
Readme for Basler pylon 2.3.x for Linux

Version 2.3.x

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Basler pylon 2.3.x for Linux Release for Use with Basler Gigabit Ethernet (GigE) Cameras

This document relates to Basler pylon 2.3.x for Linux software. You can download the software free of charge from the Basler website at <http://www.baslerweb.com>

You can also download the Installation Guide for Basler pylon 2.3.x for Linux (AW001004xx000) from the same website.

System Requirements

A GigE network adapter that supports jumbo frames is recommended. For best performance, we recommend using an adapter from the Intel PRO 1000 series. Although the pylon software will work with any GigE network adapter, we observed a significantly higher CPU load when grabbing image data with network adapters other than from the recommended Intel PRO 1000 series.

Installation

The installation of pylon 2.3 for Linux is described in the Installation Guide for Basler pylon 2.3.x for Linux.

Performance Optimization

To increase performance and to minimize CPU usage when grabbing images, the following settings should be considered:

- Enable Jumbo Frames

Many GigE network adapters support so-called jumbo frames, i.e., network packets larger than the usual 1500 bytes. To enable jumbo frames, the maximum transfer unit (MTU) size of the PC's network adapter must be set to a high value (see the description in the Installation Guide for Basler pylon 2.3.x for Linux). We recommend using a value of 8192.

- Increase the packet size

When jumbo frames are enabled, the camera's packet size must be increased to benefit from the larger packets. The 'Optimizing Packet Size' section of the Installation Guide for Basler pylon 2.3.x for Linux describes how to set the packet size.

- Real-time Priority

The GigE Vision implementation of Basler pylon software uses a thread for receiving image data. Basler pylon tries to set the thread priority for the receive thread to real-time thread priority. This requires certain permissions. The 'Permissions for Real-time Thread Priorities' section of the Installation Guide for Basler pylon 2.3.x for Linux describes how to grant the required permissions.

Documentation

The installation archive includes an HTML subfolder containing the Pylon Programmer's Guide and API reference documentation.

Sample Programs

The installation archive includes a set of sample programs. These sample programs are simple command line programs demonstrating the basic pylon use cases.

They are located in the 'Samples' folder. The folder contains a top-level Makefile that can be used to build the different sample programs.

Camera Emulator

In addition to the GigE Vision transport layer, this release contains a transport layer able to create simple camera emulator devices that allow you to develop applications without having a physical camera device attached. The emulator has very limited functionality, but is able to create test images for different bitdepths.

The number of available emulator devices can be controlled by exporting the `PYLON_CAMEMU` environment variable. For example,

```
export PYLON_CAMEMU=2
```

will provide two emulator devices. These devices are accessible both by using the pylon API and the pylon Viewer program.

When `PYLON_CAMEMU` is not set, no emulator devices are provided.

API Differences Compared to the Windows Version

Differences as compared to the Windows Version of the pylon API are described in the 'Differences Between the Linux and the Windows Versions of the pylon API' section of the 'The pylon 2.3 Programmer's Guide and API reference' html documentation.

Troubleshooting

Problem: I cannot see my camera in the pylon Viewer, even after waiting for more than one minute.

(Note: Depending on the camera's and adapter's IP configuration it can take up to one minute until a valid IP address is assigned to the camera.)

Solution: Start the Basler IP Configuration Tool (`/opt/pylon/bin/lpConfigurator`). Is the camera shown by the IP Configuration Tool?

If "yes", the camera's IP address is in a different subnet than the network adapter's IP address. Both the camera and the network adapter must use IP addresses within the same subnet. Refer to the Installation Guide for Basler pylon 2.3.x for Linux for IP address setup.

If "no", the most likely reason is an enabled firewall. As described in the Installation Guide for Basler pylon 2.3.x for Linux, disable the firewall for those network adapters to which cameras will be connected. If you don't have a firewall enabled reverse path filtering in the kernel may prevent detection of the camera. See the Installation Guide for Basler pylon 2.3.x for Linux for further details.

Problem: The IP Configuration Tool cannot see my camera due to a bad IP configuration. I'm not able to reconfigure the camera to make it visible again.

Solution: First make sure you don't have a firewall enabled on your network interface the camera is connected to.

If you still cannot see the camera reverse path filtering in the kernel may prevent the IP Configuration Tool to detect the camera.

On some kernels reverse path filtering may prevent the discovery of GigE Vision cameras. This can happen if the camera's IP is not within the same subnet as the network adapter the camera is attached to. Normally the IP Configuration Tool can handle this by using broadcast to discover the camera on any subnet. Reverse Path Filtering may prevent the IP Configuration Tool to receive the answer from the broadcast which in turn prevents the IP Configuration Tool from detecting the camera. To check whether filtering is turned on run the following command:

```
sysctl -a 2>/dev/null | grep '\.rp_filter'
```

In the output look for the following lines:

```
net.ipv4.conf.all.rp_filter=1
net.ipv4.conf.eth1.rp_filter=1
```

where `eth1` is the network adapter the camera is connected to.

The `net.ipv4.conf.all.rp_filter` is a global switch which must be turned off. The `net.ipv4.conf.eth1.rp_filter` tells whether filtering for the specified network adapter is activated. To disable filtering you must first turn off filtering for "all" and the specific network interface (in this sample `eth1`). Use the following commands to change the filtering behavior at runtime:

```
sudo sysctl net.ipv4.conf.all.rp_filter=0
sudo sysctl net.ipv4.conf.eth1.rp_filter=0
```

Restart the IP Configuration Tool and check whether the camera(s) are detected. Reconfigure the camera(s) and use "Write Configuration" to make your changes persistent. You can re-enable filtering by executing the same commands but set a value of 1. If you want to turn off filtering permanently you can edit the same values in `/etc/sysctl.conf`.

Problem: When grabbing images, the CPU load is higher than expected.

Solution: Ensure that jumbo frames are enabled and large network packets are used as described above in the 'Performance Optimization' section.

Problem: Grabbing images leads to errors with error code 0x81010014.

This error code indicates that the PC received incomplete images.

Solution 1: Ensure that jumbo frames are enabled as described above in the 'Performance Optimization' section. Also make sure that the camera's packet size is set to a high value if possible 8192.

Solution 2: Ensure that the application has the required permissions to set the pylon receive thread's priority to real-time thread priority as described in the Installation Guide for Basler pylon 2.3.x for Linux.

Solution 3: Check the cable. For GigE, Cat 5e cables are recommended. Poor cable quality or damaged cables can lead to unrecoverable transmission errors.

Solution 4: The amount of data produced by the camera(s) exceeds the amount of bandwidth the network adapter(s) or the PC can provide. Reduce the camera frame rate by increasing the camera's Inter Packet Delay parameter. When using the pylon API, the inter packet delay is controlled with the `GevSCPD` parameter.

Problem: The pylon viewer seems to acquire images but no images are displayed.

Solution: Start the pylon Viewer from the command line to see if the Viewer displays any messages.

Solution 1: The viewer only receives incomplete frames. In that case error messages such as 'Failed to grab image: GX status 0x81010014' are displayed. Please refer to the previous problem for tips about how to solve this issue.

Solution 2: No error messages are displayed. All data packets transmitted from the camera seem to be discarded. Make sure that the camera's current packet size doesn't exceed the network adapter's MTU size.

If the packet size is less than or equal to the MTU size, but greater than 1500, stop image acquisition and set the camera's packet size to 1500. Restart image acquisition. If an image is displayed using this packet size, either jumbo frames are not enabled on the network adapter or the adapter doesn't support jumbo frames.

Solution 3: Grabbing images is failing for other reasons. Please report the error messages displayed by the Viewer to Basler technical support.

Known Issues

- Same IP address for camera and network interface.

If the camera has been assigned a permanent IP address that equals the address assigned to the network adapter, the camera will not be accessible, even when using the IP configurator.

Either change the network adapter's address or use a different PC to assign a different IP address to the camera.

- Error messages displayed by the pylon Viewer when image acquisition is stopped.

When the pylon Viewer is started from a command line and image acquisition is stopped, the Viewer displays error messages such as "Failed to grab image: GX status 0x81010017". This diagnostic output indicates that image buffers have been cancelled by the pylon GigE vision library on user request instead of being filled with image data. This is expected behavior.

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