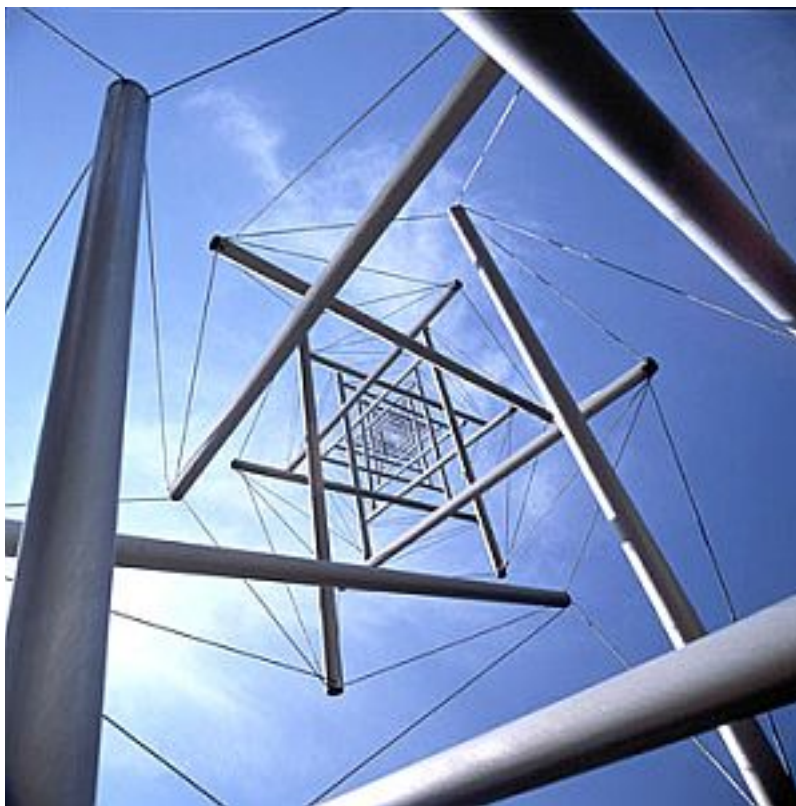


# GigE Vision Module for Sopera LT

User's Manual  
Edition 2.11

sensors | cameras | frame grabbers | processors | **software** | vision solutions



P/N: OC- SAPM-GVFU0  
[www.teledynedalsa.com](http://www.teledynedalsa.com)



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Edition 2.11

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### **About Teledyne DALSA**

Teledyne DALSA is an international high performance semiconductor and electronics company that designs, develops, manufactures, and markets digital imaging products and solutions, in addition to providing wafer foundry services.

Teledyne DALSA Digital Imaging offers the widest range of machine vision components in the world. From industry-leading image sensors through powerful and sophisticated cameras, frame grabbers, vision processors and software to easy-to-use vision appliances and custom vision modules.

Based in Waterloo, ON, Canada, the company has operations in Montreal, QC; Bromont, QC; Eindhoven, NL; Munich, Germany and Tokyo, Japan.

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# Overview

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## GigE Vision Application Description

The Teledyne DALSA GigE Vision Module provides support for Teledyne DALSA GigE Vision cameras under Sopera Vision applications. Key points are:

- Sopera LT 8.01 or greater now includes the GigE Vision module as an optional installation chosen by the user.
- Automatically installed with any Teledyne DALSA framework package.
- Support for 32-bit or 64-bit versions of Windows XP, Windows Vista, Windows 7, and Windows 8/8.1.
- Support for GigE Vision 1.0 compliant devices.
- Supported by Sopera™ LT (version 7.20 or greater) software libraries (see page 3 of the Sopera LT User's Manual for information on the various Sopera packages).



**Note:** Third party GigE Vision cameras can also be supported within Sopera Vision applications with the purchase of a valid Sopera Processing standard run-time license.

## Supported Industry Standard



GigE Vision cameras that are compliant with the GigE Vision 1.0 specification which defines the communication interface protocol used by any GigE Vision device. The device description and capabilities are contained in an XML file. For more information see:  
<http://www.machinevisiononline.org/public/articles/index.cfm?cat=167>

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## Module Installation

The GigE Vision Module is included with Sopera LT 8.01 or later. The user selects to install the package by via a tick box show during the Sopera installation.

The GigE Vision Module software provides all components required to control GigE Vision devices. The GigE Vision Module includes the Network Imaging driver (refer to the *Teledyne DALSA Network Imaging Module manual* and the Sopera GigE server. The CamExpert tool is installed separately if the Sopera LT library is not installed.

---

# Connect the GigE Vision Camera




Connect a power supply to the camera and an Ethernet cable from the camera to the host computer. Once communication with the host computer is started the automatic IP configuration sequence will assign an LLA IP address or a DHCP IP address if a DHCP server is present on your network.



**Note:** The Teledyne DALSA Network Configuration tool can enable the Teledyne DALSA Smart DHCP server to function on the NIC used for the GigE Vision camera.

## GigE Vision Verification

After a successful GigE Vision Module installation, the GigE Server icon is visible in the desktop taskbar tray area. After connecting a camera (see following section), allow a few seconds for the GigE Server status to update.

	Device Available	Device IP Error	Device Not Available
<b>GigE Server Tray Icon:</b>	 <p>The normal GigE server tray icon when the GigE Vision device is found. It will take a few seconds for the GigE Server to refresh its state after the device has obtained an IP address.</p>	 <p>The GigE server tray icon shows a warning when a device is connected but there is some type of IP error.</p>	 <p>A red X will remain over the GigE server tray icon when the GigE Vision device is not found. This indicates a major network issue.</p>

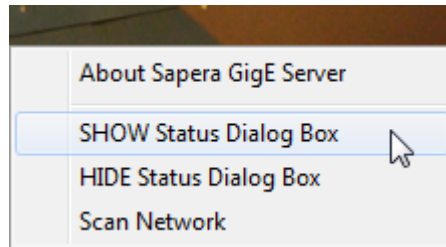
If you place your mouse cursor on this icon, the GigE Server will display the number of GigE Vision devices found by your PC. Right click the icon and select status to view information about those devices. See "Running the Network Configuration Tool" on page 8 and "Troubleshooting" on page 28 for more information.

## GigE Server Status

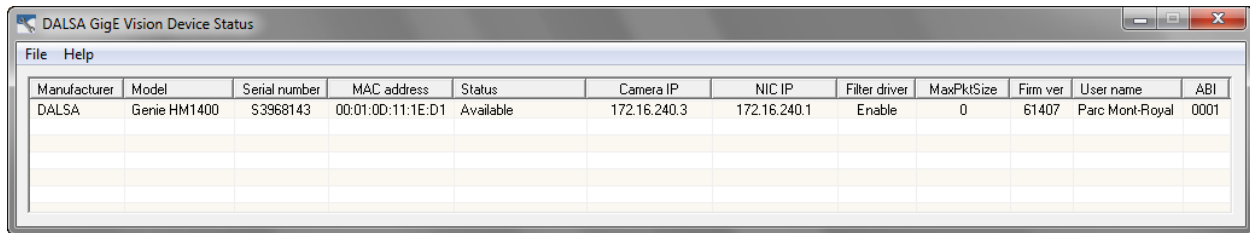
Once the GigE Vision device is assigned an IP address the GigE server tray icon will not have a red X through it, indicating that the device was found. It might take a few seconds (dependent on the Auto Discovery interval) for the GigE Server to refresh its state after the device has obtained an IP address.



Right-click the GigE Server tray icon to open the following menu:



Click on **Status** to open a window listing all GigE Vision devices connected to the host system. Each device is listed by name along with important information such as the assigned IP address and device MAC address. The screen shot below shows a connected Teledyne DALSA Genie camera with no networking problems.

A screenshot of the "DALSA GigE Vision Device Status" window. The window has a menu bar with "File" and "Help". Below the menu bar is a table with the following data:

Manufacturer	Model	Serial number	MAC address	Status	Camera IP	NIC IP	Filter driver	MaxPktSize	Firm ver	User name	ABI
DALSA	Genie HM1400	S3968143	00:01:0D:11:1E:D1	Available	172.16.240.3	172.16.240.1	Enable	0	61407	Parc Mont-Royal	0001

In the event that the device is physically connected, but the Spera GigE Server icon is indicating that the connected device is not recognized, click **Scan Network** to force the discovery process even if Automatic Discovery is disabled. Note that the GigE server periodically scans the network automatically to refresh its state. See "Troubleshooting" on page 28 for network problems.

---

# Optimizing the Network Adapter

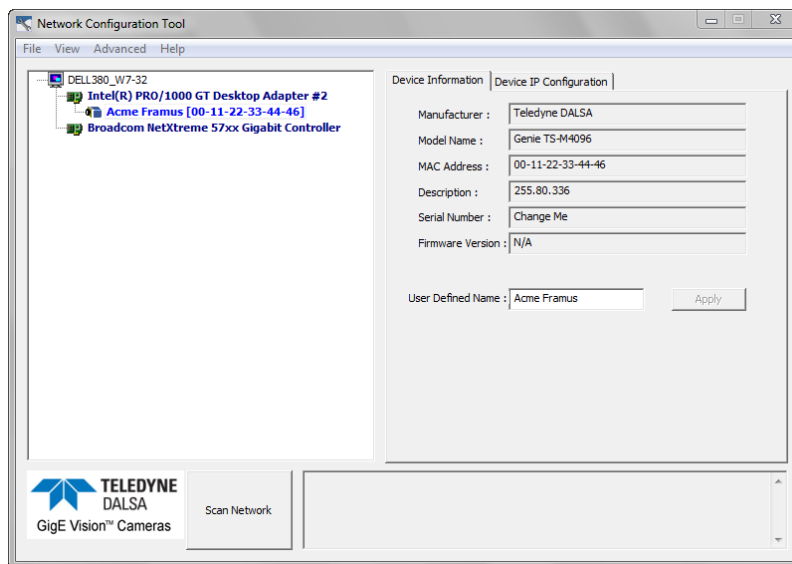
Most Gigabit network interface controllers (NIC) allow user modifications to parameters such as Adapter Buffers and Jumbo Frames. These should be optimized for use with the GigE Vision devices during the installation. Refer to the **Teledyne DALSA Network Imaging Package manual** for optimization information.

## Running the Network Configuration Tool

The Network Configuration tool provides information and parameter adjustments for network adapters installed in the system and any connected GigE Vision camera without use of any Windows Control Panel application. This tool allows you to:

- Activate the Network Imaging driver used for image acquisition on any NIC.
- Disable the imaging driver for any NIC not used with a GigE Vision camera.
- Enable or Disable the Auto Discovery process.
- Change the Auto Discovery Interval from the default of 15 seconds.
- Add the DALSA GigE server to the Windows firewall exception list.
- Configure the NIC and camera IP settings.
- Assign a User-Defined name to a connected camera.
- Execute a Force IP address to a camera instead of the default DHCP/LLA assigned address.
- Easily Configure the NIC as a DHCP server for connected GigE Vision cameras.

Refer to the **Teledyne DALSA Network Imaging module manual** for more detailed information on using this tool. As shown below, the Network Configuration tool can quickly verify and modify the network configuration of the imaging system.





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## Windows Embedded 7 Installation

Windows Embedded 7 is not officially supported by Teledyne DALSA due to the number of possible configurations. However, Sopera LT and other Teledyne DALSA products should function properly on the Windows Embedded 7 platform provided that the required components are installed.

Teledyne DALSA provides answer files (.xml) for use during Windows Embedded 7 installation that install all necessary components for running Sopera LT 32-bit or 64-bit versions (SDK or Runtime), Sopera Processing 32-bit or 64-bit versions (SDK or Runtime), Teledyne DALSA framegrabbers or Genie GigE Vision devices.

For each platform (32 or 64-bit), the answer file is provided:

- SoperaGenie.xml: Configuration for Sopera LT, Sopera Processing and Teledyne DALSA Genie devices

These files are located in the following directories:

- <Install Directory>\Sopera\Install\Win7\_Embedded\Win32
- <Install Directory>\Sopera\Install\Win7\_Embedded\Win64

The OS footprint for these configurations is less than 1 GB. Alternatively, the Windows Thin Client configuration template provided by Microsoft in the Windows Embedded 7 installation also provides the necessary dependencies for Sopera LT, Teledyne DALSA framegrabbers and Genie devices (with an OS footprint of approximately 1.5 GB).

If you are installing other applications on the Windows Embedded 7 platform, it is recommended that you verify which components are required, and if necessary, create a corresponding Answer File.

For more information on performing dependency analysis to enable your application on Windows Embedded 7, refer to the Microsoft Windows Embedded 7 documentation.


# Sapera CamExpert Example

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## Using CamExpert with GigE Vision Cameras

*CamExpert is the camera-interfacing tool* supported by the Sapera library. When used with a GigE Vision camera, CamExpert allows a user to test most of the supported operating modes defined by the camera XML file. Additionally CamExpert can save the camera configuration as individual camera parameter files on the host system (\*.ccf).

An important component of CamExpert is its live acquisition display window which allows immediate verification of timing or control parameters without the need to run a separate acquisition program.

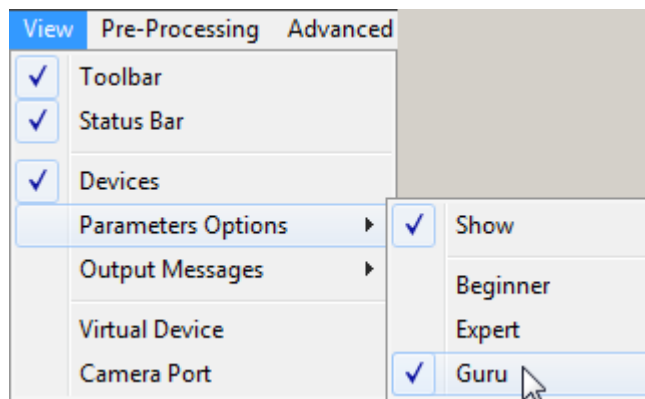
For context sensitive help, click on the  button then click on a camera configuration feature. The information shown is extracted from the device XML file.

The following sections provide an overview of CamExpert function areas, while controlling an example Teledyne DALSA Genie camera.

### Selecting GigE Vision Feature Visibility

GigE Vision features listed in a device XML file use a visibility tag to group them as **Beginner**, **Expert**, or **Guru** Functions. Select View from the CamExpert toolbar, click on Parameters Options, and then select from the three visibility levels.

The GigE Vision device manufacture uses the parameter visibility tag to allow filtering, such that a user chooses to see only basic functions (**Beginner**), advanced functions (**Expert**), or all functions (**Guru**).



---

# Camera Information and Features

Camera and sensor information, defined in the device XML file are retrieved via a controlling application. Parameters such as camera model, firmware version, sensor characteristics, etc. are read to uniquely identify the connected device.

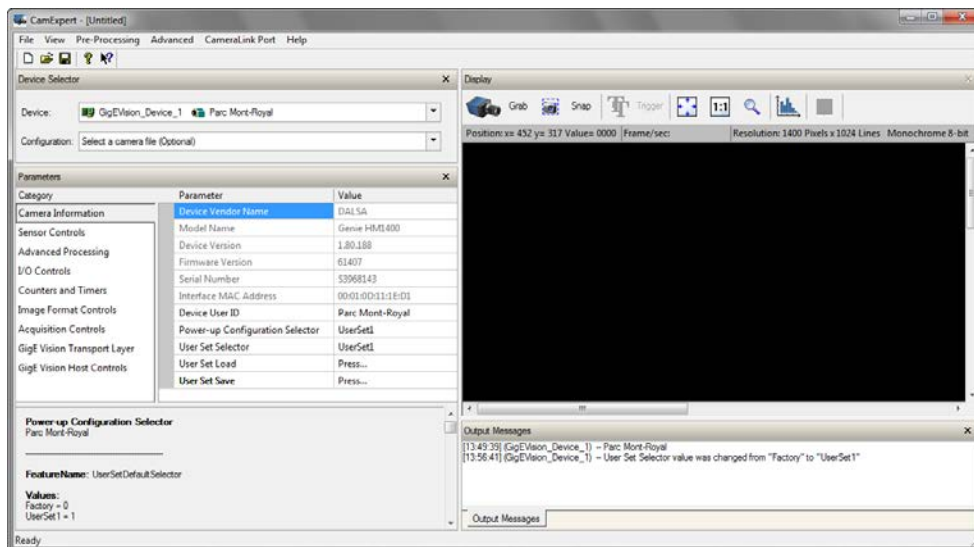
Read-only features are gray while features writable by the user are black. Following is an overview of CamExpert displaying this device information and controls as defined by the device XML file.

**Important:** CamExpert Category tabs and features are dynamic – dependent on the connected device’s XML file. All feature values and limitations are defined by the device manufacturer. Only the GigE Vision Host Controls parameters are defined by the XML file installed by the Teledyne DALSA Sopera driver.

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## CamExpert User Controls Description

The following screen capture shows the CamExpert panes when controlling a Teledyne DALSA Genie camera.



The CamExpert application uses 5 windows to simplify choosing and configuring camera files or acquisition parameters for the installed device.

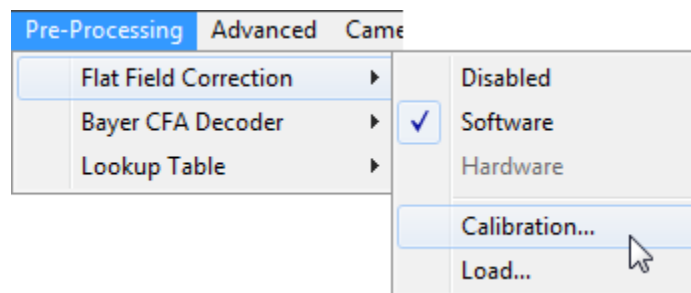
- **Device Selector pane:** View and select from any installed GigE Vision acquisition device. Once a device is selected CamExpert will only present acquisition parameters applicable to that device (as defined by the device XML file). Optionally select a CamExpert camera file previously saved by the user.
- **Parameters pane:** The Parameters section of CamExpert lists the top rank Categories on the left, as described by the GigE Vision camera’s hierarchal parameter information listed in its XML file. For each top rank group, one or more features are presented (dependent on the selected feature visibility). The user changeable features are drop selection menus or data entry fields.
- **Display pane:** Provides a live or single frame acquisition display. Frame buffer parameters are shown in an information bar above the image window.
- **Control Buttons:** The Display pane includes CamExpert control buttons. These are:

 Grab  Freeze	<b>Acquisition control button:</b> Click once to start live grab, click again to stop. (Sets command AcquisitionMode=Continuous + AcquisitionStart or AcquisitionStop)
 Snap	<b>Single frame grab:</b> Click to acquire one frame from device. (Sets command AcquisitionMode=SingleFrame + AcquisitionStart)
 Trigger	<b>Software trigger button:</b> With the I/O control parameters set to Trigger Enabled / Software Trigger type, click to send a single software trigger command.
	<b>CamExpert display controls:</b> (these do not modify the frame buffer data) Stretch image to fit, set image display to original size, or zoom the image to any size and ratio.
	<b>Histogram / Profile tool:</b> Select to view a histogram or line/column profile during live acquisition.

- **Output Message pane:** This section displays messages from CamExpert or the GigE Vision driver.

## CamExpert Toolbar Controls

CamExpert provides controls to process images with Teledyne DALSA hardware only. If Teledyne DALSA devices support Bayer Filter decoding and/or LUT controls, these Pre-Processing functions are available to the user. Additionally software Flat Field correction is available within the CamExpert tool if the connected hardware does not support it. The following screen capture shows the Flat Field calibration menu.



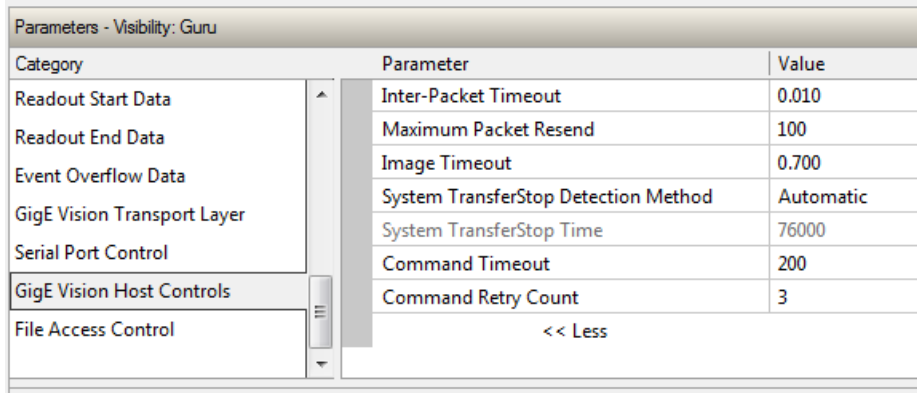
In this example, software Flat Field correction is selected and the mouse pointer is floating over the Calibration selection. Calibration of a dark field and light gray field must be performed before Flat Field correction is applied to the acquired image. Information on Flat Field calibration is found in any Teledyne DALSA Genie camera manual.

## Use CamExpert to Set GigE Vision Host Controls

The GigE Vision Host controls, as shown by CamExpert, groups parameters used to configure the host computer system GigE Vision features used for connected camera networking management. None of these parameters are stored in the connected device.

These features allow optimizing the network configuration for maximum bandwidth. Settings for these parameters are highly dependent on the number of devices connected to a NIC, the data rate of each and the trigger modes used.

Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.



The screenshot shows a window titled "Parameters - Visibility: Guru". It contains a list of categories on the left and a table of parameters on the right. The "GigE Vision Host Controls" category is selected and highlighted in gray. The parameters listed are:

Category	Parameter	Value
Readout Start Data	Inter-Packet Timeout	0.010
Readout End Data	Maximum Packet Resend	100
Event Overflow Data	Image Timeout	0.700
GigE Vision Transport Layer	System TransferStop Detection Method	Automatic
Serial Port Control	System TransferStop Time	76000
GigE Vision Host Controls	Command Timeout	200
File Access Control	Command Retry Count	3

At the bottom of the parameter list, there is a button labeled "<< Less".

## GigE Vision Host Control Feature Descriptions

Display Name	Feature	Description	View
Inter-Packet Timeout	InterPacketTimeout	Specifies the inter-packet timeout period used by the GigE server running on the host computer (in seconds). The inter-packet timeout is the amount of time the GigE server will wait between successive packets. If the inter-packet timeout expires, the GigE server will issue a packet resend request to the camera. The range of permitted values is 0.000000 to 0.65535. By default this value is greater than and must be greater than the Inter-Packet Delay inserted by the Genie. Else the GigE server will force packet resends when none may be required. Increasing the timeout period is required when a NIC has a number of Genie cameras connected via an Ethernet switch, and packet resends can be avoided if the GigE server delays assuming data is lost.	Beginner
Maximum Packet Resend	packetResendMax	Maximum number of packets to resend per frame.	Guru
Image Timeout	ImageTimeout	Specifies the timeout period for an image acquisition used by the GigE server running on the host computer (in seconds – max=60). The Image timeout value is the amount of time the GigE server will wait for an image to be transferred from the camera to the host buffer memory. By default this value is greater than (and must be greater than) the time required to receive a complete frame. The time required may depend on the number of Genie cameras connected to the NIC and whether they transmit frames simultaneously. If the timeout period is too short, data will be trashed and packet resend commands will be issued. If the timeout period is too long, recovery from transmission errors may be too slow.	Beginner
System TransferStop Detection Method	systemTransferStopDetectionMethod	Specify if the systemTransferStopdetectionMethod feature is based on the GigEVision driver or is controlled by the User, based on the SystemTransferStopTime feature. SystemTransferStopTime defines if a TransferStop is truly completed, if no data arrives from the device after the timer count is the last DATA trailer.	Guru
	<i>Automatic</i>	<i>The stream is considered stopped when it is idle for more than the current exposure time.</i>	
	<i>Manual</i>	<i>The transfer is considered stopped when it is idle for more than the feature systemTransferStopTime.</i>	
System Transfer Stop Time	systemTransferStopTime	When the feature systemTransferStopDetectionMethod is set to Manual, this is used to set the time a transfer can be inactive before been considered stopped. This time is only used by the CorXferStop and CorXferWait functions.	Guru
Command Timeout	CommandAcknowledgeTimeout	Specifies the time the host system controller will wait for a command acknowledgment from the connected GigE Vision device. Minimum and maximum values are dependent on the connected device (as defined in its XML file).	Beginner
Command Retry Count	CommandRetryCount	Specifies the number of retries for a command sent to a device.	Beginner

# Sapera Demo Programs

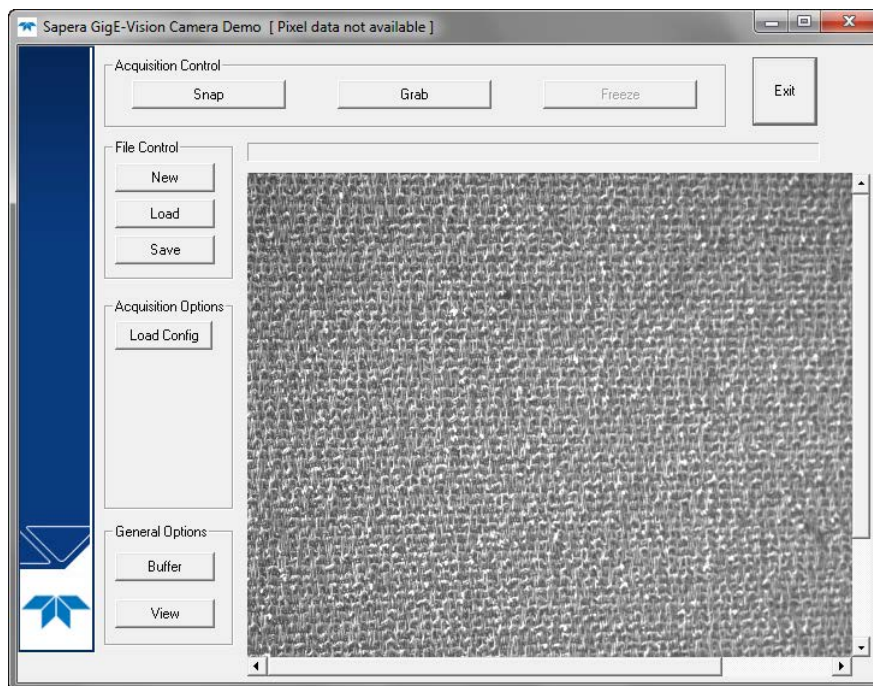
Teledyne DALSA provides a number demo programs designed for Teledyne DALSA GigE Vision cameras. These simple demos along with their source code enable users to quickly understand, extract the code and implement that functionality into their own applications.

---

## GigE-Vision Camera Demo

This program demonstrates how to acquire images from a Teledyne DALSA GigE Vision™ camera. This demo provides no camera specific controls. The demo either loads a configuration file (previously generated by CamExpert) or uses the camera's current (last exposure, frame rate, etc.) or default state.

The minimum requirement to run this demo is a Sapera-compatible GigE-Vision camera. The supplied executable is built using Sapera++ plus the MFC library under Visual Studio 2005.



## Acquisition Control

Common acquisition controls used with many Sapera LT demo programs. All camera exposure and frame rate settings remain as last used or as defined by loading a CamExpert configuration file.

- **Snap:** Click to do a single frame acquisition
- **Grab:** Click to start the continuous acquisition mode
- **Freeze:** Click to stop the acquisition

## General Options

Click **Buffer** to select the number of buffers allocated in system memory. For this simple demo, the default Sapera value for the buffer allocation is adequate. Requesting a value higher than what can be allocated will result in an error message.

Click **View** to adjust the display scaling, which can either fill the screen with the application maximized or some smaller portion of the screen. Note that you must click on the OK button to see display scaling changes.

## File Control

These provide simple display buffer tools to save or load images.

- **New:** Clears the display buffer
- **Load:** Loads a previously saved acquisition frame into the display buffer
- **Save:** Saves the current display buffer as an image file

## Installed Executable and Project Files

The GigE Vision Sequential Grab Demo executable is located here (default Sapera LT installation file path in Windows 7):

- "C:\Program Files\Teledyne DALSA\Sapera\Demos\Binaries\GigCameraDemo.exe"

The Sapera++ or .NET demo project files are available for different Visual Studio versions:

- C:\Program Files\Teledyne DALSA\Sapera\Demos\Classes\VC
- C:\Program Files\Teledyne DALSA\Sapera\Demos\NET

The Sapera ++ or .NET demo source code is within these sub-folders:

- C:\Program Files\Teledyne DALSA\Sapera\Demos\Classes\VC\GigCameraDemo
- C:\Program Files\Teledyne DALSA\Sapera\Demos\NET\GigCameraDemo\CSharp

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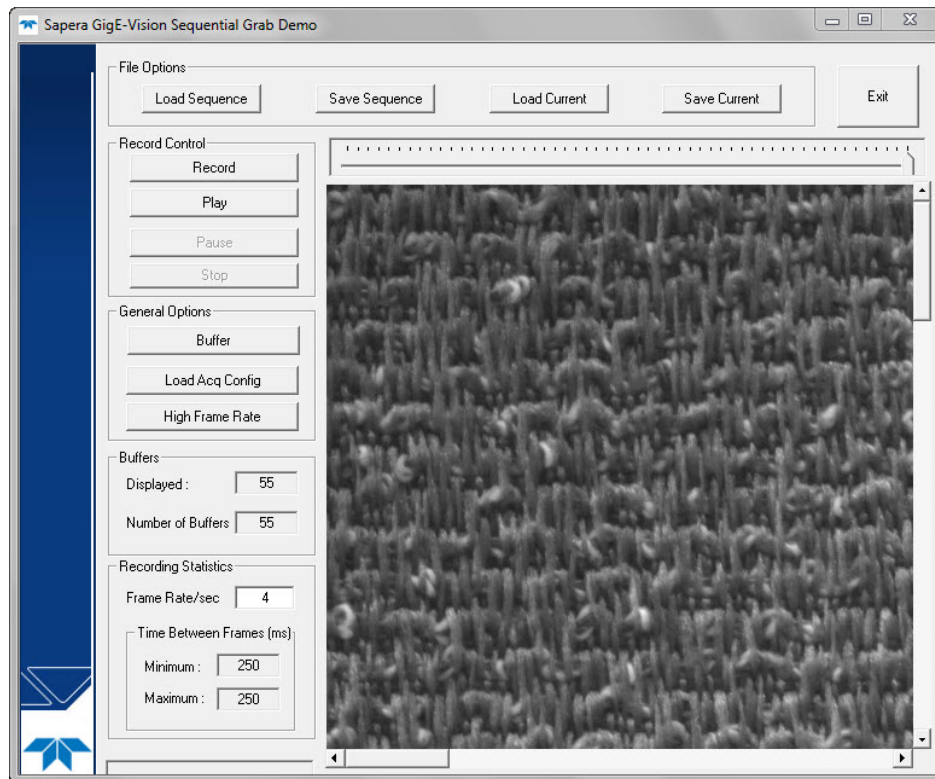
## GigE-Vision Camera Sequential Grab Demo

This program demonstrates how to grab a sequence of images from a Teledyne DALSA GigE Vision™ camera into memory and then display those images. The program allows you to record several images and save AVI files, plus load those AVI files for playback. Each image is stored in its own buffer and can be reviewed. A small number of images are allocated by default, but can be increased using the buffer options inside the demo.

The minimum requirement to run this demo is a Sapera-compatible GigE-Vision camera. The supplied executable was built using Sapera++ plus the MFC library under Visual Studio 2005.

Note that this demo provides no camera specific controls. The camera will remain in it's last state (i.e. exposure, frame rate, etc.) unless the user loads a different configuration file.





## Record Control

Simple controls, similar to any video recorder, to acquire and play back the image sequence.

- Click **Record** to grab the number of images as set by the Buffer option.
- Click **Play** to automatically display the recorded image sequence.
- Click **Pause** to delay finishing the sequence.
- Click **Stop** to abort the acquisition.

## Current Image Buffer Indicator Bar

The horizontal slider over the image display window indicates the number of buffers enabled for sequential acquisitions. The pointer will indicate the current buffer during a sequence grab. Once a sequence is in memory, the user can click the bar to display any individual buffer.

## General Options

Click **Buffer** to select the number of buffers allocated in system memory. The number of buffers defines the length of the sequential acquisition. Requesting a value higher than what can be allocated will result in an error message.

Click **Load Acq Config** to select a saved Spera configuration file to set a camera to a consistent state.

Click on the **High Frame Rate** button to select the number of frame acquired for each callback event. A callback event is used to display the acquired image.

The default setting of "1" displays each acquired frame in the sequence. But this will prevent the camera from using high frame rates due to the time required for the demo program to display each frame. By setting the callback rate to some higher number of frames, the program only displays the  $n^{\text{th}}$  frame allowing the camera to operate at its higher frame rate.

## Buffers

The Buffers area has two read-only fields about the host system buffers.

- **Displayed:** Shows the current buffer index of the image buffer in the display window.
- **Number of Buffers:** Shows the total number of host system buffers allocated in memory.

## Recording Statistics

This section provides information (frame rate and time between exposures), about the last recorded sequence. Camera exposure and frame rate changes can be made with the Sopera CamExpert application.

## File Options

The demo allows saving and loading files that comprise the whole sequence captured or individual images from the sequence.

**Save Sequence:** Saves the current sequence of image frames as an .avi file.

**Load Sequence:** Loads a saved image sequence (.avi) into system memory.

**Save Current:** Saves the image currently displayed, as an image file. Choose the file type from the drop menu within the file dialog.

**Load Current:** Load a saved image file into the current buffer as selected by the buffer display slider.

## Installed Executable and Project Files

The GigE Vision Sequential Grab Demo executable is located here (default Sopera LT installation file path in Windows 7):

- "C:\Program Files\Teledyne DALSA\Sopera\Demos\Binaries\GigESeqGrabDemo.exe"

The Sopera++ or .NET demo project files are available for different Visual Studio versions:

- C:\Program Files\Teledyne DALSA\Sopera\Demos\Classes\VC
- C:\Program Files\Teledyne DALSA\Sopera\Demos\NET

The Sopera ++ or .NET demo source code is within these sub-folders:

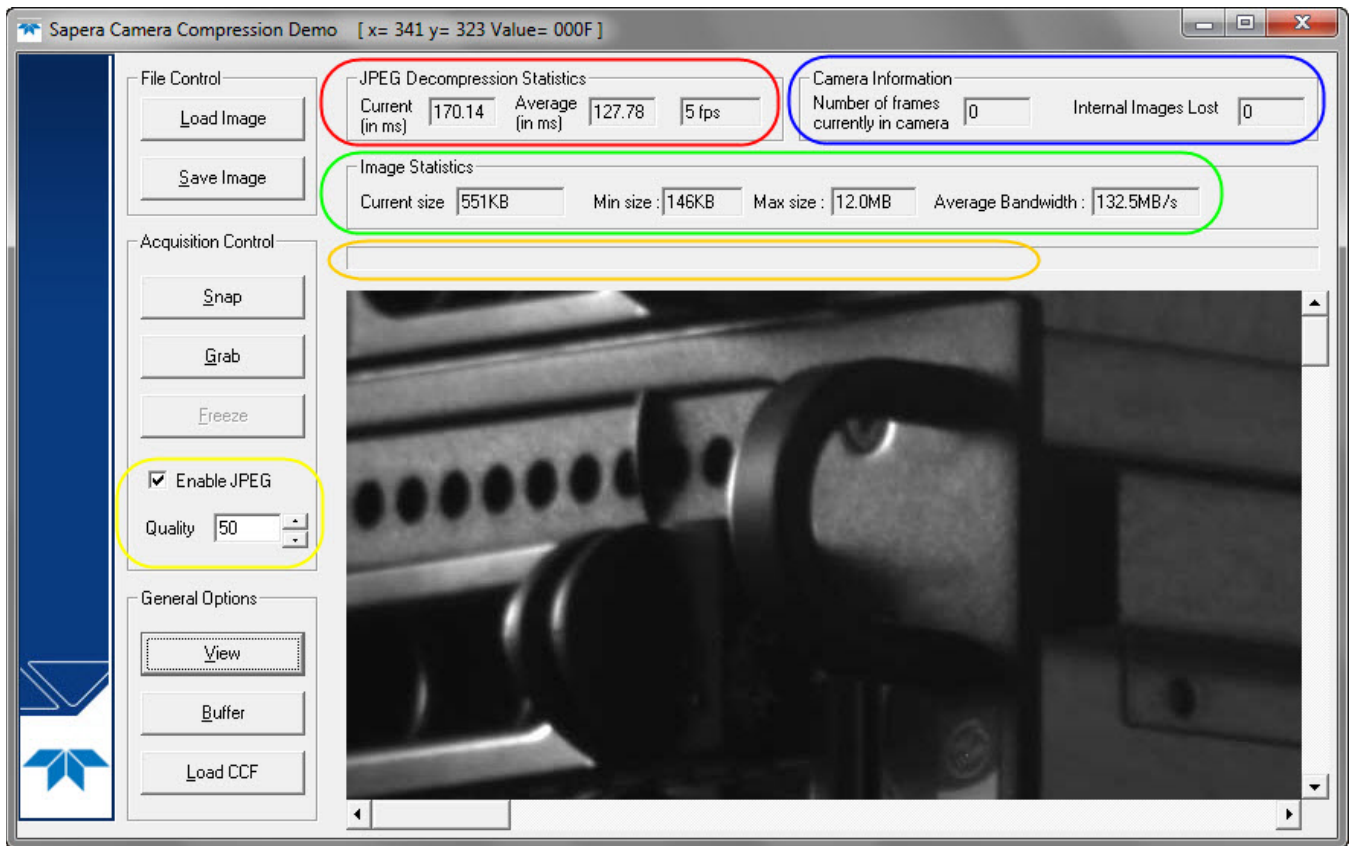
- C:\Program Files\Teledyne DALSA\Sopera\Demos\Classes\VC\GigESeqGrabDemo
- C:\Program Files\Teledyne DALSA\Sopera\Demos\NET\GigESeqGrabDemo\CSharp

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## Sopera Camera Compression Demo

The compression demo works with cameras with onboard image compression such as the Genie TS with JPEG firmware (model dependent). The demo allows activating the camera's compression function and decompresses the image stream to display on the host system monitor.

The demo program's decompression features are highlighted in the image below. The remaining buttons serve identical functions as found in many of the Sopera Demo programs.



## Enable JPEG

Enable the camera's JPEG compression function (yellow highlight) and select the image quality factor. The quality factor for a Genie TS ranges from:

- 1 (minimum quality/maximum compression)
- 99 (maximum quality/minimum compression)

## JPEG Decompression Statistics

These three readouts (Red Highlight) provide information about the demo program's JPEG decompression performance. For a given camera and frame rate, different host computers and networks will show performance variations.

## Image Statistics

The four readout fields (Green Highlight) provide real time information about the image data received from the camera. The current size and average bandwidth fields update live during the decompression, while the minimum and maximum fields provide feedback about image sizes after a change in the quality setting.

## Camera Information

The two camera information fields (Blue Highlight) provide camera internal buffer information. The Genie TS used in this example has an internal circular buffer for outgoing image data in cases where the network or host computer are too busy to receive incoming packets. If the camera internal buffers are all filled and subsequent image frames overwrite previous frames, the image lost counter is incremented.

## Message Area

The unlabeled field (Orange Highlight) can have messages about the demo program status, concerning non-typical events.

## Source Code Descriptions

Refer to the Sopera LT (v7.50 or later) documentation for descriptions of the demo source code and project files.

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# GigE-Vision Camera Flat Field Demo

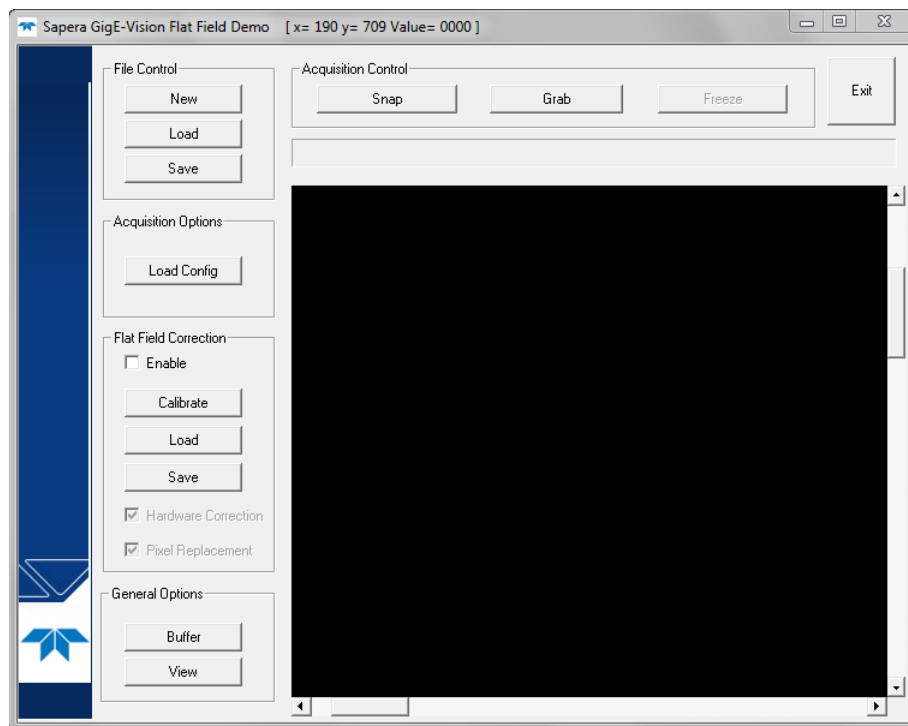
This program demonstrates how to use the flat field correction function included in Sopera++ with a Teledyne DALSA GigE Vision™ camera. Flat Field Correction (FFC) includes Fixed Pattern Noise (FPN), Pixel Replacement, Photo Response Non Uniformity (PRNU), and Shading Correction.

Flat Field Correction is the process of eliminating small gain differences between pixels in a CCD array. When calibrated flat field correction is applied to the image, the CCD exposed to a uniformly lighted field will have no gray level differences between pixels. The demo includes an interactive calibration of flat field gain and offset settings.

The minimum requirement to run this demo is a Sopera-compatible GigE-Vision camera. The supplied executable is built using Sopera++ plus the MFC library under Visual Studio 2005.

## Demo Application Window

This Sopera demo shares many common controls as used with the other demo programs. File, Acquisition, and Buffer controls serve the same common purpose. Note that this demo provides no camera specific controls. The camera will remain in it's last state (i.e. exposure, frame rate, etc.) unless the user loads a different configuration file.



The Flat Field Correction controls can start the calibration sequence, load or save a flat field calibration file, and enable flat field correction on the connected camera.

## Calibration Setup

Calibration requires the user to setup dark and light gray acquisitions. For the dark acquisitions, just use a black lens cap. For the light gray acquisitions, aim the camera at a clean evenly lighted white wall or non-glossy paper with the lens slightly out of focus. Or ideally a diffused light source aimed directly at the lens could be used.

- First verify the current state of the camera (exposure, frame rate, etc.) since the demo has no camera controls. Use the Grab and Freeze controls located above the display window.
- Click the **Calibrate** button. The calibration window opens as shown.
- Modify the variable user set parameters if you have specific requirements, else the program defaults will be fine in most cases.

Flat Field Calibration

Parameters

Correction type: Flat Field

Video type: Bayer

Number of lines to average: 128

Number of frames to average: 10

Vertical offset from top: 0

Maximum deviation from average dark pixel value: 64

Maximum deviation from average bright pixel value: 64

Maximum percentage of black (0-value) pixels in corrected dark image: 2

Calibration index: 0

Consider as defective a pixel with offset or gain coefficient that reaches the hardware limit:

Step 1: Acquire a dark image (recommended average pixel value below 64) [Acquire Dark Image]

Step 2: Acquire a non-saturated bright image (recommended average pixel value around 204) [Acquire Bright Image]

Step 3: Save Calibration offset and gain files [Save and Upload]

to User Flat Field Destination: User FlatField coefficients 1

Ok Cancel

- The field **Number of frames to average** should be set to more than one to avoid false data from random pixel noise.
- The two fields for **Maximum deviation from average** (dark and bright) default to 25% of the gray level range captured, (64 for 8-bit capture, 256 for 10-bit capture, and so forth). This value sets the threshold for detecting static dead pixels. Users will need to adjust these to best isolate dead pixels from their imaging source.
- The field for **Maximum percentage of black pixels** in corrected dark image defaults to 2. A high percentage of 0 value pixels should be avoided so that gain adjustments can be properly calibrated.

## Calibration Procedure

- Setup the camera to capture a uniform dark image.
- Click on **Acquire Black Image**. The flat field demo will grab a sequence of frames, analyze the pixel gray level spread, and present the statistics. If acceptable, use the image as the black reference.
- Setup the camera to acquire a uniform bright non-saturated image.
- Click on **Acquire Bright Image**. The flat field demo will grab a sequence of frames, analyze the pixel gray level spread, and present the statistics. If acceptable, use the image as the white reference.
- Click on Save and Upload to save to a local drive and upload this Flat Field correction data to the camera.
- Test the calibration by enabling flat field correction during a live grab. If necessary, adjust the dead pixel detection threshold and repeat the calibration.

## Installed Executable and Project Files

The GigE Vision Camera Flat Field Grab Demo executable is located here (default Sopera LT installation file path in Windows 7):

- "C:\Program Files\Teledyne DALSA\Sopera\Demos\Binaries\GigEFlatFieldDemo.exe"

The Sopera++ or .NET demo project files are available for different Visual Studio versions:

- C:\Program Files\Teledyne DALSA\Sopera\Demos\Classes\VC
- C:\Program Files\Teledyne DALSA\Sopera\Demos\NET

The Sopera ++ or .NET demo source code is within these sub-folders:

- C:\Program Files\Teledyne DALSA\Sopera\Demos\Classes\VC\GigEFlatFieldDemo
- C:\Program Files\Teledyne DALSA\Sopera\Demos\NET\GigEFlatFieldDemo\CSharp

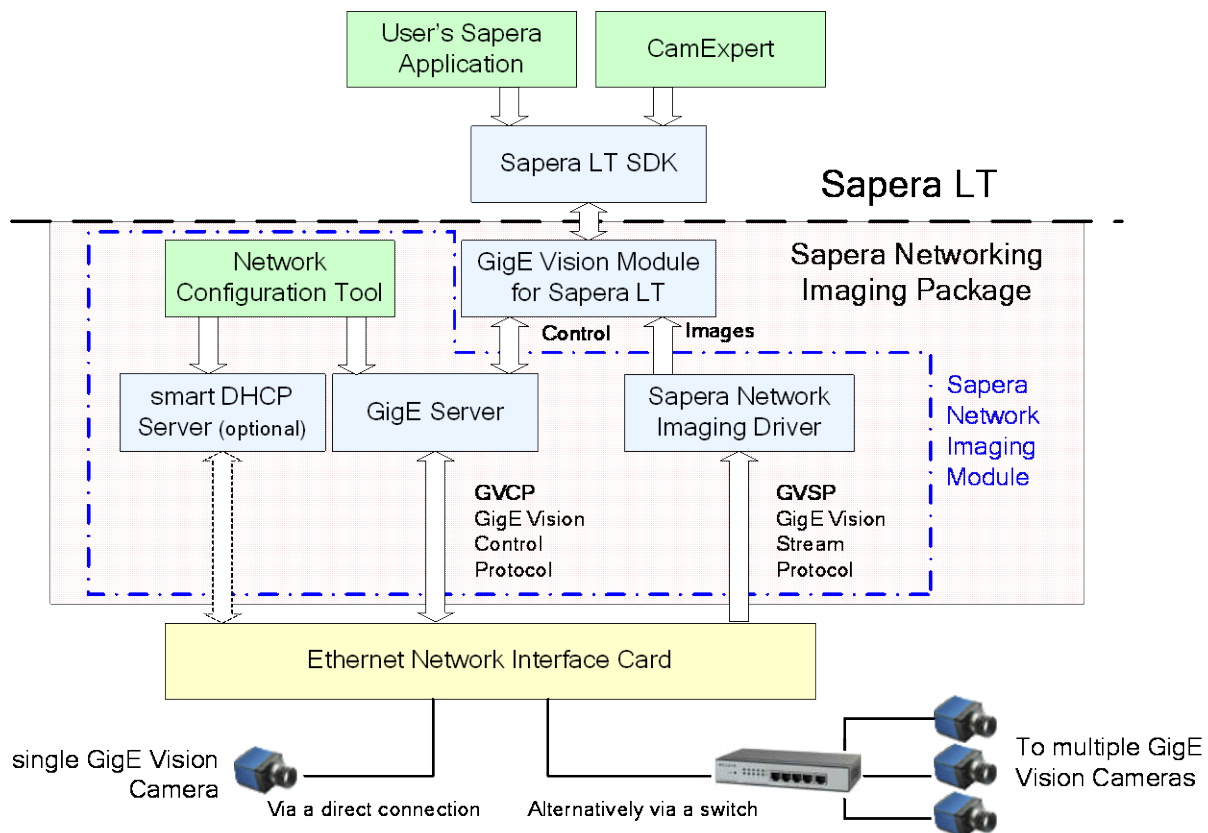
# Application Development Overview

## Sapera LT Library with Optional Processing

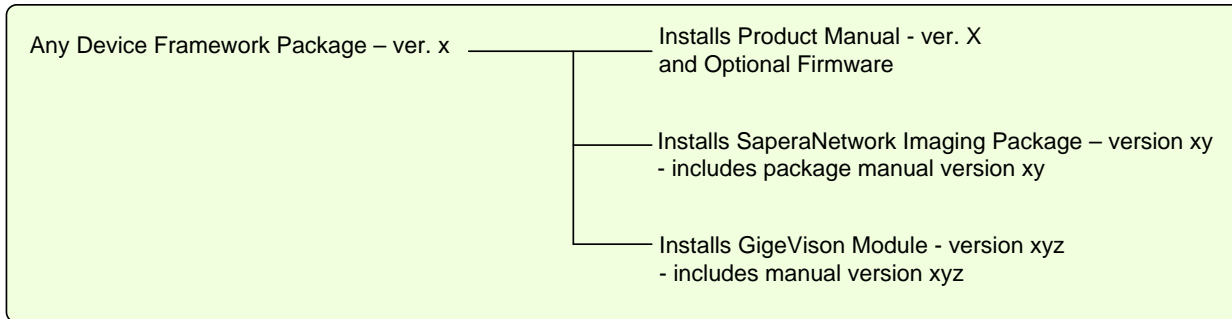
Sapera LT is a powerful development library for image acquisition and control. Sapera LT provides a single API across current and future Teledyne DALSA hardware or GigE Vision devices. Sapera LT delivers a comprehensive feature set including program portability, versatile camera controls, flexible display functionality and management, plus easy to use application development wizards.

Sapera Processing is a comprehensive set of C++ classes for image processing and analysis. Sapera Processing offers highly optimized tools for image processing, blob analysis, search (pattern recognition), OCR and barcode decoding.

The following is a Sapera GigE Vision application functional block diagram.



## Framework and Module Distribution Overview



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## GigE Vision XML Files for Host and Device Controls

The GigE Vision XML device description file is retrieved from devices such as the Teledyne DALSA Genie products, allowing GigE Vision Compliant applications to know the camera capabilities. The Host Control XML file is provided with the GigE Vision Module.

### GigE Vision Host Controls XML File

The GigE Vision Host Controls are independent of any GigE Vision device used with the Teledyne DALSA driver. The default parameter values are specified by an XML file installed by the Teledyne DALSA GigE Vision Module.

At application run time, the Host controls XML contents are merged with the GigE Vision device XML to define the total feature set of the vision system. See Use CamExpert to Set GigE Vision Host Controls for details about these Host controls.

- File location: \Teledyne DALSA\GigEVision\hostfeatures.xml.
- User can change parameter default values if required.
- User should respect the specified minimum and maximum parameter range values to avoid problems.

### Automatic Retrieval of Device XML Files

Device XML feature files are automatically retrieved from the device when first connected. By convention, the XML files will have unique names such that new versions for the device are easily identified.

- When connecting a device for the first time, its XML parameter file is copied to the host system.
- When connecting the same device again, its XML file is not retrieved unless the file name is different than the one previously transferred to the host system.
- The Teledyne DALSA XML file naming convention for GigE Vision cameras includes the camera firmware version, for easy identification.



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## Sapera Support for Third Party GigE Vision Devices

Third party GigE Vision cameras are visible to the GigE Vision applications such as the Teledyne DALSA CamExpert tool when Sapera runtime is installed. Camera parameters can be controlled, as defined by the camera manufacturer.

What a Sapera runtime application cannot do is acquire from the third party camera, unless a standard Sapera Processing license is purchased. With a Sapera license, GigE Vision Sapera applications are fully functional.

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## Sapera GigE Vision Camera Demo and Example Code

<b>Program</b>	Teledyne DALSA • Sapera LT • Demos • Cameras • GigE Vision Camera Demo
<b>Program file</b>	\\...\\Sapera\Demos\Classes\vc\GigeCameraDemo\Release\GigeCameraDemo.exe
<b>Workspace</b>	\\...\\Sapera\Demos\Classes\vc\SapDemos.dsw
<b>.NET Solution</b>	\\...\\Sapera\Demos\Classes\vc\SapDemos_2003.sln \\...\\Sapera\Demos\Classes\vc\SapDemos_2005.sln \\...\\Sapera\Demos\Classes\vc\SapDemos_2008.sln \\...\\Sapera\Demos\Classes\vc\SapDemos_2010.sln
<b>Description</b>	This program demonstrates the basic acquisition functions included in the Sapera library. The program allows you to acquire images, either in continuous or in one-shot mode. The program code may be extracted for use within your own application.
<b>Remarks</b>	This demo is built using Visual C++ 6.0. It is based on Sapera C++ classes. See the Sapera User's and Reference manuals for more information.

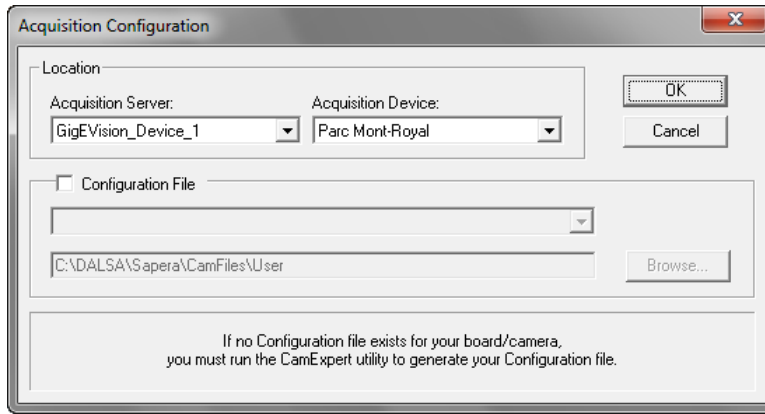
### Using the Grab Demo

#### Server Selection

Run the grab demo from the start menu:

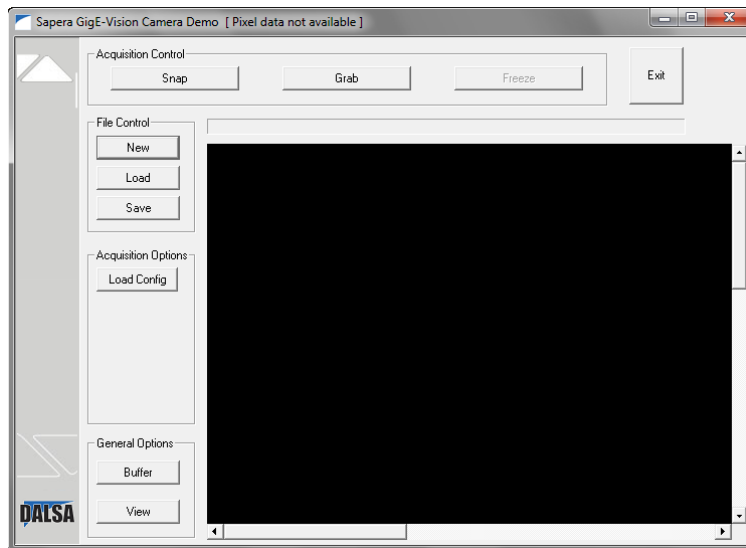
**Start • All Programs • Teledyne DALSA • Sapera LT • Demos • Cameras • GigE Vision Camera Demo.**

The demo program first displays the acquisition configuration menu. The first drop menu displayed permits selecting from any installed Sapera acquisition servers (installed DALSA acquisition hardware using Sapera drivers). The second drop menu permits selecting from the available input devices present on the selected server. In this example a Genie camera is selected.



## Grab Demo Main Window

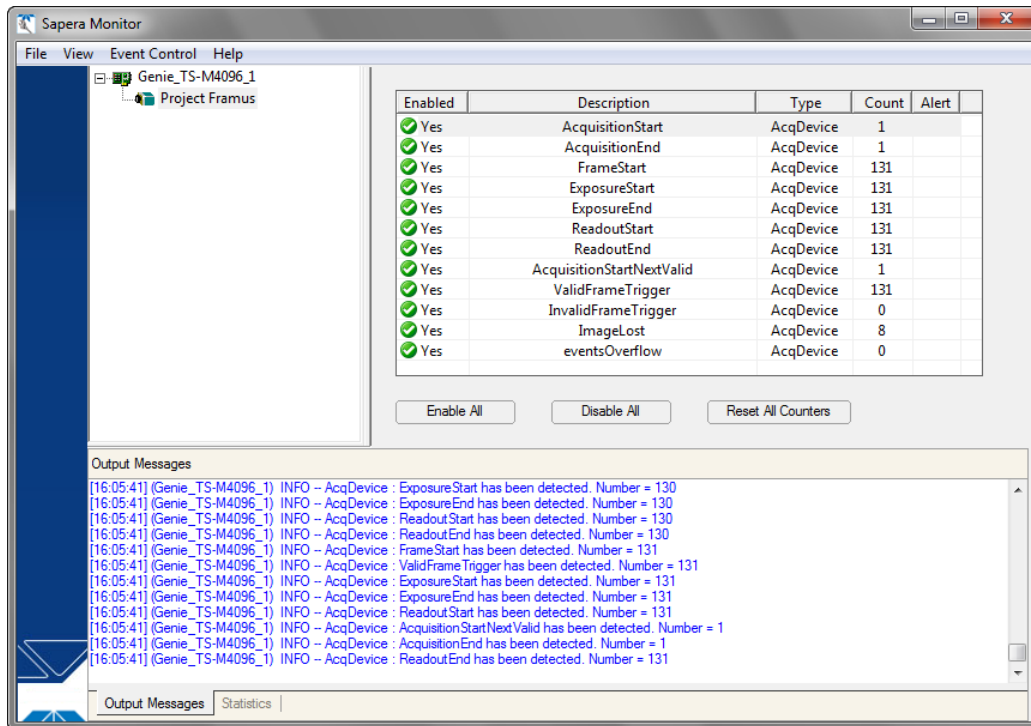
The Grab Demo program provides basic acquisition control for the selected GigE Vision device.



Refer to the Sapera LT User's Manual (OC-SAPM-USER), in section "Demos and Examples – Acquiring with Grab Demo", for more information on the Grab Demo. Specifically, the C++ Acquisition classes specific to Camera products or feature based devices are the SApAcqDevice and SapFeature. The legacy SapAcquisition class provides support for Teledyne DALSA frame grabber products.

# Event Monitoring with the Sapera Monitor Tool

The Sapera Monitor tool provides a simple method to observe device events. In the example shown in the following screen shot, the Teledyne DALSA Genie TS was configured in continuous 10-bit acquisition mode, with 24 internal buffers, and at a frame rate where the acquisition data rate exceeds the bandwidth to the host computer. When the internal buffers are filled, the camera must overwrite image data that was not transmitted. This is indicated by the non-zero count for the ImageLost event.



## Key points about Genie TS acquisitions are:

Image acquisitions are buffered based on the user set number of internal buffers, where the maximum number depends on the amount of camera internal memory.

Maximum frame rates, using 10-bit full frame image buffers will exceed the GigE Vision data transfer maximum. When the device's internal buffers are consumed, image frames will be automatically dropped.

Stopping or pausing the frame grab allows the previously buffered frames to be transmitted to the host computer.




When the internal buffers are filled, the **ImageLost** event is generated to indicate that the number of internal buffers needs to be increased or the frame rate needs to be reduced. This point is exemplified at the beginning of this section.

# Troubleshooting

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## Overview

In rare cases an installation may fail or there are problems in controlling and using the cameras. The GigE Server status provides visual information on possible problems. The three states are shown in the following table.

	Device Not Available	Device IP Error	Device Available
<b>GigE Server Tray Icon:</b>			
Note: It will take a few seconds for the GigE Server to refresh its state after any change.	A red X will remain over the GigE server tray icon when the device is not found. This indicates a network issue where there is no communication with the camera.	The GigE server tray icon shows a warning when a device is connected but there is some type of IP error.	The GigE server tray icon when the device is found, has obtained an IP address and there are no network issues. Optimization may still be required to maximize performance.

## Problem Type Summary

Problems are either installation types where the device is not found on the network, or setup errors where the device is found but not controllable. Additionally a device may be properly installed but network optimization is required for maximum performance.

Please refer to the Troubleshooting section of the **Teledyne DALSA Network Imaging Module** manual, for information on installation issues or network optimizations.

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## Issues with Cognex VisionPro

When the Cognex VisionPro package is uninstalled, the Genie TS becomes not available within CamExpert due to the Cognex uninstaller removing GigE Vision components. This forces a Genie TS user to reinstall the framework package.

Cognex VisionPro remains a useable third party product except for their uninstaller fault. Genie TS users just need to account for this issue until resolved by Cognex.

# Contact Information

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## Technical Support

Submit any support question or request via our web site:

Technical support form via our web page:  
Support requests for imaging product installations,  
Support requests for imaging applications

Camera support information

Product literature and driver updates

<http://www.teledynedalsa.com/mv/support>

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