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 *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

1.2. References

[BMS] *UPnP BasicManagement:1 Service Document*, UPnP Forum, July 20, 2010.
Available at: www.upnp.org/specs/dm/UPnP-dm-BasicManagement-v1.0-Service.pdf

[CMS] *UPnP ConfigurationManagement:1 Service Document*, UPnP Forum, July 20, 2010.
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, http://tools.ietf.org/html/rfc2119

[SMS] *UPnP SoftwareManagement:1 Service Document*, UPnP Forum, July 20, 2010.
Available at: http://www.upnp.org/specs/dm/UPnP-dm-SoftwareManagement-v1.0-Service.pdf

[SOAP] *Simple Object Access Protocol (SOAP) 1.1, http://www.w3.org/TR/2000/NOTE-SOAP-20000508*

[UDA] *UPnP Device Architecture, version1.0*, UPnP Forum, July 20, 2006.
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:

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 2-1: Device Requirements

DeviceType	Root	Req. or Opt.[1]	ServiceType	Req. or Opt.[1]	Service ID[2]
ManageableDevice:1	*Root* or *Embedded*	*R*	*BasicManagement:1*	*R*	*BasicManagement*
			ConfigurationManagement:1[3]	*R*	*ConfigurationManagement*
			SoftwareManagement:1	*O*	*SoftwareManagement*
			Standard non-DM services defined by UPnP (QoS, Security etc.) go here.	*X*	*TBD*
			Non-standard services embedded by an UPnP vendor go here.	*X*	*TBD*
Standard devices embedded by a UPnP vendor go here.	*Embedded*	*O*	*Services as defined by the corresponding standard UPnP Device Definition go here.*		
Non-standard devices embedded by a UPnP vendor go here.	*TBD*	*X*	*TBD*	*TBD*	*TBD*

[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.

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.

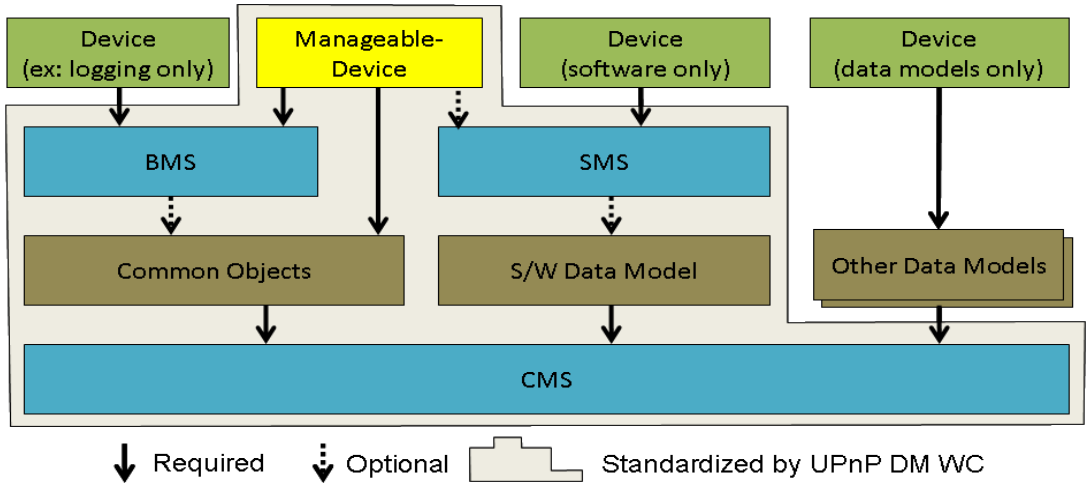

Figure 2-1: Architecture Diagram

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*.

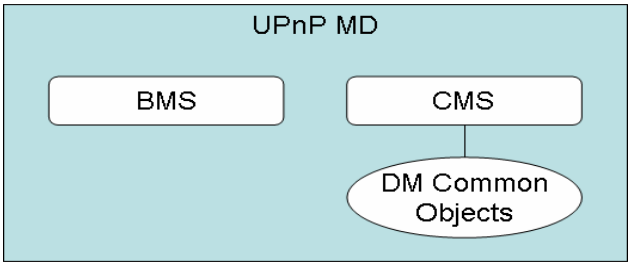

Figure 2-2: UPnP *ManageableDevice* (minimum implementation)

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.

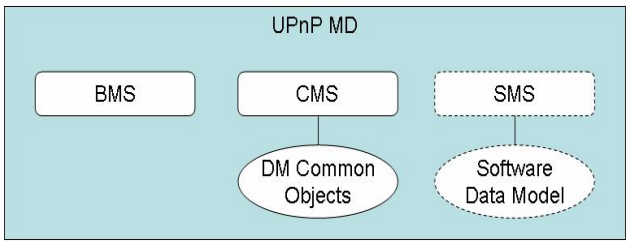

Figure 2-3: UPnP *ManageableDevice* (extended implementation)

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;

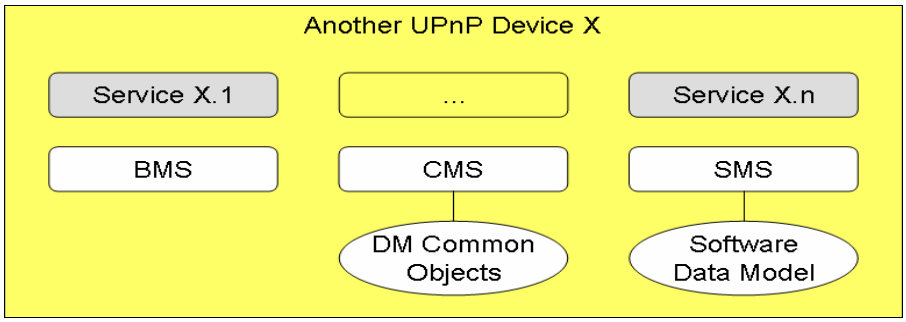

Figure 2-4: Example UPnP device including UPnP DM services

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.

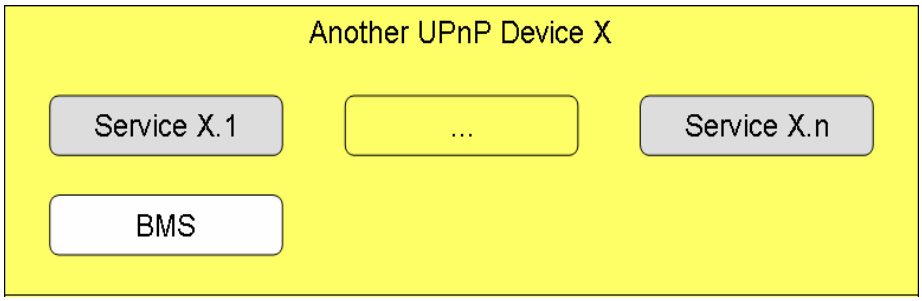

Figure 2-5: Example UPnP device including BMS only

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.

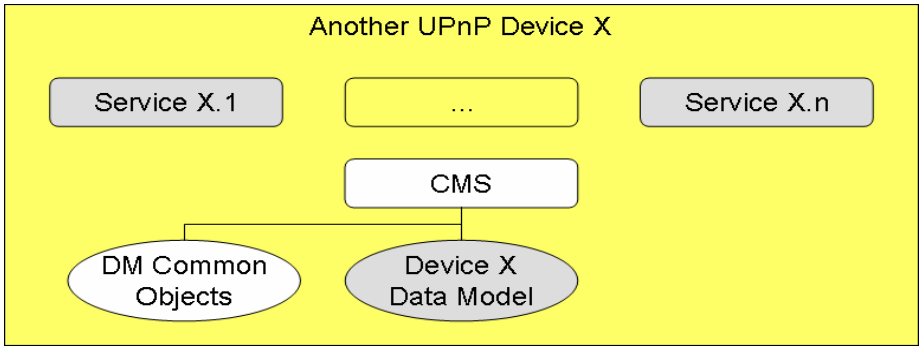

Figure 2-6: Example UPnP device including CMS only

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).

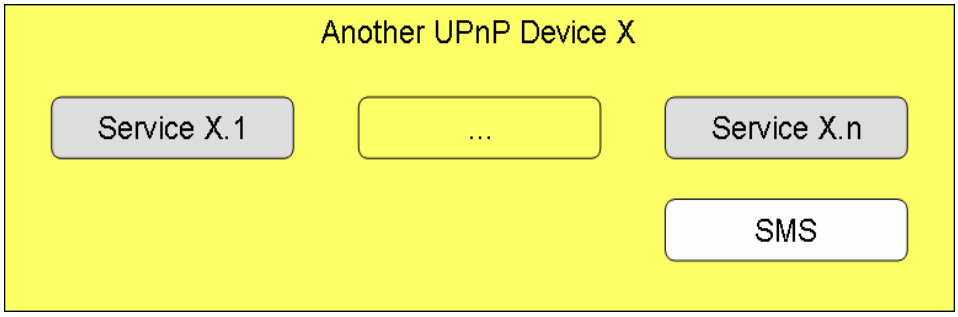

Figure 2-7: Example UPnP device including SMS only

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.

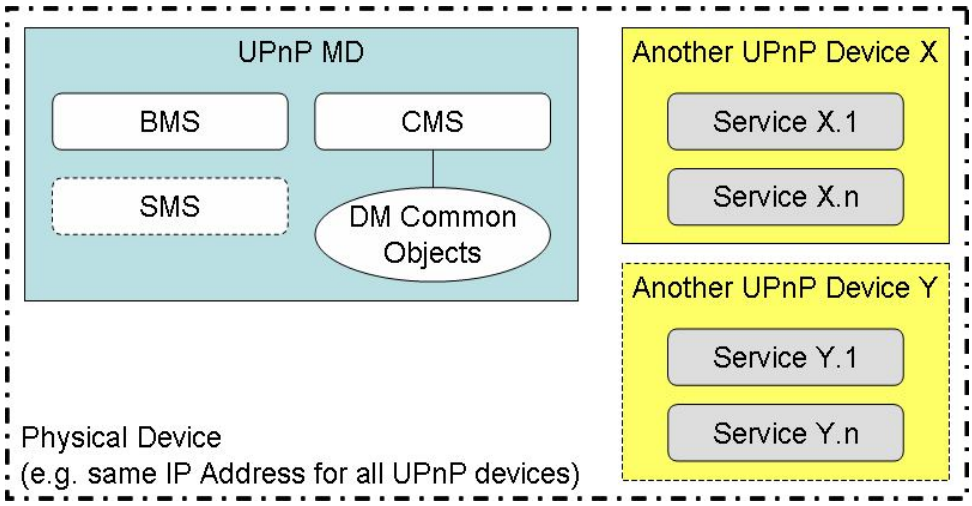

Figure 2-8: Multiple UPnP Root Devices

2.4.4. Option 4: Embedded *ManageableDevice*

Figure 2-9 illustrates the deployment option where the *ManageableDevice* is embedded within another UPnP device:

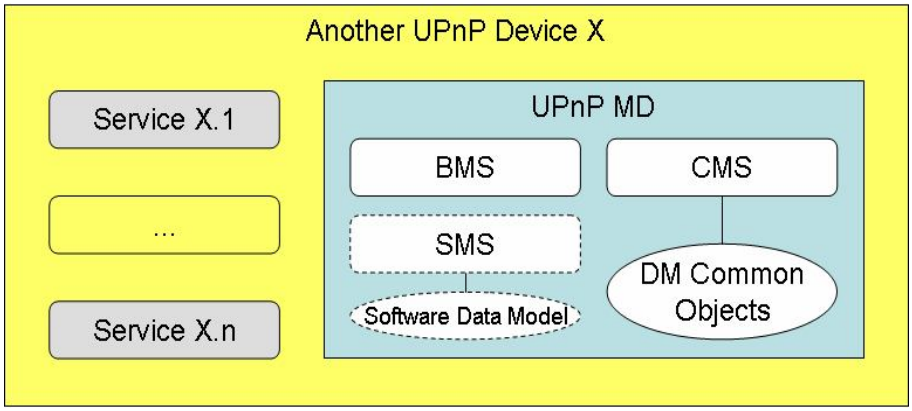

Figure 2-9: UPnP *ManageableDevice* as embedded device

2.4.5. Option 5: *ManageableDevice* embedding other UPnP devices

Figure 2-10 illustrates the deployment option where the *ManageableDevice* is embedding other UPnP devices:

- The UPnP *ManageableDevice* 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.

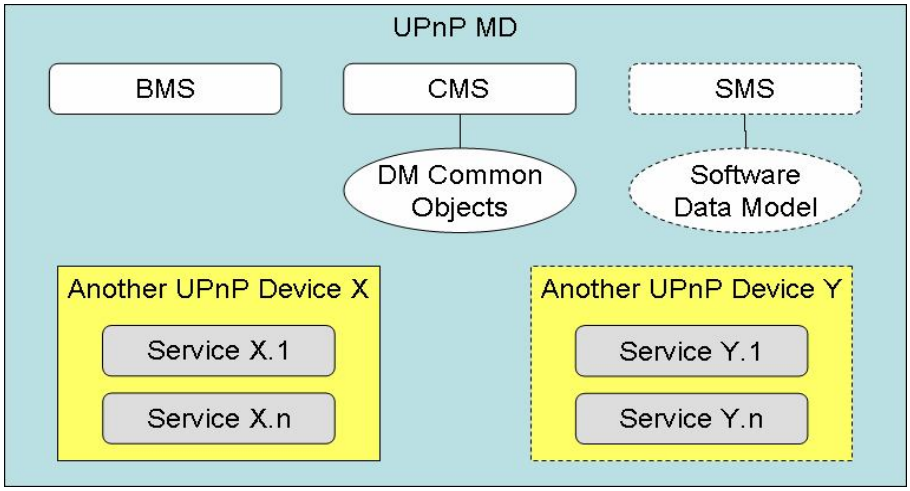

Figure 2-10: UPnP *ManageableDevice* embedding other UPnP devices

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.

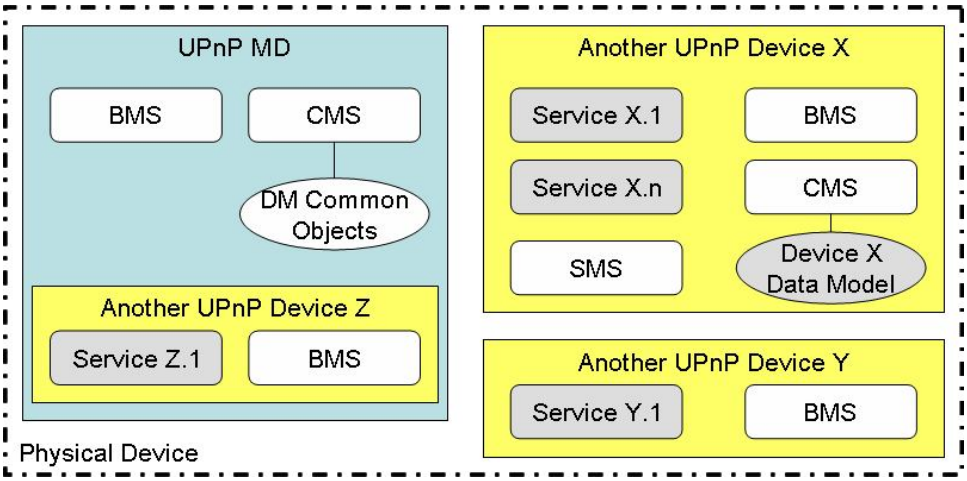

Figure 2-11: An example of complex implementation with device management features

3. XML Device Description

```
<?xml version="1.0"?>
<root xmlns="urn:schemas-upnp-org:device-1-0">
  <specVersion>
    <major>1</major>
    <minor>0</minor>
  </specVersion>
  <device>
    <deviceType>urn:schemas-upnp-org:device:ManageableDevice:1</deviceType>
    <friendlyName>short user-friendly title</friendlyName>
    <manufacturer>manufacturer name</manufacturer>
    <manufacturerURL>URL to manufacturer site</manufacturerURL>
    <modelDescription>long user-friendly title</modelDescription>
    <modelName>model name</modelName>
    <modelNumber>model number</modelNumber>
    <modelURL>URL to model site</modelURL>
    <serialNumber>manufacturer's serial number</serialNumber>
    <UDN>uuid:UUID</UDN>
    <UPC>Universal Product Code</UPC>
    <iconList>
      <icon>
        <mimetype>image/format</mimetype>
        <width>horizontal pixels</width>
        <height>vertical pixels</height>
        <depth>color depth</depth>
        <url>URL to icon</url>
      </icon>
      XML to declare other icons, if any, go here
    </iconList>
    <serviceList>
      <service>
        <serviceType>
            urn:schemas-upnp-org:service:BasicManagement:1
        </serviceType>
        <serviceId>urn:upnp-org:serviceId:BasicManagement</serviceId>
        <SCPDURL>URL to service description</SCPDURL>
        <controlURL>URL for control</controlURL>
        <eventSubURL>URL for eventing</eventSubURL>
      </service>
      <service>
        <serviceType>
            urn:schemas-upnp-org:service:ConfigurationManagement:1
        </serviceType>
        <serviceId>urn:upnp-org:serviceId:ConfigurationManagement</serviceId>
        <SCPDURL>URL to service description</SCPDURL>
        <controlURL>URL for control</controlURL>
        <eventSubURL>URL for eventing</eventSubURL>
      </service>
      <service>
        <serviceType>
```

```
            urn:schemas-upnp-org:service:SoftwareManagement:1
        </serviceType>
          <serviceId>urn:upnp-org:serviceId:SoftwareManagement</serviceId>
          <SCPDURL>URL to service description</SCPDURL>
          <controlURL>URL for control</controlURL>
          <eventSubURL>URL for eventing</eventSubURL>
        </service>
            Declarations for other services defined by a UPnP Forum working
        committee (if any) go here
        Declarations for other services added by UPnP vendor (if any) go here
      </serviceList>
      <deviceList>
        Description of embedded devices defined by a UPnP Forum working
        committee (if any) go here
        Description of embedded devices added by UPnP vendor (if any) go here
      </deviceList>
      <presentationURL>URL for presentation</presentationURL>
    </device>
</root>
```