Nüvü Camēras
Installation Guide

Revision 4.8.0

every photon counts

Contents

Chapter 1

Requirements

- Operating system: Windows 7 or Linux 64 Bits (tested on Ubuntu 12.04 LTS and 16.04 LTS; CentOS 6 and 7)
- Minimum hard disk space: 1GB (additional hard disk space may be required for large volumes of acquired images)
- Recommended processor: 2.0 GHz
- Recommended memory: 2 GB (32-bit OS) or 4 GB (64-bit OS)
- Recommended software development environment for SDK use:
  - Windows: Microsoft Visual Studio 2005 or later. Tested with Microsoft Visual Studio versions 2010 and 2013.
  - Linux: GNU Compiler Collection (GCC).
- For the Camera Link interface, an available standard expansion card slot for the PCI Express (PCIe) 4X acquisition card is required.
- For the Gigabit Ethernet interface, an available Gigabit Ethernet port is required.

Chapter 2

Hardware installation

2.1 Camera Link Data Interface

The instructions listed below apply to cameras equipped with the Camera Link data interface. For cameras equipped with the GigE Vision data interface, proceed directly to section 2.2 below.

1. Shut down and unplug the computer.
2. Shut down and unplug all peripheral devices.
3. Disconnect all peripheral devices from the computer.
4. Ensure that appropriate static control procedures are in place to avoid damaging equipment.
5. Open the side panel of your computer.
6. Insert the PCI Express card into an available computer expansion slot and secure it with a screw.
7. Close the side panel of your computer.
8. Using the provided Camera Link cable, connect the camera to the PCI Express card via the slot labeled “0”. In the event of a PCI Express card with slots labeled “1” and “2”, connect the camera to the PCI Express card via the slot labeled “1”.
9. Connect all peripheral devices to the computer.
10. Connect the camera to the Nüvü Camēras power supply box.

11. Connect the Nüvü Camēras power supply box to a power outlet.
12. Connect the computer and all peripheral devices back to their respective power outlets.
13. If you intend to control the camera acquisition using external triggers, connect the camera trigger input to the trigger source using a coaxial cable.
14. If you intend to control external devices using the camera's shutter and/or acquiring and/or armed states, connect the Shutter and/or Fire and/or Arm outputs, respectively, to the appropriate devices using a coaxial cable.
15. Ensure that grounding is adequate. Power on the computer, camera and peripheral devices.
16. Wait until after software installation has been completed to power on the camera.

Your system is now ready for software installation. Please proceed directly to chapter 3.

2.2 GigE Vision Data Interface

The instructions listed below apply to cameras equipped with the GigE Vision data interface. For cameras equipped with the Camera Link data interface, refer to section 2.1 above.

1. Using the provided Ethernet cable, connect the camera to the computer via an available Gigabit Ethernet port.
2. Connect the camera to the Nüvü Camēras power supply box.
3. Connect the Nüvü Camēras power supply box to a power outlet.
4. Ensure that grounding is adequate.
5. Wait until after software installation has been completed to power on the camera.

Your system is now ready for software installation. Please proceed to chapter 3.

Chapter 3

Software installation

3.1 Installation for Windows

Note: Prior to installing your Nüvü Camēras software, please ensure that all Nüvü Camēras hardware has first been installed according to the instructions in chapter 2.

Otherwise, hardware communication errors may result in faulty software installation.

1. Connect the provided Nüvü Camēras USB key to the computer.
2. Open USB key drive.
3. Run installation\nc_camera_setup.exe.

4. The Welcome window (figure 3.1) will inform you of the version of the Nüvü Camēras software that will be installed. Click Next to continue.

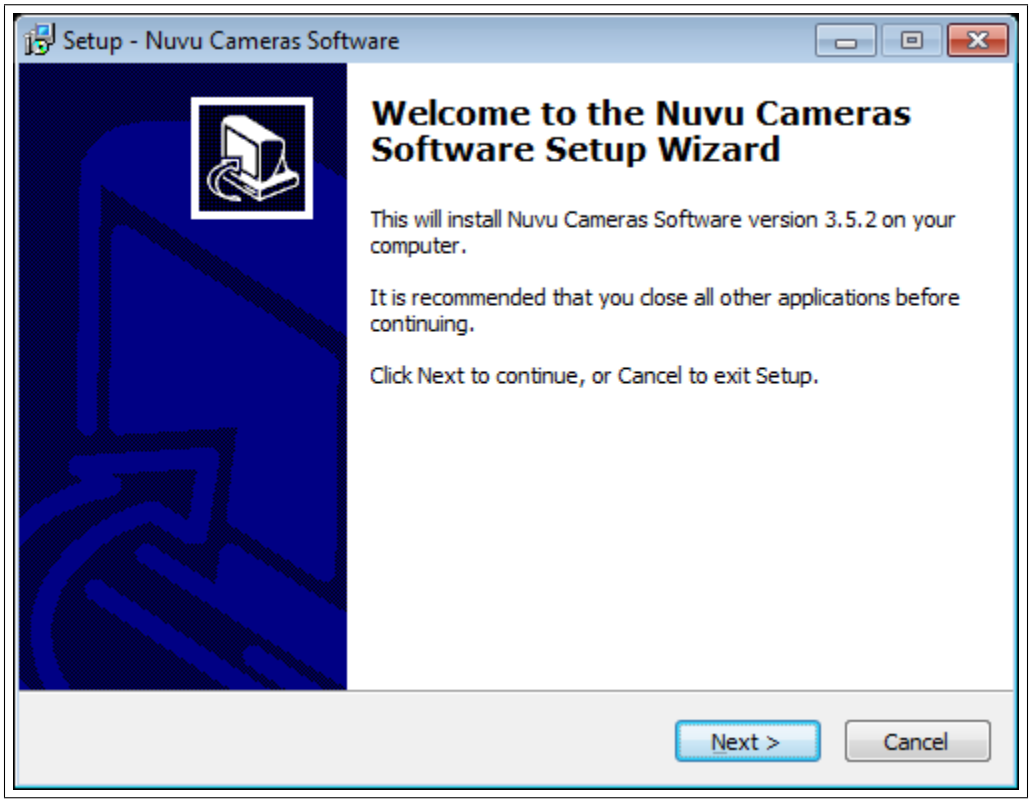

Figure 3.1: Setup welcome window

5. Fully read the licence agreement before proceeding. By continuing the installation, you agree to all terms and conditions as specified in the Licence Agreement (figure 3.2). Click Next to continue.

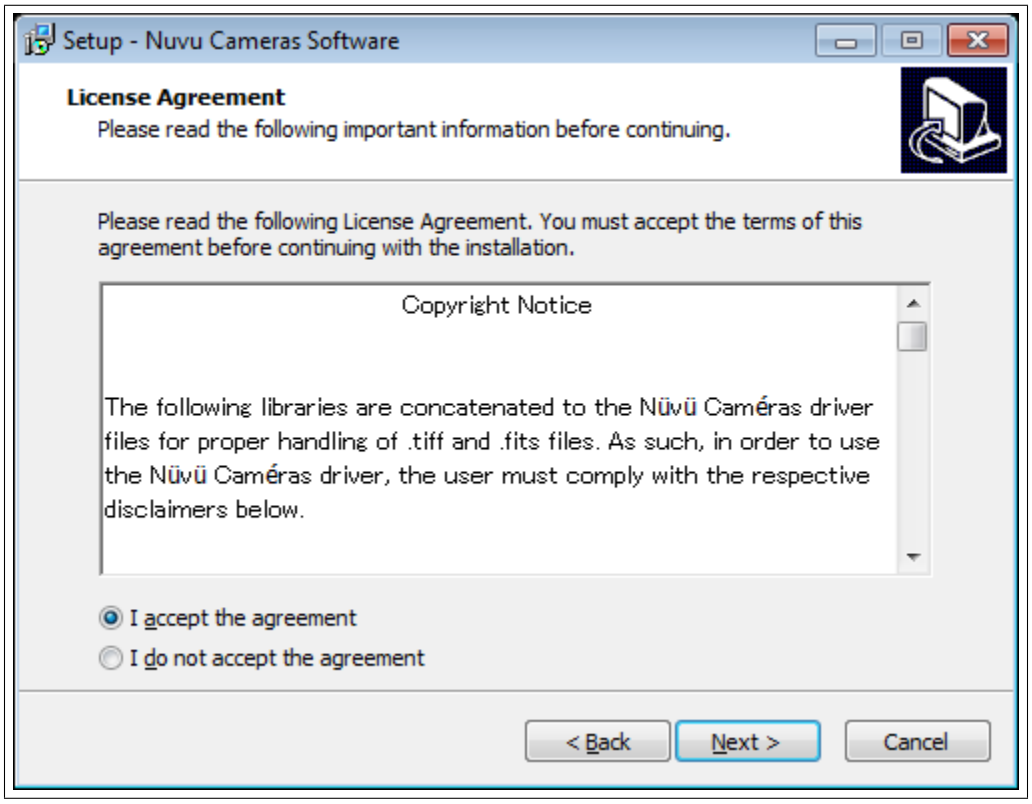

Figure 3.2: Licence Agreement

6. Select the location where the Nuvu Cameras software will be installed. The default location is C:\Program Files\Nuvu Cameras. This location can be changed using the Browse function (figure 3.3).

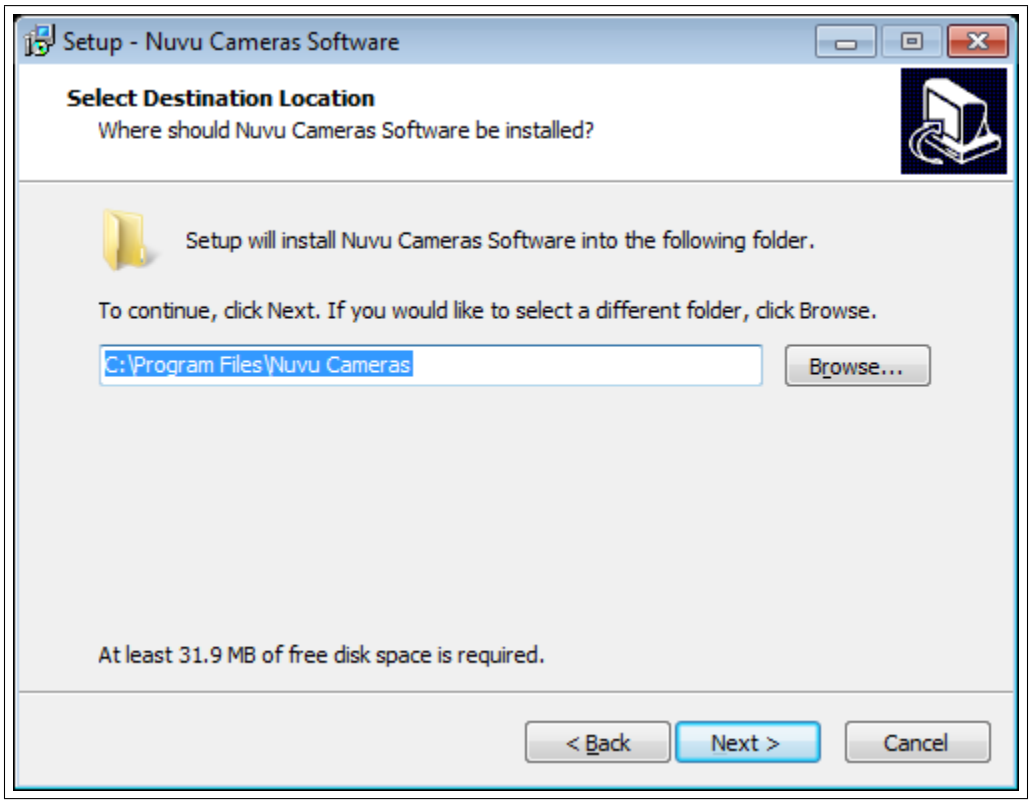

Figure 3.3: Destination selection

7. Select the name of the folder that will be created in the Start Menu (figure 3.4). Different files and features related to the Nüvü Camēras driver will also be available in this folder, including camera and software user manuals as well as some software examples using the software development kit (SDK). The default folder is Nuvu Cameras. This location can be changed using the Browse function.

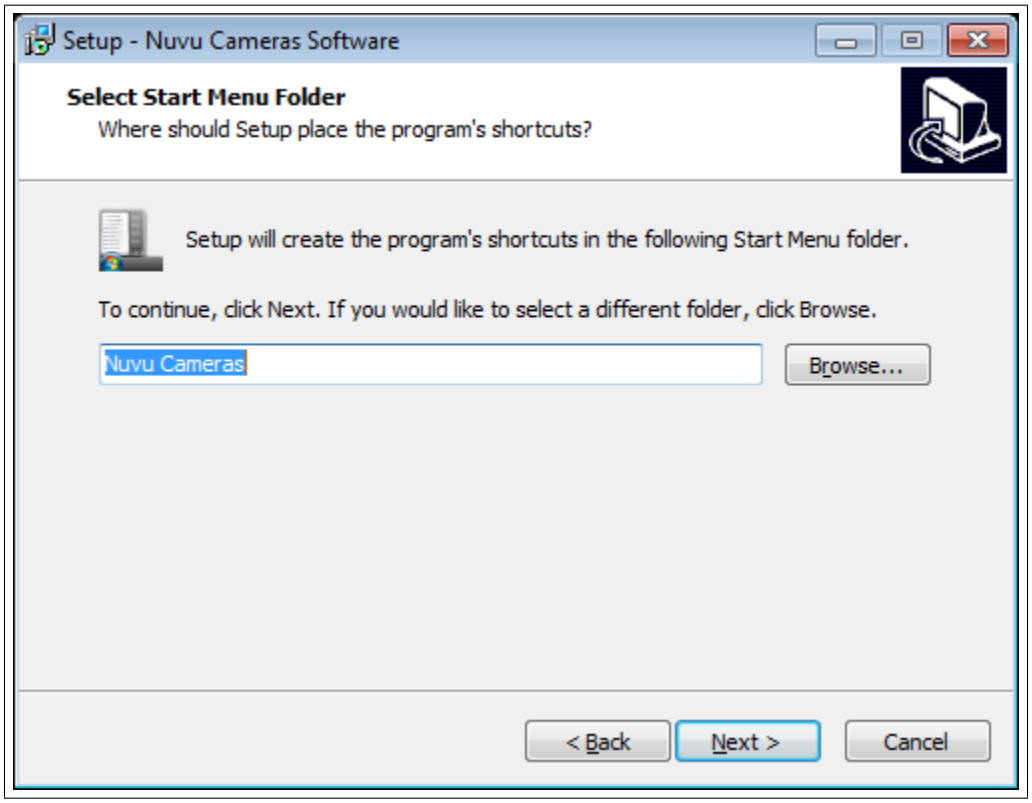

Figure 3.4: Start Menu folder selection

8. If the appropriate C++ Redistributable for Visual Studio is not already installed on the system, the Nüvü Camēras installer will begin its installation automatically.

9. After the installation has completed, a Nuvu Cameras folder will be available in the Start Menu (figure 3.5). This folder contains a section dedicated to the SDK, which includes documentation as well as some examples of implementation. There is also a section dedicated to NüPixel that includes the application itself, documentation and a shortcut to the image repository.

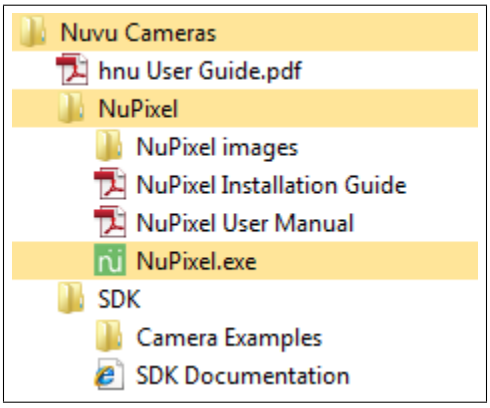

Figure 3.5: Start Menu folders

10. Finally, install the acquisition plug-in appropriate for the acquisition interface. The appropriate installation package and installation instructions are included in the provided Nüvü Camēras USB key in the directory installation\plugins.

11. Prior to first using the camera, please consult the provided documentation to fully benefit from the performance of all Nüvü Camēras products and to learn more about product warranties.

3.2 Installation for Linux

Prior to installing Nüvü Camēras software, please verify the following points :

1. All Nüvü Camēras hardware must already be installed according to the instructions in chapter 2. Otherwise, hardware communication errors may result in faulty software installation.
2. The installer requires `root` privileges (`sudo` may provide this for you if it has been suitably configured; in case of difficulty, consult your local systems administrator).
3. The computer must be connected to the Internet, as required packages may need to be downloaded during the procedure.
4. The Linux OS is up-to-date and currently running the latest kernel.

Note: You may want to consider disabling automatic kernel updates as they risk eventually invalidating any kernel modules associated with third-party drivers for the frame grabber supplied with your camera or controller.

3.2.1 Installation steps

1. Connect the provided Nüvü Camēras USB key to the computer.
2. Locate the `installation` directory on the USB key and copy the `NuvuSW_4.8.0-Linux*.tgz` file appropriate to your distribution (`Linux` = `EL` for Enterprise Linux, i.e. Scientific Linux or CentOS; `Linux` = `Ubuntu` for Ubuntu) to your home directory. If for example your username is `user_name`, then the file should be copied into the `/home/user_name` directory.
3. Open a new Terminal window.

   ```
   [user_name@host_name ~]$
   ```

4. Unpack the `.tgz` file.

   ```
   [user_name@host_name ~]$ tar -xz -f NuvuSW_4.8.0-Linux*.tgz
   ```

5. Step into the installer directory via `cd NuvuSW_4.8.0/NuvuInstaller`.

   ```
   [user_name@host_name ~]$cd NuvuSW_4.8.0/NuvuInstaller
   ```

6. Run the installer.

   Under Ubuntu proceed as follows:

(a) Run the installer as SuperUser via `sudo ./installNuvuCameras.sh`

```
[user_name@host_name NuvuInstaller]$ sudo ./installNuvuCameras.sh
```

(b) Enter the user password when prompted to do so.

```
[sudo] password for user_name:*******
```

Under Scientific Linux or CentOS proceed as follows:

(a) Run the installer as `root` via `su -c ./installNuvuCameras.sh`

```
[user_namer@host_name NuvuInstaller]$ su -c ./installNuvuCameras.sh
```

(b) Enter the `root` password when prompted to do so.

```
Password:
```

7. When prompted to continue, enter `y`.

   Note: The installation process may take several minutes. The installer will complete a number of tasks: install necessary packages; compile and install libraries; install dependencies required by Nüvü Camēras software; set environmental variables; create a group named `nuvu-cameras` (to which the current user is added); and set up symbolic links to the new shared libraries.

8. Eventually you will be prompted to install a plugin that provides a virtual camera framework that will allow you to use Nüvü Camēras software without a physical camera. Enter `y` or `n` to continue.

9. You will then be prompted to install third-party drivers for the frame grabber supplied with your camera or controller. Enter `y` to continue.

10. You will be prompted to identify the brand of frame-grabber supplied. This information should be available on the packing list that came with the camera. If you are not sure, you may identify the type of connector you will plug into the computer in order to connect to the camera.

    Note: Under Scientific Linux and CentOS, if Pleora is installed (for Gigabit Ethernet), SELinux will be configured as permissive and the firewall will be disabled.

11. If Pleora is installed (for Gigabit Ethernet), after the installation process is complete, you will also need to perform the following steps, as explained in section 3.2.2:

    (a) The configuration script must be manually configured to use the correct Ethernet interface for the camera.

(b) The network settings for the Ethernet interface may also have to be manually configured to avoid reconnecting to the network.

12. Any other users who will need to use the camera should be added to the group named `nuvu-cameras`.

13. A reboot is mandatory for the Nüvü Camēras drivers to function properly.

    Note: If the Nüvü Camēras hardware uses a Camera Link interface, always ensure that the camera is either off or unplugged when rebooting to avoid problems with the initialisation of the frame-grabber.

If the installation did not follow the complete procedure outlined above, examine carefully the output of the installation process and take any steps suggested. If an error was reported, please refer to the troubleshooting section 4.1.

All Nüvü Camēras files are installed in the `/opt/NuvuCameras` directory (see section 3.2.4), with the exception of the configuration file for `ld` which is installed at `/etc/ld.so.conf.d/nuvu.conf`. Installation of third-party drivers will install other files including some system configuration files. See below for details.

To verify that the installation was successful use the examples provided in the directories: `/opt/NuvuCameras/GrabExamples` or `/opt/NuvuCameras/CamExamples`, depending on the installation performed. These examples are source codes in `C` and must be compiled; a `Makefile` using GCC is provided for each example. If `NuPixel` was installed, you can verify the installation by running `NuPixel` from the `/opt/NuvuCameras` directory.

Prior to the first use of the camera, please consult the provided documentation to fully benefit from the performance of all Nüvü Camēras products. Also learn more about product warranties and safety precautions.

Plugin installation

If you have not installed any frame-grabber plugins during normal installation, you will not be able to use the camera until you run at least one of the frame-grabber plugin installers appropriate to your frame grabber hardware and then run `ldconfig` and reboot your system. The frame-grabber plugin installers are in the same directory as the `installNuvuCameras.sh` script and are as follows :
`nc-install-edt.bash`, `nc-install-matrox.bash` and `nc-install-pleora.bash`. Some may not be available, depending upon your particular OS.

Nüvü Camēras also provides some plugins which mimic or replace some of the behaviour of a frame-grabber. The installers for these plugins are as follows : `nc-install-virtual.bash`

and `nc-install-serial.bash`. The first provides access to the virtual camera framework that allows you to use Nüvü Camēras software without a physical camera. The second provides serial communication only (given a suitable adapter) which may be useful for configuring the camera for readout using the special features of the Nüvü Camēras SDK while receiving images through a custom frame-grabber implementation; please contact Nüvü Camēras if you would like to use this facility.

3.2.2 GigE configuration for Pleora

In order to use Gigabit Ethernet to connect with a suitably-equipped camera, the GigE interface intended for this purpose on the host computer must first be correctly configured. The `ReconnectPleora.sh` script, installed in the `/opt/NuvuCameras/tools` directory, should be used for this purpose. When the script is first run, it will list valid Ethernet interfaces that could be candidates for connecting to a camera equipped with a GigE interface; the present IP address of the interface (if any) is also indicated. Once you have determined which interface will be used you must edit the script, replacing the value of the `INTERFACE` variable with the chosen valid Ethernet interface. You must then run the script with root permissions before attempting to connect with the camera, and after any reboot of the host computer.

The script sets the IP address of the chosen interface to the default subnet used by Pleora GigEVision devices. It also attempts to optimise the parameters of the Network Interface Card (using `ethtool`) and relaxes the firewall for the chosen interface only (using `firewalld`).

Additional configuration of network settings

The following steps explain how to configure the network settings of the Ethernet interface so that it does not disconnect from the Nüvü Camēras hardware.

1. Right-click on the network connection icon at the top right corner of the screen: it will display several options.
2. Click ‘Edit Connections...’: the ‘Network Connections’ window will appear.
3. Under the ‘Wired’ tab, select the network interface to be used by your camera, then click on the ‘Edit...’ button: it will open a new window.
4. At the top left corner is the ‘Connect automatically’ check box: ensure that it is unchecked.
5. Click the ‘Save’ or ‘Apply’ button.

Pleora environmental variables script

The `nc-install-pleora.bash` script installs the `set_puregev_env.sh` script in the `/etc/profile.d` directory. During the booting process, it sets environmental variables needed by Nüvü Camēras software to run the plugin for cameras equipped with a GigE interface.

SELinux configuration (Scientific Linux and CentOS only)

Note that the configuration file `/etc/selinux/config` is replaced with a new file. This new file suppresses SELinux to allow the use of GigE to receive images. The original file will be saved as `/etc/selinux/config.bak`.

3.2.3 Serial device configuration for Matrox

In order for the Matrox frame grabber to properly use serial communication, permissions must be set on the correct serial device. This may be performed by the user with the script `/opt/NuvuCameras/tools/nc_serial_mil.sh` but should be done at start up by the upstart service defined in `/etc/init/nc_serial_mil.conf`. For these tools to work correctly, certain privileges must be given to the group named `mil` and specifically for the use of the command `setserial`. The `nc-install-matrox.bash` script adds privileges for the `mil` group to the `sudoers` file and installs the sudo config file `/etc/sudoers.d/mil_serial`. If you use a Matrox frame grabber, any other users who will need to use the camera should be added to `mil` group.

3.2.4 The `/opt` directory

This directory contains all the software needed to use and develop applications for Nüvü Camēras products.

- The `/opt/NuvuCameras` directory contains links to the installed applications (i.e. `NuPixel` or the components of `cccpSuite`) as well as configuration files.
- The `/opt/NuvuCameras/tools` directory contains scripts for ensuring the correct system configuration and an uninstall script. If the network adapter needs to reconnect to a Gigabit Ethernet equipped camera, the script `ReconnectPleora.sh` found in this directory can be executed by the user (requires `root` permissions). To ensure the correct serial permissions for communicating with a Camera Link equipped camera via a Matrox Solios acquisition board, the script `nc_serial_mil.sh` found in this directory

can be executed by the user (requires `root` permissions): note that the upstart service configuration file `nc_serial_mil.conf` performs the same task automatically at start-up.

- The `/opt/NuvuCameras/bin` directory contains the executables for installed applications
- The `/opt/NuvuCameras/lib` directory contains the libraries needed to make use of the camera, whereas `/opt/NuvuCameras/include` contains the headers files for `C` compilers.
- The `/opt/NuvuCameras/include` directory contains the header files needed to compile the examples or any applications you may write that use the Nüvü Camēras SDK
- The `/opt/NuvuCameras/CameraExamples` directory contains several examples in `C` along with their respective `Makefiles`, these examples will help understanding how to use the camera.
- The `/opt/NuvuCameras/GrabExamples` directory contains several examples in `C` along with their respective `Makefiles`, these examples will understanding how to use the controller.
- The `/opt/NuvuCameras/LockFiles` directory is a location for file-backed shared memory access across all programs using the Nüvü Camēras SDK, notably allowing the safe use of multiple cameras by multiple programs concurrently.
- The `/opt/NuvuCameras/Plugins` directory contains files necessary for the Nüvü Camēras software to exploit third-party drivers for connecticvity between the camera and the host.
- The `/opt/pleora`, `/opt/EDTpdv` and `/opt/mil` directories contain third-party drivers that are required to allow connectivity between the camera and the Nüvü Camēras software running on the host.

Note: The following files and folders might not be installed depending on the Nüvü Camēras and third-party hardware used :
`NuPixel` and `/opt/NuvuCameras/CameraExamples`, or `cccpComm`, `cccpServer`, `cccpView`, and `/opt/NuvuCameras/GrabExamples`; `/opt/EDTpdv`; `/opt/pleora` and `ReconnectPleora.sh`; `/opt/mil`, `nc_serial_mil.sh` and `nc_serial_mil.conf`.

Chapter 4

Troubleshooting

4.1 Difficulties encountered during installation

4.1.1 Failure to install Qt libraries from the KDE repository

This problem affects only installation on Linux systems, specifically Scientific Linux or CentOS.

The required version of Qt for Nüvü Camēras GUI software is made available by the `kde-redhat` repository and depends upon the `kdebase` package. An earlier version of the contents of that package was supplied by the `kde-baseapps` package. If this package has been installed on your system, to ensure that the package manager (`yum`) correctly switches dependencies to the newer version it is necessary to execute the following command :

```
[user_name@host_name ~]$ su -c "yum upgrade kdebase"
```

The Nüvü Camēras installer will now be able to proceed without error; return to the process outlined in section 3.2.1.

4.2 Difficulties encountered interfacing with a camera or controller

4.2.1 PCI Express drivers for Camera Link frame grabbers

For cameras equipped with the Camera Link data interface, problems may arise if the Nüvü Camēras software was installed on the system prior to installing the PCI Express card.

Under Windows, to resolve these issues please follow the procedure detailed below :

1. Open the Control Panel.
2. Select Administrative Tools –> Computer Management –> Device Manager.
3. On the right side of the window, open the "PCI Devices" section, in which there should appear an icon with an exclamation mark warning.
4. Right-click on this icon and select "Update Driver".
5. Select "Search using a specific location" and browse for the path that was entered when the Nüvü Camēras software was first installed. If the default path was used, it will be in Program Files\Nuvu Cameras.
6. Select the "Driver" folder from the specified path.

Under Linux, re-install the Nüvü Camēras software and third-party drivers :

1. Open a new Terminal window.

   ```
   [user_name@host_name ~]$
   ```

2. Execute the uninstall script with `root` permissions.

   Under Ubuntu proceed as follows:

   (a) Run the script as SuperUser via `sudo /opt/NuvuCameras/tools/uninstall.sh`

   ```
   [user_name@host_name ~]$ sudo /opt/NuvuCameras/tools/uninstall.sh
   ```

   (b) Enter the user password when/if prompted to do so.

   ```
   [sudo] password for user_name:*******
   ```

   Under Scientific Linux or CentOS proceed as follows:

   (a) Run the script as `root` via `su -c /opt/NuvuCameras/tools/uninstall.sh`

   ```
   [user_namer@host_name ~]$ su -c /opt/NuvuCameras/tools/uninstall.sh
   ```

(b) Enter the `root` password when prompted to do so.

```
Password:
```

3. Reboot and repeat the installation procedure described in section 3.2.1

4.2.2 Failure to set readout mode using Matrox with large detectors

The default non-paged memory reserved by the Matrox drivers may not be sufficient when using large detectors. Modify the configuration of the Matrox Imaging Library installed on your system using the utility located, under Windows, in the Start Menu in :

"All Programs –> Matrox Imaging –> Tools –> MilConfig"

or, under Linux, at :

`/opt/matrox_imaging/tools/milconfig`

Proceed as described below :

1. Launch the MIL configuration utility.
2. Open the MIL Non-Paged Memory configuration panel (figure 4.1).
3. Increase the Requested Non-Paged Memory Size. The recommended amount of memory for using a 1024x1024 CCD with NuPixel is 128 MB.
4. Click Apply and reboot your computer.

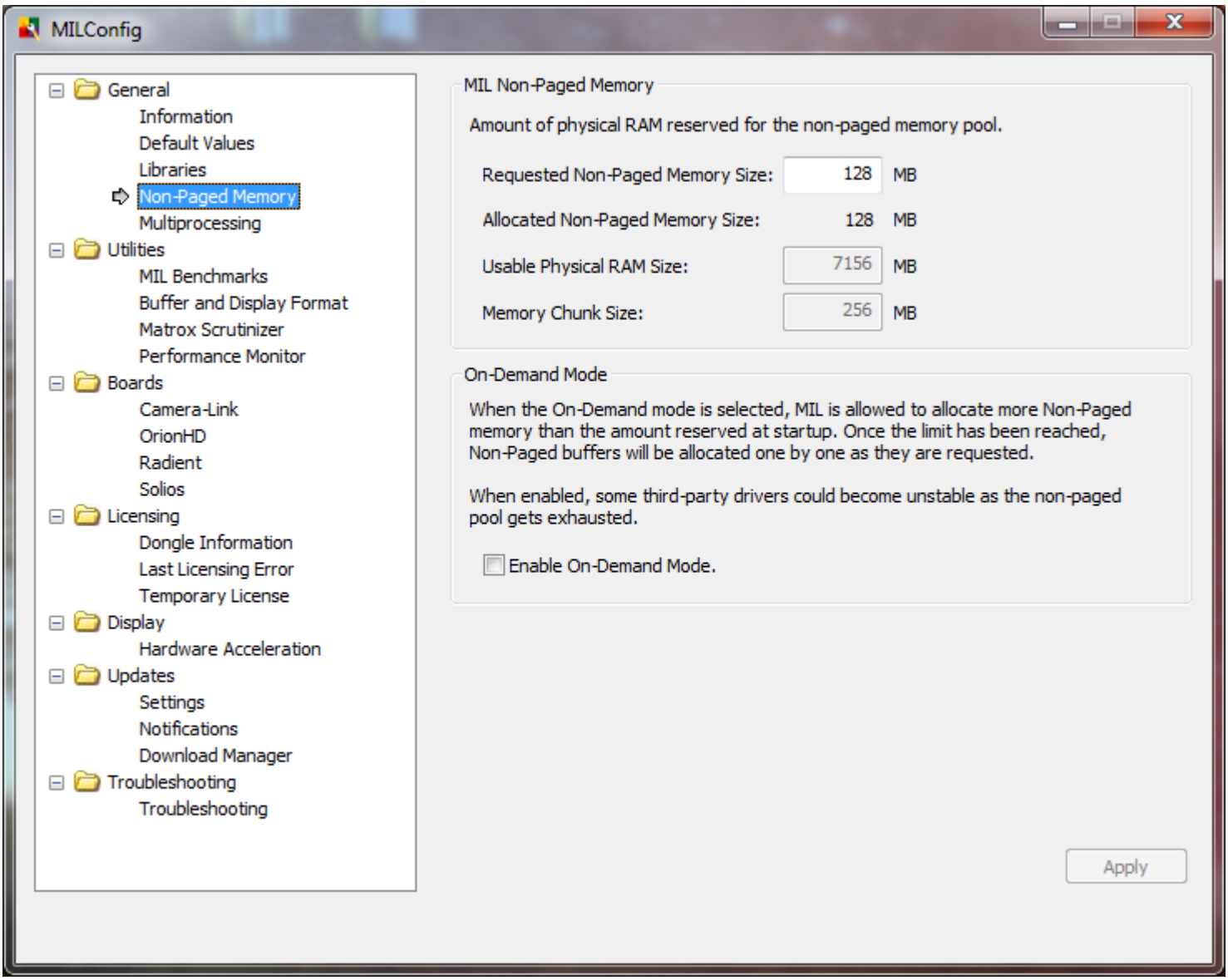

Figure 4.1: MIL configuration utility

4.2.3 Failure to communicate with a camera using EDT

Under Linux, this may occur if a kernel update has rendered the EDT kernel module incompatible. Check for the required kernel module as follows :

1. List the installed EDT kernel module for the current kernel.

   ```
   [user_name@host_name ~]$ ls -lht /lib/modules/$(uname -r)/kernel/drivers/misc/edt.k
   ```

If the required kernel module was not found re-compile the EDT kernel module as follows :

1. Ensure that no software is using the EDT frame grabber.
2. Navigate to the EDT installation directory.

   ```
   [user_name@host_name ~]$ cd /opt/EDTpdv
   ```

3. As a precaution, unload the EDT kernel module (requires `root` permissions).

   ```
   [user_name@host_name ~]$ sudo ./edt_unload
   ```

4. Re-build the EDT kernel module (requires `root` permissions).

   ```
   [user_name@host_name ~]$ sudo make -C ./module cleano default
   ```

5. Re-load the EDT kernel module (requires `root` permissions).

   ```
   [user_name@host_name ~]$ sudo ./edt_load

   [root@host_name ~]# exit
   ```

6. Confirm that the problem has been resolved by connecting to the camera with `NüPixel`.

4.2.4 Missing or corrupted images with a camera using EDT

Images may not be received correctly by an EDT frame-grabber if the camera was running and connected to the frame-grabber when the host system was started up. Disconnect the cable connecting the camera to the EDT frame-grabber or power-off the camera before rebooting the host system. Reconnect the cable after the reboot.

4.2.5 Failure to communicate with a camera using GigE

IP address

Cameras using a GigE interface will fail to communicate if your Ethernet adapter is set to an incompatible static IP address.

Under Linux, the `ReconnectPleora.sh` script solves this problem by setting the required subnet mask and an appropriate IP address; it must be run with `root` permissions.

Under Windows, follow these instructions to set your IP automatically :

1. Open the Control Panel
2. Click on Network and Internet
3. Click on Network and Sharing Center
4. Click on Change adapter settings
5. Right-click on the Ethernet adapter to be used with the camera
6. Click on Properties
7. Double-click on Internet Protocol Version 4 (TCP/IPv4) item (figure 4.2)
8. Select the Obtain an IP address automatically option (figure 4.3)
9. Click Ok

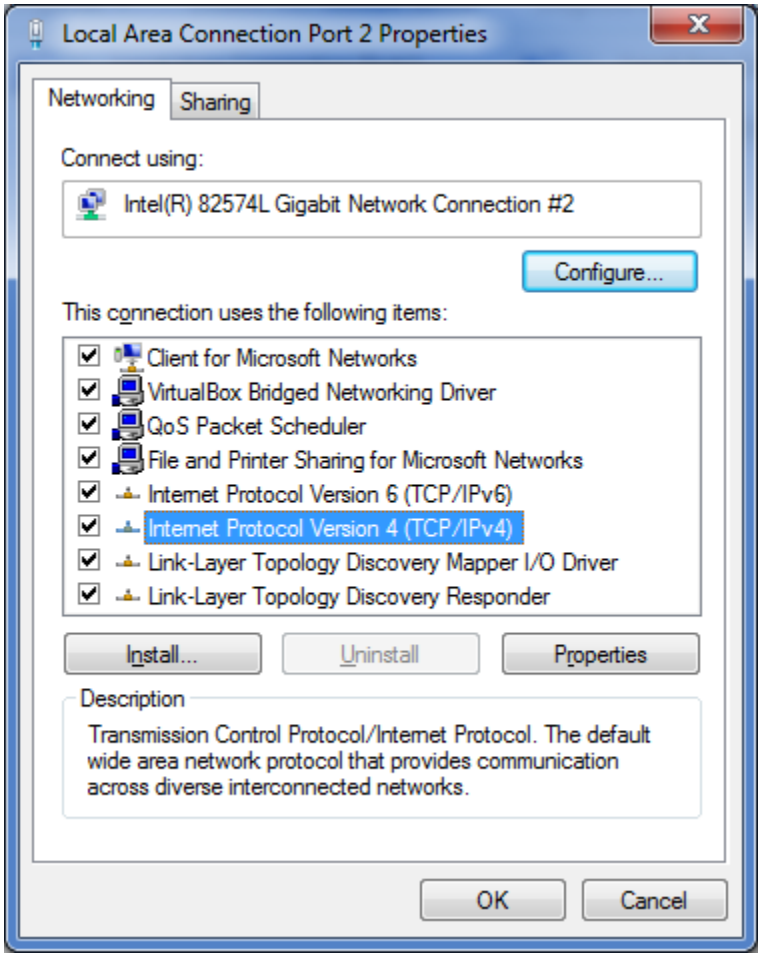

Figure 4.2: Ethernet Adapter Settings

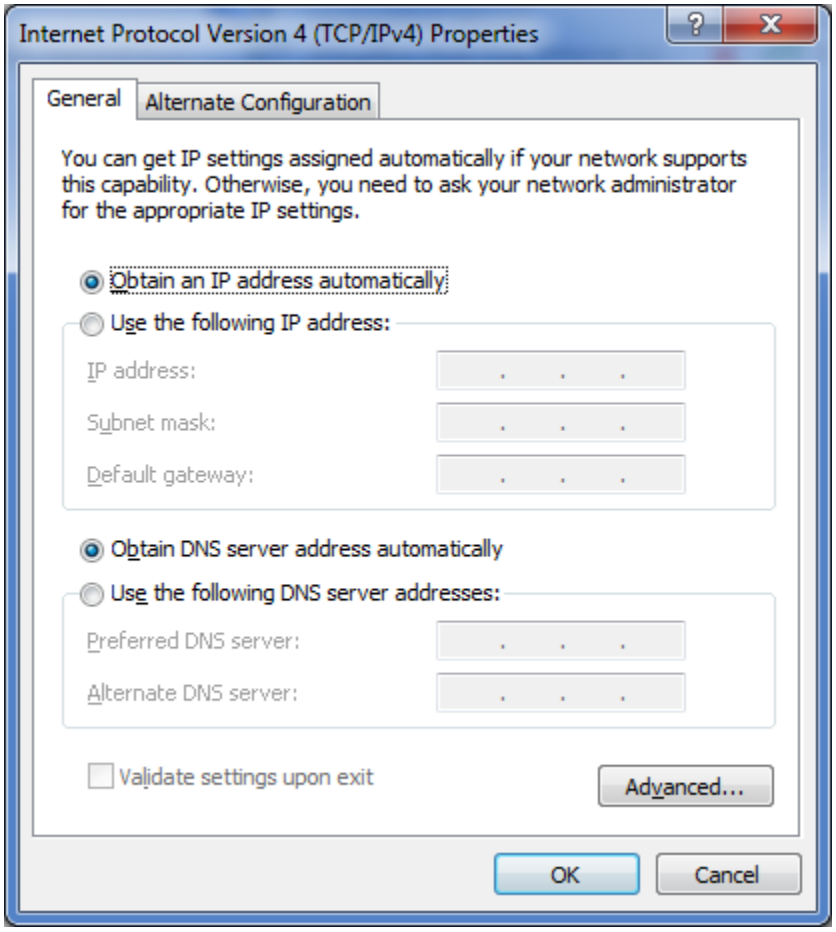

Figure 4.3: Obtain an IP address automatically

GenICam parameters

Certain installations of the third-party drivers for GigE on Ubuntu 12.04 fail to have appropriate permissions to properly interpret the GenICam parameters related to the camera's GigE interface. To restore the correct permissions within the third-party drivers, follow the following procedure :

1. Ensure your camera is connected to the required Ethernet port.
2. Run the `ReconnectPleora.sh` script (see 3.2.2); it must be run with `root` permissions.
3. Open a `bash` shell with `root` permissions.

   ```
   [user_name@host_name ~]$ sudo bash
   ```

4. Enter the user password when/if prompted to do so.

   ```
   [sudo] password for user_name:*******
   ```

5. Load the environment required by the third-party drivers.

   ```
   [root@host_name ~]# . /opt/pleora/ebus_sdk/Ubuntu-12.04-x86_64/bin/set_puregev_env
   ```

6. Run the tool supplied by the third-party software suite (`eBUSPlayer`): it will launch a GUI.

   ```
   [root@host_name ~]# eBUSPlayer
   ```

7. Turn on your camera.
8. In the `eBUS Player` GUI, click the 'Select/Connect' button: a new window will open entitled 'Device Selection' showing a list of available Network Interfaces. After up to a minute, the GigE device of your camera (called NTx-Mini) should appear in the list associated with the Network Interface controlled by the `ReconnectPleora.sh` script. If your camera does not become available in the list after two minutes, turn it off and ensure that it is connected to the correct Ethernet port before repeating this procedure.
9. When your camera becomes available in the list, click on it to select it and then click on the 'OK' button.
10. You may now click on the 'Disconnect' button and exit `eBUSPlayer`.
11. Exit the bash shell.

    ```
    [root@host_name ~]# exit
    ```

12. Confirm that the problem has been resolved by connecting to the camera with `NüPixel`.

4.2.6 Only one user can connect to a camera using GigE on a particular Ethernet port

Under Linux, if a program using Pleora's eBUS_SDK to connect to a camera over Gigabit Ethernet has crashed, it may leave in place lockfiles, specific to that Ethernet port, owned by the user who had exectued the program in question. Other users will subsequently be prevented from connecting over that specific port. A workaround for this problem is to correct the permissions on the lockfile in question. The specific file depends on the MAC address of the host's Ethernet port affected and can be found at :

`/dev/shm/sem.eBUS_SDK_<MAC_ADDRESS>_mem`

where `<MAC_ADDRESS>` has the format `xx_xx_xx_xx_xx_xx`. The file should have permissions `rwxrwxr-x` instead of the default `rwxr-xr-x`. To correct them perform the following :

1. Open a new Terminal window.

   ```
   [user_name@host_name ~]$
   ```

2. Modify the permissions of the eBUS_SDK lockfile using the `chmod` command.

   ```
   [user_name@host_name ~]$ chmod g+w /dev/shm/sem.eBUS_SDK_<MAC_ADDRESS>_mem
   ```

4.2.7 Missing or corrupted images with a camera using GigE

In some cases, GigE vision devices send network packets that are larger than expected. This can lead to missing or corrupt images unless the Jumbo Packet option is enabled.

Under Linux, the `ReconnectPleora.sh` script solves this problem by setting the MTU of the adapter; it must be run with `root` permissions.

Under Windows, follow these instructions to enable the Jumbo Packet option :

1. Open the Control Panel
2. Click on Network and Internet
3. Click on Network and Sharing Center
4. Click on Change adapter settings
5. Right-click on the Ethernet adapter to be used with the camera
6. Click on Properties
7. Click on the Configure... button

8. Click on the Advanced tab
9. Select the Jumbo Packet option (figure 4.4)
10. Select 9014 Bytes from the Values dropdown list
11. Click Ok

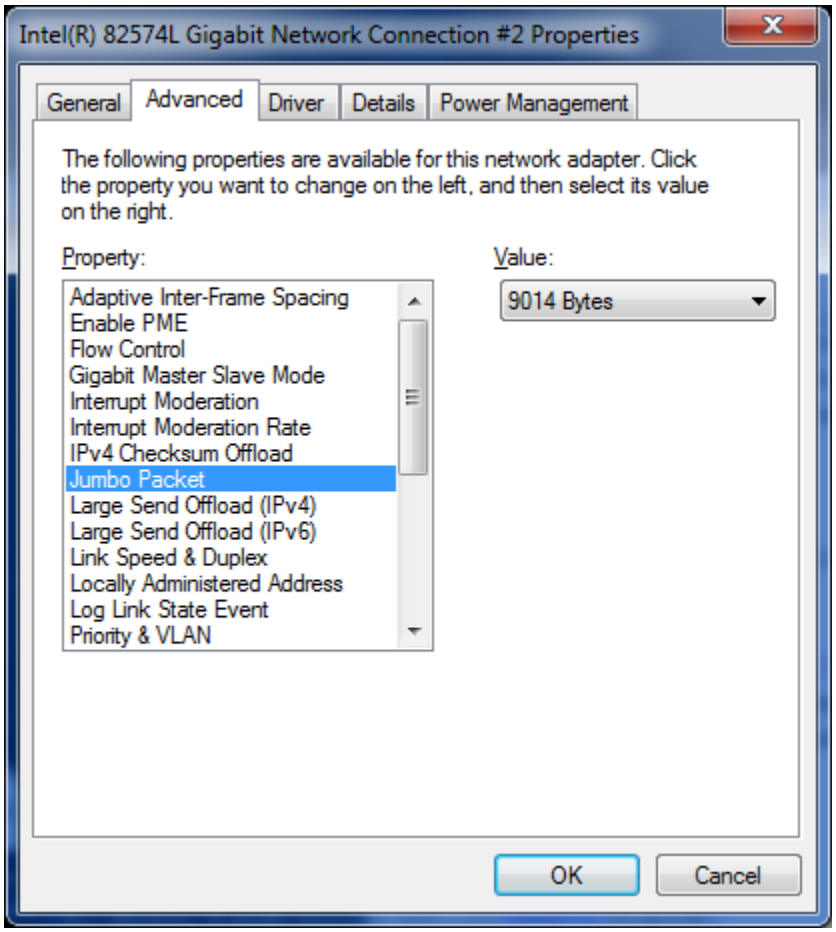

Figure 4.4: Activating Jumbo Packets