ONVIF™
Imaging Service Specification

Version 2.4
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ONVIF Core Specification
<http://www.onvif.org/onvif/specs/core/ONVIF-Core-Specification-v220.pdf>

3 Terms and Definitions

3.1 Definitions

Digital PTZ	Function that diminishes or crops an image to adjust the image position and ratio.
Imaging Service	Services for exposure time, gain and white balance parameters among others.
Input/Output (I/O)	Currently relay ports and Video/Audio Inputs/Outputs are handled.
Optical Zoom	Changes the focal length (angle of view) for the device by moving the zoom lens in the camera's optics.
Image Stabilization	Functionality used to avoid blurring of images due to movement of the device or its objects.

4 Overview

The imaging service provides configuration and control data for imaging specific properties. WSDL is part of the framework and provided in the Imaging WSDL file.

The service includes the following operations:

- Get and set imaging configurations (exposure time, gain and white balance, for example).
- Get imaging configuration options (valid ranges for imaging parameters).
- Move focus lens.
- Stop ongoing focus movement.
- Get current position and move status for focus.

WSDL for this service is specified in http://www.onvif.org/ver20/imaging/wsdl/imaging.wsdl.

Table 1: Referenced namespaces (with prefix)

Prefix	Namespace URI
env	http://www.w3.org/2003/05/soap-envelope
ter	http://www.onvif.org/ver10/error
xs	http://www.w3.org/2001/XMLSchema
tt	http://www.onvif.org/ver10/schema
timg	http://www.onvif.org/ver20/imaging/wsdl
tns1	http://www.onvif.org/ver10/topics

5 Service

The imaging service provides operations used to control and configure imaging properties on a device. A device that has one or more video sources should support the imaging service as defined in [ONVIF Imaging WSDL]. The imaging settings are part of the VideoSource entity. This means that imaging parameters directly affect a specific video source.

5.1 Imaging settings

The imaging service provides operations to get or set imaging parameters and the valid ranges for those parameters. Some parameters have no effect if a specific mode is not set. Some of the parameters included in the settings require a specific imaging capability that can be requested through the GetOptions command. The following settings are available through the imaging service operations:

BacklightCompensation: Enables/disables BLC mode (on/off)

- On
    - Optional level parameter (unspecified unit).
- Off

Brightness: Adjusts the image brightness (unspecified unit).

ColorSaturation: Adjusts the color saturation in the image (unspecified unit).

Sharpness: Adjusts the sharpness in the image (unspecified unit).

Contrast: Adjusts the image contrast (unspecified unit).

Exposure:

- Auto – Enables the exposure algorithm on the device:
    - Priority – Sets the exposure priority mode (low noise/framerate).
    - Window – Rectangular exposure mask.
    - Min/MaxExposureTime – Exposure time range allowed to be used by the algorithm.
    - Min/MaxGain – The sensor gain range that is allowed to be used by the algorithm.
    - Min/MaxIris – The iris range allowed to be used by the algorithm.
- Manual – Disables the exposure algorithm on the device:
    - ExposureTime – The fixed exposure time used by the image sensor (μs).
    - Gain – The fixed gain used by the image sensor (dB).

- Iris – The fixed attenuation of input light affected by the iris (dB). 0dB maps to a fully opened iris.

Focus:

- Auto (parameters that apply to automatic mode only):
  - Near/FarLimit – Limits for focus lens (m).
- Manual (parameters that apply to manual mode only):
  - Default speed – The default speed for focus move operation (when the speed parameter not is present). Manual control is done through the move command, see Section 5.1.4.

Ir cut filter: Toggles the Ir cut filter state between on, off and auto. The auto state lets the exposure algorithm handle when the Ir cut filter should be turned on or off.

- On: Enable Ir cut fiter. Typically Day mode.
- Off: Disable Ir cut filter. Typically Night mode.
- Auto: Ir cut filter is automatically activated by the device.

IrCutFilterAutoAdjustment: Optional parameters applied to only auto mode to adjust timing of toggling Ir cut filter

- BoundaryType – Specifies which boundaries to automatically toggle Ir cut filter following parameters are applied to:
  - Common: Applied to both boundaries automatically toggling Ir cut filter on and off
  - ToOn/ToOff: Applied individually to one of the boundaries automatically toggling Ir cut filter to on/off
- BoundaryOffset – Adjusts boundary exposure level for toggling Ir cut filter to on/off specified with unitless normalized value from +1.0 to -1.0. Zero is default and -1.0 is the darkest adjustment (Unitless).
- ResponseTime – Delay time of toggling Ir cut filter to on/off after crossing of the boundary exposure levels

Whitebalance:

- Auto whitebalancing mode (auto/manual).
- Manual (parameters that apply to manual mode only):
  - Rgain (unitless).
  - Bgain (unitless).

WideDynamicRange: Whide dynamic range (on/off):

- On
    - Optional level parameter (unitless).
- Off

Image Stabilization: Enables/disables Image Stabilization feature (on/off/auto):

- On: Enable Image Stabilization feature.
    - Optional level parameter (unspecified unit).
- Off: Disable Image Stabilization feature
- Auto: Image Stabilization feature is automatically activated by the device

The available imaging settings can be retrieved through the GetVideoSources command part of the media service, as specified in the ONVIF Media Service Specification. The imaging settings are part of the video source.

5.1.1 Get imaging settings

This operation requests the imaging setting for a video source on the device. A device implementing the imaging service shall support this command.

If the Video Source supports any of the imaging settings as defined by the ImagingSettings type in the [ONVIF Schema], then it should be possible to retrieve the imaging settings from the device through the GetImagingSettings command.

The imaging settings parameters are described in Section 5.1.

Table 2: GetImagingSettings command

GetImagingSettings	Access Class: READ_MEDIA
Message name	**Description**
GetImagingSettingsRequest	*This message contains a reference to the VideoSource for which the ImagingSettings should be requested.* tt:ReferenceToken **VideoSourceToken**[1][1]
GetImagingSettingsResponse	*This message contains the ImagingSettings for the VideoSource that was requested* tt:ImagingSettings20**ImagingSettings**[1][1]
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoSource	*The requested VideoSource does not exist.*
env:Receiver ter:ActionNotSupported ter:NoImagingForSource	*The requested VideoSource does not support imaging settings.*

5.1.2 Set imaging settings

This operation sets the imaging settings for a video source on a device. A device implementing the imaging service shall support this command.

If the device supports any of the imaging settings as defined by the ImagingSettings type in [ONVIF Schema], then the it should be possible to configure these parameters in the device through the SetImagingSettings command.

The possible configurable imaging settings parameters are described in Section 5.1. Settings options are obtained through the command defined in Section 5.1.3

Table 3: SetImagingSettings command

SetImagingSettings	Access Class: ACTUATE
Message name	**Description**
SetImagingSettingsRequest	*This message contains a reference to the VideoSource and ImagingSettings that should be set.* *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:ReferenceToken **VideoSourceToken**[1][1] tt:ImagingSettings20**ImagingSettings**[1][1] xs:boolean **ForcePersistence** [0][1]
SetImagingSettingsResponse	*This message contains no response.*
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoSource	*The requested VideoSource does not exist.*
env:Receiver ter:ActionNotSupported ter:NoImagingForSource	*The requested VideoSource does not support imaging settings.*
env:Sender ter:InvalidArgVal ter:SettingsInvalid	*The requested settings are incorrect.*

5.1.3 Get options

This operation gets the valid ranges for the imaging parameters that have device specific ranges. A device implementing the imaging service shall support this command. The command shall return all supported parameters and their ranges such that these can be applied to the SetImagingSettings command.

For read-only parameters which cannot be modified via the SetImagingSettings command only a single option or identical Min and Max values shall be provided.

Table 4:GetOptions command

GetOptions	Access Class: READ_MEDIA
Message name	**Description**
GetOptionsRequest	*Reference to the VideoSource for which the imaging parameter options are requested.* tt:ReferenceToken **VideoSourceToken**[1][1]
GetOptionsResponse	*This message contains the valid ranges for the imaging parameters that are categorized as device specific.* tt:ImagingOptions20 **ImagingOptions**[1][1]
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoSource	*The requested VideoSource does not exist.*
env:Receiver ter:ActionNotSupported ter:NoImagingForSource	*The requested VideoSource does not support imaging settings.*

5.1.4 Move

The Move command moves the focus lens in an absolute, a relative or in a continuous manner from its current position. The speed argument is optional for absolute and relative control, but required for continuous. If no speed argument is used, the default speed is used. Focus adjustments through this operation will turn off the autofocus. A device with support for remote focus control should support absolute, relative or continuous control through the Move operation. The supported MoveOpions are signalled via the GetMoveOptions command.

At least one focus control capability is required for this operation to be functional.

The move operation contains the following commands:

Absolute – Requires position parameter and optionally takes a speed argument. A unitless type is used by default for focus positioning and speed. Optionally, if supported, the position may be requested in m^{-1} units.

Relative – Requires distance parameter and optionally takes a speed argument. Negative distance means negative direction.

Continuous – Requires a speed argument. Negative speed argument means negative direction.

Table 5: Move (focus) command

Move	Access Class: ACTUATE
Message name	**Description**
MoveRequest	*Reference to the VideoSource for the requested move (focus) operation.* tt:ReferenceToken **VideoSourceToken**[1][1] tt:FocusMove **Focus**[1][1]
MoveResponse	*This message is empty*
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoSource	*The requested VideoSource does not exist.*
env:Receiver ter:ActionNotSupported ter:NoImagingForSource	*The requested VideoSource does not support imaging settings.*

5.1.5 Get move options

The GetMoveOptions command retrieves the focus lens move options to be used in the move command as defined in Section 5.1.4. A device that supports the imaging service shall support the GetMoveOptions command. The response to the command shall include all supported Move Operations. If focus move is not supported at all, the reponse shall be empty.

Table 6: GetMoveOptions (focus) command

GetMoveOptions	Access Class: READ_MEDIA
Message name	**Description**
GetMoveOptionsRequest	*Reference to the VideoSource for the requested move options.* tt:ReferenceToken **VideoSourceToken**[1][1]
GetMoveOptionsResponse	*This message contains the valid ranges for the focus lens move options.* tt:MoveOptions20 **MoveOptions**[1][1]
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoSource	*The requested VideoSource does not exist.*
env:Receiver ter:ActionNotSupported ter:NoImagingForSource	*The requested VideoSource does not support imaging settings.*

5.1.6 Stop

The Stop command stops all ongoing focus movements of the lense. A device with support for remote focus control as signalled via the GetMoveOptions should support this command. The operation will not affect ongoing autofocus operation.

Table 7: Stop (focus) command

Stop	Access Class: ACTUATE
Message name	**Description**
StopRequest	*Reference to the VideoSource where the focus movement should be stopped.* tt:ReferenceToken **VideoSourceToken**[1][1]
StopResponse	*This message is empty*
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoSource	*The requested VideoSource does not exist.*
env:Receiver ter:ActionNotSupported ter:NoImagingForSource	*The requested VideoSource does not support imaging settings.*

5.1.7 Get imaging status

The GetStatus command requested the current imaging status from the device. A device with support for remote focus control as signalled via the GetMoveOptions shall support this command.

The imaging status contains:

- Focus position, move status and error information.
    - The focus position is represented in a unitless type.
    - Move status may be in a MOVING, IDLE or UNKNOWN state.
    - Error information provided as a string, for example a positioning error indicated by the hardware.

Table 8: GetStatus (focus) command

GetStatus	Access Class: READ_MEDIA
Message name	**Description**
GetStatusRequest	*This message contains a reference to the VideoSource where the imaging status should be requested.* tt:VideoSourceToken **VideoSourceToken**[1][1]
GetStatusResponse	This message contains the requested imaging status. tt:ImagingStatus20 **ImagingStatus**[1][1]
Fault codes	**Description**
env:Sender ter:InvalidArgVal ter:NoSource	*The requested VideoSource does not exist.*
env:Receiver ter:ActionNotSupported ter:NoImagingForSource	*The requested VideoSource does not support imaging settings.*

5.1.8 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:

ImageStabilization: Indicates whether or not Image Stabilization feature is supported.

Table 9: GetServiceCapabilities command

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

5.2 Service specific data types

5.2.1 ImagingStatus

```
<xs:complexType name="ImagingStatus"/>
   <xs:element name="FocusStatus" type= "tt:FocusStatus"/>
</xs:complexType>
```

- **FocusStatus**

5.2.2 FocusStatus

```
<xs:complexType name="FocusStatus"/>
   <xs:element name="Position" type="xs:float"/>
   <xs:element name="MoveStatus" type="tt:MoveStatus"/>
   <xs:element name="Error" type="xs:string"/>
</xs:complexType>
```

- **Position**
  Status of focus position.

- **MoveStatus**
  Status of focus MoveStatus.

- **Error**
  Error status of focus.

5.2.3 FocusConfiguration

```
<xs:complexType name="FocusConfiguration"/>
   <xs:element name="AutoFocusMode" type="tt:AutoFocusMode"/>
   <xs:element name="DefaultSpeed" type="xs:float"/>
   <xs:element name="NearLimit" type="xs:float"/>
   <xs:element name="FarLimit" type="xs:float"/>
```

```
</xs:complexType>
```

- **AutoFocusMode**
- **DefaultSpeed**
- **NearLimit**
  Parameter to set autofocus near limit (unit: meter).
- **FarLimit**
  Parameter to set autofocus far limit (unit: meter). If set to 0.0, infinity will be used.

5.2.4 ImagingSettings

```
<xs:complexType name="ImagingSettings"/>
 <xs:element name="BacklightCompensation" type= "tt:BacklightCompensation"
            minOccurs="0"/>
   <xs:element name="Brightness" type="xs:float" minOccurs="0"/>
   <xs:element name="ColorSaturation" type="xs:float" minOccurs="0"/>
   <xs:element name="Contrast" type="xs:float" minOccurs="0"/>
   <xs:element name="Exposure" type= "tt:Exposure" minOccurs="0"/>
   <xs:element name="Focus" type= "tt:FocusConfiguration" minOccurs="0"/>
   <xs:element name="IrCutFilter" type="tt:IrCutFilterMode" minOccurs="0"/>
   <xs:element name="Sharpness" type="xs:float" minOccurs="0"/>
   <xs:element name="WideDynamicRange" type= "tt:WideDynamicRange"
            minOccurs="0"/>
   <xs:element name="WhiteBalance" type= "tt:WhiteBalance minOccurs="0"/>
</xs:complexType>
```

- **BacklightCompensation**
  Enabled/disabled BLC mode (on/off).
- **Brightness**
  Image brightness (unit unspecified).
- **ColorSaturation**
  Color saturation of the image (unit unspecified).
- **Contrast**
  Contrast of the image (unit unspecified).
- **Exposure**
  Exposure mode of the device.
- **Focus**
  Focus configuration.
- **IrCutFilter**
  Infrared Cutoff Filter settings.
- **Sharpness**
  Sharpness of the Video image.
- **WideDynamicRange**
  WDR settings.
- **WhiteBalance**
  White balance settings.

5.2.5 Exposure

```
<xs:complexType name="Exposure"/>
   <xs:element name="Mode" type="tt:ExposureMode"/>
   <xs:element name="Priority" type="tt:ExposurePriority"/>
```

```
   <xs:element name="Window" type= "tt:Rectangle"/>
   <xs:element name="MinExposureTime" type="xs:float"/>
   <xs:element name="MaxExposureTime" type="xs:float"/>
   <xs:element name="MinGain" type="xs:float"/>
   <xs:element name="MaxGain" type="xs:float"/>
   <xs:element name="MinIris" type="xs:float"/>
   <xs:element name="MaxIris" type="xs:float"/>
   <xs:element name="ExposureTime" type="xs:float"/>
   <xs:element name="Gain" type="xs:float"/>
   <xs:element name="Iris" type="xs:float"/>
</xs:complexType>
```

- **Mode**
  Exposure Mode
    - Auto – Enabled the exposure algorithm on the device.
    - Manual – Disabled exposure algorithm on the device.
- **Priority**
  The exposure priority mode (low noise/framerate).
- **Window**
  Rectangular exposure mask.
- **MinExposureTime**
  Minimum value of exposure time range allowed to be used by the algorithm.
- **MaxExposureTime**
  Maximum value of exposure time range allowed to be used by the algorithm.
- **MinGain**
  Minimum value of the sensor gain range that is allowed to be used by the algorithm.
- **MaxGain**
  Maximum value of the sensor gain range that is allowed to be used by the algorithm.
- **MinIris**
  Minimum value of the iris range allowed to be used by the algorithm.
- **MaxIris**
  Maximum value of the iris range allowed to be used by the algorithm.
- **ExposureTime**
  The fixed exposure time used by the image sensor (µs).
- **Gain**
  The fixed gain used by the image sensor (dB).
- **Iris**
  The fixed attenuation of input light affected by the iris (dB). 0dB maps to a fully opened iris.

5.2.6 WideDynamicRange

```
<xs:complexType name="WideDynamicRange"/>
   <xs:element name="Mode" type="tt:WideDynamicMode"/>
   <xs:element name="Level" type="xs:float"/>
</xs:complexType>
```

- **Mode**
  White dynamic range (on/off)
- **Level**
  Optional level parameter (unitless)

5.2.7 BacklightCompensation

```
<xs:complexType name="BacklightCompensation"/>
   <xs:element name="Mode" type= "tt:BacklightCompensationMode"/>
   <xs:element name="Level" type="xs:float"/>
</xs:complexType>
```

- **Mode**
  Backlight compensation mode (on/off).

- **Level**
  Optional level parameter (unit unspecified).

5.2.8 FocusMove

```
<xs:complexType name="FocusMove"/>
   <xs:element name="Absolute" type= "tt:AbsoluteFocus" minOccurs="0"/>
   <xs:element name="Relative" type= "tt:RelativeFocus" minOccurs="0"/>
   <xs:element name="Continuous" type= "tt:ContinuousFocus" minOccurs="0"/>
</xs:complexType>
```

- **Absolute**
  Parameters for the absolute focus control.

- **Relative**
  Parameters for the relative focus control.

- **Continuous**
  Parameter for the continuous focus control.

5.2.9 AbsoluteFocus

```
<xs:complexType name="AbsoluteFocus"/>
   <xs:element name="Position" type="xs:float"/>
   <xs:element name="Speed" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Position**
  Position parameter for the absolute focus control.

- **Speed**
  Speed parameter for the absolute focus control.

5.2.10 RelativeFocus

```
<xs:complexType name="RelativeFocus"/>
   <xs:element name="Distance" type="xs:float"/>
   <xs:element name="Speed" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Distance**
  Distance parameter for the relative focus control.

- **Speed**
  Speed parameter for the relative focus control.

5.2.11 ContinuousFocus

```
<xs:complexType name="ContinuousFocus"/>
   <xs:element name="Speed" type="xs:float"/>
</xs:complexType>
```

- **Speed**
  Speed parameter for the Continuous focus control.

5.2.12 MoveOptions

```
<xs:complexType name="MoveOptions"/>
<xs:element name="Absolute" type= "tt:AbsoluteFocusOptions" minOccurs="0"/>
   <xs:element name="Relative" type= "tt:RelativeFocusOptions"
            minOccurs="0"/>
   <xs:element name="Continuous" type= "tt:ContinuousFocusOptions"
            minOccurs="0"/>
</xs:complexType>
```

- **Absolute**
- **Relative**
- **Continuous**

5.2.13 AbsoluteFocusOptions

```
<xs:complexType name="AbsoluteFocusOptions"/>
<xs:element name="Position" type= "tt:FloatRange"/>
   <xs:element name="Speed" type= "tt:FloatRange"minOccurs="0"/>
</xs:complexType>
```

- **Position**
  Valid ranges of the position.
- **Speed**
  Valid ranges of the speed.

5.2.14 RelativeFocusOptions

```
<xs:complexType name="RelativeFocusOptions"/>
<xs:element name="Distance" type= "tt:FloatRange"/>
            <xs:element name="Speed" type= "tt:FloatRange"/>
</xs:complexType>
```

- **Distance**
  Valid ranges of the distance.
- **Speed**
  Valid ranges of the speed.

5.2.15 ContinuousFocusOptions

```
<xs:complexType name="ContinuousFocusOptions"/>
   <xs:element name="Speed" type= "tt:FloatRange"/>
</xs:complexType>
```

- **Speed**
  Valid ranges of the speed.

5.2.16 WhiteBalance

```
<xs:complexType name="WhiteBalance"/>
   <xs:element name="Mode" type="tt:WhiteBalanceMode"/>
   <xs:element name="CrGain" type="xs:float"/>
   <xs:element name="CbGain" type="xs:float"/>
</xs:complexType>
```

- **Mode**
  Auto whitebalancing mode (auto/manual).
- **CrGain**
  Rgain (unitless).

- **CbGain**
  Bgain (unitless).

5.2.17 ImagingStatus20

```
<xs:complexType name="ImagingStatus20"/>
   <xs:element name="FocusStatus20" type= "tt:FocusStatus20"
            minOccurs="0"/>
</xs:complexType>
```

- **FocusStatus20**
  Status of focus.

5.2.18 FocusStatus20

```
<xs:complexType name="FocusStatus20"/>
   <xs:element name="Position" type="xs:float"/>
   <xs:element name="MoveStatus" type="tt:MoveStatus"/>
   <xs:element name="Error" type="xs:string" minOccurs="0"/>
</xs:complexType>
```

- **Position**
  Status of focus position.

- **MoveStatus**
  Status of focus MoveStatus.

- **Error**
  Error status of focus.

5.2.19 ImagingSettings20

```
Type describing the ImagingSettings of a VideoSource. The supported options
            and ranges can be obtained via the GetOptions command.
<xs:complexType name="ImagingSettings20"/>
   <xs:element name="BacklightCompensation" type=
            "tt:BacklightCompensation20" minOccurs="0"/>
   <xs:element name="Brightness" type="xs:float" minOccurs="0"/>
   <xs:element name="ColorSaturation" type="xs:float" minOccurs="0"/>
   <xs:element name="Contrast" type="xs:float" minOccurs="0"/>
   <xs:element name="Exposure" type= "tt:Exposure20" minOccurs="0"/>
   <xs:element name="Focus" type= "tt:FocusConfiguration20" minOccurs="0"/>
   <xs:element name="IrCutFilter" type="tt:IrCutFilterMode" minOccurs="0"/>
   <xs:element name="Sharpness" type="xs:float" minOccurs="0"/>
   <xs:element name="WideDynamicRange" type= "tt:WideDynamicRange20"
            minOccurs="0"/>
   <xs:element name="WhiteBalance" type= "tt:WhiteBalance20 minOccurs="0"/>
   <xs:element name="Extension" type="tt:ImagingSettingsExtension20"
            minOccurs="0"/>
</xs:complexType>
```

- **BacklightCompensation**
  Enabled/disabled BLC mode (on/off).

- **Brightness**
  Image brightness (unit unspecified).

- **ColorSaturation**
  Color saturation of the image (unit unspecified).

- **Contrast**
  Contrast of the image (unit unspecified).

- **Exposure**
  Exposure mode of the device.

- **Focus**
  Focus configuration.

- **IrCutFilter**
  Infrared Cutoff Filter settings.

- **Sharpness**
  Sharpness of the Video image.

- **WideDynamicRange**
  WDR settings.

- **WhiteBalance**
  White balance settings.

5.2.20 ImagingSettingsExtension20

```
<xs:complexType name=" ImagingSettingsExtension20"/>
   <xs:element name=”ImageStabilization" type="tt:ImageStabilization"
            minOccurs="0"/>
   <xs:element name="Extension" type="tt:ImagingSettingsExtension202"
            minOccurs="0"/>
</xs:complexType>
```

- **ImageStabilization**
  Optional element to configure Image Stabilization feature.

5.2.21 ImagingSettingsExtension202

```
<xs:complexType name=" ImagingSettingsExtension202"/>
   <xs:element name=”IrCutFilterAutoAdjustment"
            type="tt:IrCutFilterAutoAdjustment" minOccurs="0"
            maxOccurs="unbounded"/>
   <xs:element name="Extension" type="tt:ImagingSettingsExtension203"
            minOccurs="0"/>
</xs:complexType>
```

- **IrCutFilterAutoAdjustment**
  Optional parameters applied to only auto mode to adjust timing of toggling of Ir cut filter.

5.2.22 ImageStabilization

```
<xs:complexType name="ImageStabilization"/>
   <xs:element name="Mode" type="tt:ImageStabilizationMode"/>
   <xs:element name="Level" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
  Parameter to enable/disable Image Stabilization feature.

- **Level**
  Optional level parameter (unit unspecified)

5.2.23 IrCutFilterAutoAdjustment

```
<xs:complexType name="IrCutFilterAutoAdjustment"/>
   <xs:element name="BoundaryType" type="xs:string"/>
   <xs:element name="BoundaryOffset" type="xs:float" minOccurs="0"/>
   <xs:element name="ResponseTime" type="xs:duration" minOccurs="0"/>
</xs:complexType>
```

- **BoundaryType**
  Specifies which boundaries to automatically toggle Ir cut filter following parameters are applied to. Its options shall be chosen from tt:IrCutFilterAutoBoundaryType.

- **BoundaryOffset**
  Adjusts boundary exposure level for toggling Ir cut filter to on/off specified with unitless normalized value from +1.0 to -1.0. Zero is default and -1.0 is the darkest adjustment (Unitless).

- **ResponseTime**
  Delay time of toggling Ir cut filter to on/off after crossing of the boundary exposure levels.

5.2.24 WideDynamicRange20

Type describing whether WDR mode is enabled or disabled (on/off).

```
<xs:complexType name="WideDynamicRange20"/>
   <xs:element name="Mode" type="tt:WideDynamicMode"/>
   <xs:element name="Level" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
  Wide dynamic range mode (on/off).

- **Level**
  Optional level parameter (unit unspecified).

5.2.25 BacklightCompensation20

Type describing whether BLC mode is enabled or disabled (on/off).

```
<xs:complexType name="BacklightCompensation20"/>
   <xs:element name="Mode" type= "tt:BacklightCompensationMode"/>
   <xs:element name="Level" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
  Backlight compensation mode (on/off).

- **Level**
  Optional level parameter (unit unspecified).

5.2.26 Exposure20

Type describing the exposure settings.

```
<xs:complexType name="Exposure20"/>
   <xs:element name="Mode" type="tt:ExposureMode"/>
   <xs:element name="Priority" type="tt:ExposurePriority" minOccurs="0"/>
   <xs:element name="Window" type= "tt:Rectangle" minOccurs="0"/>
   <xs:element name="MinExposureTime" type="xs:float" minOccurs="0"/>
   <xs:element name="MaxExposureTime" type="xs:float" minOccurs="0"/>
   <xs:element name="MinGain" type="xs:float" minOccurs="0"/>
   <xs:element name="MaxGain" type="xs:float" minOccurs="0"/>
   <xs:element name="MinIris" type="xs:float" minOccurs="0"/>
   <xs:element name="MaxIris" type="xs:float" minOccurs="0"/>
   <xs:element name="ExposureTime" type="xs:float" minOccurs="0"/>
   <xs:element name="Gain" type="xs:float" minOccurs="0"/>
   <xs:element name="Iris" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
  Exposure Mode

- Auto – Enabled the exposure algorithm on the device.
- Manual – Disabled exposure algorithm on the device.

- **Priority**
  The exposure priority mode (low noise/framerate).
- **Window**
  Rectangular exposure mask.
- **MinExposureTime**
  Minimum value of exposure time range allowed to be used by the algorithm.
- **MaxExposureTime**
  Maximum value of exposure time range allowed to be used by the algorithm.
- **MinGain**
  Minimum value of the sensor gain range that is allowed to be used by the algorithm.
- **MaxGain**
  Maximum value of the sensor gain range that is allowed to be used by the algorithm.
- **MinIris**
  Minimum value of the iris range allowed to be used by the algorithm.
- **MaxIris**
  Maximum value of the iris range allowed to be used by the algorithm.
- **ExposureTime**
  The fixed exposure time used by the image sensor (µs).
- **Gain**
  The fixed gain used by the image sensor (dB).
- **Iris**
  The fixed attenuation of input light affected by the iris (dB). 0dB maps to a fully opened iris.

5.2.27 ImagingOptions20

```
<xs:complexType name="ImagingOptions20"/>
   <xs:element name="BacklightCompensation" type=
            "tt:BacklightCompensationOptions20" minOccurs="0"/>
   <xs:element name="Brightness" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="ColorSaturation" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="Contrast" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="Exposure" type= "tt:ExposureOptions20" minOccurs="0"/>
   <xs:element name="Focus" type= "tt:FocusOptions20 minOccurs="0"/>
   <xs:element name="IrCutFilterModes" type="tt:IrCutFilterMode"
            minOccurs="0" maxOccurs="unbounded"/>
   <xs:element name="Sharpness" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="WideDynamicRange" type= "tt:WideDynamicRangeOptions20"
            minOccurs="0"/>
   <xs:element name="WhiteBalance" type= "tt:WhiteBalanceOptions20"
            minOccurs="0"/>
   <xs:element name="Extension" type="tt:ImagingOptions20Extension"
            minOccurs="0"/>
</xs:complexType>
```

- **BacklightCompensation**
  Valid range of Backlight Compensation.
- **Brightness**
  Valid range of Brightness.

- **ColorSaturation**
  Valid range of Color Saturation.

- **Contrast**
  Valid range of Contrast.

- **Exposure**
  Valid range of Exposure.

- **Focus**
  Valid range of Focus.

- **IrCutFilterModes**
  Valid range of IrCutFilterModes.

- **Sharpness**
  Valid range of Sharpness.

- **WideDynamicRange**
  Valid range of WideDynamicRange.

- **WhiteBalance**
  Valid range of WhiteBalance.

5.2.28 ImagingOptions20Extension

```
<xs:complexType name="ImagingOptions20Extension"/>
   <xs:element name="ImageStabilization"
            type="tt:ImageStabilizationOptions" mixOccurs="0"/>
   <xs:element name="Extension" type="tt:ImagingOptions20Extension2"
            minOccurs="0"/>
</xs:complexType>
```

- **ImageStabilization**
  Options of parameters for Image Stabilization feature.

5.2.29 ImagingOptions20Extension2

```
<xs:complexType name="ImagingOptions20Extension2"/>
   <xs:element name="IrCutFilterAutoAdjustment" type="tt:
            IrCutFilterAutoAdjustmentOptions" mixOccurs="0"/>
   <xs:element name="Extension" type="tt:ImagingOptions20Extension3"
            minOccurs="0"/>
</xs:complexType>
```

- **IrCutFilterAutoAdjustment**
  Options of parameters for adjustment of Ir cut filter auto mode.

5.2.30 ImageStabilizationOptions

```
<xs:complexType name="ImageStabilizationOptions"/>
   <xs:element name="Mode" type="tt:ImageStabilizationMode"
            maxOccurs="unbounded"/>
   <xs:element name="Level" type="tt:FloatRange" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
  Supported options of Image Stabilization mode parameter.

- **Level**
  Valid range of the Image Stabilization.

5.2.31 IrCutFilterAutoAdjustmentOptions

```
<xs:complexType name="IrCutFilterAutoAdjustmentOptions"/>
   <xs:element name="Mode" type="tt:IrCutFilterAutoBoundaryType"
            maxOccurs="unbounded"/>
   <xs:element name="BoundaryOffset" type="xs:boolean" minOccurs="0"/>
   <xs:element name="ResponseTimeRange" type="xs:durationRange"
            minOccurs="0"/>
</xs:complexType>
```

- **Mode**
  Supported options of boundary types for adjustment of Ir cut filter auto mode.

- **BoundaryOffset**
  Indicates whether or not boundary offset for toggling Ir cut filter is supported.

- **ResponseTimeRange**
  Supported range of delay time for toggling Ir cut filter.

5.2.32 WideDynamicRangeOptions20

```
<xs:complexType name="WideDynamicRangeOptions20"/>
   <xs:element name="Mode" type="tt:WideDynamicMode"
            maxOccurs="unbounded"/>
   <xs:element name="Level" type= "tt:FloatRange" minOccurs="0"/>
</xs:complexType>
```

- **Mode**

- **Level**

5.2.33 BacklightCompensationOptions20

```
<xs:complexType name="BacklightCompensationOptions20"/>
   <xs:element name="Mode" type= "tt:BacklightCompensationMode
            maxOccurs="unbounded"/>
   <xs:element name="Level" type= "tt:FloatRange" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
  'ON' or 'OFF'

- **Level**
  Level range of BacklightCompensation.

5.2.34 ExposureOptions20

```
<xs:complexType name="ExposureOptions20"/>
   <xs:element name="Mode" type="tt:ExposureMode" maxOccurs="unbounded"/>
   <xs:element name="Priority" type="tt:ExposurePriority" minOccurs="0"
            maxOccurs="unbounded"/>
   <xs:element name="MinExposureTime" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="MaxExposureTime" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="MinGain" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="MaxGain" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="MinIris" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="MaxIris" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="ExposureTime" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="Gain" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="Iris" type= "tt:FloatRange" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
  Exposure Mode

- Auto – Enabled the exposure algorithm on the device.
- Manual – Disabled exposure algorithm on the device.

- **Priority**
  The exposure priority mode (low noise/framerate).
- **MinExposureTime**
  Valid range of the Minimum ExposureTime.
- **MaxExposureTime**
  Valid range of the Maximum ExposureTime.
- **MinGain**
  Valid range of the Minimum Gain.
- **MaxGain**
  Valid range of the Maximum Gain.
- **MinIris**
  Valid range of the Minimum Iris.
- **MaxIris**
  Valid range of the Maximum Iris.
- **ExposureTime**
  Valid range of the ExposureTime.
- **Gain**
  Valid range of the Gain.
- **Iris**
  Valid range of the Iris.

5.2.35 ImageStabilizationOptions

```
<xs:complexType name="ImageStabilizationOptions"/>
   <xs:element name="Mode" type="tt:ImageStabilizationMode"
            maxOccurs="unbounded"/>
   <xs:element name="Level" type="tt:FloatRange" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
  Supported options of Image Stabilization mode parameter.
- **Level**
  Valid range of the Image Stabilization.

5.2.36 MoveOptions20

```
<xs:complexType name="MoveOptions20"/>
   <xs:element name="Absolute" type= "tt:AbsoluteFocusOptions
            minOccurs="0"/>
   <xs:element name="Relative" type= "tt:RelativeFocusOptions20
            minOccurs="0"/>
   <xs:element name="Continuous" type= "tt:ContinuousFocusOptions
            minOccurs="0"/>
</xs:complexType>
```

- **Absolute**
  Valid ranges for the absolute control.
- **Relative**
  Valid ranges for the relative control.

- **Continuous**
  Valid ranges for the continuous control.

5.2.37 RelativeFocusOptions20

```
<xs:complexType name="RelativeFocusOptions20"/>
   <xs:element name="Distance" type= "tt:FloatRange"/>
   <xs:element name="Speed" type= "tt:FloatRange"minOccurs="0"/>
</xs:complexType>
```

- **Distance**
  Valid ranges of the distance.

- **Speed**
  Valid ranges of the speed.

5.2.38 WhiteBalance20

```
<xs:complexType name="WhiteBalance20"/>
   <xs:element name="Mode" type="tt:WhiteBalanceMode"/>
   <xs:element name="CrGain" type="xs:float" minOccurs="0"/>
   <xs:element name="CbGain" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
  'AUTO' or 'MANUAL'

- **CrGain**
  Rgain (unitless).

- **CbGain**
  Bgain (unitless).

5.2.39 FocusConfiguration20

```
<xs:complexType name="FocusConfiguration20"/>
   <xs:element name="AutoFocusMode" type="tt:AutoFocusMode"/>
   <xs:element name="DefaultSpeed" type="xs:float" minOccurs="0"/>
   <xs:element name="NearLimit" type="xs:float" minOccurs="0"/>
   <xs:element name="FarLimit" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **AutoFocusMode**
  Mode of auto fucus.
  - AUTO
  - MANUAL

- **DefaultSpeed**

- **NearLimit**
  Parameter to set autofocus near limit (unit: meter).

- **FarLimit**
  Parameter to set autofocus far limit (unit: meter).

5.2.40 WhiteBalanceOptions20

```
<xs:complexType name="WhiteBalanceOptions20"/>
   <xs:element name="Mode" type="tt:WhiteBalanceMode"
            maxOccurs="unbounded"/>
   <xs:element name="YrGain" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="YbGain" type= "tt:FloatRange" minOccurs="0"/>
```

```
</xs:complexType>
```

- **Mode**
  Mode of WhiteBalance.
  - AUTO
  - MANUAL
- **YrGain**
- **YbGain**

5.2.41 FocusOptions20

```
<xs:complexType name="FocusOptions20"/>
   <xs:element name="AutoFocusModes" type="tt:AutoFocusMode" minOccurs="0"
            maxOccurs="unbounded"/>
   <xs:element name="DefaultSpeed" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="NearLimit" type= "tt:FloatRange" minOccurs="0"/>
   <xs:element name="FarLimit" type= "tt:FloatRange" minOccurs="0"/>
</xs:complexType>
```

- **AutoFocusModes**
  Mode of Auto Focus.
  - AUTO
  - MANUAL
- **DefaultSpeed**
  Valid range of DefaultSpeed.
- **NearLimit**
  Valid range of NearLimit.
- **FarLimit**
  Valid range of FarLimit.

5.3 Events

The Message structure of these events is given by the following Message Description:

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

The SourceToken points to the source the image is coming from. This is in case of the Analytics or Image Service a VideoSource token and in case of the Recording Service the Recording job token.

5.3.1 Tampering

For Video Sources, Tamper Alarm situations are defined which indicate that the video camera is blended, covered, moved, or unplugged.

The tampering could be detected be different services (e.g by the Imaging Service or the Analytics Service). Some clients may want to get the information which service detected the event. Therefore the topic is used to give this additional information. The following three services are defined as source, a device MAY add additional ones if necessary.

5.3.1.1 ImageTooBlurry

When a camera is out-of-focus, such that important details are lost, the device should use the ImageTooBlurry notification in order to notify a client about the possible tampering if the device supports this feature.

```
tns1:VideoSource/ImageTooBlurry/AnalyticsService

tns1:VideoSource/ImageTooBlurry/ImagingService

tns1:VideoSource/ImageTooBlurry/RecordingService
```

5.3.1.2 ImageTooDark

When a camera is covered, such that the corresponding video signal becomes mostly black, the device should use the ImageTooDark notification in order to notify a client about the possible tampering if the device supports this feature.

```
tns1:VideoSource/ImageTooDark/AnalyticsService

tns1:VideoSource/ImageTooDark/ImagingService

tns1:VideoSource/ImageTooDark/RecordingService
```

5.3.1.3 ImageTooBright

When a camera is blended, such that the corresponding video signal becomes mostly white, the device should use the ImageTooBright notification in order to notify a client about the possible tampering if the device supports this feature.

```
tns1:VideoSource/ImageTooBright/AnalyticsService

tns1:VideoSource/ImageTooBright/ImagingService

tns1:VideoSource/ImageTooBright/RecordingService
```

5.3.1.4 GlobalSceneChange

When a large portion of the video content changes, the cause can be tamper actions like camera movement or coverage. If this feature is supported by the device it should notify the client using the following event:

```
tns1:VideoSource/GlobalSceneChange/AnalyticsService
```

```
tns1:VideoSource/GlobalSceneChange/ImagingService

tns1:VideoSource/GlobalSceneChange/RecordingService
```

5.3.1.5 SignalLoss

For devices having an analog input source, cutting the analog line between device and camera is a possible tampering which results in Video Loss. A device that supports this feature shouldprovide the following event:

```
tns1:VideoSource/SignalLoss
```

5.3.2 MotionAlarm

When a device detects motion (e.g by an Analytics Service) it can inform a client using this event. This event is a basic motion alarm event that should be supported by all devices that support motion detection. If a device has a more complex algorithm running it is free to provide a vendor specific motion alarm event. If the device supports motion detection it should provide the following event.

```
tns1:VideoSource/MotionAlarm
```

5.4 Service specific fault codes

Table 9 lists the imaging service specific fault codes. In addition each command can also generate a generic fault.

The specific faults are defined as subcode of a generic fault. The parent generic subcode is the *subcode* at the top of each row below and the specific fault *subcode* is at the bottom of the cell.

Table 10: Imaging specific fault codes

Fault Code	Parent Subcode Subcode	Fault Reason	Description
env:Receiver	ter:ActionNotSupported ter:NoImagingForSource	VideoSource does not support imaging settings	The requested VideoSource does not support imaging settings.
env:Sender	ter:InvalidArgVal ter:SettingsInvalid	Invalid configuration	The requested settings are incorrect.
env:Sender	ter:InvalidArgVal ter:NoSource	Video source does not exist	The requested VideoSource does not exist.

Annex A. Revision History

Rev.	Date	Editor	Changes
2.1	Jul-2011	Hans Busch	Split from Core 2.0 without change of content.
2.1.1	Jan-2012	Hans Busch	Change Requests 535
2.2	Feb-2012	Takahiro Iwasaki	Addition of Image Stabilization and events Change Requests 654, 662, 664, 665
2.2.1	Dec-2012	Hans Busch	Change Request 708, 709
2.4	Mar-2013	Takahiro Iwasaki	Addition of IRCF Auto Adjustment parameters