

Movidius™

CDK User Guide for Myriad 2

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Revision History

Date	Version	Description
May 2018	1.0	Initial version.
August 2018	1.1	Added new use-cases: 3xIMX208 and 1xIMX214 + 2xIMX208.

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1 Introduction

This document describes the functionality and any known issues for the Camera Development Kit for the Myriad 2 processor (MA2x5x).

1.1 Intended Audience

This document is intended for users of the Myriad 2 Camera Development Kit (CDK) to enable them become familiar with the ISP pipeline on the MA2x5x processor.

This document assumes the reader is familiar with the Myriad 2 processor [1], the Myriad Development Kit (MDK) [2, 3] and the development board (MV0212) hardware platform [4].

1.2 Scope of the CDK release

This document describes the CDK for the Myriad 2 Development Kit Software Release v18.08 providing information on the following:

- Supported software capabilities and features in the CDK.
- Build and install instructions.
- How to run the CDK applications.

1.3 Dependencies

WARNING: This version of the CDK is built with the Movidius MDK release package v18.08 and Tools release v18.06.6. The complete MDK release package can be downloaded from <https://www.movidius.org/>.

The CDK GUI PC application to control/view the streams from the development board, MultiCameraAppForVPUs, is built and runs on Ubuntu Linux 16.04 LTS 64-bit.

1.4 Licensing Information

Use of this software is covered by the appropriate Intel Movidius Software License Agreement.

1.5 Disclaimer

The information in this document and any document referenced herein is provided for informational purposes only, is provided AS IS AND WITH ALL FAULTS and cannot be understood as substituting for customized service and information that might be developed by Intel Movidius for a particular user, based upon that user's particular environment. RELIANCE UPON THIS DOCUMENT AND ANY DOCUMENT REFERENCED HEREIN IS AT THE USER'S OWN RISK.

1.6 Support Information

For MDK support you can post your questions on tickets at <https://www.movidius.org/>.



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1.7 Referenced Documents

Ref. #	Document	Revision
1	Myriad 2 MA2x5x Databook	0.98
2	MDK MA2x5x Getting Started Guide	3.8
3	MDK MA2x5x Programmer's Guide	4.61
4	MDK MA2x5x MV0212 User Manual	1.2

2 CDK Overview

2.1 Features and Capabilities

The Movidius Camera Development Kit (CDK) for the Myriad 2 processor [1] is intended for users developing camera or image processing pipelines.

The CDK provides a number of multi-camera deployments to show the capabilities of the processor and to provide a starting point for users developing their own image processing or camera applications.

2.2 Hardware

The CDK runs on the mv0212 development board (see reference [4]).



Figure 1: CDK mv0212 Development board

2.3 Software

The development platform for this CDK release is Ubuntu 16.04 LTS 64-bit.

The CDK provides software for the following:

1. Source code for building CDK application use-cases on MA2450.
2. CDK GUI application for controlling and previewing video streams from applications.

The CDK comes with the following use-cases for the Myriad 2 processor:

1. cdk_FLIC_1xIMX214 – one 13MP master on CamA, frames stored in DDR before ISP processing.
2. cdk_SrcLsp_1xIMX214 – one 13MP master on CamA, frames fed directly to ISP hardware (sensor raw frames not stored in DDR).
3. cdk_FLIC_1xIMX214_2xIMX208 – one 13MP master on CamA and one master and one slave 2MP sensors on CamB.
4. cdk_FLIC_3xIMX208 – one 2MP master on CamA and two 2MP masters on CamB.

Sensors are configured by the CDK - the master sensor is the sensor driving 2A (AE and AWB).

3 Installing the CDK

3.1 Dependencies

1. Ubuntu Linux 16.04 LTS 64-bit with G++ tool chain.
2. Olimex JTAG dongle – Either [ARM-UB-TINY](#) or [ARM-USB-TINY-H](#) plus USB2 cable. These are delivered with the Myriad 2 Development Kit.

3.2 Install the CDK for MA2x5x

1. Download the release archive from the [movidius.org](#) site and unzip it.
2. The Myriad 2 tools are included in the MDK release package (download it from the [movidius.org](#) site).
3. Install the Olimex JTAG driver. See section 2.4.1 of the MDK Getting Started Guide, [2].
4. Install dependencies of CDK GUI application, see section 3.3.
5. You are now ready to build the CDK applications, see section 4.

If the MDK has not been installed previously, please refer to the MDK Getting Started Guide, [2], that accompanies the MDK release.

3.3 CDK GUI PC application

The MDK release package includes the CDK GUI PC application (executable image located in folder mdk/examples/cdk/pc/MultiCameraAppForVPUs/).

This application is used for displaying video streams from the development board and controlling the camera application running on the MA2x5x.

It runs on Linux release Ubuntu 16.04 LTS 64 bit.

3.3.1 Updating dependent libraries

These libraries are only required for first time installation.

CDK GUI requires the following libraries to be installed:

```
sudo apt-get install -y intltool
sudo apt-get install -y autotools-dev
sudo apt-get install -y libsdl2-dev
sudo apt-get install -y libgtk-3-dev
sudo apt-get install -y libpng12-dev
sudo apt-get install -y libavcodec-dev
sudo apt-get install -y libavutil-dev
sudo apt-get install -y libv4l-dev
sudo apt-get install -y libudev-dev
sudo apt-get install -y libusb-1.0-0-dev
sudo apt-get install -y libpulse-dev
sudo apt-get install -y libgs10-dev
sudo apt-get install -y build-essential
sudo apt-get install -y libtool
sudo apt-get install -y libsdl2-ttf-dev
```

3.3.2 Install YUV viewer and conversion utilities

To display captured YUV files, we recommend vooya (<http://www.offminor.de/>) or avconv.

To install vooya, download the Ubuntu 64-bit install package, vooya-1.8-amd64.deb, from:
<http://www.offminor.de/downloads.html>

Install the dependencies required by downloading the libTiff installer from http://old-releases.ubuntu.com/ubuntu/pool/universe/t/tiff3/libtiff4_3.9.7-2ubuntu1_amd64.deb

And run the following commands:

```
sudo dpkg -i ./libtiff4_3.9.7-2ubuntu1_amd64.deb
sudo apt-get install libqt4-dev
sudo apt-get install libqt4-core
sudo apt-get install libqt4-gui
sudo apt-get -f install
```

Install vooya:

```
sudo dpkg -i vooya-1.8-amd64.deb
```

To install avconv (and libav):

```
sudo apt-get install -y libav-tools ubuntu-restricted-extras
sudo apt-get install -y libavcodec-extra-54 libavformat-extra-54
sudo apt-get install libav-tools
sudo apt-get -f install
```

4 Building the MA2x5x Use-case Images

The CDK comes with the following use-cases:

- cdk_FLIC_1xIMX214 (see section [4.1](#))
- cdk_FLIC_1xIMX214_2xIMX208 (see section [4.2](#))
- cdk_FLIC_3xIMX208 (see section [4.3](#))
- cdk_SrcIsp_1xIMX214 (see section [4.4](#))

To build individual use-cases, the step-by-step instructions are provided in the sub-sections below. Applications are built for MA2450.

4.1 FLIC 1 x 13MP IMX214 Camera – DDR frame buffering

Use-case: cdk_FLIC_1xIMX214

```
cd <mdk_root>/examples/cdk/apps/arch/ma2x5x/cdk_FLIC_1xIMX214
$ make clean
$ make all -j
```

4.2 FLIC 1 x 13MP IMX214 + 2 x 2MP IMX208 Cameras

Use-case: cdk_FLIC_1xIMX214_2xIMX208

```
cd <mdk_root>/examples/cdk/apps/arch/ma2x5x/cdk_FLIC_1xIMX214_2xIMX208
$ make clean
$ make all -j
```

4.3 FLIC 3 x 2MP IMX208 Cameras

Use-case: cdk_FLIC_3xIMX208

```
cd <mdk_root>/examples/cdk/apps/arch/ma2x5x/cdk_FLIC_3xIMX208
$ make clean
$ make all -j
```

4.4 1x 13MP IMX214 Camera with direct feed to ISP hardware

Use-case: cdk_SrcIsp_1xIMX214_ma2x5x

```
cd <mdk_root>/examples/cdk/apps/arch/ma2x5x/cdk_SrcIsp_1xIMX214
$ make clean
$ make all -j
```

5 Setting up the Hardware

5.1 Required boards and accessories:

- Myriad Development board – MV0212.
- 1x mv201 with IMX214 sensor, module part number P13N05A.
- 1x mv200 with 2x IMX208 sensors, modules part number P2N05A.
- Olimex JTAG dongle – Tiny-H.
- USB cable Type A to Type B to connect the Olimex to the PC.
- USB3 type A to Micro B cable to connect Linux PC with Myriad board USB connector.

5.2 CDK DIP switch Settings for running with moviDebug2

To run an application using moviDebug2, the DIP settings on the development board are set as follows:



Figure 2: DIP Switch Settings to run with moviDebug2

5.3 CDK Board Configuration



Figure 3: Single IMX214 on CamA interface

6 Running the CDK use-cases

The steps to run each of the use-cases are similar.

1. Verify the DIP settings on the development board as described in section [5.2](#).
2. Ensure that the correct configuration of sensors is mounted on the development board for that use case.
3. Check that the Olimex JTAG connector is plugged into the development board.
4. Make sure that the USB3 cable from the board is connected to the PC USB 3.0 socket.

Each step is described in more detail in the next sub-sections.

6.1 Running the use-case on MA2x5x using moviDebug2

To run a particular use-case, execute the following steps:

1. Connect the Olimex JTAG dongle via USB cable to the PC.
2. Connect the development board USB3 port to an USB3 port of the PC running Linux.
3. Change `pwd` to <test-case>:
`cd <mdk_root>/examples/cdk/apps/arch/ma2x5x/<use-case>`
4. Start the moviDebug server:
`make start_server`
5. To start an application running on MV0212/MA2450, run:
`make debug -j`
6. It takes some seconds for the moviDebug2 to setup, load and start the application on the hardware. Some warning messages will be displayed on the moviDebug2 console.

6.2 Start CDK GUI PC Streaming Application

1. Ensure the Myriad application is started on MA2x5x as described in section [6.1](#).
2. The USB3 cable is connected from the PC to the USB3 port on the MV0212 board.
3. BEFORE starting the CDK GUI, ensure that DIP switch position 2 is in the up position. Put DIP switch 2 to On (Up) position: DUDDUUDD.



Figure 4: DIP Switch Settings to run – Boot CRTL (2) UP

4. Run the CDK GUI executable found at the following path:
`mdk/examples/cdk/pc/CDK_MultiCameraAppForVPUs/`

The application GUI should appear as shown in [Figure 5](#).

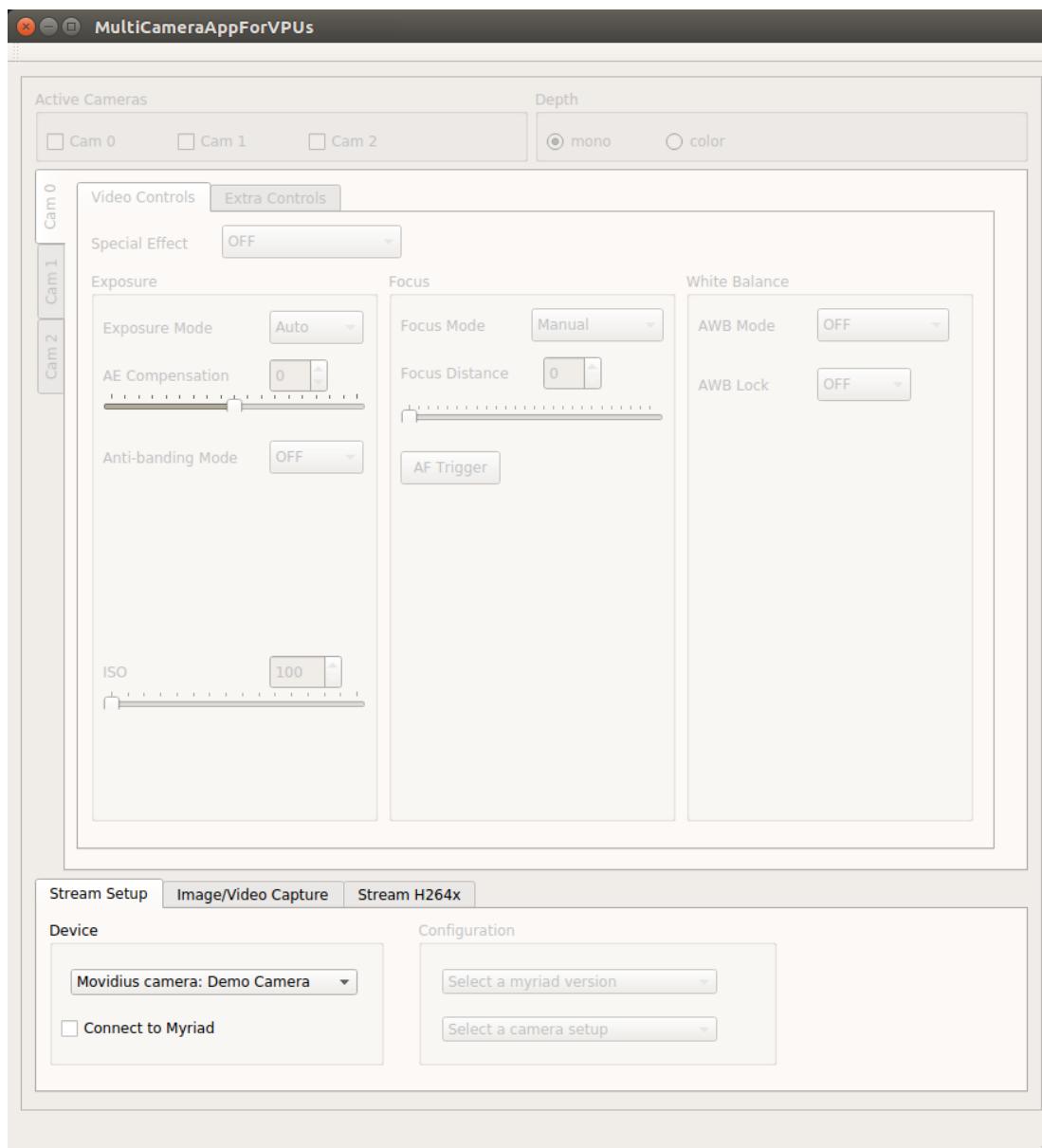


Figure 5: Startup-screen

If the “Movidius camera” is not automatically detected, then select the video device “Movidius camera” from the drop down list:

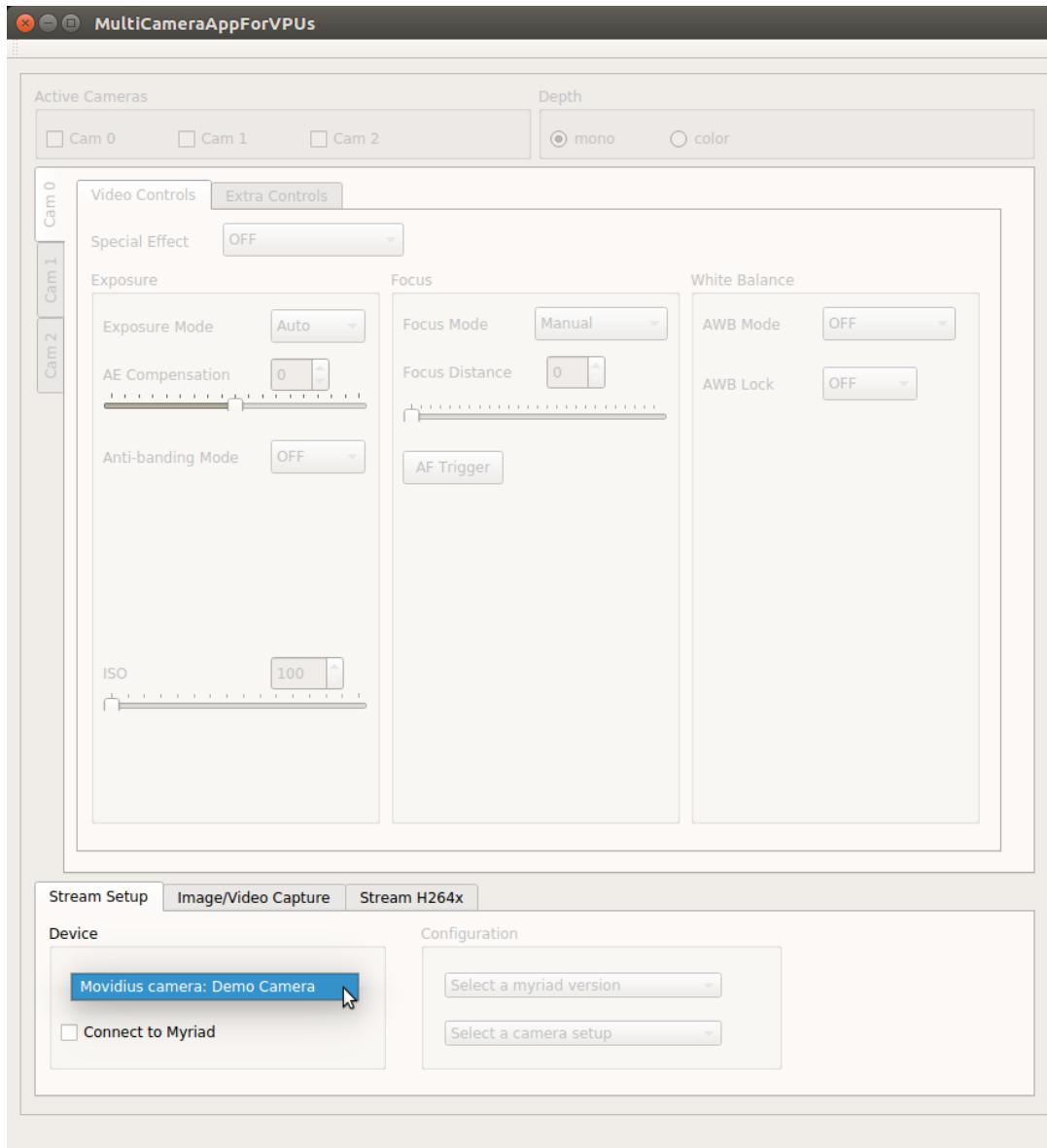


Figure 6: Video device selection drop-down menu

Click on the “Connect to Myriad” check-box.

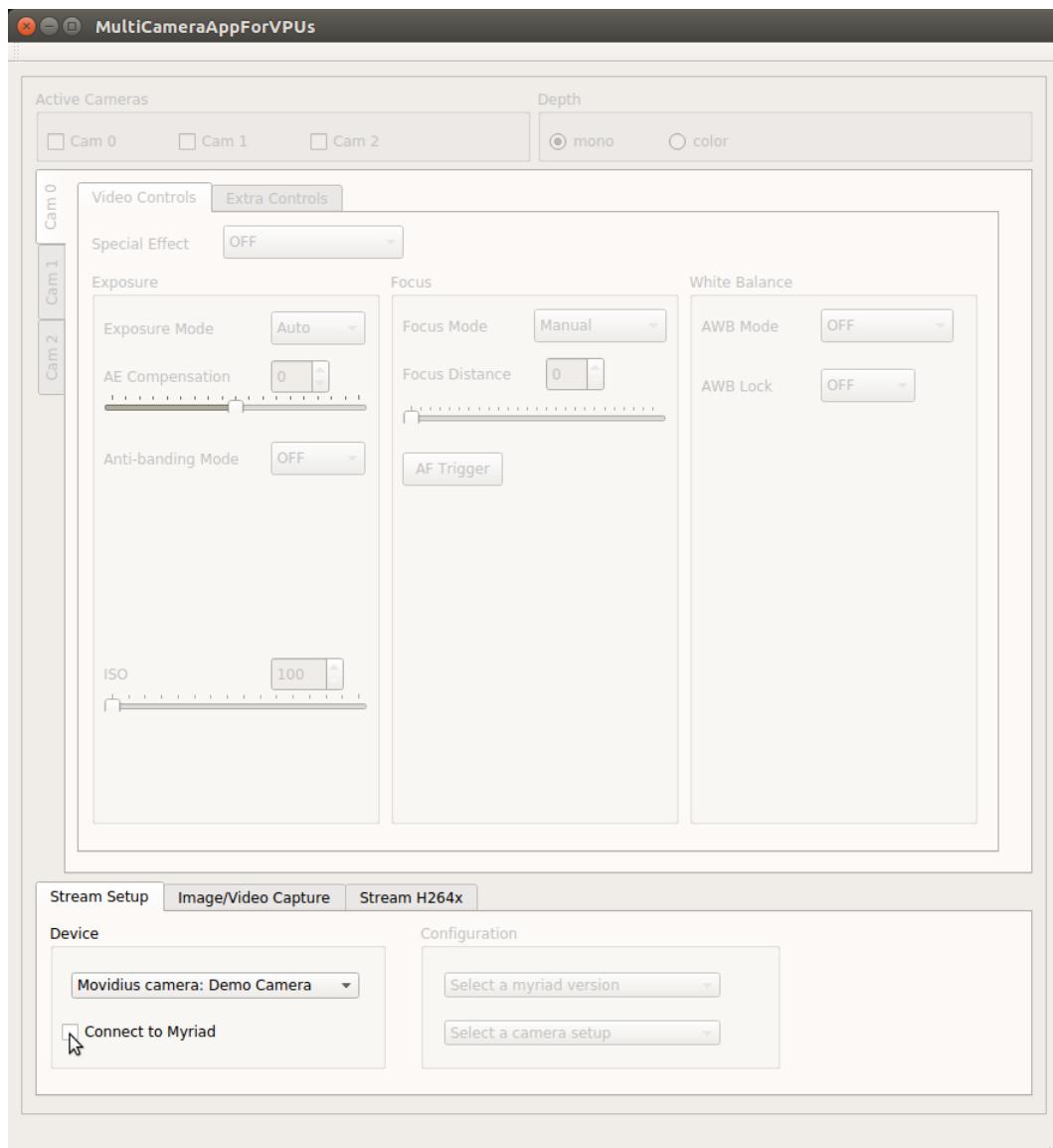


Figure 7: Connect to Myriad

The user should select “MA2x5x” as the Myriad version from the drop-down list (see [Figure 8](#)).

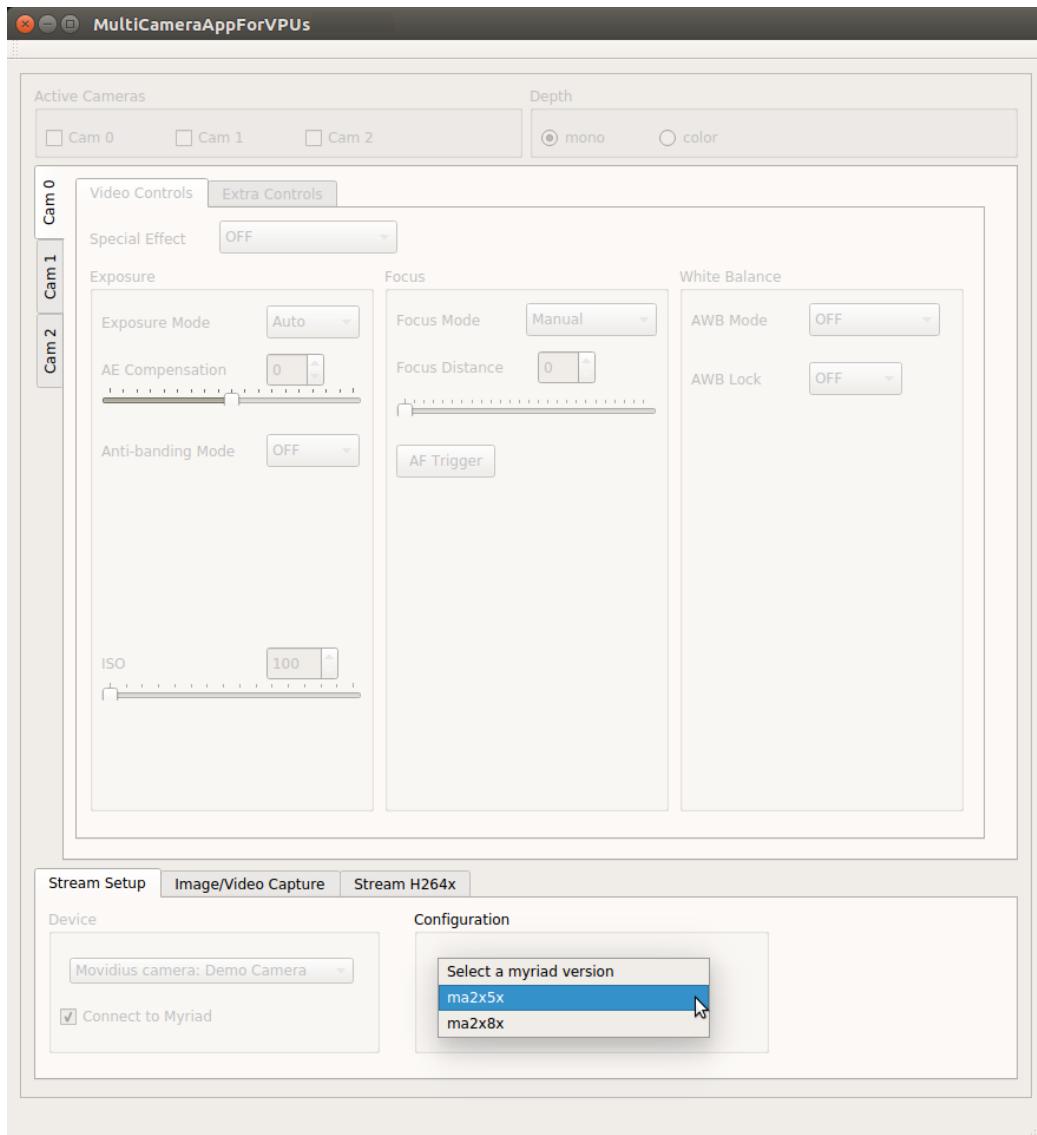


Figure 8: Select Myriad version from drop-down menu

Select the configuration for the application from the drop-down Configuration menu (see [Figure 9](#)).

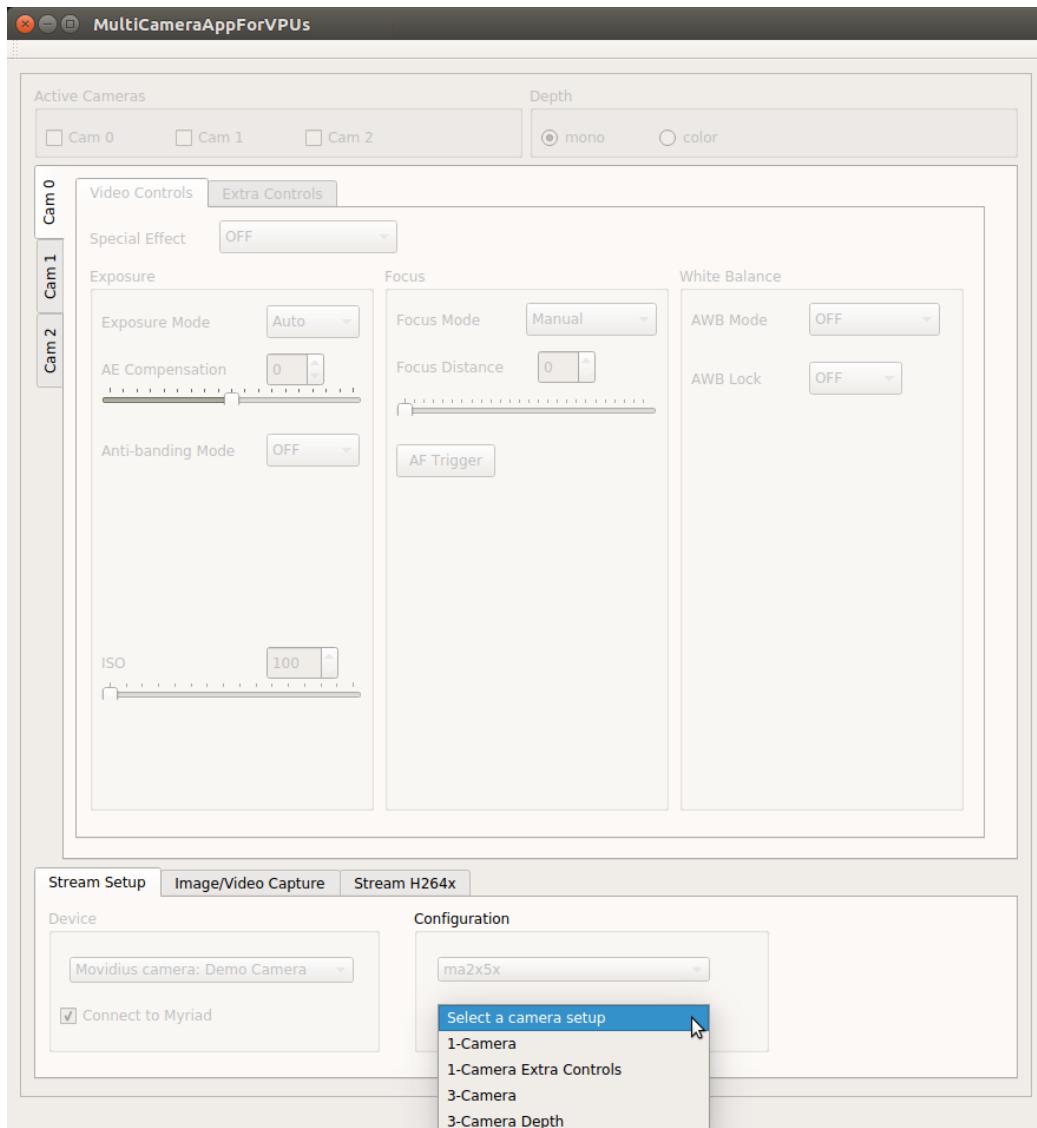


Figure 9: Camera configurations drop-down menu

At this point, the camera selection should be enabled. Select “Cam 0” in order to turn it On (off by default).

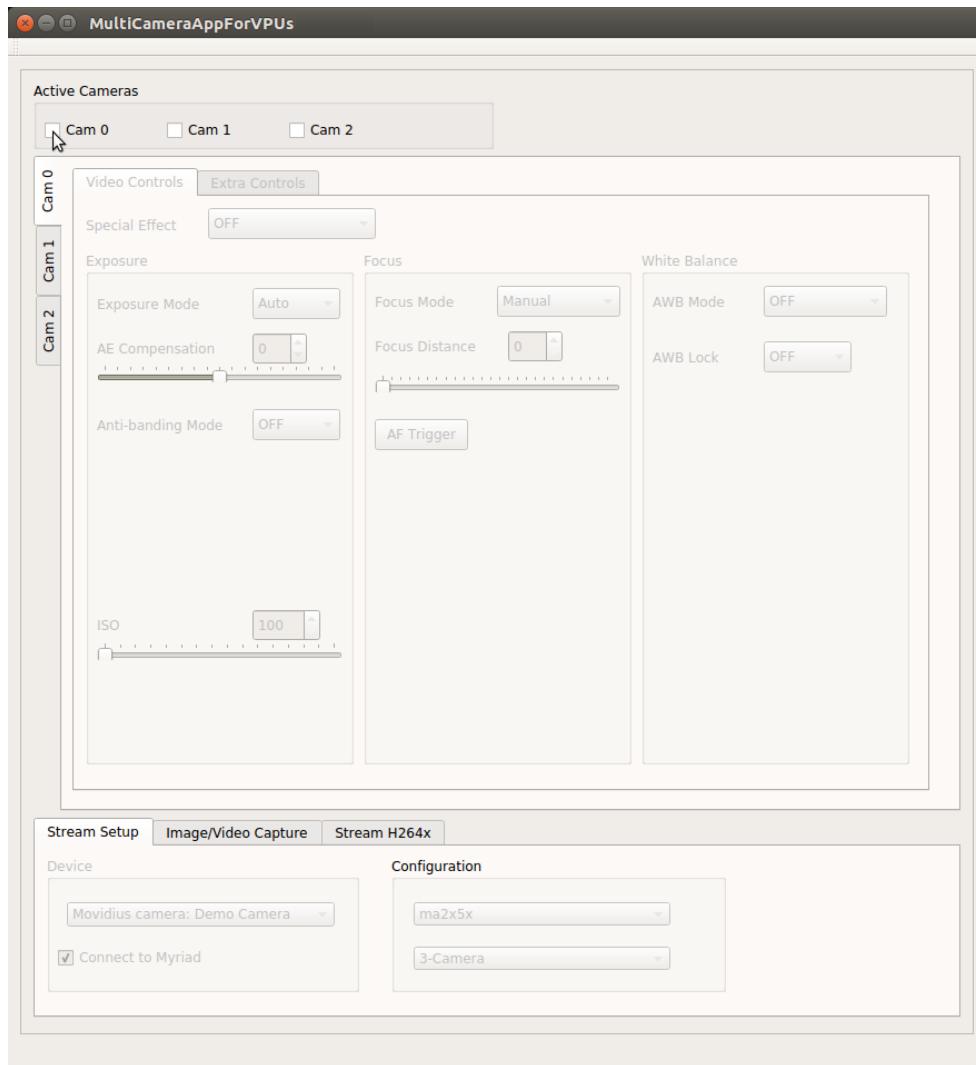


Figure 10: Camera Start screen

Depending on application (i.e., depending on camera configuration), start “Cam 1” and “Cam 2” and additional preview screens should appear (see [Figure 11](#)).

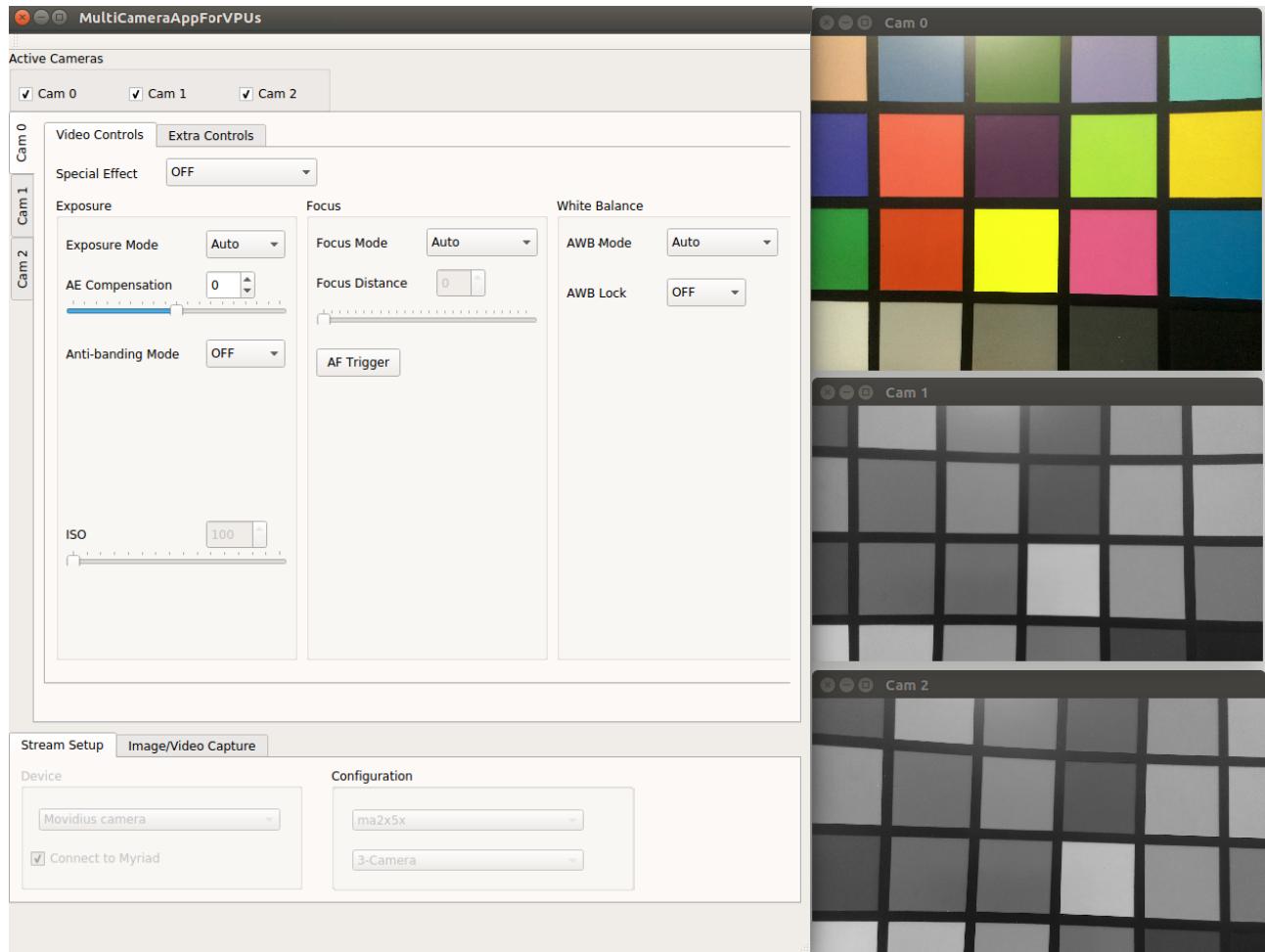


Figure 11: Three camera preview Windows

6.3 Camera Controls

6.3.1 Exposure

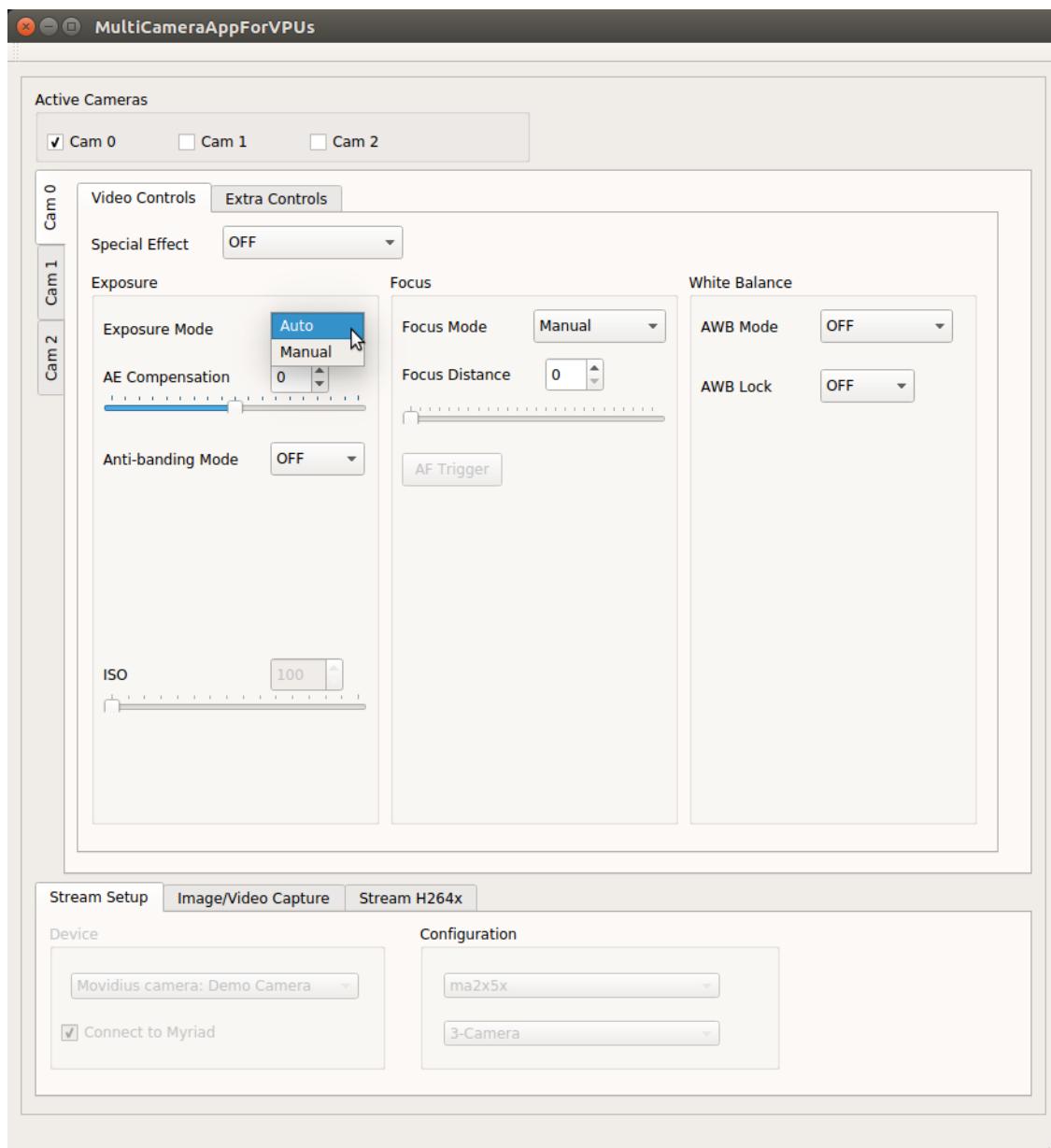


Figure 12: Video Controls - Exposure

In the Exposure panel, the Auto Exposure (AE) settings include: AE Compensation, Anti-Banding Mode and AE Lock. The ISO setting can also be changed by the user when Exposure Mode is on “Manual”.

6.3.2 White Balance

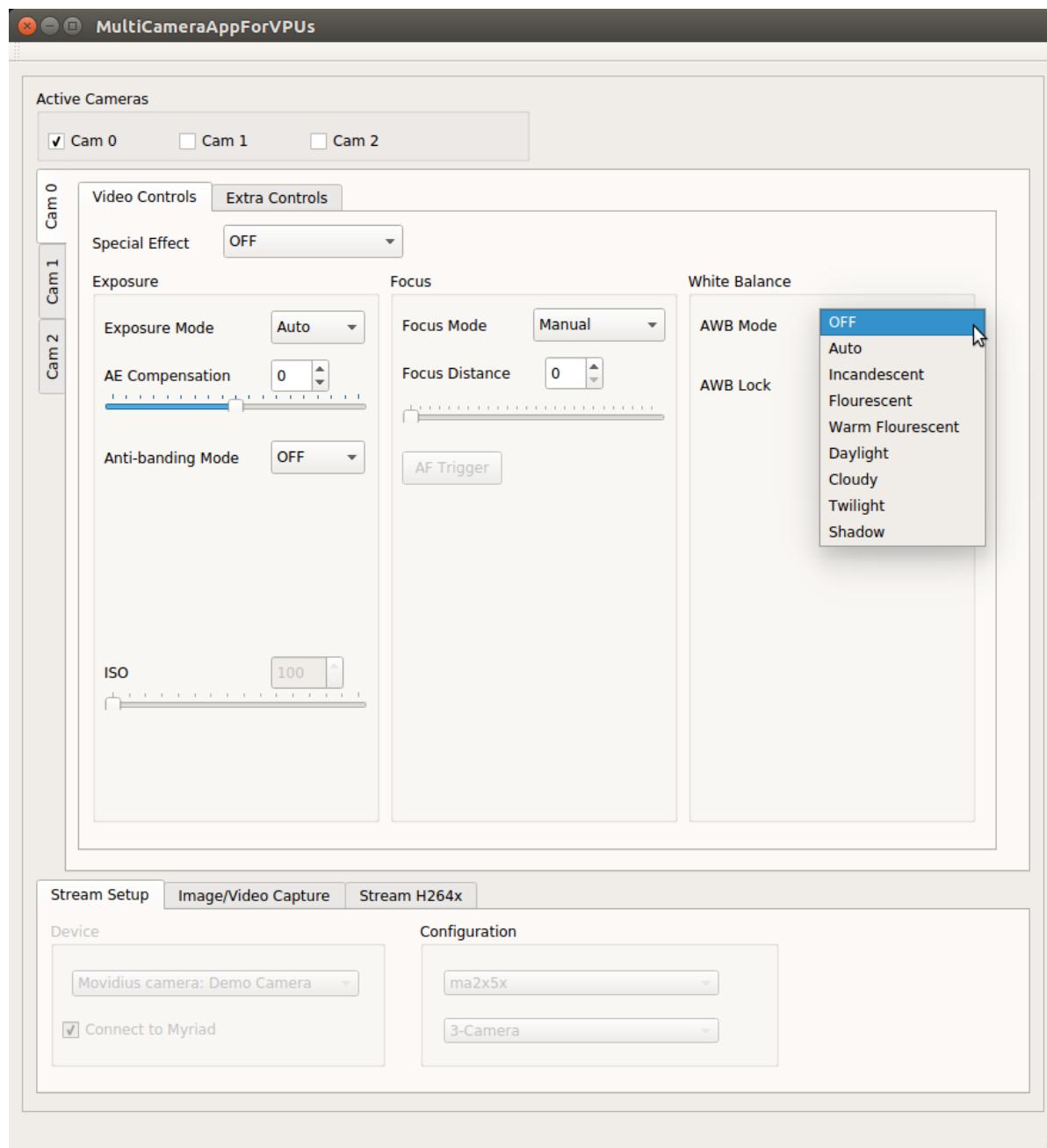


Figure 13: Video Controls – White Balance

In the Auto White Balance (AWB) panel, AWB mode can be changed by selecting a particular illumination target for white balance adjustment. AWB lock will lock the latest parameter settings for white balance.

6.3.3 Focus

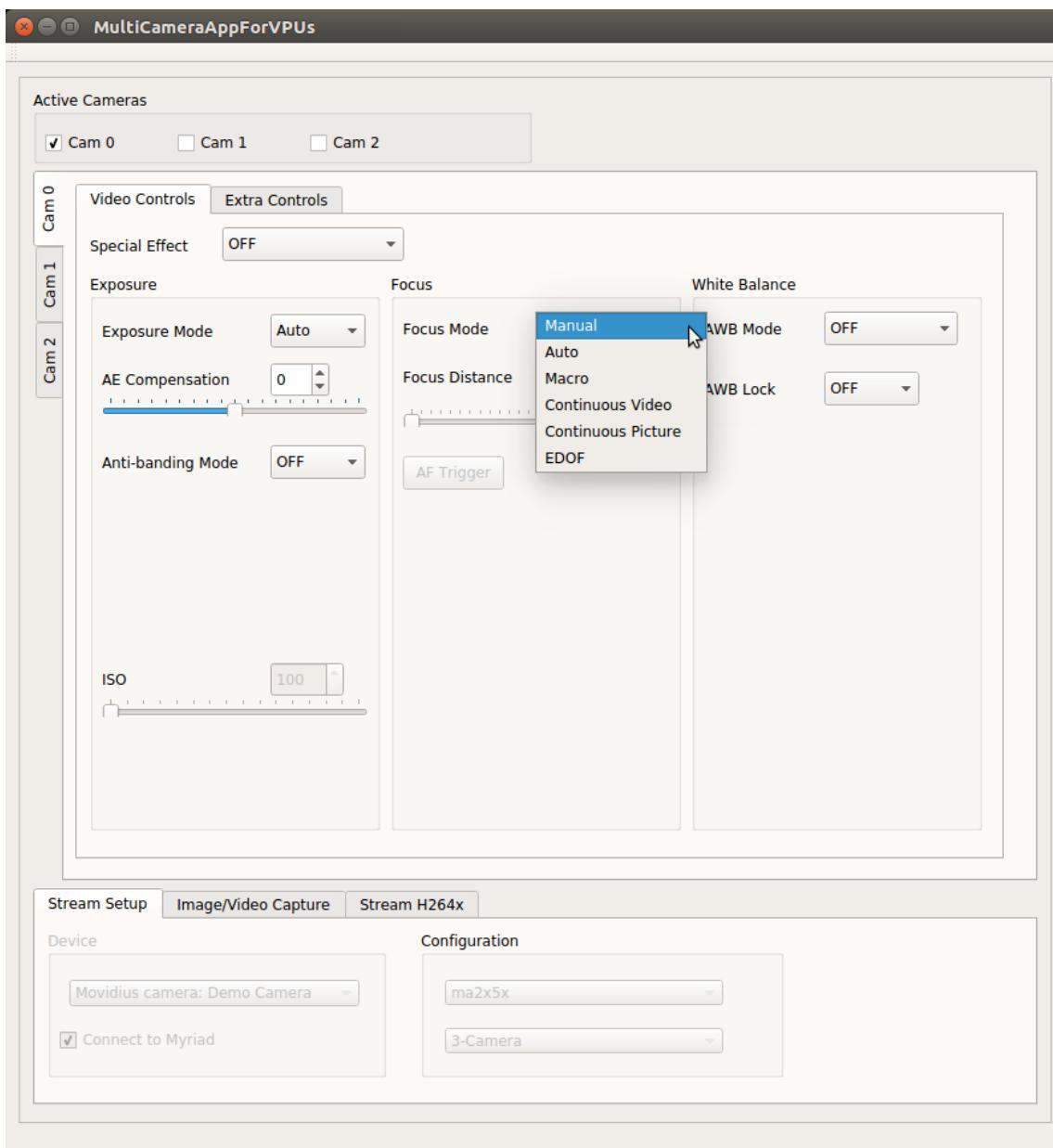


Figure 14: Video Controls – Focus Mode Selection

In the Auto Focus (AF) panel, AF mode can be changed by selecting a particular use case. The AF trigger will trigger the auto-focus algorithm. Switching to Manual Focus Mode, the Focus Distance will be enabled and the user can manually adjust it.

6.4 Still Capture

To capture a still image, click “Capture” from the “Image/Video Capture” tab at the bottom menu bar (see Figure 15).

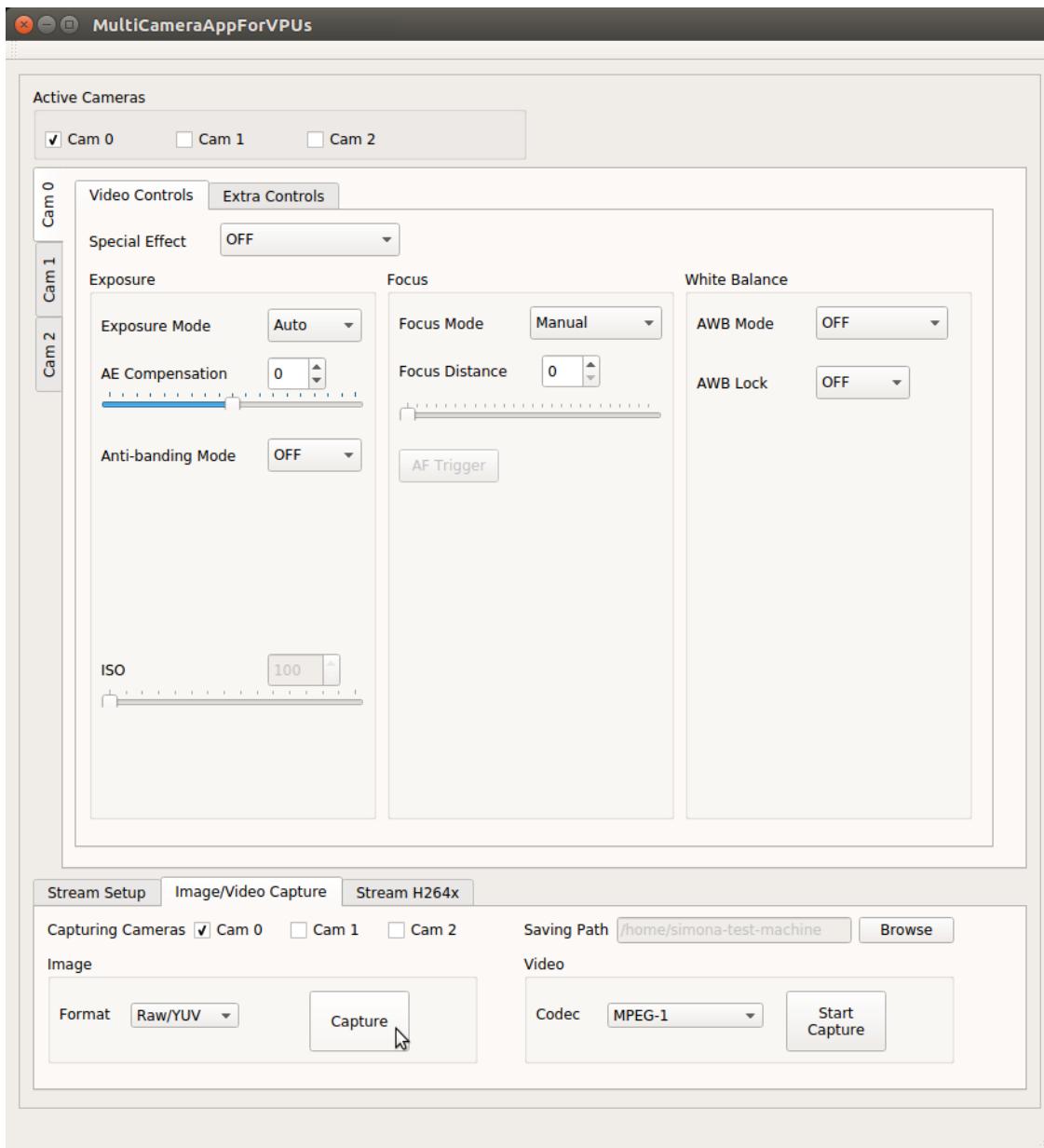


Figure 15: Start still photo capture

Via the Image/Video Capture menu, it is possible to do the image capture and select the camera from which to capture still images.

The image Saving Path, can be changed by clicking Browse → <desired_location>. The default storage folder for still images is the \$HOME / \$USER folder.

6.5 Video Capture

In order to start/stop video capture, press the Capture button from the Video panel on the Image/Video Capture tab, as shown in [Figure 16](#).

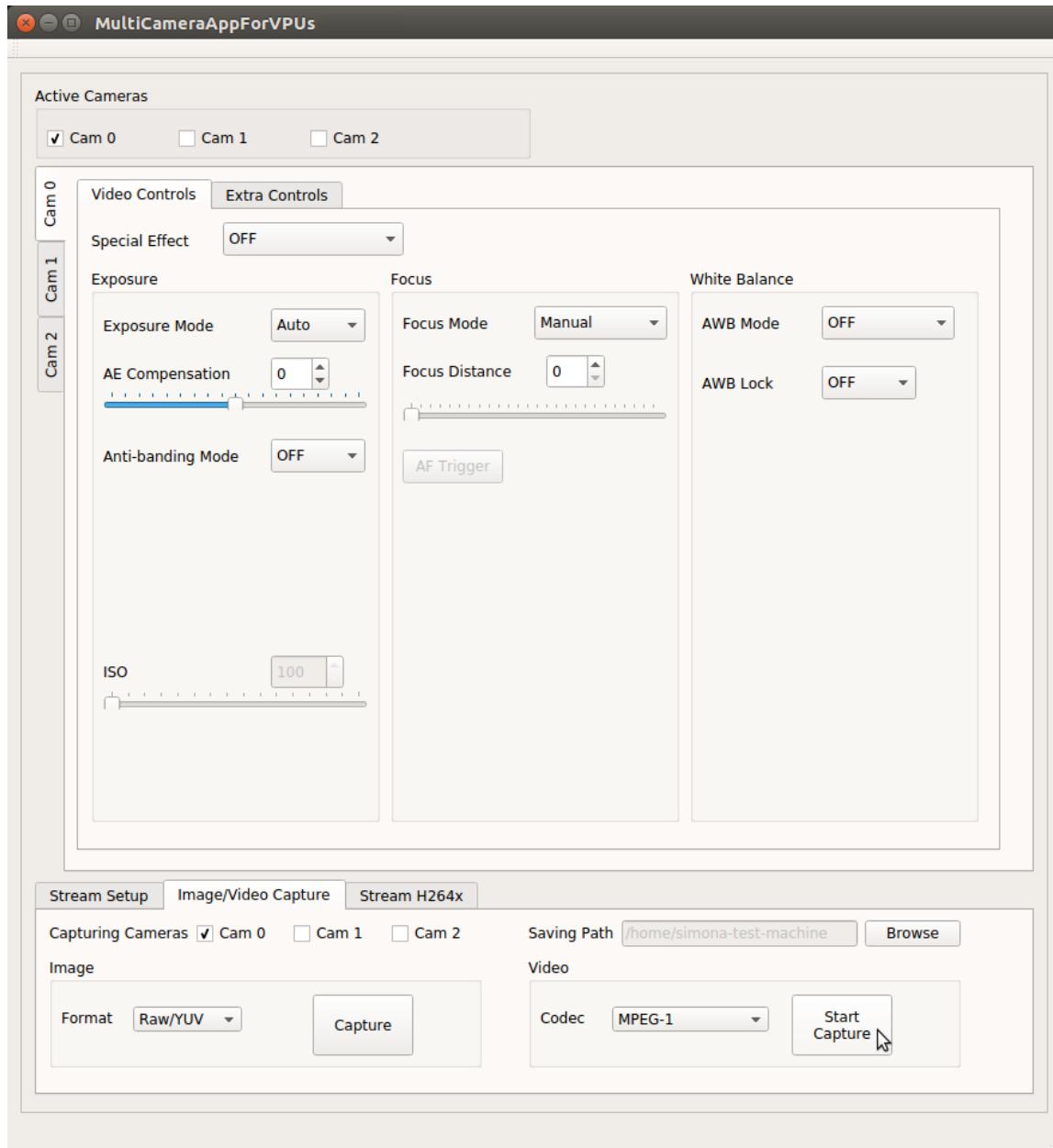


Figure 16: Start video capture

Depending on application, it may be possible to select the camera from which to capture video streams from the Image/Video Capture menu tab (see [Figure 16](#)). The default storage folder for video files is the \$HOME/\$USER folder, but it's configurable using Saving Path field (click Browse).

6.5.1 Video encoder Selection

It is possible to select alternative video recording engines from a list of installed encoders on the Linux PC.

To view the available list of Video Codecs, from Image/Video Capture → Video, click on the drop-down menu. Select the desired video encoder (see [Figure 17](#)).

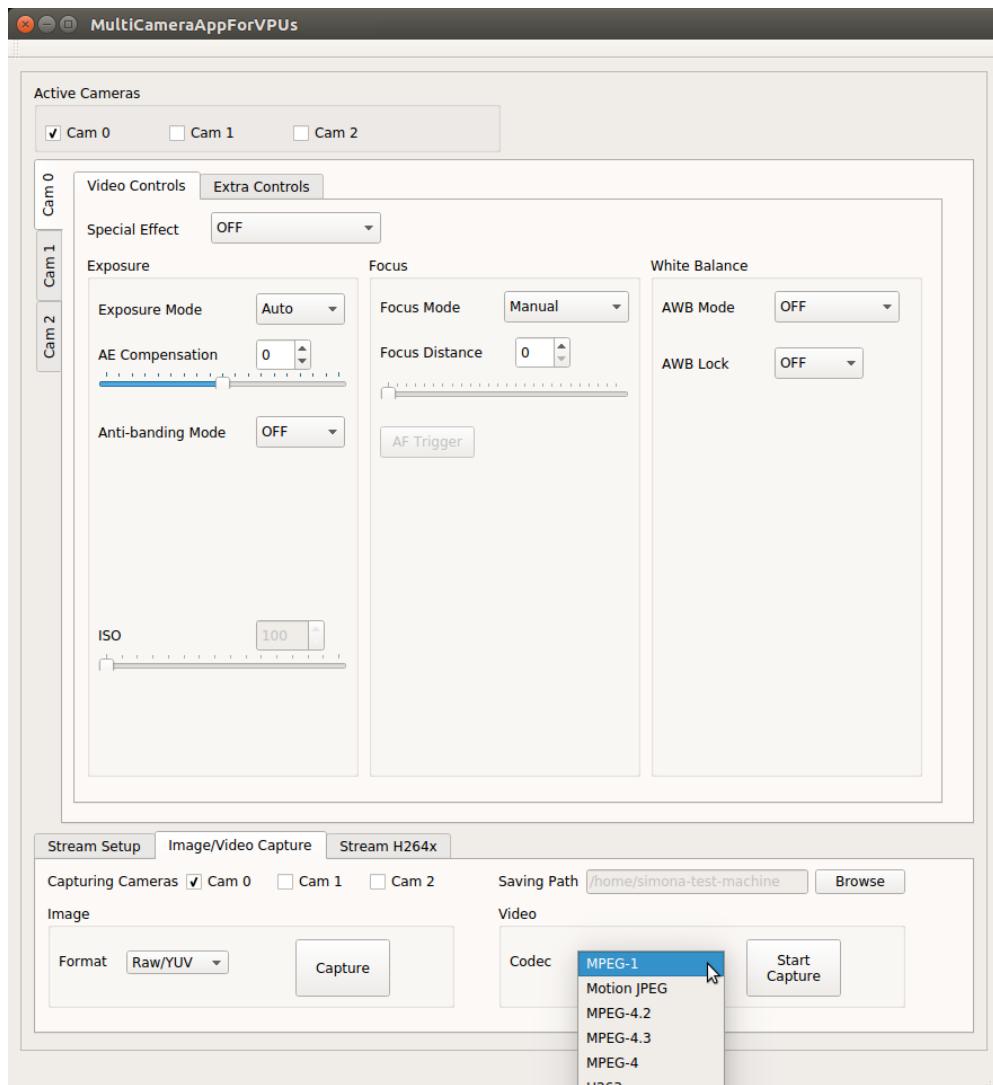


Figure 17: Video Encoder selection

7 CDK Utilities – Convert YUV to Jpeg

To convert the generated YUV420 file use the `avconv` utility:

```
avconv -f rawvideo -pix_fmt yuvj420p -s 4208x3120 -i <YUVFILE> -r 1  
<OUTPUT>.jpg
```