Migrating to Goldeye G from earlier camera models

Summary

Many applications running in the field are using a legacy Allied Vision camera setup incl. Pleora GigE Vision module (within this document termed *Pleora GEV*). This application note explains how to migrate that setup to the latest technology, using second generation Goldeye G SWIR cameras.

The Goldeye G provides a newly implemented set of features, using the Allied Vision GigE protocol. Compared to its predecessors Goldeye P and NIR-300F /-600F, the Goldeye G offers extended functionality and distincly increased convenience of use, however is not compatible with the legacy Pleora iPort and GEV interface.

General migration aspects

In the scope of this migration guide we do not distinguish between the Goldeye G and Goldeye G Cool models. Cool models provide enhanced cooling capabilities and cooling-related features. While discussing the migration aspects with respect to host software implementation, those features may be disregarded.
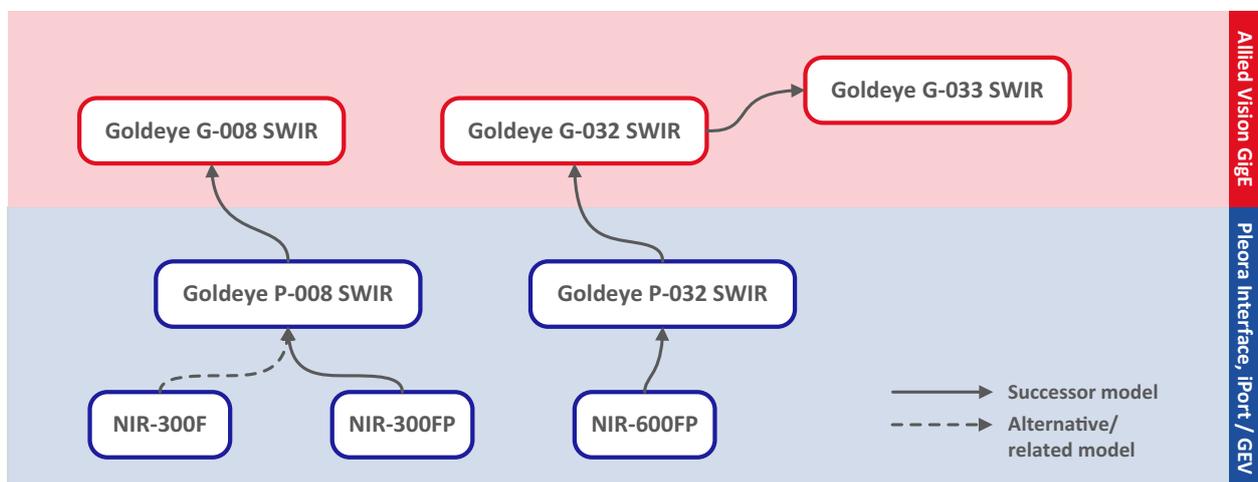

Figure 1: Camera model overview - from legacy models equipped with a Pleora interface to Goldeye G cameras equipped with Allied Vision GigE interface
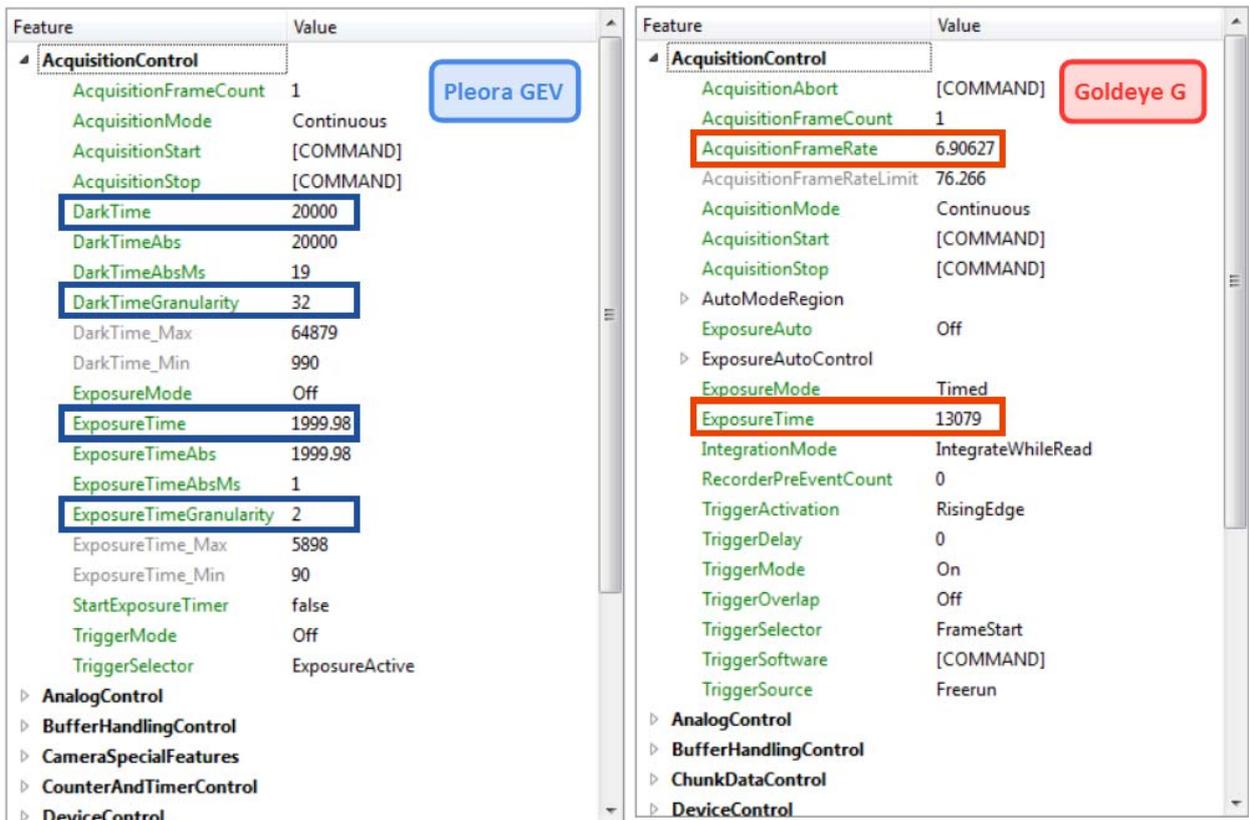
Coming from legacy NIR models to Goldeye P, the GEV version includes very minor changes, only providing the additional trigger selector `ExposureStart`. All NIR models as well as all cameras of the Goldeye P series are fitted with a Pleora interface, they also provide iPort and GEV functionality. Since iPort isn't maintained by Pleora any longer, those cameras are delivered with additional GEV functionality by default. It is also possible to order the GEV versions with pure iPort functionality as well. For iPort and GEV the immediate successor models of the NIR series (i.e. Goldeye P series) can be used as a 'drop-in' replacement.

Starting with Goldeye G, the Allied Vision GigE interface has been implemented. These cameras are completely GigE Vision compliant and can be used with any software that can handle GigE camera devices. Therefore, the Goldeye G can be used with the Pleora eBus SDK as well (additional Pleora license required).

On the following pages, some key aspects will be highlighted to explain the main differences in handling legacy cameras with Pleora GEV interface and Goldeye G models with Allied Vision GigE interface.

Acquisition / trigger modes

For Pleora GEV, the continuous mode is activated by switching the `TriggerMode` to *Off*, image-on-demand (IOD) mode is activated by switching the `TriggerMode` to *On*. In IOD mode, the exposure depends on the `DarkTime` and `ExposureTime` features, and is started with `StartExposureTimer=True` or `ExposureMode=Timed`. The frame rate results from the current dark time and exposure time settings. To receive frames at a fixed frame rate, the dark time has to be calculated and modified each time the exposure time is changed.

Figure 2: Acquisition Configuration for Pleora GEV and Goldeye G cameras

The internal timer as well as the continuous mode (i.e. camera sends images independently at maximum frame rate) are the result of the modular solution, consisting of camera head and external interface module. The Goldeye G is designed to appear in a more monolithic solution. Although, compared to Pleora GEV, the range of acquisition modes has been extended, all legacy acquisition modes can be realized as well. See Table 1 on page 3 for comparison.

	Pleora GEV	Goldeye G series
Exposure modes	Continuous mode	Fixed rate or freerun mode with `IntegrateWhileRead`
	IOD mode	Any mode with `IntegrateThenRead`
Trigger modes	`ExposureActive`	External exposure trigger mode
	`ExposureStart`	External framestart trigger mode

Table 1: Equivalent acquisition modes of legacy cameras using Pleora GEV and Goldeye G models

In freerun mode (see Figure 3) the camera captures images continuously at maximum frame rate, however, depending on the defined exposure time and region of interest (ROI) size.
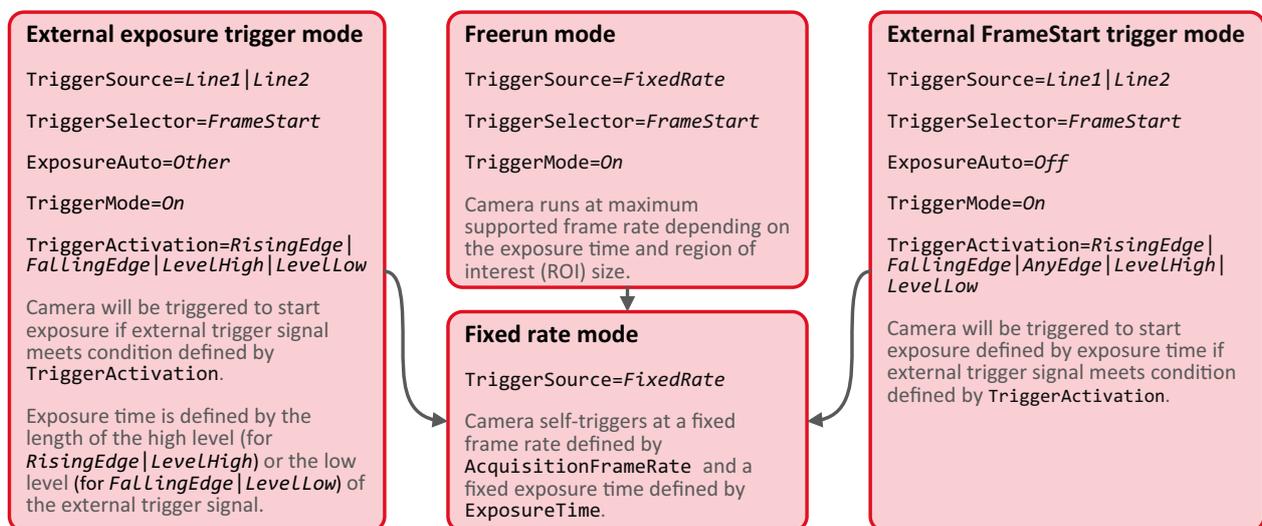
External exposure trigger mode

TriggerSource=*Line1|Line2*

TriggerSelector=*FrameStart*

ExposureAuto=*Other*

TriggerMode=*On*

TriggerActivation=*RisingEdge| FallingEdge|LevelHigh|LevelLow*

Camera will be triggered to start exposure if external trigger signal meets condition defined by `TriggerActivation`.

Exposure time is defined by the length of the high level (for *RisingEdge|LevelHigh*) or the low level (for *FallingEdge|LevelLow*) of the external trigger signal.

Freerun mode

TriggerSource=*FixedRate*

TriggerSelector=*FrameStart*

TriggerMode=*On*

Camera runs at maximum supported frame rate depending on the exposure time and region of interest (ROI) size.

Fixed rate mode

TriggerSource=*FixedRate*

Camera self-triggers at a fixed frame rate defined by `AcquisitionFrameRate` and a fixed exposure time defined by `ExposureTime`.

External FrameStart trigger mode

TriggerSource=*Line1|Line2*

TriggerSelector=*FrameStart*

ExposureAuto=*Off*

TriggerMode=*On*

TriggerActivation=*RisingEdge| FallingEdge|AnyEdge|LevelHigh| LevelLow*

Camera will be triggered to start exposure defined by exposure time if external trigger signal meets condition defined by `TriggerActivation`.

Figure 3: Acquisition modes for Goldeye G, the arrows indicate switching TriggerMode=Off

The fixed rate mode can be used like the freerun mode to capture images continuously at a given frame rate which is defined by `AcquisitionFrameRate`. If exposure time is changed, the new maximum frame rate (readable from `AcquisitionFrameRateLimit`) will be calculated and modified appropriately. If the current `AcquisitionFrameRate` exceeds `AcquisitionFrameRateLimit`, the frame rate will be reset to the currently achievable maximum (i.e. to `AcquisitionFrameRateLimit`) automatically.

The camera can be triggered by an external trigger signal as well. While the legacy cameras are fitted with one opto-coupled trigger input to trigger `ExposureActive` (additionally `ExposureStart` for Goldeye P), the Goldeye G offers two available inputs, which may be used independently (one opto-isolated TTL and one non-isolated TTL). For small noise impacts and cable lengths the TTL input is preferable because its trigger latency is much lower. In idle state the maximum trigger latency for the TTL input is 0.6 µs and for the opto-isolated input 3.5 µs.

The external frame start trigger mode (`TriggerSelector=FrameStart`) allows to trigger the start of exposure as soon as the condition defined by `TriggerActivation` is fulfilled. Duration of exposure is set by `ExposureTime`.

In external exposure trigger mode (sometimes also referred to as level-trigger) the start and duration of exposure is controlled by the pulse length of the trigger signal.

The external trigger modes may also be used to trigger the start or end of the acquisition process, or the *AcquisitionRecord* mode defined by `TriggerSelector`.

The camera can be switched from any trigger mode to *FixedRate* mode by setting `TriggerMode=Off`, as shown in Figure 3.

Gain settings

The gain for Pleora GEV is set by using the feature `GainRaw`. The valid values to be used with `GainRaw` are camera specific and sensor specific.

The `GainRaw` feature has been replaced in the Goldeye G series by `SensorGain`, which is not a numeric value, but an enumeration that may be set to *Gain0* and *Gain1* (and additionally to *Gain2* for G-033).
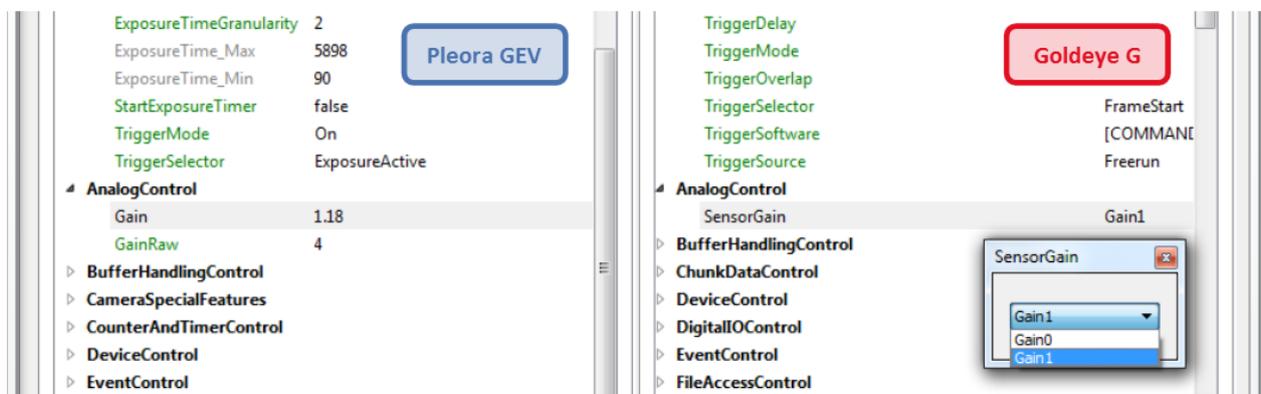

Figure 4: Gain settings for Pleora GEV and Goldeye G cameras

Additional features

The Pleora GEV cameras have three outputs for Exposure Output, Line Sync and FrameSync Output. The Goldeye G series also features three outputs (two opto-isolated & one non-isolated TTL) which each may be set to specific `LineOutSource` values (see Figure 5).

The `PixelFormat` for the Pleora GEV cameras is limited to *Mono12*. The Goldeye G series additionally provides options for *Mono8*, *Mono12packed* and even *Mono14*.

The target sensor temperature can be set by `SensorTemperatureSetpointValue`. The minimum temperature differences that may be achieved by cooling are depicted in Table 2.

Models	FPA cooling
G-008 SWIR	TEC1, Min. ΔT = 20K
G-032 SWIR	TEC1, Min. ΔT = 30K
G-033 SWIR	TEC1, Min. ΔT = 25K
G-032 SWIR Cool	TEC2, Min. ΔT = 60K

Table 2: Goldeye G camera models and cooling features

The non-uniformity correction (NUC) has been enhanced by offering a `NUCDatasetAuto` feature. If this feature is set to *Continuous*, the camera will automatically select the NUC data set most suitable for the current parameter settings. Furthermore, the Goldeye G series provides up to four user sets that can be used to save and load certain feature configurations. To switch back to the default factory-set configuration, a read-only default user set is also available.
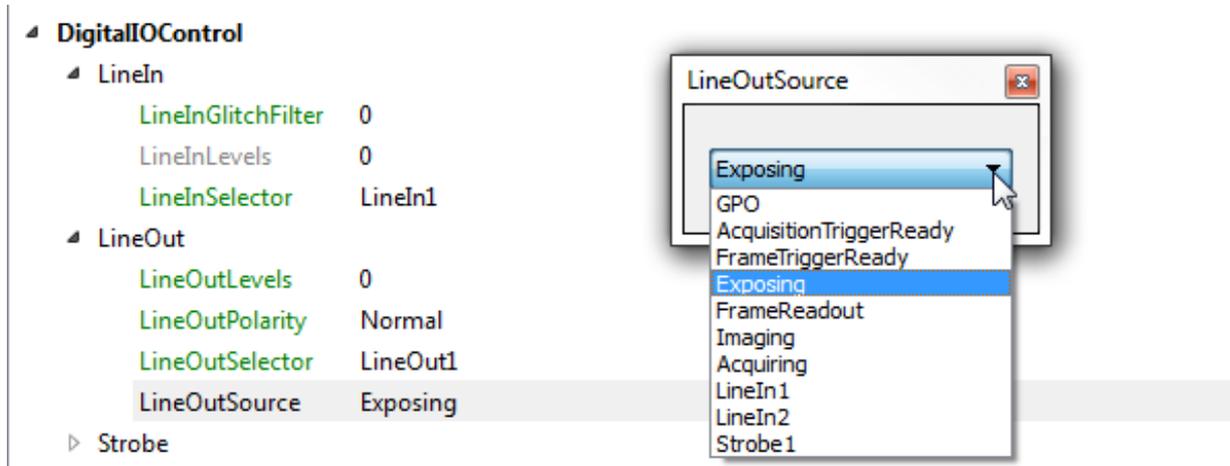

Figure 5: Options for Goldeye G outputs

Conclusion

The Goldeye G provides an enhanced feature set, and several auto functions have been implemented. All models are fully GigE Vision compliant and can be used with any third party software that supports the GigE Vision standard. Due to the rather homogeneous solution, the Goldeye G offers more flexibility in many aspects. A variety of trigger modes is available and the inputs and outputs can be configured freely to one of several options. Frame rates can be set directly, and neither granularity nor dark time have to be taken into account.

The Pleora GEV cameras are fitted with an implicit license for the Pleora eBus SDK. The Goldeye G camera may also be used within applications using the Pleora eBus SDK, but an additional explicit license must be purchased from Pleora.

Allied Vision also provides the future-proof and platform-independent Vimba SDK for GigE Vision, IEEE 1394, USB3 Vision, and Camera Link cameras, and the viewer and image analysis application AcquireControl.

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