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INTERNATIONAL STANDARD

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Digital living network alliance (DLNA) home networked device interoperability guidelines –
Part 1-3: Architecture and protocols – Cloud access

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CONTENTS

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

Part 1-3: Architecture and protocols – Cloud access

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International Standard IEC 62481-1-3 has been prepared under technical area 8: Multimedia home systems and applications for end-user network 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
100/2738/CDV	100/2886/CDV

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- withdrawn,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

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INTRODUCTION

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

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

Part 1-3: Architecture and protocols – Cloud access

1 Scope

This part of IEC 62481 specifies guidelines for accessing content in the cloud, that is, outside of the home by devices in the home.

These Guidelines focus on the discovery, association, and control of Apps capable of augmenting DLNA devices with the ability to consume content from sources outside the home. The basic support is realized with the UPnP ApplicationManagement Service.

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) Guidelines – Part 1-1: Architecture and protocols*

IEC 62481-2:2017, *Digital living network alliance (DLNA) Guidelines – Part 2: Media format profiles*

IEC 62481-6-1:2017, *Digital living network alliance (DLNA) Guidelines – Part 6-1: HTML 5 RUI*

ISO/IEC 29341-3-10, *Information Technology – UPnP Device Architecture – Part 3-10: Audio Video Device Control Protocol – Audio Video Transport Service*

ISO/IEC 29341-3-11, *Information Technology – UPnP Device Architecture – Part 3-11: Audio Video Device Control Protocol – Connection Manager Service*

ISO/IEC 29341-20-12, *Information technology – UPnP Device Architecture – Part 20-12: Audio video device control protocol – Level 4 – Content directory service*

IETF RFC 3986, *Uniform Resource Identifier (URI): General Syntax.*
http://www.ietf.org/rfc/rfc3986.txt

UPnP/AMS, *ApplicationManagement:1, UPnP Forum*
https://members.dlna.org/apps/org/workgroup/ils/download.php/30975/ApplicationManagement-v1&2_-_20140331_v0.75[1].zip

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 General terms

3.1.1
App
computer software application

Note 1 to entry: General shorthand for the term.

3.1.2
Cloud Content Renderer
DMR or XDMR that supports the Cloud Access Device Function

3.1.3
Cloud Service
one or more media servers outside of the home network

Note 1 to entry Typically, it would provide content using non-DLNA means.

3.1.4
AVT
Audio Video Transport
UPnP service that provides network-based control for common transport operations such as play, stop, pause, next, previous and seek; the AVTransport service specification is a standard UPnP DCP

3.1.5
CDS
Content Directory Service
UPnP service that provides network-based discovery of content and ContentDirectory Service specification is a standard UPnP Device Control Protocol

3.1.6
DMR
Digital Media Renderer
DLNA Device Class having home network environmental characteristics, with the role of rendering content it receives after being setup by another network entity

3.1.7
DMS
Digital Media Server
DLNA Device Class having home network environmental characteristics, with the role of exposing and distributing content throughout the home

3.1.8
MSCP
Media Server Control Point
UPnP AV control point that issues actions to a DMS

3.1.9
XDMR
eXtended DMR
DLNA device class defined to combine the functionality of a Digital Media Renderer (DMR) and a Media Server Control Point (MSCP)

Note 1 to entry: This device class is equivalent to combining previous device classes known as a DMR and a DMP.

3.2 Conventions

In this document a number of terms, conditions, mechanisms, sequences, parameters, events, states, or similar terms are printed with the first letter of each word in uppercase and the rest lowercase (e.g., Move). Any lowercase uses of these words have the normal technical English meaning.

4 Networking architecture, device models and guideline conventions

4.1 DLNA home networking architecture

This document 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 in IEC 62481-1-1:2017 for a full description of the DLNA document conventions.

4.3 Guideline structure and layout

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

5 Cloud Access Device Model and Device Function

5.1 Device Model

Refer to 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. See 0 for additional description on Cloud Service access models and device interaction.

5.2 Device Function

For the Cloud Access guidelines, the following Device Function is defined.

Cloud Access Device Function: this enables a Rendering Endpoint to express support for Cloud Services and the available Apps needed to render the content from Cloud Services. This complements Media Management Guidelines in Clause 10 of IEC 62481-1-1:2017.

6 Cloud Access Device Function guidelines

6.1 Implementation requirements

6.1.1

[GUIDELINE] A DLNA Device Class should implement the Cloud Access Device Function.

[ATTRIBUTES]

S	A	DMC, DMR, XDMR	M-DMC	n/a	n/a	I8OWW	

6.1.2

[GUIDELINE] If a DLNA Device Class implements the Cloud Access Device Function, then it shall conform to the Guidelines in 6.2, 6.3, and 6.4.

[ATTRIBUTES]

M	A	DMC, DMR, XDMR	M-DMC	n/a	n/a	8KZ67	

6.2 Cloud Service and parameter syntax

6.2.1 Cloud-service-name type syntax

[GUIDELINE] The cloud-service-name type is a UTF-8 quoted-string of a fully-qualified domain name.

[ATTRIBUTES]

M	A	n/a	n/a	n/a	IETF RFC 3986	Q6M9Z	

[COMMENT] Example: MyService.example.com

6.2.2 ProtocolInfo syntax

[GUIDELINE] The ProtocolInfo value describing support for dlna-service URIs shall be compliant with the following definition:
cloud-protocolInfo = "dlna.org:*:dlna-service:*"

[ATTRIBUTES]

M	A	n/a	n/a	n/a	ISO/IEC 29341-3-11	LDC2P	

[COMMENT] This string is used by the Cloud Content Renderer in its ConnectionManager:SinkProtocolInfo state variable to indicate that it supports the dlna-service URI scheme.

6.2.3 dlna-service URI syntax (cloudservice-URI)

[GUIDELINE] The URI that identifies a content item located on a Cloud Service shall be compliant with the following definition:

cloudservice-URI = "dlna-service://" cloud-service-name "?" URI-parameters

cloud-service-name is defined in 6.2.1

– URI-parameters = (app-id-parameter "&" content-id-parameter) |
(content-id-parameter ["&" app-id-parameter])
– app-id-parameter = "appid=" DQUOTE app-id DQUOTE
– app-id = the application@id attribute of an <application> element in the ApplicationManagement service
– content-id-parameter = "contentid=" DQUOTE content-id DQUOTE
– content-id = 1*(ALPHA | "." | "_" | ":" | "/")

[ATTRIBUTES]

M	A	n/a	n/a	n/a	UPnP/AMS	AU9Y2	

[COMMENT] Examples:

```
dlna-service://MyService.example.com?contentid="item-123"
dlna-service://MyService.example.com?appid="5E0E4EC1-6CC4-4D12-9995-7F996B709726"&c
ontentid="item-123"
```

6.2.4 upnp:resExt::dlna:serviceInitialization element syntax

[GUIDELINE] The dlna:serviceInitialization element shall be a child-element of the upnp:resExt XML element, defined in ISO/IEC 29341-20-12.

The data type of dlna:serviceInitialization shall be xsd:string.

[ATTRIBUTES]

M	A	n/a	n/a	n/a	ISO/IEC 29341-20-12	LQJP2	

[COMMENT] A UPnP AV MediaRenderer control point can use the dlna:serviceInitialization element to pass parameters to the App on the Rendering Endpoint. For example, dlna:serviceInitialization can convey parameters needed by the App to initialize its communication with the Cloud Service. The syntax of any such parameters is not defined here, as they are specific to the App or Cloud Service.

Example:

```
<item id="100" parentID="200" restricted="0">
<dc:title>Media Item 100</dc:title>
<upnp:class>object.item.videoItem</upnp:class>
<res id="100-res-1"
  protocolInfo="dlna.org:*:dlna-service:*">
  dlna-service://MyService.example.com?contentid="item-100"
</res>
<upnp:resExt id="100-res-1">
  <dlna:serviceInitialization>service_parameter1=ABCD</dlna:serviceInitialization>
</upnp:resExt>
</item>
```

6.3 Cloud Service advertisement

6.3.1 Cloud Service advertisement UPnP service

[GUIDELINE] A Cloud Content Renderer shall implement one ApplicationManagement:1 service, or a higher version of that UPnP service.

[ATTRIBUTES]

M	A	DMR, XDMR	n/a	n/a	UPnP/AMS	SSQLS	

[COMMENT] This enables UPnP AV MediaRenderer control points to determine which Apps are available, and to obtain the app-id for each App. The app-id can be specified in the dlna-service URI.

6.3.2 Cloud Service advertisement element

[GUIDELINE] If a Cloud Content Renderer supports an App that is able to render content from a Cloud Service, then the Cloud Content Renderer's ApplicationManagement's AppInfoList state variable shall contain for that App an <application> element that contains a <function> element that contains the corresponding cloud-service-name.

[ATTRIBUTES]

M	A	DMR, XDMR	n/a	n/a	UPnP/AMS	OD8K9	

[COMMENT] In other words, Apps that support streaming from a Cloud Service shall have a <function> element when listed by the ApplicationManagement service. The <function> element shall state the name of the Cloud Service.

Example:

```
<?xml version="1.0" encoding="UTF-8"?>
<AppInfoList  xmlns="urn:schemas-upnp-org:ms:ams"
    xsi:schemaLocation="urn:schemas-upnp-org:ms:AppInfoList
      http://www.upnp.org/schemas/av/AppInfoList.xsd">
  <application id="5E0E4EC1-6CC4-4D12-9995-7F996B709726">
    <friendlyName>Example Cloud Service App</friendlyName>
    <function org="cloudservice.dlna.org">MyService.example.com</function>
  </application>
</AppInfoList>
```

6.3.3 HTML5 RUI Cloud Service advertisement element

[GUIDELINE] If a Cloud Content Renderer is implemented in conjunction with a +RUIHPL+ or +RUIHSINK+ Device Capability, then the Cloud Content Renderer's ApplicationManagement's AppInfoList state variable shall contain an <application> element with the following info:

– cloud-service-name in the application::function element set to "generic-cloudservice.dlna.org";

– application::alternativeID element set to "HTML5_RUI_Browser";

– with @org attribute set to "www.dlna.org".

[ATTRIBUTES]

M	A	DMR, XDMR	n/a	n/a	IEC 62481-6-1: 2017 UPnP/AMS	KKDDG	

[COMMENT] By complying with this guideline, a Rendering Endpoint signals that it can launch an HTML5 RUI browser to initiate a cloud HTML5 RUI service. Note that the <dlna:serviceInitialization> element would be used to supply HTML5 RUI URL and associated session parameters needed for session transfer.

Example:

```
<?xml version="1.0" encoding="UTF-8"?>
<AppInfoList  xmlns="urn:schemas-upnp-org:ms:ams"
    xsi:schemaLocation="urn:schemas-upnp-org:ms:AppInfoList
      http://www.upnp.org/schemas/av/AppInfoList.xsd">
  <application id="6E0E4EC1-6CC4-4D12-9995-7F996B709726">
    <alternativeID org="www.dlna.org">HTML5_RUI_Browser</alternativeID>
<function org="cloudservice.dlna.org">generic-cloudservice.dlna.org</function>
  </application>
</AppInfoList>
```

6.3.4 Cloud Service advertisement element detail

[GUIDELINE] If A Cloud Content Renderer supports an App that renders content from a Cloud Service, then the Cloud Content Renderer's ApplicationManagement's application::function element that specifies the cloud-service-name shall have an application::function@org attribute with the value "cloudservice.dlna.org".

[ATTRIBUTES]

M	A	DMR, XDMR	n/a	n/a	UPnP/AMS	E47TK	

[COMMENT] The application::function@org attribute specifies how the application::function element shall be interpreted. If the attribute is set to "cloudservice.dlna.org", it indicates that application::function specifies a cloud-service-name.

6.3.5 Cloud Service advertisement search support

[GUIDELINE] The ApplicationManagement:SupportedTargetFields state variable of a Cloud Content Renderer shall include the value "function".

[ATTRIBUTES]

M	A	DMR, XDMR	n/a	n/a	UPnP/AMS	V87OE	

[COMMENT] The ApplicationManagement:GetSupportedTargetFields action returns a comma-separated list of element names that can be specified in the value of the TargetFields parameter of the ApplicationManagement:GetAppIDList action. In order for it to be possible to use the GetAppIDList action to search for a cloud-service-name, the ApplicationManagement service supports searching for Apps based on their application::function value if the SupportedTargetFields state variable includes the value "function".

6.3.6 dlna-service URI advertisement

[GUIDELINE] A Cloud Content Renderer shall include cloud-protocolInfo (defined in 6.2.2) in its ConnectionManager.SinkProtocolInfo state variable.

[ATTRIBUTES]

M	A	DMR, XDMR	n/a	n/a	ISO/IEC 29341-3-11	RLZWR	

[COMMENT] By including cloud-protocolinfo in the SinkProtocolInfo state variable, the Cloud Content Renderer advertises that it supports the dlna-service URI scheme.

6.3.7 Support for dlna-service URI

[GUIDELINE] A Cloud Content Renderer shall support the dlna-service URI (specified in 6.2.3) in the AVTransport:SetAVTransportURI and AVTransport:SetNextAVTransportURI actions.

[ATTRIBUTES]

M	A	DMR, XDMR	n/a	n/a	ISO/IEC 29341-3-10	VGCM7	

[COMMENT] Upon starting to play from a dlna-service URI, the Cloud Content Renderer is expected to launch an App that can access the Cloud Service, if the appropriate App is not already running.

6.3.8 Support for dlna-service URI without app-id-parameter

[GUIDELINE] If a Cloud Content Renderer receives a dlna-service URI (specified in 6.2.3) that does not include the app-id-parameter, then the Cloud Content Renderer shall use an App that

can access the Cloud Service identified by cloud-service-name to render the content identified by content-id-parameter.

[ATTRIBUTES]

M	A	DMR, XDMR	n/a	n/a	n/a	FR4SC	

6.3.9 Support for dlna-service URI with app-id-parameter

[GUIDELINE] If a Cloud Content Renderer receives a dlna-service URI (specified in 6.2.3) that includes the app-id-parameter, then the Cloud Content Renderer shall use the App identified by the app-id-parameter to render the content identified by content-id-parameter.

[ATTRIBUTES]

M	A	DMR, XDMR	n/a	n/a	n/a	LH8S4	

[COMMENT] Even if the Cloud Content Renderer prefers to use a different App that supports the same Cloud Service, if app-id-parameter is specified it needs to use only the specified App. This is to avoid a situation where the UPnP AV MediaRenderer control point specifies a dlna:serviceInitialization parameter value tailored for a specific App, and the parameter is not understood when passed to a different App.

6.4 Service invocation

6.4.1 Service invocation only if Cloud Access is supported

[GUIDELINE] A UPnP AV MediaRenderer control point shall only invoke an AVTransport:SetAVTransportURI or AVTransport:SetNextAVTransportURI action with a dlna-service URI (specified in 6.2.3) if the Rendering Endpoint advertises support (specified in 6.3.6) for the dlna-service URI.

[ATTRIBUTES]

M	A	DMC	M-DMC	n/a	ISO/IEC 29341-3-10	7IPJX	

[COMMENT] This guideline requires a UPnP AV MediaRenderer control point to verify that the Rendering Endpoint supports the Cloud Access Device Function in order to avoid unexpected results on Rendering Endpoints that do not understand the dlna-service URI.

6.4.2 Service initialization parameters

[GUIDELINE] When a UPnP AV MediaRenderer control point invokes an AVTransport:SetAVTransportURI or AVTransport:SetNextAVTransportURI action, it may include a <dlna:serviceInitialization> element for each <res> element that specifies a cloudservice-URI.

[ATTRIBUTES]

O	A	DMC	M-DMC	n/a	ISO/IEC 29341-3-10	ESHEV	

[COMMENT] The dlna:serviceInitialization element can be used to provide parameters to the App on the Rendering Endpoint to initialize the App's communications with the Cloud Service.

Annex A
(informative)

Cloud Service access and device interaction

A.1 Cloud Service access model

A Rendering Endpoint uses the UPnP ApplicationManagement service to identify the Cloud Services from which it can render content. The UPnP AV MediaRenderer control point can use the UPnP ApplicationManagement:GetAppIDList action with input argument Target set to the name of the Cloud Service, and the input argument TargetFields set to "function" to search for Apps that support a specific Cloud Service.

When the UPnP AV MediaRenderer control point wants the Rendering Endpoint to play a content item from a Cloud Service, it will invoke the AVTransport:SetAVTransportURI action. The CurrentURI parameter or one of the <res> elements in the CurrentURIMetaData parameter will be used to identify the Cloud Service and the desired content item, using a special "cloud service URI". The cloud service URI uses the "dlna-service" protocol scheme, instead of "http" or "rtsp".

The URI can also specify the app-id of the App that the Rendering Endpoint shall use to access the Cloud Service. This is useful when there are multiple Apps that can access the same Cloud Service.

Some Cloud Services may require a special initialization process, such as authentication that delivers limited-access token that grants access to the Rendering Endpoint for a limited period of time. Service initialization parameters are needed to trigger the initialization process. Such initialization parameters can be conveyed by the UPnP AV MediaRenderer control point through the CurrentURIMetaData parameter of the AVTransport:SetAVTransportURI action in the AVTransport service. This is done through a new element called <dlna:serviceInitialization> which is associated with the <res> element that contains the cloud service URI.

A.2 Cloud device interaction

This section illustrates the interaction between the entities implementing the Cloud Service access model. This involves a user at a UPnP AV MediaRenderer control point (Cloud-DMC in diagram) in home network, which enables a user to find the content item from a Cloud Service and make it play on a Rendering Endpoint, as well as enabling interacting applications between the UPnP AV MediaRenderer control point and the Rendering Endpoint as shown in Figure 0.1.