Hikrobot Machine Vision Software (for Linux System)

User Manual

Contents

Chapter 1 Get Support

If you cannot solve your problems with the help of the user manual, please check the information about your current software version and PC system and contact us for assistance.

- Official Website: Visit *https://en.hikrobotics.com/* to get other related documents or inquire us online.
- Email: tech_support@hikrobotics.com

Note

- To check software version information: Click **Help** → **About**.
- To check the information about the PC system, see *System Info*.

Chapter 2 Revision History

The following table shows the revision history of the Software.

Table 2-1 Revision History

Version	Date	Changes
3.0.0	5th Mar. 2024	● On the General page, adds temperature screening configuration and Bayer interpolation configuration. ● Supports enumerating frame grabbers and cameras linked with frame grabbers. ● In the feature configuration area, adds the function of showing temperature window. ● Supports moving modules in the feature tree. ● Supports importing/exporting the features of a single frame grabber. ● Supports importing/exporting the features of multiple frame grabbers. ● Supports moving the cross line of live view page. ● Adds the function of temperature screening configuration and configuration of related parameters. ● The firmware upgrade tool supports automatically enumerating GigE cameras, USB cameras, frame grabbers, and cameras linked with frame grabbers, and supports upgrading the firmware of frame grabbers and cameras linked with frame grabbers in a batch. ● Adds the function of configuring log service.
2.1.0	21st Nov. 2020	Combined the user manual for the Linux X86 version and the one for Linux ARM version into one user manual, and updated the newly supported features as follows. ● Updated ***Other Features*** to introduce how to stick a GigE Vision camera to the top of the GigE Visioin camera list. ● Updated ***Other Features*** to introduce how to stick a USB3 Vision camera to the top of the USB3 Vision camera list. ● Added ***Configure White Balance (Bayer)*** to introduce how to set white balance when the pixel

Version	Date	Changes
		format is set to Bayer. ● Updated ***Set Cross Line*** due to UI updates. ● Added ***View Histogram*** to introduce the newly supported Histogram feature.

Chapter 3 Overview

This chapter mainly introduce the Software, including the key features, system requirements, revision history, and main interface.

3.1 Introduction

MVS, which is the acronym for Machine Vision Software (hereafter simplified as "the Software"), is designed by Hikrobot for controlling and managing the machine vision cameras (including GigE Vision cameras and USB3 Vision cameras) in your Vision system. The Software allows you to batch export and import features of different cameras via multiple methods, providing great convenience for camera feature configuration in different usage scenarios. Not just a controller, it also receives image data and allows you to view the live videos streamed from cameras. While viewing the live videos, you can adjust the image quality, save captured pictures and recorded videos, and adjust camera parameters.
With the Software, you can determine the optimal settings for your Vision system.

3.2 Key Features

- Easy to Install: Install the software easily without installing driver separately.
- Interface for Better User Experience: Provides clear and simple user interfaces.
- Multiple-Camera Live View: Supports setting window division and viewing the live view of multiple cameras simultaneously.

Multiple Tools: Integrated with multiple tools for convenient configuration and management of the cameras and the PC system.

3.3 System Requirements

Make sure the operating environment where you install the Software meets the following requirements.

3.3.1 System Requirements for Linux X86

- Operating System: Ubuntu 12.04/14.04/16.04/18.04 (32-bit and 64-bit), Ubuntu 20.04 (64-bit), CentOS 7 (32-bit and 64-bit), Red Hat Enterprise Linux 7 (64-bit)
- CPU: Intel Pentium IV 2.0 GHz (minimum); Intel Pentium IV 3.0 GHz and above (recommended)
- Memory: 1 GB (minimum); 4 GB and above (recommended)
- Display Resolution: 640 × 480 and above

- Network Adapter: Intel Pro1000, I210, I350 series
- USB Port: USB 2.0 (minimum); USB 3.0 (recommended)

3.3.2 System Requirements for Linux ARM

Option	Demoboard	Operating System
1	NVIDIA Jetson TX2	Ubuntu 16.04/18.04/20.04
2	Odroid XU4	Ubuntu 16.04/18.04/20.04
3	Raspberry Pi 3 Model B+	Raspbian OS

3.4 Software Installation and Running

3.4.1 Software Installation

You need to install the Software with proper installation package.

Select Installation Package

Before installing the software, you should select the installation package.

For MVS Linux X86

Select the installation package based on the returned value after you entered the command *getconf LONG_BIT*.

Table 3-1 Select Installation Package

Returned Value	Supported Installation Package
32	aarch64
64	armhf

For MVS LinuxARM

Select the installation package based on your computer system.

Table 3-2 Select Installation Package

Computer System	Supported Installation Package
Ubuntu 12.04/14.04/16.04/18.04 (32-bit)	● CPU Architecture: i386 ● Installation Package Format: deb Example: MVS-2.00_i386_20190929.deb

Computer System	Supported Installation Package
Ubuntu 12.04/14.04/16.04/18.04 (64-bit)	● CPU Architecture: amd64 ● Installation Package Format: deb Example: MVS-2.00_x86_64_20190929.deb
Ubuntu 12.04/14.04/16.04/18.04 (32-bit), CentOS 7 (32-bit)	● CPU Architecture: i386 ● Installation Package Format: tar.gz Example: MVS-2.0.0_i386_20190929.tar.gz
Ubuntu 12.04/14.04/16.04/18.04 (64-bit), CentOS 7 (64-bit), Red Hat Enterprise Linux 7 (64-bit)	● CPU Architecture: amd64 ● Installation Package Format: tar.gz Example: MVS-2.0.0_X86_64_20190929.tar.gz

Install the Software with a deb* Package

You can install the software with a deb* package.

Steps

1. Get the root permission.
2. Execute the command *dpkg –i *****.deb.*.

Note

***** here represents the name of the installation package.

Example

For the installation package "MVS-2.00_i386_20190929.deb", you should enter "dpkg –i MVS-2.00_i386_20190929.deb".

Install the Software with a tar.gz Package

You can install the Software with a tar.gz* package.

Steps

1. Get the root permission.
2. Decompress the installation package you select.
3. Execute the command *cd *****.

Note

***** here represents the name of the decompressed package.

4. Execute the command *./setup.sh*.
5. Optional: After installation, check the files in the installation directory.

Figure 3-1 Installation Directory

Note

The functions of each file in the installation directory is shown below:

Table 3-3 Function Description

Name	Description
bin	Contains all the executable programs of MVS.
doc	Contains text information about the Software.
driver	Contains driver related information.
Include	Contains all the header files required for software development.
lib	Contains software development library (.so file).
license	Contains license related information.
logserver	Contains log service related scripts.
Samples	Contains software development demo.
ReleaseNOTE_CH.txt	Contains the Chinese version release note.
ReleaseNote_EN.txt	Contains the English version release note.

3.4.2 Run the Software (for MVS Linux)

After installation, you can perform the following steps to run the Software.

Steps

1. Open the terminal.
2. Execute the command "cd /opt/MVS/bin".

> **Note**
> The Software is installed in the directory /opt/MVS by default. Please do not move the MVS file to other directories.

3. Execute the command "./MVS.sh" to run the Software.

3.4.3 Software Uninstallation

You can uninstall the Software with the following two methods.

Method 1

Steps

1. Execute the command "/opt/MVS/logserver/RemoveServer.sh".
2. Delete all files in the directory "/opt/MVS".

Method 2

Steps

> **Note**
> This method is available only if you use DEB package when installing the Software.

1. Get the root permission.
2. Execute the command "dpkg -r MVS".

3.5 Main Window Introduction

The main window of the Software is shown below.

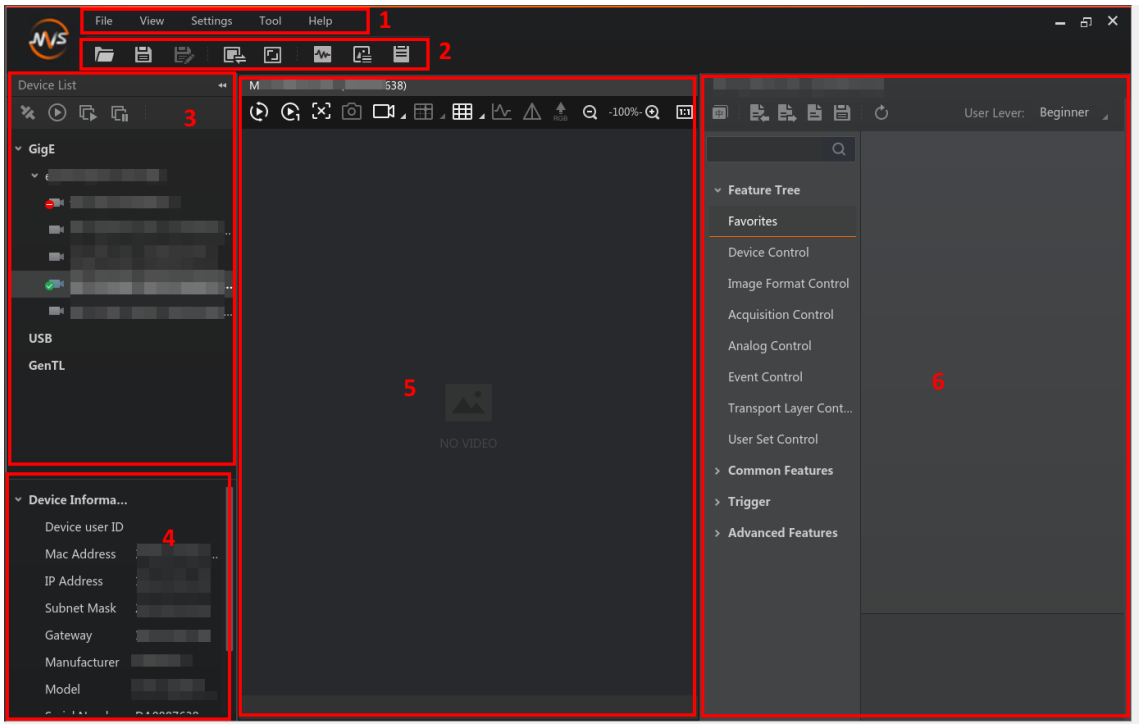


Figure 3-2 Main Window

The following table shows the description of each part of the main window.

Table 3-4 Main Window Description

No.	Area Name	Description
1	Menu Bar	Function modules, including File, View, Settings, Tool, and Help.
2	Control Toolbar	File control, division settings of the display window, acquisition status, etc.
3	Device List Pane	• Shows the GigE Vision cameras, USB3 Vision cameras, and GenTL. • Provides buttons for connecting/disconnecting camera, start/stop acquisition, and refreshing device list.
4	Device and Interface Information Panel	Displays the information about the selected camera and its interface.
5	Display Window	Displays the live video of the selected camera.
6	Feature Panel	You can view and configure features of the selected camera and perform other operations such as importing, exporting, and saving features.

Chapter 4 Environment Configuration

Before further operations such as camera feature configuration and image data acquisition, you should configure the running environment for the Software to ensure stability and fluency of Software running and data transmission.

4.1 Turn off Firewall

To ensure the stability of Client running and the enumeration of local cameras, disable the PC's firewall before running the Client.

Turn off Firewall in Linux X86 System

- For Ubuntu 12.04/14.04/16.04/18.04 (32-bit and 64-bit), execute the command ***ufw disable*** to turn off the fire wall.
- For CentOS 7 (32-bit and 64-bit) and Red Hat Enterprise Linux 7 (64-bit), execute the command ***sudo systemctl stop firewalld*** to turn off the firewall temporarily. Or execute the command ***sudo systemctl disable firewalld***, and then restart the system to turn off the firewall permanently.

Turn off Firewall in Linux ARM System

- For Ubuntu 16.04/18.04 (32bit or 64bit), execute the command ***ufw disable*** to turn off the fire wall.
- For Raspbian, execute the command ***sudo ufw disable*** to turn off the firewall.

4.2 Configure Local Network Parameters

You should set the IP address of the PC where the Software runs to the same subnet with the camera, or camera connection may fail. You should also enable Jumbo Frame for the Network Interface Controller (NIC), or packet losses may occur during image data acquisition.

Before You Start

Make sure that the cameras are powered on and connected to network.

Steps

Note

As different Linux systems are similar, here we only take configuring local network parameters of Ubuntu system as an example.

1. Configure the local network IP address.
   1) Click **System Settings** → **Network** → **Wired** in the PC.
   2) Select a wired network.
   3) Click **Option** to open following window.

Figure 4-1 Edit Ethernet Connection

   4) In the **Method** drop-down list, you can select a parameter to set the system to obtain IP address automatically, or set the IP address of the PC to the same subnet with the cameras on the window manually.

Note

It is recommended that you set the IP address as static IP for a stable work of the camera.

5) Click **Save** to save the settings.

2. Enable **Jumbo Frame**.

Jumbo Frame

Jumbo Frame functionality can reduce the CPU usage and improve the data transmission efficiency. After you enable the Jumbo Frame functionality, the Jumbo Frame value will be set to 9 KB or 9014 Bytes automatically.

1) Execute the command ***sudo su*** or ***su root*** to get the root permission.

2) Execute the command ***ifconfig*** to check the network status.

```
ipconfig: command not found
root@hik-desktop:/home/hik/MVS-1.0.0_x86_64/MVS/bin# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0a:c4:5d:7b:dd
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
          Memory:d0700000-d0780000

eth1      Link encap:Ethernet  HWaddr 00:0a:c4:5d:7b:de
          inet addr:10.67.128.98  Bcast:10.67.128.255  Mask:255.255.255.0
          inet6 addr: fe80::20a:c4ff:fe5d:7bde/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:9000  Metric:1
          RX packets:4359361 errors:0 dropped:0 overruns:0 frame:0
          TX packets:218479 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:12113317746 (12.1 GB)  TX bytes:11801894 (11.8 MB)
          Memory:d0600000-d0680000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
```

Figure 4-2 Execute Command

3) Enable Jumbo Frame temporally or permanently.

- **Temporarily**: Execute the command ***ifconfig XXXX mtu 9000*** to enable Jumbo Frame temporally.
- **Permanently**: Execute the command ***echo "9000" >/sys/class/net/XXXX/mtu*** to enable Jumbo Frame permanently.

Note

- ***XXXX*** refers to the NIC connected with the camera. For example, you can enter the command ***echo "9000" >/sys/class/net/eth0/mtu*** or ***echo "9000" >/sys/class/net/eth1/mtu***.
- Different NIC may have different parameters. If setting Jumbo frame is unavailable on your PC, you can update the NIC driver or change the NIC with the NIC of Intel Pro 1000 series or above.
- For cameras connected to the network via network switch, static IP address is not required. If the camera is connected to the network directly, you should configure the static IP address, or the camera will not be enumerated.

3. Optional: If the camera is not connected to the Software, edit the IP address of the camera. See *IP Configurator* for details.

Chapter 5 Menu Bar

The menu bar provides functionality such as saving and opening project file, setting display mode, software settings, tools (e.g., IP configurator and firmware updater), language settings, as well information of the Software and the user manual.

5.1 File

The File sub-menu provides functionality related to project file, functionality for opening local files, as well as the functionality for exiting from the Software. Project file is useful if you need to switch global camera settings in different scenarios. You can save the current settings of all the connected cameras as a project file (format: mcfg) to the local PC, after which you can fast restore the settings of the same connected cameras by opening the saved project file.

Note

- When you save cameras' settings as a project file, the serial No. of the cameras are saved as well.
- Network exception, GenICam error, or failure of exporting features will cause saving failure.
- Only the feature settings of the CONNECTED cameras can be saved.

Save as Project File in Default Saving Path

Note

Make sure you have connected cameras.

For the first time saving, you need to select a saving path as the default saving path for project file, so next time you can skip the step for selecting saving path and save the project file in the default path directly.

Click on the control toolbar or click **File** → **Save** to open the Save Project File window, and then select a saving path as the default saving path for project files, and finally click **Save**.

Note

You can click **View** on the prompt popped up when saving completes to go to the saving path of the project file.

Save Project File in Custom Saving Path

Note

- Make sure you have connected cameras.
- The first project file should have been saved in the default saving path.

After the first project file being saved in the default saving path, the function of saving in custom path will be available.
Click on the control toolbar or click **File** → **Save as** to open the Save Project File window, and then select a custom saving path, and finally click **Save**.

Note

You can click **View** on the prompt popped up when saving completes to go to the saving path of the project file.

Open Project File

Note

- Make sure you haveconnected cameras.
- The first project file should have been saved in the default saving path.

You can open a project file to restore the saved feature settings to the cameras with matched serial numbers.
When the Software has been running, you can perform one of the operations in the following list to open a project file.

- Click **File** → **Open Recent** and then select a recently saved project file to open it.
- Click on the control toolbar or click **File** → **Open** to open the Selected Project File window, and then select a project file from the PC, and finally click **Open**.

5.2 View

You can adjust the image quality of the live video by setting the display mode. You can set the display mode to 30 fps or 60 fps, the latter provides better image quality.

Note

The settings will be effective for all cameras on the Software.

Set Display Mode

You can click **View** → **Display Mode** and then select **30 fps** or **60 fps** to set the image frame rate to 30 frames per second or 60 frames per second respectively.

Note

The larger the image frame rate, the better the image quality.

5.3 Settings

You can configure settings for the Software, including general parameters, recording and capture parameters, buffer size, and packet resending parameters via the Settings sub-menu.

5.3.1 General Settings

You can set the general parameters, including user level and auto-refresh settings of the device list.

User Level

You can select **Beginner** or **Guru** as the user level, which determines the visibility of features for users of different professional knowledge levels. The higher the user level, the more camera features will be displayed on the feature panel.

Application Options

Camera List Auto-Refresh

You can turn on **Camera List Auto-Refresh** to refresh online cameras of GigE and USB interface regularly and display them.

ACK mode of devices Discovery

The communication mode between the Software and the detected IP addresses in the same network segment with the PC where the Software runs. By default, the ACK mode is **Broadcast**. If the Software fails to enumerate a camera, you can switch it to **Unicast** and try again.

Character Encoding Type

The encoding type of characters displayed on the Software interface. If you find a character on the interface unreadable, change the character encoding type and try again. Local encoding type refers to the encoding type of the current PC where the Software runs. UTF-8 is a method for encoding Unicode characters using 8-bit sequences.

Bayer Interpolation

The interpolating modes for transferring an image of bayer format to RGB format.

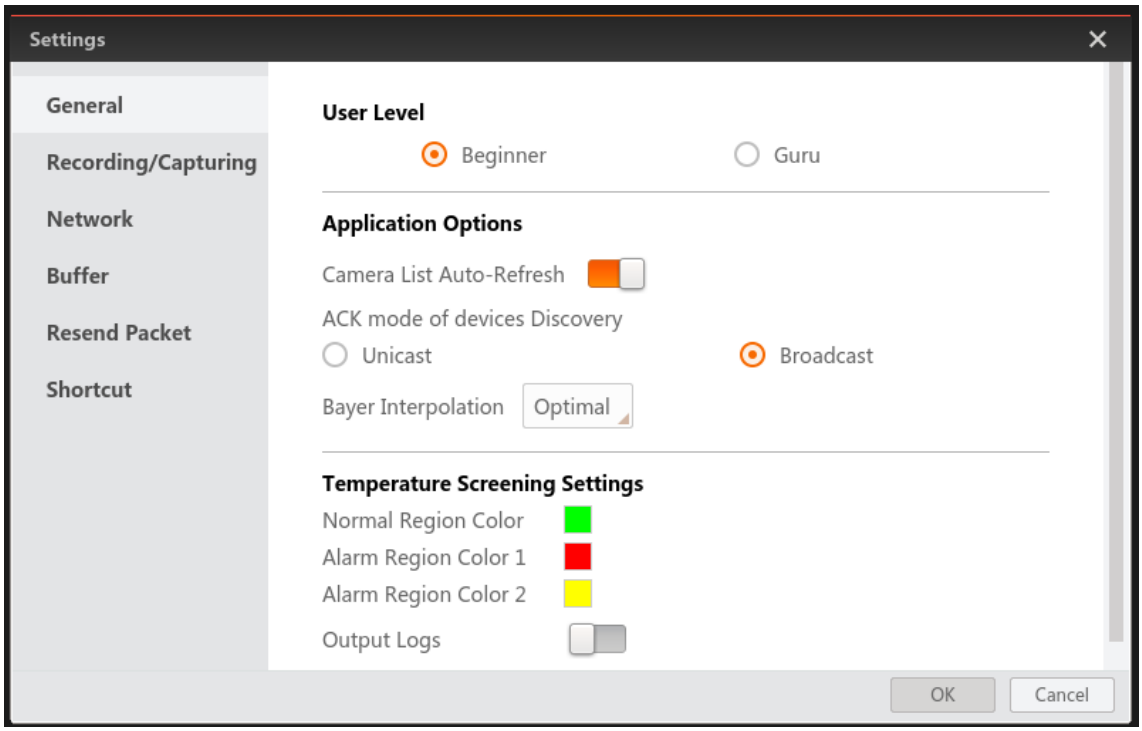


Figure 5-1 General Settings

Temperature Screening Settings

Normal Region Color

The color or regions with normal temperature.

Alarm Region Color 1/2

The two colors of regions with an alarm triggered by abnormal temperatures.

Note

If the alarm of screening region is not acknowledged after 200 seconds, the two colors will flash by turns.

Output Logs

Logs about temperature screening can be output if you enable this.

Note

To display the colors of screening regions, you need to finish the following operations beforehand.

- Draw a temperature screening region. See *Temperature Screening Configuration*.
- Set alarm rules of temperature screening regions. See *Configure Temperature Screening Parameters*.
- Select **Region Information Overlap** as **Client**.

5.3.2 Capture and Recording Settings

You can set the recording parameters and capture parameters as required.

Note

For details about capture and recording, see *Capture and Recording*.

Go to **Settings** → **Recording/Capturing** to configure the following parameters.

Select Directory

Select Directory for the captured pictures and recorded videos.

Saving Path

Set a saving path for the recorded video files or captured pictures during live view.

Auto Save

When enabled, the recorded video files or the captured pictures during live view will be automatically saved to the saving path you set.

Note

The maximum pictures that can be auto saved depends on the storage space of the saving path you set.

Recording

Set parameters related to recording.

Video Format

Set format (AVI or RAW) for the recorded video files.

Video Quality

If you set AVI as the video format, you can select **Normal**, **Better**, or **Best** from the drop-down list as the video quality, or drag the slider to adjust the compression ratio so as to set video quality.
The compression ratio for **Normal** is from 0 to 40, for **Better** from 41 to 70, for **Best** from 71 to 100.

Note

The higher the compression ratio is, the better the video quality. The better the video quality, the more image details can be displayed.

Playback Speed

If you set AVI as the video format, you can set the playback speed for the recorded video files.

Original Frame Rate

Set the original frame rate of the recorded video file as the playback speed.

Custom

Enter a frame rate as the playback speed.

Video Naming Rule

Customize a prefix and select **Date and Time** or **Increasing No.** as the naming rule.

Date and Time

The video name will be a number which represents the data and time when the video file is saved. For example, if you set *Video* as the prefix of the name, the full name would be *Video_20190424051532390*.

Increasing No.

The video names will be increasing No. For example, if a video file is the second one you saved and you set *Video* as the prefix, the full name of the video would be *Video_02*.

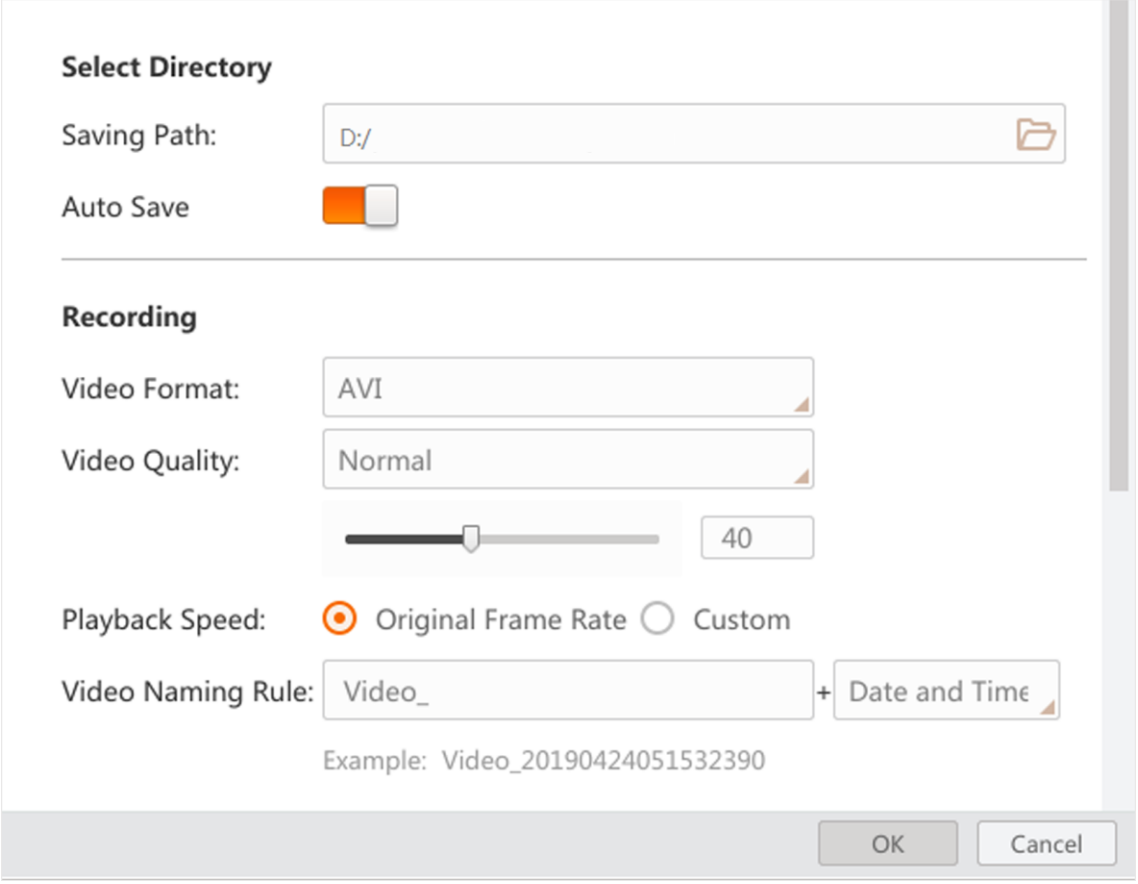


Figure 5-2 Recording Settings

Capturing

Set parameters related to the capturing of pictures.

Picture Format

Set format (**BMP**, **RAW**, or **JPG**) for the captured pictures during live view.

Picture Quality

If you set **JPG** as the picture format, you can select **Normal**, **Better**, or **Best** from the drop-down list as the picture quality, or drag the slider to adjust the compression ratio so as to set picture quality.
The compression ratio for **Normal** is from 0 to 40, for **Better** from 41 to 70, for **Best** from 71 to 100.

Note

The higher the compression ratio is, the better the picture quality.

File Naming Rule

Customize a prefix and select **Date and Time** or **Increasing No.** as the naming rule for the captured pictures.

Date and Time

The picture name will be a number which represents the data and time when the video file is saved. For example, if you set *Image* as the prefix of the name, the full name would be *Image_20190424051532390*.

Increasing No.

The picture names will be increasing No. For example, if a picture file is the second one you saved and you set *Image* as the prefix, the full name of the video would be *Image_02*.

Continuous Capture

Set the capture mode.

Capture by Frame

The pictures will be captured by frame(s) and the capture will be stopped after the set number of frames. For example, if you set "Capture Every 3 Frame(s)" and "Stop Capturing after 1000 Frame(s)" as the capture mode, a picture will be captured for each 3 frames, and the capture actions end after 1000 frames being acquired.

Capture by Time

The pictures will be captured by time and the capture will be stopped after the time period you set. For example, if you set "Capture Every 2 Second(s)" and "Stop Capturing after 5 Minute(s)" as the capture mode, one picture will be captured each two seconds, and the capture actions will last 5 minutes.

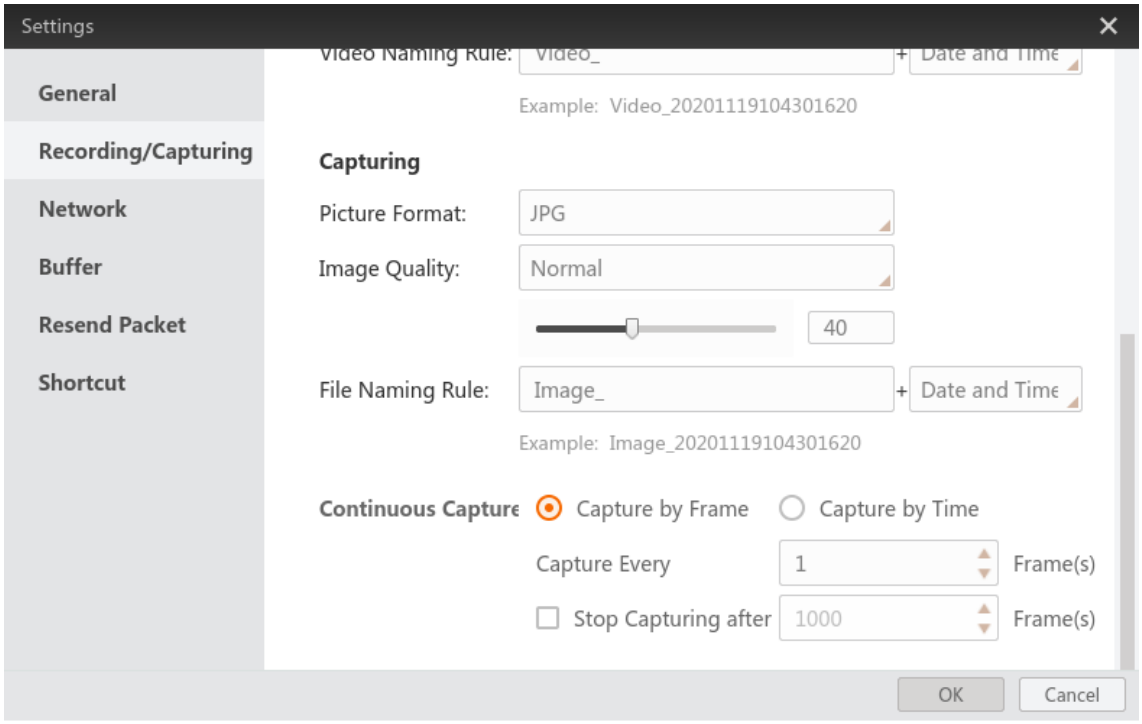


Figure 5-3 Capture Settings

5.3.3 Network Settings

You can configure the network settings, including automatic network detection and adaptive dropping frame.
You can enable or disable **Automatic Network Detection** and (or) **Adaptive Drop Frame** to ensure the fluency of the image data acquisition according to the actual network environment.

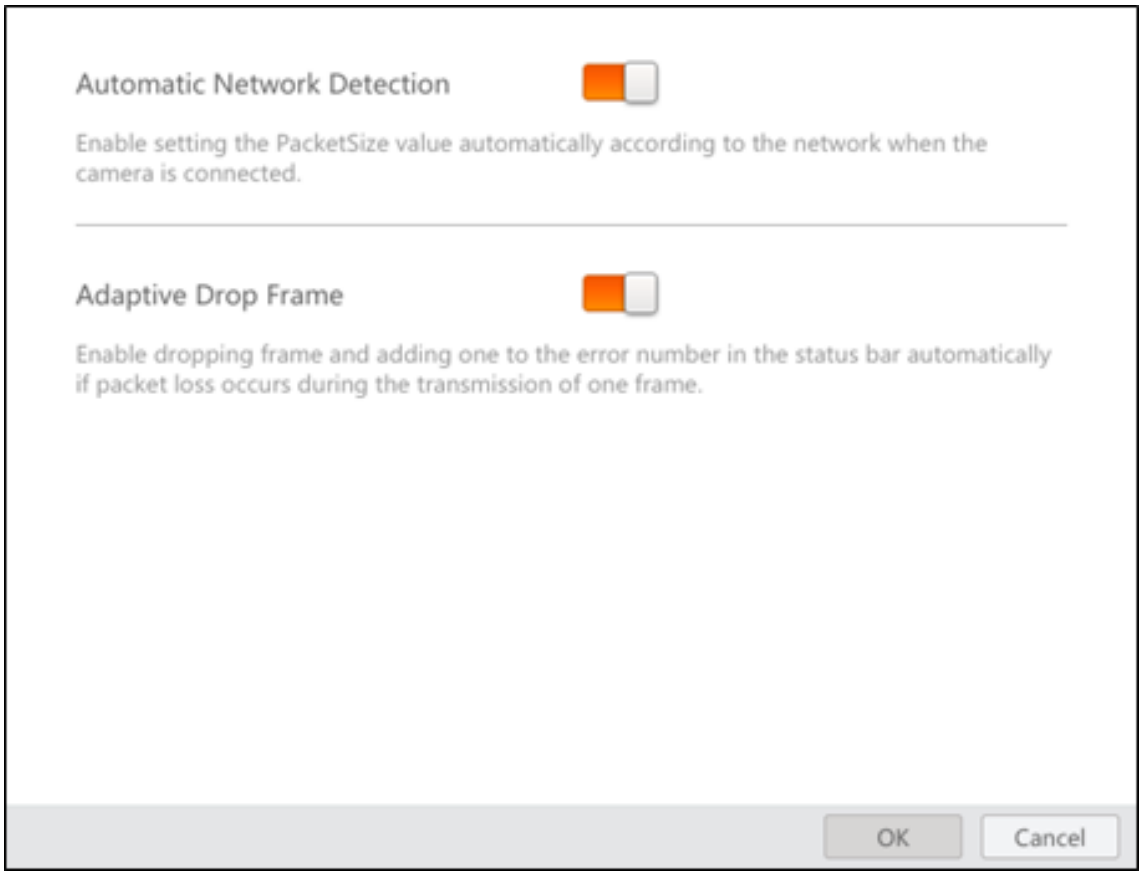


Figure 5-4 Network Settings

5.3.4 Buffer Settings

Buffer settings allow you to balance image quality against image fluency.
You can adjust the values of **Buffers for Getting Stream** and (or) **Buffers for Capture and Recording** according to the memory conditions.

Buffers for Getting Stream

The maximum value is 30.

Buffers for Capture and Recording

The maximum value is 10000.

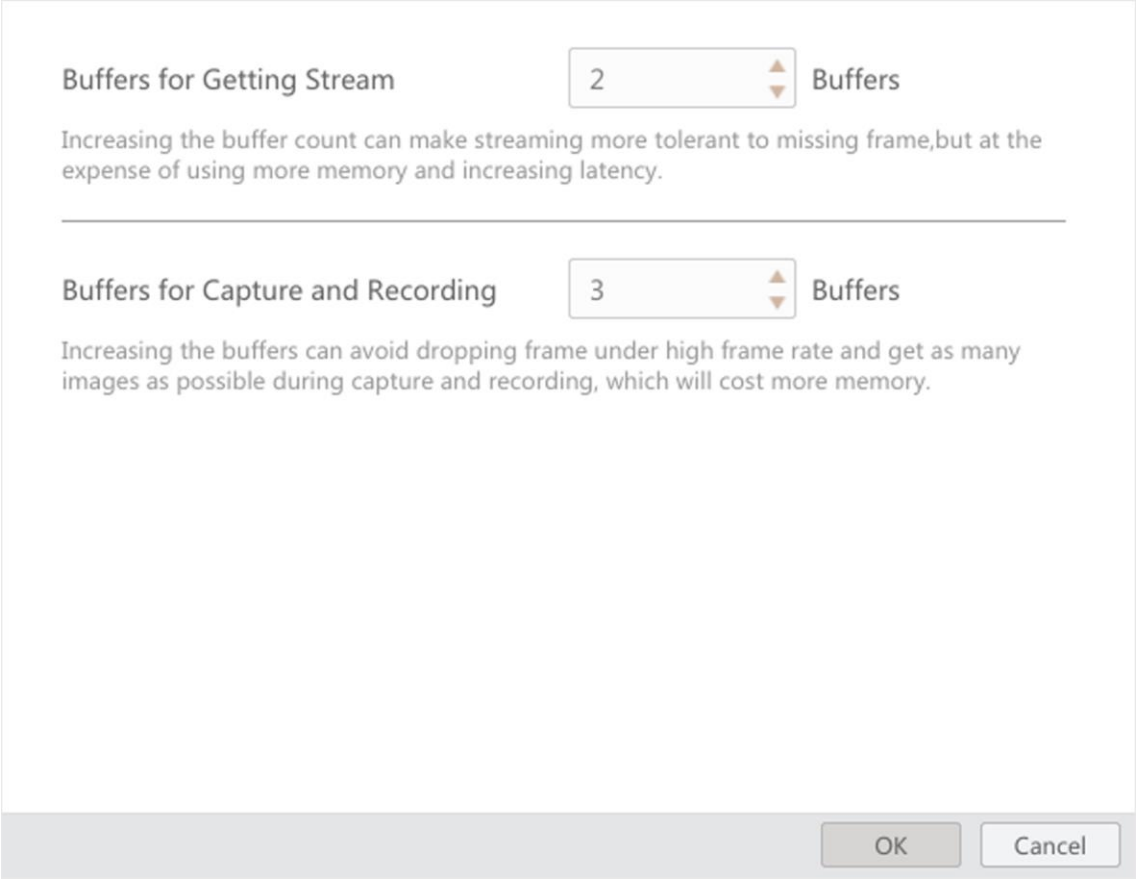


Figure 5-5 Buffer Settings

5.3.5 Resend Packet

Packet resending is a mechanism to ensure image quality by resending the lost or damaged packets during image data acquisition. You can set the packet-resending for the Software, including maximum packet resending percent and the timeout period for packet resending.

Note

Make sure the camera is disconnected from the Software.

You can set the **Resend Packet** switch to on to enable the Software to resending packets, and then configure the following parameters.

Max. Packet Resending Percent (%)

The maximum percent of packets resent within one frame (default value: 10%). With larger packet resending percent, you can get more complete image data. Conversely, you can get more real-time image data.

Timeout Period (ms)

The maximum time period (default value: 50 ms) that the Software can wait between two packets that need to be resent (either for the packet is lost or damaged). If the waiting time exceeds the time you set, the Software will not wait for or resend any packet.

Note

- You can set a relatively long timeout period if there are excessive packet losses.
- You can set the value of Timeout Period from 0 ms to 1000 ms.

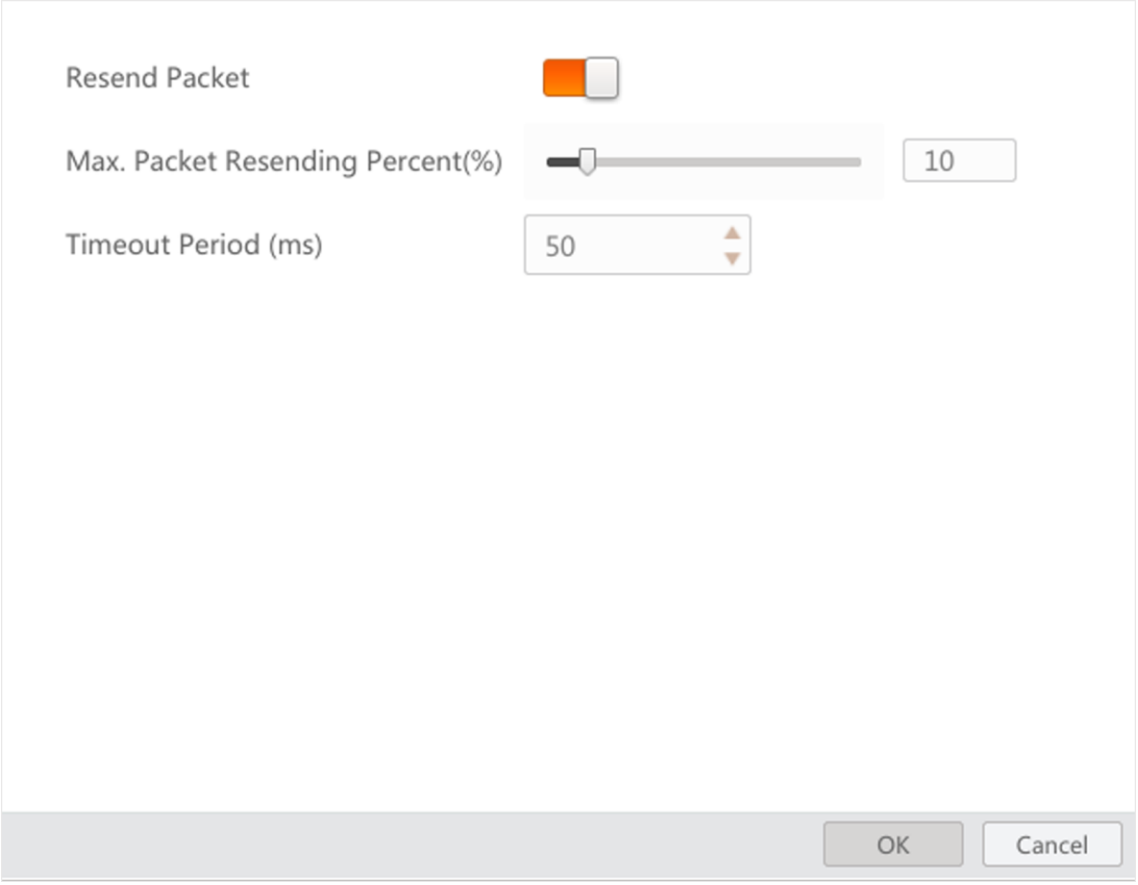


Figure 5-6 Packet Resending Settings

5.3.6 Shortcut

The Software provides default keyboard shortcuts for some frequently-used functions such as connecting/disconnecting camera and starting and stopping acquisition. You can customize the shortcuts according to your actual needs.

Note

The Delete key cannot be used as a keyboard shortcut.

Click **Settings** → **Shortcut** to enter the Shortcut page.
You can do the following operations.

- Customize a Shortcut: Select the text field of a function (such as Start/Stop Live View), and then press one or more keys at the same time to set a shortcut for the function.
- Delete a Shortcut: Select the text field of a function, and then press the Delete key to delete the shortcut.
- Enable **Respond in Priority**: When you turn on **Respond in Priority**, the shortcut of the Software will still be executed even if the Software is minimized or not on the top layer of the PC desktop.Restore Defaults: Click **Restore Defaults** to restore the shortcuts for all the listed functions to the default settings.

5.4 Tool

The Software provides multiple tools for camera configuration and management.
The following table shows the brief description of each tool.

Table 5-1 Tool Description

Tool	Description
IP Configurator	Configure the IP address of the GigE Vision cameras.
Firmware Updater	Update the firmware of GigE Vision cameras and USB3 Vision cameras.
Import/Export Features	Export the selected cameras' feature configuration information as a MFS file to the local PC, or import the MFS file containing camera feature information from the local PC to the selected cameras.
Log Viewer	View SDK logs.
GigE Vision Action Command	Trigger actions in multiple cameras at the same time.

5.5 Help

The Help sub-menu offers access to the language switching functionality, user manual, and the Software information.
Click **Help** → **Language** to switch the Software's language to English or Simplified Chinese.
Click **Help** → **User Manual** to open the user manual of the Software.
Click **Help** → **About** to view the Software information.

Chapter 6 Device Management

On the device list, the devices are classified into two types, namely, GigE and USB, according to the camera interface. After connecting cameras to the Software, you can perform operations such as saving GemICam XML for secondary development, and using Event Monitor to determine issues that may occur on your cameras.

6.1 GigE Vision Camera Management

GigE Vision camera is the camera using GigE Vision interface standard for data transmission. After connecting GigE Vision cameras to the Software, you can perform operations such as Multicast settings, saving GenICam XML, and editing device user ID.

Note

GigE Vision is an interface standard for machine vision cameras. It provides a framework for transmitting high-speed video and related control data over Ethernet networks.

6.1.1 Connect GigE Vision Camera

You can connect GigE Vision cameras to the Software in three ways, i.e., letting the Client automatically enumerating local cameras, connecting camera by command, or adding remote camera.

Automatically Enumerate Local Cameras

All the GigE Vision cameras in the same local subnet with the Software will be automatically enumerated in the device list.
You can hover the cursor over the camera interface and then click to refresh the enumerated cameras on the same local subnet with the PC on which the Software runs. Or you can enable the Software to automatically refresh the device list. See ***Settings*** for details.
When the cameras are enumerated, if the camera status is available, you can double-click the camera or click to connect it to the Software.

Note

For details about status of the GigE Vision cameras, see ***Status of GigE Vision Camera***.

Figure 6-1 Local Camera Enumeration

Connect Camera by Command

You can use CMD commands to run the Software and connect cameras to it.

Steps

1. Press **Ctrl+Alt+T** on keyboard.
2. Execute the command "./MVS.sh /IP xx.xx.xx.xx" to run the Software and connect the camera.

Note

xx.xx.xx.xx here refers to the IP address of the to-be-added camera.

Add Remote Camera

You can add GigE Vision camera NOT in the same local subnet with the client software to the device list.

Steps

1. Right-click the network interface card (for example, **eth0** in the following picture) to open the right-click menu.

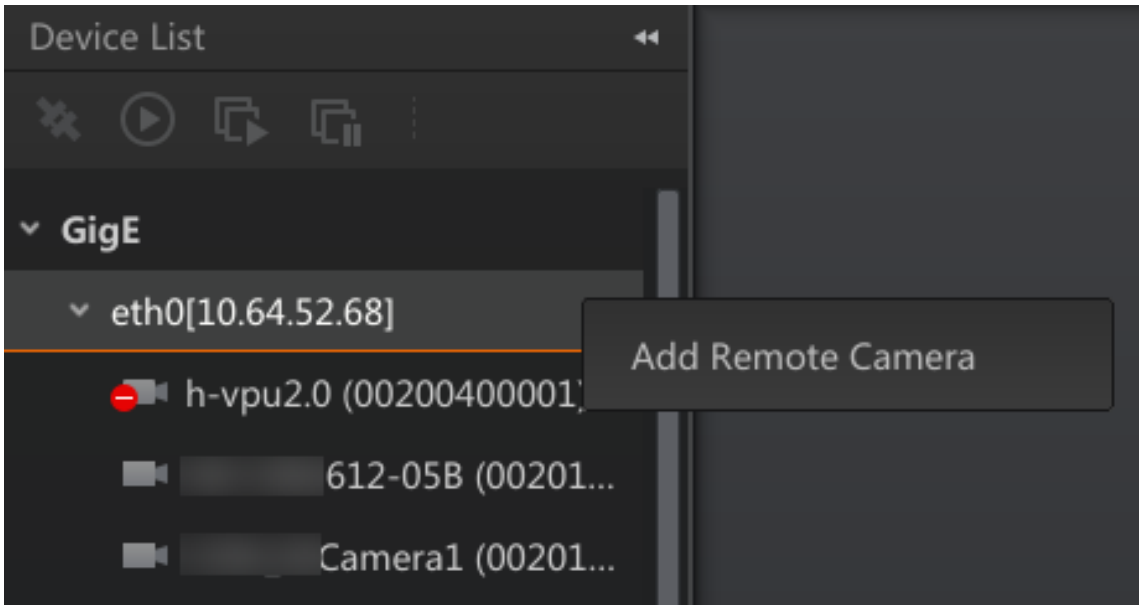


Figure 6-2 Right-Click Menu

2. Click **Add Remote Camera** to open the Add Remote Camera window.

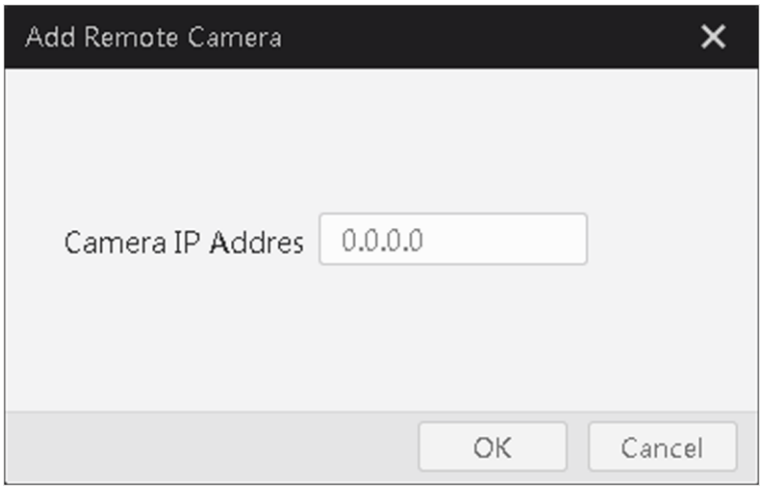


Figure 6-3 Add Remote Camera

3. Enter the camera IP address and then click **OK** to add the camera.

6.1.2 Status of GigE Vision Camera

The Software provides multiple icons to represent different status of GigE Vision cameras. The following table shows the descriptions of the status of the GigE Vision camera on the device list.

Table 6-1 Status Description

Camera Status	Description
	Available and disconnected.

Camera Status	Description
	Note You can double-click the camera or select it and click on the control toolbar to connect it to the Software. Once connected, changes to .
	Not available. Another Software or process is accessing the camera.
	The camera is on the same subnet with the PC on which the Software runs, but NOT in the same network segment. You should configure its IP address to the same network segment before you can connect and use the camera. **Note** You can double-click the camera or click **Tool** → **IP Configurator** to configure the camera's IP address.
	Connected.
	The camera is acquiring streams. **Note** See *Acquisition and Live View* for details about how to start acquisition.
	Multicast of the camera is enabled on another Software. And the camera is connected to the current Software. **Note** See *Multicast Settings* for details about how to enable Multicast.
	Multicast of the camera is enabled on another Software. And the camera is not connected to the current Software. **Note**

Camera Status	Description
	See *Multicast Settings* for details about how to enable Multicast.

6.1.3 Edit Camera IP Address

If the camera is displayed as (not reachable for the camera is on the same subnet with the PC on which the Software runs, but not in the same network segment), you can edit the camera's IP address to make it reachable.

Steps

1. Right-click the camera displayed as to open the right-click menu.
2. Click **Modify IP** on the right-click menu to edit IP address of the camera.

Note

For details about editing camera IP address, see *IP Configurator*.

6.1.4 Multicast Settings

By enabling Multicast, a GigE Vision camera can be accessed through multiple MVS (hereafter simplified as "Software" in this chapter). This is especially useful when a camera needs to be accessed by different end users. Before that, you need to configure roles for the Softwares to specify different permission for them to access different cameras.

Note

- Multicast configuration is only available for GigE Vision cameras.
- Multicast configuration should be supported by the GigE Vision camera.

For different cameras, a Software can be configured with different roles to access them. In other words, the end user of a Software can have different permissions to access different cameras. The following roles are available:

Table 6-2 Role Description

Role	Description
Controller and Data Receiver	The camera's features are editable, and the Software can receive camera data to display live image.
Controller	The camera's features are editable, but the Software cannot receive camera data to display live images.
Data Receiver	The camera's features are NOT editable, but the Software can

Role	Description
	receive camera data to display live images. **Note** ● You cannot set the role of a Software as Data Receiver manually. ● Multiple Softwares can be Data Receiver of the same camera.

Note

- For one camera, only one Software can be the role of "Controller and Data Receiver" or "Controller".
- You can configure Multicast for a camera only when the role is set to "Controller and Data Receiver" or "Controller".
- For the Softwares running on the same PC, one of them can only be configured as "Controller" and the others as "Data Receiver".

Enable Multicast When Camera is Available but Disconnected

If the camera status is available and disconnected, you can set "Controller" or "Controller and Receiver" as the Software's role.

Steps

1. Right-click a camera (available and disconnected) on the device list to open the right-click menu.
2. Click **Multicast Setting** to open the Multicast Setting window.
3. Select **Controller** from the **Role** drop-down list.
4. Click **OK** to save the role settings.
   The camera will be connected and Multicast will be enabled automatically.
5. Optional: Edit the IP address and port.

   IP Address

   The IP address of the selected camera.

   Port

   The port No. of the selected camera.

   Note

   Only root user can use a port number that is smaller than 1024.

6. Click **OK** to save the settings.
   After enabling Multicast mode of a camera on Software A, if the camera is remotely

added to Software B, or the camera is on the same local subnet of the PC on which the Software C runs, the camera will be displayed as (when disconnected) or (when connected) on Software B or Software C. And the role of Software B and Software C (relative to the camera) will be "Data Receiver".

Enable Multicast When Camera is Connected

For a connected camera, you can only set the Software's role to "Controller and Receiver".

Steps

1. Right-click the camera and then click **Multicast Setting** to open the Multicast Setting window.

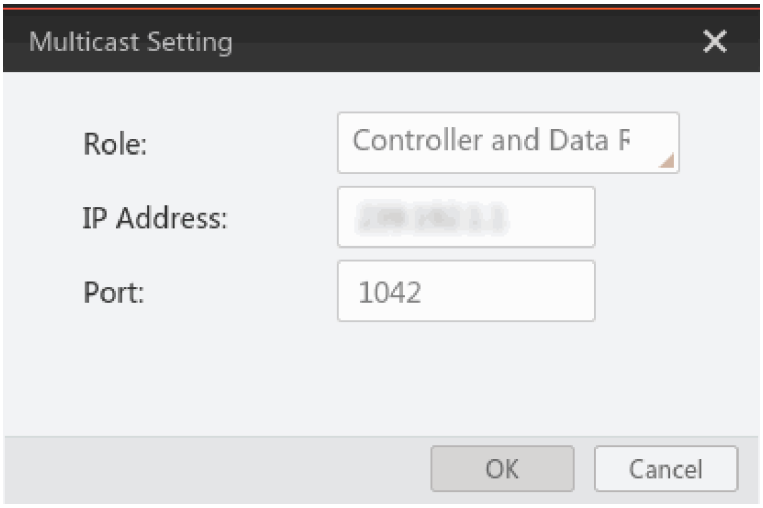


Figure 6-4 Mutlticast Stetting Window

The role for the current Software is set to **Controller and Data Receiver** by default and cannot be edited.

2. Optional: Edit the IP address and port.

IP Address

The IP address of the selected camera.

Port

The port No. of the selected camera.

Note

Only root user can use a port number that is smaller than 1024.

3. Click **OK** to save the settings.
After enabling Multicast mode of a camera on Software A, if the camera is remotely added to Software B, or the camera is in the same local subnet of the PC on which the Software C runs, the camera will be displayed as (when disconnected) or (when connected) on Software B or Software C. And the role of Software B and Software C (relative to the camera) will be Data Receiver. In this scenario, the user has the

permission to modify the camera's features, as well as view the live video of the camera on Software A; While on Software B and Software C, the user has no permission to modify the camera feature, but can view the live video and features of the camera.

6.1.5 Other Features

Other features are provided for the GigE Vision cameras on the device list, including, GenICam XML settings, device user ID settings, etc.

Save GemICam XML

Right-click a GigE Vision camera, and then click **Save GemICam XML** to save the camera information as XML file for purposes such as secondary development of the Software.

Note

Saving GemICame XML is only available when the camera is connected or in acquisition.

Rename User ID

Right-click a GigE Vision camera, and then click **Rename User ID** to edit user ID of the camera.

Note

Renaming user ID is only available when the camera is connected or in acquisition.

Stick Camera to Top

Right-click a GigE Vision camera and then click **Stick to Top** to stick the camera to the top of the GigE Vision camera list.
If you want to cancel sticking the camera to the top, right-click the camera and then click **Cancel Sticking to Top**.

6.2 USB3 Vision Camera Management

USB3 Vision camera is the camera using USB3 Vision interface standard for data transmission. You can connect USB3 Vision to the Software for further management such as image data acquisition.

6.2.1 Add USB3 Vision Camera

You can add USB3 Vision camera to the Software in two ways, i.e., by automatically enumerating camera, or by command.

- After you connecting a USB3 Vision camera to the PC on which the Software runs, the camera will be automatically enumerated if the USB driver is properly installed. For details about automatically enumerating camera, see *Automatically Enumerate Local*

Cameras.

- You can also connect a USB3 Vision camera to the Software by command. For details, see *Connect Camera by Command*.

6.2.2 Status of USB3 Vision Camera

The Software provides multiple icons to indicate the status of the USB3 Vision camera. You can do further management according to the status of the cameras.
The following table shows the descriptions of different status.

Table 6-3 Status Description

Camera Status	Description
	Available and disconnected. You can double-click the camera or select it and click on the control toolbar to connect it to the Software. Once connected, the status changes to  .
	Connected.
	USB driver exception. You should reinstall the USB driver.
	Not available. Another MVS or process on the same PC is accessing the camera.
	The camera is acquiring image data.
	USB driver exception (the USB interface of the PC is USB 2.0 interface). You should reinstall the USB driver.
	Connected (the USB interface of the PC is USB 2.0 interface).
	Available and disconnected (the USB interface of the PC is USB2.0 interface).
	Not available (the USB interface of the PC is USB 2.0 interface). Another MVS or process on the same PC is accessing the camera.
	The camera is acquiring image data (the USB interface of the PC is USB 2.0 interface).

6.2.3 Other Features

Other features are provided for the USB3 Vision cameras on the device list, including U3V Transfer settings, device user ID settings, GenICam XML settings, etc.

U3V Transfer Settings

You can edit the packet size and streaming channels for a USB3 Vision camera.
Right-click a USB3 Vision camera and then click **U3V Transfer Setting** to open the U3V

Transfer setting window, and then configure **Packet Size** (value range: 64 to 20,480 KB, default value: 1024 KB) and **Streaming Channel(s)** (value range: 1 to 10, default value: 8) according to the performance of the USB frame grabber. The lower the performance of the USB frame grabber, the smaller the **Packet Size** and the more **Streaming Channel(s)** you should set so as to alleviate data transmission between and camera and the Software.

Note

U3V transfer settings is only available when the camera is connected or in acquisition.

Save GemICam XML

Right-click a USB3 Vision camera, and then click **Save GemICam XML** to save the camera information as XML file for secondary development of the Software.

Note

Saving GemICame XML is only available when the camera is connected or in acquisition.

Rename User ID

Right-click a USB3 Vision camera, and then click **Rename User ID** to edit user ID of the camera.

Note

Renaming user ID is only available when the camera is connected or in acquisition.

Stick Camera to Top

Right-click a USB3 Vision camera and then click **Stick to Top** to stick the camera to the top of the USB3 Vision camera list.
If you want to cancel sticking the camera to the top, right-click the camera and then click **Cancel Sticking to Top**.

6.3 GenTL Management

The GenTL (short for Generic Transport Layer) standard provides a generic way to allow the Software enumerate cameras, communicate with cameras and, if possible, stream data from cameras independent from the underlying transport technology. This allows the Software to control cameras (including third-party cameras) and to acquire data in a transport layer agnostic way.

Steps

Note

Only MVS in Linux X86 system supports enumerating frame grabbers and cameras managed by frame grabbers.

1. Right-click **GenTL** on the device list and then click **Select cti File**.
2. Select a cti file from the local PC and load it.

Note

- The cti files of GigE interface and USB3 Vision interface are provided by the Software (directory: *C:\Program Files (x86)\Common Files\MVS\Runtime\Win32_i86* or *C:\Program Files (x86)\Common Files\MVS\Runtime\Win64_x64*).
- The Software supports loading the cti files of GigE, CameraLink, CoaXPress frame grabber. The saving path of the file is *C:\Program Files (x86)\Common Files\MVS\Runtime\Win32_i86* or *C:\Program Files (x86)\Common Files\MVS\Runtime\Win64_x64*.
- The Software also supports third-party cti files which conform to the GenTL standard.
- For third-party cti files, you need to get them by yourself. You can contact the corresponding manufacturer for support.
- If the default path of cti file is configured, the Software will load it automatically once you start the Software. See ***General Settings*** for details about how to set the default path of cti file.

The device list will enumerate the cameras that can be discovered by the cti file.

Note

CoaXPress cameras can only be connected by GenTL. If connected, you can control the camera and acquire image data.

3. Optional: Connect the frame grabber, and then click to refresh cameras after loading the cti file.

Note

- After connecting to the frame grabber, the feature tree of the frame grabber will be

displayed on the right.
- After disconnecting to the frame grabber, you can right-click the frame grabber and select **Upgrade Firmware** to upgrade its firmware.

4. Optional: Clear the currently loaded cti file.
   1) Disconnect all cameras under **GenTL**.
   2) Right-click **GenTL**, and then click **Clear cti File**.
5. Optional: Right-click a cti file and click **Upgrade Firmware** to upgrade the firmware.

6.4 Event Monitor

The Event Monitor is a tool that you can use to determine causes of issues that may occur during the use of your device. When enabled, you can view all the time-stamped GigE Vision or USB3 Vision events.

Steps

Note

The Event Control feature should be supported by your device, or the Event Monitor functionality will be unavailable.

1. Connect the camera with the software by one of the following operations.
   – Select a camera from the device list and click on the control toolbar to connect it with the software.
   – Double-click the camera on the device list to connect it with the software.
2. Click **Feature Tree** on the Feature List Panel to display the camera feature list.
3. Click to display the parameters under the **Event Control** feature, and then select an event from the **Event Selector** parameter.
4. Set **Event Notification** to **Notification ON**.
5. Right-click the camera on the device list and then click **Event Monitor** to open the Event Monitor window.
6. Check **Messaging Channel Event**.
7. Optional: Click to select a saving path, and then check **Auto Save** to enable the Software to automatically save the generated events to the PC.
8. Start acquisition, and then a large number of events will appear on the Event Monitor window.
   – Click to start acquisition.
   – Right-click the camera and click **Start Acquisition**.

Note

- Up to 10000 events can be displayed on the Event Monitor window.
- Events will keep being obtained even if you close the Event Monitor window.

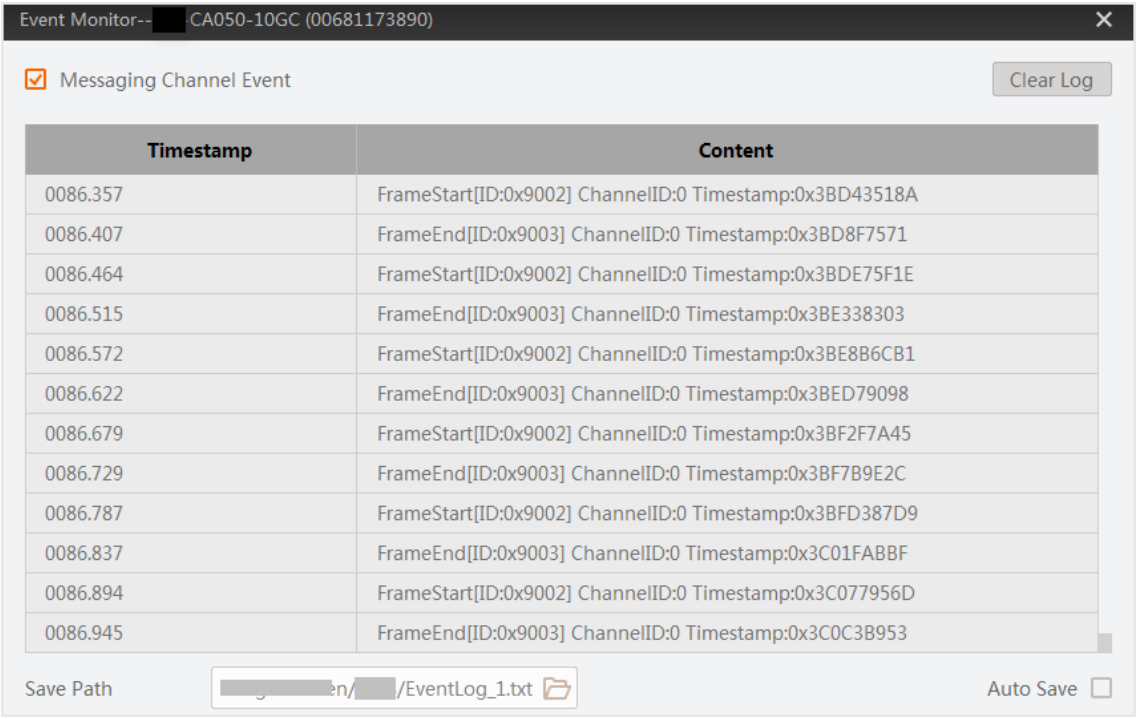


Figure 6-5 Event Monitor

9. Optional: Click **Clear Log** at the upper-right side of the window to clear all the events displayed before.

Chapter 7 Camera Feature Configuration

The Software provides multiple methods to configure the camera features, including configuring manually, configuring via User Set, configuring via project file, configuring via File Access, and batch exporting and importing features.

7.1 Feature Tree

Features are capabilities of the cameras and camera modules that can be controlled by setting firmware parameters. The feature tree displays all available features of a connected camera and you can edit the parameters under each feature.

Note

The available features of the camera vary with different camera models.

You can perform the following four generic operations.

Table 7-1 Generic Operations on Feature Tree

Generic Operation	Description
Show or Hide Features	Click to show or hide the camera features under all feature categories.
Switch User Level	Switch user level (Beginner, Expert, or Guru) at the bottom of the Feature Tree tab. **Note** The higher the user level, the more camera features will be displayed. Guru Level provides the most comprehensive camera features for professional use.
Add Feature/Parameter to Favorites	Right-click a frequently-used feature category or a specific feature/parameter, and then click **Add to Favorites** to add it to the Favorites. By default, the features/parameters added to Favorites are ranked by time. You can drag the added feature/parameter to adjust its rank. Also, the rank of Favorites will remain unchanged when you enter the software for the next time.
View Description of Feature/Parameter	Click the name of a feature or parameter to view its description at the bottom of the tab page.

The following table briefly introduces the description of each feature category.

Table 7-2 Feature Category Description

Feature Category	Description
Device Control	Contains the features related to the control and information of the camera. You can do the followings: ● View the camera details including device type, version, manufacturer details, device ID, device temperature, etc. ● Modify the alias and reset the camera.
Image Format Control	Contains the features related to the format of the transmitted image. You can do the followings: ● View the live view image width and height, pixel size, etc. ● Set ROI, modify pixel format, set image reverse, test pattern, and set the embedded information, etc.
Acquisition Control	Contains the features related to image acquisition, including trigger and exposure control. You can set the trigger mode, trigger source, acquisition mode, etc.
Analog Control	Contains the features related to the video signal conditioning in the analog domain. You can adjust the analog signal including analog gain, black level, brightness, gamma, sharpness, AOI, etc.
LUT Control	Contains the features related to the look-up table (LUT) control. You can view the user look-up table and set the LUT index and value.
Digital I/O Control	Contains the features related to the control of the input and output pins of the camera. You can manage the digital input and output.
Action Control	Contains the features related to the control of action command. You can use the features to define the mechanism of the action command.

Feature Category	Description
Counter and Timer Control	Contains the features related to the usage of programmable counters and timers. You can set the counter and timer, which count the triggering signal and control the exposure according to your needs.
File Access Control	Contains the features related to accessing files in the camera. You can use File Access to export and import camera settings.
Event Control	Contains the features related to the generation of event notifications by the camera. You can use Event Monitor to view the messaging channel events to determine causes of issues that may occur during the use of your camera.
Chunk Data Control	Contains the features related to the generation of supplementary image data (i.e., Chunk data) and the appending of that data to every image that you acquire. You can enable chunk data, and set the content of the chunk data.
Transport Layer Control	Contains the features related to the control of transport layer. You can set the parameters of transport layer of the camera.
User Set Control	Contains the features related to the global control of camera settings. You save or load the camera parameter settings.

7.2 Common Features

On the Common Features tab, you can configure the features which are frequently used in camera configuration, including basic features (Acquisition Frame Rate Control Enable, Exposure Auto, Gain Auto, etc.), Bayer, and embedded information.

7.2.1 Basic Features

The Basic Features allow you to set features like Acquisition Frame Rate, Exposure Time, Gain, etc.

Note

The available features and parameters vary with different camera models. Here we only introduce part of the features and parameters.

Acquisition Frame Rate Enable

Controls if the Acquisition Frame Rate feature is adjustable and used to control the acquisition rate. Otherwise, the acquisition rate is implicitly controlled by the combination of other features like Exposure Time, etc...

Acquisition Frame Rate

Set an upper limit for the frame rate (fps) at which frames are captured.
This is useful if you want to operate the camera at a constant frame rate in continuous image data acquisition.

Resulting Frame Rate

Displays the value of the maximum allowed frame rate (fps) in image data acquisition. In continuous acquisition, the **Resulting Frame Rate** parameter is useful for optimizing the frame rate for your imaging application. You can adjust **Acquisition Frame Rate** until the **Resulting Frame Rate** reaches the desired value.

Exposure Time

Specify how long the image sensor is exposed to light during image acquisition when **Exposure Mode** is Timed and **Exposure Auto** is Off.

Note

- The **Exposure Mode** parameter should be set to Timed, or the **Exposure Time** parameter is not available.
- The **Exposure Auto** parameter should be set to Off, or the **Exposure Time** parameter is not available.

Gain Auto

Set the Automatic Gain Control (AGC) mode.

Off

Gain is controlled manually using **Gain**.

Once

The camera will automatically adjust gain for only once. After that, the state will automatically return to **Off**.

Continuous

Gain will be constantly auto-adjusted by the camera.

Gain

Set an amplification factor applied to the video signal so as to increase the brightness of the image output by the camera.

Note

- **Gain Auto** should be set to Off, or the parameter will not be available.

- Increasing the gain increases all pixel values of the image.

Gamma Enable

Enable the gamma correction of pixel intensity, which helps optimizing the brightness of acquired images for displaying on a monitor.

Gamma Selector

Specify a gamma correction mode.

User

The gamma correction value can be entered manually for the **Gamma** parameter as desired.

sRGB

The gamma correction value will be automatically set to approximately 0.4. This value is optimized for image display on sRGB monitors.

Gamma

The gamma correction value.

Sharpness Enable

If enabled, the **Sharpness** parameter will be available. The larger the **Sharpness** value, the more distinct the contours of the image objects will be. This is especially useful in applications where cameras must correctly identify numbers, letters or characters.

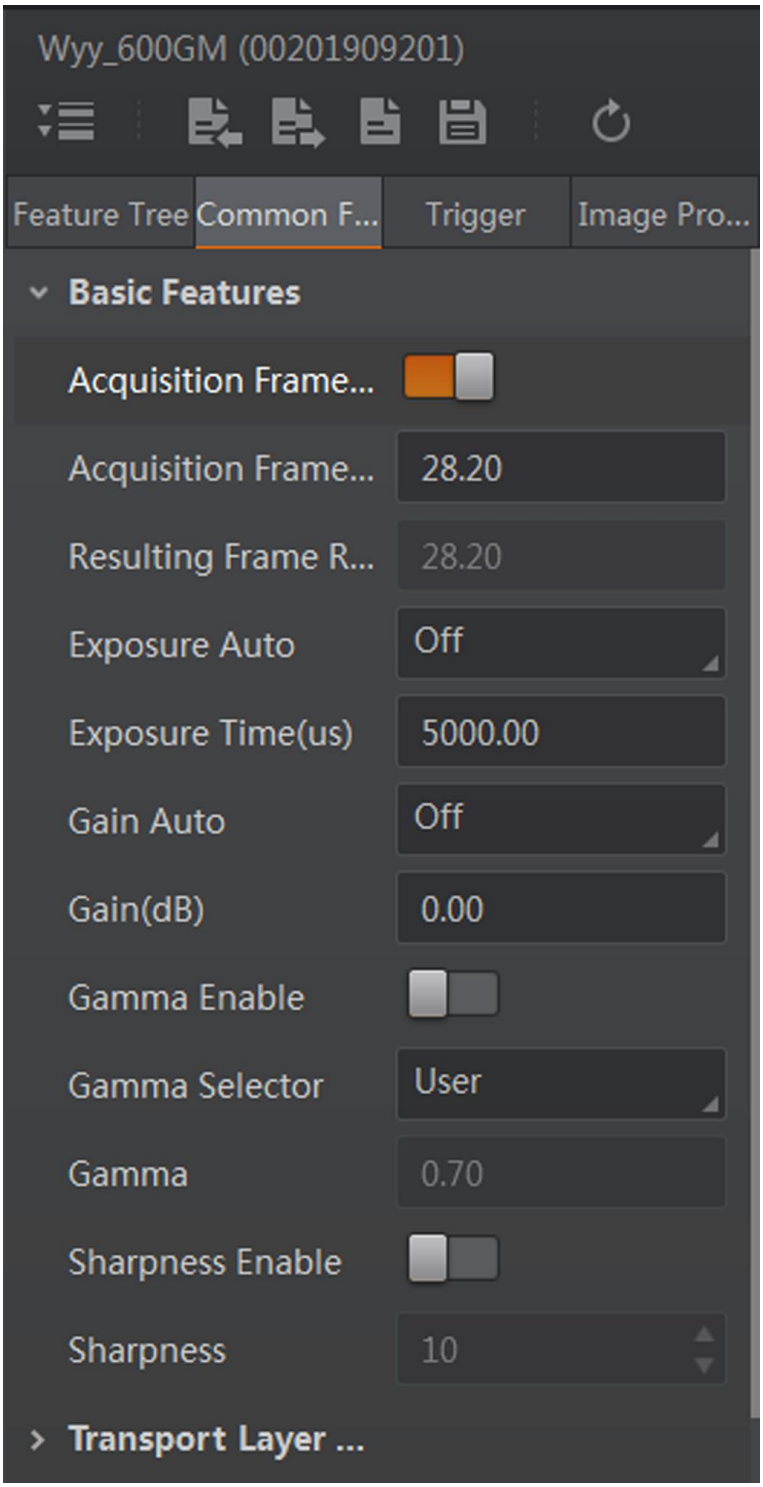


Figure 7-1 Basic Features

7.2.2 Transport Layer Control

The Transport Layer Control feature allows you to configure parameters related to data

packet transmission.

Note

The available features and parameters vary with different camera models. Here we only introduce part of the features and parameters.

GEV SCPS Packet Size

Specify the maximum size (unit: byte) of a data packet transmitted via Ethernet. The larger the packet size, the less the Ethernet overhead load and hence the higher the network efficiency.
The default value (1,500 bytes), which is also the recommended value, is sufficient for most configurations.

Note

If you increase the packet size above 1,500 bytes, make sure that Jumbo Frame of the network adapter is enabled.

Gev SCPD

Specify the delay (in timestamp counter units) to insert between each packet for this stream channel. This can be used as a flow-control mechanism if the application or the network infrastructure cannot keep up with the packets coming from the device.

Note

Increasing the delay may reduce the amount of dropped packets at the expense of slowing the data transmission. As a result, the camera's frame rate may decrease.

7.2.3 White Balance Control

White balance refers to the white balancing between different color channels of the color camera. Through white balance control, you can correct color shifts so that white objects appear white in images acquired.

Configure White Balance (Bayer)

If the **Pixel Format** parameter of the camera is set to Bayer, perform the following steps to configure white balance parameters.

Before You Start

Make sure you have started acquiring image data. For details, see *Acquisition and Live View in 1-Window Mode*.

Steps

1. Go to the White Balance section of the Common Features tab.

2. Set **Balance White Auto**.

Balance White Auto

Set the mode for automatic white balancing between the color channels. Once set, the white balancing ratios are automatically adjusted.

Off

Set white balancing manually. See the step 3 below for details.

Once

White balancing is automatically adjusted once by the camera. Once it has converged, it automatically returns to the Off state.

Note

If you select **Once**, skip step 3.

Continuous

White balancing is constantly automatically adjusted by the camera.

Note

If you select **Continuous**, skip step 3.

3. If you select **Off** as the value of Balance White Auto, perform the following sub-steps to configure white balance manually.

Note

- To configure white balance manually, the **Gamma Enable** parameter in the feature tree should be turned off.
- To configure white balance manually, the **Color Transformation Enable** parameter in the feature tree should be turned off if the camera supports this parameter.
- To configure white balance manually, the **Hue Enable** parameter and the **Saturation Enable** parameter should be turned off if the camera supports the two parameters.

1) Click **Execute** of **White Balance** to open the White Balance Settings window.
2) Click **Capture** to capture an image.
3) Click draw a Region of Interest (ROI), which is shown as a green rectangle, on the original image to select the white area on the image.

Note

- If there's no white area on the original image, place a white object in front of the camera.
- You can also click to cancel the ROI settings.

Once you have drawn the ROI, the recommended value for the R (Red) channel, G (Green) channel, and B (Blue) channel will be displayed. You can manually adjust them

if required.

4) Optional: Click **Restore** to restore the settings.

5) Click **Optimize** to execute optimization.

- The optimized image will be displayed on the right.
- You can view the optimized value of R (Red) channel, G (Green) channel, and B (Blue) channel at the lower right of optimized image.

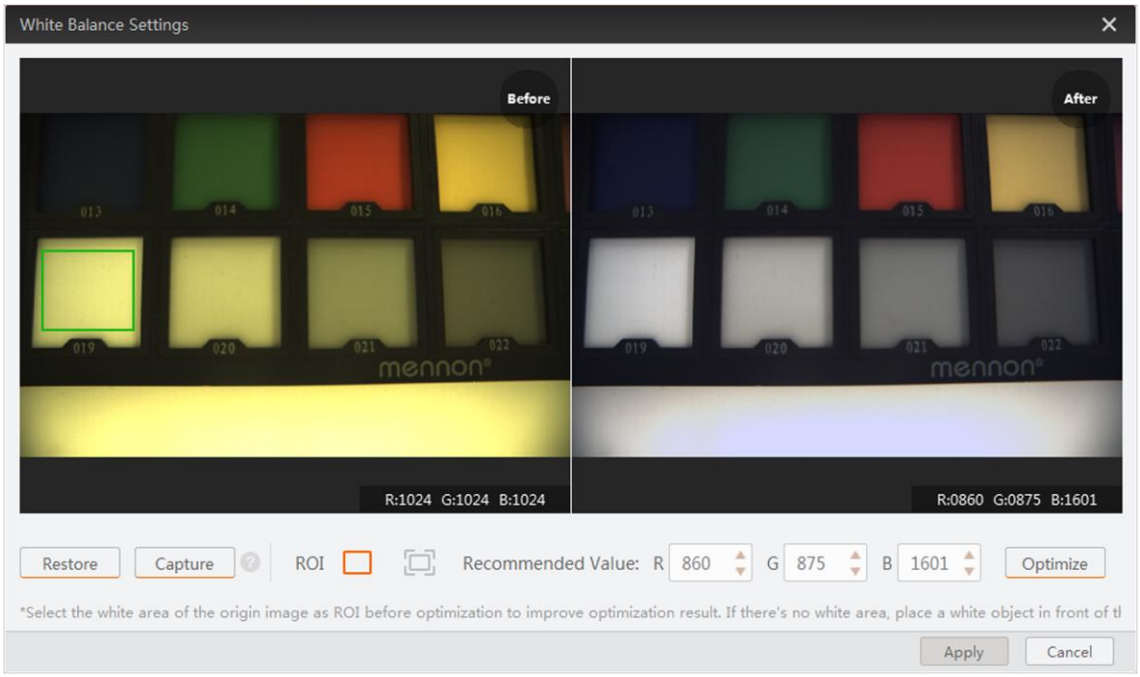


Figure 7-2 Optimization Result

6) Click **Apply** to apply the settings to the camera.

Configure White Balance (RGB/BGR)

If the **Pixel Format** parameter of the camera is set to RGB or BGR, you can go to the White Balance section of the Common Features tab to set the white balance parameters.

Note

- White balance parameters in only available for color camera.
- The available parameters vary with different camera models.

Balance White Auto

Set the mode for automatic white balancing between the color channels. Once set, the white balancing ratios are automatically adjusted.

Off

Set white balancing manually using **Balance Ratio Selector** and **Balance Ratio**.

Once

White balancing is automatically adjusted once by the camera. Once it has converged, it automatically returns to the Off state.

Continuous

White balancing is constantly automatically adjusted by the camera.

Balance Ratio Selector

Selects which Balance ratio to control.

Red

Balance Ratio will be applied to the red channel.

Green

Balance Ratio will be applied to the green channel.

Blue

Balance Ratio will be applied to the blue channel.

Balance Ratio

Set the weight value (0 to 4095) for the channel selected from **Balance Ratio Selector**.

7.2.4 Bayer

The Bayer features allows you to set interpolation method for the color cameras which support Bayer format.
The available interpolation methods include **Nearest Neighbor**, **Bilinear**, and **Optimal**. In most occasions, the nearest-neighbor interpolation or bilinear interpolation is enough for displaying quality image. While in occasions when high-quality image is required, you can select **Optimal** as the interpolation method at the expense of consuming more time for acquiring image data and lowering the frame rate.

Note

- You can set Bayer features only when the camera supports color image and Bayer format.
- If the pixel format of the camera is not Bayer format, you should set the pixel format to Bayer format before you can set interpolation method.

7.2.5 Embedded Information

The Embedded Information feature allows you to embed data into the acquired images. You can select data to embed them into the acquired images. The selected ones will be displayed on the Embedded Information window, you can view the data details on it.

Note

- For details about viewing details of the embedded information on the Embedded Information window, see *View Embedded Information*.

- The types of data that can be embedded into the acquired images include Timastamp, Gain, Exposure, Brightness, White Balance, Frame Number, Triggering Number, Alarm Input/Output, and ROI.
  White Balance data is only available for color camera.

Embedding data into acquired images is realized in two ways, i.e., through the Hikrobot private protocol, or through the Chunk Data Control feature. If the camera supports the Chunk Data Control feature, the way through the Chunk Data Control feature shall prevail; If the camera doesn't support the Chunk Data Control feature, embedding data is realized through the Hikrobot private protocol.

- If the camera supports the Chunk Data Control feature, you should check **Chunk Mode Active** first, and then select data.
- If the camera doesn't support the Chunk Data Control feature, select data directly (see the picture below).

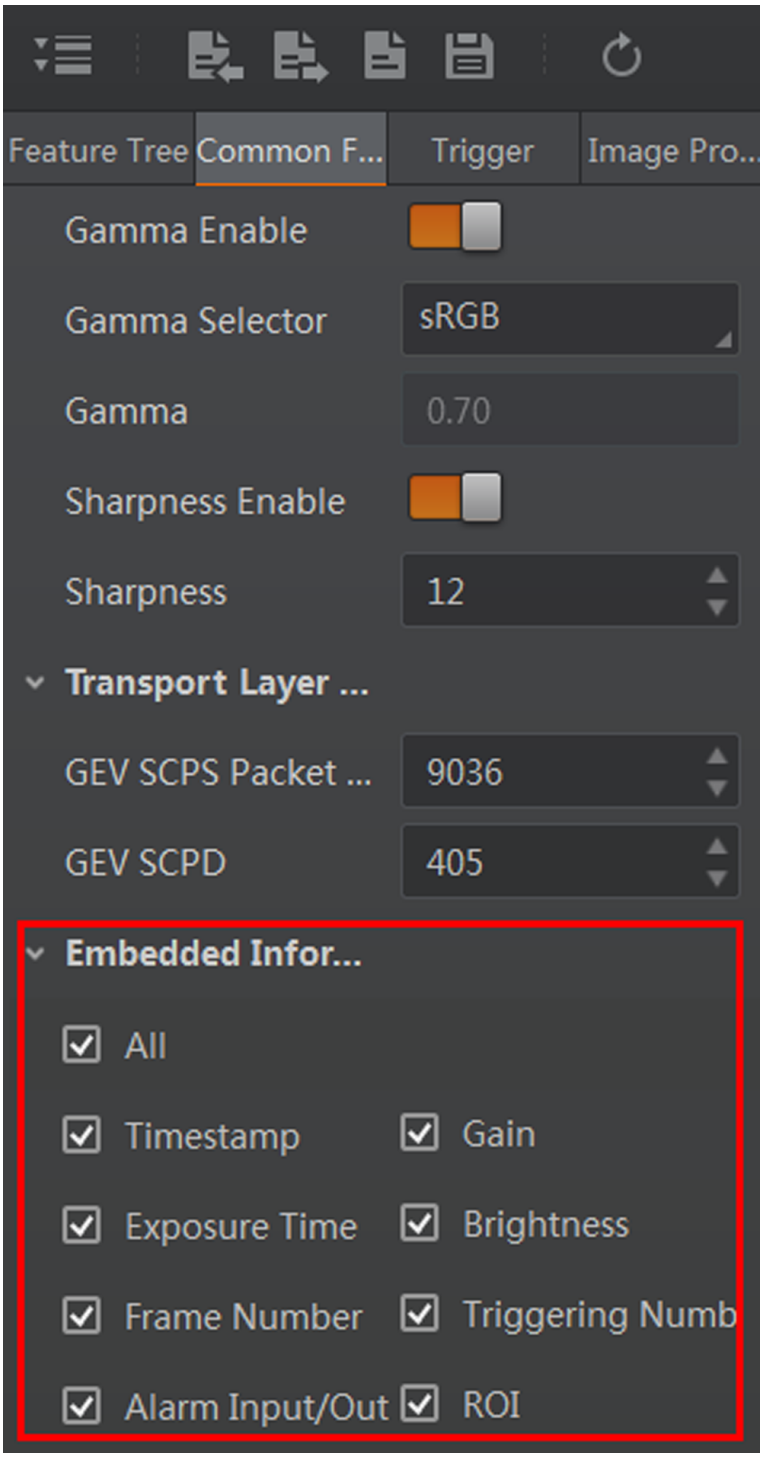


Figure 7-3 Embedded Information

7.3 Trigger

On the Trigger tab, you can configure features related to the trigger of image acquisition

and digital input/output.

7.3.1 Acquisition Control

On the Trigger tab, the Acquisition Control section displays trigger related parameters, which can be used to control the acquisition of images.

Note

The features vary with different camera models.

Trigger Selector

Select the type of trigger for image acquisition.

Frame Burst Start

The trigger for starting the capture of the bursts of frames in an acquisition.
A burst of frame(s) is defined as the capture of a group of one or many frame(s) within an acquisition

Trigger Mode

Controls if the selected trigger is active.

Off

Disable the selected trigger.

On

Enable the selected trigger.

Trigger Source

Specify the internal signal or physical input Line as the trigger source.

Software

Specify that the trigger source will be generated by the software when you execute the *TriggerSoftware* command or set **Enable Auto Trigger** switch to on.

Line 0, Line 1, Line 2 ...

Specify the selected physical line (or pin) and associated I/O control block as the external source for the trigger signal.

Counter 0

Specify the selected Counter signal as the internal source for the trigger.

Action 1

Specify the selected Action Command as the internal source for the trigger.

Note

For details about Action Command, see *GigE Vision Action Command*.

Anyway

All the above-mentioned trigger source types (**Software**, **Line 0, Line 1, Line 2 ...**, **Counter 0**, and **Action 1**will be used as the source for the trigger.

Trigger Activation

Specify which signal transition activates the trigger.

Note

Trigger Activation is only available when **Trigger Source** is set to **Line 0, Line 1, Line 2 ...**, **Counter 0**, or **Anyway**.

Rising Edge

Specify that the trigger is considered valid on the rising edge of the source signal.

Falling Edge

Specify that the trigger is considered valid on the falling edge of the source signal.

Level High

Specify that the trigger is considered valid if the level of the source signal is high.

Level Low

Specify that the trigger is considered valid if the level of the source signal is low.

Trigger Delay

Specify the delay in microseconds (μs) to apply after the trigger reception before activating it.

Auto Trigger Time

Specify the interval in milliseconds (ms) to generate the trigger signal automatically.

Note

- **Auto Trigger Time** is only available when you set **Software** as the Trigger Source.
- **Auto Trigger Time** is only effective when the **Enable Auto Trigger** switch is set to on.

Enable Auto Trigger

Enable the software to generate the trigger signal automatically.

Note

The parameter is only available when you set **Software** as the Trigger Source.

Trigger Software

Click **Execute** to execute the *TriggerSoftware* command so as to generate the trigger signal.

7.3.2 Digital I/O Control

On the Trigger tab, the Digital I/O Control section provides parameters which allow you to control the general input and output signals of the camera.

Note

The displayed features vary with different camera models. Here only introduces common Digital I/O Control features.

Line Selector

Selects the physical line (or pin) of the external device connector or the virtual line of the Transport Layer to configure its parameters such as line mode.

Line Mode

Control if the selected line is used to input signals, output signals, or control lights.

Input

Use the selected line to input signals.

Strobe

Used the selected line to output signals to control light source of the camera.

Line Source

Exposure Start Active

If the exposure starts, the output signals for controlling the light will be triggered.

Acquisition Start Active

If acquisition starts, the output signal for controlling the light will be triggered.

Acquisition Stop Active

If acquisition stops, the output signal for controlling the light will be triggered.

Frame Burst Start Active

If the burst of a frame starts, the output signal for controlling the light will be triggered.

Frame Burst Stop Active

If the burst of a frame stops, the output signal for controlling the light will be triggered.

Soft Trigger Active

Trigger the output signal for controlling the light via the Software.

Hard Trigger Active

Trigger the output signal for controlling the light via the camera.

Counter Active

Trigger the output signal for controlling the light by the counter.

Timer Active

Trigger the output signal for controlling the light by the timer.

Strobe Enable

Enable the strobe mode.

Strobe Line Duration

Set the time duration (unit: μs) of the output signal for controlling the light.

Strobe Line Delay

Set the delay time (unit: μs) for triggering the output signal for controlling the light if the events defined in **Line Source**occur.

7.4 Image Processing Features

On the Image Processing tab, you can configure features related to image processing, including ROI feature, AOI feature, HDR feature, and LUT (Look-up Table) feature.

7.4.1 Draw ROI

After ROI (Region of Interest) being configured, the system only acquires the image data within the ROI, which improves the acquisition efficiency.

Before You Start

Make sure you have exited the AOI drawing mode.

Steps

Note

You can also go to **Feature Tree** → **Image Format Control** and then configure Width, Height, Offset X, and Offset Y to set ROI. The value of Width plus the value of Offset X should not be larger than the Max. Width, and the value of Height plus the value of Offset Y should not be larger than the Max. Height.

1. Click or double-click the camera to connect it with the Software.
2. Select the connected camera.
3. Click **Image Processing** on the Feature List panel to enter the Image Processing page.
4. Click to display the ROI features.
5. Select an ROI from the ROI Selector drop-down list.
6. Select pixel format from the Pixel Format drop-down list.
7. Draw ROI.
   – Click **ReDraw**, and then drag the cursor on the image to draw ROI (displayed as a blue

rectangle).
  – Click **Edit**, and then the ROI (displayed as a blue rectangle) will cover the whole image. You can move the cursor to the edge of the rectangle, and then drag the two-way arrow to adjust the ROI.
8. Perform one of the following operations.
  – Manually adjust the OffsetX, OffsetY, width of ROI, and height of ROI.
  – Move the cursor to the edge of the blue rectangle, and then drag the two-way arrow to adjust the size of the ROI.

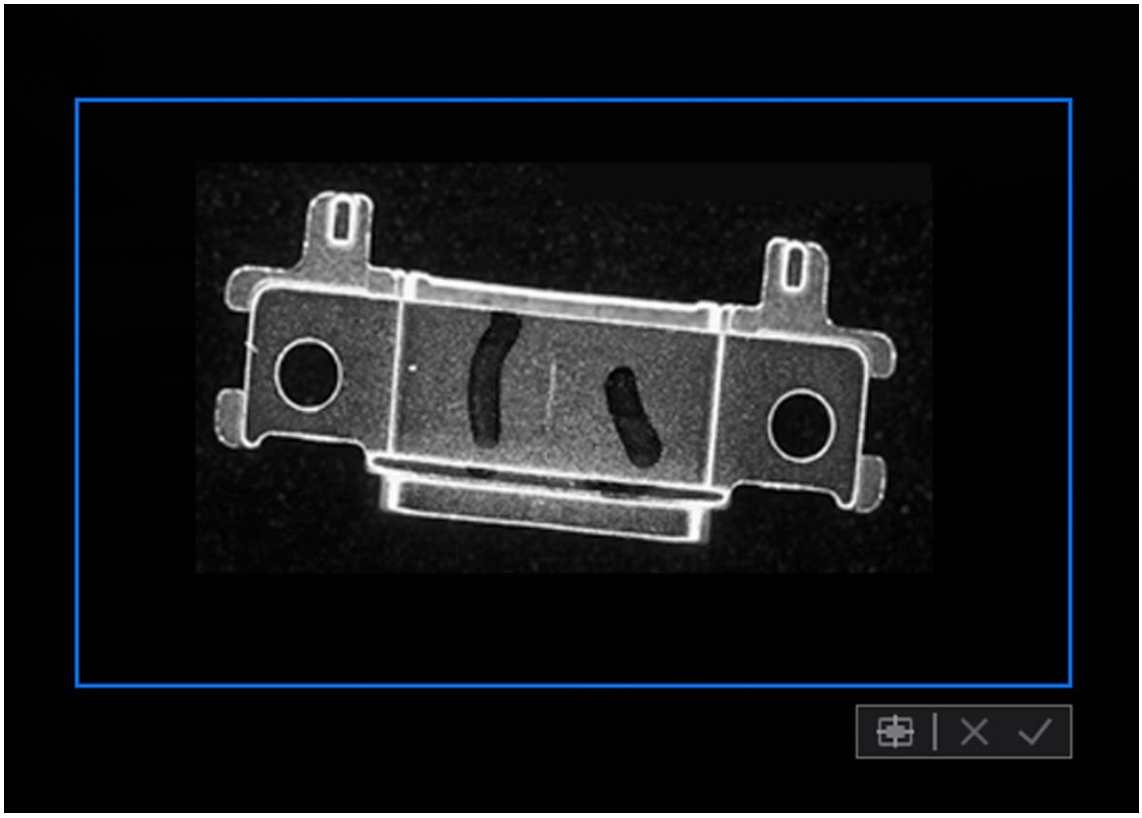


Figure 7-4 ROI

9. Optional: Adjust the position of the ROI.
  – Click to move the ROI to the center of the Live View window.
  – Hover the cursor onto the ROI until the cursor turns into a hand icon and then drag the ROI to adjust its position.
10. Finnish drawing.
  – Right-click the image and then click **Finish**.
  – Click ✓.

Note

The image resolution will be lower after setting ROI.

Only the selected ROI will be displayed.

11. Optional: Click **Restore Max. ROI** to restore the image to the original size.

Note

The image resolution will also be restored to the original state.

7.4.2 Configure AOI

AOI, which is short for Auto Function ROI, is the ROI that provides certain automatic functions.

Perform the following steps to configure AOI.

Steps

1. Draw an AOI.

Note

Drawing the AOI is similar to drawing ROI. You can refer to ***Draw ROI*** for details.

2. Select the AOI type.
   - Select **AOI1** from **AOI Selector**, and then enable **AOI Usage Intensity** to set the exposure of the whole image to the same as the AOI exposure.
   - Select **AOI2** from **AOI Selector**, and then enable **AOI Usage White Balance** to set the white balance of the whole image to the same as the AOI white balance.

Note

AOI2 is only available for color camera.

7.4.3 Configure HDR

By setting the value of shutter and gain for four sets of HDR configuration and then enabling the function, you can make the brightness of the live view image change periodically.

Steps

Note

Both HDR shutter and HDR gain should be supported by the device.

1. Click or double-click the camera to connect it with the client software.
2. Select the connected camera.
3. Click **Image Processing** on the Feature List panel to enter the Image Processing page.
4. Click to display the HDR features.
5. Select a value of HDR Selector.
6. You can set the value to 0, 1, 2, and 3, each represents a set of HDR configuration.

7. Repeat step 5 to step 6 to set the shutter value and gain value for the other three sets of HDR configuration.
8. Set to to enable HDR.
   During live view, the brightness of the image will change periodically according to the four sets of HDR configuration.

7.4.4 Configure LUT

LUT is short for Look-up Table, which is basically an array. It provides a mathematically precise and fast way to replace the pixel values in the image by values defined by you. For example, you can create a "luminance look-up table" to replace the luminance value (or gray value) in the images to optimize the luminance of the images. The Software sorts out the frequently-used LUT parameters in the LUT section of the Image Processing tab, allowing you to configure LUT directly without the inconvenience of searching for the LUT feature in the feature tree first.

Before You Start

Make sure you have set **LUT Index** and **LUT Value** in the feature tree.

LUT Index

Set a pixel value that you want to replace with a new value.

LUT Value

Set the new pixel value to replace the value you set in **LUT Index**.

Steps

1. Connect the camera to the Software and select the camera.
2. Go to the **Image Processing** tab on the Feature List panel.
3. Click to display the LUT parameters.
4. Select a value (e.g., Luminance, Red, Green, or Blue) from **LUT Selector** to set the LUT type.

   Luminance

   Luminance LUT, i.e., the look-up table for optimizing luminance of the images.

   Red

   Red LUT, i.e., the look-up table for optimizing red value of the images.

   Green

   Green LUT, i.e., the look-up table for optimizing the green value of the images.

   Blue

   Blue LUT, i.e., the look-up table for optimizing the blue value of the images.

Note

The available LUT types vary with different camera models.

5. Turn on **LUT Enable** to enable LUT.
6. Select the type of line (Fold Line, Curve, or Free Line) to be displayed on the LUT chart.

Note

- Each point on the line defines the Output value in corresponding to an Input value. The Input values represent the pixel values that need to be replaced, while the Output values represent the new pixel values that will replace the old ones.
- By default, the maximum Input value for the line is the value you set for **LUT Index**, and the maximum Output value for the line is the value you set for **LUT Value**.

7. Optional: Customize the line on the LUT chart.
   – For Fold Line and Curve, drag the square-shaped node point to edit the line.
   – For Free Line, drag the cursor on the chart to edit the line.
8. Click **Execute** of **Apply to Camera** to apply the LUT settings to the camera.
9. Optional: Perform the following operations.

Load LUT Settings from Camera	Click **Execute** of **Load from Camera** to load LUT settings from the camera to the chart.
Export LUT Settings from File	Click **Execute** of **Export to File** to export the LUT settings to the local PC as a TXT file.
Import LUT Settings from File	Click **Execute** of **Import from File** to import the LUT settings from a TXT file.
Clear Line Settings	Click **Execute** of **Clear** to clear the line settings of the chart.

7.5 Temperature Window

The Temperature Window allows you to view temperature values and variation curves of temperature screening regions.
When configuring the temperature screening parameters, you can choose whether to display on the Temperature Window the temperature values and curves of the temperature screening regions you have drawn. The value shows the real-time statistics of the corresponding region; the curve shows the temperature variation of the corresponding region over the last 12 hours.

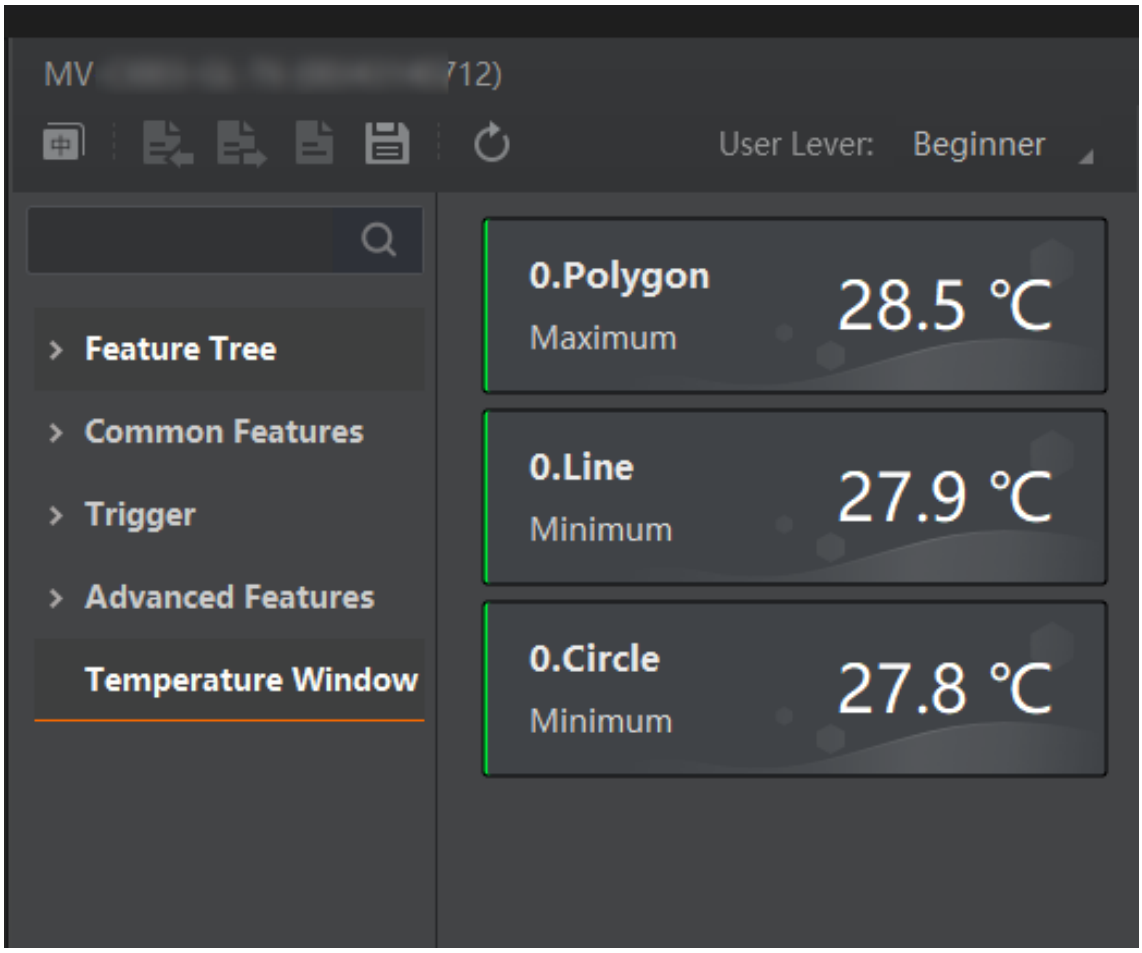


Figure 7-5 Temperature Window

Note

The number of windows displayed on this tab depends on the display parameter configurations. Up to 4 temperature value windows and 1 temperature curve window are allowed to be displayed here.

Refer to *Temperature Screening Configuration* for details about how to draw regions for temperature screening and how to configure the relevant parameters.

7.6 Import/Export Features of Single Device

You can export the feature configurations of the selected device as a MFS file to the local PC, or import the MFS file from the local PC to the selected devices to fast configure all of its features without the inconvenience of configuring its features one by one.

Before You Start

Connect the camera or frame grabber.

To export features of a selected device, click . If you need to import features of single

device, perform the following steps.

Note

Only MVS in Linux X86 system supports exporting features of frame grabbers.

Steps

1. Click and then select a MFS file from the local PC.

   Note

   Only when the model of the source device is same with that of the target device can the MFS file be imported.

2. Click **Import** to import the feature configurations to the camera.

7.7 Import/Export Features of Multiple Devices

You can select multiple cameras or frame grabbers and then export their feature configurations to the local PC as MFS files, or import MFS files to fast load the feature configurations to them.

Steps

Note

Make sure the devices are available.

1. Open the Import/Export Features window in one of the following two ways.
   - Click **Tool** → **Import/Export Features**.
   - Click **Import_Export_Features** in the installation directory of the Software.
2. Select an interface from the interface list on the left.
3. Select cameras or frame grabbers.

   Note

   You can select either cameras or frame grabbers.

4. Export or import the features of the selected cameras.
   - Click **Import** to select a MFS file so as to import the features saved in the file to the selected cameras.

Note

Only when the model of the source devices is same with that of the target devices can the MFS file be imported.

– Click **Export** to export the features of the selected cameras as a MFS file.

Note

The Software will export each device's features in a file respectively.

7.8 File Access

The File Access feature allows you to export the User Set or DPC (Defective Pixel Correction) file of a connected device to the local PC as a binary file, or import a binary file from the local PC to a connected device.

Note

- The feature should be supported by the camera.
- The File Access feature is available to use only when the camera is idle, i.e., not acquiring images.
- For details about User Set, see *User Set Control*.

7.8.1 Import User Set

You can import a binary file from the local PC to the User Set of the camera.

Steps

1. Connect the camera to the Software.
2. Click to open the File Access window.
3. Select a User Set (**User Set1**, **User Set2**, or **User Set3**) or **DPC** from the drop-down list.
4. Click **Import** to select the corresponding binary file and import it.

Note

- DPC can only be imported to the same camera, while User Set can only be imported to the cameras of the same model.
- The DPC will be imported and be effective directly. While for User Set, you should load the User Set to make it effective (see Step 5).

5. If you select a User Set in step 3, load the User Set to make it effective.
   1) Click **Feature Tree**.
   2) Click to display the features under **User Set Control**.
   3) Select a User Set from **User Set Selector**.

4) Click **Execute** to execute the ***User Set Load*** command to load the selected User Set.

7.8.2 Export User Set

Perform the following task to export User Set to the local PC.

Before You Start

Save the current camera settings to a specific User Set. See ***User Set Control*** for details.

Steps

1. Connect the camera to the Software.
2. Click to open the File Access window.

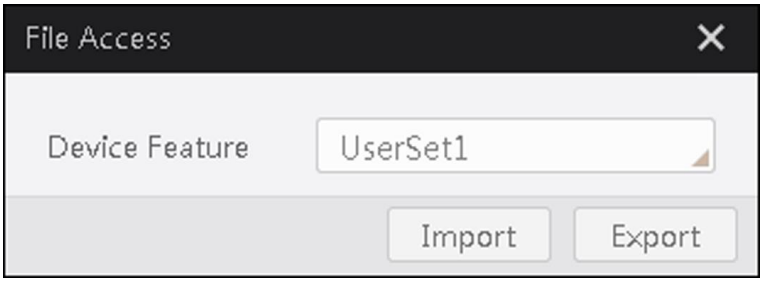


Figure 7-6 File Access Window

3. Select a User Set or DPC from the drop-down list.
4. Click **Export** to export the User Set to the PC as a binary file.

Note

- The file format is mfa by default.
- The name of the exported file is "Camera Model_Camera Serial Number_User Set Name" by default. Example: MV-CA023-10GC_00682345470_UserSet2.mfa

A prompt will appear when the Use Set is exported.

5. Optional: Click **View** to go to the directory of the exported file.

7.9 User Set Control

A User Set is a group of parameter values with all the settings needed to control the camera. In other words, each User Set includes the values of almost all camera parameters. You can globally control the camera settings by saving and loading User Set. If you have configured the camera parameters as required, you can save them as a User Set. After that, you can load the User Set to restore the camera to the saved group of parameter values with a minimum of configuration effort.

User Set Control Description

Click or double-click the camera to connect it to the Software, and then click to save open the Save Features window.

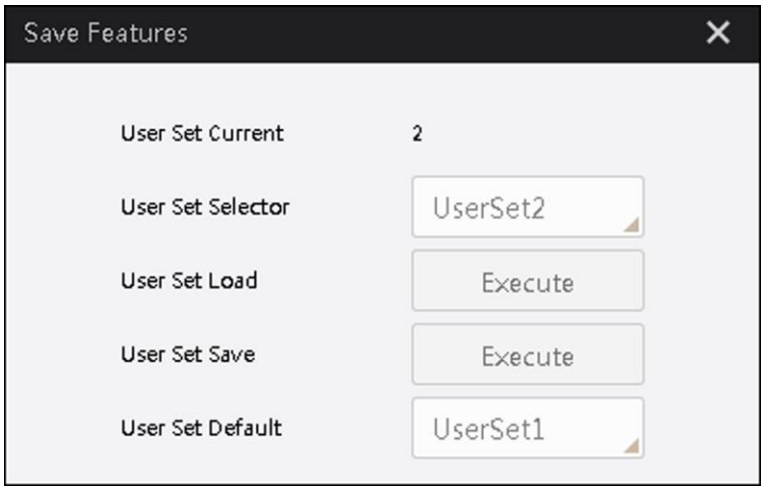


Figure 7-7 Save Features Window

User Set Current

The currently loaded user set.

- "0" represents **Default**, i.e., the factory settings.
- "1" represents **UserSet1**.
- "2" represents **UserSet2**.
- "3" represents **UserSet3**.

User Set Selector

Select User Set.

Note

The number of User Sets vary with different camera models.

Default

The read-only factory settings. In other words, the default startup settings on the camera.

User Set1, User Set2, User Set3

The user sets that can be used to load and save your own camera settings.
Initially, these user sets contain the same parameter values as the **Default** user set.
You can save one of them to overwrite those values with your own settings to create a user set that is customized for your usage scenario. See the description of **User Set Save** below for details about saving User Set.

User Set Load

Load the User Set specified by User Set Selector to the camera and make the it active.
When a user set is loaded, it overwrites the current camera settings.

Note

- Loading a user set is only possible when the camera is idle, i.e., not acquiring images.

- Except for the **Default** user set, you need to have saved a User Set before you can load it. See the description of **User Set Save** below for details about saving User Set.

User Set Save

Save your own camera settings as the User Set specified by User Set Selector.

Note

- Only the **UserSet1**, **UserSet2**, and **UserSet3** can be saved. The other user sets are read-only.
- Saving a user set is only possible when the camera is idle, i.e., not acquiring images.

User Set Default

Select User Set to automatically load and make it active by default when the camera is reset to its power up state.

Operations for User Set Control

Table 7-3 Operation Description

Operation	Description
Save Camera Settings in User Set	Select a User Set (excluding **Default**) from **User Set Selector**, and then click **Execute** of **User Set Save**.
Load Camera Settings Saved in User Set	Select a User Set (excluding **Default**) from **User Set Selector**, and then click **Execute** of **User Set Load**. **Note** You can do the operation only when the camera is connected but NOT acquiring image data.
Set Default Camera Settings	Select a User Set from **User Set Default** to automatically load the camera settings saved in the selected User Set and make the camera settings active by default when the camera is reset to its power up state.

Chapter 8 Acquisition and Live View

You can start image data acquisition and view the live video of a single machine vision camera or the live video of multiple machine vision cameras simultaneously. And during the live view, you can determine the optimal image quality and perform operations such as recording video, capturing pictures, and zooming in or out.
Acquisition and live view are two different concepts:

Acquisition

The process in which the camera acquires image data.

Live View (or Live Video)

The display of live images by rendering the image data acquired by the camera.

8.1 Acquisition and Live View in 1-Window Mode

You can view the live video of a specific camera or multiple cameras in 1-window mode. When viewing live videos of multiple cameras, you can switch camera to view live video.

Steps

1. Connect camera(s) to the Client.
2. Start acquiring image data.
   – If only one camera is connected, click to start acquiring image data from the camera.
   – If multiple cameras are connected, click to start acquiring image data from the connected cameras simultaneously.

   If you are acquiring image data from single camera, the live view of the camera will be displayed; If multiple cameras, the live view of the currently selected camera will be displayed.

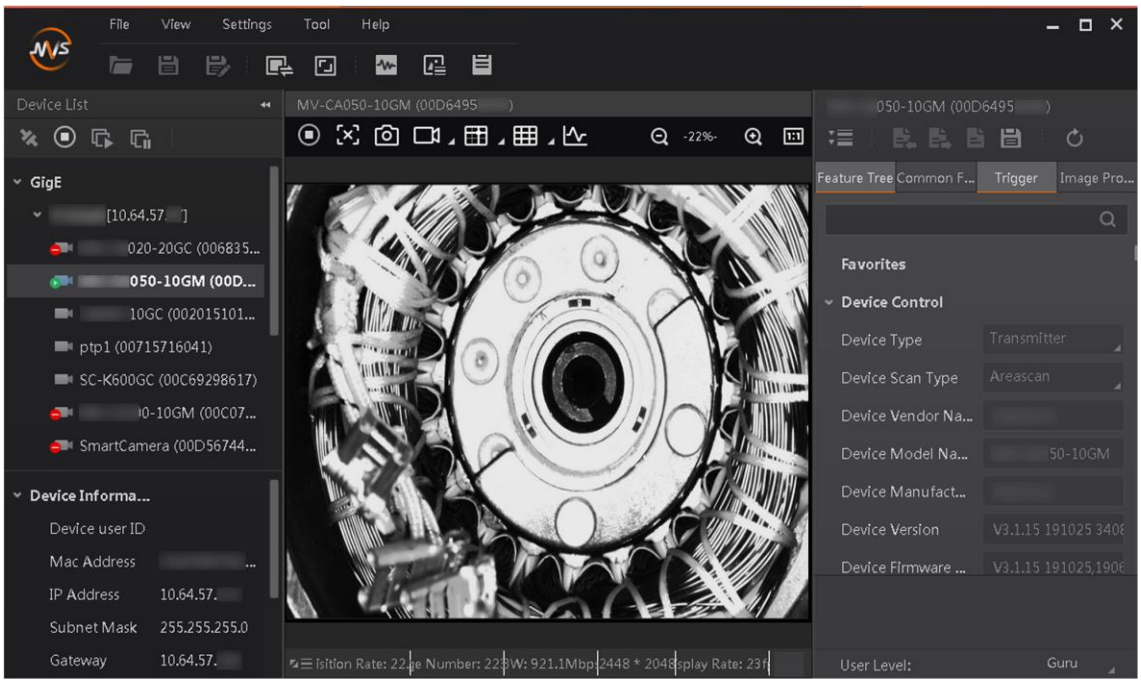


Figure 8-1 1-Window Mode Live View

3. Optional: Perform the following operations if required.

Stop/Resume Live View	Click to stop live view, and click to resume live view. **Note** After live view being stopped, acquisition still goes on.
Switch Camera for Live View	If you are acquiring image data from multiple cameras, you can double-click the connected camera on the device list to switch camera for live view.

4. Stop acquisition.
   - Click to stop acquiring image data from the currently selected camera.
   - Click to batch stop acquiring image data from the connected cameras.

8.2 Acquisition and Live View in Multiple-Window Mode

You can view the live view of a specific camera or the live videos of multiple cameras in multiple-window mode. In this mode, you can view the live videos of multiple cameras simultaneously.

Steps

Note

You can acquire image data from up to 16 cameras simultaneously.

1. Connect camera(s) to the Software.
2. Click , and then select a multiple-division mode.
3. Drag the connected camera(s) from the device list to the display window(s) to view the camera's live video.
4. Start acquiring image data.
   - If only one camera is connected, click to start acquiring streams from the camera.
   - If multiple cameras are connected, click to start acquiring image data from the connected cameras simultaneously.
5. Optional: Perform the following operations after starting acquisition.

Adjust Window Position	Drag the title bar of a display window under live view to adjust its position.
Stop/Resume Live View	Move the cursor to the lower part of the live video image, and then click on the appeared toolbar to stop live view of the selected camera. And click to resume live view.

Note

After live view being stopped, acquisition still goes on.

Switch to 1-Window Mode	Double-click the live video image or click the Maximize button to switch to 1-window mode.

Note

- You can double-click the live video image again or click the Minimize button to restore the window division mode to multiple-window mode.
- When switching from multiple-window mode to 1-window mode, the live video of the first live-viewed camera in multiple-window mode will be displayed. You can drag the camera from the device list to the display window or double-click to camera to switch camera for live view.

6. Stop acquiring image data.
   – Move the cursor to the lower part of the live video image, and then click on the appearing toolbar to stop acquisition of the selected camera.
   – Click to batch stop acquisition.

8.3 Full Screen Live View

You can view live view in full screen in both 1-window mode or multiple-window mode.
In multi-window mode, you can click or **Full Screen** on the right-click menu to enter the full screen mode. And right-click the image and then click **Exit Full Screen** to exit full screen mode.
In 1-window mode, you can double-click the image to enter or exit the full-screen mode.

8.4 Customize Window Division

Three default window division modes are provided in Custom Division module, i.e., 2 X 2 (4-Window), 3 X 3 (9-Window), and 4 X 4 (16-Window). You can add the three modes to the Window Division panel, or merge (or split) windows based on the three modes.

Steps

1. Click to display the window division panel.

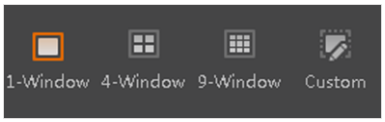


Figure 8-2 Window Division

2. Click **Custom** to open the Custom Division window.

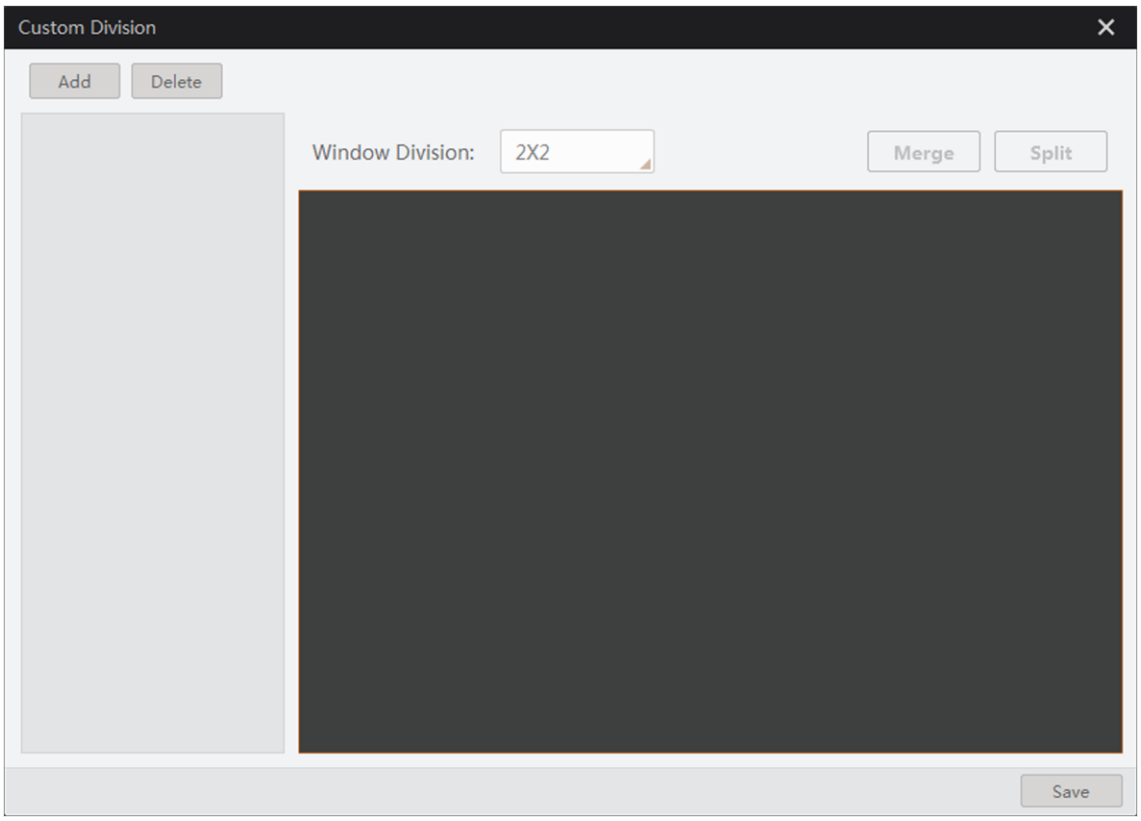


Figure 8-3 Custom Division

3. Click **Add** to open the following window.

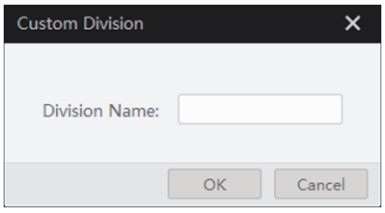


Figure 8-4 Division Name

4. Create a name for the window division mode and then click **OK**.
5. Select a window division mode from the Window Division drop-down list.
6. Optional: Merge or split windows.
   1) Select windows.

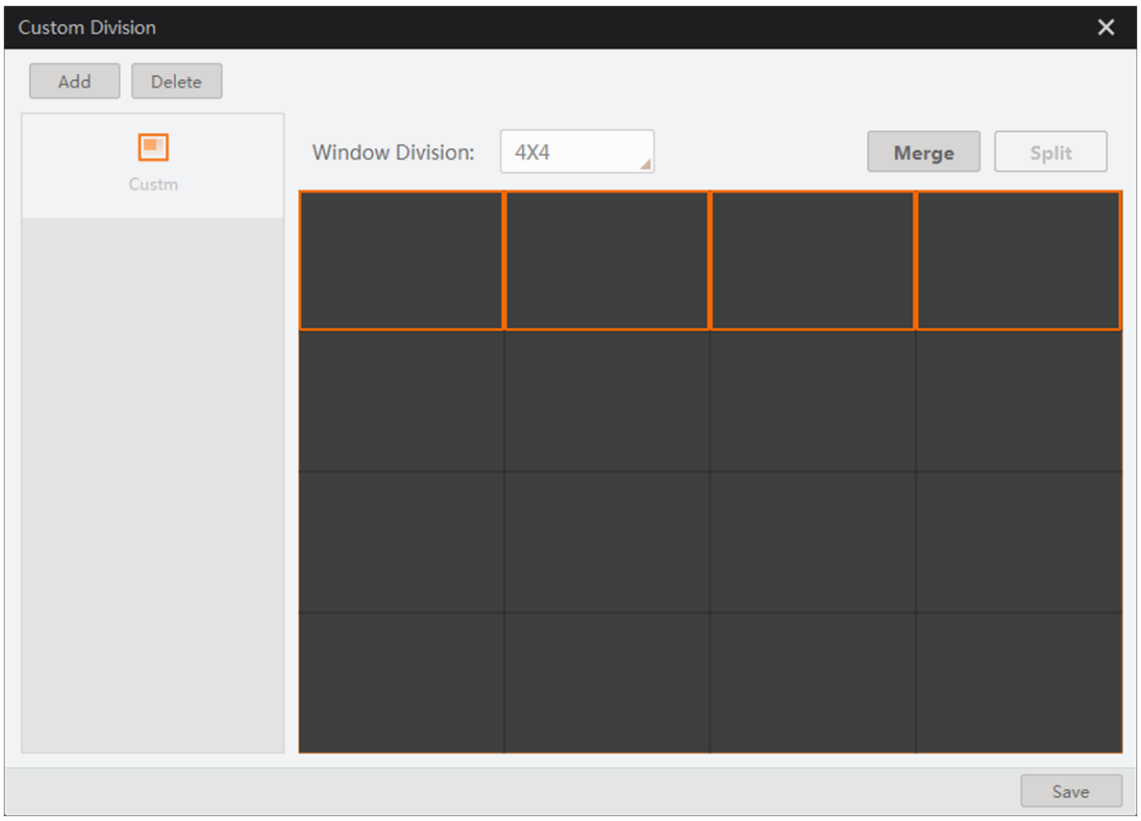


Figure 8-5 Select Windows

2) Click **Merge** to merge the selected windows into a larger one.

Note

You can merge the selected windows only when the combination of the selected windows is of rectangle shape.

3) Optional: Select the merged window and then click **Split** to split it into the original windows.

7. Click **Save**.
   The custom window division mode will be displayed on the window division panel.

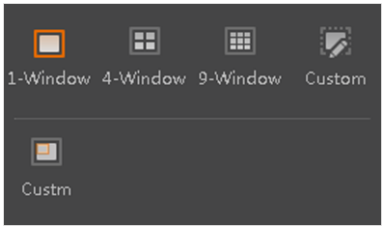


Figure 8-6 Custom Division Added

8.5 Capture and Recording

During live view, you can capture pictures and record video files.

Steps

1. Start live view. See *Acquisition and Live View in 1-Window Mode* for details.
2. Perform the following operations.

Capture and Save Picture	Click to capture a picture and save the picture to the local PC.
Start or Stop Recording	Click to start recording, and click again to stop recording. **Note** During recording, the recording time will be displayed, and you can click at the upper-right of the display window to view the buffer usage, number of frame processed and frame dropped.
Continuously Start and Stop Capturing Pictures	Click (beside) and then click to continuously capture pictures of the live view, and click the icon again to stop capturing. **Note** During recording, the number of the captured pictures will be displayed in real time, and you can click at the upper-right side of the display window to view the buffer usage, number of frame processed and frame dropped. A prompt will pop up once you finish capturing picture(s) or recording.

3. Optional: Click **View** on the prompt to view the picture(s) or video file(s) in the saving path.

Note

You can set the saving path of the captured picture(s) and recorded video file(s). You can also set other parameters for recording or continuous capture. See *Capture and Recording Settings* for details.

8.6 Set Cross Line

During live view, you can display a cross line on the live view image to adjust the position of the object in the view.

Steps

The function is only available during the live view of a single camera under 1-division mode.

1. Click beside .
2. Select **Window Coordinates** or **Image Coordinates**.

   Window Coordinates

   The cross line will be displayed on the display window.

   Image Coordinates

   The cross line will only be displayed on the image.
3. Set the **Axis X** and **Axis Y**.

   Note

   Click **Center** to position the cross line to the center.
4. Edit the **Thickness** of the cross line.
5. Click on the right of **Color** to select a color for the cross line.
6. Optional: Enable **Zoom Center** to zoom in or zoom out the image based on the intersection point of the cross line.
7. Click to open the cross line.

8.7 View Acquisition Status

During acquisition or live view, you can view the acquisition status of the camera(s), including the acquisition rate, image number, bandwidth, resolution, errors, packets lost and display rate, etc.

View Acquisition Status in 1-Window Mode

During acquisition or live view (in 1-Window mode), a status bar appears at the bottom of the display window to display in real time the acquisition status of the selected camera. You can click in the lower-left corner to select status parameters (the selected ones will be displayed on the status bar).

For GigE Vision cameras, you can select the following status parameters: acquisition rate, image number, bandwidth, resolution, errors, packet lost, packets requested to resend, packets resent, display rate, location, RGB, YUV, zoom, and temperature.

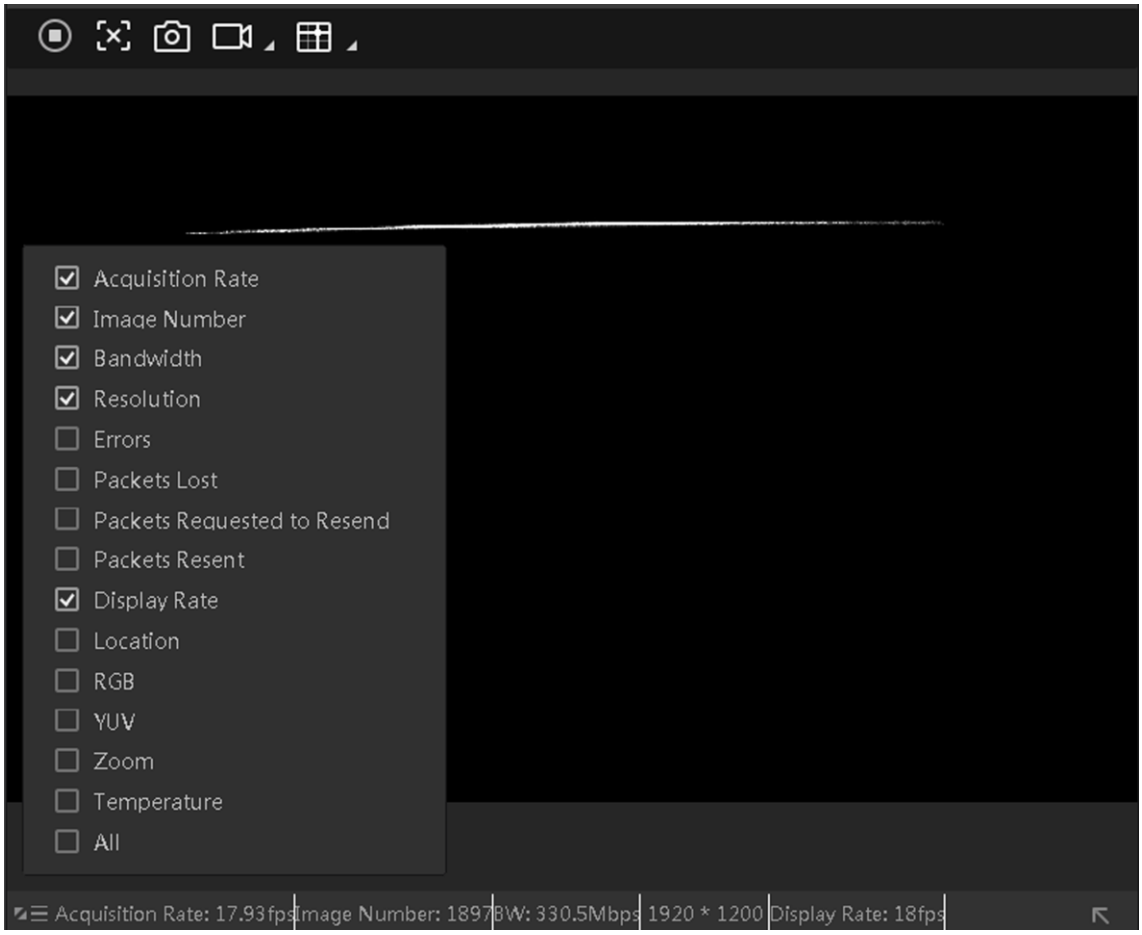


Figure 8-7 GigE Vision Camera Acquisition Status

For USB3 Vision cameras, you can select the following status parameters: acquisition rate, image number, bandwidth, resolution, errors, packet lost, display rate, location, RGB, YUV, zoom, and temperature.

Figure 8-8 USB3 Vision Camera Acquisition Status

View Acquisition Status of Multiple Cameras Simultaneously

During live view of multiple cameras, you can click to open the Status window to view the acquisition status of these cameras. After that, you can click **More** to open the parameter panel, and then select parameters to be displayed on the Status window or status bar.

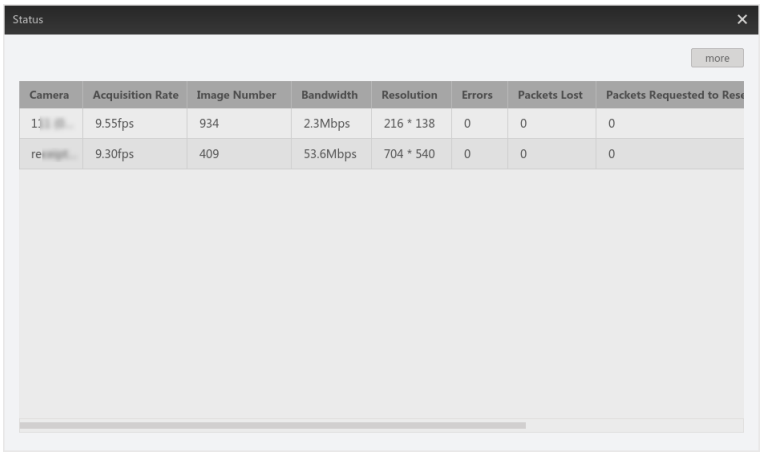


Figure 8-9 The Status Window

8.8 View Embedded Information

During live view, you can view the information embedded into the image data, including timestamp, gain, exposure, external trigger number, etc.
After starting live view, you can click to open the Embedded Information window to view the embedded information.
You can click **More** to select the information (timestamp, gain, exposure, etc.) which needs to be displayed on the window.

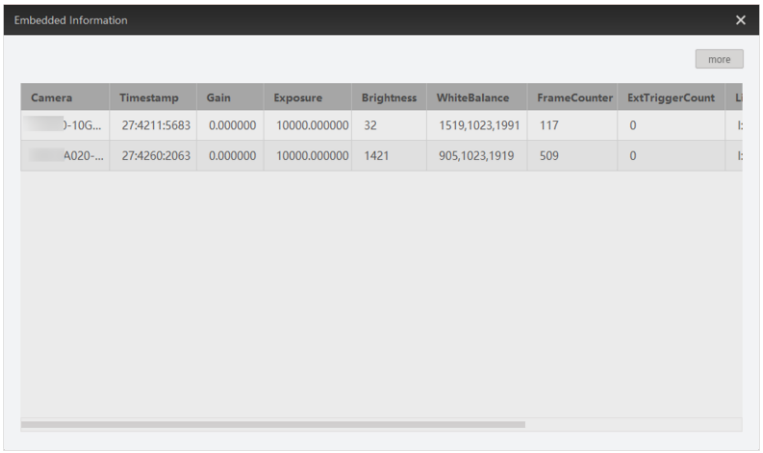


Figure 8-10 Embedded Information Window

8.9 View Histogram

The Histogram functionality allows you to quickly evaluate the image quality by viewing the real-time distribution of different color channels (for color camera) or the real-time distribution of gray values in the images (for mono camera).

Note

The following text only takes viewing the histogram data of color camera for an example.

Start acquisition and then click to open the Histogram window.

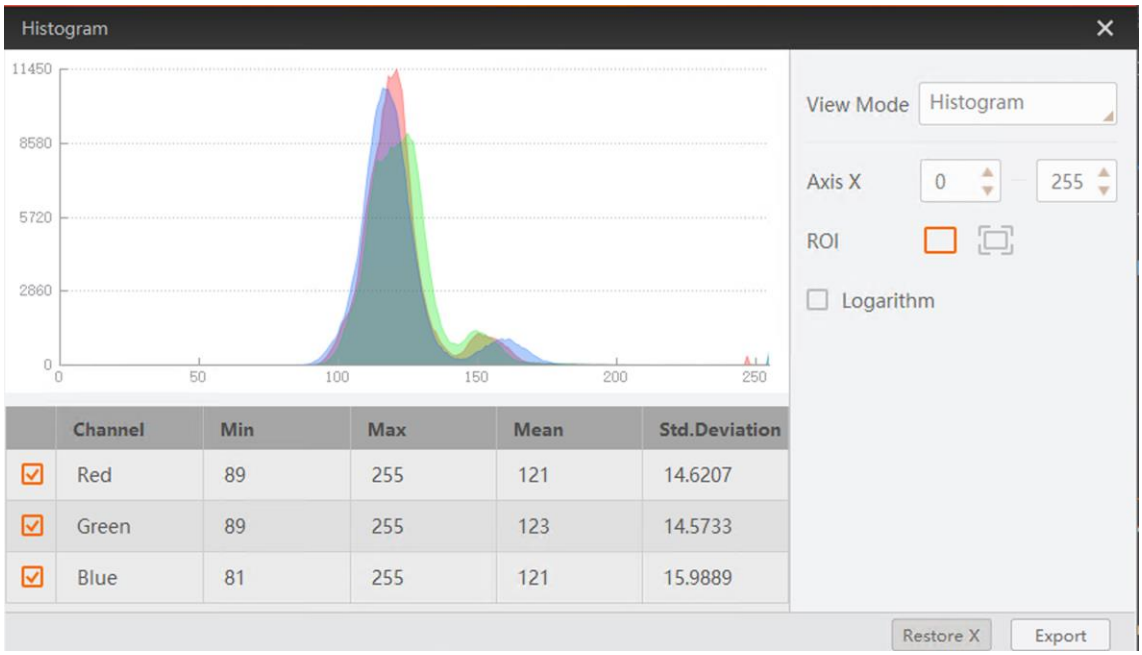


Figure 8-11 The Histogram Window

View Mode

Set the view modes, including Histogram, Line Profile and Column Profile.

Histogram

Axis X

Set the value range of the axis X of the histogram.

Line Profile

Location

Display the coordinates value of your cursor when you moving your cursor on the images.

Line Axis

Set the value range (0 to the horizontal resolution of the image) of the selected line which is parallel with the X axis.

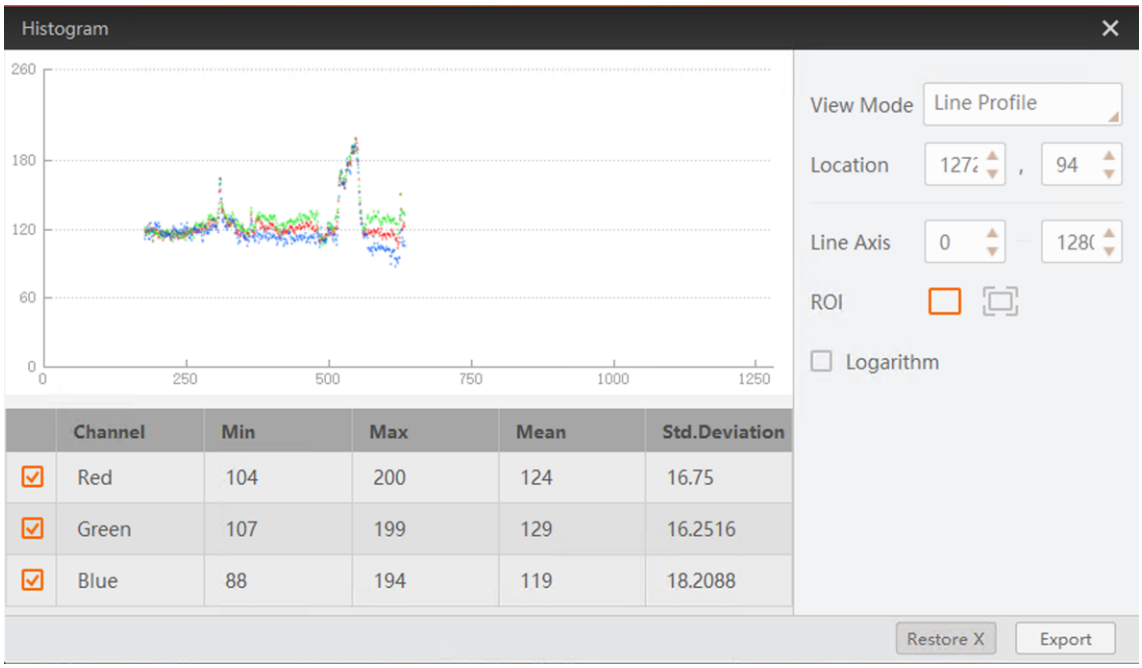


Figure 8-12 Line Profile Mode

Column Profile

Location

Display the coordinates value of your cursor when you moving your cursor on the images.

Column Axis

Set the value range (0 to the vertical resolution of the image) of the selected line which is parallel with the X axis.

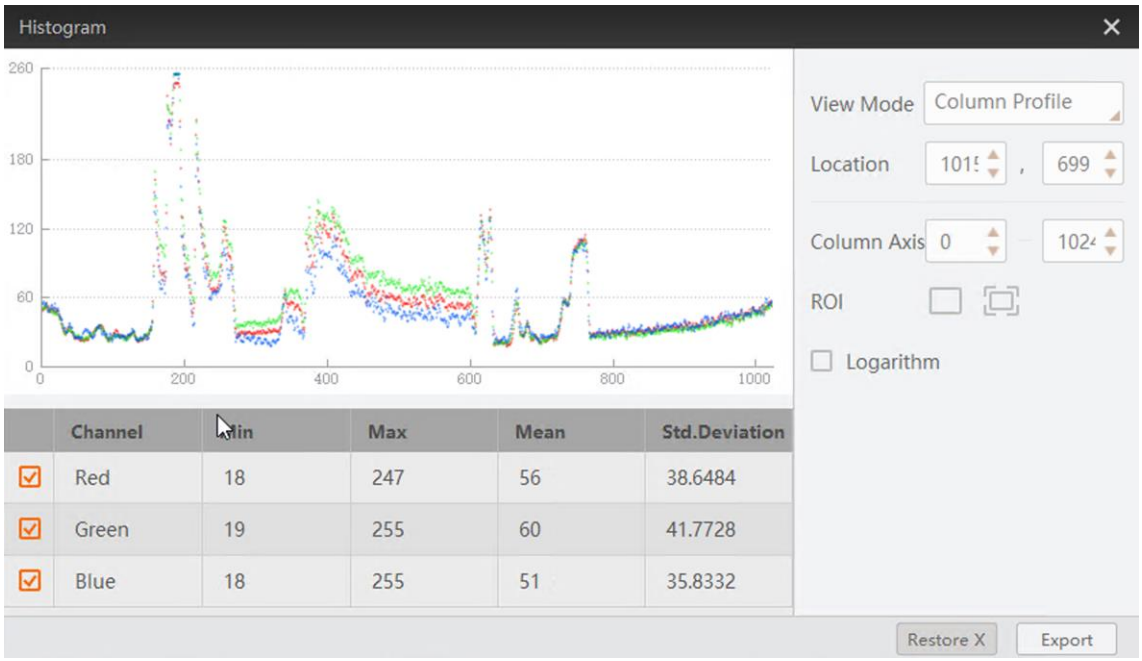


Figure 8-13 Column Profile Mode

ROI

Click and then drag the cursor on the image to draw a ROI. After that, the histogram only displays the color channel distribution or gray value distribution within the ROI.

You can click to cancel the ROI settings.

Logarithmic Scale

Switches between a linear and a logarithmic view of the data.

You can do the following operations if required.

Table 8-1 Available Operations

Operation	Description
Panning and Zooming	Panning and zooming allows you to look at specific areas of the histogram in more detail. ● Panning: Drag the cursor on the histogram to pan the histogram. ● Zooming: Move the cursor to the histogram and then scroll the mouse wheel to zoom in or zoom out. Scan the QR code to view the video clip which shows panning and zooming.

Operation	Description
	
Select Color Channel for Display	If the camera is a color camera, you can check the checkbox(es) in the table, the selected color channel's real-time distribution will be displayed on the histogram.
Export Histogram Data	Click **Export** to export the histogram data to the local PC.
Restore X	Click **Restore X** to restore the coordinates if you have zoomed the histogram.

8.10 Temperature Screening Configuration

For infrared cameras, you can perform temperature screening configurations, such as drawing different types of temperature screening regions and configuring the relevant parameters, including those related to screening, alarm, and display.

8.10.1 Configure Temperature Screening Parameters

Besides drawing temperature screening regions, you can also set parameters related to screening, alarm, and display on the Temperature Screening Region Settings window.

Note

For the configurations to take effect, you can either click **OK** on the bottom right corner of the window or click **Apply Param** on the bottom left. Clicking **OK** will close the configuration window, whereas clicking **Apply Param** will not and you can continue with the configurations.

Screening

Under **Screening**, you can configure parameters related to the palette mode, camera basics, global screening, and expert mode.

Palette Mode

Select a palette mode for the camera from White Hot, Black Hot, etc.

Camera Parameter

Brightness

Adjust the brightness level of the live view image correspondingly. The larger the value, the brighter the image.

Gamma Enable

When enabled, you can set the gamma value correspondingly. The larger the value, the stronger the contrast.

Sharpness Enable

When enabled, you can set the sharpness level for the edges of the live view image.

Noise Reduction Enable

When enabled, the signal-to-noise ratio of the image will be boosted, so as to improve the quality of the image.

Global Screening

Set the global temperature screening parameters for the temperature screening regions.

Atmospheric Transmissivity

If a germanium glass needs to be added in front of the lens of the infrared camera, the transmittance of the germanium glass can be set by this parameter.

Note

If no germanium glass is needed, you can keep this parameter as 100.

Temp Measurement Range

Select a temperature measurement range as needed from **-20℃ ~ 150℃** and **0℃ ~ 550℃**.

Target Distance

Set the linear distance from the target object to be measured to the device (unit: m).

Full Screen Emissivity

Set the emissivity of the target object. The emissivity value varies for different objects. Refer to the user manual of the corresponding camera model for details.

Temp Measurement Expert Mode

When enabled, you can set the corresponding parameters for each temperature screening region respectively.

Expert Mode

Temp Region Reflect Enable

Set whether to enable reflection for the temperature screening region when there is a high-temperature object at the scene, and a measured object with low emissivity reflects the high-temperature object.

Temp Region Reflectance

Set the reflectance value of the temperature screening region, which needs to be consistent with the temperature value of the high-temperature object.

Temp Region Target Distance (m)

Set the linear distance from the target object to be measured to the device (unit: m).

Temp Region Emissivity

Set the emissivity value of the target object (unit: %). The emissivity value varies for different objects. Refer to the user manual of the corresponding camera model for details.

Alarm

Under **Alarm**, you can configure parameters related to the temperature triggered alarms for a single region or of comparing two regions.

Single Region Alarm

Set the alarm rule for a single temperature screening region you have drawn.

Point

For point ROIs, you can set the following parameters for conditions to trigger or restore alarms.

Point Temp

Select **>** or **<** from the drop-down list, and enter a temperature value correspondingly to set the alarm rule.
E.g., If you select **>** and enter 50 in the box, an alarm will be triggered when the screened temperature exceeds 50°C.

Tolerance Temp

Set the threshold for restoring alarms of the region.
E.g., If the tolerance temperature is set to 5°C while the rule for triggering alarms is set to > 50°C, alarms will be canceled when the screened temperature is less than or equal to 45°C.

Polygon/Line/Circle

For polygon, line, and circle ROIs, you can select a specific type of temperature statistics (Maximum, Minimum, Average, and Variation) and set the corresponding alarm triggering and restoring rules. The configuration process is similar to those of setting **Point Temp** and **Tolerance Temp** for point ROIs.
E.g., If you select **Maximum**, **>**, and enter 50 in the box, an alarm will be triggered when the maximum temperature value of the region exceeds 50°C.

Multi-Region Alarm

Set up to four multi-region alarm rules which compare the chosen type of statistics of two temperature screening regions. Follow the steps below to configure a rule.

1. Select a region from the drop-down list for **Region Index 1**, which will be set as the

reference region (i.e., the region being compared to).

2. Select another region from the drop-down list for **Region Index 2**, which will be set as the target region.
3. Choose a specific type of temperature statistics to be compared between the regions from **Maximum**, **Minimum**, **Average**, and **Variation**.
4. Select **>** or **<** from the second drop-down list, and enter a temperature value correspondingly to set the alarm rule.

E.g., If you select **Maximum**, **>**, and enter 10 in the box, an alarm will be triggered when the maximum temperature value of the target region is 10°C greater than that of the reference region.

Display

Under **Display**, you can configure parameters related to the display settings of the live view window and the temperature window.

Basic Display

Temperature Bar

When enabled, a temperature bar will be displayed on the right side of the live view window.

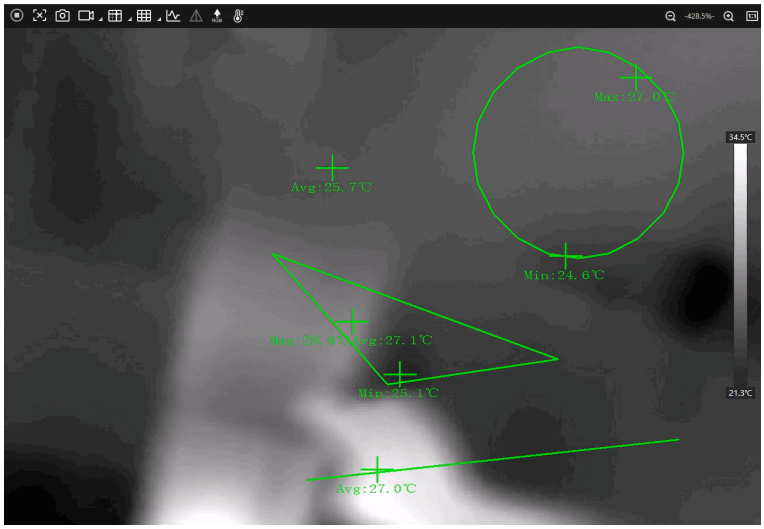


Figure 8-14 Temperature Bar

Region Information Overlay

Select a overlay mode for the region information from the followings.

- **None**: Disable region information overlay. No information is displayed when the camera acquires images or when the images are saved.
- **Camera**: Overlay information of the temperature screening regions to the camera, so that the information will be displayed when the camera acquires images and when the images are saved.
- **Client**: Overlay information of the temperature screening regions to the Client, so that the information will be displayed when the camera acquires images, but not

when the images are saved.

Temperature Window

You can set up to 4 displays of temperature values and 1 display of the temperature curve to be displayed on the Temperature Window. For each display, you can select a temperature screening region and a type of statistics as shown below.

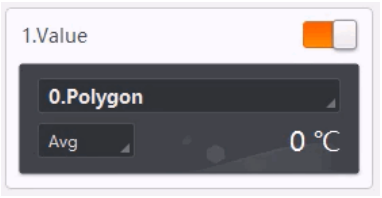


Figure 8-15 Temperature Window Settings

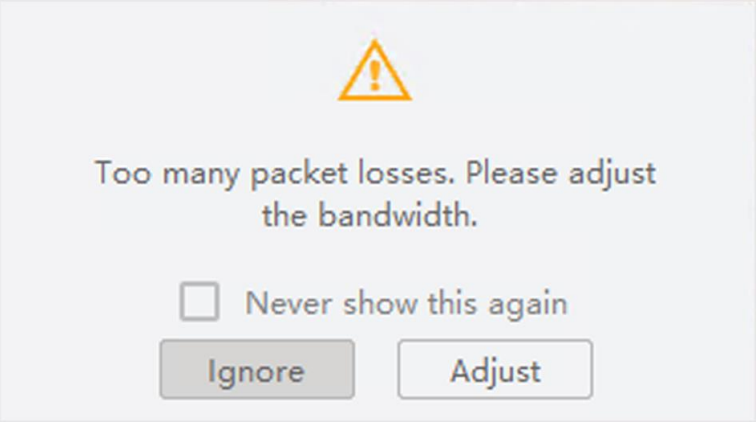
Refer to *Temperature Window* for how the display outcome looks like.

8.11 More Functions

More functions are provided during live view, such as digital zoom and image rotation.

Table 8-2 Function Description

Function	Description
Image Zooming	Right-click the image to open the right-click menu and then click **Zoom in**/**Zoom out**, or move the cursor to the image and scroll the mouse wheel to zoom in or zoom out the image. **Note** This operation is not supported by local images and local videos. **Note** ● After zooming in the live view image, you can drag the image to view more details. For details about how to set window division, see *Customize Window Division*. ● You can also use cross line for image zooming. See *Set Cross Line* for details. ● You can set keyboard shortcut for image zooming. See *Shortcut* for details.

Function	Description
Fit to Window/Actual Size	Right-click the image, and then click **Fit to Window** to fit the size of the image to that of the display window. Right-click the image, and then click **Actual Size** to restore the image to its original size (original resolution). **Note** ● You can set keyboard shortcuts for the two operations. See ***Shortcut*** for details. ● The two operations are not supported by local images and local videos.
View Settings	Adjust the image quality of the live video by setting the display mode, filtering mode, vertical synchronization mode, and rendering engine. See ***View*** for details.
Adjust Band Width	During image data acquisition, if excessive packet losses occurs, a prompt will pop up to remind you to adjust bandwidth. In this case, you can tap **Adjust** to adjust the bandwidth so as to alleviate packet losses.  **Figure 8-16 Excessive Packet Losses Prompt**

Chapter 9 Tool Application

The Software provides multiples tools for the management, configuration, and maintenance of cameras, such as IP Configurator (for editing camera IP address), Firmware Updater (for updating camera firmware), GigE Vision Action Command (for triggering actions in multiple cameras simultaneously), and System Info (for checking system information).

9.1 IP Configurator

You can use IP Configurator to check the connection status of GigE Vision cameras and edit their IP configurations.

Steps

1. Select **Tool** → **IP Configurator** to open IP Configurator.

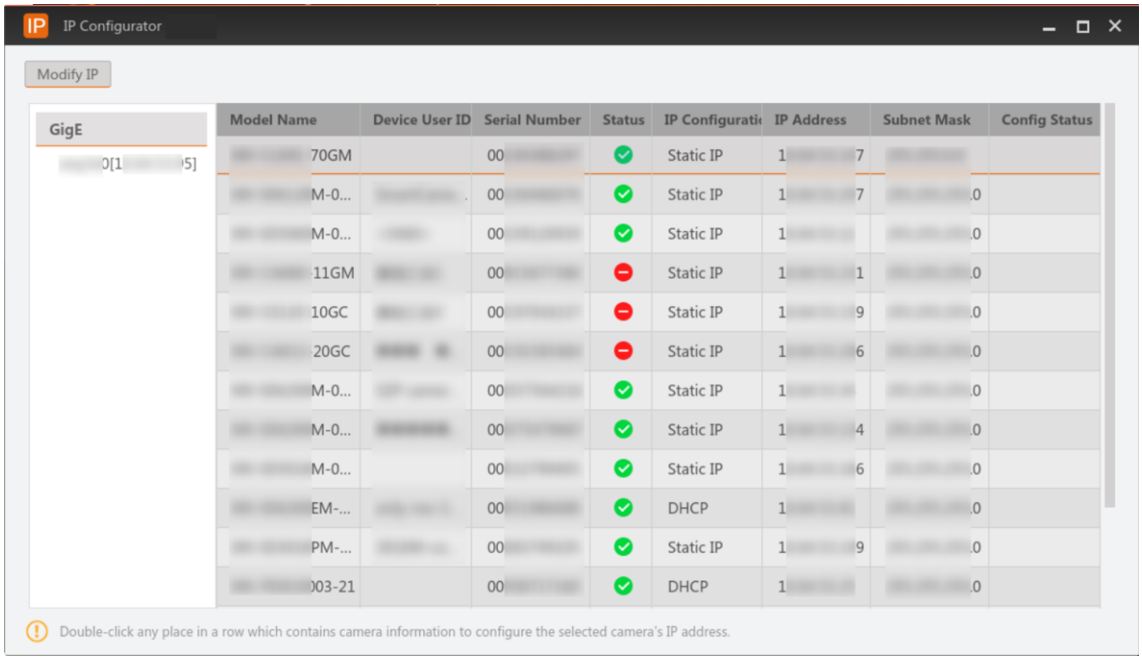


Figure 9-1 IP Configurator

2. Double-click a camera item or select a camera item and then click **Modify IP** to open the Modify IP Address window.

Note

You cannot change the IP configurations when the camera's status is connected or in acquisition.

Figure 9-2 Modify IP Address Window

3. Select **Static IP**, **DHCP**, or **LLA** as the IP type.

Note

If you change the IP type, the camera will be reset to its power-up state.

Static IP

You can edit the IP address, subnet mask, and default gateway.

DHCP

The camera is set to automatically obtain an IP address. This means that the IP address will change dynamically (within a range) every time the camera or PC reboots.

LLA

The camera uses a default IP address from the link-local address block. Link-local addresses for IPv4 are defined in the address block 169.254.0.0/16 in CIDR notation.

In IPv6, they are assigned the address block fe80::/10.

4. Optional: Edit the camera name in the Device User ID field.
5. Click **OK** to save the settings.

Note

If the modified IP address conflicts with another device's IP address on the same local subnet, a prompt will pop up. Change the IP address in this situation.

9.2 Firmware Upgrade Tool

You can use the Firmware Upgrade Tool (hereinafter simplified as "the Tool") to upgrade the firmware of GigE cameras, USB cameras, frame grabbers, and cameras enumerated by frame grabbers. The camera firmware upgrading process mainly contains three parts, and they are Search for Device, Start to Upgrade, and View Upgrading Status.

Search for Devices

After you open the Tool, you can see the computer interface information displayed on the left. The available operations may vary according to devices with different interfaces.

- GigE and USB Interfaces:
  - Select GigE or USB, and the devices that can be found will be displayed on the right pane.
  - Select an interface under GigE or USB, and the devices that can be found will be displayed on the right pane.
  - The Tool can automatically refresh and enumerate the devices under the GigE and USB interfaces, or you can click to manually refresh and enumerate devices.
- GenTL Interface:
  - Click on the right side of the **GenTL** to manually or automatically enumerate frame grabbers and cameras linked with frame grabbers from the CTI file.
    - › Click → **Default Loading**, and you can check the automatically loaded CTI file. After it is checked, the Tool will automatically enumerate the cameras linked with frame grabbers from the CTI file.

Note

For the parameter **MvFGProducerCML**, you can select **Default** or **Virtual Port** to open the CTI files of GenTL frame grabbers.

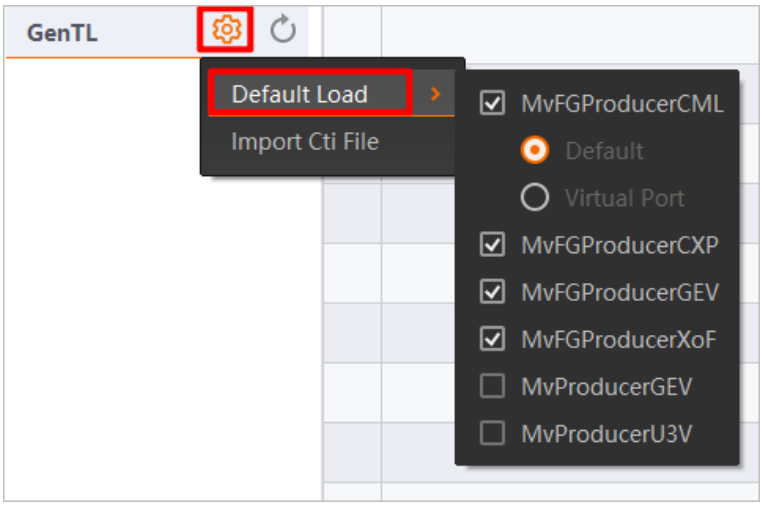


Figure 9-3 Load CTI Files by Default

› Click → **Import Cti File**. You can manually select a CTI file and click **Open** to enumerate the frame grabbers and cameras linked with frame grabbers from the CTI file.

- After opening a cti file, select **GenTL** to display all frame grabbers contained in the cti file on the right.
- After opening a cti file, select a frame grabber under **GenTL**. Only cameras can be found in the frame grabber will be displayed on the right.
- After opening a cti file, select **Camera** under **GenTL** to display all cameras that can be found in all frame grabbers.
- By default, the Tool does not automatically refresh the enumerated the cameras linked with frame grabbers under GenTL. You need to click to manually refresh the enumeration on the right pane.

Start to Upgrade

Check if the camera to be upgraded is available. Click to select a firmware upgrade package (dav file) in the upper right side of the Tool.
The Tool can upgrade the firmware of multiple cameras in a batch. Up to 20 cameras can be selected at the same time.

- If the upgrade package is for a specific model, only devices of the same model can be upgraded in batch. For devices of other models, the status bar will prompt "Upgrading failed. (Error code: 0x900006500) Firmware mismatch.".
- If the upgrade package is for multiple models, you can upgrade the devices of multiple models in the upgrade package. For devices of the other models that are not included in the upgrade package, if you upgrade them, the status bar will prompt "Upgrading Failed. (Error code: 0x900006500) Firmware mismatch.".

After selecting the firmware upgrading package, click **Upgrade**.

Note

- Do not disconnect the devices from the PC during firmware upgrade.
- The devices will reboot automatically after upgrading.

- You should reboot your PC after upgrading the firmware of frame grabbers, or the upgrade will not take effect.

9.3 GigE Vision Action Command

The Action Command is used to trigger actions in multiple cameras in a network simultaneously. When Action Command is configured, the Software can send commands across the network and have devices in a predefined group respond based on how they have been configured to respond to certain commands. In this way, a single command can trigger actions such as Frame Start in multiple cameras with a minimum of latency and configuration effort. The Action Command can be used in various scenarios where image fusion is required.

Before You Start

Search for the following three parameters in the feature tree and configure them for each camera that needs to receive commands.

Note

- The camera should support the Action Control feature, or configuring Action Command will be unavailable.
- ActionDeviceKey, ActionGroupKey, and ActionGroupMask are all displayed in hexadecimal notation.

Table 9-1 Parameter Description

Parameter	Description
ActionDeviceKey	A kind of password which enables the camera to check the validity of the commands.
ActionGroupKey	Used to specify a group of cameras to perform actions.
ActionGroupMask	Used to filter out some cameras from the specified group.

Steps

1. Go to **Tool** → **GigE Vision Action Command**.

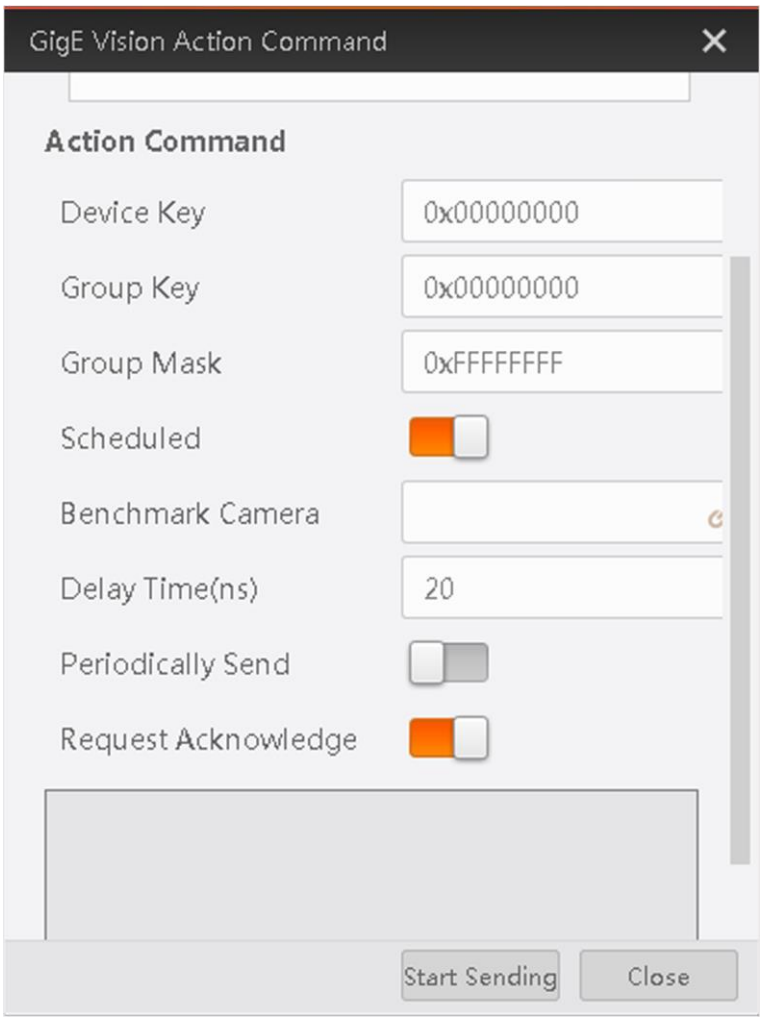


Figure 9-4 GigE Vision Action Command Window

2. Select network interface(s) to set the subnet(s) that the command to be sent to.
3. Enter the device key, group key, and group mask.

Parameter	Requirement
Device Key	Its value should be the same with the value of the ActionDeviceKey feature.
Group Key	Its value should be the same with the ActionGroupKey feature.
Group Mask	The bitwise AND operation of the Group Mask against the ActionGroupMask feature should results in non-zero.

4. Optional: Set in **Scheduled** field to to enable scheduled action command.

Benchmark Camera

The value of the GevTimestampValue feature of the selected camera will be automatically acquired and be used as the start time point for the delay.

Delay Time

The delay time should NOT be shorter than the maximum time required to transmit the command across the network.

When the benchmark camera receives the command, all the cameras will trigger certain actions simultaneously after the specified delay time.

5. Optional: Enable the Software system to send commands periodically.
   1) Enable **Periodically Send**.
   2) Enter the interval for sending the command.

Note

- If you enable **Periodically Send**, **Request Acknowledge** will be disabled, or vice versa.
- The default value is 1000ms, and valid value range is from 1ms to 3600000ms.

6. Optional: Enable **Request Acknowledge** to display the acknowledgment messages.

Note

- If you enable **Request Acknowledge**, **Periodically Send** will be disabled, or vice versa.
- Up to 50 messages can be displayed. Once the message number exceeds 50, the earliest message will be automatically deleted.

7. Click **Start Sending**.

Example

Sample Use Case

To generate slow-motion playback in stadiums for the purpose of viewing and analyzing the athlete's movement details, a group of camera is installed parallel to a race track (see picture below).

When the athlete passes, four cameras (subgroup 1) synchronously execute an action (capture images in this example).

As the athlete advances, the next four cameras (subgroup 2) synchronously capture images. One after the other, the subgroups continue in this way until the athlete has reached the end of the race track. The resulting images can be combined and processed to generate the slow-motion playback in subsequent steps using other technology and programs.

In this sample use case, the followings should be defined.

- Use the **ActionDeviceKey** parameter to authorize the execution of the synchronous image acquisition. The device key should be configured on each camera and it should be same with the device key for the action command protocol message.
- Use the **ActionGroupKey** parameter to define the group of cameras in a network segment that is addressed by the action command (in this use case: group 1).
- Use the **ActionGroupMask** parameter to define the subgroups in the group of cameras that capture images synchronously (in this use case: subgroups 1, 2, and 3).

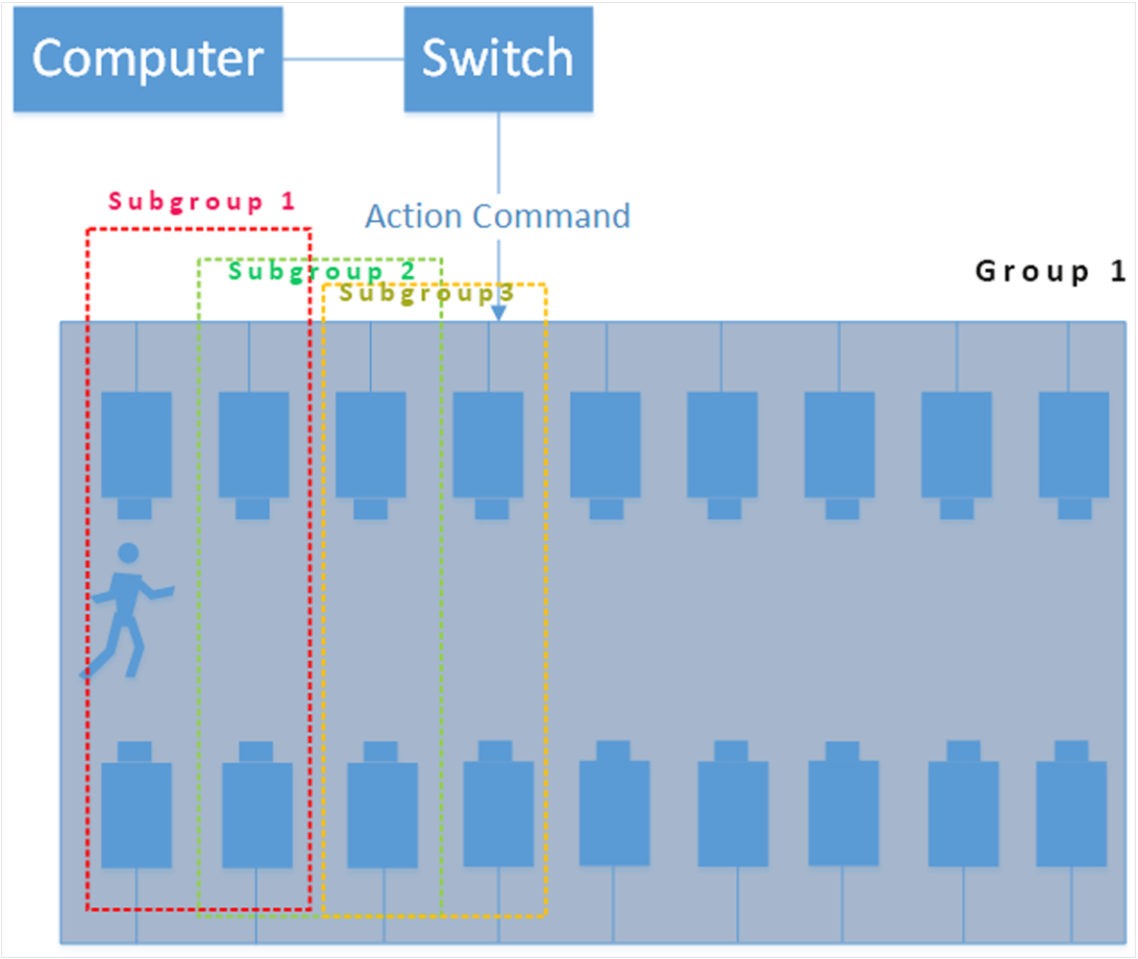


Figure 9-5 Sample Use Case In Stadium

9.4 System Info

You can view the PC system information with the System Info tool. The system information includes CPU information, CPU core number, available memory, operating system, etc.

Follow the steps to run System Info tool.

Steps

1. Execute the command "cd /opt/MVS/bin".
2. Execute the command *./System_Info.sh* to open the System Information window.

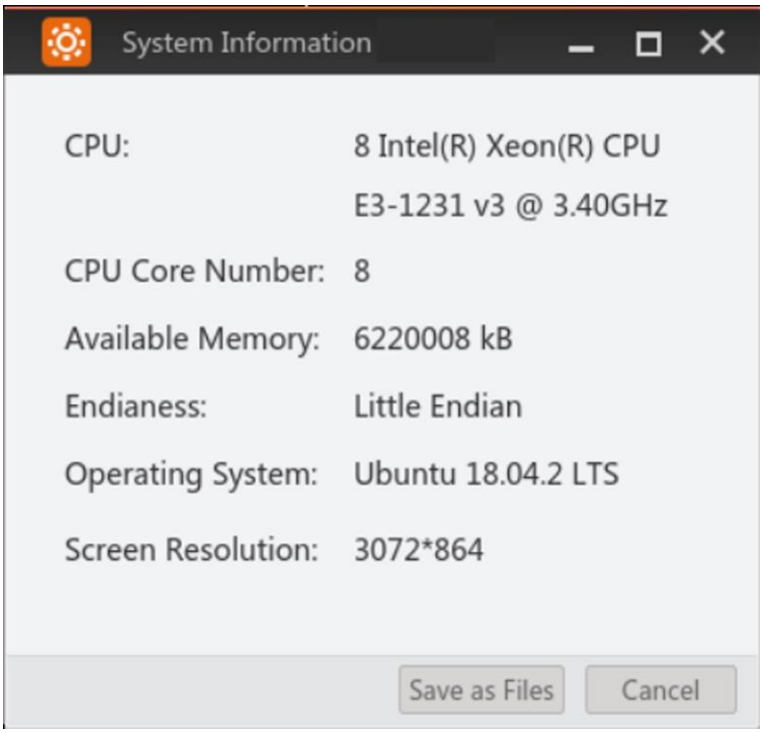


Figure 9-6 System Information Window

3. Optional: Click **Save as File** to save system information as a TXT file to local disk.

Chapter 10 Logs

You view both logs about progresses and operations on the Client, and the SDK (Software Development Kit) logs.

10.1 Software Logs

You can view the logs about operations and progresses on the Software.
Click to open the Log Information window.
You can view the information such as importance level, date, content, and source.
You can click **Clear Logs** to clear all the displayed logs.

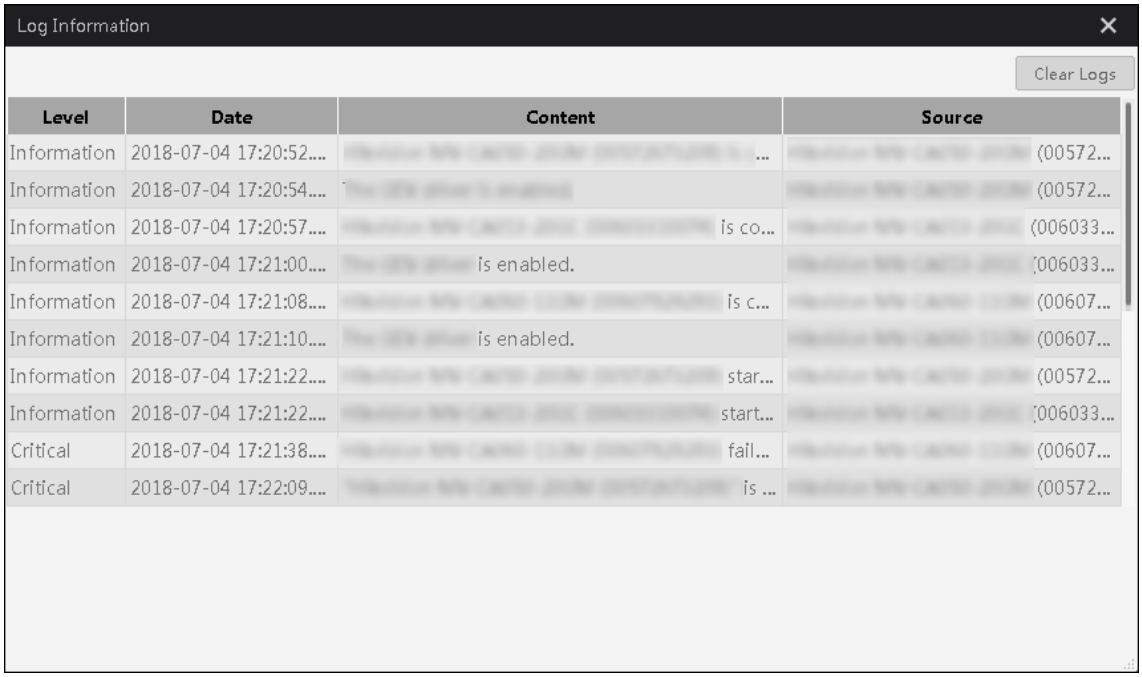


Figure 10-1 Log Information Window

10.2 SDK Logs

Via the Log Viewer tool, you can view the SDK logs of MvCameraControl.dll, MVGigEVisionSDK.dll, MvUsb3vTL.dll, MvCamLVision.dll, and other DLL(s) if required. You can also configure log settings such as the maximum number of the displayed SDK logs.

10.2.1 View SDK Logs

You can view the SDK logs of the Software with Log Viewer. Each log contains the information including log type, log time, log content, process name, etc.
Select **Tool** → **Log Viewer** to open Log Viewer.

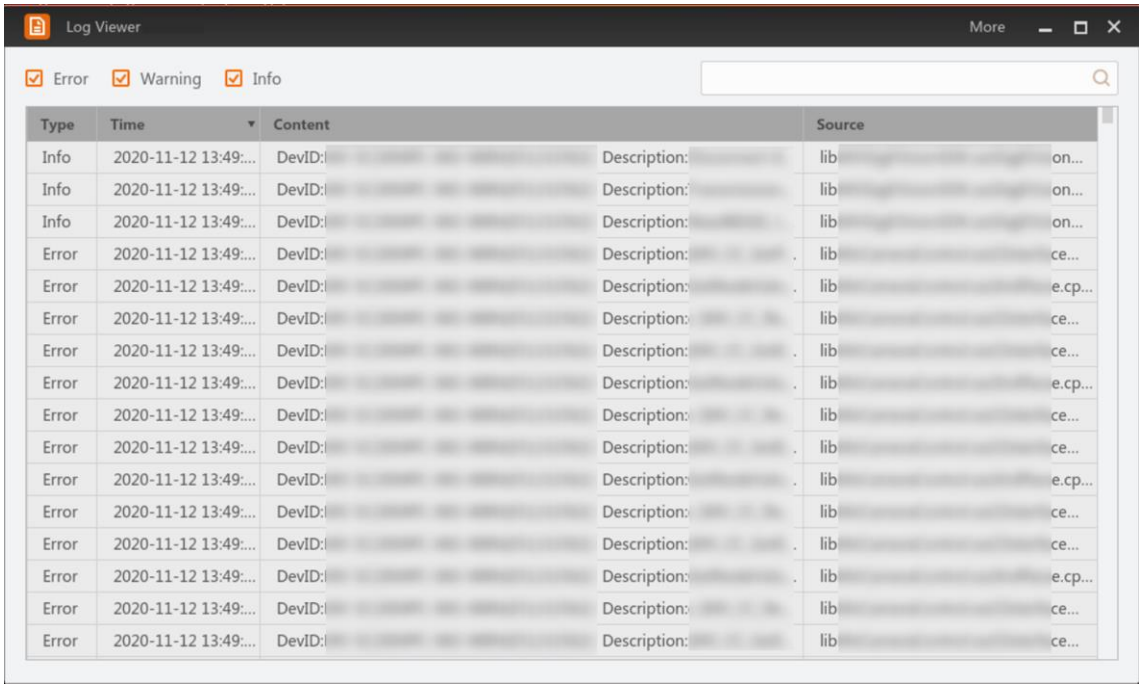


Figure 10-2 Log Viewer

The following table shows the descriptions of the types of SDK logs.**Table 10-1 SDK Log Types**

Log Type	Description
Error	Errors occurred in the Software
Warning	Warning information sent by the Software when precondition error occurs
Information	Information about operations

You can perform the following operations.

Table 10-2 SDK Log Operations

Operation	Description
Search Logs	Enter the keywords to search logs. **Note** You can only search by the keywords of the content of the log. Searching by the keywords of log type, log time, or log source is not supported.
Export All SDK Logs	Right-click the log list and then click **Export All Logs**.
Export Selected SDK Logs	Press and hold the Shift or Ctrl key and select SDK logs, and then right-click the log list and click **Export Selected Logs**.
Copy All SDK Logs	Right-click the log list and then click **Copy All Logs**.
Copy Selected SDK Logs	Press and hold the Shift or Ctrl key and select SDK logs, and then right-click the log list and click **Copy Selected Logs**.
Clear All SDK Logs	Right-click the log list ant then click **Clear Logs**.
Rank Logs	Click a table header to rank the logs by its category (in descending or ascending order).
Configure Log Viewer	Click **More** → **Settings** to modify log sources, maximum logs, and update interval. See *Configure SDK Logs* for details.

10.2.2 Configure SDK Logs

You can filter logs by so files and set the maximum number of the displayed logs and the interval of updating the log list.

Steps

1. In Log Viewer, click **More** to open the Log Settings window.
2. Set the so files that shows in Log Viewer.

MvCameraControl

Logs about operations on the Software will be displayed (if exist).

MVGigEVisionSDK

Logs about the Software accessing GigE Vision cameras will be displayed (if exist).

MvUsb3vTL

Logs about the Software accessing USB3 Vision cameras will be displayed (if exist).

3. Configure other parameters.

Max. Displayed Logs

Set the maximum number of displayed logs.

Note

The range of maximum displayed logs is 1 to 100,000 (default value: 1,000).

Interval for Update (ms)

Set the time interval (unit: ms) for updating the log list.

Note

The range of the time interval is 100 to 1000,000 (default value: 1,000).

Max. Storage Size (MB)

Used for setting the size of a single file.

Storage Type

Check the types of SDK logs that need to be displayed.

4. Click **OK** to save the settings.

Chapter 11 FAQ

You can refer to this chapter if you encounter the problems described in the following Frequently Asked Questions (FAQ).
Before checking the details of the FAQ, please check the running environment first if the Software cannot detect the camera, or the camera live view fails.
Make sure:
- The Software is running on a PC or industrial PC with Gigabit network interface card.
- The connection between the camera and the PC or industrial PC is Gigabit network.
- The Jumbo Frame of the PC's network adapter is enabled. If not, enable the Jumbo Frame function of the network adapter.
- The USB interfaceof the PC running the Software supports USB3.0.
- The USB cable which connects the PC and the USB3 Vision camera meets the USB3.0 specifications.
- Running environment meets the requirements in ***System Requirements***.

If you cannot solve the problems with the solutions provided in the FAQ, please contact us for support. See ***Get Support*** for details.

11.1 No GigE Vision camera is enumerated after running the Software.

Question

What can I do if no GigE Vision camera is enumerated after running the Software?

Possible Cause

The camera is not properly started or the network cable not properly connected.

Solution

Check the power supply of the camera (by checking PWR indicator) and network connection (by checking Link light in LAN interface).

11.2 No USB3 Vision camera is enumerated after running the Software.

Question

What should I do if no USB3 Vision camera is enumerated after running the Software?

Possible Cause

The camera is not properly started or USB line wiring exception.

Solution

Check if the LED indicator of the camera is in normal status.

11.3 The Software enumerates a GigE Vision camera, but fails to connect it.

Question

What should I do if the Software enumerates a GigE Vision camera, but fails to connect it?

Possible Causes

- Cause 1: The camera is not on the same LAN with the Software.
- Cause 2: The camera has been connected to other programs.

Solutions

- For Cause 1: Edit the camera IP address.
- For Cause 2: Disconnect the camera from other programs, and then connect it to the Software.

11.4 The Software enumerates a USB3 Vision camera, but fails to connect it.

Question

What should I do if the Software enumerates a USB3 Vision camera, but fails to connect it?

Possible Causes

- Cause 1: USB3 driver exception.
- Cause 2: The USB3 Vision camera has been connected to another program.

Solution

- For Cause 1: Re-plug the USB3 Vision camera, or reinstall the USB3 driver.
- For Cause 2: Disconnect the camera from other programs and then connect it to the Software.

11.5 Live view shows black image.

Question

What should I do if live view shows black image?

Possible Causes

- Cause 1: Iris of the camera lens is closed.
- Cause 2: Camera exception.

Solutions

- For Cause 1, open the aperture of the lens.
- For Cause 2, power off and reboot the camera.

11.6 Acquisition works fine. But when the trigger signals are provided by external device, no image is triggered.

Question

What should I do if no image is triggered (although acquisition works fine) when the trigger signals are provided by external device?

Possible Causes

- Cause 1: Certain trigger mode is not activated, or the rigger source is incorrectly selected.
- Cause 2: External device wiring error.

Solutions

For Cause 1, check if the camera trigger mode of the current application scenario and the related line input is normal.
For Cause 2, make sure that the wiring of the external device is normal.

Legal Information

About this Document

- This Document includes instructions for using and managing the Product. Pictures, charts, images and all other information hereinafter are for description and explanation only.
- The information contained in the Document is subject to change, without notice, due to firmware updates or other reasons. Please find the latest version of the Document at the Hikvision website (*https://www.hikvision.com*). Unless otherwise agreed, Hangzhou Hikvision Digital Technology Co., Ltd. or its affiliates (hereinafter referred to as "Hikvision") makes no warranties, express or implied.
- Please use the Document with the guidance and assistance of professionals trained in supporting the Product.

About this Product

This product can only enjoy the after-sales service support in the country or region where the purchase is made.

Acknowledgment of Intellectual Property Rights

- Hikvision owns the copyrights and/or patents related to the technology embodied in the Products described in this Document, which may include licenses obtained from third parties.
- Any part of the Document, including text, pictures, graphics, etc., belongs to Hikvision. No part of this Document may be excerpted, copied, translated, or modified in whole or in part by any means without written permission.
- HIKVISION and other Hikvision's trademarks and logos are the properties of Hikvision in various jurisdictions.
- Other trademarks and logos mentioned are the properties of their respective owners.

LEGAL DISCLAIMER

- TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, THIS DOCUMENT AND THE PRODUCT DESCRIBED, WITH ITS HARDWARE, SOFTWARE AND FIRMWARE, ARE PROVIDED "AS IS" AND "WITH ALL FAULTS AND ERRORS". HIKVISION MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY, SATISFACTORY QUALITY, OR FITNESS FOR A PARTICULAR PURPOSE. THE USE OF THE PRODUCT BY YOU IS AT YOUR OWN RISK. IN NO EVENT WILL HIKVISION BE LIABLE TO YOU FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, OR INDIRECT DAMAGES, INCLUDING, AMONG OTHERS, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, OR LOSS OF DATA, CORRUPTION OF SYSTEMS, OR LOSS OF DOCUMENTATION, WHETHER BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE), PRODUCT LIABILITY, OR OTHERWISE, IN CONNECTION WITH THE USE OF THE PRODUCT, EVEN IF HIKVISION HAS BEEN

ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR LOSS.

- YOU ACKNOWLEDGE THAT THE NATURE OF THE INTERNET PROVIDES FOR INHERENT SECURITY RISKS, AND HIKVISION SHALL NOT TAKE ANY RESPONSIBILITIES FOR ABNORMAL OPERATION, PRIVACY LEAKAGE OR OTHER DAMAGES RESULTING FROM CYBER-ATTACK, HACKER ATTACK, VIRUS INFECTION, OR OTHER INTERNET SECURITY RISKS; HOWEVER, HIKVISION WILL PROVIDE TIMELY TECHNICAL SUPPORT IF REQUIRED.
- YOU AGREE TO USE THIS PRODUCT IN COMPLIANCE WITH ALL APPLICABLE LAWS, AND YOU ARE SOLELY RESPONSIBLE FOR ENSURING THAT YOUR USE CONFORMS TO THE APPLICABLE LAW. ESPECIALLY, YOU ARE RESPONSIBLE, FOR USING THIS PRODUCT IN A MANNER THAT DOES NOT INFRINGE ON THE RIGHTS OF THIRD PARTIES, INCLUDING WITHOUT LIMITATION, RIGHTS OF PUBLICITY, INTELLECTUAL PROPERTY RIGHTS, OR DATA PROTECTION AND OTHER PRIVACY RIGHTS. YOU SHALL NOT USE THIS PRODUCT FOR ANY PROHIBITED END-USES, INCLUDING THE DEVELOPMENT OR PRODUCTION OF WEAPONS OF MASS DESTRUCTION, THE DEVELOPMENT OR PRODUCTION OF CHEMICAL OR BIOLOGICAL WEAPONS, ANY ACTIVITIES IN THE CONTEXT RELATED TO ANY NUCLEAR EXPLOSIVE OR UNSAFE NUCLEAR FUEL-CYCLE, OR IN SUPPORT OF HUMAN RIGHTS ABUSES.
- IN THE EVENT OF ANY CONFLICTS BETWEEN THIS DOCUMENT AND THE APPLICABLE LAW, THE LATTER PREVAILS.