HVAC_System:1 Device Template

For UPnP™ Device Architecture V 1.0

Status: Standardized DCP
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1. Overview and Scope

This device template is compliant with the Universal Plug and Play Architecture, Version *1.0*.

HVAC_System:1 provides the following functionality:

- 1 to n ZoneThermostats are part of this device. If ZoneThermostats are added (or removed) a new device description is established and advertised.
- The ability to set or get system level operating and fan modes. This information can be different from similar information found in the ZoneThermostats
- Optionally an outdoor temperature sensor service

Add drawing here

1.1. Change Log

7/27/2000		Changes per 7/17/2000 meeting and conversion to .996 template
8/18/2000		Clean-up
8/30/00	v0.8	Clean-up following 8/27/00 meeting, advance to 0.8, add xml.
2/21/01		Move to 1.1 template, update to latest service versions, updated Theory of Operation and XML
5/1/2001	v0.87	Updated to v0.87
8/6/2001	v0.88	Spelling of “Setpoint” adjusted v0.88
[31 May 2002]	v0.9	Revision marks removed. Test chapter added.
[13 May 2003]	v1.0	Converted to Approved Standard.

2. Device Definitions

2.1. Device Type

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

urn:**schemas-upnp-org:device**:*HVAC_System:1*

2.2. Device Model

Products that expose devices of the type **urn:schemas-upnp-org:device:***HVAC_System:1* must implement minimum version numbers of all required embedded devices and services specified in the table below.

Table 1: Device Requirements

DeviceType	Root	Req. or Opt.[1]	ServiceType	Req. or Opt.[1]	Service ID[2]
HVAC_System:1	Root	R			
			HVAC_UserOperatingMode:1	R	SystemUserMode
			HVAC_FanOperatingMode:1	O	SystemFanMode
			FanSpeed:1	O	SystemFanSpeed
			TemperatureSensor:1	O	OutsideTemperature
			HVAC_SetpointSchedule:1	O	SystemSetpointSchedule
Non-standard devices embedded by a UPnP vendor go here.	*TBD*	*X*	*TBD*	*TBD*	*TBD*
HVAC_ZoneThermostat:1		At least one is required			
			Non-standard services embedded by an UPnP vendor go here.	*X*	*TBD*

[1] R = Required, O = Optional, X = Non-standard.
[2] Prefixed by urn:**upnp-org**:**serviceId**: .

2.2.1. Description of Device Requirements

Any number of HVAC_ZoneThermostats may be included in the system device. Each time a ZoneThermostat is added the System device must go bye-bye and then re-advertise its existence via normal UPnP protocols.

HVAC_UserOperatingMode, HVAC_FanOperatingMode, FanSpeed, and HVAC_SetpointSchedule services are used in both the System device and the ZoneThermostat device. Their use is differentiated by use of the Service ID. In the System device these services indicate the system level operating modes.

2.2.2. Relationships Between Services

N/a

2.3. Theory of Operation

A HVAC system includes all the heating and cooling equipment necessary to independently condition a whole house or a region of a house. Large homes may include several independent systems. Small homes may only have one system. Individual systems may be zoned.

A forced air system may typically include a furnace with heat exchangers and a fan or a blower, an air conditioning compressor unit, filters, duct work, temperature sensors, temperature setpoints, mode controls and in zoned systems electrically controllable valve or dampers.

Hydronic systems are usually zoned and may typically include a boiler, cooler, pumps, valves, radiators, temperature sensors, temperature setpoints and mode controls.

HVAC_Systemis a container for all the elements of a system. It is not necessarily a recognizable single physical device. All the elements are not necessarily exposed. This DCP is targeted at user control and does not expose operational details.

HVAC system may include independent controls for sub-regions or zones. This is called a Zoned HVAC System.

HVAC_System is the root device and includes system level services and one or more HVAC_ZoneThermostat Devices. The Thermostats provide the zone level controls. Binding of the Thermostats to the System is implied by the hierarchical design of the System device.

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>
  <URLBase>base URL for all relative URLs</URLBase>
  <device>
    <deviceType>urn:schemas-upnp-org:device:HVAC_System: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:
HVAC_UserOperatingMode:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:SystemUserMode</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:
HVAC_FanOperatingMode:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:SystemFanMode</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:FanSpeed:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:SystemFanSpeed</serviceId>
        <SCPDURL>URL to service description</SCPDURL>
        <controlURL>URL for control</controlURL>
        <eventSubURL>URL for eventing</eventSubURL>
      </service>
```

```
<serviceType>urn:schemas-upnp-org:service:TemperatureSensor:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:OutdoorTemperature</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:HVAC SetpointSchedule:1
</serviceType>
        <serviceId>urn:upnp-org:serviceId:SystemSetpointSchedule</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>
      Implementors shall insert one or more HVAC_Thermostats here
Description of embedded devices added by UPnP vendor (if any) go here
    </deviceList>
    <presentationURL>URL for presentation</presentationURL>
  </device>
</root>
```

4. Test

Testing of the UPnP functions Addressing, Discovery, Description, Control (Syntax) and Eventing are performed by the UPnP Test Tool v1.1 based on the following documents:

- UPnP Device Architecture v1.0
- The Device Definitions in chapter 2 of this document
- The XML Device Description in chapter 3 of this document
- The UPnP Test Tool device template test file: ***HVAC_System1.xml***
- The template documents for the services referenced by this device, together with their respective UPnP Test Tool service template test files.