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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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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- withdrawn,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.

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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.

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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.

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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*

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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/

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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/

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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

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

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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.

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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.

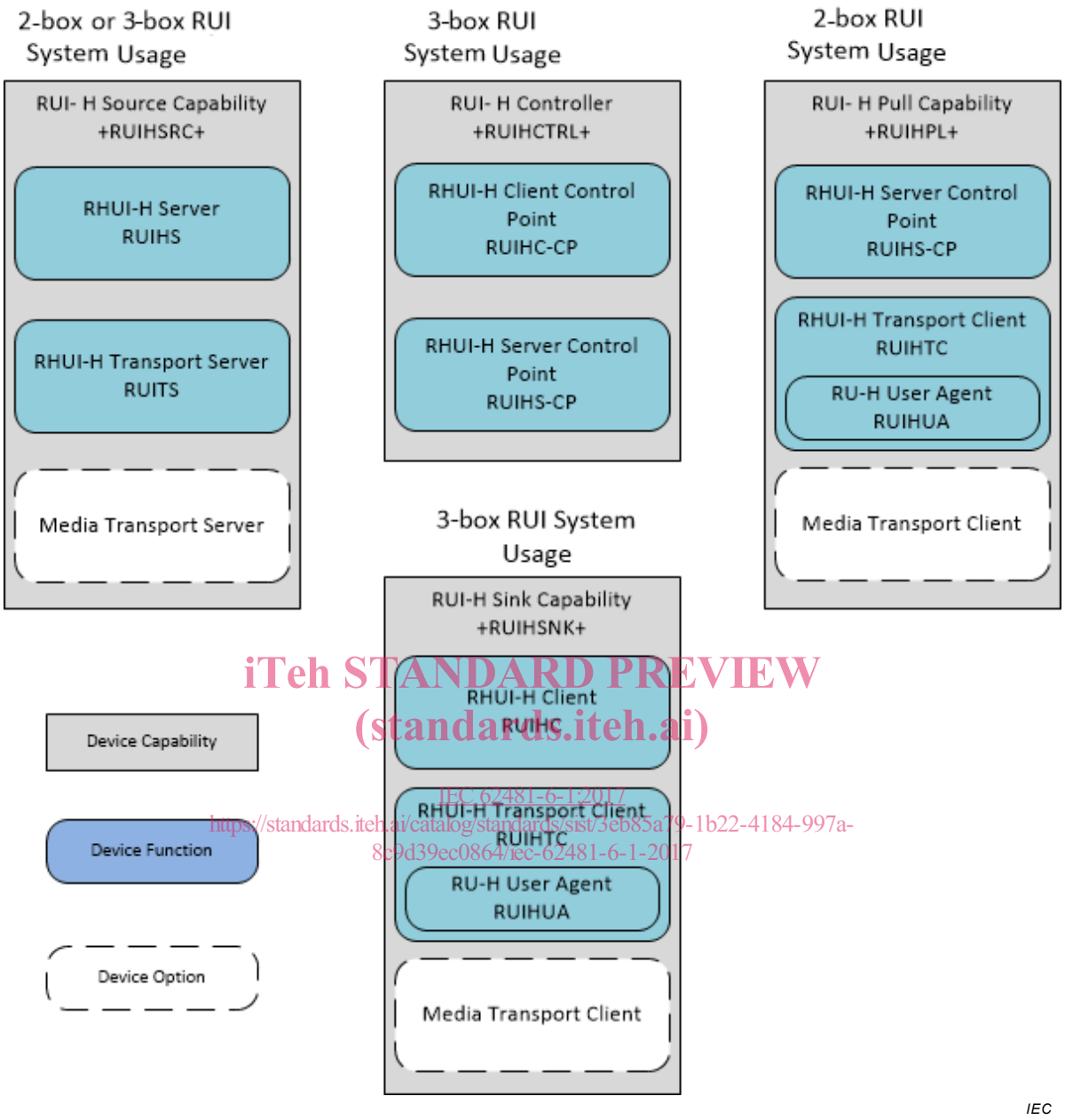

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Figure 1 — Relationship of RUI-H components

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.

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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.

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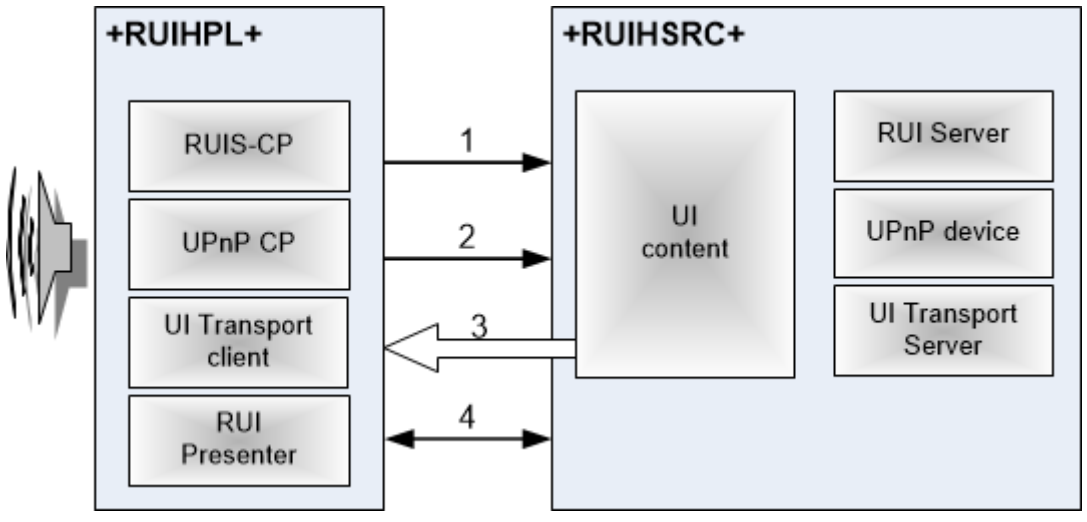


Figure 2 – RUI-H Pull without A/V system usage interaction model

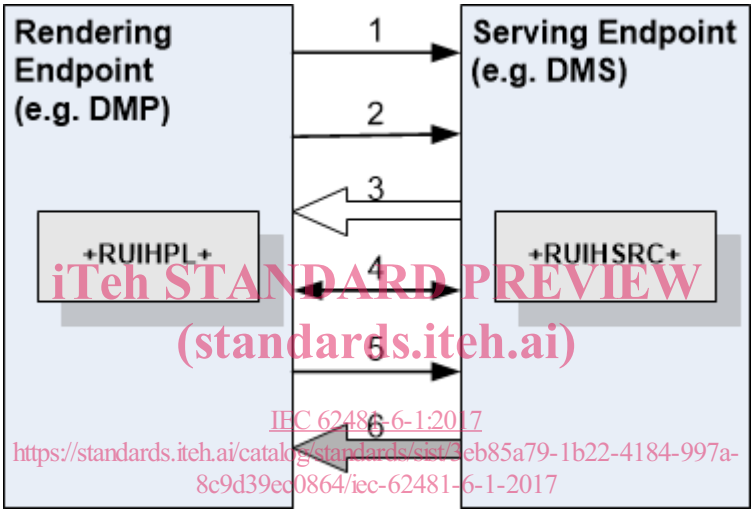
This system usage can be extended to control, transport and render A/V content inside the UI. This is enabled through co-location of the +RUIHPL+ and +RUIHSRC+ capability with the appropriate Media Transport Client/Server device functions of existing Device Classes to which the capabilities are added.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



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IEC 62481-6-1:2017
https://standards.iteh.ai/catalog/standards/sist/3eb85a79-1b22-4184-997a-8c9d39ec0864/iec-62481-6-1-2017

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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+.