BOARD SUPPORT PACKAGE

For Connect Tech NVIDIA® Jetson Orin™ NX and Orin™ Nano Carriers

BSP Version: ORIN-NX-NANO-35.3.1 V005
Last Updated: 2023/08/21

1. Introduction

This Board Support Package adds support for the Connect Tech Jetson Orin™ NX and Orin™ Nano family of carrier boards to Linux4Tegra. It includes any extra files required to use all the features of Connect Tech carriers.

Please check Section 3 for supported features for your board and Section 7 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/

2. Requirements

- x86/x64 based host machine running Ubuntu 18.04 or 20.04
- JetPack™ 5.1.1 / L4T 35.3.1 installed (see Section 4)
- Orin™ NX or Orin™ Nano module
- Connect Tech Orin™ Nano/Orin™ NX Carrier
- USB Cable for flashing

  *L4T version can be found in /etc/nv_tegra_release and will look like this:
  # R35 (release), REVISION: 3.1

3. BSP Features

3.1 Supported Cameras in BSP

- Raspberry Pi IMX219
- Framos IMX290

- Framos IMX296
- Framos IMX304**
- Framos IMX412
- Framos IMX415
- Framos IMX464
- Framos IMX565
- Framos IMX585
- Framos IMX678

**See Section 3.1.1

3.1.1 Programming Camera Firmware

The IMX304 cameras need to have their Crosslinks SRAM configured in order to stream. Neither firmware nor crosslink is provided in this BSP you will have to contact Framos for the IMX304 v.1.3.4.0 Firmware and Crosslink_configurator.

Example usage:

./crosslink_configurator {I2C BUS No} {CReset_B GPIO No} {Algorithm/Data File}

The corresponding I2C Bus and CReset_B Gpio numbers for Boson are;

Port 1 - (I2c Bus) 30 (Gpio) 301
Port 2 - (I2c Bus) 31 (Gpio) 303

In case you have the wrong Firmware version as indicated by a dmesg error seen after running the above command, you would need to contact Framos for the correct version.

More documentation on programming can be found on Framos's Driver Binary User Guide https://www.framos.com/en/fsm-startup under NVIDIA® Jetson Family.

3.2 Product Specific Details

NGX004 (Photon)

- USB 3.0 Support
- USB OTG Supported in device mode.
- HDMI Support
- Micro SD Card Not Supported on Jetson Orin™ NX & Orin™ Nano
- NVMe Card Support
- PoE Support
- Wifi/Bluetooth Card Not Supported on Jetson Orin™ NX & Orin™ Nano
    - o NVMe/Wifi-bluetooth mux switch must always be on NVMe
    Since device flashes onto NVMe!

- Cellular Card Support
- RGB LED Support
- UART Support
- I2C Support
- GPIO Support
- Tachometer read through driver currently Not Supported.
- MIPI camera support

NGX007 (Boson)

- USB 3.0 Support
- USB OTG Support
- Display(HDMI)
- Micro SD Card Not Supported on Jetson Orin™ NX & Orin™ Nano
- GbE Phy Support
- CAN Support
- UART Support
- SPI Support
- I2C Support
- PWM Support
- Wifi/Bluetooth Support
- NVMe Card Support

NGX010 (Rudi-NX)

- USB 3.0 Support
- USB OTG Support
- HDMI 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
- RTC Battery Support

NGX012 (Hadron)

- USB 3.0 Support
- USB OTG Support

- Micro SD Card
- GbE Phy Support
- NVMe Card Support
- Wifi/Bluetooth support
- CAN Support
- UART Support
- I2C Support
- GPIO Support
- SPI Support
- PWM Support
- MIPI camera support

3.3 Limitations and Known Issues

- 1. Micro SD card on CTI Xavier-NX carriers will not work Jetson Orin™ NX & Orin™ Nano, As pin mapping for those pins has changed.

  2. Camera Port 4 on Boson Carrier will not stream with Orin™ NX & Orin™ Nano due to changes in CSI_4 pin function. New Carrier Boson for Orin™ NX & Orin™ Nano fixes this issue.

4. Installation

4.1 Obtaining NVIDIA® JetPack™

Before Installing the BSP you will need to install JetPack™ 5.1.1 on the host system using NVIDIA® SDK Manager (section 4.1.1) or from the NVIDIA® Embedded Download Center (section 4.1.2)

4.1.1 Installing JetPack™ from SDK Manager

For installing using sdkmanager, please follow installation steps from kdb373 for JetPack™ 4.2+ https://connecttech.com/resource-center/kdb373/

4.1.2 Installing JetPack™ from NVIDIA® Embedded Download Center

1. Create a new directory for installing the JetPack™. Referred to as <BSP_ROOT> in these instructions.

2. Go to JetPack™ Release Page https://developer.nvidia.com/embedded/jetson-linux-r3531

3. Download the "L4T Driver Package (BSP)" and "Sample Root Filesystem" files for Orin™ modules (t234 platform).

4. Put the "L4T Driver Package (BSP)" and "Sample Root Filesystem" in <BSP_ROOT>. Afterwards, you should have the following files in <BSP_ROOT>
- jetson_linux_r35.3.1_aarch64.tbz2
- tegra_linux_sample-root-filesystem_r35.3.1_aarch64.tbz2

5. Extract the "L4T Driver Package" tarball:

cd <BSP_ROOT>
sudo tar -jxf jetson_linux_r35.3.1_aarch64.tbz2

6. You should now have a new directory called Linux_for_Tegra in your <BSP_ROOT> folder. Extract the "Sample Root Filesystem" into Linux_for_Tegra/rootfs.

sudo tar -C Linux_for_Tegra/rootfs/ -xjf tegra_linux_sample-root-filesystem_r35.3.1_aarch64.tbz2

4.2 CTI BSP Installation

1. Copy the CTI-L4T-ORIN-NX-NANO-35.3.1-V###.tgz package into <BSP_ROOT>/Linux_for_Tegra.

If you are using NVIDIA®'s SDK manager then "<BSP_ROOT>" will be:
~/nvidia/nvidia_sdk/<JetPack_Version>_Linux_JETSON_NX_ORIN_TARGETS/
or
~/nvidia/nvidia_sdk/<JetPack_Version>_Linux_JETSON_NANO_ORIN_TARGETS/
depending on your target module.

Otherwise if manually installing from the NVIDIA® Embedded Download Center <BSP_ROOT> will be the folder created previously

cp CTI-L4T-ORIN-NX-NANO-35.3.1-V###.tgz <BSP_ROOT>/Linux_for_Tegra

2. Extract the BSP: tar -xzf CTI-L4T-ORIN-NX-NANO-35.3.1-V###.tgz
cd <BSP_ROOT>/Linux_for_Tegra
sudo tar -xzf CTI-L4T-ORIN-NX-NANO-35.3.1-V###.tgz

3. Change into the CTI-L4T directory:
cd <BSP_ROOT>/Linux_for_Tegra/CTI-L4T

4. Run the install script (as root or sudo) to automatically install the BSP files to the correct locations:

```
sudo ./install.sh
#return to Linux_for_Tegra
cd ..
```

5. The CTI-L4T BSP is now installed on the host system and it should now be able to flash the Orin™ NX/Orin™ Nano module.

5. Flashing Orin-NX/Orin-NANO Modules

1. Connect an NVMe m.2 card to one of the m.2 slots on your Orin™ NX/Orin™ Nano carrier.

2. Connect the Orin™ NX/Orin™ Nano and Carrier to the computer via USB, following the instructions in the appropriate manual.

3. Put the system to be flashed into recovery mode, following the instructions in the appropriate manual

4. There are two options for flashing Jetson modules:

Using CTI's automated script:
./cti-flash.sh

Follow the menu and select your desired configuration. Once selected,

the device will start to flash.

Using the Manual Method with cti-nvme-flash:

Note do not add the ".conf" file extension to the <config> parameter:

Manual Flash: ./cti-nvme-flash.sh cti/<module>/<boardname>/<config>

<module> is either orin-nx or orin-nano depending on your module.

Examples:
./cti-nvme-flash.sh cti/orin-nx/boson/base
./cti-nvme-flash.sh cti/orin-nano/boson/base

5. Once the flashing has completed, the Orin™ NX/Orin™ Nano will reboot

6. Upgrading to a New Package Release

Upgrading L4T or CTI-BSP versions without reflashing is not currently supported.

7. Switching Profiles on Orin™ NX

1. Open a terminal on the Orin™ NX/Orin™ NANO

2. Run "sudo cti-orin-nx-nano-fdt.sh"

3. Select the profile you wish to switch to from the menu.

4. Select the target module (Orin™ NX or Orin™ NANO) from the menu.

5. Restart the system

Note: This script updates the dtb by appending/replacing the FDT variable in extlinux.conf

8. Change Log

Version ORIN-NX-NANO-35.3.1 V005, Aug 21, 2023
- Initial release of Rudi-NX (NGX010) for Orin™ NX/Orin™ Nano.

Version ORIN-NX-NANO-35.3.1 V004, July 21, 2023
- Added FSM IMX304, IMX290, IMX296. IMX412, IMX415, IMX464, IMX565, IMX585, IMX678 camera configs for Boson on Orin™ Nano

Version ORIN-NX-NANO-35.3.1 V003, July 17, 2023
- Added FSM IMX304, IMX290, IMX296. IMX412, IMX415, IMX464, IMX565, IMX585, IMX678 camera configs for Boson on Orin™ NX

Version ORIN-NX-NANO-35.3.1 V002, May 15, 2023
- Initial release of Hadron (NGX012) for Orin™ NX/Orin™ Nano.
  Includes RPI-IMX219 config.
- Fixed intermittent OTG device mode detect issues in Orin™ NX/Orin™ Nano configurations.
- Retargeted Ubuntu to use vrs_rtc instead of tegra_rtc by default. There is a software bug in JetPack™ 5.0+ that causes tegra_rtc to lose it's time setting after poweroff, regardless of whether an accumulation battery is connected. Vrs_rtc has been verified as reliable and does not have this issue.

Version ORIN-NX-NANO-35.3.1 V001, Mar 30, 2023

- Initial Release for Orin™ NX and Orin™ Nano on JetPack™ 5.1.1.
  - Merged into one package since Orin™ NX and Orin™ Nano are very similar and share sources.
- Added fix for GP_PWM7, interface GPIO07 can now be used as PWM.
- Added Photon and Boson Base configs to Orin™ Nano.
- Added RPI-IMX219 camera configs for Photon on Orin™ NX and Orin™ Nano.

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	Please go to the <u>Connect Tech Resource Center</u> for product manuals, installation guides, device drivers, BSPs and technical tips. Submit your <u>technical support</u> 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.
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