# ISO/IEC 29341-6-15

Edition 1.0 2008-11

# INTERNATIONAL STANDARD

## Information technology – UPnP Device Architecture – Part 6-15: Heating, Ventilation and Air Conditioning Device Control Protocol – Temperature Sensor Service



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## Information technology – UPnP Device Architecture – Part 6-15: Heating, Ventilation and Air Conditioning Device Control Protocol – Temperature Sensor Service

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## Part 6-15: Heating, Ventilation and Air Conditioning Device Control Protocol – Temperature Sensor Service

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The list of all currently available parts of the ISO/IEC 29341 series, under the general title *Universal plug and play (UPnP) 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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(informative)

Reference may be made in this document to original UPnP documents. These references are retained in order to maintain consistency between the specifications as published by ISO/IEC and by UPnP Implementers Corporation. The following table indicates the original UPnP document titles and the corresponding part of ISO/IEC 29341:

| **UPnP Document Title** | **ISO/IEC 29341 Part** |
|---|---|
| UPnP Device Architecture 1.0 | ISO/IEC 29341-1 |
| UPnP Basic:1 Device | ISO/IEC 29341-2 |
| UPnP AV Architecture:1 | ISO/IEC 29341-3-1 |
| UPnP MediaRenderer:1 Device | ISO/IEC 29341-3-2 |
| UPnP MediaServer:1 Device | ISO/IEC 29341-3-3 |
| UPnP AVTransport:1 Service | ISO/IEC 29341-3-10 |
| UPnP ConnectionManager:1 Service | ISO/IEC 29341-3-11 |
| UPnP ContentDirectory:1 Service | ISO/IEC 29341-3-12 |
| UPnP RenderingControl:1 Service | ISO/IEC 29341-3-13 |
| UPnP MediaRenderer:2 Device | ISO/IEC 29341-4-2 |
| UPnP MediaServer:2 Device | ISO/IEC 29341-4-3 |
| UPnP AV Datastructure Template:1 | ISO/IEC 29341-4-4 |
| UPnP AVTransport:2 Service | ISO/IEC 29341-4-10 |
| UPnP ConnectionManager:2 Service | ISO/IEC 29341-4-11 |
| UPnP ContentDirectory:2 Service | ISO/IEC 29341-4-12 |
| UPnP RenderingControl:2 Service | ISO/IEC 29341-4-13 |
| UPnP ScheduledRecording:1 | ISO/IEC 29341-4-14 |
| UPnP DigitalSecurityCamera:1 Device | ISO/IEC 29341-5-1 |
| UPnP DigitalSecurityCameraMotionImage:1 Service | ISO/IEC 29341-5-10 |
| UPnP DigitalSecurityCameraSettings:1 Service | ISO/IEC 29341-5-11 |
| UPnP DigitalSecurityCameraStillImage:1 Service | ISO/IEC 29341-5-12 |
| UPnP HVAC_System:1 Device | ISO/IEC 29341-6-1 |
| UPnP HVAC_ZoneThermostat:1 Device | ISO/IEC 29341-6-2 |
| UPnP ControlValve:1 Service | ISO/IEC 29341-6-10 |
| UPnP HVAC_FanOperatingMode:1 Service | ISO/IEC 29341-6-11 |
| UPnP FanSpeed:1 Service | ISO/IEC 29341-6-12 |
| UPnP HouseStatus:1 Service | ISO/IEC 29341-6-13 |
| UPnP HVAC_SetpointSchedule:1 Service | ISO/IEC 29341-6-14 |
| UPnP TemperatureSensor:1 Service | ISO/IEC 29341-6-15 |
| UPnP TemperatureSetpoint:1 Service | ISO/IEC 29341-6-16 |
| UPnP HVAC_UserOperatingMode:1 Service | ISO/IEC 29341-6-17 |
| UPnP BinaryLight:1 Device | ISO/IEC 29341-7-1 |
| UPnP DimmableLight:1 Device | ISO/IEC 29341-7-2 |
| UPnP Dimming:1 Service | ISO/IEC 29341-7-10 |
| UPnP SwitchPower:1 Service | ISO/IEC 29341-7-11 |
| UPnP InternetGatewayDevice:1 Device | ISO/IEC 29341-8-1 |
| UPnP LANDevice:1 Device | ISO/IEC 29341-8-2 |
| UPnP WANDevice:1 Device | ISO/IEC 29341-8-3 |
| UPnP WANConnectionDevice:1 Device | ISO/IEC 29341-8-4 |
| UPnP WLANAccessPointDevice:1 Device | ISO/IEC 29341-8-5 |
| UPnP LANHostConfigManagement:1 Service | ISO/IEC 29341-8-10 |
| UPnP Layer3Forwarding:1 Service | ISO/IEC 29341-8-11 |
| UPnP LinkAuthentication:1 Service | ISO/IEC 29341-8-12 |
| UPnP RadiusClient:1 Service | ISO/IEC 29341-8-13 |
| UPnP WANCableLinkConfig:1 Service | ISO/IEC 29341-8-14 |
| UPnP WANCommonInterfaceConfig:1 Service | ISO/IEC 29341-8-15 |
| UPnP WANDSLLinkConfig:1 Service | ISO/IEC 29341-8-16 |
| UPnP WANEthernetLinkConfig:1 Service | ISO/IEC 29341-8-17 |
| UPnP WANIPConnection:1 Service | ISO/IEC 29341-8-18 |
| UPnP WANPOTSLinkConfig:1 Service | ISO/IEC 29341-8-19 |
| UPnP WANPPPConnection:1 Service | ISO/IEC 29341-8-20 |
| UPnP WLANConfiguration:1 Service | ISO/IEC 29341-8-21 |
| UPnP Printer:1 Device | ISO/IEC 29341-9-1 |
| UPnP Scanner:1.0 Device | ISO/IEC 29341-9-2 |
| UPnP ExternalActivity:1 Service | ISO/IEC 29341-9-10 |
| UPnP Feeder:1.0 Service | ISO/IEC 29341-9-11 |
| UPnP PrintBasic:1 Service | ISO/IEC 29341-9-12 |
| UPnP Scan:1 Service | ISO/IEC 29341-9-13 |
| UPnP QoS Architecture:1.0 | ISO/IEC 29341-10-1 |
| UPnP QosDevice:1 Service | ISO/IEC 29341-10-10 |
| UPnP QosManager:1 Service | ISO/IEC 29341-10-11 |
| UPnP QosPolicyHolder:1 Service | ISO/IEC 29341-10-12 |
| UPnP QoS Architecture:2 | ISO/IEC 29341-11-1 |
| UPnP QOS v2 Schema Files | ISO/IEC 29341-11-2 |

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| UPnP Document Title | ISO/IEC 29341 Part |
|---|---|
| UPnP QosDevice:2 Service | ISO/IEC 29341-11-10 |
| UPnP QosManager:2 Service | ISO/IEC 29341-11-11 |
| UPnP QosPolicyHolder:2 Service | ISO/IEC 29341-11-12 |
| UPnP RemoteUIClientDevice:1 Device | ISO/IEC 29341-12-1 |
| UPnP RemoteUIServerDevice:1 Device | ISO/IEC 29341-12-2 |
| UPnP RemoteUIClient:1 Service | ISO/IEC 29341-12-10 |
| UPnP RemoteUIServer:1 Service | ISO/IEC 29341-12-11 |
| UPnP DeviceSecurity:1 Service | ISO/IEC 29341-13-10 |
| UPnP SecurityConsole:1 Service | ISO/IEC 29341-13-11 |

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# 1. Overview and Scope

This service definition is compliant with the UPnP Device Architecture version *1.0*.

This service type enables the following functions:

- Reading of the current temperature of a temperature sensor
- Setting and reading of the intended application for this temperature sensor
- Setting and reading of the user name for this sensor

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# 2. Service Modeling Definitions

## 2.1. ServiceType

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

**urn:schemas-upnp-org:service:TemperatureSensor:1**

## 2.2. State Variables

**Table 1 State Variables**

| Variable Name | Req. or Opt.[1] | Data Type | Allowed Value [2] | Default Value [2] | Eng. Units |
|---|---|---|---|---|---|
| **Application** | R | string | see table | (none) | n/a |
| **CurrentTemperature** | R | i4 | see table | (none) | .01 degrees Celsius |
| **Name** | O | string | | Zero length string | N/a |
| *Non-standard state variables implemented by an UPnP vendor go here.* | *X* | *TBD* | *TBD* | *TBD* | *TBD* |

[1] R = Required, O = Optional, X = Non-standard.

[2]Values listed in this column are required. To specify standard optional values or to delegate assignment of values to the vendor, you must reference a specific instance of an appropriate table below.

**Table 2 AllowedValueList for Application**

| Value | Req. or Opt. [1] |
|---|---|
| *Vendor defined as "none"*<br><br>*R/W -This allows a control point to establish the application type* | *O* |
| *Vendor-defined*<br><br>*One value required. Reserved names are:*<br><br>*Room,*<br>*Outdoor,*<br>*Pipe,*<br>*AirDuct,* | *0* |
| *Vendor-defined* | *O* |

[1] R = Required, O = Optional, X = Non-standard.

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**Table 3 AllowedValueRange for CurrentTemperature**

| | Value | Req. or Opt. [1] |
|---|---|---|
| minimum | *Vendor-defined* | *R* |
| maximum | *Vendor-defined* | *R* |
| step | *Step=1 (i.e. 0.01 Celsius)* | *R* |

[1] R = Required, O = Optional, X = Non-standard.

### 2.2.1. Application

This variable states the intended application of this service.

### 2.2.2. CurrentTemperature

This variable exposes the setpoint of a service that is controlling temperature to that setpoint.

### 2.2.3. Name

This optional variable may be used to capture a friendly name or location for this sensor.

### 2.2.4. Relationships Between State Variables

None

## 2.3. Eventing and Moderation

**Table 4 Eventing & Moderation**

| Variable Name | Evented | Moderated Event | Max Event Rate[1] | Logical Combination | Min Delta per Event[2] |
|---|---|---|---|---|---|
| Name | Yes | No | none | none | On-change |
| Application | Yes | No | none | none | On-change |
| CurrentTemperature | Yes | Yes | 10 sec | | Per 0.2 degree Celsius change or 20 units |
| *Non-standard state variables implemented by an UPnP vendor go here.* | *TBD* | *TBD* | *TBD* | *TBD* | *TBD* |

[1] Determined by N, where Rate = (Event)/(N secs).
[2] (N) * (allowedValueRange Step).

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### 2.3.1. Event Model

**Table 5 Event Model**

| Variable Name | UI requirements | Async Requirements | Func. Vs max rate tradeoffs | Est of Max rate | Reason not evented |
|---|---|---|---|---|---|
| Application | Needed for UI | | | Very Low | N/a |
| CurrentTemperature | Needed for UI | | | Very low | N/a |
| Name | Needed for UI | | | Very low | N/a |

## 2.4. Actions

**Table 6 Action list**

| Name | Req. or Opt. [1] |
|---|---|
| SetApplication | *O* |
| GetApplication | *R* |
| GetCurrentTemperature | *R* |
| GetName | O |
| SetName | O |
| *Non-standard actions implemented by an UPnP vendor go here.* | X |

[1] R = Required, O = Optional, X = Non-standard.

### 2.4.1. SetApplication

Provides the Application value to a control point or other devices

#### *2.4.1.1. Arguments*

**Table 7 Arguments for SetApplication**

| Argument | Direction | relatedStateVariable |
|---|---|---|
| NewApplication | *IN* | Application |

#### *2.4.1.2. Dependency on State (if any)*

None

#### *2.4.1.3. Effect on State (if any)*

Changes the Application.

#### *2.4.1.4. Errors*

| errorCode | errorDescription | Description |
|---|---|---|
| none | | |

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## 2.4.2. GetApplication

Provides the Application value to a control point or other devices

### *2.4.2.1. Arguments*

**Table 8 Arguments for GetApplication**

| Argument | Direction | relatedStateVariable |
|---|---|---|
| CurrentApplication | *Out* [R] | Application |

[R] Return Value

### *2.4.2.2. Dependency on State (if any)*

Depends on Application

### *2.4.2.3. Effect on State (if any)*

None

### *2.4.2.4. Errors*

| errorCode | errorDescription | Description |
|---|---|---|
| none | | |

## 2.4.3. GetCurrentTemperature

### *2.4.3.1. Arguments*

**Table 9 Arguments for GetCurrentTemperature**

| Argument | Direction | relatedStateVariable |
|---|---|---|
| CurrentTemp | *Out*[R] | CurrentTemperature |

[R] Return Value

### *2.4.3.2. Dependency on State (if any)*

Depends on the temperature.

### *2.4.3.3. Effect on State*

None

### *2.4.3.4. Errors*

| errorCode | errorDescription | Description |
|---|---|---|
| none | | |

## 2.4.4. GetName

Provides the Name value to a control point or other UPnP device

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#### *2.4.4.1. Arguments*

**Table 10 Arguments for GetName**

| Argument | Direction | relatedStateVariable |
|---|---|---|
| CurrentName | *Out*[R] | Name |

[R] Return Value

#### *2.4.4.2. Dependency on State (if any)*

None

#### *2.4.4.3. Effect on State*

None

#### *2.4.4.4. Errors*

| errorCode | errorDescription | Description |
|---|---|---|
| none | | |

### 2.4.5. SetName

Provides a new Name value for the Name variable.

#### *2.4.5.1. Arguments*

**Table 11 Arguments for SetName**

| Argument | Direction | relatedStateVariable |
|---|---|---|
| NewName | *In* | Name |

#### *2.4.5.2. Dependency on State (if any)*

None

#### *2.4.5.3. Effect on State*

Changes Name.

#### *2.4.5.4. Errors*

| errorCode | errorDescription | Description |
|---|---|---|
| none | | |

### 2.4.6. Non-Standard Actions Implemented by a UPnP Vendor

To facilitate certification, non-standard actions implemented by UPnP vendors should be included in this service template. The UPnP Device Architecture lists naming requirements for non-standard actions (see the section on Description).

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### 2.4.7. Relationships Between Actions

*None.*

### 2.4.8. Common Error Codes

The following table lists error codes common to actions for this service type. If an action results in multiple errors, the most specific error should be returned.

**Table 12: Common Error Codes**

| errorCode | errorDescription | Description |
|---|---|---|
| 401 | Invalid Action | See UPnP Device Architecture section on Control. |
| 402 | Invalid Args | See UPnP Device Architecture section on Control. |
| 404 | Invalid Var | See UPnP Device Architecture section on Control. |
| 501 | Action Failed | See UPnP Device Architecture section on Control. |
| 600-699 | TBD | Common action errors. Defined by UPnP Forum Technical Committee. |
| 701-799 | | Common action errors defined by the UPnP Forum working committees. |
| *800-899* | *TBD* | *(Specified by UPnP vendor.)* |

## 2.5. Theory of Operation

This service allows a temperature read from a temperature sensor.

Control points or other devices may set and get an application value for this service. The following applications are defined:

- Room – Indoor room temperature
- Outdoor – Outdoor temperature
- AirDuct – Temperature inside an air duct
- Pipe – surface temperature of a pipe.

Manufacturers shall establish the allowable range of temperatures using the maximum and minimum allowed values. A Control Point or other device can find these values in the XML description.

Control points or other devices may optionally establish a Name for this sensor.

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# 3. XML Service Description

```
<?xml version="1.0"?>
<scpd xmlns="urn:schemas-upnp-org:service-1-0">
  <specVersion>
    <major>1</major>
    <minor>0</minor>
  </specVersion>
  <actionList>
    <action>
    <name>GetApplication</name>
      <argumentList>
        <argument>
          <name>CurrentApplicationname>
          <direction>out</direction>
          <retval />
          <relatedStateVariable>Application</relatedStateVariable>
        </argument>
      </argumentList>
    </action>
  The following action is optional
<action>
    <name>SetApplication</name>
      <argumentList>
        <argument>
          <name>NewApplicationname>
          <direction>in</direction>
          <relatedStateVariable>Application</relatedStateVariable>
        </argument>
      </argumentList>
    </action>

<action>
    <name>GetCurrentTemperature</name>
      <argumentList>
        <argument>
          <name>CurrentTemp</name>
          <direction>out</direction>
          <retval />
          <relatedStateVariable>CurrentTemperature</relatedStateVariable>
        </argument>
      </argumentList>
    </action>

The following action is optional
<action>
    <name>GetName</name>
      <argumentList>
        <argument>
          <name>CurrentName</name>
          <direction>out</direction>
          <retval />
          <relatedStateVariable>Name</relatedStateVariable>
        </argument>
      </argumentList>
    </action>
      The following action is optional
    <action>
    <name>SetName</name>
      <argumentList>
        <argument>
          <name>NewName</name>
          <direction>in</direction>
```

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```
          <relatedStateVariable>Name</relatedStateVariable>
        </argument>
      </argumentList>
    </action>
    Declarations for other actions added by UPnP vendor (if any) go here
  </actionList>

  <serviceStateTable>
    <stateVariable sendEvents="yes">
      <name>Application</name>
      <dataType>string</dataType>
      <allowedValueList>
        <allowedValue> vender defined </allowedValue>
        Other allowed values defined by UPnP Forum working committee (if
        any) go here
      </allowedValueList>
    </stateVariable>

    <stateVariable sendEvents="yes">
      <name>CurrentTemperature</name>
      <dataType>i4</dataType>
      <allowedValueRange>
        <minimum>manufacturer defined</minimum>
        <maximum>manufacturer defined</maximum>
        <step>1</step>
      </allowedValueRange>
    </stateVariable>

  The following state variable is optional
      <stateVariable sendEvents="yes">
      <name>Name</name>
      <dataType>string</dataType>

    </stateVariable>

    Declarations for other state variables defined by UPnP Forum working
    committee(if any) go here
    Declarations for other state variables added by UPnP vendor (if any)
    go here
  </serviceStateTable>
</scpd>
```

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# 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 Service Definitions in chapter 2 of this document
- The XML Service Description in chapter 3 of this document
- The UPnP Test Tool service template test file: ***TemperatureSensor1.xml***
- The UPnP Test Tool service template test file: ***TemperatureSensor1.SyntaxTests.xml***

The test suite does not include tests for Control Semantics, since it is felt that such tests would not provide a higher level of interoperability.

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