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Information technology – UPnP Device Architecture –
Part 6-12: Heating, Ventilation and Air Conditioning Device Control Protocol –
Fan Speed Service

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Part 6-12: Heating, Ventilation and Air Conditioning Device Control Protocol – Fan Speed 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.

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
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
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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

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1. Overview and Scope

This service definition is compliant with the UPnP Device Architecture version 1.0. It defines a service type referred to herein as FanSpeed:1.

FanSpeed:1 provides programmatic control and status information for air fans used in Heating, Ventilation and Air-Conditioning (HVAC) applications. It allows a control point to command the speed of the fan by means of a continuous 0% to 100% control variable. Fans which are On/ Off or three speed (Off/ Low/ Medium/ High) respond by mapping the continuous control variable to specific vendor-dependent switching points. It provides optional functionality for dual direction reversible fans.

FanSpeed:1 enables the following functions:

- Control of the speed of an air-conditioning or ventilation fan.
- Reversible fans.

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2. Service Modeling Definitions

2.1. Service Type

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

urn:schemas-upnp-org:service:FanSpeed:1

The shorthand FanSpeed:1 is used herein to refer to this service type.

2.2. State Variables

Defines the state variables for the target running speed of the fan and its actual speed. Additionally defines optional state variables for “forward” and “reverse” operation.

NOTE: (Explanation of the meaning of speed): Table 1 below describes Allowed Value ranges of 0 to 100 which signify a fan speed in the range of 0% to 100%. In all such cases, a value of 0% corresponds to a FULLY STOPPED physical condition, and a value of 100% corresponds to the FULL SPEED physical condition. For values between 0% and 100% the physical condition of the fan is mapped as closely as possible to the 0% to 100% control variable. In particular for fans with discrete speeds (e.g. Off/ Low/ Medium/ High) the mapping takes the form of a “staircase”. The exact mapping is left to the vendor’s discretion.

Table 1: State Variables

Variable Name	Req. or Opt. ¹	Data Type	Allowed Value ²	Default Value ²	Eng. Units
FanSpeedTarget	R	ui1	$\geq 0, \leq 100, += 1$	0	Percent
FanSpeedStatus	R	ui1	$\geq 0, \leq 100, += 1$	0	Percent
DirectionTarget	O	boolean	0 = “Forward”, 1 = “Reverse”	0	n/a
DirectionStatus	O	boolean	0 = “Forward”, 1 = “Reverse”	0	n/a
<i>Non-standard state variables implemented by an UPnP vendor go here.</i>	<i>X</i>	<i>TBD</i>	<i>TBD</i>	<i>TBD</i>	<i>TBD</i>

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

² Values listed in this column are (all) required.

2.2.1. FanSpeedTarget

Determines the target speed for the fan. (See the above note “Explanation of the meaning of speed”).

2.2.2. FanSpeedStatus

Represents the actual speed for the fan. (See the above note “Explanation of the meaning of speed”).

2.2.3. DirectionTarget

Determines the target running direction for the fan. This is an optional state variable; in the case of fans that do not implement this state variable, they must behave as if DirectionTarget were equal to 0 i.e. “Forward”.

2.2.4. DirectionStatus

Represents the actual running direction for the fan. This is an optional state variable; in the case of fans that do not implement this state variable, a control point must behave as if DirectionStatus were equal to 0 i.e. “Forward”.

2.2.5. Relationships Between State Variables

Whenever the value of FanSpeedTarget changes, the actual physical fan speed should start to change toward the value of FanSpeedTarget according to the mapping illustrated in the examples below. Due to the physical inertia of the fan, this process will take a certain period of time that depends on the vendor’s implementation. The value of the FanSpeedStatus state variable should correspond to the actual physical fan speed according to the mapping illustrated in the examples below.

FanSpeedTarget and FanSpeedStatus are integers with the range 0% to 100%. Depending on the actual type of fan employed (e.g. three speed fan, modulating fan etc.), the 0...100% range should map to the actual physical fan speed according to the following principles.

Two common examples are given below for guidance, but actual implementation is at the discretion of the vendor:

Table 2: Modulating Fan Example

Input of Setting of FanSpeedTarget	Resulting Actual Physical Speed	Resulting value of FanSpeedStatus
0%	Off (“hard” off)	0%
1...Minimum Speed (i.e. Stalling Speed)%	Off (“soft” off)	1%
Min. Stall Speed...100%	Linear mapping according to the value of FanSpeedTarget	Actual speed: (Min. Stall Speed ... 100%)

Table 3: Three-Speed Fan Example

Input of Setting of FanSpeedTarget	Resulting Actual Physical Speed	Resulting value of FanSpeedStatus
0%	Off (“hard” off)	0%
1...25%	Off (“soft” off)	Same mapping as FanSpeedTarget
26...50%	Low	ditto
51...75%	Medium	ditto
76...100%	High	ditto

NOTE: To facilitate certification, UPnP vendors should include their own version of the mapping table illustrated above.

Whenever the value of DirectionTarget changes, the actual physical fan direction should start to change toward the value of DirectionTarget. Due to the physical inertia of the fan, this process will take a period of time that depends on the vendor’s implementation. The corresponding value of the DirectionStatus state variable should in turn reflect the actual physical fan direction.

NOTES:

- i) If the actual physical fan speed or direction deviates from what is expected in FanSpeedTarget or DirectionTarget, then the corresponding xxxStatus state variable should reflect the real physical fan status and NOT the xxxTarget values.