ManageableDevice:1

Device Template Version 1.01

For UPnP Version 1.0
Status: Standardized DCP (SDCP)
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1. Overview and Scope

1.1. Introduction

This device specification is compliant with the UPNP Device Architecture version 1.0. It defines a device type referred to herein as ManageableDevice, and a set of UPnP services that provide UPnP Device Management (DM) functions.

UPnP DM services can be used to add management operations to any UPnP device. Management includes such functions as device and service configuration, troubleshooting and diagnostics, and software/firmware image management. Section 2.3 defines the general architecture for deployment of these services, which provide functionality to:

- Perform basic management operations on a device using the BasicManagement service (refer to the BasicManagement service specification [BMS] for details).
- Configure a device using the ConfigurationManagement service (refer to the ConfigurationManagement service specification [CMS] for details).
- Manage software components on a device using the SoftwareManagement service (refer to the SoftwareManagement service specification [SMS] for details).

In addition, a set of generic configuration/status parameters, referred to as the UPnP DM Common Objects, is defined in the ConfigurationManagement service [CMS], and are accessible via the actions defined in the ConfigurationManagement service. A ManageableDevice has to support these parameters (some are optional) via the ConfigurationManagement service. They can also be supported by other types of UPnP device.

A full-featured UPnP DM device provides control points with the following capabilities:

- **BasicManagement:**
  - Reboot and/or reset the device
  - Perform IP (Internet Protocol) layer and self-test diagnostics
  - Retrieve status and content of device logs

- **ConfigurationManagement:**
  - Check the configuration and status of a device
  - Provision or configure devices

- **SoftwareManagement:**
  - Manage software lifecycle on a device
  - Update software components and firmware images

The UPnP DM service specifications do not specify or restrict:

- Format and content of log files
- Protocols for downloading software or firmware

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1.2. References

Available at: www.upnp.org/specs/dm/UPnP-dm-BasicManagement-v1.0-Service.pdf

Available at: http://www.upnp.org/specs/dm/UPnP-dm-ConfigurationManagement-v1.0-Service.pdf

[RFC 2119] RFC 2119, Key words for use in RFCs to Indicate Requirement Levels, March 1997,

Available at: http://www.upnp.org/specs/dm/UPnP-dm-SoftwareManagement-v1.0-Service.pdf


Available at: http://www.upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.0.pdf

1.3. Glossary

BMS BasicManagement Service
CMS ConfigurationManagement Service
CP Control Point
DM Device Management
EE Execution Environment
MD ManageableDevice
SDO Standards Development Organization
SMS SoftwareManagement Service
UDA UPnP Device Architecture
VM Virtual Machine

1.4. Notation

- In this document, features are described as Required, Recommended, or Optional as follows:

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The key words “MUST,” “MUST NOT,” “REQUIRED,” “SHALL,” “SHALL NOT,” “SHOULD,” “SHOULD NOT,” “RECOMMENDED,” “MAY,” and “OPTIONAL” in this specification are to be interpreted as described in [RFC 2119].

These keywords are thus capitalized when used to unambiguously specify requirements over protocol and application features and behavior that affect the interoperability and security of implementations. When these words are not capitalized, they are meant in their natural-language sense.

- Strings that are to be taken literally are enclosed in “double quotes”.
- Words that are emphasized are printed in italic.
- Data model names and values, and literal XML, are printed using the data character style.
- Keywords that are defined by the UPnP DM 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.
2. Device Definitions

The requirements in this section apply only when ManageableDevice is used. Section 2.3 defines the general architecture for deployment of the UPnP DM services.

2.1. Device Type

The following device type identifies a device that is compliant with this specification:

urn:schemas-upnp-org:device:ManageableDevice:1

2.2. Device Model

A ManageableDevice MUST implement minimum version numbers of all REQUIRED embedded devices and services specified in the table below. A ManageableDevice device can be either a Root device or can be embedded within another UPnP device. A ManageableDevice device can contain other embedded devices as well.

<table>
<thead>
<tr>
<th>DeviceType</th>
<th>Root or Embedded</th>
<th>Req. or Opt.</th>
<th>ServiceType</th>
<th>Req. or Opt.</th>
<th>Service ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>ManageableDevice:1</td>
<td></td>
<td></td>
<td>BasicManagement:1</td>
<td></td>
<td>BasicManagement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ConfigurationManagement:1</td>
<td></td>
<td>ConfigurationManagement</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>SoftwareManagement:1</td>
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<td>SoftwareManagement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Standard non-DM services defined by UPnP (QoS, Security etc.) go here.</td>
<td>X</td>
<td>TBD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Non-standard services embedded by an UPnP vendor go here.</td>
<td>X</td>
<td>TBD</td>
</tr>
<tr>
<td>Standard devices embedded by a UPnP vendor go here.</td>
<td>Embedded</td>
<td>O</td>
<td>Services as defined by the corresponding standard UPnP Device Definition go here.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-standard devices embedded by a UPnP vendor go here.</td>
<td>TBD</td>
<td>X</td>
<td>TBD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 R = Required, O = Optional, X = Non-standard.
2 Prefixed by urn:upnp-org:serviceId:
3 MUST support the UPnP DM Common Objects as defined in ConfigurationManagement service.

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2.3. Architecture

This section provides the general architectural concepts for the deployment of UPnP DM services, within ManageableDevice or within any other UPnP device.

Figure 2-1 shows the dependency diagram for ManageableDevice and for several other example UPnP devices. It can be seen that this diagram implies most of the ManageableDevice requirements of Table 2-1:

- **BasicManagement** [BMS] is required.
- **ConfigurationManagement** [CMS] is required (in order to access the required UPnP DM Common Objects).
- **SoftwareManagement** [SMS] is optional.

Three other UPnP devices are illustrated:

- The first one implements only logging actions and so requires only BasicManagement. BasicManagement has an optional dependence on the UPnP DM Common Objects (see [BMS] for details).
- The second one implements only software life-cycle actions and so requires only SoftwareManagement. SoftwareManagement has an optional dependence on the Software Data Model.
- The third one requires access to some additional data models, and so requires only ConfigurationManagement.

Initially the architecture diagram for UPnP DM components is provided. Following this the common objects is described.

The UPnP DM Common Objects define baseline configuration information for the device, which is accessible via the ConfigurationManagement service. When the ConfigurationManagement service is included in a UPnP device
other than ManageableDevice, the UPnP DM Common Objects will not necessarily be supported; instead other specific data models might be provided by the UPnP device. If this is a standard UPnP device type, additional data models might also be defined by the corresponding UPnP Working Committee.

Since many other definitions of sets of parameters for device management (data models) are widely available in the industry, a mechanism for importing data model definitions from other SDOs into the UPnP DM data model is also defined. Details about this mechanism can be found in [CMS]. This mechanism also recommends how data models from other UPnP working committees should be handled by the ConfigurationManagement service.

2.4. Theory of Operation

After a control point discovers UPnP device implementing UPnP DM device or services within the home network, it can invoke various actions defined within services listed in Table 2-1: Device Requirements. In the following subsections, a set of basic usage scenarios are introduced.

All examples in this section are provided with reference to the ManageableDevice device type, but they apply also to other types of UPnP device that include the corresponding UPnP DM services.

2.4.1. Option 1: UPnP DM services contained within ManageableDevice

The following two figures illustrate the two main options for deploying ManageableDevice as a root device, Figure 2-2 outlines the minimum deployment option, where only required UPnP DM services are provided:

- The BasicManagement service (BMS) provides basic features for administration and diagnostics;
- The ConfigurationManagement service (CMS) provides management of UPnP DM Common Objects.

Figure 2-2: UPnP ManageableDevice (minimum implementation)

Figure 2-3 outlines the extended deployment option, where all UPnP DM services are provided:

- The SoftwareManagement service (SMS) targets an EE and adds management functions for firmware upgrade and software management.

Figure 2-3: UPnP ManageableDevice (extended deployment)
2.4.2. Option 2: UPnP DM services included in other types of UPnP device

UPnP DM services are designed to be included in other types of UPnP device. The following figures illustrate some possible deployment options for UPnP DM services inside an arbitrary UPnP device.

Figure 2-4 below outlines the most general deployment option of the complete set of UPnP DM services within UPnP Device X (which also provides its own services):

- BMS, CMS and SMS provide the corresponding management features for UPnP Device X;

![Diagram](image1)

**Figure 2-4: Example UPnP device including UPnP DM services**

Figure 2-5 outlines a minimal deployment option, where only one UPnP DM service (BMS) is included within UPnP Device X (which also provides its own services):

- BMS provides basic management features for the targeted UPnP device.

![Diagram](image2)

**Figure 2-5: Example UPnP device including BMS only**

Figure 2-6 outlines another minimal deployment option, where only one UPnP DM service (CMS) is included within a UPnP Device X (which also provides its own services):

- CMS provides configuration management features for specific parameters defined for the targeted device (Device X Data Model);
- UPnP DM Common Objects can be optionally supported.

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If a standard UPnP device adopts this option, it can also define its own data model to be manipulated by CMS.

Figure 2-7 outlines another minimal deployment option, where only one UPnP DM service (SMS) is included within a UPnP Device X (which also provides its own services):

- SMS provides software management features for the targeted device;
- The UPnP DM Software Data Model as defined in SoftwareManagement service can be optionally supported (not shown in figure). In that case CMS will also be supported (not shown in figure).

2.4.3. Option 3: Multiple root devices

Figure 2-8 illustrates the deployment option where multiple root UPnP devices are available in a single physical device (product), and one of these is the ManageableDevice:

- UPnP Device X and Device Y provide their own functionality;
- UPnP ManageableDevice provides management features for either the physical device or the other UPnP root device(s); this choice depends upon the implementation or can be specified by the UPnP Working Committee defining such architecture for these UPnP devices.
2.4.4. Option 4: Embedded ManagedDevice
Figure 2-9 illustrates the deployment option where the ManagedDevice is embedded within another UPnP device:

- The UPnP ManagedDevice actions affect also the embedded UPnP devices;
- Indeed additional data models (not shown in the figure) can be added for addressing specific management requirements of the embedded devices.

2.4.5. Option 5: ManagedDevice embedding other UPnP devices
Figure 2-10 illustrates the deployment option where the ManagedDevice is embedding other UPnP devices:

- The UPnP ManagedDevice actions affect also the embedded UPnP devices;
- Indeed additional data models (not shown in the figure) can be added for addressing specific management requirements of the embedded devices.

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2.4.6. Example: A Complex Deployment

Figure 2-11 is an example of a complex deployment where some of the previous deployment options are mixed, in order to get the desired combination and scope for the different device management domains:

- Each UPnP DM service targets its parent UPnP device.

Figure 2-11: An example of complex implementation with device management features
3. XML Device Description

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        <major>1</major>
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        <modelDescription>long user-friendly title</modelDescription>
        <modelName>model name</modelName>
        <modelNumber>model number</modelNumber>
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        <serialNumber>manufacturer's serial number</serialNumber>
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        <UPC>Universal Product Code</UPC>
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                <height>vertical pixels</height>
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