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# INFORMATION TECHNOLOGY – UPNP DEVICE ARCHITECTURE –

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

## FOREWORD

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International Standard ISO/IEC 29341-16-11 was prepared by UPnP Forum Steering committee[1], 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.

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

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## 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 Connec -tivity | Bearer Status | Wake UP mechanism | Proxy | User Power State |
|---|---|---|---|---|---|---|
| Active | FULL | ON | 802.3: LINK ON/ATTACHED [b]<br>802.11:ON<br>BTH: ON/PAN ON | None | None | On |
| Transparen t Sleep | FULL | ON | 802.3: LINK ON/ATTACHED<br>802.11: ON/Power Save<br>BTH: Sniff &Hold/PAN ON | Invoking the Wakeup Action on the device or autonomous wake up | Optional [c] | On/ Sleep [d] |
| Deep Sleep Online | PARTIAL [e] | ON | 802.3: LINK ON/ATTACHED<br>802.11: ON/ Power Save<br>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<br>802.11: OFF<br>BTH: LINK ON/PAN OFF | Bearer specific wakeup mechanisms i.e., Wake-On-XXX mechanism (e.g. WoL [h])<br>Non-bearer specific wakeup mechanisms (e.g. infrared)<br>Autonomous Wake up | Optional [i] / Required [j] | Sleep |
| Disconnect | OFF | OFF | 802.3: LINK OFF/DETACHED<br>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 *Transparent* 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 *Deep Sleep Offline* 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