CHROMASENS

Offline User Manual for GCT2 Version 1.0.0

chromasens
IMAGING FOR PROFESSIONALS

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About this instruction manual

This instruction manual provides the necessary information for safe and efficient use of the product throughout its life cycle.

Representational tools

- Font markup **bold**: clickable areas in the software GCT.
- Font markup *italic*: windows and views to navigate to in the software GCT.

History

Version 1.0.0

The initial version of this Documentation is July 2023.

Offline/Old versions

GCT 2.3

Download the Manual for GCT Version 2.3.

Overview

The GenICam Control Tool (GCT) permits communication with cameras that fulfill the GenICam standards. The tool allows one to set up a camera, browse and adjust parameters, perform camera calibration tasks, and visualize and analyze acquired images.

The following graphic shows an overview of the connection between the GCT software and the camera. The host software uses the CSGenICam SDK to connect to the camera. Regarding the GenIcam GenTL standard, the software and your program are interface-independent. The only difference is that the appropriate transport layer should be used for each interface type. This means if you are using a GigE camera, you need a network adapter and the s2i or Kithara transport layer, if you want to use a CoaXPress camera you need a frame grabber and the CoaXPress transport layer (delivered from the frame grabber vendor).

Scheme of the communication between a host software and the camera
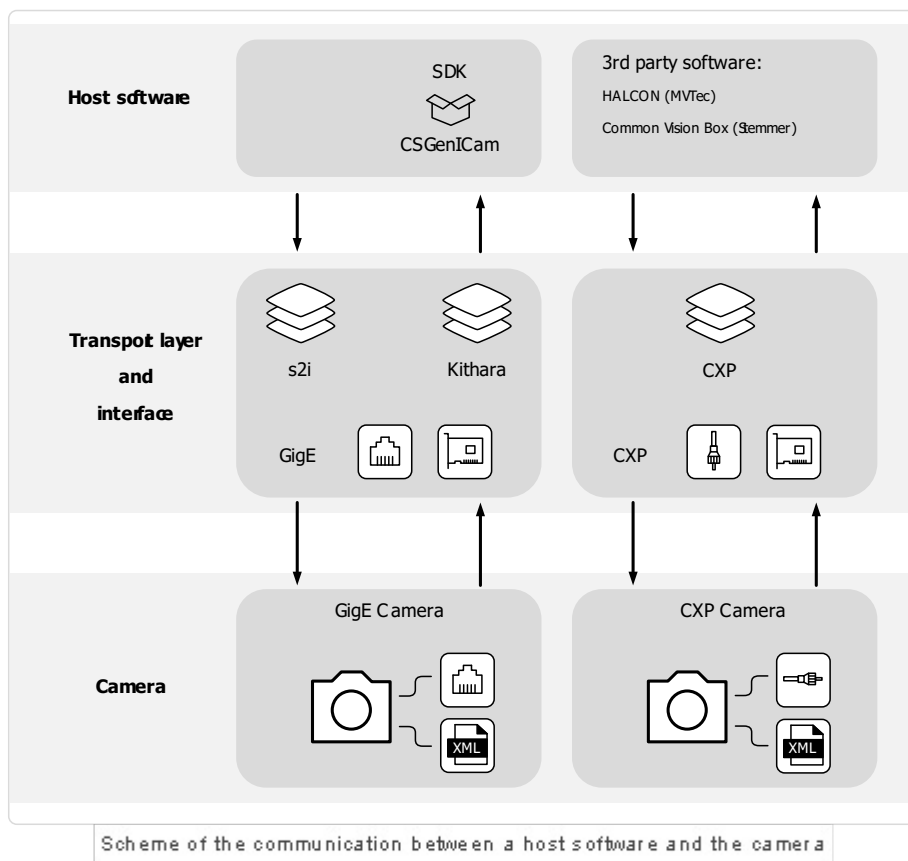
Intended use

- The device is designed for machines and systems which are used for commercial and industrial applications.
- The device is designed for contactless optical detection of primarily two dimensional objects.
- The device may only be connected or used as described in this manual.
- Do not use the device in safety relevant control circuits and potentially explosive environment.

Line scan system
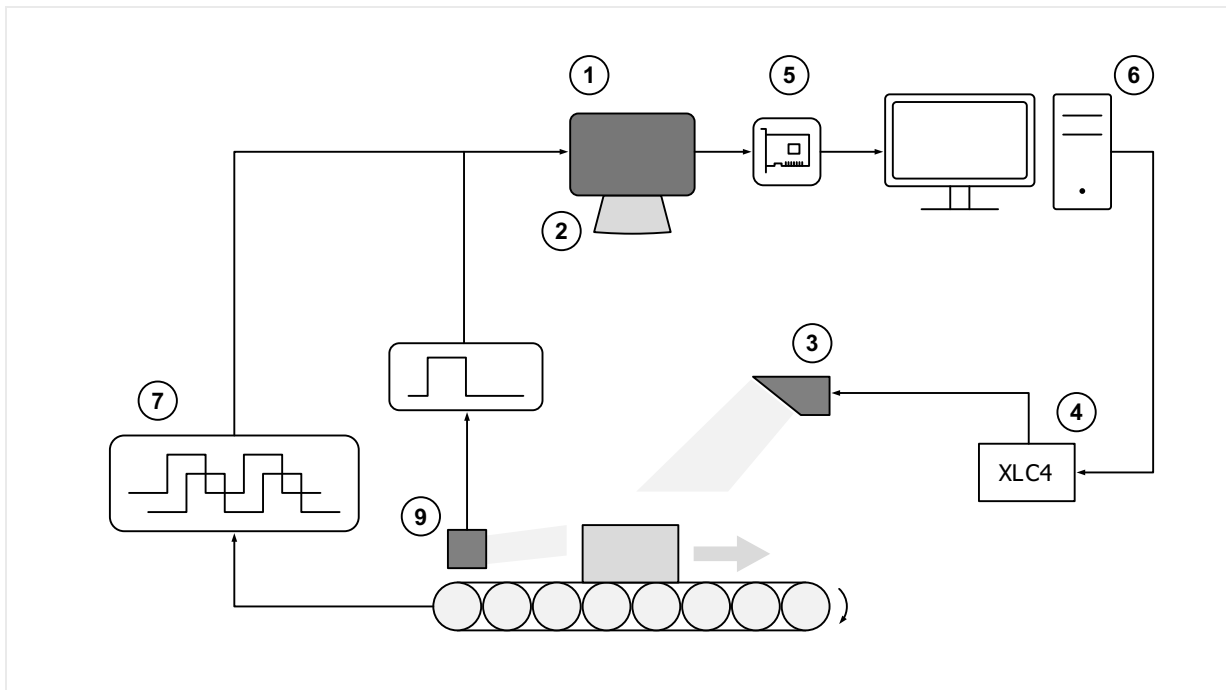
1	Line scan camera: Scans the image line by line and communicates with the PC.	2	Optical system: Lenses and mounts
3	Illumination: Lights up the information carrier/scan area.	4	Illumination controller: Controls and monitors the illumination unit.
5	Cables and suitable network card or frame grabber in the PC: The image data are sent to a PC.	6	PC: The PC performs subsequent processing of the image data and can optionally control the illumination system.
7	Speed detection: The speed of the object/conveyor belt can be detected by an optional incremental encoder. The encoder can be connected to the camera.	8	Conveying unit: Moves the scanned object.
9	Frame trigger: A light barrier can be used to detect the object and start the image acquisition on time. The frame trigger can be connected to the camera.		

System Requirements

Hardware requirements:

- TKH Vision GenICam-standard camera
- Intel Core i7 or higher
- 16GB RAM or higher
- Min. PCIe 3.0 lane with min. 8 lanes to install your frame grabber or network card

Software requirements:

- Win10 x64 bit operating system
- Driver for 10-Gigabit Ethernet network interface card or frame grabber software

Installation GigE

To install the GCT software for Windows:

1. Download the installer from our homepage.
2. Install the NIC-10GigE-Driver Files, please refer to Network adapters and transceivers.
3. Connect the camera to the PC and turn it on.
4. Start the GCT installer and follow the instructions.
5. At the window *Select Components:* Select the **Full installation**, if you want to install *Kithara* or use the **Installation for GigE & CXP** if you only need the *s2i* TL.
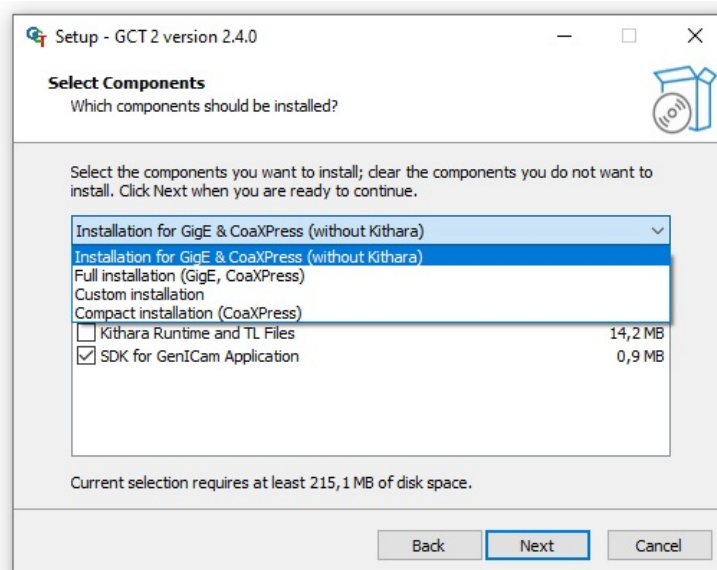
6. For *Kithara* a License Dongle is required
7. During installation, you will be asked if you want to configure the **GigE network adapters**, if you are using a network adapter with an *Intel* chipset, you should answer with **Yes**
   1. The command line window lists all available ethernet adapters and you can configure the network adapter by entering a **Y** into the script. Now the script setup your network card.
   2. For each adapter, you will be asked in the script.

```
Administrator: C:\WINDOWS\system32\cmd.exe                                    —   □   ×
This program detects the type and manufacturer of the network adapter and configures the 10 GigE network connections.
Please ensure the camera is powered on and already cable-connected to the computer.
Please ensure the filter driver from s2i is installed on the computer.
===========================
 2  10 Gigabit Ethernet connection(s) are found.

InterfaceDescription                                    Name          Speed Index
-------------------                                     ----          ----- -----
Intel(R) Ethernet Converged Network Adapter X710 #4 Ethernet 5 10000000000     0
Intel(R) Ethernet Converged Network Adapter X710 #3 Ethernet 4 10000000000     1


===========================
Setting the parameters of Intel network adapter
Start IntelNetCmdlets...
IntelNetCmdlets is started.
===========================
Intel(R) Ethernet Converged Network Adapter X710 #4
Do you want to setup for  Ethernet 5 ?
[y/n] Please enter the key 'y' for 'yes', or 'n' for 'no'.
_
```

> **Note**
>
> If an error occurs during the execution of the script you have to configure the network adapter manually.
>
> Make sure that the **parameters** of your **network adapter** are set correctly. For more information, see **Configure the network adapter**.

8. After the configuration of the network parameter, the script can help you to set a static IP Address of the network adapter. *We recommend disagreeing* by entering **N** into the window. If you want to set a static IP Address for your network, you can answer with **Y**.
9. Restart the PC
10. If you want to use Kithara please configure Kithara after the restart. To set up *Kithara,* please follow the instructions 10 GigE with Kithara transport layer.

Installation CXP

> **Note**
>
> The connection between the CXP camera and GCT is done with a transport layer from the frame grabber vendor. For the driver of the CoaXPress frame grabber as well as the transport layer, please follow the instructions of the grabber's manufacturer.

To install the GCT software for Windows:

1. Download the installer from our homepage.
2. Install your *Framegrabber* software
3. Start the GCT installer and follow the installation instructions.
4. At the window *Select Components:* Select the **Compact installation** for a CXP camera.
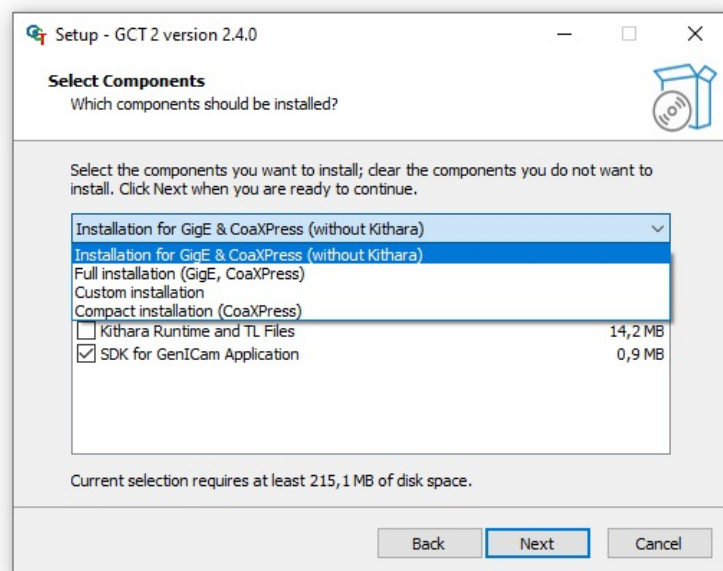
5. After the installation please *restart* your PC.

Overview

The software provides different panel elements, they can be placed, resized, and docked freely within GCT window. The GCT user interface starts after a successful connection with your camera. The window contains four main areas. The Menu bar widget for general access, the Toolbar widget for fast access to the most common functions, the image view widget where the image and all relevant information's are displayed and the configuration widget for the camera configuration.

Menu Bar

The Start Menu offers the following functions:

- Connect/Disconnect: Opens device discovery widget or disconnect the camera, see
- Start Grabbing: Starts continues image grabbing
- Device description: Load and save xml file from the camera
- Settings: GCT setting options, see
- Exit: Close GCT window

The Tools Menu offers the following functions

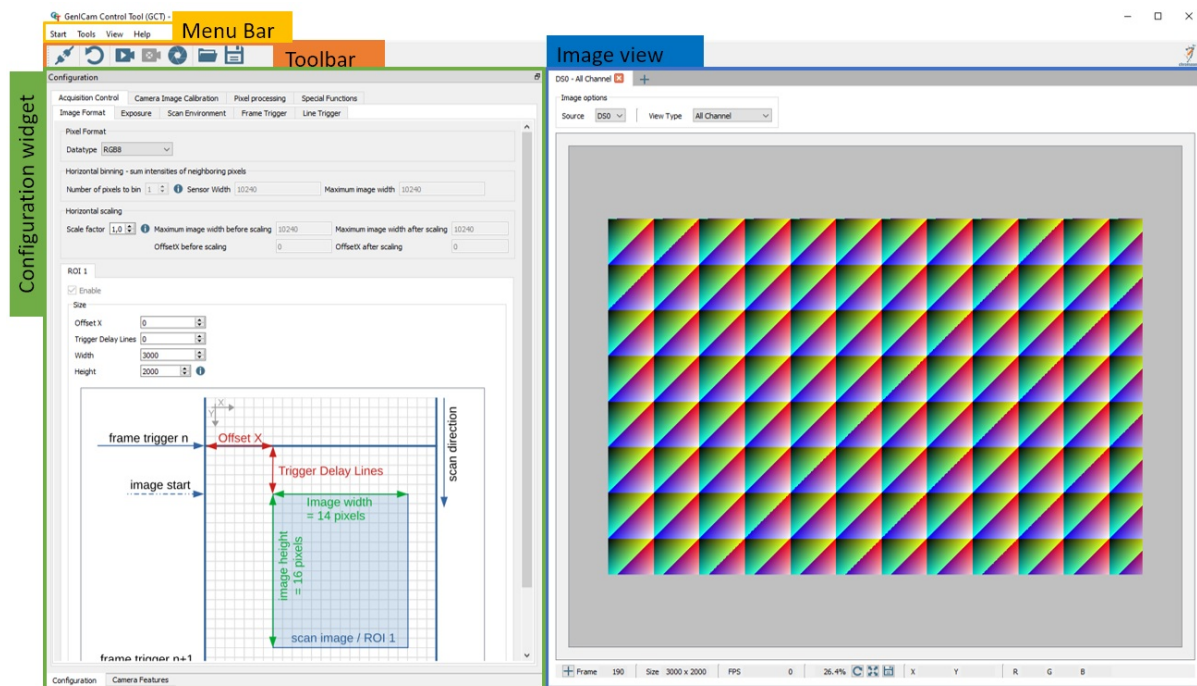- Calibration: Opens a camera calibration dialog, Creating a black-reference (DSNU) and Creating a shading-reference (PRNU)
- Maintenance Mode: Only for experts
- Up/Download: Opens a Up/Download dialog, see
- Register Editor: Only for experts
- Kithara Configurator: Opens the Kithara Network Configurator, see

The View Menu offers the following functions

- Default view: Set the GCT view to default
- Camera Configurations: Shows the configuration panel in the configuration widget
- Message Log: Display the Message Log under the Image view

- Refresh Feature Tree: Refreshes the feature tree

The Help Menu offers the following functions

- About: General Information's about GCT
- Open GCT Manual: Opens the GCT Manual
- System Information: Generates a System information report
- Search for GCT Update: Search for GCT updates

Toolbar widget

The Toolbar widget contains the following icons and their functions.
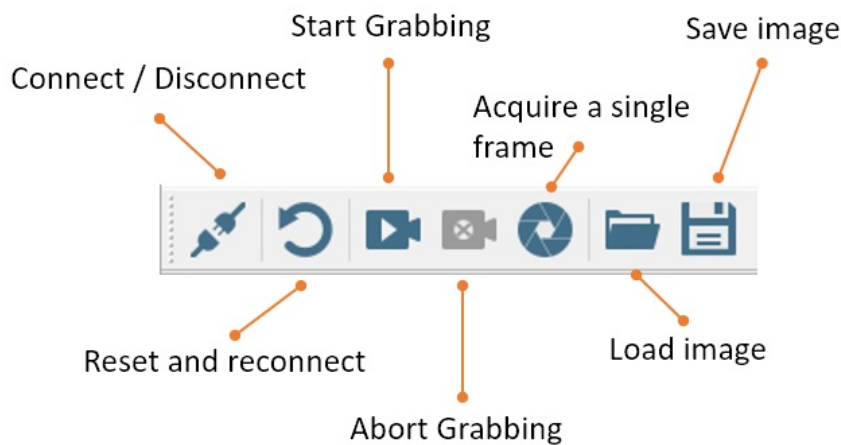
The Toolbar widget offers the following button functions:

- Connect/Disconnect: Opens device discovery widget or disconnect the camera, see
- Reset and reconnect: Resets the camera and reconnect
- Start Grabbing: Starts continues image grabbing
- Abort Grabbing: Stops the image acquisition
- Acquire a single frame: Acquires a single frame
- Load image: Load an image from disk
- Save image: Save image to disk

Configuration widget

The Configuration widget provides two panels, Camera features which is the GenIcam parameter tree and the configuration panel which is a graphical representation of the GenIcam parameter tree.

The following image shows the configuration panel of the configuration widget. The panel contains a tab view, from which four main categories can be selected. Each tab contains another tab view with subcategories. The content in each sub tab view is scrollable.

An Info box or tooltip is shown when hovering over a parameter input field or the blue information icon.

Tab view with four main categories

Additional information

Explanation picture

Configuration Tab
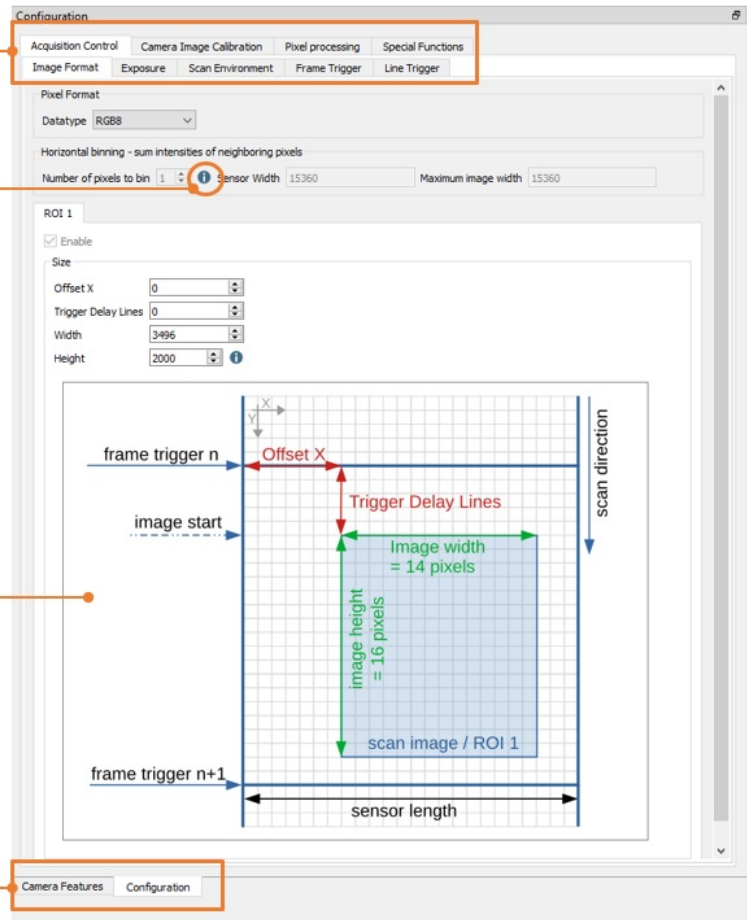
The Camera Features tab contains the GenIcam parameter tree, the user setup level and an extra panel to set up the filter driver.

User Level

GenIcam
XML tree

Camera
feature tab
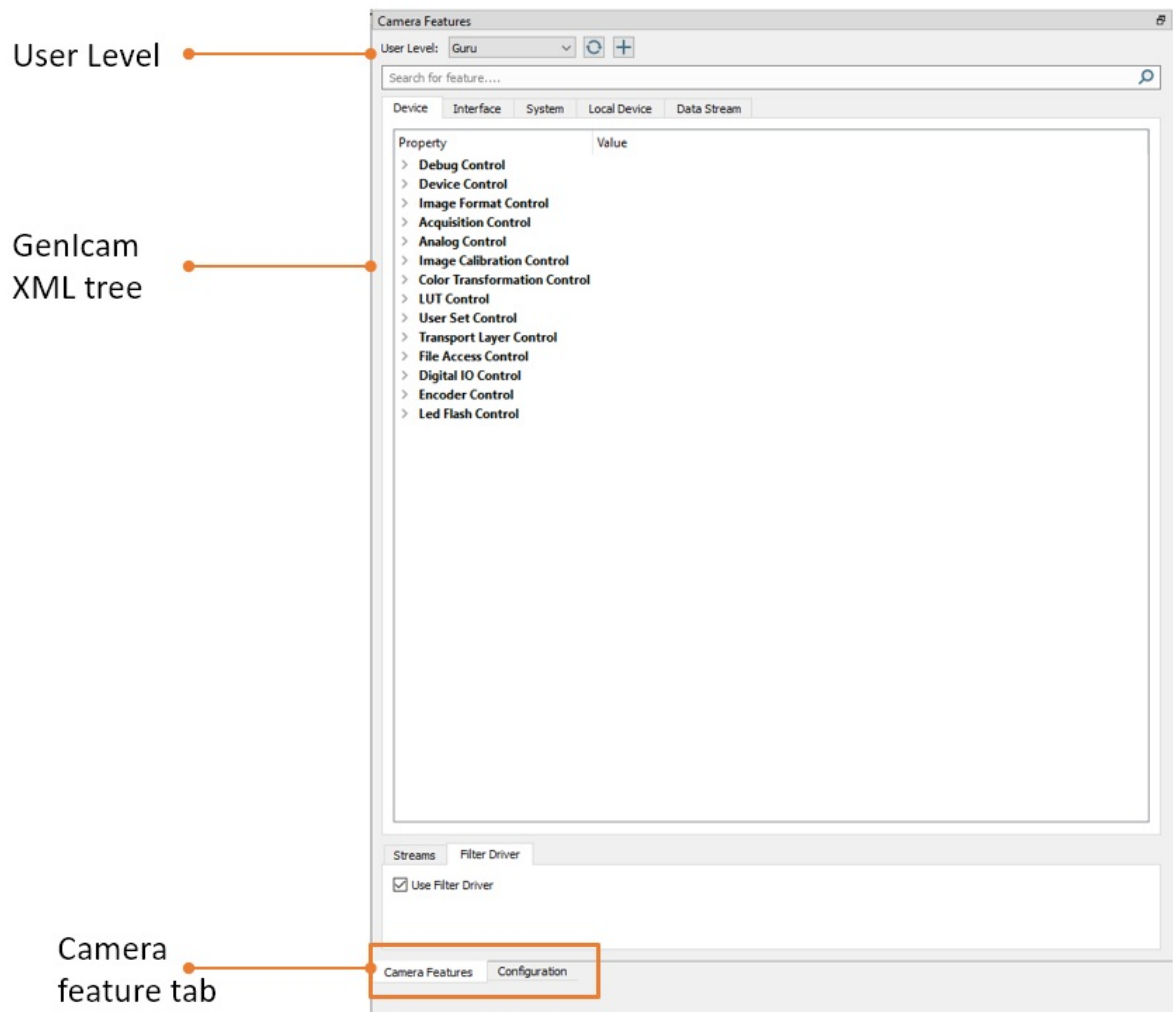
Image view widget

The image view widget shows the current image view and additional image and stream relevant information's.

Image view options

Additional information's

Refresh, Resize and save image

Image content
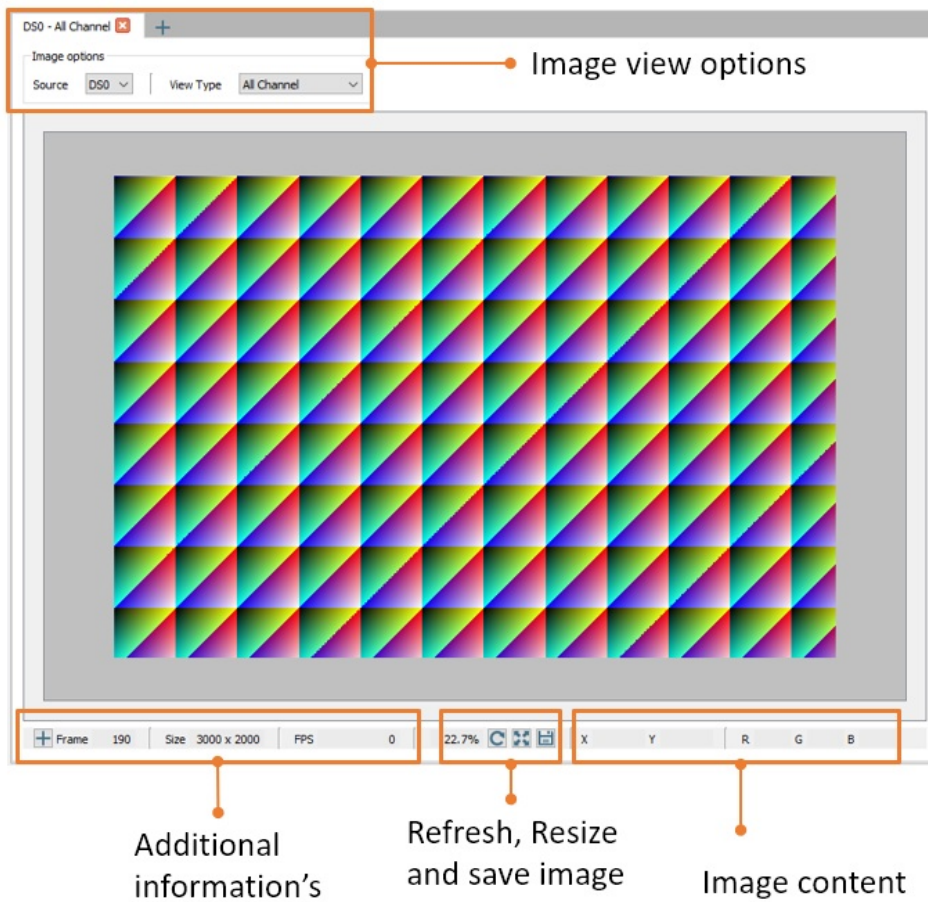
Line plot view

GCT2 can display a horizontal line plot in the image view widget. To add this feature, add a new tab, therefore press the plus on the top. A popup window will be open, please select under the "View Type" the "Horizontal Line plot.

Horizontal Line Plot
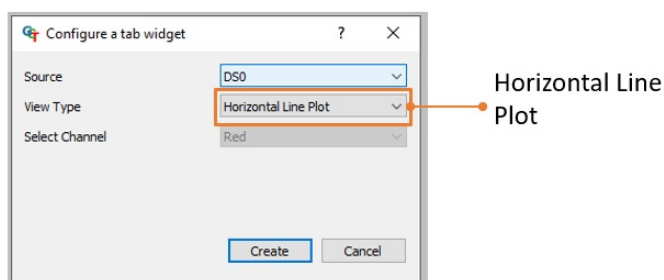
After this configuration a new window will open as shown in the following figure.
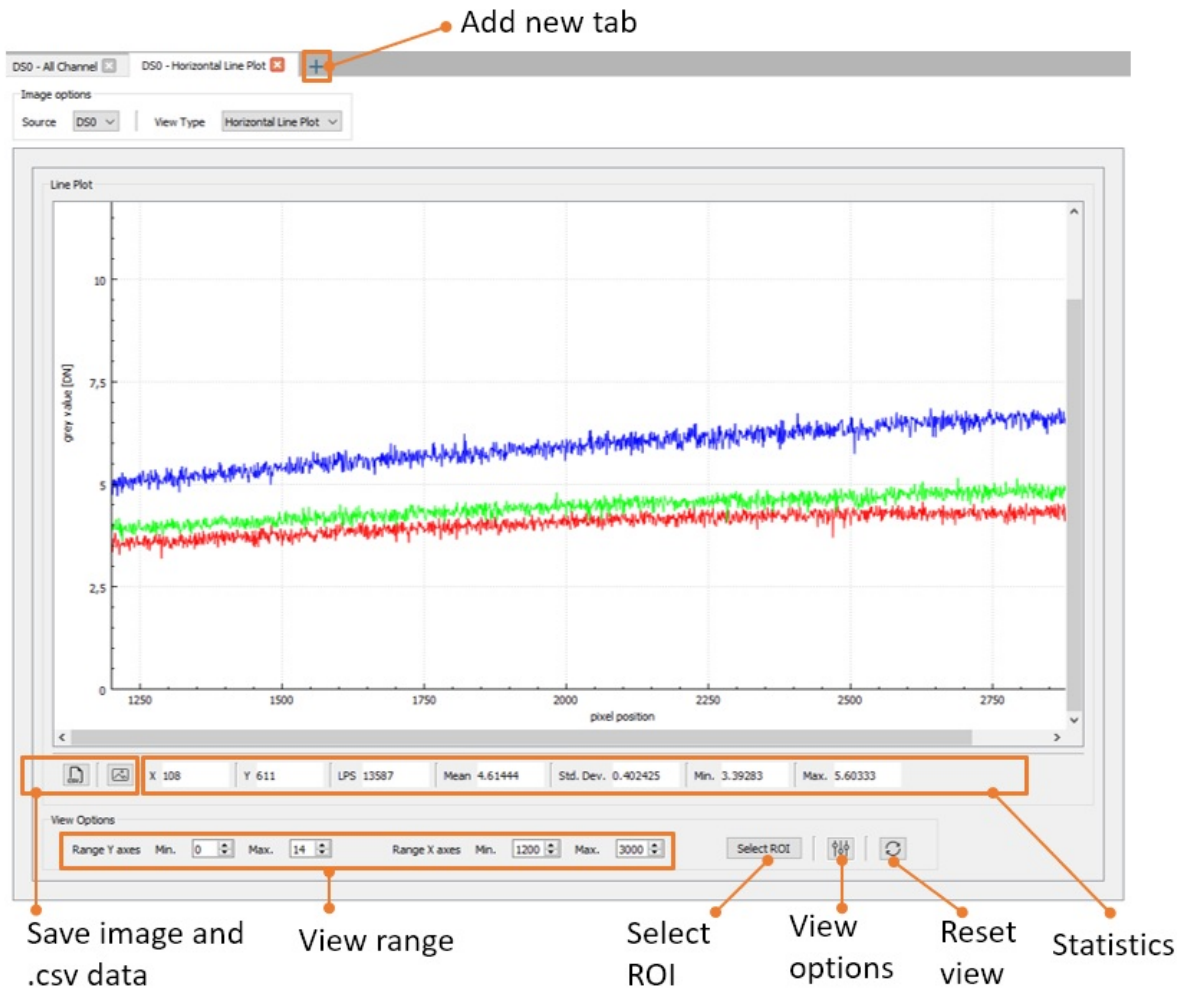
Histogram view

GCT2 can display a histogram of in image content in the image view widget. To add this feature, add a new tab, therefore press the plus on the top. A popup window will be open, please select under the "View Type" the "Horizontal Line plot.
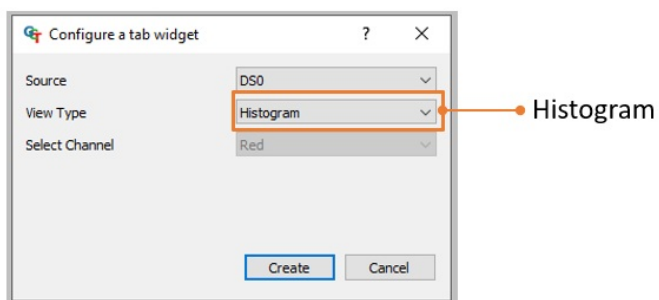
After this configuration a new window will open as shown in the following figure.

Add new tab

Save image and .csv data | View range | Select ROI | View options | Reset view | Statistics

Arrange / Rearrange widgets

The software provides different widget elements, they can be placed, resized, and docked freely within GCT window. If you are using two monitors you can place, for example, the configuration widget on the second screen and the image view widget on the first screen.

The software provides different widget elements, they can be placed, resized, and docked freely within GCT window. If you are using two monitors you can place, for example, the configuration widget on the second screen and the image view widget on the first screen.
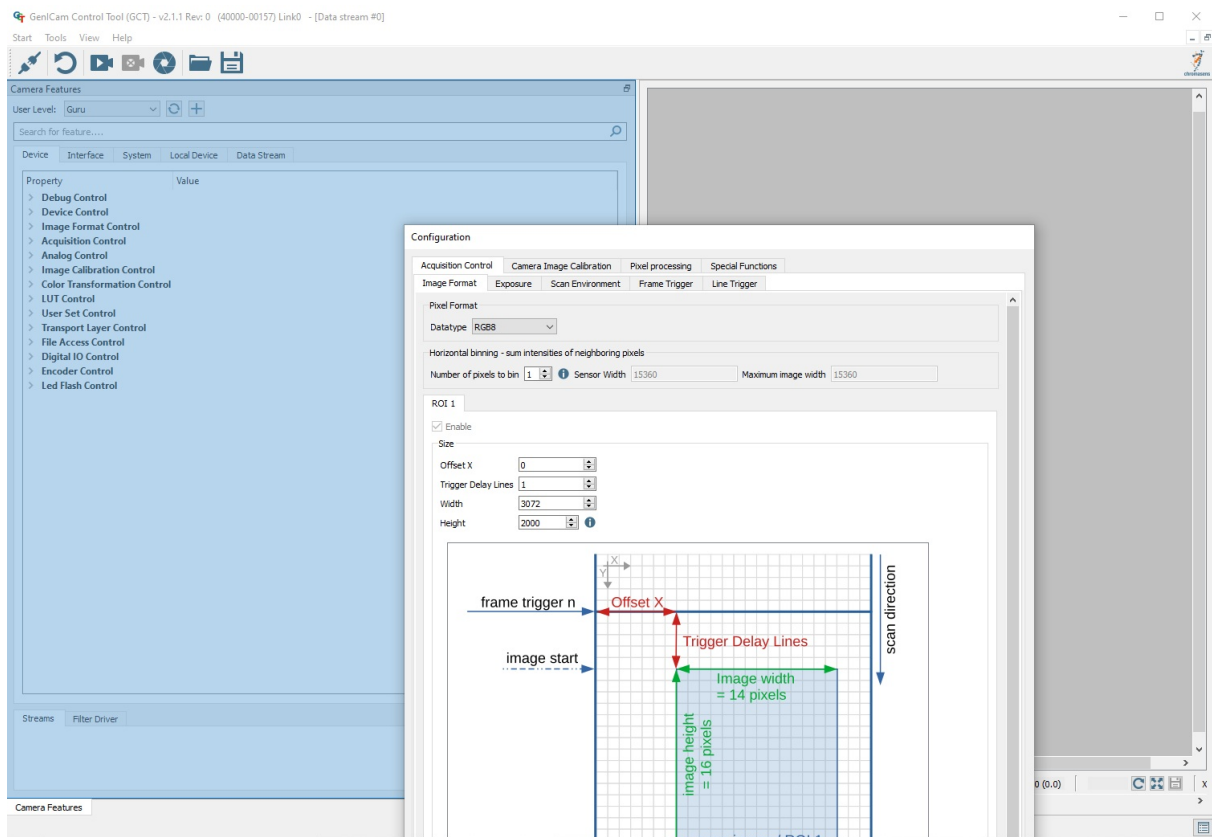
Connection and disconnection of Camera

To be able to access the camera, GCT needs to create a connection to the camera and to download an XML file that specifies the camera interface.

Connecting the camera

1. Switch on the camera. Initialization can take up to about 40 seconds.
2. Start GCT.
3. On the toolbar click Run device discovery.

The Discovery dialog box opens and the Discovered Devices list shows information about the detected camera. If the camera is not found, wait a few seconds, and then click Start Discovery.

In the Discovered Devices list, select the camera, and click Open. GCT now downloads the file with the camera interface specification, which takes a few seconds. Afterward, the Discovery dialog box is closed, and the available camera parameters are shown in the configuration widget.

If the Discovered Devices show no camera, and if you have a GigE camera, please follow the instructions of 10 GigE with s2i transport layer or 10 GigE with Kithara transport layer.
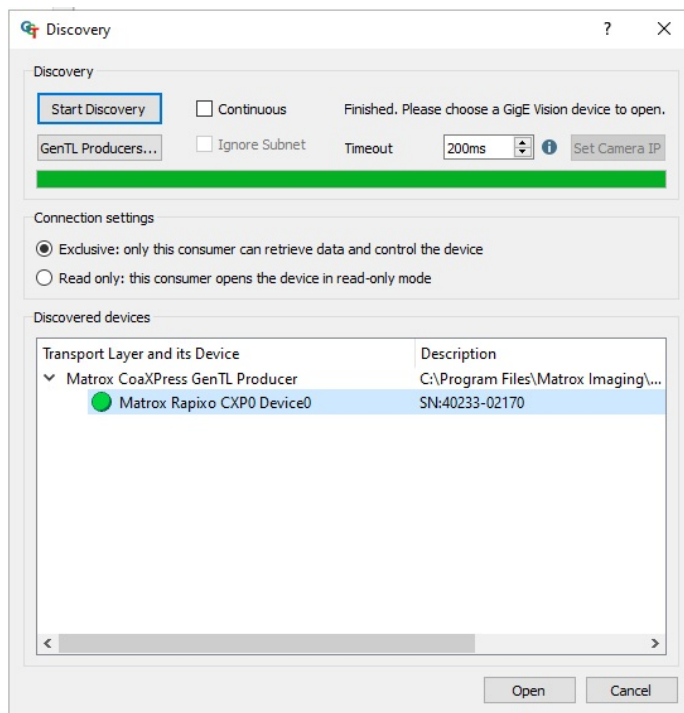
The camera discovery is controlled by several parameters and options, which can be modified if necessary:

Disconnecting the camera

After the camera is connected, the Discovery button is replaced by a Disconnect button. Click this button to unlink the connection. If you want to disconnect the camera while it is grabbing images, it is recommended to stop the grabbing process completely before you click Disconnect. The disconnection progress may take several seconds, due to the cleanup of generated temporary data in the background.

Connection two cameras with one PC

The latest GCT2 version does not have support for multiple cameras in one GCT2 instance. To connect more than one camera to the PC, you need to open two instances (Windows) to connect the camera to a PC.

If you connect two cameras to the PC and open a new instance of GCT2, you can select one camera and connect it to the GCT2 instance. Both cameras are visible in the Discovery window. With a second GCT2 instance, you can connect the second camera.

Edit Transport Layer

The Transport Layer (TL) is used to refer to the interface such GigE (Kithara or s2i) or CoaXPress.

During the first discovery process after installation, GCT fetches the paths from the system environment variable GENICAM_GENTL64_PATH and searches for .cti files in each of those folders. If cti transport layer files are found and can be parsed, the camera can be detected with the corresponding transport layer. This may take several minutes during the first discovery process.

If it is required to change the TL you can change it in the Discovery dialog window, as shown in the previous chapter. To change the TL press the GenTL Producers button, a Producer List shows the available TL, as shown in the image below.
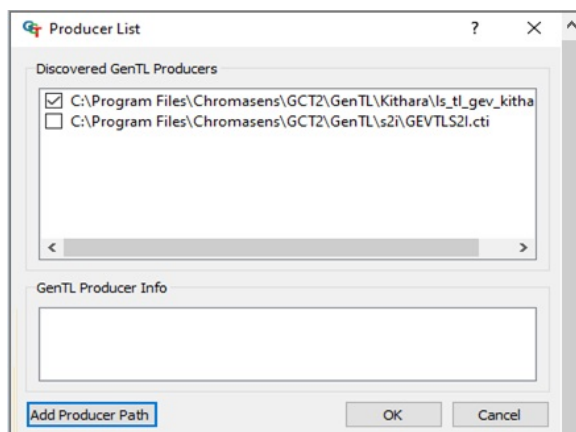
To enable or disable a Transport layer, select a certain file, for example, ls_tL_gev_kithara.cti or GEVTLS2l.cti, and click or clear the bock. The discovery process is then started using a certain Transport layer. We recommend enabling only one transport layer.

Modifying and showing features

Modifying features

GCT allowed to modify the features in two different ways. On the one hand, the configuration panel makes setting functions more convenient, special views show a set of related functions on which you can easily change these parameters. On the other hand, the camera feature panel allowed to edit the parameter in the XML-Tree.

In the Configuration panel

The view consists of four main tabs Acquisition Control, Camera Image Calibration, Pixel Processing and Special functions. Each tab shows several subtabs.

The Acquisition Control tab, for example, show five subtabs, which permit to specify many features such as image format and trigger settings. Some features also have additional explanation pictures.
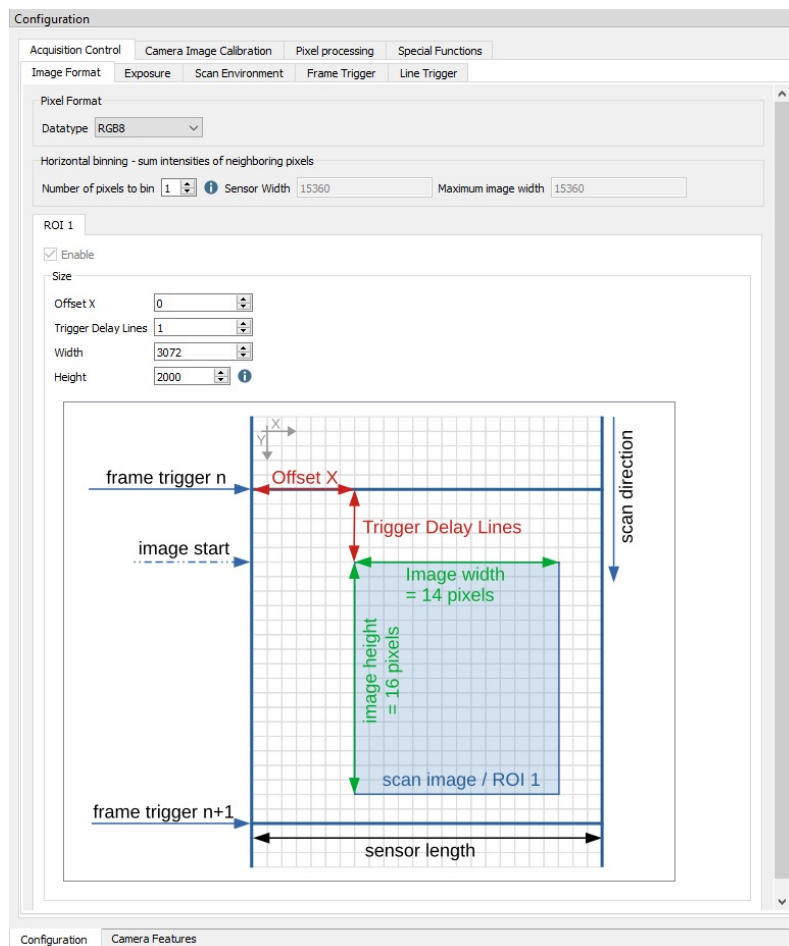
In the camera feature panel (XML Tree)

On the left side of the GCT window, features and their values are shown in a tree structure organized in feature groups. To show the features of a feature group, click on the arrow preceding the group name.
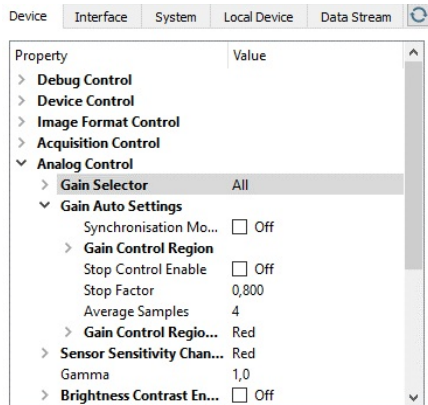
Modifying features

In the configuration panel, the information is displayed when you move the mouse pointer over the parameter input field or the blue information icon.

Showing feature details

Feature details can be displayed in the configuration panel and in the camera feature panel.

In the Configuration panel

In the configuration panel, the information is displayed when you move the mouse pointer over the parameter input field or the blue information icon.
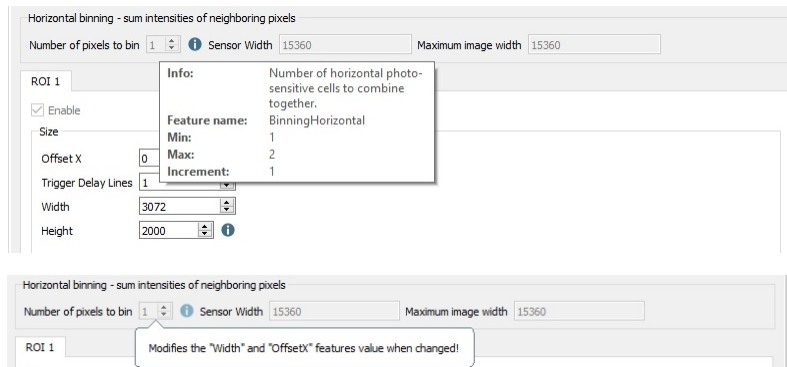
Up-Download

	NOTICE
	Irreparable damage to the camera
	If the camera ist powered down during firmware update it may get into a non-functional state. Recovery may not be possible.

The Up-/Download dialog allows you to Upload files from the PC to the Camera, for example, Camera Package files, as well as user sets. You can also download files from the camera to the PC. Supported file types and extensions depend on the camera type.

Uploading files to the camera

You can restore user settings, calibration files, and other file types which are previously downloaded from the camera.

1. In the *menu bar* navigate to *Tools.* 2. Click **Up-/Download** or use the hotkey **Ctrl+D**.	
The *Update/Download* wizard opens. 3. Click **Select Update File** and select the file you want to upload and click **Open**. 4. GCT shows a warning message. 5. Check if the Type of your file corresponds to the selected category in *Update.* 6. Click **Start Update**. 7. GCT shows a warning message. 8. Click **Yes** to start the Upload. 9. Check the text in the Info Box: If the update was successful, it contains a green confirmation message "Update is successfully completed".	

Downloading files from the camera to the PC

Firmware files, as well as user sets and other file types, can be downloaded from the camera to the PC and saved to a file.

1. In the *menu bar* navigate to *Tools.* 2. Click **Up-/Download** or use the hotkey **Ctrl+D**.	
The *Update/Download* wizard opens. 1. Click **Download** and select your file in the drop-down menu. 2. Click **Download to**. 3. Select a folder, enter a file name, and then click **Save**.	
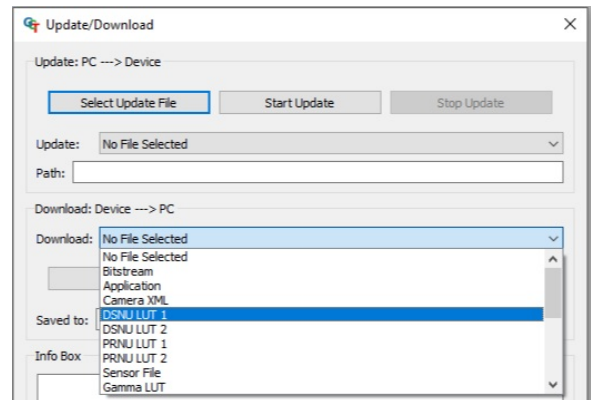
Updating the firmware

1. Download firmware from the Chromasens website or use the firmware file provided by Chromasens.	
2. Note the **Device Package Version** of the currently installed firmware displayed in the *Device Control feature* group.	
3. In the *menu bar* navigate to *Tools.* 4. Click **Up-/Download** or use the hotkey **Ctrl+D**.	
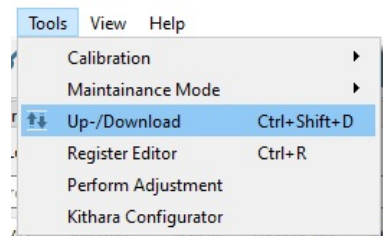
The *Update/Download* wizard opens.

4. Click **Select Update File** and select the *Firmware Package file* to upload and click **Open.**

> **NOTE: Firmware Package file**
>
> For allPIXA evo select the allPIXAevo_listfile_......ini file.
> For allPIXA neo select the allPIXAneo_listfile_.....ini file.

5. GCT shows a warning message.
6. Check if the *Update* field shows the *Firmware Package file* type.
7. Click **Start Update.**
8. GCT shows a warning message.
9. Click **Yes** to start the Upload.

> **NOTE: Time for Update**
>
> Depending on the file size, firmware upload may take up to several minutes.

10. Check the text in the Info Box: If the update was successful, it contains a green confirmation message "Update is successfully completed".
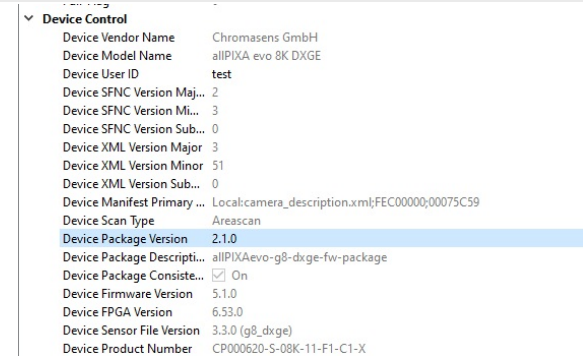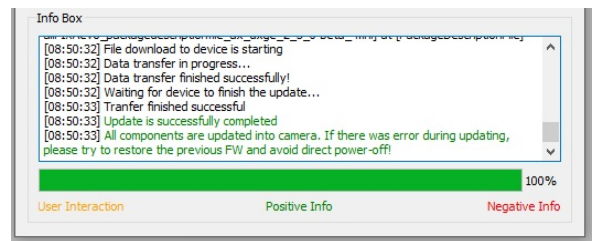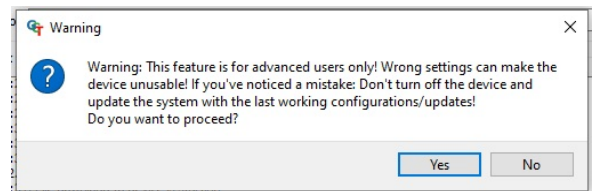
> **NOTE: Update Status**
>
> If the update was unsuccessful, do not switch off the camera, try to restore the previous state by uploading the correct file for the previously selected file type.
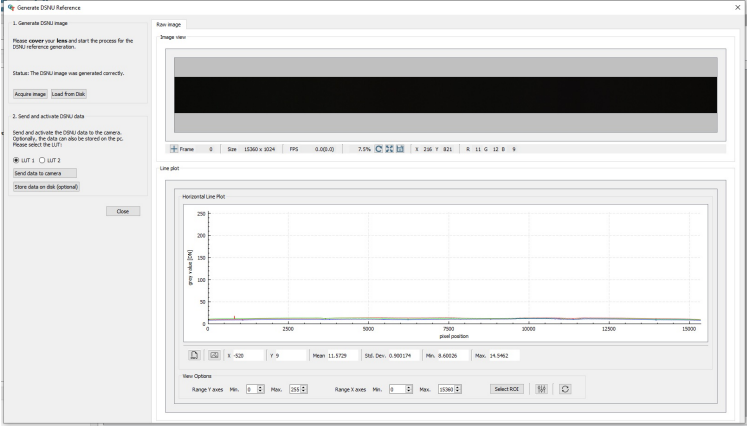
11. Reconnect and Restart the camera

12. Check the **Device Package Version** in the *Device Control feature* group to make sure that the camera successfully booted with the new firmware.

Update/Download		
Update: PC ---> Device		
Select Update File	Start Update	Stop Update
Update:	Firmware Package File	
Path:	....\allPIXAevo_listfile_g8_dxge_2_3_0.ini	

Warning
Please check if the recommended category is correct for the selected file before clicking "Start Update"!
Yes

Warning
Warning: This feature is for advanced users only! Wrong settings can make the device unusable! If you've noticed a mistake: Don't turn off the device and update the system with the last working configurations/updates!
Do you want to proceed?
Yes   No

Info Box
[08:50:32] File download to device is starting
[08:50:32] Data transfer in progress…
[08:50:32] Data transfer finished successfully!
[08:50:32] Waiting for device to finish the update…
[08:50:33] Tranfer finished successful
[08:50:33] Update is successfully completed
[08:50:33] All components are updated into camera. If there was error during updating, please try to restore the previous FW and avoid direct power-off!
100%
User Interaction   Positive Info   Negative Info

Video description

Create a black-reference (DSNU)

Create a black-reference with DSNU.

<table>
<tr>
<td>
1. Switch off the illumination.
2. Cover the lens with a black or dark piece of cardboard or plastic.
No light may reach the sensor.
</td>
<td></td>
</tr>
<tr>
<td>
3. In the *menu bar* navigate to *Tools → Calibration*.
4. Click **Generate DSNU Reference**.
</td>
<td>

Tools   View   Help

Calibration   ▶   Generate DSNU Reference

Maintainance Mode   ▶   Generate PRNU Reference

</td>
</tr>
<tr>
<td>
The *Generate DSNU Reference* wizard opens.

5. Click **Acquire image** to generate the DSNU directly from the camera **or**
click **Load from Disk** to load an image from the hard drive.

> **NOTE: Load from Disk**
>
> Make sure that the image has been taken with active image calibration mode by using the wizard.

The raw image and the line plot of the image is displayed.

Send the calculated DSNU to the camera:

6. Select **LUT 1** or **LUT 2**.
7. Click **Send data to camera**.
</td>
<td></td>
</tr>
</table>

8. In the Configuration window navigate to *Camera Image Calibration → DSNU/PRNU*.

9. Make sure that DSNU is enabled.

Create a shading-reference (PRNU)

Create a shading-reference with PRNU.

1. Place a moving white target. If using a stationary target, place it slightly out of focus. Acquire an image: 2. In the toolbar click **Acquire a single frame** **or** click **Start grabbing**, wait until an image ist displayed, click **Stop grabbing**.	
3. In the *menu bar* navigate to *Tools → Calibration*. 4. Click **Generate PRNU Reference**.	Tools View Help Calibration ▶ Generate DSNU Reference Maintainance Mode ▶ Generate PRNU Reference

The *Generate PRNU Reference* wizard opens.

5. Click **Acquire image** to generate the PRNU directly from the camera **or** click **Load from Disk** to load an image from the hard drive.

> **NOTE: Load from Disk**
>
> Make sure that the image has been taken with active image calibration mode by using the wizard.

The raw image and the line plot of the image is displayed.

6. Click **Start 2-Click-Selection**.
7. Click **on the image** to select the ROI.

Send the calculated PRNU to the camera:
8. Select **LUT 1** or **LUT 2**.
9. Click **Send data to camera**.

Activate brightness and contrast:
10. Select the **Activate Brightness and contrast** checkbox.
11. Set the **Contrast** to 0.9.
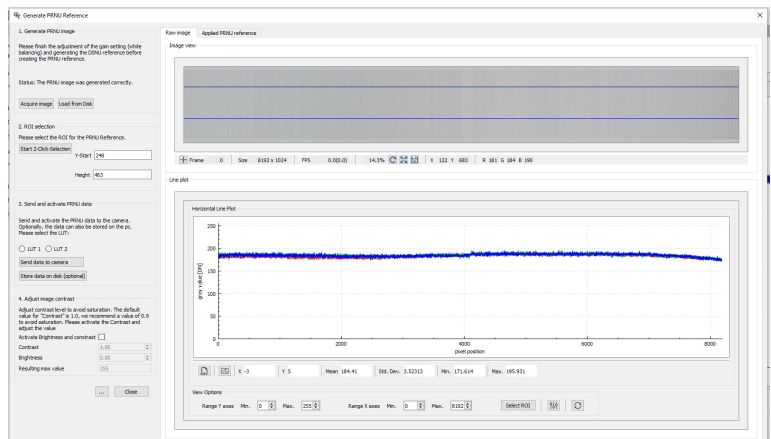
User level

Each camera contains an XML file specifying the available camera features. When GCT connects to the camera, it loads the XML file and shows the features as a tree structure.

Each feature has a visibility level. While all features are displayed for user-level **Developers**, many advanced features are hidden for user-level **Beginner**.

The User Level is shown above the feature area. To modify the user level, click the displayed User Level, and then click the desired level:
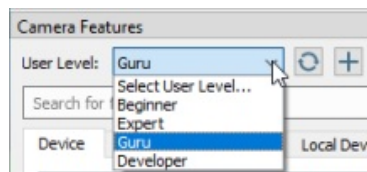
Show message log

To show the message log, click **Message Log** on the **View** menu or click **Show message log window** in the bottom right corner of the GCT window. A **Message Log** area is then shown below the image area:
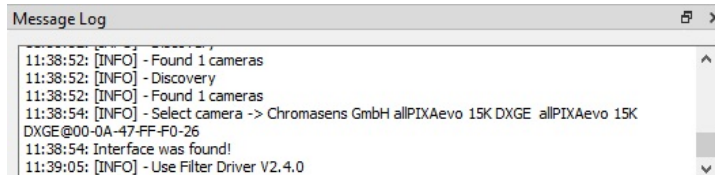
To copy messages to the clipboard, mark the messages, right-click on the selected messages, and then click **Copy** on the appearing context menu.

To copy all present messages, right-click on the **Message Log** area, click **Select All** on the appearing context menu, and then press **Ctrl+C**.

GCT Options

To open the **Options** dialog box, click **Settings** on the **Start** menu.
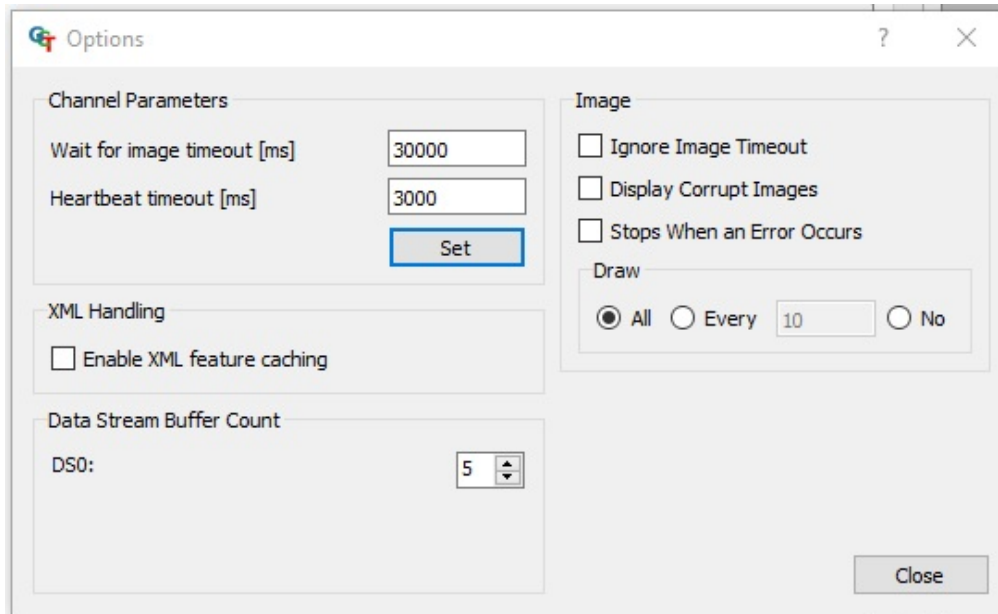
Option name	Default value	Description
Wait for image timeout	30000	If the next image is not received after the specified time, then it will send a timeout. The value can be modified. When GCT is restarted, it is set back to 30000.
Heartbeat timeout	3000	Read the value of **GevHeartbeatTimeout** from the camera (control channel).
Data Stream Buffer Count	5	Specifies the number of buffers used for each stream. The value should be at least 2 or 3.
Ignore Image Timeout	Not selected	Can be selected if the acquisition process should continue despite timeout error.
Display Corrupt Image	Not selected	Can be selected if an image should be displayed despite missing data
Stops If an Error Occurs	Not selected	
Draw	All	Can be set to display every x frames, or to shut off display to reduce CPU usage.
Enable XML feature caching	Not selected	So that the actual value is retrieved directly from the camera, instead of from a cached register.

The options (except **Wait for image timeout** and **Heartbeat timeout**) are saved in GCC.ini

GCC.ini file

The GCC.ini file, which is located under *C:\Users\Public\Documents\Chromasens\GCT2,* including the content of producer path, producer filename, and selected producer for the discovery are already adjusted automatically in the file GCC.ini. file. Therefore, if the discovery has already been executed, the file GCC.ini could look as follows in the block of [DefaultProducers].

```
[DefaultProducers]
ProducerList=C:\\Program Files\\Chromasens\\GCT2\\GenTL\\Kithara\\ls_tl_gev_kithara.cti, C:\\Program Files\\Chromasens\\GCT2\\GenTL\\s2i\\GEVTLS2I.cti
AdditionalSearchPath=C:\\Program Files\\Chromasens\\GCT2\\GenTL\\s2i
SelectedProducerList=C:\\Program Files\\Chromasens\\GCT2\\GenTL\\Kithara\\ls_tl_gev_kithara.cti
```

- ProducerList contains the found cti transport layer files.
- AdditionalSearchPath contains the additional search paths for cti files, which can be added by clicking **Add Producer Path**.
- SelectedProducerList contains the cti transport layer files which are selected to be applied for the discovery process.

10 GigE transport layer

GCT offers two different configurations of the GigE interface Transport Layer to connect and configure a TKH vision group camera. The 10 GigE real-time solution with the Kithara Transport Layer (*Lakesight Tech. GEV TL, "C:\Program Files\Chromasens\GCT2\GenTL\Kithara\ls_tl_gev_kithara.cti"*) and the 10 GigE with the s2i Transport Layer (S2I GEV TL Interface,*"C:\Program Files\Chromasens\GCT2\GenTL\s2i\GEVTLS2I.cti"*).

We recommend using the Kithara real-time solution for any real-time application. In some cases, it is also possible to use the s2i Transport Layer, but only for single link connections. For dual link connections, the use of the Kithara Transport Layer is recommended.

> **Info**
>
> Packets lost can occur without the Kithara real-time kernel solution even with large receive buffers in combination with different Hardware components

10 GigE with Kithara transport layer

Kithara real-time can provide fast image capturing with the GigE Vision standard and can achieve high performance. Running Kithara real-time requires dedicated CPU cores. On those reserved cores, the real-time system is booted, which, from here on, functions just like a separate RTOS while Windows retains its full operability on the remaining CPU cores. From this point on, Windows and the real-time system run simultaneously and parallel to each other on the same computer, without one restricting the other.

The Kithara transport layer enables communication with GigE cameras based on the Kithara software.

> **Note**
>
> Make sure that your PC offers enough 8-lane PCIe 3.1 slots to cope with the data transmission of two cameras! For more information see the manual of our PC (Mainboard)

General Kithara Informations

Requirements

PC:

- Kithara supports up to 48 logic cores in the system
- Kithara supports up to 125 GB RAM
- The maximum usage of dedicated CPUs is 8 (one CPU per link)
- The maximum usage of network ports is 8
  - A Single Link consumes 1 port
  - A Dual Link consumes 3 ports (2 physical, 1 virtual port)
  - This result in a maximum of 8 Single Link or 2 Dual Link cameras and 2 Single Link cameras
- One dongle per PC-System is required, regardless of the number of connected cameras

Valid camera configuration:

- Using DHCP
- Using static IP address in the range of 169.254.X.X (169.254.1.202 using a subnet mask of 255.255.0.0)

Licensing

A valid software license including a USB dongle is required to use the Kithara transport layer. Don't hesitate to get in touch with Chromasens about the information on licensing options. The license dongle is part of the delivery for allPIXA evo DXGE cameras.

Camera connection with Kithara Transport Layer

After the configuration of Kithara, the camera connection is working with the Kithara Transport Layer. To connect the camera, proceed as follows:

1. Make sure that the license USB dongle is plugged in before using the Kithara Transport Layer.
2. Make sure that you configure the Kithara Transport Layer properly. The configuration is done
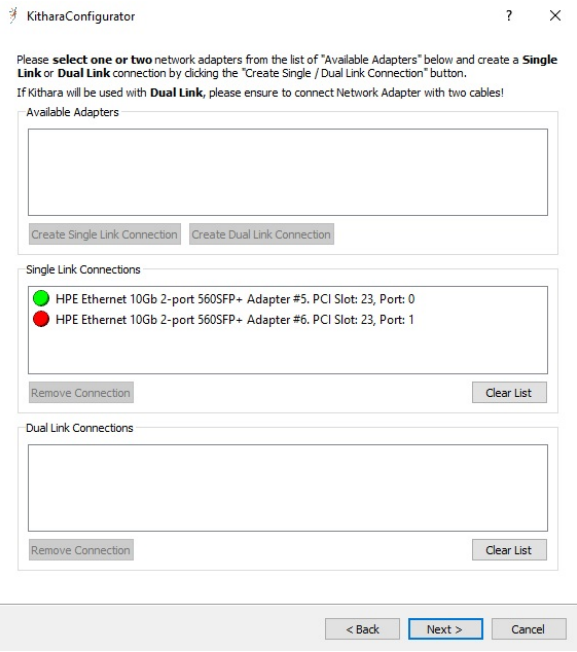
automatically during the installation of GCT.

3. When you start GCT, the first step is to detect the camera. The Kithara TL can be used like any other producer.

> **Note**
>
> If the Kithara transport layer file ls_tl_gev_kithara.cti has been selected in the Select TL Producer dialog box, and the file kithara_config.txt in the folder C:\Users\Public\Documents\Chromasens\GCT2 has been configured, a blue Kithara window may appear for some seconds during the first camera discovery with Kithara TL.

Setting up the Kithara Transport Layer

You can Configure the Kithara Transport Layer with the Kithara Configurator on your Desktop.

1. Plug in the license USB dongle before using the Kithara Transport Layer.	
2. Open the **Generate Config for Kithara** from your desktop.	
3. Read the instructions and *confirm* by *clicking* **Next.**	
4. Select the adapter. • If Kithara is going to be used with a single cable connection, select the corresponding adapter port in the adapter list and *click***Create Single Link Connection**. • If Kithara is going to be used with two cables (which connect two dual ports of the same network adapter), select the two adapter ports in the adapter list and *click* **Create Dual Link Connection**.	
5. *Click* **Next** to confirm the configuration.	

The configurator adds a file kithara_config.txt to the folder C:\Users\Public\Documents\Chromasens\GCT2, which contains the hardware IDs of the network adapters on which Kithara will be executed. Without this file, the Kithara transport layer is not able to detect the devices in GCT. The Kithara Configurator also adds the dedicated CPU cores for Kithara and disables Hyper-Threading. The Kithara Configurator will prompt the system to reboot to update the changes.

> **Warning**
>
> The Kithara configuration can currently be executed once before the first use of Kithara. After Kithara has been used at least once, the configured adapter port(s) are dedicated to Kithara and cannot be used from within Windows unless the driver is set back manually. In the Windows Device Manager, the network adapters can be found in the Kithara System Device section. If the cable connection for Kithara is changed, it is required to reset the network adapter driver to the original Windows network adapter driver (so that the device can be found under Windows) and rerun the Kithara Configurator.

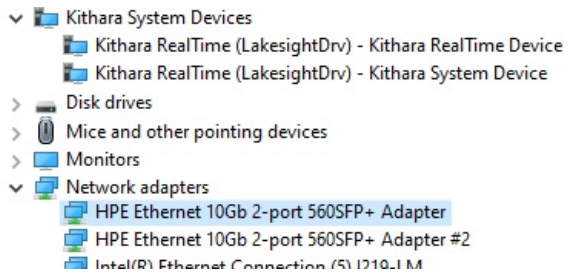## Resetting network adapter driver back to Windows driver

After discovering the camera with the Kithara transport layer file, the corresponding network adapter connections are assigned to the Kithara driver and can no longer be found in the list of normal network adapters in the Windows Device Manager.

As shown in the following screenshot of the Windows Device Manager, the two entries of the dual port HP network adapter (HPE Ethernet 10Gb 2-port 560SFP) are not available in the Network adapters list. Instead, they are present in the Kithara System Devices list with the name Kithara RealTime -PCI Intel 10 GbE Network Controller.

To reset a Kithara RealTime PCI network controller:

1. Open the **Generate Config for Kithara** from your desktop.	
2. Read the instructions and *confirm* by *clicking* **Next.**	
3. Remove the single or dual link connection from the list, therefore, select the connection and press the **Remove** connection button.	
4. *Click* **Next** to confirm the configuration.	
5. Navigate to *Windows Settings* and click **Network & Internet.**	Network & Internet WiFi, flight mode, VPN
6. Click **Change adapter options.**	Advanced network settings Change adapter options View network adapters and change connection settings.

7. **Right-click** one of the Kithara RealTime PCI network controllers, and then click **Properties**.	
8. Click **Configure** and on the next dialog box click the **Drivers** tab.	
7. Click **Update Driver**.	
8. Click **Search driver** on my PC and then click **Select available drivers from a list of my PC**.	
9. Select the suitable adapter driver and then click **Continue**.	
10. After the resetting of Kithara you can find the Network adapter in the Device manager under Network adapters.	∨ 📁 Kithara System Devices 　📁 Kithara RealTime (LakesightDrv) - Kithara RealTime Device 　📁 Kithara RealTime (LakesightDrv) - Kithara System Device › 💾 Disk drives › 🖱 Mice and other pointing devices › 🖥 Monitors ∨ 🖧 Network adapters 　🖧 HPE Ethernet 10Gb 2-port 560SFP+ Adapter 　🖧 HPE Ethernet 10Gb 2-port 560SFP+ Adapter #2 　🖧 Intel(R) Ethernet Connection (5) I219-LM

> **Note**
>
> After the reset of the Network adapter it is required to set up the parameter of the network adapter, therefore please refer to **Configure the network adapter**.

Kithara_config.txt file

The kithara_config.txt contains the hardware ID of the network adapters and the configuration whether it is a single or dual connection. The file is created by executing the Kithara Configurator. The file is stored under:

C:\Users\Public\Documents\Chromasens\GCT2

- If only a single link is used with Kithara, this file contains the hardware ID of the chosen connection as a single entry.
- If the dual link is used with Kithara, this file contains two items from the dual connections.

📄 kithara_config.txt - Editor

Datei Bearbeiten Format Ansicht Hilfe

PCI\VEN_8086&DEV_10FB&SUBSYS_17D3103C&REV_01\#01
PCI\VEN_8086&DEV_10FB&SUBSYS_17D3103C&REV_01\#02

10 GigE with s2i transport layer

The s2i transport layer does not require an additional license dongle.

> **Note**
>
> Make sure that the **parameters** of your **network adapter** are set correctly. For more information, see **Configure the network adapter**.

Connect the camera with s2i transport layer

1. *Stat* **Device Discovery**	
2. *Press* **GenTL Producers** and *check* the **GEVTLS2I.cti** file.	
3. *Press* **OK**.	
4. *Press* **Start Discovery**.	

Filter driver

The s2i transport layer offers the usage of a filter driver. A filter driver is used to get the UDP-image-data packets before the operating system accesses them. This leads to a drastically improved error rate and decreases the number of lost packets drastically. To configure the filter driver, go to the Configuration widget and select the Camera Features tab, here you can check and uncheck the filter driver.

Configure the network adapter

Set network adapter parameter

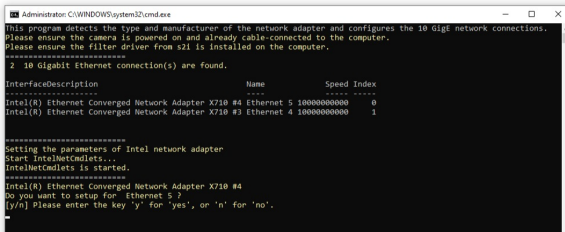### Automatic setting of the parameters

> **Note**
>
> This configuration of your **GigE network adapters** is done during the installation of GCT. You will also need it if you want to remove the *Kithara TL*.
>
> You can run this script if you use a network adapter with an Intel chipset.

In the Public folder of GCT installation, a configuration script is also stored.

For the configuration please:

1. Turn on your camera and connect it to the PC.	
2. Open the Windows command line in the *Administrator* mode, therefore press **Start** and type **CMD** into the search box. Now you can open the **CMD** in the *Administrator* mode.	
3. Copy the following command into the **CMD** and press **enter**.	cd C:\Users\Public\Documents\Chromasens\GCT2
4. Copy the following command into the **CMD** and press **enter**.	runConfig10GigE.bat
5. The command line window lists all available ethernet adapters and you can configure the network adapter by entering a **Y** into the script. **Note** If an error occurs during the execution of the script you have to configure the network adapter manually.	
6. After the configuration of the network parameter, the script can help you to set a static IP Address of the network adapter. *We recommend disagreeing* by entering **N** into the window. If you want to set a static IP Address for your network, you can answer with **Y**.	

Manual setting of the parameters

In contrast to the section above, this section is now oriented to the network adapters, which are not supported by Intel, or the operating system is Win7 x64. The setup depends on the adapter manufacturer.

1. Navigate to *Windows Settings* and click **Network & Internet**.	🌐 Network & Internet WiFi, flight mode, VPN
2. Click **Change adapter options**.	Advanced network settings 🖥 Change adapter options View network adapters and change connection settings.
3. Right-click the Ethernet adapter that will be used to connect the camera, and then click **Properties**.	
4. In the network tab only enable **Sphinx GigE Filter Driver** and **Internet Protocol version 4 (TCP/IPv4)**.	☑ Sphinx GigE Vision Filter Driver ☐ MVTec GigE Vision Streaming Filter ☐ VirtualBox NDIS6 Bridged Networking Driver ☐ QoS-Paketplaner ☑ Internetprotokoll, Version 4 (TCP/IPv4)
4. *Click* **Configure**, and then *click* the **Advanced tab**. The available parameters may vary and are depending on the adapter.	
5. Set the following parameter.	

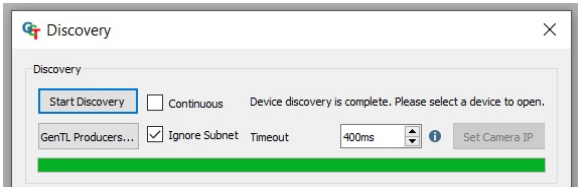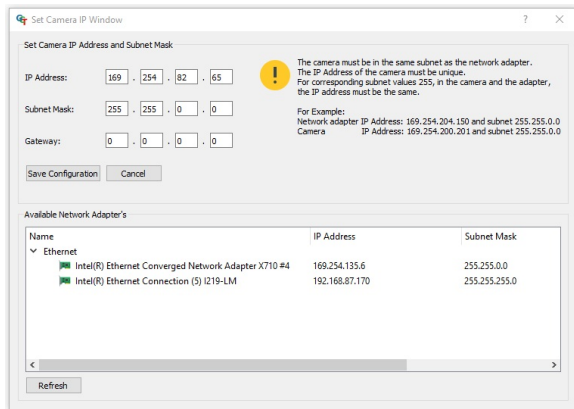| Attribute name (English)	Attribute name (German)	Value
Interrupt Moderation	Interrupt-Drosselung	Enabled
Jumbo packet	Jumbo Packet	9014 Byte
Large-Send-Offload V2(IPv4)	Large-Send-Offload V2(IPv4)	Enabled
Large-Send-Offload V2(IPv6)	Large-Send-Offload V2(IPv6)	Enabled
Direct Cache Access	Direct Cache Access	Enabled
Receive Buffers	Empfangsbuffer	Max (e.g. 4096)
Flow control	Flusssteuerung	Disabled
Interrupt Moderation Rate	Interrupt-Drosselungsrate	Adaptive
Low Latency Interrupts	Low Latency Interrupts(LLIs)	Disabled
Transmit Buffers	Übertragungspuffer	Max (e.g.16384)
Rx and Tx from Offloading Options	Rx und Tx von Offload-Optionen	Enabled
Receive Side Scaling	RSS (Empfangsseitige Skalierung)	Enabled
RSS queues	RSS-Warteschlangen	2
Log Link State Event	Verbindungsereignis protokollieren	disabled

Set IP address

To connect GCT to the camera, you may need to adjust the properties of the network adapter. There are basically three methods to configure the IP address and subnet mask of your PC and camera:

- Use LLA (link-local address) autoconfiguration, this is by default always enabled.
- Use a DHCP server to configure the network settings of the PC and camera, in the default factory setting it is enabled.
- Use manually assigned persistent IP addresses and subnet masks for the camera and network adapter, in the default factory setting it is disabled.

In typical installations, the camera is connected directly to the network adapter of the PC with the DHCP server configuration.

Set the camera IP address with GCT

If the camera does not show up in the GCT discovery window you can set the IP-Address in GCT.

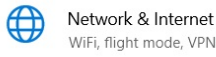|	
1. Start **Device Discovery** in *GCT*.	
2. *Enable* the **Ignore Subnet** check box. If the camera now shows up but cannot be connected (Open button is disabled), you can set the camera IP address manually.	
3. *Click* the **Set Camera IP** button	
4. *Select* the network adapter the camera is connected. The program will assign an IP address to the camera	
5. *Click* **Save Configuration**	
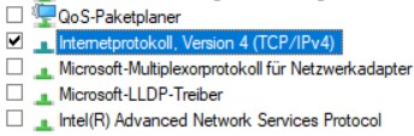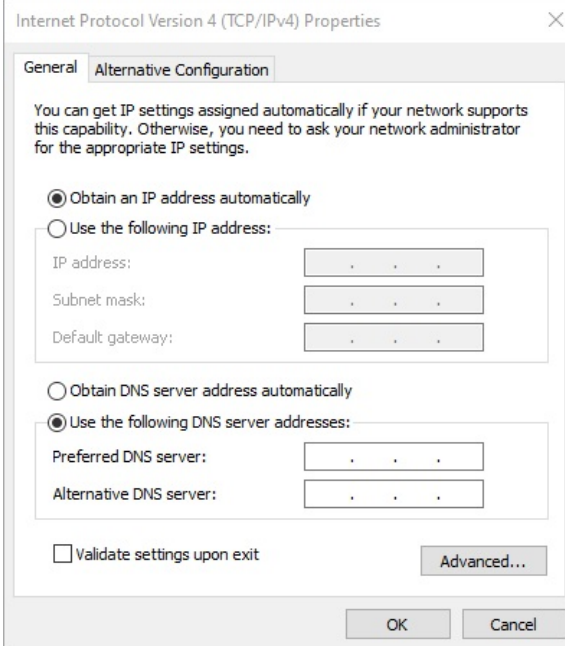
DHCP server configuration

The DHCP server configuration tries to assign different IP addresses from the Link-Local-Block (169.254.x.x) to both the camera and network adapter automatically and set the subnet mask of both devices to 255.255.0.0.

Configure the DHCP Mode in the Camera:

1. Switch On and connect the camera with GCT.	
2. In the *Camera Feature* tab navigate to --> *Transport Layer Control --> GigE Vision --> Gev Interface Selector.* 3. *Switch the* **Gev Current IPConfiguration DCHP** *--> On.* 4. *Switch the* **Gev Current IPConfiguration Persistent IP** *--> Off.*	

Configure the DHCP Mode in the Network adapter:

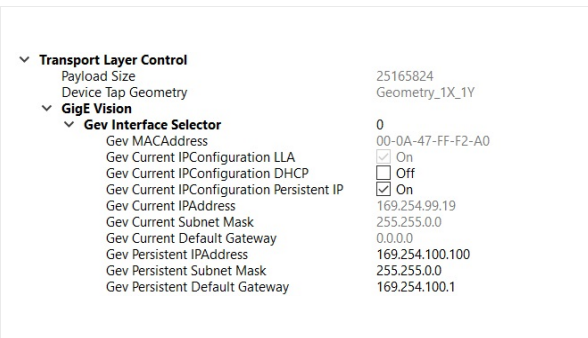|	
1. Navigate to *Windows Settings* and click **Network & Internet.**	⊕ Network & Internet WiFi, flight mode, VPN
2. Click **Change adapter options.**	Advanced network settings 🖥 Change adapter options View network adapters and change connection settings.
3. Right-click the Ethernet adapter that will be used to connect the camera, and then click **Properties.**	
4. On the Networking tab select the *Internet Protocol Version 4* item and then click **Properties.**	☐ QoS-Paketplaner ☑ Internetprotokoll, Version 4 (TCP/IPv4) ☐ Microsoft-Multiplexorprotokoll für Netzwerkadapter ☐ Microsoft-LLDP-Treiber ☐ Intel(R) Advanced Network Services Protocol
5. Make sure that the **Obtain anIP address automatically** check box is selected.	Internet Protocol Version 4 (TCP/IPv4) Properties ✕ General Alternative Configuration You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings. ◉ Obtain an IP address automatically ○ Use the following IP address: IP address: Subnet mask: Default gateway: ○ Obtain DNS server address automatically ◉ Use the following DNS server addresses: Preferred DNS server: Alternative DNS server: ☐ Validate settings upon exit Advanced... OK Cancel

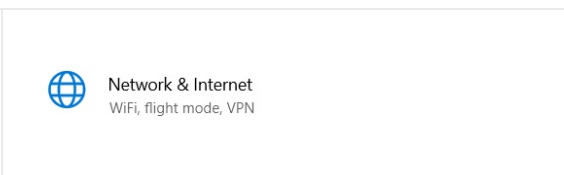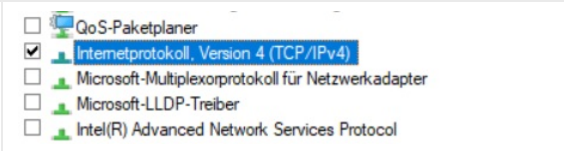## Persistent IP adress configuration

The persistent IP address implies that the feature Current IP Configuration Persistent IP is switched on in the camera.

Configure the Persistent IP Mode in the Camera:

1. Switch On and connect the camera with GCT.	

2. In the *Camera Feature* tab navigate to -->
*Transport Layer Control --> GigE Vision --> Gev
Interface Selector.*

3. Switch the **Gev Current IPConfiguration
DCHP** *--> Off.*

4. Switch the **Gev Current IPConfiguration
Persistent IP** *--> On.*

∨ **Transport Layer Control**	
Payload Size	25165824
Device Tap Geometry	Geometry_1X_1Y
∨ **GigE Vision**	
∨ **Gev Interface Selector**	0
Gev MACAddress	00-0A-47-FF-F2-A0
Gev Current IPConfiguration LLA	☑ On
Gev Current IPConfiguration DHCP	☐ Off
Gev Current IPConfiguration Persistent IP	☑ On
Gev Current IPAddress	169.254.99.19
Gev Current Subnet Mask	255.255.0.0
Gev Current Default Gateway	0.0.0.0
Gev Persistent IPAddress	169.254.100.100
Gev Persistent Subnet Mask	255.255.0.0
Gev Persistent Default Gateway	169.254.100.1

Configure the Persistent IP MOde in the Network adapter:

1. Navigate to *Windows Settings* and click **Network & Internet**.	🌐 Network & Internet WiFi, flight mode, VPN
2. Click **Change adapter options.**	Advanced network settings 🖥 Change adapter options View network adapters and change connection settings.
3. Right-click the Ethernet adapter that will be used to connect the camera, and then click **Properties.**	
4. On the Networking tab select the *Internet Protocol Version 4* item and then click **Properties.**	☐ 🖳 QoS-Paketplaner ☑ 🖳 Internetprotokoll, Version 4 (TCP/IPv4) ☐ 🖳 Microsoft-Multiplexorprotokoll für Netzwerkadapter ☐ 🖳 Microsoft-LLDP-Treiber ☐ 🖳 Intel(R) Advanced Network Services Protocol
5. Click **Use the following IP address.** 6. In the *IP address* field of the Network adapter specify an address that differs from the IP address of the camera only in the last field. When the camera IP address shown in the GCT discovery window is **169.254.100.100**, you can set the *IP address* of the network adapter e.g. to **169.254.100.99**. 7. At the Subnet mask enter **255.255.0.0**. 8. Close the properties dialog boxes by clicking **OK**. **Note** For Kithara use a static IP address in the range of 169.254.X.X (169.254.1.202 using a subnet mask of 255.255.0.0)	

Network adapters and transceivers

SFP+ connection

⚠	If you are using the s2i Transport Layer it is required to configure the network adapter properly. The **HPE Ethernet 10Gb 2-port 560SFP+ Adapter** and **Intel (X710)** are configured during installation. * Some manufacturers encode their cards. Those cards can only be used with the appropriate transceivers. Example: Intel X710 chipsets only work with Intel or Intel-configured transceivers

Network adapter

The following network adapters are tested with GCT2. The results are shown in the following table.

Vendor Name	Type	Result	S2i TL	Kithara TL
HPE	HPE Ethernet 10Gb 2-port 560SFP+ Adapter	Fully functional	X	X
HPE *	HPE Ethernet 10Gb 2-port 562SFP+ Adapter	Not supported yet		
Intel *	Intel® Ethernet-Converged-Network-Adapter X710	Fully functional	X	X
Myricom	Myricom 2x 10GbE SFP+ low-profile NIC	Only with s2i	X	
Myricom	Myricom 1x 10GbE SFP+ low-profile NIC	Only with s2i	X	
Mellanox	NVIDIA Mellanox MCX512A-ACAT ConnectX®-5 EN Network adapter	Only with s2i	X	

Installation

Network adapter	
HPE Ethernet 10Gb 2-port 560SFP+ Adapter	**Download and install the following files** Download the *Wired_dirver_xx* and the *Wired_PROSet_xx* from the *Intel Homepage*.
Network adapter with X550 Intel chipset	**Download and install the following files** Download the *Wired_dirver_xx* and the *Wired_PROSet_xx* from the *Intel Homepage*.

Network adapter with X710 Intel chipset	**Download and install the following files** Download the Release_xx *from the* [**Intel Homepage**]().

Transceiver

The following transceivers are tested with the allPIXA evo camera and the network adapters.

Vendor Name	Type	Comment	Camera side	Network adapter side
Finisar	FTLX8574D3BCL Class 1 21CFR1040:10		X	X
FS	SFP-10GSR-85		X	X
FS	Intel E10GSFPSRX Compatible 10GBASE-SR SFP+ 850nm 300m DOM Duplex LC MMF Transceiver Module	Recommended for Network adapters that are marked with *		X

RJ45 connection

Network adapter

The following network adapters are tested with GCT2. The results are shown in the following table.

Vendor name	Type	Result	s2i TL	Kithara TL
Broadcom	P210TP - 2 x 10GBASE-T PCIe NIC	Fully functional	X	

Installation

1. Download the driver file and follow the installation instructions.	**Download** For the Broadcom Network adapter "P210TP - 2 x 10GBASE-T PCIe NIC", you can find the download files [**here**]().

2. Set Jumbopacket Size
- **Open** the *Device Manager*
- **Right-click** one *ethernet connection* of the Gigabit Ethernet network card, and then click Properties
- Click **Configure**, and then click the **Advanced** tab
- **Set** *Jumbo packet* to 9014 byte

Setup

1. Open the camera with GCT	
2. In GCT navigate to *DS0*	
3. Enable the **Enable Packet Resend** feature	
4. Set the Packet Resend Count to 255 (or 99)	
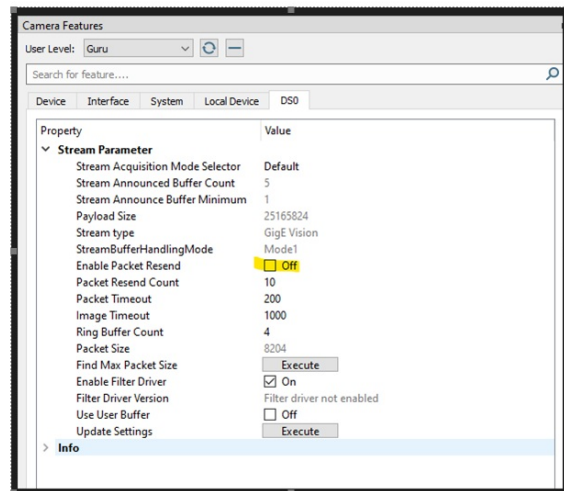
Tested frame grabbers

The following CXP frame grabbers are tested with GCT2. The results are shown in the following table.

Manufacturer	Type	Result	Comment
Euresys	CoaxLink Quad CXP12	Fully functional	
Matrox	Rapixo CXP	Known Bugs	Updating the image width causes a GCT crash, a restart of GCT is necessary, No support of RGBa8 images
Basler	CXP-12 Interface Card 4C	Fully functional	
Bitflow	CYTON CXP4	Fully functional	

Connection two cameras with one frame grabber

If you want to use two cameras with one frame grabber, you may have to configure the frame grabber (see frame grabber manual). Once it is configured correctly, you can connect the cameras as described in chapter Connection and disconnection of Camera
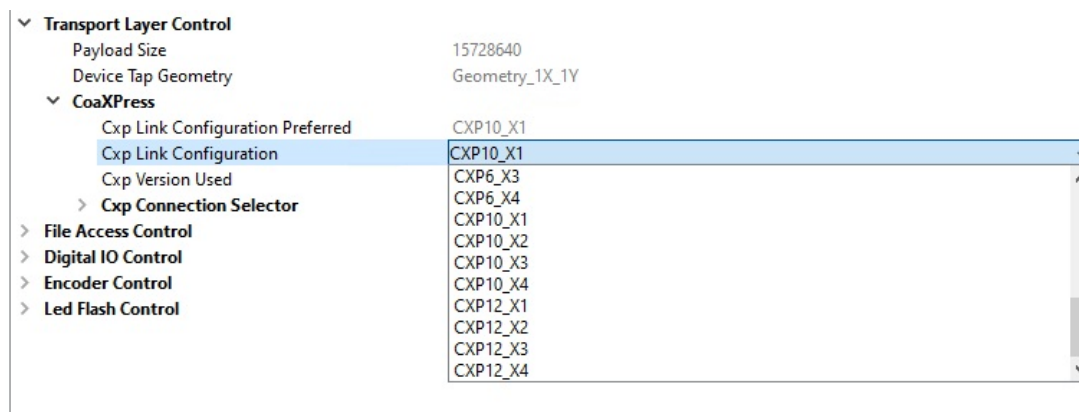
CXP link configuration

Configure CXP version

The data transfer rate depends on the configured CXP standard version. This option can be set with the parameter "Cxp version used" as shown in the following figure. We recommend using the version CSP_Version_2_0. The CSP standard 1.0 supports a data rate of 6.26 Gbps, the CXP standard 2.0 supports a data rate of 12.5 Gbps per cxp cable.
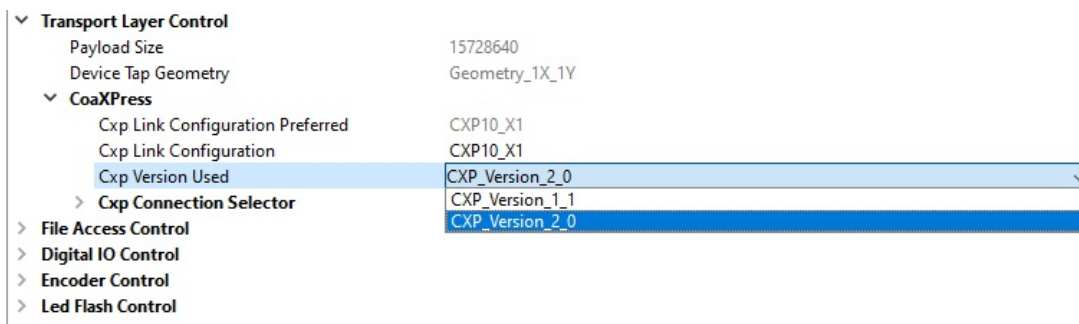
Link configuration

The link configuration defines how many CoaXPress cables are connected to the camera and the data transfer rate. The number of connected CoaXPress cables are assigned with the Xn. For example, a X2 means that two cables are connected to the camera. The data transfer rate per connected cable is defined with the first number in the selectable cxp link configuration CXPt_Xn.

The following table shows the link configuration parameters and there corresponding data rate (for CXP Version 2.0). The data rate refers to one connected CXP cable X1. The data rate increases with additional connected CXP cable. CXP12_X2, for example, has a data rate of 25 Gbps.

Link configuration	Data rate per link Xn in Gbps
CXP1_Xn	1.25
CXP2_Xn	2.50
CXP3_Xn	3.125
CXP5_Xn	5.00
CXP6_Xn	6.25
CXP10_Xn	10.00
CXP12_Xn	12.5

SDK – CSGenICam

The Chromasens GenICam SDK (CSGenICam SDK) is an optional part of the GCT software package. It can be seen as an abstraction layer above the GenICam GenApi and GenTL interfaces, as shown in graphic below:
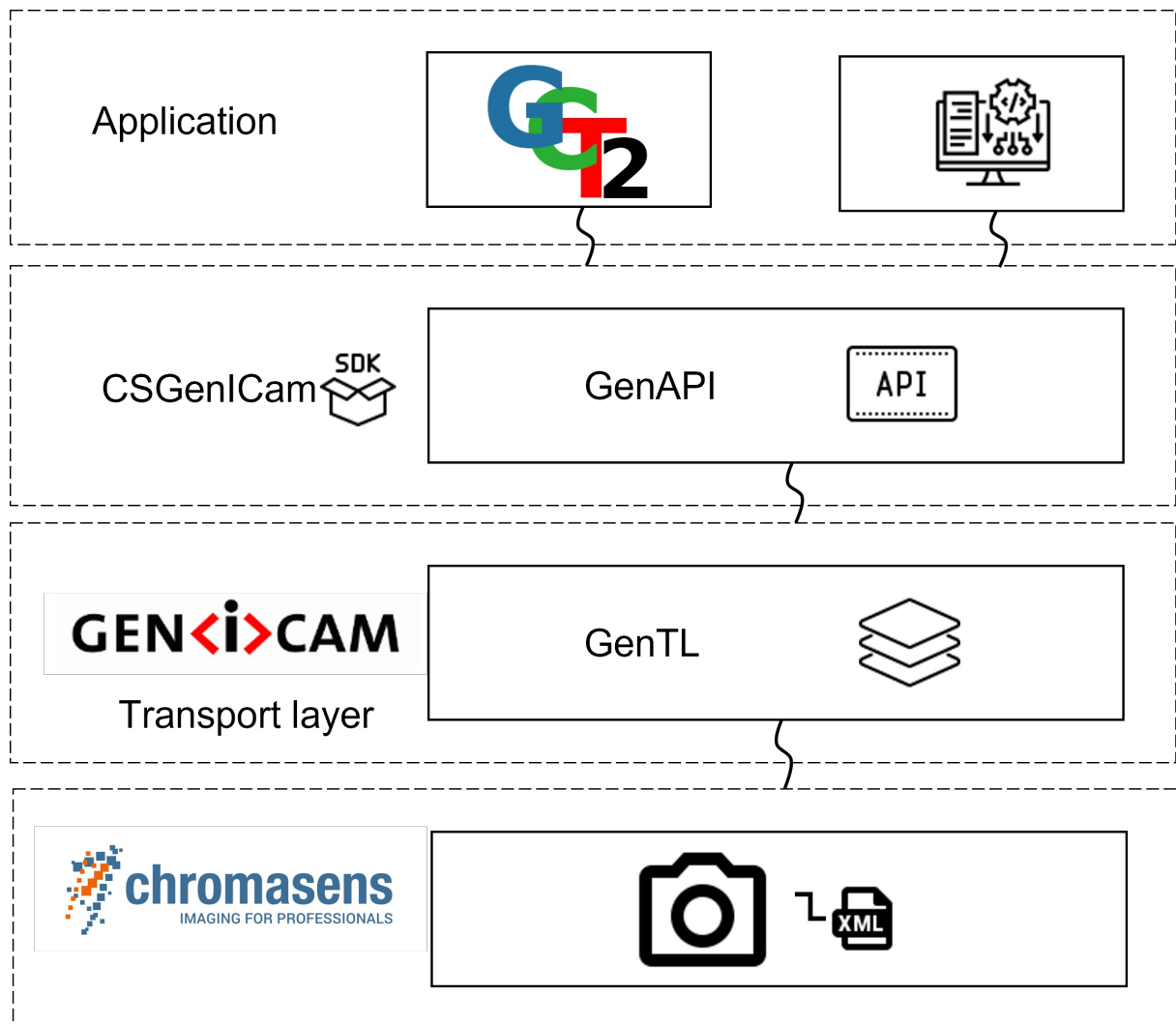
It permits to write applications against the CSGenICam interface. The CSGenICam interface provides a set of convenience functions and additional functionalities specific to Chromasens cameras. As an example, it adds functions that permit to perform file transfers from/to the device. It has a slightly simplified interface when compared to the more abstract GenApi and GenTL producer libraries.

For more information on how to use the SDK, including a complete API reference, refer to the SDK documentation.

🖥️	https://chromasens.de/de/software

Documentation

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Performance Test

The GCT installer provides a performance test tool. The tool allowed you to analyze the performance of your camera connection.

> **Performance Test tool folder**
>
> C:\Users\Public\Documents\Chromasens\GCT2\performanceTest

On your desktop, you can find a direct link to the performance test, therefore **double-click** the desktop link *"Testperformance GCT2"*.
The folder provides three different *.bat* files. These files are predefined examples to run the performance test.

Name	Description
performanceTestCompatHelp.bat	Opens the Help dialog of the *performance test tool*
runPerformanceTestCSIGeneric.bat	Opens a generic configuration of the *performance test tool,* can be used for CXP and Gige Cameras
runPerformanceTestCSIwithKithara.bat	Opens the *performance test tool* for *Kithara* configured cameras
runPerformanceTestCSIwiths2i.bat	Opens the *performance test tool for S2I configured cameras*

Parameter description

The program has the following adjustable parameters:

Parameter	Entries	Description
--checkImageConsistency	*None*, *GreyHorizontalRamp* or *GreyHorizontalRampMoving*	Method for checking error proune images
--checkImageConsistencyOption	*STSISDComplete* or *STSISD*	Option for checking error proune images
--deviceSelection	*auto* or *manual*	"auto" selects the first visible device, "manual" you can select the device
--height		Height in pixel
--help		Performance tool options
--line_time_step_width		Number of microseconds to increase from one test run to the next
--pixelFormat	*RGB8, Mono8....*	GeniCam SFNC Pixel Format
--reportFileDir		Option for setting directory of the written report file
--ring_buffer_count		Number of used frame buffers
--single_test_duration		Duration in seconds for a single integration time
--start_line_time		Line time to start with in us.
--stop_line_time		When this line time is reached, the test will be stopped.

--use_filter_driver	*1 and 0*	1 for on or 0 for off, default off
--width		Width in pixel

Example of a command line:

> PerformanceTest.exe --use_filter_driver 1 --single_test_duration 3 --start_line_time 60 --
> line_time_step_width 3 --stop_line_time 65 --pixelFormat RGB8 --checkImageConsistency
> GreyHorizontalRamp

This means the camera uses RGB8 as image format, starts with an acquisition line time of 60 microseconds (us), stops after 65 us, and the step is 3 us. With each acquisition line time, the test of each different line time will take 3 seconds. The filter driver for the S2I transportlayer is set to "on". An image consistency check is done with the *"GreyHorizontalRamp"*. The running program can be stopped by pressing any key.

Results and Output

The output of the *Performance Test Tool* is shown in the command line window and in the Test Reports folder.

> **Test Reports Folder**
>
> *C:\Users\Public\Documents\Chromasens\GCT2\performanceTest\TestReports*

Parameter	Description
Duration [s]	Acquiring time in seconds
Line/Frame Time [us]	Set line time in microseconds
Acquired	Acquired frames
Dropped	Dropped frames
Corrupted (N/Min/Max)	Number of corrupted pixels N = corrupted images, Min = Minimum number of corrupted pixels in one image, Max = Maximum number of corrupted pixels in one image
Packets OK	Number of transmitted packets without an error
Packets Error	Number of transmitted packets with an error
First Frame Packets Error	Packet error in the first frame
GBit/s	Transmission rate

*(-1 means that this method was not used for this test)

Troubleshooting with Kithara transport layer

No camera is found during discovery

Make sure that the license USB dongle is plugged in. Also make sure to configure the Kithara transport layer before use by following the steps described in the section xx

Discovery takes a long time to finish

It may happen that the discovery takes a long time to finish its process without detecting the camera, even though the system is configured properly. In such cases, restart the system and try again. If the Kithara Transport layer is used to detect the camera, run the Kithara Configurator application again to set all the Kithara-related parameters correctly.

Possible reasons for GEV_TIMEOUT_ERROR

Sometimes during image grabbing, there comes no image from the camera, and the message log shows GEV_TIMEOUT_ERROR in the bottom area. This can be caused by following reasons.

Trigger mode not set correctly

Trigger source: If there is no explicit trigger available and the camera should run in "free-running" mode, but the value of trigger source does not correspond to this mode, then GCT will return "GEV_TIMEOUT_ERROR" and cannot grab images.

Filter driver not installed properly (only for 10GiGE without Kithara)

GCT can use the filter driver developed by s2i. If the filter driver should be used for the grabbing process, it must be installed and enabled correctly beforehand in the adapter settings.

To check the adapter settings, go to Start menu -> Settings -> Network & Internet. On the Settings window, click Change adapter options. A new dialog box opens with a list of network connections. Right-click the corresponding GigE Ethernet connection for the camera and then click choose Properties. If a teaming group is used, then right-click the teaming group and choose its attributes. Ensure that s2i GigE-Vision Filter Driver is selected and that the version is correct.

"Secure Boot" not disabled in BIOS settings (only for 10GiGEwithout Kithara)

If the filter driver is installed properly and can also be detected, but "GEV_STATUS_DRIVER_READ_ERROR" appears during grabbing, it could be due to Secure Boot in the BIOS settings. In this case refer to section 3.4.2.

Firewall is not completely allowed for GCT

Data transfer between camera and PC requires firewall allowance. Normally, the firewall rule is exclusively allowed for GCT automatically after installation.
To verify the firewall rule:

1. On the Window Start menu, click Settings-> Update & Security -> Windows Security -> Firewall & network protection.
2. Click Advanced settings and highlight Inbound Rules in the left panel.
3. Find the rule name GCT2_x64, open its properties, and ensure that the firewall rule is allowed for all types: domain, private, and public.

Reboot

If GEV_TIMEOUT_ERROR occurs only if the filter driver is activated, you can reboot your PC to resolve unknown conflicts in the hardware.