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INTERNATIONAL STANDARD

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Digital living network alliance (DLNA) home networked device interoperability guidelines –
Part 8: Diagnostics

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

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FOREWORD

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International Standard IEC 62481-8 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
100/2746/CDV	100/2890/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- withdrawn,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 8: Diagnostics

1 Scope

This part of IEC 62481 specifies guidelines for Diagnostics. The DLNA Diagnostics guidelines focus mostly on the collection of data through test actions and queries. The procedures for troubleshooting and remedies are outside the scope of the DLNA guidelines. The user can be an operator accessing the Diagnostics Application through a TR-069 (an application layer protocol for remote management of end-user devices) management interface, or a technician or end-user accessing it through a browser or screen interface as shown in Figure 1.

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*

IEEE 1905, *IEEE Standard for a Convergent Digital Home Network for Heterogeneous Technologies, Institute of Electrical and Electronics Engineers* http://standards.ieee.org/about/get/

UPnP BasicManagement:2, UPnP Forum
http://upnp.org/specs/dm/UPnP-dm-BasicManagement-v2-Service.pdf

UPnP ConfigurationManagement:2, UPnP Forum
http://upnp.org/specs/dm/UPnP-dm-ConfigurationManagement-v2-Service.pdf

3 Terms, definitions and definitions

For the purposes of this document, the terms and definitions given in IEC 62481-1-1 and the following apply.

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

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

3.1 Definition of terms

3.1.1
Diagnostics Controller
DLNA Device Capability that invokes diagnostics actions on a Diagnostics Device

3.1.2
Diagnostics Endpoint
DLNA Device Capability that accepts diagnostics actions from a Diagnostics Controller

3.1.3
BMS
BasicManagement Service
UPnP service that provides access to basic diagnostics functionality through action requests

Note 1 to entry: The BasicManagement Service specification is a standard UPnP DCP.

3.1.4
CfgMS
ConfigurationManagement Service
UPnP service that makes available device information through action requests

Note 1 to entry: The ConfigurationManagement Service specification is a standard UPnP DCP.

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

4 Networking architecture and guideline conventions

4.1 DLNA home networking architecture

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

4.2 Document conventions

See Clause 6 of IEC 62481-1-1:2017 for a 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

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.

5.2 Diagnostic Device Functions

For the Diagnostics guidelines, the following Device Functions are defined.

- UPnP BasicManagement Service: a UPnP BasicManagement Service makes available diagnostics features and functions and services diagnostics action requests.
- UPnP ConfigurationManagement Service: a UPnP ConfigurationManagement Service makes available device information through action requests.
- UPnP BasicManagement Control Point: a UPnP BasicManagement Control Point issues action requests to UPnP BasicManagement Service to implement diagnostics features and functions.

- UPnP ConfigurationManagement Control Point: a UPnP ConfigurationManagement Control Point issues action requests to ConfigurationManagement Services to get device information.
- Diagnostics Application: a Diagnostics Application interfaces with a UPnP BasicManagement Control Point, UPnP ConfigurationManagement Service, 1905 Management Primitives, and other not-specified-by-DLNA diagnostics Device Functions to provide meaningful and actionable information regarding DLNA devices. It provides input to a user or management system interface to enable a user to control and see results from diagnostics features and functions.
- 1905 Management Primitives: a function that provides a 1905 signaling capability on a physical interface. It can also receive requests and report 1905 data to a co-resident Diagnostics Application.

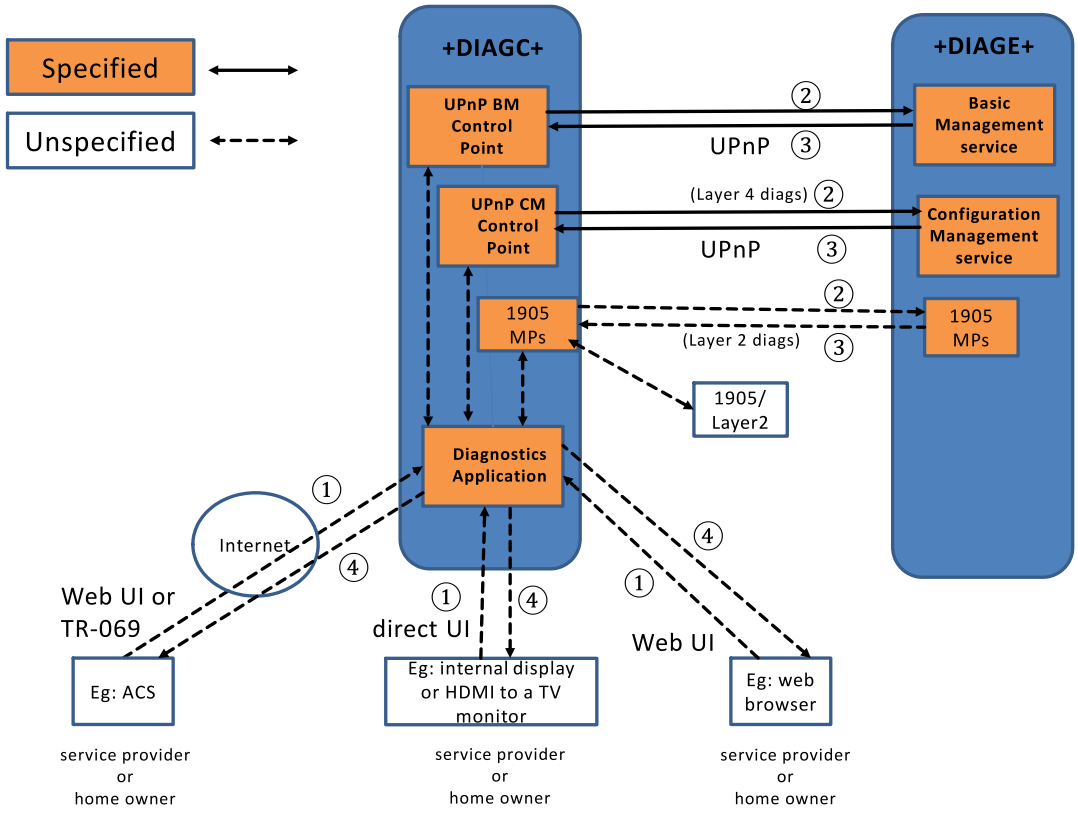
5.3 Device Capabilities

For the Diagnostics guidelines, the following Device Capabilities are defined:

- a Diagnostics Endpoint (+DIAGE+) with the role of offering diagnostics services and responding to diagnostics action requests;
- a Diagnostics Controller (+DIAGC+) with the role of providing a Diagnostics Application and a control point for issuing action requests to a Diagnostics Endpoint.

5.4 System usages

The diagnostics system usage has a Diagnostics Controller capability to instruct a Diagnostics Endpoint capability to execute specific diagnostics actions.



IEC

Figure 1 illustrates this device interaction model. The following steps are performed in this system usage:

1. User or management system interacts with Diagnostics Application (unspecified in DLNA).
2. Diagnostics Application invokes UPnP actions or 1905 messages to request diagnostics functions.
3. Transport diagnostics information via UPnP action or 1905 messages.
4. Present diagnostics information to user or management system (unspecified in DLNA).

NOTE The Diagnostics Controller (+DIAGC+) capability and the Diagnostics Endpoint (+DIAGE+) capability functionality can be incorporated in any valid DLNA Device Class. Thus both capabilities inherit other Device Functions (e.g. IP Connectivity) at other layers in the DLNA Device Architecture, for the purpose of DLNA certification. Implementing these capabilities external to an existing DLNA Device Class (e.g., as a stand-alone device) is not prohibited, but such usages will not be included in DLNA's certification procedures.

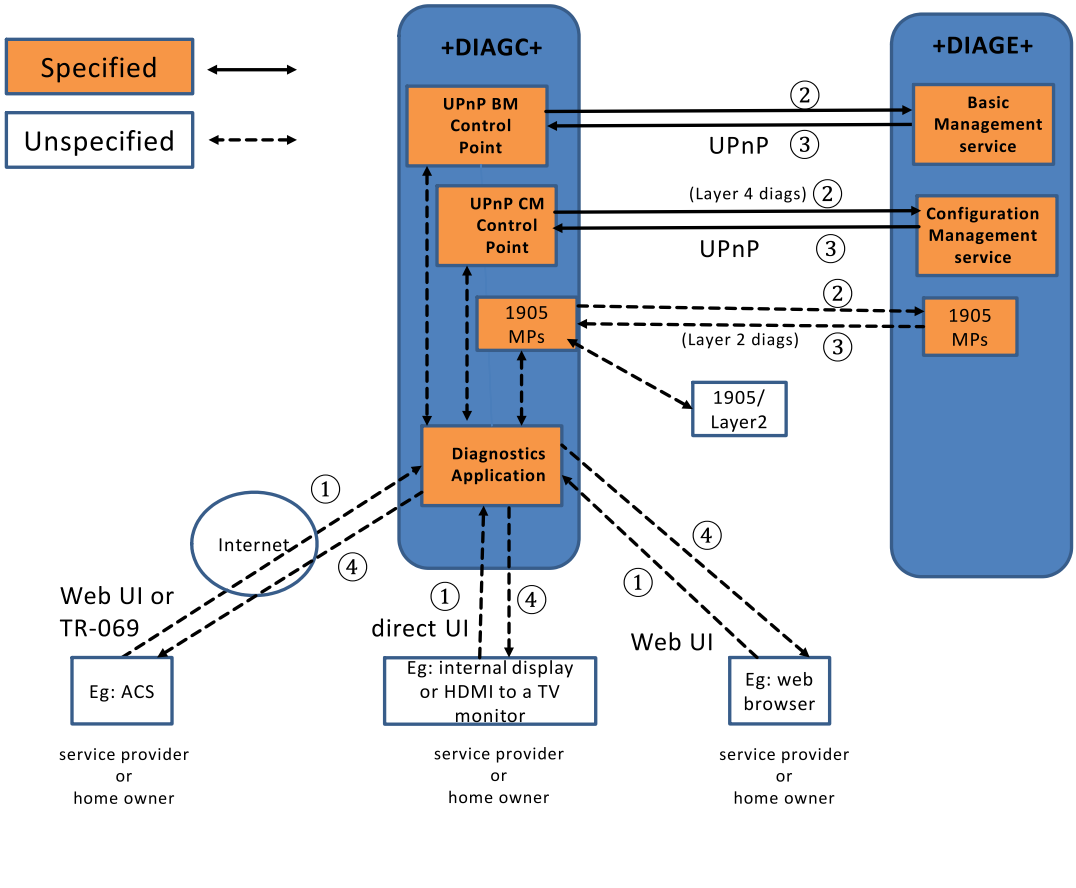


Figure 1 – Diagnostics system usage

Figure 2 provides some examples of how the new capabilities can exist within some of the existing DLNA Devices Classes, and potential usages in the context of 2-box pull and 3-box scenarios.

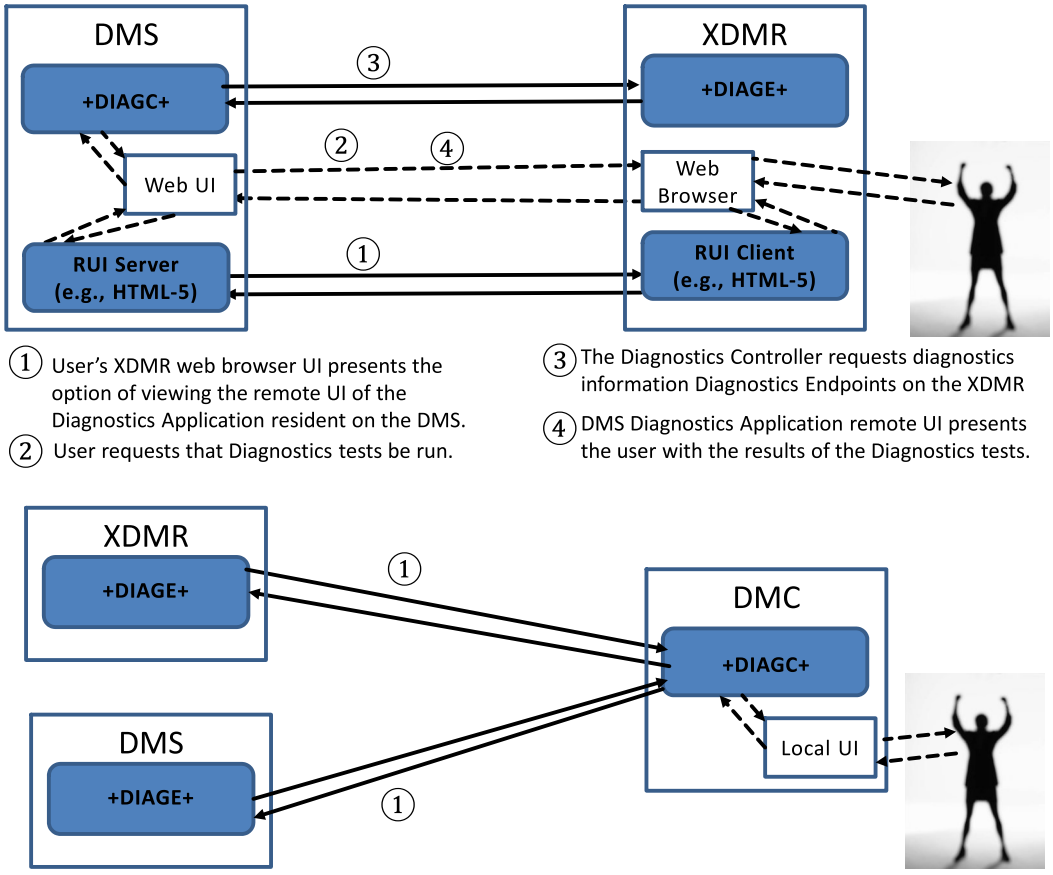


Figure 2 – Examples of diagnostics usage in the context of DLNA 2-box Pull and 3-box usage models

6 Diagnostics guidelines

6.1 General

Clause 6 contains guidelines for Device Functions that are elements of DLNA Diagnostics Endpoint and Controller capabilities.

6.2 Device Discovery & Control

6.2.1

[GUIDELINE] A Diagnostics Endpoint capability shall be allowed to be deployed in conjunction with any DLNA Device Class.

[ATTRIBUTES]

M		+DIAGE+	n/a	n/a	IEC 62481-1-1:2017	AUJYC	

[COMMENT] These capabilities can also exist externally to DLNA Device Classes. However, such existence is outside the scope of these guidelines. By existing within a DLNA Device Class, these capabilities inherit all the networking and connectivity functionality of the underlying DLNA Device Class.

6.2.2

[GUIDELINE] A Diagnostics Controller capability shall be allowed to be deployed in conjunction with any DLNA Device Class.

[ATTRIBUTES]

M		+DIAGC+	n/a	n/a	IEC 62481-1-1:2017	K5GU7	

[COMMENT] These capabilities can also exist external to DLNA Device Classes. However, such existence is outside the scope of these guidelines. By existing within a DLNA Device Class, these capabilities inherit all of the networking and connectivity functionality of the underlying DLNA Device Class.

6.2.3

[GUIDELINE] A Diagnostics Endpoint shall conform to all guidelines in Clause 9 of IEC 62481-1-1:2017 pertaining to UPnP devices and UPnP endpoints.

[ATTRIBUTES]

M		+DIAGE+	n/a	n/a	IEC 62481-1-1:2017	QN85V	

6.2.4

[GUIDELINE] A Diagnostics Controller shall conform to all guidelines in Clause 9 of IEC 62481-1-1:2017 pertaining to UPnP control points and UPnP endpoints.

[ATTRIBUTES]

M		+DIAGC+	n/a	n/a	IEC 62481-1-1:2017	3MTLJ	

6.2.5

[GUIDELINE] A Diagnostics Endpoint capability shall use the value of "+DIAGE+" for the dlna-dev-capability field.

[**ATTRIBUTES**]

M	A	+DIAGE+	n/a	n/a	IEC 62481-1-1:2017	PU6TJ	

6.3 UPnP BasicManagement

6.3.1

[GUIDELINE] If a DLNA Device Class contains the Diagnostics Endpoint capability then it shall implement a UPnP BasicManagement Service Device Function.

[ATTRIBUTES]

M	A	+DIAGE+	n/a	n/a	n/a	SYRX9	

6.3.2

[GUIDELINE] A UPnP BasicManagement Service shall implement the required actions and state variables defined in UPnP BasicManagement:2.

[ATTRIBUTES]

M	R	+DIAGE+	n/a	n/a	UPnP BasicManagement:2	S3K4Q	

[COMMENT] BMS:GetDeviceStatus is the only required action and BMS.DeviceStatus is the only required state variable.

6.3.3

[GUIDELINE] A UPnP BasicManagement Service shall implement the diagnostics feature as specified in UPnP BasicManagement:2.

[ATTRIBUTES]

M	R	+DIAGE+	n/a	n/a	UPnP BasicManagement:2	3UWLP	

[COMMENT] This guideline makes the following actions mandatory: BMS:GetTestIDs, BMS:GetActiveTestIDs, BMS:GetTestInfo and BMS:CancelTest. This guideline makes the following state variables mandatory: BMS.TestIDs and BMS.ActiveTestIDs.

6.3.4

[GUIDELINE] A UPnP BasicManagement Service shall implement the Ping diagnostics feature as specified in UPnP BasicManagement:2.

[ATTRIBUTES]

M	R	+DIAGE+	n/a	n/a	UPnP BasicManagement:2	V5CUE	

[COMMENT] This guideline makes the following actions mandatory: BMS:Ping and BMS:GetPingResult.

6.3.5

[GUIDELINE] A UPnP BasicManagement Service shall implement the NSLookup diagnostics feature as specified in UPnP BasicManagement:2.

[ATTRIBUTES]

M	R	+DIAGE+	n/a	n/a	UPnP BasicManagement:2	EZUN4	

[COMMENT] This guideline makes the following actions mandatory: BMS:NSLookup() and BMS:GetNSLookupResult.

6.3.6

[GUIDELINE] A UPnP BasicManagement Service shall implement the Traceroute diagnostics feature as specified in UPnP BasicManagement:2.

[ATTRIBUTES]

M	R	+DIAGE+	n/a	n/a	UPnP BasicManagement:2	UCBK2	

[COMMENT] This guideline makes the following actions mandatory: BMS:Traceroute and BMS:GetTracerouteResult.

6.3.7

[GUIDELINE] A UPnP BasicManagement Service shall maintain and make available (via TestIDs values) the results of the most recent execution (since the UPnP BasicManagement Service started running) of supported test types.

[ATTRIBUTES]

M	R	+DIAGE+	n/a	n/a	UPnP BasicManagement:2	FSH7U	

[COMMENT] Only the most recent execution (since UPnP BasicManagement Service started running) of a test type (for example, ping, traceroute, nslookup) needs to be kept by the device. Maintaining test results beyond that is at the discretion of the device manufacturer. Maintaining test results prior to startup is at the discretion of the device manufacturer.

6.3.8

[GUIDELINE] A UPnP BasicManagement Device should implement BMS:GetSelfTestResult action as specified in UPnP BasicManagement:2.

[ATTRIBUTES]

S	R	+DIAGE+	n/a	n/a	UPnP BasicManagement:2	WTMOO	

[COMMENT] This action is only relevant for a device that supports a self-test function. The specification of such a self-test function is outside the scope of these guidelines. This function could be run autonomously by a device or initiated through some other mechanism. A control point can discover that self-test results exist by using BMS:GetTestIDs.

6.4 UPnP ConfigurationManagement

6.4.1

[GUIDELINE] If a DLNA Device Class contains the Diagnostics Endpoint capability then it should implement the UPnP ConfigurationManagement Service Device Function.

[ATTRIBUTES]

S	A	+DIAGE+	n/a	n/a	n/a	K7LMT	

6.4.2

[GUIDELINE] A UPnP ConfigurationManagement Service shall implement the required actions and state variables defined in UPnP ConfigurationManagement:2.

[ATTRIBUTES]

M	R	+DIAGE+	n/a	n/a	UPnP ConfigurationManagement:2	4SEYS	

[COMMENT] These are the actions listed in UPnP ConfigurationManagement:2 Table 2-18 as "R" in the "Device R/O" column and the state variables listed in UPnP ConfigurationManagement:2 Table 2-13 as "r" in "Req or Op." column. Implementations can choose to hardcode state variable values that will not change, in order to simplify response to certain actions (for example, in simple devices, responses to all but CfgMS:GetValues cannot be capable of changing) as described in 6.4.5.

6.4.3

[GUIDELINE] A Diagnostics Endpoint with a UPnP ConfigurationManagement Service shall implement the required data model parameters of the following data model objects, as defined in UPnP ConfigurationManagement:2, but modified by

a) replacing the path name prefix "/UPnP/DM/" with "/DLNA/Diag/", and

b) not requiring the EventOnChange attribute to be supported for any parameter.

– /UPnP/DM/DeviceInfo/
– /UPnP/DM/DeviceInfo/PhysicalDevice/
– /UPnP/DM/DeviceInfo/PhysicalDevice/DeviceID/
– /UPnP/DM/DeviceInfo/PhysicalDevice/NetworkInterface/#/
– /UPnP/DM/Configuration/Network/
– /UPnP/DM/Configuration/Network/IPInterface/#/
– /UPnP/DM/Configuration/Network/IPInterface/#/IPv4/
– /UPnP/DM/Monitoring/
– /UPnP/DM/Monitoring/IPUsage/#/

[ATTRIBUTES]

M	A	+DIAGE+	n/a	n/a	UPnP ConfigurationManagement:2	RV4IO	

[COMMENT] Only the parameters that are noted as being required (R) in UPnP ConfigurationManagement:2 are specified by this guideline. An example of the path to be used by a Diagnostics Endpoint is "/DLNA/Diag/DeviceInfo/" instead of "/UPnP/DM/DeviceInfo/". It is still allowed for a device to implement EventOnChange for a parameter, if desired. It is also allowed for a parameter to be made writable, but this is not required for any parameter.

6.4.4

[GUIDELINE] A Diagnostics Endpoint with a UPnP ConfigurationManagement Service shall include the following elements in reply to a CfgMS:GetSupportedDataModels action:

– <URI>urn:dlna-org:Part8:Diagnostics:<yyyymmdd></URI>
– <Location>/DLNA/Diag/</Location>

[ATTRIBUTES]

M	A	+DIAGE+	n/a	n/a	UPnP ConfigurationManagement:2	YJWIW	

[COMMENT] These are the mandatory elements for a CfgMS:GetSupportedDataModels response. In the URI string, the word "Part" is a literal string. <n> represents the Part number assigned to the DLNA guideline Part that contains these Diagnostics guidelines. There is no space between the word "Part" and its number. <Part_Name> is the name of the DLNA guideline Part, with underscores replacing spaces. <yyyymmdd> is the publication year and month on the cover page of the guideline Part, with day of "01". For example, the December 2011 Part 1 guidelines would be:

<URI>urn:dlna-org:Part1:Architectures_and_Protocols:20111201</URI>.

6.4.5

[GUIDELINE] A Diagnostics Endpoint with UPnP ConfigurationManagement Service that advertises that it only implements the minimum functionality necessary to comply with UPnP ConfigurationManagement:2 shall indicate this through X_DLNACAP value of "CMS-minimum".

[ATTRIBUTES]

M	L	+DIAGE+	n/a	n/a	UPnP ConfigurationManagement:2	P89VZ	

[COMMENT] It is allowed for a device to have a minimal implementation without identifying itself as "CMS-minimum". The formal syntax of the <dlna:X_DLNACAP> element is:

<dlna:X_DLNACAP xmlns:dlna="urn:schemas-dlna-org:device-1-0">
CMS-minimum
</dlna:X_DLNACAP>

6.4.6

[GUIDELINE] A Diagnostics Endpoint with UPnP ConfigurationManagement Service that provides the X_DLNACAP value of "CMS-minimum" shall not include optional elements when responding to actions.

[ATTRIBUTES]

M	L	+DIAGE+	n/a	n/a	UPnP ConfigurationManagement:2	JRZTZ	

[COMMENT] Such an implementation will only provide required elements in its responses. Values for required elements of a CfgMS:GetSupportedDataModels response are provided in 6.4.4.

6.4.7

[GUIDELINE] A Diagnostics Endpoint with UPnP ConfigurationManagement Service that provides the X_DLNACAP value of "CMS-minimum" shall not include in a CfgMS:GetSupportedParameters or CfgMS:GetAttributes response any StructurePath or NodeAttributePath value that is not one of the paths listed below, or not a required parameter within one of the paths listed below.

/DLNA/Diag/DeviceInfo/
/DLNA/Diag/DeviceInfo/PhysicalDevice/
/DLNA/Diag/DeviceInfo/PhysicalDevice/DeviceID/
/DLNA/Diag/DeviceInfo/PhysicalDevice/NetworkInterface/#/
/DLNA/Diag/Configuration/Network/
/DLNA/Diag/Configuration/Network/IPInterface/#/
/DLNA/Diag/Configuration/Network/IPInterface/#/IPv4/
/DLNA/Diag/Monitoring/
/DLNA/Diag/Monitoring/IPUsage/#/

[ATTRIBUTES]

M	L	+DIAGE+	n/a	n/a	UPnP ConfigurationManagement:2	Q5X7G	

[COMMENT]

a) CfgMS.A_ARG_TYPE_StructurePathList is the only required output state variable in response to the CfgMS:GetSupportedParameters action. StructurePath is the only required element of this variable. The precise set of values returned is dependent on the values of input state variables CfgMS.A_ARG_TYPE_StructurePath and CfgMS.A_ARG_TYPE_SearchDepth.

b) CfgMS.A_ARG_TYPE_NodeAttributeValueList is the only required output state variable in response to the CfgMS:GetAttributes action. The only required element of this variable is NodeAttributePath. The precise set of values returned is dependent on the values of input state variable CfgMS.A_ARG_TYPE_NodeAttributePathList.

6.4.8

[GUIDELINE] A Diagnostics Endpoint with UPnP ConfigurationManagement Service that provides the X_DLNACAP value of "CMS-minimum" shall not include in a CfgMS:GetInstances response any InstancePath value that is not listed below. If there is only one instance, then #=1, for that instance. If more than one instance exists, the value of # is incremented by 1 for each additional instance.

/DLNA/Diag/DeviceInfo/PhysicalDevice/NetworkInterface/#/
/DLNA/Diag/Configuration/Network/IPInterface/#/
/DLNA/Diag/Monitoring/IPUsage/#/

[ATTRIBUTES]

M	L	+DIAGE+	n/a	n/a	UPnP ConfigurationManagement:2	255MM	

[COMMENT] CfgMS.A_ARG_TYPE_InstancePathList is the only output state variable in response to the CfgMS:GetInstances action. The only required element of this variable is InstancePath. The precise set of values returned is dependent on the values of input state

variables CfgMS.A_ARG_TYPE_PartialPath and CfgMS.A_ARG_TYPE_SearchDepth, and upon the number of instances of each of these nodes that exist.

6.4.9

[GUIDELINE] A Diagnostics Endpoint with UPnP ConfigurationManagement Service that provides the X_DLNACAP value of "CMS-minimum" shall return the value "0,<time stamp of a non-future date set during coding; dateTime format>" for any CfgMS.ConfigurationUpdate CfgMS.SupportedDataModelsUpdate, or CfgMS.SupportedParametersUpdate state variable included in a response.

[ATTRIBUTES]

M	L	+DIAGE+	n/a	n/a	UPnP ConfigurationManagement:2	2QFLQ	

[COMMENT] CfgMS.ConfigurationUpdate is the only required state variable in response to CfgMS:GetConfigurationUpdate action. CfgMS.SupportedDataModelsUpdate is the only required state variable in response to CfgMS:GetSupportedDataModelsUpdate. CfgMS.SupportedParametersUpdate is the only required state variable in response to CfgMS:GetSupportedParametersUpdate.

6.4.10

[GUIDELINE] A Diagnostics Endpoint with UPnP ConfigurationManagement Service that provides the X_DLNACAP value of "CMS-minimum" shall return the value "0" for any CfgMS.CurrentConfigurationVersion state variable included in a response.

[ATTRIBUTES]

M	L	+DIAGE+	n/a	n/a	UPnP ConfigurationManagement:2	ELFDA	

[COMMENT] CfgMS.CurrentConfigurationVersion is the only required state variable in response to CfgMS:GetCurrentConfigurationVersion action.

6.5 1905 Topology Discovery and Link Metrics

6.5.1

[GUIDELINE] If a DLNA Device Class contains the Diagnostics Endpoint capability or the Diagnostics Controller capability, then it should implement the 1905 Management Primitives Device Function.

[ATTRIBUTES]

S	A	+DIAGE+ +DIAGC+	n/a	n/a	IEEE *1905*	UM5TJ	

6.5.2

[GUIDELINE] A 1905 Management Primitives function shall implement the 1905 Topology Discovery Protocol feature.

[ATTRIBUTES]

M	R	+DIAGE+ +DIAGC+	n/a	n/a	IEEE *1905*	A7U6U	

[COMMENT] This Layer 2 protocol allows discovery of the network topology even if devices are having IP addressing issues.

6.5.3

[GUIDELINE] A 1905 Management Primitives function shall implement the 1905 Link Metrics feature.

[ATTRIBUTES]

M	R	+DIAGE+ +DIAGC+	n/a	n/a	IEEE *1905*	S4DXH	

6.5.4

[GUIDELINE] A 1905 Management Primitive shall invoke the 1905 Topology Discovery Protocol feature when a user initiates a Topology Discovery request.

[ATTRIBUTES]

M	R	+DIAGC+	n/a	n/a	IEEE *1905*	TFXHX	

6.5.5

[GUIDELINE] A 1905 Management Primitive shall invoke the 1905 Link Metrics feature when a user initiates a Link Metrics request.

[ATTRIBUTES]

M	R	+DIAGC+	n/a	n/a	IEEE *1905*	F37UB	

6.6 Diagnostics Application

6.6.1

[GUIDELINE] If a DLNA Device contains the Diagnostics Controller capability then it shall implement the Diagnostics Application.

[ATTRIBUTES]

M	A	+DIAGC+	n/a	n/a	n/a	W4DD5	

6.6.2

[GUIDELINE] A Diagnostics Application shall implement a local user interface or a remote/browser user interface accessible by the consumer that provides the ability to invoke functionality provided by a UPnP BasicManagement Control Point, UPnP ConfigurationManagement Control Point, or 1905 Management Primitive also present in the Diagnostics Controller.

[ATTRIBUTES]

M	R	+DIAGC+	n/a	n/a	n/a	4AT63	

[COMMENT] A local user interface, for example, would be where an application runs on a PC or a Set Top Box and uses the local user interface capabilities of the device.

6.7 UPnP BasicManagement Control Point

6.7.1

[GUIDELINE] If a DLNA Device contains the Diagnostics Controller capability then it shall implement the UPnP BasicManagement Control Point Device Function.

[ATTRIBUTES]

M	A	+DIAGC+	n/a	n/a	n/a	2UHUO	

6.7.2

[GUIDELINE] A UPnP BasicManagement Control Point shall invoke the BMS:Ping and BMS:GetPingResult actions in UPnP BasicManagement:2 when a user initiates a Ping test against a UPnP BasicManagement Service.

[ATTRIBUTES]

M	R	+DIAGC+	n/a	n/a	UPnP BasicManagement:2	PX7EJ	

6.7.3

[GUIDELINE] A UPnP BasicManagement Control Point shall invoke the BMS:NSLookup and BMS:GetNSLookupResult actions in UPnP BasicManagement:2 when a user initiates a NSLookup function against a UPnP BasicManagement Service.

[ATTRIBUTES]

M	R	+DIAGC+	n/a	n/a	UPnP BasicManagement:2	WGWOA	

6.7.4

[GUIDELINE] A UPnP BasicManagement Control Point shall invoke the BMS:Traceroute and BMS:GetTracerouteResult actions in UPnP BasicManagement:2 when a user initiates the Traceroute function against a UPnP BasicManagement Service.

[ATTRIBUTES]

M	R	+DIAGC+	n/a	n/a	UPnP BasicManagement:2	9GK5T	

6.7.5

[GUIDELINE] A UPnP BasicManagement Control Point shall invoke the BMS:GetDeviceStatus action in UPnP BasicManagement:2 when a user initiates a request for diagnostics information against a UPnP BasicManagement Service.

[ATTRIBUTES]

M	R	+DIAGC+	n/a	n/a	UPnP BasicManagement:2	HU4PV	

[COMMENT] This is a request that provides very basic high level status of the root device.

6.7.6

[GUIDELINE] A UPnP BasicManagement Control Point should invoke the BMS:GetTestIDs and BMS:GetSelfTestResult actions in UPnP BasicManagement:2 when a user initiates a request for diagnostics information against a UPnP BasicManagement Service.

[ATTRIBUTES]

S	R	+DIAGC+	n/a	n/a	UPnP BasicManagement:2	O2XCP	

[COMMENT] The Control Point does not have the ability to request a self-test to be done, but if the UPnP BasicManagement Service performs self-tests autonomously or initiated through some other means, this will allow the CP to retrieve that information.

6.8 UPnP ConfigurationManagement Control Point

6.8.1

[GUIDELINE] If a DLNA Device contains the Diagnostics Controller capability then it should implement the UPnP ConfigurationManagement Control Point Device Function.

[ATTRIBUTES]

S	A	+DIAGC+	n/a	n/a	n/a	Y78II	

6.8.2

[GUIDELINE] A UPnP ConfigurationManagement Control Point shall implement a UPnP ConfigurationManagement:2 Control Point.

[ATTRIBUTES]

M	R	+DIAGC+	n/a	n/a	UPnP ConfigurationManagement:2	YSIHM	

[COMMENT] Examples of how these actions can be used are given in Annex A.

6.8.3

[GUIDELINE] A Diagnostics Controller with a UPnP ConfigurationManagement Control Point shall invoke the CfgMS:GetValues action for the /DLNA/Diag/ data model when a user initiates a request for information from a UPnP ConfigurationManagement Service that is known to support this data model (due to some prior invocation of CfgMS:GetSupportedDataModels returning this as a Location value).

[ATTRIBUTES]

M	L	+DIAGC+	n/a	n/a	UPnP BasicManagement:2	QC86K	

[COMMENT] This does not preclude the ability to invoke additional UPnP ConfigurationManagement:2 actions, when obtaining information from a UPnP ConfigurationManagement:2 service. Once CfgMS:GetSupportedDataModels has been requested, the resulting ContentPath values can be cached, so this action does not need to be invoked every time CfgMS:GetValues is invoked. Examples of how some of the parameters can be used are given in Annex A.

Annex A
(informative)

Diagnostics usage examples

A.1 Overview

The DLNA Diagnostics guidelines focus mostly on the collection of data through queries and test actions. The procedures for troubleshooting and invoking the tests or any remedies are outside the scope of these guidelines, other than requiring a user interface that will allow user access to Diagnostics data and capabilities. That user can be a service provider accessing the Diagnostics Application through a TR-069 management interface, or a technician or end user accessing it through a browser or screen interface.

While problem identification, troubleshooting, and remedy procedures cannot be specified through normative guidelines, this annex includes example Diagnostics Applications implementing those procedures.

A.2 Using a TR-069 service provider interface

In some cases, a service provider may want to use the Broadband Forum's TR-069 specification as the protocol to interface to a Diagnostics Application across the internet. Figure A.1 shows an example.

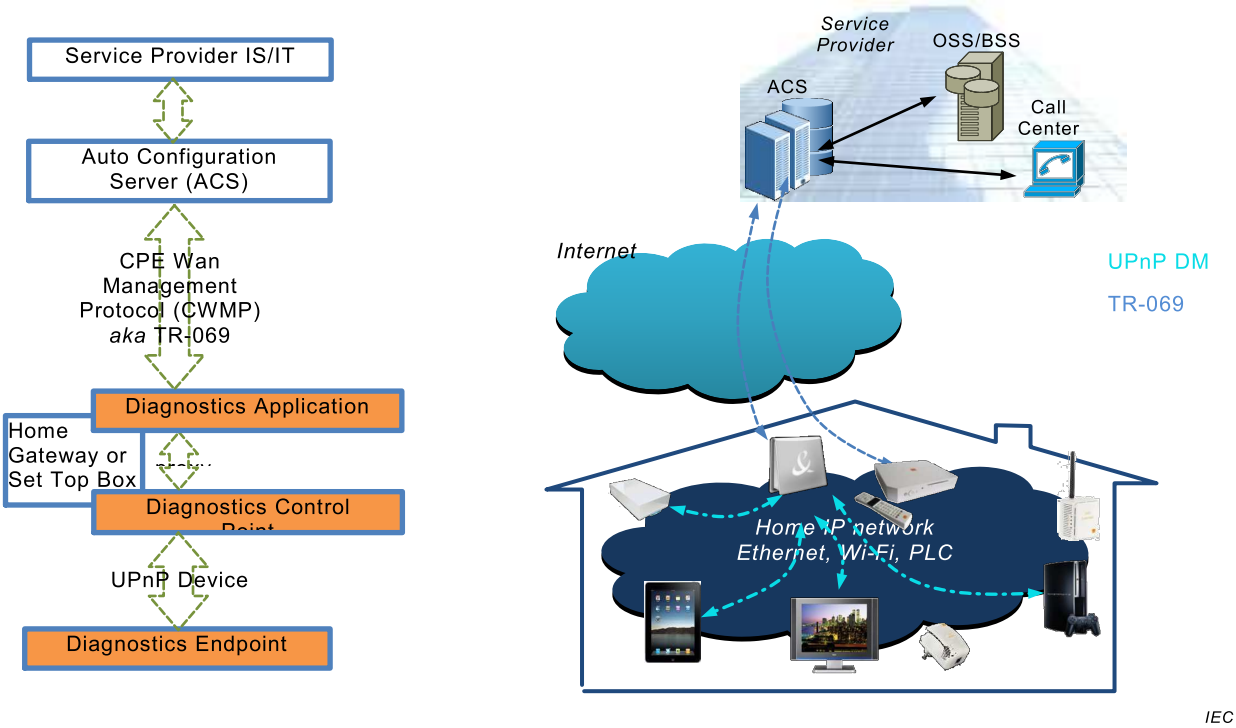


Figure A.1 – End-to-end infrastructure

The TR-069 protocol is used between the service provider location and the home gateway or set top in the home (it could be any device connected to the home network and the internet). In this case, the Diagnostics Application implements a TR-069 client that provides a proxy function between TR-069 and UPnP.

A.3 Providing an end user interface

A.3.1 General

It is considered useful for the Diagnostics Application to provide a user interface that is accessible by the end user. This interface might be browser-based or it could be provided directly by a built-in or otherwise connected screen.

The following sections are intended to describe possible functionality that can be included in a Diagnostics Application intended for a user, to assist them in diagnosing troubles they can be experiencing.

A.3.2 Potential troubles

In Table A.1 are some of the more likely trouble scenarios that a user could experience. To a large extent, the service quality issues are not addressed by these guidelines.

Table A.1 – Trouble scenarios

Category	Perceived problem	Possible causes
Device Discovery / Connectivity	Unable to find expected new client devices	– Network delivery path not working (no physical layer connectivity, IP connectivity not working) – Device is powered down or sleeping – DLNA services down / malfunctioning
	Unable to find previously known client device	
Service quality	Degraded performance of content delivery	– Network path congested – Network impaired / reduced throughput – Client device health – Insufficient client resources – Client has sub-optimal response

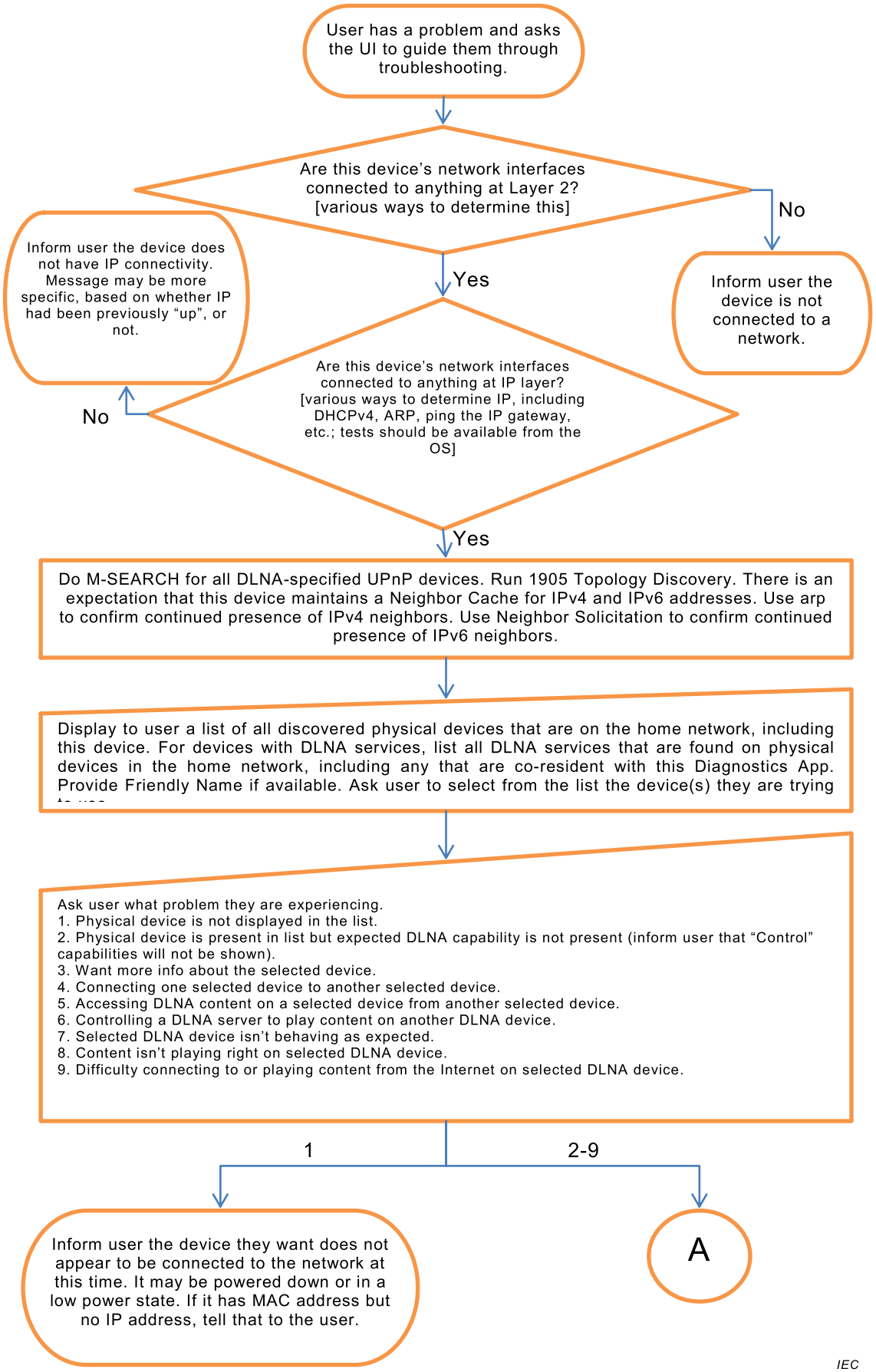
A.3.3 User interface diagnostics functions

In order for a diagnostics function to be useful to "average" users, it needs to allow users to approach it based on what they are experiencing, and not with an assumption that they already know how to diagnose what they are experiencing. Advanced users do exist who appreciate direct access to diagnostic tools, so it is reasonable to provide user interface paths for both sets of users (for example, "Guided troubleshooting" and "Advanced diagnostics tests"). When providing direct access to diagnostics tests, it is still a good idea to group some tests together so they can be invoked by the end user with a single command (for example, Run diagnostics).

A.3.4 Example guided troubleshooting flow

Following is a sample of how users can be guided through troubleshooting of the problems they are experiencing. This is provided simply as a potential flow, and is purely informational.

Figure A.2 shows the Diagnostics Application making use of functions that are not a part of a DLNA Diagnostics Controller capability, but which should either exist as capabilities provided by the underlying Operating System (OS), or could be included by the vendor as an element of the overall DLNA application. This includes ping, traceroute, nslookup and other OS-provided test functions, as well as UPnP Control Point (CP) device discovery capabilities (MSEARCH and processing of ssdp:alive messages) for all DLNA-specified UPnP services.


User has a problem and asks the UI to guide them through troubleshooting.
Are this device's network interfaces connected to anything at Layer 2? [various ways to determine this]
No
Inform user the device is not connected to a network.
Yes
Inform user the device does not have IP connectivity. Message may be more specific, based on whether IP had been previously "up", or not.
No
Are this device's network interfaces connected to anything at IP layer? [various ways to determine IP, including DHCPv4, ARP, ping the IP gateway, etc.; tests should be available from the OS]
Yes
Do M-SEARCH for all DLNA-specified UPnP devices. Run 1905 Topology Discovery. There is an expectation that this device maintains a Neighbor Cache for IPv4 and IPv6 addresses. Use arp to confirm continued presence of IPv4 neighbors. Use Neighbor Solicitation to confirm continued presence of IPv6 neighbors.
Display to user a list of all discovered physical devices that are on the home network, including this device. For devices with DLNA services, list all DLNA services that are found on physical devices in the home network, including any that are co-resident with this Diagnostics App. Provide Friendly Name if available. Ask user to select from the list the device(s) they are trying
Ask user what problem they are experiencing.
1. Physical device is not displayed in the list.
2. Physical device is present in list but expected DLNA capability is not present (inform user that "Control" capabilities will not be shown).
3. Want more info about the selected device.
4. Connecting one selected device to another selected device.
5. Accessing DLNA content on a selected device from another selected device.
6. Controlling a DLNA server to play content on another DLNA device.
7. Selected DLNA device isn't behaving as expected.
8. Content isn't playing right on selected DLNA device.
9. Difficulty connecting to or playing content from the Internet on selected DLNA device.
1
2-9
Inform user the device they want does not appear to be connected to the network at this time. It may be powered down or in a low power state. If it has MAC address but no IP address, tell that to the user.
A

IEC

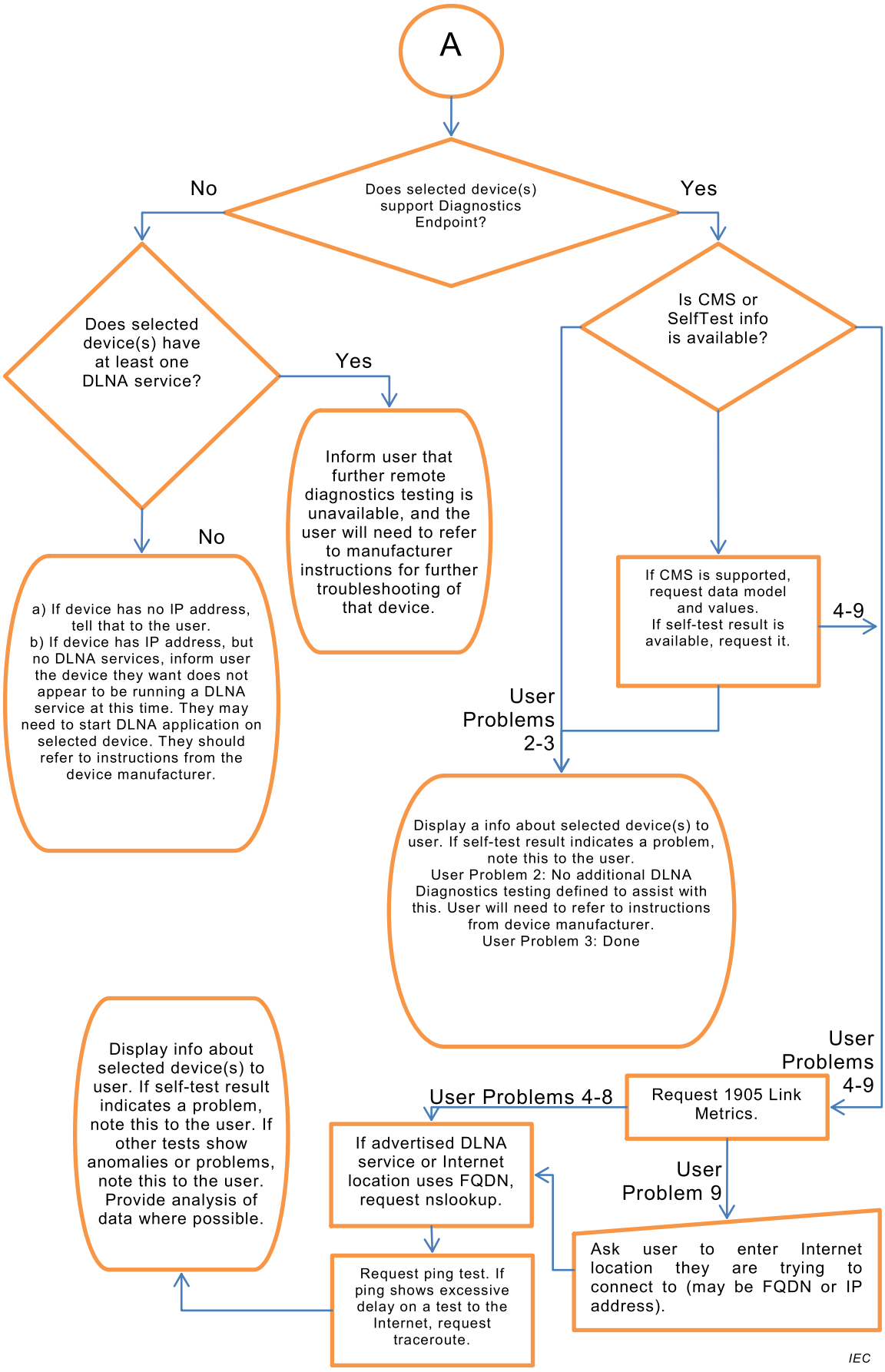


Figure A.2 – Guided troubleshooting flow chart

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