APPLICATION NOTE

// Create an instant camera object with the first camera Camera_t camera(CT1Factory::GetInstance().CreateCamera(0));

// Register an image event handler that accesses the camera camera.RegisterImageEventHandler(new CSampleImageOwnership_TakeOwnership);

// Open the camera camera.Open();

Interfacing Basler GigE and USB3 Vision Cameras with NeuroCheck

Applicable to Vision Interface Standard cameras and Windows operating systems only

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1 Introduction

This document explains how to interface a Basler GigE or USB3 Vision camera with the NeuroCheck software using standard USB 3.0 ports or Gigabit Ethernet network adapters and the Basler pylon software.

2 Steps to be Carried Out

2.1 Checking Hardware Requirements

In addition to the Basler camera and its power supply, an Ethernet cable (Cat 6 or higher) is required.

For GigE cameras, your PC must be equipped with a Gigabit Ethernet network adapter card (also called Network Interface Controller or NIC). For USB 3.0 cameras, you need a USB 3.0 port onboard or provided by a USB 3.0 host controller. For all devices, you need a suitable cable.

We recommend using an Intel Pro 1000 family network adapter or an adapter with a comparable chipset. These adapters generally work well with the Basler performance driver. The performance driver lowers the CPU load required to handle the network traffic between the PC and the camera. It also has a more flexible packet resend request mechanism.

With other Ethernet adapters, a standard GigE Vision filter driver will be installed, and no automatic hardware-based optimization takes place. This may result in low camera performance and low frame rates. See Section 3 for recommendations.

For USB 3.0, please refer to the Setting up a Stable USB 3.0 Camera System document. The document can be downloaded from the Basler website.

2.2 Checking Software Requirements

To use the driver, the following software must be installed on your system:
- Basler pylon NeuroCheck Driver, version 6.1
- Basler pylon Camera Software Suite, version 6.1
- NeuroCheck, version 6.2

You can download the pylon Camera Software Suite from the Basler website.

2.3 Configuring Your Network Adapter

By default, Basler GigE Vision cameras are configured to obtain their IP address automatically (no static IP address). We recommend that you also configure your network adapter to obtain IP addresses automatically. If there’s already another network adapter configured to obtain IP addresses automatically, consider configuring a statically addressed subnet.
1. Open the **Network Connections** window in the Windows Control Panel. For quick access, press the **Windows + R** keys, enter `ncpa.cpl` and press Enter.

2. Right click on the connection that is used for your cameras and select **Properties** from the context menu.

3. In the connection properties window, select **Internet Protocol Version 4 (TCP/IPv4)** and click the **Properties** button.

4. In the **Internet Protocol Version 4 (TCP/IPv4) Properties** window, you can configure automatic IP address allocation (see Figure 1) or manual input of the IP address (see Figure 2).

![Figure 1: Automatic IP Address Configuration](image1)

![Figure 2: Manual IP Address Configuration](image2)

For more information, see the **Network Configuration (GigE Cameras)** topic in the Basler Product Documentation.
2.4 Configuring Your GigE Vison Camera

To configure your camera’s IP address, you can use the Basler pylon IP Configurator.

Figure 3: pylon IP Configurator and IP Address Options

In the lower left area of the window, you can configure your camera’s IP address. Choose between Static IP, DHCP or Auto IP (LLA) and enter the IP configuration if necessary.

Figure 4: IP Address Options in pylon IP Configurator
2.5 Configuring Your USB3 Vision Camera

Typically, simply plugging in your camera should be sufficient for it to work. If problems occur, you can use the pylon USB Configurator to check for possible issues, e.g. incompatible ports, incorrect drivers, and insufficient bandwidth allocation.

![USB Configurator](image_url)

Figure 5: USB Configurator

The tool can be downloaded from the [Basler website](http://example.com) as part of the pylon Camera Software Suite. For more information, see the Overview of the pylon USB Configurator topic in the Basler Product Documentation.
2.6 Connecting Your Camera Using the NeuroCheck Software

Before accessing a camera device with the NeuroCheck software, the camera must be configured as a new device in NeuroCheck:

1. Open NeuroCheck.
2. In the Intro window, click New.
   This creates a new check routine.

3. In the toolbar of the check routine window, click the Device Manager button:

4. In the Device Manager window, click New ...
5. In the **Hardware Wizard** window, select **Digital camera** and click **Next**:

![Hardware Wizard](image1)

6. In the **Driver type** drop down list, select **Basler pylon camera driver** and click **Next**:

![Driver selection](image2)

7. In the list of available devices, select the devices that you want to use with the NeuroCheck software:

![Device selection](image3)
If the expected camera does not appear in the list, ensure that the camera is correctly connected to your PC and properly configured. Then, press the Rescan button to repeat the device discovery.

8. Click Finish.
9. The selected devices are now listed in the Device Manager window.

10. Select a device in the tree view on the left and click Properties…
11. Change the camera parameters as required by your application.

In the Driver type drop down list (see Figure 6), you can click **About** to display version information and driver settings, e.g. for logging:

![Figure 7: Driver and Version Information](image)

Interfacing Basler GigE and USB3 Vision Cameras with NeuroCheck
2.7 Acquiring Images Using NeuroCheck

In the toolbar of the check routine window, click the Live View button:

![Figure 8: Live View Button](image)

The Live View window opens, allowing you to grab images with your camera:

![Figure 9: Live View Window](image)

3 Troubleshooting

3.1 GigE Vision Cameras

3.1.1 Firewall Settings

Any application using the GigE Vision network protocol must be able to accept data from the camera on several different UDP ports. On systems equipped with a firewall, you should disable the firewall at least for the network adapter to which your camera is connected.

This especially applies to newer operating systems, as they handle firewall rules more strictly.

If you are using the Basler GigE Vision performance driver, the firewall setting is bypassed and has no effect on the camera stream channel (image grab) transmission.
3.1.2 Network Interface Controller (NIC) Settings

If image acquisition is unreliable, change, if applicable, the following settings of your network adapter card:

- **Packet size:** The maximum size of a data packet transmitted via Ethernet. By default, the packet size is set to 1500 bytes. This will be sufficient for most configurations. However, with more demanding camera models or inadequate hardware, it may be necessary to increase the packet size. This is possible because the GigE Vision stream can handle larger packet sizes than 1500 bytes. Basler recommends a significant increase of the packet size to up to 9014 bytes. This will reduce Ethernet overhead load and thus improve efficiency.

  - Increasing the packet size above 1500 bytes requires that you enable the so-called Jumbo Frames support on each involved network device including possible switches.
  - Whenever you increase the packet size for your network controller card, you must also adjust the packet size on camera side.

- **Ethernet flow control:** Basler recommends to enable Ethernet flow control if the network adapter supports it. This may decrease packet loss. If enabled, the streaming packet flow can pause and restart. This prevents the main memory from falling behind the packet processing.

- **Receive buffers:** The Ethernet adapter buffers received packets in so-called receive descriptors. If the number of descriptors for storing received camera stream packets is lower than actually required, the overflow will be lost. The number of buffers is essential to ensure high bandwidth stream transmission. The best choice is to increase the number of buffers to the maximum applicable value.

- **Interrupt moderation:** Controls how interrupts are received and handled. While normal traffic requires a lower rate of moderation, a typical GigE Vision stream demands more interrupt moderation. However, dealing with interrupt moderation affects the camera-to-network-adapter transmission as well as the CPU load. Try to find the optimum amount of moderation for your network configuration. Usually, the moderation can be set in predefined steps, e.g., Low, High, Extreme or Adaptive.

The parameters mentioned above can be found in the Windows Network Connections window. To access the window, right-click on your network adapter, select Properties and click Configure…

3.1.3 Transport Layer Settings

- **Packet Size:** Whenever you increase the packet size for your network controller card (see Section 3.1.2), you must also adjust the packet size on camera side. Make sure the value for the camera doesn’t exceed the values set for other communication partner devices. Otherwise, streaming may fail due to blocked packets.

- **Inter-packet delay:** If your Ethernet adapter or other devices can’t handle the incoming packet rate, it is useful to increase the delay between packet transmissions. This may reduce the amount of dropped packets.
3.2 USB3 Vision Cameras

**Throughput Limit:** If image acquisition is unreliable, you can limit the bandwidth of the USB interface. This can be enabled by setting the Throughput Limit Mode parameter to On and entering a maximum value for the bandwidth.

If the pylon software is installed with USB support, the USB Configurator application can be used to display USB device information and to create a report file.
### Revision History

<table>
<thead>
<tr>
<th>Document Number</th>
<th>Date</th>
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<tr>
<td>AW00139001000</td>
<td>25 July 2016</td>
<td>Initial release version of this document.</td>
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<td>Aligned document with the documentation delivered with the pylon NeuroCheck Driver package.</td>
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