ONVIF™
Device IO Service Specification

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1 Scope

This document defines the web service interface for all physical inputs and outputs. For most inputs and outputs this is a pure get interface while for e.g. relays also configuration and control is include.

Web service usage is outside of the scope of this document. Please refer to the ONVIF core specification.

2 Normative references

ONVIF Core Specification
<http://www.onvif.org/specs/core/ONVIF-Core-Spec-v210.pdf>
ONVIF Media Service Specification
<http://www.onvif.org/specs/srv/media/ONVIF-Media-Service-Spec-v210.pdf>

3 Terms and Definitions

3.1 Definitions

Input/Output (I/O) Currently relay ports and Video/Audio Inputs/Outputs are handled.

3.2 Abbreviations

ONVIF Open Network Video Interface Forum

4 Overview

The DevideIO service offers commands to retrieve and configure the settings of physical inputs and outputs of a device.

The DeviceIO service supports the configuration of the following device interfaces:

- VideoOutputs
- VideoSources
- AudioOutputs
- AudioSources
- RelayOutputs

The following commands list existing interfaces:

- GetVideoOutputs – Gets all existing video outputs of the device.
- GetVideoSources – Gets all existing video sources of the device.
- GetAudioOutputs – Gets all existing audio outputs of the device.
- GetAudioSources – Gets all existing audio sources of the device
- GetRelayOutputs– Gets all existing relay outputs of the device

For VideoOutputs, VideoSources, AudioOutputs and AudioSources the following commands are supported:

- *Set<device name>Configuration* – Modifies the configuration of a specific interface.
- *Get< device name >Configuration* – Gets the configuration of a specific interface.

- *Get< device name >ConfigurationOptions* – Gets the supported property values for a specific interface.

RelayOutputs supports following commands:

- SetRelayOutputSettings – Modifies the configuration of a relay output
- SetRelayOutputState – Sets the logical state

WSDL for the DeviceIO service is specified in http://www.onvif.org/ver10/deviceio.wsdl.

5 Service

This service offers commands to retrieve and configure the physical Inputs and Outputs of a device.

Commands to request the available video and audio in- and outputs are defined as well as commands to request the available relays. This service also offers functions to request and change the configuration of these entities.

A device that has physical sources and outputs SHALL support this service as described in [DeviceIOService.wsdl].

Some functionality of this service overlaps with functionality that is defined in the Media Service. If a device (e.g. a NVT) needs to implement both services it should use the commands that are defined in this service to configure its audio in- and outputs or its video sources.

5.1 VideoOutputs

The VideoOutput type represents the physical Video Outputs of a device that can be connected to a monitor to display the video signal. The structure contains the Layout Settings that can be configured using the Display Service.

5.1.1 GetVideoOutputs

This command lists all available video outputs of a device. A device that has one or more physical video outputs shall support listing of available video outputs through the GetVideoOutputs command.

Table 1: GetVideoOutputs command

GetVideoOutputs	Access Class: READ_MEDIA
Message name	**Description**
GetVideoOutputsRequest	*This is an empty message.*
GetVideoOutputsResponse	*Contains a list of structures describing all available video outputs of the device. If a device has no VideoOutputs an empty list is returned.* tt:VideoOutput **VideoOutputs** [0][unbounded]
Fault codes	**Description**

No specific fault codes.	

5.2 VideoOutputConfiguration

5.2.1 GetVideoOutputConfiguration

This operation requests the configuration of a Video Output. A device that has one or more Video Outputs shall support the retrieval of the VideoOutputConfiguration through this command.

Table 2: GetVideoOutputConfiguration command

GetVideoOutputConfiguration	Access Class: READ_MEDIA
Message name	**Description**
GetVideoOutputConfigurationRequest	*This message contains the token of the VideoOutput.* tt:ReferenceToken **VideoOutputToken** [1][1]
GetVideoOutputConfigurationResponse	*This message contains the requested VideoOutputConfiguration with the matching token.* tt:VideoOutputConfiguration **VideoOutputConfiguration** [1][1]
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoVideoOutput	*The requested VideoOutput indicated with **VideoOutputToken** does not exist.*

5.2.2 SetVideoOutputConfiguration

This operation modifies a video output configuration. A device that has one or more video outputs shall support the setting of its video output configuration through this command.

Table 3: SetVideoOutputConfiguration command

SetVideoOutputConfiguration	Access Class: ACTUATE
Message name	**Description**
SetVideoOutputConfiguration-Request	*The **Configuration** element contains the modified VideoOutput configuration.* *The **ForcePersistence** element determines if the configuration changes shall be stored and remain after reboot. If true, changes shall be persistent. If false, changes MAY revert to previous values after reboot.* tt:VideoOutputConfiguration **Configuration** [1][1] xs:boolean **ForcePersistence** [1][1]
SetVideoOutputConfiguration-Response	*This message is empty.*
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoVideoOutput	*The requested Video Output does not exist*
env:Sender ter:InvalidArgVal ter:ConfigModify	*The configuration parameters are not possible to set.*

5.2.3 GetVideoOutputConfigurationOptions

This operation requests the VideoOutputConfigurationOptions of a VideoOutput. A device that has one or more video outputs shall support the retrieval of VideoOutputConfigurationOptions through this command.

Table 4: GetVideoOutputConfigurationOptions command

GetVideoOutputConfigurationOptions	Access Class: READ_MEDIA
Message name	**Description**
GetVideoOutputConfiguration-OptionsRequest	*The **VideoOutputToken** element specifies the VideoOutput whose options are requested. The VideoOutput shall exist in the device* tt:ReferenceToken **VideoOutputToken**[1][1]
GetVideoOutputConfiguration-OptionsResponse	*The response contains the VideoOutputOptions of the device.* tt:VideoOutputConfigurationOptions **VideoOutputOptions**[1][1]
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoVideoOutput	*The requested Video Output does not exist*

5.3 VideoSources

A VideoSource represents physical video input. The structure contains the pixel resolution of the video, framerate and imaging settings. The imaging settings can be manipulated through the ImagingService if supported and contains parameters for focus, exposure and brightness, for example.

5.3.1 GetVideoSources

This operation lists all available video sources for the device. The device that has one or more video inputs shall support the listing of available video sources through the GetVideoSources command.

Table 5: GetVideoSources command

GetVideoSources	Access Class: READ_MEDIA
Message name	**Description**
GetVideoSourcesRequest	*This is an empty message.*
GetVideoSourcesResponse	*Contains a list of structures describing all available video sources of the device. If a device has no Video Source an empty list is returned* tt:VideoSource **VideoSource** [0][unbounded]
Fault codes	**Description**
No specific fault codes.	

5.4 VideoSourceConfiguration

A VideoSourceConfiguration contains a reference to a VideoSource and a Bounds structure containing either the whole VideoSource pixel area or a sub-portion of it. The Bounds and VideoSource define the image that is streamed to a client.

5.4.1 GetVideoSourceConfiguration

This operation lists the video source configurations of a VideoSource. A device with one or more video sources shall support the GetVideoSourceConfigurations command.

Table 6: GetVideoSourceConfiguration command

GetVideoSourceConfiguration	Access Class: READ_MEDIA
Message name	**Description**
GetVideoSourceConfigurationRequest	*This message contains the token of the video input.* tt:ReferenceToken **VideoSourceToken** [1][1]

GetVideoSourceConfigurationResponse	*This message contains the requested VideoSourceConfiguration with the matching token.* tt:VideoSourceConfiguration **VideoSourceConfiguration** [1][1]
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoVideoSource	*The requested VideoSource indicated with **VideoSourceToken** does not exist.*

5.4.2 SetVideoSourceConfiguration

This operation modifies a video input configuration. A device that has one or more video sources shall support the setting of the VideoSourceConfiguration through this command.

Table 7: SetVideoSourceConfiguration command

SetVideoSourceConfiguration	Access Class: ACTUATE
Message name	**Description**
SetVideoSourceConfiguration-Request	*The **Configuration** element contains the modified VideoSource configuration. The Configuration contains an element that specifies the VideoSource whose configuration is to be modified. The VideoSource shall exist in the device* *The **ForcePersistence** element determines if the configuration changes shall be stored and remain after reboot. If true, changes shall be persistent. If false, changes MAY revert to previous values after reboot.* tt:VideoSourceConfiguration **Configuration** [1][1] xs:boolean **ForcePersistence** [1][1]
SetVideoSourceConfiguration-Response	*This message is empty.*
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoVideoSource	*The requested VideoSource does not exist*
env:Sender ter:InvalidArgVal ter:ConfigModify	*The configuration parameters are not possible to set.*

5.4.3 GetVideoSourceConfigurationOptions

This operation requests the VideoSourceConfigurationOptions of a VideoSource. A device with one or more video sources shall support this command.

Table 8: GetVideoSourceConfiguartionOptions command

GetVideoSourceConfiguartionOptions	Access Class: READ_MEDIA
Message name	**Description**
GetVideoSourceConfiguration-OptionsRequest	*The **VideoSourceToken** element specifies the Video Input whose options are requested. The Video Input shall exist in the device* tt:ReferenceToken **VideoSourceToken**[1][1]
GetVideoSourceConfiguartion-OptionsResponse	*The **VideoSourceOptions** return the valid Bounds as well as a element that delivers the VideoSourceToken available. This field shall be set to the Source whose options are requested.* tt:VideoSourceConfigurationOptions **VideoSourceOptions**[1][1]
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoVideoSource	*The requested Video Input does not exist*

5.5 AudioOutputs

The Audio Output represents the physical audio outputs that can be connected to a loudspeaker.

5.5.1 GetAudioOutputs

This command lists all available audio outputs of a device. A device that has one ore more physical audio outputs shall support listing of available audio outputs through the GetAudioOutputs command.

Table 9: GetAudioOutputs command

GetAudioOutputs	Access Class: READ_MEDIA
Message name	**Description**
GetAudioOutputsRequest	*This is an empty message.*
GetAudioOutputsResponse	*Contains a list of structures describing all available audio outputs of the device. If a device has no AudioOutputs an empty list is returned.* tt:AudioOutput **AudioOutputs** [0][unbounded]
Fault codes	**Description**
env:Receiver *ter:ActionNotSupported* *ter:AudioOutputNotSupported*	*Audio or Audio Outputs are not supported by the Device*

5.6 AudioOutputConfiguration

An AudioOutputConfiguration contains a reference to an existing AudioOutput. The AudioOutput configuration contains a parameter to control the output level.

5.6.1 GetAudioOutputConfiguration

This operation requests the AudioOutputConfiguration of an AudioOutput. A device that has one or more AudioOutputs shall support the retrieval of the AudioOutputConfiguration through this command.

Table 10: GetAudioOutputConfiguration command

GetAudioOutputConfiguration	Access Class: READ_MEDIA
Message name	**Description**
GetAudioOutputConfigurationRequest	*This message contains the token of the AudioOutput.* tt:ReferenceToken **AudioOutputToken** [1][1]
GetAudioOutputConfigurationResponse	*This message contains the requested AudioOutputConfiguration with the matching token.* tt:AudioOutputConfiguration **AudioOutputConfiguration** [1][1]
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoAudioOutput	*The requested AudioOutput indicated with **AudioOutputToken** does not exist.*

5.6.2 SetAudioOutputConfiguration

This operation modifies an audio output configuration. A device that has one ore more audio outputs shall support the setting of the AudioOutputConfiguration through this command.

Table 11: SetAudioOutputConfiguration command

SetAudioOutputConfiguration	Access Class: ACTUATE
Message name	**Description**
SetAudioOutputConfiguration-Request	*The **Configuration** element contains the modified AudioOutput configuration. The Configuration contains an element that specifies the Audio Output whose configuration is to be modified. The Audio Output shall exist in the device.* *The **ForcePersistence** element determines if the configuration changes shall be stored and remain after reboot. If true, changes shall be persistent. If false, changes MAY revert to previous values after reboot.* tt:AudioOutputConfiguration **Configuration** [1][1] xs:boolean **ForcePersistence** [1][1]
SetAudioOutputConfiguration-Response	*This message is empty.*
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoAudioOutput	*The requested Audio Output does not exist*
env:Sender ter:InvalidArgVal ter:ConfigModify	*The configuration parameters are not possible to set.*

5.6.3 GetAudioOutputConfigurationOptions

This operation requests the AudioOutputConfigurationOptions of an AudioOutput. A device that has one or more AudioOutputs shall support this command.

Table 12: GetAudioOutputConfigurationOptions command

GetAudioOutputConfigurationOptions	Access Class: READ_MEDIA
Message name	**Description**
GetAudioOutputConfiguration-OptionsRequest	*The **AudioOutputToken** element specifies the Audio Output whose options are requested. The Audio Output shall exist in the device* tt:ReferenceToken **AudioOutputToken**[1][1]
GetAudioOutputConfiguration-OptionsResponse	*The **AudioOutputsOptions** return the valid value ranges for SendPrimacy and OutputLevel as well as the AudioOutputToken available. This field shall be set to the Output whose options are requested.* tt:AudioOutputConfigurationOptions **AudioOutputOptions**[1][1]
Fault codes	**Description**

env:Sender ter:InvalidArgVal ter:NoAudioOutput	*The requested Audio Output does not exist*

5.7 AudioSources

An AudioSource represents unencoded audio input and states the number of input channels

5.7.1 GetAudioSources

This operation lists all available audio sources for the device. The device that has one or more audio sources shall support the listing of available audio inputs through the GetAudioSources command.

Table 13: GetAudioSources command

GetAudioSources	Access Class: READ_MEDIA
Message name	**Description**
GetAudioSourcesRequest	*This is an empty message.*
GetAudioSourcesResponse	*Contains a list of structures describing all available audio sources of the device. If a device has no Audio Input an empty list is returned* tt:AudioSource **AudioSource** [0][unbounded]
Fault codes	**Description**
env:Receiver *ter:ActionNotSupported* *ter:AudioOutputNotSupported*	*NVT does not support audio.*

5.8 AudioSourceConfiguration

An AudioSourceConfiguration contains a reference to an Audio Source.

5.8.1 GetAudioSourceConfiguration

This operation lists the configuration of an Audio Input. A device with one or more audio inputs shall support the GetAudioSourceConfiguration command.

Table 14: GetAudioSourceConfiguration command

GetAudioSourceConfiguration	Access Class: READ_MEDIA
Message name	**Description**
GetAudioSourceConfigurationRequest	*This message contains the token of the AudioSource.* tt:ReferenceToken **AudioSourceToken** [1][1]
GetAudioSourceConfigurationResponse	*This message contains the requested AudioSourceConfiguration with the matching token.* tt:AudioSourceConfiguration **AudioSourceConfiguration** [1][1]

Fault codes	Description
env:Sender ter:InvalidArgVal ter:NoAudioSource	*The requested AudioSource indicated with **AudioSourceToken** does not exist.*

5.8.2 SetAudioSourceConfiguration

This operation modifies an audio source configuration. A device that has a one or more audio sources shall support the setting of the AudioSourceConfiguration through this command.

Table 15: SetAudioSourceConfiguration command

SetAudioSourceConfiguration	Access Class: ACTUATE
Message name	**Description**
SetAudioSourceConfiguration-Request	*The **Configuration** element contains the modified AudioSource configuration. The Configuration contains an element that specifies the AudioSource whose configuration is to be modified. The Audio Input shall exist in the device* *The **ForcePersistence** element determines if the configuration changes shall be stored and remain after reboot. If true, changes shall be persistent. If false, changes MAY revert to previous values after reboot.* tt:AudioSourceConfiguration **Configuration** [1][1] xs:boolean **ForcePersistence** [1][1]
SetAudioSourceConfiguration-Response	*This message is empty.*
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoAudioSource	*The requested AudioSource does not exist*
env:Sender ter:InvalidArgVal ter:ConfigModify	*The configuration parameters are not possible to set.*

5.8.3 GetAudioSourceConfigurationOptions

This operation requests the AudioSourceConfigurationOptions of an AudioSource. A device with one or more AudioSources shall support this command.

Table 16: GetAudioSourceConfigurationOptions command

GetAudioSourceConfigurationOptions	Access Class: READ_MEDIA
Message name	**Description**
GetAudioSourceConfigurationOptions-Request	*The **AudioSourceToken** element specifies the Audio Input whose options are requested. The AudioSource shall exist in the device* tt:ReferenceToken **AudioSourceToken**[1][1]
GetAudioSourceConfiguration-Response	*The **AudioSourcesOptions** return the AudioSourceToken available. This field shall be set to the source whose options are requested.* tt:AudioSourceConfigurationOptions **AudioSourceOptions**[1][1]
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoAudioSource	*The requested Audio Input does not exist*

5.9 Relay Outputs

The Input/Output (I/O) commands are used to control the state or observe the status of the I/O ports. If the device has I/O ports, then it shall support the I/O commands.

Handling of relay outputs is also defined in DeviceManagement, see ONVIF Core Specification secion Input/Output.

5.9.1 Get relay outputs

This operation gets a list of all available relay outputs and their settings.

Table 17: GetRelayOutputs command

GetRelayOutputs	Access Class: READ_MEDIA
Message name	**Description**
GetRelayOutputsRequest	*This is an empty message.*
GetRelayOutputsResponse	*This message contains an array of relay outputs.* tt:RelayOutput **RelayOutputs** [0][unbounded]
Fault codes	**Description**
	No command specific faults!

5.9.2 Set relay output settings

This operation sets the settings of a relay output.

The relay can work in two relay modes:

- Bistable – After setting the state, the relay remains in this state.
- Monostable – After setting the state, the relay returns to its idle state after the specified time.

The physical idle state of a relay output can be configured by setting the IdleState to ‘open’ or ‘closed’ (inversion of the relay behaviour).

Idle State ‘open’ means that the relay is open when the relay state is set to ‘inactive’ through the trigger command (see Section 5.9.3) and closed when the state is set to ‘active’ through the same command.

Idle State ‘closed’ means, that the relay is closed when the relay state is set to ‘inactive’ through the trigger command (see Section 5.9.3) and open when the state is set to ‘active’ through the same command.

The Duration parameter of the Properties field “DelayTime” describes the time after which the relay returns to its idle state if it is in monostable mode. If the relay is set to bistable mode the value of the parameter shall be ignored.

Table 18: SetRelayOutputSettings command.

SetRelayOutputSettings	Access Class: ACTUATE
Message name	**Description**
SetRelayOutputSettingsRequest	*This message contains:* • *"RelayOutputToken": Token reference to the requested relay output.* • *"RelayOutputSettings": The settings of the relay* . tt:ReferenceToken **RelayOutputToken** [1][1] tt:RelayOutputSettings **RelayOutputSettings** [1][1]
SetRelayOutputSettingsResponse	*This is an empty message.*
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:RelayToken	*Unknown relay token reference.*
env:Sender ter:InvalidArgVal ter:ModeError	*Monostable delay time not valid*

5.9.3 Trigger relay output

This operation triggers a relay output[1].

Table 19: SetRelayOutputState command

SetRelayOutputState	Access Class: ACTUATE
Message name	**Description**
SetRelayOutputStateRequest	*This message contains:* • *RelayOutputToken": Token reference to the requested relay output.* • *"LogicalState": Trigger request, i.e., active or inactive.* tt:ReferenceToken **RelayOutputToken** [1][1] tt:RelayLogicalState **LogicalState** [1][1]
SetRelayOutputStateResponse	*This is an empty message.*
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:RelayToken	*Unknown relay token reference.*

[1] There is no GetRelayState command; the current logical state of the relay output is transmitted via notification and their properties.

5.10 Capabilities

The capabilities reflect optional functions and functionality of a service. The information is static and does not change during device operation. The following capabilites are available:

FixedLayout: Indication if the device has a certain set of predefined layouts..

InputConnectors: The number of input connectors.

RelayOutputs: The number of relay outputs.

Auxiliary: Indication of support for auxiliary service along with list of supported auxiliary commands

Table 20: GetServiceCapabilities command

GetServiceCapabilities	Access Class: PRE_AUTH
Message name	**Description**
GetServiceCapabilitiesRequest	*This message contains a request for device capabilities.*
GetServiceCapabilitiesResponse	*The capability response message contains the requested service capabilities using a hierarchical XML capability structure.* tmd:Capabilities **Capabilities** [1][1]
Fault codes	**Description**
	No command specific faults!

5.11 Service specific fault codes

The table below lists the DeviceIO service specific fault codes. Additionally, each command can also generate a generic fault as defined in the ONVIF Core specification.

Table 21: DeviceIO service specific fault codes

Fault Code	Parent Subcode Subcode	Fault Reason	Description
env:Sender	ter:InvalidArgVal ter:ConfigModify	Invalid configuration parameters	The configuration parameters are not possible to set.
env:Sender	ter:InvalidArgVal ter:NoVideoOutput	Video output token does not exist.	The requested VideoOutput indicated with **VideoOutputToken** does not exist.
env:Sender	ter:InvalidArgVal ter:NoVideoSource	Video source token does not exist.	The requested VideoSource indicated with **VideoSourceToken** does not exist.
env:Sender	ter:InvalidArgVal ter:NoAudioOutput	Audio output token does not exist.	The requested AudioOutput indicated with **AudioOutputToken** does not exist.
env:Sender	ter:InvalidArgVal ter:NoAudioSource	Audio source token does not exist.	The requested AudioSource indicated with **AudioSourceToken** does not exist.
env:Sender	ter:InvalidArgVal ter:RelayToken	Unknown relay token reference	The requested RelayOutput indicated **RelayOutputToken** does not exist.
env:Sender	ter:InvalidArgVal ter:ModeError	Monostable delay time not valid	