Technical Note

Getting Started with GenICam for CSI-2 and Vimba X

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Purpose and scope of this document

You can access Alvium 1800 C cameras with CSI-2 interface via:

- V4L2 (Video for Linux 2) Access
- Direct Register Access
- GenICam for CSI-2 Access - enables camera access via Vimba X CSI-2 transport layer

This document summarizes what you need to know to use Alvium CSI-2 cameras with Vimba X:

- Compatibility
- Installation
- Known issues and restrictions
- Questions and answers
- Further readings

This document covers software topics. For hardware installation instructions, see section Further readings.

Compatibility

Vimba X

This document is valid for **Vimba X for ARM 2023-2.**

Supported Alvium CSI-2 camera models

Vimba X supports all Alvium 1800 C camera models with CSI-2 interface. The Firmware Updater can additionally be used with Alvium 1500 C cameras with CSI-2 interface. Please use the latest firmware for best compatibility and performance with your ARM board or SOM.

Multiple camera support

If supported by the ARM board and adapter board, you can connect and operate multiple Alvium cameras.

Compatible ARM boards and drivers

The CSI-2 transport layer contained in Vimba X can be used with several ARM boards / SOMs and drivers available on GitHub:

- Compatible NVIDIA SOMs, JetPack versions, and the latest versions of the driver: https://github.com/alliedvision/linux_nvidia_jetson
- i.MX 8M Plus Evaluation Kit (Yocto): https://github.com/alliedvision/alvium-manifest-imx8mpevk
- AMD Xilinx Kria KV260 (Yocto): https://github.com/alliedvision/alvium-manifest-kv260
- AMD Xilinx ZCU106 Eval Kit (Yocto): https://github.com/alliedvision/alvium-manifest-zcu106

Installation

Yocto

Please follow the instructions in the previously listed GitHub repositories the to install Vimba X on the supported boards.

NVIDIA Jetson

Prerequisites

The following prerequisites are required for the driver installation:

- Host PC with Ubuntu 18.04 or 20.04 (required to install JetPack on the target board)
- NVIDIA Jetson AGX Xavier developer kit or Xavier NX developer kit

You can connect your Alvium CSI-2 camera to the Jetson board before or after the driver installation.

Backup of your Jetson board

Before starting the installation, create a backup of your Jetson board.

Step 1:   Install JetPack

You can skip this step if JetPack 5.1.0 is already installed.

To install JetPack, we recommend using [NVIDIA SDK Manager](#).

1. Connect your Jetson board to the host PC as per NVIDIA's instructions.
2. Download NVIDIA SDK Manager to your host PC.
3. Install JetPack 5.1. (L4T 35.2.1), following the instructions of NVIDIA SDK Manager: https://developer.nvidia.com/embedded/jetpack-archive. Higher JetPack versions are currently not supported.

Step 2:   Install the the Alvium CSI-2 driver

4. Go to https://github.com/alliedvision/linux_nvidia_jetson.
5. The driver version that was tested with Vimba X 2023-1 is available in the master branch and tagged with l4t-35.2.1-5.1.0.
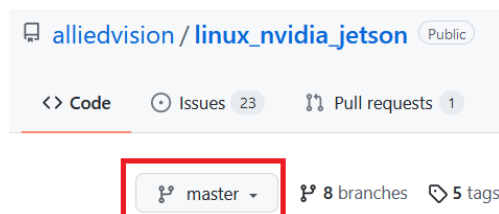
6. Follow the instructions of the Readme on GitHub.

Step 3:   Install Vimba X

You can download and install [Vimba X for ARM64](#) "as usual".
If you need instructions, please read the [Release Notes](#).

Step 4:   Check and update the camera firmware version

Check the camera firmware version of your Alvium CSI-2 camera with Vimba X Firmware Updater. You can find the current firmware version at:
https://www.alliedvision.com/en/support/firmware-downloads/

Known issues and restrictions

Please note the following known issues and restrictions (valid for operating the camera with Vimba):

- Please use "alloc and announce" for best possible performance, see the AsynchrounousGrab example (C++: Program.Config.h, optional parameter /x, C: Program.c, optional parameter /x, Python: optional parameter /x).
- If your application causes dropped frames, try to increase the number of frame buffers from 3 (default) to approximately 7.
- Switching the camera from GenICam for CSI-2 to V4L2 or vice versa requires rebooting the board.
- After running the Device Reset GenICam command, we recommend to reboot the board.
- Exposure times greater than approx. 1 second: Stopping acquisition may cause an error. Please close and open the camera to start streaming again.
- Issues that may occur occasionally:
  - Python API: The first acquired images may get lost, especially with high frame rates.

Camera firmware issue:
The camera always opens with default settings when *GenICam for CSI-2* is used. You can find more details about the firmware in the Firmware Release Notes.

Questions and answers

Question: Are Vimba X CSI transport layer and Alvium 1800 C cameras GenICam-compliant?
Answer: In contrast to GigE Vision and USB Vision, MIPI CSI-2 is not officially designed for GenICam-compliance. The Vimba X CSI-2 TL is compliant to the GenICam GenTL standard, so that Allied Vision CSI-2 cameras can be used like any other GenICam devices.

Question: Can I use Vimba X Firmware Updater for firmware versions that are incompatible with *GenICam for CSI-2*?
Answer: Yes, you can use Vimba X Firmware Updater for firmware versions that are incompatible with *GenICam for CSI-2* and continue using your camera with V4L2. You can even use the Vimba X Firmware Updater with Alvium 1500 C cameras.

Question: Can I use the driver with both V4L2 and Vimba X?
Answer: Yes, you can use the driver with V4L2 and Vimba X, but not at the same time. To switch between V4L2 and *GenICam for CSI-2*, please reboot the board before using the cameras with Vimba X. Without rebooting, image acquisition is not possible.

Question: If I set camera features with the V4L2 API and use the camera with *GenICam for CSI-2* later (or vice versa), are the settings retained ?
Answer: No, the settings are not retained, the camera opens with default settings.

Question: Does Vimba X automatically find and list Alvium 1800 C cameras?
Answer: Yes, Vimba X finds and lists Alvium 1800 C cameras automatically.

Question: Can I use an Alvium MIPI CSI-2 camera model that is currently not listed as supported?
Answer: Alvium 1500 C cameras are designed for use with V4L2 only. If you want to use an Alvium 1800 C model that is currently not listed as supported, please contact us.

Question: With the V4L2 API, some custom Jetson pixel formats deviate from the standard. Is this also the case when I use the Vimba X CSI TL?
Answer: No, the Vimba CSI TL represents GenICam/PFNC pixel formats without deviations.

Question: Can I prototype my vision application with an Alvium USB camera on a PC and reuse the source code with an Alvium CSI-2 camera and an ARM board?
Answer: Yes, Vimba X is platform-independent and the Alvium USB and MIPI CSI-2 camera feature behavior is designed in a consistent way. As always, check which features might be available on one camera interface only. To cross-compile your code, read [Cross-Compiling Vimba X Source Code to ARM](#). If you have questions, our experienced [Technical Support](#) team is happy to help!

Further readings

For **camera documentation**, visit:
https://www.alliedvision.com/en/support/technical-documentation/alvium-csi-2-documentation/

The *Alvium CSI-2 Camera User Guide* is the basis document. It provides camera specifications, hardware installation instructions, and links to other documents and webpages.
Alvium USB and CSI-2 cameras share a common *Features Reference* document, which is also available from the link above.

Software documentation:
Vimba X documentation is contained in the Vimba X SDK and on https://docs.alliedvision.com/

Useful application notes:
- [Optimizing the Performance of Jetson](#)
- [Cross-Compiling Vimba X Source Code to ARM](#).