

[This is a preview - click here to buy the full publication](#)



ISO/IEC 29341-16-11

Edition 1.0 2011-08

INTERNATIONAL STANDARD



**Information technology – UPnP device architecture –
Part 16-11: Low Power Device Control Protocol – Low Power Service**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

G

ICS 35.200

ISBN 978-2-88912-644-6

CONTENTS

1	Overview and Scope.....	3
1.1	Referenced Specifications	4
1.2	Notation	4
1.3	Abbreviations	5
1.4	Non-goals	5
2	Service Modeling Definitions.....	5
2.1	ServiceType	5
2.2	State Variables.....	5
2.2.1	Derived data Types.....	5
2.2.2	BatteryLow	6
2.2.3	ExternalPowerSupplySource	7
2.2.4	WakeupMethod.....	7
2.2.5	PowerSupplyStatus.....	7
2.2.6	SleepPeriod.....	7
2.2.7	PowerState.....	8
2.2.8	Low power SSDP extensions.....	8
2.3	Eventing and Moderation	8
2.4	Generic LP-aware control point recommendations.....	8
2.5	Actions.....	9
2.5.1	GetPowerManagementInfo().....	9
2.5.2	Wakeup().....	10
2.5.3	GoToSleep().....	11
2.6	Theory of Operation.....	11
2.6.1	Explanation of Actions and operations.....	11
2.6.2	Low power state behavior	12
3	XML Service Descriptions.....	14
4	Test	16
5	Sample Argument XML documents	16
5.1	PowerSupplyStatus	16
5.2	WakeUpMethod.....	16
	Figure 1 — UPnP Low Power states.....	13
	Table 1 — Low power states.....	3
	Table 2 — Abbreviations.....	5
	Table 3 — State Variables	6
	Table 4 — SSDP power management extension headers.	8
	Table 5 — State variable eventing	8
	Table 6 — Actions	9
	Table 7 — Arguments for GetPowerManagementInfo().....	9
	Table 8 — Error Codes for GetPowerManagementInfo().....	10
	Table 9 — Error Codes for WakeUp().....	10

Table 10 — Arguments for GoToSleep().....	11
Table 11 — Error Codes for GoToSleep().....	11
Table 12 — State machine Transition Description	14

INFORMATION TECHNOLOGY – UPNP DEVICE ARCHITECTURE –

Part 16-11: Low Power Device Control – Low Power Service

FOREWORD

- 1) ISO (International Organization for Standardization) and IEC (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. Their preparation is entrusted to technical committees; any ISO and IEC member body interested in the subject dealt with may participate in this preparatory work. International governmental and non-governmental organizations liaising with ISO and IEC also participate in this preparation.
- 2) In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.
- 3) The formal decisions or agreements of IEC and ISO on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC and ISO member bodies.
- 4) IEC, ISO and ISO/IEC publications have the form of recommendations for international use and are accepted by IEC and ISO member bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC, ISO and ISO/IEC publications is accurate, IEC or ISO cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 5) In order to promote international uniformity, IEC and ISO member bodies undertake to apply IEC, ISO and ISO/IEC publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any ISO/IEC publication and the corresponding national or regional publication should be clearly indicated in the latter.
- 6) ISO and IEC provide no marking procedure to indicate their approval and cannot be rendered responsible for any equipment declared to be in conformity with an ISO/IEC publication.
- 7) All users should ensure that they have the latest edition of this publication.
- 8) No liability shall attach to IEC or ISO or its directors, employees, servants or agents including individual experts and members of their technical committees and IEC or ISO member bodies for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication of, use of, or reliance upon, this ISO/IEC publication or any other IEC, ISO or ISO/IEC publications.
- 9) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 10) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 29341-16-11 was prepared by UPnP Forum Steering committee¹, was adopted, under the fast track procedure, by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

The list of all currently available parts of the ISO/IEC 29341 series, under the general title *Information technology – UPnP device architecture*, can be found on the IEC web site.

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

¹ UPnP Forum Steering committee, UPnP Forum, 3855 SW 153rd Drive, Beaverton, Oregon 97006 USA. See also "Introduction".

[This is a preview - click here to buy the full publication](#)

29341-16-11 © ISO/IEC:2011(E)

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 publication using a colour printer.

1 Overview and Scope

This service definition is compliant with the UPnP Device Architecture version 1.0 and This service enables implementation of power saving functionality for UPnP devices.

Low power devices implement all or some of the sleep states defined in this document (e.g. Transparent Sleep, Deep Sleep Online and Deep Sleep Offline) and may be in any of those sleep states. Depending on the triggers that cause the device to transition from sleep states, the device can be modeled as a sleep/autonomous device that changes its sleep state autonomously, or a sleep/controlled device that changes its sleep state by actions from a control point. Sleeping devices (i.e., sleep capable devices in a state other than the active or disconnected) are discoverable if they respond to M-Search requests issued by Control Points. Sleeping devices that do not respond to M-Search requests are still discoverable if there is a Basic Power Management Proxy that keeps track of low power devices in the network by caching low power states announced in SSDP messages. A BPMPX is an optional component in the network that is used to cache the low power states of low power devices. A low power aware control point can find a sleeping device by querying it from a Basic Power Management Proxy.

The low power device must implement at least one of the following power states. Table 1 illustrates the relation between the internal UPnP low device power states and user visible power states [IEEE 1621]. Notice that when devices enter Deep Sleep Online or Offline states they will not respond to the UPnP M-Search discovery messages, but a low power aware control points can locate devices in this state by invoking UPnP control action on the optional Basic Power Management Proxy.

Table 1 — Low power states.

Power State	UPnP State ^a	IP Connectivity	Bearer Status	Wake UP mechanism	Proxy	User Power State
Active	FULL	ON	802.3: LINK ON/ATTACHED ^b 802.11: ON BTH: ON/PAN ON	None	None	On
Transparent Sleep	FULL	ON	802.3: LINK ON/ATTACHED 802.11: ON/Power Save BTH: Sniff & Hold/PAN ON	Invoking the Wakeup Action on the device or autonomous wakeup	Optional ^c	On/ Sleep ^d
Deep Sleep Online	PARTIAL ^e	ON	802.3: LINK ON/ATTACHED 802.11: ON/ Power Save BTH: Sniff & Hold/PAN ON	Invoking the Wakeup Action on the device (e.g. Unicast Wakeup Action message)	Optional ^f / Required ^g	Sleep
Deep Sleep Offline	OFF	OFF	802.3: LINK OFF/ATTACHED 802.11: OFF BTH: LINK ON/PAN OFF	Bearer specific wakeup mechanisms i.e., Wake-On-XXX mechanism (e.g. WoL ^h) Non-bearer specific wakeup mechanisms (e.g. infrared) Autonomous Wake up	Optional ⁱ / Required ^j	Sleep
Disconnect	OFF	OFF	802.3: LINK OFF/DETACHED 803.11: OFF	Vendor defined method (e.g. POWER ON BUTTON)	None	Off

			BTH: OFF		
a	UPnP state consists of the UPnP stack information that is active in the device. The FULL state corresponds to the full maintenance of discovery, control and subscriptions state. The PARTIAL state corresponds to the maintenance of certain parts of the UPnP device state (e.g. the device maintains IP connectivity and, can be waken up by later defined wake up mechanisms).				
b	ATTACHED, DETACHED refers to the physical connection, both electrically and mechanically.				
c	The device has full UPnP state but it may provide lower quality of service due low power state.				
d	The UI on the control point device can represent the <i>Transparent</i> sleep as ON or SLEEP state depending on the implementation of the vendor.				
e	PARTIAL UPnP state means the discovery layer of the UPnP stack is ON. The device will only respond to the Wakeup action.				
f	The proxy is optional if the device wakes up autonomously.				
g	A proxy is required to allow a device to go into Deep Sleep Online and still be able to be part of the UPnP network.				
h	Wake On LAN (WoL) is a wake up mechanism defined for Ethernet networks.				
i	A proxy is optional if the sleeping device is waking up autonomously based on e.g. timers.				
j	A proxy is required to allow a device to go into <i>Deep Sleep Offline</i> and still be able to be part of the UPnP network. The proxy handles the bearer dependent wake up mechanism.				

1.1 Referenced Specifications

Unless explicitly stated otherwise herein, implementation of the mandatory provisions of any standard referenced by this specification shall be mandatory for compliance with this specification.

[IEEE 1621] IEEE 1621 Standard for User Interface Elements in Power Control of Electronic Devices Employed in Office/Consumer Environments” <http://eetd.LBL.gov/Controls/1621>.

[DEVICE11] UPnP Device Architecture, version 1.1

[DEVICE10] UPnP Device Architecture, version 1.0

[XML10] Extensible Markup Language (XML) 1.0 (Second Edition), T. Bray, J.Paoli, C. M. Sperberg-McQueen, E Maler, eds. W3C Recommendations, 6 October 2000.

[ISO 8601] ISO 8601 Specification for representation of dates and times in information exchange