# ISO/IEC 29341-6-11

Edition 1.0 2008-11

# INTERNATIONAL STANDARD

## Information technology – UPnP Device Architecture – Part 6-11: Heating, Ventilation and Air Conditioning Device Control Protocol – Fan Operating Mode Service

ISO/IEC 29341-6-11:2008(E)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE E

ICS 35.200

ISBN 2-8318-1007-7

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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 |
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| 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 |

| 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 definition enables the following functions:

- Changing and reading the user operating modes of a Forced Air HVAC system

# 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:HVAC_FanOperatingMode: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 |
|---|---|---|---|---|---|
| **Mode** | R | string | see table | Auto | N/a |
| **FanStatus** | R | string | see table | none | none |
| **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.

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 Mode**

| Value | Req. or Opt. [1] |
|---|---|
| *Auto* | *R* |
| *ContinuousOn* | *R* |
| *PeriodicOn* | *O* |
| *Vendor-defined* | *R* |
| *Vendor-defined* | *O* |

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

**Table 3 AllowedValueList for FanStatus**

| Value | Req. or Opt. [1] |
|---|---|
| *On* | *R* |
| *Off* | *R* |
| *Vendor-defined* | *R* |
| *Vendor-defined* | *O* |

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

### 2.2.1. Mode

Exposes the target operating mode of an HVAC fan or blower.

### 2.2.2. FanStatus

Exposes the current operating mode of an HVAC fan or blower.

### 2.2.3. Name

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

### 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 |
| Mode | Yes | No | none | none | On-change |
| FanStatus | Yes | No | none | none | On-change |
| *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 |
|---|---|---|---|---|---|
| Name | Needed for UI | | | On set-up only | N/a |
| Mode | Needed for UI | | | Very low | N/a |
| FanStatus | Needed for UI | | | Very low | N/a |

## 2.4. Actions

**Table 6 Action list**

| Name | Req. or Opt. [1] |
|---|---|
| SetMode | *R* |
| GetMode | *R* |
| GetFanStatus | *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. SetMode

Changes the operating mode of the HVAC fan or blower.

#### *2.4.1.1. Arguments*

**Table 7 Arguments for SetMode**

| Argument | Direction | relatedStateVariable |
|---|---|---|
| NewMode | *IN* | Mode |

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

none

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

Sets the new value of Mode

#### *2.4.1.4. Errors*

| errorCode | errorDescription | Description |
|---|---|---|
| 700 | Mode not available | The requested mode is not available |

### 2.4.2. GetMode

Provides Mode information to control points or other devices

#### *2.4.2.1. Arguments*

**Table 8 Arguments for GetMode**

| Argument | Direction | relatedStateVariable |
|---|---|---|
| CurrentMode | *Out*$^{R}$ | Mode |

R- Return Value

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

Depends on the value of Mode

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

None

#### *2.4.2.4. Errors*

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

### 2.4.3. GetFanStatus

GetFanStatus retrieves the current operational status of the Fan.

#### *2.4.3.1. Arguments*

**Table 9 Arguments for GetFanStatus**

| Argument | Direction | relatedStateVariable |
|---|---|---|
| CurrentStatus | *Out*[R] | FanStatus |

R- Return Value

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

Reflects the current fan status.

#### *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)*

Reflects the currents value of Name

#### *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 Control Point to set and observe the operating mode of a HVAC fan or blower. Defined operating modes are:

- Auto or automatic – in this mode the fan cycles with the heating or cooling unit. The HVAC system may impose on and off delays. Delay times are not exposed by this service.
- ContinuousOn – in this mode the fan is on continuously.
- PeriodicOn – in this mode the fan cycles with the heat or cooling unit AND will cycle periodically when the heating or cooling unit has not cycled for an extended time. The periodic time is not exposed by this service.

Different vendors employ different modes of operation. This service allows vendors to subset the defined operating modes per their particular implementation.

# 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>SetMode</name>
      <argumentList>
        <argument>
          <name>NewMode</name>
          <direction>in</direction>
     <relatedStateVariable>Mode</relatedStateVariable>
        </argument>
      </argumentList>
    </action>

<actionList>
    <action>
    <name>GetMode</name>
      <argumentList>
        <argument>
          <name>CurrentMode</name>
          <direction>out</direction>
          <retval/>
          <relatedStateVariable>Mode</relatedStateVariable>
        </argument>
      </argumentList>
    </action>

<actionList>
    <action>
    <name>GetFanStatus</name>
      <argumentList>
        <argument>
          <name>CurrentStatus</name>
          <direction>out</direction>
          <retval/>
          <relatedStateVariable>FanStatus</relatedStateVariable>
        </argument>
      </argumentList>
    </action>

<action>
    <name>GetName</name>
      <argumentList>
        <argument>
          <name>CurrentName</name>
          <direction>out</direction>
            <retval/>
          <relatedStateVariable>Name</relatedStateVariable>
        </argument>
      </argumentList>
    </action>

    <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>Mode</name>
        <dataType>string</dataType>
        <defaultValue>Auto</defaultValue>
        <allowedValueList>
          <allowedValue>Auto</allowedValue>
          <allowedValue>ContinuousOn</allowedValue>
        The following allowed value is optional
        <allowedValue>PeriodicOn</allowedValue>
        Vendor defined allowed values go here
        </allowedValueList>
      </stateVariable>

     <serviceStateTable>
      <stateVariable sendEvents="yes">
        <name>FanStatus</name>
        <dataType>string</dataType>
        <allowedValueList>
          <allowedValue>Off</allowedValue>
          <allowedValue>On</allowedValue>
        Vendor defined allowed values go here
        </allowedValueList>
      </stateVariable>
        <stateVariable sendEvents="yes">
        <name>Name</name>
        <dataType>string</dataType>

      </stateVariable>


      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: ***HVAC_FanOperatingMode1.xml***
- The UPnP Test Tool service template test file: ***HVAC_FanOperatingMode1.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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