ibaCapture GigE

Video Recording with GigE Vision Cameras

Manual

Issue 5.1.1

Measurement Systems for Industry and Energy

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The current version is available for download on our web site www.iba-ag.com.

Version	Date	Revision - Chapter / Page	Author	Version SW
5.1.1	03-2021	Order information	st	5.1.1

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Content

1 About this manual

This documentation describes the function, the design and the application of the software product ibaCapture when using GigE Vision cameras.

This documentation is a supplement to the ibaCapture manual. Information about basic characteristics and functions of ibaCapture may be found in the ibaCapture manual.

1.1 Previous knowledge

This documentation addresses qualified professionals, who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded as a professional if he/she is capable of assessing the work assigned to him/her and recognizing possible risks on the basis of his/her specialist training, knowledge and experience and knowledge of the standard regulations.

This documentation in particular addresses persons, who are concerned with the configuration of video camera systems in conjunction with ibaCapture. As ibaCapture is an add-on for ibaPDA, the following basic knowledge is required for the configuration:

■ Windows operating system

■ Basic knowledge of ibaPDA

■ Knowledge of video processing (coding, transmission) is useful but not required.

1.2 Notations

In this manual, the following notations are used:

Action	Notation
Menu command	Menu *Logic diagram*
Calling the menu command	*Step 1 – Step 2 – Step 3 – Step x* Example: Select the menu *Logic diagram - Add - New function block*.
Keys	<Key name> Example: <Alt>; <F1>
Press the keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Key name> Example: <OK>; <Cancel>
File names, paths	"Filename", "Path" Example: "Test.doc"

1.3   Used symbols

If safety instructions or other notes are used in this manual, they mean:

Danger!

The non-observance of this safety information may result in an imminent risk of death or severe injury:

■ Observe the specified measures.

Warning!

The non-observance of this safety information may result in a potential risk of death or severe injury!

■ Observe the specified measures.

Caution!

The non-observance of this safety information may result in a potential risk of injury or material damage!

■ Observe the specified measures

Note

A note specifies special requirements or actions to be observed.

Tip

Tip or example as a helpful note or insider tip to make the work a little bit easier.

Other documentation

Reference to additional documentation or further reading.

2 Overview

2.1 Introduction

ibaCapture is a video capture system designed for recording video from multiple cameras simultaneously. It can be connected to ibaPDA, which allows synchronized recording of video and measured data.

This synchronized connection of image information and measured data allows recognizing relations between process and measurement and improves the quality of data analysis.

This document describes the connection and handling of cameras which support the GigE Vision® standard, so-called GigE cameras. When connecting GigE cameras to ibaCapture Server, some specific information has to be considered.

GigE cameras allow high-speed capturing with frame rates of up to 300 fps. It is recommended to connect GigE cameras to an ibaCapture Server via a dedicated gigabit ethernet network card (e. g. Intel® Ethernet Server Adapter I350-T4V2). The mentioned card allows connecting up to 4 GigE cameras. If GigE cameras are used, further system requirements apply, see chapter ↗ *Requirements*, page 8. In addition, due to the high demands during video encoding, the requirements in terms of PCI Express bandwidth, processing power and GPU support need to be considered.

Principle of video processing with GigE cameras
In order to receive video from GigE cameras, a Software Development Kit (SDK) is required to configure the GigE camera and subsequently get the images from the GigE camera. In the next step, the raw images are encoded into a video stream by one of the supported video encoding libraries. ibaCapture supports several SDKs and video encoders as shown in the figure below.
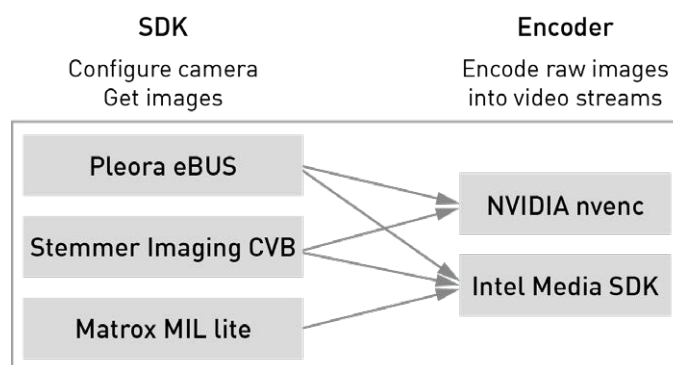

Fig. 1: Supported SDKs and video encoders

NVIDIA encoding is supported for Pleora eBUS and Stemmer CVB GigE Vision cameras. Intel Quick Sync video encoding is supported by GigE cameras receiving images with Pleora eBUS, Stemmer CVB or Marox MIL lite SDKs.

The SDK to be used has to be licensed and installed separately.

When using Stemmer Imaging CVB, TurboDrive technology by Teledyne Dalsa is supported for compatible cameras. This technology enables a more efficient usage of the interface bandwidth

allowing cameras to increase their effective throughput. Please note that this feature can only be used by cameras that support TurboDrive.

iba recommends Pleora eBUS SDK for GigE Vision grabbers.

ibaCapture also supports multicast mode with multicast capable GigE cameras. In multicast mode, raw images from GigE-Vision cameras can be streamed to multiple receivers. A specific camera type *Pleora eBUS SDK Multicast slave* enables the ibaCapture Encoder to subscribe to the multicast stream of the GigE Vision device. The camera type makes use of the Pleora eBUS SDK internally. Thus, an installation of the eBUS Runtime Package is required. Multicasting can be enabled/disabled using any GigE Vision compliant third party software, but not with ibaCapture. More information can be found in chapter ↗ *Pleora eBUS SDK Multicast slave camera configuration*, page 23
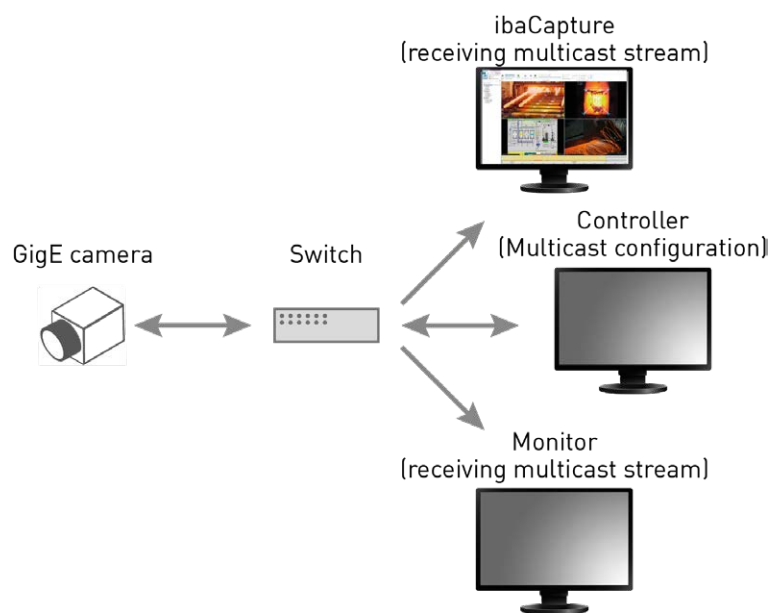
Fig. 2: Multicast topology

2.2 Requirements

2.2.1 Software

■ ibaCapture Server license

■ Camera license(s) (recording or display-only)

■ Interface license GigE-Vision

   ▪ The license for the used GigE vision SDK has to be available on the ibaCapture Server PC

■ ibaCapture Encoder (is part of the ibaCapture Installer)

■ Up-to-date graphics drivers for GPU-accelerated encoding

■ Windows 7 or Windows 10 are supported. Support for server operating systems depends on the used SDK.

The following software requirements depend on the used SDK and the used video encoding. The SDKs must be licensed and installed separately.

Requirements for SDKs:

- Pleora eBUS

  - eBUS Runtime (available on the DVD "iba Software & Manuals" 01_iba_Software\ibaCapture\ibaCapture\05_Pleora_eBUS)

- Stemmer Imaging CVB

  - CVB Runtime (https://www.commonvisionblox.com/en/software/run-time-only-setups-cvb-2017/)

- Matrox MIL

  - MIL lite V10 Runtime (available on the DVD "iba Software & Manuals" \01_iba_Software\ibaCapture\ibaCapture\03_Matrox_Imaging_Library_MIL\MILv10)

Requirements for video encoding in GPU

- NVIDIA encoding

  - NVIDIA GPU: A list of supported GPUs with their features is available in the NVENC Support Matrix: https://developer.nvidia.com/video-encode-decode-gpu-support-matrix#Encoder Please also see chapter ⬈ *NVIDIA encoding*, page 29 for detailed information.

- Intel Quick Sync in HW-accelerated mode

  - Intel® HD Graphics 3000 or higher for H.264 encoding

  - Intel® HD Graphics 530 or higher for H.265/HEVC encoding

2.2.2 Hardware

- PC, Intel Core-CPU 2nd Generation or newer (from Intel Core i7-2x00K CPU)

- 4 GB RAM

- GigE network card for PCI Express (frame grabber) Intel Ethernet I350 T4 V2 SVR is recommended by iba; other GigE network cards capable of handling jumbo packets are also supported.

  Please note that 4-port GigE network cards require a 4x PCI Express slot to provide enough bandwidth between the connected cameras and GPU/CPU

- GigE vision cameras supporting the GenICam protocol

Note

| i | iba recommends always using the latest graphics drivers. |

2.2.3 Order information

Server licenses

Order no.	Name	Description
38.000001	ibaCapture-V5-Server-60fps	Video recording for up to 60 fps, up to 8 client live-streams
38.000002	ibaCapture-V5-Server-180fps	Video recording for up to 180 fps, up to 16 client live-streams
38.000003	ibaCapture-V5-Server-480fps	Video recording for up to 480 fps, up to 48 client live-streams
38.000004	ibaCapture-V5-Server-960fps	Video recording for up to 960 fps, up to 96 client live-streams
38.000005	ibaCapture-V5-Server-1440fps	Video recording for up to 1440 fps, up to 144 client live-streams
38.000010	Upgrade-ibaCapture-V5-Server-60fps to 180fps	Extension from 60 fps to 180 fps
38.000011	Upgrade-ibaCapture-V5-Server-180fps to 480fps	Extension from 180 fps to 480 fps
38.000012	Upgrade-ibaCapture-V5-Server-480fps to 960fps	Extension from 480 fps to 960 fps
38.000013	Upgrade-ibaCapture-V5-Server-960fps to 1440fps	Extension from 960 fps to 14400 fps

Camera licenses

Order no.	Name	Description
38.000030	ibaCapture-V5-1CAM-REC	1 camera license for recording
38.000031	ibaCapture-V5-1CAM-DISP	1 camera license for displaying only
38.000032	ibaCapture-V5-1CAM-VIRT	1 camera license for recording HMI or ibaVision images
38.000033	ibaCapture-V5-1CAM-GigE	1 GigE camera license for recording
38.000043	License dongle for Pleora eBUS Runtime	Runtime license for GigE-Vision SDK

Hardware

Order no.	Name	Description
19.116011	GigE network card for PCI Express	Intel Ethernet I350 T4 V2 SVR
43.001001	NVIDIA Quadro graphic card	Upgrade ibaRackline-PC HD/CAM with graphic card

An ibaCapture Server license always has a limit for total frames per seconds (fps) over all cameras. The highest variant offers 1440 fps.

With the purchase of GigE camera licenses, the fps count in ibaCapture works differently: Independent of the available ibaCapture Server license, GigE cameras will always be able to use up to 1440 fps on an ibaCapture Server. For all other camera types, the licensed fps limit is applied. Any single ibaCapture Server will only manage up to 1440 fps, even when using mixed camera configurations.

Example: An ibaCapture-Server-60fps license allows recording two IP cameras with 30 fps each. If GigE camera licenses are available as well, these still can utilize up to 1380 fps.

3 Additional Installations

3.1 ibaCapture Encoder

When using GigE cameras ibaCapture Encoder has to be installed with ibaCapture.
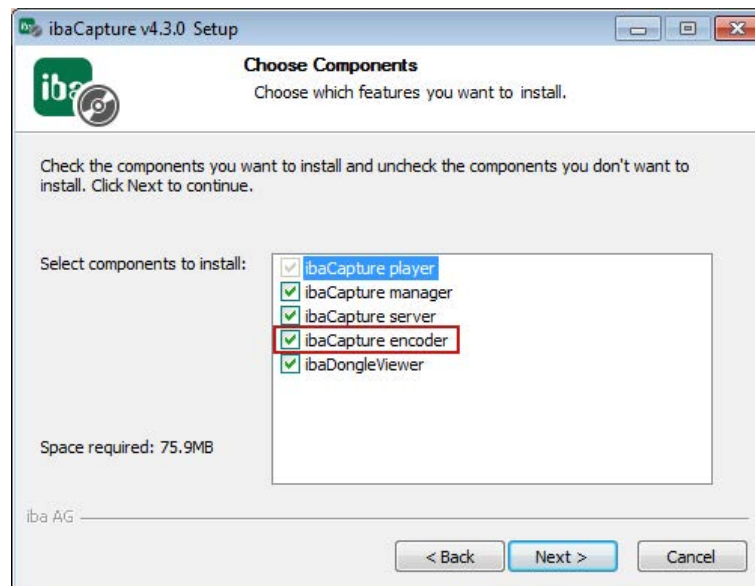
Fig. 3: ibaCapture setup with ibaCapture encoder

The application ibaCapture Encoder grabs image data from GigE cameras and provides an H.264-compliant video encoder to compress incoming video data to a video stream. This video stream can be processed and stored by ibaCapture.

Additionally, ibaCapture Encoder provides diagnostic information for the operation of GigE cameras.

Unlike ibaCapture Server, ibaCapture Encoder does not run as service but as application and hence needs a logged-on user account, see chapter ➚ *Preparatory Windows settings for GigE cameras*, page 15.

ibaCapture Encoder is opened by clicking on the -symbol in the Windows taskbar. The user needs administration rights to execute the program.
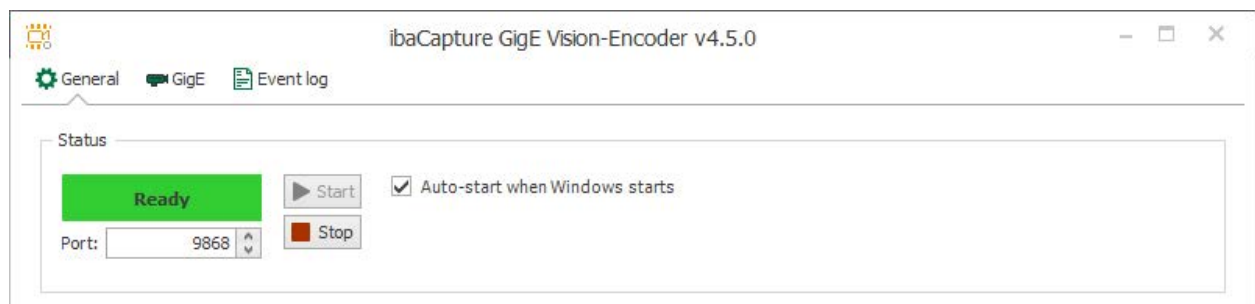
Fig. 4: ibaCapture Encoder, General tab

General

On the "General" tab, the status of the program is displayed. The encoder can be started and stopped with the <Start> and <Stop> button. If the option "Auto-start at Windows start" is activated, the Encoder starts automatically when logging in to Windows.
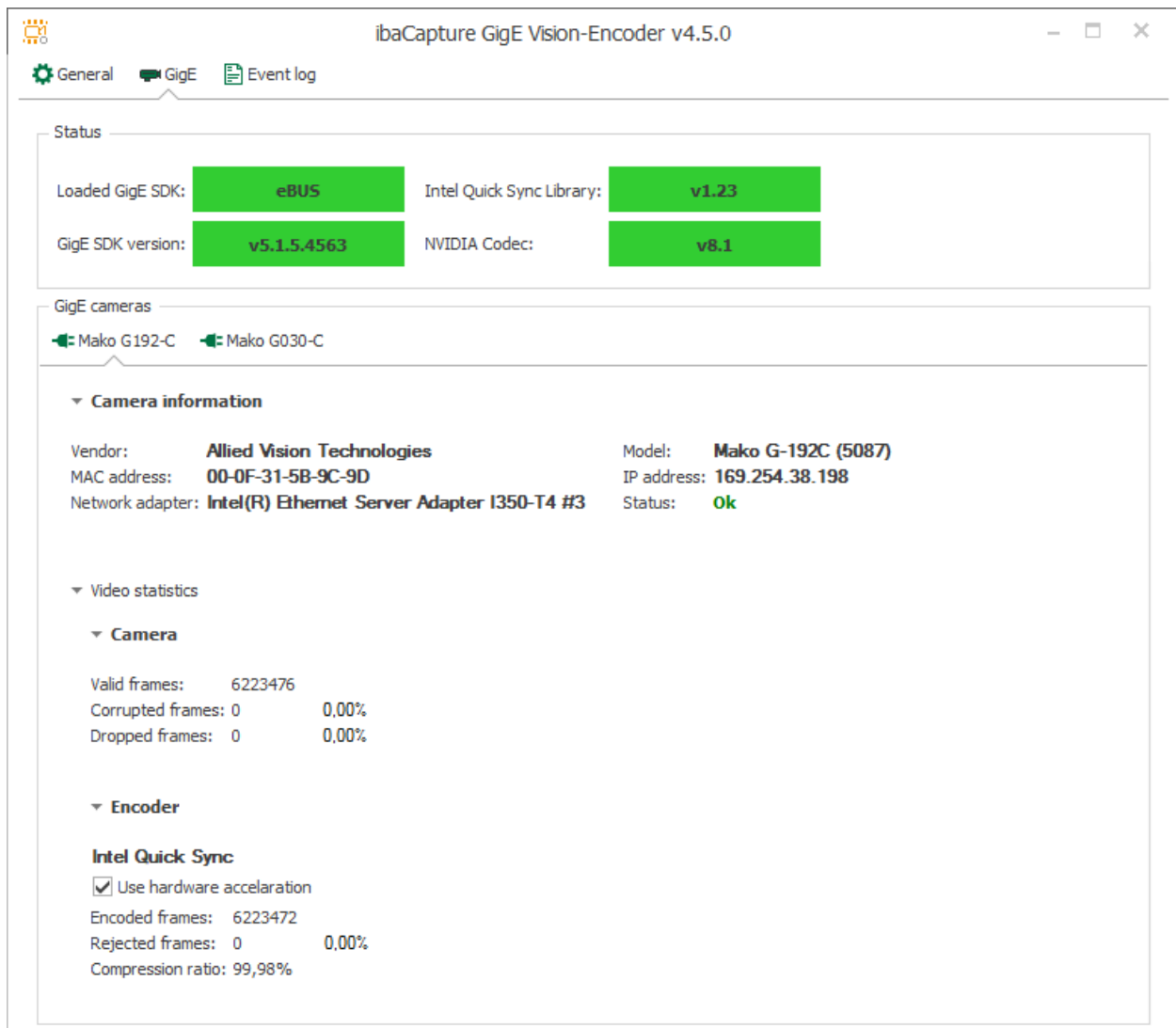

Fig. 5: ibaCapture Encoder, GigE tab

GigE

On the "GigE" tab, the loaded GigE SDK and its version are shown, as well as the versions of Intel Quick Sync Library and NVIDIA Codec. If the libraries have been installed correctly, the display fields are green, red fields indicate an error.

The tab offers sub-tabs for each connected GigE camera. These sub-tabs show camera information and statistics for video acquisition. The information is constantly updated during acquisition.

Camera

The total number of frames, captured by the GigE camera, sent to the computer and received by ibaCapture Server (service). When frames are received from the camera, there could be cor-

rupted frames, and when the encoder is too busy, frames can be dropped. Of course, the number of corrupted and dropped frames should be as low as possible, ideally 0.

Encoder
The encoder selected for this camera is displayed. The following group of values shows how many frames are used for encoding, after corrupted and dropped frames are lost (encoded frames). In addition, the number of frames that were rejected by the encoder is shown.

In case the percentage value of rejected frames is constantly in a critical range (> 5 %), you should consider taking measures such as reduction of frame rate or resolution.

Use hardware acceleration
This checkbox shows whether hardware acceleration is enabled in the camera's configuration (recommended).
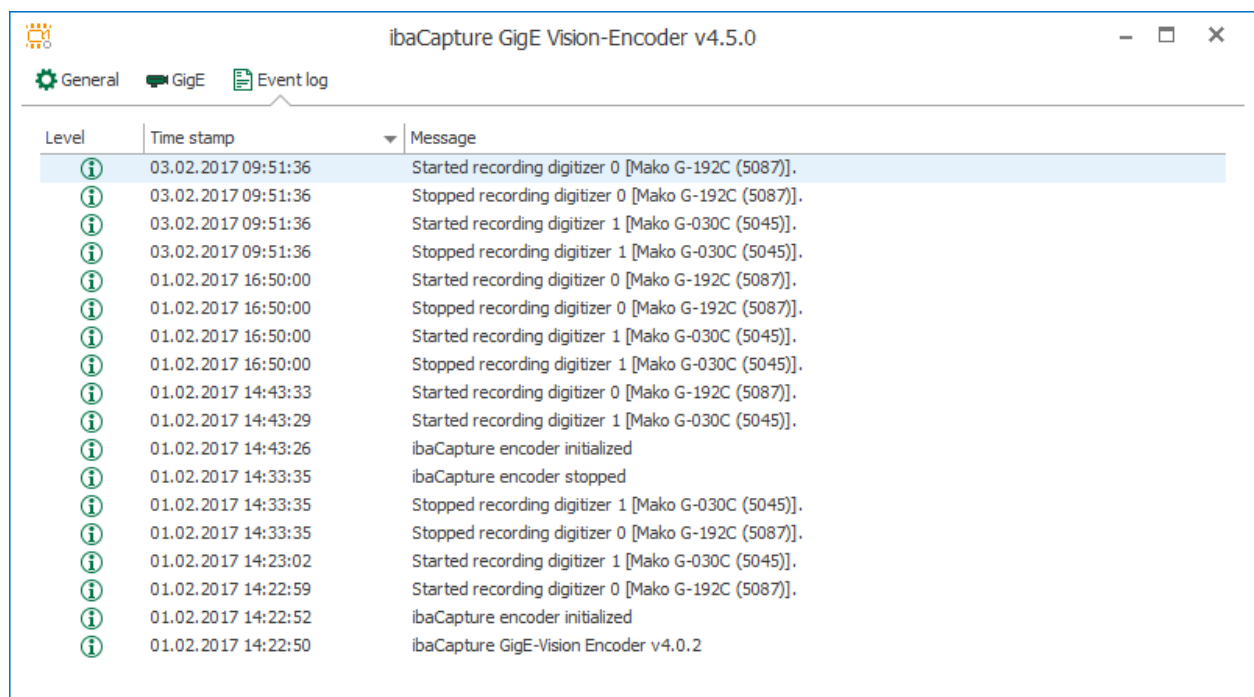
Fig. 6: ibaCapture Encoder, Event log tab

Event log
On the "Event log" tab, events, especially error and warning messages are displayed. All events are stored in a text file, which is stored in the installation directory of ibaCapture Encoder.

3.2 Preparatory Windows settings for GigE cameras

- User account control settings (UAC):
  set notification level to "Never notify". When using Windows 7or higher, you can open these settings by clicking on the <Start> button and entering "UAC" in the search box.
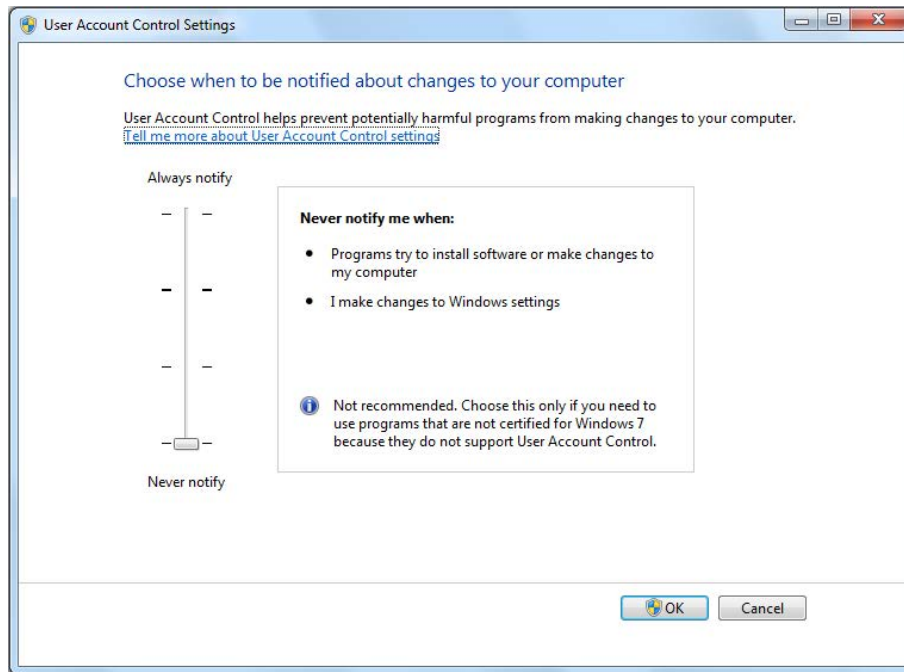
- User account for Auto-logon
  Unlike ibaCapture Server, the iba video encoder program that is needed for hardware acceleration on video encoding, runs as a program and not as a service and thus requires a logged on user account.
  In order to grant automatic restart of the system, create a user account, which automatically logs on at system start. The installation of ibaCapture Server registers the video encoder program for automatic startup.

How to create a user account (local user) for Auto-logon under Windows 7 or higher

1. Click on the <Start> button, enter the command **netplwiz** in the search box and press <ENTER>.
   The dialog for the user account configuration opens.

2. In the "User" tab, uncheck the option "Users must enter user name and password".

3. Click on <Accept>.

4. When the dialog "Automatic login" opens, enter the user name for automatic login under Windows 7. Enter also the corresponding password.

5. Click <OK> and close the dialog "User accounts" by clicking <OK>.

How to create a user account for domain users

If the user is logged-in as domain user, the selection field „Users must enter user name and password" is not shown as default in the "User account" dialog and thus cannot be deactivated for individual users. If the appropriate setting has been done in the Windows Registry, the selection field is shown.

1. Click on the <Start> button, enter the command **regedit** in the search field and press <Enter>.
   The Registry Editor is opened.

2. Navigate in the Registry Editor to the path "HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\ Windows NT\CurrentVersion\ Winlogon"
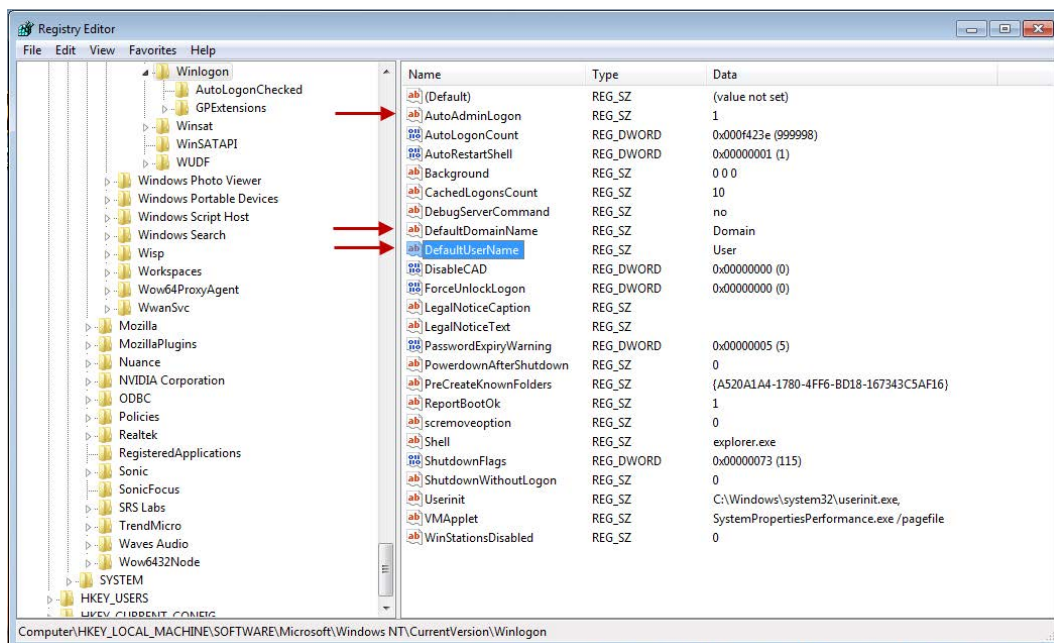
3. Change the value for "AutoAdminLogon" to 1.

4. Click again on the <Start> button, enter the netplwiz command in the search field and press <Enter>.
   The dialog for configuring the user accounts is opened.

5. Select the user you want to log in automatically and deactivate the checkbox „Users must enter user name and password".

6. In the following dialog, you will be asked to enter the user password. Enter the password and confirm with <OK>.

7. Call once again the Registry Editor.

8. Change the setting for "DefaultDomainName" to the domain the user belongs to.

9. Enter under "DefaultUserName" the user that is to be logged in automatically.

10. Close the Registry Editor and reboot the computer. Now, the user should be logged in automatically.

3.3 Settings for network cards

For the best experience when using GigE cameras, it is recommended to perform several settings for the used network adapters. These recommendations only apply to network adapters which are connected to GigE cameras.

3.3.1 IP and subnet settings

Using unmodified settings of the network interface and a GigE camera, a connection will most likely succeed. In case no IP address has been assigned, both the network interface and the camera will automatically use link-local addresses from the range 169.254.0.0/255.255.0.0.

When a single camera is used, this configuration can be used without limitations. As soon as one or more additional cameras are used, it is recommended to manually set up the IP address configurations.

For each used network adapter, a configuration with a different subnet should be used. As an example, the address of the first adapter could be set to 192.168.1.1, for the second adapter 192.168.2.1 could be used, and so on. In this case it is important to use 255.255.255.0 as a subnet for all adapters.

After changing the addresses of the network adapters, the camera configurations need to be adapted accordingly. So, the camera connected to the first network interface could be configured to use 192.168.1.2, the second camera 192.168.2.2 and so on.
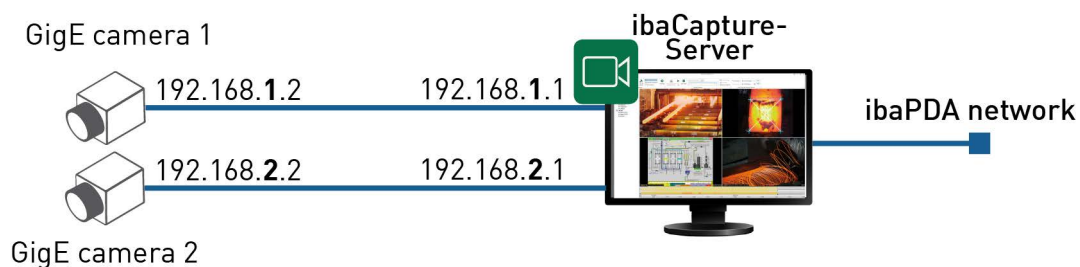
Fig. 7: Subnet settings example

The way to set persistent IP addresses varies with the used GigE SDK and also depending on the camera manufacturer. Please refer to documentation for your installed SDK or for the camera manufacturer. If in doubt, contact iba support to get assistance.

A helpful guide to set IP addresses when using eBUS can be found online:
 https://supportcenter.pleora.com/s/article/configuring-the-network-settings-for-a-gige-vision-device-kbase.

3.3.2 Driver settings for network adapters

For optimal performance, the following settings should be made in the driver settings for the used network adapters. Please consider that the screenshots shown here were made for Intel adapters. When using different hardware, the same settings might be named differently.

You can access the driver settings from the Ethernet properties dialog:
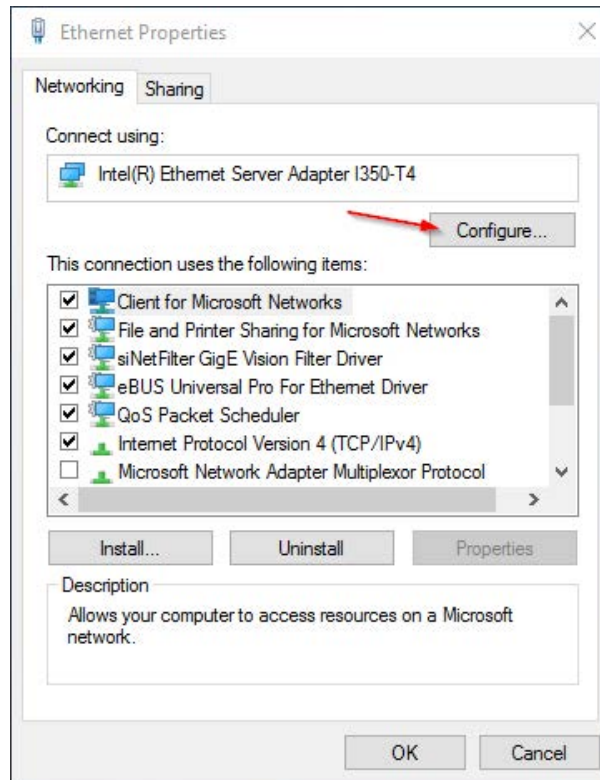
Jumbo packets

To minimize overhead for the network transmission, the packet size should be maximized. This property should be set to the highest possible value.
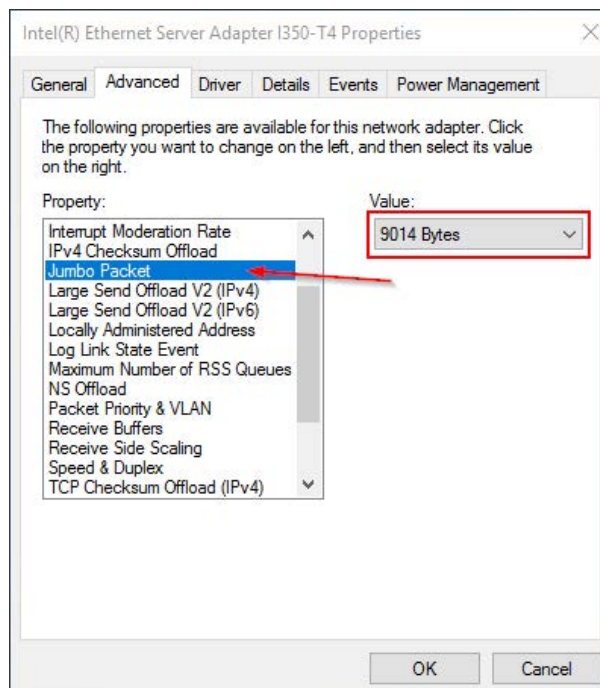
Interrupt moderation

To reduce the number of interrupts and thus the CPU load, the interrupt moderation feature should be adjusted. Interrupt moderation is enabled by default. The value for interrupt moderation rate should be set to "High".
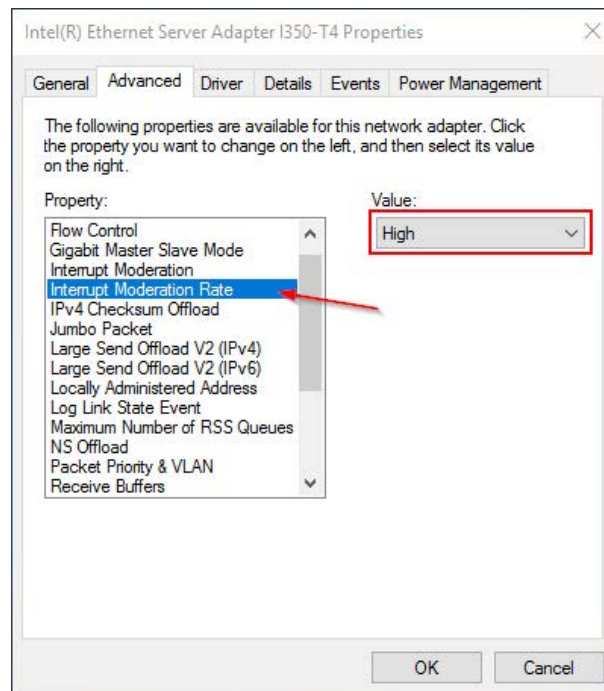
Receive buffers

As the amount of streamed data from GigE cameras is immense, for best stability of the stream it is recommended to increase the size of the receive buffers. The value should be increased to the highest possible setting.
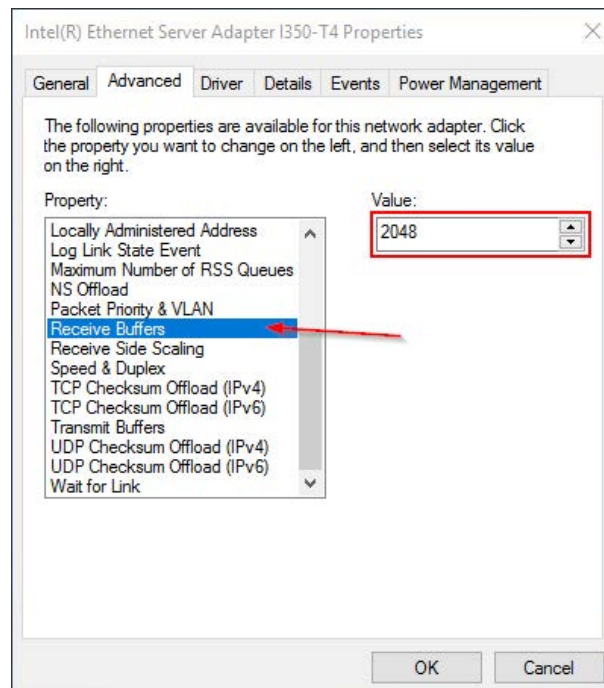
4 Camera configuration

Provided ibaCapture Server is properly installed and running, you can add and configure GigE cameras. Switch to server configuration mode and select the ibaCapture Server the GigE camera is connected to.

4.1 Adding a camera

In order to add a new camera click *Add new camera* ⊕ in the ribbon. A configuration wizard guides you through the configuration process.
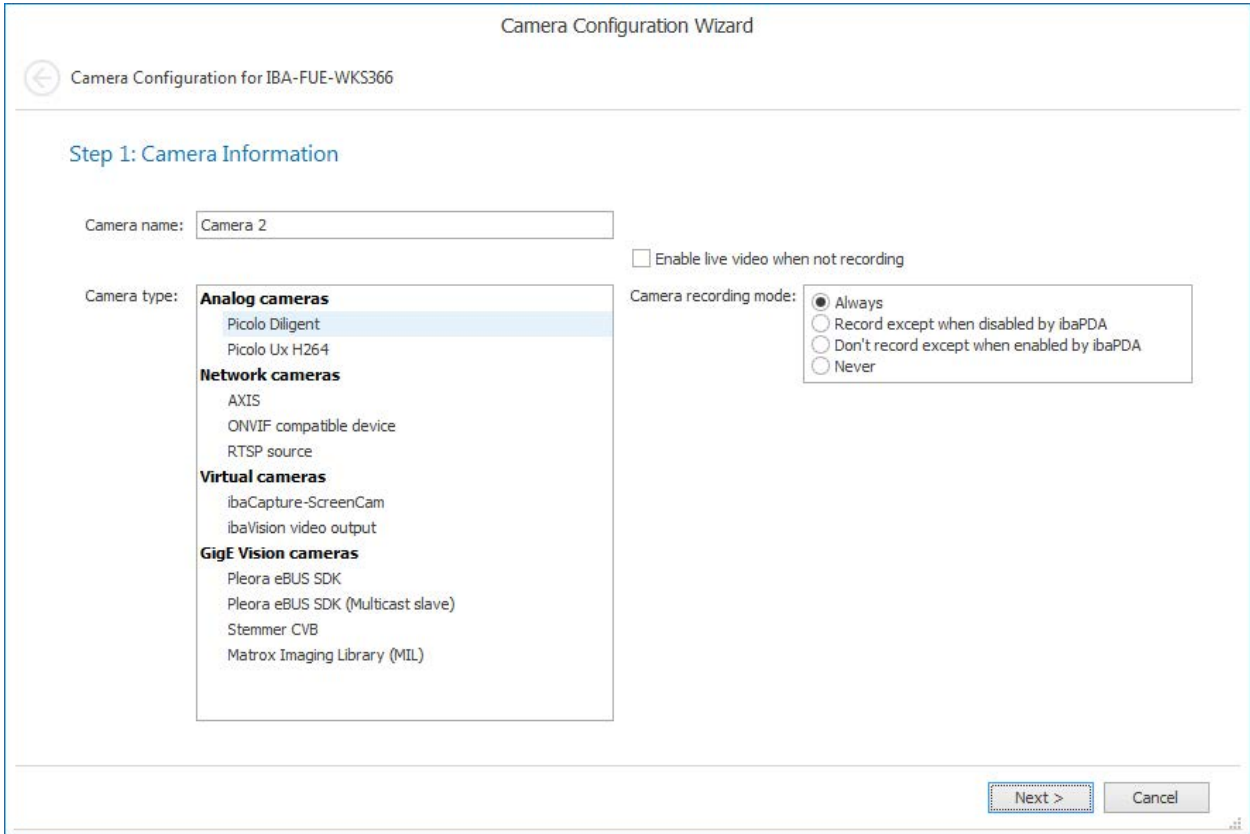
Fig. 8: Camera Configuration Wizard

1. Depending on the used SDK select the corresponding GigE camera type and select the camera recording mode. On a single ibaCapture server, you can only use GigE cameras with the same SDK. It is not possible to configure additional GigE cameras with a different SDK.

   You can also enable live video when ibaCapture is not recording.

2. Configure the camera settings.

   ▪ For Pleora eBUS SDK cameras see chapter ↗ *Pleora eBUS SDK camera configuration*, page 21

   ▪ For Pleora eBUS SDK Multicast slave cameras see chapter ↗ *Pleora eBUS SDK Multicast slave camera configuration*, page 23

   ▪ For Stemmer CVB cameras see chapter ↗ *Stemmer CVB camera configuration*, page 24

- For Matrox Imaging Library (MIL) cameras see chapter ↗ *MIL camera configuration*, page 26

3. Set the streaming ports. For detailed information about streaming ports please refer to the ibaCapture manual.

4. Configure the storage settings. For detailed information about storage settings please refer to the ibaCapture manual.

4.2   Pleora eBUS SDK camera configuration
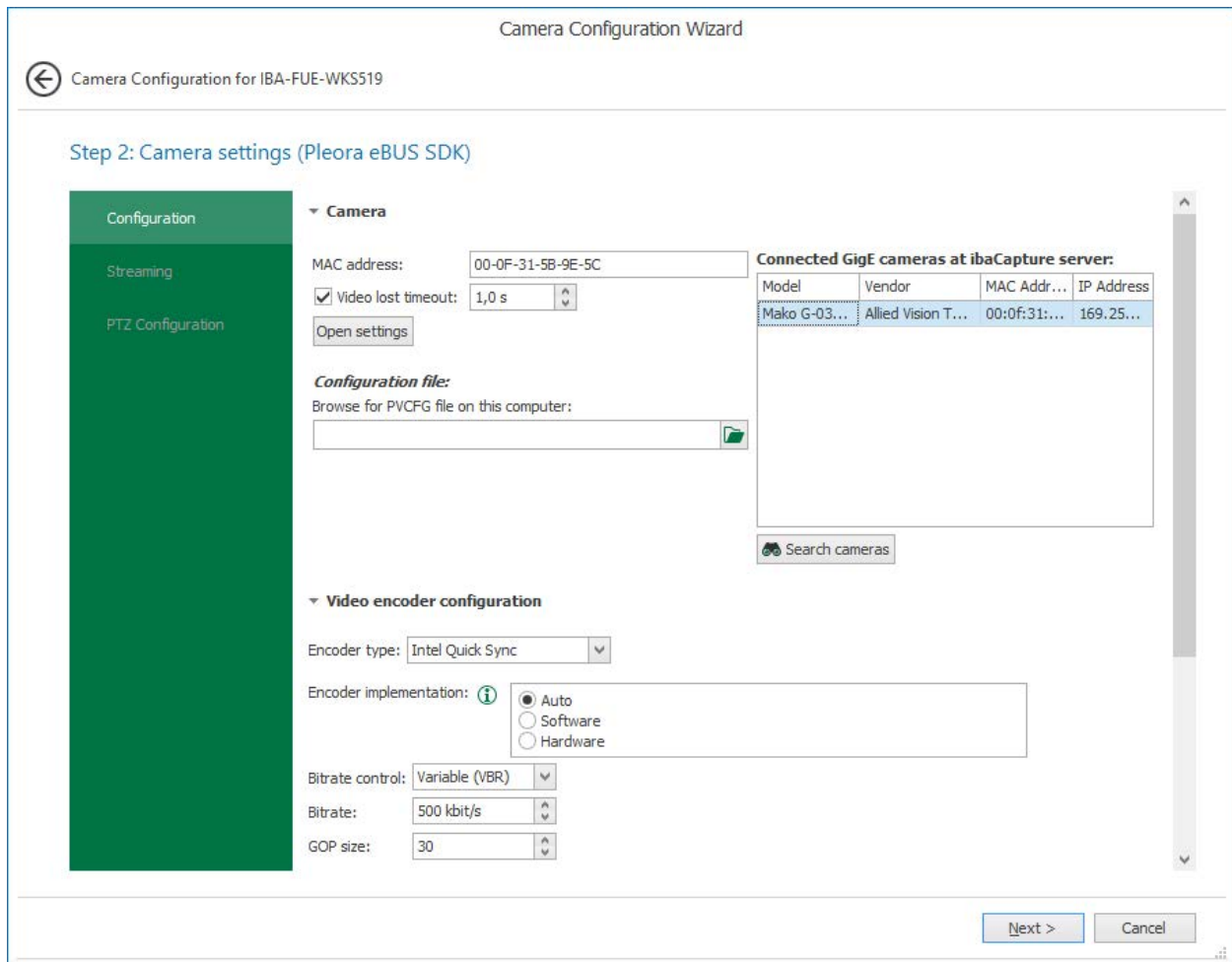
Fig. 9: Camera settings, Pleora eBUS SDK

MAC address of the camera
Each camera is uniquely identified by a MAC address. Enter the MAC address of the camera or select it from the list of connected cameras.

Configuration file
Here you can select a PVCFG configuration file. Configuration files in PVCFG format can be created using the eBUS Player application. This is part of the eBUS installation.

You can also create PVCFG configuration files in ibaCapture. Click <Open settings> to open a pop-up dialog with all camera settings.
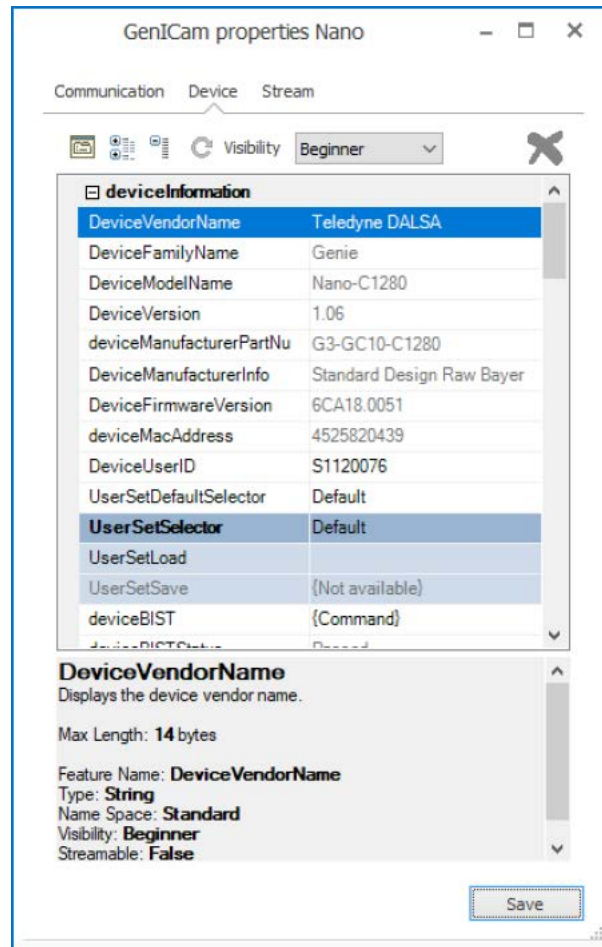
Fig. 10: GenICam properties settings

After setting all properties for this specific camera configuration, click <Save> to store the camera settings in a PVCFG file.

Video encoder configuration

Description see chapter ↗ *Video encoder configuration*, page 29

Streaming settings

For detailed information about streaming ports please refer to the ibaCapture manual.

4.3 Pleora eBUS SDK Multicast slave camera configuration

Fig. 11: Camera setting, Pleora eBUS SDK (Multicast slave)

MAC address of the camera

Each camera is uniquely identified by a MAC address. Enter the MAC address of the camera or select it from the list of connected cameras.

Video lost timeout

Time span after which "No video signal" error will be shown if no frames are received from the camera.

Determine address and port dynamically

Enable this option to obtain the address and the port of the GigE device that provides the multicast stream automatically.

If it is not possible to receive the multicast address and port dynamically, enter the respective data manually.

Video encoder configuration

Description see chapter ↗ *Video encoder configuration*, page 29.

Streaming settings

For detailed information about streaming ports please refer to the ibaCapture manual.

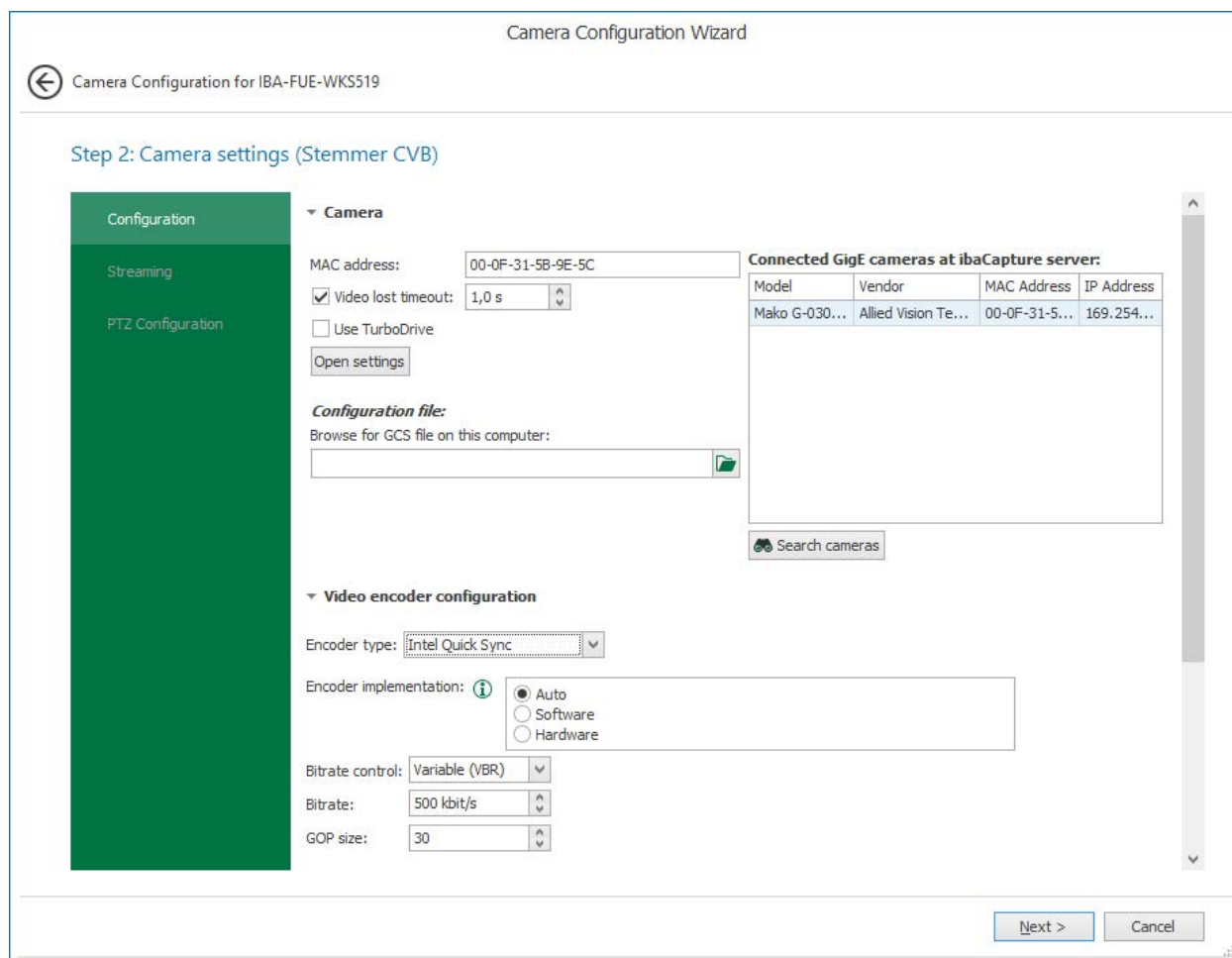## 4.4   Stemmer CVB camera configuration

Fig. 12: Camera settings, Stemmer CVB

Camera

MAC address of the camera
Each camera is uniquely identified by a MAC address. Enter the MAC address of the camera or select it from the list of connected cameras.

Use TurboDrive
TurboDrive is supported by Teledyne Dalsa GigE Vision cameras, but only certain models. When TurboDrive is enabled, GigE cameras compress their frames in a lossless way before sending them to the receiver. Therefore, they are able to send at an increased frame rate. Before enabling this setting, make sure the used GigE camera supports TurboDrive.

When you enable this checkbox while configuring a non-TurboDrive camera, you will experience errors in the image acquisition.

Configuration file
Here you can select a GCS configuration file. GCS files are used to store the camera's settings for this configuration.

One way to set up a GCS file is to use the application "GenICam Browser", which is part of the Common Vision Blox runtime installation.

Alternatively, you can click "Open settings" to access the "GenICam properties" pop-up form.

Fig. 13: GenICam properties settings

After setting the camera features, click the <Save> button in the properties form to save the camera settings as GCS file.

Video encoder configuration

Description see chapter ↗ *Video encoder configuration*, page 29

Streaming settings

For detailed information about streaming ports please refer to the ibaCapture manual.

4.5   MIL camera configuration

GigE cameras offer a wide range of control and configuration features. The basic settings should be made using the software tools Matrox Intellicam and/or Matrox Capture Assistant.

These tools are automatically installed with the MIL (Matrox Imaging Library). These tools can be started in two ways:

■ Via the two buttons on the camera's configuration tab
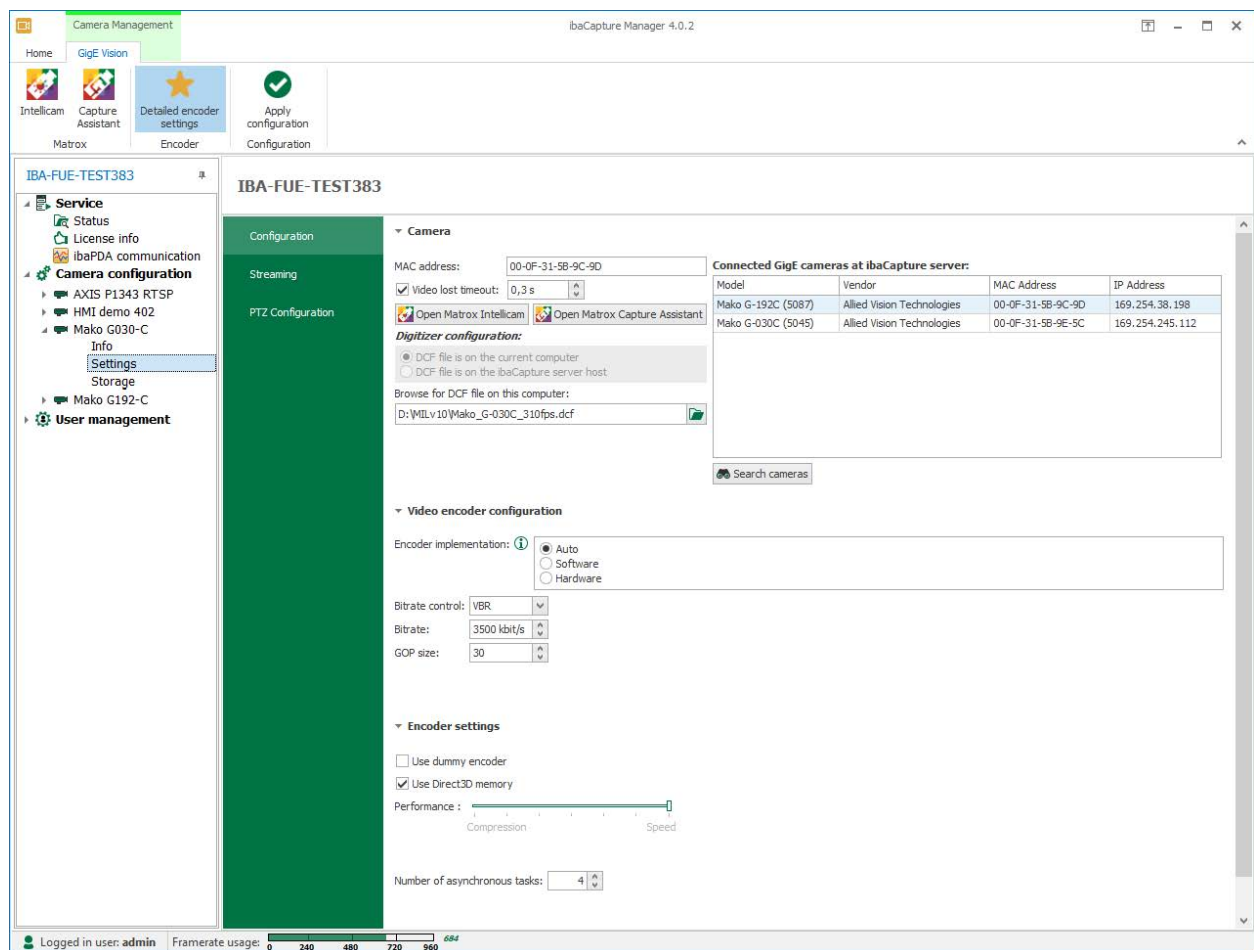
■ Or via the commands in the ribbon

Fig. 14: Camera settings, Configuration tab

Matrox Intellicam

This program can be used to access GigE cameras after they have been connected to the network card. It offers interactive access to all recording functions of your cameras. Matrox Intellicam allows you to preview images and see the results of configuration changes immediately.

You can then use Matrox Intellicam to create or edit digitizer configuration files (DCF files). These files can be used to adapt camera setting to specific needs for your video capture application.

In order to learn more about Matrox Intellicam, please use the online help of the program.

Matrox Capture Assistant

This program should be used to get information about the connected cameras as well as network and system configuration. The assistant automatically detects all connected cameras and lists them in a table. Select a camera to retrieve information about this camera and its configuration.

4.5.1 Camera settings – Configuration tab

Fig. 15: Camera settings, configuration tab

Camera

MAC address of the camera

Each camera is uniquely identified by a MAC address. Enter the MAC address of the camera or select it from the list of connected cameras.

Digitizer configuration and browse button

If you have saved a digitizer configuration with Matrox Intellicam (DCF file) before, you can select and load the file here. ibaCapture Server extracts from this file the exposure- and image acquisition parameters of the camera. If this field remains empty, the camera will be operated with its default settings.

Video encoder configuration

When using an MIL camera type you can only select the Intel Quick Sync encoder. Description see chapter ↗ *Intel Quick Sync video encoding*, page 31.

Streaming settings

For detailed information about streaming ports please refer to the ibaCapture manual.

4.6 Video encoder configuration

ibaCapture Encoder supports NVIDIA encoding and Intel Quick Sync video encoding. The desired encoder can be selected from a drop-down menu. The corresponding configuration options will appear accordingly.

Please note: When using MIL cameras only Intel Quick Sync video encoding is available.

4.6.1 NVIDIA encoding

To use NVIDIA encoding, it is necessary that a supported NVIDIA GPU is installed into the ibaCapture server PC. The support matrix can be found here https://developer.nvidia.com/video-encode-decode-gpu-support-matrix.

Important: Pay attention to the column "Max # of concurrent sessions" in the support matrix. If the value is 2, only 2 streams per system will be supported. This is also true if multiple NVIDIA GPUs are installed. Only GPUs from the Quadro series (value "Unrestricted") will allow more concurrent streams. For recording from GigE cameras in ibaCapture, one camera requires one stream.
So if you plan to record from more than 2 GigE cameras, it is necessary to install an appropriate GPU. Running ibaVision with video outputs via NVIDIA also counts into the number of sessions. In case you are not sure about your application, contact your local iba support for clarification.

Please note that when using an NVIDIA GPU, hardware accelerated Intel® Quick Sync Video encoding will be disabled. If a camera is configured to use Intel Quick Sync, ibaCapture Encoder will automatically switch to software-based Intel® Quick Sync Video encoding.

Fig. 16: NVIDIA encoder configuration

Device
GPU on which the encoding will be performed (in case multiple GPUs are installed)

Encoder preset
The NVIDIA encoder API provides different presets. Their names indicate their intended use. If a preset is not supported by the GPU, it reverts to the default preset.

Codec

ibaCapture supports H.264 and H.265 (or HEVC) encoding. The main benefit of H.265 encoding is a reduction of the required storage space compared to H.264 encoding. However, this comes at the cost of an increased demand for processing power (both during encoding and decoding). Select the encoding type in the dropdown menu:

- H.264

- HEVC (H.265)
  Device compatibility for HEVC can also be checked in the support matrix. (link at the top of this chapter).

GOP size

GOP (Group Of Pictures) defines the number of pictures after which a full picture, a so called keyframe will be stored. The pictures between the keyframes are derived from the previous keyframe, in between, only changes of the pictures are stored. With a high GOP, possible encoding errors exist longer, with a low GOP, the bitrate and hence the memory requirements of the video stream tend to grow. The default setting 30 is suitable for most of the cameras.

Bitrate control

- VBR (Variable Bit Rate)
  With VBR, the bitrate is always set according to the complexity of the taken image. That means, that a high bandwidth is required for a high activity and a low bandwidth for low activity in the video.

- CBR (Constant Bit Rate)
  If you select CBR, you can configure a fixed maximum bitrate and hence make sure that the demand for the bandwidth remains calculable. Thus, the maximum value will not be exceeded, no matter how much activity is in the video.

Bitrate

If VBR is configured for the bitrate control, you can configure here the average bitrate. If CBR is selected, you can configure the maximum bitrate here.

Note

| i | Demosaicing of 8-bit Bayer pixel formats is executed on the GPU with the use of the NVIDIA Performance Primitives (NPP) library v9.2. Therefore, make sure your GPU driver supports CUDA 9.2. |

4.6.2 Intel Quick Sync video encoding

Fig. 17: Intel Quick Sync encoder configuration

Encoder implementation

- Auto
  Attempts to use hardware acceleration. If no acceleration device was found, software implementation is used.

- Software
  Use software implementation

- Hardware
  Use hardware acceleration. Currently, only Intel HD Graphics GPUs are supported.

Codec

ibaCapture supports H.264 encoding as well as H.265 (or HEVC). Select the encoding type in the dropdown menu:

- H.264

- HEVC (H.265)
  When using a hardware encoder, make sure that the device supports this codec. Software-encoding is only possible on 64 bit systems.

Bitrate control

- VBR (Variable Bit Rate)
  With VBR, the bitrate is always set according to the complexity of the taken image. That means, that a high bandwidth is required for a high activity and a low bandwidth for low activity in the video.

- CBR (Constant Bit Rate)
  If you select CBR, you can configure a fixed maximum bitrate and hence make sure that the demand for the bandwidth remains calculable. Thus, the maximum value will not be exceeded, no matter how much activity is in the video.

Bitrate

If VBR is configured for the bitrate control, you can configure here the average bitrate. If CBR is selected, you can configure here the maximum permitted bitrate.

GOP size

GOP (Group Of Pictures) defines the number of pictures after which a full picture, a so called keyframe will be stored. The pictures between the keyframes are derived from the previous keyframe, in between, only changes of the pictures are stored. With a high GOP, possible encoding errors exist longer, with a low GOP, the bitrate and hence the memory requirements of the video stream tend to grow. The default setting 30 is suitable for most of the cameras.

Optional settings

Number of asynchronous tasks
The number of asynchronous tasks can be tuned in certain scenarios. The default setting should be okay for most cases.

Use Direct3D memory
Enable this option to use the Direct3D memory of the GPU.

Performance slider
The performance can be adjusted with the slider to prioritize either compression or speed. Please note that a high speed causes low compression and requires large memory space. High compression requires high computing capacity and lowers the speed.

4.7   Camera info

For each camera, there is an "info" branch, where you can enable/disable the camera, find status information, diagnostics and a camera preview.

For detailed information about camera info please refer to the ibaCapture manual.

5 Supported GigE cameras

Generally, ibaCapture supports all types of GigE Vision compatible cameras which provide the GenICam protocol.

Here, you find an overview of current, registered GigE Vision compatible cameras and devices as well as a search function:

Link: http://www.visiononline.org/vision-standards-details.cfm?id=39&type=5

iba has tested the following models:

Manufacturer	Model	Resolution	Remark
Dalsa	Genie HM640/HC640	640 x 480	300 fps, monochrome
JAI	RM-6740GE	640 x 480	200 fps, monochrome
Baumer	TXG13c	1392 x 1036	20 fps, color
Basler	acA640-90gc	658 x 492	90 fps, color
Basler	piA2400-17gc	2454 x 2056	17 fps, color
Allied Vision	Mako G-030C	644 x 484	312 fps, color
Allied Vision	Mako G-192C	1600 x 1200	60 fps, color

Notes on the compatibility of GigE cameras

Color resolution
When using GigE Vision compatible cameras, the resolution is limited to 8 Bit. Other formats like e.g. Mono16 cannot be used.

Trigger mode
If the trigger mode is activated in the camera settings, external signals are required for triggering the images. If these external signals are not available, the camera does not provide video. If the trigger mode is not used explicitly, it should be deactivated.

6 Appendix

6.1 Trouble shooting

6.1.1 Adapt the packet size of the camera when using MIL

Problem

In the image display, pictures are missing repeatedly or too few pictures/second are transferred.

Background

Video data are sent in Ethernet telegrams to ibaCapture Server. The size of standard Ethernet frames is max. 1500 Bytes, whereas the GigE Vision standard supports so-called Jumbo frames with up to 9000 Bytes.

As GigE cameras usually send uncompressed video data, a video frame has to be distributed to several Ethernet packets. As each Ethernet packet contains a header besides the user data, more overhead data are generated when sending many small packages and hence more bandwidth is occupied than by sending a few big packages.

The data-overhead for many small packets can have a negative effect on the performance of the network card, i.e. video frames can be lost or damaged. If too many frames get lost, we recommend checking the packet size and to increase it if required.

Remedy

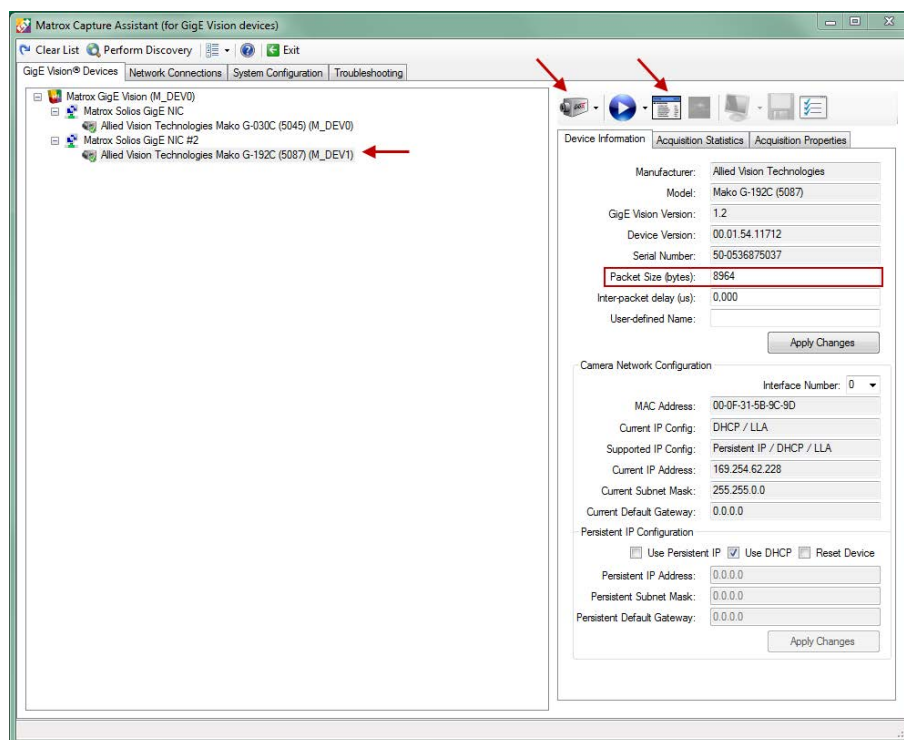Open the Matrox Capture Assistant in ibaCapture Manager.

Fig. 18: Matrox Capture Assistant

Select the appropriate camera. On the right of the "Device Information" tab, you can see the current packet size. In order to change the packet size, click on the camera symbol 📷 to load the camera resources. A click on the feature-browser symbol 📋 opens the properties dialog of the camera.
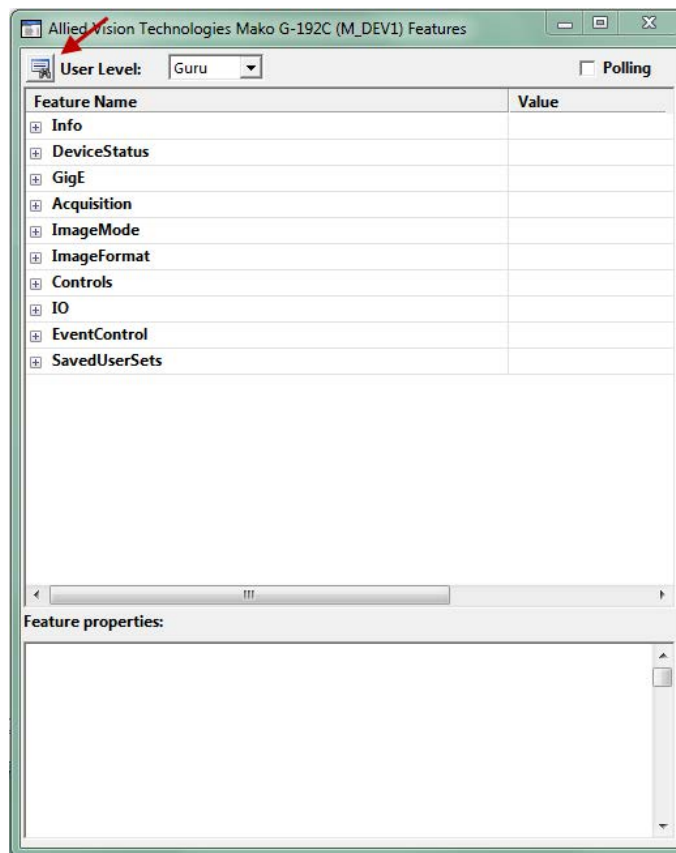

Fig. 19: Matrox Capture Assistant, Feature Browser

The properties list of the GigE cameras is not the same for all cameras. This is why the settings for the packet size can be found in different sub-menus. If you do not know the sub-menu where it can be found, a search function will help you. You can open this function by clicking on the search symbol 🔍.
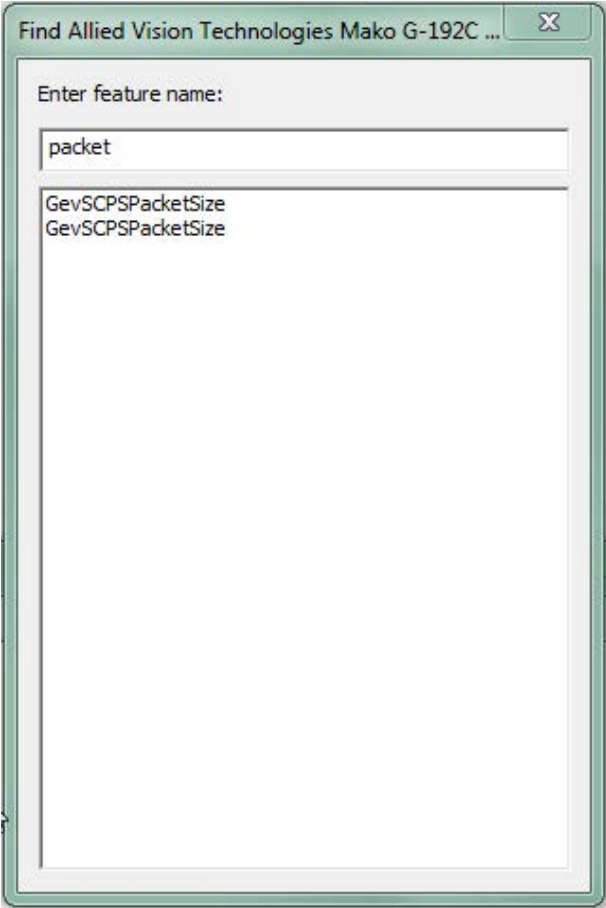
Fig. 20: Search function

Enter "packet" in the search field and select "Packet size" in the list. This way, you can open directly the appropriate sub-menu.
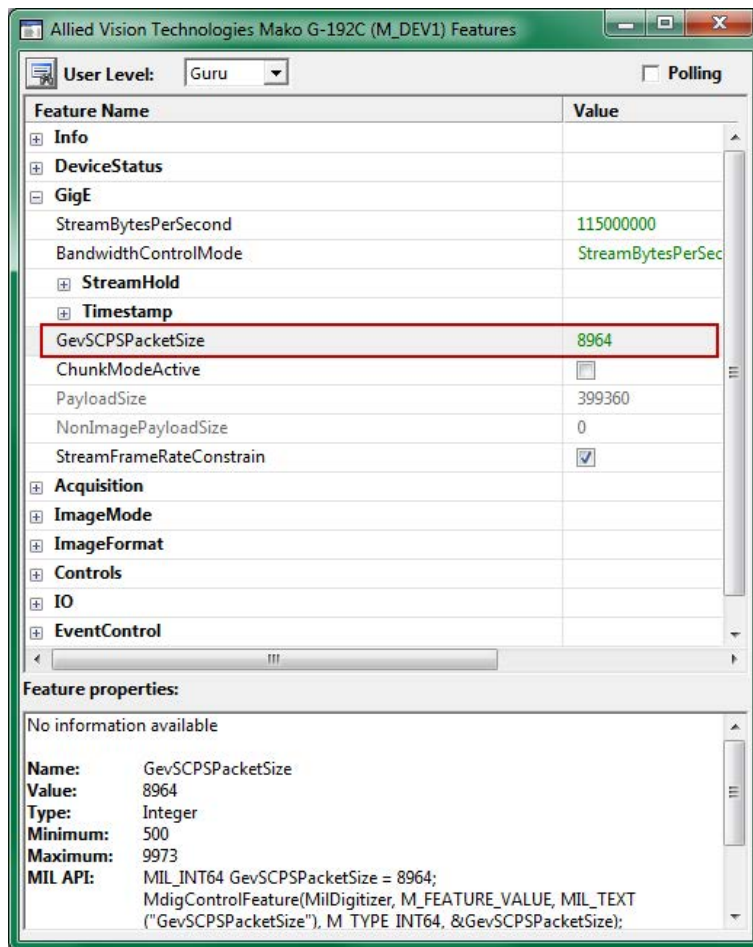
Fig. 21: Edit Feature Browser

Change the packet size to the desired size and close the properties dialog.

Back in the main window of the Matrox Capture Assistant, release the camera sources again by clicking on the camera symbol that first shows a blocked camera ⬚. Now, the new packet size is displayed.

6.2   BIOS settings for ibaCapture Server PCs

Note

This chapter only applies when using a Matrox Solios card.

The following mainboards were delivered in ibaCapture Rackline server systems.

Fujitsu D3076

■ Switch off ASPM:

- Advanced - PCI Subsystem Settings - ASPM Support
  Change this setting to "Disabled".

■ Switch off Speedstep and C-States:

- Advanced - CPU Configuration - Power Technology
  Change this setting to "Custom".

- Advanced - CPU Configuration - Enhanced SpeedStep
  Change this setting to "Disabled".

- Advanced - CPU Configuration - Package C State limit
  Change this setting to "C0".

Leave the BIOS-setup and save the values.

Supermicro X10SAT

■ Switch off ASPM:

- Advanced - Chipset Configuration - System Agent (SA) Configuration -
  PCIe Configuration - CPU_SLOT4 PCI-E 3.0 X8 (IN X16)- ASPM
  Change this setting to "Disabled".

- Advanced - Chipset Configuration - System Agent (SA) Configuration -
  PCIe Configuration - CPU_SLOT2 PCI-E 3.0 X4 (IN X16)- ASPM
  Change this setting to "Disabled".

■ Switch off Speedstep and C-States:

- Advanced - CPU Configuration - EIST
  Change this setting to "Disabled".

- Advanced - CPU Configuration - CPU C States
  Change this setting to "Disabled".

Leave the BIOS and save the values.

6.3   Creating a DCF file

Note

> Some default settings of the cameras may have as a consequence, that the camera might not deliver a video when connected to ibaCapture. In that case, you have to create a DCF file to use this camera properly. The settings are described in the manual of the camera. You will find notes on the compatibility of certain settings for the use with ibaCapture in chapter .↗ *Supported GigE cameras*, page 33

It is recommended to create a DCF file which can be used for digitizer configuration. For this purpose start Matrox Intellicam by clicking the <Matrox Intellicam> button. This causes the ibaCapture Encoder program to pause as concurrent access to cameras by multiple applications is not possible.

A new DCF file can be opened via the menu "File - New".
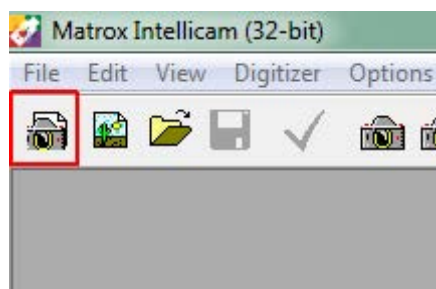
Choose "GigE Vision" in the following dialog and click <OK>.
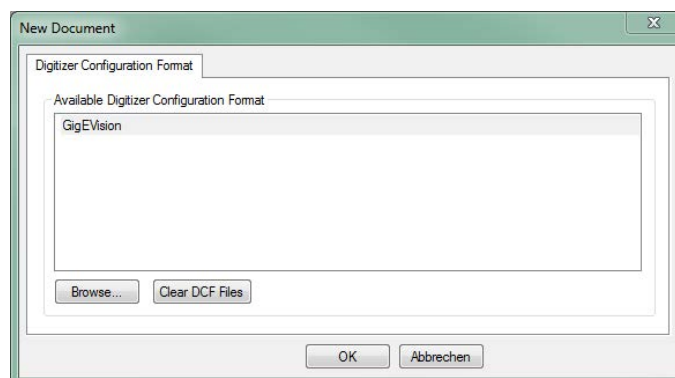
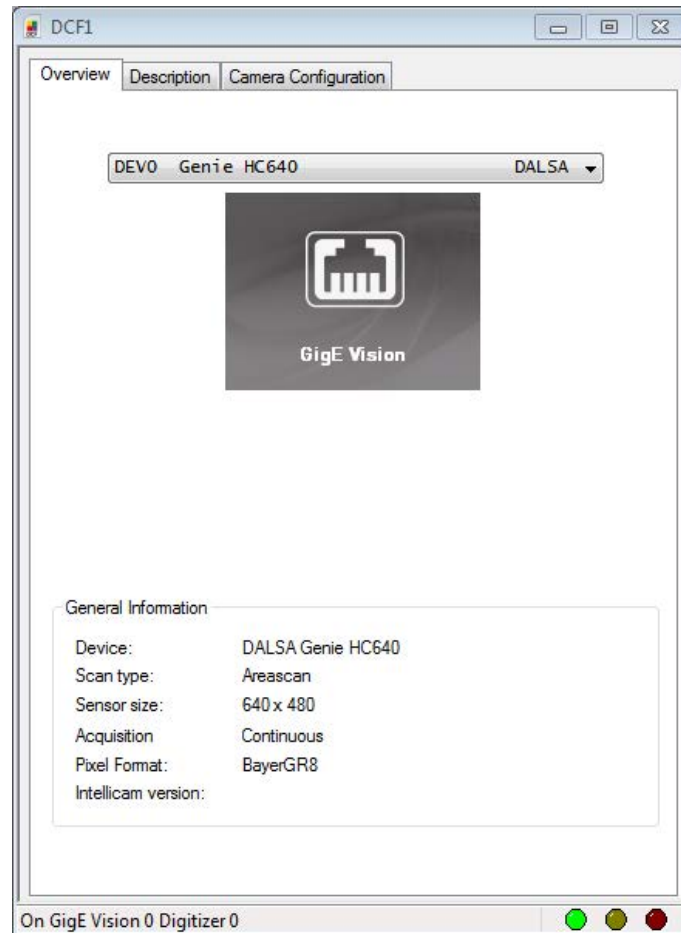A window where all connected cameras can be configured is displayed.

Fig. 22: Matrox Intellicam, Camera overview

Select the camera you wish to configure from the drop-down list and switch to the "Camera Configuration" tab. For a new DCF file, the list of settings is initially empty. To test whether the camera is working, you can display the camera's image. There are a few icons in the toolbar to access the according functions.

A "single grab" can be done with the first button on the left . To display a continuous grab, click the third button . While the feed is displayed, the <Stop> button is enabled and stops the frame grabber, when clicked.

To show the feature browser which displays all features of the selected camera, click on the right-most icon .

Each camera has different settings and perhaps different designations for the features. Please refer to the camera's manual for detailed information. Some of the settings are limited due to dependencies on other settings. E.g. the exposure time cannot be longer than the time between two images, so if the camera records images at 100 fps, the theoretical maximum exposure time would be 10 ms.
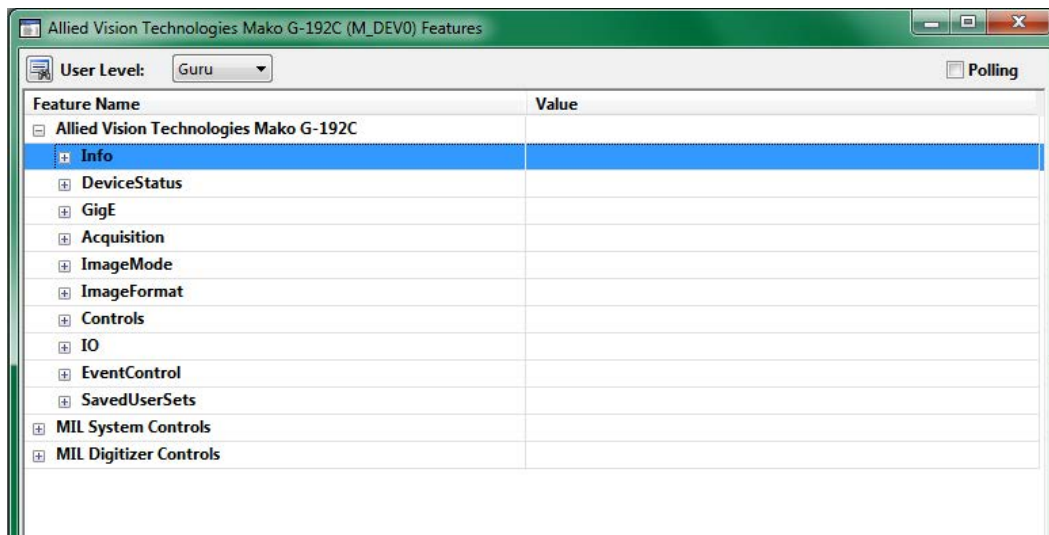
Fig. 23: Feature Browser

The camera's settings can now be changed in the feature browser when the camera is currently not streaming images. A typical error source for missing images is the "Trigger Mode" setting, which can be found for the camera in the example below under "Acquisition" - "Trigger" - "Trigger Selector". If there is no external trigger signal connected to the camera, the trigger mode setting must be "Off".

Fig. 24: Feature Browser, Trigger mode

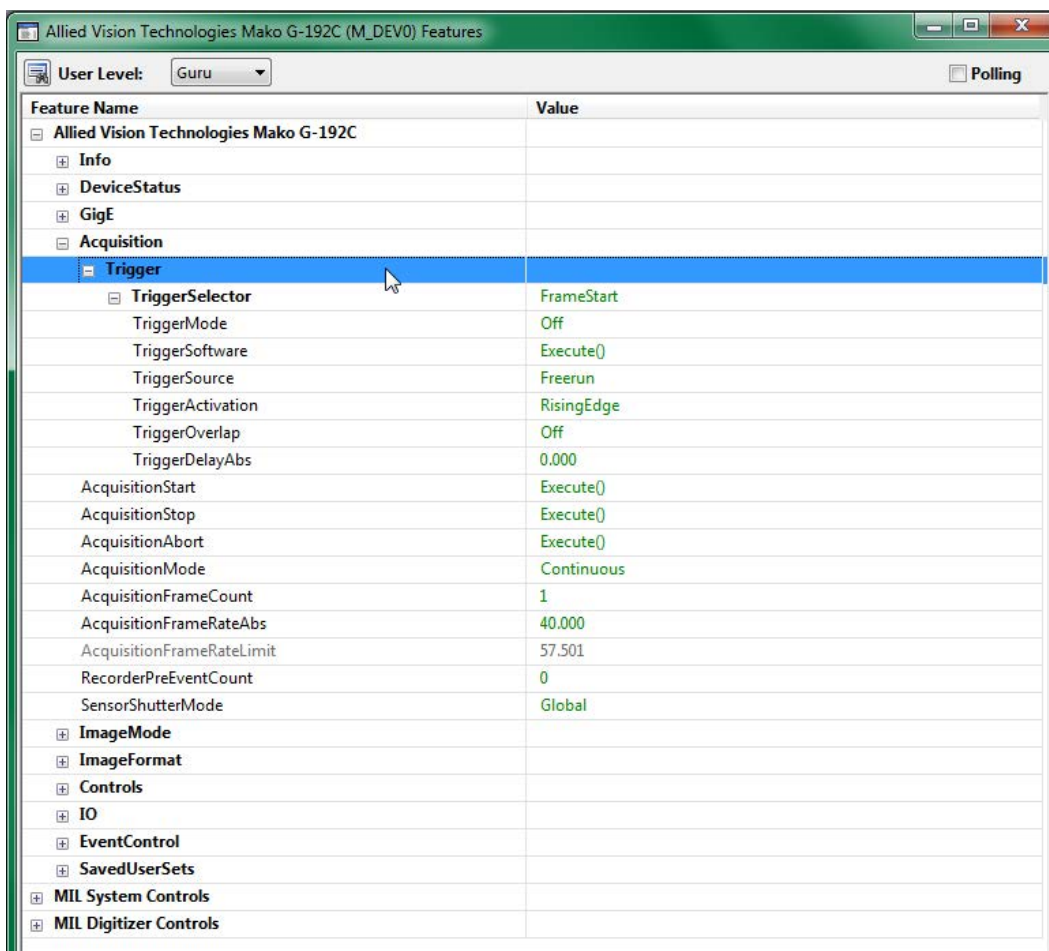The most common settings are image dimensions (width, height) and frame rate. After adjustments have been made in the feature browser, the camera image has to be restarted for checking the consequences.

For the settings to be applied to the DCF file, the checkbox "Recording Mode" has to be enabled in the previously selected "Camera Configuration" tab. Then, you can see with every change in the feature browser that the values are adopted in the DCF configuration.
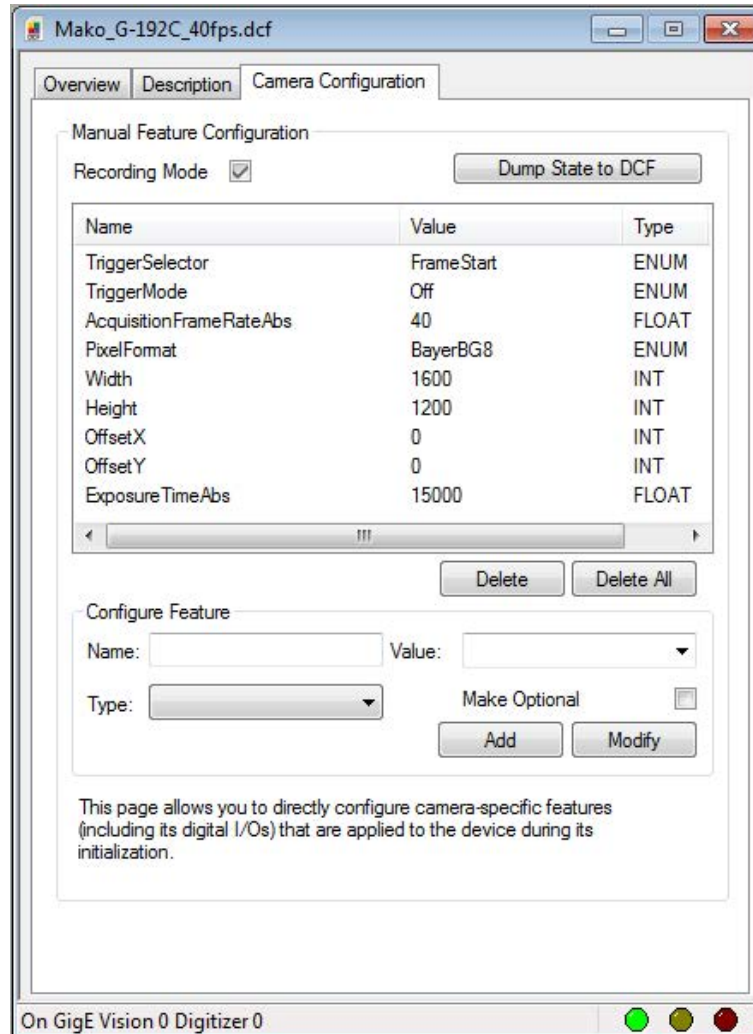

Fig. 25: Matrox Intellicam, Recording mode

When all settings have been done, the DCF file can be saved under "File - Save as". This file can then be selected in the camera configuration of ibaCapture as digitizer configuration. The configuration has to be revalidated on ibaCapture Server.
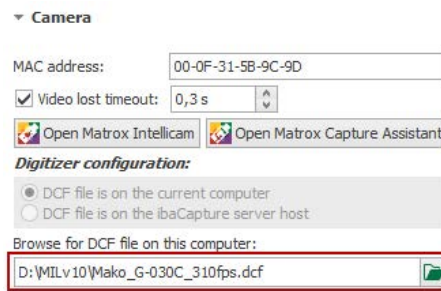
Fig. 26: Select a DCF file

6.4 Special considerations when updating MIL

Note

This chapter is only relevant, if you use GigE Vision compatible cameras and MIL version 9 is installed on your computer.

If you intend to use CVB or eBUS, this chapter does not apply.

Starting with ibaCapture-CAM 3.7.0, MIL version 10 is required for the use of GigE cameras with ibaCapture. When upgrading MIL version 9 to 10, pay attention to the measures described hereinafter and observe the given order, because there are many dependencies between the individual components that participate in processing video from GigE cameras.

Step 1: Adapt the BIOS settings of the mainboard

The used network card (either of the Matrox Solios GigE or Intel® Ethernet Server Adapter I350-T4V2 type) for recording the video pictures works best, if certain BIOS settings related to energy saving are disabled. The following settings are relevant:

- ASPM
  These are energy saving measures for PCI Express devices. Depending on the mainboard, this function can be enabled/disabled globally or for each individual slot. The function has to be disabled at least for the slot in which the network card is installed.

- Intel Speedstep
  This technology allows reducing the clock rate of the CPU during phases of low load. This function has to be disabled. (Sometimes called in the BIOS "EIST", Enhanced Intel Speedstep Technology").

- ACPI CPU C-States
  C states can be set by single CPU cores to save energy. This function has to be disabled.

For PCs delivered by iba that have mainboards of Fujitsu or Supermicro installed, we describe in chapter ⌐ *BIOS settings for ibaCapture Server PCs*, page 38 where the individual settings can be found.

If you use another PC, please see the device documentation.

Step 2: Save the current configuration of ibaCapture or ibaCapture-CAM

To make sure the configuration is available after uninstalling and installing ibaCapture, save the current camera configuration.

When using older ibaCapture-CAM versions, click on the disk symbol in the configuration view. Select a target directory in the dialog that is opened now. The configuration is saved in an XML-format.

When using ibaCapture V4.0 or later, click the <Save configuration> command in the ribbon.

Thus, the configuration is available as reference, in case settings should be missing after the upgrading process.

Step 3: Uninstall ibaCapture(-CAM)

The uninstallation process can be started via "Start menu - All programs - iba – ibaCapture(-CAM) - Uninstall". All programs (ibaCapture(-CAM) Encoder) and services (ibaCapture(-CAM) Server) are stopped. This is a requirement for the next step.

Step 4: Uninstall Matrox Imaging Library (MIL) v9

Matrox Imaging Library (MIL) is used by ibaCapture(-CAM) to access GigE cameras which are GenICam compliant. With the upgrade to ibaCapture V4.0 it is necessary to replace the currently used MIL version with a more recent one.

First of all, the MIL needs to be uninstalled. Open the Start menu and type "programs" into the search field.
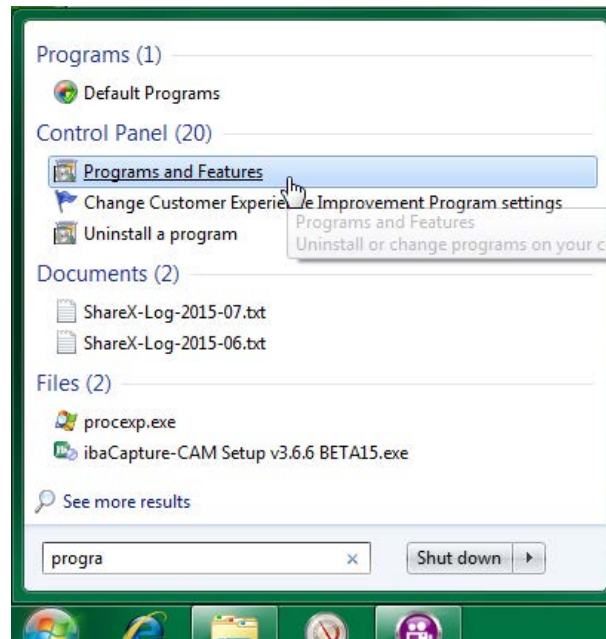
The result list contains "Programs and Features". After clicking this item, a window listing all installed software packages is opened.
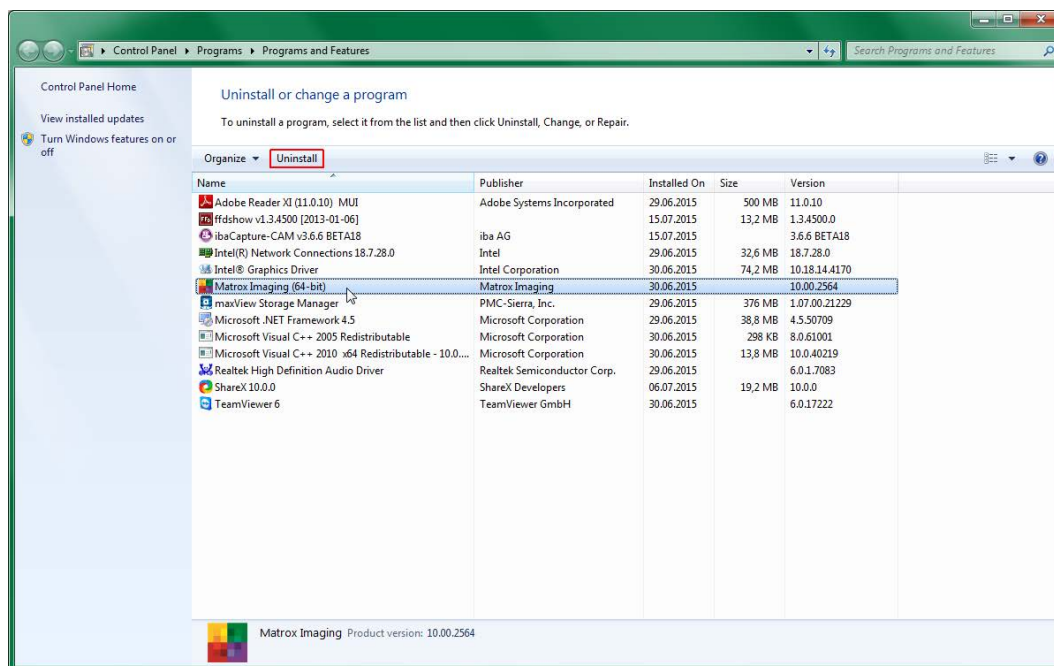
Select "Matrox Imaging" and click on <Uninstall>. Confirm the steps in the following dialogs. After the process is finished you are prompted to do a reboot. Reboot the computer.
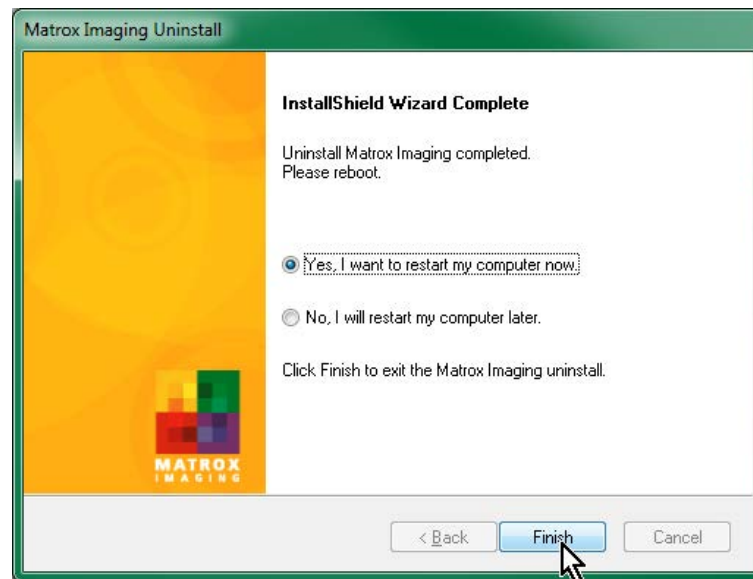
Step 5: Perform update of the graphics drivers for Intel HD graphics

To encode images delivered from GigE cameras as raw data, hardware acceleration on integrated Intel HD Graphics is used. As drivers for graphics adapters are constantly improved for performance and reliability it's necessary to install the latest drivers for the installed graphics chip.

First of all, you need to identify the exact type of Intel HD Graphics chip available in your system. For the systems delivered by iba AG, this is either "Intel HD Graphics 3000" (earlier than 08/2014) or "Intel HD Graphics 4600" (later than 08/2014).

To obtain the latest driver, visit the Intel website (www.intel.com) and download the appropriate driver in the support section.

Now, start the installation and reboot the system when the installation has been finished.

Step 6: Install Matrox Imaging Library (MIL) v10

As a prerequisite to access GigE cameras, the new version of MIL now needs to be installed on the system.

The installer files are available on the DVD "iba Software & Manuals":
01_iba_Software\ibaCapture\ibaCapture\03_Matrox_Imaging_Library_MIL\MILv10.

Select the correct installer for your architecture (32 or 64 bit) and execute it.

Step 7: Install current version of ibaCapture

After the restart, the installation of ibaCapture V4.0 or higher can be performed. Please make sure that all four components (Player, Manager, Server, Encoder) are enabled in the according step.

After the successful installation, open ibaCapture Manager.

Step 8: Adapt configuration of the GigE cameras

The changes in GigE Vision support partially affect camera configurations.

To confirm that the settings are still valid, open all camera configuration views.
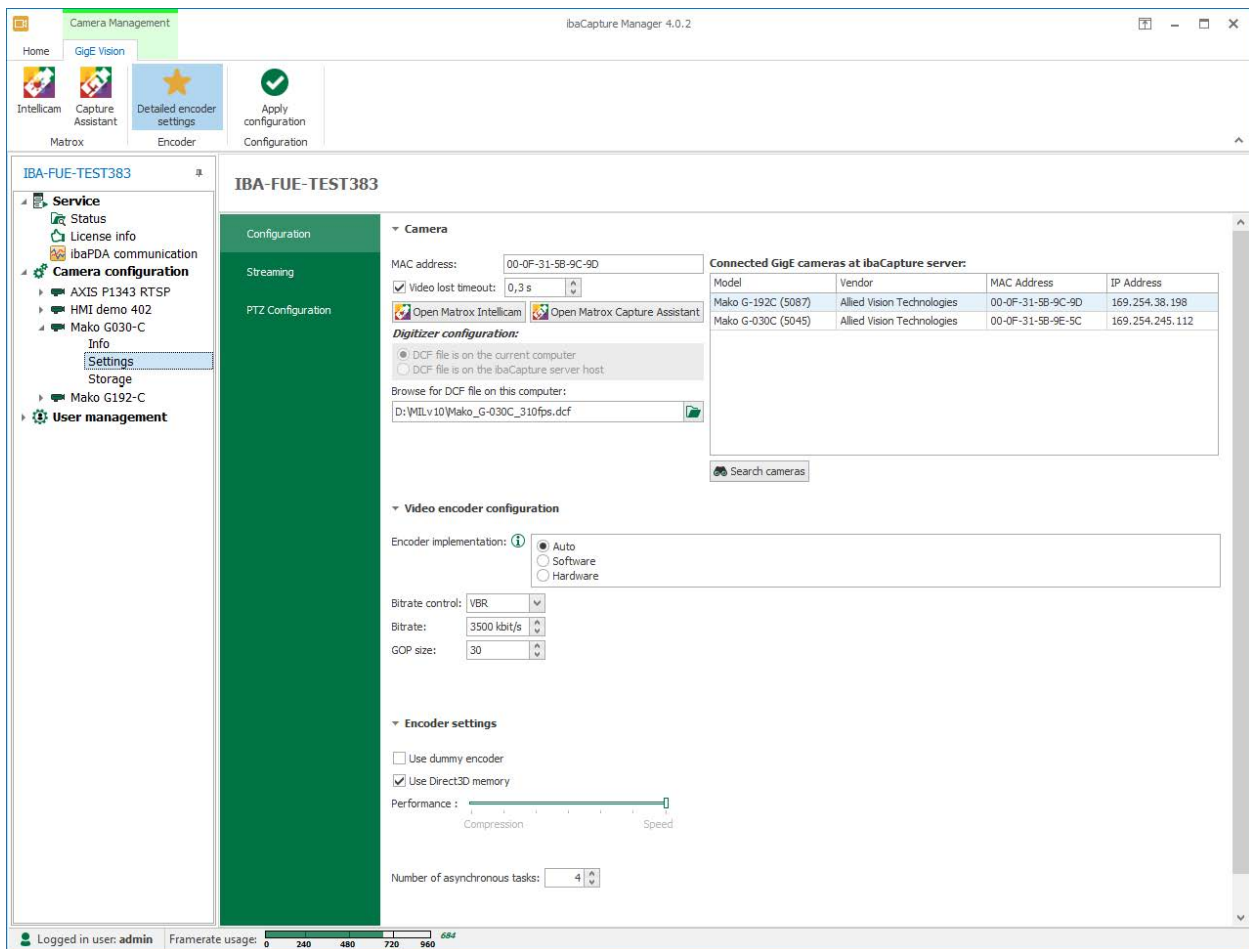
Fig. 27: Camera settings, configuration tab

First, check whether the MAC address is still correct. You can display a list of connected cameras with "Matrox Capture Assistant". This tool also allows to read the connected cameras' MAC addresses.

If you leave the textbox "Digitizer configuration" empty, the camera will be used with its default settings. The camera configuration settings for frame rate and image size which were available in previous versions have now been removed from ibaCapture. If you need to change these settings you now have to specify them in a DCF file using "Matrox Intellicam" (refer to the following chapter). If you enter a DCF file as digitizer configuration and this configuration is applied by ibaCapture Server, the camera is used according to the settings in the DCF file.

Using these steps you can set up each camera in the same way it was configured in previous versions of ibaCapture.

If you have further questions, please contact the iba support.

7   Support and contact

Support

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Email: support@iba-ag.com

Note

If you require support, indicate the serial number (iba-S/N) of the product or the license number.

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