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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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FOREWORD

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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.

ORIGINAL UPNP DOCUMENTS
(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
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UPnP WANDevice:1 Device	ISO/IEC 29341-8-3
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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

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

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

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" *R/W -This allows a control point to establish the application type*	*O*
Vendor-defined *One value required. Reserved names are:* *Room,* *Outdoor,* *Pipe,* *AirDuct,*	*0*
Vendor-defined	*O*

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

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).

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		

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

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).

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.

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>
```

```
          <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>
```

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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