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Milestone Systems

Universal drivers

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milestone

Contents

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Overview

Introduction

The Universal driver is to be used when:

- there is no dedicated driver for the device, or
- the device is not ONVIF compatible.

In order to be able to use the Universal driver you need to know the RTSP or HTTP URL of the video/audio stream and the currently used codec. Getting the URL and the type of codec of the device can usually be done from the device's Web Page or documentation.

Please note: Specific information on how to get the URL and codec of the device is out of the scope of this document.

The Universal driver can be looked at as a stream media receiver/player. It does only receive multimedia streams and does not control the device in any way. As no specifics of command API or protocols are known the driver does not send any commands to the device. The Universal driver tries to receive a multimedia stream from a device using standard streaming methods (RTSP/RTP, HTTP streaming or JPEG snapshots).

There are currently 3 variations of the Universal driver available in XProtect:

- 1 channel
- 16 channels
- 64 channels

The operation of all these is the same - with the difference of number video/audio channels available from the same device with one IP/hostname.

This document covers the configuration for the 1 channel driver - but the information is valid for the other 2 drivers as well.

Supported features

- Video streaming
    - Codecs: JPEG, MPEG4, H.264, H.265
    - Streaming modes: RTSP/TCP (interleaved), RTSP/UDP/unicast, RTSP/UDP/multicast, RTSP/HTTP and HTTP (only for JPEG, MPEG4 and H.264)

Note: H.264 streamed over HTTP is supported only in "H.264 Annex B" format, with prefix codes. AVCC and MP4 (MPEG-4 Part 14) formats are not currently supported.

- Audio streaming
  - Codecs: G.711, G.721, G.723, G.726, AAC
  - Streaming modes: RTPS/TCP, RTSP/UDP/unicast, RTPS/UDP/multicast, RTSP/HTTP and HTTP
- HTTPS – transferring data and video/audio over secure HTTP (HTTPS) – applicable only when HTTP or RTSP/HTTP streaming modes are selected.

Note: To use secure streaming, HTTPS must be enabled on the device as well. This is usually done through the device's web page.

Not supported features

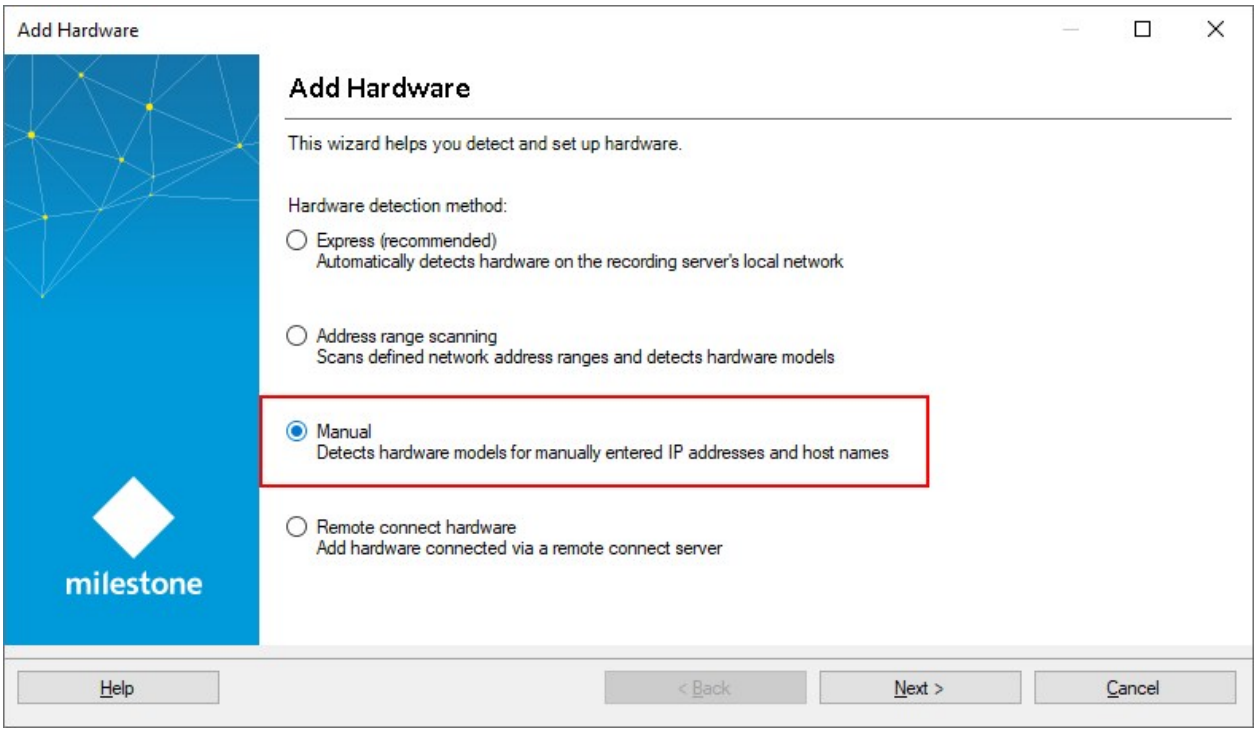
- Modifying settings of device – resolution, codec, fps, brightness, contrast, etc.
- Edge Storage – retrieving of recordings from device.
- PTZ – controlling movement of device.
- Events – receiving information about events such as motion detection, tampering, etc.
- Digital Inputs – receiving information about I/O functions of device.
- Relay Output – controlling relays of device.
- Audio Out – sending audio for playback on device's speaker (audio backchannel).
- Metadata – receiving analytics data from device.
- SRTP – secure transfer of video/audio over RTP.

Using the Universal Driver

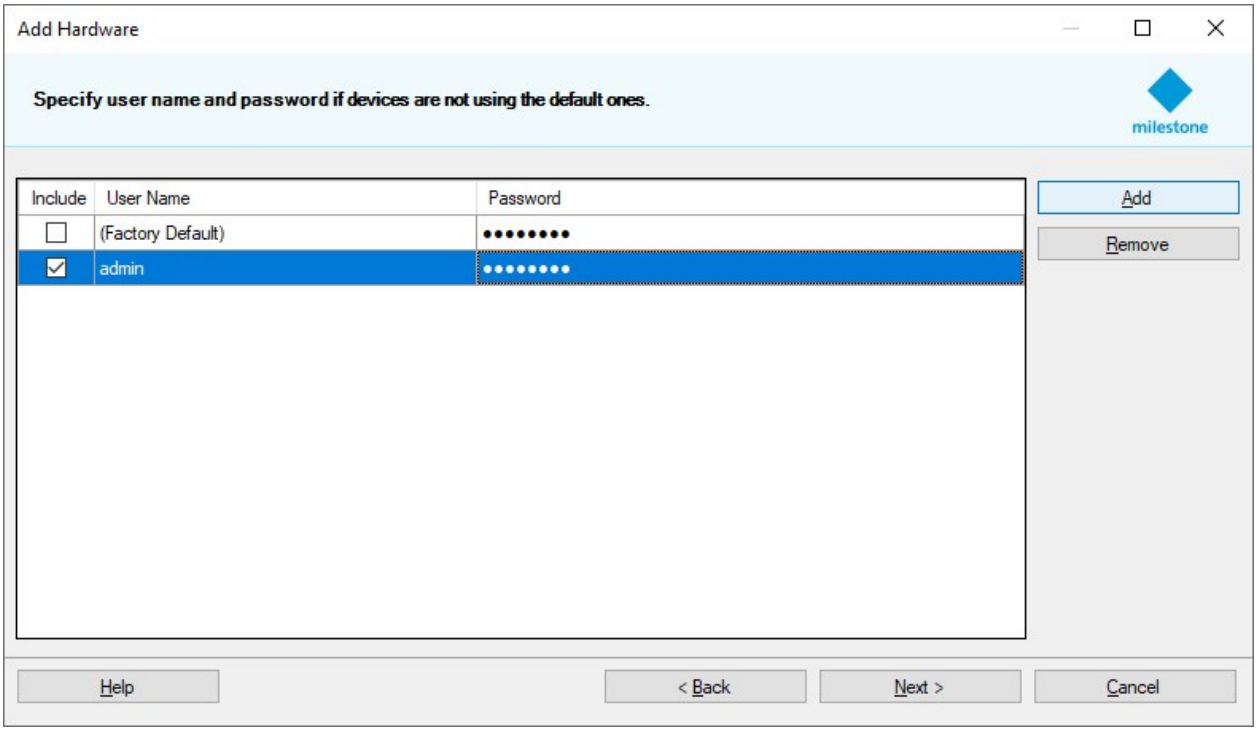
Adding in XProtect Management Client

Any device can be added to the XProtect system using the Universal driver as no checks for compatibility are done.

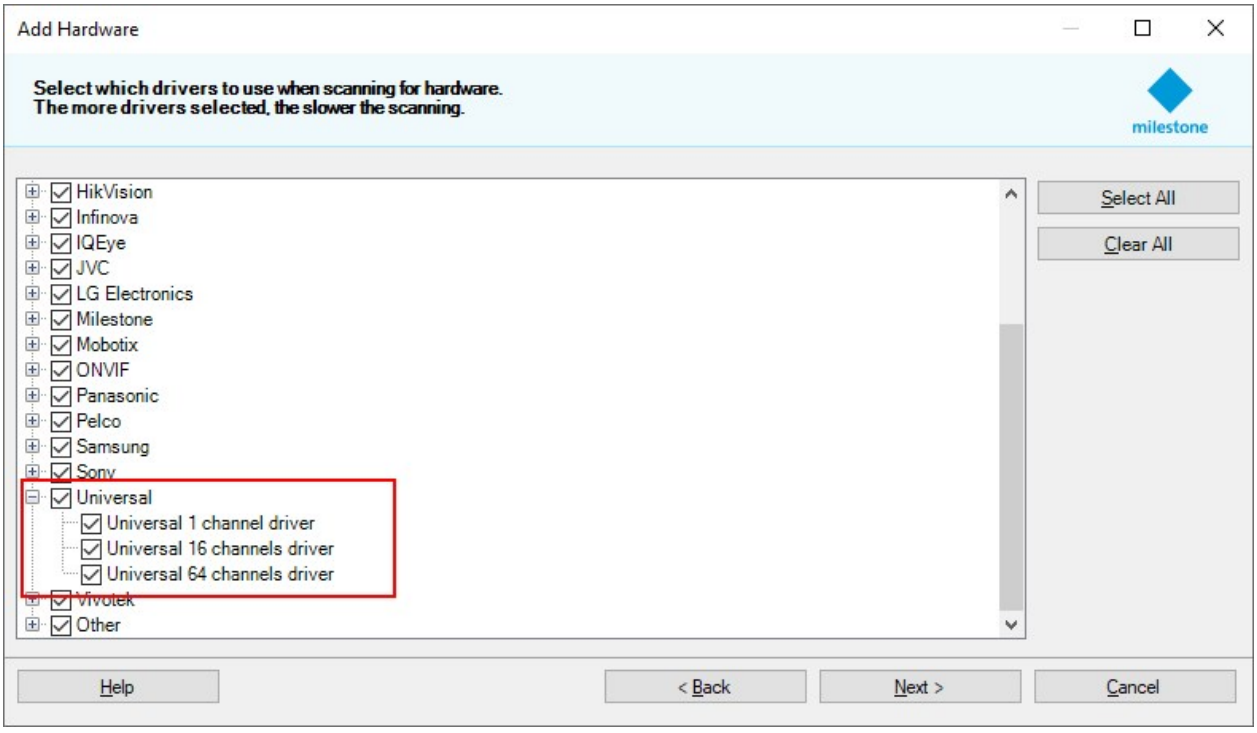
In Management Client select Add Hardware. Select “Manual” option.



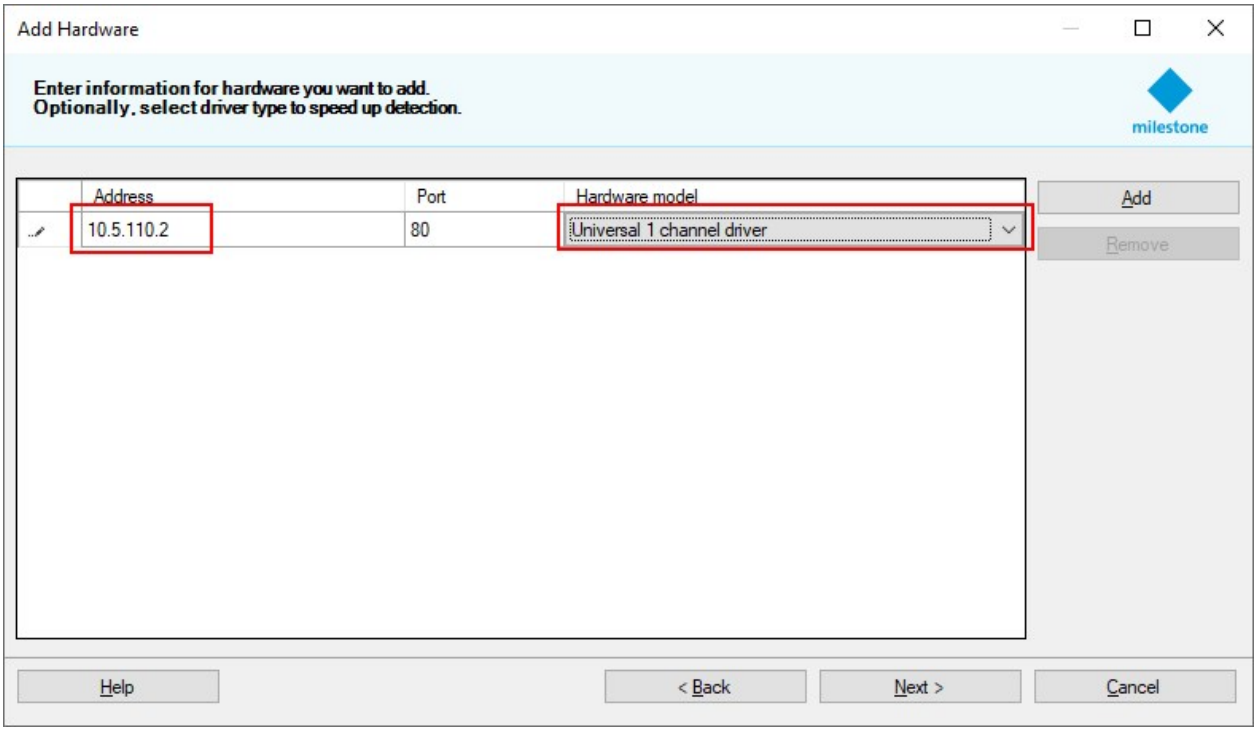
If the device requires authorization of the streams add a new username and password and de-select the “Factory Default” option.



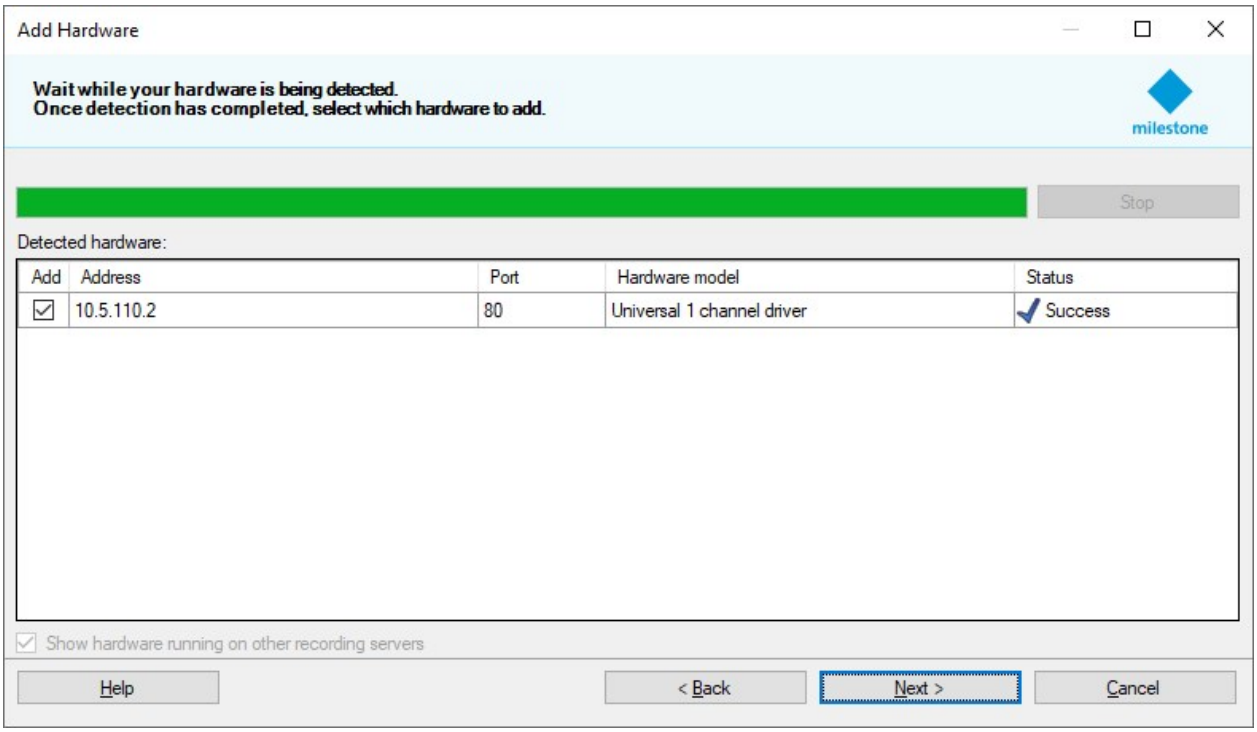
On the next step make sure that the Universal driver is selected in the list. You can use “Select All” to avoid finding it in the list.



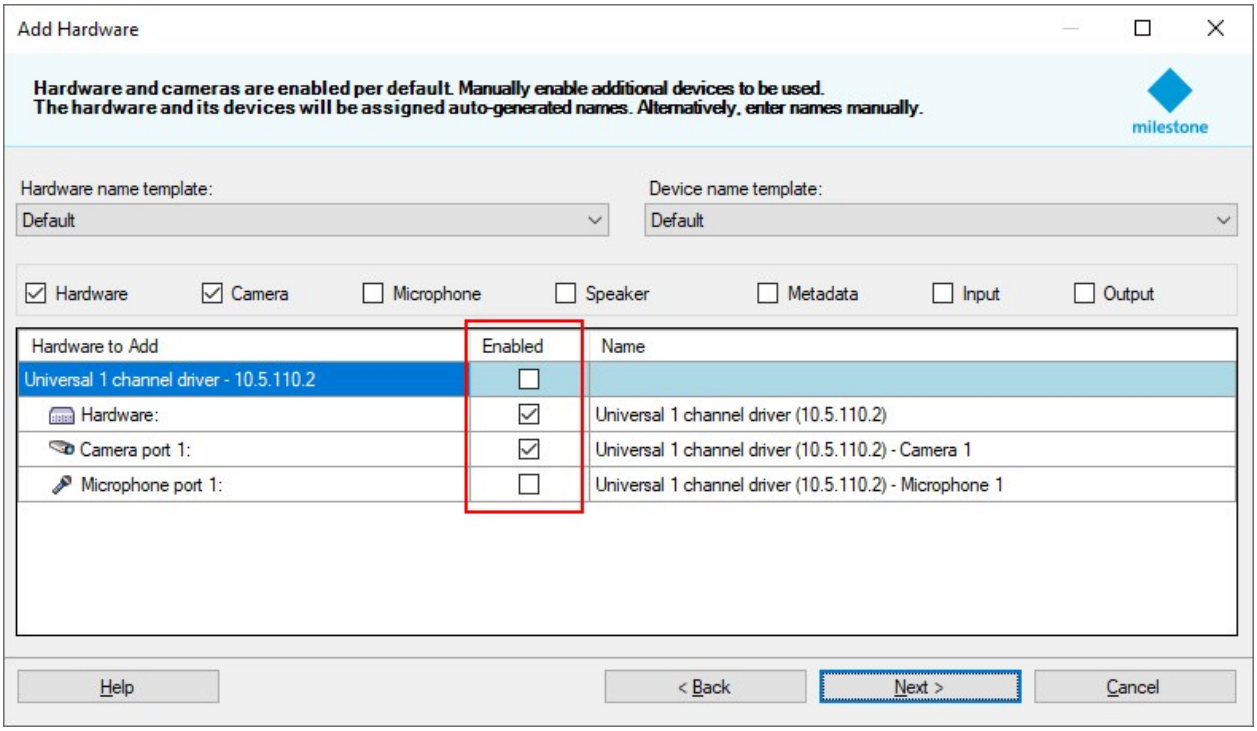
Enter the IP address or the hostname of the device and for Hardware model manually select the Universal driver. The port on this step matters only if HTTP streaming or HTTP JPEG snapshot modes will be used. If RTSP streaming is used the port specified here is not used in the driver.



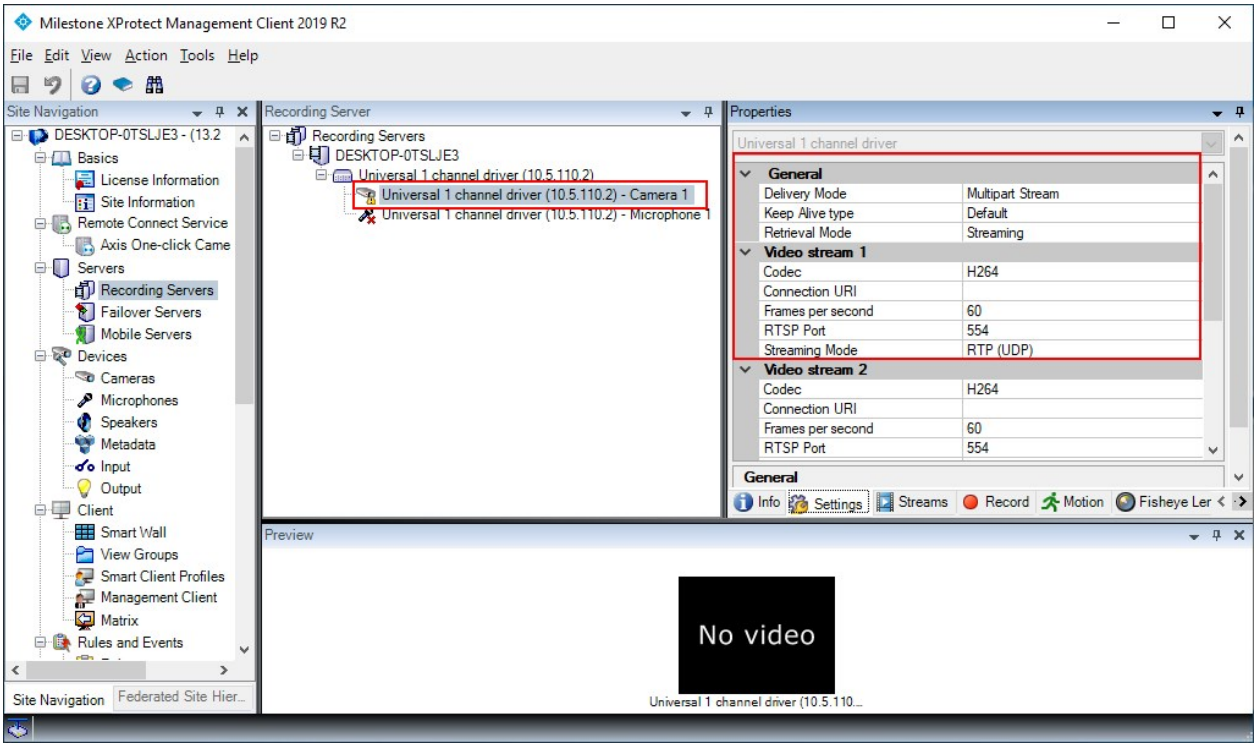
You should see success on the next two steps. At this point no communication is done with the device.



At the final two steps select whether you want to have video and/or audio and add them to groups.



After finishing the wizard you will see the device in the Recording Server's list. You will probably see a black screen for video and an error specifying lost connection. This is normal as the driver is not yet fully configured. You need to configure the parameters of the stream in the properties section of the video/audio channel.



Configuring the Universal Driver

In order for the Universal driver to receive video/audio it needs to know the Retrieval Mode, URI, codec and port.

General settings

Setting Name	Possible values	Description
Include URI options on PLAY	Yes No	Controls whether to include query parameters in the URL used for RTSP PLAY command. If “No” the query parameters (everything after “?”) in the Connection URI will be stripped before issuing the RTSP PLAY command.
HTTPS Enabled	No Yes	Used only when HTTP or RTSP/RTP/HTTP/TCP streaming is selected. No – Default value. Connection with the device will be established on the HTTP port during device add.

Setting Name	Possible values	Description
		Yes – Connection with the device will be established over HTTPS using the HTTPS port.
HTTPS Port	1-65535	Used only when HTTPS Enabled is set to Yes. Defines the HTTPS port to be used. Default value is 443.
HTTPS Validate Certificate	No Yes	Used only when HTTPS Enabled is set to Yes. No – Default value. The driver will not check the validity of the certificate. Yes – The driver will check the validity of the certificate of the device it is connecting to. If the certificate cannot be verified (is expired or the certificate chain does not lead to a trusted root), the connection will be dropped.
HTTPS Validate Hostname	No Yes	Used only when HTTPS Enabled is set to Yes. No – Default value. The driver will not check the validity of the hostname. Yes –The driver will check whether the hostname of the device it's connecting to matches the ones the certificate is issued to.

Video Channel settings

Setting Name	Possible values	Description
Delivery Mode	Multipart Stream Non Multipart Stream	Used only when HTTP streaming is selected. Controls whether to use HTTP multipart data transfer (see https://www.w3.org/Protocols/rfc1341/7_2_Multipart.html)
Keep Alive type	Default OPTIONS	Used only when RTSP streaming is selected. Defines what type of RTSP connection keep alive should be used.

Setting Name	Possible values	Description
	OPTIONS (no URL) GET_PARAMETER RTCP Never	**Default** – selected by the driver as the most appropriate. **OPTIONS** – RTSP OPTIONS command will be send by the driver periodically. **OPTIONS (no URL)** – RTSP OPTIONS command without URL will be send by the driver periodically. **GET_PARAMETER** – RTSP GET_PARAMETER command will be send by the driver periodically. **RTCP** – Driver will send RTCP client messages. **Never** – do not use keep alive. The selection for this setting depends on the requirements of the device. If you experience periodic interruptions and reconnections of the stream (once every 30 seconds to once every 5 minutes) try changing this setting.
Retrieval Mode	Streaming Snapshot	**Streaming** – RTSP streaming or HTTP streaming will be used. **Snapshot** – JPEG snapshot will be used to retrieve frames.
Codec	MJPEG MPEG-4 H264 H265	The codec of the incoming video that the driver should expect. This should match the codec selected on the device for the video stream. Can be checked on device's Web Page or using VLC (see Testing with VideoLan Player (VLC) on page 22)
Connection URI		URI to be used for establishing a video stream or to request JPEG snapshots. **NOTE: the URI must be without the IP/hostname, port and the first slash ("/") of the URL.** Example: If the URL of the video stream for the device is: "rtsp://192.168.0.10:5544/channel1/stream1" then the URI should be set as:

Setting Name	Possible values	Description
		“channel1/stream1” (without the quotes) The IP/hostname and port will be taken from the settings.
Frames per second	0.00028 - 60	Used only when the JPEG Snapshot mode is selected. Controls the interval at which to poll the device for JPEGs. Examples: 60 – poll the device 60 times per second 1 – poll the device once every second 0.1 – poll the device once every 10 seconds 0.00028 – poll the device once every hour
Multicast address	Valid multicast address	Used only for “RTP/UDP multicast”Must be set when using “RTP/UDP multicast” with “No RTSP” option. Not used otherwise.
Multicast port	1 - 65535	Multicast port that the device streams to. Must be set when Streaming mode is “RTP/UDP multicast” and Use RTSP is “No RTSP”. Not used otherwise.
RTSP Port	1 - 65535	Used only if RTSP streaming mode is selected. Sets the RTSP port to be used when connecting to the device.
SDP	“|” delimited string	String containing the SDP specification for the stream. Must be set when Streaming mode is “RTP/UDP multicast” and Use RTSP is “No RTSP”. Not used otherwise. At a minimum it must contain the following descriptions, separated by “|” - Origin (“o=”) – Multicast packets source - Media Descriptions (“m=”) – Provides information for the received stream media. - Attributes (“a=”) – Provides additional information for the stream,

Setting Name	Possible values	Description
		like codec-specific parameters
Streaming Mode	RTP/UDP RTP/RTSP/TCP HTTP RTP/UDP multicast RTP/RTSP/HTTP/TCP	Used only when “Streaming” is selected for Retrieval Mode. **RTP/UDP** – RTSP will be used and during RTSP SETUP UDP unicast RTP transfer will be requested from the device. **RTP/RTSP/TCP** - RTSP will be used and during RTSP SETUP TCP unicast interleaved RTP transfer will be requested from the device. **HTTP** – HTTP streaming mode will be used. The driver will issue a HTTP GET command and will expect in response to get the video data. If HTTPS is enabled, the HTTPS port will be used. **RTP/UDP multicast** - RTSP will be used and during RTSP SETUP UDP multicast RTP transfer will be requested from the device. **RTP/RTSP/HTTP/TCP** – RTSP will be used and tunneled through the HTTP port. If HTTPS is enabled, the HTTPS Port will be used.
Use RTSP	RTSP No RTSP	**RTSP** – Default value **No RTSP** – Compatible only with “RTP/UDP multicast” streaming mode. Requires “Multicast Port”, “Multicast Address” and “SDP” settings to be configured. The driver will try to receive an existing multicast UDP stream without using RTSP.

Audio Channel settings

Setting Name	Possible Values	Description
Delivery Mode	Multipart Stream Non Multipart Stream	Used only when HTTP streaming is selected. Controls whether to use HTTP multipart data transfer (see https://www.w3.org/Protocols/rfc1341/7_2_Multipart.html)

Setting Name	Possible Values	Description
Keep Alive type	Default OPTIONS OPTIONS (no URL) GET_PARAMETER RTCP Never	Used only when RTSP streaming is selected. Defines what type of RTSP connection keep alive should be used. **Default** – selected by the driver as the most appropriate. **OPTIONS** – RTSP OPTIONS command will be send by the driver periodically. **OPTIONS (no URL)** – RTSP OPTIONS command without URL will be send by the driver periodically. **GET_PARAMETER** – RTSP GET_PARAMETER command will be send by the driver periodically. **RTCP** – Driver will send RTCP client messages. **Never** – do not use keep alive.
Audio Codec	PCM RAW PCM mju-law PCM A-law G.711 mju-law G.711 A-law G.721 32 kbps Little-Endian G.721 32 kbps Big-Endian G.723 24 kbps Little-Endian G.723 40 kbps Little-Endian G.723 24 kbps Big-Endian G.723 40 kbps Big-Endian G.726 16 kbps Little-Endian G.726 24 kbps Little-Endian G.726 32 kbps Little-Endian G.726 40 kbps Little-Endian	The codec of the incoming audio that the driver should expect.

Setting Name	Possible Values	Description
	G.726 16 kbps Big-Endian G.726 24 kbps Big-Endian G.726 32 kbps Big-Endian G.726 40 kbps Big-Endian AAC	
Connection URI		URI to be used for establishing an audio streaming connection. NOTE: the URI must be without the IP/hostname, port and the first slash ("/") of the URL. Example: If the URL of the audio stream for the device is: "rtsp://192.168.0.10:5544/channel1/audio1" then the URI should be set as: "channel1/audio1" (without the quotes) The IP/hostname and port will be taken from the settings.
Multicast address	Valid multicast address	Multicast address that the device streams to. Must be set when using "RTP/UDP multicast" with "No RTSP" option. Not used otherwise.
Multicast port	1 - 65535	Multicast port that the device streams to. Must be set when Streaming mode is "RTP/UDP multicast" and Use RTSP is "No RTSP". Not used otherwise.
RTSP Port	1 - 65535	Used only if RTSP streaming mode is selected. Sets the RTSP port to be used when connecting to the device.
SDP	"|" delimited string	String containing the SDP specification for the stream. Must be set when Streaming mode is "RTP/UDP multicast"

Setting Name	Possible Values	Description
		and Use RTSP is “No RTSP”. Not used otherwise. At a minimum it must contain the following descriptions, separated by “|” - Origin (“o=”) – Multicast packets source - Media Descriptions (“m=”) – Provides information for the received stream media. - Attributes (“a=”) – Provides additional information for the stream, like codec-specific parameters
Streaming Mode	RTP/UDP RTP/RTSP/TCP HTTP RTP/UDP Multicast RTP/RTSP/HTTP/TCP	Used only when “Streaming” is selected for Retrieval Mode. **RTP/UDP** – RTSP will be used and during RTSP SETUP UDP unicast RTP transfer will be requested from the device. **RTP/RTSP/TCP** - RTSP will be used and during RTSP SETUP TCP unicast interleaved RTP transfer will be requested from the device. **HTTP** – HTTP streaming mode will be used. The driver will issue a HTTP GET command and will expect in response to get the audio data. If HTTPS is enabled, the HTTPS port will be used. **RTP/UDP multicast** - RTSP will be used and during RTSP SETUP UDP multicast RTP transfer will be requested from the device. **RTP/RTSP/HTTP/TCP** – RTSP will be used and tunneled through the HTTP port. If HTTPS is enabled, the HTTPS Port will be used.
Use RTSP	RTSP No RTSP	**RTSP** – Default value **No RTSP** – Compatible only with “RTP/UDP multicast” streaming mode. Requires “Multicast Port”, “Multicast Address” and “SDP” settings to be configured. The driver will try to receive an existing multicast UDP stream without using RTSP.

Configurations for different stream types:

RTSP/RTP over UDP	
Retrieval Mode	Streaming
Codec	MJPEG, MPEG4, H264 or H265
Streaming Mode	RTP/HTTP

RTSP/RTP over TCP	
Retrieval Mode	Streaming
Codec	MJPEG, MPEG4, H264 or H265
Streaming Mode	RTP/RTSP /TCP

RTSP/RTP over multicast	
Retrieval Mode	Streaming
Codec	MJPEG, MPEG4, H264 or H265
Streaming Mode	RTP/UDP multicast

RTP over multicast with No RTSP	
Retrieval Mode	Streaming
Codec	MJPEG, MPEG4, H264 or H265
Multicast address	Multicast address to which the device is streaming
Multicast port	Multicast port to which the device is streaming
SDP	"|" delimited SDP specification for the stream
Streaming Mode	RTP/UDP multicast
Use RTSP	No RTSP

*Example SDP for a H264 stream:

"o=- 0 1 IN IP4 10.5.122.63|m=video 50004 RTP/AVP 96|a=fmtp:96 packetization-mode=1;sprop-parameter-sets=Z2QAKa0AxSAeAIn5ZuAgIDSgAzf5gDN/mAHhAIVA,aO48sA==;profile-level-id=640029;level-asymmetry-allowed=1"

HTTP streaming	
Retrieval Mode	Streaming
Delivery Mode	"Multipart Stream" or "Non Multipart Stream"
Codec	MJPEG, MPEG4, H264 or H265
Streaming Mode	HTTP

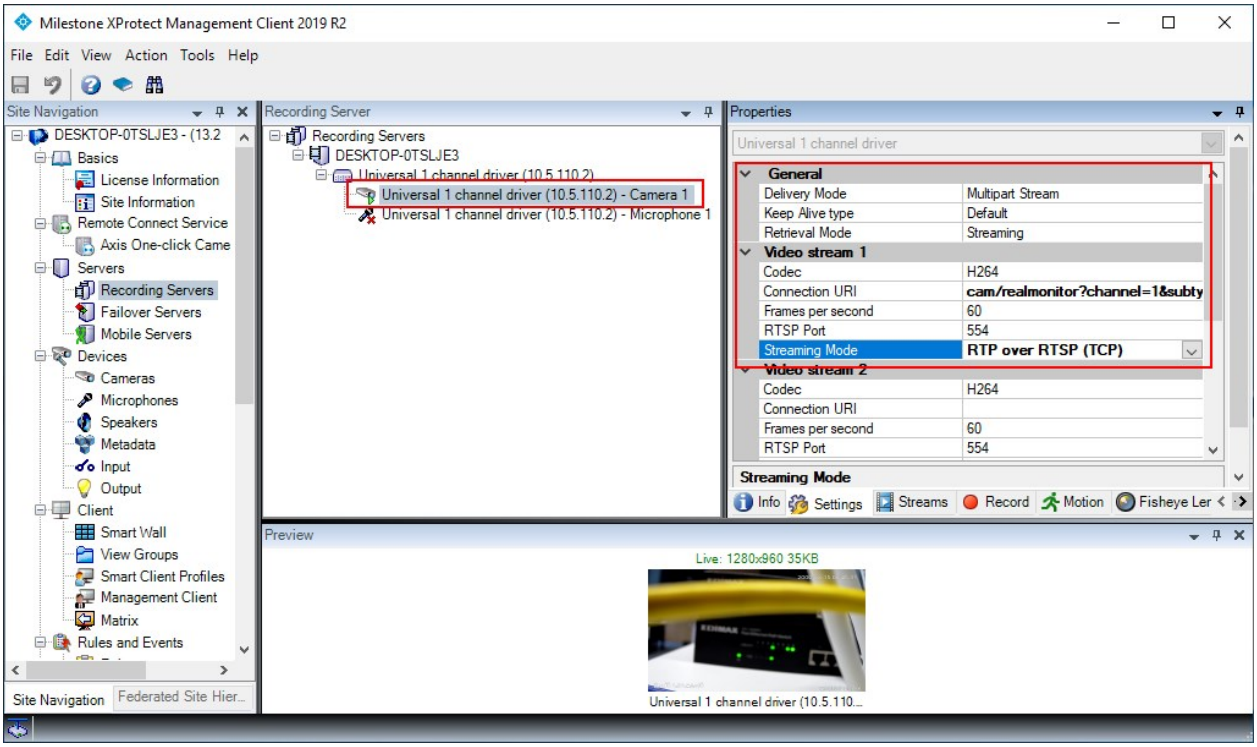
JPEG Snapshots	
Retrieval Mode	Snapshot
Codec	MJPEG
Frames per second	Needed snapshot interval
Streaming Mode	HTTP

RTSP over HTTP	
Retrieval Mode	Streaming
Codec	MJPEG, MPEG4, H264 or H265
Streaming Mode	RTP/RTSP/HTTP /TCP

RTSP over HTTPS	
Retrieval Mode	Streaming
Codec	MJPEG, MPEG4, H264 or H265
Streaming Mode	RTP/RTSP/HTTP /TCP
HTTPS Enabled	Yes
HTTPS Validate Certificate	Yes*
HTTPS Validate Hostname	Yes*

*Note: For testing purposes only “HTTPS Validate Certificate” and “HTTPS Validate Hostname” can be disabled.

Note: All configurations except “JPEG Snapshot” are valid for audio streaming as well.

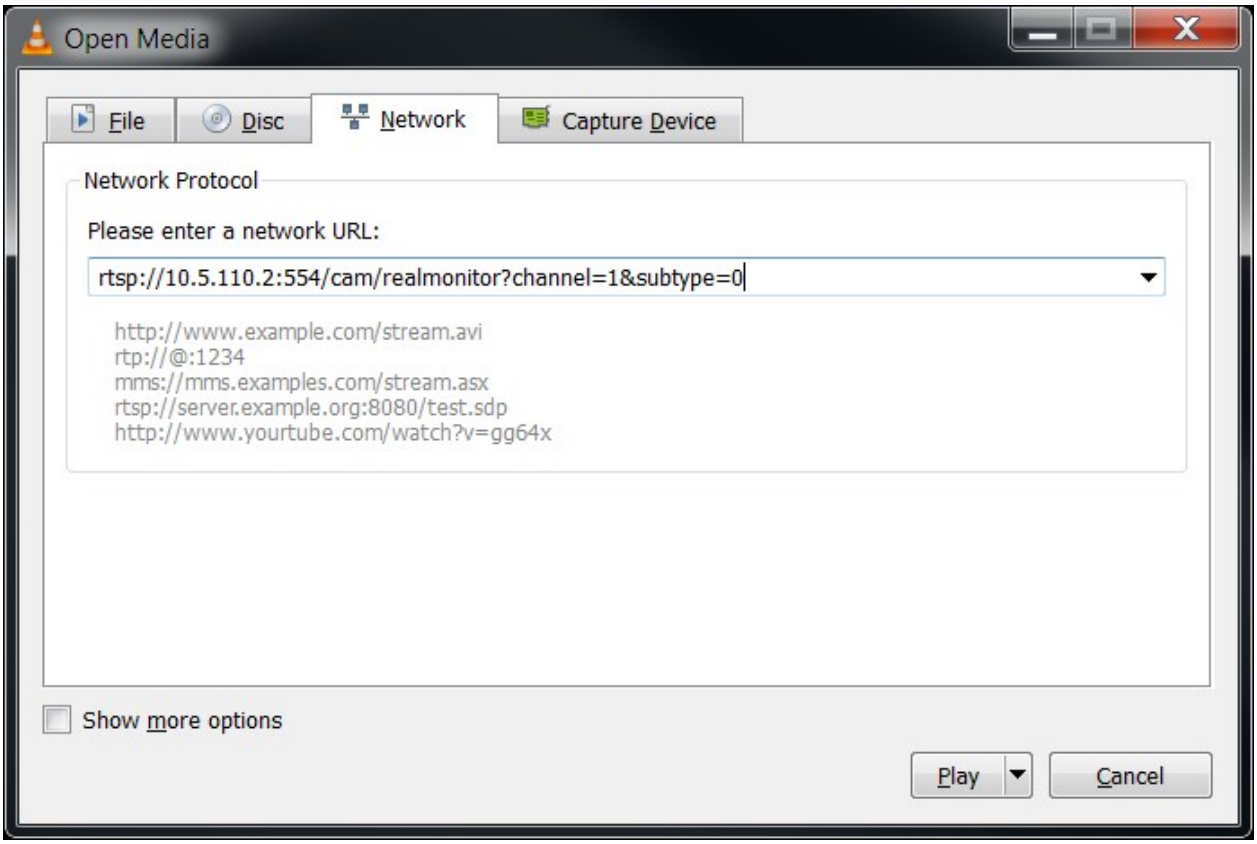


Troubleshooting

Testing with VideoLan Player (VLC)

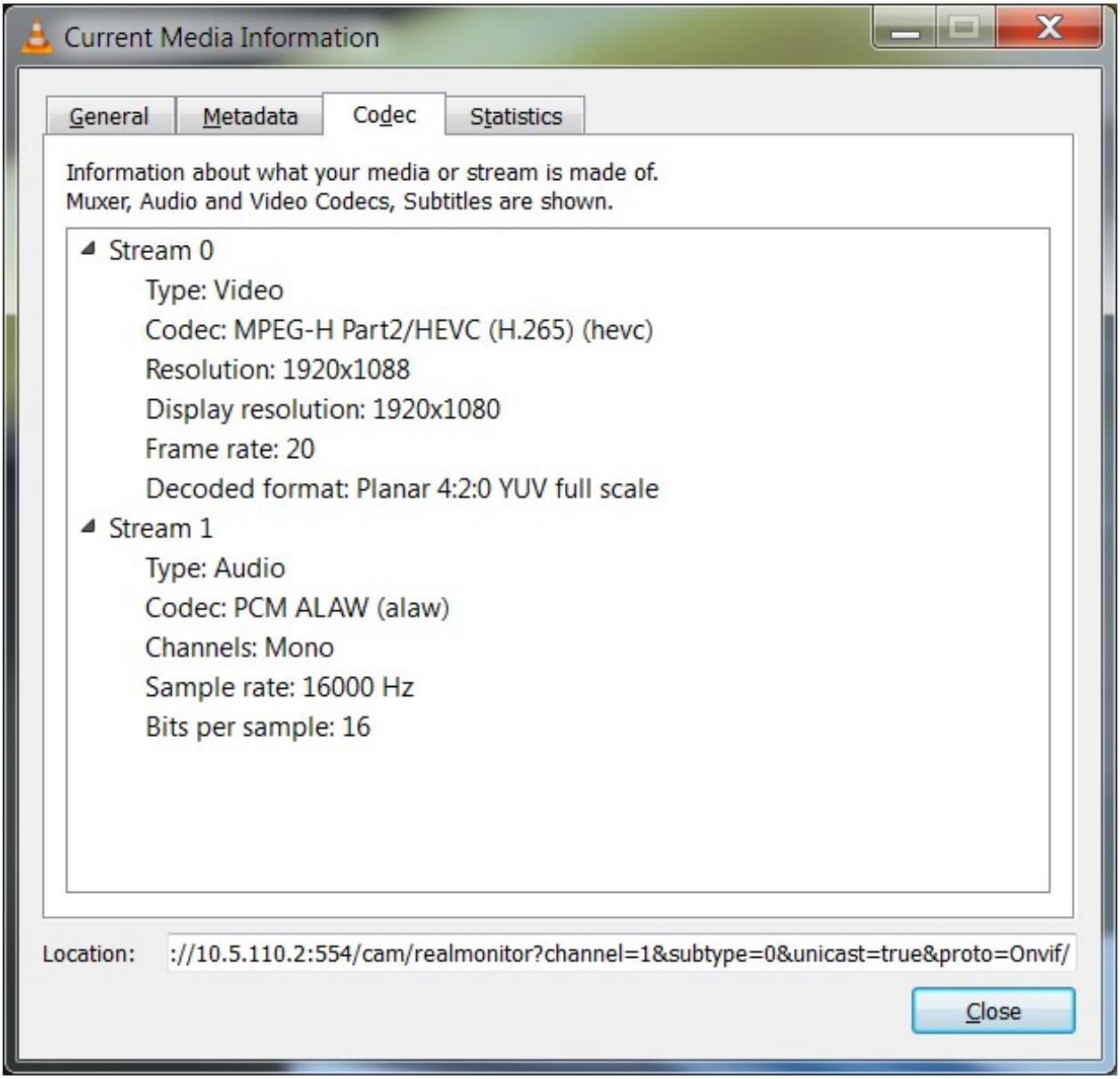
Download the player from https://www.videolan.org/.

From the Media menu select “Open Network Stream” (Ctrl+N). In the text field enter the URL of the video/audio stream from the device.



You might get a prompt to enter authorization credentials. Make sure to use the same credentials also when adding the device in the Management Client.

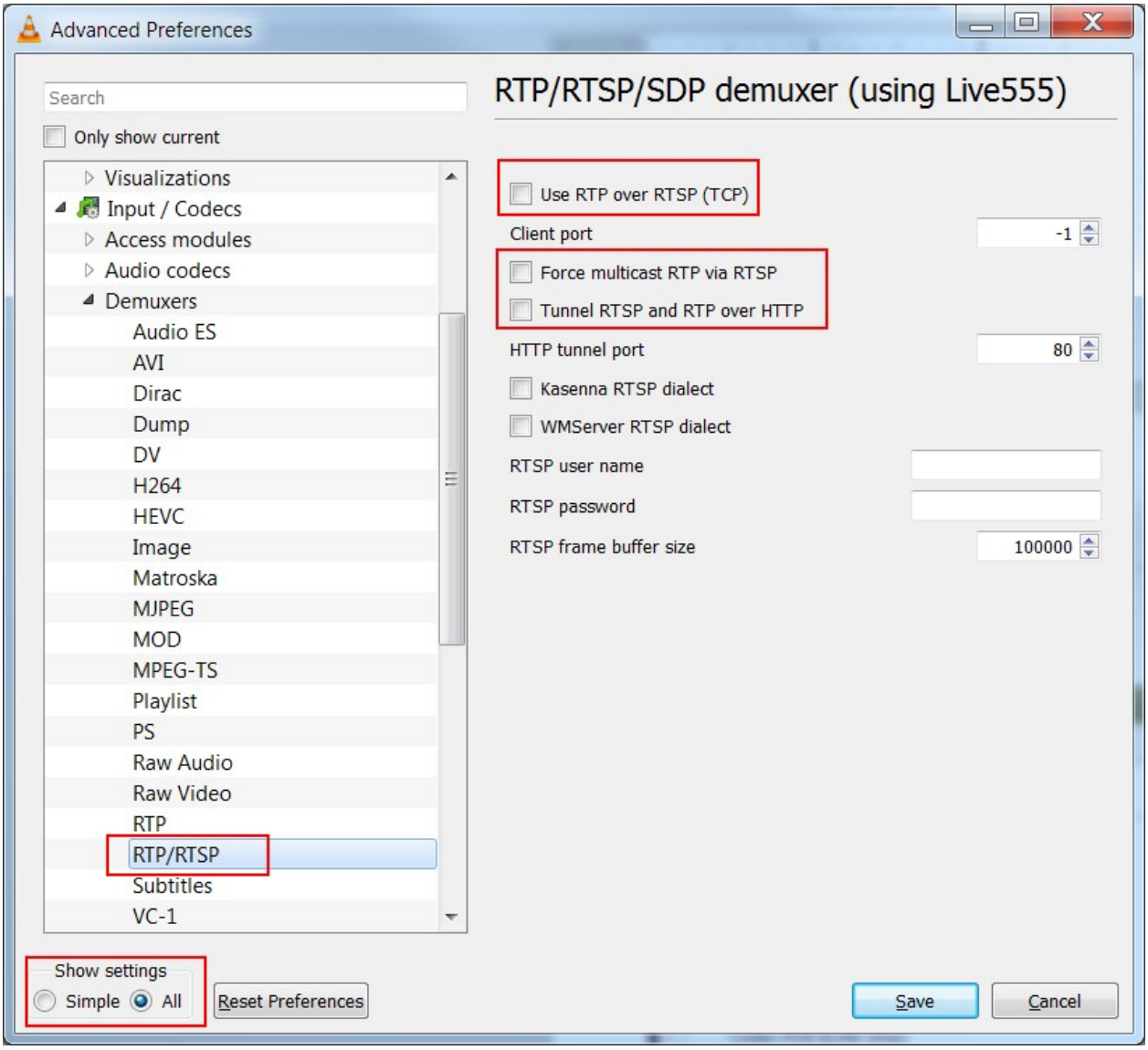
If the video/audio starts playing, verify that the codec is correct with the one set in the Management Client. To see the codec of the stream in VLC select Tools->Codec Information (Ctrl+J)



Also verify that VLC uses the same Streaming Mode as is specified in the Management Client.

Open the VLC Preferences dialog – Tools->Preferences (Ctrl + P).

Select “All’ for “Show settings” in the lower left corner of the dialog.



If "Use RTP over RTSP (TCP)" is selected this is the same as selecting "RTP/ RTSP/TCP" for Streaming Mode in the Management Client.

If "Force multicast RTP via RTSP" is selected this is the same as selecting "RTP/UDP multicast" for Streaming Mode in the Management Client.

If "Tunnel RTSP and RTP over HTTP" is selected this is the same as selecting "RTP/RTSP/HTTP/TCP" as Streaming Mode in Management Client.

If none of the option in VLC is selected this is the same as selecting "RTP/UDP" for Streaming Mode in the Management Client.

Note: The streaming method, shown in VLC settings as "Tunnel RTSP and RTP over HTTP" is different from the HTTP Streaming mode described in the document. If HTTP Streaming testing is done in VLC the URL entered in the "Open Network Stream" dialog should start with "http://<hostname>/..."

Testing with XProtect

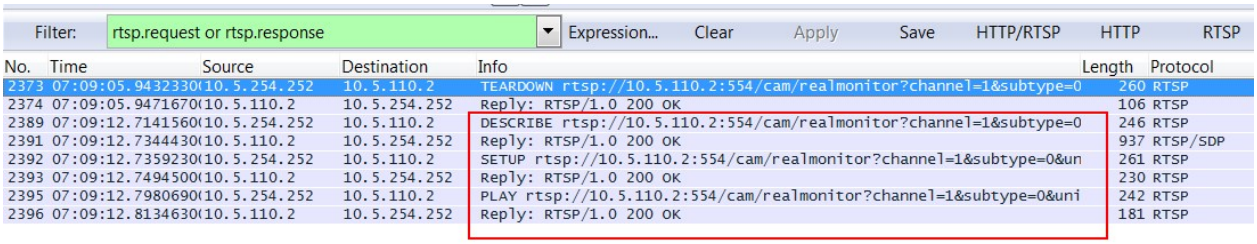
After adding the device and configuring the settings, if you still do not get video/audio stream either in Management Client or in Smart Client, you can try check one of the following:

Make sure that the selected Codec matches the one on the device. Consult either the device's Web page or the documentation.

If "RTP/UDP" or "RTP/UDP multicast" is selected as Streaming Mode, make sure that the UDP packets sent from the device to the Recording Server machine are not blocked by a firewall. For testing purposes you can try disabling the Windows Firewall and see if that fixes the problem.

If you experience regular periodic interruptions of the video/audio stream try changing the "Keep Alive type" to see if it helps. There is no way of knowing the correct "Keep Alive type" for a specific device other than receiving this info from the manufacturer.

You can try to verify that the Universal driver uses the correct URL by looking at the RTSP requests in Wireshark (https://www.wireshark.org/).



You should see a DESCRIBE, SETUP and PLAY request using the URL specified in the settings. You can try to play this same exact URL in VLC (see Testing with VideoLan Player (VLC) on page 22)

Change history

Document version history

Ver.	Date	Section	Description	Author
1.0	April 2019		Initial version	Maxim Zapryanov
1.1	June 2019	Introduction on page 4	Clearer introduction. Add list of supported and not supported features. Changed screenshot to XPCO 2019 R2	Maxim Zapryanov
1.2	July 2020	Supported features on page 4	Add note about supported format of H.264 over HTTP	Maxim Zapryanov
1.3	August 2020	Supported features on page 4	Added RTSP/RTP/HTTP/TCP streaming method and HTTPS as supported feature	Gabriela Tzanova
		Not supported features on page 5	Removed HTTPS from unsupported feature	Gabriela Tzanova
		Configuring the Universal Driver on page 10	Added description of HTTPS settings and RTP/RTSP/HTTP/TCP streaming method. Updated Streaming method display names. Added RTSP over HTTP configuration. Added RTSP over HTTPS configuration with note. Added note about configuration usage for audio streaming.	Gabriela Tzanova
		Testing with VideoLan Player (VLC) on page 22	Updated information about “Tunnel RTSP and RTP over HTTP” option in VLC	Gabriela Tzanova
1.4	August 2021	Adding in XProtect Management	Fix references to Management Client	Maxim Zapryanov

Ver.	Date	Section	Description	Author
		Client on page 6		
1.5	February 2023	Configuring the Universal Driver on page 10	Removed duplicated value in Audio codec list	Kalin Stoychev
1.6	December 2024	Configuring the Universal Driver on page 10	Added description for new stream settings	Gabriela Tzanova

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About Milestone

Milestone Systems is a leading provider of open platform video management software; technology that helps the world see how to ensure safety, protect assets and increase business efficiency. Milestone Systems enables an open platform community that drives collaboration and innovation in the development and use of network video technology, with reliable and scalable solutions that are proven in more than 150,000 sites worldwide. Founded in 1998, Milestone Systems is a stand-alone company in the Canon Group. For more information, visit https://www.milestonesys.com/.