

BOARD SUPPORT PACKAGE

For Connect Tech NVIDIA Jetson Xavier NX Carriers

BSP Version: Xavier-NX-32.7.1 V001
Last Updated: 2022/03/31

Introduction

This Board Support Package adds support for Connect Tech Jetson Xavier-NX family of carrier boards to Linux4Tegra. It includes any extra files required to use all the features of the carriers. Please check the "Product Specific Details" section for what features for your board is supported with this BSP release and the "Changes" section for the changes made between versions. You can check which version of the BSP you have installed by running: `cat /etc/cti/CTI-L4T.version`

Check for the Latest Version of the CTI-L4T BSP at:

<https://connecttech.com/resource-center/l4t-board-support-packages/>

Requirements

- x86 based host machine running Ubuntu 16.04 or Ubuntu 18.04
- Jetpack 4.6.1 installed via NVIDIA SDK Manager (from NVIDIA Embedded Download Center)
- Xavier-NX module
- Connect Tech Xavier-NX Family Carrier
- USB Cable for flashing

*L4T version can be found in `/etc/nv_tegra_release` and will look like this:

```
# R32 (release), REVISION: 7.1
```

Supported Cameras in BSP

- ECON: NileCAM30: AR0330
- ECON: STURDeCAM20: AR0230
- ECON: NileCAM21: AR0233
- ECON: e-CAM50_CUNX: AR0521
- ECON: e-CAM24: AR0234
- ECON: e-CAM80: IMX415
- ECON: e-CAM30: AR0330
- Leopard: LI-IMX390-GMSL2
- Arducam: IMX477
- Raspberry Pi Camera Module v2: IMX219
- Framos: IMX415
- Framos: IMX464
- Framos: IMX290
- Framos: IMX327
- Framos: IMX412

- Famos: IMX462
- Famos: IMX477
- Famos: IMX577
- Famos: IMX264
- Famos: IMX296
- Famos: IMX297
- Famos: IMX334
- Famos: IMX335
- Famos: IMX565
- Basler*: daA2500-60mci**
- Basler*: daA4200-30mci

***NOTE:** The pylon Camera Software Suite, which contains Basler's camera APIs and camera viewing application, is not included and must be installed separately. See "Installing Pylon SDK (For Basler)" below.

****NOTE:** The daA2500-60mci and daA2500-60mc are different camera models, check to make sure yours has an "i" at the end.

Installation (Preferred approach)

- Before Installing the BSP you will need to install JetPack 4.6.1 on the x86 host system using the NVIDIA SDK Manager or from the source packages on NVIDIA's website as detailed below.
- Copy the CTI-L4T-XAVIER-NX-32.7.1-V001.tgz package into
`~/nvidia/nvidia_sdk/JetPack_4.6.1_Linux_JETSON_XAVIER_NX_DEVKIT/Linux_for_Tegra/`
- Extract the BSP:
`tar -xzf CTI-L4T-XAVIER-NX-32.7.1-V001.tgz`
- Change into the CTI-L4T directory:
`cd ./CTI-L4T`
- Run the install script (as root or sudo) to automatically install the BSP files to the correct locations:
`sudo ./install.sh`
`cd ..`
- The CTI-L4T BSP is now installed on the host system and it should now be able to flash the Xavier-NX.
- To flash on the Xavier-NX use the following (do not add ".conf"):
CTI Assisted Flashing: `./cti-flash.sh`
Manual Flash: `./flash.sh cti/xavier-nx/photon/base mmcblk0p1`

Installing JetPack from NVIDIA's Source packages (Alternate approach)

- Go to <https://developer.nvidia.com/embedded/linux-tegra> and download the "L4T Driver Package (BSP)" and "Sample Root Filesystem" files for Xavier NX. Alternatively, you can use the files "Jetson_Linux_R32.7.1_aarch64.tbz2" and "Tegra_Linux_Sample-Root-

Filesystem_R32.7.1_aarch64.tbz2" from your SDKManager downloads folder (This would be the folder you selected as the "Download folder" in step 2 "Details and License" of SDKManager).

- Create a directory named `~/nvidia/nvidia_sdk/JetPack_4.6.1_Linux_JETSON_XAVIER_NX_DEVKIT/` and copy the "Jetson_Linux_R32.7.1_aarch64.tbz2" file you downloaded into that directory.
- Unzip the tarball with `"sudo tar jxf Jetson_Linux_R32.7.1_aarch64.tbz2"`. You should now have a new directory called `Linux_for_Tegra` in your folder. Change directories into that and then copy the "Tegra_Linux_Sample-Root-Filesystem_R32.7.1_aarch64.tbz2" file you downloaded into the `rootfs` folder.
- Change into the `rootfs` folder and unzip the tarball with `"sudo tar jxf Tegra_Linux_Sample-Root-Filesystem_R32.7.1_aarch64.tbz2"`
- You can change directories back to `~/nvidia/nvidia_sdk/JetPack_4.6.1_Linux_JETSON_XAVIER_NX_DEVKIT/Linux_for_Tegra/` and run `"sudo ./apply_binaries.sh"` if you wish to flash one of NVIDIA's devkits, or move on to installing CTI's BSP with the instructions above.

Flashing Xavier-NX

- Connect the Xavier-NX and Carrier to the computer via USB Following the instructions in the appropriate manual
- Put the system to be flashed into recovery mode, following the instructions in the appropriate manual
- Run `./flash.sh "/code>./cti-flash.sh" or ./flash.sh cti/xavier-nx/<board>/<config> mmcblk0p1" from Linux_for_Tegra directory`
- Once the flashing has completed, the Xavier-NX will reboot
- To switch between different boards, you can repeat these steps. Alternatively follow the instructions below for runtime switching profiles on the Xavier-NX

Switching Profiles on Xavier-NX

- Open a terminal on the Xavier-NX
- Run `"sudo cti-nx-fdt.sh"`
- Select the profile you wish to switch to from the menu
- Restart the system

Note: This script updates dtb by appending/replacing the FDT variable in `extlinux.conf`. It also sets `root=/dev/mmcblk0p1` by modifying the "APPEND" variable.

Installing Pylon SDK (For Basler)

Camera application development support for Basler camera models is provided by the "pylon Camera Software Suite" created by Basler. It can be downloaded from their website at:

<https://www.baslerweb.com/en/sales-support/downloads/software-downloads/#type=pylonsoftware;language=all;version=all;os=linuxarm;series=all;model=all>

On your NX module, navigate to the webpage above and download the latest version of the pylon Camera Software Suite which is followed by "Linux ARM 64 bit - Debian Installer Package" (e.g. "pylon 6.2.0 Camera Software Suite Linux ARM 64 bit - Debian Installer Package"). After the download is complete, navigate to your Downloads directory over command line and run:

```
sudo dpkg -i pylon_<VERSION>_arm64.deb
```

replacing <VERSION> with the version number of the package. This will install Basler's camera SDK and documentation to the /opt/pylon directory.

If you wish to develop in Python, you will need to install an additional API with the following commands:

```
sudo apt install python3-pip
```

```
sudo pip3 install https://github.com/basler/pyppylon/releases/download/1.6.0/pyppylon-1.6.0-cp36-cp36m-linux_aarch64.whl
```

To use the pylon viewer application, enter:

```
/opt/pylon/bin/pylonviewer
```

over the command line. For additional documentation about the pylon viewer application, please consult:

<https://docs.baslerweb.com/overview-of-the-pylon-viewer>

For further support with camera application development with Basler product cameras, please consult Basler support at <https://www.baslerweb.com/en/sales-support/support-contact/>

Product Specific Details

NGX003 (Photon)

- USB 3.0 Support
- USB OTG Support
- MIPI Camera Support
- HDMI Support
- Micro SD Card Support
- NVMe Card Support
- PoE Support
- Wifi/Bluetooth Card Support
- Cellular Card Support
- RGB LED Support
- UART Support
- I2C Support
- GPIO Support

NGX004 (Quark)

- USB 3.0 Support
- USB OTG Support
- MIPI Camera Support
- Micro SD Card
- GbE Phy Support
- CAN Support
- UART Support
- I2C Support
- GPIO Support
- SPI Support
- PWM Support

NGX006 (Rudi-NX)

- USB 3.0 Support
- USB OTG Support
- GMSL Camera Support (ECON and Leopard Imaging)
- HDMI Support
- SD Card Support
- NVMe Card Support
- CAN Support
- GbE Phy Support
- Cellular Card Support
- Wifi/Bluetooth card Support
- UART Support
- RS485 Support
- I2C Support
- GPIO Support
- SPI Support
- PWM Support

NGX007 (Boson)

- USB 3.0 Support
- USB OTG Support
- FRAMOS Camera Support
- Display(HDMI)
- Micro SD Card
- GbE Phy Support
- CAN Support
- UART Support
- SPI Support
- I2C Support
- PWM Support
- Wifi/Bluetooth Support
- NVMe Card Support

Changes

Version Xavier-NX-32.7.1 V001, March 31, 2022

- Initial release for L4T 32.7.1

Version Xavier-NX-32.6.1 V010, March 02, 2022

- Added support for FRAMOS IMX565 sensor on Boson
- Added support for e-CAM30 on Photon and Quark
- Added leopard imx390 20210715 patch that was intended to fix flicker issues.
- This patch appears to have improved reliability seen in the bug noted below in V001, that was present since 32.5.
- When testing with 2 cameras, both will often launch immediately, although sometimes one will timeout. If a stream does fail, a second run of gstreamer will work.

Version Xavier-NX-32.6.1 V008, January 13, 2022

- Added support for e-CAM24 and e-CAM80 on photon and quark
- Fixed issue with USB-C port on Boson

Version Xavier-NX-32.6.1 V007, November 18, 2021

- Added UHS support to all xavier-nx carriers that support SD cards.

Version Xavier-NX-32.6.1 V006, November 12, 2021

- Internal Release.

Version Xavier-NX-32.6.1 V005, October 20, 2021

- Added support for NileCAM21 (AR0233) on the rudi-nx.
- Added frame synchronization support for both AR0230 and AR0233.

Version Xavier-NX-32.6.1 V004, October 1, 2021

- Adds support for additional Framos sensors (IMX264, IMX296, IMX297, IMX334, and IMX335)
- Fixed bug with OTG port on Boson

Version Xavier-NX-AVT-32.6.1 V003, September 9, 2021

- Adding support for Allied vision cameras for Photon and Quark
- NOTE: No other cameras are supported on this BSP release

Version Xavier-NX-32.6.1 V002, September 3, 2021

- Restored Basler Camera support
- Added Leopard's camera isp overrides for the IMX390 cameras

Version Xavier-NX-32.6.1 V001, August 13, 2021

- Initial release for L4T 32.6.1
- Adds updates addressed in Nvidia's June 18th security bulletin
- Integrates FRAMOS cameras and Boson (NGX007) into main BSP

- Note: Found bug with Leopard LI-IMX390-GMSL2 previously present in BSP 32.5. When using gstreamer or nvstcapture, LI-IMX390-GMSL2 will always fail to connect the first time, succeeding on the second attempt. Leopard has been contacted and we will work to resolve this issue.
- Note: Basler cameras not included in this release due to newly introduced bug after adding FRAMOS

Version Xavier-NX-32.5 V007, June 17, 2021

- Adding support for Basler Dart BCON for MIPI cameras

Version Xavier-NX-32.5 V006, May 07, 2021

- Restoring support for LI IMX390 GMSL cameras

Version Xavier-NX-FRAMOS-32.5 V005, April 23, 2021

- Added support for Framos IMX464 camera sensor
- NOTE: Only IMX464 and IMX415 are supported on this BSP release. No other cameras supported

Version Xavier-NX-32.5 V004, April 23, 2021

- Added support for ECON STURDeCAM20: AR0230 cameras for Rudi-NX

Version Xavier-NX-FRAMOS-32.5 V003, April 01, 2021

- Adding support for FRAMOS IMX415 camera for Boson carrier
- NOTE: No other cameras are supported on this BSP release

Version Xavier-NX-AVT-32.5 V002, March 05, 2021

- Adding support for Allied vision cameras for Photon and Quark
- NOTE: No other cameras are supported on this BSP release

Version Xavier-NX-32.5 V001, February 08, 2021

- Initial Release for L4T 32.5
- IMX390 not supported in this release
- Bootloader OTA upgrades supported
- OTA source list does not include previous releases as they are from a different major revision

Version Xavier-NX-32.4.4 V005, January 11, 2021

- Added support for Arducam 12.3MP IMX477 HQ Camera Module for quark.
- Booting Off External media: NVME supported.

Version Xavier-NX-32.4.4 V004, December 17, 2020

- Added support for Arducam 12.3MP IMX477 HQ Camera Module for Photon.
- Booting Off External Media like SD card and NVME not supported.

Version Xavier-NX-32.4.4 V003, December 08, 2020

- Resolved disagrees about module layout issue for loading external kernel modules.
- Booting Off External Media like SD card and NVME not supported.

Version Xavier-NX-32.4.4 V002, December 03, 2020

- Added support for ECON e-CAM50-CUNX camera with AR0521 sensor on photon and quark.
- Booting Off External Media like SD card and NVME not supported.

Version Xavier-NX-32.4.4 V001, November 12, 2020

- Initial Release for L4T 32.4.4
- Booting Off External Media like SD card and NVME not supported.

Version Xavier-NX-32.4.3 V006, November 02, 2020

- Updated Readme file

Version Xavier-NX-32.4.3 V005, October 07, 2020

- Internal Release

Version Xavier-NX-32.4.3 V004, October 7, 2020

- Integrated Leopard patch IMX390 single camera on rudi-nx.
 - A single imx390 camera can function when connected to 1 deserializer.
 - With 2 deserializers on rudi-nx, 2 cameras can also be connected(one on each deserializer) at a time.
 - /dev/video0 and /dev/video1 are the video devices.
- Incorporated Leopard patch for IMX390 colour issue(for 4-CAM).
 - This also supports single camera.
- Recommends to perform powercycle while switching camera profiles using extlinux.conf

Version Xavier-NX-32.4.3 V003, August 20, 2020

- Supports apt-get upgrade
- Upgrade support from cti debian server from this version onwards
- Image backup available in case to have bootoptions in extlinux.conf
- Installs a script to modify extlinux.conf to switch dtb
 - Script: cti-nx-fdt.sh
 - Install path: /usr/bin
 - Execute: sudo cti-nx-fdt.sh
- Note: This script updates dtb by appending/replacing FDT variable. It also sets root=/dev/mmcblk0p1 by modifying "APPEND" variable

Version Xavier-NX-32.4.3 V001, July 20, 2020

- Initial Release for L4T 32.4.3

Version Xavier-NX-32.4.2 V005, July 06, 2020

- Added PWM support for Rudi-NX and Quark

Version Xavier-NX-32.4.2 V004, June 29, 2020

- Added support for IMX390 and AR0330
- Added support for Quectel EM06 modem

Version Xavier-NX-32.4.2 V003, June 03, 2020

- Fixed issue with not being able to login when using SDK Manager

- Fixed an issue with nvpmmodel not being configured correctly
- Rudi-NX carrier release

Version Xavier-NX-32.4.2 V001, May 07, 2020

- Initial Release for the Xavier-Nx

Contact Connect Tech

If you have any problems, questions or suggestions regarding the Board Support Package and hardware, please feel free to contact Connect Tech Inc.

Contact Information	
Support	<p>Please go to the Connect Tech Resource Center for product manuals, installation guides, device drivers, BSPs and technical tips.</p> <p>Submit your technical support questions to our support engineers. Technical Support representatives are available Monday through Friday, from 8:30 a.m. to 5:00 p.m. Eastern Standard Time.</p>
Contact Information	<p>support@connecttech.com sales@connecttech.com www.connecttech.com</p> <p>Toll Free: 800-426-8979 (North America only) Telephone: +1-519-836-1291 Facsimile: 519-836-4878 (on-line 24 hours)</p>