, Specification	SYO9L	E

6.3.3.2

[GUIDELINE] RUI-H Transport Clients shall support the use of [HTTPS] specification as defined in W3C HTML5, Specification for secure transport of the RUI-H content.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	TLY8P	E

6.3.3.3

[GUIDELINE] RUI-H Transport Servers should support the use of [HTTPS] specification as defined in W3C HTML5, Specification for secure transport of the RUI-H content.

[ATTRIBUTES]

S	L	+RUIHSRC+	n/a	n/a	W3C HTML5, Specification	ULRLB	

6.3.3.4

[GUIDELINE] RUI-H Transport Clients shall implement the TLS1.2 protocol, IETF RFC 5246, for secure transport of the RUI-H content.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHCTRL+	n/a	n/a	IETF RFC 5246	WXS67	E

[COMMENT] TLS 1.2 is mandatory for RUI-H Transport Clients. This guideline is not intended to limit the types of content delivered using TLS.

6.3.3.5

[GUIDELINE] If RUI-H Transport Server implements HTTPS, then it shall implement the TLS1.2 protocol, IETF RFC 5246, for secure transport of the RUI-H content.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	IETF RFC 5246	FN7H5	E

[COMMENT] TLS 1.2 is conditionally mandatory for RUI-H Transport Server depending on the support for HTTPS.

6.3.3.6

[GUIDELINE] RUI-H Transport Clients should implement TLS 1.0, IETF RFC 2246, and TLS1.1, IETF RFC 4346, protocols for secure transport of the RUI-H content.

[ATTRIBUTES]

S	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	IETF RFC 2246 IETF RFC 4346	5W5XR	

[COMMENT]   TLS 1.0 and 1.1 are recommended for RUI-H Transport Clients.

6.3.3.7

[GUIDELINE]   RUI-H Transport Servers may implement TLS 1.0, IETF RFC 2246, and TLS1.1, IETF RFC 4346, protocols for secure transport of the RUI-H content.

[ATTRIBUTES]

O	L	+RUIHSRC+	n/a	n/a	IETF RFC 2246 IETF RFC 4346	OHCL3	

[COMMENT]   TLS 1.0 and 1.1 are optional for RUI-H Transport Servers.

6.3.3.8

[GUIDELINE]   RUI-H Transport Servers and Clients should implement TLS1.2, IETF RFC 5246, certificate-based client authentication.

[ATTRIBUTES]

S	A	+RUIHPL+ +RUIHSINK+ +RUIHSRC+	n/a	n/a	IETF RFC 5246	GGZNF	

[COMMENT] Recommended requirement to support certificate-based client side authentication.

6.3.4   Media Formats and AV metadata

6.3.4.1

The playback of AV inside the remote UI cannot rely on the CDS res element to provide the AV metadata, in particular the 4th field protocolInfo-value that is needed to properly set up and use a DLNA compatible AV stream. The Guidelines 6.3.4.2 to 6.3.4.10 describe how the res element contents and properties are conveyed to the RUI-H User Agent using the HTML5 video and audio elements. Annex B describes mechanisms for dynamically updating the UI with new information coming from an RUI-H source capability.

6.3.4.2

[GUIDELINE]   If an RUI-H capability plays AV streams, then it shall comply with each of the following:

- allow the use of the HTML5 video element for the playback of DLNA AV content as described by guidelines 6.3.4.8, 6.3.4.9, 6.3.4.10 and guidelines in 6.3.5 and 6.3.5.9;
- ability to render each of the DLNA mandatory Media Format Profiles for the DLNA AV Media Class that is common (i.e. overlapping) to the HND and MHD Device Categories as defined in Guidelines 6.2.7 (GUN QOSMM) and 6.2.9 (GUN 44ZVV) in IEC 62481-2:2017.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	IEC 62481-2:2017 W3C HTML5, Specification	MS3HU	

[COMMENT]   This creates a conditional mandatory requirement for the RUI-H capability to support playing AV through the HTML5 video element.

6.3.4.3

[GUIDELINE]   If an RUI-H capability plays AV streams, then it should be able to render each of the DLNA mandatory Media Format Profiles for the DLNA AV Media Class in both the HND and MHD Device Categories as defined in Guidelines 6.2.7 (GUN QOSMM) and 6.2.9 (GUN 44ZVV) in IEC 62481-2:2017.

[ATTRIBUTES]

S	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	IEC 62481-2:2017 W3C HTML5, Specification	GIH5Z	

[COMMENT]   In order to achieve better media format interoperability, it is desirable for HTML5 RUI clients to render all the mandatory DLNA AV Media Format Profiles for both the HND and MHD Device Categories.

6.3.4.4

[GUIDELINE]   If a RUI-H Source capability serves AV streams, then it shall be able to serve at least one of the DLNA mandatory Media Format Profiles for the DLNA AV Media Class that is common to the HND and MHD Device Categories as defined in Guidelines 6.2.7 (GUN QOSMM) and 6.2.9 (GUN 44ZVV) in IEC 62481-2:2017.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	IEC 62481-2:2017	PI43P	

[COMMENT]   This requirement does not imply that a RUI-H Source capability be capable of performing media transcoding or provisioned by the content provider to always provide media in a particular format.

6.3.4.5

[GUIDELINE]   If an RUI-H capability plays audio streams, then it shall comply with each of the following:

- allow the use of the HTML5 audio element for the playback of DLNA Audio content as described by Clause 6.3.4;
- ability to render each of the DLNA mandatory Media Format Profiles for the Audio Media Class that is common (i.e. overlapping) to the HND and MHD Device Categories as defined in Guidelines 6.2.3 (GUN Q77AY) and 6.2.5 (GUN OSMM7) in IEC 62481-2:2017.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	IEC 62481-2:2017 W3C HTML5, Specification	3UNXA	

[COMMENT]   This creates a conditional mandatory requirement for the RUI-H capability to support playing audio through the HTML5 audio element.

6.3.4.6

[GUIDELINE]   If an RUI-H capability plays audio streams, then it should be able to render each of the DLNA mandatory Media Format Profiles for the Audio Media Class in both the HND and MHD Device Categories as defined in Guidelines 6.2.3 (GUN Q77AY) and 6.2.5 (GUN OSMM7) in IEC 62481-2:2017.

[ATTRIBUTES]

S	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	IEC 62481-2:2017 W3C HTML5, Specification	UPPBK	

[COMMENT]   In order to achieve better media format interoperability, it is desirable for HTML5 RUI clients to render all the mandatory audio Media Format Profiles for both the HND and MHD Device Categories.

6.3.4.7

[GUIDELINE]   If a RUI-H Source capability serves audio streams, then it shall be able to serve at least one of the DLNA mandatory Media Format Profiles for the Audio Media Class that is common to the HND and MHD Device Categories as defined in Guidelines 6.2.3 (GUN Q77AY) and 6.2.5 (GUN OSMM7) in IEC 62481-2:2017.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	IEC 62481-2:2017	AY4HH	

6.3.4.8

[GUIDELINE]   The RUI-H User Agent shall implement requirements 11.4.3.11.3 (GUN Q868P) and 11.4.3.11.4 (GUN W6L8O) in IEC 62481-1-1:2017 to ensure res@protocolInfo information is retrieved for DLNA AV or DLNA Audio content identified by the HTML5 video or audio element.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification IEC 62481-1-1:2017	5JUFF	A

[COMMENT]   Requirements 11.4.3.11.3 (GUN Q868P) and 11.4.3.11.4 (GUN W6L8O) in IEC 62481-1-1:2017 describe use of getContentFeatures.dlna.org to obtain res information. This changes the guideline compliance classification of 11.4.3.11.3 (GUN Q868P) in IEC 62481-1-1:2017 from "may" to "shall".

6.3.4.9

[GUIDELINE]   If the canPlayType() function of the HTML5 video or audio element, as specified in W3C HTML5, Specification, is called with the type attribute set to the DLNA MIME Type before any encryption is applied and the codecs parameter set to a DLNA Media Format Profile ID (prefixed by "DTCP_" for DTCP-IP encrypted content), then the function shall return the result 'probably' only if the applicable DLNA Media Format Profile ID is supported by the RUI-H User Agent.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	LDVGI	C

[COMMENT]   The canPlayType() function provides a mechanism for the application to filter out the content items that may not be rendered by the rendering endpoint. The canPlayType() function includes a type input argument, which accepts a MIME Type attribute encoded with an optional 'codecs' parameter. This guideline extends the use of that 'codecs' parameter in order to pass the DLNA Media Format Profile ID.

The return value of the canPlayType() has a stronger meaning when a supported DLNA Profile ID is set in the codecs parameter. The canPlayType() function follows the HTML5 specification for all instances when the codecs parameter is absent or is not equal to a DLNA Media Format Profile ID associated with the MIME Type.

Example:

```
<script>
var v = document.createElement('video');
    if (null==v) {
        alert ("Cannot create video element");
    }
else
{

var type=' video/vnd.dlna.mpeg-tts; codecs="AVC_TS_MP_HD_AC3_T" ';
if ( v.canPlayType(type) == 'probably' ) alert ("This DLNA Media Format profile is
supported by the device");
}
</script>
```

6.3.4.10

[GUIDELINE]   If the type attribute of the child source element of HTML5 video or audio element, as specified in W3C HTML5, Specification, is set to an DLNA MIME Type before any encryption is applied and includes the 'codecs' parameter that is set to a DLNA Media Format Profile ID (prefixed with 'DTCP_' for DTCP-IP encrypted content), that is supported by the Content Receiver of the RUI-H Capability, then the RUI-H User Agent shall accept this Source element as having a type it can render in the Resource Selection Algorithm specified in W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	HODY9	C

[COMMENT]   The HTML5 resource selection algorithm defines the process for selecting HTML5 source elements and includes a check of the source element's 'type' attribute to see if it is of a type the user agent can render. However, the HTML5 W3C specification does not clearly define the criteria used to detect whether the source element has a type it can render. This guideline mandates that if the type and codec contains a DLNA Media Format Profile ID that is supported by the Content Receiver then the user agent needs to recognize this as a type it can render as it processes the resource selection algorithm. See Annex A for HTML5 RUI client capability detection.

The HTML5 video or audio element may have one or more HTML source element children. These HTML source elements include a MIME type attribute encoded with an optional 'codecs' parameter.

Example:

```
<video>
     <source src='/myUrl1' type='video/mpeg; codecs="AVC_TS_MP_HD_HEAAC_L2_ISO"'>
     <source src='/myUrl2' type='video/mpeg; codecs="AVC_TS_MP_HD_AC3_ISO"'>
     <source src='/myUrl2' type='video/mpeg; codecs="DTCP_AVC_TS_MP_HD_AC3_ISO"'>
</video>
```

6.3.5   Media Transport and control

6.3.5.1

The following guidelines provide for the playback of DLNA Audio & AV content inside the remote UI. The guidelines extend the HTML5 media elements with the transport layer DLNA requirements associated with the streaming of DLNA Audio and AV content.

6.3.5.2

[GUIDELINE]   An RUI-H capability that plays DLNA Audio or AV streams shall conform to all Content Receiver related requirements in 11.4.3.1 to 11.4.3.58 and 11.4.4 of IEC 62481-1-1:2017.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	IEC 62481-1-1: 2017	LAA8I	A

6.3.5.3

[GUIDELINE]   RUI-H Source Capabilities that support DLNA Audio or AV streams accessed through a Remote UI shall conform to all Content Source guidelines in 11.4.3.1 to 11.4.3.58, 11.4.4 and 10.1.3.28 of IEC 62481-1-1:2017.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	IEC 62481-1-1: 2017	JBHBY	E

6.3.5.4

[GUIDELINE]   When the HTMLMediaElement playbackRate attribute has a value of 1 for playback of content in the DLNA Audio or AV Media Class then:

- if the transport is HTTP, then the Content Receiver shall operate the same as the Play media operation in Guideline 11.4.3.39 (U6498) in IEC 62481-1-1:2017;

- if the transport is RTP, then the Content Receiver shall operate the same as the Play media operation in Guideline 11.4.4.164.1 (QA6ZW) in IEC 62481-1-1:2017.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	IEC 62481-1-1: 2017	4KXIL	A

6.3.5.5

[GUIDELINE]   If the HTMLMediaElement playbackRate attribute is set to a value not equal to 0 or 1 for playback of content in the DLNA Audio or AV Media Class, then the Content Receiver shall operate according to the fast and slow scan operation guidelines for forward and backward playback as follows:

- if the transport is HTTP, then the Content Receiver shall at least operate according to Requirement 11.4.3.45.1 (TY7CW), 11.4.3.45.2 (T24LR), 11.4.3.46.1 (L6RNZ), 11.4.3.46.2 (Z9BD2), 11.4.3.47.1 (Y7CWO), 11.4.3.47.2 (V46LS), 11.4.3.48.1 (6RNZ6), 11.4.3.48.2 (A89O5), 11.4.3.49.1 (6TQT3), 11.4.3.52.1 (8H8X2), 11.4.3.53.3 (A772R), 11.4.3.53.8 (ZAVEC), 11.4.3.58.1 (772R2), and 11.4.3.11.7 (P7NKR) in IEC 62481-1-1:2017;

- if the transport is RTP, then the Content Receiver shall operate the same as the SCAN media operation defined in Guideline 11.4.4.171 in IEC 62481-1-1:2017.

In addition, the following requirement shall be met:

- the playspeed values within the media transport operation request to the server shall be rounded to the nearest fractional value as indicated of being supported through the ps-param of the 4th field protocolInfo value.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a		n/a		IEC 62481-1-1: 2017	OJ4JT	E

[COMMENT] This guideline mandates support for byte-seek and time-seek trick mode operations.

6.3.5.6

[GUIDELINE] If an RUI-H User Agent sets the HTMLMediaElement playbackRate attribute to a value not equal to 0 or 1 for playback of content in the DLNA AV Media Class then the RUI-H Transport Client should operate according to the fast and slow scan operation guidelines for forward and backward playback as follows:

- for HTTP transport, the RUI-H User Agent should operate according to Requirement 11.4.3.45.3 (TYB9P), 11.4.3.46.3 (3W8KS), 11.4.3.47.3 (ZHSFA), 11.4.3.48.3 (2DQOQ), 11.4.3.49.1 (6TQT3), 11.4.3.52.1 (8H8X2), 11.4.3.53.3 (A772R), 11.4.3.53.8 (ZAVEC), 11.4.3.58.1 (772R2), and 11.4.3.11.7 (P7NKR) in IEC 62481-1-1:2017.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a		n/a		IEC 62481-1-1: 2017	BOE2P	E

[COMMENT] This guideline mandates support for byte-seek and time-seek trick mode operations.

6.3.5.7

[GUIDELINE] If the HTMLMediaElement playbackRate attribute is set to a value of zero, or the paused attribute to a value of "true" for playback of content in the DLNA Audio or AV Media Class, then the Content Receiver shall operate according to the media operation guidelines for pause as follows:

- if the transport is HTTP, then the Content Receiver shall operate the same as the Pause media operation defined in Guidelines 11.4.3.41 to 11.4.3.43 of IEC 62481-1-1:2017.

- if the transport is RTP, then the Content Receiver shall operate the same as the Pause media operation defined in Guidelines 11.4.4.175 to 11.4.4.178 of IEC 62481-1-1:2017.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a		n/a		IEC 62481-1-1: 2017	XD9NR	E

6.3.5.8

[GUIDELINE]   When the HTMLMediaElement currentTime attribute is set during playback of content in the DLNA Audio or AV Media Class, the Content Receiver shall operate according to the seek media operation as follows:

- if the transport is HTTP, then the Content Receiver shall operate the same as the Seek media operation in Guideline 11.4.3.44 of IEC 62481-1-1:2017;

- if the transport is RTP, then the Content Receiver shall operate the same as the Seek media operation defined in Guidelines 11.4.4.167 to 11.4.4.169 of IEC 62481-1-1:2017.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	IEC 62481-1-1: 2017	M46ZT	A

6.3.5.9

[GUIDELINE]   If an RUI-H User Agent is rendering a content binary that conforms to a DLNA Media Format Profile and the content binary contains closed captions, then the User Agent shall render the captions when the TextTrack mode corresponding to the captions is set to "showing".

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification IEC 62481-2:2017	SJJAN	N

[COMMENT]   This guideline clarifies the rendering User Agent responsibility for DLNA Media Format Profiles that include a closed caption definition.

6.3.5.10   AvailableSeekRange.dlna.org for Full Random Access Data Availability

6.3.5.10.1

[GUIDELINE]   A   +RUIHSRC+   Device   Capability   shall   support   the getAvailableSeekRange.dlna.org HTTP header field and availableSeekRange.dlna.org HTTP header field in HTTP GET/HEAD requests for the content binary as defined in 11.4.3.20.5 [GUN NKR8W], 11.4.3.20.6 [GUN R8WAA] and 11.4.3.20.7 [GUN 8OUBZ] of IEC 62481-1-1:2017 when operating under the Full Random Access Data Availability model.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	W3C HTML5, Specification IEC 62481-1-1: 2017	58A3H	N

[COMMENT]   In IEC 62481-1-1:2017, support for the getAvailableSeekRange.dlna.org HTTP header field and availableSeekRange.dlna.org HTTP header field is required only when operating under the LRADA model. However, a RUI-H User Agent needs to set the HTMLMediaElement duration attribute, as defined in W3C HTML5, Specification, but without a Content Directory Service to supply res@duration or res@size the client may need to rely on these header fields to be available in all cases when duration is knowable, as in the case of operating under the FRADA model.

6.3.5.10.2

[GUIDELINE]   When operating under Full Random Access Data Availability model, the notation of the availableSeekRange.dlna.org HTTP header field shall be as defined in 11.4.3.20.8 [GUN UBZ33] of IEC 62481-1-1:2017, except:

- npt-range = "npt" "=" npt-time of the content binary's zero position "-" npt-time of the instance-duration, if the a-val flag of the Operations Parameter for HTTP is set to 1;

- bytes-range = "bytes" "=" "0" "-" instance-length, if the b-val flag of the Operations Parameter for HTTP is set to 1, where the instance-length shall be set to the cleartext byte domain instance length if the Cleartext Byte Full Data Seek flag is set.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	W3C HTML5, Specification IEC 62481-1-1: 2017	OEEJH	N

[COMMENT]   The availableSeekRange.dlna.org header is defined in IEC 62481-1-1:2017 only for Limited Random Access Data Availability model. This guideline extends the definition of how to set the range-specifier when operating under Full Random Access Availability model. The mode syntax is maintained according to Limited Random Access Data Availability model to allow minimal changes to server implementations; however the value of mode has no defined meaning or purpose when operating under Full Random Access Data Availability model and is therefore ignored.

6.3.5.11

[GUIDELINE]   If the content binary does not contain a duration in the embedded metadata, the RUIH User Agent shall set the duration attribute and seekable TimeRanges object of the HTMLMediaElement as defined in W3C HTML5, Specification based on the availableSeekRange.dlna.org HTTP header response to a getAvailableSeekRange.dlna.org HTTP header request for the content binary as defined in IEC 62481-1-1:2017.

- When operating under Full Random Access Data Availability model, the duration attribute shall be set to the instance-duration, which may be an estimated value from the instance-length if instance-duration is not available.

- When operating under Limited Random Access Data Availability model the duration attribute shall be set to NaN.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification IEC 62481-1-1: 2017	4BZBT	N

[COMMENT]   MPEG-2 media formats do not carry content duration or size information in the stream. However, a RUIHSRC is required to support getAvailableSeekRange.dlna.org for FRADA content and LRADA, and so can be used to determine content duration (or size, which can be converted to duration). For LRADA content, the duration may not be determinable; however, the seekable TimeRanges object is useful for RUI-H applications to determine seekable content range, s_0 to s_N, which will always be within the time range of r_0 to r_N.

6.3.5.12

[GUIDELINE]   If an RUI-H User Agent supports MPEG-2 Transport, it shall invoke addtrack or removetrack events, respectively, in responding to additions or deletions of elementary streams in the Program Map Table (PMT).

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification W3C HTML Sourcing Inband Tracks	TYXVB	N

[COMMENT] This requirement addresses the fact that W3C HTML5 Specification does not mandate support for the addtrack or removetrack events in responding to PMT changes.

6.3.6 Content Protection guidelines

[GUIDELINE] When the HTMLMediaElement currentTime attribute is set during playback of protected content, then the following guidelines for the seek media operation as defined in IEC 62481-3:2017 are also applicable.

- If the transport of the protected content is HTTP, then the Content Receiver shall act the same as the Seek media operation in 7.6.4.3, 7.6.4.3.4, and 7.6.4.4.2 of IEC 62481-3:2017. When using DTCP-IP link protection system, 8.6.1.2 and 8.6.1.3 of IEC 62481-3:2017 are also applicable. When using the WMDRM-ND link protection system, 9.6.1.7 and 9.6.1.8 of IEC 62481-3:2017, are also applicable.

- If the transport of the protected content is RTP, then 7.6.5 of IEC 62481-3:2017 is applicable.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	IEC 62481-3: 2017	BHR8J	

[COMMENT] This guideline is applicable for seek operation on protected content only. Other guidelines referred to in this guideline (e.g. 7.6.4.3, etc.) can be found in IEC 62481-3:2017. For more information on DLNA Seek Models for protected content, please see Clause A.2 of IEC 62481-3:2017. For more information on Seek Operations on protected content, please see Clause A.5 of IEC 62481-3:2017.

6.3.7 HTML5 presentation and control: General

6.3.7.1

[GUIDELINE] When communicating with the RUI-H Transport Server, an RUI-H User Agent shall identify that it supports the DLNA-HTML5-1.0 protocol in all HTTP and HTTPS requests by including the product token DLNA-RUIH/1.0 in the User-Agent request header's value as defined in the [HTTP] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	N77KE	E

[COMMENT] The presence of the specified token permits the receiver to determine that the (originating) sender supports the DLNA-HTML5-1.0 protocol. This product token is required to be sent to the RUI-H Transport Server, but is not required to be sent to other home and Internet HTTP servers for privacy and other security concerns.

6.3.7.2

[GUIDELINE] When communicating with the RUI-H Transport Server using HTTPS, a RUI-H User Agent shall include the comment sequence (CertID <CertID>) after the product token

DLNA-RUIH/1.0 in the User-Agent request header's value as defined in the [HTTP] reference as defined by W3C HTML5, Specification, where <CertID> is the HTML5 RUI Certification ID assigned to this device during DLNA Certification Process.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	S5AYU	E

[COMMENT] This product token and comment sequence is required to be sent to the RUI-H Transport Server, but is not required to be sent to other home and Internet HTTP servers for privacy and other security concerns.

6.3.7.3

[GUIDELINE] A RUI-H Pull Controller, Controller, and Sink shall be able to handle URLs of up to 2 048 bytes that are part of the RUI-H content, the RemoteUIClient.A_ARG_TYPE_CompatibleUIs state variable or the RemoteUIServer.A_ARG_TYPE_CompatibleUIs state variable.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+ +RUIHCTRL+	n/a	n/a	ISO/IEC 29341 -12-11 ISO/IEC 29341 -12-10	VNEVA	N

[COMMENT] The purpose of this guideline is to ensure implementations do not limit the maximum length to 1 024 bytes, as defined for other URIs in DLNA guidelines (e.g., IEC 62481-1-1:2017, 9.2.24.6 [GUN E7GO8] and 10.1.3.10.4 [GUN NQQRV]). Supporting URLs of even greater length (more than 2 048 bytes) is desirable but not required.

6.3.8   HTML5 presentation and control: HTML and DOM

6.3.8.1

[GUIDELINE]   A RUI-H User Agent shall support all mandatory features defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	6HUUI	E

[COMMENT] Features mandated by HTML5 are required to be supported by a RUI-H User Agent.

6.3.8.2

[GUIDELINE] A RUI-H User Agent shall support the text/html (HTML syntax of HTML5) media type as a top-level document type in a manner consistent with W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	XCW8P	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for any top-level document type.

6.3.8.3

[GUIDELINE]   An RUI-H User Agent shall support the application/xhtml+xml (XHTML syntax of HTML5) media type as a top-level document type in a manner consistent with W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a		n/a	W3C HTML5, Specification	DLBEM	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for any top-level document type.

6.3.9   HTML5 presentation and control: CSS

6.3.9.1

[GUIDELINE]   A RUI-H User Agent shall support the text/css media type of the [CSS] reference as defined by W3C HTML5, Specification as follows:

- it shall satisfy CSS Level 2 Revision 1 conformance requirements; and
- if the device implementing the capability controls, or is capable of direct interface to, a screen, then it shall support the screen CSS media type.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a		n/a	W3C HTML5, Specification	873CM	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for any specific version of CSS. Support for a specific CSS media type entails support for all CSS properties designated as applying to that type or to the CSS media group that includes that type.

6.3.9.2

[GUIDELINE]   A RUI-H User Agent shall support the opacity style property of the [CSSCOLOR] reference as defined by W3C HTML5, Specification. In addition, it shall support the <color> property value type as defined therein in any context that prescribes use of the CSS <color> property value type.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a		n/a	W3C HTML5, Specification	NZ4DN	E

[COMMENT]   This requirement addresses the fact that neither W3C HTML5, Specification nor CSS Level 2 Revision 1 mandates support for the opacity property or full use of the <color> property value type.

6.3.9.3

[GUIDELINE]   An RUI-H User Agent shall support the features defined by the following CSS Level 3 modules, CSS Background and Borders, W3C CSS Background, CSS Transforms, W3C CSS Transforms, and [CSSUI], [CSSANIMATIONS], [CSSTRANSITIONS] references as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C CSS Background W3C CSS Transforms W3C HTML5, Specification	KBKVE	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not define support for declarative style animation, transforms, transitions, or certain other desirable CSS Level 3 features.

6.3.9.4

[GUIDELINE]   An RUI-H User Agent should support the features defined by the following CSS Level 3 modules: CSS Image Values and Replaced Content [CSSIMAGES] reference as defined by W3C HTML5, Specification, CSS Multi-Column Layout as defined by W3C CSS Multicolumn, CSS Namespaces as defined by W3C CSS Namespaces, CSS Selectors [SELECTORS] reference as defined by W3C HTML5, Specification, CSS Text as defined by W3C CSS Text, CSS Values and Units [CSSVALUES] and W3C CSS Writing Modes [CSSWM] references as defined by W3C HTML5, Specification.

[ATTRIBUTES]

S	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification W3C CSS Multicolumn W3C CSS Namespaces W3C CSS Text	NVH5N	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not define support for certain desirable CSS Level 3 features.

6.3.9.5

[GUIDELINE]   An RUI-H User Agent shall support the @font-face rule in the context of using the text/css media type of the [CSSFONTS] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	LWO98	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for the @font-face rule, and, that, without it, there is no defined mechanism to associate content with a downloadable font.

6.3.9.6

[GUIDELINE]   An RUI-H User Agent shall implement all mandatory features of the [CSSOM] and [CSSOMVIEW] references as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	SHAZT	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for any specific version of the CSS Object Model.

6.3.10   HTML5 presentation and control: Image and Font Formats

6.3.10.1

[GUIDELINE]   An RUI-H User Agent shall support the image/svg media type of the [SVG] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	VHYFD	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for any specific image media type.

6.3.10.2

[GUIDELINE]   A RUI-H User Agent shall support the image/jpeg media type as defined by the [JPEG] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	ZKPK2	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for any specific image media type.

6.3.10.3

[GUIDELINE]   A RUI-H User Agent shall support the image/png media type including support for all image types as defined by the [PNG] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	672SO	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for any specific image media type.

6.3.10.4

[GUIDELINE]   A RUI-H User Agent shall support the image/gif media type as defined by the [GIF] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	BYIJ3	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for any specific image media type.

6.3.10.5

[GUIDELINE]   A RUI-H User Agent shall support the application/font-woff media type as defined by W3C WOFF for use with the @font-face rule, and, more specifically, shall support the OpenType font format as defined by ISO/IEC 14496-22 when encapsulated in a WOFF file.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification W3C WOFF ISO/IEC 14496-22	I6HMW	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for any specific font media type for use with the @font-face rule.

6.3.10.6

[GUIDELINE]   A RUI-H User Agent shall support the application/opentype media type as defined by ISO/IEC 14496-22 for use with the @font-face rule; and, further, shall support any media resource in such context regardless of its media type, if it can be determined that it (the media resource) conforms to the OpenType font format defined by ISO/IEC 14496-22.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification ISO/IEC 14496-22	BUVB3	E

[COMMENT]   This requirement enables support for font resources that conform to the OpenType font format, but which are not encapsulated in WOFF.

6.3.11   HTML5 presentation and control: JavaScript and JavaScript APIs

6.3.11.1

[GENERAL]   Some of the JavaScript APIs specified in 6.3.11 are new mandates in this version of the DLNA guidelines and may not be available on legacy implementations. JavaScript applications that want to use these JavaScript APIs are advised to first detect if an API and its associated attributes are available.

6.3.11.2

[GUIDELINE]   An RUI-H User Agent shall support JavaScript as defined in the [ECMA262] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	XQGDA	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for any scripting language.

6.3.11.3

[GUIDELINE]   An RUI-H User Agent shall support the '2d' canvas context type as defined by the reference [CANVAS2D] as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	T7KL6	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for any specific canvas context type and that this requirement mandates support for the 2d context type.

6.3.11.4

[GUIDELINE]   If a RUI-H User Agent is implemented on a device that supports 3-dimensional graphics then it shall support the 'webgl' canvas context type as defined by the reference [WEBGL] as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	556BO	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for any specific canvas context type and that this requirement mandates support for the 3d (webgl) context type only on devices that otherwise support three-dimensional graphics.

6.3.11.5

[GUIDELINE]   An RUI-H User Agent and RUI-H Source shall support the WebSocket interface as defined by W3C WebSocket.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+ +RUIHSRC+	n/a	n/a	W3C WebSocket	2AZ5A	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for WebSocket objects. For content to make use of WebSocket objects, the protocol needs to be supported by the user agent and the RUI-H content sever.

6.3.11.6

[GUIDELINE] An RUI-H User Agent shall support the SharedWorkerGlobalScope, DedicatedWorkerGlobalScope, and related interfaces of the [WEBWORKERS] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	DS8OY	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for Web Workers.

6.3.11.7

[GUIDELINE]   An RUI-H User Agent shall support the *XMLHttpRequest* and related interfaces of the [XHR] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	COS4E	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for XMLHttpRequest (a.k.a. AJAX).

6.3.11.8

[GUIDELINE]   An RUI-H User Agent shall support the *EventSource* interface and related features of the [EVENTSOURCE] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	PRNJ8	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for Server Sent Events, which enables content servers to send push data.

6.3.11.9

[GUIDELINE]   An RUI-H Server may support the *XMLHttpRequest* and related interfaces of the [XHR] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

O	A	+RUIHSRC+	n/a	n/a	W3C HTML5, Specification	CL6UE	

6.3.11.10

[GUIDELINE] A RUI-H Server may support the EventSource interface and related features of the [EVENTSOURCE] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

O	A	+RUIHSRC+	n/a	n/a	W3C HTML5, Specification	RJTLK	

6.3.11.11

[GUIDELINE] A RUI-H User Agent shall support the WindowSessionStorage interface, WindowLocalStorage interface, and related interfaces of the [WEBSTORAGE] reference as defined by W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML5, Specification	TVU6H	E

[COMMENT] This requirement addresses the fact that W3C HTML5, Specification does not mandate support for Web Storage.

6.3.11.12

[GUIDELINE] An RUI-H User Agent shall conform to the W3C MSE (Media Source Extensions) specification and implement the JavaScript interfaces as required by the W3C MSE specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C MSE	JTYVM	N

6.3.11.13

[GUIDELINE] A RUI-H User Agent shall conform to the W3C EME (Encrypted Media Extensions) specification and implement the JavaScript interfaces as required by the W3C EME specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C EME	VE3YC	N

6.3.11.14

[GUIDELINE] An RUI-H User Agent shall conform to the W3C Crypto (Web Cryptography API) specification and implement the JavaScript interfaces as required by the W3C Crypto specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C Crypto	79WOU	N

6.3.11.15

[GUIDELINE]   An RUI-H User Agent shall support the algorithms specified in the Recommended Algorithms section of the W3C Crypto specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a		n/a	W3C Crypto	OPCL5	N

6.3.11.16

[GUIDELINE]   If an RUI-H User Agent is implemented on a device that supports a touchscreen, then it shall support TouchEvent types as defined by W3C Touch Events.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a		n/a	W3C Touch Events	3UV5Y	N

6.3.11.17

[GUIDELINE]   An RUI-H User Agent shall implement at least one of the following mechanisms for input capture by the HTML5 RUI application:

- MouseEvent types as defined by the [DOMEVENTS] reference of W3C HTML5, Specification;

- TouchEvent types as defined by W3C Touch Events;

- KeyboardEvent types as defined by the [DOMEVENTS] reference of W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+	n/a		n/a	W3C HTML5, Specification W3C Touch Events	M7NC2	N

[COMMENT]   The mechanisms referenced in this guideline are synonymous with the term "input device" as referenced in the W3C HTML5, Specification, the [DOMEVENTS] reference of W3C HTML5, Specification, and the W3C Touch Events Specification. A device indicates support for key, mouse or touch events through registration during certification. Annex E describes supported HTML5 input events.

6.3.11.18

[GUIDELINE]   A mechanism that generates KeyboardEvents as defined by the [DOMEVENTS] reference of the W3C HTML5, Specification shall implement all of the following key events defined in W3C Key Values:

- 'ArrowUp',

- 'ArrowDown',

- 'ArrowLeft',

- 'ArrowRight',

- 'Enter'.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a		n/a	W3C HTML5, Specification W3C Key Values	4OLCD	N

[COMMENT] The mechanism referenced in this guideline is synonymous with the term "input device" as referenced in the W3C HTML5, Specification, the [DOMEVENTS] reference of W3C HTML5, Specification, and the W3C Touch Events specification. Other key values can also be handled by an application.

6.3.11.19

[GUIDELINE] A mechanism that generates a KeyboardEvents as defined by the [DOMEVENTS] reference of W3C HTML5, Specification shall implement at least one of the following key events defined in W3C Key Values:

- 'Backspace',
- 'MediaLast'.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a		n/a	W3C HTML5, Specification W3C Key Values	7SMGI	N

[COMMENT] The mechanism referenced in this guideline is synonymous with the term "input device" as referenced in the W3C HTML5, Specification, the [DOMEVENTS] reference of W3C HTML5, Specification, and the W3C Touch Events specification. The guideline allows an application to implement back to previous context functionality through a keyboard event.

6.3.12 HTML5 presentation and control: Cross Origin Resource Sharing

6.3.12.1

[GUIDELINE] The RUI-H User Agent and RUI-H Server shall support the [ORIGIN] specification as defined in W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+ +RUIHRC+	n/a		n/a	W3C HTML5, Specification	K7O62	E

[COMMENT] This requirement addresses the fact that W3C HTML5, Specification does not mandate support for the Origin specification in HTTP requests.

6.3.12.2

[GUIDELINE] An RUI-H Server shall support the [CORS] specification as defined in W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a		n/a	W3C HTML5, Specification	77UWE	E

[COMMENT]   This requirement addresses the fact that W3C HTML5, Specification does not mandate support for the Cross Origin Resource Sharing specification.

6.3.13   Quality of Service

[GUIDELINE]   If DLNAQOS as defined in 8.3.2 of IEC 62481-1-1:2017 is implemented, Remote User Interface protocol messages shall be tagged with DLNAQOS_1, or a lower DLNAQOS_UP value, where "or a lower" is defined by Requirements 8.3.2.2.2 (5NZMS) and 8.3.2.2.3 (V64Y4) in IEC 62481-1-1:2017, for both requests and responses in accordance with Table 7 of IEC 62481-1-1:2017 — Normative Priorities for DLNA Traffic Types. Remote User Interface protocol messages include transfer of RUI-H content, HTTP requests and responses that are the result of a user input action on the remote UI, messages that are sent through a TCP connection created through a Web Socket or XMLHttpRequest in W3C HTML5, Specification.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+ +RUIHSRC+	n/a	n/a	W3C HTML5, Specification IEC 62481-1-1: 2017	SUQJC	E

[COMMENT]   In addition to Remote User Interface protocol messages, there are two other types of traffic related to remote UI, each with their own DLNAQOS_UP value:

- for DLNA AV content that is combined with remote UI: see the requirements defined in 11.4.2.12 of the "Media Transport" guidelines in IEC 62481-1-1:2017;

- for UPnP Device and control point traffic for remote UI, see requirement defined in 9.2.36 (VJQP3) of IEC 62481-1-1:2017.

6.3.14   Presentation of MPEG-2 TS Elementary Streams

6.3.14.1

[GUIDELINE]   RUI-H User Agents that support MPEG-2 TS based DLNA Media Format Profiles shall conform to the W3C HTML Sourcing Inband Tracks specification for the mapping of inband tracks found in MPEG-2 Transport Streams to HTML5 attribute.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML Sourcing Inband Tracks	2G6QB	N

[COMMENT]   Support for W3C HTML Sourcing Inband Tracks specification is optional in the W3C HTML5, Specification. This guideline mandates that the section on MPEG-2 TS from the W3C HTML Sourcing Inband Tracks specification be used to for the definition of how to map MPEG-2 TS inband tracks to HTML5 attributes. Also, W3C HTML Sourcing Inband Tracks does not mandate which tracks and cues shall be detected, only how to map them to HTML5, and so the following guidelines add the necessary mandatory language.

6.3.14.2

[GUIDELINE]   RUI-H User Agents that support MPEG-2 TS based DLNA Media Format Profiles shall detect all AudioTracks in the MPEG-2 Transport Stream and map them to HTML5 as defined in W3C HTML Sourcing Inband Tracks.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML Sourcing Inband Tracks	W6WNO	N

[COMMENT] The W3C HTML Sourcing Inband Tracks does not mandate which tracks and cues are to be detected, only how to map them to HTML5. This guideline mandates that AudioTracks be mapped according to this specification.

6.3.14.3

[GUIDELINE] RUI-H User Agents that support MPEG-2 TS-based DLNA Media Format Profiles shall detect the main VideoTrack in the MPEG-2 Transport Stream and map it to HTML5 as defined in W3C HTML Sourcing Inband Tracks.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML Sourcing Inband Tracks	2ULN3	N

[COMMENT] The W3C HTML Sourcing Inband Tracks does not mandate which tracks and cues are to be detected, only how to map them to HTML5. This guideline mandates that the main VideoTrack be mapped according to this specification.

6.3.14.4

[GUIDELINE] RUI-H User Agents that support MPEG-2 TS based DLNA Media Format Profiles should detect VideoTracks other than the main VideoTrack in the MPEG-2 Transport Stream and map them to HTML5 as defined in W3C HTML Sourcing Inband Tracks.

[ATTRIBUTES]

S	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML Sourcing Inband Tracks	F5TRZ	N

[COMMENT] The W3C HTML Sourcing Inband Tracks does not mandate which tracks and cues are to be detected, only how to map them to HTML5. This guideline recommends detection and mapping of VideoTracks other than the main VideoTrack.

6.3.14.5

[GUIDELINE] RUI-H User Agents that support MPEG-2 TS based DLNA Media Format Profiles shall detect all captions in the MPEG-2 Transport Stream and map them to an HTML5 TextTrack as defined in W3C HTML Sourcing Inband Tracks.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML Sourcing Inband Tracks	YG7HJ	N

[COMMENT] The W3C HTML Sourcing Inband Tracks does not mandate which tracks and cues are to be detected, only how to map them to HTML5. This guideline mandates that captions be mapped to TextTracks according to this specification.

6.3.14.6

[GUIDELINE] RUI-H User Agents that support MPEG-2 TS based DLNA Media Format and detect captions can map caption contents to TextTrackCues as defined in W3C HTML Sourcing Inband Tracks.

[ATTRIBUTES]

O	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML Sourcing Inband Tracks	B7EHZ	N

[COMMENT] The W3C HTML Sourcing Inband Tracks does not mandate which tracks and cues are to be detected, only how to map them to HTML5. This guideline makes mapping of caption cues optional since there is no well-defined way for CEA708 type captions to be presented to HTML5 as cues.

6.3.14.7

[GUIDELINE] RUI-H User Agents that support MPEG-2 TS-based DLNA Media Format Profiles shall detect all subtitles in the MPEG-2 Transport Stream and map them to an HTML5 TextTrack as defined in W3C HTML Sourcing Inband Tracks.

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML Sourcing Inband Tracks	MLAD4	N

[COMMENT] The W3C HTML Sourcing Inband Tracks does not mandate which tracks and cues are to be detected, only how to map them to HTML5. This guideline mandates subtitles be mapped to TextTracks according to this specification but the subtitle cues are optional.

6.3.14.8

[GUIDELINE] RUI-H User Agents that support MPEG-2 TS based DLNA Media Format Profiles that detects subtitles in the MPEG-2 Transport Stream can map the subtitle contents to TextTrackCues as defined in W3C HTML Sourcing Inband Tracks.

[ATTRIBUTES]

O	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML Sourcing Inband Tracks	Z8ANW	N

[COMMENT] The W3C HTML Sourcing Inband Tracks does not mandate which tracks and cues are to be detected, only how to map them to HTML5. This guideline makes mapping of subtitle cues optional since there is no well-defined way for many subtitle formats to be presented to HTML5 as cues.

6.3.14.9

[GUIDELINE]   RUI-H User Agents that support MPEG-2 TS based DLNA Media Format Profiles should detect inband metadata tracks in the MPEG-2 Transport Stream, and map each to an HTML5 TextTrack and map the metadata track contents to a Cue format as defined in W3C HTML Sourcing Inband Tracks.

[ATTRIBUTES]

S	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	W3C HTML Sourcing Inband Tracks	ECV4P	N

[COMMENT]   The W3C HTML Sourcing Inband Tracks does not mandate which tracks and cues are to be detected, only how to map them to HTML5. This guideline makes metadata TextTrack and TextTrackCue support recommended.

6.3.15   DLNA-HTML5-1.0 protocolInfo value

6.3.15.1   General syntax

[GUIDELINE]   If a <protocol> element has a @shortName with the value "DLNA-HTML5-1.0" and a <protocolInfo> child element, then the <protocolInfo> element shall contain an XML block conforming to the schema defined in Annex F.

The namespace for DLNA defined properties shall be "urn:schemas-dlna-org:metadata-1-0/" and the namespace prefix shall be "dlna:".

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	ISO/IEC 29341-12-11	YT7JA	N

[COMMENT]   See examples in Annex G for proper use of this namespace and prefix.

6.3.15.2   dlna:expires

6.3.15.2.1

[GUIDELINE]   The <dlna:expires> shall be a string defined as follows:

dlnaexpires-value = XML dateTime as defined in 3.2.7 of W3C XML Schema Part 2.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	W3C XML Schema Part 2	TYAL9	N

[COMMENT]   Several examples, using <dlna:expires> are provided in Annex G.

6.3.15.2.2

[GUIDELINE]   If either the <dlna:expires> element or the <protocolInfo> element is omitted, then dlnaexpires-value (as defined in 6.3.15.2.1) shall be undefined and adhere to standard UPnP behaviour for the validity of UIListing (see UIListingUpdate in ISO/IEC 29341-12-11).

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	n/a	27YP3	N

6.3.15.3   dlna:uiScope

6.3.15.3.1

[GUIDELINE]   The <dlna:uiScope> shall be a string defined as follows:

    dlnascope-value = "local" | "global"

The dlnascope-value of "local" shall indicate that the URI pointed to by the <uri> element refers to a service that is accessible only on the current LAN.

The dlnascope-value of "global" shall indicate that the URI pointed to by the <uri> element refers to a service that is accessible from any network with an internet connection.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	ISO/IEC 29341-12-11	JK75X	N

[COMMENT]   This provides a client with an indication whether a service is only accessible from within the home or if it can be accessible from outside the home. An example, using both values for <dlna:uiScope>, is provided in Clause G.1.

6.3.15.3.2

[GUIDELINE]   If either the <dlna:uiScope> element or the <protocolInfo> element is omitted, then dlnascope-value (as defined in 6.3.15.2.1) shall be "local".

[ATTRIBUTES]

M	A	+RUIHPL+ +RUIHSINK+	n/a	n/a	ISO/IEC 29341-12-11	DOT7J	N

6.3.15.3.3

[GUIDELINE]   If <dlna:uiScope> element contains the value "global", then the <protocolInfo> element shall contain the <dlna:expires> element.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	ISO/IEC 29341-12-11	C6AOG	N

6.3.15.3.4

[GUIDELINE]   If <dlna:uiScope> element contains the value "global", then the <uri> element in the UIListing output argument of RemoteUIServer:GetCompatibleUIs for the RUI-H service shall use a fully qualified domain name (FQDN) for the Host.

[ATTRIBUTES]

M	A	+RUIHSRC+	n/a	n/a	IETF RFC 1983 IETF RFC 3986	86Q2D	N

6.3.16   RUI-H service location caching

6.3.16.1   General

Subclause 6.3.16 provides guidelines for caching <ui> elements. Caching is desirable to allow RUI-H services to be accessed from networks other than the one the RUI-H service was discovered on, e.g. a tablet can discover an RUI-H service inside a home, but still access it when taken outside the home.

6.3.16.2

[GUIDELINE]   An RUI-H Pull Controller shall cache any <ui> element with a dinascope-value of "global" up to the number of <ui> elements required by 6.3.16.3.

[ATTRIBUTES]

M	A	+RUIHPL+	n/a	n/a	ISO/IEC 29341-12-11	SJ5H2	N

6.3.16.3

[GUIDELINE]   An RUI-H Pull Controller shall be capable of caching at least 10 <ui> elements.

[ATTRIBUTES]

M	A	+RUIHPL+	n/a	n/a	ISO/IEC 29341-12-11	WCKNH	N

6.3.16.4

[GUIDELINE]   If an RUI-H Controller's cache of <ui> elements fills then the least recently used <ui> elements shall be discarded to make room for the most recently discovered <ui> elements.

[ATTRIBUTES]

M	A	+RUIHPL+	n/a	n/a	ISO/IEC 29341-12-11	E39XX	N

[COMMENT]   This guideline defines the behaviour when the <ui> element cache fills. The actual size of the cache is vendor defined, but will be at least big enough to store 10 entries as defined in 6.3.16.3.

6.3.16.5

[GUIDELINE]   If a user explicitly designates that a <ui> element is to remain cached, the RUI-H Server Control Point may keep that <ui> element cached when determining which one to discard.

[ATTRIBUTES]

O	A	+RUIHPL+	n/a	n/a	ISO/IEC 29341-12-11	JQIGS	N

[COMMENT]   This guideline allows RUI-H Server Control Points to offer functionality to mark a particular RUI-H as a favourite and prevent it from being removed from the cache to make room for new RUI-H.

6.3.16.6

[GUIDELINE]   An RUI-H Pull Controller capability shall remove a RUI-H <ui> element from cache when the current dateTime equals or exceeds the value in the <dlna:expires> element.

[ATTRIBUTES]

M	A	+RUIHPL+	n/a	n/a	ISO/IEC 29341-12-11	G3UHI	N

[COMMENT]   The <ui> element is unusable for starting a RUI-H HTML5 application once removed from cache. An RUI-H Server can be contacted in order to re-acquire the RUI-H UIListing.

6.3.16.7

[GUIDELINE]   An RUI-H Pull Controller capability shall allow a user to select cached RUI-H <ui> elements even when an RUI-H Server cannot be discovered.

[ATTRIBUTES]

M	A	+RUIHPL+	n/a	n/a	ISO/IEC 29341-12-11	H5EU4	N

[COMMENT]   This guideline allows RUI-H services to be accessed from networks other than the one the RUI-H service was discovered on, e.g. a tablet can discover an RUI-H service inside a home, but still access it when taken outside the home.

Annex A
(informative)

HTML5 RUI client capability detection

A.1   HTML5 client capability detection

This clause is informative and describes how web pages can use HTML5, CSS and JavaScript to tailor presentation of UI and media to best match the capabilities of the HTML5 Content Receivers. Use of a WebSocket interface is one of the examples of communicating this information between an RUI-H client and an RUI-H Server.

Table A.1 lists HTML5 mechanisms available to an RUI-H Source capability for tailoring user interface presentation on a client.

Table A.1 – HTML5 client capability detection

1) Client capability	2) HTML5 RUI detection method
Viewport Position information	Window interface attributes innerWidth, innerHeight, screenX, screenY defined in the [CSSOMVIEW] reference of W3C HTML5, Specification
Display area Information	Screen interface attributes width, height, availWidth, availHeight defined in the [CSSOMVIEW] reference of W3C HTML5, Specification
Number of display colors	Screen interface attribute colorDepth defined in the [CSSOM] reference of W3C HTML5, Specification
Viewport scrolling	Window interface attribute scrollbars as defined in the [CSSOM] reference of W3C HTML5, Specification.
Rendering text depending on available fonts	Select font: see [CSSFONTS] reference in W3C HTML5, Specification font-family property. Download required font: @font-face rule
Key support	Defined in the [DOM] reference of W3C HTML5, Specification.
Pointer input type	JavaScript detection of mouse and touch events
Secure connection	W3C HTML5, Specification requires support for HTTP over TLS, i.e. HTTPS
Browser and video area overlays	Defined by W3C HTML5, Specification and in the [CSS] reference as defined by W3C HTML5, Specification
Supported media MIME types	W3C HTML5, Specification media resource selection algorithm using multiple <source> elements and/or media.canPlayType() can be used to identify supported media MIME types.

A.2   CSS client capability detection

The Media Queries specification as defined by the [MQ] reference in W3C HTML5, Specification allows different styles to be applied depending on the characteristics of the output device. Many of the media types detectable in Media Queries can also be detected through interfaces defined in the CSSOM View Module as defined by the [CSSOM] reference in W3C HTML5, Specification. Table A.2 lists display attributes that can be used as media types in Media Queries and the equivalent CSSOM View Module interface.

Table A.2 – CSS client capability detection

1) Display attribute	2) Using media queries	3) Using CSSOM View Module
Viewport width and height	width, height	window.innerWidth, window.innerHeight
Display area width and height	device-width, device-height	window.screen.width, window.screen.height
Viewport orientation	Orientation	Derivable from window.innerWidth and window.innerHeight
Viewport aspect ratio	aspect-ratio	Derivable from window.innerWidth and window.innerHeight
Device aspect ratio	device-aspect-ratio	Derivable from window.screen.width and window.screen.height
Bits per color	Color	window.screen.colorDepth