HVAC_ZoneThermostat:1 Device Template

For UPnP™ Device Architecture V 1.0

Status: Standardized DCP
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1.   Overview and Scope

The HVAC_ZoneThermostat is intended to be a sub device of the HVAC_System device. Any number of HVAC_ZoneThermostats may be included in the system device.

HVAC_ZoneThermostat is a zone level controller for heating and/or cooling. It provides the following functionality:

- The ability to set or get zone level operating and fan modes.
- Temperature in the zone
- Zone level Heating and/or cooling temperature setpoints
- Optional fan speed control
- Optional zone level daily schedule for events and heating and cooling setpoints
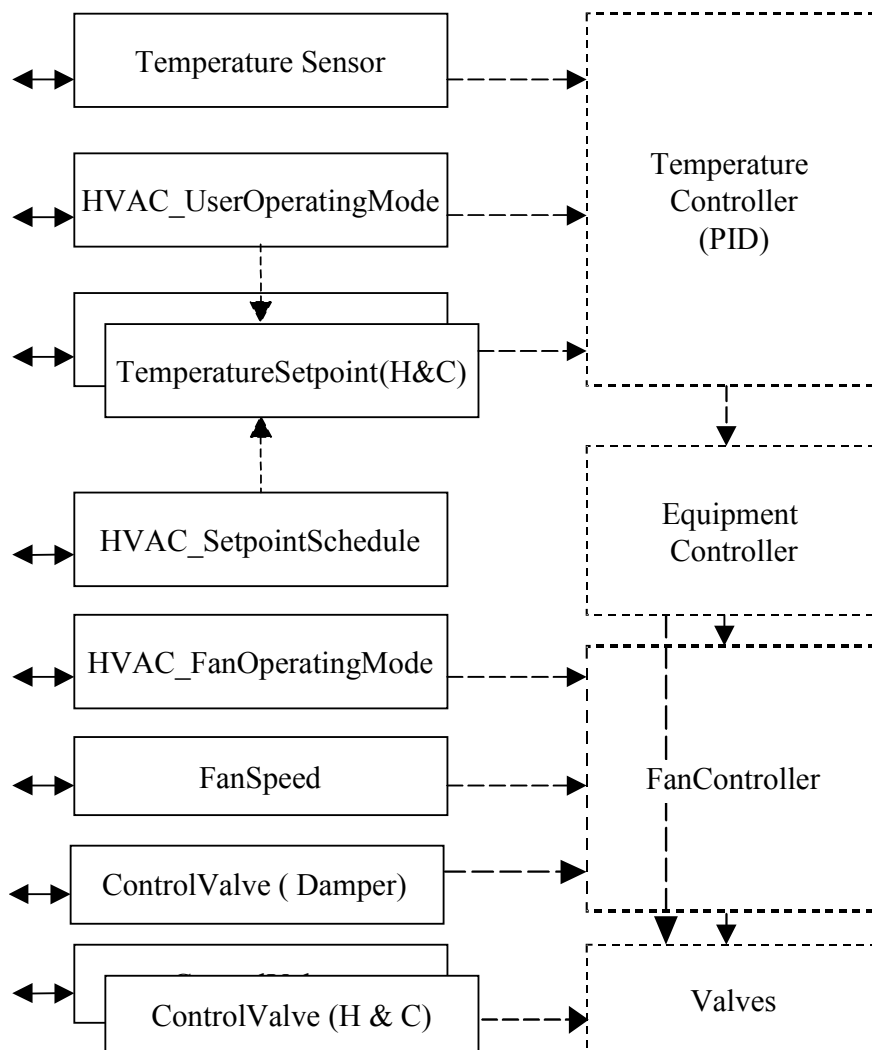
Solid lines indicate interfaces exposed via UPnP
Dotted lines indicate interfaces and services not directly visible via UPnP

Figure 1 HVAC_ZoneThermostat:1 Functional Diagram

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
2/26/01		Proof read, and functional diagram added
3/11/01		Updated functional diagram, added relationships between services
5/1/01		Updated functional diagram, device model and XML
8/6/01		Changed "SetPoint" to "Setpoint" in several locations
[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_ZoneThermostat:1***

2.2.   Device Model

Products that expose devices of the type **urn:schemas-upnp-org:device:***HVAC_ZoneThermostat: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_ZoneThermostat:1	Root	R			
			HVAC_UserOperatingMode:1	R	ZoneUserMode
			HVAC_FanOperatingMode:1	O	ZoneFanMode
			FanSpeed:1	O	ZoneFanSpeed
			ControlValve:1	O	HeatingValve
			ControlValve:1	O	CoolingValve

			ControlValve:1	O	AirDamper
			TemperatureSetpoint:1	This device is required to include either a heating or cooling setpoint or both	HeatingSetpoint
			TemperatureSetpoint:1	This device is required to include either a heating or cooling setpoint or both	CoolingSetpoint
			TemperatureSensor:1	O	ZoneTemperature
			HVAC_SetpointSchedule:1	O	ZoneSchedule
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**: .

2.2.1. Description of Device Requirements

The HVAC_ZoneThermostat is intended to be a sub device of the HVAC_System device. 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.

In the ZoneThermostat devices these services allow the user to select modes for zone operation. One zone can be set to cool while another can be set to heat. The system modes and the zone modes may be different.

At least one TemperatureSetpoint service must be present – heating or cooling. Both may be present for ZoneThermostats that support both heating and cooling.

2.2.2. Relationships Between Services

TemperatureSensor may be internally wired to a PID controller

Some user operating modes provide a TemperatureSetpoint variable. Example: EnergySavings mode typically implies an "above freezing" TemperatureSetpoint.

FanSpeed and ControlValves variables may be determined by internal PID, equipment and fan controllers.

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.

This device, HVAC_ZoneThermostat, is a container for the HVAC control elements related to a particular zone. 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 lower level operational details.

The controls and interfaces for each zone may be contained in a single physical device or distributed among other devices. This DCP illustrates them in a single device called a HVAC_ZoneThermostat. Other DCP's may use the same services but show them used in other containers.

3.   XML Device Description

```xml
<?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 ZoneThermostat: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:ZoneUserMode</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:ZoneFanMode</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:ControlValve:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:HeatingValve</serviceId>
        <SCPDURL>URL to service description</SCPDURL>
        <controlURL>URL for control</controlURL>
        <eventSubURL>URL for eventing</eventSubURL>
      </service>
```

```
<service>
<service>
        <serviceType>urn:schemas-upnp-org:service:ControlValve:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:CoolingValve</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:ControlValve:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:AirDamper</serviceId>
        <SCPDURL>URL to service description</SCPDURL>
        <controlURL>URL for control</controlURL>
        <eventSubURL>URL for eventing</eventSubURL>
    </service>
        <serviceType>urn:schemas-upnp-org:service:FanSpeed:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:ZoneFanSpeed</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:
TemperatureSetpoint:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:HeatingSetpoint</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:
TemperatureSetpoint:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:CoolingSetpoint</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:
TemperatureSensor:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:ZoneTemperature</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:ZoneSchedule</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>
```