

# ONVIF™ Device IO Service Specification

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## 4 Overview

The DeviceIO 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
- DigitalInputs
- Send and/or Receive serial data communication

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
- GetDigitalInputs – Gets all existing digital inputs of the device
- GetSerialPorts - Gets a list of all available serial ports and their settings.

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

SerialPorts additionally support the following command:

- Send and/or Receive serial command - Transmit/receive generic controlling data to/from a serial device

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

**Table 1: Referenced namespaces (with prefix)**

Prefix	Namespace URI
env	<a href="http://www.w3.org/2003/05/soap-envelope">http://www.w3.org/2003/05/soap-envelope</a>
ter	<a href="http://www.onvif.org/ver10/error">http://www.onvif.org/ver10/error</a>
xs	<a href="http://www.w3.org/2001/XMLSchema">http://www.w3.org/2001/XMLSchema</a>
tt	<a href="http://www.onvif.org/ver10/schema">http://www.onvif.org/ver10/schema</a>
tmd	<a href="http://www.onvif.org/ver10/deviceIO/wsdl">http://www.onvif.org/ver10/deviceIO/wsdl</a>

## 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 2: GetVideoOutputs command**

GetVideoOutputs		Access Class: READ_MEDIA
Message name	Description	
GetVideoOutputsRequest	<i>This is an empty message.</i>	
GetVideoOutputsResponse	<i>Contains a list of tokenenumerating all available video outputs of the device. If a device has no VideoOutputs an empty list is returned.</i>  tt:ReferenceToken <b>Token</b> [0][unbounded]	
Fault codes	Description	
<i>No specific fault codes.</i>		

### 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 3: GetVideoOutputConfiguration command

GetVideoOutputConfiguration		Access Class: READ_MEDIA
Message name	Description	
GetVideoOutputConfigurationRequest	This message contains the token of the VideoOutput. Tt:ReferenceToken <b>VideoOutputToken</b> [1][1]	
GetVideoOutputConfigurationResponse	This message contains the requested VideoOutputConfiguration with the matching token.  Tt:VideoOutputConfiguration <b>VideoOutputConfiguration</b> [1][1]	
Fault codes	Description	
env:Sender ter:InvalidArgVal ter:NoVideoOutput	The requested VideoOutput indicated with <b>VideoOutputToken</b> 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 4: SetVideoOutputConfiguration command

SetVideoOutputConfiguration		Access Class: ACTUATE
Message name	Description	
SetVideoOutputConfiguration-Request	The <b>Configuration</b> element contains the modified VideoOutput configuration.  The <b>ForcePersistence</b> 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 <b>Configuration</b> [1][1] xs:boolean <b>ForcePersistence</b> [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 5: GetVideoOutputConfigurationOptions command**

GetVideoOutputConfigurationOptions		Access Class: READ_MEDIA
Message name	Description	
GetVideoOutputConfigurationOptionsRequest	<p>The <b>VideoOutputToken</b> element specifies the VideoOutput whose options are requested. The VideoOutput shall exist in the device</p> <p>tt:ReferenceToken <b>VideoOutputToken</b>[1][1]</p>	
GetVideoOutputConfigurationOptionsResponse	<p>The response contains the VideoOutputOptions of the device.</p> <p>Tt:VideoOutputConfigurationOptions <b>VideoOutputOptions</b>[1][1]</p>	
Fault codes	Description	
env:Sender ter:InvalidArgVal ter:NoVideoOutput	<p>The requested Video Output does not exist</p>	

## 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 6: GetVideoSources command**

GetVideoSources		Access Class: READ_MEDIA
Message name	Description	
GetVideoSourcesRequest	<p>This is an empty message.</p>	
GetVideoSourcesResponse	<p>Contains a list of tokenenumerating all available video sources of the device. If a device has no video sources an empty list is returned.</p> <p>tt:ReferenceToken <b>Token</b> [0][unbounded]</p>	
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 7: GetVideoSourceConfiguration command**

GetVideoSourceConfiguration		Access Class: READ_MEDIA
Message name	Description	
GetVideoSourceConfigurationRequest	<i>This message contains the token of the video input.</i> Tt:ReferenceToken <b>VideoSourceToken</b> [1][1]	
GetVideoSourceConfigurationResponse	<i>This message contains the requested VideoSourceConfiguration with the matching token.</i>  Tt:VideoSourceConfiguration <b>VideoSourceConfiguration</b> [1][1]	
Fault codes	Description	
env:Sender ter:InvalidArgVal ter:NoVideoSource	<i>The requested VideoSource indicated with <b>VideoSourceToken</b> does not exist.</i>	

### 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 8: SetVideoSourceConfiguration command**

<b>SetVideoSourceConfiguration</b>		Access Class: ACTUATE
Message name	Description	
SetVideoSourceConfiguration-Request	<p>The <b>Configuration</b> 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</p> <p>The <b>ForcePersistence</b> 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.</p> <p>Tt:VideoSourceConfiguration <b>Configuration</b> [1][1]            xs:boolean <b>ForcePersistence</b> [1][1]</p>	
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 9: GetVideoSourceConfigurationOptions command**

<b>GetVideoSourceConfigurationOptions</b>		Access Class: READ_MEDIA
Message name	Description	
GetVideoSourceConfiguration-OptionsRequest	<p>The <b>VideoSourceToken</b> element specifies the Video Input whose options are requested. The Video Input shall exist in the device</p> <p>tt:ReferenceToken <b>VideoSourceToken</b>[1][1]</p>	
GetVideoSourceConfiguration-OptionsResponse	<p>The <b>VideoSourceOptions</b> 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.</p> <p>Tt:VideoSourceConfigurationOptions <b>VideoSourceOptions</b>[1][1]</p>	
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 10: GetAudioOutputs command**

GetAudioOutputs		Access Class: READ_MEDIA
Message name	Description	
GetAudioOutputsRequest	<i>This is an empty message.</i>	
GetAudioOutputsResponse	<i>Contains a list of tokenenumerating all available audio outputs of the device. If a device has no audio outputs an empty list is returned.</i>  tt:ReferenceToken <b>Token</b> [0][unbounded]	
Fault codes	Description	
<i>env:Receiver</i> <i>ter:ActionNotSupported</i> <i>ter:AudioOutputNotSupported</i>	<i>Audio or Audio Outputs are not supported by the Device</i>	

## 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 11: GetAudioOutputConfiguration command**

GetAudioOutputConfiguration		Access Class: READ_MEDIA
Message name	Description	
GetAudioOutputConfigurationRequest	<i>This message contains the token of the AudioOutput.</i> Tt:ReferenceToken <b>AudioOutputToken</b> [1][1]	

GetAudioOutputConfigurationResponse	<i>This message contains the requested AudioOutputConfiguration with the matching token.</i>  Tt:AudioOutputConfiguration <b>AudioOutputConfiguration</b> [1][1]
Fault codes	Description
env:Sender ter:InvalidArgVal ter:NoAudioOutput	<i>The requested AudioOutput indicated with <b>AudioOutputToken</b> does not exist.</i>

### 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 12: SetAudioOutputConfiguration command**

SetAudioOutputConfiguration		Access Class: ACTUATE
Message name	Description	
SetAudioOutputConfiguration-Request	<p><i>The <b>Configuration</b> 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.</i></p> <p><i>The <b>ForcePersistence</b> 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.</i></p> <p>Tt:AudioOutputConfiguration <b>Configuration</b> [1][1] xs:boolean <b>ForcePersistence</b> [1][1]</p>	
SetAudioOutputConfiguration-Response	<i>This message is empty.</i>	
Fault codes	Description	
env:Sender ter:InvalidArgVal ter:NoAudioOutput	<i>The requested Audio Output does not exist</i>	
env:Sender ter:InvalidArgVal ter:ConfigModify	<i>The configuration parameters are not possible to set.</i>	

### 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 13: GetAudioOutputConfigurationOptions command**

<b>GetAudioOutputConfigurationOptions</b>		Access Class: READ_MEDIA
Message name	Description	
GetAudioOutputConfiguration-OptionsRequest	<p>The <b>AudioOutputToken</b> element specifies the Audio Output whose options are requested. The Audio Output shall exist in the device</p> <p>tt:ReferenceToken <b>AudioOutputToken</b>[1][1]</p>	
GetAudioOutputConfiguration-OptionsResponse	<p>The <b>AudioOutputsOptions</b> return the valid value ranges for <i>SendPrimacy</i> and <i>OutputLevel</i> as well as the <i>AudioOutputToken</i> available. This field shall be set to the Output whose options are requested.</p> <p>Tt:AudioOutputConfigurationOptions <b>AudioOutputOptions</b>[1][1]</p>	
Fault codes	Description	
env:Sender ter:InvalidArgVal ter:NoAudioOutput	<p>The requested Audio Output does not exist</p>	

## 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 14: GetAudioSources command**

<b>GetAudioSources</b>		Access Class: READ_MEDIA
Message name	Description	
GetAudioSourcesRequest	<p>This is an empty message.</p>	
GetAudioSourcesResponse	<p>Contains a list of tokenenumerating all available audio sources of the device. If a device has no audio sources an empty list is returned.</p> <p>tt:ReferenceToken <b>Token</b> [0][unbounded]</p>	
Fault codes	Description	
env:Receiver ter:ActionNotSupported ter:AudioOutputNotSupported	<p>The devices does not support audio.</p>	

## 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 15: GetAudioSourceConfiguration command**

GetAudioSourceConfiguration		Access Class: READ_MEDIA
Message name	Description	
GetAudioSourceConfigurationRequest	<i>This message contains the token of the AudioSource.</i> Tt:ReferenceToken <b>AudioSourceToken</b> [1][1]	
GetAudioSourceConfigurationResponse	<i>This message contains the requested AudioSourceConfiguration with the matching token.</i>  Tt:AudioSourceConfiguration <b>AudioSourceConfiguration</b> [1][1]	
Fault codes	Description	
env:Sender ter:InvalidArgVal ter:NoAudioSource	<i>The requested AudioSource indicated with <b>AudioSourceToken</b> does not exist.</i>	

### 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 16: SetAudioSourceConfiguration command**

SetAudioSourceConfiguration		Access Class: ACTUATE
Message name	Description	
SetAudioSourceConfiguration-Request	<i>The <b>Configuration</b> 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</i>  <i>The <b>ForcePersistence</b> 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.</i>  Tt:AudioSourceConfiguration <b>Configuration</b> [1][1] xs:boolean <b>ForcePersistence</b> [1][1]	
SetAudioSourceConfiguration-Response	<i>This message is empty.</i>	
Fault codes	Description	



env:Sender ter:InvalidArgVal ter:NoAudioSource	<i>The requested AudioSource does not exist</i>
env:Sender ter:InvalidArgVal ter:ConfigModify	<i>The configuration parameters are not possible to set.</i>

### 5.8.3 GetAudioSourceConfigurationOptions

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

**Table 17: GetAudioSourceConfigurationOptions command**

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

## 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 section Input/Output.

### 5.9.1 Get relay outputs

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

**Table 18: GetRelayOutputs command**

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

### 5.9.2 Get relay output options

Request the available settings and ranges for one or all relay outputs. The method shall return the information for exactly one output when a RelayOutputToken is provided as request parameter. Otherwise the method shall return the information for all relay outputs.

A device that has one or more RelayOutputs should support this command..

Two examples:

2) Device supports PT1S to PT120S:

```
<tmd:RelayOutputOptions token='44'>
  <tmd:Mode>Monostable</tmd:Mode>
  <tmd:DelayTimes>1 120</tmd:DelayTimes>
</tmd:RelayOutputOptions>
```

2) Device supports values PT0.5S, PT1S, PT2s and PT1M:

```
<tmd:RelayOutputOptions token='123'>
  <tmd:Mode>Monostable</tmd:Mode>
  <tmd:DelayTimes Discrete='True'>0.5 1 2 60</tmd:DelayTimes>
</tmd:RelayOutputOptions>
```

**Table 19: GetRelayOutputOptions command**

<b>GetRelayOutputOptions</b>		Access Class: PRE_AUTH
<b>Message name</b>	<b>Description</b>	
GetRelayOutputOptionsRequest	<ul style="list-style-type: none"> <li>“RelayOutputToken”: Optional token reference to the requested relay output.</li> </ul> Tt:ReferenceToken <b>RelayOutputToken</b> [0][1]	
GetRelayOutputOptionsResponse	<i>This message contains an array of relay output options.</i> Tmd:RelayOutputOptions <b>RelayOutputOptions</b> [0][unbounded]	
<b>Fault codes</b>	<b>Description</b>	
	<i>No command specific faults!</i>	

### 5.9.3 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 5.9.4) 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 5.9.4) 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 20: SetRelayOutputSettings command.**

<b>SetRelayOutputSettings</b>		Access Class: ACTUATE
Message name	Description	
SetRelayOutputSettingsRequest	<p><i>This message contains:</i></p> <ul style="list-style-type: none"> <li>• “RelayOutputToken”: Token reference to the requested relay output.</li> <li>• “RelayOutputSettings”: The settings of the relay</li> </ul> <p>tt:ReferenceToken <b>RelayOutputToken</b> [1][1]            tt:RelayOutputSettings <b>RelayOutputSettings</b> [1][1]</p>	
SetRelayOutputSettingsResponse	<i>This is an empty message.</i>	
Fault codes	Description	
env:Sender ter:InvalidArgVal ter:RelayToken	<i>Unknown relay token reference.</i>	
Env:Sender ter:InvalidArgVal ter:ModeError	<i>Monostable delay time not valid</i>	

#### 5.9.4 Trigger relay output

This operation triggers a relay output<sup>1</sup>.

**Table 21: SetRelayOutputState command**

<b>SetRelayOutputState</b>		Access Class: ACTUATE
Message name	Description	
SetRelayOutputStateRequest	<p><i>This message contains:</i></p> <ul style="list-style-type: none"> <li>• <i>RelayOutputToken</i>: Token reference to the requested relay output.</li> <li>• <i>LogicalState</i>: Trigger request, i.e., active or inactive.</li> </ul> <p>Tt:ReferenceToken <b>RelayOutputToken</b> [1][1]            tt:RelayLogicalState <b>LogicalState</b> [1][1]</p>	
SetRelayOutputStateResponse	<i>This is an empty message.</i>	
Fault codes	Description	
env:Sender ter:InvalidArgVal ter:RelayToken	<i>Unknown relay token reference.</i>	

<sup>1</sup> There is no GetRelayState command; the current logical state of the relay output is transmitted via notification and their properties.

## 5.10 Digital Inputs

The `DigitalInput` type represents the integrated physical digital inputs of a device which enable connection to external devices, such as doorbells, detectors, lights or switches (device that can be toggled between an open and closed circuit).

### 5.10.1 GetDigitalInputs

This command lists all available digital inputs of a device. A device that signals support for digital inputs via its capabilities shall support listing of available inputs through the `GetDigitalInputs` command.

The following operations allow client to configure the digital inputs configuration data of device. Device shall support these operations if device signals that it supports Digital input configurations via `DigitalInputOptions` capability.

**Table 22: GetDigitalInputs command**

<b>GetDigitalInputs</b>		Access Class: READ_MEDIA
<b>Message name</b>	<b>Description</b>	
<code>GetDigitalInputsRequest</code>	<i>This is an empty message.</i>	
<code>GetDigitalInputsResponse</code>	<i>Contains a list of structures describing all available digital inputs of the device. If a device has no digital inputs an empty list is returned.</i>  Tt:DigitalInput <b>DigitalInputs</b> [0][unbounded]	
<b>Fault codes</b>	<b>Description</b>	
<i>No specific fault codes.</i>		

### 5.10.2 GetDigitalInputConfigurationOptions

This operation retrieves the digital input configuration options when the digital input configuration token is known. If a specific digital input is specified, the options shall concern that particular configuration. If a token is not specified, the options shall be considered generic for the device.

**Table 23: GetDigitalInputConfigurationOptions command**

<b>GetDigitalInputConfigurationOptions</b>		Access Class: READ_SYSTEM
<b>Message name</b>	<b>Description</b>	
<code>GetDigitalInputConfigurationOptionsRequest</code>	<i>This message contains an optional token of a digital input configuration. If no token is specified, the options are applicable for all digital inputs.</i>  tt:ReferenceToken <b>Token</b> [0][1]	
<code>GetDigitalInputConfigurationOptionsResponse</code>	<i>The message contains the configuration options.</i>  tt:DigitalInputOptions <b>DigitalInputOptions</b> [1][1]	
<b>Fault codes</b>	<b>Description</b>	
env:Sender ter:InvalidArgVal	<i>The requested configuration indicated by Token does not exist.</i>	

ter:NoConfig	
--------------	--

### 5.10.3 SetDigitalInputConfigurations

This operation modifies existing digital input configurations. When applying multiple configuration settings, the expected behaviour is to configure all or none. If the setting is invalid, the expected behaviour is to configure none, and a remark is provided in fault to indicate which digital input configuration is not acceptable.

**Table 24: SetDigitalInputConfigurations command**

SetDigitalInputConfigurations		Access Class: ACTUATE
Message name	Description	
SetDigitalInputConfigurationsRequest	<p>The <b>DigitalInputs</b> element contains the modified digital input configurations containing the unique configuration token. The digital input configuration shall exist in the device.</p> <p>tt:DigitalInput <b>DigitalInputs</b>[1][unbounded]</p>	
SetDigitalInputConfigurationsResponse	<p>This message is empty.</p>	
Fault codes	Description	
env:Sender ter:InvalidArgVal ter:NoConfig	<p>The requested digital input configuration does not exist.</p>	
env:Sender ter:InvalidArgVal ter:SettingsInvalid	<p>The requested settings are incorrect. Token need to be returned to indicate which digital input configuration is not acceptable.</p>	

## 5.11 SerialPorts

The SerialPort type represents the physical serial port on the device and allows serial data to be read and written.

### 5.11.1 GetSerialPorts

This command lists all available serial ports of a device. A device that has one or more physical serial ports shall support listing of available serial ports through the GetSerialPorts command.

**Table 25: GetSerialPorts command**

<b>GetSerialPorts</b>		Access Class: READ_SYSTEM
<b>Message name</b>	<b>Description</b>	
GetSerialPortsRequest	<i>This is an empty message.</i>	
GetSerialPortsResponse	<i>Contains a list of structures describing all available serial ports of the device. If a device has no serial ports an empty list is returned</i>  tmd:SerialPort <b>SerialPort</b> [0][unbounded]	
<b>Fault codes</b>	<b>Description</b>	
<i>No specific fault codes.</i>		

### 5.11.2 GetSerialPortConfiguration

This operation gets a list of all available Serial ports and their settings.

**Table 26: GetSerialPortConfiguration command**

<b>GetSerialPortConfiguration</b>		Access Class: READ_SYSTEM
<b>Message name</b>	<b>Description</b>	
GetSerialPortConfigurationRequest	<i>This message contains the token of the serial port.</i>  Tt:ReferenceToken <b>SerialPortToken</b> [1][1]	
GetSerialPortConfigurationResponse	<i>This message contains an array of SerialPortConfiguration.</i>  Tmd:SerialPortConfiguration <b>SerialPortConfiguration</b> [1][1]	
<b>Fault codes</b>	<b>Description</b>	
env:Sender ter:InvalidArgVal ter:InvalidSerialPort	<i>The supplied serial port token does not exist.</i>	

### 5.11.3 SetSerialPortConfiguration

This operation sets the setting of serial port.

**Table 27: SetSerialPortConfiguration command**

SetSerialPortConfiguration		Access Class: WRITE_SYSTEM
Message name	Description	
SetSerialPortConfigurationRequest	<p>The <b>SerialPortToken</b> element specifies the serial port whose configuration is to be modified.</p> <p>The <b>SerialPortConfiguration</b> element contains the modified serial port configuration.</p> <p>The <b>ForcePersistence</b> 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.</p> <p>Tt:ReferenceToken <b>SerialPortToken</b>[1][1]            tmd:SerialPortConfiguration <b>SerialPortConfiguration</b> [1][1]            xs:boolean <b>ForcePersistence</b>[1][1]</p>	
SetSerialPortConfigurationResponse	<p>This is an empty message.</p>	
Fault codes	Description	
env:Sender ter:InvalidArgVal ter:InvalidSerialPort	<p>The supplied serial port token does not exist.</p>	
Env:Sender ter:InvalidArgVal ter:ConfigModify	<p>The configuration parameters are not possible to set.</p>	



#### 5.11.4 GetSerialPortConfigurationOptions

This operation requests the SerialPortConfigurationOptions of a SerialPort. A device that has one or more SerialPorts shall support this command.

**Table 28: GetSerialPortConfigurationOptions command**

GetSerialPortConfigurationOptions		Access Class: READ_SYSTEM
Message name	Description	
GetSerialPortConfigurationOptions-Request	<p>The <b>SerialPortToken</b> element specifies the Serial Port whose options are requested.</p> <p>Tt:ReferenceToken <b>SerialPortToken</b>[1][1]</p>	
GetSerialPortConfigurationOptions-Response	<p>tmd:SerialPortConfigurationOptions <b>SerialPortConfigurationOptions</b> [1][1]</p>	
Fault codes	Description	
env:Sender ter:InvalidArgVal ter:InvalidSerialPort	<p>The supplied serial port token does not exist.</p>	

### 5.11.5 Send and/or Receive serial command

This section describes operations to transmit/receive *generic* controlling data to/from a serial device that is connected to the serial port of the device.

This operation can be used for the following purposes.

- Transmitting arbitrary data to the connected serial device
- Receiving data from the connected serial device
- Transmitting arbitrary data to the connected serial device and then receiving its response data

In order to make use of this command for the above purpose, this specification defines the input parameter structure as follows.

- token

This element shall be present in the request. It indicates the physical serial port reference to be used when this request is invoked.

- SerialData

This element is optional to be put in the request. When transmitting serial data is needed, the request should contain the element.

- TimeOut

This element is optional to be put in the request. Depending on the specified value, it is possible for various configurations as follows.

- (i) TimeOut > PT0S: Indicates that the command should be responded back within the specified period of time. In the case the device received the data which meets one of the following conditions of DataLength and Delimiter, the device should respond back with the received data instead of waiting for the specified time.
- (ii) TimeOut = PT0S: Indicates that the command should be responded back immediately (Non-blocking). It will be used in the case of only transmitting data.
- (iii) TimeOut = -PT1S: Indicates that the command should be responded after one of the following conditions (DataLength / Delimiter) is met. How long the device can hold the blocking state is *vendor specific*.

If this element is not present in the request, the command should be responded after one of the following conditions (DataLength / Delimiter) is met. How long the device can hold the blocking state is *vendor specific*.

- DataLength

This element is optional to be put in the request. This element may be put in the case that data length returned from the connected serial device is already determined as some fixed bytes length. It indicates the length of received data which can be regarded as available.

- Delimiter

This element is optional to be put in the request. This element may be put in the case that the delimiter codes returned from the connected serial device is already known. It indicates the termination data sequence of the responded data. In case the string has more than one character a device shall interpret the whole string as a single delimiter. Furthermore a device shall return the delimiter character(s) to the client.

A device that indicates generic serial communication service capability shall support this command.

**Table 29: Send and/or Receive serial command**

<b>SendReceiveSerialCommand</b>		Access Class: ACTUATE
<b>Message name</b>	<b>Description</b>	
SendReceiveSerialCommandRequest	<i>See above for information about the parameters.</i>  Tmd:SerialData <b>SerialData</b> [0][1] xs:duration <b>TimeOut</b> [0][1] xs:integer <b>DataLength</b> [0][1] xs:string <b>Delimiter</b> [0][1]	
SendReceiveSerialCommandResponse	<i>This message contains the serial data.</i>  Tmd:SerialData <b>SerialData</b> [0][1]	
<b>Fault codes</b>	<b>Description</b>	
env:Sender ter:InvalidArgVal ter:InvalidSerialPort	<i>The supplied serial port token does not exist.</i>	
Env:Sender ter:OperationProhibited ter:DataLengthOver	<i>Number of available bytes exceeded.</i>	
Env:Sender ter:OperationProhibited ter:DelimiterNotSupported	<i>Sequence of character (delimiter) is not supported.</i>	

## 5.12 Capabilities

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

**VideoSources:** Number of video sources (defaults to none).

**VideoOutputs:** Number of video outputs (defaults to none).

**AudioSources:** Number of audio sources (defaults to none).

**AudioOutputs:** Number of audio outputs (defaults to none).

**RelayOutputs:** Number of relay outputs (defaults to none).

**DigitalInputs:** Number of digital inputs (defaults to none).

**SerialPorts:** Number of serial ports (defaults to none).

**Table 30: GetServiceCapabilities command**

<b>GetServiceCapabilities</b>		Access Class: PRE_AUTH
<b>Message name</b>	<b>Description</b>	
GetServiceCapabilitiesRequest	<i>This is an empty message.</i>	
GetServiceCapabilitiesResponse	<i>The capability response message contains the requested service capabilities using a hierarchical XML capability structure.</i>  Tmd:Capabilities <b>Capabilities</b> [1][1]	
<b>Fault codes</b>	<b>Description</b>	
	<i>No command specific faults!</i>	

## 5.13 Events

For the definition of configuration change events see also the Event section of the ONVIF Media Service Specification.

### 5.13.1 DigitalInput State Change

A device that signals support for digital inputs in its capabilities shall provide the following event whenever one of its input state changes:

Topic: tns1:Device/Trigger/DigitalInput

```
<tt:MessageDescription IsProperty="true">
  <tt:Source>
    <tt:SimpleItemDescription Name="InputToken" Type="tt:ReferenceToken"/>
  </tt:Source>
  <tt:Data>
    <tt:SimpleItemDescription Name="LogicalState" Type="xs:boolean"/>
  </tt:Data>
</tt:MessageDescription>
```

Digital Input LogicalState can be either set at "true" to represent the circuit in the closed state or set at "false" to represent the circuit in the open state.

### 5.13.2 Relay Output Trigger

A device that signals RelayOutputs in its capabilities should provide the Trigger event whenever its relay output state is changed. A device shall use the following topic and message format:

Topic: tns1:Device/Trigger/Relay

```
<tt:MessageDescription IsProperty="true">
  <tt:Source>
    <tt:SimpleItemDescription Name="RelayToken" Type="tt:ReferenceToken"/>
  </tt:Source>
  <tt:Data>
    <tt:SimpleItemDescription Name="LogicalState" Type="tt:RelayLogicalState"/>
  </tt:Data>
</tt:MessageDescription>
```

### 5.14 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 31: DeviceIO service specific fault codes**

Fault Code	Parent Subcode	Fault Reason	Description
	Subcode		
env:Sender	ter:InvalidArgVal	Invalid configuration parameters	The configuration parameters are not possible to set.
	Ter:ConfigModify		
env:Sender	ter:InvalidArgVal	Video output token does not exist.	The requested VideoOutput indicated with <b>VideoOutputToken</b> does not exist.
	Ter:NoVideoOutput		
env:Sender	ter:InvalidArgVal	Video source token does not exist.	The requested VideoSource indicated with <b>VideoSourceToken</b> does not exist.
	Ter:NoVideoSource		
env:Sender	ter:InvalidArgVal	Audio output token does not exist.	The requested AudioOutput indicated with <b>AudioOutputToken</b> does not exist.
	Ter:NoAudioOutput		
env:Sender	ter:InvalidArgVal	Audio source token does not exist.	The requested AudioSource indicated with <b>AudioSourceToken</b> does not exist.
	Ter:NoAudioSource		
env:Sender	ter:InvalidArgVal	Unknown relay token reference	The requested RelayOutput indicated <b>RelayOutputToken</b> does not exist.
	Ter:RelayToken		
env:Sender	ter:InvalidArgVal	Monostable delay time not valid	
	ter:ModeError		
env:Sender	ter:InvalidArgVal	Serial port token not valid	The supplied serial port token does not exist.
	Ter:InvalidSerialPort		
env:Sender	ter:OperationProhibited	Data length over	Number of available bytes exceeded.
	Ter:DataLengthOver		
env:Sender	ter:OperationProhibited	Delimiter is not supported	Sequence of character (delimiter) is not supported.
	Ter:DelimiterNotSupported		
env:Sender	ter:InvalidArgVal	The requested digital input configuration does not exist.	The requested configuration indicated by the configuration token does not exist.
	ter:NoConfig		
env:Sender	ter:InvalidArgVal	Invalid configuration.	The requested settings are incorrect.

**Annex A. Revision History**

Rev.	Date	Editor	Changes
2.1	Jul-2011	Hans Busch	Split from Core 2.0 Change Request 232
2.1.1	Jan-2012	Hans Busch	Change Requests 259, 291, 535
2.2	May-2012	M.Tonomura	Add serial port function
2.2.1	Dec-2012	Hans Busch	Change Request 708
2.4.1	Dec-2013	Michio Hirai	Change Request 1217
2.5	Dec-2014	Michio Hirai	Change Request 1492, 1516
2.6	Jun-2015	Michio Hirai	Change Request 1589, 1639, 1642
2.6.1	Aug-2015	Tom Yui Hans Busch	Add Digital Input Configuration Change Request 1633