Information technology — UPnP Device Architecture —

Part 30-2: IoT management and control device control protocol — IoT management and control device

Technologies de l'information — Architecture de dispositif UPnP —
Partie 30-2: Protocole de contrôle de dispositif de gestion et de contrôle de l'Internet des objets — Dispositif de gestion et de contrôle de l'Internet des objets
CONTENTS

1 Scope ............................................................................................................................ 1
2 Normative References ................................................................................................... 1
3 Terms, Definitions and Abbreviations ............................................................................. 2
4 Notations and conventions ............................................................................................. 2
  4.1 Notation ............................................................................................................... 2
  4.2 Data Types ........................................................................................................... 2
  4.3 Vendor-defined Extensions ................................................................................... 3
5 Device Definitions .......................................................................................................... 3
  5.1 Device Type ......................................................................................................... 3
  5.2 Device Model ........................................................................................................ 3
    5.2.1 Description of Device Requirements .......................................................... 4
    5.2.2 Relationships Between Services ................................................................ 4
6 XML Device Description ................................................................................................. 4
Annex A - Theory of Operation (informative) ......................................................................... 6
  A.1 Introduction .......................................................................................................... 6
  A.2 Device Discovery .................................................................................................. 6
  A.3 Sensor Discovery, Configuration and Status Reading ............................................ 6
  A.4 Reading and Writing of Data ................................................................................. 6
  A.5 Connecting Sensors to Transport Clients ............................................................... 7
Figure 1 — IOT Management and Control Device Functional Diagram ................................... 1
Figure A.1 — Simple Read and Write Flow Diagram. ............................................................. 7
Figure A.2 — Connecting a IoT Management and Control Device to an External Storage. ......................................................................................................................... 8
Table 1 — Device Requirements .......................................................................................... 3
Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see http://www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of Standards, the meaning of the ISO specific terms and expressions related to conformity assessment, as well as information about ISO’s adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword – Supplementary information.

ISO/IEC 29341-30-2 was prepared by UPnP Forum and adopted, under the PAS procedure, by joint technical committee ISO/IEC JTC 1, Information technology, in parallel with its approval by national bodies of ISO and IEC.

The list of all currently available parts of ISO/IEC 29341 series, under the general title Information technology — UPnP Device Architecture, can be found on the ISO web site.
Introduction
ISO and IEC draw attention to the fact that it is claimed that compliance with this document may involve the use of patents as indicated below.

ISO and IEC take no position concerning the evidence, validity and scope of these patent rights. The holders of these patent rights have assured ISO and IEC that they are willing to negotiate licenses under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statements of the holders of these patent rights are registered with ISO and IEC.

Intel Corporation has informed IEC and ISO that it has patent applications or granted patents.
Information may be obtained from:
Intel Corporation
Standards Licensing Department
5200 NE Elam Young Parkway
MS: JFS-98
USA – Hillsboro, Oregon 97124

Microsoft Corporation has informed IEC and ISO that it has patent applications or granted patents as listed below:
Information may be obtained from:
Microsoft Corporation
One Microsoft Way
USA – Redmond WA 98052

Philips International B.V. has informed IEC and ISO that it has patent applications or granted patents.
Information may be obtained from:
Philips International B.V. – IP&S
High Tech campus, building 44 3A21
NL – 5656 Eindhoven

NXP B.V. (NL) has informed IEC and ISO that it has patent applications or granted patents.
Information may be obtained from:
NXP B.V. (NL)
High Tech campus 60
NL – 5656 AG Eindhoven

Matsushita Electric Industrial Co. Ltd. has informed IEC and ISO that it has patent applications or granted patents.
Information may be obtained from:
Matsushita Electric Industrial Co. Ltd.
1-3-7 Shiromi, Chuoh-ku
JP – Osaka 540-6139

Hewlett Packard Company has informed IEC and ISO that it has patent applications or granted patents as listed below:
5 956 487 / US; 6 170 007 / US; 6 139 177 / US; 6 529 936 / US; 6 470 339 / US; 6 571 388 / US; 6 205 466 / US
ISO/IEC 29341-30-2:2017(E)

Information may be obtained from:

Hewlett Packard Company  
1501 Page Mill Road  
USA – Palo Alto, CA 94304

Samsung Electronics Co. Ltd. has informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Digital Media Business, Samsung Electronics Co. Ltd.  
416 Maetan-3 Dong, Yeongtang-Gu,  
KR – Suwon City 443-742

Huawei Technologies Co., Ltd. has informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Huawei Technologies Co., Ltd.  
Administration Building, Bantian Longgang District  
Shenzhen – China 518129

Qualcomm Incorporated has informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Qualcomm Incorporated  
5775 Morehouse Drive  
San Diego, CA – USA 92121

Telecom Italia S.p.A. has informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Telecom Italia S.p.A.  
Via Reiss Romoli, 274  
Turin - Italy 10148

Cisco Systems informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA – USA 95134

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. ISO and IEC shall not be held responsible for identifying any or all such patent rights.
Reference may be made in this document to original UPnP documents. These references are retained in order to maintain consistency between the specifications as published by ISO/IEC and by UPnP Implementers Corporation and later by UPnP Forum. The following table indicates the original UPnP document titles and the corresponding part of ISO/IEC 29341:

<table>
<thead>
<tr>
<th>UPnP Document Title</th>
<th>ISO/IEC 29341 Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPnP Device Architecture 1.0</td>
<td>ISO/IEC 29341-1:2008</td>
</tr>
<tr>
<td>UPnP Device Architecture 1.1</td>
<td>ISO/IEC 29341-1:1:2011</td>
</tr>
<tr>
<td>UPnP Device Architecture 2.0</td>
<td>ISO/IEC 29341-1-2</td>
</tr>
<tr>
<td>UPnP Basic:1 Device</td>
<td>ISO/IEC 29341-2</td>
</tr>
<tr>
<td>UPnP AVTransport:1 Service</td>
<td>ISO/IEC 29341-3:1-2011</td>
</tr>
<tr>
<td>UPnP ContentDirectory:1 Service</td>
<td>ISO/IEC 29341-3:11</td>
</tr>
<tr>
<td>UPnP RenderingControl:1 Service</td>
<td>ISO/IEC 29341-3:12</td>
</tr>
<tr>
<td>UPnP MediaRenderer:1 Device</td>
<td>ISO/IEC 29341-3:2</td>
</tr>
<tr>
<td>UPnP MediaRenderer:2 Device</td>
<td>ISO/IEC 29341-3:2-2011</td>
</tr>
<tr>
<td>UPnP MediaServer:1 Device</td>
<td>ISO/IEC 29341-3-3</td>
</tr>
<tr>
<td>UPnP AVTransport:2 Service</td>
<td>ISO/IEC 29341-4-10:2008</td>
</tr>
<tr>
<td>UPnP AVTransport:2 Service</td>
<td>ISO/IEC 29341-4-10:2011</td>
</tr>
<tr>
<td>UPnP ConnectionManager:2 Service</td>
<td>ISO/IEC 29341-4-11:2008</td>
</tr>
<tr>
<td>UPnP ConnectionManager:2 Service</td>
<td>ISO/IEC 29341-4-11:2011</td>
</tr>
<tr>
<td>UPnP ContentDirectory:2 Service</td>
<td>ISO/IEC 29341-4-12</td>
</tr>
<tr>
<td>UPnP ScheduledRecording:1</td>
<td>ISO/IEC 29341-4-14</td>
</tr>
<tr>
<td>UPnP ScheduledRecording:2</td>
<td>ISO/IEC 29341-4-14:2011</td>
</tr>
<tr>
<td>UPnP MediaRenderer:2 Device</td>
<td>ISO/IEC 29341-4-2</td>
</tr>
<tr>
<td>UPnP MediaServer:2 Device</td>
<td>ISO/IEC 29341-4-3</td>
</tr>
<tr>
<td>UPnP AV Datastructure Template:1</td>
<td>ISO/IEC 29341-4-4:2008</td>
</tr>
<tr>
<td>UPnP AV Datastructure Template:1</td>
<td>ISO/IEC 29341-4-4:2011</td>
</tr>
<tr>
<td>UPnP DigitalSecurityCamera:1 Device</td>
<td>ISO/IEC 29341-5-1</td>
</tr>
<tr>
<td>UPnP DigitalSecurityCameraMotionImage:1 Service</td>
<td>ISO/IEC 29341-5-10</td>
</tr>
<tr>
<td>UPnP DigitalSecurityCameraSettings:1 Service</td>
<td>ISO/IEC 29341-5-11</td>
</tr>
<tr>
<td>UPnP DigitalSecurityCameraStillImage:1 Service</td>
<td>ISO/IEC 29341-5-12</td>
</tr>
<tr>
<td>UPnP HVAC_System:1 Device</td>
<td>ISO/IEC 29341-6-1</td>
</tr>
<tr>
<td>UPnP ControlValve:1 Service</td>
<td>ISO/IEC 29341-6-10</td>
</tr>
<tr>
<td>UPnP HVAC_FanOperatingMode:1 Service</td>
<td>ISO/IEC 29341-6-11</td>
</tr>
<tr>
<td>UPnP FanSpeed:1 Service</td>
<td>ISO/IEC 29341-6-12</td>
</tr>
<tr>
<td>UPnP HouseStatus:1 Service</td>
<td>ISO/IEC 29341-6-13</td>
</tr>
<tr>
<td>UPnP HVAC_SetpointSchedule:1 Service</td>
<td>ISO/IEC 29341-6-14</td>
</tr>
<tr>
<td>UPnP TemperatureSensor:1 Service</td>
<td>ISO/IEC 29341-6-15</td>
</tr>
<tr>
<td>UPnP TemperatureSetpoint:1 Service</td>
<td>ISO/IEC 29341-6-16</td>
</tr>
<tr>
<td>UPnP HVAC_UserOperatingMode:1 Service</td>
<td>ISO/IEC 29341-6-17</td>
</tr>
<tr>
<td>UPnP HVAC_ZoneThermostat:1 Device</td>
<td>ISO/IEC 29341-6-2</td>
</tr>
</tbody>
</table>
UPnP BinaryLight:1 Device
UPnP Dimming:1 Service
UPnP SwitchPower:1 Service
UPnP DimmableLight:1 Device
UPnP InternetGatewayDevice:1 Device
UPnP LANHostConfigManagement:1 Service
UPnP Layer3Forwarding:1 Service
UPnP LinkAuthentication:1 Service
UPnP RadiusClient:1 Service
UPnP WANCableLinkConfig:1 Service
UPnP WANCommonInterfaceConfig:1 Service
UPnP WANDevice:1 Device
UPnP WANDevice:1 Device
UPnP Wandevice:1 Device
UPnP WANEthernetLinkConfig:1 Service
UPnP WANIPConnection:1 Service
UPnP WANPOTSLinkConfig:1 Service
UPnP LANDevice:1 Device
UPnP WANPPPConnection:1 Service
UPnP WLANConfiguration:1 Service
UPnP WANDevice:1 Device
UPnP WANConnectionDevice:1 Device
UPnP WLANAccessPointDevice:1 Device
UPnP Printer:1 Device
UPnP ExternalActivity:1 Service
UPnP Feeder:1.0 Service
UPnP PrintBasic:1 Service
UPnP Scan:1 Service
UPnP Scanner:1.0 Device
UPnP QoS Architecture:1.0
UPnP QosDevice:1 Service
UPnP QosManager:1 Service
UPnP QosPolicyHolder:1 Service
UPnP QoS Architecture:2
UPnP QosDevice:2 Service
UPnP QosManager:2 Service
UPnP QosPolicyHolder:2 Service
UPnP QOS v2 Schema Files
UPnP RemoteUIControlClientDevice:1 Device
UPnP RemoteUIControlClient:1 Service
UPnP RemoteUIServer:1 Service
UPnP RemoteUIServerDevice:1 Device
UPnP DeviceSecurity:1 Service
UPnP SecurityConsole:1 Service
UPnP ContentDirectory:3 Service
UPnP MediaServer:3 Device
UPnP ContentSync:1
UPnP LowPowerArchitecture:1
UPnP LowPowerProxy:1 Service
UPnP LowPowerDevice:1 Service
ISO/IEC 29341-16-11:2011

UPnP QoS Architecture:3
ISO/IEC 29341-17-1:2011

UPnP QosDevice:3 Service
ISO/IEC 29341-17-10:2011

UPnP QosManager:3 Service
ISO/IEC 29341-17-11:2011

UPnP QosPolicyHolder:3 Service
ISO/IEC 29341-17-12:2011

UPnP QosDevice:3 Addendum

UPnP RemoteAccessArchitecture:1
ISO/IEC 29341-18-1:2011

UPnP InboundConnectionConfig:1 Service

UPnP RADAConfig:1 Service

UPnP RADASync:1 Service

UPnP RATAConfig:1 Service

UPnP RAClient:1 Device

UPnP RAServer:1 Device

UPnP RADiscoveryAgent:1 Device

UPnP SolarProtectionBlind:1 Device

UPnP TwoWayMotionMotor:1 Service

UPnP AV Architecture:2
ISO/IEC 29341-20-1

UPnP AVTransport:3 Service
ISO/IEC 29341-20-10

UPnP ConnectionManager:3 Service
ISO/IEC 29341-20-11

UPnP ContentDirectory:4 Device
ISO/IEC 29341-20-12

UPnP RenderingControl:3 Service
ISO/IEC 29341-20-13

UPnP ScheduledRecording:2 Service
ISO/IEC 29341-20-14

UPnP MediaRenderer:3 Service
ISO/IEC 29341-20-2

UPnP MediaServer:4 Device
ISO/IEC 29341-20-3

UPnP AV Datastructure Template:1
ISO/IEC 29341-20-4

UPnP InternetGatewayDevice:2 Device
ISO/IEC 29341-24-1

UPnP WANIPConnection:2 Service
ISO/IEC 29341-24-10

UPnP WANIPv6FirewallControl:1 Service
ISO/IEC 29341-24-11

UPnP WANConnectionDevice:2 Service
ISO/IEC 29341-24-2

UPnP WANDevice:2 Device
ISO/IEC 29341-24-3

UPnP Telephony Architecture:2
ISO/IEC 29341-26-1

UPnP CallManagement:2 Service
ISO/IEC 29341-26-10

UPnP MediaManagement:2 Service
ISO/IEC 29341-26-11

UPnP Messaging:2 Service
ISO/IEC 29341-26-12

UPnP PhoneManagement:2 Service
ISO/IEC 29341-26-13

UPnP AddressBook:1 Service
ISO/IEC 29341-26-14

UPnP Calendar:1 Service
ISO/IEC 29341-26-15

UPnP Presence:1 Service
ISO/IEC 29341-26-16

UPnP TelephonyClient:2 Device
ISO/IEC 29341-26-2

UPnP TelephonyServer:2 Device
ISO/IEC 29341-26-3

UPnP Friendly Info Update:1 Service
ISO/IEC 29341-27-1

UPnP MultiScreen MultiScreen Architecture:1
ISO/IEC 29341-28-1

UPnP MultiScreen Application Management:1 Service
ISO/IEC 29341-28-10

UPnP MultiScreen Screen:1 Device
ISO/IEC 29341-28-2

UPnP MultiScreen Application Management:2 Service
ISO/IEC 29341-29-10

UPnP MultiScreen Screen:2 Device
ISO/IEC 29341-29-2

UPnP IoT Management and Control Architecture Overview:1
ISO/IEC 29341-30-1
ISO/IEC 29341-30-2:2017(E)

<table>
<thead>
<tr>
<th>Service</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPnP DataStore:1 Service</td>
<td>ISO/IEC 29341-30-10</td>
</tr>
<tr>
<td>UPnP IoT Management and Control Data Model:1 Service</td>
<td>ISO/IEC 29341-30-11</td>
</tr>
<tr>
<td>UPnP IoT Management and Control Transport Generic:1 Service</td>
<td>ISO/IEC 29341-30-12</td>
</tr>
<tr>
<td>UPnP Energy Management:1 Service</td>
<td>ISO/IEC 29341-31-1</td>
</tr>
</tbody>
</table>
1 Scope

This document defines the device for IOT Management and Control, which identifies Level 1 of the device named IOT Management and Control. This Publicly Available Specification is applicable to Standardized DCPs of the UPnP Forum which include this device.

This device definition is compliant with the UPnP Device Architecture version 1.0 [1]. It defines a device type referred to herein as IOT Management and Control device.

This specification defines a general-purpose device that can be used to instantiate a bridge or gateway device that is connected to Sensors and Actuators. This device implements a bridge between the UPnP network and Sensors/Actuators endpoints. It exposes services to check the status, and send and receive data from Sensors. Sensors/Actuators may be connected using a variety of transport protocols including Bluetooth, ZigBee and IEEE 11073.

The device defined herein provides the following capabilities:

2. Expose configuration information from Sensors and Actuators.

![Figure 1 — IOT Management and Control Device Functional Diagram](image)

The shaded boxes represent UPnP services that are contained by the IOT Management and Control device. The un-shaded boxes represent device specific modules that are vendor specific.

2 Normative References

The following referenced documents are indispensable for the application 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.


Terms, Definitions and Abbreviations
For the purposes of this document, the terms and definitions given in [1] and [2] apply.

Notations and conventions

Notation

- Strings that are to be taken literally are enclosed in "double quotes".
- Words that are emphasized are printed in italic.
- Keywords that are defined by the UPnP Working Committee are printed using the forum character style.
- Keywords that are defined by the UPnP Device Architecture are printed using the arch character style.
- A double colon delimiter, "::", signifies a hierarchical parent-child (parent::child) relationship between the two objects separated by the double colon. This delimiter is used in multiple contexts, for example: Service::Action(), Action()::Argument, parentProperty::childProperty.

Data Types

This specification uses data type definitions from two different sources. The UPnP Device Architecture defined data types are used to define state variable and action argument data types [1]. The XML Schema namespace is used to define property data types [10].

References


